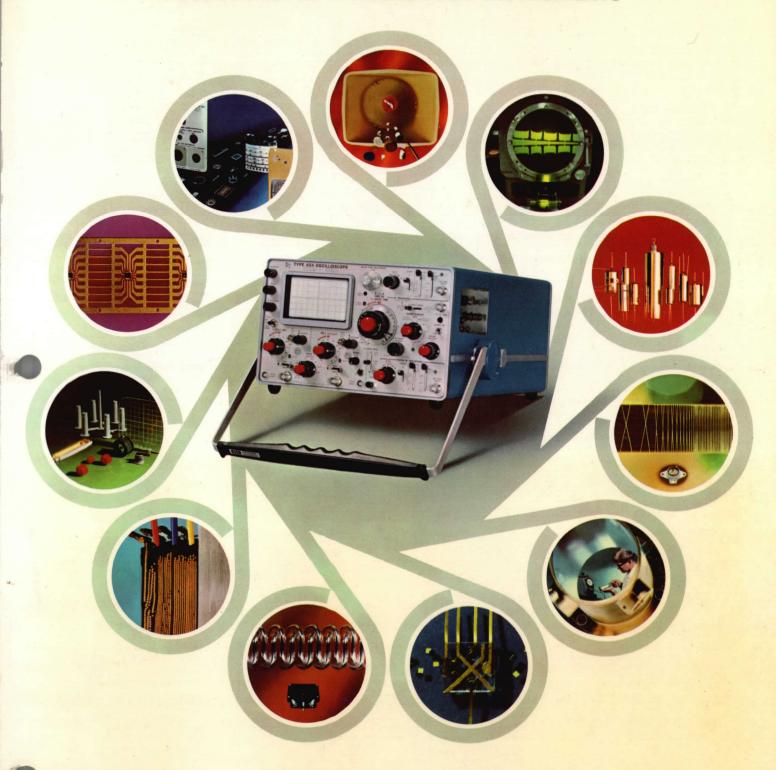
# **TEKTRONIX**

**OSCILLOSCOPES & ASSOCIATED INSTRUMENTS** 





committed to progress in waveform measurement

# TYPE 601



- BISTABLE STORAGE
- 1-V FULL-SCALE DEFLECTION FACTOR FOR VERTICAL AND HORIZONTAL DIFFERENTIAL AMPLIFIERS
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS
- ALL SOLID-STATE DESIGN

The Type 601 Storage Display Unit provides stored displays of alphanumeric and graphic information from digital computers and other data transmission systems. The Tektronix-developed bistable Storage CRT used in the Type 601 eliminates the need for costly memory devices for refreshing the information display. The built-in vertical and horizontal differential amplifiers permit Y versus T plots up to 100 kHz for remote storage monitor applications. All solid-state modular circuit design insures long-term stable performance.

#### CHARACTERISTIC SUMMARY

#### VERTICAL (Y) AND HORIZONTAL (X)

CALIBRATED DEFLECTION FACTOR—1-V full-screen deflection X and Y axis.

INFORMATION STORAGE RATE—100 thousand dots per second.

#### Z AXIS

TURN-ON LEVEL-+1 V or greater.

TURN-OFF LEVEL-+0.5 V or less.

INPUT RC—100 k $\Omega$  paralleled by 50 pF.

#### STORAGE CRT

DISPLAY AREA—Vertical—8 cm, Horizontal—10 cm.

RESOLUTION—Vertical—100 stored line pairs, Horizontal—125 stored line pairs.

ERASE TIME-200 ms.

DOT WRITING TIME-9 µs.

#### **OTHER**

REMOTE CONTROL OF ERASE AND NON-STORE

POWER REQUIREMENTS—90 to 136 or 180 to 272 VAC, 48 to 440 Hz, 57 watts max power consumption.

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ABCDEFGHIJKLMNOPGRSTUUMXYZ[~]^\_

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Stored display of standard ASCII character sets.

#### OPERATING FUNCTIONS

The Erase and Non-Store operating functions are remotely programmable through contacts at the remote program connector on the rear panel. An Erase Interval signal is also provided at this connector. X, Y, Z inputs are provided through rear BNC connectors or the remote program connector. Manual control of Erase and Power On-Off is provided on the front panel. A "ready-to-write" mode is established by erasing the CRT manually or remotely. Remote programming of the Type 601 is achieved by grounding the appropriate contacts at the rear program connector. The Intensity, Focus, Astigmatism, and Operating Level Controls are located behind the front access door for convenience of the operator.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

#### DEFLECTION FACTOR

Vertical—1 V for 8-cm deflection, adjustable from 0.75 V to 1.1 V using internal controls.

Horizontal—1 V for 10-cm deflection, adjustable from 0.9 V to 1.1 V using internal controls.

With Attenuation Resistors—Up to 150-V full screen can be obtained by adding attenuation resistors to input circuits.

#### PHASE SHIFT

Not more than 1° between X and Y up to 100 kHz.

#### Y-T DISPLAYS

Useful to 100 kHz for displaying waveforms on a Y versus T plot.

#### INITIAL BEAM POSITION

Positioned by internal adjustment to any point on the screen. Position drift is not more than 1 mm/h after 20-min warm-up.

#### POLARITY

Positive input to the vertical and horizontal inputs moves the beam up and to the right.

#### LINEARITY

The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 5%.

#### MAXIMUM INPUT VOLTAGE

±50 V combined DC and Peak AC.

#### INPUT RC

 $100 \text{ k}\Omega$  paralleled by approx 50 pF.

#### Z AXIS

The Z-axis on-time should be at least  $9\,\mu s$  to insure good storage of each written dot. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

#### INPUT

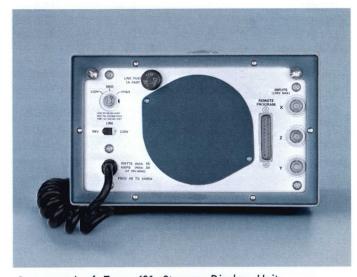
Turn-on level (unblanked) is +1 V. Turn-off level (blanked) is +0.5 V or less. Recommended source impedance for driving the Z-axis is 1 k $\Omega$  or less.

#### MAXIMUM INPUT VOLTAGE

±50 V combined DC and peak AC.

#### INPUT RC

 $100 \text{ k}\Omega$  paralleled by approx 50 pF.



Rear panel of Type 601 Storage Display Unit.

#### CRT DISPLAY AND STORAGE

#### TEKTRONIX CRT

5-inch flat-faced bistable storage tube, phosphor similar to P1.

#### DISPLAY SIZE

8 cm vertically and 10 cm horizontally.

#### STORED LUMINANCE

At least 3 foot-lamberts.

#### CONTRAST RATIO

3:1 or greater.

# TYPE 601

#### DISPLAY LINEARITY

HORIZONTAL—No more than 5% difference between any two cm.

VERTICAL—No more than 2% difference between any two cm.

#### RESOLUTION

100 stored line pairs along the vertical axis. 125 stored line pairs along the horizontal axis.

#### LINE WRITING SPEED (STORED)

At least 5 cm/ms (at specified resolution).

#### DOT WRITING TIME

9  $\mu$ s or less is required to write (store) one dot.

INFORMATION STORAGE RATE—100 thousand dots per s.

#### VIEWING TIME

Up to 15 min recommended. Longer times may be obtained; however, erasure of previously stored information becomes more difficult.

#### **ERASE TIME**

200 ms is required to clear screen of stored information.

#### OTHER CHARACTERISTICS

#### POWER REQUIREMENTS

90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz, 57 watts maximum power consumption. Rear panel selector provides rapid accommodation for six line-voltage ranges.

#### DIMENSIONS AND WEIGHTS

Height	6 in	15.3 cm
Width	$8\frac{1}{2}$ in	21.6 cm
Depth	$17^{3}/_{8}$ in	44.1 cm
Net weight	171/2 lb	8.0 kg
Domestic shipping weight	$\approx$ 24 lb	$\approx$ 10.9 kg
Export-packed weight	$\approx$ 30 lb	$\approx$ 13.6 kg

#### INCLUDED STANDARD ACCESSORIES

Connector (131-0570-00), connector cover (200-0821-00), two instruction manuals (070-0747-00).

TYPE 601	STORAGE DISPLAY UNIT	\$1075
TYPE 601	MOD 146B	\$1050

Standard instrument, less cabinet, for mounting in rack adapter.

#### **OPTIONAL ACCESSORIES**

Optional accessories serve to extend the usefulness of the Type 601 in certain applications.

#### RACK ADAPTER

#### PANEL ASSEMBLY

For covering  $\frac{1}{2}$  of rack adapter when only one Type 601 is rackmounted, order 016-0116-00 . . . . . . . . . . \$7.50



#### C-30A CAMERA



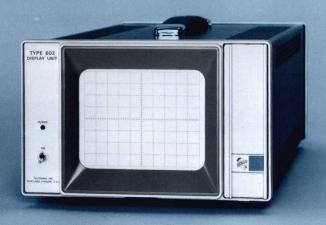
#### C-30A CAMERA CARRYING CASE

U.S. Sales Prices FOB Beaverton, Oregon Please refer to Terms and Shipment, General Information page.

<sup>\*</sup>Registered Trademark, Polaroid Corporation

# 5-INCH DISPLAY UNIT

# NEW



- 1-MHz X AND Y BANDWIDTH
- 100-mV/cm X AND Y DEFLECTION FACTORS
- X-Y PHASE DIFFERENCE WITHIN 1° TO 1 MHz
- UNIFORMLY SMALL SPOT SIZE
- DC-COUPLED Z AXIS
- ALL SOLID-STATE DESIGN

The Type 602 Display Unit is a compact, solid-state instrument with excellent resolution providing accurate displays of information from X, Y and Z signal inputs. Application areas are: phase shifts and frequency ratios using Lissajous figures, graphic and alphanumeric displays from computers, high-resolution raster displays with intensity modulation and Y-T plots of amplitude versus time displays.

Permanent records of the Type 602 display are provided on Polaroid prints using the Tektronix C-30A Camera with adapter. Two Type 602's may be mounted side-by-side using an optional rack adapter.

#### CHARACTERISTIC SUMMARY

#### VERTICAL (Y) AND HORIZONTAL (X)

BANDWIDTH-DC to 1 MHz.

DEFLECTION FACTOR—Vertical 90 mV/cm to 135 mV/cm. Horizontal 90 mV/cm to 110 mV/cm. Internally variable.

PHASE DIFFERENCE—Within 1° between X and Y to 1 MHz.

INPUT R and C—  $\approx$ 100 k $\Omega$  and  $\approx$ 30 pF.

MAXIMUM INPUT VOLTAGE— ±10 V DC plus peak AC.

#### Z AXIS

BANDWIDTH-1 MHz.

SIGNAL AMPLITUDE-0.0 to +1 V.

INPUT R and C—  $\approx$ 100 k $\Omega$  and  $\approx$ 70 pF.

MAXIMUM INPUT VOLTAGE— ±10 V DC plus peak AC.

#### **CRT**

DISPLAY AREA—8 x 10 cm.

PHOSPHOR—P31.

#### **OTHER**

POWER REQUIREMENTS—90 to 136 or 180 to 272 VAC, 48 to 440 Hz. 50 W at 115 VAC, 60 Hz.

# TYPE 602

#### VERTICAL AND HORIZONTAL AMPLIFIERS

The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.



Signal input is via BNC connectors on the rear panel.

#### BANDWIDTH

DC to 1 MHz at 3-dB down.

#### DEFLECTION FACTOR

Vertical—90 mV/cm to 135 mV/cm, internally variable. Horizontal—90 mV/cm to 110 mV/cm, internally variable.

#### PHASE DIFFERENCE

Not more than 1° between X and Y amplifiers up to 1 MHz.

#### BEAM POSITION

Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/h after 20-min warm up.

#### MAXIMUM INPUT VOLTAGE

 $\pm 10\,\mathrm{V}$  DC plus peak AC.

#### INPUT RC

 $100 \text{ k}\Omega \pm 10\%$  paralleled by 30 pF or less.

### RECOMMENDED SOURCE IMPEDANCE

 $1 \text{ k}\Omega$  or less.

#### Z AXIS

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: DC to 1 MHz over 0.0 V to  $\pm$ 1 V range. Signal input is via a BNC connector on the rear panel.

#### MAXIMUM INPUT VOLTAGE

 $\pm 10\,\mathrm{V}$  DC and peak AC.

#### INPUT RC

 $100 \text{ k}\Omega$  paralleled by approx 70 pF.

### RECOMMENDED SOURCE IMPEDANCE

 $1 \text{ k}\Omega$  or less.

#### **CRT**

#### TEKTRONIX CRT

5-inch flat-faced rectangular CRT with P31 phosphor standard, P7 phosphor optional.

#### DISPLAY SIZE

8 cm vertically and 10 cm horizontally.

#### **GRATICULE**

Standard graticule—internal, parallax-free, variable illumination.

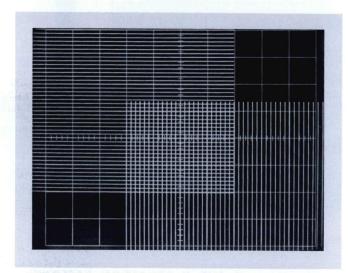
Optional graticule—internal  $8 \times 10$ -cm outline (no graticule lines).

#### TRACE WIDTH

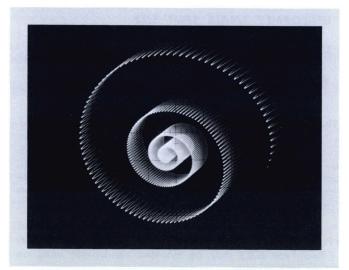
Maximum trace width within the  $8 \times 10$ -cm display area is 14 mils at 0.5- $\mu A$  beam current.

#### DISPLAY LINEARITY

The difference in any 2-cm deflection on the vertical axis is not more than 1%. The difference in any 2-cm deflection on the horizontal axis is not more than 6%.



The Type 602 provides uniform line width and linearity over full 8 x 10-cm display area.



Displayed is a low-frequency damped sinewave with 90° phase difference between X and Y inputs. A 1-MHz timing sinewave is also applied to the X, Y and Z input. Intensity modulation with the 1-MHz timing waveform adds the third display parameter and creates the illusion of depth.

# TYPE 602

#### OPTIONAL ACCESSORIES

Optional accessories serve to extend the usefulness of the Type 602 in certain applications.



#### PANEL ASSEMBLY

For covering  $\frac{1}{2}$  of rack adapter when only one Type 602 is rackmounted, order 016-0116-00 ..... \$7.50



#### C-30A CAMERA

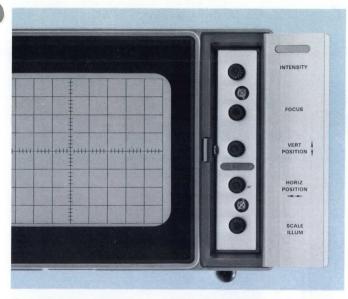
#### C-30A CAMERA CARRYING CASE

Constructed of heavy-gage, high-impact plastic, has foam-backed, vacuum-formed styrene liner. Holds C-30A Camera, all standard accessories and extra film.

Order 016-0126-00 ......\$ 35

\*Registered Trademark, Polaroid Corporation.

U.S. Sales Prices FOB Beaverton, Oregon Please refer to Terms and Shipment, General Information page.



Operating controls are conveniently located behind front panel door.

#### OTHER CHARACTERISTICS

#### POWER REQUIREMENTS

90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz. 50 watts at 115 VAC, 60 Hz. Rear panel selector provides rapid accommodation for six line-voltage ranges.

#### **TEMPERATURE**

Electrical specifications are valid over the range of  $0^{\circ}$ C to  $+50^{\circ}$ C ambient.

#### FINISH

Blue vinyl painted cabinet, aluminum construction.

#### DIMENSIONS AND WEIGHT (cabinet included)

Height	6 in	15.3 cm
Width	8½ in	21.6 cm
Depth	$17^{3}/_{8}$ in	44.1 cm
Net weight	171/2 lb	7.9 kg
Domestic shipping weight	$\approx$ 22 lb	$\approx$ 9.9 kg
Export-packed weight	≈28 lb	$\approx$ 12.7 kg

#### INCLUDED STANDARD ACCESSORIES

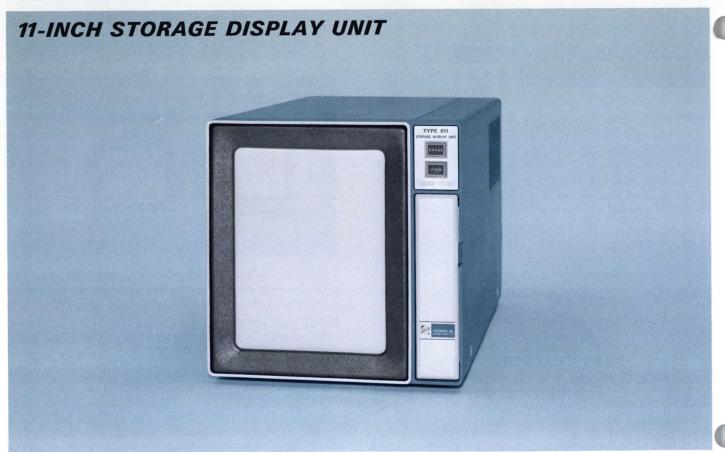
Smoke-gray filter, installed (378-0586-00); two instruction manuals (070-0799-00).

TYPE	602	DISPLAY	UNIT										٠.	\$700

# TYPE 602 MOD 146B DISPLAY UNIT ..... \$675

Standard instrument, without cabinet, for mounting in rack adapter. Requires  $5\frac{1}{4}$ -inch vertical rackmounting space.

If optional P7 phosphor is ordered, smoke-gray filter (378-0586-00) is deleted and orange filter (378-0595-00) is added.



- FLICKER-FREE DISPLAYS
- HIGH RESOLUTION ALPHANUMERIC AND GRAPHICS DISPLAY CAPABILITIES
- WRITE-THROUGH ABILITY
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS

The Type 611 Storage Display Unit permits stored displays of combined alphanumeric and graphic information from digital computers and other data transmission systems. The Tektronix-developed bistable Storage CRT used in the Type 611 eliminates the need for costly memory devices for refreshing the information display and provides high information density without flicker or drift and with excellent resolution. A write-through feature provides the operator the ability to visually position the writing beam to any point on the CRT display area without distrubing previously stored information. All solid-state circuit design insures long-term stable performance. The standard instrument provides a vertical format display area with the same aspect ratio as a typewritten page. A horizontal format display is available in a Type 611 Mod 162C.

#### CHARACTERISTIC SUMMARY

#### VERTICAL AND HORIZONTAL

CALIBRATED DEFLECTION FACTOR—1-V full screen deflection X and Y axis.

**SETTLING TIME**—3.5  $\mu$ s/cm + 5  $\mu$ s.

#### Z AXIS

TURN-ON LEVEL-+1 V or greater.

TURN-OFF LEVEL-+0.5 V or less.

INPUT RC—100 k $\Omega$  paralleled by 50 pF.

#### STORAGE CRT

**DISPLAY AREA**—Vertical—21 cm, Horizontal—16.2 cm. 25% incrementally storable.

RESOLUTION—Equivalent to 400 stored line pairs along the vertical axis; 300 stored line pairs along the horizontal axis.

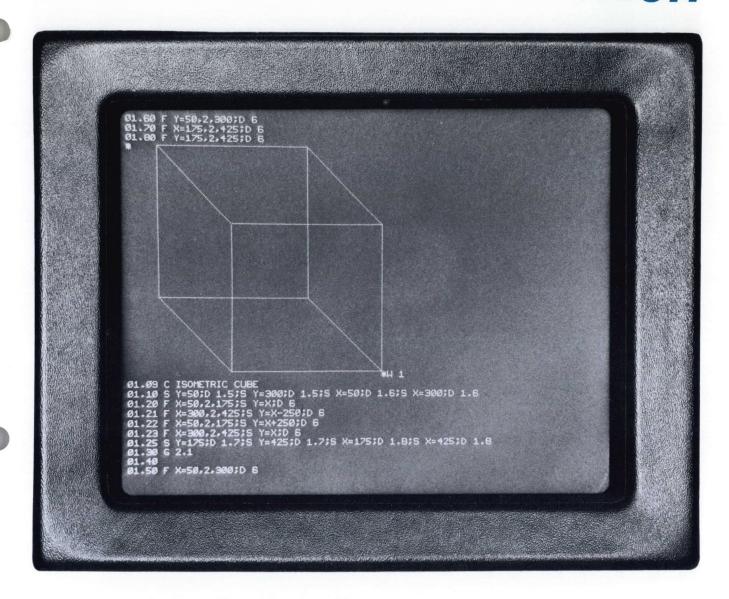
ERASE TIME—0.5 seconds.

DOT WRITING TIME—20  $\mu$ s

#### **OTHER**

REMOTE CONTROL OF ERASE, NON-STORE, VIEW AND WRITE-THROUGH

POWER REQUIREMENTS—90 to 136 or 180 to 272 VAC, 48 to 66 Hz, 250 watts.



The Type 611 Storage Display Unit is ideally suited for information display applications. Up to 4000 alphanumeric characters may be stored and legibly displayed. The above photo, and the photo at the top of page 284, was taken from a Type 611 used as the readout device of a remote computer terminal.

#### OPERATING FUNCTIONS

The Erase, Non-Store, Write-Through and View operating functions are remotely programmable through contacts at the remote program connector on the rear panel. An Erase Interval signal is also provided at this connector. X, Y, Z inputs are provided through rear BNC connectors or the remote program connector (optional). Manual control of Erase and View is provided on the front panel. Remote programming of the Type 611 is achieved by grounding the appropriate contacts at the rear program connector. The remote switching device must be capable of switching +10 V to approx ground (+0.5 V to -10 V) and handle up to 5 mA of current.

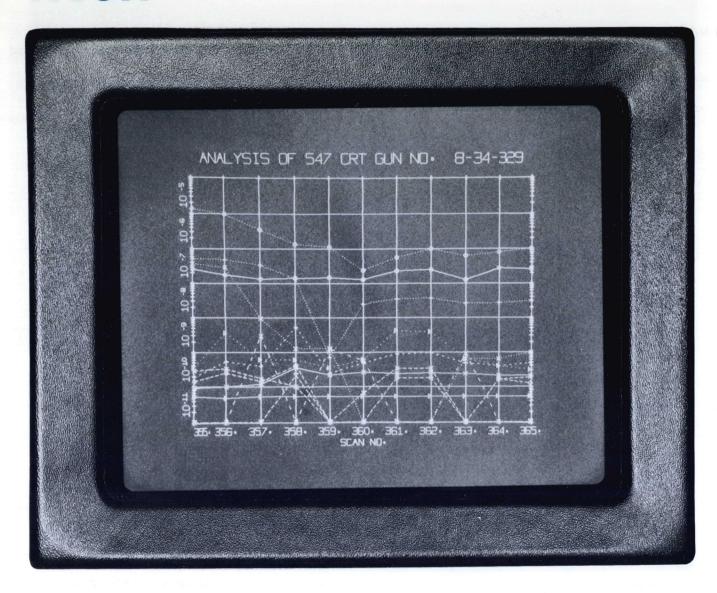
A "ready-to-write" mode is established by erasing the CRT. When the new information has been written, the instrument will be in the "view" mode for approximately one minute and will then automatically switch to the "hold" mode. This holds in-

formation stored on the CRT at a low brightness to improve CRT life. Pressing the VIEW switch while in the "hold" mode returns instrument to the "view" mode for approximately 1 minute.

A special "write-through" feature is provided and is programmed through the rear-panel program connector. When the program contact is closed the CRT beam is unblanked if Z-axis is activated, and "viewed" without destroying previously stored information, and without storing new information. A combination of reduced beam current and beam movement to form a circular small diameter Lissajous pattern prevents storage.

The Intensity, Focus, Operating Level, Power Switch and Test Spiral controls are located behind a front-panel access door. Pushing the Test Spiral switch causes the instrument to complete an erase cycle and store a single-shot test pattern presentation. Pulling TEST SPIRAL switch provides a "non-store" mode with repetitive test pattern for focusing and other tests.

# TYPE 611



Alphanumeric and graphic display taken from a Type 611 used in a remote computer terminal application.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

#### **DEFLECTION FACTOR**

Vertical—1-V full scale (16.2 cm for square format or 21 cm for rectangular format), accuracy within 2%.

Horizontal—1-V full scale (16.2 cm), accuracy within 2%.

With Attenuation Resistors—Up to 75-V full screen for vertical or horizontal deflection can be obtained by adding attenuation resistors to input circuits.

#### INITIAL BEAM POSITION

Any one of 9 initial beam positions can be selected by internal switches. Each position is adjustable  $\pm 10\%$  of full scale both vertically and horizontally.

#### SETTLING TIME

 $3.5 \,\mu s/cm \,+\, 5 \,\mu s$ , to within 1 spot diameter of final position.

#### POLARITY

Positive input to the vertical and horizontal inputs moves the beam up and to the right.

#### LINEARITY

The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 10%.

#### MAXIMUM INPUT VOLTAGE

±50 V combined DC and peak AC.

#### INPUT RC

100 k $\Omega$  paralleled by approx 60 pF.

#### POSITIONAL STABILITY

0.16 mm (or less)/hour with 75- $\Omega$  source impedance at 20° C to 30° C. Within 1.6 mm/hour with 75- $\Omega$  source impedance at 10° C to 50° C. Reference 25° C.



#### **Z-AXIS**

#### INPUT

Turn-on level (unblanked) is +1 V. Turn-off level (blanked) is +0.5 V.

#### MAXIMUM INPUT VOLTAGE

±50 V combined DC and peak AC.

#### INPUT RC

 $100 \text{ k}\Omega$  paralleled by approx 50 pF.



Rear panel of Type 611 Storage Display Unit.

#### CRT DISPLAY AND STORAGE

#### TEKTRONIX CRT

11-inch flat-faced bistable storage tube, phosphor similar to P1.

#### DISPLAY SIZE

Vertically—21 cm (approx  $8^5/_{32}$  in), Horizontally—16.2 cm (approx  $6^7/_{16}$  in). Display area is up to 25% incrementally storable.

#### STORED LUMINANCE

At least 3 foot-lamberts.

#### CONTRAST RATIO

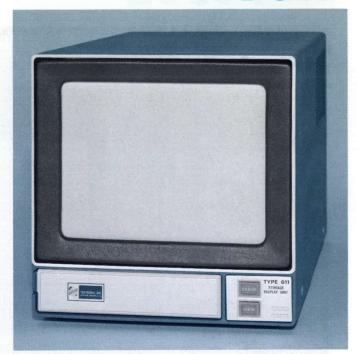
3:1 or greater.

#### RESOLUTION

4,000 characters based on a 90 x 70 mil matrix, clearly legible with good spacing. Equivalent to 400 vertical x 300 horizontal stored line pairs. (Resolution is measured using 400 x 300 stored dots since closely spaced line pairs exceed 25% incremental storage.)

#### VIEWING TIME

Less than 15 min recommended. Viewing time may be longer; however, erasure of previously stored information becomes more difficult.



Type 611 MOD 162C features a horizontal display format.

#### **ERASE TIME**

500 ms or less.

#### DOT WRITING TIME

20 µs is required to write (store) one bit of information.

#### OTHER CHARACTERISTICS

#### ERASE INTERVAL PULSE

A negative-going erase pulse is provided at the rear program connector to inhibit external equipment during an erase cycle. Amplitude is approx 10 V, source impedance approx  $2 \, k\Omega$ .

#### POWER REQUIREMENTS

90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 250 watts maximum at 115 V and 60 Hz. Rear panel selection provides rapid accommodation for six line-voltage ranges.

#### DIMENSIONS AND WEIGHT

11.1.1.	117/	20.1
Height	$11\frac{7}{8}$ in	30.1 cm
Width	$11^{5}/_{8}$ in	29.5 cm
Depth	$22^{3}/_{8}$ in	56.8 cm
Net weight	51 lb	23.1 kg
Domestic shipping weight	62 lb	28.1 kg
Export-packed weight	72 lb	32.6 kg

#### INCLUDED STANDARD ACCESSORIES

External program connector (131-0570-00); connector cover (200-0821-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0752-00).

# TYPE 611 STORAGE DISPLAY UNIT ...... \$2500 TYPE 611 MOD 162C ...... \$2500

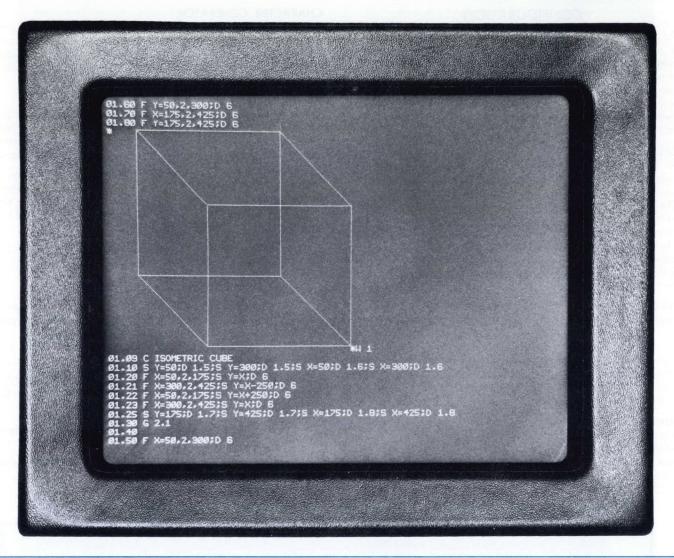
Horizontal display format with same accessories as standard instrument.

U.S. Sales Price FOB Beaverton, Oregon Please refer to Terms and Shipment, General Information page.

# TYPE **T4002**



The Tektronix Type T4002 Graphic Computer Terminal is a completely self-contained, desk-top, information display system designed to facilitate rapid and efficient exchange of information between man and computer. Complete communication interaction is achieved through a solid-state, data-entry keyboard and visual displays of high-resolution alphanumerics and graphics. A Tektronix developed, direct-view storage cathode-ray tube is used as the display medium. High-density alphanumerics and complex graphics are presented without flicker or drift. Resolution achieved is equivalent to 400 x 300 line pairs.



# CHARACTERISTIC SUMMARY

#### CONTROL PANEL

KEYBOARD—Full USASCII (128 codes).

POWER—Key switch.
CONTROL LOCK—Key switch for security purposes.

#### MODE CONTROLS:

On line/local.

Computer status indicator (ready/busy).

Input (keyboard/auxiliary).

Output (display/auxiliary or both).

#### SPECIAL FUNCTIONS:

Page full—Halts output when screen is full.

Margin shift—Allows four margin positions for increased information.

Error indicator-Lights on detected error.

Data received—Indicates computer output.

Interrupt—Used to halt computer output.

#### **INTERFACE**

TYPE 4801—For Digital Equipment Corporation PDP-8 Series Computers.

TYPE 4802—For Bell System Type 201 and Type 202 data sets and other compatible modems or highspeed data systems.

#### DISPLAY CHARACTERISTICS

DISPLAY AREA—61/2 inches x 81/4 inches.

ERASE TIME-0.5 second.

LUMINANCE->3 fL.

CONTRAST RATIO— >3:1.

RESOLUTION—Equivalent to 400 x 300 line pairs.

#### DISPLAY CAPABILITY

96 USASCII symbols including both upper and lower case characters, numbers and special symbols.

#### **GRAPHICS:**

Point plot.

Incremental plot.

Linear interpolation (vector).

1024 x 1024 addressable points.

#### ALPHANUMERIC:

35 lines.

80 symbols per line.

2 sizes of characters under program control (others avail-

Approximately 1000 characters per second writing capability.

# TYPE **T4002**

#### CONFIGURATION

All of the elements required to effectively communicate with a computer are contained within the T4002 console. System components are: display unit; terminal control; character generator, input/output interface; and keyboard. Space is provided within the terminal to accommodate an auxiliary module for expanding system capability. Interfaces are available for direct coupling to computers or data communication systems.

#### DISPLAY UNIT

A Tektronix, 11-inch, direct-view, bistable storage tube is used as the display medium. High-density alphanumerics and complex graphics are presented without flicker or drift. The 6½-inch by 8½-inch screen will accommodate up to 35 lines of alphanumeric characters with 80 symbols per line. More than 2800 characters may be displayed with excellent clarity. Resolution achieved is equivalent to 400 x 300 line pairs. The luminance level of stored information is at least 3 fL and contrast ratio at least 3:1. Stored information may be erased in 0.5 seconds or less.

#### **KEYBOARD**

Manual entry of data is through a solid-state keyboard with full USASCII capability (128 codes). 96 upper and lower-case characters, numbers and special symbols are provided for alphanumeric data entry. Two sizes of characters are under program control with others available. 32 additional control characters are included for communications between the computer and the terminal.

#### TERMINAL CONTROL

The terminal control provides timing logic, data buffers and interconnection logic for the character generator, keyboard and auxiliary module. Linear interpolation is a function of the terminal control, D/A converters and plot logic. 1024 x 1024 points are addressable.

#### CHARACTER GENERATOR

The character generator provides a set of 94 USASCII printable characters. Two sizes of characters are under program control,  $70 \times 90$  mils and  $140 \times 180$  mils. Up to 1000 characters per second (average) may be generated and stored on the display tube.

#### CONTROLS AND INDICATORS

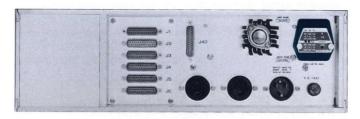
In addition to a standard alphanumeric keyboard, other controls are provided to enhance ease of operation. The number of panel controls are minimized and control functions made automatic where practical (see photo of control panel).

- Control Characters—The USASCII provides for 32 control characters to be utilized for communication between computers and remote I/O equipment. Keys to activate these control characters are provided on the right portion of the keyboard.
- VIEW—Switches the display from a hold mode to a view mode for approximately 1 minute.
- 3. ERASE—Erases the display.
- Format Controls—Provide a means of moving the cursor when fixed-format alphanumerics are used. The five format buttons (top left of keyboard) move the cursor UP, DOWN, RIGHT, LEFT or HOME (fixed reference point).
- POWER—Key switch for Power ON/OFF and CON-TROL LOCK. Control lock position locks out all keyboard and control functions.
- ON LINE/LOCAL—Controls on-line and off-line terminal operation and indicates status.
- READY/BUSY—Indicator to signal the status of the computer when an initial inquiry is made from the terminal.



# TYPE **T4002**

- INPUT—Permits selection of KEYBOARD or AUXILI-ARY as input to computer. Indicates status.
- OUTPUT—Permits selection of the DISPLAY or AUX-ILIARY or both to receive output from computer. Indicates status.
- PAGE FULL—Indicates full page and stops information from computer.
- 11. MARGIN SHIFT—Allows a choice of four margin positions, starting on the left and moving to the right. Useful when writing columns of short statements.
- ERROR/HALT—Indicates echoplexed character is not identical to the character sent. HALT control allows a halt on data error detection.
- DATA RECEIVED—When the computer makes an entry to the display, the indicator lights. Pressing the control extinguishes the indicator.
- 14. INTERRUPT—Any time the computer is sending data, all controls on the terminal are inhibited except the INTERRUPT switch (and the POWER switch). Pressing this switch stops the transmission and allows the operator to send data to the computer.
- 15. DIRECT/COMPOSE—Controls text editing function and indicates status.
  Direct: Each character is processed as it is typed. Compose: Each character is sent to an editor-buffer for future corrections, additions, or processing.
- OVERFLOW/CLEAR—Overflow indicator lights when the editor-buffer capacity is exceeded. Depressing the control will clear the editor-buffer of stored information.
- TRANSMIT—Depressing the control switches the terminal to direct and processes the information stored in the editor-buffer.



Rear panel of Type T4002

# OTHER CHARACTERISTICS

#### POWER REQUIREMENTS

Quick-change line-voltage selector provides three ranges: 90 to 110 V, 104 to 126 V and 112 to 136 V. 48 to 66 Hz, 375 watts maximum at 117 V and 60 Hz. An AC outlet, with power controlled by the terminal ON/OFF switch, is provided at the rear panel for auxiliary equipment. Maximum available power from the outlet is 300 watts.

#### OPERATING TEMPERATURE

Normal operation over 20°C to 50°C range.

#### DIMENSIONS AND WEIGHTS

Height	191/2 inches
Length	35 inches
Width	19 inches
Net weight	103 pounds

#### TYPE T4002 GRAPHIC COMPUTER TERMINAL .... \$8000

#### **OPTIONS**

#### INPUT/OUTPUT INTERFACE

The terminal interface provides code conversion, logic levels and necessary connections to interface with a computer or data communication system. Initially two types of interface are available: Type 4801 for Digital Equipment Corporation PDP-8 Series Computers; and Type 4802 for interface with Bell System Type 201 and Type 202 Data Sets and other compatible acoustic modems or high-speed data systems.

# TYPE 4801 DEC PDP-8 SERIES INTERFACE, WITH CABLE

# TYPE 4802 DATA COMMUNICATIONS INTERFACE, WITH CABLE ...... \$ 515

#### AUXILIARY MODULE

Provision is made inside the terminal console for an auxiliary plug-in module to expand future capability. Inputs to peripheral gear and outputs from peripheral gear such as teleprinters, tape readers and magnetic recorders are feasible. A blank plug-in is available to satisfy unusual or special design requirements.

AUXILIARY MODULE, order 040-0507-00 ...... \$ 75

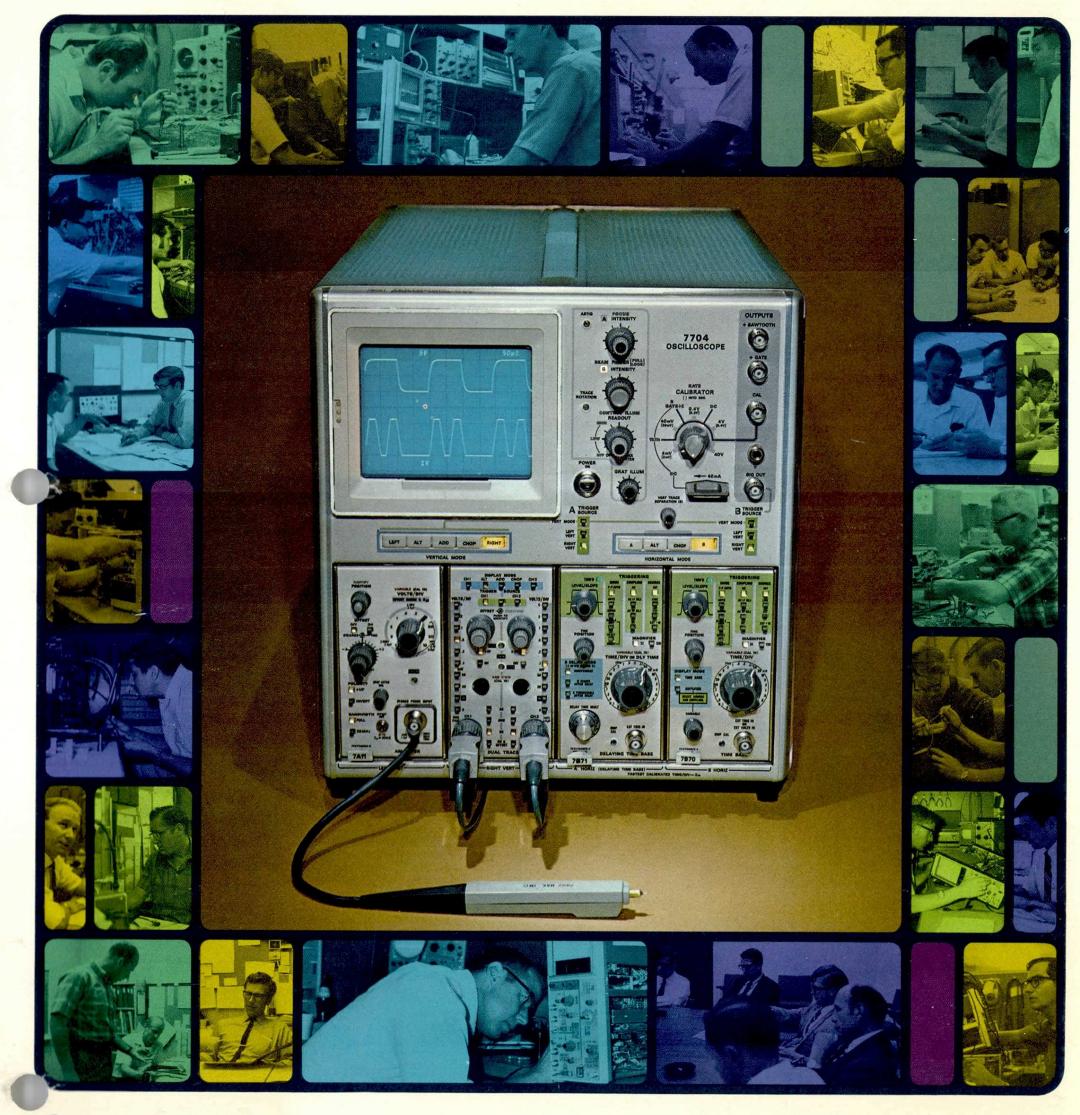
#### CAMERA

A specially designed camera will be available that permits photographing displays on Polaroid film for permanent records.

U.S. Sales Prices FOB Beaverton, Oregon Please refer to Terms and Shipment, General Information page.

# TEKTRONX

**OSCILLOSCOPES & ASSOCIATED INSTRUMENTS** 





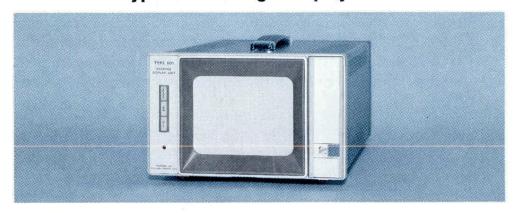
committed to progress in waveform measurement

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In recognition of the increasing needs for readout devices for computer consoles and remote terminals, Tektronix has devoted considerable time and effort to designing and producing display components which will effectively fulfill these needs. These products cover a wide range of applications including scientific research, process monitoring, production control, retrieval of information necessary for managerial decisions, classroom needs, and computer program development.

The following is a summary of the Tektronix Information Display Devices. The specification pages contain a more detailed description of the technical aspects and full capabilities of each device.

Type 601 Storage Display Unit



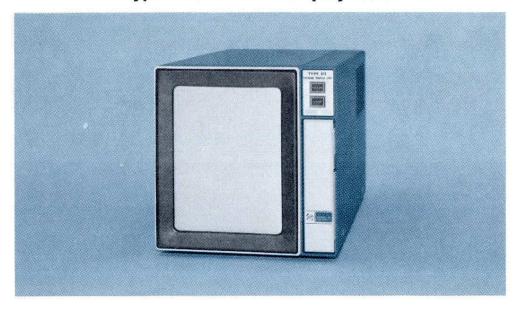
The Type 601 Storage Display Unit provides stored displays of alphanumeric and graphic information from digital computers and other data transmission systems. Costly memory devices for refreshing the information display are not necessary. Resolution is specified at 100 (vertical) and 125 (horizontal) stored line pairs for the 8 x 10 cm display area. X, Y, Z inputs are provided through rear BNC connectors or through the remote program connector.

Type 602 Display Unit



The Type 602 Display Unit is a compact, solid-state refreshed instrument with excellent resolution providing accurate displays of information through X, Y, and Z signal inputs. The Type 602 is particularly suited for applications which require unusually high resolution. Maximum trace width within the 8 x 10-cm display area is 14 mils at 0.5  $\mu$ A beam current. Typical application areas are: phase shift and frequency ratio measurements, graphic and alphanumeric displays from computers, high-resolution raster displays with intensity modulation and Y-T plots of amplitude versus time.

Type 611 11-Inch Display Unit



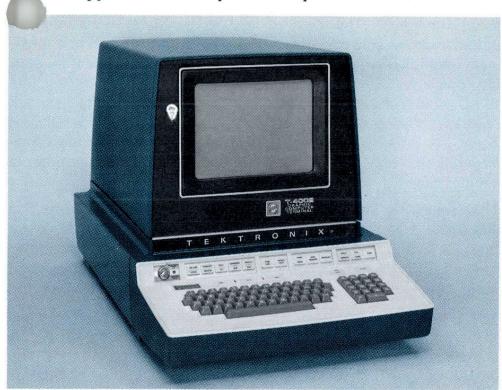
The Type 611 Storage Display Unit is designed to function as a readout device for computer terminals. With X, Y, and Z input signals provided by peripheral equipment, this instrument is capable of displaying high-density alphanumeric and comparable information without drift or annoying flicker. The screen is 21 cm x 16.2 cm with resolution equivalent to 400 (vertical) and 300 (horizontal) stored line pairs. 4000 characters, 90 x 70 mils in size may be clearly displayed.

Type 4501 Scan Converter Unit



The Type 4501 Scan Converter Unit is an analog memory device with readout in the form of a composite television signal. Information written on its 5-inch storage tube from a computer or other source is converted to composite video or modulated RF for convenient viewing on large-screen television monitors or receivers. The bright displays achieved in this manner are ideal for individual or group viewing under high-ambient light conditions. A Tektronix, 5-inch rectangular bistable storage tube is utilized as the memory device and provides resolutive equivalent to 100 by 125 stored line pairs. Output from single scan converter may be looped through a number of monitors for viewing at remote locations. Multiple scan converter outputs can be mixed for color displays.

Type T4002 Graphic Computer Terminal



The Type T4002 is a completely self-contained, desk-top information system which provides a high-resolution, flicker-free display with both high-speed complex graphic and high-density alphanumeric capability. Its unique direct-view storage tube eliminates the requirement for a separate refresh memory and minimizes the information rate requirements of the data source. The annoying flicker associated with most refreshed displays is also eliminated. The new data is written only once and data can therefore be sent to the terminal at a convenient rate of 2000 characters per second (AVERAGE).

T4002 Graphic Computer Terminal consists of a display unit, terminal control, character generator, keyboard module, input/output interface and auxiliary unit.

The direct-view bistable storage tube provides most of the economic advantage of this type of system by eliminating costly refresh memory devices. The slower speed allows the use of software for much of the data formatting and data control functions. An analog character generator, with its characteristic of high-accuracy and low-slew rate also contributes to the low-system cost.

The 11-inch, flicker-free display  $(6-1/2 \times 8-1/4-inch \text{ screen})$  accommodates 39 lines of alphanumeric characters of 85 symbols each, permitting more than 3000 characters to be displayed. Resolution is equivalent to 287 x 400 line pairs. Stored information may be erased in less than 0.5 second.

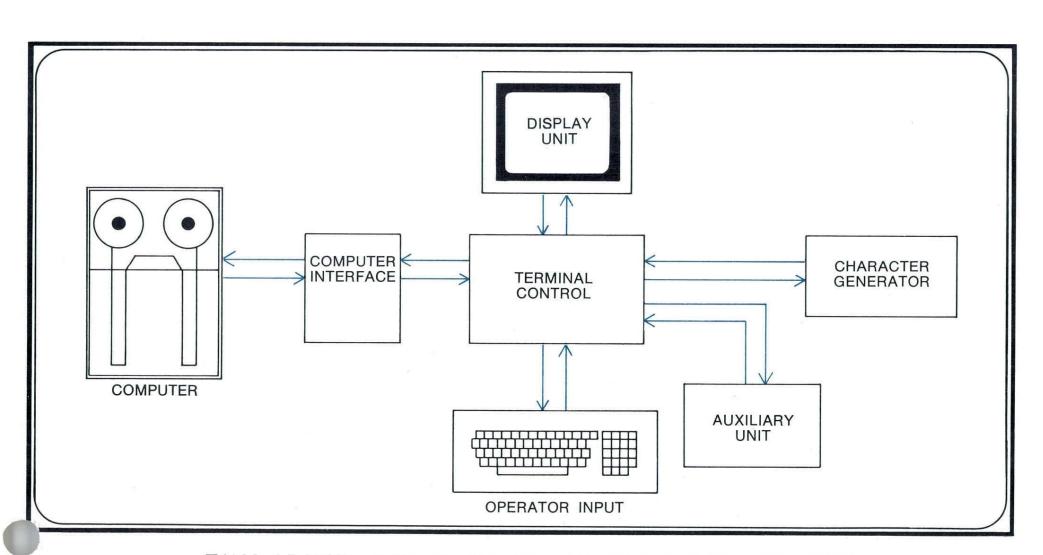
The terminal control provides timing logic, data buffers, interconnection logic, function decoding, line-buffer control, D/A converters and plot logic for the character generator, keyboard and auxiliary module. All the data is routed and priorities determined by the terminal control.

The character generator provides a complete set of USASCII printable characters with both upper and lower case, numerals and special symbols. Two sizes of characters are under program control.

The control panel is designed for ease of operation with panel controls held to a minimum by automatic control functions. The standard keyboard contains keys for 96 USASCII characters and 32 control characters.

To ensure maximum flexibility, the terminal can be interfaced with the following Tektronix Display instruments.

Type 601		(5-inch storage	monitor)
Type 602	? (5-inch	high-resolution	monitor)
Type 611		(11-inch storage	monitor)
Type 450	1 Scan Converter	(large-screen TV	display)



T4002 GRAPHIC COMPUTER TERMINAL BASIC BLOCK DIAGRAM

The T4002 is designed to use existing software as much as possible. TTY teletype interface is provided to allow complete compatibility with common existing teletype terminals. Thus, the user who is connected into a time-share service or computer with a regular teletype can connect the terminal with no change in software. Note: There may be a teletype-speed limitation unless the computer interface is modified to eliminate the time delays for TTY teletype. Once this high-speed link is available, however, the full capabilities of the Tektronix Type T4002 may be utilized.

Four modes of display are selectable on the Type T4002: (1) Alphanumeric, (2) Point plotting, (3) Incremental plotting, and (4) Linear interpolation plotting. A fixed grid of 1024 x 742 viewable points are available in any of the four modes.

The following discusses three modes of graphic displays selectable on the T4002. Programs that have been developed in any of the three modes mentioned below will generally be suitable for use with the Type T4002 with only minor modifications.

- Point Plot: The point-plot mode generates a display by providing a separate address for each point and then plotting it. Although there is no restriction on where the point is placed, this mode can be inefficient because of the amount of data required to draw a graphic display.
- 2. Incremental Plot: Incremental-plot mode is widely used by mechanical plotters. The display is generated by providing an address for the beginning point. The next point must be adjacent in one of eight directions and may be printed or not printed. This incremental technique saves data bits compared to the point-plot mode.
- 3. Linear Interpolation: The linear-interpolation mode provides a beginning and ending address. A line is then generated between the two points. This vector-type display allows smoother lines to be drawn since the beginning and ending points are the only points that must be on the fixed grid. Because minimal data is required to draw graphics, this mode is particularly appropriate for transmitting data over phone lines.

One of the greatest advantages of the computer terminal is the fact that programming is made so much easier and quicker. When writing and "debugging" programs, a teletype readout is slow enough that the programmer often loses his train of thought. The mind usually thinks much faster than a teletype can print out program elements. The tremendous speedup of the T4002 with its quick readout allows a rapid input back into the system. Thus, ideas and changes are applied without delay and the effects may be immediately observed. This interactive display capability is particularly important when developing graphics programs, since there is little delay from program development to program observation.

# LINE BUFFER

The new Line-Buffer feature of the T4002 Graphic Computer Terminal consists of a one-line, 84-character local memory. This memory is used in conjunction with a 1-cm x 21-cm refreshed area at the bottom of the tube. The information is in alphanumeric form, thus the user can edit the text before sending the information to the computer as a one-line message block. Information may be updated and verified, corrected if necessary, before it is sent to the computer.

Use of the Line-Buffer feature is as follows: The COMPOSE button is pressed to change operation from DIRECT to COMPOSE. At this time, any characters previously entered into the Line Buffer are presented in one line across the bottom of the tube. Information can be changed in one of several manners.

The CLEAR button clears the Line Buffer and the cursor reverts to the left-hand edge of the refreshed area (point of entropy next character). The desired text is typed, entered into buffer memory and appears in the Line-Buffer area. When maximum capacity is reached, the FULL button is lighted to alert the operator. Once the message is complete, pressing the SEND button sends all of the text to the computer as a block of data. The buffer memory is not erased until the CLEAR control is pressed. Therefore, if an error is made during transmission, the text can be recalled and sent to the computer a second time.

This operation offers two advantages. First, text is edited and you know it is correct before you send it; second, it allows you to send a burst of text (i.e., one complete line as opposed to a number of individual characters) which minimizes transmission time.

The Line-Buffer area is also convenient for correcting messages. If the message is not correct as first typed, editing is accomplished as follows: The keyboard is backspaced until the cursor is positioned above the location where a change is desired. Backspacing across a character erases that character from the buffer memory. The character is deleted and the erased part of the text is retyped.

The Line Buffer operation combines many of the advantages of refreshed terminal with the advantages of the direct-view storage tube. This feature is particularly desirable where relatively unskilled operators require information over a time-share network, e.g., parts information and parts drawing applications where a very small amount of input must be accurate.

Another area of Line-Buffer usage is when the terminal is used as a remote "batch" device. Such a use requires upda of information in computer files. The information that is be sent to the computer is the updated information and must be correct. Therefore, it is desirable to compose and verify the entire entry before sending it to the computer.

# **INTERFACE UNITS**

Several interface options are available for the T4002 which increase its efficiency and versatility as a data communications terminal.

# Type 4801 and Type 4803 Interface Unit

The Type 4801 Interface Unit is designed to interface the Tektronix Graphic Computer Terminal to the Digital Equipment Corporation's PDP-8 Series of computers with negative input/ output buses. The Type 4803 Interface Unit is designed to match the Tektronix Graphic Computer Terminal to the Digital Equipment Corporation's PDP-8 Series of small computers with positive input/output buses. (The following applies to the Type 4801 and Type 4803.) Data is transferred in parallel under Program Data Transfer control of the PDP-8. When receiving input data from the PDP-8, the unit decodes the data, converts the logic, and provides transfer timing information to the Terminal Control. When transmitting output data, the unit changes the Terminal Control data to match the PDP-8 logic and transfers it under control of the computer's timing pulses. Each unit has its own external interconnecting cable wired for direct connection to the PDP-8's Input/Output Bus.

# Type 4802 Interface Unit

The Type 4802 is designed to allow the Tektronix Graphic Computer to communicate with devices which transfer data ser in either a full or half duplex mode. It is designed to conto EIA Standard RS-232-B (October, 1968) which defines the minimum required circuits and electrical signal characteristics for exchanging binary serialized data. The Type 4802 has its

own internal clocks or it can be synchronized with external times signals. Therefore, it is compatible with synchronous and as, chronous modems. It has its own external interconnecting cable which matches up with many of the most common modems.

The main feature of the Type 4802 is that it gives the Graphic Computer Terminal the capability of working with time-sharing computers over telephone lines. The Type 4802 is wired at the factory to interface with a particular modem specified by the customer. Therefore, the customer, when ordering a Type 4802 must specify a baud transmit and receive rate. The unit he receives will be wired accordingly. Additional timing interface cards may be purchased to adapt the Type 4802 to different modems.

### **APPLICATIONS**

The following are intended to illustrate examples of Type T4002 applications. These brief examples should not be considered as all encompassing. The Type T4002 is a versatile Graphic Computer Terminal capable of solving an extremely wide range of applications.

### MATHEMATICAL CALCULATION



The most common usage of time-sharing terminals today is calculation. With FORTRAN, engineers and scientists can create complex and highly repetitive routines for the computer to handle, insert the variables or parameters, and in a very short time obtain output. This allows exploration of a broad range of possible solutions, and decision-making based on analysis of a large sample or of ALL possible outcomes.

The T4002 is particularly useful in this kind of problem solving when the output is graphic rather than numeric. Certain kinds of problems need to be reduced to graphic form just to enable the user to understand the answer. Other problems lend themselves to easier solution when graphics can be used to reduce a mass of data to a form from which conclusions can more easily be drawn.

# INQUIRY PROCESSING

The Entire keypunch, key verify, card handling sequence is eliminated in data processing applications when a display terminal ded for reference, addition, and correction. A typical application would be master file of customers with frequent re-

quests for access to change data or to obtain information on which to take action. A personnel system in a medium or large-size corporation would be another data base which could be economically handled with display terminal access and input. Particular advantage is gained in situations where the customer is "on-line" at the same time as his record is (Customer service Telephone answering).

# MANAGEMENT INFORMATION RETRIEVAL



A series of displays, graphs, or charts, with appropriate titling and explanations is very conveniently displayed with the T4002 on the executive's desk top. It can be called up by the executive himself, using simple instructions to the computer. The individual manager can implement his own particular needs for information, with the emphasis on data summary and exception reporting, within a standardized format so that the programming effort does not become prohibitive. Updating of the data for these displays can be done automatically with the updating cycles of the master files.

# PROGRAMMING AND DEBUGGING

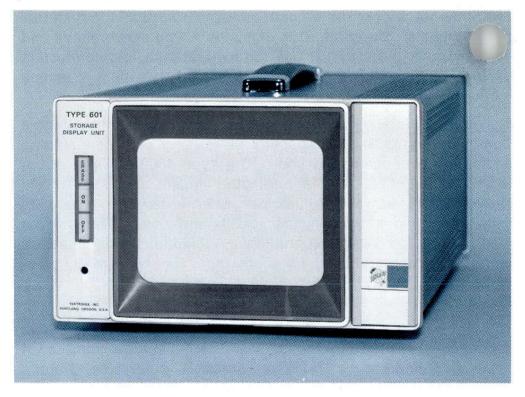
The T4002 is well suited for use in a time-sharing or multiprogramming environment, particularly for on-line conversational program development. The terminal can be connected to a computer with a BASIC support program in its library and the user can begin to write his problem-oriented program. As each line of the program is completed, the computer will examine it against the parameters of the support program and respond on the display screen. The transmission speed and display writing speed of the T4002 make program development and debugging more efficient. When the programmer wishes to review the program written, for whatever reason, he can quickly scan "page after page" in rapid succession. When the program is completed, it can be assigned a place in the program library, located in a high-speed data storage unit, peripheral to the central computer, available for immediate use.

- BISTABLE STORAGE
- 1-V FULL-SCALE DEFLECTION FACTOR FOR VERTICAL AND HORIZONTAL DIFFERENTIAL AMPLIFIERS
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS
- ALL SOLID-STATE DESIGN

The Type 601 Storage Display Unit provides stored displays of alphanumeric and graphic information from digital computers and other data transmission systems. The Tektronix-developed bistable Storage CRT used in the Type 601 eliminates the need for costly memory devices for refreshing the information display. The built-in vertical and horizontal differential amplifiers permit Y versus T plots up to 100 kHz for remote storage monitor applications. All solid-state modular circuit design insures long-term stable performance.

# OPERATING FUNCTIONS

The Erase and Non-Store operating functions are remotely programmable through contacts at the remote program connector on the rear panel. An Erase Interval signal is also provided at this connector. X, Y, Z inputs are provided through rear BNC connectors or the remote program connector. Manual control of Erase and Power On-Off is provided on the front panel. A "ready-to-write" mode is established by erasing the CRT manually or remotely. Remote programming of the Type 601 is achieved by grounding the appropriate contacts at the rear program connector. The Intensity, Focus, Astigmatism, and Operating Level Controls are located behind the front access door for convenience of the operator.



# CHARACTERISTIC SUMMARY

# VERTICAL (Y) AND HORIZONTAL (X)

CALIBRATED DEFLECTION FACTOR—1-V full-screen deflection X and Y axis.

**INFORMATION STORAGE RATE**—100 thousand dots per second.

# Z AXIS

TURN-ON LEVEL-+1 V or greater.

TURN-OFF LEVEL—+0.5 V or less.

INPUT RC—100 k $\Omega$  paralleled by 50 pF.

# STORAGE CRT

DISPLAY AREA—Vertical—8 cm, Horizontal—10 cm.

**RESOLUTION**—Vertical—100 stored line pairs, Horizontal—125 stored line pairs.

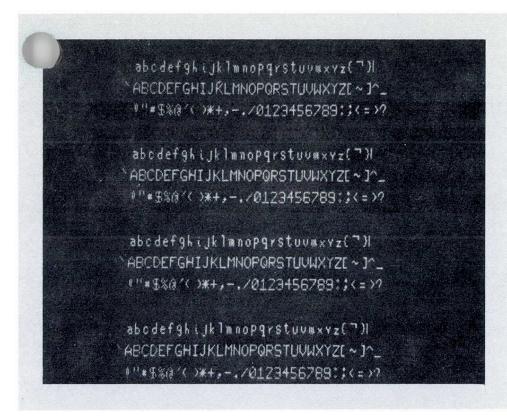
ERASE TIME-200 ms.

DOT WRITING TIME-9 µs.

# **OTHER**

REMOTE CONTROL OF ERASE AND NON-STORE

POWER REQUIREMENTS—90 to 136 or 180 to 272 VAC, 48 to 440 Hz, 57 watts max power consumption.



Stored display of standard ASCII character sets.

# VERTICAL AND HORIZONTAL AMPLIFIERS

The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

# DEFLECTION FACTOR

Vertical—1 V for 8-cm deflection, adjustable from 0.75 V to 1.1 V using internal controls.

to 1.1 V using internal controls.

With Attenuation Resistors—Up to 150-V full screen can be obtained by adding attenuation resistors to input circuits.

# PHASE SHIFT

Not more than 1° between X and Y up to 100 kHz.

# Y-T DISPLAYS

Useful to 100 kHz for displaying waveforms on a Y versus T plot.

# INITIAL BEAM POSITION

Positioned by internal adjustment to any point on the screen. Position drift is not more than 1 mm/h after 20-min warm up.

# **POLARITY**

Positive input to the vertical and horizontal inputs moves the beam up and to the right.

# LINEARITY

The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 5%.

# MAXIMUM INPUT VOLTAGE

 $\pm 50$  V combined DC and peak AC.

# INPUT RC

100 k $\Omega$  paralleled by approx 50 pF.

# Z AXIS

e Z-axis on-time should be at least 9  $\mu$ s to insure good storage of each written dot. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

# INPUT

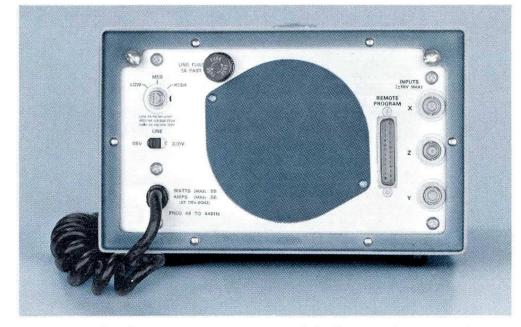
Turn-on level (unblanked) is +1 V. Turn-off level (blanked) is +0.5 V or less. Recommended source impedance for driving the Z-axis is  $1 \text{ k}\Omega$  or less.

### MAXIMUM INPUT VOLTAGE

±50 V combined DC and peak AC.

#### INPUT RC

 $100 \text{ k}\Omega$  paralleled by approx 50 pF.



Rear panel of Type 601 Storage Display Unit.

# CRT DISPLAY AND STORAGE

# TEKTRONIX CRT

5-inch flat-faced bistable storage tube, phosphor similar to P1.

# DISPLAY SIZE

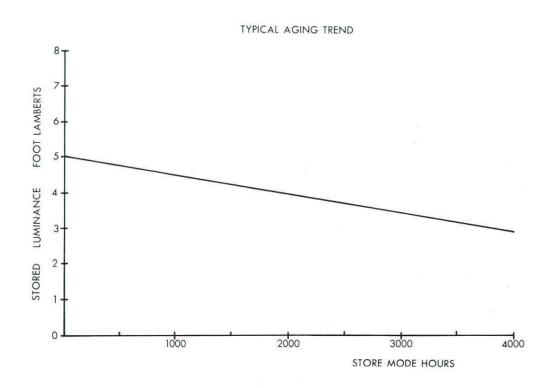
8 cm vertically and 10 cm horizontally.

# STORED LUMINANCE

At least 3 foot-lamberts.

# CONTRAST RATIO

5:1 or greater.



Typical Aging Trends with Normal Usage

Normal usage is defined as uniform use of all parts of the display area. The Type 601 CRT storage area has improved target stability which extends view time and keeps long-term aging characteristics relatively uniform.

# DISPLAY LINEARITY

HORIZONTAL—No more than 5% difference between any two cm.

VERTICAL—No more than 2% difference between any two cm.

#### RESOLUTION

100 stored line pairs along the vertical axis. 125 stored line pairs along the horizontal axis.

# LINE WRITING SPEED (STORED)

At least 5 cm/ms (at specified resolution).

# DOT WRITING TIME

9  $\mu$ s or less is required to write (store) one dot.

# INFORMATION STORAGE RATE—100 thousand dots per s.

#### VIEWING TIME

Up to 15 min recommended. Longer times may be obtained; however, erasure of previously stored information becomes more difficult.

### **ERASE TIME**

200 ms is required to clear screen of stored information.

# OTHER CHARACTERISTICS

#### POWER REQUIREMENTS

90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz, 57 watts maximum power consumption. Rear panel selector provides rapid accommodation for six line-voltage ranges.

### DIMENSIONS AND WEIGHTS

Height	6 in	15.3 cm
Width	$8\frac{1}{2}$ in	21.6 cm
Depth	$17^{3}/_{8}$ in	44.1 cm
Net weight	$17\frac{1}{2}$ lb	8.0 kg
Domestic shipping weight	$\approx$ 24 lb	$\approx$ 10.9 kg
Export-packed weight	pprox30 lb	pprox13.6 kg

# INCLUDED STANDARD ACCESSORIES

Connector (131-0570-00), connector cover (200-0821-00), two instruction manuals (070-0747-00).

# TYPE 601 STORAGE DISPLAY UNIT ..... \$1175

# OPTIONAL ACCESSORIES

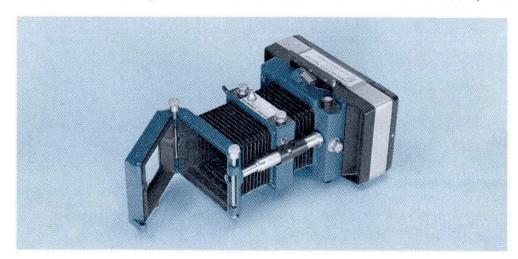


Optional accessories serve to extend the usefulness of the Type 601 in certain applications.

# RACK ADAPTER

### PANEL ASSEMBLY

For covering  $\frac{1}{2}$  of rack adapter when only one Type 601 is rackmounted, order 016-0116-00 . . . . . . . . . . . . . . 8



### C-30A CAMERA



# C-30A CAMERA CARRYING CASE

U.S. Sales Prices FOB Beaverton, Oregon Please refer to Terms and Shipment, General Information page.

<sup>\*</sup>Registered Trademark, Polaroid Corporation

- 1-MHz X AND Y BANDWIDTH
- 100-mV/cm X AND Y DEFLECTION FACTORS
- X-Y PHASE DIFFERENCE WITHIN 1° TO 1 MHz
- UNIFORMLY SMALL SPOT SIZE
- DC-COUPLED Z AXIS
- ALL SOLID-STATE DESIGN

The Type 602 Display Unit is a compact, solid-state instrument with excellent resolution providing accurate displays of information from X, Y and Z signal inputs. Application areas are: phase shifts and frequency ratios using *Lissajous* figures, graphic and alphanumeric displays from computers, high-resolution raster displays with intensity modulation and Y-T plots of amplitude versus time displays.

Permanent records of the Type 602 display are provided on Polaroid prints using the Tektronix C-30A Camera with adapt-Two Type 602's may be mounted side-by-side using an onal rack adapter.

# VERTICAL AND HORIZONTAL AMPLIFIERS

The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

# BANDWIDTH

DC to 1 MHz at 3-dB down.

# DEFLECTION FACTOR

Vertical—90 mV/cm to 135 mV/cm, internally variable. Horizontal—90 mV/cm to 110 mV/cm, internally variable.

# PHASE DIFFERENCE

Not more than 1° between X and Y amplifiers up to 1 MHz.

# BEAM POSITION

Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/h after 20-min warm up.

# MAXIMUM INPUT VOLTAGE

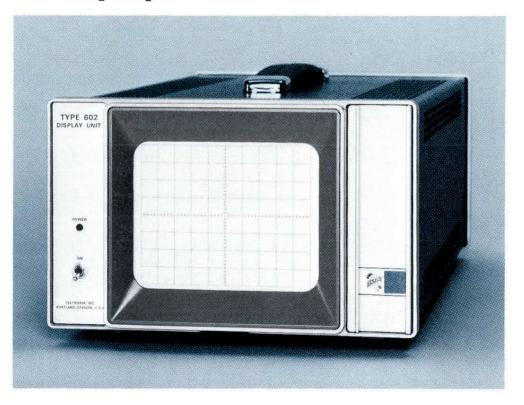
 $\pm$ 10 V DC plus peak AC.

# INPUT RC

 $100 \, k\Omega \, \pm 10\%$  paralleled by 30 pF or less.

# RECOMMENDED SOURCE IMPEDANCE

 $k\Omega$  or less.



# CHARACTERISTIC SUMMARY

# VERTICAL (Y) AND HORIZONTAL (X)

BANDWIDTH-DC to 1 MHz.

DEFLECTION FACTOR—Vertical 90 mV/cm to 135 mV/cm. Horizontal 90 mV/cm to 110 mV/cm. Internally variable.

PHASE DIFFERENCE—Within 1° between X and Y to 1 MHz.

INPUT R and C—  $\approx$ 100 k $\Omega$  and  $\approx$ 30 pF.

MAXIMUM INPUT VOLTAGE— ±10 V DC plus peak AC.

# Z AXIS

BANDWIDTH-1 MHz.

SIGNAL AMPLITUDE—0.0 to +1 V.

INPUT R and C—  $\approx$ 100 k $\Omega$  and  $\approx$ 70 pF.

MAXIMUM INPUT VOLTAGE—  $\pm 10 \, \text{V}$  DC plus peak AC.

# CRT

DISPLAY AREA— $8 \times 10$  cm.

PHOSPHOR—P31.

# **OTHER**

POWER REQUIREMENTS—90 to 136 or 180 to 272 VAC, 48 to 440 Hz. 50 W at 115 VAC, 60 Hz.

# Z AXIS

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: DC to 1 MHz over 0.0 V to +1 V range. Signal input is via a BNC connector on the rear panel.

# MAXIMUM INPUT VOLTAGE

 $\pm 10$  V DC and peak AC.

# INPUT RC

 $100 \, k\Omega \, \pm 10\%$  paralleled by 70 pF or less.

# RECOMMENDED SOURCE IMPEDANCE

 $1 \text{ k}\Omega$  or less.

# **CRT**

#### TEKTRONIX CRT

5-inch flat-faced rectangular CRT with P31 phosphor standard, P7 phosphor optional.

#### DISPLAY SIZE

8 cm vertically and 10 cm horizontally.

# **GRATICULE**

Standard graticule—internal, parallax-free, variable illumination.

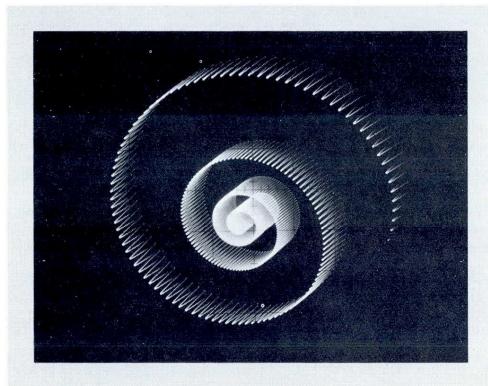
Optional graticule—internal  $8 \times 10$ -cm outline (no graticule lines).

# TRACE WIDTH

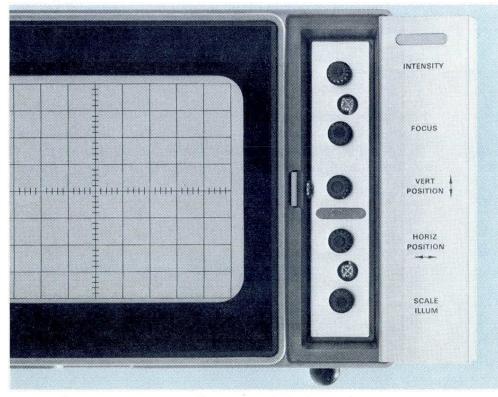
Maximum trace width within the  $8 \times 10$ -cm display area is 14 mils at 0.5- $\mu A$  beam current.

#### DISPLAY LINEARITY

The difference in any 2-cm deflection on the vertical axis is not more than 1%. The difference in any 2-cm deflection on the horizontal axis is not more than 6%.



Displayed is a low-frequency damped sinewave with 90° phase difference between X and Y inputs. A 1-MHz timing sinewave is also applied to the X, Y and Z input. Intensity modulation with the 1-MHz timing waveform adds the third display parameter and creates the illusion of depth.



Controls are conveniently located behind front panel door.

# OTHER CHARACTERISTICS

### POWER REQUIREMENTS

90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz. 50 watts at 115 VAC, 60 Hz. Rear panel selector provides rapid accommodation for six line-voltage ranges.

# **TEMPERATURE**

Electrical specifications are valid over the range of 0°C to +50°C ambient.

# **FINISH**

Blue vinyl painted cabinet, aluminum construction.

# DIMENSIONS AND WEIGHTS (cabinet included)

Height	6 in	15.3 cm
Width	$8\frac{1}{2}$ in	21.6 cm
Depth	$17^{3}/_{8}$ in	44.1 cm
Net weight	$17\frac{1}{2}$ lb	7.9 kg
Domestic shipping weight	pprox22 lb	pprox 9.9 kg
Export-packed weight	pprox28 lb	pprox12.7 kg

#### INCLUDED STANDARD ACCESSORIES

Smoke-gray filter, installed (378-0586-00); two instruction manuals (070-0799-00).

# TYPE 602 DISPLAY UNIT ..... \$750

# 

Standard instrument, without cabinet, for mounting in adapter. Requires 51/4-inch vertical rackmounting space.

If optional P7 phosphor is ordered, smoke-gray filter (378-0586-00) is deleted and orange filter (378-0595-00) is added.

# OPTIONAL ACCESSORIES

Optional accessories serve to extend the usefulness of the Type 602 in certain applications.

# 

# PANEL ASSEMBLY

# C-30A CAMERA

# C-30A CAMERA CARRYING CASE

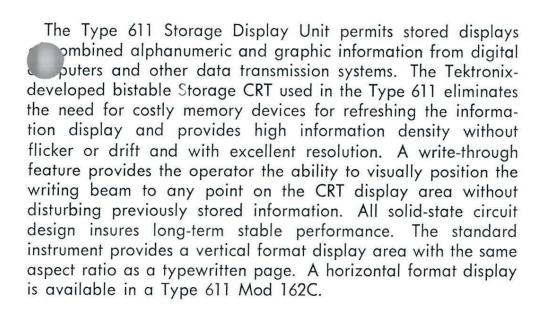
Constructed of heavy-gage, high-impact plastic, has foam-backed, vacuum-formed styrene liner. Holds C-30A Camera, all standard accessories and extra film.

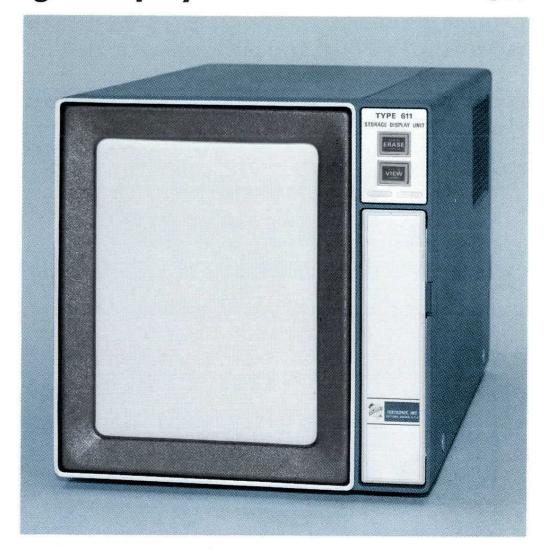
Order 016-0126-00 ..... \$ 38

\*Registered Trademark, Polaroid Corporation.

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Please refer to Terms and Shipment, General Information page.

- FLICKER-FREE DISPLAYS
- HIGH RESOLUTION ALPHANUMERIC AND GRAPHICS DISPLAY CAPABILITIES
- WRITE-THROUGH ABILITY
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS





# CHARACTERISTIC SUMMARY

VERTICAL AND HORIZONTAL

CALIBRATED DEFLECTION FACTOR—1-V full screen deflection X and Y axis.

**SETTLING TIME** $-3.5 \mu s/cm + 5 \mu s$ .

Z AXIS

TURN-ON LEVEL—+1 V or greater.

TURN-OFF LEVEL-+0.5 V or less.

**INPUT** RC—100 k $\Omega$  paralleled by 50 pF.

# STORAGE CRT

DISPLAY AREA—Vertical—21 cm, Horizontal—16.2 cm. 25% incrementally storable.

RESOLUTION—Equivalent to 400 stored line pairs along the vertical axis; 300 stored line pairs along the horizontal axis.

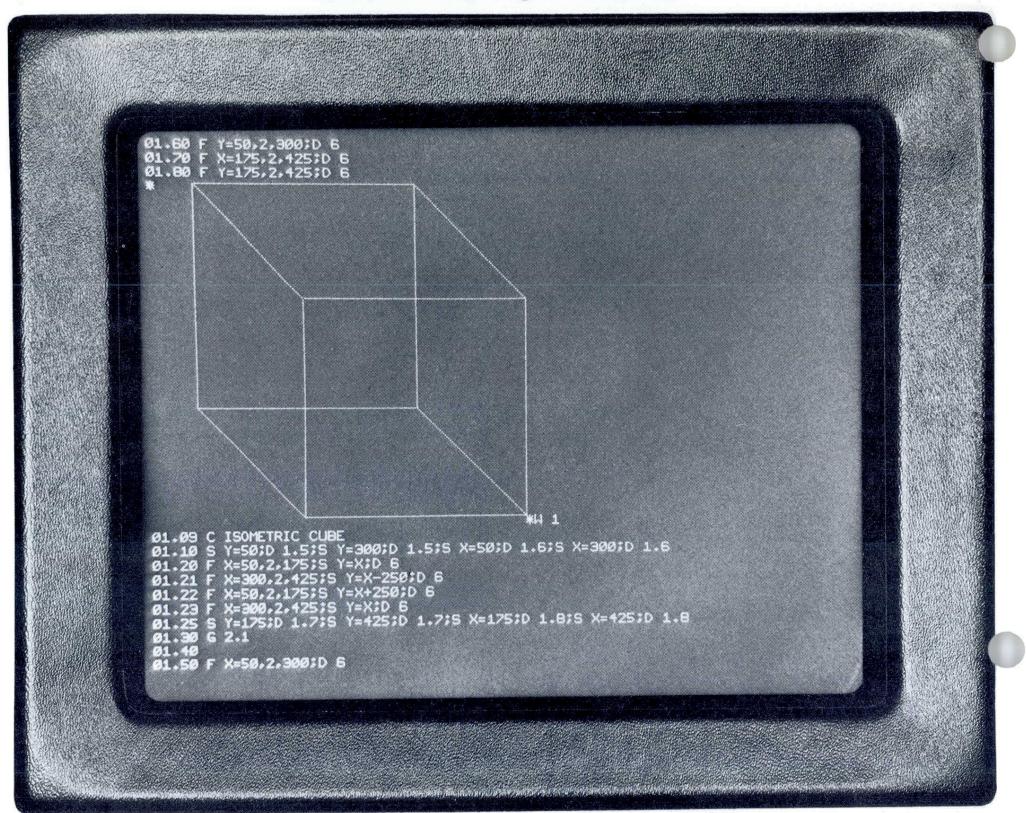
ERASE TIME-0.5 seconds.

DOT WRITING TIME—5  $\mu$ s.

# **OTHER**

REMOTE CONTROL OF ERASE, NON-STORE, VIEW AND WRITE-THROUGH

POWER REQUIREMENTS—90 to 136 or 180 to 272 VAC, 48 to 66 Hz, 250 watts.



The Type 611 Storage Display Unit is ideally suited for information display applications. Up to 4000 alphanumeric characters may be stored and legibly displayed. The above photo, and the photo on the next page were taken from a Type 611 used as the readout device of a remote computer terminal.

# OPERATING FUNCTIONS

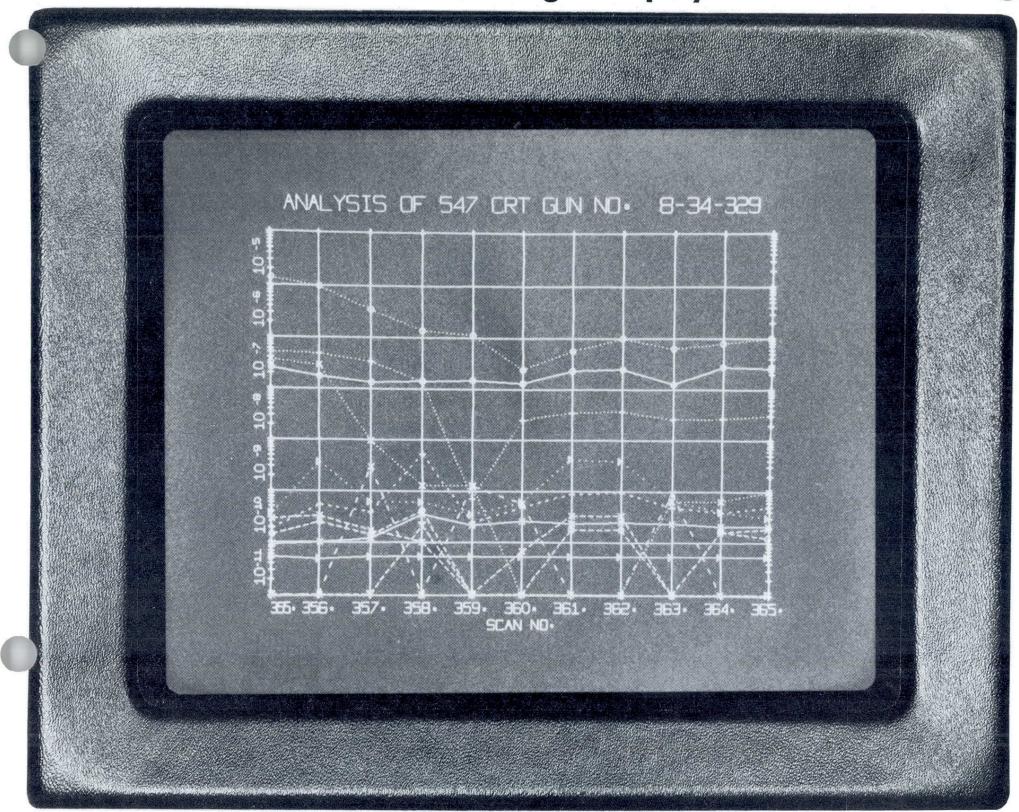
The Erase, Non-Store, Write-Through and View operating functions are remotely programmable through contacts at the remote program connector on the rear panel. An Erase Interval signal is also provided at this connector. X, Y, Z inputs are provided through rear BNC connectors or the remote program connector (optional). Manual control of Erase and View is provided on the front panel. Remote programming of the Type 611 is achieved by grounding the appropriate contacts at the rear program connector. The remote switching device must be capable of switching +10 V to approx ground (+0.5 V to -10 V) and handle up to 5 mA of current.

A "ready-to-write" mode is established by erasing the CRT. When the new information has been written, the instrument will be in the "view" mode for approximately one minute and will then automatically switch to the "hold" mode. This holds in-

formation stored on the CRT at a low brightness to improve CRT life. Pressing the VIEW switch while in the "hold" mode returns instrument to the "view" mode for approximately 1 minute.

A special "write-through" feature is provided and is programmed through the rear-panel program connector. When the program contact is closed the CRT beam is unblanked if Z axis is activated, and "viewed" without destroying previously stored information, and without storing new information. A combination of reduced beam current and beam movement to form a circular small diameter Lissajous pattern prevents storage.

The Intensity, Focus, Operating Level, Power Switch and Test Spiral controls are located behind a front-panel access door. Pushing the Test Spiral switch causes the instrument to compan erase cycle and store a single-shot test pattern presentation. Pulling TEST SPIRAL switch provides a "non-store" mode with repetitive test pattern for focusing and other tests.



Alphanumeric and graphic display taken from a Type 611 used in a remote computer terminal application.

# VERTICAL AND HORIZONTAL AMPLIFIERS

# DEFLECTION FACTOR

Vertical—1-V full scale (16.2 cm for square format or 21 cm for rectangular format), accuracy within 2%.

Horizontal—1-V full scale (16.2 cm), accuracy within 2%.

With Attenuation Resistors—Up to 75-V full screen for vertical or horizontal deflection can be obtained by adding attenuation resistors to input circuits.

# INITIAL BEAM POSITION

Any one of 9 initial beam positions can be selected by internal switches. Each position is adjustable  $\pm 10\%$  of full scale both vertically and horizontally.

# SETTLING TIME

 $\mu$ s/cm + 5  $\mu$ s, to within 1 spot diameter of final position.

# POLARITY

Positive input to the vertical and horizontal inputs moves the beam up and to the right.

# LINEARITY

The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 10%.

# MAXIMUM INPUT VOLTAGE

 $\pm 50 \, \text{V}$  combined DC and peak AC.

# INPUT RC

 $100 \text{ k}\Omega$  paralleled by approx 60 pF.

# POSITIONAL STABILITY

0.16 mm (or less)/hour with 75- $\Omega$  source impedance at 20° C to 30° C. Within 1.6 mm/hour with 75- $\Omega$  source impedance at 10° C to 50° C. Reference 25° C.

# Z AXIS

#### INPUT

Turn-on level (unblanked) is +1 V. Turn-off level (blanked) is +0.5 V.

# MAXIMUM INPUT VOLTAGE

 $\pm 50 \, \text{V}$  combined DC and peak AC.

### INPUT RC

 $100 \text{ k}\Omega$  paralleled by approx 50 pF.



Rear panel of Type 611 Storage Display Unit.

# CRT DISPLAY AND STORAGE

# TEKTRONIX CRT

11-inch flat-faced bistable storage tube, phosphor similar to P1.

# DISPLAY SIZE

Vertically—21 cm (approx  $8^{5}/_{32}$  in), Horizontally—16.2 cm (approx  $6^{7}/_{16}$  in). Display area is up to 25% incrementally storable.

# STORED LUMINANCE

At least 6 foot-lamberts.

# CONTRAST RATIO

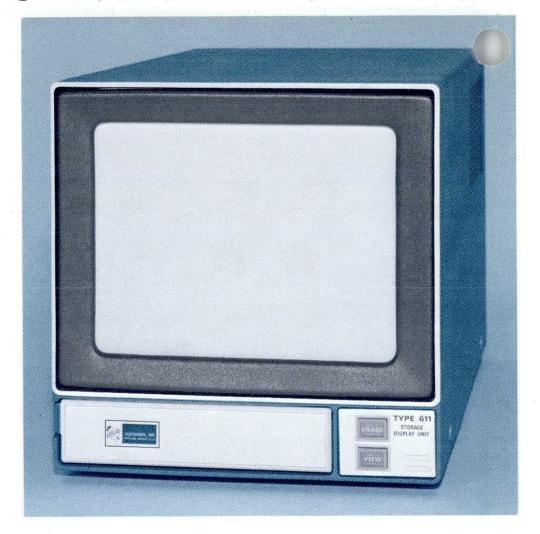
6:1 or greater.

# RESOLUTION

4,000 characters based on a  $90 \times 70$  mil matrix, clearly legible with good spacing. Equivalent to 400 vertical x 300 horizontal stored line pairs. (Resolution is measured using  $400 \times 300$  stored dots since closely spaced line pairs exceed 25% incremental storage.)

# VIEWING TIME

Less than 15 min recommended. Viewing time may be extended to one hour; however, erasure of previously stored information becomes more difficult.



Type 611 MOD 162C features a horizontal display format.

# **ERASE TIME**

500 ms or less.

### DOT WRITING TIME

 $5 \,\mu s$  is required to write (store) one bit of information.



# OTHER CHARACTERISTICS

# ERASE INTERVAL PULSE

A negative-going erase pulse is provided at the rear program connector to inhibit external equipment during an erase cycle. Amplitude is approx 10 V, source impedance approx  $2 \, \mathrm{k} \Omega$ .

# POWER REQUIREMENTS

90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 250 watts maximum at 115 V and 60 Hz. Rear panel selection provides rapid accommodation for six line-voltage ranges.

# DIMENSIONS AND WEIGHTS

Height	$11\frac{7}{8}$ in	30.1 cm
Width	$11^{5}/_{8}$ in	29.5 cm
Depth	$22^{3}/_{8}$ in	56.8 cm
Net weight	51 lb	23.1 kg
Domestic shipping weight	pprox62 lb	pprox28.1 kg
Export-packed weight	$\approx$ 72 lb	$\approx$ 32.6 kg

# INCLUDED STANDARD ACCESSORIES

External program connector (131-0570-00); connector cover (200-0821-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0752-00).

# TYPE 611 STORAGE DISPLAY UNIT ..... \$2695

# TYPE 611 MOD 162C ..... \$2695

Horizontal display format with same accessories as standard instrument.

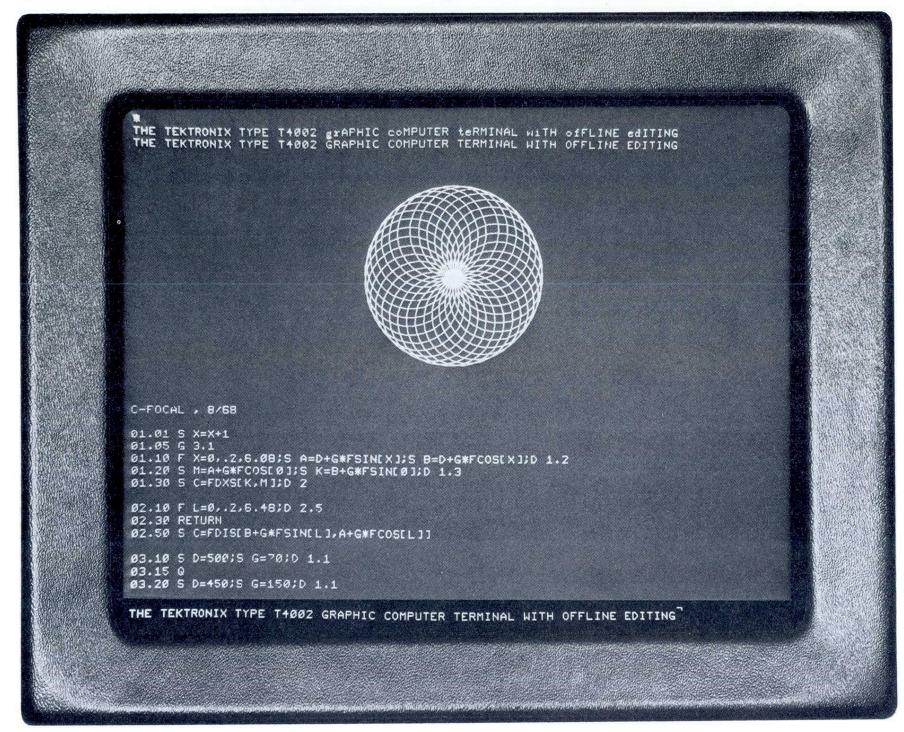
U.S. Sales Price FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.





- COMPLEX GRAPHICS
- HIGH-DENSITY ALPHANUMERICS
- FLICKER-FREE STORED DISPLAYS
- LINE-BUFFER AREA FOR EDITING
- SOLID-STATE DESIGN

The Tektronix Type T4002 Graphic Computer Terminal is a completely self-contained, desk-top, information display system designed to facilitate rapid and efficient exchange of information between man and computer. Complete communication interaction is achieved through a solid-state, data-entry keyboard and visual displays of high-resolution alphanumerics and graphics. A Tektronix developed, direct-view storage cathode-ray tube is used as the display medium. High-density alphanumerics and complex graphics are presented without flicker or drift. Resolution achieved is equivalent to 400 x 287 line pairs.



The Line-Buffer feature of the T4002 simplifies text composition, verification and correction. The first line in the above photograph is incorrect. The line is recalled from

the buffer memory and corrected in the Line-Buffer area at the bottom of the display. After correction, the line is retransmitted to the stored display area.

# CHARACTERISTIC SUMMARY

# CONTROL PANEL

KEYBOARD—Full USASCII (128 codes).

POWER—Key switch.

CONTROL LOCK—Key switch for security purposes.

MODE CONTROLS AND INDICATORS:

ON LINE/LOCAL

TRANSMIT/RECEIVE—Communication-mode status.

ASCII/TTY—Communication-code indicator.

DISPLAY/AUXILIARY or both—Input source indicator.

SPECIAL FUNCTIONS:

PAGE FULL—Halts output when screen is full.

MARGIN SHIFT—Allows four fixed margin positions for increased information.

COMM ERROR —Lights on detected error.

DATA RECEIVED—Indicates computer output.

INTERRUPT—Used to halt computer output.

# DISPLAY CHARACTERISTICS

DISPLAY AREA—15.2 cm x 21 cm.

ERASE TIME-0.5 second.

LUMINANCE >6 fL.

CONTRAST RATIO—>6:1.

RESOLUTION—Equivalent to 400 x 287 line pairs.

# DISPLAY CAPABILITY

96 USASCII symbols including both upper and lower case characters, numbers and special symbols.

# **GRAPHICS:**

Point plot.

Incremental plot.

Linear interpolation (vector).

1024 x 1024 addressable points.

1024 (X) by 742 (Y) viewable points.

# ALPHANUMERIC:

39 lines, 85 characters per line in stored area.

1 line, 84 characters in Line-Buffer area.

2 sizes of characters under program control.

2000 characters per second (average) writing capability.

# INTERFACE UNITS

TYPE 4801—For Digital Equipment Corporation PDP-8
Series Computers with negative input/output

TYPE 4802—For use with devices which transfer data serially in either full or half-duplex mode. Conforms to EIA Standard RS-232B (October, 1968).

TYPE 4803—For Digital Equipment Corporation PDP-8 Series Computers with positive input/output buses.

# CONFIGURATION

of the elements required to effectively communicate with a computer are contained within the T4002 console. System components are: display unit; terminal control; character generator, input/output interface; and keyboard. Space is provided within the terminal to accommodate an auxiliary module for expanding system capability. Interfaces are available for direct coupling to computers or data communication systems.

# DISPLAY UNIT

A Tektronix, 11-inch, direct-view, bistable storage tube is used as the display medium. High-density alphanumerics and complex graphics are presented without flicker or drift. The 15.2-cm by 21-cm screen will accommodate up to 39 lines of alphanumeric characters with 85 symbols per line. More than 3000 characters may be displayed with excellent clarity. Resolution achieved is equivalent to 400 x 287 line pairs. The luminance level of stored information is at least 6 fL and contrast ratio at least 6:1.

#### LINE-BUFFER AREA

The Line Buffer capability of the T4002 makes use of one 84-character line of discrete memory. Data is entered through the keyboard, stored in memory, and displayed in a 1-cm x 21-cm continuously refreshed, flicker-free area at the bottom of the screen. The information in this memory can be verified and edited before it is sent to the computer as a single message block.

A cursor is always positioned over the next area to be written. Any character may be changed by backspacing the cursor to the character to be changed. Backspacing past a character erases that character from local memory. Pressing SEND control transmits the Line Buffer Area information to the computer if ON LINE, or to the designated output device if in LOCAL.

# KEYBOARD

Manual entry of data is through a solid-state keyboard with full USASCII capability (128 codes). 96 upper and lower-case characters, numbers and special symbols are provided for alphanumeric data entry. Two sizes of characters are under program control. 32 additional control characters are included for communications between the computer and the terminal.

# TERMINAL CONTROL

The terminal control provides timing logic, data buffers and interconnection logic for the character generator, keyboard and auxiliary module. Linear interpolation is a function of the terminal control, D/A converters and plot logic. 1024 by 1024 points are addressable. 1024 (X) by 742 (Y) points are viewable.

# CHARACTER GENERATOR

The character generator provides a set of 96 USASCII characters, including 1 "space" and 1 "delete" character. Two sizes of characters are under program control,  $70 \times 90$  mils and  $140 \times 180$  mils. Up to 2000 characters per second (average) may be generated and stored on the display tube.

# CONTROLS AND INDICATORS

In addition to a standard alphanumeric keyboard, other controls are provided to enhance ease of operation. The number of panel controls are minimized and control functions made automatic where practical (see photo of control panel).

- CONTROL CHARACTERS—The USASCII provides for 32 control characters to be utilized for communication between computers and remote I/O equipment. Keys to activate these control characters are provided on the right portion of the keyboard. Functions peculiar to the Type T4002 are also controlled from this keyboard area.
- 2. VIEW/HOLD—Switches the display from a hold mode to a view mode for 1 to 2 minutes.
- 3. **ERASE**—The erase function erases the entire stored display area.
- 4. FORMAT CONTROLS—Provide a means of moving the cursor when fixed-format alphanumerics are used. The five format buttons (top left of keyboard) move the cursor UP, DOWN, RIGHT, LEFT or HOME (fixed point upper left corner—resets T4002 from Graphics to Alphanumerics).
- 5. POWER OFF/ON/CONTROL LOCK—Key-operated, 3-position rotary switch controls line voltage to the T4002. A color-coded mechanical flag showing through the POWER ON aperture indicates the position of the switch. CONTROL LOCK is a "security" position in which input from the T4002's control panel and keyboard is locked out.



- 6. ON LINE/LOCAL—Controls on-line and off-line terminal operation and indicates status.
- 7. TRANSMIT/RECEIVE—Controls and indicates the communication mode status.
- 8. ASCII/TTY—Indicates and controls communication code being output by the keyboard.
- 9. INPUT: KEYBOARD/AUX—Permits selection of KEY-BOARD or AUXILIARY as input to computer. Indicates status.
- OUTPUT: DISPLAY/AUX—Permits selection of the DISPLAY or AUXILIARY or both to receive output from computer. Indicates status.
- 11. PAGE FULL—Indicates full page and stops information from computer (in alphanumeric mode only).
- 12. MARGIN SHIFT—Allows a choice of four fixed margin positions, starting on the left and moving to the right. Useful when writing columns of short statements.
- 13. COMM/ERROR—Indicates an error at the terminal control interface.
- 14. DATA RECEIVED—When the computer makes an entry to the display, the indicator lights. Pressing the control extinguishes the indicator.
- 15. INTERRUPT—Any time the computer is sending data all controls on the terminal are inhibited except the INTERRUPT switch (and the POWER switch). Pressing this switch stops the transmission and allows the operator to send data to the computer.
- 16. DIRECT/COMPOSE—Controls text editing function and indicates status.
  - Direct: Each character is processed as it is typed. Compose: Each character is sent to an editor-buffer for future corrections, additions, or processing.
- 17. FULL/CLEAR—Overflow indicator lights when the editor-buffer capacity is reached. Depressing the control will clear the editor-buffer of stored information.
- 18. SEND—Pressing the control causes the information in the editor-buffer to be transmitted to the computer if in ON LINE and to the designated output device if in LOCAL.

# OTHER CHARACTERISTICS

# POWER REQUIREMENTS

A quick-change line-voltage selector provides six ranges: 90 to 110 V, 104 to 126 V, 112 to 136 V, 180 to 220 V, 208 to 252 V, and 224 to 272 V. Frequency range is 48 to 66 Hz. Maximum consumption at 115 V is 400 watts.

# OPERATING TEMPERATURE

Normal operation over 20° C to 40° C range.

# DIMENSIONS AND WEIGHTS

193/ inches	48.7 cm
, 9	88.7 cm
19 inches	48.3 cm
130 pounds	46.8 kg

TYPE T4002 GRAPHIC COMPUTER TERMINAL . . . . . \$8800

# **OPTIONS**

#### INTERFACE UNITS

The interface provides code conversion, logic level and necessary connections to interface the terminal with certain computers and data communication systems. Currently, three types of interface are available: Type 4801 for Digital Equipment Corporation PDP-8 Series Computers with negative input/output buses. Type 4802\* designed to communicate with devices which transfer data serially in either full or half-duplex mode. (Conforms to EIA Standard RS-232-B, October, 1968.) Type 4803 for Digital Equipment Corporation PDP-8 Series of computers with positive input/output buses.

\*NOTE: Timing Interface Boards are factory wired for a specified baud send and receive rate. Since the Type 4802 has a multitude of send and receive capabilities, the customer must advise a baud rate for both send and receive before his Type 4802 order is complete. Additional boards may be ordered. Each board would be factory wired to the customer's baud rate specifications.

# 

# 

# 

Additional Timing Interface Boards are available to facilitate operation at baud rates other than that specified on Type 4802 order. Specify Transmit and Receive baud rates necessary with each order for additional boards.

# ORDER TIMING INTERFACE BOARD ..... \$125

# AUXILIARY INTERFACE

Space is provided inside the terminal for a plug-in module to expand future capability. The module may be used for a customer designed interface unit to integrate input/output equipment, such as tape or disk drives, printers, mechanical plotters, card readers/punches, etc., into the system, or for some other purpose. A blank plug-in is available from Tektronix for use as a frame in which to build the auxiliary module.

# BLANK PLUG-IN MODULE, order 040-0507-00 .... \$83

# **CAMERA**

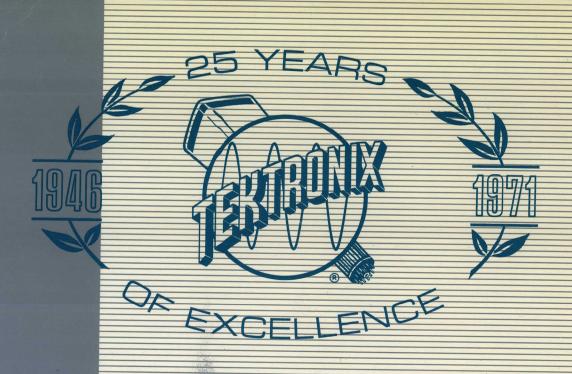
The C-10 is a fixed-focus, light-weight camera designed for use with the Type T4002. An f/8 lens with sufficient depth of field and convenient hand grips allow the C-10 to be held against the display area for photographing of displays. The C-10 housing accommodates a Graflok<sup>1</sup> 4 x 5 back.

C-10 CAMERA \$4	.(	(	ĺ	(	ĺ	(	(	(	(			ŀ	1	4	4	4	4	4	4	4	4	1	1	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ŀ	ŀ	ŀ	ŀ	ļ	ļ	ļ	4	1	4	ļ	ļ	ļ	ļ	1	4	4	4	1	1	ļ	1	1	4	4	1	1	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ļ	ļ	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	1	4	4	4	1	1	1	4			4	) .	)	Þ	1	,																ì														•	,							
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<sup>&</sup>lt;sup>1</sup>Registered Trademark Graflex, Inc.

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TEKTRONIX®

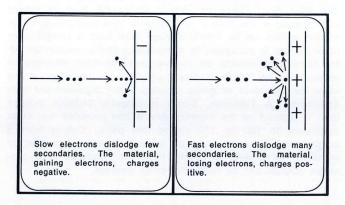
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#### STORAGE CRTS FOR INFORMATION DISPLAY

The Tektronix bistable storage tube is a significant break-through in CRT design. Initially introduced as an oscilloscope display medium, this rugged CRT design is now incorporated into several Tektronix information display products. For display of computer-generated graphics and alphanumerics, the bistable CRT eliminates or minimizes the need for refreshed memory systems. The computer need only write once and then go on to other work. The CRT display remains, flicker-free, for further examination.

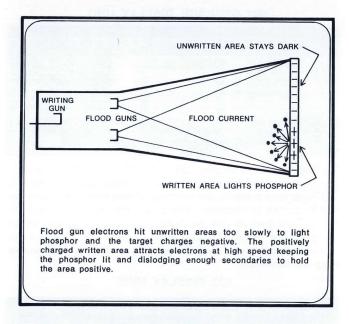
The Tektronix direct-view bistable storage tube (DVBST) is based on a secondary emission principle. When a stream of primary electrons strikes the phosphor target, secondary electrons are dislodged from the phosphor surface. As the potential increases, each primary electron displaces more than one secondary electron, resulting in the material charging positive.



In addition to the normal CRT writing guns, flood guns are used to cover the complete phosphor screen uniformly with low-velocity electrons. A conductive transparent face plate under the phosphor completes the circuit and allows storage to take place.

The normal writing gun bombards the phosphor screen with a beam of high-speed focused electrons. The beam writes and also dislodges great numbers of secondary electrons. The written surface where the waveform is traced out loses electrons and charges positive.

By using the flood-electron guns, the display may be stored. The flood guns emit low-velocity electrons over the whole CRT-screen area. The electrons strike the unwritten area too slowly to jar loose many secondaries. As a result, these areas merely collect electrons until they are driven negative and can attract no more current.



The latent image where the beam has written attracts flood electrons at such a velocity so each entering primary dislodges sufficient secondaries to hold the phosphor target positive. Thus, the written area neither gains nor loses electrons but remains positively charged and continues to attract flood current. As a result of this equilibrium, the trace is stored.

This is the basis for all Tektronix direct-view bistable storage tubes. Since this process is primarily internal to the CRT, other advantages are provided. Maintenance is reduced because of the reduction in external electronics which is needed to display information on refreshed CRT's. The direct-view storage CRT is durable and does not require special operating consideration or care.

An important characteristic of a bistable storage tube is the ability to display dynamic information in a refreshed mode. Thus, information which is most meaningful when presented in a refreshed mode may be displayed in a manner the same as that for displaying data on oscilloscope CRT's.

The 611 Storage Display Unit has an 11-inch CRT. A slightly modified version of this CRT is used in Tektronix terminals. A "write-thru" feature of the 611 allows the operator to display cursors or any generated pattern without degrading previously stored data and without storing new data. In the "write-thru" and "non-store" modes the display remains on screen as long as it is refreshed.

# INFORMATION DISPLAY PRODUCTS

In recognition of the increasing needs for readout devices for computer consoles and remote terminals, Tektronix has devoted considerable time and effort to designing and producing display components which will effectively fulfill these needs. These products cover a wide range of applications including scientific research, process monitoring, production control, retrieval of information necessary for managerial decisions, classroom needs, and computer program development.

The following is a summary of the Tektronix Information Display Devices. The specification pages contain a more detailed description of the technical aspects and full capabilities of each device.

#### **601 STORAGE DISPLAY UNIT**



The 601 Storage Display Unit provides stored displays of alphanumeric and graphic information from digital computers and other data transmission systems. Costly memory devices for refreshing the information display are not necessary. Resolution is specified at 100 (vertical) and 125 (horizontal) stored line pairs for the 8 x 10 cm display area. X, Y, Z inputs are provided through rear BNC connectors or through the remote program connector.

#### **602 DISPLAY UNIT**



The 602 Display Unit is a compact, solid-state refreshed instrument with excellent resolution providing accurate displays of information through X, Y, and Z signal inputs. The 602 is particularly suited for applications which require unusually high resolution. Maximum trace width within the 8 x 10-cm display area is 14 mils at 0.5  $\mu\text{A}$  beam current. Typical application areas are: phase shift and frequency ratio measurements, graphic and alphanumeric displays from computers, high-resolution raster displays with intensity modulation and Y-T plots of amplitude versus time.

#### **611 STORAGE DISPLAY UNIT**



The 611 Storage Display Unit is designed to function as a readout device for computer terminals. With X, Y and Z input signals provided by peripheral equipment, this instrument is capable of displaying high-density alphanumeric and complex graphic information without drift or annoying flicker. The screen is 21 cm  $\times$  16.2 cm with resolution equivalent to 400 (vertical) and 300 (horizontal) stored line pairs. 4000 characters, 90  $\times$  70 mils in size may be clearly displayed.

#### **4501 SCAN CONVERTER UNIT**



The 4501 Scan Converter Unit is an analog memory device with readout in the form of a composite television signal. Information written on its 5-inch storage tube from a computer or other source is converted to composite video or modulated RF for convenient viewing on large-screen television monitors or receivers. The bright displays achieved in this manner are ideal for individual or group viewing under high-ambient light conditions. A Tektronix, 5-inch rectangular bistable storage tube is utilized as the memory device and provides resolution equivalent to 100 by 125 stored line pairs. Output from a single scan converter may be looped through a number of monitors for viewing at remote locations. Multiple scan converter outputs can be mixed for color displays.

### **T4002 GRAPHIC COMPUTER TERMINAL**



The T4002 with optional interactive graphics is a completely self-contained, desk-top terminal which provides a high-resolution, flicker-free display with both high-speed complex graphic and high-density alphanumeric capability. Its unique direct-view storage tube eliminates the requirement for a separate refresh memory and minimizes the information rate requirements of the data source. The annoying flicker associated with most refreshed displays is also eliminated. The new data is written only once and can be sent to the terminal at a convenient rate of 5,000 characters per second (AVERAGE).

The T4002 Graphic Computer Terminal consists of a display unit, terminal control, character generator, keyboard module, input/output interface and auxiliary unit.

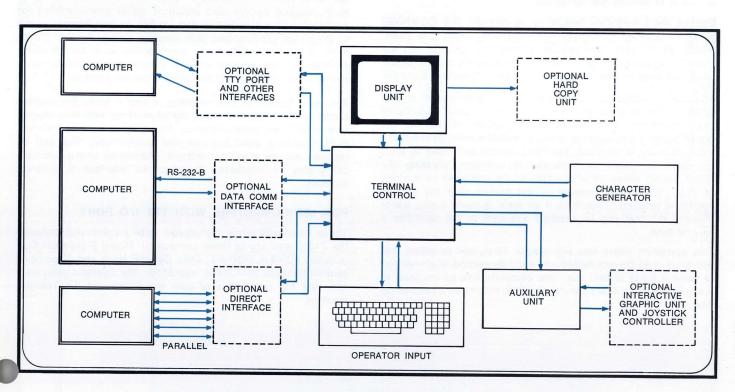
The terminal control provides timing logic, data buffers, interconnection logic, function decoding, line-buffer control, D/A converters and plot logic for the character generator, keyboard and auxiliary module. All the data is routed and priorities determined by the terminal control.

The character generator provides a complete set of USASCII printable characters with both upper and lower case, numerals and special symbols. Two sizes of characters (and two sizes of italics) are under program control.

The control panel is designed for ease of operation with panel controls held to a minimum by automatic control functions. The standard keyboard contains keys for 96 USASCII characters and 32 control characters.

The direct-view bistable storage tube provides most of the economic advantage of this type of system by eliminating costly refresh memory devices. The 11-inch, flicker-free display (6 1/2 x 8 1/4-inch screen) accommodates 39 lines of alphanumeric characters of 85 symbols each, permitting 3300 70 x 90 mil characters to be displayed. Resolution is equivalent to 287 x 400 line pairs. Stored information may be erased in less than 0.5 second.

The T4002 has a one-line 84-character local memory which displays data in a refreshed mode in a 1 cm  $\times$  21 cm area at the bottom of the CRT. This Line-Buffer feature is used, among other things, for composing and verifying alphanumeric data before it is sent to the computer as a message block.



T4002 GRAPHIC COMPUTER TERMINAL BASIC BLOCK DIAGRAM

#### **OPERATING MODES**

Four modes of display are selectable on the T4002: (1) alphanumeric; (2) point plotting; (3) incremental plotting; and (4) linear interpolate (vector). A fixed grid of 1024 x 1024 addressable points is available in any of the graphic modes. Of these points, 1024 x 760 points are viewable.

### INTERACTIVE GRAPHICS

Tektronix Interactive Graphic devices offer distinct advantages in applications which require inputs of graphic data to the computer. These small modules plug into the Graphic Computer Terminal and interface the terminal to devices which output X and Y analog signals. The Interactive Graphic Units generate a clearly visible, parallax-free, cross-hair cursor which always covers the entire XY dimension of the screen. Upon command, they will digitize the graphic address at the intersection of the cross-hair cursor to a resolution within one LSB in 1,020 bits.

The cursor generation system has several advantages over other types of systems. These advantages minimize tracking errors, and eliminate drift and registration problems.

### LINE BUFFER

The Line-Buffer feature of the T4002 Graphic Computer Terminal consists of a one-line, 84-character local memory. This memory is used in conjunction with a 1-cm x 21-cm refreshed area at the bottom of the tube. The information is in alphanumeric form, thus the user can edit the text before sending the information to the computer as a one-line message block. Information may be updated and verified, corrected if necessary, before it is sent to the computer.

Use of the Line-Buffer feature is as follows: The COMPOSE button is pressed to change operation from DIRECT to COMPOSE. At this time, any characters previously entered into the Line Buffer are presented in one line across the bottom of the tube. Information can be changed in one of several manners.

The CLEAR button clears the Line Buffer and the cursor reverts to the left-hand edge of the refreshed area (point of entry of next character). The desired text is typed, entered into the buffer memory and appears in the Line-Buffer area. When maximum capacity is reached, the FULL button is lighted to alert the operator. Once the message is complete, pressing the SEND button sends all of the text to the computer as a block of data. The buffer memory is not erased until the CLEAR control is pressed. Therefore, if an error is made during transmission, the text can be recalled and sent to the computer a second time.

This operation offers two advantages. First, text is edited and you know it is correct before you send it; second, it allows you to send a burst of text (i.e., one complete line as opposed to a number of individual characters) which minimizes transmission time.

The Line-Buffer area is also convenient for correcting messages. If the message is not correct as first typed, editing is accomplished as follows: The keyboard is backspaced until the cursor is positioned above the location where a change is desired. Backspacing across a character erases that character from the buffer memory. The character is deleted and the erased part of the text is retyped.

### INTERFACE UNITS

Several interface options are available for the T4002 which increase its efficiency and versatility as a data communications terminal.

### FOR DEC PDP-8 SERIES

Separate interfaces are available for computers with negative input/output buses and computers with positive input/output buses. Data is transferred in parallel under Program Data Transfer control of the PDP-8. When receiving input data from the PDP-8, the unit decodes the data, converts the logic, and provides transfer timing information to the Terminal Control. When transmitting output data, the unit changes the Terminal Control data to match the PDP-8 logic and transfers it under control of the computer's timing pulses. Each unit has its own external interconnecting cable wired for direct connection to the PDP-8's Input/Output Bus.

### FOR DATA COMMUNICATION SYSTEMS

An interface allows the Tektronix Graphic Computer Terminal to communicate with devices which transfer data serially in either a full or half duplex mode. It is designed to conform to EIA Standard RS-232-B (October, 1968) which defines the minimum required circuits and electrical signal characteristics for exchanging binary serialized data. It has its own internal clocks or it can be synchronized with external timing signals. Therefore, it is compatible with synchronous and asynchronous modems. It has its own external interconnecting cable which matches up with many of the most common modems.

The main feature of this interface is that it gives the Graphic Computer Terminal the capability of working with time-sharing computers over telephone lines. The customer, when ordering, must specify a baud transmit and receive rate. The unit he receives will be wired accordingly. Additional timing interface cards may be purchased to adapt the interface to different modems.

### FOR MINICOMPUTERS WITH TTY I/O PORT

These interfaces allow high-speed data transmission between the T4002 and any of these computers: Digital Equipment Corporation PDP-8/I, PDP-8/L, Data General Nova and Supernova, Hewlett-Packard 2114, 2115, and 2116. The operator selectively uses the full capabilities of both the T4002 and the Teletype machine.

### INFORMATION DISPLAY PRODUCTS

### **APPLICATIONS**

The following are intended to illustrate examples of T4002 applications. These brief examples should not be considered as all encompassing. The T4002 is a versatile Graphic Computer Terminal capable of solving an extremely wide range of applications.

### MATHEMATICAL CALCULATION



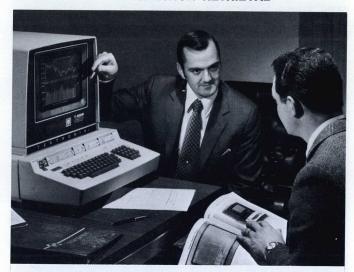
The most common usage of time-sharing terminals today is calculation. With FORTRAN, engineers and scientists can create complex and highly repetitive routines for the computer to handle, insert the variables or parameters, and in a very short time obtain output. This allows exploration of a broad range of possible solutions, and decision-making based on analysis of a large sample or of ALL possible outcomes.

The T4002 is particularly useful in this kind of problem solving when the output is graphic rather than numeric. Certain kinds of problems need to be reduced to graphic form just to enable the user to understand the answer. Other problems lend themselves to easier solution when graphics can be used to reduce a mass of data to a form from which conclusions can more easily be drawn.

### **INQUIRY PROCESSING**

A typical application for inquiry processing is a master file of customers with frequent requests for access to change data or for information on which to take action. A personnel system in a medium or large-size corporation is another data base which can be economically handled with display terminal access and input. Particular advantage is gained in situations where the customer is "on-line" at the same time as his record (customer service telephone answering).

### MANAGEMENT INFORMATION RETRIEVAL



A series of displays, graphs, or charts, with appropriate titling and explanations is very conveniently displayed with the T4002 on the executive's desk top. It can be called up by the executive himself, using simple instructions to the computer. The individual manager can implement his own particular needs for information, with the emphasis on data summary and exception reporting, within a standardized format so that the programming effort does not become prohibitive. Updating of the data for these displays can be done automatically with the updating cycles of the master files.

### PROGRAMMING AND DEBUGGING

The T4002 is well suited for use in a time-sharing or multiprogramming environment, particularly for on-line conversational program development. The terminal can be connected to a computer with the appropriate program in its library and the user can begin to write his problem-oriented program. As each line of the program is completed, the computer will examine it against the parameters of the support program and respond on the display screen. The transmission speed and display writing speed of the T4002 make program development and debugging more efficient. When the programmer wishes to review the written program, for whatever reason, he can quickly scan displays in rapid succession. When the program is completed, it can be assigned a place in the program library, located in a high-speed data storage unit, peripheral to the central computer, available for immediate use.

When writing and "debugging" programs, a teletype readout is slow enough that the programmer often loses his train of thought. The mind usually thinks much faster than a teletype can print out program elements. The tremendous speedup of the T4002 with its quick readout allows a rapid input back into the system. Thus, ideas and changes are applied without delay and the effects may be immediately observed. This interactive display capability is particularly important when developing graphics programs, since there is little delay from program development to program observation.

### **T4005 GRAPHIC DISPLAY**

Rapid access to computer-generated plots is available using the T4005 Graphic Display. The T4005 is more than a large-screen display device; it's also a graphic controller for selecting and manipulating the display, as well as routing the information to separate display devices.





Computer plots of complex graphics which up to now have required several minutes to plot, can now be displayed in a matter of seconds. Detailed analysis can be made of any selected portion of the display. This is accomplished by positioning a "frame" of a selected size and aspect ratio around the point of interest. Pushing a button erases the original display and in seconds replots only the previously framed portion for close examination. Magnification up to 32 times is available, enough to resolve the individual computer-generated dots which comprise the display.

Up to 8 commonly-referred-to displays can be stored for rapid recall, using the memory files of the associated computer. Once filed, they are protected from accidental erasure, but can be modified or replaced as desired.

The T4005, and companion 4201 which is essentially the controller section without display device, may be interfaced to the IBM 1130. A standard software package is included.

### **4601 HARD COPY UNIT**

Permanent copies of CRT displays are quickly available from Tektronix 611, T4002, and T4005. The 8½ x 11-inch copies provide the high image contrast required for high-resolution reproductions of complex graphics and alphanumerics. Copy cost is low, and copies are available in seconds, without tying up valuable computer time. The 4601 copy command may be initiated by pressing a front panel control on the self-contained unit, or by supplying an external command.



PLEASE HAVE YOUR NAME ADDED TO THE TEKTRONIX MAIL LIST OR CONTACT ANY LOCAL TEKTRONIX FIELD ENGINEER OR APPLICATION ENGINEER FOR ADDITIONAL INFORMATION.

An actual size segment of the 8 1/2 x 11-inch hard copy

- FLICKER-FREE, BISTABLE STORAGE
- HIGH-RESOLUTION ALPHANUMERIC AND GRAPHIC DISPLAYS
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS

The Type 601 Storage Display Unit provides stored displays of alphanumeric and graphic information from digital computers and other data transmission systems. The Tektronix-developed bistable Storage CRT used in the Type 601 eliminates the need for costly memory devices for refreshing the information display. The built-in vertical and horizontal differential amplifiers permit Y versus T plots up to 100 kHz for remote storage monitor applications. All solid-state modular circuit design insures long-term stable performance.



Stored display of standard ASCII character sets, photographed with C-30A Camera.

### **OPERATING FUNCTIONS**

The Erase and Non-Store operating functions are remotely programmable through contacts at the remote program connector on the rear panel. An Erase Interval signal is also provided at this connector. X, Y, Z inputs are provided through



rear BNC connectors or the remote program connector. Manual control of Erase and Power On-Off is provided on the front panel. A "ready-to-write" mode is established by erasing the CRT manually or remotely. Remote programming of the Type 601 is achieved by grounding the appropriate contacts at the rear program connector. The Intensity, Focus, Astigmatism, and Operating Level Controls are located behind the front access door for convenience of the operator.

### VERTICAL AND HORIZONTAL AMPLIFIERS

The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

**Deflection Factor**—Vertical: 1 V for 8-cm deflection, adjustable from 0.75 V to 1.1 V using internal controls. Horizontal: 1 V for 10-cm deflection, adjustable from 0.9 V to 1.1 V using internal controls. With Attenuation Resistors: Up to 150-V full screen can be obtained by adding attenuation resistors to input circuits.

Phase Difference—Not more than 1° between X and Y up to 100 kHz.

**X-T Displays**—Useful to 100 kHz for displaying waveforms on a Y versus T plot.

**Initial Beam Position**—Positioned by internal adjustment to any point on the screen. Position drift is not more than 1 mm/h after 20-min warm up.

Polarity—Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C— 100 k $\Omega$  paralleled by approx 50 pF.

Maximum Input Voltage—  $\pm 50 \text{ V}$  combined DC and peak AC.

Recommended Source Impedance— 1 k $\Omega$  or less.

### Z AXIS

The Z-axis on-time should be at least 9  $\mu$ s to insure good storage of each written dot. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

Input—Turn-on level (unblanked) is +1 V. Turn-off level (blanked) is +0.5 V or less.

Input R and C- 100 k $\Omega$  paralleled by approx 50 pF.

Maximum Input Voltage—  $\pm 50$  V combined DC and peak AC.

Recommended Source Impedance— 1  $k\Omega$  or less.

### CRT DISPLAY AND STORAGE

Tektronix CRT—5-inch flat-faced bistable storage tube, phosphor similar to P1.

Display Size - 8 cm vertically and 10 cm horizontally.

**Resolution**—Equivalent to 100 vertical x 125 horizontal stored line pairs. (Resolution is measured using 100 x 125 stored dots since closely spaced line pairs exceed 25% incremental storage.)

Display Linearity—The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 3% in the vertical direction, and 5% in the horizontal direction.

Viewing Time—At least 15 minutes without loss of resolution. Viewing time may be extended to one hour; however, several erasures may be required to fully remove previously stored data.

**Dot Writing Time**—  $9 \, \mu s$  or less is required to write (store) one dot.

Information Storage Rate-100 thousand dots per second.

Line Writing Speed (Stored)—At least 5 cm/ms (at specified resolution).

Erase Time—200 ms is required to clear screen of stored information.

#### OTHER CHARACTERISTICS

Power Requirements—90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz, 57 watts maximum power consumption. Rear panel selector provides rapid accommodation for six line-voltage ranges.

<b>Dimensions</b>	and	Weights	(cabinet	includ	ded)—	
Height				6	in	15.3 cm
Width				8	1/2 in	21.6 cm
Depth				17	3/8 in	44.1 cm

Net weight 17 1/2 lb 8.0 kg
Domestic shipping weight  $\approx$ 24 lb  $\approx$ 10.9 kg
Export-packed weight  $\approx$ 30 lb  $\approx$ 13.6 kg

Included Standard Accessories—Program connector (131-0570-00); connector cover (200-0821-00); instruction manual (070-0747-00).

### **OPTIONAL ACCESSORIES**

Optional accessories serve to extend the usefulness of the Type 601 in certain applications.



5 1/4-Inch Rack Mounting Adapter For Type 601, 602, and 528—Accepts two Type 601's side-by-side in a standard 19-inch rack, includes rim clamps which allow fastening or removing instruments from the front, order 016-0115-02 ............\$95



C-30A Camera—f/1.9 lens, magnification variable from 1.5:1 to 0.7:1; Polaroid Land\* Pack-Film, order C-30A-P .......... \$480 Type 601 to C-30A Camera adapter, order 016-0248-00 ... \$16



\*Registered Trademark Polaroid Corporation

**Display Unit** 

- 1-MHz X AND Y BANDWIDTH
- 100-mV/cm X AND Y DEFLECTION FACTORS
- X-Y PHASE DIFFERENCE WITHIN 1° TO 1 MHz
- UNIFORMLY SMALL SPOT SIZE
- DC-COUPLED Z AXIS

The Type 602 Display Unit is a compact, solid-state instrument with excellent resolution providing accurate displays of information from X, Y, and Z signal inputs. Application areas are: phase shifts and frequency ratios using *Lissajous* figures, graphic and alphanumeric displays from computers, high-resolution raster displays, with intensity modulation, and Y-T plots of amplitude versus time displays.

Permanent records of the Type 602 display are provided on Polaroid prints using the Tektronix C-30A Camera with adapter. Two Type 602's may be mounted side-by-side using an optional rack adapter.

### **VERTICAL AND HORIZONTAL AMPLIFIERS**

The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

Bandwidth-DC to 1 MHz at 3-dB down.

**Deflection Factor**—Vertical: 90 mV/cm to 135 mV/cm, internally variable. Horizontal: 90 mV/cm to 110 mV/cm, internally variable.

Phase Difference—Not more than 1° between X and Y amplifiers up to 1 MHz.

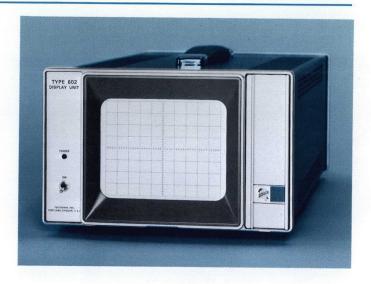
**Beam Position**—Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/h after 20-min warm up.

**Polarity**—Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C— 100 k $\Omega$   $\pm 10\%$  paralleled by 30 pF or less.

Maximum Input Voltage- ±10 V DC plus peak AC.

Recommended Source Impedance— 1 kΩ or less.



### Z AXIS

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: DC to 1 MHz over 0.0 V to  $\pm$ 1 V range. Signal input is via a BNC connector on the rear panel.

Input R and C— 100 k $\Omega$   $\pm$ 10% paralleled by 70 pF or less.

Maximum Input Voltage—  $\pm 10 \, \text{V}$  DC and peak AC.

Recommended Source Impedance— 1  $k\Omega$  or less.

### CRT

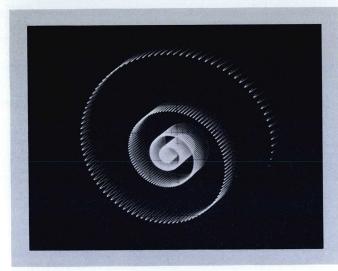
**Tektronix CRT**—5-inch flat-faced rectangular CRT with P31 phosphor standard, P7 phosphor optional.

Display Size-8 cm vertically and 10 cm horizontally.

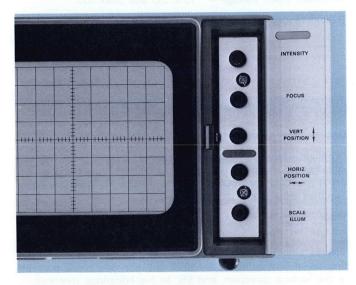
**Graticule**—Standard graticule: Internal, parallax-free, variable illumination. Supplied with standard 602, as shown above. Optional graticule: Internal 8 x 10-cm outline (no graticule lines). Supplied with 602 MOD 174K.

**Trace Width—**Maximum trace width within the 8 x 10-cm display area is 14 mils at 0.5- $\mu$ A beam current.

**Display Linearity**—The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 2% in the vertical direction, and 6% in the horizontal direction.



Displayed is a low-frequency damped sinewave with 90° phase difference between X and Y inputs. A 1-MHz timing sinewave is also applied to the X, Y and Z input. Intensity modulation with the 1-MHz timing waveform adds the third display parameter and creates the illusion of depth.



Controls are conveniently located behind the front panel door.

### OTHER CHARACTERISTICS

Power Requirements— 90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz. 50 watts at 115 VAC, 60 Hz. Rear panel selector provides rapid accommodation for six line-voltage ranges.

**Temperature**—Electrical specifications are valid over the range of  $0^{\circ}$ C to  $+50^{\circ}$ C ambient.

Finish-Blue vinyl painted cabinet, aluminum construction.

Dimensions and Weights (cabir	et included)—
Height	6 in 15.3 cm
Width	8 1/2 in 21.6 cm
Depth	17 3/8 in 44.1 cm
Net weight	17 1/2 lb 7.9 kg
Domestic shipping weight	$\approx$ 22 lb $\approx$ 9.9 kg
Export-packed weight	$\approx$ 28 lb $\approx$ 12.7 kg

**Included Standard Accessories—**Smoke-gray filter, installed (378-0586-00); instruction manual (070-0799-00).

If optional P7 phosphor is ordered, smoke-gray filter (378-0586-00) is deleted and orange filter (378-0595-00) is added.

TYPE 602 DISPLAY UNIT	\$750
TYPE 602 MOD 174K DISPLAY UNIT	\$ <b>750</b> outline

### **OPTIONAL ACCESSORIES**

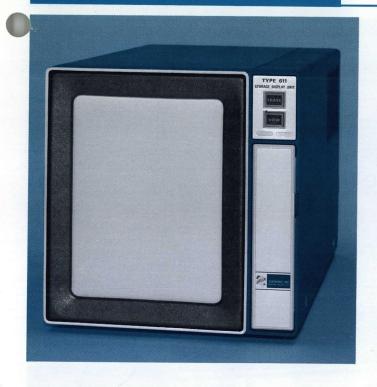
Optional accessories serve to extend the usefulness of the 602 in certain applications. Photos are shown with 601 description.

5 1/4-Inch Rack Mounting Adapter For Type 601, 602, and 528—Accepts two instruments side-by-side in a standard 19-inch rack, includes rim clamps which allow fastening or removing instruments from the front, order 016-0115-02 ............\$95

Panel Assembly—For covering 1/2 of rack adapter when only one Type 602 is rackmounted, order 016-0116-00 ...... \$8

C-30A Camera—f/1.9 lens, magnification variable from 1.5:1 to 0.7:1; Polaroid Land Pack-Film Back, order C-30A-P . . \$480

Type 602 to C-30A Camera adapter, order 016-0248-00 .. \$16





Type 611 MOD 162C features a horizontal display format.

### FLICKER-FREE BISTABLE STORAGE

- HIGH-RESOLUTION ALPHANUMERIC AND GRAPHIC DISPLAYS
- HARD COPY COMPATIBLE
- WRITE-THRU ABILITY
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS

The Type 611 Storage Display Unit permits stored displays of combined alphanumeric and graphic information from digital computers and other data transmission systems. The Tektronix-developed bistable Storage CRT used in the Type 611 eliminates the need for costly memory devices for refreshing the information display and provides high information density without flicker or drift and with excellent resolution. A write-thru feature provides the operator the ability to visually position the writing beam to any point on the CRT display area without disturbing previously stored information. All solid-state circuit design insures long-term stable performance. The standard instrument provides a vertical format display area with the same pect ratio as a typewritten page. A horizontal format display available in a Type 611 Mod 162C.

### CHARACTERISTIC SUMMARY

### **VERTICAL AND HORIZONTAL**

Calibrated Deflection Factor— 1-V full screen deflection X and Y axis.

Settling Time—3.5  $\mu$ s/cm + 5  $\mu$ s.

#### Z AXIS

Turn-on Level—+1 V or greater.

Turn-off Level—+0.5 V or less.

Input R and C—  $100 \text{ k}\Omega$  paralleled by 70 pF.

### STORAGE CRT

Display Area—Vertical: 21 cm. Horizontal: 16.2 cm. 25% incrementally storable.

Resolution—Equivalent to 400 stored line pairs along the vertical axis; 300 stored line pairs along the horizontal axis.

Erase Time-0.5 seconds.

Dot Writing Time- 5 µs.

### **OTHER**

Remote Control of Erase, Non-Store, View and Write-Thru

Power Requirements—90 to 136 or 180 to 272 VAC, 48 to 66 Hz, 250 watts.

## Storage Display Unit



The Type 611 Storage Display Unit (MOD 162C shown) is ideally suited for information display applications. Up to 4000 alphanumeric characters may be stored and legibly displayed. These displays are directly copied by the 4601, providing an accurate representation of the display on 3M Type 777 Dry-Silver Paper.

### **OPERATING FUNCTIONS**

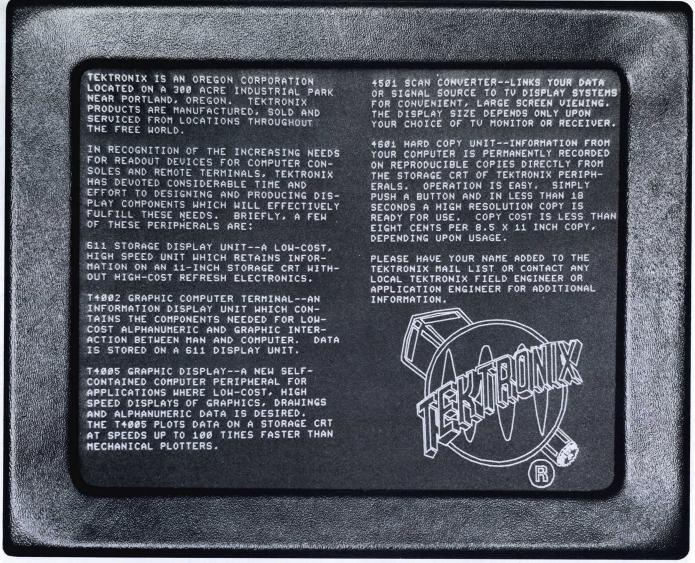
The operating functions are View, Erase, Non-Store, and Write-Thru. View and Erase are under manual or programmable control; Non-Store and Write-Thru are under programmable control. The Erase function, when initiated, removes all previously stored data from the display area and returns the CRT to a "ready-to-write" mode. As new information is written, it is retained on the CRT in the "view" mode. Within 90 seconds after the display is written, the 611 will automatically switch to a "hold" mode. This holds data stored on the CRT at a low brightness to extend storage time. Pressing the VIEW switch while in the "hold" mode, returns the display to the "view" mode for at least 60 seconds, but not more than 90 seconds. The "view" mode may be programmed for continuous viewing.

A special "write-thru" feature is provided for displaying additional information on a screen which may already contain stored information. In the "write-thru" mode the CRT beam is unblanked and a cursor, or any generated pattern, may be displayed without destroying previously stored data and without storing new data. This function is useful for positioning cursors

and locating the CRT writing beam. In the "write-thru" and "non-store" modes the display remains on screen as long as it is refreshed.

The Intensity, Focus, Operating Level, Power Switch and Test Spiral controls are located behind a front-panel access door. Pushing the Test Spiral switch causes the instrument to complete an erase cycle and store a single-shot test pattern presentation. Pulling Test Spiral switch provides a "non-store" mode with repetitive test pattern for focusing and other tests.

The Erase, Non-Store, Write-Thru and View operating functions are remotely programmable through contacts at the remote program connector on the rear panel. An Erase Interval signal is also provided at this connector. X, Y, Z inputs are provided through rear BNC connectors or the remote program connector. Manual control of Erase and View is provided on the front panel. Remote programming of the Type 611 is achieved the grounding the appropriate contacts at the rear program connector. The remote switching device must be capable of switching  $\pm 10~\rm V$  to approx ground ( $\pm 0.5~\rm V$  to  $\pm 10~\rm V$ ) and handle up to 5 mA of current.



Alphanumeric and graphic display taken from a Type 611 MOD 162C used in a remote computer terminal application.

### VERTICAL AND HORIZONTAL AMPLIFIERS

**Deflection Factor**—Vertical: 1-V full scale (16.2 cm for square format or 21 cm for rectangular format), accuracy within 2%.

Horizontal: 1-V full scale (16.2 cm), accuracy within 2%.

With Attenuation Resistors: Up to 75-V full screen for vertical or horizontal deflection can be obtained by adding attenuation resistors to input circuits.

Initial Beam Position—Any one of 9 initial beam positions can be selected by internal switches. Each position is adjustable ±10% of full scale both vertically and horizontally.

Settling Time— 3.5  $\mu \rm{s/cm} + 5~\mu \rm{s},$  to within 1 spot diameter of final position.

Positional Stability—0.16 mm (or less)/hour with 75- $\Omega$  source

impedance at 20° C to 30° C. Within 1.6 mm/hour with 75- $\Omega$  source impedance at 10° C to 50° C, reference 25° C.

**Polarity**—Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C— 100 k $\Omega$  paralleled by approx 70 pF.

Maximum Input Voltage—  $\pm 50 \text{ V}$  combined DC and peak AC.

### Z AXIS

**Input**—Turn-on level (unblanked) is +1 V. Turn-off level (blanked) is +0.5 V or less.

Input R and C—100 k $\Omega$  paralleled by approx 70 pF.

Maximum Input Voltage—  $\pm 50$  V combined DC and peak AC.

### CRT DISPLAY AND STORAGE

Tektronix CRT—11-inch flat-faced bistable storage tube, phosphor similar to P1.

**Display Size**—Vertically: 21 cm (approx 8 1/4 inches), Horizontally: 16.2 cm (approx 6 3/8 inches). Display area is up to 25% incrementally storable.

**Resolution**—4,000 characters based on a 90 x 70 mil matrix, clearly legible with good spacing. Equivalent to 400 vertical x 300 horizontal stored line pairs. (Resolution is measured using  $400 \times 300$  stored dots since closely spaced line pairs exceed 25% incremental storage.)

**Display Linearity**—The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 10%.

Viewing Time—At least 15 minutes without loss of resolution. Viewing time may be extended to one hour; however, several erasures may be required to fully remove previously stored data.

**Dot Writing Time—**  $5\,\mu s$  is required to write (store) one bit of information.

Erase Time-500 ms or less.



**Erase Interval Pulse**—A negative-going erase pulse is provided at the rear program connector to inhibit external equipment during an erase cycle. Amplitude change is approx  $+10\,\text{V}$  to  $+0.3\,\text{V}$ , source impedance approx  $2\,\text{k}\Omega$ .

**Power Requirements**—90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 250 watts maximum at 115 V and 60 Hz. Rear panel selection provides rapid accommodation for six line-voltage ranges.

Dimensions and Weights—	Di	mension	s and	Weig	hts-
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Height	11	7/8 in	30.1 cm
Width	11	5/8 in	29.5 cm
Depth	22	3/8 in	56.8 cm
Net weight	51	lb	23.1 kg
Domestic shipping weight	≈62	lb	≈28.1 kg
Export-packed weight	≈72	lb	$\approx$ 32.6 kg

Included Standard Accessories—Program connector (131-0570-00); connector cover (200-0821-00); instruction manual (070-0752-01).

TYPE 611 STORAGE DISPLAY	UNIT	 \$2695

TYPE 611 MOD 162C STORAGE DISPLAY UNIT ..........\$2695 Horizontal display format with same accessories as standard instrument.

### **ACCESSORIES**

Viewing Accessories—Combination light filters and implosion shields improve contrast for high ambient light viewing.

The matt finish of filter 015-0145-00 improves contrast but causes slight loss of resolution. Order 015-0145-00 ...... \$35

The glossy surface of filter 014-0040-00 improves contrast, retains resolution but causes reflections. Order 014-0040-00. \$35



**Hard Copy Unit**—The 4601 used in conjunction with Tektronix Storage Display Units provides a convenient means for permanently copying alphanumeric and graphic displays. High-resolution displays obtained on the Type 611, T4002, or T4005 are copied by the 4601, providing an accurate representation of the stored display on 8 1/2 x 11-inch 3M Type 777 Dry-Silver Paper.

4601 HARD COPY UNIT ......\$3750



**Camera**—The C-10 is a fixed-focus, light-weight camera designed for use with all Tektronix Information Display Products which have an 11-inch CRT. An f/8 lens with sufficient depth of field and convenient hand grips allows the C-10 to be held against the display area for photographing displays. The C-10 includes a Polaroid<sup>1</sup>  $4 \times 5$  film holder.

C-10 CAMERA ..... \$400

Rack Adapter—Rack height for the 611 is 14 inches, rack depth is 21 3/8 inches. Rack adapter includes slide-out assembly. Front panel finish is black, order 040-0551-00 ...........\$95

<sup>1</sup>Registered Trademark Polaroid Corporation



- 8 Channels with Differential Inputs
- Calibrated Timebase
- Four Channel X-Y Plot
- Mixed X-Y, Y-T Displays

The 4701 Eight-Channel Multiplexer features eight vertical channels and a calibrated timebase that provides signal conditioning for the Tektronix display instruments including the Type 601 and 611 Storage Display Units, the Type 4501 Scan Converter and the Type 602 Display Unit. The 4701 provides conventional 8-channel Y-T displays, 4-channel displays and mixed displays of X-Y and Y-T.

The 4701 also provides automatic erase for the Tektronix storage display units. The calibrated timebase provides full screen displays from 10  $\mu s$  to 50 s and an oscilloscope type trigger circuit with automatic, AC or DC triggering.

### **VERTICAL CHARACTERISTICS**

Deflection Factor 1 V to 10 V, continuously variable.

Bandwidth-DC to 1 MHz.

input Impedance— 1 M $\Omega$  paralleled by  $\approx$  20 pF.

Common-Mode Rejection Ratio-at least 100:1.

Output— 1 V into 50 Ω with 1 V input.

Operating Modes—Alternate in sequence 1 thru 8. Chopped: internal switch selects chopping rates of approximately 2.5 kHz, 30 kHz or 300 kHz. Externally programmed: 3 lines of TTL compatible binary code select the channel which is to be programmed.

**X-Y Plots**—Selected by the selector switch on channels 5, 6, 7 and 8 that select channels 1, 2, 3 and 4 respectively for their X display.

### HORIZONTAL CHARACTERISTICS

**Timebase**—Provides full screen normal or single sweep displays from 10  $\mu$ s to 50 s in a 1, 2, 5 sequence. A non-calibrated mode is continuously variable between steps.

**Triggered Modes**—Automatic peak-to-peak, AC coupled and DC coupled, plus and minus slope.

Trigger Inputs—Can be internal from each selected channel, external, or from the power line.

**Automatic Erase**—Provides automatic control of the Tektronix storage display unit and permits the 4701 to retain the display in a view mode from 0.5 s to 30 s, (continuously variable) after all channels are displayed.

### OTHER CHARACTERISTICS

Power Requirements— 90 to 136 V or 180 to 272 V, 48 to 400 cycles, 21 watts maximum.

Dimensions and Weights—Height 3 1/2 inches, width 16 7/8 inches, depth 20 1/8 inches, and weight approximately 15 pounds.

Included Standard Accessories— 6 foot interconnecting cable (012-0258-00); 25-pin male connector (131-0570-00); instruction manual (070-1164-00).

### 4701 EIGHT-CHANNEL MULTIPLEXER ..... \$1500

To adapt the 4701 for use in a standard 19-inch rack, order rackmounting kit 602-0307-00 .....\$30



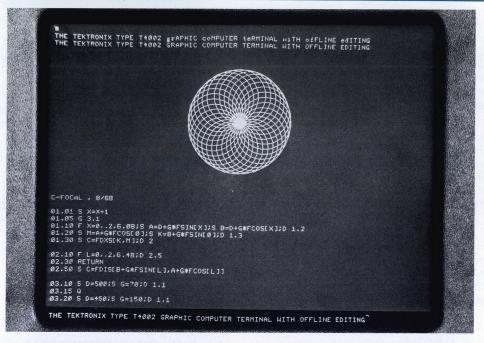
Shown with optional joystick

- INTERACTIVE GRAPHICS
- SOFTWARE SUPPORTED
- HARD-COPY COMPATIBLE
- RETAINS DISPLAYS WITHOUT REFRESHING
- HIGH DENSITY ALPHANUMERIC AND COMPLEX GRAPHIC DISPLAYS
- LINE-BUFFER AREA FOR EDITING

The Tektronix T4002 Graphic Computer Terminal is a completely self-contained, desk-top, information display terminal designed for rapid and efficient information exchange between man and computer. Complete communication interaction is achieved through the T4002 data-entry keyboard and optional Tektronix Interactive Graphic Units. The display device is a Tektronix developed, direct-view bistable storage tube which displays alphanumeric and graphic computer outputs without refreshing.

The Tektronix 4601 Hard Copy Unit or C-10 Camera produce permanent copies of the T4002 display. The Hard Copy Unit produces high quality, reproducible 8 1/2 x 11-inch paper copies of the stored screen contents in seconds. Copy command is either manual or computer initiated for unattended operation. The camera photographs the stored and line-buffer screen contents on a 4 x 5 Polaroid\* film.

<sup>\*</sup>Registered Trademark Polaroid Corporation



The Line-Buffer feature of the T4002 simplifies text composition, verification and correction. The first line in the above photograph is incorrect. The line is recalled from the buffer memory

and corrected in the Line-Buffer area at the bottom of the display. After correction, the line is retransmitted to the stored display area.

### CHARACTERISTIC SUMMARY

### CONTROL PANEL

Power-Key switch.

Keyboard-Full USASCII (128 codes).

Control Lock-Key switch for security purposes.

Mode Controls and Indicators:

On Line/Local-Indicates on-line or off-line connection.

Transmit/Receive—Communication-mode status.

ASCII/TTY—Communication-code indicator.

Display/Auxiliary (or both)—Input source indicator.

Special Functions:

Page Full—Halts output when screen is full of alphanumerics.

Margin Shift—Allows four fixed margin positions for increased information.

Comm Error—Lights on detected error at interface bus. Data Received—Indicates computer input to T4002.

Interrupt-Used to halt computer output.

### **DISPLAY CAPABILITY**

96 USASCII symbols including both upper and lower case characters, numbers and special symbols.

### Graphics:

1024 x 1024 addressable points.

1024 (X) by 760 (Y) viewable points.

Incremental plot.

Point plot.

Linear interpolation (vector).

### Alphanumeric:

39 lines, 85 characters per line in stored area.

1 line, 84 characters in Line-Buffer area.

2 sizes of characters and italics under program control. 5000 characters per second (average) writing capability.

### DISPLAY CHARACTERISTICS

Display Area—15.2 cm x 21 cm.

Erase Time-0.5 second.

Resolution-Equivalent to 400 x 287 line pairs.

### INTERFACE UNITS

For Digital Equipment Corporation PDP-8 Series Computers with negative input/output buses.

For use with devices which transfer data serially in either full or half-duplex mode. Conforms to EIA Standard RS-232B (October, 1968).

For Digital Equipment Corporation PDP-8 Series Computers with positive input/output buses.

For computers with TTY I/O port.

### CONFIGURATION

The T4002 console contains the following system components: display unit, terminal control, character generator, input/output interface, and keyboard. Space is provided within the terminal to accommodate an auxiliary module for expanding system caability. Interfaces are available for direct coupling to computers or data communication systems.

### DISPLAY UNIT

A Tektronix, 11-inch, direct-view, bistable storage tube is used as the display medium. High-density alphanumerics and complex graphics are presented without flicker or drift. The 15.2-cm by 21-cm screen will accommodate up to 39 lines of alphanumeric characters with 85 symbols per line. More than 3300 characters may be displayed with excellent clarity. Resolution achieved is equivalent to 400 x 287 line pairs. Viewing time is at least 15 minutes. Viewing time may be extended to one hour; however, successive erasure of previously stored information may be required.

### INFORMATION DISPLAY PRODUCTS

#### LINE BUFFER AREA

The Line Buffer capability of the T4002 makes use of one 84-character line of discrete memory. Data is entered through the keyboard, stored in memory, and displayed in a 1-cm x 21-cm continuously refreshed, flicker-free area at the bottom of the screen. The information in this memory can be verified and edited before it is sent to the computer as a single message block.

A cursor is always positioned over the next area to be written. Any character may be changed by backspacing the cursor to the character to be changed. Backspacing past a character erases that character from local memory. Pressing the SEND control transmits the Line Buffer Area information to the computer if ON LINE, or to the designated output device if in LOCAL.

#### **KEYBOARD**

Manual entry of data is through a solid-state circuit keyboard with full USASCII capability (128 codes). 96 upper and lower-case characters, numbers and special symbols are provided for alphanumeric data entry. Two sizes of characters and two sizes of italics are under program control. 32 additional control characters are included for communications between the computer and the terminal. All controls are program callable. The keyboard has 2-key rollover protection.

### TERMINAL CONTROL

The Terminal Control is the traffic director which interfaces all of the major components of the system. It provides interface logic, code conversion, data timing, data-buffering, mode switching and digital/analog conversion. Terminal Control routes alphanumeric data to the character generator and controls graphics directly. The Terminal Control's I/O interface bus is TTL compatible.

The T4002 operates in one of four display modes set by Terminal Control in response to control characters or control bits.

**Alphanumerics**—Prints, on a fixed format, alphabetical and numerical characters according to the USASCII code.

Graphics—The T4002 operates under program control in one of three modes to form graphic figures. The terminal then assembles incoming data as XY information and either plots points or draws lines to form graphic figures. The three graphic modes are:

- Incremental plot: In this mode, the T4002 increments the plot position one point in any one of eight directions from the last point location, according to an assigned code in the data word.
- Point plotting: In this mode, the X and Y address in each data word is decoded and the point is printed on command from Terminal Control.
- 3. Linear interpolation: In this mode, the T4002 draws a smooth line between two sets of XY coordinates contained in a data sequence. The line (or vector) can be intensified or dark. The lines can be any length, but for uniform intensity, they should be held to two inches or less.

Character Input Speeds—Data character input speeds to Terminal Control are as follows:

Alphanumeric - 5,000 characters per second (average).

**Incremental Plot**— 75,000 intensified (displayed) points per second maximum. 15,625 unintensified (not displayed) points per second maximum.

**Point Plot**—Same as for incremental plot except points must be adjacent.

Linear Interpolation— 2 ms/vector for unintensified (not displayed) vectors. 8 ms/vector for intensified (displayed) vectors.

### CHARACTER GENERATOR

The character generator provides a set of 96 USASCII characters, including 1 "space" and 1 "delete" character. Two sizes of characters are under program control, 70 x 90 mils and 140 x 180 mils. At least 5000 characters per second (average) may be generated.



### **Graphic Computer Terminal**

### CONTROLS AND INDICATORS

In addition to a standard alphanumeric keyboard, other labeled and light-coded controls are provided to enhance ease of operation. The number of panel controls is minimized and control functions made automatic where practical (see photo of keyboard).

Control Characters—The USASCII provides for 32 control characters to be utilized for communication between computers and remote I/O equipment. Keys to activate these control characters are provided on the right portion of the keyboard. Functions peculiar to the T4002 are also controlled from this keyboard area. Certain of these control characters are easily rewired to perform application oriented functions in addition to the defined functions.

View/Hold—Switches the display from a hold mode to a view mode for 60 to 250 seconds.

Erase-Erases the entire stored display area.

Format Controls—Provide a means of moving the cursor when fixed-format alphanumerics are used. The five format buttons (top left of keyboard) move the cursor UP, DOWN, RIGHT, LEFT or HOME (fixed point upper left corner—resets T4002 from Graphics to Alphanumerics).

Power Off/On/Control Lock—Key-operated, 3-position rotary switch controls line voltage to the T4002. A color-coded mechanical flag showing through the POWER ON aperture indicates the position of the switch. CONTROL LOCK is a "security" position in which input from the T4002's control panel and keyboard is locked out.

On Line/Local—Controls on-line and off-line terminal operation and indicates status.

**Transmit/Receive**—Controls and indicates the communication mode status,

**ASCII/TTY**—Controls and indicates communication code being output by the keyboard.

**Input:** Keyboard/Aux—Controls and indicates selection of KEY-BOARD and/or AUXILIARY as input to computer.

Output: Display/Aux—Controls and indicates selection of the DISPLAY and/or AUXILIARY or both to receive output from computer.

Page Full—Indicates full page and stops information from computer (in alphanumeric mode only).

Margin Shift—Allows a choice of four fixed margin positions, starting on the left and moving to the right. Useful when writing columns of short statements.

Comm Error—Indicates an error at the terminal control interface.

Data Received—When the computer makes an entry to the display, the indicator lights. Pressing the control extinguishes the indicator.

Interrupt—Pushing this button initiates a function which may be interpreted by the computer as an interrupt.

**Direct/Compose**—Controls and indicates text editing function. Direct: Each character is processed as it is typed.

Compose: Corrections, additions and deletions are made from the keyboard and displayed as edited in the line-buffer area.

Full/Clear—FULL indicates the capacity of the 84-character line-buffer's memory has been reached. Pressing the CLEAR button while in the COMPOSE mode will clear the storage register.

Send—Pressing this control while in COMPOSE causes the information in the line-buffer to be transmitted to the computer if in ON LINE and to the designated output device if in LOCAL.

#### SOFTWARE

The T4002 Graphic Computer Terminal is supplied with a standard Utility Software Package. It provides the routines to exercise the various functions of the terminal in its different modes of operation; and also subroutines for outputting all ASCII characters.

In addition, a Fundamental Plot Package of FORTRAN subroutines is supplied enabling the user to graphically operate in Point Plot, Incremental Plot and Linear Interpolate, to draw axes, do scaling, and perform other graphic manipulations.

The Standard Software Package offered with the T4002 is for users facilities which support a FORTRAN capable of either "A" format (i.e., unspecified character format) or assembly level access from FORTRAN. The T4002 Graphic Computer Terminal software will be negotiated on an individual basis for users whose facilities do not support FORTRAN.

When ordering the T4002, please specify the following information about the intended facility:

Hardware-Computer type, by make and model.

Software—If an operating system is used, please identify by manufacturer and indicate any variation. What languages does the facility support (please state levels). Which of these languages allows assembly level access?

#### OTHER CHARACTERISTICS

**Power Requirements**—A quick-change line-voltage selector provides six ranges: 90 to 110 V, 104 to 126 V, 112 to 136 V, 180 to 220 V, 208 to 252 V, and 224 to 272 V. Frequency range is 48 to 66 Hz. Maximum consumption at 115 V is 400 watts.

Operating Temperature Range— $+10^{\circ}$ C to  $+40^{\circ}$ C.

#### **Dimensions and Weights**

Height	19	3/8	in	48.7 cm
Depth	34	7/8	in	88.7 cm
Width	19	in		48.3 cm
Net weight	130	lb		46.8 kg
Domestic shipping weight	191	lb		86.6 kg

Included Standard Accessories—Specifications manual (070-0996-00), display unit maintenance manual (070-1051-00), keyboard unit maintenance manual (070-1052-00), drawer unit maintenance manual (070-1053-00).

### **ACCESSORIES**

The matt finish of filter 015-0145-00 improves contrast but causes slight loss of resolution. Order 015-0145-00 ...... \$35

The glossy surface of filter 014-0040-00 improves contrast, retains resolution but causes reflections. Order 014-0040-00. \$35

### DATA COMMUNICATION INTERFACE UNIT

Serial Asynchronous Interface for Data Communication Systems—This interface allows the Graphic Computer Terminal to operate with systems which transfer data serially in either a full-duplex or half-duplex mode. It conforms to EIA Standard RS-232-B (October, 1968) which defines the minimum required circuits and electrical signal characteristics for exchanging binary serialized data. Internal clocks or external timing signals may be used. Transmit and receive rates are independent of each other and must be specified on order. Standard rates are 110, 150, 300, 600, 1200, 1800, 2000, 2400 bits/sec inclusive. For other optional rates, contact your Application Engineer.

**Included Standard Accessories**—Interconnecting cable to RS-232-B type modems (015-0150-00); user's manual (070-1049-00); instruction manual (070-0998-00).

Order 021-0002-00 Serial Data Communications Interface (please specify standard send and receive rates) .... \$600

### TELETYPE PORT INTERFACE UNITS

Serial Asynchronous Teletype Port Interface Unit—The Teletype Port Interface allows high-speed data transmission between the Tektronix T4002 Graphic Computer Terminal and a computer through the computer's TTY I/O port. Currently, T4002 Teletype Port Interfaces are available for the following minicomputers: Digital Equipment Corporation PDP-8/I and PDP-8/L Computers, Data General Corporation Nova and Supernova Computers, Hewlett-Packard 2114, 2115 and 2116 Computers. Interfaces for other computers are under development. Contact your Application Engineer concerning your interface requirements.

The Teletype Port Interface allows the operator to selectively use the full capabilities of either the T4002 or the teletype-writer. To operate the T4002 and computer, standard computer/ terminal programming procedures are followed. To switch from T4002 to TTY operation, the user simply pushes the T4002 front panel LOCAL/ON LINE button to LOCAL. This electrically disconnects the T4002 and connects the teletypewriter to the computer through the TTY port interface, and automatically changes the data rate to 110 baud.

When using the TTY Port Interface, data is transferred serially by the interface in a full-duplex mode. The receiving rate is adjustable between 125 baud and 125 kilobaud. The transmitting rate is adjustable between 125 baud and 6.25 kilobaud. The interface is compatible with the full USASCII code and will assemble the information in the graphic compatible format when the T4002 is in a graphic mode of operation. The TTY Port Interface is current operated like the teletypewriter and is provided with necessary cabling and connectors for direct connection to the computer I/O Bus. As an option, it may be converted to an EIA RS-232-B configuration (voltage operation) for use with modems or couplers by the replacement of two optional plug-in cards and a connecting cable. Also the computer's previously existing TTY interface electronics is utilized, retaining the computer/Teletype system capabilities, including the reader and punch.

The operational characteristics of each unit are determined by the computer with which it interfaces. The rear panel mechanical configuration of each unit is compatible with the appropriate TTY and computer connections. A switch on the rear panel allows the user to select either MODEM or TTY capability when optional circuit boards are installed.

With this Interface, users of minicomputers utilize the many advantages of the T4002 Graphic Computer Terminal in applications where high display speeds and graphics are beneficial. One of the greatest advantages of the T4002 is the fact that programming is made so much easier and quicker than with slower terminals. The speed of the T4002 readout allows the programmer to retain his train of thought when writing and "debugging" programs. The tremendous speedup of the T4002 with its quick readout allows a rapid input back into the system. Thus, ideas and changes are applied without delay and the effects may be immediately observed. This interactive display capability is particularly important when developing graphics programs, since there is little delay from program development to program execution.

Also, the T4002 provides users the capability of displaying information in a graphic format. Many kinds of applications, such as scientific computations and process controls, give the user a clearer, more concise understanding of the information when it's presented graphically. Other problems lend themselves to easier solution where graphics reduce a mass of data to a format from which changes, trends and conclusions are easily drawn.

### SOFTWARE

The Teletype Port Interface Unit is provided with software which facilitates program access to the T4002 and Interactive Graphics Units. Documentation includes program descriptions, flow diagrams and program listings.

### **ORDERING**

When ordering, please specify your computer system configuration by manufacturer, model and/or type number, and your TTY or data communications I/O options.

Each interface includes an interconnecting cable and necessary accessories to match computer specified in order, software package to match computer specified in order, instruction manual, and user's manual.

For PDP-8/I & PDP-8/L,	order 021-0004-00	\$750
For Nova and Supernova,	order 021-0005-00	\$750
For 2114, 2115, and 2116,	order 021-0006-00	\$750

**Optional Accessories**—To convert the TTY Interface to a RS-232-B compatible Interface requires the substitution of the following accessories.

Timing interface control board, (please specify baud se	
receive rate)	\$175.00
Level converter board, order 670-0798-00	\$100.00
Modem cable (RS-232-B), order 015-0150-00	\$50.00
User's manual, order 070-1049-00	\$2.50
Interface unit maintenance manual, order 070-0998-00	\$3.00

### **DIRECT INTERFACE UNITS**

Interface Units 021-0001-00 and 021-0003-00 match the Tektronix T4002 Graphic Computer Terminal to the Digital Equipment Corporation's PDP-8 family of small computers with negative or positive input/output buses respectively. Data is transferred in parallel under Program Data Transfer control of the computer. When receiving input data from the computer, the interface decodes the data, converts the logic and levels, and provides transfer timing information to Terminal Control. When transmitting output data, the interface changes the Terminal Control data to match the computer logic and levels and transfers it under control of the computer's timing pulses. The interface has its own external interconnecting cable wired for direct connection to the computer's input/output bus.

Parallel Interface for Digital Equipment Corporation PDP-8/I Computer with Negative Input/Output Buses—Included standard accessories are: interconnecting cable to PDP-8/I (015-0151-00); circuit card assembly, I/O bus terminator card (018-0036-00); user's manual (070-1050-00); instruction manual (070-0997-00).

Order 021-0001-00 Parallel Interface ...... \$675

Parallel Interface for Digital Equipment Corporation PDP-8/I or PDP-8/L Computer with Positive Input/Output Buses—Included standard accessories are: either interconnecting cable to PDP-8/I (015-0151-00), or interconnecting cable to PDP-8/L (015-0159-00) (please specify); circuit card assembly, I/O bus terminator card (018-0035-00); user's manual (070-1050-00); instruction manual (070-1041-00).

Blank Card Interface Unit—A kit assembly of five blank cards and supporting hardware for user fabrication of a special T4002 input/output interface unit. Order 040-0552-00 ...... \$270

# 4901 and 4902

### **Interactive Graphic Units**

### INFORMATION DISPLAY PRODUCTS



- INTERACTIVE GRAPHICS FOR T4002 GRAPHIC COMPUTER TERMINAL
- SOFTWARE SUPPORTED
- CLEARLY VISIBLE, PARALLAX-FREE, FULL-SCREEN, HIGH-RESOLUTION CURSOR
- RESOLUTION WITHIN ONE LSB IN 1020 BITS
- COMPATIBLE WITH GRAPHIC INPUT DEVICES WHICH OUTPUT ANALOG SIGNALS OF +5 V OR LESS

### 4901 INTERACTIVE GRAPHIC UNIT

The 4901 Interactive Graphic Unit interfaces the Tektronix T4002 Graphic Computer Terminal\* with graphic input devices which output X and Y analog signals. Analog signals are received by the 4901 from the graphic input device. The 4901 continuously compares these signals with the data in the T4002 D/A converters. Upon command from the computer, the T4002 keyboard, or an external graphic device, the 4901 will digitize the graphic address of the intersection of the crosshair cursor. The digitized graphic address is sent to the computer through the T4002 I/O interface unit.

The 4901 generates a refreshed, clearly visible, full-screen cursor which always covers the entire X, Y dimensions of the T4002 storage display. The cursor forms perpendicular, horizontal and vertical lines which have a clearly discernible intersection. This provides a sharply defined point for use in accurate graphic formatting. Cursor positioning is controlled by the X, Y inputs from the external graphic device.

The cursor position accuracy is within one Least Significant Bit (LSB) in each of the two axes. This accuracy is accomplished by counting, in one direction only, the X, Y registers which generate the crosshair cursor. This means that the point \*T4002's below Serial #B010180 must be modified for use with 4901 and 4902. Contact your Tektronix Application Engineer for information.



of interest is always approached from the same direction, providing accuracy to one LSB.

The cursor generation system uses the T4002 D/A converter system. This common system provides several advantages. It eliminates tracking errors, and drift and registration problems which usually exist between the display system and the graphic input device in equipment where two different converter systems are used. A single system also eliminates a number of critical calibration adjustments and allows the user to take full advantage of the complete addressability of the display system.

The 4901 interfaces with the T4002 Graphic Computer Terminal through the T4002's auxiliary I/O and is housed in the T4002 console space provided for auxiliary modules.

### 4902 INTERACTIVE GRAPHIC UNIT

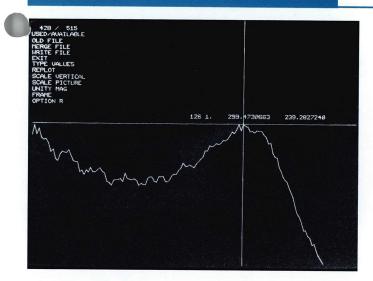
The 4902 is an electronic interface between the Tektronix T4002 Graphic Computer Terminal\* and several kinds of auxiliary input devices, which output analog signals of  $+5\,\text{V}$  or less. The 4902 Interactive Graphic Unit performs all the functions of the 4901 Interactive Graphic Unit plus the following additional features:

**Point Digitization**—The 4902 can digitize and transmit to the computer, data representing either a single point or an array of points, programmable from 16 to 1024 maximum.

Programmable and Strappable Features—The modes of operation of the 4902 are under program control utilizing ASCII control functions and a control word with specific bit assignments. The ASCII control function used in the 4902 can be selectively patched to any one of the 32 ASCII functions thereby maintaining computer data communication and system compatibility requirements, such as line control, coding, and record lengths. Parity can be strapped for either odd or even depending upon system configuration.

The 4902 interfaces with the T4002 through the T4002's Auxiliary Channel and is housed within the T4002 console in the space provided for auxiliary modules.

Front panel connections J1000, J1001, and J2000 are provided for connecting up to three input devices as additional ones are made available, and to provide input interfaces for the operator who wishes to use a device which he designs. Optional 4951 Joystick, connects to J1000.



The above photograph pictures the clearly visible parallax-free, crosshair cursor generated by the 4901 or 4902. The cursor always covers the entire X, Y dimensions of the display. Positioning accuracy is within one LSB along each axis.

# COMMON CHARACTERISTICS X AND Y DIFFERENTIAL AMPLIFIERS

Sensitivity-1 bit/5 mV.

Gain Accuracy-Within 1.5% of full scale.

Common Mode Signal Range—At least  $\pm$  15 V.

Differential Input Signal Range-5.115 V or less.

 ${\bf Maximum~Safe~Input~Voltage-} + 22~{\rm V~to~} - 22~{\rm V,~each~input~referenced~to~program~ground.}$ 

Maximum DC Offset-50 mV or less.

Nominal Input Resistance—Single-ended 80 kΩ, differential 160 kΩ.

Maximum Input Current Offset—plus inputs, 75  $\mu$ A; minus inputs, 250 nA

T4002/4901 or 4902/Graphic Input Device System Resolution—X axis resolution is within one addressable point (1 LSB) between and including points 3 to 1023. Y axis resolution is within one addressable point (1 LSB) between and including points 0 to 1020.

Time to Digitize—XY point, 20 ms or less, including 10 ms cursor turn on; Y point only, 10 ms or less.

Data Multiplexing Time Delay Requirement—5  $\mu s$  or less plus delay added by parallel interface units.

**Program Digitize Delay**—At least 10 ms must be allowed between cursor turn on and first digitized command following turn on. Applies to 4901 only.



The 4902 being placed into the T4002.

### **SOFTWARE**

Each Interactive Graphic Unit is provided with a standard Software Package consisting of the routines necessary to facilitate communication between a computer and the T4002 Graphic Computer Terminal/Interactive Graphic Unit.

The standard Software Package is for user's facilities which support FORTRAN capable of either "A" format (i.e., unspecified character format) or assembly level access from FORTRAN. The Interactive Graphic Unit software will be negotiated on an individual basis for user's facilities which do not support FORTRAN.

A Fundamental Interactive Graphic Package is available for FORTRAN users. It includes FORTRAN routines for the user to create, modify, and manipulate graphic displays.

Documentation will include program descriptions, flow diagrams and program listings.

When ordering the 4901 and 4902 Interactive Graphic Unit, please specify the following information about the intended facility:

Hardware-Computer type, by make and model.

Software—If an operating system is used, please identify by manufacturer and indicate any variation. What languages does the facility support (please state levels). Which of these languages allows assembly level access?

# INTERACTIVE GRAPHIC UNIT INTERFACE CONNECTIONS

**Logic**—The logic form is positive, and logic levels are standard TTL. All TTL input control lines present 5 or less normalized loads to a TTL output. Input pulse widths are at least 500 ns.

Cursor Intensity Input Voltage Range-+5 V to +15 V.

### OTHER CHARACTERISTICS

Operating Temperature Range $-+10^{\circ}$ to $+40^{\circ}$ C.	
Net Weight—Approximately 2 lb; 1 kg.	
4901 INTERACTIVE GRAPHIC UNIT Includes instruction manual 070-1059-00.	\$525
4902 INTERACTIVE GRAPHIC UNIT	\$750

## 4901 and 4902

### **Interactive Graphic Units**

### INFORMATION DISPLAY PRODUCTS



### 4951 JOYSTICK

The 4951 Joystick inputs signals to the Tektronix 4901 and 4902 Interactive Graphic Units. These signals provide the X and Y information for positioning the cursor generated by the 4901 and 4902. The Joystick elements which sense the X and Y voltages are high-resolution potentiometers, controlled with a single handle, centered on a sphere mounted within a shroud. The potentiometers have low start-up and in-motion torque for very positive operator control of the screen position of the cursor.

The Joystick has an IG OFF/CURSOR BRIGHTNESS control which turns the Joystick on and adjusts the intensity of the displayed cursor. A READY light, when lit, indicates that the Interactive Graphic Unit is ready to accept new information.

The Joystick is equipped with its own interconnecting cable for the Interactive Graphic Unit. Instruction manual (070-1060-00) is included.

### **CHARACTERISTICS**

X and Y Resolution—Within one LSB of a previously stored point.

Cursor Brightness Voltage Output Range—  $+6\,\mathrm{V}$  or less to at least  $+14\,\mathrm{V}$ .

Seek Input Voltage Range- $+2.4 \, \mathrm{V}$  to  $+5.5 \, \mathrm{V}$ .

**Joystick Excursion**—Side-to-side excursion is 66° within  $4^{\circ}$ ; corner-to-corner excursion is  $94^{\circ}$  within  $4^{\circ}$ .

Operating Temperature Range $-0^{\circ}$ C to  $+50^{\circ}$ C.

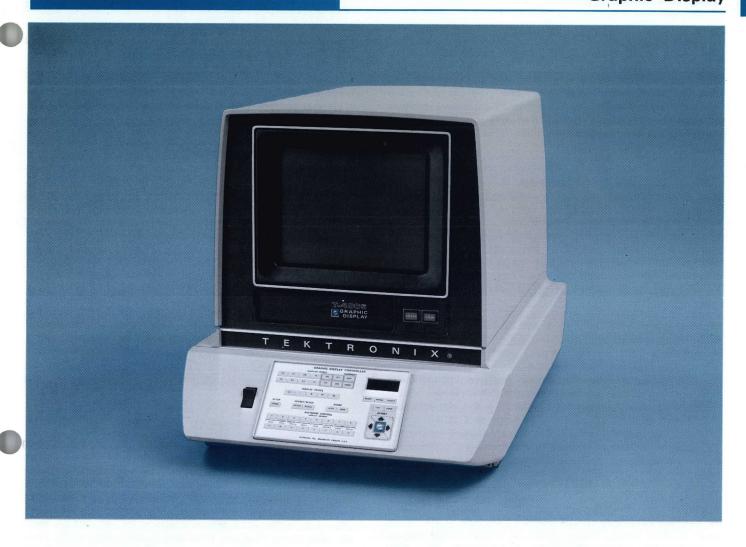
Finish-Anodized aluminum.

Net Weight-21/2 lb; 1.1 kg.

**Dimensions**—Diameter: 6 inches, 15.3 cm; height: approximately 5.4 inches, 13.8 cm.

4951 JOYSTICK .....

. \$300



- Drive capability for four display devices, individually selectable, remote or local operation.
- 8192 x 8192 Display Matrix capacity.
- Display Scale selections: 8192, 4096, 2048, 1024, 512, and 256 points per axis.
- Magnification sufficient to resolve each plotted point. Aspect ratios from 32:1 to 1:32.
- Origin offsetting anywhere within the 8K x 8K display matrix with 16-point resolution.
- Movable Frame windows the area to be displayed next. Zooming feature allows sequential framing in all display scale settings.
- Positionable Locator to position plot origin.
- Eight sense lines individually set by push button.
- Eight push-button interrupts (manual or program disabled).
- Programmable software status lights under Interrupt push buttons.
- Real Time Clock.
- Computer control of most Front-Panel functions.
- Interrupt structure can be disabled manually or by computer.
- Hard copy compatible.

The Tektronix T4005 Graphic Display is an integrated self-contained computer peripheral designed for high-speed, low-cost displays of large drawings, graphics and text. With the aid of appropriate parallel interfaces, the T4005 requests, accepts, controls, and displays data from present day digital computers routinely used for generating drawings and graphics. Graphic data is displayed on a Tektronix developed Storage Display Unit containing an 11-inch Storage CRT. Displays, written once on the Tektronix Storage CRT, are retained in a "view" mode without flicker, drift, or loss of resolution. When old data is erased, the display unit is ready to store new data within 500 ms after initiation of the erase function.

The operator controls and the hardware which converts computer outputs into the drive signals for graphic and alphanumeric displays are contained in the Graphic Display Controller component of the T4005. This hardware performs a number of graphic editing and enhancement functions such as scaling, magnifying, origin offsetting, windowing, and intensity augmenting.

Provisions for driving three additional display devices, and provisions for auxiliary functions add to the versatility of the T4005.

### **DISPLAY UNIT**

The T4005 dislay medium is a Tektronix developed 611 Storage Display Unit. The storage CRT in the 611 retains complex alphanumerics and graphics on an 11-inch display area after the information is written one time. The ability to store information on the CRT is accomplished through a process primarily internal to the CRT. This eliminates the need for costly refresh hardware and provides flicker-free, stable displays.

The storage display area is 21 x 16.2 cm. Resolution is equivalent to 400 x 300 stored line pairs. Storage capacity is at least 4000 clearly spaced, legible characters, based on a 90 x 70 mil dot matrix. Display view time is at least 15 minutes without loss of resolution. Viewing time may be extended to one hour; however, several erasures may be required to fully remove previously stored data. The erase cycle duration is 500 ms. Dot writing time is  $5\,\mu s$ ; beam positioning time is  $3.5\,\mu s$ /cm plus  $5\,\mu s$  stabilizing time. Line writing time in the stored mode is at least  $25\,cm/ms$  at specified resolution.

Operating Functions—The operating functions are View, Erase, Non-Store, and Write-Thru. View and Erase are under manual or software control; Non-Store and Write-Thru are under software control. The Erase function, when initiated, removes all previously stored data from the display area and returns the CRT to a "ready-to-write" mode. As new information is written, it is retained on the CRT in the "view" mode. Within two minutes after the display is written, the 611 will automatically switch to a "hold" mode. This holds data stored on the CRT at a low brightness to extend storage time. Pressing the VIEW switch while in the "hold" mode, returns the display to the "view" mode for at least one minute, but not more than two minutes. The "view" mode may be programmed for continuous viewing for as long as fifteen minutes.

A special "write-thru" feature is provided for displaying cursors on a screen which may contain stored information. In the "write-thru" mode a clearly visible cursor, or any generated pattern, is displayed at an intensity too low to be stored. Thus, both stored and dynamic (non-stored) data may be viewed simultaneously. In the "write-thru" and "non-stored" mode, the display remains on screen as long as it is refreshed.

### GRAPHIC DISPLAY CONTROLLER

The Graphic Display Controller (GDC) is a slide-out drawer unit which contains operator controls and the graphic control electronics. The GDC may be purchased separately as the 4201 Graphic Display Controller. The following discussion applies to the 4201 Graphic Display Controller as well as the GDC portion of the T4005 Graphic Display.



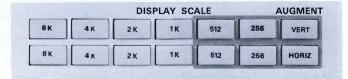
4201 Graphic Display Controller

### DISPLAY DRIVER

The GDC has a D/A converter and an output architecture capable of driving four Tektronix Display Devices. A Display Controller driver card is required for each display device. The T4005 is supplied with one Display Controller/611 card. Optional cards may be purchased to drive other display devices.

### **GRAPHIC CONTROLLER PANEL**

The Graphic Display Controller Panel is equipped with backlighted push buttons. The Push On/Off buttons are the primary means of mode selection and control of the display device. The secondary means of control is through the use of computer software. An indicator window gives the status of four computer/T4005 functions. The control panel may be removed from its housing and remotely located to serve the user's convenience. An optional cable is available for this purpose.



### **DISPLAY SCALES**

The Display Scale push buttons, when lit, indicate the selected vertical and horizontal scale values. Six scales are available in each axis. A lit scale indicates how many step commands the GDC must receive along each axis to drive the D/A converter of that axis over its full range of 1024 distinct analog levels. The number of steps required are: 8192, 4096, 2048, 1024, 512, or 256. With display scales of 8K, 4K, and 2K, there are more steps than the 1024 D/A levels available. At these display scales, the access steps are uniformly absorbed without change in the D/A converter output. As an example, in the 4K selection, every fourth step results in a one-level change in the D/A output, while the other three steps are absorbed. The display scales are operated manually or by computer command.

### **FRAMING**

Framing is the T4005 feature which performs in hardware the "windowing" function most often done in software by other graphic systems. A visible, non-stored Frame is positioned around the area the operator wishes to display next. Frame sizes range from 256 to 8192 dots on each axis, independently selectable, so that aspect ratios from 32:1 to 1:32 are possible. Displays selected by the 256 x 256 Frame become highly magnified so that each computer generated point is clearly visible.

### ZOOMING

Zooming is the T4005 feature which allows Framing to occur on any stored display. When display scales are selected in the Frame mode, a Frame appropriately scaled with respect to the stored display is presented. Thus, one can Zoom from 8K x 8K, to 2K x 2K, and then to 512 x 512, and finally to 256 x 256.

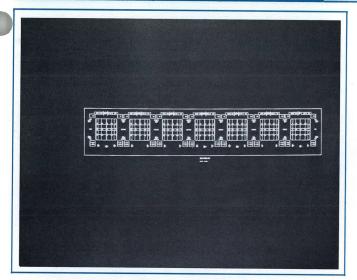


Figure 1

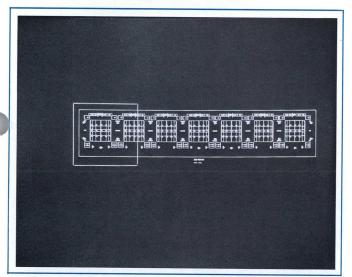


Figure 2

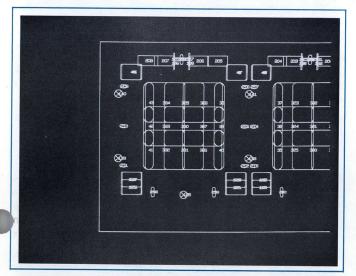


Figure 3

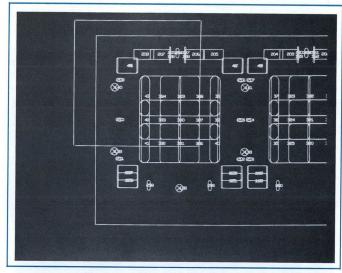


Figure 4

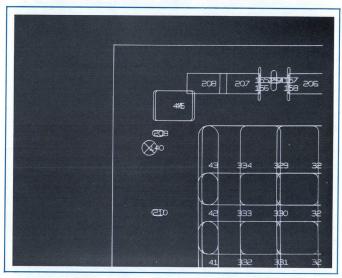


Figure 5

The above photographs illustrate the use of Framing and Zooming to magnify any portion of a display. Figure 1 shows, at 8K x 8K display scales, a complete drawing of seven identical parts to be produced from one piece of metal. Figures 2 through 5 illustrate how a portion of this drawing is magnified for detailed examination. Figure 2 shows a 2K x 2K Frame placed around the area at the left which contains the first part. Only that portion of the drawing windowed by the 2K x 2K Frame reappears in Figure 3. A 1K x 1K Frame is then placed over the upper left portion of this display as shown in Figure 4. The portion of the display windowed by this 1K x 1K Frame is then replotted as shown in Figure 5. Any selected part of the original 8K x 8K display may be magnified as much as 32 times by this straightforward procedure.

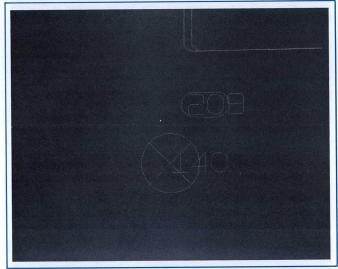
### **ANNOTATION**

In the above photographs, 20% of the storage CRT screen is an annotation area. A T4005 feature called Shift allows the computer to address this area which is outside of the 16 x 16 cm plotting area of the T4005's D/A converters. Thus, annotation need not overlay plotted data.

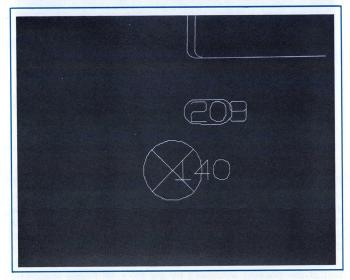
### INFORMATION DISPLAY PRODUCTS

### **AUGMENT**

In the highly magnified 512 and 256 display scales, the computer data may be displayed as received. This results in a separation between the displayed dots. If a brighter display is preferred, Augment can be selected to insert additional dots between those generated from the computer data received. The augment function is selected manually or by computer command.



A non-augmented 256  $\times$  256 display. Non-augmented displays are used for examining in detail the actual computer generated dot pattern.



An augmented 256 x 256 display with additional dots inserted by the T4005.



### DISPLAY DEVICE

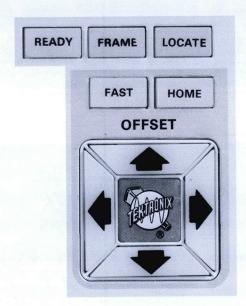
Indicates selected status of each of the four display devices which may be attached to the GDC. Each device is selected manually or by program control.

### DISPLAY MODE CONTROLS

READY, FRAME, and LOCATE are functions which indicate the current operating mode of the T4005. The controls are operated manually or by computer command.

Ready—Removes the Not-Ready status flagged to the computer, and readies the GDC to process computer write commands.

Frame—Places a write-thru frame, whose aspect ratio is dependent upon the Display Scales selected, on those display devices selected by the GDC.



Locate—Places an "L" shaped write-thru Locator on those display devices selected by the GDC. The Locator serves uses such as locating the point from which subsequent display commands are started. The Locator can be used in conjunction with software and the interrupt structure, to determine the precise address of the Locator to within one point anywhere in the 8192 x 8192 graphic matrix.

Offset—A 4-button group which provides positioning control for the FRAME and LOCATOR and indicates positioning information such as which direction the cursor may be offscreen and when a selected frame is larger than the display.

Fast—Provides two positioning speeds for FRAME and LO-CATE. Pushing and lighting FAST selects a speed for rapid positioning. The second initiation turns the light off and selects a slow speed for precise positioning.

Home—When pressed, returns the FRAME or LOCATOR to the lower left hand corner (0,0) of the screen.



### SET UP

**Initial**—Sets the T4005 hardware to a predetermined state, zeros registers and clears pending interrupts. This function may be computer controlled.

### OFFSET/SCALE

**Retain**—Places in the Retain Storage Registers the current Display Scale values and the current contents of the X and Y axis Offset Registers.

**Recall**—Places the contents of the Retain Storage Registers into the Display Scale Registers and the Offset Registers, reestablishing the retained display scale and offset parameters. Also, it initiates a display interrupt and places the GDC in the READY mode.

#### **ERASE**

Screen erase can be initiated several ways. Activating erase clears the full screen contents and returns the CRT to a ready-to-write mode within 500 ms after the function is activated.

**Auto—**When in this mode, the selected Display Device(s) are automatically erased when DISPLAY or RECALL is initiated or when the fully READY mode is reached.

Manual—Erases the selected Display Device(s) any time it is initiated.

CONTROLLER INTERRUPT ADDRESSED PENDING PROCESSOR INTERRUPT RUNNING DISABLED

### STATUS INDICATORS

Indicates status of the T4005/Computer system. Backlighted labels light when the indicator structure is addressed.

Controller Addressed—Indicates the T4005 has been addressed by the computer within the last 0.5 second.

**Interrupt Pending**—Indicates the T4005 has requested an interrupt but it has not been serviced.

**Processor Running**—Indicates the computer is running, e.g. not in a WAIT condition.

Interrupt Disabled—Indicates the T4005 interrupt capability has been manually disabled or the computer has not enabled the T4005's interrupt hardware.



#### SOFTWARE CONTROL

The circuitry in support of software interaction consists of an interrupt structure, status information and a real-time clock.

The interrupt structure is activated when Buttons A-H on the Graphic Controller Panel are pushed. Computer interrupt subroutines must service the pending interrupt before a new interrupt is initiated. In addition to Buttons A-H, the computer can also sense the state of DISPLAY NUMBER buttons 1-8 (only

one of which is selected at any one time). Thus, 64 distinct interrupt states can be sent to the computer by the use of Display Number buttons and interrupts buttons A-H. The interrupt feature may be logically disconnected from the computer by use of the interrupt control switch located at the rear of the T4005. This three position switch allows the interrupt structure to be connected, disconnected, or placed under computer control.

Ninety-six bits of status information are gated to the computer by three GDC Status Gates. Depending upon the computer interface installed, these information bits may be transferred to the computer as 8, 12, 16, or 24 bit words.

A real time clock is turned on and off by computer control commands. The clock interrupts the computer every 16.7 ms. External frequencies to 500 kHz may be applied to the clock for interrupting the computer at any selected interval.

#### **SOFTWARE**

The T4005, when ordered with the IBM 1130 Interface Unit 021-0018-00, is provided with the following software:

T4005/1130 Saveplot System. This system is a comprehensive set of routines allowing the user to display and record computer-generated plots for later replay.

Control Function Subroutines. These subroutines provide access to and support of the full set of Graphics Display Controller functions.

Text Handling Subroutines. These subroutines aid the user in displaying alphanumeric data in various formats on the T4005. Five character sets, including one for APL, are available.

Program descriptions and usage information is included with the above software. Flow diagrams, program listings and a cross-reference program directory are available as optional accessories.

Software provided with other than the IBM 1130 Interface will be negotiated on an individual basis.

### OTHER CHARACTERISTICS

**T4005 Power Requirements**—A quick-change line-voltage selector provides six ranges: 90 to 110 V, 104 to 126 V, 112 to 136 V, 180 to 220 V, 208 to 252 V, and 224 to 272 V. Frequency range is 48 to 66 Hz. Maximum power dissipation at 115 VAC is 310 watts.

**4201 GDC Power Requirements**—Same as T4005 except maximum power consumption is 81 watts at 115 VAC.

T4005 and 4201 Operating Temperature—Normal operation over  $10^{\circ}\text{C}$  to  $40^{\circ}\text{C}$  range.

### **Dimensions and Weights**

	T400	05	4201		
Show Installed	INCHES	cm	INCHES	cm	
Height	20	50.8	5 1/4	13.3	
Depth	29 1/2	73.8	28 3/4	73.0	
Width	19	48.3	19	48.3	
	POUNDS	kg	POUNDS	kg	
Net Weight	107	48.7	40	18	

## T4005

### **Graphic Display**

**INFORMATION DISPLAY PRODUCTS** 

T4005 Included Standard Accessories—Drawer unit user's manual 070-1085-00, maintenance manual 070-1086-00, 611 Storage Display Unit manual 070-0752-01.

T4005 GRAPHIC DISPLAY, without interface ....................\$7850

**4201 Included Standard Accessories**—Drawer unit user's manual 070-1085-00, maintenance manual 070-1086-00.

4201 GRAPHIC DISPLAY CONTROLLER, without interface ...... \$4950

### **INTERFACE UNITS**

The interface for the IBM 1130 Computer includes an interconnecting cable (012-0215-00) and interface manual (070-1087-00).

Order Interface Unit 021-0018-00 \$850

The T4005 Graphic Display and 4201 Graphic Display Controller can be interfaced with most present day digital computers. Tektronix will quote interface costs and availability upon request.

### **OPTIONS**

The T4005 and 4201 are available with a blue cabinet. Order T4005 GRAPHIC DISPLAY option one (without interface) ...... \$7850 4201 GRAPHIC DISPLAY CONTROLLER option one (without interface) ...... \$4950

**Driver Cards**—The T4005 Graphic Display and 4201 Graphic Display Controller will drive the following Tektronix Display Units: 601 Storage Display Unit, 611 Storage Display Unit, 4501 Scan Converter. The T4005 and 4201 is interfaced with each display device by a driver card.

Order driver cards as follows:

T4005/4201 to 601 or 4501 Scan Converter order 670-0925-00 \$200 T4005/4201 to 611 Storage Display Unit order 670-0926-00 \$200

**20-Foot Interconnecting Cable**—The T4005 or 4201 control panel may be detached for remote operation, through use of this cable.

Order 012-0216-00 ......\$75

### **ACCESSORIES**

Viewing Accessories—Combination light filters and implosion shields improve contrast for high ambient light viewing.

The matt finish of filter 015-0145-00 improves contrast but causes slight loss of resolution. Order 015-0145-00 ...... \$35

The glossy surface of filter 014-0040-00 improves contrast, retains resolution but causes reflections. Order 014-0040-00. \$35



Hard Copy Unit—The 4601 used in conjunction with Tektronix Storage Display Units provides a convenient means for permanently copying alphanumeric and graphic displays. Hi-resolution displays obtained on the T4005 are copied by the 4601, providing an accurate representation of the stored display on 3M Type 777 Dry-Silver Paper.

4601 HARD COPY UNIT ......\$3750



Camera—The C-10 is a fixed-focus, light-weight camera designed for use with the Type T4005. An f/8 lens with sufficient depth of field and convenient hand grips allow the C-10 to be held against the display area for photographing displays. The C-10 housing accommodates a Graflok $^1$  4 x 5 back.

C-10 CAMERA ..... \$400

<sup>1</sup>Registered Trademark Graflex, Inc.



- LINKS DATA AND SIGNAL SOURCES TO LARGE-SCREEN TV MONITORS OR RECEIVERS
  - CONFORMS TO EIA OR CCIR STANDARDS
  - OUTPUT DRIVES SEVERAL MONITORS
  - DC-TO-10 MHz X AND Y AMPLIFIERS
  - REMOTELY PROGRAMMABLE

The 4501 Scan Converter accepts alphanumeric and graphic data—in the form of analog inputs—and converts it to displays on TV receivers and monitors. The hi-contrast TV displays are ideal for individual or group viewing—even under bright light conditions. The displays may be viewed as light data on a dark background or as dark data on a light background, selected from the 4501 front panel.

The 4501 uses a Tektronix bistable storage CRT. Data may be written once on the storage CRT and retained for an hour without refreshing. The results are: call for your data once, then view it as long as one hour on a TV-size display. The 4501 also transfers continuously written data to your TV display.

The output video signal conforms to EIA 525-line, 60-field television standards. Provision is made to internally switch to CCIR, 625 line, 50 field to accommodate European television standards. The modulated RF output permits displaying information on Channel 2, 3, or 4 of conventional television receivers.

### **DISPLAY MODES**

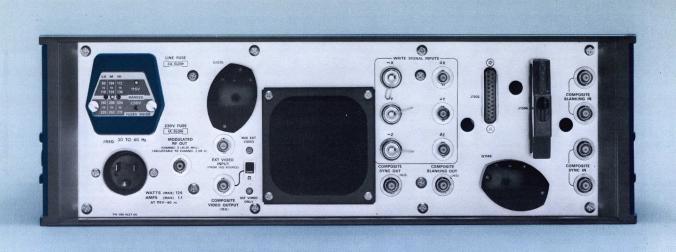
The scan converter may be operated in a STORE or NON-STORE mode. In the STORE mode, information from X, Y and Z-axis signal inputs is stored in a conventional manner on the storage CRT. Conversion is obtained by raster scanning the storage target with the CRT writing beam. The detected signal is then combined with internally generated television sync and blanking, and is provided at the rear panel as composite video or modulated RF. Operation of the Type 4501 in the NON-STORE mode is similar to operating in the STORE mode except displays are not retained. In this mode dynamic displays of changing information may be scan converted for large-screen viewing.

Associated with the STORE and NON-STORE operating modes are the WRITE ONLY, WRITE AND READ and READ ONLY operating functions. The WRITE AND READ function permits a display to be visually written and read simultaneously. This is accomplished by "time-sharing" the single electron beam. Using the same deflection amplifiers and electron beam to perform the write and read functions insures excellent input-output tracking, thus adding negligible position errors to the output monitor.

### VERTICAL AND HORIZONTAL AMPLIFIERS

The DC coupled X (horizontal) and Y (vertical) differential input amplifiers provide cancellation of common-mode signal components, permit convenient polarity inversion and provide a means for mixing of two signals from separate sources. The display aspect ratio is 3 units vertical and 4 units horizontal. Access to (+) and (-) inputs is through rear-panel BNC connectors. Simultaneous access to the (+) inputs is available through the remote program connector.

### Scan Converter



**Bandwidth**—At least 10 MHz within center 7.5-cm scan area,  $+20^{\circ}$ C to  $+30^{\circ}$ C.

**Deflection Factor**—Vertical: 0.75-V full screen (7.5 cm), variable from 0.375-V full screen to 1.125-V full screen with internal adjustment. Horizontal: 1.0-V full screen (10 cm), variable from 0.5-V full screen to 1.5-V full screen with internal adjustment.

Phase Difference—Within 10° between X and Y at 10 MHz.

**Dot Settling Time**—0.15  $\mu$ s or less to within 1% of final position.

**Position Stability—**Within 10 mV of graticule center,  $+20^{\circ}$  C to  $+30^{\circ}$  C; within 50 mV of graticule center,  $0^{\circ}$  C to  $+50^{\circ}$  C.

**Gain Stability**—Within 1% of setting,  $+20^{\circ}$  C to  $+30^{\circ}$  C; within 4%,  $0^{\circ}$  to  $+50^{\circ}$  C.

**Polarity—**(+) X input moves the beam up, (-) X input moves the beam down, (+) Y input moves the beam right, (-) Y input moves the beam left.

Input R and C—1 M $\Omega$  within 2%, paralleled by 47 pF.

Maximum Input Voltage-200 V., (DC plus peak AC).

**Differential Input**—Linear common mode signal range: + and - 2.5 V, total not to exceed 5 V P-P. Common mode rejection ratio:  $\geq$ 500:1 at 10 kHz;  $\geq$ 100:1 at 1 MHz.

### **Z AMPLIFIER**

The DC-coupled Z-axis amplifier provides cancellation of common-mode signal components, permits convenient polarity inversion and provides a means for mixing of two signals from separate sources. In all WRITE modes, the CRT beam intensity is determined by the Z-axis input and the INTENSITY control. Access to (+) and (-) inputs is through BNC connectors on the rear panel. Simultaneous access to the (+) input is available through the remote program connector.

The Z amplifier input has two operating modes: LINEAR and LIMITING.

# LINEAR AMPLIFIER CHARACTERISTICS (Single ended or differential input)

Bandwidth—  $\geq$  5 MHz with 1-V input.

Risetime—  $\leq$ 75 ns with 1-V input step.

**Amplitude Requirements—**Maximum intensity is achieved at 1.0 V P-P. Normal writing intensity is produced by 0.5 V P-P and minimum useable intensity is 0.05 V P-P.

**Polarity**—Positive signal on the (+) input increases intensity, negative signal on the (-) input increases intensity. (Intensity modulation of the CRT beam is the resultant difference between the signal applied to the (+) and (-) Z-axis inputs).

Input R and C— 1 M $\Omega$ ,  $\pm 2\%$  paralleled by 47 pF.

Maximum Input Voltage - 200 V (DC plus peak AC).

**Linear Common Mode Signal Range—** + and - 2.5 V, not to exceed 5 V P-P.

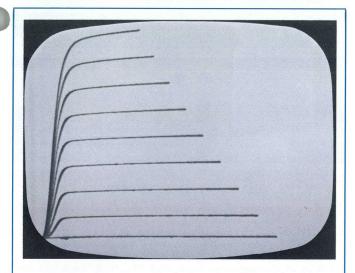
Common Mode Rejection Ratio—  $\geq$ 500:1 at 10 kHz;  $\geq$ 100:1 at 1 MHz;  $\geq$ 10:1 at 10 MHz. (A single-ended signal to either (+) or (—) input receives rejection of common-mode components existing on the signal lead and the signal ground).

### LIMITING AMPLIFIER CHARACTERISTICS

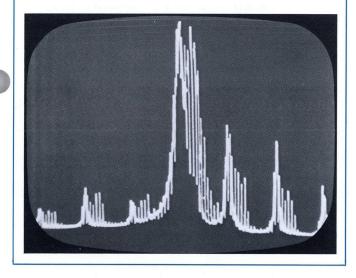
A single-ended signal at the (+) input connector can be routed through an amplitude limiting stage by moving an internal switch. The drive signal to the Z-axis amplifier is automatically limited to 1 V P-P.

**Input Requirements—**Voltage levels of  $+1\,\mathrm{V}$  or more turn the beam on to a fixed level. The fixed level can be adjusted with the intensity control. Voltage levels of  $+0.5\,\mathrm{V}$  or less keep the beam turned off.

Maximum Input Voltage-50 V (DC and peak AC).



Displays may be viewed with a light or dark background (top and bottom photo). The front-panel BACKGROUND switch provides a choice of LIGHT (written area is displayed dark on a light background) or DARK (written area is displayed light on a dark background).



### STORAGE CRT

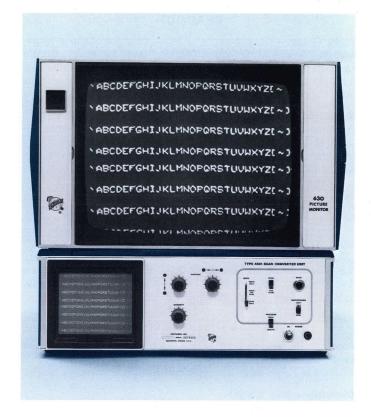
Tektronix CRT—5-inch, flat-faced bistable storage tube, phosphor similar to P1.

Aspect Ratio—Three units vertically by four units horizontally.

Resolution—Equivalent to 100 vertical 125 horizontal stored line pairs.

**Display Time**—At least 15 minutes without loss of resolution. Display time may be extended to one hour; however, several erasures may be required to fully remove previously stored data.

Dot Writing Time—8  $\mu$ s or less.



The information written on the 5-inch CRT of the scan converter (bottom) is converted to composite video and is displayed on the Tektronix monitor (top).

### READ RASTER

Readout is accomplished by scanning the CRT storage target with a TV raster. The necessary TV sync, blanking and raster scanning voltages are developed in the scan converter unit. Sync and video are combined to assemble a composite TV signal. An internal switch permits selection of either EIA 525-line, 60-field or CCIR 625-line, 50-field TV standards. Provision is made to automatically utilize external sync and blanking when these signals are connected to the scan converter.

Sync Frequency

	EIA	CCIR
Vertical	60 Hz	50 Hz
	or <u>1</u> H	or <u>1</u> H
Horizontal	15.75 kHz	15.625 kHz
	within 0.12%	within 0.12%

Composite Sync and Blanking Outputs—Conforms to EIA or CCIR timing requirements. Amplitude is -4 volts within 0.2 V into 75  $\Omega$ .

Composite Sync and Blanking Inputs—Inputs must meet EIA or CCIR timing requirements. 75- $\Omega$  loop through connections allow one or more units to be driven by the same source. Return loss is  $\geq$ 30 dB, 50 Hz to 5 MHz.

### READOUT

**Video Output**—Video polarity is black negative. Output amplitude is 30 to 150 mV above blanking level for stored signals and 600 to 800 mV above blanking level for non-stored signals if a light background large display is being used. The inverse is true if a dark background display is used.

**Modulated RF Output**—The carrier frequency is set to 61.25 MHz (TV Channel 3) and is internally adjustable from 55.25 MHz (TV Channel 2) to 67.25 MHz (TV Channel 4). Frequency stability is within 250 kHz of carrier frequency from 20° C to 30° C. Amplitude is at least 10 mV P-P into 75  $\Omega$ .

### REMOTE PROGRAMMING

Remote programming of the Type 4501 Scan Converter Unit is accomplished through 2 rear-panel program connectors. The NON-STORE, ERASE, READ ONLY, WRITE ONLY and BACK-GROUND are externally programmable by grounding or switching between  $+0.5\,\mathrm{V}$  and  $-10\,\mathrm{V}$  on the appropriate program line. The (+) inputs to the X, Y and Z amplifiers are also available at the remote program connectors.

### OTHER CHARACTERISTICS

**Power Requirements**—90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 125 watts maximum at 115 V 60 Hz. Rear-panel selector provides rapid accommodation for 6 line voltage ranges.

#### Dimensions and Weights

Differences and Weights							
Height	6 in	15.3 cm					
Width	16 3/4 in	42.6 cm					
Depth	21 1/4 in	54.0 cm					
Net Weight	37 1/4 lb	17.0 kg					
Domestic shipping							
weight	64 lb	29.0 kg					
Height	5 1/4 in	13.4 cm					
Width	19 in	48.3 cm					
Depth	20 1/2 in	52.0 cm					
Net Weight	37 1/4 lb	17.0 kg					
Domestic shipping							
weight	68 lb	30.9 kg					
	Height Width Depth Net Weight Domestic shipping weight Height Width Depth Net Weight Domestic shipping	Height       6 in         Width       16 3/4 in         Depth       21 1/4 in         Net Weight       37 1/4 lb         Domestic shipping weight       64 lb         Height       5 1/4 in         Width       19 in         Depth       20 1/2 in         Net Weight       37 1/4 lb         Domestic shipping					

**Temperature**—Performance characteristics are valid over an operating temperature range of 0° C to  $+50^\circ$  C.

Included Standard Accessories—25-pin connector (131-0570-00); connector cover (200-0821-00); 25-ft, 75- $\Omega$ , BNC cable (012-0157-00); 37-pin connector (131-0422-00); connector cover (200-0660-01); UHF to BNC adapter (103-0015-00); 3-conductor power cord (161-0010-03); instruction manual (070-0943-00). Type R4501 also includes rackmounting hardware.

TYPE	4501	SCAN	CONVERTER	UNIT	***************************************	\$2500
<b>TYPE</b>	R4501	SCAN	CONVERTER	UNIT		
(rac	ckmou	nt mod	el)		f Wordtw	\$2500

-----



Rackmount version, Type R4501

### **TELEVISION MONITORS**

The Type 4501 Scan Converter Unit provides an output in the form of composite or modulated RF. High resolution displays are achieved using the Tektronix Picture Monitor and other quality monitors and receivers. Tektronix field offices will supply ordering information on monitors and receivers.

- POINT, DRAW, WRITE, MAGNIFY ON TV MONITORS AND RECEIVERS
- USE IN BROADCASTING, TEACHING, COMPUTER-AIDED INSTRUCTION
- ANALOG AND DIGITAL OUTPUTS

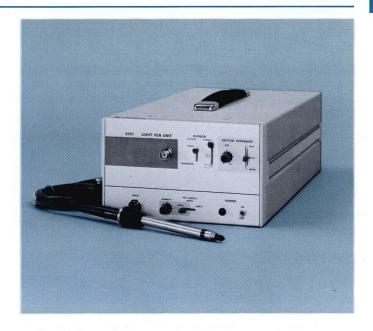
The 4551 Light Pen Unit, when used in any 525/60 or 625/50 line TV system, produces a visible location indicator (cursor) on all TV displays in the system. The cursor may appear as a crosshair — , a rectangular box \_\_\_\_ , or the crosshair may be enclosed by the box \_\_\_\_\_ . Conventional video mixing techniques are used to insert the cursor into the TV display system. The cursor tracks the position of a pen as the user moves it across the screen of the TV display.

The cursor calls the attention of the TV audience to any point on the display. For example, news commentators will use the Light Pen Unit to call attention to areas on weather maps during weather broadcasting. Instructors on educational TV programs can use the Light Pen Unit to keep the attention of the audience concentrated on the appropriate point as material is discussed from sources such as blackboards, charts, books and drawings. Medical usage includes applications such as surgery which is being monitored by TV for lecturing purposes. The lecturing physician would use the Light Pen Unit to point to each anatomical area as it is discussed.

In any application where the Light Pen Unit is used, the user reduces distractions by removing himself and physical pointers from the display.

At any time the cursor's position is defined as a set of X-Y coordinates. Analog and digital signals corresponding to the X-Y coordinates are available at rear panel connectors. These signals may be fed into a data system for use in applications such as computer-aided instruction. For example, the computer would generate a display through appropriate software and ask a question of the student. The student points to an answer with the Light Pen Unit. Output signals from the Light Pen Unit would be used by the computer to validate the student's answer.

A pen connects to the Light Pen Unit through a modified BNC connector. Switches on the pen tip are used for controlling the cursor position and for writing on the display. One of these switches consists of a pair of rings (conducting surfaces) separated by a 5-mm gap (non-conducting surface). To illustrate how this functions, first assume that a stationary cursor is on the screen. To move the cursor the operator places the pen against the display area. The cursor will remain stationary until the user bridges the gap on the pen with his finger. When this is done the cursor moves to the pen's position. As long

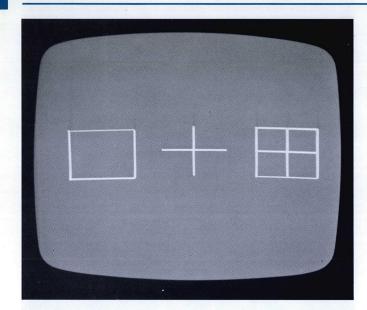


as the gap is bridged and the pen is held against the display, the cursor tracks the pen movements. To stop the cursor movement, the operator simply lifts his finger.

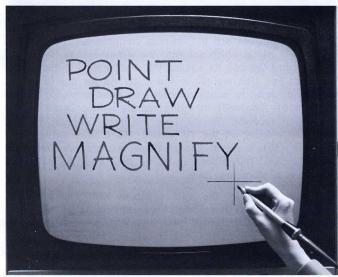
Users who wish to write on the TV display may do so by using the Light Pen Unit with the Tektronix 4501 Scan Converter. These two devices are plug-to-plug compatible. The pen has a switch in its tip which activates the write function. When the user presses the pen tip against the display area, outputs from the Light Pen Unit are fed to the 4501. As the pen is moved to write or draw, its movements are converted to stored images in the 4501. The 4501 then displays the written image on the monitor or receiver. To the user the image appears as if it is written directly on the TV screen. To remove written data from the 4501, the user pushes Erase, a Light Pen Unit front panel control. This erases all stored data from the 4501 and readies it to store new data.

Application areas for the write capability would be the same as those previously described. News commentators, teachers, lecturers and students will find that writing material on TV screens is a convenient means of communicating with a large. scattered audience.

The Light Pen, when used with a scan converter such as the 4501, provides a convenient means to magnify displays. Data received from a source such as a computer is retained by the 4501 and converted to a display on the TV screens. To magnify, a cursor is placed over that portion of the display which is to be enlarged. With the Light Pen Unit operating in the MAG mode, the area enclosed by the cursor is magnified up to five times. In the MIXED mode, the area enclosed by the cursor is displayed alternately as a magnified and then a non-magnified area. The user views this as superimposed displays. The magnification ratio is variable by a front panel control on the Light Pen Unit.



The above photos (multiple exposure) show the crosshair, box, and boxed crosshair cursor which the Light Pen Unit inserts into the TV display.



Artist conception of 4551 features.



The boxed-crosshair cursor is being used in a broadcasting application to attract the viewers attention to the geographic area being discussed.

### LIGHT PEN CHARACTERISTICS

Output Signals—For analog applications the voltage output level varies from 0 to 5 V (nominal) as a function of the cursor position. Output current is 1 mA or less. The recommended load impedance should be at least 5 k $\Omega$ . In digital applications the vertical coordinates are provided by 9 parallel lines of binary information. The horizontal coordinates are also provided by 9 parallel lines of binary information. The lines are TTL compatible and each has a fan-out capability of 5 TTL loads.

### OTHER CHARACTERISTICS

Power Source—Quick-change line voltage selector provides 4 ranges as follows: 90 V to 118 V, 104 V to 136 V, 180 V to 236 V, 208 V to 272 V. Line frequency range is 48 Hz to 440 Hz. Power requirement is approximately 20 Watts.

### Dimensions and Weights-

Includes instruction manual, 070-1149-00.

Height	4 i	n	10.2 cm
Width	8 i	n	20.4 cm
Depth	16 i	n	40.7 cm
Net Weight	10 1	b	4.5 kg
4551 LIGHT PEN UNIT			\$1800



T4002 Graphic Computer Terminal with 4601 Hard Copy Unit

The 4601 used in conjunction with Tektronix Storage Display Units provides a convenient means for permanently copying alphanumeric and graphic displays. Hi-resolution displays obtained on the 611, T4002 and T4005 are copied by the 4601, providing an accurate representation of the stored display on 3M Type 777 Dry-Silver Paper.

Since the 4601 is completely self-contained, installation consists merely of connection to the power line and to the appropriate Tektronix unit. Copy command may be initiated by pressing a front panel control, or by supplying an external command.

### **HOW THE 4601 WORKS**

The signal source is "looped through" the 4601 to the Tektronix Display Device. When the copy command is received, the signal source is automatically disconnected from the Display Device.

Hard Copy is produced by systematically scanning the target of the storage unit. Scanning ramps are generated by scan generators located in the Hard Copy Unit. An electrical signal is taken from the target electrode and fed to the Z axis of a line scan CRT. A fiber optic faceplate couples the light output from the phosphor to the recording material. Heat development of

the latent image takes place after this exposure. Hard Copy is available about 18 seconds after initiation of the copy command.

### THE COPY MEDIUM

The processing unit in the 4601 is designed to be used with 3M Brand Type 777 Dry-Silver Paper.

Type 777 Paper provides the high image contrast required for high-resolution copies of complex graphics and alphanumerics. It offers the user the stability normally associated with wet-process photosensitive paper, plus the convenience of dry print-out papers. Cost is low: 5 to 8 cents per 8½ by 11-inch copy, depending on usage. Further economies can be realized using smaller copies. Copy size is adjustable from 8½ by 6 inches to 8½ by 14 inches. Roll size is 8½ inches by 500 feet.

Dry-Silver prints can be handled much like any conventional paper. Records can be easily written upon with pencil or pen. Pencil marks are erasable. Shelf life of unexposed paper is six months, providing the paper is not removed from its protective wrapper and is stored at room temperatures.

TEKTRONIX IS AN OREGON CORPORATION LOCATED ON A 300 ACRE INDUSTRIAL PARK NEAR PORTLAND, OREGON. TEKTRONIX PRODUCTS ARE MANUFACTURED, SOLD AND SERVICED FROM LOCATIONS THROUGHOUT THE FREE HORLD.

IN RECOGNITION OF THE INCREASING NEEDS FOR READOUT DEVICES FOR COMPUTER CONSULES AND REMOTE TERMINALS, TEKTRONIX HAS DEVOTED CONSIDERABLE TIME AND EFFORT TO DESIGNING AND PRODUCING DISPLAY COMPONENTS WHICH HILL EFFECTIVELY FULFILL THESE NEEDS. BRIEFLY, A FEW OF THESE PERIPHERALS ARE:

811 STORAGE DISPLAY UNIT--A LOH-COST, HIGH SPEED UNIT WHICH RETAINS INFOR-MATION ON AN 11-INCH STORAGE CRT WITH-OUT HIGH-COST REFRESH ELECTRONICS.

T4002 GRAPHIC COMPUTER TERMINAL--AN INFORMATION DISPLAY UNIT WHICH CONTAINS THE COMPONENTS NEEDED FOR LOW-COST ALPHANUMERIC AND GRAPHIC INTER-ACTION BETWEEN MAN AND COMPUTER. DATA IS STORED ON A 611 DISPLAY UNIT.

T4005 GRAPHIC DISPLAY--A NEW SELF-CONTAINED COMPUTER PERIPHERAL FOR APPLICATIONS WHERE LOW-COST, HIGH SPEED DISPLAYS OF GRAPHICS, DRAWINGS AND ALPHANUMERIC DATA IS DESIRED. THE T4005 PLOTS DATA ON A STORAGE CRT AT SPEEDS UP TO 100 TIMES FASTER THAN MECHANICAL PLOTTERS.

+501 SCAN CONVERTER--LINKS YOUR DATA OR SIGNAL SOURCE TO TV DISPLAY SYSTEMS FOR CONVENIENT, LARGE SCREEN VIEWING. THE DISPLAY SIZE DEPENDS ONLY UPON YOUR CHOICE OF TV MONITOR OR RECEIVER.

+601 HARD COPY UNIT--INFORMATION FROM YOUR COMPUTER IS PERMANENTLY RECORDED ON REPRODUCIBLE COPIES DIRECTLY FROM THE STORAGE CRT OF TEKTRONIX PERIPHERALS. OPERATION IS EASY. SIMPLY PUSH A BUTTON AND IN LESS THAN 18 SECONDS A HIGH RESOLUTION COPY IS READY FOR USE. COPY COST IS LESS THAN EIGHT CENTS PER 8.5 X 11 INCH COPY. DEPENDING UPON USAGE.

PLEASE HAVE YOUR NAME ADDED TO THE TEKTRONIX MAIL LIST OR CONTACT ANY LOCAL TEKTRONIX FIELD ENGINEER OR APPLICATION ENGINEER FOR ADDITIONAL INFORMATION.



E 4881 COPY OF SCREEN CONTENTS OF T4882 GRAPHIC COMPUTER TERMINAL 3

Photo of a 4601 copy

### **CHARACTERISTICS**

Copy Size—Adjusted to  $8\frac{1}{2}$  x 11 inches at factory, variable between  $8\frac{1}{2}$  x 6 inches and  $8\frac{1}{2}$  x 14 inches.

Copy Time-18 seconds for first copy.

Warmup Time-20 minutes.

**Remote Copy Command**—Closure to ground for at least  $5 \mu s$ . **Resolution** (with 3M Brand Type 777 Paper)—Essentially the same as displayed on the 611, T4002, or T4005 Display Device. Actual-size copies of a 4000-character display, based on a 90 x 70 mil matrix, are clearly legible.

Ambient Temperature—Between  $+20^{\circ}\text{C}$  and  $+30^{\circ}\text{C}$  is recommended. If extreme environmental conditions exist, other recording papers may be substituted. Contact your local Tektronix Field Office.

Compatibility—Designed for use with Tektronix T4002 Graphic Computer Terminal, T4005 Graphic Display, and Type 611 Display Units serial numbers B142240 and above. Type 611's below this serial number require a modification; contact your local Tektronix Field Office for additional information.

Power Source (factory-wired options)—90 to 136 VAC, 115 V nominal, 50 or 60 Hz. Maximum power consumption at 115 V,

 $60\;Hz$  is  $1450\;W$  for first  $40\;s$  after turn on, 220 to 520 W for normal operation,  $100\;W$  standby.

**Dimensions** (height, width, length)—11 x 17 x 24 inches; 27.9  $\times$  42.7 x 61 cm.

Weight-Approximately 69 pounds; approximately 31 kg.

Included Standard Accessories— 25-pin input connector (131-0570-00); two 6-foot interconnecting cables (012-0258-00); 6-foot detachable power cord (161-0065-01); instruction manual (070-1156-00).

4601 HARD COPY UNIT ......\$3750
The standard 4601 has a light tan cabinet and the output scan voltage is 5 V. The 4601 is available in a blue cabinet with an output scan voltage of 1 V.
4601 HARD COPY UNIT Option One ....\$3750

Paper—One roll is included with the 4601. Refills are available from Tektronix, Inc.



## TEKTRONIX PRODUCTS 1973





# INFORMATION GENERATION AND CONDITIONING



#### 4701 Eight-Channel Multiplexer

Display the inputs from as many as eight different signal sources on a single display unit with the 4701 8-channel multiplexer. See details on page 266.





#### 4501 Scan Converter

Alphanumeric and graphic data in analog form are converted to video displays with the 4501 Scan Converter. For full details on performance and price, refer to page 264.



4551 Light Pen Unit

The 4551 Light Pen Unit is the quick, modern way to point out areas of TV displays, or write or draw new information on TV display screens. Complete information about the Light Pen is found on page 265.

## DISPLAY



602 Monitor

Bright, sharp X, Y, and Z axis displays are yours with the high-resolution 1-MHz bandwidth 602 Display Unit. Specifications and price information on page 256.



603 Monitor

Choose bright, flicker-free stored displays, or non-stored conventional displays with the low-cost big screen 603 Storage Display Monitor. Details on page 257.



604 Monitor

A big CRT in a small package. That's the low-cost 604 Display Monitor. See page 258.



630 Series Monitors





## **MONITORS**





611 Monitor

611 MOD 162C Monitor

Fill the big 8¼ by 6% inch display screen of the 611 Storage Monitor with as many as 4000 alphanumeric characters, or graphic displays of great complexity. Page 260 has the full story on price and specifications.

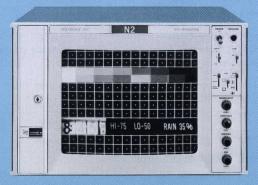




613 Monitor

613-1 Monitor

This year's big news in storage tubes is the brightness of the 613 bistable storage CRT. See page 262 for price and specification information.



650 Series Monitors

## HARD COPY



4601 Hard Copy Unit

Sharp, legible permanent dry copies of your computer terminal displays are yours in seconds at low cost with the 4601 Hard Copy Unit. See page 268 for performance and price details.



4610 Hard Copy Unit

The 4610 is a worthy partner for the popular 4010-1 Computer Display Terminal, making legible, high-resolution permanent hard copies directly from the 4010-1 display. Price and performance information is found on page 272.



4602 Video Hard Copy Unit

The 4602 is a high-speed video hard copy unit which produces high-resolution gray scale copies of pictures, graphs, notes or drawings directly from the screen of your video monitor. See page 270 for details.





- 1-MHz X AND Y BANDWIDTH
- 100-mV/cm X AND Y DEFLECTION FACTORS
- X-Y PHASE DIFFERENCE WITHIN 1° TO 1 MHz
- UNIFORMLY SMALL SPOT SIZE
- DC-COUPLED Z AXIS

The Type 602 Display Unit is a compact, solid-state instrument with excellent resolution providing accurate displays of information from X, Y, and Z signal inputs. Application areas are: phase shifts and frequency ratios using *Lissajous* figures, graphic and alphanumeric displays from computers, high-resolution raster displays, with intensity modulation, and Y-T plots of amplitude versus time displays.

Permanent records of the Type 602 display are provided on Polaroid\* prints using the Tektronix C-30A Camera with adapter. Two Type 602's may be mounted side-by-side using an optional rack adapter.

#### **CRT DISPLAY**

**Tektronix CRT**—5-inch flat-faced rectangular CRT with P31 phosphor standard, P7 phosphor optional.

Display Size-8 cm vertically and 10 cm horizontally.

**Graticule**—Standard graticule: Internal, parallax-free, variable illumination. Supplied with standard 602, as shown above. Optional graticule: Internal 8 x 10-cm outline (no graticule lines). Supplied with 602 MOD 174K.

Trace Width—Maximum trace width within the 8 x 10-cm display area is 14 mils at 0.5-µA beam current.

**Display Linearity**—The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 2% in the vertical direction, and 6% in the horizontal direction.

#### \*Registered Trademark Polaroid Corporation

#### VERTICAL AND HORIZONTAL AMPLIFIERS

The X (Horizontal) and Y (Vertical) differential amplifier inpucircuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

Bandwidth-DC to 1 MHz at 3-dB down.

**Deflection Factor**—Vertical: 90 mV/cm to 135 mV/cm, internally variable. Horizontal: 90 mV/cm to 110 mV/cm, internally variable.

**Phase Difference**—Not more than  $1^{\circ}$  between X and Y amplifiers up to 1 MHz.

**Beam Position**—Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/h after 20-min warm up.

**Polarity**—Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C— 100 k $\Omega$   $\pm$ 10% paralleled by 30 pF or less.

Maximum Input Voltage— ±10 V DC plus peak AC.

Recommended Source Impedance— 1  $k\Omega$  or less.

#### Z AXIS

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: DC to 1 MHz over 0.0 V to  $\pm$ 1 V range. Signal input is a BNC connector on the rear panel.

Input R and C— 100 k $\Omega$   $\pm 10\%$  paralleled by 70 pF or less.

Maximum Input Voltage- ±10 V DC and peak AC.

Recommended Source Impedance— 1 k $\Omega$  or less.

#### OTHER CHARACTERISTICS

**Power Requirements**— 90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz. 50 watts at 115 VAC, 60 Hz. Rear panel selector provides rapid accommodation for six line-voltage ranges.

**Temperature**—Electrical specifications are valid over the range of  $0^{\circ}$ C to  $+50^{\circ}$ C ambient.

Finish—Blue vinyl painted cabinet, aluminum construction.

#### Dimensions and Weights (cabinet included)-Height 6 in 15.3 cm Width 81/2 in 21.6 cm Depth 17% in 44.1 cm Net weight 171/2 lb 7.9 kg Domestic shipping weight ≈22 lb $\approx 9.9 \, \mathrm{kg}$ Export-packed weight ≈28 lb $\approx$ 12.7 kg

Included Accessories-smoke-gray filter, installed.

**Optional Accessories**— 51/4-inch rack adapter; panel assembly; C-30A camera; Type 602 to C-30A camera adapter; C-30A camera carrying case.

If optional P7 phosphor is ordered, smoke-gray filter is deleted and orange filter is added.

#### ORDER INFORMATION

602 DISPLAY UNIT	. \$950
602 MOD 174K DISPLAY UNIT	\$950
Standard instrument with optional internal 8 x 10-cm	outline
graticule.	

602 MOD 146B DISPLAY UNIT ......\$925

Standard instrument, without cabinet, for mounting in rack adapter. Requires 51/4-inch vertical rackmounting space.

NEW



- LOW-COST X-Y MONITOR
- TIME BASE OPTION
- 6-1/2-INCH STORAGE CRT
- 1 MILLION DOTS/SEC WRITING SPEED
- VARIABLE STORED BRIGHTNESS
- VIEW FOR EXTENDED PERIODS
- DIFFERENTIAL INPUTS

The 603 is an X-Y monitor for displaying alphanumeric and graphic data in either a refreshed or stored mode on a 61/2-inch CRT. It is well suited for applications such as ultrasonic detection systems, electron microscope systems, radiation and thermal scanning systems, speech therapy, mechanical pressure, volume and vibration analysis, medical and biophysical systems.

Now available is an optional, horizontal time-base. With calibrated sweep rates, conventional Y-T measurements are a valuable addition to the 603's high-performance X-Y monitor features.

The TEKTRONIX-developed bistable storage CRT used in the 603 eliminates the need for costly memory devices to refresh the display. Brightness of stored displays may be adjusted to obtain optimum photographic results, to integrate multiple traces and extend storage time to at least ten hours. Permanent records of the 603 display can be obtained on Polaroid\* prints using the TEKTRONIX C-5 Camera.

Operating functions are remotely programmable through a rear panel connector which interfaces directly with TTL systems. X-Y-Z differential inputs are available via BNC connectors. A remote program connector is also available for positive inputs.

#### CRT DISPLAY AND STORAGE

Cathode-Ray Tube-61/2-inch flat-faced bistable storage tube. Phosphor is similar to P1. 3.5-kV accelerating potential. Two storage tubes are available (standard CRT for a brighter stored display or Option 2 for a faster writing speed). When used in the nonstore mode, both tubes exhibit characteristics of a conventional CRT.

\*Registered Trademark Polaroid Corporation



Writing Speed-Standard CRT, at least 20 div/ms; Option 2, at least 200 div/ms.

Dot Writing Time-Time required to write (store) one dot: standard CRT, 4 µs or less; Option 2 CRT, 0.5 µs or less.

Information Storage Rate-Standard CRT, at least 200 thousand dots/second; Option 2 CRT, at least one million dots/second.

Display Size-4 inches vertically, 5 inches horizontally. An internal nonilluminated graticule is available as Option 1.

Resolution-Stored, equivalent to 80 vertical x 100 horizontal stored line pairs. Nonstored, equivalent to 128 vertical x 160 horizontal line pairs.

Display Linearity-The voltage required to produce a 1 inch deflection from any point on the CRT will not vary more than 5%.

Viewing Time—At least one hour at normal intensity without loss of resolution. Viewing time can be extended to ten hours by utilizing the variable brightness control.

Erase Time-Approximately 250 ms.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth—DC to 2 MHz at 3-dB down (80% full screen scan).

Polarity—Positive signal to both + inputs moves the beam up and to the right.

Deflection Factor—Vertical and horizontal: ≈50 mV/div to 250 mV/div, internally adjustable, 5:1 fixed internal attenuator extends range to at least 1.25 V/div.

#### NEW



Input R and C-1 M $\Omega$  ±1%, paralleled by less than 47 pF.

X-Y Phase Difference-1° or less to at least 500 kHz.

Beam Position-Front panel position controls permit setting zero to any point on screen. Position shift is 1 mm/h or less after 20-min warm-up.

Settling Time—0.2  $\mu$ sec or less for distances of 1 div or less. 1 µsec or less from any point on the CRT to within one spot diameter of final position.

Maximum Input Voltage-±100 V DC plus peak AC.

Linear Common-Mode Signal Range—±3 V, ±15 V in 5X fixed attenuator position.

Common-Mode Rejection Ratio-At least 100:1 to at least 100 kHz.

Recommended Source Impedance—10 k $\Omega$  or less.

Optional Horizontal Time Base-1 µsec/div to 0.1 sec/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approximately 1 sec/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For non-triggered operation, an internal switch selects bright base-line or no sweep.

#### Z AXIS

Linear Z-axis amplifier permits intensity modulation of the writing beam in nonstored mode. Positive input to + input increases the display intensity.

To insure storage of each written dot the Z-axis on-time should be at least  $4 \mu s$  with the standard CRT and at least  $0.5 \mu s$  with Option 2 CRT. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

Bandwidth-DC to 5 MHz over usable range. Sensitivity is adjustable from 1 to 5 V.

Differential Input-CMRR at least 100:1 and common-mode range at least  $\pm 5 \text{ V}$ .

Input R and C-1 M $\Omega$  ±1%, paralleled by less than 47 pF. Maximum Input Voltage-±100 V DC plus peak AC.

#### OTHER CHARACTERISTICS

Power Requirements-Line voltage selector allows operation from 100, 110, 120, 200, 220 and 240 V (±10% on each range), 50 to 60 Hz and 400 Hz. 75 watts maximum at nominal line voltage.

Dimensions and Weights-See next page.

Included Accessories-External program connector (131-0570-00); connector cover (200-0821-00); external graticule (331-0303-00).

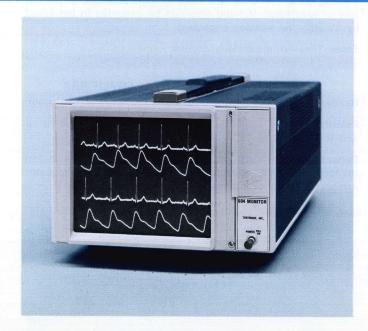
Optional Accessories—51/4-inch rack conversion kit, C-5 Camera.

#### ORDER INFORMATION

603 STORAGE MONITOR\$1100 Standard instrument is without graticule. (External 8 x 10 div graticule provided for test purposes.)
OPTION 1
OPTION 2 \$1125 Standard instrument with fast-writing CRT.
OPTION 3
OPTION 4
Field Modification Kit, order 040-0623-00

U.S. Sales Prices FOB Beaverton, Oregon Please refer to General Information page

#### NEW **Display Monitor** 604



- LOW-COST MONITOR
- TIME BASE OPTION
- 6½-INCH, EASY VIEWING CRT
- 2 MHz X AND Y BANDWIDTH
- DC-COUPLED 5 MHz Z AXIS
- X-Y PHASE DIFFERENCE WITHIN 1° TO 500 kHz
- DIFFERENTIAL INPUTS

The 604, with a 61/2-inch CRT, ideally meets the display and space requirements of system designers in such applications as pulse height analysis, infrared detection, data communications systems testing, component and logic testing, vibration analysis and medical instrumentation. The 604 is also well





suited for many other applications including: phase shifts and equency ratios using Lissajous figures, raster displays with intensity modulation and apparent dynamic three-dimensional illustrations. Calibrated horizontal sweep rates, available optionally, provide a convenient extension of the 604 measurement field. Visual display of computer-processed data enhances understanding of the processed information. Permanent records of the 604 display can be obtained on Polaroid\* prints using the TEKTRONIX C-5 Camera. Differential inputs are available via BNC connectors on the rear panel. Plus inputs are also available via a 25 pin connector.

#### CRT DISPLAY

Cathode-Ray Tube—6½-inch flat-faced rectangular CRT with P31 phosphor. Optional phosphors; P7 (includes orange filter) and P4.

**Display Size**—Internal parallax-free, nonilluminated graticule marked in 8 vertical and 10 horizontal divisions (½ in/div). Option 1 is without graticule.

**Display Linearity**—The voltage required to produce 1 inch deflection at any point on the CRT will not vary more than 5%.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth—DC to 2 MHz at 3-dB down (80% full screen scan).

**Polarity**—Positive signal to both + inputs moves the beam up and to the right.

Deflection Factor—Vertical and horizontal: ≈50 mV/div to 250 mV/div, internally adjustable, 5:1 fixed internal attenuator extends range to at least 1.25 V/div.

Input R and C—1 M $\Omega$  ±1%, paralleled by less than 47 pF.

X-Y Phase Difference-Not more than 1° to at least 500 kHz.

**Beam Position**—Front panel position controls permit setting zero to any point on screen. Position shift is 1 mm/h or less after 20-min warm-up.

Maximum Input Voltage-±100 V DC plus peak AC.

Linear Common-Mode Signal Range—  $\pm 3$  V,  $\pm 15$  V in 5X fixed attenuator position.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuator.

Recommended Source Impedance—10  $k\Omega$  or less.

Optional Horizontal Time Base— 1  $\mu$ sec/div to 0.1 sec/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approximately 1 sec/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For non-triggered operation, an internal switch selects bright base-line or no sweep.

#### Z AXIS

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

Bandwidth—DC to 5 MHz over usable range, sensitivity is adjustable from 1 to 5 V.

**Differential Input**—CMRR at least 100:1 and common-mode range at least  $\pm 5 \, \text{V}$ .

Input R and C—1 M $\Omega$  ±1% paralleled by less than 47 pF.

Maximum Input Voltage—±100 V DC plus peak AC.

#### OTHER CHARACTERISTICS

**Power Requirements**—Line voltage selector allows operation from 100, 110, 120, 200, 220 and 240 V ( $\pm$ 10% on each range), 50 to 60 Hz and 400 Hz, 56 watts maximum at nominal line voltage.

Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00).

Optional Accessories—51/4-inch rack conversion kit, C-5 Camera.

#### **ORDER INFORMATION**

604 MONITOR Standard instrument with internal nonilluminated graticule.	\$700
OPTION 1	\$700
OPTION 2	\$690
OPTION 4	\$825
Field Modification Kit, order 040-0623-00	

#### **RACKMOUNTING FOR 603 AND 604**

Cabinet-to-rackmount conversion kit, equipped with slide-out assembly, required to rackmount a TM 503 modular test system and a 603 or a 604 in a standard rack width.

Order 040-0624-00 .....

#### 603/604 DIMENSIONS AND WEIGHTS

Dimensions	Cabinet		Rackmount	
	in	cm	in,	cm
Height	6.0	15.25	5.25	13.5
Width	8.5	21.5	8.5	21.5
Length	20.0	50.9	19.0	48.0
Weights (approx)	lb.	kg	lb :	kg
Net	17.5	7.9	17.5	7.9
Domestic shipping	22.0	9.9	22.0	9.9
Export shipping	28.0	12.7	28.0	12.7

<sup>\*</sup>Registered Trademark Polaroid Corporation





- HIGH RESOLUTION ALPHANUMERIC AND GRAPHIC DISPLAYS
- FLICKER-FREE BISTABLE STORAGE
- ELIMINATES COSTLY MEMORY DEVICES
- HARD COPY COMPATIBLE
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS

The 611 Storage Display Unit provides stored displays of combined alphanumeric and graphic information from analog sources, digital computers and other data transmission systems. The TEKTRONIX-developed bistable storage CRT used in the 611 eliminates the need for costly memory devices for refreshing the information display and provides high information density without flicker or drift and with excellent resolution. The standard instrument provides a vertical format display area with the same aspect as a typewritten page. A horizontal display format is available in the 611 MOD 162C.

#### **OPERATING FUNCTIONS**

Operating functions are View, Erase, Non-Store, and Write-Thru. View and Erase are under manual or programmable control; Non-Store and Write-Thru are under programmable control. The Erase function, when initiated, removes all previously stored data from the display area and returns the CRT to "ready-to-write" mode. As new information is written, it is retained on

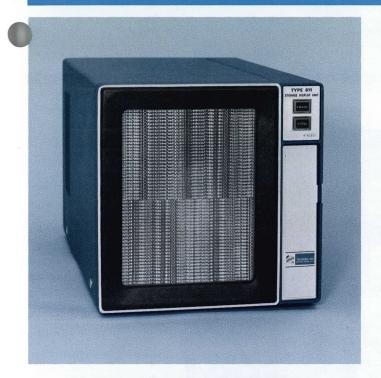
the CRT in the "view" mode. Within 90 seconds after the display is written, the 611 will automatically switch to a "hold" mode. This holds data stored on the CRT at a low brightness to extend storage time. Pressing the VIEW switch while in the "hold" mode, returns the display to the "view" mode for at least 60 but not more than 90 seconds. The "view" mode may be programmed for continuous viewing.

A special "write-thru" feature is provided for displaying additional information on a screen already containing stored information. In the "write-thru" mode the CRT beam is unblanked and a cursor, or any generated pattern, may be displayed without destroying previously stored data and without storing new data. This function is useful for positioning cursors and locating the CRT writing beam. In the "write-thru" and "non-store" modes the display remains on screen as long as it is refreshed.

The Intensity, Focus, Operating Level, Power Switch and Test Spiral controls are located behind a front-panel access door. Pushing the Test Spiral switch causes the instrument to complete an erase cycle and store a single-shot test pattern presentation. Pulling Test Spiral switch provides a "non-store" mode with repetitive test pattern for focusing and other tests.

The Erase, Non-Store, Write-Thru and View operating functions are remotely programmable through contacts at the remote program connector on the rear panel. An Erase Interval signal is also provided at this connector. X, Y, Z inputs are provided through rear BNC connectors or the remote program connector. Manual control of Erase and View is provided on the front panel.





# CHARACTERISTICS CRT DISPLAY AND STORAGE

Cathode Ray Tube—11-inch flat-faced bistable storage tube, phosphor similar to P1.

Display Size-Vertically: 21 cm. Horizontally: 16.2 cm.

**Resolution**— 4,000 characters based on a 90 x 70-mil matrix, clearly legible with good spacing. Equivalent to 400 vertical x 300 horizontal stored line pairs.

**Viewing Time**—At least 15 minutes without loss of resolution. Viewing time may be extended to one hour; however, several erasures may be required to fully remove previously stored data.

Dot Writing Time—  $5\,\mu s$  or less is required to write (store) one bit of information.

Erase Time-500 ms or less.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

**Deflection Factor—Vertical:**1-V full scale (16.2 cm for square format or 21 cm for rectangular format), accuracy within 2%.

Horizontal: 1-V full scale (16.2 cm), accuracy within 2%.

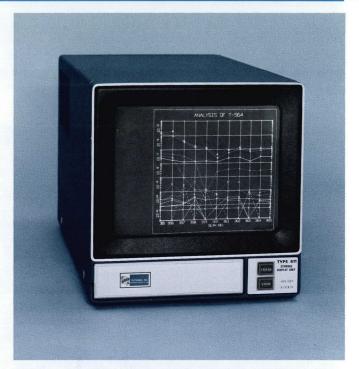
Initial Beam Position—Any one of 9 initial beam positions can be selected by internal switches. Each position is adjustable.

Settling Time— 3.5  $\mu \mathrm{s/cm} \ + \ 5 \ \mu \mathrm{s},$  to within 1 spot diameter of final position.

**Positional Drift**— 0.16 mm (or less)/hour with 75- $\Omega$  source impedance at 20°C to 30°C. Within 1.6 mm/hour with 75- $\Omega$  source impedance at 10°C to 50°C, reference 25°C.

**Polarity**—Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C—  $100 \text{ k}\Omega$  shunted by approx 70 pF.



Type 611 MOD 162C features a horizontal display format.

#### Z AXIS

**Input**—Turn-on level (unblanked) is +1 V. Turn-off level (blanked) is +0.5 V or less.

Input R and C— 100 k $\Omega$  paralleled by approx 70 pF.

Maximum Input Voltage— ±50 V combined DC and peak AC.

#### OTHER CHARACTERISTICS

Erase Interval Pulse—A negative-going erase pulse is provided at the rear connector to inhibit external equipment during an erase cycle. Amplitude change is approx  $+10\,\mathrm{V}$  to  $+0.3\,\mathrm{V}$ , source impedance approx  $2\,\mathrm{k}\Omega$ .

Remote Control—Contacts at the remote program connector on the rear panel provide remote control of the Erase, Non-Store, Write-Thru, and View operating functions.

Power Requirements—90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 250 watts maximum at 115 V and 60 Hz. Rear panel selection provides rapid accommodation for six line-voltage ranges.

Dimensions and Weights		
Height	11% in	30.1 cm
Width	11% in	29.5 cm
Depth	22% in	56.8 cm
Net weight	≈51 lb	≈23.1 kg
Domestic shipping weight	≈62 lb	≈28.1 kg
Export-packed weight	≈72 lb	≈32.6 kg

Included Accessories-Program connector; connector cover.

#### ORDER INFORMATION

611 STORAGE DISPLAY UNIT	\$3175
611 MOD 162C STORAGE DISPLAY UNIT	

NEW





- BRIGHT FLICKER-FREE VIEWING
- LOW COST
- STORAGE ECONOMY
- HARD COPY COMPATIBILITY

The 613 Storage Display is a bright, low cost, large screen data storage and display unit. Use includes any environment where a substantial amount of data is stored and presented in a single display.

#### **Applications Versatility**

The 613 Storage Display provides digital and analog displays in business, education, banking, electronic data processing, medicine, and process control.

Use of a newly-designed storage cathode-ray tube provides a bright trace for easy viewing of high density alphanumeric and graphic displays in high ambient light conditions. The 613 Storage Display provides high information density without flicker.

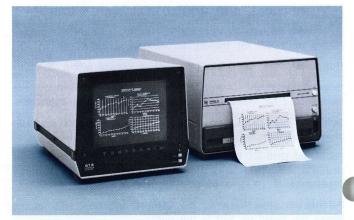
Permanent hard copies of the displayed information are available by using the fully compatible 4610 Hard Copy Unit, which provides full screen copies in eighteen seconds. Storage technology eliminates expensive components required in refreshed information display.

### **Multiplexing Option**

A 4610 Hard Copy Unit, Option 1 is available. This is a multiplex unit that allows from one to four 613's to operate into a single 4610 Hard Copy Unit thereby reducing copy costs.

#### **Operating Functions**

613 operating functions are View, Erase, Non-Store and Cursor. View and Erase are under manual or programmable control. Non-Store and Cursor are under programmable control only.



The 613 Storage Display is fully compatible with the 4610 Hard Copy Unit.



Remote programming of the 613 is achieved by grounding the ppropriate program lines of a program connector on the rear panel.

The Erase function, when initiated, removes all previously stored data from the display area and returns the CRT to a "ready-to-write" mode. Within ninety seconds after the display is written, the 613 will automatically switch to a "Hold" mode, storing data on the CRT at a low brightness to extend the storage time. Pressing the VIEW switch while in the "Hold" mode returns the display to the "View" mode for at least 60, but not more than 90 seconds. The "View" mode may be programmed for continuous viewing.

In the "Non-Store" mode the display remains on the screen as long as it is refreshed.

The Intensity, Focus and Power switch controls are located on the rear panel. The View and Erase switches are located on the front panel. X, Y, and Z BNC connectors are available on the rear panel.

#### **CRT DISPLAY & STORAGE**

Cathode-Ray Tube- 11-inch flat faced storage tube.

Display Size-Vertically: 15 cm. Horizontally: 20 cm.

Resolution - 200 vertical x 266 horizontal stored line pairs.

Display Linearity—Full Scale—spot will settle within 1.5% proper position along center axes for voltage applied.

Incremental—less than 15% difference between any 2 cm deflection, at any position in the display.

Viewing Time—Nominally 15 minutes. Longer viewing may require more than one erasure.

Dot Writing Time— $5\,\mu s$  or less is required to write (store) one bit of information.

Erase Time-800 ms or less.

## VERTICAL AND HORIZONTAL AMPLIFIERS

**Deflection Factor**—Horizontal: 1 V/20 cm rectangular format, accuracy within 2%. Vertical: 1 V/15 cm, within 2%. Either input driven differential or single ended.

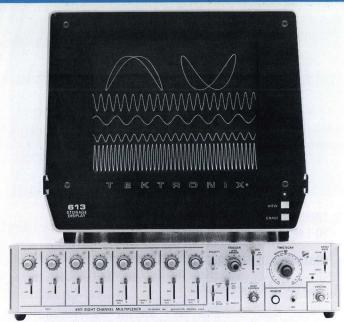
**Initial Beam Position**—Any one of 9 initial beam positions may be selected by two internal connectors. Each position is adjustable  $\pm 10\%$  of full scale vertically and horizontally.

**Settling Time**— 14.0  $\mu$ s/cm + 6  $\mu$ sec/cm up to 2 cm to within 1 spot diameter of final position.

Polarity—Positive input to the vertical moves beam up; positive input to the horizontal moves beam to the right.

Input R and C-20 k minimum. Shunted by less than 60 pF.

Maximum Input Voltage—  $\pm$  18 V DC plus peak AC.



Bright, easily-viewed traces from as many as eight sources can be portrayed on the 613 Storage Display when used with the 4701 Eight-Channel Multiplexer.

#### Z AXIS

**Input**—At least +1 V turns beam on; +0.5 V or less turns beam off.

Input R and C-10 k shunted by ≈50 pF.

#### OTHER CHARACTERISTICS

Remote Control—All 613 operating modes can be controlled by applying appropriate ground closures to the remote program connector. All control signal inputs are TTL compatible (2 TTL per input). Modes which may be controlled remotely are: Erase, View, Non-Store and Cursor.

Power Requirements—90 VAC to 132 VAC or 180 VAC to 264 VAC, 48-66 Hz. 180 watts maximum, 115 VAC, 60 Hz.

#### **Dimensions and Weights**

Height	28.19 cm	11.100 in.
Width	33.65 cm	13.250 in.
Depth	53.34 cm	21.000 in.
Weight	$\approx$ 19.5 kg	$\approx$ 43 lbs.

#### ORDER INFORMATION

613 STORAGE DISPLAY  Horizontal Display format	\$2200
613-1 STORAGE DISPLAY  Vertical display format	\$2200

#### **Optional Accessories**

An optional EMI Filter is available for use in high electrical noise environments. Order TEKTRONIX part number 337-1743-00.





- LINKS DATA AND SIGNAL SOURCES TO LARGE SCREEN TV MONITORS
- CONFORMS TO EIA OR CCIR STANDARDS
- REMOTELY PROGRAMMABLE

The 4501 Scan Converter Unit accepts alphanumeric and graphic data—in the form of analog inputs—and converts it to displays on TV receivers and monitors. The hi-contrast TV displays are ideal for individual or group viewing—even under bright light conditions. The displays may be viewed as light data on a dark background or as dark data on a light background, selected from the 4501 front panel.

# CHARACTERISTICS VERTICAL AND HORIZONTAL AMPLIFIERS

The DC coupled X (horizontal) and Y (vertical) differential input amplifiers provide cancellation of common-mode signal components, permit convenient polarity inversion, and provide a means for mixing of two signals from separate sources.

**Bandwidth**—At least 10 MHz within center 7.5-cm scan area,  $+20^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$ .

**Deflection Factor—Vertical:** 0.75-V full screen (7.5 cm), variable from 0.375-V full screen to 1.125-V full screen. **Horizontal:** 1.0-V full screen (10 cm), variable from 0.5-V full screen to 1.5-V full screen.

Phase Difference-Within 10° between X and Y at 10 MHz.

**Dot Settling Time**—0.15  $\mu$ s or less to within 1% of final position.

**Gain Stability**—Within 1% of setting,  $+20^{\circ}$ C to  $+30^{\circ}$ C; within 4%,  $0^{\circ}$ C to  $+50^{\circ}$ C. (+) Y input moves the beam up, (-) Y input moves the beam down, (+) X moves the beam right, (-) X input moves the beam left.

Input R and C-1 M $\Omega$  within 2%, paralleled by 47 pF.

Maximum Input Voltage-200 V, (DC plus peak AC).

**Differential Input**—Linear common mode signal range: + and -2.5 V, total not to exceed 5 V P-P. Common mode rejection ratio:  $\geq 500:1$  at 10 kHz;  $\geq 100:1$  at 1 MHz;  $\geq 10:1$  at 10 MHz.

#### **Z-AXIS AMPLIFIER**

The differential DC-coupled Z-axis amplifier provides cancellation of common-mode signal components, permits convenient polarity inversion and provides a means for mixing of two signals from separate sources. In all WRITE modes, the display intensity is determined by the Z-axis input and the INTENSITY control. Access to (+) and (\_) inputs is through BNC con-

nectors on the rear panel. Simultaneous access to the (+) input is available through the remote program connector.

The Z amplifier input has two operating modes: LINEAR and LIMITING.

#### Linear Amplifier (Single-ended or differential)

Bandwidth—≥5 MHz with 1-V input.

Risetime—<75 ns with 1-V input step.

**Moduluation Amplitude**—Maximum intensity is achieved at 1.0 V P-P. Input writing intensity is produced by 0.5 V P-P and minimum usable intensity is 0.05 V P-P.

**Polarity**—Positive signal on the (+) input increases intensity, negative signal on the (-) input increases intensity.

Input R and C—1 M $\Omega$ ,  $\pm 2\%$  paralleled by 47 pF.

Maximum Input Voltage-200 V (DC plus peak AC).

Linear Common Mode Signal Range— + and - 2.5 V, not to exceed 5 V P-P.

Common Mode Rejection Ratio—  $\geq$ 500:1 at 10 kHz;  $\geq$ 100:1 at 1 MHz;  $\geq$ 10:1 at 5 MHz.

#### **Limiting Amplifier**

A single-ended signal at the (+) input connector can be routed through an amplitude limiting stage by moving an internal switch. The drive signal to the Z-axis amplifier is automatically limited to 1 V P-P.

Input Requirements—Voltage levels of  $+1\,\mathrm{V}$  or more turn the beam on to a fixed level. Voltage levels of  $+0.5\,\mathrm{V}$  or less keep the beam turned off.

Maximum Input Voltage - 200 V (DC and peak AC).

#### STORAGE CRT

Cathode Ray Tube— 5-inch, flat-faced bistable storage tube, phosphor similar to P1.

Aspect Ratio-Three units vertically by four units horizontally.

Resolution—Equivalent to 100 vertical/125 horizontal stored line pairs.

**Display Time**—At least 15 minutes without loss of resolution. Display time may be extended to one hour.

Dot Writing Time—8  $\mu$ s or less.

#### OTHER CHARACTERISTICS

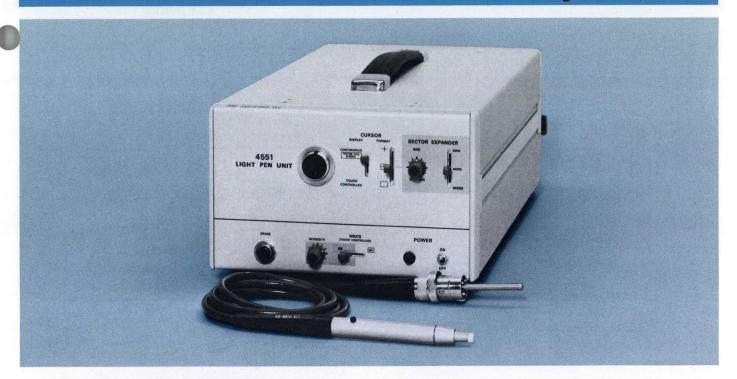
Power Requirements—90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 125 watts maximum at 115 V 60 Hz. Rear-panel selector provides rapid accommodation for 6 line voltage ranges.

**Temperature**—Performance characteristics are valid over an operating temperature range of  $0^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ .

Included Accessories—25-pin connector; connector cover; 25-ft, 75- $\Omega$ , BNC cable; 37-pin connector; connector cover; UHF to BNC adapter; 3-conductor power cord. R4501 also includes rackmounting hardware.

4501 SCAN CONVERTER	UNIT		\$3175
<b>R4501 SCAN CONVERTER</b>	UNIT	(rackmount model)	\$3175





- POINT, DRAW, AND WRITE ON TV MONITORS AND RECEIVERS
- USE IN BROADCAST TV, CCTV AND CATV SYSTEMS
- MAGNIFY SELECTED AREAS OF TV DISPLAYS

Add to, change, direct viewer attention to, or highlight TV displays by writing on, pointing to, or drawing on TV monitors, using the 4551 Light Pen Unit with a scan converter.

The 4551 Light Pen Unit is an interactive device for video displays which interface to standard 525 line/60 Hz or 625 line/50 Hz video systems. The 4551 Light Pen Unit has a number of useful outputs which allow transfer or retrieval of information from a computer being used with a video display system. The Light Pen Unit outputs both analog and digital signals which represent the display address at the intersection of its cross-hair cursor.

Analog and digital signals corresponding to the cursor's X-Y coordinates are generated within the Light Pen Unit and available to the user. These signals may be fed into a data system for use in computer-aided instruction and limited data reduction applications. With the hand-held 4551 Light Pen, viewer attention can be directed to any point on a TV display and can supplement the information viewed with drawings, sketches and words.

The location and path of the cursor is determined with a light pen held and moved by the operator's hand, just as an ordinary pen is used. The cursor's position is defined as a set of X-Y coordinates. You can elect to display or not display a cursor, and to cause the cursor to track the pen's movement

or remain stationary. You can cause the pen to write, or not to write, as it is moved or held stationary.

As the pen is moved to write or draw, its movements are converted to stored images on a scan converter. The scan converter then displays the written image on the monitor or receiver. To the viewer, the image appears as if it is written directly on the TV screen.

To remove written information from the screen, simply press the ERASE button on either the light pen or the 4551 Light Pen Unit front panel. The mixed video picture written upon remains unchanged by erasure of the written information.

#### LIGHT PEN CHARACTERISTICS

Output Signals—For analog applications the voltage-output level varies from 0-to-5 V (nominal) as a function of the cursor position. Output is 1 mA or less. The recommended load impedance should be at least  $5\,\mathrm{k}\Omega$ . In digital applications, both the vertical and horizontal coordinates are provided by 9 parallel lines of binary information. The lines are TTL compatible and each has a fan-out capability of 5 TTL loads.

#### OTHER CHARACTERISTICS

**Power Source**—Line-voltage selector switch provides 2 ranges as follows: 95 V to 132 V, 190 V to 264 V. Line frequency range is 50 Hz to 440 Hz. Power requirement is approximately 50 watts.

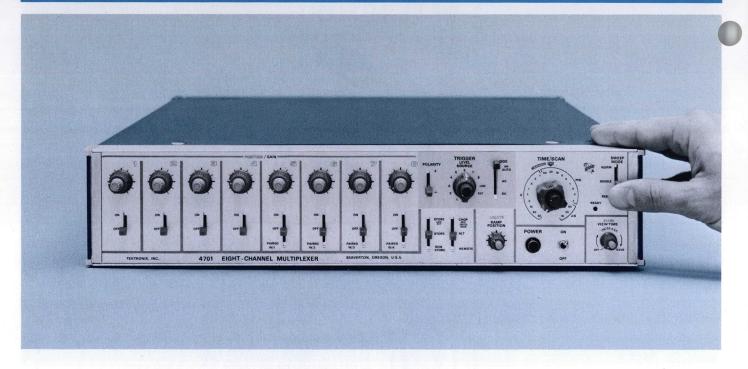
#### Dimensions and Weights-

Height	5 in	12.7 cm
Width	8 in	20.4 cm
Depth	16 in	40.7 cm
Net Weight	$\approx$ 4.5 kg	≈10 lb

Included Accessories—Light Pen Unit to Scan Converter interconnecting cable (012-0314-00).

4551 LIGHT PEN UNIT .......\$1800





- DISPLAYS 8 CHANNELS Y-T or 4 CHANNELS X-Y
- REMOTE CHANNEL SELECTION
- CALIBRATED TIME BASE

Display signals from as many as eight separate sources on a single screen with the 4701 Eight-Channel Multiplexer and a TEKTRONIX Display Unit. The 4701's calibrated Time Base makes possible as many as 8 simultaneous Y-T displays; up to four X-Y displays are possible using the channels in pairs; or a mixture of X-Y and Y-T displays can be selected.

Automatic erase for TEKTRONIX Storage Display Units is provided by the 4701. Operating modes for the 8 channels include Alternate, in Channel 1 through Channel 8 sequence; Chopped, with individual-channel viewing time selected according to the Display Unit in use; and Remote, as programmed from an external source.

#### INPUT CHARACTERISTICS

The eight channels have identical characteristics. Differential inputs provide for noise cancellation where long lines are used. This is an advantage in areas where the point of signal acquisition is at some distance from the 4701. Conventional 1-M $\Omega$  impedance minimizes circuit loading, and allows use of signal probes if further isolation or attenuation is desired. Front panel controls provide a continuously variable 10:1 attenuation.

## **APPLICATION AREAS**

#### Medical

Operating Rooms and Intensive Care—Monitoring the level of anesthesia, blood pressure, heart rate and ECG signals.

Medical Schools—Monitoring actual and simulated ECG's, EDG's, EEG's, EMG's, etc. The 4701/611/4601 and 4701/4501/TV monitors fill needs here.

Medical Clinics—Multi-signal tests performed on blood and other biophysical elements.

#### Education

The 4701 finds a variety of use in Engineering, Physics, Psychology, Veterinarian Departments and Technical Schools in lecture, labs and research applications.

#### Petroleum/Chemical

Research and refinery process control applications monitoring pressure, temperature, oxygen, etc. often occur in oil company and chemical plants. Auto erase and the externally-programmed channel selection feature are particularly significant when used with computers. Hard copy capability is a plus in this environment.





The 4701 Eight-Channel Multiplexer and the 613 Storage Display comprise a system capable of portraying eight different signal sources.

# CHARACTERISTICS VERTICAL CHARACTERISTICS

Deflection Factor— 1 V to 10 V, continuously variable.

Bandwidth-DC to 1 MHz.

Input Impedance— 1 M $\Omega$  paralleled by  $\approx$ 20 pF.

Common-Mode Rejection Ratio-at least 100:1.

Output— 1 V into 50  $\Omega$  with 1 V input.

**Operating Modes**—Alternate: in sequence 1 thru 8. Chopped: internal switch selects chopping rates of approximately 2.5 kHz, 30 kHz or 300 kHz. Remote: 3 lines of TTL compatible binary code select the output channel.

X-Y Plots—Selector switches on channels 5, 6, 7 and 8 select channels 1, 2, 3 and 4 respectively for their X displays.

#### TIME-BASE CHARACTERISTICS

**Sweep**—Provides full screen normal or single sweep displays at 20 different Time/Scan settings from 10  $\mu$ s to 50 s in a 1, 2, 5 sequence. A non-calibrated mode is continuously variable between steps. Either repetitive or single sweeps can be selected.

**Triggered Modes**—Automatic peak-to-peak, AC coupled and DC coupled, plus and minus slope.

**Trigger Inputs**—Can be internal from each selected channel, external, or from the power line.

View Time—Provides automatic control of a TEKTRONIX storage display unit and permits the 4701 to retain the display in a view mode from 0.1 s to 30 s, (continuously variable) after all channels are displayed.

#### OTHER CHARACTERISTICS

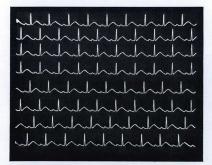
Power Requirements— 90 to 136 V or 180 to 272 V, 48 to 440 Hz, 21 watts maximum.

Dimensions and Weights—Height 3½ inches, width 16% inches, depth 20% inches, and weight approximately 15 pounds.

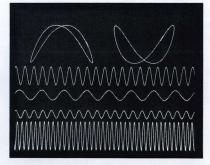
Included Accessories— 6-foot interconnecting cable; 25-pin male connector.

4701 EIGHT-CHANNEL MULTIPLEXER	\$1500
R4701 EIGHT-CHANNEL MULTIPLEXER	\$1525
613 STORAGE DISPLAY Horizontal Display format	\$2200
613-1 STORAGE DISPLAY Vertical display format	\$2200

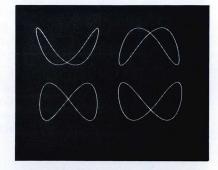
U.S. Sales Prices FOB Beaverton, Oregon Please refer to General Information page



8-Channel Y-T Displays—Full-Screen normal or single sweep displays are swept at 10  $\mu$ s to 50 s full scale, from a time base internat to the 4701. Oscilloscope-type triggering is also provided. Simulated ECG is shown.



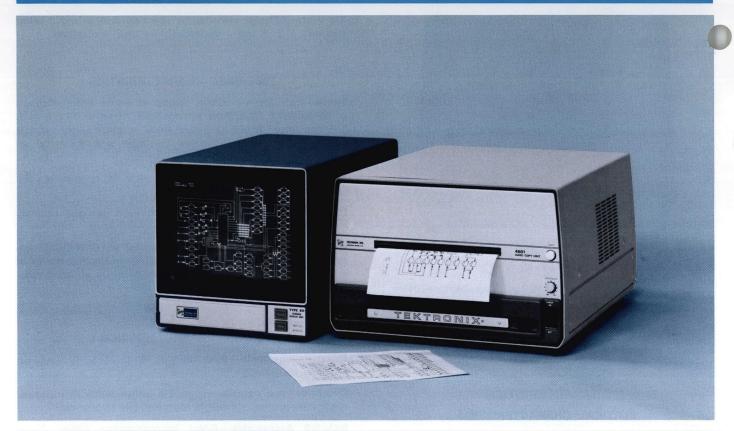
MIXED X-Y and Y-T Displays—Simultaneous display of four frequencies versus time and two frequencies versus two other frequencies. Other display combinations include 1 X-Y with 6 Y-T displays and 3 X-Y with 2 Y-T displays.



**4-CHANNEL X-Y Displays**—Format can be horizontal or vertical, depending on the display unit ordered.

The above displays were photographed on a 611 MOD 162C Display Unit.





- A NEW STANDARD OF USER CONVENIENCE
- PERMANENT COPIES OF STORED DISPLAYS
- COPY COSTS AS LOW AS 5 CENTS A COPY
- ACCURATE 8½" x 11" INFORMATION COPY

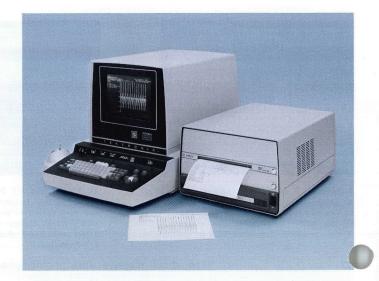
The 4601 Hard Copy Unit is a convenient, economical way of permanently copying alphanumeric and graphic displays. High resolution displays obtained on the 611 Storage Display or 4002A Graphic Computer Terminal are copied by the 4601, providing an accurate representation of the stored display on 3M\* Type 777 Dry-Silver Paper.

Installation and operation are quick and simple. Installation is just a matter of connection to the power line and the appropriate TEKTRONIX Display Unit. Copy command is initiated manually by pressing a front panel control, or by supplying an external command under program control.

#### THE COPY PROCESS

The signal source is "looped through" the 4601 to the TEK-TRONIX display device. When the copy command is received, the signal source is automatically disconnected from the display device.

Hard Copy is produced by systematically scanning the target of the storage unit. Scanning ramps are generated by scan generators located in the Hard Copy Unit. An electrical signal is taken from the target electrode and fed to the Z axis of a line scan CRT. A fiber-optic faceplate couples the light output from the phosphor to the recording material. Heat development of the latent image takes place after this exposure. Hard Copy is available about 18 seconds after initiation of the copy command.



The 4601 Hard Copy unit copies stored displays of the 4002A Graphic Computer Terminal and the 611 Storage Display Unit.

<sup>\*</sup>Registered Trademark of Minnesota Mining and Manufacturing Company

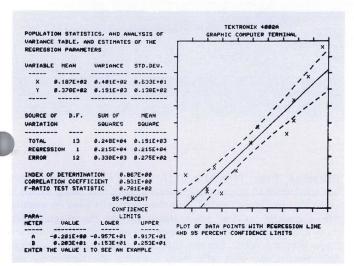


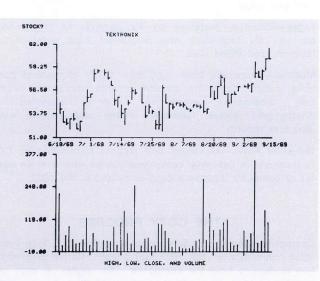
#### THE COPY MEDIUM

he processing unit in the 4601 uses 3M Brand Type 777 Dry-Silver Paper.

Type 777 Paper provides the high image contrast required for high-resolution copies of complex graphics and alphanumerics. It offers the stability normally associated with wet-process photosensitive paper, plus the convenience of dry print-out papers. Cost is low: 5 to 8 cents per 8½ by 11-inch copy, depending on quantity purchased. Further economies can be realized using smaller copies. Copy size may be set from 8½ by 6 inches to 8½ by 14 inches. Roll size is 8½ inches by 500 feet.

Dry-Silver prints can be handled much like any conventional paper. Records can be written upon with pencil or pen. Pencil marks are erasable. Shelf life for unexposed paper is six months, providing the paper is not removed from its protective wrapper and is stored at room temperatures.





The 4601 Hard Copy Unit provides permanent, 8½ x 11 inch copies of a wide range of alphanumeric and graphic displays as viewed on the TEKTRONIX 4002A Graphic Computer Terminal and 611 Storage Display Unit.

#### **CHARACTERISTICS**

Copy Size—Adjusted to  $8\frac{1}{2}$  x 11 inches at factory, variable between  $8\frac{1}{2}$  x 6 inches and  $8\frac{1}{2}$  x 14 inches.

Copy Time-18 seconds for first copy.

Warmup Time-20 minutes.

Remote Copy Command—Closure to ground for at least  $5 \mu s$ .

**Resolution (with 3M Brand Type 777 Paper)**—Essentially the same as displayed on the 611 or 4002A Display Devices. Actual-size copies of a 4000-character display, based on a 90 x 70-mil matrix, are clearly legible.

Capability—Designed for use with TEKTRONIX 4002A Graphic Computer Terminal, and Type 611 Display Unit serial numbers B142240 and above. Type 611's below this serial number require a modification; contact your local TEKTRONIX Field Office for additional information.

**Power Source (factory-wired options)**— 90 to 136 VAC, 115 V nominal, 50 to 60 Hz. Maximum power consumption at 115 V, 60 Hz is 1450 W for first 40 seconds after turn on, 220 to 520 W for normal operation, 100 W standby.

#### **Dimensions and Weights**

Height	11	in	27.9 cm
Width	17	in	42.7 cm
Length	≈24	in	$\approx$ 61 cm
Weight	≈69	lbs	≈31 kg

Included Accessories—two 6-foot interconnecting cables; 8-foot detachable power cord.

#### ORDER INFORMATION

4601 HARD COPY UNIT .....

115 volt, 50-60 Hz power
<b>4601-1 HARD COPY UNIT</b>
The 4601 and 4601-1 have light tan cabinets and are set up for use with the TEKTRONIX 4002A Graphic Computer Terminal.
4601 or 4601-1 HARD COPY UNITS, Option 1 \$3750
Option 1 provides blue cabinets and setup for use with the TEKTRONIX 611 Storage Display Unit.
Optional Accessories Copy Catcher, order 016-0298-00\$95
Paper—One roll is included with the 4601. Refills are available from Tektronix, Inc.
For one roll, order 006-1603-00

U.S. Sales Prices FOB Beaverton, Oregon Please refer to General Information page

For one carton of 4 rolls, order 006-1603-01 .....

\$3750





#### PERMANENT HARD COPIES OF TV DISPLAYS

#### GRAY SCALE PORTRAYAL

The 4602 Video Hard Copy Unit makes permanent facsimile copy from static television signals. The TV signal is copied on 3M\* Dry-Silver Paper by the 4602, providing an accurate gray scale representation of the television inputs.

Since the 4602 is completely self-contained, installation consists merely of connection to the power line and to the video information to be copied. Front-panel controls allow the user to standardize the copy video signals in the range of 0.2 V P-P to 3 V P-P. Copy command is initiated by pressing a front-panel control, or by supplying an external command. Contrast and Density are adjusted by the operator with simple to use front-panel controls.

#### **APPLICATIONS**

Easy-to-handle  $8\frac{1}{2}$  x 11 inch dry copies are convenient for communication, documentation, recording and filing uses in unlimited applications, a few of which are:

Education—Permanent hard copy of pictures, graphs, notes, and drawings from video tapes or TV assisted lectures.

Banking and Finance—Account information for clients directly from CRT displays; signatures and identification are easily and accurately verified.

Law Enforcement—High-resolution copies of criminal identification, fingerprints, sketches, handwriting, and crime records.

\*Registered Trademark of Minnesota Mining and Manufacturing Company

Refreshed Video Terminals—Alphanumerics, graphics or gray scale information appearing on display terminals using standard video signals. Most TV CRT refreshed terminals have an acquisition connector to the video signal driving the display unit. Hard copies of any display appearing on these terminals are made with the 4602. Several terminals may timeshare a single 4602 Hard Copy Unit, effectively lowering the hard copy unit cost per setup.

**Legal**—Microfilm projected by TV cameras to remote video monitors for immediate and permanent hard copy of case histories and dated files.

Medical—Permanent hard copy from CCTV of medical operations, patient monitoring, medical records, accounting information, biophysical waveforms, anatomy sketches and photographs, X-rays, laboratory charts and medical supply inventory records.

Industrial Firms—Messages and records transmitted by CCTV to locations in industrial complexes copied whenever an operator or computer initiates a copy command to the 4602.

#### THE COPY PROCESS

Composite television picture video is applied to a loop-through input connection on the 4602 rear panel. Internal synchronization is derived from the composite video signal. A copy command, provided by a front-panel pushbutton or via remot electrical input, initiates a sampling process. The video signals are sequentially sampled, providing information to modulate the line-scan CRT intensity. A fiber-optic faceplate couples the light output to the recording material, producing



gray scale copy. This latent image is heat-developed in the 602, cut to 8½ x 11 inch sheets. Video information must be unvarying during a brief sampling period. An additional 20 seconds is required to process the hard copy.

#### THE COPY MEDIUM

The processing unit in the 4602 is designed to be used with 3M Brand Type 777 Dry-Silver Paper.

Type 777 Paper provides the high image contrast required for high-resolution copies of complex graphics and alphanumerics. Cost is low: 5 to 8 cents per 8½ x 11 inch copy, depending on quantity purchased. Roll size is 8½ inches by 500 feet.

Dry-Silver prints can be handled much like any conventional paper and can be easily written upon with pencil or pen. Pencil marks are erasable. Shelf life of unexposed paper is six months, providing the paper is not removed from its protective wrapper and is stored at room temperature.



Clear, full gray scale hard copies are available from the 4602 Video Hard Copy Unit.

#### **CHARACTERISTICS**

**Video Input**—Two rear-panel BNC connectors arrayed for loop-through connection of 75 ohm coax video cable. Response is within 3 dB from 50 Hz to 30 MHz. Common-mode rejection ratio is 40 dB at 50 to 60 Hz with a common-mode signal range up to 5 V P-P. Return loss is greater than 46 dB from 50 Hz to 5 MHz.

Video Monitor Output—Composite video output with 75  $\Omega$  source impedance allows use of a video picture monitor as a setup aid. Output amplitude is 1 V P-P when video gain is properly adjusted for copy.

Copy Size—Adjusted to 81/2 x 11 inches at factory.

Copy Time— 40 seconds for first copy. Additional copies of the same display take about 20 seconds each.

Warmup Time-20 minutes.

Remote Copy Command—Closure to ground for at least  $5 \mu s$ .

Ambient Temperature—0°C to +35°C is recommended.

**Power Source** (factory-wired options)— 90 to 136 VAC, 115 V nominal, 50 or 60 Hz. Maximum power consumption at 115 V, 60 Hz is 1450 W for first 40 s after turn-on, 220 to 520 W for normal operation, 100 W standby.

	<b>Dimensions</b>	and	Weights
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For one roll, order 006-1603-00 .

Height	11	in	27.9 cm
Width	17	in	42.7 cm
Leigth	24	in	61 cm
Weight	≈69	lbs	$\approx$ 31 kg

Included Accessories—75  $\Omega,$  BNC Termination, 25 ft., 75  $\Omega$  BNC Video cable.

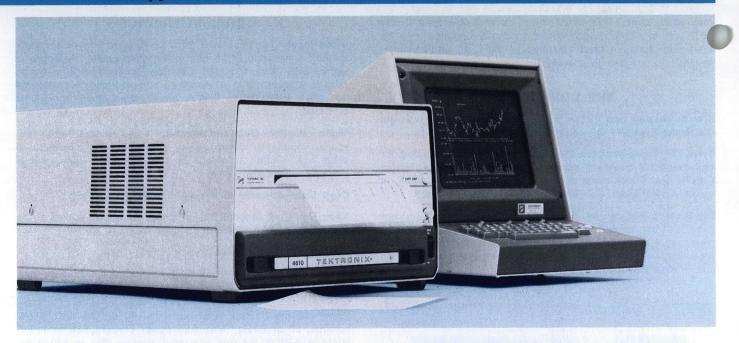
#### ORDER INFORMATION

<b>4602 Video Hard Copy Unit Standard</b>
<b>4602-1 Video Hard Copy Unit</b>
<b>4602 or 4602-1 with Option ONE</b>
Optional Accessory Copy Catcher (Part No. 016-0298-00)
<b>Paper</b> —One roll is included with the 4602. Refills are available from Tektronix, Inc.

U.S. Sales Prices FOB Beaverton, Oregon Please refer to General Information page

For one carton of 4 rolls, order 006-1603-01





- DRY-PROCESS HARD COPY FROM GRAPHIC COMPUTER TERMINALS AND STORAGE DISPLAY UNITS
- SAME RESOLUTION AS STORAGE CRT
- COPIES IN ONLY 18 SECONDS

Sharp, permanent hard copies are made from the CRT display of the new 613 Storage Display, or any 4010-Family Computer Display Terminal by the 4610 Hard Copy Unit. And the 4610 can be multiplexed to provide a copying capability of from one to four 4010-1 Computer Display Terminals and/or 613 Storage Displays.

Operation is simple. A single pushbutton control on the 4610 front panel or a rocker switch on the computer terminal initiates copy-making manually, or program control will accomplish it from the computer.

Installation is equally simple—just a power line connection from the nearest 115-volt 60-Hz AC outlet, and one cable connection to the computer terminal or display unit.

The 4610 processor unit uses 3M\* Brand Type 777 Dry-Silver paper, which gives the high image-contrast needed for the most complicated graphic and alphanumeric displays. Type 777 paper provides the same long-term stability you expect from wet-process papers, with all the convenience of dry process. Copies can be handled like any other paper—write on them with pen or pencil, and erase pencil marks without smearing or damaging the paper. Stored under prescribed conditions of temperature and humidity, the paper has a shelf life of six months or better.

Copy size may be set from  $8\frac{1}{2}$  by 6 inches to  $8\frac{1}{2}$  by 14 inches. Roll size is  $8\frac{1}{2}$  inches by 500 feet.

\*Registered Trademark of Minnesota Mining and Manufacturing Company

#### **CHARACTERISTICS**

Copy Size—Adjusted to  $81/2 \times 11$  inches at factory, variable between  $81/2 \times 6$  inches and  $81/2 \times 14$  inches.

Copy Time- 18 seconds for first copy.

Warmup Time— 20 minutes.

Dimensions and Weights			
Height	11	in	27.9 cm
Width	17	in	42.7 cm
Length	24	in	61 cm
Weight	≈69	lbs	≈31 kg

Resolution (with 3M brand Type 777 paper)—Essentially the same as the display.

Power Source (factory-wired options)—115 Volt nominal, 50 to 60 Hz. Maximum power consumption 1450 watts for first 40 seconds after turn-on, 220 to 520 watts for normal operation, and 100 watts standby.

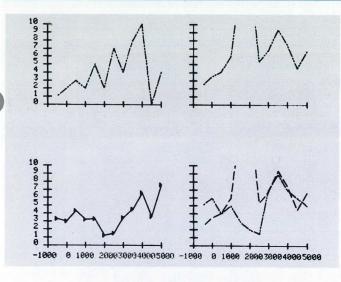
Operating Ambient Temperature—Between  $+0^{\circ}\mathrm{C}$  and  $+35^{\circ}\mathrm{C}$  is recommended. If operation is necessary in extreme environmental conditions, see your TEKTRONIX Field Engineer or Application Engineer.

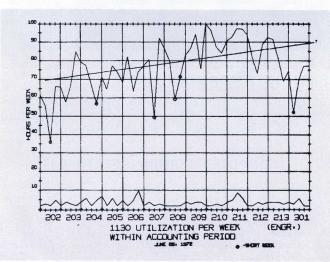
**Included Accessories—** 8-foot detachable power cord, interconnecting cable.



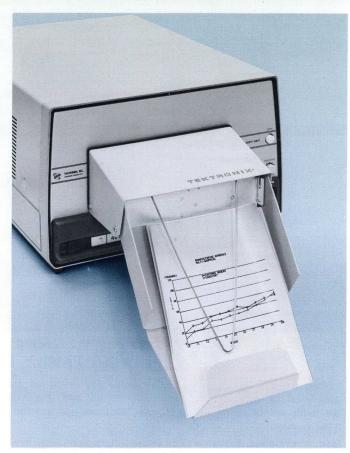


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The 4610 provides clear copies of graphic and alphanumeric data.



The Copy Catcher pulls and stacks hard copies from all Tektronix 4600-series Hard Copy units.

Optional Accessories	
Copy Catcher, order 016-0298-00	 \$95

### **ORDER INFORMATION**

Product Price
4610 HARD COPY UNIT\$3550
<b>4610-1 HARD COPY UNIT</b>
4610 HARD COPY UNIT, Option 1
4610-1 HARD COPY UNIT, Option 1
Paper—One roll is included with the 4610 or 4610-1. Refills are available from Tektronix, Inc.
For one roll, order 006-1603-00





4002A 4010-1 4012 4013 A GROWING FAMILY OF TEKTRONIX TERMINALS

Interactive graphic display capability has vastly increased the usefulness of computer-processed information, and improved the utility of computers in educational, business and scientific environments.

Now a complete family of TEKTRONIX Computer Terminals has been developed, providing a model for nearly every purpose. Included are (1) the 4002A, a versatile general-purpose display terminal with both storage display and refreshed scratch pad sections (for on-line editing), a full ASCII character set, with 96 printing characters and three distinct graphic modes in addition to alphanumeric operation; (2) the 4010, a low-priced terminal combining alphanumeric and graphic mode operation, and 64 printing characters; (3) the 4012, with Alphanumeric, Graphic Display, and Interactive Graphing operating modes and the complete ASCII character set; and (4) the 4013, offering all of the features of the 4012, plus the complete APL character set. Additional information about each of these terminals will be found on pages 274-276.

The PLOT-10 Software system makes the fully software supported terminals useful for hundreds of business, educational, scientific, and industrial applications-and the terminal can be

interfaced with many different data communication systems and computer configurations. Consult with your TEKTRONIX Applications Engineer for complete details. PLOT-10 is described on page 277.

#### **COMPUTER TERMINAL FEATURES**

The 4010, 4012 and 4013 are designed in a convenient deskheight stand-alone pedestal configuration, making them excellent for use in any office, laboratory or industrial location.

Further operational versatility is added to all TEKTRONIX terminals with a wide variety of optional accessories. Graphic mode operation of the 4002A can be augmented with 4901 and 4903 Interactive Graphic Units and 4951 Joystick. The 4010-Family terminals offer such auxiliaries as a Display Multiplexer, an Audio Recorder card, and accessory instruments including the 4911 Reader/Perforator and the 4912 Digital Cassette Tape Unit.

Price information on all of the above-mentioned accessories is found in this section. For complete information on these and other Computer Display Products, just check and return the reply card at the back of this catalog.

#### 4002A **Graphic Computer Terminal**

- FULL SCREEN GRAPHING CAPABILITY
- STORAGE TUBE GRAPHICS WITH REFRESHED TUBE EDITING
- **FULL ASCII CHARACTER SET**

The 4002A is a self-contained computer terminal which provides a high-resolution, flicker-free display of both complex graphics and high-density alphanumerics.

This graphic computer terminal provides benefits of both storage tube graphics and refreshed tube editing. A split screen, direct-view storage tube eliminates the need for a separate refreshed memory for the main display. This minimizes the information rate requirements of the data source. A one line refreshed scratch pad enhances editing. The full ASCII character set is provided, including 96 printing characters.

Three separate modes of graphic display are offered-Point Plot, Linear Interpolate, and Incremental Plot. In any of the graphic modes 1024 points can be addressed in either horizontal or vertical planes. 761 points can be viewed in the vertical plane, 1024 in the horizontal.

Added performance in graphics is provided by the use of the 4951 Joystick in combination with the 4901 or 4903 Interactive Graphic Units. The 4901 or 4903 fit directly into the 4002A, and generate a cross-hair cursor, which can be positioned to any point on the display screen by the Joystick. The Inter-

274

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active Graphic Unit then digitizes the graphic address at the cross-hair intersection and sends the X and Y address components to the computer.

#### **CHARACTERISTICS**

Jisplay Medium—11-inch (diagonal) direct-view, bistable storage CRT with refreshed scratch pad area.

Display Area—8.3-inches horizontal by 6.1-inches vertical.

#### Alphanumeric Mode

Format—39 lines of 85 normal or italic characters in main area, one line of 84 characters in scratch pad area.

**Character Set**— 96 upper and lower case printing characters (ASCII code).

Character Size—70 x 90 mils (approx) can be made double size

Character Generation-7 x 9 dot matrix.

Cursor-Pulsating 7 x 9 matrix.

#### **Graphic Modes**

Linear Interpolate, Incremental Plot, Point Plot. 1024 x 1024 addressable points, 1024 x 761 viewable points.

Graphic Input Mode—1024 (X), 761 (Y) points. Joystick controlled. Cross-hair cursor.

Input Power—110/120 VAC with line voltage selector. HI, MED, or LOW line voltage switch selectable.

Operating Temperature—+10°C to +40°C.

**Dimensions**—19% inches high, 19 inches wide, 34% inches deep.

Weight—130 pounds (approx).

4002A GRAPHIC COMPUTER TERMINAL, without Interface ... \$8800

## Graphic Computer Terminal Interfaces 4002A

Part Number 4002A with DAT	Description A COMMUNICATIONS INTERFACE\$9400	021-0038-00 021-0039-00	Honeywell H316 Interdata Computers and G. E. Process Computers with Teletype Control Card
021-0033-00	This interface transfers data in a serial asynchronous format either full-duplex or half-duplex mode. It conforms to EIA Standard RS-232-C and CCITT V24. Internal clocks or external timing signals may be used. Transmit and receive rates are independent of each other and easily selected on back panel switches. Standard selectable rates are 110, 150, 300, 600, 1200, 2400, 4800, 9600 bits/sec inclusive. Two positions of each switch are provided for user chosen rates.	021-0039-01 021-0040-00 021-0041-00 021-0043-00 021-0045-00 021-0045-01 021-0046-00 021-0047-00	Type 32-062 F01 Interdata Computers and G. E. Process Computers with Teletype Control Card Type 32-120 F01 DEC PDP-11 Varian 620F Raytheon 703, 704, 706 DEC PDP-9 DEC PDP-8 (S/N 150 & up) DEC PDP-8 (S/N 149 & below) DEC PDP-15 DEC PDP-8/e with Module M865
4002A with TEL	ETYPE PORT INTERFACE\$9550	021-0047-01 021-0051-00	DEC PDP-8/e with Module M8650 Honeywell DDP 516
021-0034-00 021-0035-00 021-0036-00	DEC PDP-8/i, 8/L and 12 Data General Computers HP 2100 Series & 2000A (12531 card)		TIVE GRAPHIC UNIT \$525 TIVE GRAPHIC UNIT \$1000

## Computer Display Terminal 4010, 4010-1 NEW

- SUPPORTS ALPHANUMERIC PLUS LOW-COST INTERACTIVE COMPUTER GRAPHICS
- CONVENIENT PEDESTAL DESIGN FOR USER ENVIRONMENTS

Varian 620/i, 620/L, 620/R

FLICKER-FREE STORAGE DISPLAY

021-0037-00

COMPLETE SOFTWARE SUPPORT—PLOT-10

The 4010 Computer Display Terminal is a low-cost computer terminal for use in business, educational and scientific environments. Until recently, cost was a major barrier to the use of graphic terminals in many applications. The 4010 has broken the cost barrier, with complete interactive graphics and alphanumeric display at a new, economical price. Direct-view bistable storage makes the CRT display clear and flicker-free, with excellent resolution on all parts of the screen.

For alphanumeric operation, the full TTY ASCII character set of 64 printing characters is featured, with a format of 35 lines

of 72 characters each—a total of 2520 characters maximum on the display screen.

4951 JOYSTICK .....

For graphics, the 7.5 by 5.6-inch display area includes 1024 addressable points in both X and Y planes. Viewing limits are 1024 points in the X plane, and 780 in the Y plane.

Permanent hard copies can be made quickly and inexpensively by mating the 4010-1 version of the terminal with the 4610 Hard Copy Unit.

#### **4010-FAMILY CHARACTERISTICS**

Display Medium-11-inch direct-view bistable storage CRT.

Display Area - 7.5 inches wide by 5.6 inches high.

#### Alphanumeric Mode

Format—72 characters per line, 35 lines; 2520 characters per screen.

U.S. Sales Prices FOB Beaverton, Oregon Please refer to General Information page

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**4010** Character Set— 64 printing characters (TTY ASCII Code). **4012** and **4013** Character Set— 96 printing characters, full ASCII set (upper and lower case).

4013 APL Character Set-Full APL character set.

4010 Cursor—Pulsating 5 x 7 dot matrix.

4012 and 4013 Cursor-Pulsating 7 x 9 dot matrix.

Graphic Mode—Vectors only. Vector drawing time 2.6 ms. 1024 x 1024 addressable points; 1024 x 780 viewable points.

Graphic Input Mode— 1024 (X), 780 (Y) points. Thumbwheel controlled cross-hair cursor.

4010 COMPUTER DISPLAY TERMINAL	\$3950
4010-1 COMPUTER DISPLAY TERMINAL	\$4250

## **NEW 4012 Computer Display Terminal**

- LOW COST FULL RANGE PERFORMANCE
- UPPER AND LOWER CASE ALPHANUMERICS
- GRAPHIC CAPABILITY WITH HIGH RESOLUTION
- FULL ASCII CHARACTER SET

New operating versatility in low-cost computer graphics is offered by the 4012 Computer Display Terminal. TEKTRONIX direct-view bistable storage provides clear, flicker-free CRT display with excellent resolution on every part of the display screen. High-density alphanumeric and graphic displays contain as many as 2520 alphanumeric characters on 35 lines of

72 characters each. Addressable points for graphic operation are 1024 in X and 1024 in Y planes, with 780 in the Y plane and 1024 in the X viewable on screen.

The full ASCII character set of 96 printing characters is included, with both upper and lower case letters.

Three modes of operation are provided. In addition to alphanumeric mode, Graphic Display (Graf) and Interactive Graphics (Gin) can be used.

Hard copies of all 4012 displays can be made with the 4610 Hard Copy Unit mated to the terminal.

4012 COMPUTER DISPLAY TERMINAL ......\$4950

## **NEW 4013 Computer Display Terminal**

- PROGRAMMING EASE FOR SCIENTISTS, MATHEMATICIANS, EDUCATORS
- APL CHARACTER CAPABILITY WITH HIGH RESOLUTION
- FULL ASCII CHARACTER SET

APL (A Programming Language) makes computer graphics a faster, more effective procedure and makes programming easier for scientists, mathematicians and educators. APL operation is a feature of the new 4013 Computer Display Terminal. This versatile new terminal, utilizing the TEKTRONIX direct-view bistable storage CRT, offers, in addition to the APL character

set, the complete ASCII character set of 96 printing characters, including both upper and lower case letters.

The 4013 is an even more effective tool of data communication when used with the new TEKTRONIX PLOT-10 APL/Graph software or with the PLOT-10 software developed for the 4010-series Computer Display Terminals.

As with other TEKTRONIX Computer Display Terminals, hard copies of all displays can be made in seconds, and at minimum cost by using the 4013 with the 4610 Hard Copy Unit.

4013 COMPUTER DISPLAY TERMINAL ...... \$5450

## NEW 4010-Family Computer Display Terminal Interfaces

## (specify interface at time of order.)

4010 WITH STANDARD INTERFACE	\$3950
4010 WITH ANY OPTIONAL INTERFACE	\$4250
4010-1 WITH STANDARD INTERFACE	\$4250
4010-1 WITH ANY OPTIONAL INTERFACE	\$4550
4012 WITH STANDARD INTERFACE	-
4012 WITH ANY OPTIONAL INTERFACE	\$5250
4013 WITH STANDARD INTERFACE	\$5450
4013 WITH ANY OPTIONAL INTERFACE	\$5750
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#### **Data Communication Interfaces**

Standard

Standard Data Communication Interface included with the 4010-Family is RS-232-C compatible. Strap selectable input/output data rates of 150, 300, 600, 1200, 2400, 4800 and 9600 bits/sec.

Option 1

Optional Data Communication Interfaces with convenient switch selectable functions including: local-echo, full-duplex, half-duplex and independent transmit and receive rates of 110, 150, 300, 600, 1200, 2400, 4800 and 9600 bits/sec.

#### Teletype Interfaces

Option 2 DEC PDP-11

Option 3	DEC PDP-8/i, 8/L, 12, 15
Option 4	Data General Computers
Option 5	DEC PDP-8/e with Module M865
Option 5A	DEC PDP-8/e with Module M8650
Option 6	HP 2100 Series, 2000A (12531 card)
Option 7	Varian 620/i, 620/L, 620/R
Option 9	Raytheon 703, 704, 706
Option 10	DEC PDP-8 (S/N 150 & up), PDP-9
Option 10A	DEC PDP-8 (S/N 149 & below)
Option 11	Honeywell H316
Option 12	Honeywell DDP 516
Option 13	Interdata Computers and G.E. Process
	Computers with Teletype Control
	Card Type 32-062 F01
Option 13A	Interdata Computers and G.E. Process
	Computers with Teletype Control Card
	Type 32-120 F01
Option 14	Varian 620F
DISPLAY MILLT	IPLEXER CARD. order 018-0067-00

 DISPLAY MULTIPLEXER CARD, order 018-0067-00
 \$195

 AUDIO RECORDER CARD, order 018-0066-01
 \$295



- SAVES MONEY AND TIME
- SAVES COMPUTER CORE

Punched tape capability greatly expands the limited memory capacity of a mini-computer. With the 4911 Reader/Perforator Unit, programs that would otherwise consume valuable space in core storage are kept in permanent off-line form, ready to be read into the computer at 200 characters per second.

With a 4911 Reader/Perforator Unit, the programs and data normally filed in a timesharing or in-house computer system can be converted to 8-channel punched tape and used for file maintenance through the 4010-Family Computer Display Terminal.

The 4911 Reader/Perforator Unit uses standard, easily-obtained one-inch paper, paper-mylar, or aluminum-mylar tapes with a thickness range of 0.0030 to 0.0043 inch.

4911 READER/PERFORATOR ..... \$2950

- MAKES OFF-LINE DATA STORAGE SIMPLE
- PERMITS OFF-LINE EDITING
- SAVES TIME AND MONEY

The 4912 Digital Cassette Tape Unit, connected to a TEKTRONIX 4010-Family Computer Display Terminal, makes off-line program and data storage a simple error-free process.

The 4912 Digital Cassette Tape Unit enhances off-line storage by capturing data in peak activity periods and permitting file updating and manipulation in slack periods.

Installing, loading and operating the 4912 is simple and fast. All data access and tape manipulation can be accomplished under program control from the computer.

4912 DIGITAL CASSETTE TAPE UNIT .......\$1950

## SOFTWARE PRODUCTS NEW

- MOST EXTENSIVE GRAPHING SOFTWARE AVAILABLE ANYWHERE
- INTERFACES TO MORE THAN TWENTY MAJOR MINIS
- COMPATIBLE WITH MAJOR TIMESHARING SYSTEMS
- SOFTWARE ACCESSIBILITY TO 360/370 SYSTEMS

Tektronix, Inc. has expanded its programs of total software support to provide the most extensive graphing software ever offered. This graphing software is compatible with most timesharing systems, with IBM 360/370 O/S and TSO and with numerous mini-computers. PLOT-10 offers a series of modules from which can be selected those elements that best suit the operating environment and application.

#### **PLOT-10/Mini-Computer**

The PLOT-10/mini-computer package lets the operator easily use the TEKTRONIX terminals on his mini-system. PLOT-10 consists of assembly-language subroutines supporting graphics input/output and special functions of the terminal.

#### PLOT-10/360/370 Graphics Software

The PLOT-10/360/370 software module provides the capability to access TEKTRONIX terminals from within application programs. Written in assembler language using IBM's Execute Channel Program I/O facility, modules can be assessed from any of the IBM programming languages by subroutine calls. Special facilities are provided for PL/I compatibility. The module will handle multiple terminals, and operates under O/S MFT or MVT, or MVT with TSO.

## **PLOT-10/Terminal Control System**

This package sets a new standard for interactive graphics terminal software. It provides a comprehensive base of graphic software to support user application programs.

The software is written in FORTRAN IV. These routines allow all or part of your picture to be displayed on any region of the terminal screen. All clipping and scaling are automatic.

Routines are included for erasing the screen; making a hard copy; determining character size and font, plotting absolutely or relatively; handling and formatting alphanumeric output; and performing graphic input of screen points.

#### PLOT-10/Advanced Graphing—Scientific Routines

This set of routines allows the user to display data graphically without concerning himself with programming details. Alphanumeric data tables can be converted to graphs with a single subroutine call. Routines are included for data plotting in cartesian, semi-log, log-log, and polar-coordinate systems, with automatic or specified scaling. One curve or several curves can be drawn on the same set of coordinates.

#### PLOT-10/Advanced Graphing—Business Routines

These routines provide support for users of all levels in the business environment.

An extensive set of routines are available to allow an easy and flexible graphic presentation of user data in commonly accepted formats (e.g. pie charts, histograms, time series scales). Routines are included to allow the user to create his graph from utilizing the interactive graphics facility of the terminal.

#### **PLOT-10/Application Interface**

This series of graphing modules permit the user to obtain graphs directly from existing applications packages.

A modular approach has been adopted for the application interfacing packages. Computations required are isolated from the graphics that display their results, which allows flexibility in future development.

#### PLOT-10/APL/Graph Software

APL/Graph is an integrated collection of user oriented APL functions adapted from the popular Terminal Control System and Advanced Graphing Routines. They are designed to allow highly interactive, easy to use computer graphics. The package includes functions to control all utilities of the terminal itself, including screen erasure, windowing, clipping, hard copy generation, and alphanumeric handling.

An extensive set of functions is also available to provide support for users in all facets of business, scientific, mathematical, and educational work. These include functions for creation of pie charts, histograms, time-series scales, and all types of X, Y plotting. Functions are also included to allow polynomial curve fitting. Normal X, Y plotting can be done on cartesian, semi-log, log-log, and polar coordinate systems with any number of curves drawn on the same set of coordinates.



# TEKTRONIX PRODUCTS 1974





# INFORMATION GENERATION AND CONDITIONING



#### 4701 Eight-Channel Multiplexer

Display the inputs from as many as eight different signal sources on a single display unit with the 4701 8-channel multiplexer. See details on page 268.





#### 4503 Scan Converter

The 4503 Scan Conversion Storage Unit provides a graphical storage medium with write-in and readout scanning electronics. This unit is designed to provide large screen video displays of graphic and alphanumeric data and video pictures written on its storage CRT. Information is both written and read by a time-shared electron beam.

Uses include displaying data symbols, graphs, facsimile images, industrial process monitoring, biophysical monitoring, education and training, computer display and other applications where a TV display is desired. See details on page 267.

## DISPLAY



602 Monitor

Bright, sharp X, Y, and Z axis displays are yours with the high-resolution 1-MHz bandwidth 602 Display Unit. Specifications on page 254.



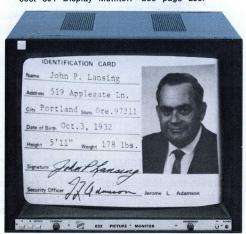
603 Monitor

Choose bright, flicker-free stored displays, or nonstored conventional displays with the low-cost big screen 603 Storage Display Monitor. Details on page 255.



604 Monitor

A big CRT in a small package. That's the low-cost 604 Display Monitor. See page 256.



630 Series Monitors





## **MONITORS**



611 Monitor

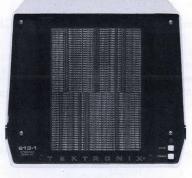


611-2 Monitor

Fill the big 81/4 by 63/6-inch display screen of the 611 Storage Monitor with as many as 4000 alphanumeric characters, or graphic displays of great complexity. Page 258 has the full story.

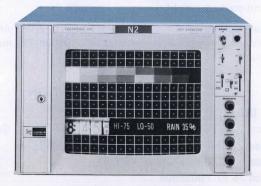


613 Monitor



613-1 Monitor

Big news in storage tubes is the brightness of the 613 bistable storage CRT. See page 260.



650 Series Monitors

## HARD COPY



4601 Hard Copy Unit

Sharp, legible, permanent dry copies of your computer terminal displays are yours in seconds at low cost with the 4601 Hard Copy Unit. See page 262.



4610 Hard Copy Unit

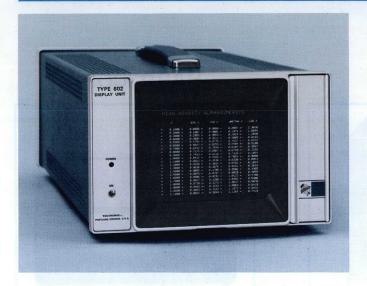
The 4610 is a worthy partner for the popular 4010-1 Computer Display Terminal, making legible, high-resolution, permanent hard copies directly from the 4010 Series Computer Terminals and the 613 Monitors. See page 264.



4632 Video Hard Copy Unit

The 4632 provides permanent hard copies from television picture signals or from refreshed alphanumeric/graphic terminals. The unit is self-contained and extremely simple to operate. High quality copies are produced in seconds and exit into a built-in stacking tray. See page 266 for details.





- 1-MHz X AND Y BANDWIDTH
- 100-mV/cm X AND Y DEFLECTION FACTORS
- X-Y PHASE DIFFERENCE WITHIN 1° TO 1 MHz
- UNIFORMLY SMALL SPOT SIZE
- DC-COUPLED Z AXIS

The Type 602 Display Unit is a compact, solid-state instrument with excellent resolution providing accurate displays of information from X, Y, and Z signal inputs. Application areas are: phase shifts and frequency ratios using *Lissajous* figures, graphic and alphanumeric displays from computers, high-resolution raster displays, with intensity modulation, and Y-T plots of amplitude versus time displays.

Permanent records of the Type 602 display are provided on Polaroid film using the TEKTRONIX C-30A Camera with adapter. Two Type 602's may be mounted side-by-side using an optional rack adapter.

#### **CRT DISPLAY**

**TEKTRONIX CRT**— 5-inch flat-faced rectangular CRT with P31 phosphor standard, P7 phosphor optional.

Display Size-8 cm vertically and 10 cm horizontally.

**Graticule**—Standard graticule: Internal, parallax-free, variable illumination. Supplied with standard 602, as shown above. Optional graticule: Internal 8 x 10-cm outline (no graticule lines). Supplied with Option 2.

Trace Width—Maximum trace width within the  $8 \times 10$ -cm display area is 14 mils at 0.5- $\mu A$  beam current.

**Display Linearity**—The voltage required to produce a 2-cm deflection at any point on the CRT will not vary more than 2% in the vertical direction, and 6% in the horizontal direction.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

Bandwidth-DC to 1 MHz at 3-dB down.

**Deflection Factor**—Vertical: 90 mV/cm to 135 mV/cm, internally variable. Horizontal: 90 mV/cm to 110 mV/cm, internally variable.

Phase Difference—Not more than 1° between X and Y amplifiers up to 1 MHz.

**Beam Position**—Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/h after 20-min warm up.

Polarity—Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C-100 k $\Omega$  ±10% paralleled by 30 pF or less.

Maximum Input Voltage— ±10 V DC plus peak AC.

Recommended Source Impedance— 1 k $\Omega$  or less.

#### Z AXIS

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: DC to 1 MHz over 0.0 V to +1 V range. Signal input is a BNC connector on the rear panel.

Input R and C— 100 k $\Omega$   $\pm$ 10% paralleled by 70 pF or less.

Maximum Input Voltage—  $\pm 10 \text{ V}$  DC and peak AC.

Recommended Source Impedance— 1  $k\Omega$  or less.

#### OTHER CHARACTERISTICS

Power Requirements— 90 to 136 VAC or 180 to 272 VAC, 48 to 440 Hz. 50 watts at 115 VAC, 60 Hz. Rear panel selector provides rapid accommodation for six line-voltage ranges.

**Temperature**—Electrical specifications are valid over the range of  $0^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  ambient.

Finish—Blue vinyl painted cabinet, aluminum construction.

#### Dimensions and Weights (cabinet included)-

Height	6 in	15.3 cm
Width .	81/2 in	21.6 cm
Depth	17% in	44.1 cm
Net Weight	17½ lb	7.9 kg
Domestic shipping weight	≈22 lb	≈9.9 kg
Export-packed weight	≈28 lb	$\approx$ 12.7 kg

**Included Accessories**—Smoke-gray filter installed on standard instrument; orange filter installed with Option 76; maintenance manual.

#### **ORDERING INFORMATION**

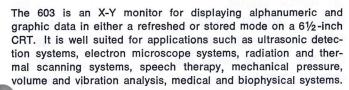
602 DISPLAY UNIT	\$950
Option 1 WITHOUT CABINET	
Option 2 INTERNAL 8 x 10-cm OUTLINE GRATICULE	No Charge
Option 5 VECTOR DISPLAY GRATICULE	•
Option 76 P7 PHOSPHOR	

#### **OPTIONAL ACCESSORIES**

5¼-inch rack adapter (016-0115-02); panel assembly (016-0116-00); C-30A camera; Type 602 to C-30A adapter; C-30A camera carrying case.



- LOW-COST X-Y MONITOR
- TIME BASE OPTION
- 6-1/2-INCH STORAGE CRT
- 1 MILLION DOTS/SEC WRITING SPEED
- VARIABLE STORED BRIGHTNESS
- VIEW FOR EXTENDED PERIODS
- DIFFERENTIAL INPUTS



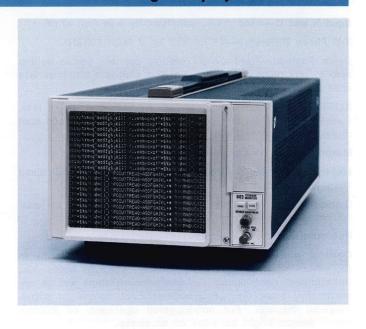
Now available is an optional, horizontal time-base. With calibrated sweep rates, conventional Y-T measurements are a valuable addition to the 603's high-performance X-Y monitor features.

The Tektronix-developed bistable storage CRT used in the 603 eliminates the need for costly memory devices to refresh the display. Brightness of stored displays may be adjusted to obtain optimum photographic results, to integrate multiple traces and extend storage time to at least ten hours. Permanent records of the 603 display can be obtained on Polaroid prints using the TEKTRONIX C-5 Camera.

Operating functions are remotely programmable through a rear panel connector which interfaces directly with TTL systems. X-Y-Z differential inputs are available via BNC connectors. A remote program connector is also available for positive inputs.

#### CRT DISPLAY AND STORAGE

Cathode-Ray Tube—6½-inch flat-faced bistable storage tube. Phosphor is similar to P1. 3.5-kV accelerating potential. Two storage tubes are available (standard CRT for a brighter stored display or Option 2 for a faster writing speed). When used in the nonstore mode, both tubes exhibit characteristics of a conventional CRT.



Writing Speed—Standard CRT, at least 20 div/ms; Option 2, at least 200 div/ms.

**Dot Writing Time**—Time required to write (store) one dot: standard CRT,  $4 \mu s$  or less; Option 2 CRT,  $0.5 \mu s$  or less.

Information Storage Rate—Standard CRT, at least 200 thousand dots/second; Option 2 CRT, at least one million dots/second.

**Display Size—4** inches vertically, 5 inches horizontally. An internal nonilluminated graticule is available as Option 1.

**Resolution**—Stored, equivalent to 80 vertical x 100 horizontal stored line pairs. Nonstored, equivalent to 128 vertical x 160 horizontal line pairs.

Display Linearity—The voltage required to produce a 1 inch deflection from any point on the CRT will not vary more than 5%

Viewing Time—At least one hour at normal intensity without loss of resolution. Viewing time can be extended to ten hours by utilizing the variable brightness control.

Erase Time-Approximately 250 ms.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

Bandwidth—DC to 2 MHz at 3-dB down (80% full screen scan).

**Polarity**—Positive signal to both + inputs moves the beam up and to the right.

Deflection Factor—Vertical and horizontal: ≈50 mV/div to 250 mV/div, internally adjustable, 5:1 fixed internal attenuator extends range to at least 1.25 V/div.

### **DISPLAY PRODUCTS**

## 603 Storage Display Monitor



Input R and C-1 M $\Omega$  ±1%, paralleled by less than 47 pF.

X-Y Phase Difference—1° or less to at least 500 kHz.

**Beam Position**—Front panel position controls permit setting zero to any point on screen. Position shift is 1 mm/h or less after 20-min warm-up.

Settling Time—0.2  $\mu$ sec or less for distances of 1 div or less. 1  $\mu$ sec or less from any point on the CRT to within one spot diameter of final position.

Maximum Input Voltage—±100 V DC plus peak AC.

Linear Common-Mode Signal Range— $\pm 3$  V,  $\pm 15$  V in 5X fixed attenuator position.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz.

Recommended Source Impedance—10 k $\Omega$  or less.

**Optional Horizontal Time Base**— 1  $\mu$ sec/div to 0.1 sec/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approximately 1 sec/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For non-triggered operation, an internal switch selects bright base-line or no sweep.

#### Z AXIS

Linear Z-axis amplifier permits intensity modulation of the writing beam in nonstored mode. Positive input to + input increases the display intensity.

To insure storage of each written dot the Z-axis on-time should be at least  $4\,\mu s$  with the standard CRT and at least  $0.5\,\mu s$  with Option 2 CRT. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

Bandwidth—DC to 5 MHz over usable range. Sensitivity is adjustable from 1 to 5 V.

**Differential Input**—CMRR at least 100:1 and common-mode range at least  $\pm 5$  V.

Input R and C—1 M $\Omega$  ±1%, paralleled by less than 47 pF.

Maximum Input Voltage-±100 V DC plus peak AC.

#### OTHER CHARACTERISTICS

**Power Requirements**—Line voltage selector allows operation from 100, 110, 120, 200, 220 and 240 V ( $\pm$ 10% on each range), 50 to 60 Hz and 400 Hz. 75 watts maximum at nominal line voltage.

Dimensions and Weights-See next page.

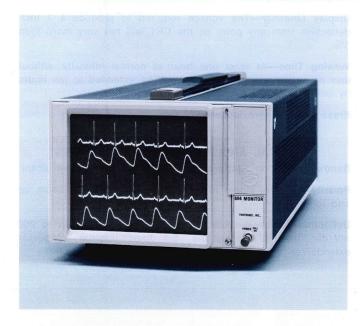
Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00); external graticule (331-0303-00).

#### **ORDER INFORMATION**

603 STORA	GE MONITOR \$1100
OPTION 1	INTERNAL GRATICULE No Charge
OPTION 2	FAST WRITING CRT Add \$25
OPTION 3	WITHOUT HANDLE AND FEET Sub \$10
OPTION 4	TIME BASE Add \$125
and Town or Tall and	The state of the s

Optional Accessories—51/4-inch rack conversion kit, C-5 Camera.

## 604 Display Monitor



- LOW-COST MONITOR
- TIME BASE OPTION
- 6½-INCH, EASY VIEWING CRT
- 2 MHz X AND Y BANDWIDTH
- DC-COUPLED 5 MHz Z AXIS
- X-Y PHASE DIFFERENCE WITHIN 1° TO 500 kHz
- DIFFERENTIAL INPUTS

The 604, with a 6½-inch CRT, ideally meets the display and space requirements of system designers in such applications as pulse height analysis, infrared detection, data communications systems testing, component and logic testing, vibration analysis and medical instrumentation. The 604 is also well



suited for many other applications including: phase shifts and requency ratios using Lissajous figures, raster displays with intensity modulation and apparent dynamic three-dimensional illustrations. Calibrated horizontal sweep rates, available optionally, provide a convenient extension of the 604 measurement field. Visual display of computer-processed data enhances understanding of the processed information. Permanent records of the 604 display can be obtained on Polaroid prints using the TEKTRONIX C-5 Camera. Differential inputs are available via BNC connectors on the rear panel. Plus inputs are also available via a 25 pin connector.

#### **CRT DISPLAY**

Cathode-Ray Tube—6½-inch flat-faced rectangular CRT with P31 phosphor. Optional phosphors; P7 (includes orange filter) and P4.

**Display Size**—Internal parallax-free, nonilluminated graticule marked in 8 vertical and 10 horizontal divisions ( $\frac{1}{2}$  in/div). Option 1 is without graticule.

Display Linearity—The voltage required to produce 1 inch deflection at any point on the CRT will not vary more than 5%.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth—DC to 2 MHz at 3-dB down (80% full screen scan).

**Polarity**—Positive signal to both + inputs moves the beam up and to the right.

**Deflection Factor**—Vertical and horizontal:  $\approx$ 50 mV/div to 250 mV/div, internally adjustable, 5:1 fixed internal attenuator extends range to at least 1.25 V/div.

Input R and C-1 M $\Omega$  ±1%, paralleled by less than 47 pF.

X-Y Phase Difference-Not more than 1° to at least 500 kHz.

**Beam Position**—Front panel position controls permit setting zero to any point on screen. Position shift is 1 mm/h or less after 20-min warm-up.

Maximum Input Voltage-±100 V DC plus peak AC.

**Linear Common-Mode Signal Range**—  $\pm 3$  V,  $\pm 15$  V in 5X fixed attenuator position.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuator.

Recommended Source Impedance—10 k $\Omega$  or less.

Optional Horizontal Time Base— 1  $\mu$ sec/div to 0.1 sec/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approximately 1 sec/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For non-triggered operation, an internal switch selects bright base-line or no sweep.

#### Z AXIS

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

Bandwidth—DC to 5 MHz over usable range, sensitivity is adjustable from 1 to 5 V.

Differential Input—CMRR at least 100:1 and common-mode range at least  $\pm 5 \text{ V}$ .

Input R and C—1 M $\Omega$   $\pm 1\%$  paralleled by less than 47 pF.

Maximum Input Voltage-±100 V DC plus peak AC.

#### OTHER CHARACTERISTICS

**Power Requirements**—Line voltage selector allows operation from 100, 110, 120, 200, 220 and 240 V ( $\pm$ 10% on each range), 50 to 60 Hz and 400 Hz, 56 watts maximum at nominal line voltage.

Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00).

#### ORDER INFORMATION

604 MONITO	OR	\$700
	WITHOUT GRATICULE	
OPTION 3	WITHOUT HANDLE AND FEET	Sub \$10
OPTION 4	TIME BASE	Add \$125
OPTION 5	VECTOR DISPLAY GRATICULE	. Add \$25
OPTION 74	P4 PHOSPHOR	No Charge
OPTION 76	P7 PHOSPHOR	No Charge

Optional Accessories—51/4-inch rack conversion kit, C-5 Camera.

#### **RACKMOUNTING FOR 603 AND 604**

### 603/604 DIMENSIONS AND WEIGHTS

Dimensions	Cal	oinet	Rackm	nount
	in	cm	in	cm
Height	6.0	15.25	5.25	13.5
Width	8.5	21.5	8.5	21.5
Length	20.0	50.9	19.0	48.0
Weights (approx)	lb	kg	lb -	kg
Net	17.5	7.9	17.5	7.9
Domestic shipping	22.0	9.9	22.0	9.9
Export shipping	28.0	12.7	28.0	12.7





Type 611-2 Storage Display Unit with 4601 Hard Copy Unit.

- HIGH-RESOLUTION ALPHANUMERIC AND GRAPHIC DISPLAYS
- FLICKER-FREE BISTABLE STORAGE
- ELIMINATES COSTLY MEMORY DEVICES
- HARD-COPY COMPATIBLE
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS

The 611 Storage Display Unit provides stored displays of combined alphanumeric and graphic information from analog sources, digital computers and other data transmission systems. The TEKTRONIX-developed bistable storage CRT used in the 611 eliminates the need for costly memory devices for refreshing the information display and provides high information density without flicker or drift and with excellent resolution. The standard instrument provides a vertical format display area with the same aspect as a typewritten page. A horizontal display format is available in the 611-2.

#### **OPERATING FUNCTIONS**

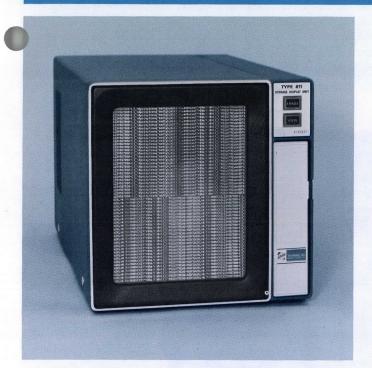
Operating functions are View, Erase, Non-Store, and Write-Thru. View and Erase are under manual or programmable control; Non-Store and Write-Thru are under programmable control. The Erase function, when initiated, removes all previously stored data from the display area and returns the CRT to "ready-to-write" mode. As new information is written, it is retained on the CRT in the "view" mode. Within 90 seconds after the dis-

play is written, the 611 will automatically switch to a "hold" mode. This holds data stored on the CRT at a low brightness to extend storage time. Pressing the VIEW switch while in the "hold" mode, returns the display to the "view" mode for at least 60 but not more than 90 seconds. The "view" mode may be programmed for continuous viewing.

A special "write-thru" feature is provided for displaying additional information on a screen already containing stored information. In the "write-thru" mode the CRT beam is unblanked and a cursor, or any generated pattern, may be displayed without destroying previously stored data and without storing new data. This function is useful for positioning cursors and locating the CRT writing beam. In the "write-thru" and "non-store" modes the display remains on screen as long as it is refreshed.

The Intensity, Focus, Operating Level, Power Switch and Test Spiral controls are located behind a front-panel access door. Pushing the Test Spiral switch causes the instrument to complete an erase cycle and store a single-shot test pattern presentation. Pulling Test Spiral switch provides a "non-store" mode with repetitive test pattern for focusing and other tests.

The Erase, Non-Store, Write-Thru and View operating functions are remotely programmable through contacts at the remote program connector on the rear panel. An Erase Interval signal is also provided at this connector. X, Y, Z inputs are provided through rear BNC connectors or the remote program connector. Manual control of Erase and View is provided on the front panel.



Type 611 features a vertical display format.

# CHARACTERISTICS CRT DISPLAY AND STORAGE

cathode Ray Tube—11-inch flat-faced bistable storage tube, phosphor similar to P1.

Display Size-Vertically: 21 cm. Horizontally: 16.2 cm.

**Resolution**— 4,000 characters based on a 90 x 70-mil matrix, clearly legible with good spacing. Equivalent to 400 vertical x 300 horizontal stored line pairs.

**Viewing Time**—At least 15 minutes without loss of resolution. Viewing time may be extended to one hour; however, several erasures may be required to fully remove previously stored data.

**Dot Writing Time—**  $5 \, \mu s$  or less is required to write (store) one bit of information.

Erase Time- 500 ms or less.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

**Deflection Factor—Vertical:**1-V full scale (16.2 cm for square format or 21 cm for rectangular format), accuracy within 2%.

Horizontal: 1-V full scale (16.2 cm), accuracy within 2%.

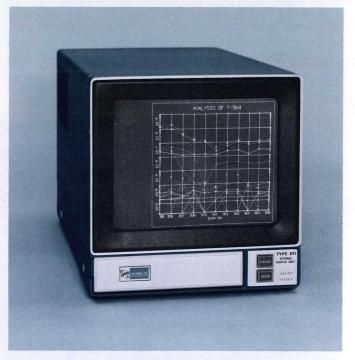
**Initial Beam Position**—Any one of 9 initial beam positions can be selected by internal switches. Each position is adjustable.

Settling Time—  $3.5~\mu \mathrm{s/cm}~+~5~\mu \mathrm{s}$ , to within 1 spot diameter of final position.

**Positional Drift**— 0.16 mm (or less)/hour with 75- $\Omega$  source impedance at 20°C to 30°C. Within 1.6 mm/hour with 75- $\Omega$  source impedance at 10°C to 50°C, reference 25°C.

**Polarity**—Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C— 100 k $\Omega$  shunted by approx 70 pF.



Type 611-2 features a horizontal display format.

#### Z AXIS

**Input**—Turn-on level (unblanked) is +1 V. Turn-off level (blanked) is +0.5 V or less.

Input R and C— 100 k $\Omega$  paralleled by approx 70 pF.

Maximum Input Voltage—  $\pm 50 \, \text{V}$  combined DC and peak AC.

#### OTHER CHARACTERISTICS

**Erase Interval Pulse**—A negative-going erase pulse is provided at the rear connector to inhibit external equipment during an erase cycle. Amplitude change is approx +10 V to +0.3 V, source impedance approx  $2 \text{ k}\Omega$ .

Remote Control—Contacts at the remote program connector on the rear panel provide remote control of the Erase, Non-Store, Write-Thru, and View operating functions.

**Power Requirements**— 90 to 136 VAC or 180 to 272 VAC, 48 to 66 Hz, 250 watts maximum at 115 V and 60 Hz. Rear panel selection provides rapid accommodation for six line-voltage ranges.

<b>Dimensions</b>	and	Weights	
Height			
Width			

Width	11% in	29.5 cm
Depth	223/8 in	56.8 cm
Net weight	≈51 lb	≈23.1 kg
Domestic shipping weight	≈62 lb	≈28.1 kg
Export-packed weight	~72 lb	~32 6 kg

11% in

Included Accessories—Program connector; connector cover, and maintenance manual.

#### ORDERING INFORMATION

611 STORAGE DISPLAY UNIT		\$3175
611-2 HORIZONTAL DISPLAY	FORMAT	\$3175

30.1 cm





- BRIGHT FLICKER-FREE VIEWING
- LOW COST
- STORAGE ECONOMY
- HARD-COPY COMPATIBILITY
- REMOTE PROGRAMMING OF DISPLAY FUNCTIONS

The 613 Storage Display is a bright, low cost, large screen data storage and display unit. Use includes any environment where a substantial amount of data is stored and presented in a single display.

#### **Applications Versatility**

The 613 Storage Display provides digital and analog displays in business, education, banking, electronic data processing, medicine, and process control.

Use of a newly-designed storage cathode-ray tube provides a bright trace for easy viewing of high density alphanumeric and graphic displays in high ambient light conditions. The 613 Storage Display provides high information density without flicker.

Permanent hard copies of the displayed information are available by using the fully compatible 4610 Hard Copy Unit, which provides full-screen copies in eighteen seconds. Storage technology eliminates expensive components required in refreshed information display.

A 4610 Hard Copy Unit, Option 1 is available. This is a multiplex unit that allows from one to four 613's to operate into a single 4610 Hard Copy Unit thereby reducing copy costs.

## **Operating Functions**

613 operating functions are View, Erase, Non-Store and Write Through. View and Erase are under manual or programmable control. Non-Store and Write Through are under programmable control only.



The 613 Storage Display is fully compatible with the 4610 Hard Copy Unit.



Remote programming of the 613 is achieved by grounding the ppropriate program lines of a program connector on the rear panel.

The Erase function, when initiated, removes all previously stored data from the display area and returns the CRT to a "ready-to-write" mode. Within ninety seconds after the display is written, the 613 will automatically switch to a "Hold" mode, storing data on the CRT at a low brightness to extend the storage time. Pressing the VIEW switch while in the "Hold" mode returns the display to the "View" mode for at least 60, but not more than 90 seconds. The "View" mode may be programmed for continuous viewing.

In the "Non-Store" mode the display remains on the screen as long as it is refreshed.

The Intensity, Focus and Power switch controls are located on the rear panel. The View and Erase switches are located on the front panel. X, Y, and Z BNC connectors are available on the rear panel.

#### **CRT DISPLAY & STORAGE**

Cathode-Ray Tube-11-inch flat-faced storage tube.

Display Size-Vertically: 15 cm. Horizontally: 20 cm.

Resolution—Equivalent to 200 vertical x 266 horizontal stored line pairs.

Display Linearity—Full Scale—spot will settle within 1.5% of proper position along center axes for voltage applied.

Incremental—less than 15% difference between any 2 cm deflection, at any position in the display.

**Viewing Time**—Nominally 15 minutes. Longer viewing may require more than one erasure.

**Dot Writing Time**— $5 \mu s$  or less is required to write (store) one bit of information.

Erase Time-900 ms or less.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

**Deflection Factor**—Horizontal:  $1\,\text{V}/20\,\text{cm}$  rectangular format, accuracy within 2%. Vertical:  $1\,\text{V}/15\,\text{cm}$ , within 2%. Either input driven differential or single ended.

Initial Beam Position—Any one of 9 initial beam positions may be selected by two internal connectors. Each position is adjustable  $\pm 10\%$  of full scale vertically and horizontally.

Settling Time— 14.0  $\mu$ s/cm plus 6  $\mu$ s/cm up to 2 cm to within 1 spot diameter of final position.

Polarity—Positive input to the vertical moves beam up; positive input to the horizontal moves beam to the right.

Input R and C-20 k minimum. Shunted by less than 60 pF.

Maximum Input Voltage— ± 18 V DC plus peak AC.



Bright, easily-viewed traces from as many as eight sources can be portrayed on the 613 Storage Display when used with the 4701 Eight-Channel Multiplexer.

#### Z AXIS

**Input**—At least +1 V turns beam on; +0.5 V or less turns beam off.

Input R and C— 10 k shunted by ≈50 pF.

#### OTHER CHARACTERISTICS

Remote Control—All 613 operating modes can be controlled by applying appropriate ground closures to the remote program connector. All control signal inputs are TTL compatible (2 TTL per input). Modes which may be controlled remotely are: Erase, View, Non-Store and Write-Through.

Power Requirements—90 VAC to 132 VAC or 180 VAC to 264 VAC, 48-66 Hz. 180 watts maximum, 115 VAC, 60 Hz.

#### **Dimensions and Weights**

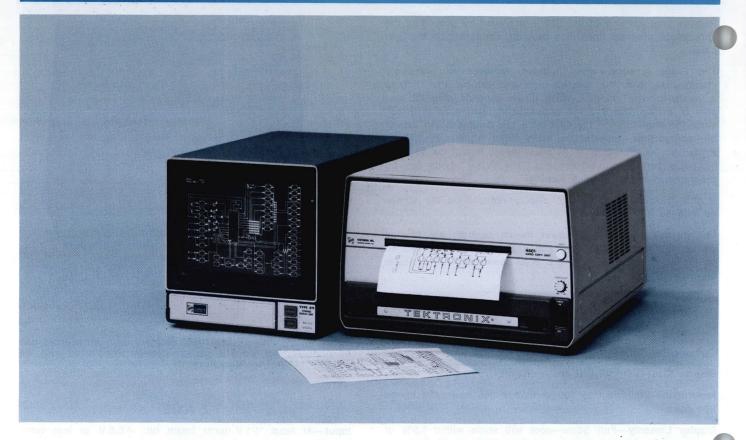
Height	11.100 in.	28.19 cm
Width	13.250 in.	33.65 cm
Depth	21.000 in.	53.34 cm
Weight	≈43 lbs.	≈19.5 kg

Included Accessories—Maintenance manual.

#### ORDERING INFORMATION

613 STORAGE DISPLAY Horizontal Display format	\$2200
613-1 STORAGE DISPLAY  Vertical display format	\$2200





- A NEW STANDARD OF USER CONVENIENCE
- PERMANENT COPIES OF STORED DISPLAYS
- COPY COSTS AS LOW AS 5 CENTS A COPY
- ACCURATE 8½" x 11" INFORMATION COPY

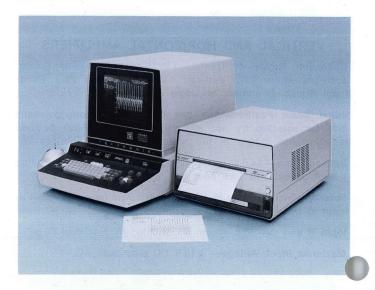
The 4601 Hard Copy Unit is a convenient, economical way of permanently copying alphanumeric and graphic displays. High resolution displays obtained on the 611 Storage Display or 4002A Graphic Computer Terminal are copied by the 4601, providing an accurate representation of the stored display on 3M Type 777 Dry-Silver Paper.

Installation and operation are quick and simple. Installation is just a matter of connection to the power line and the appropriate TEKTRONIX Display Unit. Copy command is initiated manually by pressing a front panel control, or by supplying an external command under program control.

#### THE COPY PROCESS

The signal source is "looped through" the 4601 to the TEK-TRONIX display device. When the copy command is received, the signal source is automatically disconnected from the display device.

Hard Copy is produced by systematically scanning the target of the storage unit. Scanning ramps are generated by scan generators located in the Hard Copy Unit. An electrical signal is taken from the target electrode and fed to the Z axis of a line scan CRT. A fiber-optic faceplate couples the light output from the phosphor to the recording material. Heat development of the latent image takes place after this exposure. Hard Copy is available about 18 seconds after initiation of the copy command.



The 4601 Hard Copy Unit copies stored displays of the 4002A Graphic Computer Terminal and the 611 Storge Display Unit.

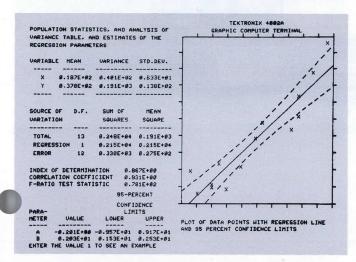


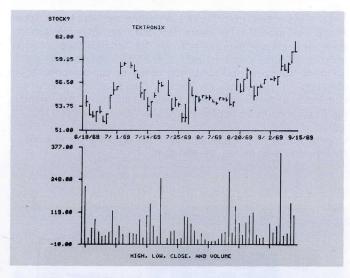
#### THE COPY MEDIUM

he processing unit in the 4601 uses 3M Brand Type 777 Dry-Silver Paper.

Type 777 Paper provides the high image contrast required for high-resolution copies of complex graphics and alphanumerics. It offers the stability normally associated with wet-process photosensitive paper, plus the convenience of dry print-out papers. Cost is low: 5 to 8 cents per 8½ by 11-inch copy, depending on quantity purchased. Further economies can be realized using smaller copies. Copy size may be set from 8½ by 6 inches to 8½ by 14 inches. Roll size is 8½ inches by 500 feet.

Dry-Silver prints can be handled much like any conventional paper. Records can be written upon with pencil or pen. Pencil marks are erasable. Shelf life for unexposed paper is





The 4601 Hard Copy Unit provides permanent, 8½ x 11-inch copies of a wide range of alphanumeric and graphic displays as viewed on the TEKTRONIX 4002A Graphic Computer Terminal and 611 Storage Display Unit.

six months, providing the paper is not removed from its protective wrapper and is stored at room temperatures.

#### **CHARACTERISTICS**

Copy Size—Adjusted to  $8\frac{1}{2}$  x 11 inches at factory, variable between  $8\frac{1}{2}$  x 6 inches and  $8\frac{1}{2}$  x 14 inches.

Copy Time- 18 seconds for first copy.

Warmup Time-20 minutes.

Remote Copy Command—Closure to ground for at least  $5 \mu s$ .

**Resolution (with 3M Brand Type 777 Paper)**—Essentially the same as displayed on the 611 or 4002A Display Devices. Actual-size copies of a 4000-character display, based on a 90 x 70-mil matrix, are clearly legible.

Capability—Designed for use with TEKTRONIX 4002A Graphic Computer Terminal, and Type 611 Display Unit serial numbers B142240 and above. Type 611's below this serial number require a modification; contact your local TEKTRONIX Field Office for additional information.

**Power Source (factory-wired options)**— 90 to 136 VAC, 115 V nominal, 50 to 60 Hz. Maximum power consumption at 115 V, 60 Hz is 1450 W for first 40 seconds after turn on, 220 to 520 W for normal operation, 100 W standby.

#### **Dimensions and Weights**

Height	11	in	27.9 cm
Width	17	in	42.7 cm
Length	≈24	in	≈61 cm
Weight	≈69	lbs	≈31 kg

**Included Accessories—**Two 6-foot interconnecting cables; 8-foot detachable power cord.

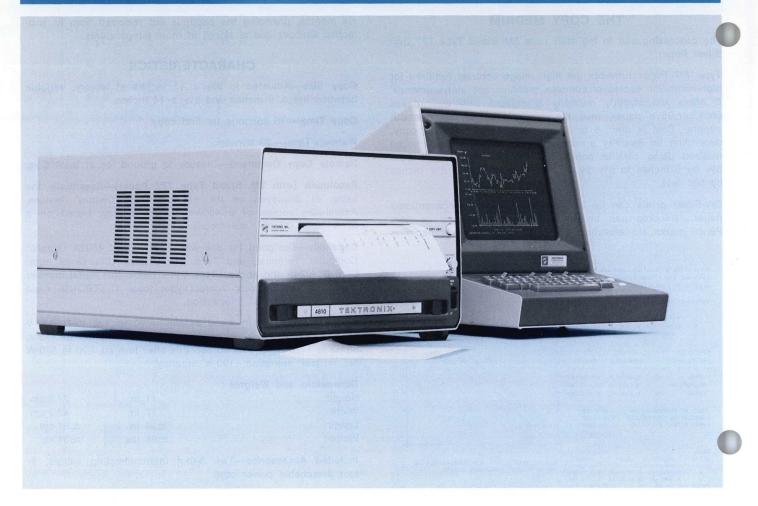
#### **ORDERING INFORMATION**

<b>4601 HARD COPY UNIT</b>
<b>4601-1 HARD COPY UNIT</b> \$3750 230 volt, 50-60 Hz power
The 4601 and 4601-1 have light tan cabinets and are setup for use with the TEKTRONIX 4002A Graphic Computer Terminal.
Option 1 BLUE CABINETS
Instrument set up for use with the TEKTRONIX 611 Storage Display Unit.

#### **OPTIONAL ACCESSORIES**

Copy Catcher, order 016-0298-00	\$95
Paper—One roll is included with from Tektronix, Inc.	the 4601. Refills are available
For one roll, order 006-1603-00 For one carton of 4 rolls, order 000	





- DRY-PROCESS HARD COPY FROM GRAPHIC COMPUTER TERMINALS AND STORAGE DISPLAY UNITS
- SAME RESOLUTION AS STORAGE CRT
- COPIES IN ONLY 18 SECONDS

Sharp, permanent hard copies are made from the CRT display of the new 613 Storage Display, or any 4010-Family Computer Display Terminal by the 4610 Hard Copy Unit. And the 4610 can be multiplexed to provide a copying capability of from one to four Computer Display Terminals and/or 613 Storage Displays.

Operation is simple. A single pushbutton control on the 4610 front panel or a rocker switch on the computer terminal initiates copy-making manually, or program control will accomplish it from the computer.

Installation is equally simple—just a power line connection from the nearest 115-volt 60-Hz AC outlet, and one cable connection to the computer terminal or display unit.

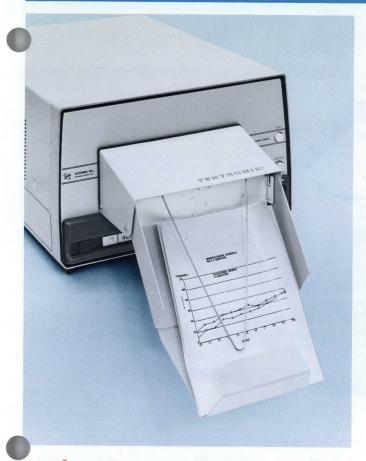
The 4610 processor unit uses 3M Brand Type 777 Dry-Silver paper, which gives the high image-contrast needed for the

most complicated graphic and alphanumeric displays. Type 777 paper provides the same long-term stability you expect from wet-process papers, with all the convenience of dry process. Copies can be handled like any other paper—write on them with pen or pencil, and erase pencil marks without smearing or damaging the paper. Stored under prescribed conditions of temperature and humidity, the paper has a shelf life of six months or better.

Copy size may be set from  $8\frac{1}{2}$  by 6 inches to  $8\frac{1}{2}$  by 14 inches. Roll size is  $8\frac{1}{2}$  inches by 500 feet.







The Copy Catcher pulls and stacks hard copies from all TEK-TRONIX 4600-Series Hard Copy units.

#### **CHARACTERISTICS**

Copy Size—Adjusted to  $8\frac{1}{2}$  x 11 inches at factory, variable between  $8\frac{1}{2}$  x 6 inches and  $8\frac{1}{2}$  x 14 inches.

Copy Time-18 seconds for first copy.

Warmup Time-20 minutes.

<b>Dimensions</b>	and	Weights
Dillichalona	allu	AA CIGIII2

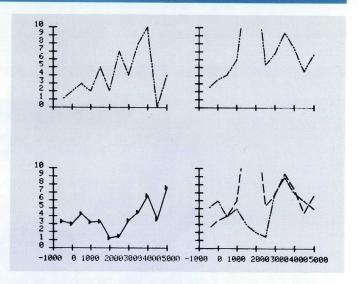
Height	Livery and 11	in	27.9 cm
Width	17	in	42.7 cm
Length	24	in	61 cm
Weight	≈69	lbs	≈31 kg

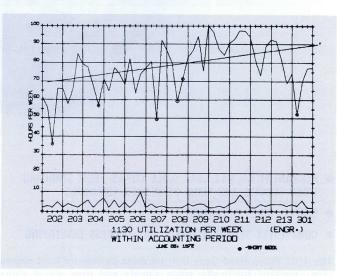
**Resolution (with 3M brand Type 777 paper)**—Essentially the same as the display.

**Power Source (factory-wired options)**—115 Volt nominal, 50 to 60 Hz. Maximum power consumption 1450 watts for first 40 seconds after turn-on, 220 to 520 watts for normal operation, and 100 watts standby.

Operating Ambient Temperature—Between  $+0^{\circ}\text{C}$  and  $+35^{\circ}\text{C}$  is recommended. If operation is necessary in extreme environmental conditions, see your TEKTRONIX Field Engineer or Application Engineer.

**included Accessories**— 8-foot detachable power cord, interconnecting cable.





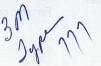
The 4610 provides clear copies of graphic and alphanumeric data.

#### ORDERING INFORMATION

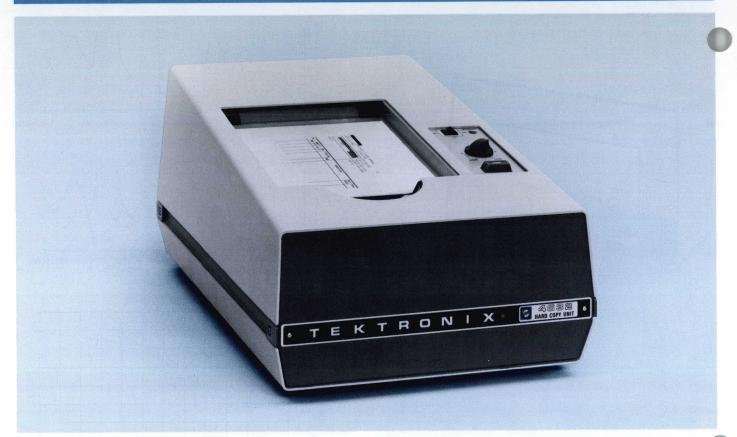
4610 HARD COPY UNIT\$3550
4610-1 HARD COPY UNIT
Option 1 MULTIPLEXING CIRCUITRY Add \$400
Provides copying capability from one to four Computer Display Terminals. Applies to both 4610 and 4610-1.

#### **OPTIONAL ACCESSORIES**

Copy Catcher, order 016-0298-00	\$95
<b>Paper</b> —One roll is included with the 4610 or 4610-1. are available from Tektronix, Inc.	Refills
For one roll, order 006-1603-00	111111111111111111111111111111111111111







- PERMANENT 8½ x 11 GRAY SCALE COPIES FROM STANDARD VIDEO SIGNALS AND FROM REFRESHED TERMINALS
- SIMPLE, QUIET OPERATION
- COMPLETELY SELF CONTAINED. DRY PROCESS DEVELOPING

The 4632 Video Hard Copy Unit provides permanent hard copies from standard composite video signals and from digital video signals of refreshed alphanumeric/graphic terminals. The 4632 provides both high contrast (black and white) or gray scale copies. The 4632 development is a dry process and is completely self-contained, lightweight and quiet. The 4632 is easily interfaced to a video system or refreshed terminal by a single cable. The operation of the control panel used to initiate a copy is extremely simplified. High quality copies are produced in seconds and exit, completely dry, into a built-in stacking tray.

#### **CHARACTERISTICS**

Input Signal Requirements—Input signals may be any one of three configurations. Configuration 1: Composite Video. Configuration 2: Video with horizontal drive and vertical drive. Configuration 3: Video with composite sync.

Input Video (composite video or video)—Amplitude; 0.3 V to 5 V. Impedance; 75-ohm loop-through. Return loss;  $\geq$ 46 dB. Common mode rejection;  $\geq$ 30 dB. Maximum input; 10 VDC plus peak AC.

Input Sync—Amplitude; 0.3 V to 8 V p-p. Impedance; 20 k $\Omega$ . Horizontal and Vertical drive; 0.3 V to 8 V p-p. Maximum input; 10 VDC plus peak AC.

Copy Size—Adjusted to  $8\frac{1}{2}$  x 11 inches for horizontal raster display (4:3 aspect ratio).

Copy Time—Approximately 18 seconds for first copy (typical 525 line, 60 Hz display). Additional copies of the same display take about 7 seconds each.

Warmup Time-20 minutes.

**Power Source (factory-wired options)**— 100-115 VAC, 50/60 Hz, 200-230 VAC 50/60 Hz.

#### **Dimensions and Weights**

Height	11 in	27.9 cm
Width	16 in	40.6 cm
Length	25.5 in	64.8 cm
Weight	65 lb	29 kg

Included Accessories—Users manual (070-1660-00), one roll 3M Type 777 dry silver paper (006-1603-00), one 75 ohm termination (011-0102-00).

#### ORDERING INFORMATION

4632 VIDEO HARD COPY UNIT	\$2950
Option 1 COPY COUNTER	Add \$35
Option 2 4-Channel multiplexer	Add \$450
Provides copying capability from one to four video	sources.

#### **OPTIONAL ACCESSORIES**

Service Manual (mailed on request) N	o Charge
25-foot 75-ohm BNC cable (012-0157-00)	. \$13.20
	19 (19 (19 (19 (19 (19 (19 (19 (19 (19 (

Paper—One roll is included with the 4632. Refills are available from Tektronix, Inc.

For one carton of four rolls, order 006-1603-01 \$40





- LINKS DATA AND SIGNAL SOURCES TO LARGE-SCREEN TV MONITORS
- STORE, INTEGRATE, DIFFERENTIATE, ADD, SUBTRACT, SCAN-CONVERT, DIGITIZE, COMPOSE AND SELECTIVELY ERASE
- GRAY SCALE STORAGE, VARIABLE PERSISTENCE, SELECTIVE ERASE, FRAME FREEZE

The 4503 Scan converter is a high performance instrument with at least 500 lines resolution per picture height at 50% modulation. The primary application is to process digital and video signals with storage tube image writing and read-out.

The CRT target may be written by XY positioning the beam at random and writing at each point, or a series of points by staircase stepping. The beam may be scanned linearly, fast or slow, with modulation of the beam by a video signal or digital pulses. Analog waveforms may be written, preceded by a continuous erase bar.

# CHARACTERISTICS DISPLAY

**Displayed Resolution**—At least 500 lines at 50% modulation per picture height. (1000 lines optional).

Line Writing Time—25 microseconds.

Dot Writing Time-25 nanoseconds.

Read Storage Time—At least 45 minutes (saturated signal). At least 15 minutes for full gray scale.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

Bandwidth-1 MHz.

**Deflection Factor**—Vertical: 1 V full screen, Horizontal: 1 V II screen.

Input Resistance— 1 Megohm.

Input Capacitance— 100 pF or less.

Maximum Safe Input Voltage-200 VDC.

Common Mode Rejection Ratio—minimum, 500:1 at 10 kHz, 100:1 at 1 MHz.

#### Z AXIS AMPLIFIER

Bandwidth-30 MHz.

Input Amplitude-1 V (beam full on).

Input Resistance— 1 Megohm (loop-through unterminated).

Input Capacitance— 100 pF or less.

Maximum Safe Input Voltage-200 VDC.

Minimum Pulse Width-40 nanoseconds with 1 V input.

Common Mode Signal Range-plus or minus 2 V.

Full Frame Z Signal—Composite Video 75 ohm (loop-through terminated).

TTL Z Signal-Logic "Lo" unblanks the writing beam.

#### OTHER CHARACTERISTICS

Power Requirements— 100 watts maximum at 115 V or 230 V, 50/60 Hz.

Composite Sync Out—Amplitude; 0 V to —4 V. Return loss; at least 30 dB.

Composite Video Output—Video information can be displayed at any TV line rate from 525 to 1225 lines. Instrument timing can be internally generated or externally synchronized.

Composite Sync In—Amplitude; 0 V to -4 V. Return loss; at least 40 dB at 5 MHz. The external sync circuit will derive sync from a composite video waveform and will automatically phase lock to any TV line rate from 525 to 2048 lines.

**Included Accessories**—75-ohm terminator; 25-pin connector, operator's manual.

4503 SCAN CONVERTER UNIT	\$2950
R4503 SCAN CONVERTER UNIT (rackmount model)	\$2950
Option 1 1000 LINE RESOLUTION	Add \$500
Option 2 RF MODULATOR	Add \$100

## 4701 Eight-Channel Multiplexer





- DISPLAYS 8 CHANNELS Y-T or 4 CHANNELS X-Y
- REMOTE CHANNEL SELECTION
- CALIBRATED TIME BASE

Display signals from as many as eight separate sources on a single screen with the 4701 Eight-Channel Multiplexer and a TEKTRONIX Display Unit. The 4701's calibrated Time Base makes possible as many as 8 simultaneous Y-T displays; up to four X-Y displays are possible using the channels in pairs; or a mixture of X-Y and Y-T displays can be selected.

Automatic erase for TEKTRONIX Storage Display Units is provided by the 4701. Operating modes for the 8 channels include Alternate, in Channel 1 through Channel 8 sequence; Chopped, with individual-channel viewing time selected according to the Display Unit in use; and Remote, as programmed from an external source.

#### INPUT CHARACTERISTICS

The eight channels have identical characteristics. Differential inputs provide for noise cancellation where long lines are used. This is an advantage in areas where the point of signal acquisition is at some distance from the 4701. Conventional 1-M $\Omega$  impedance minimizes circuit loading, and allows use of signal probes if further isolation or attenuation is desired. Front panel controls provide a continuously variable 10:1 attenuation.

#### **APPLICATION AREAS**

#### Medical

Operating Rooms and Intensive Care—Monitoring the level of anesthesia, blood pressure, heart rate and ECG signals.

Medical Schools—Monitoring actual and simulated ECG's, EDG's, EEG's, EMG's, etc. The 4701/611/4601 and 4701/4503/TV monitors fill needs here.

Medical Clinics—Multi-signal tests performed on blood and other biophysical elements.

#### **Education**

The 4701 finds a variety of uses in Engineering, Physics, Psychology, Veterinarian Departments and Technical Schools in lecture, labs and research applications.

#### Petroleum/Chemical

Research and refinery process control applications monitoring pressure, temperature, oxygen, etc. often occur in oil company and chemical plants. Auto erase and the externally-programmed channel selection features are particularly significant when used with computers. Hard copy capability is a plus in this environment

# DISPLAY PRODUCTS Eight-Channel Multiplexer 4701

X-Y Plots—Selector switches on channels 5, 6, 7 and 8 select channels 1, 2, 3 and 4 respectively for their X displays.



Sweep—Provides full screen normal or single sweep displays at 20 different Time/Scan settings from 10  $\mu$ s to 50 s in a 1, 2, 5 sequence. A non-calibrated mode is continuously variable between steps. Either repetitive or single sweeps can be selected.

**Triggered Modes**—Automatic peak-to-peak, AC coupled and DC coupled, plus and minus slope.

**Trigger Inputs**—Can be internal from each selected channel, external, or from the power line.

View Time—Provides automatic control of a TEKTRONIX storage display unit and permits the 4701 to retain the display in a view mode from .08 to 30 s, (continuously variable) after all channels are displayed.



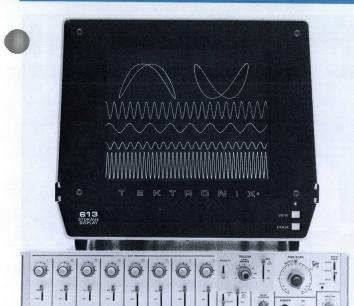
Power Requirements— 90 to 136 V or 180 to 272 V, 48 to 440 Hz, 21 watts maximum.

Dimensions and Weights—Height 3½ inches, width 16% inches, depth 201/8 inches, and weight approximately 15 pounds.

**Included Accessories**— 6-foot interconnecting cable; 25-pin male connector.

4701 EIGHT-CHANNEL MULTIPLEXER	\$1500
R4701 EIGHT-CHANNEL MULTIPLEXER	\$1525
613 STORAGE DISPLAY	\$2200
C12 1 CTORECE DIODIEV	

613-1 STORAGE DISPLAY ..... \$2200 Vertical display format



The 4701 Eight-Channel Multiplexer and the 613 Storage Display comprise a system capable of portraying eight different signal sources.

# CHARACTERISTICS VERTICAL CHARACTERISTICS

eflection Factor 1 V to 10 V, continuously variable.

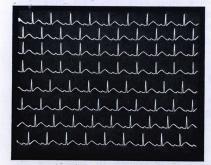
Bandwidth-DC to 1 MHz.

Input Impedance— 1 M $\Omega$  paralleled by  $\approx$ 20 pF.

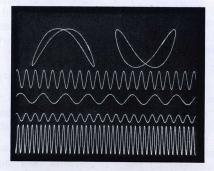
Common-Mode Rejection Ratio-at least 100:1.

Output— 1 V into 50  $\Omega$  with 1 V input.

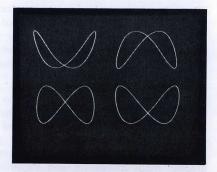
**Operating Modes**—Alternate: in sequence 1 thru 8. Chopped: internal switch selects chopping rates of approximately 2.5 kHz, 30 kHz or 300 kHz. Remote: 3 lines of TTL compatible binary code select the output channel.



8-Channel Y-T Displays—Full-Screen normal or single sweep displays are swept at 10 µs to 50 s full scale, from a time base internal the 4701. Oscilloscope-type triggering also provided. Simulated ECG is shown.



MIXED X-Y and Y-T Displays—Simultaneous display of four frequencies versus time and two frequencies versus two other frequencies. Other display combinations include 1 X-Y with 6 Y-T displays and 3 X-Y with 2 Y-T displays.



**4-CHANNEL X-Y Displays**—Format can be horizontal or vertical, depending on the display unit ordered.

The above displays were photographed on a 611-2 Display Unit.





#### A GROWING FAMILY OF TERMINALS

Three new terminals add even greater variety and versatility to the successful TEKTRONIX line of Computer Display Terminals. Big screen storage combines with full ASCII and APL capability in the 4014 and 4015—newest members of the 4010 Family. The new 4023 refreshed alphanumeric terminal marks the first TEKTRONIX entry into this field.

The TEKTRONIX Terminal Family also includes (1) the 4002A, a general-purpose display terminal with both storage display and refreshed scratch pad (for on-line editing), a full 96-character ASCII set, and three distinct graphic modes; (2) the 4010, a low-priced terminal combining alphanumeric and graphic mode operation, and 64 printing characters; (3) the 4012, with Alphanumeric Display and Interactive Graphic operating modes, and the complete ASCII character set; and (4) the 4013, offering all of the features of the 4012, plus the complete APL character set. Additional information about each of these terminals is found on pages 271-275.

The PLOT-10 Software system makes the terminals useful for hundreds of business, educational, scientific, and industrial applications—and they can be interfaced with many different data communication systems and computer configurations. PLOT-10 is described on page 275.

#### **COMPUTER TERMINAL FEATURES**

The 4010-Family Terminals are designed in a convenient deskheight stand-alone pedestal configuration; excellent for use in any office, laboratory or industrial location.

A Hard Copy can be mated with each TEKTRONIX computer terminal, and high-resolution hard copies of displayed information obtained in seconds.

Further operational versatility is added to all TEKTRONIX terminals with a wide variety of optional accessories.

Price information on all accessories is found in this section.



# COMPUTER TERMINAL PRODUCTS

## **Graphic Display Terminal 4002A**

- FULL SCREEN GRAPHING CAPABILITY
- STORAGE TUBE GRAPHICS WITH REFRESHED TUBE EDITING
- FULL ASCII CHARACTER SET
- HARD COPY COMPATIBILITY

The 4002A is a self-contained computer terminal which provides a high-resolution, flicker-free display of both complex graphics and high-density alphanumerics.

This graphic computer terminal provides benefits of both storage tube graphics and refreshed tube editing. A split screen, direct-view storage tube eliminates the need for a separate refreshed memory for the main display. This minimizes the information rate requirements of the data source. A one line refreshed scratch pad enhances editing. The full ASCII character set is provided, including 96 printing characters. Upper and lower case letters, as well as double size and italics can be displayed.

Three separate modes of graphic display are offered—Point Plot, Linear Interpolate, and Incremental Plot. In any of the graphic modes 1024 points can be addressed in either horizontal or vertical planes. 761 points can be viewed in the vertical plane, 1024 in the horizontal.

Added performance in graphics is provided by the use of the 4951 Joystick in combination with the 4901 or 4903 Interactive Graphic Units. The 4901 or 4903 fit directly into the 4002A, and generate a cross-hair cursor, which can be positioned to any point on the display screen by the Joystick. The Interactive Graphic Unit then digitizes the graphic address at the ross-hair intersection and sends the X and Y address comonents to the computer.

Hard copy output from the 4002A is furnished by the 4601 Hard Copy Unit. Specification and price information on the 4601 is found on pages 262 and 263.

#### **CHARACTERISTICS**

Display Medium—11-inch (diagonal) direct-view, bistable storage CRT with refreshed scratch pad area.

Display Area—8.3-inches horizontal by 6.1-inches vertical.

#### Alphanumeric Mode

Format—39 lines of 85 normal or italic characters in main area, one line of 84 characters in scratch pad area.

Character Set— 96 upper and lower case printing characters (ASCII code).

Character Size—70 x 90 mils (approx) can be made double size.

Character Generation— 7 x 9 dot matrix.

Cursor—Pulsating 7 x 9 matrix.

#### **Graphic Modes**

Linear Interpolate, Incremental Plot, Point Plot.  $1024 \times 1024$  addressable points,  $1024 \times 761$  viewable points.

Graphic Input Mode—1024 (x), 761 (y) points. Joystick controlled. Cross-hair cursor.

Input Power—110/120 VAC with line voltage selector. HI, MED, or LOW line voltage switch selectable.

Operating Temperature—+10°C to +40°C.

Dimensions—19% inches high, 19 inches wide, 34% inches deep.

Weight-130 pounds (approx).

4002A GRAPHIC COMPUTER TERMINAL, without Interface ... \$8800

# Graphic Computer Terminal Interfaces 4002A

# INTERFACES FOR 4002A GRAPHIC COMPUTER TERMINAL

DATA COMMUNICATIONS INTERFACE FOR 4002A ..... \$600

# AMANATOL IGNO

021-0033-00

This interface transfers data in a serial asynchronous format either full-duplex or half-duplex mode. It conforms to EIA Standard RS-232-C and CCITT V24. Internal clocks or external timing signals may be used. Transmit and receive rates are independent of each other and easily selected on back panel switches. Standard selectable rates are 110, 150, 300, 600, 1200, 2400, 4800, 9600 bits/sec inclusive. Two positions of each switch are provided for user chosen rates.

## TELETYPE PORT INTERFACE FOR 4002A ...... \$750

21-0034-00 DEC PDP-8/i, 8/L and 12 21-0035-00 Data General Computers

021-0036-00 HP 2100 Series & 2000A (12531 card)

021-0037-00	Varian 620/i, 620/L, 620/R
021-0038-00	Honeywell H316
021-0039-00	Interdata Computers and G. E. Process
	Computers with Teletype Control Card
	Type 32-062 F01
021-0039-01	Interdata Computers and G. E. Process
	Computers with Teletype Control Card
	Type 32-120 F01
021-0040-00	DEC PDP-11
021-0041-00	Varian 620F
021-0043-00	Raytheon 703, 704, 706
021-0044-00	DEC PDP-9
021-0045-00	DEC PDP-8 (S/N 150 & up)
021-0045-01	DEC PDP-8 (S/N 149 & below)
021-0046-00	DEC PDP-15
021-0047-00	DEC PDP-8/e with Module M865
021-0047-01	DEC PDP-8/e with Module M8650
021-0051-00	Honeywell DDP 516
4001 INTERACT	IVE GRAPHIC UNIT \$525
4501 INTERACT	IVE GRAPHIC UNIT

4903 INTERACTIVE GRAPHIC UNIT

4951 JOYSTICK .....

\$1000

# COMPUTER TERMINAL PRODUCTS 4010, 4010-1 Computer Display Terminal



- SUPPORTS ALPHANUMERIC PLUS LOW-COST INTERACTIVE COMPUTER GRAPHICS
- CONVENIENT PEDESTAL DESIGN FOR USER ENVIRONMENTS
- FLICKER-FREE STORAGE DISPLAY
- COMPLETE SOFTWARE SUPPORT—PLOT-10

The 4010 Computer Display Terminal is a low-cost computer terminal for use in business, educational and scientific environments. Until recently, cost was a major barrier to the use of graphic terminals in many applications. The 4010 has broken the cost barrier, with complete interactive graphics and alphanumeric display at a new, economical price. Direct-view bistable storage makes the CRT display clear and flicker-free, with excellent resolution on all parts of the screen. Thumbwheel control of the cross-hair graphic cursor speeds and simplifies graphics input.

For alphanumeric operation, the full TTY ASCII character set of 64 printing characters is featured, with a format of 35 lines of 72 characters each—a total of 2520 characters maximum on the display screen.

For graphics, the 7.5 by 5.6-inch display area includes 1024 addressable points in both X and Y planes. Viewing limits are 1024 points in the X plane, and 780 in the Y plane.

Permanent hard copies can be made quickly and inexpensively by mating the 4010-1 version of the terminal with the 4610 Hard Copy Unit. Price and specification details for the 4610 are found on pages 264 and 265.

#### **4010 CHARACTERISTICS**

Display Medium-11-inch direct-view bistable storage CRT.

Display Area - 7.5 inches wide by 5.6 inches high.

#### Alphanumeric Mode

Format—72 characters per line, 35 lines; 2520 characters per screen.

4010 Character Set- 64 printing characters (TTY ASCII Code).

4010 Cursor-Pulsating 5 x 7 dot matrix.

Graphic Mode—Vectors only. Vector drawing time 2.6 ms. 1024 x 1024 addressable points; 1024 x 780 viewable points.

Graphic Input Mode— 1024 (X), 780 (Y) points. Thumbwheel controlled cross-hair cursor.

4010 COMPUTER DISPLAY TERMINAL	\$3950
4010-1 COMPUTER DISPLAY TERMINAL	
ANY OPTIONAL INTERFACE Ad	

## 4012 Computer Display Terminal

- LOW COST FULL RANGE PERFORMANCE
- UPPER AND LOWER CASE ALPHANUMERICS
- GRAPHIC CAPABILITY WITH HIGH RESOLUTION
- FULL ASCII CHARACTER SET

New operating versatility in low-cost computer graphics is offered by the 4012 Computer Display Terminal. TEKTRONIX direct-view bistable storage provides clear, flicker-free CRT display with excellent resolution on every part of the display screen. High-density alphanumeric and graphic displays contain as many as 2520 alphanumeric characters on 35 lines of 72 characters each. Addressable points for graphic operation are 1024 in X and 1024 in Y planes, with 780 in the Y plane and 1024 in the X viewable on screen.

Three modes of operation are provided. In addition to alphanumeric mode, Graphic Display (GRAF) and Interactive Graphics (GIN) can be used. The entire PLOT-10 Software System is available for use with the 4012, and interfaces can be arrange with a wide variety of data communication and computer systems.

The full ASCII character set of 96 printing characters is included, with both upper and lower case letters.

Hard copies of all 4012 displays can be made with the 4610 Hard Copy Unit mated to the terminal. See pages 264 and 265 for price and specification information on the 4610.

4012 COMPUTER DISPLAY TERMINAL	\$4950
ANY OPTIONAL INTERFACE	Add \$300

## 4013 Computer Display Terminal

- PROGRAMMING EASE FOR SCIENTISTS, MATHEMATICIANS, EDUCATORS
- APL CHARACTER CAPABILITY WITH HIGH RESOLUTION
- FULL ASCII CHARACTER SET

APL (A Programming Language) makes computer graphics a faster, more effective procedure and makes programming easier for scientists, mathematicians and educators. APL operation is a feature of the new 4013 Computer Display Terminal. This versatile new terminal, utilizing the TEKTRONIX direct-view bistable storage CRT, offers, in addition to the APL character set, the complete ASCII character set of 96 printing characters, including both upper and lower case letters.

The 4013 is an even more effective tool of data communication when used with the new TEKTRONIX PLOT-10 APL/Graph

software or with the PLOT-10 software developed for the 4010series Computer Display Terminals.

The 4013 offers high character density and exceptional display resolution. Up to 35 lines of 72 alphanumeric characters can be displayed simultaneously—and in the graphic modes, a 1024 by 1024-point matrix is addressable from the keyboard or from the computer. 1024 X addresses by 780 Y addresses are viewable on screen. All 4013 displays are flicker-free because of the TEKTRONIX storage CRT.

As with other TEKTRONIX Computer Display Terminals, hard copies of all displays can be made in seconds, and at minimum cost by using the 4013 with the 4610 Hard Copy Unit. Price and specification details for the 4610 are found on pages 26 and 265.

4013 COMPUTER DISPLAY	TERMINAL	 \$5450
ANY OPTIONAL INTERFACI		 Add \$300



# New

# COMPUTER TERMINAL PRODUCTS Computer Display Terminal 4014

- LARGE SCREEN DIRECT-VIEW STORAGE DISPLAY
- FOUR PROGRAM-SELECTABLE FORMATS IN ALPHANUMERIC MODE
- VECTOR AND DISCRETE-PLOT GRAPHIC MODES
- FIVE PROGRAM-SELECTABLE FORMATS IN GRAPHIC MODE

Storage display is presented on a big screen with the new 19-inch direct-view storage CRT in the 4014 Computer Display Terminal. Pictures, designs, graphs, procedures can all be presented in large, sharp, high-resolution displays. Any information on the screen can be copied on 8½ by 11-inch dry copies with a TEKTRONIX 4600-series Hard Copy Unit.

#### **CHARACTERISTICS**

**Display Area**— 15 inches ( $\approx$ 381 mm) wide by 11 inches ( $\approx$ 279 mm) high.

**Alphanumeric Mode**—Four program-selectable formats from 74 characters per line with 35 lines per display, to 133 characters per line with 64 lines per display. 7 x 9 dot pulsating cursor. Full ASCII character set (94 printing characters).

**Vector Mode**—Vector drawing time: 5000 inches per second. Addressable Points: 1024(X) by 1024(Y), Displayable Points: 1024(X) by 780(Y).

**Discrete Plot Mode**—Incremental plot capability with 4096(X) by 3124 (Y) displayable points. Also allows program control of Z axis.

4014 COMPUTER DISPLAY TERMINAL		\$8450
ANY OPTIONAL INTERFACE	Add	\$300
DISCRETE PLOT OPTION (018-0073-00)	Add	\$500

# New

## **Computer Display Terminal 4015**

- FULL APL and ASCII CHARACTER SETS
- LARGE DIRECT-VIEW STORAGE CRT
- INTERACTIVE GRAPHICS CAPABILITY

The 4015 makes alphanumeric/graphic displays available on a large 15-inch by 11-inch viewing screen with storage capalility. Included are the full ASCII and APL character sets (188 total printing characters), and a 7 x 9 dot pulsating cursor. Vector mode features 5000 inches per second vector drawing time.

The 4015 is compatible with all present APL systems, and makes use of all PLOT-10 software (see page 275). Pictures, designs, graphs, procedures can be displayed in a large, sharp, high-resolution, easily viewable size. As many as 8,512 alphanumeric characters can be displayed at one time. Permanent, dry-process hard copies of any information on the screen are made with a TEKTRONIX 4600-Series Hard Copy Unit.

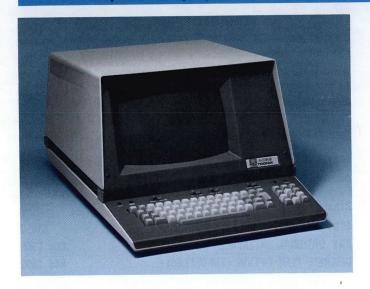
4015 COMPUTER DISPLAY TERMINAL	\$8950
ANY OPTIONAL INTERFACE	Add \$300
DISCRETE PLOT OPTION (018-0073-00)	Add \$500

# Computer Display Terminal Interfaces 4010-Family

Charles A please			
	(specify interface at time of order.)	Option 6	HP 210 Series, 2000O (12531 card)
ANY OPTIONA	L INTERFACE Add \$300	Option 7	Varian 620/i, 620/L, 620/R
Data Commu	nication Interfaces	Option 9	Raytheon 703, 704, 706
Standard	Standard Data Communication Interface included with the 4010 and 4010-1 is RS-232-C compatible. Strap selectable input/output data rates	Option 10	DEC PDP-8 (S/N 150 & up), PDP-9 (Also see Option 18)
	of 150, 300, 600, 1200, 2400, 4800 and 9600 bits/sec.	Option 11	Honeywell H316
gol FB == 1	and the second of the second o	Option 12	Honeywell DPD 516
Option 1	Optional Data Communication Interfaces with convenient switch-selectable functions including: local-echo, full-duplex, half-duplex and independent transmit and receive rates of 110,	Option 13	Interdata Computers and G.E. Process Computers with Teletype Control Card Type 32-062 FOI (Also see Option 19)
	150, 300, 600, 1200, 2400, 4800 and 9600 bits/ sec.	Option 14	Varian 620F
062 665 330		Option 15	APL 360
<b>Teletype Inte</b> Option 2		Option 16	DEC PDP-11 with D-11 Controller
	DEC PDP-11 (Also see Option 16)	Option 17	DEC PDP-8/e with Module M8650
Option 3	DEC PDP-8/i, 8/L, 12, 15	Option 18	DEC PDP-8 (S/N 149 & below)
Option 4	Data General Computers	Option 19	Bide Locked towns Includes transmittable
Option 5	DEC PDP-8/e with Module M865 (Also see Option 17)	Option 19	Interdata Computers and G.E. Process Computers with Teletype Control Card Type 32-120 FOI

## New





- LOW COST REFRESHED VERSATILITY
- UPPER AND LOWER CASE CAPABILITY
- OPERATES AT THE SPEEDS YOU REQUIRE

The newest member of the growing family of TEKTRONIX computer display terminals, the 4023 Refreshed Computer Display Terminal, for all of its low cost, is not a stripped-down version. It provides powerful editing and display formatting capabilities.

The 4023 keyboard provides selection of a full ASCII set of 94 printing characters, or the 63 character TTY upper case subset.

The memory (buffer) of the 4023 allows space for 24 lines with 80 characters each, providing a total of 1920 characters. Standard Terminal features permit the cursor to be addressed to any one of the 1920 character positions.

The 4023 can communicate directly with a computer, bypassing the buffer; or it can communicate via the buffer. Communicating directly to the computer is a character-by-character process; whereas, in buffered communications the data can be sent as one complete block.

Function Control and Numeric Pad—A cluster of 12 keys to the right of the keyboard that provides a dual purpose. Normally these keys provide control for editing, transmission, cursor movement, etc. However, pressing the NUM LOCK key located in the bottom right corner of the key cluster, enables the 12 keys to function as a numeric pad.

Editing Capabilities—Insert character and line, delete character and line, erase to end, erase input, and erase page. Editing is speeded by tab, back tab, and repeating character keys.

Field and Data Formatting—Displayed data can be arranged to resemble the source document. Forms information can then be rapidly retrieved, updated, edited, and entered. Visual field formats include: inverted, blinking, blanked, and dim fields. Logical formats include: transmittable, non-transmittable, protected, non-protected, and non-alpha fields.

Data Communications Interfacing—Provided by two data communications interfaces for telephone line connection. One is the standard Data Communications Interface supplied with the 4023 when no other interface is specified. Compatible with RS-2320, this interface provides switch-selectable input/output data rates of 110, 150, 300, 600, 1200, 4800, or 4600 baud. Local echo is also switch selectable.

#### **CHARACTERISTICS**

CRT-12-inch diagonal.

Display Size-9 inches wide by 5.5 inches high

Phosphor Type—P-4 (white)

Video—Composite Video, compatible with standard interlaced 525 line monitor

Refresh Rate-60 Hz

Cursor Type—7 by 10 dot matrix, non-destructive remote or local control

Character Generator-5 x 7 dot matrix

Character Size—80 mils by 120 mils (0.80 inch wide by 0.12 inch high)

Character Code—128 ASCII, 94 printing upper and lower case characters.

Characters Per Line-80

Lines Per Display-24

Refreshed Buffer-MOS RAM

Intensity—Normal 30 foot lamberts, dim 15 foot lamberts for background identification

**Keyboard**— 64/96 ASCII upper and lower case, 2 key roll-over, auto-repeat for any keys depressed over 0.3 second

Input/Output—Standard Data Communications Interface is RS-232C compatible, Full Duplex, Serial Asynchronous, Start/Stop, LSB first, Baud rate Transmit/Receive selectable 110-9600 with backpanel switch, Transmission code is 128 ASCII upper/lower case.

Power Requirements— 115/230 (hi, medium, lo) VAC, 50 to 400 Hz, nominal 220 watts

Physical—Height	13 inches	≈33 cm
Width	18 inches	≈46 cm
Depth	23 inches	≈58 cm
Net Weight	46 lbs.	≈21 kg
Shipping Weight	67 lbs.	≈30 kg

## ORDERING INFORMATION

4023 COMPUTER DISPLAY	TERMINAL	\$2995
Option 1 OPTIONAL DATA	COMMUNICATION INTERFACE	Add \$300

**OPTIONAL ACCESSORIES** 

#### whe interfaces

Audio Recorder Card, order 018-0086-00	\$29
Rulings Character Set, order 020-0085-00	



# COMPUTER TERMINAL PRODUCTS Reader/Perforator 4911

# SAVES MONEY AND TIME SAVES COMPUTER CORE

Punched tape capability greatly expands the limited memory capacity of a mini-computer. With the 4911 Reader/Perforator Unit, programs that would otherwise consume valuable space in core storage are kept in permanent off-line form, ready to be read into the computer at 200 characters per second. Unprocessed data can be recorded in punched tape form and fed into the computer at convenient times.

With a 4911 Reader/Perforator Unit, the programs and data normally filed in a timesharing or in-house computer system

can be converted to 8-channel punched tape and used for file maintenance through the 4010-Family Computer Display Terminal.

Tape loading and operation of both the reader and the perforator are quick and simple through convenient grouping of front panel pushbutton controls.

The 4911 Reader/Perforator Unit uses standard, easily-obtained one-inch paper, paper-mylar, or aluminum-mylar tapes with a thickness range of 0.0030 to 0.0043 inch.

#### ORDER INFORMATION

4911 READER/PERFORATOR UNIT .....\$2950

## SOFTWARE PRODUCTS

MOST EXTENSIVE GRAPHING SOFTWARE AVAILABLE ANYWHERE

- INTERFACES TO MORE THAN TWENTY MAJOR MINIS
- COMPATIBLE WITH MAJOR TIMESHARING SYSTEMS
- SOFTWARE ACCESSIBILITY TO 360/370 SYSTEMS

Tektronix, Inc. has expanded its program of total software support to provide the most extensive graphing software ever offered. This graphing software is compatible with most timesharing systems, with IBM 360/370 O/S and TSO and with numerous mini-computers. PLOT-10 offers a series of modules from which can be selected those elements that best suit the operating environment and application. Now users can quickly a deasily get computer data into a graphing form directly lpful to decision making.

#### PLOT-10/Mini-Computer

The PLOT-10/mini-computer package lets the operator easily use the TEKTRONIX terminals on his mini-system. PLOT-10 consists of assembly-language subroutines supporting graphics input/output and special functions of the terminal.

#### PLOT-10/360-370 Graphics Software

The PLOT-10/360/370 software module provides the capability to access TEKTRONIX terminals from within application programs. Written in assembler language using IBM's Execute Channel Program I/O facility, modules can be assessed from any of the IBM programming languages by subroutine calls. Special facilities are provided for PL/I compatibility. The module will handle multiple terminals, and operates under O/S MFT or MVT, or MVT with TSO.

Hardware connection between the S360/370 and the TEK-TRONIX terminal is made through IBM's 270X series telecommunications control units. Varying speed capability, 300, 600, 1200, 2400, 4800 or 9600 baud, is available by replacing the IBM oscillator card in the IBM 2701 Control Unit with a TEK-TRONIX oscillator card.

#### **PLOT-10/Terminal Control System**

This package sets a new standard for interactive graphics terminal software. It provides a comprehensive base of graphic software to support user application programs.

e software is written in FORTRAN IV. These routines allow or part of your picture to be displayed on any region of the terminal screen. All clipping and scaling are automatic.

Routines are included for erasing the screen; making a hard copy; determining character size and font, plotting absolutely or

relatively; handling and formatting alphanumeric output; and performing graphic input of screen points. Care has been taken to maximize transferability to any operating system that supports a FORTRAN IV compiler.

#### PLOT-10/Advanced Graphing—II

This set of routines allows the user to display data graphically without concerning himself with programming details. Alphanumeric data tables can be converted to graphs with a single subroutine call. Routines are included for data plotting in cartesian, semi-log, log-log, and polar-coordinate systems, with automatic or specified scaling. One curve or several curves can be drawn on the same set of coordinates.

#### **PLOT-10/Decision Maker**

PLOT-10/Decision Maker is an interactive system of FORTRAN IV subroutines which provide graphic analysis, forecasting, and report generation capabilities for a variety of business applications.

Two versions of PLOT-10/Decision Maker are available: (1) for Digital Equipment Corporation's PDP-10 with the standard DEC monitor; and (2) for IBM systems supporting TSO.

#### PLOT-10/APL Graph Software

APL/Graph is an integrated collection of user oriented APL functions adapted from the popular Terminal Control System and Advanced Graphing Routines. They are designed to allow highly interactive, easy to use computer graphics. The package includes functions to control all utilities of the terminal itself, including screen erasure, windowing, clipping, hard copy generation, and alphanumeric handling.

An extensive set of functions is also available to provide support for users in all facets of business, scientific, mathematical, and educational work. These include functions for creation of pie charts, histograms, time-series scales, and all types of X, Y plotting. Functions are also included to allow polynomial curve fitting. Normal X, Y plotting can be done on cartesian, semi-log, log-log, and polar coordinate systems with any number of curves drawn on the same set of coordinates.

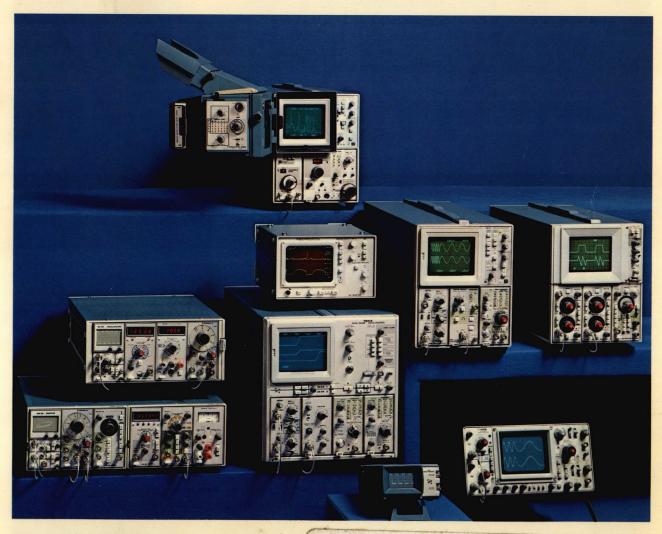
#### **Dataform**

Dataform is a set of FORTRAN IV routines which allows the user to create, edit, save, and display forms in a TEKTRONIX 4023 refreshed terminal environment.

Included in the Dataform package is support of terminal functions such as erase, Hard Copy, cursor positioning, and others including the Ruling Character Set accessory for the 4023.



# 1975 PRODUCTS



FIELD OFFICES, DISTRIBUTORS, and REPRESENTATIVES, Page 327 FUNCTIONAL INDEX, Page 330

Cleveland FO.

MARY, LEWIS

FOR DESK RACK USE

# **Display Products**



Tektronix offers many instruments for displaying information. Each is designed for specific application areas — from small screen monitors, to stored display monitors, to the large screen 630 series of tv monitors. And each has its own special set of features to provide the exact instruments for most purposes. A new addition to the display product line is the 605 Variable Persistence Storage Monitor. Many of the most sought-after display features are combined in this new low-cost X-Y-Z monitor.

Permanent storage of displays is available through accessories such as the easy-to-operate hard copy units. These units produce high quality copies in a matter of seconds through a dry process. TEKTRONIX cameras are compatible with the smaller screen monitors (the 5" and 6" ones) to produce Polaroid prints.



1-MHz X and Y Bandwidth
100-mV/cm X and Y Deflection Factors
X-Y Phase Difference within 1° to 1 MHz
Uniformly Small Spot Size
Dc-Coupled Z Axis

The Type 602 Display Unit is a compact, solid-state instrument with excellent resolution providing accurate displays of information from X, Y, and Z signal inputs. Application areas are: phase shifts and frequency ratios using *Lissajous* figures, graphic and alphanumeric displays from computers, Y-T plots of amplitude versus time displays, and gamma camera displays.

Permanent records of the Type 602 display are provided on Polaroid film using the TEKTRONIX C-30A Camera with adapter. Two Type 602's may be mounted side-by-side using an optional rack adapter.

#### **CRT DISPLAY**

Cathode-Ray Tube— 5-inch flat-faced rectangular crt with P31 phosphor standard, P7 phosphor optional.

Display Size—8 cm vertically and 10 cm horizontally.

**Graticule**—Standard graticule: Internal, parallax-free, variable illumination supplied with standard 602, as shown above. Optional graticule: Internal 8 x 10-cm outline (no graticule lines) supplied with Option 2.

Trace Width—Maximum trace width within the  $8 \times 10$ -cm display area is 14 mils at 0.5- $\mu A$  beam current.

**Display Linearity**—The voltage required to produce a 2-cm deflection at any point on the crt will not vary more than 2% in the vertical direction, and 6% in the horizontal direction.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

The X (Horizontal) and Y (Vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

Bandwidth-Dc to 1 MHz at 3-dB down.

**Deflection Factor**—Vertical: 90 mV/cm to 135 mV/cm, internally variable. Horizontal: 90 mV/cm to 110 mV/cm, internally variable.

Phase Difference—Not more than 1° between X and Y amplifiers up to 1 MHz.

Beam Position—Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/h after 20-min warm up.

Polarity—Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C— 100 k $\Omega$  ±10% paralleled by 30 pF or less.

Maximum Input Voltage— ±10 V dc plus peak ac.

Recommended Source Impedance— 1 k $\Omega$  or less.

#### Z AXIS

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: dc to 1 MHz over 0.0 V to  $\pm$ 1 V range. Signal input is a BNC connector on the rear panel.

Input R and C- 100 k $\Omega$  ±10% paralleled by 70 pF or less.

Maximum Input Voltage—  $\pm 10 \, \text{V}$  dc and peak ac.

Recommended Source Impedance— 1  $k\Omega$  or less.

#### OTHER CHARACTERISTICS

Power Requirements—90 to 136 Vac or 180 to 272 Vac, 48 to 440 Hz. 50 watts at 115 Vac, 60 Hz. Rear panel selector provides rapid accommodation for six line-voltage ranges.

**Temperature**—Electrical specifications are valid over the range of  $0^{\circ}$ C to  $+50^{\circ}$ C ambient.

Finish—Blue vinyl painted cabinet, aluminum construction.

#### Dimensions and Weights (cabinet included)—

Height	6 in	15.3 cm
Width	8½ in	21.6 cm
Depth	17% in	44.1 cm
Net Weight	171/2 lb	7.9 kg
Shipping weight	≈22 lb	≈9.9 kg

**Included Accessories**—Smoke-gray filter installed on standard instrument; orange filter installed with Option 76; maintenance manual.

#### **ORDERING INFORMATION**

602 Display Unit	\$995
Option 1 without Cabinet	. Subtract \$25
Option 2 Internal 8 x 10-cm Outline Graticule	No Charge
Option 5 Vector Display Graticule	Add \$25
Option 76 P7 Phosphor	No Charge

#### OPTIONAL ACCESSORIES

51/4-inch rack adapter (016-0115-02); panel assembly (016-0116-00); C-30A camera; Type 602 to C-30A adapter; C-30A camera carrying case.

Low-Cost X-Y Monitor
Time Base Option

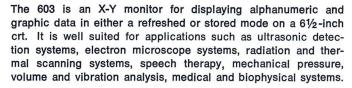
61/2-Inch Storage Crt

1 Million Dots/Sec Writing Speed

Variable Stored Brightness

**View for Extended Periods** 

**Differential Inputs** 



Now available is an optional, horizontal time-base. With calibrated sweep rates, conventional Y-T measurements are a valuable addition to the 603's high-performance X-Y monitor features.

The Tektronix-developed bistable storage crt used in the 603 eliminates the need for costly memory devices to refresh the display. Brightness of stored displays may be adjusted to obtain optimum photographic results, to integrate multiple traces and extend storage time to at least ten hours. Permanent records of the 603 display can be obtained on Polaroid prints using the TEKTRONIX C-5 Camera.

Operating functions are remotely programmable through a rearpanel connector which interfaces directly with TTL systems. X-Y-Z differential inputs are available via BNC connectors. A remote program connector is also available for positive inputs.

#### CRT DISPLAY AND STORAGE

Cathode-Ray Tube—6½-inch flat-faced, bistable, storage tube. Phosphor is similar to P1. 3.5-kV accelerating potential. Two storage tubes are available (standard crt for brighter stored display or Option 2 for a faster writing speed). When used in the nonstore mode, both tubes exhibit characteristics of a conventional crt.



Writing Speed—Standard crt, at least 20 div/ms; Option 2, at least 200 div/ms.

**Dot Writing Time**—Time required to write (store) one dot: standard crt,  $4 \mu s$  or less; Option 2 crt,  $0.5 \mu s$  or less.

Information Storage Rate—Standard crt, at least 200 thousand dots/second; Option 2 crt, at least one million dots/second.

Display Size—4 inches vertically, 5 inches horizontally. An internal, nonilluminated graticule is available as Option 1.

**Resolution**—Stored, equivalent to 80 vertical x 100 horizontal stored-line pairs. Nonstored, equivalent to 128 vertical x 160 horizontal line pairs.

**Display Linearity—**The voltage required to produce a 1 inch deflection from any point on the crt will not vary more than 5%.

Viewing Time—At least one hour at normal intensity without loss of resolution. Viewing time can be extended to ten hours by utilizing the variable brightness control.

Erase Time—Approximately 250 ms.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

Bandwidth-Dc to 2 MHz at 3-dB down (80% full screen scan).

**Polarity**—Positive signal to both + inputs moves the beam up and to the right.

**Deflection Factor**—Vertical and horizontal:  $\approx$ 50 mV/div to 250 mV/div, internally adjustable, 5:1 fixed internal attenuator extends range to at least 1.25 V/div.

#### 603 Storage Display Unit

input R and C—1 M $\Omega$  ±1%, paralleled by less than 47 pF.

X-Y Phase Difference—1° or less to at least 500 kHz.

Beam Position—Front-panel position controls permit setting zero to any point on screen. Position shift is 1 mm/h or less after 20-min warm-up.

Settling Time— $0.2 \,\mu$ sec or less for distances of 1 div or less. 1  $\mu$ sec or less from any point on the crt to within one spot diameter of final position.

Maximum Input Voltage— ± 100 V dc plus peak ac.

**Linear Common-Mode Signal Range**— $\pm 3$  V,  $\pm 15$  V in 5X fixed attenuator position.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuator.

Recommended Source Impedance—10  $k\Omega$  or less.

Optional Horizontal Time Base—  $1\mu$ s/div to 0.1 s/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approximately 1 s/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For non-triggered operation, an internal switch selects bright base-line or no sweep.

#### Z AXIS

Linear Z-axis amplifier permits intensity modulation of the writing beam in nonstored mode. Positive input to + input increases the display intensity.

To insure storage of each written dot the Z-axis on-time should be at least  $4\,\mu s$  with the standard crt and at least  $0.5\,\mu s$  with Option 2 crt. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

Bandwidth—Dc to 5 MHz over usable range. Sensitivity is adjustable from 1 to 5 V.

**Differential Input**—Cmrr at least 100:1 and common-mode range at least  $\pm 5$  V.

Input R and C—1 M $\Omega$  ±1%, paralleled by less than 47 pF.

Maximum Input Voltage— ± 100 V dc plus peak ac.

#### **OTHER CHARACTERISTICS**

**Power Requirements—**Line voltage selector allows operation from 100, 110, 120, 200, 220 and 240 V ( $\pm$ 10% on each range), 50 to 60 Hz and 400 Hz. 75 watts maximum at nominal line voltage.

Dimensions and Weights-See next page.

Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00); external graticule (331-0303-00).

#### ORDERING INFORMATION

603 Stora	ge Monitor \$1150
Option 1	Internal Graticule No Charge
Option 2	Fast Writing Crt Add \$25
Option 3	Without Handle and Feet Sub \$10
Option 4	Time Base Add \$125
Optional A	Accessories—51/4-inch rack conversion kit, C-5 Camera.

604

**Display Unit** 

Low-Cost Monitor with 61/2" Screen



12

**Low-Cost Monitor** 

**Time Base Option** 

61/2-Inch, Easy Viewing Crt

2 MHz X and Y Bandwidth

Dc-Coupled 5 MHz Z Axis

X-Y Phase Difference within 1° to 500 kHz

**Differential Inputs** 

The 604, with a 61/2-inch crt, ideally meets the display and space requirements of system designers in such applications as pulse-height analysis, infrared detection, data communications systems testing, component and logic testing, vibration analysis and medical instrumentation. The 604 is also well

suited for many other applications including: phase shifts and frequency ratios using Lissajous figures, raster displays with intensity modulation and apparent dynamic three-dimensional illustrations. Calibrated horizontal sweep rates, available optionally, provide a convenient extension of the 604 measurement field. Visual display of computer-processed data enhances understanding of the processed information. Permanent records of the 604 display can be obtained on Polaroid prints using the TEKTRONIX C-5 Camera. Differential inputs are available via BNC connectors on the rear panel. Plus inputs are also available via a 25 pin connector.

#### CRT DISPLAY

Cathode-Ray Tube—6½-inch flat-faced rectangular crt with P31 phosphor. P7 phosphor optional (includes orange filter).

Display Size—Internal parallax-free, nonilluminated graticule marked in 8 vertical and 10 horizontal divisions (½ in/div). Option 1 is without graticule.

Display Linearity—The voltage required to produce a 1 inch deflection at any point on the crt will not vary more than 5%.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

Bandwidth—Dc to 2 MHz at 3-dB down (80% full screen scan).

**Polarity**—Positive signal to both + inputs moves the beam up and to the right.

**Deflection Factor—**Vertical and horizontal:  $\approx 50 \text{ mV/div}$  to 250 mV/div, internally adjustable, 5:1 fixed internal attenuator extends range to at least 1.25 V/div.

Input R and C—1 M $\Omega$  ±1%, paralleled by less than 47 pF.

X-Y Phase Difference-Not more than 1° to at least 500 kHz.

**Beam Position**—Front panel position controls permit setting zero to any point on screen. Position shift is 1 mm/h or less after 20-min warm-up.

Maximum Input Voltage— ±100 V dc plus peak ac.

**Linear Common-Mode Signal Range—**  $\pm 3$  V,  $\pm 15$  V in 5X fixed attenuator position.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuator.

Recommended Source Impedance—10  $k\Omega$  or less.

**Optional Horizontal Time Base**— $1\mu$ s/div to 0.1 s/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approximately 1 s/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For non-triggered operation, an internal switch selects bright base-line or no sweep.

#### Z AXIS

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

Bandwidth—Dc to 5 MHz over usable range, sensitivity is adjustable from 1 to 5 V.

**Differential Input**—Cmrr at least 100:1 and common-mode range at least  $\pm 5 \, \text{V}.$ 

Input R and C—1 M $\Omega$  ±1% paralleled by less than 47 pF.

Maximum Input Voltage— ±100 V dc plus peak ac.

#### **OTHER CHARACTERISTICS**

**Power Requirements**—Line voltage selector allows operation from 100, 110, 120, 200, 220 and 240 V ( $\pm$ 10% on each range), 50 to 60 Hz and 400 Hz, 56 watts maximum at nominal line voltage.

Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00).

#### **ORDERING INFORMATION**

604 Monito	r \$735
Option 1	Without Graticule No Charge
Option 3	Without Handle and Feet Sub \$10
Option 4	Time Base Add \$125
Option 5	Vector Display Graticule Add \$30
Option 76	P7 Phosphor No Charge

Optional Accessories—51/4-inch rack conversion kit, C-5 Camera.

#### **RACKMOUNTING FOR 603 AND 604**

Cabinet-to-rackmount conversion kit, equipped with slide-out assembly, required to rackmount two 603 Option 3s or two 604 Option 3s side-by-side in a standard rack width.

Order 040-0600-00 ...... \$50

Rackmount-to-cabinet conversion kit required to convert a rackmount 603 or 604 to a cabinet style.

Order 040-0602-00 \$25

Cabinet-to-rackmount conversion kit, equipped with slide-out assembly, required to rackmount a TM 503 modular test system

and a 603 or a 604 in a standard rack width.

Order 040-0624-00 ......\$44

#### 603/604 DIMENSIONS AND WEIGHTS

Dimensions	Cabinet		Rackmount	
	in	cm	in	cm
Height	6.65	16.9	5.25	13.5
Width	8.4	21.4	8.4	21.4
Length	19.25	48.9	19.0	48.25
Weights (approx)	lb	kg	lb	kg
Net	17.5	7.9	17.5	7.9
Shipping Weight	23.0	10.4	23.0	10.4





Low Cost X-Y-Z Monitor

Variable Persistence Storage

1 Div/µs Writing Speed

3 MHz X-Y Bandwidth

5 MHz on Z axis

Front Panel Controls

Remote Programmability

Time Base Option

The 605 displays low repetition rate signals, single-shot waveforms, and slowly scanned images at normal intensity, without flicker. Low-repetition-rate applications include viewing biophysical signals and mechanical waveforms such as those in engine analysis. Bright, uncluttered single-shot displays of vibration waveforms are obtained with the fast (1  ${\rm div}/\mu {\rm s})$  writing speed. An example of a slow-scanning application is the gray-scale image of a metal sample shown on the 605 pictured above. The image is from a scanning electron microscope at 2000 times magnification.

Simply turning a dial varies the length of time a display is held on the crt from a fraction of a second to more than 5 minutes. The 605 combines variable persistence storage with an intensity input to produce slow-scan, gray-scale images. Ultrasound, thermographic, and nuclear scanning are biophysical applications for which the 605 is well suited. Fast spot response makes the instrument an excellent choice for random scanning use. An optional low-cost time base adds the capability of monitoring real-time biophysical signals.

Resolution of spectrum analyzers is improved since the desired frequency span can be viewed at low scan rate. The slowly fading trace of the 605 provides valuable trajectory information for radar and sonar displays.

#### CRT DISPLAY AND STORAGE

Variable Persistence Storage Crt— 5-inch, flat-faced, rectangular tube with P31 phosphor. 8.5 kV accelerating potential.

**Display Size**— 8 divisions vertically, 10 divisions horizontally at 0.9 cm/div.

**Graticule**—Standard graticule, external. Internal 8 x 10-div graticule supplied as Option 1.

**Maximum Writing Speed**—At least 1 div/ $\mu$ s for 1 minute viewing time.

Storage View Time—Greater than 5 minutes at reduced writing speed.

Save Time—Viewing time is extended up to 10 times in the save mode.

Halftone Resolution-At least 10 lines/div.

Halftone Luminance-At least 100 fl.

Erase Time—  $\simeq$ 500 ms.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

Bandwidth-Dc to 3 MHz at 3 dB down (80% full screen scan).

 $\begin{tabular}{lll} \textbf{Polarity} & \textbf{Positive signal to both } + \textbf{ inputs moves beam up} \\ \textbf{and to the right.} \\ \end{tabular}$ 

**Deflection Factor**—Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. Internal 5.1 attenuator extends deflection factor range to 12.5 V full scale.

Input R and C— 1 M $\Omega$  paralleled by less than 47 pF.

X-Y Phase Difference-Not more than 1° to 500 kHz.

**Beam Position**—Front-panel position control allows setting zero-signal position to any point on screen. Position shift is 0.09 cm/hr or less after 20 minute warm-up.

**Spot Response Time**—Typically 0.5  $\mu s$  to settle within 1 spot diameter.

Maximum Input Voltage— ±100 V (dc plus peak ac).

**Linear Common-Mode Signal Range—**  $\pm 3 \text{ V}$  (non-attenuated);  $\pm 15 \text{ V}$  with 5X attenuation.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuation.

Recommended Source Impedance— 10 k $\Omega$  or less.

Optional Horizontal Time Base— 1  $\mu s$ /div to 0.1 s/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated continuously variable between steps and to approximately 1 s/div, TRIG SLOPE/LEVEL Control for stable, triggered displays. For nontriggered display, an internal switch selects bright base line or no sweep.

#### **Z-AXIS AMPLIFIER**

#### 605 Variable Persistence Storage Monitor

**Bandwidth**—Dc to 5 MHz (-3 dB). Sensitivity adjustable from  $\pm 1$  V to  $\pm 5$  V for full intensity control.

Differential Input—Cmrr at least 100:1 to 100 kHz up to  $\pm 5$  V.

Input R and C— 1 M $\Omega$  paralleled by less than 47 pF.

Maximum Input Voltage—  $\pm 100 \, \text{V}$  (dc plus peak ac).

#### OTHER CHARACTERISTICS

Remote Inputs—TTL compatible. 0.52 V or less provides logic low. 2.5 V or more provides logic high.

**Erase Interval Output**—TTL compatible. Logic low is 0.4 V or less. Logic high is 2.5 V or more. Will drive 10 unit loads.

**Power Requirements**—Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 volts ( $\pm 10\%$  on each range), and 50 to 60 Hz. Power consumption is 40 watts maximum at nominal line voltage.

**Included Accessories**—External program connector (131-0570-00); connector cover (200-0281-00).

**Ambient Temperature Limits—**  $0^{\circ}$ C to  $50^{\circ}$ C operating;  $-40^{\circ}$ C to  $+70^{\circ}$ C nonoperating.

#### **DIMENSIONS AND WEIGHTS**

Dimensions	Cabinet		Rackmount	
	in	cm	in	cm
Height	6.65	16.9	5.25	13.5
Width	8.4	21.4	8.4	21.4
Length	19.25	48.9	19.0	48.25
Weights (approx)	lb	kg	lb	kg
Net	17.5	7.9	17.5	7.9
Shipping Weight	23.0	9.9	23.0	9.9

#### **ORDERING INFORMATION**

605 Variable Persistence Storage Monitor \$1,675
Option 1 Internal Graticule No Charge
Option 3 Without Handle and Feet Sub \$10
Option 4 Internally Triggered Time Base Add \$125

#### Rackmounting for 605

Cabinet-to-rackmount conversion kit, equipped with slide-out assembly, required to rackmount a 605 in a standard rack width. This includes securing hardware and a blank front panel when only one instrument is utilized.

Order	040-0601-00	 \$77
Oluei	U4U-U0U I-UU	 TI I

Cabinet-to-rackmount conversion kit, equipped with slide-out assembly, required to rackmount two 605 Option 3's side-by-side in a standard rack width.

Rackmount-to-cabinet conversion kit, required to convert a rackmount 605 to a cabinet style.

## Order 040-0602-00 ......\$25

**Cabinet-to-rackmount conversion kit,** equipped with slide-out assembly, required to rackmount a TM 503 modular test system and a 605 in a standard rack width.

Order	040-0624-00	 44

For displays of exceptional density and high resolution

High-Resolution Alphanumeric and Graphic Displays

Flicker-Free Bistable Storage

**Eliminates Costly Memory Devices** 

**Hard-Copy Compatible** 

**Remote Programming of Display Functions** 

The 611 Storage Display Unit provides stored displays of combined alphanumeric and graphic information from analog sources and digital computers, using built-in digital to analog converters. The stored display eliminates the need for costly memory devices to refresh the display, and provides high information density with excellent resolution without flicker or drift. All 611 control functions (Erase, Write-Thru, Nonstore, and View) are remotely programmable. The 4601 Hard Copy Unit will copy the 611 Display.

#### **DESIGN CHARACTERISTICS**

**The Display**—The 611 uses an 11" (diagonal measure) flat-faced storage tube. Resolution is 4000 characters, based on a 70 x 90 mil dot matrix; this is equivalent to 400 vertical by 300 horizontal (300 vertical by 400 horizontal for the 611-2) stored line pairs. Dot writing time is 5  $\mu$ s or less; erase time is 500 ms or less. Viewing time is 15 minutes without loss of resolution but may be extended to one hour.

**Vertical and Horizontal Amplifiers**—The deflection factor is 1 V full scale, either axis. Any of 9 adjustable initial beam positions can be selected by internal switches. Input R and C is 100 k $\Omega$  shunted by approximately 70 pF.

**Z** axis Amplifier—Input turn-on level (unblanked) is + 1 V; turn-off level (blanked) is + 0.5 V or less. Input R and C is the same as the Vertical and Horizontal amplifier.

Other Features—A busy signal is provided at the rear connector to inhibit external equipment (computer, etc.) during the erase cycle.

Requirements—The 611 operates on 110 or 220 VAC (LO, MED, HI) 48 to 66 Hz, and requires 250 watts at 115 V, 60 Hz.

**Included Accessories**—Program connector; connector cover, and maintenance manual.

#### **ORDERING INFORMATION**

611 Storage Display Unit (vertical format)	\$3495
611-2 Storage Display Unit (horizontal format)	\$3495

,

Storage Display Unit

Bright, large screen data storage display

**Bright Flicker-Free Viewing** 

Low Cost

Storage Economy

**Hard-Copy Compatibility** 

**Remote Programming of Display Functions** 

The 613 Storage Display Unit is a bright, large screen data storage display unit which allows satisfactory viewing under high ambient light conditions. It is ideal for storing and presenting a substantial amount of data in a single display. The 613 provides greater stored display brightness of alphanumeric and graphic information from analog sources and digital computers, using built-in digital to analog converters.

Horizontal or vertical display formats are available. Hard copies of stored displays can be made using a TEKTRONIX 4610 Hard Copy Unit.

#### **DESIGN CHARACTERISTICS**

The Display—The 613 uses an 11" (diagonal measure) flat-faced crt, with resolution equivalent to 200 vertical by 266 horizontal line pairs. Viewing time is 15 minutes; longer viewing may require more than one erasure to clear previously stored data. Dot writing time is  $5\,\mu s$  or less; erase time is 900 ms or less.

**Vertical and Horizontal Amplifiers**—The deflection factor is 1 V full scale, either axis. Any one of nine initial beam positions may be internally selected. Input R and C is 20 k $\Omega$  minimum, shunted by less than 60 pF.

**Z** axis Amplifier—Beam turn-on (unblanked) level is + 1 V; beam turn-off (blanked) is + 0.5 V or less. Input R and C is 10  $\rm k\Omega$  shunted by approximately 50 pF. A TTL LO input circuit may be selected to turn on the crt writing beam.

Other Features—All 613 operating modes (Erase, View, Nonstore, Cursor) can be remotely controlled by applying the appropriate ground closures to the remote program connector. All control signal inputs are TTL compatible.

Power Requirements—The 613 operates on 110 or 220 VAC, (LO, MED, HI), 48-66 Hz, and requires 180 watts (maximum) at 115 VAC, 60 Hz.

Included Accessories—Maintenance manual.

613 Storage Display (Horizontal format)	\$2495
613-1 Storage Display (Vertical format)	\$2495

12

User Convenience

Permanent Copies Of Stored Displays
Copy Costs As Low As 6 Cents A Copy

Accurate 81/2" x 11" Information Copy

The 4601 Hard Copy Unit is a convenient, economical way of permanently copying alphanumeric and graphic displays. High resolution displays obtained on the 611 Storage Display or 4002A Graphic Computer Terminal are copied by the 4601, providing an accurate representation of the stored display on 3M Type 777 Dry-Silver Paper.

Copy command is initiated manually by pressing a front panel control, or by supplying an external command under program control.

#### **CHARACTERISTICS**

Copy Size—Adjusted to  $8\frac{1}{2} \times 11$  inches at factory, variable between  $8\frac{1}{2} \times 6$  and  $8\frac{1}{2} \times 14$  inches.

Copy Time— 18 seconds for first copy.

Warmup Time-20 minutes.

Resolution (with 3M Brand Type 777 Paper)—Essentially the same as displayed on the 611 Display Devices or 4002A Graphic Display Terminal. Actual-size copies of a 4000-character display, based on a 90 x 70-mil matrix, are clearly legible.

**Power Source (factory-wired options)**— 90 to 136 Vac, 115 V nominal, 50 to 60 Hz. Maximum power consumption is 1450 W for first 40 seconds after turn on, 220 to 520 W for normal operation, 100 W standby.

Included Accessories—Two 6-foot interconnection cables; 8-foot detachable power cord.

#### **ORDERING INFORMATION**

4601 Hard Copy Unit	\$3995
4601-1 Hard Copy Unit	\$3995
Paper—One roll is included with the 4601. Refills are able from Tektronix, Inc.	avail-
For one roll, order 006-1603-00	. \$40
For one carton of 4 rolls, order 006-1603-01	\$143
OPTIONAL ACCESSORIES	
Copy Catcher, Order 016-0298-00	\$101

Dry-Process Hard Copies from Graphic Computer Terminals and Storage Display Units

Same Resolution as Storage Crt

Copies in Only 18 Seconds

Sharp, permanent hard copies are made from the crt display of 613 Storage Display, or any 4010-family Computer Display Terminal by the 4610 Hard Copy Unit. The 4610 can be multiplexed to provide a copying capability from one to four Computer Display Terminals and/or 613 Storage Displays.

Operation is simple. A single push-button control on the 4610 front panel or a rocker switch on the computer terminal initiates copy-making manually, or program control will accomplish it from the computer.

#### **CHARACTERISTICS**

Copy size-81/2 x 11 inches.

Copy Time- 18 seconds for first copy.

Warmup Time-20 minutes.

Resolution (with 3M brand Type 777 paper)—Essentially the same stored on the display.

Power Source (factory-wired options)— 90 to 136 Vac, 115 volt nominal, 50 to 60 Hz. Maximum power consumption 1450 watts for first 40 seconds after turn-on, 220 to 520 watts for normal operation, and 100 watts standby.

Included Accessories— 8-foot detachable power cord, 10 ft. interconnecting cable.

<b>4610 Hard Copy Unit</b>
<b>4610-1 Hard Copy Unit</b>
Option 1 Multiplexing Circuitry Add \$400 Provides copying capability from one to four Computer Display Terminals or 613 Display Unit. Applies to both 4610 and 4610-1.
Option 2
Paper—One roll is included with the 4610 or 4610-1. Refills are available from Tektronix, Inc.
For one roll, order 006-1603-00\$40
For one carton of 4 rolls, order 006-1603-01 \$143
OPTIONAL ACCESSORIES
Copy Catcher, order 016-0298-00 \$101

**Hard Copy Unit** 

Hard Copies of 4023 Alphanumeric Terminal Displays

Simple, Quiet Operation

**Completely Self-Contained** 

**Dry Process Developing** 

The 4623 Hard Copy Unit is designed to produce permanent high quality, 81/2" x 11" copies from the 4023 refreshed alphanumeric terminal. Operation is simple and quiet, with dryprocess development within one lightweight unit.

Installation is easy and simple. The 4623 is plug-to-plug compatible to the 4023. Four-channel input, which accommodates up to four 4023's, is standard, allowing copying capabilities from one to four terminals.

#### **DESIGN CHARACTERISTICS**

Standard copy size adjustment is 81/2 inches by 11 inches for horizontal raster display (4:3 aspect ratio). Copy time is approximately 18 seconds for the first copy and about 8 seconds for additional copies of the same display. Machine warmup time is 20 minutes. The recommended ambient temperature for operation is  $0^{\circ}$ C to  $+35^{\circ}$ C.

Remote Signal Inputs—Remote copy. A logic level "LO" (ground closure) initiates a copy command.

Power Requirements—The 4623 operates on 100, 115, 200, or 230 Vac, 50-60 Hz. These are factory-wired options.

Included Accessories—One 10-foot 15-pin interconnecting cable.

#### **ORDERING INFORMATION**

4623 Hard Copy Unit\$339	95
Option 1 Copy Counter Add \$	50
Standard color is tan if color is not specified.	
Option 56 Gold Add \$4	40
Option 57 Red Add \$4	40
Option 58 Green Add \$4	40
<b>Paper</b> —One roll is included with the 4623. Refills are available from Tektronix, Inc.	le
For one roll, order 006-1603-00\$	10
For one carton of 4 rolls, order 006-1603-01	43

4632

**Video Hard Copy Unit** 

Dry Process Development within One Lightweight Unit

Permanent  $8\frac{1}{2}$ " x 11" Gray Scale Copies From Standard Video Signals And Refreshed Terminals

Simple, Quiet Operation

Completely Self-Contained. Dry Process Developing

The 4632 Video Hard Copy Unit provides permanent hard copies from standard composite video signals and from digital video signals of refreshed alphanumeric/graphic terminals. The 4632 provides both high contrast (black and white) or gray scale copies. The 4632 development is a dry process and is completely self-contained, lightweight and quiet. The 4632 is easily interfaced to a video system or refreshed terminal by a single cable. As an option, it can be multiplexed to provide copying capability from one to four video sources.

#### **DESIGN CHARACTERISTICS**

Standard Copy size adjustment is 81/2 inches by 11 inches for horizontal raster display (4:3 aspect ratio). Copy time is approximately 18 seconds for the first copy and about 8 seconds for additional copies of the same display. Machine warmup time is 20 minutes. The recommended ambient temperature for operation is  $0^{\circ}$ C to  $+35^{\circ}$ C.

Input Requirements—Input signals may be any one of three configurations: composite video, video with horizontal and vertical drive, or video with composite sync. Input video amplitude is from 0.3 V to 5 V. Impedance is 75 ohms, loop-through. Return loss is at least 46 dB. Common mode rejection is at least 30 dB. Maximum input is 10 Vdc plus peak ac. Input sync amplitude is 0.3 V to 8 V p-p; impedance is 20 k $\Omega$ .

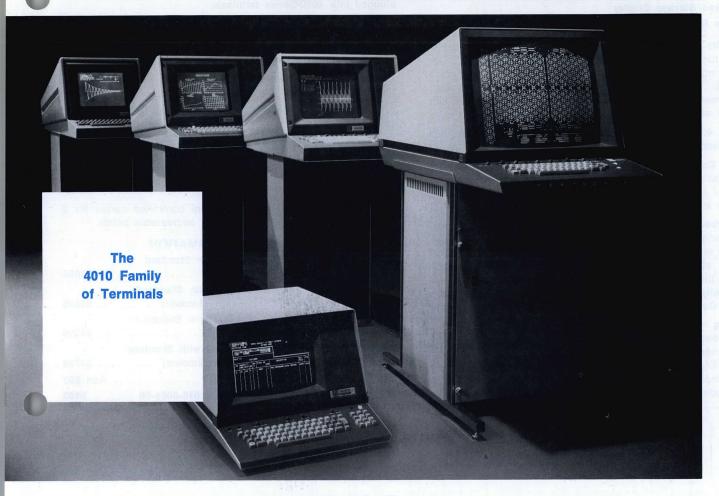
**Power Requirements—**The 4632 operates on 110-115 Vac, or 200-230 Vac, 50-60 Hz; these are factory wired options.

Included Accessories—Users manual, one 75-ohm termination.

4632 Video Hard Copy Unit\$3395
Option 1, Copy Counter Add \$50
Option 2, 4-channel Multiplexer Add \$500
Option 3, Set up for 625 Line, 50 Hz Field Operation
Option 4, Set up for 1029 Line, 60 Hz Field Operation No Charge
$ \begin{tabular}{ll} \textbf{Paper} \end{tabular} \begin{tabular}{ll} \textbf{Paper} \end{tabular} \begin{tabular}{ll} \textbf{One roll is included with the 4632.} \end{tabular} \begin{tabular}{ll} \textbf{Refills are available from Tektronix, Inc.} \end{tabular} $
For one roll, order 006-1603-00

# 13

# **Terminal Products**



The 4010 family of terminals, (the 4010, 4012, 4013, 4014, and 4015), have capabilities to fit a variety of situations. The 4010 family can be adapted to most computer systems and tasks by using the right combination of interfaces, software, and peripheral equipment.

They are each shipped with a Standard Data Communication Interface installed if no option is specified. Also available is an option (option 1) for full or half duplex Data Communication system operations. Six additional options are also offered to provide connections at the TTY port of the most commonly used minicomputers. (Special TTY interfaces are available by special quote). In addition, there are two code converting interfaces available for operation in a 2741 environment or a CDC synchronous environment.

A complete line of software which can be used with any of the 4010 family of terminals further increases flexibility of application. (Software listed on page 309).

Any of the 4010 family can be used with the 4911 Paper Tape Reader/Perforator Unit, the 4921 and 4922 Flexible Disc Memory Units and the 4953 and 4954 Graphic Tablets.

Model variations are also available to be compatible with the 4610 Hard Copy Unit, providing permanent copies of display information.

For low-cost graphics and alphanumerics

13

Supports Alphanumeric Plus Low-Cost Computer Graphics Convenient Pedestal Design for User Environments Flicker-Free Storage Display Complete Software Support

Despite its low price, the 4010 Computer Display Terminal is a data handling tool of great capacity and flexibility. The pedestal minibus design opens the way to a variety of system concepts. You can start with a simple, low-cost terminal, leaving room for future expansion, or you may enlarge it with a variety of options for larger systems.

With the 4010-1, permanent hard copies of displayed data can be obtained, using a 4610 Hard Copy Unit.

**Physical Configurations**—The keyboard and display unit may be secured at the top of the pedestal in a convenient free-standing model, or may be mounted on a desktop. An extra-cost rackmount is also available.

The Keyboard—The 4010 has a TTY style keyboard featuring 63 printing characters (including upper case alphanumerics), and standard ASCII control characters. Convenient rocker switches above the keyboard select Local or Line operation and (on the 4010-1) produce hard copies from the 4610. Independently-operated X and Y axis thumb-wheels position the Graphic Cursor in the Graphic Input Mode.

Operating Modes—Three operating modes can be selected from the keyboard or the computer. In Alphanumeric mode, 35 lines of 74 characters each constitute a full display screen. In Graphic Display mode, the terminal produces clear, accurate vector display in response to computer commands. In Graphic Input Mode, operator/computer interactivity is permitted.

Minibus Extender, Option 30—This circuit card allows up to 5 additional interfaces, options and/or peripherals to be plugged into 4010-Series terminals.

#### **DESIGN CHARACTERISTICS**

Screen Size—The screen is a direct-view storage crt 81/4 inches wide by 63/6 inches high.

Format—The 4010 allows 74 characters per line, and 35 lines (2590 characters) per full screen.

Character Set—Includes 63 printing characters (TTY ASCII Code).

Character Generation—  $5 \times 7$  dot matrix. Up to 1200 Characters per second.

**Graphic Display Mode**—Vectors only. There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode**—A thumb-wheel controlled cursor for 3 through 1023 X, and 0 through 780 Y addressable points.

#### **ORDERING INFORMATION**

4010 Computer Display Terminal with Standard	
Data Communications Interface\$3	995
R4010 Computer Display Terminal with Standard	
Data Communications Interface (Rackmount) \$4	395
4010-1 Computer Display Terminal with Standard	
Data Communications Interface\$4	395
R4010-1 Computer Display Terminal with Standard	
Data Communications Interface (Rackmount) \$4	795
Option 30 Minibus Extender Add	\$95
Minibus Extender added later, order 018-0069-00 \$	100

4012

#### **Computer Display Terminal**

A high resolution, cost-effective graphic terminal

Low-Cost Full Range Performance
Upper and Lower Case Alphanumerics
Graphic Capability With High Resolution
Full ASCII Character Set

The 4012 Computer Display Terminal adds keyboard selection of the full ASCII set of 96 upper and lower case printing characters, or the 63 character TTY subset. In addition, the 4012 offers higher resolution graphics in two operational modes. The 4012 is compatible with the 4610 Hard Copy Unit, for providing permanent copies of display information.

The Display—The TEKTRONIX storage display tube permits circuit simplification, making the 4012 easy to operate, inexpensive to maintain, and economical to purchase.

The Keyboard—Alphanumeric and control key entries are made directly from the keyboard. The TTY upper case subset is enabled by a special TTY lock key. Character repeat is accomplished by holding a key down. The graphic cross-hair cursor is controlled by keyboard thumb-wheels.

**Physical Configurations**—The keyboard and display unit may be secured to the top of the pedestal in a convenient freestanding model, or may be mounted on a desktop. An extracost rackmount version is also available.

The Pedestal—The 4012 pedestal contains the Power Supply and the Terminal Minibus. The Minibus adaptability makes the 4012 an extremely versatile data-handling device.

Operating Modes—Alphanumeric mode uses the full upper and lower case ASCII character set, or the TTY upper case subset. In Graphic Display mode, vector displays are drawn in response to computer commands. In Graphic Input mode, the thumbwheel controlled cross-hair cursor can be posiţioned on the display, for operator/computer interactivity.

#### **DESIGN CHARACTERISTICS**

Screen Size—The screen is a direct-view storage crt 81/4 inches wide by 63/6 inches high.

Character Set—The 4012 has 96 printing characters on a 7 x 9 dot Matrix. (Full ASCII Code).

Graphic Display Mode-Vector Drawing time, 2.6 ms.

**Graphic Matrix**—There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode**—A thumb-wheel controlled cross-hair cursor.

Data Communications Interface	\$5205
R4012 Computer Display Terminal with Standard	<b>\$3233</b>
Data Communications Interface (Rackmount)	\$5695

# APL Character Capability With High Resolution Full ASCII Character Set

APL (A Programming Language), is a highly interactive, problem-solving language which lends itself ideally to graphic display of computer data.

The 4013 Computer Display Terminal is especially designed to be used with APL, in addition to the complete ASCII upper and lower case character set and the TTY subset. The 88 symbol APL set includes the complete upper case italic alphabet, number set, special APL function symbols, and APL composites.

Another advantage of the 4013 is copying capability from the 4610 Hard Copy Unit.

The Display—The 4013, like other 4010 series terminals, has all the advantages of the storage display tube, such as high resolution display.

**The Keyboard**—The 4013 has APL symbols on the top surfaces of the keys, and the ASCII symbol differences on the forward surfaces. Graphic cross-hair cursor controls and character repeat are also featured on the 4013 keyboard.

Physical Configurations—The 4013 keyboard and display unit may be secured to the pedestal base, or may be detached and mounted on a desktop. An extra-cost rackmount version is also available.

The Pedestal—The Power Supply and Terminal Minibus are contained in the pedestal. The Minibus contains space for up to five additional options and/or interface cards.

**Operating Modes**—The 4013 offers Alphanumeric mode, Graphic Display mode for computer outputs, and the interactive Graphic input mode.

#### **DESIGN CHARACTERISTICS**

Screen Size—The screen is a direct-view storage crt  $8\frac{1}{4}$  inches wide by  $6\frac{1}{8}$  inches high.

Character Set—Includes 96 printing characters on a 7 x 9 dot matrix, (full ASCII code), and 88 character APL set.

**Graphic Display Mode**—There are 1024 X by 1024 Y address-able points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode**—The 4013 has a thumb-wheel controlled cross-hair cursor.

#### ORDERING INFORMATION

4013 Computer Display Terminal with Standard	
Data Communications Interface	\$5495
R4013 Computer Display Terminal with Standard	
Data Communications Interface (Rackmount)	\$5895

#### **Computer Display Terminal**

4014

Interactive graphics and large-screen capabilities

4014-1

Large Screen Direct-View Storage Display

Four Program-Selectable Formats in Alphanumeric Mode

Vector and Discrete-Plot Graphic Modes

Five Program-Selectable Formats in Graphic Mode

This TEKTRONIX 19-inch Computer Display Storage Terminal allows over three times more graphic and alphanumeric data display than ever before, with better resolution. The 4014 offers the complete ASCII upper and lower case character set, plus the TTY upper case subset.

Also available is the 4014-1, which is compatible with the 4610 Hard Copy Unit to provide permanent copies of display information.

The Display—A direct view 19-inch storage display tube allows up to 8512 alphanumeric characters, and four different character sizes. The 4014 has two display modes and the option of five vector types for graphic display.

**The Keyboard**—Alphanumeric and control entries are made from the keyboard, where the TTY lock key and graphic cross-hair cursor controls are also located.

Physical Configuration—The display unit (with keyboard) is secured to the pedestal to form a desk-height unit. The pedestal contains power supply and control circuitry, character generator, plus communication interfaces and optional inter-

face space. An optional cable is available to allow desktop mounting of the display unit.

#### **DESIGN CHARACTERISTICS**

Screen Size—A direct-view storage crt, 15 inches wide by 11 inches high.

Character Set—Includes 96 characters (full ASCII upper and lower case, plus a TTY subset).

**Vector Mode**—There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode**—Thumb-wheel controlled cross-hair cursor for 3 through 1024 X, and 0 through 780 Y addressable points.

**4014 Enhanced Graphics Module, Option 34**—With this extracost option, capacity is extended to 4096 X by 4096 Y addressable points, and 4096 X by 3120 Y displayable points. Dotted and dashed line vectors (five variables). Three point plotting codes allow program control of Writing Beam Brightness.

4014 Computer Terminal with Standard  Data Communications Interface	995
4014-1 Computer Display Terminal with Standard Data Communications Interface	495
Option 34 Enhanced Graphics Module add \$ (Factory Installed Only)	700

4015-1

#### Full APL and ASCII Character Sets

Large Direct-View Storage Crt

Interactive Graphics Capability

The 4015 Computer Display Terminal adds the powerful problem-solving APL Language to the increased display power of the 19-inch screen, along with the full ASCII upper and lower case set and TTY subset.

Also available is the 4015-1 model, compatible with the 4610 Hard Copy Unit to provide permanent copies of display information.

The Display—The 19-inch display is a direct view storage tube with a capacity of up to 8512 characters. The 4015 has four different sizes of character display, two display modes and five vector types for graphic display.

The Keyboard—APL characters are depicted on the top surfaces of the keys, with ASCII symbol differences on the forward surfaces.

Physical Configurations—The keyboard and display unit is secured to the top of the pedestal to form a desk-height unit. An optional cable is available for desktop use of the keyboard and display unit.

The Pedestal—The 4015 pedestal contains a power supply, control circuits, character generator, plus communication interfaces and option interface space.

**Operation Modes**—The 4015 functions in three modes: the Alphanumeric Mode, Graphic Display Mode for computer outputs, and the interactive Graphic Input Mode. Data received may be displayed alphanumerically or graphically.

#### **DESIGN CHARACTERISTICS**

Screen Size—The screen is a direct-view storage crt 15 inches wide by 11 inches high.

Character Set—Includes 96 characters (Full ASCII upper and lower case), a TTY subset, and an 88 character APL set.

**Vector Mode**—There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode**—A thumb-wheel controlled cross-hair cursor for 3 through 1024 addressable points horizontally, and 0 through 780 addressable points vertically.

**4015 Enhanced Graphics Module, Option 34**—Expands capabilities to 4096 X by 4096 Y addressable points, and 4096 X by 3120 Y displayable points. Dotted and dashed line vectors (5 variables), three point plotting modes allow program control of Writing Beam Brightness.

#### **ORDERING INFORMATION**

4015 Computer Display Terminal with Standard	
Data Communications Interface \$	495
4015-1 Computer Display Terminal with Standard	
Data Communications Interface\$	995
Option 34, Enhanced Graphics Module Add (Factory Installed Only)	700

4023

#### **Computer Display Terminal**

For refreshed upper and lower case alphanumerics

Low Cost Refreshed Versatility
Upper and Lower Case Capability

Operates at the Speeds You Require

The TEKTRONIX 4023 is a general-purpose alphanumeric, refreshed terminal with all the built-in features of a refreshed terminal — it is quiet, bright, and buffered, plus it has other features which are oriented toward rapid error-free data base entry and retrieval operations. Hard copies are available by connecting the 4023 to the 4623 Hard Copy Unit.

The 4023 keyboard provides selection of the full ASCII set of 96 printing characters, or the 63 character TTY upper case subset. Additional features of the keyboard include two-key roll-over and auto-repeat for any keys depressed over 0.3 second.

The memory (buffer) of the 4023 allows space for 24 lines with 80 characters each, providing a total of 1920 characters. Standard terminal features permit the cursor to be addressed to any one of the 1920 character positions.

The 4023 can communicate directly with a computer, bypassing the buffer; or it can communicate via the buffer. Communicating directly to the computer is a character-by-character process; whereas, in buffered communications the data can be sent as one complete block.

Function Control and Numeric Pad—A cluster of 12 keys to the right of the keyboard serves a dual purpose: one, to provide control for editing, transmission, cursor movement, etc.; and two, by pressing the NUM LOCK key, to function as a numeric pad.

Editing Capabilities—Insert character and line, delete character and line, erase to end, erase page. Editing is speeded by tab, back tab, and repeating character keys.

Field and Data Formatting—Displayed data can be arranged to resemble the source document. Forms information can then be rapidly retrieved, updated, edited, and entered. Visual field formats include: inverted, blinking, blanked, and dim fields. Logical formats include: transmittable, non-transmittable, protected, non-protected, and non-alpha fields.

Interfacing—Provided by two data communication interfaces for telephone line connection. One is the Standard Data Communications Interface supplied with the 4023 if no interface option is specified. Also available is an optional Data Communications Interface with added features for full- or half-duplex Data Communication system operations.

Software—A special software package, Dataform, has been created for the 4023.

The Display—A refreshed crt, 9 inches wide by 5.5 inches high, P-4 type phosphor.

Video—Composite Video compatible with standard interlaced 525 line monitor.

Character Code— 128 ASCII, 96 printing upper and lower case characters.

4023 Computer Display Terminal		\$2995
Option 31 Rulings Character Set (Factory Installed Only)	Add	\$ 330
Option 56 (gold), Option 57 (red), Option 58 (green)	No (	Charge

#### **Computer Display Terminal Interfaces**

The essential link between terminal and computer

Through these interfaces, the 4010-Series terminal can communicate directly to your computer or mini-computer, or remotely by data-communications. TTY port interfaces which communicate directly with mini-computers are available, as well as interfaces for data-communication with large timeshare computers, for both basic and more complex functions.

Standard Data Communications Interface—This is the standard interface which is included with each 4010-Series terminal, unless another interface is selected. It is RS-232 C compatible, full duplex, and has strap selectable input-output data rates of 150, 300, 600, 1200, 2400, 4800, and 9600 bits/s.

**Option 1**—Optional Data Communication Interfaces with additional flexibility and convenience to fit the more sophisticated data communications requirements of complex systems. Convenient switch-selectable functions include: local-echo, full-duplex, half-duplex and independent transmit and receive rates of 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600 bits/s.

**2741 Correspondence Code/APL Interface**—Operates in any data communications environment with APL or standard 2741 correspondence code character sets. Features externally switchable data communication rates—134.5, 300, 600, 1200 baud.

#### Teletype Interfaces—

Option 2 (DEC PDP-11 with KL-11 Controller)

Option 3 (DEC PDP-8/i, 8/I, 12, 15)

Option 4 (Data General Nova, Super Nova, Nova 800, Nova 1200, Nova 1220)

Option 6 (Hewlett-Packard 2100 Series, with 12531 B or C I/O Controller)

Option 16 (DEC PDP-11 with DL-11 Controller and PDP 11/ 05)

Option 17 (DEC PDP 8/e with Module M8650)

Additional interfaces may be available upon request. Contact your Tektronix Applications Engineer for availability and quotations.

#### **ORDERING INFORMATION**

Any Optional Interface, except Option 20 ...... Add \$330 (Specify interface at time of order)

Ordered separately or as additional interfaces ....... \$660

#### **NEW Synchronous Interface**

Editing features include easy character delete and one-key rubout. The code expander shifts quickly to expand the standard 64 characters to the full 127-character code, thus enabling graphics.

In the Asynchronous Mode, standard baud rates are easily set, up to 4800 and in-between rates are diode programmable. Two optional PLOT-10 Software packages (TCS and AG-II) will provide substantial graphics support.

#### ORDERING INFORMATION

#### **Software Products**

Make maximum use of TEKTRONIX graphics terminals

age, Implementation for IBM with TSO, Implementation for PDP-11 with DOS, Implementation for CDC 6000 Systems.

PLOT-10/Advanced Graphing-II: Standard Function Package, Implementation for CDC 6000 Systems.

PLOT-10/Character Generation System

PLOT-10/Preview Routines for CalComp Plotters

PLOT-10/Display Multiplexer Utility Routines

PLOT-10/Flexible Disc Utility Routines

**PLOT-10/Graphics Tablet Utility Routines** 

PLOT-10/360-370 Graphics Software

PLOT-10/Minicomputer Software

PLOT-10/APL GRAPH-II: Standard Function Package, Implementation for APL\360.

**Dataform:** Standard Function Package, implementation for IBM with TSO.

### Provides Low-Cost Graphics for CDC 6000-Series Computers Synchronous and Asynchronous Modes

Tektronix offers a complete CDC-compatible Synchronous Interface for use with TEKTRONIX 4010 Family Graphic Display Terminals. The interface sends and receives the communcations protocol for CDC systems. The interconnecting plug is RS-232C compatible, enabling full duplex asynchronous communication from the same terminal, if desired, with standard modem hook-ups. The Interface includes standard site address code ability that can significantly reduce data transmission charges. With its multi-drop polling capability, one phone line can serve several terminals at once.

# Most Extensive Graphics Software Available Anywhere Interfaces to a Variety of Minicomputers Compatible with Major Timesharing Systems

Tektronix, Inc. has expanded its graphics software support to provide the most extensive offering of programming support ever. The graphics software is compatible with most timesharing systems, and specific packages are offered for IBM O/S and TSO, CDC SCOPE/INTERCOM, APL\360, and numerous minicomputers.

The following list is a summary of the graphics software that is available. For more detailed information, check the box labeled "Software Guide for Computer Products" on the Business Reply Card, or contact your local Applications Engineer.

PLOT-10/Terminal Control System: Standard Function Pack-

An efficient peripheral to extend your system's capabilities

#### Saves Money and Time

#### **Saves Computer Core**

The 4911 Paper Tape Reader/Perforator is an efficient and useful peripheral that can enhance your graphic capabilities. With the appropriate interface card inserted into the minibus extender of the 4010 series of graphic display terminals, the 4911 can significantly reduce cost and on-line time by entering data or programs from pre-punched tape at slack computer times. This same capability can also expand the limited memory capacity of a minicomputer. Programs and data that would otherwise consume valuable space in core storage can be kept in permanent off-line form, and can be readily updated using a 4010-series Computer Display Terminal. Data can then be entered into the computer, using the 4911, at rates up to 200 characters per second.

Tape loading and operation of the reader and perforator are quick and simple through convenient grouping of front panel push-button controls. The 4911 uses standard, easily obtained one-inch paper, paper mylar, or aluminum-mylar tapes with a thickness range of 0.0030 to 0.0043 inch.

The 4911 requires Minibus Extender (Option 30). See page 306.

#### **DESIGN CHARACTERISTICS**

Punch Speed-75 characters per second.

Reader Speed— 200 characters per second.

Tapes—Paper, aluminum, or mylar, on roll form.

Bit Format—8 bit (8 channel).

#### **ORDERING INFORMATION**

### **NEW** 4921 4922

#### Flexible Disc Memory

Desk-side graphics memory for 4010-Series of terminals

The Flexible Disc Memory is for users who need a convenient, user-controlled storage system for off-line or auxiliary use. The Disc Memory consists of one or two disc drive units, plugin circuit boards, and its own interfacing board, which slides into the 4010-series terminal.

The Memory has its own power supply and interface electronics to make it a versatile, local memory and terminal driver. The user has full control.

The Memory can store data from any of the terminal keyboards, and send data up onto any terminal screen. It can also send data to (or receive it from) a computer.

The 4922 (the two-disc drive model) can duplicate discs and store or send lengthy, continuous data streams. Either Memory can replace a paper tape device with few, if any, software changes.

The Memory has a "read-after-write" feature and a Disc/Error light for an extraordinary safe  $10^{-8}$  error rate.

Number of data tracks: 64

Number of sectors/track: 32

8 bit bytes per sector: 128

Total disc capacity: 262,144 bytes

#### ORDERING INFORMATION

4921 Flexible Disc Memory (single drive with interface)	\$3495
4922 Flexible Disc Memory (dual drive with interface)	\$5750

## **NEW** 4953 4954

#### **Graphic Tablet**

High resolution, real-time graphic input

Single Point Entry
Multiple Point Entry
Tracking (Continuous) Entry
Local Display

The Graphic Tablet comes complete, with its own electronics, one of two input device options, and easy-to-follow set-up instructions.

Choice of a pen for the ultimate in convenience, or a pushbutton cursor where exacting accuracy is required. Keep pen to tablet to get instant vectors, or lift the pen between inputs for separated points. You can input points, or all of anything you put on the tablet, including maps, graphic hard copies, drawings, schematics, designs. Select options from a written "menu" placed on the Graphic Tablet. Use it for fast digitizing, freehand graphics, etc. Use it to get numbers out of any graphic display. You can store these inputs, recall them later, and make hard copies of them, just like any other graphics.

Two sizes of tablets are available: the 11 x 11-inch model 4953, or the drawing board size  $40 \times 30$ -inch model 4954.

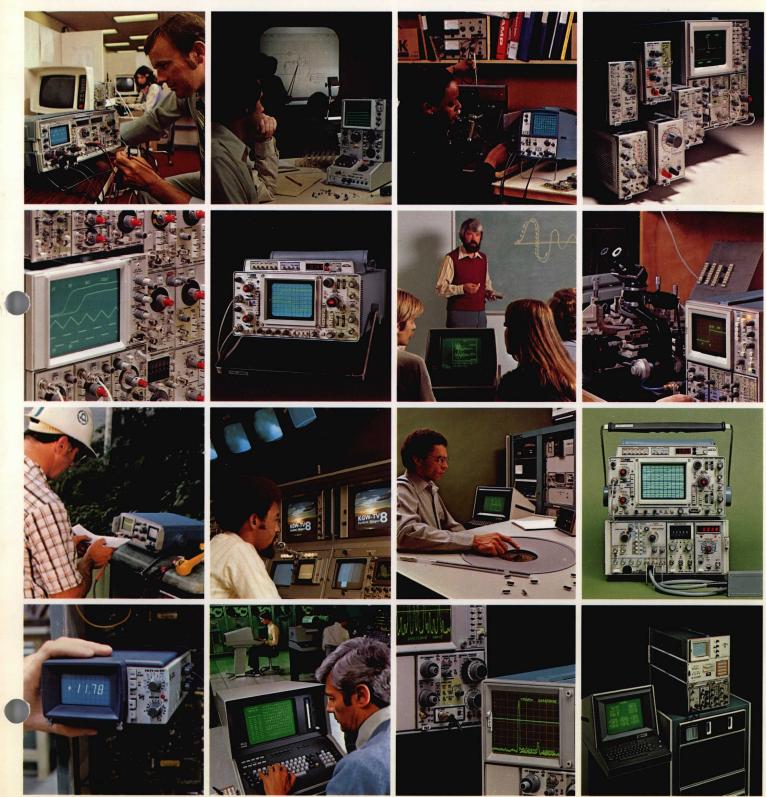
Either Graphic Tablet is compatible with the entire family of TEKTRONIX Graphic Display Terminals. TEKTRONIX PLOT-10 Software effectively supports operation of the Graphic Tablet in the vast majority of mini- and major-computer environments.

4954	Graphics Tak	olet	\$4995
(with	interface)	lable. For more detailed Information	
	Graphics Tab interface)	olet	\$2795
		0)	\$ 200

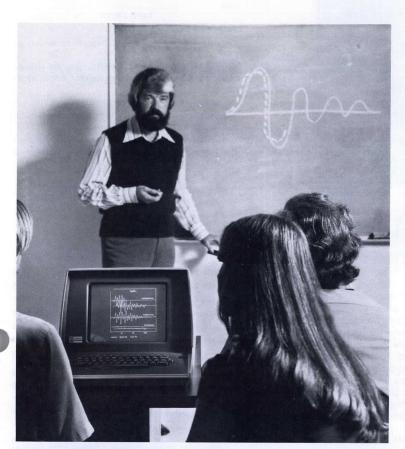
# TEKTRONIX® PRODUCTS 1976

Quality electronic products to help you test, measure, display, record and calculate:

• OSCILLOSCOPES and PLUG-INS • SPECTRUM ANALYZERS • CURVE TRACERS and AUTOMATED TEST SYSTEMS • TRACE RECORDING CAMERAS • MODULAR TEST and MEASUREMENT PRODUCTS • COUNTERS • SIGNAL SOURCES • SIGNAL PROCESSORS • MULTIMETERS • POWER SUPPLIES • DISPLAY PRODUCTS • TELEVISION PRODUCTS • TERMINAL and CALCULATOR PRODUCTS • MEDICAL PRODUCTS • PROBES and ACCESSORIES

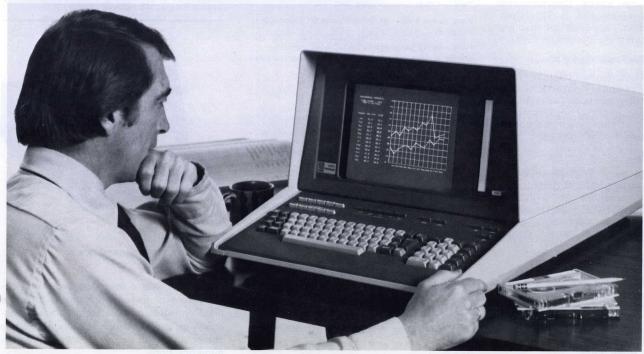


# Information Display Group Products



Information Display Group's new computer peripheral and calculator products provide a broad line of graphic and computational solutions to meet your professional needs. Included in the following pages are a few of the Group's most recent developments as well as our successful, time-proven products presently at work in a variety of applications. Whether the 4051's computational, desktop capability or the 4006-1's low-cost, graphics capability fit your particular application, you can rely upon Tektronix to provide a full line of low-cost peripherals for present and future needs.

For additional product information and details on interface, software, and accessory support, please indicate your interest on the postcard at the back of the catalog.





#### 4051

Desktop Computational Power Alphanumerics and Graphics High-level BASIC Up to 32k Work Space

#### Off-line Intelligence in a Graphics Terminal

A compact, comprehensive package with built-in computational power and high-density desktop graphics.

Up to 32k of work space. Conversational interactivity with high-level BASIC. Complete on-line option. Plus graphic capability. Standard interfacing and peripheral support.

#### 8k of Self-sufficient Processing Power

Expandable in 8k increments to supply plenty of computational power right on your desk and right at your fingertips. The standard 8k of work space packs enough power to plot over 300 1-inch vectors simultaneously, with room to spare.

#### **BASIC Vocabulary**

We've enhanced easy, English-like BASIC with some ordinarily unBASIC graphics extras...including functions like WINDOW, VIEWPOINT, and ROTATE, plus file system data access, formatting commands, and a unique interrupt control of the IEC peripherals.

#### More for The Money

The basic package also includes a built-in 300k-byte capacity cartridge tape unit for plenty of extra storage; 20 user-definable functions; ten liner editor functions; full 128-character ASCII with upper-lower case keyboard; IEEE standard (488-1975) rear connector, and much more.

Our Data Communications Interface Option makes the 4051 perform all the functions of our famous 4012 Graphic Display Terminal: edit offline in any language; send and receive in batch, via the internal mag tape unit, at asynchronous speeds up to 2400 baud. Add on plug-to-plug peripherals like our 4631 Hard Copy Unit; the 4924 Auxiliary Magnetic Tape Unit for fast data I/O and tape copying. Plug in a digital plotter, a versatile joystick, and more.

#### CENTRAL PROCESSING UNIT

Type — LSI Microprocessing Unit.

**Work Space Size** — 8k Bytes Standard Expandable to 32k Bytes.

**Programming Language** — BASIC with integrated operating system, built-in graphics, and numerous other extensions.

Numeric Accuracy — 14 decimal digits.

Numeric Range — 1 x 10 ±308

#### INTERNAL PERIPHERALS

#### Keyboard -

Complete upper and lower case alphanumerics with auto-repeating keys. Full ASCII. 128 characters.

10 Function Keys with SHIFT for up to 20 separate function calls.

Five editing keys with SHIFT, control 10 different editing functions used to modify BASIC source programs.

Calculator key pad including 10 key numeric pad, 5 math operator keys, decimal point, and parenthesis.

Control keys — AUTO NUMBER—generates program line numbers automatically; STEP—executes program steps one at a time; AUTO LOAD—automatically loads and runs File 1 on tape; REWIND—rewinds tape; MAKE COPY—activates optional 4631 Hard Copy Unit.

#### DISPLAY CHARACTERISTICS

Type — Direct view storage crt.

Dimensions — 8 in wide by 6 in high (20.3 cm x 15.2 cm).

Alphanumeric Format — 72 characters per line, 35 lines; 2520 total.

Character Set — Full ASCII character set, including upper/lower case. Also includes Scandinavian, German, General European, and Spanish fonts.

Graphic Resolution - 1024 x 780 points.

Hard Copy — Compatible with our 4631 Hard Copy Unit.

#### TAPE DRIVE

Type - 3M DC300A cartridge.

Capacity — 300k bytes max (dependent on number of files).

System Characteristics — File structures for storage of programs or data. Access is via 4051 BASIC operating system.

#### **GENERAL PURPOSE INTERFACE BUS (GPIB)**

Specifications — Conforms to IEEE standard 488-1975. Byte serial, bit parallel transfer mode.

Control Mode — External devices can be serviced via interrupt procedures available in the BASIC operating system. Enable/disable, polling, and data transfer commands are available under program control.

#### PHYSICAL CHARACTERISTICS

Height - 13.6 in (34.5 cm).

Width — 18.3 in (46.5 cm).

**Depth** — 32.5 in (82.6 cm). **Weight** — 65 lb (29.5 kg).

#### SOFTWARE

4050A01 PLOT 50: Statistics, Vol 1\$175
4050A02 PLOT 50: Statistics, Vol 2\$175
4050A03 PLOT 50: Statistics, Vol 3\$400
4050A04 PLOT 50: Mathematics, Vol 1\$175
4050A05 PLOT 50: Mathematics, Vol 2\$225
4050A06 PLOT 50: Electrical Eng, Vol 1 \$400
4051 Graphic System \$6995
Opt 1 Data Comm I/F
Opt 10 RS 232 Printer I/F +550
Opt 20 16k Bytes Total Memory +2150*
Opt 21 24k Bytes Total Memory $\dots +3350*$
Opt 22 32k Bytes Total Memory +4550*

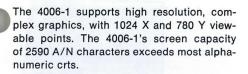
\*The same item ordered after the 4051 is delivered is available as an accessory at a higher price because of field installation or special handling.



#### 4006-1

High Resolution Graphics and Alphanumerics Under \$3000

The 4006-1 sets a new standard in the development of low-cost graphics. It is the first terminal to consolidate graphics, alphanumerics, and Tektronix quality at a price competitive with terminals offering alphanumerics alone.



#### **New Software**

A software package that makes graphics easy for nonprogrammers, and which multiplies the capabilities of the experienced programmer, the PLOT-10/Interactive Graphing Package (IGP), provides easy-to-learn, English language structured commands that enable you to construct, edit, save, and recall graphs in a conversational relationship with the computer.

The IGP software package provides you the power to read data and commands from file; edit graphic data points; and update and compare graphs from storage.

There are plug-in peripheral options like our 4631 Hard Copy Unit, or the 4923 Digital Cartridge Tape Recorder for 200k-bytes of data storage on each tape.

#### **SPECIFICATIONS**

Display Medium - Direct view Bistable Storage crt.

Display Area — 7.5 in wide x 5.6 in high (19.05 cm x 14.22 cm).

Alphanumeric Mode Format — 35 lines, 74 characters per line, 2590 characters full screen.

Character Set — 63 printing characters (TTY ASCII Code).

Character Generation - 5 x 7 dot matrix.

Cursor - 8 x 8 dot matrix.

Graphics Display Mode — Vectors only. Vector drawing time, 3.6  $\pm$  0.2 ms.

Information Density — 1024 X by 1024 Y addressable points. 1024 X by 780 Y viewable points.

 ${\bf Baud~Rate}$  — Transmit and receive independently selectable from 75 to 4800 baud.

Input Power — 110/240 V ac (Low, Medium, High) 50 to 440 Hz, 105W.

Operating Temperature — +10°C to +40°C.

Operating Altitude — To 15,000 ft.

#### PHYSICAL CHARACTERISTICS

Height - 12% in (31.43 cm).

Width - 151/4 in (38.74 cm).

Length — 271/2 in (69.85 cm).

Net Weight — 42 lb (19.05 kg).

Shipping Weight — 50 lb (22.68 kg).

Interfacing — The 4006-1 is shipped with a Standard Data Communication Interface, with inputs and outputs conforming with EIA RS-232-C.

Peripherals — The 4006-1 is compatible with the 4631 Hard Copy Unit, for dry, high-quality,  $8\frac{1}{2}$  x 11 in copies of any information displayed on the 4006-1 corporal.

The 4923 Digital Cartridge Tape Recorder, a low-cost off-line data storage device, is also compatible with the 4006-1.

#### ORDERING INFORMATION

4006-1 Computer Display Terminal . . . \$2995
Option 1 Half Duplex Module . . . . . . . . . . + \$300



#### 4010-1

Supports Alphanumeric Plus Low-Cost Computer Graphics

Convenient Pedestal Design for User Environments

Flicker-Free Storage Display

**Complete Software Support** 

With its low price, the 4010 Computer Display Terminal is a data handling tool of great capacity and flexibility. The pedestal minibus design opens the way to a variety of system concepts.

With the 4010-1, permanent hard copies of displayed data can be obtained, using a 4610 Hard Copy Unit.

The Keyboard — The 4010 has a TTY style keyboard featuring 63 printing characters (including upper case alphanumerics), and standard ASCII control characters. Independently operated X and Y axis thumbwheels position the Graphic Cursor in the Graphic Input Mode.

Operating Modes — Three operating modes can be selected from the keyboard or the computer. In Alphanumeric mode, 35 lines of 74 characters each constitute a full display screen. In Graphic Display mode, the terminal produces clear, accurate vector display in response to computer commands. In Graphic Input Mode, operator/computer interactivity is permitted.

#### DESIGN CHARACTERISTICS

Screen Size — The screen is a direct-view storage crt  $8\frac{1}{4}$  in wide x  $6\frac{3}{6}$  in high.

Format — The 4010 allows 74 characters per line, and 35 lines (2590 characters) per full screen.

**Character Set** — Includes 63 printing characters (TTY ASCII Code).

 $\mbox{\bf Character Generation} \mbox{\bf — 5 x 7 dot matrix.}$  Up to 1200 characters per second.

**Graphic Display Mode** — Vectors only. There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode** — A thumb-wheel controlled cursor for 3 through 1023  $\rm X$ , and 0 through 780  $\rm Y$  addressable points.

#### **ORDERING INFORMATION**

4010 Computer Display Terminal with Standard Data Communications Interface .....\$4195

4010-1 Computer Display Terminal with Standard Data Communications Interface .....\$4695



#### 4012

Low-Cost Full Range Performance
Upper and Lower Case Alphanumerics
Graphic Capability with High Resolution
Full ASCII Character Set

The 4012 Computer Display Terminal adds keyboard selection of the full ASCII set of 96 upper and lower case printing characters, or the 63 character TTY subset.

The Keyboard — Alphanumeric and control key entries are made directly from the keyboard. The TTY upper case subset is enabled by a special TTY lock key. Character repeat is accomplished by holding a key down. The graphic cross-hair cursor is controlled by keyboard thumb-wheels.

Operating Modes — Alphanumeric mode uses the full upper and lower case ASCII character set, or the TTY upper case subset. In Graphic Display mode, vector displays are drawn in response to computer commands. In Graphic Input mode, the thumbwheel controlled cross-hair cursor can be positioned on the display, for operator/computer interactivity.

#### DESIGN CHARACTERISTICS

Screen Size — The screen is a direct-view storage crt 81/4 in wide x 63/6 in high.

Character Set — The 4012 has 96 printing characters on a 7 x 9 dot matrix. (Full ASCII Code).

Graphic Display Mode — Vector Drawing time, 2.6 ms. Graphic Matrix — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

Graphics Input Mode — A thumb-wheel controlled cross-hair cursor.

#### ORDERING INFORMATION

4012 Computer Display Terminal with Standard Data Communications Interface \$5995

R4012 Computer Display Terminal with Standard Data Communications Interface (Rackmount) .......\$6395

#### **Information Display Group Products**

Computer Display Terminals



#### 4013

APL Character Capability with High Resolution

#### **Full ASCII Character Set**

APL (A Programming Language), is a highly interactive, problem-solving language which lends itself ideally to graphic display of computer data.

The 4013 Computer Display Terminal is especially designed to be used with APL, in addition to the complete ASCII upper and lower case character set and the TTY subset. The 88 symbol APL set includes the complete upper case italic alphabet, number set, special APL function symbols, and APL composites.

The Keyboard — The 4013 has APL symbols on the top surfaces of the keys, and the ASCII symbol differences on the forward surfaces. Graphic cross-hair cursor controls and character repeat are also featured on the 4013 keyboad.

**Operating Modes** — The 4013 offers Alphanumeric mode, Graphic Display mode for computer outputs, and the interactive Graphic Input mode.

#### DESIGN CHARACTERISTICS

Screen Size — The screen is a direct-view storage crt 81/4 in wide x 63/8 in high.

Character Set — Includes 96 printing characters on a 7 x 9 dot matrix (full ASCII code), and 88 character APL set.

**Graphic Display Mode** — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points

**Graphics Input Mode** — The 4013 has a thumb-wheel controlled cross-hair cursor.

#### **ORDERING INFORMATION**

4013 Computer Display Terminal with Standard Data Communications Interface \$6195 R4013 Computer Display Terminal with Stan-



#### 4014-1

Large Screen Direct-View Storage Display

Four Program-Selectable Formats in Alphanumeric Mode

**Vector and Discrete-Plot Graphic Modes** 

Five Program-Selectable Formats in Graphic Mode

This TEKTRONIX 19 inch Computer Display Storage Terminal allows over three times more graphic and alphanumeric data display than ever before, with better resolution. The 4014 offers the complete ASCII upper and lower case character set, plus the TTY upper case subset.

Also available is the 4014-1, which is compatible with the 4631 Hard Copy Unit to provide permanent copies of display information.

The Display — A direct view 19 inch storage display tube allows up to 8512 alphanumeric characters, and four different character sizes. The 4014 has two display modes and the option of five vector types for graphic display.

#### DESIGN CHARACTERISTICS

Screen Size — A direct-view storage crt, 15 in wide x 11 in high.

Character Set — Includes 96 characters (full ASCII upper and lower case, plus a TTY subset).

**Vector Mode** — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode**—Thumb-wheel controlled cross-hair cursor for 3 through 1024 X, and 0 through 780 Y addressable points.

4014 Enhanced Graphics Module, Option 34 — With this extra-cost option, capacity is extended to 4096 X by 4096 Y addressable points, and 4096 X by 3120 Y displayable points. Dotted and dashed line vectors (five variables). Three point plotting codes allow program control of Writing Beam Brightness.

#### **ORDERING INFORMATION**

4014 Computer Terminal with Standard Data Communications Interface . . . . \$10,595

4014-1 Computer Display Terminal with Standard Data Communications Interface ......\$10.995

Option 34 Enhanced Graphics Module (Factory Installed Only).....Add \$750



#### 4015-1

Full APL and ASCII Character Sets Large Direct-View Storage Crt Interactive Graphics Capability

The 4015 Computer Display Terminal adds the powerful problem-solving APL Language to the increased display power of the 19 inch screen, along with the full ASCII upper and lower case set and TTY subset.

Also available is the 4015-1 model, compatible with the 4631 Hard Copy Unit to provide permanent copies of display information.

The Display — The 19 inch display is a direct view storage tube with a capacity of up to 8512 characters. The 4015 has four different sizes of character display, two display modes, and five vector types for graphic display.

Operation Modes — The 4015 functions in three modes: the Alphanumeric Mode, Graphic Display Mode for computer outputs, and the interactive Graphic Input Mode. Data received may be displayed alphanumerically or graphically.

#### DESIGN CHARACTERISTICS

Screen Size — The screen is a direct-view storage crt 15 in wide x 11 in high.

Character Set — Includes 96 characters (Full ASCII upper and lower case), a TTY subset, and an 88 character APL set.

Vector Mode — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode** — A thumb-wheel controlled cross-hair cursor for 3 through 1024 addressable points horizontally, and 0 through 780 addressable points vertically.

4015 Enhanced Graphics Module, Option 34 — Expands capabilities to 4096 X by 4096 Y addressable points, and 4096 X by 3120 Y displayable points. Dotted and dashed line vectors (5 variables), three point plotting modes allow program control of Writing Beam Brightness.

#### ORDERING INFORMATION

4015-1 Computer Display Terminal with Standard Data Communications Interface ......\$11,395

Option 34, Enhanced Graphics Module (Factory Installed Only).....Add \$750



# Low Cost Refreshed Versatility Upper and Lower Case Capability Operates at the Speeds You Require

The TEKTRONIX 4023 is a general-purpose alphanumeric, refreshed terminal with all the built-in features of a refreshed terminal — it is quiet, bright, and buffered, plus it has other features which are oriented toward rapid error-free data base entry and retrieval operations.

The 4023 keyboard provides selection of the full ASCII set of 96 printing characters, or the 63 character TTY upper case subset. Additional features of the keyboard include two-key roll-over and auto-repeat for any keys depressed over 0.3 second.

The memory (buffer) of the 4023 allows space for 24 lines with 80 characters each, providing a total of 1920 characters.

Field and Data Formatting — Displayed data can be arranged to resemble the source document. Forms information can then be rapidly retrieved, updated, edited, and entered. Visual field formats include: inverted, blinking, blanked, and dim fields.

Interfacing — Provided by two data communication interfaces for telephone line connection. One is the Standard Data Communications Interface supplied with the 4023 if no interface option is specified. Also available is an optional Data Communications Interface with added features for full- or half-duplex Data Communication system operations.

**The Display**—A refreshed crt, 9 inches wide by 5.5 inches high, P-4 type phosphor.

Video — Composite Video compatible with standard interlaced 525 line monitor.

#### **ORDERING INFORMATION**

4023 Cor	nputer Di	splay	T	er	mi	na	al	,	Ir	10	cl	u	des
Rulings (	Character	Set.										. !	\$3495
Ontional	Data Con	nmur	ic	at	io	ne							

Optional Data Communications Interface ......Add \$350



### Dry Process

#### 81/2 x 11 Inch Copies

#### Supports up to Four Terminals

The 4631 Hard Copy Unit is compatible with the 4006-1, 4010 family of display terminals and the 613 and 613-1 Storage Display Units; and at no additional cost to 4014-1 or 4015-1 owners. The 4631 provides permanent, dry copies of any information displayed on the terminal screen. For greater flexibility it can also be multiplexed to make copies from up to four display terminals and/or display monitors. When you need to keep records, or present information at that last-minute meeting, a touch of the button gives you copies of any displayed data quickly and easily.

The 4631 uses 3M Brand 777 Dry-Silver paper to give you the high image contrast you need for complex graphics and alphanumerics.

The 4631's copy time is 18 seconds for the first copy, and 10 seconds for subsequent copies.

#### CHARACTERISTICS

Paper Size — 81/2 x 11 in.

Copy Size — Position I and III produces an  $8.85 \times 6.7$  in copy, oriented horizontally on an  $8\frac{1}{2} \times 11$  in piece of paper. Position II produces a 7.1 in x 5.4 in copy, oriented vertically on an  $8\frac{1}{2} \times 11$  in piece of paper — not recommended for 19 in display tubes.

**Exposure Time** — Position I and II approx 7 s, position III approx 14 s.

**Dimension** — (Height, width, length) 11.6 x 16 x 25.5 in  $(29.5 \times 40.6 \times 64.9 \text{ cm})$ .

Weight - Approx 65 1b (29.48 kg).

Standard Accessories — One 10 ft Connecting Cable (012-0547-00).

#### ORDERING INFORMATION

#### 4631 Hard Copy Unit . . . . . . . . . . . . . . . . . \$3995

Option 2 — Four Channel Multiplexer.....Add \$535 One 4631 can copy up to 4 separate terminal displays and/or storage display units.



#### **RS-232-C Compatible**

#### 200,000 Characters of Storage

The 4923 Digital Cartridge Tape Recorder is the perfect step up in storage to team up with our 4010 family of terminals, or any system using an RS-232-C interface. Each tape cartridge can hold about 200,000 characters in high density storage. Each data file has a variable number of formatted records.

This is the perfect medium for local program storage, and a means to get better mileage out of your system — previewing and editing data before you go to the central processor.

Use the 4923 on audit trail to record all the data coming in from the central processor and terminal, or from our graphics terminal/tablet system. All transactions become a matter of record, so you can debug and alter later, if it's necessary.

The standard model hooks up directly to the 4010-Series terminals through the terminal bus; Option 1 uses an RS-232-C Data Communications Interface. Our standard version operates at approx 10k baud, while Option 1 lets you select the baud rate, from 110 to 9600.

#### SPECIFICATIONS

Cartridge Type — DC300A 3M data cartridge.

Tape Length - 300 usable ft.

Storage Capacity - 200,000 bytes (nominal).

Characters/Record — 128 eight-bit bytes.

Recording Density — 1600 bpi.

Data Transfer Rate —

Internal—48 kHz.

External—Standard, up to 10k baud. Option 1, 110 to 9600 baud selectable.

Data Format — 8-bit binary or 8-bit ASCII.

Data Integrity — Performs a read-after-read error check when an error is detected.

Number of Tracks - One effective data track.

Recording Format - NRZ two-track self-clocking.

Dimension — Width: 8.75 in; depth: 17.25 in; height: 6 in; weight: 17 lb.

Standard Accessories - One data cartridge.

#### ORDERING INFORMATION

4923 Digital Cartridge Tape Recorder \$1895
Option 1, RS-232C Compatible ...........No Charge



# Microprocessor Based 4-Character Fonts

**RS-232-C Compatible** 

The new TEKTRONIX 4662 Interactive Digital Plotter is micro-processor based, interactive, flexible in capabilities, and easy to use. It extends high industry standards which include:

10 in x 15 in drawing area
High resolution
1:1 reproduction of crt displays up to 19 in diagonal
Proven Tektronix technology
Convenient, accurate electrostatic positioning
16 to 22 ips

It is plug compatible with many Data Communications Systems (RS-232C, Full Duplex) and with the TEKTRONIX 4051 and IEEE 488-1975 interface standard. It offers systems flexibility and the following pacesetting characteristics:

The First Fully Resident Internal Character Generator Excellent Quality Character Reproduction Easy Labeling from Terminal Keyboard Labeling of Curves without Loss of Spacing Exact Sizing to 'Fit' Any Graph or Plot Expandability

Its prime advantage as a digitizer (tablet) and plotter is in applications requiring reduced system cost and reduced space requirements. In many uses, the 4662 can actually function as a stand alone terminal.

Specific 4662 product capabilities include:
Accommodation of Formatted Media
Easy Ratio Selection
Multiple Images
Calibration to Scale
Allowance for Up-Dating or Changes on Back of
Master Plot
Less Heat, Cost
Improved Reliability
Quietness and Lightness

#### **ORDERING INFORMATION**

4662 Interactive Digital Plotter . . . . . \$3995

Option 1 Interactive Digital Plotter (for 4051 Graphic System) . . . . . No Charge



#### 4921/4922

The Flexible Disc Memory is for users who need a convenient, user-controlled storage system for off-line or auxiliary use. The Disc Memory consists of one or two disc drive units, plug-in circuit boards, and its own interfacing board, which slides into the 4010-Series terminal.

The Memory has its own power supply and interface electronics to make it a versatile, local memory and terminal driver. The user has full control.

The Memory can store data from any of the terminal keyboards, and send data up onto any terminal screen. It can also send data to (or receive it from) a computer.

The 4922 (the two-disc drive model) can duplicate discs and store or send lengthy, continuous data streams. Either Memory can replace a paper tape device with few, if any, software changes.

The Memory has a "read-after-write" feature and a Disc/Error light for an extraordinarily safe 10-8 error rate.

Number of data tracks: 64

Number of sectors/track: 32

8 bit bytes per sector: 128

Total disc capacity: 262,144 bytes

#### **ORDERING INFORMATION**

4921 Flexible Disc Memory	
(single drive with interface)	\$3695
4922 Flexible Disc Memory	
(dual drive with interface)	\$5995



#### 4953/4954

Single Point Entry

Multiple Point Entry

Tracking (Continuous) Entry

Local Display

The Graphic Tablet comes complete, with its own electronics, one of two input device options, and easy-to-follow set-up instructions.

Choice of a pen for the ultimate in convenience, or a pushbutton cursor where exacting accuracy is required. Keep pen to tablet to get instant vectors, or lift the pen between inputs for separated points. You can input points, or all of anything you put on the tablet, including maps, graphic hard copies, drawings, schematics, designs. Select options from a written "menu" placed on the Graphic Tablet. Use it for fast digitizing, freehand graphics, etc. Use it to get numbers out of any graphic display. You can store these inputs, recall them later, and make hard copies of them, just like any other graphics.

Two sizes of tablets are available: the 11 x 11 inch model 4953, or the drawing board size 40 x 30 inch model 4954.

Either Graphic Tablet is compatible with the entire family of TEKTRONIX Graphic Display Terminals. TEKTRONIX PLOT-10 Software effectively supports operation of the Graphic Tablet in the vast majority of miniand major-computer environments.

#### **ORDERING INFORMATION**

4953 Graphics Tablet
(with interface) 11 in x 11 in \$2995
4954 Graphics Tablet
(with interface) 40 in x 30 in \$4995
Cursor (119-0622-00) \$220



High-Resolution Alphanumeric and Graphic Displays

Flicker-Free Bistable Storage
Eliminates Costly Memory Devices
Hard-Copy Compatible

**Remote Programming of Display Functions** 

The 611 Storage Display Unit provides stored displays of combined alphanumeric and graphic information from digital computers having D/A converters and from analog signal sources. The stored display eliminates the need for costly memory devices to refresh the display, and provides high information density with excellent resolution without flicker or drift. All 611 control functions (Erase, Write-Thru, Non-store, and View) are remotely programmable.

#### **DESIGN CHARACTERISTICS**

The 611 uses an 11 in (diagonal measure) flat-faced storage tube. Resolution is 4000 characters, based on a 70 x 90 mil dot matrix; this is equivalent to 400 vertical by 300 horizontal (300 vertical by 400 horizontal for the 611-2) stored line pairs. Dot writing time is 5  $\mu s$  or less; erase time is 500 ms or less. Viewing time is 15 minutes without loss of resolution but may be extended to one hour.

Vertical and Horizontal Amplifiers — The deflection factor is 1 V full scale, either axis. Any of 9 adjustable initial beam positions can be selected by internal switches. Input R and C is 100 k $\Omega$  shunted by approx 70 pF.

**Z Axis Amplifier** — Input turn-on level (unblanked) is + 1 V; turn-off level (blanked) is + 0.5 V or less. Input R and C is the same as the Vertical and Horizontal amplifier.

Other Features — A busy signal is provided at the rear connector to inhibit external equipment (computer, etc) during the erase cycle.

Requirements — The 611 operates on 110 or 220 V ac (LO, MED, HI) 48 to 66 Hz, and requires 250 watts at 115 V, 60 Hz.

**Included Accessories** — Program connector; connector cover, and maintenance manual.

#### **ORDERING INFORMATION**

	611 Storage Display Unit
ì	(Vertical Format)\$3950
	611-2 Storage Display Unit
	(Horizontal Format)\$3950



613

Bright Flicker-Free Viewing
Low Cost
Storage Economy
Hard-Copy Compatibility

**Remote Programming of Display Functions** 

The 613 Storage Display Unit is a bright large screen data storage display unit which allows satisfactory viewing under high ambient light conditions. It is ideal for storing and presenting a substantial amount of data in a single display. The 613 provides greater stored display brightness of alphanumeric and graphic information from digital computers having D/A converters and from analog signal sources.

The TEKTRONIX 4631 Hard Copy Unit will copy the 613 Display Monitor.

#### DESIGN CHARACTERISTICS

The 613 uses an 11 in (diagonal measure) flat-faced crt, with resolution equivalent to 200 vertical by 266 horizontal line pairs. Viewing time is 15 minutes; longer viewing may require more than one erasure to clear previously stored data. Dot writing time is 5  $\mu s$  or less; erase time is 900 ms or less.

Vertical and Horizontal Amplifiers — The deflection factor is 1 V full scale, either axis. Any one of nine initial beam positions may be internally selected. Input R and C is 20  $k\Omega$  minimum, shunted by less than 60 pF.

**Z Axis Amplifier** — Beam turn-off (unblanked) level is + 1 V; beam turn-off (blanked) is + 0.5 V or less. Input R and C is 10 k $\Omega$  shunted by approx 50 pF. A TTL LO input circuit may be selected to turn on the crt writing beam.

Other Features — All 613 operating modes (Erase, View, Nonstore, Cursor) can be remotely controlled by applying the appropriate ground closures to the remote program connector. All control signal inputs are TTL compatible.

Power Requirements — The 613 operates on 110 or 220 V ac, (LO, MED, HI), 48-66 Hz, and requires 180 watts (max) at 115 V ac, 60 Hz.

#### ORDERING INFORMATION

613 Storage Display									
(Horizontal Format)									\$3195
613-1 Storage Displa	ay	,							
(Vertical Format) .								 	\$3195



4632

Permanent 8½ in x 11 in Gray Scale Copies from Standard Video Signals and Refreshed Terminals

Simple, Quiet Operation

Completely Self-Contained Dry Process Developing

The 4632 Video Hard Copy Unit provides permanent hard copies from standard composite video signals and from digital video signals of refreshed alphanumeric/graphic terminals. The 4632 provides both high contrast (black and white) or gray scale copies. The 4632 development is a dry process and is completely self-contained, lightweight, and quiet. The 4632 is easily interfaced to a video system or refreshed terminal by a single cable. As an option, it can be multiplexed to provide copying capability from one to four video sources.

#### DESIGN CHARACTERISTICS

Standard Copy size adjustment is  $8\frac{1}{2}$  in by 11 in for horizontal raster display (4:3 aspect ratio). Copy time is approx 18 s for the first copy and about 8 s for additional copies of the same display. Machine warmup time is 20 min. The recommended ambient temperature for operation is 0°C to +35°C.

Input Requirements — Input signals may be any one of three configurations: composite video, video with horizontal and vertical drive, or video with composite sync. Input video amplitude is from 0.3 V to 5 V. Impedance is 75 ohms, loop-through. Return loss is at least 46 dB. Common mode rejection is at least 30 dB. Max input is 10 V dc plus peak ac. Input sync amplitude is 0.3 V to 8 V p-p; impedance is 20  $k\Omega$ .

Power Requirements — The 4632 operates on 110-115 V ac, or 200-230 V ac, 50-60 Hz; these are factory wired options.

Included Accessories — One 75 ohm termination.

#### ORDERING INFORMATION

4632 Video Hard Copy Unit \$3995
Option 1, Copy Counter Add \$55
Option 2, 4-channel MultiplexerAdd \$535
Option 3, Set up for 625 Line, 50 Hz Field Operation
Option 4, Set up for 1029 Line, 60 Hz Field Operation
Paper — One roll is included with the 4632. Refills are available from Tektronix, Inc.
For one roll, Order 006-1603-00
For one carton of four rolls, Order 006-1603-01\$180



35 Built-in Math Function Keys 25 User-Definable Function Keys Complete Alphanumeric Keyboard Optional Silent Alphanumeric Printer

The 31 is the desk-top programmable calculator that serves as the controller for graphic calculator systems, instrumentation systems, and is powerful enough to stand alone.

**Data Storage Memory** — 74 data storage registers are standard. Each register will store any number shown in the display.

**Program Memory** — The calculator comes with a 512-step program memory. This memory is also the storage area for the user-definable feature, whereby a user can recall and execute complex sequences with a single keystroke.

**Permanent Storage** — Any program — all or part — up to 6000 steps or 600 registers may be transcribed on magnetic tape cartridges.

**PROMs** — The 31 PROMs (programmable-read-only-memory) add to — rather than subtract from — existing calculator memory. They are permanent, nonerasable copies of your important programs.

Easy Programming — With such features as:
• data entry with floating, scientific, or mixed notation • conditional branching • unconditional branching • single key register arithmetic • indirect addressing • symbolic addressing of subroutines • subroutine nesting • programmable flag • comprehensive editing • overrange indication.

**Display** — A 10-digit mantissa with a 2 digit exponent.

Standard Accessories — 31 instruction manual • 31 Verification program • power cord • one 6000-step magnetic tape cartridge • two user overlays.

#### ORDERING INFORMATION

31 Programmable Calculator\$2850
Option 1 — Alphanumeric Thermal Printeradd \$700
Order 040-0685-02 if added lateradd \$750
Magnetic Tape Cartridge, Order 020-0082-00\$13
User-Definable Overlay Package (10/package) Order 016-0578-00\$16
Thermal Printer Paper (5/package) 006-1775-00\$8



31/53

Modularity Versatility

Natural Programming Ease
Low Cost High Performance

Tektronix's instrumentation system, the 31/53, is the choice for many data acquisition and processing applications. Its capabilities include logging, documenting, program control, and all the mathematical operations the job requires.

With this versatility, the low-cost 31/53 ofers an excellent alternative to many higher priced minicomputer systems. The system combines the 31 Programmable Calculator and the 153 Instrumentation Interface. For the instrumentation package, you get a mainframe/power supply unit which accepts two modular plug-ins; a digital translator/interface unit is already plugged in. You choose the other two instruments to complete your system. You can use a digital multimeter and a digital counter, or two of a kind.

#### 153 INTERFACE FEATURES

The 153 is capable of transmitting to the 31 all data displayed on the module's digital displays.

Programmable interface pulse outlets.

Trigger out, front and back panels 12  $\mu s$  width.

Logic levels are TTL compatible  $\geq$ 2.4 V high,  $\leq$ 0.8 V low.

Calculator display flashed by interface with a momentary short or pulldown to 0.8 V or less.

#### PATCH PLUG INFORMATION

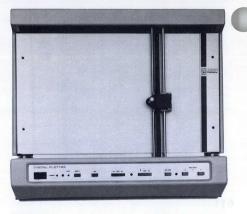
A Type 1 patch plug is provided as standard for use with one counter and one multimeter in the 31/53 system mainframe. For a system with two multimeters, Option 30 should be ordered (no charge). It replaces the Type 1 as standard equipment. For a system with two counters, Option 31 should be ordered (no charge). It replaces the Type 1 as standard equipment. When ordering subsequent instrumentation, all additional patch plugs are available as optional accessories.

#### **ORDERING INFORMATION**

31/53 Calculat	or Instrumentat	ion
System		\$3995
153 Instrument	tation Interface	\$995
31/53 Choice	of Multimeter	and Counter
Modules.		

Counters pp 132-135

Digital Multimeters pp 136-137



4661

Repeatability: Pen Will Return to Any Previously Plotted Point,  $\pm$  0.0025 in

Accuracy:  $\pm$  0.0025 in and  $\pm$  0.4% of Vector Length

The low cost 4661 can provide graphic displays of statistical data, histograms, sales curves, production rates.

**Versatility** — Scale controls and electrostatic hold-down allow either full or half size plots on paper size to 11 x 17 inch max.

Plotting Area — 10 x 15 inch, on Y and X axis respectively (approx 26 x 40 cm).

Scale Selection — Front panel selection of full or half scale can be made independently for each axis.

Data Zero — (a) A floating zero point can be established at any place on the plotting surface from the front panel of the plotter or the calculator. (b) Zero is automatically set for first-quadrant operation on power up.

Data Range — In full scale mode, the plotter accepts 10 inch of Y data and 15 inch of X data. In half scale mode, the plotter accepts 20 inch of Y data, and 30 inch of X data.

Motor Drive —  $\pm 0.005$  inch (0.127 mm).

**Resolution** — Numerical — (a) At full scale, resolution is 0.010 in (0.254 mm). (b) At half scale, resolution is 0.005 in (0.127 mm).

#### **ORDERING INFORMATION**

4661 Digital Plotter
OPTIONAL ACCESSORIES
Paper: 100 sheets/package (11 x 16½ in),
10 x 15 in linear, 10 div/in (006-1698-00)\$7

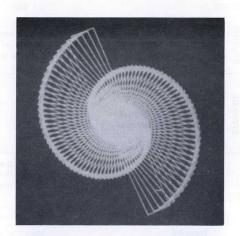
10 x 15 in linear, 10 div/in (006-1699-00) ... \$7
25 x 38 cm linear, 10 div/cm (006-1699-00) ... \$7
15 in x 3 cycles (006-1700-00) ... ... \$7
Semi-log: 15 in x 2 cycles (006-1701-00) ... \$7
Log-log: 2 cycles x 3 cycles (006-1702-00) ... \$7

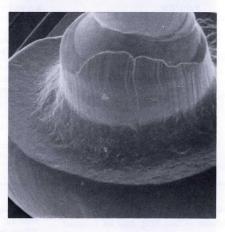
# **Display Monitors**

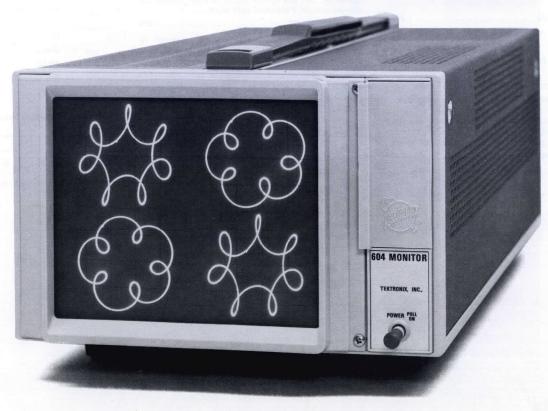
Tektronix' growing line of display monitors now includes the 602 High-Resolution Monitor, the 603 X-Y Monitor with bistable storage and variable stored brightness, the 604 Monitor featuring small screen size and easy operation at a low cost, and the 605 3-MHz Monitor with variable persistence storage.

There are a number of factors to be considered in selecting the appropriate display monitor for your particular application. Whether you plan to view or photograph the display, parameters like bandwidth, rise time, resolution, and so on must be evaluated, and the optimum combination of phosphor, filters, and film type must be determined.

The following pages will help you choose the monitor that's right for you. Our Display Monitors Booklet (it's yours for the asking) gives in-depth information on TEKTRONIX Monitors, detailed guidelines for performance and instrument specifications, and examples of monitor applications; it also includes an indispensable monitor selection chart. Consult your local Tektronix field engineer for expert up-to-date advice on which TEKTRONIX Monitor will meet your special requirements.







#### **MONITORS SELECTION CHART**

ARACTERISTIC	S	602	603*	604*	605*
GENERAL	Standard Phosphor Graticule Size Standard Graticule Spot Diameter Accelerating Voltage	P31 8 x 10, 1 cm/div Int Illum 0.20 mm at 0.5 μA 4 kV	P1 8 x 10, 1.27 cm/div None 0.50 mm at 0.5 μA 3.5 kV	P31 8 x 10, 1.27 cm/div Int Non-Illum 0.50 mm at 0.5 μA 3.5 kV	P31 8 x 10, 0.9 cm/div Int, Non-Illum 0.50 mm at 0.5 μA 8.5 kV
CRT	Type of Storage Writing Speed Dot Writing Speed Short Axis Resolution Long Axis Resolution View Time Luminance (Brightness)	the 605	Bistable Storage $\geq$ 25 cm/ms <sup>(5)</sup> $\leq$ 4 $\mu$ s <sup>(5)</sup> $\geq$ 80 Line Pairs $\geq$ 100 Line Pairs $\geq$ 60 Min $\geq$ 50 Nits <sup>(5)</sup>	Storage Storag	Variable Pers ≥ 900 cm/ms $^{(2)}$ ≤ 300 ns ≥ 80 Line Pairs ≥ 100 Line Pairs ≥ 5 Min $^{(3)}$ ≥ 340 Nits
VERTICAL (Y-AXIS)	Input RC Volts/Div Common-Mode Rej Ratio Max Common-Mode Signal Linearity (2 Div Signal) Bandwidth	100 kΩ 30 pF Adj 90-135 mV Single Input — ≤ 2% Change Dc to 1 MHz	1 MΩ < 47 pF Adj 50-1250 mV 100:1 at 100 kHz ± 3 V(I) ≤5% Change Dc to 2 MHz(4)	1 M $\Omega$ $<$ 47 pF Adj 50-1250 mV 100:1 at 100 kHz $\pm$ 3 V (I) $\leq$ 5% Change Dc to 2 MHz(4)	1 M $\Omega$ $<$ 47 pF Adj 50-1250 mV 100:1 at 100 kHz $\pm$ 3 V(I) $\leq$ 5% Change Dc to 3 MHz(4)
HORIZONTAL (X-AXIS)	Input RC Volts/Div Common Mode Rej Ratio Max Common-Mode Signal Linearity (2 Div Signal) Bandwidth	100 k $\Omega$ 30 pF Adj 90-110 mV Single Input — $\leq$ 6% Change Dc to 1 MHz	1 M < 47 pF Adj 50-1250 mV 100:1 at 100 kHz ± 3 V(I) ≤ 5% Change Dc to 2 MHz(4)	1 M < 47 pF Adj 50-1250 mV 100:1 at 100 kHz ± 3 V(I) ≤ 5% Change Dc to 2 MHz(4)	1 M < 47 pF Adj 50-1250 mV 100:1 at 100 kHz ± 3 V(I) ≤ 5% Change Dc to 3 MHz(4)
X & Y AXES	Phase Difference Settling Time (Full Scale) O-V Beam Position Adj	$\leq$ 1° to 1 MHz $\leq$ 1 $\mu$ s for $\pm$ 0.20 mm Any point on screen	$\leq$ 1° to 500 kHz/ $\leq$ 1 $\mu$ s for $\pm$ 0.50 mm Any point on screen	$\leq$ 1° to 500 kHz $\leq$ 1 $\mu$ s for $\pm$ 0.50 mm Any point on screen	$\leq$ 1° to 500 kHz $\leq$ 1 $\mu$ s for ±0.50 m Any point on screen
INTENS (Z-AXIS)	Input RC Bright-to-Blank-Range Bandwidth	100 kΩ 70 pF 0-1 V Dc to 1 MHz	1 M $\Omega$ $<$ 47 pF Adj 0-1 to 0-5 V Dc to 5 MHz	1 M $\Omega$ $<$ 47 pF Adj 0-1 to 0-5 V Dc to 5 MHz	1 M $\Omega$ $<$ 47 pF (Two) Adj 0-1 to 0-5 V Dc to 5 MHz

<sup>\*</sup> Optional built-in time base and trigger.

#### 3. At reduced writing speed without save.

#### **RACKMOUNTING FOR 602**

51/4 in Rack Adapter — Two 602s may be mounted side by side.

Order 016-0115-02 .....\$130

Blank Panel — For covering half of 016-0115-02 Rack Adapter.

Order 016-0116-00 .....\$20

#### RACKMOUNTING FOR 603, 604, and 605

Cabinet-to-Rackmount Conversion Kit, equipped with slide-out assembly, required to rackmount a 603 Option 3, 604 Option 3, or 605 Option 3, in a standard rack width. This includes securing hardware and a blank front panel when only one instrument is used.

Order 040-0601-00 ......\$100

Cabinet-to-Rackmount Conversion Kit, equipped with slide-out assembly, required to rackmount two 603 Option 3s, two 604 Option 3s, or two 605 Option 3s, side-by-side in a standard rack width.

Order 040-0600-00 .....\$70

Rackmount-to-Cabinet Conversion Kit, required to convert a rackmount 603, 604, or 605 to a cabinet style.

Order 040-0602-00 ......\$65

Cabinet-to-Rackmount Conversion Kit, equipped with slide-out assembly, required to rackmount a TM 503 modular test system and a 603, 604, or 605 in a standard rack width.

Order 040-0624-00 .....\$5

#### **Crt Light Filters**

	Monitor	Filter	Part No	Price
	602	Smoke-gray	378-0586-00	\$2.20
	602	Amber	378-0595-00	\$6.00
		Clear	337-1440-00	\$1.50
	603	Green	337-1440-01	\$1.50
	604	Amber	337-1440-02	\$1.50
	605	Blue	337-1440-03	\$1.50
		Gray	337-1440-04	\$1.50

#### Camera Selection Chart

Monitors	Recommended Cameras
602 and 605	C-5A, C-30A, or C-59G
603 and 604	C-5A, C-59P, or C-59R

See camera section for complete information.

<sup>1.</sup> Or  $\pm$  15 V for 50:1 cmrr.

<sup>2.</sup> For 1-min view time.

<sup>4.</sup> For 80% or less of full-scale deflection.

<sup>5.</sup> Faster option with less luminance.

<sup>6.</sup> TTL input available.





1 MHz X and Y Bandwidth

100 mV/cm X and Y Deflection Factors

X-Y Phase Difference within 1° to 1 MHz **Uniformly Small Spot Size** 

#### c Coupled Z Axis

The Type 602 Display Unit is a compact instrument with excellent resolution providing accurate displays of information from X, Y, and Z signal inputs. Application areas are phase shifts and frequency ratios using Lissajous figures, graphic and alphanumeric displays from computers, Y-T plots of amplitude vs time displays, and gamma camera displays.

Permanent records of the 602 display can be made on Polaroid film with a TEKTRONIX Camera. Two 602s may be mounted side by side using an optional rack adapter.

#### CRT DISPLAY

Cathode Ray Tube-5 in flat-faced rectangular crt with P31 phosphor.

Display Size-8 cm vertically and 10 cm horizontally.

Graticule-Standard graticule: internal, parallax-free, variable illumination supplied with standard 602, as shown above. Optional graticule: internal 8 x 10 cm outline (no graticule lines) supplied with Option 2.

Trace Width-Max trace width within the 8 x 10 cm display area is 14 mils at 0.5  $\mu A$  beam current (typically less than 10 mils).

Display Linearity-The voltage required to produce a 2 cm deflection at any point on the crt will not vary more than 2% in the vertical direction and 6% in the horizontal direction.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

The X (horizontal) and Y (vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

Bandwidth-Dc to 1 MHz at 3 dB down.

Deflection Factor-Vertical: 90 mV/cm to 135 mV/ cm, internally variable. Horizontal: 90 mV/cm to 110 mV/cm, internally variable.

Phase Difference-Not more than 1° between X and Y amplifiers up to 1 MHz.

Beam Position-Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/hr after 20 min warm up.

Polarity-Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C— 100 k $\Omega$  ±10% paralleled by 30 pF or less.

Max Input Voltage- ± 10 V (dc and peak ac).

Recommended Source Impedance— 1 k $\Omega$  or less.

#### Z-AXIS AMPLIFIER

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: dc to 1 MHz over 0.0 V to +1 V range. Signal input is a BNC connector on the rear panel.

Input R and C- 100 k $\Omega$  ±10% paralleled by 70 pF

Max Input Voltage- ±10 V (dc and peak ac).

Recommended Source Impedance— 1 k $\Omega$  or less.

#### OTHER CHARACTERISTICS

Power Requirements-90 to 136 V ac, or 180 to 272 V ac, 48 to 440 Hz. 50 W at 115 V ac, 60 Hz. Rear-panel selector provides rapid accommodation for 6 line-voltage ranges.

Temperature-Electrical specifications are valid over the range of 0°C to +50°C ambient.

Finish-Blue vinyl painted cabinet, aluminum construction.

#### Dimension and Weights (Cabinet Included)-

San	in	cm
Height	6	
Width	8½	
Depth	17%	
	lb	kg
Net Weight	17½	7.9
Shipping Weight	≈22	≈9.9

Included Accessories-Smoke-gray filter; maintenance manual.

#### ORDERING INFORMATION

602 Display U	nit			. \$	1075
Option 1 without					
Option 2 Internal	8 x 10 cm	Outline	Grati	cule	
			N	o C	harge
Option 5 Vector	Display	Graticule	(P31	Pho	sphor
Only)				. Ad	d \$25
Option 7 without	Handles,	Feet,	and	AII	Dust
Covers				. Su	b \$20

See page 210 for information on cameras, crt light filters, and rackmounting.

X-Y Monitor with Variable Stored Brightness



Low-Cost X-Y Monitor
Time Base Option
6½ In Storage Crt
1 Million Dots/S Writing Speed
Variable Stored Brightness
View for Extended Periods
Differential Inputs

The 603 is an X-Y monitor for displaying alphanumeric and graphic data in a refreshed or stored mode on a 6½ in crt. It is well suited for applications such as ultrasonic detection systems, electron microscope systems, radiation and thermal scanning systems, speech therapy, mechanical pressure, volume and vibration analysis, medical and biophysical systems.

Now available is an optional horizontal time base. With calibrated sweep rates, conventional Y-T measurements are a valuable addition to the 603's high-performance X-Y monitor features.

The Tektronix-developed bistable storage crt used in the 603 eliminates the need for costly memory devices to refresh the display. Brightness of stored displays may be adjusted to obtain optimum photographic results, to integrate multiple traces, and extend storage time to at least 10 hr. Permanent records of the 603 display can be obtained on Polaroid prints using a TEKTRONIX Camera.

Operating functions are remotely programmable through a rear-panel connector which interfaces directly with TTL systems. X-Y-Z differential inputs are available via BNC connectors. Also included is a remote program connector for positive signal inputs.

#### CRT DISPLAY AND STORAGE

Cathode Ray Tube—61/2 in flat faced bistable, storage tube. Phosphor is similar to P1. 3.5 kV accelerating potential. Two storage tubes are available (standard crt for brighter stored display or Option 2 for a faster writing speed at lower stored brightness). When used in the nonstore mode, both tubes exhibit characteristics of a conventional crt.

Writing Speed—Standard crt, at least 20 div/ms; Option 2, at least 200 div/ms.

Dot Writing Time—Time required to write (store) one dot: standard crt, 4  $\mu s$  or less; Option 2 crt, 0.5  $\mu s$  or less.

Information Storage Rate—Standard crt, at least 200,000 dots/s; Option 2 crt, at least 1 million dots/s.

Display Size— 10.2 cm vertically, 12.7 cm horizontally. An internal nonilluminated graticule (8 x 10 div, 1.27 cm/div) is available as Option 1.

Resolution—Stored, equivalent to 80 vertical x 100 horizontal stored line pairs. Nonstored, equivalent to 128 vertical x 160 horizontal line pairs.

**Display Linearity—**The voltage required to produce a 1 in deflection from point on the crt will not vary more than 5%.

Viewing Time—At least 1 hr at normal intensity without loss of resolution. Viewing time can be extended to 10 hr with the variable brightness control.

Erase Time-Approx 250 ms.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth—Dc to 2 MHz at 3 dB down from 80% of full scan.

Deflection Factor—Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. Internal 5X attenuator extends deflection factor range to 12.5 V full scale.

Input R and C— 1 M $\Omega$  ±1% paralleled by less than 47 pF.

X-Y Phase Difference—1° or less to at least 500 kHz.

Beam Position—Front-panel position controls permit setting 0 signal position to any point on screen. Position shift is 1 mm/hr or less after 20 min warm-up.

Settling Time—  $0.2~\mu s$  or less for distances of 1 div or less.  $1~\mu s$  or less from any point on the crt to within 1 spot diameter of final position.

Max Input Voltage- ± 100 V dc plus peak ac.

Linear Common-Mode Signal Range—  $\pm 3$  V,  $\pm 15$  V in 5X fixed attenuator position.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuator.

Recommended Source Impedance— 10 k $\Omega$  or less.

Optional Horizontal Time Base— 1  $\mu$ s/div to 0.1 s/div in 6 calibrated steps (decade sequence), accurate within 3%. Uncalibrated continuously variable between steps and to approx 1 s/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For nontriggered operation, an internal switch selects bright baseline or no sweep.

#### Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam in nonstored mode. Positive input to + input increases the display intensity. To insure storage of each written dot, the Z-axis on-time should be at least 4  $\mu s$  with the standar crt and at least 0.5  $\mu s$  with the Option 2 crt. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

Bandwidth—Dc to 5 MHz over usable range. Sensitivity is adjustable from +1 V to +5 V for full intensity control; 0 V input cuts off intensity.

Differential Input—Cmrr at least 100:1 and common-mode range at least  $\pm 5 \ \text{V}.$ 

Input R and C— 1M $\Omega$  ±1% paralleled by less than 47 pF.

Max Input Voltage— ±100 V (dc plus peak ac).

#### OTHER CHARACTERISTICS

**Power Requirements—**Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V (±10% on each range), 50 to 60 Hz and 400 Hz. 75 W max at nominal line voltage.

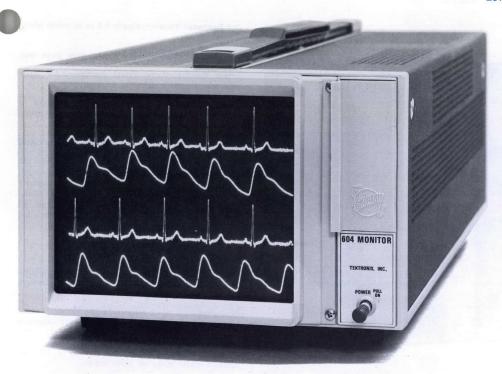
Dimensions and Weights—See next page.

included Accessories—External program connector (131-0570-00); connector cover (200-0821-00); external graticule (331-0303-00).

#### ORDERING INFORMATION

603 Store	age Monito	r		\$1	300
Option 1	Internal Grati	cule	No	Ch	arge
Option 2	Fast Writing	Speed Crt		Add	\$35
Option 3	without Handl	e and Feet		Sub	\$10
Option 4	Time Base			Add :	\$150
Option 7	without Hand	iles, Feet,	and	AII	Dust
Covers				Sub	\$2

See page 210 for information on cameras, crt light filters, and rackmounting.



**Low Cost Monitor** 

**Time Base Option** 

61/2 in Easy Viewing Crt

2 MHz X and Y Bandwidth

Dc Coupled 5 MHz Z-Axis

X-Y Phase Difference within 1° to 500 KHz

#### **Differential Inputs**

With its 61/2 in crt, the 604, ideally meets the display and space requirements of system designers in such applications as pulse-height analysis, infrared detection, data communications systems testing, component and logic testing, vibration analysis, and medical instrumentation. The 604 is also well suited for many other applications including phase shifts and frequency ratios using Lissajous figures, raster displays with intensity modulation, and apparently dynamic 3 dimensional illustrations. Optionally available calibrated horizontal sweep rates provide a convenient extension of the 604 measurement field. Visual display of computer-processed data enhances understanding of the processed information. Permanent records of the 604 display can be obtained on Polaroid prints using a TEKTRONIX Camera. Differential inputs are available via BNC connectors on the rear panel. Plus inputs are also available via a 25 pin connector.

#### CRT DISPLAY

Cathode Ray Tube—  $6\frac{1}{2}$  in flat-faced rectangular crt with P31 phosphor.

Display Size—Internal parallax-free nonilluminated graticule marked in 8 vertical and 10 horizontal div (1.27 cm/div). Option 1 is without graticule.

**Display Linearity—**The voltage required to produce a 1 in deflection at any point on the crt will not vary more than 5%.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth—Dc to 2 MHz at 3 dB down from 80% of full scan.

**Deflection Factor—**Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. Internal 5X attenuator extends deflection factor range to 12.5 V full scale.

Input R and C— 1 M $\Omega$  ±1% paralleled by less than 47 pF.

X-Y Phase Difference—Not more than 1° to at least 500 kHz.

**Beam Position**—Front panel position controls permit setting 0 signal position to any point on screen. Position shift is 1 mm/hr or less after 20 min warm up.

Max Input Voltage— ±100 V (dc plus peak ac).

Linear Common-Mode Signal Range—  $\pm 3$  V,  $\pm 15$  V in 5X fixed attenuator position.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuator.

Recommended Source Impedance— 10  $k\Omega$  or less.

#### Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

**Bandwidth**—Dc to 5 MHz over usable range. Sensitivity is adjustable from +1 V to +5 V for full intensity control; 0 V input cuts off intensity.

Differential Input—Cmrr at least 100:1 and common-mode range at least  $\pm 5 \ V$ .

Input R and C— 1M $\Omega$  ±1% paralleled by less than 47 pF.

Max Input Voltage- ±100 V (dc plus peak ac).

#### OTHER CHARACTERISTICS

Power Requirements—Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V ( $\pm 10\%$  on each range), 50 to 60 Hz and 400 Hz, 56 W max at nominal line voltage.

Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00).

#### 603/604 DIMENSIONS AND WEIGHTS

Dimensions	Cabinet		Rackmount	
	in	cm	in	cm
Height	6.65	16.9	5.25	13.5
Width	8.4	21.4	8.4	21.4
Length	19.25	48.9	19.0	48.25
Weight (approx)	lb	kg	lb	kg
Net	17.5	7.9	17.5	7.9
Shipping Weight	23.0	10.4	23.0	10.4

#### ORDERING INFORMATION

604 Mo	nitor \$900
Option 1	Without Graticule No Charge
Option 3	without Handle and Feet Sub \$10
Option 4	Time Base Add \$150
Option 5	Vector Display Graticule (P31 Phosphor

See page 210 for information on cameras, crt light filters, and rackmounting.

3 MHz Variable Persistance Storage Monitor



Low Cost X-Y-Z Monitor
Variable Persistence Storage
1 Div/µs Writing Speed
3 MHz X and Y Bandwidth
5 MHz Dc-coupled Z-Axis Amplifier
Front Panel Controls
Remote Programmability
Time Base Option

The 605 displays low-repetition-rate signals, single-shot waveforms, and slowly scanned images at normal intensity without flicker. Low-repetition-rate applications include viewing biophysical signals and mechanical waveforms such as those in engine analysis. Bright, uncluttered single-shot displays of vibration waveforms are obtained with the fast (1 div/ $\mu$ s) writing speed. An example of a slow scanning application is the gray-scale image of a metal sample shown on the 605 pictured above. The image is from a scanning electron microscope at X2000 magnification.

Simply turning a dial varies the length of time a display is held on the crt from a fraction of a second to more than 5 min. The 605 combines variable peristence storage with an intensity input to produce slow scan, gray scale images. Ultrasound, thermographic, and nuclear scanning are biophysical applications for which the 605 is well suited. Fast dot response makes the instrument an excellent choice for random scanning use. An optional low cost time base adds the capability of monitoring real time biophysical signals.

Resolution of spectrum analyzers is improved since the desired frequency span can be viewed at low scan rate. The slowly fading trace of the 605 provides valuable trajectory information for radar and sonar displays.

#### CRT DISPLAY AND STORAGE

Variable Persistence Storage Crt— 5 in flat faced, rectangular tube with P31 phosphor. 8.5 kV accelerating potential.

Display Size— 8 div vertically, 10 div horizontally at 0.9 cm/div.

Graticule—Standard external, graticule. Internal 8 x 10 div graticule supplied as Option 1.

Max Writing Speed—At least  $1 \, \text{div}/\mu \text{s}$  for 1 min viewing time.

**Storage View Time**—Greater than 5 min at reduced writing speed.

Save Time—Viewing time is extended up to 10 times in the save mode.

Halftone Resolution—At least 10 lines/div.

Halftone Luminance—At least 100 footlamberts.

Erase Time-Approx 500 ms.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth—Dc to 3 MHz at 3 dB down from 80% of full scan.

**Polarity**—Positive signal to both + inputs moves beam up and to the right.

**Deflection Factor—**Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. Internal 5X attenuator extends deflection factor range to 12.5 V full scale.

Input R and C— 1 M $\Omega$  paralleled by less than 47 pF. X-Y Phase Difference—Not more than 1° to 500 kHz.

Beam Position—Front-panel position control allows setting 0 signal position to any point on screen. Position shift is 0.09 cm/hr or less after 20 min warm-up.

**Dot Response Time**—Typically 0.5  $\mu$ s to settle within 1 dot diameter.

Max Input Voltage— ±100 V (dc plus peak ac).

Linear Common-Mode Signal Range—  $\pm 3$  V (non-attenuated);  $\pm 15$  V with 5X attenuation.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuation.

Recommended Source Impedance— 10  $k\Omega$  or less.

#### Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam. Display intensity increases with positive inputs.

**Bandwidth**—Dc to 5 MHz (-3 dB). Sensitivity is adjustable from +1 V to +5 V for full intensity control: 0 V input cuts off intensity.

Differential Input—Cmrr at least 100:1 to 100 kHz; common-mode range at least ±5 V.

Input R and C— 1 M $\Omega$  paralleled by less than 47 pF.

Max Input Voltage— ±100 V (dc plus peak ac).

#### OTHER CHARACTERISTICS

Remote Inputs—TTL compatible. 0.52 V or less provides logic low. 2.5 V or more provides logic high.

Erase Interval Output—TTL compatible. Logic low is 0.4 V or less. Logic high is 2.5 V or more. Will drive 10 unit loads.

**Power Requirements—**Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V (±10% on each range), and 48 to 440 Hz. Power consumption is 40 W max at nominal line voltage.

Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00).

Ambient Temperature Limits—  $0^{\circ}$ C to  $+50^{\circ}$ C operating;  $-40^{\circ}$ C to  $+70^{\circ}$ C nonoperating.

#### DIMENSIONS AND WEIGHTS

Dimensions	Cabinet		Rackmount	
	in   cm		in	cm
Height	6.65	16.9	5.25	13.5
Width	8.4	21.4	8.4	21.4
Length	19.25	48.9	19.0	48.25
Weight (approx)	lb	kg	lb	kg
Net	17.5	7.9	17.5	7.9
Shipping Weight	23.0	10.4	23.0	10.4

#### ORDERING INFORMATION

605 Variable Persistence Storage Monitor
\$1695
Option 1 Internal Graticule No Charge
Option 3 Without Handle and Feet
Sub \$10
Option 4 Time Base Add \$150
Option 7 without Handles, Feet and All Dust Covers

See page 210 for information on cameras, crt light filters, and rackmounting.

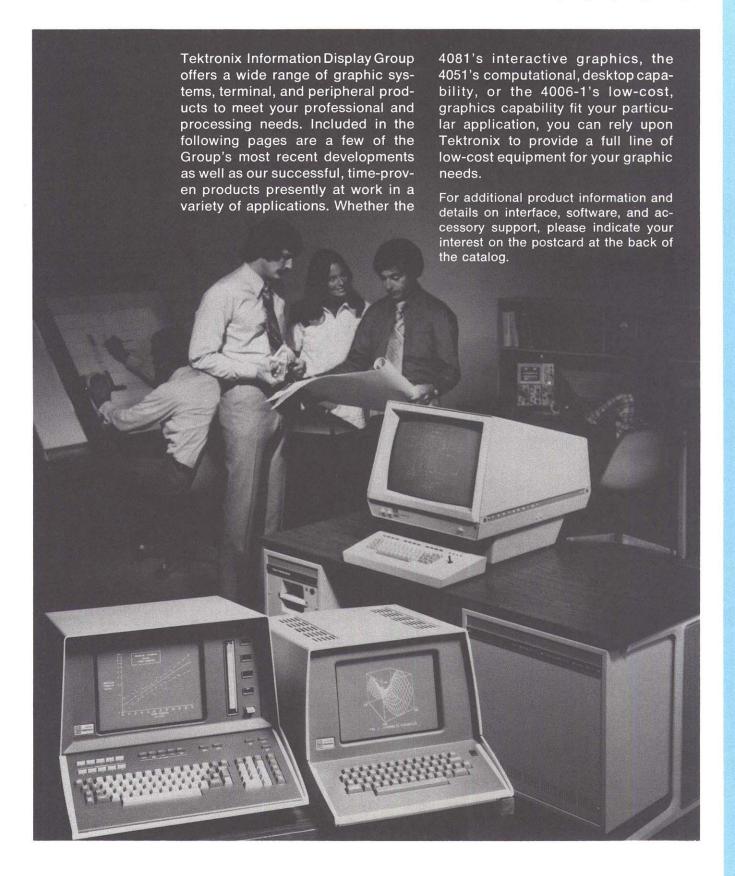
# **Tektronix**®

COMMITTED TO EXCELLENCE



1977

# Information Display Group Products





Tektronix has merged two significant graphics technologies to create a technological first. The new 4081 Interactive Graphics Terminal is a picture manipulation tool with potential for more productive man/machine interaction. Refresh tube technology provides motion; storage tube technology offers high-resolution graphics, even of complex images.

They come together in the 4081 - you get the advantages of both refresh and storage in one tube. Better still, all the hardware, firmware, and software needed to do the job are combined into an integrated package. You're not buying individually priced components, then linking them.

It's one complete system. The necessary interfaces between hardware and application programs are already built in. Powerful operational software smooths the path from the 4081 to the host computer-and frees your programmers from months of tedious

It's the time-saving, cost-saving approach to problem solving for both users and management. System users get an immediate and powerful tool; management gets a fast return on capital investment.

Now, for the first time, sophisticated operational software matches versatile hardware. Together, they form a powerful, functional, and interactive graphics terminal.

Together, refresh and storage graphics create a more effective work environment. Better overall cost effectiveness starts with better man-machine effectiveness. With the 4081, you can work with both fixed and variable factors at the same time. You can move, change, enlarge, rotate, or delete selected portions of a display, while the rest of the picture remains fixed. You can explore alternatives, manipulate, and work with large amounts of data in a more meaningful way when you see both the action and the effect of change.

As a powerful stand-alone picture manipula-

tion tool, or as an intelligent terminal, the 4081 can support any number of diversified working environments. It's designed for optimum flexibility—both for the people who use it, and for the communications environment in which it operates.

The 4081's picture processor and local storage capability combine to lower communications overhead, timesharing costs, and host loading charges. When you work with the 4081, you can do more, faster and without the host, so it measurably reduces the man-hours per job.

Adding optional peripherals takes a couple of extra steps: plugging them in and turning them on.

You get permanent, dry, easy-to-work-with hard copies of information displayed in storage mode on the 4081 screen from the convenient 4631 Hard Copy Unit.

You have several options for adding memory. Start with 32k bytes more on the picture processor, for a total of 64k bytes. A second digital cartridge magnetic tape drive supplements local storage with an additional 256k bytes. And you can go further. Use the 4905 Mass Storage Module to create a total capacity of over 40 megabytes of memory. And, there is a full complement of other peripherals standing by ready to support your precise needs.

The 4641 Printer gives you a quick, quiet, alphanumeric printout—with complete form and format versatility.

The microprocessor-controlled 4662 Interactive Digital Plotter expands your graphics plotting capability with high-speed accuracy and repeatability.

Graphic tablets come in two sizes (11 x 11 or 40 x 30)-either the 4953 or 4954 will provide a fast, accurate, highly versatile way to capture graphic information directly to the

There's even more: an expansion package with additional power supply; power/fail protection; a programmer's hexadecimal display panel and a variety of PLOT 80 Software products. Enough software for all your applications.

#### SPECIFICATIONS

Display Medium - Storage and refresh combined on a 19-inch diagonal crt.

Addressable Points - 2048 x 1536 displaceable raster units.

Write Rate - 56,000 vector/cm in refresh and 14,000 vector/cm in storage.

Graphics Resolution - 16 line pairs/cm.

Spot Size — 20 mils, maximum.

Display Processor — 16 general purpose registers, 16 bit words, 104 instructions, 8 interrupt levels, 32k byte MOS memory accommodating up to 8 DMA peripherals.

Display Controller - Maintains a refreshed picture with 352 unique hardware dash patterns; displays a maximum of 64 gray scaling intensities.

#### Standard System Features -

Asynchronous RS-232 communications interface operating at 110 to 4800 baud in full duplex mode.

Cartridge magnetic tape drive with 256k byte storage capacity.

Alphanumeric keyboard with full upper and lower case ASCII characters.

Twelve programmable function keys.

Joyswitch with terminator button.

Four system status lights.

Graphic Operating System for local picture manipulation and storage

4014 terminal simulation.

Input Power - 115 volts, 30 amperes at 60 Hz, singlephase power (220 V, 50 Hz also available).

Power Consumption - 3450 watts (11,782 btu/hr).

Temperature — +10°C to +35°C (+32°F to +95°F)

Humidity - 0 to 20% (non-condensating). Altitude - To 15,000 feet (4572 m).

Shock — 20 g's (non-operating).

#### ORDERING INFORMATION\* 4081 Interactive Graphics Terminal . . \$27,000

Option 22	32k Byte Additional Picture
Data Sto	prage+3,950
Option 31	Expansion Package+1,800
Option 32	Power Fail Protection+600
Option 33	Second Digital Cartridge
Tape Dr	ive+2,495
4905 Ma	ss Storage Module
(not s	hown)
Option 31	Dual Flexible Disc+5,400
Option 32	Two Dual Flexible Discs+10,800
Option 33	
Option 34	Dual Hard Disc+26,500
	PERIPHERALS
4631 Har	d Copy Unit
4641 Prin	nter\$4,495
4662 Inte	eractive Digital Plotter \$3,995
4953 Gra	phic Tablet (11 x 11 inch)\$3,195
4954 Gra	phic Tablet (40 x 30 inch)\$5,295
	ACCESSORIES
067-0772-0	0 Hexadecimal Display Panel \$700
067-0794-0	0 Prom Bootstrap Loader \$1,275
067-0795-0	0 Custom Extender\$90
062-2775-0	00 4081 Operators Manual
Package	e (Vol 1)
062-2776-0	00 Intelligent Graphics Terminal
Package	e (Vol 2)
062-2777-0	0 4081 Diagnostic Package (Vol 3)\$300
062-2778-0	0 4081 Overlay Package \$25
	SOFTWARE
4080A01 P	LOT 80: Programming Support
Package	\$3.000

\*The 4081 and 4905 may not be available in some areas of the world. Consult your Distributor or Representative.

4080A02 PLOT 80: FORTRAN IV Compiler....\$1,500

4080A03 PLOT 80: Graphics Function Manager \$2,500



Desktop Computational Power Alphanumerics and Graphics High-level BASIC Up to 32k Work Space

#### Off-line Intelligence in a Graphics Terminal

A compact, comprehensive package with built-in computational power and high-density desktop graphics.

Up to 32k of work space. Conversational interactivity with high-level BASIC. Complete on-line option. Plus graphic capability. Standard interfacing and peripheral support.

#### 8k of Self-sufficient Processing Power

You can expand your 4051's work space in 8k increments, and tailor your processing power to your application needs. The standard 8k of work space packs enough power to plot over 300 1-inch vectors simultaneously, with room to spare.

#### **BASIC Vocabulary**

We've enhanced easy, English-like BASIC with some ordinarily unBASIC graphics extras...including functions like WINDOW, VIEWPOINT, and ROTATE, plus file system data access, formatting commands, and a unique interrupt control of the IEC peripherals.

#### More for The Money

The basic package also includes a built-in 300k-byte capacity cartridge tape unit for extra storage; 20 user-definable functions; ten liner editor functions; full 128-character ASCII with upper-lower case keyboard; IEEE standard (488-1975) rear connector, and much more.

#### Accessories

Our Data Communications Interface Option makes the 4051 perform functions of our famous 4012 Graphic Display Terminal: edit offline in any language; send and receive in batch, via the internal magnetic tape unit, at asynchronous speeds up to 2400 baud. The RS-232-C Connector Option drives your choice of printer, printing terminal or other compatible peripheral. Add on plug-to-plug peripherals like our 4631 Hard Copy Unit; the 4924 Auxiliary Magnetic Tape Unit for fast data I/O and tape copying; the 4641 Printer for reliable performance at speeds up to 180 cps; the 4662 Interactive Digital Plotter for speed, precision and resolution; the 4956 Graphic Tablet available in a 20" x 20" GRIB tablet and a 36" x 48" version; the 4952 Option 02 Joystick for positioning the graphic cursor.

Special cables, dust cover, viewing hood, and other accessories are available.

### CENTRAL PROCESSING UNIT

Type — LSI Microprocessing Unit.

Work Space Size — 8k bytes standard expandable to 32k bytes.

**Programming Language** — BASIC with integrated operating system, built-in graphics, and numerous other extensions.

Numeric Accuracy — 14 decimal digits.

Numeric Range - 1 x 10 ±308

#### INTERNAL PERIPHERALS

#### Keyboard —

Complete upper and lower case alphanumerics with autorepeating keys. Full ASCII. 128 characters.

10 Function Keys with SHIFT for up to 20 separate function calls.

Five editing keys with SHIFT, control 10 different editing functions used to modify BASIC source programs.

Calculator key pad including 10 key numeric pad, 5 math operator keys, decimal point, and parenthesis.

Control keys — AUTO NUMBER—generates program line numbers automatically; STEP—executes program steps one at a time; AUTO LOAD—automatically loads and runs File 1 on tape; REWIND—rewinds tape; MAKE COPY—activates optional 4631 Hard Copy Unit.

#### **DISPLAY CHARACTERISTICS**

Type — Direct view storage crt.

**Dimensions** — 8 in wide by 6 in high (20.3 cm  $\times$  15.2 cm).

Alphanumeric Format — 72 characters per line, 35 lines; 2520 total.

Character Set — Full ASCII character set, including upper/lower case. Also includes Scandinavian, German, General European, and Spanish fonts.

Graphic Resolution - 1024 x 780 points.

Hard Copy — Compatible with our 4631 Hard Copy Unit.

#### TAPE DRIVE

Type - 3M DC300A cartridge.

Capacity — 300k bytes max (dependent on number of files).

System Characteristics — File structures for storage of programs or data. Access is via 4051 BASIC operating system.

#### GENERAL-PURPOSE INTERFACE BUS (GPIB)

Specifications — Conforms to IEEE standard 488-1975. Byte serial, bit parallel transfer mode.

Control Mode — External devices can be serviced via interrupt procedures available in the BASIC operating system. Enable/disable, polling, and data transfer commands are available under program control.

**4051R01 Matrix ROM** — Supplements the 4051 with five commonly used matrix functions: multiply, transpose, inverse, determinant, and identity.

4051R05 Binary Program Loader ROM — May be used to rapidly store and load programs in binary machine code allowing the programs to bypass translation during a SAVE process.

**4051R06 Editor ROM** — May be used to expand the capabilities of the 4051 by editing text that is collected and stored on the 4051 tape.

#### PHYSICAL CHARACTERISTICS

Height - 13.6 in (34.5 cm).

Width — 18.3 in (46.5 cm).

Length — 32.5 in (82.6 cm). Net Weight — 65 lb (29.5 kg).

Shipping Weight — 81 lb (36.8 kg).

# ORDERING INFORMATION 4051 Graphic System ....................\$7500

Option 01 Data Communications Interface add \$1500
Option 10 RS-232 Printer Interface add \$550
Option 20 4051 with 16k byte memory*add \$2150
Option 21 4051 with 24k byte memory* add \$3350
Option 22 4051 with 32k byte memory* add \$4550
SOFTWARE
4050A01 PLOT 50: Statistics, Vol. 1\$350
4050A02 PLOT 50: Statistics, Vol. 2\$350
4050A03 PLOT 50: Statistics, Vol. 3\$600
4050A10 PLOT 50: Statistics. Vol. 4\$600
4050A13 Statistics Library
4050A04 PLOT 50: Mathematics, Vol. 1\$300
4050A05 PLOT 50: Mathematics, Vol. 2\$400
4050A14 Mathematics Library \$600
4050A15 Scientific Library\$2400
4050A06 PLOT 50: Electrical Eng., Vol. 1\$300
4050A07 PLOT 50: Graph Plot\$350
4050A08 PLOT 50: Gen. Util. Prgm., Vol. 1 \$275
4050A09 PLOT 50: Business Planning & Analysis,
Vol. 1\$350
ROM PACKS
4051R01 Matrix Function ROM Pack\$350

4051R06 Editor ROM Pack..........\$600

\*The same item ordered after the 4051 is delivered is available as an accessory at a higher price because of field installation or special handling.

4051R05 Binary Program Loader ROM Pack.....\$200



#### 4006-1

#### **High Resolution**

#### **Graphics and Alphanumerics**

The 4006-1 sets a new standard in the development of low-cost graphics. It is the first terminal to consolidate graphics, alphanumerics, and Tektronix quality at a price competitive with terminals offering alphanumerics alone.

A software package that makes graphics easy for nonprogrammers, and which multiplies the capabilities of the experienced programmer, the PLOT 10 Interactive Graphing Package (IGP), provides easy-to-learn, English language structured commands that enable the user to construct, edit, save, and recall graphs in a conversational relationship with the computer.

The IGP software package provides the power to read data and commands from file; edit graphic data points; and update and compare graphs from storage.

Peripherals for the 4006-1 include the 4631 Hard Copy Unit, or the 4923 Digital Cartridge Tape Recorder for 200k-bytes of data storage on each tape.

#### **SPECIFICATIONS**

Display Medium — Direct view bistable storage crt.

**Display Area** — 7.5 in wide x 5.6 in high (19.1 cm x 14.2 cm).

**Alphanumeric Mode Format** — 35 lines, 74 characters per line, 2590 characters full screen.

Character Set — 63 printing characters (TTY ASCII Code).

Character Generation — 5 x 7 dot matrix.

Cursor - 8 x 8 dot matrix.

Graphics Display Mode — Vectors only. Vector drawing time, 3.6  $\pm$  0.2 ms.

Information Density — 1024 X by 1024 Y addressable points. 1024 X by 780 Y viewable points.

Baud Rate — Transmit and receive independently selectable from 75 to 4800 baud.

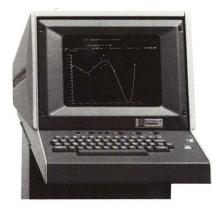
Input Power — 110/240 V ac (Low, Medium, High) 50 to 440 Hz, 105 W.

Interfacing — The 4006-1 is shipped with a Standard Data Communication Interface, with inputs and outputs conforming with EIA RS-232-C.

Peripherals — The 4006-1 is compatible with the 4631 Hard Copy Unit, for dry, high-quality,  $8\frac{1}{2}$  x 11 in copies of any information displayed on the 4006-1

The 4923 Digital Cartridge Tape Recorder, a low-cost off-line data storage device, is also compatible with the 4006-1.

#### **ORDERING INFORMATION**



#### 4010-1

Supports Alphanumeric Plus Low-Cost Computer Graphics

Convenient Pedestal Design for User Environments

Flicker-Free Storage Display
Complete PLOT 10 Software Support

With its low price, the 4010-1 Computer Display Terminal is a data-handling tool of great capacity and flexibility. The pedestal minibus design opens the way to a variety of system concepts.

A wide variety of peripherals can be interfaced easily: 4631 Hard Copy Unit, 4662 Interactive Digital Plotter, 4923 Digital Cartridge Tape Recorder, 4953/4954 Graphic Tablets, and 4921/4922 Flexible Disc Memory Units.

The Keyboard — The 4010-1 has a TTY style keyboard featuring 63 printing characters (including upper case alphanumerics), and standard ASCII control characters. Independently operated X and Y axis thumbwheels position the Graphic Cursor in the Graphic Input Mode.

Operating Modes — Three operating modes can be selected from the keyboard or the computer. In Alphanumeric mode, 35 lines of 74 characters each constitute a full display screen. In Graphic Display mode, the terminal produces clear, accurate vector displays in response to computer commands. In Graphic Input Mode, operator/computer interactivity is permitted.

#### **DESIGN CHARACTERISTICS**

Screen Size — The screen is a direct-view storage 7-1/2 inches wide x 5-3/5 inches high.

Format — The 4010-1 allows 74 characters per line, and 35 lines (2590 characters) per full screen.

Character Set — Includes 63 printing characters (TTY ASCII Code).

Character Generation — 5 x 7 dot matrix. Up to 1200 characters per second.

**Graphic Display Mode** — Vectors only. There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphics Input Mode** — A thumb-wheel controlled cursor for 3 through 1023 X, and 0 through 780 Y addressable points.

#### **ORDERING INFORMATION**

4010-1 Computer Display Terminal with Standard Data Communications Interface .....\$4950



#### 4012

**Alphanumerics** 

High Resolution Flicker-Free Graphics Attractive Upper and Lower Case

#### **Proven High Quality and Performance**

The 4012 Computer Display Terminal offers all the capabilities of the 4010-1 plus several valuable enhancements. For attractive alphanumerics, the 4012 offers the full ASCII set of 96 upper and lower case printing characters, drawn using a 7 x 9 dot matrix, plus the standard ASCII control characters. By enabling a special TTY lock key, you may use a TTY upper case subset. For convenience, all keys offer character repeat when held down. The 4012 is also easily interfaced to the same peripherals as the 4010, and supported by the complete PLOT 10 Family of software products.

Operating Modes — Alphanumeric mode uses the full upper and lower case ASCII character set, or the TTY upper case subset. In Graphic Display mode, vector displays are drawn in response to computer commands. In Graphic Input mode, the thumbwheel controlled cross-hair cursor can be positioned on the display, for operator/computer interactivity.

#### DESIGN CHARACTERISTICS

Screen Size — The screen is a direct-view storage crt  $8\frac{1}{4}$  in wide x  $6\frac{3}{6}$  in high.

Character Set — The 4012 has 96 printing characters on a 7 x 9 dot matrix. (Full ASCII Code).

Graphic Display Mode — Vector drawing time, 2.6 ms. Graphic Matrix — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

 $\begin{array}{lll} \textbf{Graphics} & \textbf{Input} & \textbf{Mode} \longrightarrow \textbf{A} & \textbf{thumb-wheel} & \textbf{controlled} \\ \textbf{cross-hair} & \textbf{cursor.} \end{array}$ 

#### **ORDERING INFORMATION**

4012 Computer Display Terminal with Standard Data Communications Interface \$6350

#### 4013

#### 4012 High Performance Plus APL Character Set

APL (A Programming Language) is a highly interactive, problem-solving language which lends itself ideally to graphic display of computer data.

The 4013 Computer Display Terminal is especially designed to be used with APL, in addition to the complete ASCII upper and

lower case character set and the TTY subset. The 88 symbol APL set includes the complete upper case italic alphabet, number set, special APL function symbols, and APL composites.

The Keyboard — The 4013 has APL symbols on the top surfaces of the keys, and the ASCII symbol differences on the forward surfaces. Graphic cross-hair cursor controls and character repeat are also featured on the 4013 keyboard.

Operating Modes - The 4013 offers Alphanumeric mode, Graphic Display mode for computer outputs, and the interactive Graphic input mode.

#### DESIGN CHARACTERISTICS

Screen Size - The screen is a direct-view storage crt 81/4 in wide x 63/8 in high.

Character Set - Includes 96 printing characters on a 7 x 9 dot matrix (full ASCII code), and 88 character

Graphic Display Mode — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable

Graphics Input Mode - The 4013 has a thumb-wheel controlled cross-hair cursor.

#### ORDERING INFORMATION

4013 Computer Display Terminal with Standard Data Communications Interface . \$6850

R4013 Computer Display Terminal with Standard Data Communications Interface 

#### **PLOT 10 SOFTWARE**

FOR 4010-SERIES TERMINALS AND THE 4006-1

Tools for easy use of graphic and alphanumeric capabilities of TEKTRONIX Terminals.

4010A01 PLOT 10 Terminal Control System.....\$650 4010A10 PLOT 10 Terminal Control System, Implemen-

tation for IBM with TSO ......\$850 4010A11 PLOT 10 Terminal Control System, Implementation CDC SCOPE/Intercom with Option 20 Interface

4010A12 PLOT 10 Terminal Control System, Implementation for PDP-11 with DOS ......\$850

Versatile software to graph your data using a powerful set of FORTRAN IV sub-routines.

4010A02 PLOT 10 Advanced Graphing II......\$850

Powerful graphing through English language commands for the non-programmer. 4010A03 PLOT 10 Interactive Graphing Package \$1200

Correct your graphics easily with a TEKTRONIX Terminal before plotting.

4010A04 PLOT 10 Preview Routines for CalComp Plotters ......\$110

Provides complete flexibility of character definition, including rotation, scaling, and special characters.

4010A05 PLOT 10 Character Generation System. . \$160 Point by point TEKTRONIX 4953 and 4954 support,

plus pencil and paper input ease for many computer

4010A06 PLOT 10 Graphic Tablet Utility Routines \$125 Support for graphic files and easy installation are

featured by current software.
4010A07 PLOT 10 Flexible Disc Utility Routines..\$160

Individual addressing of up to 12 Tektronix displays. 4010A08 PLOT 10 Display Multiplexer Utility Routines Complete support for TEKTRONIX 4013 and 4015 with

self documenting commands, for the APL Programmer. 4010A09 PLOT 10 APL GRAPH-II ......\$650

4010A13 PLOT 10 APL GRAPH-II, Implementation for APL/360 .....\$850



#### 4014-1

Large Screen Direct-View Storage Display

Program-Selectable Formats in Alphanumeric and Graphic Modes

Vector and Discrete-Plot Graphic Modes

High-Resolution, Attractive, Flicker-Free Interactive Graphics

This TEKTRONIX 19-inch Computer Display Terminal is the most effective way to display a large data base. The 4014-1 offers the complete ASC11 upper and lower case character set, plus the TTY upper case subset.

The 4014 is easily interfaced to our same full line of peripherals as the 4010 and supported by the PLOT 10 family of software products.

The Display — A direct view 19-inch storage display tube allows up to 8512 alphanumeric characters, and four different character sizes. The 4014-1 has two display modes and the option of five vector types for graphic display.

#### **DESIGN CHARACTERISTICS**

Screen Size - A direct-view storage crt, 15 in wide x 11 in high.

Character Set - Includes 96 characters (full ASCII upper and lower case, plus a TTY subset).

Vector Mode - There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

Graphics Input Mode - Thumb-wheel controlled cross-hair cursor for 3 through 1024 X, and 0 through 780 Y addressable points.

4014-1 Enhanced Graphics Module, Option 34 - With this extra-cost option, capacity is extended to 4096 X by 4096 Y addressable points, and 4096 X by 3120 Y displayable points. Dotted and dashed line vectors (five variables). Three point plotting codes allow program control of Writing Beam Brightness.

#### ORDERING INFORMATION

4014-1 Computer Display Terminal with **Standard Data Communications** Interface .....\$11,650

Option 34, Enhanced Graphics Module (Factory Installed Only) ......Add \$750



#### 4015-1

Full API and ASCII Character Sets 4014-1 High Performance plus APL **Character Set** 

Interactive Graphics Capability

The 4015-1 Computer Display Terminal adds the powerful problem-solving APL Language to the increased display power of the 19-inch screen, along with the full ASCII upper and lower case set and TTY subset.

The 4015-1 is compatible with the 4631 Hard Copy Unit to provide permanent copies of display information.

The Display-The 19-inch display is a directview storage tube with a capacity of up to 8512 characters. The 4015-1 has four different sizes of character display, two display modes, and five vector types for graphic display.

Operation Modes - The 4015-1 functions in three modes: the Alphanumeric Mode, Graphic Display Mode for computer outputs, and the interactive Graphic Input Mode. Data received may be displayed alphanumerically or graphically.

#### **DESIGN CHARACTERISTICS**

Screen Size - The screen is a direct-view storage crt 15 in wide x 11 in high.

Character Set - Includes 96 characters (Full ASCII upper and lower case), a TTY subset, and an 88 character APL set.

Vector Mode — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

Graphics Input Mode - A thumb-wheel controlled cross-hair cursor for 3 through 1024 addressable points horizontally, and 0 through 780 addressable points vertically.

4015-1 Enhanced Graphics Module, Option 34 - Expands capabilities to 4096 X by 4096 Y addressable points, and 4096 X by 3120 Y displayable points. Dotted and dashed line vectors (5 variables), three point plotting modes allow program control of Writing Beam Brightness.

#### ORDERING INFORMATION

4015-1 Cd	mputer Display Terminal with	
Standard	Data Communications	
Interface	\$12,7	00

Option 34, Enhanced Graphics	Module
(Factory Installed Only)	Add \$750



Dry Process

8½ x 11 Inch Copies

Supports up to Four Terminals

The 4631 Hard Copy Unit is compatible with the 4051, 4081, the 4006-1, 4010 family of display terminals and the 613 and 613-1 Storage Display Units. The 4631 provides permanent dry copies of any information displayed on the terminal screen. For greater flexibility it can also be multiplexed to make copies from up to four display terminals and/or display monitors. When you need to keep records, or present information a touch of the button gives you copies of any displayed data quickly and easily.

The 4631 uses 3M Brand 7770 Dry-Silver paper to give you the high-image contrast you need for complex graphics and alphanumerics.

The 4631's copy time is 18 seconds for the first copy, and 10 seconds for subsequent copies.

#### CHARACTERISTICS

Paper Size — 81/2 x 11 in.

Copy Size — Position I and III produces an  $8.85 \times 6.7$  in copy, oriented horizontally on an  $81/2 \times 11$  in piece of paper. Position II produces a  $7.1 \times 5.4$  in copy, oriented vertically on an  $81/2 \times 11$  in piece of paper — not recommended for 19 in display tubes.

Exposure Time — Position I and II approx 7 s, position III approx 14 s.

Dimension — (Height, width, length) 11.6  $\times$  16  $\times$  25.5 in (29.5  $\times$  40.6  $\times$  64.8 cm).

Weight - Approx 65 lb (29.5 kg).

and/or storage display units.

Standard Accessories — One 10 ft Connecting Cable (012-0547-00).

#### ORDERING INFORMATION

4031 Hard Copy Unit	\$4295
Option 01 — Copy Counter—Automatically	counts the
copies made by the 4631	Add \$60

Option 02 — Four Channel Multiplexer.....Add \$575
One 4631 can copy up to 4 separate terminal displays



#### 4023

Low Cost Refreshed Versatility
Upper and Lower Case Capability
With Built-in Forms Ruling

The TEKTRONIX 4023 is a general-purpose alphanumeric, refreshed terminal with all the built-in features of a refreshed terminal — it is quiet, bright, and buffered, plus it has other features which are oriented toward rapid error-free data base entry and retrieval operations.

The 4023 keyboard provides selection of the full ASCII set of 96 printing characters, or the 63 character TTY upper case subset. Additional features of the keyboard include two-key roll-over and autorepeat for any keys depressed over 0.3 second.

The memory (buffer) of the 4023 allows space for 24 lines with 80 characters each, providing a total of 1920 characters.

Field and Data Formatting — Displayed data can be arranged to resemble the source document. Forms information can then be rapidly retrieved, updated, edited, and entered. Visual field formats include: inverted, blinking, blanked, and dim fields.

Interfacing — Provided by two data communication interfaces for telephone line connection. One is the Standard Data Communications Interface supplied with the 4023 if no interface option is specified. Also available is an optional Data Communications Interface with added features for full- or half-duplex data communication system operations

**The Display**—A refreshed crt, 9 inches wide by 5.5 inches high, P-4 type phosphor.

**Video** — Composite Video compatible with standard interlaced 525 Line Monitor.

#### ORDERING INFORMATION

<b>4023 Computer Display</b>	Terminal, Includes	
Rulings Character Set.	\$3495	



#### 4632

Permanent 8½ in x 11 in Gray Scale Copies from Standard Video Signals and Most Refreshed Terminals

Simple, Quiet Operation Completely Self-Contained Dry Process Developing

The 4632 Video Hard Copy Unit provides permanent hard copies from standard composite video signals and from digital video signals of most refreshed alphanumeric/graphic terminals. The 4632 provides both high contrast (black and white) or gray scale copies. The 4632 development is a dry process and is completely self-contained, and quiet. The 4632 is easily interfaced to a video system or refreshed terminal by a single cable. As an option, it can be multiplexed to provide copying capability from one to four video sources.

#### **DESIGN CHARACTERISTICS**

Standard Copy size adjustment is 81/2 in by 11 in for horizontal raster display (4:3 aspect ratio). Copy time is approx 18 s for the first copy and about 8 s for additional copies of the same display. Machine warmup time is 20 min. The recommended ambient temperature for operation is 0°C to +35°C.

Input Requirements — Input signals may be any one of three configurations: composite video, video with horizontal and vertical drive, or video with composite sync. Input video amplitude is from 0.3 V to 5 V. Impedance is 75 ohms, loop-through. Return loss is at least 46 dB. Common-mode rejection is at least 30 dB. Max input is 10 V dc plus peak ac. Input sync amplitude is 0.3 V to 8 V p-p; impedance is 20 k $\Omega$ .

Power Requirements — The 4632 operates on 110-115 V ac, or 200-230 V ac, 50-60 Hz; these are factory wired options.

Included Accessories — One 75 ohm termination.

ORDERING INFORMATION
4632 Video Hard Copy Unit \$3995
Option 01, Copy CounterAdd \$60
Option 02, 4-channel Multiplexer Add \$575
Option 03, Set up for 625 Line, 50 Hz Field OperationNo charge
Option 04, Set up for 1029 Line, 60 Hz Field Operation
Option 05, Compatible with TEKTRONIX 4023 TerminalNo charge
Option 06, Enhanced Gray ScaleAdd \$200
Option 07, Compatible with HP 2640 Series Terminals
For one roll, Order 006-1603-00\$50
For one carton of four rolls, Order 006-1603-01\$180



### Microprocessor Based 7-Character Fonts RS-232-C and GPIB Compatible

The new TEKTRONIX 4662 Interactive Digital Plotter is microprocessor based, interactive, flexible in capabilities, and easy to use. It extends high industry standards which include:

10 in x 15 in drawing area 0.005 inch resolution  $\pm$  0.0025 inch repeatability 1:1 reproduction of crt displays up to 19 in diagonal Convenient, electrostatic positioning 16 to 22 ips

It is plug compatible with many Data Communications Systems (RS-232-C, Full Duplex) and with the TEKTRONIX 4051 and IEEE 488-1975 interface standard. It offers systems flexibility and the following pacesetting characteristics:

The Fully Resident Internal Character Generator **Excellent Quality Character Reproduction** Easy Labeling from Terminal Keyboard Labeling of Curves without Loss of Spacing Exact Sizing to 'Fit' Any Graph or Plot 1600 byte buffer

Its prime advantage as a digitizer (tablet) and plotter is in applications requiring reduced system cost and reduced space requirements. In many uses, the 4662 can function as a stand-alone terminal.

Specific 4662 product capabilities include: Accommodation of Formatted Media **Fasy Ratio Selection** Multiple Images Calibration to Scale Allowance for Up-Dating or Changes on Back of Mylar

Master Plot Improved Reliability 90 watts maximum, 60 watts typical power requirement 30 lb, 13.8 kg Approx Weight

UL Listed, CSA Approved

4662 Interactive Digital Plotter

#### ORDERING INFORMATION

¢3995

4002 Interac	live Digital	r lotter	40000
Option 01, Inter	active Digital	Plotter (for 405	1 Graphic
System)			Add \$500



The 4931 Modem is available as an option installed internally in 4010 Family terminals or in stand alone form as pictured above. These Bell compatible Modems are available in 300 baud full duplex, 1200 baud half duplex, and 1200 baud half duplex with supervisor channel. All are designed to work on unconditioned voice grade phone lines with a DAA (Direct Access Arrangement).

#### **ORDERING INFORMATION\***

4931 Modem (300 baud full duplex)...\$400 4931 Option 01 (1200 baud half duplex) . . . . . Add \$350 4931 Option 02 (1200/5 baud half duplex)...Add \$450 When ordered as an integrally installed modem in a 4010 family terminal:

Option 37 (300 baud full duplex)......Add \$350 Option 38 (1200 baud half duplex)......Add \$700 Option 39 (1200/5 baud half duplex)......Add \$800

\*Communication protocalls supported by this product may not be appropriate in some areas of the world. Consult your Distributor or Representative.



#### 4921/4922

The Flexible Disc Memory is for users who need a convenient, user-controlled storage system for off-line or auxiliary use. The Disc Memory consists of one or two disc drive units, plug-in circuit boards, and its own interfacing board, which slides into the 4010-Series Terminal.

The Memory has its own power supply and interface electronics to make it a versatile local memory and terminal driver. The user has full control.

The Memory can store data from any of the terminal keyboards, and send data up onto any terminal screen. It can also send data to (or receive it from) a computer.

The 4922 (the two-disc drive model) can duplicate discs and store or send lengthy, continuous data streams. Either Memory can replace a paper tape device with few, if any, software changes.

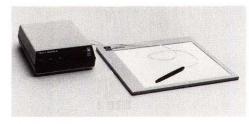
The Memory has a "read-after-write" feature and a Disc/Error light for an extraordinarily safe 10-8 error rate.

Number of data tracks: 64 Number of sectors/track: 32 8 bit bytes per sector: 128 Total disc capacity: 262,144 bytes

4021 Flevible Disc Memory

#### ORDERING INFORMATION

(Single Drive with Interface)	. \$3995
4922 Dual Flexible Disc Memory	
(Dual Drive with Interface)	\$6355



#### 4953/4954

**Single Point Entry** Multiple Point Entry Tracking (Continuous) Entry **Local Display** 

The Graphic Tablet comes complete with its own electronics, one of two input device options, and easy-to-follow set-up instructions.

Choice of a pen for the ultimate in convenience, or a pushbutton cursor where exacting accuracy is required. Keep pen to tablet to get instant vectors, or lift the pen between inputs for separated points. You can input points, or all of anything you put on the tablet, including maps, graphic hard copies, drawings, schematics, designs. Select options from a written "menu" placed on the Graphic Tablet. Use it for fast digitizing, freehand graphics, etc. Use it to get numbers out of any graphic display. You can store these inputs, recall them later, and make hard copies of them, just like any other graphics.

Two sizes of tablets are available: the 11 x 11 inch model 4953, or the drawing board size 40 x 30 inch model 4954.

Either Graphic Tablet is compatible with the entire family of TEKTRONIX Graphic Display Terminals. TEKTRONIX PLOT-10 Software effectively supports operation of the Graphic Tablet in the vast majority of miniand major-computer environments.

#### ORDERING INFORMATION

(with Interface) 11 in x 11	in					. 5	\$3195
4954 Graphics Tablet (with Interface) 40 in x 30	in	•		•		. \$	\$5295
Cursor (119-0622-00)			•				. \$235



### RS-232-C Compatible 200,000 Characters of Storage

The 4923 Digital Cartridge Tape Recorder is the perfect step up in storage to team up with our 4010 family of terminals, or any system using an RS-232-C interface. Each tape cartridge can hold 200,000 characters in high-density storage. Each data file has a variable number of formatted records.

This is the perfect medium for local program storage, and a means to get better mileage out of your system — previewing and editing data before you go to the central processor.

Use the 4923 on audit trail to record all the data coming in from the central processor and terminal, or from our graphics terminal/tablet system. All transactions become a matter of record, so you can debug and alter later, if it's necessary.

The standard model hooks up directly to the 4010-Series terminals through the terminal bus; Option 01 uses an RS-232-C Data Communications Interface. Our standard version operates at approx 10k baud, while Option 01 lets you select the baud rate, from 110 to 9600.

#### SPECIFICATIONS

Tape Length — 300 usable ft.

Storage Capacity — 200,000 bytes (nominal).

Characters/Record — 128 eight-bit bytes.

Recording Density - 1600 bpi.

Data Transfer Rate — Internal—48 kHz.

External—Standard, up to 10k baud. Option 01, 110 to 9600 baud selectable.

Data Format — 8-bit binary or 8-bit ASCII.

Data Integrity — Performs a read-after-read error check when an error is detected.

Number of Tracks — One effective data track.

Recording Format — NRZ two-track self-clocking.

Dimension — Width: 8.75 in; depth: 17.25 in; height: 6 in; weight: 17 lb.

Standard Accessory — One data cartridge.

#### ORDERING INFORMATION

4923 Digital Cartridge Tape Recorder \$1995
Option 01, RS-232-C Compatible............No charge



#### 611

High-Resolution Alphanumeric and Graphic Displays

Flicker-Free Bistable Storage Eliminates Costly Memory Devices Hard-Copy Compatible

**Remote Programming of Display Functions** 

The 611 Storage Display Unit provides stored displays of combined alphanumeric and graphic information from digital computers having D/A converters and from analog signal sources. The stored display eliminates the need for costly memory devices to refresh the display, and provides high information density with excellent resolution without flicker or drift. All 611 control functions (Erase, Write-Thru, Nonstore, and View) are remotely programmable.

#### DESIGN CHARACTERISTICS

The 611 uses an 11 in (diagonal measure) flat-faced storage tube. Resolution is 4000 characters, based on a 70 x 90 mil dot matrix; this is equivalent to 400 vertical by 300 horizontal (300 vertical by 400 horizontal for the 611-2) stored line pairs. Dot writing time is 5  $\mu s$  or less; erase time is 500 ms or less. Viewing time is 15 minutes without loss of resolution but may be extended to one hour.

Vertical and Horizontal Amplifiers — The deflection factor is 1 V full scale, either axis. Any of 9 adjustable initial beam positions can be selected by internal switches. Input R and C is 100 k $\Omega$  shunted by approx 70 pF.

**Z** Axis Amplifier — Input turn-on level (unblanked) is + 1 V; turn-off level (blanked) is + 0.5 V or less. Input R and C is the same as the Vertical and Horizontal amplifier.

Other Features — A busy signal is provided at the rear connector to inhibit external equipment (computer, etc) during the erase cycle.

Power Requirements — The 611 operates on 110 or 220 V ac (LO, MED, HI) 48 to 66 Hz, and requires 250 W at 115 V, 60 Hz.

**Included Accessories** — Program connector; connector cover, and maintenance manual.

#### **ORDERING INFORMATION**

611 Charana Diamlar Iluia

(Vertical Format)	-				•					. \$3950
611-2 Storage Dis	pla	ay	ι	Jn	it					
(Horizontal Forma	it)						•			. \$3950



#### 613

Bright Flicker-Free Viewing
Low Cost
Storage Economy
Hard-Copy Compatibility
Remote Programming of Display Functions

The 613 Storage Display Unit is a bright large screen data storage display unit which allows satisfactory viewing under high ambient light conditions. It is ideal for storing and presenting a substantial amount of data in a single display. The 613 provides greater stored display brightness of alphanumeric and graphic information from digital computers having D/A converters and from analog signal sources.

The TEKTRONIX 4631 Hard Copy Unit will copy the 613 Display Monitor.

#### DESIGN CHARACTERISTICS

The 613 uses an 11 in (diagonal measure) flat-faced crt, with resolution equivalent to 200 vertical by 266 horizontal line pairs. Viewing time is 15 minutes; longer viewing may require more than one erasure to clear previously stored data. Dot writing time is 5  $\mu$ s or less; erase time is 900 ms or less.

Vertical and Horizontal Amplifiers — The deflection factor is 1 V full scale, either axis. Any one of nine initial beam positions may be internally selected. Input R and C is 20  $k\Omega$  minimum, shunted by less than 60 pF.

Z Axis Amplifier — Beam turn-off (unblanked) level is + 1 V; beam turn-off (blanked) is + 0.5 V or less. Input R and C is 10 k $\Omega$  shunted by approx 50 pF. A TTL LO input circuit may be selected to turn on the crt writing beam.

Other Features — All 613 operating modes (Erase, View, Nonstore, Cursor) can be remotely controlled by applying the appropriate ground closures to the remote program connector. All control signal inputs are TTL compatible.

Power Requirements — The 613 operates on 110 or 220 V ac (LO, MED, HI), 48-66 Hz, and requires 180 W (max) at 115 V ac, 60 Hz.

#### ORDERING INFORMATION

613 Storage Displa (Horizontal Forma	-		٠		٠						\$31	95
613-1 Storage Disp (Vertical Format)		-				٠		·			\$31	95

# **Display Components**

For 30 years, Tektronix has evolved an oscillography and display technology that is second to none. This depth, and an ever-increasing sensitivity to OEM and end-user requirements, have resulted in the broadest and most useful display component product line available.

Seven instruments make it easier for you to optimally choose the right combination of screen size, resolution, storage capability and price. And these display units are complemented by a full line of cameras, filters, rack-mounting options, and other accessories.

#### OEM assistance . . . Call your nearest Tektronix Field Office

It can be difficult to specify and select the correct monitor for your system. That's why Tektronix is prepared to help you now—with applications assistance and technical information on displaying and recording any type of data; also on installing, and operating display monitors and Cameras—contact your nearest Tektronix Representative

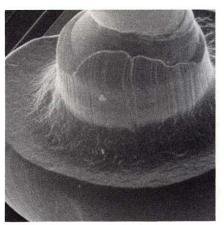
#### **Timely Sales and Ordering Information**

Call your nearest Tektronix Field Engineer (listing on pages 260-261). He is well prepared to discuss display and camera components and their accessories. He'll also advise you of OEM arrangements and quantity discounts.

#### After-sales Service

Tektronix' philosophy of technical excellence extends to after-sales service. Fifty Tektronix Service Centers across the country and around the world will keep your display instruments operating up to spec. Technicians are well-versed on monitor documentation and use the latest test equipment and test fixtures designed specifically to facilitate repair or calibration of each TEKTRONIX Display Monitor type.







		603 BISTABLE STORAGE	607 PERSISTENCE STORAGE
CRT	Spot Size	0.25 mm at 0.5 µ A	0.25 mm at 0.5 μA
• • • • • • • • • • • • • • • • • • • •	Display Size	10.2 cm vertically, 12.7 cm horizontally	7.2 cm vertically; 9 cm horizontally
	Phosphor (Standard)	P1	P31
	Cathode Ray Tube	6-1/2 in, flat faced	5 in, flat faced
	Graticule (Standard)	No graticule	No graticule
	Display Linearity	The voltage required to produce a 2.5 cm deflection from any point on the crt will not vary more than 5%.	The voltage required to produce a 1.8 cm deflection from any point on the crt will not vary more than 5%
	Acceleration Potential	3.5 kV	12 kV
STORAGE	Type of Storage	Bistable	Variable Persistence
	Writing Speed	Standard: 20 div/ms Option 2: 200 div/ms	0.8 div/ µs, viewable for 1.0 minute
	Dot Writing Time	Standard: 4 µs Option 2: 0.5 µs	0.5 $\mu$ s, viewable for 15 seconds 1 $\mu$ s, viewable for 3 minutes
	Resolution Stored	Vertical: 80 line pairs Horizontal: 100 line pairs	18 dots/div
	Storage Rate	Standard: 200,000 dots/s Option: 1 million dots/s	1 million dots/s, viewable for 3 minutes
	Viewing Time	At least 1 hour — up to 10 hours with variable brightness control.	Greater than 5 min at reduced writing speed. Extended up to 10 times in the save mode.
	Erase Time	250 ms	500 ms
VERTICAL	Bandwidth	Dc to ≥2 MHz	Dc to ≥3 MHz
HORIZONTAL	Settling Time	$\leq$ 1 $\mu$ s from any point on the crt within 0.36 mm of final position.	$\leq$ 1 $\mu$ s from any point on the crt within 0.3 mm of final position.
AMPLIFICATION	Deflection Factor	Nominally 125 mV/div. Adjustable from < 0.05 to 1.25 V/div.	Nominally 125 mV/div. Adjustable from < 0.05 to 1.25 V/div.
	Input R and C	1 MΩ ±1% paralleled by less than 47 pF	1 MΩ ± 1% paralleled by less than 47 pF
	X-Y Phase Difference Maximum Input Voltage (non destructive)	< 1° to 500 kHz ± 100 V (dc + peak ac)	≤ 1° to 500 kHz ± 100 V (dc + peak ac)
	Linear Common-Mode Signal Range	± 3 V (nonattenuated), ± 15 V in 5X attenuator position.	± 3 V (nonattenuated), ± 15 V in 5X attenuated position.
	Common-Mode Rejection Ratio	≥100:1 to at least 100 kHz ≥50:1 to 100 kHz with 5X attenuator.	≥100:1 to at least 500 kHz. ≥40:1 to 500 kHz with 5X attenuator.
	Recommended Source Impedance	≤10 kΩ	≤10 k Ω
Z AXIS	Bandwidth	Dc to ≥5 MHz	Dc to ≥ 5 MHz
	Rise Time	≤ 70 ns	≤ 70 ns
AMPLIFIER	Linear Common-Mode Signal Range	± 5 V	± 5 V
	Common-Mode Rejection Ratio	≤ 100:1 to 100 kHz	≤100:1 to 100 kHz
	Input R and C	1 M Ω < 47 pF	1 MΩ < 47 pF
	Input Sensitivity Range	Adjustable from 0-1 to 0-5 V	Adjustable from 0-1 to 0-5 V
	Recommended Source Impedance	≤ 10 k Ω	≤10 kΩ
OTHER CHARACTERISTICS	Power Requirements	Nominal line voltages are 100, 110, 120, 200, 220, or 240 internally selectable. 48 to 440 Hz 75 W max at nominal line voltage.	Nominal line voltages are 100, 110, 120, 200, 220, or 240 internally selectable. 48 to 440 Hz 53 W max at nominal line voltage.
	Temperature Range for Electrical Specifications	0°C to + 50°C	0°C to + 50°C
	Finish	Blue vinyl painted cabinet, aluminum construction.	Blue vinyl painted cabinet, aluminum construction
	Dimensions	Dimensions         Cabinet in cm in cm in cm           Height         6.65 16.9 5.25 13.3           Width         8.4 21.3 8.4 21.3           Length         19.25 48.9 19.0 48.3           Weight         (Approx)         Ib kg           Net         17.5 7.9 17.5 7.9           Shipping         23.0 10.4 23.0 10.4	Dimensions         Cabinet in cm in cm         Rackmount in cm           Height         6.65 16.9 5.25 13.3           Width         8.4 21.3 8.4 21.3           Length         19.25 48.9 19.0 48.3           Weight         (Approx)         lb kg         lb kg           Net         17.5 7.9 17.5 7.9           Shipping         23.0 10.4 23.0 10.4
INCLUDED ACCESS	ORIES	External 25-pin program connector; connector cover; ruled clear external graticule; instruction manual.	Operator's manual; instruction manual; ruled 8 x 10 div clear external graticule; 25-pin connector connector cover, smoke gray filter.
OPTIONS		01—Internal graticule 02—Fast writing speed crt 03—without handle and feet 04—Time base 06—UL listed 07—without handle, feet and all dust covers	01—Internal graticule 03—without handle and feet 04—Time base 06—UL listed 07—without handle, feet and all dust covers
	MERAS		

	606 HIGH RESOLUTION	604 LOW COST	602 8 MIL SPOT SIZE
	0.13 mm at 0.1 $\mu$ A	0.36 mm at 0.5 µA	0.20 mm at 0.5 μA
	8 cm vertically; 10 cm horizontally	10.2 cm vertically; 12.7 horizontally	8 cm vertically, 10 cm horizontally
	P31	P31	P31
	5 in, flat faced	6-1/2 in, flat faced	5 in, flat faced
	No graticule	Internal, parallax free, nonilluminated, 8 x 10 divisions	Internal, parallax free, variable illumination. 8 x 10 divisions
	The voltage required to produce a 2 cm deflection from any point on the crt will not vary more than 5%.	The voltage required to produce a 2.5 cm deflection from any point on the crt will not vary more than 5%.	The voltage required to produce a 2 cm deflection at any point on the crt will not vary more than 2% in the vertical direction and 6% in the horizontal direction.
	5.6 kV	3.5 kV	4 kV
	NON-STORAGE MONITOR	NON-STORAGE MONITOR	NON-STORAGE MONITOR
	Dc to ≥ 3 MHz	Dc to ≥2 MHz	Dc to ≥1 MHz
	$\le 0.5~\mu s$ from any point on the crt to within 0.25 mm of final position.	$\leq$ 1 $\mu$ s from any point on the crt to within 0.36 mm of final position.	$\leq 1\mu s$ from any point on the crt to within 0.20 mm of final position.
	Nominally 125 mV/div. Adjustable from < 0.05 to 1.25 V/div.	Nominally 125 mV/div. Adjustable from - 0.05 to 1.25 V/div.	Nominally 100 mV/div. Adjustable from .09 to .135 V/div.
	1 M $\Omega$ ± 1% paralleled by less than 47 pF	1 M $\Omega$ ± 1% paralleled by less than 47 pF	100 k $\Omega$ ± 10% paralleled by less than 30 pF
	≤ 1° to 500 kHz	≤ 1° to 500 kHz	≤1° to 1 MHz
	± 100 V (dc + peak ac)	± 100 V (dc + peak ac)	± 10 V (dc + peak ac)
	± 3 V (nonattenuated), ± 15 V in 5X attenuated position.	± 3 V (nonattenuated), ± 15 V in 5X attenuated position.	Not Applicable
	≥100:1 to at least 500 kHz ≥40:1 to 500 kHz with 5X attenuator	≥ 100:1 to at least 100 kHz ≥ 50:1 to 100 kHz with 5X attenuator	Not Applicable
	≤10 k Ω	≤ 10 k Ω	≤1 kΩ
	Dc to ≥10 MHz	Dc to ≥ 5 MHz	Dc to ≥1 MHz
	≤ 35 ns	≤70 ns	<200 ns
	± 5 V	±5 V	Not Applicable
	≤ 100:1 to 500 kHz	≥100:1 to 100 kHz	Not Applicable
	1 MΩ < 47 pF	1 MΩ < 47 pF	100 kΩ < 70 pF
	Adjustable from 0-1 to 0-5 V	Adjustable from 0-1 to 0-5 V	0-1 V
	≤10 k Ω	≤ 10 kΩ	≤1 kΩ
	Nominal line voltages are 100, 110, 120, 200, 220, or 240 internally selectable. 48 to 440 Hz 75 W max at nominal line voltage.	Nominal line voltages are 100, 110, 120, 200, 220, or 240 internally selectable. 48 to 440 Hz 56 W max at nominal line voltage.	90 to 136 V ac, or 180 to 270 V ac, 48 to 440 Hz 50 W at 115 V ac, 60 Hz. Rear Panel Selector provides for 6 line-voltage ranges.
	0°C to + 50°C	0°C to + 50°C	0°C to + 50°C
	Blue vinyl painted cabinet, aluminum construction.	Blue vinyl painted cabinet, aluminum construction.	Blue vinyl painted cabinet, aluminum construction.
	Dimensions         Cabinet in cm cm         Rackmount in cm           Height         6.65 16.9 5.25 13.3           Width         8.4 21.3 8.4 21.3           Length         19.25 48.9 19.0 48.3           Weight (Approx)         Ib kg Ib kg           Net         17.5 7.9 17.5 7.9           Shipping         23.0 10.4 23.0 10.4	Dimemsions         Cabinet in cm cm in cm         Rackmount in cm           Height         6.65 16.9 5.25 13.3         3.4 21.3           Width         8.4 21.3 8.4 21.3         8.4 21.3           Length         19.25 48.9 19.0 48.3         48.3           Weight (Approx)         Ib kg Ib kg         Net           Net         17.5 7.9 17.5 7.9         7.9 5.9           Shipping         23.0 10.4 23.0 10.4         23.0 10.4	Dimensions Cabinet in cm  Height 6.5 16.5 Width 8.5 21.6 Length 17.38 44.2 Weight (Approx) Ib kg Net 17.5 7.9 Shipping 22.0 10.0
	External 8 x 10 cm graticule instruction manual; operator's manual.	External 25-pin program connector; connector cover; instruction manual.	Smoke gray filter; instruction manual.
	01—Internal graticule 03—without handle and feet 04—Time base 05—Vector display graticule 06—UL listed 07—without handle, feet and all dust covers	01—without graticule 03—without handle and feet 04—Time base 05—Vector display graticule (P31 phosphor only) 06—UL listed 07—without handle , feet and all dust covers	01—without cabinet 02—without graticule 05—Vector display graticule (P31 phosphor only) 07—without handle, feet and all dust covers
	C-30AP, C-5A, C-5A Opt 1	C-59P , C-5A, C-5A Opt 1	C30AP, C-5A, C-5A Opt 1
_			

#### 50-minute storage

Less deterioration of stored image than any other variable persistence monitor

#### Adjustable persistence

#### Remotely programmable storage functions

The TEKTRONIX 607 Variable Persistence Storage Display Monitor produces detailed images that may be stored up to 50 minutes, with less deterioration than any other variable persistence monitor. Display persistence is adjustable to allow the image to fade at a rate consistent with the event being monitored. The TEKTRONIX 607 writes at  $0.8 \text{ div}/\mu\text{s}$ ; X- and Y-axis bandwidth is 3 MHz and Z-axis bandwidth is 5 MHz. It features excellent gray scale capability and a 20 mil-(.51 mm) stored, and 12 mil-(.30mm) nonstored spot size, measured by the shrinking raster method. Differential inputs are standard; erase, non-store, and save-storage functions may be programmed remotely at TTL logic levels. The 607 may be ordered with a time base option that adds amplitudeversus-time measurement capability.

The 607 is an ideal display component where excellent gray scale, resolution and contrast are needed. For instance, in scanning Auger microprobe (SAM) applications where nondestructive analysis of semiconductor, metal or insulator surfaces is performed, the TEKTRONIX 607 is utilized as a preview monitor, while a companion TEKTRONIX 606 and camera are used for photography. Typically, the SAM operator will examine an image on the 607 for impurities or inappropriate elements on, for example, a semiconductor surface. If he suspects a problem, the high resolution TEKTRONIX 606 is used to photograph the area of concern for more exhaustive study. The TEKTRONIX 607 Display Component is especially applicable where display of several recurrences of a transient event, or capture and storage of single-shot events are required. This variable persistence monitor also accommodates display of repetitive phenomena where the persistence is adjusted to let the image fade immediately before the signal is repeated. This is required in applications such as engine analysis, spectrum analysis and radar/sonar displays.

#### SPECIFICATIONS

#### CRT DISPLAY AND STORAGE

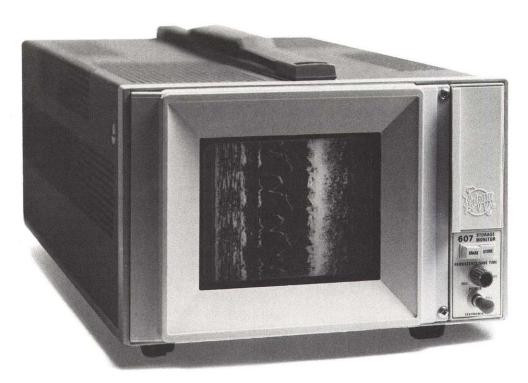
Variable Persistence Storage Crt—5-inch, flat-faced rectangular tube with P31 phosphor. 12 kV accelerating potential.

Display Size—8 divisions vertically, 10 divisions horizontally at 0.9 cm/div.

Graticule—Standard graticule, external; internal 8 x 10-div graticule supplied as Option 01.

**Maximum Writing Speed**—At least .8 div/ $\mu$ s for 1 minute viewing time.

Stored Dot Writing Time—A stationary dot written in 500 ns or less can be viewed for at least 15 seconds. With a black background, a stationary dot written in 1  $\mu$ s or less can be viewed for at least 3 minutes. (Measured within a 6 x 8 div quality area.)



Storage View Time—Greater than 3 minutes at reduced writing speed.

Save Time—Viewing time is extended to over 50 minutes.

Halftone Resolution-At least 18 dots/div.

Halftone Luminance-At least 200 fL.

Erase Time—Approximately 500 ms.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

 $\bf Bandwidth{\longrightarrow} {\rm Dc}$  to 3 MHz at 3 dB down (80% full screen scan).

Polarity—Positive signal to both + inputs moves beam up and to the right.

**Deflection Factor—Nominally 1 V full scale.** Internally adjustable from 0.5 V to 2.5 V full scale. Internal 5:1 attenuator extends deflection factor range to 12.5 V full scale.

Input R and C—1M  $\Omega$  paralleled by less than 47 pF. X-Y Phase Difference—Not more than 1° to 500 kHz.

Beam Position—Front-panel position control allows setting zero-signal position to any point on screen. Position shift is 0.09 cm/hr or less after 20 minute warm-up.

Settling Time—Typically 1.0  $\mu s$  to settle within 1 spot diameter.

Maximum Input Voltage— $\pm 100$  V (dc plus peak ac).

Linear Common-Mode Signal Range— $\pm 3$  V (without attenuators;  $\pm 15$  V with 5X attenuators.

Common-Mode Rejection Ratio—At least 100:1 to at least 500 kHz, 40:1 to 500 kHz with 5X attenuators. Recommended Source Impedance—10  $k\Omega$  or less.

Optional Horizontal Time Base—1  $\mu$ s/div to 0.1 s/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated continuously variable between steps and to approximately 1 s/div, TRIG SLOPE/LEVEL control for stable, triggered displays. For nontriggered display, an internal switch selects bright base line or no sweep.

#### Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam. Display intensity increases with positive inputs.

Bandwidth—Dc to 5 MHz (-3 dB). Sensitivity adjustable from 1 V to 5 V for full intensity control.

Differential Input—Cmrr at least 100:1 to 100 kHz up

Input R and C—1M  $\Omega$  paralleled by less than 47 pF. Maximum Input Voltage— $\pm 100$  V (dc plus peak ac).

#### OTHER CHARACTERISTICS

#### Remote Program Connector—

Inputs—Provides direct connections at the + X-(horizontal), + Y-(vertical), and + Z-axis amplifiers.

The erase, non-store and save-storage functions can be controlled remotely with TTL compatible signals.

Outputs—Erase interval—TTL Compatible. Logic low is 0.4 V or less. Logic high is 2.5 V or more. Will drive 10 unit loads.

Power Requirements—Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 volts ( $\pm$ 10% on each range), and 50 to 60 Hz. Power consumption is 40 watts maximum at nominal line voltage.

Ambient Temperature Limits— $0^{\circ}$ C to  $50^{\circ}$ C operating;  $-40^{\circ}$ C to  $+70^{\circ}$ C nonoperating.

Dimensions	Ca	oinet			
	cm	in			
Height	16.9	6.65			
Width	21.4	8.4			
Length, overall	51.9	20.4			
Weights (Approx)	kg	lb			
Net	7.7	17.0			
Shipping Weight	≈9.9	≈22.0			

Included Accessories—External graticule (331-0391-00); external program connector (131-0570-00); connector cover (200-0281-00).

#### ORDERING INFORMATION

607 X-Y	Display Monitor\$1800
Option 01	Internal Graticule No Charge
Option 03	Without Handle and FeetSub \$10
	(Not available with Option 07)
Ontion 04	Time Base Add \$150

See page 226 for information on Cameras, page 222 for crt light filters and page 224 for rackmounting.

5-mil or smaller spot size at  $0.1\mu A$  beam current

Light output uniform across crt Ideal for photography

10 MHz linear Z-axis bandwidth

An excellent choice for crisp photographs and well-defined displays, the new TEK-TRONIX 606 is a very high resolution X-Y Display Monitor. Spot size is 5 mils (.13mm), measured at  $0.1 \mu A$  beam current and by the shrinking raster method; light output is uniform over the entire crt. The linear Z-axis amplifier, with 10 MHz bandwidth, allows the many shades of gray necessary for an accurate image.

The high resolution of the 606 is most useful in applications such as scanning Auger and electron microscopes, ultrasound systems, and gamma camera systems. In medical gamma camera operation, the TEKTRONIX 606 displays the emission of injected radioactive fluid as it moves through and collects in areas of a patient's body. The high resolution of the 606 is well-suited to displaying the tiny dot-like bursts of light that a TEKTRONIX Camera with open shutter integrates onto film. The resulting sharp photo aids the doctor in analysis and diagnosis.

The TEKTRONIX 606 Display Component is also useful where several concurrent waveforms must be displayed, yet resolution maintained. For instance, in an ultrasound application (photo above) the brightness of the 606 results in four high resolution waveforms; the first and third convey tissue density information; the second provides a centimeter scale to measure against; and the bottom waveform imparts time gain curve (TGC) data from which the operator visually sets the ultrasound system gain characteristics.

#### SPECIFICATIONS CRT DISPLAY

Cathode-Ray Tube—5-inch flat-faced rectangular crt with P31 phosphor. P7 and P11 phosphor optional.

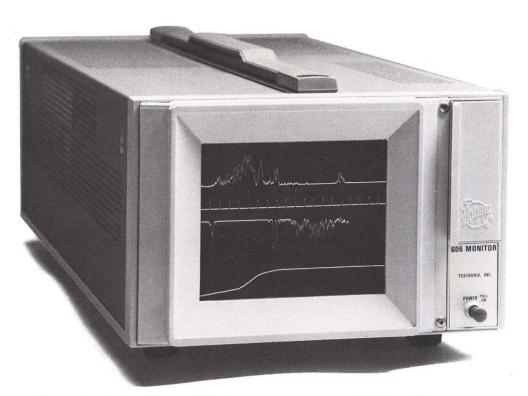
Display Size-8 cm vertically, 10 cm horizontally.

 $\mbox{\bf Graticule}\mbox{\bf —External 8}$  x 10 cm graticule included as accessory. Internal 8 x 10 cm graticule supplied as Option 01.

**Display Linearity**—The voltage required to produce a 2-cm deflection at any point on the crt will not vary more than 5%.

Center Screen Spot Diameter—(Measured with shrinking raster method.) 0.005 inch or less at  $0.1\mu A$  beam current, 0.007 inch or less at  $5\mu A$  beam current.

Acceleration Potential-5.6 kV.



#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth—Dc to 3 MHz at 3-dB down (80% full screen scan).

**Polarity**—Positive signal to both + inputs moves the beam up and to the right.

**Deflection Factor—**Vertical and horizontal: Nominally set for IV full scale. Internally adjustable from .5 to 2.5 V full scale. 5:1 fixed internal attenuator extends range to at least 12.5 full scale.

Input R and C—1 M $\Omega$  +1%, paralleled by less than 47 pF.

X-Y Phase Difference—Not more than 1° to at least 500 kHz.

Beam Position—Front panel position controls permit setting spot to any point on screen without input signal. Position shift is 0.1 cm or less per hour after 20-min warm-up with cabinet covers in place. Less than 0.2 cm in 24 hours.

 $\textbf{Maximum Input Voltage} \underline{\hspace{0.1cm}} \pm 100 \text{ V dc plus peak ac.}$ 

Linear Common-Mode Signal Range— $\pm 3$  V (without attenuators):  $\pm 15$  V with 5X attenuators.

Common-Mode Rejection Ratio—At least 100:1 to at least 500 kHz, 40:1 to 500 kHz with 5X attenuator.

Recommended Source Impedance—10 k $\Omega$  or less.

Optional Horizontal Time Base—1  $\mu$ s/div to 0.1 s/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approximately 1 s/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For non-triggered operation, an internal switch selects bright base line or no sweep.

#### Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

**Bandwidth**—DC to 10 MHz (-3 dB). Sensitivity range adjustable from 0 to 1 V to 0 to 5 V for full intensity control.

Differential Input—Cmrr at least 100:1 to 500 kHz up to 5 V p-p.

Input R and C—1  $M\Omega$  ±1% paralleled by less than 47 pF.

Maximum Input Voltage—±100 V dc plus peak ac.

#### OTHER CHARACTERISTICS

Power Requirements—Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V ( $\pm 10\%$  on each range), 50 to 60 Hz and 400 Hz, 75 watts maximum at nominal line voltage.

Dimensions	Cabinet							
	cm	in						
Height	16.9	6.65						
Width	21.4	8.4						
Length, overall	51.9	20.4						
Weights (Approx)	kg	lb						
Net	7.7	17.0						
Shipping Weight	≃9.9	≃22.0						

Included Standard Accessories—External graticule (337-1674-10).

#### ORDERING INFORMATION

606 Disp	lay Monitor \$1425
Option 01	Internal Graticule No Charge
Option 03	Without Handle and FeetSub \$10
	(Not available with Option 07)
Option 04	Time Base
Option 06	UL ListedAdd \$50
Option 07	Without Handle, Feet and All Dust Covers (not available with Option 03) Sub \$20
Option 76	P7 Phosphor
Ontion 79	D11 Phoenhor No Charge

See page 226 for information on cameras, page 222 for crt light filters, and page 224 for rackmounting.

Large 10.2 x 12.7 cm (6½-inch diagonal crt)
X-Y phase difference within 1° to 500 kHz

#### Time base option

Priced under \$1000, the TEKTRONIX 604 Display Monitor is an excellent choice for cost-sensitive applications. Its 10.2 x 12.7 cm view area, and 5 MHz Z-axis bandwidth result in an easy-to-view display and a versatile instrument.

In medical diagnostic ultrasound applications, the 604 displays an A-scan waveform that shows the depth of tissue density changes. The screen is calibrated, so that the waveform on the TEKTRONIX 604 can be matched to the scan to determine the precise distances and movements of the organs.

The 604 may also be switched to display a cross-sectional B-scan waveform. Ultrasound is typical of numerous applications where a low cost display component with a large screen is required—the 604 is an apt choice for such system installations.



Cathode Ray Tube—6½-in flat-faced rectangular crt with P31 phosphor.

Display Size—Internal parallax-free nonilluminated graticule marked in 8 vertical and 10 horizontal div (1.27 cm/div). Option 1 is without graticule.

Display Linearity—The voltage required to produce a 2.5 cm deflection at any point on the crt will not vary more than 5%.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

 ${\bf Bandwidth}{\longrightarrow}{\bf Dc}$  to 2 MHz at 3 dB down from 80% of full scan.

Deflection Factor—Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. Internal 5X attenuator extends deflection factor range to 12.5 V full scale.

Input R and C— 1 M $\Omega$   $\pm 1\%$  paralleled by less than 47 pF.

X-Y Phase Difference—Not more than 1° to at least 500 kHz.

Beam Position—Front panel position controls permit setting 0 signal position to any point on screen. Position shift is 1 mm/hr or less after 20 min warm up.

Max Input Voltage—±100 V (dc plus peak ac).

Linear Common-Mode Signal Range—  $\pm 3$  V,  $\pm 15$  V in 5X fixed attenuator position.



Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuator. Recommended Source Impedance— 10 k $\Omega$  or less.

Optional Horizontal Time Base— 1  $\mu$ s/div to 0.1 s/div in 6 calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 1 s/div. TRIG SLOPE/LEVEL control for stable triggered displays. For nontriggered operation, an internal switch selects bright baseline or no sweep.

#### Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

Bandwidth—Dc to 5 MHz over usable range. Sensitivity range is adjustable from 0 to +1 V to 0 to +5 V for full intensity control; 0 V input cuts off intensity.

Differential Input—Cmrr at least 100:1 and common-mode range at least  $\pm 5 \ \text{V}.$ 

Input R and C—1  $M\Omega$  ±1% paralleled by less than 47 pF.

Max Input Voltage— $\pm 100$  V (dc plus peak ac).

#### OTHER CHARACTERISTICS

Power Requirements—Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V ( $\pm$ 10% on each range), 50 to 60 Hz and 400 Hz, 56 W max at nominal line voltage.

Dimensions	Cabinet		Rackmount	
	cm	in	cm	in
Height	16.9	6.65	13.5	5.25
Width	21.4	8.4	21.4	8.4
Length	48.9	19.25	48.25	19.0
Weights (Approx)	kg	lb	kg	lb
Net	7.9	17.5	7.9	17.5
Shipping Weight	10.4	23.0	10.4	23.0

Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00).

#### ORDERING INFORMATION

604 Mon	itor
Option 01	Without GraticuleNo Charge
	Without Handle and FeetSub \$10 ble with Opt 07)
Option 04	Time Base
	Vector Display Graticule (P31 Phosphor
Option 06	U.L. Listed
	Without Handle, Feet, and All Dust Covers ble with Opt 03)Sub \$20
Option 76	P7 PhosphorNo Charge
Option 78	P11 Phosphor No Charge
	226 for information on cameras, page 224 bunting and tables below for crt light filters.

# **Light Filters/Graticules**

Monitor	Filters/Graticules	Part No.	Price
602	Smoke-Gray Filter*	378-0586-00	\$2.20
	Amber Filter for Opt. 76	378-0595-00	\$6.00
	Blue Filter	378-0845-00	\$1.90
	Graticule*	331-0406-00	\$4.25
	Clear Shield*	337-1017-00	\$6.25
603 and 604	Clear Filter for 604*	337-1440-00	\$1.50
	Green Filter for 603*	337-1440-01	\$1.50
	Amber Filter for Opt. 76	337-1440-02	\$1.50
	Blue Filter	337-1440-03	\$1.50
	Gray Filter	337-1440-04	\$1.50
	Graticule*	331-0303-00	\$3.30

Monitor	Filters/Graticules	Part No.	Price
605 and 607	Blue Filter	337-1674-00	\$2.15
	Amber Filter	337-1674-05	\$2.50
	Smoke-Gray Filter*	337-1674-06	\$2.15
	Graticule*	331-0391-00	\$3.90
606	Smoke-Gray Filter	337-1674-06	\$2.15
	Blue Filter	337-1674-11	\$2.40
	Amber Filter	337-1674-12	\$3.15
	Graticule*	337-1674-10	\$2.50
	Clear Shield*	337-1674-13	\$2.50

<sup>\*</sup>Shipped on or with the standard instrument.

#### 10-Hour Storage

1 million dot/second stored writing speed

#### Large 10.2 cm x 12.7 cm viewing area

#### Stored or nonstored display

The 603 utilizes a Tektronix-developed bistable storage crt that makes refreshing of the display and associated costly memory devices unnecessary. Image brightness may be adjusted to extend storage time to ten hours. Erase and store commands are remotely programmable and are accessable together with +X, +Y, and +Z inputs through a 25-pin connector on the rear panel.

The TEKTRONIX 603 Bistable Storage Monitor assists in analysis and documentation of changing mechanical, electrical or biological phenomena. The 603 is indispensable for direct comparison of successive images. In a dental application, for example, a kinesiograph monitors bite position or jaw movement producing a series of stored displays on the 603. These waveforms help the dental specialist in diagnosis, or confirming success of a treatment.

The TEKTRONIX 603 also functions as a preview monitor. Information can be stored and studied before taking a photograph; or when many repetitions of an event are performed, each may be stored and scrutinized before deciding to photograph, eliminating the need to record every occurrence.

#### CRT DISPLAY AND STORAGE

Cathode Ray Tube—6½-in flat-faced, bistable storage tube. Phosphor is similar to P1. 3.5 kV accelerating potential. Two storage tubes are available (standard crt for brighter stored display or Option 02 for a faster writing speed at lower stored brightness). When used in the nonstore mode, both tubes exhibit characteristics of a conventional crt.

Writing Speed—Standard crt, at least 20 div/ms; Option 02, at least 200 div/ms.

Dot Writing Time —Time required to write (store) one dot: standard crt, 4  $\mu s$  or less; Option 02 crt, 0.5  $\mu s$  or less.

Information Storage Rate—Standard crt, at least 200,000 dots/s; Option 02 crt, at least 1 million dots/s.

Display Size  $\longrightarrow$  10.2 cm vertically, 12.7 cm horizontally. An internal nonilluminated graticule (8 x 10 div, 1.27 cm/div) is available as Option 01.

Resolution—Stored, equivalent to 80 vertical x 100 horizontal stored line pairs. Nonstored, equivalent to 128 vertical x 160 horizontal line pairs.

**Display Linearity**—The voltage required to produce a 1-in deflection from point on the crt will not vary more than 5%.

Viewing Time—At least 1 hr at normal intensity without loss of resolution. Viewing time can be extended to 10 hr with the variable brightness

Erase Time—Approx. 250 ms.



#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth—Dc to 2 MHz at 3 dB down from 80% of full scan

**Deflection Factor**—Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. Internal 5X attenuator extends deflection factor range to 12.5 V full scale.

Input R and C—1 M $\Omega$  ±1% paralleled by less than 47 pF.

X-Y Phase Difference—1° or less to at least 500 kHz. Beam Position—Front-panel position controls permit setting 0 signal position to any point on screen. Position shift is 1 mm/hr or less after 20-min warm-up.

Settling Time—0.2  $\mu s$  or less for distances of 1 div or less. 1  $\mu s$  or less from any point on the crt to within 1 spot diameter of final position.

Max Input Voltage— $\pm$  100 V dc plus peak ac.

Linear Common-Mode Signal Range— $\pm 3\,$  V,  $\pm 15\,$  V in 5X fixed attenuator position.

Common-Mode Rejection Ratio—At least 100:1 to at least 100 kHz, 50:1 to 100 kHz with 5X attenuator. Recommended Source Impedance— 10  $k\Omega$  or less.

Optional Horizontal Time Base—1  $\mu$ s/div to 0.1 s/div in 6 calibrated steps (decade sequence), accurate within 3%. Uncalibrated continuously variable between steps and to approx 1s/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For nontriggered operation, an internal switch selects bright baseline or no sweep.

#### Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam in nonstored mode. Positive input to + input increases the display intensity. To insure storage of each written dot, the Z-axis on-time should be at least  $4\mu s$  with the standard crt and at least  $0.5~\mu s$  with the Option 2 crt. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

**Bandwidth**—Dc to 5 MHz over usable range. Sensitivity range is adjustable from 0 to +1 V to 0 to +5 V for full intensity control; 0 V input cuts off intensity.

Differential Input—Cmrr at least 100:1 and common-mode range at least  $\pm 5 \text{ V}.$ 

Input R and C—1M $\Omega$  ±1% paralleled by less than 47 pF.

Max Input Voltage-±100 V (dc plus peak ac).

#### OTHER CHARACTERISTICS

Power Requirements—Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V (±10% on each range), 50 to 60 Hz and 400 Hz. 75 W max at nominal line voltage.

Cabinet		Rackmount	
cm	, in	cm	in
16.9	6.65	13.5	5.25
21.4	8.4	21.4	8.4
48.9	19.25	48.25	19.0
kg	lb	kg	lb
7.9	17.5	7.9	17.5
10.4	23.0	10.4	23.0
	cm 16.9 21.4 48.9 <b>kg</b> 7.9	cm in 16.9 6.65 21.4 8.4 48.9 19.25 kg lb 7.9 17.5	cm         in         cm           16.9         6.65         13.5           21.4         8.4         21.4           48.9         19.25         48.25           kg         lb         kg           7.9         17.5         7.9

Included Accessories—External program connector (131-0570-00); connector cover (200-0821-00); external graticule (331-0303-00).

#### ORDERING INFORMATION

	OTTO ETTILIS TO THE OTTO TO THE
603 Stor	age Monitor\$1400
Option 01	Internal GraticuleNo Charge
Option 02	Fast Writing Speed Crt Add \$35
Option 03	Without Handle and FeetSub \$10 (not available with Opt 01)
Option 04	Time Base
Option 06	U.L. Listed
	Without Handle, Feet, and All Dust Cov- vailable with Opt 03)Sub \$20

See pages 226 for information on cameras, page 222 for crt light filters, and page 224 for rackmounting.

# High resolution—an excellent value X-Y phase difference within 1° to 1 MHz 1 MHz X and Y Bandwidth

The TEKTRONIX 602 is a prime value. Its 8-mil (.20mm) spot size will satisfy many applications requiring high resolution (spot size measured at .5 µA beam current and by shrinking raster method). A linear Z-axis amplifier permits precise intensity modulation of the writing beam. The 602 display area measures 8 x 10 cm, but the entire monitor is just 16.5 x 21.6 x 44.2 cm.

Its performance features, size, and low cost make the 602 an excellent choice for graphic, alphanumeric, and vector display applications. For instance, the 602 is sold with an optional vector display graticule; when used with a TEKTRONIX 650 Color Monitor in video tape recorder systems, it provides an exceptionally accurate vector display.

The phase and amplitude of a tv signal's color components, as referenced to a standard color burst signal, are aligned to where vector peaks line up with designated points on the vector graticule. The result is precise color. The 602 Monitor's stability contributes to an accurate color separation display.

#### CRT DISPLAY

Cathode Ray Tube-5-in flat-faced rectangular crt with P31 phosphor.

Display Size-8 cm vertically and 10 cm horizontally. Graticule-Standard graticule: internal, parallax-free, variable illumination supplied with standard 602, as shown above. Optional graticule: internal 8 x 10 cm outline (no graticule lines) supplied with Option 02. Trace Width-Max trace width within the 8 x 10 cm

display area is 14 mils at 0.5 µA beam current (typically less than 10 mils).

Display Linearity—The voltage required to produce a 2 cm deflection at any point on the crt will not vary more than 2% in the vertical direction and 6% in the horizontal direction.

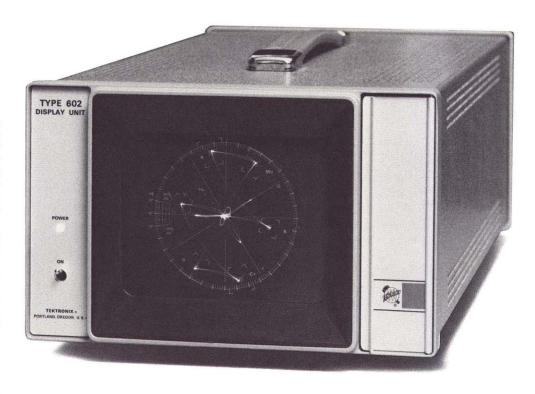
#### VERTICAL AND HORIZONTAL AMPLIFIERS

The X (horizontal) and Y (vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

Bandwidth-DC to 1 MHz at 3 dB down.

Deflection Factor-Vertical: 90 mV/cm to 135 mV/ internally variable. Horizontal: 90 mV/cm to 110mV/cm, internally variable.

Phase Difference-Not more than 1° between X and Y amplifiers up to 1 MHz.



Beam Position-Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/hr after 20 min warm up.

Polarity-Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C-100 k $\Omega$  ±10% paralleled by 30 pF

Max Input Voltage—± 10 V (dc and peak ac). Recommended Source Impedance—1  $k\Omega$  or less.

#### Z-AXIS AMPLIFIER

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: dc to 1 MHz over 0.0 V to +1 V range. Signal input is a BNC connector on the rear panel.

Input R and C—100 k $\Omega$   $\pm$ 10% paralleled by 70 pF or

Max Input Voltage-+10 V (dc plus peak ac). Recommended Source Impedance—1  $k\Omega$  or less.

#### OTHER CHARACTERISTICS

Power Requirements-90 to 136 V ac, or 180 to 272 V ac, 48 to 440 Hz. 50 W at 115 V ac, 60 Hz. Rearpanel selector provides rapid accommodation for 6 line-voltage ranges.

Temperature-Electrical specifications are valid over the range of 0°C to +50°C ambient.

Finish-Blue vinyl painted cabinet, aluminum construction.

Dimensions	Cabinet		
	cm	in	
Height	15.3	6	
Width	21.6	81/2	
Length	44.1	173/8	
Weights (approx)	kg	lb	
Net Weight	7.9	171/2	
Shipping Weight	≈9.9	≈22	

Included Accessories-Smoke-gray filter.

#### ORDERING INFORMATION

602 Disp	lay Unit \$1150
Option 01	
Option 02	Without graticuleNo Charge
	Vector Display Graticule (P-31 Phosphor
Option 76	P7 Phosphor
Option 78	P11 PhosphorNo Charge

See page 226 for information on cameras, page 222 for crt light filters, and below for rackmount/conversion information.

#### Rackmounts / Conversions

**Backmounting For 602** 51/4-inch Rack Adapter-Two 602s may be mounted Order 016-0115-02 .....\$155 Blank Panel-For covering half of 016-0115-02 Rack Adapter when only one 602 is used. Order 016-0116-00 .....\$22

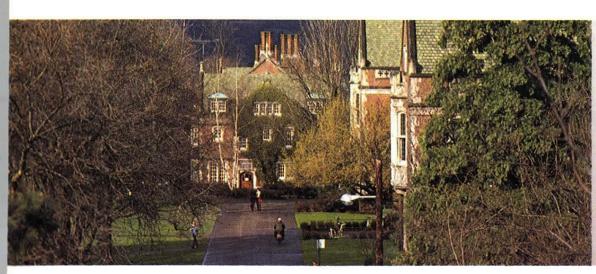
Rackmounting For 603, 604, 605, 606 and 607 Cabinet-to-Rackmount Conversion, equipped slide-out assembly, to rackmount any TEKTRONIX Display Monitor (except 602) with Option 03 in a standard 19-inch rack. This includes securing hardware and a blank front panel. Order 040-0601-00 .....\$112

Cabinet-to-Rackmount Conversion, equipped with slide-out assembly, to rackmount any two TEK-TRONIX Display Monitors (except 602) with Option 03, side-by-side in a standard rack width. Order 040-0600-00 .....\$80

Rackmount-to-Cabinet Conversion, required to convert a rackmount 603, 604, 605, 606 or 607 to a cabinet style. Order 040-0602-00 .....\$65

Cabinet-to-Rackmount Conversion, equipped with slide-out assembly, required to rackmount a TM503 modular test system and a 603, 604, 605, 606 or 607 in a standard 19-inch rack. Order 040-0624-00 .....\$65



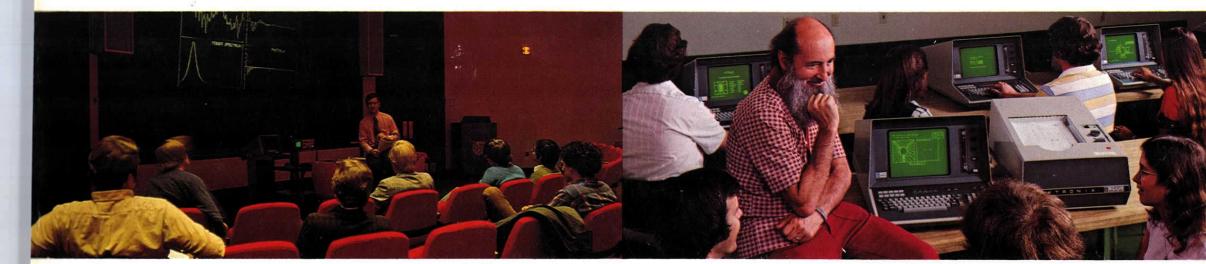




TM 500 compactness and versatility mean fast focus on the problem to be solved



Microprocessor Labs provide software and hardware development support for the design of microprocessor-based products

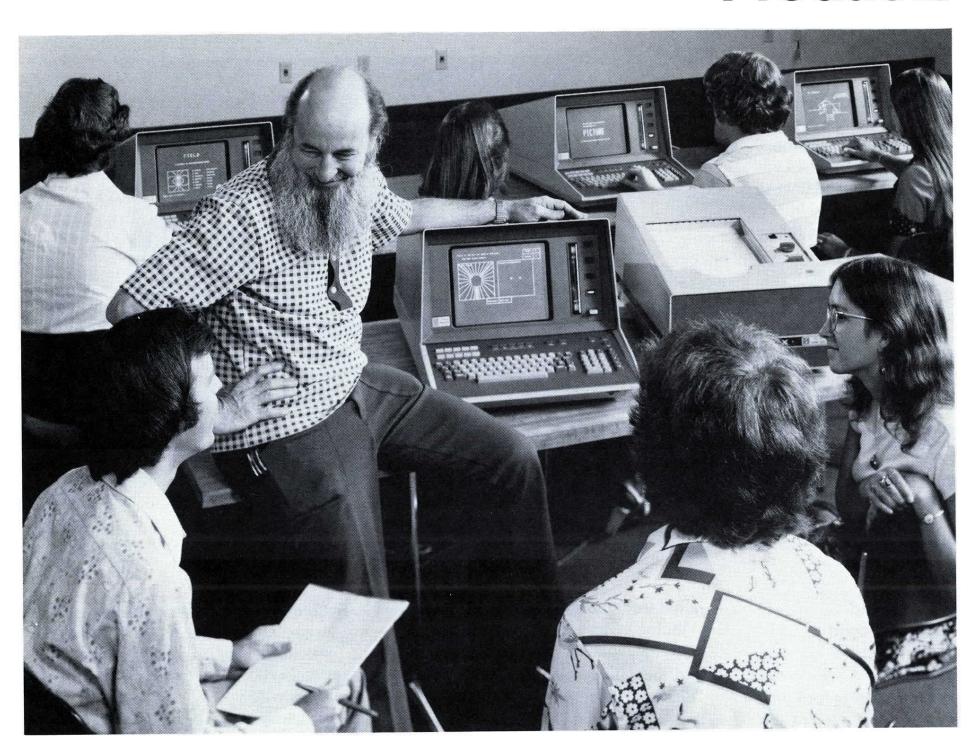


Computer graphics help provide special insight into abstract problems



The 851 Digital Tester can help cut soaring field service costs that sap profits

# Information Display Group Products



Today, scores of applications within government, industry and education, rely on Computer Graphics to find oil, fight disease, forecast budgets, stimulate education, plan cities, design circuits, unsnarl traffic—to instantly interpret complex ideas. Everything expressed in Graphics is better understood and more effectively communicated.

As the world's Graphics leader, Tektronix can give your communications a dimension you've been missing. With high resolution graphics terminals. Desktop computing calculators. And complete graphic systems. All supported by peripheral devices, proven software, wideranging sales and service — and a worldwide reputation for quality and dependability.

For additional product information and details on interface, software, and accessory support, please indicate your interest on the postcard at the back of the catalog.

# 4025 Computer Display Terminal

From Alphanumerics to Graphics. Now your terminals can keep pace with your needs.

The 4025 takes you beyond alphanumerics. When you're ready to go beyond data entry and editing, the 4025 is the terminal that can take you there. The 4025 gives you the unique ability to expand your terminal from basic alphanumerics, to forms ruling and then into graphics. No other terminal has such versatility. With all its options, the 4025 provides unmatched report generation capability.

# **4025 Specifications**

# Display mechanism:

Display type — Video monitor Screen size — 30 cm (12 in) diagonal Usable display area — 16.2 cm x 21.6 cm (6.4 in. x 9 in.)

Phosphor type — P39 green phosphor Video bandwidth — 20 MHz

Raster lines — Standard 525 line scan, with 480 lines displayed.

Scan - 30 Hz

Refresh rate:

Dot— 30 times/second Frame— 30 times/second

Field — 60 times/second

# Display characteristics:

Cursor type — Wide underscore Character size — 7 x 9 in a 8 x 14 dot matrix

(Graphics cells are 8 x 14 matrix) Character sets:

Standard — 64/96 upper and lower case ASCII.

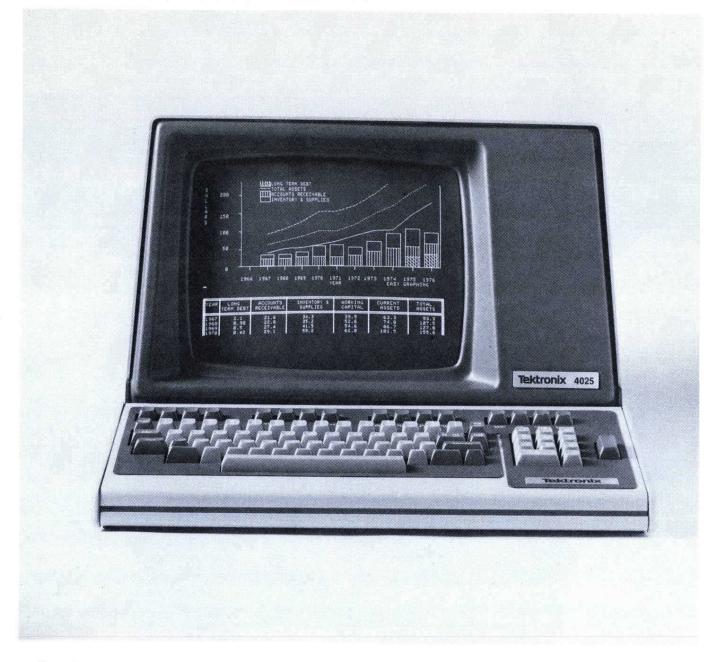
Optional — 64 characters each, to a maximum of 6 character sets; or 128 characters each, to a maximum of 3 character sets. Can include rulings or math characters, for example.

With the graphics option. Up to 31 character sets can be defined by the user.

Characters/line — 80 Lines/display — 34

Total characters/display — 2720

Visual attributes — Characters can be displayed with shaded background, inverted fields (dark on light background rather than light on dark background), or underlines. In addition, the display can "blink" (alternate) between combinations of visual attributes.



Logical attributes — Fields can be protected, modified, alphanumeric, and numeric only.

# Interface characteristics:

Transmission speed — The transmitting and receiving baud rates are independently selectable up to 9600 baud. Baud rates can be entered from the keyboard or the host computer.

# Interface with the host computer:

Standard — RS-232-C full duplex
Option 1 — RS-232-C half duplex, with
or without supervisory channel.
Option 2 — 20 mA current loop

Option 10 — Polling Interface permits multiple terminal configurations on one host communication line. Terminal interface is current loop using 4020 Series Polling Protocol. Communications buffered or unbuffered.

Option 11 — Polling Controller — IBM 3270 compatible. Converts IBM 3270 protocol to 4020 Series polling protocol. Will drive Option 10. Provides control for up to eight terminals in a polling system.

# Buffering and editing capabilities:

Size of display memory — 4K bytes standard; may be expanded to 8K (Option 20), 16K (Option 21), or 32K (Option 22).

Parts of memory —

Monitor — Holds and displays conversational text such as conversations between the user and the host computer, or commands to the 4025.

Workspace — Holds and displays text, forms, and graphics. One or several pages of text can be saved in the workspace, edited, and later sent to the host or to a peripheral.

# **Keyboard Specifications:**

Number of keys — 86

Lighted keys — 4 (Insert mode, TTY lock, Numeric lock, Command lockout)

Programmable keys — 80

Major keyboard functions — Typewriter keys, terminal function control, programmable function keys, numeric pad, cursor control, scolling.

Tactile features — Curved profile, tactile feedback at typing "home" position.

Relationship to display — Detachable, flexible (8 foot) cable. Editing keys: Delete character, Delete line, Erase and skip Insert line, and Insert mode.

# Graphic specifications

Amount of Graphics Memory: Option 23 — 4096 8-bit words (covers 256 cells). Option 24 — 8192 8-bit words (covers 512 cells). Option 25 — 16384 8-bit words (covers 1024 cells). Option 26 — 32768 8-bit words (covers 2048 cells).

The maximum amount of graphics memory that may be needed depends on the number of graphics "cells" (character positions) in the part of workspace used for holding the graph. Display memory is also required to put graphics in the workspace.

Line types: Solid lines, Seven styles of dashed lines, Single points, and "Dark vectors", which erase lines previously drawn.

Type of display — Dot matrix: each graphics cell (character position) has 14 rows of 8 dots each.

Resolution — 28 addressable points/cm.

# User definable Character Sets

Up to 16 fonts may be defined by the operator or the host computer. Characters per font — 128 (or two sets of 64 each).

Number of fonts available:

Option 23 - 2. Option 24 — 4. Option 25 — 8. Option 26 — 16.

Option 31 — Character set Expansion option — permits addition of up to 6 character sets (64 characters), or three 128-character sets.

Option 32 — Ruling Characters — Optional character set which contains the special characters used to rule forms.

Option 34 — Math Characters — Optional character set which provides the special characters most commonly used in mathematics (includes special symbols and Greek letters).

Option 35 — ROM Option — required for the addition of multiple options. Refer to the option summary for list of options requiring the ROM option board.

Option 41 — Self Test — The standard 4025 performs an automatic "self test" on power-up. This test verifies the initial status, memory, and operating parameters. The optional self test feature provides additional testing capabilities to verify options and peripheral availability.

# Power requirements:

Line plug and power cord — 15 ampere capability, detached

Input line voltages —

Standard —

115 VAC, 3A 90-100 V (low)

105-125 V (med)

112-136 V (high)

Option 48 —

220 VAC, 1.5 A

180-220 V (low)

208-252 V (med)

224-272 V (high)

Line frequency — 49 to 63 Hz Power consumption — 295 W

maximum at 125 VAC

Safety recognition — Listed by Underwriters Laboratories under the following standards:

114 — Office Appliances

478 — Electronic Data Processing Units and Systems

Also certified by Canadian standards Association under standard C22.2 No. 154.

# Physical characteristics:

Weight — 27.2 kg (60 lbs.)

Dimensions:

Cabinet:

Height — 31.7 cm (12.5 in.)

Width — 44.5 cm (17.5 in.)

Depth — 54 cm (21.25 in.)

Keyboard:

Height — 7.6 cm (3 in.)

Width — 45.7 cm (18 in.)

Depth — 23.5 cm (9.25 in.)

# Environmental:

Temperature —

 $-60 \text{ to } +50^{\circ} \text{ C (Storage)}$ 

+10 to +40° C (Operating)

Humidity — 0 to 95% (Storage)

0 to 70% (Operating)

Altitude — to 50,000 feet (Storage) to 15,000 feet (Operating)

# 4025 Option Summary

Option:

1 Half Duplex Interface (see note
2)
2 Current Loop Interface \$230
3 RS-232-C Peripheral Interface
(Transmit Only). See Note 1\$300
4 GPIB Peripheral Interface (see
note 1)
10 Polling Interface \$250
11 Polling Controller\$2,000
20 8K bytes of Display Memory\$250
21 16K bytes of Display Memory .\$750
22 32K bytes of Display Memory \$1750
23 4K bytes of Graphics Memory
(note 2)\$550
24 8K bytes of Graphics Memory
(note 2)\$800
25 16K bytes of Graphics Memory
(note 2)\$1300
26 32K bytes of Graphics Memory
(note 2)\$2300
31 Character Set Expansion \$250
32 Ruling Characters (note 3) \$150
34 Math Characters (note 3) \$100
35 ROM Expansion
36 Peripherals (Used with options 3
and 4) see note 2\$150
40 Hard Copy and Video Output\$70
41 Self Test (note 2 & 4)\$100
48 220 Volts, 50HzNo charge
Notes:
1. Requires options 35 and 36

2. Requires option 35

3. Requires option 31

4. Option 1 & 41 cannot be configured together.

## **Ordering Information**

4025 Computer Display Terminal . .\$3595

# 4024 Computer Display Terminal

The complete alphanumerics terminal

Everything you need for data entry, program writing, editing and forms fill-out. The 4024 was designed to allow fast, straight-forward interaction with your host computer and maximum efficiency in the manipulation of alphanumeric data. For writing and editing programs. Editing text. Or for filling out and editing forms.

# **4024 Specifications**

# Display Mechanism:

Display type — Video Monitor Screen size — 30 cm (12 in.) diagonal Usable display area — 16.2 cm x 21.6 cm (6.38 x 8.5 in.)

Phosphor type — P39 green phosphor Video bandwidth — 20 MHz

Raster lines: Standard 525 line scan

Raster lines: Standard 525 line scan, with 480 lines displayed.

Scan — 30 Hz

Refresh rate: Dot—30 times/second

Frame — 30 times/second

Field — 60 times/second

# **Display Characteristics:**

Cursor type — Wide underscore Character size — 7 x 9 in a 8 x 14 dot matrix

Character sets:

Standard — 64/96 upper and lower case ASCII

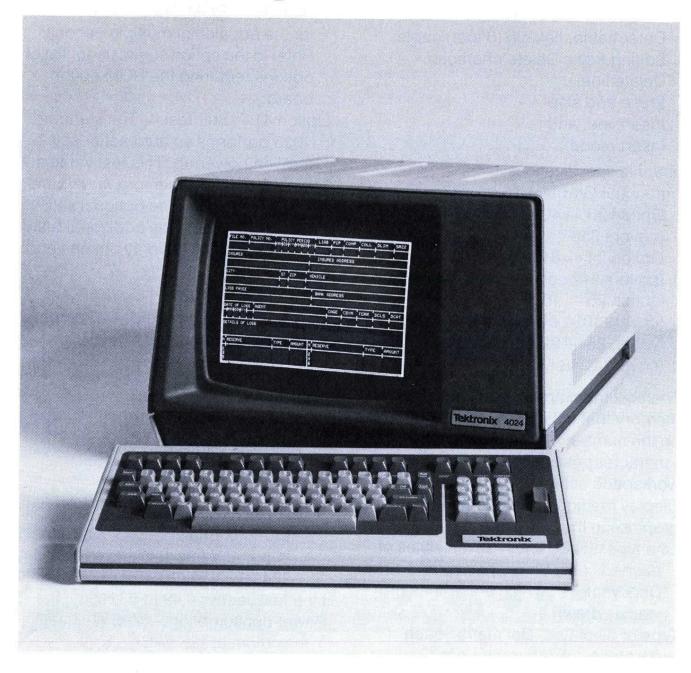
Optional (Option 32)—Rulings character set – 32 characters for single and double line ruling. Used for forms generation.

Characters/line — 80 Lines/display — 34

Total characters/display — 2740
Visual attributes — Characters can be on an enhanced background. In addition the display can "blink" (alternate) between combinations of

visual attributes.

Logical attributes — Fields can be protected, modified, alphanumeric, or numeric.



# Interface characteristics:

Transmission speed — The transmitting and receiving baud rates are independently selectable using internal strap selection. The baud rates available are: 75, 110, 150, 300, 600, 1200, 2400, 4800, and 9600 baud.

# Interface with Host computer:

Standard — RS-232-C full duplex Option 02 — 20 mA current loop

Option 10 — Polling Interface — permits multiple terminal configurations on one host communication line. Terminal interface is current loop using TEKTRONIX 4020 Series Polling Protocol.

Command format — English Communications — Buffered or unbuffered.

# Buffering and editing capabilities:

Size of Display Memory — 4K bytes standard; may be expanded to 8K bytes (Option 20), 16K bytes (Option 21), or 32K bytes (Option 22).

Parts of Memory —

Monitor — Holds and displays conversational text, such as conversations between the user and the host computer, or commands to the 4024. Workspace — Holds and displays text or forms. One or several pages of text can be saved in the workspace, edited, and later sent to the host computer or to the printer.

Keyboard specifications:  Number of keys — 86  Lighted keys — 4 (insert mode, TTY lock, Numeric lock and Command lockout)  Programmable keys — 80  Major keyboard functions — Typewriter keys, terminal function control keys, programmable function keys, numeric pad, cursor control and scrolling.  Tactile functions — Curved profile, tactile feedback at typing "home" position.  Relationship to display — Detachable, flexible 2.5 m (7 ft) cable  Editing keys — Delete character, Delete line, Erase and skip, Insert line and Insert mode.  Power Requirements:  Line plug and power cord — 15 Ampere capability, detached.  Input line voltages — Standard — 115 VAC, 3A 90-110 V (low) 105-126 V (med) 112-136 V (high)  Option 48 — 220 VAC, 1.5A 180-220 V (low) 208-252 V (med) 224-272 V (high)  Line frequency — 49 to 63 Hz	Physical characteristics: Weight — 25 kg (58 lb.) Dimensions: Cabinet Height — 31.7 cm (12.5 in) Width — 44.5 cm (17.5 in) Depth — 54 cm (21.25 in) Keyboard: Height — 7.6 cm (3 in) Width — 45.7 cm (18 in) Depth — 23.5 cm (9.25) Environmental: Temperature — — 60 to +50° C (storage) +10 to +40° C (operating) Humidity —0 to 95% (storage) 0 to 70% (operating) Altitude — Storage — to 15000 m (50,000 feet) Operating — to 5000 m (15,000 feet)  4024 Option Summary Option  2 20 mA Current Loop\$230 3 RS-232-C Peripheral Interface, transmit only\$300 10 Polling Interface\$300 10 Polling Interface\$250 20 8K bytes Display Memory\$250 21 16K bytes Display Memory\$750 22 32K bytes Display Memory \$1750 32 Rulings Character set\$150 48 220 V, 50 HzNo charge
Power consumption — 285 W maximum at 125 VAC. Safety recognition — Listed by Underwriters Laboratories under the following standards: 114 — Office Appliances 478 — Electric Data Processing Units and Systems Also certified by Canadian Standards Association under standard C22.2 No. 154	Ordering Information 4024 Computer Display Terminal\$2995

# 4006-1 Computer Display Terminal

The power of Graphics for the price of alphanumerics.

## The 4006-1 is a Tektronix break-

**through** towards making interactive, high-resolution Graphics applicable and affordable to cost-conscious disciplines and departments.

Priced no more than many alphanumeric terminals, the 4006-1 makes graphic capability as practical for the stockroom, the classroom and the conference room as for other departments where Graphics is used.

# **Specifications:**

# Display Medium:

Direct View Bistable Storage CRT

# Display Area:

7.5 inches wide by 5.6 inches high (19.05 cm x 14.22 cm)

# Alphanumeric Mode Format:

35 lines, 74 character per line 2590 characters full screen

# Character Set:

63 printing characters (TTY ANSI Code)

# Character Generation:

5 x 7 dot matrix

## Cursor:

8 x 8 dot matrix

# Graphics Display Mode:

Vectors only

Vector drawing time,  $3.6 \pm .2$  ms.

# Information density:

1024 X by 1024 Y addressable points 1024 X by 780 Y viewable points

# Baud Rate:

Transmit and receive independently selectable from 75 to 4800 baud

# Input power:

110/240 VAC (Low, Medium, High) 50 to 440 Hz, 105W

# **Operating Temperature:**

+10° C to +40° C

# Operating Altitude:

To 15,000 feet



# **Physical Characteristics:**

Height, 12% inches (31.43 cm.) Width, 15¼ inches (38.74 cm.) Length, 27½ inches (69.85 cm.) Net weight, 42 pounds (19.05 kg.) Shipping weight, 50 pounds (22.68 kg.)

# **Computer Interfaces:**

The 4006-1 is shipped with a Standard Data Communication Interface, with inputs and outputs conforming with EIA RS-232-C, Asynchronous Full Duplex only. Option 1: Half Duplex Interface

# **Companion Products:**

4631 Hard Copy Unit4923 Digital CartridgeTape Recorder4662 Interactive Digital Plotter

## Accessories:

# Standard Accessories:

A User's Manual is supplied at no extra cost.

# **Ordering Information**

4006-1 Computer Display Terminal \$2995

# **Computer Display Terminal**

# 4010-1

Flicker-free alphanumerics with picture-perfect Graphics.

# Easy input. Easy-to-use output.

The 4010-1 Computer Display Terminal is an easy to use, cost effective tool that brings out the best of Tektronix famous Graphics capability. It has been engineered for interactive communications, a variety of operating modes and easy system expansion.

Up to 1024X by 780Y viewable points may be displayed on the 4010-1's flicker-free 11" (27.9 cm) screen. The result: high-resolution graphs, charts, diagrams and renderings, without delays for printout or hand plotting. For immediate analysis and manipulation, graphic data can be input via the standard TTY-style keyboard or with the thumb-wheel controlled cross-hair cursor.

# Specifications:

# Display Medium:

Direct View Storage CRT.

# Display Area:

7.5 inches wide by 5.6 inches high (19.05 cm x 14.22 cm).

# Alphanumeric Mode Format:

35 lines, 74 characters per line, 2590 characters full screen.

# Character Set:

63 printing characters. (TTY ANSI Code).

# Character Generation:

5 x 7 dot matrix MOS Read-Only Memory 1200 Characters per Second

# Cursor:

Pulsating 5 x 7 matrix

# Graphic Display Mode

Vectors only.

Vector Drawing Time, 2.6 ms. 1024X by 1024Y addressable points. 1024X by 780Y viewable points.

# Graphic Input Mode:

Thumb-wheel controlled cross-hair cursor.

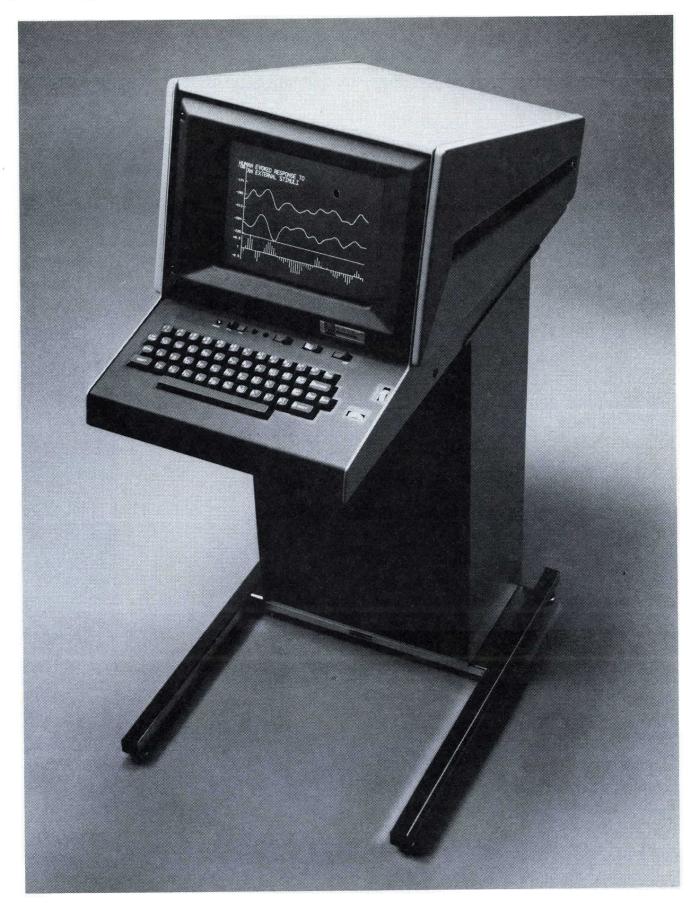
3 through 1023X, 0 through 780Y.

# Input Power:

110/220 VAC (Low, Med, Hi). 50 to 400 Hz, 110W

# Operating Temperature:

 $+10^{\circ}$  to  $+40^{\circ}$  C.



# **Physical Characteristics:**

# Dimensions:

Height, 41½ inches (103.41 cm). Width, 15 inches (38.1 cm). Length, 28½ inches (72.39 cm).

# Weight:

Net, 78 pounds (35.10 kg). Shipping, 87 pounds (39.15 kg).

# Computer Interfaces:

Basic Data Communication Interface included with the 4010-1 is EIA RS-232-C compatible, Full Duplex only.

Note: EIA RS-232 is comparable to the European Standard CCITT (V.24).

# Ordering Information

4010-1 Computer Display Terminal \$4950

# 4012/13 Graphic Display Terminals

4012: Full ASCII Characters set 4013: APL-compatible

Full ASCII, flicker-free Graphics with

APL option. Alphanumerics can transcribe computer data; Graphics can interpret and amplify that data. We've made high-resolution graphic representation and upper-and lower-case ASCII alphanumerics available in 4012 and APL-language 4013 Graphic Display terminals.

The 4012/4013's flicker-free 11-inch (27.94 cm) screen provides up to 1024X by 780Y viewable graphic points or as many as 2590 A/N characters per display. The TTY-style keyboard simplifies input, while the thumbwheel controlled cross-hair cursor enhances graphic input.

# **Specifications:**

# Display medium:

Direct View Bi-Stable Storage CRT

# Display Area:

8 inches (20.3 cm) wide x 6 inches (15.2 cm) high

# Alphanumeric mode:

Format

74 characters per line35 lines per display2590 characters per display

# Alphanumeric cursor:

Pulsating 7 x 9 dot matrix

# Character set:

94 printing characters on 7 x 9 dot matrix (Full ASCII code)
94 character APL set (4013 only)

Character size:

85 mils x 105 mils

# Character generation:

7 x 9 dot matrix
MOS Read-Only Memory
1,000 characters per second

# Graphic mode:

Vectors only

Vector drawing time 2.6 ms

# Graphic matrix:

 $1024(X) \times 1024(Y)$  addressable points  $1024(X) \times 780(Y)$  viewable points

## Interactive graphics mode:

Thumbwheel controlled crosshair cursor 3 thru 1023 X, 0 thru 780 Y



## Local mode:

Terminal isolated from CPU, keyboard data is displayed and executed

# Hard copy mode:

Allows a copy to be made of display by a hard copy unit

# Input power:

110/220 (Hi, Med, Low) VAC strappable 48 to 440 Hz, 110W

# Operating temperature:

+10°C to +40°C

Operating altitude to 15,000 feet

# Dimensions:

Height — 41.5 inches (105.4 cm) Width — 19 inches (48.3 cm) Depth — 29 inches (73.7 cm)

## Weight:

90 pounds (40.9 kg)

# **Computer Interfaces:**

**Note:** EIA RS232 is comparable to the European Standard CCITT (V.24).

## Ordering Information

4012 Computer Display Terminal . .\$6350 4013 Computer Display Terminal . .\$6850

# **Graphic Display Terminals**

4014-1/15-1

4014-1: Full ASCII character set 4015-1: APL compatible

High-resolution, low-cost, APL option: our 19" (48.26 cm) Graphics terminal. The most effective way to display a large data base is big screen Graphics. The 19-inch (48.26 cm) flicker-free 4014-1 and APL-language 4015-1 Graphic Display Terminals give you capabilities in all kinds of applications—mapping, design, manufacturing, medicine, energy exploration and many more.

Big screen. Big features. The 4014-1 and 4015-1 offer 1024X by 780Y displayable points standard, up to 4096X by 3120Y displayable points optional, with the Enhanced Graphics Module. Full 96-character ASCII keyboard with four program-selectable alphanumeric formats. Up to 8512 characters on display at once. Graphic crosshair cursor control, and hard copy compatibility.

# Specifications:

# Display medium:

Direct View Bi-Stable Storage CRT

## Display area:

15 inches (38.1 cm) wide by 11 inches (27.9 cm) high

# Alphanumeric mode:

Four program-selectable formats:

- 1. 74 characters per line with 35 lines per display.
- 2. 81 characters per line with 38 lines per display.
- 3. 121 characters per line with 58 lines per display.
- 4. 133 characters per line with 64 lines per display.

# Alphanumeric cursor:

7 x 9 dot pulsating cursor

# Character set:

4014-1—Full ASCII character set (94 printing characters).

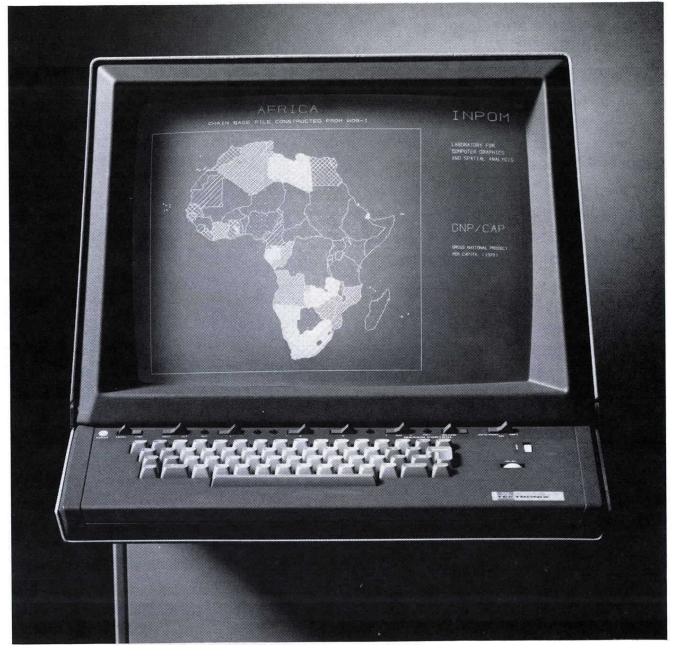
4015-1—Full ASCII and APL character sets (188 total printing characters).

# Vector mode:

Vector drawing time is 5000 inches per second (127 meters).

1024(X) by 1024(Y) addressable points (10 bits).

1024(X) by 780(Y) viewable points.



Enhanced graphics module:

4096(X) by 4096(Y) addressable points (12 bits).

4096(X) by 3120(Y) viewable points.

# Vector formats:

5 formats, including straight, dotted and dashed lines.

# Point plotting modes:

Point Plot Mode

Special Point Plot Mode—absolutely addresses points with program control of plotted point size—.010 to .050 inch (0.25 to 1.27 mm) approximate point sizes.

Incremental Plot Mode—relative addressing 1 of 8 directions, one step at a time.

# Interactive graphic mode:

Thumbwheel controlled crosshair cursor.

3 thru 1024 addressable points horizontally.

0 thru 780 addressable points vertically.

# Power source:

110/220 (Hi, Med, Low) VAC 48 to 440 Hz, 350 W.

# Dimensions:

Height—43½ inches (110.48 cm) Width—20 inches (50.80 cm) Length—32½ inches (82.55 cm)

# Weight:

150 pounds (68 kg)

# **Computer Interfaces:**

Basic Data Communication interface included with the 4014-1 or 4015-1 is EIA RS-232-C compatible. Full duplex only.

Note: EIA RS-232-C is comparable to the European Standard CCITT (V.24).

## **Ordering Information**

ruering innermanen	
4014-1 Computer Display	
Terminal	,650
4015-1 Computer Display	
Terminal	.700

# 4051 Graphic System

Desktop Computational Power Alphanumerics and Graphics High-level BASIC Up to 32k Work Space

# **Central Processing Unit**

Type:

LSI Microprocessing Unit.

Work Space Size:

8k bytes standard expandable to 32k bytes.

Programming Language:

BASIC with integrated operating system, built-in graphics, and numerous other extensions.

Numeric Accuracy:

14 decimal digits.

Numeric Range:

 $1 \times 10 \pm 308$ 

# **Internal Peripherals**

Keyboard:

Complete upper and lower case alphanumerics with autorepeating keys. Full ASCII. 128 characters.

10 Function Keys with SHIFT for up to 20 separate function calls.

Five keys with SHIFT, control 10 different editing functions used to modify BASIC source programs.

Calculator key pad including 10 key numeric pad, 5 math-operator keys, decimal point, and parenthesis.

Control keys:

AUTO NUMBER—generates program line numbers automatically; STEP—executes program steps one at a time; AUTO LOAD—automatically leads and runs File 1 on tape; REWIND—rewinds tape; MAKE COPY—activates optional 4631 Hard Copy Unit.

# **Display Characteristics**

Type:

Direct view storage crt.

Dimensions:

8 in wide by 6 in high (20.3 cm x 15.2 cm)

Alphanumeric Format:

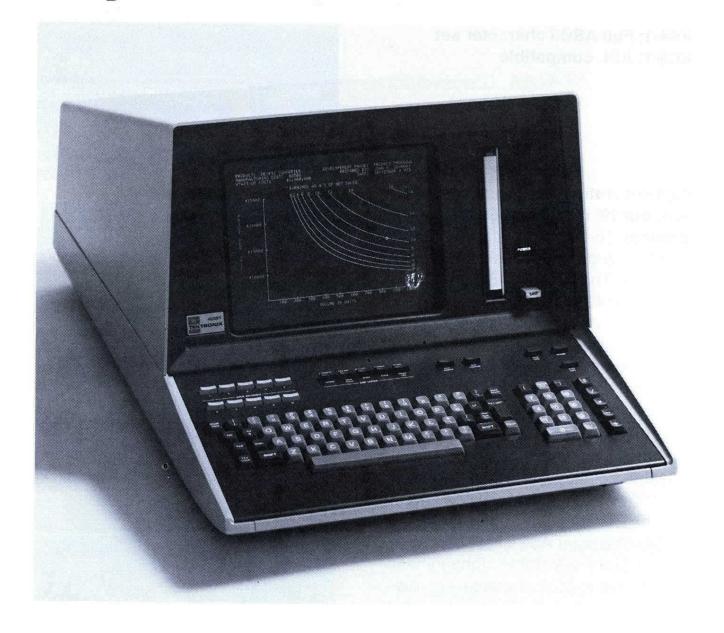
72 characters per line, 35 lines; 2520 total.

Character Set:

Full ASCII character set, including upper/lower case. Also includes Scandinavian, German, General European, and Spanish fonts.

Graphic Resolution:

1024 x 780 points.



Hard Copy:

Compatible with our 4631 Hard Copy Unit.

# **Tape Drive**

Type:

3M DC300A cartridge.

Capacity:

300k bytes max (dependent on number of files).

System Characteristics:

File structures for storage of programs or data. Access is via 4051 BASIC operating system.

# General-Purpose Interface Bus (GPIB)

Specifications:

Conforms to IEEE standard 488-1975. Byte serial, bit parallel transfer mode.

Control Mode:

External devices can be serviced via interrupt procedures available in the BASIC operating system. Enable/disable, polling, and data transfer commands are available under program control.

# **Power Requirements**

Operates between 90V to 132V RMS, or 180V to 264V RMS, 48-66 Hz, 200W max.

# 4051R01 Matrix ROM:

4051R05 Binary Program Loader ROM:

# 4051R06 Editor ROM:

May be used to expand the capabilities of the 4051 by editing text that is collected and stored on the 4051 tape ......\$600

# **Physical Characteristics**

Height:

13.6 in (34.5 cm)

Width:

18.3 in (46.5 cm)

Length:

32.5 in (82.6 cm)

Net Weight:

65 lb (29.5 kg)

Shipping Weight: 81 lb (35.8 kg).

### **Ordering Information**

4051 Graphic System . . . . . . . . . . \$7500

# Interactive Graphics Terminal

4081

Merging Storage and Refresh Graphics to Create A Technological First.

The 4081 Interactive Graphics Terminal has incorporated the benefits of both a refresh-type and a storage-type display via the use of a specially-designed display controller. This terminal allows the user to display storage and refreshed information simultaneously.

With the 4081 a user can display high resolution, high density pictures with storage while concurrently displaying dynamic pictures using refresh.

The 4081 Interactive Graphics Terminal provides both technologies at a significantly lower price than a refresh-only display.

#### **Product Data:**

### General:

Asynchronous RS-232 communications interface operating at 110 to 4800 baud in full or half duplex mode

Cartridge magnetic tape drive with 256K-byte storage capacity

Alphanumeric keyboard with full upper and lower case ASCII characters

Twelve function keys

Joyswitch with terminator button

Four system status lights

4014 terminal emulation

Control storage standard with optional picture data storage

Up to eight peripherals

#### **CRT Controller:**

Maintains a refreshed picture 352 unique hardware dash patterns Four levels of beam intensity Writes stored image

# CRT Display:

Graphic write rate of 56,000 vector-cm./sec. in refresh and 14,000 vector-cm./sec. in storage
2048 x 1536 displayable raster units
Resolution of 16 line pairs/cm.
Spot size of 20 mils, maximum
Flicker free for up to 1600 vector cm. or 800 vectors refresh, 50,000 vector cm storage



# Specifications:

#### Power:

115-volt, 30 amperes, 60 Hz, singlephase power

Power consumption 3450 watts, 11,782 BTU/hr.

# Physical:

Height—49.6 inches (126 cm) Width—60.1 inches (152.6 cm) Depth—30.1 inches (76.5 cm) Weight—720 lb. (326.5 kg)

# **Environment:**

Operating temperatures—+10°C to +35°C (+32°F to +95°F) Operating altitude—to 15,000 ft. (to 4572 m) Shock—20g's (non-operating)

#### **Standard Features:**

4014 Terminal Emulator
Local Graphics transfer
Local storage of graphics information
Host control of terminal functions
Command language
Device independence
Hard copy compatible
Host-Terminal data error detection

# **Standard Accessories:**

RS-232-C Interface Terminal Manuals

#### Ordering Information \*

# **4662 Interactive Digital Plotter**

Compatible in all RS-232-C ASCII environments; and with Plot-10 Graphic Software.

An intelligent plotter: what will it think of next? The 4662 is the first plotter with built-in processing power. As such it has the capability to work on its own, without bogging down computational operations. Studded with state-of-the art technology, it works with an accuracy and repeatability that no other low-cost plotter can approach.

# Specifications:

# Performance Characteristics:

# Plotting area:

X-Axis greater than 15" (381 cm) Y-Axis greater than 10" (254 cm)

# Repeatability:

 $\pm 0.0025''$  ( $\pm 0.06$  mm)

# **Default Accuracy**

±0.0025 inch; ±0.4% of vector length

# **Boundary Definable Accuracy**

±0.005 inch

# Time to Maximum Velocity:

approx. 120 ms.

# Data Resolution:

0.005" (0.127 mm)

# Plotting rate:

16-22 IPS vector dependent (406-559 mm/sec).

# Point plotting rate:

Pen action rate 10 points/sec. max.

## Character set:

95 ASCII printing characters plus BEL, BS, CR, FF, HT, LF and VT control characters.

#### Pen Control:

By software control or by operation of front panel PEN button. Pen may be disabled manually.

# Position controls:

Joystick vector rates variable from .015 ips to 4 ips. (.38 mm/sec to 102 mm/sec)

# Writing method:

Nylon-tipped pen.

# Paper size:

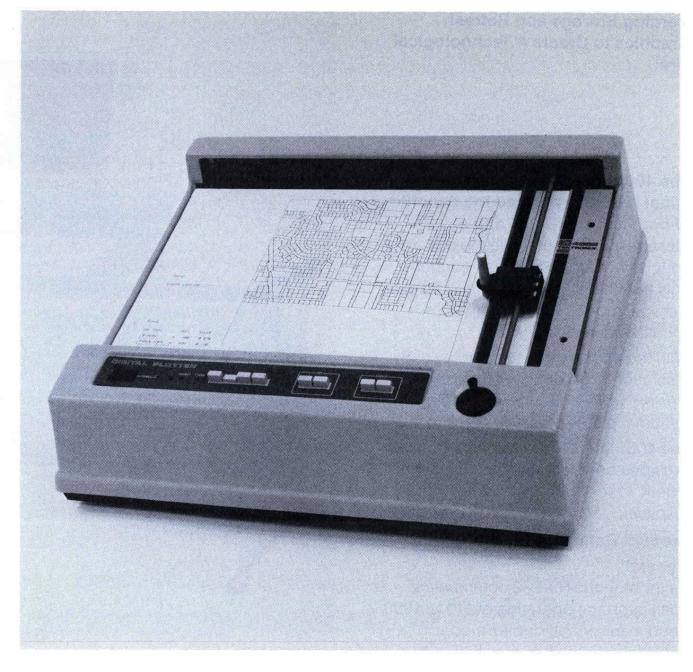
11" x 17" maximum (279 mm x 432 mm)

# Paper retainer:

Electrostatic holddown.

#### Drive characteristics:

Pen motion in the X and Y axes is con-



trolled by four phase stepping motors operating through a precision pulley/cable system.

# **Operating Modes:**

The 4662 has 2 input modes in RS-232-C; Alphanumeric (Alpha), Graphic plot (Graphic). The 4662 also has Graphic Input (GIN) to the host.

# General Purpose Interface Bus (GPIB)

Specifications: Conforms to IEEE standard 488-1975. Byte serial, bit parallel transfer mode.

# Input Power:

90W maximum, 60W typical. Selection of 105V  $\pm$ 14%, 116V  $\pm$ 14%, 210V  $\pm$ 14%, 232V  $\pm$ 14%. Line frequency 48 to 66 Hz.

#### Dimensions:

Width: 20%"/517 mm. Height: 8"/203 mm. Depth: 191/2"/495 mm.

## Weight:

30 lbs. 4 oz., 13.8 kg.

#### **Shipping Weight:**

45 lbs. 14 oz., 20.8 kg.

# Environmental:

#### Temperature:

Operating 0° to 50°C. Non-operating -55°C to +75°C.

#### Altitude:

Operating to 15,000 feet. Non-operating to 50,000.

# Safety Considerations:

Designed to UL and IEC standards. UL listed. CSA approved.

# Transportation:

Qualities under National Safe Transit Committee test procedure, 1A, Category II.

# Standard Accessories:

Power cord.

4662 RS-232-C cable.

3 pens each, black, red, green, blue. User's Manual.

Stylus (for digitizing cursor).

Paper (100 sheets, 11" x 17" 279 mm x 432 mm) linear grid lines 10 x 10 to the inch

### Optional Accessories:

**Ordering Information** 

Pens.

Paper. (Linear, logarithmic, blank) Dust cover.

"REMOTE CALL" foot switch.

Option 1, GPIB cable. 2 meters long. Carrying/shipping case ... No charge

4662 Interactive Digital Plotter ....\$4195

Compatible with entire line of graphic display terminals, the 613 Storage Display Unit, the 4051 Graphic Computing System and the 4081 Interactive Graphics Terminal. Multiplexes up to four display terminals and/or display monitors.

Variable formats. Easy maintenance. Quick, clean, dry results. When onscreen data needs to be preserved 8½" x 11" (21.6 x 27.9 cm) hard copies are the answer. They're convenient, permanent and easy to work with.

# Specifications:

# Paper size:

8½ x 11 inches (21.6 x 27.9 cm)

# Copy size:

Format A, position I and III, produces an 8.85 x 6.7 inch (22.5 x 17.0 cm) copy, oriented horizontally on an 8½ x 11 inch (21.6 x 27.9 cm) piece of paper. Format B, position II, produces a 7.1 x 5.4 inch (18.0 x 13.7 cm) copy, oriented vertically on an 8½ x 11 inch (21.6 x 27.9 cm) piece of paper [not recommended for 19" (48.26 cm) display tubes].

# Copy time:

Approximately 18 seconds for first copy. Additional copies of the same display take about 10 seconds each. 36 seconds for first copy when using position III and 17 seconds for additional copies of same display.

## Exposure time:

Position I and II, approximately 7 seconds; position III, approximately 14 seconds.

# Warmup time:

10 minutes.

# Ambient temperature:

0°C to +35°C is recommended

# Power source:

(Factory-wired options)

100 VAC 50-60 Hz

115 VAC 50-60 Hz

120 VAC 50-60 Hz

200 VAC 50-60 Hz

220 VAC 50-60 Hz

230 VAC 50-60 Hz

240 VAC 50-60 Hz

#### Dimensions:

Height—11.6 inches (29.5 cm)

Width—16 inches (40.6 cm)

Length—25.5 inches (64.9 cm)

#### Weight:

Approximately 65 pounds (29.48 kg)



# Options:

# Standard accessories:

User's Manual

One 10-foot (3.05 m) Connecting Cable (Part No. 012-0547-00)

# Optional accessories:

Service Manual

10-foot (3.05 m) Connecting Cable (Part No. 012-0547-00) . . . . . \$80.00 20-foot (6.1 m) Connecting Cable (Part No. 012-0548-00) . . . . . \$115.00 50-foot (15.2 m) Connecting Cable (Part No. 012-0549-00) . . . . \$170.00

# Paper:

One roll of 3M Type 7770 Dry-Silver paper will be included with each hard copy shipment. Refills may be purchased from Tektronix, Inc. For one roll, order Part No. 006-1603-00. ...\$50.00 For one carton of 4 rolls, order Part No. 006-1603-01. .....\$180.00

# Remote signal input:

Remote Copy—TTL, a logic level "LO" (>1 msec.) initiates a copy command.

# Output signal:

Copy Busy—Open collector low during time plus 3 seconds.

# Ordering Information

4631 Hard Copy Unit ......\$4295

# 4632 Video Hard Copy Unit

Clean, crisp reproduction from any standard video system. Compatible with the 4023 alphanumeric display terminal and videorefreshed display monitors.

The 4632 Video Hard Copy Unit lets you make paper copies of any video-refreshed raster image at the line rate you choose, whether your input is standard video (TV-type), or a digital video signal. Within seconds, you've got a clean, dry 8½ x 11 inch (21.6 x 27.9 cm) copy of your display, gray scale or black/white, characters or graphics.

# Specifications:

### Characteristics:

# Copy size:

Adjusted to 8.4" x 6.3" (21.3 x 16.0 cm)

# Copy time:

Approximately 18 seconds for first copy (typical 525 line, 60 Hz display). Additional copies of the same display take about 8 seconds each.

### Warmup time:

10 minutes

# Ambient temperature:

0°C to +35°C is recommended

# Power source:

(Factory-wired options)

100 VAC 50-60 Hz

115 VAC 50-60 Hz

120 VAC 50-60 Hz

200 VAC 50-60 Hz

220 VAC 50-60 Hz

230 VAC 50-60 Hz

240 VAC 50-60 Hz

### Dimensions:

Height—11 inches (27.9 cm)

Width—16 inches (40.6 cm)

Length—25.6 inches (64.9 cm)

# Weight:

Approximately 65 pounds (29.48 kg)

# Options:



Option 6—Enhanced Gray Scale. \$200 Option 7—Compatible with HP2640 Series terminals. . . . . . . . . . . . \$100 If not specified, the 4632 will be set up and shipped to operate on 525 line 60 Hz.

#### Standard accessories:

75 Ohm Terminator

(Part No. 011-0102-00)

User's Manual

# Optional Accessories:

Service Manual

Interconnecting Cable, 75 Ohm, BNC, 25 feet (7.6 m)

(Part No. 012-0504-00) ......\$70 20 ft. (6.1 m), 15 pin interconnecting

(Part No. 012-0504-02) ......\$90

200 ft. (60.1 m), 15 pin interconnecting cable

(Part No. 012-504-03) . . . . . . . \$230 For information concerning interface requirements for your particular video application, contact your local Tektronix Sales Engineer.

#### Paper:

006-1603-01.....\$180

Ordering Information
4632 Video Hard Copy Unit .....\$4295

# File Manager

4907

Low cost mass storage, compatible with the 4051.

Now your 4051 can command a high-capacity, highly reliable mass storage device with built-in file manager and controller. Our 4907 brings together more advanced capabilities and conveniencies than you'll find integrated into any comparable peripheral. Yet its ease of operation and compact design make it a natural companion to 4051 computing.

The 4907 is a direct access, flexible disc device, with a double density read/write feature that enables up to 630,000 byte capacity per disc.

# These are many of the major features and capabilities contained within the 4907:

Double-density read/write High-level system software 630,000 bytes per disc total useravailable space

Disc Caching (data buffering) in 15 caches of 256 bytes each

Up to 9 simultaneously open files
Password protected library capability
Implementation of execute-only
(secret) files

ASCII and Binary data and program storage and retrieval

Cyclic Redundancy Checking (CRC) for greater reliability

Named file saves

Dynamic file expansion

Real Time Clock

GPIB (IEEE 488-1975) compatible

As an option, up to two additional disc drives can be connected to one 4907. It is compact enough to fit on a desktop or in a rack mount.

Software commands are extensive, as you'd expect from one of the most talented file managers and mass storage devices on the market.

# **Specifications:**

# Technical:

Total number of tracks per disc: 77 max

Number of user-available tracks: 77 max

Number of sectors per track: 32



Number bytes per sector: 256
Total user-available storage per disc: 630,000

Rotational speed: 360 rpm Average access time: 340 ms Transfer time: 4.2 ms/sector

# Power requirements:

100 VAC to 240 VAC, 50 Hz to 60 Hz

# Power consumption:

200 watts at 120 VAC, 60 Hz Max. 2 amps

# Dimensions:

Width—20.26" (51.46 cm) Depth—25.75" (65.41 cm) Height—7.7" (19.56 cm) Weight—60 lbs. (132 kg)

#### Standard Accessories:

4907 Installation Guide
4051 File Manager ROM Pack
4051 File Manager Operator's Manual
4051 File Manager Pocket
Reference Card
Line Cord
GPIB Cable
1 Flexible Disc
Cleaning Pads

# Optional Accessories:

Option 30 — Second disc drive .\$2500 Option 31 — Third disc drive ...\$4000 Flexible discs (10 per package) 4907 Service Manual 4 meter GPIB cable

# Environmental Range:

10°C to 35°C (ambient)
Storage temperature:
-30°C to +60°C (without media)
Relative humidity: 20% to 70% (25.5°C max wet bulb temperature)
Heat dissipation: 275 BTU/hr max

System operating temperature range:

# Ordering Information

4907 File Manager .....\$3900

# **GMA Series OEM Computer Displays**

19-inch high-performance modules Graphic and alphanumeric displays with varied storage and refresh capabilities.

The GMA Series is a new display product family designed to provide a glove fit to your OEM application. It achieves this through the blending of storage and refresh technologies, modular construction, and a variety of performance, interface, and packaging options.

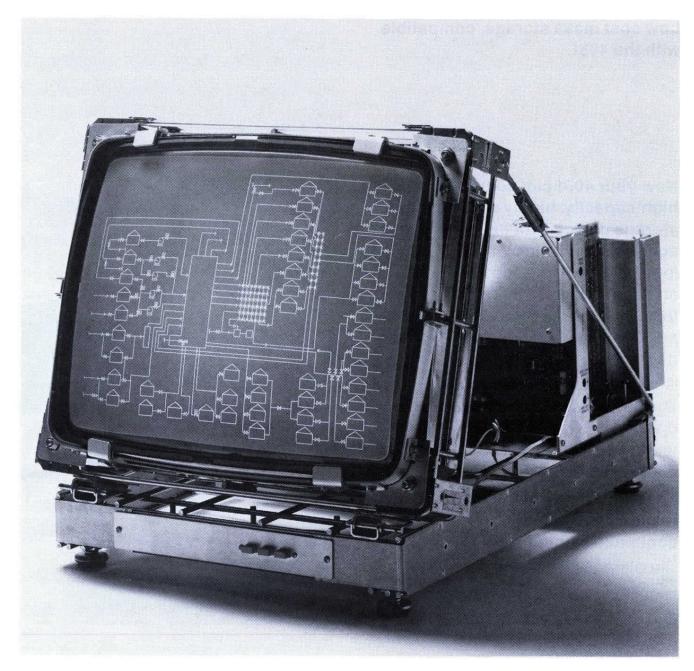
The GMA 101A is the lowest cost 19-inch DVST display available. It is tailored for applications which emphasize storage graphics, with only limited refresh capability. The fast drawing rate of the GMA 101A allows the entire screen to be redrawn in less than one second, permitting effective zooming and panning.

The GMA 102A is designed for the OEM who wants the combined benefits of storage and refresh technologies. Storage mode presents highresolution, high-density graphics at low cost, while the refresh feature adds the benefits of selective erase, interactivity, and dynamic motion with the same high resolution of storage. By placing fixed or finalized data in store while retaining dynamic or working data in refresh, you can achieve highdensity interactive graphics while allowing the computer to address the application rather than support the display. This maximizes computer efficiency and productivity, while reducing memory costs.

The modular construction of both the GMA 101A and 102A allows you to select the exact features you need to get the job done, without paying for unwanted features. You can package the display according to your own system design needs. The wireform chassis permits the display to be vertical or tilted as far back as 15° from vertical and oriented in either the horizontal or vertical (page) format. It also facilitates circuit board removal and overall servicing.

The GMA Series includes many options with such features as:

Illuminated spot overlap (12-bit resolution), which produces smooth vectors of unsurpassed quality.



A high-speed digital interface, which allows easy interfacing to a computer and faster transfer rates.

Front-panel switches for easy operator control of erase, view, and copy functions.

Blue glass filter, which enhances viewability in fluorescent light conditions and enhances display image clarity.

A high-speed vector generator (GMA 102A only), which produces more refreshed vectors without affecting image stability. It also provides bright refresh, virtually as bright as storage for 60 Hz refresh rates.

A high-speed character generator, which allows more refreshed characters per second without affecting image stability, and increases throughout.

# **Design Characteristics**

## Crt:

19-inch (48 cm) diagonally measured Direct View Storage Tube

# Addressable Area:

10.5 in (26.7 cm) x 14 in (35.6 cm).

# Stored Resolution:

Screen center, 80 picture elements per inch (31 picture elements/cm). Screen periphery 70 picture elements per inch (28 picture elements/cm).

# Stored Dot Writing Time:

 $5 \mu s$  or less.

### Stored Vector Writing Rate:

GMA 101A—3937 in/s (10 cm/ms). GMA 102A—5900 in/s (15 cm/ms).

# Refreshed Vector Writing Rate GMA 101A:

(Non-store) 19,685 in/s (50 cm/ms), 650 vector inches (maximum) at 30 frames per second.

# Refreshed Vector Writing Rate GMA 102A:

(Write-thru and non-store) 47,240 in/s (120 cm/ms), 1575 vector inches (maximum) at 30 frames per second.

# Ordering Information\*

Available to qualified OEM buyers only.

\*The GMA may not be available in some areas of the world. Consult your Distributor or Representative.

# **OEM Storage Computer Displays 611/613**

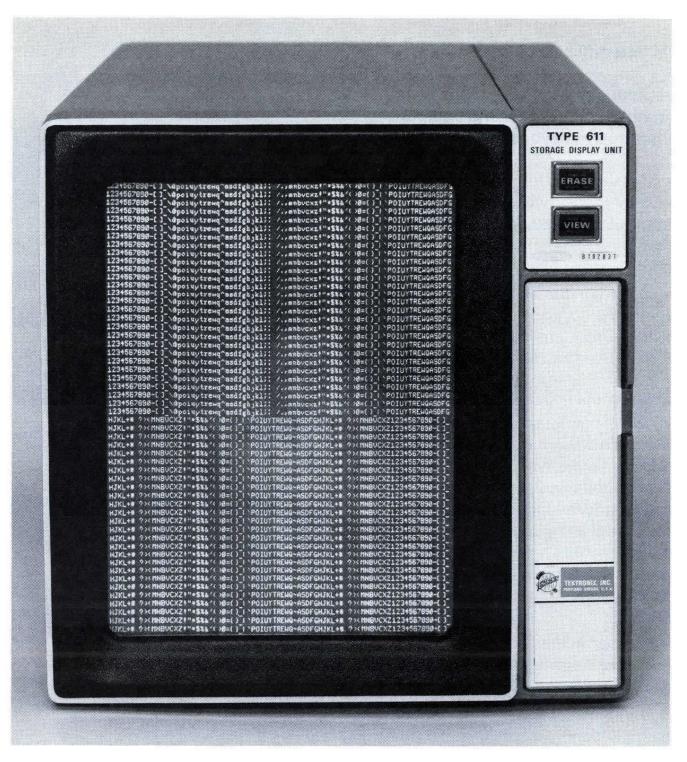
11-inch high information density alphanumeric storage displays.

The 11-inch storage display product family provides a means for the system builder to offer flicker free, high density, high resolution graphics while conserving processing memory. This is a standard benefit of storage displays driven with high performance magnetic deflection systems. Your computer needs to process the display list only once to retain the graphics quality image. Then it can address the application task rather than support refresh of the display.

One product, the 611 display, is specifically designed to be used in those applications requiring high resolution. It is capable of presenting 4000 characters based on a 70 x 90 mil matrix. Basic resolution of the display is 600 x 800 picture elements (short axis x long axis). All 611 control functions are remotely programmable.

The lower priced 613 offers 400 x 532 picture element resolution and a different cabinet styling. Display functions are all remotely programmable and designed to interface to digital TTL logic.

X and Y inputs to both displays are analog, with the writing beam resting at one of nine selectable screen positions with zero volts applied.



# **Design Characteristics**

# CRT:

11-inch (27.9 cm) diagonally measured Direct View Storage Tube.

# Addressable Area:

611: Horizontal, 5.9 in. (15 cm.); Vertical, 7.9 in. (20 cm.)

613: Horizontal, 7.9 in. (20 cm.); Vertical, 5.9 in. (15 cm.)

# Stored Dot Writing Time:

 $5 \mu sec or less.$ 

### Stored Vector Writing Rate:

393/ in/sec. (10 cm/msec)

# Refreshed Vector Writing Rate:

(Non-Store) 9842 in/sec (25 cm/msec)

# Erase Time:

611: 500 msec or less 613: 900 msec or less

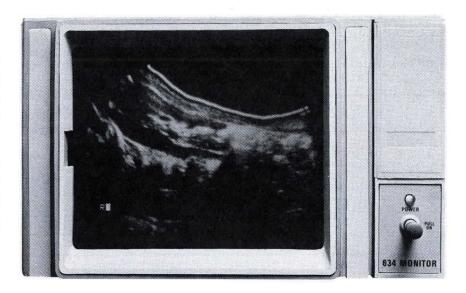
Ordering Information	
611 Storage Display	
(Vertical Format)\$3950	
611-2 Storage Display	
(Horizontal Format)\$3950	
613 Storage Display	
(Horizontal Format) \$3195	
613-1 Storage Display	
(Vertical Format)	

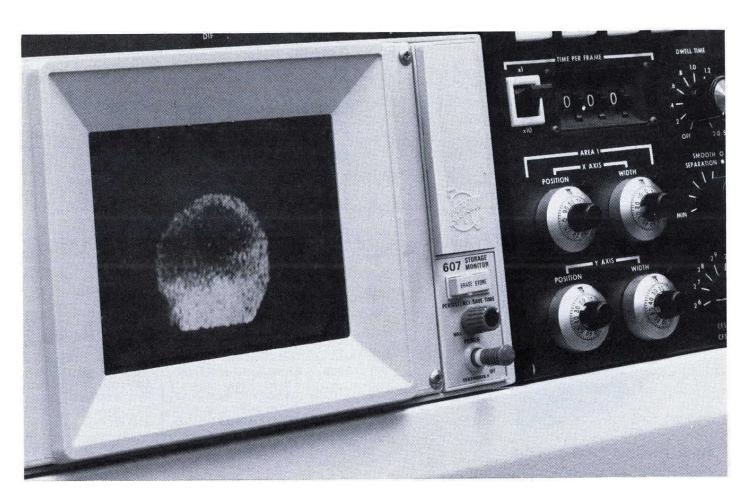
# **Display Components**

# The Tektronix OEM Commitment ...

... means that we understand your needs as an original equipment manufacturer and that we'll help you be as competitive as possible in your market place. That's why we provide in-depth applications assistance... discount pricing to qualified OEMs... U.L. 544 Listing and Component Recognition on most instruments.

What's more, we've inaugurated a program that lets you select from a wider-than-ever range of options for each instrument. You start with a basic display, then add on just the options you need. This lets you customize to meet your system's more exact price/performance requirements. (This new program explains the addition of the letter "A" to the nomenclature of the 603, 604, 606 and 607).





# Applications assistance . . . as near as . . .

... your local Tektronix Field Engineer. He'll help you select those instruments and options that most closely match your price/performance requirements. He can also show you how one of our many cameras extends your system's capability still further.

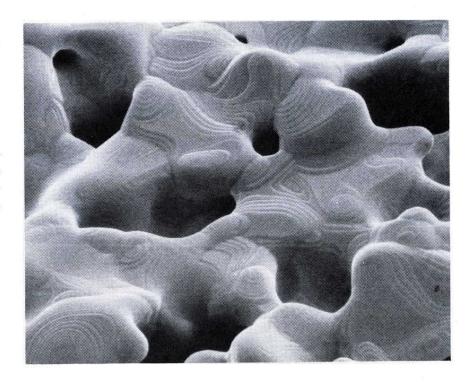
If you need additional assistance, a Tektronix Applications Engineer will work with you to achieve optimum interface between our component and your system. Instrument and visual mods are just some of the ways he can help.

# Service . . . as near as . . .

... the worldwide Tektronix service network (35 centers in the U.S. alone). We're equipped to handle your customers' needs quickly and expertly.

# Find out now how we can help you.

For additional product information, applications assistance, or demonstration of Tektronix OEM products, simply complete and return the postpaid card at the back of this catalog. If you need even faster service, please contact your local Tektronix Field Office today. See page 271 for listing.



# **OEM Display Components and Accessories—at a glance**

New to the 1978 catalog: the 608 High Brightness Monitor, the 624 Display Monitor and the 634 Video Monitor. Now—all of our products have a new OEM tailored pricing structure for both basic unit and options.

PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

For full details, see your Tektronix Field Engineer or Representative.

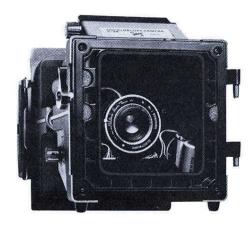
For complete specifications, including those of the 634 Video Monitor, see individual product pages.							
	608	624	604A	606A	607A	603A	602
Spot size	0.26 mm 10 mils	0.30 mm 12 mils	0.36 mm 14 mils	0.13 mm 5 mils	0.25 mm 10 mils	0.25 mm 10 mils	0.20 mm 8 mils
Display size	9.8 x 12.2 cm	9.8 x 12.2 cm	10.2 x 12.7 cm	8 x 10 cm	7.2 x 9 cm	10.2 x 12.7 cm	8 x 10 cm
Acceleration Potential	22.5 kV	≃18 kV	3.5 kV	5.6 kV	12 kV	3.5 kV	4 kV
Bandwidth, X-Y <sup>2</sup>	≥5 MHz	≥3 MHz	≥2 MHz	≥3 MHz	≥3 MHz	≥2 MHz	≥1 MHz
Bandwidth, Z <sup>2</sup>	≥10 MHz	≥5 MHz	≥5 MHz	≥10 MHz	≥5 MHz	≥5 MHz	≥1 MHz
Rise Time	≤35 ns	≤70 ns	≤70 ns	≤35 ns	≤70 ns	≤70 ns	≤200 ns
Type of Storage					Variable Persistence	Bistable	
Writing Speed <sup>3, 4,</sup>					0.8 div/μs	20 div/ ms	
Dot Writing Time <sup>5</sup>					0.5 μs/15 sec /μs/3 min	4 μs	
Viewing Time <sup>6</sup>					5 to 50 min	1-10 hrs	

- 1. Measured at  $0.5\mu A$ , except for the 606A, measured at  $0.1\mu A$ .
- 2. Full spec would read: "Dc to . . . " appropriate figure.
- 3. Option 02 on 603A is 200 div/ms.
- 4. Option 08 on 607A offers Fast Writing Speed of 200ns/div.
- 5. Option 02 on 603A is  $0.5\mu s$ .
- 6. 603A: variable brightness control required for 10 hour viewing.
- 607A: greater than 5 minutes at reduced writing speed. Extended up to 10 times in the save mode.

# Extend component usefulness with these system-oriented accessories.

# **Cameras Priced for the OEM**

For complete information on the C-28, the C-5B and other Tektronix cameras, see pages 225-234. For OEM purchasing information, please contact your local Field Engineer or Representative.



#### The High Performance C-28 Camera

Features changeable magnification (1:0.67 to 1:0.85), remotely controllable electric shutter, and rigid body design that eliminates trapezoidal distortion. F-stops from f/2.8 to f/16, and 8 shutter speeds (from 1/50 to 2 seconds, plus "bulb" and "open") handle a broad variety of exposure variables. Comes with a combination Graflok'/Polaroid² film back for 3¼" x 4¼" Polaroid film or user's choice of Graflok-compatible accessories such as 70 or 90 mm roll film backs. Three other object-to-image ratio lens mounts are also available.

T.M., Singer Education Systems.

<sup>2</sup>T.M., Polaroid Corporation.



#### The Low-Cost C-5B Camera

The C-5B is a light weight, easy-to-use camera that quickly attaches and removes from the display. It features changeable magnification ratios to accommodate both 8 x 10 and 10 x 12 cm displays, an exceptionally reliable electric shutter, and an f16 lens that requires no focusing.

# **Integrated Instrument Package Options**



The modular mechanical package options provide attractive, full-rack width (horizontal) or double-height (vertical) instrument packages for your custom circuit designs. System power (ac) is obtained by a single ac power cord. The single top cover and handle add to the integrated appearance. Included accessories

#### Rackmounts/Conversions

#### Rackmounting For 602

51/4-inch Rack Adapter — Two 602s may be mounted side by side.
Order 016-0115-02\$170
Blank Panel — For covering half of 016-0115-02 Rack Adapter when only one 602 is used.
Order 016-0116-00\$25

Rackmounting For 603A, 604A, 606A, 607A, 608 and 624 Cabinet-to-Rackmount Conversion, equipped with slide-out assembly, to rackmount any TEKTRONIX Display Monitor (except 602) in a standard 19-inch rack. This includes securing hardware and a blank front panel.

Order 040-0601-00 .....\$120

Cabinet-to-Rackmount Conversion, equipped with slide-out assembly, to rackmount any two TEKTRONIX Display Monitors (except 602) side-by-side in a standard rack width.

Order 040-0600-00 .....\$90

Rackmount-to-Cabinet Conversion, required to convert a rackmount 603A, 604A, 606A, 607A, 608 and 624 to a cabinet style.

Order 040-0624-01 .....\$70

## **Light Filters/Graticules**

Monitor	Filters/Graticules	Part No.	Price	
Smoke Gray Filter* Amber Filter Blue Filter Graticule* Clear Shield*		378-0586-00 378-0595-00 378-0845-00 331-0406-00 337-1017-00	\$3.50 6.00 1.90 6.25 6.25	
603A & 604A	Clear Filter (604*) Green Filter (603*) Amber Filter Blue Filter Gray Filter Graticule (603*)	337-1440-00 337-1440-01 337-1440-02 337-1440-03 337-1440-04 331-0303-00	2.20 2.20 3.30 3.30 2.50 3.50	
607A	Blue Filter	337-1674-00	2.15	
	Amber Filter	337-1674-05	2.50	
	Smoke-Gray Filter*	337-1674-06	2.50	
	Graticule	331-0391-00	3.90	
606A	Smoke-Gray Filter	337-1674-06	2.50	
	Blue Filter	337-1674-11	2.40	
	Amber Filter	337-1674-12	3.15	
	Graticule*	337-1674-10	2.50	
	Clear Shield*	337-1674-13	3.00	
608	Amber Filter	378-0704-00	2.20	
	Green Filter	378-0705-00	2.20	
	Graticule*	337-2126-02	3.50	

\*Shipped on or with the standard instrument.

#### Other Accessories

Lab carts. Provide equipment mobility. See pages 256-258.



are guide rails and interface connectors for blank plug-ins.

These modular mechanical packages are available for the 603A, 604A, 608, and 624. Get full details from your Field Engineer or Representative.

1400-line nominal resolution—center screen at 100 cd/m<sup>2</sup> (30 fL)

Non-linearity  $\leq$  .5% within a 9 cm circle—≤1% at corners

<20% phosphor non-uniformity

Modular construction for ease of installation and servicing

Minimal corner defocus ( $\leq$ 25% with option 18)

The TEKTRONIX 634 is a very high resolution, low geometric distortion raster scan (video) monitor, designed for applications requiring superior performance. Key specifications include:

Standard resolution of 1400 lines (nominal) - center screen at 100 cd/m2 (30 fL). Delivers detailed imaging and optimum gray scale for photography. Especially important when images have large, varied and detailed data content, like those in multi-imaging, ultrasound and computerized tomography or scanning electron microscopy.

System manufacturers requiring less than 1400-line resolution will want the TEKTRON-IX 634 Option 01. It offers standard resolution of 800 lines nominal — center screen at 10 cd/m<sup>2</sup> (30 fL) — while meeting other 634 specifications including distortion, phosphor uniformity and corner focus.

Non-linearity:  $\leq .5\%$  within a 9 cm circle, <1% at corners — This performance is crucial in applications where highly accurate measurements must be taken from photographs.

≤20% phosphor non-uniformity — means there is more consistent gray scale over the entire display surface area. This is essential when comparing tissue densities from different areas of the display.

The P45 phosphor formulation — standard on the 634 - reduces the graininess of photographs taken with blue-sensitive film (like most x-ray film).

Corner de-focusing is minimized to  $\leq$ 25% (with Option 18), providing clear imaging across the entire screen that you can rely on with confidence.

#### SPECIFICATIONS

Note: To save you valuable calibration time, every 634 is calibrated to meet all specifications before it leaves the factory.

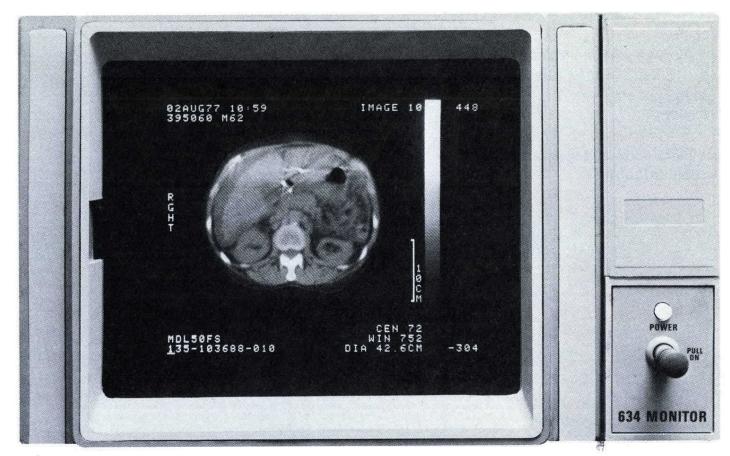
#### **DISPLAY PERFORMANCE**

Crt display - monochrome: 9 cm vertically; 12 cm horizontally; 15 cm diagonal (6 in.); flat screen, magnetic deflection; 4 x 3 aspect ratio.

Resolution - Measured by the shrinking raster method with no interlacing, center screen at 100 cd/m<sup>2</sup> (30 fL).

	634	634 Option 01
Worst case:	1100 line	650 line
Nominal:	1400 line	800 line

Position Accuracy/Non-linearity) — <.5% within 9 cm circle,  $\leq$ 1% in corners.



Brightness — 515 cd/m² (150 fL) maximum.

Phosphor Non-uniformity — ≤20% using J16 Photo-

Phosphor Type — P45 Standard.

Black Level Stability - Back porch dc restoration.

#### **VIDEO INPUT**

Description — Video with negative sync.

Signal Level — .35 V p-p to 2 V p-p.

Maximum Safe Input — ±5 V p-p.

Bandwidth — 1 Hz to 10 MHz (Standard).

#### RASTER

Vertical Rate - 60 ramps/sec.

Horizontal Rate — 15,750 ramps/sec. (Adjustable ±10% range).

Note: Our standard instrument will accept the line/ field rate of 625/50.

#### SAFETY

Department of H.E.W. [BRH Rule 1020.10 (C) (1)] -Standard.

U.L. 544 — Listing and Component Recognition (Options 06 and 09).

#### POWER

Standard - Ac 50 watts, 50-400 Hz. 100, 110, 120, 200, 220, 240 V, ±10%.

Option 20 - Unregulated dc. +9 V at 300 mA with 1 V ripple; +23 V at 1.6 A with 4 V ripple; -22 V at .70 A with 3 V ripple.

#### OTHER CHARACTERISTICS

Temperature Range for Electrical Specifications — 0° to +50°C.

Included Accessories - Operator's and Instruction Manual; linearity graticule.

Recommended Cameras — C-5B, C-28 (external 15V dc 750 mA power supply required for C-28).

Dimensions	Cabinet			
	cm	in		
Height (with feet)	14.9	5.85		
Height (without feet and handle)	13.2	5.25		
Width	21.3	8.4		
Depth (Ac power)	41.9	16.5		
Depth (Dc power— Option 20)	36.3	14.3		

#### ORDERING INFORMATION

634 Raster Scan Display Monitor with standard resolution of 1400 lines nominal, 1100 lines worst case (center screen at 100 cd/ m<sub>2</sub> [30 fL], without handle, feet and covers .....\$1125

Option 01 Standard resolution of 800 lines nominal, 650 lines worse case (center screen at 100 cd/m2 [30 fL]) ......Sub \$225

PERFORMANCE OPTIONS Option 11 External Sync—Switchable .....Add \$25

Option 13 Video Reverse ......Add \$50 Option 16 Remote Brightness, Contrast, Focus, Blanking ......Add \$30 Option 17 Contrast, Brightness and Focus Controls are Removed from the Front Panel and Positioned on the Top Side of the Instrument. (Not available with Options

Option 18 ≤25% Corner Defocus ......Add \$55 Option 20 DC Supply (±21-25 V +9 V

unregulated) ......Sub \$50

SAFETY OPTIONS

Option 06 U.L. Listing (Not available with Options 17, 20 or 28) . . . . . . . . . . . . . . . Add \$75

Option 09 U.L. Component Recognition (U.L. 544) ......No Charge

**Mechanical Package Options** 

Option 23 With Handle, Feet, and Covers (Not available with Options 17 or 20, 28) ....Add \$50 Option 28 Covers Only. (Not available with 

Option 30 Metal Shield .......Add \$35

Phosphors

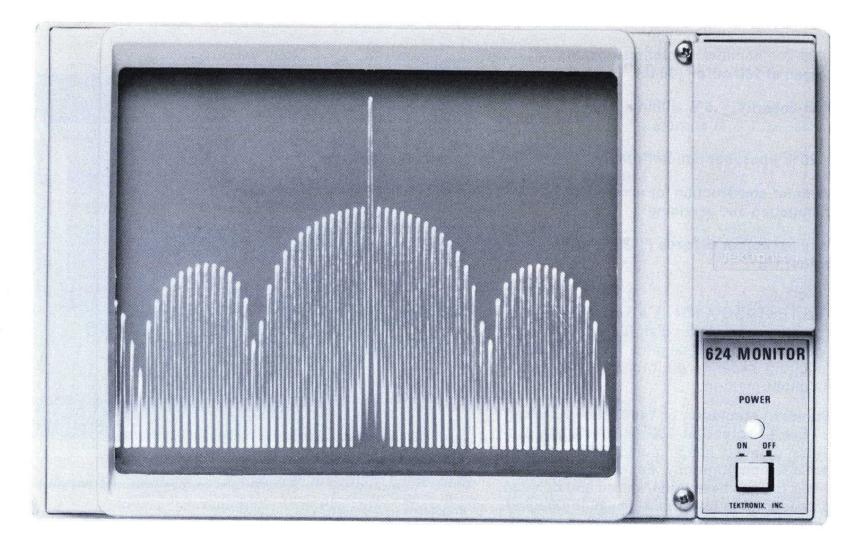
Option 74 P4 ......No Charge

PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANU-FACTURERS.

Large 9.8 x 12.2 cm screen

Small spot size — 12 mils

Delivers up to 40 footlamberts usable brightness<sup>1</sup>



The TEKTRONIX 624 combines large screen size (9.8 x 12.2 cm), 137 cd/m $^2$  (40 fL) brightness and small spot size (12 mils). The result: detailed displays that are easy to read in high ambient light and deliver quality photographs.

Major applications include: Ultrasound and other medical non-invasive diagnostic equipment; electronic instrumentation; mechanical measurement systems; and a variety of uses in the military and in aerospace.

A broad selection of options lets you adjust both capability and pricing to meet your system's needs and to make your product more cost-effective.

There's U.L. Listing and component recognition; metal bezel for accommodating heavier cameras including those with motorized film backs; time base, to display voltage vs time; dc power supply that's ±18 V unregulated. This means you can save money by using your system's existing power supply. You' don't have to pay for an additional power supply or power supply design.

# SPECIFICATIONS CRT DISPLAY

Cathode Ray Tube — Flat-faced, electrostatic deflection. P31 phosphor standard. P4, P11 phosphors optional.

**Display Size** — 9.8 cm vertically, 12.2 cm horizontally. Internal graticule is available without charge (Option 01)  $-8 \times 10$  divisions (1.22 cm/div).

**Display Linearity** — The voltage required to produce a 2.5 cm deflection from any point on the crt will not vary more than 5%.

Spot size — 12 mils.

Acceleration Potential — ≥18 kV overall.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth — Dc to >3 MHz.

**Deflection Factor** — Adjustable <50 mV to >0.25 V/div. Option 22 extends gain range 5 x to >1.25/V div.

 Measured with quality area flooded by a 60 Hz raster, 320 horizontal lines. Input R and C — 1 M $\Omega$  paralleled by less than 47 pF.

X-Y Phase Difference — Not more than 1° to at least 1.5 MHz.

Maximum Input Voltage — ±100 V (dc plus peak ac)

Linear Common-Mode Signal Range (with Option 21) —  $\pm 3$  V, non-attenuated. Option 22 extends range 5 x to  $\pm$  15 V.

Common-Mode Rejection Ratio (with Option 21) — At least 100:1 to at least 100 kHz. Option 22 (5X attenuator) reduces cmrr to 40:1 to 100 kHz.

Optional Horizontal Time Base—1  $\mu$ s/div to 0.1 s/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated continuously variable between steps and to approximately 1 s/div, TRIG SLOPE/LEVEL control for stable, triggered displays. For nontriggered display, an internal switch selects bright base line or no sweep.

# Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam.

**Bandwith** — Dc to 5 MHz over usable range. Sensitivity range is adjustable from zero to  $\pm 1$  V to zero to  $\pm 5$  V for full intensity control. 0 V input cuts off intensity with front panel control at midrange.

Input R and C — 1 M $\Omega$   $\pm 1\%$  paralleled by less than 47 pF.

Linear Common-Mode Signal Range (with Option 21) — ±5 V, non-attenuated.

Common-Mode Rejection Ratio (with Option 21) —  $\leq$ 100:1 to 100 kHz.

# OTHER CHARACTERISTICS

**Power Requirements** — Nominal line voltages are 100, 110, 120, 200, or 240 internally selectable, 48 to 440 Hz, 61 W max at nominal line voltage.

Temperature Range for Electrical Specifications—  $0^{\circ}$  to  $+50^{\circ}$ C.

**Finish** — Anodized aluminum front panel, blue vinyl painted cabinet (optionally available), gray vinyl painted frame.

Recommended Cameras — C-5B, C-28 (external 15 V dc 750 mA power supply required for C-28).

**Included Accessories** — Operator's and Instruction Manuals.

Dimensions	Cal	binet	Rackmount	
	cm	in	cm	in
Height	16.9	6.65	13.3	5.25
Width	21.3	8.4	21.3	8.4
Length	51.8	20.4	48.3	19.0
Weight (approx)	kg	lb	kg	lb
Net	8.0	17.6	8.0	17.6
Shipping	10.4	23.0	10.4	23.0

#### **ORDERING INFORMATION**

624 Display Monitor \$1075 (without handle, feet and covers)
Option 01 — Internal GraticuleNo Charge
Option 04 — Time Base
Option 06 — U.L. 544 Listed,Add \$75 includes Handle, Feet and Covers
Option 09 — U.L. Component Recognition . No Charge
Option 10 — Remote Program Connector X, Y and Z Single ended inputs only. 25 pin connector
Option 20—Without AC supply (±18V Unregulated dc Supply Required, not available with Option 06)
Option 21 — Full Differential Inputs Add \$25 (X, Y and Z)
Option 22 — Extended Gain Range (X5) Add \$20
Option 23 — Handle, Feet and Covers Add \$50 (not available with Options 06 and 28)
Option 25 — TTL BlankingAdd \$50
Option 26—50 $\Omega$ Inputs (X, Y and Z)Add \$20
Option 28 — Covers OnlyAdd \$40 (not available with Options 06 and 23)
Option 29 — Metal BezelAdd \$50
Option 30 — Full Crt Magnetic Shield Add \$75
Option 74 — P4 Phosphor
Option 78 — P11 PhosphorNo Charge

See page 216 for information on cameras, rackmounts, light filters/graticules.

PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

More usable brightness

Minimal trace halo

10 mil spot

The 608 Display Monitor delivers a lot more than high brightness. It delivers more usable brightness — up to 240 cd/m² (70 fL) — plus improved image contrast and enhanced

detail in shadow areas. A special crt design supresses the diffuse expansion mesh halo usually present in high intensity displays; the result is a more uniformly readable display that provides those subtle nuances of gray scale vital to accurate interpretation.

Ease of interpretation is also aided by large screen size (9.8 x 12.2 cm). Displays are viewed easily, even in high ambient light. Resultant photographs are crisp. And the 608 accurately displays fast signals at varying intensity levels. The specs speak for themselves: Bandwidth of 5 MHz for X and Y axes—10 MHz for Z axis. Settling time:  $\leq$ 300 ns. Accelerating potential: 22.5 kV.

A full range of options are provided for broad flexibility in both pricing and capability. And you can select from several phosphors—for high ambient light viewing, longer persistence, photography — depending on your requirements.

The TEKTRONIX 608 can be integrated readily with medical non-invasive diagnostic equipment, electronic instrumentation, analytical instruments and non-destructive test systems.

#### SPECIFICATIONS

#### CRT DISPLAY

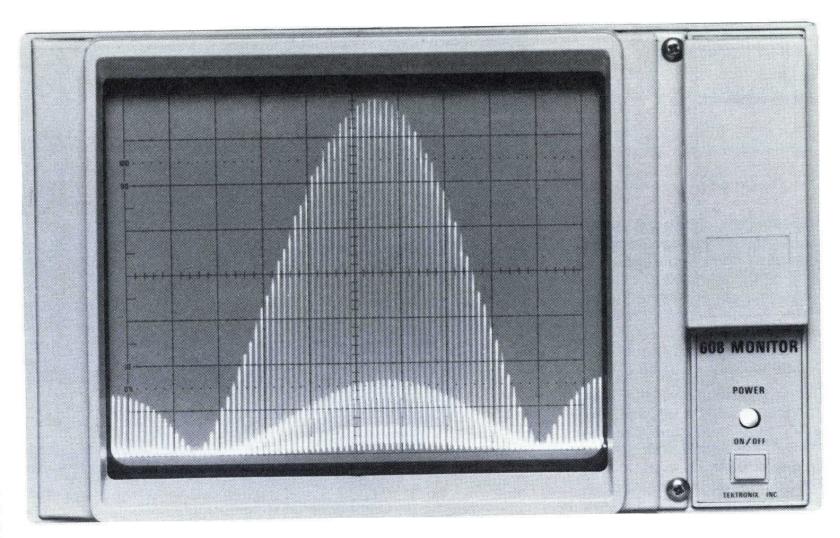
Cathode Ray Tube — Flat-faced, electrostatic deflection. P31 phosphor standard. P4, P7, P11 phosphors optional.

**Display Size** —  $\simeq$ 9.8 cm vertically, 12.2 cm horizontally. Internal graticule is available without charge (Option 01) — 8 x 10 divisions (1.22 cm/div).

**Display Linearity** — The voltage required to produce a 2.5 cm deflection from any point on the crt will not vary more than 5%.

**Spot Size** — 10 mils at 50 footlamberts, with usable brightness up to 240 cd/m<sup>2</sup>—70 footlamberts (0.26 mm, at 0.5  $\mu$ A).

Acceleration Potential — 22.5 kV overall.



# VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth — Dc to  $\geq$ 5 MHz.

**Deflection Factor**—Adjustable <50 mV/div to >0.25 V/div. Option 22 extends gain range 5X to >1.25 V div.

Input R and C — 1 M $\Omega$  paralleled by less than 60 pF. X-Y Phase Difference — Not more than 1° to at least

1.5 MHz.

Maximum Input Voltage — ±100 V (dc plus peak ac).

Linear Common-Mode Signal Range (with Option 21) —  $\pm 3V$ , nonattenuated. Option 22 extends range 5X to  $\pm 15~V$ .

Common-Mode Rejection Ratio (with Option 21) — At least 100:1 to at least 100 kHz. Option 22 (5X attenuator) reduces cmrr to 40:1 to 100 kHz.

Recommended Source Impedance — 10  $k\Omega$  or less.

# Z-AXIS AMPLIFIER

Linear Z-axis amplifier permits intensity modulation of the writing beam.

**Bandwidth** — Dc to 10 MHz over usable range. Sensitivity range is adjustable from 0 to  $\pm 1V$  to 0 to  $\pm 5V$  for full intensity control, zero V input cuts off intensity with front panel control at midrange.

Input R and C — 1M $\Omega$  ±1% paralleled by less than 60 pF

Linear Common-Mode Signal Range (with Option 21) — ±5V, nonattenuated.

Common-Mode Rejection Ratio (with Option 21) — <100:1 to 100 kHz.

#### OTHER CHARACTERISTICS

**Power Requirements** — Nominal line voltages are 100, 110, 120, 200, or 240 internally selectable, 48 to 440 Hz, 61 W max at nominal line voltage.

Temperature Range for Electrical Specifications —  $0^{\circ}$  to  $+50^{\circ}$  C.

**Finish** — Anodized aluminum front panel, blue vinyl painted cabinet (optionally available), gray vinyl painted frame.

Recommended Cameras — C-5B, C-5B Option 01, C59P, C-28 (external 15 V dc 750 mA power supply required with C-28).

Included Accessories — Operator's and Instruction Manuals.

Dimensions	Cab	oinet	Rackmount		
	cm	in	cm	in	
Height	16.9	6.65	13.3	5.25	
Width	21.3	8.4	21.3	8.4	
Length	51.8	20.4	48.3	19.0	
Weight (approx)	kg	lb	kg	lb	
Net	8.0	17.6	8.0	17.6	
Shipping	10.4	23.0	10.4	23.0	

# ORDERING INFORMATION

608 Display Monitor\$1250
(without handle, feet and covers)
Option
01—Internal graticuleNo Charge
04—Time Base
(See description of time base for 624 on previous
page)
06-U.L. 544 listed, includes Handle, Feet and
CoversAdd \$75
09—UL Component recognitionNo Charge
10—Remote Program-Connector—X, Y and Z,
Single Ended Inputs Only. 25 Pin Connector . Add \$30
20—without ac supply — (±18 V Unregulated dc
Supply Required, not available with Option 06)
Sub \$50
21—Full Differential Inputs (X, Y and Z) Add \$25
22—extended gain range (X5) Add \$20
23—Handle, Feet and CoversAdd \$50
(not available with options 06 and 28)
24—Linearized Z Axis (gamma correction) Add \$50
25—TTL BlankingAdd \$50
26—50Ω Inputs (X, Y and Z)Add \$20
27—Internal Gain Adjustments OnlyAdd \$10
28—Covers OnlyAdd \$40
(not available with Options 06 and 23)
29—Metal BezelAdd \$50
30—Full crt Magnetic ShieldAdd \$75
74—P4 PhosphorNo Charge
76—P7 Phosphor
78—P11 Phosphor
See page 216 for information on cameras, rackmounts, light filters/graticules.

PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

5-mil or smaller spot size Ideal for photography 10 MHz **Z-axis** bandwith

An excellent choice for sharp photographs and well-defined displays. Spot size is 5 mils (.13 mm), measured by the shrinking raster method. The linear Z-axis amplifier, with 10 MHz bandwidth, delivers the many shades of gray necessary for an accurate, detailed image.

The high resolution of the 606A is most useful in applications such as gamma camera systems, ultrasound systems, electron and scanning Auger microscopes. In medical gamma camera operation, the 606A displays the emission of injected radio-

active fluid as it moves through and collects in areas of a patient's body.

The clear image provided by the 606A is particularily well suited for use with the TEKTRONIX cameras to provide sharp photographs for analysis and diagnosis.

The 606A is also useful where several concurrent waveforms must be displayed while maintaining resolution. For instance, in an ultrasound application the brightness of the 606A results in four high resolution waveforms; the first and third convey tissue density information; the second provides a centimeter scale to measure against; and the bottom waveform imparts time gain curve data from which the operator sets ultrasound system gain characteristics.

#### **SPECIFICATIONS** CRT DISPLAY

Cathode-Ray Tube — 5-inch flat-faced rectangular crt with P31 phosphor. P11 phosphor optional.

Display Size — 8 cm vertically, 10 cm horizontally.

Graticule — External 8 x 10 cm graticule included as accessory. Internal 8 x 10 cm graticule supplied as Option 01.

Display Linearity — The voltage required to produce a 2-cm deflection at any point on the crt will not vary more than 5%.

Center Screen Spot Diameter — (Measured with shrinking raster method.) 0.005 inch or less at  $0.1 \mu A$ beam current, 0.007 inch or less at 5 µA beam current.

Acceleration Potential - 5.6 kV.

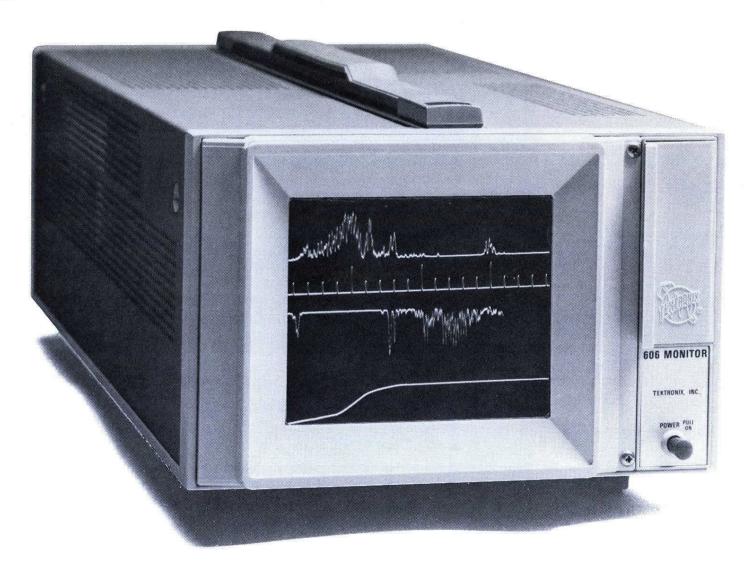
# VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth - Dc to 3 MHz at 3 dB down (80% full screen scan).

Polarity — Positive signal to both + inputs moves the beam up and to the right.

Deflection Factor — Vertical and horizontal: Nominally set a 1 V full scale. Internally adjustable from .5 to 2.5 V full scale. 5:1 attenuator (Option 22) extends range to at least 12.5 full scale.

\*See page 215 for explanation of "A" designation.



Input R and C — 1 M $\Omega$  +1%, paralleled by less than 47 pF.

X-Y Phase Difference — Not more than 1° to at least

Beam Position — Front panel position controls permit setting spot to any point on screen without input signal. Position shift is 0.1 cm or less per hour after 20-min warm-up with cabinet covers in place. Less than 0.2 cm in 24 hours.

Maximum Input Voltage — ± 100 V dc plus peak ac.

Linear Common-Mode Signal Range (with Option 21) +3 V non-attenuated. Option 22 extends range 5X to  $\pm$  15 V.

Common-Mode Rejection Ratio (with Option 21) -At least 100:1 to at least 500 kHz. Option 22 5X attenuator reduces cmrr to 40:1 to 500 kHz.

Recommended Source Impedance — 10 k $\Omega$  or less.

Optional Horizontal Time Base—1  $\mu$ s/div to 0.1 s/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approximately 1 s/div. TRIG SLOPE/LEVEL control for stable, triggered displays. For non-triggered operation, an internal switch selects bright base line or no sweep.

# **Z-AXIS AMPLIFIER**

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

Bandwidth-Dc to 10 MHz (-3 dB). Sensitivity range adjustable from 0 to 1 V to 0 to 5 V for full intensity control.

Differential Input (Option 21) — Cmrr at least 100:1 to 500 kHz up to 5 V p-p.

#### OTHER CHARACTERISTICS

Power Requirements — Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V ( $\pm$ 10% on each range), 50 to 60 Hz and 400 Hz, 75 watts maximum at nominal line voltage.

Temperature range for electrical specification — 0°C to +50°C.

Finish - Blue vinyl painted cabinet (optionally available), aluminum construction.

Included Standard Accessories — External graticule.

Recommended Cameras — C-59P, C-5B, C-5B Option 01, C-28 (external 15 V dc 750 mA power supply required for C-28).

Dimensions	Ca	binet	Rackmount		
	cm	in	cm	in	
Height	16.9	6.65	13.3	5.25	
Width	21.3	8.4	21.3	8.4	
Length, overall	51.8	20.4	48.3	19.0	
Weights (Approx)	kg	lb	kg	lb	
Net	7.7	17.0	7.9	17.5	
Shipping Weight	~9.9 €	~22.0	≃10.4	<b>≃23.0</b>	

# **ORDERING INFORMATION**

606A Dis	play Monitor \$1535 andle, feet and covers)
Option 01	Internal GraticuleNo Charge
Option 04	Time BaseAdd \$165
Option 06 Feet and C	U.L. 544 Listed, includes Handle, coversAdd \$75
Option 09	U.L. Component Recognized . No Charge
	Full Differential Inputs (X, Y
	Extended (X5) Gain RangeAdd \$20
Option 23 (not availa	With Handle, Feet and Covers ble with Option 06 and 28)Add \$50
	50 $\Omega$ Inputs (X, Y and Z)Add \$20
Option 28 (not availal	With Covers OnlyAdd \$40 ble with Options 06 and 23)
Option 29	Metal BezelAdd \$50
	P11 PhosphorNo Charge

See page 216 for information on cameras, rackmounts, light filters/graticules.

PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MAN-UFACTURERS.

X-Y phase difference within 1° to 500 kHz

Time base option

The TEKTRONIX 604A Display Monitor is an excellent choice for cost-sensitive applications. Its 10.2 x 12.7 cm view area, and 5 MHz Z-axis bandwidth result in an easy-to-view display and a versatile instrument with truly competitive pricing.

In logic analyzer applications where up to 16 lines of timing diagrams must be displayed, the 604A lets you see all 16 lines with good definition and clarity — thus making comparisons for digital system analysis and fault-finding significantly easier.

And the larger screen size of the 604A shows more detail in each line for easier detection of even the very small glitches that can affect performance of your digital system.

The larger display area is also important in spectrum analysis, as it permits viewing of the entire spectrum in greater detail.

# SPECIFICATIONS CRT DISPLAY

Cathode Ray Tube —  $6\frac{1}{2}$ -in flat-faced rectangular crt with P31 phosphor.

Display Size — 10.2 cm vertically; 12.7 horizontally.

**Display Linearity** — The voltage required to produce a 2.5 cm deflection at any point on the crt will not vary more than 5%.

# VERTICAL AND HORIZONTAL AMPLIFIERS

**Bandwidth** — Dc to 2 MHz at 3 dB down from 80% of full scan.

**Deflection Factor** — Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. Internal 5X attenuator extends deflection factor range to 12.5 V full scale.

\*See page 215 for description of "A" designation.

Input R and C — 1 M $\Omega$  ±1% paralleled by <47 pF.

X-Y Phase Difference — Not more than 1° to at least 500 kHz.

**Beam Position** — Front panel position controls permit setting zero signal position to any point on screen. Position shift is ≤1 mm/hr after 20 min warm up.

Max Input Voltage—±100 V (dc plus peak ac).

Linear Common-Mode Signal Range (with Option 21)— $\pm 3$  V non-attenuated. Option 22 extends range 5X to  $\pm 15$  V.

Common-Mode Rejection Ratio (with Option 21) — At least 100:1 to at least 100 kHz. Option 22 (5X attenuator) reduces cmrr to 50:1 to 100 kHz.

Recommended Source Impedance — 10  $k\Omega$  or less.

Optional Horizontal Time Base — 1  $\mu$ s/div to 0.1 s/div in 6 calibrated steps (decade sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 1 s/div. TRIG SLOPE/LEVEL control for stable triggered displays. For nontriggered operation, an internal switch selects bright baseline or no sweep.

#### **Z-AXIS AMPLIFIER**

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

**Bandwidth** — Dc to 5 MHz over usable range. Sensitivity range is adjustable from 0 to  $\pm$ 1 V to 0 to  $\pm$ 5 V for full intensity control; 0 V input cuts off intensity.

Differential Input (Option 21) — Cmrr at least 100:1 and common-mode range at least  $\pm$ 15 V.

Input R and C — 1 M $\Omega$  ±1% paralleled by less than 47 pF.

Max Input Voltage — ±100 V (dc plus peak ac).

# OTHER CHARACTERISTICS

**Power Requirements** — Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V ( $\pm 10\%$  on each range), 50 to 60 Hz and 400 Hz, 56 W max at nominal line voltage.

Temperature range for electrical specifications —  $0^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ .

Finish — Blue vinyl painted cabinet (optionally available), aluminum construction.

Recommended Cameras — C-5B, C-5B Option 01, C-59P, C-28 (external 15 V 750 mA power supply required for C-28).

Included Accessories — External program connector (131-0570-00); connector cover (200-0821-00).

Dimensions	Cabinet		Rackmount	
	cm	in	cm	in
Height	16.9	6.65	13.5	5.25
Width	21.4	8.4	21.4	8.4
Length	48.9	19.25	48.25	19.0
Weights (Approx)	kg	lb	kg	lb
Net	7.9	17.5	7.9	17.5
Shipping Weight	10.4	23.0	10.4	23.0

#### ORDERING INFORMATION

604A Display Monitor \$975 (without handle, feet and covers)
Option 01 With Internal Graticule No Charge
Option 04
Option 05 External Vector Display Graticule (P31 Phosphor Only)
Option 06 U.L. 544 Listed, includes Handle, Feet and Covers
Option 08 External SECAM Vector GraticuleAdd \$10
Option 09 U.L. Component Recognized No Charge
Option 10 Remote Program Connector — X, Y and Z 25-pin rectangular connector, Single-ended inputs only
Option 21 Full Differential Inputs (X, Y and Z)Add \$25
Option 22 Extended (X5) Gain Range Add \$20
Option 23 With Handle, Feet and Covers (not available with Option 06 and 28) Add \$50
Option 28 With Covers Only

See page 216 for information on cameras, rack-mounting, and light filters.

PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

# 50-minute storage

### Adjustable persistence

#### Remotely programmable storage functions

The TEKTRONIX 607A stores detailed images up to 50 minutes. Display persistence is adjustable so the image fades at a rate consistent with the event being monitored.

The 607A writes at 0.8 div/ $\mu$ s. It features excellent gray scale and 20 mil-(.51 mm) stored, 10 mil-(.25 mm) non-stored spot size, measured by the shrinking raster method.

The detailed gray scale, high resolution and image contrast are ideally suited, for instance, to M-mode ultrasound scans, where gray scale is used to determine tissue density, and the persistence allows accumulation of data to form a clear picture for accurate diagnosis.

In Gamma camera applications, the 607A delivers bright, sharply focused dots over the entire screen. You can adjust the fade time to synchronize with your count rate to insure a complete picture.

The ability to adjust length of storage time adds significantly to the 607A's capability in spectrum analysis, engine analysis and radar/sonar where the highest resolution requires a slow sweep. On the 607A, the persistence can be adjusted to last long enough to see the entire sweep.

# SPECIFICATIONS CRT DISPLAY AND STORAGE

Variable Persistence Storage Crt — 5-inch, flat-faced rectangular tube with P31 phosphor. 12 kV accelerating potential (8.5 kV, Option 08).

**Display Size** — 8 divisions vertically, 10 divisions horizontally at 0.9 cm/div.

**Graticule** — Standard graticule, external; internal 8 x 10-div graticule available as Option 01.

**Maximum Writing Speed** — At least .8 div/ $\mu$ s for 1 minute viewing time (200 div/ns with Option 08).

Stored Dot Writing Time — A stationary dot written in 500 ns or less can be viewed for at least 15 seconds. With a black background, a stationary dot written in 1  $\mu$ s or less can be viewed for at least 3 minutes. (Measured within a 6 x 8 div quality area.)

**Storage View Time** — Greater than 3 minutes at reduced writing speed.

Save Time — View time is extended to >50 minutes.

Halftone Resolution — At least 18 dots/div.

Halftone Luminance — At least 685.24 cd/m² (200 fL),

Erase Time — Approximately 500 ms.

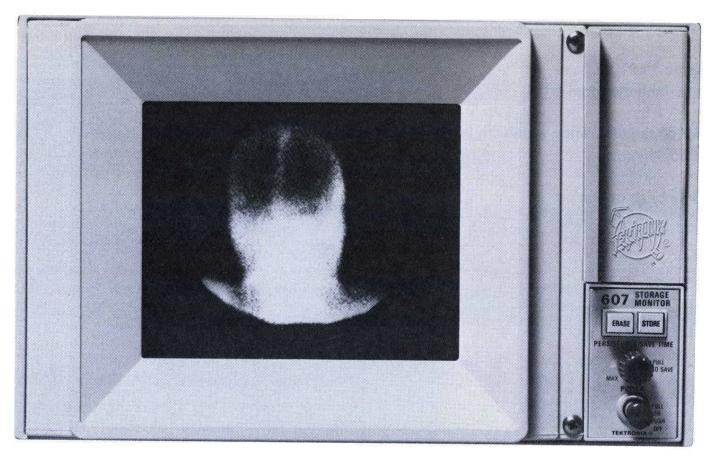
# **VERTICAL AND HORIZONTAL AMPLIFIERS**

**Bandwidth** — Dc to 3 MHz at 3 dB down (80% full screen scan).

**Polarity** — Positive signal to both + inputs moves beam up and to the right.

**Deflection Factor** — Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. 5:1 attenuator (Option 22) extends deflection factor range to 12.5 V full scale.

\*See page 215 for description of "A" designation.



Input R and C — 1M  $\Omega$  paralleled by less than 47 pF.

X-Y Phase Difference — Not more than 1° to 500 kHz.

**Beam Position** — Front-panel position control allows setting zero-signal position to any point on screen. Position shift is  $\leq$ 0.09 cm/hr after 20 minute warm-up.

Settling Time — Typically 1.0  $\mu s$  to settle within 1 spot diameter.

Maximum Input Voltage—± 100 V (dc plus peak ac).

Linear Common-Mode Signal Range (with Option 21) —  $\pm 3$  V non-attenuated. Option 22 extends range 5X to  $\pm 15$  V.

Common-Mode Rejection Ratio (with Option 21) — At least 100:1 to at least 500 kHz. Option 22 (5X attenuator) reduces cmrr to 40:1 to 500 kHz.

Recommended Source Impedance — 10 k $\Omega$  or less.

Optional Horizontal Time Base—1  $\mu$ s/div to 0.1 s/div in six calibrated steps (decade sequence), accurate within 3%. Uncalibrated continuously variable between steps and to approximately 1 s/div, TRIG SLOPE/LEVEL control for stable, triggered displays. For nontriggered display, an internal switch selects bright base line or no sweep.

#### **Z-AXIS AMPLIFIER**

Linear Z-axis amplifier permits intensity modulation of the writing beam. Display intensity increases with positive inputs.

**Bandwidth** — Dc to 5 MHz (-3 dB). Sensitivity adjustable from 1 V to 5 V for full intensity control.

**Differential Input** — Cmrr at least 100:1 to 100 kHz up to 5 V p-p.

Input R and C — 1M  $\Omega$  paralleled by less than 47 pF.

Maximum Input Voltage —  $\pm 100 \text{ V}$  (dc plus peak ac).

# OTHER CHARACTERISTICS

**Inputs** — Provides direct connections at the + X-(horizontal), + Y-(vertical), and + Z-axis amplifiers. The erase, non-storage and save-storage functions can be controlled remotely with TTL compatible signals.

**Outputs** — Erase interval—TTL Compatible. Logic low is 0.4 V or less. Logic high is 2.5 V or more. Will drive 10 unit loads.

**Power Requirements** — Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 volts ( $\pm 10\%$  on each range), and 50 to 60 Hz. Power consumption is 40 watts max at nominal line voltage.

**Ambient Temperature Limits** —  $0^{\circ}$ C to  $50^{\circ}$ C operating;  $-40^{\circ}$ C to  $+70^{\circ}$ C nonoperating.

Finish—Blue vinyl painted cabinet (optionally available), aluminum construction.

**Recommended Cameras** — C-5B, C-5B Option 01, C-28 (external 15 V dc 750 mA power supply required for C-28).

**Included Accessories** — External graticule; external program connector; connector cover.

Dimensions	Cabinet		Rackmount	
	cm	in	cm	in
Height	16.9	6.65	13.3	5.25
Width	21.4	8.4	21.3	8.4
Length, overall	51.9	20.4	48.3	19.0
Weights (Approx)	kg	lb	kg	lb
Net	7.7	17.0	7.9	17.5
Shipping Weight	≈9.9	≈22.0	≈10.4	≈23.0

# ORDERING INFORMATION

607A Variable Persistence Storage Display Monitor\$1775 (without handle, feet and covers)
Option 01 Internal GraticuleNo Charge
Option 04 Time BaseAdd \$165
Option 06 U.L. 544 Listed, Includes Handle, Feet and CoversAdd \$75
Option 08 Fast Writing Speed (200 ns/div), Lower ResolutionSub \$75
Option 09 U.L. Component Recognized . No Charge
Option 10 Remote Program Connector— Contains Remote Save, Erase, Erase Internal, Non-store and Single Ended Inputs only. 25 pin Rectangular Connector
Option 21 Full Differential Inputs (X, Y and Z)Add \$25
Option 22 Extended (X5) Gain Range Add \$20
Option 23 With Handle, Feet and Covers (not available with Option 06 and 28)Add \$50
Option 26—50 $\Omega$ Inputs (X, Y and Z)Add \$20
Option 28 With Covers Only Add \$40 (not available with Options 06 and 23)

See page 216 for information on cameras, crt light filters, and rackmounting.

PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

#### 10-Hour Storage

# 1 million dot/second stored writing speed

#### Large 10.2 cm x 12.7 cm viewing area

#### Stored or nonstored display

The 603A features a bistable storage crt that eliminates refreshing the display and associated costly memory devices. Image brightness adjusts to extend storage time to ten hours. Erase and store commands are remotely programmable (with Option 10) and are accessible together with +X, +Y, and +Z inputs through the Option 10 25-pin connector.

The 603A helps document changing mechanical, electrical or biological phenomena through direct comparison of successive images. In dentistry, for instance, a kinesiograph monitors bite position or jaw movement, producing a series of stored displays on the 603A. These waveforms help the dental specialist in diagnosis.

As a preview monitor, the 603A lets you examine a display in detail before deciding to photograph it. This can eliminate the cost of unnecessary photographs.

#### **SPECIFICATIONS**

#### CRT DISPLAY AND STORAGE

Cathode Ray Tube - 61/2-in flat-faced, bistable storage tube. Phosphor is similar to P1. 3.5 kV accelerating potential. Two storage tubes are available (standard crt for brighter stored display or Option 02 for a faster writing speed at lower stored brightness). When used in the nonstore mode, both tubes exhibit characteristics of a conventional crt.

Writing Speed - Standard crt, at least 20 div/ms; Option 02, at least 200 div/ms.

Dot Writing Time - Time required to write (store) one dot: standard crt, 4  $\mu s$  or less; Option 02 crt, 0.5  $\mu$ s or less.

Information Storage Rate — Standard crt, at least 200,000 dots/s; Option 02 crt, at least 1 million dots/s.

Display Size - 10.2 cm vertically; 12.7 cm horizontally.

Resolution - Stored, equivalent to 80 vertical x 100 horizontal stored line pairs. Nonstored, equivalent to 128 vertical x 160 horizontal line pairs.

Display Linearity — The voltage required to produce a 1-in deflection from any point on the crt will not vary more than 5%.

Viewing Time — At least 1 hr at normal intensity without loss of resolution. Can be extended to 10 hrs with the variable brightness control.

Erase Time - Approx. 250 ms.

# **VERTICAL AND HORIZONTAL AMPLIFIERS**

Bandwidth - Dc to 2 MHz at 3 dB down from 80% of

Deflection Factor - Nominally 1 V full scale. Internally adjustable from 0.5 V to 2.5 V full scale. Option 22 (5X attenuator) extends deflection factor range to 12.5 V full scale.

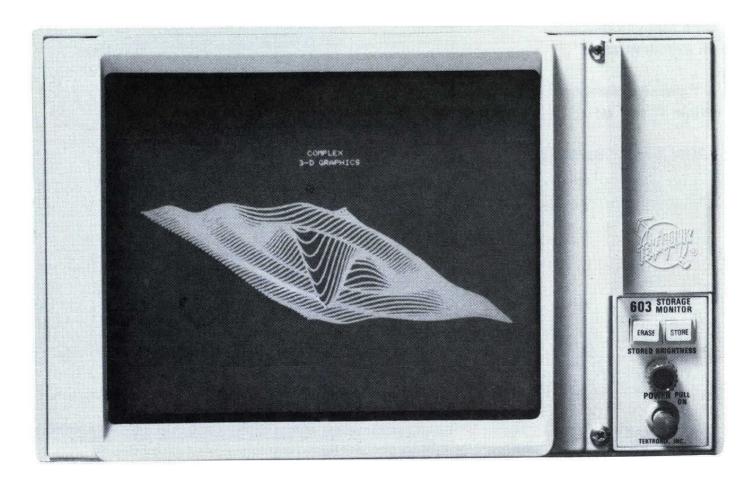
Input R and C — 1 M $\Omega$  ±1% paralleled by <47 pF.

X-Y Phase Difference —  $\leq$ 1° to at least 500 kHz.

Beam Position - Front-panel position controls permit setting ZAO signal position to any point on screen. Position shift is  $\leq$ 1 mm/hr after 20-min warm-up.

Setting Time — 0.2  $\mu s$  or less for distances of 1 div or less. 1µs or less from any point on the crt to within 1 spot diameter of final position.

Max Input Voltage —  $\pm$  100 V dc plus peak ac.



Linear Common-Mode Signal Range (with Option 21) ±3 V, non-attenuated. Option 22 extends range 5X to  $\pm$  15 V.

Common-Mode Rejection Ratio (with Option 21) -At least 100:1 to at least 100 kHz. Option 22 (5X attenuator) reduces cmrr to 50:1 to 100 kHz.

Recommended Source Impedance — 10 k $\Omega$  or less.

Optional Horizontal Time Base - 1 µs/div to 0.1 s/div in 6 calibrated steps (decade sequence), accurate within 3%. Uncalibrated continuously variable between steps and to approx 1s/div. TRIG SLOPE/ LEVEL control for stable, triggered displays. For nontriggered operation, an internal switch selects bright baseline or no sweep.

#### **Z-AXIS AMPLIFIER**

Linear Z-axis amplifier permits intensity modulation of the writing beam in nonstored mode. Positive input to + input increases the display intensity. To insure storage of each written dot, the Z-axis on-time should be at least 4  $\mu s$  with the standard crt and at least 0.5 us with the Option 02 crt. The Z-axis pulse should be timed so that the system settling time is completed before unblanking occurs.

Bandwidth - Dc to 5 MHz over usable range. Sensitivity range is adjustable from 0 to +1 V to 0 to +5 V for full intensity control; Zero V input cuts off

Differential Input (Option 21) - Cmrr at least 100:1 and common-mode range at least  $\pm 5$  V.

Input R and C — 1 M $\Omega$  ±1% paralleled by <47 pF.

Max Input Voltage —  $\pm$  100 V (dc plus peak ac).

#### OTHER CHARACTERISTICS

Power Requirements — Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V ( $\pm\,$ 10% on each range), 50 to 60 Hz and 400 Hz. 75 W max at nominal line voltage.

Temperature range for electrical specifications — 0°C to +50°C.

Finish - Blue vinyl painted cabinet (optionally available), aluminum construction.

Recommended Cameras — C-59P, C-5B, C-5B Option 01, C-28 (External 15 V dc 750 mA power supply reauired).

Included Accessories — External program connector; connector cover; external graticule.

Dimensions	Cabinet		Rackmount	
	cm	in	cm	in
Height	16.9	6.65	13.5	5.25
Width	21.4	8.4	21.4	8.4
Length	48.9	19.25	48.25	19.0
Weight (approx)	kg	lb	kg	lb
Net	7.9	17.5	7.9	17.5
Shipping	10.4	23.0	10.4	23.0

# **ORDERING INFORMATION**

603A Storage Display Monitor \$1450 (without handle, feet and covers)
Option 01 Internal GraticuleNo Charge
Option 02 Fast Writing Speed Crt (200 div/ms)
Option 04
Option 06 U.L. 544 Listed, includes Handle, Feet and Covers
Option 09 U.L. Component RecognizedNo Charge
Option 10 Remote Program Connector.  Contains: Erase internal, non-store, enable/disable, erase and single ended inputs only: 25-pin rectangular connector
Option 21 Full Differential Inputs (X, Y, Z). Add \$25
Option 22 Extended (X5) Gain Range Add \$20
Option 23 With Handle, Feet and Covers (not available with Options 06 and 28) Add \$50
Option 28 With Covers Only

See page 216 for information on cameras, rackmounts, light filters/graticules.

\*See Page 215 for explanation of "A" designation.

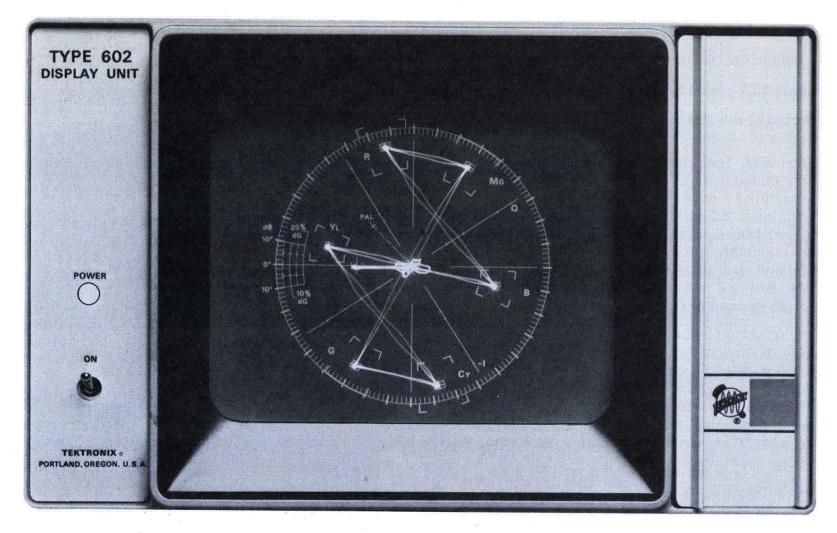
PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANU-FACTURERS.

8-Mil spot size

High resolution an excellent value

X-Y phase difference within 1° to 1 MHz

1 MHz X and Y Bandwidth



The TEKTRONIX 602 is an excellent value — offering high resolution at a competitive price. Its 8-mil (.20 mm) spot size will satisfy many applications requiring high resolution (spot size measured at .5  $\mu$ A beam current and by shrinking raster method). A linear Z-axis amplifier permits precise intensity modulation of the writing beam. The 602 display area measures 8 x 10 cm, but the entire monitor is just 16.5 x 21.6 x 44.2 cm.

Its performance features, size, and low cost make the 602 an excellent choice for graphic, alphanumeric, and vector display applications. For instance, when used with a TEKTRONIX 650 Color Monitor in video tape recorder systems, the 602 provides an exceptionally accurate vector display (vector and SECAM vector graticules optionally available).

The 602 Monitor's stability contributes to an accurate color separation display. Phase and amplitude of a tv signal's color-components, as referenced to a standard color burst signal, are aligned when vector peaks line up with designated points on the vector graticule. The result is precise color.

# SPECIFICATIONS

#### **CRT DISPLAY**

Cathode Ray Tube — 5-in flat-faced rectangular crt with P31 phosphor.

Display Size — 8 cm vertically and 10 cm horizontally.

**Graticule** — Standard 602 comes without graticule. Internal 8 x 10 cm graticule is available as Option 02. Vector and SECAM Vector graticules are available as Option 05 and 08 respectively.

**Trace Width** — Max trace width within the 8 x 10 cm display area is 14 mils at  $0.5\mu A$  beam current (typically less than 10 mils).

**Display Linearity** — The voltage required to produce a 2 cm deflection at any point on the crt will not vary more than 2% in the vertical direction and 6% in the horizontal direction.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

The X (horizontal) and Y (vertical) differential amplifier input circuits are isolated from ground and offer noise-rejection capabilities to minimize noise signals common to the inner and outer conductor of the connecting cables.

Bandwidth — DC to 1 MHz at 3 dB down.

**Deflection Factor** — Vertical: 90 mV/cm to 135 mV/cm, internally variable. Horizontal: 90 mV/cm to 110mV/cm, internally variable.

Phase Difference — Not more than  $1^{\circ}$  between X and Y amplifiers up to 1 MHz.

Beam Position — Front panel vertical and horizontal position ranges permit setting zero signal position to any point on screen. Position shift is not more than 1 mm/hr after 20 min warm-up.

**Polarity** — Positive input to the vertical and horizontal inputs moves the beam up and to the right.

Input R and C — 100 k $\Omega$  ±10% paralleled by 30 pF or less.

Max Input Voltage —  $\pm$  10 V (dc and peak ac).

Recommended Source Impedance — 1 k $\Omega$  or less.

#### **Z-AXIS AMPLIFIER**

A linear Z-axis amplifier permits intensity modulation of the writing beam. Analog input: dc to 1 MHz over 0.0 V to  $\pm$ 1 V range. Signal input is a BNC connector on the rear panel.

Input R and C — 100 k $\Omega$   $\pm\,10\,\%$  paralleled by 70 pF or less.

Max Input Voltage —  $\pm 10$  V (dc plus peak ac).

Recommended Source Impedance — 1 k $\Omega$  or less.

#### OTHER CHARACTERISTICS

**Power Requirements** — 90 to 136 V ac, or 180 to 272 V ac, 48 to 440 Hz. 50 W at 115 V ac, 60 Hz. Rearpanel selector provides rapid accommodation for 6 line-voltage ranges.

**Temperature** — Electrical specifications are valid over the range of  $0^{\circ}$ C to  $+50^{\circ}$ C ambient.

**Finish** — Blue vinyl painted cabinet, aluminum construction.

Recommended Cameras — C-5B, C-5B Option 01, C-28 (external 15 V dc 750 mA power supply required for C-28).

Included Accessories — Smoke-gray filter.

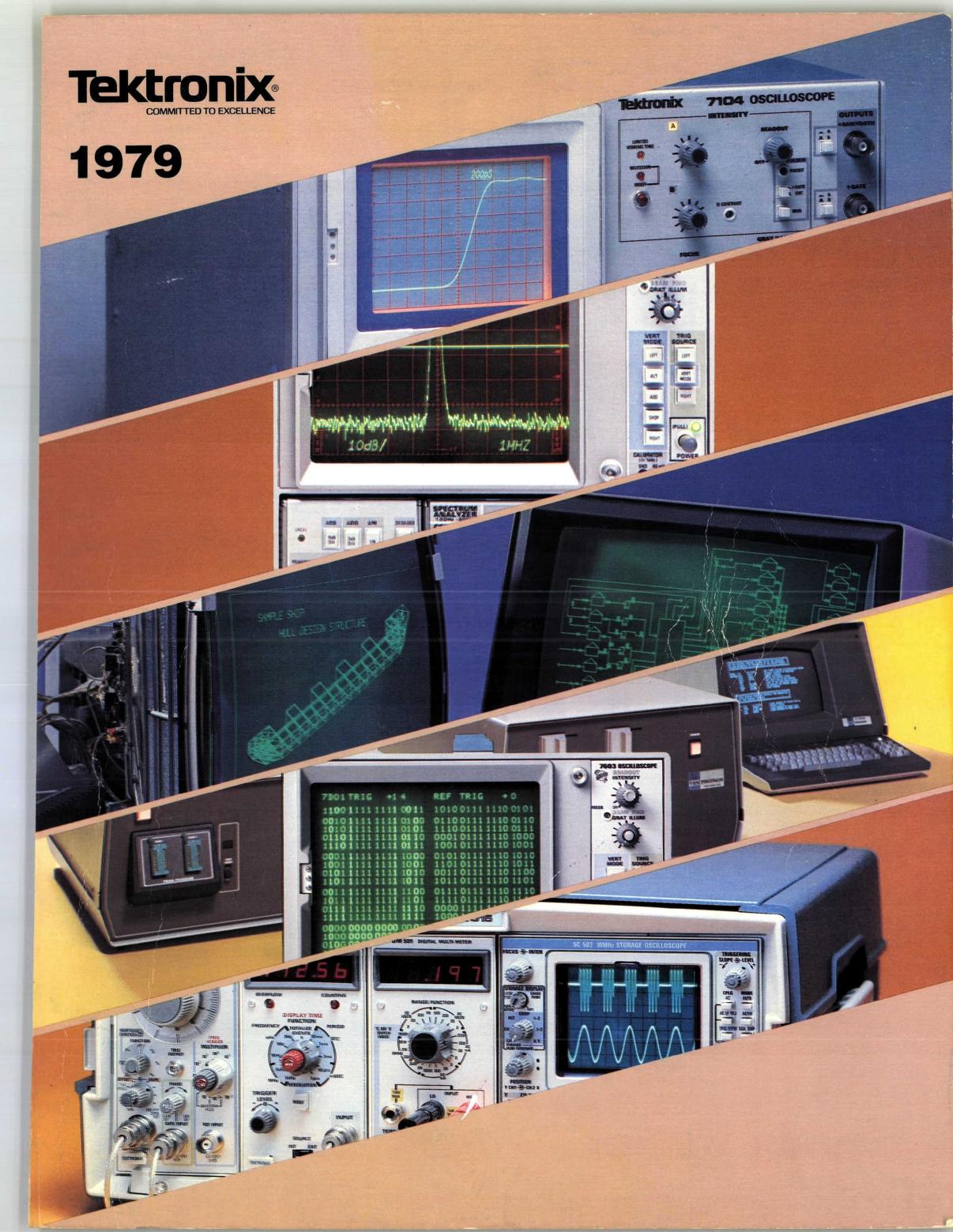
Dimensions	Cabinet		
	cm	in	
Height	16.5	6	
Width	21.6	8.5	
Length	44.2	17.4	
Weights (approx)	kg	lb	
Net Weight	7.9	17.5	
Shipping Weight	≈9.9	≈22	

## **ORDERING INFORMATION**

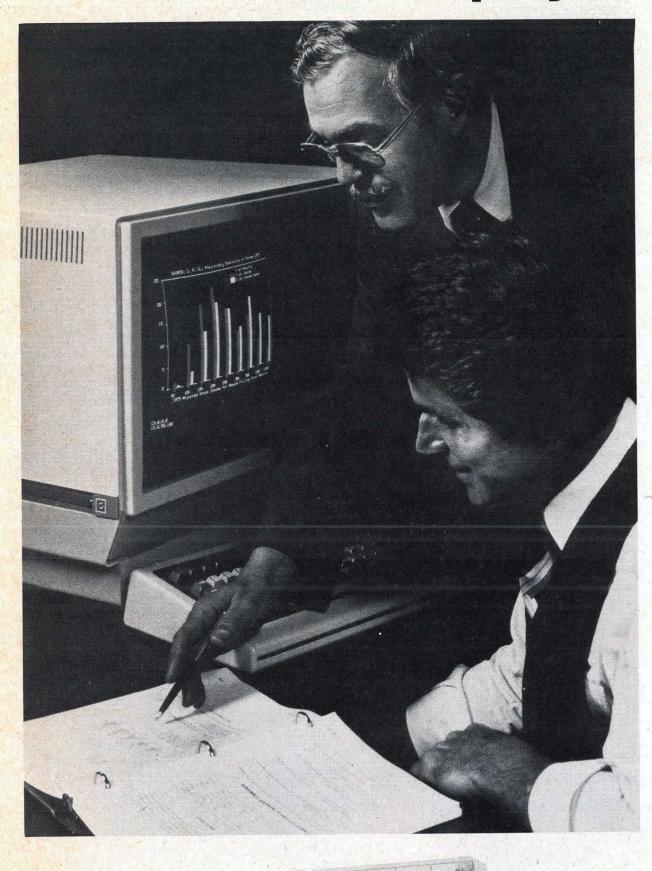
602 Disp	lay Monitor \$1260
	Without cabinetSub \$25
	With graticuleNo Charge
Option 05	Vector Display Graticule sphor Only)Add \$30
Option 08	External SECAM sticuleAdd \$8
	P7 Phosphor

See page 216 for information on cameras, crt light filters, and rackmounting.

PLEASE NOTE: PRICES QUOTED IN THIS SECTION ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.



# Information Display Group Products



As the world's computer graphics leader, Tektronix Information Display Group enters each market with a commitment to the best solution in the industry. You'll see that commitment demonstrated here in low cost graphics. High information density. Alphanumerics and forms ruling. Local intelligence. Color. Software. Peripheral support and service. From business and scientific graphing to complete graphic computer systems, our product development is a mutual process: As our customers demonstrate new needs, we continue to develop solutions. On the following pages you'll see where the graphics market, and thus the graphics leader, are heading.

For additional product information and details on interfacing, software, and accessory support, please indicate your interest on the postcard at the back of the catalog.

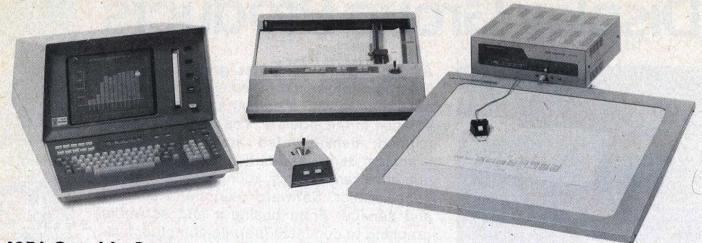
The Graphic Computing Systems Division (GCS) of Tektronix provides computing products and associated peripherals to serve the growing need for stand-alone graphics, desktop computing systems and intelligent graphics terminals.

Simple to use, high technology GCS products have been used in business, medicine, education engineering, and scientific research and development applications.

The nucleus of the GCS product line is the 4051, a proven product with friendly graphics and extended BASIC, interfacing flexibility and a wide range of options and peripherals providing affordable and expandable computing power. A choice of mass storage devices, line printers, graphic input and output devices, plug-in functions (ROM Packs), and applications software packages further extends 4051 versatility.

The 4051 is an integrated system providing approachable computing and graphics technology for efficient and meaningful display of information. With 4051 systems, computing and graphics become friendly, useful tools, whether your expertise is in education, mathematics, the sciences, business, engineering or some other field. GCS products are supplied with a commitment to high quality, worldwide service and support synonymous with Tektronix.





# 4051 Graphic System

The 4051 is an integrated desktop computer with Extended Basic programming language, a graphics-alphanumeric display, keyboard, magnetic tape cartridge drive and IEEE (Std-488-1975) interface built-in. Extensions of the language make it simple for the beginning programmer, but powerful for advanced problem solving. Built-in peripherals and IEEE interface are easy to handle; the language commands accommodate built-in or expanded peripherals through device independent keywords.

The keyboard contains full 128 character ASCII encoding plus user definable function keys, program editing keys, numeric and calculator function keys.

Numeric results are accurate over a wide range. Accurate results are provided to 14 decimal digits from  $\pm 1 \times 10^{-308}$  to  $\pm 10^{308}$ .

The CRT display, using storage tube technology, is 20.3 cm x 15.2 cm (8 inches wide

by 7 inches) high. There is capacity for 35 lines of 72 characters; 2520 characters total. High resolution graphics—1024 x 780 points—means smooth plots of data or functions.

Screen copies are possible with a 4631 Hard Copy Unit plugged into the built-in interface.

File structured storage is readily accessible via the built-in language and 3M® DC300 cartridge drive. Up to 300k bytes of program or data may be stored on the cartridge. Direct access memory of 8k bytes is standard. Optionally it may be extended to 32k bytes.

The General-Purpose Interface Bus (488-1975) provides byte serial, bit parallel data and control for a broad range of peripherals and instruments. Language extentions give program control over interrupt handling polling, and data transfer.

#### **RS-232 Interfaces:**

An RS-232-C printer interface (Option 10) permits connecting the 4051 to any RS-232-C compatible printer.

An asynchronous communications interface (Option 01) permits the 4051 to share data with a host computer. Option 01 gives the 4051 a terminal mode making it look like a 4012 terminal with 300k bytes of local storage. You may send and receive in batch mode directly to or from your host computer and 4051 tape cartridge.

### PHYSICAL CHARACTERISTICS

Height - 34.5 cm (13.6 in).

Width - 46.5 cm (18.3 in).

Length - 82.6 cm (32.5 in).

Net Weight - 29.5 kg (65 lb).

Shipping Weight — 36.8 kg (81 lb).

# **GPIB Product**

# ORDERING INFORMATION

# 4907 File Manager

The 4907 File Manager is a high capacity, highly reliable mass storage device with a built-in file manager and controller. Its ease of operation and compact design make it a natural companion to the 4051. It is compact enough to fit on a desktop or in a rack mount.

The 4907 is a direct access, flexible disc device for the storage and retrieval of ASCII and Binary data and programs. A GPIB (IEEE 488-1975) cable is used to connect the 4907 to the 4051 and provides data and command communication. Data and program integrity is assured by the use of CRC (Cyclic Redundancy Checking) and automatic recovery from erroneous disc reads. A special 4051 File Manager ROM Pack is included to extend the BASIC language to include file management and access commands. None of the 4051 read/write memory is required by the 4907 or ROM Pack. No overhead is added to the 4051 because the 4907's builtin controller assumes the functional tasks.

The flexible disc provides a capacity of 630 kilobytes of user accessible storage using a double density recording technique. As an option, up to two additional disc drives can be connected to one 4907 providing a total of 1.89 megabytes of storage capacity.



The 4907 File Manager offers many features available only on large computer systems. A real-time clock providing date and time of file activities, up to 9 simultaneously open files, file security (passwording and execute only) and dynamic allocation of file space are examples of these enhancements. No bootstrapping of system software is ever required. An advanced multiple level file-

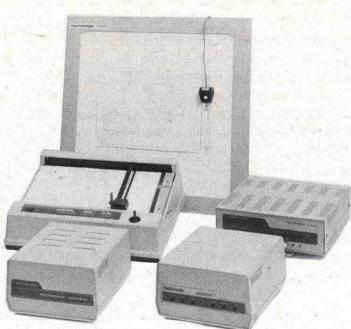


by name system includes a directory that maintains user files, passwords, and available space.

**GPIB Product** 

ORDERING INFORMATION
4907 File Manager ......\$4400





# **4641 MATRIX PRINTER**

180 Characters Per Second
132 Column Printout

# Form Versatility

The 4641 is a 180 character per second matrix printer offering reliable performance with complete form versatility for a variety of output applications. A selectable form feature lets you handle a variety of format sizes, from labels to legal. A format control will adjust machine operation to 11 different form lengths.

A servo controlled carriage assures precise placement of characters, upper and lower case on a 7 x 7 dot matrix, 132 characters per line, six lines to the vertical inch. A tractor-driven paper feed system provides dependable feeding of multipart forms. The printer will adjust for forms up to 6 parts (.020 maximum thickness) and in varying widths. An alarm signals when paper is exhausted.

# 

# 4050C01 SYNCHRONOUS COMMUNICATION INTERFACE

9600 Baud

#### IBM Binary Synchronous 2780 RJE Protocol

The 4050C01 Synchronous Communications Interface allows up to 9600 baud, error free communications between IBM computer systems and TEKTRONIX 4051 Graphic Systems.

The 4050C01 connects through a ROM backpack slot and is a firmware implementation of IBM Binary Synchronous 2780 remove job entry protocol in a microprocessor based intelligent peripheral interface.

Compatible modems which are supported include Bell 201A, 201B or C, 208 or 209 which support baud rates from 2000 to 9600.

## ORDERING INFORMATION

4050C01 Synchronous
Communications I/F .....\$3200

# 4924 DIGITAL CARTRIDGE TAPE DRIVE

300k Bytes of Storage

# **GPIB Product**

The 4924 auxiliary tape drive provides inexpensive storage and enhances the built-in storage capacity of 4051 Graphic Systems. 300k bytes of information can be stored on each tape cartridge and the 4924 can be addressed by the same commands used to control a 4051 built-in tape unit.

The 4924 can also be placed on-line to another controller which follows the IEEE 488-1975 standard protocol or off-line in talk only or listen only mode, which allows limited data logging capability.

ORDERING INFORMATION
4924 Digital Cartridge Tape Drive ...\$2495

# **4642 PRINTER**

# 60 Characters Per Second 80 and 132 Column Output

The 4642 is a 60 character per second, low cost printer which utilizes standard RS232 interfacing. Regular and elongated characters are available in 80 column and condsensed 132 column output, using a 5 x 7 dot matrix.

The 4642 is a compact, table top unit which supports inexpensive roll paper, or with the optional tractor feed paper drive, can be used with both fan-fold paper and multi-part forms.

#### ORDERING INFORMATION

4642 Printer .....\$2250

# 4051E01 ROM EXPANDER

The 4051E01 ROM Expander Unit is a desktop accessory for the 4051 Graphic System and provides 8 additional slots for connecting ROM packs.

The ROM Expander Unit is interfaced using an Expander Interface ROM Pack and allows any combination of special functions or interface ROM packs to be inserted into the remaining backpack slot or any of the 8 slots provided by the expander.

# ORDERING INFORMATION 4051E01 ROM Expander ......\$795

# 4952/Opt. 02 Joystick

The 4952 Option 02 Joystick provides increased interactive graphics input power to users of 4051 Graphic Systems.

The 4952 utilizes a vertical lever which can be moved in the direction you want to move the cursor; speed is controlled by the angle or distance of the lever from the center position.

When activated by the BASIC command, POINTER, the joystick returns an X, Y coordinate accurate to .1% for percise input. The joystick provides the perfect combination of free form and guided direction needed for interactive graphics.

# ORDERING INFORMATION 4952/Option 02 Joystick . . . . . . . . . . . . \$595

# **4956 GRAPHIC TABLET**

**GPIB** Interface

Resolution: 0.1 mm (0.005")

**Available In Two Sizes** 

The 4956 Graphic Tablet provides users of 4051 Graphic Systems with digitizing, tracing, and free-hand graphics capability. Available in two sizes, 20" x 20" x 48", the 4956 offers exceptional resolution and accuracy with a choice of stylus or cursor input. The tablet uses the IEEE 488-1975 standard interface and has four digitizing modes which allows one or more data points to be input at a user selectable rate.

# ORDERING INFORMATION

4956 Graphic Tablet 20" x 20" \$4900
4956 Option 33
36" x 48" Graphic Surface Add \$2600

# SOFTWARE:



4051 software provides flexible, interactive programs that aid the user in business, scientific, and general purpose applications. High quality graphics are an integral part of the software. Each package comes complete with a binder, program tape(s), instruction manual, and any required key overlays.

Plot 50: Mathematics Vols. 1 and 2 can be purchased individually, or together as the Plot 50: Mathematics Program Library. Plot 50: Mathematics Vol. 1 contains 23 programs and subroutines that provide fast solutions to frequently encountered mathematical probelms. Included are conversions, function analysis and plotting, integration, differentiation, and solutions to linear and differential equations. Plot 50: Mathematics Vol. 2 consists of 16 programs and subroutines for solving more advanced mathematical probelms, such as linear programming, data fitting, and fast fourier transforms. The package also provides sophisticated techniques for advanced matrix operations, integration, and solutions to linear or differential equations.

Plot 50: Statistics Vols. 1, 2, 3, and 4 may be purchased separately, or together as the Plot 50: Statistics Program Library. Plot 50: Statistics Vol. 1 contains 24 programs that generate tabled values for many common statistical distributions, allow testing of various hypotheses, and provide several data plotting and regression techniques. Plot 50: Statistics Vol. 2 provides six sophisticated programs for one, two, and three-way analysis of variance and covariance; and Latin squares. PLOT 50: Statistics Vol. 3 contains two large, highly interactive programs for performing polynomial and multiple linear regression. Plot 50: Statistics Vol. 4 is a comprehensive package that provides 9 sophisticated non-linear regression techniques.

The Plot 50 Mathematics, Statistics, and Graph Plot packages may be purchased together as the Plot 50: Scientific Library.

Plot 50: Graph Plot helps either the novice or the sophisticated user prepare data representation graphics on the display or the 4662 Plotter. The package allows convenient data entry from keyboard or tape, then lets the user create a "presentation" of his data; arranging combinations of graphs, tables, and text together on one page.

The data and the completed presentation can be stored on tape. The format of the presentation can also be saved, and used again with different sets of data.

Plot: 50 General Utility Programs Vol. 1 contains fifteen subroutines and programs that aid the user in everyday 4051 tasks. Included are routines to edit BASIC programs quickly and easily, sort strings or data, duplicate tapes, and name tape files. Also included is a program that generates easy-to-read formatted listings of any BASIC program.

Plot 50: Business Planning and Analysis Vol. 1 is a collection of interactive programs for business decision-making and problem solving. The programs perform 1) general financial analysis, 2) quantitative decision analysis, and 3) recordkeeping and sorted data report generation. Problem solutions are presented graphically, on the display or the 4662 Plotter. Data reports can be shown on the display or the 4641/2 Printer.

Plot 50: Electrical Engineering Vol. 1 is a set of programs for modeling and analyzing audio, high frequency, VHF, UHF, and microwave circuits and systems. The programs are highly interactive and allow the user complete control over the circuit model, the method of analysis, and the type of graphic or tabular output.

Modeling and Reporting Software is a general-purpose modeling and reporting system that allow the user to automate his analysis and reporting processes. The package is optimized for user convenience, and requires no previous computer experience. Using simple English-like statements, the user can enter, manipulate, and store his data in matrix format. Once the desired calculations and format are saved in the form of a model, reports and graphics can be produced simply by revising the data and running the model. Report-quality tabular and graphic output are available from the display, the 4641 Printer, or the 4662 Plotter. The model and the reporting structure can be saved on tape or disc for future use.

# **ORDERING INFORMATION**

4050A01 PLOT 50: Statistics, Vol. 1\$350
4050A02 PLOT 50: Statistics, Vol. 2 \$350
4050A03 PLOT 50: Statistics, Vol. 3\$600
4050A10 PLOT 50: Statistics, Vol. 4 \$600
4050A13 Statistics Library \$1550
4050A04 PLOT 50: Mathematics, Vol. 1.\$300
4050A05 PLOT 50: Mathematics, Vol. 2.\$400
4050A14 Mathematics Library \$600
4050A15 Scientific Library\$2400
4050A06 PLOT 50:
Electrical Eng., Vol. 1\$300
4050A07 PLOT 50: Graph Plot\$350
4050A08 PLOT 50:
Gen. Util. Prgm., Vol. 2\$275
4050A09 PLOT 50:
Business Planning & Analysis, Vol. 1 .\$350
4050B01 Modeling and Reporting
Software\$2000
Option 05 (Flexible Disc Version) N C

# THE 4051 APPLICATIONS LIBRARY:

4051 owner and users are encouraged to join tht 4051 Application Libarary. A library of contributed software is maintained which provides a central resource of existing programs. A free newsletter, **TEKniques**, informs members of other users' applications, programming tips, new programs in the library and new 4051-related products.

4051 APPLICATIONS LIBRARY MEMBER-SHIP write to: Group 451, P.O. Box 500, Beaverton, Oregon 97077.

# SPECIAL FUNCTION ROM PACKS



Special function ROM packs are accessories that plug into the 4051 backpack or into the 4051E01 ROM Expander Unit. The ROM packs provide additional 4051 commands, without using any read/write memory.

The 4051R01 matrix functions ROM pack supplements the 4051 with five commonly used matrix operations: matrix multiplication, matrix inversion, transpose, identity, and determinant. The operations are 2 to 8 times faster than functionally equivalent BASIC programs.

The 4051R05 Binary Program Loader ROM pack provides four commands that allow fast program loading and storing in binary format. Program file saving, recalling, overlaying and appending are 3 to 10 times faster using the Binary Loader ROM pack.

The 4051R06 EDITOR ROM pack is a general-purpose text editor that can be used to create, edit, and store ACSII text of any kind. Twenty-nine commands are provided for quickly rearranging and modifying text. The text can be any set of ASCII characters: programs, data, or free-form text.

The EDITOR lets you use the 4051 to write or update programs in FORTRAN, COBAL, and other programming languages. This greatly enhances the 4051's capabilities as an intelligent terminal. You can develop programs off-line using the EDITOR, then use the 4051 Option 01 Data Communications Interface to send them to a host computer for processing.

# ORDERING INFORMATION

# ROM PACKS 4051R01 Matrix Function ROM Pack . \$350 4051R05 Binary Program Loader ROM Pack . . . . . \$200 4051R06 Editor ROM Pack . . . . . \$600

## 4006-1



Low Cost
High Resolution
Graphic and Alphanumerics

#### **SPECIFICATIONS**

**Display Size** — The screen is a direct-view storage crt, 19.1 cm wide x 14.2 cm high, (7-1/2 in wide x 5-3/5 in high).

Alphanumeric Mode Format — 35 lines, 74 characters per line, 2590 characters full screen.

Character Set — 63 printing characters (TTY ASCII

**Graphic Display Mode** 

Vectors Only.

Vector drawing time  $3.6 \pm .2$  ms.

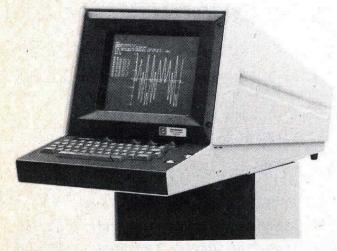
Information Density — 1024 X by 1024 Y Addressable points. 1024 X by 780 Y viewable points.

**Baud Rate** — Transmit and receive independently selectable from 75 to 4800 baud.

Interfacing — The 4006-1 is shipped with a Standard Data Communication Interface, with inputs and outputs conforming with EIA RS-232-C.

ORDERING INFORMATION

4010-1



Supports Alphanumerics Plus Low-Cost Computer Graphics

**Graphic Input** 

Convenient Bus Structure for Peripheral add-on

Complete PLOT 10 Software Support

### SPECIFICATIONS

**Display Size** — The screen is a direct view storage crt, 19.1 cm wide x 14.2 cm high, (7-1/2 in wide x 5-3/5 in high).

Alphanumeric Mode Format — 35 lines, 74 characters per line, 2590 characters full screen.

Character Set — 63 printing characters (TTY ASCII Code).

Character Generation — 5 x 7 dot matrix. Up to 1200 characters per second.

Graphic Display Mode — Vectors only. There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

Graphics Input Mode — A thumb-wheel controlled cross-hair cursor for 3 through 1023 X and 0 through 780 Y addressable points.

#### ORDERING INFORMATION

4010-1 Computer Display Terminal with Standard Data Communication Interface ......\$4,950

#### 4012

**High Resolution Flicker-Free Graphics** 

Full Upper and Lower Case ASCII character set

Convenient bus structure for peripheral add-on

## SPECIFICATIONS

Display Size — The screen is a direct-view storage crt 21 cm wide x 16.2 cm high, (81/4 in wide by 63/8 in high).

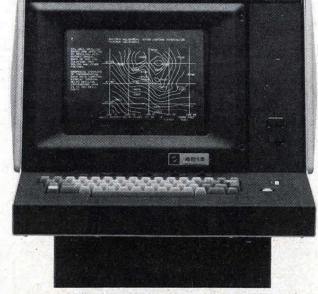
Character Set — The 4012 has 96 printing characters and a 7 x 9 dot matrix. (Full ASCII code).

**Graphic Display Mode** — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphic Input Mode** — A thumb-wheel controlled cross-haired cursor for 3 through 1023 X and 0 through 780 Y addressable points.

# ORDERING INFORMATION

4013



4012 High Performance plus APL Character Set

# ORDERING INFORMATION

 4014-1



48.3 cm (19 in), Direct-View Storage Display

**Selectable Formats in Alphanumeric** and **Graphic Modes** 

**Plug-in Intelligence Options** 

High-Resolution, Attractive, Flicker-Free Interactive Graphics

The 4014-1's 19-inch, high resolution and interactive graphics capabilities have made it the leading graphics device in a growing number of graphic applications.

#### SPECIFICATIONS

**Display Size** — The screen is a direct-view storage crt, 38.1 cm wide x 28 cm high; 48.3 cm diagonal (15 in wide x 11 in high; 19 in diagonal).

Character Set — Includes 96 characters (full ASCII upper and lower case, plus a TTY subset).

Vector Mode — There are 1024 X by 1024 Y addressable points, and 1024 X by 780 Y viewable points.

**Graphic Input Mode** — Thumb-wheel controlled cross-hair cursor for 3 through 1024 X and 0 through 780 Y addressable points.

4014-1 Enhanced Graphics Module, Option 34 — With this extra-cost option, capacity is extended to 4096 X by 4096 Y addressable points and 4096 X by 3120 Y displayable points. Dotted and dashed line vectors (five variables).

# ORDERING INFORMATION

# 4015-1

Full APL and ASCII Character Sets
4014-1 High Performance plus
APL Character Set
Interactive Graphics Capability

## **ORDERING INFORMATION**

# **Information Display Products**

Computer Display Terminals

4016-1



63.6 cm (25 inch) Direct-View
Storage Display
High Resolution Flicker-free Graphics
Selectable Formats in Graphic and
Alphanumeric Modes
Plug-in Intelligence Options

The Tektronix 25 inch Computer Display Terminal is the most effective way to display a large data base. It features a big 63.6 cm (25 inch), diagonal screen.

The 63.6 cm (25 inch), direct-view storage display tube allows over 15,000 characters on the screen in 179 characters per line columns, or in 3 other format sizes. A variety of vector types, point plot modes, and interactive modes are provided.

# Complete TEKTRONIX 4014-1 Compatibility

The 4016-1 was designed for complete compatibility with all PLOT 10 Software, peripherals, communications support, and the series of intelligent plug-in options.

### **ORDERING INFORMATION**

4016-1 Computer Display Terminal with Standard Data Communications Interface ......\$19,500



Interactive Graphics Terminal

Merging Storage and Refresh Graphics
to Create a Technological First

#### **Standard Features:**

Local Graphics Editor
4014 Terminal Emulator
Graphics File Transfer
Local Storage of Graphics Information
Host Control of Terminal Functions
Command Language
Service Independence
Hard Copy Compatible
Host-terminal Data Error Detection

# ORDERING INFORMATION\* 4081 Interactive Graphics Terminal . \$27,000 Option 06 CDC Synchronous Interface . . . . . . . . . . . . . . . . . Add \$3,995 Option 22 64K Byte Total Memory . . . . . . . . . . . . . . Add \$3,950 Option 31 Expansion Package . . Add \$1,800 4905 Mass Storage Module . . . . . . . . . . . . \$635 Option 31 Dual Flexible Disc .....\$5,725 Option 32 Two Dual Flexible Discs .\$11,450 Option 33 Single Hard Disc .....\$12,000 Option 34 Dual Hard Disc ......\$21,000 4080A04 PLOT 80 Programming Support Package .....\$2,000 4080A05 PLOT 80 Fortran IV and Distributed **Graphics Support Subroutines .....\$3,000**

\*The 4081 and 4905 may not be available in some areas of the world. Consult your local Tektronix Representative or Distributor.

#### 4020 Series

**Computer Display Terminals** 



4024 — The Complete Alphanumerics Terminal Data Entry, Program Writing, Editing, and Forms Fill Out with optional forms ruling.



4025 — Expandable from full alphanumerics, to forms rulings, and then into graphics.



# Rolling & Scrolling both alphanumerics and graphics.

4027 — Full Color Graphics and Alphanumerics rolling and scrolling of alphanumerics and graphics Multi-paged graphing. With the added dimension of color Graphics Input.

#### **4025 SPECIFICATIONS**

Display Medium — Video Monitor.

Display Size — 22.9 cm wide x 16.3 cm high. (9 in wide x 6.4 in high).

Raster Line — Standard 525 line scan, with 480 lines displayed.

Character Set — 64/96 Upper and Lower Case ASCII (Optional character sets available).

#### **ALPHANUMERIC**

Mode Format — 34 lines, 80 charactears per line, 2720 characters full screen.

#### CHARACTER

Generation — 7 x 9 in a 8 x 14 dot matrix (graphic cells are 8 x 14 matrix).

Cursor — Wide underscore.

Baud Rate - Selectable to 9600 baud.

Graphics — Optional.

#### **4027 SPECIFICATIONS**

Display Size — 25.4 cm wide x 19.1 cm high, (10 in wide x 7.5 in high).

Graphics — Standard with Full Screen cross-hair cursor.

Color — 8 colors displayable, colors selected from a pallette of 64 colors.

Patterns — 120 user definable color patterns.

Local Functions — Circle and pie generation, polygon fill.

Other 4027 Specification — Same as 4025.

#### ORDERING INFORMATION

4024 Computer Display Terminal ...\$2,995 4025 Computer Display Terminal ...\$3,595 4027 Color Graphics Terminal .....\$8,695

#### **PLOT 10 SOFTWARE**

For 4010-Series Terminals. 4006-1, 4025 and 4027 color display.

Tools for easy use of graphic and alphanumeric capabilities of TEKTRONIX Terminals.

4010A01 PLOT 10 Terminal Control System ......\$850 4010A10 PLOT 10 Terminal Control System, Implementation for IBM with TSO ...\$1,095 4010A11 PLOT 10 Terminal Control System, Implementation CDC SCOPE/Intercom with 4010A12 PLOT 10 Terminal Control System, Implementation for PDP-11 with DOS . \$895 Versatile software to graph your data using a powerful set of FORTRAN IV subroutines. 4010A02 PLOT 10 Advance Graphing II \$950 Complete Support for TEKTRONIX 4013 and 4015 with self documenting commands, for the APL Programmer. 4010A09 PLOT 10 APL GRAPH II .... \$850 4010A13 PLOT 10 APL GRAPH II, Implementation for

APL/360 .....\$1,095
Office machine simplicity for the production

of the most popular formats in graphing.
4010B01-5 PLOT 10 Easy Graphing . . . \$875
4010B01 Plot 10 Easy Graphing

Punch Paper Tape ......\$875 4010B02 Plot 10 Easy Graphing

026 Format Punched Cards . . . . . . . \$875 4010B03 Plot 1 Easy Graphing

Punch Cards ......\$875

4010C01 PLOT 10 Interactive Graphics Library.

Powerful graphing through English language commands for the non-programmer 4010A03 PLOT 10 Interactive Graphing

Correct your graphics easily with a TEK-TRONIX Terminal before plotting.

4010A04 PLOT 10 Preview Routines for CalComp Plotters .....\$350

Provides complete flexibility of character definition, including rotation, scaling, and special characters.

4010A05 PLOT 10 Character Generation System ......\$175

Point by point TEKTRONIX 4953 and 4954 support plus pencil and paper input ease for many computer systems.

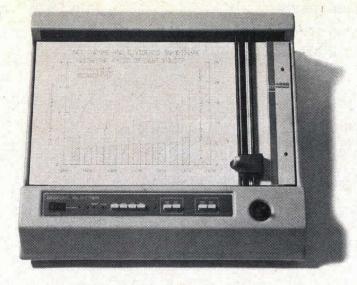
4010A06 PLOT 10 Graphic Tablet Utility Routines .....\$125

Individual addressing of up to 12 Tektronix displays.

4010A08 PLOT 10 Display Multiplexer Utility Routines .....\$110

Designed for device independent control of DVST, raster scan displays, and plotters. Offers a growing array of graphics control functions such as commands for color, 3-D, line smoothing, and multi font text manipulation.

#### 4662



Microprocessor Based
7-Character Fonts
RS-232-C and GPIB Compatible

# **GPIB Product**

The Tektronix 4662 Interactive Digital Plotter is microprocessor based, interactive, flexible in capabilities and easy to use.

25.5 mm x 38.1 mm, (10 in x 15 in), drawing area.

0.005 inch resolution  $\pm 0.0025$  inch repeatability.

1:1 reproduction of crt displays up to 19 in diagonal.

Convenient, electrostatic positioning. Pen speed is 16 to 22 ips.

It is plug compatible with many Data Communications Systems (RS-232-C Full Duplex) and with the TEKTRONIX 4051 and IEEE 488-1975 interface standard.

The Fully Internal Character Generator Easy Labeling from Terminal Keyboard Exact Sizing to "Fit" only Graph or Plot.

1600 byte buffer.

Accommodation of Formatted Media.

Joystick Positioning.

Allowance for up-dating or changes on back of acetate.

90 watts maximum, 60 watts typical power requirement.

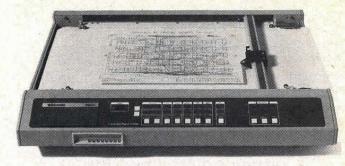
30 lb 13.8 kg Approx Weight.

UL Listed, CSA Approved.

# ORDERING INFORMATION

4662 Interactive Digital Plotter\$4	195
Option 01, Interactive Digital Plotter	(for
4051 Graphic System)	NC.
Option 30, RS232 Interface for	
4081	525

# 4663



Built-in Processing Power
C-Size: 420 mm x 594 min
Unique Parameter Entry Device

# **GPIB Product**

The 4663 is the first high speed C-size plotter with the built-in processing power. This built-in processing power together with 5.5k buffer memory frees the host from many routine computational operations.

This gives you maximum system efficiency. The paper advance option is available for roll stock.

The plotter features dual programmable pen control with interchangeable multi-color pens and is capable of producing dotted or dashed lines from local firmwave.

### SPECIFICATIONS

Max. Plotting Area — X axis 569 mm x Y axis 432 mm (22.4 in x 17 in).

Repeatability — ±.0025 inches.

Max. Plotting Speed — 16-22 ips Vector Dependent.

Paper Size — U.S. C-size (17 in x 22 in)—European A2-size (420 mm x 594 mm).

Media Type — Paper or acetate.

Baud Rate — -110 -9600 BPS.

Joystick — Manually positions the pens or crosshairs. US Listed CSA Approved.

# ORDERING INFORMATION

4663 Interactive Digital Plotter . . . . . \$9,495 Option 36 Paper Advance . . . . . Add \$700

4631



**Dry Process Hard Copy Unit** 

21.6 cm x 28 cm, (8½ in x 11 in), copies Supports up to Four Terminals with optional multiplexer

# SPECIFICATIONS

Paper Size — 21.6 cm x 28 cm, (8½ in x 11 in) Dry Silver.

Copy Size — Position I and III produces 22.5 cm x 17.1 cm, (8.85 in x 6.7 in), copy, oriented horizontally

# **Information Display Group**

**OEM Products** 

on an 21.6 cm x 28 cm, (8½ in x 11 in), piece of paper. Position II produces a 18.1 cm x 13.8 cm, (7.1 in x 5.4 in), copy, oriented vertically on an 21.6 cm x 28 cm, (8½ in x 11 in), piece of paper.

Exposure Time — Position I and II approx 7 s., position III approx 14 s.

Dimension — (Height, width, length) 29.5 cm x 40.7 cm x 64.8 cm, (11.6 in x 16 in x 25.5 in).

Weight - Approx 29.5 kg (65 lb).

Standard Accessories — One 10 ft Connecting Cable (012-0547-00).

#### **ORDERING INFORMATION**

4631 Hard Copy Unit	\$4,495
Option 01 — Copy Count	er, automatically
counts the copies made by	the
4631	Add \$60

#### 4632

Simple, Quiet Operation
Completely Self-Contained
Dry Process Developing

Permanent 21.6 cm x 28 cm, (8½ in x 11 in), Gray Scale Copies from Standard Video Signals and Most Refreshed Terminals.

#### SPECIFICATIONS

Standard Copy size adjustment is 21.6 cm x 28 cm, (8½ in by 11 in), for horizontal raster display (4:3 aspect ratio). Copy time is approx 18 s for the first copy and about 8 s for additional copies of the same display.

Input Requirements — Input signals may be any one of three configurations: composite video, video with horizontal and vertical drive, or video with composite sync. Input video amplitude is from 0.3 V to 5 V. Impedance is 75 ohms, loop-through. Return loss is at least 46 dB. Common-mode rejection is at least 30 dB. Max input is 10 V dc plus peak ac. Input sync amplitude is 0.3 V to 8 V p-p; impedance is 20 k $\Omega$ .

#### ORDERING INFORMATION

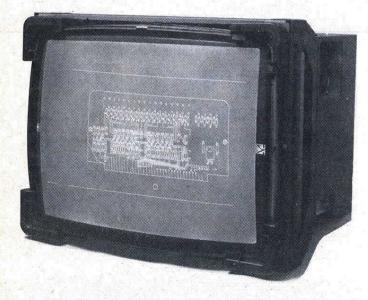
4632 Video Hard Copy Unit ......\$4,595

# **OEM Products**

The GMA Series of displays are designed to allow a system builder significant flexibility in incorporating a computer display with both low-cost and higher-performance options.

The following three GMA's are basic modules, each of which may be coupled to the many performance options to meet the specific need of the system builder. Exceptions on module/performance capability can be noted in the list of options.

#### **GMA 125**



The GMA125 was designed exclusively for systems builders and is intended to satisfy display applications of the greatest size and complexity. It incorporates 70% more workspace than even our own previous industry leaders, the 19-inch GMA102A and GMA101A. Like other members of the GMA series, it provides high resolution storage tube graphics at low cost.

The detail of storage. The dynamics of refresh. The GMA125 features a 25-inch crt that offers unequaled information display capacity. Adjacent points that would be indistinguishable on a smaller screen can be seen as distinct units on the GMA125. It is ideal for group viewing and for greater graphics detail. A new 110 degree crt enables greater brightness with less energy

# **GMA Series Information Display Group**

	GMA	101A	GMA	GMA 125	
PERFORMANCE CRITERIA	Display	Opt 32 V/C Gen	Display	Opt 43 Hi Speed V/C Gen	Display
Screen Size (diagonal)	48.3 cm 19 in	No.	48.3 cm 19 in		63.6 cm 25 in
Stored Writing Speed: Vectors (Kcm/sec) Characters (char/sec) Vectors/msec	10	10 2000 >140	15	>11 >6000 >160	20
Refresh Capacity (30 Hz): Vector inches Characters Vectors/frame			1575 in	>1100 in >300 >13,000	19 <mark>68 in</mark>
Refresh Speed: Vectors (Kcm/sec) Characters (char/sec) Vectors/msec			120	90 >10,000 >390	150
Stored Dot Writing Time (µS)	5	- 10 N	5	The second	2
Settling Time ( $\mu$ S): >1 cm move <1 cm move	5+5/cm		1+2/cm	b is	1+2/cm
Resolution: Line Pairs/inch (Screen center) Line Pairs/axis Addressable Points/long axis Addressable Points/inch Addressable Picture Elements Characters/line Lines/Page Characters/page	40 420x525	4096 >290 >12M 133 64 >8500	40 420x525	4096 >290 >12M 133 64 >8500	40 540x675
Contrast Ratio: Refresh (60 Hz) Stored	4:1		4:1 4:1		4:1 4:1
Stored Luminance (foot-Lamberts)	5	Wigner 1	5		8

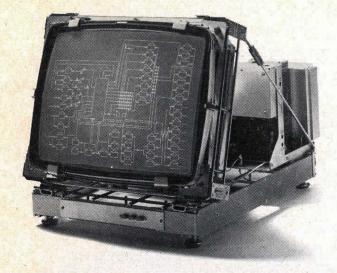
consumption in a more compact package than would be achievable with a 90 degree crt

The GMA125 will display up to 1968 vector inches of refreshed data, enabling all the benefits of selective erase, interactivity and dynamic motion with the same high resolution of storage. By placing fixed or finalized data in store while retaining dynamic or working data in refresh, you can work interactively with high density graphics and alphanumerics while making maximum use of

processing power to address the application rather than support the display.

Modular design assures ideal building economy. Order crt chassis and power supply only, or configure it based on your own manufacturing capabilities and system specifications. The welded-steel, symmetrically structured chassis may be rotated vertically or horizontally, and tilted to any degree. Space is left in the card cage for you to add up to three circuit boards with your own application options.

#### GMA102A/101A



GMA102A is a 19-inch high performance member of the GMA Series with both storage and refresh capability. The GMA 102A can display up to 1575 vector inches of refreshed data while simultaneously providing all of the benefits of storage technology. The refresh feature adds the benefits of selective erase, interactivity and dynamic motion with the same high resolution of storage.

The GMA101A is the 19-inch low cost, high resolution storage display available to the system builder and tailored for an application that emphasizes storage graphics. It has a very fast stored data-drawing capability of 3900 inches per second and at this rate, the entire screen can be redrawn in less than a second, permitting effective zooming or panning.

Modular Construction. Both the GMA102A and GMA101A have crt and printed circuit board modules arranged on a unique high strength wireform chassis. This construction not only supports different performance, interface and packaging options but permits easy removal of modules for field service.

#### **GMA SERIES OPTIONS**

#### **Options**

Option 30 Non-Hard Copy

Option 31 Vertical format (no charge)\*

Option 32 Dot Character/Vector Generator

Option 33 Front Panel Pushbutton Switches\*

Option 34 Analog Rear Connector

Option 35 Digital Rear Connector

Option 36 Excess Current +5 Volt Supply

Option 37 Green Glass CRT Filter\*

Option 38 Blue Glass CRT Filter

Option 39 Green Plastic CRT Filter\*

Option 40 Blue Plastic CRT Filter\*

Option 42 High Speed Vector Generator (includes Option 36)\*\*

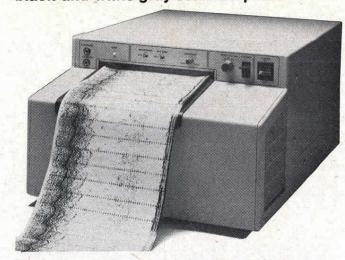
Option 43 High Speed Vector Character Generator (Includes Option 36)\*\*

- \*Available on GMA101A or GMA102A only. Option 37 is included with basic GMA125.
- \*\*Available only with GMA102A or GMA125.

#### Peripheral

**TEKTRONIX 4631 Hard Copy Unit** 

4633A Continuous Recorder. High-resolution black-and-white gray scale output.



The 4633A Continuous Recorder provides high-resolution hard copy from devices such as M-mode ultrasound systems, which produce a Z-axis input signal simultaneously with a horizontal ramp signal. It is particularly easy for the OEM system builder to integrate within any M-mode ultrasound system.

The key to its consistent high quality is the Tektronix fiber optics technology. Images are exposed one line at a time as paper moves across the fiber optic crt. They are then thermally-developed by the internal processor and emerge via a slot in the front panel.

Operation is especially straightforward, for example, in continuous format, output may continue either automatically or only as long as the RECORD switch is depressed. Page formats are adjustable for either 190 mm (7.5 in) or 270 mm (10.6 in) lengths.

Image width is also adjustable to a maximum full seven inches, allowing multiplexing of other signals alongside. Paper speed is selectable from 10 mm/sec, 25 mm/sec, 50 mm/sec and a two times speed control for rates of 20 mm/sec, 50 mm/sec and 100 mm/sec.

These and other options such as, inverted image, or slow scan continuous configurations are front panel selctable and easily implemented via simple jumper strap or pin adjustments on the internal circuit boards.

#### **SPECIFICATIONS**

# RECORDING SPECIFICATIONS

Recording Paper — 3M Dry Silver, Type 7772.

Roll Paper Length — 152 m (500 ft)

Paper Width — 21.6 cm (8.5 in)

Image Width — 18 cm (7 in).

Resolution — Spot Size: 15 mm (.006 in).

Shades of Gray — 5 distinguishable levels with 8 linear input steps of 0.125 volts each.

Selectable Paper Speeds — 10 mm/s, 25 mm/s, 50 mm/s.

-2X SPEED (jack for foot switch) — 20 mm/s, 50 50 mm/s, 100 mm/s. Depress to double selectable paper speed, release to return to normal speed.

Record Mode Selection — Internal Jumper Selectable for page mode or one of two continuous modes.

Page Format — 190 mm (7.5 in) copy or 270 mm (10.6 in) copy.

Continuous Format — Push to Start, then Push to End the record; Or Push to Start, Release to End the record.

RUN/PAUSE (jack for foot switch) — Depress to initiate record, release to interrupt.

SAFETY

Listed by Underwriters (UL) 114 and Canadian Standards Association (CSA) 154.

4634 Image Forming Module. High contrast, gray scale dry paper records from raster scan video signals.



The 4634 uses Tektronix fiber optics technology to reproduce raster scan video signals on high quality photographic paper. The process is dry, fast, efficient and inexpensive, and is designed to provide the necessary stability required for consistently sharp gray scale images.

Virtually any video refresh display can be exposed and developed within seconds. Line rates are easily selectable—up to 1029 interlaced or 512 non-interlaced. The video image must remain static for about 8.5 seconds for the image to be properly recorded/exposed.

The exposed image is then thermally-processed and advanced through the front panel, dry and ready-to-use. Total image-forming time for an 11-inch record is 26 seconds for the first frame, aproximately 12 seconds for subsequent images.

The 4634 is adaptable, via rear panel switch, to use two types of paper for either best dynamic range and gray scale uniformity, or for instances where gerater operating economy is preferred to enhance gray scale.

# SPECIFICATIONS

#### RECORDING SPECIFICATIONS

**Recording Paper** — 3M Dry Silver, Type 7772, or switch selectable to 3M Type 7770 paper.

Roll Paper Length — 152 m (500 ft); or about 540 11 inch copies.

Roll Paper Width — 22.6 cm (8.5 in).

Record Length - 17.8 cm (8.5 in).

Image Size — 20.3 cm (8 in) by 15.2 cm (6 in) ma.

Resolution — 125 Line per inch at optical density of

Optical Density Range — Max Density 1.5; Min Density 0.12 with 3M Type 7772 paper.

# COMPOSITE VIDEO OR VIDEO INPUT

Amplitude - Composite Video: 0.5 to 5 V, P-P.

Impedance — 75  $\Omega$  loop-through.

Return Loss — 46 dB or greater from dc to 5 MHz.

Common Mode Rejection — 30 dB or greater at 60 Hz.

System Bandwidth — 16 MHz or greater.

Maximum Input, Operating —  $\pm 10$  V (Signal and do offset).

# SAFETY -

Listed by Underwriters (UL) 114 and Canadian Standard Association (CSA) 154.

\*The GMA and Image Forming Series of IDG OEM Products are ONLY available to those qualified customers who purchase for resale. These products are separately priced and also have specific IDG quantity discounts, warranty arrangements and service contracts.

# GRAPHICS FOR THE MECHANICAL DESIGN AND MANUFACTURING ENGINEER

The DIMENSION Series is a truly modular, uniquely flexible approach to CAD/CAM. We've brought together the state-of-the-art in interactive graphics and processing power, plus the latest generation of proven, powerful, easy to use mechanical design and manufacturing software, packaged according to your special requirements. You select from major software packages and subsets to begin your growth.

#### **Design Software**

This package represents the ultimate in two and three dimensional geometric construction, with facilities for splines, conics, surfaces, composites and more by a variety of techniques. A step by step menu guides the designer from rough ideas to refined plot. Various subsets will allow analysis of the geometry defined, including spline analysis, section properties, center of mass, moment of inertia, and other 2-D and 3-D analysis functions.

# **Finite Element Modeling Software**

Our FEM software provides the most powerful graphics yet available to finite element modeling. Interactivity with the menu allows easy selection of commands. Automatic node labeling, nodal copy, Z-plane clipping, shrink element and other convenient commands simplify graphics generation and vastly reduce design time. A Mesh Generator is also available to further enhance your modeling capabilities.

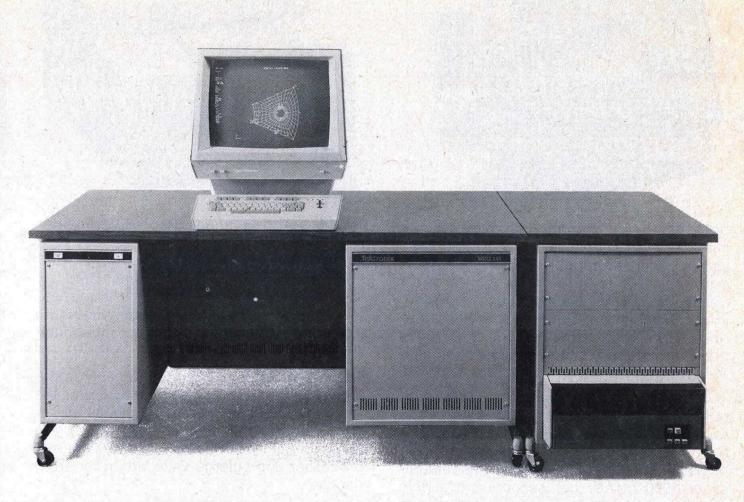
# **Drafting Software**

This package provides a sophisticated, automated environment for mechanical drafting, parts management and attribute management with a variety of view and display controls available. Users can take advantage of dimensioning, line type, cross hatching, balloon and true position tolerance symbols, user definable character sets and basic geometric construction. Options include three dimensional construction and additional, advanced graphing support.

# N/C Software

This enables numerical tape preparation via powerful, interactive graphics. Step-by-step menu format permits handling of multi-axis machining problems. It provides for a high level interactivity during both geometry construction and cutter motion creation, enhances clarity through labeling capabilities and alleviates conversion problems by creating a standard APT CL file. Highly modular, N/C software packages permit incremental function enhancements from basic systems to optional multi-axis routines. Contains automatic features or user controlled drive and check surfaces.

Dimension Series hardware is designed to satisfy specific equipment, graphic and growth need in virtually all applications and environments of mechanical design and manufacturing.



#### **MEG121 Graphics Workstation**

For users with existing computer systems, MEG121 provides easy access to Tektronix' advanced software capabilities. A complete console assembly incorporating the best of Tektronix' large screen high-resolution graphics, MEG121 can serve as a high performance vehicle for your own software or processing system; as the focal point for Tektronix' application software; or as an additional graphics workstation within a MEG131 multi-user application system.

#### **MEG131 Graphics Application System**

In its simplest form, MEG131 is configured with an integral minicomputer and one (or more) graphics workstation. But the real benefit of MEG131 is to provide multi-user capability and integrated data base throughout your design, analysis, drafting, and manufacturing environments.

# MEG141 Intelligent Graphics Workstation

The MEG141 provides a powerful, interactive, stand-alone tool, compatible with virtually any host processor including the MEG131 applications system. Its standalone capability, disc memory and refresh graphic capabilities make it ideal for mechanical design and manufacturing applications including design, analysis, drafting, and manufacturing.

Peripherals like the following are plug compatible with all workstations and intelligent terminals in the Dimension Series.

# 4631 Hard Copy Unit

Quiet, quick, and proven reliable, the 4631 provides sharp 8½" x 11" paper copies of on-screen displays. Facsimiles are dry, permanent, and processed within seconds.

#### 4662 and 4663 Digital Plotters

Both of these microprocessor-based units have set the standard for B- and C-size plotters. Packed with unexpected capabilities, as well as exceptional speed and precision, both plotters produce camera-ready graphics and alphanumerics on paper or acetate, in one, two or more colors.

#### 4953 and 4954 Graphic Tablets

Console or drawing board size, these tablets let you digitize graphics directly from drawings to on-screen display, thus maximizing your interactivity with the system.

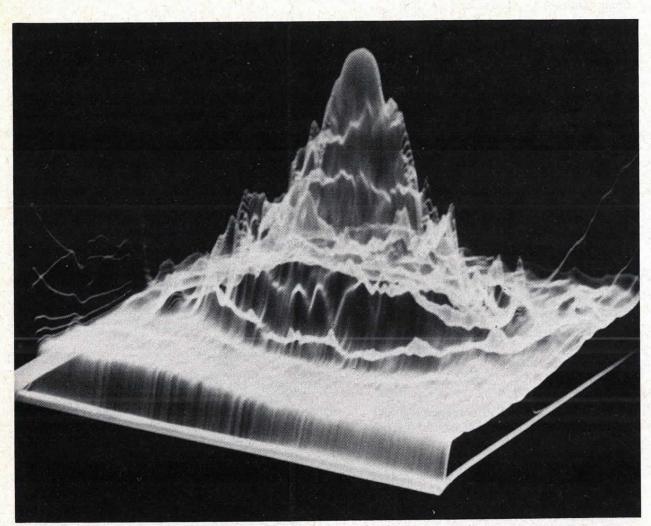
#### You can rely on us for total support

Support that begins at our manufacturing headquarters, with a rigorous inspection and testing program that makes every piece of equipment prove its dependability. You'll have experienced personnel getting your system up and running, and throroughly acquainting your engineers and programmers with its easy operations.

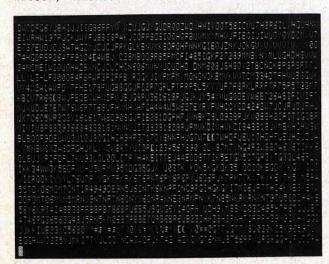
We provide both on-site training and specialized classroom seminars. We provide conscientious response to service requests, and can usually plug in replacement parts to get you back on the job quickly.

Tektronix' excellent warranty and regular maintenance programs make life a lot simpler for you. And there are a variety of financial arrangements available that make the Dimension Series all the more attractive.

# Display Components



The 604A displaying a three-dimensional isometric video image. Courtesy of Optical Electronics, Inc., Tucson, Arizona.



The 634 with alphanumerics display.



The 608 in M-mode and A-mode ultrasound applications. Courtesy of Advanced Technology Laboratories, Inc., Seattle, Washington.

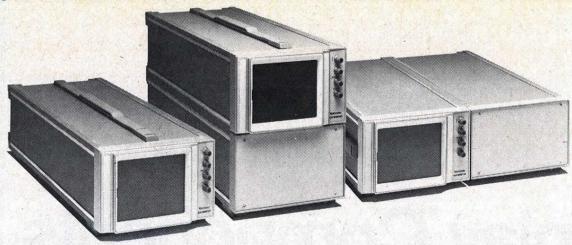
# As the leader in quality OEM displays . . .

We know your needs and we can meet them with the greatest variety of small screen display products in the business. We know that you expect our displays and cameras to do the job they're specified for—day after day. You expect us to offer you the most competitive price/performance packages. To work closely with you in solving your interface requirements. To support you totally, before and after purchase. To grow as you grow, so we can both meet the new technologies, government regulations, and competitive pressures that impact our business...

# See for yourself.

Our broad product offering is just the beginning: small-screen displays, cameras priced for the OEM, and a wide range of options including UL 544 Listing and **Component Recognition and modular** packaging. Add in-depth assistance, full service and support programs for a truly profitable working relationship. For additional product information, applications assistance, or a demonstration, simply complete and return the card at the back of the catalog. Or, call Tektronix automatic answering service toll-free: 1-800-547-1512. In Oregon, call collect: 644-9051. For even faster service, call your nearest Tektronix office.

# **Display Accessories**



# Modular packaging and rack mounting

# Dress packaging for the 620.

You can order the 620 in the following configurations:

- 1. Without handle, feet or covers, for insystem installation.
- 2. With covers only for stand-alone applications.
- 3. With covers, plus handle and feet. Covers also come with UL 544 Listing (Option 06).
- 4. With vertical double height packaging. Included handle is centered on top of the instrument.
- 5. With horizontal full rack-width packaging. Included handle can be mounted on either side of the instrument. Both vertical and horizontal packages also include feet, and let you put your custom electronic circuitry in the empty compartment and connect it to the display, all in one contemporarily-styled, integrated enclosure.

Vertical	dress	package.	Includes	handle,	feet	and
covers.						

Order No. 016-0409-00 ......\$145

Horizontal dress package. Includes handle, feet and

### Rackmount kits for the 620.

Slide-out 19" rack assembly which rackmounts one 620 and an empty compartment horizontally. In the compartment you may put your custom electronic circuitry and combine it with the display. Includes frame, covers and rack slides. Not available with Options 06, 23, 28.

Order No. 016-0404-00 .....\$150

Slide-out 19" rack assembly which rackmounts two 620s side by side. Includes covers and rack slides. Not available with Options 06, 23, 28, 31.

Order No. 016-0405-00 .....\$110

#### Packaging for other instruments.

New packaging for other instruments is continually being developed to meet the needs of our OEM customers. Your local Tektronix Representative can help you obtain full information.

#### Rackmounting for the 634

Slide-out 19" rack assembly which rackmounts one 634 and an empty compartment horizontally. In the

compartment you may put your custom electronic circuitry and connect it to the display. Includes covers and rack slides.

Order 016-0402-00 .....\$150

Slide-out 19" rack assembly which rackmounts two 634 side by side. Includes covers and rack slides.

Order 016-0403-00 .....\$110

#### Rackmounting for 603A, 604A, 606A, 607A, 608, 624.

Rackmount and Empty Cabinet Kit for 603A, 604A, 606A, 607A, 608, and 624. Slide-out 19" rack assembly which mounts a display monitor and an empty compartment horizontally. In the compartment you may put your custom electronic circuitry and connect it to the display, all in one enclosure.

Order 040-0601-00 .....\$150

Display/Power Module Kit. Allows rackmounting of 603A, 604A, 606A, 607A, 608, and 624 with TM 503 Power Module. Minimizes mechanical design time. Simply design your own electronics using TM 500 Custom Plug-in kits described on p. 167. Then plug them in. Fits standard 19" rack.

Order 040-0624-01 .....\$75

# Rackmounting kit for 603A, 604A, 606A, 607A, 608, and 624.

Slide-out 19" rack assembly which rackmounts any two of the above displays side by side. Includes covers and rack slides.

Order 040-0600-00 .....\$110

Rackmount-to-Cabinet Conversion, required to convert a rackmount 603A, 604A, 606A, 607A, 608 and 624 to a cabinet style.

# **Cameras Priced for the OEM**

For complete information on the C-28, the C-5B and other Tektronix cameras, see pages 209-216. For OEM purchasing information, please contact your local Sales Engineer or Representative.



# The High Performance C-28 Camera

Features changeable magnification (1:0.67 to 1:0.85), remotely controllable electric shutter, and rigid body design that eliminates trapezoidal distortion. F-stops from f/2.8 to f/16, and 8 shutter speeds (from 1/50 to 2 seconds, plus "bulb" and "open")

handle a broad variety of exposure variables. Comes with a combination Graflok'/Polaroid² film back for 3¼" x 4¼" Polaroid film or user's choice of Graflok-compatible accessories such as 70 or 90 mm roll film backs. Three other object-to-image ratio lens mounts are also available.



# The Low-Cost C-5B Camera

The C-5B is a light weight, easy-to-use camera that quickly attaches and removes from the display. It features changeable magnification ratios to accommodate both 8 x 10 and 10 x 12 cm displays, an exceptionally reliable electric shutter, and an f16 lens that requires no focusing.

T.M., Singer Education Systems.

<sup>2</sup>T.M., Polaroid Corporation.

# Light Filters/Graticules

	dianouico		
Monitor	Filters/Graticules	Part No.	Price
603A & 604A	Clear Filter (604A*) Green Filter (603A*) Amber Filter Blue Filter Gray Filter Graticule (603A*)	337-1440-00 337-1440-01 337-1440-02 337-1440-03 337-1440-04 331-0303-00	2.60 2.50 3.30 3.30 3.30 4.00
607A	Blue Filter Amber Filter Smoke-Gray Filter* Graticule*	337-1674-00 337-1674-05 337-1674-06 331-0391-00	3.00 3.00 3.00 4.00
606A	Smoke-Gray Filter Blue Filter Amber Filter Graticule* Clear Shield*	337-1674-06 337-1674-11 337-1674-12 337-1674-10 337-1674-13	3.00 3.00 3.15 2.50 3.00
608 624	Amber Filter Green Filter Graticule (608, 624*)	378-0704-00 378-0705-00 337-2126-02	2.30 2.30 4.00

\*Shipped on or with the standard instrument.

# **Other Accessories**

Lab carts. Provide equipment mobility.

# **KEY SPECIFICATIONS FOR X-Y DISPLAYS**

For options and ordering information, see individual product pages. See product literature for complete specifications.

	603A	604A	606A	607A	608	620	624
Spot Size	0.25 mm (10 mils)	0.36 mm (14 mils)	0.13 mm (5 mils)	0.25 mm (10 mils)	0.26 mm (10 mils)	<15 mil, <25 mil at max drive	0.30 mm (12 mils)
Display Size	10.2 x 12.7 cm	10.2 x 12.7 cm	8 x 10 cm	7.2 x 9 cm	9.8 x 12.2 cm	10 x 12 cm	9.8 x 12.2 cm
Acceleration Potential	3.5 kV	3.5 kV	5.6 kV	12 kV	22.5 kV	12 kV	≈18 kV
Bandwidth, X-Y <sup>2</sup>	≥2 MHz	≥2 MHz	≥3 MHz	≥3 MHz	≥5 MHz	≥2 MHz	≥3 MHz
Bandwidth, Z <sup>2</sup>	≥5 MHz	≥5 MHz	≥10 MHz	≥5 MHz	≥10 MHz	≥5 MHz	≥5 MHz
Rise Time	≤70 ns	≤70 ns	≤35 ns	≤70 ns	≤35 ns		≤70 ns
Input R and C, X-Y <sup>3</sup>	1 MΩ ±1%    <47 pF	1 MΩ ±1%    <47 pF	1 MΩ ±1%    <47 pF	1 MΩ ±1%    <47 pF	1 MΩ,    ≤60 pF	1 M $\Omega$ $\parallel$ by 47 pF	1 MΩ    <47 pF
Input R and C, Z <sup>3</sup>	1 MΩ    <47 pF	1 MΩ ±1%    <47 pF	1 MΩ <47 pF	1 MΩ <47 pF	1 MΩ, ≤60 pF	1 MΩ <47 pF	1 MΩ    <47 pF
X-Y Phase Difference	≤1° to 500 kHz	≤1° to ≤500 V	<1° to 500 kHz	≤1° to 500 kHz	≤1° to 1.5 MHz	$\leq$ 1° dc to 500 kHz $^{\circ}$	<1° to 1.0 MHz
Maximum Input Voltage4	±100 V	±100 V	±100 V	±100 V	±100 V	±25 V	±100 V
Linear Common-Mode Signal Range (Opt. 22) X-Y <sup>5</sup>	±15 V	±15 V	±15 V	±15 V	±15 V	Not Applicable	±15 V
Linear Common-Mode Signal Range (Opt. 21), Z	±5 V	±5 V	±5 V	±5 V	±5 V	Not Applicable	±5 V
Common-Mode Rejection Ratio (Opt. 21), X-Y	≥100:1 to ≥100 kHz, ≥50:1 to ≥100 kHz (Opt. 22)	≥100:1 to ≥100 kHz; ≥50:1 (Opt. 22)	≥100:1 to 500 kHz; ≥40:1 (Opt. 22)	≥100:1 to 500 kHz; ≥40:1 (Opt. 22)	≥100:1 to 100 kHz; ≥40:1 (Opt. 22)	Not Applicable	≥100:1 to 100 kHz; ≥40:1 (Opt. 22)
Common-Mode Rejection Ratio (Option 21), Z	≥100:1 to 100 kHz	≥100:1 to 100 kHz	≥100:1 to 100 kHz	≥100:1 to 100 kHz	≥100:1 to 100 kHz	Not Applicable	≥100 to 100 kHz
Recommended Source Impedance, X-Y and Z	≤10 kΩ	≤10 kΩ	≤10 kΩ	≤10 kΩ	≤10 kΩ	≤10 kΩ	≤10 kΩ
Temperature Range	0°C to +50°C	0°C to +50°C	0°C to +50°C	0°C to +50°C	0°C to +50°C	0°C to +50°C	0°C to +50°C
Power Requirements <sup>6</sup>	75 W	56 W	75 W	53 W	61 W	See footnote	61 W
Included Accessories	External program connector; connec- tor cover; external graticule	External program connector; connector cover.	External graticule	External program connector; connector cover; external graticule.	Lined external im- plosion shield (graticule) for ad- justment purposes.	Lined external im- plosion shield (graticule) for ad- justment purposes.	
Recommended Cameras <sup>7</sup>	C-59P, C-5B C-5B Opt. 01, C-28	C-59P, C-5B Opt. 01, C-28	C-28, C-5B Opt. 01, C-59P	C-5B, C-5B Opt. 01, C-28	C-5B, C-59P, C-28	C-5B, C-5B Opt. 01, C-28	C-5B, C-28

I. Measured at 0.5  $\mu$ A, except for the 606A, measured at 0.1  $\mu$ A.

# Small screen measurement display applications.

Additional options may be required to optimize display quality for your application. See your Tektronix Representative for full details.

	620	634	634 Opt. 01	608	624	606A	607A	603A	604A
Ultrasound			CALLED Y						
B-scan	Land Co	-	-	PERMIT	The state of the s	Cyle Stanishing	Next I work for the	To the state of the state of	1
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M-mode					-		-		
Real time	A STATE OF			-	T. P.	and the second	CONTRACTOR OF		
Multi-imaging							West of the last		
Nuclear	X-14 X-1				-	-			
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Gamma						A Law Law			
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Photography	NEW YORK		-						A Party of the
Computerized Tomography									
Photography		-	V	Torra La					
Electronic Instrumentation	-	-	-	11 11	-	-	-		V
Electronic Test & Measurement	V			-	V		-		
Mititary/Aerospace	V V	-	-	-	-	~	-	"	-
Communications	-	-	-	-	-		-	-	-

<sup>2.</sup> Full spec would read: "DC to . . ." appropriate figure.

 $<sup>3 \</sup>cdot "|| < "$  means "paralleled by less than".

<sup>4. (</sup>dc + peak ac)

<sup>5.</sup> With Option 21  $=\pm3$  V (non-attenuated) for all but the 620 where not applicable.

<sup>6.</sup> Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V (±10% on each range). 48 to 440 Hz (except the 624 which excludes 220). Number given shows watt max at nominal line voltage. The 620's power requirements are 90-132 V ac; 48-440 Hz line frequency, 22 W max, 0.2A at 120 V ac 60 Hz.

<sup>7.</sup> External 15 V dc 750 mA power supply required for C-28.

1400-line Nominal Resolution—Center Screen at 100 cd/m<sup>2</sup> (30 fL)

Non-linearity ≤.5% within a 9 cm Circle—≤1% at Corners

Brightness Uniformity Better than ±10%

Modular Construction for Ease of Installation and Servicing

The TEKTRONIX 634 is a very high resolution, low geometric distortion video monitor, designed for applications requiring superior performance. Key specifications include:

Standard resolution of 1400 lines (nominal) — center screen at 100 cd/m² (30 fL). Delivers detailed imaging and optimum gray scale for photography. Especially important when images have large, varied and detailed data content, like those in multi-imaging, ultrasound and computerized tomography or scanning electron microscopy.

System manufacturers requiring less than 1400-line resolution will want the TEKTRON-IX 634 Option 01. It offers standard resolution of 800 lines nominal — center screen at 10 cd/m² (30 fL) — while meeting most other 634 specifications including distortion, phosphor uniformity and corner focus.

Non-linearity:  $\leq$ .5% within a 9 cm circle,  $\leq$ 1% at corners — This performance is crucial in applications where highly accurate measurements must be taken from photographs. (1% within a 9 cm circle, 2% at corners with Option 01.)

≤20% phosphor non-uniformity — means there is more consistent gray scale over the entire display surface area. This is essential when comparing tissue densities from different areas of the display.

The P45 phosphor formulation — standard on the 634 — reduces the graininess of photographs taken with blue-sensitive film (like most x-ray film).

# SPECIFICATIONS

Note: To save you valuable calibration time, every 634 is calibrated to meet all specifications **before** it leaves the factory.

# DISPLAY PERFORMANCE

Crt display — monochrome: 9 cm vertically; 12 cm horizontally; 15 cm diagonal (6 in.); flat screen, magnetic deflection; 4 x 3 aspect ratio.

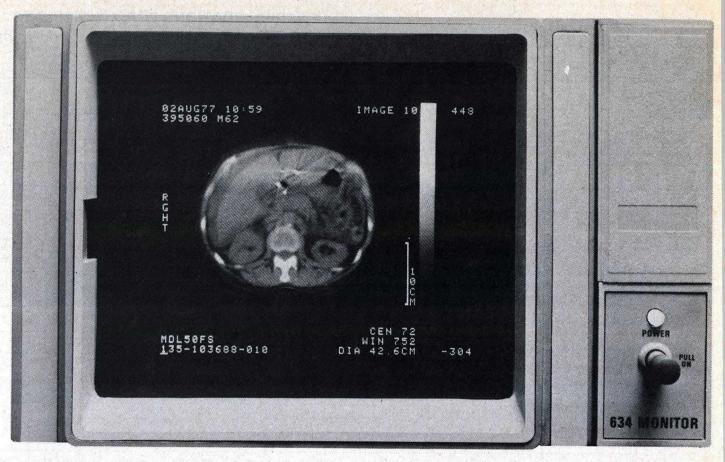
**Resolution** — Measured by the shrinking raster method with no interlacing, center screen at 100 cd/m<sup>2</sup> (30 fL).

	634	634 Option 01
Worst case:	1100 line	650 line
Nominal:	1400 line	800 line

**Position Accuracy/Non-linearity** —  $\leq$ .5% within 9 cm circle,  $\leq$ 1% in corners. For Option 01: 1% within 9 cm circle, 2% at corners.

Brightness — 515 cd/m² (150 fL) maximum.

Brightness Non-uniformity — Less than ±10% using J16 Photometer.



Phosphor Type — P45 Standard.

Black Level Stability - Back porch dc restoration.

#### VIDEO INPUT

Description — Video with negative sync.

Signal Level — .35 V p-p to 2 V p-p.

Maximum Safe Input — ±5 V p-p.

Bandwidth — 1 Hz to 10 MHz (Standard). 20 MHz Z-axis bandwidth available as Option 14.

#### RASTER

Vertical Rate - 60 ramps/sec.

Horizontal Rate — 15,750 ramps/sec. (Adjustable  $\pm 10\% \text{ range}$ ).

Note: Our standard instrument will accept the line/field rate of 625/50, 660-1029 rate available as Option 15.

#### SAFETY

Department of H.E.W. [BRH Rule 1020.10 (C) (1)] — Standard.

U.L. 544 — Listing and Component Recognition (Options 06 and 09).

### POWER

**Standard** — Ac 50 watts, 50-400 Hz. 100, 110, 120, 200, 220, 240 V,  $\pm$ 10%.

Option 20 — Unregulated dc. +9 V at 300 mA with 1 V ripple; +23 V at 1.6 A with 4 V ripple; -22 V at .70 A with 3 V ripple.

### OTHER CHARACTERISTICS

Temperature Range for Electrical Specifications — 0° to +50°C.

Included Accessories — Operator's and Instruction Manual; linearity graticule.

Recommended Cameras — C-5B, C-28 (external 15V dc 750 mA power supply required for C-28).

Dimensions	Cal	oinet
	cm	in
Height (with feet)	14.9	5.3
Height (without feet and handle)	13.2	5.3
Width	21.3	8.4
Depth (Ac power)	41.9	16.5
Depth (Dc power— Option 20)	36.3	14.3

#### ORDERING INFORMATION

634 Raster Scan Display Monitor with standard resolution of 1400 lines nominal, 1100 lines worst case (center screen at 100 cd/m<sub>2</sub> [30 fL], without handle, feet and covers ......\$1195

Option 01 Standard resolution of 800 lines nominal, 650 lines worse case (center screen at 100 cd/m² [30 fL]) ......Sub \$225

## PERFORMANCE OPTIONS

Option 11	External Sync—SwitchableAdd \$25	
	Video ReverseAdd \$50	
Option 14	20 MHz Z-Axis BandwidthAdd \$60	
Option 15	660-1029 Line RateAdd \$120	
	Remote Brightness, Contrast, anking	
Controls a and Position Instrument	Contrast, Brightness and Focus re Removed from the Front Panel oned on the Top Side of the . (Not available with Options 8)	
	Dc Supply (±21-25 V +9 V d)Sub \$50	

#### SAFETY OPTIONS

Option 06 UL Listing (Not available with	
Options 17, 20 or 28)	Add \$75
Option 09 UL Component Recognition	
(UL 544)	lo Charge

# MECHANICAL PACKAGE OPTIONS

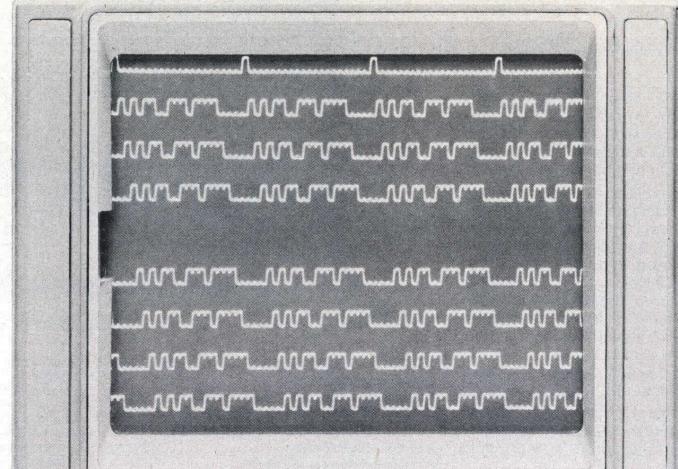
Option 23 With Handle, Feet, and Covers (Not available with Options 17 or 20, 28) Add \$50
Option 28 Covers Only. (Not available with Options 06, 17, 20, 23)
Option 30 Metal ShieldAdd \$35

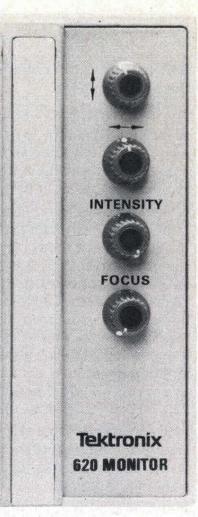
## PHOSPHORS

Option 74 P4		Add \$35
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See page 202 for information on cameras, filters and packaging.

PLEASE NOTE: PRICES QUOTED ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.





The TEKTRONIX 620 is a very low-cost, electrostatically deflected display that offers spot size of 15 mils, a 10 x 12 cm screen, and brightness up to 100 cd/m2 (30 fl') while still maintaining crisp imaging. A range of options including modular packaging (see p. 202) combine to make the 620 an excellent value in highly competitive price/ performance situations where good system/ display interface is also required.

**Low Cost Display** 

15 mil Spot Size

30 fL Brightness

Available

**Modular Packaging** 

You can use the 620 in any situation requiring a low-cost solidly performing X-Y display. Electronic instrumentation applications include pulse height, network, spectrum and signal analyzers/digitizers. Mechanical measurement instrument uses are vibration and engine analyzers and flaw detectors.

1. Measured with full screen 60 Hz 300 line raster.

# **SPECIFICATIONS CRT DISPLAY**

Cathode Ray Tube - 61/2" flat-faced rectangular crt with P31 Phosphor.

Spot Size — 36 mm (15 mils) at  $.5\mu$ A.

Display Size — 10 cm vertically, 12 cm horizontally.

Graticule — External graticule included as accessory. Internal 8 x 10 cm graticule available as Option 01.

Display Linearity — The voltage required to produce a 2.5 cm deflection from any point on the crt will not vary more than 5%.

Acceleration potential — 12 kV.

#### **VERTICAL AND HORIZONTAL AMPLIFIERS**

Bandwidth - Dc to 2 MHz.

Setting Time — 1 µs from any point on the crt within 0.05 cm of final position.

Deflection Factor — Adjustable, ≤0.9 V to ≥1.5 V full scale (vertical), ≤0.8 V to >1.2 V (horizontal).

Input R and C — 1 M $\Omega$  paralleled by 47 pF.

X-Y Phase Difference — ≤1° dc to 500 Hz.

Max Input Voltage — ±25 V (dc + peak ac). Recommended Source Impedance — 10 k $\Omega$  or less.

# **Z-AXIS AMPLIFIER**

Linear Z-axis amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity.

Bandwidth — Dc to  $\geq$ 5 MHz.

Input Sensitivity Range — Full drive 1 volt.

#### OTHER CHARACTERISTICS

Power Requirements - 90-132 V ac line voltage; 48-440 Hz line frequency; 22 W, 0.2A at 120 V ac, 60 Hz max power. Dc power (Option 20) +17 to +26 V.

Temperature Range for Electrical Applications — 0° to 50°C.

Finish - Blue vinyl painted aluminum cabinet (optionally available); aluminum castings and extrusions.

Recommended Cameras — C-5B, C-28 (external 15 V dc 750 mA power supply required).

Included Accessories - Instruction manual; external graticule.

Dimensions	Cabinet	
(without modular packaging)	cm	in
Height (without feet)	13.3	5.2
Width	21.4	8.4
Length	49.9	19.6
Weight (approx. without handle, feet and covers)	kg	lb
Net	5.3	11.8
Shipping	6.9	15.2

#### ORDERING INFORMATION

	olay (without handle, I covers)\$795
Option 01	— With internal graticule No Charge
	— UL 544 Listed, handle, feet and coversAdd \$75
Option 09	— UL Component Recognition No Charge
X, Y and	Remote 25-pin program connector Z axes. Single-ended inputs only able with Option 31)
power rec	— Delete ac power. External dc juired (+17 to 26 V≃.9A). Not with Option 31Sub \$30

Option 23 — With handle, feet and covers (not available with Options 06, 28 and modular packaging)
Option 25 — TTL blanking
Option 28 — With cover only—no trim strips (not available with Options 06, 23 and modular packaging)
Option 31 — Delete all real panel BNC's, dc power connector and ac power supply and switch. Option 31 includes provision for external dc power (+17 V unregulated). All power connections and input signals are made to interconnect pins inside monitor. Not compatible with Options 10 or 20. Can be used with 016-0409-00 or 016-0410-00 packaging
Modular dress packaging <sup>2</sup> : Vertical package. Includes handle, feet and covers. Order No. 016-0409-00
Horizontal package. Includes handle, feet and covers. Order No. 016-0410-00
RACKMOUNT KITS
Rackmount for one 620 in a 19-inch rack. Includes frame, covers and rack slides. Not available with Options 06, 23, 28. Order No. 016-0404-00
Rackmount for two 620s side-by-side in a 19- inch rack. Includes covers and rack slides.

<sup>2</sup>OEM pricing and quantity discounts unavailable on modular packaging.

Not available with Options 06, 23, 28, 31.

Order No. 016-0405-00 .....

See page 202 for information on cameras, filters, and rackmounting.

SPECIAL PRICING, TERMS AND CONDI-TIONS ARE AVAILABLE TO QUALIFIED **OEMS. CONTACT YOUR LOCAL TEK-**TRONIX REPRESENTATIVE FOR COM-PLETE INFORMATION.

\$110

# 624

Large 9.8 x 12.2 cm Screen

Small Spot Size — 12 mils

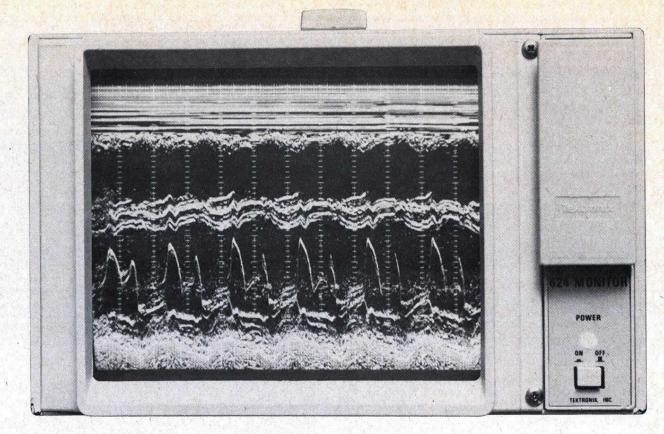
# Delivers Up to 40 Footlamberts Usable Brightness<sup>1</sup>

The TEKTRONIX 624 combines large screen size (9.8 x 12.2 cm), 137 cd/m² (40 fl¹) brightness and small spot size (12 mils). The result: detailed displays that are easy to read in high ambient light and deliver quality photographs.

The small 12-mil spot size makes the 624 an excellent choice for the detailed imaging required for both B-scan and A-mode ultrasound, echocardiography and real-time ultrasound. The 624 delivers a sharp picture that aids the doctor in making more precise measurements, and 40 fl brightness makes the 624 suitable for direct viewing as well as photography.

If you're a manufacturer of spectrum analyzers, logic analyzers, or other electronic test and measurement systems, you can be assured of an accurate, crisp representation of the signal, thanks to the 624's small spot size and linearity.

The 624 readily interfaces with a variety of systems. The wide deflection factor and sensitivity range—adjustable 50 mV to 0.25 V/div. (up to >1.25 V/div with extended gain range option)—facilitates integration with a broad range of designs. Remote program connector option allows control by the user's system, and a TTL blanking option is available for digital control. Dc power option



allows the OEM to use his system's own power supply.

Measured with quality area flooded by a 60 Hz raster, 320 horizonal lines.

#### **ORDERING INFORMATION**

624 Display Monitor \$1335
(without handle, feet and covers)
Option 01 — Internal Graticule No Charge
Option 04 — Time Base
Option 06 — UL 544 Listed,
includes Handle, Feet and CoversAdd \$75
Option 09 — UL Component Recognition No Charge
Option 10 — Remote Program Connector
X, Y and Z Single ended inputs only.
25 pin connector
Option 20- Without ac supply (±18V Unregulated dc
supply required not available with Option 06) . Sub \$50
Option 21 — Full Differential Inputs Add \$30
(X, Y and Z)

Option 22 — Extended Gain Range (X5) Add \$20
Option 23 — Handle, Feet and Covers Add \$50
(not available with Options 06 and 28)
Option 25 — TTL BlankingAdd \$50
Option 26—50 $\Omega$ Inputs (X, Y and Z)Add \$20
Option 28 — Covers Only
(not available with Options 06 and 23)
Option 29 — Metal Bezel
Option 30 — Full Crt Magnetic Shield Add \$75
Option 40 — P-39 Phosphor Add \$35
Option 74 — P4 Phosphor Add \$35
Option 78 — P11 Phosphor

See page 202 for information on cameras, rackmounts, light filters/graticules.

PLEASE NOTE: PRICES QUOTED ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

# 608

## **High Brightness Monitor**

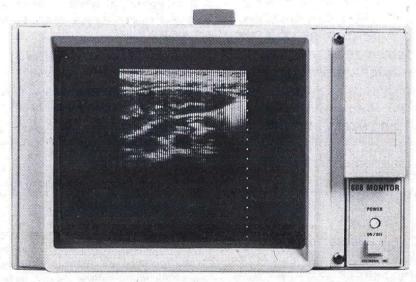
### For High Ambient Light Viewing

The 608 accommodates X-Y and raster scan displays with excellent gray scale and detailed dot scans, thanks to the small 10-mil spot size. Imaging is critically sharp from corner to corner for nuclear multi-imaging applications.

The large, bright, flat-faced electrostatic deflection crt displays a clear waveform for excellent presentation of detail for easy reading in high ambient light, and for photographic applications.

B-scan, echocardiography, and real-time ultrasound OEMs will find the 608 extremely well suited for their high performance display applications. Suppression of the expansion mesh halo eliminates annoying stray light that ordinarily gives lower contrast, and the "washed-out" appearance that interferes with high light intensity gray scale displays. The result is a more readable display with subtle and accurate gray scale graduation for precise measurement or diagnosis.

The 608 can also be integrated with non-destructive test systems, electronic instruments such as logic and spectrum analyzers, and with mechanical measurement systems and analytical instruments—and other areas where a high quality, high brightness display is required.



# **ORDERING INFORMATION**

608 Display Monitor \$1630 (without handle, feet and covers)
Option 01 — Internal Graticule No Charge
Option 04 — Time Base
Option 06 — UL 544 Listed, includes Handle,
Feet and Covers
Option 09 — UL Component Recognition No Charge
Option 10 — Remote Program-Connector—
X, Y and Z, Single Ended Inputs Only. 25
Pin Connector
Option 20 — Without ac supply — (±18 V
Unregulated dc supply required; not
available with Option 06)Sub \$50
Option 21 — Full Differential Inputs
(X, Y and Z)Add \$30
Option 22 — Extended gain range (X5) Add \$20
Option 23 — Handle, Feet and Covers Add \$50
(not available with options 06 and 28)

Option 24 — Linearized Z Axis
(gamma correction)
Option 25 — TTL BlankingAdd \$50
Option 26 — 50 $\Omega$ Inputs (X, Y and Z)Add \$20
Option 27 — Internal Gain Adjustments Only . Add \$10
Option 28 — Covers Only Add \$40
(not available with Option 06 and 23)
Option 29 — Metal BezelAdd \$50
Option 30 — Full Crt Magnetic Shield Add \$75
Option 40 — P39 Phosphor
Option 74 — P4 Phosphor
Option 76 — P7 PhosphorAdd \$35
Option 78 — P11 PhosphorAdd \$35
See page 202 for information on cameras, rackmounts,
light filters/graticules.
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PLEASE NOTE: PRICES QUOTED ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

#### 607A

#### **50-Minute Storage**

#### **Adjustable Persistence**

#### **Remotely Programmable Storage Functions**

The 607A is a display with variable persistence gray-scale storage lasting up to 50 minutes. It operates in both store and non-store modes.

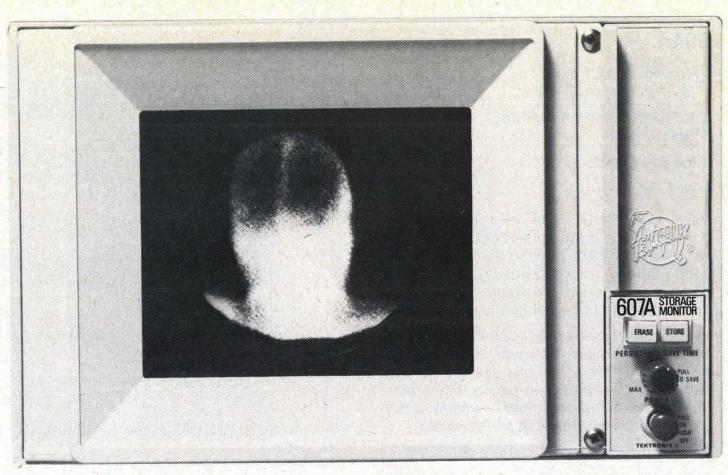
It is designed as a component for such medical diagnostic equipment as Gamma camera (preview monitor) and M-mode ultrasound as well as for analytical instrumentation, electronic counter-measures equipment and other electronic instrumentation.

In Gamma camera applications, the 607A delivers bright, sharply focused dots over the entire screen. You can adjust the fade time to synchronize with your count rate to insure a complete picture.

When displaying repetitive phenomena the persistence may be adjusted to let the image fade just as the new signal is being repeated. Or, multiple successive events can be simultaneously shown to compare changes over time.

#### ORDERING INFORMATION

607A Variable Persistence Storage	
Display Monitor (without handle, feet and covers)	. \$2000
Option 01 Internal GraticuleNo	Charge
Option 04 Time Base	Add \$175



Option 06 UL 544 Listed, Includes Handle, Feet and Covers
Option 08 Fast Writing Speed (200 ns/div), Lower Resolution
Option 09 UL Component Recognized No Charg
Option 10 Remote Program Connector— Contains Remote Save, Erase, Erase Interval, and Non-store. Single Ended Inputs only. 25 pin Rectangular ConnectorAdd \$5
Option 21 Full Differential Inputs (X, Y and Z)

See page 202 for information on cameras, rackmounts and filters.

PLEASE NOTE: PRICES QUOTED ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

#### 606A

5-mil or smaller spot size Ideal for Photography
10 MHz Z-axis Bandwidth Very High Resolution

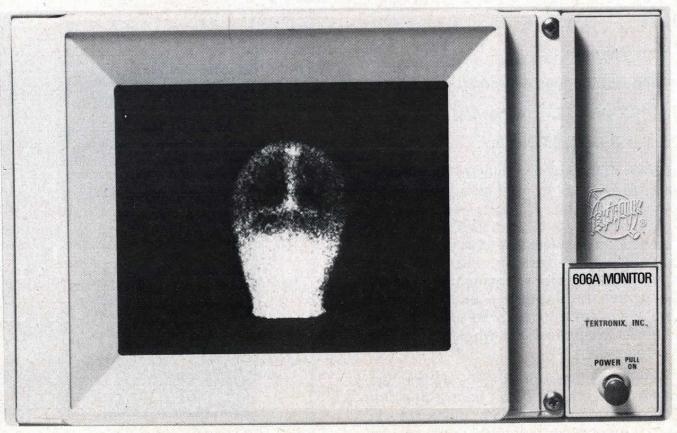
The TEKTRONIX 606A is a very high resolution display for applications requiring critically sharp photographs and displays. Spot size is only 5 mils (13 mm), measured at 0.1 µA beam current by the shrinking raster method. The Z-axis amplifier is very linear, with 10 MHz bandwidth. Linearized Z-axis (gamma correction) is built into the 606A, providing the excellent gray scale performance necessary for the most accurate, detailed photography.

The 606A also offers excellent image stability. Position shift is only 0.1 cm or less per hour after a 20-minute warm-up. Position shift is less than 0.2 cm in 24 hours.

The sharply detailed imaging provided by the 606A is particularly well suited for photographic recording applications in medical gamma camera systems and nuclear multi-imaging systems. Non-medical applications of the 606A include scanning Auger and electron microscopy.

#### ORDERING INFORMATION

606A Display Monitor		\$1735
(without handle, feet and co	vers)	
Ontion 01 Internal Graticu	ıle	No Charge



Shown above: 606A dot scan as accumulated on film.

Option 04	Time Base
	UL 544 Listed, includes Handle, coversAdd \$75
Option 09	UL Component Recognized No Charge
	Full Differential Inputs (X, Y
Option 22	Extended (X5) Gain RangeAdd \$20
Option 23 (not availa	With Handle, Feet and Covers ble with Option 06 and 28)Add \$50
Option 26	50 Ω Inputs (X, Y and Z)Add \$20

Option 28 (not availa	With Covers OnlyAdd \$40 ble with Options 06 and 23)
Option 29	Metal BezelAdd \$50
	P11 Phosphor Add \$35
See page :	202 for information on cameras, rackmounts

PLEASE NOTE: PRICES QUOTED ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

#### 604A

Large 10.2 x 12.7 cm (6½-inch diagonal) crt

X-Y Phase Difference within 1° to 500 kHz

**Time Base Option** 

**Low Cost** 

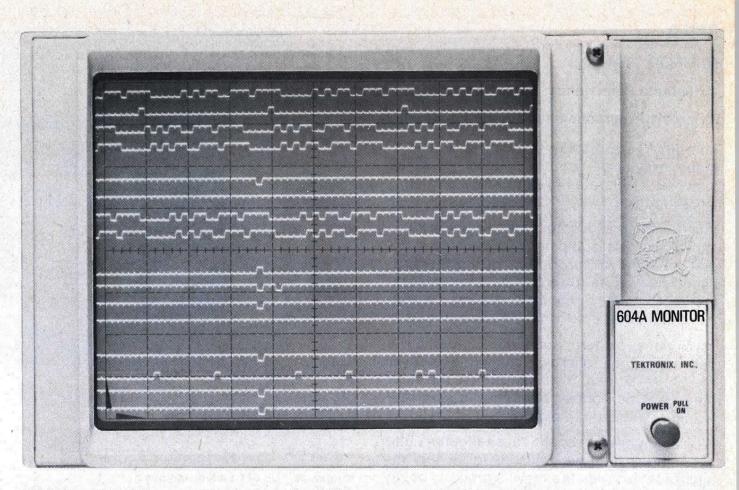
The TEKTRONIX 604A is a low-cost X-Y display with a large screen (10.2 x 12.7 cm) view area, 5 MHz Z-axis bandwidth, and a wide range of standard options for optimum component/system interface. It combines versatility with truly competitive pricing.

In logic analyzer applications where up to 16 line of timing diagrams must be displayed, the 604A lets you see all 16 lines with good definition and clarity—thus making comparisons for digital system analysis and fault-finding significantly easier.

There's a wide range of features and options that make the 604A easier to interface with a total system. Both vector and SECAM graticules are optionally available for vector display applications. A remote program connector option allows control of X, Y and Z axes by the user's system. An optional time base allows the monitor to supply sweeps for the X-signal.

#### **ORDERING INFORMATION**

604A Dis	play Monito	r		.\$1195
(without h	andle, feet and	covers)		
Option 01	With Internal	Graticula	N	o Charge



Option 04 Time Base
Option 05 External Vector Display Graticule
(P31 Phosphor Only)
Option 06 UL 544 Listed, includes Handle,
Feet and Covers Add \$75
Option 08 External SECAM Vector
GraticuleAdd \$10
Option 09 UL Component Recognized No Charge
Option 10 Remote Program Connector —
X, Y and Z. 25-pin rectangular connector,
Single-ended inputs onlyAdd \$30
Option 21 Full Differential Inputs (X, Y, Z). Add \$30

Option 22 Extended (X5) Gain Range ..... Add \$20
Option 23 With Handle, Feet and Covers
(not available with Option 06 and 28) ..... Add \$50
Option 28 With Covers Only ...... Add \$40
(not available with Option 06 and 23)

See page 202 for information on cameras, rackmounting, and filters.

PLEASE NOTE: PRICES QUOTED ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

#### 603A

10-Hour Storage

1 Million Dot/Second Stored Writing Speed

Large 10.2 cm x 12.7 cm Viewing Area

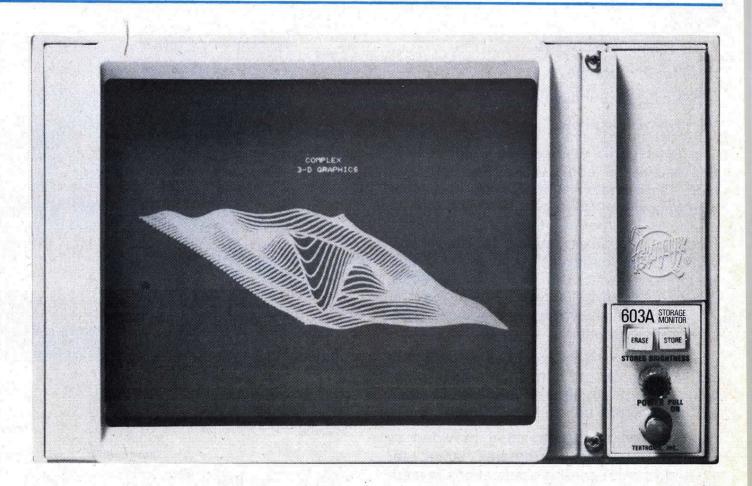
#### Stored or Nonstored Display

The Tektronix 603A bistable storage display offers storage up to 10 hours, one-million dot/second stored writing speed (with Option 02), a small 10 mil spot size, and a large 10.2 x 12.7 cm viewing area. Crt design eliminates display refreshing and associated costly memory devices. The 603A is particularly useful in capturing and recording single, transient events to be viewed up to four hours in applications where gray scale is not required.

As a preview monitor, the 603A lets you examine a display in detail before deciding to photograph it. This can eliminate the cost of unnecessary photographs, as well as the time and effort involved in setting up for "trial and error" shots.

#### ORDERING INFORMATION

603A Sto	orage Display Monitor\$1770 andle, feet and covers)
Option 01	Internal Graticule No Charge
Option 02	Fast Writing Speed Crt
	Time Base Add \$175
Option 06	UL 544 Listed, includes



(not available with Options 06 and 28) ..... Add \$50

Option 23 With Handle, Feet and Covers

See page 202 for information on cameras, rackmounting, and filters.

PLEASE NOTE: PRICES QUOTED ARE ONE-EACH PRICES. EVEN LOWER PRICES ARE AVAILABLE FOR QUALIFIED ORIGINAL EQUIPMENT MANUFACTURERS.

Tektronix 1980

esktop Graphic Computers Color Graphics Terminals Gra rminals Interactive Digital Plotters Video Hard Copy Units g Software Computer Graphics Products OEM Image Form EM Graphic Computer Modules Graphing Software Desk omputer Graphic Terminals OEM Image Forming Modules

#### **Computer Graphics Products**

Graphics display of computer-based information has proven an effective method of bridging the gap between users and their information sources. As a result, Tektronix now offers a wide range of computer terminals, desktop graphic computing systems, graphic peripheral products and supporting software.

Our long-standing corporate commitment to excellence has helped establish Tektronix as the world leader in this rapidly expanding market. This same commitment has helped set standards for the development of new technologies dedicated to helping people understand information. As our customers demonstrate new needs, we continue to develop solutions.

For additional product information and details on interfacing, software and accessory support, please indicate your interest on the postcard at the back of the catalog.



#### 4010 Series

# Computer Graphics Products Computer Display Terminals



#### 4006-1 Computer Display Terminal

#### Low Cost Flicker-free High Resolution Graphic and Alphanumerics

The 4006-1 is one of our solutions towards making interactive, high-resolution graphics affordable to cost-conscious disciplines and departments. Priced no more than many alphanumeric terminals, the 4006-1 makes graphic capability practical for the stock room, the classroom and the conference room as well as for other graphic applications.

The 4006-1 connects readily to most mainframes, thanks to its RS-232-C interface. With a screen capacity of 2590 alphanumeric characters in addition to complete graphics capability, the 4006-1 can work in configuration with existing alphanumeric terminals to interpret statistics and coordinates into meaningful charts, tables, graphs and diagrams.

#### SPECIFICATIONS

**Display Medium** — Direct View Bistable Storage crt **Display Area** — 7.5 in (19.5 cm) wide x 5.6 in (14.2 cm) high **Alphanumeric Mode Format** — 35 lines, 74 character per line. 2590 characters full screen.

Character Set — 63 printing characters (TTY ANSI Code).

Character Generation — 5 x 7 dot matrix.

Cursor — 8 x 8 dot matrix.

**Graphics Display Mode** — Vectors only. Vector drawing time,  $3.6 \pm 0.2$  ms.

Information Density — 1024(x) by 1024(y) addressable

points. 1024(x) by 780(y) viewable points. **Baud Rate** — Transmit and receive independently. Selectable from 75 to 4800 baud.

# ORDERING INFORMATION 4006-1 Computer Display Terminal ...\$2995



#### **4010-1 Computer Display Terminal**

Supports Alphanumerics Plus Low-Cost Computer Graphics Convenient Bus Structure for Peripheral Add-On Complete PLOT 10 Software Support Graphic Input

The 4010-1 Computer Display Terminal is an easy to use, cost effective tool that brings out the best of Tektronix' famous graphics capability. Included are flicker-free display, high-resolution graphs, charts, diagrams and renderings produced on a matrix of 1024(x) by 780(y) viewable points and interactive graphics construction via thumbwheel cursor control.

The standard TTY-style keyboard enables easy data entry. Command of both alphanumeric and graphic display is so immediate that hours of hand drafting can become the matter of a few seconds.

#### **SPECIFICATIONS**

Display Medium — Direct view storage crt.
Display Area — 7.5 in (19.05 cm) wide x 5.6 in (14.22 cm) high.
Alphanumeric Mode Format — 35 lines, 74 characters per line, 2590 characters full screen.

Character Set — 63 printing characters (TTY ANSI Code). Character Generation — 5 x 7 dot matrix with MOS Read-Only Memory. 1200 characters per second.

Cursor — Pulsating 5 x 7 matrix.

**Graphic Display Mode** — Vectors only. Vector Drawing Time 2.6 ms.

Information Density — 1024(x) by 1024(y) addressable points. 1024(x) by 780(y) viewable pionts.

**Graphic Input Mode** — Thumb-wheel controlled cross-hair cursor. 3 through 1023(x) 0 through 780(y).

#### **ORDERING INFORMATION**

4010-1 Computer Display Terminal with Standard Data Communication Interface ......\$4950



# 4012/4013 Computer Display Terminals

High-Resolution, Flicker-Free Graphics
Full Upper and Lower Case ASCII
Character Set
Conventional Bus Structure For Peripheral
Add-On
APL Character Set Available

The 4012 combines the world's leading graphics with complete alphanumerics. Alphanumerics can tabulate computer data, but graphics can amplify that data into usable, immediately meaningful information. High-resolution graphic presentations and the full upper and lower-case ASCII alphanumerics are available in the 4012 and the APL-language 4013 Graphic Display Terminals.

The flicker-free screen provides up to 1024(x) by 780(y) viewable graphic points or as many as 2590 A/N characters per display. The TTY-style keyboard simplifies input while the thumb-wheel controlled crosshair cursor enhances graphic interactivity. With thumbwheel control, users can direct the x-y cursor for speedy additions or deletions of data to the display screen.

#### **SPECIFICATIONS**

Display Medium — Direct view bi-stable storage crt.
Display Area — 8 in (20.3 cm) wide x 6 in (15.2 cm) high.
Alphanumeric Mode Format — 74 characters per line; 35 lines per display; 2590 characters per display.
Alphanumeric Cursor — Pulsating 7 x 9 dot matrix.
Character Set — 94 printing characters on 7 x 9 dot matrix.
(Full ASCII code) 94 character APL set (4013 only).
Character Size — 85 mils x 105 mils.
Character Generations — 7 x 9 dot matrix with MOS Read-Only Memory. 1,000 characters per second.
Graphic Mode — Vectors only. Vector drawing time 2.6 ms.
Graphic Matrix — 1024(x) x 1024(y) addressable points.
1024(x) x 780(y) viewable points.
Interactive Graphics Mode — Thumbwheel controlled crosshair cursor. 3 thru 1023(x) 0 thru 780(y).

#### ORDERING INFORMATION



# 4014-1/4015-1 Computer Display Terminals

19 in (48.3 cm), Direct View Storage Display Selectable Formats in Alphanumeric and Graphic Modes High-Resolution, Interactive Graphics Capability Plug-In Intelligence Options APL Character Set Available

Tektronix' famous 4014-1 has long been a favorite for display of large data bases and precise detail. Its flicker-free 19 in (48.3 cm) screen offers priced-right performance for applications in mapping, design, manufacturing, medicine, energy, exploration and many other diverse disciplines. Recently, Tektronix has augmented the 4014-1 and APL-language 4015-1 performance with plug-in firmware options, adding powerful firmware capabilities like keyboard programmability, local symbol design, scaling, clipping and rotation.

#### **SPECIFICATIONS**

**Display Medium** — Direct view bi-stable storage crt **Display Area** — 15 in (38.1 cm) wide x 11 in (27.9 cm) high. **Alphanumeric Mode** — 4014-1 Full ASCII character set (94 printing characters).

4015-1 Full ASCII and APL character sets (188 total printing characters).

Character Format — Four program-selectable formats:

- 1) 74 characters per line with 35 lines per display.
- 2) 81 characters per line with 38 lines per display.
- 3) 121 characters per line with 58 lines per display.4) 133 characters per line with 64 lines per display.

Alphanumeric Cursor — 7 x 9 dot pulsating cursor.

Keyboard — Typewriter paried upper and lower case with auto repeating keys. 4015-1 adds APL character set.

Graphics Mode — Vector drawing time 5,000 in/s (127 m/s).

Information Density — 1024(x) by 1024(y) addressable points.

points (10 bits). 1024(x) by 780(y) viewable points.

Interactive Graphic Mode — Thumbwheel controlled crosshair cursor. 3 thru 1024 addressable points horizontally. 0 thru 780 addressable points vertically.

#### ORDERING INFORMATION

OEM terms available on these products.



4016-1 Computer Display Terminal 25 in (63.6 cm) Direct-View Storage Display High-Resolution, Flicker-Free Graphics Selectable Formats in Graphic and Alphanumeric Modes Plug-In Intelligence Options

The 4016-1 is ideal for designers of electronic circuit boards, utility networks, automotive components, schematic diagrams, street maps or similar applications where fine detail is important while maintaining the total picture perspective.

With its big 25 in (63.6 cm) diagonal screen, 4096 by 3120 viewable points, and finely etched 10 mil wide vectors, the 4016-1 is uniquely suited for displaying highly complex graphics. Graphic lines are sharp, stable and flicker-free, simplifying the study of fine details. A thumbwheel-controlled crosshair cursor makes it easy to interactively manipulate the display. Besides enabling the display of more high-density graphic information than any other terminal available, the 4016-1 provides high density alphanumerics for applications from graphic labeling to newspaper page layout.

#### **SPECIFICATIONS**

**Display Medium** — Direct view bi-stable storage crt. Written image bright green on green background.

Display Area — 18 in (45.4 cm) wide x 13.5 in (34 cm) high. Character Set — Full ASCII character set (94 printing characters).

#### Standard Character Format

- 1) 74 char/line by 35 lines.
- 2) 81 char/line by 38 lines.
- 3) 133 char/line by 64 lines.
- 4) 179 char/line by 86 lines.

#### **Optional Character Formats**

- 1) 74 char/line by 35 lines.
- 2) 81 char/line by 38 lines.
- 3) 121 char/line by 58 lines.4) 133 char/line by 64 lines.

Alphanumeric Cursor — 7 x 9 dot pulsating cursor Keyboard — Typewriter paried upper and lower case with

auto repeating keys. **Graphics Mode** — Vector drawing time is 8000 in/s (20,000 cm/s)

Information Density — 4096(x) by 4096(y) addressable

points (12 bits). 4096(x) by 3120(y) viewable points. **Vector Formats** — 5 formats, including straight, dotted and dashed lines.

**Point Potting Modes** — Point Plot Mode: special Point Plot Mode absolutely addresses points with program control of plotted point size. Incremental Plot Mode relative addressing 1 of 8 directions, one step at a time.

Interactive Graphic Mode — Thumbwheel controlled crosshair cursor. 0 thru 1023 addressable points horizontally. 0 thru 780 addressable points vertically.

Hard Copy Mode — Switch selectable hard copy of screen using the 4631 Hard Copy Unit.

#### ORDERING INFORMATION



**Computer Graphics Products** 

4010 Series

# 4081 Interactive Graphics System Interactive Graphics Terminal Merged Storage and Refresh Graphics Software Packages Provide Broad Selection of Tools

The Tektronix 4081 Interactive Graphics System combines screen-stored graphics with refreshed graphics in one display. The mixing of these two technologies in one crt allows the user to display both static and dynamic, complex and high resolution graphics, without the flicker associated with pure refresh directed beam displays.

The 4081 Interactive Graphics System provides the user with a fully integrated graphics system at a significantly lower price than refresh-only display systems.

With the 4081, a user can work with both fixed and moveable pictures generated either by a host computer or locally. The user can move, change, enlarge or reduce, rotate, and add or delete selected portions of displayed graphics data.

#### SPECIFICATIONS

**Processor** — 16 bit word with 16 and 32 bit integer arithmetic, 32 and 64 bit floating point arithmetic, and stack instructions standard for a total of 154 machine instructions.

Memory — 32K bytes of memory standard. Cartridge magnetic tape drive with 281K bytes storage capacity.

Baud Rate — asychronous RS-232-C communications interface operating from 110 to 9600 baud in full duplex mode.

Character Set — Alphanumeric keyboard with full ASCII character set

Crt Display — 19 inch crt display. Write rate of 56,000 vector-cm/s in refresh mode, and 14,000 vector-cm/s in storage mode. 2048 x 1536 displayable raster units, virtual image: 65535 x 65535 units. Resolution of 16 line-pairs/cm. Spot size of 20 mils, maximum.

Mode Capacity — Can display over 50,000 vector-cm in storage mode, while simultaneously displaying flicker-free graphics for up to 1600 vector-cm or 800 vectors (whichever limit occurs first), in refresh mode.

**Display Controller** — Maintains refreshed picture independent of processor, displays screen-stored pictures, supports 352 unique dash patterns, supports four vector intensities, and supports 64 point intensities.

#### ORDERING INFORMATION

4081 Interactive Graphics Terminal . \$27,000
Option 06 CDC Synchronous Interface Add \$3995
Option 22 64K Byte Total Memory Add \$3950
Option 31 Expansion Package Add \$1800
4905 Mass Storage Module
Option 32 Two Dual Flexible Discs Add \$11,450
Option 33 Single Hard Disc Add \$12,000
Option 34 Dual Hard DiscAdd \$21,000

Tektronix offers maintenance training and introductory programming classes on the 4081 Interactive Graphics Terminal. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.

#### **Computer Graphics Products**



#### **4024 Computer Display Terminal**

# Complete Alphanumeric Terminal Easy To Use For The Novice As Well As The Experienced Programmer Forms Ruling Options Available Easy Interface, Optional Polling

The 4024 was designed to allow fast, straightforward interaction with your host computer and maximum efficiency in the manipulation of alphanumeric data. For writing and editing programs, editing text or filling out and editing forms, the 4024 can display a full 34 lines of 80 characters each on its 12 inch diagonal display screen. The complete upper and lower case ASCII character set is provided. The keyboard is layed out in a familiar office typewriter configuration.

Predefined editing keys let you insert and delete lines and characters. Thirteen user-definable keys, plus virtually any other key on the keyboard, can be defined to generate a command or character string at the touch of a finger. This lets a programmer or other user quickly restructure the keyboard to suit a particular need. The green-on-black screen with adjustable brightness level is easy on the eyes.

A 4K memory is standard with the 4024, but can expand to 32K, allowing buffering and scrolling of hundreds, even thousands of words.

#### SPECIFICATIONS

**Display Size** — Video monitor display on 12 in (30 cm) diagonal screen.

**Raster Lines** — Standard 525 line scan, with 480 lines displayed. Scan — 30 Hz.

**Display Characteristics** — Cursor Type. Wide underscore. Character size —  $7 \times 9$  in a  $8 \times 14$  dot matrix.

Character Sets — 64/96 upper and lower case ASCII. 80 characters/line, 34 lines/display. 2720 Total characters/display.

**Baud Rates** — The transmitting and receiving baud rates are independently selectable using internal strap selection. The baud rates available are: 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600 baud.

# ORDERING INFORMATION 4024 Computer Display Terminal .... \$2995



#### **4025 Computer Display Terminal**

# From Alphanumerics To Graphics ASCII Character Set and Finger Tip Editing Forms Ruling Option Available

The 4025 gives you the ability to expand a computer terminal from basic alphanumerics to forms ruling and then to graphics. No other terminal has such versatility up to and including the capacity for unsurpassed report generation.

You can create and store multiple graphs in the terminal memory, create more than one graph on a single page, and scroll graphics along with alphanumeric information. In addition, you can interactively create bar charts with multiple shadings, histograms, log plots, pie charts and period axes, all with a wide variety of labeling options. Operation is easy for anyone, because the 4025 uses English language commands based on the ASCII character set.

With this total formal flexibility, you can create page after page of reports that include combinations of alphanumerics, forms and graphs. The 4025 can display a full 34 lines of 80 characters each on its 12 inch diagonal display screen.

A 4K memory is standard with the 4025, expandable to 32K, allowing buffering and scrolling of hundreds and even thousands of words.

#### **SPECIFICATIONS**

**Display Size** — Video monitor display on 9 in (22.9 cm) wide  $\times$  6.4 in (16.3 cm) high.

Raster Lines — Standard 525 line scan with 480 lines displayed.

**Character Set** — 64/96 upper and lower case ASCII (optional character sets available).

**Alphanumeric** — Mode format is 34 lines, 80 characters per line, 2720 characters full screen.

Character — Generation — 7 x 9 in an 8 x 14 dot matrix (graphic cells are 8 x 14 matrix)

Cursor — Wide underscore.

Baud Rate — Selectable to 9600 baud.

Graphics - Optional.

# ORDERING INFORMATION 4025 Computer Display Terminal . . . . . \$3595



#### **4027 Color Graphics Terminal**

#### Full Color Graphics and Alphanumerics PLOT 10 Compatible Fully Supported Color Capability Dynamic Displays Created Easily

The 4027 offers all the easy data entry, scrolling and graphics capabilities of the Tektronix high-performance 4020 raster-scan family. Most importantly, it provides the kind of fully supported color capability you could expect only from the world's graphics leader.

Colors are selected from a 64 color palette with up to eight colors displayable simultaneously. For specifying lightness, saturation and hue, you will find the 4027 system as easy as it is versatile. Local capabilities include colored vectors, characters, symbols and polygon fill. Firmware enables a second color to border the polygon and allows user selection of up to 120 different patterns or color combinations for special applications. Because the capabilities are intitiated by firmware, not software, 4027 operation makes minimal demands on host computer communications.

Up to 32 K bytes of built-in display memory and up to 192K bytes of graphic memory allow the same scrolling, dual-screen and multiple field formatting featured in other 4020 Series terminals.

#### SPECIFICATIONS

**Display Size** — 10 in (25.4 cm) wide x 7.5 in (19.1 cm) high. **Graphics** — Standard with full screen crosshair cursor.

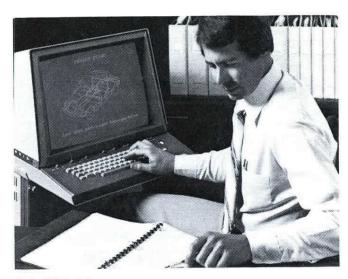
Color — 8 colors displayable, colors selected from a pallette of 64 colors.

Patterns — 120 user definable color patterns.

Local Functions — Circle and pie generation, polygon fill.

Other 4027 specifications - Same as 4025.

# ORDERING INFORMATION 4027 Color Graphics Terminal .....\$8695



#### PLOT 10 Graphics Software Library

PLOT 10 is the world's leading commercial graphics library. Versatile, modular, and fully documented, it lets you start with only the code you need to do your job, then expand with modules and utilities to develop more sophisticated or specialized applications. PLOT 10 builds to high-level, "cookbook" solutions such as English-like commands for business applications and other non-programmer environments.

PLOT 10 includes the following packages:
Terminal Control Systems (TCS) — A composite of FORTRAN IV subroutines, TCS contains the basic building blocks for all graphic operations. It permits modular as well as system independent programming, and supports such basic graphic functions as window-

Advanced Graphing Package — AG II subroutines let a programmer tailor the size, shape and format of graphs, specifying more than 40 graphic elements.

ing, clipping and rotation.

Interactive Graphing Package — IGP simplifies the task of graph storage, editing, recall and updating, so a user with little or no programming experience can create a presentation quality graph.

Easy Graphing — A straightforward English lanquage command structure that gives the non-programmer wide-ranging command of graphics in business decision-making tasks.

Interactive Graphics Library — IGL is a uniquely modular system of I/0, device drivers, primary commands and advanced feature support that lets the user move at will among any Tektronix display devices or technology. Advanced options such as color panel filing, many character fonts and 3-D may be added.

Plotter Utility Routines — Those routines link your data base, terminal and Tektronix 4660 Series plotters to enable easy, powerful command of multicolored graphs, charts, maps and renderings. Digitizing is just as versatile by using the built-in joystick.

#### **PLOT 10 ORDERING INFORMATION**

ulation.

For 4010 Series Terminals. 4006-1, 4025 and 4027 color display.

Tools for easy use of graphic and alphanumeric capabilities of Tektronix Terminals.

4010A01 PLOT 10 Terminal Control System\$850
4010A10 PLOT 10 Terminal Control System, Implementation for IBM with TSO \$1,095
4010A11 PLOT 10 Terminal Control System, Implementation CDC SCOPE/Intercom with Option 20 Interface
4010A12 PLOT 10 Terminal Control System, Implementation for PDP-11 with DOS \$895
Versatile software to graph your data using a powerful set of FORTRAN IV subroutines. 4010A02 PLOT 10 Advance Graphing II . \$950
Complete Support for TEKTRONIX 4013 and 4015 with self documenting commands, for the APL Programmer. 4010A09 PLOT 10 APL GRAPH II \$850
4010A13 PLOT 10 APL GRAPH II, Implementation for APL/360 \$1,095
Powerful graphing through English language commands for the non-programmer 4010A03 PLOT 10 Interactive Graphing Package
Correct your graphics easily with a Tektronix Terminal before plotting. 4010A04 PLOT 10 Preview Routines for Cal- Comp Plotters
Provides complete flexibilty of character definition, including rotation, scaling, and special characters. 4010A05 PLOT 10 Character Generation System
Point by point Tektronix 4953 and 4954 support, plus pencil and paper input ease for many computer systems. 4010A06 PLOT 10 Graphic Tablet Utility Routines\$125
Individual addressing of up to 12 Tektronix displays. 4010A08 PLOT 10 Display Multiplexer Utility Routines\$110
Office machine simplicity for the production of the most popular formats in graphing. 4010B01 PLOT 10 Easy Graphing Punch Paper Tape
4010B02 PLOT 10 Easy Graphing 026 Format Punched Cards\$875
4010B03 PLOT 10 Easy Graphing Magnetic Tape\$1250
4010B04 PLOT 10 Easy Graphing Dec RK-05 Hard Disc\$1000
4010B05 Easy Graphing 029 Format Punch Cards\$875
Designed for device independent control of DVST, raster scan displays, and plotters. Offers a growing array of graphics control functions such as commands for color, 3-D, line smoothing, and multi font text manip-

4010C01 PLOT 10 Interactive Graphics

Library(typical configurations) \$2500-10,000

# PLOT 80 Programming Language

**PLOT 80** programming languages provide the means for a 4081 programmer to locally develop a complete graphics application system specifically for the user's production work environment.

PLOT 80 FORTRAN IV. The primary 4081 application implementation language is FORTRAN IV. 4081 FORTRAN meets all the requirements of ANSI Standard X3.9-1966, and provides several extensions to this standard.

4081 FORTRAN IV is fully integrated with 4081 hardware and the Graphics Operating System (GOS). It takes direct advantage of the instruction set of the 4081 processor, making use of Tektronix-designed stack instructions.

PLOT 80 DGS. DGS supports all the needs of a FORTRAN graphic application program. Areas supported include general floating point graphics output, graphics transformations, graphics input, window-viewport mapping, circles and arcs, polygons, splines, file manipulaiton, command processors, host computer communications, charter and bit string manipulation, input/output, and overlays.

PLOT 80 MACRO Assembler. The PLOT 80 Macro Assembler allows optimization of critical parts of graphics application programs. FORTRAN COMMON may be shared with assembly language programs, allowing these programs to be used as FORTRAN subroutines. The macro capability allows the assembly language programmer to save time by using previously defined segments of code. Object code generated by the assembler may be either relative or absolute.

PLOT 80 TECO. TECO is a flexible, characteroriented text editor that allows 4081 users to edit any ASCII file. TECO provides powerful commands which enable the user to write editing macros to provide functions such as block text movement, conditional execution, recursive subroutine calling and command trace.

PLOT 80 Library Linker/Loader. The Library Linker/Loader joins separate segments of object program code into an operable program module. The Linker/Loader will also generate memory image program overlays allowing execution of programs too large to reside in memory.

PLOT 80 SYSGEN Tools. PLOT 80 programming languages are augmented by GOS generation (SYSGEN) tools, allowing the programmer/user to configure GOS to suit the particular needs of the graphics application. With SYSGEN tools, the user may add or remove GOS services as required. GOS services may be deleted entirely or made non-resident.

# Computer Graphics Products GPIB Product



# 4051 GRAPHIC COMPUTING SYSTEM

Low cost High resolution Graphics and alphanumerics

The 4051 is a desktop graphic computer that performs productively by putting solutions-oriented BASIC language at your fingertips. It includes integrated computing, peripherals, and GPIB (IEEE-488) interface.

The 300K bytes magnetic cartridge drive is integrated into the 4051 hardware and language. The typewriter keyboard is also integrated into the system with a 36 character buffer that makes losing entries virtually impossible.

Input and output operations are easy to program and debug because the 4051 I/O commands use device-independent keywords. Input and output can be as simple as INPUT or PRINT or can have FORTRAN-like power with PRINT USING and IMAGE commands (optional).

Intelligent terminal modes permit sharing data with a host computer. The asynchronous interface lets you choose either fully programmable or terminal mode communications at up to 2400 baud.

#### SPECIFICATIONS

Processor — LSI 8 bit microprocessor.

**User Memory Workspace** — 8K bytes standard, expandable to 32K bytes.

**Keyboard** — Full 128 ASCII character upper and lower case with auto repeat. 10 key numeric and 5 math function calculator key pad. Line/character editor keys.

**User definable function keys** — 10 shiftable to 20. Keys for single step execution of programs, auto-numbering, rewinding magnetic tape, or automatic loading and execution of the first program on tape.

**Tape Drive** — 3M DC 300A cartridge. 300K bytes maximum (dependent on number of files).

Rewind speed — 90 ips.

Search/read speed — 30 ips.

Structure — 256 bytes with header. File oriented access via BASIC commands

Crt — direct view storage crt.

Alphanumeric — 72 characters per line, 35 lines.

**Character set** — Full ASCII including upper/lower case. Also includes Scandinavian, German, General European, Spanish, and special graphic symbol fonts.

Graphic resolution - 1024 x 780 points.

Visibility - Flicker-free, easy-on-the-eyes display.

Copier — Compatible with Tektronix 4631 Hard Copy Unit.

#### **ORDERING INFORMATION**

4051 Graphic Computing	System	\$5995
Option 20 16K bytes total memory	<i>,</i>	Add \$900
Option 21 24K bytes total memory		
Option 22 32K bytes total memory		Add\$1900



# 4052 GRAPHIC COMPUTING SYSTEM

Fast processing
High level BASIC
Expendable memory

The 4052 is a desktop computer offering high performance, stand-alone computing power, flexible data communications, and easy-to-learn, extended BASIC. These features, combined with high resolution graphics, make the 4052 an excellent choice for scientific and statistical research, forecasting, data acquisition and analysis.

For rapid calculation, the 4052 has a fast processor with microcoded floating point. Fast processing coupled with simultaneous display of text and graphics offer an excellent solution to many application requirements.

The 4052 comes standard with 32K bytes of memory, and can be optionally expanded to 64K bytes, allowing larger and more complex programs to be handled. A 300K bytes magnetic cartridge tape drive is built-in, allowing both ASCII and binary programs or data to be easily sorted and retrieved using simple file management commands in BASIC.

The GPIB Bus conforming to IEEE Standard 488-1975 is built-in and can be programmed using 4052 BASIC I/O commands.

Data Communications provided by an optional asynchronous interface on the 4052 allows programmable or terminal mode operation at up to 9600 baud.

#### **SPECIFICATIONS**

Processor - LSI bi-polar 16 bit.

**User Memory Workspace** — 32K standard, expandable to 64K

**Keyboard** — Improved, sculptured, matte finish. Keyboard identical in other specifications to 4051 keyboard.

**Tape Drive** — Identical to 4051 tape drive but provides faster storage and retrieval of programs with direct-to-file operation and built-in Binary program functions.

Crt - Direct view storage crt.

Alphanumeric — 72 characters per line, 35 lines.

Character Set — Full ASCII including upper/lower case.

**Special fonts** — Selectable under program control — Swedish, German, British, Spanish, Danish/Norwegian, Graphic, and Business.

**Graphic resolution** —  $1024 \times 780$  viewable points,  $1024 \times 1024$  addressable points.

Visibility — Flicker-free, easy-on-the-eyes display.

Copier — Compatible with Tektronix 4631 Hard Copy Units.

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Tektronix offers maintenance training and introductory programming classes on the 4051 Graphic System. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return at the back of this catalog.



# 4054 GRAPHIC COMPUTING SYSTEM

19 inch high resolution display Dynamic graphics (option) Expandable memory Enhanced graphics

The 4054 is the only desktop computer that combines easy-to-learn, extended BASIC with the unique features of a large screen, high resolution Tektronix display. For rapid calculation, the 4054 has a fast processor with microcoded floating point. The 4054's memory capacity can be expanded from a standard 32K bytes, up to 64K bytes.

The 4054, with 4096 (x) by 4096 (y) resolution (13 million addressable points) has all the graphics capability you will need for even the most complex display. With ASCII strokegenerated characters programmable in four sizes and eight fonts, the 4054 has the tools to alphanumerically dress up your output to suit any professional requirement, including preveiwing of 132 column line printer output.

For your graphing needs there are 36 distinct dot-dashed patterns selectable under program control, providing for effective data presentation. For interactivity the 4054 has a thumbwheel driven, true crosshair cursor.

#### **SPECIFICATIONS**

Processor — LSI bi-polar 16 bit, same as 4052.

**Keyboard** — Identical to 4052 keyboard but includes added thumbwheels which control crosshair cursor.

Tape Drive — Identical to 4052

Crt — direct view storage crt.

**Alphanumerics** — Four program selectable formats.

72 characters per line with 35 lines per display.

79 characters per line with 38 lines per display.

119 characters per line with 58 lines per display. 132 characters per line with 64 lines per display.

**Character set** — Full ASCII, upper/lower case, high quality, stroke generated characters.

**Special fonts** — Selectable under program control-Swedish, German, British, Spanish, Danish/Norwegian, Graphic and Business.

Graphics — Vector drawing time - 15k cm/sec.

Addressable resolution — 4096 (x) by 4096 (y) - 12 bits.

Viewable resolution — 4096 (x) by 3125 (y).

Dot-dashed vectors, programmable in 36 visibly distinct patterns.

Crosshair cursor with built-in thumbwheels for interactivity.

Visibility — Flicker-free, easy-on-the-eyes display.

Copier — Compatible with Tektronix 4631 Hard Copy Unit.

#### **ORDERING INFORMATION**

4054 Graphic Computing System	\$16,500
Option 24 64K bytes total	
memory	Add \$2000
Option 30 Dynamic Graphics	Add \$2500

#### **OPTIONS**\*

# Option 01 Data Communications Interface (4051, 4052 and 4054)

Allows synchronous, bit serial communications between 4050 Series desktop graphic computer and any external device conforming to EIA RS232 standard. Ease of use is facilitated by a special overlay and added language commands that make communication parameters and communications programmable.

Option 01						•					٠									\$1400
Option 02										10	d	<p< td=""><td>0</td><td>a</td><td>C</td><td>k</td><td></td><td></td><td></td><td></td></p<>	0	a	C	k				
(4052 and	4	0	5	4	C	10	1	y	1)											

Four slot backpack to provide additional slots, for connecting ROM Packs.

Option 03 Backpack (4052 and 4054 only)

Four slot backpack with Option 01 Data Communications Interface built-in.

#### Option 03 .....\$1700 Option 10 Printer Output Interface (4051, 4052 and 4054)

Enables 4050 Series desktop graphic computer to output alphanumerics to any printer or output device conforming to the RS-244A Standard for EIA Numerical Machine Control.

#### Option 10 ......\$550 Option 30 Dynamic Graphics Option (4054 only)

Dynamic Graphics adds increased interactivity to the graphics of the 4054 Graphic Computing System. Complex graphics objects can be created, edited, saved and recalled with simple BASIC language commands. These objects, saved in a Dynamic Graphics memory, can be displayed, moved anywhere on the screen, and removed without affecting the rest of the display.

Dynamic Graphics brings the user closer to the solution by providing the Graphic power to work directly with the graphic elements of the design problem. Complicated displays can be constructed quickly and easily with user-defined objects.

Option 30 .....\$2500



# 4051C01 Synchronous Communications Interface (4051 only)

Microprocessor-based interface/peripheral which allows telephone connection from the 4051 to a computer supporting IBM Binary Synchronous communications protocol.

4051C01 .....\$3200

#### **ROM PACKS\***

## 4051R01 Matrix Functions ROM Pack (4051 only)

Provides fast matrix manipulation: Multiply, Inverse, Transpose, Identity and Determinant functions. Built-in on 4052 and 4054.

# 4051R05 Binary Program Loader ROM Pack (4051 only)

Allows storage and retrieval of programs on internal and external magnetic tape in binary format. Built-in on 4052 and 4054.

#### 4051R06/4052R06 Editor ROM Pack

Allows general ASCII file editing of data or programs or text (including FORTRAN, BASIC and COBOL programs) offline. Includes 29 commands such as COPY, INSERT, MOVE, SEARCH, and SORT for creating, manipulating and storing ASCII text.

# 4051R07/4052R07 Signal Processing ROM Pack #1

Adds seven new functions which can be applied to one dimensional data arrays: integration, differentiation (2 and 3 point), fast graphing, locating minimum and maximum, and crossing over a threshold.

# 4051R08/4052R08 Signal Processing ROM Pack #2

Extends array handling capabilities by adding commands that perform Fast Fourier Transform (FFT), its inverse (IFT), convolution, correlation, windowing and related utility functions.

#### 4051E01 ROM Expander (4051 only)

The 4051E01 ROM Expander Unit is a desk top accessory for the 4051 Graphic Computing System and provides 8 additional slots for connecting ROM packs.

4051E01.....\$850

#### PLOT 50

#### Graphics Software Library

PLOT 50 software provides flexible, interactive programs that aid the user in business, scientific, and general purpose applications. High quality graphics are an integral part of the software. Each package comes complete with a binder, program tape(s), instruction manual, and any required key overlays for the 4051, 4052, and 4054.

Statistics Vol. 1 contains 24 programs that generate tabled values for many common statistical distributions, allow testing of various hypotheses, and provide several data plotting and regressional techniques.

Statistics Vol. 2 provides six sophisticated programs for one, two and three-way analysis of variance and covariance; and Latin squares.

Statistics Vol. 3 contains two large, highly interactive programs for performing polynomial and multiple linear regression.

Statistics Vol. 4 is a comprehensive package that provides 9 sophisticated non-linear regression techniques.

Mathematics Vol. 1 contains 23 programs and subroutines that provide fast solutions to frequently encountered mathematical problems.

Mathematics Vol. 2 consists of 16 programs and subroutines for solving more advanced problems, such as linear programming, data fitting, and Fast Fourier Transforms.

**Electrical Engineering Vol. 1** is a set of programs for modeling and analyzing audio, high frequency, VHF, UHF, and microwave circuits and systems.

**Graph Plot** helps either the novice or the sophisticated user prepare data representation graphics on the display.

General Utility Programs Vol. 1 contains fifteen subroutines and programs that aid the user in everyday 4050 Series tasks.

Business Planning and Analysis Vol. 1 is a collection of interactive programs for business decision-making and problem solving.

Business Planning and Analysis Vol. 2 provides a comprehensive, interactive program package for time series analysis and forecasting.

Order 4050A11 (tape version) . . . . . . . \$850 4050A12 (disc version) . . . . . . . \$850

Modeling and Reporting Software (MARS) is a general purpose modeling and reporting system that allows the user to automate the analysis and reporting processes.

Order 4050B01 (tape version) . . . . . . . \$2000 or Option 05 (disc version) . . . . . No Charge

4050 Series Applications Library consists of contributed software and is maintained as a central resource for existing user-contributed programs. A free newsletter, TEKniques, informs members of other users' applications, programming tips, new programs in the library and new 4050 Series related products.

Supplementary Software and Service Catalog lists third party software and services available for the 4050 Series. Applications include General Business, Management Reporting and Analysis, Data Management, Engineering, Industrial, Mathematics and Statistics, and Scientific.



### INTERACTIVE DIGITAL PLOTTER

Intelligent B-size (A3) plotter
Multi-color capability
Built-in RS-232 and GPIB interface
GPIB Product

The 4662 Interactive Digital Plotter is an intelligent B-size (A3) plotter with multiple pen types, colors, and output mediums. It automatically adjusts for 10 x 15 in (254 mm x 381 mm) plot. There's no need to worry how the last plot was set up. When you wish to set a different plotting area or adjust to a new paper size, you simply use the SET control buttons on the front panel to define the new area. The 4662 plots on paper, vellum, Mylar, acetate film and preprinted forms.

Repeatability is excellent, time after time. There is no servo hysteresis, no draft as in potentiometric feed back systems. And no slidewires to clean, no moving electrical contacts, no servo adjustments to be made.

Input data is internally buffered so you can optimize data transfer from your host processor, or move on to your next computation while the 4662 is plotting.

Using the RS-232 interface, up to four 4662's can be teamed up in series. Up to fifteen 4662's can be used with one GPIB device like the Tektronix 4050 Series desktop graphic computers. A simple, unique code activates each plotter.

#### SPECIFICATIONS

Plotting area — X-Axis greater than 15 in (381 mm). Y-Axis greater than 10 in (254 mm).

Repeatability  $-\pm 0.0025$  in ( $\pm 0.06$  mm).

Time to maximum velocity — Approx. 120 mm/s.

**Resolution** — 0.005 in (0.127 mm).

Plotting rate — 16-22 ips (40.6-55.9 mm/s) vector dependent.

Point plotting rate — Pen action rate 10 points/s max.

Character set — Full ASCII character set.

**Pen control** — By software control or by operation of front panel PEN button. Pen may be disabled manually.

**Position controls** — Joystick vector rates variable from 0.015 ips to 4 ips.

Writing method — Nylon-tipped pen or wet ink drafting pen.

Paper size — 11 x 17 in (279 mm x 432 mm) maximum.

Paper retainer — Electrostatic hold-down.

**Drive characteristics** — Two four-phase stepping motors, each operating a pulley/cable system to propel the pen in that motor's respective axis.

GPIB -- Conforms to IEEE standard 488-1975.

#### ORDERING INFORMATION

4662 Interactive Digital Plotter	\$4195
Option 01 - GPIB I/F cable instead of	
RS-232-C I/F cable	No Charge
Option 30-RS-232-C (4081 only)	Add \$525

4662A01 PLOT 10 Utility routines software	\$295
Drafting vellum (17 in x 22 in), order 006-2836-00 (100 sheets)	
Mylar sheets (17 in x 22 in), order 006-2835-00 (100 sheets)	



#### **4631 HARD COPY UNIT**

High resolution Copies in seconds DVST compatible

The 4631 provides permanent dry copies of any information displayed on the terminal screen. It can be multiplexed to copy up to four display terminals and/or display monitors.

The 4631 is compatible with the 4010 and 4020 Series of computer display terminals, the 4081 Interactive Graphics Terminal, and the 4050 Series of Graphic Computing Systems. It also interfaces with Tektronix 11" and 19" computer display modules.

The 4631 is an easily-installed, completely self-contained unit with built-in stacking tray. It is small enough to fit on a table top, and portable enough to be moved where needed. There are no messy chemicals to spill. It's clean and quiet enough to fit into the most sensitive system.

Copy time is 18 seconds for the first copy, 8 seconds for subsequent copies.

The 4631 uses dry-silver paper for the high image contrast needed for complex graphics and alphanumerics. It provides all the handling ease of dry, conventional paper and is easy to write on with pen or pencil.

#### **SPECIFICATIONS**

Paper size — 8.5 in x 11 in (216 mm x 277 mm).

**Copy size** — Format A, positions I and III, produces a 8.85"x6.7" (225 mm x 170 mm) copy, oriented horizontally on a 8.5"x11" (216 mm x 277 mm) piece of paper.

Format B, position II, produces an 7.1"x5.4" (180 mm x 137 mm) copy, oriented vertically on a 8.5" x 11" (216 mm x 279 mm) piece of paper (not recommended for 19" (482 mm) display tubes).

Warmup time — 10 minutes.

#### **ORDERING INFORMATION**

4631 Hard Copy Unit \$4495
Option 01 Copy Counter
Option 02 Four Channel Multiplexer Add \$575
Option 31 Compatible with the 4025
006-1603-01\$180

Tektronix offers maintenance training classes on Hard Copy Units and the terminals they support. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.



#### **4632 VIDEO HARD COPY UNIT**

Grey scale capabilities
Dry process developing
Copies in seconds
Video source compatible

Clean, crisp reproduction for any video system. The 4632 Video Hard Copy Unit lets you make paper copies of most raster scan video sources including 525 to 1029 line interlaced and 256 to 512 line non-interlaced, whether your input is analog video, or a digital video signal. Within seconds, you've got a clean, dry 8.5 x 11 inch (216 mm x 279 mm) copy of your display, gray scale or black and white, characters or graphics.

The 4632's dry-process development system uses dry-silver paper for the high image quality required by complex graphics and alphanumerics. No liquid toner mess, wasted paper, or additional operating costs. You may store copies for years in your files, write on them in pen or pencil, and erase pencil marks without damage.

The 4632 produces the first copy in about 18 seconds, and subsequent copies at 8 second intervals. Its 540 copy paper roll minimizes loading downtime. Operation is so simple that anyone can plug it in and make copies without special training.

#### **SPECIFICATIONS**

Copy size — 8.4 x 6.3 in (213 mm x 160 mm).

Copy time — Approximately 18 seconds for first copy (typical 525 line, 60 Hz display). Additional copies at 8 second intervals.

Warmup time — 10 minutes.

Input signal configurations — Composite Video, Video, Horizontal Drive, Vertical Drive, Video, Composite Sync.

Input Video — Composite Video or Video Amplitude 0.3V to 5 V peak, TTL compatible.

Input sync Composite or H&V Drive — Amplitude 0.3 to 8V p-p. Impedance 20 K $\Omega$ . Maximum input 10V dc + peak ac.

#### ORDERING INFORMATION

4632 Video Hard Copy Unit \$4595
Option 01 — Copy Counter Add \$60
Option 02 — Four Channel Multiplexer Add \$575
Option 03 — 625 line, 40 Hz No Charge
Option 04 — 1029 line, 60 Hz No Charge
Option 05 — Set up for 4023 Terminal operation . No Charge
Option 06 — Enhanced grey scale
Option 07 — Compatible with HP 2640 Series Terminals
Option 08 — Compatible with DEC
Minc Systems No Charge
Circuit timing board only, Order 670-5723-02 \$280
Paper — one roll, order 006-1603-00 \$55 — carton of four rolls, order
006-1603-01

### **Computer Graphic Peripherals**

# 4663 INTERACTIVE DIGITAL PLOTTER \*

Intelligent C-Size (A2) plotter
Dual programmable pen control
Nine character fonts
RS-232 and GPIB product

The 4663 is the first high speed C-size plotter with built-in processing power and 5.5K byte buffer memory to free the host from many routine computational operations.

The 4663 can handle either 420 mm x 594 mm (European A-2 drafting size) or 432 mm x 559 mm (American C size — 17 in x 22 in) paper, Mylar or acetate with felt tip, liquid ball, or wet ink pens to give you crisp clean camera-ready copies or overhead transparencies.

The plotter features dual programmable pen control with interchangeable multicolor pens and is capable of producing dotted or dashed lines from local firmware. Built-in joystick allows easy manual positioning of the pens for digitizing or page scaling adjustments.

The unique parameter entry device lets you quickly identify or select operating parameters without resorting to binary switches, straps, status display devices, and volumes of operator manuals.

#### **SPECIFICATIONS**

Max Plotting Area — X axis-22.4 in (569 mm). Y axis-17 in (432 mm).

Repeatability  $-\pm 0.001$  in (.025 mm).

Max. Plotting Speed — 16-22 ips (406-559 mm) Vector dependent.

Point Plotting Rate — 10 pts per sec. max.

Character Generator — 95 ASCII, 15 x 7 Matrix, 7 Special Fonts Std.

Paper Size — U.S. C-Size 17 in x 22 in. European A2 Size (420 mm x 594 mm).

Paper Retention — Electrostatic hold down, sprocket feed

paper advance (Optional).

Media Types — Paper or Mylar.

Drive Characteristics — Microprocessor controlled stepping motors controlling cable system connected to pen arm

Baud Rate — 110-9600 baud.

Standard Interface — RS-232-C, full duplex, Loop-through.

#### ORDERING INFORMATION

ORDENING INFORMATION
4663 Interactive Digital Plotter \$9975
Option 01-GPIB I/F cable (deletes RS-232-C) Add \$425
Option 04-GPIB only (deletes RS-232-C) No Charge
Option 30-RS-232-C (4081 only) Add \$525
Ontion 31-Circular interpolation and
programmable macros Add \$525
Ontion 32-Math character set and down
leadable characters
Option 36-Paper advance
Option 37-Added default parameters
4663A01 PLOT 10 Utility Routines
software
Drafting vellum (17 in x 22 in),
Diating ventili (17 iii x 22 iii),
order 006-2836-00 (100 sheets) \$20
Mylar sheets (17 in x 22 in) order
006-2835-00 (100 sheets)
Dust Cover — Soft vinyl,
Dust Cover — Cont vinyi,
order 200-2392-00\$20

Tektronix offers maintenance training on the 4663 Interactive Digital Plotter. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.



4641 Matrix Printer

The 4641 is a high quality matrix, alphanumeric impact printer. It will provide 132 column output on line printer paper, which can have up to 6 parts. Varying paper widths can be handled, and a format control allows handling of 11 different form lengths. The 4641 prints up to 180 characters per second, upper and lower case, using a 7 x 7 dot matrix.

4641 Matrix Printer									\$4315
Option 02 4052/4054 Interf	a	CE	9						 No Charge



4642 Matrix Printer

The 4642 is a matrix alphanumeric impact printer. 80 column format is standard with a choice of regular or elongated characters, or 132 column output using a condensed character set can be selected via a front panel switch. The 4642 is a table top unit, requiring minimum space. It prints 60 upper or lower case characters per second, using a 5 x 7 dot matrix.

4642 Matrix Printer								. \$2250
Option 01 Rear Feed Tract	or As	sem	bly					Add \$225
4905 Mass	Sto	rag	e	Mo	dυ	ile	•	

The 4905 provides a medium density, memory storage system designed especially for the 4080 graphics display users.

The 4905 comes with a controller that serves two disc drives. The byte storage facility of the system provides up to 20 million bytes on one 4905 option — yet you can start out with an option which provides 630K bytes of additional storage at extremely reasonable cost.

4905 Mass Storage Module	\$635
Option 31 Dual Flexible Disc	Add \$5725
Option 32 Two Dual Flexible Disc	Add \$11,450
Option 33 Single Hard Disc	Add \$12,000
Option 34 Dual Hard Disc	Add \$21,000



4907 File Manager \*

The 4907 is a direct access, flexible disc device with a double density read/write feature that enables up to 630K bytes capacity per disc.

An advanced multiple level file-by-name system includes a directory that maintains the user files, passwords and available space. For applications requiring additional storage capacity, several drives may be connected to the file manager. Software commands are extensive with the File Manager, and its compact size is small enough to let it fit on a desktop or lab bench.

4907 File Manager	\$4750
Option 30 Two Disc Drives Total	
Option 31 Three Disc Drives Total	d \$4300
Option 40 4052/4054 Interface	

#### 4923 Digital Cartridge Tape Recorder \*

Both digital recorders are highly reliable, and easy to use for data storage and retrieval. They also contain an RS-232-C interface which allows them to support any compatible computer display terminal from 110 to 9600 baud.



#### 4924 Digital Cartridge Tape Drive

Each tape cartridge can store approximately 300K bytes of high density digital data. Files of variable length and files containing variable number of formatted records can be easily stored by these two storage systems. GPIB configurable.

4924 Digital Cartridge Tape Drive . . . . \$2695

Tektronix offers maintenance training classes on the 4641 Matrix Printer as part of an intelligent graphic system. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.



#### 4952 Joystick \*

The 4952 controls the position of a graphic cursor on the display screen. The direction and speed of the cursor movement is controlled by the direction and amount of the control lever tilt. The joystick is activated by the BASIC command POINTER and is terminated with a keystroke. The X, Y coordinates, in user data units, of the current position of the cursor on the screen and the value of the key pressed to terminate the operation are returned to the executing program.

4952 Joystick (4014/4015)		٠	•			•	*	\$52	5
Option 01 Joystick (4010, 4012/401)	3)						*00	 . Add \$7	75
Option 02 Joystick (4050 Series)								 Add \$10	)(

#### 4953 Graphic Tablet

The 4953 Graphic Tablet is a desktop unit that enables you to digitize points and send their data content directly into storage, then display them on a Tektronix computer graphics terminal.

4953 Graphic Table	t	1	1	,	">	K	1	1	"	ĺ						
(279 mm x 279 mm	1)		٠		0 0			٠	٠					.\$	34	75
Option 30 4081 I/F Cable .																
Cursor, order 119-0622-00	• ::											 			. \$2	235

#### 4954 Graphic Tablet

The 4954 Graphic Tablet is an E-size unit that can be either placed on a desk, or ordered with an optional tilting stand for large digitizing jobs.

4954 Graphic Tablet 40"x30"
(1016 mm x 762 mm)\$5675
Option 30 4081 I/F Cable
4954F32 Pedestal\$1325
Cursor, order 119-0622-00 \$235

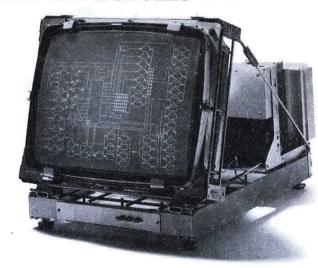
#### 4956 Graphic Tablet

The 4956 is a microprocessor based Graphic Tablet which comes in two sizes: 20" x 20" or 36" x 48". The 4956 Tablet Controller allows digitizing in one of four possible modes which control the rate and method of digitization. Tablet software is provided which allows data to be graphically displayed, or written to magnetic tape. The 4956 is compatible with GPIB (IEEE Standard 488-1975) and comes with a 2 meter interconnecting cable.

4956 Graphic Tablet 20"x20"	
(510 mm x 510 mm)	5195
Option 33 Graphic Tablet (36"x48")Add	
Cursor, order 119-0875-00	\$300

**\*OEM** terms available on these products.

# OEM GRAPHIC DISPLAY MODULES\*



The GMA Series of computer display modules is designed to allow systems builders significant flexibility in integrating displays into their systems. There are three GMA displays in the series, each of which may be coupled to a variety of options, from low-cost to higher-performance, to meet specific needs.

Two of the displays, the GMA101A and GMA102A, are 19 in (48 cm) graphic and alphanumeric storage displays. The GMA101A is a storage-only display, while the GMA102A is a higher performance instrument that also has refresh capability. Both have crt and printed circuit board modules arranged on a unique, high strength, wireform chassis. This construction not only supports different performance, interface and packaging options, but permits easy removal of modules for field service.

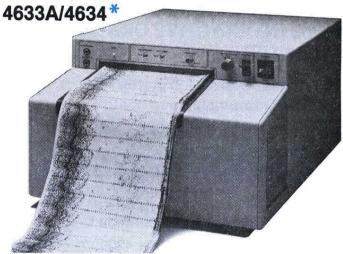
The GMA101A offers very fast stored data drawing capability — 3900 inches per second. At this drawing rate, the entire screen can be redrawn in less than one second, permitting effective zooming or panning.

With the GMA102A, you can display up to 1575 vector inches (30 Hz refresh rate) of refreshed data while simultaneously having all the benefits of storage technology. The storage mode presents high resolution, high density graphics at low cost, while the refresh feature adds the benefits of selective erase, interactivity and dynamic motion with the same high resolution of storage.

The third member of the series, the GMA125, features a 25 in (63.5 cm) crt that offers unequaled information capacity. Adjacent points that would be indistinguishable on a smaller screen can be seen as distinct units on the GMA125. Like the GMA102A, this unit combines storage and refresh capability, but the GMA125 will display up to 1968 vector inches (30 Hz refresh rate) of refreshed data.

The interface to and operation of all of the GMA Series displays has been standardized. All display functions are completely programmable and designed to interface to TTL logic.

All three display modules are available only to the OEM system builder. If you're an OEM, please contact us for complete OEM information. OEM IMAGE INFORMING MODULES



# 4633A Continuous Recorder Line scan real time recorder

Black on white recordings
Excellent gray scale, resolution and linearity
Paper speeds selectable up to 100 mm/sec
Ideal for M-Mode echo-cardiography
Low copy cost

The wide image — 18 cm across — allows room for more information, enhancing accuracy of interpretation. The gray scale, small spot size and excellent linearity all combine to provide a crisp, detailed copy.



4634 Image Forming Module
Photographic quality video images — ideal for many applications

Excellent gray scale and resolution

Compatible with most raster scan video systems

Dry, quick, convenient process Large, file-sized image Low copy cost

Provides excellent detail in both highlight and shadow areas. Thanks to the high resolution, details stand out clearly and the large overall image size 8.5 x 11 in, or (21.6 cm x 27.9 cm) makes fine subtleties even more discernable. The first copy is ready in just 26 seconds: subsequent copies take as little as 12 seconds.

Both recorders are available in either benchtop or rackmount versions and readily interface with a wide variety of OEM systems. As dry process systems, they require minimal routine maintenance. The dry silver paper means no image fading.

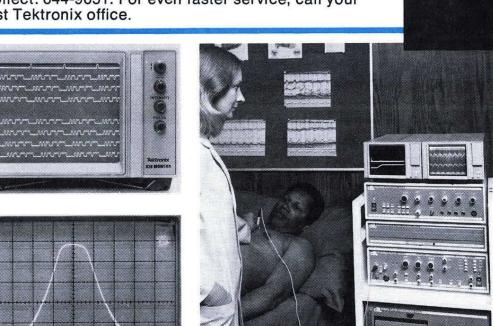
The 4633A and 4634 are available only through an OEM system builder. If you are an OEM, please contact us for complete OEM information. If you're a user, please contact your system builder for ordering information or a demo. Tideo Display X-Y Displays High Resolution Displays Modit Displays Variable Persistence Storage Display Bistable Son Displays Display Components Modular Packaging Variable Storage Display X-Y Displays High Resolution Display Packaging Low-Cost Displays Variable Persistence Stular Packaging

#### As the leader in quality OEM displays . . .

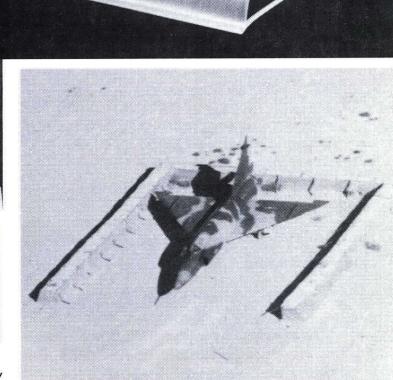
We know your needs and we can meet them with the greatest variety of small screen display products in the business. We know that you expect our displays and cameras to do the job they're specified for—day after day. You expect us to offer you the most competitive price/performance packages. To work closely with you in solving your interface requirements. To support you totally, before and after purchase. To grow as you grow, so we can both meet the new technologies, government regulations, and competitive pressures that impact our business . . .

#### See for yourself.

Our broad product offering is just the beginning: small-screen displays, cameras priced for the OEM, and a wide range of options including UL 544 Listing and Component Recognition and modular packaging. Add in-depth assistance, full service and support programs for a truly profitable working relationship. For additional product information, applications assistance, or a demonstration, simply compete and return the card at the back of the catalog. Or, call Tektronix automatic answering service toll-free: 1-800-547-1512. In Oregon, call collect: 644-9051. For even faster service, call your nearest Tektronix office.



The 608 in M mode and A-mode ultrasound applications. Courtesy of Advanced Technology Laboratories, Inc., Seattle, Washington.



#### **Display applications**

Additional options may be required to optimize display quality for your application.

See your Tektronix Representative for full details.

	603A	604A	606A	606B	607A	608	620	624	634	634 Opt. 01
Ultrasound B-scan									_	~
A-mode		100				~	~	~		
M-mode					~	~		1		
Real time						~		~	1	~
Sector scan						1		-	-	
Multi-imaging Nuclear			_	_						
Ultrasound				~		~		<b>_</b>	-	~
Computerized Tomography				~					~	~
Gamma Visual					_					
Photography			~	-					-	~
Computerized Tomography Photography									_	-
Electronic Instrumentation	~	~	~		~	~	~	~	~	~
Electronic Test & Measurement					~	~	~	~		~
Military/Aerospace	1	1	~	~	1	~	1	~	~	-
Communications	1	~			-	~	~	~	~	-

#### Key specifications for 634 video display

Video Displa	у	634	634 Opt. 01			
D 1.11	Worst case	1100 line	650 line			
Resolution	Nominal	1400 line	800 line			
Display Size		9x12 cm (flat screen)				
Position Accuracy/ Non-Linearity		≤0.5% within 9 cm circle, ≤1% in corners. For Option 01: 1% within 9 cm circle, 2% at corners.				
Brightness		515 cd/m² (150 fL) max.				
Brightness Non-uniformity		Less than ±10%				
Bandwidth		1 Hz-10 MHz std. 20 MHz Z-axis bandwidth available as Option 14.				

Note: Standard 634 accepts the line/field rate of 625/50. 660/1029 rate available as Option 15.

Recommended Cameras:	C-5C	, C28 .
Price	\$1275	Sub \$250

#### **KEY SPECIFICATIONS FOR X-Y DISPLAYS**

See your local Tektronix representative for complete specifications, options and ordering information, or use the return card.

	603A	604A	606A	606B	607A	608	620	624
Spot Size!	0.25 mm (10 mils)	0.36 mm (14 mils)	0.13 mm (5 mils)	0.08 mm (3.1 mils)	0.25 mm (10 mils)	0.26 mm (10 mils)	<15 mil, <25 mil at max drive	0.30 mm (12 mils)
Display Size	10.2 x 12.7 cm	10.2 x 12.7 cm	8 x 10 cm	8 x 10 cm	7.2 x 9 cm	9.8 x 12.2 cm	10 x 12 cm	9.8 x 12.2 cm
Acceleration Potential	3.5 kV	3.5 kV	5.6 kV	5.5 kV	12 kV	22.5 kV	12 kV	≈18 kV
Bandwidth, X-Y <sup>2</sup>	≥2 MHz	≥2 MHz	≥3 MHz	>3 MHz	≥3 MHz	≥5 MHz	≥2 MHz	≥3 MHz
Bandwidth, Z <sup>2</sup>	≥5 MHz	≥5 MHz	≥10 MHz	5 MHz	≥5 MHz	≥10 MHz	≥5 MHz	≥5 MHz
Rise Time	≤70 ns	≤70 ns	≤35 ns	<35 ns	≤70 ns	≤35 ns		≤70 ns
Input R and C, X-Y <sup>3</sup>	1 M $\Omega$ ±1%    <47 pF	1 M $\Omega$ ±1%    <47 pF	1 MΩ ±1%    <47 pF	1 M $\Omega$ ±1% or 50 $\Omega$    <47 pF	1 M $\Omega$ ±1%    <47 pF	1 MΩ,    ≤60 pF	1 MΩ    47 pF	1 MΩ    <47 pF
Input R and C, Z <sup>3</sup>	1 MΩ    <47 pF	1 M $\Omega$ ±1%    <47 pF	1 MΩ <47 pF	1 MΩ or 5 MΩ	1 MΩ <47 pF	1 MΩ, ≤60 pF	1 MΩ <47 pF	1 MΩ    <47 pF
X-Y Phase Difference	≤1° to 500 kHz	≤1° to ≤500 V	<1° to 500 kHz	-1° to ≥500 kHz	≤1° to 500 kHz	≤1° to 1.5 MHz	≤1° dc to 500 kHz	<1° to 1.0 MHz
Maximum Input Voltage4	±100 V	±100 V	±100 V	1 MΩ impedance: ±100 V 50 MΩ impedance: ±5 V	±100 V	±100 V	±25 V	±100 V
Linear Common-Mode Signal Range (Opt. 22) X-Y <sup>5</sup>	±15 V	±15 V	±15 V	±15 V, attenuator 5X ±3 V, attenuator 1X	±15 V	±15 V	Not Applicable	±15 V
Linear Common-Mode Signal Range (Opt. 21), Z	±5 V	±5 V	±5 V	≥100 from dc to <500 kHz. For signals <3 V with 5X atten. in 1X pos., at least 50:1. From 500 kHz to 1 MHz with atten. in 1X pos. At 40:1 with atten. in 1X pos.	±5 V	±5 V	Not Applicable	±5 V
Common-Mode Rejection Ratio (Opt. 21), X-Y	≥100:1 to ≥100 kHz, ≥50:1 to ≥100 kHz (Opt. 22)	≥100:1 to ≥100 kHz; ≥50:1 (Opt. 22)	≥100:1 to 500 kHz; ≥40:1 (Opt. 22)		≥100:1 to 500 kHz; ≥40:1 (Opt. 22)	≥100:1 to 100 kHz; ≥40:1 (Opt. 22)	Not Applicable	≥100:1 to 100 kHz; ≥40:1 (Opt. 22)
Common-Mode Rejection Ratio (Option 21), Z	≥100:1 to 100 kHz	≥100:1 to 100 kHz	≥100:1 to 100 kHz	≤100:1 to 100 kHz ≤50:1 to 1 MHz	≥100:1 to 100 kHz	≥100:1 to 100 kHz	Not Applicable	≥100 to 100 kHz
Recommended Source Impedance, X-Y and Z	≤10 kΩ	≤10 kΩ	≤10 kΩ	<10 $\Omega$ in 1 $\Omega$ pos.	≤10 kΩ	≤10 kΩ	≤10 kΩ	≤10 kΩ
Temperature Range	0°C to +50°C	0°C to +50°C	0°C to +50°C	0° to 50°C	0°C to +50°C	0°C to +50°C	0°C to +50°C	0°C to +50°C
Power Requirements <sup>6</sup>	75 W	56 W	75 W	75 W	53 W	61 W	See footnote	61 W
Included Accessories	External program connector; connec- tor cover; external graticule	External program connector; connector cover.	External graticule		External program connector; connector; cover; external graticule.	Lined external im- plosion shield (graticule) for ad- justment purposes.	Lined external im- plosion shield (graticule) for ad- justment purposes.	
Recommended Cameras <sup>7</sup>	C-59P, C-5C C-5C Opt. 01, C-28	C-59P, C-5C Opt. 01, C-28	C-28, C-5C Opt. 01, C-59P		C-5C, C-5C Opt. 01, C-28	C-5C, C-59P, C-28	C-5C, C-5C Opt. 01, C-28	C-5C, C-28
Base Price	\$1895	\$1280	\$1850	\$3250	\$2190	\$1730	\$880	\$1475

- $^{\text{I}}\cdot$  Measured at 0.5  $\mu\text{A},$  except for the 606A, measured at 0.1  $\mu\text{A}.$
- 2. Full spec would read: "dc to . . ." appropriate figure.
- $^{3}$ . "|| <" means "paralleled by less than".
- 4. (dc + peak ac) 5. With Option 21  $=\pm3$  V (non-attenuated) for all but the 620 where not applicable.
- 6. Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V (±10% on each range). 48 to 440 Hz (except the 624 which excludes 220). Number given shows watt max at nominal line voltage. The 620's power requirements are 90-132 V ac; 48-440 Hz line frequency, 22 W max, 0.2A at 120 V ac 60 Hz.
- 7. External 15 V dc 750 mA power supply required for C-28.



# MODULAR PACKAGING AND RACK MOUNTING

**PACKAGING FOR THE 620** 

Vertical dress package. Includes handle, feet and covers.

covers.
Order 016-0410-00 ......\$145

#### Rackmount kits for the 620.

Slide-out 19" rack assembly which rackmounts one 620 and an empty compartment horizontally. In the compartment you may put your custom electronic circuitry and combine it with the display. Includes frame, covers and rack slides. Not available with Options 06, 23, 28.

Order 016-0404-00 ......\$150

Slide-out 19" rack assembly which rackmounts two 620s side by side. Includes covers and rack slides. Not available with Options 06, 23, 28, 31.

Small-width packaging. Smaller-width packaging removes controls (intensity, focus, spot position) from the right side of the crt. Allows OEM to mount elsewhere in this system. Request quote from your Tektronix representative.

### RACKMOUNTING FOR 603A, 604A, 606A, 606B ,607A, 608, 624

Rackmount and Empty Cabinet Kit for 603A, 604A, 606A, 606B, 607A, 608, and 624. Silde-out 19" rack assembly which mounts a display monitor and an empty compartment horizontally. In the compartment you may put your custom electronic circuitry and connect it to the display, all in one enclosure.

Display/Power Module Kit. Allows rackmounting of 603A, 604A, 606A, 606B, 607A, 608, and 624 with TM 503 Power Module. Minimizes mechanical design time. Simple design your own electronics using TM 500 Custom Plug-in kits described on p. 166. Then plug them in. Fits standard 19" rack.

Order 040-0624-01 .....\$75

Rackmounting kit for 603A 604A, 606A, 606B, 607A, 608, and 624.

Slide-out 19" rack assembly which rackmounts any two of the above displays side by side. Includes covers and rack slides.

Order 040-0600-00 ......\$110

Rackmount-to-Cabinet Conversion, required to convert a rackmount 603A, 604A, 606A, 606B, 607A, 608 and 624 to a cabinet style.

Order 040-0602-00 .....\$100

#### Cameras Priced for the OEM

For complete information on the C-28, the C-5C and other Tektronix cameras, see page 208. For OEM purchasing information, please contact your local Sales Engineer or Representative.

#### **OEM TERMS AND CONDITIONS**

If you're an original equipment manufacturer (OEM), you may qualify for special pricing, terms and conditions of sale on many Tektronix products. Our representatives are also ready to assist you in other areas, including the planning of delivery to coordinate with your manufacturing schedule, mechanical and electrical interface, option selection assistance to assure optimum value, special modification, and more. Call your Tektronix representative for full OEM details.

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# **Computer Graphics Products**



# "The Graphic Standard"

Graphics, the true universal language. For 12 years, Tektronix has set the standards by which graphics information is measured. In resolution. Size. Software. Service. Reliability. Compatibility. And breadth of product line. Whatever your own standards of productivity and graphics performance, you can turn to Tektronix.

For additional product information and details on interfacing, software and accessory support, please indicate your interest on the reply card at the back of the catalog.

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### **Computer Display Terminal**



#### 4014-1/4015-1

19 in (48.3 cm), Direct-View Storage Display

Selectable Formats in Alphanumeric and Graphic Modes

High-Resolution, Interactive Graphics Capability

**Plug-In Intelligence Options** 

**APL Character Set Available** 

We've added some intelligent choices to the choicest of graphics. Tektronix' famous 4014-1 has long been a favorite for display of large data bases and precise detail. Its flicker-free 483 mm (19") screen offers pricedright performance for applications in mapping, design, manufacturing, medicine, energy exploration and many other diverse disciplines.

Recently, Tektronix has augmented the 4014-1 and APL language 4015-1 performance with plug-in firmware options adding powerful firmware capabilities like keyboard programmability, local symbol design, scaling, clipping and rotation. In many instances, they can reduce data transmission costs by 50 percent or more, with the aid of local interactive intelligence.

Big Screen. Big Features. The 4014-1 and 4015-1 offer 1024 (x) by 780 (y) displayable points standard and up to 4096 (x) by 3120 (y) displayable points with the optional Enhanced Graphics Module. Its 12 million point capability is more than sufficient to solve most complex mapping and design tasks. Full 96-character ASCII includes four program-selectable alphanumeric formats which display up to 8512 characters at once.

Of course, the 4014-1 and 4015-1 are immediately compatible with the full range of Tektronix peripherals, including the 4631 Hard Copy Unit, the 4923 Digital Cartridge Tape Recorder, B-Size 4662 and C-Size 4663

Interactive Digital Plotter, plus others. Optional minibus extender allows expanded accessory and peripheral capability. And Tektronix PLOT 10 Software provides a library of proven graphics packages. PLOT 10 offers versatile modular software for all levels of users. PLOT 10 Terminal Control System to link to existing applications, PLOT 10 Easy Graphing for rapid generation business or scientific graphs. For device independent applications projects add our PLOT 10 Interactive Graphics Library.

Options 5, 40 and 41: local enhancements with up to 26K of RAM. Attractively priced, this series of local capabilities lets you recall complex displays with a single keystroke.

You can enlarge, reduce and rotate picture elements with ease. You can design your own stroke-drawn characters and symbols, and position them anywhere on the screen using the built-in crosshair cursor. You can also command local and program control of Tektronix tape drive, plotters, the 4907 File Manager and 4953/54 Graphic Tablets. You enjoy maximum graphic interactivity without mainframe costs or transmission line glitches.

The 4014-1 has become standard equipment to many phases of research, medicine, engineering, business, energy-related fields, cartography, manufacturing and others where its price/performance practically lends itself.

Tektronix offers maintenance training classes on instruments in the 4010 DVST Graphic Terminal Series. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.

#### SPECIFICATIONS

Display Medium — Direct View Bistable storage crt.

**Display Area** — 15 in (38.1 cm) wide x 11 in (27.9 cm) high. **Alphanumeric Mode** — 4014-1 Full ASCII character set (94

printing characters). 4015-1 Full ASCII and APL character sets (188 total printing characters).

Character Format — Four program-selectable formats:

- 1) 74 characters per line with 35 lines per display.
- 2) 81 characters per line with 38 lines per display.
- 3) 121 characters per line with 58 lines per display.4) 133 characters per line with 64 lines per display.

Alphanumeric Cursor — 7 x 9 dot pulsating cursor.

**Keyboard** — Typewriter paried upper and lower case with auto repeating keys. 4015-1 adds APL character set. **Graphics Mode** — Vector drawing time 5,000 in/s (127)

**Information Density** — 1024(x) by 1024(y) addressable points (10 bits). 1024(x) by 780(y) viewable points.

Interactive Graphic Mode — Thumbwheel controlled crosshair cursor. 3 thru 1024 addressable points horizontally. 0 thru 780 addressable points vertically.

#### ORDERING INFORMATION

4014-1 Computer Display Terminal with Standard Data Communications
Interface
Option 34, Enhanced Graphics Module (factory installed only)
Interface
Option 34, Enhanced Graphics Module (factory installed only)



#### 4016-1

25 in (63.6 cm) Direct-View Storage Display

High-Resolution, Flicker-Free Graphics

Selectable Formats in Graphic and Alphanumeric Modes

**Plug-In Intelligence Options** 

The easiest viewing, most exceptional graphics ever. The 4016-1 was built for designers of electronic ciruit boards, utility networks, automotive components, schematic diagrams, street maps or similar applications who need to work with fine detail while maintaining the total picture perspective.

With its big 635 mm (25") diagonal screen, 4096 (x) by 3120 (y) viewable points, and finely etched 10 mil wide vectors, the 4016-1 is uniquely suited for displaying highly complex graphics. Using a Direct View Storage Tube (DVST) display, graphic lines are sharp, stable and flicker-free, simplifying the study of fine details. Thumbwheel-controlled crosshair cursor makes it easy to interactively manipulate the display.

Over 15,000 displayable characters. Besides enabling display of more high density graphic information than any other terminal available, the 4016-1 provides high density alphanumerics for applications, from graphic labeling to newspaper page layout. Over 15,000 characters may be displayed simultaneously and may be formatted as 179 alphanumeric characters per line, like a line printer, or in two 85 character columns, like an open book.

Three other larger character formats are standard with the 4016-1, the largest of which is suitable for group viewing.

Complete Tektronix 4014-1 compatibility. The 4016-1 is compatible with 4014-1 application software, communication support, and other

Tektronix peripheral devices. The 4016-1 is supported by the family of PLOT 10 software products.

Plug-in intelligence. Using the modular 4010 bus structure, add-on low-cost options include up to 26K of usable graphics display memory, scaling, relative graphics, clipping, circular arc generation, rotation by 1° increments, user definable stroke characters, programmable keyboard, GPIB interfacing to the intelligent 4924 Digital Cartridge Tape Drive, 4907 File Manager, and 4662 and 4663 Interactive Digital Plotters, plus the 4953 or 4954 Graphics Tablet.

Commands also allow a user to digitize data with distance, time, or gradient filtering; edit graphics from a host computer, local 4907, 4924 storage device or Option 40 programmable keys. Implement off-line plotting by accessing data via local storage devices.

Added enhancements. The 4016-1 includes a convenient detachable keyboard and detachable display.

Other standard enhancements include hardware generated solid, dashed, and dotted lines; point plotting with software controllable point sizes and incremental "relative graphics" plotting.

Hard copy compatibility provides 216 mm  $\times$  279 mm (8½"  $\times$  11") hard copies from our dependable, dry-process 4631 Hard Copy Unit.

Tektronix offers maintenance training classes on instruments in the 4010 DVST Graphic Terminal Series. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.

#### **SPECIFICATIONS**

**Display Medium** — Direct View Bistable storage CRT. Written image bright green on green background.

**Display Area** — 18 in (45.4 cm) wide x 13.5 in (34 cm) high. **Character Set** — Full ASCII character set (94 printing characters).

#### Standard Character Format

- 1) 74 char/line by 35 lines.
- 2) 81 char/line by 38 lines.
- 3) 133 char/line by 64 lines.4) 179 char/line by 86 lines.

#### Optional Character Formats

- 1) 74 char/line by 35 lines.
- 2) 81 char/line by 38 lines.
- 3) 121 char/line by 58 lines.4) 133 char/line by 64 lines.

Alphanumeric Cursor — 7 x 9 dot pulsating cursor.

**Keyboard** — Typewriter paried upper and lower case with auto repeating keys.

**Graphics Mode** — Vector drawing time is 8000 in/s (20,000 cm/s).

Information Display — 4096(x) by 4096(y) addressable points (12 bits). 4096(x) by 3120(y) viewable points.

Vector Formats — 5 formats, including straight, dotted

and dashed lines.

Point Plotting Modes — Point Plot Mode: special Point Plot Mode absolutely addresses points with program control of plotted point size. Incremental Plot Mode relative

addressing 1 of 8 directions, one step at a time.

Interactive Graphic Mode — Thumbwheel controlled crosshair cursor. 0 thru 1023 addressable points horizontally. 0 thru 780 addressable points vertically.

**Hard Copy Mode** — Switch selectable hard copy of screen using the 4631 Hard Copy Unit.

#### ORDERING INFORMATION

### **Color Graphics Terminal**



#### 4027

**Full Color Graphics and Alphanumerics** 

**PLOT 10 Compatible** 

**Fully Supported Color Capability** 

**Dynamic Displays Created Easily** 

Tektronix makes it practical to add the color dimension. The 4027 offers all the easy data entry, scrolling, and graphics capabilities of the Tektronix high performance 4020 rasterscan family. Most importantly, it provides the kind of fully supported color capability you could expect only from the world's graphics leader.

Full-color graphics, easy to grasp. Colors are selected from a 64-color palette with up to eight colors displayable simultaneously. For specifying lightness, saturation and hue, you'll find the 4027 system as easy as it is versatile.

Local capabilities include colored vectors, characters, symbols, and polygon fill. Firmware enables a second color to border the polygon... and allows user selection of up to 120 different patterns or color combinations for sepcial applications. Because the capabilities are initiated by firmware, not software, 4027 operation makes minimal demands on host computer communications.

Easy-to-use graphic software. For graphic representation, the 4027 uses color-enhanced PLOT 10 Easy Graphing Software. Easy Graphing simplifies even non-programmer construction of up to six curves or colored bar charts, line graphs with special symbols and dashed lines, legends, titles, and grids.

For more general color graphic applications, Tektronix offers the new PLOT 10 Interactive Graphics Library. IGL is a highly modular package offering all the support commonly required in graphic applications such as 3-D, color panels, line smoothing and many character fonts. PLOT 10 IGL is upward and downward compatible with the full line of Tektronix graphic display terminals.

Graphic input. Graphic input capability consists of a graphic crosshair cursor controlled by graphic cursor keys. In addition to reporting the coordinates back to the host, the terminal also reports the color of the designated coordinate.

Up to 32K bytes of built-in display memory, and up to 192K bytes of graphic memory, allow the same scrolling, dual screen and multiple field formatting featured in other 4020 Series terminals.

The optional video signal output allows connection of the 4027 to external video displays for group viewing and presentations.

Gray scale representations of 4027 color displays can be made with a Tektronix 4632 Video Hard Copy Unit. Detailed, cameraready color copies of graphs and alphanumeric data can be made on paper or acetate via the Tektronix 4660 Series of Interactive Digital Plotters.

To the standard full duplex, 4027 interface options add half duplex, current loop, polling interface and IBM 3270 compatible polling controller.

All this and alphanumerics, too. In addition to graphic capabilities, the 4027's extensive alphanumeric capabilities include full ASCII, special and user-definable character sets, and 34 rows of 80 characters.

#### **4027 SPECIFICATIONS**

 $\textbf{Display Size -} \ 10 \ \text{in (25.4 cm) wide x 7.5 in (19.1 cm) high}.$ 

Graphics — Standard with full screen crosshair cursor.

**Color** — 8 colors displayable, colors selected from a pallette of 64 colors.

Patterns — 120 user definable color patterns.

Local Functions — Circle and pie generation, polygon fill.

Other 4027 specifications — Same as 4025.

#### ORDERING INFORMATION

4027 Color Graphics Terminal . . . . . . \$8695

OEM terms available on these products.

Tektronix offers maintenance training classes and user application workshops on instruments in the 4020 Raster Scan Terminal Series. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.

### **Computer Display Terminals**





### 4024

**Complete Alphanumeric Terminal** 

Easy To Use For The Novice As Well As The Experienced Programmer

Forms Ruling Options Available

Easy Interface, Optional Polling

The 4024 is everything you need for data entry, editing and forms fill-out. It was designed to allow fast, straightforward interaction with your host computer and maximum efficiency in the manipulation of alphanumeric data. In writing and editing programs. Editing text. Or filling out and editing forms.

Easy-to-use for the novice as well as the experienced programmer. The 4024 can display a full 34 lines of 80 characters each on its 304 mm (12") diagonal display screen. The complete upper and lower case ASCII character set is provided. The keyboard is in the familiar office typewriter configuration.

Predefined editing keys let you insert and delete lines and characters. Twenty user-definable keys, plus nearly any other key on the keyboard, can be defined to generate a command or character string at the touch of a finger. This lets a programmer or other user quickly restructure the keyboard to suit a particular need. Our green-on-black screen with adjustable brightness level is easy on the eyes.

A 4K memory is standard with the 4024, but can be expanded to 32K, allowing buffering and scrolling of hundreds, even thousands of words.

Develop or duplicate forms of any complexity with a variety of single and multiple horizontal and vertical rules selected from the Ruling Character Set. Expandable memory and scrolling let you create forms far beyond the length of the display screen.

To make data entry and editing easier, you can divide the display screen into two separate display areas, each with independent scrolling. Use the monitor area to communicate with the host and the workspace area for the form itself. Visual attributes in-

clude enhanced and blinking fields. Logical attributes include protected fields, modified, alphanumeric or numeric only.

The "send modify" command streamlines data entry by transferring only the modified, keyed-in data to the host. The fixed format remains ready for the next series of entries.

Operation is easy for anyone, because the 4024 uses English language commands based on the ASCII character set.

#### **SPECIFICATIONS**

**Display Size** — Video monitor display on 12 in (30 cm) diagonal screen.

**Raster Lines** — Standard 525 line scan, with 480 lines displayed. Scan — 30 Hz.

**Display Characteristics** — Cursor Type. Wide underscore. Character size — 7 x 9 in a 8 x 14 dot matrix.

Character Sets — 64/96 upper and lower case ASCII. 80 characters/line, 34 lines/display. 2720 Total characters/display.

**Baud Rates** — The transmitting and receiving baud rates are independently selectable using internal strap selection. The baud rates available are: 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600 baud.

#### **ORDERING INFORMATION**

4024 Computer Display Terminal . . . . \$3200

#### 4025

From Alphanumerics To Graphics

ASCII Character Set and Finger Tip Editing
Forms Ruling Option Available

The 4025 creates the perfect marriage of alphanumerics and graphics. You can create and store multiple graphs in memory, create multiple graphs per page, and scroll graphics along with alphanumeric information.

The 4025 gives you the ability to expand a computer terminal from basic alphanumerics, to forms ruling and then to graphics. No

other terminal has such versatility up to and including the capacity for unsurpassed report generation.

Start with an ASCII character set and fingertip editing. In its simplest configuration, the 4025 can display a full 34 lines of 80 characters each on its 279 mm (12") diagonal display screen. Complete upper-and lower-case ASCII character set is provided. Green-onblack display with adjustable brightness level keeps even long sessions easy on the eyes.

The keyboard, an office typewriter configuration, is immediately familiar to new users. Pre-defined editing keys simplify insertion, deletion and input of lines and characters. Thirteen user-defineable keys, plus nearly all other keys on the keyboard can be redefined to generate a command or character string at the touch of a finger.

A 4K memory is standard with the 4025 display, expandable to 32K, allowing buffering and scrolling of hundreds and even thousands of words.

#### SPECIFICATIONS

**Display Size** — Video monitor display on 9 in (22.9 cm) wide x 6.4 in (16.3 cm) high.

Raster Lines — Standard 525 line scan with 480 lines displayed.

Character Set — 64/96 upper and lower case ASCII (optional character sets available).

**Alphanumeric** — Mode format is 34 lines, 80 characters per line, 2720 characters full screen.

**Character** — Generation — 7 x 9 in an 8 x 14 dot matrix (graphic cells are 8 x 14 matrix).

Cursor — Wide underscore.

Baud Rate — Selectable to 9600 baud.

Graphics — Optional.

#### ORDERING INFORMATION

4025 Computer Display Terminal . . . . \$3800

### **Computer Display Terminals**



**4006-1**Computer Display Terminal

**Low Cost** 

Flicker-free High Resolution

**Graphic and Alphanumerics** 

The 4006-1 is one of four solutions towards making interactive, high-resolution graphics affordable to cost-conscious disciplines and departments. Priced no more than many alphanumeric terminals, the 4006-1 makes graphic capability practical for the stock room, the classroom and the conference room as well as for other graphic applications.

The 4006-1 connects readily to most mainframes, thanks to its RS-232-C interface. With a screen capacity of 2590 alphanumeric characters in addition to graphics capability, the 4006-1 can work in configuration with existing alphanumeric terminals to interpret statistics and coordinates into meaningful charts, tables, graphs and diagrams.

#### SPECIFICATIONS

**Display Medium** — Direct View Bistable Storage CRT. **Display Area** — 7.5 in (19.5 cm) wide x 5.6 in (14.2 cm) high.

**Alphanumeric Mode Format** — 35 lines, 74 character per line. 2590 characters full screen.

Character Set — 63 printing characters (TTY ANSI Code). Character Generation — 5 x 7 dot matrix.

Cursor — 8 x 8 dot matrix.

Graphics Display Mode — Vectors only. Vector drawing time, 3.6  $\pm$  0.2 ms.

**Information Density** — 1024 (x) by 1024 (y) addressable points. 1024 (x) by 780 (y) viewable points.

**Baud Rate** — Transmit and receive independently. Selectable from 75 to 4800 baud.

#### **ORDERING INFORMATION**



**4010-1**Computer Display Terminal

Supports Alphanumerics Plus Low-Cost Computer Graphics

Convenient Bus Structure for Peripheral Add-On

Complete PLOT 10 Software Support

**Graphic Input** 

The 4010-1 Computer Display Terminal is an easy to use, cost effective tool that brings out the best of Tektronix' famous graphics capability. Included are flicker-free display, high-resolution graphs, charts, diagrams and renderings produced on a matrix of 1024 (x) by 780 (y) viewable points and interactive graphics construction via thumbwheel cursor control.

The standard TTY-style keyboard enables easy data entry. Command of both alphanumeric and graphic display is so immediate that hours of hand drafting can become the matter of a few seconds.

#### **SPECIFICATIONS**

**Display Medium** — Direct View Bistable Storage CRT. **Display Area** — 7.5 in (19.05 cm) wide x 5.6 in (14.22 cm) high.

**Alphanumeric Mode Format** — 35 lines, 74 characters per line, 2590 characters full screen.

Character Set — 63 printing characters (TTY ANSI Code). Character Generation — 5 x 7 dot matrix with MOS Read-Only Memory. 1200 characters per second.

Cursor — Pulsating 5 x 7 matrix.

 $\begin{tabular}{lll} \textbf{Graphic Display Mode } -- & \begin{tabular}{lll} \textbf{Vector bound} & \begin{tabular}{lll} \textbf{Vector drawing} & \begin{tabular}{lll} \textbf{Vector bound} & \begin{tabular}{lll} \textbf{Vector drawing} & \begin{tabular}{lll} \textbf{Vector$ 

**Information Density** — 1024 (x) by 1024 (y) addressable points. 1024 (x) by 780 (y) viewable pionts.

**Graphic Input Mode** — Thumbwheel controlled cross-hair cursor. 3 through 1023 (x) 0 through 780 (y).

#### ORDERING INFORMATION

4010-1 Computer Display Terminal with Standard Data Communication Interface .....\$5200

Tektronix offers maintenance training classes on instruments in the 4010 DVST Graphic Terminal Series. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.



**4012**Computer Display Terminal

High-Resolution, Flicker-Free Graphics

Full Upper and Lower Case ASCII Character Set

Conventional Bus Structure For Peripheral Add-On

The 4012 combines the world's leading graphics with complete alphanumerics. Alphanumerics can tabulate computer data, but graphics can amplify that data into usable, immediately meaningful information. High-resolution graphic presentations and the full upper and lower-case ASCII alphanumerics are available in the 4012.

The flicker-free screen provides up to 1024 (x) by 780 (y) viewable graphic points or as many as 2590 A/N characters per display. The TTY-style keyboard simplifies input while the thumbwheel controlled crosshair cursor enhances graphic interactivity. With thumbwheel control, user can direct the x-y cursor for speedy additions or deletions of data to the display screen.

#### SPECIFICATIONS

**Display Medium** — Direct View Bistable Storage CRT.

Display Area — 8 in (20.3 cm) wide x 6 in (15.2 cm) high.

**Alphanumeric Mode Format** — 74 characters per line; 35 lines per display; 2590 characters per display.

Alphanumeric Cursor — Pulsating 7 x 9 dot matrix.

**Character Set** — 94 printing characters on 7 x 9 dot matrix. (Full ASCII code).

Character Size - 85 mils x 105 mils.

Character Generation —  $7 \times 9$  dot matrix with MOS Read-Only Memory. 1,000 characters per second.

**Graphic Mode** — Vectors only. Vector drawing time 2.6 ms. **Graphic Matrix** — 1024 (x) by 1024 (y) addressable points. 1024 (x) by 780 (y) viewable pionts.

**Graphics Input Mode** — Thumbwheel controlled cross-hair cursor. 3 through 1023 (x) 0 through 780 (y).

#### ORDERING INFORMATION

4012 Computer Display Terminal with Standard Data Communication Interface ......\$7500

#### PLOT 10 ORDERING INFORMATION

For 4010 Series Terminals. 4006-1, 4025 and 4027 color display.

Tools for easy use of graphic and alphanumeric capabilities of Tektronix Terminals.

4010A10 PLOT 10 Terminal Control System, Implementation for IBM with TSO . . . . \$1750

4010A12 PLOT 10 Terminal Control System, Implementation for PDP-11 with DOS . \$1500

Versatile software to graph your data using a powerful set of FORTRAN IV subroutines. 4010A02 PLOT 10 Advance Graphing II \$2000

Complete Support for TEKTRONIX 4013 and 4015 with self documenting commands, for the APL Programmer.

4010A09 PLOT 10 APL GRAPH II .....\$1500 4010A13 PLOT 10 APL GRAPH II, Implemen-

Correct your graphics easily with a Tektronix Terminal before plotting.

Provides complete flexibilty of character definition, including rotation, scaling, and special characters.

Point by point Tektronix 4953 and 4954 support, plus pencil and paper input ease for many computer systems.

4010A06 PLOT 10 Graphic Tablet Utility Routines .....\$200

Individual addressing of up to 12 Tektronix displays.

4010A08 PLOT 10 Display Multiplexer Utility Routines .....\$150

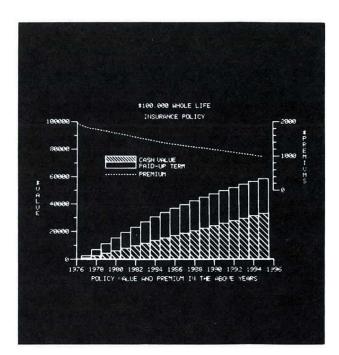
4010B02 PLOT 10 Easy Graphing 026 Format Punched Cards .....\$1380

4010B03 PLOT 10 Easy Graphing Magnetic Tape .....\$1950

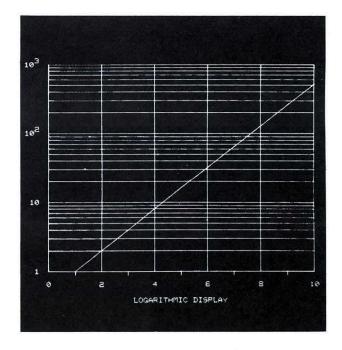
4010B05 Easy Graphing 029 Format Punch Cards .....\$1380

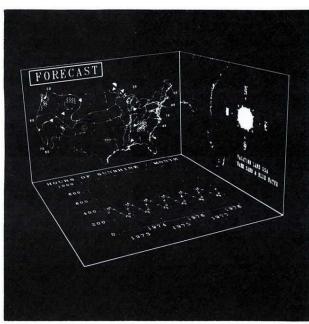
Designed for device independent control of DVST, raster scan displays, and plotters. Offers a growing array of graphics control functions such as commands for color, 3-D, line smoothing, and multi font text manipulation.

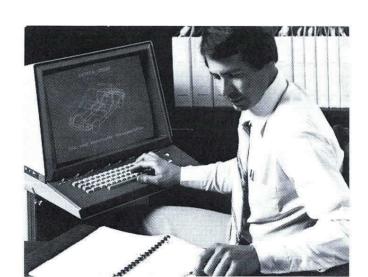
4010C01 PLOT 10 Interactive Graphics Library ......\$2500-10,000











#### PLOT 10 Graphics Software Library

PLOT 10 is the world's leading commercial graphics library. Versatile, modular, and fully documented, it lets you start with only the code you need to do your job, then expand with modules and utilities to develop more sophisticated or specialized applications. PLOT 10 builds to high-level, "cookbook" solutions such as English-like commands for business applications and other non-programmer environments.

PLOT 10 includes the following packages:

Terminal Control System (TCS) — A composite of FORTRAN IV subroutines, TCS contains the basic building blocks for all graphic operations. It permits modular as well as system independent programming, and supports such basic graphic functions as windowing, clipping and rotation for DVST terminals and 4660 Series Plotters.

Plotter Utility Routines — Those routines link your data base, terminal and Tektronix 4660 Series plotters to enable easy, powerful command of multicolored graphs, charts, maps and renderings. Digitizing is just as versatile by using the built-in joystick.

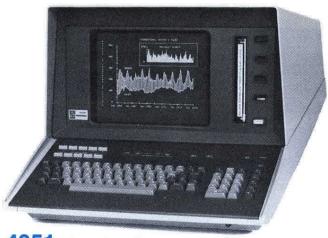
**Advanced Graphing Package** — AG II subroutines let a programmer tailor the size, shape and format of graphs, specifying more than 40 graphic elements.

Interactive Graphing Package — IGP simplifies the task of graph storage, editing, recall and updating, so a user with little or no programming experience can create a presentation quality graph, on DVST terminals.

**Easy Graphing** — A straightforward English lanquage command structure that gives the non-programmer wide-ranging command of graphics in business and engineering decision-making tasks.

Interactive Graphics Library — IGL is a uniquely modular system of I/0, device drivers, primary commands and advanced feature support that lets the user move at will among any Tektronix display devices or technology. Advanced options such as color panel filing, many character fonts and 3-D may be added.

### **Desktop Computers**



**4051** Desktop Computer

**Low Cost** 

**High Resolution** 

**Graphics and Alphanumerics** 

#### **GPIB Product**

Desktop computing for a whole spectrum of problem solving, data analysis, and decision making applications. The 4051 is a standalone computer that is approachable, affordable, and able to grow as your applications grow. From the day you plug it in, the 4051 performs productively by putting solutionoriented BASIC language and meaningful graphic information at your fingertips.

Friendly graphics. Commands like DRAW and ROTATE built into the 4051 give you full graphics flexibility while working in your units, not machine or raster units. Easy graphics accelerates analysis, decision making and model building. It supplements your intuition and gets your point across by making information easy to understand. Once you use graphics you'll wonder how you got along without it.

The GPIB bus is built-in and easy to program with the 4051 BASIC I/O commmands. As the industry's choice for connecting instrumentation it is our choice for the 4051 and its many available peripherals.

It includes integrated computing, peripherals, and a GPIB (IEEE Standard 488-1978) interface. You don't have to know how the internal processor works to use it, you simply use the graphically-enhanced BASIC commands.

A 300K bytes magnetic cartridge tape drive is built into the 4051 hardware and language. No bits, no status words to check. File management commands like FIND, OLD, READ, and WRITE, retrieve or store programs and data. A comfortable typewriter keyboard is integrated into the system with a 28character buffer that eliminates lost entries.

Friendly, extended BASIC provides both power for the sophisticated programmer and simplicity for the beginner. Input and output operations are easy to program and debug because the 4051 commands use device independent keywords. Input and output can be as simple as INPUT or PRINT or can have FORTRAN like power with PRINT, DELETE and IMAGE commands.

A data communication option permits sharing data with a host computer. The asynchronous RS-232 interface lets you choose terminal mode communications at up to 2400 baud. Terminal modes provide performance like our popular 4012 Computer Display Terminal with local intelligence and direct data transfer between the built-in cartridge tape drive and host computer.

#### **SPECIFICATIONS**

Processor - LSI 8 bit microprocessor.

User Memory Workspace - 8K bytes standard, expandable to 32K bytes.

Keyboard - Full 128 ASCII character upper and lower case with auto repeat. 10 key numeric and 5 math function calculator key pad. Line/character editor keys.

User definable function keys - 10 shiftable to 20. Keys for single step execution of programs, auto-numbering, rewinding magnetic tape, or automatic loading and execution of the first program on tape.

Tape Drive - 3M DC 300A cartridge. 300K bytes maximum (dependent on number of files).

Rewind speed - 90 ips.

Search/read speed - 30 ips.

Structure - 256 bytes with header. File oriented access via BASIC commands

CRT — Direct view storage CRT.

Alphanumeric - 72 characters per line, 35 lines.

Character set - Full ASCII including upper/lower case. Also includes Scandinavian, German, General European, Spanish, and special graphic symbol fonts.

Graphic resolution - 1024 x 780 points.

Visibility - Flicker-free, easy-on-the-eyes display.

Copier - Compatible with Tektronix 4631 Hard Copy Unit.

#### ORDERING INFORMATION

4051 Desktop Computer System	. \$5995
Option 20 16K bytes total memory	Add \$900
Option 21 24K bytes total memory A	dd \$1400
Option 22 32K bytes total memory	dd \$1900

The 4051 and 4052 are designed to comply with IEEE Standard 488-1978, and with Tektronix Codes and Formats Standard. GPIB Interface Functions: Control, Talk,



**4052** Desktop Computer

**Fast Processing** 

**High Level BASIC** 

**Expandable Memory** 

#### **GPIB Product**

High performance computation and communications for a whole spectrum of problem solving, data analysis, and decision making applications. The 4052 is a desktop computer offering high performance, stand-alone computing power, flexible data communications, and easy-to-learn, extended BASIC. These features, combined with high resolution graphics, make the 4052 an excellent choice for scientific and statistical research, forecasting, data acquisition and analysis.

The 4052 is an integrated system offering all the tools necessary to immediately begin providing relevant solutions. For rapid calculation, the 4052 has a fast processor with microcoded floating point. The state-of-theart graphics capabilities of the 4052 provide for demand hard copy of any combination of text and high-density graphics (with optional

hard copy unit). Fast processing coupled with simultaneous display of text and graphics meets the needs of most application requirements.

The 4052 comes standard with 32K bytes of memory, and can be optionally expanded to 64K bytes, allowing larger and more complex programs to be handled. A 300K bytes magnetic cartridge tape drive is built-in, allowing both ASCII and binary programs or data to be easily stored and retrieved using simple file management commands in BASIC. The 4052 keyboard retains the familiar, easy-to-use format of the 4051 typewriter keyboard, yet contains subtle changes made with the user in mind like sculptured keys and non-glare keycaps.

A Family and a System. Our 4051 set the standard for high performance, affordable desktop computing. Following in the 4051's footsteps, the 4052 offers a faster processor and larger memory capacity. The 4054, with a processor similar to the 4052, offers enhanced graphics on a 19" DVST screen. Combined, they make up the 4050 Series, the only desktop computer line with software compatibility. Programs developed on a 4051 will operate on the 4052 and the 4054 without modification.

The 4050 Series continues to set the standards for high performance, easy-to-use desktop computers. Flexible GPIB and RS-232 interfacing to a wide variety of proven peripheral products allows considerable versatility in designing a system to fit your needs. Additional peripherals can be readily integrated as your application needs grow.

Friendly extended BASIC provides the simplicity desired by the beginner and the flexibility and power required by the experienced programmer. Device independent keywords such as INPUT and PRINT make progamming input and output operations easy. Fast matrix functions such as multiply, inverse, transpose, identity and determinants are built into BASIC.

Friendly graphics. Commands like MOVE, DRAW and ROTATE in BASIC allow graphic displays to be created on the 4052 using user defined units, not machine or raster units. Using graphics to display information accelerates analysis, decision making, and model building. It supplements your intuition and gets your point across by making information simple to understand.

#### **SPECIFICATIONS**

Processor - LSI bi-polar 16 bit.

User Memory Workspace — 32K standard, expandable to

Keyboard — Improved, sculptured, matte finish. Keyboard identical in other specifications to 4051 keyboard.

Tape Drive — Identical to 4051 tape drive but provides faster storage and retrieval of programs with direct-to-file operation and built-in Binary program functions.

CRT — Direct view storage CRT.

Alphanumeric — 72 characters per line, 35 lines.

Character Set — Full ASCII including upper/lower case.

Special fonts - Selectable under program control -Swedish, German, British, Spanish, Danish/Norwegian, Graphic, and Business.

Graphic resolution - 1024 x 780 viewable points, 1024 x 1024 addressable points.

Visibility - Flicker-free, easy-on-the-eyes display.

Copier — Compatible with Tektronix 4631 Hard Copy Units.

ORDERING INFORMATION

4052 Desktop Computer System . . . \$10,950 Option 24 64K bytes total memory . . . . . . . Add \$2000



#### 4054 Desktop Computer

19 inch, High Resolution Display

**Dynamic Graphics (option)** 

**Expandable Memory** 

**Enhanced Graphics** 

#### **GPIB Product**

The 4054 is designed to comply with IEEE Standard 488-1978, and with Tektronix *Codes and Formats* Standard. GPIB Interface Functions: Control, Talk, Listen.

Unequalled graphics and powerful, fast computing in an integrated desktop computer. The 4054 is the only desktop computer that combines easy-to-learn, extended BASIC with the unique features of a large-screen, high resolution Tektronix display. For rapid calculation, the 4054 has a fast processor with microcoded floating point. The state-ofthe-art graphics capabilities of the 4054 provide demand hard copy on any combination of text and high density graphics (with optional hard copy unit). Fast processing coupled with simultaneous text and graphics display offer an excellent fit for many sophisticated graphics environments. In addition, the 4054's memory capacity can be expanded from a standard 32K bytes, to 64K bytes.

Tektronix offers maintenance training classes and user application workshops on the 4050 Graphic System Series. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.

The 4054 has a long list of proven peripheral products GPIB (General Purpose Interface Bus) and RS-232-C interfacing coupled with easy-to-program BASIC I/O commands allow considerable versatility in designing your own system.

The 4054 features software compatibility with the rest of the 4050 Series of desktop computers. Programs developed on the 4051 and 4052 will operate on the 4054, giving 4054 users access to a wealth of PLOT 50 software, already written and debugged, thus reducing program development costs often associated with new systems.

The Dynamic Graphics Option adds increased interactivity to the graphics of the 4054 Desktop Computer.

Dynamic Graphics brings the user closer to the solution by providing the graphic power to work directly with the graphic elements of the design problem. Complicated displays can be constructed quickly and easily with movable user-defined objects.

Superior graphic and alphanumeric display. The 4054 with 4096 (x) and 3125 (y) resolution — 13 million addressable points — has all the graphics capability you will need for even the most complex display. With strokegenerated characters programmable in four sizes and eight fonts, the 4054 has the tools to alphanumerically dress up your output to suit any professional requirment. The large screen permits previewing of 132 column line printer output.

For your graphing needs there are 36 distinct dot-dash patterns, selectable under program control, providing for maximum effect of represented data. For interaction the 4054 has a thumbwheel driven, true crosshair cursor. All of these features are implemented using the extended BASIC of the 4054.

Friendly extended BASIC provides the simplicity desired for the beginner together with the flexibility and power required by the experienced programmer. Device independent keywords make program and data input/output operations easy either binary or ASCII formats. Fast, built-in BASIC functions such as SINE, LOG, SQR, etc., plus a complete set of matrix functions provide powerful computation at your fingertips.

#### SPECIFICATIONS

Processor - LSI bi-polar 16 bit, same as 4052.

**Keyboard** — Indentical to 4052 keyboard but includes added thumbwheels which control crosshair cursor.

Tape Drive - Identical to 4052.

CRT — Direct view storage CRT.

Alphanumerics — Four program selectable formats. 72 characters per line with 35 lines per display. 79 characters per line with 38 lines per display. 119 characters per line with 58 lines per display. 132 characters per line with 64 lines per display.

Character set — Full ASCII, upper/lower case, high quality, stroke generated characters.

**Special fonts** — Selectable under program control-Swedish, German, British, Spanish, Danish/Norwegian, Graphic and Business.

Graphics - Vector drawing time - 15k cm/sec.

**Addressable resolution** — 4096 (x) by 3125 (y). Dot-dashed vectors, programmable in 36 visibly distinct patterns.

Crosshair cursor with built-in thumbwheels for interactivity.

Visibility — Flicker-free, easy-on-the-eyes display.

Copier — Compatible with Tektronix 4631 Hard Copy Unit.

#### 

### **Desktop Computer ROM Packs and Options**

#### 4051R01

Matrix Functions ROM Pack (4051 only)

Provides fast matrix manipulation. Multiply, Inverse, Transpose, Identity and Determinant functions. Up to 8.5 times faster with a typical 10 x 10 matrix than equivalent BASIC routines. Useful for solving systems of linear equations, performing 2-D or 3-D transformations, operations research, forecasting, statistics or probability analysis. Built-in on 4052 and 4054.

#### 4051R05

Binary Program Loader ROM Pack (4051 only)

Allows storage and retrieval of programs on internal and external magnetic tape in binary format with speed increases up to 4-6 times over the equivalent ASCII operations. Adds LINK function for fast program overlaying in binary format, leaving all variables and their values intact. Built-in on 4052 and 4054.

Order 4051R05 . . . . . . . . . . . . . . . . . . \$225

### 4051R06

Editor ROM Pack (4051 only)

Allows general ASCII file editing of data or programs or text (including FORTRAN, BASIC and COBOL programs) offline. Includes 29 commands such as COPY, INSERT, MOVE, SEARCH and SORT for creating, manipulating and storing ASCII text.

Order 4051R06.....\$650

#### 4052R06

Editor ROM Pack (4052 and 4054 only)

Same capability as 4051R06.

Order 4052R06 or 4054R06 ......\$650

#### 4051R07

Signal Processing ROM Pack #1 (4051 only)

Adds seven new functions which can be applied to one dimensional data arrays; integration, differentiation (2 and 3 point), fast graphing, locating minimum and maximum, and crossing over a threshold. Functions operate 2-10 times faster than equivalent BASIC routines.

#### 4052R07

Signal Processing ROM Pack #1 (4052 and 4054 only)

Same capability as 4051R07.

Order 4052R07 or 4054R07......\$350

#### 4051R08

Signal Processing ROM Pack #2 (4051 only)

Extends array handling capabilities by adding commands that perform Fast Fourier Transform (FFT), its inverse (IFT), convolution, correlation, windowing and related utility functions. Functions execute 7-20 times faster than BASIC routines.

#### 4052R08

Signal Processing ROM Pack #2 (4052 and 4054 only)

Same capability as 4051R08. **Order 4052R08......\$700** 

#### 4052R09

Real Time Clock ROM Pack (4052 and 4054 only)

Provides five time related functions for date and timekeeping, elapsed time measurement and a time programmable 4050 BASIC level interrupt. All functions may be executed directly from the keyboard or may be used within a program.

#### 4051E01

ROM Expander (4051 only)

Permits connecting up to eight ROM Packs to the 4051. Utilizes one slot of existing two slot backpack.

#### Option 01

Data Communications Interface (4051, 4052 and 4054)

Allows asynchronous bit serial communications between 4050 Series desktop computer and any external device conforming to EIA RS-232 standard. Ease of use is facilitated by a special overlay and added language commands that make communication parameters and communications programmable.

Order Option 01.....\$1400

#### Option 02

Backpack (4052 and 4054 only)

Optional four-slot backpack.

Order Option 02.....\$400

#### Option 03

Backpack (4052 and 4054 only)

Optional four-slot backpack with Option 01 Data Communications Interface built-in.

Order Option 03.....\$1700

### Option 10

Printer Output Interface (4051, 4052 and 4054)

Enables 4050 Series system to output alphanumerics to any printer or output device conforming to the RS-232-C or RS-244A Standard for EIA Numerical Machine Control. Data rates are switch-selectable to 50, 75, 134.5, 110, 150, 200, 300, 600, 1200, 4800, 9600 or 16x external clocking. (**Note:** 9600 data rate not available with 4051.)

## Option 30 Dynamic Graph

Dynamic Graphics (4054 only)

Permits complex graphic objects to be created, saved, and recalled with simple BASIC language commands. These objects, saved in a Dynamic Graphics memory can be displayed, blinked, moved anywhere on the screen, and removed without affecting the rest of the display.

Order Option 30.....\$3250

### **Computer Graphics Software**

#### **STATISTICS**

The statistics software includes four tape cartridge-based products (statistics Volumes 1-4) and three disk-based products. These packages represent a well-rounded portfolio of statistics routines, from simple descriptive statistics to multiple linear regressions. The 4050DXX Series of statistics software has been enhanced with a special user interface to make the use of statistics extremely easy in your problem solving.

Functions include small samples analysis, analysis of variance and co-variance, polynomiac and multiple linear regressions, and sophisticated non-linear regression techniques. A key feature of the packages is the use of graphics to better understand the nature of the data.

The statistics packages may be purchased separately or at discount as the Statistics Library.

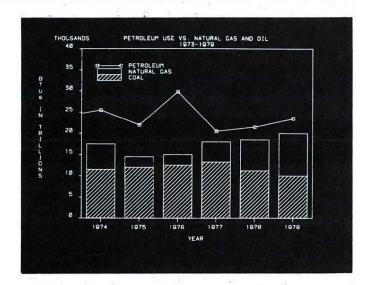
#### MANAGEMENT GRAPHICS

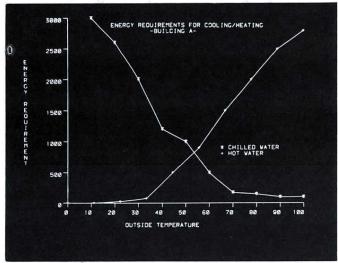
Business and technical managers are supported by a number of flexible graphing packages. Business Planning and Analysis Volume 1 & 2 provide programs for basic decision making, such as Break-Even Analysis, to Time Series Analysis and Forecasting. Modeling and Reporting Software (MARS) is a general purpose modeling package that allows the user to automate the reporting processes. Data is entered, stored, and manipulated in matrix format. Presentation Aids are oriented towards the easy generation of overhead transparencies, both graphic and textual.

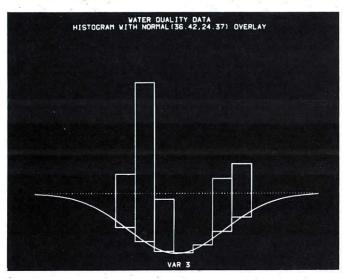
#### **OTHER PLOT 50 PRODUCTS**

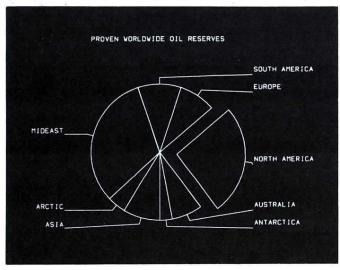
Picture Composition allows the user to create simple or complex drawings from a tablet without being a programming expert. Graph plot provides the user with multiple graphs per page. General utilities provide subroutines for editing, duplicating, and sorting. Digitizing provides editing and computation support during graphic input. And there's more.

Tektronix offers OEM Software Licensing Agreements. See your Tektronix OEM representative for full details.









#### PLOT 50 Graphics Software Library

PLOT 50 software supports the 4050 Series Desktop Computing Systems. The PLOT 50 software provides flexible, interactive programs that aid the user in scientific, engineering and management applications through easy-to-use high quality graphics.

#### **MATHEMATICS VOLUMES 1 & 2**

Volume 1 (23 programs) and Volume 2 (16 programs) consist of routines that provide fast solutions to frequently encountered mathematical problems. Included are function analyses, conversions, integration, differentiation, linear programming, and Fast Fourier Transforms. The math volumes can be purchased separately or together at discount as the Math Library.

### **Digital Plotter**



#### **4662** Interactive Digital Plotter

Intelligent B-size (A3) Plotter

**Multi-color Capability** 

**Built-in RS-232 and GPIB Interface** 

**GPIB Product** 

#### **GPIB Peripheral**

The 4662 is the first plotter with built-in processing power. As such it has the capability to work on its own, without bogging down computational operations. Studded with state-of-the-art technology, it works with an accuracy and repeatability that no other plotter can approach for the price.

From the moment you turn it on, you can tell the difference: the 4662 automatically adjusts for 254 mm x 391 mm (10" x 15") plot. There's no need to worry how the last plot was set up. When you wish to set a different plotting area or adjust to a new paper size, you simply use the SET control buttons on the front panel to define the new area. The 4662 plots on paper, vellum, mylar, acetate-film and preprinted forms.

Once it starts moving, you really notice the improvement over other plotters: the 4662's digital stepping motors and internal vector generator work at high speed, with microprocessor-controlled acceleration and deceleration.

Repeatability is excellent, time after time. There is no servo hysteresis, no drift as in potentiometric feedback systems. And no slidewires to clean, no moving electrical contacts, no servo adjustments to be made.

It's a better kind of plotter with a competitive price for which Tektronix is famous.

The complete plotter. The 4662 is not only easy to talk to; it has a great memory. Input data is internally buffered so you can optimize data transfer from your host processor, or move on to your next computation while the 4662 is plotting.

Up to four 4662's can be teamed up in series, and up to 15 4662's can be used with one GPIB device like the Tektronix 4050 Series of desktop graphic computers. Each plotter can perform its own job simultaneously while the host processor turns to other tasks. A simple, unique code activates each plotter.

Digitizing on any compatible graphic terminal or host system is easy with the 4662's built-in joystick control. Move the pen to the desired position on the plot, press the CALL key, and the plotter sends the x-y data points to the system. A GIN command causes the plotter to send the current x-y pen coordinates and pen up, pen down information. If the pen is outside the page boundaries, boundary values are sent and a bell on the plotter signals the operator.

The 4662's internal alphanumeric character generator produces a full upper-lower case ASCII character set. You can request alphanumerics of any height and width. Selected characters are available in seven different standard fonts. In addition, interchangeable pens and pen types offer multicolor and multiline width capability.

Plot from any point of view. Not only is character scaling possible, but alphanumerics can just as rapidly be rotated in 1° or finer increments. Drawing speed is generally as fast or faster than any other plotter in the 4662's price range. Both RS-232 and GPIB interfaces are standard at no extra cost.

Contact your local Tektronix Sales Engineer for more information on this easy-to-use, exceptional B-size plotter.

#### SPECIFICATIONS

Plotting area — X-Axis greater than 15 in (381 mm). Y-Axis greater than 10 in (254 mm).

Repeatability  $-\pm 0.0025$  in ( $\pm 0.06$  mm).

Time to maximum velocity — Approx. 120 mm/s.

**Resolution** — 0.005 in (0.127 mm).

Plotting rate - 16-22 ips (40.6-55.9 mm/s) vector dependent.

Point plotting rate — Pen action rate 10 points/s max.

Character set - Full ASCII character set.

**Pen control** — By software control or by operation of front panel PEN button. Pen may be disabled manually.

**Position controls** — Joystick vector rates variable from 0.015 ips to 4 ips.

Writing method — Nylon-tipped pen or wet ink drafting pen.

**Paper size** — 11 x 17 in (279 mm x 432 mm) maximum.

Paper retainer — Electrostatic hold-down.

**Drive characteristics** — Two four-phase stepping motors, each operating a pulley/cable system to propel the pen in that motor's respective axis.

GPIB — Conforms to IEEE Standard 488-1978.

#### ORDERING INFORMATION

4662 Interactive Digital Plotter \$4600
Option 01 — GPIB I/F cable instead of RS-232-C I/F cable
4662A01 PLOT 10 Utility routines software
Drafting vellum (17 in x 22 in), order 006-2836-00 (100 sheets) \$30
Mylar sheets (17 in x 22 in), order 006-2835-00 (100 sheets) \$100



#### **4663** Interactive Digital Plotter

Intelligent C-Size (A2) plotter

Dual programmable pen control

Nine character fonts

RS-232 and GPIB product

#### **GPIB Peripheral**

Finally: An intelligent plotter that saves time without sacrificing flexibility. The 4663 is the first high speed C-size plotter with built-in processing power and 5.5K buffer memory to free the host from many routine computational operations. But the 4663 story isn't just the intelligence, but how intelligently it has been put to use.

The 4663 can handle either 420 mm x 594 mm (European A-2 drafting size) or 432 mm x 559 mm (American C size — 17" x 22") paper, mylar or acetate with felt tip, liquid ball, or wet ink pens to give you crisp, clean cameraready copies or overhead transparencies.

A paper advance option is available for roll stock, with form feed remotely or locally programmable. This option allows the 4663 to operate unattended with a variety of form sizes.

Tektronix offers maintenance training classes on the 4663 Interactive Digital Plotter. For further training information, contact your local Field Office or request a copy of the Tektronix Customer Training Catalog on the return card at the back of this catalog.

The plotter features dual programmable pen control with interchangeable multicolor pens and is capable of producing dotted or dashed lines from local firmware. Built-in joystick allows easy manual positioning of the pens for digitizing or page scaling adjustments.

Features like these make the 4663 a natural for printed circuit board manufacturing and metal working applications or civil engineering and drafting environments including CalComp previewing and mapping.

Unique parameter entry device. This front panel card device lets you quickly identify or select operating parameters without resorting to binary switches, straps, status display devices, and volumes of operator manuals. It allows you to quickly program baud rate, pen type, acceleration, plotting speed, aspect ratio, page size and many other parameters.

These parameters can be stored up to 90 days without power. Up to four users can configure the plotter to their individual requirements with Option 37.

**Excellent penmanship.** Nine character fonts come standard with the 4663, including the full ASCII character set. All characters can be scaled, slanted, rotated and may be centered when used as plot symbols.

Several other performance options are offered such as downloadable character sets, and programmable macros. Arc and circle generation capability, utilizing circular interpolation, is also available. Standard fixed macros allow the current viewport to be outlined or an axis drawn.

Local functions. Various graphic functions are implemented via firmware. Page scaling, windowing, viewporting and clipping are typical.

Hardware loop through RS-232-C interface is standard and optional interfaces include GPIB, TTY and 20/60 mA current loop.

Graphing software support. Tektronix PLOT 10 Utility Routines for the 4663 control the plotter's multiple pens, paper advance, and built-in arc and circle generation. They also control selection of built-in character fonts. The 4663 is also compatible via GPIB with the 4050 Series of desktop computers using BASIC language keywords to provide similar controls.

#### **SPECIFICATIONS**

Max Plotting Area — X axis-22.4 in (569 mm). Y axis-17 in (432 mm).

Repeatability - ± 0.001 in (.025 mm).

Max. Plotting Speed — 16-22 ips (406-559 mm) Vector dependent.

Point Plotting Rate — 10 pts per sec. max.

Character Generator — 95 ASCII, 15 x 7 Matrix, 7 Special Fonts Std.

Paper Size — U.S. C-Size 17 in x 22 in. European A2 Size (420 mm x 594 mm).

Paper Retention — Electrostatic hold down, sprocket feed paper advance (Optional).

Media Types — Paper or Mylar.

**Drive Characteristics** — Microprocessor controlled stepping motors controlling cable system connected to pen arm.

Baud Rate — 110-9600 baud.

Standard Interface — RS-232-C, full duplex, Loop-through.

#### ORDERING INFORMATION

ORDERING IN CHIMATION
4663 Interactive Digital Plotter\$11,000
Option 01-GPIB I/F cable (deletes RS-232-C) Add \$425 Option 04-GPIB only (deletes RS-232-C) No Charge
Option 30-RS-232-C (4081 only) Add \$600 Option 31-Circular interpolation and
programmable macros
leadable characters Add \$450
Option 36-Paper advance
4663A01 PLOT 10 Utility Routines
software
Drafting vellum (17 in x 22 in),
006-2836-00 (100 sheets)
006-2835-00 (100 sheets)
200-2392-00\$20

#### **Hard Copy Devices**

Quick and convenient copies of complex information displayed on a screen are essential to the use of graphic terminals, desktop computing systems, and video image processing systems. Graphic and alphanumeric information is recorded on paper at the press of a button, to fulfill a variety of user needs. These include the need for quick preview copy before final plotting, and copies of intermediate steps during interactive work sessions. Just as important are permanent records of results for the file, and final output of high quality for use in reports and presentations. Tektronix offers three display copying devices to cover all of these hard copy needs.

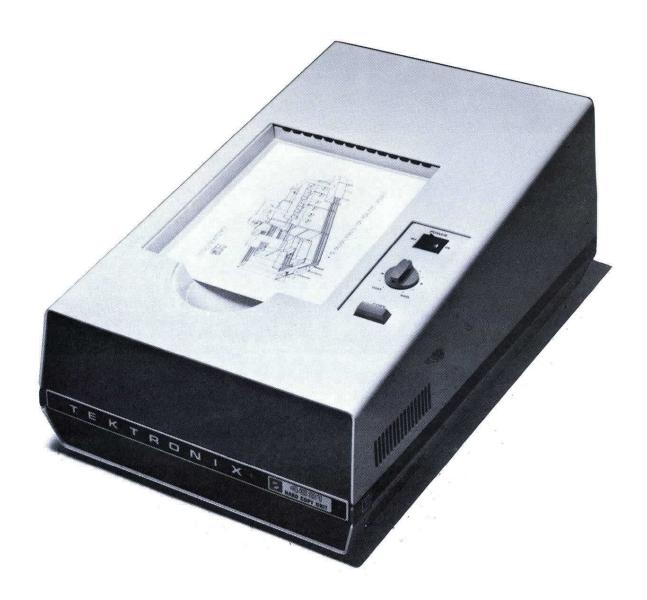
Within the product family one device for copying storage tube screens, and two for copying general video devices such as raster scan terminals, video cameras and monitors, or image processing systems. Tektronix' own implementation of fiber optic technology is provided in the 4631 for storage tube copy, and in the 4632 and 4634 for video imaging copy. See pages 59 and 70 for more information.

Fiber optics, based on photosensitive (light exposure) techniques, gives the highest quality hard copy for dense and complex graphic displays.

The concept of these alternative family offerings is to fulfill a variety of hard copy requirements — whether the need is for low-cost black and white terminal copy, or for high resolution gray shaded copy from a sophisticated image processing system.

PRODUCT		TECHNOLOGY	DESIGNED FOR		
4631	Hard Copy Unit	fiber optic	storage tube displays		
4632	Video Hard Copy Unit	fiber optic	raster scan terminals/video signal sources		
4634	Imaging Hard Copy Unit	fiber optic	raster scan/video image processing systems		

Tektronix offers maintenance training classes on Hard Copy Units and the terminals they support. For further training information, contact your local Field Office or request a copy of the Customer Training Catalog on the return card at the back of this catalog.



### 4631 Hard Copy Unit

**High Image Quality** 

Copies in Seconds

**Fiber Optic Process** 

Storage Tube Compatible

The 4631 provides permanent, dry copies of any graphic and alphanumeric information displayed on the storage tube screen. The 4631's fiber optic process uses dry silver paper for the fine detail and photographic quality image needed when copying complex graphics and alphanumerics. The 4631 requires no toners or chemical additives of any kind. The entire process is clean and safe, as images are created using only light and heat.

The 4631 is a tabletop unit, easy to move wherever needed. As a special convenience, the 4631 automatically cuts and stacks all copies into its built-in tray. A four-digit copy counter is an optional feature.

Copies can be made in either vertical or horizontal format. The copy time is 18 seconds for the first copy and only 10 seconds for subsequent copies of the same display. A special "slow scanning" mode allows images on the horizontal format to be made at even higher resolution and image quality.

The 4631 can be multiplexed to copy up to four storage tube terminals and/or display monitors. It is compatible with the 4010 Series of computer display terminals, the 4025 terminal, the 4050 Series of graphic computing systems, and the 4081 interactive graphics terminal. The 4631 is also compatible with Tektronix 11" and 19" computer display modules.

#### SPECIFICATIONS

Weight - 65 lb.

Paper size — 8.5 in. x 11 in. (216 mm x 277 mm)

Image size — 8.85 in. x 6.7 in. (225 mm x 170 mm), horizontal format 7.1 in. x 5.4 in. (180 mm x 137 mm), vertical

format

Copy time — 18 seconds first copy (36 seconds in special

scan mode)
8 seconds subsequent copies (17 seconds in special scan mode)

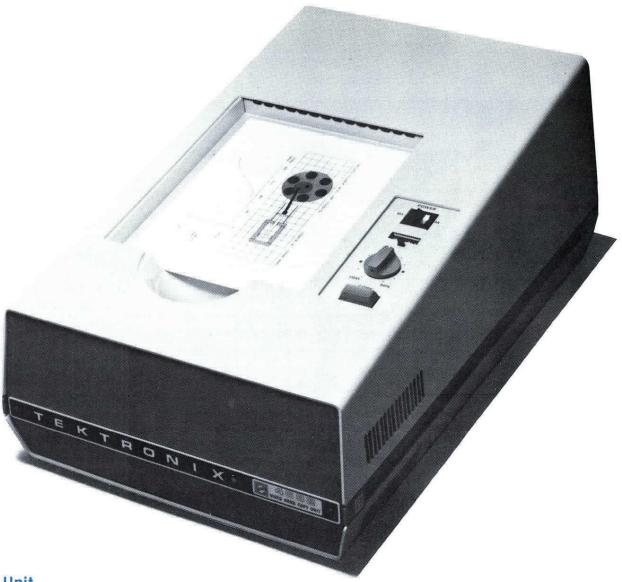
Warmup Time - 10 min.

Addressability — 200 dots per inch, horizontal

171 dots per inch, vertical Paper — standard dry-silver, 500 ft. per roll

#### ORDERING INFORMATION

4631 Hard Copy Unit	\$4,950
Option 02 Four-Channel Multiplexer	Add \$600 Charge
Supplies	· · · · · · · · · · · · · · · · · · ·
Paper — one roll, order 006-1603-00	\$70.00
Paper — one case of four rolls,	
order 006-1603-01	240.00



#### 4632 Video Hard Copy Unit

**High Image Quality** 

**Gray Scale Capability** 

Copies in Seconds

Video Source Compatible

The 4632 provides permanent copies of graphic and alphanumeric information from raster scan terminals and other video signal sources. The 4632's fiber optic process is clean and safe, as images are created using only light and heat.

The 4632 is a tabletop unit, easy to move wherever needed. As a special convenience, the 4632 automatically cuts and stacks all copies into its built in tray. A four-digit copy counter is an optional feature. All copies are horizontally oriented. The copy time is 18 seconds for the first copy, and only 8 seconds for subsequent copies of the same display. Eight distinct shades of gray can be copied by the 4632 with a special gray scale enhancement option. The standard 4632 can clearly show six different shades of gray, for polygon fill-in, bar charts, and many other applications.

The 4632 can be multiplexed to copy up to four raster scan terminals, and can accept remote copy signals. The 4632 is compatible with a wide variety of raster scan terminals and video signal sources, including those which produce RS-170, RS-330, RS-375A, RS-343A and RS-412A type signals. The standard 4632 is prepared for use with 525 line, 60 Hz sources. Many other adjustments are provided as options, including adjustments for 625 line, 50 Hz and for high resolution 1029 line, 60 Hz.

#### SPECIFICATIONS

Weight - 65 lb.

Paper size - 8.5 in. x 11 in. (216 mm x 277 mm)

Image size — 8.4 in. x 6.3 in. (213 mm x 160 mm)

Copy time — 18 seconds first copy

8 seconds subsequent copies Warmup Time — 10 min.

Addressability - 200 dots per inch, horizontal

171 dots per inch, vertical

Paper — standard dry-silver, 500 ft. per roll

#### ORDERING INFORMATION

4632 Video Hard Copy Unit \$4,950
Option 02 Four-Channel Multiplexer Add \$600
Option 03 Setup for 625 Line, 50 Hz No Charge
Option 04 Setup for 1029 Line, 60 Hz No Charge
Option 05 Setup for 4023 Terminal No Charge
Option 06 Enhanced Gray Scale Add \$500
Option 07 Compatible with HP 2640 Series
Terminals
Option 08 Compatible with DEC MINC Systems No Charge
Option 09 Setup for AT&T GEMINITM 100 Systems .\$60.00
Option 48 220 V, 50 Hz No Charge
Paper — one roll, order 006-1603-00 \$70.00
case of four rolls, order 006-1603-01 \$240.00

### **Matrix Printers and File Manager**



#### **4641** Matrix Printer

Printed output from a thoroughly dependable package. The Tektronix 4641 Matrix Printer lets you command alphanumeric printout quickly and quietly, with complete form and format versatility.

When interfaced with a 4050 Series desktop computer, the 4641 is ready for reliable performance at speeds up to 180 cps, for all kinds of output applications.

A servo-controlled carriage assures precise placement of characters, upper and lower case, on a 7 x 7 dot matrix, 180 characters per line, six lines to the vertical inch. A selectable form feed feature lets you handle a variety of format sizes, from labels to legal.

The printer includes a self-test function that automatically runs through all characters.

Geared for forms. A tractor-driven paper feed system facilitates dependable feeding of multipart forms. The printer will adjust for forms up to 6 parts (0.020 maximum thickness) and in varying widths. Accurate vertical and horizontal character placement is provided.

Format control will adjust machine operation to 11 different form lengths. An alarm signals when paper is exhausted.

The 4641-1 is the 220 V ac, 50 Hz version of the 4641. All options and accessories are identical.

ORDERING	INFORMATION								1			
<b>4641 Matrix Printer</b>				٠								\$4,550
Option 02 4052/4054 Interfa	ıc	е					857		 100			. No Charge



#### **4642** Matrix Printer

Fast printer output is yours at low cost with the Tektronix 4642 Matrix Printer. This table top printing unit offers 60 character-persecond output speed, along with a variety of print alternatives. It is compatible with the Tektronix 4020 Series of Computer Display Terminals and 4050 Series of desktop computers. Interface is standard RS-232-C.

A variety of type faces. The 4642 gives the operator a varied selection of upper and lower case type faces. The standard format prints in 80 columns, and provides a choice of regular and elongated characters. A condensed character set, selectable from a front panel switch, gives 132 column output, and again, a choice of regular or elongated characters. Characters are formed on a 5 x 6 dot matrix.

Compact, easy to use. The 4642 requires minimum space for operation. Paper feed is by friction on the standard version, which uses inexpensive roll paper. The optional tractor feed paper drive can be used with both fan-fold paper and multipart forms.

A choice of features. A complete selection of features and accessories can make the 4642 Matrix Printer even more versatile. For example, Option 1, a rear feed tractor paper drive option, allows output of an original and four copies. A printer stand is available to convert the 4642 to a floor unit. The 4642-1 is the 220 V ac, 50 Hz version of the 4642. All options and accessories are identical.

#### 



#### 4907 File Manager

The 4907 is a direct access flexible disc device with a double density read/write feature that enables up to 630K bytes capacity per disc.

An advanced multiple level file-by-name system includes a directory that maintains the user files, passwords and available space. For applications requiring additional storage capacity, several drives may be connected to the file manager. Software commands are extensive with this file manager and its compact size is small enough to let it fit on a desktop or lab bench.

Built-in ROMs and special 4050 Series Desktop Computer's ROM Packs contain the 4907 operating system software. No 4050 Series Memory is required to support the operating system. The 4907 can also be used with some of the 4010 Series of graphic terminals.

ORDERING INFORMATION	
4907 File Manager\$48	50
Option 30 Two Disc Drives Total Add \$2	
Option 31 Three Disc Drives Total Add \$4	300
Option 40 4052/4054 Interface No Cha	

OEM terms available on these products.

#### **4905** Mass Storage Module

The 4905 provides a medium density, memory storage system designed especially for the 4080 graphics display users.

The 4905 comes with a controller that serves two disc drives. The byte storage facility of the system provides up to 20 million bytes on one 4905 option — yet you can start out with an option which provides 630K bytes of additional storage at extremely reasonable cost.

ORDERING INFORMATION	
4905 Mass Storage Module	\$635
Option 31 Dual Flexible Disc	dd \$5725
Option 32 Two Dual Flexible Disc Add	l \$11,450
Option 33 Single Hard Disc Add	1 \$12,000
Option 34 Dual Hard DiscAdd	1 \$21,000

### Digital Cartridge Tape Recorder/Drive, Graphic Tablets and Joystick



# 4923 Digital Cartridge Tape Drive 4924 Recorder GPIB Peripheral

Both digital recorders are highly reliable, very easy to use for data storage and retrieval. They also contain an RS-232-C interface which allows them to support any compatible computer display terminal from 110 to 9600 band.

Each tape cartridge can store approximately 300K bytes of high density digital data. Files of variable length and files containing variable number of formatted records can be easily stored by these two storage systems.

The 4924 offers a tape fetch feature and terminal interrupt capability and can operate with Tektronix graphics terminals via the terminal IEEE-488 bus. Transfer data rates are 10K baud max. Read data operates at 762 mm/sec (30 inches/sec) and the Fast Forward Mode allows you to skip forward or reverse at 2290 mm/sec (90 inches/sec). Up to 15 tape drives may be multiplexed to any 4050 Series Desktop Graphic Computer at any one time.

### ORDERING INFORMATON 223 Digital Cartridge Tape Recorder \$2

#### 4953, 4954, 4956 Graphic Tablets

With the 4953/54/56 Graphic Tablets, you can choose one of two input device options: a pen for best convenience, or a push-button cursor where exacting accuracy is required. You can input points or vectors to digitize or display maps, graphic drawings, schematics and other designs.

From precision mapping to exacting parts outlines, Tektronix Graphic Tablets satisfy a wide range of user needs. You can select options from a written "menu" placed on a Graphic Tablet. You can store graphic input on peripheral disc or recorder devices, recall it later, and make quick, dry-process copies on a Tektronix hard copy unit.

And Tektronix offers all of the pieces you'll need with your computer for a truly interactive graphics system. Take your pick of the 279 mm x 279 mm (11" x 11") 4953 model, the drawing board-sized 10.16 mm x 762 mm (40" x 30") 4954 model, or the 4956 in two sizes. Standard is 510 mm x 510 mm (20" x 20") and the Option 33 version is 910 mm x 1220 mm (36" x 48"). The latter version is large enough to accommodate E-size engineering drawings. Power modules are compact to help curb desktop clutter for all these graphic tables.

#### ORDERING INFORMATION

4953 Graphic Tablet 11" x 11"
(279 mm x 279 mm) \$3475
Option 30 4081 I/F Cable
4954 Graphic Tablet 40" x 30"
(1016 mm x 762 mm) \$5675
Option 30 4081 I/F Cable
4954F32 Pedestal\$1325
Cursor, order 119-0622-00
4956 Graphic Tablet 20" x 20"
(510 mm x 510 mm) \$5195
Option 33 Graphic Tablet 36"x48"
(910 mm x 1220 mm)
Cursor, order 119-0875-00



For desktop computer users needing increased interactivity, the 4952 Option 2 Joystick is the last word in fingertip input control. Accurate to 0.1%, the sensitive cursor control activated by the POINTER command lets you quickly position the cursor the first time precisely.

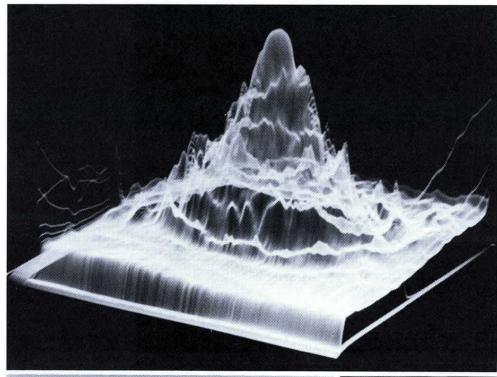
More to build on, less to repair. By entering a command in BASIC the 4952 Joystick will put the pointer on-screen and initiate movement. Drift is negligible.

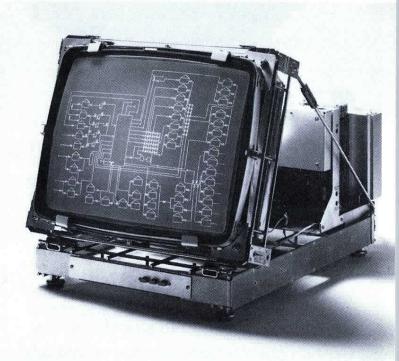
The 4952 is simplicity itself. Just move the center lever in the direction you want to move the cursor; speed is controlled by the angle and distance of the lever from the center position. And when you want to stop the cursor, simply release the lever to its natural vertical position.

Compatibility for the Joystick is assured with all terminals in our 4010 family, 4081 Interactive Graphic Systems and 4050 Series Desktop Computers.

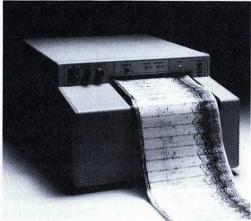
ORDERING INFORMATION	
4952 Joystick (4014/4015)	\$525
Option 01 Joystick (4010, 4012/4013)	
Option 02 Joystick (4050 Series)	Add \$100

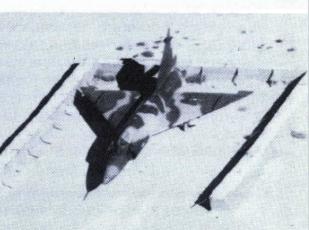
# **OEM Imaging Products**











# The Tektronix OEM Commitment

Reliability. Performance. Value. Support.

When you deal with Tektronix, you're dealing with a supplier who stands behind you every step of the way. As a world leader in display technology, we're committed to building lasting OEM relationships and supporting them with continuing new product developments.

Your Tektronix resource starts with a broad and comprehensive package of OEM support: OEM pricing, terms and conditions to help make you competitive. OEM service agreements and service capability throughout the United States and in many countries. Applications engineering including interface assistance, custom mods, documentation, software compatibility, and much more.

At Tektronix, our product reliability is your foundation. Your systems can only be as reliable as the components that go into them. At Tektronix, we're committed to producing the most dependable components possible. You can be confident that the reliability we

engineer into every component can help keep your customers satisfied and your service costs down. That's quality you can bank on.

Leadership in systems must begin with leadership in components. Explore the advantages to working with Tektronix: excellence in products, in OEM support, and service. Your local Tektronix OEM Representative can give you full details on how you can profit from a partnership with Tektronix.

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Recorder and Image Forming Module	70

### **OEM Imaging Products Reference**

#### **KEY SPECIFICATIONS FOR X-Y DISPLAYS**

See your local Tektronix representative for complete specifications, options and ordering information, or use the return card.

	603A	604A	606A	606B	607A	608	620	624
Spot Size <sup>1</sup>	0.25 mm (10 mils)	0.36 mm (14 mils)	0.13 mm (5 mils)	0.08 mm (3.1 mils)	0.25 mm (10 mils)	0.26 mm (10 mils)	<15 mil, <25 mil at max drive	0.30 mm (12 mils)
Display Size	10.2 x 12.7 cm	10.2 x 12.7 cm	8 x 10 cm	8 x 10 cm	7.2 x 9 cm	9.8 x 12.2 cm	10 x 12 cm	9.8 x 12.2 cm
Acceleration Potential	3.5 kV	3.5 kV	5.6 kV	5.5 kV	12 kV	22.5 kV	12 kV	≈18 kV
Bandwidth, X-Y <sup>2</sup>	≥2 MHz	≥2 MHz	≥3 MHz	>3 MHz	≥3 MHz	≥5 MHz	≥2 MHz	≥3 MHz
Bandwidth, Z <sup>2</sup>	≥5 MHz	≥5 MHz	≥10 MHz	5 MHz	≥5 MHz	≥10 MHz	≥5 MHz	≥5 MHz
Rise Time	≤70 ns	≤70 ns	≤35 ns	<35 ns	≤70 ns	≤35 ns		≤70 ns
Input R and C, X-Y <sup>3</sup>	1 M $\Omega$ ±1%    <47 pF	$1 \text{ M}\Omega \pm 1\% \parallel < 47 \text{ pF}$	$1 \text{ M}\Omega \pm 1\% \parallel < 47 \text{ pF}$	1 M $\Omega$ ±1% or 50 $\Omega$ $  $ <47 pF	1 MΩ ±1%    <47 pF	1 MΩ,    ≤60 pF	1 MΩ    47 pF	1 MΩ    <47 pF
Input R and C, Z <sup>3</sup>	1 MΩ    <47 pF	1 M $\Omega$ ±1%    <47 pF	1 MΩ <47 pF	1 M $\Omega$ or 5 M $\Omega$	1 MΩ <47 pF	1 MΩ, ≤60 pF	1 MΩ <47 pF	1 MΩ    <47 pF
X-Y Phase Difference	≤1° to 500 kHz	≤1° to ≤500 V	<1° to 500 kHz	1° to ≥500 kHz	≤1° to 500 kHz	≤1° to 1.5 MHz	≤1° dc to 500 kHz	<1° to 1.0 MHz
Recommended Source Impedance, X-Y and Z	≤10 kΩ	$\leq$ 10 k $\Omega$	≤10 kΩ	<10 $\Omega$ in 1 $\Omega$ pos.	≤10 kΩ	≤10 kΩ	≤10 kΩ	≤10 kΩ
Temperature Range	0°C to +50°C	0°C to +50°C	0°C to +50°C	0° to 50°C	0°C to +50°C	0°C to +50°C	0°C to +50°C	0°C to +50°C
Power Requirements <sup>4</sup>	75 W	56 W	75 W	75 W	53 W	61 W	See footnote4	61 W
Included Accessories	External program connector; connector cover; external graticule	External program connector; connector cover.	External graticule		External program connector; connector cover; external graticule.	Lined external implosion shield (graticule) for adjustment purposes.	Lined external im- plosion shield (graticule) for ad- justment purposes.	
Recommended Camerass	C-59A, C-5C C-5C Opt. 01, C-28	C-59A, C-5C Opt. 01, C-28	C-28, C-5C Opt. 01, C-59A	C-28, C-30BP	C-5C, C-5C Opt. 01, C-28	C-5C, C-59A, C-28	C-5C, C-5C Opt. 01, C-28	C-5C, C-28

 $<sup>^{\</sup>text{I}}\cdot$  Measured at 0.5  $\mu\text{A},$  except for the 606A, measured at 0.1  $\mu\text{A}.$ 

The standard displays come without a handle, feet or covers. See your local Tektronix Representative for complete specifications, options and ordering information, or use the return card.



# MODULAR PACKAGING AND RACK MOUNTING

PACKAGING FOR THE 620

Vertical dress package. Includes handle, feet and covers.

Order 016-0409-00 ......\$175

Horizontal dress package. Includes handle, feet and covers.

Rackmount kits for the 620.

Slide-out 19" rack assembly which rackmounts one 620 and an empty compartment horizontally. In the compartment you may put your custom electronic circuitry and combine it with the display. Includes frame, covers and rack slides. Not available with Options 06, 23, 28.

Order 016-0404-00 .....\$195

Slide-out 19" rack assembly which rackmounts two 620s side by side. Includes covers and rack slides. Not available with Options 06, 23, 28, 31.

Small-width packaging. Smaller-width packaging removes controls (intensity, focus, spot position) from the right side of the crt. Allows OEM to mount elsewhere in this system. Request quote from your Tektronix representative.

### RACKMOUNTING FOR 603A, 604A, 606A, 606B, 607A, 608, 624

Rackmount and Empty Cabinet Kit for 603A, 604A, 606A, 606B, 607A, 608, and 624. Slide-out 19" rack assembly which mounts a display monitor and an empty compartment horizontally. In the compartment you may put your custom electronic circuitry and connect it to the display, all in one enclosure.

Display/Power Module Kit. Allows rackmounting of 603A, 604A, 606A, 606B, 607A, 608, and 624 with TM 503 Power Module. Minimizes mechanical design time. Simply design your own electronics using TM 500 Custom Plug-in kits described on p. 220. Then plug them in. Fits standard 19" rack.

Order 040-0624-01 ......\$90

Rackmounting kit for 603A, 604A, 606A, 606B, 607A, 608, and 624.

Slide-out 19" rack assembly which rackmounts any two of the above displays side by side. Includes covers and rack slides.

Order 040-0600-00 .....\$135

Rackmount-to-Cabinet Conversion, required to convert a rackmount 603A, 604A, 606A, 606B, 607A, 608 and 624 to a cabinet style.

Order 040-0602-00 ......\$125

#### Key specifications for 634 video display

Video Display		634	634 Opt. 01		
Resolution	Worst case	1100 line	650 line		
*	Nominal	1400 line	800 line		
Display Siz	:e	9x12 cm (	flat screen)		
Position Ad Non-Linear		≤0.5% within 9 cm circle, ≤1% in corners. For Option 01 within 9 cm circle, 2% at corn			
Brightness		515 cd/m² (150 fL) max.			
Brightness Non-uniformity		Less than ±10%			
Bandwidth		1 Hz-10 MHz std. 20 MHz Video bandwidth available as Option 14.			

Note: Standard 634 accepts the line/field rate of 625/50. Discrete line rates of 675/60 through 1083/60 can be accommodated using option 15.

\*Merged raster lines.

Recommended Cameras: C-5C, C287.

<sup>2.</sup> Full spec would read: "dc to . . ." appropriate figure.

<sup>3. &</sup>quot;|| <" means "paralleled by less than".

<sup>4.</sup> Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V (±10% on each range). 48 to 440 Hz (except the 624 which excludes 220). Number given shows watt max at nominal line voltage. The 620's power requirements are 90-132 V ac; 48-440 Hz line frequency, 22 W max, 0.2A at 120 V ac 60 Hz.

<sup>5.</sup> External 15 V dc 750 mA power supply required for C-28.

# **Applications For Selected OEM Imaging Products**

Recommended Display	Medical Instrumentation	Electronic Test Equipment	Defense Electronics	Analytical Instrumentation
634 Very High Resolution Video Display	Ultrasound raster scan Computerized tomography Multi-imaging cameras	High-density graphics, alphanumerics and imaging	Reconnaissance & surveillance Target acquisition FLIR LLLTV	Electron microscopy
606B Very High Resolution X-Y Display	Nuclear multi-imaging Gamma camera Ultrasound multi-imaging	High-density graphics alphanumerics and imaging	Imaging for scan conversion	Scanning electron microscopy  Micro probe  Radiation and thermal scanning
606A High Resolution X-Y Display	Nuclear multi-imaging Gamma camera Ultrasound multi-imaging	High-density graphics, alphanumerics and imaging	Imaging for scan conversion	Scanning electron microscopy
608 High Brightness X-Y Display	Ultrasound: M-Mode Real time Sector scan B-scan	Spectrum analysis	Navigation and control Automated test systems Simulators IR imaging	Mass Spectrometry Nondestructive testing NMR FTIR
620 General Purpose X-Y Display	Ultrasound: A-mode Physiological measurements	Logic analyzers  Automated test equipment  Spectrum analysis  RF-sweepers  TV waveform monitor	Electronic counter- measures Radar-A scopes Sonar PPI	Nondestructive testing Multi-channel pulse height analyzers
607A Variable Persistence Storage X-Y Display	Gamma camera Ultrasound:     M-mode ECG EKG	Transient analysis Automated test equipment Spectrum analysis	Navigation and control  Electronic counter-measures  Automated test equipment  Target acquisition	Scanning electron microscopy NMR Mass spectrometry
603A Bistable Storage X-Y Display	Physiological measurements	Transient analysis  Spectrum     analysis  Graphics and     alphanumerics	Direction finding Spectrum analysis	Mechanical shock testing Seismic analysis Strain gauge measurement Nondestructive testing

# High Resolution Video Display and General Purpose Waveform Display

### 634

High Resolution Video Display for critical applications (1400 lines, shrinking raster)

< 1/2 % Linearity Inside the 9 cm Quality Area

Excellent Gray Scale and Brightness Uniformity

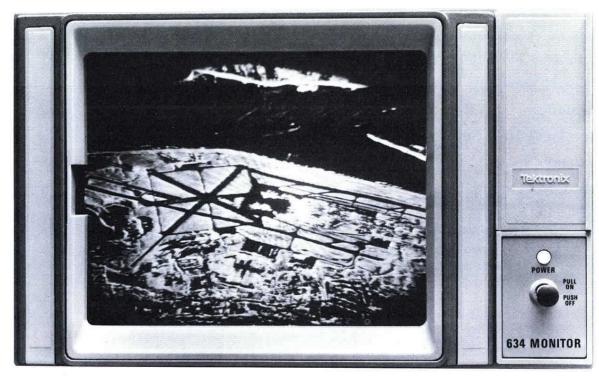
The 634 raster scan monitor delivers extremely high quality video images for both viewing and photography.

Because of its 1400 line (merged raster) nominal horizontal resolution and dynamic focusing, the 634 assures clear, crisp images, even in the corners. Excellent gray scale and brightness uniformity (less than  $\pm 10\%$  variation across the screen), mean that you get consistently accurate imaging.

The 634 is available, on a standard basis, at 525/60 and 625/50 rates. Rates of 875/60, 945/60, 1023/60 and 1083/60 can be accommodated using Option 15, providing flexibility in selecting vertical resolution. Option 14 (20 MHz video amplifier) is recommended for use with high line rates.

#### ORDERING INFORMATION

Option 01 Standard resolution of 800 lines nominal, .....Sub \$180



#### PERFORMANCE OPTIONS

Option 11 External Sync — Switchable Add \$25
Option 13 Video ReverseAdd \$50
Option 14 20 MHz Video Amplifier Add \$85
Option 15 High Line Rate. Factory calibrated at 1083/60. User changeable to rates between 675/60 and 1083/60 with minor modifications Add \$165
Option 16 Remote Brightness, Contrast, Focus, Blanking
C CEO

#### SAFETY OPTIONS

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

#### 620

General Purpose X-Y Waveform Display

**Many Packaging Options** 

**Exceptionally High Reliability** 

The 620 can be used in any situation requiring an economical, solidly performing X-Y waveform display.

Electronic instrumentation applications include pulse height, network, spectrum, logic and signal analyzers and digitizers. The 620 is also used in mechanical measurement instruments for vibration tests and NDT. In the medical field it is used for A mode imaging. The 620 offers spot size of 0.38 mm (15 mils), a 10 x 12 cm screen, and usable brightness up to 100 cd/m² (30 fL).

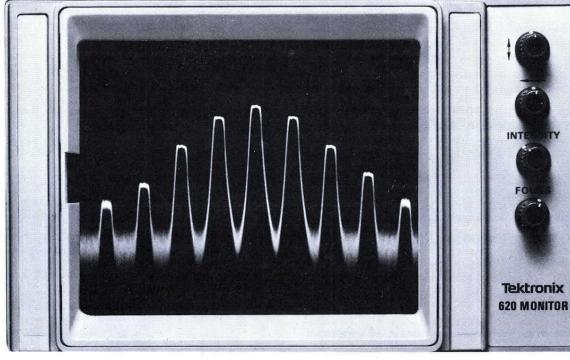
The 620 comes with a wide variety of packaging options:

- 620 Narrow Package (MOD BD) As wide as the CRT bezel. Operator controls can be located anywhere on your cabinet.
- 2. 620 Standard Package Easily mounts in your custom cabinetry. Operator controls as shown.
- 3. 620 Stand-alone Package With handle, feet and covers: an excellent choice for your remote monitor.
- 4. 620 Horizontal and Vertical Packages An empty compartment next to or below the display provides ample space for your custom circuitry, resulting in an integrated enclosure.
- 5. 620 Rackmount Package Slide-out 19 inch rack assembly mounts one 620 and one compartment along-side (or two 620s side by side).

**NOTE:** While the 620 Narrow Package is configured for dc power only, the standard 620 can be configured for either ac power (built-in supply) or dc power from your system.

#### **ORDERING INFORMATION**

620 Display (without handle, feet or covers) ...\$1,025 Option 01 With internal graticule .......No Charge



Option 06 UL 544 Listed. Includes handle, feet and covers
Option 09 UL Component Recognition* No Charge
Option 10 Remote 25-pin program connector, X, Y and Z axes. Single ended inputs only. (not available with Option 31)
Option 20 Delete ac power. External dc power required (+17 to 26 V $\simeq$ 0.9A). Not available with Option 31 Sub \$30
Option 23 Handle, feet and covers (not available with Options 06, 28 and modular packaging)
Option 25 TTL blanking*Add \$30
Option 28 With cover only—no trim strips (not available with Options 06, 23 and modular packaging)

Option 31 Delete all real panel BNC's, dc power connector and ac power supply and switch. Option 31 includes provision for external dc power (+17 V unregulated). All power connections and input signals are made to interconnect pins inside monitor. Not compatible with Options 10 or 20. Can be used with 016-0409-00 or 016-0410-00 packaging . . . . . Sub \$30

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#### RACKMOUNT KITS

Rackmount for one 620 in a 19 inch rac	k. Includes
frame, covers and rack slides. Not ava	liable with
Options 06, 23, 28. Order 016-0404-00	\$195
Rackmount for two 620s side by side in a 19 Includes covers and rack slides. Not available of 23, 28, 31.	inch rack. Ailable with
Order 016-0405-00	\$175
620 Narrow Package (MOD BD) without hat covers. Dc power only	ndle, feet or quest Quote

\*Also available for the 620 Narrow Package.

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

# **Direct Viewing Displays**

### 608/624

**High Brightness X-Y Displays** 

**Ambient Light Viewing** 

**High Resolution** 

**Expansion Mesh Halo Supression** 

**Excellent Gray Scale** 

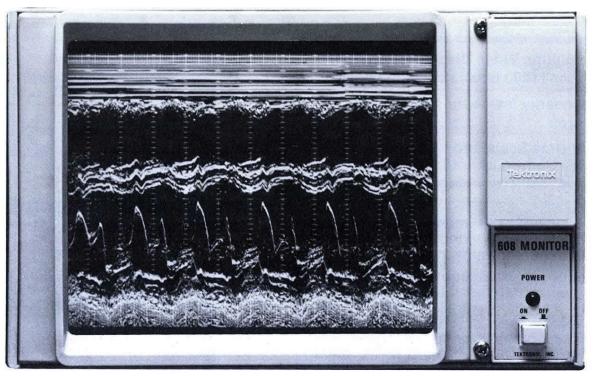
**Optional UL 544 Listing** 

The 608 is our finest directed beam viewing monitor. It is extremely well suited for high performance imaging applications, such as diagnostic ultrasound and electronic instrumentation. The related 624, a comparable but more economical alternative, provides excellent direct viewing capability for systems that don't require optimum performance.

The 608's high usable brightness of up to 240 cd/m² (70 fL), a 0.25 mm (10 mil) spot size, and large 9.8 x 12.2 cm screen, combine to give you optimum viewing capability. Where such a high degree of clarity or brightness is not required, we recommend the 624 with a 0.30 mm (12 mil) spot size, display brightness of 135 cd/m² (40 fL), and a screen size of 9.8 x 12.2 cm. Both instruments produce detailed displays that are easy to read in high ambient light and that produce quality photographs.

Both instruments have a special expansion mesh halo suppression CRT design which eliminates annoying stray light that otherwise causes lower contrast.

The 608 displays both excellent gray scale images and detailed waveform displays, because of its small 0.26 mm (10 mil) spot size (0.30 mm or 12 mils for the 624). In addition, imaging is critically sharp from corner to corner in both instruments, using dynamic focus. (Not available on the 624.)



# ORDERING INFORMATION 608 Display ......\$1895

(without handle, feet or covers)	
624 Display\$167 (without handle, feet or covers)	5
PERFORMANCE OPTIONS	
Option 10 25-pin Remote Program Connector — X, Y and Z. Single Ended Inputs Add \$3	30
Option 20 Without ac supply—(±18 V Unregulated dc Supply Required. (Not available with Option 06) (624 only) Sub \$2	20

Option 21 Full Differential Inputs (X, Y, and Z) Add \$30

Option 09 UL Component Recognition . . . . No Charge

# Option 22 5x Attenuators Add \$20 Option 24 Linearized Z-Axis (Gamma Correction) (608 only) Add \$50 Option 25 TTL Blanking Add \$50

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#### MECHANICAL PACKAGING

MEDIANICAL FACKAGING
Option 01 Internal graticuleNo Charge
Option 23 Handle, Feet and Covers (not available with Options 06 and 28)
Option 28 Covers Only (not available with Options 06 and 23)
Option 29 Metal BezelAdd \$50
Rackmount kit to mount two 608s or 624s side by side, or one 608 or 624 and a 603A, 604A, 606A, 606B, or 607A side by side in a 48.3 cm (19 inch) rack.  Order 040-0600-00
Rackmount kit to mount one 608 or 624 and one empty cabinet side by side in a 48.3 cm (19 inch) rack.  Order 040-0601-00\$175
or 607A side by side in a 48.3 cm (19 inch) rack. Order 040-0600-00

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#### 604A

**Versatile General Purpose Display** 

**Easy Interface Options** 

**Optional UL 544 Listing** 

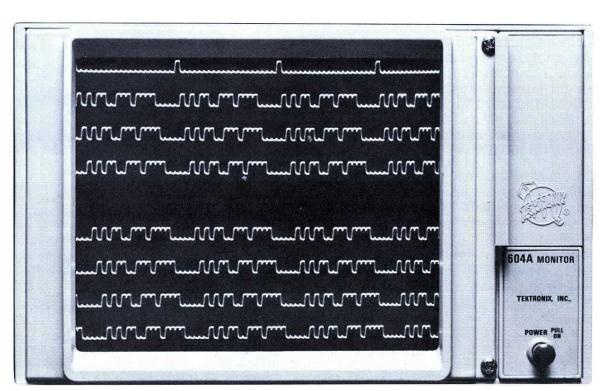
Modular Packaging

The reliability of the 604A X-Y display monitor has been proven through its many years of use in a wide variety of electronics applications.

A wide range of options and modular packaging make the 604A a truly flexible, general purpose display for easy interface with your system. UL 544 listing optional.

#### ORDERING INFORMATION

604A Display\$1500
(without handle, feet or covers)
Option 01 With Internal Graticule No Charge
Option 04 Time Base
Option 05 External Vector Display Graticule (P31 Phosphor Only) Add \$40



Option 06 UL 544 Listed; includes Handle, Feet and CoversAdd \$80
Option 09 UL Component Recognition No Charge
Option 10 25-pin Rectangular Remote Program Connector — X, Y and Z axes; Single-ended Inputs only
Option 21 Full Differential Inputs (X, Y and Z) Add \$35
Option 22 Extended (x5) Gain Range Add \$25

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

# **High Resolution Displays**

### 606A

High Resolution 0.13 mm (5 mil) X-Y Display
Optimum Photographic Gray Scale

**Multi-imaging Applications** 

**Optional UL 544 Listing** 

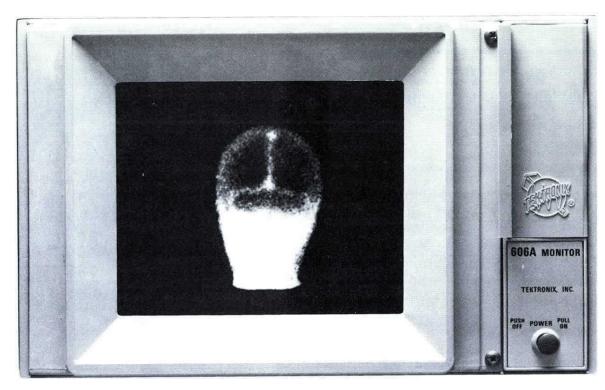
The 606A has 0.13 mm (5 mil) resolution for applications requiring critically detailed photographs and displays.

The sharply detailed imaging provided by the 606A is particularly well suited for photographic recording applications in medical gamma camera systems and multi-imaging systems. Non-medical applications include scanning Auger and electron microscopy, and ATE.

When image stability and gray scale performance are critical to the quality of measurement or the accuracy of a medical diagnosis, the 606A's performance is consistently reliable.

Spot size of the 606A is only 0.13 mm (5 mils), for discerning even the most subtle details. And the Z-axis amplifier is very linear, with 10 MHz bandwidth. This linearity (gamma correction) provides the excellent gray scale performance you require, particularly for photography.

This display also offers excellent image stability: position shift is less than 0.1 cm per hour after 20 minute warm-up, and less than 0.2 cm in 24 hours.



Because of its high resolution, the 606A is excellent for multi-imaging: all images, regardless of on-screen location, are delivered with excellent clarity and discernability.

A broad selection of options (including UL 544 Listing) helps optimize interface of the 606A with a variety of systems.

#### ORDERING INFORMATION

606A Display	Monitor						•	. \$2000
(without handle,								

Option 06 UL 544 Listed. Includes Handle, Feet and Covers .......Add \$75 SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

#### 606B

Very High 0.079 mm Resolution (3.1 mil) X-Y Display

**Uniform Resolution and Variable Spot Size** 

**Excellent Stability** 

**Multi-imaging Applications** 

≤10% Light Output Variation in Quality Area

The 606B features a 0.079 mm (3.1 mil) spot size for applications requiring the most critically sharp photographs and displays.

The 606B is particularly well suited for photographic recording applications in medical gamma camera systems and multi-imaging systems. It can also provide superior imaging in such applications as electron microscopy, and radiation and thermal scanning systems.

When image stability, gray scale performance and brightness uniformity are critical to the quality of measurement or the accuracy of a medical diagnosis, you need the consistent performance and high reliability of the 606B.

The 606B also has uniform resolution and variable spot size. When dealing with a small number of data inputs, the dc programmable spot size enlarges the spots to allow them to merge into an easier-to-interpret image.



The high resolution and brightness uniformity of the 606B is excellent for multi-imaging. All images, regardless of on-screen location, are delivered with fine clarity and readability.

Optional UL 544 Listing and Component Recognition available.

#### ORDERING INFORMATION

606B Display .....\$3480 (without handle, feet or covers)

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

# Bistable and Variable Persistence Storage Displays

#### 603A

**Bistable Storage X-Y Display** 

High Resolution 0.25 mm (10 mil) Spot Size

**Up to 10 Hour Storage** 

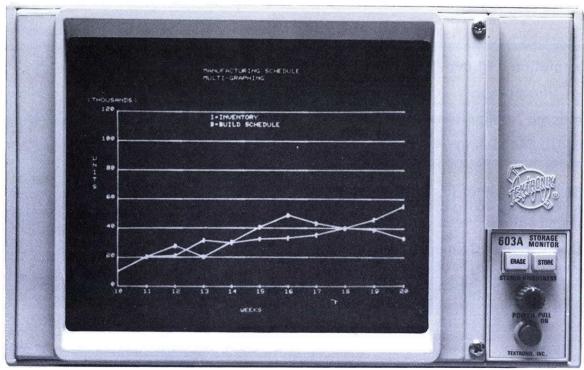
**Modular Packaging** 

For waveform, graphics and alphanumerics, the 603A is a cost-effective alternative to digital memory. The storage capability of the 603A eliminates any need for display refreshing and associated costly memory devices.

The 603A is particularly useful in capturing and recording single, relatively slow-occurring transient events, such as in seismic analysis, mechanical shock tests. It also excels in displaying computer graphic and alphanumeric data, and in other displays where gray scale is not required. It offers storage up to 10 hours, one million dot/second stored writing speed (with Option 02), small 0.25 mm (10 mil) spot size, and a large 10.2 x 12.7 cm viewing area.

As a preview monitor the 603A can save you time and money by avoiding unnecessary photographs.

Modular mechanical packaging provides either full rackwidth or double-height instrument packages that combine your custom circuit designs with the 603A in an integrated enclosure. The 603A may also be ordered with UL 544 Listing.



#### **ORDERING INFORMATION**

603A Bistable Storage Display
Monitor\$2100
(without handle, feet or covers)
Option 01 Internal GraticuleNo Charge
Option 02 Fast Writing Speed CRT
(200 div/ms)Add \$40
Option 04 Time Base
Option 06 UL 544 Listed. Includes handle,
feet and coversAdd \$75
Option 09 UL Component Recognized No Charge

Option 10 25-pin Rectangular Remote Program Connector. Contains: Erase interval, non-store, enable/disable, erase. Single ended inputs only .... Add \$50 Option 21 Full Differential Inputs (X, Y, Z) ... Add \$30 Option 22 5x Attenuators .... Add \$20 Option 23 Handle, Feet and Covers (not available with Options 06 and 28) .... Add \$60 Option 28 Covers Only (not available with Options 06 and 23) .... Add \$50

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

#### 607A

Variable Persistence Storage X-Y Display

High Resolution 0.25 mm (10 mil) Non-Store Spot Size

**Gray Scale Storage up to 50 minutes** 

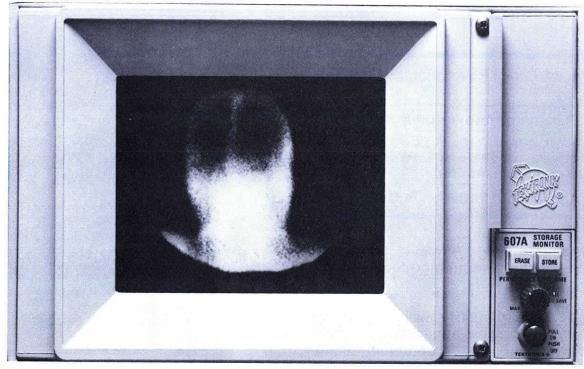
**Optional UL 544 Listing** 

The 607A is a cost effective alternative to digital memory, since its storage capability eliminates any need for display refreshing and other costly memory devices.

This display unit is often found in gamma camera applications as a preview monitor, as well as in cardiac studies, M-mode, ultrasound, scanning Auger and electron microscopy systems. It operates in both store and non-store modes, and writes at 0.8  $\mu$ s/div, with 0.51 mm (20 mil) stored or 0.25 mm (10 mil) non-stored spot size.

Adjustable persistence and the ability to display multiple successive events simultaneously enhance the 607A's applicability in areas where the highest resolution requires a slow sweep, such as in spectrum analysis, radar and sonar.

The 607A is especially useful when you require gray scale displays of multiple transient events, or for capture and storage of single-shot events. If you plan to photograph the image, the 607A is an excellent preview monitor.



#### ORDERING INFORMATION

607A Variable Persistence Storage Display	. \$2375
70	
Option 01 Internal GraticuleN	o Charge
Option 06 UL 544 Listed. Includes handle,	
feet and covers	. Add \$75
Option 09 UL Component Recognized N	o Charge
Option 10 25-pin Rectangular Remote Program	n
Connector: contains remote Save, Erase, Eras	se .
Interval, Non-store, Single Ended Inputs only	Add \$30

Option 21 Full Differential Inputs (X, Y	and Z) Add \$30
Option 22 5x Attenuators	Add \$20
Option 23 Handle, Feet and Covers (not available with Option 06 and 28)	
Option 28 Covers Only (not available with Options 06 and 23)	) Add \$50

SPECIAL PRICING TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

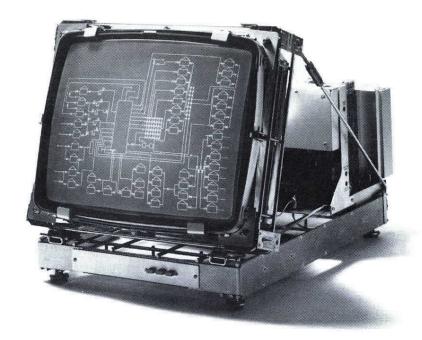
# **OEM Computer Display Modules**

### **GMA 101A/GMA 102A**

Both the GMA 101A and GMA 102A are 483 mm (19") diagonal modular graphic and alphanumeric storage displays. The GMA 101A is a storage-only display. The GMA 102A is a higher performance instrument that also has refresh capability. Both are configured for optimum modularity, with printed circuit board modules arranged on a unique high-strength wireform chassis. This construction not only supports different performance, interface and packaging options, but permits easy removal of modules for field service.

The GMA 101A — high resolution storage. The GMA 101A makes the benefits of low cost, high resolution storage technology graphics available to the OEM system builder in a modular display. This family member is tailored for an application that emphasizes storage graphics. You can use our options or yours to take advantage of the very fast stored data-drawing capability of the GMA 101A - 3900 inches per second. At this drawing rate, the entire screen can be redrawn in less than one second, permitting effective zooming or panning. In addition, data or picture editing can proceed with minimal thought-process interruption. You can achieve high density interactive graphics while freeing your computer to address the application rather than drive the display.

The GMA 102A — storage and refresh. With the GMA 102A, you can display up to 1575 vector inches (30 Hz refresh rate) of refresh data while simultaneously having all of the benefits of storage technology. The stor-



age mode presents high resolution, high density graphics at low cost, while the refresh feature adds the benefits of selective erase, interactivity and dynamic motion with the same high resolution of storage. By placing fixed or finalized data in store while retaining dynamic or working data in refresh, you can achieve high density, interactive graphics while making maximum use of your computer to address the application task rather than support the display.

Operation — both instruments. All display functions are completely programmable and designed to interface to TTL logic. They are Write-Thru (GMA 102A only.) Non-Store; Brite, Defocus, Center, Copy, Erase, View and G Busy.

Options Addressed to the OEM. Both instruments in the standard display format are driven as X-Y directed beam displays using analog inputs. Both have clear glass light filters and are compatible with Tektronix hard copy units. On either, the display can be supplied with the CRT module tilted as far back as 15° or oriented in either the horizontal or vertical (page) format. Space has been left in the card cage for you to add up to three circuit boards with your application options. Additionally, on the GMA 102A, our Option 42 Vector Generator or Option 43 Vector/Character Generator can be plugged into two of these positions to give you a completely digital interface (16 bit word format plus control and status signals).

On both instruments, you can use your interface connector or ask for our Option 34 (analog) or Option 35 (digital) connector as appropriate.

#### **GMA 125**

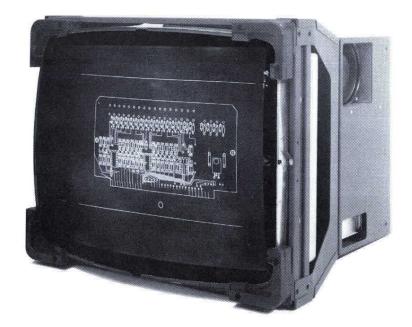
The GMA 125 was designed exclusively for systems builders, and is intended to satisfy display applications of the greatest size and complexity. It incorporates 65 percent more workspace than even our own previous industry leaders, the 483 mm (19") GMA 101A and GMA 102A. Like other members of the GMA series, it provides low cost, high resolution, storage tube graphics and unique flexibility of performance, interfacing and packaging.

Further, the GMA 125 offers that same powerful combination of simultaneous storage and refreshed displays that was first provided in the GMA 102A.

The detail of storage. The dynamics of refresh. The GMA 125 features a 635 mm (25") CRT that offers unequaled information display capacity. Adjacent points that would be indistinguishable on a smaller screen can be seen as distinct units on the GMA 125. It is ideal for group viewing and for greater graphics detail. A new 110° CRT provides greater display brightness with less energy consumption in a more compact package.

The GMA 125 will display up to 1968 vector inches of refreshed data, enabling all the benefits of selective erase, interactivity and dynamic motion with the same high resolution of storage.

By placing fixed or finalized data in store while retaining dynamic or working data in refresh, you can work interactively with high



density graphics and alphanumerics while making maximum use of processing power to address the application rather than support the display.

Modular design assures ideal building economy. Order CRT, chassis and power supply only, or configure your GMA 125 to best fit your own manufacturing capabilities and system specifications. The welded-steel, symmetrically structured chassis may be rotated vertically or horizontally, and tilted to any degree. Space is left in the card cage for your own application options. Or you can plug in our Option 42 Vector Generator or Option 43 Vector/Character Generator to provide you with a completely digital inter-

face (16 bit word format plus control and status signals). You can use your interface connector or our analog or digital interface options.

Colored light filters and several other support options are also available.

Operation. The standard display instrument is driven as an X-Y directed beam display using analog inputs. The CRT beam is positioned at center screen with zero volts applied. All other display functions are completely programmable and designed to interface to TTL logic. The display functions are Write-Thru, Non-Store, Brite, Defocus, Center, Copy, Erase, View and G Busy. The Zaxis input is a digital signal.

# **Image Forming Modules**

# **4633A (OEM Only)**

Line scan recorder

Black on white or gray scale

**Excellent resolution** 

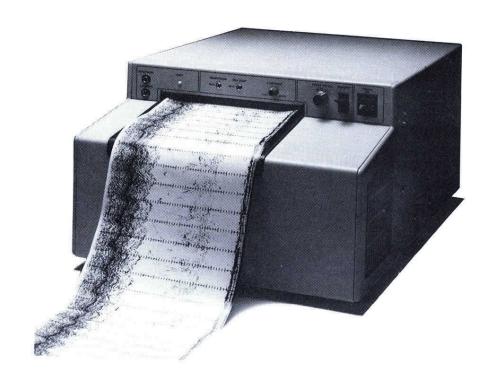
Low copy cost

100 mm/s paper speed

The Tektronix 4633A Continuous Recorder is designed to provide hard copy output from systems that provide a Z-axis input signal simultaneously with an X-axis (horizontal ramp) signal. It is uniquely suited to the requirements of the medical echocardiography market and can also be modified to suit other applications where there is a need for recording real time data.

The 4633A has three basic speeds, selectable on the front panel: 10 mm/s, 25 mm/s, and 50 mm/s. Another switch allows the operator to double each of the three basic speeds. This provides a maximum speed capability of 100 mm/s and also gives the operator considerable operational flexibility.

The 4633A is available as either a rack-mount or benchtop model. The rackmount version fits into any standard 19-inch (482.6 mm) rack.



The medium: high performance/low cost, dry process, full-size paper. The 4633A is designed for high performance/low cost dry silver paper: The state of the art in dry process gray scale.

After the paper has been exposed by a fiber optic CRT, it passes through a processor, where the latent image is thermally developed. The developed image is trans-

ported by a conveyor through an opening in the front panel.

Unwanted interruptions will be minimal. Big 500-foot paper rolls mean few time-outs for reloading. The paper is a full 8½" wide.

The 4633A's image quality, convenience, reliability, and competitive pricing combine to make it a valuable component of an OEM system.

### 4634

Photographic quality images

Excellent gray scale and resolution

Compatible with most raster scan video systems

Dry, quick, convenient process

Large, file-sized image

Low copy cost

The Tektronix 4634 Imaging Hard Copy Unit is designed to record images of photographic quality from raster scan video sources. It is suited to a variety of industrial, commercial and medical imaging applications.

The 4634 is easily coupled to video sources, both analog and digital. It can be adjusted to accommodate a wide range of line rates: from 525-1029 lines interlaced, and from 256-512 lines non-interlaced for both 50 Hz and 60 Hz systems. If image size is reduced, higher line rates are achievable.

The 4634 is available as either a rackmount or benchtop model. The rackmount version fits into any standard 19 inch (482.6 mm) rack.

The 4634 uses a cathode ray tube (CRT) to expose the image on dry silver paper. A



fiber optic faceplate on the CRT effectively couples the light output to the paper, providing photographic quality images of fine detail.

After exposure, the image is developed in a Thermal Processor. The entire process of exposure and development is completed in just 26 seconds. The costs of space, equipment, and labor associated with wet process films are eliminated.

Users may select two types of paper: standard performance for lowest cost per image, and high performance for optimal image quality. Both paper types are significantly less expensive than film.

The combination of high image quality, operational simplicity, speed and convenience, and low cost makes the 4634 Imaging Hard Copy Unit an excellent choice for a wide variety of raster scan video applications.

Computer Graphics Products OEM Image ng Plug-in Oscilloscopes Portable Os loscopes Logic Analyzers Data Comr Testers General Purpose Instruments Signal Processing Systems Semicond Test Systems CurveTracers CableTes ers Microcomputer Development Prod TV Demodulators, Vectorscopes, Gen erators, Waveform & Picture Monitors Automatic Measurement System Spe trum Analyzers & Swept Frequency Sy Testers-TDR Photometer/Radiomete Cameras, Probes, Carts, & Accessorio



# INFORMATION DISPLAY DIVISION

Vision is the most effective human channel of communication. Computer graphics translate computed data to quickly and easily understood visual forms. For statistical mapping or mechanical design, Tektronix provides monochrome and color displays, desktop computers, copiers, plotters, software and peripherals to answer the graphics needs of scientists and engineers. Mickey Westhoff, division sales manager for the Information Display Division presents two 4110 Series Computer Display Terminals, designed to be compatible with existing product lines and offer maximum efficiency with enhanced communications and local intelligence.



# COMPUTER GRAPHICS PRODUCTS

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#### "The Graphic Standard"

Tektronix has set the standard in computer graphics for the past 13 years. We continue in the same tradition with the introduction of new products like the 4110 Series. Designed to be compatible with existing product lines, the 4110 Series offers enhanced communications and local intelligence for maximum efficiency. These new products join a broad range of graphics equipment including desktop computers, color and monochrome display terminals, hard copy and storage devices, graphics software and peripherals.

For additional product information and details on interfacing, software and accessory support, please indicate your interest on the reply card enclosed in your catalog.







Raster Scan Monochrome Display

**Local Picture Segments** 

2-D Transforms, True Zoom and Pan up to 3 Memory Planes

Compatible with TEKTRONIX 4010 Series

New economies of communications traffic and CPU time. The 4112 capitalizes on many conveniences and special capabilities of a raster scan display. Designed to satisfy a broad range of evolving needs, from basic line graphs to high density design, the 4112 provides access to an unusually wide assortment of graphics capabilities. Its powerful local intelligence keeps user interactivity high and host dependency low.

The 4112 is designed to be compatible with the popular Tektronix 4010 Series of computer display terminals. Programs developed for the 4012 or 4014, for example, may require only minor software revisions—mostly to account for new expanded capabilities—in order to run on the 4112. By using the modular device drivers and advanced feature support of the TEKTRONIX PLOT 10 Interactive Graphics Library (IGL), updating existing programs for the new 4112 features is a simple process.

In addition, there is great commonality among all members of the new 4110 Series. The selection allows you to specify the best terminal for each need, without significant investment in increased operator training or software.

The 4112 offers a bright, flicker-free 381 mm (15 in) raster scan display with a viewable resolution of 640 x 480 points, augmented by 4096 x 4096 point addressability and by zoom and pan.

In addition, the user can specify as many as 64 viewports for simultaneous display of multiple design perspective, or for any other consolidated presentation of related information. Each viewport can be zoomed into and out of individually.

The 4112 incorporates several valuable local features that enhance user interactivity and graphics capacity, while radically reducing the load on the host and the volume of communications traffic. These features include:

Local picture segments. A local picture segment is a group of graphic primitives that describes a portion or segment of a picture. These primitives are retained in the terminal's memory to be redrawn and manipulated at any time by using the 4112's local "segments" capability. Eight programmable function keys are provided for user-definable functions that may be used locally.

Schematic components, symbols, titles and text can be defined as segments, for example, then stored in local memory and redrawn when needed, with minimal computer time and communications traffic required.

**2-D Transforms.** Local segments may also be rotated, scaled or moved around the screen, by a simple command from the host processor.

**Zoom and pan.** An addressable display space of 4096  $\times$  4096 points is accessible locally by simple, key-actuated zoom and pan or via the host. The thumbwheel controls are used to pan the display with a rectangular cursor and to set the viewport dimensions of the magnified image.

**Multiple display memory planes.** Optionally, two additional bit map buffers, or memory planes, may be added to the 4112, providing as many as three display surfaces. This capability enables a number of effects, including overlays of text and/or graphic information.

Tektronix offers maintenance training classes on instruments in the 4112 Intelligent Terminal. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.

Secondly, the memory planes can be used to create gray scale effects, with up to eight shades of gray/displayable at once. A panel flooding feature enables easy fill-in of closed figures with gray scale or with patterns.

**Definable dialog area.** At any time, the user can specify the size and position of the region where communications between terminal and host are displayed. This dialog area is scrollable by the thumbwheels, allowing for easy recall of previous communications.

**Memory.** The standard 4112 memory consists of 32k bytes of RAM and 72k bytes of ROM. It is expandable incrementally up to a total of 672k bytes RAM.

An optional, integral flexible disk drive can be specified to add a total 494k bytes per disk of off-line mass storage with disk drive.

#### **CHARACTERISTICS**

#### DISPLAY

Medium — Raster-scan CRT.

Display Area — 220 mm x 254 mm (8.6 in x 11.5 in).

Phosphor Type - White P4

Scan Type — 60 Hz non-interlaced or 50 Hz non-interlaced (optional).

#### KEYBOARD

Normal Keyboard — 72 typewriter paired upper and lower case, programmable and auto repeating (seven lighted).

8 user-definable programmable function keys, 4 terminal control keys, and 4 special keys for zoom and pan functions.

Other Controls — Thumbwheels contol graphic cursor, zoompan function, and scrolling.

#### ALPHANUMERIC MODE

Standard Character Set — Full ASCII set of 94 displayable characters.

#### **GRAPHICS MODE**

Resolution — 640 horizontal by 480 vertical pixels.

Addressability — 4096 x 4096 points.

**Gray Scale** — Eight levels of gray scale are provided if two optional (three total) memory planes are included.

Interactive Graphics — Thumbwheels in the keyboard control a graphic cursor. The graphic cursor may have its shape defined by the user (with hardware cross-hairs as default). The user can also control zooming, scrolling, and the alpha cursor position by keyboard keys.

Computer Interfaces — Basic data communications interface, EIA RS-232C compatible, full or half-duplex.

Flexible Disk Characteristics — (Option 42)

8 in single-sided double-density disk.

Direct memory access.

## ORDERING INFORMATION 4112 Computer

#### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 Universal Euro 220 V/16A	No	Charge
Option A2 UK 240 V/13A	No	Charge
Option A3 Australian 240 V/10A	No	Charge
Option A4 North American 240 V/15A	No	Charge





**Direct View Storage Tube** 

**Local Picture Segments** 

2-D Transforms, Refresh Support and Fast Redraw

Compatible with TEKTRONIX 4010 Series

New standards of fast graphics throughput. Enhanced user interactivity with reduced host overhead. The 4114 has been designed to satisfy the evolving needs of graphics users for faster, more versatile throughput in high density graphics applications. Its local intelligence and expandable memory can significantly reduce the delays and costs associated with overdependence on the host computer.

The 4114 has been designed to be compatible with the popular TEKTRONIX 4010 Series of computer display terminals. Programs developed for the 4014, for example, may require only minor software revisions—mostly to account for expanded capabilities—in order to run on the 4114. By using the modular device drivers and advanced feature support of the TEKTRONIX PLOT 10 Interactive Graphics Library (IGL), updating existing programs for the new 4114 capabilities is a simple process.

In addition, there is a great commonality among all members of the new 4110 Series: project teams can share programs and peripherals while utilizing the 4110 Series terminal best suited for each application's need.

The display: more to see than ever. The 4114 is designed around a 483 mm (19-inch) directview bistable storage tube. Its 4096X by 4096Y addressable points (4096X by 3120Y displayable points) provide resolution high enough for the most complex engineering and scientific graphics. The 4114 offers enhanced text display with as many as 16 hardware-generated sizes of stroke upper-and-lower case ASCII characters. A large number of dot-dash line styles and markers, plus rubberbanding capability, simplify graphics development. Thumbwheel-controlled symbols enable easy placement and revision of display elements.

An intelligent evolution of graphics efficiency. Through its advanced local intelligence and its capacity to do much more per host command, the 4114 achieves new standards of productivity. Specific features of this intelligence include:

**Local picture segments.** A segment is a group of graphic primitives describing a portion or segment of a picture, retained as a unit in local memory to be redrawn or manipulated at any time by using the 4114's local "segments" capability.

**2-D transforms.** Local segments can be rotated, scaled or moved around the screen, with only a simple command from the host.

**Refresh support.** More than 1500 cm or approximately 3000 short vectors of flicker-free refresh.

Color enhanced refresh option for easy recognition of refresh information, for high density applications and those with a great deal of refresh manipulation, the Color Enhanced Refresh (Option 31) presents all refresh vectors in amber, for clear contrast with stored vectors.

**Memory.** Standard 4114 memory includes 32k bytes of RAM and 56k bytes of ROM. RAM memory is expandable up to 800k bytes total.

**Fast redraw augments the powers of local intelligence.** 26,000 short vectors may be redrawn in under 1/2 s.

**Definable, refresh dialog area.** The user may define the size and location of a scrollable dialog area—all in refresh. This area can be redefined and repositioned at any time.

Mass storage option. Single or dual integral flexible disk drive mass storage may be specified, for convenient local storage of segments, fonts, macros, and completed graphic displays. Each disk offers a 494k byte capacity.

#### CHARACTERISTICS

#### DISPLAY

Medium — Direct view storage tube 4096 x 4096 addressable points; 4096 x 3120 displayable points; Enhanced refresh; Fast redraw

Display Area — 368.3 mm x 276.9 mm (14.5 in x 10.9 in).

#### KEYBOARD

Normal Keyboard — 72 typewriter paired upper and lower case, programmable and auto repeating, (five lighted).

Eight user-definable programmable function keys. Thumbwheels to control graphic cursor

#### ALPHANUMERIC MODE

Standard Character Set — Full ASCII set of 94 displayable characters.

Flexible Disk Characteristics — (Options 42 and 43)

8 in single-sided double-density disk.

IBM compatible soft-sectored recording format.

Cyclic redundancy checking and automatic data recovery retry for reliability.

Direct memory access.

#### ORDERING INFORMATION

4114 Computer Display Terminals .	\$17,500
Option 31 Color Enhanced Refresh	Add \$2000
Option 42 Single Flexible Disk and	
Disk Controller	Add \$2800
Option 43 Dual Flexible Disk and Disk Controller	Add \$4200

#### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 Universal Euro 220 V/16A	No Charge
Option A2 UK 240 V/13A	No Charge
Option A3 Australian 240 V/10A	No Charge
Option A4 North American 240 V/15A	No Charge

Tektronix offers maintenance training classes on instruments in the 4114 Intelligent Terminal. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.

#### 4014-1/4015-1

483 mm (19 in), Direct-View Storage Display

Selectable Formats in Alphanumeric and Graphic Modes

High-Resolution, Interactive Graphics Capability

Plug-In Intelligence Options

**APL Character Set Available** 

We've added some intelligent choices to the choicest of graphics. Tektronix' famous 4014-1 has long been a favorite for display of large data bases and precise detail. Its flicker-free 483 mm (19 in) screen offers priced-right performance for applications in mapping, design, manufacturing, medicine, energy exploration and many other diverse disciplines.

Firmware options provide up to 26k of graphics memory for local symbols, stroke-drawn characters, overlays, or background graphics which can be redisplayed on command from the host or keyboard. Reduce data transmission as you redraw portions of your graphics from local memory and generate circles and arcs by a single command. Add local scaling, rotation, and clipping of graphics. Buffered communications with the host and keyboard. Reduce CPU connectime trough local control of graphic tablets, plotters, and tape and disk storage. A variety of optional intelligence designed to help you keep up with new methods in mapping, process layout, financial graphing and many other applications.

Big Screen. Big Features. The 4014-1 and 4015-1 offer 1024 (X) by 780 (Y) displayable points standard and up to 4096 (X) by 3120 (Y) displayable points with the optional Enhanced Graphics Module. Its 12 million point capability is more than sufficient to solve most complex mapping and design tasks. Full 96-character ASCII includes four program-selectable alphanumeric formats which display up to 8512 characters at once

Of course, the 4014-1 and 4015-1 are immediately compatible with the full range of Tektronix peripherals, including the 4631 and 4611 Hard Copy Units, the 4923 Digital Cartridge Tape Recorder, B-Size 4662 and C-Size 4663 Interactive Digital Plotter, plus others. Optional minibus extender allows expanded accessory and peripheral capability. And TEKTRONIX PLOT 10 Software provides a library of proven graphics packages. PLOT 10 offers versatile modular software for all levels of users. PLOT 10 Terminal Control System to link to existing applications, PLOT 10 Easy Graphing for rapid generation business or scientific graphs. For device independent applications projects add our PLOT 10 Interactive Graphics Library.



**Previews and overviews.** Interactive previewing on the 4014-1 can lop considerable time off normal plotter trial-and-error. As a cartographer's tool, for instance, the 4014-1 will draw precise maps of cities, states, and land formations, and isolate and enlarge those areas you choose.

The 4014-1 has become standard equipment to many phases of research, medicine, engineering, business, energy-related fields, cartography, manufacturing and others where its price/performance practically lends itself.

#### CHARACTERISTICS

Display Medium — Direct View Bistable storage CRT.

Display Area — 381 mm x 279 mm (15 in x 11 in).

**Alphanumeric Mode** — 4014-1 Full ASCII character set (94 printing characters).

4015-1 Full ASCII and APL character sets (188 total printing characters).

Character Format — Four program-selectable formats:

- 1) 74 characters per line with 35 lines per display.
- 2) 81 characters per line with 38 lines per display.
- 3) 121 characters per line with 58 lines per display.
- 133 characters per line with 64 lines per display.
   Alphanumeric Cursor 7 x 9 dot pulsating cursor.

**Keyboard** — Typewriter paired upper and lower case with auto repeating keys 4015-1 adds APL character set.

**Graphics Mode** — Vector drawing time 5,000 in/s (127 m/s). **Information Density** — 1024 (X) by 1024 (Y) addressable points (10 bits). 1024 (X) by 780 (Y) viewable points.

Interactive Graphic Mode — Thumbwheel controlled crosshair cursor. 3 thru 1024 addressable points horizontally. 0 thru 780 addressable points vertically.

Computer Interfaces — Basic Data Communication Interface. EIA RS-232-C compatible. Full Duplex.

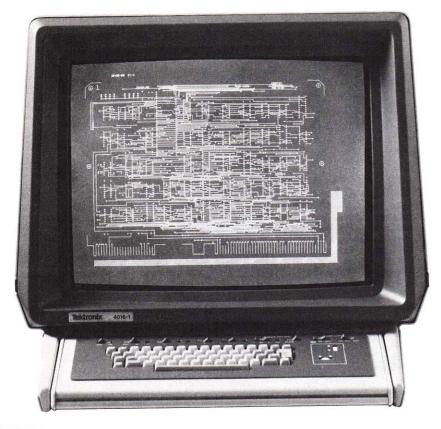
We also offer a range of optional interfacing designed for communications with most of the widely used mainframes and minicomputers.

#### ORDERING INFORMATION

4014-1 Computer Display Terminal with Standard Data Communications
Interface \$14,775
Option 34, Enhanced Graphics Module
(factory installed only) Add \$925
4015-1 Computer Display Terminal with Standard Data Communications
Interface \$16,900
Option 34, Enhanced Graphics Module
(factory installed only) Add \$925

OEM terms available on these products.

Tektronix offers maintenance training classes on instruments in the 4010 DVST Graphic Terminal Series. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.



#### 4016-1

636 mm (25 in) Direct-View Storage Display

High-Resolution, Flicker-Free Graphics

Selectable Formats in Graphic and Alphanumeric Modes

Plug-In Intelligence Options

The easiest viewing, most exceptional graphics ever. The 4016-1 was built for designers of electronic circuit boards, utility networks, automotive components, schematic diagrams, street maps or similar applications who need to work with fine detail while maintaining the total picture perspective.

With its big 636 mm (25 in) diagonal screen, 4096 (X) by 3120 (Y) viewable points, and finely etched 10 mil wide vectors, the 4016-1 is uniquely suited for displaying highly complex graphics. Using a Direct View Storage Tube (DVST) display, graphic lines are sharp, stable and flicker-free, simplifying the study of fine details. Thumbwheel-controlled crosshair cursor makes it easy to interactively manipulate the display.

Over 15,000 displayable characters. Besides enabling display of more high density graphic information than any other terminal available, the 4016-1 provides high density alphanumerics for applications, from graphic labeling to newspaper page layout. Over 15,000 characters may be displayed simultaneously and may be formatted as 179 alphanumeric characters per line, like a line printer, or in two 85 character columns, like an open book.

Three other larger character formats are standard with the 4016-1, the largest of which is suitable for group viewing.

Complete TEKTRONIX 4014-1 compatibility. The 4016-1 is compatible with 4014-1 application software, communication support, and other Tektronix peripheral devices. The 4016-1 is supported by the family of PLOT 10 Software products.

Plug-in intelligence. Using the modular 4010 bus structure, add-on low-cost options include up to 26k of usable graphics display memory, scaling, relative graphics, clipping, circular arc generation, rotation by 1° increments, user definable stroke characters, programmable keyboard, GPIB interfacing to the intelligent 4924 Digital Cartridge Tape Drive, 4907 File Manager, and 4662 and 4663 Interactive Digital Plotters, plus the 4953 or 4954 Graphics Tablet.

Commands also allow a user to digitize data with distance, time, or gradient filtering; edit graphics from a host computer, local 4907,4924 storage device or Option 40 programmable keys. Implement off-line plotting by accessing data via local storage devices.

Added enhancements. The 4016-1 includes a convenient detachable keyboard and detachable display.

Other standard enhancements include hardware generated solid, dashed, and dotted lines; point plotting with software controllable point sizes and incremental "relative graphics" plotting.

Hard copy compatibility provides 216 mm x 279 mm (8 1/2 in x 11 in) hard copies from our dependable, dry-process 4631 and 4611 Hard Copy Units.

#### CHARACTERISTICS

**Display Medium** — Direct View Bistable storage CRT. Written image bright green on green background.

Display Area — 454 mm x 340 mm (18 in x 13.5 in).

Character Set — Full ASCII character set (94 printing characters).

#### Standard Character Format

- 1) 74 char/line by 35 lines.
- 2) 81 char/line by 38 lines.
- 3) 133 char/line by 64 lines.
- 4) 179 char/line by 86 lines.

#### Optional Character Formats

- 1) 74 char/line by 35 lines.
- 2) 81 char/line by 38 lines.
- 3) 121 char/line by 58 lines.
- 4) 133 char/line by 64 lines.

Alphanumeric Cursor — 7 x 9 dot pulsating cursor.

**Keyboard** — Typewriter paried upper and lower case with auto repeating keys.

**Graphics Mode** — Vector drawing time is 8000 in/s (20,000 cm/s).

**Information Display** — 4096 (X) by 4096 (Y) addressable points (12 bits). 4096 (X) by 3120 (Y) viewable points.

Vector Formats — 5 formats, including straight, dotted and dashed lines.

**Point Plotting Modes** — Point Plot Mode: special Point Plot Mode absolutely addresses points with program control of plotted point size. Incremental Plot Mode relative addressing 1 of 8 directions, one step at a time.

Interactive Graphic Mode — Thumbwheel controlled crosshair cursor. 0 thru 1023 addressable points horizontally. 0 thru 780 addressable points vertically.

Hard Copy Mode — Switch selectable hard copy of screen using the 4611 or 4631 Hard Copy Unit.

#### ORDERING INFORMATION

INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 Universal Euro 220 V/16A	No Charge
Option A2 UK 240 V/13A	No Charge
Option A3 Australian 240 V/10A	No Charge
Ontion A4 North American 240 V/15A	No Charge

OEM terms available on these products.

Tektronix offers maintenance training classes on instruments in the 4010 DVST Graphic Terminal Series. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.



NEW 4027A

Full Color Graphics and Alphanumerics

**PLOT 10 Compatible** 

**Fully Supported Color Capability** 

**Dynamic Displays Created Easily** 

Tektronix makes it practical to add the color dimension. The 4027A offers all the easy data entry, scrolling, and graphics capabilities of the Tektronix high performance 4020 raster-scan family. Most importantly, it provides the kind of fully supported color capability you could expect only from the world's graphics leader.

Full-color graphics, easy to grasp. Colors are selected from a 64-color palette with up to eight colors displayable simultaneously. For specifying lightness, saturation and hue, you'll find the 4027A system as easy as it is versatile.

Local capabilities include colored vectors, characters, symbols, and polygon fill. Firmware enables a second color to border the polygon ... and allows user selection of up to 120 different patterns or color combinations for special applications. Because the capabilities are initiated by firmware, not software, 4027A operation makes minimal demands on host computer communications.

Easy-to-use graphic software. For graphic representation, the 4027A uses color-enhanced PLOT 10 Easy Graphing Software. Easy Graphing simplifies even non-programmer construction of up to six curves or colored bar charts, line graphs with special symbols and dashed lines, legends, titles, and grids.

For more general color graphic applications, Tektronix offers the new PLOT 10 Interactive Graphics Library. IGL is a highly modular package offering all the support commonly required in graphic applications such as 3-D, color panels, line smoothing and many character fonts. PLOT 10 IGL is upward and downward compatible with the full line of Tektronix graphic display terminals.

Graphic input. Graphic input capability consists of a graphic crosshair cursor controlled by graphic cursor keys. In addition to reporting the coordinates back to the host, the terminal also reports the color of the designated coordinate.

Up to 32k bytes of built-in display memory, and up to 192k bytes of graphic memory, allow the same scrolling, dual screen and multiple field formatting featured in other 4020 Series Terminals.

The optional video signal output allows connection of the 4027A to external video displays for group viewing and presentations.

Gray scale representations of 4027A color displays can be made with a TEKTRONIX 4632 or 4612 Video Hard Copy Unit. Detailed, cameraready color copies of graphs and alphanumeric data can be made on paper or acetate via the TEKTRONIX 4660 Series of Interactive Digital Plotters.

To the standard full duplex, 4027A interface options add half duplex, current loop, polling interface and IBM 3270 compatible polling controller.

All this and alphanumerics, too. In addition to graphic capabilities, the 4027A's extensive alphanumeric capabilities include full ASCII, special and user-definable character sets, and 34 rows of 80 characters.

#### CHARACTERISTICS

Display Size — 254 mm x 191 mm (10 in x 7.5 in).

Graphics - Standard with full screen crosshair cursor.

Color — 8 colors displayable, colors selected from a pallette of 64 colors.

Patterns — 120 user definable color patterns.

Local Functions — Circle and pie generation, polygon fill.

Other 4027A Specifications — Same as 4025A.

Order 4027A Color Graphics

Terminal ...... \$10,000

OEM terms available on these products.

Tektronix offers maintenance training classes on instruments in the 4020 Raster Scan Terminal Series. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.



# NEW 4025A

From Alphanumerics To Graphics

**ASCII Character Set and Finger Tip Editing** 

Forms Ruling Option Available

The 4025A creates the perfect marriage of alphanumerics and graphics. You can create and store multiple graphs in memory, create multiple graphs per page, and scroll graphics along with alphanumeric information.

The 4025A gives you the ability to expand a computer terminal from basic alphanumerics, to forms ruling and then to graphics. No other terminal has such versatility up to and including the capacity for unsurpassed report generation.

Start with an ASCII character set and finger-tip editing. In its simplest configuration, the 4025A can display a full 34 lines of 80 characters each on its 279 mm (12 in) diagonal display screen. Complete upper-and lower-case ASCII character set is provided. Green-on-black display with adjustable brightness level keeps even long sessions easy on the eyes.

The 4025A Forms Ruling option can duplicate essentially any form. Visual attributes include enhanced blinking, inverted and underlined fields. Logical attributes include protected fields, modified, alphanumeric or numeric only.

The "send modify" command streamlines data entry by transferring only the modified, keyed-in data to the host. The fixed format remains, ready for the next series of entries. Develop or duplicate forms of any complexity with a variety of single and multiple horizontal and vertical rules selected from the Ruling Character Set. Expandable memory and scrolling let you create forms far beyond the length of the display screen.

To make data entry and editing easier, you can divide the display screen into two separate display areas, each with independent scrolling. You use the monitor area to communicate with the host and the workspace area for the form itself.

The PLOT 10 Easy Graphing Software package lets you interactively create bar charts with multiple shadings, histograms, log plots, pie charts and period axes, all with a wide variety of labeling options.

The keyboard, an office typewriter configuration, is immediately familiar to new users. Pre-defined editing keys simplify insertion, deletion and input of lines and characters. Thirteen user-defineable keys, plus nearly all other keys on the keyboard can be redefined to generate a command or character string at the touch of a finger.

A 16k memory is standard with the 4025A display, expandable to 32k, allowing buffering and scrolling of hundreds and even thousands of words.

Using TEKTRONIX 4631 and 4612 Hard Copy Units you can duplicate on-screen and buffered displays of up to 80 characters by 53 lines. The 216 mm x 279 mm (8 1/2 in x 11 in) copies are clean, dry, and sharp. For detailed, camera-ready copies of graphs and alphanumeric data, choose the TEKTRONIX 4662 Interactive Digital Plotter. The dependable 4642 Printer gives you copies of alphanumeric output only. The 4924 Digital Cartridge Tape Drive provides an inexpensive method of storing forms, graphic formats and other data

Using the optional 4025A polling controller, you can poll multiple terminals on a single data communications line.

#### CHARACTERISTICS

**Display Size** — Video monitor display on 229 mm x 163 mm (9 in x 6.4 in).

Raster Lines — Standard 525 line scan with 480 lines displayed.

Character Set — 64/96 upper and lower case ASCII (optional character sets available).

**Alphanumeric** — Mode format is 34 lines, 80 characters per line, 2720 characters full screen.

Character — Generation — 7 x 9 in an 8 x 14 dot matrix (graphic cells are 8 x 14 matrix).

Cursor — Wide underscore.

Baud Rate — Selectable to 9600 baud.

Graphics — Optional.

# ORDERING INFORMATION 4025A Computer Display Terminal .......\$5200

OEM terms available on these products.

Tektronix offers maintenance training classes on instruments in the 4020 Raster Scan Terminal Series. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.



#### 4006-1

**Low Cost** 

Flicker-free High Resolution

Graphic and Alphanumerics

The 4006-1 is one of four solutions towards making interactive, high-resolution graphics affordable to cost-conscious disciplines and departments. Priced no more than many alphanumeric terminals, the 4006-1 makes graphic capability practical for the stock room, the classroom and the conference room as well as for other graphic applications.

The 4006-1 connects readily to most mainframes, thanks to its RS-232-C interface. With a screen capacity of 2590 alphanumeric characters in addition to graphics capability, the 4006-1 can work in configuration with existing alphanumeric terminals to interpret statistics and coordinates into meaningful charts, tables, graphs and diagrams.

#### CHARACTERISTICS

**Display Medium** — Direct View Bistable Storage CRT. **Display Area** — 190.5 mm x 142.2 mm (7.5 in x 5.6 in).

Alphanumeric Mode Format — 35 lines, 74 character per line. 2590 characters full screen.

Character Set — 63 printing characters (TTY ANSI Code).Character Generation — 5 x 7 dot matrix.

Cursor - 8 x 8 dot matrix.

**Graphics Display Mode** — Vectors only. Vector drawing time, 3.6  $\pm$  0.2 ms.

**Information Density** — 1024 (X) by 1024 (Y) addressable points. 1024 (X) by 780 (Y) viewable points.

**Baud Rate** — Transmit and receive independently. Selectable from 75 to 4800 baud.

#### ORDERING INFORMATION

4006-1 Computer Display Terminal ... \$3600 Option 01, Data Communications Interface ....... Add \$385

Tektronix offers maintenance training classes on instruments in the 4010 DVST Graphic Terminal Series. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.



#### 4010-1

Supports Alphanumerics Plus Low-Cost Computer Graphics

Convenient Bus Structure for Peripheral Add-On

Complete PLOT 10 Software Support

**Graphic Input** 

The 4010-1 Computer Display Terminal is an easy to use, cost effective tool that brings out the best of Tektronix' famous graphics capability. Included are flicker-free display, high-resolution graphs, charts, diagrams and renderings produced on a matrix of 1024 (X) by 780 (Y) viewable points and interactive graphics construction via thumbwheel cursor control.

The standard TTY-style keyboard enables easy data entry. Command of both alphanumeric and graphic display is so immediate that hours of hand drafting can become the matter of a few seconds.

#### CHARACTERISTICS

Display Medium — Direct View Bistable Storage CRT.

Display Area — 190.5 mm x 142.2 mm (7.5 in x 5.6 in).

**Alphanumeric Mode Format** — 35 lines, 74 characters per line, 2590 characters full screen.

Character Set — 63 printing characters (TTY ANSI Code).

Character Generation —  $5\times7$  dot matrix with MOS Read-Only Memory. 1200 characters per second.

Cursor — Pulsating 5 x 7 matrix.

**Graphic Display Mode** — Vectors only. Vector drawing time 2.6 ms.

**Information Density** — 1024 (X) by 1024 (Y) addressable points.

1024 (X) by 780 (Y) viewable points.

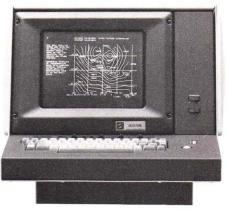
**Graphic Input Mode** — Thumbwheel controlled cross-hair cursor. 3 through 1023 (X) 0 through 780 (Y).

#### ORDERING INFORMATION

4010-1 Computer Display Terminal with Standard Data Communication Interface ......\$5900

INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 Universal Euro 220 V/16A	No Charge
Option A2 UK 240 V/13A	No Charge
Option A3 Australian 240 V/10A	No Charge
Option A4 North American 240 V/15A	No Charge



#### 4012

High-Resolution, Flicker-Free Graphics

Full Upper and Lower Case ASCII Character Set

## Conventional Bus Structure For Peripheral Add-On

The 4012 combines the world's leading graphics with complete alphanumerics. Alphanumerics can tabulate computer data, but graphics can amplify that data into usable, immediately meaningful information. High-resolution graphic presentations and the full upper and lower-case ASCII alphanumerics are available in the 4012.

The flicker-free screen provides up to 1024 (X) by 780 (Y) viewable graphic points or as many as 2590 A/N characters per display. The TTY-style keyboard simplifies input while the thumbwheel controlled crosshair cursor enhances graphic interactivity. With thumbwheel control, user can direct the X-Y cursor for speedy additions or deletions of data to the display screen.

#### CHARACTERISTICS

Display Medium — Direct View Bistable Storage CRT.

Display Area — 203 mm x 152 mm (8 in x 6 in).

**Alphanumeric Mode Format** — 74 characters per line; 35 lines per display; 2590 characters per display.

Alphanumeric Cursor — Pulsating 7 x 9 dot matrix.

Character Set — 94 printing characters on 7  $\times$  9 dot matrix. (Full ASCII code).

Character Size — 85 mils x 105 mils.

Character Generation — 7  $\times$  9 dot matrix with MOS Readonly Memory. 1,000 characters per s.

Graphic Mode — Vectors only. Vector drawing time 2.6 ms.

Graphic Matrix — 1024 (X) by 1024 (Y) addressable points.

1024 (X) by 780 (Y) viewable points. **Graphics Input Mode** — Thumbwheel controlled cross-hair

cursor. 3 through 1023 (X) 0 through 780 (Y).

#### ORDERING INFORMATION

INTERNATIONAL POWER CORD AND PLUG OPTIONS

The second secon	21 110143
Option A1 Universal Euro 220 V/16A	No Charge
Option A2 UK 240 V/13A	No Charge
Option A3 Australian 240 V/10A	No Charge
Option A4 North American 240 V/15A	No Charge

OEM terms available on these products.



# PLOT 10 Graphic Software Library

PLOT 10 is the world's leading commercial graphics library. Versatile, modular, and fully documented, it lets you start with only the code you need to do your job, then expand with modules and utilities to develop more sophisticated or specialized applications. PLOT 10 builds to high-level, "cookbook" solutions such as Englishlike commands for business applications and other non-programmer environments.

PLOT 10 Includes the following packages: Terminal Control System (TCS) — A composite of FORTRAN IV subroutines, TCS contains the basic building blocks for all graphic operations. It permits modular as well as system independent programming, and supports such basic graphic functions as windowing, clipping and rotation for DVST terminals and 4660 Series Plotters.

Plotter Utility Routines — These routines link your data base, terminal and TEKTRONIX 4660 Series plotters to enable easy, powerful command of multicolored graphs, charts, maps and renderings. Digitizing is just as versatile by using the built-in joystick.

**Advanced Graphing Package** — AG II subroutines let a programmer tailor the size, shape and format of graphs, specifying more than 40 graphic elements.

Interactive Graphing Package — IGP simplifies the task of graph storage, editing, recall and updating, so a user with little or no programming experience can create a presentation quality graph, on DVST terminals.

**Easy Graphing** — A straight forward English language command structure that gives the non-programmer wide-ranging command of graphics in business and engineering decision-making tasks.

Interactive Graphics Library — IGL is a uniquely modular system of I/O, device drivers, primary commands and advanced feature support that lets the user move at will among any Tektronix display devices or technology. Advanced options such as color panel filling, many character fonts, segments and 3-D may be added

#### ORDERING INFORMATION

For 4110, 4010 Series Terminals. 4006-1, 4025A and 4027A color display.

Tools for easy use of graphic and alphanumeric capabilities of Tektronix Terminals.

4010A01 PLOT 10 Terminal Control System	\$1500
4010A10 PLOT 10 Terminal Control	
System, Implementation for IBM with TSO	\$1750

Versatile software to graph your data using a powerful set of FORTRAN IV subroutines.
4010A02 PLOT 10 Advance
Graphing II .......\$2000

Powerful graphing through English language commands for the non-programmer 4010A03 PLOT 10 Interactive Graphing Package .........\$2250

Provides complete flexibilty of character definition, including rotation, scaling, and special characters.
4010A05 PLOT 10 Character
Generation System .......\$225

Office machine simplicity for the production of the most popular formats in graphing.
4010B01 PLOT 10 Easy Graphing Punch Paper Tape ......\$1380

4010B02 PLOT 10 Easy Graphing 026 Format Punched Cards ...... \$1380

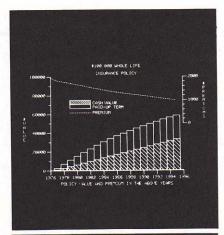
4010B03 PLOT 10 Easy Graphing
Magnetic Tape ......\$1950

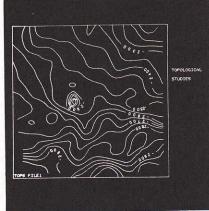
4010B04 PLOT 10 Easy Graphing RK-05 Hard Disk ...... \$1480

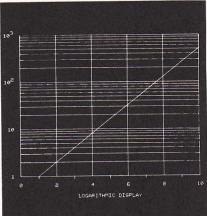
4010B05 Easy Graphing 029 Format Punch Cards ...... \$1380

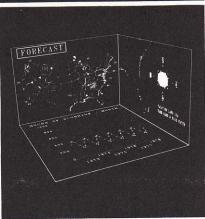
Designed for device independent control of DVST, raster scan displays, and plotters. Offers a growing array of graphics control functions such as commands for color, 3-D, line smoothing, and multi font text manipulation. Provides graphic segments support for fast creation and maintenance of picture data bases. Developed in response to proposed ANSI graphics standard.

4010C01 PLOT 10 Interactive Graphics Library .......\$2500-10,000















The 4041 is designed to comply with IEEE Standard 488-1978 and with Tektronix *Codes and Formats* Standard.

#### Optimized for Instrumentation Control

Modular Design - Rackmount or Portable

Efficient, Easy to use BASIC Language with Extensions

Expandable Capability Through Memory (to 160 k Bytes) and Other Options

The new 4041 Controller is a powerful, flexible, expandable IEEE-488 systems controller designed to work with Tektronix and other vendor's IEEE-488 instruments. While the basic unit is intended principally for execute only environments such as production line testing, a variety of options and peripherals will equip the 4041 for full interactive flexibility in research lab applications. Tektronix full line of terminals (graphics or alphanumeric, storage or raster, and color) are compatible to create an optimum programmer interface in the more sophisticated areas. Software features similarly span the range from the occasional programmer to the sophisticated programming team tackling complex products. The basic 4041 compactness, permits configuration of very compact systems which can go into applications impractical for earlier generations of systems.

#### 4041 Architecture

The 4041 controller contains three micro-processors, with the CPU being the powerful 16-bit 68000. Standard memory is 32k bytes (approximately 25k user-available), with optional 32k increments to 160k maximum. A 20-character alphanumeric LED display, 20 character thermal printer, DC-100 casette drive, 18 function keys, an IEEE-488 port, and a RS-232 port are standard. A real time clock and calender capability are standard on the 4041. Option 01 adds a second pair of ports (one IEEE-488 and one RS-232). The Option 01 IEEE-488 port has Direct Memory Access capability. Other options include an 8-bit parallel TTL port, (Option 02) the program development

ROMs and carrier (Option 30), and a program development/debug keyboard (Option 31). BASIC is an excellent language, and was chosen for the 4041. Its English-like commands, simple syntax, and line-by-line interpreter implementation combine for friendly, easy use. To improve the self-documenting characteristics and thus reduce maintenance costs, 4041 BASIC is enhanced by several features. Variable names may be up to 8 characters, allowing the programmer to select meaningful names like RISETIME, VOLTAGE 1, or DELAY. Subprograms and program lines may be named, with examples such as SRQHANDL or CALCRMS.

4041 BASIC includes many enhancements such as FORTRAN-like subprograms. Variable passing from main to subprograms and the ability to declare any variables as local or global means that a team of programmers can work quite independently on a massive task, with the main program ultimately being not much more than a series of subprogram CALL statements. Other powerful features include optional data types (short and long floating point plus integer), a COMPRESS command to optimize memory use, a proceed mode which overlaps I/O and processing operations for maximum system speed, logical unit assignment capability, and up to 160k bytes of memory directly addressable without overlays or paging techniques.

#### **Test and Measurement Orientation**

The 4041 controller was developed and optimized as an instrument controller. Many of the IEEE-488 functions are simple high level commands in 4041 BASIC. Examples include ATN, GET, LLO, and several others. In its power-up default condition, the 4041 implements Tektronix Codes and Formats standard and thus can communicate instantly with Tektronix IEEE-488 instruments without any programmer attention to formats, syntax, delimiters, number format, etc. However, the 4041 also has virtually complete, programmable control over every IEEE-488 line and condition. When this ability is combined with the 4041's Logical Unit assignment and stream specification ability, virtually any IEEE-488 instrument or device can be easily handled. The stream specification ability means that a particular device's format, syntax, end-of-message character, and other idiosyncrasies can be described one time in a Logical Unit assignment statement. Thereafter, the programmer can control or obtain data from that instrument as easily as from an instrument which fully complies with Tektronix Codes and Formats Standard

The error trapping and handling capabilities of the 4041 are of particular importance in test and measurement systems. Virtually any category of error — in instruments, peripherals, on the bus, or even within the 4041 — can be trapped and handled by software drivers.

#### MAGNETIC TAPE DRIVE

File Structure — 48 named files (max).

Capacity (physical records) — 650 typical (600 min).

Physical Record — 256 bytes.

Average Transfer Rate — 13,324 bits per s.

Search Speed — 1520 mm/s 60 in/s.

Tape Rewind — 1520 mm/s 60 in/s.

Tape Cartridge — DC 100 cassette.

#### PRINTER

Printing Method — Thermal, fixed head.

Capacity — 20-character alphanumeric line.

Font - 5 x 8 dot matrix printed.

Character Size — 2.5 mm high x 1.8 mm wide (.10 in high x .07 in wide).

Line Spacing — 4.23 mm (6 lines per in).

Printing Speed — 1.8 lines/s.

Feed Speed — 8.46 mm per s (.34 in/s).

Character Set — 128 Total

Paper Size - 60 mm x 25 m (2.36 in x 82 ft)

#### CONTROLLING THE BUS

The 4041 automatically controls all bus management signals in the proper sequence for the desired interface task and instrument interaction.

A bus management function program that uses direct IEEE-488 mnemonic commands accommodates differences in implementation of GPIB on other equipment. Virtually all legal bus states can be programmed this way, which affords a high degree of flexibility for addressing various system applications.

#### **BUS INTERRUPTS**

The 4041 has the ability to detect and respond to various types of interrupt conditions that can be generated in the GPIB. User-specified software handlers can be written to perform various tasks when these conditions occur. Interrupts can be programmably ENABLED or DISABLED.

Interrupt conditions are:

Mnemonic	Message
SRQ	Service Request
EOI	End or Identify
IFC	Interface Clear
DCL	Device Clear
GET	<b>Group Execute Trigger</b>
TCT	Take Control
MTA	My Talk Address
MLA	My Listen Address

#### **BUS COMMUNICATION**

Interface and bus device addressing are programmable. This allows the user to direct message and data flow to and/or from the appropriate interface and GPIB peripheral. Information such as primary and secondary addressing, along with pertinent device-dependent information, can be attached to a specific logical unit number. Subsequent communication with that GPIB device can be directed to the logical unit, eliminating the need for redundant or repetitious statement programing.

#### TRANSFER RATES (IEEE-488)

Transfer rates for the standard interface are given below.

	Input	Output
Interrupt Mode	Exceeds	Exceeds
	5k Bytes/s	5k Bytes/s
Fast Mode	Exceeds	Exceeds
	16.5k Bytes/s	19.5k Bytes/s

#### SERIAL INTERFACE

The 4041 comes with a standard serial asynchronous RS-232C Interface. The 4041 can support applications requiring terminals, modem/host communication, or instrumentation with this interface protocol.

In addition to standard transmission rates from 75 to 9600 baud, transmission rates are programmable to any integer ranging from 2 to 9600 baud.

Full Duplex — Full Capability (half duplex not supported)
Transmit/Receive — Matched rate only
Bits Per Character — 5, 6, 7, or 8 bits
Stop Bits — 1 or 2
Parity — Even, Odd, One, Zero, None

For a complete description and ordering information, refer to pages 292-294.



#### 4054



The 4054 is designed to support other products which comply with IEEE Standard 488-1978.

#### 19 In, High Resolution Display

Dynamic Graphics (Option)

**Expandable Memory** 

#### **Enhanced Graphics**

Unequalled graphics and powerful, fast computing in an integrated desktop computer. The 4054 is the only desktop computer that combines easyto-learn, extended BASIC with the unique features of a large-screen, high resolution Tektronix display. For rapid calculation, the 4054 has a fast processor with microcoded floating point. The state-of-the-art graphics capabilities of the 4054 provide demand hard copy on any combination of text and high density graphics (with optional hard copy unit). Fast processing coupled with simultaneous text and graphics display offer an excellent fit for many sophisticated graphics environments. In addition, the 4054's memory capacity can be expanded from a standard 32k bytes, to 64k bytes.

The 4054 has a long list of proven peripheral products. GPIB (General Purpose Interface Bus) and RS-232-C interfacing coupled with easy-to-program BASIC I/O commands allow considerable versatility in designing your own system.

The 4054 features software compatibility with the rest of the 4050 Series of desktop computers. Programs developed on the 4051 and 4052 will

operate on the 4054, giving 4054 users access to a wealth of PLOT 50 Software, already written and debugged, thus reducing program development costs often associated with new systems.

The Dynamic Graphics Option adds increased interactivity to the graphics of the 4054 Desktop Computer.

Dynamic Graphics brings the user closer to the solution by providing the graphic power to work directly with the graphic elements of the design problem. Complicated displays can be constructed quickly and easily with movable user-defined objects.

Superior graphic and alphanumeric display. The 4054 with 4096 (X) and 3125 (Y) resolution — 13 million addressable points — has all the graphics capability you will need for even the most complex display. With stroke-generated characters programmable in four sizes and eight fonts, the 4054 has the tools to alphanumerically dress up your output to suit any professional requirement. The large screen permits previewing of 132 column line printer output.

For your graphing needs there are 36 distinct dotdash patterns, selectable under program control, providing for maximum effect of represented data. For interaction the 4054 has a thumbwheel driven, true cross hair cursor. All of these features are implemented using the extended BASIC of the 4054.

Friendly extended BASIC provides the simplicity desired for the beginner together with the flexibility and power required by the experienced programmer. Device independent keywords make program and data input/output operations easy either binary or ASCII formats. Fast, built-in BASIC functions such as SINE, LOG, SQR, etc., plus a complete set of matrix functions provide powerful computation at your fingertips.

#### CHARACTERISTICS

Processor — LSI bi-polar 16 bit, same as 4052.

**Keyboard** — Indentical to 4052 keyboard but includes added thumbwheels which control crosshair cursor.

Tape Drive — Identical to 4052

CRT — Direct view storage CRT.

Alphanumerics — Four program selectable formats.

- 72 characters per line with 35 lines per display.
- 79 characters per line with 38 lines per display.
- 119 characters per line with 58 lines per display.
- 132 characters per line with 64 lines per display.

Character Set — Full ASCII, upper/lower case, high quality, stroke generated characters.

**Special fonts** — Selectable under program control-Swedish, German, British, Spanish, Danish/Norwegian, Graphic and Business.

Graphics - Vector drawing time - 15k cm/s.

Addressable resolution — 4096 (X) by 3125 (Y).

Dot-dashed vectors, programmable in 36 visibly distinct patterns.

Crosshair cursor with built-in thumbwheels for interactivity.

Visibility — Flicker-free, easy-on-the-eyes display.

Copier — Compatible with TEKTRONIX 4631 and 4611 Hard Copy Units.

#### ORDERING INFORMATION

Olip Zilinia ilin	
4054 Desktop Computer	\$20,100
Option 24 64k Bytes Total Memory	. Add \$800
Option 30 Dynamic Graphics	Add \$3315
Option 31 Color Enhanced Dynamic Graphics .	Add \$5315

OEM terms available on these products.

Tektronix offers maintenance training classes on the 4050 Graphic System Series. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.



4051

**GPIB** 

The 4051 is designed to support other products which comply with IEEE Standard 488-1978

**Low Cost** 

**High Resolution** 

#### Graphics and Alphanumerics

Desktop computing for a whole spectrum of problem solving, data analysis, and decision making applications. The 4051 is a stand-alone computer that is approachable, affordable, and able to grow as your applications grow. From the day you plug it in, the 4051 performs productively by putting solution-oriented BASIC language and meaningful graphic information at your fingertips.

Friendly graphics. Commands like DRAW and ROTATE built into the 4051 give you full graphics flexibility while working in your units, not machine or raster units. Easy graphics accelerates analysis, decision making and model building. It supplements your intuition and gets your point across by making information easy to understand. Once you use graphics you'll wonder how you got along without it.

The GPIB bus is built-in and easy to program with the 4051 BASIC I/O commands. As the industry's choice for connecting instrumentation it is our choice for the 4051 and its many available peripherals

It includes integrated computing, peripherals, and a GPIB (IEEE Standard 488-1978) interface. You don't have to know how the internal processor works to use it, you simply use the graphically-enhanced BASIC commands.

A 300k bytes magnetic cartridge tape drive is built into the 4051 hardware and language. No bits, no status words to check. File management commands like FIND, OLD, READ, and WRITE, retrieve or store programs and data. A comfortable typewriter keyboard is integrated into the system with a 28-character buffer that eliminates lost entries

Friendly, extended BASIC provides both power for the sophisticated programmer and simplicity for the beginner. Input and output operations are easy to program and debug because the 4051 commands use device independent keywords. Input and output can be as simple at INPUT or PRINT or can have FORTRAN like power with PRINT, DELETE and IMAGE commands

A data communication option permits sharing data with a host computer. The asynchronous. RS-232 interface lets you choose terminal mode communications at up to 2400 baud. Terminal modes provide performance like our popular 4012

Computer Display Terminal with local intelligence and direct data transfer between the built-in cartridge tape drive and host computer.

#### CHARACTERISTICS

Processor — LSI 8 bit microprocessor.

User Memory Workspace — 16k bytes standard, expandable to 32k bytes.

Keyboard — Full 128 ASCII character upper and lowercase with auto repeat 10 key numeric and 5 math function calculator key pad. Line/character editor keys.

User Definable Function Keys. — 10 shiftable to 20. Keys for single step execution of programs, auto-numbering, rewinding magnetic tape, or automatic loading and execution of the first program on tape.

Tape Drive — 3M DC 300A cartridge 300k bytes maximum (dependent on number of files).

Rewind Speed — 90 ips.

Search/read Speed - 30 ips

 ${f Structure}-256$  bytes with header. File oriented access via BASIC commands

CRT — Direct view storage CRT.

Alphanumeric — 72 characters per line, 35 lines

**Character Set** — Full ASCII including upper/lower case. Also includes Scandinavian, German, General European, Spanish, and Special graphic symbol fonts.

Graphic Resolution - 1024 x 780 points.

Visibility - Flicker-free, easy-on-the-eyes display. Copier — Compatible with TEKTRONIX 4631 AND 4611 Hard Copy Units

#### ORDERING INFORMATION

4051 Desktop Computer System ..... \$6295 Option 22 32k bytes total memory ..... .... Add \$1000



4052



The 4052 is designed to support other products which comply with IEEE Standard 488-1978

**Fast Processing** 

High Level BASIC

#### **Expandable Memory**

High performance computation and communications for a whole spectrum of problem solving, data analysis, and decision making applications. The 4052 is a desktop computer offering high performance, stand-alone computing power, flexible data communications, and easy-to-learn, extended BASIC. These features, combined with high resolution graphics, make the 4052 an excellent choice for scientific and statistical research, forecasting, data acquisition and analysis.

The 4052 is an integrated system offering all the tools necessary to immediately begin providing relevant solutions. For rapid calculation, the 4052 has a fast processor with microcode floating point. The state-of-the-art graphics capabilities of the 4052 provide for demand hard copy of any combination of text and high-density graphics (with optional hard copy unit). Fast processing coupled with simultaneous display of text and graphics meets the needs of most application requirements.

The 4052 comes standard with 32k bytes of memory, and can be optionally expanded to 64k bytes, allowing larger and more complex programs to be handled. A 300k bytes magnetic cartridge tape drive is built-in, allowing both ASCII and binary programs or data to be easily stored and retrieved using simple file management com-mands in BASIC. The 4052 keyboard retains the familiar, easy-to-use format of the 4051A typewriter keyboard, yet contains subtle changes made with the user in mind like sculptured keys and non-glare keycaps.

A Family and a System. Our 4051 set the standard for high performance, affordable desktop computing. Following in the 4051's footsteps, the 4052 offers a faster processor and larger memory capacity. The 4054, with a processor similar to the 4052, offers enhanced graphics on a 19 in DVST screen. Combined, they make up the 4050 Series, the only desktop computer line with software compatibility. Programs developed on a 4051 will operate on the 4052 and the 4054 without modification.

The 4050 Series continues to set the standards for high performance, easy-to-use desktop computers. Flexible GPIB and RS-232 interfacing to a wide variety of proven peripheral products allows considerable versatility in designing a system to fit your needs. Additional peripherals can be readily integrated as your application needs grow

Friendly extended BASIC provides the simplicity desired by the beginner and the flexibility and power required by the experienced programmer. Device independent keywords such as INPUT and PRINT make progamming input and output operations easy. Fast matrix functions such as multiply, inverse, transpose, identity and determinants are built into BASIC.

Friendly graphics. Commands like MOVE, DRAW and ROTATE in BASIC allow graphic displays to be created on the 4052 using user defined units, not machine or raster units. Using graphics to display information accelerates analysis, decision making, and model building. It supplements your intuition and gets your point across by making information simple to understand

#### CHARACTERISTICS

Processor — LSI bi-polar 16 bit.

**User Memory Workspace** — 32k standard, expandable to 64k.

**Keyboard** — Improved, sculptured, matte finish. Keyboard identical in other specifications to 4051 keyboard.

Tape Drive — Identical to 4051 tape drive but provides faster storage and retrieval of programs with direct-to-file operation. CRT - Direct view storage CRT.

Alphanumeric — 72 characters per line, 35 lines.

Character Set — Full ASCII including upper/lower case.

Special Fonts — Selectible under program control — Swedish, German, British, Spanish, Danish/Norwegian, Graphic, and

Graphic Resolution — 1 1024 addressable points. - 1024 x 780 viewable points, 1024 x

Visibility — Flicker-free, easy-on-the-eyes display.

Copier — Compatible with TEKTRONIX 4631 and 4611 Hard Copy Units

#### ORDERING INFORMATION 4052 Desktop Computer System ...... \$9900

Option 24 64k bytes total memory ...... Add \$800

Tektronix offers maintenance training classes on the 4050 Graphic System Series. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.



#### 4051R06

Editor ROM Pack (4051 only)

Allows general ASCII file editing of data or programs or text (including FORTRAN, BASIC and COBOL programs) offline. Includes 29 commands such as COPY, INSERT, MOVE, SEARCH and SORT for creating, manipulating and storing ASCII text.

Order 4051R06 ...... \$650

#### 4052R06

Editor ROM Pack (4052 and 4054 only)

#### 4051R07

Signal Processing ROM Pack #1 (4051 only)

Adds seven new functions which can be applied to one dimensional data arrays; integration, differentiation (2 and 3 point), fast graphing, locating minimum and maximum, and crossing over a threshold. Functions operate 2-10 times faster than equivalent BASIC routines.

Order 4051R07 ......\$350

#### 4052R07

Signal Processing ROM Pack #1 (4052 and 4054 only)

Same capability as 4051R07.

Order 4052R07 ......\$350

#### 4051R08

Signal Processing ROM Pack #2 (4051 only)

Extends array handling capabilities by adding commands that perform Fast Fourier Transform (FFT), its inverse (IFT), convolution, correlation, windowing and related utility functions. Functions execute 7-20 times faster than BASIC routines.

Order 4051R08 ..... \$700

#### 4052R08

Signal Processing ROM Pack #2 (4052 and 4054 only)

Same capability as 4051R08. Order 4052R08 ......\$700

#### 4052R09

Real Time Clock ROM Pack (4052 and 4054 only)

Provides five time related functions for date and timekeeping, elapsed time measurement and a time programmable 4050 BASIC level interrupt. All functions may be executed directly from the keyboard or may be used within a program.

Order 4052R09 ..... \$500

#### 4052R11

Character and Symbol ROM Pack (4052 or 4054 only)

Generates high resolution stroked characters that can be scaled, rotated and slanted to user's specifications. In addition to the over one-hundred standard characters, users can construct unique custom symbols. The degree of smoothness is selectable for quick screen previews before final plotter copy. Additional commands are provided to extend Dynamic Graphic capabilities.

Order 4052R11 ..... \$900

#### 4051R10

Advanced File Manager ROM Pack (4051 only)

Provides easy access to advanced file management offered by the 4909 Multi-User File Management System. Accessible using commands in BASIC, capabilitites such as indexed or "keyed" files, variable length records and dynamic file allocation are supported.

Order 4051R10 ..... \$750

#### 4052R10

Advanced File Manager ROM Pack (4052 and 4054 only)

Same capability as 4051R10.

Order 4052R10 .....\$750

#### 4050E01

ROM Expander (4051, 4052 and 4054)

Permits connecting up to eight ROM Packs to the 4050 Series Desktop Computer. Utilizes one slot of existing twos lot backpack.

Order 4051E01 ..... \$1150

#### Option 01

Data Communications Interface (4051, 4052 and 4054)

Allows asynchronous bit serial communications between 4050 Series Desktop Computer and any external device conforming to EIA RS-232 standard. Ease of use is facilitated by a special overlay and added language commands that make communication parameters and communications programmable.

Order Option 01 (4052/4054) ..... Add \$1400 Order Option 01 (4051) ...... Add \$900

#### Option 02

Backpack (4052 and 4054 only)

Optional four-slot backpack.

Order Option 02 ...... Add \$400

#### Option 03

Backpack (4052 and 4054 only)

Optional four-slot backpack with Option 01 Data Communications Interface built-in.

Order Option 03 ...... Add \$1700

### Option 10

Printer Output Interface (4051, 4052 and 4054)

Enables 4050 Series system to output alphanumerics to any printer or output device conforming to the RS-232-C or RS-244A Standard for EIA Numerical Machine Control. Data rates are switch-selectable up to 2400 baud with the 4051, and 9600 baud with the 4052 or 4054.

Order Option 10 ...... Add \$550

### Option 30

Dynamic Graphics (4054 only)

Permits complex graphic objects to be created, saved, and recalled with simple BASIC language commands. These objects, saved in a Dynamic Graphics memory can be displayed, blinked, moved anywhere on the screen, and removed without affecting the rest of the display.

Order Option 30 ..... Add \$3315

#### Option 31

Color Enhanced Dynamic Graphics (4054 only)

Contains Option 30 Dynamic Graphics (see above) with the addition of the latest technology, two color DVST. Refreshed graphics appear in an orange color while stored graphics are displayed in the familiar green. Distinguishability between refreshed and stored graphics are improved with the additional color.

Order Option 31 (factory option only) ...... Add\$5315

#### PLOT 50 Graphics Software Library

PLOT 50 software supports the 4050 Series Desktop Computers. The PLOT 50 software provides flexible, interactive programs that aid the user in scientific, engineering and management applications through easy-to-use high quality graphics.

#### **MATHEMATICS VOLUMES 1 & 2**

Volume 1 (23 programs) and Volume 2 (16 programs) consist of routines that provide fast solutions to frequently encountered mathematical problems. Included are function analyses, conversions, integration, differentiation, linear programming, and Fast Fourier Transforms. The math volumes can be purchased separately or together at discount as the Math Library.

#### **STATISTICS**

The statistics software includes four tape cartridge-based products (statistics Volumes 1-4) and three disk-based products. These packages represent a well-rounded portfolio of statistics routines, from simple descriptive statistics to multiple linear regressions. The 4050DXX Series of statistics software has been enhanced with a special user interface to make the use of statistics extremely easy in your problem solving.

Functions include small samples analysis, analysis of variance and co-variance, polynomiac and multiple linear regressions, and sophisticated non-linear regression techniques. A key feature of the packages is the use of graphics to better understand the nature of the data.

The statistics packages may be purchased separately or at discount as the Statistics Library.

#### MANAGEMENT GRAPHICS

Business and technical managers are supported by a number of flexible graphing packages. Business Planning and Analysis Volume 1 & 2 provide programs for basic decision making, such as Break-Even Analysis, to Time Series Analysis and Forecasting. Modeling and Reporting Software (MARS) is a general purpose modeling package that allows the user to automate the reporting processes. Data is entered, stored, and manipulated in matrix format. Presentation Aids are oriented towards the easy generation of overhead transparencies, both graphic and textual.

#### OTHER PLOT 50 PRODUCTS

Picture Composition allows the user to create simple or complex drawings from a tablet without being a programming expert. Graph plot provides the user with multiple graphs per page. General utilities provide subroutines for editing, duplicating, and sorting. Digitizing provides editing and computation support during graphic input. And there's more.

PLOT 50 Software supports the 4050 Series Desktop Computers, providing powerful, interactive programs to aid the user in scientific, engineering, and management application.

Each PLOT 50 volume is driven by menus, prompts and defaults that keep operation fast, friendly, logical and forgiving. You can proceed from master menu to graph, for example, in as few as four keystrokes. You can transfer operation from computer to peripheral in many programs at the stroke of a single key.

Tektronix announces 10 new PLOT 50 Software packages this year:

2-D Drafting
Interactive Digitizing
Picture Composition
Micro Pert 2 Project Management
Document Preparation
Statistics: Test & Distribution
Statistics: Analysis of Variance
Statistics: Multiple Regression
Statistics: Non-Linear Estimation

Presentation Aids

At the heart of the library is Tektronix graphics: more kinds of interactive graphics and more meaningful graphics than any competitive software on the market. Access to information is of little value if the keys to understanding and communicating it aren't there, too. PLOT 50 supports the unequalled graphics capability of the 4050 Series.

The displays are not only sharper—thanks to each 4050 Series computer's high-resolution display—they're more complete, too, with features like automatically labeled data points. Or the capability to easily transform the same data into different kinds of graphs.

Most PLOT 50 is compatible with the entire 4050 Series, so you can change computers or exchange data quickly and easily.

Most importantly, PLOT 50 packs tremendous power into the fewest possible keystrokes. Combined with the processing speed of the 4052 or 4054, PLOT 50 Software can perform routines many times faster than competitive packages—and offers many capabilities simply unavailable elsewhere.

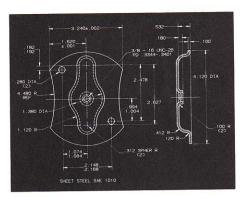
PLOT 50 lets you sit down at the computer, load the program, and proceed to the solution. Even complete newcomers to computers can put most volumes to use in less than an hour! With PLOT 50's multiple menus, help files and tutorials, continual prompting and graphic output, even operators unskilled in the application itself can perform many common tasks.

#### **Common Data Exchange Formats**

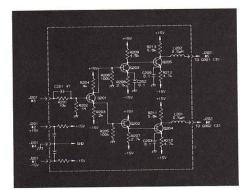
Tektronix has developed common data exchange formats for a number of the PLOT 50 packages to make re-entry of data unnecessary and sharing of data across programs very easy. Standard File Formats (SFF) allow sharing of numeric data across programs and the Graphic Model Exchange (GMX) Format allows sharing of graphic data across program. These common exchange formats represent significant productivity gains for desktop computing graphics users.

Tektronix offers OEM Software Licensing Agreements. See your Tektronix OEM representative for full details.

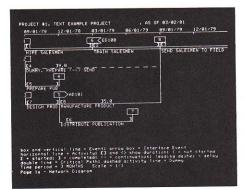
# **TFK**



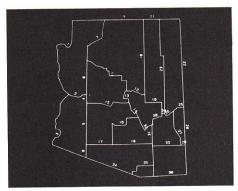
2-D Drafting



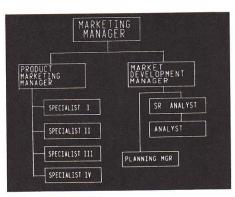
2-D Drafting



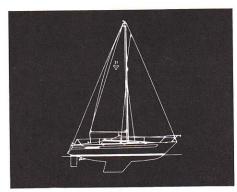
Micro Pert 2 - Project Management



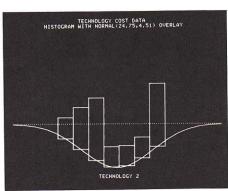
Interactive Digitizing



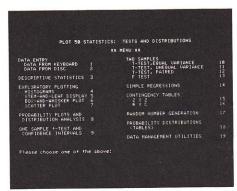
Picture Composition



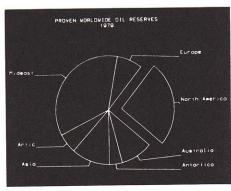
Picture Composition



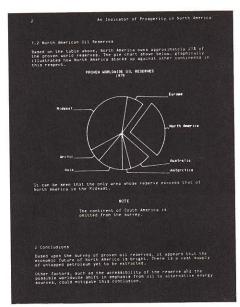
Statistics



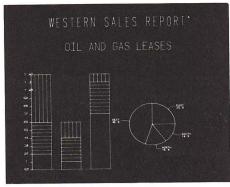
Statistics



Easy Graphing



Document Preparation



Presentation Aids Vol 1



Shared Access by a Maximum of 10 Users

Public and Private File Workspaces for Operational Flexibility/File Protection

32 or 96 Megabyte Drive Capacity

Expandable up to 8 drives (768 Megabytes)

Indexed (Keyed) Files Support

**Dynamically Allocated Files** 

Variable Length Records

Concatenated Volumes

High Speed GPIB (IEEE 488-1978) interfacing

**English Command Operation Over GPIB** 

Time of Day Clock with Battery Backup

File Names up to 100 Characters Long

**Multiple Level Library Names** 

The 4909 is a high performance mass storage system based on a controller which provides advanced file management between multiple desktop computers and large capacity hard disk drives.

Flexible file management provides controlled access to files, expandable records and files, and enhanced data storage and retrieval. Plug-in interfacing capability permits host interfacing flexibility and the ability to add more disk drives for expanded capacity.

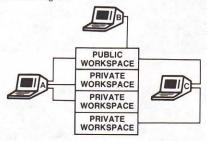
#### Mass Storage Expandability

The 4909 offers 32 megabytes of data storage capacity as standard. Optionally, 96 megabytes of storage capacity is available. Each drive comes with a 16 megabyte removable disk cartridge allowing data transportability and fast backup. For increased capacity, additional disk drives can be added by acquiring the 4909AC Auxiliary Cabinet. This cabinet will hold one or two additional disk drives of either 32 or 96 megabyte capacity. Interfacing to the 4909 is by a plug-in disk interface which can support two hard disk drives. A maximum of four disk interface plug-ins can be used on the 4909, supplying a maximum of 768 megabytes of online mass storage capacity.

#### File Security

Several levels of file security are provided by the 4909. The removable disk cartridge allows large collections of files to be completely removed from the 4909 and placed in a physically secure place. For archival storage, the removable cartridge is highly effective.

Files cannot be affected at the volume level unless a master password is known. If a master password was specified when the original disk volume was formatted, subsequent reformatting cannot take place unless the master password is known, thus prohibiting the modification of existing files.



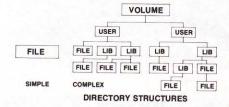
Within a multi-user environment, access to files within a private file workspace is controlled by an access list assigned to each file.

For security, users permitted to use a file within other private file workspaces can be given different levels of access, ranging from read-only to write and delete.

#### **Multi-User Access**

The cost effectiveness and contribution to productivity of a mass storage system is enhanced when two or more users are allowed to share information simultaneously. The 4909 allows the sharing and updating of files by up to 10 users. Private file access is permitted after users supply a User-ID and password when accessing the 4909. Access is permitted to a private file workspace if the user entry matches a pre-defined User-ID list maintained by the 4909.

Users who do not provide a User-ID and password when "signing-on" are automatically placed into a public file workspace. All users utilizing the public file workspace have access to the same files, each of which is collectively subject to operations currently taking place by other users within the public file workspace. Public file workspaces allow users of dedicated 4909 systems to not be burdened with multi-user "sign-on" constraints.

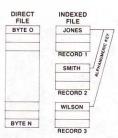


#### Superior File Management

The 4909 is designed for ease of use and superior file management flexibility. The 4909 lets you manage your files, they don't manage you! File names, for example, can be up to 100 characters long. Multiple levels of files called libraries are provided, allowing files to be grouped according to some particular criteria or need. When files are created, users need not worry about how big a file should be, nor what to do if they write more information than the file can hold. The 4909 provides for dynamic allocation or automatic expansion of files, eliminating this "bookkeeping" task by the user.

#### Indexed ("Keyed") Files

For users requiring faster, more flexible access to record information stored in files, the 4909 provides indexed files. Each record can be stored and retrieved on the basis of an alphanumeric key. The key used might be an employee's name or a product reference number. With indexed files, information can be organized better, and retrieved faster. A variety of useful commands are provided to allow complete control of indexed files.



Indexed files don't have to be treated differently from regular files, like on some systems supporting this capability.

#### **True Concatenated Volumes**

The 4909 introduces the concept of "concatenated" volume. File size is no longer constrained by the capacity of the drive on which it is located. Multiple drives can logically be configured together to appear as one. Any individual file can assume the size of the total configured drive capacity. Fixed as well as removable disk cartridges can be configured together, or kept separate to allow removable cartridges to be transported between other 4909 hard disk systems. Also, when drives are configured together, users need not be concerned with specifying which of the volumes on which a particular file is stored.

#### Variable Length Records

Variable length records support by the 4909 provides additional flexibility in creating and updating files, allowing records to change in accordance with user requirements.

#### Interfacing Flexibility

The 4909 controller has eleven plug-in slots allowing a variety of special purpose interfaces to be supported. In addition to hard disk interfacing, access to desktop computers is provided using a GPIB (IEEE 488-1978) plug-in interface. Assuming the 4909 controller contained only a single disk interface, up to ten GPIB interfaces could be supported. A maximum data transfer rate of 240,000 bytes/second is possible per GPIB interface, with some performance degradation depending on the number of users, and the amount of disk access taking place.

#### **ROM Pack Operation**

Access to the 4909 from the 4050 Series of desktop computers will be via GPIB interfacing used in conjunction with a ROM pack to provide file management operation. ROM packs for the 4050 Series include the 4051R10 for use with the 4051, and the 4052R10 for use with the 4052/4054.

#### **English Command Operation**

Without a ROM pack, devices supporting any IEEE 488-1978 Standard Compatible interface can communicate directly with the 4909, using English commands. The 4909 will respond to ASCII command strings sent over the bus, and can therefore be used by a variety of non-Tektronix desktop computers or controllers.

Real Time System Clock

The 4909's real time clock, once set, automatically assigns the time and date to a file, allowing users to keep track of when files were created or updated. Files can be manipulated on the basis of their time/date "stamps," e.g. a user may want to delete all files that have not been accessed since a particular date.

ORDERING INFORMATION
4909 Multi User File System \$22,000
Option 33 96 Megabytes Disk Add \$4000
4909AC Auxiliary Cabinet \$13,000
Option 33 96 Megabytes Disk Add \$4000 FIELD INSTALLABLE OPTIONS
4909F01 GPIB Interface \$1600
4909F03 Disk Interface \$1600
4909F10 Controller Expansion\$1000 ROM PACK OPTIONS
4051R10 ROM Pack\$750
4052R10 ROM Pack



# 4662 Option 31

Intelligent B-Size (A3) Plotter

8-pen Turret Version

Compatible in RS-232C ASCII Environments

#### Supported by PLOT 10 and PLOT 50 Software

The 4662 Option 31 adds the convenience of an automatic 8-pen turret to the built-in processing and feature-packed performance of the world's most versatile small plotter.

Tektronix has always offered its plotter customers the largest selection of colors, pen types and line widths. With the Option 31 turret, you can insert any eight pens and program the 4662 to make the selection for you. Mix and match hard-nib, fibertip and wet-ink pens. Include fine line widths for the most precise plots, or for drawing several plots on a single page. Work with nine available colors in adding greater clarity and appeal to presentations and camera-ready plots.

You can retrofit your present 4662 with the Option 31 turret. It can be installed quickly and reliably by any Tektronix service engineer. Updating existing programs to include programmed pen selection requires the addition of just a few lines of code.

That's all part of the Tektronix design philosophy of product upgradability (we also provide 4662 owners with a field-installable 8k memory enhancement). That's why Tektronix has a worldwide reputation not only for product reliability, but for the reliability of its products as long-term investments.

From the moment you turn it on, you can see that it is convenient, cooperative, and more than competent. It automatically adjusts for a maximum 254 mm x 381 mm (10 in x 15 in) plot. To set a different plotting area or to adjust to a new paper size, you simply use the SET control buttons on the front panel to define the new area.

And once it starts moving, you can see it drawing on its microprocessor intelligence to draw curves that are really curve forms. To maintain superior accuracy and repeatability, even at speeds as high as 559 mm/s (22 ips). To select and seat each pen perfectly, whichever pen style it picks

Because input data is internally buffered, you can optimize data transfer from the host processor, or move on to your next computation while the 4662 is plotting.

The 4662 Option 31 is equipped with both RS-232C and GPIB interfaces as standard.

Digitizing on any compatible Desktop Computer or host system is easy with the 4662's built-in joystick control. Move the pen to the desired position on the plot, press the CALL key, and the plotter sends the X-Y data points to the system. A GIN command causes the plotter to send the current XY pen coordinates and pen up, pen down information.

The 4662's internal alphanumeric character generator produces a full upper-lower case ASCII character set. You can request alphanumerics of any height and width, and rotate them as fine as 1° increments.

Selected characters are available in seven different standard fonts. You can plot on paper, on Mylar, or on acetate for overhead transparencies of the highest quality.

Plotter utility routines in the PLOT 10 Graphics Software Library are comprehensive and proven in thousands of sites around the world. In the PLOT 50 Library, for use with Tektronix Desktop Computers, are powerful new menu-based Picture Composition and Easy Graphing packages that take you from first idea to final plot in the fewest possible keystrokes-just as the Option 31 turret gets you there with the fewest possible delays.

OEM terms available on these products.

#### CHARACTERISTICS

Plotting Area — X-Axis >381 mm (15 in). Y-Axis >254 mm

Repeatability —  $\pm\,0.063$  mm (  $\pm\,0.0025$  in) same pen.  $\pm\,0.25$  mm (  $\pm\,0.010$  in) pen exchanged.

Time to Maximum Velocity —  $\approx$  120 ms.

Data Resolution - 0.127 mm (0.005 in).

Plotting Rate — User programmable from 10 mm/s to 570 mm/s in 10 mm/s increments.

Point Plotting Rate — Pen action rate 10 points s max.

Pen Control — Each pen may be selected either under software control or by operating buttons on the Pen Control Module

Position Controls — Joystick vector rates variable from .038 mm/s to 102 mm/s (0.015 ips to 4 ips).

Writing Method - Fiber-tip hard-nib or wet-ink pens

Paper Size — 279 mm x 431 mm (11 in x 17 in max).

Paper Retainer — Electrostatic holddown.

Front Panel Controls -

POWER switch POWER indicator PROMPT indicator

ERROR indicator

Disengages electrostatic holddown moves pen to upper right corner of plotting surface.

LOCAL switch
For data communication between terminal and plotter with the RS-232C interface.

PEN switch Provides manual control of pen up-down motion.

CALL switch
Used to store coordinate points during digitizing operations.

SET controls Two switches--SET LOWER LEFT and SET UPPER RIGHT-—used for convenient page scaling and aspect ratio changes if desired. May be used to allow plotting mirror images.

JOYSTICK positioning control.

LOCATE controls
Two switches LOCATE LOWERLEFT and LOCATE UPPERRIGHT position pen in respective corner of the currently de-

Pen Control Module — 1-8 switches. Exchange active pen in location corresponding to numbered switch depressed.

location corresponding to numbered switch depressed. The following functions are activated by holding the switch in the down position until the bell rings.

STORE PEN switch causes the active pen to be stored in the turret.

[1-4] Opens turret to the 1-4 position for loading pens.

[5-8] Opens turret to the 5-8 position for loading pens.
[RETURN] Returns turret to the closed position
[FAST] Switch directs plotter to plot at full speed.

SLOW| Switch directs plotter to plot at half speed.
PAUSE| Causes the plotting motion to stop in the middle of a

[RESUME] Causes the plotting motion to begin after a pause has been enabled, without any loss of data. Rear Panel Controls — Four rotary hexadecimal switches to

real Failer Controls — Four focally hexadecimal switches to control various interface parameters.

RS-2320C interface Asynchronous full duplex data transmission at 110. 150, 300, 600 or 1200 baud. All data transmitted in

Operating Modes — The 4662 Option 31 has 2 input modes in RS-232C. Alphanumeric (Alpha) and Graphic plot (Graphic) The 466 Option 31 also has Graphic input (GIN) to the host.

Character Set - The alphanumerics feature includes 95 AS-Character Set — The alphanumerics feature includes 95 AS-CII printing characters plus BELL. RS, CRT, FF, HT, LF, and VT characters, all under full program control. The alphanumeric feature may be changed to suit the individual needs by modifying Alpha Scale which allows changing character size. Alpha Scale which allows changing character size. Alpha Rotate which rotates the printing plane and Alpha Font which allows selection of 7 sets of special character fonts.

Input Power — 90 W max 60 W typical. Selection of 105 V  $\pm14\%.$  116 V  $\pm14\%$  210 V  $\pm14\%;$  232 V  $\pm14\%.$  Line frequency 48 to 66 Hz.

PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	654	25.75
Height	203	8.00
Depth	495	19.50
Weight	kg	lb
Net	16	35
Shipping	21	46

#### ORDERING INFORMATION 4662 Interactive Digital Plotter Option 31 ..... \$5300 Span Field Retrofit Kit for standard 4662 (021-0339-00) ...... \$1500



4662

Intelligent B-size (A3) Plotter

**Multi-color Capability** 

Built-In RS-232 and GPIB Interface

The 4662 is the first plotter with built-in processing power. As such it has the capability to work on its own, without bogging down computational operations. Studded with state-of-the-art technology, it works with an accuracy and repeatability that no other plotter can approach for the price.

From the moment you turn it on, you can tell the difference: the 4662 automatically adjusts for 254 mm  $\times$  391 mm (10 in  $\times$  15 in) plot. There's no need to worry how the last plot was set up. When you wish to set a different plotting area or adjust to a new paper size, you simply use the SET control buttons on the front panel to define the new area. The 4662 plots on paper, vellum, mylar, acetate-film and preprinted forms.

Once it starts moving, you really notice the improvement over other plotters: the 4662's digital stepping motors and internal vector generator work at high speed, with microprocessor-controlled acceleration and deceleration.

Repeatability is excellent, time after time. There is no servo hysteresis, no drift as in potentiometric feedback systems. And no slidewires to clean, no moving electrical contacts, no servo adjustments to be made.

It's a better kind of plotter with a competitive price for which Tektronix is famous.

The complete plotter. The 4662 is not only easy to talk to; it has a great memory. Input data is internally buffered so you can optimize data transfer from your host processor, or move on to your next computation while the 4662 is plotting.

Up to four 4662's can be teamed up in series, and up to 15 4662's can be used with one GPIB device like the TEKTRONIX 4050 Series of desktop graphic computers. Each plotter can perform its own job simultaneously while the host processor turns to other tasks. A simple, unique code activates each plotter.

Digitizing on any compatible graphic terminal or host system is easy with the 4662's built-in joystick control. Move the pen to the desired position on the plot, press the CALL key, and the plotter sends the X-Y data points to the system. A GIN command causes the plotter to send the current X-Y pen coordinates and pen up, pen down information. If the pen is outside the page boundaries, boundary values are sent and a bell on the plotter signals the operator.

The 4662's internal alphanumeric character generator produces a full upper-lower case ASCII character set. You can request alpha-numerics of any height and width. Selected characters are available in seven different standard fonts. In addition, interchangeable pens and pen types offer multicolor and multiline width capability.

Plot from any point of view. Not only is character scaling possible, but alphanumerics can just as rapidly be rotated in 1° or finer increments. Drawing speed is generally as fast or faster than any other plotter in the 4662's price range. Both RS-232 and GPIB interfaces are standard at no extra cost.

Contact your local Tektronix Sales Engineer for more information on this easy-to-use, exceptional B-size plotter.

#### CHARACTERISTICS

Plotting Area — X-Axis >381 mm (15 in).

Y-Axis >254 mm (10 in).

Repeatability —  $\pm 0.06$  mm ( $\pm 0.0025$  in).

Time to Maximum Velocity — ≈ 120 mm/s.

Resolution — 0.127 mm (0.005 in).

Plotting Rate — 40.6-55.9 mm/s (16-22 ips) vector dependent.

Point Plotting Rate — Pen action rate 10 points/s max.

Character Set - Full ASCII character set.

Pen Control — By software control or by operation of front panel PEN button. Pen may be disabled manually.

**Position Controls** — Joystick vector rates variable from 0.015 ips to 4 ips.

Writing Method — Fiber-tipped pen or wet ink drafting pen.

Paper Size — 279 mm x 432 mm (11 x 17 in) max.

Paper Retainer — Electrostatic hold-down.

AGGO Internative Digital Digital

**Drive Characteristics** — Two four-phase stepping motors, each operating a pulley/cable system to propel the pen in that motor's respective axis.

#### ORDERING INFORMATION

4002 interactive Digital Plotter \$4600
Option 01 GPIB I/F cable instead of
RS-232C I/F cable No Charge
Option 20 8k Buffer Add \$495
Option 31 8 pen turret Add \$700
4662A01 PLOT 10 Utility routines software Add \$420
INTERNATIONAL DOWER CORP AND BUT OFFICE

#### 

OEM terms available on these products.



#### 4663



The 4663 is designed to support other products which comply with IEEE Standard 488-1978.

#### Intelligent C-Size (A2) Plotter

**Dual Programmable Pen Control** 

Nine Character Fonts

#### RS-232 and GPIB Product

Finally: an intelligent plotter that saves time without sacrificing flexibility. The 4663 is the first high speed C-size plotter with built-in processing power and 5.5k buffer memory to free the host from many routine computational operations. But the 4663 story isn't just the intelligence, but how intelligently it has been put to use.

The 4663 can handle either 420 mm x 594 mm (European A-2 drafting size) or 432 mm x 559 mm (American C size — 17 in x 22 in) paper, mylar or acetate with felt tip, hard-nib, or wet ink pens to give you crisp, clean camera-ready copies or overhead transparencies.

A paper advance option is available for roll stock, with form feed remotely or locally programmable. This option allows the 4663 to operate unattended with a variety of form sizes.

The plotter features dual programmable pen control with interchangeable multicolor pens and is capable of producing dotted or dashed lines from local firmware. Built-in joystick allows easy manual positioning of the pens for digitizing or page scaling adjustments.

Features like these make the 4663 a natural for printed circuit board manufacturing and metal working applications or civil engineering and drafting environments including CalComp previewing and mapping.

**Unique parameter entry device.** This front panel card device lets you quickly identify or select operating parameters without resorting to binary switches, straps, status display devices, and volumes of operator manuals. It allows you to quickly program baud rate, pen type, acceleration, plotting speed, aspect ratio, page size and many other parameters.

These parameters can be stored up to 90 days without power. Up to four users can configure the plotter to their individual requirements with Option 37

**Excellent penmanship.** Nine character fonts come standard with the 4663, including the full ASCII character set. All characters can be scaled, slanted, rotated and may be centered when used as plot symbols.

Several other performance options are offered such as downloadable character sets, and programmable macros. Arc and circle generation capability, utilizing circular interpolation, is also available. Standard fixed macros allow the current viewport to be outlined or an axis drawn.

**Local functions.** Various graphic functions are implemented via firmware. Page scaling, windowing, viewporting and clipping are typical.

Hardware loop through RS-232C interface is standard and optional GPIB is available.

Graphing software support. Tektronix PLOT 10 Utility Routines for the 4663 control the plotter's multiple pens, paper advance, and built-in arc and circle generation. They also control selection of built-in character fonts. The 4663 is also compatible via GPIB with the 4050 Series of desktop computers using BASIC language keywords to provide similar controls.

#### CHARACTERISTICS

Max Plotting Area — X-axis 569 mm (22.4 in). Y-axis 432 mm (17 in).

Repeatability —  $\pm 0.025$  mm ( $\pm 0.001$ ).

Max Plotting Speed — 406-559 mm (16-22 ips) Vector dependent.

Point Plotting Rate — 10 pts per s max.

Character Generator — 95 ASCII, 15 x 7 Matrix, 7 Special Fonts Std.

Paper Size — European A2 size 420 mm x 594 mm, U.S. C-Size 17 in x 22 in.

Paper Retention — Electrostatic hold down, sprocket feed paper advance (Optional).

Media Types — Paper or Mylar.

**Drive Characteristics** — Microprocessor controlled stepping motors controlling cable system connected to pen arm.

Baud Rate - 110-9600 baud.

Standard Interface — RS-232-C, full duplex, loop-through.

#### ORDERING INFORMATION

4663 Interactive Digital Plotter \$10,900
Option 01 GPIB I/F cable Add \$525
Option 04 GPIB only (deletes RS-232C) No charge
Option 31 circular interpolation and programmable macros
Option 32 Math character set and down loadable characters
Option 36 Paper advance Add \$990
Option 37 Added default parameters Add \$325
INTERNATIONAL POWER CORD AND PLUG OPTIONS
Option A1 Universal Euro 220 V/16A No Charge
Option A2 UK 240 V/13A No Charge
Option A3 Australian 240 V/10A No Charge
Option A4 North American 240 V/15A No Charge
4663A01 PLOT 10 Utility Routines
Software \$665

OEM terms available on these products.

Tektronix offers maintenance training classes on the 4663 Interactive Digital Plotter. For further training information, contact your local Sales Office or request a copy of the Tektronix Customer Training Catalog on the return card.

#### **Hard Copy Devices**

Quick and convenient copies of complex information displayed on a screen are essential to the use of graphic terminals, desktop computing systems, and video image processing systems. Graphic and alphanumeric information is recorded on paper at the press of a button, to fulfill a variety of user needs. These include the need for quick preview copy before final plotting, and copies of intermediate steps during interactive work sessions. Just as important are permanent records of results for the file, and final output of high quality for use in reports and presentations. Tektronix offers six display copying devices to cover all of these hard copy needs.

Within the product family are two devices for copying storage tube screens, and four for copying general video devices such as raster scan terminals, video cameras and monitors, or image processing systems. Tektronix' own implementation of fiber optic technology is provided in the 4631 for storage tube copy, and in the 4632, 4633A and 4634 for video imaging copy and line scanning recording copy. An innovative Tektronix implementation of electrostatic technology is offered in the 4611 for storage tube copy, and the 4612 for video copy.

Fiber optics, based on photosensitive (light exposure) techniques, gives the highest quality hard copy for dense and complex graphic displays.

Electrostatic technology, based on charge transfer techniques, provides the highest contrast black-and-white images with high quality at an economical cost per copy.

The concept of these alternative family offerings is to fulfill a variety of hard copy requirements — whether the need is for low-cost black and white terminal copy, or for high resolution gray shaded copy from a sophisticated image processing system.



MEM

4611

**Low Copy Cost** 

High Contrast, Permanent Images

**Electrostatic Process** 

Storage Tube Compatible

The 4611 provides permanent, dry copies of graphic and alphanumeric information displayed on storage tube screens. The 4611 is based on electrostatic (charge transfer) technology, and uses electrographic paper for high contrast, archivable copies at an economical copy cost.

The 4611 uses a unique dry toning process that is convenient, non-messy and superior to liquid toner systems. Images are permanently fused and made from inert, safe ingredients.

Compact and lightweight, the 4611 can easily be moved from desk to desk. A warm-up light and paper-out indicator are provided. All copies are vertically oriented, and the copy time is 24 seconds.

The 4611 can be multiplexed to copy up to four storage tube terminals and/or display monitors. It is compatible with the 4010 Series of computer display terminals, the 4114 terminal, the 4025 terminal, the 4050 Series of graphic computing systems, and the 4081 interactive graphics terminal. The 4611 is also compatible with Tektronix 11 in and 19 in computer display modules.

#### CHARACTERISTICS

Weight - 45 lb.

Paper Size — 216 mm x 277 mm (8.5 in x 11 in).

Image Size — 7.5 in x 5.7 in standard

7.5 in x 8.9 in when copying 4025 terminal.

Copy Time — 24 s (30 s when copying 4025 terminal).

Warmup Time — 2 min.

Addressability — 256 dots per in, horizontal 171 dots per in, vertical.

Toner — Dry magnetic 4.9 oz. per bottle.

Paper — Electrographic (dielectric) 500 ft per roll.

#### ORDERING INFORMATION

4611 Hard Copy Unit \$4	1400
Option 02 Four — Channel Multiplexer	\$500
Option 31 Compatible with the 4025 Terminal No C	harge
Paper — One case of two rolls, 006-2838-00	. \$24
Toner — One bottle, 006-2990-00	. \$20
INTERNATIONAL POWER CORD AND PLUG OPTIO	NS
Option A1 Universal Euro 220 V/16A No C	harge
Option A2 UK 240 V/13A No C	harge
Option A3 Australian 240 V/10A No C	harge
Option A4 North American 240 V/15A NO C	narge
	_

Tektronix offers maintenance training classes on Hard Copy Units and the terminals they support. For further training information, contact your local Sales Office or request a copy of the Customer Training Catalog on the return card.



NEW

4012

Low Copy Cost

High Contrast, Black and White Images

**Electrostatic Process** 

Video Source Compatible

The 4612 provides permanent black-and-white copies of graphic and alphanumeric information from raster scan terminals and other video signal sources. Based on electrostatic technology, the 4612 uses electrographic paper for high contrast, archival copies at an economical copy cost. The 4612 uses a unique dry toning process that is convenient, non-messy and superior to liquid toner systems. Images are permanently fused and made from inert, safe ingredients.

Compact and lightweight, the 4612 can easily be moved from desk to desk. A warm-up light and paper-out indicator are provided. A special self-test switch allows the operator to verify that the unit is operating correctly. All copies are vertically oriented, and the copy time is 24 seconds. The 4612 can be multiplexed to copy up to four raster scan terminals, and can accept remote copy signals. The 4612 is compatible with the TEKTRONIX 4112 Option 11 terminal, and with a wide variety of raster scan terminals and video signal sources; including those which produce RS-170, RS-330 or RS-375A type signals.

The standard unit is prepared for use with 525 line, 60 Hz sources. Adjustment for 625 line, 50 Hz is provided as an option. In some cases, internal adjustments can also be made to accommodate non-standard video sources.

#### CHARACTERISTICS

Weight - 45 lb.

Paper Size - 216 mm x 277 mm (8.5 in x 11 in).

Image Size — 7.5 in x 5.8 in standard when copying 525 line, 60 Hz signals.

Copy Time — 24 s.

Warmup Time — 2 min.

Addressability - 256 dots per in, horizontal;

171 dots per in, vertical.

Toner — Dry magnetic 4.9 oz. per bottle.

Paper — Electrographic (dielectric), 500 ft per roll.

#### 

Option A1 Universal Euro 220 V/16A	No Charge
Option A2 UK 240 V/13A	No Charge
Option A3 Australian 240 V/10A	No Charge
Option A4 North American 240 V/15A	No Charge
	and the second second

Paper — One case of two rolls, 006-2838-00	\$24
Toner — One bottle, 006-2990-00	\$20

OEM terms available on these products.



4631 Hard Copy Unit

**High Image Quality** 

Copies in Seconds

**Fiber Optic Process** 

Storage Tube Compatible

The 4631 provides permanent, dry copies of any graphic and alphanumeric information displayed on the storage tube screen. The 4631's fiber optic process uses dry silver paper for the fine detail and photographic quality image needed when copying complex graphics and alphanumerics. The 4631 requires no toners or chemical additives of any kind. The entire process is clean and safe, as images are created using only light and heat.

The 4631 is easy to move wherever needed. As a special convenience, the 4631 automatically cuts and stacks all copies into its built-in tray. A four-digit copy counter is an optional feature.

Copies can be made in either vertical or horizontal format. The copy time is 18 seconds for the first copy and only 10 seconds for subsequent copies of the same display. A special "slow scanning" mode allows images on the horizontal format to be made at even higher resolution and image quality.

The 4631 can be multiplexed to copy up to four storage tube terminals and/or display monitors. It is compatible with the 4010 Series of computer display terminals, the 4114 terminal, the 4025 terminal, the 4050 Series of graphic computing systems, and the 4081 interactive graphics terminal. The 4631 is also compatible with Tektronix 11 in and 19 in computer display modules.

4632 Video Hard Copy Unit

**High Image Quality** 

**Gray Scale Capability** 

Copies in Seconds

#### Video Source Compatible

The 4632 provides permanent copies of graphic and alphanumeric information from raster scan terminals and other video signal sources. All copies are horizontally oriented. The copy time is 18 seconds for the first copy, and only 8 seconds for subsequent copies of the same display. Eight distinct shades of gray can be copied with a special gray scale enhancement option. The standard 4632 can clearly show six different shades of gray, for polygon fill-in, bar charts, and many other applications.

The 4632 can be multiplexed to copy up to four raster scan terminals, and can accept remote copy signals. The 4632 is compatible with the TEKTRONIX 4112 Terminal and with a wide variety of raster scan terminals and video signal sources, including those which produce RS-170, RS-330, RS-375A, RS-343A and RS-412A type signals. The standard 4632 is prepared for use with 525 line, 60 Hz sources. Many other adjustments are provided as options, including adjustments for 625 line, 50 Hz and for high resolution 1029 line, 60 Hz.

#### COMMON CHARACTERISTICS

Weight — 65 lb.

Paper Size - 216 mm x 277 mm (8.5 in x 11 in).

Warmup Time - 10 min.

Addressability — 20 dots per in, horizontal. 171 dots per in, vertical.

Paper - Standard Dry-Silver, 500 ft per roll.

#### 4631 CHARACTERISTICS

Image Size — 225 mm x 170 mm (8.85 in x 6.7 in), horizontal format.

180 mm x 137 mm (7.1 in x 5.4 in), vertical format.

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Copy Time — 18 s first copy (36 s in special scan mode).

8 s subsequent copies (17 s in special scan

**High Resolution (Special Scan Mode)** — 340 dots per in, horizontal. 300 dots per in, vertical.

#### **4632 CHARACTERISTICS**

Image Size — 213 mm X 160 mm (8.4 in X 6.3 in).

Copy Time — 18 s first copy, 8 s subsequent copies.

Gray Shades — Min six standard min, eight with Option 06.

#### ORDERING INFORMATION

4631 Hard Copy Unit	\$5575
4632 Video Hard Copy Unit	\$5575
COMMON OPTIONS	

#### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Paper — One roll, 006-1603-00 ...... \$73 One case of four rolls, 006-1603-01 ...... \$250

4631 ONLY OPTIONS

Option 31 Compatible with the 4025 Terminal .. No Charge 4632 ONLY OPTIONS

Terminals ...... Add \$350
Option 08 Compatible with DEC MINC Systems No Charge

Option 09 Setup for AT&T GEMINI 100 Systems ....... \$60

OEM terms available on these products.



**Low Cost Printing** 

Flexible for Many Applications

Crisp, Matrix Quality Printing

Easy to Use

**International Characters** 

**High Reliability** 

With high reliability built-in, the 4643 is a convenient and economical choice requiring no preventive maintenance and infrequent servicing.

Fast but not expensive, the 4643 Printer uses bidirectional logic technology to print 340 characters per second. With a full 132 character line, speeds of 125 lines per minute are nominal.

Virtually no maintenance means an even greater savings, and less downtime for repairs as well, A diagnostic display and self-testing routine virtually eliminates the need for preventive maintenance calls.

The expected (head) life is more than 300 million characters with no maintenance. This figure normally means at least two full years of continuous work from a single matrix head. The fabric ribbon, continuous loop cassette is usable for at least 5 million characters. Both the matrix head and ribbon cassette are quickly operator-replaceable eliminating the need for a service call.

**High quality matrix printing** is assured by the unique 14-wire printing head. The 7 by 7 format print font permits easy reading and the operator can specify condensed, expanded or standard characters. In the condensed (character) face, the 4643 prints out a 132-character line format on an 8 1/2 by 11 in sheet. Because the 4643 uses impact printing, six very legible copies (including five NCR or carbon copies) can be made to save time and avoid the expense of photo copies.

Compatibility. The printer of choice for high technology systems, the standard Tektronix 4643 is RS-232 compatible and can be interfaced with most standard RS-232 data processing instruments and systems. Option 01 provides a parallel interface. The 4643 is compatible with the following Tektronix products: 4010 Series Computer Display Terminals, 4025A Terminal, and 4050 Series of Desktop Graphic Computers; the 8001 and 8002A Microprocessor Labs and 8550 Microcomputer Development Lab; the S-3250, S-3270 and S-3280 Semiconductor Test Systems; the 7612D and 7912D Programmable Digitizers, and the 7854 Oscilloscope.

#### STANDARD ACCESSORIES

Ribbon Cassette (118-1314-00) RS-232 Interface

#### 

OPTIONAL ACCESSORIES	
Pedestal (118-1335-00)	\$185
Denor Bookst (119 1216 00)	\$80



4642

Fast printer output is yours at low cost with the TEKTRONIX 4642 Matrix Printer. This tabletop printing unit offers 60 character-per-second output speed, along with a variety of print alternatives. It is compatible with the TEKTRONIX 4020 Series of Computer Display Terminals and 4050 Series of desktop computers. Interface is standard RS-232C.

A variety of type faces. The 4642 gives the operator a varied selection of upper and lower case type faces. The standard format prints in 80 columns, and provides a choice of regular and elongated characters. A condensed character set, selectable from a front panel switch, gives 132 column output, and again, a choice of regular or elongated characters. Characters are formed on a  $5 \times 6$  dot matrix.

Compact, easy to use. The 4642 requires minimum space for operation. Paper feed is by friction on the standard version, which uses inexpensive roll paper. The optional tractor feed paper drive can be used with both fanfold paper and multipart forms.

A choice of features. A complete selection of features and accessories can make the 4642 Matrix Printer even more versatile. For example, Option 01, a rear feed tractor paper drive option, allows output of an original and four copies. A printer stand is available to convert the 4642 to a floor unit. The 4642-1 is the 220 V ac, 50 Hz version of the 4642. All options and accessories are identical.

#### ORDERING INFORMATION

4642 Matrix Printer	\$2900
Option 01 Rear Feed Tractor Assembly	
4642-1 Matrix Printer	\$2900
Option 01 Rear Feed Tractor Assembly	Add \$280



#### 4907 File Manager

The 4907 is a direct access flexible disc device with a double density read/write feature that enables up to 630k bytes capacity per disc.

An advanced multiple level file-by-name system includes a directory that maintains the user files, passwords and available space. For applications requiring additional storage capacity, several drives may be connected to the file manager. Software commands are extensive with this file manager and its compact size is small enough to let it fit on a desktop or lab bench.

Built-in ROMs and special 4050 Series Desktop Computer's ROM Packs contain the 4907 operating system software. No 4050 Series Memory is required to support the operating system. The 4907 can also be used with some of the 4010 Series of graphic terminals.

#### ORDERING INFORMATION

4907 File Manager	\$5280
Option 30 Two Disc Drives Total	Add \$3000
Option 31 Three Disc Drives Total	Add \$4550
Option 40 4052/4054 Interface	No Charge

OEM terms available on these products.



#### 4924 Digital Cartridge Tape Drive

#### 4923 Digital Cartridge Tape Recorder

Both digital recorders are highly reliable, very easy to use for data storage and retrieval. The 4923 contains an RS-232C interface which supports any compatible computer display terminal from 110 to 9600 baud.

Each tape cartridge can store approximately 300k bytes of high density digital data. Files of variable length and files containing a variable number of formatted records can be easily stored by these two storage systems.

The 4924 offers a tape fetch feature and terminal interrupt capability and can operate with Tektronix graphics terminals via the terminal IEEE-488 bus. Transfer data rates are 10k baud max. Read data operates at 762 mm/s (30 in/s) and the Fast Forward Mode allows you to skip forward or reverse at 2290 mm/s (90 in/s). Up to 15 4924 tape drives may be multiplexed to any 4050 Series Desktop Graphic Computer at any one time.

#### ORDERING INFORMATON

4923	<b>Digital Cartridge</b>	Tape	Recorde	r . \$2600
Option	01 RS-232-C			No Charge
4924	<b>Digital Cartridge</b>	Tape	Drive	\$2990



For desktop computer users needing increased interactivity, the 4952 Option 02 Joystick is the last word in fingertip input control. Accurate to 0.1%, the sensitive cursor control activated by the POINTER command lets you quickly position the cursor the first time precisely.

More to build on, less to repair. By entering a command in BASIC the 4952 Joystick will put the pointer on-screen and initiate movement. Drift is negligible.

The 4952 is simplicity itself. Just move the center lever in the direction you want to move the cursor; speed is controlled by the angle and distance of the lever from the center position. And when you want to stop the cursor, simply release the lever to its natural vertical position.

Compatibility for the Joystick is assured with all terminals in our 4010 family, 4081 Interactive Graphic Systems and 4050 Series Desktop Computers.

#### ORDERING INFORMATION

4952 Joystick	(4014/4015)	. \$590
Option 01 Joystick	(4010, 4012/4013)	Add \$75
Option 02 Joystick	(4050 Series)	Add \$100

OEM terms available on these products.



4634 Imaging Hard Copy

#### **Photographic Quality Images**

**Excellent Gray Scale and Copy Quality** 

Compatible with Most Raster Scan Video Systems

Dry, Quick, Convenient Process

Large, File-Sized Image

The TEKTRONIX 4634 Imaging Hard Copy Unit is designed to record images of photographic quality from raster scan video sources. It is suited to a variety of industrial, commercial and medical imaging applications.

The 4634 is easily coupled to video sources. It can be adjusted to accommodate a wide range of line rates: from 525-1029 lines interlaced, and from 256-512 lines non-interlaced for both 50 Hz and 60 Hz systems. If image size is reduced, higher line rates are achievable.

The 4634 is available as either a rackmount or benchtop model. The rackmount version fits into any standard 482.6 mm (19 inch) rack.

The 4634 uses a cathode ray tube (CRT) to expose the image on dry silver paper. A fiber optic faceplate on the CRT effectively couples the light output to the paper, providing photographic quality images of fine detail.

After exposure, the image is developed in a thermal processor. The entire process of exposure and development is completed in just 26 seconds. The costs of space, equipment, and labor associated with wet process films are eliminated.

Users may select two types of paper: standard performance for lowest cost per image, and high performance for optimal image quality. Both paper types are significantly less expensive than film.

The combination of high image quality, operational simplicity, speed and convenience, and low cost makes the 4634 Imaging Hard Copy Unit an excellent choice for a wide variety of raster scan video applications.

### CHARACTERISTICS RECORDING MEDIUM

**Material** — Dry Silver Paper — High Performance Tektronix Standard Paper.

Paper Roll Width — 152 m (500 ft).

Paper Roll Width — 216 mm (8.5 in).

#### GENERAL PERFORMANCE CHARACTERISTICS

Warmup Time - 20 min.

Image Format — Horizontal scan lines in direction of exiting paper motion.

**Gray Shades** — 12 with High Perfromance Paper 6 with Standard Paper.

#### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Height	265.8	10.47
Length	685.8	27
Width	425.4	16.75
Weight	kg	lb
Net	30.5	67

#### ORDERING INFORMATION

4634 Imaging Hard Copy Unit \$8400
Option 30 Delete Rackmount Hardware Sub \$85
Option 45 END-USER set-up No charge
High Performance Paper One roll, 006-2432-00 \$165
One case of four rolls, 006-2432-01 \$560

INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 Universal European 220V/16A	No Charge
Option A2 United Kingdom 240V/13A	No Charge
Option A3 Australian 240V/10A	No Charge
Option A4 North American 240V/15A	No Charge

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

Tektronix offers maintenance training classes on Hard Copy Units and the terminals they support. For further training information, contact your local Sales Office or request a copy of the Customer Training Catalog on the re-

#### 4953, 4954, 4956 Graphic Tablets

With the 4953/54/56 Graphic Tablets, you can choose one of two input device options: a pen for best convenience, or a push-button cursor where exacting accuracy is required. You can input points or vectors to digitize or display maps, graphic drawings, schematics and other designs.

From precision mapping to exacting parts outlines, Tektronix Graphic Tablets satisfy a wide range of user needs. You can select options from a written "menu" placed on a Graphic Tablet. You can store graphic input on peripheral disc or recorder devices, recall it later, and make quick, dry-process copies on a Tektronix hard copy unit.

And Tektronix offers all of the pieces you'll need with your computer for a truly interactive graphics system. Take your pick of the 279 mm  $\times$  279 mm (11 in  $\times$  11 in) 4953 model, the drawing board-sized 1016 mm  $\times$  762 mm (40 in  $\times$  30 in) 4954 model, or the 4956 in two sizes. The 4956 is an IEEE-488 device which connects to the 4050 Series Desktop Computers. Standard is 510 mm  $\times$  510 mm (20 in  $\times$  20 in) and the Option 33 version is 910 mm  $\times$  1220 mm (36 in  $\times$  48 in). The latter version is large enough to accommodate E-size engineering drawings. Power modules are compact to help curb desktop clutter for all these graphic tables.

#### ORDERING INFORMATION

ONDENING INFORMATION	
4953 Graphic Tablet 279 mm x 279 mm (11 in x 11 in)\$3	795
Cursor, 119-0622-00	
4954 Graphic Tablet 1016 mm x 762 mm	
(40 in x 30 in)\$6	190
4954F32 Pedestal \$1	
Cursor, 119-0622-00	\$315
4956 Graphic Tablet 20 in x 20 in (510 mm x 510 mm)\$5	670
Option 33 Graphic Tablet 36 in x 48 in	
(910 mm x 1220 mm) Add \$	2600
Cursor, 119-0875-00	\$365

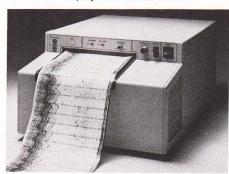
# OEM PRODUCTS

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GMA 125 25-inch Display Module 1	01
4633A Continuous Recorder 1	01



634 Video Display at 945/60 line rate



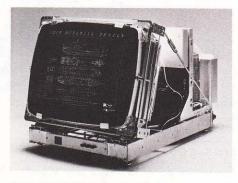
4633A Continuous Recorder

# The Tektronix OEM Commitment

# Reliability. Performance. Value. Support.

When you deal with Tektronix, you're dealing with a supplier who stands behind you every step of the way. As a world leader in display technology, we're committed to building lasting OEM relationships and supporting them with continuing new product developments.

Your Tektronix resource starts with a broad and comprehensive package of OEM support: OEM pricing, terms and conditions to help make you competitive. OEM service agreements and service capability throughout the United States and in many countries. Applications engineering including interface assistance, custom mods, documentation, software compatibility, and much more.



GMA 103 OEM Computer Display



634 Video Display with aerial reconnaissance

At Tektronix, our product reliability is your foundation. Your systems can only be as reliable as the components that go into them. At Tektronix, we're committed to producing the most dependable components possible. You can be confident that the reliability we engineer into every component can help keep your customers satisfied and your service costs down. That's quality you can bank on.

Leadership in systems must begin with leadership in components. Explore the advantages of working with Tektronix: excellence in products, in OEM support, and service. Your local Tektronix OEM Representative can give you full details on how you can profit from a partnership with Tektronix.

The standard displays come without a handle, feet or covers. See your local Tektronix Representative for complete specifications, options and ordering information, or use the



#### MODULAR PACKAGING AND RACK MOUNTING PACKAGING FOR THE 620

#### Rackmount kits for the 620

Slide-out 19 in rack assembly which rackmounts one 620 and an empty compartment horizontally. In the compartment you may put your custom electronic circuitry and combine it with the display. Includes frame, covers and rack slides. Not available with Options 06, 23, 28.

Slide-out 19 in rack assembly which rackmounts two 620s side by side. Includes covers and rack slides. Not available with Options 06, 23, 28, 31.

Order 016-0405-00 ......\$215

Small-width packaging. Smaller-width packaging removes controls (intensity, focus, spot position) from the right side of the CRT. Allows OEM to mount elsewhere in this system. Request quote from your Tektronix representative.

#### **RACKMOUNTING FOR 606B, 608, 624**

Rackmount and Empty Cabinet Kit for 606B, 608, and 624. Slide-out 19 in rack assembly which mounts a display monitor and an empty compartment horizontally. In the compartment you may put your custom electronic circuitry and connect it to the display, all in one enclosure.

Order 040-0601-00 \$290
Display/Power Module Kit. Allows rackmounting of 606B,

Display/Power Module Kit. Allows rackmounting of 606B, 608, and 624 with TM 503 Power Module. Minimizes mechanical design time. Simply design your own electronics using TM 500 Custom Plug-in kits described on p. 298. Then plug them in. Fits standard 19 in rack.

Order 040-0624-01 ..... \$90

Rackmounting kit for 606B, 608, and 624.

Slide-out 19 in rack assembly which rackmounts any two of the above displays side by side. Includes covers and rack slides.

Order 040-0600-00 ......\$180

Rackmount-to-Cabinet Conversion, required to convert a rackmount 606B, 608 and 624 to a cabinet style.

Order 040-0602-00 .......\$160

KEY SPECIFICATIONS FOR 634 VIDEO DISPLAY

Video Display		634	634 Opt. 01
Resolution	Worst case	1100 line	650 line
•	Nominal	1400 line	800 line

•	Nominal	1400 line	800 line	
Display Size Position Accuracy/ Non-Linearity		9x12 cm (flat screen)  <0.5% within 9 cm circle, <1% in corners. For Option 01: 1% within 9 cm circle, 2% at corners.		
Brightness Non-uniformity		Less than ±10%		
Bandwidth		1 Hz - 10 MHz std. 20 MHz Video		

Note: Standard 634 accepts the line/field rate of 525/60 and 625/50.

bandwidth available as Option 14.

Discrete line rates of 675/60 through 1083/60 can be accommodated using option 15.

\*Merged raster lines.

#### KEY SPECIFICATIONS FOR X-Y DISPLAYS

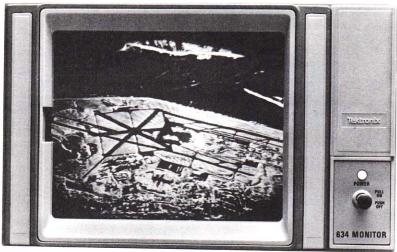
See your local Tektronix representative for complete specifications, options and ordering information, or use the return card.

	608	620	624	
Spot Size <sup>1</sup>	0.26 mm (10 mils)	0.38 mm (15 mils)	0.30 mm (12 mils)	
Display Size	9.8 x 12.2 cm	10 x 12 cm	9.8 x 12.2 cm	
Acceleration Potential	22.5 kV	12 kV	≈18 kV	
Bandwidth, X-Y <sup>2</sup>	≥5 MHz	≥2 MHz	≥3 MHz	
Bandwidth, Z <sup>2</sup>	≥10 MHz	≥5 MHz	≥5 MHz	
Rise Time	≤35 ns		≤70 ns	
Input R and C, X-Y3	1 MΩ,    ≤60 pF	1 MΩ    47 pF	1 MΩ    <47 pF	
Input R and C, Z <sup>3</sup>	1 MΩ, ≤60 pF	1 MΩ <47 pF	1 M $\Omega$    <47 pF	
X-Y Phase Difference	≤1° to 1.5 MHz	≤1° dc to 500 kHz	<1° to 1.0 MHz	
Recommended Source ≤10 kΩ Impedance, X-Y and Z		≤10 kΩ	≤10 kΩ	
Temperature Range	0°C to +50°C	0°C to +50°C	0°C to +50°C	
Power Requirements <sup>4</sup>	61 W	See footnote4	61 W	
Included Accessories	Lined external im- plosion shield (graticule) for ad- justment purposes.	Lined external im- plosion shield (graticule) for ad- justment purposes.		
Recommended Cameras <sup>5</sup>	C-5C, C-59A, C-28	C-5C, C-5C Opt. 01, C-28	C-5C, C-28	

- Measured at 0.5 μA.
- 2. Full spec would read: "dc to . . ." appropriate figure.
- 3. "|| <" means "paralleled by less than".
- 4. Line voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V (±10% on each range), 48 to 440 Hz (except the 624 which excludes 220). Number given shows watt max at nominal line voltage. The 620's power requirements are 90-132 and 180-250 V ac; 48-440 Hz line frequency, 22 W max, 0.2A at 120 V ac 60 Hz.
- 5. External 15 V dc 750 mA power supply required for C-28.

#### APPLICATIONS FOR SELECTED OEM IMAGING PRODUCTS

Recommended Display	Medical Instrumentation	Electronic Test Equipment	Defense Electronics	Analytical Instrumentation
634 Very High Resolution Video Display	Ultrasound raster scan Computerized tomography Multi-imaging cameras	High-density graphics, alphanumerics and imaging	Reconnaissance & surveillance Target acquisition FLIR LLLTV	Electron microscopy
608 High Brightness X-Y Display	Ultrasound M-Mode Real time Sector scan B-scan	Spectrum analysis	Navigation and control Automated test systems Simulators IR imaging	Mass Spectrometry Nondestructive testing NMR FTIR
620 General Purpose X-Y Display	Ultrasound: A-mode Physiological measurements	Logic analyzers Automated test equipment Spectrum analysis RF-sweepers TV waveform	Electronic counter- measures Radar-A scopes Sonar PPI	Nondestructive testing Multi-channel pulse height analyzers



### 634

High Resolution Video Display for Critical Applications (1400 lines, shrinking raster)

<1/2% Non-Linearity Inside the 9 cm **Quality Area** 

**Excellent Gray Scale and Brightness Uniformity** 

**Extremely High Resolution, Low Distortion** Displays for Demanding Applications.

The 634 raster scan monitor delivers extremely high quality video images for both viewing and photography. Applications include: medical diagnostic imaging, military infrared imaging, and automated test systems.

The 634 has been specifically designed to deliver the superior performance required to meet those

Textronix distortion requirements surpass normal standards. With the 634, you'll have less than 1/2% distortion inside the 9 cm quality area. Outside: less than 1%. And the 634 has an optically flat screen to preserve geometric correctness in viewing and photographic applications.

Resolution vastly outperforms other monitors. Resolution on video displays can be separated into two categories: Vertical and horizontal.

Vertical resolution, of course, is limited by the video line rate used. At the RS-170 rate of 525/60, approximately 480 lines are visible. Option 15 extends the 634 line rate to 1083/60, and accordingly improves the vertical resolution.

When we talk about the 634's 1400-line nominal horizontal resolution, we're only counting the white lines. If we added all the black and white lines, that resolution would approximate 2800 lines. And that far surpasses anything else on the market. In addition, dynamic focusing assures crisp images, even in the corners.

Optimum gray scale. The 634 is designed to faithfully display gray scale images on its P45 CRT. Because of the demanding performance required by our engineers, the CRT was designed by Tek Labs, and utilizes an advanced gun

design. Excellent brightness uniformity - (variation is less than  $\pm 10\%$  across the screen) means that results are consistent from point to point on the screen.

Built for the job. The 634 is not an upgraded television monitor. It has been conceived, designed and constructed as a high-precision imaging display. Its design continues the tradition of superior CRT technology expertise developed by Tektronix.

The sliding panel packaging optimizes service access and each instrument is fully calibrated to strict Tektronix standards before leaving the factory.

Safety Options. The 634 is available with safety options. UL 544 (Medical/Dental) listing, for standalone applications, includes covers and feet. You may select the UL 544 Component Recognition option if you intend to house the 634 in your system. Certifications required by many other industries or governments are also available.

Optional features. You may also order an optional video reverse feature which provides black on white or white on black imaging. This is particularly valuable in medical imaging, where many doctors perfer to view the scan as a black image on a white background. Manual or TTL levels will activate video reversal.

A remote-programming option permits control of contrast, brightness focus and blanking by the user's system. And there is a dc option that eliminates the ac power supply, lowering weight, cost and power consumption, while permitting operation from your system's dc power.

Qualified OEMs may also order the 634 with certain custom modifications including matching colors. See your Tektronix representative for complete applications assistance and pricing.

High line rate capability. The 634 is available. on a standard basis, at 525/60 and 625/50 rates. Common rates of 675/60, 875/60, 945/60, 1023/60 and 1083/60 can be accommodated using Option 15. These higher rates allow the systems builder maximum flexibility in selecting desired vertical resolution. The optionally available 20 MHz video amplifier is recommended for use with high line rates.

### CHARACTERISTICS

### DISPLAY PERFORMANCE

Monochrome CRT Display — 9 cm vertical; 12 cm horizontal; 15 cm diagonal (6 in.); flat screen, magnetic deflection; 4 x 3 aspect ratio.

**Resolution** — Measured by the shrinking raster method with no interlacing, center screen at 100 cd/m² (30 fL) (merged raster lines, not TV lines).

634 - 1100 lines, worst case; 1400 lines, nominal.

634 Option 01 - 640 lines, worst case; 800 lines, nominal.

Position Accuracy/Non-Linearity -

**634** —  $\leq$ 0.5% within 9 cm circle,  $\leq$ 1% in corners.

634 Option 01 — ≤1% within 9 cm circle, ≤2% in corners. Brightness — 515 cd/m<sup>2</sup> (150 fL) maximum.

Brightness Uniformity — Better than  $\pm 10\%$  over the scan area, measured by J16 Photometer.

Phosphor Type — P45.

#### VIDEO INPUT

**Description** — Composite video with negative sync. RS-170 compatible.

Signal Level — 0.35 V p-p to 2 V p-p.

Maximum Safe Input — ±5 V p-p. Bandwidth 634 - 1 Hz to 10 MHz

634 Option 14 - 1 Hz to 20 MHz.

Impedance — 75  $\Omega$  with loop through and switchable termination.

Return Loss — 46 dB to 5 MHz with internal 75 Ω termination and power on.

Dc Restoration - Referenced to back porch.

### RASTER

Vertical Rate - 50 to 60 Hz.

Horizontal Rate 634 - 15,750 Hz.

634 Option 15 - 32,490 Hz, adjustable ± 10%.

Note: Our standard instrument will accept the line/field rate of 625/50. With Option 15, parts are supplied to permit setup at rates between 675/60 and 1083/60 (RS-343A compatible). Contact your Tektronix Sales Engineer for further information.

Department of D.H.H.S. (BRH Rule 1020 10 (C) (1) standard. UL 544 Listing (Option 06) and UL 544 Component Recognition (Option 09). C.S.A. certified.

### ORDERING INFORMATION

634 Video Display \$	2900
With standard resolution of 1400 merged raster lines	s nomi-
nal, 1100 line worst case (center screen at 100 cd	/m <sup>2</sup> (30
fL), without handle feet and covers.	
Option 01	Sub\$60
Standard resolution of 800 merged raster lines nomin	nal, 650
lines worst case (center screen at 100 cd/m [30 fL])	)
PERFORMANCE OPTIONS	

Option 11 External Sync—switchable ...... Add \$40 Option 13 Video Reverse ....... Option 14 20 MHz Video Amplifier ...... Add \$145 Option 15 High Line Rate. Factory calibrated at 1083/60. User changeable to rates between 675/60 and 1083/60 with supplied parts kit ...... Add \$280 Option 16 Remote Brightness, Contrast, Focus, Video Reverse, Blanking ..... .. Add \$60 Option 20 Dc Supply- +23 V, -22 V, +9 V (unregulated) ... .... Sub \$20

### SAFETY OPTIONS

Option 06 UL 544 Listing (covers included; not available with Options 20 or 28) ...... Option 09 UL 544 Component Recognition ...... No Charge

MECHANICAL PACKAGE OPTIONS

Option 23 Handle, Feet and Covers (not available with Options 06, 20 or 28) .... .. Add \$80 Option 28 Covers only (not available with Options 06,20,23). Rackmount kit to mount two 634s side by side in 19 in rack Not compatible with Option 20. 016-0403-00\* ...... \$215 Rackmount Kit to mount one 634 and one empty cabinet side by side. Not compatible with Option 20. 016-0402-00 ..... ..... \$265

OEM PRICING NOT AVAILABLE ON BACKMOUNT KITS QUANTITY DISCOUNT INFORMATION IS AVAILABLE ON REQUEST.

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAIL-ABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION

### 608/624

High Brightness X-Y Displays

**Ambient Light Viewing** 

**High Resolution** 

**Expansion Mesh Halo Suppression** 

**Excellent Gray Scale** 

Optional UL 544 Listing

The 608 is our finest directed beam viewing monitor. It is extremely well suited for high performance display applications, such as medical and military imaging and electronic instrumentation. The related 624, a comparable but more economical alternative, provides excellent direct viewing capability for systems that require good performances at a more favorable price. The 608's high usable brightness of up to 240 cd/m² (70 fL), a 0.25 mm (10 mil) spot size, and large 9.8 x 12.2 cm screen, all combine to give you optimum viewing capability. Where such a high degree of clarity or brightness is not required, we recommend the 624 with a 0.3 mm (12 mil) spot size, display brightness of 135 cd/m² (40 fL), and a screen size of 9.8 x 12.2 cm. Both instruments produce detailed displays that are easy to read in high ambient light and that result in quality photographs.

Special CRT design suppresses expansion mesh halo. Characteristic of both instruments, this suppresses secondary electron emissions, the annoying stray light that ordinarily gives lower contrast and a "washed out" appearance that interferes with high brightness gray scale displays.

Expansion mesh halo suppression results in a more readable display with subtle and accurate gray scale graduation for precise measurement or analysis.

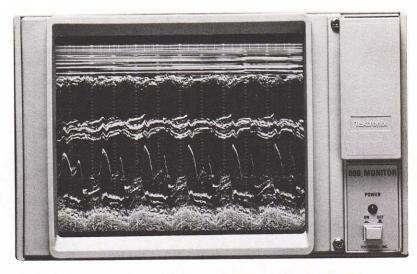
High resolution. The 608 displays both excellent gray scale images and detailed waveform displays, thanks to its small 0.25 mm (10 mil) spot size (0.3 mm or 12 mils for the 624). In addition, imaging is critically sharp from corner to corner particularly on the 608, which utilizes dynamic focusina

A wide range of options for broad interface capability. You may order your 608 or 624 with an internal graticule with 8 x 10 divisions, etched on the inside of the screen for minimal parallax. Other options facilitate control of either display by your system. The TTL blanking option blanks the Z axis with any TTL logic source. And an optional 25-pin connector permits connection of X, Y and Z input signals.

The wide deflection factor—adjustable from 50 mV/div to 0.25 V/div (up to 1.25 V/div with extended gain range option)—facilitates integration with a broad range of designs. An optional metal bezel lets you use heavy cameras, including those with motorized roll film backs, without causing distortion, defocus or light-leaks.

In addition, optional full differential inputs help reject unwanted common-mode signals such as ground noise and power supply hum. Additionally the 608 can be ordered with a gamma correction option for photographic applications: This produces linear light output changes with a linear change of Z-axis input, typically within 20

Both the 608 and 624 are available with UL 544



Listing. Handle, feet and covers are included. If you house the 608 or 624 in your system you may select UL 544 Component Recognition.

Packaging further expands flexibility. Packaging option include carrying handle, protective covers and feet. Rackmount kits can also be ordered for either 608 or 624, further extending packaging versatility, and providing space for your electronic circuitry.

### CHARACTERISTICS

CRT DISPLAY

Cathode Ray Tube — Flat-faced, electrostatic deflection. P31 Phosphor standard.

Display Size - 9.8 cm vertically, 12.2 cm horizontally. Internal graticule is available without charge (Option 01) with 8 x 10 divisions (1,22 cm/div).

Display Linearity — The voltage required to produce a 2.5 cm deflection at any point on the CRT will not vary more than 5%.

Spot Size — 608 — 0.25 mm (10 mils) at 170 cd/m2 (50 fL), with maximum usable brightness of 240 cd/m² (75 fL). 624 -0.3 mm (12 mils) at 170 cd/m2 (50 fL).

**Acceleration Potential** 

608 - 22.5 kV overall.

624 - ≈ 18 kV overall

VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth 608 - Dc to ≥5 MHz.

624 - Dc to ≥3 MHz

Deflection Factor — Adjustable <50 mV/div to >0.25 V/div. Option 22 (5X attenuator) extends deflection factor to >1.25 V/div

Input R and C

608 — 1 M $\Omega$  paralleled by <60 pF.

624 — 1 M $\Omega$  paralleled by <47 pF.

X-Y Phase Difference

608 - Not more than 1° to at least 1.5 MHz.

624 - Not more than 1° to at least 1.0 MHz.

Maximum Input Voltage - ± 100 V (dc plus peak ac).

Linear Common-Mode Signal Range (with Option 21) — ±3 V, nonattenuated. (Option 22 extends range 5X to  $\pm$  15 V.) Common-Mode Rejection Ratio (with Option 21) - At least 100:1 from DC to at least 100 kHz. Option 22 (5X attenuator) reduces cmrr to 40:1 to 100 kHz.

Recommended Source Impedance — 10 kΩ or less.

Z-AXIS AMPLIFIER

Z-axis amplifier permits intensity modulation of the writing

Bandwidth

608 - Dc to 10 MHz over the usable range

624 - Dc to 5 MHz over usable range

Sensitivity range is adjustable from 0 to +1 V to 0 to +5 V for full intensity control. Zero V input cuts off intensity with front panel control at midrange.

Input R and C

608 — 1 M $\Omega$  ±1% paralleled by <60 pF.

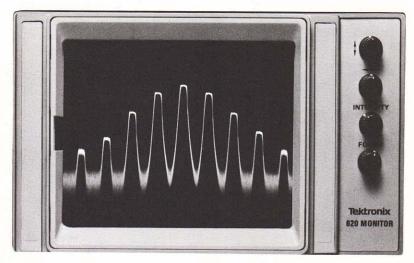
624 — 1 M $\Omega$  ±1% paralleled by <47 pF

Linear Common-Mode Signal Range (with Option 21) - ±5 V nonattenuated.

Common-Mode Rejection Ratio (with Option 21) - ≥100:1 to 100 kHz.

ORDERING INFORMATION
608 Display
624 Display\$2640 (without handle, feet or covers) PERFORMANCE OPTIONS
Option 10 25-pin Remote Program Connector X, Y and Z, single ended inputs Add \$50
Option 20 Without ac supply (± 18 V unregulated dc supply required. (Not available with Option 06) (624 only)
Option 21 Full Differential Inputs (X, Y, and Z) Add \$50
Option 22 5X Attenuators Add \$35
Option 24 Linearized Z-Axis (Gamma Correction)
(608 only) Add \$75
Option 25 TTL Blanking Add \$75
SAFETY OPTIONS
Option 06 UL 544 Listed, includes handle, feet and covers
Option 09 UL 544 Component Recognition No Charge MECHANICAL PACKAGING OPTIONS
Option 01 Internal graticule No Charge
Option 23 Handle, Feet and Covers (not available with Options 06 and 28)
Option 28 Covers only (not available with Options 06 and 23) Add \$70
Option 29 Metal Bezel Add \$70
Rackmount kit to mount two 608s or 624s side by side, or one 608 or 624 and a 606B side by side in a 19 in rack.  Order 040-0600-00\$180
Rackmount kit to mount one 608 or 624 and one empty cabinet side by side in a 19 in rack.
Order 040-0601-00\$290

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAIL-ABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.



### 620

### General Purpose X-Y Waveform Display

### Many Packaging Options

### **Exceptionally High Reliability**

The 620 can be used in any situation requiring an economical, X-Y waveform display. Electronic instrumentation applications include pulse height, network, spectrum, logic and signal analyzers and digitizers. The 620 is also used in mechanical measurement instruments for vibration tests and NDT. And in the medical field it is used for Amode imaging. The 620 offers spot size of 0.38 mm (15 mils), a 10 x 12 cm screen, and usable brightness up to 100 cd/m² (30 fL).

**Built-in reliability.** The typical power requirement of about 22 watts means less power drain and a lighter weight power supply, so your overall system can be lighter, more compact, and generate less heat. An option allowing dc operation from your power supply further reduces power consumption and weight. By using fewer parts and lower power, display and system reliability are improved, and service costs can be lower.

Packaged the way you want it. The 620 comes with a wide variety of packaging options which allow you to easily integrate the display into your system.

**620 standard package.** Easily mounts in your custom cabinetry. The operator controls are conveniently positioned to the right of the CRT.

The 620 narrow package (Mod BD). Easy to install in your product. Mount in any position: Horizontal, vertical, angled or upside down. All electronics are on one side, for simplified interface and adjustments.

Once installed in your product, only the CRT screen and metal bezel show. Position the four operator controls wherever you want. Controls can even be mounted internally.

Just 17.5 cm (6.9 in) wide, to save you space. Weighs only 3.5 kg (7.7 lb), to help make your product lighter.

The Display Narrow Package requires external dc power (+ 18 V to 26 V dc unregulated), which must be supplied by your system. Mod BD cannot be powered directly from ac sources. All power connections and input signals are made to interconnect pins inside the monitor. Connector pins and cables are supplied with the unit.

**620 stand-alone package.** With handle, feet and covers: An excellent choice for your remote monitor.

**620 horizontal and vertical packages.** An empty compartment next to or below the display provides space for your custom circuitry, resulting in an integrated enclosure. You can assemble this package for your product and save valuable development and tooling costs. The handle fits on top of the vertical package and on the side of your choice for the horizontal package. Option 31 allows you to use your own power supply and a single ac power cord.

**620 rackmount package.** Slide-out 19 in rack assembly mounts one 620 and one compartment for your electronics alongside. Or, you can mount two 620s side by side.

**NOTE:** While the 620 Display Narrow Package is configured for dc power only, the standard 620 is configured for ac power (built-in supply). It can also be configured for dc power.

Any 620 package can be ordered with UL 544 Component Recognition, for applications where the 620 is directly inserted into an OEM system. UL 544 Listing is also available and includes handle, feet and covers.

Comprehensive support services. All Tektronix displays are backed by a worldwide service network. Comprehensive, easy-to-read manuals and complete drawings are provided, and complete drawings are available to speed mechanical integration. Spare parts documentation is available to optimize serviceability and lower your spare parts inventory cost.

### CHARACTERISTICS

### CRT DISPLAY

 ${\bf Cathode~Ray~Tube~-16.5~cm~(6.5~in)~flat-faced~rectangular~CRT~with~P31~Phosphor.} \\$ 

Spot Size — 0.38 mm (15 mils) at 0.5  $\mu$ A.

Display Size — 10 cm vertically, 12 cm horizontally.

**Graticule** — External graticule included as accessory. Internal 8 x 10 div (1.22 cm/div) graticule available as Option 01.

**Display Linearity** — The voltage required to produce a 2.5 cm deflection from any point on the CRT will not vary more than 5%.

Acceleration Potential — 12 kV.

### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth - Dc to 2 MHz.

Settling Time — 1  $\mu s$  from any point on the CRT within 0.05 cm of final position.

**Deflection Factor** — Adjustable,  $\leq 0.9$  V to  $\geq 1.5$  V per 10 cm (vertical),  $\leq 0.8$  V to  $\geq 1.2$  V per 10 cm (horizontal). Input R and C — 1 M $\Omega$  shunted by < 47 pF.

X-Y Phase Difference — ≤1° dc to 500 Hz.

Max Input Voltage — ±25 V (dc plus peak ac).

Recommended Source Impedance — 10  $\mathrm{k}\Omega$  or less.

### Z-AXIS AMPLIFIER

**Linear Z-Axis** — Amplifier permits intensity modulation of the writing beam. Positive input to + input increases the display intensity. Can be reversed by internal change.

Bandwidth — Dc to ≥5 MHz.

Input Sensitivity Range — Not adjustable. 1.0 V will produce maximum brightness with Intensity Control set at mid-range.

### INCLUDED ACCESSORIES

### **External Graticule.**

### CABINET DIMENSIONS (without modular packaging)

Dimensions (without cm in modular packaging) Height (without feet) 13.26 5.22 Width 21.40 8.43 Length 50.04 19.70 Weight (without handle kg lb feet and covers) Net 5.33 11.75 Shipping (without 6.89 15.2 handle, feet and covers)

### MOD BD DISPLAY NARROW PACKAGE

The 620 Display Narrow package (Mod BD) is designed to be easily incorporated within your cabinetry.

### CABINET DIMENSIONS FOR NARROW PACKAGE

Dimensions	cm	in
Height (without feet)	12.88	5.07
Width	17.46	6.88
Length (overall)	47.68	18.77
OPENING N	EED FOR BEZEL	(≈)
Height	12.97	5.11
Width	14.14	5.11
Cornerradii	0.48	0.19

### ORDERING INFORMATION

620 Display (without handle, feet and covers)
Option 01 Internal Graticule No Charge
Option 06 UL 544 Listed includes handle,
feet and covers Add \$100
Option 09 UL Component Recognition*
(not compatible with Option 06) No Charge

### RACKMOUNT KITS

### \*Also available for 620 Narrow Package. MODULAR DRESS PACKAGING

Vertical Package — Consists of empty compartment, connecting hardware, handle, feet, and covers Order 016-0409-00 .....

Horizontal Package — Consists of empty compartment,

connecting hardware, handle, feet, and covers

Order 016-0410-00

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.



### **GMA 103**

19 Inch High Performance

Modular Graphic and Alphanumeric Display

Storage and Color Refresh Capability

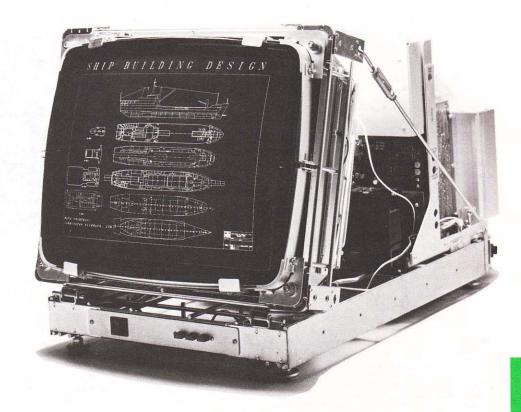
The GMA 103 is a high performance member of the GMA display product family which provides the new feature of color enhanced refresh. The family features are: A) a blending of storage and refresh technology, B) modular construction and C) performance, interface and packaging options to configure a display to fit your application.

Color refresh for quick differentiation of refresh from stored information. The powerful combination of having storage and refresh display technology combined in one computer display module is further enhanced by the use of color. Stored information appears in the familiar green color while refresh data is displayed in a new yellow-orange hue. The result is that working files in refresh are easily distinguished from even the most dense fixed or more finalized stored files.

The dynamics of color enhanced refresh. The flicker-free data density and detail of storage. The GMA 103 will display up to 40 vector meters (1,575 vector inches) (30 Hz refresh rate) of refreshed data while simultaneously having all the benefits of storage technology. The storage mode presents high resolution, high density graphics at a low cost. Color refresh adds selective erase, interactivity and dynamic motion with the same high resolution of storage. By placing fixed or finalized data in store while retaining dynamic or working data in refresh, you can achieve high density, interactive graphics while making maximum use of your computer to address the application task rather than support the display.

**Modular Construction.** The CRT, low voltage power supply and printed circuit board modules are arranged on a unique high-strength wireform chassis. This construction not only supports different performance, interface and packaging options but permits easy removal of modules for field service.

Options Addressed to the OEM. The standard instrument is driven as an X-Y directed beam display using analog inputs. Space has been left in the card cage for you to add up to three circuit boards with your application options. Our Option 43 High Speed Vector/Dot Character Generator can be plugged into two of these positions to give you a completely digital interface (16 bit word format plus control and status signals). You



can use your interface connector or ask for our Option 34 (analog) or Option 35 (digital) connector as appropriate. The standard instrument has a colored glass filter and is compatible with Tektronix hard copy units. The display can be supplied with the CRT module tilted as far back as 15° and oriented in either the horizontal or vertical (page) format. Several support options are also available.

**Operation.** All display functions are completely programmable and designed to interface to TTL logic. The display functions are Write-Thru, Non-Store, Brite, Defocus, Center, Copy, Erase, View and G Busy. The X-Y inputs are analog, the beam resting at center screen with zero volts applied. The GMA 103 is completely compatible with other members of the GMA family. If refresh is already being used in a GMA family display, no new signals are required to support color refresh.

**Write-Thru.** Displays refreshed information on the screen concurrently with stored data.

**Non-Store.** Allows the GMA 103 to be used as a refresh-only display at a higher viewing contrast.

**Defocus.** Increases the spot size slightly. May be used in store or refresh modes.

**Brite.** Increases the intensity slightly for storing wide vectors or boldface characters. To be used in conjunction with DEFOCUS.

**Center.** Resets the origin shift circuitry used to protect the CRT during repeated over-write operation.

Copy. Initiates hard copy when attached to a TEKTRONIX 4611 or 4631 Hard Copy Unit.

**Erase.** Activates full screen erasure of stored information.

**View.** Switches the GMA 103 back to the View Mode after it has switched to the nonprogrammable Hold Mode.

**Hold.** Automatically activated to reduce the brightness of the stored display after 112 seconds of display inactivity, thus increasing CRT life. Supplying a positive-going edge to **G-BUSY** will prevent the display from dropping into the Hold Mode. Inputs on the **Z-AXIS** normally serve this purpose.

In addition to the control functions, other signals are provided by the GMA 103 to indicate status. **SLU** and **D-BUSY** are outputs provided to let the system know whether or not to send the display any additional data. If either of these signals is set true, another function is taking place and data should not be sent.

A CRT anti-burn circuit is provided to protect against burning the CRT phosphor in the event that X and Y deflection is not commanded to move or is lost with the writing beam on. In addition, the screen is automatically erased after 30 minutes from the last **Z-AXIS** or **G-BUSY** pulse or **VIEW** initiate, thus preventing residual images.

Special Performance or Packaging Requirements? Your local Tektronix Sales Engineer can describe all standard options, and put you in touch with Tektronix Application Engineers to resolve special requirements.

Continued overleaf

### **DISPLAY CHARACTERISTICS**

CRT — 483 mm (19 in) diagonally measured Direct View Storage Tube.

Addressable Area — 267 mm x 356 mm (10.5 in x 14 in).

Stored Resolution — Screen Center, 157 line pairs/mm (40 line pairs/in). Screen periphery, 138 line pairs/mm (35 line pairs/in).

Stored Dot Writing Time - 5 µs or less.

Stored Vector Writing Rate — 150 m/s (5900 in/s).

**Refreshed Vector Writing Rate** — (Write-Thru and Non-Store) 1200 m/s, (47,240 in/s), 40 vector meters, (1575 vector in) (maximum) at 30 frames/s.

Viewing Time — At least 15 minutes at specified resolution.

Erase Time — 1.5 s  $\pm$  20%.

### DEFLECTION AMPLIFIERS

X-Y Inputs — Differential.

Origin -

(X=0, Y=0 Volts) — Center screen.

Origin Shifter — Shifts display origin to one of eight locations. Resets to a beginning point after a Center command. Total travel is 4.5 mm (0.179 in).

Polarity (with respect to X-Y inputs) — X = long axis, Y = short axis, selected by jumpers): + V moves beam right (X) and up (Y) when applied to "+" inputs. - V moves beam left (X) and down (Y) when applied to "+" inputs.

**Input Sensitivity** — Long axis: 10 V p-p full screen  $\pm 2.5\%$ . Short axis: 7.5 V p-p full screen  $\pm 2.5\%$  of long axis.

 $\label{eq:maximum input Voltage} \begin{tabular}{ll} \textbf{Maximum Input Voltage} & $-\pm 6.5$ V (dc + peak ac). \\ \begin{tabular}{ll} \textbf{Input Impedance} & $-\pm 0.0$ k$\Omega$ $\pm 10\%$ paralleled by $<\!100$ pF. \\ \end{tabular}$ 

Slew Rate (non-linear operation) — 5000 m/s.

Settling Time (non-linear operation) — 1  $\mu$ s + 2  $\mu$ s/cm to within one spot diameter for vector lengths >1 cm. 3  $\mu$ s to within one spot diameter for vector lengths  $\leqslant$ 1 cm.

**Positional Accuracy** — All points within the CRT addressable area are addressable with an accuracy of  $\pm 1.25\%$  of the long axis dimension.

### Z-AXIS

 $\ensuremath{ \mbox{Input Requirements}}$  — TTL compatible. LO True. (Strap selectable to HI True).

Rise Time — 70 ns, limited to 1 MHz continuous repetition rate.

Input Impedance — 50  $\Omega$ . (Strap selectable to 75  $\Omega$  or 93  $\Omega$ .

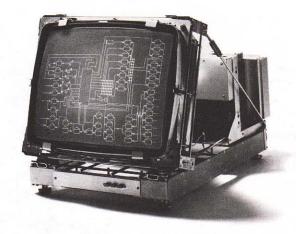
### OTHER CHARACTERISTICS

Remote Control — All operating modes can be controlled by applying appropriate TTL LO True signals to the appropriate control line at the interconnect board. These modes are Erase, View, Copy, Write-Thru, Non-Store, Brite, Defocus, Center and G Busy.

Status Signals — Output signals provided to indicate status of display are D Busy and SLU. The HCU status signal is available when an appropriate hard copy device is connected.

CHARACTERISTIC	

Horizontal Format	0° tilt		-15° tilt		
Dimensions	mm	in	mm	in	
Height	461	18.2	450	17.7	
Width	487	19.2	487	19.2	
Depth	705	27.8	660	26.0	
Vertical Format	0° tilt		- 15	° tilt	
Height	563	22.2	547	21.5	
Width	425	16.8	425	16.8	
Depth	705	27.8	660	26.0	



### GMA 101A/GMA 102A

Both the GMA 101A and GMA 102A are 483 mm (19 in) diagonal modular graphic and alphanumeric storage displays. The GMA101A is a storage-only display. The GMA102A is a higher performance instrument that also has refresh capability. Both are configured for optimum modularity, with printed circuit board modules arranged on a unique high-strength wireform chassis. This construction not only supports different performance, interface and packaging options, but permits easy removal of modules for field service.

The GMA 101A - high resolution storage. The GMA 101A makes the benefits of low cost, high resolution storage technology graphics available to the OEM system builder in a modular display. This family member is tailored for an application that emphasizes storage graphics. You can use our options or yours to take advantage of the very fast stored data-drawing capability of the GMA101A - 100 m (3900 inches) per second. At this drawing rate, the entire screen can be redrawn in less than one second, permitting effective zooming or panning. In addition, data or picture editing can proceed with minimal thoughtprocess interruption. You can achieve high density interactive graphics while freeing your computer to address the application rather than drive the display

The GMA 102A — storage and refresh. With the GMA 102A, you can display up to 40 vector meters (1575 vector inches) (30 Hz refresh rate) of refresh data while simultaneously having all of the benefits of storage technology. The storage mode presents high resolution, high density graphics at low cost, while the refresh feature adds the benefits of selective erase, interactivity and dynamic motion with the same high resolution of storage. By placing fixed or finalized data in store while retaining dynamic or working data in refresh, you can achieve high density, interactive graphics while making maximum use of your computer to address the application task rather than support the display.

**Operation** — **both instruments.** All display functions are completely programmable and designed to interface to TTL logic. They are Write-Thru (GMA 102A only), Non-Store, Brite, Defocus, Center, Copy, Erase, View and G Busy.

Options Addressed to the OEM. Both instruments in the standard display format are driven as X-Y directed beam displays using analog inputs. Both have clear glass filters and are compatible with Tektronix hardcopy units. On either, the display can be supplied with the CRT module tilted as far back as 15° or oriented in either the horizontal or vertical (page) format. Space has been left in the card cage for you to add up to three circuit boards with your application options. Additionally, on the GMA 102A, our Option 42 Vector Generator or Option 43 Vector/Character Generator can be plugged into two of these positions to give you a completely digital interface (16 bit word format plus control and status signals).

On both instruments, you can use your interface connector or ask for our Option 34 (analog) or Option 35 (digital) connector as appropriate.

### **GMA 125**

The GMA 125 was designed exclusively for systems builders, and is intended to satisfy display applications of the greatest size and complexity. It incorporates 65 percent more workspace than even our own previous industry leaders, the 483 mm (19 in) GMA 101A and GMA 102A. Like other members of the GMA series, it provides low cost, high resolution, storage tube graphics and unique flexibility of performance, interfacing and packaging.

Further, the GMA 125 offers that same powerful combination of simultaneous storage and refreshed displays that was first provided in the GMA 102A.

The detail of storage. The dynamics of refresh. The GMA 125 features a 635 mm (25 in) CRT that offers unequaled information display capacity. Adjacent points that would be indistinguishable on a smaller screen can be seen as distinct units on the GMA 125. It is ideal for group viewing and for greater graphics detail. A new 110° CRT provides greater display brightness with less energy consumption in a more compact package.

The GMA 125 will display up to 50 vector meters (1968 vector inches) of refreshed data, enabling all the benefits of selective erase, interactivity and dynamic motion with the same high resolution of storage.



By placing fixed or finalized data in store while retaining dynamic or working data in refresh, you can work interactively with high density graphics and alphanumerics while making maximum use of processing power to address the application rather than support the display.

Modular design assures ideal building economy. Order CRT, chassis and power supply only, or configure your GMA 125 to best fit your own manufacturing capabilities and system specifications. The welded-steel, symmetrically structured chassis may be rotated vertically or horizontally, and tilted. Space is left in the card cage for your own application options. Or you can plug in our Option 42 Vector Generator or Option 43 Vector/Character Generator to provide you with a

completely digital interface (16 bit word format plus control and status signals). You can use your interface connector or our analog or digital interface options.

Colored light filters and several other support options are also available.

**Operation.** The standard display instrument is driven as an X-Y directed beam display using analog inputs. The CRT beam is positioned at center screen with zero volts applied. All other display functions are completely programmable and designed to interface to TTL logic. The display functions are Write-Thru, Non-Store, Brite, Defocus, Center, Copy, Erase, View and G Busy. The Z-axis input is a digital signal.

### 4633A

Line Scan Recorder

Black on White or Gray Scale

**Excellent Copy Quality** 

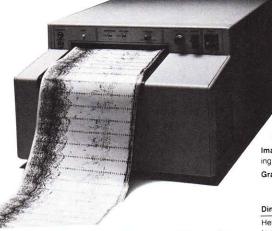
100 mm/s Paper Speed

The Tektronix 4633A Continuous Recorder is designed to provide hard copy output from systems that provide a Z-axis input signal simultaneously with an X-axis (horizontal ramp) signal. It is uniquely suited to the requirements of the medical echocardiography market and can also be modified to suit other applications where there is a need for recording real time data.

The 4633A has three basic speeds, selectable on the front panel: 10 mm/s, 25 mm/s, and 50 mm/s. Another switch allows the operator to double each of the three basic speeds. This provides a maximum speed capability of 100 mm/s and also gives the operator considerable operational flexibility.

The 4633A is available as either a rackmount or benchtop model. The rackmount version fits into any standard 19 inch rack.

The medium: high performance/low cost, dry process, full-size paper. The 4633A is designed for high performance/low cost dry silver paper: The state of the art in dry process gray scale.



After the paper has been exposed by a fiber optic CRT, it passes through a processor, where the latent image is thermally developed. The developed image is transported by a conveyor through an opening in the front panel.

Unwanted interruptions will be minimal. Big 500-foot paper rolls mean few time-outs for reloading. The paper is a full 8 1/2 inches wide.

The 4633A's image quality, convenience, reliability, and competitive pricing combine to make it a valuable component of an OEM system.

### CHARACTERISTICS

**Recording Medium** 

Material — Dry silver paper — High performance.

Paper Roll Length — 152 m (500 ft).

Paper Roll Width — 216 mm (8.5 in).

### GENERAL PERFORMANCE CHARACTERISTICS

Warmup Time — 20 min.

Image Width — 14-20 cm (5.5-7.9 in).

Image Format — Scan lines perpendicular to direction of exiting paper.

Grav Shades - 5 levels min.

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Height	265.9	10.47
Length	655.4	25.80
Width	425.4	16.75
	kg	lb
Weight	≈ 30.5	67.0

### 4633A OPTIONS

Option 30 Delete Rackmount Hardware

PHONS
No Charge
No Charge
No Charge
No Charge

### SUPPLIES

**High Performance Paper** — One roll, order 006-2432-00 One case, order 006-2432-01.

computer Graphics Products Softwar lug-in & Portable Oscilloscopes OEN ata Comm Testers Logic Analyzers ( PIB Programmable Instruments Acq ition/Processing Systems Semicond est Systems Curve Tracers Cable Te rs Microcomputer Development Pro 'V Demodulators Vectorscopes Gene ators Waveform Monitors Cable Test ntelligent Graphics Workstations Spe um Analyzers & Swept Frequency Sy igitizers TDR Photometer/Radiomet Cameras Probes Carts & Accessories



# INFORMATION DISPLAY PRODUCTS

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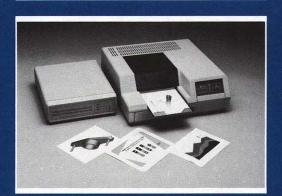
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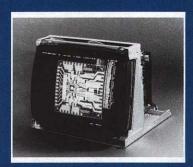
Tektronix sees itself as a company that defines itself not in terms of its products but in terms of its customers. As their needs have expanded — requirements for color, higher speed, local processing, more powerful processing, easier hardware/software integration, more comfortable ergonomic designs — Tek has kept pace by providing state-of-the-art engineering graphic display and computer products at affordable prices.

Tek continues as an industry leader for its product line breadth, its family compatibility, its peripheral support, its use of industry standards and its range of price/performance options. Tek products fill application needs ranging from CAD/CAM to technical data analysis to artificial intelligence (AI). The same graphic capabilities available on our extensive line of host-based graphic terminals are now available in powerful intelligent workstations. Tedious manual digitization of engineering drawings is eliminated with a Tek graphic input workstation. And, Tek color copiers produce hardcopy with resolutions that exceed terminal resolution. Tek innovation, reliability and flexibility are built into all Tek products, which continue to set standards around the world.











#### **Tektronix New 6000 Family** Price 6212 Intelligent 6210 Graphics Intelligent Workstation 6205 Graphics Intelligent 6130 Workstation Graphics Intelligent Workstation 6120 Graphics Intelligent Workstation 6110 Graphics Workstation Instrument Controller Performance Scientific CAE/CAD CAE/CAD CAE/CAD Instrument/ Engineering **Process** Data Data Control **Analysis** Analysis/ CAE

### Introducing Tektronix 6000 Family

Developing a workstation strategy is more than a matter of finding "the right" system—because no single configuration can meet the needs of a diverse group of scientists and engineers. Even within a single company or agency, disciplines as varied as electrical engineering, mechanical engineering, software engineering, documentation, data analysis, automated testing, and materials planning need to work together and share data; yet each group has its own specialized computing requirements. To meet those requirements, you look for a mix of display technologies, processing power and software tools; for systems that deliver the right price and performance on each desk; and for products that you can use with your existing equipment, not in place of it.

In the past, Tektronix has supported the needs of scientists and engineers by providing engineering instrumentation, computing controllers, software, and affordable, high-quality graphics terminals. Now, Tek expands its support by offering the 6000 Family—32-bit, high-performance, multifunction workstations that deliver not just a single type of display or level of computing power, but a range of capabilities to handle the full spectrum of scientific and engineering applications.

Also part of the 6000 Family are sophisticated software tools that play a key role in enhancing professionals' productivity. With the 6000 Family, Tek products now span from "dumb" terminals, entirely host dependent, through "smart" terminals with local graphics processing, to "intelligent" graphics workstations powerful enough for standalone applications.

### **MEETING A RANGE OF NEEDS**

The 6000 Family is made up of two distinct but compatible product groups: the 6100 and 6200 Series. Together, they form a very broad product offering of six different models:

- The 6110 Instrument Controller—a 32-bit execute-only system with a realtime operating system
- The 6120 Intelligent Graphics Workstation—a 32-bit BASIC-language system designed for scientists and researchers.
- The 6130 Intelligent Graphics Workstation—a low-cost, high-performance 32-bit system with an operating system based on UNIX.\*
- The 6205 Intelligent Graphics Workstation—an economical and expandable 32-bit system that offers high-performance graphics and based on UNIX. The 6205 can also be configured as a file or peripheral server for workstations on a Local Area Network (LAN).
- The 6210 Intelligent Graphics Workstation—a system that delivers full 32-bit processing power, high-performance graphics, and based on UNIX. The 6210 can also be configured as a file or peripheral server for workstations on a Local Area Network (LAN).
- The 6212 Intelligent Graphics Workstation —a powerful CAD workstation based on UNIX, with multiple 32-bit CPUs and high-performance graphics.

Along with delivering a range of price/performance ratios for each application, the 6000 Family has the configurability and expandability to fit into your current environment and grow as your requirements change. The 6000 Family is designed to make it easy to add hardware capabilities and peripherals, and to develop and transport applications programs. As a result, you can put together exactly the system you need. In addition, flexible interfacing and a LAN interface mean that the workstations can be used with your existing.

many peripherals and hosts. And both the 6100 and 6200 Series can support multiple users and multiple displays per user.

All members of the 6000 Family share common design goals. The user interface and operating system based on UNIX are the same across the family. The one exception to this is the 6110 Instrument Controller, which has its own Realtime Operating System. (RTOS). This commonality means that users can go from one workstation to another without having to learn new commands and protocols. It also simplifies the task of porting software—an application program ported to one member of the family will run on other similarly-configured 6000 Family workstations.

### A RANGE OF PROCESSING POWER

The 6000 Family is based on National Semiconductor's Series 32000\* microprocessors, which feature "mainframe on a chip" architecture and an instruction set designed for efficient execution of high-level-language programs. The 6100 Series uses National's NS32016, a 32-bit processor with a 16-bit data bus, and 32-bit registers and data paths in the chip. The 6200 Series uses the NS32016 for its entry-level workstation, the 6205; and the NS32032, which features a full 32-bit data bus for even higher performance in the 6210 and 6212 workstations. To off-load the CPU and maintain peak throughput, the 6100 and 6200 Series workstation displays use dedicated display processors, and the 6200 Series workstations use an additional I/O processor.

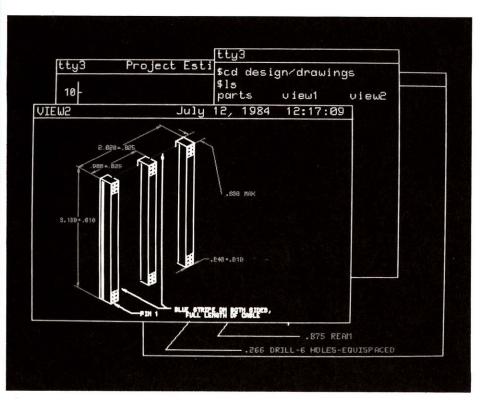
### A RANGE OF DISPLAY SYSTEMS

As important as the range of processing power is the variety of display systems supported. With the 6000 Family, Tektronix adds dynamic, bit/block transfer (BITBLT)/Vector display systems to its extensive line of graphics terminals. The 6000 Family integrated window-managed displays offer a powerful, highly interactive graphics environment that features excellent display list processing, fast vector performance, true zoom and pan, smooth text scrolling, multiple fonts, variable cursors, and rapid pattern-area filling.

Multiple windows, pop-up menus, and a threebutton "mouse" make system use both more productive and more enjoyable. Commands are entered by using the mouse as a pointing device to select menu options, locations, or actions. (Conventional command line entry is available, as well.) Windows allow the user to view separate processes that are executing concurrently. Each window is analogous to a terminal, in effect, allowing the user to interact with several terminals simultaneously.

In keeping with the philosophy of the 6000 Family, a range of price/performance display systems are available, including color and monochrome systems. Both the 6100 and 6200 Series displays contain their own 32-bit processors; the 6200 Series adds a microprogrammed display-list processor for enhanced performance. All displays provide a 60 Hz, non-interlaced monitor, detached keyboard with integral keypad, and DEC VT-102 emulation. A Modular User Input Bus can be used to expand the number and type of input devices. See following pages.

\* UNIX is a registered trademark of AT&T Bell Laboratories, Inc.



### 4000 and 6000 Series

In addition to the window-managed displays, the 6000 Family workstations support Tektronix 4010, 4100 and 4110 Series Computer Display Terminals. The 6100 Series can simultaneously support a 6100 Series window-managed display and multiple 4000 Series terminals. The 6200 Series can simultaneously support multiple 6200 Series displays and multiple 4000 Series terminals. This means you'll be able to choose from DVST, color raster and BITBLT/Vector graphics to obtain the display that matches the resolution and interactivity you require. And you can utilize multiple displays/terminals in a single workstation configuration.

### Flexible Interfacing

A workstation needs to fit into your existing environment. For maximum flexibility in interfacing, the 6000 Family provides RS-232, high-speed serial\* and 24-bit parallel\* ports. Also supported are a Centronics-compatible hardcopy interface, Multibus, IEEE Standard 488 General Purpose Interface Bus\* (GPIB), and high-speed buses. The 6000 Family also supports the Small Computer System Interface\* (SCSI), an auxiliary mass storage interface, and IBM PC compatible flexible disk format.

Terminal emulation is available as well, enabling the workstation to function as a terminal to a host computer. The 6000 Family display system can also emulate the DEC VT-102 terminal, and Tektronix 4014 with 4105 color commands. So, for example, host-based software that interacts with a Tektronix 4014 Computer Display Terminal can easily be ported to the 6100 and 6200 Series workstations and interact with the 6000 Family display system. Terminal emulation combines with the display's windowing capability, so that you can open a terminal emulation window to a host while simultaneously executing application programs through other windows.

Workstations can be interconnected to a Local Area Network (LAN) based on the IEEE-802.3 standard, using the TCP/IP protocol. The LAN can also be used for communications with VAX computers running compatible versions of UNIX or VMS. Supporting software handles communication services such as the ability to log in to a remote workstation and transfer files between workstations. A distributed file system is also provided. In addition, the Tektronix operating system, based on UNIX, includes an electronic mail utility that provides user-to-user communications. An optional, fully relational database management system facilitates data sharing among workstations. The LAN also allows workstations to easily share the use of peripherals.

\* The 6200 Series will support the high-speed serial, 24-bit parallel, GPIB, and an external SCSI interface beginning mid-1985.

### THE SOFTWARE STORY

The 6000 Family workstations provide an integrated, state-of-the-art, user interface and a variety of general-purpose software tools that enhance professional productivity. In addition, the porting of software to the workstations is simplified by the extensive use of software standards and by specialized tools that support the tasks of developing applications programs.

The Casual User Interface (CUI) provides a graphically rich environment that takes advantage of the windowing, mouse, and pop-up menus that are part of the 6000 Family integrated window managed displays. Separate programs can execute in separate windows, and the user can view several files at the same time.

The Casual User Interface is a complete operating environment. The user can move within the CUI to use the conventional operating system interface. Application programs developed or acquired may also be added to the CUI.

The CUI supports the tasks of system and network administration, making it easy to add network nodes or peripherals without detailed knowledge of the operating system.

### The Environment

Running within the CUI are optional sophisticated personnel productivity tools that together with the CUI and relational database management system, make up THE ENVIRONMENT. The user's interaction techniques are the same for all software within THE ENVIRONMENT, so the learning time spent on any one of the tools applies to the others as well. The following tools are available:

- The Document Processor—a sophisticated and easy-to-use word processing system designed to handle the complex documentation needs of engineers and scientists.
- The Graphics Editor—an interactive, visuallyoriented tool for creating conceptual sketches, technical illustrations and presentation graphics, which can then be incorporated into a document created with the Document Processor. The Graphics Editor can also be used to post-edit pictures created in another environment.
- The Project Manager—a set of interactive, graphically-oriented tools for controlling technical project resources, costs and schedules. Activities are easily performed such as producing Gantt and PERT charts, calculating a project's critical path, and producing a variable calendar.

### Relational Database Management

A powerful, easy-to-use relational database management system can be used within the CUI as well as from the conventional environment which is based on UNIX. This system allows the user to keep information in independent files, instead of locking data into specific programs. These are displayed as simple, easy-to-read tables called "relations." A collection of relations make up a "database." Because the databases are maintained independent of any particular application, different programs can access the same data. This data independence also means you will be able to get answers to questions your programs aren't programmed to ask by using simple, English phrases (through the Query Language). It also allows databases to be reorganized as changing requirements dictate.



The database management system has the following features:

- SQL Query Language—SQL, the IBM standard for Non-Procedural (i.e., not requiring programming) Query Languages, allows the user to ask questions of the database.
- Report Writer—The Report Writer allows users to quickly define reports to be produced from data in databases. These definitions can be edited to reflect changing requirements.
- Program Interface—All the facilities of the database management system are available to any programming language: C, FORTRAN, Pascal, even proposed ANSI BASIC.
- Full Help Facilities—All data management programs have full interactive HELP facilities through the CUI.

The database management system provides a tool for handling the extensive information management needs of today's professionals. It can also be a network resource, allowing users from varied disciplines and locations within a corporation to share data.

### **Teknical Tools**

Other 6000 Family personal productivity tools can be used with ANSI terminals, as well as with the 6000 Family integrated window-managed displays:

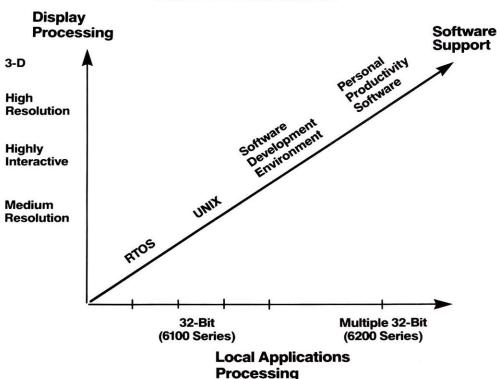
- Q-ONE—a word processing system with an easy-to-use interface and powerful formatting capabilities.
- Minitab—a general-purpose statistics package with built-in table-formatting and FORTRAN-formatted input and output.
- 20/20—a spreadsheet program that combines graphics and data management capabilities to produce an integrated modeling environment.

### **Software Development**

To lower the cost of developing and transporting application programs, the 6000 Family uses an open architecture approach and supports a number of software standards.

In addition, the UIMS (User Interface Management System) allows application programmers to build programs with a sophisticated and consistent user interface. The programs can also use the interface provided by the Casual User Interface. The UIMS provides interactive user-interface language constructs that standardize the user interface across applications while reducing the amount of code to be written by the application developer. Using the UIMS, an applications programmer can interactively specify such user interface issues as the size, location and color of menus and messages.

## **Tektronix 6000 Family: New Dimensions**



Standardization begins with the fact that the workstation's operating system is based on UNIX, which is becoming a standard among 16bit and now 32-bit systems. The Tektronix implementation includes an enhanced version of System V and Berkeley 4.2, with demand paged virtual memory for the efficient execution of very large programs. For languages, the 6000 Family has high-performance compilers for FORTRAN 77, C, and ISO Pascal. Also supported is the proposed ANSI BASIC, which integrates graphics, program segmentation, file processing and structured programming concepts. A language translation utility is available to assist conversion of Tektronix 4050 Series Desktop Computers BASIC programs to the 6000 Family workstations.

The 6100 and 6200 window managed displays are designed to support the Graphical Kernel System (GKS), a standard that brings the advantages of device-independent graphics to workstation applications while maintaining high performance. Also supported are Tektronix PLOT 10 Computer-Aided Drafting (TekniCAD), TCS and IGL.

A large pool of existing UNIX applications programs can run on the workstations. To further expand the possibilities for accessing existing software solutions, the 6120 and 6130 Intelligent Graphics Workstations can add an optional PC Co-Processor that provides compatibility with the MS-DOS operating system.

### **A Computing Strategy**

In selecting workstations, you look for systems that support a range of computing and display requirements, allow you to utilize your existing investment in computing hardware and software, and can continue to grow as your requirements change. The 6000 Family workstations meet those needs, and as value-added they have Tek's graphics experience, service and support organization behind them. The 6000 Family gives you not just a workstation but the core of a computing strategy.

The Summary Chart on page 48 shows the range of hardware and software configurations available.

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Machines.

Minitab is a trademark of Minitab, Inc.

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Q-ONE is a trademark of Quadratron Systems, Inc.

Series 32000 is a trademark of National Semiconductor Corporation.

UNIX is a trademark of AT&T Bell Laboratories, Inc.

VAX, VMS and VT-100 are trademarks of Digital Equipment Corporation.

MS-DOS is a trademark of Microsoft, Inc.

### TEK INTELLIGENT GRAPHICS WORKSTATIONS

**TEKTRONIX 6000 FAMILY HARDWARE SUMMARY** 

	6110	6120	6130	6205/6210	6212
Processors	32016 CPU	32016 CPU 32081 FP Processor	32016 CPU 32081 FP Processor	32016 CPU (6205) 32032 CPU (6210) 32016 I/O Processor 32081 FP Processor	Dual 32032 CPUs 32016 I/O Processor 32081 FP Processor
Optional		PC Co-Processor	PC Co-Processor	32032 CPU (6210 only)	32032 CPU
Memory	256 k	1 Mb	1 Mb	1 Mb	4 Mb
Optional/Additional	512 k, or 1 Mb	1 Mb or 2 Mb	512 kb, 1 Mb or 2 Mb	9 Mb	16 Mb
Storage	360 kb diskette	360 kb diskette 10 Mb Winchester	360 kb diskette 20 Mb Winchester	40 Mb Winchester	80 Mb Winchester
Optional	10 Mb Winchester	20 Mb, 40 Mb, or 80 Mb, Winchester (subs)	40 Mb, or 80 Mb Winchester Winchester (subs)	40 Mb or 80 Mb Winchester 40 Mb cart tape	40 Mb or 80 Mb Winchester 40 Mb cart tape
		External 40 Mb cart tape	External 40 Mb cart tape	9-track tape 280 Mb SMD disks (1.1 GB max) 360 kb diskettes	9-track tape 280 Mb SMD disks (1.1 GB max) 360 kb diskettes
Interface Ports	RS-232C (2) GPIB LAN	RS-232C (2) GPIB LAN	RS-232C (2) GPIB LAN	RS-232/RS-422 RS-232C (3) LAN, 8-bit parallel	RS-232/RS-422 RS-232C (3) LAN, 8-bit parallel
Optional	High-speed GPIB High-speed serial 24-bit parallel 8-bit parallel Multibus adaptor Additional Dual RS-232	High-speed GPIB High-speed serial 24-bit parallel 8-bit parallel SCSI Multibus adaptor Additional Dual RS-232	High-speed GPIB High-speed serial 24-bit parallel 8-bit parallel SCSI Multibus adaptor Additional Dual RS-232	High-speed GPIB*2 High-speed serial*2 24-bit parallel*2 SCSI*2 Multibus adaptor Additional Dual RS-232*2	High-speed GPIB*2 High-speed serial*2 24-bit parallel*2 SCSI*2 Multibus adaptor Additional RS-232*2
Display Options		32-bit display list processor*1	32-bit display list processor*1	32-bit display list processor and 24-bit, bit-slice vector processor*1	32-bit display list processor and 24-bit, bit-slice vector processor*1
6000 Family:		13 in 640 x 480 color 15 in 640 x 480 monochrome	13 in 640 x 480 color 15 in 640x 480 monochrome	19 in 1024 x 768 color 19 in 1024 x 768 monochrome	19 in 1024 x 768 color 19 in 1024 x 768 monochrome
4000 Family:		4010 Series 4100 Series 4110 Series	4010 Series 4100 Series 4110 Series	4010 Series 4100 Series 4110 Series	4010 Series 4100 Series 4110 Series
Peripheral Options 4644 Dot Matrix Printer 4695 Color Graphics Copier	yes yes	yes yes	yes yes	yes yes	yes yes
Support for Letter Quality Printer	no	no	ves	yes	yes
Line Printer Large-format Plotter	no no	no no	yes no	yes yes	yes yes

<sup>\*1</sup> Display processors come standard in the 6000 Family display systems.

### **TEKTRONIX 6000 FAMILY SOFTWARE SUMMARY**

Operating Systems	RTOS	Proposed ANSI BASIC Based on UNIX*3 (subset)	Based on UNIX*3	Based on UNIX*3	Based on UNIX*3
Optional		Based on UNIX*7 (full) PC Co-Proc. Support*3*4	PC Co-Proc. Support*4		
Languages		Proposed ANSI BASIC			
Optional	Executes object code from FORTRAN 77, C, ISO Pascal and proposed ANSI BASIC	C*5 ISO Pascal*5 Enhanced FORTRAN 77*5	Proposed ANSI BASIC C ISO Pascal Enhanced FORTRAN 77	Proposed ANSI BASIC C ISO Pascal Enhanced FORTRAN 77	Proposed ANSI BASIC C ISO Pascal Enhanced FORTRAN 77
Graphics Libraries		GKS Level 0b (subset)			
Optional		PLOT 10 IGL*5 PLOT 10 TCS*5	GKS Level 3c PLOT 10 IGL PLOT 10 TCS PLOT 10 TekniCAD	GKS Level 3c PLOT 10 IGL PLOT 10 TCS PLOT 10 TekniCAD	GKS Level 3c PLOT 10 IGL PLOT 10 TCS PLOT 10 TekniCAD
General Purpose Software Options					
Casual User Interface Document Processor Graphics Editor Project Manager UIMS <b>Database Manager</b> Q-ONE Minitab	no no no no no no no	no no no no no no ves*5 yes*5	yes*4 yes*4 yes*4 yes*4 yes*4 yes yes	yes*4 yes*4 yes*4 yes*4 yes*4 yes yes yes	yes*4 yes*4 yes*4 yes*4 yes*4 yes yes yes
20/20	no	yes*6	yes*6	yes*6	yes*6

<sup>\*3</sup> Enhanced version of System V and Berkeley 4.2 UNIX. \*4 Requires 6000 Family display system.
\*6 Requires a graphics terminal for plotting. \*7 Requires 20 Mbyte or larger hard disk.

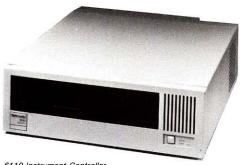
<sup>\*2</sup> Mid-1985 availability.

<sup>\*5</sup> Requires additional memory, disk upgrades, and full operating system.

### The 6100 Series

The 6100 Series consists of three products, all with low cost and high performance. They are designed for applications such as process/ instrument control, data analysis, and design applications. The 6100 Series is upward compatible with the 6200 Series; applications developed on the 6120 and 6130 will run on the 6200 Series at an increased speed.

The 6100 Series system cabinet is a compact, desk-top unit measuring approximately 6 x 17 x 24 inches and containing six half-wide or three full-wide slots for expansion. The cabinet may be attached to an optional floor stand and placed under or at the side of the work surface.



6110 Instrument Controller

### 6110 Instrument Controller

32-Bit Processor

**Execute-Only System Controller** 

Realtime Operating System

256 Kbytes Memory, 360 Kbytes Flexible Disk Storage

### Dual RS-232 Ports (Up to 9600 Baud)

The 6110 is a complete satellite unit for a process control system or instrumentation control. It features a Realtime Operating System and can execute object programs generated in BASIC, C, Pascal, or FORTRAN. Object programs can be downloaded from the other 6000 Family workstations via RS-232, flexible disk, or LAN.

The full-function GPIB port includes talker, listener and controller functions. Other standard 6110 features are 256 kbytes of memory, dual RS-232 ports (up to 9600 baud), and a 360 kbytes flexible disk. Optionally available is a high-speed GPIB port with single-character EOM detection and cache memory transfers.

### **CHARACTERISTICS**

PROCESSOR

Standard — 32016 CPU.

DATA TRANSMISSION

Data Rate — Up to 9600 baud.
Interface Ports — Standard: RS-232C (2), GPIB, LAN.
Optional — High-speed GPIB, high-speed serial, 24-bit parallel, 8-bit parallel, Multibus adaptor, additional dual RS-232.

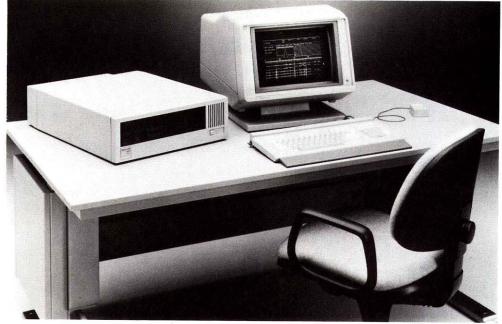
### MEMORY

Standard - 256 kbytes. Optional/Additional — Up to 1.5 Mbyte.

STORAGE Standard - 360 kbytes diskette. Optional - 10 Mbyte Winchester

SOFTWARE

Operating System — Realtime Operating System.



6120 Configuration

### ORDERING INFORMATION

6110 Instrument Controller ...... \$4,995 WARRANTY-PLUS SERVICE PLANS REFER TO PAGE 14 Installation and Setup ...... Service Plan + 9 Months Service ...... OEM Service Plan +12 Months Service

COMPANION PRODUCT

\$1,350 Matrix Printer

### 6120 Intelligent Graphics Workstation

32-Bit Processing for Scientific and **Research Applications** 

Floating Point Processor

**Proposed ANSI BASIC** 

GPIB, RS-232C, LAN Interfaces

### 1 Mbyte Memory, 360 Kbytes Flexible Disk and 10 Mbytes Hard Disk Storage

The 6120 is an excellent system for researchers, mathematicians, and scientists such as astronomers, physicists, biologists, chemists, geologists, zoologists, and oceanographers. The 6120's 32bit processing power goes hand-in-hand with the ease-of-use and extended capabilities of the proposed ANSI BASIC. The result is perfect for applications such as data acquisition and analysis, scientific and statistical research, data presentation and fore casting.

For increased power and capability, a subset of the 6000 Family operating system, based on UNIX; is included with the BASIC system. It can be accessed directly by the user, to provide a multiuser, multiprocessing environment. With additional disk capacity and memory, compilers for C, FORTRAN, and ISO Pascal can be added. A full version of the operating system is also available.

Optional 6120 integrated window-managed displays include a 15 inch, 640 x 480 monochrome display system and a 13 inch. 640 x 480 color display system with four planes. Both systems include keyboard and mouse input. Additional terminals can be added for multi-user support.

### CHARACTERISTICS

### PROCESSOR

Standard — 32016 CPU, 32081 Floating Point processor. Optional - PC Co-processor.

### **DATA TRANSMISSION**

Data Rate — Up to 9600 baud.

Interface Ports - Standard: RS-232C (2), GPIB, Local Area Network (LAN). Optional: High-speed GPIB, high-speed serial, 24-bit par- allel, 8-bit parallel, SCSI, Multibus adaptor, additional dual RS-232.

### MEMORY

Standard — 1 Mbyte.

Optional/Additional - Up to 2 Mbytes.

### STORAGE

Standard — 360 kbytes diskette, 10 Mbyte Winchester. Optional - 20 Mbyte, 40 Mbyte, or 80 Mbyte Winchester (subs), external 40 Mbyte cartridge tape.

### SOFTWARE

Operating System — Standard: BASIC, and UNIX Subset. Optional: UNIX\*1\*4 (full), PC Co-processor\*2

Languages — Standard: Proposed ANSI BASIC. Optional: Enhanced FORTRAN 77\*3, C\*3, ISO Pascal\*3.

Graphics Libraries - Standard: GKS Level Ob. Optional: PLOT 10 IGL\*3, PLOT 10 TCS\*3.

### OPTIONAL DISPLAY SYSTEMS

6000 Family - 32-bit display processor. Color: 13-inch 640 x 480. Monochrome: 15-inch 640 x 480. 4000 Family - 4010, 4100, 4110 Series.

Refresh Rate - 60 Hz, non-interlaced.

### ORDERING INFORMATION

6120 Intelligent Graphics Workstation (Display	
not included) \$7,995	
WARRANTY-PLUS SERVICE PLANS REFER TO PAGE 14 NO — Installation and Setup +\$250	

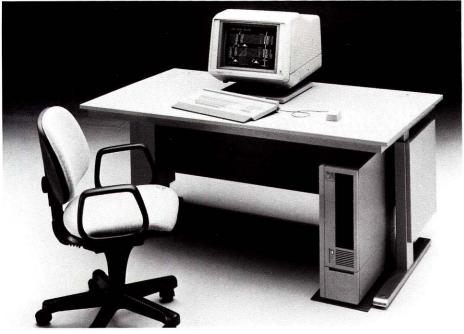
WARRANTY-PLUS SERVICE PLANS REFER TO PA	GE 14
N0 — Installation and Setup	+\$250
N1 — Service Plan + 9 Months Service	+\$470
N3 — OEM Service Plan + 12 Months Service	+\$630
	1000

COMPANION PRODUCTS - Dot Matrix Printer .... 4695 — Color Graphics Copier .....

- \*1 Enhanced version of System V and Berkeley 4.2 UNIX.
- 2 Requires 6000 Family display system.
- 3 Requires disk upgrades and full operating system.
- 4 Requires 20 Mbyte or larger hard disk.







INTELLIGENT GRAPHICS

WORKSTATIONS

6130 configuration

### 6130 Intelligent Graphics Workstation

Powerful Graphics Workstation for CAE, Data Analysis, and Software Development

32-Bit Processor, Floating Point Processor

Optional PC Co-processor

GPIB, RS-232C, LAN Interfaces

1 Mbyte Memory, 360 Kbytes Flexible Disk, 20 Mbytes Hard Disk Storage

The 6130 is a powerful graphics workstation designed for applications such as data analysis, software development, schematics entry, and computer-aided engineering.

Like the 6200 Series, the 6130's operating system is an enhanced version of System V and Berkeley 4.2 UNIX. For programming support, the 6130 has optional high-performance-compilers for C, FOR-TRAN, ISO Pascal, and the proposed ANSI BASIC, as well as GKS level 3c support.

An optional PC Co-Processor provides the user with access to a large group of existing software solutions written for the MS-DOS operating system.

Optional 6130 integrated window managed displays include a 15 inch, 640 x 480 monochrome display system and a 13 inch, 640 x 480 color display system with four planes. Both systems include keyboard and mouse input. Additional terminals can be added for multi-user support.

### CHARACTERISTICS

### PROCESSORS

Standard - 32016 CPU, 32081 Floating Point processor. Optional - PC Co-processor

### DATA TRANSMISSION

Data Rate — Up to 9600 baud.

Interface Ports - Standard: RS-232C (2), GPIB, Local Area Network (LAN). Optional: High-speed GPIB, high-speed serial, 24-bit parallel, 8-bit parallel, SCSI, Multibus adaptor, additional dual RS-232.

### MEMORY

Standard - 1 Mbyte.

Optional/Additional — Up to 2 Mbytes.

### STORAGE

Standard - 360 kbytes diskette, 20 Mbyte Winchester. Optional - 40 Mbyte or 80 Mbyte Winchester (subs), External 40 Mbyte cartridge tape.

### SOFTWARE

Operating System — Standard: Based on UNIX\*1. Optional: PC Co-processor support\*2.

Languages - Optional: Proposed ANSI BASIC, C, ISO Pascal, Enhanced FORTRAN 77.

Graphics Libraries - Optional: GKS Level 3c, PLOT 10 IGL. PLOT 10 TCS, PLOT 10 TekniCAD.

### OPTIONAL DISPLAY SYSTEMS

6000 Family - 32-bit display list processor. Color: 13-inch 640 x 480. Monochrome: 15-inch 640 x 480. 4000 Family - 4010, 4100, 4110 Series.

Refresh Rate - 60 Hz. non-interlaced

NO - Installation and Setup .....

N1 - Service Plan + 9 Months Service ...

### ORDERING INFORMATION

6130 Intelligent Graphics Workstation (Disp	lay
not Included)\$9,5	00
WARRANTY-PLUS SERVICE PLANS REFER TO PAGE	14

... +\$515

### N3 - OEM Service Plan + 12 Months Service ....... +\$685 COMPANION PRODUCTS

4644 — Dot Matrix Printer	\$1,350
4695 — Color Graphics Copier	\$1,595

Enhançed version of System V and Berkeley 4.2 UNIX.

### The 6200 Series

The 6200 Series workstations' high-resolution, window-managed display system, range of processing power, and integrated LAN interface work together to produce flexible and powerful systems suitable for the most demanding tasks. Hardware virtual memory and Floating Point support are standard, as is a dedicated I/O processor.

Along with the flexible interfacing and support for standards that it shares with the 6100 Series, the 6200 Series derives additional power and configurability from its basic internal architecture. The 6200 Series is built around a global bus and uses a state-of-the-art architecture to provide very high performance, long life and adaptability to a variety of cost-performance requirements. And because the underlying operation of the system doesn't depend on the specific components, the workstations can expand, add additional CPUs and special-purpose processors, and even change processor technologies-all at a low incremental cost and without loss of investment.

The 6200 Series workstations can support multiple users, each with a 6200 Series integrated display, Tektronix graphics terminal, or any ANSI terminal. Additionally, multiple displays per user are supported. The 6000 Family multi-processing architecture ensures that the performance degradation sometimes associated with multiple users is minimized.

The 6200 Series workstation cabinet is a deskside unit that is approximately 26 inches high, 8.75 inches wide, and 33.5 inches deep.

<sup>2</sup> Requires 6000 Family display system.







6205 Configuration

6210 Configuration

### 6205 Intelligent Graphics Workstation

Economical Entry into the High Performance 6200 Series

### NS32016 Processing Power for Multiple Users

The 6205 affords an economical entry into the high-performance 6200 Series product line. It is designed to meet the processing and graphics requirements of computer-aided design and computer-aided engineering applications, and to provide interfacing for the more powerful peripherals that are desirable to support such tasks.

To deliver the processing power needed for multiple users and for CAE/CAD tasks, the 6205's NS32016 central processor, which includes floating point and virtual memory, is aided by an I/O Processor (NS32016) that handles I/O interactions

The 6205 comes standard with a 40 Mbyte, 51/2 inch Winchester disk. For increased storage capacity, the 40 Mbyte disk can be replaced by an 80 Mbyte disk, and any one of the following can be added: 40 Mbyte cartridge tape, 360 kbyte flexible disk drive, an additional 40 Mb or 80 Mb Winchester disk.

One megabyte of Error Correcting Code (ECC) RAM is standard for the 6205. The 6205 can support up to 10 Mbyte of memory if terminals are used, up to 6 Mbyte of memory if the 6200 Series monochrome display option is used, and up to 2 Mbyte of memory if the 6200 Series color display option is used. Display systems are optional.

Flexible hardware interfacing is provided by a LAN port; an 8-bit Centronics-compatible hardcopy port; and four high-speed RS-232C ports (19.2 kbaud), one of which can be configured as a high-speed RS-422 serial port.

The 6205 can be configured to act as a specialpurpose node such as a file and peripheral server to the other workstations on a Local Area Network. It can be used, for example, as a network node through which other workstations can share peripherals, rather than having the peripherals attached to an individual user's workstation.

To keep pace as your computing needs grow, the 6205, which contains slots for five circuit boards, can be expanded into a 6210 Intelligent Graphics Workstation, with faster 32032-based processing, seven board slots on the system's global bus, and additional peripheral interfacing capacity.

### **CHARACTERISTICS**

### PROCESSORS

Standard — 32016 CPU, 32016 I/O processor, 32081 Floating Point processor.

### DATA TRANSMISSION

RS-232 Data Rate — Up to 19.2 kbaud.

Interface Ports - Standard: RS-232C (3), RS-232/422, Local Area Network (LAN), 8-bit parallel. Optional: High speed GPIB, high speed serial, 24-bit parallel, SCSI, Multibus adaptor, additional RS-232, plotter controller (Mid-1985 availability).

### MEMORY

Standard — 1 Mbyte.

Optional Additional — 9 Mbyte.

### STORAGE

Standard — 40 Mbyte Winchester.

Optional — 40 Mbyte or 80 Mbyte Winchester, 40 Mbyte cartridge tape, 9-track tape, 280 Mbyte SMD disks (1.1 GB maximum), 360 kbyte diskettes

### SOFTWARE

Operating System - Based on UNIX\*1.

Languages — Optional: Proposed ANSI BASIC, C, ISO Pascal, Enhanced FORTRAN 77.

Graphics Libraries — Optional: GKS Level 3c, PLOT 10 IGL, PLOT 10 TCS, PLOT 10 TekniCAD.

### OPTIONAL DISPLAY SYSTEMS

6000 Family - 32-bit display list processor and 24-bit, bit-slice vector processors. Color or Monochrome: 19-inch 1024 x 768. 4000 Family - 4010, 4100, 4110 Series.

Refresh Rate - 60 Hz. noninterlaced

### ORDERING INFORMATION

6205 Intelligent Graphics Workstation (Display Not Included) ...... \$13,950

### WARRANTY-PLUS SERVICE PLANS REFER TO PAGE 14 N0 — Installation and Setup ...... +\$250 N1 — Service Plan + 9 Months Service ...... +\$770 N3 - OEM Service Plan + 12 Months Service ..... +\$1,025

### COMPANION PRODUCTS

4644 — Dot Matrix Printer	\$1,350
4695 — Color Graphics Copier	\$1,595

<sup>\*</sup> Enhanced version of System V and Berkeley 4.2 UNIX.

### **6210** Intelligent Graphics Workstation

Multiple-User Configuration for CAE and **CAD Engineering Applications** 

Dedicated Floating Point, I/O and Display **List Processors** 

RS-232C, RS-232/422, LAN, 8-Bit Parallel Interfaces

### 1 Mbyte ECC RAM, 40 Mbyte Hard Disk Storage

The 6210 combines 32-bit processing and the high-resolution graphics of the 6200 Series display in a system that is ideal for multiple users and for demanding engineering applications such as ECB design, VLSI design, and mechanical design and analysis.

The central applications processor for the 6200 Series is the NS32032, which includes a 32-bit data bus for full 32-bit processing. Floating point and virtual memory hardware are standard. To further increase system performance, an NS32016-based I/O Processor offloads the central processor and handles all input and output interactions. In addition, the optional 6200 Series display systems include their own 32-bit processor. Additional CPUs, each with their own memory, can be added under Tek's unique multiprocessor UNIX kernel

The 6210 comes standard with a 40 Mbyte, 51/4 inch Winchester disk and 1 Mbyte of Error Correcting Code (ECC) RAM. The 40 Mbyte disk can be replaced by a 40 Mbyte or 80 Mbyte disk, along with an additional 9 Mbyte of memory. A 360 kbyte, 5.25 inch flexible disk drive, 40 Mbyte cartridge tape, and an additional 40 Mbyte or 80 Mbyte Winchester are also available. In addition, plug-in controllers are available for high performance SMD disks, 9-track tape drives, and Versatec plotters. Each disk controller can support up to four drives of 280 Mbyte each for 1.1 GB of external disk storage. A special mass storage cabinet is available to house any combination of two disk drives and one 9-track tape.

### INTELLIGENT GRAPHICS WORKSTATIONS

For increased configuration flexibility, the 6210 has seven circuit board slots; an optional doublewide configuration allows the workstation to support an increased number of board slots. Like the 6205, the 6210 can be configured to act as a file and peripheral server for other workstations on a Local Area Network.

Hardware interfacing for the 6210 includes as standard: four high-speed RS-232C ports (one configurable as RS-422), a Local Area Network port, and an 8-bit, Centronics-compatible hardcopy port.

### **CHARACTERISTICS**

### **PROCESSORS**

Standard — 32032 CPU, 32016 I/O processor, 32081 Floating Point processor.

Optional - 32032 CPU.

#### DATA TRANSMISSION

RS-232 Data Rate — Up to 19.2 kbaud.

Interface Ports - Standard: RS-232C (3), RS-232/422, Local Area Network (LAN), 8-bit parallel. Optional: High-speed GPIB, high-speed serial, 24-bit parallel, SCSI, Multibus adaptor, additional RS-232, plotter controller. (Mid-1985 availabilty.)

#### MEMORY

Standard - 1 Mbyte.

Optional/Additional - 9 Mbyte.

Standard — 40 Mbyte Winchester.

Optional - 40 Mbyte or 80 Mbyte Winchester, 40 Mbyte cartridge tape, 9-track tape, 280 Mbyte SMD disks (1.1 GB maximum), 360 kbyte diskettes.

### SOFTWARE

Operating System — Based on UNIX\*1.

Languages — Optional: Proposed ANSI BASIC, C, ISO Pascal, Enhanced FORTRAN 77.

Graphics Libraries — Optional: GKS Level 3c, PLOT 10 IGL, PLOT 10 TCS, PLOT 10 TekniCAD.

### **OPTIONAL DISPLAY SYSTEMS**

**6000 Family** — 32-bit display list processor, and 24-bit, bit-slice vector processor. Color or Monochrome: 19-inch 1024 x

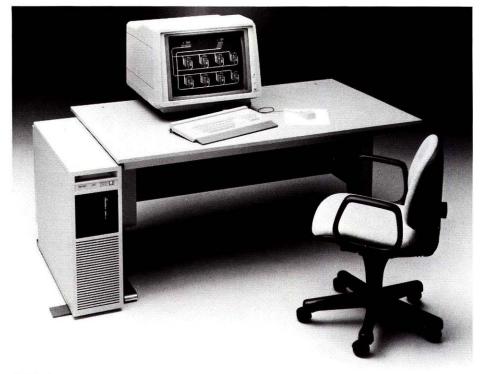
4000 Family - 4010, 4100, 4110 Series

Refresh Rate — 60 Hz, noninterlaced.

### ORDERING INFORMATION

6210 Intelligent Graphics Workstation (D not Included)	
WARRANTY-PLUS SERVICE PLANS REFER TO PA	GE 14
N0 — Installation and Setup	+\$300
N1 — Service Plan + 9 Months Service	+\$470
N3 — OEM Service Plan + 12 Months Service	+\$630
COMPANION PRODUCT	
4644 — Dot Matrix Printer	\$1,350
4695 — Color Graphics Copier	\$1,595

<sup>&</sup>lt;sup>↑</sup> Enhanced version of System V and Berkeley 4.2 UNIX.



6212 Configuration

### 6212 Intelligent Graphics Workstation

Multiprocessing, Multi-User Configuration for Highly Interactive, Compute Intensive **Applications** 

Dedicated Floating Point, I/O and Display **List Processors** 

RS-232C, RS-232/422, LAN, 8-Bit Parallel Interfaces

### 4 Mbytes Memory, 80 Mbyte Winchester Disk Storage

The 6212 is the most powerful member of the 6000 Family, although it too can be expanded to include additional CPUs for even higher performance. With seven circuit board slots it can easily support multiple users and multiple displays.

In addition to the capabilities of the 6210, the 6212 features dual applications processors; two 32-bit CPUs are standard, and additional CPUs can be added. Multiple CPUs allow separate tasks-such as editing a schematic and simulating a circuit—to proceed simultaneously on separate CPUs and be monitored via separate windows on the integrated display system.

The 6212's high performance makes it especially suited to tasks that are both highly interactive (such as editing engineering drawings) and highly compute-intensive (such as circuit simulation or finite element analysis). The 6212 provides the local computing power necessary to concurrently perform both interactive and CPU-intensive tasks without relying on a separate host computer.

For memory support for these compute-intensive tasks, the 6212 comes with a standard 2 Mbytes of memory per CPU, and up to 10 Mbytes per CPU is available. Disk capacity is greater than on the 6210, as well; 80 Mbytes is standard, and another 80 Mbytes can be added. All of the 6205 and 6210 options and peripherals are also available, including the 6200 Series integrated window-managed displays.

### **CHARACTERISTICS**

PROCESSORS
Standard — Dual 32032 CPUs, 32016 I/O processor, 32081 Floating Point processor Optional - 32032 CPU

### **DATA TRANSMISSION**

RS-232 Data Rate — Up to 19.2 kbaud. Interface Ports — Standard: RS-232C (3), RS-232/422, Local Area Network (LAN), 8-bit parallel. Optional: High-speed GPIB, high-speed serial, 24-bit parallel, SCSI, Multibus adaptor, additional RS-232, plotter controller (Mid-1985 availability).

### MEMORY

Standard — 4 Mbytes. Optional/Additional — 16 Mbytes.

### STORAGE

Standard — 80 Mbyte Winchester.

Optional — 40 Mbyte or 80 Mbyte Winchester (total of 160 Mbyte), 40 Mbyte cartridge tape, 9-track tape, 280 Mbyte SMD disks (1.1 GB maximum), 360 kbyte diskettes.

### SOFTWARE

Operating System — Based on UNIX\*1.

Languages — Optional: Proposed ANSI BASIC, C, ISO Pascal, Enhanced FORTRAN 77.

Graphics Libraries — Optional: GKS Level 3c, PLOT 10 IGL, PLOT 10 TCS, PLOT 10 TekniCAD.

### OPTIONAL DISPLAY SYSTEMS

6000 Family - 32-bit display list processor and 24-bit, bit-slice vector processor. Color or Monochrome: 19-inch 1024 x 768.

4000 Family — 4010, 4100, 4110 Series.

Refresh Rate — 60 Hz, noninterlaced.

6212 Intelligent Graphics Workstation	(Display
not Included)	\$39,950
WARRANTY-PLUS SERVICE PLANS REFER TO	PAGE 14
N0 — Installation and Setup	+\$300
N1 - Service Plan + 9 Months Service	+\$1,695
N3 - OEM Service Plan + 12 Months Service	+\$2,280

COMPANION PRODUCTS	
4644 — Dot Matrix Printer	\$1,350
4695 — Color Graphics Copier	\$1.595

\* Enhanced version of System V and Berkeley 4.2 UNIX.





**4644** Dot Matrix Printer

**Hardcopy Output for Workstation Printing** 

160 CPS Print Speed

**High-Resolution Graphics Capability** 

### RS-232 and Parallel Interfaced (Centronics Compatible)

The 4644 Dot Matrix Printer is supported by the 6000 Family Workstations via an RS-232 port or a Centronics-compatible connector. The 4644's compact packaging accommodates full carriage-width printing at a speed of 160 characters per second in a space no larger than that occupied by a standard office typewriter. Multiple pitches allow for pica, elite, condensed and enlarged printing. The 23 x 16 dot matrix permits near-letter-quality printing as a standard capability. High-resolution graphics can be printed at selectable densities of up to 240 dots per inch. A buffer provides non-stop printing. Both tractor and friction-feed are standard.

### **CHARACTERISTICS**

Print Speed — 160 cps draft, 27 cps near-letter-quality. Character Set — 96 ASCII, 7 international. Character Density — 11 x 9 draft, 23 x 16 near-letter-quality. Character Pitch — 5, 6, 8, 10, 12, 17.2 cpi. Maximum Columns — 156 (at 10 cpi). Graphics — 60 to 240 horizontal, 72 to 216 vertical. Noise Level — <60 DBA ( $\le$ 55 DBA measured). Physical Dimensions — 23.5 in wide x 13.5 in deep x 5.1 in

### INCLUDED ACCESSORIES

Ribbon cartridge (118-3876-00); operator's manual.

high.

ORDERING INFORMATION
4644 Dot Matrix Printer ...... \$1,350

### OPTIONAL ACCESSORIES

Ribbon Cartridge — Order 118-3876-00.\*1
RS-232 Cable — Order 012-1119-00.\*1
Centronics-Type Cable — Order 012-1092-00.\*1

This is a preliminary 6000 Family product description. Specifications may change without notice.

### 6210S1 Server Node

Configured Network Node Based on 6210 Workstation

### **Shared Peripherals**

### 1 Mbyte Memory, 40 Mbyte Winchester

The 6210S1 Server Node functions as a network peripheral "bank" that allows other networked workstations to share large or expensive peripherals. Additionally, it permits the isolation of those peripherals that might exceed comfortable office noise levels. The 6210S1 is a bundled system comprised of a standard 6210 Intelligent Graphics Workstation, a 280 Mbyte SMD disk subsystem, a 9-track tape subsystem, an internal streaming tape cartridge drive, and a Local Area Network (LAN) transceiver. The user can add his own low-cost ANSI terminals or Tektronix 4100 Series terminals.

For product specifications, refer to the 6210 Intelligent Graphics Workstation (page 51) and the various peripheral devices listed on this page.

### 60TD10 9-Track Tape

Tape Storage for 6200 Series Workstations

9-Track, 1600 BPI, Phase-Encoded

Streaming and Start/Stop Operation

The 60TD10 9-track tape is a convenient, industry-standard storage system for 6200 Series Workstations. Using the popular, industry-wide PE (phase-encoded) format, the 60TD10 provides transportable media backup for high-capacity fixed media SMD disks. Both streaming (100 ips) and start/stop modes are available for operational flexibility. The 60TD10 is packaged in a low-profile cabinet (60GC01) that blends easily into workstation environment and allows for easy servicing.

### **CHARACTERISTICS**

Recording Density — 1600 bpi.

Storage Capacity — Up to 40 Mbyte on 10.5 in reel.

Number Tracks — 9.

Tape Width — 1/2 in.

Recording Format — PE.

Streaming Speed — 100 ips.

Start/Stop Speed — 25 ips.

Rewind Speed — 2.50 min.

Interfacing — Requires 62KM31 9-track tape controller (in 6200 Series Workstation) or user-supplied SCSI interface for 6100 Series.

### INCLUDED ACCESSORIES

1/2 in tape real, 2400 ft (002-1439-00); installation/operation manual.

### ORDERING INFORMATION

60TD10	9-track	Tape	Drive	and	Cabinet
					\$9,950
62KM31	Tape Cor	ntroller			\$2,500

### 60DH01 280 Mbyte SMD Disk

High-Capacity Disk Storage for 6200 Series Workstations

The 60DH01 SMD disk provides 280 Mbytes of formatted storage for data-intensive workstation applications or for use as a shared data source in a local area network. The 60DH01 can be packaged in an optional stand-alone mass storage cabinet (60GC01) or it can be easily installed into the 60TD10 9-track tape drive cabinet for a cost-effective storage/backup combination. Each cabinet can house up to two 60DH01's; and up to four drives can be driven by the same 6200 Series controller (62KM30). The 60DH01 provides 20 ms access times (average) and a maximum data rate of 1.2 Mbytes/second.

### **CHARACTERISTICS**

Capacity — 340 Mbytes unformatted, 280 Mbytes formatted. Access Time — 20 ms (average).

Interfacing — Requires 62KM30 SMD Disk Controller in 6200 Series Workstation.

### PHYSICAL CHARACTERISTICS

Dimensions	SMD Drive Only 60DH01		Tape With Cabinet 60TD10		Cabinet Only 60GC01	
	mm	in	mm	in	mm	in
Width	216	8.5	546	21.5	546	21.5
Height	259	10.2	915	36.0	915	36.0
Depth	762	30.0	915	36.0	915	36.0
Weights≈	kg	lb	kg	lb	kg	lb
Net	37.0	82.0	72.5	160.0	27.2	60.0

### INCLUDED ACCESSORIES

Installation/operation manual

### ORDERING INFORMATION

60DH01 300 Mbyte	SMD Disk	 \$15,400
62KM30 SMD Disk	Controller	 \$2,900

### 60GC01 Mass Storage Cabinet

The 60GC01 Mass Storage Cabinet is a compact, space-saving means of housing up to two SMD Disk Drives (60DH01) and one 60TD10 9-track tape drive. The cabinet is the standard enclosure for the 60TD10 9-track tape drive and may be ordered separately for disk-only configurations.

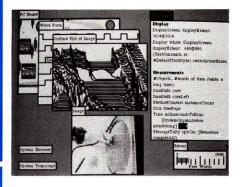
No separate order is required for a disk/tape combination in the same cabinet.

### ORDERING INFORMATION

60GC01 Mass Storage Cabinet ......... \$1,950

Contact your local sales representative.

### TEK THE GRAPHICS STANDARD



4404 Display

### CONTINUING THE GRAPHICS STANDARD Compatibility Across the Board

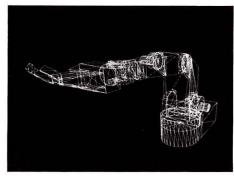
Compatibility of hardware and software is the basis for building a line of products that can change with market and application requirements, expand as needed, and take advantage of new technologies as they become available. In 1985 Tektronix Information Display Group continues its ongoing commitment to provide customers with the highest quality and the most technologically advanced graphics products. All of Tek's new products are fully compatible with existing product lines, protecting software investments and making hardware upgrades simple and inexpensive. Highlighted here are several new products and enhancements that reinforce Tek's reputation as a leader in high quality color graphics products.

Two new enhancement packages for the 4115B and M4115B Computer Display Terminals debuted this year. Both add power and greater adaptability, extending performance and increasing user productivity. The M4115B's sophistication and interactivity is also configured in another new product introduced by Tektronix this year, the 4991S1 Graphic Input Workstation.

The 4991S1 provides customers with a cost-effective means of inputting vast amounts of graphical data into the data bases of popular CAD systems, resulting in up to ten times productivity increase over manual digitization.

We've augmented our 4100 Series of low-cost color graphics terminals with a new entry, the 4106. And, we've introduced a new color graphics copier, the 4692, that features a patented ink transient suppressor technology for clean, reliable operation. With the new 4510 Color Graphics Rasterizer, users can take advantage of the full resolution of their copiers, rather than limiting hardcopy resolution to that of their terminals.

Pushing back price barriers in yet another technological area, Tek introduced a low-cost artificial intelligence system that supports Al research and provides a viable delivery system for Albased software, at one half to one eighth the cost of existing Al machines.



4115B 3-D wireframe display

Finally, in continuing to meet the needs of our OEM customers, we have made available a family of high-quality computer display monitors featured in our 4100 and 4110 Series graphics terminals.

### Advanced 3-D Wireframe Capability and Feature Extensions

The 4115B and M4115B Computer Display Terminals have been enhanced to include full 3-D wireframe capability, in addition to their existing 2-D feature sets. The 4115F58 3-D wireframe enhancement is particularly useful for such tasks as structural analysis and design, finite element modeling, and thermal vibration analysis. The ability to perform local 3-D matrix transformations is resident in terminal firmware, reducing dependency on the host. The most frequently used 3-D transformations, including rotation, scaling, clipping and skewing, are all available.

A second 4115B enhancement package is a set of four features designed to be downloaded from a host or local disk. The features increase performance and productivity by enabling the user to edit segments without redrawing and retransmitting the image; to call segments from within other segments; to manage windows through pop-up menus and scrolling dialog areas; and to automatically draw circular arcs.

### 4991S1 Graphic Input Workstation

The 4991S1 Graphic Input Workstation was designed to eliminate time-consuming and tedious manual digitization of archived drawings. Consisting of a Tektronix 4991 Autovectorizer, an M4115B Computer Display Terminal, a 4957 Graphics Tablet and proprietary Graphics Structuring and Host Interfacing Software, the 4991S1 represents a tremendous productivity boon to users involved in conversion of existing drawings—on paper, Mylar\*1 or other media—into vector data for storage in CAD data bases.

### New Member of the 4100 Series

The 4106 Computer Display Terminal is an extension to the popular 4100 Series of high-quality, low-cost color graphics terminals. The 4106 broadens the series' price/performance range by offering higher resolution than the 4105 along with the enhanced features of the 4107 terminal (but with less local memory). The 4106 features 640 x 480 resolution, interactive color selection, segment support of up to 4,000 short vectors and VT-100 compatibility. Key application areas include technical data analysis, complex charting and graphing, and sophisticated business graphics.

### **High-Resolution Peripherals**

The new 4692 Color Graphics Copier offers high-quality A-size color copying from 4100 and 4110 Series color display terminals or from a host using the new 4510 Color Graphics Rasterizer. The 4692 introduces a new standard for ink-jet reliability, featuring a unique ITS (Ink Transient Suppressor) that prevents head clogging. Up to 154 dots per inch addressability in both directions provides crisp, sharp images on either paper or transparency media.

The new 4510 Color Graphics Rasterizer allows the 4691 and 4692 Color Graphics Copiers to produce images at the full resolution of the copiers, rather than the resolution of the terminals. By converting screen images into raster format, the 4510 eliminates jagged lines and smooths blurred characters. The 4510 can also be used to offload host-based workstations of rasterization tasks, increasing system throughput and lowering CPU overhead.

### **OEM Monitors**

In its new family of display monitors, Tek gives OEM customers even greater latitude in system development. Offerings include a monochrome raster or a selection of color raster monitors, in a variety of screen sizes, with a variety of resolutions, and within a wide price range to meet diverse OEM system-builder needs.

### Low-Cost Artificial Intelligence Tool

The 4404 Artificial Intelligence System is a powerful tool to support AI research and development through a complete exploratory programming environment that includes a powerful microprocessor, mass storage, a sophisticated user interface, optional networking capability, and a proprietary implementation of the Smalltalk-80\*2 programming language. The 4404 increases productivity in application areas such as expert systems, natural languages, intelligent robotics and vision systems.

Product overviews and specifications follow. In many cases, factors such as ergonomic features, display speed and quality, color brilliance and hardcopy quality are best seen to be fully appreciated. We invite you to ask your local Tektronix Sales Engineer for a demonstration. Or, simply indicate your interest on the enclosed reply card.

<sup>\*1</sup> Mylar is a registered trademark of E.I duPont de Nemours and Company Inc.

<sup>\*2</sup> Smalltalk-80 is a trademark of Xerox Corporation.





### 4105 Computer Display Terminal

Low-Cost, High-Quality Color Graphics and VT100-Compatible Alphanumerics

Supported by a Push-button Color Copier and a Local Graphics Processing Module

Compatible with Tek 4010, 4100 and 4110 Series Terminals

One Year On-Site Warranty-Three Year Option

### The Tek 4105 is a Color Raster Display Terminal Designed to Bring Color Graphics and Alphanumeric Capabilities Within Easy Reach of Every Technical Professional

Excellent display quality and ergonomic design facilitate easy creation and editing of color graphics and color text. Flicker-free 60 Hz noninterlaced refresh rate; precision in-line gun with fixed convergence, and antiglare etched screen combine to optimize the clarity and brightness of the terminal's 480 x 360 displayable matrix.

### Windowing

Resolution is enhanced by an addressable display matrix of 4096 x 4096 points. This allows the 4105 to accept data files displayed on terminals such as Tektronix' high resolution 4114B or 4115B. The user can "window in" on any portion of the matrix, and by retransmitting the data from the host, display the selected window with significantly greater detail.

In the graphics mode, the user can access up to eight colors selected from a palette of 64. Colors may be changed locally by using the friendly color user interface. Text may also be specified in as many as eight colors; up to 16 colors may be on-screen simultaneously when both the graphics and alphanumerics planes are displayed. Text editing is in compliance with ANSI X3.64 standards for screen editors.

The alphanumerics surface can be used to display host communications without interfering with the graphics on-screen.

### **Ergonomic Design**

The 4105 features a low-profile, detached DIN standard keyboard with complete ASCII characters. Integral to the keyboard is an innovative Joydisk for positioning the crosshair cursor or scrolling text in the dialog area. The 4105 can be mounted on an adjustable stand that allows it to be easily tilted up or down, swiveled left or right, lowered or elevated, or moved forward and back.

### Wide-ranging Software Compatibility

The 4105 will accept existing programs written for Tek 4010 Series terminals and is upwardly compatible with the other 4100 desktop terminals and with the 4110 Series terminals. It can be used with a wide range of utility and applications software, including Tektronix' PLOT 10 Interactive Graphics Library (IGL), PLOT 10 Graphical Kernal System (GKS) and PLOT 10 Terminal Control System (TCS); DISSPLA\*1 and TELL-A-GRAF\*1; SAS/GRAPH\*2; and popular personal productivity tools such as WordStar\*3, SuperCalc2\*4, DR Graph\*5 and InfoStar\*3. (See page 74 Personal Productivity Tools). The 4105 is also fully VT100compatible with powerful editing and word processing designed to ANSI X3.64 standards.

### Plug-Compatible Peripheral Devices

A number of plug-compatible peripheral devices further extend the value and versatility of the 4105. These include the 4695 Color Graphics Copier (for high-quality color hard copy), the 4170 Local Graphics Processor (for off-line use of the 4105) and the 4970 Cluster Controller (for operation in synchronous IBM SNA environments)

The 4100 Series color terminals are so reliable, the 90-day industry expected warranty just doesn't apply. 4105 quality is guaranteed by a one-year on-site service warranty, with two and three year extended coverage available.

### CHARACTERISTICS

**DATA TRANSMISSION** 

Data Rate - Up to 38.4 kbaud Communications Interface — RS-232C.

DISPLAY

Medium — Shadow-mask color raster.

Size - 330 mm (13 in) diagonal

Refresh Rate — 60 Hz. noninterlaced.

### KEYBOARD

Standard Keyboard -- Detached, complete ASCII characters, 14-key numeric keypad.

User Definable and Programmable Function Keys - Eight.

Programmable Keys - 82.

Graphic Cursor Control — Joydisk.

GRAPHICS MODE

Addressability - 4096 x 4096 points.

Resolution - 480 x 360 pixels

Line Types - Solid, seven dashed types.

Graphic Command Syntax — PLOT 10 compatible.

Graphics Primitives - Vectors, polygons, text.

Colors — Eight (independent of alphanumeric colors).

Palette Selection — 64.

### ALPHANUMERIC MODE

Primary Character Set — 94 (full ASCII).

Alternate Character Set — 94 (International, VT-100, rulings and mathematics).

Character Format - 5 x 9 dot matrix in 6 x 12 dot character

#### AC POWER

Line Voltage - 87 V ac to 128 V ac or 174 V ac to 250 V ac.

Line Frequency — 48 Hz to 66 Hz.

Power - 200 W max at 125 V

### PHYSICAL CHARACTERISTICS

Dimensions	Module		Keyboard	
	mm	in	mm	in
Width	419	16.5	423	16.6
Height	353	13.9	41	1.6
Depth	495	19.5	180	7.0
Depth (with cables)	572	22.5		37741100
Weights	kg	lb	kg	lb
Net	20.0	44.0	2.3	5.0

### INCLUDED ACCESSORIES

8 ft power cord; 12 ft host port RS-232 cable (012-0911-00); pkg of six keyboard overlays (334-5164-00); standard keyboard (119-1592-00); operators manual; programmer's reference manual; reference guide.

### ORDERING INFORMATION

4105 Computer Display Terminal \$3,995	i
Option 4A — United Kingdom Keyboard NC	;
Option 4B — French Keyboard NC	;
Option 4C — Swedish Keyboard NC	;
Option 4F — Danish/Norwegian Keyboard NC	;
Option 4G — German Keyboard NC	;
INTERNATIONAL POWER CORD AND PLUG OPTIONS	

Option A1 — Universal Euro 220 V/16 A, 50 Hz Option A2 — UK 240 V/13 A, 50 Hz

Option A3 - Australian 240 V/10 A, 50 Hz

Option A4 — North American 240 V/15 A, 60 Hz Option A5 — Switzerland 220 V/10 A, 50 Hz

### WARRANTY PLUS SERVICE PLAN REFER TO PAGE 14 N0 — Installation and Setup ...... +\$150

N2 — Service Plan +2 Years Service ..... N3 - OEM Service Plan + 12 Months Service ....... +\$120

### **OPTIONAL ACCESSORIES**

RS-232 Loopback Connector — Order 067-1042-00	. \$10
Copier Port Loopback Connector — Order 013-0214-00	. \$20
Graticule — Order 067-1150-00	\$145
Service Manual	
Pixel Operation ROM's — Order 040-1135-00	\$300
COMPANION PRODUCTS	

ADS01 — Adjustable Display Stand Provides Tilt, Sw	ivel,
Elevate and Glide Adjustments	\$495
4170 — Local Graphics Processing Unit	\$5,500
4695 — Color Graphics Copier	\$1,595
4970 — Cluster Controller	\$6,200

- \*1 DISSPLA and TELL-A-GRAF are trademarks of Integrated Software Systems Corporation
- \*2 SAS/GRAPH is a trademark of SAS Institute, Inc.
- \*3 WordStar and InfoStar are registered trademarks of Micro-Pro International Corporation.
- \*4 SuperCalc2 is a registered trademark of Sorcim Corporation.
- \*5 DR Graph is a trademark of Digital Research.

See this color product in the reference section beginning on page 17.

### TEK COMPUTER DISPLAY



### **4106** Computer Display Terminal

Low-Cost, High-Performance Color Graphics and VT100-Compatible Alphanumerics

Supported by Push-Button Color Copiers, Color Graphics Rasterizer and Local Graphics Processing Module

Compatible with Tek 4010, 4100, and 4110 Series Terminals

One Year On-Site Warranty - Three Year Option

# The Tek 4106 is a Color Raster Terminal that Offers Excellent Display Quality and a Friendly Input Interface to Make Creation and Editing of Color Graphics and Text Incredibly Easy

The flicker-free 60 Hz noninterlaced refresh rate, and shadow-mask color CRT, provides the vivid clarity and brightness of the 4106's 640  $\times$  480, displayable matrix. The 330 mm (13 inch) screen has a 241 mm  $\times$  178 mm ( 9 ½  $\times$  7 inch) viewing area. Resolution is enhanced by an addressable display matrix of 4096  $\times$  4096 points.

### **Endless Color Graphics Possibilities**

Draw solid or dashed lines in up to 16 colors, selectable from a total palatte of 64. Color selections are made quickly and easily through the friendly interface to the color map. Advanced graphics features include multiple views; segments; surface support; user-definable graphtext; and full 4110 graphics input features, including inking, rubberbanding, gridding, user-definable cursor and tablet support.

Alphanumeric information is displayed on a separate surface, so that host communications don't interfere with on-screen graphics.

### Designed for Convenience and Comfort

For maximum productivity, the 4106 features a low-profile, standard DIN detached keyboard with complete ASCII characters; a 14-key numeric

keypad; four special-function keys; eight dedicated programmable function keys; and N-key rollover. The 4106 can be mounted on an adjustable stand that allows the display to be tilted up or down, swiveled left or right, lower or elevated, or moved forward and back.

### Wide-Ranging Software Compatibility

The 4106 will accept programs written for Tek 4010 Series terminals and is upwardly compatible with programs for 4100 and 4110 Series terminals. It can be used with a wide range of utility and applications software, including Tektronix' PLOT 10 Interactive Graphics Library (IGL), PLOT 10 Graphical Kernal System (GKS) and PLOT 10 Terminal Control System (TCS); DISSPLA\*1 and TELL-A-GRAF\*1; SAS/GRAPH\*2; and popular personal productivity tools such as WordStar\*3, SuperCalc2\*4, DR Graph\*5 and InfoStar\*3 (See page 74 Personal Productivity Tools). The 4106 is also fully VT100-compatible with powerful editing and word processing designed to ANSI X3.64 standards.

### **Plug-Compatible Peripheral Devices**

These include the 4695 and 4692 Color Graphics Copiers, the 4510 Color Graphics Rasterizer (which eliminates terminal-imposed limitations on copier resolution), the 4170 Local Graphics Processing Unit (for off-line, host-independent use), and 4970 Cluster Controller (for operation in synchronous IBM SNA environments).

4106 quality is guaranteed by a one-year on-site service warranty, with two and three-year extended coverage available.

### CHARACTERISTICS

DATA TRANSMISSION
Data Rate — 38.4 kbaud.

Communications Interface — RS-232C.

### DISPLAY

Medium — Shadow mask color raster. Size — 330 mm (13 inch) diagonal. Refresh Rate — 60 Hz, noninterlaced.

### KEYBOARD

**Standard Keyboard** — Detached, complete ASCII characters, 14-key numeric keypad.

User-Definable and Programmable Function Keys — Eight Programmable Keys — 82.

Graphic Cursor Control — Joydisk.

### **GRAPHICS MODE**

Addressability - 4096 x 4096 points.

Resolution — 640 x 480 pixels.

Line Types - Solid, seven dashed types.

Graphic Command Syntax — PLOT 10 compatible.

Colors - 16

Palette Selection — 64.

### ALPHANUMERIC MODE

Primary Character Set — 94 (full ASCII).

Alternate Character Set — 94 (International, VT100, rulings and mathematics).

Character Format - 7 x 9 matrix in 8 x 14 dot character cell.

### **AC POWER**

Line Voltage — 87 V ac to 128 V ac or 174 V ac to 250 V ac.

Line Frequency — 48 Hz to 66 Hz.

### Power — 200 W maximum at 125 V. PHYSICAL CHARACTERISTICS

Dimensions	Module		Keyboard	
	mm	in	mm	in
Width	419	16.5	423	16.7
Height	353	13.9	41	1.6
Depth	495	19.5	180	7.1
Depth (With Cables)	572	22.5		
Weights	kg	lb	kg	lb
Net	20.0	44.0	2.3	5.0

#### INCLUDED ACCESSORIES

8 ft power cord (161-0066-00); 12 ft host port RS-232 cable (012-0911-00); pkg of six keyboard overlays (334-5164-00); standard keyboard (119-1592-00); operator's manual, programmer reference manual, reference guide.

### ORDERING INFORMATION

4106 Computer Display Terminal \$6,5	595
Option 4A — United Kingdom Keyboard	NC
Option 4B — French Keyboard	NC
Option 4C — Swedish Keyboard	NC
Option 4F — Danish/Norwegian Keyboard	NC
Option 4G — German Keyboard	NC

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz

Option A2 — UK 240 V/13 A, 50 Hz Option A3 — Australian 240 V/10 A, 50 Hz

Option A4 — North American 240 V/10 A, 50 Hz

Option A4 — North American 240 V/15 A, 60 H Option A5 — Switzerland 220 V/10 A, 50 Hz

### WARRANTY PLUS SERVICE PLAN REFER TO PAGE 14

N0 — Installation and Setup	+\$150
N2 — Service Plan +2 Years Service	
N3 — OFM Service Plan +12 Months Service	+\$195

### OPTIONAL ACCESSORIES

RS-232 Loopback Connector — Order 067-1042-00	. \$10
Copier Port Loopback Connector — Order 013-0214-00	. \$20
Graticule — Order 067-1150-00	\$145
Service Manual	

### COMPANION PRODUCTS

ADS01 — Adjustable Display Stand Provides Tilt, Swi	vel, Ele-
vate and Glide Adjustments	\$495
4170 — Local Graphics Processing Unit	\$5,500
4510 — Color Graphics Rasterizer	\$3,500
4692 — Color Graphics Copier	\$5,995
4695 — Color Graphics Copier	\$1,595
4970 — Cluster Controller	\$6,200

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- \*2 SAS/GRAPH is a trademark of SAS Institute, Inc.
- \*3 WordStar and InfoStar are registered trademarks of Micro-Pro International Corporation.
- \*4 SuperCalc2 is a registered trademark of Sorcim Corporation.
- \*5 DR Graph is a trademark of Digital Research.

See this color product in the reference section beginning on page 17.





### 4107 Computer Display Terminal

Low-Cost, High-Performance Color Graphics and VT100-Compatible Alphanumerics

Supported by Push-button Color Copiers, Color Graphics Rasterizer, and Local Graphics Processing Module

Compatible with Tek 4010, 4100, and 4110 **Series Terminals** 

One Year On-Site Warranty-Three Year Option

### The Tek 4107 is a Color Raster Terminal that Rivals Much More Costly Displays in Resolution, Reliability, Alphanumerics Capability, and Local Graphics Manipulation

Excellent display quality and friendly input interface facilitate easy creation and editing of color graphics and color text. Flicker-free 60 Hz noninterlaced refresh rate and shadow mask color CRT combine to optimize the clarity and brightness of the terminal's 640 x 480 displayable

The resolution is enhanced by an addressable display matrix of 4096 x 4096 points. To view a section in greater detail, the user zooms in on a portion of the display and the 4107 recomputes the coordinate information to display the designated section. Rather than "pixel replication" that simply enlarges the picture without providing additional detail, this true zoom significantly increases resolution.

### Up to 256 k of RAM Permits Picture Elements to be Locally Stored, then Redrawn and Manipulated as Necessary

Users can develop symbols and picture segments pertinent to the application, and recall them saving transmission and CPU time, thus improving interactivity

The user can select up to 16 colors on the graphics plane from a total palette of 64 colors. Colors can be changed locally by using the friendly interface to the color map. Text may also be specified in as many as eight colors. Text editing is in com-pliance with ANSI X3.64 standards for screen editors.

Alphanumeric information is displayed on a separate surface that can be used to display host communications without interfering with the graphics on-screen.

### Designed for Comfort and Convenience

For maximum productivity, the 4107 has a lowprofile, standard DIN detached keyboard with complete ASCII characters. Integral to the keyboard is an innovative Joydisk for positioning the crosshair cursor or scrolling text in the dialog area. In addition, the 4107 can be mounted on an adjustable stand that allows the terminal to be easily tilted up or down, swiveled left or right, lowered or elevated, or moved forward and back.

The 4107 will accept existing programs written for Tek 4010 Series terminals and is upwardly compatible with programs for 4100 and 4110 Series terminals. It can be used with a wide range of utility and applications software, including Tektronix' PLOT 10 Interactive Graphics Library (IGL), PLOT 10 Graphical Kernal System (GKS) and PLOT 10 Terminal Control System (TCS); DISSPLA\*1 and TELL-A-GRAF\*1; SAS/GRAPH\*2; and popular personal productivity tools such as WordStar\*3, SuperCalc2\*4, DR Graph\*5 and InfoStar\*3. (See page 74 Personal Productivity Tools). The 4107 is fully VT100-compatible with powerful editing and word processing designed to ANSI X3.64 standards. The 4107 allows for a smooth transition to higher-end terminals as application needs change.

### **Plug-Compatible Peripheral Devices**

These include the 4695 and 4692 Color Graphics Copiers, the 4510 Color Graphics Rasterizer (which eliminates terminal-imposed limitations on copier resolution), the 4170 Local Graphics Processing Unit (for off-line, host-independent use), and the 4970 Cluster Controller (for operation in synchronous IBM SNA environments)

The 4100 Series color terminals are so reliable, the 90-day industry expected warranty just doesn't apply. 4107 quality is guaranteed by a one-year on-site service warranty, with two and three-year extended coverage available.

### CHARACTERISTICS DATA TRANSMISSION

Data Rate - 38.4 kbaud. Communications Interface — RS-232C.

### DISPLAY

Medium — Shadow mask color raster. Size - 330 mm (13 in) diagonal. Refresh Rate - 60 Hz, noninterlaced.

#### KEYBOARD

Standard Keyboard — Detached, complete ASCII characters, 14-key numeric keypad

User Definable and Programmable Function Keys — Eight.

Programmable Keys — 82 Graphic Cursor Control - Joydisk.

### **GRAPHICS MODE**

Addressability - 4096 x 4096 points.

Resolution - 640 x 480 pixels.

Line Types - Solid, seven dashed types,

Graphic Command Syntax — PLOT 10 compatible.

Colors - 16

Palette Selection - 64.

### ALPHANUMERIC MODE

Primary Character Set — 94 (full ASCII).

Alternate Character Set — 94 (International, VT100, rulings and mathematics).

Character Format — 7 x 9 matrix in 8 x 14 dot character cell.

### **AC POWER**

Line Voltage - 87 V ac to 128 V ac or 174 V ac to 250 V ac.

Line Frequency — 48 Hz to 66 Hz.

Power - 200 W max at 125 V

### PHYSICAL CHARACTERISTICS

Dimensions	Module		Keyboard	
	mm	in	mm	in
Width	419	16.5	423	16.6
Height	353	13.9	41	1.6
Depth	495	19.5	180	7.0
Depth (With Cables)	572	22.5		
Weights	kg	lb	kg	lb
Net	20.0	44.0	2.3	5.0

### INCLUDED ACCESSORIES

8 ft power cord (161-0066-00); 12 ft host port RS-232 cable (012-0911-00); pkg of six keyboard overlays (334-5164-00); standard keyboard (119-1592-00); operator's manual, programmer's reference manual, reference guide.

### ORDERING INFORMATION

4107 Computer Display Terminal \$7,5	95
Option 4A — United Kingdom Keyboard	
Option 4B — French Keyboard	NC
Option 4C — Swedish Keyboard	NC
Option 4F — Danish/Norwegian Keyboard	NC
Option 4G — German Keyboard	NC

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz Option A2 — UK 240 V/13 A, 50 Hz

Option A3 — Australian 240 V/10 A, 50 Hz
Option A4 — North American 240 V/15 A, 60 Hz

Option A5 - Switzerland 220 V/10 A, 50 Hz

### WARRANTY PLUS SERVICE PLAN REFER TO PAGE 14

NO — Installation and Setup	+\$150
N2 — Service Plan +2 Years Service	+\$325
N3 - OEM Service Plan + 12 Months Service	+\$225

### **OPTIONAL ACCESSORIES**

RS-232 Loopback Connector — Order 067-1042-00 ..... \$10 Copier Port Loopback Connector — Order 013-0214-00 . \$20 Graticule - Order 067-1150-00 ..... Service Manual

### COMPANION PRODUCTS

ADS01 — Adjustable Display Stand Provides Tilt, Swi	vel,
Elevate and Glide Adjustments	\$495
4170 — Local Graphics Processing Unit	\$5,500
4510 — Color Graphics Rasterizer	\$3,500
4692 — Color Graphics Copier	\$5,995
4695 — Color Graphics Copier	\$1,595
4970 — Cluster Controller	\$6,200

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- \*2 SAS/GRAPH is a trademark of SAS Institute, Inc.
- \*3 WordStar and InfoStar are registered trademarks of Micro-Pro International Corporation.
- \*4 SuperCalc2 is a registered trademark of Sorcim Corporation.
- \*5 DR Graph is a trademark of Digital Research.

See this color product in the reference section beginning on page 17.

### COMPUTER DISPLAY TERMINAL



### **4109** Computer Display Terminal

Low-cost, High-performance Color Graphics and VT100-Compatible Alphanumerics on a 19 Inch Display

Select from a Palette of 4096 Colors

Supported by Push-button Color Copiers, Color Graphics Rasterizer and a Local **Graphics Processing Module** 

Compatible with Tek 4010, 4100 and 4110 **Series Terminals** 

One Year On-Site Warranty-Three Year Option

The Tek 4109 Computer Display Terminal is a Color Raster Terminal That Rivals Much More Costly Displays in Resolution, Reliability, Alphanumerics Capability and Local Graphics Manipulation

Excellent display quality and friendly input interface facilitate easy creation and editing of color graphics and color text. Flicker-free 60 Hz noninterlaced refresh rate and shadow mask color CRT combine to optimize the clarity and brightness of the terminal's 640 x 480 displayable matrix.

Effective 4109 resolution is considerably enhanced by an addressable display matrix of 4096 x 4096 points. To view a section in greater detail, the user zooms in on a portion of the display and the 4109 recomputes the coordinate information to display the designated section. Rather than "pixel replication" that simply enlarges the picture without providing additional detail, this true zoom significantly increases resolution.

### Up to 256 k of RAM Permits Picture Elements to be Locally Stored, then Redrawn and Manipulated as Necessary

Users can develop symbols and picture segments pertinent to the application, and recall them, saving transmission and CPU time, thus improving interactivity.

The user can select up to 16 colors on the graphics plane from a palette of 4096 colors. Colors can be changed locally by using the friendly interface to the color map. Text may also be specified in as many as eight colors. Text editing is in compliance with ANSI X3.64 standards for screen editors. The 4109 can display ASCII complete upperand lower-case alphanumerics, as well as alternate character fonts.

Alphanumeric information is displayed on a separate surface that can be used to display host communications without interfering with the graphics on-screen.

### **Designed for Comfort and Convenience**

The 4109 has a low-profile, standard DIN detached keyboard with complete ASCII characters. Integral to the keyboard is an innovative Joydisk for positioning the crosshair cursor or scrolling text in the dialog area.

The 4109 will accept existing programs written for Tek 4010 and 4100 Series terminals, and is upwardly compatible with 4110 Series terminals. It can be used with a wide range of utility and applications software, including Tektronix' PLOT 10 Interactive Graphics Library (IGL), PLOT 10 Graphical Kernal System (GKS) and PLOT 10 Terminal Control System (TCS); DISSPLA\*1 and TELL-A-GRAF\*1; SAS/GRAPH\*2; and popular personal productivity tools such as WordStar\*3, SuperCalc2\*4, DR Graph\*5 and InfoStar\*3. (See page 74 Personal Productivity Tools). The 4109 is also fully VT100-compatible with powerful editing and word processing designed to ANSI X3.64 standards. The 4109 allows for a smooth transition to higher-end terminals as application needs

### **Plug-Compatible Peripheral Devices**

These include the 4695 and 4692 Color Graphics Copiers, the 4510 Color Graphics Rasterizer (which eliminates terminal-imposed limitations on copier resolution), the 4170 Local Graphics Processing Unit (for off-line, host-independent use), and the 4970 Cluster Controller (for operation in synchronous IBM SNA environments).

The 4100 Series color terminals are so reliable. the 90-day industry expected warranty just doesn't apply. 4109 quality is guaranteed by a one-year on-site service warranty, with two and three-year extended coverage available.

### CHARACTERISTICS

DATA TRANSMISSION

Data Rate - 38.4 kbaud. Communications Interface — RS-232C.

#### DISPLAY

Medium - Shadow mask color raster Size — 483 mm (19 in) diagonal. Refresh Rate — 60 Hz, noninterlaced.

### KEYBOARD

Normal Keyboard — Detached, complete ASCII characters, 14-key numeric keypad.

User Definable and Programmable Function Keys — Eight. Programmable Keys — 82.

Graphic Cursor Control — Joydisk.

### GRAPHICS MODE

Addressability - 4096 x 4096 points.

Resolution — 640 x 480 pixels.

Line Types — Solid, seven dashed types.

Graphic Command Syntax — PLOT 10 compatible.

Palette Selection — 4096.

### ALPHANUMERIC MODE

Primary Character Set — 94 (full ASCII).

Alternate Character Set — 94 (International, VT-100, rulings and mathematics)

Character Format - 7 x 9 matrix in 8 x 14 dot character cell.

### **AC POWER**

Line Voltage - 87 V ac to 128 V ac or 174 V ac to 250 V ac. Line Frequency — 48 Hz to 66 Hz. Power — 200 W max at 125 V.

### PHYSICAL CHARACTERISTICS

Dimensions ≈	Module		Keyboard	
	mm	in	mm	in
Width	559	22.0	423	16.6
Height	425	16.8	41	1.6
Depth	572	22.5	180	7.0
Weight ≈	kg	lb	kg	lb
Net	31.8	70.0	2.3	5.0

### INCLUDED ACCESSORIES

8 ft power cord (161-0066-00); 12 ft host port RS-232 cable (1012-0911-00); pkg of six keyboard overlays (334-5164-00); standard keyboard (119-1592-00); operator's manual, programmer's reference manual; reference guide.

### ORDERING INFORMATION

4109	Computer Display Terminal	\$9,950
Option	4A — United Kingdom Keyboard	NC
Option	4B — French Keyboard	NC
Option	4C — Swedish Keyboard	NO
Option	4F - Danish/Norwegian Keyboard	NC
Option	4G — German Keyboard	NC

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz
Option A2 — UK 240 V/13 A, 50 Hz
Option A3 — Australian 240 V/10 A, 50 Hz
Option A4 — North American 240 V/15 A, 60 Hz
Option A5 — Switzerland 220 V/10 A, 50 Hz

Service Manual

WARRANTY PLUS SERVICE PLANS REFER TO PAGE 14 N0 - Installation and Setup ..... N2 - Service Plan +2 Years Service ....... N3 - OEM Service Plan + 12 Months Service ...... +\$300

### **OPTIONAL ACCESSORIES**

RS-232 Loopback Connector — Order 067-1042-00 ..... \$10 Copier Port Loopback Connector — Order 013-0214-00 . \$20

### **COMPANION PRODUCTS**

ADS01 - Adjustable Display Stand Provides Tilt, Swi	vel, Ele-
vate and Glide Adjustments	\$495
4170 — Local Graphics Processing Unit	\$5,500
4510 — Color Graphics Rasterizer	\$3,500
4692 — Color Graphics Copier	\$5,995
4695 — Color Graphics Copier	\$1,595
4970 — Cluster Controller	\$6,200

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- \*3 WordStar and InfoStar are registered trademarks of Micro-Pro International Corporation.
- \*4 SuperCalc2 is a registered trademark of Sorcim Corporation.
- \*5 DR Graph is a trademark of Digital Research.

See this color product in the reference section beginning on





### 4170 Local Graphics Processing Unit

Provides Local Intelligence and Graphics Processing to 4100 Series Desktop Terminals

Upward-Compatible with 4110 Series Terminals

The Tektronix 4170 is a Local Graphics Processing Unit that Provides the 4105, 4106, 4107, and 4109 Computer Display Terminals with Standalone Power Specialized for Graphics Tasks

It offers all the elements necessary to locally write, edit, compile, link, debug, and run programs; to control 4105, 4106, 4107, or 4109 terminals; and to control peripherals connected to the system.

The 4170 consists of a standalone microprocessor, local mass storage and local memory on an industry standard CP/M-86 operating system, FORTRAN-86 compiler, four serial I/O ports, and Tektronix graphics software support.

### **Dual Microprocessors Speed Local Processing**

The 4170 is powered by the 16-bit Intel 8086 and the 8087 Numeric Co-processor which speeds floating point operations. The chips provide powerful throughput and 20-bit addressability.

The 4170 comes standard with 256 kbytes of error checking and correcting memory. The 4170's total capacity is 896 kbytes. This provides host independence and more programming workspace in error free local memory.

The 4170 has two 5 \(^1/4\) inch disk drives as standard, allowing work to be easily backed up, system programs and user files maintained separately, and programs changed when necessary. Each formatted diskette can hold 327 kbytes of data. Eight Mbytes of Winchester hard disk storage is optionally available for larger mass storage requirements.

The 4170 allows the user to locally perform preand post-processing of graphics information, calling upon the host only when intensive processing is needed. The result is greater host efficiency; the ability to support more terminals and; most importantly, greater individual user productivity in a time sharing environment.

Self-diagnostics make system adjustments quick to identify and repairs readily verified.

### CHARACTERISTICS

### **PROCESSORS**

Intel 8086 MPU.

Intel 8087 Numeric Co-Processor.

### MEMORY

Port A 375 ns  $\leq$  memory cycle of Port B < 1.2  $\mu$ s.

Standard — 256 k Error Checking and Correcting.

Option 30 — 512 k Error Checking and Correcting.

Option 31 - 768 k Error Checking and Correcting.

Option 32 - 896 k Error Checking and Correcting.

### DISK STORAGE

 $\bf Standard - \bf Two$  each  $5\,^{1}\!/_{\! 4}$  in Floppy Disk Drives, 327 k formatted capacity per diskette, IBM P.C. compatible, 125 kbits/s transfer rate.

Option 03 — 51/4 in Winchester Disk Drive, 8 Mbytes formatted capacity, 5 Mbits/s transfer rate.

### COMMUNICATIONS INTERFACE

**Standard** — Host Port RS-232C DTE, Terminal Port RS-232C DCE, two Peripheral Ports RS-232C DCE.

**Option 10** — Three additional RS-232 Ports, all RS-232 Ports are capable of 300, 600, 1200, 2400, 4800, 9600, 19.2 kbaud.

### COLOR COPIER INTERFACE

Option 09 — 4690 Series Color Copier Interface.

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	224	8.8
Height	597	23.5
Depth	622	24.5
Depth (with cables)	673	26.5
Weight	kg	lb
Net	22.2	49.0

### INCLUDED ACCESSORIES

Cue card (334-0083-00); pkg of 10 blank diskettes (119-1583-01); one set system software diskettes (016-0764-00); 12 ft host port RS-232 cable (012-0911-00); self-test adaptor (067-1043-00); instruction manual.

### ORDERING INFORMATION

4170 Local Graphics Processing Unit . \$5,500
4170F03 — Hard Disk \$3,000
4170F09 — Parallel Interface (for Copiers and Plotters) \$500
4170F10 — Additional Three-Port Peripheral Interface . \$950
4170F30 — Additional 256 k RAM \$1,790
4170F31 — Additional 512 k RAM \$3,580
4170F32 — Additional 640 k RAM \$4,480
4170F44 — Disk Interface Flexible Disk NC
$\bf 4170F45$ — Disk Interface Hard and/or Flexible Disk . $\bf \$1,100$

Above options are field installable, may be factory installed at time of order.

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz
Option A2 — UK 240 V/13 A, 50 Hz

Option A3 — Australian 240 V/10 A, 50 Hz

Option A4 — North American 240 V/15 A, 60 Hz

Option A5 - Switzerland 220 V/10 A, 50 Hz

### 

N1 — Service Plan + 9 Months Service ...... +\$340
N3 — OEM Service Plan + 12 Months Service ...... +\$455

### OPTIONAL ACCESSORIES

Alignment Diskette Order 119-1692-00	\$65
Extender Board Order 067-1005-00	\$300

### TEK COMPUTER DISPLAY



Pedestal Configuration: Display shows new 4115P51 feature enhancement which enables efficient implementation of host-based window management functions.

### 4115B/M4115B

**Computer Display Terminal** 

High Performance Color With Unparalleled Resolution and Speed

Up to 256 Colors Displayed from a Palette of 16 Million Colors.

**Autoconvergence** 

Local True Zoom and Pan

3-D Wireframe Capability

Feature Extensions for Window Management, Segment Subroutines and Editing, and Circular Arcs

Compatibility with 4010, 4100, and 4110 Series Hardware and Software

### The Tektronix 4115B is a High Resolution Computer Display Terminal that Combines High Performance Graphics with Unmatched Display Quality

With a 32-bit coordinate space and up to 256 simultaneously displayable colors, the 4115B represents the leading edge in color graphics displays. The display controller redraws a high-density mechanical drawing or typical gate array design in less than a second. The 4115B also offers all the powerful local graphics functions of the Tektronix 4110 Series—including local picture segments and true zoom and pan.

### **Unsurpassed Display Resolution**

The 4115B's 483 mm (19 in) raster scan display achieves unparalleled line quality with resolution of 1280 x 1024 pixels. Resolution is further refined by a precise contrast ratio, by low reflection, and automatic control of display convergence. A 60 Hz noninterlaced refresh rate also improves display clarity and productivity by greatly reducing flicker and resultant eye fatigue.

An 8086 CPU and 8087 Coprocessor Team up with a Bipolar Bit Slice Graphics Processor to Yield Singularly Fast Response Times The 4115B redraws at 50,000 vectors per second. Panel fill occurs at a rate of 10,000 rectangles per second. Large rectangular areas may be color filled at a rate of 125 million pixels per second.

### Advanced 3-D Wireframe Performance\*1

The new 4115F58 3-D Wireframe Kit delivers exceptional value via feature enrichment. The enhancement adds 3-D wireframe capability to the existing 2-D feature set, making possible local 3-D transformations such as rotation, scaling, clipping and skewing. Users can mix 2-D and 3-D information on the screen at the same time ... all with local zoom and pan, including spherical zoom and pan on 3-D wireframe models. 3-D cursors facilitate graphic input and manipulation, and a 24-bit integer terminal space is provided for building 3-D vectors, wireframe panels and polygons.

Parallel and perspective projections enable users to orient their eye position at any angle or distance and view images from the front, rear or side along any axis. The enhancement allows positioning of horizontal text and markers of uniform size, facing the user. This orientation device can save hours when working on complex images.

### Software-Resident Feature Enhancements for Sophisticated Graphics Manipulation and Highly Interactive Applications

A special enhancement package, the 4115P51, increases productivity by providing a set of four powerful terminal features. The first provides new features to support host window management with pop-up menus and multiple scrolling dialog areas. Small menus can be saved in terminal memory without disturbing on-screen graphics. The terminal's single dialog area is expandable to 64 independently scrolling dialog areas, which allows up to 64 separate host tasks -- graphics or text -- to be simultaneously displayed on the screen. The host controls the programs (such as mail and language compilers) and routes the output to separate dialog areas. The 4115B can be connected to multiple computers (via a communications network), allowing display of information from multiple tasks.

\*1 Available Spring 1985

Next, the 4115P51 segment subroutine feature allows segments to be stored in a hierarchical structure that more closely corresponds with host program structures. This lets users call segments from within other segments and is useful for local storage of pictures with many repeated elements, such as integrated circuit design.

The third 4115P51 feature gives the 4115B the ability to perform general editing of segments without recreating and retransmitting the entire segment, significantly reducing complexity and editing time.

Finally, the 4115P51 allows the user to define circular arcs by specifying only three points. The terminal automatically connects the points with a series of vectors, making the arc as coarse or smooth as the user wishes. This feature can result in greatly reduced communications traffic.

The 4115P51 enhancements are included in the 4115F58 3-D Wireframe Kit.

### 4110 Series/PLOT 10 Compatible

The 4115B is supported by the Tektronix PLOT 10 IGL (Interactive Graphics Library) and is designed for ease of integration with other 4110 Series terminals.

The 4115B Option 09 provides plug-compatibility with the Tektronix 4691 and 4692 Color Graphics Copiers.

Option 19 provides 4695 Color Graphics Copier plug-compatibility.

The 4115B can be configured either as a pedestal unit or in separate display, processing, and keyboard modules (M4115B) for workstation configurations. Local memory can be expanded to 800 kbytes and mass storage is available in combinations of single or dual flexible and Winchester disks.

### CHARACTERISTICS

DATA TRANSMISSION

Data Rate — 19.2 kbaud.

Communications Interface — RS-232C.

### MEMORY

Standard — 288 kbytes, expandable to 800 kbytes.

### DISPLAY

Medium — Color raster.

Size — 483 mm (19 in) diagonal.

Refresh Rate — 60 Hz, noninterlaced

Convergence — Automatic

### KEYBOARD

Normal Keyboard — 72 typewriter paired upper and lower case, programmable and autorepeating.

User Definable Programmable Function Keys — Eight.

Terminal Control Keys — Four.

Zoom and Pan Keys — Four.

Graphic Cursor Control — Thumbwheels.

### GRAPHICS MODE

Addressability — Four billion x four billion.

Resolution — 1280 x 1024 pixels.

**Graphic Command Syntax** — PLOT 10 compatible, 4010, 4100 and 4110 Series compatible.

Colors - 16 standard, expandable to 256.

Palette Selection — 16 million.

### ALPHANUMERIC MODE

Character Set — 94 (full ASCII).

Character Format — 80 columns, 34 rows and 160 columns, 64 rows.





Modular Configuration (furniture not included). Display shows new 4115F58 enhancement which provides the 4115B with 3-D wireframe capability in addition to its current 2-D feature set.

### AC POWER

Line Voltage — 115 V, 230 V RMS. Line Frequency — 48 Hz to 66 Hz.

Power — 1400 W.

### PHYSICAL CHARACTERISTICS

Dimensions	Module		Pedestal	
	mm	in	mm	in
Width	432	17.0	610	24.0
Height	622	24.5	876	34.5
Depth	762	30.0	787	31.0
Weight	kg	lb	kg	lb
Net	65.0	140.0	75.0	165.0

### PHYSICAL CHARACTERISTICS

Dimensions	Display		Keyboard	
	mm	in	mm	in
Width	584	23.0	508	20.0
Height	406	16.0	43	1.7
Depth	559	22.0	203	8.0
Weight	kg	lb	kg	lb
Net	55.0	120.0	2.5	5.0

### INCLUDED ACCESSORIES

Two 8 ft power cables (161-0123-00); 12 ft host port RS-232 cable (012-0911-00); three 4115B BNC cables (012-0074-00); 4115B display assembly to pedestal cable (012-0525-00); pkg of six function key overlays (334-3290-02); operator's manual; 4110 series host programmer's manual; 4110 series command reference manual; 4110 series command reference guide; introduction brochure. M4115B also includes: Three 10 ft BNC cables, (175-2753-00); 10 ft display assembly to pedestal cable (012-0387-00).

### ORDERING INFORMATION

ORDERING INFORMATION
4115B Computer Display Terminal \$22,950
M4115B Computer Display Terminal Worksta-
tion \$22,950
Option 01 — Extended Communications Interface +\$1,000
Option 2A - Additional 256 kbytes RAM with ECC
+\$2,500
Option 2B — Additional 512 kbytes RAM with ECC
+\$5,000 Option 3A — DMA Interface for DEC VAX Unibus; Requires
Option 3B or Modified Cable+\$4,600
Option 3B — 30 ft Cable for Option 3A; Must be Ordered Sep-
arately+\$250
Option 4A — United Kingdom Keyboard +\$175
Option 4C — Swedish Keyboard+\$175
Option 4F — Danish/Norwegian Keyboard +\$175 Option 4K — Japanese (Katakana) Keyboard +\$175
Option 09 — 4691/4692 Color Copier Interface +\$700
Option 10 — Three-port Peripheral Interface +\$1,350
Option 14 — Graphic Tablet, 30 in x 40 in, with Controller
+\$4,950
Option 19 — 4695 Color Copier Interface +\$700
Option 22 — Additional Two Planes Display Memory
+\$3,300
Option 23 — Additional Four Planes Display Memory
+\$6,600
Option 42 — Single Flexible Disk with Controller +\$2,000
Option 43 — Dual Flexible Disk with Controller +\$2,800
Option 45 — Mass Storage Interface +\$1,500
Option 46 — 10 MB Hard Disk (For M4115B only) . +\$2,600
Option 47 — Dual 10 Mbyte Hard Disks (For M4115B only)
+\$4,100

### **ENHANCEMENTS**

4115P51 Feature Extension (Requires Option)
\$1,000
<b>Option 01</b> — 9-Track, EBCDIC, Standard Label, Block 10 x 80, 1600 BPI
Option 02 — Eight inch Flexible Disk, 4110 Format NC
Option 03 — 9-Track, PDP-11 DOS, ASCII, 800 BPI NC
Option 04 — 9-Track, PDP-11 DOS, ASCII, 1600 BPI NC
Option 05 — 9-Track, EBCDIC, No Label, Block 10 x 80,
1600 BPI NC
Option 08         — 9-Track, IBM ASCII, No Label, 1600 BPI
4115F58 3-D Wireframe Kit (Requires
Option 01)
CP40101 — (101 4110/104110B Offly)

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A3 — Australian 240 V/10 A, 50 Hz	
Option A4 - North American 240 V/15 A, 60 Hz	
Option A5 — Switzerland 220 V/10 A, 50 Hz	

Option A1 - Universal Euro 220 V/16 A, 50 Hz Option A2 - UK 240 V/13 A, 50 Hz

WARRANTY-PLUS SERVICE PLANS REFER TO PAGE 14 N1 — Service Plan + 9 Months Service ..... +\$1,025 N3 — OEM Service Plan + 12 Months Service ....... \$1,370

### OPTIONAL ACCESSORIES

Service Manual Vol I - 070-4666-00. Service Manual Vol II - 070-4667-00.

Display Service Manual — 070-4668-01.

Loop Connector for Host-Port Test (RS-232) — Order 067-1043-00 ...... \$17 411X Logic Extender Board — Order 067-1005-00 ..... \$300 Raster Bus Extender Board — Order 067-1173-00 ..... \$125

Media, Flexible Disk (Pkg of 10) — Order 119-1376-01 . \$110 Calibration Graticule, Display — Order 067-1142-00 .. \$235 Convergence Checker RCA Type 507R - Order

### 067-1164-00 ...... \$470 M4115B OPTIONAL ACCESSORIES

Optional accessories for the M4115B are the same as those for the 4115B except for the following: Display Stand, (Tilts, Swivels, Stands on Floor) - Order Ergonomic Chair — Order 016-0698-00 ...... \$600 Workstation Table — Order 016-0791-00 ...... \$1,795

### COMPANION PRODUCTS

4691 — Color Graphics Copier	\$12,950
4692 — Color Graphics Copier	\$5,995
4695 — Color Graphics Copier	\$1,595
4510 — Color Graphics Rasterizer	\$3,500
4634 — Hard Copy Unit	\$7,900
4926 — Hard Disk	\$4,200

See this color product in the reference section beginning on page 17.

### COMPUTER DISPLAY TERMINALS



### 4114B/4114B30

Computer Display Terminal

**Direct View Storage Tube with Local Picture** Seaments

2-D Transforms, Refresh Support and Fast Redraw

Compatible with Tektronix 4010, 4100 and 4110 Series Terminals

### The 4114B Computer Display Terminal Satisfies the Needs of Graphics Users for Faster, More Versatile Throughput in High Density Graphics Applications.

Its local intelligence and expandable memory can significantly reduce the delays and costs associated with over-dependence on a host computer. The 4114B has a resolution high enough for the most complex engineering and scientific graphics. The upgraded "B" Series provides for our Local Programmability capability. Earlier 4114 or 4114A terminals can easily be field upgraded to

Direct local access to all 4114B features under program control is provided by the addition of either the 4100P01 or 4100P02 Local Programmabil-

### The 4114B is Compatible with Tektronix 4010, 4100 and 4110 Series Computer Display Terminals.

Using the modular device drivers and advanced feature support of Tektronix PLOT 10 IGL (Interactive Graphics Library) makes updating existing programs a simple process.

The 4114B supports local picture segments which are a group of graphic primitives describing a portion of a picture, retained as a unit in local memory to be redrawn or manipulated at any time. Schematic components, symbols, titles, and text can be defined as segments, then stored and recalled easily. Local segments can be rotated, scaled or moved around the screen, with only a simple command from the host or a local program.

### Refresh Support

Local generation of more than 1500 cm or approximately 3000 short vectors of flicker-free refresh. Option 31 provides color enhanced (amber) refresh for easy recognition of refresh information.



### 4114B30 Workstation

Computer display terminal operators can improve their performance with the efficiency, convenience and comfort of the 4114B30, modular workstation

The pedestal module contains the power supply and circuit board cage, and also houses one or two optional flexible disk drives for convenient local storage. Supporting the display at eye level, the table module can be installed on the left or the right side of the pedestal. The keyboard for the 4114B30 can be detached from the table module for positioning in the lap, on the pedestal, or underneath the display screen.

### CHARACTERISTICS

DATA TRANSMISSION Data Rate - 50 b/s to 19,200 b/s.

Data Type — 7-bit asynchronous serial ASCII, plus parity bit.

Block Mode — Option 01 Extended Communications.

Communications Interface — RS-232C.

Medium — Direct view storage tube; 4096 x 4096 addressable points; 4096 x 3120 displayable points; enhanced refresh; fast redraw.

Dimensions — 368 mm x 277 mm (14.5 in x 10.9 in); 483 mm (19 in) diagonal.

### MEMORY

Standard - 56 kbytes ROM and 288 kbytes RAM (expandable to 800 k).

### KEYBOARD

Normal Keyboard - 72 typewriter paired, upper and lower case, programmable and auto repeating, (five lighted). User Definable Programmable Function.

User Definable Programmable Function Keys — Eight. Graphic Cursor Control — Thumbwheels

Alpha Cursor Position — Key control.

Scrolling — Thumbwheels.

### **GRAPHICS MODE**

Addressability — 4096 x 4096.

Line Types — Solid dashed, defocused. Drawing Speed (Storage) - 134 m/s.

Drawing Speed (Refresh) - 537 m/s.

Graphic Command Syntax — Tektronix PLOT 10 compatible.

#### ALPHANUMERIC MODE

Standard Displayable Character Set — 94 characters (full

#### AC POWER

90 V ac to 132 V ac, 11 A maximum or 180 V ac to 250 V ac, 5.5 A maximum, 48 Hz to 62 Hz.

### PHYSICAL CHARACTERISTICS (4114B)

Dimensions	mm	in
Width	597	23.5
Height	1290	51.0
Depth	813	32.0
Weight	kg	lb
Net	107.5	237.0

### PHYSICAL CHARACTERISTICS (4114B30)

Monitor Height - 425 mm (16.8 in). Width: 584 mm (23.0 in).

Depth: 582 mm (22.9 in).

Pedestal Height - 743 mm to 762 mm (29 in to 30 in).

Width: 565 mm (22.3 in).

Depth: 851 mm (33.5 in).

Keyboard Height — 38 mm to 70 mm (1.5 in to 2.8 in).

Width: 508 mm (20.0 in). Depth: 229 mm (9.0 in).

Table Height — 673 mm to 692 mm (26.5 in to 27.2 in).

Width: 1219 mm (48.0 in). Depth: 762 mm (30.0 in). Total Weight - 165.9 kg (365.7 lb).

### INCLUDED ACCESSORIES 4114B/4114B30

8 ft power cord (161-0123-00); 21 in pedestal to display power cable (161-0145-00); 12 ft host port RS-232 cable (012-0911-00); pkg of eight re-legendable key caps (366-1882-00); pkg of six function key overlays (334-3290-01); 4114B/4116B operator's manual; 4114B/4116B host programmer's manual; 4110B Series command reference; 4114B/4116B introduction brochure.

### All accessories for the 4114B30 are the same as those for the 4114B, except for the following:

Display swivel/tilt base (016-0467-01); pedestal to display power cable (161-0126-00); 4110B30 Series desk configuration service manual

### ORDERING INFORMATION

### 4114B Computer Display Terminal ... \$17,900 4114B30 Computer Display Terminal Workstation ...... \$19,400 Option 01 — Extended Communications ...... +\$1,000 Option 10 - Three - Port Peripheral Interface ...... +\$1,350 Option 14 - 30 x 40 in Graphic Tablet w/Pen ...... +\$4,950 Option 2A — Adds 256 Kbytes of RAM ...... +\$2,500 Option 2B — Adds 512 Kbytes of RAM ...... +\$5,000 Option 31 — Color Enhanced Refresh ...... +\$1,000 Option 32 — Table Module (4114B30 only) ...... +\$500 Option 4A — United Kingdom Keyboard ...... +\$175 Option 4C — Swedish Keyboard ...... +\$175 Option 4E — APL Keyboard ...... +\$850 Option 4F — Danish/Norwegian Keyboard ...... +\$175 Option 4K - Japanese (Katakana) Keyboard ...... +\$175 Option 41 - Ten-Slot Peripheral Bus Extender; 90-110 line Option 42 - Single Flexible Disk and Disk Controller Option 43 — Dual Flexible Disk and Disk Controller . +\$2,800 Option 45 — Mass Storage Interface ...... +\$1,500 INTERNATIONAL POWER CORD AND PLUG OPTIONS Option A1 - Universal Euro 220 V/16 A, 50 Hz Option A2 - UK 240 V/13 A, 50 Hz Option A3 - Australian 240 V/10 A, 50 Hz Option A4 - North American 240 V/15 A, 60 Hz Option A5 — Switzerland 220 V/10 A, 50 Hz WARRANTY-PLUS SERVICE PLANS REFER TO PAGE 14 N1 — Service Plan + 9 Months Service ...... +\$810 N3 - OEM Service Plan + 12 Months Service ....... \$1,080

### OPTIONAL ACCESSORIES

Ergonomic Chair — Order 016-0698-00	\$600
Display Stand — Order 016-0717-01	\$750

See the color enhanced refresh option in the reference section beginning on page 17.





### 4404 Artificial Intelligence System

Low-Cost, High-Performance Al Development System

32-Bit CPU, Virtual Memory

Smalltalk-80 Programming Environment

Bit-Mapped Graphics with Mouse Input

**ANSI X3.64 Terminal Emulation** 

Franz LISP and Prolog Languages Available as Options

### The Tektronix 4404 Artificial Intelligence System Provides a Powerful, Highly Interactive Environment for Al Research and Development at an Affordable Price.

Combining 32-bit processing power with the Smalltalk-80 programming language, virtual memory and a bit-mapped graphics user interface, the 4404 sets a new price/performance standard for Al development systems in applications such as expert systems, natural languages, intelligent robotics and automatic programming.

The object-oriented Smalltalk-80 language was designed expressly for exploratory programming. Tek's proprietary implementation of Smalltalk-80, combined with the 4404's display capabilities, achieves execution speeds that are exceeded only by far costlier systems. The 4404 also offers the LISP and Prolog languages as programming options.

### Powerful Bit-Mapped Graphics and Mouse Input

A bit-mapped graphics display with mouse input is closely coupled to the processor for a state-of-the-art user interface. The 13-inch monochrome display has 640 x 480 pixel resolution operating with 60 Hz noninterlaced refresh. It functions as a window into a  $1024 \times 1240$  bit-map memory. The bit-mapped display facilitates the 4404's window management, pop-up menus and mouse manipulation. Highly responsive graphics make screen animation possible.

### High Performance Through Thoughtful Design

The 4404 uses a multi-tasking operating system with a hierarchical file system and virtual memory support. The user has an 8 Mbyte virtual address space for program development and both a 40 Mbyte hard disk and a 5 ½-inch floppy disk for storage of large programs and data bases. Although the 4404 is an independent development environment, it can emulate a host-based terminal through an RS-232 port. It can also be used in a local area network through an optional Ethernet interface. The 4404 is easily expandable through the addition of an optional 40 Mbyte hard disk with streaming tape backup, and an additional 1 Mbyte of physical memory.

### 4404 CHARACTERISTICS

DATA TRANSMISSION

Interface Ports — RS-232C.

Data Rate — 9600 baud (with flagging).

DISPLAY

Medium — Monochrome Raster CRT.

**Size** — 330 mm (13 in).

Viewing Area — 241 mm x 178 mm (9.5 in x 7 in). Refresh Rate — 60 Hz, noninterlaced.

Bit-Map Resolution — 640 points x 480 points

Addressable Points — 1024 x 1024.

Input Devices — Joydisk, mouse.

STORAGE

Hard Disk — 40.8 Mbyte (formatted).

Flexible Disk - 320 kbyte (formatted).

AC POWER
Line Voltage — 115 V (nominal), 87 V to 128 V, 230 V (nominal), 174 V to 250 V.

Line Frequency — 48 Hz to 66 Hz.

Power — <200 W operating.

PHYSICAL CHARACTERISTICS

Dimensions	nsions Terminal		Keyboard		Mass Storage	
	mm	in	mm	in	mm	in
Width	419	16.5	423	16.7	368	14.5
Height	353	13.9	41	1.6	128	5.0
Depth	995	19.5	180	7.1	433	17.0
Weights	kg	lb	kg	lb	kg	lb
Net	20.0	44.0	11.0	5.0	6.4	14.0

### MASS STORAGE (OPTION 20) PERFORMANCE

Capacity — 40.8 Mbyte (formatted).

Access Time — 30 ms (average), 6 ms (track-to-track).

Average Latency - 8.3 ms.

Data Transfer Rate — 100 kbyte/s maximum burst rate.

Error Rates — Nonrecoverable (hard) 1 in 1012 bits.

Interface Ports — SCSI described in ANSI document X3T9.2/82.2.

Power — 140 W.

### **INCLUDED ACCESSORIES (4404)**

Power cord (161-0066-00); standard keyboard (119-1872-00); RS-232C cable (012-0911-00); SCSI terminator (011-0090-00); users manual, reference manual, Introduction to Smalltalk.

### **INCLUDED ACCESSORIES (OPTION 20)**

Power cord (161-0066-00); SCSI cable (012-0037-00); instruction manual.

### ORDERING INFORMATION

4404 Artificial Intelligence System \$14,950
Option 01 — Additional 1 Mb Memory +\$5,000
Option 10 — Ethernet Interface +\$2,000
Option 20 or 4404F20 - 40 Mb Hard Disk with Tape Stream-
er for Backup +\$6,500
4400P30 — Franz LISP Programming Language \$4,000
Option 02 - 51/4 in Floppy Media; 4400P31 Prolog Program-
ming Language NC
4400P31 — Prolog EMACS Editor \$4,000
Option 02 -51/4-inch floppy Media NC
4400P32 — EMACS Editor
Option 02 — 51/4 in Floppy Media NC

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A. 50 Hz

Option A2 — UK 240 V/13 A, 50 Hz

Option A3 — Australian 240 V/10 A, 50 Hz

Option A4 - North American 115 V/15 A, 60 Hz

### Option A5 — Switzerland 220 V/6 A, 50 Hz WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14

 N0 — Installation and Setup
 \$175

 N1 — Service Plan + 9 Months Service
 +\$560

N1 — Service Plan + 9 Months Service ...... +\$560 N3 — OEM Service Plan + 12 Months Service ....... +\$740

Smalltalk-80 is a trademark of Xerox Corporation.

Initially available within the U.S. only. Contact your nearest Sales Office for availability in your area.



GRAPHIC INPUT WORKSTATION



### 4991S1 Graphic Input Workstation

Cost-Effective Means of Inputting Vast Amounts of Graphical Data into Computer **Databases** 

**GRAPHIC INPUT** WORKSTATION

Automatically Scans and Vectorizes Documents Up to 35 Inches x 47 Inches (E-Size)

Produces Lines, Arcs, Text, Symbols and Layers Through Interactive Software

Inserts Data Directly into Data Bases of Popular CAD Systems

The Tektronix 4991S1 Graphic Input Workstation is a CAD Database Creation Tool Designed to Increase Productivity Over Redesign on the Screen or Manual Digitizing The 4991S1 transforms existing drawings - on paper, Mylar or other media - into vector data for storage in CAD databases. You can design new products on your CAD system using existing drawings as points of departure. Time-consuming, tedious manual digitization is eliminated.

The 4991S1 consists of a Tektronix 4991 Autovectorizer, an M4115B Computer Display Terminal, a 4957 Graphics Tablet, and special Graphics Structuring and Host Interfacing Software.

### Local Scanning, Vectorizing and Structuring of Data

Scanning and structuring of data are performed locally, preserving CAD system resources. First, the 4991 Autovectorizer scans the source document and converts it into a computer-based list of vector data. Second, the data is interactively structured on the M4115B with the aid of proprietary Graphics Structuring Software. Userselectable structuring features include semi-automatic arc, line, text and symbol replacement; N-point registration; snap-to-grid; and linestraightening. Alphanumeric tags can be

assigned to features (e.g., information on color, year built, etc.) Also, the user can directly select specific portions of the drawing and store them in separate lavers

Third, the Host Interfacing Software resident on the host computer accepts data from the 4991S1 and stores it in a form acceptable to the host CAD system using CAD system calls.

The 4991S1 supports many popular CAD systems on the market and may be interfaced to a variety of others through user-customized Host Interfacing Software

### **4991 AUTOVECTORIZER** CHARACTERISTICS

Scanning Technology - High-precision drum scanner with halogen lamp illumination and linear photodiode detection.

Maximum Scan Area - 885 mm x 1200 mm (34.84 inch x 47.24 inch).

Resolution — 12 samples per mm (304.8 samples per inch). Typical Media — Black graphic lead or black ink on vellum. Black plastic lead or black ink on drafting film. Photographics artwork. High contrast bluelines (contrast ≥ 5).

Minimum Line Detected — 0.254 mm (contrast ≥ .5).

Programmable Features - User-definable: scan area, dot and void removal, edge-smoothing, line-gap filling, digitizing threshold, line-fitting accuracy

### **COMMUNICATIONS CAPABILITIES**

Hardware - RS-232C, 19.2 kbaud.

Protocol - "KERMIT-type"\*1

Modes - Freeman code data, polynode data, interconnect data, combined data.

### AC POWER

Line Voltage - 87 V to 128 V, 174 V to 250 V. Line Frequency — 48 Hz to 62 Hz.

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	1219	48
Height	1283	51
Depth	787	31
Weights	kg	lb
Net	150	330

\*1 KERMIT is a product of Columbia University Center for Computing Activities

### M4115B WORKSTATION CHARACTERISTICS

### MEMORY

Standard - 2.0 Mbytes RAM with ECC, 20 Mbytes internal hard disk

Note: For all other M4115B product specifications, refer to page 60.

#### GRAPHIC STRUCTURING SOFTWARE

Interaction — Menu-driven system using tablet interface. Structuring Capabilities — Graphical Primitives Supported: Lines, polylines, polygons, arcs, circles, text, symbols, ellipses, arrows, dimensions. Attributes Supported: Layer number, pen number, color, line width and style, text font, character slant,

Transformation Operations - N-point alignment, snap-toarid reflection

Viewing Capabilities - Zoom, pan, previous view, original view.

Local Calculations — Position, distance.

Host Control and Interfacing Capabilities — Protocol —"KERMIT-type" communications.

Training Tutorial — Built-in.

user definable attributes

Performance — Capacity, 98,000 nodes. Larger drawings are managed by structuring smaller sections of original file.

### PHYSICAL CHARACTERISTICS

Media - Eight inch floppy disks.

### HOST INTERFACING SOFTWARE

Data Communications — "KERMIT-type" protocol.

Data Conversion - 4991S1 to IBM CADAM, Version 19 (MVS). 4991S1 to Computervision CADDS4X. 4991S1 to Tektronix PLOT 10 Computer-Aided Drafting (TekniCAD). Other conversions planned.

Data Checking - Unrecognized or illegal host system commands or data displayed on 4991S1 display for immediate correction.

Configuration - Host system resident.

Language - FORTRAN IV.

### PHYSICAL CHARACTERISTICS

Media - Nine-track mag tape, 1600 BPI.

Format - Block 80 x 10, either standard label EBCDIC or unlabelled ASCII.

### INCLUDED ACCESSORIES

Workstation table (016-0791-00); spare lamp; DC 100 program load tapes; power line cord; communications cable; drum cleaner; 4991S1 Operator's Manual, Reference Manual.

### ORDERING INFORMATION

4991S1 Graphic Input Workstation \$150,000

INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option AI - Universal Euro 220 V/16 A. 50 Hz Option A2 - UK 240 V/13 A, 50 Hz

Option A3 — Australian 240 V/10 A, 50 Hz

Option A5 - Switzerland 220 V/10 A, 50 Hz

WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14

. +\$445 N1 - Service Plan + 9 Months Service ... N3 — OEM Service Plan +12 Months Service ...... +\$5,930

### **OPTIONAL ACCESSORIES**

Board-Level Diagnostics Tape — Order 062-7779-00.\*1

Replacement Lamps — Order 150-0142-00.\*1

Replacement Program Load Tape — Order 062-7778-00.\*1

Ergonomic Chair — Order 016-0698-00 ...... \$600 4110 Display Stand — Order 016-0717-01 ...... \$750 Service Manual.

\*1 Contact your local sales representative.

Initially available within the U.S. only. Contact your nearest Sales Office for availability in your area.





### 4691 Color Graphics Copier

High Image Quality and Excellent Color Saturation

Adjustable for A and B Size

Landscape and Portrait Formats

Clear Transparency Capability

**Four-Way Multiplexer Option** 

125 Color Patterns from Local Programmability

256 Color Patterns from New Enhanced 4110 Series Option 09

### The 4691 Color Graphics Copier Provides High Performance Color Copying from the 4113B, 4115B/M4115B Computer Display Terminals and Other Raster Data Sources

Copies can be made in A size (8.5 in x 11 in) or B size (11 in x 17 in) and their metric equivalents, in as little as two to three and a half minutes. The high performance drop-on-demand ink-jet technology provides addressability of six dots per mm (150 dots per inch) in both horizontal and vertical directions. This allows up to 1560 x 2460 points in a B size image, and up to 1560 x 1200 points in an A size image. Full resolution B-size copies are particularly suited for complex engineering drawings. For best B-size quality, it is recommended the 4691 be used with the NEW 4510 Color Graphics Rasterizer. (See page 67 for details). The 4691 produces true black by using a separate black ink supply, superior to that obtained by mixing the three primary inks. Vivid overhead transparencies can also be produced.

Copies are generated by program command, or by pushing a button on the Tektronix 4113B or 4115B terminal keyboard. Image orientation and multiple copies of the same image can be controlled through program control.

### Flexible Configuration

The 4691 uses a Centronics-type parallel interface, with modifications from the basic standard to support color, four-channel multiplexing and faster data transfer. With four-channel multiplexing (Option 02), the 4691 can serve up to four data sources at once.

The 4691 copies color shading patterns that are produced by the data source, including the 125 callable shading patterns supported by Local Programmability and the 256 color patterns produced by the new enhanced 4110 Series, Option 09 firmware.

When supported by a host driving routine and rasterizing software, the 4691 is compatible with many systems offering a Centronics-style parallel output port.

### CHARACTERISTICS

Addressability — Vertical and Horizontal: 6 dots/mm (150 dots/in).

Copy Time — 2.0 to 3.5 minutes minimum. Copy times may be longer if data transfer from image source is not maintained at 18 KB.

Page and Image Format — B and A, or A3 and A4 Output Sizes. Landscape and Portrait Format selectable under program control. Pixel replication is used for B and A3 images.

 $\mbox{\sc Image Sizes}$  — Variable depending on page size and image source.

Colors — Eight (magenta, yellow, cyan, red, green, blue, black, white).

Media Types — Paper sheet, overhead transparency.

Compatibility — 4113B Option 09 and 4115B/M4115B Option 09. Order 4110F09 and level three firmware to upgrade an existing 4113 for compatibility.

Interface — Eight bit parallel.

Data Rate — Up to 400 kbytes/s (burst mode).

### **AC POWER**

Line Voltage — 90 V ac to 110 V ac, 105 V ac to 129 V ac, 180 V ac to 220 V ac, or 211 V ac to 258 V ac, all at 48 Hz to 62 Hz.

Input Power — 500 W operating.

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	608	23.9
Height	346	13.6
Depth	821	32.3
Weight	kg	lb
Net	60.0	132.0

### **INCLUDED ACCESSORIES**

500 sheets (B size and A3 size when Opt 01 is ordered) ink jet copy paper (016-0711-00); 200 ml capacity each ink jet cartridges, cyan (016-0713-00); black (016-0714-00); yellow (016-0715-00); magenta (016-0716-00); 10 ft interconnecting cable 3 meters (012-0518-00); power cable (161-0104-00); "A" and "B" Size (Standard) paper tray (118-2557-00); "A3" and "A4" Size (if Option 01 is ordered) paper tray (118-2556-00); 3/pkg drum adaptors (118-2593-00); operator's manual, operator's quide.

### ORDERING INFORMATION

### Option 02 — Four Channel Multiplexer ...... +\$1,200 INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz Option A2 — UK 240 V/13 A, 50 Hz Option A3 — Australian 240 V/10 A, 50 Hz Option A4 — North American 240 V/15 A, 60 Hz Option A5 — Switzerland 220 V/10 A, 50 Hz

### WARRANTY PLUS SERVICE PLANS REFER TO PAGE 14

N0 — Installation and Set-Up	NC
N1 — Service Plan +9 Months Service	+\$900
N3 - OEM Service Plan +12 Months Service +	\$1,200

### OPTIONAL ACCESSORIES

Ink Jet Copy Paper - "A" Size, 216 x 279 mm (8.5 in x 11 in)

(500 sheets/pkg). Order 016-0712-00 ...... \$25

### 

"B" Size — 279 x 432 mm (11 in x 17 in). Order 016-0711-00

"A4" Size — 297 x 210 mm (For use w/Opt 01 only) Order 016-0709-00

"A3" Size — 297 x 420 mm (For use w/Opt 01 only). Order 016-0710-00

"S35

Transparency Film — "A" Size 100 sheets/pkg. Order 016-0765-00

Transparency Kit — "A" Size (Field Retrofit). Order 020-1161-00

\$200

 Ink Jet Cartridges
 — (200 cc) See included accessories.

 Cyan: Order 016-0713-00
 \$85

 Black: Order 016-0714-00
 \$85

 Yellow: Order 016-0715-00
 \$85

 Magenta: Order 016-0716-00
 \$85

 Drum Adaptors
 3/pkg. Order 118-2593-00
 \$15

"A4" Size — Order 020-1162-00 ...... \$200

### COMPANION PRODUCT

See this color product in the reference section beginning on page 17.

### TEK COLOR GRAPHICS



### 4692 Color Graphics Copier

Superior Image Quality and Excellent Color Saturation

Unique Ink Transient Suppressor for Reliable Operation

Adjustable for A and A4 Size

Horizontal and Vertical Formats

Four-Channel Multiplexer I/F Option

Variable Image Density and Copy Time

216 On-board Colors

**Auto-Handling of Paper and Transparencies** 

# The new Tek 4692 Color Graphics Copier Offers High-Quality A and A4-size Color Copying from 4100 and 4110 Series Color Display Terminals or from a Host with the Tek 4510 Color Graphics Rasterizer

The 4692 represents a new standard in color inkjet reliability. The high performance drop-on-demand air flow technology provides addressability of up to 154 dots per inch (6 dots per mm) in both horizontal and vertical directions. This allows up to 1536 by 1152 dots in an A-size image. Specially matched paper and transparency media and inks provide highly saturated colors (including vivid black due to a separate black ink supply).

Each ink-jet head is backed by a unique Ink Transient Suppressor (patent pending) that effectively prevents the ink clogs and bubbles associated with some ink-jet printers.

### **Color Copies With Ease**

Copies can be made in as little as one minute by pushing a single button. Image orientation, image density and color (from 216 on board colors) can

be selected. Up to 50 sheets of paper or 25 transparencies are fed, processed and stacked automatically in the output tray. Individual snap-in easily replaceable ink cartridges provide approximately 4,000 copies.

### Flexible Configuration

The 4692's 8-bit parallel interface is compatible with the 4106, 4107, 4109, 4113B Option 09, and 4115B Option 09 Computer Display Terminals. With four-channel multiplexing (Option 02), the 4692 can serve any four of these terminals at once. The 4692 also functions as a host-connected shared-system resource, particularly when paired with the 4510 Color Graphics Rasterizer. An optional device driver development manual is available to assist OEMs or end users incorporating the 4692 into their system.

### CHARACTERISTICS

Addressability — Fixed mode vertical and horizontal: 6 dots/mm (154 dots/in). Variable "preview" mode vertical and horizontal 128 dots/in to 158 dots/in.

**Copy Time** — 1.0 minutes to 3.0 minutes (depending on image format, addressability mode, and the signal source).

Page and Image Format — A and A4 output sizes. Landscape and portrait format selectable under program control.

Image Sizes — Variable depending on orientation and image source. (For A-size output; A4-size output slightly smaller to maintain adequate margins).

4106/4107/4109/4113B: Landscape is 10 in  $\times$  7.5 in. Portrait is 5 in by 3.75 in. 4115B: Landscape is 9.4 in  $\times$  7.5 in. Portrait is not available. 4510: Landscape is 10 in  $\times$  7.5 in. Portrait is 7.5 in  $\times$  5.6 in.

Colors — 216 on-board colors and shades.

Media Types — Paper sheet, overhead transparency.

Compatibility — 4106, 4107, 4109, 4113B Option 09 and 4115B Option 09 Computer Display Terminals, 4510 Color Graphics Rasterizer.

Interface — Eight-bit parallel.

Data Rate — Up to 400 kbytes (burst mode).

### **AC POWER**

Line Voltage — 87 V ac to 107 V ac, 104 V ac to 128 V ac, 191 V ac to 235 V ac, 209 V ac to 250 V ac, all at 48 Hz to 62 Hz.

Input Power - 35 W idle, 110 W printing, 360 W peak.

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	610	24.0
Height	216	8.5
Depth	610	24.0
Weight	kg	lb
Net	32.0	70.0

### INCLUDED ACCESSORIES

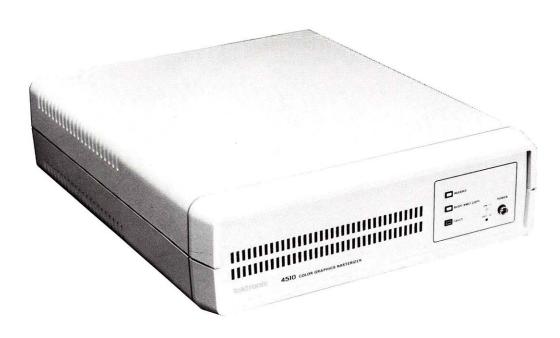
Power cord (161-0066-00); Size "A".-"A4" input media tray (436-0172-01); output media tray (436-0189-00) operator's manual (070-4816-00);

### ORDERING INFORMATION

&E 00E

### OPTIONAL ACCESSORIES

See this color product in the reference section beginning on page 17.



### 4510 Color Graphics Rasterizer

Full Resolution Output to Tek 4692 and 4691 Color Graphics Copiers

RS-232, Four-Way Multiplexed Input

More than 274,000 Selectable Colors

Tek 4100 Series Command Set

**Shared System Resource** 

# The 4510 Color Graphics Rasterizer enhances the copy quality of the 4691 and 4692 Color Graphics Copiers by converting vector images into raster format.

The result is hardcopy at the full resolution of the copier, rather than output limited to the resolution of the terminal. Blurred characters become crisp, jagged lines become smooth, even E-size engineering drawings can be legibly printed on B-size paper from the 4691. The 4510 also expands the color palette for the 4691 and 4692 to over 274,000 selectable colors.

### **Shared System Resource**

The 4510 accepts images from one or more hosts or workstations as high-level graphics commands across a 4-channel multiplexed RS-232 ASCII interface. It offloads the host from the rasterization and spooling tasks, resulting in faster throughput and lower CPU overhead. The 4510 cuts the cost per user by providing four different users access to the copier resource, and still maintains superior quality color hardcopy regardless of the type of terminals in use. Three separate memory options are available and accommodate approximately 200,000 vectors. The 4510 accommodates graphics images of various levels of complexity.

### Flexible Configuration

The 4510 supports a subset of the 4100/4110 Computer Display Terminal command set with minor modifications for use with a noninteractive hardcopy output resource. For "loop-through" mode operation from the host through the terminal's peripheral port interface, the 4510 can be connected directly to Tek 4106, 4107, 4109, 4113B, or 4115B Computer Display Terminals. The terminals can also drive the 4510 locally.

### CHARACTERISTICS

Addressability — 4096 x 4096 points.

**Resolution** — Up to 2048 x 4096 pixels, depending on copier resolution, media size and copy orientation.

Graphic Command Syntax — Tek 4100 Format.

Line Types — Solid and dashed lines, wide lines (vectors only); variable from 1 to 4 dots wide.

**Graphic Primitives** — Vectors, panels, markers, rectangles, alpha text, graphtext.

Number of Colors — 274, 625 selectable colors, 256 printable per image.

Interfaces — Input: 4-channel multiplexed modular RS-232 in-

terface. Output: 8-bit parallel. **Approximate Vector Capacity** — Option 30: 12,000. Option

31: 50,000. Option 32: 200,000.

Data Rate — Selectable 75 to 19,200 baud.

Output Size — Automatically senses copy size from copier; supports A, A4, B and A3 output sizes.

**Image Orientation** — Selectable for horizontal and vertical; image automatically scaled and rotated for copy size and orientation.

**International Character Sets** — UK, Swedish, Danish/Norwegian, German.

Image Transformations — Windowing.

### AC POWER

 $\textbf{Line Voltage} \longrightarrow 87~\text{V}$  ac to 128 V ac, 174 V ac to 250 V ac, all of 48 Hz to 66 Hz.

Input Power — 120 W maximum.

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	406	16.0
Height	135	5.3
Depth	478	18.8
Weight	kg	lb
Net	7.0	15.5

### INCLUDED ACCESSORIES

Power cord (161-0066-00); RS-232 host port cable (012-0911-00); operator's manual.

### ORDERING INFORMATION

CHELITING IN CHIMATION
4510*1 Color Graphics Rasterizer \$3,500
Option 30 — 128 kbytes total memory. (Capacity: Approximately 12,000 vectors)+\$995
Option 31 — 512 kbytes total memory. (Capacity: Approximately 50,000 vectors)
Option 32 — 2 Mbytes total memory. (Capacity: Approximately 200,000 vectors)+\$6,495

\*1 Note: The 4510 must be ordered with a memory option.

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz

Option A2 — UK 240 V/13 A, 50 Hz

Option A3 — Australian 240 V/10 A, 50 Hz

Option A4 — North American 240 V/15 A, 60 Hz Option A5 — Switzerland 220 V/10 A. 50 Hz

WARRANTY PLUS SERVICE PLAN REFER TO PAGE 14

N1 — Service Plan + 9 Months Service ....... +\$85 N3 — OEM Service Plan + 12 Months Service ....... +\$115

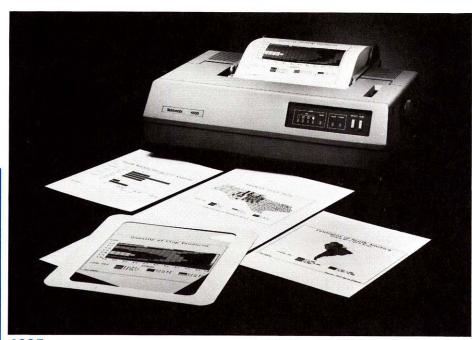
### OPTIONAL ACCESSORIES

_			
Copier Interconne	ect Cables —	Three meter,	(10 ft). Order
012-0518-00			\$130
Ten meter, (30 ft)	<ul><li>Order 012-05</li></ul>	27-00	\$165
Programmer's	Reference	Manual	<ul><li>Order</li></ul>
070-5043-00			\$50
<b>Pocket Reference</b>	Guide — Order	r 070-5041-0	0 \$10
Service Manual -	- Order 070-504	2-00	\$150

See this color product in the reference section beginning on page 17.

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### TEK COLOR GRAPHICS



### 4695 Color Graphics Copier

Unprecedented Image Quality in its Price Range

Clear Transparency Capability

Quiet, 20 Character/Second Printing

Small, Compact Package

Choice of Roll or Sheet Paper

Compatible with IBM PC and PC XT

### The 4695 Color Graphics Copier Provides Low Cost, High Performance Color Copying from the 4100 and 4110 Series Color Display Terminals and Other Raster Data Sources

The 4695's unique implementation of drop-on-demand ink-jet technology provides addressability of 4.8 dots per mm (120 dots per inch) in both horizontal and vertical directions. This allows up to 1280 points x 960 points per A size (8½ in x 11 in) image.

### A Multipurpose Output Device

In addition to providing high quality color graphics copies, the 4695 can function as a bi-directional, dot matrix printer with a print speed of 20 characters per second. A specially formulated clear transparency media can be used with the 4695 to develop striking, full color presentations. Paper is fed automatically from a roll or precut sheets are fed manually.

### Companion Copier for the 4100 and 4110 Series Color Terminal Family

The 4695 is plug-compatible with the entire 4100 Series (4105, 4106, 4107, 4109) and the 4110 Series (4113B and 4115B) color terminals. Copies are generated either by program command, or by pushing a button on the terminal keyboard. As a

special feature, the 4695 can copy from the terminal graphics area while the dialog area continues to communicate with the host. The 4695 copies color shading patterns that are produced by the data source. These include the 125 callable shading patterns supported by 4110 Local Programmability, and 410X/4170 Local Programmability, and the 256 color patterns produced by the new enhanced firmware, 4110 Series Opt. 19.

### A Copier for Other Data Sources

The 4695's interface is modeled after the Centronics-style parallel interface, with modifications to support color. An optional software utility is available which allows the 4695 to make screen copies from the PC and PC XT IBM Personal Computers. In addition, detailed interface specifications and functional descriptions of driving routines are available from Tektronix. These documents can be used to reach compatability between the 4695 and data sources which have a Centronics-style parallel interface.

### CHARACTERISTICS

 $\label{eq:Addressability} \textbf{Addressability} \ - \ \text{Horizontal and Vertical: 4.8 dots/mm} \\ \text{(120 dots/in)}.$ 

**Copy Time** — 4105: 2 min to 3.5 min. 4106/4107/4109: 3 min to 5.25 min. 4113B: 6 min to 8.5 min. 4115B: 8.5 min to 17.5 min.

Printing Speed — 20 characters/s.

Character Set — Full ASCII including control characters.

Printing Matrix — 12 x 16 dot matrix.

Page and Image Format — A 216 mm x 279 mm ( $8\frac{1}{2}$  in x 11 in) and A4 in 210 mm x 297 mm (8.3 in x 11.7 in). Landscape/Portrait format selectable under program control.

Image Size — 4105 Copy: 8 in x 6 in portrait format. 4106, 4107, 4109 Copy: 10.6 in x 8 in landscape format. 4113B Copy: 10.7 in x 8 in landscape format, 4 in x 5.3 in portrait; 4115B Copy: 10.7 in x 8.5 in landscape format.

Colors — Eight (magenta, yellow, cyan, red, green, blue, black, white).

**Media Types** — Paper sheet, paper roll, overhead transparency.

Interface — Eight bit parallel.

#### AC POWER

Line Voltage — 47 Hz to 63 Hz, 99 V ac to 132 V ac, 198 V ac to 264 V ac.

Input Power - 120 W or less.

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	500	19.7
Height	151	5.9
Depth	336	13.2
Weight	kg	lb
Net	11.0	24.2

### **INCLUDED ACCESSORIES**

One roll ink jet copy paper (016-0743-00); two each yellow (016-0734-00); magenta (016-0735-00); cyan (016-0736-00); black (016-0737-00); interconnecting cable (012-0555-00); power cable (161-0066-00); operator's manual.

### ORDERING INFORMATION

4695 Color Graphics Copier		\$1,595
Option 01 - Screen Copier S/W for	IBM Personal	Computer
		±\$100

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

	. O. T.		00110		
Ontion A1	Universal	Euro	220 1/1	16 1	50 Hz

Option A2 — UK 240 V/13 A, 50 Hz

Option A3 — Australian 240 V/10 A, 50 Hz

Option A4 — North American 240 V/15 A, 60 Hz
Option A5 — Switzerland 220 V/10 A, 50 Hz

#### 

OPTIONAL ACCESSORIES	
Service Manual	
Ink Jet Paper — 6 rolls/pkg. Order 016-0743-00	\$25
Ink Jet Paper, (500 sheets/pkg)	
"A" Size — 216 mm x 279 mm (8.5 in x 11.0 in). C 016-0739-00	
"A4" Size — 210 mm x 297 mm (8.3 in x 11.7 in). C 016-0740-00	
Transparency Film — 100 sheets/pkg. Order 016-048	
Ink Jet Cartridges (2.5 cc ea, 16/pkg)	
Yellow — Order 016-0734-00	\$25
Magenta — Order 016-0735-00	\$25
Cyan — Order 016-0736-00	\$25
Black — Order 016-0737-00	\$25
Black — Order 016-0737-00	
	\$10

Lubricant (5 cc) — Order 016-0742-00 ...... \$1.65







### 4926 10 Megabyte Hard Disk

51/4 Inch Winchester Technology

10 Megabyte Formatted Capacity

Easy Integration Through a Standard Interface

Complements 4110 Series Terminals with **Local Programmability** 

The 4926 is a 10 Mbyte hard disk drive that provides mass storage for 4110 Series terminals with local programmability. It gives users of 4110 Series terminals direct local access to large capacity mass storage, increasing applications flexibility and efficiency. The 4926 may also be configured with two optional flexible disks providing even more storage or removable media for backup. The high capacity afforded by Winchester technology lowers the cost per Mbyte to the user and provides the level of local data storage and fast access time that interactive graphics require. Sealed drive heads also improve reliability and environment protection and reduce maintenance. The 4926 has 10 Mbytes formatted capacity, that can be increased in 10 Mbyte increments. Each 4926 cabinet can house two drives, using the same power supply, controller, and interface hardware. Terminal interfacing is easy with the Mass Storage Interface Bus (MSIB), Tektronix' implementation of the popular SCSI specification.

### **CHARACTERISTICS**

Capacity — Unformatted: 12.76 Mbytes. Formatted: 10.0 Mbytes.

Access Times - Average Access Time: 85 ms. Track-to-Track: 3 ms.

Recording Surfaces — 4 per drive.
Recording Format — 512 Bytes/Sector.
Track Density — 16 Sectors/Track.

Average Latency — 8.3 ms.

Data Transfer Rate — 10.2 kbytes/s max burst rate.

Error Rates — Recoverable (soft): 1 in 109 bits. Nonrecoverable (hard): 1 in 1012 bits.

Interfacing - MSIB, Tektronix implementation of the SCSI described in ANSI document X3T9.2/82.2.

AC POWER

Power Requirements — 100 V ac to 125 V ac at 2 A;
180 V ac to 240 V ac at 1 A; 50 to 60 Hz.

Power Consumption — 140 W maximum.

### PHYSICAL CHARACTERISTICS

mm	in 14.5	
368		
128	5.0	
433	17.1	
kg	lb	
6.4	14.0	
	368 128 433 <b>kg</b>	

### INCLUDED ACCESSORIES

Power cable (161-0066-00); 6.5 ft 2 meter MSIB cable (Mass Storage Interface Bus) (012-0037-00); instruction manual.

### ORDERING INFORMATION

4926 10 Mbyte Hard Disk	\$4,200
Option 25 - Dual 51/4 in Flexible Disk; also Field I	Installable
(Kit Number 4926F25)	+\$1,600
Option 26 — Additional 10 Mbyte Hard Disk Drive;	also Field
Installable (Kit Number 4926F26)	+\$2,200
Option 49 — Rental Tag	

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz Option A2 — UK 240 V/13 A, 50 Hz

Option A3 - Australian 240 V/10 A, 50 Hz

Option A4 — North American 240 V/15 A, 60 Hz Option A5 — Switzerland 220 V/10 A, 50 Hz

WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14

N1 - Service Plan + 9 Months Service .......

### **OPTIONAL ACCESSORIES**

Remote Power Cable (BNC) — Order 012-0476-00 ...... \$23 Diskettes — Pkg of 10 Order 119-1583-01 ....... \$55

### **4970** Cluster Controller

IBM SNA/SDLC Compatibility with 3270 Full Screen Emulation

### Microprocessor Driven with Intel 8086

128 kbyte RAM Memory for Program Storage and Buffers. Communications Parameters Stored in Battery-Powered CMOS Memory.

### The 4970 Cluster Controller and Companion Software Allow Tektronix Graphics Terminal Users to Access SNA, Multihost Environments

Communicating to the host like an IBM 3274 or 3276 Terminal Controller, the 4970 accepts asynchronous data (at rates up to 19.2 kbps) from as many as four Tek asynchronous ASCII terminals and converges it to a single synchronous EBCDIC data stream transmitted at data rates up to 9,600 bps. Allows Tek terminals to be used in 3270 full screen applications. Supports Tek graphics in 3270 communications environment.

### **Increased Communications Efficiency**

The 4970 reduces transmission line and port costs, since the 4970 system allows Tek graphics terminals to operate in a polled environment.

### **Error Free Graphics**

Network (SNA) error recovery is automatic, and since SDLC provides error checking, data integrity is assured at the link level.

### CHARACTERISTICS

### HOST INTERFACE

Mode — Synchronous. Baud Rate - 300 bps to 9600 bps.

Code — EBCDIC.
Link Protocol — SDLC.

Network Compatibility — SNA Physical Unit (PU 4970 looks like an IBM 3274 or 3276 to the host. - SNA Physical Unit (PU) type 2; the

Communication Media Supported — Leased line/dial-up

### TERMINAL SUPPORT

Mode — Asynchronous

Baud Rate — Selectable: 300 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps and 19.2 kbps.

Code — ASCII.

Flagging - DC1/DC3 or CTS/DTR.

### SELF-TEST CAPABILITY

Power-up - Self-test routine.

**User-Initiated** — Extended self-test including DCE and DTE loopback for fault isolation.

Stress Test — Maximum/minimum voltage.

### DC 100 TAPE DRIVE

For protocol program loading and creating back-up tapes.

### COMMUNICATIONS PARAMETERS

Method of Entry - Password-protected monitor port in back panel.

Parameter Volatility — Battery-maintained CMOS maintains

parameters through power-downs or outages.

User-Selectable Parameters — Controller address, terminal baud rate, echo, flagging mode, end-of-message (EOM) character, message size, controller S/N (for dial-up connection).

### FRONT PANEL INDICATORS

Port Status — One LED for each terminal. Host Status — One LED each for: Data Carrier Detect (DCD). Transmit Data (TD), Receive Data (RD).

Ac Power - On/off.

### AC POWER

Power Requirements — 130 W maximum.

Voltage Fuse — Low Range: 90 V ac to 125 V ac, 2.5 A fast blow fuse. High Range: 175 V ac to 250 V ac, 1.5 A fast blow

### PHYSICAL CHARACTERISTICS

FITTSIC	AL CHARACTERISTI	03
Dimensions	mm	in
Width	406	16.0
Height	133	5.3
Depth	483	19.0
Weight ≈	kg	lb
Net	8.6	19.0

### INCLUDED ACCESSORIES

Tape cartridge with current level SNA/SDLC software (4970P02), power cord (161-0066-00); 12 ft RS-232 modem I/F cable (012-0911-00); DTE loopback test adaptor (013-0211-00); DCE loopback test adaptor (013-0212-00); instruction sheet; user guide (070-4771-01); reference manual (070-4810-01).

### ORDERING INFORMATION

4970 Cluster Controller ...... \$6,200 INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 - Universal Euro 220 V/16 A, 50 Hz

Option A2 — UK 240 V/13 A, 50 Hz
Option A3 — Australian 240 V/10 A, 50 Hz
Option A5 — Switzerland 220 V/10 A, 50 Hz

WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14 N1 - Service Plan + 9 Months Service ..... .... +\$215

### OPTIONAL ACCESSORIES

Blank DC 100 Tape Cartridge — Order 119-1350-00 .... \$25 Service Manual — Order 070-4393-00 ...... \$50





### 4957 Graphic Tablet

Graphic Input Capabilities for 4100 and 4110 Computer Display Terminals.

**GRAPHIC TABLET** AND RGB MIXER

**RS-232C Compatible** 

### Simple Four-Button Cursor Control

To use the 4957, merely touch the four-button cursor-puck to the tablet's active area. The tablet calculates the coordinates and relays them to the host computer for storage or manipulation.

### **Applications Fit**

The 4957 can augment a terminal keyboard as a menu selection device, move a cursor around a display screen, or help transfer data from paper to a computerized database.

### Compatability

The 4957 is compatible with the Tek 4106, 4107. 4109 and 4110 Family of computer display terminals.

### **CHARACTERISTICS**

Size - 419 mm x 394 mm (16.5 in x 15.5 in).

Active Writing Area — 297 mm x 297 mm (11.7 in x 11.7 in). Resolution\*1 — User selectable up to 1000 points/inch.

Speed\*1 — User selectable up to 90 coordinates/second.

Accuracy - ± .625 mm (0.025 in).

Repeatability — ± .250 mm (0.010 in).

\*1 Maximum specs may not be accessible from various terminals

### INCLUDED ACCESSORIES

Power supply and cord (119-1748-00); four-button cursor (119-1775-00); instruction manual.

### ORDERING INFORMATION

4957 Graphics Tablet ...... \$895

INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 - Universal Euro, 220 V/16 A, 50 Hz Option A2 - UK, 240 V/13 A, 50 Hz

Option A3 - Australian, 240 V/10 A, 50 Hz

Option A5 - Switzerland, 220 V/10 A, 50 Hz WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14

N1 - Service Plan + 9 Months Service ...... .... +\$45

N3 - OEM Service Plan +12 Months Service ....... .... +\$55

**OPTIONAL ACCESSORY** 

One Button Stylus - Order 119-1776-00 ......

### RGB Mixer

### Quick, High Resolution Gray Scale Copies off Color Terminals

High resolution, gray scale copies can be made from a color terminal without composite video. with the aid of Tektronix' RGB Mixer and the 4632 Video Hard Copy Unit or 4634 Imaging Hard Copy

If you need a guick, guiet, guality, hard copy from your IBM 3279 terminal\*1 or similar terminals, the low cost RGB mixer will enable to hook up a Tektronix 4632 or 4634 Hard Copy Unit to your system.

Besides the IBM 3279, other terminals that have been successfully tested in this configuration

Ramtek 6211 Mitsubishi 3919 Lexidata 3400

The mixer requires five BNC cables to operate: four are inputs from the terminal, and the fifth is the composite video output to the copier. Four channel multiplexing is available (with one mixer per terminal), as a remote copy button capability.

\*1 IBM 3279 users should have either Model 3B with video out option, or Model 3X with feature 8750. Also, Model S3G's can be converted to Model 3X.

### ORDERING INFORMATION

RGB MIXER (016-0596-00) ..... \$425

INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro, 220 V/16 A, 50 Hz Order 016-0596-01.

Option A2 - UK, 240 V/13 A, 50 Hz

Order 016-0596-02 Option A3 — Australian, 240 V/10 A, 50 Hz

Order 016-0596-03.

Option A4 - North American, 240 V/15 A, 60 Hz

Order 016-0596-04.

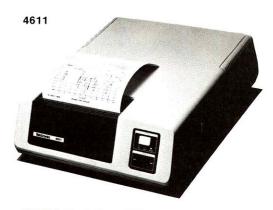
Option A5 - Switzerland, 220 V/10 A, 50 Hz

Order 016-0596-05.

### OPTIONAL ACCESSORIES

Remote Copy Button — (For 4632). Order 016-0722-00 BNC Cable - 10 ft. Order 175-2753-00 .....





### 4611 Hard Copy Unit

Low Copy Cost

High Contrast, Permanent Images

**Electrostatic Process** 

### Storage Tube Compatible

The 4611 provides low cost, high quality copies of complex graphics and alphanumerics from storage tube displays at the press of a button. The 4611 is based on electrostatic (charge transfer) technology, and uses electrographic paper for high contrast, permanent copies at an economical per-copy cost.

The 4611's high addressability and dot overlap result in uniquely dark, smooth lines for optimum copy quality. The dry toning system employed by the 4611 is cleaner, more convenient and more consistent than liquid toning systems. Images are permanently fused and made from inert, safe ingredients. Typical user applications include quick preview copies before final plotting, copies of intermediate steps during interactive work sessions, and final output copies for reports, presentations, and file records. Copies can be produced in both portrait and landscape format.

Compact and lightweight, the 4611 can be easily moved from desk to desk. It also can be multiplexed to copy up to four teminals and/or display monitors. Warm up lights and paper-out indicators are provided.

The 4611 is compatible with the Tektronix 4010 Series of Computer Display Terminals, the (4114, 4114A, 4116A, 4025, and the 4025A) Terminals, the 4050 Series of Graphic Computing Systems, and the 4081 Interactive Graphics Terminal. The 4611 is also compatible with Tektronix 11 and 19 inch computer display modules.

### **CHARACTERISTICS**

Warm-up Time - Two minutes. Copy Time — 24 s (vertical format). Paper Type — Electrographic (dielectric).

Image Size — Vertical Format: 190 mm x 147 mm (7.5 in x 5.8 in). Option 31: 190 mm x 226 mm (7.5 in x 8.9 in). Addressability - Vertical: 171 dots/in. Horizontal:

Toner — Dry magnetic.

### **AC POWER**

Voltage Range - 90 V ac to 128 V ac and 180 V ac to 250 V ac. (High range requires Options A1, A2, A3 or A4). Line Frequency — 48 Hz to 62 Hz.

Power - Warm-up: 300 W nominal, 370 W maximum. Operating: 215 W nominal, 290 W maximum. Idle: 120 W nominal, 185 W maximum

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	425	16.7
Height	181	7.1
Depth	625	20.6
Weight	kg	lb
Net	20.0	45.0

### INCLUDED ACCESSORIES

Power cord (161-0066-00); 10 ft 15-pin hard copy cable (012-0547-00); two rolls/case electrographic paper (006-2838-00); 4.9 oz dry copy toner (006-2990-00); operator's

### ORDERING INFORMATION

4611 Hard Copy Unit	\$5,050
Option 02 — Four-Channel Multiplexer	+\$660

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz

Option A2 - UK 240 V/13 A, 50 Hz Option A3 - Australian 240 V/10 A, 50 Hz

Option A4 - North American 240 V/15 A, 60 Hz

Option A5 - Switzerland 220 V/10 A, 50 Hz

WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14 N1 — Service Plan + 9 Months Service ...... +\$515 N3 - OEM Service Plan +12 Months Service ...... \$685

### OPTIONAL ACCESSORIES

Interconnect	Cable —	14-pin	(20 ft).	Order	012-0548-00
					\$220
Interconnect	Cable -	15-pin	(50 ft).	Order	012-0549-00
					\$305
Extender Ca	ble — Fo	r servici	ng only.	Order	175-3421-00
					\$36
PAPER & TO	NER				
Electrographi	ic Paper	— 2 ro	lls/case.	Order	006-2838-00

Dry Copy Toner — 4.9 oz. Order 006-2990-00 ...... \$23

### 4631 Hard Copy Unit

High Image Quality, Copies in Seconds

**Fiber Optic Process** 

### Storage Tube Compatible

The 4631 Hard Copy Unit provides superior quality copies of any graphic and alphanumeric information displayed on a storage tube display. The 4631's fiber optic process uses Dry Silver paper for the fine detail and photographic quality image needed when copying complex graphics and alphanumerics. It requires no toners or chemical additives of any kind. Copies can be made in either vertical or horizontal format. A special "slow scanning" mode allows images on the horizontal format to be made at even higher resolution and image quality.

The 4631 can be multiplexed to copy up to four storage tube terminals and/or display monitors. It is compatible with the Tektronix 4010 Series of Computer Display Terminals, the 4114B and 4116B Terminal, the 4025 and 4025A Terminal, the 4050 Series of Graphic Computing Systems, and the 4081 Interactive Graphics Terminal. The 4631 is also compatible with Tektronix 11 and 19 inch computer display modules.

### 4631



### CHARACTERISTICS

Warmup Time - Ten minutes.

Normal Scan — 18 s first copy; 9 s subsequent.

Slow Scan - 36 s first copy; 16 s subsequent.

Paper Size — 216 mm x 277 mm (8.5 in x 11 in).

Paper Type - Std Dry Silver (500 ft roll).

Addressability, Normal Scan — Vertical: 79 dots/cm (200/in). Horizontal: 67 dots/cm (170/in).

Slow Scan — Vertical: 118 dots/cm (300/in). Horizontal: 134 dots/cm (340/in).

Image Size - Vertical Format: 180 mm x 137 mm (7.1 in x 5.4 in). Horizontal Format: 225 mm x 170 mm (8.85 in x 6.7 in). Option 31: 163 mm x 190 mm (6.4 in x 7.5 in).

#### AC POWER

Voltage Range, Standard - 104 V ac to 126 V ac. Strappable Low Range — 90 V ac to 110 V ac. Strappable High Range - 108 V ac to 132 V ac.

Power, Warmup — 620 W nominal; 750 W on high range.

Power, Copy Process — 200 W nominal; 240 W on high

PHYSICAL CHARACTERISTICS

THE STATE OF THE S			
Dimensions	mm	in	
Width	406	16.0	
Height	295	11.6	
Depth	648	25.5	
Weight	kg	lb	
Net	29.5	65.0	

### INCLUDED ACCESSORIES

10 ft 15-pin interconnect cable (012-0547-00); 500 ft roll standard dry silver paper (006-1603-00); user's manual

### ORDERING INFORMATION

4631 Hard Copy Unit	\$6,500
Option 01 — Copy Counter	
Option 02 — Four Channel Multiplexer	+\$730
Option 31 — Compatible with Tektronix 4025 and 4 minals	

### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 - Universal Euro 220 V/16 A 50 Hz Option A2 - UK 240 V/13 A 50 Hz

Option A3 - Australian 240 V/10 A 50 Hz Option A4 - North American 240 V/15 A 60 Hz

Option A5 - Switzerland, 220 V/10 A, 50 Hz

WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14 N1 - Service Plan + 9 Months Service ..... +\$600 N3 - OEM Service Plan + 12 Months Service ....... +\$800

### **OPTIONAL ACCESSORIES**

Interconnect Cable 15-pin (20 ft) — Order 012-0548-00 Interconnect Cable 15-pin (50 ft) — Order 012-0549-00

Service Manual



4612 Video Hard Copy Unit

Low Copy Cost

High Contrast, Black and White Images

**Electrostatic Process** 

### Video Source Compatible

Hard copy units such as the 4612 provide quick and convenient copies of complex information that has been displayed on a screen. These devices are essential to the use of graphic terminals, desktop computing systems, and video image processing systems. To fulfill a variety of user needs, graphic and alphanumeric information is permanently recorded on paper at the press of a button. These needs include quick preview copies before final plotting, copies of intermediate steps during interactive work sessions, and final output copies for reports, presentations, and

The 4612 provides permanent black-and-white copies of graphic and alphanumeric information from raster scan terminals and other video signal sources. Based on electrostatic technology, the 4612 uses electrographic paper for high contrast copies at an economical copy cost. The 4612 is compatible with the Tektronix 4025A terminal, the 4112A Option 11 terminal, and with a wide variety of raster scan terminals and video signal sources including DEC VT100 Series terminals, DEC MINC Systems and those sources that produce RS-170, RS-330 or RS-375A type signals.

The 4612 is compact and lightweight, and can easily be moved from desk to desk. Its unique dry toning process is convenient, non-messy and su-perior to liquid toner systems. Images are perma-nently fused and made from inert, safe ingredients. Warm-up lights and paper-out indicators are provided. All copies are vertically oriented. The 4612 can be multiplexed to copy up to four terminals and/or display monitors with Option 02.

The standard 4612 unit is prepared for use with 525 line, 60 Hz sources. Adjustment for 625 line, 50 Hz is provided as an option.

### CHARACTERISTICS

Warm-up Time — Two minutes. warm-up Time — 140 milliotes.

Copy Time — 24 s.

Paper Type — Electrographic (dielectric).

Image Size — 7.5 x 5.8 std (525 line, 60 Hz signals).

Addressability — Horizontal: 256 dots/in. Vertical: 171 Toner — Dry magnetic.

### AC POWER

Voltage Range — 90 V ac to 128 V ac and 180 V ac to 250 V ac. (High range requires Options A1, A2, A3 or A4.)
Warm-up — 300 W nominal, 370 W maximum.
Copy Process — 215 W nominal, 290 W maximum.
Idle — 120 W nominal, 185 W maximum.

PHYSICAL CHARACTERISTICS

mm	in		
425	16.7		
181	7.1		
525	20.6		
kg	lb		
20.0	45.0		
	mm 425 181 525 kg		

### INCLUDED ACCESSORIES

Power cord (161-0066-00); two rolls/case electrographic paper (006-2838-00); 4.9 oz dry copy toner (006-2990-00); 10 ft BNC interconnect cable (175-2753-00); operator's manual.

### ORDERING INFORMATION

ORDERING INFORMATION
4612 Video Hard Copy Unit \$4,690
Option 02 — Four-Channel Multiplexer +\$660
Option 03 — Setup for 625/50 Hz Scanning Std NC
Option 08 — Setup for DEC VT100 Series Terminals NC
Option 15 — Video Input 15-pin Connector NC
INTERNATIONAL POWER CORD AND PLUG OPTIONS
Option A1 — Universal Euro 220 V/16 A, 50 Hz
Option A2 — UK 240 V/13 A, 50 Hz
Option A3 — Australian 240 V/10 A, 50 Hz
Option A4 — North American 240 V/15 A, 60 Hz
Option A5 — Switzerland 220 V/10 A, 50 Hz
WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14
N1 — Service Plan + 9 Months Service +\$515
N3 — OEM Service Plan +12 Months Service \$685

### OPTIONAL ACCESSORIES

Interconnect	Cable,	BNC 10	) ft) -	— C	)rde	r 175-2	753-00	\$23
Interconnect	Cable, E	<b>SNC (25</b>	ft) -	- Or	der	012-01	57-00	\$100
"T" Connecto	or, BNC	- Orde	er 10	3-00	30-	00		\$6.50
Interconnect	Cable,	15-pin	(10	ft)	-	Order	012-05	04-00
								\$150
Interconnect	Cable,	15-pin	(20	ft)	_	Order	012-05	04-01
								\$155
Interconnect	Cable,	15-pin	(50	ft)	_	Order	012-05	04-02

Remote Copy Button and 50 ft Cable — Order 016-0722-02

25 ft Cable for Remote Copy Button - Order 012-0985-00 50 ft Cable for Remote Copy Button — Order 012-0986-00

PAPER & TONER Electrographic Paper — Two rolls/case. Order 006-2838-00 

### 4632 Video Hard Copy Unit

### Copies Many Color Displays

**Gray Scale Capability** 

Copies in Seconds

### Video Source Compatible

The 4632 provides permanent copies of graphic and alphanumeric information from raster scan terminals and other video signal sources. All copies are horizontally oriented. Eight distinct shades of gray can be copied with a special gray scale enhancement option. The standard 4632 can clearly show six different shades of gray, for polygon fill-in, bar charts, and many other applications. With the RGB Mixer, the 4632 can be used to copy many color displays for quick working copy applications.

With Option 02, the 4632 can be multiplexed to copy up to four raster scan terminals, and can accept remote copy signals. The 4632 is compatible with the Tektronix 4020 Series, 4112, 4112A, 4113, 4113A terminals and with a wide variety of raster scan terminals and video signal sources, including those that produce RS-170, RS-330, RS-375A, RS-343A and RS-412A type signals. The 4632 is also compatible with VT100 Series terminals, the HP 2640 Series, the AT&T Gemini 100 Systems, and an optional RGB mixer provides 4632 compatibility with many color displays such as the IBM 3279.

The standard 4632 is prepared for use with 525 line, 60 Hz sources. Many other adjustments are provided as options, including adjustments for 625 line, 50 Hz and for high resolution 1029 line, 60 Hz.



### **CHARACTERISTICS**

Warmup Time — Ten minutes.

Copy Time — 18 s first copy; 9 s subsequent copies. Paper — Size: 216 mm x 277 mm (8.5 in x 11 in). Type: Std Dry Silver (500 ft roll).

Addressability - Incoming signal dependent. Image Size — 203 mm x 152 mm (8 in x 6 in).

Gray Levels — Six min (8 w/Option 06).

AC POWER
Voltage Range, Standard — 104 V ac to 126 V ac. Strappable — Low Range: 90 V ac to 110 V ac. High Range: 108 ac to 132 V ac.

Warmup — 620 W nominal, 750 W maximum. Copy Process — 200 W nominal; 240 W maximum. Idle - 120 W nominal, 185 W maximum.

#### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	406	16.0
Height	295	11.6
Depth	648	25.5
Weight ≈	kg	lb
Net	29.5	65.0

### INCLUDED ACCESSORIES

500 ft roll standard dry silver paper (006-1603-00); 75  $\Omega$  BNC terminator (011-0102-00); user's manual.

The 4632 is not shipped with an interconnect cable; order the desired cable from the following optional accessories list.

### ORDERING INFORMATION

4632 Video Hard Copy Unit \$6,500
Option 01 — Copy Counter +\$150
Option 02 — Four Channel Multiplexer +\$730
Option 03 — Setup for 625 Line/50 Hz NC
Option 04 — Setup for 1029 Line/60 Hz NC
Option 05 — Setup for Tektronix 4023 Terminal NC
Option 06 — Enhanced Gray Scale +\$970
Option 07 — Compatible with HP 2640 Series Terminals
+\$150
Option 08 — Compatible with DEC MINC Systems +\$150
Option 09 — Setup for AT&T GEMINI 100 Systems . +\$150
Option 10 — Set up for 4109 NC
016-0596-00 — RGB Mixer \$425
INTERNATIONAL DOWER CORD AND BLUC OPTIONS

INTERNATIONAL POWER CORD AND PLUG (
Option A1 — Universal Euro 220 V/16 A, 50 Hz
Option A2 — UK 240 V/13 A, 50 Hz
Option A3 — Australian 240 V/10 A, 50 Hz
Option A4 — North American 240 V/15 A, 60 Hz
Option A5 — Switzerland 220 V/10 A, 50 Hz

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### OPTIONAL ACCESSORIES

Interconnect Cable, 15-pin (10 ft) — Order 012-0504-00
\$150
Interconnect Cable, 15-pin, (20 ft) — Order 012-0504-01
\$155
Interconnect Cable, 15-pin, (50 ft) - Order 012-0504-02
\$200
Interconnect Cable, BNC, 75 Ω (25 ft) — Order 012-0157-00
\$100
Remote Copy Button — Order 016-0722-00 \$110
Remote Copy Button and 25 ft Cable — Order 016-0722-01
\$180
Remote Copy Button and 50 ft Cable — Order 016-0722-02
\$ 220
25 ft Cable for Remote Copy Button — Order 012-0985-00
50 ft Cable for Remote Copy Button — Order 012-0986-00
\$100
RGB Video Mixer — Order 016-0596-00 \$425
PAPER
Standard Dry Silver Paper (500 ft roll) — Order 006-1603-00

lard Dry Silver Paper (500 ft roll) — Order 006-16 Standard Dry Silver Paper, (4 rolls/carton) — Order 006-1603-01 ...

Service Manual





4634 Imaging Hard Copy Unit

**Excellent Gray Scale and Resolution** 

Quick Working Copy for Color Systems

The 4634 Imaging Hard Copy Unit records images of photographic quality from most TV video sources, both analog and digital. The 4634 can be quickly adjusted to accommodate a wide variety of line rates, for both 50 Hz and 60 Hz systems.

It uses a fiber-optic CRT and thermal processor to produce a finished image with excellent resolution and gray scale in less than half a minute. Cost per copy for large, file-sized images is low. An optional RGB mixer provides 4634 compatibility with many color displays such as the IBM 3279.

Video information is input through rear panel connectors. In most cases a simple BNC connector is all that's required.

The 4634 is available as either a rackmount or benchtop model.

#### CHARACTERISTICS

Recording Medium — Dry Silver Paper; Tektronix' High Performance (7772) Paper or switch selectable to Tektronix' Standard (7770) Paper.

Paper Packaging - Rolls of paper encased in light-sealed cylindrical cassettes.

Paper Dimensions — 216 mm x 152 m (8.5 in x 500 ft).

Shelf Life of Tektronix Paper - 12 months at +20°C with

50% relative humidity.

Recording Technique — Raster scan video with fiber optic CRT.

Developing Technique — Heat via internal processor.

Warmup Time — 20 min. Copy Time — 26 s.

Exposure Time (11 in Copy) — 8.5 s. Copy Repetition Rate —  $\approx$  12 s. Copy Length Range — 178 mm to 279 mm (7.0 in to 11.0 in) in 19 mm (3/4 in) increments.

Horizontal Image Size Range — 127 mm to 203 mm (5 in to 8 in) for 60 Hz field rate; 152 mm to 203 mm (6 in to 8 in) for 50 Hz field rate.

Vertical Image Size Range — Adjusts for correct aspect ratio. Gray Shades — 12 w/Tektronix High Performance (7772) Paper. Six w/Tektronix Standard (7770) Paper.

Resolution — At least 4.92 lines/mm (125 lines/in) w/Tektronix High Performance (7772) Paper. At least 3.94 lines/mm (100 lines/in) w/Tektronix Standard (7770) Paper.

#### **AC POWER**

Line Voltage Range ( $\pm 10\%$ ) — Jumper selectable for 100 V ac, 115 V ac, 120 V ac, 200 V ac, 220 V ac, 230 V ac and 240 V ac.

Line Frequency — 48 Hz to 62 Hz.

PHYSICAL CHARACTERISTICS

FHISICAL CHARACTERISTICS				
Dimensions	mm	in		
Width	425	16.7		
Height	266	10.5		
Depth	686	27.0		
Weight ≈	kg	lb		
Net	30.5	67.0		

#### INCLUDED ACCESSORIES

500 ft roll high performance dry silver paper (006-2432-00); 75  $\Omega$  terminator (001-0131-00); instruction manual (for 4634 OEM); instruction manual (for 4634 Option 45).

The 4634 is not shipped with an interconnect cable; order the desired cable from the following optional accessories list. ORDERING INFORMATION

4634 Imaging Hard Copy Unit ...... \$7,900

Option 09 — Set up for 4109	NC
Option 30 — Delete Rackmount Hardware\$	85
Option 45 — End-User Set-up	NC
016-0596-00 — RGB Mixer \$4	25
INTERNATIONAL POWER CORD AND PLUG OPTIONS	
Option A1 — Universal Euro 220 V/16 A, 50 Hz	
Option A2 — UK 240 V/13 A, 50 Hz	
Option A3 — Australian 240 V/10 A, 50 Hz	
Option A4 — North American 240 V/15 A, 60 Hz	

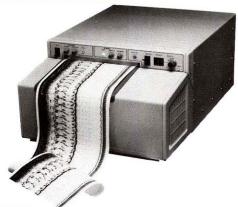
WARRANTY-PLUS SERVICE PLANS REFER TO PAGE 14

N1 — Service Plan + 9 Months Service ...... +\$600 N3 — OEM Service Plan +12 Months Service ...... +800

OPTIONAL ACCESSORIES
Cable — 75 Ω (42 in) BNC. Order 012-0074-00 \$17.50
Soard Extender — Order 067-0687-01 \$135
Card Extender — Order 067-0708-00 \$95
nterconnect Cable — 15-pin, (10 ft). Order 012-0504-00 \$200
nterconnect Cable — 15-pin, (20 ft). Order 012-0504-01
nterconnect Cable — 15-pin, (50 ft). Order 012-0504-02 \$200
RGB Video Mixer — Order 016-0596-00 \$425
PAPER

High Performance Dry Silver Paper — 500 ft roll. Order \$215 High Performance Dry Silver Paper — Four rolls/carton). Order 006-2432-01 ......

OEM terms available on the 4634.



4635 Imaging Recorder

Combined Line Scan/TV Imager

Superior Image Quality

**Excellent Gray Scale and Resolution** 

Choice of Two Recording Media

#### Available Only to Qualified OEMs

The 4635 Imaging Recorder produces high-quality gray-scale images from both line scan and composite TV video sources. It is optimized for the requirements of diagnostic ultrasound, but can also be used for other applications requiring dual mode recording capability.

The 4635 records on two types of photographic Dry Silver Paper: a High-Performance Paper for applications demanding extended gray scale and a lower cost standard paper for limited gray-scale needs. The 4635 can withstand heavy usage demands, processing a minimum of 50 rolls of paper (25,000 feet) between planned maintenance.

Images produced by the 4635 are exposed using a CRT with a fiber-optic faceplate. Tiny fiber-optic filaments in the faceplate transmit the light output of the CRT to the paper.

Following exposure the paper is advanced through a thermal processor, where the latent image is developed. The fully processed image then exits the recorder through a front-panel opening.

The 4635's combination of superior imaging capability, rugged design, and low cost operation make it the standard for quality and value among imaging recorders.

#### CHARACTERISTICS

Recording Technique — Exposing photographic Dry Silver Paper with light output from a fiber-optic CRT (Cathode Ray

Developing Technique - Heating the Dry Silver Paper in an internal processor.

#### IMAGE SIZE

Line Scan — Width is adjustable from 100 mm to 200 mm. TV, Horizontal — 60 Hz: 125 mm to 210 mm. 50 Hz: 150 mm to 210 mm.

TV, Vertical - Adjustable to provide correct aspect ratio.

#### IMAGE FORMATS

Line Scan - Successive lines written across width of paper, perpendicular to path of exiting paper, continuous recording. Raster Scan TV — Raster lines written in direction of paper path. OEM can select either cut TV page or TV frame insertion into continuous line scan recording.

#### IMAGE

Density Range — High Performance Paper: Min 0.2, maximum 1.4. Standard Paper: 1.2.
Shades of Gray — TV Page: 12 levels for High Performance

Paper, 8 levels for Standard Paper. Line Scan: 8 levels for High Performance Paper, 6 levels for Standard Paper.

Resolution - Four cycles per mm in line. Two cycles per mm

#### RECORDING MEDIA

**Material** — Tektronix High Performance Dry Silver Paper or Tektronix Standard Dry Silver Paper. Paper Roll Dimensions — 152 m (500 ft) long, 216 mm (8.5 in)

#### PAPER SPEEDS

Lines Scan — 10 mm/s to 100 mm/s.

TV Page — 35 mm/s.

POWER SPECIFICATIONS

Voltage Ranges (±10%) — 100 V ac, 115 V ac, 120 V ac, 200 V ac, 220 V ac, and 230 V ac or 240 V ac
Line Frequency — 48 Hz to 62 Hz.

Power Consumption - 800 W maximum peak power

#### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	425	16.8
Height	266	10.5
Depth	667	26.3
Weight ≈	kg	lb
Net	34.0	75.0

#### **INCLUDED ACCESSORIES**

500 ft roll high performance dry silver paper (006-2432-00)

#### ORDERING INFORMATION 4635 Imaging Recorder

#### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option AI - Universal Euro 220 V/16 A, 50 Hz

Option A2 - UK 240 V/13 A, 50 Hz

Option A3 - Australian 240 V/10 A, 50 Hz

Option A4 - North American 240 V/15 A, 60 Hz

Option A5 - Switzerland 220 V/10 A, 50 Hz

#### WARRANTY-PLUS SERVICE PLANS REFER TO PAGE 14

N1 - Service Plan + 9 Months Service.

N3 - OEM Service Plan + 12 Months Service



#### **Personal Productivity Tools**

Compatible with all Tek 4110B Series Raster Terminals Using Local Programmability and 410X Series Terminals (with the 4170 Local Graphics Processing Unit)

PERSONAL PRODUCTIVITY TOOLS

Data Exchange with Other Business Software and User-Written CP/M-86\*1 Applications

Hardcopy Support from Tektronix Color Copiers and Plotters

# Tektronix offers a set of personal productivity tools for use in 4100 and 4110 Local Programmability Units.

This collection of business-oriented application software is comprised of several popular personal computer packages, including WordStar\*2 Word Processing, SuperCalc2\*3 Spreadsheet, DR Graph\*4 Interactive Graphing, and InfoStar\*5 Data Base Management.

#### WordStar

WordStar has become the most popular word processing package for microcomputers in the world. A sophisticated tool for the preparation of all kinds of written communication or computer programs, WordStar is a screen editor, showing you exactly how your document will look when printed. WordStar is designed for the nontechnical user and features on-line help menus and full prompting instructions at four different experience levels.

Powerful editing commands allow you to delete characters, lines or blocks of text; move, copy or delete blocks; find and replace items; realign blocks; read to and write from other files; and many other kinds of text manipulation. Flexible print commands give the user control over page length; top, bottom and side margins; headings and footing markers and page number locations.

File management, including saving, copying, naming and transferring documents, is simple enough for the novice to understand.

#### SuperCalc2

SuperCalc2 allows Local Programmability users to create a comprehensive electronic spreadsheet in ten minutes or less. Balance sheets, profit and sales projections, job cost estimates, general ledgers, cash flow analyses and inventory controls are only a few of the accounting reports possible. SuperCalc2 prompts the user each step of the way in designing spreadsheets and manipulating data into desired formats. All row and columns can be sorted alphabetically or numerically and entire row/column value ranges computed. A "black box" capability even allows you to write canned spreadsheet applications that others can execute by following prompts.

#### **DR** Graph

DR Graph Interactive Graphing package enables the nontechnical user to create and edit a wide variety of business graphs in minutes. Line, bar, pie, step, stick and scatter graphs are among the many possibilities. Following prompts, the user creates the graph on his terminal, and DR Graph automatically plots the data points. Among user-defined parameters are line width, style and color; text font, size and text placement; and color selections. Graphs can easily be output on Tek's full line of hardcopy devices, including ink jet copiers and plotters, which produce high-quality output on paper and transparency media.

#### InfoStar

InfoStar is a menu-driven data base management system that allows the first-time user to effectively manipulate data without learning a data base language. The system provides four different help levels, giving extensive aid to the beginner without encumbering the experienced user.

InfoStar allows duplication of documents onscreen for fast data entry. As data is entered, the system automatically generates indices from user-specified fields. Up to 25 key fields can be designated, with each file capable of holding over 65,000 records. Once data is in the system, a high-speed sort facility quickly arranges data into user-specified order. Up to 255 files can be open at one time, providing tremendous flexibility in combining data.

A quick-report feature allows a variety of reports to be created in less than a minute, while a custom-report feature provides a means of producing more elaborate report formats.

#### Compatible Business Software

Tektronix personal productivity software supports a common data exchange, enabling data to be transferred from one package to another. For instance, financial data from SuperCalc2 could be copied to DR Graph and plotted as a bar chart. These packages can also exchange data with user-written CP/M-86 programs. All data can be written as ASCII files, enabling a user-written FORTRAN or Assembly language program to access and manipulate the files.

#### ORDERING INFORMATION

ORDERING IN CHIMATION
4100P22 - SuperCalc2 Spreadsheet \$325
4100P24 — InfoStar Data Base Management
\$550
4100P25 - DR Graph Interactive Graphing
\$210
4100P27 - WordStar Word Processing
\$550
Option 01 — 8 In Diskette NC
Option 02 — 5 1/4 In Diskette NC
Option 10 — 4170 with CP/M (Requires Option 02) NC
Option 11 — 411X with CP/M-86 (Requires Option 01) NC

- \*1 CP/M-86 is a registered trademark of Digital Research.
- \*2 WordStar is a registered trademark of MicroPro International Corporation.
- \*3 SuperCalc2 is a registered trademark of Sorcim Corporation.
- \*4 DR Graph is a trademark of Digital Research.
- \*5 InfoStar is a trademark of MicroPro International Corporation.





#### **Local Programmability**

For 4110B, 410X Series Terminals

Powerful State-Of-The-Art Graphics Under User-Written Software Control

Local Access to Graphics Manipulation Capabilities

CP/M-86

**ANSI FORTRAN 77** 

Core Graphics Package (PLOT 10 IGL)

# Local Programmability Puts Graphics Computer Power in the Hands of the User

The 4110B/410X Series Local Programmability gives terminals independence from host computers by equipping them with local intelligence and processing power. Local Programmability supplies the elements needed to locally develop and run programs; to access the graphics and alphanumeric features resident in the 4110B Series and 410X firmware; and to control peripherals connected to the terminal.

The package for 4110B Series terminals consists of a disk-based CP/M-86 operating system, FORTRAN-86 compiler, ASM-86 or ASM86 macro assembler; utility programs; and a library of Direct Terminal Interface (DTI) subroutines that enable the FORTRAN programmer to exercise all 4100 Series terminal features. All package components are also available on the 4170 with 410X terminals. Optionally, a local version of Tektronix PLOT 10 IGL is available.

# Increased Productivity Through Distributed Processing

Local Programmability gives the user the flexibility to run programs locally or through a host. By promoting more efficient use of the host system, Local Programmability cuts costly CPU time, frees the host to do the kinds of processing it does best, and allows the host to support more terminals. Many CAD/CAM, data analysis and graphing applications can be written and run entirely without host support.

#### Software Compatibility Across 4100 Line

User-developed software using the Direct Terminal Interface is upward-compatible from 410X to 4110B terminals if common terminal firmware features are supported. This compatibility allows easy portability of applications from low to highend terminals without loss of software investment.

With a local version of PLOT 10 IGL, existing IGL-based host programs can be run locally on 410X and 4110B terminals and easily moved to other Tektronix terminals (such as 4010 or 4020 Series). The user can thus choose where an application will run most efficiently -- on the host, the terminal or a combination of the two.

#### Series-Wide Compatibility

Local Programmability runs on all 4110B Series terminals and on the 4170. The recommended system configuration includes a minimum of 256 kbytes of RAM. For program development the terminal needs two disk drives, although only one drive is needed to run programs locally.

#### **CHARACTERISTICS**

GENERAL INFORMATION

Memory Requirements — 256 kbytes.

**Equipment Requirements** — 4110B Computer Display Terminal or 4170 Local Graphics Processing Unit supporting 410X Series Computer Display Terminals. Dual disk functionality provided by any of the following: dual floppy disk drives, floppy disk and Winchester drive. Requires at least one floppy for

4110B's. 4170 has two floppy disks standard. Program execution requires at least a single disk drive and sufficient memory to run the program.

#### INCLUDED ACCESSORIES

Blank floppy disk(s) user manual, programmer reference manuals.

#### ORDERING INFORMATION

Note: Prices are approximate depending on option.

**PLOT 10** IGL Primary Command Set plus Panel Support are included with purchase of 4170 Local Graphics Processing Unit. For further upgrading, order Option 23 or Option 24 below.

4170P73 PLOT 10 Interactive Graphics Library

Tektronix offers user training on Local Programmability. For further information contact the Customer Training Registrar at (503) 685-3808 or your nearest Tektronix sales office.

#### TEK GRAPHICS SOFTWARE

#### **PLOT 10 GRAPHICS SOFTWARE**

Tektronix has been setting graphics standards for over a decade. Our new products reflect the implementation of the evolving international standards and the concepts that underlie those standards—software portability and device independence. The goal is to protect your software investment and provide a hardware growth path, and Tek software is designed to meet your changing needs.

Tektronix offers PLOT 10 products to make that goal a reality. PLOT 10 software takes advantage of the graphic capabilities of the 4010, 4100, and 4110 Series computer display terminals together with our color copiers.

PLOT 10 includes applications software as well as powerful tools to build applications to suit your specific needs.

#### Software Support

When you buy Tektronix software, you are also investing in the people and services behind the product. A SSS (Software Subscription Service) provides current releases of Tek licensed software products, updates to the documentation, along with additional information on applications and enhancements. The TAS (Technical Assistance Services) are designed to supplement your own resources and to provide training as well as short-term consulting during your software implementation. These combined programs help you get maximum benefit from your Tektronix software products.

Product overviews and specification data follows. We invite you to ask your local Tektronix Sales Engineer for a demonstration. Or, simply indicate your interest on the enclosed reply card.

#### **PLOT 10 APPLICATIONS SOFTWARE**

PLOT 10 application software has been built to take full advantage of the powerful features included in the 410X and 411XB Series of terminals.

# PLOT 10 Computer-Aided Drafting Software (TekniCAD)

Tektronix Computer-Aided Drafting Software (TekniCAD) is an interactive drafting package for automating a full range of drafting tasks. Based on the high-performance capabilities of the Tektronix 4100 and 4110 Families of graphic terminals, TekniCAD improves productivity by reducing the time spent creating and modifying drawings. Since the software was designed for office and drafting room operation, special electrical or environmental facilities are unnecessary. While adhering to ANSI Y14 and ISO international standards, TekniCAD can be easily adapted to current company drafting standards and practices.

PLOT 10 TekniCAD employs English Language prompts and either on-screen menus or tablet menu input to speed and simplify the creation and editing of technical drawings.

#### **Drawing Geometry**

The geometric portion of a drawing is constructed using three item types (points, lines and arc/circles) and symbols.

#### Symbols

May consist of any combination of lines, arcs, notes and symbols. They may be created as original objects or may be selected from items in a drawing.

#### Annotation

Arrows, crosshatching, notes, dimensions and other annotation can be added to enhance or describe drawing geometry.

#### **Environmental Parameters**

TekniCAD allows the user to set environmental parameters that apply to the drawing. These parameters include: dash type, pen assignments, level parameter, arc smoothness, text formats, keyboard and cursor control, and drawing units.

#### **Workset Functions**

TekniCAD's Workset Functions will group drawing items so that they can be manipulated as a unit.

#### **Drawing Management**

A drawing file contains all the geometry, symbols, annotation, and environmental parameters associated with a drawing when it was saved. Drawings may be saved, restored, or merged into other drawings.

#### **Plot Operations**

PLOT 10 TekniCAD includes support for most major plotters available today. This means TekniCAD can output an entire drawing or selected portions of a drawing on a pen-plotter.

#### **CAD Interfacing**

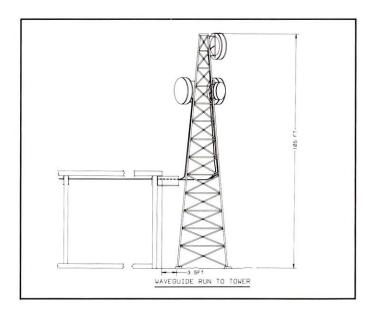
As an additional aid in integrating PLOT 10 TekniCAD into already existing CAD environments, and to interface to other major CAD software and turnkey systems, an I.G.E.S. (Initial Graphic Exchange Standard) interface is available. This transfer utility provides the ability to read and write industry standard I.G.E.S. format files with TekniCAD.

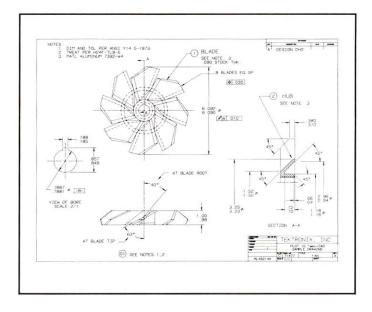
PLOT 10 TekniCAD Operates in a variety of computing environments to suit your requirements. Current installations include: DEC VAX computers with the VMS Operating Systems, Tektronix 6000 Family of Intelligent Graphics Workstations and under C/PM-86 in the Tektronix 411XB Computer Display Terminal and 4170 Local Graphics Processing Unit.

PLOT 10 TekniCAD provides draftsmen with a powerful tool, operating either locally or in a host-connected environment. Its complete set of features make PLOT 10 TekniCAD the solution for many drafting environments.

#### **PLOT 10 STANDARD TOOLS**

PLOT 10 consists of three software libraries, each optimized for different graphics applications: Terminal Control System, Interactive Graphics Library, and PLOT 10 Graphical Kernel System.







# Peripheral Support for Device-Independent Graphics

PLOT 10 products are packaged with device drivers for graphics hardware products; applications can be written without concern for the physical attributes of a device because the specifics reside in these device-dependent software modules. Many non-Tektronix products are advertising PLOT 10 compatibility; a special driver may not even be needed. PLOT 10 GKS includes drivers for Tektronix terminals, plotters and digitizing tablets. In addition, a device driver model and its documentation are provided offering the professional programmer a tool to develop drivers for non-Tek devices. PLOT 10 IGL also includes a full complement of device drivers to support the entire 4100 and 4110 lines.

#### **Software Portability**

Portability has always been the ultimate goal of the graphics standards efforts. Now it is not only possible to transport applications to a variety of host computers, but it is also possible to move applications to workstations using local programmability. Implementations of PLOT 10 TCS (the Terminal Control System that provides the basic graphics building blocks) and PLOT 10 IGL are available locally on 4100 series units. Options add advanced capabilities to the local version of IGL including line smoothing and 3-D graphics routines providing the power of mainframes computer graphics with the benefits of local programmability. An important feature of local programmability means enhanced interactivity at local processor speed rather than data communication line rates.

Existing applications on the host can be downloaded and run locally, thereby increasing interactivity and saving storage costs.

# PLOT 10 TCS (Terminal Control System) & AG-II (Advanced Graphing II)

A composite of FORTRAN IV subroutines, TCS contains the basic building blocks for all graphic operations. Anything that can be displayed graphically can be managed by TCS. Its proven uses range from simple business graphs and forecast diagrams to contour maps of electron

densities, interactive design of electrical circuit boards, and complex architectural renderings. Several data sets can be displayed on-screen at once by using the system's windowing functions, or graphics can be superimposed in the same screen area. It permits modular as well as system independent programming, and supports such basic graphic functions as windowing, clipping and rotation.

Advanced Graphing II Software is a Versatile Terminal Control System module to graph your data using a powerful set of FORTRAN IV subroutines. AG-II combines simplicity of use with highly flexible subroutines to let a programmer tailor the size, shape and format of graphs, by specifying more than 40 graphic elements. AG-II is as much a boon to the new user as to the expert. By using the system's built-in default determinations, you can supply as few as two subroutine calls to produce a full-screen graph properly scaled and annotated

#### PLOT 10 GKS (Graphical Kernel System)

The PLOT 10 Graphical Kernel System (4000P70) is a FORTRAN '77 implementation of GKS at level 2B. GKS is the first international standard for computer graphics with language binding to FORTRAN '77. An application written for one version of GKS will run on any other of the same or higher level. GKS is device independent using device drivers to adapt to the display at hand. Colored lines, panels, multiple text fonts and graphic segments are included in PLOT 10 GKS. Each display surface, or workstation to GKS, may have its own set of attribute bundles. A programmer will find it easier to produce applications requiring interaction with separate windows and viewports with the tools in GKS. A metafile concept is included for storage and retrieval of drawings in a device independent manner. New 2-D applications will benefit from the strong engineering of this product, designed to meet the specifications of the first international graphics standard.

#### PLOT 10 IGL (Interactive Graphics Library)

PLOT 10 IGL is a uniquely modular system of I/O, device drivers, primary commands and ad-

vanced feature support that lets the user move at will among any Tektronix display devices or technology. The structure of PLOT 10 Interactive Graphics Library follows the concepts suggested in the ACM/SIGGRAPH study on a core standard for computer graphics. Advanced options such as Line Smoothing, Color Panel Support, Graphics Text Composer, Segments and 3-D graphics may be added. Device drivers are included in PLOT 10 IGL for 4020, 4010, 4110, and 4100 Series terminals. Subsets of PLOT 10 IGL features may be generated from our standard configurations to better match specific application requirements. Host computer and display device independence attributes of PLOT 10 IGL make it an excellent choice for 3-D graphics applications.

#### Local or Host

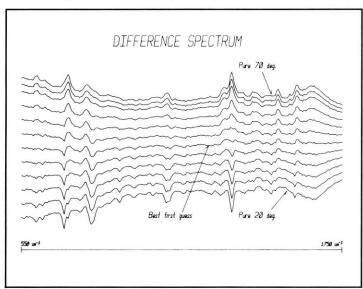
PLOT 10 GKS is available in ANSI FORTRAN '77 source form. PLOT 10 TCS, and PLOT 10 IGL are available in FORTRAN source form for host mainframe computers or in object code form to run on 4100 and 4110 Series terminals with CP/M-86.

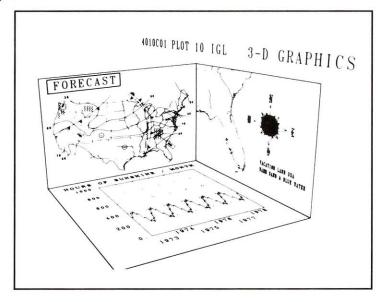
#### ORDERING INFORMATION

Note: Prices are approximate depending on options. 4000P70 - PLOT 10 Graphical Kernel System \$8,000 4100P30 PLOT 10 Computer-Aided Drafting C/PM-86 . \$2,200 4100P31 PLOT 10 TekniCAD/IGES Utility C/PM-86 4000P35 PLOT 10 Computer-Aided Drafting Tektronix 6000 Family ..... ......\$4,000-\$8,000 DEC VAX with VMS ..... . \$12,000-\$16,000 4010A01 - PLOT 10 Terminal Control System 4010A15 - PLOT 10 TCS/IGL Bridge ..... 4663A01 — PLOT 10 Utility Routines ...... 4010C01 - PLOT 10 Interactive Graphics Library ..... \$4,000-\$17,000 4010C02 — PLOT 10 Preview Routines .......

Tektronix offers user training classes on PLOT 10 IGL. For further information, contact the Customer Training Registrar at (503) 685-3808, or your nearest Tektronix office.

PLOT 10 GKS classes begin January 1985.





#### VRIS LAYOUT SOFTWARE

VRIS (VR Information Systems, Inc.,) A wholly owned subsidiary of Tektronix, Inc., is the technological leader in layout software for design of VLSI circuits and in software for design of printed circuit boards.

MERLYN-G® Automated Layout System is the standard of comparison in the layout phase of the VLSI design process. Using sophisticated placement and routing algorithms the MERLYN-G slashes the time normally associated with the design of VLSI circuits. With the MERLYN-G, 100% of the layout function is automated and allows the design engineer to layout major array technologies using almost any array topology and any set of design rules.

The MERLYN-G offers expandable design capacity up to 10,000 gates, automated connectivity and design rule verification, and interactive graphical layout editors.

MERLYN-PCB® Printed Circuit Board Design System applies the same technological sophistication of the MERLYN-G to the entire design process of printed circuit boards. From schematic capture, through interactive placement, autoplacement, autorouting, wiring optimization, design documentation, film tooling and CAM interfaces the MERLYN-PCB is the complete solution to PCB design problems.

MERLYN-G and MERLYN-PCB are the products of VR Information Systems, a pioneer in circuit design tools since 1976.

VR Information Systems not only provides the best in VLSI layout tools and PCB design systems, but also extensive support and training services for its design products, including formal classroom instruction, demonstration exercises, applications assistance, periodic system updates, and complete documentation.

#### **MERLYN-G®**

**Fully Automatic Placement and Routing** 

Array Style and Technology Independence

Highly Transportable, Written in FORTRAN 66

Expandable Capacity (100 Gates to 10,000 Gates)

Automatic Connectivity and Design Rule Verification

Interactive Graphical Placement and Wiring Editors

#### **Automated Gate Array Layout**

MERLYN-G slashes the time normally associated with gate array layout. It is a fully automated physical layout system for personalizing gate arrays. It automatically performs all of the layout functions such as cell/macro placement, routing, and wire path optimization using sophisticated state-of-the-art algorithms. Additionally, MERLYN-G has graphical editing facilities that allow the designer to interactively modify the layout.

MERLYN-G provides a variety of benefits to the gate array designer including:

- Rapid Turn-Around of Designs
- · Consistent Application of Design Rules
- · Support for new array styles and technologies
- Strong technical support, maintenance, and ongoing enhancements

#### **Fully Automatic Placement and Routing**

The MERLYN-G layout system is truly an automatic system. As long as a design does not exceed the autoroutable cell utilization limit (typically 70% to 85% for an average array), no designer intervention in the layout process is required. Available cell utilization can be increased to greater than 90% when interactive editing techniques are used (depending on the complexity of the circuit).

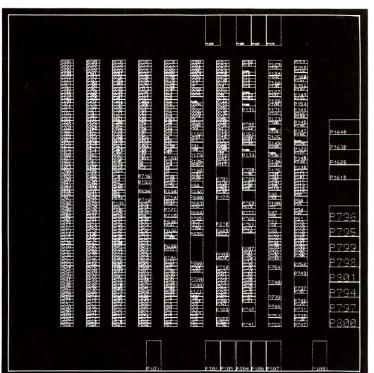
#### Array Personalization Process

MERLYN-G uses a reference data base to store individual cell/macro descriptions and the general array specifications. The actual array personalization information (i.e., circuit specification) is entered as a free-format text file. The file can be automatically generated from a commercially available schematic capture system, or it can be created manually with a text editor. The MERLYN-G PREPROCESSOR combines the circuit specification with the relevant reference information to produce a machine-readable design file which can be manipulated by MERLYN-G.

MERLYN-G calculates a suitable placement for the cells used in the array.

MERLYN-G has a variety of tools to perform cell/macro placement and placement improvement functions. There are initial placers, automatic placement improvement tools, and interactive graphical placement editors. MERLYN-G placers initially locate cells/macros on the array and then rearrange their locations to enhance routing completion.

#### **Placement**



Example of 100% auto-placed gate array, showing optimum placement of cells/macros for enhanced routing completion. No manual intervention was required.



#### Array Style and Technology Independance

MERLYN-G has a proven track record in laying out the major array technologies. It supports almost any array topology using any set of design rules. Further, VR actively maintains active technical liaison with the major array vendors to ensure that MERLYN-G will continue to support the latest technology.

#### **Highly Transportable**

The MERLYN-G system is a highly transportable system written in ANSI standard FORTRAN 66. Both object and source code (United States only) licenses are available. The system is currently installed and running on superminis (DEC/VAX, HARRIS, PRIME) as well as mainframes (IBM, NAS, Amdahl).

# Expandable Capacity (100 Gates to 10,000 Gates)

The MERLYN-G system has a modular configurable architecture that allows the designer to expand the capabilities of his system in step with his needs and expanding computer power.

#### Automatic Connectivity and Design Rule Verification

MERLYN-G has special facilities for verifying net connectivity and testing for shorts or design rule violations.

#### **Extensive Support and User Training**

MERLYN-G training is performed at the user's site and includes formal classroom instruction, demonstration exercises, and hands-on assistance with the user's own design problems. Optional sustaining technical support is available including periodic system updates as well as access to VR's customer support staff.

#### System Environment

The MERLYN-G system currently runs in a variety of hardware and operating system environments. The following specifications describe the required operating environment.

C	OMPILER	FORTRAN 66
P	HYSICAL MEMORY	2 Mb minimum
C	PERATING SYSTEM	Virtual (4 Mb to 12 Mb)
	DISK CAPACITY	140 Mb or more
C	ODE TRANSFER	Magnetic Tape
C	RAPHICS TERMINALS	Tektronix
P	LOTTERS Vei	rsatek, Nicolet, Tektronix,
		Zeta, Gerber, etc.

After layout, MERLYN-G generates check plots, descriptive reports, and data files compatible with major manufacturing systems (e.g. CALMA, etc.

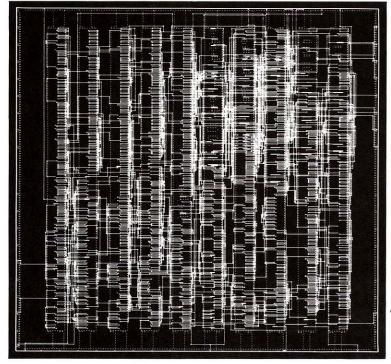
For further information about the MERLYN-G gate array layout system as it applies to your particular design needs, please contact VR Information Systems, Inc. (a wholly owned subsidiary of Tektronix. Inc.)

VR Information Systems, Inc. 12212-A Technology Blvd. Austin, Texas 78727 Phone: (512) 331-1303 TLX: (910) 874-2052

MERLYN-G has a variety of routing systems to accomodate various array styles. The BASIC CHANNEL ROUTER is used to route simple row/column style arrays. The ADVANCED CHANNEL ROUTER routes complex arrays with intersecting channels. Also, there are special routing tools for particularly difficult probems, including the MAZE ROUTER for barrier strewn topologies and the RIPUP AND RETRY ROUTER for isolated nodes.

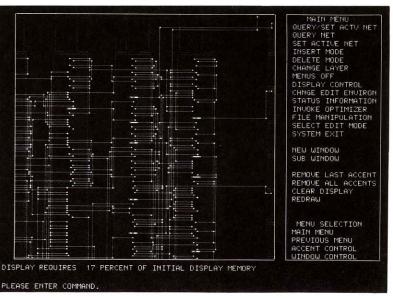
MERLYN-G has dynamic on-line layout editing facilities for both placement and wiring. A GRAPHICAL PLACEMENT EDITOR allows the designer to interactively modify placement, and A GRAPHICAL WIRE EDITOR allows the designer to interactively modify wiring.

#### Routing



Example of 100% auto-routed gate array (using placement shown in previous illustration). No manual intervention was required.

#### Interactive Editing



This particular example illustrates the capabilities of the interactive graphical wire editor MERLYN-G offers to the designer.

# VRIS PRINTED CIRCUIT BOARD DESIGN SYSTEM

#### MERLYN-PCB®

Schematic Capture/Implicit Schematic Back Annotation

Continuous Design

Automatic/Interactive Placement, Routing (to 1 mil) and Packaging

Board Outlines up to 32.7 Inches Square

User Command with On-Screen Menus, Keyboard, Graphic Tablet and Puck

**Manufacturing Output and Printed Reports** 

Reentrant Autoplacer/Autorouter

Partial Placement/Partial Routing Options

Interactive Stitching Simultaneous to 16 Layers, Real-time Checking

**Diagonal Autorouting, Stitching** 

Grid Size Changes During Autorouting, Stitching

**CAM Package** 

#### **Cost Effective**

MERLYN-PCB offers design engineers an integrated, interactive, easy-to-use system for PCB design. This system can realize payback in as few as three designs, clearly making it the most cost effective PCB design system available.

At the heart of the MERLYN-PCB system is PC-BASE® which contains all of the data needed to layout a PCB (including the electrical and mechanical characteristics of the components), the board geometry and layout rules, as well as the circuit schematic data. Since all of the data is stored in a single data base, you do not need to translate file formats or provide special interfaces when advancing through layout phases.

All of these features are contained in one of the best price-performance packages available today.

#### User Friendly, Menu-Driven Interface

The MERLYN-PCB system dynamically enforces all predefined drafting standards. Assist functions are supported to help the designer with the schematic input. It automatically routes the schematic connections (including support for bus connections). When a symbol for a logical device is moved, MERLYN-PCB automatically reroutes the connections. The system also features implicit schematic back annotation, which checks the board design back to the schematic. MERLYN-PCB has been designed to speed the schematic capture process by the inclusion of a 3-bend autorouter.

The MERLYN-PCB package includes a standard library of more than 400 commonly used electrical components. The conversational library maintenance system allows definition of other devices as needed, and up to four personal libraries may be created.

#### Schematic Analysis and Netlist Generation

MERLYN-PCB provides checks for completeness and for common electrical errors. It can also perform loading analysis on the circuit. After all checks are completed, MERLYN-PCB automatically generates the netlist for use in placement and routing phases of the layout. This netlist can be used as input to a logic simulator or an automatic test pattern generator.

#### **Automatic/Interactive Placement**

MERLYN-PCB supports both interactive and automatic component placement. The system offers reentrant features during autoplacement, allowing the designer to automatically place all of the components, then manually relocate components as needed. MERLYN-PCB supports a NET GRAPH display that visually shows the connections between components to help the designer find the best component locations.

A density analysis display shows the minimum spanning tree network (as line-of-site connections) on the components. This helps the designer locate areas of potential wiring congestion.

The placement optimization system finds the optimal component placement for a circuit based on the shortest interconnection wire length.

#### **Automatic Routing**

MERLYN-PCB has a fully automatic router that generates wiring on up to 16 different layers. It can generate multiple width traces, route off or on grid, generate diagonal (45 degrees) wiring and "T" (Steiner) connections. The router is a design-rule-driven system, with rules being specified in real dimensions, not just in terms of a wiring grid. It uses a very persistant wave expansion algorithm with a variety of tunable attributes.

#### Multilayer Interactive Wire Editing

MERLYN-PCB has an advanced interactive wire editing facility for making design changes and completing boards that are not 100% automatically routed. Included is the Edit and Adjust Function which moves traces and components aside to allow for new wiring. The Strip Net Utility provides the designer with the option of removing designated wiring. Net Graphs may be displayed that highlight the wiring associated with a given net. Rapid panning and zooming display capabilities and highlighting functions are other valuable features of MERLYN-PCB.

#### **Board Optimization**

The wiring optimization package improves the manufacturability of a layout. MERLYN's via reduction capability reduces the number of vias required to complete the net, and contains a hanging wire removal program that eliminates unused paths. MERLYN-PCB also has a special acute angle removal capability that reduces sharp bends in the wire paths.

#### Complete Design Documentation and Artwork/CAM Package

MERLYN-PCB produces well designed, standard outputs directly from the MERLYN-BASE Central-Database. CAD/CAM outputs are selected from a series of application menus which control the output process and ensure that computer accuracy is maintained.

#### System Environment

The MERLYN-PCB system currently runs in two computing environments, on the VAX-750/780 supermini or on the AT&T 3B2 minicomputer. Both environments will utilize the Tektronix 4100 Series graphics terminals as input devices.

# CHARACTERISTICS PARAMETER MAXIMUMS

Vias Per Design — 6250\*1.

Vias Per Net - 2000.

Components Per Design — 512\*1.

Components of the Same Type Per Design — 512\*1.

Preplaced Components Per Design — 256.

From-Tos Per Design (Pin-To-Pin Connection) — 5000\*1.

Nets Per Design (Unique Names) — 1200\*1.

Pins Per Design (Used and Unused) - 5000\*1

Pins Per Component Type (Including Connectors) -256.

Pins Per Gate — 256

Pins Per Connector — 256.

Pins Per Net - 500\*1.

Gates Per Design — No Practical Limit.

Gates of the Same Type Per Design — 512\*1.

Gates Types — No Practical Limit

Gates Per Component — 256.

Gates Per Net - No Practical Limit.

Void Areas — 200.

Line-Vectors on Signal Layers — 15,000.

Board Size - 32.7 x 32.7.

Number of Line-Vectors Per Net — 2000\*1.

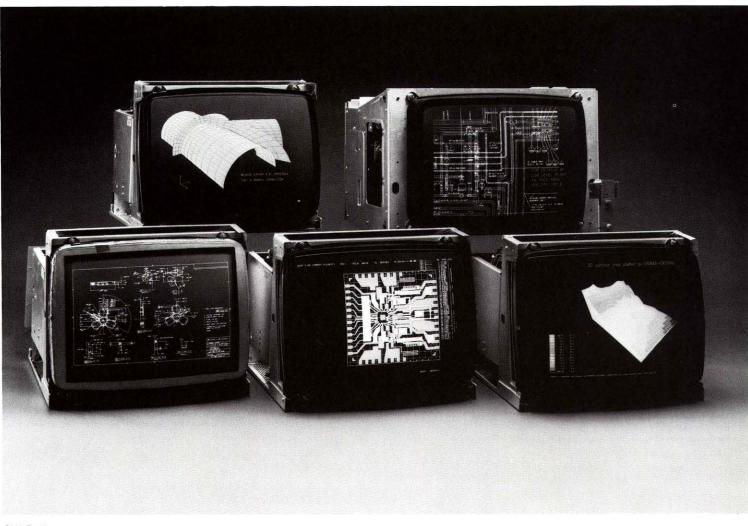
\*1 Can be recompiled to be higher if required.

For further information, about the MERLYN-PCB layout system as it applies to your particular design needs, please contact VR Information Systems, Inc. (a wholly owned subsidiary of Tektronix, Inc.)

VR Information Systems, Inc. 12212-A Technology Blvd. Austin, Texas 78727 Phone: (512) 331-1303

TLX: (910) 874-2052





GMA Family

#### **DISPLAY PRODUCTS**

#### Reliability, Performance, Value, Support

As a world leader in display technologies, Tektronix is committed to building lasting OEM relationships and supporting its OEM customers with continuing product developments. We introduced a total of five new 19-inch raster monitors this year, including monitors employing two patented breakthroughs; a high-resolution color monitor with automatic convergence (GMA304) and a monochrome monitor with a low-capacitance electron gun that yields very high video bandwidth with low power consumption (GMA201).

Our comprehensive OEM support program includes OEM service agreements and capabilities throughout the United States and the world; interface assistance and applications engineering and documentation; and OEM pricing, terms and conditions to help you be competitive.

We know that your systems can only be as reliable as the components that go into them. For that reason, we place a premium on dependability. We produce products that will keep you and your customers satisfied and service costs down.

#### Flexible Product Families

Tek offers its OEM products as families rather than as a collection of individual products, to give the OEM greater flexibility in meeting changing market requirements. The three Tek display product families are:

#### Small-Screen X-Y Monitors

Tek's small-screen monitors are proven performers in diverse applications ranging from medical imaging to military systems, and provide crisp, high-resolution presentation of waveform or image data.

#### Large-Screen DVST Displays

Another Tek innovation, the Direct View Storage Tube, enables information to be written and stored on a CRT without constant image refresh. All permit real-time motion, rotation, scaling and selective erasure before storage.

#### Large-Screen Raster Displays

This year brings five new raster displays to Tektronix' portfolio of display products. The GMA family of raster displays spans the spectrum from monochrome to color and medium to very high resolution. Features include CRT guns of

precision-in-line, delta and low-capacitance design; dynamic and autoconvergence correction of the color beam alignment; contrast enhancement panels to optimize viewability; and highly-tuned electronic circuits for accurate and stable images. When enclosed in optional Tektronix-designed cabinets, each of the displays conforms to world-wide EMI requirements. These raster displays fit application needs ranging from process control to the high-performance requirements of imaging and computer-aided design.

Consider the advantages of working with Tektronix: a wide selection of display technologies and models covering the spectrum of performance, all within our display product families. Exceptional performance. Built-in reliability. Measurable value. Extensive service and support. Your local Tektronix OEM Representative will show you how to profit from a partnership with Tektronix.

Special pricing, terms and conditions are available to qualified OEMS. Contact your local Tektronix representative for complete information.





GMA201

#### **GMA201**

Monchrome Raster Display Monitor

High-Resolution Video for the System Builder

Bright, Stable Noninterlaced 60 Hz Refresh

200 MHz Video Amplifier Bandwidth

**ROM-based Dynamic Focus** 

#### Modular Construction for Easy Field Service

# The GMA201 is a member of Tektronix OEM display product family that provides unparalleled raster scan video performance.

Key features of the GMA201 monochrome display include 1536 vertical by 2048 horizontal addressable pixels, digitally-adjusted focus, astigmatism correction, contrast enhancement panel, and a crisp, well-focused beam at all points on the screen. A patented low-capacitance gun structure was developed to address the requirements for small uniform spot size, rugged construction and low power dissipation.

The GMA201 is well-suited to system builders in the fields of gray-scale imaging, CAD/CAM, computer-aided publishing, document retrieval, and related technical applications that require extremely high performance. The GMA201 complies with worldwide safety and emissions standards.

#### **CHARACTERISTICS**

#### DISPLAY

Addressable Area — 267 mm x 356 mm (10.5 in x 14 in).

Addressable Resolution — 1536 pixels x 2048 pixels at 60 Hz noninterlaced.

Aspect Ratio — 3:4 nominal.

CRT Orientation — Long axis horizontal.

Brightness — 100 cd/m2 (30 fL) with installed contrast enhancement filter.

**Geometric Distortion** — Incremental nonlinearity:  $\pm 3\%$  at 25°C. Positional Accuracy:  $\pm 1\%$  of image height. Peak-To-Peak Line Variation:  $\pm 5\%$ .

**Spot Size** — 7.5 mils (0.19 mm) center screen (maximum). 9.0 mils (0.23 mm) corners (maximum).

Focus, Astigmatism — Dynamically controlled, digitally adjusted using ROM look-up table.

Phosphor Type — WW (P4).

#### VIDEO AMPLIFIER

Bandwidth — Dc to 200 MHz (-3 dB) Pulse Response —  $T_r \le 1.75$  ns.  $Tf \le 1.75$  ns.

#### VIDEO INPUT

Interface - Linear, dc coupled.

Impedance —  $50 \Omega$ .

Recommended Input Signal Rise and Fall Time —  $\leq$ 1 ns.

Level — Black = 0 V, white = +1.0 V.

Maximum Non-Destructive Input - +5 V, -2 V.

#### SYNC INPUTS

Interface — TTL Compatible, falling-edge triggered.

Horizontal Sync — 93.6 kHz, ±2%.

**Vertical Sync** — 50 Hz or 60 Hz  $\pm$  3 Hz. Factory-calibrated to 60 Hz

Vertical Retrace Time —  $\leq 250 \mu s$ . Horizontal Retrace Time —  $\leq 2 \mu s$ .

#### AC POWER

 $\label{eq:Range} \textbf{Range} \leftarrow 87 \text{ V to } 128 \text{ V}, 174 \text{ V to } 256 \text{ V}, \text{ all at } 48 \text{ Hz to } 63 \text{ Hz}.$   $\label{eq:Range} \textbf{Power Consumption} \leftarrow 150 \text{ W maximum}.$ 

#### CONDITION INDICATORS

Scan fail, low-voltage power supply, high-voltage power supply.

#### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	447	17.6
Height	389	15.3
Depth	485	19.1
Weight	kg	lb
Net	25.0	55.0

INCLUDED ACCESSORY

Service Manual.

#### ORDERING INFORMATION

Option 23\*1 — Cabinetry and CRT Bezel ..... +\$870

#### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A. 50 Hz

Option A2 — UK 240 V/13 A, 50 Hz

Option A3 — Australian 240 V/10 A, 50 Hz
Option A4 — North American 240 V/15 A, 60 Hz

Option A5 - Switzerland 220 V/10 A, 50 Hz



GMA301

#### GMA301/302/303/304

**Color Raster Display Monitors** 

High-Performance 19-Inch Color Raster Display Monitors

**Dynamic Convergence** 

Bright, Stable Noninterlaced 60 Hz Refresh

Modular Construction for Easy Field Service

The GMA300 Series of Color Raster Display Monitors offers OEM System Builders High Performance and a Range of Resolution in Modular Product Packaging.

The Tektronix GMA Series offers OEMs a family of raster displays to fit any application need and budget. The GMA300 Family includes: the GMA301, with 525-line noninterlaced field and an addressable pixel matrix of 640 x 480; the GMA302 with an 800-line field with a 1024 x 768 matrix; and the GMA303 and GMA304, which offer a 1067-line field with a 1280 x 1024 matrix.

The GMA300 Series color displays are designed for system builders requiring high-quality, full-color 19-inch displays. The GMA300 family addresses a range of performance and market areas including CAD/CAM, cartography, process control, computer-aided publishing, and related technical applications.

In addition to having a 19-inch screen, all family members operate at a flicker-free 60 Hz noninterlaced refresh rate. Display quality is further enhanced in the GMA301, 302 and 303 by dynamic convergence correction, which allows adjustment of the color convergence to ≤0.3 mm over the entire display area, and a precision-inline gun CRT. The GMA304 incorporates Tek's patented autoconvergence which, at the push of a button, automatically adjusts the color convergence to ≤0.25 mm over the entire display quality area. To reduce viewing fatigue, an antireflective coated neutral density contrast enhancement panel is bonded to the CRT faceplate.

<sup>\*1</sup> Option 23 includes a standard North American 115 V power cord. Option 23 is required to order A1-A5 power cords.







#### **GMA302**

#### Display Accuracy Sharpens Image

The high-voltage power supply in the GMA Series incorporates stringent voltage regulation to minimize raster size changes. Circuit accuracy and stability in the deflection system minimize geometric distortion and linearity errors. Power supplies are synchronized to the deflection system, eliminating image "swim."

#### Modular Construction for OEM Flexibility

The GMA Series was designed with the OEM system builder in mind. The CRT and circuit boards are arranged in a compact, easily integrated open-frame sheet-metal chassis. Circuit modules can be removed in the field for less down-time and lower service costs. The monitors are designed to allow easy interfacing of power, degauses and brightness controls, allowing the OEM to use hardware and a mounting design of their choice. Because the GMA201, 301, 302 and 303 share a similar mechanical package, OEMs can upgrade their systems with minimal mechanical changes.

#### CHARACTERISTICS

#### DISPLAY

Addressable Area — 301:  $356 \text{ mm} \times 267 \text{ mm}$  (14.0 in x 10.5 in). Addressable resolution is 640 pixels x 480 pixels. 302:  $356 \text{ mm} \times 267 \text{ mm}$  (14.0 in x 10.5 in). Addressable resolution is 1024 pixels x 768 pixels. 303:  $343 \text{ mm} \times 274 \text{ mm}$  (13.5 in x 10.8 in). Addressable resolution is 1280 pixels x 1024 pixels. 304:  $342.9 \text{ mm} \times 274.3 \text{ mm}$  (13.5 in x 10.8 in). Addressable resolution is 1280 pixels. x 1024 pixels.

Refresh Rate — 60 Hz noninterlaced.

Aspect Ratio - 301, 302: 4.3 nominal. 303, 304: 5.4 nominal.

**Convergence** — **301, 302, 303:**  $\leqslant$ 0.3 mm over the entire display area. **304:**  $\leqslant$ 0.25 mm over the entire display area.

Colorimetry (White) — 9300°k.

Intensity — With contrast enhancement panel. White Luminance:  ${\gg}70\text{cd/m}^2$  ( ${\gg}20\text{ fL})$  for the entire series.

Black Level Stability — 301, 302, 303:  $\leq$ 5 cd/m2 ( $\leq$ 1.5 fL). 304:  $\leq$ 0.4 cd/m2 ( $\leq$ 0.1 fL).

**Geometric Distortion (304)** — All points within 3.43 mm (0.135 in) of true position. From  $0^{\circ}$ C to  $40^{\circ}$ C true position within 6.0 mm (0.236 in).

Raster Size Variation — 301, 302, 303:  $\leq$ 0.25% from minimum to maximum luminance. 304:  $\leq$ 0.1% from minimum to maximum luminance.

#### **GMA303**

Positional Accuracy — At calibration temperature, all points within 3.57 mm (0.14) in) of true position. Over specified operating temperature, all points within 7.14 mm (0.28 in) of true position on 301 and 302; within 6.1 mm (0.24 in) on 303.

Incremental Linearity — At calibration temperature: ≤3% error. Over specified operating temperature range: ≤5% error.

Incremental Line Straightness — At calibration tempeature: Peak-to-peak deviation ≤3% of measurement interval. Over specified operating temperature range: Peak-to-peak deviation ≤5% of measurement interval.

#### **ELECTRICAL CHARACTERISTICS**

#### Video Amplifiers -

**301** Bandwidth:  $\leq$ 50 Hz to  $\geq$ 30 MHz at -3 dB. Pulse Response:  $\leq$ 11.5 ns.

**302** Bandwidth:  $\leq$ 50 Hz to  $\geq$ 60 MHz at -3 dB. Pulse Response:  $\leq$ 5.8 ns.

**303** Bandwidth:  $\leq$ 50 Hz to  $\geq$ 90 MHz at -3 dB.

Pulse Response: ≤4.0 ns.

**304** Bandwidth:  $\leq$ 50 Hz to  $\geq$ 90 MHz at -3 dB.

Input Pulse Response: ≤1.0 ns.

#### Video Signal Timing —

	301	302	303	304
Vertical Freq	60 Hz	60 Hz	60 Hz	60 Hz
Horizontal Freq	31.5 kHz	48 kHz	64 kHz	64 kHz
Vertical Retrace	600 μs	600 μs	550 μs	550 μs
	max	max	max	max
Horizontal	5 μs	5 μs	4.5 μS	4.5 µs
Retrace	max	max	max	max

#### Video Inputs —

Interface 301, 302, 303: Linear, ac coupled, BNC type.

Interface 304: Linear, dc coupled, BNC type.

Impedance: 75  $\Omega$ .

Level: -0.5 V p-p minimum, 3.0 V p-p maximum (factory-cali-

brated for 1.0 V p-p).

#### GMA304 Option 23

Level: White level positive with respect to back porch. Maximum non-destructive input: ±15 V, dc plus peak ac, momentary input; ±5 V, dc plus peak ac continuous input. Sync **301** Interface: Composite input with green video.

Amplitude: 0.4 V peak-to-peak. Level: Negative with respect to back porch.

Sync 302, 303, 304 Interface: Separate H-Sync and V-Sync inputs, BNC type.

Level: TTL-compatible

Impedance: TTL-compatible (2 Schottky TTL loads).

#### INCLUDED ACCESSORY

Service Manual

#### ORDERING INFORMATION

#### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz
Option A2 — UK 240 V/13 A, 50 Hz
Option A3 — Australian 240 V/10 A, 50 Hz
Option A4 — North American 240 V/15 A, 60 Hz
Option A5 — Switzerland 220 V/10 A, 50 Hz

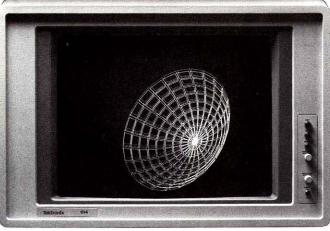
\*1 Option 23 includes a standard North American 115 V power cord. Option 23 is required to order the Option A1-A5 power cords.

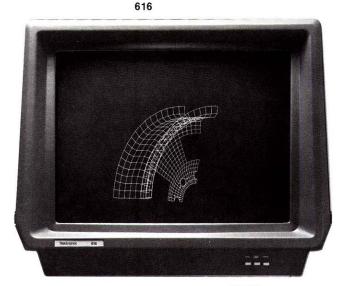
#### PHYSICAL CHARACTERISTICS

PHYSICAL CHARACTERISTICS								
Dimensions	CRT 1	GMA301	, 302, 303 With O	otion 23	Stan	GMA dard		ption 23
	mm	in	mm	in	mm	in	mm	in
Width	447	17.6	553	21.8	548	21.8	584	23.0
Height	389	15.3	429	16.9	386	15.2	422	16.6
Depth	485	19.1	567	22.3	564	22.2	584	23.0
Weights	kg	lb	kg	lb	kg	lb	kg	lb
Net	25	55	34	75	41	90	52	115

# STORAGE DISPLAY MONITORS

614





#### 614/616 Storage Display Monitors

**High Resolution Graphics** 

Combined Stored and Write Thru Mode

19 Inch and 25 Inch Diagonal CRT

The 614 and 616 are high performance analog input bistable storage display monitors. This family of displays is capable of displaying alphanumerics and high resolution, high density graphics at a low cost. In the storage mode, graphic lines are sharp, stable, and flicker-free making it easy for the user to study the finer details of a design. The write-thru mode (a technique by which refreshed data appears on the screen at the same time as stored graphics), allows increased viewability, selective erase, interactivity, and dynamic motion with the same high resolution. Write-thru color is green on the 616 and yelloworange on the 614. This permits rapid differentiation of working and stored information.

#### **APPLICATIONS**

The 614 and 616 are well suited as a high-speed interactive graphics attachment to the IBM 3277 Model 2 Display Station, enhancing the capabilities of the overall system. The graphics attachment and software (RPQ7H0284 and P09013 from IBM) allows the display monitor to add a wide range of graphics capabilities to the station. A dual display station is thus configured with the IBM monitor displaying the alphanumeric data and the Tektronix storage monitor displaying graphics information and special symbols. The 614 and 616 are versatile displays and can be used in other environments which can benefit from productivity improvements offered by advanced storage display monitors with refresh capabilities

#### **614/616** Operations

All display functions are completely programmable and designed to interface to standard TTL level logic. The X and Y deflection amplifiers have differential analog inputs. A CRT antiburn circuit is provided to help protect against burning the CRT phosphor in the event that the beam is moving too slowly across the CRT with the Z-axis turned on or the X and Y deflection fails. If there is no screen activity for approximately two minutes. the screen brightness will be reduced to prolong CRT life. After thirty minutes of inactivity, the screen is automatically erased.

#### CHARACTERISTICS

The following characteristics are the same for the 614 and 616 unless otherwise noted.

#### DISPLAY

CRT Type - Direct view storage.

Dimensions - 614: 48 cm (19 in) diagonal. 616: 63 cm (25 in)

Display Area — 614: 26.7 cm x 35.6 cm (10.5 in x 14 in). 616: 49.0 cm x 36.2 cm (19.3 in x 14.25 in).

Stored Writing Speed - 614: 150 m/s. 616: 200 m/s. Refresh Writing Speed — 614: 500 m/s. 616: 1500 m/s.

Write-Thru Contrast Ratio - ≥4:1.

Max Z-Axis Repetition Rate - 614: 1 MHz. 616: 2 MHz. Stored Luminance — 614: N/A. 616: 13.7 cd/m<sup>2</sup> (>4 fl).

Resolution — Center Screen: 15.7 lines/cm (40 lines/inch). Screen Edges: 13.8 lines/cm (35 lines/inch).

Positional Accuracy - 614: ±1.25% of long axis. 616: ± 2.5% of long axis.

Stored Dot Writing Time — 614:  $\leq$ 5  $\mu$ s. 616:  $\leq$ 2  $\mu$ s.

Settling Time (Non linear operation; ≥1 cm deflection) — 614:  $3 \mu s + 4 \mu s/cm$  to within 1 spot diameter.

616: 1  $\mu$ s +2  $\mu$ s/cm to within 1 spot diameter

Erase Time - 614: 1.5 s ± 20%. 616: 1.0 s ± 12%

#### POWER

Line Voltage - 614: 100 V ac, 120 V ac, 220 V ac, 240 V ac ±10%. 616: 90 V ac to 132 V ac and 190 V ac to 250 V ac (selectable)

Line Frequency - 614: 48 Hz to 66 Hz. 616: 48 Hz to 440 Hz.

Power at 115 V ac, 60 Hz - 614: 220 W maximum. 616: 350 W maximum

#### PHYSICAL CHARACTERISTICS

Dimensions	6	616		
	mm	in	mm	in
Width	584	23.0	686	27.0
Height	426	16.8	591	23.3
Depth	582	22.9	565	22.2
Weights	kg	lb	kg	lb
Net	46.0	100.0	68.0	150.0

#### INCLUDED ACCESSORIES

Power cord (161-0066-00); instruction manual.

#### ORDERING INFORMATION

614 Storage Display Monitor	\$9,200
616 Storage Display Monitor	\$14,375
Option 30 - Interconnecting Cable (to Allow Atta	achment to
IBM 3277 Model 2)	+\$155
Option 38 — Blue Glass Filter (616 Only)	NC

#### INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz

Option A2 — UK 240 V/13 A, 50 Hz

Option A3 - Australian 240 V/10 A, 50 Hz

Option A4 - North American 240 V/15 A, 60 Hz

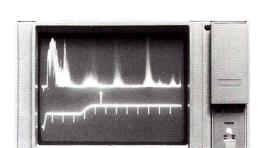
Option A5 - Swiss 220 V/10 A, 50 Hz

#### WARRANTY-PLUS SERVICE PLAN REFER TO PAGE 14

N1 — (614) Service Plan + 9 Months Service	+\$685
N3 - (614) OEM Service Plan + 12 Months Service	+\$910
N1 - (616) Service Plan + 9 Months Service	+\$855
N3 — (616) OEM Service Plan + 12 Months Service	+\$1,140

Tektronix offers compatible hard copy units that allow Graphic and Alphanumeric information to be copied from the storage CRT. See page 71 for a complete description on the 4611/4631 Hard Copy Units.

Special pricing, terms, and conditions are available to qualified OEM's. Contact your local Tektronix representative for complete information.



#### 608 Monitor

High Resolution with Ambient-Light Viewing

Expansion-Mesh-Halo Suppression

#### **Excellent Gray Scale, High Brightness** Display

The 608 is Tektronix' finest directed-beam viewing monitor. It is extremely well suited for highperformance display applications such as medical and military imaging and electronic instrumentation. The 608's high usable brightness, small spot size, and large screen give excellent direct-viewing capability. It produces detailed displays that are easy to read in high ambient light and produce quality photographs.

The special CRT design suppresses expansionmesh halo, which ordinarily causes lower contrast and a "washed out" appearance that interferes with high-brightness gray-scale displays. Expansion-mesh-halo suppression results in a more readable display with subtle and accurate grayscale images and detailed waveforms. In addition, imaging is critically sharp from corner to corner because of the dynamic focusing employed.

The wide deflection factor facilitates integration with a broad range of designs. An optional metal bezel lets you use heavy cameras, including those with motorized roll-film backs, without causing distortion, defocus, or light leaks.

In addition, optional full-differential inputs help reject unwanted common-mode signals such as ground noise and power-supply hum. Plus, the 608 can be ordered with gamma-correction for photographic applications. This option produces linear light-output changes with a linear change of Z-axis input, typically within 20 percent.

#### CHARACTERISTICS

Type — Flat-faced, electrostatic CRT.

Dimensions — 98 mm x 122 mm (3.9 in x 4.8 in).

Phosphor — GH (P31) is standard.

Spot Size — 0.25 mm (10 mils) at 170 cd/m2 (50 fL); max brightness -240 cd/m2 (75 fL).

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Bandwidth - Dc to at least 5 MHz.

Deflection Factor - Adjustable 50 mV/div to 0.25 V/div. Option 22 (5X attenuator) extends deflection factor to 1.25 V/div.

Input R and C — 1 M $\Omega$  ±1% paralleled by <60 pF.

X-Y Phase Difference - One degree max to at least 1.5 MHz

Maximum Input Voltage — ± 100 V (dc plus peak ac).

Linear Common-Mode Signal Range — With Option 21  $\pm$  3 V. (Option 22 extends range to  $\pm$  15 V.)

Recommended Source Impedance — ≤10 kΩ.

#### **Z-AXIS AMPLIFIER**

Z-Axis amplifier permits intensity modulation of the writing

Bandwidth — Dc to 10 MHz over usable range.

Sensitivity range is adjustable from 0 V to +1 V to 0 V to +5 V for full-intensity control.

Input R and C — 1 M $\Omega$  ± 1% paralleled by <60 pF.

Linear Common-Mode Signal Range — With Option 21

#### **AC POWER**

Voltage Ranges (±10%) - 100 V ac, 110 V ac, 120 V ac, 200 V ac, 220 V ac, and 240 V ac.

Line Frequency — 48 Hz to 440 Hz.

Power - 61 W maximum at 120 V ac.

#### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	133	5.2
Height (without feet)	213	8.4
Depth	493	19.4
Weight≈	kg	lb
Net	8.0	17.6
Shipping	10.4	23.0

#### **INCLUDED ACCESSORIES**

CRT graticule (337-2126-02); instruction manual; operator's manual.

#### ORDERING INFORMATION

608 Monitor (without handle, feet, or covers)

\$2,935
Option 01 — Internal Graticule NC
Option 09 — UL 544 Component Recognition NC
Option 10 - 25-pin Remote Program Connector X, Y, and Z,
Single-ended Inputs+\$55
Option 21 — Full Differential Inputs (X,Y,Z) +\$60
Option 22 — Extended Gain Range 5X Attenuator +\$45
Option 23 - Handle, Feet, and Covers (Not Available with
Option 28)+\$110
Option 24 — Linearized Z-Axis (Gamma Correction) +\$75
Option 25 — TTL Blanking +\$75
Option 28 — Covers Only (Not Available with Option 23)
+\$90
<b>Option 29</b> — Metal Bezel +\$70

#### **OPTIONAL ACCESSORIES**

Rackmounting — See page 86 for rackmounting accessories. Cameras — A variety of cameras are available in a wide range of performance. See page 420 for camera recommendations.

#### 606B Monitor

Very High Resolution X-Y Display for Applications Requiring the Most Critically Sharp Photographs and Displays

The 606B offers image stability, gray-scale performance, and uniform brightness, critical to the quality of measurement or the accuracy of a medical diagnosis.

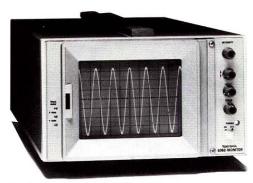
Uniform resolution and variable spot size are also provided by the 606B. The 606B's metal bezel is a solid mount for heavy cameras and prevents light leaks or distortion.

#### CHARACTERISTICS

#### DISPLAY

Type — Flat-faced rectangular CRT.

Dimensions - 80 mm x 100 mm (3.2 in x 3.9 in).



Display Linearity - 1% of full scale along major axes.

Spot Size - 0.079 mm (3.1 mils) or less.

Spot Growth - Not >20% at constant intensity within the quality area (70 mm x 90 mm).

Brightness Uniformity - <10% variation within quality area (70 mm x 90 mm)

Phosphor — GH (P31) is standard.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

Risetime - 116 ns or less.

Settling Time - <500 ns with deflection-input attenuation in

Bandwidth - Dc to at least 3 MHz (-3 dB).

Input — Differential; BNC connectors

Deflection Factor (Vertical and Horizontal) - Adjustable, 0.5 V to 2.5 V for 80 mm deflection.

Input Impedance — 1 M $\Omega$  or 50  $\Omega$  ±1%, paralleled by <47 pF; internally selectable.

X-Y Phase Difference - Not more than 1° to at least 500 kHz.

Max Input Voltage — 1 M $\Omega$  Zin:  $\pm$  100 V (dc peak ac). 50  $\Omega$ Zin: ±5 V (dc peak ac).

#### **Z-AXIS AMPLIFIER**

Input - Differential; BNC connectors.

Bandwidth - Dc to 5 MHz (-3 dB).

Risetime — ≤35 ns.

Sensitivity Range - Adjustable from 0 V to 1 V to 0 V to 5 V for full intensity control.

#### AC POWER

Voltage Ranges (±10%) - 100 V ac, 110 V ac, 120 V ac, 200 V ac, 220 V ac, and 240 V ac.

Line Frequency - 48 Hz to 440 Hz

Power - 50 W nominal; 75 W maximum at 120 V ac.

#### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	213	8.4
Height	133	5.2
Depth	519	20.4
Weight ≈	kg	lb
Net	7.9	17.5
Shipping	10.3	22.7

#### INCLUDED ACCESSORIES

25-pin connector (131-0570-00); 25-pin connector housing (200-0821-00); CRT graticule (337-1674-10); power cord (161-0123-00); service manual; operator's manual

#### ORDERING INFORMATION

606B Monitor (without handle, feet or covers)

......\$4,780 Option 06 — UL 544 Listing (includes handle, feet, and covers) (shown above) Option 07 — Front-Panel Controls Changed to Screwdriver Adjustments .... Option 09 — UL 544 Component Recognized .. Option 28 — With covers (not available with Option 06) +\$90

#### OPTIONAL ACCESSORIES

Rackmounting — See page 86 for rackmounting accessories. Cameras — A variety of cameras are available in a wide range of performance. See page 420 for camera recommendations.

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAIL-ABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEK-TRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.

# TEK DISPLAY MONITORS

620 (With Option 23)



#### 620 Monitor

#### General Purpose, Economical, X-Y Waveform Display

The 620 is a dependable, economical display, designed for electronic instrumentation, mechanical measurement instruments, and medical A-mode imaging applications.

#### The 620 has Built-in Reliability

With fewer parts and lower power consumption, display and system reliability are improved, and service costs are lower.

Option 20 allows DC operation from a single DC source (17-26 VDC, 1.0A), which further reduces power dissipation and weight.

All circuit boards and controls are conveniently located on one side for simplified interfacing, adjustments, and servicing.

#### Package the 620 the Way You Want It

A wide variety of packaging options are available for easy integration into your system.

Complete packaging descriptions follow the specifications below.

#### **CHARACTERISTICS**

#### DISPLAY

Type — Flat-faced rectangular CRT.

Dimensions — 100 mm x 120 mm (3.9 in x 4.7 in).

Phosphor — GH (P31) is standard

Spot Size — 0.38 mm (15 mils) at 0.5  $\mu$ A

**Linearity** — The voltage required to produce a 25-mm deflection from any point on the CRT will not vary more than 5%.

Usable Brightness — Up to 100 cd/m² (30 fL).

#### VERTICAL AND HORIZONTAL AMPLIFIERS Bandwidth — Dc to 2 MHz.

Settling Time — 1  $\mu s$  from any point on the CRT within 0.5 mm of final position.

**Deflection Factor** — (Adjustable) Vertical:  $\leq$ 0.9 V to  $\geq$ 1.5 V/100 mm. Horizontal:  $\leq$ 0.8 V to  $\geq$ 1.2 V/100 mm.

Input R and C — 1 M $\Omega$  paralled by <47 pF.

X-Y Phase Difference — 1  $^{\circ}$  maximum, dc to 500 kHz.

Max Input Voltage —  $\pm 25$  V (dc plus peak ac).

Recommended Source Impedance —  $\leq 10 \text{ k}\Omega$ 

#### Z-AXIS AMPLIFIER

Bandwidth — Dc to  $\geq$ 5 MHz.

 $\label{limited limits} \begin{array}{ll} \mbox{Input Sensitivity Range} & -\mbox{Not adjustable. 1.0 V will produce} \\ \mbox{maximum brightness with Intensity Control set at mid-range.} \end{array}$ 

#### AC POWER

**Voltage Ranges** ( $\pm 10\%$ ) — 100 V ac, 110 V ac, 120 V ac, 200 V ac, 220 V ac and 240 V ac.

Line Frequency — 48 Hz to 440 Hz

Power - 26 W at 120 V ac (maximum).

#### PHYSICAL CHARACTERISTICS

FITSICAL CHARACTERISTICS			
Dimensions	mm	in	
Height (without feet)	133	5.2	
Width	213	8.4	
Depth	500	19.7	
Weight ≈	kg	lb	
Net	5.3	11.7	
Shipping	6.9	15.2	



#### INCLUDED ACCESSORIES

CRT graticule (331-0455-00); instruction manual; operator's manual.

#### ORDERING INFORMATION

620 Monitor

(without handle, feet or covers) ...... \$1,600 Option 01 — Internal Graticule (8 x 10 div at 12.2 mm/div) . NC Option 06\*1 - UL 544 Listed (includes handle, feet, covers) Option 09 — UL Component Recognition (not compatible with Option 10 — Remote 25-pin Program Connector, X, Y, Z-axes to 26 V, at 1.0 A), (not available with Option 06 or 31) —\$20 Option 23 — Handle, Feet and Covers, (not available with Options 06, 28, or 31) ..... able with Options 06, 23, or 31) ..... Option 31 — Delete all Rear Panel BNCs, dc Power Connector and ac Power Supply and Switch. Provision for External dc Power (+17 V unregulated) is Provided. (not compatible with Options 06, 10, 20, 23 and 28). Can be Used with 016-0409-00 or 016-0410-00 Packaging .... \*1 Not available with Option 20, 23, 28, or 31.

SPECIAL PRICING, TERMS AND CONDITIONS ARE AVAILABLE TO QUALIFIED OEMS. CONTACT YOUR LOCAL TEKTRONIX REPRESENTATIVE FOR COMPLETE INFORMATION.



620 (With 016-0404-00)

#### **OPTIONAL ACCESSORIES (620)**

Modular Packaging allows you to combine the 620 Display with your own custom electronic circuitry in an adjacent compartment.

Vertical Package — Includes empty compartment, connecting hardware, handle, feet and covers. Order 016-0409-00

Horizontal Package — Includes empty compartment, connecting hardware, handle, feet and covers. Order 016-0410-00

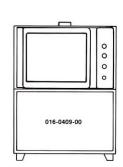
Rackmounting — Includes empty compartment, frame, covers, and rack slides for mounting in a 19-inch rack. Not available with Options 06, 23, or 28. Order 016-0404-00 ..... \$415
Side-by-Side 620 Rackmounting — To rackmount two 620s side by side in a 19-inch rack. Includes covers and rack slides. Not available with options 06, 23, 28, or 31. Order 016-0405-00

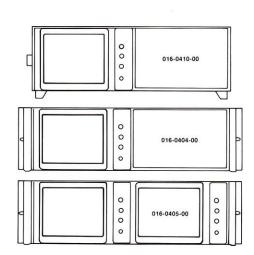
Cameras — A variety of cameras are available in a wide range of performance. See page 420 for camera recommendations.

#### RACKMOUNTING ACCESSORIES (606B, 608)

Rackmounting Kit for 606B, 608, — Slide-out 19 in rack assembly which rackmounts any two of the above displays side by side. Includes covers and rack sides. Order 040-0600-00 \$250.

Rackmount-to-Cabinet Conversion — Required to convert a rackmount 606B or 608 to a cabinet style. Order 040-0602-00







#### INTRODUCTION

Now you can rely on Tektronix as your single supply source for all media, pens and ink for your Tektronix copiers, plotters, printers and storage devices. By using Tektronix brand supplies, you can be assured of getting the best output quality of your Tek peripherals.

For further information, or to order any of the Tektronix brand supplies listed below, call your local Tektronix Sales Office.

#### INK-JET SUPPLIES

4691, 4692 Ink Cartridges	
200 ml Each	046 0740 00 605
Cyan Black	016-0713-00 <b>\$85</b> 016-0714-00 <b>\$85</b>
Yellow	016-0715-00 \$85
Magenta	016-0716-00 \$85
4691 Ink Jet Copy Paper	
500 Sheets Per Package	
216 x 279 mm (8.5 x 11 in) A Size	016-0712-00 <b>\$25</b>
279 x 432 mm (11 x 17 in) B Size	016-0711-00 \$40
297 x 210 mm (only for use with 4691 A4 Size	016-0709-00 <b>\$20</b>
297 x 420 mm (only for use with 4691	
A3 Size	016-0710-00 \$35
4692 Ink Jet Copy Paper	
500 Sheets Per Package	
216 x 279 mm (8.5 x 11 in) A Size	016-0793-00 \$35
297 x 210 mm A4 Size	016-0794-00 <b>\$35</b>
4691 Transparency Film	
100 Sheets Per Package A Size	016-0765-00 \$85
A4 Size	016-0766-00 \$75
4692 Transparency Film	010 07 00 00 1111111 410
100 Sheets Per Package	
A Size	016-0765-02 \$90
A4 Size	016-0766-02 \$90
4691 Drum Adaptors	
Package of 3	118-2593-00 \$15
4692 Maintenance Cartridge	
250 ml	016-0777-00 <b>\$10</b>
4695 Ink Cartridge Packages	
2.5 cc Each, 16 per package	016-0734-00 \$25
Yellow Magenta	016-0734-00 \$25
Cyan	016-0736-00 \$25
Black	016-0737-00 \$25
4695 Ink Jet Copy Paper	
50 m Each 6 Rolls Per Box	
Roll Paper	016-0743-00 <b>\$50</b>
4695 Ink Jet Copy Paper	
500 Sheets Per Package	010 0700 00 605
A Size A4 Size	016-0739-00 <b>\$25</b> 016-0740-00 <b>\$22</b>
	010-0740-00 \$22
4695 Transparency Film 100 Sheets Per Package	016-0480-00 \$85
Liquids	010-0100-00
Maintenance Liquid (200 cc)	016-0732-00 \$10
Print Head Protect Liquid (10 cc)	016-0733-00 \$4.00
PLOTTER PEN	S
4663, 4662 Option 31	
Presentation Pack	020-0888-00 \$60
4663, 4662 Option 31 Paper Pens	020-0888-00 \$60
4663, 4662 Option 31 Paper Pens Regular Width	
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa	acks.
4663, 4662 Option 31 Paper Pens Regular Width	
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-04 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-04 \$8.00 016-0414-05 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-04 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-05 \$8.00 016-0414-05 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-04 \$8.00 016-0414-05 \$8.00 016-0414-07 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-04 \$8.00 016-0414-06 \$8.00 016-0414-07 \$8.00 016-0414-07 \$8.00 016-0414-07 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-05 \$8.00 016-0414-05 \$8.00 016-0414-07 \$8.00 016-0414-07 \$8.00 016-0414-08 \$8.00 016-0414-09
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-05 \$8.00 016-0414-05 \$8.00 016-0414-07 \$8.00 016-0414-09 \$8.00
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa Black	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-04 \$8.00 016-0414-06 \$8.00 016-0414-07 \$8.00 016-0414-09 \$25 acks 016-0725-00 \$12
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa	10.00 models of the control of the c
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa Black Brown Red Orange	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-04 \$8.00 016-0414-05 \$8.00 016-0414-07 \$8.00 016-0414-09 \$25 acks 016-0725-00 \$12 016-0725-01 \$12 016-0725-02 \$12
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-05 \$8.00 016-0414-05 \$8.00 016-0414-06 \$8.00 016-0414-07 \$8.00 016-0414-07 \$8.00 016-0414-09 \$25  acks 016-0725-00 \$12 016-0725-01 \$12 016-0725-03 \$12 016-0725-03 \$12
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-03 \$8.00 016-0414-05 \$8.00 016-0414-05 \$8.00 016-0414-07 \$8.00 016-0414-09 \$25  acks 016-0725-01 \$12 016-0725-02 \$12 016-0725-03 \$12 016-0725-04 \$12 016-0725-04 \$12
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue	acks.  016-0414-00 \$8.00  016-0414-01 \$8.00  016-0414-02 \$8.00  016-0414-03 \$8.00  016-0414-05 \$8.00  016-0414-05 \$8.00  016-0414-07 \$8.00  016-0414-09 \$25  acks  016-0725-01 \$12  016-0725-02 \$12  016-0725-03 \$12  016-0725-04 \$12  016-0725-04 \$12  016-0725-05 \$12  016-0725-05 \$12
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-03 \$8.00 016-0414-05 \$8.00 016-0414-05 \$8.00 016-0414-07 \$8.00 016-0414-09 \$25  acks 016-0725-01 \$12 016-0725-02 \$12 016-0725-03 \$12 016-0725-04 \$12 016-0725-04 \$12
4663, 4662 Option 31 Paper Pens Regular Width Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Magenta 9-Pen Multicolor Pack 4663, 4662 Option 31 Paper Pens Fine Line Individual Colors Available in 3-Pen Pa Black Brown Red Orange Yellow Green Blue Purple Holyon Pack Brown Red Orange Yellow Green Blue Purple	acks. 016-0414-00 \$8.00 016-0414-01 \$8.00 016-0414-02 \$8.00 016-0414-03 \$8.00 016-0414-05 \$8.00 016-0414-05 \$8.00 016-0414-06 \$8.00 016-0414-07 \$8.00 016-0414-07 \$8.00 016-0414-07 \$8.00 016-0414-09 \$25  acks 016-0725-01 \$12 016-0725-01 \$12 016-0725-03 \$12 016-0725-04 \$12 016-0725-05 \$12 016-0725-06 \$12 016-0725-06 \$12 016-0725-06 \$12

4663, 4662 Option 31 Transparency	
Individual Colors Available in 3-Pen Pa Black	ocks 016-0469-00 <b>\$10</b>
Brown	016-0469-01 \$10
Red Orange	016-0469-02 <b>\$10</b> 016-0469-03 <b>\$10</b>
Yellow	016-0469-04 \$10
Green Blue	016-0469-05 <b>\$10</b> 016-0469-06 <b>\$10</b>
Purple	016-0469-07 \$10
Magenta 9-Pen Multicolor Pack	016-0469-08 <b>\$10</b> 016-0469-09 <b>\$25</b>
4663, 4662 Option 31 Wet Ink Pens	010-0409-09 \$25
0.3 mm (0.01 in) Dia Tip Pen Body	016-0444-01 \$23
0.5 mm (0.02 in) Dia Tip Pen Body 0.8 mm (0.03 in) Dia Tip Pen Body	016-0442-01 <b>\$23</b> 016-0443-01 <b>\$23</b>
Replacement Tips	010-0440-01 \$25
0.3 mm (0.01 in) Dia Tip	214-2706-00 \$16
0.5 mm (0.02 in) Dia Tip 0.8 mm (0.03 in) India Tip	214-2706-01 \$16 214-2706-02 \$16
4662 Paper Pens Standard 1-Pen Un	
Individual Colors Available in 3-Pen Pa	ckages
Red Green	016-0589-00 <b>\$8.00</b> 016-0589-01 <b>\$8.00</b>
Black	016-0589-02 \$8.00
Blue	016-0589-03 \$8.00
4662 Transparency Pens (Standard Individual Colors are Available in 3-Per	
Black	016-0648-00 \$8.00
Brown Red	016-0648-01 <b>\$8.00</b> 016-0648-02 <b>\$8.00</b>
Orange	016-0648-03 \$8.00
Yellow	016-0648-04 \$8.00
Green Blue	016-0648-05 <b>\$8.00</b> 016-0648-06 <b>\$8.00</b>
Purple	016-0648-07 \$8.00
Magneta	016-0648-08 \$8.00
4662 Wet Ink Pens (Standard 1-Pen 0.35 mm (0.014 in) Dia Tip Pen Body	016-0448-00 <b>\$24</b>
0.46 mm (0.018 in) Dia Tip Pen Body	016-0449-00 \$24
0.56 mm (0.022 in) Dia Tip Pen Body	016-0450-00 \$24
Replacement Tips 0.35 mm (0.014 in) Dia Tip	016-0445-00 \$18
0.46 mm (0.018 in) Dia Tip	016-0446-00 \$18
0.56 mm (0.022 in) Dia Tip  Wet Ink Pen Accessories	016-0447-00 \$17
Replaceable Wet Ink Pens Parts Kit	006-2968-01 \$18.25
Extra Ink Single Cartridge	016-0649-00 \$2.00
Inks for Polyester Film (¾ oz Squeeze Brown	Bottle) 016-0423-00 \$3.00
Green	016-0424-00 \$3.00
Blue	016-0425-00 \$3.50
Red Black	016-0426-00 \$3.50 016-0427-00 \$3.00
Inks for Paper (3/4 oz Squeeze Bottle)	
Black	016-0428-00 <b>\$5.00</b>
Wet Ink Cleaning and Maintenance S	Systems 002-1555-00 \$180
Cleaning Fluid with Strainer 5.2 oz	002-0920-01 \$5.00
Pressure/Suction Cleaning Bulb	002-1560-00 \$12
Magnifying Instrument Pen Storage Humidifier	002-1558-00 <b>\$95</b> 002-1559-00 <b>\$11.50</b>
PLOTTING MEDI	A
4662 Plotter Paper	
Blank White Paper 280 x 432 mm (11 x 17 in) 100 Each	
B-Size	006-2410-00 \$10
Printed Paper	i.
10 x 10 cm (11 x 16.5 in) Grid 100 Eac Linear Paper	006-1698-00 <b>\$12</b>
10 x 10 cm (11 x 16.5 in) 100 Each	
Linear Paper	006-1699-00 \$12
10 x 3 Cycle (11 x 16.5 in) 100 Each	006-1700-00 \$12
Semi-log Paper 10 x 2 Cycle (11 x 16.5 in) 100 Each	000-1700-00 \$12
Semi-log Paper	006-1701-00 \$12
2 x 3 Cycle (11 x 16.5 in) 100 Each	
Full-log Paper	006-1702-00 \$12
Blank Paper Cream Colored, Punched	
279 x 419 mm (11 x 16.5 in)	006-6591-00 \$10

4662 A-Size Plotter Film Quick Dry Plotter Film 8.5 x 11 in 50 Sheet Package	006-5939-00 \$30
4663 C-Size Polyester Film Antistatic Polyester Film	006-5959-00 \$30
17 x 22 in, 100 Sheets 4663 C-Size Plotting Paper	006-2835-00 <b>\$120</b>
Translucent Bond 18 in x 200 ft (2 Each) C-Size After To	ear Off
Blank Roll Paper	006-2837-00 \$40
Translucent Bond 18 in x 200 ft (2 Each)	
Metric Size A2 After Tear Off	
Blank Roll Paper	006-3473-00 \$42
Translucent Bond 432 x 559 mm (17 x 22 in), 100 Each	
Blank Sheet	006-3150-00 <b>\$15</b>
Vellum, 100% Rag Content 432 x 559 mm (17 x 22 in) 100 Each	
Blank Sheet	006-2836-00 \$45
COPIER PAPE	R
4631, 4632 and 4635 Tektronix Standard Dry Silver Paper 216 mm x 152 m (8.5 in x 500 ft)	
Single Roll 4 Roll Carton	006-1603-00 <b>\$90</b> 006-1603-01 <b>\$320</b>
4633A, 4634 and 4635	000 1000 01 mm <b>1020</b>
Tektronix High Performance Dry Silv	rer Paper
216 mm x 152 m (8.5 in x 500 ft) Single Roll	006-2432-00 \$215
4 Roll Carton	006-2432-01 \$750
4611/4612 Dielectric Hard Copy Pag 216 mm x 152 m (8.5 in x 500 ft)	er
2 Roll Package	006-2838-00 \$35
4611/4612 Tektronix Dry Copy Tone 4.9 oz Bottle	r 006-2990-00 <b>\$23</b>
PRINTER PAPER AND	
4641 Printer Ribbon	
Box of 12	119-0820-00 \$180
4642 Printer Paper-Tab Stock, Fan Fold,	
270 mm x 279 mm, (10.6 x 11 in) 2500 Sheets/Carton	002-0262-01 \$65
Paper Roll Box of 12	002-1084-01 \$70
Ribbons Package of 4	002-1451-01 \$70
4643 Printer Ribbon	110 1011 00 605
Cassette MAGNETIC MED	118-1314-00 \$25
4110 Series 8 inch Flexible Magnetic	
512 kbytes Formatted Capacity Box of 10	119-1376-01 <b>\$110</b>
4170, 4925 and 4926 Option 25 Flex	
650 kbytes Formatted Capacity Box of 10	
4905 Options 31 & 32 Flexible 8 inch	119-1583-01 \$55 Magnetic Disk
315 kbytes Formatted Capacity	
Package of 10 4907 Flexible 8 inch Magnetic Disk	119-0848-01 <b>\$115</b>
630 kbytes Formatted Capacity	
Package of 10	119-1011-01 <b>\$150</b>
4905 Options 33 and 34 Hard Disk Pack Formatted Capacity	
5 Mbyte	119-0855-00 <b>\$250</b>
4909 Disk Cartridge 13 Mbyte	
Formatted Capacity	119-1462-00 <b>\$300</b>
4050 Series, 4923 and 4924	
Certified Data Cartridge 300 ft Each Cartridge	119-0680-00 \$30
Package of 5	119-0680-01 <b>\$120</b>
Certified Data Cartridge 450 ft Each Cartridge	119-1439-00 \$35
Certified Data Cartridge (4050 Series	Only.)
600 ft Each Cartridge	119-1463-00 \$45



# INFORMATION DISPLAY SOLUTIONS

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Tektronix has been an industry leader in information display products since it introduced the age of low cost graphics displays with the discovery of the directview, bistable storage tube (DVST or Anderson Tube) in 1962. Today, the breadth of the Tektronix product line, its family compatibility, peripheral support, leadership in meeting industry standards, and range of price/performance options, make Tek information display products the best-equipped to meet research, engineering, business and manufacturing needs.

Tektronix has designed its information display products to offer a wide range of price/performance. Customers can select from a variety of entry-level and high-performance graphics workstations, color terminals, and color output systems. All information display products, at all price/performance levels, provide Tektronix-quality display and power.

Tek's new products in 1988 are designed to increase selection and choice so that customers can get just the power and performance they need. Product adaptability and access to applications are broadened with IBM and DEC compatibility with most information display products. Together, Tek's current and new information display products meet the need for performance, targeted application and increased economy in graphics products.

#### **Color Graphics Terminals**

The 4200 Series of Color Graphics Terminals expands its versatile offering, bringing advanced features like an optional networking capability with the new 4211 terminal.

# 3D/2D Color Graphics Workstations and Terminals

Families of 3D and 2D Color Graphics Workstations and Terminals present users with the ultimate in choice for high-performance graphics systems. Both graphics workstations and terminals are offered in 3D and 2D with a selection of features that truly reflects the specific needs of graphics users. Tek anticipates growth paths by offering easy upgrade from terminal to workstation. And while introducting new graphics systems, Tek also protects investment in current Tek products by offering local computing resources for 4100, 4120, and 4200 Series terminals.

#### **Applications Software**

PLOT 10® Applications Software and Standard Tools expand Tek's standard-setting family of graphics software with enhanced design and presentation softwre, increased portability from other applications, and the NEW PHIGS library of subroutines to aid development of interactive graphics applications.

#### **Color Output Systems**

The 4693 Color Output Systems introduce a new technology: thermal wax printing. Offering quality printing, full color, and fast processing, thermal wax technology is available in a standalone color printer and, for highest quality, in a rasterizer system. All Tek color output products combine to offer a range of price/performance, and now include compatibility with IBM PC and Apple Macintosh II systems.

As always, Tektronix provides a complete offering of graphics supplies.

#### **Monitors**

Tek offers a variety of monitors for your viewing needs. Monitor selections include ultra-high resolution, high resolution and general-purpose video monitors.

# RECONDITIONED TEKTRONIX INFORMATION DISPLAY PRODUCTS

- Quick Delivery
- Low Prices
- New Product Warranties
- Quantity Discounts

With Tek's quick delivery, you can be using Information Display products at substantial savings in just two weeks. Tektronix remanufactures demo and lease returns to latest specifications and offers them with new product warranties. Quantity discounts apply to current as well as discontinued products.

In the U.S., contact your local Tektronix Field Office for IDG Reconditioned Product availability and prices. Overseas customers call your Tektronix Sales Office.

# TEKTRONIX 4300 SERIES GRAPHICS WORKSTATIONS

# Tektronix Visualization ...Setting the Pace to See the Future

#### Continuing the Lead

Tektronix continues to provide the graphics world with the best in price performance value in its new series of graphics workstations and terminals. Offering the serious graphics user a selection of 3D and 2D workstations and terminals and an ability to upgrade terminals to workstations, Tek meets the need for performance, value and versatility in the graphics environment.

#### Graphics Workstations and Graphics Nodes

Tek's Graphics Workstations perform as completely integrated solutions to graphics intensive applications. Additionally, they can be used separately as graphics terminals or as standalone compute platforms.

For example, the graphics subsystems of Tek's high end workstations can be used as a terminal connected to a VAX or other host via RS-232, DMA or LAN connections as an intelligent graphics node in a network. The compute engine can stand alone as a file server, compute server or engineering workstation.

#### Flexibility of Implementation

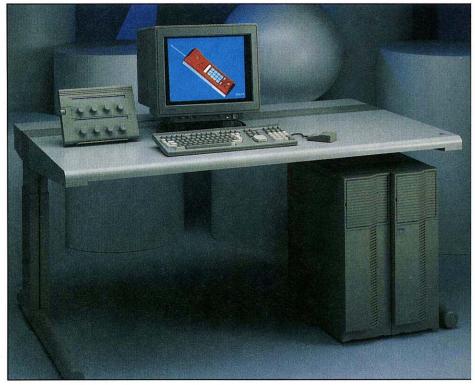
The Tek 4300 family can be deployed in multiple computer environments. For example, the Tek terminal subsystem can be connected to a host computer, then, as the application requires a more dedicated resource, the terminal can be removed from the host and attached directly to a Tek compute engine via a high speed bus connection, forming an integrated workstation.

#### Compatibility

Tektronix has been the graphics leader for over twenty years. Insuring a protected investment for our large installed base, our new workstations are compatible with the thousands of Tek graphics terminals already in use. Out PLOT 10® graphics kernels include the latest GKS and PHIGS as well as Tek's popular STI, TCS, and IGL graphics drivers.

#### **Applications**

A large number of applications currently run on Tek terminals in the fields of mechanical CAD, earth resources, design, drafting and research. Many of these same applications also run on Tek's new integrated workstations, providing standalone solutions to the design marketplace.



Tektronix 4300 Series Workstations Family.

#### Common System Software

The UTek operating system continues to be a Tek strength as one of the leading implementations of bsd 4.2 with System V extensions. A rich set of utilities and system administration functions have positioned UTek as a solid, high performance, easy to use UNIX implementation, well suited to graphics applications.

#### Wide Family Range

The design process consists of Defining and Conceptualization, Construction and Detailed Design, Rendering and Displaying objects. Tek provides the perfect match for each stage: From personal graphics drafting stations, to visualization systems and real time animation systems. And, all from one family of products with compatibility, common operating systems and graphics libraries as well as a wide range of options to match any graphics computing environment.

Every workstation on the market was designed for a primary task such as software development, realtime control, math computations or general purpose use. Tek's specialty is graphics, and in the graphics intensive applications areas, Tek workstations excel at meeting the market's needs.

So, if your applications is graphics, and your focus is on Graphics Power, then Tektronix is the logical choice.

Tek Graphics Workstations depicted on the following pages consist of three families of the 4300 Series:

- 4330 3D High Performance System
- $\bullet$  4320 2D Medium Performance System
- 4319 Bit-Mapped X Window System

Each of these systems can be expanded and optioned for most any graphics applications.

Tektronix 4330 Graphics Workstation for 3D and shaded surface design visualization, realtime rotation and viewing.

4330 Graphics Workstation

#### TYPICAL APPLICATIONS

- 3D Mechanical Design/Modeling
- Simulation Animation
- Earth Resources
- Cartography
- Molecular Modeling
- Finite Element Analysis
- Visualization

#### **FEATURES**

#### **Graphics Power**

- 68020 Graphics Processor (16 MHz)
- 4 to 52 MB Display List Memory
- Pipelined Parallel Architecture
- Transform Engine
- Tiling Engine
- 4 to 24 Bit Plane Frame Buffer
- 16 to 16.7 Million Colors
- 340,000 3D Vectors/Second
- 450,000 2D Vectors/Second
- 20,000 Shaded Polygons/Second
- 1280×1024 Pixel Addressability
- 16 and 19-Inch Monitors
- Three-Button Mouse
- · Optional 16-bit Z Buffer
- Optional Valuator Dials
- Printer Output Port
- Tektronix Terminal Compatibility

#### **Compute Power**

- 20 MHz Motorola 68000 CPU
- 68881 Floating Point Co-Processor
- · Optional High Speed Floating Point
- VME Bus Expansion
- 4 to 12 MBytes Main Memory
- 86 MB to 300 MB Disk Storage
- 1.2 MB Flexible Disk Drive
- Ethernet TCP/IP
- SCSI Controller
- · Serial, Parallel and Optional GPIB Ports
- VT200 Compatible Keyboard
- · Optional Mass Storage
- Optional 60 MB Streamer Tape

- System Software UTek<sup>™</sup> (bsd 4.2) System
- System V Extensions
- C Programming Language
- X Window System
- NFS Network File System
- System Utilities
- IBM PC Emulation
- Optional Languages—Fortran, Pascal
- Unify and Ingres Database
- High Performance Third-Party Software Applications Packages
- PLOT 10<sup>®</sup> Graphics Compatibility



Tektronix High Performance 3D Graphics Workstation

The 4330 is the system for visualization of product concepts, allowing threedimensional interaction with creative designs. Before parts are actually built, designs on the 4330 can be viewed, simulated, modified and perfected without requiring old fashioned time consuming and expensive prototype and model processes.

The Tek 4330 is the ideal workstation for design processes requiring visualization and manipulation of 3D images at very high speeds.

#### **Dual Processors**

One 68020 processor is used for the operating system and applications processing. Another 68020 processor is used to drive the graphics subsystem, ensuring maximum graphics and compute throughput, with a dedicated processor for each of these functions.

#### **Workstation Performance**

The 4330 is a high performance workstation designed 3D for graphics-intensive applications. The display processor includes a 16 MHz 68020 which communicates with the application process, manages the graphics peripherals and loads the display memory. A 6.5 MIPS bit slice engine traverses the display list and speeds coordinate geometry into a 13 MFLOP Transform Engine which performs real time scaling, clipping and rotations. A 52 MOPS Tiling Address Generator calculates the pixel values between the end point coordinates and produces Gourand or smooth shaded surfaces. Additional custom gate arrays load the frame buffer in parallel and the results are displayed on a high resolution 1280×1024 display at a flicker free 60 Hz refresh rate.

Up to 16 light sources and 64 possible views allow objects to be viewed in parallel or perspective projection, sectioned, clipped, rolled and rotated. Graphics segments and a 32-bit virtual graphics coordinate space support true zoom and pan. Segment editing and subroutining and the powerful Draw Facets command, provide high-level programming entities. With the optional liquid crystal stereo display, images come to life in real time.

Tektronix 4320 Graphics Workstation for detailed design and construction with high speed 2D vector graphics.

4320 Graphics Workstation

#### TYPICAL APPLICATIONS

- 2D Mechanical and Electrical Design
- Earth Resources
- Cartography
- Finite Element Analysis
- Visualization

#### **FEATURES**

#### **Graphics Power**

- 68020 Graphics Processor (16 MHz)
- 4 to 8 MB Display List Memory
- Bit Slice Graphics Engine
- 8 Bit Planes
- 256 Colors
- 16.7 Million Color Lookup Table
- 100,000 2D Vectors/Second
- 1024×768 Pixel Addressability
- Optional 1280×1024 Pixel Addressability
- 16 and 19-Inch Monitors
- Printer Output Port
- Tektronix Terminal Compatibility

#### **Compute Power**

- 20 MHz Motorola 68000 CPU
- 68881 Floating Point Co-Processor
- · Optional High Speed Floating Point
- VME Bus Expansion
- 4 to 12 MBytes Main Memory
- 86 MB to 300 MB Disk Storage
- 1.2 MB Flexible Disk Drive
- Ethernet TCP/IP
- SCSI Controller
- · Serial, Parallel and Optional GPIB Ports
- VT200 Compatible Keyboard
- Optional Mass Storage
- Optional 60 MB Streamer Tape

#### System Software

- UTek<sup>™</sup> (bsd 4.2) System
- System V Extensions
- · C Programming Language
- X Window System
- NFS Network File System
- System Utilities
- IBM PC Emulation
- · Optional Languages—Fortran, Pascal
- · Unify and Ingres Database
- · High Performance Third-Party Software Applications Packages
- PLOT 10<sup>®</sup> Graphics Compatibility



Tektronix High Performance 2D Graphics Workstation

The 4320 is the recommended system for the detailed design and construction stage of product concepts, allowing fast two dimensional panning, zooming and vector drawing. Drawings are completed and viewed at high speeds, increasing productivity.

#### **Dual Processors**

One 68020 processor is used for the operating system and applications processing. Another 68020 processor is used to drive the graphics subsystem, ensuring maximum graphics and compute throughput, with a dedicated processor for each of these functions.

#### **Workstation Performance**

The 4320 is a high-performance workstation designed for 2D graphics-intensive applications. The 68020 Graphics processor communicates with the applications process, manages graphics peripherals and loads the display memory. A high-speed bit slice engine converts coordinate geometry into full color results which are displayed on a 1024 ×768 or a high-resolution 1280×1024 display at a flicker free 60 Hz refresh rate.

Graphics segments, combined with 32-bit graphics coordinate space, allow full detail viewing.

Tektronix 4319 Graphics Workstation for design/drafting and general-purpose UNIX-based x window graphics.

NEW 4319 Graphics Workstation

#### TYPICAL APPLICATIONS

- 2D Mechanical and Electrical Design/Drafting
- Cartography/Mapping
- Software Development
- Artificial Intelligence
- Personal Workstation

#### **FEATURES**

#### **Graphics Power**

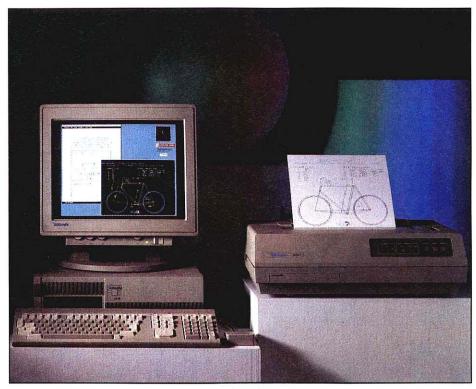
- 8 Bit Planes
- 256 Million Colors
- 16.7 Million Color Pallette
- Color × Cache Graphics Accelerator
- 1280×1024 Pixel Addressability
- 16 and 19-Inch Monitors

#### **Compute Power**

- 20 MHz Motorola 68000 CPU
- 4 to 20 MBytes Main Memory
- 86 MB to 300 MB Disk Storage
- 1.2 MB Flexible Disk Drive
- Ethernet TCP/IP
- SCSI Controller
- 2 Serial Ports
- 1 Parallel Port
- VT200 Compatible Keyboard
- Optional GPIB Controller
- Optional Mass Storage
- Optional 60 MB Streamer Tape
- · Output to Tek Color Printers
- · Attractive Design, Compact Size

#### System Software

- UTek<sup>™</sup> (bsd 4.2) System
- System V Extensions
- C Programming Language
- X Window System
- NFS Network File System
- System Utilities
- IBM PC Emulation
- · Optional Languages—Fortran, Pascal
- · Optional Smalltalk, Lisp, Prologue
- · Unify and Ingres Database
- · High Performance Third Party Software Applications Packages
- PLOT 10® Graphics Compatibility



Tektronix X Windows System Graphics Workstation

Most graphics workstation applications require varying levels of price/performance and the Tek 4319 is the ideal choice for the conceptualization and drafting functions of the design process. As a member of Tek's workstation family, the 4319 is compatible with the higher performance 4320 and 4330 Series.

#### **Workstation Performance**

The Tek 4319 is well suited to the drafting portion of the design process and excels as a general purpose UNIX bitmapped graphics workstation. The 4319 compute power and system throughput are high, matching its quality graphics presentation and display speed.

Color ≠ Cache<sup>TM</sup>, Tek's proprietary custom gate array graphics accelerator, increases graphics pixel drawing speed by up to a factor of eight over standard bitmapped workstations.

High speed X window system performance was a key design criteria for the 4319 and as a result, user interaction is excellent, with very fast pop-up menus, multiple X windows, client and server tasks and on-line system utilities.

A Tek 4107 graphics emulator is supplied with the system to provide compatibility with Tek vector graphics applications. The 4107 emulator runs in an X window concurrently with other X tasks.

The Tektronix 4301 is also used to form the compute platform for integrated Tek graphics workstations.

4301 Compute Engine

#### **FEATURES**

#### **Compute Power**

- Motorola 68020 20 MHz CPU
- 68881 Floating Point Processor
- Optional Floating Point FPU
- 256 MB Virtual Memory

#### Bus

- VME Bus Architecture
- · High Speed Graphics Bus
- High Speed Internal Bus

#### Communications

- Ethernet TCP/IP
- 2 RS-232 Ports
- · Parallel Printer Port
- Optional RS-232 Ports
- · Optional Centronics Parallel Ports
- Optional GPIB

#### **Mass Storage**

- 86, 156, and 300 MB Disks
- 60 MB Streamer Tape
- 1.2 MB Flexible Disk

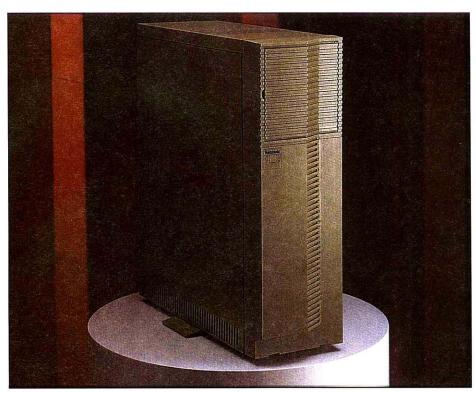
#### Input/Output

- VT200 Compatible Keyboard
- Three-Button Mouse
- GIN Devices

Major graphics applications have traditionally required large mainframe hosts to provide the necessary computing power to generate the complex geometry required to feed graphics processors. Now, in one compact unit, the power of a mainframe is available in a single workstation, closely coupled to the graphics subsystem, without the communications overhead of traditional systems. Lower costs, higher performance and user interactivity are the key benefits of the 4301 compute engine.

The 4301 compute engine provides 2.5 MIPS (million instructions per second) of computing power and 0.7 MFLOPS (million floating point instructions per second) to address medium range performance requirements.

The 4301 fits well into a heterogeneous computer networking environment. Standard communications ports are provided.



4301 Compute Engine Application Processor

The cabinet can contain one 5-inch disk drive, streamer tape and flexible drive. Additional peripherals may be added up to a total of 1.2 gigabytes of disk drive. A high speed imbedded SCSI controller insures quick response time and rapid disk access.

A variety of Tektronix input devices and high resolution color output printers are available as peripherals to the 4301 compute engine. Plotters and printers connect through standard output ports.

#### Graphics

The 4301 is fully compatible with Tek's high performance 2D and 3D Graphics subsystems and can be connected via RS-232, DMA or Bus with Tektronix 4220 and 4230 terminals.

#### Software

The 4301 Compute Engine runs UTek (bsd 4.2) ensuring access to a wide range of available software.

Virtual memory of 256 Gigabytes is supported and services are provided for all major peripherals.

System V extensions provide a wide range of utilities, and Network File System (NFS) and X Window System ensure access to industry standards.

#### **High Performance**

The Motorola 68000 processor provides powerful industry-standard computer performance. Producing 2.5 MIPS and 0.7 MFLOPS, the 68000 is ideally suited for graphics programs. The 4301 compute engine can be coupled with Tektronix high performance graphics display processors to form integrated workstations with 'twin engine' horsepower for the most demanding applications.

#### Terminal to Workstation Upgrade

Existing Tek 4220 and 4230 terminals can be upgraded in the field to graphics workstations by the addition of the 4301 compute engine. A 4301 can also drive a number of graphics terminals over an Ethernet LAN using TCP/IP, or via RS-232.

The 4310 can be used as a file server or compute service in a network of graphics workstations.

In addition to forming the graphics subsystem of Tek's 4300 Graphics Workstations, the following Tektronix terminals can also be used as graphics terminals connected to host computers.

# 4200 Terminal Subsystems

These terminals maintain compatibility with Tek's 4100 and 4200 terminal families and provide a logical upgrade path to increase the performance of host based graphics terminals for high speed 2D and 3D applications.

#### **Segment Memory**

4 to 52 MBytes of display list memory are supported for quick access to large drawings.

#### Compatibility

Connections to host computers, minicomputers or to other workstations can be accomplished by four different methods:

- RS-232 high speed ports
- DMA to a VAX DR11-C connection
- · LAN connection on a network
- · Bus connection to a Tek workstation

The LAN connection provides a diskless, Graphics Node, forming an ideal solution in a networking environment. DMA provides the highest speed link to a VAX. RS-232 connection allows flexibility in deploynment of several terminals with the widest range of host options.

The most efficient and highest speed connection is to a Tek workstation, integrating the compute and graphics functions together into a closely coupled system as described in the 4320 and 4330 Graphics Workstation section.

#### **Printer Output**

A high speed printer port provides very fast output to the Tek 4693D color printer for full color printed images. Other Tek printers such as the 4692 and 4696 are also supported.

#### Stereo

Optional Stereo displays show 3D images with true depth perception.



4200 Terminal Subsystems

#### **3D Terminals**

The 4230 Series feature very high speed graphics with true color representation.

#### **FEATURES**

- 68020 Graphics processor (16 MHz)
- 4 to 52 MB Display List memory
- Pipelined Parallel Architecture
- Transform Engine
- Tilina Engine
- 4 to 24 Bit Plane Frame Buffer
- 16 to 16.7 million colors
- 340,000 3D Vectors Second
- 450,000 2D Vectors/Second
- 20,000 Shaded Polygons/Second
- 1280×1024 Pixel Addressability
- 16 and 19 inch Monitors
- Three Button Mouse
- · Optional 16 bit Z buffer
- Optional Valuator Dials
- Tektronix terminal compatibility

#### 400E

- 4 bit planes
- · 4 MBytes display list memory

#### 4236

- 8 bit planes
- 4 MByte display list memory

#### 4237

- 12 bit planes
- · Z buffer with 16 planes
- 4 MByte display list memory

#### 2D Terminals

The 4220 Series feature high speed 2D graphics for detailed design.

#### **FEATURES**

- 68020 graphics processor (16 MHz)
- 4 to 8 MB Display List memory
- · Bit slice graphics engine
- · 8 bit planes
- 256 colors
- 16.7 million color lookup table
- 100,000 2D Vectors/Sec
- 1024×768 pixel addressibility
- Optional 1280×1024 pixel addressability
- 16 and 19 inch Monitors
- Tektronix terminal compatibility

#### 4224

- 1024×768 pixel addressibility
- 4 MBytes display list memory

#### 4225

- 1280×1024 pixel addressibility
- 4 MByte display list memory

#### ORDERING INFORMATION 4319 2D Graphic Workstation \$11,950 37,500 4335 3D Graphics Workstation. INTERNATIONAL POWER PLUG 4336 3D/2D Graphics Workstation. \$47,500 **OPTIONS OPTIONS** 4337 3D/2D Graphics Workstation. \$51,500 Option A1-Universal Euro 220 V, 50 Hz. Option 1B-Add 4MB Memory 4235 3D Graphics Terminal. \$23,500 +\$3,000 Option A2-UK 240 V, 50 Hz. (8MB total) 4236 3D Graphics Terminal. \$33,500 Option 1C-Add 8MB Memory Option A3-Australian 240 V, 50 Hz. 4237 3D Graphics Terminal. \$37,500 Option A4\*2—North American 240 V, 60 Hz. (12MB total) +\$6,000 4324 2D Graphics Workstation. \$26,950 Option 1D-Add 12MB Memory Option A5-Switzerland 220 V, 50 Hz. 4325 2D Graphics Workstation. \$29,950 (16MB total) + \$9,000SOFTWARE 4224 2D Graphics Terminal. \$12,950 Option 1E-Add 16MB Memory This is a partial list of the software available 4225 2D Graphics Terminal. \$15,950 (20MB total) + \$12,000 for 4300 Series workstations. Please refer to the 4301 Compute Engine. \$14,950 Option 10-Add 360KB flexible software catalog for a complete list of software. STANDARD ACCESSORIES +\$500 4319P01-UTek O/S Backup Media Includes: Color display, tilt/swivel base, Option 11-360KB flexible disk Option S9-Warranty Plus graphics module, compute module, VT200-type and 60MB streamer tape (replaces Option 01—Streamer Tape keyboard, mouse, power cords, keyboard 1.2 MB flexible disk) + \$2,000Option 02-1.2MB Flexible Disk overlays, RGB cables, and manuals. Option 12-Add 60MB streamer 4300P34—Color Smalltalk +\$2,000tape Option S9-Warranty Plus **OPTIONS** Option 13—Removable hard disk -\$2,500Option 01—Streamer Tape Option 1A-Floating Point Accel-Option 16-156 MB hard disk (re-Option 02—1.2MB Flexible Disk erator (4301, 4330/4320 Series). +\$4,900places 86MB) +\$2,300 4300P21—Data Base Manager Option 1B-4 MByte Additional Option 17-300MB hard disk (re-4300P22—Interactive Database Memory (8 MBytes total) (4301, places 86MB) +\$5,500 Development Env. 4330/4320 Series). +\$3,000 Option 3J—GPIB interface +\$300 4300P32—EMACS Editor 4300P33—Tek Common Lisp Option 1C-8 MByte Additional Option 32-19" color display +\$1,500 Memory (12 MBytes total) (4301, Option 49—Rental Tag NC Programming Language 4330/4320 Series). +\$6,000 FIELD KITS 4300P36-Quintus Prolog Option 2A-Additional 4 Bit Planes 4319F1B-Add 4MB Memory \$3,000 Programming Language (8 total) (4235/4335). +\$4,000 \$6,000 4319F1C—Add 8MB Memory 4300P37-Fortran 77 Option 2E-12 Bit Planes Double 4319F3J-GPIB interface \$300 4300P38—Pascal Buffered (4237/4337). + \$12,000 Option 3A-Dual RS-232C DMA WARRANTY-PLUS SERVICE PLANS RECONDITIONED (4301, 4330/4320 Series). +\$700 See Service Support on page 559. **TEKTRONIX INFORMATION** Option 3B-Dual Centronics Inter-Option S0-Onsite installation and face (4301, 4330/4320 Series). **DISPLAY PRODUCTS** +\$700 setup +\$323 Option 3E-Network Adapter Option E1-E/U +1 year onsite Quick Delivery (4301, 4330/4320 Series). +\$500 + \$1,872service Low Prices Option 3F-Interactive DMA for Option S1-OEM +1 year onsite New Product Warranties DEC DRV-11WA Interface. + \$1,500service\*1 Quantity discounts Option 3G-Local Bus Adapter Option E2-E/U +2 year onsite With Tek's quick delivery, you can be +\$3,975 (4301, 4330/4320 Series). + \$500service using Information Display products at Option 3W-Interactive DMA for Option S2-OEM +2 year onsite DEC DR-11W Interface.\*1 service\*1 substantial savings in just two weeks. Option 10-Additional 360 Kbyte Option E3-E/U +3 year onsite Tektronix remanufactures demo and +5,289Flexible Disk (4301, 4330/4320 service lease returns to latest specifications and Series). +\$500Option S3-OEM +3 year onsite offers them with new product warranties. Option 11-Additional 360 Kbyte service\*1 Quantity discounts apply to current as Option S4-OEM 90 day onsite Flexible Disk and Streamer Tape well as discontinued products. (4301, 4330/4320 Series). + \$2,000 service\*1 Option 12—Additional Streamer Option S9-1 year S/W update and In the U.S., contact your local Tektronix Tape (4301, 4330/4320 Series). + \$2,000phone support\*1 Field Office for IDG Reconditioned Pro-

#### Option 33—Stereoscopic Display. + \$12,000 WARRANTY-PLUS SERVICE PLANS

+\$2,300

+\$5,500

+ \$1,500

NC

See Service Support on page 559.

Option 16-156 MByte Hard Disk

Option 17-300 MByte Hard Disk

Option 32-19-inch 1280×1024

(4301, 4330/4320 Series).

(4301, 4330/4320 Series).

Option 49-Rental Tag.

Color Display.

#### OPTIONAL ACCESSORIES

Includes: Service manual, display calibration graticules, and software porting guide.

duct availability and prices. Overseas

customers call your Tektronix Sales

Office.

<sup>\*1</sup> Contact your local sales office.

<sup>\*2</sup> Unavailable for 4319.

# 4200 Series Graphics Terminals

#### TYPICAL APPLICATIONS

- CAD/CAM/CIM
- Automated Mapping and Facilities Management
- · Presentation Graphics/Data Analysis
- Process Control

#### **BENEFITS**

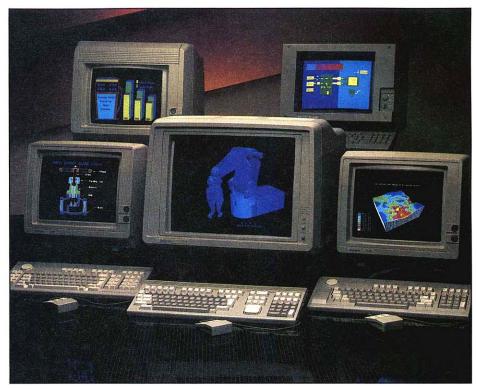
- Investment Protection
- User Productivity
- User Confidence
- Matches Users Needs

#### **FEATURES**

- Compatibility with Thousands of S/W Applications and Host Platforms (DEC & IBM)
- Sophisticated Graphics Capabilities
- Excellent Reliability
- Product Flexibility/Modularity

Tektronix color graphics terminals provide advanced features at affordable prices, with a full range of fully compatible terminals to select from.

The 4205 is our lowest cost terminal; the 4207 and 4208 offer more advanced features and higher resolution. The SF4208 is adapted specifically for shop floor, rough and dirty environments. The 4209 is a large-screen version (19-inch) of the



4200 Series Graphics Terminals

4207 and, in addition, offers video out. The 4211 Networked Graphics Terminal is the newest addition to our family of fully compatible graphics display products.

It combines the best of all the 4200 Series terminals with a higher resolution ( $1024 \times 768$ ) display. It achieves the fastest speeds yet in the low-cost color arena, and offers optional networking capability.

#### 4200 SERIES TERMINAL SELECTION GUIDE

Features	4205	4207	4208	SF4208	4209	NEW 4211
Display size	13-inch	13-inch	13-inch	13-inch	19-inch	15 or 19-inch
Displayable colors:						
Graphics	16	16	16	16	16	16 or 256
Alphanumeric	8	8	8	8	8	8
Palette size	64	64	64	64	64	4096 or 16.7 million
Addressable points	480×360	640×480	640×480	640×480	640×480	1024×768
Virtual graphics						1107-1-10
coordinate space	4096×4096	4096×4096	4096×4096	4096×4096	4096×4096	4 billion×4 billion
Segment operations	Yes	Yes	Yes	Yes	Yes	Yes
Local zoom andpan	Yes	Yes	Yes	Yes	Yes	Yes
Arc and circle commands	Yes	Yes	Yes	Yes	Yes	Yes
Pixel operations	Yes	Yes	Yes	Yes	Yes	Yes
Two-port peripheral						
interface	No	Yes	Yes	Yes	Yes	Yes
Color & monochrome						
copier support	Yes	Yes	Yes	Yes	Yes	Yes
4957/4958 Tablet support	No	Yes	Yes	Yes	Yes	Yes
4510A support	No	Yes	Yes	Yes	Yes	Yes
System memory, standard (bytes)	256 K	256 K	512 K	512 K	512 K	2 MB
Optional additional megabytes						
of memory	1.0	1.0	1.0	1.0	1.0	2.0
Video out	No	No	Yes	Yes	Yes	Yes
Prices begin at						
(U.S. end user)	\$2,495	\$3,995	\$4,995	\$5,495	\$6,995	\$8,995

Contact your local Tektronix Sales representative.

#### **Software Compatibility**

The 4200 Series terminals incorporate specific features needed to meet the needs of applications in four specific areas: CAD/CAM/CIM, automated mapping/facilities management, presentation graphics and data analysis, and process control.

4200 Series users can run any program written for Tek 4100 Series terminals, including Tektronix' PLOT 10, TekniCAD, STI, GDI, GKS, and IGL. Other 4200 Series-compatible applications include packages from Computer Associates, SAS, MCS, SDRC, ESRI, and Sierra Geophysics.

# Advanced Intelligent Graphics Capability Performance and productivity are improved by enhanced segment operations, local zoom and pan, and multiple view functions. Local memory and graphics intelligence allow users to define objects at the host, save them in the terminal, and then manipulate and edit them locally with only minimum interaction with the

host.

True local zoom and pan on the 4200 Series rescales images using the full addressability of the terminal's 4096-by-4096 coordinate space. Users can enlarge an image to view it in detail, then pan beyond the image displayed on the screen to zoom in on a portion. These powerful functions are handled locally by the terminal and do not require host interaction.

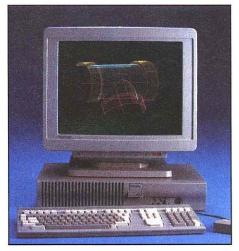
Users can display up to 64 views in independent viewports on the screen, allowing them to compare graphics information simultaneously, look at different views of one object, or display time-series data.

The 4200 Series is ANSI X3.64-compatible and supports standard industry alphanumerics. Users can download custom character fonts from the host computer to fit specific applications.

The 4200 Series supports Tek's 4690 Series Color Copiers, including the new, powerful 4693D, and popular low-cost printers such as the HP ThinkJet, HP LaserJet, Epson FX-80, and others. A background copy feature frees the computer for continued use while it makes hard copies. New to the 4200 Series is support for HPGL-compatible plotters.

TekniCAD is a trademark of Tektronix, Inc. PLOT 10 is a registered trademark of Tektronix, Inc.

Flexible leasing programs available in the continental U.S.



NEW 4211

In addition to the graphics input device on the keyboard, the 4200 Series supports an optional mouse, plugged directly into the keyboard. The 4200 Series, except for the 4205, also supports Tek's 4957 and 4958 Graphics Tablets.

#### **VT200 Compatibility**

DEC users have full access to high-performance Tek graphics and long-term support for an upward migration path. The 4200 Series provides complete alphanumeric compatibility with DEC's VT200 family. The Tek VT200 keyboard supports most Tektronix 4100 and 4200 Series applications and VT200 applications without modification.

#### **GDDM Compatibility**

Tek brings the performance advantages of Tek graphics to IBM users while maintaining compatibility with existing GDDM applications. Both high-performance Tek graphics and existing GDDM applications are supported, giving users the widest graphics choices available.

#### **Shop Floor Features**

The SF4208 Industrial Color Graphics Terminal offers the full graphics performance of the 4200 Series Color Graphics Terminals combined with the construction to withstand the rigors of the shop floor. The SF4208 is suitable for a wide range of manufacturing applications including mechanical drawing preview, numeric control tool path simulation, production assembly and process control.

GDDM compatibility offers access to a variety of exsiting applications. Users can access up to five IBM host sessions, changing sessions by pressing just one key. The 4200/CX Series terminals have dual-host connections, so they can be linked simultaneously to an IBM host and a DEC or other RS-232 host.

#### **NEW 4211**

**Networked Graphics Terminal** 

#### ADDITIONAL FEATURES

- Networking Capability
- 15- or 19-inch Display
- Multiple Configuration Choices

The NEW 4211 combines the best of all the 4200 Series terminals with higher display resolution ( $1024 \times 768$ ). It is the fastest terminal yet in the low-cost color graphics arena, and includes advanced features like optional networking capability and dual display support for separating graphics and alphanumeric displays.

#### **Many Connections**

The 4211 allows you to connect to any computer on an RS-232 line, a coax line, or a network line. In addition, it gives you VT200 and GDDM emulation for immediate compatibility with any package conforming to these popular standards. You can expect programs currently running on any 4200 Series terminal or on the 4111 to run on the 4211 without modification.

#### **Modularly Configured**

The 4211's modular design allows you to configure the terminal with only those advanced features needed for your application. You can outfit it with an optional extra four bit planes (four are standard), giving you a palette of 16.7 million colors with 256 displayable at one time. You can select a 15 or 19-inch screen and you can purchase an extra two megabytes of memory (two are standard).

#### Flexible Packaging

The 4211's physical design allows you to place the graphics engine module out of your way. And, for the first time, we are offering a tilt and swivel base as a standard part of the product and a floor stand as an option.

#### ORDERING INFORMATION

<b>4205</b> Color Graphics Terminal	\$2,495
4207 Color Graphics Terminal	\$3,995
4208 Color Graphics Terminal	\$4,995
SF4208 Industrial Graphics	
Terminal	\$5,495
4209 Color Graphics Terminal	\$6,995
4211 Networked Graphics	2000
Terminal	\$8,995

#### STANDARD ACCESSORIES

**Includes:** Power cord, RS-232 cable and manuals.

#### **OPTIONAL ACCESSORIES**

**Includes:** Mouse, additional memory, sealed keyboards, programmers documentation and IBM coaxial interface.

International keyboard and power cords are also available.

#### WARRANTY-PLUS SERVICE PLANS

See Service Support on page 559.



# 4693D

Color Image Printer

#### TYPICAL APPLICATIONS

- Presentaton Graphics
- 2D and 3D CAD
- Computer-Generated Imagery
- Complex Business Graphics
- Desktop Publishing

#### **BENEFITS**

- Accepts All Full-Color Screen Graphics
- Handles Multiple Users and Applications Simultaneously

#### **FEATURES**

- Thermal Wax Print Technology
- High-Speed Digital Interface
- 300-dpi
- 16 Million Colors or 256 Shades of Gray
- 2048 by 1536 Pixel Resolution
- Color or Monochrome Printing at 1 Minute/Page

The 4693D Color Image Printer accepts and prints high-resolution graphic images on paper or transparencies in as little as 1.5 minutes. It features a high-speed digital interface, a Motorola 68020-based controller, and a 300-dpi color thermal wax print engine.

With a color palette of more than 16 million colors, the 4693D excels at high-quality printing of computer-generated color graphics from 2D line drawings and business graphics, to sophisticated computer imaging. It also can accept a color

image and print it in black and white, using up to 256 shades of gray. With an optional 4-channel multiplexer and optional memory, the 4693D queues and processes multiple images simultaneously, providing optimal results to each user without delay.

The 4693D is compatible with all Tektronix color display systems and workstations, as well as those from Apollo, Sun, Silicon Graphics, Apple Macintosh II, IBM PC, PC Compatibles, Commodore Amiga, Masscomp, and others.

Ordering Information is on page 58.

#### 4510A

Color Graphics Rasterizer

#### TYPICAL APPLICATIONS

 Direct Host Connection to Tektronix 4691, 4692, 4693D, 4696 Color Output Systems

#### **BENEFITS/FEATURES**

- Shared System Resource
- More Than 130,000 Colors Available
- IBM 3287-Style Coax Interface (CX4510A)
- Compatible With Tektronix 4100,4110,4120,4200 Series Graphics Terminals (2D Vector Data)

The 4510A Color Graphics Rasterizer enables a direct host connection to the 4691, 4692, 4693D, and 4696 color printer systems. This allows you to configure shareable color output systems, compatible with most computer systems or Tektronix terminals.

The 4510A accepts Tektronix-style graphics data serially to drive color graphics printers at maximum potential for quality color and high resolution.

When equipped with the optional IBMstyle coaxial interface, the 4510A can be connected simultaneously to an IBM and a non-IBM host computer.

Ordering Information is on page 58.

#### **NEW** 4693RGB

Color Screen Printer

#### TYPICAL APPLICATIONS

- 2D/3D CAD Screen Copies
- Technical Data/Scientific Images

#### **BENEFITS**

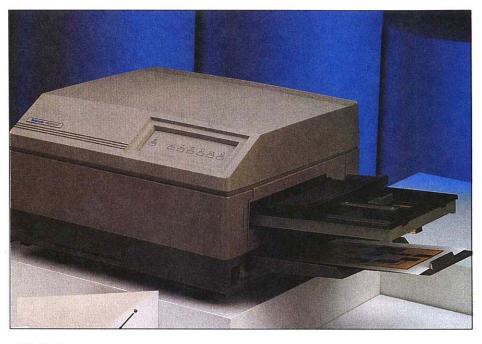
- Video Interface
- Compatible With Most Non-Interlaced Color Display Systems
- Simple Installation and Calibration
- Small Fiber-Optic Cables

#### **FEATURES**

- Screen Copies in 43 Seconds
- Sheet-fed Paper and Transparency Film
- User Installable
- Small, Lightweight Fiber Optic Interconnect Cable
- Compatible With a Wide Variety of Display Systems
- Image Capture Within 4 Seconds Regardless of Display Size and Color Pallet
- Automatic Calibration
- Image Queueing and Sizing
- 4096 Colors or 16 Gray Shades
- Personal Control Unit

The 4693RGB adds superior performance as a video-interfaced, color screen printer based on thermal-wax print technology. Features such as less than 4-second screen capture, automatic calibration, image queueing, and multi-user capability are designed to increase user productivity. Image quality is enhanced with a 4096 color palette, 300 dpi, and image sizing to the boundries of the media print area. A Personal Control Unit located at the user work-site gives the individual user a three-button, 32-character LCD display to control quanity of prints, imaging functions, and printer status.

Ordering Information is on page 58.



#### 4696

Color Ink-Jet Printer

#### TYPICAL APPLICATIONS

- · Presentation Graphics
- . PC CAD, Publishing
- Terminal Screen Copies

#### **BENEFITS**

- Low Cost
- Three Graphics Modes
- Easy Installation and Maintenance
- Roll, Sheet or Transparency Media
- Quiet, Compact Design
- · Complete Supplies Start-up Kit

#### **FEATURES**

- 120 by 240 dpi
- 0.47 Square Inch-Per-Second Printing

The 4696 Color Ink-Jet Printer combines low cost and quiet operation in a compact design. It produces high quality color screen copies at the push of a single key, in vivid color with addressability of up to  $120 \times 240$  dpi. Specially-formulated inks for the 4696 provide excellent color saturation and brilliance. A separate black cartridge ensures a true black that is unobtainable from other systems that mix dyes. Three graphics printing modes offer a variety of print qualities and speeds, including enhanced black at regular speed and enhancement of all colors at reduced speed.

Ordering Information is on page 58.

# 4521/4522

Color Video Processors

#### TYPICAL APPLICATION

 Interface for Tektronix 4692, 4693D and 4696 Color Printers to Tektronix Terminals, Workstations and Monitors

#### BENEFITS/FEATURES

- Color Screen Copy Capability for Terminals, Workstations, and Monitors with Color Video Outputs
- RGB Video Input
- Image Capture in 2 Seconds for Fast Display Off-load
- Multiple Image Queueing and Print Requests
- 8 or 64 Colors

The 4521 and 4522 Color Video Processors provide a simple method of interfacing Tektronix color ink-jet printers to a variety of terminals, workstations and monitors.

These processors quickly capture a copy of the display video signal, freeing the display for other tasks. The screen image is converted into data for use by Tek color printers to produce a copy of the screen image. The processors can also produce multiple copies of a single image, as well as multiple image capturing and queueing.

Ordering information is on page 58.

# 4957 Graphics Tablet

#### TYPICAL APPLICATION

 Data Transfer From Paper to Computer Data Base

#### **BENEFITS/FEATURES**

- 12×18 inch Active Area
- Easy to Use Four-button Cursor on Stylus
- Compatible With Tek 4100 and 4200 Series Terminals and Graphic Workstations
- RS-232C Compatible
- 1000 Points/Inch Resolution
- 0.010-inch Accuracy

The 4957 Destop Graphics Tablet reads graphic coordinate data via a four-button cursor or stylus (optional). By touching either to the tablet's surface, X-Y coordinates are calculated and relayed to the host terminal or computer for further processing. The 4957 augments your terminal's keyboard as a menu selection or cursor control device.

The 4957 is compatible with the Tektronix 4106A, 4107A, 4109A, 4110A, 4120 and 4200 Series Color Graphics Terminals and Tektronix Graphics Workstations.

# 4958 Graphics Tablet

#### TYPICAL APPLICATION

Schematic Capture

#### **BENEFITS/FEATURES**

- 18×24 to 44×60 inch Working Area
- Desktop or Pedestal Mount

The 4958 Graphics Tablet reads graphic coordinate data via a multi-button cursor or a stylus (optional). When either is touched to the tablet surface, the tablet calculates the coordinates and relays them to the host computer/terminal for further processing.

The 4958 is available in either  $18\times24$  inch desktop,  $36\times48$  inch pedestal-compatible, or  $44\times60$  inch pedestal-compatible configurations. The 4900H01 Tablet Pedestal is available for pedestal-compatible surfaces.

The tablet cursor is available with 4 or 16 buttons, and a cross-hair lens for accurate point selection. The cursor serves as a programmable hand-held keyboard from which the user can perform user-defined functions.

The 4958 offers up to 1,000 points-perinch resolution with 0.010-inch accuracy.



NEW 4991S3 Scanning/Drafting System

#### TYPICAL APPLICATIONS

- Mechanical/Electrical Engineering
- Architectural, Mapping
- Translates Hard Copy into CAD Databases

#### BENEFITS/FEATURES

- 5-Fold Productivity Increase Over Manual Digitizing or On-Screen Redesign
- Simultaneous Scanning and Vectorizing

The 4991S3 Scanning/Drafting System quickly transforms existing line-intensive documents into a useful, accurate database for CAD and mapping systems. It provides scanning, vectorizing, editing and computer-aided drafting tools for many applications in mapping, architecture, and mechanical and electrical engineering.

Because the system's 4991 Scanner/Vectorizer and 4324 2D Graphics Workstation perform scanning and editing processes locally, valuable CAD system resources are not tied up with time-consuming input tasks. The multi-tasking UNIX-based workstation allows concurrent editing of existing vector files during the scanning process.

Interactive TekScan scanning software gives the user maximum flexibility and control in preparing the most useable database for each application. Its straightforward user interface simplifies scanning and editing through on-screen menus.

The 4991S3's PLOT 10 TekniCAD editing/drafting software supports a powerful array of geometric entities, symbols, line attributes, editing functions, and user-definable macros, while its PLOT 10 CADDPort bidirectional data exchange utility software rapidly and accurately translates data to all leading CAD formats.

#### ORDERING INFORMATION

**4692** Color Graphics Copier \$7,795 The 4692 must be ordered with on-site installation and setup.

4693D Color Image Printer \$8,495 4510A Color Graphics Rasterizer 4693RGB Color Image Printer \$6,400 The 4693RGB must be ordered with a video

 adapter with prices starting at \$1,200.

 4696 Color Ink-Jet Printer
 \$1,795

 4521 Color Video Processor
 \$1,995

 4522 Color Video Processor
 \$3,995

 4957 Graphics Tablet
 \$995

 4958 Graphics Tablet
 \$500

**4991S3** Scanning/Drafting System.

#### OPTIONS

\$125,000

Contact your local Tektronix Sales Representative. WARRANTY-PLUS SERVICE PLANS

See Service Support on page 559.

#### **GRAPHICS SUPPLIES**

Paper, pens, transparencies, ink and maintenance cartridges, ribbons, toners, diskettes, data cartridges, manuals, cables for:

- Color Image Printers and Systems
- Graphics Tablets
- Graphics Terminals and Workstations

Complete Computer Graphics Supplies Catalog available through the toll-free number or your local Tektronix office.

Direct Order Desk toll-free number:

#### 1-800-TEK-6100

Alaska & Oregon call collect: 1-503-642-8000

Open from 6:00 am to 5:00 pm PSST VISA/MasterCard accepted

International customers call your local Tektronix office.

# RECONDITIONED TEKTRONIX INFORMATION DISPLAY PRODUCTS

In the U.S., contact your local Tektronix Field Office for IDG Reconditioned Product availability and prices. Overseas customers call your Tektronix Sales Office.



GMA 201 19" Ultra-High Resolution Monochrome Analog Raster Display

#### TYPICAL APPLICATIONS

- Document Retrieval
- Architectural CAD
- Gray Scale Imaging
- Computer-Aided Publishing

#### **BENEFITS**

- Image Uniformity
- High Reliability

#### **FEATURES**

- . Ultra-High Addressability and Visual Resolution
- Highly Stable Operation
- Precision Landscape-Format Display
- Over 3,000,000 Viewable Pixels

The GMA 201 features a bright, stable, flicker-free 60 Hz refresh rate, 2048 horizontal by 1536 vertical viewable pixels, and a crisp, well-focused beam at all points on the screen. A high-bandwidth 200-MHz amplifier affords maximum image fidelity while digitally-adjusted focus and astigmatism tracking provide crisp, stable displays, even in the corners.

#### ORDERING INFORMATION

GMA201 Monochrome Raster

Display Monitor.	\$3,950
OPTIONS	
Option 23*1—Cabinetry and CRT	
Bezel.	+ \$870

Option 30-64 kHz Horizontal Sync. NC Option 32—78 kHz Horizontal Sync. Option 38—75 Hz Vertical Sync. NC NC

INTERNATIONAL POWER PLUG OPTIONS Option A1-Universal Euro 220 V, 50 Hz.

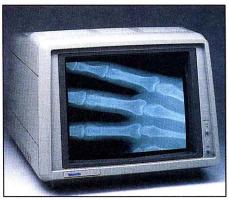
Option A2—UK 240 V, 50 Hz. Option A3—Australian 240 V, 50 Hz.

Option A4—North American 240 V, 60 Hz.
Option A5—Switzerland 220 V, 50 Hz.

\*1 Option 23 includes a standard North American 115 V power plug. Option 23 is required to order A1-A5 power plugs.

#### OPTIONAL ACCESSORY

Service Manual—Order 070-5079-00 \$130.



GMA 202 19" Ultra-High Resolution Monochrome Analog Raster Display

#### TYPICAL APPLICATIONS

- Medical Imaging
- Reconnaissance
- Computer-Aided Publishing
- Document Retrieval

#### **BENEFITS**

- · Small "Footprint"
- High Reliability

#### **FEATURES**

- Ultra-High Addressability
- Visual Resolution 1536×1536
- Highly Stable Operation
- Precision Page Format Display

The GMA 202 features a bright, stable, flicker-free display with 1536 horizontal by 2048 vertical viewable pixels and comes fully equipped with all required internal shielding.

Our modular concept provide customers a wide range of displays while minimizing costly modifications to incorporate additional displays with various limited performance ranges.

#### ORDERING INFORMATION

GMA202 Monochrome Raster Display Monitor. \$3,950 **OPTIONS** 

Option 01—WB (P45) Phosphor with 30% contrast enhancement filter. + \$100 Option 10—Composite Video + \$85 Option 41-80 kHz-120 Hz interlace NC Option B1—Service Manual. +\$75

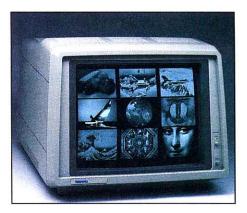
INTERNATIONAL POWER PLUG OPTIONS Option A1—Universal Euro 220 V, 50 Hz.

Option A2—UK 240 V, 50 Hz. Option A3-Australian 240 V, 50 Hz.

Option A4—North American 240 V, 60 Hz. Option A5—Switzerland 220 V, 50 Hz.

#### For further information, contact:

Tektronix, Inc. P.O. Box 500, MS 46-943 Beaverton, Oregon 97077 or call: (503) 627-6868 (800) 835-9433, ext. 6868 TWX: 910-467-8708 TLX: 151754 FAX: 503-627-2670



#### GMA 251 19" Ultra-High Resolution Digital Image Display

#### TYPICAL APPLICATIONS

- Photogrammetry
- Picture Archiving and Communication Systems (PACS)
- Reconnaissance
- Gray-Scale Imaging
- Computer-Aided Publishing

#### **BENEFITS**

- Easy Interface
- Image Update Speed

#### **FEATURES**

- 2048×1536 Pixel Display
- 2048×2048 Pixel Frame Buffer
- Scroll and Window Functions
- 16-Bit Parallel Interface Operates at Up to 20 Mbyte/Sec
- 0.2 Sec Display Update Time
- · 256 Levels of Gray-Scale

The GMA 251 makes the benefits of highresolution video available to the system builder.

The frame buffer incorporates ultra fast circuits that allow the user to update the display as fast as 5 times a second. This frame buffer has a storage capacity of 2048×2048×8 and, by scrolling the entire image can be displayed on the screen.

#### ORDERING INFORMATION

GMA251 Monochrome Digital Image Display. \$16,250

#### **OPTIONS**

Option 01—WB (P45) Phosphor with + \$100 30% contrast enhancement filter. Option B1-Service Manual. +\$150Interface Cards-Call for information on custom cards such as VME, AT, etc.

INTERNATIONAL POWER PLUG OPTIONS

Option A1—Universal Euro 220 V, 50 Hz.

Option A2—UK 240 V, 50 Hz. Option A3—Australian 240 V, 50 Hz.

Option A4—North American 240 V, 60 Hz.

Option A5-Switxzerland 220 V, 50 Hz.

### 600 Series Monitors

General-Purpose, Economical X-Y Displays to Very High-Resolution X-Y and Raster Displays for Critical **Applications** 

#### 606B Monitor

#### TYPICAL APPLICATIONS

- Ultrasound Multi-Imaging
- High Density Graphics
- Imaging For Scan conversion
- Scanning Electron Microscopy

#### **BENEFITS**

- Ultra Sharp Images
- Image Stability
- High Reliability

#### **FEATURES**

- Uniform Resolution
- · Brightness Uniformity
- Multi-Imaging Capability

#### 608 Monitor

#### TYPICAL APPLICATIONS

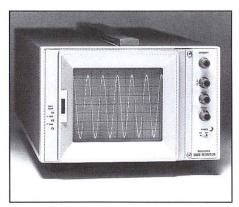
- · Spectrum analysis
- IR Imaging
- Mass Spectrometry
- Ultrasound

#### **BENEFITS**

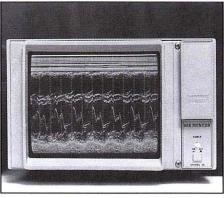
- Optimum Viewing Capability
- High Ambient Viewing
- Photographic Quality Images

#### **FEATURES**

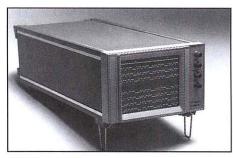
- 70 fL Useable Brightness
- High Clarity
- Excellent Gray Scale



606 Option 06



608 Option 23



620 Option 23

#### 620 Monitor

#### TYPICAL APPLICATIONS

- Ultrasound
- Logic Analyzers
- Electronic Test Equpment
- Network Analyzers

#### **BENEFITS**

- Economical Display
- High Reliability

#### **FEATURES**

- Low Cost
- Modular Packaging
- **Low Power Consumption**

#### **KEY SPECIFICATIONS FOR X-Y DISPLAYS**

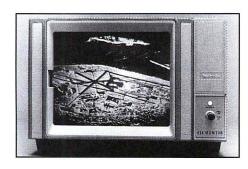
	606B	608	620
Spot Size*1	0.08 mm (3.1 mils)	0.26 mm (10 mils)	<15 mil <25 mil at max drive
Display Size	8×10 cm	9.8×12.2 cm	10×12 cm
Acceleration Potential	5.5 kV	22.5 kV	12.0 kV
Bandwidth, X-Y*2	>3 MHz	≥5 MHz	≥2 MHz
Bandwidth, Z*2	5 MHz	≥10 MHz	≥5 MHz
Rise Time	<35 ns	≤35 ns	
Input R and C, X-Y*3	1 M $\Omega$ ±1% or 50 $\Omega$ <47 pF	1 MΩ≤ ≤60 pF	1 MΩ< ≤47 pF
Input R and C, Z*3	1 M or 5 MΩ	1 MΩ ≤60 pF	1 MΩ, <47 pF
X-Y Phase Difference	1° to ≥ 500 kHz	≤1° to 1.5 MHz	≤1° dc to 500 kHz
Recommended Source Impedance, X Y and Z	<10 k $\Omega$ in 1M $\Omega$ pos.	≤10 kΩ	≤10 kΩ
Temperature Range	0 to 50° C	0 to +50° C	0 to +50° C
Power Requirements*4	75 W	61 W	See footnote*4
Included Accessories		Lined external implosion shield (graticule) for adjustment purposes.	Lined external implosion shield (graticule) for adjustment purposes
Recommended Cameras	C-30BP, C-5C Opt.01, C-7 Opt. 01	C-5C Opt. 01, C-7 Opt. 01 C-59A	C-5C, C5-C Opt 01 C-7 Opt. 01

<sup>\*1</sup> Measured at 0.5  $\mu$ A, except for the 606A, measured at 0.1  $\mu$ A.

<sup>\*2</sup> Full spec would read: "dc to . . ." appropriate figure.
\*3 "<" means "paralleled by less than".

<sup>\*4</sup> Line-voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V ( $\pm 10\%$  on each range). 48 to 440 Hz (except the 624 which excludes 220 V). Number given shows Watt max at nominal line voltage. The 620's power requirements are 90 to 132 V ac; 48 to 440 Hz, 22 W max, 0.2 A at 120 V ac, 60 Hz.





# 634/634LC Monitors

#### TYPICAL APPLICATIONS

- Multi-Imaging Cameras
- Reconnaissance and Surveillance
- Electron Microscopy

#### **KEY SPECIFICATIONS**

Video Display	634* <sup>1</sup> 634LC	634 Option 01 634LC Option 01 9×12 cm	
Display Size (flat screen)	9 cm×12 cm		
Resolution* 1 At least	1100 line	650 line	
Position Accuracy/Nonlinearity	≤1% in corners	hin 9 cm circle. s. For Option 01: 1% sircle, 2% at corners	
Brightness	515 cd/m	<sup>2</sup> (150 fL) max	
Brightness, Nonuniformity	Less t	han ±10%	
Bandwidth		d. (20 MHz video lable as Option 14.)	

- \*1 Merged raster lines.
- \*2 Standard 634 accepts the linefield rate of 625/50. Discrete line rates of 675/60 through 1083/60 can be accommodated using Option 15. Option 15 is factory calibrated at 1029/60.

#### **FEATURES**

- High Resolution
- Excellent Gray Scale
- Full Screen Brightness Uniformity

#### **BENEFITS**

- Picture Perfect Images
- Low Distortion Images
- High Stability

#### ORDERING INFORMATION

 606B Monitor\*1
 \$4,925

 608 Monitor\*1
 \$3,080

 620 Monitor\*1
 \$1,710

**634** Monitor\*1 \$3,610 **634LC** Monitor\*1 \$2,510

#### RECOMMENDED CAMERAS

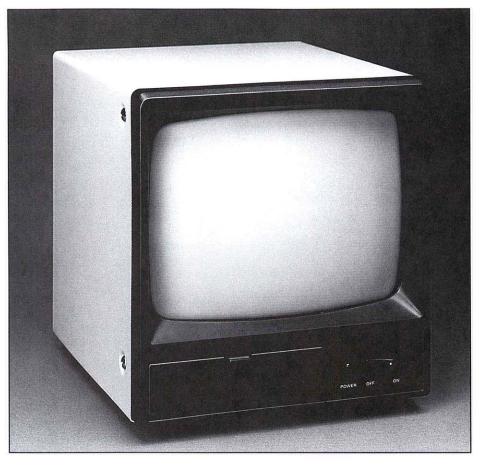
See Instrumentation Documentation Devices section. C-5C Option 01, C-7 Option 01, C-59A.

<sup>\*1</sup> Without handle feet or covers.

	606B	608	620	634	634LC	Description	Price
Option 01		~	~			Internal Graticule	NC
Option 01				~		Resolution of 800 Line Nominal, 650 Worst Case	-\$150
Option 01					~	Resolution of 800 Line Nominal, 650 Worst Case	-\$150
Option 06			~			UL 544 (Includes Handles, Feet and Covers)	+\$135
Option 06				~		UL 544 (Includes Handles, Feet and Covers)	+\$135
Option 06	~					UL 544 (Includes Handles, Feet and Covers)	+\$135
Option 07	~					Screwdriver Front Panel Controls	+\$30
Option 09	~	~	~	~		UL 544 Component Recognized	NC
Option 10		~	V			25-Pin Remote Program Connector	+\$55
Option 12		~	~			GM (P7) Phosphor with Internal Graticule	+\$65
Option 13				~		Reverse Video	+\$85
Option 14				~		20 MHz Video Amplifier	+\$145
Option 15				~		Variable Line Rates	+\$280
Option 15					V	Variable Line Rates + 20 MHz Video Amplifier	+\$600
Option 16				~		25-Pin Video Input	+\$55
Option 20			(6,31)* 1			AC Delete	-\$20
Option 21		~				Full Differential Inputs	+\$60
Option 22		~				Extended Gain Range	+\$45
Option 23		(28)* 1	(6,28,31)* 1			Handle, Feet and Covers	+\$120
Option 24		~	*			Linearized Z-axis	+\$75
Option 25		~				TTL Blanking	+\$75
Option 25			~			TTL Blanking	+\$50
Option 28	(6)* 1	(23)* 1	(6,23,31)* 1			Covers Only	+\$90
Option 29		~				Metal Bezel	+\$75
Option 31			~	Delete all Rear BNC's, DC Power Connector and AC Power Supply and Switch		-\$25	
Option 76		~	V			GM (P7) Phosphor	+\$65

<sup>\* 1</sup> Not available with these options.

Special pricing terms and conditions are available to qualified OEMs. Contact your local Tektronix representative for complete information.



#### **CHARACTERISTICS**

#### CRT

CRT—9-inch diagonal, 90° deflection angle. Resolution—≥600 lines. Phosphor—P4.

#### **ELECTRICAL**

Input Switchable Impedance— $10~k\Omega/75~\Omega$ . Output Impedance— $75~\Omega$ .

Video Input (NTSC)—Composite 0.5 to 2.0 V p-p.

Sync Input—Negative.

Power Requirements—27 W typical. Input voltage selected by range switch: 100 to 120 V ac standard, 220 to 240 V ac, Option A1. Line Frequency—50 to 60 Hz.

#### **ENVIRONMENTAL**

Operating Temperature Range—20 to  $50\,^{\circ}\text{C}.$ 

#### PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
Height	240	9.5
Width	220	8.3
Depth	246	9.75
Weight ≈	kg	lb
Net	5.9	13.0

#### ORDERING INFORMATION

DX05 Video Monitor. \$290
INTERNATIONAL POWER PLUG OPTIONS
Option A1—Universal Euro 220 V, 50 Hz.

# NEW DX05 Video Monitor

#### TYPICAL APPLICATIONS

- Closed-Circuit Television
- Display For CCD Video Camera (C1001)
- Display For Digital Camera System (DCS)

#### **BENEFITS**

- General Purpose Monitor
- Small Size

#### **FEATURES**

- NTSC Format
- Medium Resolution
- Low Cost

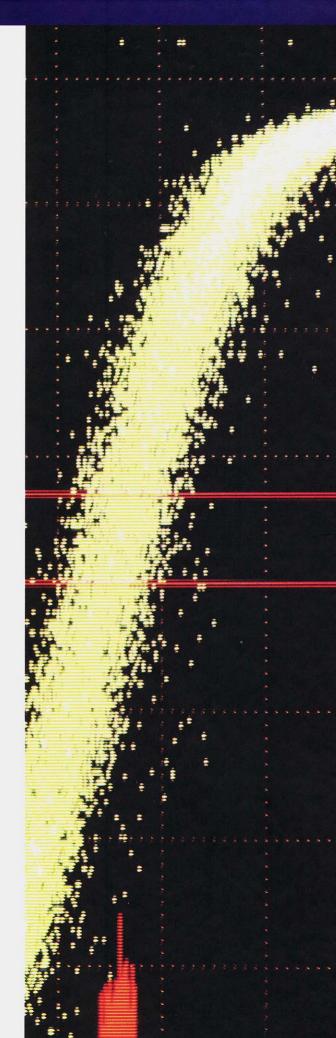
The DX05 is a nine-inch diagonal, desktop, black and white display video monitor. It is suitable for general purpose video applications requiring the NTSC format.

The low cost of the DX05 makes it an easily affordable accessory. Its small size  $(8.3 \times 9.5 \text{ in.})$  makes it especially suitable for applications with limited space.

The loop-through video connection means it can be used in series with other video devices such as the HC01/HC02 Video Copiers or the C1001 CCD Video Camera.

# Tektronix Test and Measurement

# **Product Catalog** 1993



# COMPUTER GRAPHIC

# **Computer Graphics**

#### **Computer Graphics Group**

The Computer Graphics Groups operate in three areas of the computer peripherals industry – Color Printers, Graphics Terminals, and Advanced Displays.

#### **COLOR PRINTERS**

Many electronic measurements – waveforms, digital events, etc. eventually find their way into some kind of document or graphic record. Tektronix' color printers are perfectly matched to the task of printing such records, as well as everything from postcards to T-shirt transfers in vivid color.

#### **GRAPHICS TERMINALS**

Tektronix offers traditional graphics terminals and most recently, X terminals – devices that provide windowed access to multiple hosts and applications across a network.

#### **ADVANCED DISPLAYS**

The Display Products Operation markets advanced technologies, including large, flat-panel displays; ultra-high resolution monitors; stereoscopic 3-D displays; and color shutter displays, which offer higher color definition than do conventional devices.

#### CONTENTS

#### **COMPUTER GRAPHICS**

Color Printers	506
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# IISD II PXe/PXi III PXi

## 4511A 469LAM 4693FXI

# Phaser<sup>™</sup> Color Printers

Tektronix Brings
Brilliant Color
and PostScript
Level 2 printing to
Engineering,
Scientific, and
Graphic Arts plus
a host of
Specialized
Applications.

#### **PHASER SERIES**

- Brilliant, Accurate Color
- Powerful, Fast RISC Processor
- -24 MHz (IISD, II PXi, III PXi)
- -17 MHz (II PXe)
- PostScript Level 2 Software
- 39 Resident Fonts (IISD, II PXi, III PXi)
- 17 Resident Fonts Expandable to 39 (II PXe)
- TekColor PS Color Fidelity, Software,
- Pantone Approved
- · Easy Operation
- · Room to Grow
- Worry Free Service
- · Worldwide Support



#### Phaser II SD

- Fast photographic printing
- · Process complex images
- · Photographic quality transparencies
- · Smooth shading

#### Phaser II PXe/PXi

- · Supports multiple systems
- · Powerful networking
- · Precise color control and registration



# Phaser III PXi

#### Phaser III PXi

- · Exceptional color durability on prints
- · Media Flexibility
- -Prints on letterhead, forms, tracing paper, card stock
- -Size from 4 x 6 in. (102 x 153 mm) post cards to full bleeds on 12 x 18 in. (305 x 457mm)
- · Precise registration
- · Powerful networking
- · Serves multiple hosts simultaneously

#### **Phaser Media Laminator**

By laminating Phaser III transparencies, you can produce dazzling, durable presentations with vibrant colors. Lamination gives your Phaser III presentations more fully-saturated colors and sharper edges.

**DURABLE FINISH STANDS UP TO HEAVY USE** 

Lamination provides a durable finish for transparencies and many types of paper. It protects your frequently-used prints against dirt, scratches, and wrinkles. Laminated prints are easily three-hole punched for storage in a three-ring binder.

#### APPLICATION REFERENCE

#### Phaser III PXi **Phaser IISD** Phaser II PXe/PXi · Workgroup color printing on · Workgroup production printing · Photo realistic printing · Large numbers of overhead plain paper · Highest quality paper and · Flexible paper size and overhead transparencies, transparencies often containing scanned artwork · HP-GL support type requirement . Low cost proofs for Phaser IISD · HP-GL support · EtherTalk interface (optional)

To order, contact your	
local sales office (listed on	3

#### ORDERING INFORMATION PHASER IISD Opt. 04 - 4 Mbyte Upgrade (total 20 Mbytes) ......\*1 Color Printer, Order 4684 .....\*1 Opt. 32 - 32 Mbyte Upgrade (total 48 Mbytes) ......\*1 Includes: Input Tray (adjustable for US letter/legal size media); F-KITS AND ACCESSORIES Universal Output Tray; US Power Cord; AMD 29000 RISC-based 16 Mbytes RAM - Add one kit for a total of 32 Mbytes; Image Controller w/16 Mbytes RAM; Media Startup Kit with add two kits for a total of 48 Mbytes. Order 4680F16.....\$1,995 paper/transfer roll, transfer roll tray, installation poster, user manual, cleaning kit, utilities, drivers, sample images on diskettes 4 Mbyte RAM Upgrade - Order 4690F4M ......\$595 in MAC and PC formats. EtherTalk Interface Hardware - Provides EtherTalk connectivity. Order 4684F02....\*1 Opt. 01 - Metric Media Kit and Input Tray (replaces US media and tray) .....\*1 Ethernet TCP/IP Interface - Order 4511A .....\$1,495 Opt. 02 - Internal EtherTalk Interface Hardware (provides $^{*1} Contact\ your\ local\ Tektronix\ representative\ for\ price\ information.$ EtherTalk connectivity) ......\*1

# **Phaser Color Printers**

IISD II PXe/PXi III PXi 4511A 469LAM 4693FXI

DUAGED II DV
PHASER II PXe Color Printer*1
Includes: US letter-size Input Tray (adjustable for letter and legal paper
sizes); Universal Output Tray; US Power Cord; 29000 RISC-based
Image Controller with 4 MB RAM; Media Startup Kit with paper and
transparency film, 3-color transfer roll (startup print quantity), transfer
roll tray, installation guide, user manual, cleaning kit, utilities, drivers.
PHASER II PXi
Color Printer*1
Includes: US letter-size Input Tray (adjustable for letter and
legal paper sizes); Universal Output Tray; US Power Cord;
2900 RISC-based Image Controller with 6 MB RAM; Media Startup
Kit with paper and transparency film, 3-color transfer roll (startup
print quantity), transfer roll tray, installation guide, user manual, cleaning kit, utilities, drivers and sample images for Apple
Macintosh, IBM PC/AT, PS/2 and compatibles.
Opt. 01 – Metric-size Media Kit and Input Tray (replaces
US media and tray)*1
<b>Opt. 04 –</b> Add 4 Mb memory*1
Opt. 08 – (Phaser II PXi only) Add 8 Mbyte memory*1
Opt. 1F – (Phaser II PXe only) Additional 22 fonts*1
Opt. 14 - (Phasei ii Pice offic) Additional 22 Ionis
Opt. L1 - French user manual*1
Opt. L2 - Italian user manual*1
Opt. L3 – German user manual*1
Opt. L4 - Spanish user manual*1
ACCESSORIES
Printer Cart – Two shelves for transfer roll and media
storage. Order 469CART
Extra US letter/legal-size Paper Tray – Order 436-0204-01\$99
<b>Extra Metric A4/A4 special-size Paper Tray –</b> Order 436-0205-01 <b>\$99</b>
4 MB SIMM – Adding memory with or after initial purchase.
Order 4690F4M\$99
Font Upgrade – (Phaser II PXe only) 22 additional fonts.
Order 4694F1F
PHASER III PXi
Color Printer. Order 4698PXi\$9,995
Includes: Letter-size Input Tray (adjustable for US and Metric paper
sizes); 2 Color Sticks each of black, cyan, magenta, and yellow;
Universal Output Tray; US Power Cord; AMD 29000 RISC-based
Image Controller with 10 Mbyte RAM; Media Sampler Kit with bond
paper, cover stock, and transparency film; English User Manual.
Opt. 01 – Add universal input tray and ink startup kit
(8 sticks each of black, cyan, magenta, and yellow)+\$395
Opt. 04 – Add 4 Mbyte memory (total of 14 Mbyte); this option
is required to print a full image area on 12 x 18 in. (305 mm x 457 mm) media
Opt. 08 – Add 8 Mbyte memory (total of 18 Mbyte); this
configuration provides sufficient memory for many downloaded
fonts, very complex images, and additional input buffer for
enhanced throughput*1
Opt. L1 - French User Manual substitution*1
Opt. L2 - Italian User Manual substitution*1
Opt. L3 – German User Manual substitution*1 Opt. L4 – Spanish User Manual substitution*1

1,	FORMATION
	ACCESSORIES Phaser III Printer Cart – With drawer and multi-position shelf
	for ink and media storage. Order 4698CRT
	Order 436-0224-00
	<b>Universal Input Tray –</b> For A, A4, B, A3-size media. Order 436-0222-008 <b>\$150</b>
	4 Mbyte SIMM – For adding memory to the printer after initial purchase. Order 4690F4M\$595
	PhaserPrint Screencopy Software – For SUN4 workstations. Order 4690F22\$995
	Screen Copy Software – For HP workstations. Order 4690F43 Opt. 12\$995
	Phaser Media Laminator – Optically improves transparencies for projection. Adds durability to both transparency and paper prints. The laminated prints are writable and erasable.  Order 469LAM
	Network Interface – Adapter to connect the printer into TCP/IP or DECnet Ethernet environments. Order 4511A\$1,495
	Phaser III PXiJ Configuration – Includes all the same configurations and options as a Phaser III PXi plus Kanji fonts on a 100 Mbyte external hard disk drive. Order 4698PXS\$12,990
	<b>4693FXi</b> Upgrade Kit.
	Order one or a combination of the upgrades for your 4693 printer: 4693D, 4693 DX, 4693 RGB, RGB II, Phaser CP, Phaser CPS, Phaser PE, or Phaser PX.
	4693FXi – Upgrades to PostScript Level 2 compatibility\$2,495 4693FPX – Upgrades to PostScript Level 1 compatibility\$995 4690F4M – Add 4 Mbytes memory with or after initial purchase\$595
	469LAM
	Phaser Media Laminator\$995 Includes: Laminator US power cord, Output Tray, User Manual.
	<b>Opt. 01</b> – Each kit contains 100 lamination sheets and 100 lamination folders: 016-1163-00: A size media kit (8.5 x 11 in.) 016-1164-00: A4 size media kit (210 x 297 mm)
	INTERNATIONAL POWER PLUG OPTIONS
	Opt. A4 – North American 240 V, 60 Hz
	4511A Network Interface\$1,495 Includes: One year of depot service, power supply, PC parallel port-to-printer cable, 61 meters (2 ft.) 50 $\Omega$ BNC F-M-F "T" connector, 50 $\Omega$ BNC terminator, self-adhesive mounting tape,
	4511A Network Interface User Manual.  Opt. 01 – Configuration Kit: includes all the cables needed to attach any type of terminal to the 4511A for configuration+\$80
	ADDITIONAL ACCESSORIES Field Installation Kit – PhaserSym Software: VMS print symbiont. Order 4690F41\$495
	INTERNATIONAL POWER PLUG OPTIONS
	Opt. A1 – Universal Euro 220 V, 50 Hz
	<b>Opt. A3</b> – Australian 240 V, 50 Hz
	Opt. A5 – Switzerland 220 V, 50 Hz
	*1Contact your local Tektronix representative for price information.

To order, contact your local sales office (listed on the inside back cover).

## XP300 SERIES

### XP10 SERIES

# **Terminals**

Broad Family of Affordable Price/ Performance Terminals.

#### **XP330 SERIES**

- · RISC X Terminals
- Fully Compatible with SUN, DEC and other UNIX Compute Environments
- Displays with Workstation Resolution and Quality
- Server is Optimized for Maximum Performance with a Broad Range of Demanding Technical and Engineering Applications for Superior User Productivity
- Worldwide Sales, Service and Support

#### **XP10 SERIES**

- Dual Access Via Ethernet and Serial Connection
- Fully Compatible with Sun, DEC and other UNIX Compute Environments
- Ergonomically Designed with User-Friendly Features, like Flicker-Free Resolution, Small Footprint, and Optional IBM, DEC, or UNIX Keyboard
- Validated with Hundreds of UNIX Applications
- World Wide Sales, Service and Support



XP330 Series Family

# XP330 Series APPLICATIONS

The RISC-based TekXpress™Series 330 terminals provide the best value in high-performance X terminals. With a complete range of functionality, compatibility with all major compute environments and premium-quality, workstation-class, displays, the XP330 Series meets a broad range of application needs.Whether you work in design automation, computer-aided software engineering ,process control, earth resources, or any other scientific, technical or engineering disciplines, there is a Series 330 X terminal just right for you.

The Series 330 employs a dual-processor RISC architecture that turbo-charges networking performance with a MIPS R3000 microprocessor and delegates graphics and windowing functions to a separate graphics processor. The result: blazingly fast graphics with high-throughput network communications. The superb resolution of both monochrome and color terminals enhances graphics and text and increases your productivity.

For heavy duty assignments that require optimum application performance, choose TekXpress Series 330 X terminals.

#### XP330 SELECTION GUIDE

	XP334	XP336	XP337	XP338
Display Size	19 in. tilt & swivel	17 in. tilt & swivel	19 in. tilt & swivel	19 in. tilt & swivel
Resolution	1280 x 1024	1152 x 900	1152 x 900	1280 x 1024
Display Type	gray-scale	color	color	color
Display Colors	256 shades of gray	256 colors	256 colors	256 colors
Color Palette		16.7 million	16.7 million	16.7 million
Refresh Rate	72 Hz	72 Hz	72 Hz	72 Hz
Display DPI/Dot Pitch	99	101/0.28	86/0.31	98/0.28

To order, contact your local sales office (listed on the inside back cover).

# **Terminals**

XP300 **SERIES** 

**XP10 SERIES** 





XP10 Series Family

#### **XP10 Series APPLICATIONS**

The TekXpress™ Series 10 terminals have been optimized to provide the best price-performance at the lowest possible cost while ensuring

compatibility with all major computer environments. From our lowest-cost monochrome to our most spectacular large-screen color model. TekXpress Series 10 terminals give you excellent display resolution and clarity, access to wide range of applications on a variety of hosts, and comprehensive support of industrystandard network protocols. All for less than you'd pay for comparable PC or diskless node alternatives.

XP10 Series terminals are a good fit for on-line transaction processing, computer-aided software engineering, electronic publishing, or any of a number of other networking applications requiring fast interactivity and high-resolution graphics and text. TekXpress X terminals are also more economical because they take advantage of computing power, security and storage resources of the network - something other options can't.

#### XP10 SELECTION GUIDE

	XP11	XP12	XP13	XP17	XP18
Display Size	15 in. tilt & swivel	19 in. tilt & swivel	15 in. tilt & swivel	14 in. tilt & swivel	17 in. tilt & swivel
Resolution	1024 x 786	1280 x 1024	1024 x 768	1024 x 768	1152 x 900
Display Type	monochrome	monochrome	gray-scale	color	color
Display Colors	b/w	b/w	16 shades of gray	256 colors	256 colors
Color Palette			256	16.7 million	16.7 million
Refresh Rate	70 Hz	72 Hz	70 Hz	70 Hz	72 Hz
Display DPI/Dot Pitch	100	100	100	100/.28	100/.28

#### Characteristics

#### **XP330 SERIES XP10 SERIES**

Main CPU - MIPS R3000 @ 20 MHz.

Graphics Processor - TI 34020 @ 40 MHz.

SIMM Memory - 5 MB standard expandable to 42 MB.

Boot Options - X Server code downloadable from host or optionally from ROM card.

Boot Protocols - TFTP, MOP.

Host Ports - 10base 5 AUI (thicknet), 10base 2 (thinnet) or 10baseT (twisted pair).

Peripheral Ports - Two, 9 pin RS-232 connectors.

Network Protocols - Standard: TCP/IP, NFS, BOOTP, RARP, SLIP. Opt.: TDEnet (DECnet), including DAP, LAT and MOP.

Parameter Set-up - Motif-like set-up menu system.

Available Kevboards - IBM101, VT220; Opt.: UNIX (SUN-compatible) keyboard.

Printer Support - Network printer support.

Input Options - Tablet, touchscreen, barcode reader support, trackball.

Server - X server based on X11 Release 4.

# ORDERING INFORMATIO

All XP terminals include:	
Logic Unit, Display Monitor, Ethernet Interface, 3 Button M Keyboard, Power Cord, and User Manual.	ouse,
XP11	
15 in. Monochrome Terminal	\$995
XP12	00 405
19 in. Monochrome Terminal	\$2,495
XP13 15 in. Gray-Scale Terminal	\$1,695
XP17	
14 in. Color Terminal	\$1,995
XP18	124000 111700000
17 in. Color Terminal	
Opt. 10 - ROM X-Server Boot and Fonts	
Opt. 22 – Add 2 MB Memory	
Opt. 24 – Add 4 MB Memory	+\$600
Opt. 3J - 10BASE2 Thin Thinnet LAN	NC
Opt. 3K - 10BASE5 Thick Thicknet LAN	NC
Opt. 3M - 10ASE-T TW PR Twisted Pair LAN	
XP11, XP12, XP13, XP17, XP18	
Opt. 3N - TDENET DECMET Protocol	
Opt. 31 - Delete Keyboard	
Opt. 49 – Rental ID	NC
XP334	
19 in. Gray-Scale Terminal	\$3,495

IFUKMAIIUN	
XP336 17 in. Color Terminal	\$4,750
XP337 19 in. Color Terminal	
XP338	
19 in. Color Terminal	\$5,995
Opt. LP - Low Profile Logic Module	+\$400
Opt. 10 - ROM X-Server Boot and Fonts	+\$400
Opt. 22 – Add 2 MB Memory	
<b>Opt. 24</b> – Add 4 MB Memory	
<b>Opt. 25</b> – Add 8 MB Memory	
Opt. 3A - 10BASE5/10BASE2 Thick/Thin NET	
Opt. 3B - 10ASE/10BASE5 Twisted Pair/Thicknet LAN	
Opt. 3L - Motif Window MA Local Client	
Opt. 3N - TDENET DECMET Protocol	
Opt. 49 – Rental ID	
<b>Opt. RM</b> - Rackmount (XP337, XP338 only)	+\$1,100
INTERNATIONAL POWER PLUG OPTIONS	
<b>Opt. A1 –</b> Universal Euro 220 V, 50 Hz	
<b>Opt. A2</b> – United Kingdom 240 V, 50 Hz	
<b>Opt. A3</b> – Australian 240 V, 50 Hz	
<b>Opt. A5 –</b> Switzerland 220 V, 50 Hz	NG
WARRANTY	

One year return to depot or 90 day onsite.

To order, contact your local sales office (listed on the inside back cover).

### 600 SERIES

# **Display Monitors**

All 600 Series
products are
available in open
frame configuration or with the
optional cabinet.
The products
incorporate a
Tektronix manufactured CRT and
are backed up by
the Tektronix
World-Wide Sales
and Service
Organization.

#### 606B

- Very High Resolution
- Uniform Brightness
- Multi-Imaging Capability
- · Ultra Sharp Images
- Image Stability
- · High Reliability

#### **APPLICATIONS**

- Gamma Camera Recording
- Other Photographic Recording
- Scan-Conversion Imaging
- Scanning Electron Microscopy

#### 608

- · High Brightness
- · High Resolution
- · Excellent Gray Scale
- Optimum Viewing Capability
- High Ambient Viewing
- Photographic Quality Images

#### **APPLICATIONS**

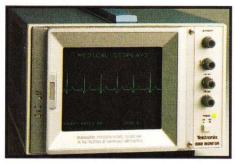
- · Ultrasound Imaging
- · Spectrum Analysis
- IR Imaging
- Mass Spectroscopy
- Test and Measurement

#### 620

- Mechanically Rugged
- Versatile Modular Packaging
- Low Power Consumption
- · Economical Display
- · High Reliability

#### **APPLICATIONS**

- · Ultrasound Analysis
- Electronic Equipment Testing
- · Network Analysis
- Non-Destructive Testing



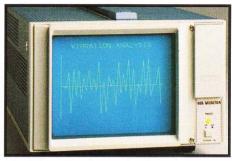
606B Option 06

#### **Very High Resolution**

The 606B Very High Resolution X-Y Display is ideal for photographic recording applications in medical gamma camera systems, where image stability, gray scale performance and uniform brightness are critical. It is also superior in applications such as electron microscopy or radiation and thermal imaging.

#### TEKTRONIX-HEWLETT PACKARD CROSS REFERENCE

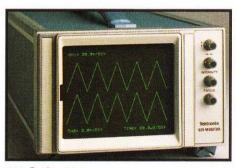
	606B	608	620
HP 1208A			X
HP 1208B			X
HP 1304A	X		
HP 1332A		Χ	
HP 1333A	X		
HP 1336S	X		
HP 1340A			Χ
TEK 602			X
TEK 604		Χ	
TEK 624		Χ	



608 Option 23

#### **High Brightness**

The 608 High Brightness X-Y Display is designed for easy reading in high ambient light. Its sharp image is well-suited for medical and military imaging and electronic instrumentation. The high brightness (70 fL), 10-mil spot size and large screen (9.8 x 12.2 cm) allow high quality photography.



620 Option 23

#### Mechanically Rugged

The 620 General-Purpose X-Y Display is economical, yet reliable and mechanically rugged. It is an ideal display for signal analyzers, yet rugged enough for vibration tests and non-destructive testing (NDT). Its 15-mil spot size and useable brightness (up to 30 fL) are appropriate for A-mode imaging in medical instrumentation.

To order, contact your local sales office (listed on the inside back cover).

# **Display Monitors**

#### SELECTION GUIDE

Key Specifications	606B	608	620		
Spot Size*1	0.08 mm (3.1 mils)	0.26 mm (10 mils)	0.38 mm (15 mils)		
Display Size	8 cm x 10 cm	9.8 cm x 12.2 cm	9.8 cm x 12.2 cm		
Acceleration Potential	5.4 kV	22.5 kV	12.0 kV		
Bandwidth, X-Y*2	≥3 MHz	≥5 MHz	≥2 MHz		
Bandwidth, Z* <sup>2</sup>	≥5 MHz	≥10 MHz	≥5 MHz		
Rise Time	≤35 ns	≤35 ns	≤70 ns		
Input R and C, X-Y*3	1 MΩ or 50 Ω "<" ≤47 pF	1 MΩ, "<" ≤60 pF	1 MΩ, ≤ "<" ≤47 pF		
Input R and C, Z*3	1 MΩ or 50 Ω "<" ≤47 pF	1 MΩ, "<" ≤60 pF	1 MΩ, "<" < 47 pF		
X-Y Phase Difference	≤1° to 500 kHz	≤1° to 1.5 MHz	≤1° to 500 kHz		
Recommended Source Impedance, X Y and Z* <sup>3</sup>	<10 k $\Omega$ in 1 M $\Omega$ pos.	≤10 kΩ	≤10 kΩ		
Temperature Range	0°C to 50°C	0°C to 50°C	0°C to 50°C		
Power Requirements*4	75 W	61 W	26 W		
Included Accessories	Lined external Implosion shield (graticule) for adjustment purposes.				
Recommended Cameras	C-9 Opt. 07	C-9 Opt. 07	C-9 Opt. 07		

 $<sup>^{*1}</sup>$  Measured at 0.5  $\mu A$ .

#### OPTIONS AND ACCESSORIES

Feature	606B	608	620	Option	Price
Internal Graticule		•		Opt. 01	+\$15
UL 544 (Includes handles, feet, and covers)			•	Opt. 06	+\$140
UL 544 (Includes handles, feet, and covers)	•			Opt. 06	+\$135
Screwdriver Front Panel Controls	•			Opt. 07	+\$45
UL 544 Component Recognized	45.5	•	•	Opt. 09	NC
25-Pin Remote Program Connector		•	•	Opt. 10	+\$55
AC Delete			• (6,31)* <sup>1</sup>	Opt. 20	-\$20
Full Differential Inputs		•		Opt. 21	+\$70
Extended Gain Range	12.74	•		Opt. 22	+\$45
Handle,feet, and covers			(6, 28, 31) <sup>-1</sup>	Opt. 23	+\$120
Handle,feet, and covers		(28)*1		Opt. 23	+\$130
Linearized Z-axis		•		Opt. 24	+\$75
TTL Blanking		•		Opt. 25	+\$75
TTL Blanking				Opt. 25	+\$50
Covers only	• (6)*1	(23)*1	(6, 23, 31)*1	Opt. 28	+\$90
Metal Bezel		•		Opt. 29	+\$75
Delete all Rear BNCs, DC Power Connector and AC Power Supply and Switch				Opt. 31	-\$25
GM (P7) Phosphor		•	•	Opt. 76	+\$65

 $<sup>^{*</sup>_{1}}$  Not available with these options.

ORDERING INFORMATION					
<b>606B</b> Monitor\$5,375	<b>620</b> Monitor\$1,910				
608					

To order, contact your local sales office (listed on the inside back cover).

 $<sup>^{\</sup>star 2}$  Full spec would read: "DC to. . ." appropriate figure.

<sup>\*3 &</sup>quot;<" means "paralleled by less than."

 $<sup>^{*4}</sup>$  Line-voltage selector allows operation from 100, 110, 120, 200, 220, and 240 V ( $\pm10\%$  on each range), 48 to 440 Hz. Number given shows Watt max at nominal line voltage.

# **Display Monitors**

Excellent color
saturation
viewable in high
ambient light,
wide range of
colors, and high
resolution for
better color
definition and
viewability.

#### **NU 900M**

- Excellent Color Uniformity
- · High Resolution
- · Ultra-High Contrast
- Large Active Display Area
- AR Coated Front-Glass
- Wide Range of Colors
- Minimal Convergence Error
- Ruggedness
- No Shadowmask Constrictions

#### **APPLICATIONS**

- Test and Measurement Products
- Process Control Systems
- Medical Instrumentation
- · Avionics Displays



#### NU 900M 9-inch Color Display

The Nu 900M is a member of a new family of color display products. Based on a technology called NuCOLOR\*, this 9-inch monitor contains a unique combination consisting of a monochrome CRT and a NuCOLOR Shutter. The NuCOLOR Shutter is an electrically switchable color filter made up to two fast liquid crystal optical switches, known as "pi-cells", plus a combination of color and neutral polarizers. Color is produced by sequentially displaying red, green, and blue field information on the monochrome CRT while the Shutter is switched to transmit red, green and blue respectively. Alternate fields, viewed through different colored filters, create full-color images.

#### **ADVANTAGES**

The Nu 900M display offers several advantages over conventional shadowmask displays including: contrast ratio of 100:1, resolution that depends on electron beam size of a monochrome CRT, color uniformity created from color polarizers utilizing light energy from a single electron beam, and a ruggedized body ideal for industrial applications.

As a result, Nu 900M offers the user excellent color saturation that is viewable even in high ambient light, a wide dynamic range of colors, no shadowmask constrictions, and high resolution allowing better color definition and viewability.

ORDERING INFORMATION

#### Characteristics

#### MONITOR

CRT - 9 in..

Display Area - 6.67 in. x 5.0 in..

Resolution  $-640 \times 480$ 

Display Luminance - >30 fL (white).

Contrast - 100:1 @ 42 foot candles.

Geometric Distortion -+0.75%.

Video Risetime - ≤4.4 ns.

Horizontal Scan Rate - 91 kHz.

Input Signal - Composite Serial Video.

#### **ELECTRICA**

Power Input - 87-250 VAC, 48-62 Hz.

Power Consumption - 100 Watts max.

Internal Power - 48 VDC @ 1.5 Amps.

Anode Voltage - 16 kV (typical).

**Reliability** – ≥33,000 hours (MIL-HNBK-217E).

#### **ENVIRONMENTAL**

Temperature - 0° to 50°C.

Humidity - 0 to 90% rel. humidity.

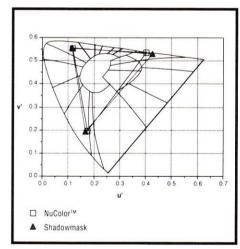
**Altitude** – 15,000 feet operating; 50,000 feet nonoperating.

#### **MECHANICAL**

**Safety** – UL 1950, CSA-950, IEC 950, EN6950. **Dimension** – 9.16 in. (W) x 7.5 in. (H) x

12 in. (L).

Weight - ≤15 pounds.



CIE Coordinates

# NU 900M 9 in. Color Display.....\$950 Opt. B1 – Service Manual ....+\$150 To order, contact your local sales office (listed on

NTERNATIONAL POWER PLUG OPTIONS	
Opt. A1 - Universal Euro. 220 V, 50 Hz	N
Dpt. A2 - United Kingdom. 240 V, 50 Hz	N(
Opt. A3 - Australian. 240 V, 50 Hz	N(
Opt. A4 - North American. 240 V, 60 Hz	NC
Dpt. A5 - Switzerland. 220 V, 50 Hz	NO