TYPE

74-03A TIME BASE PLUG-IN

Instruction Manual

Serial No. ____________________

This Plug-in Module is designed for use with the Fairchild Type 766H Series Oscilloscope. Insert this Manual into the binder you received with the Type 766H Series Instruction Manual.

FAIRCHILD
INSTRUMENTATION
50 SOMERSET PLACE, CLIFTON, N.J. 07015

Manual No. 6704 4063

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SECTION 1
TECHNICAL SUMMARY

1-1. INTRODUCTION

The Type 74-03A Time Base Plug-in Module is designed for use with the Fairchild Type 766H Series Oscilloscopes. Twenty-four calibrated sweep rates are provided at rates from 0.05 microsecond/div to 2 seconds/div and with recurrent, triggered, automatic, or single sweep operational mode. When the Time Base unit is properly calibrated, the full scale accuracy of the sweep rate is within ±3%.

The VARIABLE control provides a continuous uncalibrated range of sweep rates between the fixed steps of its concentric neighbor. A calibrated 10 times magnification control will expand the sweep about screen center. Use of this feature extends the fastest calibrated sweep rate to 5 nanoseconds/div.

Note: All measurements are taken beyond the first 50 nanoseconds of sweep time.

1-2. TECHNICAL SUMMARY

The performance specification for Type 74-03A Time Base Plug-in is given in the technical summary which follows.

section 1 — technical summary

SPECIFICATIONS

TIME BASE SYSTEM

Calibrated Sweep Range

Calibrated linear sweep rates from 0.05 μsec/div to 2 sec/div in 24 steps of 1, 2, and 5 sequence

Uncalibrated Sweep Range

The VARIABLE control provides a continuous uncalibrated range of sweep rates between ranges and extends the 2 sec/div range to 6 sec/div (60 seconds full scale). The UNCAL lamp serves as an indicator of uncalibrated vernier gain setting

Sweep Accuracy

±3% measured over the centered 8-division portion of the CRT screen

Sweep Expansion

The POSITION knob is provided with a push-pull switch; the pulled knob indicated 10X MAG of the display. The calibrated 10X MAG control will expand the sweep about screen center; extends fastest calibrated sweep rate to 5 nanoseconds/div

Expansion Accuracy

±5% for sweep rates up to 5 nanoseconds/div. All measurements taken beyond the first 50 nanoseconds of sweep time. An uncalibrated, faster sweep rate to 5 nanoseconds/div is provided. The UNCAL lamp is lit for this sweep rate setting

Expanded Sweep Positioning

Sufficient to position any full scale portion of the expanded trace on the screen

Sweep Calibration

A front-panel screwdriver SWP CAL control is provided to permit normalization of the plug-in unit to the Main Frame and standardizing the sweeps to an external time standard

Saw Out

A BNC front-panel connector provides a positive-going saw of 25 volts amplitude. Output impedance is nominally 3300 ohms, and load should be greater than 100K ohms shunted by less than 15 pf. The saw output is referenced within ±5 volts of ground and is time-coincident with the sweep

Gate Out

A BNC front-panel connector provides a positive-going pulse of more than 4 volts. Output impedance is 750 ohms; for optimum performance, load impedance should be greater than 100K ohms shunted by less than 15 pf. Gate is referenced directly to ground and is time-coincident with the sweep. Rise and fall times are faster than 0.25 microsecond

SWEEP MODES

Recurrent Sweep

The free-running sweep mode permits viewing a bright base line for zero vertical reference indication. Recurrent sweep is also used when high-frequency triggering is required

Triggered Sweep

This sweep mode is normally used. Internally or externally applied trigger signals drive the Time Base circuit

Auto Sweep

Auto sweep provides a visible base line on all sweep ranges when there is no signal input. Auto triggering maintains base line when losing a signal in dual trace vertical amplifier operation. Also see "Automatic Triggering"

Single Sweep

The single sweep mode permits but one driven sweep of the time base to appear on the screen until the sweep is reset or rearmed. The single sweep may be rearmed with a single external trigger pulse, by a front panel RESET push button, or from the EXT RESET panel connector.

The SWP READY indicator is lit whenever the sweep gate multivibrator is armed and ready to be triggered

TRIGGERING SYSTEM

HF Stability

The panel HF STAB control is provided to permit improved synchronization of high-frequency input signals in range from 5 Mc to above 50 Mc in the recurrent sweep mode. This control provides a small variation in natural repetition rate of the sweep so that exact sub multiples of the trigger frequency can be selected

Internal Trigger

Sweep will trigger from 0.3 div of Y signal up to 1 Mc; from 1 div of Y signal up to 10 Mc with Types 76-01A, 76-02A, 76-03 and 76-08 Modules in Y cavity

External Trigger

250 mv peak-to-peak from dc to 1 Mc will trigger the sweep; 1 volt peak-to-peak will trigger the sweep to 15 Mc, and 2 volts peak-to-peak to 25 Mc. Trigger leveling, slope selection, and ac or dc coupling are included

Ext Trig Input Impedance

1 megohm shunted by 40 pf (nominal)

Trigger Level

A range of ±15 volts (nominal) with respect to ground. On External Trigger source, the leveling range is extended to ±150 volts with the use of a Fairchild Type 4290 Attenuator Probe

Trigger Slope

Selection of positive or negative slopes on Internal, Line, or External triggering is available

Line Trigger

Line frequency triggering can be selected in either polarity and the triggering point may be shifted with the TRIG LEVEL control

AC Coupling

High-pass filter with low-frequency cutoff of 80 cycles

DC Coupling

Direct coupling is provided to optimize trigger sensitivity when very slow waveforms are applied; to maintain the initial reference position of the trace with respect to the CRT scale at a given trigger level setting; and to avoid trigger point variations due to random repetition rate trigger signals

LF Reject

Differentiated trigger input; high-pass filter is provided to reject hum and low-frequency amplitude modulation; low-frequency cutoff nominally 15 Kc. Signals should rise or fall in less than 100 μsec to pass the LF Reject filter

Automatic Triggering

Automatic triggering is available in conjunction with disabled trigger leveling on Internal, Line, and External trigger sources. The auto mode improves trigger sensitivity, minimizes trigger setup, and provides a continuous base line at a nominal frequency of 50 cycles

HORIZONTAL DEFLECTION SYSTEM

Bandwidth

Direct Coupled: DC to 4 Mc, (Normal)

Capacitively Coupled: Low-frequency cutoff is 80 cycles

Rise Time

Faster than 95 nanosecond

Sensitivity

X1 Range: 200 millivolts/div
X10 Mag: 20 millivolts/div (Nominal) X10 magnification required for full scan operation of X amplifier display

Input Impedance

1 megohm shunted by 40 pf (nominal)

Input Connector

EXT INPUT connector is provided to permit use of the horizontal deflection amplifier for X-Y displays

X Positioning

A front-panel control permits coarse and fine positioning of the X Input signal or any portion of the sweep to within two divisions of screen center

Beam Position Indicators

Two indicator lamps are located on the front panel to alert the operator as to the direction of the beam when it is positioned off the screen

NOTES

SECTION 2
OPERATING INSTRUCTIONS

2-1. FIRST TIME OPERATION (Figures 2-1 to 2-3)

Unless otherwise designated, it is presumed that a Y Amplifier Plug-in module is inserted in the Y cavity (left-hand side) and the Type 74-03A Time Base Plug-in unit is inserted in the X cavity (right-hand side) of the Main Frame. If the Type 74-03A Plug-in unit is inserted in the Y cavity of the Main Frame, it will provide vertical deflection of the trace and the information must be translated accordingly. In the instructions which follow, capital letters within the text indicate front-panel controls, connectors, or settings.

The following illustrations are designed to aid the operator in becoming familiar with the oscilloscope.

Figure 2-1. Front-Panel Facilities, Time Base System
Figure 2-2. Front-Panel Facilities, Triggering and External Input
Figure 2-3. Initial Setup of Type 74-03A Time Base Plug-In

We know that you are anxious to get acquainted with your new instrument. To aid you in this endeavor, you may set up the instrument using the built-in calibrator signal to demonstrate the effects of the various controls on the display.

2-2. SWEEP TRIGGERING

To obtain a stable display, the sweep must consistently start at the same time relative to recurring cycles of the input waveform. If the sweep is allowed to occur at random or at a rate unrelated to the rate of occurrence of the input waveform, the displayed pattern will be traced out at a different point on the screen each time the sweep runs. This will either cause the waveform to drift across the screen or to be unintelligible. The sweep therefore must be triggered by the input signal, or by some signal which bears a fixed time relationship to the input signal. For present purposes, the starting of each horizontal waveform across the screen may be called "triggering the sweep." The following instructions tell you how to select and use the proper triggering signal for various applications.

2-3. TRIGGER SOURCE SELECTION

a. Internal

For most applications, the sweep may be triggered by the Y Input signal. The only requirement is that the signal amplitude be sufficient to trigger the sweep. To obtain triggering of the sweep from the input signal, set the SOURCE switch to INT. Internal triggering is convenient since no external triggering connections are required. Satisfactory results are obtained in most applications.

b. External

Sometimes it is advantageous to trigger the sweep with an external signal. External triggering is especially useful where signals are going to be sampled from several different places within an instrument. With external triggering, the triggering signal usually remains constant in amplitude and shape. Thus, it is possible to observe the shaping and amplification of a signal in an external circuit without resetting the oscilloscope triggering controls for each observation. Also, time and phase relationships between the waveforms at different points in the circuit can be seen. For example, if the external triggering signal is derived from the waveform at the input to a circuit, the time relationship and phase of the waveforms at each point in the circuit are compared to the input signal by the displayed waveform.

When a stable, external triggering signal is available, it is possible to observe and accurately measure jitter of the displayed waveform with respect to the trigger input signal. This is not possible when the sweep is triggered internally. Internal triggering will not permit base line to show on screen prior to the rise of the signal being observed unless the Y system has a signal delay line. When a signal delay line is not provided, a trigger preceding the signal may be used to externally trigger the oscilloscope to display the entire signal.

External triggering should also be used with most dual-trace amplifier modules when these are operated in the alternate mode to show the proper time relationship between the two displayed signals. To obtain a stable display, the external triggering signal must have an amplitude of at least 0.25 volt, peak-to-peak, and bear a fixed time relationship to the displayed signal. To use an external signal for triggering the sweep, connect the signal to the EXT INPUT connector and set the TRIG SOURCE switch to EXT.

c. Line

If the pattern on display bears a fixed time relationship to the power-line frequency, the sweep may be triggered by this signal. To accomplish this, set the TRIG SOURCE switch to LINE.

TIME/DIV

Outer knob (black): selects calibrated sweep rates as indicated on front panel only when the concentric VARIABLE control is set to CAL

POSITION & 10X MAG

Control with push-pull switch: the control positions the trace horizontally when Time Base Plug-in is normally inserted in its X cavity; the pulled knob indicates 10X MAGnification of the internal sweep, or of the External horizontal input signal.

VARIABLE

Inner knob (red pointer): provides a continuous, uncalibrated range of sweep rates between the fixed steps of its concentric neighbor

SAW OUT

BNC connector: provides a positive saw signal coincident with sweep time

SWP CAL

Screwdriver control: permits normalization of the Plug-in unit to the Main Frame

GATE OUT

BNC connector: provides a positive output pulse coincident with sweep time for operation of auxiliary equipment

SWEEP MODE SELECTOR

Switch: selects four different internal sweep modes as indicated on front panel; or the EXT INPUT signal when the switch is set to X AMP

UNCAL

Lamp: lights and serves as a warning indicator when using uncalibrated sweep or when VARIABLE control is not turned fully clockwise

Figure 2-1. Front-Panel Facilities, Time Base System

EXT INPUT

Dual function connector:

1. External trigger operation; set Trigger SOURCE switch to EXT and apply external trigger signal to this connector.
2. X Amplifier operation; set Sweep Mode Selector switch to X AMP and apply X Input signal to this connector.

← Beam Position Indicators →

RESET or EXT RESET

Permits rearming of single sweep via contact closure to ground by either manual operation of the RESET pushbutton switch or by remote-control operation of the 2-contact EXT RESET socket

HF STAB

Control: permits improved count down and lock-in of signals having repetition rates of 5 Mc or greater

SWP READY

Lamp: lights whenever the sweep gate generator is armed and ready to be triggered

TRIGGERING

Two, 3-position and one, 2-position lever switches: enables trigger selection from internal or external SOURCE, direct or capacitive COUPLING, and choice of SLOPE polarities

TRIG LEVEL & VERNIER

Dual function control:

1. Trigger level operation (red): selects voltage level at which sweep is fired.
2. X Amplifier operation (green): serves as X VERNIER gain control.

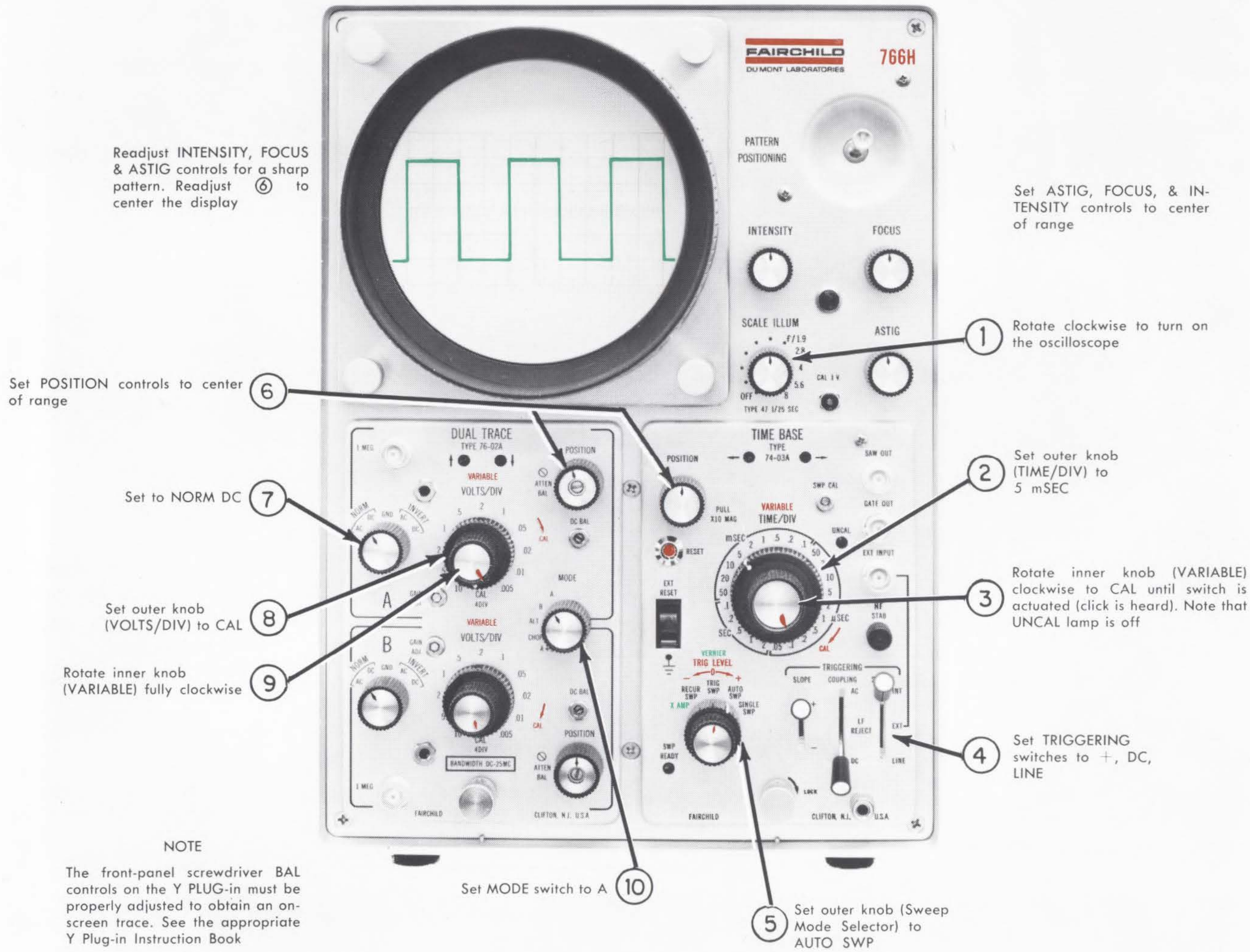
JACK

For ground connections

Figure 2-2. Front-Panel Facilities, Triggering and External Input

To obtain the calibrator display, set the controls exactly as shown and perform the numbered steps in sequence.

Use the same procedure when difficulty is experienced when obtaining a display. This will eliminate "cockpit" troubles due to misalignment of controls.



NOTE

The front-panel screwdriver BAL controls on the Y PLUG-in must be properly adjusted to obtain an on-screen trace. See the appropriate Y Plug-in Instruction Book

Figure 2-3. Initial Setup of Type 74-03A Time Base Plug-In

2-4. TRIGGER COUPLING SELECTION

a. AC Coupling

Selection of the AC triggering mode is accomplished by setting the Trigger COUPLING switch to AC. This mode is provided with a high-pass filter that has a low-frequency cut-off nominally at 80 cycles. This feature prevents erratic triggering when positioning the pattern vertically while using internal triggering. In the AC mode, triggering is unaffected by the dc components of the triggering signal or by the vertical positioning of the trace. The triggering level can be selected to provide the desired display via use of the TRIG LEVEL control.

When using the AC mode, the Trigger COUPLING switch is set to AC. The trace always starts at the same point on the *Waveform* for a given Trigger LEVEL control setting regardless of the vertical positioning.

Note: AC coupling triggering on the line-frequency calibrator signal or square wave signals less than 100 cycles may be erratic since the 80-cycle cutoff filter severely differentiates the trigger. DC coupling is recommended for these signals.

b. DC Coupling

The DC mode is especially useful for viewing waveforms which change very slowly and which are therefore discriminated against by the low-frequency cutoff of the AC position (80 cps). Because of the coupling network time constant in the AC mode, signals having random repetition rates are sometimes viewed more stably in the DC mode.

This mode permits excellent triggering on all types of waveforms and is most useful in the following applications:

1. For optimizing trigger sensitivity or operation when very low frequencies are applied;
2. For maintaining the initial reference position of the trace with respect to the CRT scale at a given TRIG LEVEL control setting when on Internal Source; and
3. For avoiding trigger point variations due to random repetition rate triggering signals.

When using the DC mode, the Trigger COUPLING switch is set to DC. When using Internal Source, the trace always starts at the same point on the *Scale* for a given setting of the TRIG LEVEL control regardless of the vertical positioning.

c. LF Reject Coupling

The LF REJECT mode is a special high-frequency form of the AC mode and is used to reject low-frequency components such as 60 cps hum, in the triggering signal. Use AC triggering unless low-frequency rejection is required. Triggering signals with frequency components below 15 Kc may not initiate the sweep circuits when the LF REJECT mode is used. *The LF REJECT mode will provide more stable triggering from the Type 76-02A Dual-Trace plug-in when it is set up for alternate sweep mode and using internal trigger source.* The LF REJECT mode reduces the effects of a difference in positioning level of the two channels on triggering stability.

Signals must have rise or fall time faster than 100 μsec when using the LF REJECT mode. If slower dual-time signals are to be displayed, use external triggering. Note that the Type 76-08 and other multi-trace plug-ins are provided with a selector switch which permits triggering from one channel only. With such units, the LF REJECT mode might find its greatest use when displaying two non-synchronous signals in the dual ALTernate mode.

Occasionally it is required to obtain stable triggering from a complex, high-frequency waveform that contains undesirable low-frequency noise or line-frequency components. In such cases, the additional noise and line pickup may make it difficult to obtain a stable display. If this occurs, select the LF REJECT triggering mode, thereby eliminating the effects of these undesired components. The low-frequency components are blocked from the triggering circuit while the high-frequency triggering waveform is passed to produce the stable triggering that is required. In all other respects, the LF REJECT triggering mode is identical to the AC mode.

2-5. TRIGGER SLOPE SELECTION

When the Trigger SLOPE switch is set to +, the sweep is triggered on the rising or positive slope of the excitation signal. When the Trigger SLOPE switch is set to −, the sweep is triggered on the falling or negative slope of the excitation signal.

2-6. TRIGGER LEVEL SELECTION

The TRIG LEVEL control permits selection of a specific voltage which the triggering signal must exceed before the sweep fires. When the Trigger SLOPE switch is set to the + position, adjustment of the TRIG LEVEL control makes it possible to trigger the sweep consistently on the positive slope of the excitation signal. Conversely, with the Trigger SLOPE switch set to the − position, adjustment of the TRIG LEVEL control makes it possible to trigger the sweep consistently on the negative slope of the excitation signal.

2-7. SWEEP MODE SELECTION

a. Automatic Sweep

When using the AUTO mode, a horizontal reference trace will appear on the screen even in the absence of an input signal. This automatic mode is very useful while testing equipment since a reference trace will always be visible regardless of whether a signal is applied to the oscilloscope or not.

The AUTO mode simplifies synchronization of signals or periodic waveforms having repetition rates greater than 50 cycles. To obtain automatic sweep operation, set Sweep Mode Selector switch to AUTO SWP.

b. Recurrent Sweep & HF Stability

Setting the SWEEP switch to RECUR SWP produces a free-running sweep independent of any triggering signal. The frequency of the recurrent sweep is dependent upon the setting of the TIME/DIV control. When using the RECUR SWP mode, the reference trace becomes more visible at higher sweep rates. The AUTO SWP and RECUR SWP modes are handy when Y dual-trace operation is used, and the trigger signal applied to either Channel A or to Channel B is intermittent. Use of the RECUR SWP mode simplifies high-frequency triggering.

The front panel HF STAB control is provided to permit improved synchronization of high frequency input signals in the range from 5 megacycles to above 50 megacycles. Use of this control provides a small variation in the natural repetition rate of the time base so that exact sub-multiples of the trigger frequency may be selected.

c. Triggered Sweep

A stable pattern for practically all types of signals can be obtained by using triggered sweep. Its use is mandatory for viewing random or non-periodic signals of low repetition rate. When operating the instrument in this manner, one sweep occurs for each single triggering impulse. Use of the triggered sweep mode of operation in the majority of applications, is the preferred condition under which optimum performance can be expected of this instrument.

When the oscilloscope is set for anything other than X AMPlifier, the spot will be visible only during forward sweep time. The INTENSITY control must be properly adjusted to make the sweep visible. Intensity should not be set so bright as to override the retrace blanking. For triggered sweep operation, proceed as follows:

1. Apply the desired signal to the Y Input connector and set Sweep Mode Selector switch to TRIG SWP.
2. Adjust TRIG LEVEL control to initiate the sweep and the POSITION controls to center the display.
3. Adjust VARIABLE control in conjunction with Y VOLTS/DIV switch to obtain a vertical deflection of approximately 5 divisions.
4. Rotate the TIME/DIV and the VARIABLE controls to obtain the desired display. Readjust the TRIG LEVEL control if necessary.
5. Adjust INTENSITY, FOCUS, and ASTIG controls to obtain a sharp trace of suitable brightness.
6. If there is any multiple triggering of the sweep, the TRIG LEVEL control may be adjusted to select the signal levels which best actuate the trigger circuit. Thus, undesirable signals of lesser amplitude will be rejected by the trigger channel.
7. Set Trigger COUPLING switch to LF REJECT to obtain a more stable display when using high-frequency triggering signals.

d. Single-Sweep Operation

Single-sweep operation means that the time base moves but one stroke until reset. Using a repetitive sweep to view a varying waveform would result in an overlapped and unintelligible display caused by many displays being superimposed on one another. However, when it is desired to view a single display of an input signal which continually varies in amplitude, shape, or time, the Sweep Mode Selector switch should be set to SINGLE SWP for single-sweep presentation. Thus, by commanding but one stroke of the sweep at a time, the SINGLE SWP position eliminates the overlapping caused by the multiple traces and enables the display to be viewed and/or recorded clearly. Reset may be accomplished manually, or through external contact closures.

1. *Manual Reset*

To arm the sweep manually, set the Sweep Mode Selector switch to SINGLE SWP and depress the RESET button. The sweep will remain armed until a trigger signal arrives to fire the sweep. One sweep will occur after which further incoming triggers are locked out until the circuit is rearmed. In other words, a single trace will sweep across the screen each time the sweep is triggered and at the end of its travel, the beam will rest off screen. The SWP READY lamp should now be off thus indicating that the sweep requires rearming (resetting).

To rearm the sweep, push in the RESET button. The SWP READY indicator lamp will go on, indicating the sweep is armed and ready to fire on the next trigger.

2. *Remote Reset By Synchro Shutter Contact Closure*

The sweep may be armed remotely by means of a contact closure introduced through the two-contact EXT RESET socket located on the front panel. This contact closure may be supplied by an Oscilloscope-Recording Camera such as the Type 450A.

The Type 4514 Cable Assembly, available as an accessory, is provided to connect the Fairchild Type 450A Camera to the rearming connector (EXT RESET) of the oscilloscope. The Type 4530-A Robot Camera only requires the Type 2637 Cable Assembly which has special connectors.

Multiple strokes of the oscilloscope display may integrate the light output sufficiently to improperly expose the film.

The recording system may now be arranged to permit but one single shot of the oscilloscope display to be seen by the film. Consequently, application of the single-sweep technique will eliminate multiple stroke light integration on film and phosphor.

If the synchro-shutter contact closure is provided by the Type 450A Camera at the instant the shutter is fully open, the lens need only be left open for a period exceeding the maximum time between sweep trigger pulses plus the total sweep time. The sum should be multiplied by a factor of 1.5 (to compensate for camera shutter speed and system variations) to assure optimum recording ease. A single setting of the illuminated graticule, trace brightness, the sweep rate then permits minimum camera exposure and oscilloscope intensity adjustments.

In applications where only a single event occurs and must be recorded to avoid duplication of the test, the above system is also applicable. Many systems require the simultaneous recording of a group of phenomena by several oscilloscopes equipped with cameras. If these cameras are to be triggered by electrically activated solenoids, the time delay differential of solenoids and shutter actuation would present a difficult problem. Nevertheless, all shutter actuation time delays may be negated when the synchro switch in the Type 450A Camera lens is permitted to arm all of the oscilloscopes in the system and ready them for simultaneous single-shot recording.

It is suggested that you consult your Oscilloscope Camera Instruction Manual or your local Fairchild Applications engineer for specific details.

2-8. SWEEP RATE CONTROLS

a. Uncalibrated or Vernier Operation

The VARIABLE control, concentric with the TIME/DIV knob, may be used to slow down the sweep rate. A continuously variable rate of greater than 3 to 1 is available to give overlap between the sweep stops. The slow end of the sweep range may therefore be extended from 2 sec/div to 6 sec/div or 1 minute full scale. The UNCAL lamp will be lit whenever the VARIABLE control is not turned fully clockwise.

b. Calibrated Sweep Magnification

When the POSITION control knob is pulled out, any portion of the trace may be expanded horizontally by a factor of 10 about the screen center. This feature extends the fastest calibrated sweep rate to 5 nanoseconds/div. Thus, to achieve a 10X expansion of a desired segment of the trace, set that segment to the screen center by the POSITION control and then pull out this control. Any portion of the expanded display may be observed by adjusting the POSITION control.

When the instrument is set up for calibrated sweep expansion, the sweep rate indicated by the setting of the TIME/DIV control must be divided by the expander factor of 10 to obtain the actual time required for the spot to move one division. The expanded sweep rate may be expressed as follows:

$$\text{Expanded Sweep Time/Div} = \frac{\text{TIME/DIV setting}}{10}$$

For example, if the TIME/DIV control is set to 10 mSEC, the VARIABLE control is rotated fully clockwise to CAL, and the POSITION control is in the PULL X10 MAG setting, the actual time per division is 10 milliseconds, divided by 10, or 1 millisecond per division.

$$\text{Or, using the formula: } \frac{10 \text{ msec/div}}{10} = 1 \text{ msec/div}$$

2-9. SWEEP CALIBRATION ADJUSTMENT

Whenever the Time Base Plug-in is removed from the Main Frame and inserted in another, the front-panel screwdriver SWP CAL control must be reset. This procedure is necessary to compensate for difference in deflection plate sensitivities.

To properly normalize the gain between channels or between the plug-in unit and the Main Frame, proceed as follows:

1. Set up the instrument for normal display of the CAL signal. Allow a warmup time of 15 minutes. (See Figure 2-3.)
2. Set TIME/DIV switch to 10 mSEC.
3. Adjust SWP CAL front-panel screwdriver control for precisely 6 cycles of the calibrator display (60-cycle line) in 10 divisions.

Note: For 50-cycle line, adjust SWP CAL control for precisely 5 cycles of the calibrator display in 10 divisions.

For 400-cycle line, use sweep rate of 0.5 mSEC/div and adjust SWP CAL control for precisely 2 cycles of the calibrator display in 10 divisions.

2-10. X-Y DISPLAYS

CAUTION

KEEP INTENSITY LOW

Screen damage can result from too intense a beam resting at one point on the screen.

X-Y displays may be used to show sweep signal generator plots, Lissajous phase measurements, curve trace information and other similar signal relationship.

When desiring to view one voltage plotted against another (not the internal time base) apply the Y signal to the Input connector on the Y Plug-in and the X signal to the EXT INPUT connector on the Time Base Plug-in. Set the Sweep Mode Selector switch to X AMP (green) and the Trigger SOURCE switch to EXT. Adjust the VOLTS/DIV controls on the Y Plug-in and the VERNIER control on the X Plug-in to obtain an appropriate display.

Note: When the Type 74-03A Time Base Plug-in is set up for X Amplifier operation, the TRIG LEVEL control (red label) now functions as the X VERNIER gain control (green label).

2-11. GATE OUTPUT

A positive gate coincident with the sweep output is available on a front-panel BNC connector labeled GATE OUT. The gate amplitude is greater than 4 volts with an output impedance of 750 ohms. For optimum performance, load impedance should be greater than 100K ohms shunted by less than 15 pf. This positive pulse may be used to trigger other devices in order to achieve sufficient delay to view the output of such devices completely displayed on the oscilloscope.

Use of the gate output in conjunction with triggered pulse generators will permit this instrument to display the leading edge of the pulse waveform even though no signal delay is incorporated in the Y Amplifier.

The period of the positive gate may, of course, be measured extremely accurately with an electronic counter. Since the period of the gate output is a direct measure of total sweep time, it is possible to use this oscilloscope in conjunction with a counter to digitize the time duration of input signals. Use of the TIME/DIV and the VARIABLE controls will permit the operator to display the waveform to be measured over the entire sweep. Timing accuracies of 1 part in 10^7 are thus readily obtainable.

2-12. SAWTOOTH OUTPUT

A BNC front-panel connector labeled SAW OUT, provides a positive-going saw of approximately 25 volts amplitude (nominal). The saw output is referenced within ±5 volts of ground and is time-coincident with the sweep.

The sawtooth may be used for initiating delayed activities controlling an X-Y plotter, or acting as a time base for associated analog equipment. The sawtooth output should not be loaded by impedance to ground of less than 100,000 ohms shunted by no more than 15 pf. Voltage take-off through a Type 4290 Attenuator Probe is recommended.

2-13. TIME MEASUREMENTS

a. How to Make Elapsed Time Measurements Using the CRT Scale

Any horizontal distance on the screen of the oscilloscope can be used to represent a precise interval of time when the time-base circuits are set up for calibrated sweep (VARIABLE control set to CAL). Use of this feature permits you to accurately measure the elapsed time between the desired point of interest on the display. To measure the time interval, proceed as follows:

1. Using the calibrated scale, measure the horizontal distance in divisions between that portion of the display whose time interval you wish to find.
2. Multiply the horizontal dimension obtained in Step 1 by the TIME/DIV control setting to obtain the time interval. See Figure 2-4.

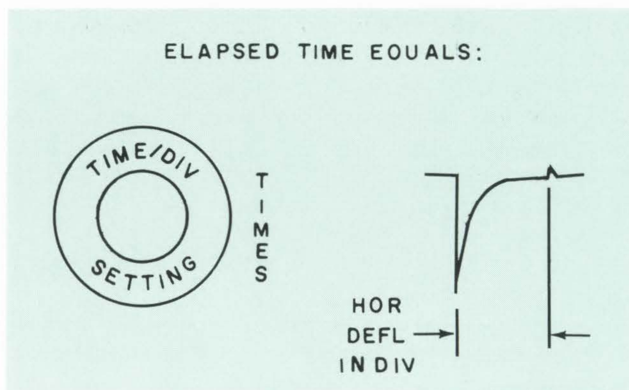


Figure 2-4. Elapsed Time Measurement

b. How to Find Repetition Rate of Frequency Using the CRT Scale

The repetition rate or frequency for periodic signals can be expressed as the number of cycles or pulses per unit of time (VARIABLE control set to CAL). To use the oscilloscope for measuring the repetition rate or frequency of periodic signals, proceed as follows:

1. Using the calibrated scale, measure the horizontal distance in divisions occupied by one cycle of the display under observation.
2. Multiply the horizontal dimension obtained in Step 1 by the TIME/DIV control setting.
3. Take the reciprocal of the product obtained in Step 2 (that is, divide it into one). The resulting quotient is the desired frequency or repetition rate in cycles per second. See Figure 2-5.

$$\text{Cycles/second} = \frac{1}{\text{Time (seconds)}}$$

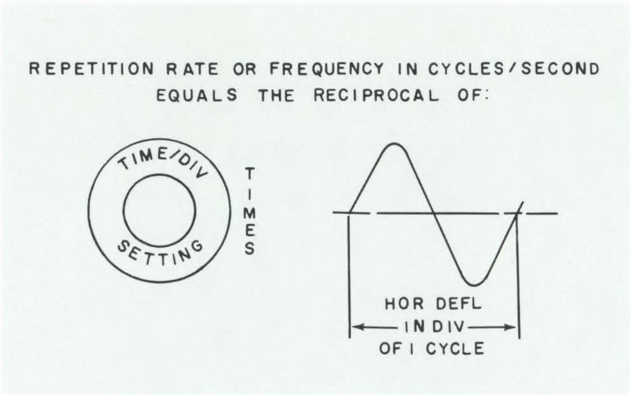


Figure 2-5. Finding the Frequency

2-14. PHASE-SHIFT MEASUREMENTS

To measure the phase difference between two sine waves, proceed as follows:

1. Set up the Time Base for externally triggered sweep operation.
2. Apply one of the sine waves to Channel A Input and the other to Channel B Input of the Type 76-02A Amplifier. Set MODE switch to ALT.
3. Adjust the TIME/DIV switch for a couple of cycles of the display on the screen.
4. Position the display so that one of the positive slopes crosses the horizontal center line at the left-hand side of the scale.
5. Measure the horizontal distance occupied by one cycle of the waveform. Label this distance A.
6. Measure the horizontal shift of the Channel B display. Label this distance B.
7. Divide the distance measured in step 5 by the distance measured in step 6 and multiply the quotient by 360°. The resulting product is the phase difference between the two sine waves. See Figure 2-6.

$$\text{Phase-shift difference} = \phi = \frac{B}{A}\,360^\circ$$

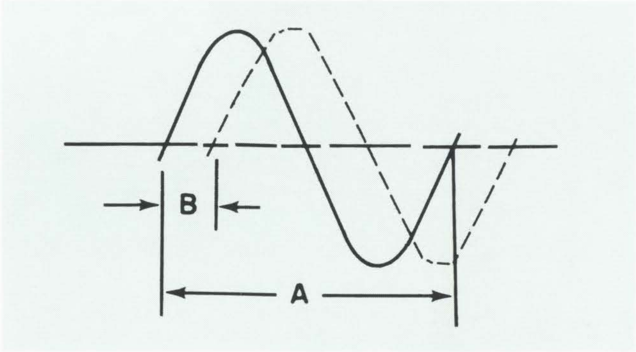


Figure 2-6. Phase-Shift Measurements

NOTES

SECTION 3
CIRCUIT DESCRIPTION

3-1. INTRODUCTION

To simplify circuit description of the Type 74-03A Time Base Plug-in, functional block and waveform diagrams are provided as follows:

Figure 3-1. Trigger Circuit, Functional Block Diagram

Figure 3-2. Sweep Generator, Simplified Block Diagram

Figure 3-3. X Deflection Amplifier, Functional Block Diagram

Figure 3-4. Timing Diagram, Type 74-03A Time Base

The timing diagram shows waveforms at critical points in the circuit and in proper time relationship. In addition, a capsule description of each waveform is provided.

The circuit description will be keyed to the aforementioned illustrations. Emphasis is placed on the interrelation of circuits rather than on detail of operation. It is also recommended that the schematics at the rear of the manual be referred to in following the circuit description.

3-2. TRIGGER CIRCUIT DESCRIPTION (Figure 3-1)

a. Trigger Input

The input to the trigger circuit may be selected from one of three sources via the Trigger SOURCE switch as follows:

1. In EXT position, the signal is obtained from an external source through the EXT INPUT front-panel BNC connector.
2. In INT position, the signal is derived from the Y Amplifier.
3. In LINE position, the signal is tapped from one side of the 6.3 VAC heater circuit.

A choice of AC, LF REJECT or DC coupling is provided by the Trigger COUPLING switch. In the AC position, the trigger signal is applied to a high-pass filter consisting of C8102 and R8107, providing a low-frequency cutoff of 80 cycles. The cut-off frequency is raised to 15 Kc in the LF REJECT position and the high-pass filter now consists of C8103 and R8104. In the DC position, the high-pass filters are disconnected and the triggering signal is applied directly to the input cathode follower V811 and V812. The RC network, R8108 and C8104, in series to the grid of V811 or V812, serves to protect the input circuit from damage due to excessive input voltage. Shunt capacitor C8104 preserves the high-frequency signal component.

b. Trigger Amplifier

The triggering signal is applied to a high-impedance input cathode follower V811 or V812. For positive-going signals, connection is made to the grid of V811, and for negative-going signals, connection is made to the grid of V812. In each case, the opposite grid is connected to a dc bias source, adjustable by means of the TRIG LEVEL control R8103F. This control is used to select the level of the triggering point for all settings of the Trigger SLOPE switch.

The output from V811 or V812 is applied to the trigger amplifier Q8101 and Q8102. The resulting output from this amplifier is always negative and is taken from the collector of Q8101 and applied to an impedance-matching emitter follower Q8103, which drives the Schmitt Trigger Generator. The output from this stage drives the Trigger Coupling transformer T8101.

The TRIG LEVEL CENT potentiometer sets the cathode voltages of V811 and V812 so that no readjustment of the TRIG LEVEL control is required when the Trigger SLOPE switch is set from plus to minus or vice versa.

c. Schmitt Trigger Generator and Auto Triggering

The Schmitt Trigger Generator is essentially a regenerative amplifier signal level selector. It consists of a two-stage amplifier having dc collector-to-base coupling from Q8105 to Q8106 and dc emitter-to-emitter coupling.

The circuit has two stable states: Q8105 conducting, and Q8106 at cutoff; and conversely, Q8106 conducting and Q8105 at cutoff. The transition from one state to the other is abrupt, producing fast rise and fall times from each side of the circuit.

The voltage applied to the base of Q8105 determines which state the circuit will be in. Assume operation as follows: Q8105 is conducting and Q8106 is at cutoff. Q8106 will remain at cutoff until the amplitude of a positive-going signal applied to its base reaches the threshold level of conduction. When this threshold level is exceeded, an abrupt transition from cutoff to full conduction will occur in Q8106. Simultaneously, Q8106 will promptly stop conducting. Transistors Q8105 and Q8106 will revert to their original condition when the amplitude of the initiation signal falls slightly below the threshold level of conduction for Q8106.

In general, the threshold voltage is higher when moving the base in a positive direction, and lower when moving the base in the negative direction. The

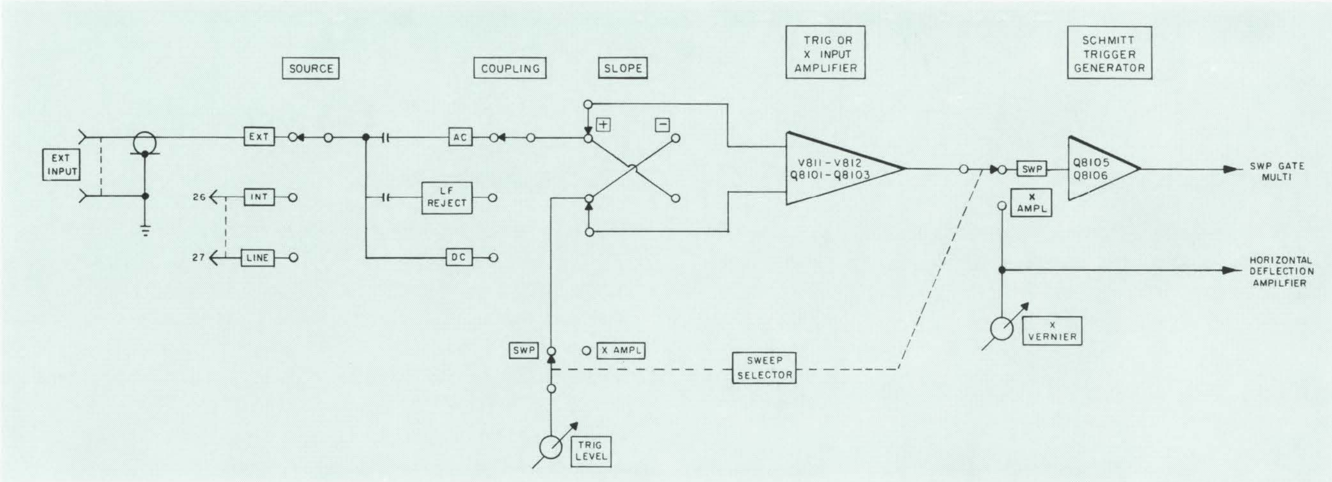


Figure 3-1. Trigger and X Input Circuits, Functional Block Diagram

two different voltage levels are called the "upper and lower hysteresis limits" of the Schmitt Trigger Generator. The hysteresis offset basically relates to the input peak-to-peak voltage sensitivity of the trigger system.

The initial base level of Q8105 can be positioned anywhere inside or outside of the hysteresis area thus establishing the input voltage required to change the state of transistor Q8105. The steady state base bias of Q8105 is normally determined by the TRIG LEVEL control setting.

The Schmitt Trigger Generator provides a negative output current pulse whose width is a function of the period of the input triggering signal. This generator will follow at rates above 10 megacycles.

When the Sweep Mode Selector switch is set to AUTO SWP, one end of capacitor C8114 is connected to R8137 (low resistance path to ground) and the other end is connected to the base of Q8105 and to the junction of R8142 and R8143. This junction oscillates up and down like the end of a "diving board" due to the charge-discharge cycle of C8114. The resulting triangular waveform developed at this junction causes Q8105 and Q8106 to flip back and forth yielding about 50 pulses per second in the AUTO position. Thus, a horizontal reference trace will appear on the screen even in the absence of an input signal.

Using AUTOmatic triggering with Multi-Trace plug-in amplifiers will still permit a display even though one or more signals is disconnected.

3-3. SWEEP CIRCUIT DESCRIPTION (Figure 3-2)

a. Sweep Gate Multivibrator

The input triggering signal is applied to the base of transistor Q8206 through series-coupling diode CR8202. The dc coupled bistable multivibrator Q8201 and Q8202 initiates the formation of the sweep after receiving a negative trigger from the Schmitt Trigger Generator. Diode CR8202 and the lockout circuit hold off subsequent triggering signals until after the sweep and retrace are completed. In the quiescent state, Q8201 is conducting and Q8202 is at cutoff. Q8201 forms a positive gate while Q8202 forms a negative gate during the forward sweep interval.

CR8202 serves as a low capacitance coupling diode which couples the negative trigger from the Schmitt Trigger Generator to the sweep gate multivibrator which flips and initiates the sweep. CR8202 also serves as a high back-impedance diode to decouple the trigger generator from the sweep gate multivibrator. After the bistable multivibrator has been triggered, the sweep runs up. When the saw reaches full screen deflection, turn-off diode CR8203 conducts and resets the multivibrator Q8201 and Q8202, which then clamps the saw. The SWEEP LENGTH potentiometer R8269 is adjusted for full screen sweep length display.

b. Saw Generation

The saw generator is of the Miller "run-up" type. The negative output developed at the collector of Q8202 is applied to the anodes of the disconnect diodes CR8206, CR8207 and CR8209. The anode voltages of these diodes no longer conduct. This action unlocks the integrator clamp and permits the selected sweep capacitor to charge linearly through Q8205, CR8211, the associated resistance network, and Q8401. The latter transistor is an emitter follower adjustable voltage source, via manipulation of the SWP CAL control.

The timing capacitor is connected to a nuvistor cathode follower V821. A cathode follower is employed here to provide high impedance for the sweep timing RC network. High impedance coupling for this network prevents extraneous current drain, thus permitting a highly linear charging voltage to be developed when large charging resistors are used.

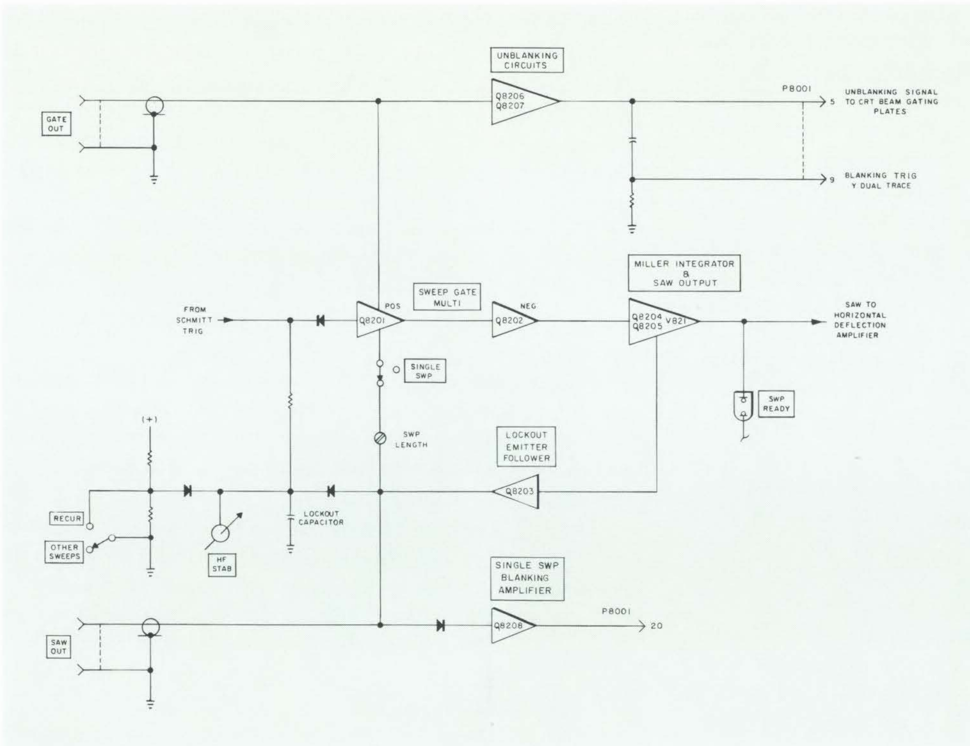


Figure 3-2. Sweep Generator, Functional Block Diagram

When the grid side of the timing capacitor starts to move in the negative direction, the cathode of V821 tends to move likewise. This produces a negative swing at the base of Q8204 and a positive swing at its collector. The positive-going voltage is coupled through emitter follower Q8205 and zener diode CR8211, and is applied to the opposite side of the timing capacitor. Zener diode CR8211 maintains a fixed voltage difference between the collector Q8204 and the grid of V821 to assure minimum voltage at the collector. The positive voltage swing on the opposite side of the timing capacitor tends to prevent the grid side from swinging negatively. It also increases the voltage to which the timing capacitor is trying to charge. The net result is to *straighten out* the charging curve (sweep voltage) by maintaining a constant current flow into the capacitor.

Since the grid of V821 remains at a constant potential within a small fraction of a volt, the current through the charging resistor remains constant and the sweep timing capacitor thus charges at a constant rate. The resulting linear sawtooth waveform is applied to the horizontal deflection amplifier through output emitter follower Q8205.

When the Sweep Mode Selector switch is set to SINGLE SWP, the saw turn-off diode CR8203 is isolated from the SWEEP LENGTH potentiometer by R8218. Thus only a single trace will now sweep across the screen when the sweep is triggered. At the end of its travel, the beam will rest off screen because the sweep gate multivibrator is locked in this position. The single sweep blanking amplifier Q8208 provides a negative pulse to turn off the beam at the completion of the sweep forward time. To reset or rearm the sweep, push the RESET button. Refer to the Operating Instructions Section for application of this technique.

c. Sweep Length

The sweep length, or the total duration of the sweep for any given sweep rate is determined by the setting of the SWEEP LENGTH adjustment R8229. A portion of the positive sawtooth voltage is fed back to the emitter follower Q8203, and the saw turn-off diode CR8203.

If the SWEEP LENGTH potentiometer is properly set, diode CR8203 will conduct when the positive-going excursion of the sawtooth has travelled 10.5 to 11 divisions on the screen. This positive peak signal will then be conducted through diode CR8203 to the base of Q8201. Upon receiving this positive pulse, the sweep gate multivibrator will revert rapidly to its original state with Q8201 conducting, and Q8202 at cutoff. The positive step from the collector of Q8202 returns the disconnect diodes CR8206, CR8207, and CR8209 to their conducting state, thus discharging the timing capacitors. The Miller circuit now returns to its quiescent level and is ready for the next sweep cycle after the lockout time interval is completed.

d. Lockout Circuit

The lockout circuit prevents the sweep gate multivibrator from being retriggered until the sawtooth has settled to its quiescent base level. The sweep does not retrace in zero time since the clamping of the Miller integrator timing capacitor is accomplished by a diode switch circuit having a small impedance. The timing circuit discharge (saw retrace) takes longer than the flipping of the sweep gate multivibrator. Consequently, the trigger excitation pulses must be held off to prevent the formation of a new saw during the retrace interval. The sawtooth waveform must be permitted to retrace completely to its quiescent base which re-establishes the beam at the left-hand side of the CRT screen. This is accomplished by holding the cathode of the series-triggering diode CR8202 at a suitable positive voltage for a given period after the completion of the sweep.

During the forward sweep interval, a portion of the positive sweep voltage is fed back to the base of the emitter follower Q8203, which charges the lockout capacitor through coupling diode CR8204. When the saw reaches its predetermined full screen length, the sweep gate multivibrator flips and clamps the Miller integrator which then causes the sweep to retrace. During the return-trace interval, diode CR8204 is cut off and the lockout capacitor is discharged through R8213. The sweep gate multivibrator will not retrigger until the preselected lockout timing capacitor, chosen to give lockout beyond the time that the sweep has returned to rest at its initial starting point, has discharged.

The required duration of the lockout interval is determined by the sweep-charging time constant and the Miller integrator clamp. Consequently, the TIME/DIV switch must also change the lockout circuit hold-off timing capacity.

The trigger coupling diode CR8202 prevents triggers from disturbing the sweep gate multivibrator during all of the sweep-forward interval. The lockout circuitry prevents retriggering during the retrace interval.

The front-panel HF STAB control may be used to adjust the duration of the lockout period that initiates Q8201. The HF STAB control thus serves as a HF Sync Adjustment and its application improves count down and lock-in of signals having repetition rate of 5 megacycles or greater.

e. Unblanking

The cathode-ray tube employed in this oscilloscope has two additional beam deflecting plates which "cut off" the electron beam independently of the control grid. Beam control pulses (trace brightening and retrace blanking pulses) can easily be dc coupled since these beam deflection plates are electrically close to ground. In conventional cathode-ray tubes, these pulses must be coupled to the control grid which is operated at high potential. The extra beam deflection plates are controlled by the sweep gate multivibrator Q8201 and Q8202.

The positive pulse developed at the collector of Q8201 of the sweep gate multivibrator is applied to the base of the unblanking cascode amplifier Q8407 and Q8406. This gate signal is coincident with the sweep forward time and is also available at a front-panel connector labeled GATE OUT. The resulting negative pulse developed at the collector of Q8206 is applied to the beam deflection plate of the cathode-ray tube through emitter follower Q8409. Therefore the display is visible only during the forward sweep interval and is blanked during the retrace and lockout interval.

The negative pulse developed at the emitter of Q8209 is applied to a differentiating network C8205 and R8205. The output from this network provides the proper trigger to the blanking multivibrator of the Dual Trace plug-in.

This Time Base Plug-in unit may be used in the X or Y cavity of the Main Frame. Only the X cavity permits retrace beam blanking signals to be coupled to the cathode-ray tube. Therefore, sweep operation in the vertical direction will show the sweep retrace.

f. Recurrent Sweep

When the Sweep Mode Selector switch is set to RECUR SWP, diode CR8201 is cut off by grounding its anode. This permits the cathode of diode CR8202 to fall far enough to trigger the sweep gate generator Q8201 and Q8202, and thus initiate a sweep. When the sweep reaches its predetermined turn-off level, the sweep gate generator is reset through CR8203 and the sweep retraces. The sweep retrace starts the lockout period whose duration is determined by the discharge time of the lockout capacitor through R8213. When the lockout voltage at the cathode of CR8202 falls far enough again, the cycle is repeated. The result is a free-running sweep whose period is the total of the sweep time plus the lockout time at any given setting of the TIME/DIV switch.

3-4. HORIZONTAL DEFLECTION CIRCUIT DESCRIPTION (Figure 3-3)

The output from the saw emitter follower Q8205, is applied to the base of emitter follower Q8301 via a frequency compensated voltage divider.

The POSITION control supplies a manually-adjustable dc voltage to the base of Q8301 for positioning the display on the screen. For the Type 766 Series, a PATTERN POSITIONING control is mounted on the front panel of the Main Frame, and it is electrically coupled to the POSITION control of both the X and Y Plug-ins. This feature permits positioning the entire display in the horizontal and vertical directions on the screen via use of the single joystick control.

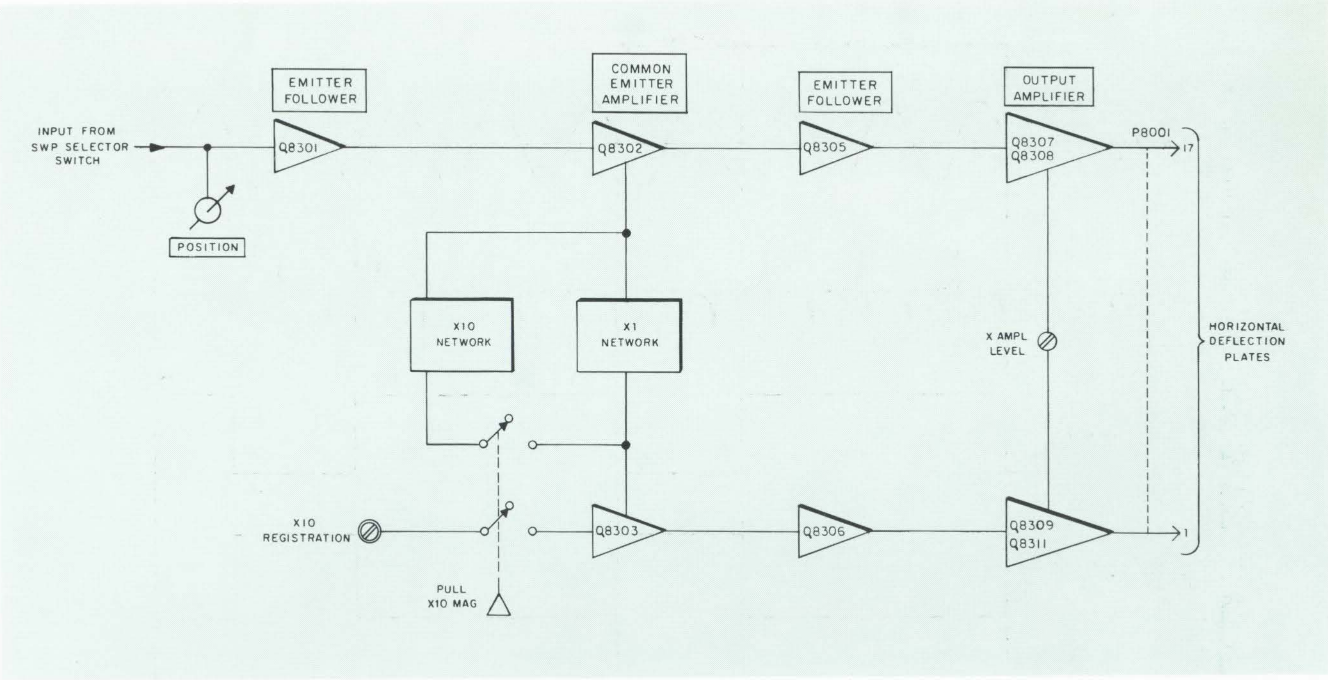


Figure 3-3. Horizontal Deflection Amplifier, Functional Block Diagram

The output from the emitter of Q8301 is applied directly to the common emitter amplifier Q8302 and Q8303, which converts the single-end input to a push-pull output. The signal progresses through emitter follower Q8305 and Q8306, and is then applied to the output amplifier Q8307 to Q8311. In this output amplifier stage, the signal develops the necessary power for driving the horizontal deflection plates.

Ten-times magnification of the sweep is accomplished by reducing the common emitter amplifier feedback of Q8302 and Q8303, by a factor of 10 when the X10 control is pulled out. Consequently, the sweep rate observed on the screen of the cathode-ray tube is effectively magnified ten times. The X10 REGISTRATION potentiometer R8311 is provided to adjust the voltage level at the base of Q8303 so that the portion of the trace at the center of the screen is not depositioned from CRT screen center when the PULL X10 switch is activated.

When the Sweep Mode Selector switch is set to X AMP, the EXT INPUT BNC connector now functions as the X Amplifier input. Simultaneously, the TRIG LEVEL control becomes the X AMPlifier VERNIER control. A portion of the trigger input circuit serves as the X preamplifier, viz: Input cathode follower V811 and V812; Horizontal preamplifier Q8101 and Q8102, and emitter follower Q8103. The output of this stage is coupled to the horizontal circuit via the X AMP setting of the Sweep Selector switch.

3-5. TIMING DIAGRAM (Figure 3-4)

A timing diagram of the Type 74-03A Time Base Plug-in shows waveforms at critical points in the circuit and in proper relative time relationship. In addition, a capsule description of each waveform is provided.

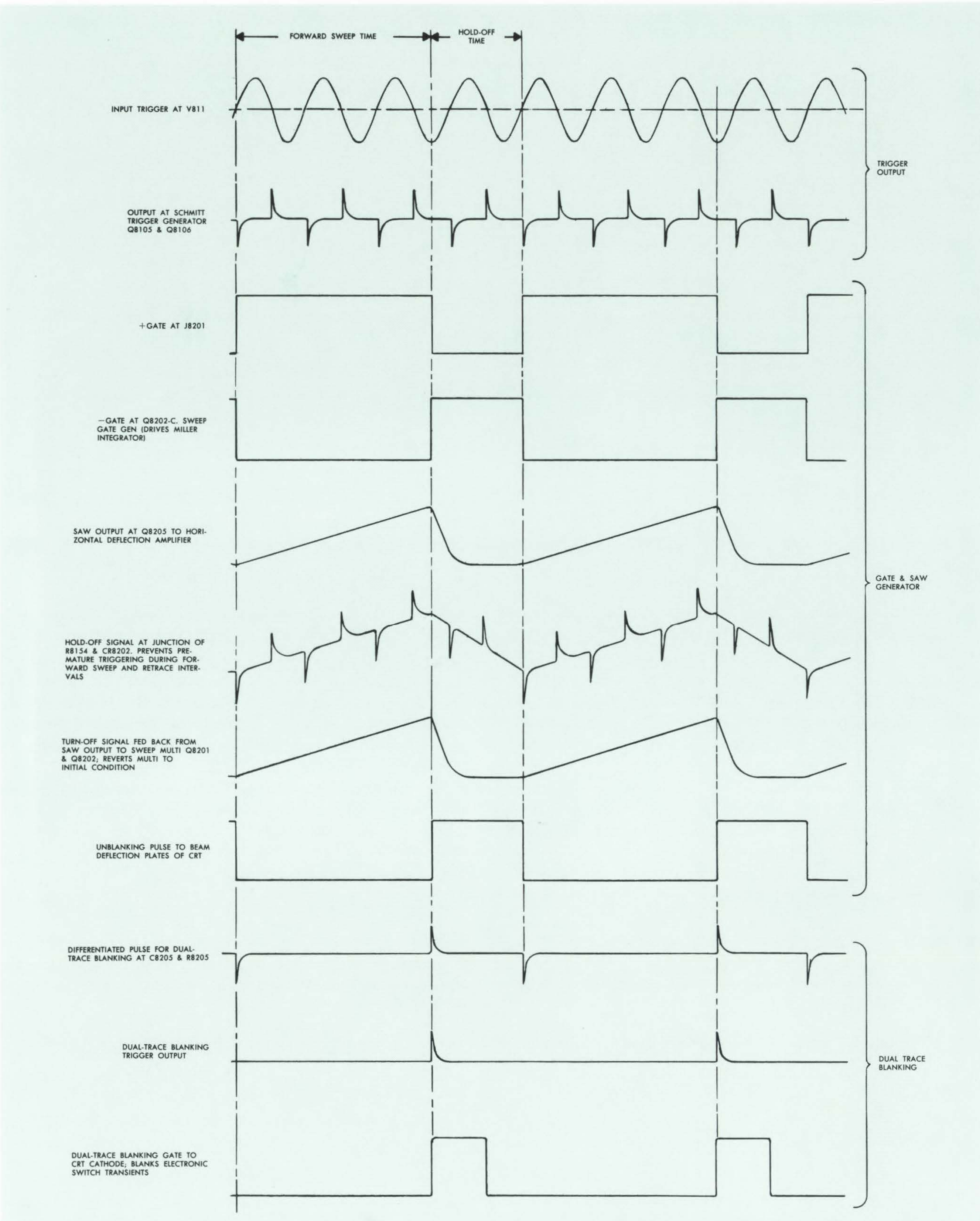


Figure 3-4. Timing Diagram of Type 74-03A Time Base Plug-In

SECTION 4
PERFORMANCE ASSURANCE TEST

4-1. MAINTENANCE CHECK TO ASSURE PERFORMANCE

The tests described in the paragraphs to follow should be performed by Instrument Test Departments and Maintenance Laboratories to certify proper performance. These tests are divided into sections for simplification and to assist those test groups where complete checking is not mandatory, or where all test equipment is not available. Refer to Section 5, paragraph 5-5, for list of test equipment required.

All tests are performed with a representative Type 766H Series Main Frame Oscilloscope and a Y Amplifier Plug-in. Both of the plug-in units must be normalized to the Main Frame before starting tests. This is accomplished by adjusting the front-panel screwdriver SWP CAL and GAIN ADJ controls as described in the appropriate Plug-in Instruction Manuals. Allow 30 to 60 minutes of warmup time before making any adjustments.

NOTE

If this Plug-in module is checked by a Receiving Inspection laboratory, the tests outlined below are recommended to certify performance. This instrument has been thoroughly tested and aged at the factory. Nevertheless, rough shipment, extreme environments, or long idle periods may necessitate minor adjustments of the controls. Hence, it is suggested that the certifying engineer try the recommended adjustments not only for recentering the controls, but also to ascertain their range and to familiarize himself with this precision instrument. If, after performing all the tests outlined in the paragraphs to follow, the instrument will not perform to specification, the assistance of the local Fairchild Field Engineering representative should be requested.

4-2. INITIAL SETUP OF TYPE 74-03A

If the controls are set exactly as shown and performed in the sequence indicated in Figure 4-1, three cycles of the calibrator signal (60-cycle line) will be displayed on screen.

The procedure just given is a good, over-all check of the Type 74-03A Time Base Module.

4-3. CHECKING SWEEP CALIBRATION

1. Connect a Time-Mark Generator to the Input connector of the Y Plug-in through a properly terminated cable.

2. Set up the instrument for AUTO sweep. Sweep accuracy is checked by counting the positive peaks in the centered 8-division portion of the CRT scale. Make sure the UNCAL lamp is off and refer to the following Sweep Check Calibration Chart for additional data. All measurements indicated in this chart should fall within ±0.25 div of the 9-division marking.

4-4. CHECKING TRIGGER SOURCE AND POLARITY

1. Preset front-panel controls as indicated:

Control	Setting
TRIG LEVEL	Zero
Sweep Mode Selector	TRIG SWP
Trigger SOURCE	LINE
Trigger COUPLING	AC
Trigger SLOPE	+
TIME/DIV	10 mSEC
TIME/DIV VARIABLE	CAL (fully ccw)
PULL X10 MAG	Pushed in (X1)
POSITION	Centered
VOLTS/DIV (Y Plug-in)	CAL

2. Six cycles of the calibrator pattern should be observed on the screen for 60-cycle line; 5 cycles for 50-cycle line.

3. Set the Trigger SOURCE switch to INT; the pattern remains stationary on the screen.

4. Set the Trigger SOURCE switch to EXT; the display should disappear.

5. Apply a line frequency sine wave signal of 0.25V peak-to-peak to the EXT INPUT connector. The amplitude of this signal should be sufficient to trigger the sweep, and the pattern should again remain stationary on the screen. The 0.25 volt test signal is suitably attenuated by the 80-cycle cutoff frequency of the AC coupling and represents a true measure of trigger sensitivity.

6. Changing the Trigger SOURCE switch from plus to minus should change the leading edge of the first cycle from positive-going to negative-going.

7. Reset Trigger SOURCE switch to INT and SLOPE switch to plus.

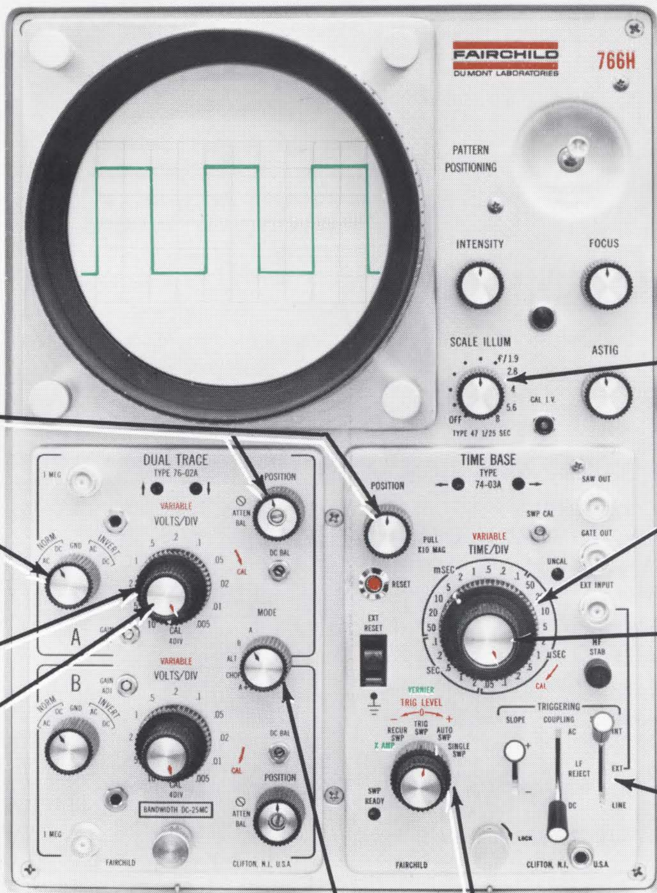
4-5. CHECKING SINGLE SWEEP

1. Adjust the instrument to obtain at least 10 cycles of the calibrator signal on the screen.

2. Set Sweep Mode Selector switch to SINGLE SWP. The display on screen should disappear.

To obtain the calibrator display, set the controls exactly as shown and perform the numbered steps in sequence.

Use the same procedure when difficulty is experienced when obtaining a display. This will eliminate "cockpit" troubles due to misalignment of controls.



NOTE

The front-panel screwdriver BAL controls on the Y PLUG-in must be properly adjusted to obtain an on-screen trace. See the appropriate Y Plug-in Instruction Book

Figure 4-1. Initial Setup of Type 74-03A Time Base Plug-In

3. Set the TRIGGER SOURCE switch to EXT. Depress the Reset button and note that the SWP READY light turns on.

4. Set the TRIGGER SOURCE switch to LINE and note that the sweep fires only once. The SWP READY light should turn off at the conclusion of the single-sweep cycle.

5. Repeat Steps 3 and 4.

6. After each sweep, check that the scope is properly blanked (naked screen) before exposing film for photo-recording.

SWEEP CHECK CALIBRATION CHART

TIME-MARK GEN set to	TIME/DIV set to	NUMBER OF POSITIVE PULSES*
10 Mc sine wave	0.05 μSEC	5 cycles
10 Mc sine wave	0.1 μSEC	9 cycles (2**)
5 Mc sine wave	0.2 μSEC	9 cycles
1 μsec marker	0.5 μSEC	5 timing markers
1 μsec marker	1 μSEC	9 timing markers
1 μsec marker	2 μSEC	17 timing markers
5 μsec marker	5 μSEC	9 timing markers
10 μsec marker	10 μSEC	9 timing markers
10 μsec marker	20 μSEC	17 timing markers
50 μsec marker	50 μSEC	9 timing markers
100 μsec marker	0.1 mSEC	9 timing markers
100 μsec marker	0.2 mSEC	17 timing markers
500 μsec marker	0.5 mSEC	9 timing markers (2**)
1 msec marker	1 mSEC	9 timing markers
1 msec marker	2 mSEC	17 timing markers
5 msec marker	5 mSEC	9 timing markers
10 msec marker	10 mSEC	9 timing markers
10 msec marker	20 mSEC	17 timing markers
50 msec marker	50 mSEC	9 timing markers
100 msec marker	0.1 SEC	9 timing markers
100 msec marker	0.2 SEC	17 timing markers
500 msec marker	0.5 SEC	9 timing markers
1 sec marker	1 SEC	9 timing markers
1 sec marker	2 SEC	17 timing markers

* Centered 8-division portion of scale.

** Expander check (Pull X10 switch out). Number of positive pulses between 10 div, +0.8 div are indicated by numbers in parenthesis. Neglect the first 50 nanoseconds of the sweep.

4-6. CHECKING AUTOMATIC SWEEP

1. Set Sweep Mode Selector switch to AUTO SWP and the VOLTS/DIV switch on the Y Plug-in to 0.2V. A horizontal reference trace should be visible on the screen.

2. Set Trigger SOURCE switch to INT and COUPLING switch to AC.

3. Apply the 1V CAL signal from the Main Frame through the Type 4290 Attenuator Probe to the Y Input connector. The pattern should be stationary on the screen and should have a vertical deflection of approximately ½ division.

4-7. DUAL TRACE SWITCH TRIGGERING CHECK (OPTIONAL)

This check is optional and is only required when a multitrace (dual trace etc.) electronically switched Y amplifier Plug-in is to be used with this Time Base module. The Time Base Module is set up to determine whether it will trigger the Dual Trace Amplifier Module when the latter unit is set up for alternate display.

1. Preset front-panel controls as indicated:

Control	Setting
TIME/DIV	10 μSEC
Trigger SOURCE	INT
Trigger COUPLING	LF REJECT
Trigger SLOPE	+
TRIG LEVEL	Zero
Sweep Mode Selector	TRIG SWP

2. Set MODE switch on Dual Trace plug-in to ALT.

3. Set frequency of Fairchild Type 791A Square Wave Generator to 30 Kc and apply output to both Channels A and B.

4. Adjust each display for 2½ divisions of deflection and observe the stable alternate display of the input waveform.

5. Check that both displays may be positioned independently with their respective Y POSITION controls.

4-8. SAW OUT AND GATE OUT CHECK

1. Connect the SAW OUT signal to Input connector of the Y Plug-in by means of a short length of cable.

2. Set Sweep Mode Selector switch to RECUR SWP and TIME/DIV switch to 2 μSEC.

3. Set VOLTS/DIV switch on the Y Plug-in to 10V. The pattern should be an oblique line with increasing slope from left to right.

4. Set VOLTS/DIV switch to 2V.

5. Transfer the cable from the SAW OUT connector to the GATE OUT connector.

6. The display should be a positive-going step with an amplitude of approximately 5 volts.

7. Check the Saw Output signal at P8001 pin 32 with a probe.

8. Disconnect the cable.

NOTES

SECTION 5
MAINTENANCE AND RECALIBRATION

5-1. INTRODUCTION

This section of the manual contains service information and procedures for internal adjustments.

5-2. REMOVAL AND REPLACEMENT OF PARTS

If it is necessary to order a replacement component from the factory, always give the Type Number and Serial Number of the instrument. Before ordering parts for in-warranty replacement or purchasing them for out-of-warranty replacement, be sure to consult the Parts List in this manual. The Parts List gives the values, tolerances, ratings, and the factory part number for all electrical components used in the instrument. This will help to expedite service.

Since your instrument left the factory, some of the parts may have been superseded by improved components. In such cases, the part numbers of these new components will not be listed in your Parts List. However, if you order a part from the factory, and it has been superseded by an improved component, the new part will be shipped in place of the part ordered.

It is the aim of the Fairchild organization to make available the most reliable commercial oscilloscopes within the state of the art and to provide services which will help the user to rapidly restore any of our equipment to its specified performance. Your local Field representative maintains a limited number of spare parts. Also the factory may be asked to air-ship replacement parts on a rush basis.

NOTE

Be sure and replace the beryllium oxide insulating washers (they serve as heat sinks) on the transistors that require them. Always grease these heat sinks with Dow Corning silicon grease for optimum heat transfer.

5-3. SERVICING HINTS

General maintenance and trouble-shooting information is given in the Type 766H Series Oscilloscope Instruction Manual. In the following discussion, it is assumed that you have already read that information and have definitely isolated a trouble in the Time Base Plug-in unit.

In trouble shooting a Plug-in unit, it becomes necessary to determine if the defect is in the plug-in or in the Main Frame of the oscilloscope. The quickest and easiest way of isolating the trouble is to substitute another plug-in unit and determine if the same trouble persists. If the trouble continues after substitution, it can be safely assumed that the defect is in the Main Frame.

There is no simple way of locating troubles. An understanding of the functions of the circuits is the best help. With an understanding of the circuit operation, it will be possible to make a good guess at the general source of troubles from the symptoms. As an aid in trouble-shooting this unit, refer to the functional block and timing diagrams in the Circuit Description Section and to the schematics.

To keep electronic units operating at top performance, it is desirable to check the equipment at regular intervals. The period between checks will depend on the installation and the conditions of operation. For these regular checks, clean all dust and dirt from the unit using a light air blast or soft brush. However, to insure the reliability of measurements, we suggest that you recalibrate the plug-in after each 500 hours of operation or every six months if used intermittently. Also, the calibration of a unit should always be fully checked and adjusted after the repair or replacement of any component in the unit. The complete adjustment procedure for this unit is given in this Section of the Instruction Manual.

In the event of improper performance of the Plug-in unit, the following suggestions are recommended:

1. The Type 4294 Extension Cable for remote operation of the plug-in from the oscilloscope is available as an accessory. This plug-in extender will be helpful for routine maintenance and recalibration. Do not use this extension for HF alignments; instead remove the Main Frame side cover.

2. Localizing the trouble is made easier by use of a test oscilloscope to check waveforms. These waveforms are shown at key points on the over-all schematics. Both the waveform amplitude and time duration are given. Use a high-impedance 10:1 Passive Attenuator Probe while trouble shooting (Fairchild Type 4290 Series). A Fairchild Type 766H Series Oscilloscope with a Y Plug-in having a bandwidth from dc to 25 Mc is recommended.

3. Maintain a high quality of workmanship. Use a clean bench and soldering iron; keep solder joints smooth and bright; do not overheat any component while soldering. Use heat sinks when soldering semiconductors. The use of a 30-watt iron such as a Hexacon Type 26S is recommended.

4. When using accessory probes or adapters, be sure the trouble is not originating in the accessory before suspecting the instrument itself.

5. Once the defective stage has been localized, the component or components causing the trouble can be located by tube and component substitution or by voltage measurement. Key voltage measurements are shown on the over-all schematics at the rear of this manual.

6. The identification of electron tubes, semiconductors and service adjustments are shown on photographs in this Section of the Instruction Manual.

5-4. GAINING ACCESS TO CHASSIS

Since the Plug-in is not contained in its own dust cover most of the components are readily accessible when the plug-in is removed from the Main Frame. To gain access to the chassis, simply unscrew the knurled thumbscrew at center bottom of unit and pull it free of the Main Frame.

WARNING

WHEN THE PANELS OR PLUG-INS ARE REMOVED FROM THE INSTRUMENT FOR SERVICING, EXERCISE CAUTION WHILE THE POWER IS ON. The lower-voltage busses are potentially more dangerous than the cathode-ray tube potential because of the high current capabilities and large filter capacitors employed in these supplies. When you reach into the instrument with one hand while it is turned on, do not grasp the metal frame with the other hand. If possible, stand on an insulated floor and use insulated tools. It is advisable to ground the third lead in the power cord whenever the instrument is in use.

5-5. TEST EQUIPMENT REQUIRED FOR SERVICE ADJUSTMENTS

a. Introduction

The adjustments outlined in the following paragraphs are based on the test procedure followed at the factory. All adjustments should be made at mid-line voltage, 115V/230V ±2%.

To set up the Time Base unit for calibration, insert an amplifier plug-in and the Time Base plug-in into the Main Frame. The amplifier plug-in module and the Main Frame must be fully tested and certified units.

CAUTION

Always use insulated tools while working or making adjustments on the unit when power is on. The transistors in this instrument may be damaged if overvoltaged by accidental grounding of one or more elements. Exercise caution and turn off power when making repairs.

b. TEST EQUIPMENT REQUIRED (Equivalent may be substituted)

Equipment	Description
Oscilloscope	Fully tested and certified Type 765 Series Main Frame
Y Plug-In	Type 76-02A with delay line installed
X Plug-In	Type 74-03A
Volt-ohmmeter	Simpson Model 260; 20K ohms/volt sensitivity
Square Wave Generator	Fairchild Type 791A
Time-Mark Generator	Fairchild Type 781A
Vacuum Tube Voltmeter	Hewlett-Packard Model 410B
Differential Voltmeter	John Fluke Model 801
Type 4290	10:1 Passive Attenuator Probe
Alignment Tools	Fairchild Type 7013 Tool Kit
50-Ohm Termination	Type 4285A

Turn on the power and allow 30 minutes of warm-up time.

Preset front-panel controls on the Type 74-03A as indicated:

Control	Setting
VARIABLE Sweep	Fully cw
Sweep Mode Selector	AUTO SWP
SOURCE	INT
COUPLING	AC
SLOPE	+
TIME/DIV	10 ms
TRIG LEVEL	Zero
HF STAB	Any position
POSITION	Centered
VOLTS/DIV (Y Plug-in)	CAL

Turn on the power and allow 30 minutes of warm-up time.

Preset front-panel controls on the Type 74-03A as indicated:

Control	Setting
VARIABLE Sweep	Fully cw
Sweep Mode Selector	AUTO SWP
SOURCE	INT
COUPLING	AC
SLOPE	+
TIME/DIV	10 ms
TRIG LEVEL	Zero
HF STAB	Any position
POSITION	Centered
VOLTS/DIV (Y Plug-in)	CAL

5-6. TRIG LEVEL CENT ADJUSTMENT (R8122)

1. Set the Sweep Mode Selector switch to X AMP, the TRIGGER SOURCE switch to EXT and the TRIGGER SLOPE to +. A vertical line should be seen on screen.
2. Adjust the TRIG LEVEL CENT potentiometer R8122 so that the vertical line will not shift while turning the X amplifier VERNIER control back and forth throughout its range.

5-7. X AMPLIFIER LEVEL ADJUSTMENT (R8339)

1. Set Sweep Mode Selector switch to TRIG SWP.
2. Connect a Simpson Voltmeter across pins 1 and 17 of P8001 and set Voltage Range switch to 2.5-volt scale.
3. Adjust the POSITION control until the voltage reads zero or less than 1/4 volt.
4. Connect the John Fluke Voltmeter from P8001, pin 1 (or pin 17) to ground and set Voltage Range switch to 500-volt scale.
5. Adjust X AMP LEVEL potentiometer R8339 to 89 volts, ±1 volt.

Note: Make sure that the measurement does not introduce any parasitic oscillation in the X Amplifier.

6. Disconnect the Voltmeter.

5-8. DC BALANCE ADJUSTMENTS (R8113)

1. Set Sweep Mode Selector switch to RECUR and position the trace to the center of the screen.
2. Set the Sweep Mode Selector switch to X AMP. Do not touch position control.
3. Adjust the DC BAL potentiometer R8113 to bring the vertical line to the center of the screen.

5-9. SWEEP LENGTH ADJUSTMENT (R8229)

The SWEEP LENGTH potentiometer is provided so that the trace may be adjusted to display a horizontal scan of 10 to 11.5 divisions of horizontal deflection.

1. Set Trigger SOURCE switch to LINE, SLOPE switch to +, and Sweep Mode Selector switch to TRIG SWP.
2. Adjust TRIG LEVEL control to obtain a steady trace.
3. Adjust SWP LENGTH. potentiometer R8229 until the trace occupies 11 divisions of horizontal deflection.

When R8113 is properly adjusted, there will be no depositioning of the display when the Sweep Mode Selector switch is set from X AMP to the sweep positions.

5-10. SLOW SWEEP CAL ADJUST

1. Preset front-panel controls as indicated:

Control	Setting
TIME/DIV	10 msec
VARIABLE	Fully cw (click is heard; UNCAL lamp is off)
SOURCE	INT
COUPLING	AC
SLOPE	+
Sweep Mode Selector	AUTO SWP
VOLTS/DIV (Y Plug-in)	CAL

2. Adjust SWP CAL front-panel screwdriver control for precisely 6 cycles of the calibrator display (60-cycle line) in 10 divisions.

Note: For 50-cycle line, adjust SWP CAL control for precisely 5 cycles of the calibrator display in 10 divisions.

For 400-cycle line, use sweep rate of 0.5 msec/div and adjust SWP CAL control for precisely 2 cycles of the calibrator display in 10 divisions.

Make sure the UNCAL lamp is off during the adjustment.

5-11. X10 REGISTRATION (R8311)

1. Position the pattern so that the leading edge of one of the calibrator pulses is coincident with the vertical center line of the scale.
2. Pull out the X10 MAG knob (POSITION control) carefully. Avoid changing the position setting.
3. Adjust the X10 Registration potentiometer R8311 until the leading edge of the same pulse is again on the vertical center line of the scale (within ±1/2 division). If the X10 Registration potentiometer is out of range, shunt resistor R8309 with a 150K, 1/2w, 5% resistor.
4. Push in the X10 MAG knob.

5-12. X AMPLIFIER HF ADJUSTMENTS (C8116, C8309, C8317, & C8301)

1. Replace the Plug-in Amplifier in the Y cavity with a tested Time Base Plug-in unit. This unit is then set up to obtain a vertical sweep triggered externally from a Fairchild Type 791A Square Wave Generator (see Figure 5-1a).

NOTE: Unless otherwise noted, the test procedure for the balance of this setup pertain to the Time Base Unit inserted in the X cavity.

2. Set Sweep Mode Selector switch to X AMP and SOURCE switch to EXT.
3. Apply a 100 Kc square wave signal from the Fairchild Type 791A Generator through a properly terminated cable to the EXT INPUT connector.

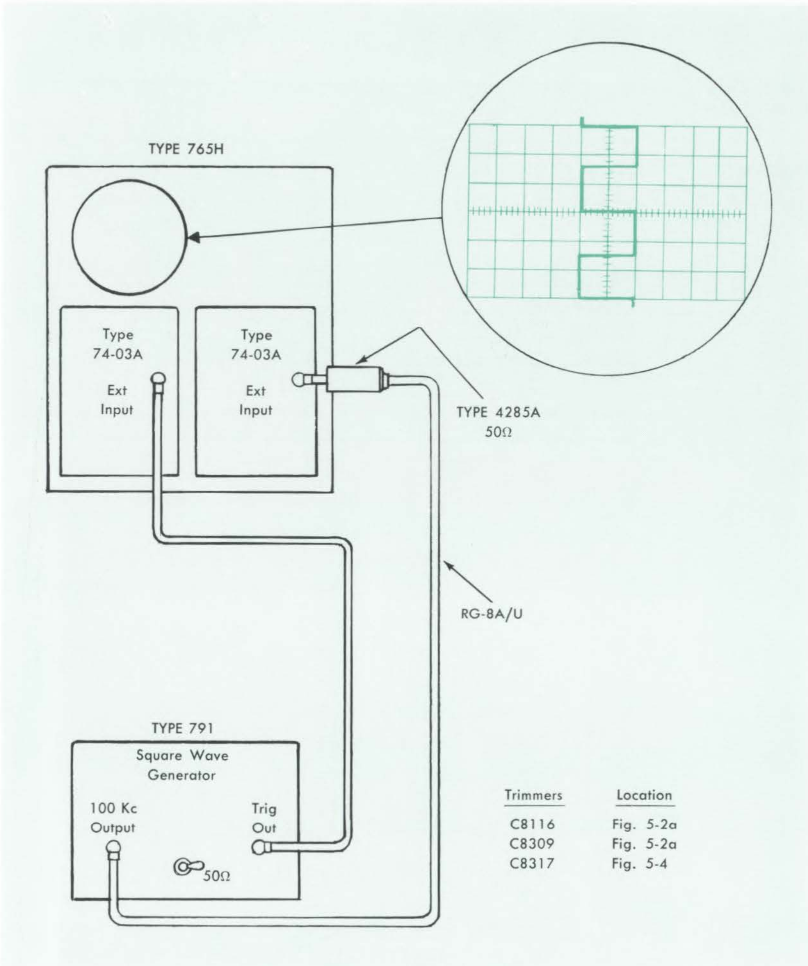


Figure 5-1a.
Test Setup for X Ampl HF Adjustment

4. Adjust amplitude of the square wave pattern for 2 divisions peak-to-peak about the scale center. In other words, 1 division to the left and 1 division to the right of the scale center line.

5. Adjust trimmer C8116 for a flat-top display.

6. Set the Square Wave Generator to 1 Mc and adjust oscilloscope controls for a 2-cycle pattern on the screen.

7. Center the pattern and adjust its amplitude the same way as was done in step 4.

8. Adjust trimmers C8309 and C8317 until best flat-top and rise time is achieved.

9. Pull out the X10 MAG control and reduce square wave amplitude to give previous display.

Note: Trimmer C8317 will have to be readjusted for the fast sweep calibration procedure given in paragraph 5-13. Therefore the square wave response at this point may have to be compromised to assure sweep calibration.

10. Temporarily ground the collector of Q8207 of the Time Base unit in the X cavity.

11. Set the Sweep Mode Selector switch to TRIG SWP.

12. Apply a 100 Kc square wave signal from the Fairchild Type 791A Generator through a properly terminated cable to the junction of R8301 and R8247. (See Figure 5-1b.)

13. Adjust trimmer C8301 for a flat-top display.

14. Remove the ground connection that was temporarily installed in the collector of Q8207.

15. Replace the Time Base unit in the Y cavity with the Y Plug-in Module originally installed.

5-13. FAST SWEEP CALIBRATION ADJUSTMENT (C8317, C8324, C8401 & C8218)

1. Apply a 1-microsecond time-marker signal from a Fairchild Type 781A Generator through a properly terminated cable to Input connector on the Y plug-in.

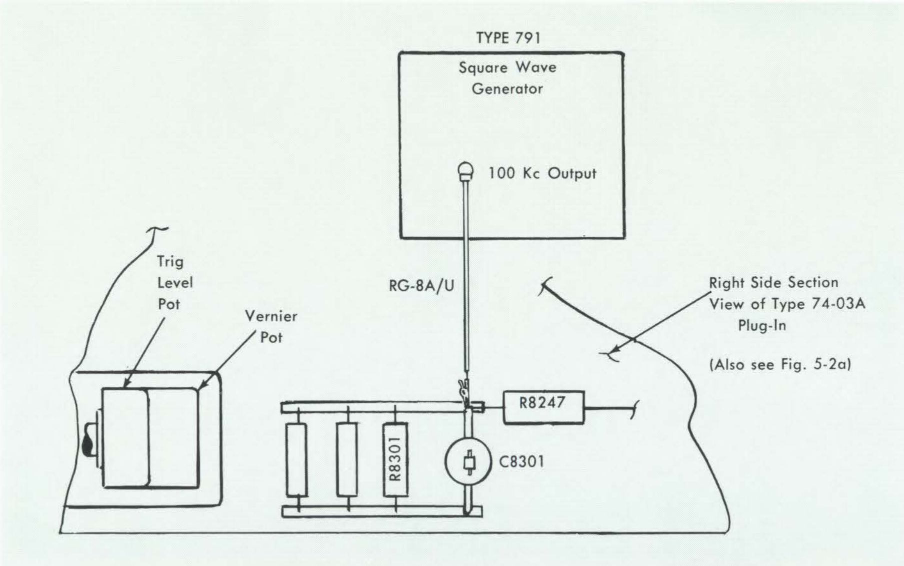


Figure 5-1b.
Test Setup for Adjusting C8301

2. Adjust the VOLTS/DIV switch to give the display a vertical amplitude of about 4 divisions.
3. Set TIME/DIV switch to 0.5 μSEC.
4. Using an insulated screwdriver, adjust trimmer C8401 located on the TIME/DIV switch until 6 timing markers occupy precisely 10 divisions.
5. Set TIME/DIV switch to 0.1 μSEC and pull out the X10 MAG control.
6. Switch the frequency of generator to 50 megacycles. A 4-cycle sine wave display should be observed within the centered 8-division portion of the graticule. If not, trim up with capacitor C8317 and C8324 to bring the calibration within 5%.
7. Set the TIME/DIV switch to 0.05. A two-cycle sine wave display should be observed within the centered 8-divisions to within 5% accuracy. If necessary readjust C8317 and C8324 to obtain a compromise between these two sweep ranges.
8. Position the sweep so that the portion of the sweep after the first 50 nanoseconds is shown on screen, then adjust C8212 to get the best calibration. A compromise may be necessary between the last two ranges.

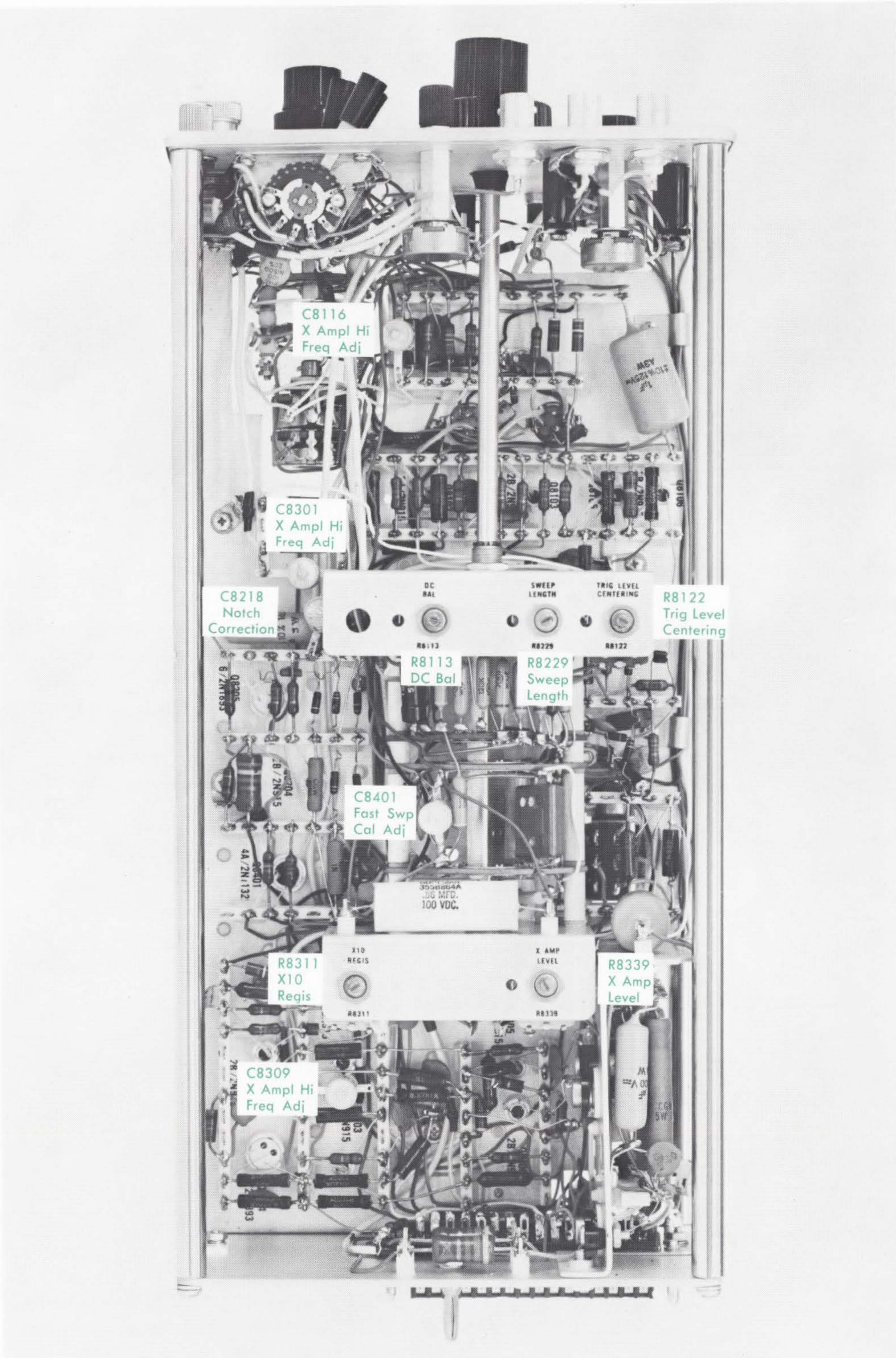


Figure 5-2a. Right Side View Showing Pots and Trimmer Adjustments

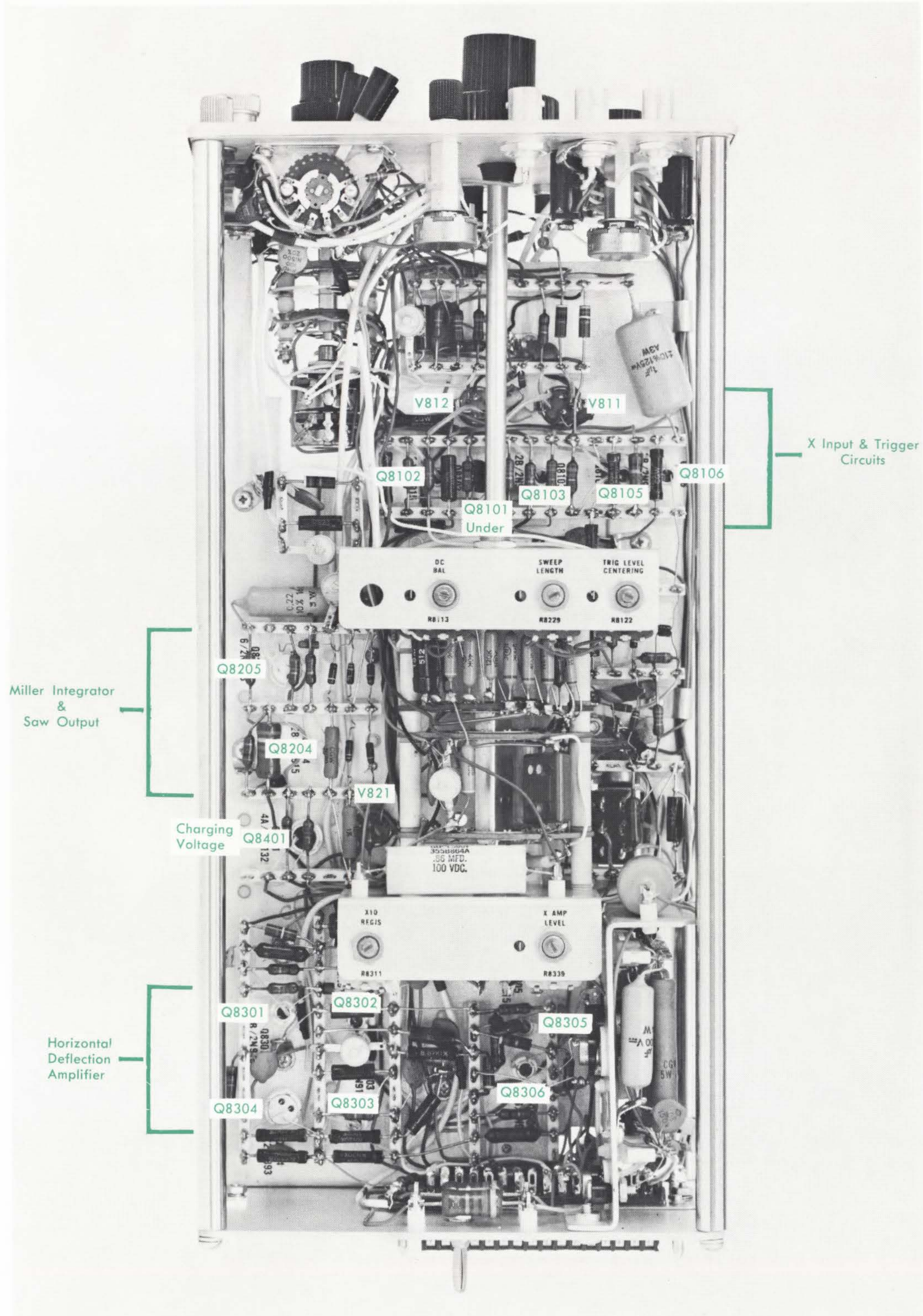


Figure 5-2b. Right Side View Showing Tubes and Transistors

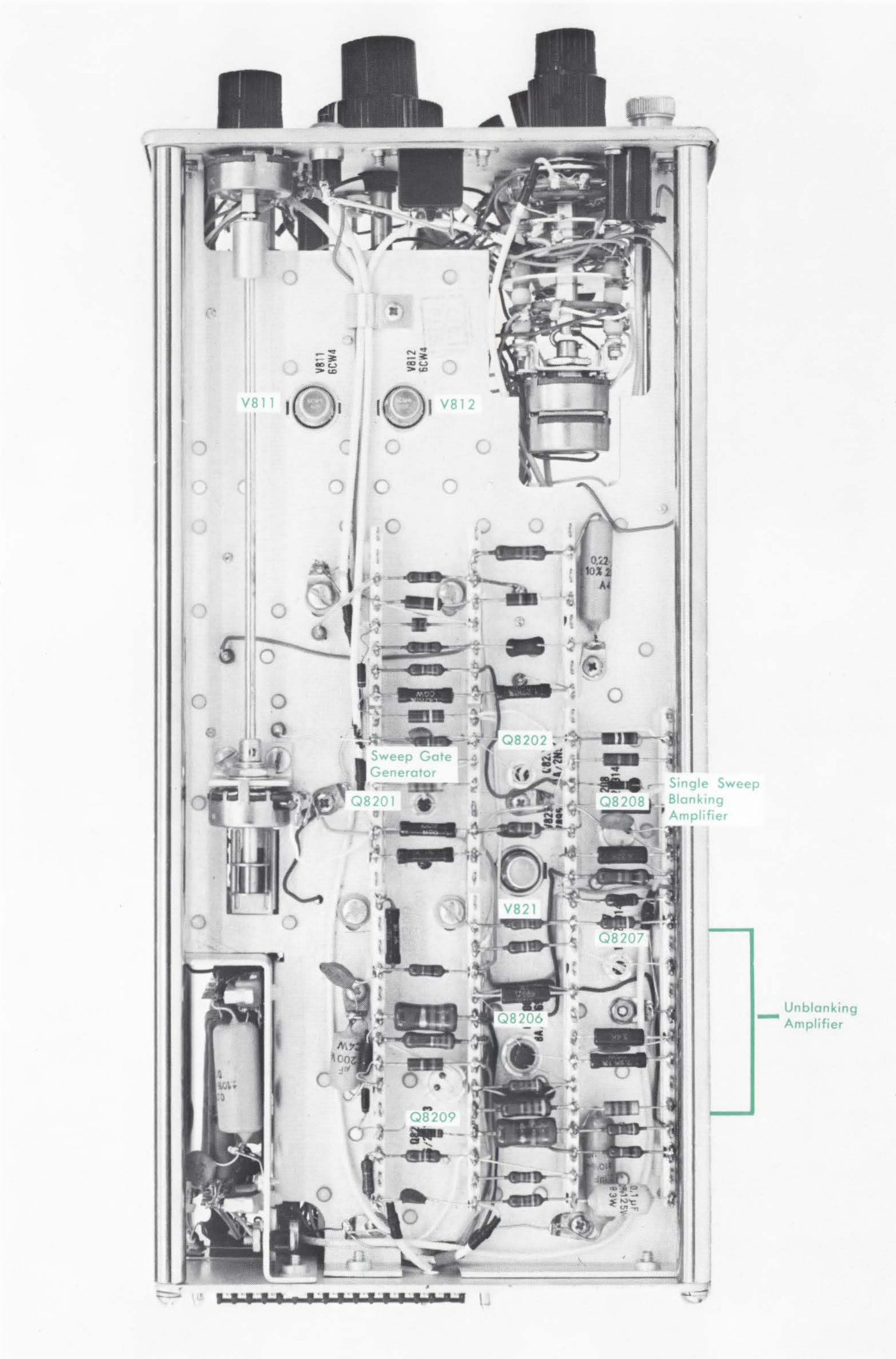


Figure 5-3. Left Side View Showing Tubes and Transistors

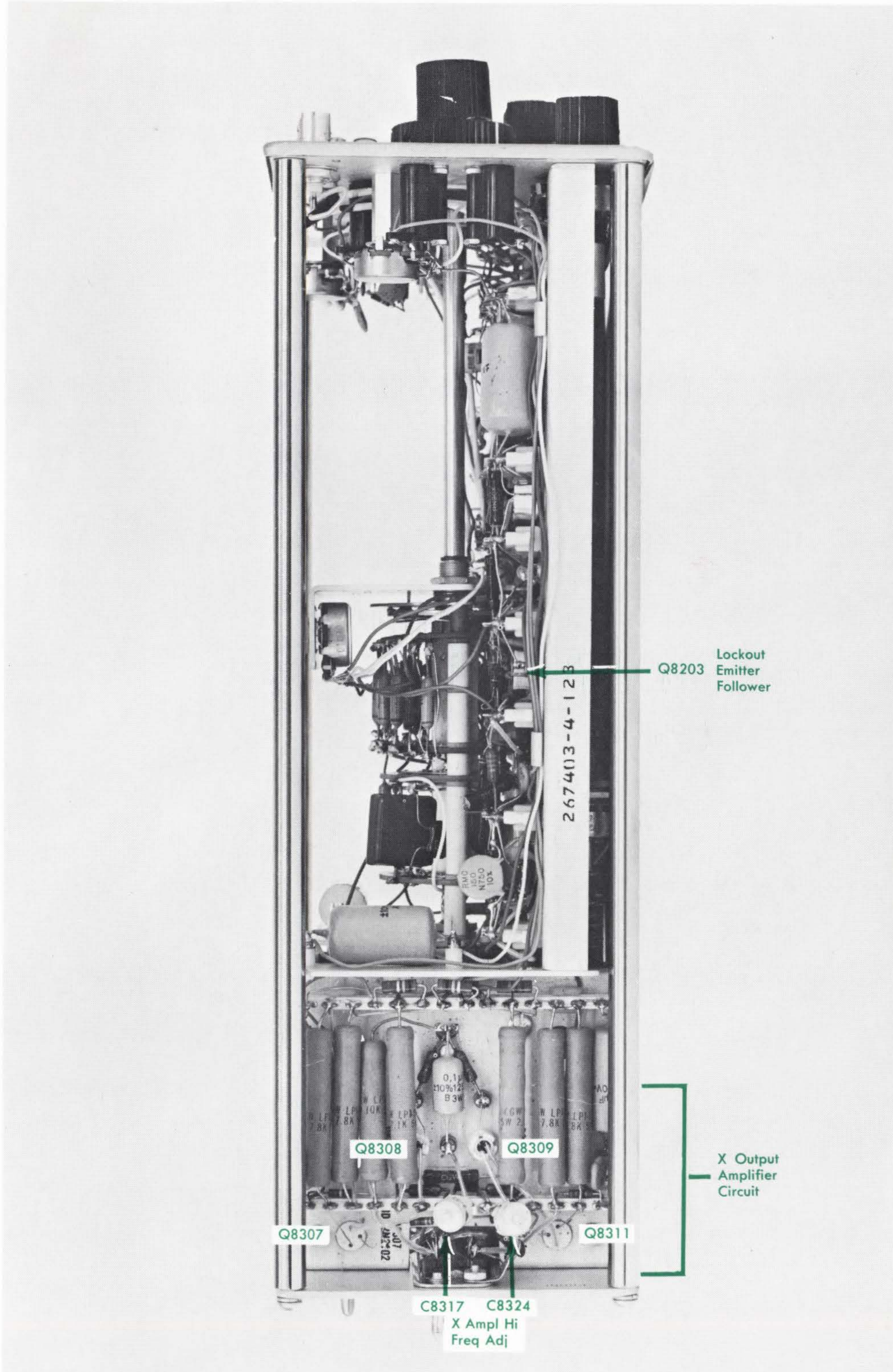


Figure 5-4. Top View Showing Transistors and Trimmer Adjustments

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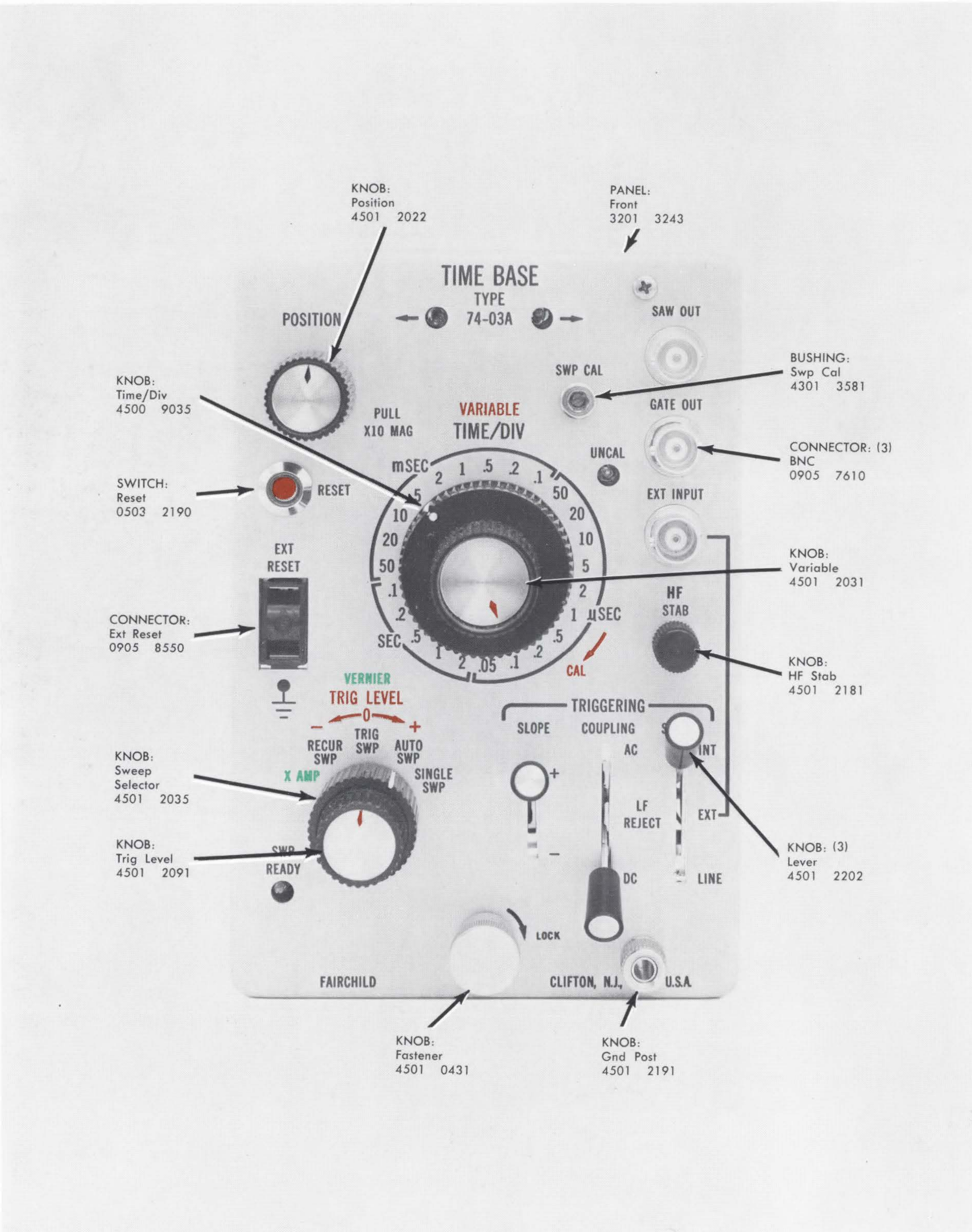


Figure 6-1. Front Panel Replaceable Parts

SECTION 6A
ELECTRICAL PARTS LIST AND SCHEMATICS
TYPE 74-03A TIME BASE

Symbol	Part Number	Description	Recommended Vendor Code	Recommended Vendor Type
		CAPACITORS		

Notes: 1. All capacitors are fixed, ceramic, and 500V unless otherwise specified; pf denotes picofarads.

2. GMV denotes Guaranteed Minimum Value.

Symbol	Part Number	Description	Code	Type
C8101	0326 4520	1000 pf, GMV	ERC	
C8102	0326 4550	2000 pf, GMV	ERC	
C8103	0315 2000	100 pf, ±20%	EIA	
C8104	0319 1060	0.01 μf, +60 −40%, 150V	CRL	DDM
C8105 to C8107	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8108 & C8109	0314 6860	5.6 pf, ±1%	EIA	
C8111	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8112	0317 5210	mica, 51 pf, ±5%	EMC	DM15
C8113	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8114	0326 7930	plastic, 1 μf, ±10%, 125V	AMX	C296AA
C8115	0316 0310	33 pf, ±5%	EIA	
C8116	0326 9480	variable, 9-35 pf, 100V	ERC	
C8117	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8118	0326 4520	1000 pf, GMV	ERC	
C8119	0316 0230	15 pf, ±5%	EIA	
C8201	0315 2000	100 pf, ±20%	EIA	
C8202	0305 5850	mica, 510 pf, ±10%, 300V	EIA	
C8203	0313 3960	composition, 10 pf, ±10%	STC	GA
C8204	0317 5100	mica, 20 pf, ±5%	EMC	DM15
C8205	0316 0230	15 pf, ±5%	EIA	
C8206	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8207	0316 0260	20 pf, ±5%	EIA	
C8208	0319 1060	0.01 μf, +60 −40%, 150V	CRL	DDM
C8209	0315 3630	150 pf, ±10%	EIA	
C8211	0315 1920	220 pf, ±20%	ERC	GP2331
C8212 & C8213	0317 5100	mica, 20 pf, ±5%	EMC	DM15
C8214	0326 7880	plastic, 0.22 μf, ±10%, 200V	AMX	C296AB
C8216	0319 1050	0.02 μf, +60 −40%, 150V	EIA	
C8217	0326 7880	plastic, 0.22 μf, ±5%, 200V	AMX	C296AB
C8218	0326 9510	variable, 2.5-11 pf, 200V	ERC	
C8261	0326 7860	plastic, 0.1 μf, ±10%, 200V	AMX	C296AB
C8262	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8263	0317 5210	mica, 51 pf, ±5%	EMC	DM15
C8264	0317 6750	mica, 1000 pf, ±5%	EMC	DM20
C8267	0326 8060	plastic, 0.1 μf, ±10%, 400V	AMX	C296AA
C8269	0326 4620	5000 pf	ERC	
C8271	0326 7860	plastic, 0.1 μf, ±10%, 200V	AMX	C296AB
C8272	0317 6750	mica, 1000 pf, ±5%	EMC	DM20
C8301	0326 9480	variable, 9-35 pf, 100V	ERC	Style 538
C8302	0319 1060	0.01 μf, +60 −40%, 150V	CRL	DDM
C8303	0316 0290	27 pf, ±5%	EIA	
C8304	0317 5110	22 pf, ±5%	EMC	DM15
C8305	0315 3630	150 pf, ±10%	EIA	
C8306 to C8308	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8309	0326 9500	variable, 5.5-18 pf, 200V	ERC	Style 538
C8310	0315 4090	10 pf, ±0.5 pf	EIA	
C8311	0326 7860	plastic, 0.1 μf, ±10%, 200V	AMX	C296AB
C8312	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8313	0326 7880	plastic, 0.22 μf, ±10%, 200V	AMX	C296AB
C8314	0326 8080	plastic, 0.22 μf, ±10%, 400V	AMX	C296AA
C8315	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8316	0316 0240	16 pf, ±5%	EIA	
C8317	0326 9480	variable, 9-35 pf, 100V	ERC	Style 538
C8318 & C8319	0319 1050	0.02 μf, +60 −40%, 150V	CRL	DDM
C8321	0317 5110	mica, 22 pf, ±5%	EMC	DM15
C8322	0317 5280	mica, 100 pf, ±5%	EMC	DM15
C8323	0315 3630	150 pf, ±10%	EIA	
C8324	0326 9480	variable, 9-35 pf, 100V	ERC	Style 538
C8401	0326 9490	variable, 2-8 pf, 200V	ERC	
C8402	0316 0300	30 pf, ±5%	EIA	355B
C8403	0326 8270	plastic, 0.86 μf, ±1%, 100V	GUD	Style 538
C8404	0327 2090	plastic, 0.03866 μf, ±0.5%, 100V	GUD	355B
C8406	0327 1510	mica, 3831 pf, ±0.5%	EMC	DM15
C8407	0327 1580	mica, 348 pf, ±0.5%	EMC	DM15
C8408	0326 7930	plastic, 1 μf, ±10%, 125V	AMX	C296AA
C8409	0319 6250	plastic, 0.05 μf, ±10%, 150V	GUD	338Y
C8411	0302 9840	mica, 4700 pf, ±10%	EIA	
C8412	0316 3850	47 pf, ±5%, 1000V	RMC	C
C8413	0316 3790	27 pf, ±5%, 1000V	RMC	C
C8414	0316 4180	9.1 pf, ±5%, 1000V	RMC	C
C8416 to C8418	0326 4520	1000 pf, GMV	ERC	

SEMICONDUCTORS

Symbol	Part Number	Description	Code	Type
CR8201 to CR8206	2600 6910	diode FD841	FCI	FD841
CR8207	2600 8020	diode, FDG3091	FCI	
CR8208 & CR8209	2600 6910	diode, FD841	FCI	FD841
CR8210	2600 6820	diode, FD281	FCI	
CR8211	2600 6990	diode, 1N752	HOF	
CR8261 & CR8262	2600 6910	diode, FD841	FCI	FD841
CR8263	2600 6820	diode, FD281	FCI	

LAMPS

Symbol	Part Number	Description	Code	Type
DS8201	1200 3960	glow, neon, NE-2 (SWP READY)	GE	NE-2
DS8302 & DS8303	1201 2350	light, indicator, neon (POSITION)	SIG	T2 27 1R100
DS8401	1200 3960	lamp, glow, neon, NE-2 (UNCAL)	GE	NE-2

HYBRID COILS

Symbol	Part Number	Description	Code	Type
HY8301, HY8307 & HY8311	2110 1560	bead, ferrite	FER	56 590 65/38

ELECTRICAL CONNECTORS

Symbol	Part Number	Description	Code	Type
J8101	0905 7610	receptacle, rf, female, 1 contact, BNC, UG-625-A/U (EXT INPUT)	EIA	
J8201	0905 7610	receptacle, rf, female, 1 contact, BNC, UG-625-A/U (GATE OUT)	EIA	

section 6a — parts lists and schematics

Symbol	Part Number	Description	Recommended Vendor Code	Recommended Vendor Type
J8202	0905 8550	receptacle, ac, female, 2 contacts, 15 amperes — 125-volt operation; 10 amperes — 250-volt operation (EXT RESET)	KUL	No. 222
J8203	0905 7610	receptacle, rf, female, 1 contact, BNC, UG-625-A/U (SAW OUT)	EIA	
P8001	0905 7340	plug, male, 32 contacts	APH	26 159 32

COILS

Symbol	Part Number	Description	Code	Type
L8201 & L8261	2102 0830	rf, female, 120 μh, ±10%	JEF	1

TRANSISTORS

Symbol	Part Number	Description	Code	Type
Q8101 to	2600 7060	DU #2	FCI	
Q8103	2600 7050	alternate 2N915		
Q8105 &	2600 8200	DU #14B	FCI	
Q8106	2600 8170	alternate 2N2369		
Q8201 &	2600 7030	DU #1B	FCI	
Q8202	2600 7000	alternate 2N914		
Q8203	2600 7260	DU #6	FCI	
	2600 7250	alternate 2N1893		
Q8204	2600 7070	DU #2A	FCI	
	2600 7050	alternate 2N915		
Q8205	2600 7280	DU #6B	FCI	
	2600 7050	alternate 2N1893		
Q8206	2600 7370	DU #8A/2N699B	FCI	
Q8207	2600 7020	DU #1A	FCI	
	2600 7000	alternate 2N914		
Q8208 &	2600 7270	DU #6A	FCI	
Q8209	2600 7250	alternate 2N1893		
Q8301 to	2600 7080	DU #2B	FCI	
Q8303	2600 7050	alternate 2N915		
Q8304	2600 7260	DU #6	FCI	
	2600 7250	alternate 2N1893		
Q8305 &	2600 7080	DU #2B	FCI	
Q8306	2600 7050	alternate 2N915		
Q8307	2600 3061	(selected 36A)	FCI	
	2600 8640	DU #36A		
Q8308 &	2600 7020	DU #1A	FCI	
Q8309	2600 7000	alternate 2N914		
Q8310 & Q8311	2600 8640	DU #36	FCI	
Q8401	2600 7170	DU #4A	FCI	
	2600 7150	alternate 2N1132		

RESISTORS

Notes: 1. All resistors are fixed, film, ±5%, ½W, and values in ohms unless otherwise specified; K = thousand, M = million

2. Listed below are the Part Numbers for fixed, film resistors used on the TIME/DIV switches of the Types 74-03A, 74-11A and 74-13A Time Base Plug-in Modules. These resistors are selected for plus or minus tolerances.

All minus tolerance units are marked with a *yellow* dot and plus tolerance units are marked with a *green* dot.

Resistor Part Number

0239 0241 to 0239 0249
0239 0251 to 0239 0259
0239 0261 to 0239 0279
0239 0281 to 0239 0299

When a replacement is ordered, a pair of resistors, one marked with a yellow dot and the other with a green dot will be sent. If a color-coded component is removed from the unit, be sure to replace it with the corresponding color dot component. This will insure proper performance of the plug-in module.

Symbol	Part Number	Description	Recommended Vendor Code	Recommended Vendor Type
R8100	0235 4850	composition, 10K, ¼W	ALB	CB
R8101	0235 4720	composition, 3K, ¼W	ALB	CB
R8102	0235 4860	composition, 11K, ¼W	ALB	CB
R8103 F/R (part of S814)	0107 2821	variable, 500K/3K, ±10% (TRIG LEVEL/X AMP VERN)	ABD	
R8104	0235 5090	100K, ¼W	ALB	CB
R8105	0236 3100	220K	CGW	C20
R8106	0234 8510	18K	CGW	C20
R8107	0235 5330	composition, 1M, ¼W	ALB	CB
R8108	0235 5170	composition, 220K, ¼W	ALB	CB
R8109	0234 8510	18K	CGW	C20
R8111	0234 8460	11K	CGW	C20
R8112	0236 6640	10K	CGW	NS20
R8113	0109 0850	variable, composition, 50K, ±20%, 0.2W (DC BAL)	CTS	Series 70
R8114	0234 7970	100	CGW	C20
R8115	0236 6640	10K, ±1%	CGW	NS20
R8116	0235 4410	composition, 130, ¼W	ALB	CB
R8117	0234 7970	100	CGW	C20
R8118	0235 4410	composition, 130, ¼W	ALB	CB
R8119	0203 0160	composition, 47	ALB	EB
R8121	0234 8380	5.1K	CGW	C20
R8122	0109 0840	variable, composition, 20K, ±20%, 0.2W (TRIG LEVEL CENT)	CTS	Series 70
R8123	0234 8380	5.1K	CGW	C20
R8124	0203 0160	composition, 47	ALB	EB
R8126	0234 7970	100	CGW	C20
R8129	0236 6630	9.76K, ±1%	CGW	N20
R8131	0236 6630	9.76K, ±1%	CGW	N20
R8132 & R8133	0234 8250	1.5K	CGW	C20
R8134	0234 8160	620	CGW	C20
R8136	0203 0160	composition, 47	ALB	EB
R8137	0234 8340	3.6K	CGW	C20
R8138	0236 6760	13.3K, ±1%	CGW	NS20
R8139	0234 8580	36K	CGW	C20
R8141	0236 5060	226, ±1%	CGW	N20
R8142	0234 8650	68K	CGW	C20
R8143	0203 1090	composition, 360K	ALB	EB
R8148	0236 5220	332, ±1%	CGW	N20
R8149	0236 6600	9.09K, ±1%	CGW	N20
R8151	0236 7250	43.2K, ±1%	CGW	N20
R8152	0233 9810	6.04K, ±1%, 2W	CGW	S25
R8153	0203 0000	composition, 10	ALB	EB
R8154	0234 8100	360	CGW	C20
R8201 & R8202	0236 5680	1K, ±1%	CGW	N20
R8203	0203 0160	composition, 47	ALB	EB
R8204	0234 9230	5.6K, 1W	CGW	C32
R8205	0234 8300	2.4K	CGW	C20
R8206	0109 2180	variable, composition, 500, ±20%, 0.3W (HF STAB)	CTS	Series 70
R8207	0236 5040	215, ±1%	CGW	N20
R8208	0234 8540	24K	CGW	C20
R8211	0236 5860	1.54K, ±1%	CGW	N20
R8212	0204 2300	composition, 91M, ±20%	ALB	EB
R8213	0234 8570	33K	CGW	C20
R8214	0234 8560	30K	CGW	C20
R8216	0234 8440	9.1K	CGW	C20
R8217	0203 1060	composition, 270K	ALB	EB
R8218	0234 8370	4.7K	CGW	C20
R8219	0234 7970	100	CGW	C20
R8221	0236 5680	1K, ±1%	CGW	N20
R8222	0234 8690	100K	CGW	C20
R8223	0234 8470	12K	CGW	C20
R8226	0236 5840	1.47K, ±1%	CGW	N20
R8227	0234 7970	100	CGW	C20
R8228	0234 8270	1.8K	CGW	C20
R8229	0109 0800	variable, composition, 1.5K, ±20%, 0.3W (SWP LENGTH)	CTS	Series 70
R8231	0234 9220	5.1K, 1W	CGW	C32
R8232	0234 8040	200	CGW	C20
R8233	0237 1210	39K, 2W	CGW	C42S
R8234	0234 8010	150	CGW	C20
R8236	0234 8320	3K	CGW	C20

Symbol	Part Number	Description	Recommended Vendor Code	Recommended Vendor Type
R8237	0234 8330	3.3K	CGW	C20
R8238	0236 0350	12K, ±1%	CGW	N20
R8239	0234 8040	200	CGW	C20
R8241	0236 5780	1.27K, ±1%	CGW	N20
R8242	0236 0350	12K, ±1%	CGW	N20
R8243	0234 9240	6.2K, 1W	CGW	C32
R8244	0203 0160	composition, 47	ALB	EB
R8246	0234 7970	100	CGW	C20
R8247	0234 8250	1.5K	CGW	C20
R8248	0234 8660	75K	CGW	C20
R8261	0234 9400	30K, 1W	CGW	C32
R8262	0234 8620	51K	CGW	C20
R8263	0236 6290	4.32K, ±1%	CGW	NS20
R8264	0234 8610	47K	CGW	C20
R8265	0234 8390	5.6K	CGW	C20
R8266	0234 8730	150K	CGW	C20
R8267	0236 6550	8.06K, ±1%	CGW	NS20
R8268	0203 0660	composition, 5.6K	ALB	EB
R8269	0236 6520	7.5K, ±1%	CGW	N20
R8271	0236 6190	3.4K, ±1%	CGW	N20
R8272	0234 8040	200	CGW	C20
R8273	0234 9200	4.3K, 1W	CGW	C32
R8274	0236 5390	499, ±1%	CGW	N20
R8275	0234 8450	10K	CGW	C20
R8276	0234 8130	470	CGW	C20
R8277	0237 1080	11K, 2W	CGW	C42S
R8278	0234 8130	470	CGW	C20
R8281	0237 1020	6.2K, 2W	CGW	C42S
R8282	0234 8690	100K	CGW	C20
R8283	0234 8010	150	CGW	C20
R8284	0234 9180	3.6K, 1W	CGW	C32
R8286	0203 0100	composition, 27	ALB	EB
R8301	0236 7190	37.4K, ±1%	CGW	NS20
R8302	0228 5110	13.3K, ±1%	IRC	DCC
R8303	0203 1030	composition, 200K	ALB	EB
R8304	0234 8690	100K	CGW	C20
R8305	0234 8420	7.5K	CGW	C20
R8306	0107 3421	variable, 30K, ±10%, ¾W (POSITION COARSE)	FIC	
R8307	0234 7970	100	CGW	C20
R8308	0234 8470	12K	CGW	C20
R8311	0109 0710	variable, composition, 750, ±10% (X10 REG)	CTS	65
R8312	0236 5260	365, ±1%	CGW	NS20
R8313	0203 0240	composition, 100	ALB	EB
R8314	0107 2891	variable, composition, 50K, ±20% (POSITION VERNIER)	ABD	
R8315	0203 1130	composition, 510K	ALB	EB
R8316	0236 4600	75, ±1%	CGW	N20
R8317	0236 6660	10.5K, ±1%	CGW	NS20
R8318	0203 0160	composition, 47, ±10%	ALB	EB
R8319	0234 7970	100	CGW	C20
R8320	0236 6640	10K, ±1%	CGW	NS20
R8321	0228 5040	1.21K, ±1%	IRC	DCC
R8322 & R8323	0236 6590	8.87K, ±1%	CGW	N20
R8324	0236 6720	12.1K, ±1%	CGW	N20
R8326	0228 5040	1.21K, ±1%	IRC	DCC
R8327	0236 6140	3.01K, ±1%	CGW	N20
R8328	0236 6100	2.74K, ±1%	CGW	N20
R8329	0236 5630	887, ±1%	CGW	N20
R8331 & R8332	0234 7970	100	CGW	C20
R8333	0234 8250	1.5K	CGW	C20
R8334	0234 8320	3K	CGW	C20
R8335	0203 0160	composition, 47	ALB	EB
R8336	0234 8320	3K	CGW	C20
R8337	0235 1760	7.8K, 5W	CGW	LPI-5
R8338	0235 4260	composition, 33, ¼W	ALB	CB
R8339	0109 0700	variable, composition, 100, ±20% 0.3W (X AMP LEVEL)	CTS	65
R8341	0235 4260	composition, 33, ¼W	ALB	CB
R8342	0235 1760	7.8K, 5W	CGW	LPI-5
R8344	0203 0070	composition, 20	ALB	EB
R8346	0235 1760	7.8K, 5W	CGW	LPI-5
R8347 & R8348	0235 1750	2.1K, 5W	CGW	LPI-5
R8349	0235 1760	7.8K, 5W	CGW	LPI-5
R8351	0236 5680	1K, ±1%	CGW	NS20
R8352	0234 7900	51	CGW	C20
R8353 & R8354	0235 5150	composition, 180K, ¼W	ALB	CB
R8355 & R8356	0203 1890	composition, 10K, ±10%	ALB	EB
R8357	0230 0410	10K, 4W	CGW	LPI-4
R8358	0234 7900	51	CGW	C20
R8401	0109 0480	variable, composition, 2.5K, ±20%, 0.3W (SWP CAL)	CTS	Series 70
R8402	0236 3190	wire wound, 1.2K, ±10%, 1W	DAL	CS1A
R8403 (part of S842)	0107 2711	variable, composition, 2.5K, ±20%, 0.3W (SWP VAR)	ABD	
R8404	0234 8690	100K	CGW	C20
R8405	0203 1000	composition, 150K	ALB	EB
R8406	0239 0251	18M, ±1%	ABD	
R8407	0239 0241	9M, ±1%	ABD	
R8408	0239 0242	5.4M, ±1%	ABD	
R8409	0239 0289	1.8M, ±0.5%	ABD	
R8411	0239 0287	900K, ±0.5%	ABD	
R8412	0239 0292	4M, ±0.5%	ABD	
R8413	0239 0291	2M, ±0.5%	ABD	
R8414	0239 0288	1.2M, ±0.5%	ABD	
R8416	0239 0285	400K, ±0.5%	ABD	
R8417	0239 0284	200K, ±0.5%	ABD	
R8418	0239 0283	120K, ±0.5%	ABD	
R8419	0239 0282	40K, ±0.5%	ABD	
R8421	0239 0281	20K, ±0.5%	ABD	
R8422	0239 0286	500K, ±0.5%	ABD	
R8423	0239 0281	20K, ±0.5%	ABD	
R8424	0236 9490	430, 2W	CGW	C42S
R8426	0236 9490	430, 2W	CGW	C42S
R8427	0237 0530	56, 2W	CGW	C42S
R8428	0234 8260	1.6K	CGW	C20
R8429	0234 8210	1K	CGW	C20
R8430	0203 1770	composition, 1K	ALB	EB

SWITCHES

Symbol	Part Number	Description	Code	Type
S811	0501 7251	lever, 3 positions (TRIG SOURCE	ABD	
S812	0501 7251	lever, 3 positions (TRIG COUPLING)	ABD	
S813	0501 7241	lever, 2 positions (TRIG SLOPE)	ABD	
S814	0501 7272	rotary, 3 sections, 5 positions (MODE)	ABD	
S821	0503 2190	sensitive, SPST N.O. (RESET)	GRY	Series 30
S830 (part of R8314)	0107 2891	push-pull, DPDT, ½ ampere, 125V	STC	LPP-50
S841 (part of R8403)	0107 2711	rotary, 3 amperes, SPDT, 125V (CAL)	CLS	43
S842	0501 7231	rotary, 4 sections, 24 positions (TIME/DIV)	ABD	

TRANSFORMER

Symbol	Part Number	Description	Code	Type
T8101	2001 3821	pulse	ABD	

ELECTRON TUBES

Symbol	Part Number	Description	Code	Type
V811 & V812	2501 3390	6CW4	RCA	Nuvistor
V821	2501 3400	7895	RCA	7895

NOTES

SECTION 6B
SPARE PARTS LIST

SPARE PARTS REQUIREMENTS

a. General

The Type 74-03A Time Base Plug-in is an extremely reliable and dependable instrument. Only components thoroughly tested and approved by the engineers of the Quality Assurance Laboratory are used in this instrument. Continued performance tests, environmental and life testing of production units make certain your oscilloscope will give many years of satisfactory service. These new Fairchild oscilloscopes are precision engineered and require no selected parts.

Two lists of "running spares" are included to aid you in periodic maintenance. The running-spare parts lists include recommended quantities and reference symbol numbers. Section 6A of this Instruction Manual gives a complete listing of all components and their recommended vendors so that you may readily procure them from a local supply house or your own stores.

NOTE: The local Fairchild Scientific Instrument Field Engineering representative and his service organization can assist you in obtaining any additional components in the shortest possible time. To help expedite service, always give the Type Number and Serial Number of the instrument; always specify the part number and give a description of the component (see Section 6A of this manual).

b. 500-Hour Spares (6 months)

The recommended list for one through three units follows.

ELECTRON TUBES

Symbol	Quantity
V811	1
V821	1

TRANSISTORS

Symbol	Quantity
Q8101	1
Q8105	1
Q8201	1
Q8203	1
Q8204	1
Q8205	1
Q8206	1
Q8208	2
Q8301	2
Q8307	1
Q8401	1

DIODES

Symbol	Quantity
CR8201 (FD841)	5
CR8207 (FDG3091)	1
CR8211 (IN752)	1

LAMPS

Symbol	Quantity
DS8201	1
DS8302	1

COILS

Symbol	Quantity
HY8301	1
L8201	1

c. 2000-Hour Spares (2 years)

The recommended list for one through five units is given below. Maintain spares indicated plus one for each oscilloscope in use; 2 of each set of the 500-hour spare list given in paragraph (b) plus the quantities listed as follows:

CAPACITORS

Symbol	Quantity	Symbol	Quantity
C8101	2	C8264	1
C8102	1	C8267	1
C8103	1	C8269	1
C8104	1	C8303	1
C8105	7	C8304	1
C8108	1	C8309	1
C8112	1	C8310	1
C8114	1	C8314	1
C8115	1	C8316	1
C8116	1	C8322	1
C8118	1	C8401	1
C8119	1	C8402	1
C8202	1	C8403	1
C8203	1	C8404	1
C8204	1	C8406	1
C8207	1	C8407	1
C8209	1	C8409	1
C2811	1	C8411	1
C8214	1	C8412	1
C8218	1	C8413	1
C8261	1	C8414	1

LAMPS

Symbol	Quantity
DS8201	1
DS8302	1

ELECTRICAL CONNECTORS

Symbol	Quantity
J8101	1
J8202	1
P8001	1

section 6b — spare parts list

RESISTORS

Symbol	Quantity	Symbol	Quantity
R8100	1	R8267	1
R8101	1	R8268	1
R8102	1	R8269	1
R8104	1	R8271	1
R8105	1	R8273	1
R8106	1	R8274	1
R8107	1	R8275	1
R8108	1	R8276	1
R8112	1	R8277	1
R8113	1	R8278	1
R8114	5	R8281	1
R8116	1	R8284	1
R8119	2	R8286	1
R8121	1	R8301	1
R8122	1	R8302	1
R8129	1	R8303	1
R8132	1	R8305	1
R8134	1	R8306	1
R8136	1	R8311	1
R8137	1	R8312	1
R8138	1	R8313	1
R8139	1	R8314	1
R8141	1	R8315	1
R8142	1	R8316	1
R8143	1	R8317	1
R8148	1	R8320	1
R8149	1	R8321	1
R8151	1	R8322	1
R8152	1	R8324	1
R8153	1	R8327	1
R8154	1	R8328	1
R8201	1	R8329	1
R8204	1	R8337	2
R8205	1	R8338	1
R8206	1	R8339	1
R8207	1	R8344	1
R8208	1	R8347	1
R8211	1	R8351	1
R8212	1	R8352	1
R8213	1	R8353	1
R8214	1	R8355	1
R8216	1	R8357	1
R8217	1	R8401	1
R8218	1	R8402	1
R8222	1	R8405	1
R8223	1	R8406	1
R8226	1	R8407	1
R8228	1	R8408	1
R8229	1	R8409	1
R8231	1	R8411	1
R8232	1	R8412	1
R8233	1	R8413	1
R8234	1	R8414	1
R8236	1	R8416	1
R8237	1	R8417	1
R8238	1	R8418	1
R8241	1	R8419	1
R8243	1	R8421	1
R8248	1	R8422	1
R8261	1	R8424	1
R8263	1	R8427	1
R8264	1	R8428	1
R8265	1	R8429	1
R8266	1		

SWITCHES

Stock only one each of the following switches for each 3 units being maintained:

S811, S813, S814, S821, S842

NOTE: Should a particular switch receive more than normal use in certain applications, then the quantity stocked of that particular switch should be doubled.

TRANSFORMER

Symbol	Quantity
T8101	1

d. Miscellaneous

The following items may be stocked in quantities of one for each 2 units being maintained:

Name and Description	Name of Control	Part Number
Bushing, shaft	Swp Cal	4301 3581
Knob, GP #3	Time/Div	4500 9035
Knob, fastener	Plug-in Lock	4501 0431
Knob, small	Position	4501 2022
Knob, medium	Variable	4501 2031
Knob, medium	Sweep Selector	4501 2035
Knob, small #1	Trig Level	4501 2091
Knob	HF Stab	4501 2181
Knob, knurled	Gnd Post	4501 2191
Knob, lever	Triggering	4501 2202
Switch, push-button	Reset	0503 2190
Panel, front		3201 3243

e. Summary

The quantities of spare parts given in the preceding paragraphs are intended for industrial and military duty under normal environment and heavy-use conditions. It is suggested that the maintenance engineer evaluate:

1. The conditions under which the instruments will be used.
2. The skill of the maintenance technicians.
3. Other similar items on hand.
4. The effect of procurement time of spares and effects of instrument down-time on your organization.

It is recommended that inventories of spare parts outlined above be adjusted according to the requirements of your own laboratory or plant.

In the first analysis, the factory recommends the availability of spares or standby equipments since extensive life testing of your instrument has shown no higher failure rate for any specific component.

LIST OF RECOMMENDED VENDORS

CODE	NAME
ABD	Du Mont Laboratories
AER	Aerovox Corporation
AHH	Arrow-Hart & Hegeman Electric Company
ALB	Allen-Bradley Company
ALC	Allied Control
ALCO	Alco Electronic Products
ALD	Alden Products Company
AMA	Amaton Electronic Hardware
AMP	Amp Inc.
AMR	Amperite Company, Inc.
AMX	Amperex Electronics Products, Inc.
APC	American Phenolic Corporation
APH	Amphenol Electronics Corporation
ARC	Arco Electronics Inc. (Elmenco)
AST	Astron Corporation
AUT	Automatic Metal Products Corporation
BEL	Belfuse
BNS	Bourns Inc.
BUR	Burndy Engrg. Company
BUS	Bussmann Mfg. Company
CAN	Cannon Electric Company
CBS	CBS-Hytron Division of CBS
CDE	Cornell-Dubilier Electric Corporation
CGW	Corning Glass Works
CH	Cutler-Hammer, Inc.
CHC	Chester Cable Corporation
CHM	Chatham Electronics
CIN	Cinch Manufacturing Company
CLS	Clarostat Mfg. Co., Inc.
COC	Continental Carbon
COM	Comar Electric
COW	Continental-Wirt Electronics Corporation
CPC	C. P. Clare & Company
CRL	Centralab, Division of Globe-Union, Inc.
CST	Chicago Standard Transformer Corporation
CTC	Cambridge Thermionic Corporation
CTS	Chicago Telephone Supply Corporation
DAG	Dage Electric Company, Inc.
DAL	Dale Products, Inc.
DLC	Dialight Corporation
DRK	Drake Mfg. Company
EBY	Hugh H. Eby, Inc.
EDL	Edal Industries
EIA	Any manufacturer meeting EIA standards
ELC	Electra Manufacturing Company
ELD	Eldema Corporation
EMC	Electro Motive Mfg. Company
EMW	Elmwood Sensors, Inc.
ERC	Erie Resistor Corporation
ESX	Essex Electronics
FAST	John E. Fast Company
FCI	Fairchild Camera and Instrument Corporation
FER	Ferroxcube Corporation of America
GDE	Good-All Electric Mfg. Company
GE	General Electric Company
GEN	General Instrument Corporation
GEP	General Products Corporation
GLB	Globe Industries
GRC	General Radio Company
GRY	Grayhill, Inc.
GUD	The Gudeman Company
HAM	The Hammarlund Manufacturing Co., Inc.

CODE	NAME
HON	Honeywell
HOP	Hopkins Engineering Company
HP	Hewlett-Packard Company
IEC	International Electronics Corporation
IRC	International Resistance Company
IRP	International Rectifier Corporation
ITT	ITT Components Division
JEF	Jeffers Electronics, Inc.
JHN	E. F. Johnson Company
JWM	J. W. Miller Company
KUL	Kulka Electric Mfg. Co. Inc.
KXM	Klixon Metals and Control Corporation
LED	Ledex Inc.
LEE	Leecraft Mfg. Company
LFI	Littlefuse, Inc.
LIN	Line Electric
MAL	P. R. Mallory & Company, Inc.
MCR	Micro Switch (Division of Minneapolis-Honeywell Regulator Co.)
MIC	Micamold Electronics Mfg. Corporation
MIL	Miller Electric Company
MOT	Motorola Semiconductor Products, Inc.
MOV	M-O Valve Company Ltd.
MUC	Mucon Corporation
MUT	The Muter Company
NYT	New York Transformer Company, Inc.
OAK	Oak Mfg. Company
PHC	Philco Corporation
PHI	Philips Electronic Tube Division
PLS	Plastoid Corporation
POT	Potter & Brumfield, Inc.
PRC	Precision Resistor Co., Inc.
PYR	Pyramid Electric Company
RCA	Radio Corporation of America
RMC	Radio Materials Corporation
ROY	Royal Electric Corporation, Inc.
RTN	Rotron Mfg. Company
SIG	Signalite Inc.
SIL	Silicon Transistor Corporation
SLT	Sealectro Corporation
SOL	Solitron Devices, Inc.
SPG	Sprague Electric Company
STC	Stackpole Carbon Company
STW	Standard Winding Company
SUM	Summit Coil Company
SWW	Stanwyck Winding Company
SYL	Sylvania Electric Products, Inc.
SYN	Syntronic Instruments, Inc.
TEC	Transistor Electronics Corporation
TEX	Texas Instruments, Inc.
THC	Thermal Control, Inc.
TOR	Torrington Mfg., Company
TRS	Tresco, Inc.
TRU	Tru-Ohm Products
TUG	Tung-Sol Electric Inc.
UCN	Ucinite Company
UTC	United Transformer Company
VIC	The Victoreen Instrument Company
WDE	Wood Electric Corporation
WDL	Ward Leonard Electric Company
WES	Weston Electrical Instrument Corporation
WYN	Welwyn International Inc.

INSTRUMENT WARRANTY AND SERVICE NOTICE

WARRANTY

The Instrumentation Division warrants that each new Cathode-ray Oscilloscope, Automotive Test Equipment, and other Electronic or Electrical Test or Measuring Equipment (hereinafter referred to as "Instrument") manufactured or sold by it, is free from defects in material or workmanship under normal use and service for a period of one year from the date of its sale to the first purchaser for use. If, upon examination by Fairchild, the Instrument is determined to be defective in workmanship or material, Fairchild will, subject to the conditions set forth below, either repair the defective part or replace it with a new part. Fairchild shall not be liable for any delay or failure to furnish a replacement part resulting directly or indirectly from any governmental restriction, priority or allocation or any other governmental regulatory order or action, nor shall Fairchild be liable for damages by reason of the failure of the Instrument to perform properly or for any consequential damages. This warranty does not apply to any Instrument that has been subject to negligence, accident, misuse or improper installation or operation or that in any way has been tampered with, altered or repaired by any person other than an authorized Fairchild service organization or an employee thereof, or to any Instrument whose serial number has been altered, defaced or removed, or to any Instrument purchased within, and thereafter removed beyond, the continental limits of the United States.

This warranty shall, at Fairchild's option, become void unless registration thereof is promptly effected as provided below. This warranty is in lieu of all other warranties, expressed or implied, and no one is authorized to assume any liability on behalf of Fairchild or impose any obligation upon it in connection with the sale of any Instrument, other than as stated above.

REGISTERING THE WARRANTY

To register this warranty, the enclosed warranty registration card must be properly filled out and mailed to the Instrument Service Department immediately upon receipt of the equipment. Complete information is necessary. BOTH THE TYPE NUMBER AND THE SERIAL NUMBER OF THE INSTRUMENT MUST BE GIVEN ON THIS CARD. Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time and to furnish merchandise in accordance with current specifications without incurring any liability to modify equipment previously sold, or to supply new equipment in accordance with earlier specifications excepting under the classification of special apparatus.

SERVICE

In order to insure service under our warranty, the enclosed warranty service card must be properly filled out and returned to the factory. In all cases where service or adjustment is requested, please first contact the factory or authorized depot, giving complete information concerning the nature of the failure and describing the manner in which the equipment was used when failure occurred. THE TYPE NUMBER AND SERIAL NUMBER of the equipment must also be given. In this way, much time can be saved and unnecessary inconvenience often avoided. When writing to the factory in this respect, address:

Fairchild Camera and Instrument Corp.
Instrumentation Division
50 Somerset Place, Clifton, New Jersey

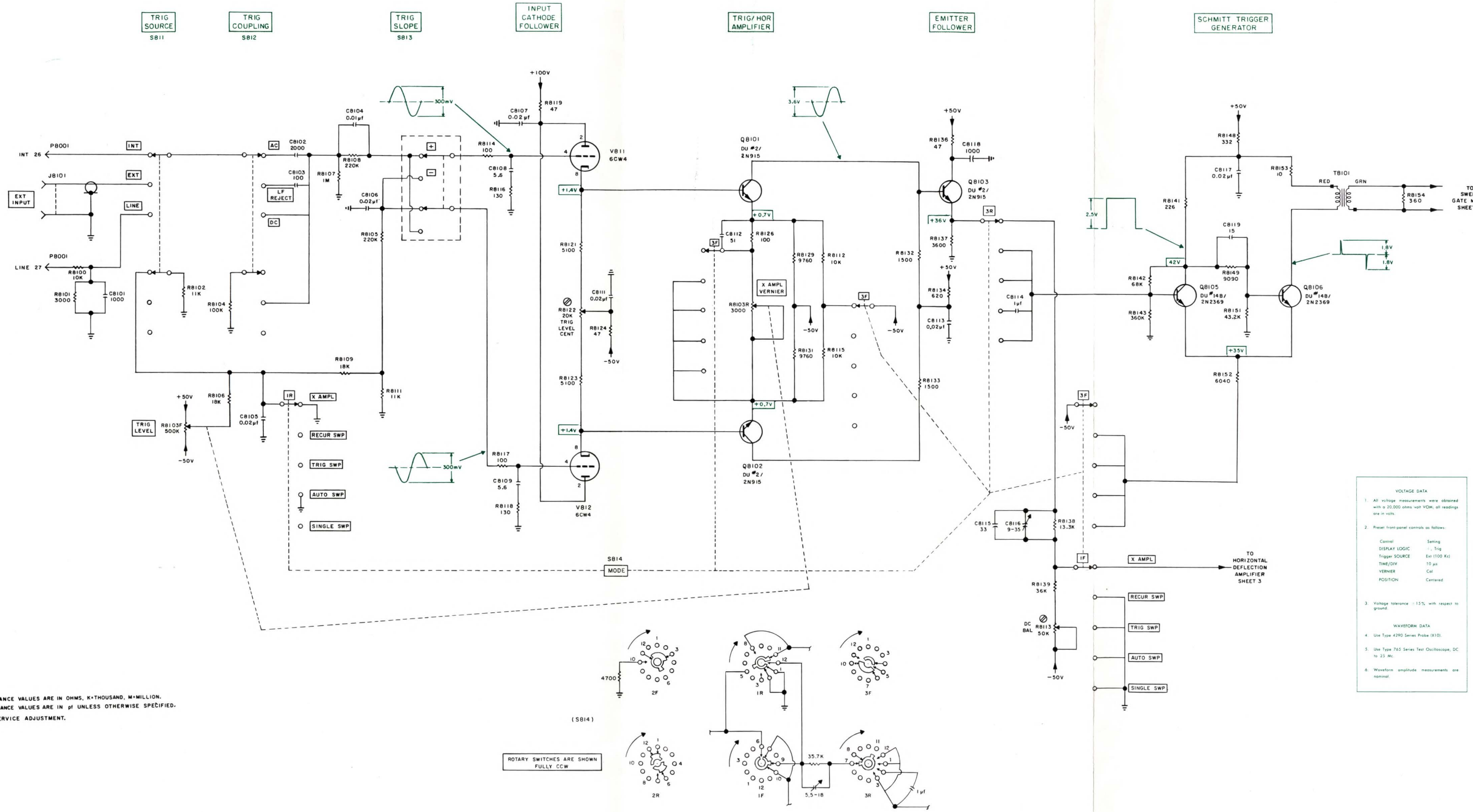
The Instrument Service Department will then send to the customer the written procedure for disposition and shipping instructions. All equipment should be packed and shipped in accordance with this procedure; and identification tags should be attached to each tube or instrument.

REPLACEMENT PARTS

If it is necessary to order a replacement component from the factory, always give the Type number and Serial number of the Instrument. Before ordering parts for in-warranty replacement or purchasing them for out-of-warranty replacement, be sure to consult the Parts List in the Instruction Manual. The Parts List gives the values, tolerances, ratings, and Fairchild part number for all electrical components used in the Instrument. This will help to expedite service.

PATENT NOTICE

Manufactured under one or more U. S. Patents owned or controlled by Fairchild Camera and Instrument Corporation. 50 Somerset Place, Clifton, New Jersey, U.S.A. Patent Numbers supplied upon request.



VOLTAGE DATA

1. All voltage measurements were obtained with a 20,000 ohms/volt VOM; all readings are in volts.
2. Preset front-panel controls as follows:

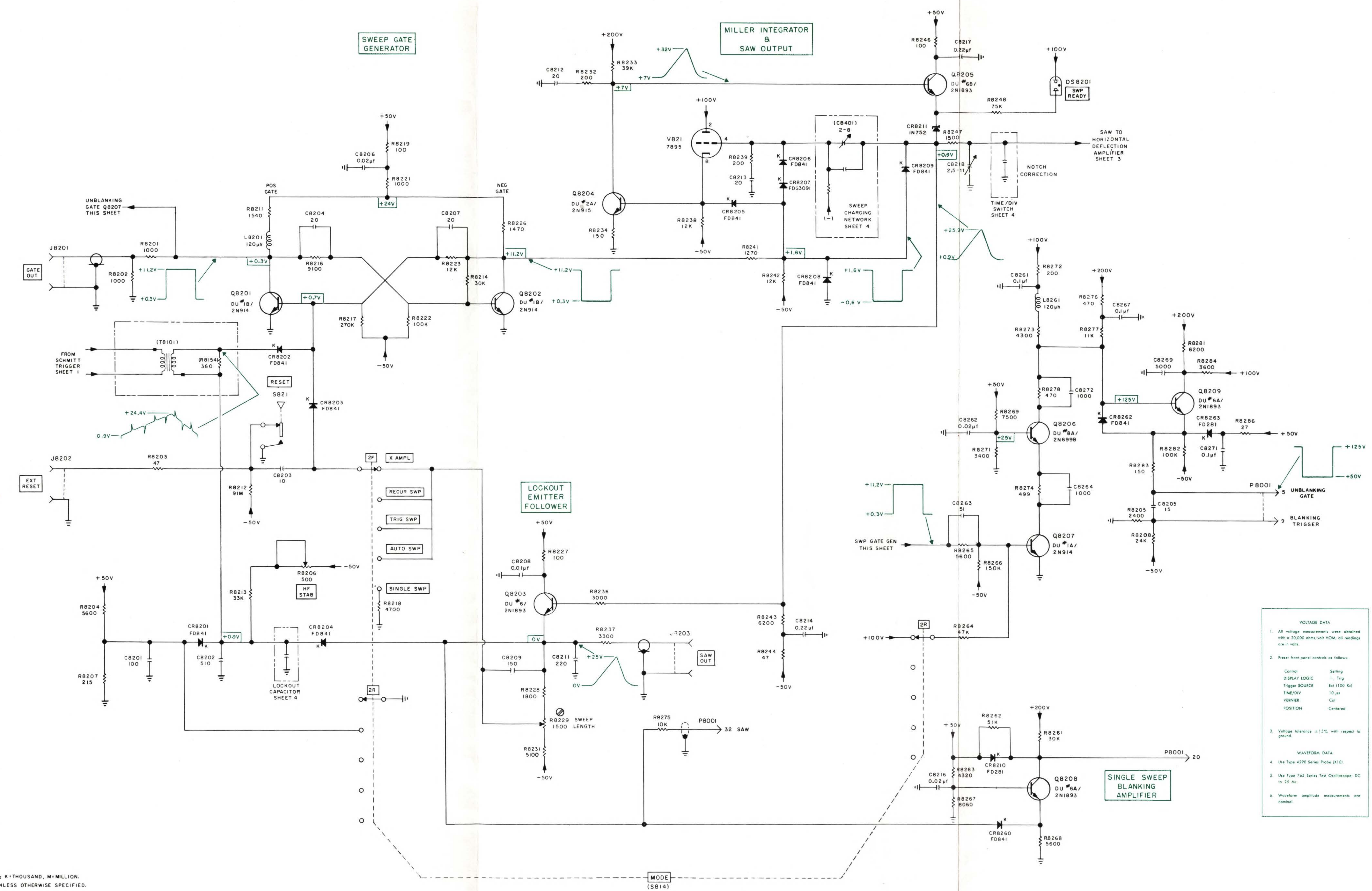
Control	Setting
DISPLAY LOGIC	+, Trig
Trigger SOURCE	Ext (100 Kc)
TIME/DIV	10 μs
VERNIER	Cal
POSITION	Centered

3. Voltage tolerance ±15% with respect to ground.

WAVEFORM DATA

4. Use Type 4290 Series Probe (X10).
5. Use Type 765 Series Test Oscilloscope, DC to 25 Mc.
6. Waveform amplitude measurements are nominal.

NOTES
1. RESISTANCE VALUES ARE IN OHMS, K=THOUSAND, M=MILLION.
2. CAPACITANCE VALUES ARE IN pf UNLESS OTHERWISE SPECIFIED.
3. ⊘ SERVICE ADJUSTMENT.



NOTES:
1. RESISTANCE VALUES ARE IN OHMS; K=THOUSAND, M=MILLION.
2. CAPACITANCE VALUES ARE IN pf UNLESS OTHERWISE SPECIFIED.
3. ⊘ SERVICE ADJUSTMENT.

VOLTAGE DATA

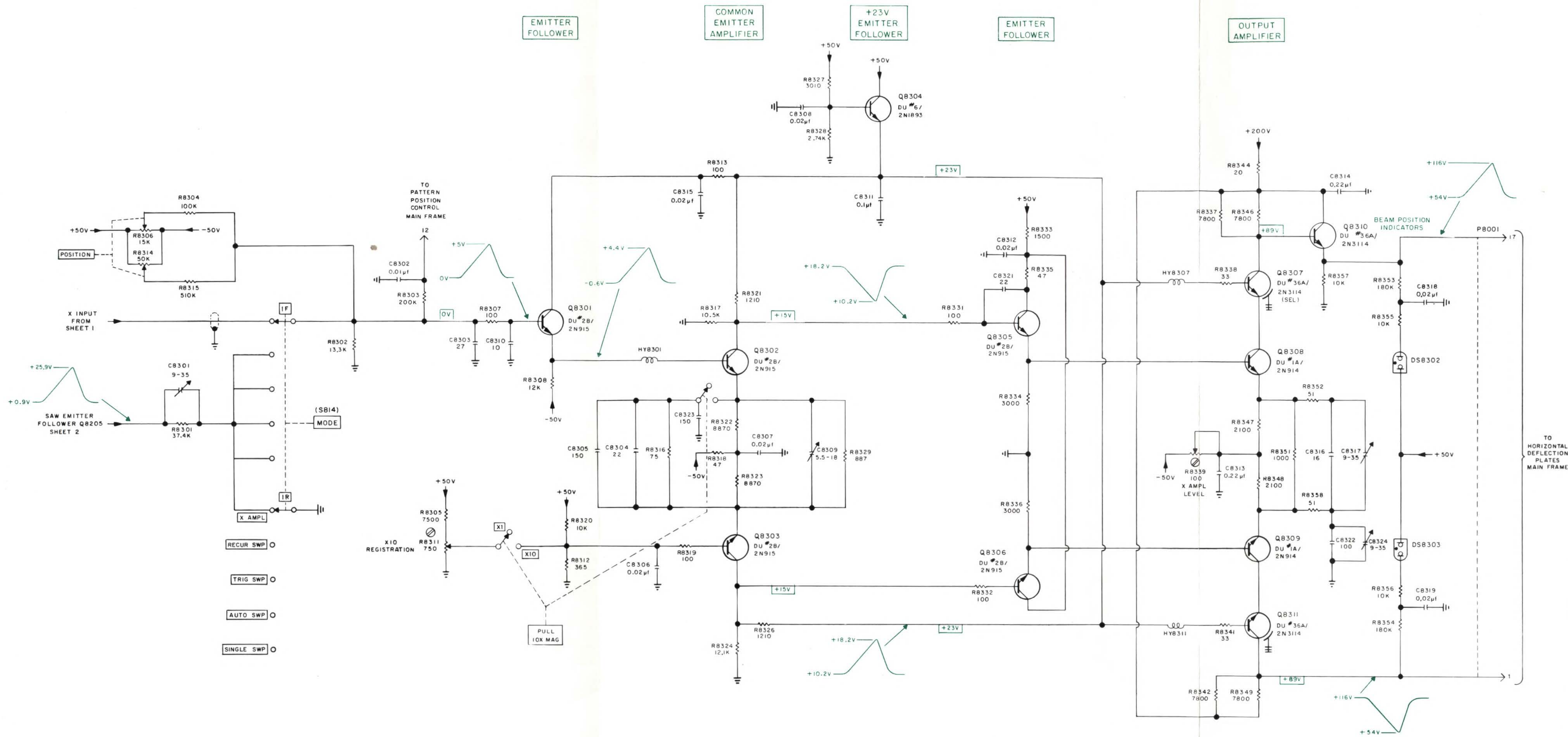
1. All voltage measurements were obtained with a 20,000 ohms/volt VOM; all readings are in volts.
2. Preset front-panel controls as follows:

Control	Setting
DISPLAY LOGIC	+, Trig
Trigger SOURCE	Ext (100 Kc)
TIME/DIV	10 μs
VERNIER	Cal
POSITION	Centered

3. Voltage tolerance ±15% with respect to ground.

WAVEFORM DATA

4. Use Type 4290 Series Probe (X10).
5. Use Type 765 Series Test Oscilloscope; DC to 25 Mc.
6. Waveform amplitude measurements are nominal.



NOTES

1. RESISTANCE VALUES ARE IN OHMS, K=THOUSAND, M=MILLION.
2. CAPACITANCE VALUES ARE IN pf UNLESS OTHERWISE SPECIFIED.
3. SERVICE ADJUSTMENT
4. HEAT SINK

VOLTAGE DATA

1. All voltage measurements were obtained with a 20,000 ohms/volt VOM; all readings are in volts.
2. Preset front-panel controls as follows:

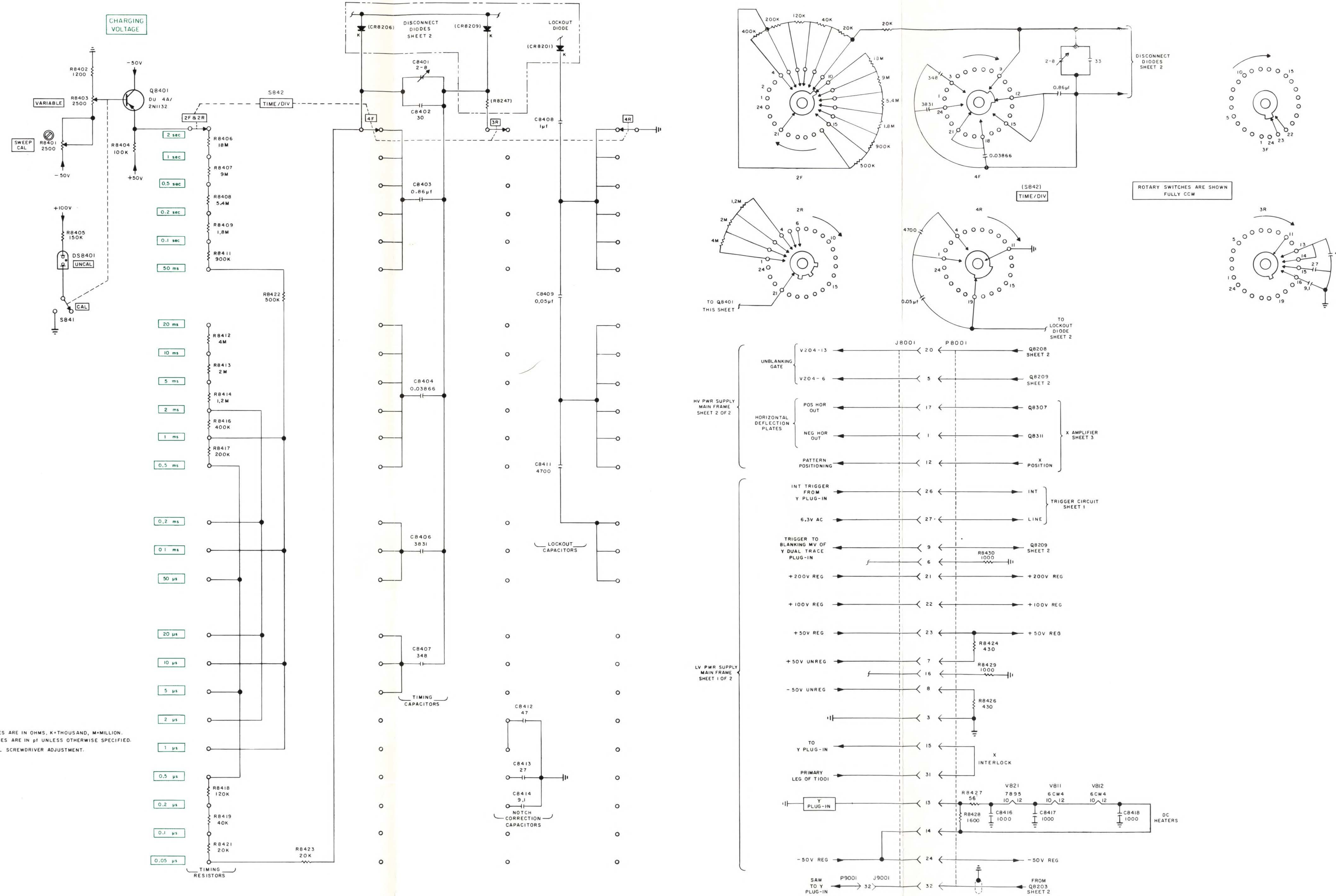
Control	Setting
DISPLAY LOGIC	+, Trig
Trigger SOURCE	Ext (100 Kc)
TIME/DIV	10 μs
VERNIER	Cal
POSITION	Centered

3. Voltage tolerance ±15% with respect to ground.

WAVEFORM DATA

4. Use Type 4290 Series Probe (X10).
5. Use Type 765 Series Test Oscilloscope, DC to 25 Mc.
6. Waveform amplitude measurements are nominal.

TYPE 74-03A TIME/DIV SWITCH



NOTES
1. RESISTANCE VALUES ARE IN OHMS, K=THOUSAND, M=MILLION.
2. CAPACITANCE VALUES ARE IN pf UNLESS OTHERWISE SPECIFIED.
3. ⊘ FRONT PANEL SCREWDRIVER ADJUSTMENT.

ADDENDUM

FOR

TYPE 74-03A TIME BASE PLUG-IN
(Reference Manual Part Number 6704 4063)

A. PURPOSE

The following change improves the operation of the Display Positioning circuit by providing an independent Vernier Control.

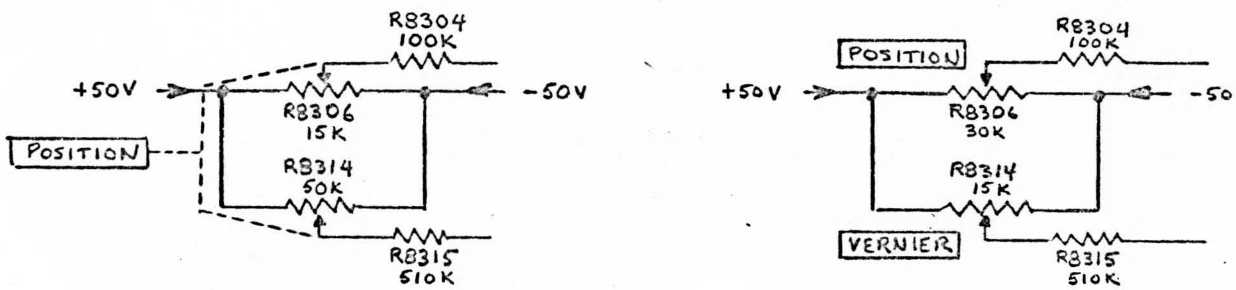
B. PARTS LIST REVISIONS

In the Parts List, change the description of R8306 as follows:

Symbol	Part Number	Description	Recommended Vendor
R8306	0107 3421	variable, 30K, ±10%, 3/4W	FCI

C. SCHEMATIC REVISIONS

On the schematic titled "Type 74-03A Hor Defl Amplifier, Sheet 3 of 4," change the arrangement of the POSITION control as follows:



BEFORE AFTER

D. OTHER CHANGES

Photographic views of the front panel do not depict the current configuration of the Position controls.

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ADDENDUM

TO

TYPE 74-03A INSTRUCTION MANUAL
Fairchild Part No. 6704 4063

A. PURPOSE OF ENGINEERING CHANGE

To improve blanking gate.

B. PARTS LIST REVISIONS.

Make the following changes to the Parts List:

	Symbol	Part Number	Description	Recommended Vendor Code	Recommended Vendor Type
Change:	C8263	0317 5140	30pf	EMC	DM15
	C8264	0317 6710	680pf	EMC	DM10
	R8274	0236 5340	442, ±1%	CGW	C5
Add:	R8287	0235 4140	composition,10,1/4W	ALB	CB
	R8288	0236 3140	330K	CGW	C5

C. SCHEMATIC REVISIONS.

1. Change the value of the following components:

Symbol	Old Value	New Value
C8263	51pf	30pf
C8264	1000pf	680pf
R8274	499Ω	442Ω

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C. <u>SCHEMATIC REVISIONS</u> (Continued)

2. Add R8287, a 10Ω resistor, in series with the emitter of Q8207 and ground.

3. Add R8288, a 330K ohm resistor, from the emitter of Q8206 to ground.

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ADDENDUM

TO

TYPE 74-03A INSTRUCTION MANUAL
Fairchild Part No. 6704 4063

A. PURPOSE OF ENGINEERING CHANGE

To correct linearity problem in timing circuit.

B. PARTS LIST REVISIONS

Revise the instruction manual parts list as follows:

Symbol	Part Number	Description	Recommended Vendor Code	Type
C8403	0236 8760	capacitor, plastic, 0.86 uf, ±1%, 100V	GUD	355B

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Sheet 1 of 1
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