

NOTE

*A nomenclature change has been introduced for the 5000 Series products. The 5403/D41 is now called the 5441 Storage Oscilloscope.*

*This composite manual incorporates the 5403 and D41 manuals, formerly bound under separate cover.*

**TEKTRONIX®**

**5441  
STORAGE  
OSCILLOSCOPE**

INSTRUCTION MANUAL

Tektronix, Inc.  
P.O. Box 500  
Beaverton, Oregon 97077

Serial Number \_\_\_\_\_

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# INSTALLATION PROCEDURE

## Before you start

1. Check the power supply/amplifier module rear panel markings. If the factory settings are compatible with the available line voltage and frequency, insert the desired plug-ins. Use the bail to raise the front of the instrument.

**...go to Operating Instructions...**

2. If a change is needed, follow these steps:

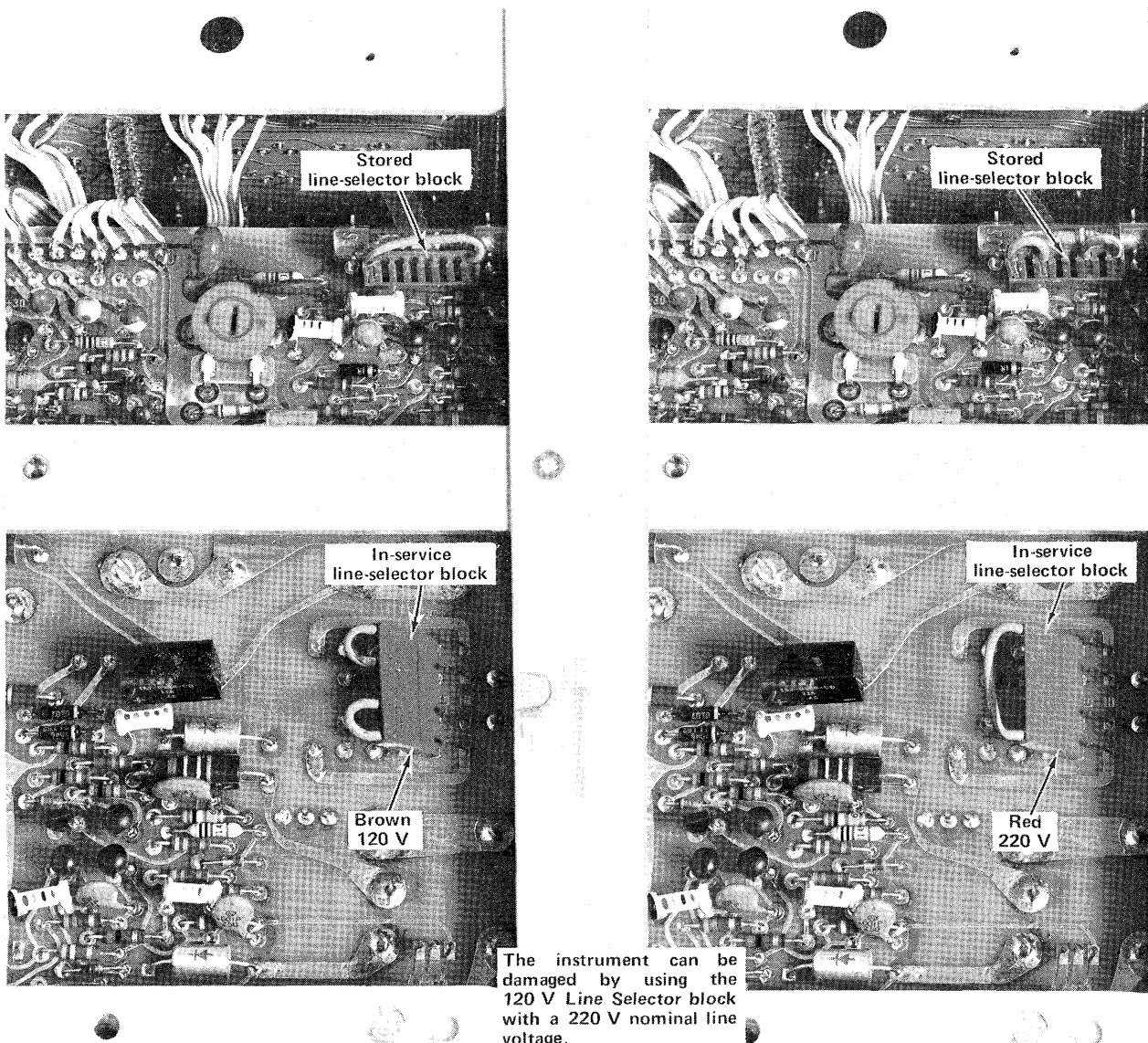


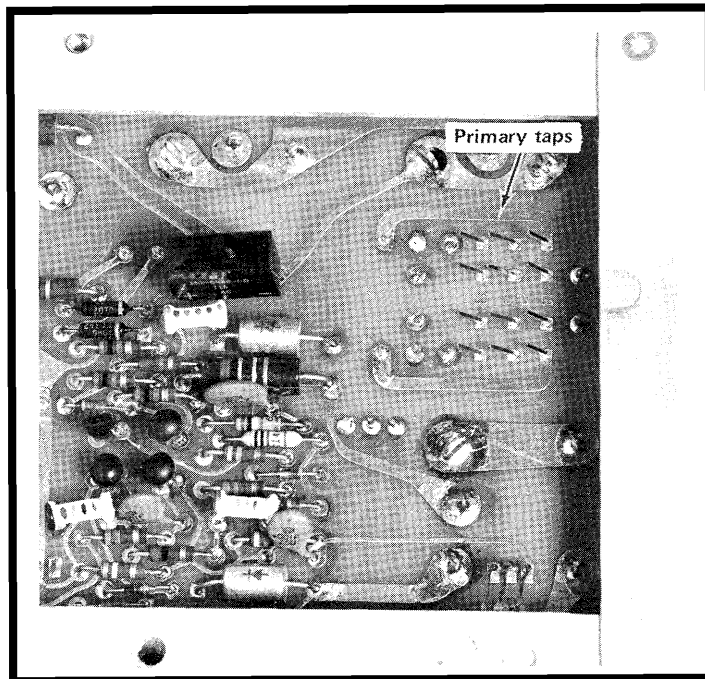
Fig. 0-1. Illustration showing a portion of power supply/amplifier module's L.V. power supply circuit board.

**a. Line Selector Block(s)**

Remove the Scope-Mobile retainer blocks and their screws, then remove the bottom dust cover from the power supply/amplifier module by turning the four slotted fasteners a quarter turn counterclockwise. This gives easy access to the Line Selector blocks located on the LV power supply circuit board.

**Regulating Ranges for Power Transformer**

Line Selector Block Position	Regulating Ranges	
	120 Volts Nominal	220 Volts Nominal
L	90 VAC to 110 VAC	180 VAC to 220 VAC
M	99 VAC to 121 VAC	198 VAC to 242 VAC
H	108 VAC to 132 VAC	216 VAC to 264 VAC
Line Fuse Data	1.25 A slow-blow	0.7 A slow-blow

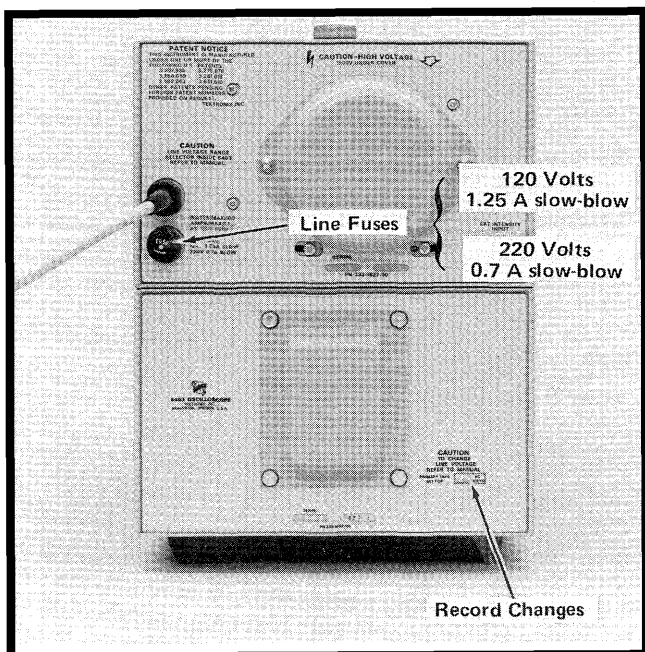


**Fig. 0-2. Primary taps area of power supply/amplifier module's L.V. power supply circuit board.**

**b. Line Range Taps**

**c. Rear Panel**

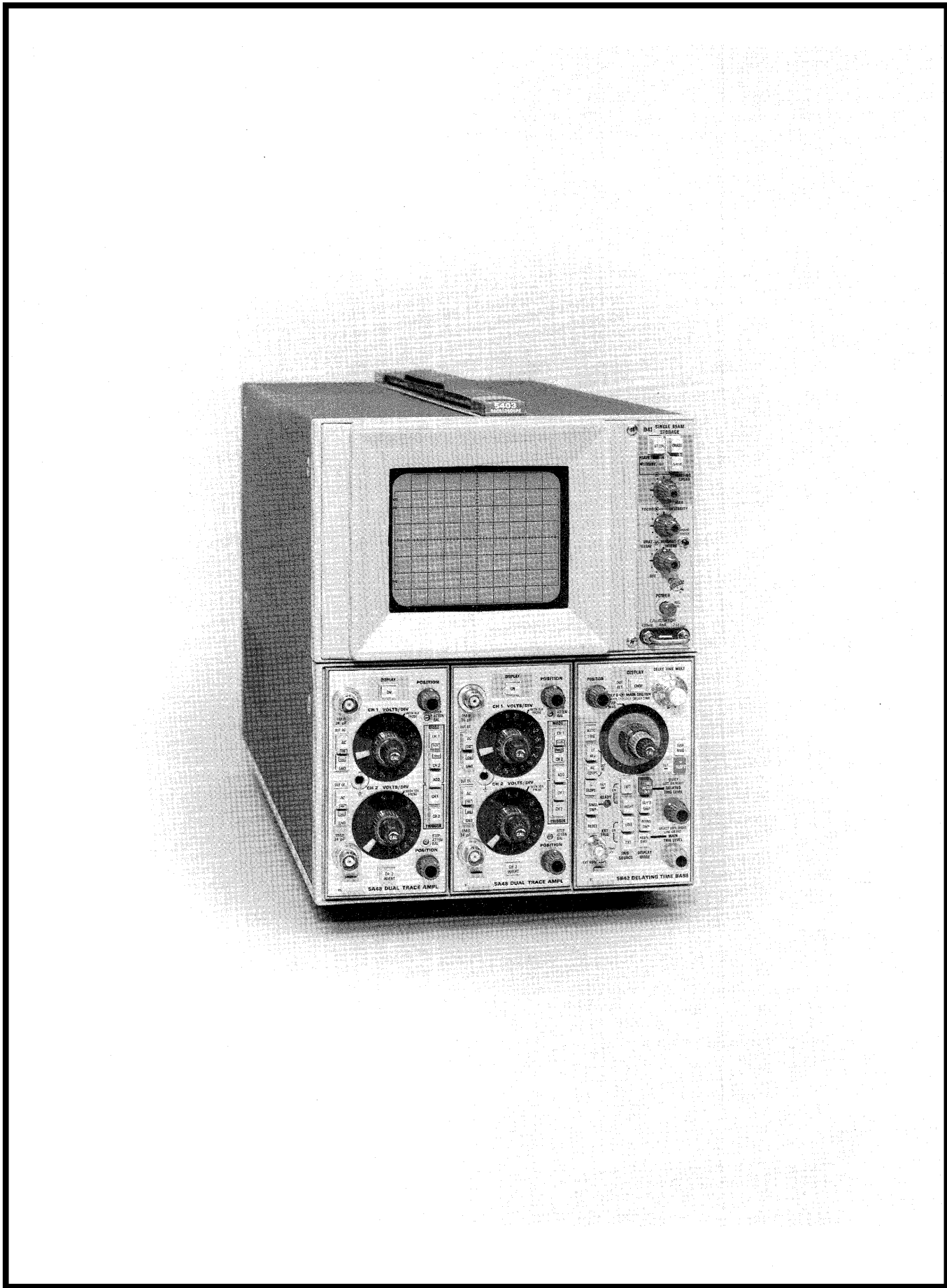
3. Replace the bottom dust cover and the two Scope-Mobile retainer blocks on the power supply/amplifier module.
4. If necessary, change the line cord power plug to match the power source receptacle or use an adapter.



**Fig. 0-3. View showing rear-panel of power supply/amplifier module.**

5. Plug the cord into the power source.
6. Insert the desired plug-ins.
7. Use the bail to raise the front of the instrument.

**...go to  
Operating  
Instructions...**





# OPERATING INSTRUCTIONS

The D41 Single Beam storage display module operates with a Tektronix 5400-series power supply/amplifier module to form an oscilloscope mainframe. This section gives a familiarization procedure, and general operating information.

The Installation section of the 5403 instruction manual should be referred to for initial preparation. It contains

information for installation of plug-ins, correct operating voltage and temperature, and general oscilloscope usage.

A brief description of the function of the front and rear panel controls and connectors is given on the controls and connectors foldout page. More detailed information is given under General Operating Information.

## BASIC OPERATION

### Setup Information

The following steps demonstrate the use of the controls and connectors of the D41.

1. Make sure the oscilloscope system is complete. The D41 must be properly connected to the power supply/amplifier module. A 5A-series amplifier plug-in should be in one of the vertical (left or center) plug-in compartments and a 5B-series time-base plug-in should be in the horizontal (right) compartment.

2. Set the POWER switch to off (pushed in) and connect the D41 to a power source that meets the voltage and frequency requirements of this instrument. See Installation section in this manual, or in the 5403 manual.

3. Turn the INTENSITY and READOUT INTENS controls counterclockwise and pull the POWER switch out to turn the instrument on. Set the front-panel controls as follows:

D41	
STORE	Non-Store (Button out)
SAVE	Off (Button out)
WRITING SPEED	Midrange
VARIABLE PERSIST (and Save Time)	Midrange
INTENSITY	See text above
FOCUS	As is
READOUT INTENS	See text above
GRAT ILLUM	As desired
BEAM FINDER	Not depressed
POWER	See text above

### Amplifier Plug-In

Display	On
Position	Centered
Ch 1 Volts/Div	.1
CH 1 Variable Volts/Div	Cal (fully clockwise)
CH 1 Input Coupling	DC
Trigger	CH 1
Mode	CH 1

### Time-Base Plug-In

Display	Alternate (Button out)
Position	Centered
Main Sec/Div	5 ms
Variable Seconds/Div	Cal (fully clockwise)
Mag	Off (Button out)
Main Trig Level	Counterclockwise
Source	Left (or Right if the amplifier plug-in is in the center compartment)
Coupling	Auto Trig, AC Coupl, + Slope
Mode	Main Sweep

4. Advance the INTENSITY control until the trace is at the desired viewing level. The trace should appear near the graticule center.

5. Connect a 1X probe or test lead from the CALIBRATOR loop to the amplifier plug-in input connector.

6. Turn the Main Trig Level control clockwise until a stable display is obtained. Adjust the vertical and horizontal

## Operating Instructions—D41

Position controls so that the display is centered vertically and starts at the left edge of the graticule.

7. Adjust the FOCUS control for a sharp, well-defined display over the entire trace length.

8. Disconnect the input signal and position the trace vertically so that it coincides with the center horizontal line of the graticule.

9. If the trace is not parallel with the center horizontal line, see Trace Alignment Adjustment in this section.

10. Rotate the GRAT ILLUM control throughout its range and notice that the graticule lines are illuminated as the control is turned clockwise. Set control so graticule lines are illuminated as desired.

### Calibration Check

11. Move the trace two divisions below graticule center and reconnect the calibrator signal to the amplifier plug-in input connector.

12. The display should be four divisions in amplitude with six complete cycles (five complete cycles for 50-hertz line frequency) shown horizontally. An incorrect display indicates that the oscilloscope mainframe or plug-ins need to be recalibrated.

### Readout

13. Turn the READOUT INTENS control clockwise until an alpha-numeric display is visible within the top or bottom division of the CRT (reset the FOCUS adjustment if necessary for best definition of the readout). Change the Volts/Div switch of the amplifier plug-in that is selected for display. Notice that the readout portion of the display changes as the deflection factor is changed. Likewise, change the Sec/Div switch of the time-base unit that is selected for display. Notice that the readout display for the time-base unit changes also as the sweep rate is changed.

14. Set the time-base unit for magnified operation. Notice that the readout display changes to indicate the correct magnified sweep rate. If a readout-coded 10X probe is available for use with the vertical unit, install it on the input connector of the vertical plug-in. Notice that the deflection factor indicated by the readout is increased by 10 times when the probe is added. Return the time-base unit to normal sweep operation and disconnect the probe.

15. Notice that the readout for a particular plug-in occupies a specific location on the display area. If either of the vertical plug-in units is a dual-trace unit, notice that the readout for channel 2 appears within the lower division of the CRT below the readout for channel 1.

### Beam Finder

16. Move the display off-screen with the vertical position control.

17. Push the BEAM FINDER button and observe that the display compresses into the screen area. Reposition the display to screen center and release the BEAM FINDER button.

### External Intensity Input

18. Connect a 5 volt, 1 kHz sine-wave or square-wave signal to the EXT INTENSITY INPUT connector on rear panel of D41. Also, use the signal to externally trigger the time-base plug-in.

19. Slowly rotate the INTENSITY control counter-clockwise until the trace appears to be a series of dimmed and brightened segments. The brightened segments correspond with the tops of the square waves.

### Storage Operation (Variable Persistence)

20. Disconnect the 5 volt, 1 kHz sine-wave or square-wave signal from the EXT INTENSITY INPUT connector. Reset the time-base plug-in triggering controls for an internally-triggered display from the vertical plug-in.

21. After making sure the calibrator signal is still connected to the amplifier plug-in input connector, set the controls on the time-base plug-in for single-sweep operation. Press the STORE button and note that the CRT will momentarily be flooded positive (becoming quite bright).

22. Press the Reset button on the time-base plug-in. One sweep will be generated, and a display should be visible, but will fade out within a few seconds. Increase the VARIABLE PERSIST control setting if a display of longer retention is required. Increase the WRITING SPEED setting to increase the background level for viewing lightly written information. If there is no display visible, increase the INTENSITY control setting and press the Reset button.

23. Press the ERASE button; the CRT should turn positive and erase. Press the Reset button on the time-base plug-in to obtain another stored display on the CRT. Press

the SAVE button; the display is stored and no other sweep or change in position will affect the display. The SAVE button, when pushed, locks out the sweep erase circuit and cuts off the current to the flood gun cathode as long as the VARIABLE PERSIST control is turned fully clockwise (display stored at the maximum time). Turning the PERSIST (Save Time) control counterclockwise will decrease the time a stored display is retained on the CRT. When the display is not being used, turn the PERSIST (Save Time) control fully clockwise; the display will not be visible on the screen, but the information has not been lost or destroyed. Turn the PERSIST (Save Time) control counterclockwise until a display is visible when needed. When the instrument is in the "SAVE" mode and the PERSIST (Save Time) control is fully clockwise, the instrument can be turned off without losing any stored information. Turn the instrument on again and turn the PERSIST (Save Time) control counterclockwise until display appears.

#### NOTE

*The D41 Save Time control and the Variable Persistence control are combined into one control. If the PERSIST (Save Time) control has been adjusted to view the display in the 'Save' mode and the D41 is then taken out of the 'Save' mode, the display will fade rapidly, since the persistence is now set for a shorter time.*

### Storage Operation (Without Variable Persistence)

24. Rotate the VARIABLE PERSIST control to its fully counterclockwise position and release the SAVE button to its off (button out) position.

25. Press the Reset button on the time-base plug-in. One sweep will be generated, and a display should be visible. Increase the WRITING SPEED setting if a brighter display is required. If there is no display visible, increase the INTENSITY control setting and press the Reset button.

26. Press the ERASE button and note that the stored waveform is erased. Another display can be stored by pressing the Reset button on the time-base plug-in.

27. Turn READOUT INTENS control slowly clockwise to the point where the stored readout information doesn't spread.

This completes the description of the basic operating procedure for the D41. Instrument operations not explained here, or operations that need further explanation are discussed under General Operating Information.

## GENERAL OPERATING INFORMATION

### Graticule

The graticule of the D41 is internally marked on the faceplate of the CRT to provide accurate, parallax-free measurements. The graticule is marked with eight vertical and ten horizontal divisions. Each division is 0.9 cm by 0.9 cm. In addition, each major division is divided into five minor divisions. The vertical gain and horizontal timing are calibrated to the graticule so that accurate measurements can be made from the graticule. The illumination of the graticule lines can be varied with the GRAT ILLUM control.

### Intensity Control

The intensity of the display on the CRT is controlled by the INTENSITY control. This control is adjusted so the display is easily visible but not overly bright. It will probably require readjustment for different displays or sweep rates. Particular care should be exercised when only a spot is displayed. A high-intensity spot may burn the CRT phosphor and cause permanent damage to the CRT if allowed to remain too long.

### Display Focus

If a well-defined display cannot be obtained with the FOCUS control, even at low intensity settings, adjustment of the internal astigmatism control may be required.

To check for proper setting of the Astig control, slowly turn the FOCUS control through the optimum setting with a signal displayed on the CRT screen. If the Astig control is correctly set, the vertical and horizontal portions of the trace will come into sharpest focus at the same position of the FOCUS control.

### Trace Alignment Adjustment

If a free-running trace is not parallel with the horizontal graticule lines, set the Trace Rotation adjustment (internal adjustment) as follows: Position the trace to the center horizontal line and adjust the Trace Rotation adjustment so that the trace is parallel with the horizontal graticule lines.

### Beam Finder

The BEAM FINDER switch provides a means of locating a display that overscans the viewing area either vertically or horizontally. When the BEAM FINDER switch is pressed, the display is compressed within the graticule area and the display intensity is increased. To locate and reposition an overscanned display, use the following procedure:

1. Press the BEAM FINDER switch, hold it in, then increase the vertical and horizontal deflection factors until the display is within the graticule area.
2. Adjust the vertical and horizontal position controls to center the display about the vertical and horizontal centerlines.
3. Release the BEAM FINDER switch; the display should remain within the viewing area.

### Readout (Works Only With 5400-Series Plug-In Units)

The readout system of the power supply/amplifier and display modules allows alpha-numeric display of information on the CRT, along with the analog waveform displays. The information displayed by the readout system is obtained from the plug-in units that are installed in the plug-in compartments. The characters of the readout display are written by the CRT beam on a time-shared basis with the signal waveforms.

The Readout System operates in a free-running mode to interrupt the waveform display to present characters. The waveform display is interrupted for only about 20 microseconds for each character that is displayed.

The readout information from each plug-in is called a word. Up to six (eight with option 3) words of readout information can be displayed on the display module (a seventh and eighth word are available when option 3 is installed). The location at which each readout word is presented is fixed and is directly related to the plug-in unit and channel from which it originated. Fig. 1-1 shows the area of the graticule where the readout from each plug-in unit channel is displayed (external readout programming is available only with option 3). Notice that the readout from channel 1 of each plug-in unit is displayed within the top division of the graticule and the readout from channel 2 is displayed directly below within the bottom division of the graticule. Only the readout from plug-in channels that are selected by display switches, or by the mode switches of dual-channel plug-ins, appears in the readout display.

The READOUT INTENS control determines the intensity of only the readout portion of the display independent of the other traces. The readout system is inoperative in the fully counterclockwise OFF position. This may be desirable when the top and bottom divisions of the graticule are to be used for waveform display, or when the trace interruptions necessary to display characters do not allow a satisfactory waveform display to be obtained.

### Option 3, Externally Programmed Seventh and Eighth Readout Words

This option adds a 25-pin connector to the rear panel of the display module, through which two ten-character readout words can be displayed on the CRT, see Fig. 1-1.

### Care of Storage Screen

The following precautions will prolong the useful storage life of the CRT screen used in this instrument.

1. Use the minimum beam intensity required to produce a clear, well-defined display. A too-high beam intensity may permanently damage the CRT screen, particularly if a bright spot is allowed to remain stationary on the display area.

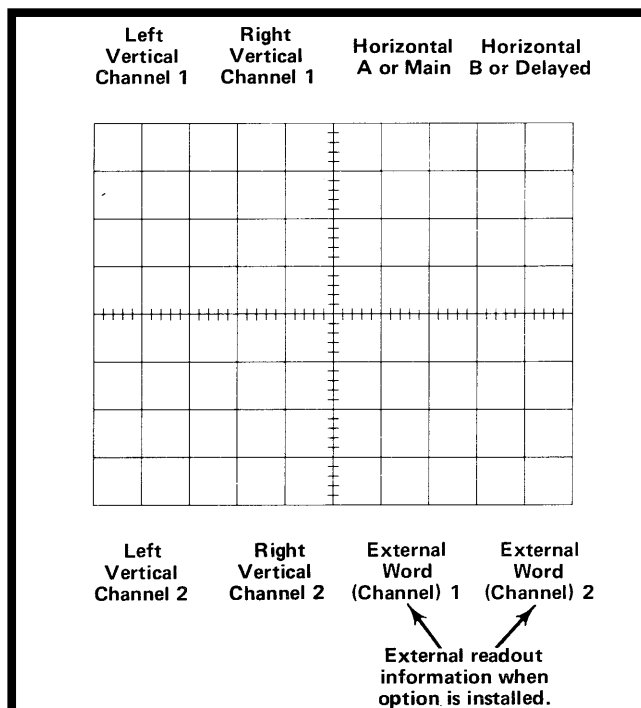


Fig. 1-1. Location of readout on the crt identifying the originating plug-in unit and channel (and external, if Option 3 is installed).

2. Avoid repeated use of the same area of the screen. If a particular display is being stored repeatedly, change the vertical position occasionally to use other portions of the display area.

3. Do not leave a stored display on the screen when it is no longer needed.

4. Operate the instrument in the non-store mode unless storage is required.

### Storage Operation

The storage feature greatly increases the versatility of the 5403-D41 Oscilloscope. The storage cathode-ray tube allows a display to be retained for a longer period of time. When the STORE button is out, the instrument operates as a conventional oscilloscope.

When the STORE button is pressed in, the instrument operates in a storage mode. Two modes of storage are available. They are Variable Persistence, where the persistence of the CRT is electrically controlled by the PERSIST control; and a SAVE mode, that allows longer retention of the displayed information. When the SAVE button is pressed in, a lockout function prevents accidental erasure of the stored display.

A stored display is erased by pressing the ERASE switch. In the SAVE mode, the erase function is disabled.

### Intensity Modulation

Intensity (Z-Axis) modulation can be used to relate a third item of electrical phenomena to the vertical (Y-Axis) and the horizontal (X-Axis) coordinates without affecting the waveshape of the displayed signal. The Z-Axis modulating signal, applied to the EXT INTENSITY INPUT, changes the intensity of the displayed waveform to provide this type of display. The voltage amplitude required for visible trace modulation depends on the setting of the INTENSITY control. About +5 volts will turn on the display to a normal brightness level from an off level, and about -5 volts will turn the display off from a normal brightness level. "Gray scale" intensity modulation can be

obtained by applying signals between these levels. Maximum safe input voltage is + or -50 volts. Usable frequency range of the Z-Axis circuit is DC to two megahertz.

Time markers applied to the EXT INTENSITY INPUT provide a direct time reference on the display. With uncalibrated horizontal sweep or X-Y operation, the time markers provide a means of reading time directly from the display. However, if the markers are not time-related to the displayed waveform, a single-sweep display should be used (for internal sweep only) to provide a stable display.

### Calibrator

The internal calibrator of the D41 provides a convenient signal source for checking basic vertical gain and sweep timing. The calibrator signal is also very useful for adjusting probe compensation, as described in the probe instruction manual. The output square-wave voltage is 400 millivolts, within 1%, and the square-wave current is 4 milliamperes, within 1%. The frequency of the square-wave signal is twice the power-line frequency. The signal is obtained by clipping the probe to the loop.

### Display Photography

A permanent record of the CRT display can be obtained with an oscilloscope camera system. The CRT bezel of the D41 provides integral mounting for a Tektronix oscilloscope camera. The instruction manuals for the Tektronix oscilloscope cameras include complete instructions for obtaining waveform photographs.

### Oscilloscope Applications

The 5400-series oscilloscope, including its associated display module and plug-in units, provides a very flexible measurement system. Specific applications for the individual plug-ins are described in the manuals for those units. Refer to the Operating Instructions section of the 5403 instruction manual for basic oscilloscope applications, including peak-to-peak AC voltage measurements, instantaneous DC voltage measurements, comparison measurements, time duration measurements, determining frequency, risetime measurements, and phase-difference measurements.

# THEORY OF OPERATION

## Z-AXIS AMPLIFIER AND CRT CIRCUIT

The CRT circuit produces the high voltage potentials and provides the control circuits necessary for operation of the cathode-ray tube (CRT). The Z-Axis amplifier circuit is included with the CRT circuit discussion, since it sets the intensity of the CRT display.

### Z-Axis Amplifier

The Z-Axis amplifier is a current driven, shunt-feedback operational amplifier with a voltage output. The amplifier consists of Q345, Q352, and Q356. The feedback path is from the Q352-Q356 collectors through C350-R349-R350 to the summing point at the base of Q345. Q352 and Q356 are connected as a collector-coupled complementary amplifier that provides a fast linear output signal while consuming minimum quiescent power. Q356 acts as the pull-up transistor and Q352 acts as the pull-down transistor for the amplifier. The output voltage from the amplifier provides the drive signal to control the CRT intensity level through the control-grid supply.

The output voltage level of the Z-Axis amplifier is determined by the voltage drop across R349 and R350 in reference to the voltage level at the summing point for the amplifier (base of Q345). The current through R349-R350 is determined by the input current from any combination of several sources, such as INTENSITY control, plug-in interface (unblanking, readout unblanking), and from Q320 and Q335. Q320 is an operational amplifier that sets the EXT INTENSITY INPUT connector signal to a level suitable for proper Z-Axis amplifier response. Q335 acts as an electronic switch to cause the CRT display intensity to increase when the BEAM FINDER switch is pushed. Q340 acts as an impedance-matching and bias-setting transistor for the Z-Axis amplifier. CR352 and current limiting resistor R352 act as a protection circuit for the Z-Axis amplifier in case of a high-voltage short.

### High-Voltage Regulator

**High-Voltage Primary.** A repetitive, sinusoidal signal is produced by a regenerative feedback oscillator in the primary of T410 and induced into the secondary. Current drive for the primary winding is furnished by Q410.

The conduction of Q410 is controlled by the collector voltage of Q400.

**High-Voltage Regulation.** Regulation is accomplished by sampling the  $-1.5$  kV across voltage divider R395A-R395B. If the output level of the cathode supply goes above the nominal  $-1.5$  kV (goes more negative), the input base of Darlington transistor Q390 goes negative from its quiescent 0 V. The output of Q390 goes more positive, reducing the conduction of Q400 and Q410. This reduces the peak-to-peak sinusoidal signal amplitude, resulting in a reduced voltage in the secondary of T410. Conversely, if the output decreases below  $-1.5$  kV (goes more positive), Q410 will conduct more, i.e., have a larger sinusoidal signal amplitude. CR395 and C395 form a delay turn-on circuit to prevent the CRT beam from coming on immediately at instrument turn-on. The delay time is controlled by the time it takes the (+) end of C395 to charge to  $+30.6$  V through R392 from the  $+200$  V power supply. At the moment the top of C395 reaches  $+30.6$  V, diode CR395 will turn on and clamp the CR395-C395-R397-R395A junction at  $+30.6$  V. R402 and C402 limit the bandwidth of the regulator to prevent oscillations.

### High-Voltage Outputs

The secondary winding of T410 provides the negative and positive accelerating potentials for the CRT and the bias voltage for the control grid.

Positive accelerating voltage for the CRT screen is supplied by voltage doubler U410. The applied voltage to the input of U410 from the T410 secondary winding is about  $+1.5$  kV peak-to-peak. The output voltage of U410 is about  $+7$  kV at the CRT anode. The negative accelerating voltage for the CRT cathode is also obtained from the T410 secondary winding. CR412 half-wave rectifies the transformer output and supplies the  $-1.5$  kV to the CRT cathode. R419 connects the CRT cathode voltage to the CRT filament to prevent cathode-to-filament breakdown.

Diodes CR420 and CR422 provide the rectified negative control voltage for the CRT control grid. The output level of this supply is set by the Intens Range adjustment R435. Diodes CR428 and CR430 clip the CRT grid bias voltage from the T410 secondary, to determine the operating level at the control grid. CR428 limits the negative excursion of the bias voltage, depending upon the output voltage of the Z-Axis amplifier. The positive clipping level at the cathode of CR430 is set by the Intens Range adjustment. CR420 acts as a DC restorer and CR422 as a rectifier. This results

## Theory of Operation—D41

in a DC level across R422 equal to the peak-to-peak excursion at the anode of CR430.

### CRT Control Circuits

In addition to the INTENSITY control discussed previously, front-panel FOCUS and internal astigmatism controls have been incorporated for arriving at an optimum CRT display. FOCUS control R440 provides the correct voltage for the second anode in the CRT. Proper voltage for the third anode is obtained by adjusting Astig control

R370. In order to obtain optimum spot size and shape, both the FOCUS and Astig controls are adjusted to provide the proper electrostatic lens configuration in the CRT.

The Geom adjustment R365 varies the positive level on the horizontal deflection plate shields to control the overall geometry of the display. The trace rotation control, R375, permits adjustment of the DC current through beam-rotation coil L375 to align the display with the horizontal graticule lines.

## HORIZONTAL AMPLIFIER

The horizontal amplifier amplifies the push-pull horizontal deflection signal from the interface circuit board and applies it to the horizontal deflection plates of the CRT.

### Input Amplifier

The horizontal signal from the interface circuit board is connected to the bases of Q200 and Q215. Under no-signal conditions, the bases of Q200 and Q215 are within 150 mV of ground. Resistive network R205-R207-R210-R212-R213, between the emitters of Q200 and Q215, controls the emitter degeneration of this stage. R212 provides a means of adjusting the emitter degeneration of the input amplifier and thereby controls the gain of the horizontal amplifier, within  $\pm 10\%$ .

To compress an off-screen display so that it may be viewed on the CRT, the BEAM FINDER reduces the dynamic range of the input amplifier. This is done by disconnecting CR208 in the emitter circuitry of Q200-Q215, and supplying a reduced current through current setting resistors R205, R208, and R213.

Resistors R202 and R217 provide thermal compensation for the input amplifier, while R222 provides a means of correcting for differential unbalance in the amplifier or CRT.

### Output Amplifier

Transistors Q240-Q244-Q250 and Q270-Q274-Q280 are connected as two separate current-driven feedback amplifiers. Input transistor Q240 (in the left output amplifier) is an NPN transistor for better response to positive-going signals, while input transistor Q270 (in the right output amplifier) is a PNP transistor for better negative-going signal response.

Negative feedback is provided from the collectors of output transistors Q244-Q250-Q274-Q280 to the base of input transistors Q240 and Q270 through feedback networks C242-R242 and C272-R272. Variable capacitors C242 and C272 adjust the transient response of the feedback networks to provide good linearity at fast sweep rates. The Zener diode-fast switching series diode, CR242-VR240 and CR272-VR270 (across each of the feedback networks in the output amplifier), turn on when the sweep passes the right edge of the CRT. This action stops the collectors of the output transistors and shunts out the feedback networks, thus current limiting the output amplifier. Capacitors C240, C250, and C280 are speed-up capacitors to improve the amplifier response to fast changes. Diodes CR246 and CR274 prevent Q244 and Q274 from going into saturation.

## VERTICAL AMPLIFIER

The vertical amplifier provides the final amplification for the vertical signal before it is applied to the vertical deflection plates of the CRT. The vertical amplifier circuitry includes the delay line and part of the beam finder circuit, which reduces the final drive to compress an over-scanned display to within the viewing area of the CRT.

### Delay Line

Delay line DL100 provides approximately 140 ns of delay for the vertical signal. This allows the time-base circuits time to initiate a sweep before the vertical signal reaches the CRT deflection plates. This delay of the vertical signal allows the leading edge of the signal originating the trigger pulse to be displayed when using internal triggering.

The delay line has a characteristic input impedance of about 75 ohms, or about 150 ohms from side-to-side.

### Amplifier

The vertical amplifier consists of a high bandpass three-stage paraphase amplifier having an input sensitivity of approximately 35 mV/division and a voltage gain of about 115. The amplifier is differentially driven at the bases of Q100 and Q125 by the input signal from the delay line. R100 and R125 terminate the delay line.

The first amplifier stage consists of Q100, Q106, Q125, and Q130. The gain of this stage is determined by the ratio of the feedback resistors R104-R103 or R128-R129 and the emitter resistor R111. The networks parallel to the emitter resistor compensates for the signal losses in the delay line. R135 acts as a DC centering control, which compensates for resistive tolerance errors and CRT electrical center error in the vertical amplifier, and allows the mainframe input to be standardized.

The next stage of amplification consists of Q148, Q170, Q165, and Q172. Thermistor RT157 resistor R157 varicap CR146 and capacitor C160 between the emitters of Q148 and Q165 comprise a thermal compensation network to correct for frequency loss with temperature changes. The two RC networks (R151-C156 and R155-C153-C155) in the emitters of Q148 and Q165, and the RCL network in the collectors of Q148 and Q165 provide high frequency compensation.

The final amplifier stage consists of Q180, Q188, Q182, and Q190. R175 provides a means of adjusting the vertical amplifier gain within a  $\pm 20\%$  range.

Pushing the BEAM FINDER compresses an off-screen display to determine its location. This is accomplished by turning off Q140, when the BEAM FINDER is pushed, which reduces the standing current in the second amplifier stage. This lowers the voltage drop across R172 and R176, which lowers the standing current in the final amplifier stage. The lower final amplifier stage standing current reduces the possible scan on the CRT.

## STORAGE CIRCUIT

The cathode-ray tube is a transmission halftone storage tube. The collector mesh is a coarse mesh, which accelerates electrons toward the target area. The target (storage mesh) is a fine mesh with a highly insulative dielectric layer deposited on it. It is in the dielectric layer that storage occurs. The flood guns cover the entire storage target with a continuous stream of low velocity electrons; these electrons are prevented from reaching the phosphor screen unless a display has been written on the storage mesh.

The collimation bands (electrodes) are used as a lens which uniformly distributes flood-gun electrons over the storage target area. In the non-store mode, the collimation bands have no control over the CRT.

Switching from the non-store mode to the store mode is done by pushing in the STORE pushbutton. When changing modes from non-storage to storage operation, an erase cycle is generated automatically.

### Flood-Gun Filaments

The flood-gun filament supply for the CRT consists of VR690-VR691 and emitter follower Q690. The power to heat the filaments is derived from the  $-20$  V power supply. VR690-VR691 sets the base voltage of Q690 and provides regulation.

### Flood-Gun Cathode

The flood-gun cathode is switched either on or off by switching transistors Q675, Q680 and Q685. Two signals control whether the flood-gun cathode is turned on; they are:

- a. The STORE switch pushed in signal turns on the flood-gun cathode.
- b. The SAVE pushbutton, S675, when depressed either turns the flood-gun cathode completely off (PERSIST control fully clockwise), or if the PERSIST control is turned away from its fully clockwise position, allows the flood-gun cathode to be pulsed at a low duty factor.

When the D41 power is turned off, in less than a microsecond Q700 turns off. This eliminates the negative voltage that would result from the slow decay of the power supply filter capacitors, leaving only the positive voltage present at the base of Q675. Q675 is turned on causing Q680 and Q685 to be off. This prevents damage to any stored information if the save mode is being utilized, since there is not any flood-gun cathode current available.

### Flood-Gun Anode

The flood-gun anode circuit consists of operational amplifier Q670-Q672. The operational amplifier is used as a



## Theory of Operation—D41

current-to-voltage conversion amplifier. A composite erase pulse is supplied to the base of Q670 to hold the flood-gun anode high during the erase cycle.

### Collimation Electrodes (CE)

The CE 1 and 2, and the CE 3 circuits consist of an emitter follower, Q655 and Q600, with base-emitter reverse voltage protection furnished by CR655 or CR600. R655, CE 1 and R600, CE 3 adjustments control the voltage level of the CE 1 and 2, and CE 3 respectively. CE 1 and 2 voltage varies between store and non-store modes of operation. R655, CE 1 adjustment sets the CE 1 and 2 level in the store mode, while R654 and VR655 sets the CE 1 and CE 2 level in the non-store mode. R655-R657 divider is allowed to float in the non-store mode.

### Collector Mesh

Emitter follower Q595, base-emitter reverse voltage protection diode CR595 and Zener diode VR595 make up the collector mesh circuitry. VR595 sets the base voltage for Q595.

### Storage Mesh

Q580, Q575 and Q585 form an operational amplifier that is used as a current-to-voltage conversion amplifier. Internal adjustments, R572, Prep Level, and R590, Op Level, set the quiescent operating levels for the CRT in the storage mode. R585, WRITING SPEED control, allows a small adjustment to be made in the operate level, which increases the CRT's ability to store a fast waveform. During the erase cycle the storage mesh is made a high positive for 50 ms, returned to its operate level for 10 ms, then made a slightly positive level for 440 ms. The two positive-going erase signals (see Fig. 2-1) are supplied to the storage mesh by the collectors of Q515 (50 ms) and Q555 (440 ms).

### Erase Generator

Pushing the ERASE pushbutton creates a negative pulse at the base of Q510. R665-R500-C500 is a contact bounce remover network for the ERASE pushbutton with R500 used to dampen any ringing. Q510 and Q515 form a 50 ms monostable multivibrator; C514 and R507 are the timing components. Coupling capacitor C528 couples the 50 ms multivibrator to the input of the 10 ms monostable multivibrator consisting of Q530-Q535. The timing components for Q530-Q535 are C534 and R530. The output from the 10 ms multivibrator is coupled to the input of the 440 ms monostable multivibrator by C538. Q550-Q555, along with timing components C554 and R545 form the 440 ms monostable multivibrator. The monostable multivibrators are cascaded to provide a sequential pulse train. Diodes CR560, CR562 and CR564 make up an OR gate to supply a composite erase signal to the flood-gun anode circuit.

The signal available from the collector of Q550 is used to retrigger the erase generator when the ERASE pushbutton is held depressed.

### Variable Persistence and Save

Q625 and Q640 form a monostable multivibrator that is triggered by the output of the 10 ms pulse generator consisting of programmable unijunction transistor Q610. The timing components for the monostable multivibrator are C625, R622 and R620 PERSIST control. The 10 ms pulse generator timing components are C610, R608 and R609. Q635 acts as a switch for R620 PERSIST control.

When S610 STORE pushbutton is pushed in, the 10 ms pulse generator feeds pulses to the storage mesh to increase the background level slightly for better storage and to the Q625-Q640 monostable multivibrator for triggering.

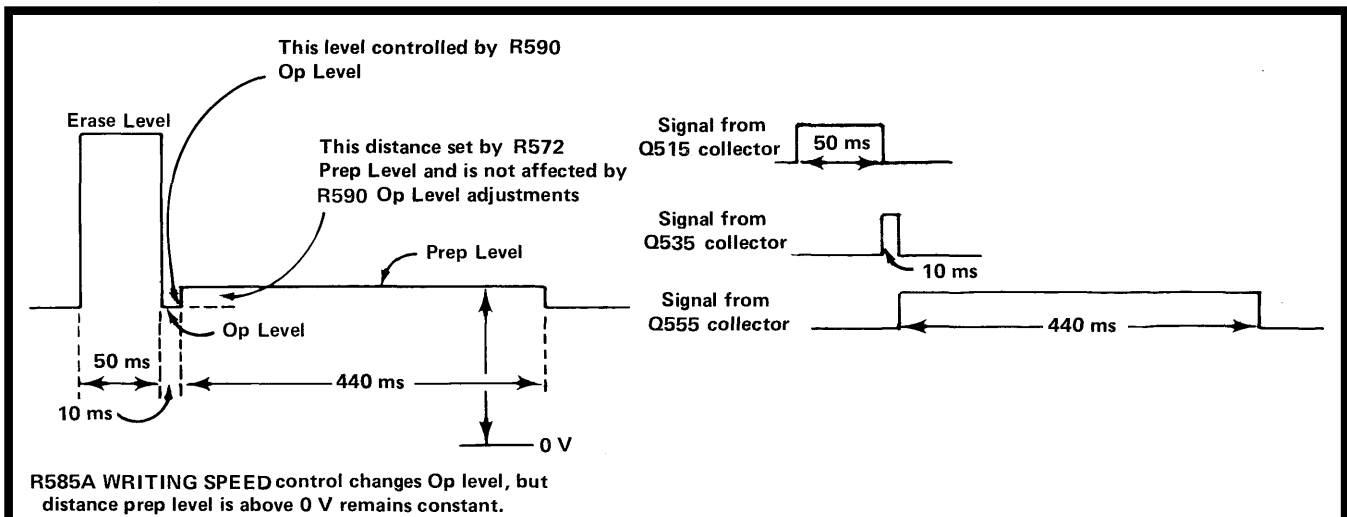


Fig. 2-1. Erase cycle waveform as seen at the storage mesh-connection to the crt.

If S675 SAVE pushbutton is not pushed in (out position), then the output of Q640 (Fig. 2-2) is supplied via CR640 to the storage mesh.

When S675 SAVE pushbutton is pushed in, then the output of Q640 (Fig. 2-2) is supplied to the flood-gun cathode. Pushing S675 in forward-biases CR650 and holds pins 16A and 17A of the time-base plug-in high, preventing a sweep.

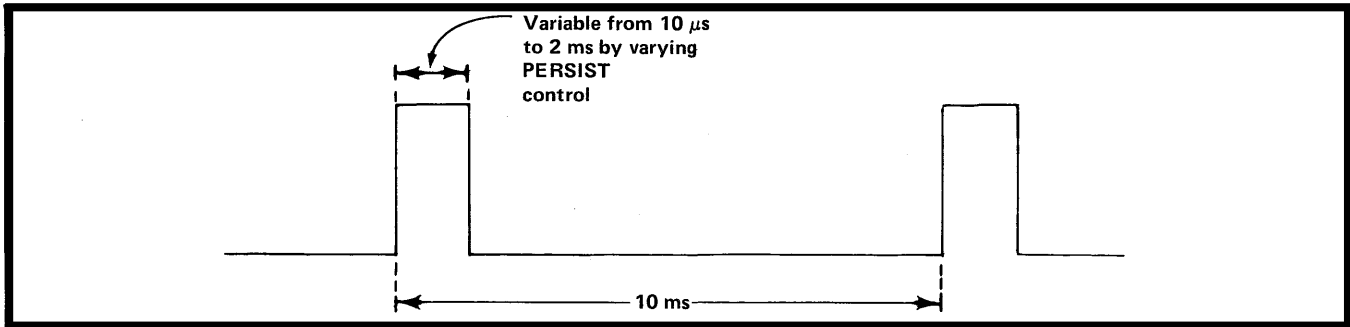


Fig. 2-2. Variable Persistence and Save circuit output waveform.

# SERVICE INFORMATION

## SPECIFICATIONS

The electrical specifications are valid only if (1) the instrument has been calibrated at an ambient temperature between +20°C and +30°C; (2) the instrument is operating at an ambient temperature between 0°C and +50°C, unless otherwise noted; (3) each plug-in must be operating (fully installed) in a calibrated system.

Unless otherwise stated, specifications are referenced to the plug-in connectors of the 5403. Any conditions that are unique to a particular specification are stated as part of that specification.

**TABLE 3-1**  
**5403-D41 Vertical Amplifier**

Characteristics	Performance Requirements	Supplemental Information
Input Signal Amplitude (Differential)		50 mV/division $\pm 2\%$ . Less than 0.5% difference between left and right vertical plug-in compartments.
Bandwidth (6-Division Reference)	Dc to at least 90 MHz with a 067-0680-00 Calibration Fixture. Dc to at least 60 MHz with a calibrated 5A48.	
Risetime (6-Division Reference)	3.9 ns or less with a 067-0680-00 Calibration Fixture. 5.8 ns or less with a calibrated 5A48.	
Aberrations (6-Division Reference)	6% or less measured with a 067-0680-00 Calibration Fixture. 3% or less measured with a calibrated 5A48.	
Position Effect on Aberrations (6-Division Reference with a 067-0680-00 Calibration Fixture.		Front corner aberrations of +step or -step response signal should not exceed $\pm 6\%$ when the waveform is positioned not more than 1 division beyond graticule center.
Vertical Centering		Within $\pm 0.5$ division of graticule center.
Delay Line Length		140 ns
Modes	Chop and alt.	
Rate		
Chop	50 kHz $+50\%$ $-30\%$ ; 3 $\mu$ s on, 2 $\mu$ s off.	
Alt	Once every two sweeps.	

**TABLE 3-2**  
**5403-D41 Horizontal Amplifier**

Characteristics	Performance Requirements	Supplemental Information
Bandwidth	DC to at least 2 MHz.	Eight division signal used as a reference.
Horizontal Centering		Within 0.5 division of graticule center.
X-Y Operation	Less than 2° phase shift from DC to at least 20 kHz.	

**TABLE 3-3**  
**D41 Z-Axis Amplifier**

Characteristics	Performance Requirements	Supplemental Information
External Input		
Input Voltage	+5 V turns CRT beam on from off condition -5 V turns CRT beam off from on condition	
Usable Frequency Range	DC to 2 MHz	
Input Impedance	Resistance: 10 kΩ Capacitance: 40 pF	
Maximum Safe Input	50 V (DC + Peak AC)	

**TABLE 3-4**  
**D41 Cathode-Ray Tube**

Characteristics	Performance Requirements	Supplemental Information
Geometry	Bowing or tilt ≤ 0.1 division	
Orthogonality	90° ± 0.7°	
Stored Writing Rate	5 div/μs at 15 second viewing time 1 div/μs at 60 second viewing time	
Phosphor	P31 standard	
Deflection	Electrostatic	
Acceleration Potential	8.5 kV	

**TABLE 3-5**  
**5403-D41 Power Supply and Calibrator**

Characteristics	Performance Requirements	Supplemental Information
Power Line Input		
Line Voltage (RMS)	Nominal 100 V, 110 V, 120 V, 200 V, 220 V, 240 V ± 10%	
Line Frequency	50 to 400 Hz	
Input Power	100 W maximum at 120 VAC, 60 Hz	
Fuse Data	1.25 A slow blow (120 VAC) 0.7 A slow blow (240 VAC)	
Calibrator		
Voltage	400 mV, ± 1%	
Current	4 mA, ± 1%	
Frequency	Twice the power line frequency	

**TABLE 3-6**  
5403-D41 Readout

Characteristics	Performance Requirements	Supplemental Information
Intensity Range		Off to full brightness. Readout in-operative when READOUT INTENS fully counterclockwise in detent position.
Location		Top words are displayed in top major graticule division between left and right extreme graticule lines. Bottom words are displayed in bottom major graticule division between left and right extreme graticule lines.
<p><b>TABLE 3-7</b> D41 Miscellaneous</p>		
Characteristics	Performance Requirements	Supplemental Information
Graticule		
Scale	8 x 10 divisions with 0.9 cm/div	
Scale Color and Type		
Normal	Orange internal graticule lines	
Beam Finder	Brings trace within viewing area and intensifies trace	

**TABLE 3-8**  
5403-D41 Environmental

Characteristics	Performance Requirements	Supplemental Information
Temperature		
Operating	0°C to +50°C	
Storage	-40°C to +70°C	
Altitude		
Operating	To 15,000 feet	
Storage	To 50,000 feet	
Vibration		
Operating and Non-Operating	With the instrument complete and operating, vibration frequency swept from 10 to 50 to 10 Hz at 1 minute per sweep. Vibrate 15 minutes in each of the three major axes at 0.015" total displacement. Hold 3 minutes at any major resonance, or if none, at 50 Hz. Total time, 54 minutes	

TABLE 3-8 (cont)

Characteristics	Performance Requirements	Supplemental Information
Shock Operating and Non-Operating	30 g's, 1/2 sine, 11 ms duration, 2 shocks in each direction along 3 major axes for a total of 12 shocks	
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II	

TABLE 3-9  
5403-D41 Physical

Parameter	Information
Finish	Anodized aluminum panel with gray vinyl coated frame. Blue-vinyl coated cabinet
Net Weight of Cabinet Version with Feet and Handle	27 lbs. (12.25 kg)
Overall Dimensions	See Fig. 3-1
Overall rack depth	19 inches

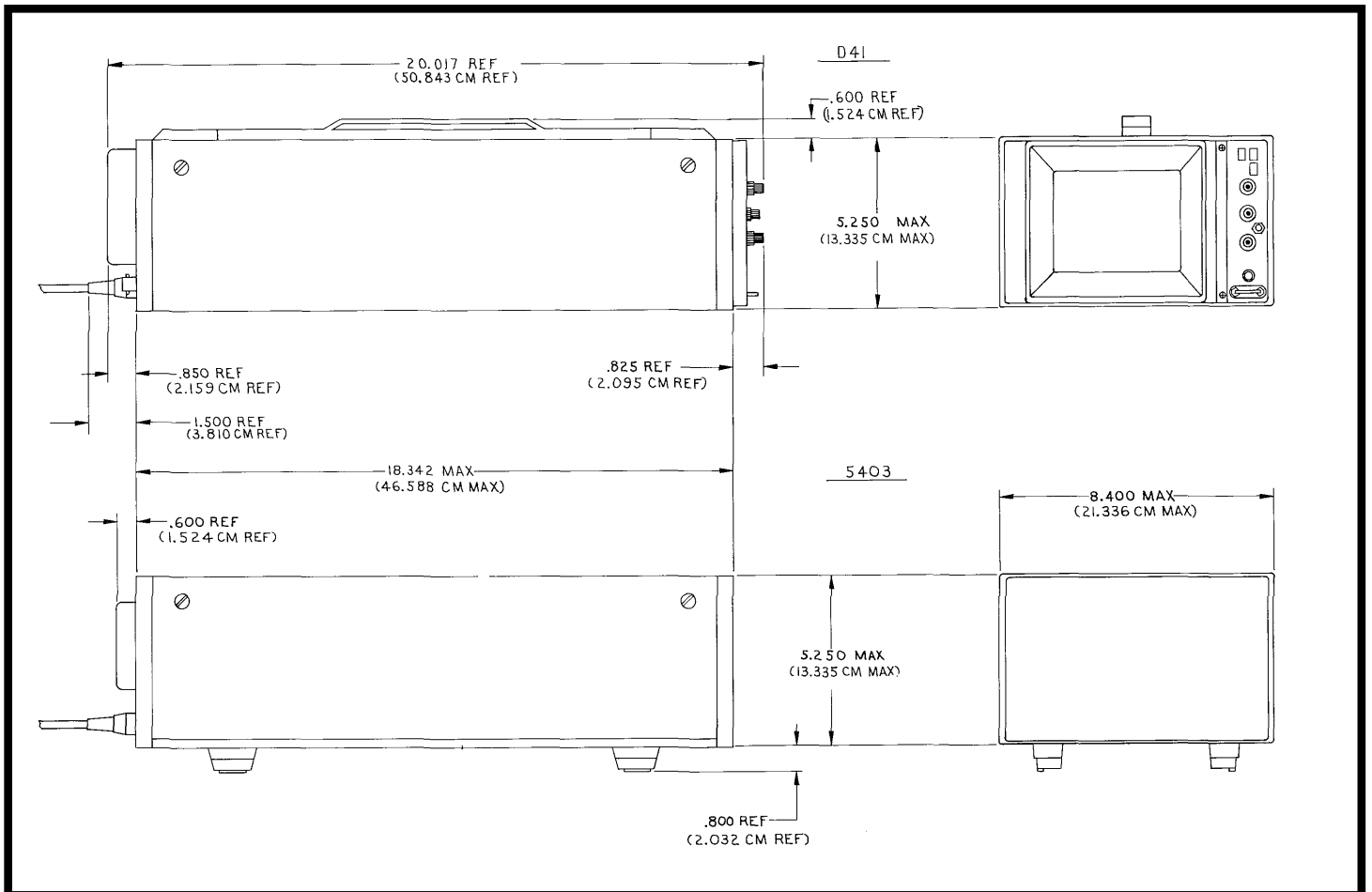


Fig. 3-1. Illustration showing dimensions of the cabinet version of the 5403 and D41.

# REPLACEABLE ELECTRICAL PARTS

## PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

## SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number  
00X Part removed after this serial number

## ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

## ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELECTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

## CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01281	TRW ELECTRONIC COMPONENTS, SEMICONDUCTOR OPERATIONS	14520 AVIATION BLVD.	LAWDALE, CA 90260
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MURTL BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
05091	TRI-ORDINATE CORPORATION	343 SNYDER AVENUE	BERKELEY HEIGHTS, NJ 07922
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
15454	RODAN INDUSTRIES, INC.	2905 BLUE STAR ST.	ANAHEIM, CA 92806
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71450	CTS CORP.	1142 W. BEARDSLEY AVE.	ELKHART, IN 46514
71744	CHICAGO MINIATURE LAMP WORKS	4433 RAVENSWOOD AVE.	CHICAGO, IL 60640
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80031	ELECTRA-MIDLAND CORP., MEPCO DIV.	22 COLUMBIA ROAD	MORRISTOWN, NJ 07960
81073	GRAYHILL, INC.	561 HILLGROVE AVE., PO BOX 373	LA GRANGE, IL 60525
81439	THERM-O-DISC, INC.	1320 S MAIN, P O BOX 1538	MANSFIELD, OH 44907
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
82104	STANDARD GRIGSBY CO., DIV. OF SUN CHEMICAL CORPORATION	920 RATHBONE AVENUE	AURORA, IL 60507
83003	VARO, INC.	P O BOX 411, 2203 WALNUT STREET	GARLAND, TX 75040
91418	RADIO MATERIALS COMPANY, DIV. OF P.R. MALLORY AND COMPANY, INC.	4242 W BRYN MAWR	CHICAGO, IL 60646
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
91929	HONEYWELL, INC., MICRO SWITCH DIV.	CHICAGO & SPRING STS.	FREEPORT, IL 61032
93410	ESSEX INTERNATIONAL, INC., CONTROLS DIV. LEXINGTON PLANT	P. O. BOX 1007	MANSFIELD, OH 44903



Electrical Parts List—D41

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont			
A1	670-3577-00	B010100	B020659	CKT BOARD ASSY:VERTICAL AMPL	80009	670-3577-00
A1	670-3577-01	B020660		CKT BOARD ASSY:VERTICAL AMPL	80009	670-3577-01
A2	670-3556-00	B010100	B019999	CKT BOARD ASSY:HORIZONTAL AMPL	80009	670-3556-00
A2	670-3556-01	B020000		CKT BOARD ASSY:HORIZONTAL AMPL	80009	670-3556-01
A3	670-3514-00	B010100	B020484	CKT BOARD ASSY:HV	80009	670-3514-00
A3	670-3514-01	B020485		CKT BOARD ASSY:HV	80009	670-3514-01
A4	670-2833-00	B010100	B061536	CKT BOARD ASSY:CONTROL/STORAGE	80009	670-2833-00
A4	670-2833-01	B061537		CKT BOARD ASSY:CONTROL/STORAGE	80009	670-2833-01
A5	670-0702-05			CKT BOARD ASSY:GRATICULE LAMP	80009	670-0702-05
C100	281-0604-00			CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	72982	301-000C0J0229C
C101	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C102	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C115	281-0204-00			CAP.,VAR,PLSTC:2-22PF,100V	80031	C010EA-20E
C120	281-0638-00			CAP.,FXD,CER DI:240PF,5%,500V	72982	301000Z5D241J
C123	281-0524-00			CAP.,FXD,CER DI:150PF,+/-30PF,500V	04222	7001-1381
C127	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C148	281-0623-00			CAP.,FXD,CER DI:650PF,5%,500V	04222	7001-1362
C153	281-0651-00			CAP.,FXD,CER DI:47PF,5%,200V	72982	374-001T2H0470J
C155	281-0204-00			CAP.,VAR,PLSTC:2-22PF,100V	80031	C010EA-20E
C156	281-0651-00			CAP.,FXD,CER DI:47PF,5%,200V	72982	374-001T2H0470J
C160	281-0651-00			CAP.,FXD,CER DI:47PF,5%,200V	72982	374-001T2H0470J
C165	281-0623-00			CAP.,FXD,CER DI:650PF,5%,500V	04222	7001-1362
C167	281-0634-00			CAP.,FXD,CER DI:10PF,+/-0.25PF,500V	72982	374-011C0G0100C
C170	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C173	283-0000-00	XB021272		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C180	290-0534-00	B010100	B021496	CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C180	283-0111-00	B021497		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C181	281-0203-00			CAP.,VAR,PLSTC:2-10PF,100V	80031	C010EA/10E
C184	281-0546-00			CAP.,FXD,CER DI:330PF,10%,500V	04222	7001-1380
C185	281-0546-00			CAP.,FXD,CER DI:330PF,10%,500V	04222	7001-1380
C188	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C192	290-0522-00	B010100	B021496	CAP.,FXD,ELCTLT:1UF,20%,50V	56289	196D105X0050HA1
C192	283-0111-00	B021497		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C197	290-0534-00	B010100	B021496	CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C197	283-0111-00	B021497		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C198	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0025HA1
C210	281-0205-00			CAP.,VAR,PLSTC:4-65PF,100V	80009	281-0205-00
C211	281-0574-00			CAP.,FXD,CER DI:82PF,10%,500V	72982	308000S2H820K
C235	281-0202-00			CAP.,VAR,PLSTC:1.5-5.5PF,100V	80031	2222-808-11558
C240	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	81314147 C 104K
C242	281-0670-00			CAP.,FXD,CER DI:1.8PF,+/-0.1PF,500V	72982	374-005C0K0189B
C244	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C250	283-0003-00	B010100	B010146	CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C250	283-0142-00	B010147		CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-551B272J
C252	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C266	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C272	281-0670-00			CAP.,FXD,CER DI:1.8PF,+/-0.1PF,500V	72982	374-005C0K0189B
C280	283-0110-00			CAP.,FXD,CER DI:0.005UF,+80-20%,150V	56289	19C242B
C282	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C286	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C335	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C350	281-0627-00			CAP.,FXD,CER DI:1PF,+/-0.25PF,500V	72982	301-000C0K0109C
C352	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0025HA1

# Electrical Parts List—D41

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C353	283-0002-00			CAP., FXD, CER DI:0.01UF, +80-20%, 500V	72982	811-546E103Z
C354	283-0110-00			CAP., FXD, CER DI:0.005UF, +80-20%, 150V	56289	19C242B
C358	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C360	283-0057-00			CAP., FXD, CER DI:0.1UF, +80-20%, 200V	56289	274C10
C395	290-0410-00			CAP., FXD, ELCTLT:15UF, +50-10%, 100V	56289	30D156F100DD4
C402	283-0249-00			CAP., FXD, CER DI:0.068UF, 10%, 50V	72982	8131N075 C 683K
C406	283-0081-00			CAP., FXD, CER DI:0.1UF, +80-20%, 25V	56289	36C600
C410	290-0525-00	B010100	B020963	CAP., FXD, ELCTLT:4.7UF, 20%, 50V	56289	196D475X0050KA1
C410	290-0767-00	B020964		CAP., FXD, ELCTLT:4.7UF, +75-10%, 160V	56289	502D228
C412	283-0261-00			CAP., FXD, CER DI:0.01UF, 20%, 4000V	56289	41C421
C414	283-0261-00			CAP., FXD, CER DI:0.01UF, 20%, 4000V	56289	41C421
C415	283-0261-00			CAP., FXD, CER DI:0.01UF, 20%, 4000V	56289	41C421
C417	283-0021-00			CAP., FXD, CER DI:0.001UF, 20%, 5000V	72982	848-556-Y5S-102M
C418	283-0081-00			CAP., FXD, CER DI:0.1UF, +80-20%, 25V	56289	36C600
C422	283-0261-00			CAP., FXD, CER DI:0.01UF, 20%, 4000V	56289	41C421
C425	283-0021-00			CAP., FXD, CER DI:0.001UF, 20%, 5000V	72982	848-556-Y5S-102M
C427	281-0512-00			CAP., FXD, CER DI:27PF, +/-2.7PF, 500V	72982	308-000C0G0270K
C430	290-0159-00			CAP., FXD, ELCTLT:2UF, +50-10%, 150V	56289	30D205F150BB9
C440	283-0021-00			CAP., FXD, CER DI:0.001UF, 20%, 5000V	72982	848-556-Y5S-102M
C500	290-0534-00			CAP., FXD, ELCTLT:1UF, 20%, 35V	56289	196D105X0035HA1
C505	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C507	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C512	283-0003-00	XB061537		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C514	285-0628-00			CAP., FXD, PLSTC:0.033UF, 20%, 300V	56289	410P33303
C520	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C528	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C534	285-0628-00			CAP., FXD, PLSTC:0.033UF, 20%, 300V	56289	410P33303
C538	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C550	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C554	290-0267-00			CAP., FXD, ELCTLT:1UF, 20%, 35V	56289	162D105X0035CD2
C564	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C610	285-0683-00			CAP., FXD, PLSTC:0.022UF, 5%, 100V	56289	410P22351
C611	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C614	283-0023-00			CAP., FXD, CER DI:0.1UF, +80-20%, 10V	91418	MX10421201R0
C625	285-0627-00			CAP., FXD, PLSTC:0.0033UF, 5%, 100V	56289	410P33251
C704	290-0573-00			CAP., FXD, ELCTLT:2.7UF, 20%, 50V	56289	196D275X0050JA1
C705	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
CR146	152-0422-00			SEMICOND DEVICE:SILICON, 4V, 7PF	01281	PG1084
CR204	152-0574-00			SEMICOND DEVICE:SILICON, 120V, 0.15A	80009	152-0574-00
CR206	152-0574-00			SEMICOND DEVICE:SILICON, 120V, 0.15A	80009	152-0574-00
CR208	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR240	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR242	152-0574-00			SEMICOND DEVICE:SILICON, 120V, 0.15A	80009	152-0574-00
CR246	152-0574-00			SEMICOND DEVICE:SILICON, 120V, 0.15A	80009	152-0574-00
CR270	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR272	152-0574-00			SEMICOND DEVICE:SILICON, 120V, 0.15A	80009	152-0574-00
CR274	152-0574-00			SEMICOND DEVICE:SILICON, 120V, 0.15A	80009	152-0574-00
CR324	152-0061-00			SEMICOND DEVICE:SILICON, 175V, 100MA	80009	152-0061-00
CR352	152-0061-00			SEMICOND DEVICE:SILICON, 175V, 100MA	80009	152-0061-00
CR390	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR391	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR395	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR412	152-0409-00			SEMICON D DEVICE:SILICON,12,000V,5MA	83003	VG12X
CR420	152-0061-00			SEMICON D DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR422	152-0061-00			SEMICON D DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR428	152-0061-00			SEMICON D DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR430	152-0061-00			SEMICON D DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR560	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR562	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR564	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR570	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR572	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR580	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR582	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR583	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR595	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR600	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR614	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR622	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR628	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR629	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR640	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR650	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR655	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR672	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR674	152-0061-00			SEMICON D DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR675	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
CR704	152-0141-02			SEMICON D DEVICE:SILICON,30V,150MA	07910	1N4152
DL100	119-0486-00			DELAY LINE,ELEC:	80009	119-0486-00
DS705	150-0137-00			LAMP,CARTRIDGE:14V,100MA	71744	CM9818
DS706	150-0137-00			LAMP,CARTRIDGE:14V,100MA	71744	CM9818
DS707	150-0137-00			LAMP,CARTRIDGE:14V,100MA	71744	CM9818
F300	159-0041-00			FUSE,CARTRIDGE:3AG,1.25A,250V,SLOW-BLOW	71400	MDX 1 25/100
F410	159-0029-00			FUSE,CARTRIDGE:0.3A,3AG,SLO-BLOW	71400	MDL3/10
J300	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	05091	31-279
L167	108-0733-00			COIL,RF:113NH	80009	108-0733-00
L197	108-0440-00			COIL,RF:8UH,TOROIDAL INDUCTOR	80009	108-0440-00
L198	108-0440-00			COIL,RF:8UH,TOROIDAL INDUCTOR	80009	108-0440-00
L365	108-0714-00	XB020000		COIL,TUBE DEFLE:Y AXIS ALIGNMENT	80009	108-0714-00
L375	108-0792-00			COIL,TUBE DEFLE:TRACE ROTATION	80009	108-0792-00
LR193	108-0328-00			COIL,RF:0.3UH	80009	108-0328-00
LR195	108-0328-00			COIL,RF:0.3UH	80009	108-0328-00
Q100	151-0441-00			TRANSISTOR:SILICON,NPN	80009	151-0441-00
Q106	151-0212-00			TRANSISTOR:SILICON,NPN	80009	151-0212-00
Q110	151-0262-00			TRANSISTOR:SILICON,NPN	80009	151-0262-00
Q123	151-0441-00			TRANSISTOR:SILICON,NPN	80009	151-0441-00
Q130	151-0212-00			TRANSISTOR:SILICON,NPN	80009	151-0212-00
Q140	151-0342-00			TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q148	151-0271-00			TRANSISTOR:SILICON,PNP	80009	151-0271-00
Q165	151-0271-00			TRANSISTOR:SILICON,PNP	80009	151-0271-00
Q170	151-0434-00			TRANSISTOR:SILICON,PNP	80009	151-0434-00
Q172	151-0434-00			TRANSISTOR:SILICON,PNP	80009	151-0434-00

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q180	151-0451-00			TRANSISTOR:SILICON,NPN	80009	151-0451-00
Q182	151-0451-00			TRANSISTOR:SILICON,NPN	80009	151-0451-00
Q188	151-0446-00			TRANSISTOR:SILICON,NPN	80009	151-0446-00
Q190	151-0446-00			TRANSISTOR:SILICON,NPN	80009	151-0446-00
Q200	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q215	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q240	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00
Q244	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q250	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q255	151-0262-00			TRANSISTOR:SILICON,NPN	80009	151-0262-00
Q270	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q274	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q280	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q320	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q335	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q340	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q345	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q352	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q356	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q390	151-0254-00			TRANSISTOR:SILICON,NPN	80009	151-0254-00
Q400	151-0342-00			TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q410	151-0262-00			TRANSISTOR:SILICON,NPN	80009	151-0262-00
Q510	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q515	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q530	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q535	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q550	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q555	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q575	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q580	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q585	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q595	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q600	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q610	151-0508-00			TRANSISTOR:SILICON,NPN,UNIUNJCTION	03508	2N6027
Q625	151-0281-00			TRANSISTOR:SILICON,NPN	03508	X16P4039
Q635	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q640	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q655	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q670	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q672	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q675	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q680	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q685	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q690	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q700	151-0341-00	B010100	B021387	TRANSISTOR:SILICON,NPN	07263	S040065
Q700	151-0192-00	B021388		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q703	151-0342-00	XB021380		TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q705	151-0352-00			TRANSISTOR:SILICON,NPN	80009	151-0352-00
R100	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
R102	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R103	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
R104	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
R108	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R110	321-0217-00			RES., FXD, FILM:1.78K OHM, 1%, 0.125W	91637	MFF1816G17800F
R111	321-0089-00			RES., FXD, FILM:82.5 OHM, 1%, 0.125W	91637	MFF1816G82R50F
R112	321-0217-00			RES., FXD, FILM:1.78K OHM, 1%, 0.125W	91637	MFF1816G17800F
R115	311-1566-00			RES., VAR, NONWIR:200 OHM, 20%, 0.50W	73138	91A-200ROM
R117	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R118	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R120	311-1560-00			RES., VAR, NONWIR:5K OHM, 5%, 0.50W	73138	91A-50000M
R123	311-1563-00			RES., VAR, NONWIR:1K OHM, 20%, 0.50W	73138	91A-10000M
R125	321-0085-00			RES., FXD, FILM:75 OHM, 1%, 0.125W	91637	MFF1816G75R00F
R127	315-0221-00			RES., FXD, CMPSN:220 OHM, 5%, 0.25W	01121	CB2215
R128	321-0097-00			RES., FXD, FILM:100 OHM, 1%, 0.125W	91637	MFF1816G100ROF
R129	321-0097-00			RES., FXD, FILM:100 OHM, 1%, 0.125W	91637	MFF1816G100ROF
R132	315-0302-00			RES., FXD, CMPSN:3K OHM, 5%, 0.25W	01121	CB3025
R135	311-1563-00			RES., VAR, NONWIR:1K OHM, 20%, 0.50W	73138	91A-10000M
R136	321-0121-00			RES., FXD, FILM:178 OHM, 1%, 0.125W	91637	MFF1816G178ROF
R138	315-0472-00			RES., FXD, CMPSN:4.7K OHM, 5%, 0.25W	01121	CB4725
R139	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R141	315-0152-00			RES., FXD, CMPSN:1.5K OHM, 5%, 0.25W	01121	CB1525
R142	315-0270-00			RES., FXD, CMPSN:27 OHM, 5%, 0.25W	01121	CB2705
R143	315-0220-00	B010100	B020659	RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R143	315-0430-00	B020660		RES., FXD, CMPSN:43 OHM, 5%, 0.25W	01121	CB4305
R144	315-0431-00			RES., FXD, CMPSN:430 OHM, 5%, 0.25W	01121	CB4315
R145	321-0148-00			RES., FXD, FILM:340 OHM, 1%, 0.125W	91637	MFF1816G340ROF
R146	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R148	315-0151-00			RES., FXD, CMPSN:150 OHM, 5%, 0.25W	01121	CB1515
R149	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R151	315-0471-00			RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715
R153	321-0093-00			RES., FXD, FILM:90.9 OHM, 1%, 0.125W	91637	MFF1816G90R90F
R155	311-1567-00			RES., VAR, NONWIR:100 OHM, 20%, 0.50W	73138	91A-100ROM
R157	315-0622-00			RES., FXD, CMPSN:6.2K OHM, 5%, 0.25W	01121	CB6225
R158	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
R160	321-0148-00			RES., FXD, FILM:340 OHM, 1%, 0.125W	91637	MFF1816G340ROF
R163	315-0431-00			RES., FXD, CMPSN:430 OHM, 5%, 0.25W	01121	CB4315
R164	315-0220-00	B010100	B020659	RES., FXD, CMPSN:22 OHM, 5%, 0.25W	01121	CB2205
R164	315-0430-00	B020660		RES., FXD, CMPSN:43 OHM, 5%, 0.25W	01121	CB4305
R165	315-0151-00			RES., FXD, CMPSN:150 OHM, 5%, 0.25W	01121	CB1515
R167	311-1564-00			RES., VAR, NONWIR:500 OHM, 20%, 0.50W	73138	91A-500ROM
R172	321-0126-00			RES., FXD, FILM:200 OHM, 1%, 0.125W	91637	MFF1816G200ROF
R173	321-0093-00			RES., FXD, FILM:90.9 OHM, 1%, 0.125W	91637	MFF1816G90R90F
R175	311-1561-00			RES., VAR, NONWIR:2.5K OHM, 20%, 0.50W	73138	91A-25000M
R176	321-0093-00			RES., FXD, FILM:90.9 OHM, 1%, 0.125W	91637	MFF1816G90R90F
R178	321-0126-00			RES., FXD, FILM:200 OHM, 1%, 0.125W	91637	MFF1816G200ROF
R180	301-0151-00	B010100	B010170	RES., FXD, CMPSN:150 OHM, 5%, 0.50W	01121	EB1515
R180	315-0910-00	B010171		RES., FXD, CMPSN:91 OHM, 5%, 0.25W	01121	CB9105
R181	321-0074-00	B010100	B010170	RES., FXD, FILM:57.6 OHM, 1%, 0.125W	91637	MFF1816G57R60F
R181	321-0079-00	B010171		RES., FXD, FILM:64.9 OHM, 1%, 0.125W	91637	MFF1816G64R90F
R182	301-0151-00	B010100	B010170	RES., FXD, CMPSN:150 OHM, 5%, 0.50W	01121	EB1515
R182	315-0910-00	B010171		RES., FXD, CMPSN:91 OHM, 5%, 0.25W	01121	CB9105
R183	301-0300-00	XB010171		RES., FXD, CMPSN:30 OHM, 5%, 0.50W	01121	EB3005
R184	315-0680-00			RES., FXD, CMPSN:68 OHM, 5%, 0.25W	01121	CB6805
R185	315-0680-00			RES., FXD, CMPSN:68 OHM, 5%, 0.25W	01121	CB6805
R187	315-0820-00			RES., FXD, CMPSN:82 OHM, 5%, 0.25W	01121	CB8205
R188	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R190	315-0820-00			RES.,FXD,CMPSN:82 OHM,5%,0.25W	01121	CB8205
R191	307-0435-00			RES.,FXD,FILM:510 OHM,5%,4W	91637	FP33G510R0J
R192	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R193	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R194	307-0435-00			RES.,FXD,FILM:510 OHM,5%,4W	91637	FP33G510R0J
R195	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R197	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R198	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R200	321-0065-00			RES.,FXD,FILM:46.4 OHM,1%,0.125W	91637	MFF1816G46R40F
R201	317-0047-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.125W	01121	BB47G5
R202	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
R203	321-0200-00			RES.,FXD,FILM:1.18K OHM,1%,0.125W	91637	MFF1816G11800F
R205	322-0205-00			RES.,FXD,FILM:1.33K OHM,1%,0.25W	75042	CEBTO-1331F
R207	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R208	315-0361-00			RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
R210	321-0149-00			RES.,FXD,FILM:348 OHM,1%,0.125W	91637	MFF1816G348R0F
R211	321-0076-00			RES.,FXD,FILM:60.4 OHM,1%,0.125W	91637	MFF1816G60R40F
R212	311-1564-00			RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A-500ROM
R213	322-0205-00			RES.,FXD,FILM:1.33K OHM,1%,0.25W	75042	CEBTO-1331F
R215	321-0065-00			RES.,FXD,FILM:46.4 OHM,1%,0.125W	91637	MFF1816G46R40F
R216	317-0047-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.125W	01121	BB47G5
R217	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
R218	321-0200-00			RES.,FXD,FILM:1.18K OHM,1%,0.125W	91637	MFF1816G11800F
R220	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R222	311-1558-00			RES.,VAR,NONWIR:20K OHM,20%,0.50W	73138	91A-20001M
R224	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R238	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R240	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
R242	323-0318-00			RES.,FXD,FILM:20K OHM,1%,0.50W	75042	CECTO-2002F
R244	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R245	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R246	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
R247	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R248	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R250	301-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.50W	01121	EB3935
R252	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
R256	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R257	304-0392-00			RES.,FXD,CMPSN:3.9K OHM,10%,1W	01121	GB3921
R258	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R259	316-0100-00			RES.,FXD,CMPSN:10 OHM,10%,0.25W	01121	CB1001
R265	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	91637	MFF1816G60400F
R266	321-0389-00			RES.,FXD,FILM:110K OHM,1%,0.125W	91637	MFF1816G11002F
R268	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R270	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R272	323-0318-00			RES.,FXD,FILM:20K OHM,1%,0.50W	75042	CECTO-2002F
R274	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R276	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R280	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R282	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
R284	301-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.50W	01121	EB3935
R286	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R289	316-0100-00			RES.,FXD,CMPSN:10 OHM,10%,0.25W	01121	CB1001
R320	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035

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Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number	
		Eff	Dscont				
R322	315-0203-00			RES., FXD, CMPSN:20K OHM, 5%, 0.25W	01121	CB2035	
R324	315-0332-00			RES., FXD, CMPSN:3.3K OHM, 5%, 0.25W	01121	CB3325	
R326	315-0202-00			RES., FXD, CMPSN:2K OHM, 5%, 0.25W	01121	CB2025	
R327	315-0822-00			RES., FXD, CMPSN:8.2K OHM, 5%, 0.25W	01121	CB8225	
R328	315-0392-00			RES., FXD, CMPSN:3.9K OHM, 5%, 0.25W	01121	CB3925	
R330	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035	
R332A,B	311-1681-00			RES., VAR, NONWIR:20K OHM X 5M OHM, 20%, 0.50W	01121	12M234	
R334	315-0224-00			RES., FXD, CMPSN:220K OHM, 5%, 0.25W	01121	CB2245	
R335	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035	
R336	315-0224-00			RES., FXD, CMPSN:220K OHM, 5%, 0.25W	01121	CB2245	
R338	315-0474-00			RES., FXD, CMPSN:470K OHM, 5%, 0.25W	01121	CB4745	
R342	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105	
R343	315-0241-00			RES., FXD, CMPSN:240 OHM, 5%, 0.25W	01121	CB2415	
R345	315-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 0.25W	01121	CB4705	
R347	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225	
R349	321-0311-00			RES., FXD, FILM:16.9K OHM, 1%, 0.125W	91637	MFF1816G16901F	
R350	321-0311-00			RES., FXD, FILM:16.9K OHM, 1%, 0.125W	91637	MFF1816G16901F	
R352	315-0221-00			RES., FXD, CMPSN:220 OHM, 5%, 0.25W	01121	CB2215	
R356	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025	
R358	315-0104-00			RES., FXD, CMPSN:100K OHM, 5%, 0.25W	01121	CB1045	
R359	315-0392-00			RES., FXD, CMPSN:3.9K OHM, 5%, 0.25W	01121	CB3925	
R360	315-0471-00			RES., FXD, CMPSN:470 OHM, 5%, 0.25W	01121	CB4715	
R362	305-0153-00			RES., FXD, CMPSN:15K OHM, 5%, 2W	01121	HB1535	
R364	311-1558-00	XB020000		RES., VAR, NONWIR:20K OHM, 20%, 0.50W	73138	91A-20001M	
R365	311-1555-00			RES., VAR, NONWIR:100K OHM, 20%, 0.5W	73138	91A-10002M	
R366	315-0332-00	XB020000		RES., FXD, CMPSN:3.3K OHM, 5%, 0.25W	01121	CB3325	
R368	315-0473-00			RES., FXD, CMPSN:47K OHM, 5%, 0.25W	01121	CB4735	
R370	311-1555-00			RES., VAR, NONWIR:100K OHM, 20%, 0.5W	73138	91A-10002M	
R375	311-1558-00	B010100	B019999	RES., VAR, NONWIR:20K OHM, 20%, 0.50W	73138	91A-20001M	
R375	311-1524-00	B020000		RES., VAR, NONWIR:20K OHM, 10%, 1W	01121	11M338	
R390	316-0102-00			RES., FXD, CMPSN:1K OHM, 10%, 0.25W	01121	CB1021	
R392	316-0154-00			RES., FXD, CMPSN:150K OHM, 10%, 0.25W	01121	CB1541	
R394	316-0472-00			RES., FXD, CMPSN:4.7K OHM, 10%, 0.25W	01121	CB4721	
R395A,B	307-0458-00			RES., FXD, FILM:HIGH VOLTAGE DIV	80009	307-0458-00	
R395C,D							
R397	316-0474-00			RES., FXD, CMPSN:470K OHM, 10%, 0.25W	01121	CB4741	
R400	316-0101-00			RES., FXD, CMPSN:100 OHM, 10%, 0.25W	01121	CB1011	
R402	316-0102-00			RES., FXD, CMPSN:1K OHM, 10%, 0.25W	01121	CB1021	
R404	315-0270-00			RES., FXD, CMPSN:27 OHM, 5%, 0.25W	01121	CB2705	
R405	316-0273-00			RES., FXD, CMPSN:27K OHM, 10%, 0.25W	01121	CB2731	
R406	316-0391-00	B010100	B021496	RES., FXD, CMPSN:390 OHM, 10%, 0.25W	01121	CB3911	
R406	316-0101-00	B021497		RES., FXD, CMPSN:100 OHM, 10%, 0.25W	01121	CB1011	
R408	316-0100-00			RES., FXD, CMPSN:10 OHM, 10%, 0.25W	01121	CB1001	
R410	307-0053-00			RES., FXD, CMPSN:3.3 OHM, 5%, 0.50W	01121	EB33G5	
R411	304-0393-00	XB020485		RES., FXD, CMPSN:39K OHM, 10%, 1W	01121	GB3931	
R412	316-0223-00			RES., FXD, CMPSN:22K OHM, 10%, 0.25W	01121	CB2231	
R415	316-0470-00			RES., FXD, CMPSN:47 OHM, 10%, 0.25W	01121	CB4701	
R417	316-0104-00			RES., FXD, CMPSN:100K OHM, 10%, 0.25W	01121	CB1041	
R418	316-0104-00			RES., FXD, CMPSN:100K OHM, 10%, 0.25W	01121	CB1041	
R420	316-0103-00			RES., FXD, CMPSN:10K OHM, 10%, 0.25W	01121	CB1031	
R422	316-0106-00			RES., FXD, CMPSN:10M OHM, 10%, 0.25W	01121	CB1061	
R425	316-0102-00			RES., FXD, CMPSN:1K OHM, 10%, 0.25W	01121	CB1021	
R427	316-0334-00			RES., FXD, CMPSN:330K OHM, 10%, 0.25W	01121	CB3341	

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Ckt No.	Tektronix	Serial/Model No.		Name & Description	Mfr	Mfr Part Number
	Part No.	Eff	Dscont		Code	
R428	316-0102-00			RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021
R430	316-0473-00			RES.,FXD,CMPSN:47K OHM,10%,0.25W	01121	CB4731
R433	316-0393-00			RES.,FXD,CMPSN:39K OHM,10%,0.25W	01121	CB3931
R435	311-1206-00			RES.,VAR,NONWIR:250K OHM,30%,0.25W	71450	201-YA5546
R500	315-0330-00			RES.,FXD,CMPSN:33 OHM,5%,0.25W	01121	CB3305
R503	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
R505	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R506	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R507	315-0475-00			RES.,FXD,CMPSN:4.7M OHM,5%,0.25W	01121	CB4755
R510	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R514	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R515	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R518	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R520	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R524	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R526	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R530	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R534	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R535	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R538	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R540	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R545	315-0155-00			RES.,FXD,CMPSN:1.5M OHM,5%,0.25W	01121	CB1555
R550	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R552	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R554	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R555	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R558	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R560	315-0244-00			RES.,FXD,CMPSN:240K OHM,5%,0.25W	01121	CB2445
R564	321-0295-00			RES.,FXD,FILM:11.5K OHM,1%,0.125W	91637	MFF1816G11501F
R565	321-0246-00			RES.,FXD,FILM:3.57K OHM,1%,0.125W	91637	MFF1816G35700F
R568	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R570	315-0754-00			RES.,FXD,CMPSN:750K OHM,5%,0.25W	01121	CB7545
R572	311-1559-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	73138	91A-10001M
R574	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R575	301-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.50W	01121	EB1545
R577	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R580	321-0452-00			RES.,FXD,FILM:499K OHM,1%,0.125W	91637	MFF1816G49902F
R581	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R582	315-0102-00	XB061537		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R584	315-0185-00			RES.,FXD,CMPSN:1.8M OHM,5%,0.25W	01121	CB1855
R585A,B	311-1682-00			RES.,VAR,NONWIR:10K OHM,20% X2.5M OHM,10%	01121	12M292
R587	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R589	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R590	311-1559-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	73138	91A-10001M
R595	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R596	315-0124-00			RES.,FXD,CMPSN:120K OHM,5%,0.25W	01121	CB1245
R598	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R600	311-1555-00			RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91A-10002M
R602	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R604	315-0124-00			RES.,FXD,CMPSN:120K OHM,5%,0.25W	01121	CB1245
R608	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R609	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R611	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015



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Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number	
		Eff	Dscont				
R612	315-0824-00			RES.,FXD,CMPSN:820K OHM,5%,0.25W	01121	CB8245	
R613	315-0101-00	XB061537		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015	
R614	315-0754-00			RES.,FXD,CMPSN:750K OHM,5%,0.25W	01121	CB7545	
R616	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055	
R622	315-0472-00	B010100	B010164	RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725	
R622	315-0911-00	B010165		RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115	
R625	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335	
R627	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025	
R629	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235	
R632	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835	
R634	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835	
R636	315-0363-00			RES.,FXD,CMPSN:36K OHM,5%,0.25W	01121	CB3635	
R640	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525	
R642	315-0164-00			RES.,FXD,CMPSN:160K OHM,5%,0.25W	01121	CB1645	
R643	315-0514-00			RES.,FXD,CMPSN:510K OHM,5%,0.25W	01121	CB5145	
R645	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215	
R646	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825	
R650	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745	
R652	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625	
R654	315-0114-00			RES.,FXD,CMPSN:110K OHM,5%,0.25W	01121	CB1145	
R655	311-1555-00			RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91A-10002M	
R657	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335	
R659	315-0124-00			RES.,FXD,CMPSN:120K OHM,5%,0.25W	01121	CB1245	
R662	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MPF1816G12101F	
R665	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055	
R667	301-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.5W	01121	EB1045	
R670	301-0184-00			RES.,FXD,CMPSN:180K OHM,5%,0.50W	01121	EB1845	
R671	315-0103-00	XB061537		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035	
R672	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735	
R673	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715	
R674	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735	
R675	315-0102-00	XB061537		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025	
R676	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735	
R678	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045	
R681	315-0222-00	B010100	B010279	RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225	
R681	315-0122-00	B010280		RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225	
R690	301-0361-00			RES.,FXD,CMPSN:360 OHM,5%,0.50W	01121	EB3615	
R692	315-0103-00	XB061537		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035	
R700A,B <sup>1</sup>	311-1492-00			RES.,VAR,NONWIR:2 X 5K OHM,20%,0.50W	01121	11M136	
R702	315-0122-00	XB021388		RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225	
R704	315-0274-00			RES.,FXD,CMPSN:270K OHM,5%,0.25W	01121	CB2745	
R706	315-0152-00	XB021388		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525	
RT157	307-0181-00			RES.,THERMAL:100K OHM,10%,4MW/DEG C	15454	1DE104-K-220EC	
S300	260-0618-00	B010100	B061809	SW,THERMOSTATIC:OPEN 60 DEG C,CL 48.9 DEG C	93410	110-362	
S300	260-0071-00	B061810		SW,THERMOSTATIC:OPEN 68.3 DEG C,CL 48.9 DEG C	81439	OBD	
S302	260-1222-00			SWITCH,PUSH-PUL:10A,250VAC	91929	2DM301	
S335	260-1238-00			SWITCH,PUSH:0.5A AT 115VAC	81073	39YY2084	
S500	260-1611-00	B010100	B021565	SWITCH,PUSH:ERASE	82104	1686PB402001	
S500	260-1742-00	B021566		SWITCH,PUSH:1 BUTTON,2 POLE	82104	OBD	
S610	260-1132-02			SWITCH,PUSH:	80009	260-1132-02	
S675	260-1211-00	B010100	B010377	SWITCH,PUSH:DPDT,PUSH-PUSH	80009	260-1211-00	
S675	260-1743-00	B010378		SWITCH,PUSH:	80009	260-1743-00	

<sup>1</sup>Furnished as a unit with S700.

## Electrical Parts List—D41

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
S700 <sup>1</sup>						
T410	120-0920-00			XFMR,PWR,SDN &:HV	80009	120-0920-00
U410	152-0584-00			SEMICONV DEVICE:V MULTR,7KV IN,7KV DC OUT	80009	152-0584-00
V400	154-0670-10			ELECTRON TUBE:CRT	80009	154-0670-10
V400 <sup>2</sup>	154-0697-10			ELECTRON TUBE:CRT	80009	154-0697-10
VR175	152-0195-00			SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0195-00
VR245	152-0427-00			SEMICONV DEVICE:ZENER,0.4W,100V,5%	04713	1N985B
VR252	152-0427-00			SEMICONV DEVICE:ZENER,0.4W,100V,5%	04713	1N985B
VR365	152-0285-00			SEMICONV DEVICE:ZENER,0.4W,62V,5%	04713	1N980B
VR435	152-0427-00			SEMICONV DEVICE:ZENER,0.4W,100V,5%	04713	1N985B
VR575	152-0247-00			SEMICONV DEVICE:ZENER,0.4W,150V,5%	04713	1N989B
VR595	152-0428-00			SEMICONV DEVICE:ZENER,0.4W,120V,5%	04713	1N987B
VR655	152-0285-00			SEMICONV DEVICE:ZENER,0.4W,62V,5%	04713	1N980B
VR690	152-0227-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	81483	69-6585
VR691	152-0127-00			SEMICONV DEVICE:ZENER,0.4W,7.5V,5%	04713	1N958B

<sup>1</sup>Furnished as a unit with R700A,B.

<sup>2</sup>Option 5 only.

# REPLACEABLE MECHANICAL PARTS

## PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

## SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number  
00X Part removed after this serial number

## FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

## INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5           Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
-----*-----
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
-----*-----
Parts of Detail Part
Attaching parts for Parts of Detail Part
-----*-----

```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---\*--- indicates the end of attaching parts.

**Attaching parts must be purchased separately, unless otherwise specified.**

## ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

## ABBREVIATIONS

#	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
ACTR	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ADPTR	ACTUATOR	ELECTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ALIGN	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
AL	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
ASSEM	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSY	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ATTEN	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
AWG	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
BD	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BRKT	BOARD	FLTR	FILTER	OB	ORDER BY DESCRIPTION	SO	SQUARE
BRS	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRZ	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BSHG	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
CAB	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAP	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CER	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CHAS	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDNT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

## CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
0000L	MATSUHITA ELECTRIC	200 PARK AVENUE, 54TH FLOOR	NEW YORK, NY 10017
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
05091	TRI-ORDINATE CORPORATION	343 SNYDER AVENUE	BERKELEY HEIGHTS, NJ 07922
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23499	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	455 N. QUINCE ST.	ESCONDIDO, CA 92025
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	P O BOX 2244, 40 BRISTOL ST.	WATERBURY, CT 06720
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
74921	ITEN FIBRE CO., THE	4001 BENEFIT AVE., P O BOX 9	ASHTABULA, OH 44004
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
81073	GRAYHILL, INC.	561 HILLGROVE AVE., PO BOX 373	LA GRANGE, IL 60525
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
83903	ACCURATE DIE AND STAMPING DIV., ALLIED PRODUCTS CORP.	1947 N. MAUD AVE.	CHICAGO, IL 60614
91929	HONEYWELL, INC., MICRO SWITCH DIV.	CHICAGO & SPRING STS.	FREEMONT, IL 61032
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641
98278	MALCO A MICRODOT COMPANY, INC. CONNECTOR AND CABLE DIVISION	220 PASADENA AVE.	SOUTH PASADENA, CA 91030

Mechanical Parts List—D41

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5					Name & Description	Mfr Code	Mfr Part Number
1-1	200-1661-00		1					BEZEL,CRT:	80009	200-1661-00	
								(ATTACHING PARTS)			
-2	211-0188-00		2					SCREW,MACHINE:4-40 X 0.30,SST	80009	211-0188-00	
								- - - - *			
-3	337-1674-01		1					SHLD,IMPLOSION:	80009	337-1674-01	
-4	386-2340-00		4					SUPPORT,CRT:FRONT	80009	386-2340-00	
-5	386-2246-00		1					SUPPORT,CRT:REAR	80009	386-2246-00	
-6	386-2876-00		1					SUPPORT,CRT:CENTER	80009	386-2876-00	
-7	386-2899-00		1					SUPPORT,CRT:FRONT	80009	386-2899-00	
-8	214-2112-00	B010100 B010107X	1					SPRING REFL MT:	80009	214-2112-00	
-9	366-1077-00		3					KNOB:GRAY W/SETSCREW	80009	366-1077-00	
								. EACH KNOB INCLUDES:			
	213-0153-00		1					. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD	
-10	366-1319-01		3					KNOB:GRAY	80009	366-1319-01	
								. EACH KNOB INCLUDES:			
	213-0153-00		1					. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD	
-11	366-1489-71		1					PUSHBUTTON:STORE	80009	366-1489-71	
-12	366-1257-46		1					PUSHBUTTON:ERASE	80009	366-1257-46	
-13	366-1489-70		1					PUSHBUTTON:SAVE	80009	366-1489-70	
-14	426-0681-00		3					FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00	
-15	384-1099-00		1					EXTENSION SHAFT:PUSH BUTON,1.54 INCH LONG	80009	384-1099-00	
-16	384-1101-00		1					EXTENSION SHAFT:4.14 INCH LONG	80009	384-1101-00	
-17	384-1161-00		1					SHAFT,EXT:POWER SWITCH	80009	384-1161-00	
-18	358-0216-00		1					BUSHING,PLASTIC:0.257 ID X 0.412 INCH OD	80009	358-0216-00	
-19	119-0238-00	B010100 B020839	1					CURRENT LOOP:U-SHAPE	80009	119-0238-00	
	119-0373-00	B020840	1					CURRENT LOOP:U SHAPED	80009	119-0373-00	
								(ATTACHING PARTS)			
	210-0442-00		2					NUT,PLAIN,HEX.:3-48 X 0.187 CD,PL BRS	73743	3014-402	
	210-0004-00		2					WASHER,LOCK:INTL,0.12 ID X 0.26"OD,STL	78189	1204-00-00-0541C	
	210-0994-00		2					WASHER,FLAT:0.125 ID X 0.25" OD,STL	83385	OBD	
	210-0935-00		2					WASHER,FIBER:0.140 ID X 0.375 " OD,W/SHOULDER	74921	OBD	
-20	361-0059-01		1					SPACER,CUR LOOP:1.094 X 0.344X 0.125 INCH	80009	361-0059-01	
-21	210-0593-00		2					NUT,FINISHING:0.25 HEX X 0.312" LONG,BRS	80009	210-0593-00	
								- - - - *			
-22	260-1238-00		1					SWITCH,PUSH:SPST	81073	39YY2084	
			1					CKT BOARD ASSY:CONTROL AND STORAGE(SEE A4 EPL)			
								. CKT BOARD ASSY INCLUDES:			
-23	131-0608-00		22					. CONTACT,ELEC:0.365 INCH LONG	22526	47357	
-24	131-0566-00		1					. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000L	ERD-18T0	
-25	210-0457-00		1					. NUT,PLAIN,EXT W:6-32 X 0.312,INCH,STL	83385	OBD	
-26	211-0507-00		1					. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD	
-27	361-0383-00		4					. SPACER,PB SW:CHARCOAL,0.33INCH LONG	80009	361-0383-00	
-28			3					. RES.,VAR:SEE R700,R332A,B AND R585A,B EPL)			
								(ATTACHING PARTS)			
-29	210-0583-00		3					. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402	
-30	210-0940-00		3					. WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD	
-31			1					. SWITCH:(SEE S610 EPL)			
-32			1					. SWITCH:(SEE S500 EPL)			
-33			1					. SWITCH:(SEE S675 EPL)			
								- - - - *			
-34			1					TRANSISTOR:(SEE Q690 EPL)			
								(ATTACHING PARTS)			
-35	211-0008-00		1					SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD	
								- - - - *			
-36	361-0122-00		2					SPACER,SLEEVE:0.125 INCH LONG BRS TUBE	80009	361-0122-00	
-37			1					CKT BOARD ASSY:GRAT LAMPS(SEE A5 EPL)			
								. CKT BOARD ASSY INCLUDES:			
-38	378-0732-00		1					. REFLECTOR LIGHT:INT GRAT ILLUM	80009	378-0732-00	
-39	361-0158-00		2					. SPACER,SLEEVE:0.116 ID X 0.156 OD,BRS	80009	361-0158-00	
-40	211-0062-00		2					. SCREW,MACHINE:2-56 X 0.312 INCH,RDH STL	83385	OBD	

**Mechanical Parts List—D41**

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5					Name & Description	Mfr Code	Mfr Part Number
1-41	131-0704-00		3	.					CONTACT,ELEC:GRATICULE LAMP (ATTACHING PARTS)	80009	131-0704-00
-42	210-0759-00		3	.					EYELET,MET:0.61 OD X 0.192 INCH L,BRS	71590	16076-11
-43	210-0957-00		3	.					WASHER,FLAT:0.0625 ID X 0.125 INCH OD,STL	83903	OBD
-44	333-1779-00		1						PANEL,FRONT:FOR D41	80009	333-1779-00
-45	376-0127-00		1						COUPLER,SHAFT:PLASTIC	80009	376-0127-00
-46	260-1222-00		1						SWITCH,PUSH-PUL:10A,250VAC	91929	2DM301
-47	-----		1						CKT BOARD ASSY:HORIZONTAL(SEE A2 EPL)		
-48	131-0608-00		17	.					CONTACT,ELEC:0.365 INCH LONG	22526	47357
	334-2438-00		1	.					MARKER,IDENT:MARKED Y AXIS ALIGN	80009	334-2438-00
-49	136-0252-04		12	.					SOCKET,PIN CONN:0.188 INCH LONG (ATTACHING PARTS)	22526	75060-001
-50	211-0007-00		3						SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-51	-----		1						CKT BOARD ASSY:VERTICAL(SEE A1 EPL)		
-52	136-0252-04		14	.					SOCKET,PIN CONN:0.188 INCH LONG	22526	75060-001
-53	214-1291-00		2	.					HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H (ATTACHING PARTS)	05820	OBD
-54	211-0007-00		2						SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-55	195-0133-00		1						LEAD,ELEC:GND FOR D41	80009	195-0133-00
-56	441-1244-00		1						CHASSIS,OSCP:HORIZ/VERT FOR D41 (ATTACHING PARTS)	80009	441-1244-00
-57	211-0008-00		3						SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-58	210-0586-00		2						NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
-59	348-0239-00		1						GROMMET,PLSTC:U-SHAPE	80009	348-0239-00
-60	337-1864-00		1						SHIELD,ELEC:FOR D41 (ATTACHING PARTS)	80009	337-1864-00
-61	211-0007-00		3						SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-62	-----		1						CKT BOARD ASSY:HV(SEE A3 EPL)		
-63	131-0566-00		1						LINK,TERM.COMNE:0.086 DIA X 2.375 INCH L	0000L	ERD-18T0
-64	131-0608-00		35	.					CONTACT,ELEC:0.365 INCH LONG	22526	47357
	131-0589-00		2	.					CONTACT,ELEC:0.46 INCH LONG	22526	47350
-65	214-0579-00		1						TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-66	344-0154-00		2						CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE (ATTACHING PARTS)	80009	344-0154-00
-67	211-0008-00		1						SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-68	129-0467-00		1						POST,MET:1.196 LG X 0.188 HEX.,W/4-40 TAP	80009	129-0467-00
-69	351-0087-00		1						GUIDE,CKT CARD:4.75 INCH LONG,MOLD PLSTC	80009	351-0087-00
-70	-----		1						TRANSISTOR:(SEE Q414 EPL) (ATTACHING PARTS)		
-71	344-0236-00		1						CLIP,SPG TENS:XSTR MTG	80009	344-0236-00
-72	342-0082-00		1						INSULATOR,PL:0.52 INCH SQ X 0.015 INCH THK	80009	342-0082-00
-73	-----		1						SILICON,HV MULTIPLIER:(SEE U410 EPL) (ATTACHING PARTS)		
	211-0008-00		2						SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-74	441-1177-00		1						CHASSIS,OSCP:FOR D41 (ATTACHING PARTS)	80009	441-1177-00
-75	211-0008-00		4						SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-76	348-0003-00		1						GROMMET,RUBBER:	70485	1411-B-6040
-77	343-0081-00		1						CLAMP,CABLE:BLACK NYLON (ATTACHING PARTS)	95987	OBD
-78	210-0407-00		1						NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402

# Mechanical Parts List—D41

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Dscnt	Qty	1 2 3 4 5	Name & Description	Mfr	
							Code	Mfr Part Number
1-79	161-0033-12			1		CABLE,PWR,ELEC:	80009	161-0033-12
-80	200-1075-00			1		COVER,ELEC CONN:PLASTIC	00779	1-480435-0
-81	358-0516-00			1		BSHG,STRAIN RLF:BOTTOM	80009	358-0516-00
-82	358-0515-00			1		BSHG,STRAIN RLF:TOP	80009	358-0515-00
	214-0230-00	XB010225		1		INDUCATOR:LINE VOLTAGE	80009	214-0230-00
-83	200-1646-00			1		CABLE NIP,PWR:1.500 X 0.625 ID W/FLANGE	80009	200-1646-00
	-----	-----	B020000	1		RESISTOR,VAR:(SEE R375 EPL)		
						(ATTACHING PARTS)		
	210-0583-00	XB020000		1		NUT,PLAIN,HEX:.0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
	210-0940-00	XB020000		1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
	210-0046-00	XB020000		1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
	366-1023-01	XB61639		1		KNOB:GRAY	80009	366-1023-01
	213-0246-00	XB61639		1		. SETSCREW:5-40 X 0.093 INCH L,HEX SOC	71159	OBD
-84	333-1827-00			1		PANEL,REAR:FOR D41	80009	333-1827-00
						(ATTACHING PARTS)		
-85	210-0401-00			2		NUT,PLAIN,HEX:.6-32 X 0.312 INCH,CD PLATED	73743	3262-402
-86	200-1204-01			1		COVER,CRT:REAR	80009	200-1204-01
						- - - * - - -		
-87	352-0076-00			1		FUSEHOLDER:W/HARDWARE	75915	342012
						(ATTACHING PARTS)		
-88	210-0873-00			1		WASHER,NONMETAL:0.5 ID X 0.688 INCH OD,NPRN	70485	OBD
						- - - * - - -		
-89	200-0237-00			1		INS HOOD,INS:FUSEHOLDER	80009	200-0237-00
-90	131-0955-00			1		CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	05091	31-279
-91	210-0201-00			1		TERMINAL,LUG:SE #4	78189	2104-04-00-2520N
						(ATTACHING PARTS)		
-92	210-0586-00			1		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
						- - - * - - -		
-93	260-0618-00			1		SWITCH,THERM:SPST	80009	260-0618-00
						(ATTACHING PARTS)		
-94	210-0586-00			2		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
						- - - * - - -		
-95	200-0616-01			1		COVER,SOCKET:CRT	80009	200-0616-01
-96	136-0301-01			1		SOCKET,CRT:	80009	136-0301-01
-97	343-0015-00	B010100	B020924	1		CLAMP,MTG STRAP:0.484" DIA,SST	80009	343-0015-00
	343-0006-00	B020925		1		CLAMP,LOOP:0.50 INCH DIAMETER,PLSTC	95987	1-2-6B
						(ATTACHING PARTS)		
-98	211-0507-00			1		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
	-----	-----	XB020000	1		COIL,TUBE DEFLE:(SEE L365 EPL)		
						(ATTACHING PARTS)		
	211-0147-00	XB020000		2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	343-0217-00	XB020000		1		CLAMP,COIL:Y-AXIS	80009	343-0217-00
	348-0004-00	XB020000		1		GROMMET,RUBBER:0.281 ID X 0.563 INCH OD	70485	763
-99	337-1986-00			1		SHLD,ELCTRN TUB:REAR	80009	337-1986-00
-100	348-0145-00			1		GROMMET,PLASTIC:U-SHP,1.0 X 0.42 INCH	80009	348-0145-00
-101	334-1379-00			1		LABEL:CRT,ADHESIVE BACK	80009	334-1379-00
-102	334-2273-00			1		LABEL,INF:DANGER	80009	334-2273-00
-103	407-1128-00			1		BRKT,CRT SHIELD:REAR	80009	407-1128-00
						(ATTACHING PARTS)		
-104	211-0589-00			1		SCREW,MACHINE:6-32 X 0.312 INCH,PNH BRS	83385	OBD
-105	211-0507-00			2		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-106	220-0419-00			3		NUT,PLAIN,SQ:6-32 X 0.312 INCH,STL	83385	OBD
-107	337-2081-00			1		SHIELD,CRT:FRONT	80009	337-2081-00
						(ATTACHING PARTS)		
	210-0586-00			2		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
	211-0116-00			2		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
-108	348-0064-00			1		GROMMET,PLASTIC:0.625 INCH DIA	80009	348-0064-00
-109	348-0253-00			1		GROMMET,PLASTIC:1.24 X 0.739 X 0.108" OA	80009	348-0253-00
-110	119-0486-00			1		DELAY LINE:FOR D41	80009	119-0486-00
	-----	-----		-		. DELAY LINE ASSEMBLY INCLUDES:		
-111	131-1576-00			2		. CONTACT,ELEC:DELAY LINE TERMINAL	80009	131-1576-00

# Mechanical Parts List—D41

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5					Name & Description	Mfr Code	Mfr Part Number
1-112	380-0342-00		1					HOUSING,DEL LINE: (ATTACHING PARTS)	80009	380-0342-00	
-113	210-0457-00		3					NUT,PLAIN,EXT W:6-32 X 0.312,INCH,STL - - - * - - -	83385	OBD	
-114	210-1092-00		3					WASHER,FLAT:0.147 ID X 0.312" OD,BRS (ATTACHING PARTS)	12327	OBD	
-115	211-0008-00		3					SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	OBD	
-116	426-1126-00		1					FRAME ASSY:	80009	426-1126-00	
-117	179-1969-00		1					WIRING HARNESS:MAIN	80009	179-1969-00	
	-----		-					. WIRING HARNESS INCLUDES:			
-118	131-0621-00		2					. CONTACT,ELEC:0.577"L,22-26 AWG WIRE	22526	46231	
-119	131-0861-00		3					. TERM.,DISC:FOR 0.22 WD X 0.02" THK TAB	00779	42617-2	
-120	200-1075-00		3					. COVER,TERM.:	00779	1-480435-0	
-121	352-0199-03		1					. HOLDER,TER.CON:3 WIRE ORANGE	80009	352-0199-03	
-122	175-0825-00		FT					WIRE,ELECTRICAL:2 WIRE RIBBON	08261	OBD	
-123	175-0826-00		FT					WIRE,ELECTRICAL:3 WIRE RIBBON	80009	175-0826-00	
-124	175-0828-00		FT					WIRE,ELECTRICAL:5 WIRE RIBBON	08261	OBD	
-125	175-0832-00		FT					WIRE,ELECTRICAL:9 WIRE RIBBON	08261	OBD	
-126	175-0855-00		FT					WIRE,ELECTRICAL:10 WIRE RIBBON	23499	TEK-175-0855-00	
	175-0860-00		FT					WIRE,ELEC:5 WIRE RIBBON	23499	TEK-175-0860-00	
	175-0863-00		FT					WIRE,ELEC:2 WIRE RIBBON	80009	175-0863-00	
-127	131-0371-00		2					CONTACT,ELEC:FOR NO.26 AWG WIRE	98278	12093-8	
-128	131-0707-00		75					CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439	
	131-0621-00		19					CONTACT,ELEC:0.577"L,22-26 AWG WIRE	22526	46231	
	352-0161-00		1					HOLDER,TERM.CON:3 WIRE BLACK	80009	352-0161-00	
-129	352-0163-00		3					HOLDER,TERM.CON:5 WIRE BLACK	80009	352-0163-00	
	352-0163-05		1					HOLDER,TERM.CON:5 WIRE GREEN	80009	352-0163-05	
-130	352-0167-00		2					HOLDER,TERM.CON:9 WIRE BLACK	80009	352-0167-00	
	352-0167-04		2					HOLDER,TERM.CON:9 WIRE YELLOW	80009	352-0167-04	
-131	352-0168-02		1					HOLDER,TERM.CON:10 WIRE RED	80009	352-0168-02	
-132	352-0169-00		1					HOLDER,TERM.CON:2 WIRE BLACK	80009	352-0169-00	
	352-0169-03		1					HOLDER,TERM.CON:2 WIRE ORANGE	80009	352-0169-03	
	352-0198-00		1					HOLDER,TERM.CON:2 WIRE BLACK	80009	352-0198-00	
	352-0201-05		1					HOLDER,TERM.CON:5 WIRE GREEN	80009	352-0201-05	
	352-0206-02		1					HOLDER,TERM.CON:10 WIRE RED	80009	352-0206-02	
-133	407-1348-00		1					BRACKET,ANGLE: (ATTACHING PARTS)	80009	407-1348-00	
-134	210-0586-00		4					NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD	
-135	211-0012-00		2					SCREW,MACHINE:4-40 X 0.375 INCH,PNH STL	83385	OBD	
-136	211-0008-00		2					SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	OBD	



# SYMBOLS AND REFERENCE DESIGNATORS

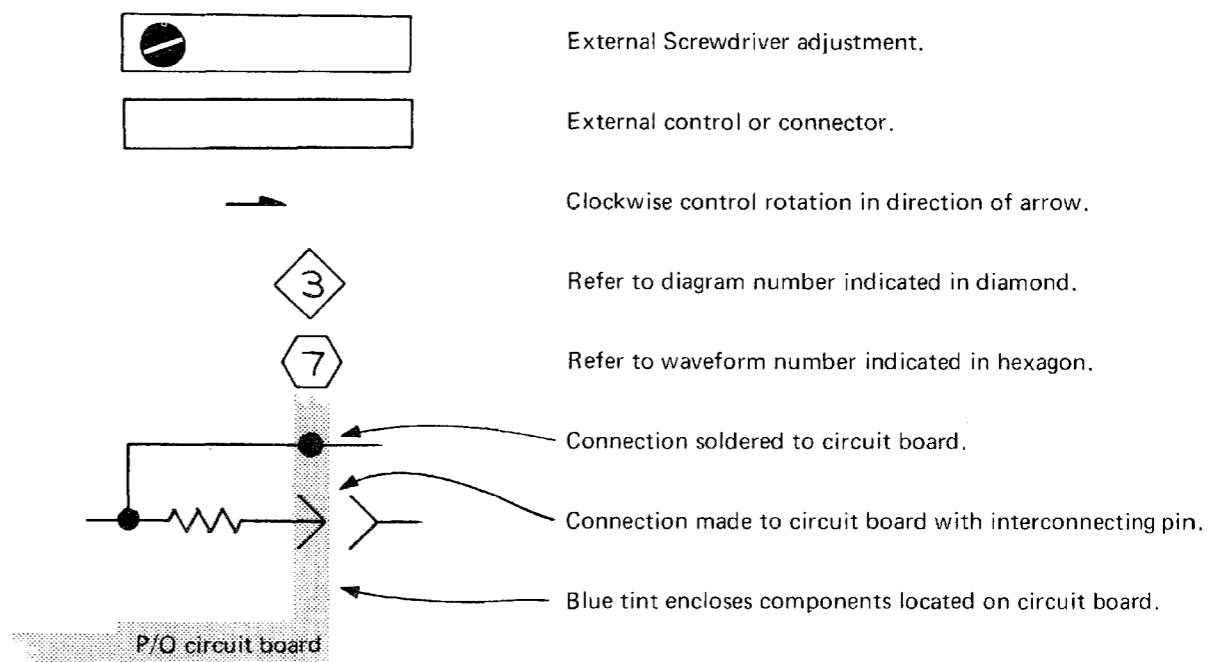
Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).  
Values less than one are in microfarads ( $\mu$ F).  
Resistors = Ohms ( $\Omega$ )

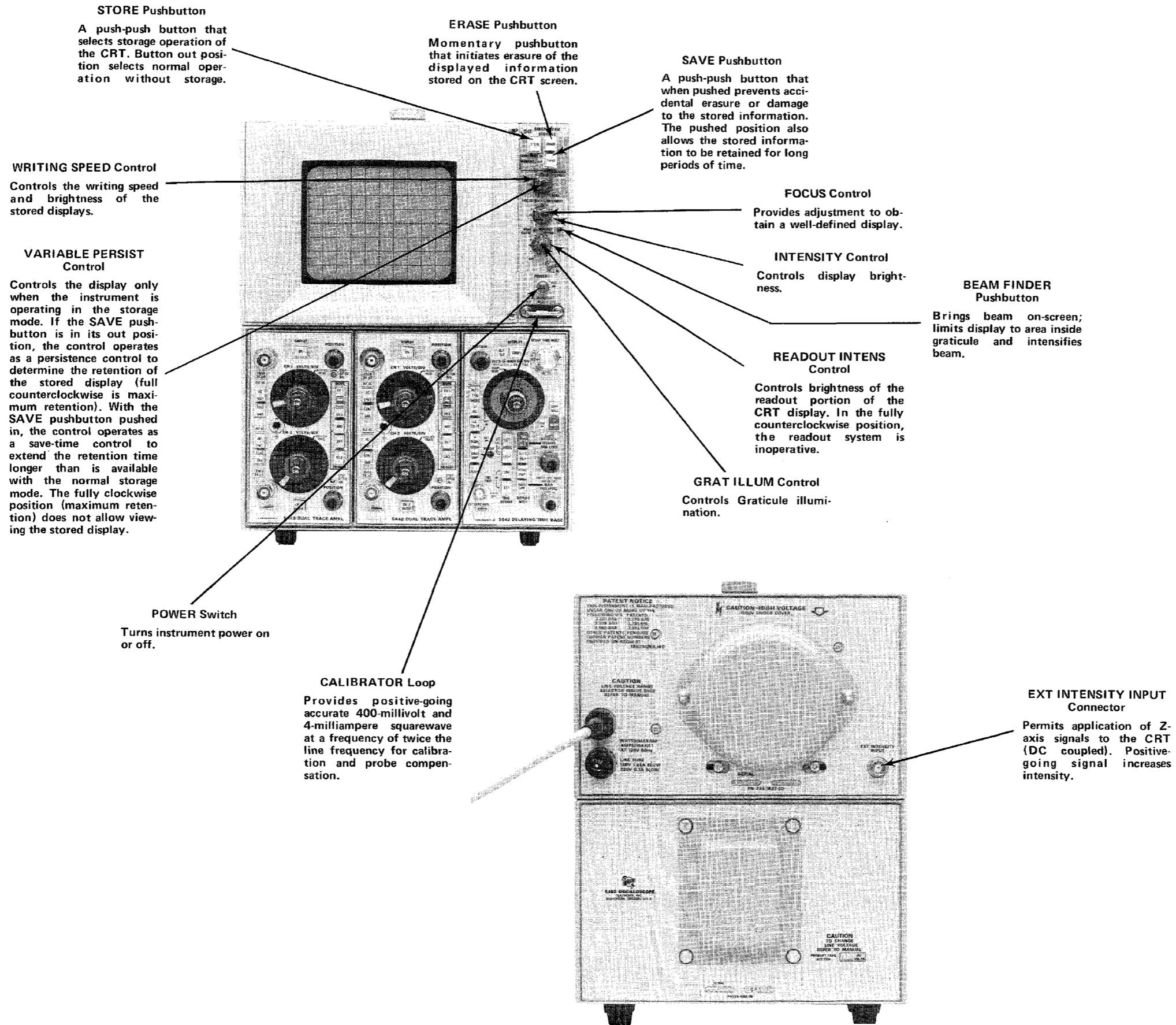
Symbols used on the diagrams are based on ANSI Y32.2 – 1970.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



# CONTROLS AND CONNECTORS



# ADJUSTMENTS

Adjustment is generally required after a repair has been made, or after long time intervals in which normal aging of components may affect instrument accuracy. For initial inspection to verify instrument operation, the basic operation procedure in section 1 should be used (the instrument is checked with its covers on, using a minimum of peripheral equipment).

Before complete adjustment, thoroughly clean and inspect this instrument as outlined in the service section of the 5403 manual. Also, the system manual contains information for general maintenance of this instrument, including preventive maintenance, component identification and replacement, etc.

## Services Available

Tektronix, Inc., provides complete instrument repair and adjustment at local Field Service Centers and at the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

## Equipment Required

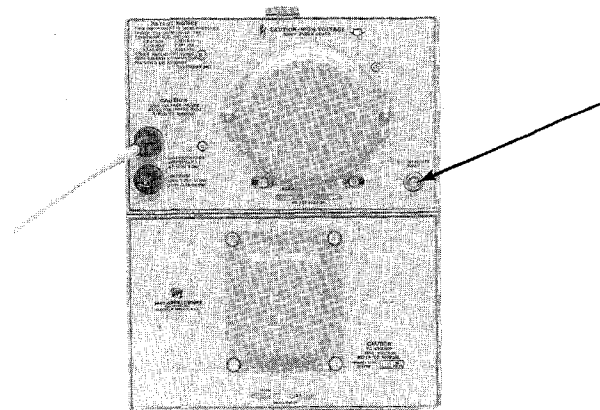
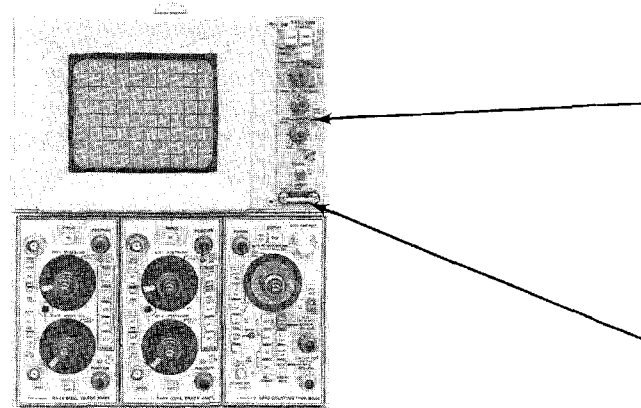
1. Time-base plug-in unit.
2. Two vertical plug-in units, both of which must be dual-trace units.
3. Sinewave generator with a variable 0-6 volt signal amplitude at 1 kHz and 60 MHz.

## Preliminary Procedure

### NOTE

*The performance of this instrument can be checked at any temperature within the 0°C to +50°C range. Make any adjustments at a temperature of +25°C, ±5°C.*

- a. Install a vertical dual-trace plug-in in the left plug-in compartment and a time-base plug-in in the right plug-in compartment.
- b. Check that the correct nominal line-selector block has been installed on the line-selector pins and that the regulating range selected includes the input line voltage, see Installation section for complete instructions.
- c. Connect the 5403-D41 to the line voltage source and pull the POWER switch out to turn the instrument on.



### 1. Check Trigger Amplifier

Connect a properly terminated 60 MHz<sup>1</sup> signal to channel 1 on the vertical plug-in. Set the time-base sec/div switch to .1 μ. Set the vertical and time-base plug-in triggering controls to trigger on + slope, channel 1, and left plug-in compartment signal.

Adjust the output amplitude of the sine-wave generator for exactly 1 major graticule division of signal. Check that a stable display can be obtained.

### 2. Check Beam Finder

Using the signal established in step 1 press the BEAM FINDER pushbutton. Check that the display intensity increases and that the signal cannot be positioned out of the viewing area as long as the BEAM FINDER pushbutton is depressed.

Disconnect the signal.

### 3. Check Calibrator

Connect the signal from the front-panel CALIBRATOR loop to channel 1 on the vertical plug-in. Set the time-base sec/div switch to 5 m and the vertical channel 1 volts/div to .1. Adjust the time-base triggering controls for a stable display. Check for a display four major graticule divisions high.

Disconnect the signal.

### 4. Check Z-Axis Amplifier

Connect a 5-volt, 1-kHz sine-wave signal to the EXT INTENSITY INPUT connector. Also, use the sine-wave signal to externally trigger the time-base plug-in. Set the time-base plug-in controls for an external, automatic, triggered 1 ms sweep. Check that bright spots occur at regular intervals along the trace. It may be necessary to reduce the trace brightness to observe the Z-axis modulation.

Disconnect the signal.

### 5. Check Chop and Alternate

Set the time-base sec/div switch to 50 m and push the chop pushbutton in. Set the vertical plug-in for dual-trace operation. Check for two spots, one above the other, going across the CRT.

Install a second dual-trace plug-in in the center plug-in compartment and set its controls for dual-trace operation. Set the time-base chop pushbutton to its out position. Check for two sweeps for the left plug-in (one for each channel), then two sweeps for the center plug-in, alternately.

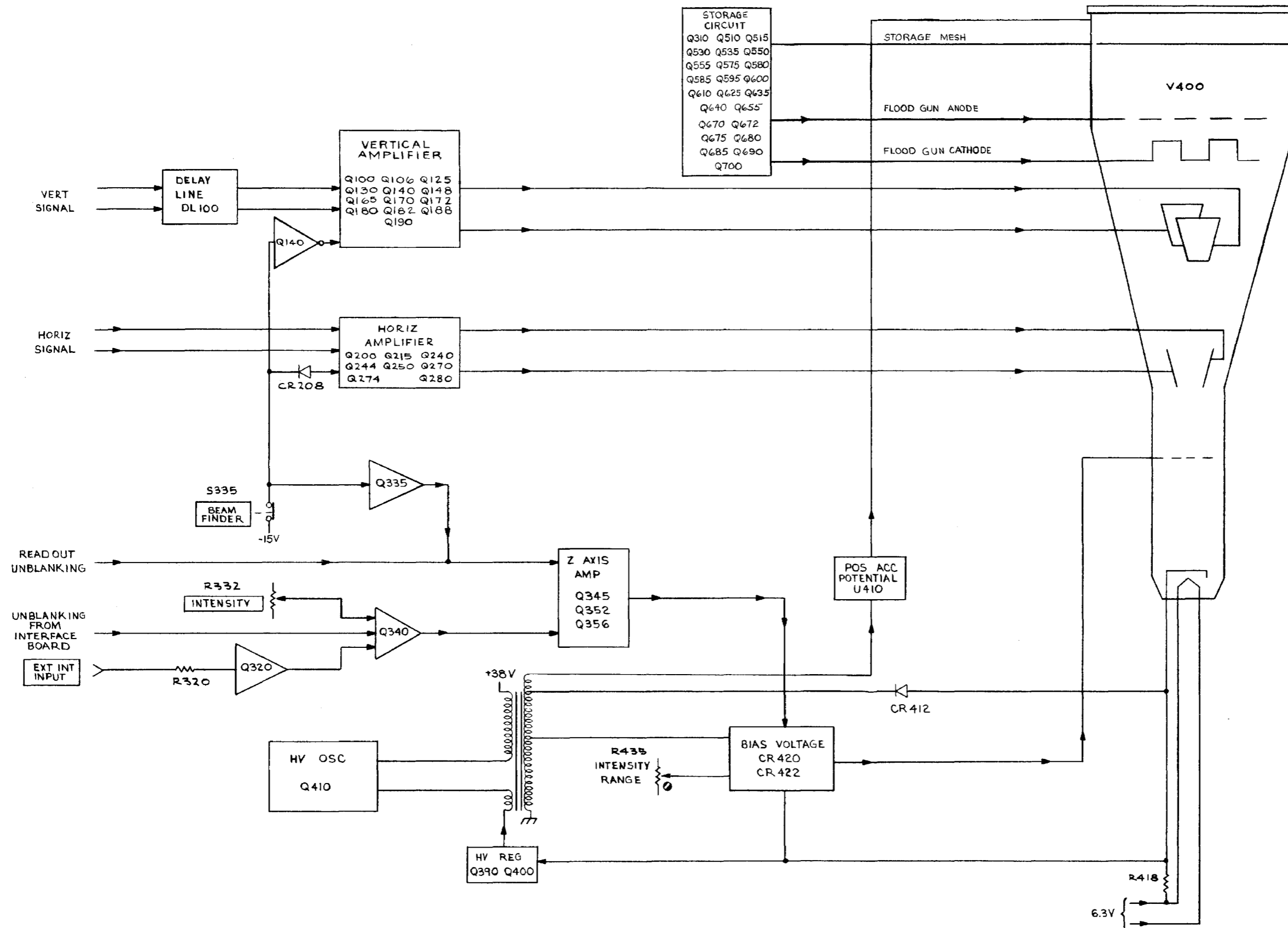
### 6. Orthogonality—R364

Connect 1 ms markers from the time marker generator to the vertical plug-in input connector using a coaxial cable.

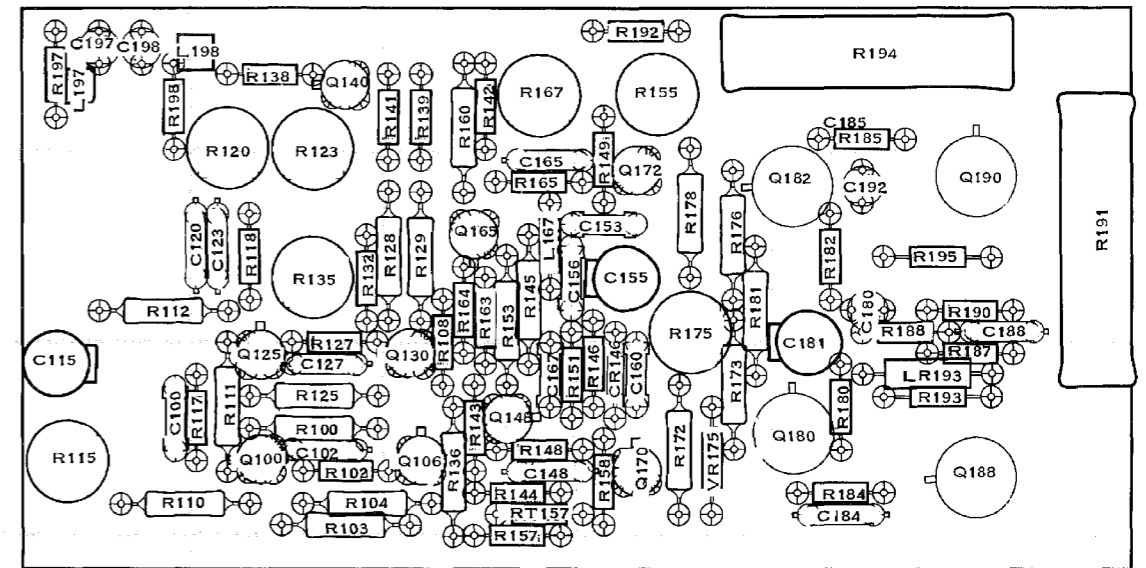
Set the time base controls for a 1 ms/Div sweep with auto triggering. Position the trace to the horizontal center line of the graticule.

Adjust R364 so that the vertical time markers make a 90° angle with the trace as observed at the graticule center. The adjustment of R364 may have to be compromised to make the angle as close as possible to the desired 90°.

<sup>1</sup> A 5A48 Dual Trace Amplifier and a 5B42 Delaying Time Base plug-in units were used for this check. If other plug-in units are used the trigger amplifier bandpass will depend on the vertical plug-in unit bandpass and the triggering capabilities of the time-base plug-in unit.



# PARTS LOCATION GRID



Located on back of board  
C173

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C100	A3	C184	E3	CR146	D3	Q100	B3	R100	B3	R129	C2	R157	C3	R187	F2
C102	B3	C185	E1			Q106	C3	R102	B3	R132	B2	R158	D3	R188	E2
C115	A2	C188	F2	L167	C2	Q125	B2	R103	B3	R135	B2	R160	C1	R190	F2
C120	B2	C192	E2	L197	A1	Q130	C2	R104	B3	R136	C3	R163	C2	R191	F2
		C197	A1	L198	A1	Q140	B1	R108	C2	R138	B1	R164	C2	R192	D1
		C198	A1			Q148	C3	R110	A3	R139	C1	R165	C2	R193	E3
C123	B2			LR193	E3	Q165	C2	R111	B3	R141	C1	R167	C1	R194	E1
C127	B3					Q170	D3	R112	A2	R142	C1	R172	D3	R195	E2
C148	C3					Q172	D1	R115	A3	R143	C3	R173	D3	R197	A1
C153	D2					Q180	E3	R117	B3	R144	C3	R175	D2	R198	A1
C155	D2					Q182	E2	R118	B2	R145	C2	R176	D2		
C156	D2					Q188	F3	R120	B1	R146	D3	R178	D2	RT157	C3
C160	D3					Q190	F2			R148	C3	R180	E3		
C165	C1							R123	B1	R149	D1	R181	D2	VR175	D3
C167	C3							R125	B3	R151	D3	R182	E2		
C180	E2							R127	B2	R153	C2	R184	E3		
C181	E2							R128	C2	R155	D1	R185	E1		

# ADJUSTMENTS

## VERTICAL AMPLIFIER

### Equipment Required

1. Time-base plug-in unit with a triggered sweep rate of at least  $0.1 \mu\text{s}$ . For example, a Tektronix 5B42 Delaying Time Base or any time base that is compatible with the Tektronix 5403-D41 Oscilloscope.
2. Special Tektronix Calibration Fixture 067-0680-00.
3. Sine-wave generator with output frequencies of 3 MHz and 100 MHz.

### Preliminary Procedure

#### NOTE

The performance of this instrument can be checked at any temperature within the  $0^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  range. Make any adjustments at a temperature of  $+25^{\circ}\text{C}$ ,  $\pm 5^{\circ}\text{C}$ .

- a. Remove the cabinet panels covering the D41.
- b. Install the 067-0680-00 Calibration Fixture in the left plug-in compartment and a time-base plug-in in the right plug-in compartment.
- c. Check that the correct nominal line-selector block has been installed on the line-selector pins and that the regulating range selected includes the input line voltage, see Installation section for complete instructions.
- d. Connect the 5403-D41 to the line voltage source and pull the POWER switch out to turn the instrument on.

#### 1. Vertical Centering, R135

Install the 067-0680-00 Calibration Fixture in left plug-in compartment. Set the 067-0680-00 test switch to com mode. Adjust R135 to center the trace vertically on the graticule.

Remove the Calibration Fixture from the left plug-in compartment and install it into the center plug-in compartment. Trace position should be within 0.5 major divisions of vertical graticule center.

#### 2. Vertical Gain, R175

Move the 067-0680-00 from the center to the left plug-in compartment. Set the test switch of the Calibration Fixture to vert or horiz gain and depress the 1 kHz rep rate switch. Position the bright trace to the center of the graticule with the position control of the 067-0680-00.

Adjust R175 so that the horizontal traces coincide with the horizontal graticule lines, one trace per division. Place the first and last trace of the center seven traces exactly on their respective graticule lines.

#### 3. Vertical Compensation Flat Top, R120, R123

Set the test switch of the 067-0680-00 Calibration Fixture to vert or horiz + step resp and depress the 100 kHz rep rate switch. Center the square-wave signal, then increase its amplitude to 6 major divisions with the amplitude control of the 067-0680-00.

Change the sweep rate of the time-base plug-in to  $1 \mu\text{s}$  and adjust R120 for a flat waveform top. Change the sec/div switch of the time-base plug-in to  $0.5 \mu\text{s}$  sweep rate and adjust R123 for optimum level top of the signal. Repeat as necessary to obtain optimum flat top on the waveform.

Square Front Corner, C115, R115, C155, R155, R167, and C181.

Depress the 1 MHz rep rate switch on the 067-0680-00 Calibration Fixture. Set the main sec/div switch of the time-base plug-in to  $0.1 \mu\text{s}$ , and adjust the main trig level for a stable step function display.

Adjust C637 (this adjustment located on interface board between vertical components, SN B061533 - up), C115, R115, C155, R155, R167, and C181 for a square front corner. There is direct interaction between C115 and R115 and between C155 and R155. Best results are usually obtained by setting R115 fully cw, then adjusting C115.

Adjust R155 and R167 for minimum ringing of front corner. Adjust C637 (on interface board between vertical compartments, SN B061533 - up), C155 and C115 for a level front corner. After other front corner adjustments have been made, adjust C181 for optimum rise-time and minimum front corner spike.

Position effect: Using a 6 division square-wave, position it down so 3 divisions remain on screen. The front corner aberrations should not exceed 0.36 division (6%).

Change the STEP RESP. to — and position the 6 division squarewave up so 3 divisions remain on screen. The front corner aberrations should not exceed 0.36 division.

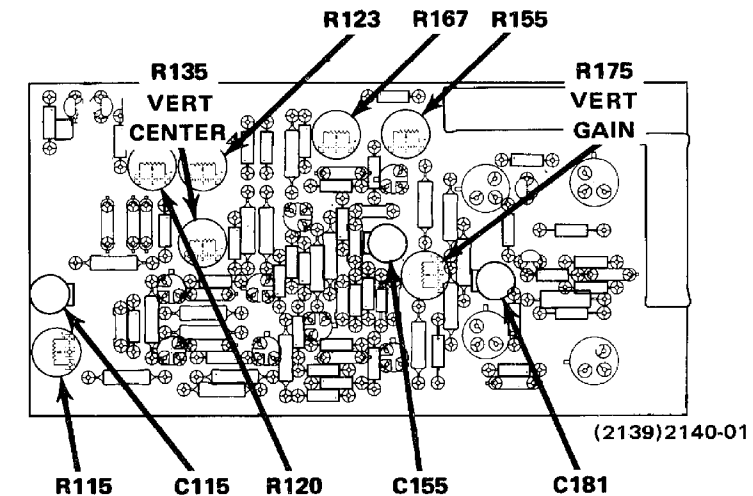
Install Calibration fixture into right plug-in compartment and repeat checks.

#### 4. Check Vertical Bandwidth

Set the 067-0680-00 test switch to vert or horiz freq resp. Connect a 3 MHz sine wave from a  $50 \Omega$  source to the 067-0680-00 aux in cw in (freq resp) connector. Adjust the output amplitude of the sine-wave generator to obtain a vertical CRT display of six major graticule divisions.<sup>1</sup> (Green light must go on.)

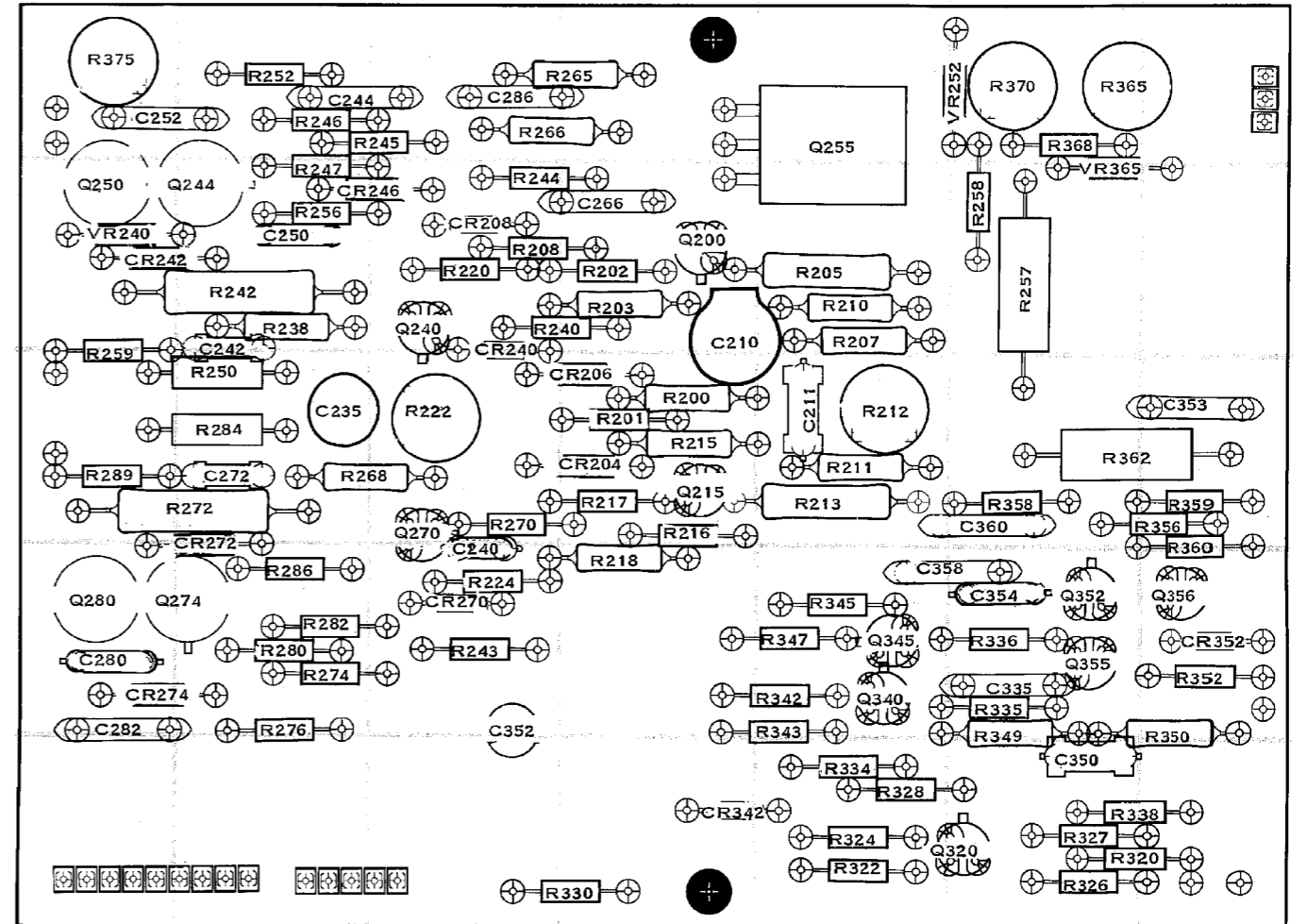
Change the sine-wave frequency to 90 MHz. Check that the vertical CRT display is still at least 4.2 major graticule divisions.

<sup>1</sup> Refer to the 067-0680-00 Calibration Fixture manual for how to get a leveled sine-wave output.





# PARTS LOCATION GRID



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C210	E2	C353	G3	CR204	D3	Q200	D2	R200	D3	R242	B2	R289	A3	R352	G4
C211	E3	C358	E4	CR206	D3	Q215	D3	R201	D3	R243	C4	R320	F5	R356	G3
C235	B3	C360	F3	CR208	C2	Q240	C2	R202	D2	R250	B3	R322	E5	R358	F3
C240	C3			CR240	C2	Q244	B2	R203	D2	R252	B1	R324	E5	R359	G3
C242	B2			CR242	A2	Q250	A2	R205	E2	R256	B2	R326	F5	R360	G3
C244	B1			CR246	C2	Q255	E1	R207	E2	R257	F2	R327	F5	R362	F3
C250	B2			CR270	A4	Q270	C3	R208	C2	R258	F2	R328	E5	R365	F1
C252	A1			CR272	B3	Q274	B4	R210	E2	R259	A2	R330	D5	R368	F1
C266	D2			CR274	B4	Q280	A4	R211	E3	R265	C1	R334	E5	R370	F1
C272	B3			CR342	D5	Q320	E5	R212	E3	R266	C1	R335	F4	R375	A1
C282	H-4			CR352	G4	Q340	E4	R213	E3	R268	C3	R336	F4		
C280	A4					Q345	E4	R215	D3	R270	C3	R338	F5		
C282	A4					Q352	F4	R216	D3	R272	B3	R342	E4	VR240	A2
C286	C1					Q355	F4	R217	D3	R274	B4	R343	E4	VR252	F1
C335	F4					Q356	G4	R218	D4	R276	B4	R345	E4	VR270	B4
C350	F5							R220	C2	R280	B4	R347	E4	VR365	F1
C352	C4							R222	C3	R282	B4	R349	F4		
C354	F4							R224	C4	R284	B3	R350	G4		
								R238	B2	R286	B4				
								R240	C2						



# ADJUSTMENTS

## HORIZONTAL AMPLIFIER

### Equipment Required

1. Vertical plug-in unit.
2. Time-base plug-in unit.
3. Special Tektronix calibration fixture 067-0680-00.
4. Time-marker generator having 10 ns and 1 ms markers.
5. Sinewave generator with output frequencies of 50 kHz and 2 MHz.

### Preliminary Procedure

#### NOTE

The performance of this instrument can be checked at any temperature within the 0°C to +50°C range. Make any adjustments at a temperature of +25°C, ±5°C.

- Remove the cabinet panels covering the D41.
- Install a vertical plug-in in the left plug-in compartment and a time-base plug-in in the right plug-in compartment.
- Check that the correct nominal line-selector block has been installed on the line-selector pins and that the regulating range selected includes the input line voltage, see Installation section for complete instructions.
- Connect the 5403-D41 to the line voltage source and pull the POWER switch out to turn the instrument on.

### 2. Trace Rotation, R375

Set the time-base controls for a 1 ms/div sweep with auto triggering. Adjust R375 to make the trace parallel to the horizontal graticule lines.

### 8. 5 ns Timing, C235

DO NOT make this ADJUSTment unless a time-base plug-in having a 5 ns sweep is available.

Connect 5 ns markers from the time-marker generator to the 067-0680-00, aux in cw in (freq resp) connector, using a coaxial cable. Adjust the 067-0680-00 amplitude control for a marker height of about five major divisions.

Set the time-base main sec/div switch to .05 and push the mag pushbutton in. Adjust the time-base triggering controls for a stable display.

Adjust C235 for one 5 ns marker per division over the center eight major graticule divisions. Check linearity ( $\pm 6 \frac{1}{2}\%$ ) of entire sweep, excluding the first three and the last ten major divisions.

C235 and C210 interact with each other. It therefore may be necessary to recheck step 7 and this step.

### 7. 10 ns Timing, C210

Interchange the 067-0680-00 and time-base plug-ins (a 5B42 plug-in or a time-base plug-in having a 10 ns sweep must be used), i.e., 067-0680-00 in left plug-in compartment and time-base in right plug-in compartment. Set 067-0680-00 test switch to aux in. Connect 10 ns markers from the time-marker generator to the 067-0680-00, aux in cw in (freq resp) connector, using a coaxial cable. Adjust the 067-0680-00 amplitude control for a marker height of about five major divisions.

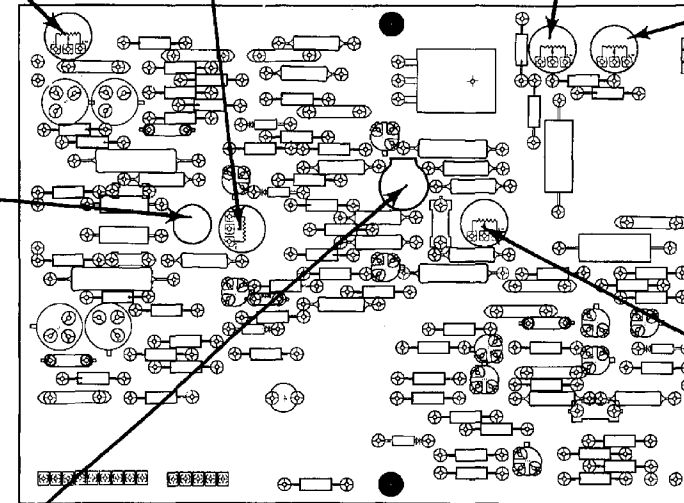
Set the time-base main sec/div switch to .1 and push the mag pushbutton in. Adjust the time-base triggering controls for a stable display.

Adjust C210 for one 10 ns marker per division over the center eight major graticule divisions. Check linearity ( $\pm 6 \frac{1}{2}\%$ ) of entire sweep, excluding the first three and the last ten major divisions.

### 3. Horizontal Centering, R222

Remove the vertical plug-in from the left plug-in compartment and install the time-base plug-in in its place. Install the 067-0680-00 calibration fixture in the right plug-in compartment.

Set the 067-0680-00 test switch to com mode. Adjust R222 to center the trace horizontally on the graticule.



### 1. Astig, R370

Set the time-base main sec/div switch to amp. Turn the FOCUS control fully clockwise, then adjust R370 for a nearly round spot on the CRT. Adjust the FOCUS control for smallest spot.

### 4. Geom, R365

Set the 067-0680-00 (located in the right plug-in compartment) test switch to vert or horiz gain and depress the 1 MHz rep rate switch. Position bright vertical trace to center graticule line. Adjust R365 for minimum bow or tilt of vertical trace, using graticule as reference. Check that the bowing or tilting does not exceed one-half minor graticule division. The adjustment of R365 may have to be a compromise to bring all points within the tolerance.

### 5. Horiz Gain, R212

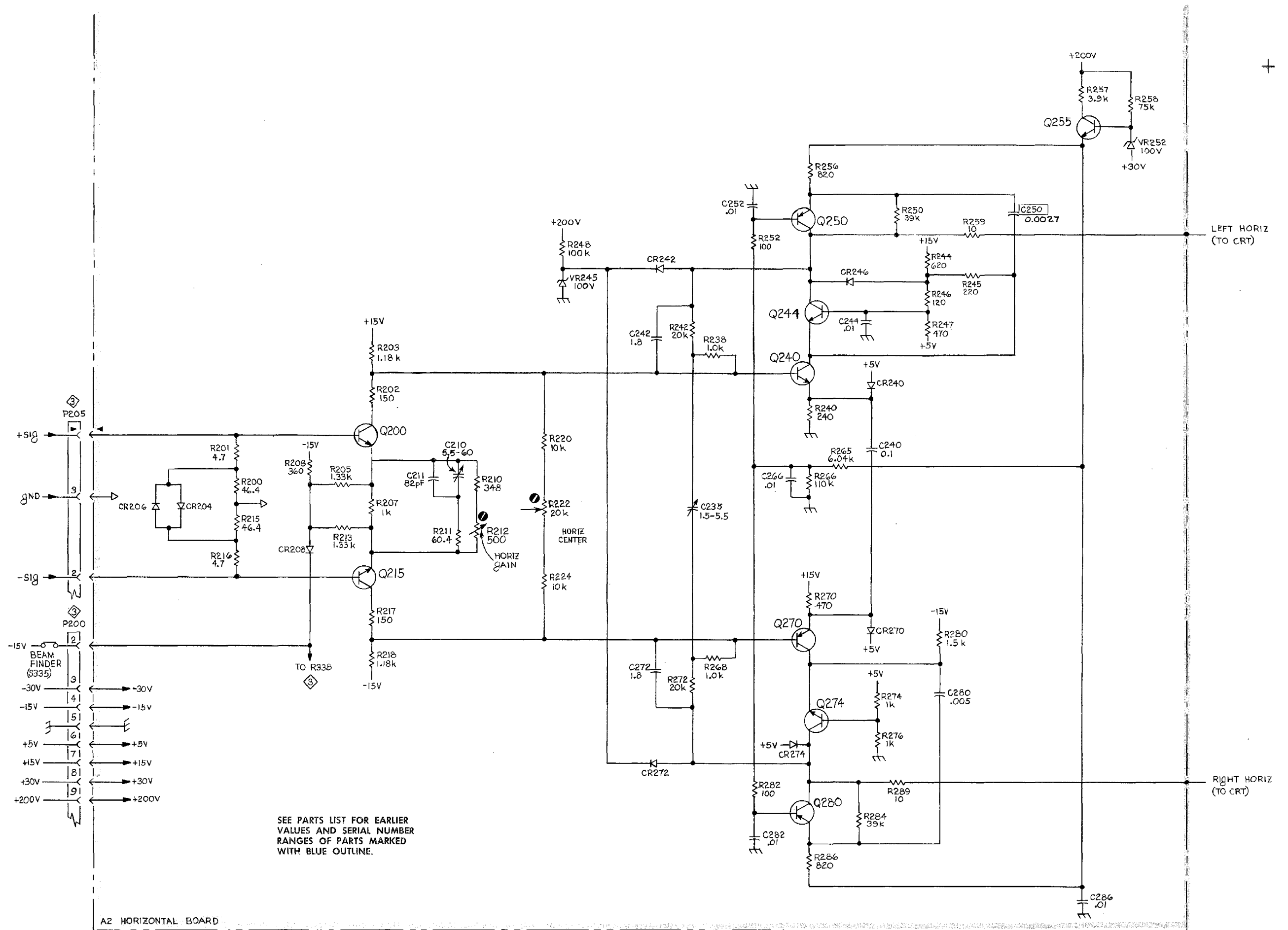
Adjust R212 for exactly eight major graticule divisions between the second and eighth vertical traces. Check for a display of one vertical line per major graticule division within one-quarter minor division.

### 6. Check Horizontal Bandwidth

Set the 067-0680-00 test switch to aux in. Connect a correctly terminated 50 kHz sine wave to the 067-0680-00 aux in cw in (freq resp) connector. Adjust the output amplitude of the sine-wave generator to obtain a horizontal CRT display of six major graticule divisions.<sup>1</sup>

Change the input sine-wave frequency to the 067-0680-00 to 2 MHz. Check that the horizontal CRT display is still at least 4.2 major graticule divisions.

<sup>1</sup> Refer to the 067-0680-00 Calibration Fixture manual for how to get a leveled sine-wave output.



A2 HORIZONTAL BOARD

SEE PARTS LIST FOR EARLIER  
VALUES AND SERIAL NUMBER  
RANGES OF PARTS MARKED  
WITH BLUE OUTLINE.

# ADJUSTMENTS

## HIGH VOLTAGE

### POWER SUPPLY CIRCUIT BOARD

#### Equipment Required

For intensity range adjustment a vertical plug-in is required.

#### Preliminary Procedure

#### NOTE

*The performance of this instrument can be checked at any temperature within the 0°C to +50°C range. Make any adjustments at a temperature of +25°C, ±5°C.*

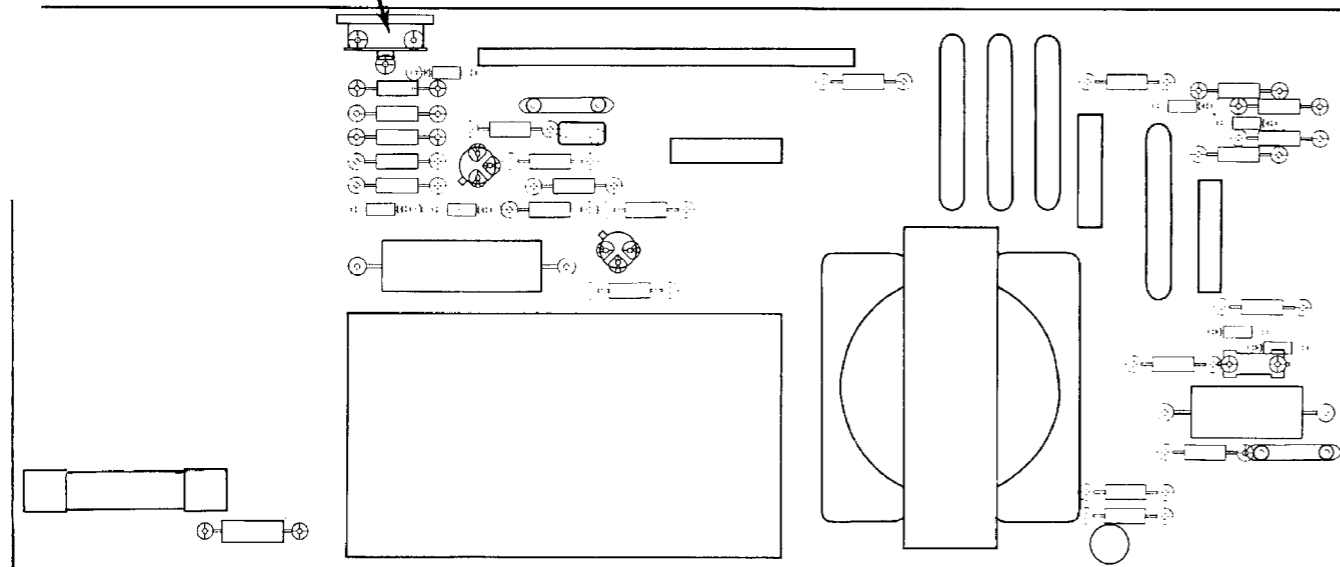
- a. Remove the cabinet panels covering the D41.
- b. Install a vertical plug-in in the right plug-in compartment.
- c. Check that the correct nominal line-selector block has been installed on the line-selector pins and that the regulating range selected includes the input line voltage, see Installation section for complete instructions.
- d. Connect the 5403-D41 to the line voltage source and pull the POWER switch out to turn the instrument on.

#### NOTE

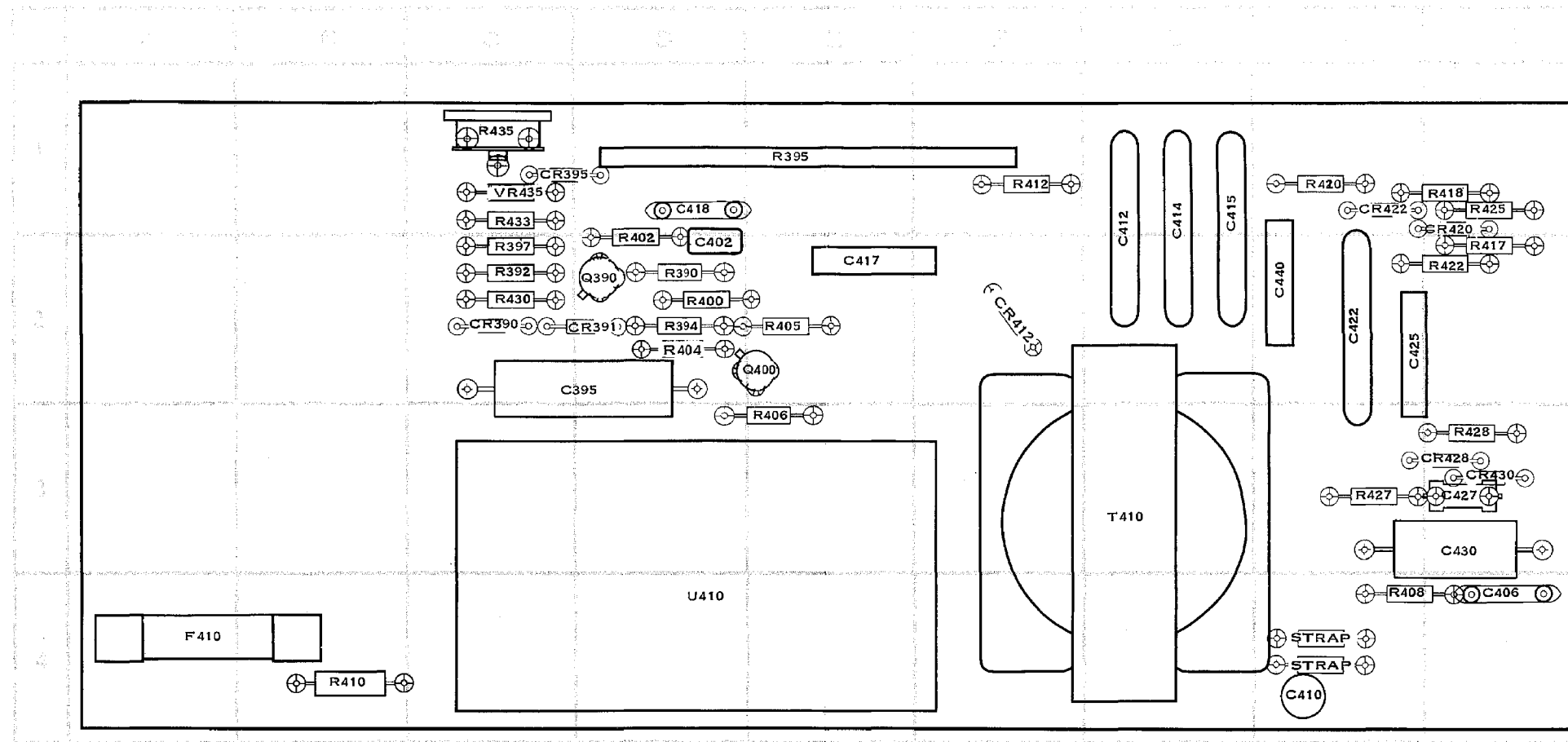
This adjustment need only be made if the CRT was changed.

#### 1. Intensity Range, R435

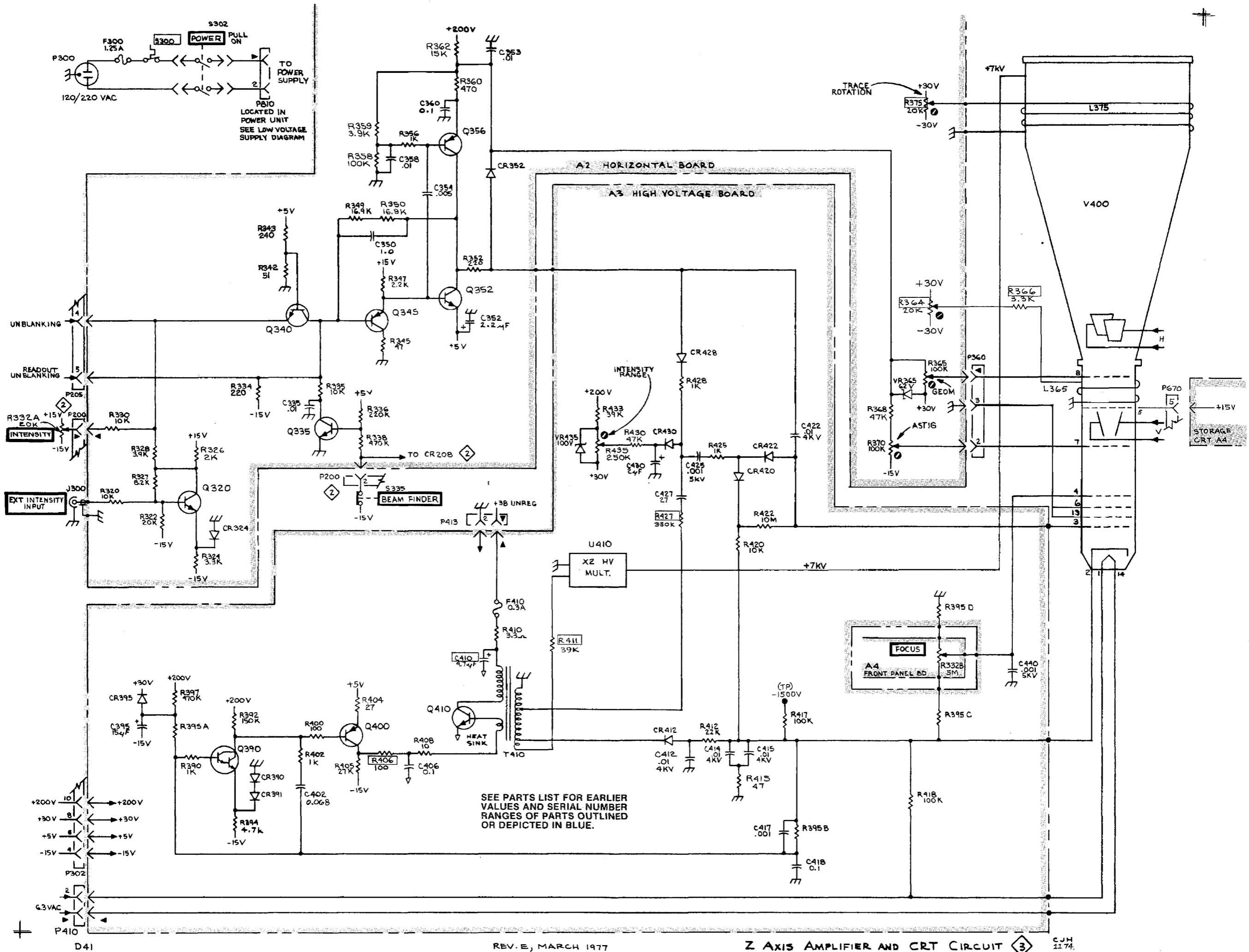
Turn INTENSITY control fully counterclockwise. Adjust R435, through the hole in the high-voltage shield, so spot is just extinguished. Turn INTENSITY control clockwise and note that visible spot appears when INTENSITY control is between its 8 and 11 o'clock positions.



# PARTS LOCATION GRID

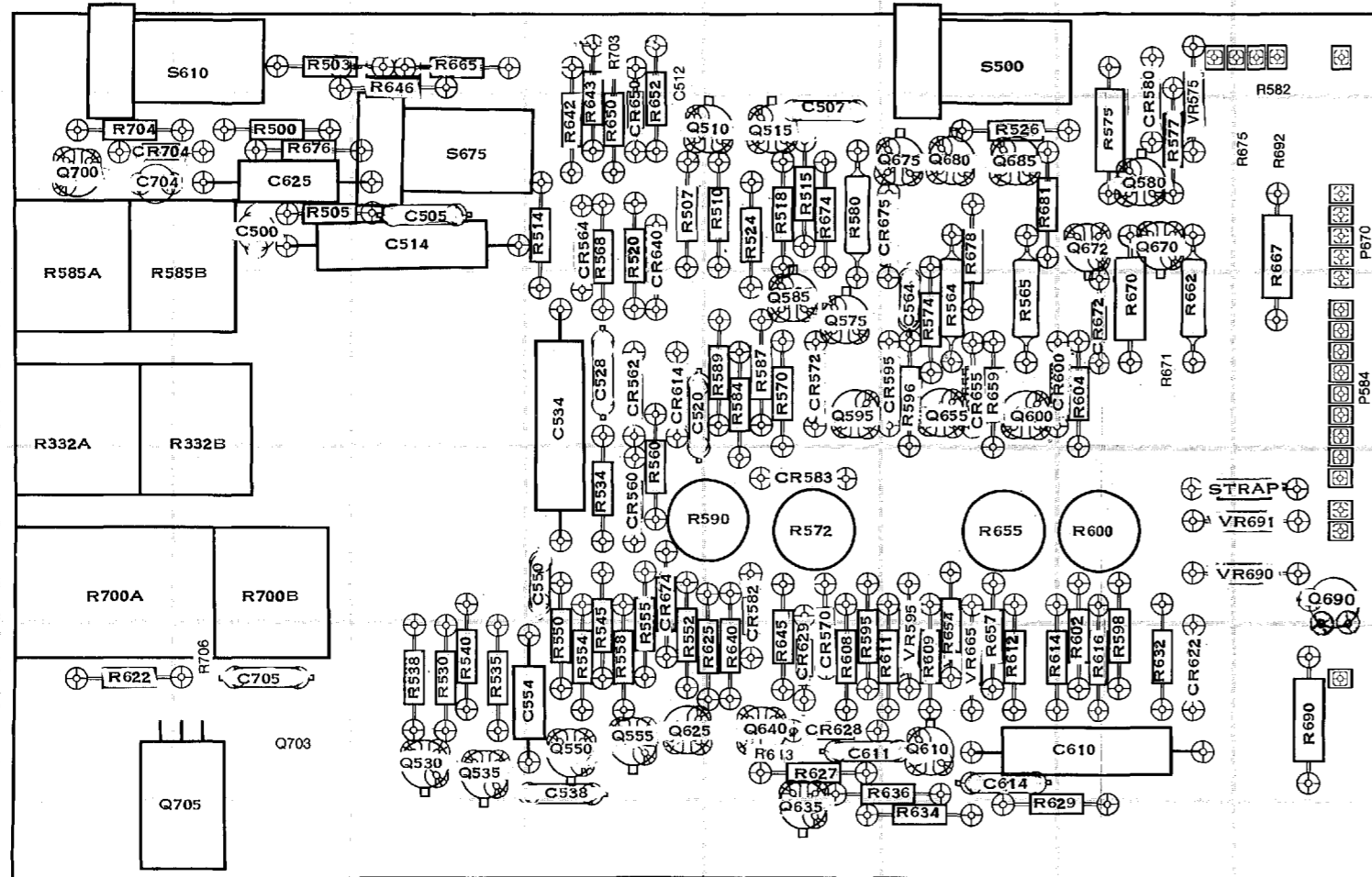


CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C395	C2	CR390	C2	F410	B4	Q390	D2	R390	D2	R420	H1	T410	G3	U410	D4	VR435	C1
C402	D1	CR391	D2			Q400	E2	R392	C2	R422	I2						
C406	I4	CR395	C1					R394	D2	R425	I1						
C410	H4	CR412	F2					R395	E1	R427	H3						
C412	G1	CR420	I1					R397	C1	R428	I3						
C414	G1	CR422	H1					R400	D2	R430	C2						
C415	G1	CR428	I3					R402	D1	R433	C1						
C417	E2	CR430	I3					R404	D1	R435	C1						
C418	D1							R405	E2								
C422	H2							R406	E2								
C425	H2							R408	H4								
C427	I3							R408	H4								
C430	I3							R410	B4								
C440	H2							R410	B4								
								R412	F1								
								R417	I1								
								R418	I1								



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN BLUE.

# PARTS LOCATION GRID



\*See Parts List for serial number ranges.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C500	B2	Q672	G2	R612	F5
C505	C2	Q675	F2	R613*	E5
C507	E2	Q680	F2	R614	G5
C512*	D2	Q685	F2	R616	G5
C514	C2	Q690	H4	R622	A5
C520	E3	Q700	A2	R625	E4
C528	D3	Q703*	B5	R627	E5
C534	D3	Q705	B5	R629	F5
C538	D5			R632	G5
C550	D4	R332A	A3	R634	F5
C554	D5	R332B	B3	R636	F5
C564	F3	R500	B2	R640	E4
C610	G5	R503	B1	R642	D2
C611	E5	R505	B2	R643	D2
C614	F5	R507	D2	R645	E4
C625	B2	R510	E2	R646	C1
C704	A2	R514	D2	R650	D2
C705	B5	R515	E2	R652	D2
		R518	E2	R654	F4
CR560	D4	R520	D2	R655	F4
CR562	D3	R524	E2	R657	F4
CR564	D2	R526	F2	R659	F3
CR570	E4	R530	C5	R662	G3
CR572	E3	R534	D4	R665	C1
CR580	G2	R535	C5	R667	H2
CR582	E4	R538	C5	R670	G3
CR583	E4	R540	C5	R671*	G3
CR595	F3	R545	D4	R672	G3
CR600	G3	R550	D4	R674	E2
CR614	D3	R552	D4	R675*	H2
CR622	G5	R554	D5	R676	B2
CR628	E5	R555	D4	R678	F2
CR629	E4	R558	D5	R681	F2
CR640	D2	R560	D4	R690	H5
CR650	D2	R564	F3	R692*	H2
CR655	F3	R565	F3	R700A	A4
CR674	D4	R568	D2	R700B	B4
CR675	F2	R570	E3	R703*	D1
CR704	A2	R572	E4	R704	A2
		R574	F3	R706*	B5
Q510	E2	R575	G2		
Q515	E2	R577	G2	S500	F1
Q530	C5	R580	E2	S610	B1
Q535	C5	R582*	H1	S675	C2
Q550	D5	R584	E3		
Q555	D5	R585A	A2	VR575	G2
Q575	E2	R585B	B2	VR595	F4
Q580	G2	R587	E3	VR665	F4
Q585	E2	R589	E3	VR690	H4
Q595	E2	R590	E4	VR691	H4
Q600	F3	R595	E4		
Q610	F5	R596	F3		
Q625	D5	R598	G4		
Q635	E5	R600	G4		
Q640	E5	R602	G4		
Q655	F3	R604	G3		
Q670	G2	R608	E5		
		R609	F5		
		R611	F5		

# ADJUSTMENTS

## STORAGE

### Equipment Required

1. Vertical plug-in unit.
2. Time-base plug-in unit.

### Preliminary Procedure

#### NOTE

*The performance of this instrument can be checked at any temperature with the 0°C to +50°C range. Make any adjustments at a temperature of +25°C, ±5°C.*

- a. Remove the cabinet panels covering the D41.
- b. Install a vertical plug-in in the left plug-in compartment and a time-base plug-in in the right plug-in compartment.
- c. Check that the correct nominal line-selector block has been installed on the line-selector pins and that the regulating range selected includes the input line voltage, see Installation section for complete instructions.
- d. Connect the 5403-D41 to the line voltage source and pull the POWER switch out to turn the instrument on.

### 2. Op Level and Prep Level, R590 and R572.

Turn the Prep Level, R572 and Op Level, R590 adjustments to their fully counterclockwise position.

Slowly turn the Op Level, R590 clockwise in small increments until the storage area no longer increases in brightness. Press the ERASE pushbutton after each increment of Op Level adjustment. When the proper operate level has been obtained, the storage area brightness should be the same as the stored trace.

Slowly rotate the Prep Level, R572 clockwise in small increments until the background level of the storage area is just visible. Press the ERASE pushbutton after each increment of Prep Level adjustment.

### 1. CE 1 and CE 3, R655 and R600

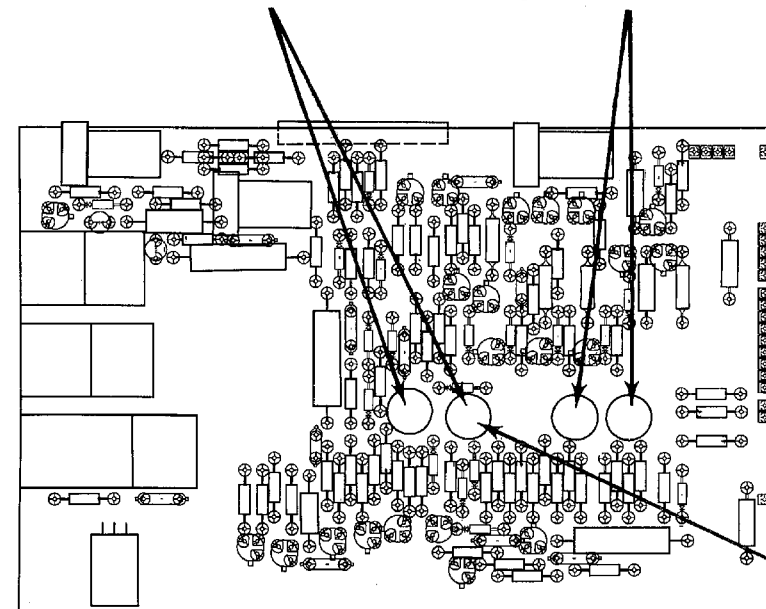
Set both the WRITING SPEED and the PERSIST controls fully clockwise. Set the SAVE pushbutton to its out position and the STORE pushbutton to its pushed-in position.

Using the time-base plug-in controls, obtain a trace. Slowly position the trace over the complete storage area of the CRT until a brightened display (storage area flooded) has been stored. If there is trouble in storing the trace, a slight adjustment can be made to the Op Level, R590, to permit storage.

Adjust CE 1, R655 and CE 3, R600 alternately until the brightened storage area just fills the area of the graticule.

### 3. Storage Functional Checks

Refer to the operating Instructions section of this manual.



### 4. Check Writing Speed

Turn the INTENSITY control cw until excessive spreading of the display just starts to occur, the FOCUS control should be adjusted for a well focused display. Set the WRITING SPEED control to its fully cw position.

Set the time base plug-in for a 0.2 μs/div sweep rate and for single-sweep operation. Rotate the time base main trigger level control from one extreme to its other extreme to cause a sweep.

If a stored trace is not visible, adjust R572 Prep Level slightly cw, then repeat this step.

# ADJUSTMENTS

## STORAGE

### Equipment Required

1. Vertical plug-in unit.
2. Time-base plug-in unit.

### Preliminary Procedure

#### NOTE

*The performance of this instrument can be checked at any temperature with the 0°C to +50°C range. Make any adjustments at a temperature of +25°C, ±5°C.*

- a. Remove the cabinet panels covering the D41.
- b. Install a vertical plug-in in the left plug-in compartment and a time-base plug-in in the right plug-in compartment.
- c. Check that the correct nominal line-selector block has been installed on the line-selector pins and that the regulating range selected includes the input line voltage, see Installation section for complete instructions.
- d. Connect the 5403-D41 to the line voltage source and pull the POWER switch out to turn the instrument on.

### 2. Op Level and Prep Level, R590 and R572.

Turn the Prep Level, R572 and Op Level, R590 adjustments to their fully counterclockwise position.

Slowly turn the Op Level, R590 clockwise in small increments until the storage area no longer increases in brightness. Press the ERASE pushbutton after each increment of Op Level adjustment. When the proper operate level has been obtained, the storage area brightness should be the same as the stored trace.

Slowly rotate the Prep Level, R572 clockwise in small increments until the background level of the storage area is just visible. Press the ERASE pushbutton after each increment of Prep Level adjustment.

### 1. CE 1 and CE 3, R655 and R600

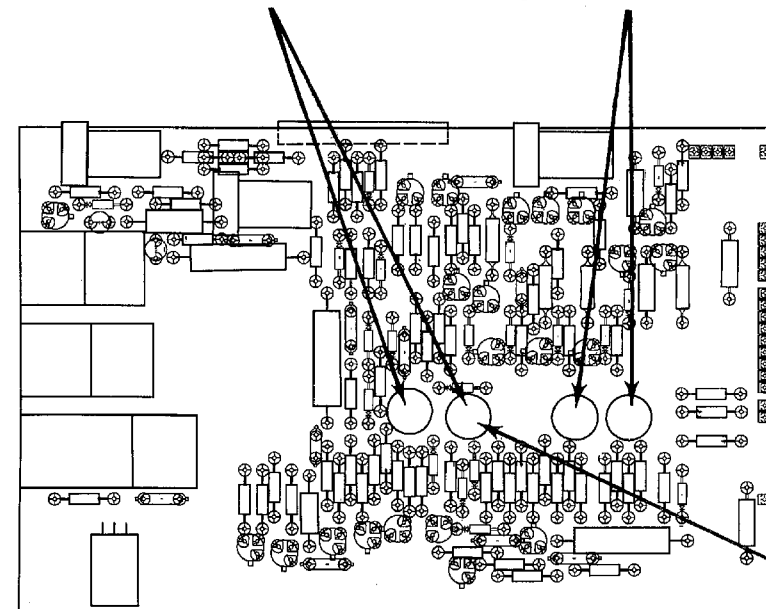
Set both the WRITING SPEED and the PERSIST controls fully clockwise. Set the SAVE pushbutton to its out position and the STORE pushbutton to its pushed-in position.

Using the time-base plug-in controls, obtain a trace. Slowly position the trace over the complete storage area of the CRT until a brightened display (storage area flooded) has been stored. If there is trouble in storing the trace, a slight adjustment can be made to the Op Level, R590, to permit storage.

Adjust CE 1, R655 and CE 3, R600 alternately until the brightened storage area just fills the area of the graticule.

### 3. Storage Functional Checks

Refer to the operating Instructions section of this manual.



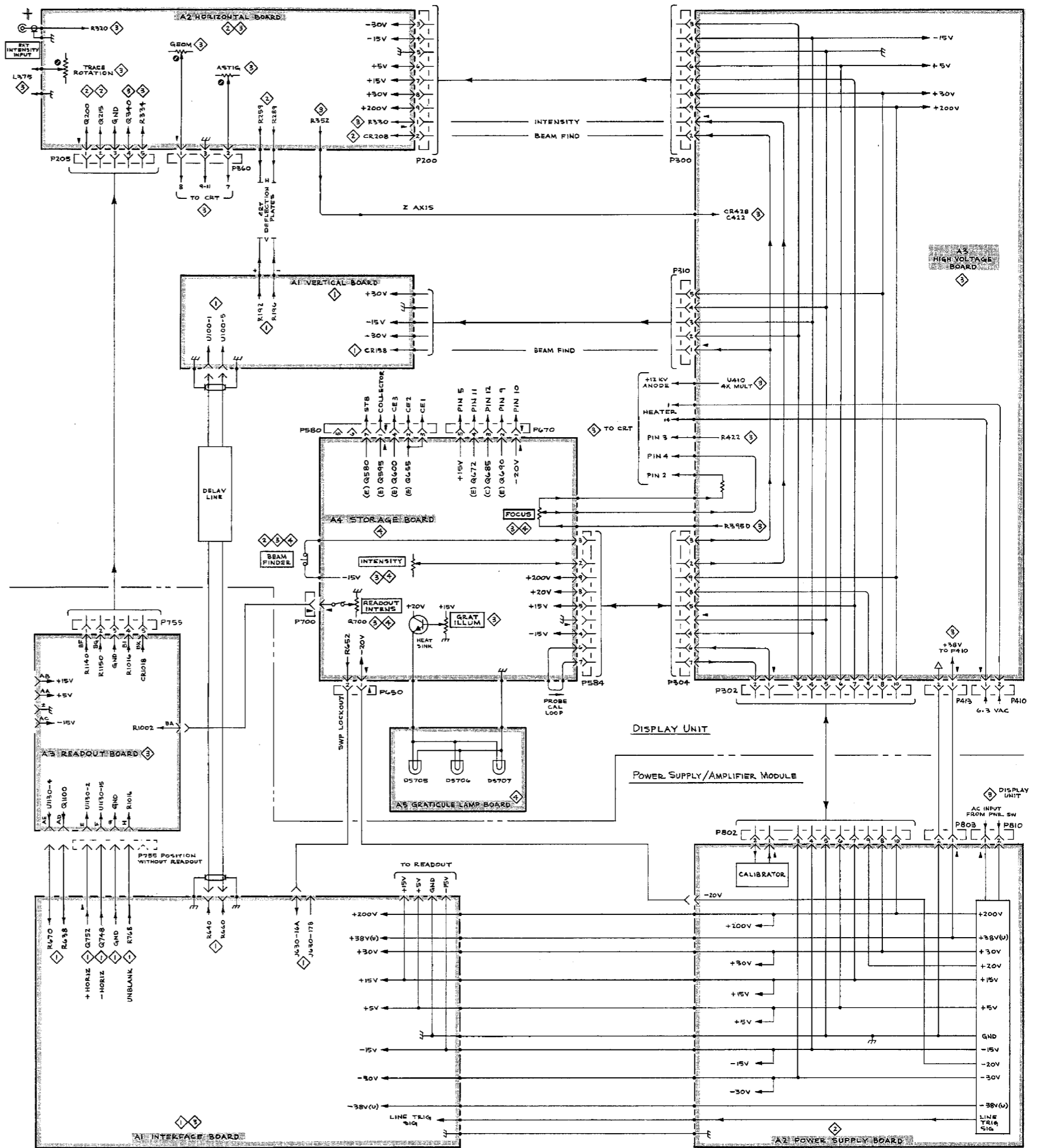
### 4. Check Writing Speed

Turn the INTENSITY control cw until excessive spreading of the display just starts to occur, the FOCUS control should be adjusted for a well focused display. Set the WRITING SPEED control to its fully cw position.

Set the time base plug-in for a 0.2 μs/div sweep rate and for single-sweep operation. Rotate the time base main trigger level control from one extreme to its other extreme to cause a sweep.

If a stored trace is not visible, adjust R572 Prep Level slightly cw, then repeat this step.





## **MANUAL CHANGE INFORMATION**

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

## **SERVICE NOTE**

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

# CALIBRATION TEST EQUIPMENT REPLACEMENT

## Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

### Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 $\Omega$ .	107 - Risetime less than 3.0 ns into 50 $\Omega$ .
108	PG 501 - 5 V output pulse; 3.5 ns Risetime.	108 - 10 V output pulse; 1 ns Risetime.
111	PG 501 - Risetime less than 3.5 ns; 8 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger Pulse delay.
114	PG 501 - $\pm 5$ V output.	114 - $\pm 10$ V output. Short proof output.
115	PG 501 - Does not have Paired, Burst, Gated, or Delayed pulse mode; $\pm 5$ V dc Offset. Has $\pm 5$ V output.	115 - Paired, Burst, Gated, and Delayed pulse mode; $\pm 10$ V output. Short-proof output.
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output.
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay.
114	PG 502 - $\pm 5$ V output	114 - $\pm 10$ V output. Short proof output.
115	PG 502 - Does not have Paired, Burst, Gated, Delayed & Undelayed pulse mode; Has $\pm 5$ V output.	115 - Paired, Burst, Gated, Delayed & Undelayed pulse mode; $\pm 10$ V output. Short-proof output.
2101	PG 502 - Does not have Paired or Delayed pulse. Has $\pm 5$ V output.	2101 - Paired and Delayed pulse; 10 V output.
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B, 191, 067-0532-01	SG 503 - Amplitude range 5 mV to 5.5 V p-p. SG 503 - Frequency range 250 kHz to 250 MHz. SG 503 - Frequency range 250 kHz to 250 MHz.	190B - Amplitude range 40 mV to 10 V p-p. 191 - Frequency range 350 kHz to 100 MHz. 0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Marker outputs, 5 sec to 1 $\mu$ s. Sinewave available at 20, 10, and 2 ns. Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns.	181 - Marker outputs, 1, 10, 100, 1000, and 10,000 $\mu$ s, plus 10 ns sinewave.
184	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Marker outputs, 5 sec to 2 ns. Sinewave available at 50, 20, 10, 5, and 2 ns. Separate trigger pulses of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 $\mu$ s. Marker amplifier provides positive or negative time marks of 25 V min. Marker intervals of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 $\mu$ s.
2901	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Marker outputs, 5 sec to 0.1 $\mu$ s. Sinewave available to 50, 10, and 5 ns. Separate trigger pulses, from 5 sec to 0.1 $\mu$ s. Multiple time-marks can be generated simultaneously.

**NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.**



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# MANUAL CHANGE INFORMATION

PRODUCT 5440/R & 5441/R  
070-2139-01 & 070-2140-00

CHANGE REFERENCE M30734

DATE 11-8-77

CHANGE:

DESCRIPTION

EFF SN B074125 (5440/R)      EFF SN B062200 (5441/R)

## ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

A2                    670-2335-04                    CKT BOARD ASSY:INTERFACE

ADD:

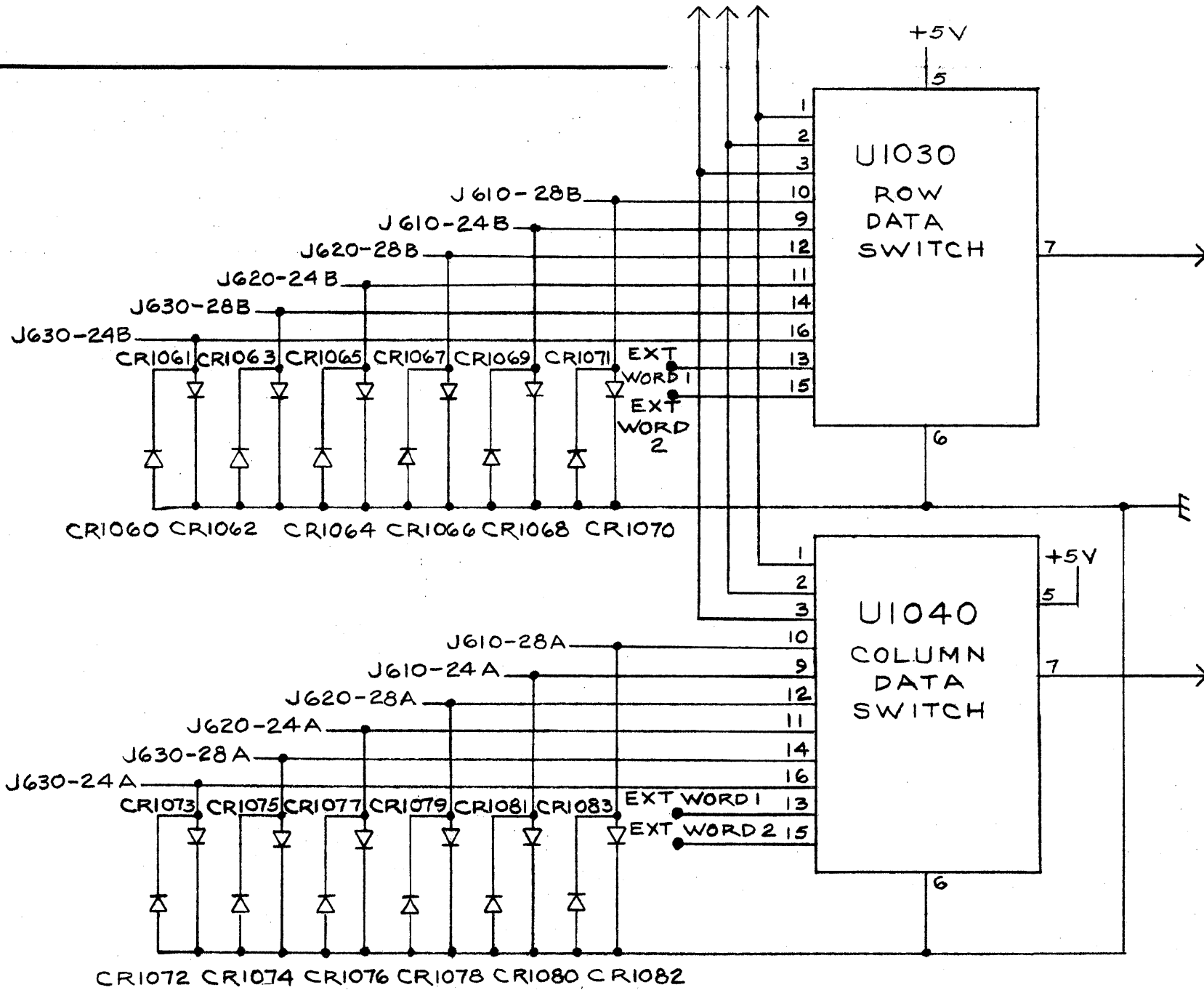
670-5035-00                    CKT BOARD ASSY:READOUT PROTECTION

CRL060

thru

CRL083

152-0333-00                    SEMICOND DEVICE:SILICON,55V,200MA,1N461D



READOUT PROTECTION

SCHEMATIC CHANGES

CHANGE:	DESCRIPTION

PRODUCT 5440/R, 5441/R CHANGE REFERENCE M30734 DATE 11-8-77



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# MANUAL CHANGE INFORMATION

PRODUCT 5440 & 5441

CHANGE REFERENCE M30792

DATE 3-17-77

**CHANGE:**

**DESCRIPTION**

EFF SN B073789 (5440) 070-2139-01

EFF SN B061967 (5441) 070-2140-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

DL100            119-0693-00            DELAY LINE,ELEC:



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# MANUAL CHANGE INFORMATION

PRODUCT 5440/R & 5441/R

CHANGE REFERENCE M24,547

DATE 10-8-76

CHANGE:	DESCRIPTION
---------	-------------

EFF SN B033100-up (5440) 070-2139-01

EFF SN B021497-up (5441) 070-2140-00

### ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

C180	283-0111-00	CAP., FXD, CER DI:0.1UF, 20%, 50V
C192	283-0111-00	CAP., FXD, CER DI:0.1UF, 20%, 50V
C197	283-0111-00	CAP., FXD, CER DI:0.1UF, 20%, 50V
C198	283-0111-00	CAP., FXD, CER DI:0.1UF, 20%, 50V

The parts listed above are located on the VERTICAL circuit board assembly and shown on diagram 1 VERTICAL AMPLIFIER.



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# MANUAL CHANGE INFORMATION

PRODUCT 5441  
070-2140-00

CHANGE REFERENCE M22400  
DATE 8-3-77 REV.     

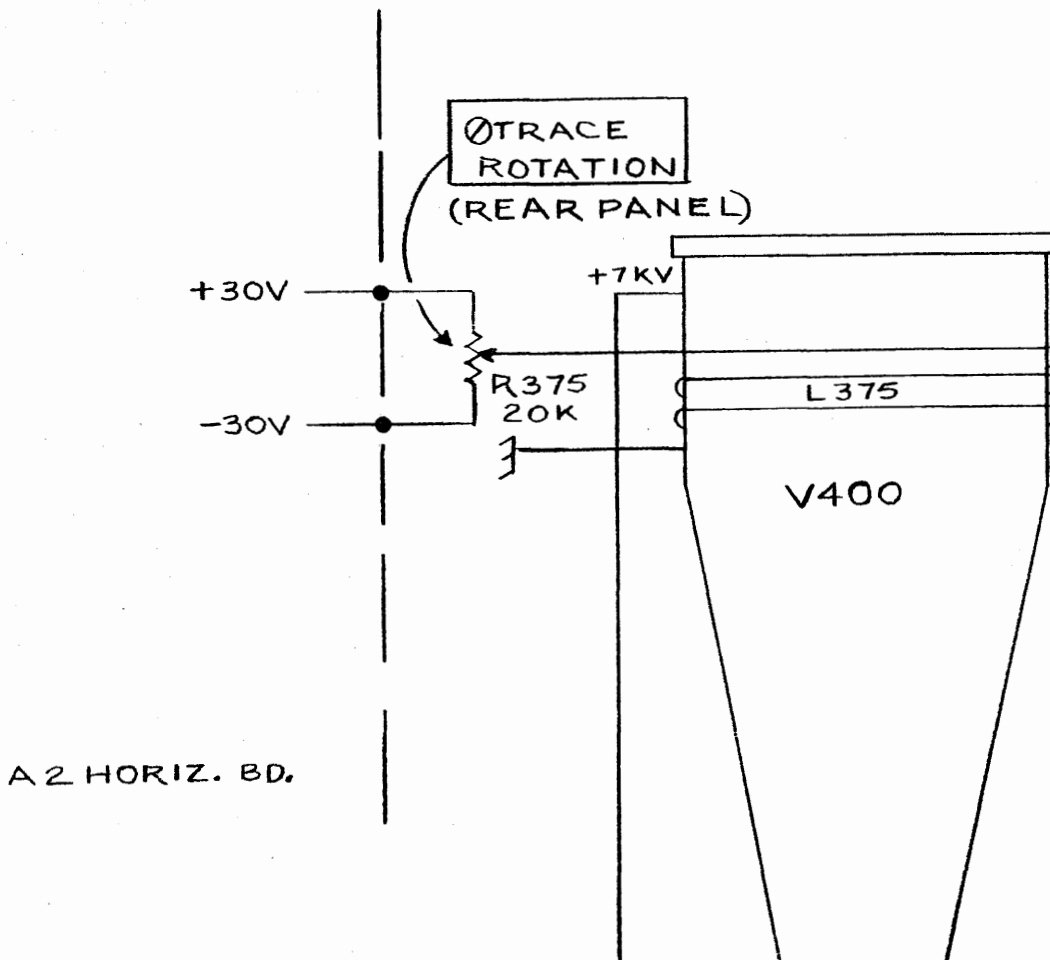
CHANGE:

DESCRIPTION

EFF SN B020000

The Trace Rotation pot R375 is moved from the HORIZONTAL AMPLIFIER circuit board to the top right corner of rear panel. See schematic sketch below.

DIAGRAM  Z-AXIS AMPLIFIER & CRT CIRCUIT







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# MANUAL CHANGE INFORMATION

PRODUCT 5440/R & 5441/R  
070-2139-01 & 070-2140-00

CHANGE REFERENCE M24973  
DATE 5-24-77 REV. 8-15-77

CHANGE:	DESCRIPTION
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EFF SN B080000-up                      MECHANICAL PARTS LIST CHANGES

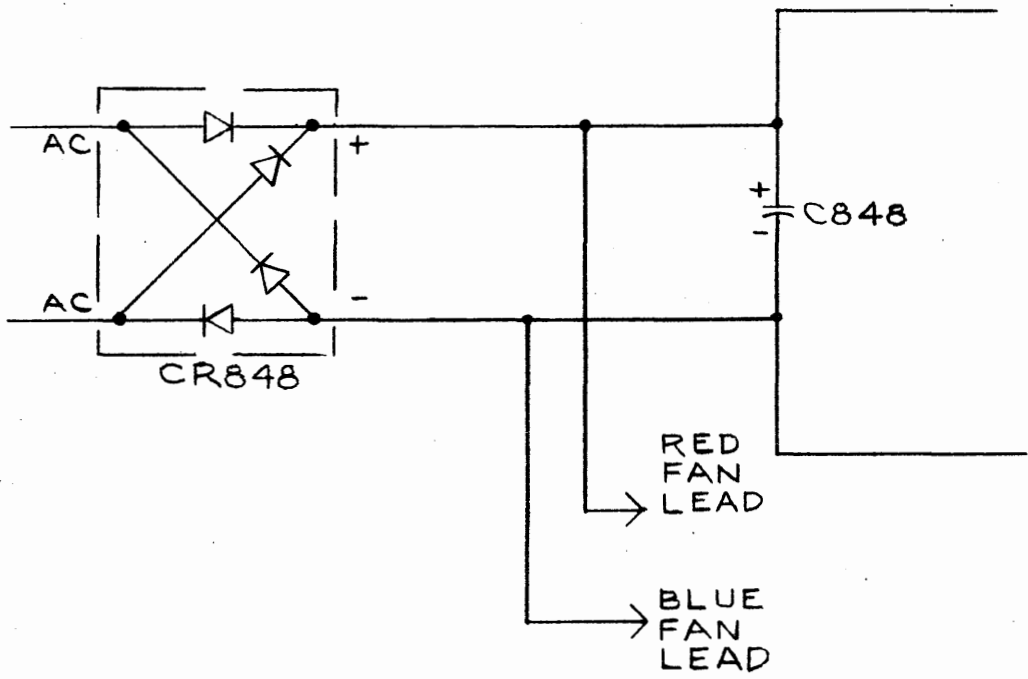
CHANGE TO:

- |           |             |   |                     |
|-----------|-------------|---|---------------------|
| Fig. 2-45 | 333-1833-02 | 1 | PANEL, REAR         |
| Fig. 2-56 | 426-0934-01 | 1 | FRAME ASSY, CABINET |
|           | 426-0719-24 | 1 | FRAME SECTION       |
|           | 390-0469-01 | 2 | CABINET SIDE        |
|           | 390-0470-01 | 1 | CABINET BOTTOM      |
|           | 390-0502-01 | 1 | CABINET SIDE        |
|           | 390-0503-01 | 1 | CABINET SIDE        |
|           | 390-0505-01 | 2 | CABINET BOTTOM      |
|           | 333-1889-01 | 1 | PANEL, REAR         |

ADD:

- |             |   |                                    |
|-------------|---|------------------------------------|
| 119-0830-00 | 1 | FAN                                |
| 378-2027-01 | 1 | FAN, GRILL                         |
| 211-0018-00 | 2 | SCREW, MACHINE: 4-40 X 0.875", PNH |
| 211-0144-00 | 4 | SCREW, MACHINE: 4-40 X 1.312, PNH  |
| 380-0490-00 | 1 | HOUSING, FAN                       |
| 407-1889-00 | 1 | BRACKET, FAN                       |
| 210-0994-00 | 4 | WASHER, FLAT                       |

DIAGRAM 2 LOW-VOLTAGE SUPPLY AND CALIBRATOR - Partial





# MANUAL CHANGE INFORMATION

PRODUCT 5440/R & 5441/R  
070-2139-01 & 070-2140-00

CHANGE REFERENCE M31308  
DATE 4-5-77

CHANGE:	DESCRIPTION
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EFF SN B073840 (5440/R)

EFF SN B062000 (5441/R)

### ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

VR245                    152-0428-00                    SEMICOND DEVICE: ZENER, 0.4W, 120V, 5%

VR245 is located on the HORIZONTAL AMPLIFIER board and shown on diagram 4 in the 5440 manual and diagram 2 in the 5441 manual.