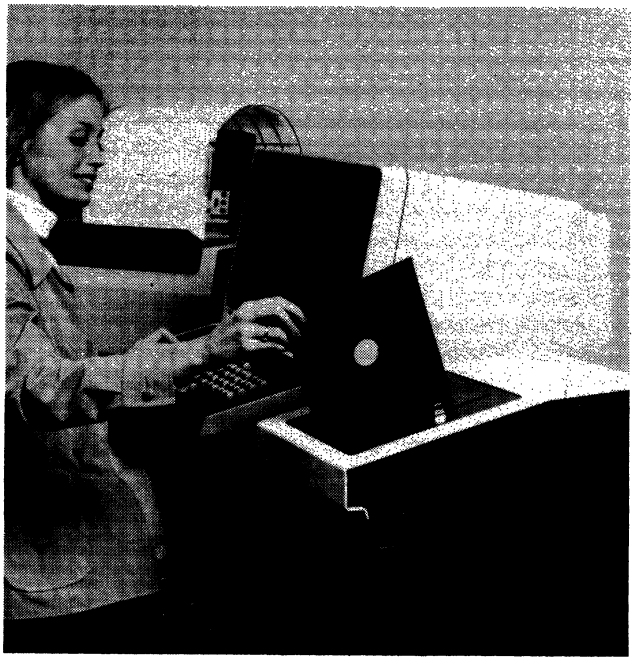
Sycor 250 Intelligent Display System



This stand-alone Sycor 250 terminal consists of a CRT display, keyboard, printer, and dual diskette unit (foreground). In cluster configurations, a Sycor 250 System can include any mix of up to 32 keyboard/display units and printers.

A programmable microprocessor-based replacement for the IBM 3270 and 3275 Information Display System in a remote environment; supports any mix of up to 24 or 32 display stations and printers.

Formatted data entry and validation using user-created format programs, a standard feature, is implemented via a parameterized programming language. Options include dual diskette storage; microprocessor-controlled, bi-directional printers rated at 66, 120 and 180 cps; a light pen; and operator ID card reader.

A typical 8-station remote cluster without printers using 1920-character screens leases for $723 per month, including maintenance, under a 42-month lease.

An 18-station remote cluster without printers using 1920-character display stations leases for $1,395 per month, including maintenance, on a 42-month lease.

A stand-alone 1920-character terminal without printer leases for $50 per month including maintenance under a 42-month lease.

The Sycor 250 is completely compatible with the IBM 3270.

MANAGEMENT SUMMARY

A direct replacement for the IBM 3270 Information Display System, the Sycor 250 features user-implemented data validation functions and an optional, Sycor-built dual diskette unit with a storage capacity of 500,000 bytes. Sycor introduced its 250 system at the National Computer Conference in June 1973, and since its initial production deliveries in January 1974 has shipped more than 7,000 units. About 4,000 of those units have been delivered to Olivetti, which markets the display system as the TCV 270, primarily in European countries.

Sycor substantially reduced Sycor 250 prices in August 1977 to fall in line with IBM's May 1977 price cuts for existing 3270 components. Sycor's current pricing for its 250 yields savings of up to 30 percent on a two-year lease (including maintenance) compared to IBM's rental prices for its existing equipment; i.e., Models 3271 (BSC), 3272, and 3277. Savings of up to 25 percent compared to IBM's two-year lease are provided under Sycor's 42-month lease. However, the 250 is not price competitive with IBM's new 3274/3278 and 3276/3278 terminals. The Sycor 290, introduced in September 1977, is price competitive with the new IBM 3270 equipment announced in May 1977 and supercedes the Sycor 250. (See Report C25-792-101.)

Dedicated to serving the data entry market, Sycor has integrated the basic data validation features of its earlier and highly successful 340 Intelligent Terminal into the ➤

CHARACTERISTICS

VENDOR: Sycor, Inc., 100 Phoenix Drive, Ann Arbor, Michigan 48104. Telephone (313) 971-0900.

DATE OF ANNOUNCEMENT: June 1973.

DATE OF FIRST DELIVERY: January 1974.

NUMBER DELIVERED TO DATE: Over 7000 units.

SERVICED BY: Sycor, Inc., and by Sorbus at remote locations. Sycor currently services about 93 percent of its customer base.

CONFIGURATION

MULTISTATION: A remote cluster configuration can be formed from either of two arrangements: a Model 251 Remote Control Unit and up to 32 attached devices or a Model 258 Control Station and up to 23 attached devices plus the integral display unit. The basic 251 can accommodate up to 4 devices and can be equipped with up to 4 device adapters, permitting a total of 32 devices. The basic Model 258 contains an integral display unit and can accommodate up to seven external devices. It can be equipped with one device adapter, permitting a total of 24 devices.

In either arrangement, the devices can consist of any combination of Model 257 CRT keyboard/display stations and ➤

Sycor 250 Intelligent Display System

250 system, thus permitting its users to perform a number of checks to verify the accuracy of the entered data prior to transmission to the remote computer. With the aid of a parameterized language called Field Instruction Language, or FIL, users can create and store fixed formats for fill-in-the-blanks applications and define the checking functions and parameters for each of the corresponding fields. The data entry capability is implemented by a microprocessor with an 8K-byte read-only memory and a user-programmable memory that is expandable to 6K bytes in 1K-byte increments.

Apart from lower cost, the Sycor 250 offers user programmability, the availability of diskette storage, and flexibile printed output compared to the IBM 3270. The data entry feature augments terminal operation by implementing error detection and correction measures at the source of entry rather than at the remote computer. This concept can lead to greatly improved data communications efficiency (and therefore to cash savings) through the elimination of complicated correction procedures. During the data entry operations, the operator is immediately alerted to a detected error in the field occupied by the cursor. Following correction, entry continues into the next field as guided by the cursor.

Fixed formats can be stored on diskette for immediate access. The diskette option also provides a batch capability for the 250. Keyed data can be batched on diskette during the day and transmitted (unattended) to the host computer after hours to avoid peak loads at the host computer. The diskette option also eliminates lost operator time resulting from computer downtime or line outages by capturing the keyed data on disk for later transmission. Other diskette-related applications include local file inquiry, report production, handling multiple print formats for multi-file operation, and page scrolling functions.

The architecture of the 250 provides each display station in a cluster with its own microprocessor, so that several jobs can be performed concurrently with no system degradation. All terminal functions are controlled by firmware that resides in the microprocessor's ROM. In addition, the firmware assembles keyed or received source statements into user programs. A total of 12 user-created formats can be stored at the terminal and used at any one time; additional user formats can be stored on the optional diskette unit or at the remote computer and retrieved as needed.

The Sycor 250 provides complete compatibility with the IBM 3270 with respect to line discipline, commands, command code structure, and addressing sequence. All features currently available with the IBM 3270 can be included in the Sycor 250.

Here's how the salient characteristics of the Sycor 250 compare with those of the IBM 3270 system:

printers. Any mix of display station and printer models can be specified. Each device can be located up to 2000 cable feet from the control unit. Each display station (including the 258 Control Station) can support a local printer, a diskette unit, a light pen, and an Operator ID Card Reader. The buffer capacity of buffered printers used as a local printer must correspond to the screen capacity of the associated display unit.

The Model 251 Control Unit and 258 Control Station are available in two versions:

- Models 251-1 and 258-1 each contain buffering for 480 characters and accommodate display stations with 480-character screens and unbuffered or buffered printers with 480-character buffers.
- Models 251-2 and 258-2 each contain buffering for 1920 characters and accommodate display stations with 1920-character screens and unbuffered or buffered printers with 1920-character buffers.

SINGLE-STATION: The Model 255 Stand-Alone Terminal contains a microprocessor controller, a display screen, and a keyboard. It is available in two versions that differ in display buffer and screen capacity: Model 255-1 has a 480-character capacity; and Model 255-2 has a 1920-character capacity. Either version of the Model 255 can support a local printer, light pen, and badge reader. Buffer capacity of the local printer corresponds to the screen capacity. Connection to a communications facility is established via a modem.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex, synchronous at 4800, 3600, 2400, 2000, or 1200 bits/second, using 8-level EBCDIC or ASCII (with parity). The Sycor 250 terminals employ the IBM Binary Synchronous Communications (BSC) technique and are transmission-compatible with the IBM 3270 Information Display System. A dial-up option for the Model 255 features a data rate selector and a disconnect switch, which are supported under IBM's CICS.

The Sycor 250 terminals have an EIA Standard RS-232C interface and connect to a voice-grade communications facility via a modem. The following table shows the relationship between transmission speed and modem type; although Bell System modems are shown, equivalent modems from independent manufacturers can be used.

Transmission Rate	Bell System Modem
1200 bps	202C/D/E/R
2000 bps	201A
2400 bps	201B/C
3600 bps	203A
4800 bps	208A/B

DEVICE CONTROL

The Sycor 250 operates under control of the program stored at the remote computer and provides complete compatibility with the addressing sequence, command code structure, and line discipline employed by the IBM 3270 Information Display System. The Sycor 250 responds to and executes the full repertoire of IBM 3270 commands via a microprocessor and Sycor firmware, which resides in an 8K-byte read-only memory (ROM).

Features include all those provided by the IBM 3270 plus an exclusive Sycor feature, Field Instruction Language (FIL), a parameterized programming language that allows the user to create and store fixed formats for fill-in-the-blanks data entry applications and to define

Sycor 250 Intelligent Display System

- Display capacity—The Sycor 250 provides two screen sizes, 480 and 1920 characters, which are identical with those available from IBM.
- System configuration—The Sycor 250 is available as a stand-alone or clustered remote terminal only. Sycor does not offer a local cluster version for direct channel attachment to replace an IBM 3270 system operating as a computer peripheral subsystem. The total number of device attachments for the cluster version of the Sycor 250 is the same as the number accommodated by the IBM 3270: 32 devices, including any combination of display units and printers. In addition, each display unit can accommodate a printer operating in local mode, a diskette unit, a light pen, and a badge reader. Sycor also offers a integrated controller/display station that accommodates a maximum of 24 devices for smaller installations.
- Communications—Transmission speeds for the Sycor 250 currently range from 1200 to 4800 bps. Those for the IBM 3270 range from 1200 to 7200 bps.
- Software support—the Sycor 250 is compatible with all existing IBM software for the 3270, including IMS and CICS.
- Printed output—Three printer models are available with the Sycor 250; these are variations of the same matrix-type, bi-directional printer and differ in speed only. Available speeds are 66, 120, and 180 characters per second. The printer was developed, and is produced, by Sycor. An integral microprocessor implements a variety of control functions, the parameters of which can be selected via keypad for each task.

The printers are available as buffered or unbuffered units; a 480- or 1920-character buffer is available. Only the buffered units can operate as communications terminals to communicate directly with the computer. The unbuffered Sycor units, when employed as local-copy printers, use the display buffers of the associated display units; therefore, displayed data cannot be erased until the data has been printed, causing a degradation of performance.

By contrast, IBM offers three matrix printers for use with its 3270, one rated at 40 cps, one at 66 cps, and one at 80 or 160 cps. Each printer attached to the IBM 3270 operates either as a local printer or communications printer, as directed by computer-issued commands. IBM also offers line printers for high-volume applications.

Service is provided by Sycor, which has service locations in 96 cities in major metropolitan areas, and by Sorbus, a nationwide service organization with headquarters in King of Prussia, Pennsylvania.

USER REACTION

In Datapro's 1977 survey of alphanumeric display terminal users, 13 users reported on their experience with 275 special checking functions for any given field via the use of Field Definition Tables. The special functions currently include check digit verification, zero balancing, logical operations, skipping, omission detection, and capacity control (field completion). The user-programmable feature is implemented via up to 6K bytes of programmable random-access memory, in 1K-byte increments.

Field Definitions Tables are linked to a displayed format by specific attribute (function) characters displayed in the Status (top non-data) Line. In the table, each data field is identified by its position on the screen, and the functions associated with each field are specified. Field definitions can be created and assembled by the terminal just before data is entered, or they can be stored in their original source statement format to be recalled and assembled as required.

Program Function and Program Attention keys, designated PF_n and PA_n, respectively, a standard feature of the IBM 3270, are also a standard feature of the Sycor 250. Each of these keys generates a unique code recognized by the controlling software as a specific program request or data identifier. The two key functions differ in that a Program Function code accompanies the displayed data as it is transmitted to the computer, while a Program Attention code is transmitted separately.

A light pen is available as an option and functionally corresponds to IBM's Selector Pen, a 3270 option. Any one of several alphanumeric or numeric fields of fixed or variable format can be selected by the pen, which transmits the address of the selected entry to the computer to initiate the programmed function.

The diskette option includes a bootstrap loader, initiated by key depression, and a 3K-byte disk control program that resides on diskette. The disk control program implements data storage and retrieval functions between display unit and diskette and between the host computer and diskette via the display units. The program also provides a key search function with an unlimited key-field length and a batch print (disk dump) function that prints the entire contents of diskette storage.

A local printed copy of displayed data can be initiated via key depression, but the standard 3270 Copy command is invalid for the unbuffered printers, and can be used with buffered printers only.

The Sycor 250 is supported under existing IBM software support for the IBM 3270, including the DATA/360 and VIDEO/370 on-line data entry programs, the IMS data base management system, and the CICS data communications monitor.

COMPONENTS

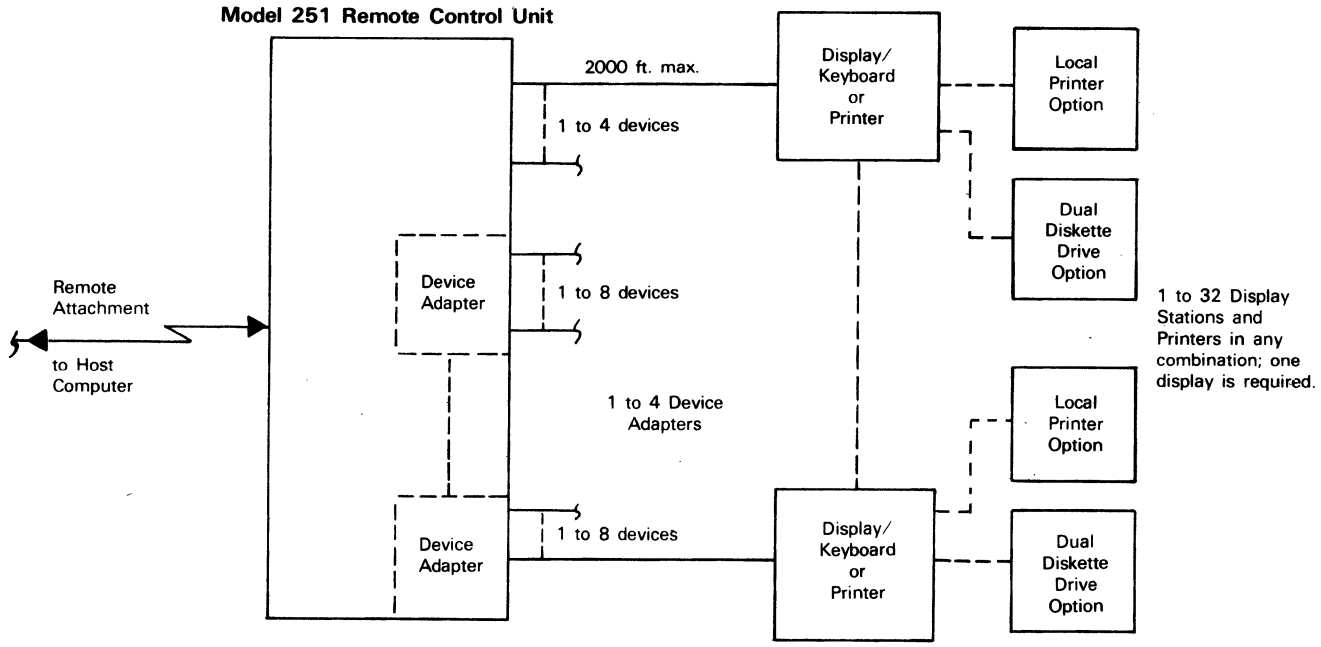
CRT DISPLAY: Via a 12-inch (diagonal measurement) CRT. The following standard display arrangements are available.

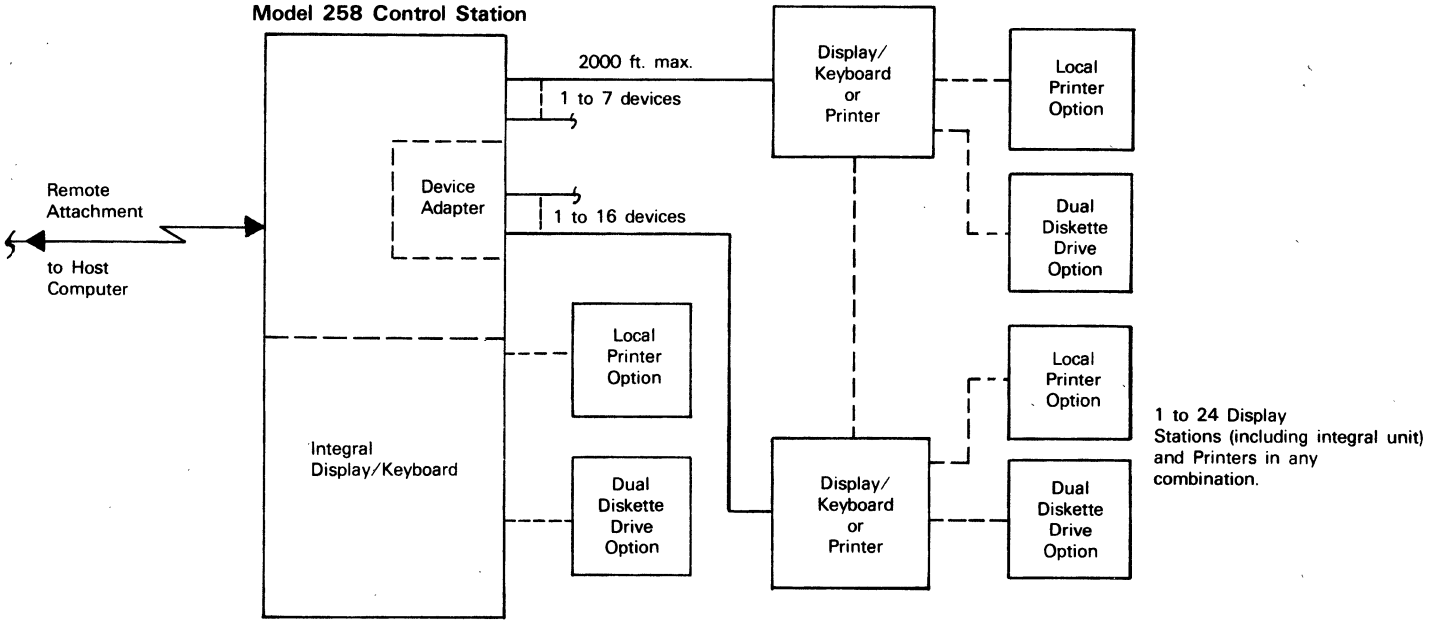
Terminal arrangement:	Cluster		Stand-Alone	
Display model:	257-1	257-2	255-1	255-2
Characters/display:	480	1920	480	1920
Lines/display:	12	24	12	24
Characters/line:	40	80	40	80

A character set of 64 ASCII characters, including upper case alphabetics, numerics, and special symbols, is displayed in green against a dark background. The Dual Case option provides an additional set of 26 lower case alphabetics. Each character is formed by a 7-by-9 dot matrix.

Sycor 250 Intelligent Display System

Multistation Configurations





Sycor 250 terminals. Their experience is summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	4	8	1	0	3.2
Ease of operation	4	9	0	0	3.3
Display clarity	1	9	3	0	2.8
Keyboard feel & usability	4	9	0	0	3.3
Hardware reliability	4	7	2	0	3.2
Maintenance service	1	8	3	1	2.7
Software & technical support	1	6	5	1	2.5

*Weighted Average on a scale of 4.0 for Excellent.

The Status Line, a standard feature, is displayed at the top of the screen as an extra line and is protected from inadvertent key entry. The Status Line presents information to the operator concerning the operation of the terminal (e.g., error conditions).

SOFTWARE SUPPORT: The Sycor 250 is supported under existing IBM software support for the IBM 3270, including the DATA/360 and VIDEO/370 on-line data entry programs, the IMS data base management system, and the CICS data communications monitor.

KEYBOARD: Four keyboards are available: a 66-key typewriter style, a 66-key keypunch style, and a 78-key typewriter style with 12 Program Function keys, and a 78-key

Sycor 250 Intelligent Display System

According to the ratings, these users are reasonably well satisfied with the product and with Sycor's response to their needs, althought these ratings have slipped slightly below those of last year. These users cited, in descending order of mentions, low cost (9 users), reliability (6 users), and programmability (5 users) as the key advantages of the Sycor 250. Four users mentioned poor support and two mentioned inflexibility as the only disadvantages.□

typewriter style with a dual-function Program Function/ numeric keypad. A numeric keyboard lock is optional.

PRINTERS: Three models of matrix-type, bidirectional impact printers are available. EAch model is offered as a buffered printer with a 480- or 1920-character buffer or as an unbuffered printer. The model numbers of the printers with various combinations of speed and buffering arrangement are listed in the following table.

Print Speed	Buffered, 480 char.	Buffered, 1920 char.	Unbuffered
66 cps	2606-1	2606-2	2606-3
120 cps	2612-1	2612-2	2612-3
180 cps	2618-1	2618-2	2618-3

Each printer model features microprocessor control, 132 print positions, and prints any of 64 or 96 (optional) EBCDIC or ASCII characters, including upper and lower (optional) case alphabetics, numerics, and special symbols. Each character is formed via a 7-by-7 dot matrix.

Horizontal and vertical spacing are 10 char/inch and 6 lines/inch, respectively. Options provide switch selection of 10 or 16½ char./inch and/or 6 or 8 lines/inch. Vertical and horizontal tabulation control is implemented via the microprocessor and is specified via a 12-key function pad. Other operations such as top-of-form, dynamic forms alignment for pre-printed forms, and diagnostic tests can also be initiated via the function keys. Diagnostic test patterns can be selected as a continuous printout of the character set on 132-character lines or alternate X's and O's on 16-character lines.

The printers feature snap-out tractor, pin-feed, and friction feed paper-handling mechanisms, which are used interchangeable. The printers accommodate 6-part continuous forms from 2 to 14-7/8 inches wide. The head position is adjustable for paper thickness and the cartridge ribbon drive features re-inking.

DISKETTE STORAGE: The optional diskette unit accommodates two IBM 3740-style diskettes, providing a maximum on-line storage capacity of 486,288 bytes. The diskettes are rotated at 360 rpm, resulting in an average rotational delay of 83 milliseconds. Positioning time is 2.5 milliseconds per track. Data is transferred at 31,250 bytes/second. The recording technique is not compatible with that of the IBM 3740.

The diskette unit organizes a diskette into 73 data tracks plus 3 spare tracks and 1 index track. Each track is divided into 26 sectors, and each sector holds 128 bytes.

PRICING

The Sycor 250 is available for purchase or on a one- or three-year lease. A separate maintenance contract is available for leased or purchased equipment. Installation is included in the price of the equipment; no extra charges are applied. The investment tax credit is passed on to the customer for puchased equipment; however, the transfer of the ITC is negotiable for leased equipment.

A minimal amount of customer training is provided, consisting of three days at the factory or training center and programmed instruction. Training centers are located at Washington, D.C. and San Francisco.

	Monthly Charge* 1-Yr. Lease	2-Yr. Lease	42-Month Lease	Purchase	Monthly Maint.
Cluster Arrangements					
Controller:					
Model 251-1; 480-characters	$111	$ 97	$ 88	$2,850	$19
Model 251-2; 1920 characters	156	136	123	4,330	23
Control Station:					
Model 258-1; 480 characters	173	118	108	5,630	33
Model 258-2; 1920 characters	223	132	121	6,250	38
Display Unit:					
Model 257-1; 480 characters	108	75	69	2,820	21
Model 257-2; 1920 characters	117	82	75	3,420	25
Device Adapter	30	18	16	800	4
Stand Alone Display Terminals					
Model 255-1; 480 characters	127	99	90	4,072	25
Model 255-2; 1920 characters	142	112	103	4,730	29
Keyboards					
66-Key Typewriter	N/C	N/C	N/C	N/C	N/C
66-Key Keypunch	N/C	N/C	N/C	N/C	N/C
78-Key Typewriter	5	5	4	400	2
78-Key Typewriter; includes dual function PF/numeric keypad	7	6	6	600	2
Options					
Model 2500 Diskette Unit	130	114	104	4,200	25
Operator ID Card Reader	30	27	25	880	10
Light Pen	25	32	20	740	5
Security Keylock	50 OTC	50 OTC	50 OTC	50 OTC	—
Numeric Keyboard Lock					
Dial Up; for Model 255 only	18	16	14	675	3

Sycor 250 Intelligent Display System

Options (Continued)	Monthly Charge* 1-Yr. Lease	2-Yr. Lease	42-Month Lease	Purchase	Monthly Maint.
Dual Case; 96 symbols	10	9	8	350	2
Program Memory, 1K bytes; 6K bytes max.	9	8	7	210	2
FIL Control Firmware	12	11	10	320	2
Printers					
Model 2606-1; 480 character buffer, 66 cps	125	**	**	5,680	30
Model 2606-2; 1920 character buffer, 66 cps	127	**	**	5,900	30
Model 2606-3; unbuffered, 66 cps	117	**	**	4,100	25
Model 2612-1; 480 character buffer, 120 cps	185	**	**	8,100	45
Model 2612-2; 1920 character buffer, 120 cps	187	**	**	8,320	45
Model 2612-3; unbuffered, 120 cps	152	**	**	5,200	40
Model 2618-1; 480 character buffer, 180 cps	235	**	**	11,000	55
Model 2618-2; 1920 character buffer, 180 cps	237	**	**	11,130	55
Model 2618-3; unbuffered, 180 cps	202	**	**	7,360	50
Friction Feed Module	15	**	**	400	5
Pin Feed Module***	20	**	**	600	5
Tractor Feed Module	23	**	**	700	5
6/8 Lines per inch; switchable	10	**	**	400	0
10/16.5 Characters per inch; switchable	15	**	**	600	0
Upper/Lower case; 96 symbols	18	**	**	675	3
Modems					
201C Compatible Modem	60	53	48	2,000	10
201B/C Compatible Modem	60	53	48	2,000	10
202C Compatible Modem	32	28	26	1,000	7

* Includes maintenance.
** Contact vendor for pricing.
*** Available at widths of 8, 9, 13⅛, and 14⅜ inches; user can specify other widths at a cost of $500 each.
OTC—One Time charge.
N/C—No charge.■

Sycor 250 Intelligent Display System

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Dedicated to serving the data entry market, Sycor has integrated the basic data validation features of its earlier and highly successful 340 Intelligent Terminal into the 250 system, thus permitting its users to perform a number of checks to verify the accuracy of the entered data prior to transmission to the remote computer. With the aid of a parameterized language called Field Instruction Language, or FIL, users can create and store fixed formats for fill-in-the-blanks applications and define the checking functions and parameters for each of the corresponding fields. The data entry capability is implemented by a microprocessor with an 8K-byte read-only memory and a user-programmable memory that is expandable to 6K bytes in 1K-byte increments.

Apart from lower cost, the Sycor 250 offers user programmability, the availability of diskette storage, and ▷

A programmable microprocessor-based replacement for the IBM 3270 and 3275 Information Display System in a remote environment; supports any mix of up to 23 or 32 display stations and printers.

Formatted data entry and validation using user-created format programs, a standard feature, is implemented via a parameterized programming language. Options include dual diskette storage; microprocessor-controlled, bi-directional printers rated at 66, 120 and 180 cps; a light pen; and operator ID card reader.

A typical 8-station remote cluster without printers using 1920-character screens rents for $1,042 per month including maintenance under a one-year lease.

A 16-station remote terminal consisting of 8 1920-character display stations and 8 66-cps printers (with pin-feed) rents for $2,218 per month including maintenance on a one-year lease.

A stand-alone 1920-character terminal without printer rents for $142 per month including maintenance under a one-year lease.

The Sycor 250 is completely compatible with the IBM 3270.

CHARACTERISTICS

VENDOR: Sycor, Inc., 100 Phoenix Drive, Ann Arbor, Michigan 48104. Telephone (313) 971-0900.

DATE OF ANNOUNCEMENT: June 1973.

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Sycor 250 Intelligent Display System

flexibile printed output compared to the IBM 3270. The data entry feature augments terminal operation by implementing error detection and correction measures at the source of entry rather than at the remote computer. This concept can lead to greatly improved data communications efficiency (and therefore to cash savings) through the elimination of complicated correction procedures. During the data entry operations, the operator is immediately alerted to a detected error in the field occupied by the cursor. Following correction, entry continues into the next field as guided by the cursor.

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Here's how the salient characteristics of the Sycor 250 compare with those of the IBM 3270 system:

- Display capacity—The Sycor 250 provides two screen sizes, 480 and 1920 characters, which are identical with those available from IBM.

- System configuration—The Sycor 250 is available as a stand-alone or clustered remote terminal only. Sycor does not offer a local cluster version for direct channel attachment to replace an IBM 3270 system operating as a computer peripheral subsystem. The total number of device attachments for the cluster version of the Sycor 250 is the same as the number accommodated by the IBM 3270: 32 devices, including any combination of display units and printers. In addition, each display unit can accommodate a printer operating

cable feet from the control unit. The Model 258 Control Station is a CRT keyboard/display station with integral controller and has the same physical appearance as the Model 257. Each display station (including the 258 Control Station) can support a local printer, a diskette unit, a light pen, and an Operator ID Card Reader. The buffer capacity of buffered printers used as a local printer must correspond to the screen capacity of the associated display unit.

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Sycor 250 Intelligent Display System

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- Communications–Transmission speeds for the Sycor 250 currently range from 1200 to 4800 bps. Those for the IBM 3270 range from 1200 to 7200 bps.

- Software support–the Sycor 250 is compatible with all existing IBM software for the 3270, including IMS and CICS.

- Printed output–Three printer models are available with the Sycor 250; these are variations of the same matrix-type, bi-directional printer and differ in speed only. Available speeds are 66, 120, and 180 characters per second. The printer was developed, and is produced, by Sycor. An integral microprocessor implements a variety of control functions, the parameters of which can be selected via keypad for each task.

The printers are available as buffered or unbuffered units; a 480- or 1920-character buffer is available. Only the buffered units can operate as communications terminals to communicate directly with the computer. The unbuffered Sycor units, when employed as local-copy printers, use the display buffers of the associated display units; therefore, displayed data cannot be erased until the data has been printed, causing a degradation of performance.

By contrast, IBM offers two matrix printers for use with its 3270, one rated at 40 cps and the other at 66 cps; each printer attached to the IBM 3270 operates either as a local printer or communications printer, as directed by computer-issued commands. IBM also offers a 120 lpm printer for high-volume applications.

Service is provided by Sycor, which has service locations in 96 cities in major metropolitan areas, and by Sorbus, a nationwide service organization with headquarters in King of Prussia, Pennsylvania.

USER REACTION

In Datapro's 1976 survey of alphanumeric display terminal users, 6 users reported on their experience with 109 Sycor Terminals. Their experience is summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	4	0	0	3.3
Ease of operation	4	2	0	0	3.7
Display clarity	3	3	0	0	3.5
Keyboard feel & usability	2	4	0	0	3.3
Hardware reliability	2	3	1	0	3.2
Maintenance service	3	2	1	0	3.3
Software & technical support	2	1	1	2	2.5

*Weighted Average on a scale of 4.0 for Excellent.

fill-in-the-blanks data entry applications and to define special checking functions for any given field via the use of Field Definition Tables. The special functions currently include check digit verification, zero balancing, logical operations, skipping, omission detection, and capacity control (field completion). The user-programmable feature is implemented via up to 6K bytes of programmable random-access memory, in 1K-byte increments.

Field Definitions Tables are linked to a displayed format by specific attribute (function) characters displayed in the Status (top non-data) Line. In the table, each data field is identified by its position on the screen, and the functions associated with each field are specified. Field definitions can be created and assembled by the terminal just before data is entered, or they can be stored in their original source statement format to be recalled and assembled as required.

Program Function and Program Attention keys, designated PF_n and PA_n, respectively, a standard feature of the IBM 3270, are also a standard feature of the Sycor 250. Each of these keys generates a unique code recognized by the controlling software as a specific program request or data identifier. The two key functions differ in that a Program Function code accompanies the displayed data as it is transmitted to the computer, while a Program Attention code is transmitted separately.

A light pen is available as an option and functionally corresponds to IBM's Selector Pen, a 3270 option. Any one of several alphanumeric or numeric fields of fixed or variable format can be selected by the pen, which transmits the address of the selected entry to the computer to initiate the programmed function.

The diskette option includes a bootstrap loader, initiated by key depression, and a 3K-byte disk control program that resides on diskette. The disk control program implements data storage and retrieval functions between display unit and diskette and between the host computer and diskette via the display units. The program also provides a key search function with an unlimited key-field length and a batch print (disk dump) function that prints the entire contents of diskette storage.

A local printed copy of displayed data can be initiated via key depression, but the standard 3270 Copy command is invalid for the unbuffered printers, and can be used with buffered printers only.

The Sycor 250 is supported under existing IBM software support for the IBM 3270, including the DATA/360 and VIDEO/370 on-line data entry programs, the IMS data base management system, and the CICS data communications monitor.

COMPONENTS

CRT DISPLAY: Via a 12-inch (diagonal measurement) CRT. The following standard display arrangements are available.

Terminal arrangement:	Cluster		Stand-Alone	
Display model:	257-1	257-2	255-1	255-2
Characters/display:	480	1920	480	1920
Lines/display:	12	24	12	24
Characters/line:	40	80	40	80

A character set of 64 ASCII characters, including upper case alphabetics, numerics, and special symbols, is displayed in green against a dark background. The Dual Case option

Sycor 250 Intelligent Display System

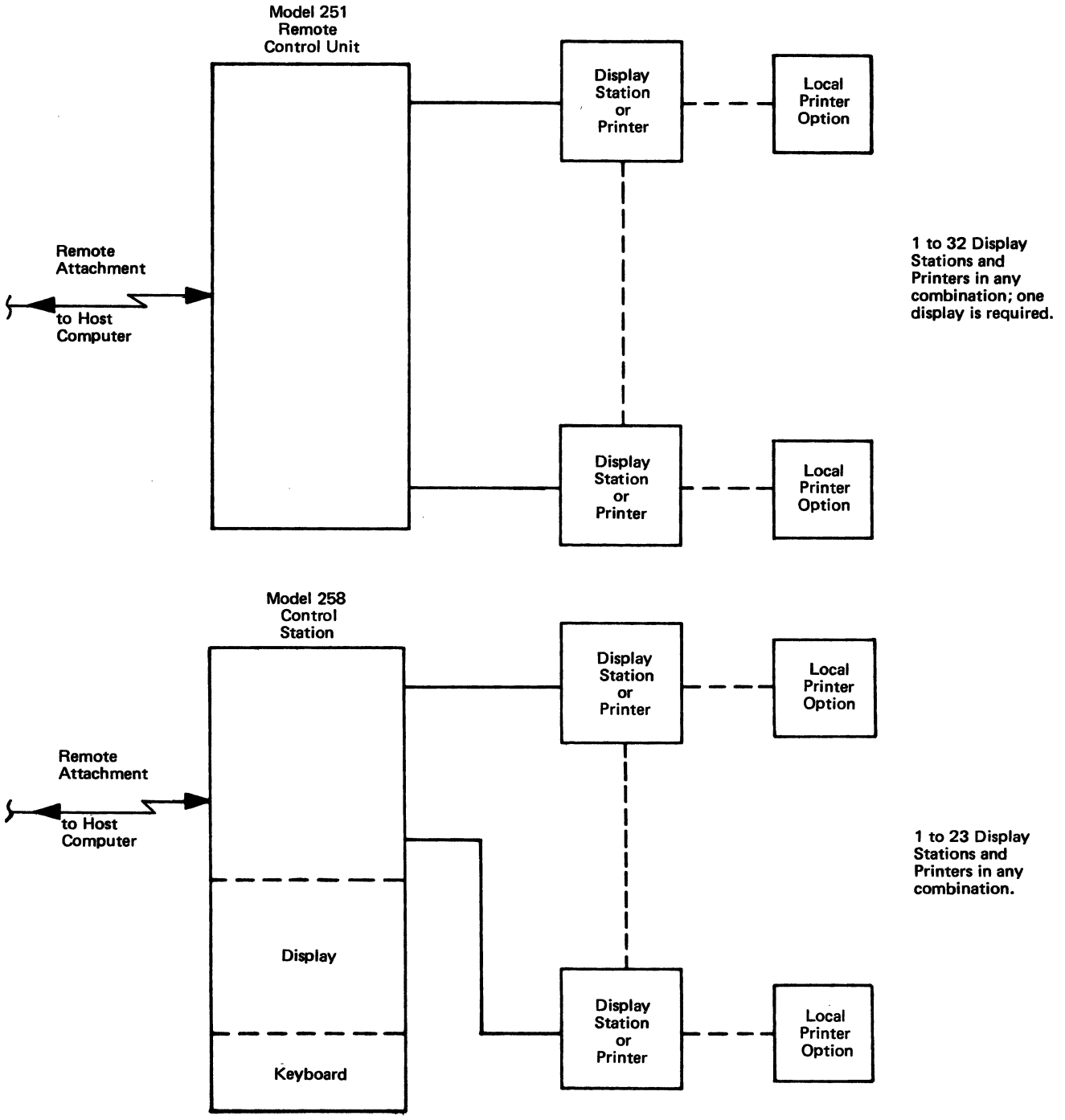
As the ratings indicate, these users were reasonably well satisfied with the product and with Sycor's response to their needs. They cited cost, reliability, programmability, and strong vendor support as principal advantages of the 250. One user did mention performance limitations as a disadvantage, and two others rated software and technical support as poor. However, these ratings, which are somewhat improved over last year's, strongly suggest that the Sycor 250 merits serious consideration by other prospective users. □

provides an additional set of 26 lower case alphabetics. Each character is formed by a 7-by-9 dot matrix.

The Status Line, a standard feature, is displayed at the top of the screen as an extra line and is protected from inadvertent key entry. The Status Line presents information to the operator concerning the operation of the terminal (e.g., error conditions).

SOFTWARE SUPPORT: The Sycor 250 is supported under existing IBM software support for the IBM 3270, including the DATA/360 and VIDEO/370 on-line data entry

Multistation Configurations



Sycor 250 Intelligent Display System

programs, the IMS data base management system, and the CICS data communications monitor.

KEYBOARD: Either of two keyboard arrangements can be specified: typewriter or data entry. The keyboard, similar in layout and key arrangement to the equivalent IBM 3270 keyboards, include a separate group of 12 Program Function keys (optional for the typewriter-style) located at the right of the main keygroup and a row of 6 function keys located above the main keygroup. An adding machine pad is also optional for the typewriter-style keyboard.

PRINTERS: Three models of matrix-type, bidirectional impact printers are available. EAch model is offered as a buffered printer with a 480- or 1920-character buffer or as an unbuffered printer. The model numbers of the printers with various combinations of speed and buffering arrangement are listed in the following table.

Print Speed	Buffered, 480 char.	Buffered, 1920 char.	Unbuffered
66 cps	2606-1	2606-2	2606-3
120 cps	2612-1	2612-2	2612-3
180 cps	2618-1	2618-2	2618-3

Each printer model features microprocessor control, 132 print positions, and prints any of 64 or 96 (optional) EBCDIC or ASCII characters, including upper and lower (optional) case alphabetics, numerics, and special symbols. Each character is formed via a 7-by-7 dot matrix.

Horizontal and vertical spacing are 10 char/inch and 6 lines/inch, respectively. Options provide switch selection of 10 or 16½ char./inch and/or 6 or 8 lines/inch. Vertical and horizontal tabulation control is implemented via the microprocessor and is specified via a 12-key function pad. Other operations such as top-of-form, dynamic forms alignment for pre-printed forms, and diagnostic tests can also be initiated via the function keys. Diagnostic test patterns can be selected as a continuous printout of the character set on 132-character lines or alternate X's and O's on 16-character lines.

The printers feature snap-out tractor, pin-feed, and friction feed paper-handling mechanisms, which are used interchangeable. The printers accommodate 6-part continuous forms from 2 to 14-7/8 inches wide. The head position is adjustable for paper thickness and the cartridge ribbon drive features re-inking.

DISKETTE STORAGE: The optional diskette unit accommodates two IBM 3740-style diskettes, providing a maximum on-line storage capacity of 486,288 bytes. The diskettes are rotated at 360 rpm, resulting in an average rotational delay of 83 milliseconds. Positioning time is 2.5 milliseconds per track. Data is transferred at 31,250 bytes/second. The recording technique is not compatible with that of the IBM 3740.

The diskette unit organizes a diskette into 73 data tracks plus 3 spare tracks and 1 index track. Each track is divided into 26 sectors, and each sector holds 128 bytes.

PRICING

The Sycor 250 is available for purchase or on a one- or three-year lease. A separate maintenance contract is available for leased or purchased equipment. Installation is included in the price of the equipment; no extra charges are applied. The investment tax credit is passed on to the customer for puchased equipment; however, the transfer of the ITC is negotiable for leased equipment.

A minimal amount of customer training is provided, consisting of three days at the factory or training center and programmed instruction. Training centers are located at Washington, D.C. and San Francisco.

	Monthly Rental*	Purchase	Monthly Maint.
Cluster Arrangements			
Controller:			
Model 251-1 (480 char.)	$111	$ 2,850	$19
Model 251-2 (1920 char.)	156	4,330	23
Control Station:			
Model 258-1 (480 char.)	173	5,400	33
Model 258-2 (1920 char.)	223	6,700	38
Display Unit:			
Model 257-1 (480 char.)	108	3,450	21
Model 257-2 (1920 char.)	117	4,185	25
Stand Alone Display Terminals			
Model 255-1 (480 char.)	127	4,850	25
Model 255-2 (1920 char.)	142	5,370	29
Options			
Model 2500 Diskette Unit	125	4,200	20
Operator ID Card Reader	30	880	10
Light Pen	25	740	5
Security Keylock	50 OCT	50	—
Numeric Keyboard Lock	0	0	0
Dial Up (for Model 255 only)	18	675	3
Dual Case (96 symbols)	10	350	2
Program Memory, 1K bytes (can specify up to 6K bytes max.)	9	210	2
Printers			
Model 2606-1 (480 char. buffer, 66 cps)	125	5,680	30
Model 2606-2 (1920 char. buffer, 66 cps)	127	5,900	30
Model 2606-3 (unbuffered, 66 cps)	117	4,100	25

Sycor 250 Intelligent Display System

	Monthly Rental*	Purchase	Monthly Maint.
Printers (Continued)			
Model 2612-1 (480 char. buffer, 120 cps)	$ 185	8,100	45
Model 2612-2 (1920 char. buffer, 120 cps)	187	8,320	45
Model 2612-3 (unbuffered, 120 cps)	152	5,200	40
Model 2618-1 (480 char. buffer, 180 cps)	235	11,000	55
Model 2618-2 (1920 char. buffer, 180 cps)	237	11,130	55
Model 2618-3 (unbuffered, 180 cps)	202	7,360	50
Printer Options			
Friction Feed Module	15	400	5
Pin Feed Module**	20	600	5
Tractor Feed Module	23	700	5
6/8 Lines, per inch (switchable)	10	400	0
10/16.5 char per inch (switchable)	15	600	0
Upper/Lower case (96 symbols)	18	675	3

* For one-year lease; includes prime-shift maintenance. Monthly rental under a three-year lease is priced at 20 percent of the monthly rental under a one-year lease excluding maintenance.

** Available at widths of 8, 9, 13-1/8, and 14-3/8 inches; user can specify other widths at a cost of $500 each.

OTC—One Time charge.■

Sycor Model 340 and 350 Series Data Entry Terminals

The Sycor 350 Intelligent Terminal is a more powerful and flexible version of the earlier 340. Introduced in June 1975, the stand-alone terminal contains integral dual diskette drives (to the right of the display screen) in place of the 340's cassette tape drives.

Single-station, programmable display terminal family for data entry/validation and batch communications.

Hardware features include microprocessor control with up to 16K bytes of user memory; single or dual cassette or diskette storage; 60-, 80-, 120-, 165-, or 180-cps serial printers; 300- or 600-lpm line printers, industry compatible magnetic tape drives, and a 250-cpm card reader. Software includes the TAL language for data entry applications plus emulators.

A typical Model 340 with 7K bytes of memory, arithmetic capability, dual cassette drives, an 80-cps printer, and an asynchronous communications adapter is priced at $16,270. Comparable monthly lease rates are $476 and $409 per month for one and two years, respectively, including maintenance.

A typical Model 351 with 16K-byte memory, dual diskette drives, a synchronous communications adapter and a 120-cps printer is priced at $17,100. Comparable monthly lease rates are $470, $435, $418, and $400 per month for one, two, three, and three and one-half years, respectively, including maintenance.

MANAGEMENT SUMMARY

Sycor's expanding product line can be divided into three families: 445/405, 440/410, and 340/350 series. This report covers the older, but still active 340/350 product line. (See Report C21-792-101 for the 445/405 and Report C21-792-301 for the 440/410).

Salient features of the Model 350 include:

- *Diskette storage*—the 350 contains an integral, front-loaded diskette drive that accommodates two 256K-byte flexible disks and accommodates an optional free-standing dual diskette drive.
- *Expanded memory*—the 350 contains a 16K-byte user-addressable memory, of which 7K bytes are available to the user.
- *Programmability*—the 350 is supported by TAL II, an upward-compatible version of Sycor's Terminal Application Language (TAL).
- *Input/output flexibility*—the 350 accommodates all I/O devices currently provided with the earlier Model 340 plus the bi-directional Sprinter matrix printer and a 600-lpm line printer.
- *Operation*—the 350 operates under the direction of Sycor-supplied terminal control programs that provide facilities for creating and maintaining data files.

CHARACTERISTICS

VENDOR: Sycor, Inc., 100 Phoenix Drive, Ann Arbor, Michigan 48104. Telephone (313) 995-1121.

DATE OF ANNOUNCEMENT: Model 340—February 1971; Model 350—June 1975. Models 310 and 320—January 1976; Model 351—June 1976.

DATE OF FIRST DELIVERY: Model 340—1971; Model 350—September 1974; Models 310 and 320—April 1976; Model 351—July 1976.

NUMBER DELIVERED TO DATE: Over 40,000 terminals (all Sycor models), of which about 50 percent are Model 340-type cassette-oriented terminals.

SERVICED BY: Sycor, Inc. at over 100 locations. Sycor currently services about 95 percent of its customer base.

MODELS

The Sycor 300 series family of intelligent data entry terminals include Models 310 and 320, which are single and dual cassette-based data entry terminals; Models 340 and 340E, which are cassette- and/or diskette-based terminals; Model 350, a diskette-based terminal; and Model 351, a group of fixed-configuration versions of Model 350.

Sycor Model 340 and 350 Series Data Entry Terminals

- *Communications*—the 350 operates in batch mode and is transmission-compatible with the IBM 2770, 2780, and 3780, as well as the Sycor Model 340 terminals and Teletype Model 33 and 35 teleprinters.

The Model 340 Intelligent Terminal, the keystone of the Sycor product line since its introduction in 1971, contains a microprocessor with an 8K read-only memory and is primarily oriented toward source data entry applications. The basic Model 340 employs the kind of programming associated with keypunch equipment, i.e., record format control.

The Sycor 340's basic capabilities are substantially enhanced through the addition of the Extended Memory feature, which is available as a 2K-byte, 3K-byte, or 7K-byte MOS random-access memory. This feature equips the 340 to use a variety of Sycor-supplied software facilities, including a specialized data entry language that Sycor calls TAL (for Terminal Application Language), a HASP communications package, an interactive communications package for time-sharing applications (ITS), and a communications package that transforms the Sycor 340 into a master station for communication with unattended Sycor 340 terminals over the dial network.

Under TAL, the user can create his own application programs and tailor them to the demands of his environment. TAL consists of a comprehensive repertoire of instructions which are implemented in the form of macro statements. The TAL source program is converted to machine language in one pass of the Sycor Program Generator. Typical applications for the use of TAL include payroll data entry, order entry, and inventory control.

TAL support for the flexible disk option accommodates up to eight files concurrently and includes sequential, random, and indexed access methods. Sycor also provides a comprehensive, file-oriented disk operating system that can be loaded from cassettes, disks, or punched cards. User programs written in TAL can be converted from cassette to disk versions simply by means of a regeneration of the source program.

Sycor also provides communications software packages including an IBM 2770 and 2780 emulator, a HASP package, and others.

The IBM 2780 emulator is designed to run in a HASP (Release 3.0 or 3.1) environment and requires 5K bytes of extended memory. The emulator provides all standard and optional IBM 2780 features except transparency. Records of up to 256 characters are assembled into blocks of up to 400 characters including data link control codes.

The HASP package is designed to emulate an IBM 2770 or 2780 communications terminal (without transparency) for operation as a remote terminal to an IBM System/360 or 370 computer running under OS/HASP Version III.

CONFIGURATION

Models 310 and 320, **basic data entry terminals, are actually versions of the original Model 340 that are not equipped to accommodate I/O devices. Model 310 is equipped with a single cassette drive, while Model 320 is equipped with two cassette drives. Model 310 is divided into two submodels: the 310-1, a basic unit; and the 310-2, which includes a 3K user memory for the execution of basic TAL programs.**

The basic *Model 340 Terminal* is a single unit that contains a microprocessor with 8K bytes of read-only memory and 1K bytes of random-access memory (for internal buffering only), keyboard, CRT display screen, and one or (optionally) two magnetic tape cassette recorders. The unit can accommodate a synchronous or asynchronous communications interface or both. The Model 340 can be equipped with an additional 2K, 3K, or 7K bytes of random-access memory (the Extended Memory feature) to allow implementation of user programs.

Optional diskette storage for the 340 is provided by a 0.5-million-byte dual diskette drive, which requires the Extended Memory feature with 7K bytes of added memory. I/O options include a 250-cpm card reader, two serial impact printers rated at 80 and 165 cps, a 300- or 600-lpm line printer, and 7- or 9-track industry-compatible magnetic tape drives.

The basic *Model 340D Terminal* is essentially a Model 340 with a dual diskette drive and 16K bytes of random-access memory (RAM). I/O options are the same as those for the Model 340.

Model 340E **is a Model 340 with ECMA-compatible cassette drives. The 340E drives outperform those of the 340.**

The basic *Model 350 Terminal* is a single unit that contains a microprocessor, 16K bytes of random-access memory, keyboard, CRT display screen, and an integral dual diskette drive. A second dual-diskette unit and a printer (any model) are optional. Diskette storage, CRT screen capacity, keyboard styles, and I/O options (except for cassette) are the same as those provided by Models 340 and 340D.

The *Model 351 Terminal* is a Model 350 with one of four printer models and a synchronous or asynchronous communications interface. The 351 is available in four models.

Model 351-1—includes a 60 cps printer.

Model 351-2—includes a 120 cps printer.

Model 351-3—includes a 180 cps printer.

Model 351-5—includes a 300 lpm printer.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex, synchronous or asynchronous. The asynchronous interface is rated at 75 to 1200 bits/second; synchronous interfaces are available for operation at 1200, 2000, 2400, 3600, or 4800 bits/second using 8-level ASCII (with parity) or EBCDIC transmission codes. Synchronous transmission employs the IBM Binary Synchronous Communications (BSC) technique and is compatible with IBM Binary Synchronous terminal such as the 2770, 2780, 3780, and 3735. The EBCDIC Transparency feature, however, is not provided.

All models are equipped with an EIA Standard RS-232C interface and can be used over a dialed, leased, or private-line communications facility via an external modem. Sycor offers its own modems, which are compatible with the Bell System Data Set 201 B/C and 202C (without reverse

Sycor Model 340 and 350 Series Data Entry Terminals

In 1976, Sycor introduced two stripped-down versions of the Model 340; Models 310 and 320 are intended for low-volume remote applications and include one or two cassette tape drives, respectively. Other I/O support is not provided for either of these basic terminals; however, basic TAL support (execute only) is provided for the single-cassette version.

Model 340 is no longer produced but Sycor refurbishes returned models and currently delivers 100 units per month.

Sycor's Sprinter, a microprocessor-controlled, bidirectional matrix printer introduced in January 1976, is a significant improvement over conventional printers. The impact printer is potentially more reliable and quieter than conventional printers, as a result of fewer moving parts. In addition, it provides a high-degree of operating flexibility and increased throughput via microprocessor control, which directs all operations, such as print head acceleration/deceleration, needle timing, carriage control, line feed, etc. Throughput is better than that of conventional printers because the printer can print in both directions (eliminating non-printing carriage returns); can start printing at either end of the line (whichever is closer); can automatically slew vertically (whenever two or more line feeds are encountered); and can skip horizontally over blank fields at a higher speed. The unit is equipped with a function keypad to permit users to set job parameters, such as margin widths. The printer is also equipped with self diagnostics. Three models are available with rated speeds of 60, 120, or 180 cps. According to Sycor, the 60 cps model can equal the throughput of a conventional 80 cps printer. Sprinter printers are used in Sycor Models 250, 350, and 400 series terminals.

Sycor's Strider printer, a 300-lpm belt printer, is produced by General Electric as the TermiNet 340. The printer features 132 print positions and is designed for quiet, high-speed printing to meet high-volume print requirements and can be used on all Sycor terminal models.

Sycor announced its original Key-Cassette Terminals in the third quarter of 1968, and deliveries began in February 1969. By mid-1971, Olivetti, Sycor's European marketing agent, had delivered over 1200 terminals. The Model 340 Terminal was announced in February 1971. Sycor also has a marketing agreement with Mitsui & Co., Ltd. of Tokyo. Mitsui has established an end-user sales organization (within Japan only) that markets, distributes, and services products purchased from Sycor.

USER REACTION

In Datapro's 1977 survey of batch terminal users, 15 users reported on their experience with a total of 322 Sycor 340 and 350 terminals. Datapro interviewed five of these users, with 165 terminals, plus six additional users, with 397 terminals, from a list supplied by Sycor. The ratings of these 21 users are presented below.

channel), for use at 1200 bps. The 202C-compatible modem provides automatic answering as a standard feature. The 201 B/C-compatible modems are available with or without Autodial. For synchronous operation, the following table lists the Bell System modems that correspond to the available data rates. Equivalent modems from independent manufacturers can be used in place of the Bell System modems.

All communications are point-to-point. Communications features include automatic answering, automatic disconnect, data (space) compression/decompression, auto restart, autodial, etc.

DEVICE CONTROL

MODELS 310, 320, AND 340D/340E: A stored format program, keyed or read from tape or diskette, controls the format of data recording by delimiting alphabetic, numeric, and alphanumeric fields and by initiating automatic field skipping, right justification (left zero or left blank fill), check digit validation (optional), or the generation of totals, subtotals, or zero balances (optional).

The program also includes format descriptors, which are displayed on the CRT to aid the operator during a keying operation. The format descriptors are displayed to the left of each variable field, which begins with a displayed symbol to define the type of field; e.g., A for alphanumeric, N for numeric. All format descriptors are protected from accidental erasure or over-recording. When transmitting, only the selected variable data is transmitted; the displayed format remains.

The basic 340 Terminal provides five operating modes: Format mode, Batch mode, Search mode, Automatic Unattended mode, and Program mode.

The Format mode is used when entering data from the keyboard or for reformatting previously-recorded data. Under program control, data entering the display buffer goes into variable fields that follow format descriptors until a complete record or "page" has been entered. Once entered, the record can then be edited prior to its transfer to a selected output device such as the second cassette recorder, printer, or communications line. Alternately, records can be written on the selected output medium as soon as the last data field is entered.

The Batch mode is used for data transfer between selected input and output devices. In this mode, the display buffer operates as two 256-character buffers that are toggled between input and output.

The Search mode is used to locate a specific record or program (record format) recorded on cassette tape or diskette by comparing a keyed identifier of up to 256 characters with the data read from tape. Any portion of a record can be used as an identifier. A program to be loaded from a cassette or diskette is located via a Search operation that searches the recorded formats for the identifier that compares with the one keyed by the operator; the selected format is then loaded.

The Automatic Unattended mode is similar to the Batch mode, except that the terminal responds to a selection sequence received from a remote Sycor terminal operating as a master station or a remote computer such as an IBM System/360 or 370. The selection sequence identifies the terminal, the terminal peripheral, and the desired mode of operation (e.g., read from cassette tape or print a message).

The Program mode is usable only on terminals equipped with Extended Memory and is defined by the program loaded in memory. The program can be loaded from cassette tape, diskette, computer tape, or punched cards.

Sycor Model 340 and 350 Series Data Entry Terminals

	Excellent	Good	Fair	Poor	WA*
Overall performance	5	10	6	0	3.0
Ease of operation	9	7	5	0	3.2
Hardware reliability	6	6	8	1	2.8
Maintenance service	2	9	8	2	2.5
Software & technical support	3	6	8	4	2.4

*Weighted Average on a scale of 4.0 for Excellent.

Users were selected for interview based on the number of terminals installed on the length of use (at least two years), and on wide geographical spread.

In general, the users are satisfied with the Sycor 340 and 350 terminals and regard them as good solid products. Hardware complaints were few. Four of the 11 interviewed users did cite frequent and recurring diskette and printer failures with the older 120-cps Centronics and LogAbax printers; these users also mentioned that the newer bi-directional Sprinter printer provided greater reliability and was much quieter in operation. Only one user reported higher than normal downtime; he also reported no preventative maintenance.

Software is operable according to the majority of interviewed users, but five of these users noted difficulties converting between software levels. Most of the interviewed users said that they were not made aware of new software releases, and most said that software documentation was poor. Some emulator problems were cited by two users.

Maintenance service quality and response times were said to be Good to Excellent by the majority of interviewed users. Three interviewed users with geographically spread installations reported spotty maintenance. Another user reported good response time but poor quality maintenance; repeated failures occured where problems were not resolved on first or second attempts.

Sycor's general response to users' needs was cited as very good by five of the interviewed users who felt they had a good relationship with Sycor. However, four other users felt that Sycor was unresponsive to their needs. One user distinctly stated "there is a lack of communications with the home office."

Sycor offers no rebuttal to these negative comments. Perhaps Sycor's rapid growth, indicated by its large installed base; its frequency of new product introductions; and its switchover from Sorbus-supplied service to its own (which requires a substantial amount of effort to bring up to an adequate level) are justifiable reasons for the negative user remarks.□

Advance and Backspace keys move the cursor forward or backward to allow for correcting errors or modifying data. These controls are repetitive when key pressure is sustained.

File maintenance is performed by inserting the cassette or diskette containing the file to be updated or modified. Each record to be modified is retrieved and displayed via a Search operation. Then, by using the Advance and Backspace keys to position the cursor, data within the existing text can be deleted or changed and new data added. The modified record can then be reinserted into the position previously occupied by the original record on tape or disk.

Pooling can be performed when the terminal is equipped with a second cassette recorder. Selected records from any number of cassettes can be consolidated on one cassette tape, or an entire field can be copied onto a second cassette tape. the second cassette recorder can also be used to enter records formats from a program cassette.

Totals or subtotals can be generated and zero balancing performed under program control by the addition of two 10-digit accumulators (the Arithmetic option).

Vacant or incomplete data fields, as a result of omitted or missing data, are detected and an error message is displayed on the screen when the Omission Detection and Capacity Control option is included. To continue, the operator must reenter the data correctly.

Large formats can be segmented into pages (program chaining). The chaining feature, included with the second recorder, automatically displays the next "page" of format descriptors when the previous "page" is completed.

The Tab Compression option permits the insertion of a horizontal tab character following data in a partially filled or skipped field; the remaining positions within the field are filled with spaces, which are eliminated when the field is transmitted or transferred to an output device.

MODELS 340D AND 350: These models operate under the direction of Sycor-supplied terminal control programs, loaded from cassette tape or diskette. The terminal control programs provide several operating modes: Data Entry, Batch, 2780 or 3780 Communications, Sort, Index, TAL or TAL II Program Generation, Blocking, Attended and Unattended modes, and Master Station operation.

The Data Entry and Batch modes are similar in operation to the Format and Batch modes of the Model 340. The data entry program recognizes the same format characters as the Format mode of the Model 340. In the Batch mode, I/O operations are overlapped only if the input and output devices differ. Cassette-to-cassette and diskette-to-diskette operations are not overlapped. A complete file is read from diskette, including deleted records unless delection is manually selected. All non-deleted records are pushed up within the output file, and relative positions of all records within their file are changed.

The 2780 or 3780 Communications mode directs the terminal to emulate an IBM 2780 or 3780 via the 2780 or 3780 Control Program. In this mode, a 340D or 350 terminal can communicate with an IBM 2780 or 3780 terminal, an IBM System/360 or 370 computer, or another Sycor 340D or 350 terminal. The basic 2780 or 3780 Control Program can be combined with program modules from the System Library to provide additional capabilities. The program modules include: Multiple Record feature, Terminal ID feature, Secondary Terminal feature, and Peripheral Drivers.

The Sort mode supports generation of an index file from an ordered or unordered data file. Each entry in the generated index file includes a 1- to 16-character alphanumeric key and the track and sector addresses of the record in the data file that contains the key. File generation input includes the data file from which the index is generated, key parameters including key length and relative position within the data record, and file description (i.e., ordered in an ascending or descending manner or unordered). The index file must be on the same diskette volume as the related data file, and the indexed data file must contain fixed-length records. The index file must be regenerated to reflect any modifications

Sycor Model 340 and 350 Series Data Entry Terminals

within the corresponding data file. More than one index file can be generated per data file.

The Index mode is used to access and modify the file directory as a result of file creation or maintenance. A new file ID can be added for each new corresponding data file or deleted for each deleted data file. An existing file ID is changed to reflect any modifications in file name, record length, file type, and the next available record pointer. Emptying a file resets the record pointer from the next available record to the beginning of the file (useful for transaction files). Initializing a volume clears all existing ID's and builds a directory (track) in an IBM-compatible format.

The TAL Generator mode is used to generate a TAL object program from a source program and TAL library. The object program is stored on cassette or diskette.

The Blocking model allows several records to be blocked on diskette and accessed via the TAL program.

The Master Station mode permits one terminal to poll and address all other stations connected to the dial network.

SOFTWARE

Sycor provides a simple but flexible data entry language called TAL (Terminal Application Language), which consists of macro statements that can be linked to data entry fields defined in the displayed data entry format. The TAL instruction repertoire includes check digit, range checking, table checking, data manipulation, arithmetic (addition, subtraction, multiplication, and division), test, branching, verify, and I/O instructions. The keyed TAL source statements are converted to machine language by the Program Generator (in one pass) and are written on cassette tape or diskette. The result is the desired application program.

Sycor introduced an enhanced version of its proprietary Terminal Application Language for use with the Model 350 as well as the Model 340 with the diskette option. Called TAL II, the new programming language includes the full complement of existing TAL instructions plus additional instructions and programming features and a new source-code format. Sycor also provides a TAL-to-TAL II translator program. Besides the original TAL instructions that provide arithmetic, logical branching, data transfer, I/O, and data verification functions, the new TAL II instructions permit naming programs and field programs, defining overlay statements, including input/output drivers in the program, and skipping to the top of a new page in the source listing.

The TAL II source program is written in single statements, omitting separate entries for instructions and tables. Source statements can be given labels and interspersed with comments for program documentation. Statement labels permit jumping to a subroutine and returning to the existing (calling) program, an enhancement over the original TAL software, which only supported jumps within the same program. The source program is entered in a single data stream under control of the TAL II generator. Source output can be either an object program, a generator listing, or both. Thus, during initial program generation, an error list can be produced for program debugging. After corrections are made, a clean object program with corresponding listing can be produced.

The TAL-to-TAL II translator produces a TAL II source program with its separate tables and groups of field programs. The TAL II source program is then processed by the TAL II generator to obtain a TAL II object program and listing.

TAL support for diskette is file-oriented and handles up to eight files concurrently. Diskette TAL includes three access methods—sequential, "random," and indexed; miscellaneous instructions including backspace, rewind, search, close file, home, and delete; and declarative instructions including open file. Sequential access includes read, write, and update instructions. Random access applies to files containing fixed-length records only; addressing is performed on a relative record basis. Indexed access is based on a 16-character key and is implemented by combining the base and index file addresses.

The disk operating system, loaded from diskette or cassette via a 128-byte ROM bootstrap loader, provides disk operating modes. The modes include data entry (equivalent to the format mode on the basic 340), communication control (essentially the same as the 2780 emulator), edit/search, batch (equivalent to the batch mode on the basic 340), directory, and program. Communication control does not include support for the IBM 2770, master station, or auto dialer; support for these capabilities is planned. Director mode provides user access to the disk directory to allocate disk files (file parameters include name, record length, write protect status, file type, and file length), delete files, modify file parameters, empty a file, and initialize a disk volume. Program mode is supported as a sub-mode that includes all modes except the directory mode.

A Sycor-supplied software library, contained on cassette tape or diskette, includes TAL, the Program Generator, a loader, and several device control routines. Support programs for diskette include programs for index file creation, volume copying (which allows selective copying of files on the input volume under keyboard control), file copying, and a planned sort/merge function.

Sycor also provides application software packages under the category of Preprogrammed Systems. These require a minimum of 3K bytes of Extended Memory and include: 1) the HASP package that emulates an IBM 2770 terminal without Transparency for use with an IBM 360/370 computer running under OS/HASP; 2) the 2780 or 3780 emulator that emulates an IBM 2780 or 3780 terminal without Transparency for use with an IBM 360/370 computer running under OS/HASP (Release 3.0 or 3.1); 3) the Interactive Time-Sharing (ITS) package for communication with ASCII-oriented time-sharing systems at speeds up to 1200 bits/second; and 4) the Communication Station package for operation as a master station communicating with unattended Sycor 340 Terminals.

COMPONENTS

DISPLAY STATION: The CRT keyboard/display unit for Models 310, 320, 340, and 350 includes a 9-inch (diagonal measurement) CRT and a typewriter-style keyboard. The display provides a viewing area 5.5 inches high by 4.75 inches wide.

The display arrangement is 9 lines of 64 characters each, providing a total of 576 display positions. The last line of 64 characters is reserved for operating status, leaving 512 positions for data entry. A character set of 62 ASCII characters, including upper case alphabetics, numerics, punctuation, and special characters, is generated via a 5-by-7 dot matrix and is displayed in green against a dark background. Model 350 is equipped with an anti-glare shield.

The typewriter and data entry style keyboards include a 10-key numeric cluster at the right of the main keygroup. Three groups of keys above the main keygroup provide manual control of I/O and control functions. Any of 64 ASCII characters can be generated, including upper case alphabetics, numerics, punctuation, and special symbols.

CASSETTE TYPE (340 SERIES): One or (optionally) two cassette tape recorders each accommodate a "Philips-type"

Sycor Model 340 and 350 Series Data Entry Terminals

cassette, which contains 280 feet of 0.15-inch magnetic tape recorded at 800 bits/inch. Total cassette capacity is rated at 200,000 characters. Data is recorded serially by bit on 2 complementary parallel tracks in the form of 9 bits/character, which includes 1 parity bit. Record gaps are 1 inch long. Record length is variable from 1 to 256 characters. A cassette can store up to 800 256-character records or up to 1400 80-character records.

The cassette tape recorders on the basic 310, 320, 340, and 340D Terminals move tape at 3.9 inches/second except when the terminal is transmitting or receiving data, in which case the tape speed is 12.5 inches/second. The Fast Recorder Option (Model 340 only) provides the 12.5-inches/second speed for all terminal operations. The data transfer rate at 3.9 inches/second is 350 or 116 char/second for read or write operation, respectively; at 12.5 inches/second, the data transfer rate is 1000 or 333 char/second for read or write operations, respectively. The lower transfer rate when writing is an effective rate that results from the unit's read-after-write checking feature, which backs up the tape and rereads each block written. Rewind speed is 120 inches/second.

The ECMA-compatible Models 310, 320, and 340E are equipped with higher-performance cassette drives that provide a standard read/write speed of 12.5 inches second and a data transfer rate (read or write) of 1000 char/second. Read-after-write checking "on the fly" is implemented via a separate read head. Tape marks are compatible with the ECMA standard.

Data transcription between cassette tape and computer-compatible magnetic tape is performed via the terminal and a separate magnetic tape unit under program control.

DISKETTE STORAGE: The optional diskette unit accommodates two IBM 3740-compatible diskettes, providing a maximum storage capacity of 485,888 bytes (242,944 bytes per diskette). The diskettes are rotated at 360 rpm for an average rotational delay of 83 milliseconds.

Positioning time is 2.5 milliseconds per track. Seek time is 27.5 milliseconds track-to-track, 93 milliseconds average, and 218 milliseconds maximum. Data is transferred at 31,250 bytes/second. The recording technique is compatible with that of the IBM 3740 when an optional EBCDIC software module is used.

The diskette unit organizes a diskette into 73 data tracks plus 2 spare tracks and 1 index track. Each track is divided into 26 sectors, and each sector into 128 bytes.

COMPUTER TAPE DRIVES: Available tape formats are 7-track, 556/800 bits/inch; 9-track, 800 bits/inch; or 9-track, 1600 bits/inch. All models record data on ½-inch tape in industry-compatible formats. Each of these computer-compatible tape drives is a separate, desk-top unit with a read/write speed of 12.5 inches/second. Rewind speed is 40 inches/second. The tape drives are manufactured by Wangco, and each accommodates an 8.5-inch reel (1200 feet).

CARD READER: A desk-top unit reads 80-column cards at 250 cards/minute. A single input hopper and output stacker have a rated capacity of 600 cards each.

SERIAL PRINTERS (Model 340): Impact matrix printers rated at 80 (3484) or 165 (3485) characters per second with 132 print positions. The printers provide a character set of 64 symbols; each symbol is formed via a 7-by-7 dot matrix. The printers accommodate six-part, continuous, pin-fed forms from 2⅛ to 15½ inches wide. Horizontal and vertical spacing is 10 characters per inch and 6 lines per inch, respectively. The printers are available with front feed in addition to, or in place of, the adjustable tractor feed and are produced by Sycor.

SERIAL PRINTERS (Model 350): Three models of bi-directional impact matrix printers provide rated speeds of 60, 120, and 180 cps and 132 print columns. Each is controlled via an integral microprocessor with 5K bytes of memory. The printers feature a standard 64-character set of ASCII symbols (each formed via a 7-by-7 dot matrix), a cartridge ribbon, and "snap-out" tractor pin or friction feed mechanisms. The printers accommodate 6-part continuous feed forms from 2 to 14⅞ inches wide via tractor feed or 4 to 4⅞ inches wide via tear-bar tractor feed. The head position is adjustable for paper thickness. Standard horizontal and vertical spacing is 10 characters/inch and 6 lines/inch. Optional spacing provides 16½ characters/inch horizontally and/or 8 lines/inch vertically. A re-inking mechanism extends ribbon life. Vertical slewing at high speed over blank lines is standard. A horizontal slew option performs high-speed skipping over blank fields. Each model is equipped with a 12-key function pad for setting margin widths, forms length, vertical and horizontal tab positions; for initiating commands such as "top-of-form"; and for setting forms alignment for pre-printed forms. The keys can also initiate generation of two diagnostic test patterns. One is a continuous printout of the character set on 132-character lines; the other is alternate X's and O's on 16 character lines.

BELT AND LINE PRINTERS: The belt printer, called Strider and produced by General Electric as the TermiNet 340, is rated at 300 lines per minute and provides 132 print positions. The printer provides a standard character set of 64 ASCII characters and accommodates 6-part continuous, pin-fed forms from 3 to 15 inches wide via adjustable tractor feed. Horizontal and vertical spacing is 10 characters per inch and 6 lines per inch, respectively.

The line printer, a drum printer produced by Data Printer is rated at 600 lines per minute and provides 132 print positions and a standard 64-character print set. Horizontal and vertical spacing is 10 characters per inch and 6 or 8 (optional) lines per inch, respectively. The printer accommodates 6-part, pin-fed continuous forms from 3½ to 19½ inches wide.

PRICING

The Sycor 300 series terminals are available for purchase or lease. Lease arrangements are available for one or two years for the Model 340 and for one, two, or three years or 42 months for Models 350 and 351.

Maintenance is priced separately for both leased and purchased equipment. Prime shift maintenance is provided; however, service for 24 hours per day 7 days per week is available on a negotiable basis. Sycor provides quantity discounts up to 25 percent for purchased units and discounts up to 25 percent for lease periods up to 5 years. A purchase credit plan is available to convert from lease to purchase.

Installation charges for Models 310, 320, 340, 350, and 351 are $100 per terminal.

Sycor provides training at its three training centers, the corporate headquarters, Washington D.C., and San Francisco. Two to four days of training are provided at a charge of $50 per day per person. Sycor also offers on-site training at a customer location for a minimum of four persons and in major cities as required.

Sycor Model 340 and 350 Series Data Entry Terminals

		Monthly Charge*			
		1-Year Lease	2-Year Lease	Purchase	Monthly Maint.
	Model 340 Terminal				
340	Communications Terminal; includes single cassette drive	$187	$160	$6,600	$37
3401	Fast Recorder Option (one per drive)	10	8	400	—
3402	Second Recorder and Auto Paging	35	30	1,120	7
3408	Tab Compression	7	6	200	2
3409	Omission Detecting Capacity Control	14	12	320	4
3412	Arithmetic Option; includes two 10-digit accumulators	24	20	800	4
3421	Extended Memory; 2K bytes	15	13	400	5
3422	Extended Memory; 3K bytes	28	24	800	8
3423	Extended Memory; 7K bytes	51	45	1,400	16
3440	Card Reader; 250 cpm	122	104	3,500	22
3456	Tape Drive; 9 tk., 1600 bpi	395	342	11,800	100
3457	Tape Drive, 7 tk., 556/800 bpi	215	183	7,200	35
3459	Tape Drive, 9 tk., 800 bpi	215	183	7,200	35
3484	Printer; 80 cps	155	133	5,600	35
3477	Front Feed Device (in place of tractor)	35	31	800	15
3485	Printer; 165 cps	250	215	6,600	55
3478	Front Feed Device (in addition to tractor)	50	45	1,200	20
3487	Printer Control (for 3484/3485)	N/C	N/C	N/C	N/C
3494	Line Printer; 600 lpm	710	606	22,500	130
3498	6/8 Lines per Inch	35	29	1,400	N/C
3499	12 channel VFU	20	—	800	—
34730	Strider Printer; 300 lpm	410	351	12,000	83
34740	Front Low Paper Sensor	6	5	145	1
34741	Basket	5	4	140	N/C
34742	Guideframes and Strap	2	2	70	N/C
3464	Asynchronous Communications Adapter; 110 to 1200 bps ASCII	24	21	750	6
	Synchronous ASCII Communications Adapter;				
3465	1200 bps	37	33	1,100	12
3466	2000/2400 bps	37	33	1,100	12
3468	3600/4800 bps	37	33	1,100	12
3464-M12	Asynchronous ASCII Communications Adapter with Modem; 1200 bps	53	46	1,600	13
3465-M12	Synchronous ASCII Communications Adapter with Modem; 1200 bps	64	56	1,900	19
3466-M24	Synchronous ASCII Communications Adapter with Modem, 2400 bps	92	79	2,900	22
3461	Unattended Communications	N/C	N/C	N/C	N/C
3404	Data Compression (terminal to terminal)	7	6	200	2
3467	EBCDIC Feature	N/C	N/C	N/C	N/C
3491	Auto Dialer (for synchronous communications)	30	26	800	10
3495	Data Compress Enable/Disable Switch	N/C	N/C	200	N/C
3496	Internal/External Clocking Switch	N/C	N/C	200	N/C
3497	ASCII/EBCDIC Switch	N/C	N/C	200	N/C
2011-3	201C Compatible Modem without Autodial; 1200 bps (for dialup lines)	60	51	2,000	10
2012-3	201C Compatible Modem, with Autodial; 1200 bps, requires 3491 (for dialup lines)	60	51	2,000	10
2013-3	201B/C Compatible Modem; 2400 bps (for leased lines)	60	51	2,000	10
3460	202C Compatible Modem; 1200 bps, requires 3464 or 3465	32	27	1,000	7

		Monthly Charge*					
		1-Year Lease	2-Year Lease	3-Year Lease	42-Month Lease	Purchase	Monthly Maint.
	Model 350/351 Terminal						
350	Terminal with 16K Memory and Dual Diskette Drive	$296	$274	$262	$251	$ 9,600	$ 71
351	Terminal with 16K Memory, Dual Diskette Drive, Printer, and 3565, 3566, or 3568 Synchronous Communications Adapter:						
351-1	With 60 cps printer	405	375	360	345	16,100	105
351-2	With 120 cps printer	470	435	418	400	17,100	120
351-3	With 180 cps printer	530	490	470	450	19,120	130
351-5	With 300 lpm printer	662	612	587	562	23,500	160

*Includes maintenance.

Sycor Model 340 and 350 Series Data Entry Terminals

		Monthly Charge*					
		1-Year Lease	2-Year Lease	3-Year Lease	42-Month Lease	Purchase	Monthly Maint.
	Model 350/351 Terminal (Continued)						
3408	Tab Compression	7	6	—	200		2
3509	Omission Detection and Capacity Control	14	13	13	12	320	4
3512	Arithmetic Option (dual accumulators)	24	22	21	20	800	4
3540	Card Reader, 250 cpm (mutually exclusive with 3564)	120	110	105	100	3,500	20
3556	Tape Drive; 9 tk., 1600 bps	395	366	351	336	11,800	100
3557	Tape Drive; 7 tk., 556/800 bpi	215	197	188	179	7,200	35
3559	Tape Drive, 9 tk., 800 bpi	215	197	188	179	7,200	35
3520	Quad, Diskette Option	140	129	124	118	4,400	30
3606	Sprinter Printer, 60 cps	134	123	118	113	4,900	27
3612	Sprinter Printer, 120 cps	197	182	174	166	5,900	42
3618	Sprinter Printer, 180 cps	255	235	225	214	7,920	52
3620	Tractor Feed Module (includes printer stand)	23	21	20	19	700	5
3624	Tear-Bar Tractor Feed Module	23	21	20	19	900	5
3635	Stand for Tear-Bar Tractor	5	5	4	4	250	N/C
3640	6/8 lines per inch	10	9	9	8	400	N/C
3642	10/16.5 char. per inch	15	14	13	12	600	N/C
3644	Fast Horizontal Slewing	20	19	18	17	600	5
3652	Upper/Lower Case ASCII (7 x 9, dot matrix)	18	17	16	15	675	3
3594	Line Printer; 600 lpm	710	652	623	494	22,500	130
3598	6/8 Lines per Inch	35	32	30	28	1,400	N/C
3599	12 channel VFU		18	17	16	800	N/C
3730	Strider Line Printer; 300 lpm	410	377	361	345	12,000	83
3740	Front Low-Paper Sensor	6	6	5	5	145	1
3741	Basket	5	5	4	4	140	N/C
3742	Guideframes & Strap; requires 3741	2	2	2	2	70	N/C
3564	Asynchronous ASCII Communitions Adapter; 110/150/300/600/1200/bps (mutually exclusive with 3540)	24	22	21	20	750	6
	Synchronous ASCII Communications Adapter:						
3565	1200 bps	37	35	33	32	1,100	12
3566	2000/2400 bps	37	35	33	32	1,100	12
3568	3600/4800/9600 bps	37	35	33	32	1,100	12
3564-M12	Asynchronous ASCII Communications Adapter with Modem; 1200 bps (mutually exclusive with 3540)	53	49	47	45	1,600	40
3565-M12	Synchronous ASCII Communications Adapter, with Modem; 1200 bps	64	60	57	55	1,900	19
3566-M24	Synchronous ASCII Communications Adapter with Modem; 2400 bps	92	85	82	78	2,900	22
2011-2	201C compatible Modem, without Autodial, 2400 bps (for dial up lines)	60	55	53	50	2,000	10
2012-2	201C compatible Modem with Autodial, 2400 bps; requires 3591 (for dial up lines)	60	55	53	50	2,000	10
2013-2	201 B/C compatible Modem, 2400 bps (for leased lines)	60	55	53	50	2,000	10
3560	202C Compatible Modem, 1200 bps (for use with 3564 or 3565)	32	30	29	27	1,000	7

*Includes maintenance.■

Sycor 300 and 400 Series Intelligent Data Entry Terminals

MANAGEMENT SUMMARY

Sycor was one of the early pioneers of intelligent terminals and the first to combine keyboard, display, and cassette drive in a single unit under the control of a data entry program on cassette tape. A whole family of intelligent data entry terminals has grown from its successful Key-Cassette Terminal, the initial product line, which was introduced in the third quarter of 1968.

The Model 340 succeeded the original Key-Cassette Terminal and has been the keystone of Sycor's product line since its introduction in 1971; there are now over 25,000 units delivered. With the introduction of the Model 350 in June 1975 and the unveiling of the Model 440 in July 1975, Sycor improved and broadened its competitive edge in the exploding data entry industry with products designed to meet the growing demands of more sophisticated users over a broader range of applications.

Model 350 is an upgraded diskette-oriented version of the Model 340, and the Model 440 is a remote, shared-processor distributed processing system. At the June 1976 NCC, Sycor introduced special versions of the 350 and 440. The 351, is a fixed-configuration Model 350 with a serial or line printer and communications interface. The 410 is a single-station version of the 440. Also in 1976, Sycor introduced two stripped-down versions of its still-popular Model 340; Models 310 and 320 are intended for low-volume remote applications and include one or two cassette tape drives, respectively. Other I/O support is not provided for either of these basic terminals; however, basic TAL support (execute only) is provided for the single-cassette version.

A family of single-station or clustered programmable display terminals that support data entry/validation, batch communications, and file maintenance for data entry and/or distributed processing applications.

Standard hardware features include cassette, diskette, and fixed disk for program and file storage. Standard software includes a programming language, assembler, disk operating system, communications emulators, and COBOL. Options include additional diskette and fixed disk storage up to 20 million bytes, a family of serial printers with rated speeds of 60 to 180 cps, 300- or 600-lpm line printers, industry-compatible 7- or 9-track tape drives, and a 250-cpm card reader.

Typical stand-alone configurations include a keyboard/display station, dual cassette or dual diskette drive, and printer. Cluster configurations can include up to 8 keyboard/display stations, up to 10 or 20 million bytes of fixed disk storage, and one or two printers.

Sycor's family of data entry terminals are intended to satisfy a wide range of applications beginning at entry level; all terminals are transmission compatible and can operate in the same network. Pricing with maintenance ranges from about $200 per month on a one-year lease for a basic single-station unit to over $1,000 per month for an 8-station cluster without peripherals.

Sycor's Model 440 Clustered Terminal Processing System, unveiled in July 1975, is a shared-processor remote data entry system that accommodates up to eight CRT keystations. The microprocessor-based controller (center) contains 5 or 10 million bytes of fixed-disk storage and either a cassette or diskette drive for program loading. An additional 10 million bytes of fixed disk storage is optional. Sycor also offers a single station version called the Model 410.

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

Other key announcements in 1976 besides the new terminal models mentioned above included:

- The unveiling of a new microprocessor-controlled printer (January).
- The introduction of COBOL for Models 440 and 410 at no extra charge (May).
- The introduction of the Network Control System (NCS) for all Sycor models (May).
- The availability of a second dual diskette drive for the Model 350 (May).
- The availability of an additional 10 million bytes of fixed disk storage for the Model 440 (May).
- The introduction of a transportation-oriented Model 440 system (440T) that operates in a multi-station network (May).

Model 340 is a key-cassette terminal that contains a microprocessor with an 8K read-only memory and is intended for source data entry applications. The basic 340 employs the kind of programming associated with keypunch equipment, i.e., record format control.

The Sycor 340's basic capabilities are substantially enhanced through the addition of the Extended Memory feature, which is available as a 2K-byte, 3K-byte, or 7K-byte MOS random-access memory. This feature equips the 340 to use a variety of Sycor-supplied software facilities, including a specialized data entry language that Sycor calls TAL (for Terminal Application Language), a HASP communications package, an interactive communications package for time-sharing applications (ITS), and a communications package that transforms the Sycor 340 into a master station for communication with unattended Sycor 340 terminals over the dial network.

Model 350 is an upgraded version of the Model 340 with a dual diskette drive in place of the 340's dual cassette drive and a 16K-byte user-addressable memory, of which, 7K bytes are available to the user. The 350 operates under the direction of Sycor-supplied terminal control programs that provide facilities for creating and maintaining data files. Data entry support is provided by TAL II, an upward-compatible version of TAL with expanded features. Standard diskette storage provides 500K bytes of storage with the option to add another 500K bytes via a free-standing dual diskette unit. Input/output flexibility is provided by the availability of the I/O devices associated with the 340. Transmission compatibility with the IBM 2770, 2780, and 3780, as well as with Sycor Model 340 terminals and Teletype 33 and 35 teleprinters, is a standard feature of the Model 350. The 351 has all the standard and optional features of the 350 and is available in four models that provide print speeds of 60 cps, 120 cps, 180 cps, or 300 lpm.

CHARACTERISTICS

VENDOR: Sycor, Inc., 100 Phoenix Drive, Ann Arbor, Michigan 48104. Telephone (313) 971-0900.

DATE OF ANNOUNCEMENT: 340: February 1971; 350: June 1975; 440: July 1975; 310 and 320: January 1976; 410 and 351: June 1976.

DATE OF FIRST DELIVERY: The Sycor 340 began deliveries in 1971 and was followed by deliveries of the 350 in September 1974 and the 440 in February 1976. The Sycor 310 and 320 began deliveries in April 1976.

The 351 and 410 are scheduled for initial delivery in July and October 1976 respectively.

NUMBER DELIVERED TO DATE: Over 30,000 terminals of which about 66 percent are Model 340-type cassette-oriented terminals.

SERVICED BY: Sycor, Inc. and by Sorbus at remote locations. Sycor currently services about 85 percent of its customer base.

MODELS

The Sycor family of intelligent data entry terminals includes Models 310 and 320, which are single and dual cassette-based basic data entry terminals; Models 340, 340D, and 340E, which are cassette- and/or diskette-based terminals; Model 350, a diskette-based terminal, Model 351 a fixed-configuration version of Model 350; Model 440, a clustered disk-based data entry system; and Model 410, a single-station version of the Model 440. All models are microprocessor-controlled and are described in the following paragraphs.

The basic *Model 340 Terminal* is a single unit that contains a microprocessor with 8K bytes of read-only memory and 1K bytes of random-access memory (for internal buffering only), keyboard, CRT display screen, and one or (optionally) two magnetic tape cassette recorders. The unit can accommodate a synchronous or asynchronous communications interface or both. The Model 340 can be equipped with an additional 2K, 3K, or 7K bytes of random-access memory (the Extended Memory feature) to allow implementation of user programs.

Optional diskette storage for the 340 is provided by a 0.5-million-byte dual diskette drive, which requires the Extended Memory feature with 7K bytes of added memory. I/O options include a 250-cpm card reader, two serial impact printers rated at 80 and 165 cps, a 300- or 600-lpm line printer, and 7- or 9-track industry-compatible magnetic tape drives.

The basic *Model 340D Terminal* is essentially a Model 340 with a dual diskette drive and 16K bytes of random-access memory (RAM). I/O options are the same as those for the Model 340.

***Model 340E* is a Model 340 with ECMA-compatible cassette drives. The 340E drives outperform those of the 340.**

The basic *Model 350 Terminal* is a single unit that contains a microprocessor, 16K bytes of random-access memory, keyboard, CRT display screen, and an integral dual diskette drive. A second dual-diskette unit and a printer (any model) are optional. Diskette storage, CRT screen capacity, keyboard styles, and I/O options (except for cassette) are the same as those provided by Models 340 and 340D.

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

Model 440 is Sycor's initial clustered data entry terminal. The cluster arrangement can accommodate up to eight CRT keyboard/display operator stations equipped with either data entry or typewriter-style keyboards; the two cannot be mixed. Disk storage provides 5 or 10 million bytes and can be expanded to 20 million bytes via a second fixed-disk cabinet. A single cassette or diskette drive provides compatibility with the other Sycor terminals and also serves as a program loader. Ample memory capacity is provided–32K to 64K bytes. I/O flexibility is provided via a host of I/O devices including a card reader, 7- and 9-track industry compatible magnetic tape drives, and printers that offer a range of print speeds from 60 cps to 60 lpm. Transmission compatibility is provided with IBM 2780 and 3780 via program emulation and with Sycor Models 340 and 350. Strong data entry support is furnished by TAL II, which is designed for data entry and data validation.

However, the 440 is not just supported as a data entry system. A subset of ANSI COBOL provides a strong batch processing language that supports file maintenance and report generation. TAL and COBOL programs can run cocurrently–TAL in the foreground, COBOL in the background. The combination of TAL and COBOL support transforms the 440 into a product that can serve the growing trend toward distributed processing. The single-station 410 is intended to satisfy low-volume requirements in a data entry or distributed processing network. Its maximum disk storage capacity of 10 million bytes should be more than adequate for this application. And it is available with the same range of printer speeds as the 440 (60 cps to 300 lpm).

The TAL II data entry language consists of a comprehensive repertoire of instructions that are implemented in the form of macro statements that can be linked to data entry fields in the display format. The TAL source program is converted to machine language in one pass of the Sycor Program Generator and written on diskette or fixed disk. The TAL II repertory consists of arithmetic, branching, data transfer, editing, and I/O instructions. Disk or diskette access methods include sequential, random, and indexed. Typical applicatons for the use of TAL include payroll, data entry, order entry, and inventory control.

Sycor's microprocessor-controller, bidirectional printer is a significant improvement over conventional mechanical printers. The printer is potentially more reliable and quieter than mechanical printers as a result of fewer moving parts. In addition, it provides a high-degree of operating flexibility and increased throughput via microprocessor control, which directs all operations such as print head acceleration/deceleration, needle timing, carriage control, line feed, etc. Throughput is better than that of conventional printers because the printer can print in both directions eliminating non-printing carriage returns, the capability to start printing at either end of the line whichever is closer, automatic vertical slewing whenever two or more line feeds are encountered and the

The Sycor 350 Intelligent Terminal is a more powerful and flexible version of the earlier 340. Introduced in June 1975, the stand-alone terminal contains integral dual diskette drives (to the right of the display screen) in place of the 340's cassette tape drives. An additional dual-diskette drive is optional. Sycor also offers a packaged version of the 350, the 357, which includes a communication interface and printer.

The *Model 351 Terminal* is a Model 350 with one of four printer models and a synchronous or asynchronous communications interface. The 351 is available in four models.

- **Model 351-1–includes a 60 cps printer.**
- **Model 351-2–includes a 120 cps printer.**
- **Model 351-3–includes a 180 cps printer.**
- **Model 351-4–includes a 300 lpm printer**

The *Model 440 Clustered Terminal Processing System* is a shared-processor remote data entry system that consists of a microprocessor-based controller and one to eight CRT keyboard/display units. The separate controller contains 32K to 64K bytes of random-access memory, 5.3 or 10.6 million bytes of fixed disk storage, and a single cassette or diskette drive. A second 10.6 million byte disk drive is optional. Each keyboard/display unit provides a screen capacity and display arrangement identical with those of the Sycor Models 340 and 350. A typewriter or data entry style keyboard can be specified. Cassette and diskette drives are identical with those of the other Sycor models. I/O options are the same as those available with Models 340 and 340D.

The *Model 410 Data Entry and Processing System* is a single-station remote data entry terminal that consists of a microprocessor-based controller, a Binary Synchronous communications interface, a CRT keyboard/display unit, and a printer. The separate controller contains 40K to 64K bytes of random-access memory, 2.5, 5, or 10.6 million bytes of fixed-disk storage, and a single cassette (standard) or diskette drive (optional). The keyboard/display unit provides a screen capacity and display arrangement identical with Sycor Models 340, 350, and 440. A typewriter or data entry style keyboard can be specified.

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

option to horizontally slew over blank fields. The unit is equipped with a function keypad to permit users to set job parameters, such as margin widths. And the printer is equipped with self diagnostics. Three models are available with rated speeds of 60, 120, or 180 cps. According to Sycor, the 60 cps model can equal the throughput of a conventional 80 cps printer.

The previous parragraphs have highlighted the key aspects of Sycor's family of data entry terminals. Sycor has committed itself to the remote data entry environment since its inception. Its products have proliferated into a broad family of compatible devices that offer users everything from an entry-level terminal to a sizeable terminal system that transcends remote data entry applications to provide the essential ingredients for implementing distributed processing.

Sycor announced its original Key-Cassette Terminals in the third quarter of 1968, and deliveries began in February 1969. By mid 1971, Olivetti, Sycor's European marketing agent, had delivered over 1200 terminals. Sycor also has a marketing agreement with Mitsui & Co., Ltd. of Tokyo. Mitsui has established an end-user sales organization (within Japan only) that markets, distributes, and services products purchased from Sycor.

USER REACTION

In Datapro's 1975 survey of alphanumeric display terminal users, 7 users reported on their experience with 70 Sycor 340 Terminals. In Datapro's 1975 survey of key entry users, 6 users reported on their experience with 116 Sycor 340's. And in Datapro's 1975 survey of remote batch terminal users, 15 users reported on their experience with 37 Sycor 340's. The combined experience of these 28 users is summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	8	17	3	0	3.2
Ease of operation	12	13	2	1	3.3
Hardware reliability	13	12	2	1	3.3
Maintenance service	3	16	8	1	2.8
Software & technical support**	3	7	9	3	2.5

* Weighted Average on a scale of 4.0 for Excellent.
**Not reported by data entry users.

The users in general were quite satisfied with the 340 Terminals. Programmability, operating flexibility, editing capability, ease of operation, reliability, and low cost were cited as the principal advantages. Disadvantages noted by the users included small screen size, limited memory capacity, and low speed and limited storage capacity of the cassette tape unit. One user with a 340 system installed since 1973 commented about ongoing problems with the card reader; this user also complained about a 24-hour service response and many problems with the initial software release. Another user complained of poor Canadian representation. Except for these few scattered complaints, user reaction as a whole was quite favorable for the Sycor 340 Terminals. □

Cassette and diskette drives are identical with those of the Sycor models. The 410 is available in four models:

- Model 410-1–includes a 60 cps printer.
- Model 410-2–includes a 120 cps printer.
- Model 410-3–includes a 180 cps printer.
- Model 410-4–includes a 300 lpm printer.

Any model of the 410 can accommodate a second printer, but cannot include two line printers.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex, synchronous or asynchronous. The asynchronous interface is rated at 75 to 1200 bits/second; synchronous interfaces are available for operation at 1200, 2000, 2400, 3600, or 4800 bits/second using 8-level ASCII (with parity) or EBCDIC transmission codes. Synchronous transmission employs the IBM Binary Synchronous Communications (BSC) technique and is compatible with IBM Binary Synchronous terminals such as the 2770, 2780, 3780, and 3735. The EBCDIC Transparency feature, however, is not provided.

All models are equipped with an EIA Standard RS-232C interface and can be used over a dialed, leased, or private-line communications facility via an external modem. Sycor offers its own modem (Model 3460), which is compatible with the Bell System Data Set 202C (without reverse channel), for use at 1200 bps. The Model 3460 provides automatic answering as a standard feature. For synchronous operation, the following table lists the Bell System modems that correspond to the available data rates. Equivalent modems from independent manufacturers can be used in place of the Bell System modems.

Data Rate, bits/second	Bell System Modem
2000	201A
2400	201B
3600	203A
4800	208A/B

All communications are point-to-point. Communications features include automatic answering, automatic disconnect, data (space) compression/decompression, auto restart, autodial, etc.

DEVICE CONTROL

MODELS 310, 320, 340, AND 340E: A stored format program, keyed or read from tape or diskette, controls the format of data recording by delimiting alphabetic, numeric, and alphanumeric fields and by initiating automatic field skipping, right justification (left zero or left blank fill), check digit validation (optional), or the generation of totals, subtotals, or zero balances (optional).

The program also includes format descriptors, which are displayed on the CRT to aid the operator during a keying operation. The format descriptors are displayed to the left of each variable field, which begins with a displayed symbol to define the type of field; e.g., A for alphanumeric, N for numeric. All format descriptors are protected from accidental erasure or over-recording. When transmitting, only the selected variable data is transmitted; the displayed format remains.

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

The basic 340 Terminal provides five operating modes: Format mode, Batch mode, Search mode, Automatic Unattended mode, and Program mode.

The Format mode is used when entering data from the keyboard or for reformatting previously-recorded data. Under program control, data entering the display buffer goes into variable fields that follow format descriptors until a complete record or "page" has been entered. Once entered, the record can then be edited prior to its transfer to a selected output device such as the second cassette recorder, printer, or communications line. Alternately, records can be written on the selected output medium as soon as the last data field is entered.

The Batch mode is used for data transfer between selected input and output devices. In this mode, the display buffer operates as two 256-character buffers that are toggled between input and output.

The Search mode is used to locate a specific record or program (record format) recorded on cassette tape or diskette by comparing a keyed identifier of up to 256 characters with the data read from tape. Any portion of a record can be used as an identifier. A program to be loaded from a cassette or diskette is located via a Search operation that searches the recorded formats for the identifier that compares with the one keyed by the operator; the selected format is then loaded.

The Automatic Unattended mode is similar to the Batch mode, except that the terminal responds to a selection sequence received from a remote Sycor terminal operating as a master station or a remote computer such as an IBM System/360 or 370. The selection sequence identifies the terminal, the terminal peripheral, and the desired mode of operation (e.g., read from cassette tape or print a message).

The Program mode is usable only on terminals equipped with Extended Memory and is defined by the program loaded in memory. The program can be loaded from cassette tape, diskette, computer tape, or punched cards.

Advance and Backspace keys move the cursor forward or backward to allow for correcting errors or modifying data. These controls are repetitive when key pressure is sustained.

File maintenance is performed by inserting the cassette or diskette containing the file to be updated or modified. Each record to be modified is retrieved and displayed via a Search operation. Then, by using the Advance and Backspace keys to position the cursor, data within the existing text can be deleted or changed and new data added. The modified record can then be reinserted into the position previously occupied by the original record on tape or disk.

Pooling can be performed when the terminal is equipped with a second cassette recorder. Selected records from any number of cassettes can be consolidated on one cassette tape, or an entire field can be copied onto a second cassette tape. The second cassette recorder can also be used to enter record formats from a program cassette.

Totals or subtotals can be generated and zero balancing performed under program control by the addition of two 10-digit accumulators (the Arithmetic option).

Vacant or incomplete data fields, as a result of omitted or missing data, are detected and an error message is displayed on the screen when the Omission Detection and Capacity Control option is included. To continue, the operator must reenter the data correctly.

Large formats can be segmented into pages (program chaining). The chaining feature, included with the second recorder, automatically displays the next "page" of format descriptors when the previous "page" is completed.

The Tab Compression option permits the insertion of a horizontal tab character following data in a partially filled or skipped field; the remaining positions within the field are filled with spaces, which are eliminated when the field is transmitted or transferred to an output device.

The Sycor 340 is substantially enhanced when the Extended Memory feature is added. The feature provides 3K or 7K bytes of MOS random-access memory and permits the Model 340 to accommodate Sycor-supplied software including TAL support, an IBM 2780 emulator, an auto dialer, and a disk operating system, and to execute user-generated application programs for specialized data entry and communications applications.

MODELS 340D AND 350: These models operate under the direction of Sycor-supplied terminal control programs, loaded from cassette tape or diskette. The terminal control programs provide several operating modes: Data Entry, Batch, 2780 or 3780 Communications, Sort, Index, TAL or TAL II Program Generation, Blocking, Attended and Unattended modes, and Master Station operation.

The Data Entry and Batch modes are similar in operation to the Format and Batch modes of the Model 340. The data entry program recognizes the same format characters as the Format mode of the Model 340. In the Batch mode, I/O operations are overlapped only if the input and output devices differ. Cassette-to-cassette and diskette-to-diskette operations are not overlapped. A complete file is read from diskette, including deleted records unless deletion is manually selected. All non-deleted records are pushed up within the output file, and relative positions of all records within their file are changed.

The 2780 or 3780 Communications mode directs the terminal to emulate an IBM 2780 or 3780 via the 2780 or 3780 Control Program. In this mode, a 340D or 350 terminal can communicate with an IBM 2780 or 3780 terminal, an IBM System/360 or 370 computer, or another Sycor 340D or 350 terminal. The basic 2780 or 3780 Control Program can be combined with program modules from the System Library to provide additional capabilities. The program modules include: Multiple Record feature, Terminal ID feature, Secondary Terminal feature, and Peripheral Drivers.

The Sort mode supports generation of an index file from an ordered or unordered data file. Each entry in the generated index file includes a 1- to 16-character alphanumeric key and the track and sector addresses of the record in the data file that contains the key. File generation input includes the data file from which the index is generated, key parameters including key length and relative position within the data record, and file description (i.e., ordered in an ascending or descending manner or unordered). The index file must be on the same diskette volume as the related data file, and the indexed data file must contain fixed-length records. The index file must be regenerated to reflect any modifications within the corresponding data file. More than one index file can be generated per data file.

The Index mode is used to access and modify the file directory as a result of file creation or maintenance. A new file ID can be added for each new corresponding data file or deleted for each deleted data file. An existing file ID is changed to reflect any modifications in file name, record length, file type, and the next available record pointer.

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

Emptying a file resets the record pointer from the next available record to the beginning of the file (useful for transaction files). Initializing a volume clears all existing ID's and builds a directory (track) in an IBM-compatible format.

The TAL Generator mode is used to generate a TAL object program from a source program and TAL library. The object program is stored on cassette or diskette.

The Blocking model allows several records to be blocked on diskette and accessed via the TAL program.

The Master Station mode permits one terminal to poll and address all other stations connected to the dial network.

Models 440 and 410: The clustered Model 440 and single-station Model 410 systems operate under the control of systems programs and user-created programs. Control programs are divided into two groups: those that supervise the operation of all control unit functions and those that interact with an operator.

Supervisory functions include task management, timer maintenance, interrupt handling, and program or program segment loading from disk. Initial loading is performed automatically during power-on and reset sequences.

The Model 440 system control program interacts with operators via the Command Language Interpreter to start and stop jobs, create and delete files, and display internal information. Three types of commands are provided: Job Control, File Control, and Information Requests.

Job Control commands are used to: 1) load the 340 emulator; 2) load a program from disk to begin a batch processing task; 3) direct the system to obtain subsequent commands from a file (control returns to the operator after the file is processed); and 4) halt batch processing (all open files are closed).

File Control Commands are used to: 1) create a sequential, random, or indexed disk file with fixed or variable record length; 2) delete a disk file; 3) remove the contents of a disk file; and 4) change the access characteristics of a disk file from read-only to read-write or vice versa.

Information Requests are used to: 1) display the status of each task; and 2) display all file directory entries on disk.

Data entry is performed by means of a 340 Emulator program, which provides nearly identical emulation of the Sycor 340's data entry facility. Three modes of data entry are supported: free-form, formatted, and format-extended; the latter is the formatted mode with added user-written TAL edit routines. Each of these modes is operator-initiated by keying a Job Control command.

SOFTWARE

Sycor provides a simple but flexible data entry language called TAL (Terminal Application Language), which consists of macro statements that can be linked to data entry fields defined in the displayed data entry format. The TAL instruction repertoire includes check digit, range checking, table checking, data manipulation, arithmetic (addition, subtraction, multiplication, and division), test, branching, verify, and I/O instructions. The keyed TAL source statements are converted to machine language by the Program Generator (in one pass) and are written on cassette tape or diskette. The result is the desired application program.

Sycor introduced an enhanced version of its proprietary Terminal Application Language for use with the Model 440 and Model 350 as well as the Model 340 with the diskette option. Called TAL II, the new programming language includes the full complement of existing TAL instructions plus additional instructions and programming features and a new source-code format. Sycor also provides a TAL-to-TAL II translator program. Besides the original TAL instructions that provide arithmetic, logical branching, data transfer, I/O, and data verification functions, the new TAL II instructions permit naming programs and field programs, defining overlay statements, including input/output drivers in the program, and skipping to the top of a new page in the source listing.

The TAL II source program is written in single statements, omitting separate entries for instructions and tables. Source statements can be given labels and interspersed with comments for program documentation. Statement labels permit jumping to a subroutine and returning to the existing (calling) program, an enhancement over the original TAL software, which only supported jumps within the same program. The source program is entered in a single data stream under control of the TAL II generator. Source output can be either an object program, a generator listing, or both. Thus, during initial program generation, an error list can be produced for program debugging. After corrections are made, a clean object program with corresponding listing can be produced.

The TAL-to-TAL II translator produces a TAL II source program with its separate tables and groups of field programs. The TAL II source program is then processed by the TAL II generator to obtain a TAL II object program and listing.

TAL support for diskette is file-oriented and handles up to eight files concurrently. Diskette TAL includes three access methods–sequential, "random," and indexed; miscellaneous instructions including backspace, rewind, search, close file, home, and delete; and declarative instructions including open file. Sequential access includes read, write, and update instructions. Random access applies to files containing fixed-length records only; addressing is performed on a relative record basis. Indexed access is based on a 16-character key and is implemented by combining the base and index file addresses.

The disk operating system, loaded from diskette or cassette via a 128-byte ROM bootstrap loader, provides disk operating modes. The modes include data entry (equivalent to the format mode on the basic 340), communication control (essentially the same as the 2780 emulator), edit/search, batch (equivalent to the batch mode on the basic 340), directory, and program. Communication control does not include support for the IBM 2770, master station, or auto dialer; support for these capabilities is planned. Director mode provides user access to the disk directory to allocate disk files (file parameters include name, record length, write protect status, file type, and file length), delete files, modify file parameters, empty a file, and initialize a disk volume. Program mode is supported as a sub-mode that includes all modes except the directory mode.

A Sycor-supplied software library, contained on cassette tape or diskette, includes TAL, the Program Generator, a loader, and several device control routines. Support programs for diskette include programs for index file creation, volume copying (which allows selective copying of files on the input volume under keyboard control), file copying, and a planned sort/merge function.

Sycor also provides application software packages under the category of Preprogrammed Systems. These require a minimum of 3K bytes of Extended Memory and include: 1)

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

the HASP package that emulates an IBM 2770 terminal without Transparency for use with an IBM 360/370 computer running under OS/HASP; 2) the 2780 or 3780 emulator that emulates an IBM 2780 or 3780 terminal without Transparency for use with an IBM 360/370 computer running under OS/HASP (Release 3.0 or 3.1); 3) the Interactive Time-Sharing (ITS) package for communication with ASCII-oriented time-sharing systems at speeds up to 1200 bits/second; and 4) the Communication Station package for operation as a master station communicating with unattended Sycor 340 Terminals.

COMPONENTS

DISPLAY STATIONS: The CRT keyboard/display unit for Models 310, 320, 340, 350 and 351 includes a 9-inch (diagonal measurement) CRT and a typewriter-style keyboard. The CRT keyboard/display unit for Models 440 and 410 includes a 12-inch CRT and a typewriter or data entry style keyboard. The display for Models 310, 320, 340, 350, and 351 provides a viewing area 5.5 inches high by 4.75 inches wide. The display for Models 440 and 410 provides a viewing area 7 inches high by 9 inches wide.

All displays are arranged in 9 lines of 64 characters each, providing a total of 576 display positions. The last line of 64 characters is reserved for operating status, leaving 512 positions for data entry. A character set of 62 ASCII characters, including upper case alphabetics, numerics, punctuation, and special characters, is generated via a 5-by-7 dot matrix and is displayed in green against a dark background. Models 350 and 351 are equipped with an anti-glare shield; Models 440 and 410 have a bonded anti-glare screen.

The typewriter and data entry style keyboards include a 10-key numeric cluster at the right of the main keygroup. Three groups of keys above the main keygroup provide manual control of I/O and control functions on all keyboards except the Model 440. Any of 64 ASCII characters can be generated, including upper case alphabetics, numerics, punctuation, and special symbols.

CASSETTE TAPE: One or (optionally) two cassette tape recorders each accommodate a "Philips-type" cassette, which contains 280 feet of 0.15-inch magnetic tape recorded at 800 bits/inch. Total cassette capacity is rated at 200,000 characters. Data is recorded serially by bit on 2 complementary parallel tracks in the form of 9 bits/character, which includes 1 parity bit. Record gaps are 1 inch long. Record length is variable from 1 to 256 characters. A cassette can store up to 800 256-character records or up to 1400 80-character records.

The cassette tape recorders on the standard 310, 320, 340, 340D and 440 Terminals move tape at 3.9 inches/second except when the terminal is transmitting or receiving data, in which case the tape speed is 12.5 inches/second. The Fast Recorder Option (Model 340 only) provides the 12.5 inches/second speed for all terminal operations. The data transfer rate at 3.9 inches/second is 350 or 116 char/second for read or write operation, respectively; at 12.5 inches/second, the data transfer rate is 1000 or 333 har/second for read or write operations, respectively; at 12.5 inches/second, the data transfer rate is 1000 or 333 char/second for read or write operations, respectively. The lower transfer rate when writing is an effective rate that results from the unit's read-after-write checking feature, which backs up the tape and rereads each block written. Rewind speed is 120 inches/second.

The ECMA-compatible Models 310, 320, 340E, and 410 are equipped with higher-performance cassette drives that provide a standard read/write speed of 12.5 inches second and a data transfer rate (read or write) of 1000 char/second. Read-after-write checking "on the fly" is implemented via a separate read head. Tape marks are compatible with the ECMA standard. The ECMA drive is optional for Model 440.

Data transcription between cassette tape and computer-compatible magnetic tape is performed via the terminal and a separate magnetic tape unit under program control.

DISKETTE STORAGE: The dual diskette unit accommodates two IBM 3740-compatible diskettes, providing a maximum storage capacity of 485,888 bytes (242,944 bytes per diskette). The diskettes are rotated at 360 rpm for an average rotational delay of 83 milliseconds.

Positioning time is 2.5 milliseconds per track. Seek time is 27.5 milliseconds track-to-track, 93 milliseconds average, and 218 milliseconds maximum. Data is transferred at 31,250 bytes/second. The recording technique is compatible with that of the IBM 3740 when an optional EBCDIC software module is used.

The diskette unit organizes a diskette into 73 data tracks plus 2 spare tracks and 1 index track. Each track is divided into 26 sectors, and each sector into 128 bytes.

FIXED DISK STORAGE: Storage capacities of 5.3 or 10.6 million bytes are provided for the Model 440; storage capacities of 2.5, 5, or 10.6 million bytes are provided for the Model 410. All fixed-disk storage except for the optional second 10.6 million bytes of storage (contained in a separate cabinet) for Model 440 is contained within the terminal controller. The disk mechanism was designed and is produced by Sycor. The drive contains a single disk recorded on both surfaces. Head positioning time is 10 milliseconds track-to-track, 70 milliseconds average, and 100 milliseconds maximum. Average rotational delay is 12.5 milliseconds. The data transfer rate is 5 million bytes/second.

COMPUTER TAPE DRIVES: Available tape formats are 7-track, 556/800 bits/inch; 9-track, 800 bits/inch; or 9-track, 1600 bits/inch. All models record data on ½-inch tape in industry-compatible formats. Each of these computer-compatible tape drives is a separate, desk-top unit with a read/write speed of 12.5 inches/second. Rewind speed is 40 inches/second. The tape drives are manufactured by Wangco, and each accommodates an 8.5-inch reel (1200 feet).

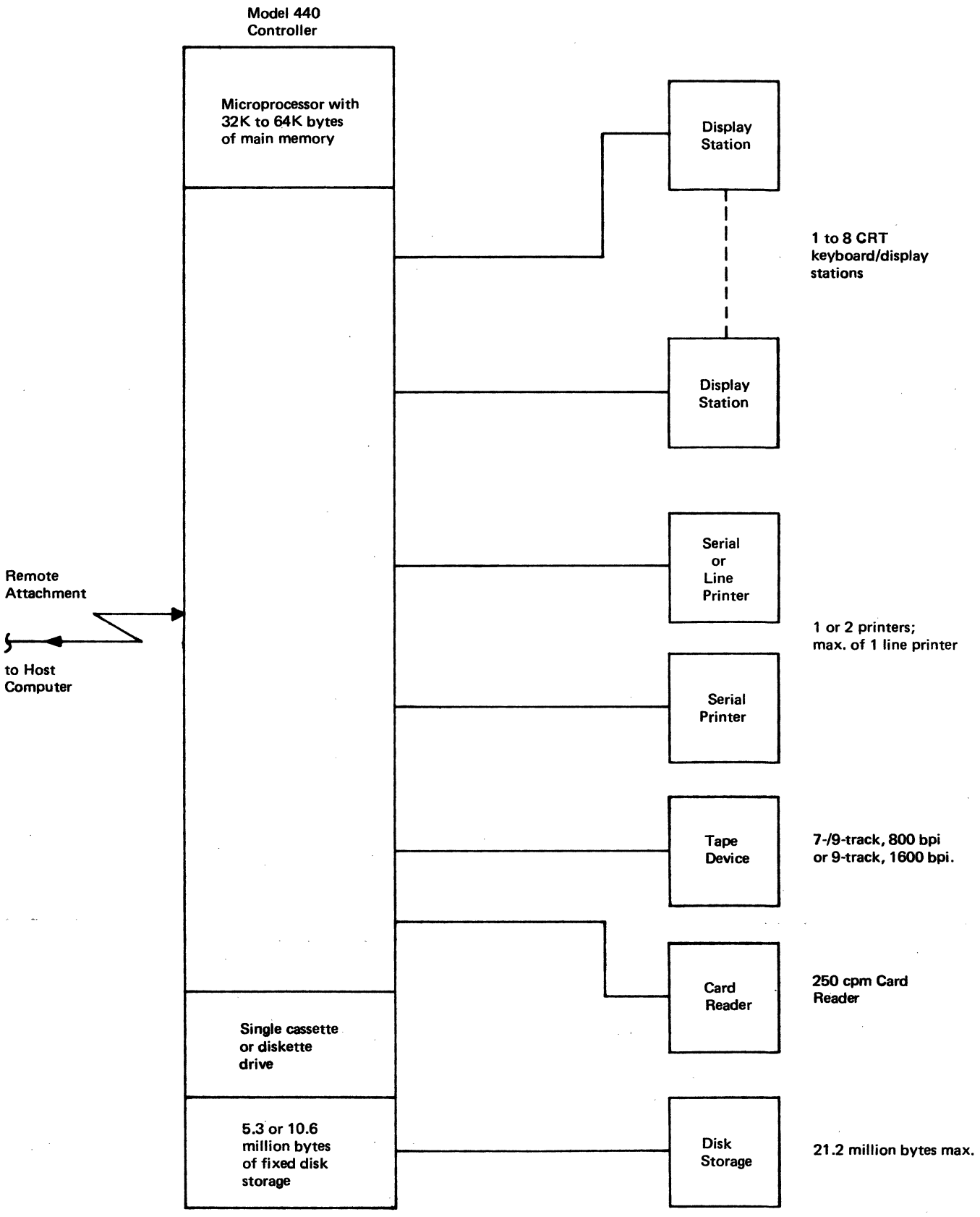
CARD READER: A desk-top unit reads 80-column cards at 250 cards/minute. A single input hopper and output stacker have a rated capacity of 600 cards each.

LINE PRINTERS: Two drum printers, produced by Data Printer, provide rated speeds of 300 or 600 lpm using a 64-character set of ASCII symbols. Each model prints 132 columns with horizontal and vertical spacing of 10 char./inch and 6 or 8 lines/inch. The printers accommodate 6-part, pin-fed continuous forms from 3-½ to 19-½ inches wide.

3400 SERIES PRINTERS: Model 3484, rated at 80 cps, and Model 3485, rated at 165 cps, are both impact matrix printers that provide 132 print columns and 64 ASCII print symbols. Horizontal and vertical spacing is 10 char./inch and 6 lines/inch. The printers form characters within a 7-by-7 dot matrix and accommodate 6-part pin-fed

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

Model 440 Configuration*



*See Configuration for other models.

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

continuous forms from 4 to 14-7/8 inches wide. The 3484 and 3485 printers are available for all terminal models, except the 351 and 410.

3600/4600 SERIES PRINTERS: Three models of bi-directional impact matrix printers provide rated speeds of 60, 120, and 180 cps and 132 print columns. These printers are not available for terminal models 310, 320, and 340. Each is controlled via an integral microprocessor with 5K bytes of memory. The printers feature a standard 64-character set of ASCII symbols (each formed via a 7-by-7 dot matrix), a cartridge ribbon, and "snap-out" tractor pin or friction feed mechanisms. The printers accommodate 6-part, continuous feed forms from 2 to 14-7/8 inches wide or cut forms. The head position is adjustable for paper thickness. Standard horizontal and vertical spacing is 10 char./inch and 6 lines/inch. Optional spacing provides 16-½ char./inch horizontally and/or 8 lines/inch vertically. A re-inking mechanism extends ribbon life. A horizontal slew option performs high-speed skipping over blank fields. Each model is equipped with a 12-key function pad for setting margin widths, forms length, vertical and horizontal tab positions; for initiating commands such as "top-of-form"; and for setting forms alignment for pre-printed forms. The keys can also initiate generation of two diagnostic test patterns. One is a continuous printout of the character set on 132-character lines; the other is alternate X's and 0's on 16 character lines.

PRICING

The Sycor intelligent terminals are available for purchase or on lease. Models 340, 350, and 351 are available on a one- or two-year lease; Models 440, and 410 are available on a one- or three-year lease.

Maintenance is priced separately for both leased and purchased equipment. Prime shift maintenance is provided; however, service for 24 hours per day 7 days per week is available on a negotiable basis. Sycor provides quantity discounts up to 25 percent for purchased units and discounts up to 25 percent for lease periods up to 5 years. A purchase credit plan is available to convert from lease to purchase.

Installation charges for Models 310, 320, 340, 350, and 351 are $100 per terminal. For Models 440 and 410, installation charges are equivalent to the cost of one month's maintenance with a $100 minimum charge.

The investment tax credit is passed on to the customer for purchased equipment only.

Sycor provides training at its three training centers, the corporate headquarters, Washington D.C., and San Francisco. Two to four days of training are provided at a charge of $50 per day per person. Sycor also offers on-site training at a customer location for a minimum of four persons and in major cities as required.

	Monthly Rental*			
Model 310 & 320 Terminals	1-Year Lease	3-Year Lease	Purchase	Monthly Maint.
310-1 single-cassette unit	204	175	6,380	40
310-2 single-cassette unit with 3K user memory	232	199	7,180	48
320 dual-cassette unit	239	205	7,500	47
Model 340 Terminal				
Basic unit; one cassette	184	157**	6,600	34
Dual-cassette unit	219	187**	7,720	41
Single-cassette & dual-diskette unit (incl. 7K Extended Memory)	360	309**	12,000	75
Dual-cassette & dual-diskette unit (incl. 7K Extended Memory)	395	339**	13,120	82
Model 340 Features				
Fast Recorder Option (per cassette drive)	10	8**	400	NC
Second Recorder & Auto Paging	35	30**	1,120	7
Dual Diskette Option	125	107**	4,000	25
Data Compression	7	6**	200	2
Data Compression Enable/Disable Switch	—	—	200	—
Tab Compression	7	6**	200	2
Omission Detection & Capacity Control	14	12**	320	4
Arithmetic Option (incl. two 10-digit accumulators)	24	20**	800	4
Extended Memory:				
2K bytes	15	13**	400	5
3K bytes	28	24**	800	8
7K bytes	51	45**	1,400	16
Software Library (recorded on two tape cassettes)	—	—	25	—
Model 340E Terminal (ECMA Compatible)				
Basic unit; one cassette	220	188	6,780	40
Dual-cassette unit	255	218	7,900	47
Single-cassette & dual-diskette unit (incl. 7K Extended Memory)	396	340	12,180	81
Dual-cassette & dual-diskette unit (incl. 7K Extended Memory)	431	370	13,300	88
Model 350 Terminal				
Basic unit (incl. 16K memory & dual diskette drive)	292	253**	9,600	67
Model 351 Terminal (includes a BSC comm. interface)				
Model 351-1 (60 cps printer)	300	250**	16,100	100
Model 351-2 (120 cps printer)	350	290**	17,100	115
Model 351-3 (180 cps printer)	400	330**	19,120	125
Model 351-4 (300 lpm printer)	535	440**	26,800	180

Sycor 300 and 400 Series
Intelligent Data Entry Terminals

Features for 310, 320, 340E, & 350	Monthly Rental* 1-Year Lease	3-Year Lease	Purchase	Monthly Maint.
Data Compression	7	6	200	2
Data Compression Enable/Disable Switch (340E & 350 only)	—	—	200	—
Tab Compression	7	6	200	2
Omission Detection & Capacity Control (340E & 350 only)	14	12	320	4
Arithmetic Option (340E & 350 only; two 10-digit accumulators)	24	20	800	4
Extended Memory (340E only):				
2K bytes	15	13	400	5
3K bytes	28	24	800	8
7K bytes	51	45	1,400	16
Software Library (recorded on two tape cassettes)	—	—	25	—
Model 440 Terminal				
Control Unit (includes 5M-byte disk, 24K memory, and display control for 1 to 4 displays)	444	373	14,865	97
Display Unit (includes typewriter or keypunch style keyboard:				
Control unit powered (1-4 per controller)	44	38	1,800	8
Local powered (1-8 per controller)	50	43	1,850	10
Display Control (for 5 to 8 displays)	20	17	730	5
Tri-Intensity Option (1 per Display Control)	10	9	500	2
8K-byte Memory Module (up to 5 max.)	33	28	1,440	4
5M-byte Disk Extension	100	84	4,500	10
Model 4421 10 Million Byte Disk Module	230	194	9,000	30
Cassette Controller	46	39	1,805	10
Diskette Controller	70	60	2,755	15
Model 410 Terminal (includes a BSC comm. interface)				
Model 410-1 (60 cps printer)	470	386	21,150	130
Model 410-2 (120 cps printer)	520	427	23,400	145
Model 410-3 (180 cps printer)	580	476	26,100	155
Model 410-4 (300 lpm printer)	705	578	31,720	210
Communications Interface				
Communications Adapter:				
Asynchronous; 110 to 1200 bps	21	18	600	6
Synchronous; 1200 bps	32	28	900	12
Synchronous; 2000/2400 bps	32	28	900	12
Synchronous; 3600/4800 bps (350)	34	30**	900	14
Synchronous 3600/4800 (440)	32	28	900	12
EBCDIC Communications	NC	NC	NC	NC
ASCII/EBCDIC Switch	—	—	200	—
Internal/External Clocking Swtich	—	—	200	—
Sycor Modem, Bell 202C compatible	32	27	1,000	7
Auto Dialer	30	26	800	10
Unattended Communications	NC	NC	NC	NC
I/O Devices (all models except 310 & 320)				
Card Reader, 250 cpm	120	102**	3,500	20
Serial Printers:				
80 cps	155	133**	5,600	35
165 cps	250	215**	6,600	55
Bi-directional Printers & Options:				
3606/4606 (60 cps)	155	133**	5,600	25
3612/4612 (120 cps)	218	190**	6,600	40
3618/4618 (180 cps)	276	242	8,620	50
Friction Feed Module***	15	13**	400	5
Pin Feed Module***	20	17**	600	5
Tractor Feed Module***	23	19**	700	5
6/8 Lines per Inch (switchable)	10	8**	400	0
10/16.5 char./Inch (switchable)	15	12**	600	0
Line Printers (incl. vertical format control):				
300 lpm	470	405**	16,300	110
600 lpm	650	456***	20,800	130
Line Printer Options:				
6/8 lines/inch	35	29**	1,400	NC
12-channel VFU	20	16**	800	NC
Tape Drives:				
9-Track, 1600 bpi	395	342**	11,800	100
7-Track, 800 bpi	210	178**	7,200	30
9-Track, 800 bpi	210	178**	7,200	30

* Includes prime-shift maintenance.

** Monthly rental under a two-year lease for Model 340 and 350 only, I/O device two-year lease prices for Models 340 and 350 are the same as the three-year lease prices for other models.

***One of these paper feed modules must be added to the price of each printer. A pin feed platen is available at standard widths of 8, 9, 13-1/8, and 14-3/8 inches; user can specify other widths at a cost of $500 each. ■

Sycor 410 and 440 Data Entry and Processing Systems

Sycor's Model 440 Clustered Terminal Processing System, unveiled in July 1975, is a shared-processor remote data entry system that accommodates up to eight CRT keystations. The microprocessor-based controller (center) contains 5 or 10 million bytes of fixed-disk storage and either a cassette or diskette drive for program loading. A second 10 million bytes of fixed disk storage in a free-standing cabinet is optional.

Single-station or clustered, programmable terminals that support up to 8 display stations for data entry/validation, batch communications, and file maintenance operations.

Hardware features include 32K to 64K bytes of user memory; 5 to 20 megabytes of disk storage; cassette or diskette storage; cartridge-tape backup for disk storage; industry compatible tape drives; a card reader; 60-, 120- or 180-cps bi-directional printers; a 300-lpm belt printer; and asynchronous or synchronous communications adapters with data rates up to 4800 bps. Software features include TAL-II, ANSI COBOL, and BASIC languages; utilities; and emulators.

A typical Model 410 system with 64K bytes of memory, a diskette drive, 5 megabytes of disk storage, a synchronous communications adapter, and a 120-cps printer is priced at $33,790. Comparable monthly lease rates are $848, $781, $748, and $712 per month for one, two, three, and three-and-one half years, respectively, including maintenance.

MANAGEMENT SUMMARY

Model 440 is Sycor's initial clustered data entry terminal. The cluster arrangement can accommodate up to eight CRT keyboard/display operator stations equipped with either data entry or typewriter-style keyboards; the two cannot be mixed. Disk storage provides 5 or 10 million bytes and can be expanded to 20 million bytes via a second fixed-disk cabinet. A single cassette or diskette drive provides compatibility with the other Sycor terminals and also serves as a program loader. Ample memory capacity is provided—32K to 64K bytes. I/O flexibility is provided via a host of I/O devices including a card reader, 7- and 9-track industry compatible magnetic tape drives, and printers that offer a range of print speeds from 60 cps to 60 lpm. Transmission compatibility is provided with IBM 2780 and 3780 via program emulation and with Sycor Models 340 and 350.

Sycor introduced a high-speed cartridge tape drive for the 440 in March 1977. The drive accommodates 3M-type cartridges and is designed as a backup device to save and restore disk files. The cartridge can store up to 5.76 million characters.

Strong data entry support is furnished by TAL II, which is designed for data entry and data validation.

However, the 440 is not just supported as a data entry system. A subset of ANSI COBOL (announced May 1976) provides a strong batch processing language that supports file maintenance and report generation. TAL and COBOL programs can run concurrently—TAL in ▷

CHARACTERISTICS

VENDOR: Sycor, Inc., 100 Phoenix Drive, Ann Arbor, Michigan 48104. Telephone (313) 971-0900.

DATE OF ANNOUNCEMENT: Model 440—July 1975; Model 410—June 1976.

DATE OF FIRST DELIVERY: Model 440—February 1976; Model 410—October 1976.

NUMBER DELIVERED TO DATE: Over 1400 Model 410 and 440 systems.

SERVICED BY: Sycor, Inc. at over 100 locations. Sycor currently services about 95 percent of its customer base.

MODELS

The *Model 440 Clustered Terminal Processing System* is a shared-processor remote data entry system that consists of a microprocessor-based controller and one to eight CRT keyboard/display units. The separate controller contains 32K to 64K bytes of random-access memory, 5.3 or 10.6 million bytes of fixed disk storage, and a single cassette or diskette drive. A second 10.6 million byte disk drive is optional. Each keyboard/display unit provides a screen capacity and display arrangement identical with those of the older Sycor Models 340 and 350. A typewriter or data entry style keyboard can be specified. Cassette and diskette drives are identical with those of the other Sycor models.

The *Model 410 Data Entry and Processing System* is a single-station remote data entry terminal that consists of a microprocessor-based controller, a Binary Synchronous communications interface, a CRT keyboard/display unit, ▶

Sycor 410 and 440 Data Entry and Processing Systems

the foreground, COBOL in the background. The combination of TAL and COBOL support transforms the 440 into a product that can serve the growing trend toward distributed processing.

The single-station 410 is intended to satisfy low-volume requirements in a data entry or distributed processing network. Its maximum disk storage capacity of 10 million bytes should be more than adequate for this application. And it is available with the same range of printer speeds as the 440 (60 cps to 300 lpm).

The TAL II data entry language consists of a comprehensive repertoire of instructions that are implemented in the form of macro statements that can be linked to data entry fields in the display format. The TAL source program is converted to machine language in one pass of the Sycor Program Generator and written on diskette or fixed disk. The TAL II repertory consists of arithmetic, branching, data transfer, editing, and I/O instructions. Disk or diskette access methods include sequential, random, and indexed. Typical applications for the use of TAL include payroll, data entry, order entry, and inventory control.

USER REACTION

In Datapro's 1977 survey of batch terminal users, 3 users reported on their experience with a total of 13 Sycor 440 series terminals. Datapro also talked with an additional 6 users, from a Sycor furnished list, who reported on 97 Sycor 440 terminals. The ratings of these 9 users are presented below.

	Excellent	Good	Fair	Poor	WA*
Overall performance	1	8	0	0	3.1
Ease of operation	4	5	0	0	3.4
Hardware reliability	0	5	3	1	2.3
Maintenance service	1	4	1	3	2.3
Software & technical support	0	3	3	3	2.0

*Weighted Average on a scale of 4.0 for Excellent.

These users expressed satisfaction with the Sycor equipment except for the disk drive which received low hardware reliability ratings. All users we talked with had had some disk problems, but most have long since been resolved by Sycor. One user reported frequent disk-related downtime and several disk drive replacements. And another user reported 26 disk drive replacements (two per system). Both of these users report that extensive Sycor engineering changes have resolved most of the problems.

Maintenance service quality and response times were reported as good to excellent by about half the respondents; however, the three users that reported poor maintenance said that the service personnel were competent on the terminal but inadequately trained for resolving disk-related and printer problems.

and a printer. The separate controller contains 40K to 64K bytes of random-access memory, 2.5, 5, or 10.6 million bytes of fixed-disk storage, and a single cassette (standard) or diskette drive (optional). The keyboard/display unit provides a screen capacity and display arrangement identical with Sycor Model 440. A typewriter or data entry style keyboard can be specified. Cassette and diskette drives are identical with those of other Sycor models. The 410 is available in four models:

- Model 410-1—includes a 60 cps printer.
- Model 410-2—includes a 120 cps printer.
- Model 410-3—includes a 180 cps printer.
- Model 410-5—includes a 300 lpm printer.

Any model of the 410 can accommodate a second printer, but cannot include two line printers.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex, synchronous or asynchronous. The asynchronous interface is rated at 75 to 1200 bits/second; synchronous interfaces are available for operation at 1200, 2000, 2400, 3600, or 4800 bits/second using 8-level ASCII (with parity) or EBCDIC transmission codes. Synchronous Communications (BSC) technique and is compatible with IBM Binary Synchronous terminals such as the 2770, 2780, 3780, ad 3735. The EBCDIC Transparency feature, however, is not provided.

All models are equipped with an EIA Standard RS-232C interface and can be used over a dialed, leased, or private-line communications facility via an external modem. Sycor offers its own modem (Model 3460), which is compatible with the Bell System Data Set 202C (without reverse channel), for use at 1200 bps. The Model 3460 provides automatic answering as a standard feature. Bell System 201, 203 or 208 series modems can be used for synchronous transmission at 2000/2400, 3600, or 4800 bps, respectively. Equivalent modems from independent manufacturers can be used in place of the Bell System modems.

All communications are point-to-point. Communications features include automatic answering, automatic disconnect, data (space) compression/decompression, auto restart, autodial, etc.

DEVICE CONTROL

The systems operate under the control of systems programs and user-created programs. Control programs are divided into two groups: those that supervise the operation of all control unit functions and those that interact with an operator.

Supervisory functions include task management, timer maintenance, interrupt handling, and program or program segment loading from disk. Initial loading is performed automatically during power-on and reset sequences.

The system control program interacts with operators via the Command Language Interpreter to start and stop jobs, create and delete files, and display internal information. Three types of commands are provided: Job Control, File Control, and Information Requests.

Job Control commands are used to: 1) load the 340 emulator; 2) load a program from disk to begin a batch processing task; 3) direct the system to obtain subsequent commands from a file (control returns to the operator after the file is processed); and 4) halt batch processing (all open files are closed).

Sycor 410 and 440 Data Entry and Processing Systems

Software is good according to these users; however, six users found difficulties obtaining adequate software and technical support; staff limitations and insufficient documentation were contributing negative factors. One user said he "could not live with frequent software level changes" and has stopped upgrading. Most users reported no difficulties with software level changes. Three interviewed users reported they had a good rapport with Sycor; however, two users noted a lack of communications with Sycor with respect to user needs and problems. One of these users felt that Sycor has not shown direction.

The user problems reported may well be just growing pains. Sycor's phenomenal growth, indicated by a substantial user base, its frequency in introducing new products, and its switch-over from Sorbus-supplied service to its own (which requires a sizeable effort to staff up to an adequate level) offer understandable reasons for the user complaints.□

File Control Commands are used to: 1) create a sequential, random, or indexed disk file with fixed or variable record length; 2) delete a disk file; 3) remove the contents of a disk file; and 4) change the access characteristics of a disk file from read-only to read-write or vice versa.

Information Requests are used to: 1) display the status of each task; and 2) display all file directory entries on disk.

Data entry is performed by means of a 340 Emulator program, which provides nearly identical emulation of the sycor 340's data entry facility. Three modes of data entry are supported: free-form, formatted, and format-extended; the latter is the formatted mode with added user-written TAL edit routines. Each of these modes is operator-initiated by keying a Job Control command.

SOFTWARE

Three programming languages are available for the 410 and 440 terminals: TAL-II (an enhanced version of TAL), BASIC, and ANSI COBOL.

TAL II includes the full complement of TAL instructions plus additional instructions and programming features and a new source-code format. Sycor provides a TAL-to-TAL II translator (TAL II Reformatter) for conversion of TAL user programs. Utility programs include Search/Edit, Batch, Sort, Logcopy, Compress/Free Space, Dump/Restore, Construct, and the TAL II Reformattor. Communications software includes emulators for IBM 2770, 3770, 2780 and 3780 as well as the IBM 360/20 and Teletype 33/35. HASP workstation Sycor communications software also includes its Network Control System (NCS) which supports communications among all Sycor 300 and 400 serial terminal systems.

The TAL II source program is written in single statements, omitting separate entries for instructions and tables. Source statements can be given labels and interspersed with comments for program documentation. Statement labels permit jumping to a subroutine and returning to the existing (calling) program, an enhancement over the original TAL software, which only supported jumps within the same program. The source program is entered in a single data stream under control of the TAL II generator. Source output can be either an object program, a generator listing, or both. Thus, during initial program generation, an error list can be produced for program debugging. After corrections are made, a clean object program with corresponding listing can be produced.

The TAL-to-TAL II translator produces a TAL II source program with its separate tables and groups of field programs. The TAL II source program is then processed by the TAL II generator to obtain a TAL II object program and listing.

TAL support for diskette is file-oriented and handles up to eight files concurrently. Diskette TAL includes three access methods—sequential, "random," and indexed; miscellaneous instructions including backspace, rewind, search, close file, home, and delete; and declarative instructions including open file. Sequential access includes read, write, and update instructions. Random access applies to files containing fixed-length records only; addressing is performed on a relative record basis. Indexed access is based on a 16-character key and is implemented by combining the base and index file addresses.

The disk operating system, loaded from diskette or cassette via a 128-byte ROM bootstrap loader, provides disk operating modes. The modes include data entry (equivalent to the format mode on the basic 340), communication control (essentially the same as the 2780 emulator), edit/search, batch (equivalent to the batch mode on the basic 340), directory, and program. Communication control does not include support for the IBM 2770, master station, or auto dialer; support for these capabilities is planned. Director mode provides user access to the disk directory to allocate disk files (file parameters include name, record length, write protect status, file type, and file length), delete files, modify file parameters, empty a file, and initialize a disk volume. Program mode is supported as a sub-mode that includes all modes except the directory mode.

A Sycor-supplied software library, contained on cassette tape or diskette, includes TAL, the Program Generator, a loader, and several device control routines. Support programs for diskette include programs for index file creation, volume copying (which allows selective copying of files on the input volume under keyboard control), file copying, and a planned sort/merge function.

Sycor BASIC features sequential and direct file access; all of the common algebraic operators including arithmetic, relational, concatenation, logical operators, and others; exponents (to a power of +38 and -39); three-dimensional arrays (with no limit on the number of array elements except available memory size); floating point (with single precision numbers up to seven digits); trigonometric functions; logarithms; and square root. Program logic is governed by such statements as If, Else, On, Go To and On, and Go-Sub (for conditional branching or for BASIC subroutine linkage).

Sycor's interactive COBOL is a subset of ANSI COBOL and features the four basic program divisions: Identification, Environment, Data, and Procedure. Random, indexed, and sequential file access is supported, plus program segmentation (overlays), subscripting, numeric editing, figurative constants (zeros, spaces, high/low values), and other basic COBOL language statements common with ANSI COBOL. Sycor's COBOL is display oriented and can be used to create data entry programs at the display station. Data entry requirements, such as displaying formats for keying data into the screen, accepting and editing data keyed by the operator, and displaying data on the screen that has been retrieved from system files or calculated by the COBOL program, are supported by Sycor's COBOL. Features include an alarm statement for keying error recognition and highlighting attributes for dual intensity. Sycor's COBOL supports foreground data entry operations on several display stations concurrently with utilities or a separate noninteractive COBOL program running in the background, such as report printing or transmitting data to a host computer. COBOL programs can interact with one another. Up to 90

Sycor 410 and 440 Data Entry and Processing Systems

characters of memory can be shared by all displays and documents can be keyed to batch number and date.

COMPONENTS

DISPLAY STATIONS: The CRT keyboard/display unit includes a 12-inch CRT and a typewriter or data entry style keyboard. The display provides a viewing area 7 inches high by 9.5 inches wide.

The display arrangement is 9 lines of 64 characters each, providing a total of 576 display positions. The last line of 64 characters is reserved for operating status, leaving 512 positions for data entry. A character set of 62 ASCII characters, including upper case alphabetics, numerics, punctuation, and special characters, is generated via a 5-by-7 dot matrix and is displayed in green against a dark background. Models 440 and 410 have a bonded anti-glare screen.

The typewriter and data entry style keyboards include a 10-key numeric cluster at the right of the main keygroup. Three groups of keys above the main keygroup provide manual control of I/O and control functions on all keyboards except the Model 440. Any of 64 ASCII characters can be generated, including upper case alphabetics, numerics, punctuation, and special symbols.

DISKETTE STORAGE: The single drive accommodates an IBM 3740-compatible diskette. The diskettes are rotated at 360 rpm for an average rotational delay of 83 milliseconds. Positioning time is 2.5 milliseconds per track. Seek time is 27.5 milliseconds track-to-track, 93 milliseconds average, and 218 milliseconds maximum. The standard data transfer rate is 31,250 bytes/second.

The recording technique is compatible with that of the IBM 3740. A Sycor utility program converts between IBM 3740 and Sycor formats. The IBM 3740 format organizes the diskette into 74 data tracks, 2 spare tracks, and 1 index tracks. Each track is divided into 26 sectors, and each sector into 128 bytes. Sycor Models 410 and 440 record single-sided, standard density diskettes. Diskette data storage capacity is 242,944 bytes.

CASSETTE TAPE STORAGE: Accommodates a "Philips-type" cassette, which contains 280 feet of 0.15-inch magnetic tape recorded at 800 bits/inch. Total cassette capacity is rated at 200,000 characters. Data is recorded serially by bit on 2 complementary parallel tracks in the form of 9 bits/character, which includes 1 parity bit. Record gaps are 1 inch long. Record length is variable from 1 to 256 characters. A cassette can store up to 800 256-character records or up to 1400 80-character records.

The cassette tape recorder moves tape at 3.9 inches/second except when the terminal is transmitting or receiving data, in which case the tape speed is 12.5 inches/second. The data transfer rate at 3.9 inches/second is 350 or 116 char/second for read or write operation, respectively; at 12.5 inches/second, the data transfer rate is 1000 or 333 har/second for read or write operations, respectively. The lower transfer rate when writing is an effective rate that results from the unit's read-after-write checking feature, which backs up the tape and rereads each block written. Rewind speed is 120 inches/second.

Data transcription between cassette tape and computer-compatible magnetic tape is performed via the terminal and a separate magnetic tape unit under program control.

CARTRIDGE TAPE DRIVE (Model 440 only): The drive accommodates a 3M-type, 4-track cartridge containing 300 feet of 0.25 inch magnetic tape. The drive has a read/write speed of 60 inches/second and a recording density of 3200 bits/inch. The data storage capacity is 5.76 million characters. Data is transferred at 24,000 characters/second and is recorded sequentially on each of the four tracks; tape direction is reversed at the end of each track and recording is performed in the opposite direction.

FIXED DISK STORAGE: Storage capacities of 5.3, 10.6, and 21.2 million bytes are provided for the Model 440; storage capacities of 2.5, 5, or 10.6 million bytes are provided for the Model 410. All fixed-disk storage except for the optional second 10.6 million bytes of storage (contained in a separate cabinet) for Model 440 is contained within the terminal controller. The disk mechanism was designed and is produced by Sycor. The drive contains a single disk recorded on both surfaces. Head positioning time is 10 milliseconds track-to-track, 70 milliseconds average, and 100 milliseconds maximum. Average rotational delay is 12.5 milliseconds. The data transfer rate is 5 million bytes/second.

COMPUTER TAPE DRIVES (Model 440 only): Available tape formats are 7-track, 556/800 bits/inch; 9-track, 800 bits/inch; or 9-track, 1600 bits/inch. All models record data on ½-inch tape in industry-compatible formats. Each of these computer-compatible tape drives is a separate, desk-top unit with a read/write speed of 12.5 inches/second. Rewind speed is 40 inches/second. The tape drives are manufactured by Wangco, and each accommodates an 8.5-inch reel (1200 feet).

CARD READER (Model 440 only). A desk-top unit reads 80-column cards at 250 cards/minute. A single input hopper and output stacker have a rated capacity of 600 cards each.

SPRINTER PRINTERS: Three models of bi-directional impact matrix printers provide rated speeds of 60, 120, and 180 cps and 132 print columns. Each is controlled via an integral microprocessor with 5K bytes of memory. The printers feature a standard 64-character set of ASCII symbols (each formed via a 7-by-7 dot matrix), a cartridge ribbon, and "snap-out" tractor pin or friction feed mechanisms. The printers accommodate 6-part continuous feed forms from 2 to 14⅞ inches wide via tractor feed or 4 to 4⅞ inches wide via tear-bar tractor feed. The head position is adjustable for paper thickness. Standard horizontal and vertical spacing is 10 characters/inch and 6 lines/inch. Optional spacing provides 16.5 characters/inch horizontally and/or 8 lines/inch vertically. A re-inking mechanism extends ribbon life. Vertical slewing at high speed over blank lines is standard. A horizontal slew option performs high-speed skipping over blank fields. Each model is equipped with a 12-key function pad for setting margin widths, forms length, vertical and horizontal tab positions; for initiating commands such as "top-of-form"; and for setting forms alignment for pre-printed forms. The keys can also initiate generation of two diagnostic test patterns. One is a continuous printout of the character set on 132-character lines; the other is alternate X's and O's on 16 character lines.

STRIDER PRINTER: An impact belt printer rated at 300 lines/minute with 132 print positions. Produced as the GE TermiNet 340, the printer provides a standard character set of 64 ASCII characters and accommodates 6-part, continuous pin-fed forms from 3 to 15 inches wide via adjustable tractor feed. Horizontal and vertical spacing is 10 characters/inch and 6 lines/inch, respectively.

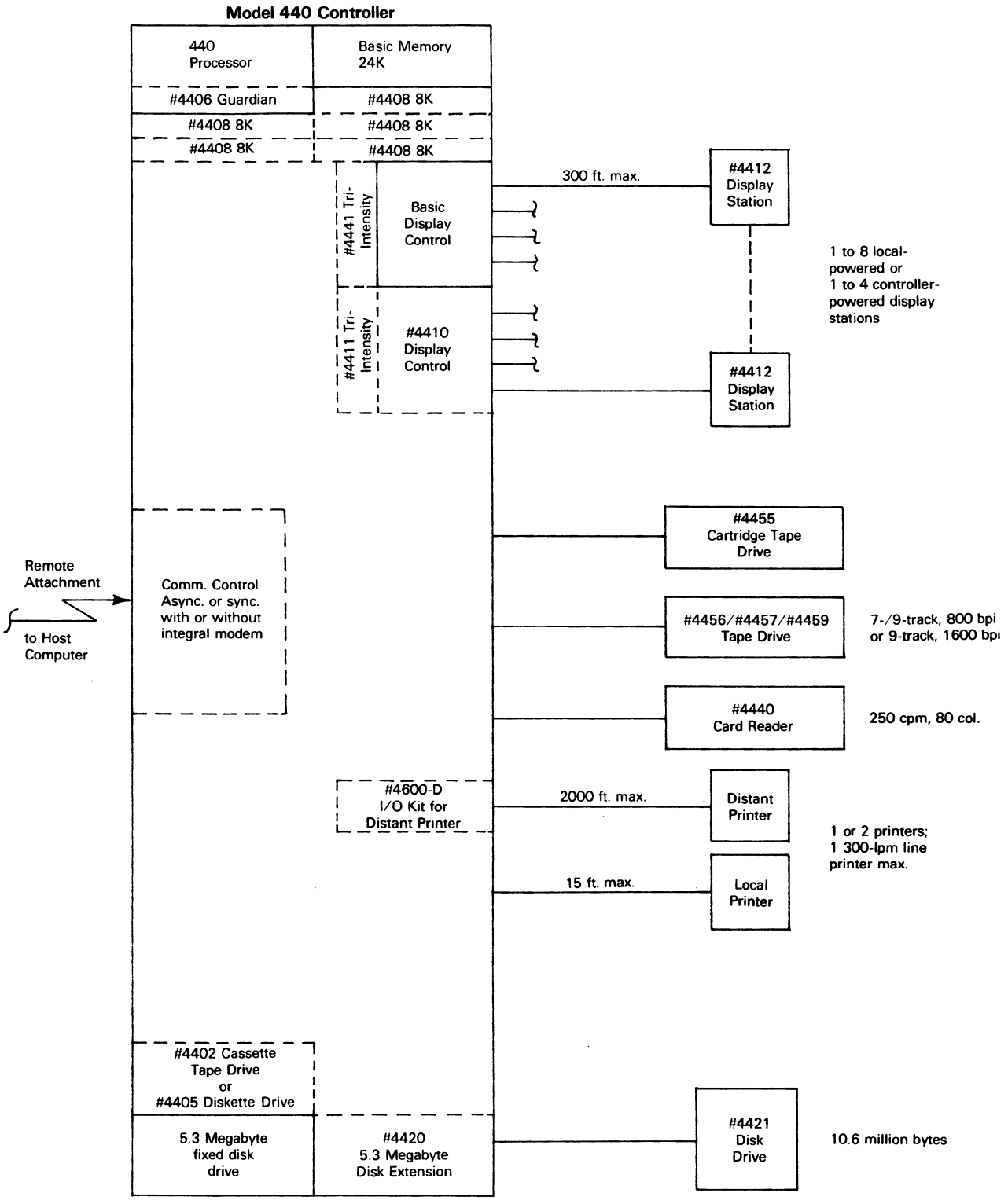
PRICING

The Sycor 410 and 440 terminals are available for purchase or lease. Lease arrangements are available for one, two, or three years or for 42 months.

Maintenance is priced separately for both leased and purchased equipment. Prime shift maintenance is provided; however, service for 24 hours per day 7 days per week is available on a negotiable basis. Sycor provides quantity

Sycor 410 and 440 Data Entry and Processing Systems

Model 440 Configuration



A #4402 cassette or #4405 diskette drive is required for terminal operation.

discounts up to 25 percent for purchased units. A purchase credit plan is available to convert from lease to purchase.

Installation charges are equivalent to the cost of one month's maintenance with a $100 minimum charge.

Sycor provides training at its three training centers, the corporate headquarters, Washington D.C., and San Francisco. Two to four days of training are provided at a charge of $50 per day per person. Sycor also offers on-site training at a customer location for a minimum of four persons and in major cities as required.

Sycor 410 and 440 Data Entry and Processing Systems

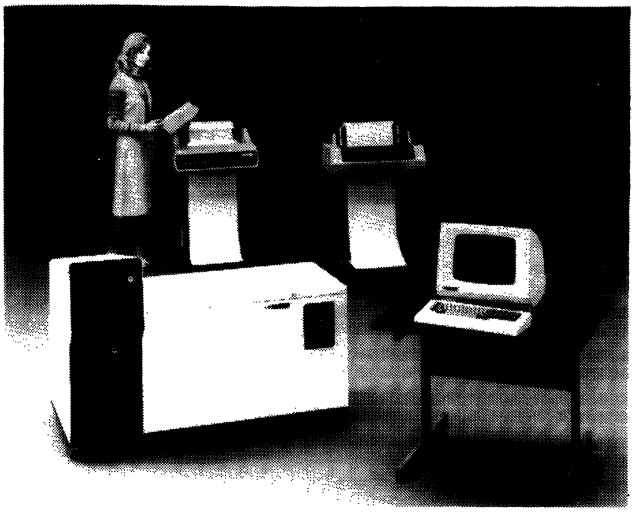
		Monthly Charge*					
		1-Year Lease	2-Year Lease	3-Year Lease	42-Mo. Lease	Purchase	Monthly Maint.
	Model 410 Terminal with 40K-byte memory, 2.5 Megabyte Disk Drive, cassette tape drive, Display Station, and Synchronous Communications Adapter						
410-1	With 60-cps controller-powered Sprinter Printer	$600	$553	$530	$506	$25,230	$130
410-2	With 120-cps controller-powered Sprinter Printer	675	623	597	571	26,270	155
410-3	With 180-cps controller-powered Sprinter Printer	745	687	658	629	28,250	165
410-5	With 300-lpm Strider Printer	845	778	744	711	32,630	173
4419	2.5 Megabyte Disk Extension (Model 410)	50	46	43	41	2,250	5
4105	Diskette Drive (used in place of standard tape cassette drive)	24	22	21	19	950	5
	Model 440 Control Unit with 24K-byte memory, 5 megabyte disk drive, and display control for display stations 1 through 4	454	419	402	385	14,865	107
	Display Station; control-unit powered (4 per 440 control unit):	44	40	39	37	1,800	8
4412CT	With typewriter keyboard						
4412CK	With keypunch keyboard; requires 4411	44	40	39	37	1,800	8
	Display Station, locally-powered (8 per 440 control unit):						
4412LT	With typewriter keyboard	50	46	44	42	2,000	10
4412LK	With keypunch keyboard; requires 4411	50	46	44	42	2,000	10
	Optional Features						
4406	Guardian Option	64	60	57	55	2,200	20
4408	Additional Memory, 8K bytes (5 max. per Model 440, 3 max. per Model 410)	33	30	29	27	1,440	4
4420	Disk Extension, 5 megabytes (1 max.; requires 4419 on Model 410)	100	91	87	82	4,500	10
4421	Disk Module, 10 megabytes, requires 4420 (not available on Model 410)	230	210	200	210	9,000	30
4410	Display Control, accommodates display stations 5 through 8 (Model 440 only)	20	19	18	17	730	5
4411	TL1—Intensity Option (1 per display controller; 2 max. per system)	10	9	9	8	500	2
4402	Cassette Drive & Controller (mutually exclusive with 4405)	46	42	41	39	1,805	10
4405	Diskette Drive (single) & controller (mutually exclusive with 4402)	70	65	62	59	2,755	15
4455	Cartridge Tape Drive (Model 440 only)	91	83	79	75	3,500	11
4440	Card Reader, 250 cpm (Model 440 only)	122	112	107	102	3,500	22
	Tape Drive (Model 440 only):						
4456	9 track, 1600 bpi	395	366	351	336	11,800	100
4457	7 track, 800 bpi	215	197	188	188	7,200	35
4459	9 track, 800 bpi	215	197	188	188	7,200	35
	Distant Sprinter Printer (requires I/O Kit 4600-D):						
4606-D	60 cps	144	133	127	121	5,250	30
4612-D	120 cps	292	191	183	175	6,250	45
4618-D	180 cps	265	244	234	223	8,270	55
4600-D	I/O Kit	15	14	14	13	500	5
	Controller-Powered Sprinter Printer (1 per 440 control unit; not compatible with Guardian option):						
4606-C	60 cps printer	122	112	107	103	4,500	25
4612-C	120 cps printer	185	171	163	156	5,500	40
4618-C	180 cps printer	243	224	214	204	7,520	50

Sycor 410 and 440 Data Entry and Processing Systems

	Optional Features (Continued)	Monthly Charge* 1-Year Lease	2-Year Lease	3-Year Lease	42-Mo. Lease	Purchase	Monthly Maint.
	Local Sprinter Printer:						
4606	60 cps	134	123	118	113	4,900	27
4612	120 cps	197	182	174	166	5,900	42
4618	180 cps	255	235	225	214	7,920	52
4620	Tractor Feed with printer stand	23	21	20	19	700	5
4624	Tear-Bar Tractor Feed	23	21	20	19	900	5
4635	Stand; for tear bar tractor feed	5	5	4	4	250	N/C
4640	6/8 Lines per Inch	10	9	9	8	400	N/C
4642	10/16.5 Char. per Inch	15	14	13	12	600	N/C
4644	Fast Horizontal Slew	20	19	18	17	600	5
4646	Vertical Slew	N/C	N/C	N/C	N/C	N/C	N/C
4652	Upper/Lower Case ASCII (7x9 dot matrix)	20	19	18	17	675	5
4730	Strider Printer; 300 lpm	410	377	361	345	12,000	83
4740	Front Load Low Paper Sensor	6	6	5	5	145	1
4741	Basket	5	5	4	4	140	N/C
4742	Guideframes & Strap	2	2	2	2	70	N/C
4464	Asynchronous ASCII Communications Controller, 110/1200 bps (1 max. on 440 only; mutually exclusive with 4440)	24	22	21	20	750	6
4465	Synchronous ASCII Communications Controller, 1200 bps	37	35	33	32	1,100	12
4466	Synchronous ASCII Communications Controller, 2000/2400 bps	37	35	33	32	1,100	12
4468	Synchronous ASCII Communications Controller, 3600/4800 bps	37	35	33	32	1,100	12
4471	Synchronous Communications Adapter, 110 to 9600 bps (for use with multileaving & BRJE only)	37	35	33	32	1,100	12
4467	EBCDIC Feature; requires 4465, 4466, or 4468	N/C	N/C	N/C	N/C	N/C	N/C
4491	Auto Dial Option; requires 4465, 4466, or 4468 (for Sycor or other non-Bell modems; not available for Model 410)	30	28	27	26	800	10
4496	Internal/External Clocking Switch; requires 4465, 4466, or 4468	200**	200**	200**	200**	**200	N/C
4497	ASCII/EBCDIC Switch; requires 4467 and 4465, 4466, or 4468	200**	200**	200**	200**	**200	N/C
4464-M12	Asynchronous ASCII Communications Controller with Modem, 1200 bps (mutually exclusive with 4440)	53	49	47	45	1,600	13
4465-M12	Synchronous ASCII Communications Controller with Modem, 1200 bps	64	60	57	56	1,900	19
4466-M24	Synchronous ASCII Communications Controller with Modem, 2400 bps	92	85	82	78	2,900	22
4471-M12	Synchronous ASCII Communications Adapter, with Sycor 202 Modem; 1200 bps for use with multi-leaving & BRJE only)	64	60	57	55	1,900	19
4471-M24	Synchronous Communications Adapter with Sycor 201 Modem; 2400 bps for use with Multileaving & BRJE only)	92	85	82	78	2,900	22
4461	201C Compatible Modem without Autodial; 2400 bps (for dialup lines)	60	55	53	50	2,000	10
4462	201C Compatible Modem with Autodial; 2400 bps requires 4491, requires 4491 (for dialup lines)	60	55	53	50	2,000	10
4463	201B/C Compatible Modem; 2400 bps (for leased lines)	60	55	53	50	2,000	10
4460	202C Compatible Modem; 1200 bps; requires 4465	32	30	28	27	1,000	7

* Includes maintenance.
**One-time charge.
N/C No Charge.■

Sycor 405 and 445 Distributed Data Entry/Processing Systems



The Sycor 445 controller (left foreground) with fixed-disk extension cabinet is surrounded by components common to both Sycor 405 and 445 terminal systems. These components include (from left) the 300-lpm Strider (GE TermiNet 340) printer, bi-directional Sprinter matrix printer, and 15-inch display station.

Single-station or clustered, programmable terminals that support up to eight display stations for operation in a shared distributed data entry and processing environment. Resource sharing is supported by Sycorlink, which permits as many as nine terminal systems in a closed loop to share data bases and peripherals.

Hardware features include 48K to 256K bytes of user memory; 0.5 to 2 megabytes of diskette storage or 5 to 70 megabytes of disk storage; 15-inch, 2000-character display screens with typewriter or data entry keyboards; 60-, 120- or 180-cps bi-directional printers; 300- and 600-lpm line printers; cartridge tape backup for disk storage; industry-compatible tape drives; and a card reader. Software features include TAL-2000, ANSI COBOL, and BASIC languages, utilities, and emulators. Asynchronous or synchronous BSC or SDLC communications are supported with data rates of up to 9600 bps.

A typical 445 system with 64K bytes of memory, a 5-megabyte disk drive, a 5-megabyte cartridge tape drive, 4 data stations, a bi-directional serial printer, and a communications adapter is priced at $60,300. Comparable monthly lease rates are $1,397, $1,277, and $1,156 per month for 1, 2, and 3½ years, respectively, including maintenance.

A typical 405 system with 48K bytes of memory, 0.5 megabytes of diskette storage, 1 data station, a bi-directional serial printer, and a communications adapter sells for $19,850. Comparable monthly lease rates are $538, $497, and $456 per month for one, two, and four years, respectively, including maintenance.

MANAGEMENT SUMMARY

In December 1977, Sycor announced the Sycor 445 as the most powerful member of its familiar 440 family. Designed for distributed data entry and processing, the 445 is a disk-based clustered terminal system that supports as many as 8 large-screen display stations with as many printers and can be equipped with 5 to 70 million bytes of disk storage. The key to the announcement is Sycorlink, a resource-sharing feature that permits peripherals and disk-based files to be shared among as many as nine 405 and 445 terminal systems in a closed loop, interlinked by up to 2500 feet of cable.

In the wake of its December announcement, Sycor introduced an entry-level version of the 445, designated the 405. The Sycor 405 is a diskette-based terminal that accommodates one or two large-screen display stations with as many printers and can be equipped with 0.5 to 2 million bytes of diskette storage. The 405 is available with two or four diskette drives that feature single- or double-sided recording. The 405 is upward compatible with the 445 and can also be linked with Sycor 445's in a Sycorlink network.

Sycor offers three programming languages for use with the 405 and 445 terminals: ANSI COBOL, BASIC, and TAL 2000—an upgraded version of TAL II, Sycor's own business language that serves as a common bond among its products. TAL II programs can be converted to TAL 2000 program by recompiling. Sycor also provides several utility programs for sort, edit, batch, and other operations. Also, several communications packages are available, including IBM HASP, 3270, and 3774 (SDLC) emulators. ➢

CHARACTERISTICS

VENDOR: Sycor, Inc., 100 Phoenix Drive, Ann Arbor, Michigan 48104. Telephone (313) 971-0900.

DATE OF ANNOUNCEMENT: Model 445—December 1977; Model 405—January 1978.

DATE OF FIRST DELIVERY: Models 445 and 405—third quarter 1978.

NUMBER DELIVERED TO DATE: —.

SERVICED BY: Sycor, Inc. at over 100 locations. Sycor currently services about 95 percent of its customer base. ➢

Sycor 405 and 445 Distributed Data Entry/Processing Systems

The Sycor 445 is equipped with an integral, high-speed cartridge tape drive for fast disk backup, software loading, and special disk files. The 3M-type cartridge drive can copy the entire contents of a 5.76-million-character disk in less than 7 seconds. Further security is provided by the Guardian option, a hardware/software feature that automatically dumps the contents of memory to disk in the case of a power failure or inadvertent power-down and automatically restores the contents of memory when power returns. Guardian's parity option detects memory parity errors and displays the memory address and program where they occurred.□

MODELS

The *Model 445 Distributed Data Entry and Processing System* is a shared-processor terminal with multiple display stations. The Model 445 controller is available with either of two processor models: Model 4500 or Model 4501.

The Model 4500 processor is available with 64K or 96K bytes of memory and accommodates one to four keyboard/display stations plus one to four printers, including one to four bi-directional Sprinter serial printers or one to three Sprinter printers and one Strider 300-lpm belt printer.

The Model 4501 processor is available with 64K to 256K bytes of memory in 32K-byte increments and accommodates one to eight keyboard/display stations plus one to eight printers. The printer mix can be one to eight Sprinter printers or one to six Sprinter printers plus one 300-lpm Strider belt printer and either a second Strider printer or a 600-lpm drum printer.

Both processor models contain an integral high-speed cartridge tape drive for disk backup. Both are available with 5 or 10 million bytes of cartridge disk storage and can accommodate an additional 10 or 60 million bytes of disk storage for a maximum disk storage capacity of 70 million bytes. An external cassette or diskette drive can be added as well as a 9-track, 800- or 1600- bpi tape drive. Two communications ports are provided for connection to independent communications facilities.

The Model 405 Distributed Data Entry and Processing System is a shared-processor terminal with one or two display stations and one printer. The 405 control unit contains a Model 4500 processor and is available with 48K or 64K bytes of memory and two or four single- or dual-sided diskette drives. The controller accommodates a 9-track, 800- or 1600-bpi magnetic tape drive and one Sprinter, Strider, or line printer. A communication port is provided for connection to a communications facility.

Sycorlink is a "local" network feature that permits multiple 445 systems (with 4501 processors) and 405 systems to be linked together via cable connections in a closed-loop, SDLC-based network. Up to 9 Sycor 445 and 405 systems can be attached by cables up to 2500 feet in length.

TRANSMISSION SPECIFICATIONS

Transmission is asynchronous or synchronous in the half- or full-duplex mode. Asynchronous rates range from 37.5 to 1200 bits/second for the 4500 processor and 600 to 9600 bits/second for the 4501 processor. Synchronous interfaces are available for BSC or SDLC protocol. The 8-level ASCII (with parity) or EBCDIC transmission code can be specified for synchronous operation. The 8-level, 10- or 11-unit ASCII code is used for asynchronous operation. Autodial is available for synchronous operation over dial-up lines. Sycor provides its own internal or external 201 B/C-type and external 202C-type modems for use over dial-up or private lines at 1200 or 2400 bps. Dial-up models are available with or without the autodial feature.

Model 405 is equipped with one RS-232C communication port. Model 445 is equipped with two RS-232C communications ports and can accommodate any two communications adapters.

SOFTWARE

Sycor software for Models 405 and 445 include TAL 2000, BASIC, and ANSI COBOL programming languages; utilities; and communications software.

TAL 2000, an expanded version of TAL II, is designed for use with Models 405 and 445. Design enhancements over TAL II include screen formats; data storage locations; I/O buffer capacity; program overlays, I/O features; and clocking, security, and logging support features.

Screen formats are designed for a 1920-character screen and can be processed by the TAL 2000 Assembler. Data storage locations provide almost the same capacity and are used about the same as with TAL II. A key feature of TAL 2000 is the use of four general storage locations in place of the memory page/byte addressing of TAL II. The four are a 1) 22-byte display area (previously used as accumulator), 2) a 1920-byte screen storage area, 3) an I/O buffer area with user defined length and location, and 4) all memory that is not used by the TAL 2000 program.

TAL 2000 supports larger files than TAL II. File length can range up to 4K bytes. The I/O buffer can reside in any memory location (including the screen) that is not used by the TAL 2000 program. Buffer length and location can be altered as often as necessary during program execution. Overlay processing is more efficient with TAL 2000 than with TAL II. Program load modules include the disk address of each overlay, precluding the need to perform a program file search for a specific overlay. The disk address of the specific overlay is used to call the named overlay directly. Up to 10 logical devices can be specified.

TAL 2000 supports four access methods: sequential (SAM), relative (RELAM), indexed (IAM), and indexed sequential (ISAM). ISAM features multiple key (up to 11) and duplicate key access. Also, ISAM files can be read sequentially by key. TAL 2000 features enhanced file access methods implemented via restructured read commands. Five read commands include Read Indexed (RDI), Read Next Key (RDN), Read Relative (RDR), Read Sequential (RDS), and Read Indexed Sequential (RDX). Also, records can be locked in all file types, rather than only some types or with TAL II. Locking a file precludes a user at another terminal (in the Sycorlink configuration) from altering the contents of a record while it is being accessed by the terminal program. Spooled files are treated as input devices. The Spool Wait command (new) suspends TAL program execution while waiting for more information to be written to a spooled file. After the information has been written, program execution is resumed. The command requires no operator intervention and does not unreasonably burden the processor. The TAL 2000 program can access the system clocks and calender to provide time/date stamping on output. The TAL 2000 program can test user ID to determine authorization for file access or execution of a particular sequence of operation within a TAL program. Messages can be written to the system log directly from a TAL 2000 program for later retrieval.

Sycor *BASIC* features sequential and direct file access; all of the common algebraic operators, including arithmetic, relational, concatenation, logical, and others; exponents (to

Sycor 405 and 445 Distributed Data Entry/Processing Systems

a power of +38 and -39); three-dimensional arrays (with no limit on the number of array elements except available memory size); floating point (with single precision numbers up to seven digits); trigonometric functions; logarithms; and square roots. Program logic is governed by such statements as If, Else, On, Go To and On, and Go-Sub (for conditional branching or for BASIC subroutine linkage).

Sycor's interactive *COBOL* is a subset of ANSI COBOL and features the four basic program divisions: Identification, Environment, Data, and Procedure. Random, indexed, and sequential file access is supported, plus program segmentation (overlays), subscripting, numeric editing, figurative constants (zeros, spaces, high/low values), and other fundamental language statements common to ANSI COBOL. Sycor's COBOL is display oriented and can be used to create data entry programs at the display station. Data entry requirements such as displaying formats for keying data into the screen, accepting and editing data keyed by the operator, and displaying data on the screen that has been retrieved from system files or calculated by the COBOL program, are supported. Features include an alarm statement for keying-error recognition and highlighting attributes for dual intensity. Foreground data entry operations on several display stations concurrently with execution of utilities or a separate noninteractive COBOL program running in the background (such as report printing or transmitting data to a host computer), is supported. COBOL programs can interact with one another. Up to 90 characters of memory can be shared by all displays, and documents can be keyed to batch number and date.

COMPONENTS

4415 DISPLAY STATIONS: A 15-inch (diagonal measurement) CRT display unit for use with terminal models 405 and 445. It provides a viewing area of 10.4 inches wide by 7.75 inches high. The display arrangement is 24 lines of 80 characters each for data, plus a 25th line of 80 characters for status information for a total display capacity of 2000 characters. A character set of 64 or 96 (optional) symbols including upper case and lower case (optional) alphabetics, numerics, and special symbols is displayed in green (P42 phosphor). Each character is formed via a 7-by-9 dot matrix within a 7-by-12 dot character cell to allow for lower case descenders. The display screen is equipped with an anti-glare shield.

The typewriter and data entry style keyboards are detachable. Each includes a 10-key numeric pad, 10 program function keys, and full cursor control keys. The keyboards are designed for IBM 3270 compatibility.

FIXED DISK STORAGE (Model 445): Storage capacities of 5.3, 10.6, 21.2, or 70 million bytes are available. The basic controller cabinet accommodates storage capacities of 5.3 or 10.6 million bytes. A second controller cabinet is required to house the second 10.6 million byte drive for a 21.2-million byte installation. A 70-million byte installation requires a 10.6 million byte drive and a separate 60 million byte drive housed in a separate cabinet. Specifications for the 5.3- and 10.6-million-byte drives are: track-to-track positioning time—10 milliseconds; average positioning time—50 milliseconds; average rotational delay—12.5 milliseconds; and data transfer rate—625K bytes/second. Specifications for the 60 million byte drive have not been defined at this writing.

CARTRIDGE TAPE DRIVE: The drive accommodates a 3M-type, 4-track cartridge containing 300 feet of 0.25 inch magnetic tape. The drive has a read/write speed of 60 inches/second and a recording density of 3200 bits/inch. The data storage capacity is 5.76 million characters. Data is transferred at 24,000 characters/second and is recorded serially on each of the four tracks; tape direction is reversed at the end of each track and recording is performed in the opposite direction.

DISKETTE STORAGE: Each drive accommodates an IBM 3740-compatible diskette. The diskettes are rotated at 360 rpm for an average rotational delay of 83 milliseconds. Positioning time is 2.5 milliseconds per track. Seek time is 27.5 milliseconds track-to-track, 93 milliseconds average, and 218 milliseconds maximum. The standard data transfer rate is 31,250 bytes/second.

Diskettes are recorded via the Sycor format, which packs diskette data. A Sycor utility program converts between IBM 3740 and Sycor formats. The IBM 3740 format, also used with other Sycor 300 and 400 series units, organizes the diskette into 74 data tracks, 2 spare tracks, and 1 index track. Each track is divided into 26 sectors, and each sector into 128 bytes. Model 445 records single-sided, standard density diskettes. Model 405 can be equipped to record single or double-sided diskettes. Diskette data storage capacity (Sycor format) is 242,944 bytes per side for standard recording density.

COMPUTER TAPE DRIVES: Available tape formats are 9-track, 800 bits/inch; or 9-track, 1600 bits/inch. Both models record data on ½-inch tape in industry-compatible formats. Each of these computer-compatible tape drives is a separate, desk-top unit with a read/write speed of 12.5 inches/second. Rewind speed is 40 inches/second. The tape drives are manufactured by Wangco, and each accommodates an 8.5-inch reel (1200 feet).

CARD READER (Model 445 only): A desk-top unit reads 80-column cards at 250 cards/minute. A single input hopper and output stacker have a rated capacity of 600 cards each.

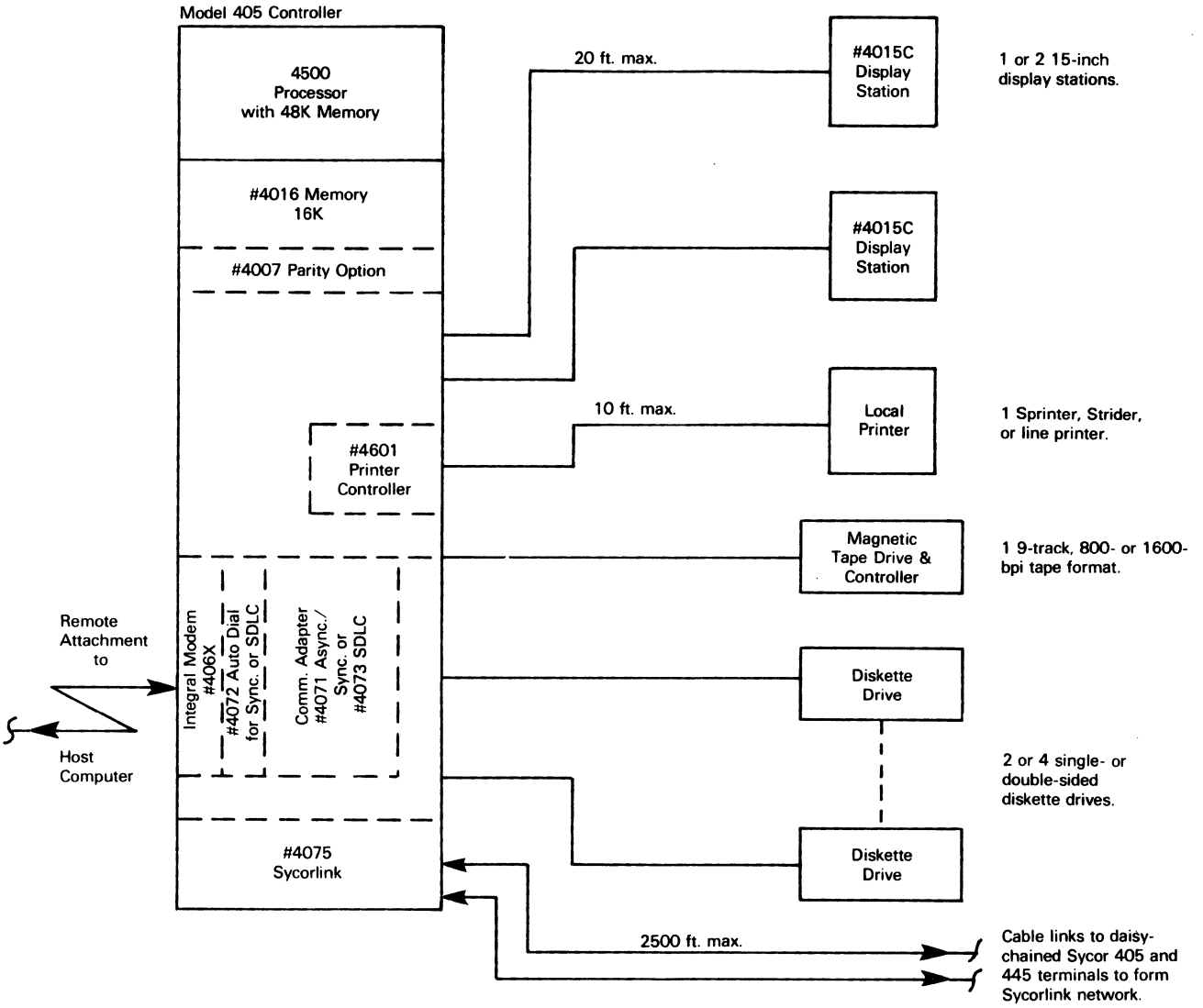
BELT AND LINE PRINTERS: The belt printer, called Strider and produced by General Electric as the TermiNet 340, is rated at 300 lines per minute and provides 132 print positions. The printer provides a standard character set of 64 ASCII characters and accommodates 6-part continuous, pin-fed forms from 3 to 15 inches wide via adjustable tractor feed. Horizontal and vertical spacing is 10 characters per inch and 6 lines per inch, respectively.

The line printer, a drum printer produced by Data Printer, is rated at 600 lines per minute and provides 132 print positions and a standard 64-character print set. Horizontal and vertical spacing is 10 characters per inch and 6 or 8 (optional) lines per inch. The printer accommodates 6-part, pin-fed continuous forms from 3-1/2 to 19-1/2 inches wide.

SPRINTER SERIAL PRINTERS: Three models of bi-directional impact matrix printers provide rated speeds of 60, 120, and 180 cps with 132 print columns. Each is controlled via an integral microprocessor with 5K bytes of memory. The printers feature a standard 64-character set of ASCII symbols (each formed via a 7-by-7 dot matrix), a cartridge ribbon, and "snap-out" tractor pin or friction feed mechanisms. The printers accommodate 6-part continuous feed forms from 2 to 14-7/8 inches wide via tractor feed or 4 to 4-7/8 inches wide via tear-bar tractor feed. The head position is adjustable for paper thickness. Standard horizontal and vertical spacing is 10 characters/inch and 6 lines/inch. Optional spacing provides 16½ characters/inch horizontally and/or 8 lines/inch vertically. A re-inking mechanism extends ribbon life. Vertical slewing at high speed over blank lines is standard. A horizontal slew option performs high-speed skipping over blank fields. Each model is equipped with a 12-key function pad for setting margin widths, forms length, vertical and horizontal tab positions; for initiating commands such as "top-of-form"; and for setting forms alignment for pre-printed forms. The keys can also initiate generation of two diagnostic test patterns. One is a continuous printout of the character set on 132-character lines; the other is alternate X's and O's on 16-character lines.

Sycor 405 and 445 Distributed Data Entry/Processing Systems

Configuration



PRICING

The Sycor intelligent terminals are available for purchase or on lease. Lease arrangements are available for one or two years or 42 months for Model 445 and one, two, or four years for Model 405.

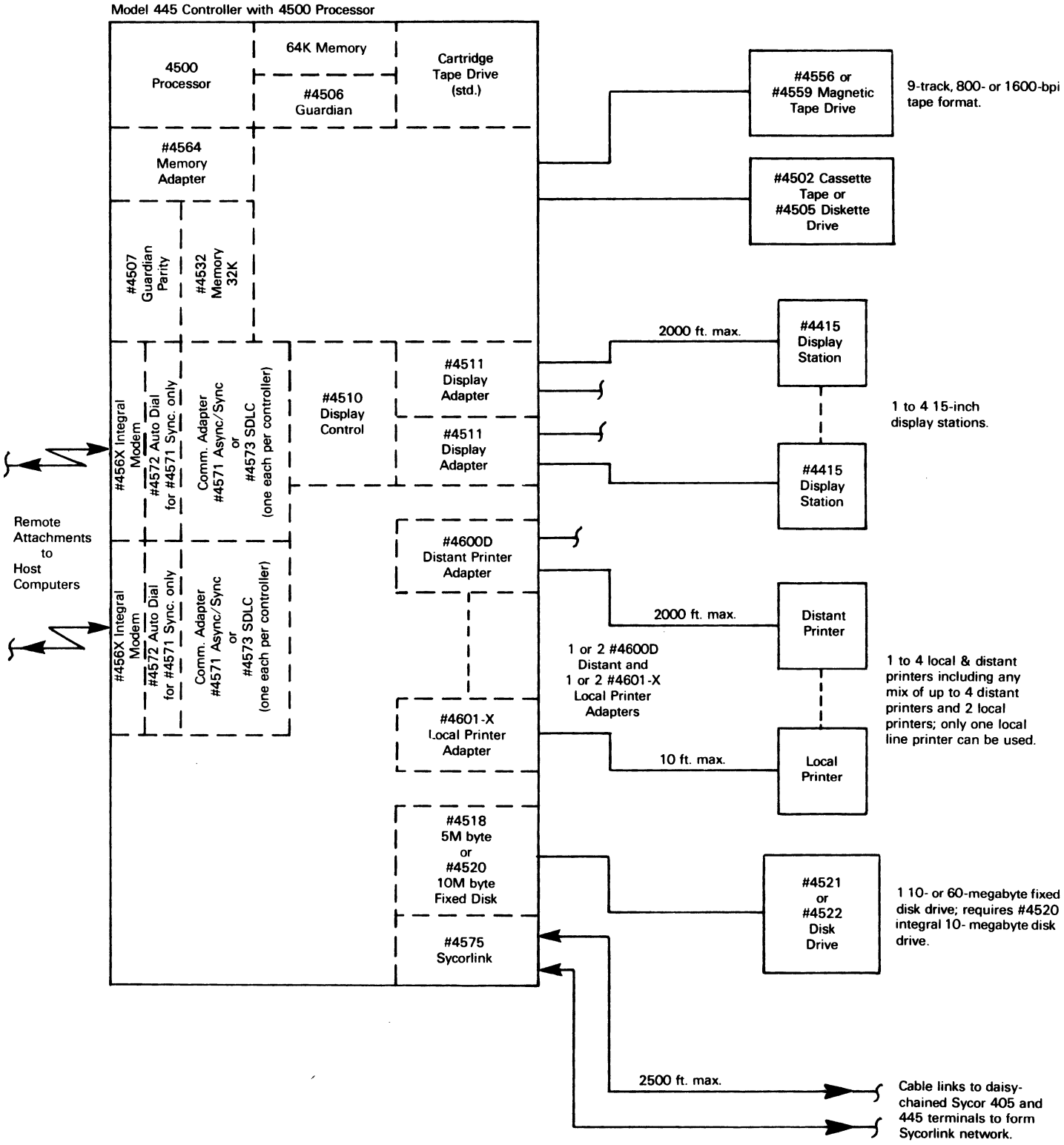
Maintenance is priced separately for both leased and purchased equipment. Prime shift maintenance is provided; however, service for 24 hours per day 7 days per week is available on a negotiable basis. Sycor provides quantity discounts up to 25 percent for purchased units and discounts up to 25 percent for lease periods up to 5 years. A purchase credit plan is available to convert from lease to purchase.

The investment tax credit is passed on to the customer for purchased equipment only.

Sycor provides training at its three training centers, the corporate headquarters, Washington, D.C., and San Francisco. Two to four days of training are provided at a charge of $50 per day per person. Sycor also offers on-site training at a customer location for a minimum of four persons and in major cities as required.

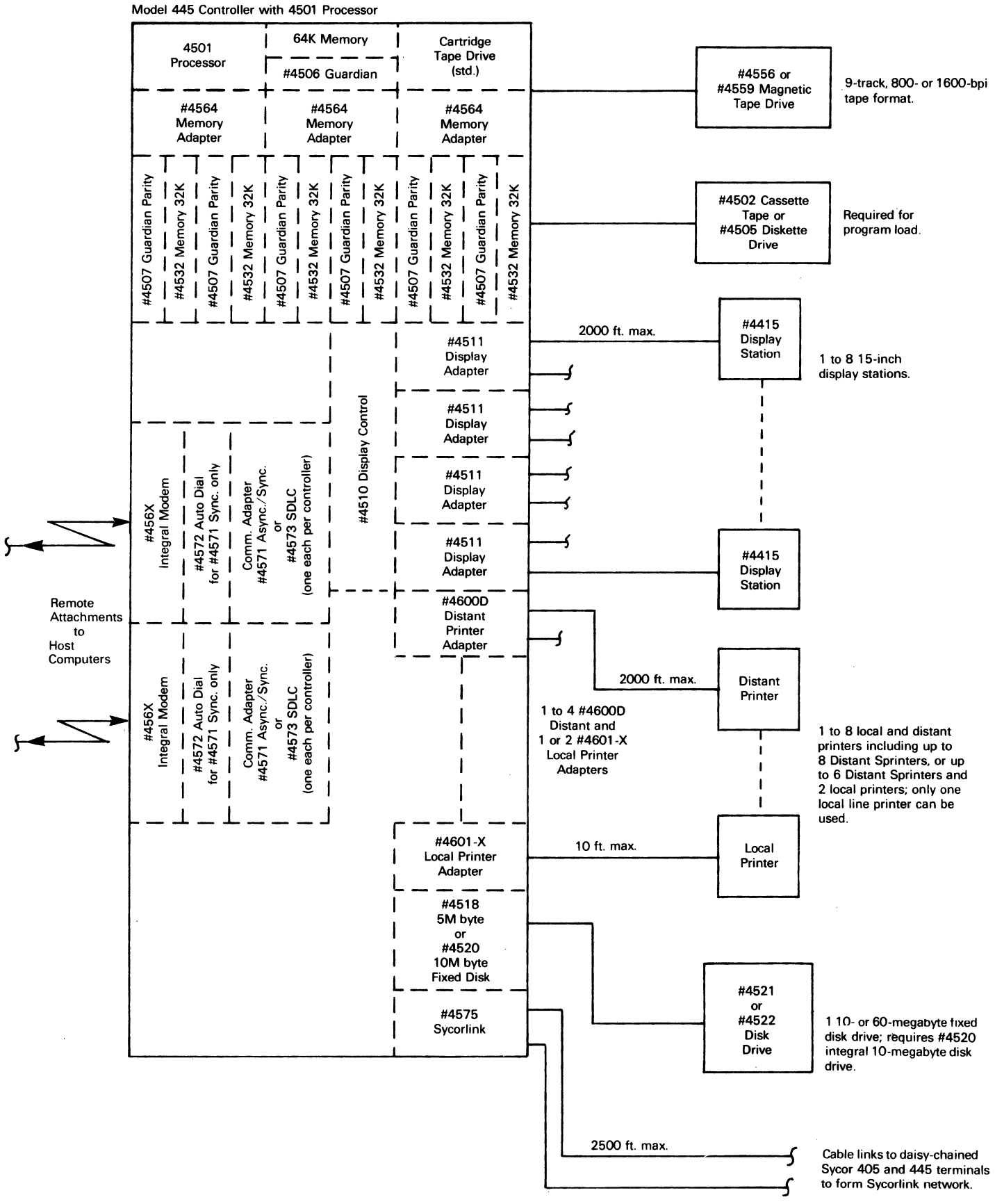
Sycor 405 and 445 Distributed Data Entry/Processing Systems

Configurations (continued)



Sycor 405 and 445 Distributed Data Entry/Processing Systems

Configurations (continued)



Sycor 405 and 445 Distributed Data Entry/Processing Systems

	Model 405 Terminal	Monthly Charge* 1-Year Lease	2-Year Lease	4-Year Lease	Purchase	Monthly Maint.
405	Control Unit with 48K bytes of memory	$167	$155	$142	$ 6,250	$42
4015C	Display; 15-inch CRT without keyboard	83	76	69	3,600	11
4416	Display Pedestal	3	3	2	150	N/C
4535	78-Key Typewriter Keyboard	N/C	N/C	N/C	N/C	N/C
4539	78-Key Keypunch Keyboard	N/C	N/C	N/C	N/C	N/C
4537	Keylock					
4016	Additional Memory; 16K bytes	26	24	22	1,000	6
4007-48	Parity for 48K memory	15	14	12	650	2
4007-64	Parity for 64K memory	18	17	15	750	3
4112	Two Diskette Drives; single side	100	92	84	3,900	22
4114	Four Diskette Drives; single side	197	182	166	7,650	44
4122	Two Diskette Drives; dual side	190	166	162	7,000	50
4124	Four Diskette Drives; dual side	320	297	274	11,500	90
4071	Asynchronous/Synchronous Communications Adapter	38	36	33	1,100	13
4072	Auto Dial; for Sync. Comm. Adapter	9	8	8	350	2
4073	SDLC Intelligent Adapter	43	40	37	1,500	13
4075	Sycorlink feature	75	70	65	2,500	25
4061/3	201C Compatible Integral Modem, 2400 bps	56	52	47	1,800	11
4460	202C Compatible External Modem; 1200 bps	27	25	23	800	7
4461/2/3	201C Compatible External Modem; 2400 bps	59	54	49	1,900	10
	Local Printer Controller—					
4601-1	For 1 Sprinter	21	20	18	760	6
4601-2	For 1 Strider; 300 lpm	21	20	18	760	6
4603-3	For 1 line printer; 600 lpm	21	20	18	760	6
40606	Local Sprinter Printer; 60 cps, requires 4601	106	98	90	4,140	28
40612	Local Sprinter Printer; 120 cps, requires 41601	136	127	118	5,140	45
40618	Local Sprinter Printer; 180 cps, requires 4601-1	166	155	144	7,160	55
4620	Tractor Feed Module with stand	23	21	19	700	5
4624	Tear-Bar Tractor Feed Module	23	21	19	700	5
4635	Stand for Tear-Bar Tractor Feed	5	4	4	250	N/C
4640	6/8 lines/inch, switchable	10	9	8	400	N/C
4642	10/16.5 chars./inch, switchable or program select	15	14	12	600	N/C
4644	Fast Horizontal Slew; requires 180-cps printer	20	19	17	600	5
4646	Vertical Slew	N/C	N/C	N/C	N/C	N/C
4652	Upper/Lower Case ASCII; 7 x 9 dot matrix	20	19	17	675	5
45730	Strider Printer, 300 lpm; requires 4601-2	395	465	334	11,240	91
4740	Front Load Low Paper Sensor	6	6	5	145	1
4741	Basket	5	5	4	140	N/C
4742	Guideframes & Strap; requires 4741	2	2	2	70	N/C
4594	Line Printer 600 lpm; requires 4603-3	708	652	595	21,740	143
4598	6/8 Lines/Inch	35	32	28	1,400	N/C
4599	12 Channel VFU	20	18	16	800	N/C
4556	Magnetic Tape Drive; 9-track, 1600 bpi	630	578	526	26,100	110
4559	Magnetic Tape Drive; 9-track, 800 bpi	279	255	231	11,900	39

*Includes maintenance.
N/C—no charge.

	Model 445 Terminal	Monthly Charge* 1-Year Lease	2-Year Lease	42-Month Lease	Purchase	Monthly Maint.
4500	Control Unit with standard processor; 64K-byte memory; and cartridge tape drive	$555	$510	$465	$22,500	$105
4501	Control Unit with high-speed processor; 64K-byte memory and cartridge tape drive	705	647	589	29,000	125
4564	Memory Adapter; for each additional 64K-bytes of memory, 1 max. per 4500 or 3 max. per 4501	40	36	33	1,800	4
4532	Additional Memory, 32K-bytes; requires #4564 for each 64K-byte increment of additional memory	43	40	37	1,600	11
4506	Guardian Option; includes 64K-byte memory parity	66	62	57	2,200	22
4507	Guardian Parity; for each 32K-byte increment beyond standard 64K-bytes	4	4	3	200	2
4510	Display Control; for up to 4 4511 Display Adapters, 2 max. per 4500 or 4 max. per 4501	62	56	52	2,800	6

*Includes maintenance.
N/C—No charge.

Sycor 405 and 445 Distributed Data Entry/Processing Systems

		Monthly Charge*				
		1-Year Lease	2-Year Lease	42-Month Lease	Purchase	Monthly Maint.
4511	Display Adapter; for 2 4415 Displays, 2 max. per 4500 or 4 max. per 4501	23	21	20	800	7
4415	Display; 15-inch CRT with keyboard	65	59	54	2,800	9
4416	Display Pedestal, adjustable	3	3	2	150	—
4518	Disk Drive; 5 Megabytes, non-removable inboard, first drive	178	164	149	7,150	33
4520	Disk Drive; 10 Megabytes, non-removable inboard, first drive	274	251	228	11,500	44
4521	Disk Drive; 10 Megabytes, non-removable outboard, add-on drive	233	213	193	9,000	33
4522	Disk Drive; 60 Megabytes non-removable outboard, add-on drive	700	655	610	22,750	250
4505	Diskette Drive; mutually exclusive with 4502	92	85	77	3,750	17
4571	Asynchronous/Synchronous Communications Adapter; 600-4800 bps for 4500 processor, 600-9600 bps for 4501 processor	38	36	33	1,100	13
4572	Auto Dial; for Sync. Comm. Adapter	9	8	8	350	2
4573	SDLC Intelligent Adapter; 600-4800 bps for 4500 processor, 600-9600 bps for 4501 processor	43	40	37	1,500	13
4575	Sycorlink feature	37	35	32	1,250	12
4561/2/3	201C Compatible Integral Modem; 2400 bps	56	52	47	1,800	11
4460	202C Compatible External Modem; 1200 bps	27	25	23	800	7
4461/2/3	201C Compatible External Modem; 2400 bps	59	54	49	1,900	10
4600D	Distant Printer Adapter; for 2 distant printers, 2 max. per 4500 or 4 max. per 4501	16	15	14	500	6
4601-1	Local Intelligent Adapter and 10-foot cable for one sprinter printer	21	20	18	750	6
4601-2	Local Intelligent Adapter and 10-foot cable for one Strider printer	21	20	18	750	6
4601-3	Local Intelligent Adapter and 10-foot cable for one line printer	21	20	18	750	6
45606	Local Sprinter printer; 60 cps	120	111	102	4,140	28
45612	Local Sprinter printer; 120 cps	185	171	157	5,140	45
45618	Local Sprinter printer; 180 cps	243	467	205	7,160	55
45606D	Distant Sprinter Printer; 60 cps	147	136	124	5,250	33
45612D	Distant Sprinter Printer; 120 cps	212	196	180	6,250	50
45618D	Distant Sprinter Printer; 180 cps	270	249	228	8,270	60
4620	Tractor Feed Module; includes printer stand	23	21	19	700	5
4624	Tear-Bar Tractor Feed Module	23	21	19	900	5
4635	Stand for Tear-Bar Tractor	5	5	4	250	—
4640	6/8 lines/inch; switchable	10	9	8	400	—
4642	10/16.5 chars./inch; switchable	15	14	12	600	—
4644	Fast Horizontal Slew; for 180-cps printer	20	19	17	600	5
4652	Upper/Lower Case ASCII 7-by-9 dot matrix; for 180-cps printer	20	19	17	675	5
45730	Strider Printer; 300 lpm, local	395	365	334	11,240	91
4740	Front-Load Low Paper Sensor	6	6	5	145	1
4741	Basket	5	5	4	140	—
4742	Guideframes and strap	2	2	2	70	—
4594	Line Printer, 600 lpm	708	652	595	21,740	143
4598	6/8 lines per inch, switchable	35	32	28	1,400	—
4599	12-channel VFU	20	18	16	800	—
4502	Cassette Tape Drive; mutually exclusive with 4505	66	61	55	2,770	11
4556	Magnetic Tape Drive; 9-tk, 1600 bpi, 8.5-inch reel, mutually exclusive with 4559	480	443	406	17,400	110
4559	Magnetic Tape Drive; 9-tk, 800 bpi, 8.5-inch reel, mutually exclusive with 4556	219	201	183	7,900	39
4540	Card Reader; 250 cpm	122	112	102	3,500	22

*Includes maintenance.
N/C—No charge.■

Sycor 405 and 445 Distributed Data Entry/Processing Systems New Product Announcement

On June 5, 1978, at the NCC, Sycor announced the *Sycor 404,* an entry-level member of its larger 405/445 family of distributed processing systems. The Sycor 404 consists of a controller with 48K bytes of RAM memory and dual single-sided diskette drives; a single 2000-character display station with typewriter or data-entry-style keyboard; 60-, 120-, or 180-cps Sprinter printer; an asynchronous or synchronous communications interface; and an integral or external modem. Synchronous transmission is supported at 600 to 9600 bits per second using ASCII or EBCDIC code and BSC or SDLC protocol. Asynchronous transmission is supported at 37.5 to 1200 bits per second using ASCII code. Sycor provides a 1200-bps, 202C-compatible external modem for dial-up operation, a 2400-bps 201C-compatible integral modem for dial-up operation, or a 2400-bps 201B-compatible integral modem for leased-line operation. Three high-level programming languages are provided: COBOL, BASIC, and TAL 2000, Sycor's data entry language. Software compatibility is provided with the Sycor 405 and 445 terminals. The Sycor 404 is not available with Sycorlink. The Sycor 404 is available for purchase only; maintenance is priced at $65 per month.

		Purchase
404	Control Unit with 48K bytes of memory, dual diskette drives, and BSC synchronous communications adapter	$6,250
4012T	Display; 12-inch CRT with typewriter keyboard	NC
4012K	Display; 12-inch CRT with keypunch keyboard	NC
4007-48	Parity for 48K memory	650
4601-1	Printer Adapter & Cable	600
4065	Asynchronous RS-232C Interface for user-supplied I/O devices	800
94073	SDLC Synchronous Communications Adapter (replaces BSC synchronous adapter)	100
94065	Asynchronous Communications Adapter (replaces BSC synchronous adapter)	100
4460	202C-Compatible External Modem, 1200 bps; dial-up	800
4461	201C-Compatible Integral Modem, 2400 bps; dial-up	1,800
4463	201B-Compatible Integral Modem, 2400 bps; leased line	1,800
9606	Sprinter Printer, 60 cps; requires 4601-1	2,985
9612	Sprinter Printer, 120 cps; requires 4601-1	3,371
9618	Sprinter Printer, 180 cps, requires 4601-1	3,838
4620	Tractor Feed Module; includes stand	700
4624	Tear-Bar Tractor Feed Module	1,600
4635	Stand for Tear-Bar Tractor Feed	300
4641	Compressed Print; 6/8 lines per inch and 10/16.5 chars. per inch, both switch selectable	500
4644	Fast Horizontal Slew; requires 180 cps printer	600
4652	Upper/Lower Case ASCII; 7 x 9 dot matrix	675

Sycor also announced the *Data Station 12,* a compact 12-inch, 576-character display station with integral typewriter or keypunch keyboard; either is equipped with a numeric keypad. The Data Station 12 is available for use with the Sycor 445 system via the 4410 Display Control. It can be located up to 300 feet from the Sycor 445 controller. Each character is formed by a 5-by-7 dot matrix, and the display features three beam intensity levels for highlighting displayed data or restricting confidential data on the screen. Up to eight Data Station 12's can be supported on the Sycor 445, up to four per 4410 Display Control. Deliveries of the Data Station 12 are scheduled for September 1978.

	Monthly Charge*					
	3-Mo. Lease	1-Yr. Lease	2-Yr. Lease	4-Yr. Lease	Purchase	Monthly Maint.
Data Station 12:						
Locally powered (via wall socket)	**$60**	**$50**	**$46**	**$42**	**$2,450**	**$10**
Control-unit powered	**53**	**44**	**40**	**37**	**1,800**	**8**
4410 Display Control	**24**	**20**	**19**	**17**	**735**	**5**

***Includes maintenance.**

Sycor 405 and 445 Distributed Data Entry/Processing Systems New Product Announcement

➢ *Additional software support for the Sycor 445,* also announced in June 1978, includes Omni, a multifunctional operating system; UMCS, multipoint communications software; and CDCRJE, RJE support for Control Data networks.

Omni supports eight concurrent foreground tasks plus eight concurrent background tasks in virtually any combination of data entry, communications, and processing functions. The 16 concurrent tasks can be running in COBOL, BASIC, and TAL 2000 along with IBM 3270 emulation and utility programs. Several benefits are derived from Omni. More background space is available for urgent tasks; distributed processing and on-line activities can be consolidated; each operator is provided with the equivalent of a Sycor 410 as a result of the extended memory and background partitioning available to each data station; the 445 system does not have to be dedicated to a single set of tasks, excluding others because they run in another language; and no apparent significant changes are required in Sycor's standard operating procedures. Omni will be available at no additional cost in April 1979.

UMCS (Unattended Multipoint Communication Station) supports the Sycor 445 on a multipoint network and is ideal for high-volume transaction applications. UMCS operates in the background and supports both transparent and nontransparent data over dial-up or leased lines at speeds of up to 9600 bps. The UMCS program interfaces an operator-accessible, user-addressable message buffer via a COBOL or TAL 2000 program. The buffer contains one to eight addressable message queues which permit the user to assign a high priority to critical jobs. Sycor's pre-polling feature permits each Data Station to use its dedicated communications buffer to store data until it is requested by the host. UMCS will be available in November 1978 for a licensing fee of $500.

CDCRJE is a remote job entry program for use with a Control Data host computer that combines the capabilities of a CDC 200 User Terminal with the flexibility of the Sycor 445. Users can tailor CDCRJE to fit the requirements of the CDC host and the available transmission capabilities by configuring the software for items such as line speed and number of buffers. This is established by setting disk-resident CDCRJE configuration instructions. CDCRJE will be available in October 1978 at no extra charge.□