11

NOTE

A nomenclature change has been introduced for the 5000 Series products. The 5403/D40 is now called the 5440 Oscilloscope.

This composite manual incorporates the 5403 and D40 manuals, formerly bound under separate cover.

TEKTRONIX®

5440 OSCILLOSCOPE

INSTRUCTION MANUAL

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

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TABLE OF CONTENTS

		Page
SECTION 0	INSTALLATION PROCEDURE	0-1
SECTION 1	OPERATING INSTRUCTIONS	
	BASIC OPERATION	
	Setup Information	1-1
	Calibration Check	1-2
	Readout	1-2
	Beam Finder	1-2
	External Intensity Input	1-2
	GENERAL OPERATING	
	INFORMATION	
	Graticule	1-2
	Intensity Control	1-2
	Display Focus	1-3
	I race Alignment Adjustment	1-3
	Beam Finder	1-3
	E400 Series Plug In Units)	1 2
	Option 3 Externally	1-5
	Programmed	1_4
	Seventh and Eighth Readout Words	14
	Intensity Modulation	1-4
	Calibrator	1-4
	Display Photography	1-4
	Oscilloscope Applications	1-4
SECTION 2	THEORY OF OPERATION	
	Z-AXIS AMPLIFIER AND CRT CIRCUIT	
	Z-Axis Amplifier	2-1
	High-Voltage Regulator	2-1
	High-Voltage Outputs	2-1
	CRT Control Circuits	2-2
	HORIZONTAL AMPLIFIER	
	Input Amplifier	2-2
	Output Amplifier VERTICAL AMPLIFIER	2-2
	Delay Line	2-3
	Amplifier	2-3

SECTION 3	SERVICE INFORMATION	
	SPECIFICATIONS Table 3-1-5403-D40	
	Vertical Amplifier Table 3-2–5403-D40	3-1
	Horizontal Amplifier Table 3-3–D40 Z-Axis	3-1
	Amplifier	3-2
	Tube	3-2
	Table 3-5–5403-D40 Power	
	Supply and Calibrator	3-2
	Table 3-6–5403-D40 Readout	3-3
	Table 3-7-D40 Miscellaneous	3-3
	Table 3-8-5403-D40	~ ~
	Environmental	3-3
	Table 3-9-5403-D40 Physical	3-4
	Options	~ -
	Symbols & Reference Designators	3-5
	Electrical Parts List	3-6
	Controls and Connectors Illustration	
	Adjustments	
	High-Voltage Power Supply	
	Circuit Board	
	Horizontal Circuit Board	
	Vertical Circuit Board	
	Operational Checks	
	Block Diagram	
	Parts Location Grid–Vertical & Hori-	
	zontal Amplifiers (Back side of folde	out)
	Vertical Amplifier Diagram	
	Porta Lagation Crid. High Valters Day	
	Parts Location Grid-High-Voltage Pol	wer
	Z Axia Amplifiar & CBT Circuit	
	Diagram	
	Parts Location Grid Front-Panel	
	Circuit Board	
	Interconnect and Voltage	
	Distribution Diagram	
	Mechanical Parts List	
	Fig. 1 Exploded View	
	Accessories and Repackaging	

D40

Page

i

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	Regulating Ranges	
Position	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
Н	108 VAC to 132 VAC	216 VAC to 264 VAC
Line Fuse Data	1.25 A slow-blow	0.7 A slow-blow

b. Line Range Taps



c. Rear Panel

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

- 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.



- 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...

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



Section 1-D40

OPERATING INSTRUCTIONS

The D40 Single Beam 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 D40.

1. Make sure the oscilloscope system is complete. The D40 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 D40 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:

D40

Amplifier Plug-In

Display	On
Position	Centered
CH1 Volts/Div	.1
CH1 Variable Volts/Div	Cal (fully clockwise)
CH1 Input Coupling	DC
Trigger	CH1
Mode	CH1

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 CALI-BRATOR 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 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.

Operating Instructions-D40

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 from 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 D40. Also, use the signal to externally trigger the time-base plug-in.

19. Slowly rotate the INTENSITY control counterclockwise until the trace appears to be a series of dimmed and brightened segments. The brightened segments correspond with the tops of the calibrator squarewaves.

This completes the description of the basic operating procedure for the D40. Instrument operations not explained here, or operations which need further explanation are discussed under General Operating Information.

GENERAL OPERATING INFORMATION

Graticule

The graticule of the D40 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 1.22 cm by 1.22 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

(A)ī

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, appear 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.



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

Option 3, Externally Programmed Seventh and Eighth Readout Words

This option adds a 25-pin connector to the rear-panel of the 5403, through which two ten-character readout words can be displayed on the CRT, see Fig. 1-1.

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 D40 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 D40 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, and phase/difference measurements.

THEORY OF OPERATION

Z-AXIS AMPLIFIER AND CRT CIRCUIT

The CRT circuit produces the high voltages and provides the control circuits necessary for operation of the cathoderay 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 combinations 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 an an impedance-matching and bias-setting transitor 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 -3 kV across voltage divider R395A-R395B. If the output level of the cathode supply goes above the nominal -3 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-topeak sinusoidal signal amplitude, resulting in a reduced voltage in the secondary of T410. Conversely, if the output drops below -3 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 C395 to charge to +30.6 V through R397 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 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 anode is supplied by voltage quadrupler U410. The applied voltage to the input of U410 from the T410 secondary winding is about +3 kV peak-to-peak. The output voltage of U410 is about +12 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 3 kV to the CRT cathode. R418 connects the CRT cathode voltage to the CRT filament to prevent cathode-to-filament breakdown.

Theory of Operation-D40

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 excursions 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. R420 connects the CRT grid voltage to the CRT cathode voltage to ensure that the CRT grid is more negative.

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 beamrotation 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. correcting for differential unbalance in the amplifier or 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

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-R238 and C272-R272-R268. 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 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 50 ohms, or about 100 ohms from side-to-side.

Amplifier

The vertical amplifier consists of a high bandpass three-stage paraphase amplifier having an input sensitivity of approximately 25 mV/division and a voltage gain of about 160. 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 R173 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.

Section 3–D40

SERVICE INFORMATION

SPECIFICATIONS

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

Unless otherwise stated, specification 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.

-	Characteristics	Performance Requirements	Supplemental Information
-	Input Signal Amplitude (Differential)		
\frown	Bandwidth	DC to at least 60 MHz with 5A48	
\bigcirc	Risetime	5.8 ns with 5A48	3.9 ns
-	Aberrations	3% when measured with a 5A48	
-	Vertical Centering		Within ±0.5 division of graticule center
	Delay Line Length		140 ns
-	Modes	Chop and alt	
-	Rate		
	Chop	50 kHz +50%30%; 3 μs on, 2 μs off.	
	Alt	Once every two sweeps	

TABLE 3-1

5403-D40 Vertical Amplifier

TABLE 3-2

5403-D40 Horizontal Amplifier

Characteristics	Performance Requirements	Supplemental Information
Bandwidth	DC to at least 2 MHz	Eight division signal used as a refer- ence
Horizontal Centering		Within 0.5 division of graticule center
X-Y Operation	Less than 1° phase shift from DC to at least 20 kHz	

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TABLE 3-3

D40 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 con- dition	
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

D40 Cathode-Ray Tube

Characteristics	Performance Requirements	Supplemental Information	
Geometry	Bowing or tilt ≤ 0.1 division		
Orthogonality	90° ±0.7°		
Photographic Writing Rate	90 cm/ μ s using a C-59 camera and Polariod 3000 speed film		(
Phosphor	P31 standard; P7 and P11 optional		
Deflection	Electrostatic, with mesh magnification		
Acceleration Potential	15 kV		

TABLE 3-5

5403-D40 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-D40 Readout

Characteristics	Performance Requirements	Supplemental Information
Intensity Range		Off to full brightness. Readout in- operative when READOUT INTENS fully counterclockwise in detent posi- tion.
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.

TABLE 3-7

D40 Miscellaneous

Characteristics	Performance Requirements	Supplemental Information
Graticule		
Scale	8 x 10 divisions with 1.22 cm/Div	
Scale Color and Type		
Normal	White internal graticule lines	
Optional	Black internal graticule lines	
Beam Finder	Brings trace within viewing area and in- tensifies trace	

TABLE 3-8

5403-D40 Environmental

Characteristics	Performance Requirements	Supplemental Information
Temperature		
Operating	0° C to $+50^{\circ}$ C	
Storage	-40° C to $+70^{\circ}$ 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	

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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 Com- mittee Test Procedure 1A, Category II	

TABLE 3-8 (cont)

TABLE 3-9

5403-D40 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	25 lbs (11 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 D40.

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OPTION INFORMATION

Your instrument may be equipped with one or more options. This section describes those options, or directs the reader to where the option is documented.

OPTION 2

This manual insert describes the features of OPTION 2 as installed in the D40 Display Unit. The graticule lights are removed and a CRT having a black lined graticule is provided.

PARTS LIST

Electrical

Front Panel Control Board

Values are fixed unless marked Variable.

Ckt. No.	Tek Par	tronix rt No.	Serial/Mod Eff	el No. Disc					De	scription	
	670-2	2441-00			Co	omple	tel	Board			
				Re	sisto	ors					
R332	311-1	428-00				20	١N	/ar IN	т		
R440	311-1	312-00				51	Лeg	Var F	-ocus	6	
R1000A	311-1	491-00				51	< Va	ar W/s	sw.REA	ADOUT	
				D	elet	е					
	670-0)702-04			Gr	raticu	le L	amp	Board	Assy.	
				(CRT						
V400	154-0	0684-00		CRT Black Lined Graticule							
				Мес	han	nical					
Fig. &				Q							
Index No.	Tektronix Part No.	Serial/N Eff	lodel No. Disc	t y	1	23	4	5		Description	
1-31	333-1623-00			1	PA	ANEL	, fro	ont			
1-7	366-0494-00			1	K	NOB					
				D	elet	6					

KNOB

1

366-1391-00

REV. B, NOV 1975

1-6

DIAGRAMS, PARTS LISTS, AND ILLUSTRATIONS

Symbols and Reference Designators

A

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 (μ F).
Resistors =	Ohms (Ω)

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:



3-5

D40

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
СКТ	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	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 CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
01281	TRW ELECTRONIC COMPONENTS, SEMICONDUCTOR		
	OPERATIONS	14520 AVIATION BLVD.	LAWNDALE, CA 90260
01295	TEXAS INSTRUMENTS, INC.,		
	SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
02735	RCA CORP., SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC CO., SEMI-CONDUCTOR		
	PRODUCTS DEPT.	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMIC CORP.	P.O. BOX 867	MURTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR		
	PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF		
	FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
50157	N. L. INDUSTRIES, INC., ELECTRONICS		
	DEPT.	P. O. BOX 787	MUSKEGON, MI 49443
52085	SKOTTIE ELECTRONICS, INC.	LINE STREET	ARCHBALD, PA 18403
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 BIVD.	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.,		
	A NORTH AMERICAN PHILLIPS CO.	22 COLUMBIA RD.	MORRISTOWN, NJ 07960
81073	GRAYHILL, INC.	561 HILLGROVE AVE.	LA GRANGE, IL 60525
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BlVD.	LOS ANGELES, CA 90069
83003	VARO, INC.	800 W. GARLAND AVE.	GARLAND, TX 75040
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601
91929	HONEYWELL, INC., MICRO SWITCH DIV.	CHICAGO & SPRING STS.	FREEPORT, IL 61032
	· · · · · · · · · · · · · · · · · · ·		

		Tektronix	Serial/Ma	odel No.		Mfr	
/	Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
		(70 20 70 00		2000000			
	AL	670-3078-00	BOIDIOO	B029999	CKT BOARD ASSY:VERTICAL	80009	670-3078-00
	AL	670-3078-01	B030000		CKT BOARD ASSY:VERTICAL	80009	670-3078-01
	A2	670-2333-00	B010100	B019999	CKT BOARD ASSY:HORIZONTAL	80009	670-2333-00
	A2	670-2333-01	B020000		CKT BOARD ASSY:HORIZONTAL	80009	670-2333-01
	A3	670-2443-00			CKT BOARD ASSY:HV	80009	670-2443-00
	A4	670-2442-00			CKT BOARD ASSY: FRONT PANEL CONTROL	80009	670-2442-00
	A5 1	670-0702-04			CKT BOARD ASSY: GRATICULE LAMPS	80009	670-0702-04
	C100	281-0604-00			CAP., FXD, CER DI:2.2PF, +/-0.25PF, 500V	72982	301-000C0J0229C
	C101	283-0003-00			CAP. FXD.CEB DI:0.01UF.+80-20%.150V	72982	855-547E103Z
	C102	283-0003-00			CAP FXD CER DI 0.01 UE +80-20% 150V	72982	855-54751037
	C115	281-0204-00			CAR VAR DISTO 2-22DE 100V	80031	CO10EA-20E
	C120	201 0204 00			CAR = VRR, FEBIC: 2-22FF, 100V	720031	20100075D241 T
	0120	201-0030-00			CAP., FAD, CER DI:240PF, 5%, 500V	12982	3010002302410
	C121	283-0032-00			CAD EVD CED DI. 470DE 58 5000	72002	921-E0075D471 T
	C121	203-0032-00			CAP. FXD.CER DI:470PF, 38, 500V	72962	831-30023D4713
		281-0524-00			CAP., FXD, CER D1:150PF, +/-30PF, 500V	04222	/001-1381
	C127	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
	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	374-001т2н0470Ј
	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	374-001т2н0470ј
	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
							5, F 042000000000
	C170	283-0000-00			CAP., FXD.CER DI:0.001UF.+100-0%.500V	72982	831-516E102P
	C180	290-0534-00			CAP., FXD. FI.CTI.T. IUF. 20% 35V	56289	196010520035#21
	C181	281-0203-00			CAP WAP DISTC $\cdot 2 = 10$ DF 100	80021	CO10ED /10E
	C184	281-0546-00			CAR EVD OFD DI.220DE 104 FOOU	04222	2001 1390
	C104	201-0540-00			CAP. JYD CER DI: 330PF, 108, 500V	04222	7001-1380
<	CT02	281-0546-00			CAP., FXD, CER DI:330PF, 10%, 500V	04222	/001-1380
	-1						
	C188	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
	C192	290-0534-00	B010100	B010278	CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
	C192	290-0522-00	B010279		CAP.,FXD,ELCTLT:1UF,20%,50V	56289	196D105X0050HA1
	C197	290-0534-00			CAP., FXD, ELCTLT: lUF, 20%, 35V	56289	196D105X0035HA1
	C198	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0025HA1
	C210	281-0205-00			CAP., VAR, PLSTC: 5.5-65PF, 100V	80031	C010GA/60E
	C211	281-0634-00	B010100	в019999	CAP., FXD, CER DI: 10PF, +/-0.25PF, 500V	72982	374-011C0G0100C
	C211	281-0574-00	B020000		CAP., FXD, CER DI:0.2UF, 10%, 50V	52085	NC7NP082PFK
	C235	281-0204-00	B010100	B019999	CAP., VAR, PLSTC: 2-22PF, 100V	80031	C010EA-20E
	C235	281-0202-00	B020000		CAP., VAR. PLSTC: 1.5-5.5PF. 100V	80031	C010EA-5E
					- ,,		
	C240	283-0167-00			CAP., FXD, CER DI:0.1UF, 10%, 100V	72982	8131N147W5R104K
	C242	281-0627-00	B010100	B019999	CAP. FXD.CER DI: 1PF.+/-0.25PF.500V	72982	301-0000000000
	C242	281-0670-00	B020000		CAP FYD CEP DI 1 80F $\pm /_0$ 10F 500V	72992	374-00500001890
	C242	201-0003-00	B020000		CAR FYD CER DI. G Olue +90 20% 1500	72902	974-005C0R0189B
	C244	203-0003-00	P010100	8010000	CAR FYD CER DI.0.0107,+80-208,150V	72962	045 53473032
	C2 J0	263-0092-00	POIOIOO	PO19999	CAP., FXD, CER DI:0.030F, +80~208, 200V	12982	845-534E3032
	0250	292 0002 00	DOJOOO	D020715		72002	055 54351037
	C250	283-0003-00	B020000	8020715	CAP., FXD, CER DI:0.010F, #80-208, 150V	72982	855-54/E1032
	C250	283-0142-00	B020716		CAP., FXD, CER DI:0.00270F, 5%, 200V	72982	8/5-551B2/2J
	C252	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
	C266	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
	C272	281-0627-00	B010100	B019999	CAP.,FXD,CER DI:1PF,+/-0.25PF,500V	72982	301-000C0K0109C
					· · · · ·		
	C272	281-0670-00	B020000		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	855-547E103Z
	C286	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
	C310	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100~0%,500V	72982	831-516E102P
	C335	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z

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Electrical Parts List-D40

	Tektronix	Serial/Ma	odel No.		Mfr	
Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
C350	281-0627-00			CAP., FXD, CER DI: 1PF. +/-0.25PF.500V	72 982	301-000с0к0109с
C352	290-0523-00			CAP. FXD. ELCTLT: 2.2UF. 20%.20V	56289	196D225X0025HA1
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	72 982	855-547E103Z
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	283-0010-00	B010100	B010372	CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C402	283-0249-00	B010373		CAP., FXD, CER DI:0.068UF, 10%, 50V	72982	8131N075WR5683K
C406	283-0081-00			CAP., FXD, CER DI:0.1UF, +80-20%, 25V	56289	360600
C410	290-0525-00	B010100	B031988	CAP., FXD, ELCTLT: 4.7UF, 20%, 50V	56289	196D475X0050KA1
C410	290-0767-00	B031989		CAP., FXD, ELCTLT: 4.7UF, +75-10%, 160V	F 60.00	41 64 9 1
0412	283-0261-00			CAP., FXD, CER D1:0.010F, 20%, 4000V	56289	41C421
0415	283-0261-00			CAP., FXD, CER DI:0.010F, 20%, 4000V	56289	410421
C415	283-0261-00			CAP., FXD, CER DI:0.010F, 20%, 4000V	56289	410421
0417	283-0021-00			CAP.,FXD,CER DI:0.0010F,20%,50000	72982	828-0051550102M
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	828-005Y5S0102M
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	30D205F150BB4
C440	283-0021-00			CAP.,FXD,CER DI:0.001UF,20%,5000V	72982	828-005¥5S0102M
CR146	152-0422-00			SEMICOND DEVICE:SILICON, 4V, 7PF	01281	PG1084
CR204	152-0574-00	XB020000		SEMICOND DEVICE:SILICON, 120V	80009	152-0574-00
CR206	152-0574-00	XB020000		SEMICOND DEVICE:SILICON, 120V	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	lN4152
CR242	152-0574-00			SEMICOND DEVICE: SILICON, 120V	800.09	152-0574-00
CR246	152-0574-00			SEMICOND DEVICE:SILICON, 120V	80009	152-0574-00
CR2 70	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR272	152-0574-00			SEMICOND DEVICE: SILICON, 120V	80009	152-0574-00
CR274	152-0574-00			SEMICOND DEVICE:SILICON, 120V	80009	152-0574-00
CR324	152-0061-00			SEMICOND DEVICE SILICON, 175V. 100Mb	80009	152-0061-00
CR352	152-0061-00			SEMICOND DEVICE SILLCON, 175V, 100MA	80009	152-0061-00
CR390	152-0141-02			SEMICOND DEVICE SILLOON, 30V-150MA	07910	191 0001 00 1N4152
CR391	152-0141-02			SEMICOND DEVICE: SILICON, 30V, 150MA	07910	1N4152
CR395	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CP4 12	152-0409-00			SEMICOND DEVICE.STITCON 12 0007 5MA	83003	VC-12X
CR412	152-0409-00			SEMICOND DEVICE SILICON 175V 100MA	80009	152-0061-00
CR420	152-0061-00			SEMICOND DEVICE SILICON 175V, 100MA	80009	152-0061-00
CR422	152-0061-00			SEMICOND DEVICE STLICON 175V 100MA	80009	152-0061-00
CR430	152-0061-00			SEMICOND DEVICE:SILICON, 175V, 100MA	80009	152-0061-00
DT 100	119-035-00	B010100	B020000	DETAV TINE ETEC.	80009	119-0392-00
001.10	119-0486-00	B030000	2023333	DELAY LINE FLEC.	80009	119-0486-00
DS310 ¹	150-0137-00	2030000		LAMP. CARTRIDGE: 14V, 100MA	71744	CM9818
DS3121	150-0137-00			LAMP, CARTRIDGE: 14V, 100MA	71744	CM9818
DS 3141	150-0137-00			LAMP, CARTRIDGE: 14V, 100MA	71744	CM9818
F300	159-0041-00			FUSE CARTRIDGE: 1.25A.3AC.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	24931	28JR200-1
L167	108-0733-00			COIL, RF:130NH	80009	108-0733-00
ГТӘ /	108-0440-00			COIL, RF: SUH, TOROIDAL INDUCTOR	80008	108-0440-00

¹Standard only.

		Tektronix	Serial/Ma	del No.		Mfr	
	Ckt No	Part No	Fff	Dscont	Name & Description	Code	Mfr Part Number
	<u>CRI 140.</u>	1 411 140.		Discom			
	L198	108-0440-00			COIL, RF:8UH, TOROIDAL INDUCTOR	80009	108-0440-00
	L375	108-0644-00			COIL, TUBE DEFLE: TRACE ROTATOR	80009	108-0644-00
	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
	Q125	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	07263	2N4249
	0140	151 0071 00					
	Q148 0165	151-0271-00			TRANSISTOR: SILICON, PNP	80009	151-0271-00
	0120	151-02/1-00			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
	Q180	151-0451-00			TRANSISTOR:SILICON, NPN	80009	151-0451-00
	0100	153 0453 00					
	Q182	151-0451-00			TRANSISTOR: SILICON, NPN	80009	151-0451-00
	ÕT88	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	151-0302-00	B010100	B019999	TRANSISTOR:SILICON, NPN	04713	2N2222A
	Q240	151-0333-00	в020000		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	07263	S37880
	Q255	151-0262-00	XB020000		TRANSISTOR:SILICON, NPN	02735	62396
-							
	Q270	151-0301-00			TRANSISTOR:SILICON, PNP	04713	2N2907A
/	Q2 74	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
	Q280	151-0406-00			TRANSISTOR:SILICON, PNP	07263	S37880
	Q310	1 51-0352-00			TRANSISTOR:SILICON, NPN	03508	X44C282
	Q320	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
	Q335	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00
	Q340	15 1- 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	07263	2N5401
	Q390	151-0254-00			TRANSISTOR:SILICON, NPN	03508	2N5 308
	Q400	151-0342-00			TRANSISTOR:SILICON, PNP	07263	2N4249
	Q410	151-0262-00			TRANSISTOR:SILICON, NPN	02735	62396
	R100	321-0068-00	B010100	B029999	RES.,FXD,FILM:49.9 OHM,1%,0.125W	75042	CEATO-49R90F
	R100	321-0085-00	в030000		RES.,FXD,FILM:75 OHM,1%,0.125W	75042	CEATO-75R00F
	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	75042	CEAT0-1000F
	R104	321-0097-00			RES., FXD, FILM:100 OHM, 1%, 0.125W	75042	CEATO-1000F
	R108	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
	R110	321-0217-00			RES.,FXD,FILM:1.78K OHM,1%,0.125W	75042	CEAT0-1781F
	R111	321-0089-00			RES., FXD, FILM:82.5 OHM, 1%, 0.125W	75042	CEATO-82R50F
	R112	321-0217-00			RES.,FXD,FILM:1.78K OHM,1%,0.125W	75042	CEAT0-1781F
	R1 15	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
	R121	311-1559-00			RES., VAR, NONWIR: 10K OHM, 20%, 0.50W	73138	91A-10001M
	R123	311-1563-00			RES., VAR, NONWIR: 1K OHM, 20%, 0.50W	73138	91A-10000M
	R125	321-0068-00	B010100	в029999	RES.,FXD,FILM:49.9 OHM,1%,0.125W	75042	CEATO-49R90F
\rightarrow	R125	321-0085-00	B030000		RES.,FXD,FILM:75 OHM,1%,0.125W	75042	CEATO-75R00F

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	Tektronix	Serial/M	odel No.		Mfr	
Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
D107	215,0221,00			DEC. EVD. ONDON 220 OUM ES 0 25W	01101	0000015
R12 /	315-0221-00			RES., FAD, CMPSN:220 OHM, 58, 0.25W	01121	
R120	321-0097-00			RES.,FAD,FILM:100 OHM,18,0.125W	75042	CEATO-1000F
R129	321-0097-00			RES.,FXD,F11M:100 OHM,1%,0.125W	75042	CEATO-IOUOF
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	75042	CEATO-1780F
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	315-0102-00	B010100	B010250	RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R141	315-0152-00	B010251		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
D142	315-0270-00			DEC EYD CHECH.27 OUM 59 0 25W	01121	CB2705
D1/2	315-0510-00			PES = FVD CMPSN:51 OHM 59 O 25W	01121	CB5105
R143	315-0310-00			RES. FAD, CMPSN:SI OHM, 55,0.25W	01121	CB3105
R144	315-0431-00			RES., FXD, CMPSN:430 OHM, 58, 0.25W	75040	CB4315
R145	321-0148-00			RES.,FXD,F1LM:340 OHM,1%,0.125W	/5042	CEATU-3400F
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
R 14 9	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	75042	CEATO-90R90F
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	СВ6225
R158	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R160	321-0148-00			RES. FXD. FTLM: 340 OHM. 18.0.125W	75042	CEAT0-3400F
R163	315-0431-00			RES FXD. CMPSN 430 OHM. 5%.0.25W	01121	CB4315
R164	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
D165	315-0151-00			255 FYD CMDCN-150 OHM 58 0 25W	01121	CB1515
D167	313 1564 00			DES UND NONWER-EOO OUM 209 0 EOM	73139	912-500P0M
R107	311-1564-00			RES., VAR, NONWIR: 500 OHM, 208, 0. 50W	75130	CENTO- 2000E
R1/2	321~0126-00			RES.,FXD,F1LM:200 OHM,1%,0.125W	75042	CEA10-2000F
R173	321-0093-00			RES.,FXD,FILM:90.9 OHM,1%,0.125W	75042	CEATO-90R90F
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	75042	CEATO-90 R9 OF
R178	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	75042	CEAT0-2000F
R180	301-0151-00	B010100	в020396	RES.,FXD,CMPSN:150 OHM,5%,0.50W	01121	EB1515
R180	315-0910-00	B020397		RES. FXD.CMPSN:91 OHM.5%.0.25W	01121	CB9105
R181	321-0059-00	B010100	B020396	RES. FXD. FTLM:40.2 OHM.1%.0.125W	75042	CEATO-40R20F
R101	221 0062 00	D020207	D020000		75042	CEATO-40820E
R181	321-0085-00	B020397	8029999	RES.,FAD,FILM:40.2 ORM,18,0.125W	75042	CEATO76880F
RT8T	301-0151-00	B030000	PU20306	$\frac{1}{100} \frac{1}{100} \frac{1}$	01121	EB1515
R102	301-0131-00	D010100	B020350	DEC. EVD CMDCN:01 OHM 5% 0.25W	01121	CB9105
R102	313-0910-00	B020397		RES., FXD, CMPSN: 91 OHM, 54, 0.25W	01121	EB3005
R183 R184	315-0680-00	XB020397		RES., FXD, CMPSN: 30 OHM, 5%, 0.50W 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
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	FP-4G510R0J
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	FP-4G510R0J
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

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	Tektronix Serial/Model No.			odel No.		Mfr	
	Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
	R200	321-0069-00	B010100	B019999	RES.,FXD,FILM:51.1 OHM,1%,0.125W	75042	CEATO-51R10F
	R200	321-0065-00	B020000		RES.,FXD,FILM:46.4 OHM,1%,0.125W	75042	CEATO-46R40F
	R201	317-0047-00	XB020000		RES.,FXD,CMPSN:4.7 OHM,5%,0.125W	01121	BB4R705
	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	75042	CEATO-1181F
	R205	322-0205-00			RES.,FXD,FILM:1.33K OHM,1%,0.25W	75042	CEBT0-1331F
	R207	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEATO-1001F
	R208	315-0361-00			RES.,FXD,CMPSN:360 OHM,5%,0.25W	01121	CB3615
	R210	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	75042	CEATO-4320F
	R211	321-0093-00	B010100	B01999	RES.,FXD,FILM:90.9 OHM,1%,0.125W	75042	CEATO-90R90F
	R211	321-0076-00	B020000		RES.,FXD,FILM:60.4 OHM,1%,0.125W	75042	CEATO-60R40F
	R212	311-1564-00			RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A-500R0M
	R213	322-0205-00			RES.,FXD,FILM:1.33K OHM,1%,0.25W	75042	CEBT0-1331F
	R215	321-0069-00	B010100	B019999	RES.,FXD,FILM:51.1 OHM,1%,0.125W	75042	CEATO-51R10F
	R215	321-0065-00	B020000		RES.,FXD,FILM:46.4 OHM,1%,0.125W	75042	CEATO-46R40F
	R216	317-0047-00	XB020000		RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB4R705
	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	75042	CEAT0-1181F
	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, FTLM: 1K OHM. 1%, 0, 125W	75042	CEATO-1001F
	R240	315-0241-00			RES., FXD.CMPSN:240 OHM.5%,0.25W	01121	CB2415
	R242	323-0318-00			RES., FXD, FTLM:20K OHM, 1%,0.50W	75042	CECT0-2002F
	R243	315-0332-00	B010100	B019999X	RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
	R244	315-0621-00			RES., FXD, CMPSN: 620 OHM, 5%, 0.25W	01121	CB6215
1	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	XB020000		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
	R250	301-0393-00			RES. FXD.CMPSN:39K OHM.5%.0.50W	01121	EB3935
	B252	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	305-0622-00	в010100	B019999	RES. FXD, CMPSN: 6.2K OHM. 5%, 2W	01121	HB6225
	R257	304-0392-00	B020000		RES., FXD, CMPSN: 3.9K OHM, 10%, 1W	01121	GB3921
	R258	315-0753-00	XB020000		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	75042	CEATO-6041F
	R266	321-0389-00			RES., FXD, FILM: 110K OHM, 1%, 0.125W	75042	CEATO-1103F
	R268	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	75042	CEATO-1001F
	R270	315-0471-00			$BES = EXD_{CMD}SN \cdot 470 OHM_{5} \cdot 0.25W$	01121	CB4715
	R270 P272	323-0318-00			RES. FILM. 20K OHM 18.0 50W	75042	CECTO-2002F
	D272	315-0102-00			DES EXD (MDSN-1K OHM 5% 0 25W	01121	CB1025
	R2/4 D275	315-0102-00	8010100	BOIGGOOV	DEC FYD (MDCN.3 3K OHM 58 0 25W	01121	CB3325
	R275 R276	315-0102-00	BOIDIOO	BUISSEX	RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
	D200				DEC EVE CHECKI, LEV OTH ES O SEN	יכווס	CB1525
	RZOU DOOO	312-0101 00			$\mathbf{E}_{\mathbf{G}} = \mathbf{E}_{\mathbf{T}} \mathbf{C}_{\mathbf{T}} \mathbf{E}_{\mathbf{G}} \mathbf{E}_{\mathbf{T}} \mathbf{C}_{\mathbf{T}} \mathbf{E}_{\mathbf{T}} \mathbf{C}_{\mathbf{T}} \mathbf{E}_{\mathbf{T}} \mathbf{C}_{\mathbf{T}} \mathbf{E}_{\mathbf{T}} \mathbf{C}_{\mathbf{T}} \mathbf{E}_{\mathbf{T}} $	01121	CB1011
	KZ0Z	301-0303 00			RED. FAD, CMPON: TOU UNIT, TUS, U. 20W	01121	EB3035
	R204 D204	315_00333-00			DEC FYD CMDCN-820 OUM 59 0 2507	01121	CB8215
	R289	316-0100-00			RES., FXD, CMP SN:10 OHM, 10%, 0.25W	01121	CB1001
					· · · ·		- 1005
	R320	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
	R322	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
	R324	315-0332-00			RES.,FXD,CMPSN:J.JK OHM,5%,0.25W	01121	CB3325

Electrical Parts List-D40

	Tektronix	Serial/M	odel No.		Mfr																																
Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number																															
B336	215-0202 00				01101																																
R326	315-0202-00			RES., FXD, CMP SN: 2K OHM, 5%, 0.25W	01121	CB2025																															
R327	315-0822-00			RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225																															
RJ20 D220	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																															
R332	311-1428-00			RES., VAR, NONWIR: 20K OHM, 1W	01121	10M459																															
D224	215 0224 00				01101	000045																															
R334	315-0224-00			RES., FXD, CMPSN:220K OHM, 5%, 0.25W	01121	CB2245																															
R335	315-0103-00			RES., FXD, CMPSN: IUK OHM, 5%, 0.25W	01121	CB1035																															
R330	315-0224-00			RES., FXD, CMPSN:220K OHM, 5%, 0.25W	01121	CB2245																															
R330	315-04/4-00			RES., FXD, CMPSN: 470K OHM, 5%, 0.25W	01121	CB4 745																															
R342	312-0210-00			RES., FXD, CMPSN:SI OHM, 5*, 0.25W	01121	CB2102																															
R343	315-0241-00			RES EXD CMDSN+240 OHM 58 0 25W	01121	CB2415																															
R345	315-0470-00			RES FUD (MDSN- 47 OHM 5% 0.25W	01121	CB2415																															
R347	315-0222-00			RES FYD CMDSN.2 2K OHM 58 0 25W	01121	CB2225																															
R349	321-0311-00			RES FYD FTLM-16 9K OHM 18 0 125W	75042	CE2225																															
R350	321-0311-00			DEC EVD ETIM. 16 OF OUM 19 0 1250	75042																																
1(330	521-0511-00			RES. , FAD, FILM. 10.9K OHM, 18,0.120W	75042	CEA10-1052F																															
R352	315-0221-00			RES EXD CMDSN+220 OHM 58 0 25W	01121	CB2215																															
R356	315-0102-00			RES. FYD CMESN, 1K OHM 5% O 25W	01121	CB1025																															
D359	315-0102-00			DEC EVD CMDEN. 100K OUM 5% 0.25W	01121	CB1025																															
N350	315 0303 00			RES. FAD, CMESN: LOOK OHM, 58, 0.25W	01121	CB1045																															
R359	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 58, 0.25W	01121	CB3925																															
R360	315-04/1-00			RES., FXD , $CMPSN:470$ OHM, $5*, 0.25W$	01121	CB4715																															
P362	303-0153-00	B010100	B010372	PEC EVE CARCILLEY OUN 5% IN	01121	CB1525																															
R362	305-0153-00	B010100	B010372	RES., FAD, CMPSN: ISK OHM, 5%, IW	01121	GB1535																															
R302	303-0153-00	POTO ² 12		RES., FAD, CMPSN: ISK OHM, 58, 2W	72120	NB1535																															
R363	311-1355-00			RES., VAR, NONWIR: LUUK OHM, 206, 0.5W	/3130	91A-10002M																															
R300	313-04/3-00			RES., FAD, CMPSN: 47K OHM, 5%, 0.25W	72120	CB4735																															
K370	311-1333-00			RES., VAR, NORWER: LOOK OHM, 208, 0.5W	/3130	91A-10002M																															
R375	311-1559-00	B010100	B020892	DES VAD NONWIDIOK OHM 208 0 50W	73138	91A-10001M																															
D275	311-1559-00	B010100	B020092	DEC UND NONWIR-10K OHM 20% 0 50W	73130	917-20001M																															
R375	316 0103 00	B020893		RES., VAR, NONWIR: 20K OHM, 208, 0.50W	/3130	GD1021																															
200	316-0102-00			RES. FAD, CHPSN: IK OHN, 108, 0.25W	01121	CD1021																															
R392 D204	316-0154-00			RES., FAD, CMPSN: ISON OHM, IO6, 0.25W	01121	CB1341																															
K354	310-04/2-00																																		RES., FAD, CMPSN:4.7K OHM, 108, 0.25W	UI121	CB4721
P395A B	307-0290-06			DES END ETTM.250K OUM	80009	307-0290-06																															
R395C.D	507 0250 00				00000	307 0290 00																															
R397	316-0474-00			RES. FXD.CMPSN:470K OHM.10%.0.25W	01121	CB4741																															
R400	316-0101-00			RES FYD CMPSN 100 OHM 10% 0 25W	01121	CB1011																															
R402	316-0182-00	B010100	B010372	RES FYD CMPSN-1 8K OHM 10% 0 25W	01121	CB1012																															
10402	510 0102 00	5010100	D010372	ABB: (1 AD) CHI SK. 1: OK OHH) 10 0,0.20	01121	CDIOLI																															
R402	316-0102-00	B010373		RES. FXD.CMPSN:1K OHM.10%.0.25W	01121	CB1021																															
R404	315-0270-00	VB010373		$PES = FYD CMDSN \cdot 27 OHM 5% 0.25W$	01121	CB2705																															
R405	316-0273-00	ADOLOG/5		$PES = FVD CMDSN \cdot 27K OHM 1.08 0.25W$	01121	CB2731																															
R405 R406	316-0391-00			RES. , IXD, CMESN. 27K CMM, 108, 0.25W	01121	CB2731																															
R408	316-0100-00			PES = FYD (MPSN + 10 OHM + 10% O 25W)	01121	CB1001																															
1400	510-0100-00			NES: (172) CHESN. 10 OIN (108/0.25)	01121	CEICOI																															
R410	307-0053-00			RES. FXD.CMPSN: 3.3 OHM. 5%. 0.50W	01121	EB33G5																															
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	CB4 701																															
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	316-0105-00			RES., FXD, CMPSN: 1M OHM, 10%, 0.25W	01121	CB1051																															
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																															

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	Tektronix	Serial/Ma	odel No.		Mfr	
Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
R440	311-1312-00			RES., VAR, NONWIR: 5M OHM, 20%, 1W	01121	10M156A
R1000A,B	¹ 311-1492-00			RES.,VAR,NONWIR:2 X 5K OHM,20%,0.50W	01121	11M136
R1000A,B	2311-1491-00			RES., VAR, NONWIR: 5K OHM, 20%, 1W		
RT157	307-0181-00			RES., THERMAL: 100K OHM, 10%, 4MW/DEG C	50157	JP-51J2
S300	260-0618-00			SW, THERMOSTATIC: OPEN 60 DEG, CLOSE 48.9 DEG C		
5302	260-1222-00			SWITCH, PUSH-PUL: 10A, 250VAC	91929	2DM301
s335 s1000 ^{1,2}	260-1238-00			SWITCH, PUSH:0.5A AT 115VAC	81073	39-2
T410	120-0822-00	B010100	B021356	XFMR, HV POWER:	80009	120-0822-00
T410	120-0920-00	B021357		XFMR, HV POWER:	80009	129-0920-00
U410	152-0495-01			SEMICOND DEVICE: HV MULTIPLIER	80009	152-0495-01
v400 ³	154-0701-00			ELECTRON TUBE:CRT	80009	152-0701-00
v400 ⁴	154-0684-00			ELECTRON TUBE:CRT	80009	152-0684-00
VR175	152-0195-00			SEMICOND DEVICE: ZENER, 0.4W, 5.1V, 5%	81483	69-6512
VR240	152-0255-00	B010100	B019999X	SEMICOND DEVICE: ZENER, 0.4W, 51V, 5%	04713	1N978B
VR242	152-0255-00	B010100	B019999X	SEMICOND DEVICE: ZENER, 0.4W, 51V, 5%	04713	1N9 7 8B
VR245	152-0427-00	XB020000		SEMICOND DEVICE: ZENER, 0.4W, 100V, 5%	04713	1N985B
VR252	152-0427-00	XB020000		SEMICOND DEVICE:ZENER,0.4W,100V,5%	04713	1N985B
VR2 70	152-0255-00	B010100	B019999X	SEMICOND DEVICE:ZENER,0.4W,51V,5%	04713	1N978B
VR272	152-0255-00	B010100	B019999X	SEMICOND DEVICE: ZENER, 0.4W, 51V, 5%	04713	1N978B
VR365	152-0285-00			SEMICOND DEVICE: ZENER, 0.4W, 62V, 5%	04713	1N980B
VR435	152-0427-00			SEMICOND DEVICE: ZENER, 0.4W, 100V, 5%	04713	1N985B

¹Furnished as a unit, standard only.
²Furnished as a unit, option 2 only.
³Standard only.
⁴Option 2 only.

D40

CONTROLS AND CONNECTORS





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BLOCK DIAGRAM CONTROLS AND CONNECTORS



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*See Parts List for serial number ranges.

СКТ	GRID	СКТ	GRID	скт	GRID	скт	GRID	СКТ	GRID	скт	GRID	СКТ	GRID	скт	GRID
NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC
C100	В-4	C184	E-4	CR146	D-4	Q100	В-4	R100	B-4	R129	C-3	R155	D-2	R187	F-3
C102	B-4	C185	E-2			Q106	C-4	R102	B-4	R132	C-3	R157	C-4	R188	F-3
C115	A-3	C188	F-3	ļ		Q125	B-3	R103	B-4	R135	B-3	R158	D-4	R190	F-3
C120	B-3	C192	E-3	1		Q130	C-3	R104	B-4	R136	C-4	R160	C-2	R191	G-3
C121	A-3	C197	A-2	L167	D-3	Q140	B-2	R108	C-3	R137	E-4	R163	C-3	R192	D-2
C123	B-3	C198	A-2	L197	A-2 B-2	Q148	C-4	R110	B-4	R138	B-2	R164	C-3	R193	F-4
C127	B-4			L198		Q165	C-3	R111	B-4	R139	C-2	R165	D-2	R194	E-2
C148	D-4]		1	F-4	Q170	D-4	R112	A-3	R141	C-2	R167	D-2	R195	F-3
C153	D-3			LR193		Q172	D-2	R115	A-4	R142	C-2	R172	D-4	R197	A-2
C155	D-3					Q180	E-4	R117	B-4	R143	C-4	R175	D-3	R198	B-2
C156	D-3		i	l		Q182	E-3	R118	B-3	R144	C-4	R176	E-3		
C160	D-4			1		Q188	F-4	R120	B-2	R145	D-3	R178	D-3	RT157	D-4
C165	D-2					Q190	F-2	R121	A-2	R146	D-4	R180	E-4		
C167	D-4							R123	B-2	R148	D-4	R181	E-3	VR175	E-4
C180	E-3							R125	B-4	R149	D-2	R182	E-3		
C181	E-3							R127	B-3	R151	D-4	R183	E-4	1	
		1		1				R128	C-3	R153	C-3	R184	E-4	l	
												R185	E-2		

ADJUSTMENTS VERTICAL AMPLIFIER

1. Vertical Centering, R135

vertically on the graticule.

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center.

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

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

divisions of vertical graticule

Equipment Required

1. Time-base plug-in unit with a triggered sweep rate of at least 0.1 μ s. For example, a Tektronix 5B42 Delaying Time Base or any time base that is compatible with the Tektronix 5403-D40 Oscilloscope.

2. Special Tektronix Calibration Fixture 067-0680-00.

3. Sinewave 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 $0^{\circ}C$ to $+50^{\circ}C$ range. Make any adjustments at a temperature of $+25^{\circ}C$, ±5°C.

a. Remove the cabinet panels covering the D40.

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-D40 to the line voltage source and pull the POWER switch out to turn the instrument on.

3. Vertical Compensation Flat Top, R121, 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 squarewave signal then increase its amplitude to 6 major divisions with the amplitude control of the 067-0680-00.

Set the time-base plug-in main sec/div switch to 2 µs sweep rate. Adjust R121 for optimum level top of squarewave. Change the sweep rate of the time-base plug-in to $1 \mu s$ and adjust the R120 for a flat waveform top. Change the sec/div switch of the time-base plug-in to $0.5 \ \mu s$ 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 μ s, and adjust the main trig level for a stable step function display.



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 graticule with the position control of the 067-0680-00.

2. Vertical Gain, R175

Adjust the 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,

Adjust the 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 C155 and C115 for a level front corner. After other front corner adjustments have been made, adjust C181 for optimum risetime and minimum front corner spike.

Position effect: Using a 6 division squarewave, position it down so 4 divisions remain on screen. Check for a front corner change of no greater than 0.2 division (3.3%) from the main level.

Change the STEP RESP. to - and position the 6 division squarewave up so 4 divisions remain on screen. Check the front corner again for no greater than 0.2 division change from the main level.

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 sinewave from a 50 Ω source to the 067-0680-00 aux in cw in (freq resp) connector. Adjust the output amplitude of the sinewave generator to obtain a vertical CRT display of six major graticule divisions.1 (Green light must go on.)

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

¹ Refer to the 067-0680-00 Calibration Fixture manual for how to get a leveled sinewave output.



REV.F , NOV. 1975

VERTICAL AMPLIFIER



HORIZONTAL AMPLIFIER PARTS LOCATION GRID

SN B02000-up



ADJUSTMENTS HORIZ-ONTAL AMP.

PARTS LOCATION GRID

	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC								
+	C210	E2	C353	G3	CR204	D3	0200	D2	R200	D3	B242	B2	R289	A3	R352	G4
•	C211	E3	C358	E4	CR206	D3	Q215	D3	R201	D3	R248	C4	R320	F5	R356	G3
	C235	B 3	C360	F3	CB208	C2	0240	C2	R202	D2	B250	B3	R322	E5	R358	F3
	C240	C3			CB240	C2	0244	B2	R203	D2	B252	81	R324	E5	R359	G3
	C242	B2			CR242	A2	Q250	A2	R205	E2	B256	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	84	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
					CR352	G4	Q335	F4	R213	E3	R268	C3	R336	F4		
	C280	A4				-	Q340	E4 -	R215	D3	R270	C3	R338	F5		
	C282	A4					Q345	E4	R216	D3	R272	B3	R342	E4		
	C286	C1					Q352	F4	R217	D3	R274	B4	R343	E4	VR245	A2
	C335	F4					Q356	G4	R218	D4	R276	B4	R345	E4	VR252	F1
	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		- •				

D40

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 narkers.

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 $0^{\circ}C$ to $+50^{\circ}C$ range. Make any adjustments at a temperature of $+25^{\circ}C$. ±5°C.

a. Remove the cabinet panels covering the D40.

b. Install a vertical plug-in in the left plug-in compartnent and a time-base plug-in in the right plug-in compartnent.

c. Check that the correct nominal line-selector block has een installed on the line-selector pins and that the egulating range selected includes the input line voltage, see nstallation section for complete instructions.

d. Connect the 5403-D40 to the line voltage source and ull the POWER switch out to turn the instrument on.

e. Allow a 20 minute warm up time before performing he calibration procedure.

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.

7. 10 ns Timing, C210

Interchange the 067-0680-00 and time-base plugins (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 μ 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 (±6 1/2%) of entire sweep, excluding the first three and the last ten major divisions.

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 μ 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 (±6 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.

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.

3. Horizontal Centering, R222

Remive 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 plus in compartment.

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



4. Geom, R365

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 sinewave to the 067-0680-00 aux in cw in (freq resp) connector. Adjust the output amplitude of the sinewave generator to obtain a horizontal CRT display of six major graticule divisions.

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

Refer to the 067-0680-00 Calibration Fixture manual for how to get a leveled sinewave output.

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

PARTS LOCATION GRID

Below SN B020000



CKT NO	GRID LOC														
C210	L-3	C353	N-3	CR208	J-2	Q200	K-2	R200	К-3	R244	J-2	R289	Н-3	R352	N-4
C235	1-3	C358	L-4	CR240	J-2	Q215	K-3	R202	K-2	R245	I-1	R320	M-5	R356	M-3
C236	1-3	C360	M-3	CR242	H-2	0240	J-2	R203	K-2	R246	1-1	R322	L-5	R358	M-3
C240	J-3			CR246	1-2	Q244	H-2	R205	L-2	R247	1-1	R324	L-5	R359	N-3
C242	1-2			CR270	J-4	Q250	H·2	R207	L-2	R252	1-1	R326	M-5	R360	N-3
C244	1-1			CR272	H-3	Q270	J-3	R208	J-2	R256	1-2	R327	M-5	R362	M-3
C250	1-2			CR274	H-4	Q274	H-4	R210	L-2	R257	L-1	R328	L-5	R365	M-1
C252	H-1			CR324	K-5	Q280	H-4	R212	L-3	R259	H-2	R330	J-5	R368	M-1
C266	K-2			CR352	N-4	Q320	L-5	R213	L-3	R265	J-1	R334	L-5	R370	M-1
C272	1-3					Q335	M-4	R215	K-3	R266	J-1	R335	M-4	R375	H-1
C274	1-4	1				Q340	L-4	R217	К.3	R268	1-3	R336	M-4		
C280	H-4					Q345	L-4	R218	К-З	R270	J-3	R338	M-5	VR240	1-2
C282	H-4					Q352	M-4	R220	J-2	R272	H-3	R342	К-4	VR270	1-3
C286	J-1					Q356	N-4	R222	J-3	R274	1-4	R343	К-4	VR365	M-1
C335	M-4							R224	J-4	R276	1-4	R345	L-4		
C350	M-5							R238	1-2	R280	1-4	R347	K-4		
C352	J-4	ļ						R240	J-2	R282	1-4	R349	M-4		
C354	M-4					1		R242	1-2	R286	1-4	R350	N-4	1	
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HORIZONTAL AMPLIFIER 2 49



RIGHT HORIZ

HORIZONTAL AMPLIFIER (2)

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LEFT HORIZ

4

HIGH VOLTAGE BOARD

PARTS LOCATION GRID



serial number ranges.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRI LOC								
C395	D-3	CR390	D-2	F410	B-4	Q390	D-2	R390	E-2	B420	1-1	τ410	н.4	11410	F-4	VB435	D-1
C402	E-2	CR395	D-1			Q400	E-3	R392	D-2	B422	J-2	1		0.110		1.1.400	5.
2406	J-4	CR420	J-2			}		R394	E-2	B425	J-1						
2410	1-5	CR422	J-1					R395	F-1	B427	J-3						
2412	H-2	CR428	J-3					R397	D-2	B428	J-3						
2414	H-2	CR430	J-3					R400	E-2	R430	D-2						
2415	1-2							R402	E-2	R433	D-2						
417	F-2							R404	E-2	R435	D-1					í	
:418	E-1							R405	F-2		_						
2422	1-2							R406	E-3			1					
C425	J-2							R408	J-4								
C427	J-3							R410	C-5								
2430	J-4							R412	G-1	1							
C440	1-2							R417	J-2								
				I		1		R418	J-1	I		I		1		i i	

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ADJUSTMENTS-HV POWER SUPPLY SUPPLY

FRONT PANEL CONTROL BOARD PARTS LOCATION GRID



CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID
NO	LOC	NO	LOC	NO	LOC	NO	LOC
C310	C-5	Q310	C-5	R332 R440 R1000A R1000B	D-4 C-3 E-2 C-2	S1000	D-2

REV. JAN 1974

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ADJUSTMENTS HIGH VOLTAGE POWER SUPPLY CIRCUIT BOARD

Adjustment is generally required after a repair has been

nade, or after long time intervals in which normal aging of

components may affect instrument accuracy. For initial

nspection to verify instrument operation, the basic operaion procedure in section 1 should be used (the instrument s checked with its covers on, using a minimum of

Before complete adjustment, thoroughly clean and

nspect this instrument as outlined in the service section of the 5403 manual. Also, the system manual contains

nformation for general maintenance of this instrument,

ncluding preventive maintenance, component identifica-

Tektronix, Inc. provides complete instrument repair and djustment at local Field Service Centers and at the Factory Service Center. Contact your local Tektronix Field Office

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

Turn INTENSITY control

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 INTEN-

Adjust

1. Intensity Range, R435

fully counterclockwise.

peripheral equipment).

tion and replacement, etc.

or representative for further information.

Services Available

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 D40.

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-D40 to the Line voltage source and pull the POWER switch out to turn the instrument on.



REV. JAN 1974

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D40

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 MHz¹.

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, $\pm5°C$.

1. Check Trigger Amplifier

Connect a properly terminated 60 MHz¹ 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 sinewave generator for exactly 1 major graticule division of signal. Check that a stable display can be obtained.

Disconnect the signal.

4. Check Z Axis Amplifier

Connect a 5 volt, 1 kHz sinewave signal to the EXT INTENSITY INPUT connector. Also, use the sinewave signal to externally trigger the time-base plugin. 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.

¹A 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 band pass will depend on the vertical plug-in unit band pass and the triggering capabilities of the time base plug-in unit. 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-D40 to the line voltage source and pull the POWER switch out to turn the instrument on.

2. Check Beam Finder

Connect a 1KHz sinewave signal to CH 1 on VERTICAL PLUG-IN. Set the TIME BASE to 1 m. Press the BEAM FINDER pushbutton. Check that the signal can not 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 frontpanel 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 display four major graticule divisions high.

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.









INTERCONNECT AND VOLTAGE DISTRIBUTION POWER SUPPLY/AMPLIFIER MODULE

REV. B, AUG. 1974

NTERCONN. & VOLT. DISTR.

(4)_b

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.

ELCTBN

ELCTLT

ELEC

ELEM

EOPT

ËPL.

EXT

FLEX

FLH

FR

FT

FXD

HDL

HEX

HEX HD

HLCPS

HLEXT

IDENT

IMPLR

ΗV

IC

1D

GSKT

FLTR

FSTNR

FII

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

IN

NIP

ŌD

PL

PN

RES

RLF

INCH NUMBER SIZE ACTR ACTUATOR ADPTR ADAPTER ALIGNMENT ALIGN AL ALUMINUM ASSEM ASSEMBLED ASSY ASSEMBLY ATTEN ATTENUATOR AWG AMERICAN WIRE GAGE ВD BOARD BRKT BRACKET BRS BRASS BRZ BRONZE BSHG BUSHING CAB CABINET CAP CAPACITOR CER CERAMIC CHAS CHASSIS СКТ CIRCUIT COMP COMPOSITION CONNECTOR CONN cov COVER CPLG COUPLING CBT CATHODE RAY TUBE DEG DEGREE

DRAWER

ELECTRICAL ELECTROLYTIC ELEMENT ELECTRICAL PARTS LIST EQUIPMENT EXTERNAL FILLISTER HEAD ELEXIBLE FLAT HEAD FILTER FRAME or FRONT FASTENER FOOT FIXED GASKET HANDLE HEXAGON HEXAGONAL HEAD HEXAGONAL SOCKET HEX SOC HELICAL COMPRESSION HELICAL EXTENSION HIGH VOLTAGE INTEGRATED CIRCUIT INSIDE DIAMETER **IDENTIFICATION** IMPELLER

ELECTRON

INCH INCANDESCENT INCAND INSULATOR INSUL INTL INTERNAL LPHLDR LAMPHOLDER MACH MACHINE MECH MECHANICAL MTG MOUNTING NIPPLE NON WIRE NOT WIRE WOUND ORDER BY DESCRIPTION OUTSIDE DIAMETER OBD OVH OVAL HEAD PHOSPHOR BRONZE PH BRZ PLAIN or PLATE PLSTC PLASTIC PART NUMBER PNH PAN HEAD PWR POWER RCPT RECEPTACLE RESISTOR RGD BIGID RELIEF RTNR RETAINER SCH SOCKET HEAD OSCILLOSCOPE SCOPE SCR SCREW

SE SINGLE END SECT SECTION SEMICOND SEMICONDUCTOR SHIELD SHLD SHOULDERED SHLDR SKT SOCKET SL1DE SL SLFLKG SELF-LOCKING SLEEVING SLVG SPR SPRING SQ SQUARE SST STAINLESS STEEL STL STEEL SW SWITCH TUBE TERM TERMINAL THREAD THD тнк тніск TENSION TAPPING TNSN TPG TRUSS HEAD TRH VOLTAGE VARIABLE VAR W/ WITH WSHR WASHER TRANSFORMER XEMB XSTR TRANSISTOR

v

DWF

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
0000C	GETTIG ENGINEERING AND MANUFACTURING CO.		SPRINGMILL, PA 16875
00779	AMP, INC.	P. O. BOX 3608	HARRISBURG, PA 17105
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
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
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71590	CENTRALAB ELECTRONICS, DIV. OF		
	GLOBE-UNION, INC.	5757 N. GREEN BAY AVE.	MILWAUKEE, WI 53201
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.	ASHTABULA, OH 44004
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
77250	PHEOLL MANUFACTURING CO., DIVISION		
	OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650
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.	LA GRANGE, IL 60525
83058	CARR CO., THE, UNITED-CARR DIV. OF		
	TRW, INC.	31 AMES ST.	CAMBRIDGE, MA 02142
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
91929	HONEYWELL, INC., MICRO SWITCH DIV.	CHICAGO & SPRING STS.	FREEPORT, IL 61032
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641
98278	MALCO A MICRODOT CO., INC.,		
	CONNECTOR AND CABLE DIVISION	220 PASADENA AVE.	SOUTH PASADENA, CA 91030

No	Tektronix Serial/Mod	el No. Decont Qty	12345 Name & Description	Mfr Codo	Mfr. Part Numbo
140.		DSCOM		Code	
1-1	200-1218-00	1	RTNR, SCALE, CRT: (ADDA CHING DARDE)	80009	200-1218-00
-2	211-0188-00	2	SCREW, MACHINE: 4-40 X 0.30"INCH, SST	80009	211-0188-00
-3	337-1440-00	1	SHLD, IMPLOSION:	80009	337-1440-00
-4	386-2544-00	4	SUPPORT, CRT:	80009	386-2544-00
-5	366-0494-00	2	KNOB: GRAY	80009	366-0494-00
	213-0153-00	1	. SETSCREW: 5-40 X 0.125 INCH, HEX SOC STL	74445	OBD
-6	366-139 1- 00 [±]	1	KNOB: GRAY	80009	366-1391-00
	213-0239-00	1	SETSCREW: 3-48 X 0.062 INCH, HEX SOC STL	71159	OBD
-7	366-1077-00	1	KNOB: GRAY	80009	366-1077-00
	213-0153-00	1	. SETSCREW: 5-40 X 0.125 INCH, HEX SOC STL	74445	OBD
-8	384-1161-00	1	EXTENSION SHAFT:	80009	384-1161-00
-9	358-0216-00	1	BUSHING, PLASTIC: 0.257 ID X 0.412 INCH OD	80009	358-0216-00
-10	119-0238-00 B010100 B	021826 1	COIL, CALIBRATIO:	80009	119-0238-00
	119-0373-00 B021827	1	COIL, CALIBRATIO:	80009	119-0373-00
			(ATTACHING PARTS)		
	210-0442-00	2	NUT, PLAIN, HEX.: 3-48 X 0.187 INCH.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, NONMETAL: FIBER, 0, 14 ID X 0, 375"OD	74921	OBD
-11	361-0059-01	1	SPACER, CUR LOOP:1.094 X 0.344 X 0.125 INCH	80009	361-0059-01
-12	210-0593-00	2	NUT, FINISHING:0.25 HEX X 0.312" LONG, BRS	80009	210-0593-00
-13	260-1238-00	1	SWITCH, PUSH: 0.5A AT 115VAC	81073	39-2
	343-0081-00 XB021800	1	STRAP, RETAINING:	95987	3-16н
			(ATTACHING PARTS)		
	211-0057-00 XB021800	1	SCREW, MACHINE: 6-32 X 0.312 WCH, PNH STL	83385	OBD
	210-0457-00 XB021800	1	NUT, PLAIN, EXT W:6-32 X 0.312 INCH, STL	83385	BOD
-14		1	CKT BOARD ASSY: FRONT PANEL CONTROL (SEE A4 EPL)		
-15	131-0608-00 B010100 B	010199 9	. CONTACT, ELEC: 0.365 INCH LONG	22526	47357
	131-0608-00 B010200	1	. CONTACT, ELEC: 0.365 INCH LONG	22526	47357
-16	200-1327-00	1	. COVER,VAR RES.:	80009	200-1327-00
-17	210-0457-00	1	. NUT, PLAIN, EXT W:6-32 X 0.312 INCH, STL	83385	OBD
-18	211-0504-00	1	. SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
-19	384-1121-00	1	. EXTENSION SHAFT:1.41 INCH LONG	80009	384-1121-00
	175-0831-00 B010200	FT	. WIRE, ELECTRICAL: 8 WIRE RIBBON	08261	TEK-175-0831-00
	131-0707-00 B010200	8	. CONTACT, ELEC: 0.48"L, 22-26 AWG WIRE	22526	47439
	352-0166-04 B010200	1	. CONN BODY, PL, EL:8 WIRE YELLOW	80009	352-0166-04
			(ATTACHING PARTS FOR CKT BD)		
-20	210-0583-00	2	NUT, PLAIN, HEX.: 0.25-32 X 0.312 INCH, BRS	73743	2X20224-402
-21	210-0940-00	2	WASHER, FLAT: 0.25 ID X 0.375 INCH OD, STL	79807	OBD
-22	1	1	CKT BOARD ASSY: GRAT LAMP (SEE A5 EPL)		
-23	378-0732-00	1	. DIFFUSER, LIGHT:	80009	378-0732-00
-24	426-1017-00	2	. MOUNT, REFLECTOR:	80009	426-1017-00
-25	211-0062-00,	2	. SCREW, MACHINE: 2-56 X 0.312 INCH, RDH STL	83385	OBD
- 26	131-0704-00	3	. CONTACT, ELEC: GRATICULE LAMP (ATTACHING PARTS)	80009	131-0704-00
-27	210-0759-00	3	. EYELET, METALLIC: 0.61 OD X 0.192 INCH L, BRS	71590	16076-11
-28	210-0957-00	3	. WASHER, FLAT: 0.0625 ID X 0.125 OD, STL	12327	OBD
			(ATTACHING PARTS FOR CKT BD)		
-29	213-0088-00	2	SCR, TPG, THD CTG: $4-24 \times 0.25$ INCH, PNH STL *	83385	OBD
-30	358-0378-00	1	BUSHING, SLEEVE: PRESS MOUNT	80009	358-0378-00
-31	333-1722-00 ¹	1	PANEL, FRONT:	80009	333-1722-00
	333-1623-00 ²	1	PANEL, FRONT:	80009	333-1623-00
-32	376-0127-00	1	COUPLER, SHAFT: PLASTIC	80009	376-0127-00
-33	260-1222-00	1	SWITCH, PUSH-PUL:10A,250VAC	91929	2DM301
		1	CKT BOARD ASSY: HORIZONTAL (SEE A2 EPL)		
-34	131-0608-00	17	. CONTACT, ELEC: 0.365 INCH LONG	22526	47357
-34 -35			SCREW, MACHINE: 4-40 X 0.25 INCH. PNH STL	83385	OBD
-34 -35 -36	211-0008-00	2			020
-34 -35 -36 -37	211-0008-00 351-0087-00	2	GUIDE,CKT CARD:4.75 INCH LONG,PLASTIC	80009	351-0087-00
-34 -35 -36 -37 -38	211-0008-00 351-0087-00	2 2 1	GUIDE,CKT CARD:4.75 INCH LONG,PLASTIC CKT BOARD ASSY:VERTICAL(SEE A1 EPL)	80009	351-0087-00
-34 -35 -36 -37 -38 -39	211-0008-00 351-0087-00 136-0252-04	2 2 1 14	GUIDE,CKT CARD:4.75 INCH LONG,PLASTIC CKT BOARD ASSY:VERTICAL(SEE A1 EPL) . CONTACT,ELEC:0.188 INCH LONG	80009 22526	351-0087-00 75060

] '

Mechanical Parts List—D40

Fig. &

Index Tektronix Serial/Model No. Mfr Qty 1 2 3 4 5 No. Part No. Eff Dscont Name & Description Code Mfr Part Number 2 . HEAT SINK, ELEC: XSTR, 0.72 OD X 0.375"H 05820 207-AB 1-40 214-1291-00 1 . CONN BODY, PL, EL:5 WIRE BLACK 80009 352-0163-00 -41 352-0163-00 . CONTACT, ELEC: 0.48"L, 22-26 AWG WIRE 22526 47439 131-0707-00 5 -42 . WIRE, ELECTRICAL2.833 FT 5 WIRE RIBBON TEK-175-0828-00 175-0828-00 \mathbf{FT} 23499 -43 (ATTACHING PARTS FOR CKT BD) SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL 83385 211-0008-00 2 OBD -44 _ _ _ * _ _ _ LEAD SET:CRT DEFLECTION -45 195-0119-00 1 80009 441-1090-00 441-1090-00 1 CHAS, ELEC EQPT: -46 (ATTACHING PARTS) SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL 83385 2 OBD -47 211-0008-00 NUT, PLAIN, EXT W:4-40 X 0.25 INCH, STL 78189 OBD -48 210-0586-00 3 _ _ _ * _ _ _ GROMMET, PLASTIC:U SHAPE -49 348-0239-00 2 80009 337-1714-00 -50 337-1714-00 1 SHIELD.ELEC:HV (ATTACHING PARTS) 83385 OBD -51 211-0008-00 2 SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL _ _ _ * _ _ _ -52 ----1 CKT BOARD ASSY:HV(SEE A3 EPL) 131-0566-00 1 . LINK, TERM. CONNE: 0.086 DIA X 2.375 INCH L 0000C L-2007-1 -53 22526 47357 . CONTACT, ELEC: 0.365 INCH LONG -54 131-0608-00 34 47350 . CONTACT, ELEC: 0.46 INCH LONG 22526 131-0589-00 2 3 . SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL 211-0008-00 83385 OBD -55 80009 214-0579-00 214-0579-00 1 . TERM., TEST PT:0.40 INCH LONG -56 2 . CLIP, ELECTRICAL: FOR 0.25 INCH DIA FUSE 80009 344-0154-00 344-0154-00 -57 (ATTACHING PARTS FOR CKT BD) SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL 83385 OBD -58 211-0008-00 2 _ _ _ * _ _ _ TRANSISTOR: (SEE Q410 EPL) -59 _____ ____ 1 (ATTACHING PARTS) 80009 344-0236-00 -60 344-0236-00 1 CLIP.SPG TENS: 80009 342-0082-00 INSULATOR, PLATE: 0.52 SQ X 0.015 INCH THK, AL 342-0082-00 1 -61 ___ * _ _ _ 80009 441-1102-00 441-1102-00 1 CHAS, ELEC EQPT: HV HORIZONTAL -62 (ATTACHING PARTS) SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL 83385 OBD -63 211-0008-00 4 _ _ _ * _ _ _ 80009 161-0033-12 CABLE ASSY, PWR, : 161-0033-12 1 -64 00779 1-480435-0 -65 200-1075-00 1 COVER, ELEC CONN: PLASTIC 80009 358-0366-00 BSHG, STRAIN, RLF: BOTTOM 358-0366-00 1 -66 80009 358-0365-00 BSHG, STRAIN, RLF: TOP -67 358-0365-00 1 CABLE,NIP.,ELEC:0.265 ID X 0.38"OD W/FLG 80009 200-1004-00 -68 200-1004-00 1 PANEL, REAR: 80009 333-1645-00 1 -69 333-1645-00 (ATTACHING PARTS) 73743 3262-402 NUT, PLAIN, HEX.: 6-32 X 0.312 INCH, CD PLATED -70 210-0401-00 2 _ _ _ * _ _ _ 75915 345001 352-0362-00 B010100 B010564 1 FUSEHOLDER: W/MOUNTING HARDWARE -71 75915 342012 FUSEHOLDER:W/HARDWARE 352-0076-00 B010565 1 (ATTACHING PARTS) WASHER, NONMETAL:0.5 ID X 0.688 INCH OD, NPRN 70485 OBD -72 210-0873-00 1 _ _ _ * _ _ _ 24931 28JR200-1 CONNECTOR, RCPT, : BNC, FEMALE -73 131-0955-00 1 78189 2104-04-00-2520N 210-0201-00 1 TERMINAL, LUG: SE #4 -74 (ATTACHING PARTS) NUT, PLAIN, EXT W:4-40 X 0.25 INCH, STL 78189 OBD -75 210-0586-00 1 _ _ _ * _ _ _ SW, THERMOSTATIC: OPEN 60 DEG, CLOSE 48.9 DEG C -76 260-0618-00 1 (ATTACHING PARTS) 78189 OBD NUT, PLAIN, EXT W:4-40 X 0.25 INCH, STL 2 210-0586-00 -77 - - - * - - -80009 200-0616-01 200-0616-01 1 COV, ELECTRON TU: -78 SOCKET, PLUG IN: -79 136-0301-01 1

6

Fig. &			
Index	Tektronix	Serial/Model	No.

\bigcirc	Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
	1-80	343-0397-00)	1	CLAMP, HOLD DOWN:CRT	80009	343-0397-00
	-81	361-0496-00		1	CALING PARIS	80009	361-0496-00
	-81 -82	211-0516-00)	2	SCREW, MACHINE: 6-32 X 0.875 INCH, PNH STL	83385	OBD
	-83	354-0409-00)	1	CLAMP,CRT:GRAY PLASTIC (ATTACHING PARTS)	80009	354-0409-00
	-84	211-0632-00)	1	SCREW, MACHINE: 6-32 X 2.25 FIL, POZ STL	83385	OBD
	-85	343-0123-01		2	CLAMP, RET., ELEC: CRT, REAR	80009	343-0123-01
	-86	220-0444-00)	1	NUT, PLAIN, SQ:6-32 X 0.250 INCH, STL	77250	OBD
	-87	348-0070-01		3	PAD.CUSHIONING:0.69 INCH.RUBBER	80009	348-0070-01
	-88	337-1712-02		ī	SHIELD, SECT, CRT: REAR	80009	337-1712-02
	-89	348-0006-00		1	GROMMET, RUBBER: 0.562 ID X 0.875 INCH OD	70485	1720
	-90	348-0145-00)	1	GROMMET, PLASTIC: U-SHP, 1.0 X 0.42 INCH	80009	348-0145-00
	-91	334-1379-00	1	1	LABEL:CRT, ADHESIVE BACK	80009	334-1379-00
	-92	337-1712-00)	1	SHIELD, ELEC: CRT, FRONT	80009	337-1712-00
					(ATTACHING PARTS)		
	-93	211-0587-00)	l	SCREW, MACHINE: 6-32 X 0.188 INCH, HSB	80009	211-0587-00
	-94			1	DELAY LINE, ELEC: (SEE DL100 EPL)		
	-95	131-1090-00	B010100 B029999X	2	. CONTACT, ELEC:	80009	131-1090-00
	-96	407-1185-00	B010100 B029999X	l	. BRACKET: DELAY LINE	80009	407-1185-00
	-97	211-0007-00	B010100 B029999X	4	(ATTACHING FARTS) SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
	-98	380-0304-00	B010100 B029999X	1	. HSG, DELAY LINE:	8000 9	380-0304-00
	_00	210-0457-00		1	(AITACHING FARIS)	02205	
	-100	343-0081-00		1	STRAD RETAINING.	95987	3_16H
	100	545 0001 00		-		55507	5 1011
	-101	426-0950-00)	1	FRAME ASSEMBLY: DISPLAY UNIT	80009	426-0950-00
\smile	-102	131-0026-00)	ī	BUTTON.PLUG:	83058	118738
	-103	200-0544-00	1	1	COVER, ELEC CONN:	80009	200-0544-00
	-104	179-1969-00)	1	WIRING HARNESS:MAIN	80009	179-1969-00
	-105	131-0621-00)	19	. CONTACT, ELEC:0.577"L, 22-26 AWG WIRE	22526	46231
	-106	131-0861-00)	3	. CONTACT, ELEC: QUICK DISCONNECT	00779	42617-2
	-107	200-1075-00	•	3	. COVER, ELEC CONN: PLASTIC	00779	1-480435-0
	-108	352-0199-03	•	1	. CONN BODY, PL, EL: 3 WIRE ORANGE	80009	352-0199-03
	-109	175-0825-00	1	FT	WIRE, ELECTRICAL: 2 WIRE RIBBON, 0.4 FEET L	23499	TEK-175-0825-00
	-110	175-0826-00)	\mathbf{FT}	WIRE, ELECTRICAL: 3 WIRE RIBBON, 0.8 FEET L	08261	TEK-175-0826-00
	-111	175-0831-00	B010100 B010199	\mathbf{FT}	WIRE, ELECTRICAL: 8 WIRE RIBBON, 0.9 FEET L	08261	TEK-175-0831-00
	-112	175-0832-00	1	\mathbf{FT}	WIRE, ELECTRICAL: 9 WIRE RIBBON, 0.7 FEET L	23499	TEK-175-0832-00
	-113	131-0707-00	B010100 B010199	37	CONTACT, ELEC: 0.48"L, 22-26 AWG WIRE	22526	47439
		131-0707-00	B010200	24	CONTACT, ELEC: 0.48"L, 22-26 AWG WIRE	22526	47439
	-114	131-0371-00)	2	CONTACT, ELEC: FOR NO.26 AWG WIRE	98278	12093-8
	-115	352-0161-00)	1	CONN BODY, PL, EL: 3 WIRE BLACK	80009	352-0161-00
	-116	352-0166-04	B010100 B010199	2	CONN BODY, PL, EL:8 WIRE YELLOW	80009	352-0166-04
	-117	352-0167-00	1	2	CONN BODY, PL, EL:9 WIRE BLACK	80009	352-0167-00
		175-0855-00)	\mathbf{FT}	WIRE, ELECTRICAL: 10 WIRE RIBBON, 1.167 FEET L	23499	TEK-175-0855-00
		175-0860-00)	\mathbf{FT}	WIRE, ELECTRICAL: 5 WIRE RIBBON, 1.104 FEET	23499	TEK-175-0860-00
		175-0863-00	1	\mathbf{FT}	CABLE, SP, ELEC: 2 WIRE RIBBON, 1.167 FEET LONG	80009	175-0863-00
		352-0163-05		1	CONN BODY, PL, EL: 5 WIRE GREEN	80009	352-0163-05
		352-0168-02		1	CONN BODY, PL, EL: 10 WIRE RED	80009	352-0168-02
		352-0169-03	5	1	CONN BODY, PL, EL: 2 WIRE ORANGE	80009	352-0169-03
		352-0199-03	5	1	CONN BODY, PL, EL: 3 WIRE ORANGE	80009	352-0199-03
		352-0201-05		1	CONN BODY, PL, EL:5 WIRE GREEN	80009	352-0201-05
		352-0206-02		1	CONN BODY, PL, EL: 10 WIRE RED	80009	352-0206-02



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FIG. ----

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D-40 DISPLAY MODULE





D-40 DISPLAY MODULE

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У	1	2	3	4	5	Description

1	CARTON ASSEMBLY, for display & power
-	modules
-	carton assembly includes:
2	FRAME, top & bottom
1	PAD SET, 3 piece
1	CARTON

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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 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108 111	PG 501 - 5 V output pulse; 3.5 ns Risetime. PG 501 - Risetime less than 3.5 ns; 8 ns Pretrigger pulse delay.	108 - 10 V output pulse; 1 ns Risetime. 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger Pulse delay.
114	PG 501 - ± 5 V output.	114 - ± 10 V output. Short proof output.
115	PG 501 - Does not have Paired, Burst, Gated, or Delayed pulse mode; ±5 V dc Offset. Has ±5 V output.	115 - Paired, Burst, Gated, and Delayed pulse mode; ±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 - ±5 V output	114 - ± 10 V output. Short proof output.
115	PG 502 - Does not have Paired, Burst, Gated, Delayed & Undelayed pulse mode; Has ±5 V output.	delayed pulse mode; ±10 V output. Short-proof output.
2101	PG 502 - Does not have Paired or Delayed pulse. Has ± 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 out- put. 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 alter- nately chopped to a reference voltage.
SG 503 replaces 190,		
190A, 190B 191	SG 503 - Amplitude range 5 mV to 5.5 V p-p. 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.
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A	TG 501 - Marker outputs, 5 sec to 1 ns.	180A - Marker outputs, 5 sec to 1 μ s.
	Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns.	Sinewave available at 20, 10, and 2 ns. Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz.
	One time-mark can be generated at a	Multiple time-marks can be
181	TG 501 - Marker outputs, 5 sec to 1 ns. Sine- wave available at 5, 2, and 1 ns.	181 - Marker outputs, 1, 10, 100, 1000, and 10,000 μ s, plus 10 ns sinewave.
184	TG 501 - Marker outputs, 5 sec to 1 ns. Sine- wave 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 μs. 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 μs.
2901	TG 501 - Marker outputs, 5 sec to 1 ns. Sine- wave 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 μ s. Sinewave available to 50, 10, and 5 ns. Separate trigger pulses, from 5 sec to 0.1 μ s. Multiple time-marks can be gene- rated simultaneously.

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



5403

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TABLE OF CONTENTS

PART I OPERATING INFORMATION

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	SECTION 0	INSTALLATION	Page	SECTION 2	THEORY OF OPERATION (cont)	Page
		OPERATING VOLTAGE			CIRCUIT ANALYSIS OF	
		5400 Panel (Dust Cover) Removal	0-1		READOUT SYSTEM	2-4
		Power Transformer	0-1		Timer	2-5
		INSTRUMENT CONVERSION	0-2		Time-Slot Counter	2.6
		RACKMOUNTING			Word Counter	2.6
		Mounting Method	0-2		Encoding The Data	2.7
		Rack Dimensions	0-2		Column and Row Data Switches	2.9
		Installing The Slide-Out Tracks	0-3		Display-Skip Generator	2-10
		R5400 Installation And Adjustment	0-4		Column and Row Decoder	2.10
		Slide-Out Track Maintenance	0-4		Zeros Logic and Memory	2.10
		OPERATING TEMPERATURE	0-6		Character Generators	2.10
		PLUGINUNITS	•••		Decimal Point Logic and	2-12
		Installation	0.6		Character Position Counter	2 1 2
		Selection	0-0		Format Concrator	2-12
		Selection	0-0		V Output Amplifian	2-13
					X Output Amplifier	2-13
	SECTION 1	OPERATING INSTRUCTIONS			A-Output Amplifier	2-13
		GENERAL OPERATING		PART II S	ERVICING INFORMATION	
		INFORMATION				
		Display Switching Logic	1.1	SECTION 3	MAINTENANCE	
		Vertical Display Mode	1-1			
		X-Y Operation	1-2		Cleaning	3-1
		Raster Display	1-2		Adjustment	3-1
2 3		BASIC OSCILLOSCOPE			REPAIR	
()		APPLICATIONS			Troubleshooting Aids	3-1
\bigcirc		Peak-to-Peak Voltage Measurements—AC	1-3		Troubleshooting Equipment	3-2
		Instantaneous Voltage Measurement-DC	1-3		Troubleshooting Techniques	3-3
		Comparison Measurements	1-4		Replacement Parts	3-4
		Time Period Measurement	1-5		Component Replacement	3-4
		Determining Frequency	1-6			0-4
		Bisetime Measurement	1.6	SECTION 4	OBTIONS	
		Time Difference Measurements	1.7	SECTION 4	OPTIONS	
		High Resolution Phase Measurement	1.8			
			1-0	SECTION 5	ELECTRICAL PARTS LIST	5-1
	SECTION 2	THEORY OF OPERATION				
				SECTION 6	ADJUSTMENTS, DIAGRAMS AND	
		LOW-VOLTAGE POWER SUPPLY			ILLUSTRATIONS	
		AND CALIBRATOR				
		Power Input	2-1		LV Power Supply Circuit Board	
		Low-Voltage Rectifiers			Readout Circuit Board	
		and Unregulated Outputs	2-1		BLOCK DIAGRAM	
		Low-Voltage Regulators	2-1		PARTS LOCATION GRID-INTERFAC	E
		Line Trigger	2.2		(Back side of foldout)	-
		CRT Heater Winding	2-2			
		Calibrator	2.2			AGE
		INTERFACE			PARTS LOCATION GRID-LOW-VOLT	
		Chop Oscillator	2-2		LOW VOLTACE SUPPLY AND	.,
		Divider Circuit	2.2			
		Vertical Amplifier and Vertical				
		Integrated Switching Circuit	2-2		(Posk cide of fold-ut)	
		Horizontal Amplifier	2.3			
		Trigger Amplifiers	2.3			
		7. Avis Signal	2.3		INTERCONNECT AND VOLTAGE	
			2-0		DISTRIBUTION DIAGRAM	
12		READUUT SYSTEM	2.2	SECTION 7	MECHANICAL PARTS LIST	7-1
()		Display Format	∠-3 2.2		FIG. 1 EXPLODED VIEW	
\sim		Developing the Display	2-3		ACCESSORIES AND REPACKAGING	





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INSTALLATION

OPERATING VOLTAGE



This instrument is designed for operation from a power source with its neutral at or near earth (ground) potential, and with a separate safety-earth conductor. It is not intended for operation from two phases of a multi-phase system, or across the legs of a single-phase, three-wire system.

5400 Panel (Dust Cover) Removal

WARNING

Dangerous potentials exist at several points throughout the oscilloscope. When the instrument must be operated with the cabinet panels removed, do not touch exposed connections or components. Some transistors have voltage present on their cases. Disconnect power before cleaning the instrument or replacing parts.

The cabinet panels (dust covers) of the 5400-series oscilloscope are held in place by slotted fasteners. To remove the panels, turn each fastener counterclockwise a quarter turn with a large screwdriver, coin, or similar device. Then the panels can be lifted away. The instrument should be operated with the panels in place to protect the interior from dust, and to eliminate shock hazard.

NOTE

The power cord on Tektronix instruments may conform to either of the following two electrical codes:

Conductor	USA (NEC) & Canada	IEC
Line	Black	Brown
Neutral	White	Light Blue*
Safety-Earth	Green w/yellow	Green w/yellow
	stripe	stripe

*Tinned copper conductor.

Power Transformer

The 5400-series oscilloscope transformer permits operation from 100-volt, 110-volt, 120-volt, 200-volt, 220-volt, and 240-volt sources with power-line frequencies of 50 to 400 hertz. The range for which the primary taps set is marked on the rear panel of the instrument. Use the following procedure to obtain correct instrument operation from the line voltage available.

1. Disconnect the instrument from the power source.

3. To convert from 120 volts to 220 volts nominal line voltage, or vice versa, remove the line-selector block from the square-pin connectors (see Fig. 0-1) and replace it with the other block. Remove the line fuse from the fuse holder located on the rear panel of the display module and replace it with one having the correct rating. The unused line-selector block and line fuse can be stored on the Power Supply circuit board. Change the line-cord power plug to match the power-source receptacle or use an adapter.



Fig. 0-1. Location of the line-selector block on the Power Supply circuit board.

Installation-5403

NOTE

The 120-volt block is color coded brown, and it connects the transformer primary windings in parallel. The 220-volt block is color coded red, and it connects the primary windings in series.

4. To change regulating ranges, place the line-selector block on the desired set of square pins. Select a range that is centered about the average line voltage to which the instrument is to be connected (see Table 0-1).

5. Change the nominal line voltage information on the rear panel of the instrument. Use a non-abrasive eraser to remove the previous data, and mark in new data with a pencil.

6. Replace the bottom dust cover and apply power to the instrument.



Damage to the instrument may result from incorrect placement of the line-selector block.

TABLE 0-1

Regulating Ranges for Power Transformer

Line Selector Block	Regulati	ng Range
Position	120-Volts Nominal	220-Volts Nominal
L	90 VAC to 110 VAC	180 VAC to 220 VAC
М	99 VAC to 121 VAC	198 VAC to 242 VAC
Н	108 VAC to 132 VAC	216 VAC to 264 VAC
Line Fuse	1.25 A slow-blow	0.7 A slow-blow

INSTRUMENT CONVERSION

The 5403 Power Supply/Amplifier module and the display module can be fastened together stacked or side by side; this permits operation as a bench oscilloscope, or in a standard 19-inch rack. The two modules can quickly be converted from a bench model to a rackmount model, or vice versa. Field conversion kits, including the necessary parts, and instructions are available from Tektronix,

Inc. Order: 040-0583-01, Bench-to-rack conversion; 040-0584-02, Rack-to-bench conversion.

NOTE

Before attempting to operate the instrument, make sure the module wiring interconnections are correct.

RACKMOUNTING

The rackmount version of the 5400-series oscilloscope is designed for operation in a standard 19-inch wide rack that has Universal, EIA, RETMA, or Western Electric hole spacing. When properly mounted, this instrument will meet all electrical and environmental specifications given in Section 3.

Mounting Method

This instrument will fit most 19-inch wide racks whose front and rear holes conform to Universal hole spacing, some drilling may be required on racks having EIA, RETMA, or Western Electric hole spacing. The slide-out tracks easily mount to the cabinet rack front and rear vertical mounting rails if the inside distance between the front and rear rails is within 10-9/16 inches to 24-3/8 inches. If the inside distance exceeds 24-3/8 inches, some means of support is required for the rear ends of the slide-out tracks. (For example, make extensions for the rear mounting brackets.)

Rack Dimensions

Height. At least 5-1/4 inches of vertical space is required to mount this instrument in a rack. If other instruments are operated in the rack, an additional 1/4 inch is required, both above and below the R5400, to allow space for proper circulation of cooling air.

Width. A standard 19-inch wide rack may be used. The dimension of opening between the front rails must be at least 17-5/8 inches for a cabinet in which the front lip of the stationary section is mounted behind an untapped front

rail as shown in Fig. 0-2A. If the front rails are tapped, and the stationary section is mounted in front of the front rail as shown in Fig. 0-2B, the dimension between the front rails should be at least 17-3/4 inches. These dimensions allow room on each side of the instrument for the slide-out tracks to operate so the instrument can move freely in and out of the rack.

Depth. For proper circulation of cooling air, allow at least two inches clearance behind the rear of the instrument and any enclosure on the rack. If it is sometimes necessary or desirable to operate the R5400 in the fully extended position, use cables that are long enough to reach from the signal source to the instrument.

Installing The Slide-Out Tracks

The slide-out tracks for the instrument consist of two assemblies, one for the left side of the instrument and one for the right side. Each assembly consists of three sections. A stationary section attaches to the front and rear rails of the rack, the chassis section attaches to the instrument (and is installed at the factory), and the intermediate section fits between the other two sections to allow the instrument to fully extend out of the rack.

The small hardware components included with the slide-out track assemblies are used to mount the tracks to most standard 19-inch vertical rack rails having this compatibility.



Fig. 0-2. Mounting the left stationary section (with its matched intermediate section, not shown in illustrations A and B) to the rack rails.

Installation-5403

NOTE

1. Front and rear rail holes must be large enough to allow inserting a 10-32 screw through the rail mounting hole if the rails are untapped (see Fig. 0-2A).

2. Or, front and rear rail holes must be tapped to accept a 10-32 screw if Fig. 0-2B mounting method is used. Note in Fig. 0-2B right illustration that a No. 10 washer (not supplied) may be added to provide increased bearing surface for the slide-out track stationary section front flange.

Because of the above compatibility, there will be some small parts left over. The stationary and intermediate sections for both sides of the rack are shipped as a matched set and should not be separated. The matched sets of both sides including hardware are marked 351-0195-00 on the package. To identify the assemblies, note that the automatic latch and intermediate section stop is located near the top of the matched set.

Mounting Procedure. Use the following procedure to mount both sides. See Fig. 0-2 for installation details.

1. To mount the instrument directly above or below another instrument in a cabinet rack, select the appropriate holes in the front rack rails for the stationary sections, using Fig. 0-3 as a guide.

2. Mount the stationary slide-out track sections to the front rack rails using either of these methods:

(a) If the front flanges of the stationary sections are to be mounted behind the front rails (rails are countersunk or not tapped), mount the stationary sections as shown in Fig. 0-2A right illustration.

(b) If the front flanges of the stationary sections are to be mounted in front of the front rails (rails are tapped for 10-32 screws), mount the stationary sections as shown in Fig. 0-2B right illustration. To provide increased bearing surface for the screw head to securely fasten the front flange to the rail, a flat washer (not supplied) may be added under the screw head. However, if this mounting method is used, the front panel will not fit flush against the front rail because of the stationary section and washer thickness. If a flush fit is preferred, method 2 (a) should be used.

3. Mount the stationary slide-out sections to the rear rack rails using either of these methods.

(a) If the rear rack rail holes are not tapped to accept 10-32 machine screws, mount the left stationary section with hardware provided as shown in the left or center illustration of Fig. 0-2A. Note that the rear mounting bracket can be installed either way so the slide-out tracks will fit a deep or shallow cabinet rack. Use Fig. 0-2A as a guide for mounting the right stationary section. Make sure that the stationary sections are horizontally aligned so they are level and parallel with each other.

(b) If the rear rack rail holes are tapped to accept 10-32 machine screws, mount the left stationary section with hardware provided as shown in the left or center illustration of Fig. 0-2B. Note that the rear mounting bracket can be installed either way so the slide-out tracks will fit a deep or shallow cabinet rack. Use Fig. 0-2B as a guide for mounting the right stationary section. Make sure the stationary sections are horizontally aligned so they are level and parallel with each other.

R5400 Installation And Adjustment

To insert the instrument into the rack, proceed as follows:

1. Pull the slide-out track intermediate sections out to the fully extended position.

2. Insert the instrument chassis sections into the intermediate sections.

3. Press the stop latches on the chassis sections and push the instrument toward the rack until the latches snap into their holes.

4. Again press the stop latches and push the instrument into the rack.

To adjust the slide-out tracks for smooth sliding action, loosen the screws used to join the stationary sections to the rails of the rack. Center the instrument, allowing the slide-out tracks to seek the proper width, then tighten the screws.

To secure the instrument front-panel to the rack, the rack must either have universal hole spacing, or a hole must be drilled and tapped for a 10-32 screw, see Fig. 0-3. Using the hardware (not furnished) indicated in Fig. 0-3, secure the R5403 to the front rails of the rack.

Slide-Out Track Maintenance

The slide-out tracks require no lubrication. The special dark gray finish on the sliding parts is a permanent lubrication.



Fig. 0-3. Dimensional diagram.

OPERATING TEMPERATURE

The 5403 can be operated where the ambient air temperature is between 0° C and $+50^{\circ}$ C. The instrument can be stored in ambient temperature between -40° C and $+70^{\circ}$ C. After storage at a temperature beyond the operating limits, allow the chassis temperature to come within the operating limits before power is applied.

A thermal cutout in the display module provides thermal protection and disconnects the power to the instrument if the internal temperature exceeds a safe operating level. This device will automatically re-apply power when the temperature returns to a safe level.

PLUG-IN UNITS

The 5403 is designed to accept up to three Tektronix 5-series plug-in units. (Only the plug-in units without an N suffix will provide display readout.) This plug-in feature allows a variety of display combinations and also allows selection of bandwidth, sensitivity, display mode, etc., to meet the measurement requirements. In addition, it allows the oscilloscope system to be expanded to meet future measurement requirements. The overall capabilities of the resultant system are in large part determined by the characteristics of the plug-ins selected.

Installation

To install a plug-in unit into one of the plug-in compartments, align the slots in the top and bottom of the plug-in with the associated guides in the plug-in compartment. Push the plug-in unit firmly into the plug-in compartment until it locks into place. To remove a plug-in, pull the release latch on the plug-in unit to disengage it and pull the unit out of the plug-in compartment. Plug-in units can be removed or installed without turning off the instrument power. It is not necessary that all of the plug-in compartments be filled to operate the instrument, the only plug-ins needed are those required for the measurement to be made.

When the display unit is adjusted in accordance with the adjustment procedure given in the display unit instruction manual, the vertical and horizontal gain are standardized. This allows adjusted plug-in units to be changed from one plug-in compartment to another without readjustment. However, the basic adjustment of the individual plug-in units should be checked when they are installed in this system to verify their measurement accuracy. See the service information section of the plug-in unit manual for verification procedure.

Selection

The plug-in versatility of the 5400-series oscilloscope allows a variety of display modes with many different plug-ins. The following information is provided here to aid in plug-in selection.

To produce a single-trace display, install a single-channel vertical unit (or dual-channel unit set for single-channel operation) in either of the vertical (left or center) compartments and a time-base unit in the horizontal (right) compartment. For dual-trace displays, either install a dual-channel vertical unit in one of the vertical compartments or install a single-channel vertical unit in each vertical compartment. A combination of a single-channel and a dual-channel vertical unit allows a three-trace display; likewise, a combination of two dual-channel vertical units allows a four-trace display.

To obtain a vertical sweep with the input signal displayed horizontally, insert the time-base unit into one of the vertical compartments and the amplifier unit in the horizontal compartment. If a vertical sweep is used, there is no retrace blanking and the time-base unit triggering must be accomplished externally.

For X-Y displays, either a 5A-series amplifier unit or a 5B-series time-base unit having an amplifier channel can be installed in the horizontal compartment to accept the X signal. The Y signal is connected to a 5A-series amplifier unit installed in a vertical compartment.

Special purpose plug-in units may have specific restrictions regarding the compartments in which they can be installed. This information will be given in the instruction manuals for these plug-ins.

OPERATING INSTRUCTIONS

The 5403 Power Supply/Amplifier module forms the basis of an oscilloscope system, and requires a display module and plug-ins to complete the system. This section describes general operating information, and some basic oscilloscope applications.

Detailed operating information for a specific display module or plug-in is given in the instruction manual for that unit.

GENERAL OPERATING INFORMATION

Display Switching Logic

The electronic switching for time-shared displays is produced at the plug-in interface within the mainframe; however, the switching logic is selected in the plug-in units. The system allows any combination of plug-ins and Display switch settings. Refer to the individual plug-in manuals for specific capabilities and operating procedures.

NOTE

At sweep rates faster than approximately 1 μ s, the 5B10, 5B12, and 5B13 Time Base plug-in trigger circuit will not respond fast enough, when used in a 5403 to allow the leading edge of the display to be observed.

Differences in wiring between the 5100-series and 5400-series oscilloscope plug-in interfaces will not allow the use of the composite trigger mode of the 5B10, 5B12, and 5B13 Time Base plug-ins when used in the 5403. If the time base units are put in this mode, they will trigger off the left vertical plug-in only.

Vertical Plug-In Compartments. When a vertical plug-in is in the active mode (Display button pushed in), a logic level is applied to the switching circuit in the mainframe and a display from this plug-in will occur. When two plug-ins are both active in the vertical compartments, a multitrace display will occur (Alternate or Chopped). When no plug-in is in the active mode, the signal from the left compartment will be displayed. A time-base unit operated in one of the vertical compartments has a permanent internal connection to apply a logic level to the switching circuit; thus, a vertical trace produced by this unit will always be displayed. Horizontal Plug-in Compartment. Alternate or Chopped display switching is selected on a time-base unit operated in the horizontal compartment. When the Display switch is out (Alt), a negative impulse is supplied at the end of the sweep to allow alternate switching between plug-ins and plug-in channels. When the Display switch is pushed in (Chop), a chopped display will appear if a multi-trace display is required by the plug-ins in the vertical compartments. A vertical plug-in unit operated in the horizontal compartment has a permanent internal connection to provide a chopped display if it is required.

Switching Sequence. Four display time slots are provided on a time-sharing basis. When two vertical plug-ins are active, each receives two time slots, so the switching sequence is: left, left, center, center, etc. The two time slots allotted to each plug-in are divided between amplifier channels in a dual-trace unit; if two dual-trace plug-ins are active, then the switching sequence is: left Channel 1, left Channel 2, center Channel 1, center Channel 2, etc. If only one vertical plug-in is active, it receives all four time slots. The switching sequence is the same for both the Alternate and Chopped display modes.

Vertical Display Mode

Display On. To display a signal, the Display button of the applicable vertical plug-in unit must be pushed in to activate the unit. If two plug-ins are installed in the vertical compartments and only the signal from one of the units is wanted, set the Display switch of the unwanted unit to Off (button out). If neither plug-in is activated, the signal from the left unit is displayed. Both plug-ins can be activated for multi-trace displays.

Operating Instructions-5403

Alternate Mode. The alternate position of the time-base unit Display switch produces a display that alternates between activated plug-ins and amplifier channels with each sweep of the CRT. The switching sequence is described under Display Switching Logic in this section. Although the Alternate mode can be used at all sweep rates, the Chop mode provides a more satisfactory display at sweep rates from about one millisecond/division to five seconds/division. At these slower sweep rates, alternate mode switching becomes difficult to view.

Chopped Mode. The Chop position of the time-base unit Display switch produces a display that is electronically switched between channels at a 100-kilohertz rate. The switching sequence is discussed earlier. In general, the Chop mode provides the best display at sweep rates slower than about one milliscond/division or whenever dual-trace, single-shot phenomena are to be displayed. At faster sweep rates, the chopped switching becomes apparent and may interfere with the display.

Dual-Sweep Displays. When a dual-sweep time-base unit is operated in the horizontal compartment, the alternate and chopped time-shared switching for either the A or B sweep is identical to that for a single time-base unit. However, if both the A and B sweeps are operating, the 5403 operates in the independent pairs mode. Under this condition, the left vertical unit is always displayed at the sweep rate of the A time base and the right vertical unit is displayed at the sweep rate of the B time-base (non-delayed sweep only). This results in two displays that have completely independent vertical deflection and chopped or alternate sweep switching.

X-Y Operation

In some applications, it is desirable to display one signal versus another (X-Y) rather than against an internal sweep. The flexibility of the plug-in units available for use with the 5403 provides a means for applying a signal to the horizontal deflection system for this type of display. Some of the 5B-series time-base units can be operated as amplifiers, in addition to their normal use as time-base generators.

Raster Display

A raster-type display can be used to effectively increase the apparent sweep length. For this type of display, the trace is deflected both vertically and horizontally by saw-tooth signals, and is accomplished by installing a 5B-series time-base unit in the left vertical compartment, as well as one in the horizontal compartment. Normally, the unit in the vertical compartment should be set to a slower sweep rate than the one in the horizontal compartment; the number of horizontal traces in the raster depends upon the ratio between the two sweep rates. Information can be displayed on the raster using the Ext Intensity Input to provide intensity modulation of the display. This type of raster display can be used to provide a television-type display. Complete information on operation using the Z-axis feature is given in the operating instructions section of the display module manuals.

BASIC OSCILLOSCOPE APPLICATIONS

The 5400-series oscilloscope and its associated plug-in units provide a very flexible measurement system. The capabilities of the overall system depend mainly upon the plug-ins that are chosen. The following information describes the techniques for making basic measurements. These applications are not described in detail, since each application must be adapted to the requirements of the individual measurement. Specific applications for the individual plug-in units are described in the manuals for these units. Contact your local Tektronix Field Office or representative for additional assistance.

The following books describe oscilloscope measurement techniques which can be adapted for use with this instrument.

Harley Carter, "An Introduction to the Cathode Ray Oscilloscope", Philips Technical Library, Cleaver-Hume Press Ltd., London, 1960. J. Czeck, "Oscilloscope Measuring Techniques", Philips Technical Library, Springer-Verlag, New York, 1965.

Robert G. Middleton, "Scope Waveform Analysis", Howard W. Sams & Co. Inc., The Bobbs-Merrill Company Inc., Indianapolis, 1963.

Robert G. Middleton and L. Donald Payne, "Using the Oscilloscope in Industrial Electronics", Howard W. Sams & Co., Inc., The Bobbs-Merrill Company Inc., Indianapolis, 1961.

John F. Rider and Seymour D. Uslan, "Encyclopedia of Cathode-Ray Oscilloscopes and Their Uses", John F. Rider Publisher Inc., New York, 1959.

John F. Rider, "Obtaining and Interpreting Test Scope Traces", John F. Rider Publisher Inc., New York, 1959.

Rufus P. Turner, "Practical Oscilloscope Handbook", Volumes 1 and 2, John F. Rider Publisher Inc., New York, 1964.

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Peak-to-Peak Voltage Measurements-AC

To make peak-to-peak voltage measurements, use the following procedure:

1. Set the input coupling on the vertical plug-in unit to Gnd and connect the signal to the input connector.

2. Set the input coupling to AC and set the Volts/Div switch to display about 5 or 6 vertical divisions of the waveform. Check that the variable Volts/Div control (red knob) is in the Cal position.

3. Adjust the time-base triggering controls for a stable display and set the Sec/Div switch to display several cycles of the waveform.

4. Turn the vertical Position control so that the lower portion of the waveform coincides with one of the graticule lines below the center horizontal line, and the top of the waveform is in the viewing area. Move the display with the horizontal Position control so that one of the upper peaks is aligned with the center vertical reference line (see Fig. 1-1).

5. Measure the vertical deflection from peak to peak (divisions).

NOTE

This technique may also be used to make measurements between two points on the waveform, rather than peak to peak.



Fig. 1-1. Measuring peak-to-peak voltage of a waveform.

6. Multiply the distance (in divisions) measured in step 5 by the Volts/Div switch setting. Also include the attenuation factor of the probe, if applicable.

EXAMPLE: Assume a peak-to-peak vertical deflection of 4.6 divisions and a Volts/Div switch setting of 5 V.



NOTE

If an attenuator probe is used that cannot change the scale factor readout (Volts/Div), multiply the right side of the above equation by the attenuation factor.

Instantaneous Voltage Measurement--DC

To measure the DC level at a given point on a waveform, use the following procedure:

1. Set the input coupling of the vertical plug-in unit to Gnd and position the trace to the bottom line of the graticule (or other selected reference line). If the voltage to be measured is negative with respect to ground, position the trace to the top line of the graticule. Do not move the vertical Position control after this reference has been established.

NOTE

To measure a voltage level with respect to a voltage other than ground, make the following changes to step 1: Set the input coupling switch to DC and apply the reference voltage to the input connector, then position the trace to the reference line.

2. Connect the signal to the input connector. Set the input coupling to DC (the ground reference can be checked at any time by setting the input coupling to Gnd).

3. Set the Volts/Div switch to display about 5 or 6 vertical divisions of the waveform. Check that the variable Volts/Div control (red knob) is in the Cal position. Adjust the time-base triggering controls for a stable display.

4. Measure the distance in divisions between the reference line and the point on the waveform at which the

Operating Instructions-5403

DC level is to be measured. For example, in Fig. 1-2 the measurement is made between the reference line and point A.

5. Establish the polarity. The voltage is positive if the signal is applied to the + input connector and the waveform is above the reference line.

6. Multiply the distance measured in step 4 by the Volts/Div switch setting. Include the attenuation factor of the probe, if applicable (see the note following the Peak-to-Peak Voltage Measurement example).

EXAMPLE: Assume that the vertical distance measured is 4.6 divisions, the polarity is positive, and the Volts/Div switch setting is 2 V.

```
Instantaneous
Voltage
4.6 X 2 = +9.2
(divisions) X (Volts/Div) = volts
```

Comparison Measurements

In some applications, it may be necessary to establish a set of deflection factors other than those indicated by the Volts/Div or Sec/Div switches. This is useful for comparing signals to a reference voltage amplitude or period. To establish a new set of deflection factors based upon a specific reference amplitude or period, proceed as follows:

Vertical Deflection Factor

1. Apply a reference signal of known amplitude to the vertical input connector. Using the Volts/Div switch and



Fig. 1-2. Measuring instantaneous DC voltage with respect to a reference voltage.

variable Volts/Div control, adjust the display for an exact number of divisions. Do not move the variable Volts/Div control after obtaining the desired deflection.

2. Divide the amplitude of the reference signal (volts) by the product of the deflection in divisions (established in step 1) and the Volts/Div switch setting. This is the Deflection Conversion Factor.

```
Deflection
Conversion =
Factor
```

reference signal amplitude (volts) deflection (divisions) X Volts/Div setting

3. To determine the peak-to-peak amplitude of a signal compared to a reference, disconnect the reference and apply the signal to the input connector.

4. Set the Volts/Div switch to a setting that provides sufficient deflection to make the measurement. Do not readjust the variable Volts/Div control.

5. To establish a Modified Deflection Factor at any setting of the Volts/Div switch, multiply the Volts/Div switch setting by the Deflection Conversion Factor established in step 2.

6. Measure the vertical deflection in divisions and determine the amplitude by the following formula:



EXAMPLE: Assume a reference signal amplitude of 30 volts, a Volts/Div switch setting of 5 V and a deflection of four divisions. Substituting these values in the Deflection Conversion Factor formula (step 2):

$$\frac{30 \text{ V}}{(4) (5 \text{ V})} = 1.5$$

Then, with a Volts/Div switch setting of 2 V, the Modified Deflection Factor (step 5) is:

To determine the peak-to-peak amplitude of an applied signal that produces a vertical deflection of five divisions with the above conditions, use the Signal Amplitude formula (step 6):

$$(3 V) (5) = 15 volts$$

Sweep Rate

1. Apply a reference signal of known frequency to the vertical input connector. Using the Sec/Div switch and variable Sec/Div control, adjust the display so that one cycle of the signal covers an exact number of horizontal divisions. Do not change the variable Sec/Div control after obtaining the desired deflection.

2. Divide the period of the reference signal (seconds) by the product of the horizontal deflection in divisions (established in step 1) and the setting of the Sec/Div switch. This is the Deflection Conversion Factor.

Deflection Conversion = Factor

reference signal period (seconds)						
horizontal		Sec/Div				
deflection	Х	switch				
(divisions)		setting				

3. To determine the period of an unknown signal, disconnect the reference and apply the unknown signal.

4. Set the Sec/Div switch to a setting that provides sufficient horizontal deflection to make an accurate measurement. Do not readjust the variable Sec/Div control.

5. To establish a Modified Deflection Factor at any setting of the Sec/Div switch, multiply the Sec/Div switch setting by the Deflection Conversion Factor established in step 2.

Modified		See/Div		Deflection		
Deflection	=	Sec/Div		Conversion		
Factor		switch setting		Factor		

6. Measure the horizontal deflection in divisions and determine the period by the following formula:

	Modified		horizontal
Period =	Deflection	Х	deflection
	Factor		(divisions)

EXAMPLE: Assume a reference signal frequency of 455 hertz (period 2.2 milliseconds), a Sec/Div switch setting of

.2 ms, and a horizontal deflection of eight divisions. Substituting these values in the Deflection Conversion Factor formula (step 2):

$$\frac{2.2 \text{ ms}}{(8) (0.2 \text{ ms})} = 1.375$$

Then, with a Sec/Div switch setting of 50 μ s, the Modified Deflection Factor (step 5) is:

$$(50 \ \mu s)$$
 $(1.375) = 68.75 \ microseconds/division$

To determine the time period of an applied signal which completes one cycle in seven horizontal divisions, use the Period formula (step 6):

$$(68.75 \,\mu s)$$
 (7) = 481 microseconds

This product can be converted to frequency by taking the reciprocal of the period (see application of Determining Frequency).

Time Period Measurement

To measure the time (period) between two points on a waveform, use the following procedure:

1. Connect the signal to the vertical input connector, select either AC or DC input coupling, and set the Volts/Div switch to display about four divisions of the waveform.

2. Set the time-base triggering controls to obtain a stable display. Set the Sec/Div switch to the fastest sweep rate that will permit displaying one cycle of the waveform in less than eight divisions (some non-linearity may occur in the first and last graticule divisions of display). Refer to Fig. 1-3.



Fig. 1-3. Measuring time duration (period) between points on a waveform.

Operating Instructions-5403

3. Adjust the vertical Position control to move the points between which the time measurement is made to the center horizontal line. Adjust the horizontal Position control to center the time-measurement points within the center eight divisions of the graticule.

4. Measure the horizontal distance between the time measurement points. Be sure the variable Sec/Div control is in the Cal position.

5. Multiply the distance measured in step 4 by the setting of the Sec/Div switch.

EXAMPLE: Assume that the horizontal distance between the time-measurement points is five divisions and the Sec/Div switch is set to .1 ms. Using the formula:

Period =

horizontal		Sec/Div							
distance	Х	switch	=	(5)	(0.1	ms)	=	0.5	ms
(divisions)		setting							

The period is 0.5 millisecond.

Determining Frequency

The time measurement technique can also be used to determine the frequency of a signal. The frequency of a periodically recurrent signal is the reciprocal of the time duration (period) of one cycle. Use the following procedure:

1. Measure the period of one cycle of the waveform as described in the previous application.

2. Take the reciprocal of the period to determine the frequency.

EXAMPLE: The frequency of the signal shown in Fig. 1-3, which has a period of 0.5 millisecond, is:

Frequency =
$$\frac{1}{\text{period}}$$
 = $\frac{1}{0.5 \text{ ms}}$ = 2 kilohertz

Risetime Measurement

Risetime measurements employ basically the same techniques as the time-period measurements. The main difference is the points between which the measurement is made. The following procedure gives the basic method of measuring risetime between the 10% and 90% points of the waveform.

1. Connect the signal to the input connector.

2. Set the Volts/Div switch and variable Volts/Div control to produce a display exactly five divisions in amplitude.

3. Center the display about the center horizontal line with the vertical Position control.

4. Set the time-base triggering controls to obtain a stable display. Set the Sec/Div switch to the fastest sweep rate that will display less than eight divisions between the 10% and 90% points on the waveform (see Fig. 1-4).

5. Adjust the horizontal Position control to move the 10% point of the waveform to the second vertical line of the graticule.

6. Measure the horizontal distance between the 10% and 90% points. Be sure the variable Sec/Div control is in the Cal position.

7. Multiply the distance measured in step 6 by the setting of the Sec/Div switch.

EXAMPLE: Assume that the horizontal distance between the 10% and 90% points is four divisions and the Sec/Div switch is set to 1 μ s.



Fig. 1-4. Measuring risetime.

Using the period formula to find risetime:

Risetime period

horizontalSec/DivdistanceXswitch= (4) (1 μ s)= 4 μ s(divisions)setting

The risetime is 4 microsecond.

Time Difference Measurements

When used in conjunction with a calibrated time-base plug-in unit, the multi-trace feature of the 5400-series oscilloscope permits measurement of time difference between two or more separate events. To measure time difference, use the following procedure:

1. Set the input coupling switches of the amplifier channels to either AC or DC.

2. Set the Display switch on the time-base unit to either Chop or Alt. In general, Chop is more suitable for low-frequency signals. More information on determining the mode is given under Vertical Display Mode in this section.

3. Set the vertical plug-in triggering switches to trigger the display on channel 1 (or left plug-in) and channel 2 (or center plug-in).

4. Connect the reference signal to the channel 1 input connector and the comparison signal to the channel 2 (or center plug-in) input connector. The reference signal should precede the comparison signal in time. Use coaxial cables or probes which have similar time-delay characteristics to connect the signal to the input connectors.

5. If the signals are of opposite polarity, invert the channel 2 (or center plug-in) display. (Signals may be of opposite polarity due to 180° phase difference; if so, take this into account in the final calculation.)

6. Set the Volts/Div switches to produce about four divisions of display waveform.

7. Set the time-base triggering controls for a stable display. Set the Sec/Div switch for a sweep rate which shows three or more divisions between the measurement points, if possible.

8. Adjust the vertical Position controls to bring the measurement points to the center horizontal reference line.

9. Adjust the horizontal Position control so the channel 1 (or left plug-in) waveform (reference) crosses the center horizontal line at a vertical graticule line.

10. Measure the horizontal distance between the two measurement points (see Fig. 1-5).

11. Multiply the measured distance by the setting of the Sec/Div switch.

EXAMPLE: Assume that the Sec/Div switch is set to 50 μ s and the horizontal distance between measurement points is four divisions. Using the formula:

Time Delay =

Sec/Div		horizontal			
switch	Х	distance	=	(50 µs) (4)	= 200 µs
setting		(divisions)			

The time delay is 200 microseconds.



Fig. 1-5. Measuring time difference between two pulses.

Operating Instructions-5403

Multi-trace Phase Difference Measurement

Phase comparison between two or more signals of the same frequency can be made using a dual-trace plug-in or two single-trace plug-ins. This method of phase difference measurement can be used up to the frequency limit of the vertical system. To make the comparison, use the following procedure:

1. Set the input coupling switches of the amplifier channels to either AC or DC.

2. Set the Display switch on the time-base unit to either Chop or Alt. In general, Chop is more suitable for low-frequency signals and the Alt position is more suitable for high-frequency signals. More information on determining the mode is given under Vertical Display Mode in this section.

3. Set the vertical plug-in triggering switches to trigger the display on channel 1 (or left plug-in) and channel 2 (or center plug-in).

4. Connect the reference signal to the channel 1 input connector and comparison signal to the channel 2 (or center plug-in) input connector. The reference signal should precede the comparison signal in time. Use coaxial cables or probes which have similar time-delay characteristics to connect the signals to the input connectors.

5. If the signals are of opposite polarity invert the channel 2 (or center plug-in) display. (Signals may be of opposite polarity due to 180° phase difference; if so, take this into account in the final calculation.)

6. Set the Volts/Div switches and the variable Volts/Div controls so the displays are equal and about five divisions in amplitude.

7. Set the time-base triggering controls to obtain a stable display. Set the Sec/Div switch to a sweep rate which displays about one cycle of the waveform.

8. Move the waveforms to the center of the graticule with the vertical Position controls.

9. Turn the variable Sec/Div control until one cycle of the reference signal (channel 1, or left plug-in) occupies exactly eight divisions between the second and tenth vertical lines of the graticule (see Fig. 1-6). Each division of



Fig. 1-6. Measuring phase difference.

the graticule represents 45° of the cycle ($360^{\circ} \div 8$ divisions = 45° /division). The sweep rate can be stated in terms of degrees as 45° /division.

10. Measure the horizontal difference between corresponding points on the waveforms.

11. Multiply the measured distance (in divisions) by 45° /division (sweep rate) to obtain the exact amount of phase difference.

EXAMPLE: Assume a horizontal difference of 0.6 division with a sweep rate of 45° /division as shown in Fig. 1-6. Use the formula:

Phase Difference =

horizontal		sweep rate					
difference	Х	(degrees/	=	(0.6)	(45°)	=	27°
(divisions)		divisions)					

The phase difference is 27° .

High Resolution Phase Measurement

More accurate dual-trace phase measurements can be made by increasing the sweep rate (without changing the variable Sec/Div control setting). One of the easiest ways to increase the sweep rate is with the Swp Mag (10X) button on the time-base unit. The magnified sweep rate is automatically indicated by the CRT readout and knob-skirt scale-factor readout.

EXAMPLE: If the sweep rate were increased 10 times with the magnifier, the magnifier sweep rate should be 45° /division $\div 10 = 4.5^{\circ}$ /division. Fig. 1-7 shows the same signals as used in Fig. 1-6, but with the Swp Mag button pushed in. With a horizontal difference of six divisions the phase difference is:

Phase Difference =

		magnified				
horizontal		sweep rate	_	10) 14 E°)	_	07°
difference	Х	(degrees/	-	(0) (4.5)	-	21
(divisions)		division)				

The phase difference is 27° .



Fig. 1-7. High-resolution phase difference measurement with increased sweep rate.

THEORY OF OPERATION

LOW-VOLTAGE POWER SUPPLY AND CALIBRATOR

The low-voltage power supply circuit provides the operating power for the oscilloscope system. Electronic regulation is used, where necessary, to provide stable, low-ripple output voltages. The circuit also includes the calibrator circuit to produce an accurate square-wave output.

Power Input

Power is applied to the primary of transformer T800/ F300/S300 through the display unit (fuse F300, thermal cutout S300, and Power switch S302, and the line-selector block, P800 or P801). The line-selector blocks allow changing the primary-winding taps of T800 to fit different line requirements.

Low-Voltage Rectifiers and Unregulated Outputs

The full-wave bridge rectifiers and associated filter components in the secondaries of T800 provide filtered DC voltages. The unregulated outputs are +200 volts, +18 volts, +38 volts, -18 volts and -38 volts. The +200-volt outputs to the display unit are protected by F800.

Low-Voltage Regulators

-30 Volt Supply. The -30-volt supply, besides providing power to circuitry throughout the instrument, provides a reference-voltage source to establish operating levels for the feedback regulators in the -15-volt, +15-volt, +30-volt and +5-volt supplies. The regulator for the -30-volt supply is a feedback amplifier system which operates between ground and the unregulated -38 volts. Current to the load is delivered by the series-pass transistor, Q940. The supply voltage is established by the drop across R948, R950, and R952, which is compared to the voltage drop across VR950 and the emitter-base junction of Q950. The feedback path is through R949, Q955, and Q958 to the base of Q940. Any variation in output voltage due to ripple, change of current through the load, etc., is immediately transmitted to the base of Q940 and nullified by a change in Q940 conduction, thus maintaining a steady output. The output of the supply is set to exactly -30 volts by adjustment of R950, -30 V adj. This control sets the conduction of Q950, which controls the bias levels of Q958 and Q940. CR955 and Q958 provide short-circuit protection by limiting the current through Q940 when the voltage drop across R940 exceeds 1.1 V.

-15-Volt Supply. The regulator for the -15 volt supply consists of series-pass transistor Q880, error amplifier Q900 and error sensing transistors Q894 and Q896. This is a feedback amplifier system which operates between +30 volts and -20 volts. Current to the load is delivered by the series-pass transistor, Q880. The supply voltage is established by comparing the supply voltage sample at the base of error sensing transistor Q894 with the reference at the base of error sensing transistor Q896. Any differences between the bases of the error sensing transistors causes a change in the Q894 collector. The error sensing circuit change is applied to the base of the error amplifier, Q900. The output of the error amplifier changes the conduction of the series-pass transistor Q880 to correct for any output error. Q885 protects the supply, in the event the output is shorted, by limiting the current demanded from the series-pass transistor under excessive load. During normal operation, Ω 885 is biased off.

+15-Volt Supply. The regulator for the +15 volt supply consists of series-pass transistor Q850, error amplifier Q870 and error sensing transistors Q864 and Q866. Operation of this feedback amplifier system is similar to that described for the -15-volt supply.

+30-Volt Supply. The regulator for the +30-volt supply consists of series-pass transistor Q910 and error amplifier Q925. This is a feedback amplifier system similar to that just described for the -30-volt supply. R920, +30 V adj, provides an adjustment to set the output of the supply at exactly +30 volts. Q915 protects the supply, if the output is shorted, by limiting the current demanded from the series-pass transistor under excessive load. During normal operation, Q915 is biased off.

+5-Volt Supply. The regulator for the +5-volt supply consists of series-pass transistor Q820, error amplifier Q824-Q832 and error sensing transistor Q838. This is a feedback amplifier system which operates between +5 volts and -30 volts. Current to the load is delivered by the series-pass transistor Q820. The supply voltage is established by the drop across R845 and R846. The error feedback path is through R845 to the base of Q838. Any variation in output voltage is immediately transmitted to the base of Q820 and nullified by a change in the conduction of Q820 which shifts the

Theory of Operation-5403

whole supply. Q830 protects the supply, if the output is shorted, by limiting the current demanded by the error amplifier transistor Q824. During normal operation, Q830 is biased off.

Line Trigger

A line-frequency signal is obtained from the secondary of T800 and attenuated by R935, R936, and R937 to provide a line-trigger source for the time-base plug-in unit.

CRT Heater Winding

A separate secondary winding is provided for the CRT writing-gun heaters. The writing-gun heaters are elevated to -3000 volts in the CRT circuit (display unit) to maintain a potential near that of the CRT cathode.

Calibrator

The Calibrator circuit composed of Q982, Q984, and their associated passive components produces a square-wave output with accurate amplitude and at a rate of twice the power-line frequency. This output is available at the probe test loop on the display unit front panel as a 4-milliampere (peak to peak) square-wave current, or as a 400-millivolt (ground to peak) square-wave voltage.

The resistive-capacitive network at the base of Q982 receives a pulsating DC voltage from full-wave rectifier CR980-CR981 and produces a nearly symmetrical switching signal for Q982 and Q984. As Q984 is alternately switched on and off at twice the line frequency, current through R986 is alternately switched through the transistor or through CR986, the probe test loop, and R987, producing the required test signal.

INTERFACE

The interface circuit provides an interconnection of signals, logic levels, and power-supply voltages between plug-in units and the oscilloscope mainframe. It incorporates circuits that determine the vertical display mode and amplify the vertical and horizontal display signals. Functions of interconnections not discussed are labeled on the interface diagram.

Chop Oscillator

The chop oscillator produces a 200-kilohertz square-wave signal for chopping between vertical plug-ins and amplifier channels within the plug-ins. This multivibrator circuit consists of U770A, U770B, and associated passive components. When the multivibrator receives a chop actuate level (+5 volts), it free-runs at a 100 kHz rate. (The chop actuate level is routed through the vertical plug-ins to the time-base unit, and is present at contact A20 of J630 when a multi-trace display is required and the time-base Display switch is set to Chop.) The chop actuate level also disables Q770, locking out alternate-drive pulses. The multivibrator has two outputs; one is sent through buffers to the divider circuit as a timing signal, and the other is sent to the U770D and U770C circuit to blank the chop-switching transients.

Divider Circuit

The divider circuit produces the display switching signal for both the Alternate and Chopped switching modes. This circuit is composed of U780 and its discrete passive components, which is connected as a pair of JK flip-flops. Each flip-flop is a divide-by-two counter, the first one driving the second. The divider circuit is activated by a negative going transition, which can come from either the chop oscillator or from the time-base plug-in unit via grounded-base amplifier Q770. The chop oscillator input results in chopped-mode vertical switching. The input from the time-base unit coincides with the end of each sweep, and results in alternate-mode vertical switching. The output from the divide-by-two portion of the divider circuit, U780A, is sent via contacts B21 of J610 and J620 to the channel-switching circuits incorporated within multi-trace vertical plug-in units. The outputs from the divide-by-four portion of the divider circuit, U780B, are used for plug-in switching; one output is sent to pin 4 of the vertical integrated switching circuit to produce plug-in switching and the other output is sent via contact B21 of J630 to produce dual-sweep switching in dual-time-base units. The vertical mode switching sequence and some of the display combination possibilities are fully discussed in the General Operating Instructions section of this manual.

Vertical Amplifier and Vertical Integrated Switching Circuit

Emitter followers Q600, Q604, Q610 and Q614 provide a high-impedance input to the vertical amplifier and vertical integrated switching circuit, U620. The vertical amplifier input resistance for the oscilloscope main frame is determined by R601, R605, R611 and R615.

The vertical integrated switching circuit permits only one of the two vertical plug-in signals to pass to the vertical output amplifier, the level at pin 4 of U620 determines the plug-in signal that is passed to the vertical amplifier. When
the Display ON pushbutton on the right-hand vertical plug-in is depressed, -30 V is connected to contact B18 of J620, turning Q680 on. This increases the voltage level on pin 4 of U620, allowing the signal from the right-hand vertical plug-in to pass. If the left-hand vertical plug-in is to be displayed, the voltage on pin 4 of U620 is decreased by applying -30 V through contact B18 of J610 to R688. The signal from the left-hand plug-in now passes through U620. If, however, both plug-ins have an "on" logic level, the two logic levels applied to Q680 cancel each other and the signal from the divider circuit controls the plug-in signal passed. In the chopped switching mode, the switching between pairs of amplifiers occurs at a 50 kHz rate (switching occurs on both the negative- and positive-going transition), and in the alternate mode, switching occurs at the end of every second sweep. If neither plug-in has an "on" logic level, the level at pin 4 of U620 is such that the left plug-in signal passes to the vertical amplifier.

The gain of the vertical amplifier portion of U620 is set by resistors R620 (left plug-in amplifier) and R626 (center plug-in amplifier). The vertical output signal at pins 12 and 13 of U620 goes to a grounded-base stage consisting of Q640 and Q660. Q640 and Q660 change the DC level of the vertical signal so that it is compatible with the vertical amplifier in the display module. Q630 and Q650 act as both a current source for the grounded base stage and an insertion point for the vertical readout and trace separation information.

Trace separation information from contact B16 of J630 is supplied to the emitter of Q650 via Q674. Trace separation information is only available when a dual time base plug-in is used.

The vertical CH switch OFF signal is supplied to Q670 where it causes Q674 to be reverse biased during readout time, thus blocking the trace separation information. The signal also goes to pin 6 of U620 where it is used to prevent any vertical signal output from U620 during readout time.

During the time of the vertical CH switch OFF signal, vertical readout signal information is supplied to the emitter of Q630.

Horizontal Amplifier

The horizontal amplifier consists of an emitter follower stage (Q740, Q744) and a gain stage (Q748, Q752). The gain setting resistor is R750. Thermistor RT754 and resistor R756 provide a temperature compensation network for the amplifier.

Trigger Amplifiers

Left Vertical Plug-In. A nominal 250 mV/division, single-ended, input signal is applied to the input stage of a two stage amplifier from contact A4 of J610. The first stage, a paraphase amplifier, consisting of Q700-Q708 amplifies the signal by 1/4. The second gain stage consists of Q710 and Q715; R713 sets the stage gain. The output signal amplitude of the trigger amplifier depends upon the input impedance of the time-base trigger circuit at contacts A3 and B4 of J630. Time-base plug-ins designed for the 5100-series oscilloscope have a high input impedance, which results in a signal amplitude of 240 mV/division. Time-base plug-ins designed for the 5400-series oscilloscope have a low impedance, which results in a signal amplitude of 50 mV/division.

Right Vertical Plug-In. The right vertical plug-in trigger Amplifier operates the same as described above.

Z-Axis Signal

The gate signal from the A and B sweeps are added on the interface circuit board. The combined A and B gate signal is also summed with the trace intensification and chopped blanking signals before being supplied, via contact 4 of P755, to the display module as the Z-Axis signal. Diode CR761 limits the combined signals on the Z-Axis signal line. C766 and R766, which are in parallel with the input to the Z-Axis amplifier, serve to increase the rise time of the Z-Axis signal.

READOUT SYSTEM

The readout system provides an alphanumeric display of information encoded by the plug-in units. This information is presented on the CRT on a time-shared basis with the analog waveform display. A schematic for the readout system is available at the rear of this manual.

Display Format

Up to eight groups of characters can be displayed on the display unit CRT. The position of each group (word) is fixed and directly related to the originating plug-in. Fig. 2-1 shows the word positions on the display unit CRT.

Each word in the readout display can contain up to ten characters, although a typical display contains between two and seven characters per word. The characters are chosen from a set of fifty.

Developing The Display

Refer to the readout portion of the block diagram during the following discussion.

The key block in the readout system is the timer stage. This stage produces the basic signals that establish the



Fig. 2-1. Location of readout words on the CRT, identifying the originating plug-in and channel.

timing sequences within the readout system. The timer stage also produces control signals for other stages within the readout system, and interrupt signals to the vertical amplifier and Z-Axis amplifier to allow a readout display to be presented.

Included in the timer block is the time-slot generator. The time-slot generator has ten outputs, each of which is energized sequentially. After the tenth output is energized, the first is again energized to repeat the cycle. The ten outputs are connected to the vertical and horizontal plug-in compartments as well as to other stages within the readout system. Each time the first time-slot output line is energized, an address counter is incremented by one. The address counter counts to seven, then returns to zero. The address counter's three outputs are connected to various readout system stages.

Within each plug-in are readout coding resistors. The coding resistors are selected by the plug-in control settings, which connect the resistors between the various time-slot lines and one of four plug-in output lines. Two of the plug-in output lines are associated with channel 1 of amplifier plug-ins or the main sweep of sweep plug-ins. The other two output lines are associated with channel 2 of the amplifier plug-ins, or with delayed (or B) sweep of time-base plug-ins.

Each pair of output lines from the plug-ins or external readout (option 3) is connected to the data switches. Currents in these eight pairs (two pairs added with option 3) of lines are transferred to the outputs of the data switches, as selected by the address counter.

The data decoders convert each of the current signals from the data switches to make one of ten logic lines (together with signals from the timer) select the character generated by the character generators.

The output amplifier combines signals from the character generator with positioning signals from the address counter position generator. The combined signals then form the vertical and horizontal components of the readout display.

The vertical component of the readout display is injected directly into the output of the vertical channel switch on the interface board. During the interval when the readout is generated, the vertical channel switch is turned off, so only the readout signal is displayed.

The horizontal component of the readout display is connected to the horizontal channel switch. When the readout is not displayed, signals from the horizontal plug-in pass through the channel switch without change. During the interval when readout is displayed, the horizontal readout signal appears at the output of the horizontal channel switch instead of the horizontal plug-in signal.

CIRCUIT ANALYSIS OF READOUT SYSTEM

The following analysis of the Readout System discusses the operation of each stage in detail. A complete schematic of the readout system is shown on the diagram at the rear of this manual.

The definitions of several terms used in this description of the Readout System follow:

- Character-A character is a single number, letter, or symbol that is displayed on the CRT, either alone or in combination with other characters.
- Word-A word is made up of a related group of characters. In the readout system, a word can consist of up to ten characters.
- Frame—A frame is a display of all words for a given operating mode and plug-in combination. Up to eight words can be displayed in one frame.

- Column-One of the vertical groups in the character selection matrix (see Fig. 2-6). Columns C-0 (column zero) to C-10 (column 10) can be addressed in the system.
- Row-One of the horizontal groups in the character selection matrix (Fig. 2-6). Row R-1 (row 1) to R-10 (row 10) can be addressed in the system.
- Time Slot-A location in a pulse train. In the readout system, the pulse train consists of 10 negative-going pulses. Each of these time-slots is assigned a number between one and ten. For example, the first time-slot is TS-1.

Timer

Time U1000 establishes the timing sequence for all circuits within the readout system. This stage produces seven time-related output waveforms (see Fig. 2-2). The triangle waveform produced at pin 6 forms the basis for the remaining signals. The basic period of this triangle waveform is about 250 microseconds, as controlled by RC network C1021-R1021. The triangle waveform is clipped and amplified by U1000 to form the trapezoidal output signal at pin 10. The amplitude of this output signal is exactly 15 volts as determined by U1000 (exact amplitude necessary to accurately encode data in plug-in units; see Encoding the Data). The triagger output at pin 5 provides the switching signal for the time-slot counter and readout intensity control Q1018.

The signals at pin 12, 13, 14, and 16 are produced only when the triangle waveform is on its negative slope and the trapezoidal waveform has reached the lower level. The timing sequence of these waveforms is very important to the correct operation of the readout system (see expanded waveforms in Fig. 2-3). The Z-Axis blank at pin 14 is produced first. This negative going signal drives Q1015 which removes the current input for the interface to the Z-Axis amplifier to blank the CRT before the display is switched to the readout system. It also produces the strobe pulse through R1010, Q1010 and CR1013 to signal other stages within the readout system to begin the sequence necessary to produce a character. The collector level of Q1010 is also connected to character generator No. 2. U1092 through Q1010-CR1010. This activates U1092 during the quiescent period of the strobe pulse (collector of Q1010 negative) and diverts the output current of row decoder U1035 to row 2. The purpose of this configuration is to prevent the zeros logic and memory stage U1060 from storing incorrect data during the quiescent period of the strobe pulse. When the strobe pulse goes positive, CR1010 is reverse biased to disconnect Q1010 from U1092, and allow the row decoder to operate in the normal manner.



Fig. 2-2. Output waveforms of timer stage.



Fig. 2-3. Detail of output at pins 12, 13, 14 and 16 of U1000.

The next signal to be produced is the channel switch off command at pin 13. This positive-going signal disconnects the plug-in signals in the vertical and horizontal deflection system so that the plug-in units do not control the position of the CRT beam during the readout display. This signal is also connected to the decimal point logic and character position counter stage and the format generator stage. The readout unblanking output at pin 12 is produced next. This current is connected to the Z-Axis amplifier to unblank the CRT to the intensity level determined by READOUT intensity control R1000. However, Q1018 prevents the intensity current from reaching the Z-Axis amplifier until the character scan ramp at pin 16 begins its positive slope. The character scan ramp at pin 16 started to go negative as this timing sequence began. The triangular character scan ramp runs negatively from about -2 volts to about -8.5volts, then returns back to the original level. This waveform provides the scanning signal for the character generator stages. Full character scan adjustment R1006 sets the DC level of the character scan ramp to provide complete characters on the display.

The timer stage operates in one of two modes, as controlled by the display skip level at pin 4. The basic mode just described is a condition that does not occur

unless all ten characters of each word (80 characters total) are displayed on the CRT. Under typical conditions only a few characters are displayed in each word. The display skip level at pin 4 determines the period of the timer output signal. When a character is to be generated, pin 4 is LO and the circuit operates as just described. However, when a character is not to be displayed, a HI level is applied to pin 4 of U1000 through CR1003 from the display skip generator stage. This signal causes the timer to shorten its period of operation to about 210 microseconds. The waveforms in Fig. 2-4 show the operation of the timer stage when the display skip condition occurs for all positions in a word. Notice that there is no output at pins 12, 13, 14, and 16 under this condition. This means that the CRT display is not interrupted to display characters. Also notice that the triangle waveform at pin 6 does not go as far negative and that the negative portion of the trapezoidal waveform at pin 10 is shorter. Complete details on operation of the display-skip generator are given later.

READOUT intensity control R1000 sets the intensity of the readout display independently of the INTENSITY control. The READOUT intensity control also provides a means of turning the readout system off when a readout display is not desired. When R1000 is turned fully counterclockwise, switch S1000 opens. The current to pin 11 of U1000 is interrupted and, at the same time, a positive voltage is applied to pin 4 through R1003 and CR1002. This positive voltage switches the stage to the same condition that were present under the display-skip conditions. Therefore, the CRT display is not interrupted to present characters. However, time-slot pulses continue to be generated.

Time-Slot Counter

Time-Slot counter U1025 is a sequential switch that directs the trapezoidal waveform input at pin 8 to one of its 10 output lines. These time-slot pulses are used to interrogate the plug-in units to obtain data for the readout system. The trigger pulse at pin 15 switches the time-slot counter to the next output line; the output signal is sequenced consecutively from time-slot 1 through time-slot 10. Fig. 2-5 shows the time-relationship of the time-slot pulses. Notice that only one of the lines carries a time-slot pulse at any given time. When time-slot 10 is completed a negative-going end-of-word pulse is produced at pin 2. The end-of-word pulse provides a drive pulse for the channel counter and also provides an enabling level to the display-skip generator during time-slot 1 only. The end-of-word pulse also resets the decimal point logic and zeros logic.

Word Counter

The word counter, made up of three flip flops in integrated circuit U1075, is a binary counter that produces the word address code for the column and row decoder stages.

L



Fig. 2-4. Timer stage operation when display-skip condition occurs.

This code instructs these stages to sequentially select and display the data from the plug-ins. The input channel that is displayed with each combination of the word address code is given in the discussion for the applicable stages.

Encoding The Data

Data is conveyed from the plug-in units to the readout system in the form of an analog code having up to 11 current levels (from zero to one milliampere in 100 microampere steps). The characters that can be selected by the encoded data are shown on the character selection matrix (see Fig. 2-6). Each character requires two currents to define it; these currents are identified as the column current and the row current which correspond to the column and row of the matrix. The column and row data is encoded by resistive programming in the plug-in units. The resistors are connected between the time-slot lines and the row or column lines.

The amplitude of the time-slot pulses is exactly -15 volts as determined by the timer stage. Therefore, the resultant output from the plug-in units can be accurately controlled by the programming resistors in the plug-in units.



Fig. 2-5. Time relationship of the time-slot (TS) pulses produced by U1025.

		C-()	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10
ROW NUMBER	CURRENT (MILLI- AMPERES)	0)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	≥ 1.0
R-1	0			0	1	2	3	4	5	6	7	8	9
R-2	0.1			+	<	I	1	+	-	+	С	Δ	>
R-3	0.2			ADD ¹ ONE ZERO	ADD ¹ TWO ZEROS	SHIFT ¹ PREFIX	SHIFT ¹ PREFIX AND ADD ONE ZERO						IDENTIFY ¹
R-4	0.3			m	μ	n	р	x	к	М	G	Т	R
R-5	0.4	sк	IP ¹	S	v	A	W	Н	d	В	с	Ω	E
R-6	0.5			U	N	L	Z	Y	Р	F	J	Q	D
R-7	0.6					DECIMAL ¹ POINT LOCATION NO. 3	DECIMAL ¹ POINT LOCATION NO. 4	DECIMAL ¹ POINT LOCATION NO. 5	DECIMAL ¹ POINT LOCATION NO. 6	DECIMAL ¹ POINT LOCATION NO. 7			
R-8	0.7		,									DECIMAL ² POINT	

UNUSED LOCATIONS. AVAILABLE FOR FUTURE EXPANSION OF READOUT SYSTEM

² DECIMAL POINT CHARACTER. SEE DECIMAL POINT CHARACTER DESCRIPTION IN TEXT.

Fig. 2-6. Character selection matrix for readout system.

Theory of Operation-5403 1195-25A R-9

R-10

0.8

0.9

ADD SPACE IN DISPLAY

¹ OPERATIONAL ADDRESS.

2-8

Scan by Zenith

Fig. 2-7A shows an idealized current waveform of row analog data, which results from the 10 time-slot pulses. Each of the steps to current shown in these waveforms correspond to 100 microamperes of current. The row numbers on the left-hand side of the waveform correspond to the rows in the character selection matrix shown in Fig. 2-6. The row analog data is connected back to the readout system via contact B28 of the plug-in interface. Idealized column current waveforms at contact A28 of the plug-in interface are shown in Fig. 2-7B.

Referring to the character selection matrix, two units of column current, along with the two units of row current encoded during TS-1, indicates that two zeros should be added to the display. One unit of column current during time-slot 2, along with the one unit of current from the row output, instructs the readout system to add an invert arrow to the display.

No column current output during TS-3 means no display on the CRT (see Display-Skip Generator for further information). Two units of column current are encoded



Fig. 2-7. Idealized current waveforms of: (A) Row analog data, (B) Column analog data.

during TS-4. There is no row current encoded during this time-slot; this results in the numeral 1 being displayed on the CRT. Neither row nor column analog data is encoded during time-slots 5, 6, and 7. During TS-8 two units of column current and three units of row current are encoded. This addresses the μ prefix in the character selection matrix. The final data output is provided from time slot 9: three units of column current and four units of row current cause a V (volts) to be displayed. The resultant CRT readout is 100 μ V.

The column analog data encoded by the plug-in unit can be modified by attenuator probes connected to the input connectors of vertical plug-in units. A special coding ring around the input connector of the plug-in unit senses the attenuation ratio of the probe (with readout-coded probes only). The probe contains a resistor that causes additional column current. For example, if a 10X attenuator probe is connected to a plug-in with the coding for 100 microvolts, an additional unit of current is added to the column analog data during time-slot 1. Since two units of current were encoded in Fig. 2-7, this additional current results in a total of three units of column analog current during this time-slot.

Referring to the character selection matrix, three units of column current, along with the two units of row current, indicates that the prefix should be reduced. Since this instruction occurs in the same time-slot that previously indicated that two zeros should be added to the display, and only one instruction can be encoded during a time-slot, the zeros do not appear in the display. The CRT readout now changes to 1 mV.

Likewise, if a 100X readout-coded probe is connected to the input of the plug-in unit, the column current during time-slot 1 is increased two units for a total of four units of column current. This addresses an instruction in the character selection matrix, which reduces the prefix and adds one zero to the display. The resultant CRT readout with the previous program is 10 mV.

Two other lines of information are connected from each plug-in compartment to the readout system. The column and row analog data from channel 2 of a dual-channel plug-in are connected to the readout system through contacts A24 and B24 of the plug-in interface, respectively.

Column and Row Data Switches

The readout data from the plug-in units is connected to the column and row data switch stages. A column-data line and a row-data line convey analog data from each of the eight data sources (two channels from each of the three plug-in compartments and two external channels, option 3).

Theory of Operation-5403

The column data switch U1040 and the row data switch U1030 receive the word address code from the word counter. This binary code directs the column data switch and the row data switch as to which channel should be the source of the readout data. Table 2-1 gives the eight combinations of the word address code and the resultant channel is selected with each combination. These stages have eight inputs and provide a single time-multiplexed output at pin 7, which includes the information from all of the input channels. Six of the eight inputs to each stage originate in the plug-in units; the seventh and eighth inputs come from an optional external access jack.

TABLE 2-1

Word Address Code

Pin 8 U1075	Pin 9 U1075	Pin 12 U1075	Channel Selected
LO	LO	LO	Channel 2 Left Vertical
LO	LO	HI	Channel 1 Left Vertical
LO	HI	LO	Channel 2 Right Vertical
LO	HI	HI	Channel 1 Right Vertical
HI	LO	LO	Channel 2 Horizontal
HI	LO	ні	Channel 1 Horizontal
ні	HI	LO	Channel 2 External Access
HI	HI	HI	Channel 1 External Access

Display-Skip Generator

The display-skip generator, Q1040-Q1048-Q1050-Q1052 monitors the time-multiplexed column data at the output of the column data switch during each time-slot, to determine if the information at this point is valid data that should result in a CRT display. The voltage at the base of Q1040B is set by divider CR1040-CR1041-R1046-R1047-R1048. Quiescently, there is about 100 microamperes of current flowing through R1040 from Q1056 and the zeros logic and memory stage (purpose of this quiescent current will be discussed in connection with the zeros logic and memory stage). This current biases Q1040A so that its base is about 0.2 volt more positive than the base of Q1040B in the absence of column data. Therefore, since Q1040A and Q1040B are connected as a comparator, Q1040A will remain on unless its base is pulled more negative than the base of Q1040B. The analog data output from the column data switch produces a 0.5-volt change at the base of Q1040A for each unit of column current that has been encoded by the plug-in unit. Therefore, whenever any information appears at the output of the column data switch, the base of Q1040A is pulled more negative than the base of Q1040B, resulting in a negative (LO) display-skip output to the timer stage through Q1052. Recall that a LO was necessary at the skip input of the timer so it could perform the complete sequence necessary to display a character.

Q1048-Q1050 also provide display-skip action. The end-of-word level connected to their emitters through R1050 is LO only during time-slot 1. This means that Q1048-Q1050 are enabled only during time-slot 1. These transistors allow the zero logic and memory stage to generate a display-skip signal during time-slot 1 when information that is not to be displayed on the CRT has been stored in memory (further information given under Zeros Logic and Memory discussion).

Column and Row Decoder

The column decoder U1070 and row decoder U1035 sense the magnitude of the analog voltages at their inputs and produce a binary output on one of ten lines corresponding to the column or row data which was encoded by the plug-in unit. These outputs provide the column digital data and row digital data, which is used by the character generator stages to select the desired character for display on the CRT. The column and row data is also used throughout the readout system to perform other functions. The input current at pin 9 of the column decoder stage is steered to only one of the ten column digital data outputs. When a display-skip signal is present (collector of Q1052 HI), pin 9 is pulled HI through CR1052. This ensures that no current is connected to the character generator stage under this condition. Notice the corresponding input on the row decoder. This input is connected to ground and causes one of the ten row outputs to saturate to ground.

Zeros Logic and Memory

The zeros logic and memory stage U1060 stores data encoded by the plug-in units to provide zeros-adding and prefix-shifting logic for the readout system. The strobe pulse at pin 15 goes positive when the data has stabilized and can be inspected. This activates the zeros logic and memory stage so it can store the encoded data. A block representation of the memory sequence is shown in Fig. 2-8. If the plug-in unit encoded data for column 1, 2, 3, 4, or 10 of row 3, the appropriate memory (or memories) is set.

If data is encoded, a negative-going output is produced at pin 7 as the memories are being set. This negative-going pulse is connected to the base of Q1050 in the display-skip generator to produce a display-skip output. Since the information that is encoded is only provided to set the memories and not intended to be displayed on the CRT at this time, the display-skip output prevents a readout display if this encoding occurs in time-slot 1.

During time-slot 5, memory A is interrogated. If information is stored in this memory, a positive-going output is produced at pin 7. This pulse is connected to pin 10 of the column decoder through Q1056 to add one unit



Fig. 2-8. Block representation of memory sequence in U1060.

of current at the input of the column decoder. This produces a zero after the character displayed on the CRT during time-slot 4. During time-slot 6, memory B is interrogated to see if another zero should be added. If another zero is necessary, a second positive output is produced at pin 7, which again results in a column 1 output from the column decoder and a second zero in the CRT display.

Finally, memory C is interrogated during time-slot 8 to obtain information on whether the prefix should be reduced, or left at the value which was encoded. If data has been encoded which calls for a reduction in prefix, a negative-going output level is produced at pin 7. This negative level subtracts one unit of column current from the data at the input to the column decoder. Notice on the character selection matrix of Fig. 2-6 that a reduction of one column when row 4 is programmed results in a one unit reduction of the prefix. For example, with the 100 μ V program, if data was received from the plug-in calling for a reduction in prefix, the CRT readout would be changed to 1 mV (zeros deleted by program; see Encoding the Data).

The 100 microamperes of quiescent current through R1041, provided by Q1056 (see Display-Skip Generator), allows the prefix to be reduced from μ (200 microamperes column current; column 2) to m (100 microamperes column current; column 1). (Notice that if the prefix program is reduced from column 1 to column zero, the readout system does not display a character at this readout location.)

A further function of the zeros logic is the blank function. If ten units of column current are encoded along with two units of row current (row 3, column 10), the zero logic produces a negative-going output pulse at pin 1 of U1060. This pulse lasts until the end of time-slot 10. Pin 1 of U1060 is connected to the base of Q1018 through R1020. When turned on, Q1018 prevents the readout intensity current from reaching the Z-Axis amplifier.

The end-of-word signal from the time-slot counter is connected to pin 9 of U1060 through C1065. At the end of each word of readout information, this pulse goes LO. This

Theory of Operation-5403

erases the four memories in the zeros logic and memory in preparation for the data to be received from the next channel.

Character Generators

The Character Generator stage consists of five similar integrated circuits U1090-U1098, which generate the X (horizontal) and Y (vertical) outputs at pins 16 and 1 respectively, to produce the character displayed on the CRT. Each integrated circuit can produce 10 individual characters. U1090 which is designated as the "numerals" character generator can produce the numerals 0 through 9 shown in row 1 of the character selection matrix (Fig. 2-6). U1092 can produce the symbols shown in row 2 of the character selection matrix and U1094 produces the prefixes and some letters of the alphabet that are used as prefixes in row 4. U1096 and U1098 produce the remaining letters of the alphabet shown in rows 5 and 6 of the character selection matrix. All of the character-generator stages receive the column digital data from column decoder U1070 in parallel. However, only one of the character generators receives row data at a particular time and only the stage that receives both row and column data is activated. For example, if column 2 is encoded by a plug-in unit, the five character generators are enabled so that either a 1, $<, \mu, V$, or an N can be produced. However, if at the same time row 4 has also been encoded by the plug-in unit, only the prefix character generator U1094 will produce an output to result in a μ displayed on the screen. This integrated circuit provides current outputs to the format generator, which produce the selected character on the CRT. In a similar manner, any of the 50 characters shown in the character selection matrix can be displayed by correct addressing of the row and column.

Decimal Point Logic and Character Position Counter

Decimal point logic and character position counter U1080 performs two functions. The first function is to produce a staircase current, which is added to the X (horizontal) signal to space the characters horizontally on the CRT. After each character is generated the negative-going edge of the channel switch OFF signal at pin 5 advances the character position counter. This produces a current step output at pin 3 which, when added to the X signal, causes the next character to be displayed one character space to the right. This stage can also be advanced when a space instruction is encoded by the plug-in unit so that a space is left between the displayed characters on the CRT. Row 10 information from the row decoder is connected to pin 4 of U1080 through R1083. When row 10 and column 0 is encoded, the output of this stage advances one step to move the next character another space to the right. However, under this condition, no display is produced on the CRT during this time-slot, since the character generators are not activated.

Time-slot pulses 1, 2, and 3 are also connected to pin 4 of U1080 through VR1080, VR1081, and VR1082 respectively and R1088, R1082. This configuration adds a space to the displayed word during time-slots 1, 2, and 3 even if information is not encoded for display during these time-slots. With this feature, the information that is displayed during time-slot 4 (1-2-5 data) always starts in the fourth character position whether data has been displayed in the previous time-slots or not. Therefore, the resultant CRT display does not shift position as normal/invert or cal/uncal information is encoded by the plug-in. The end-of-word pulse connected to pin 8 of U1080 through C1080 resets the character position counter to the first character position at the end of each word.

The decimal point logic portion of this stage allows decimal points to be added to the CRT display as encoded by the plug-in units. When row 7 is encoded in coincidence with columns 3 through 7 (usually encoded during time-slot 1), a decimal point is placed at one of the five locations on the CRT identified in row 7 of the character selection matrix (Fig. 2-6). This instruction refers to the decimal point location in relation to the total number of characters that can be displayed on the CRT (see Fig. 2-9). For example, if column 3 and row 7 are encoded during time-slot 1, the system is instructed to place a decimal point in location No. 3. As shown in Fig. 2-9, this displays a decimal point before the third character that can be displayed on the CRT (first three time-slots produce a space whether data is encoded or not; see previous paragraph). The simultaneous application of row 7 data to the Y-input of the format generator through R1080 raises the decimal point so it appears between the displayed characters.



Fig. 2-9. Readout word relating 10 possible character locations to the decimal point instructions that can be encoded, and the resultant CRT display.

When decimal-point data is encoded, the CRT is unblanked so a readout display is presented. However, since row 7 does not activate any of the five character generators, the CRT beam is not deflected but instead remains in a fixed position to display a decimal point between the character along the bottom line of the readout word. After the decimal point is produced in the addressed location, the CRT beam returns to the location indicated by the character position counter to produce the remainder of the display.

Format Generator

The X and Y deflection signals produced by the character generator stage, are connected to pins 2 and 7, respectively, of format generator U1100. The word address code from the word counter is also connected to pins 1, 8, and 15 of this stage. The word address code directs the format generator to add current to the X and Y signals to deflect the CRT beam to the area of the CRT that is associated with the plug-in channel that originated the information (see Fig. 2-1).

In addition, the character position current from the decimal point logic and character position stage is added to the X (horizontal) input signal to space the characters horizontally on the CRT (see previous discussion). The

channel switch OFF signal at pin 13 activates this stage when a character is to be displayed on the CRT. Vertical spacing adjustment, R118, sets the separation between the upper and lower readout displays.

Y-Output Amplifier

The Y-output signal at pin 6 of U1100 is connected to the Y-output amplifier Q1100. This stage provides a low impedance load for the format generator while providing isolation between the readout system and the vertical amplifier.

X-Output Amplifier

The X-output amplifier Q1110 operates similarly to the Y-output amplifier. It provides the horizontal deflection from the readout signal available at pin 4 of U1100. Horizontal position is controlled by R1110, which changes the emitter current of Q1110.

Horizontal channel switch U1130 normally passes signals from the horizontal plug-in connector to the horizontal amplifier with unity gain. When the channel switch OFF signal is generated by timer U1000, the channel switch substitutes the horizontal readout signal for the horizontal plug-in connector signal.

SERVICE INFORMATION

Maintenance and Repair information in this section applies to all instrument in the 5400-series oscilloscope system, including display units and plug-ins.

Maintenance, consisting of cleaning, visual inspection, etc., performed on a regular basis, will improve the reliability of the oscilloscope. Periodic checks of the semiconductor devices used in the system are not recommended as a preventive maintenance measure. See semiconductor-checking information given under troubleshooting. A convenient time to perform preventive maintenance is preceding instrument adjustments.

Cleaning

Avoid the use of chemical cleaning agents which might damage plastic parts. Avoid chemicals containing benzene, toluene, xylene, acetone, or similar solvents. **Exterior.** Loose dust may be removed with a soft cloth or a dry brush. Water and mild detergent may be used; however, abrasive cleaners should not be used.

Interior. Cleaning the interior of the unit should precede adjustment, since the cleaning process can alter the settings of the adjustments. Use low-velocity compressed air to blow off the accumulated dust. Hardened dirt can be removed with a soft, dry brush, cotton-tipped swab, or cloth dampened with a water and mild detergent solution.

Adjustment

To ensure accurate measurements, the performance of individual units composing the 5400-series oscilloscope should be checked periodically. Complete adjustment instructions are given in the manual for each unit.

The adjustment procedure can be helpful in isolating major troubles in a unit. Moreover, minor troubles not apparent during regular operation may be revealed and corrected during adjustment.

REPAIR

Troubleshooting Aids

Diagrams. Circuit diagrams are given on foldout pages in each individual manual. The circuit number and electrical value of each component in this instrument system is shown on the diagrams (see first page with a tab for definition of the reference designators used to identify components in each unit). Each main circuit is assigned a series of component numbers. The portions of the circuits mounted on circuit boards are enclosed with blue lines.

Cam Switch Contact Identification. Cam switches shown on the diagrams are coded to indicate the position of the contact in the complete switch assembly counting from the front, or knob end of the switch, toward the rear. The contact closure chart given on the diagrams indicates when each contact is closed.

Circuit Boards. Illustrations of the circuit boards are shown on the foldouts. These pictures are located near their respective associated schematic diagrams to aid in crossreference between the diagrams and the circuit board illustrations. Each electrical component on the boards is identified by its circuit number. The circuit boards are also outlined, on the diagrams, with a blue line that shows which portions of the circuit are located on a circuit board.

Component and Wiring Color Code. Colored stripes or dots on resistors and capacitors signify electrical values, tolerances, etc., according to the EIA standard color code. Components not color-coded usually have the value printed on the body.



This color code applies to leads within the 5400-series oscilloscope system only. Color code of the AC power cord is:

Black Line White Neutral Green with a yellow stripe Safety Earth (ground)



Fig. 3-1. Electrode configuration data for semiconductor devices.

Semiconductor Lead Configuration. Fig. 3-1 shows the lead configuration of the semiconductor devices used in this instrument.

Multi-Connector Holders. The multi-connector holder is keyed with two triangles, one on the holder and one on the circuit board. When a connection is made perpendicular to a circuit board surface, the orientation of the triangle and the slot numbers on the connector holder is determined by the direction of the nomenclature marking (see Fig. 3-2).

Troubleshooting Equipment

The following equipment is useful for troubleshooting the 5400-series oscilloscope and its plug-in units:

Semiconductor Tester

Description: Dynamic-type tester.

Purpose: To test the semiconductors used in this instrument system.

Recommended type: Tektronix Type 576 Transistor Curve Tracer or equivalent.

Multimeter

Description: VTVM, 10-megohm input impedance and 0 to 300 volts range, AC and DC; ohmmeter, 0 to 50 megohms. Accuracy, within 3%. Test probes must be insulated to prevent accidental shorting.



Fig. 3-2. Multi-connector holder orientation.

Purpose: To check voltages and for general troubleshooting in this instrument system.

NOTE

A 20,000 ohms/volt VOM can be used to check the voltages in this instrument if allowances are made for the circuit loading of the VOM at high-impedance points.

Test Oscilloscope

Description: Frequency response, DC to 50 megahertz minimum; deflection factor, 1 millivolt/division to 5 volts/division. A 10X, 10-megohm voltage probe should be used to reduce circuit loading for voltage measurements.

Purpose: To check operating waveforms in this instrument.

Troubleshooting Techniques

This troubleshooting procedure is arranged in an order that checks the simple trouble possibilities before proceeding with extensive troubleshooting. When a defective component is located, it should be replaced, following the replacement procedure given under Component Replacement.

1. Check Control Settings. Incorrect control settings can indicate a trouble that does not exist. If there is any question about the correct function or operation of any control, see the operating instructions for the instrument involved.

2. Check System and Associated Equipment. Before proceeding with troubleshooting of the 5400 system, check that the instruments in the system are operating correctly. Check for proper interconnection between the display unit and power supply/amplifier unit. Check that the signal is properly connected and that the interconnecting cables or signal source are not defective. Also, check the power source. The associated plug-in units can be checked for proper operation by substituting other units that are known to be operating properly (preferably of the same types), or by interchanging plug-in units within the 5403. If the trouble persists after substitution, the oscilloscope mainframe is probably at fault.

3. Visual Check. Visually check the portion of the instrument in which the trouble is suspected. Many troubles can be located by visual indications such as unsoldered connections, broken wires, damaged circuit board, damaged components, etc.

4. Check Instrument Adjustment. Check the adjustment of the 5400-series oscilloscope and its associated plug-ins, or check the affected circuit if the trouble appears in one circuit. The apparent trouble may only be a result of misadjustment. Complete adjustment instructions are given in the Service Information section for each instrument in the system.

5. Isolate the Trouble to a Circuit. To isolate trouble to a particular circuit, note the trouble symptom. The symptom often identifies the circuit in which the trouble is located. For example, poor focus indicates that the CRT circuit (includes high-voltage supplies) is probably at fault. When trouble symptoms appear in more than one circuit, check affected circuits by taking voltage and waveform readings.

Incorrect operation of all circuits often indicates trouble in the power supply. Check first for correct voltage of the individual supplies. However, a defective component elsewhere in the instrument can appear as a power-supply trouble and may also affect the operation of other circuits. Table 3-1 lists the tolerances of the power supplies in this instrument. These voltages are measured between the power-supply test points and ground on the Power Supply circuit board (see the adjustments LV Power Supply Circuit Board foldout page in this manual for test point locations). If a power-supply voltage is within the listed tolerance, the supply can be assumed to be working correctly. If outside the tolerance, the supply may be misadjusted or operating incorrectly. Use the procedure given in the adjustment procedure to adjust the power supplies.

TABLE 3-1

Power Supply Tolerances

Power Supply	Tolerance	Typical Ripple
200 V	+180 V to +240 V	2 V or less
+30 V	+29.925 V to +30.075 V	2 mV or less
+15 V	+14.85 V to +15.15 V	2 mV or less
+5 V	+4.9 V to +5.1 V	2 mV or less
	-14.85 V to -15.15 V	2 mV or less
	-29.925 V to -30.075 V	2 mV or less

6. Check Voltages and Waveforms. Often the defective component can be located by checking for the correct voltage or waveform in the circuit.

7. Check Individual Components. The following methods are provided for checking the individual components in the 5400-series instrument system. Components that are soldered in place are best checked by disconnecting one end, isolating the measurement from the effects of surrounding circuitry.

Power switch must be turned off before removing or replacing components, including semiconductors.

a. Transistors and Integrated Circuits. A good check of transistor operation is actual performance under operating conditions. A transistor can most effectively be checked by substituting a new component for it (or one which has been checked previously). However, be sure that circuit conditions are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester. Static-type testers are not recommended, since they do not check operation under simulated operating conditions. A desoldering tool must be used to remove soldered-in transistors; see component replacement procedure for details.

Integrated circuits can be checked with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of the circuit description is essential to troubleshooting circuits using IC's. Operating waveforms, logic levels, and other operating information for the IC's are given in the Theory Of Operation section of the appropriate manual. Use care when checking voltages and waveforms around the IC's so that adjacent leads are not shorted together. A convenient means of clipping a test probe to the 14- and 16- pin in-line IC's is with an integrated-circuit test clip. This device also doubles as an extraction tool.

b. Diodes. A diode can be checked for an open or for a short circuit by measuring the resistance between terminals with an ohmmeter set to the R X 1k scale. The diode resistance should be very high in one direction and very low when the meter leads are reversed. Do not check tunnel diodes or back diodes with an ohmmeter.

CAUTION

Do not use an ohmmeter that has a high internal current. High currents may damage the diode.

c. Resistors. Check the resistors with an ohmmeter. Resistor tolerance is given in the Electrical Parts List. Resistors normally do not need to be replaced unless the measured value varies widely from the specified value.

d. Capacitors. A leaky or shorted capacitor can be detected by checking resistance with an ohmmeter on the highest scale. Use an ohmmeter that does not exceed the voltage rating of the capacitor. The resistance reading should be high after initial charge of the capacitor. An open capacitor can best be detected with a capacitance meter, or by checking whether the capacitor passes AC signals.

8. Repair and Readjust the Circuit. Special techniques required to replace the components in this unit are given under Component Replacement. Be sure to check the performance of any circuit that has been repaired or that has had any electrical components replaced. Adjustment of the affected circuit may be necessary.

Replacement Parts

Standard Parts. All electrical and mechanical part replacements for the 5400-series oscilloscope system can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before purchasing or ordering replacement parts, check the parts lists for value, tolerance, rating, and description.

NOTE

When selecting replacement parts, it is important to remember that the physical size and shape of the component may affect its performance in the instrument. All replacement parts should be direct replacements unless it is known that a different component will not adversely affect the instrument performance.

Special Parts. Some parts are manufactured or selected by Tektronix to satisy particular requirements, or are manufactured for Tektronix to our specifications. These special parts are indicated in the parts list by an asterisk preceding the part number. Most of the mechanical parts used in this system have been manufactured by Tektronix. Order all special parts directly from your local Tektronix Field Office or representative.

Ordering Parts. When ordering replacement parts from Tektronix, Inc., refer to the page immediately preceding each electrical parts list section. Include the following information:

- 1. Instrument Type (5403, D40, 5A48, etc.)
- 2. Instrument Serial Number

3. A description of the part (if electrical, include the circuit number)

4. Tektronix Part Number

Component Replacement

The exploded-view drawings associated with the mechanical parts list (foldout pages) may be helpful when disassembling or re-assembling individual components or sub-assemblies.

Circuit Board Replacement. If a circuit board is damaged beyond repair, the entire assembly, including all soldered-on components can be replaced. Part numbers are given in the mechanical parts lists for the completely wired board.

To remove or replace a board, proceed as follows:

1. Disconnect all leads connected to the board (both soldered lead connections and solderless pin connections).

2. Remove all screws holding the board to the chassis or other mounting surface. Some boards may be held fast on one side by a slotted plastic bar in addition to the screws (for example, the H.V. and horizontal boards in the display modules). For these, remove the screws then pull the circuit board from its slot to free the board. Also, remove any obstructions that would prevent the board from being lifted out of the instrument.

3. Lift the circuit board out of the unit. Do not force or bend the board.

4. To replace the board, reverse the order of removal. Use care when replacing pin connectors; if forced into place incorrectly positioned, the pin connectors may be damaged.

Transistor and Integrated Circuit Replacement. Transistors and IC's should not be replaced unless they are actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement or switching of semiconductor devices may affect the instrument adjustment. When a transistor is replaced, check the operation of the part of the instrument that may be affected.

CAUTION

POWER switch must be turned off before removing or replacing semiconductors.

Replacement semiconductors should be of the original type or a direct replacement. Fig. 3-1 shows the lead configuration of the semiconductors used in this instrument system. When removing soldered-in transistors, use a de-soldering tool to remove the solder from the holes in the circuit board.

An extracting tool should be used to remove the 14- and 16-pin integrated circuits to prevent damage to the pins. This tool is available from Tektronix, Inc. Order Tektronix Part No. 003-0619-00. If an extracting tool is not available, use care to avoid damaging the pins. Pull slowly and evenly on both ends of the IC. Try to avoid having one end of the IC disengage from the socket before the other end.

To replace one of the power transistors mounted on the chassis adjacent to the Power Supply circuit board, first unsolder the leads. Then, loosen the nuts on the plastic bar, or the screw in the metal clamp, that clamps the transistor to the chassis. Remove the defective transistor. When replacing the transistor, use silicone grease on both sides of the insulator plate and on the metal tab, if the transistor has one, to increase heat transfer from the transistor to the chassis.

Interconnecting Pin Replacement. To replace a pin which is mounted on a circuit board, first disconnect any pin connectors. Then, unsolder the damaged pin and pull it out of the board with a pair of pliers. Be careful not to damage the wiring on the board with too much heat. Ream out the hole in the circuit board with a 0.031-inch drill. Remove the ferrule from the new interconnecting pin and press the new pin into the hole in the circuit board. Position the pin in the same manner as the old pin. If the old pin was bent at an angle to mate with a connector, bend the new pin to match the associated pins.

NOTE

A pin replacement kit including necessary tools, instructions, and replacement pins is available from Tektronix, Inc. Order Tektronix Part No. 040-0542-00.

Switch Replacement. The following special maintenance information is provided for the cam switches and pushbutton switches used in this instrument system.



Repair of cam switches should be undertaken only by experienced repair personnel. Switch alignment and spring tension of the contacts must be carefully maintained for proper operation of the switch. For assistance in repair of the cam switches, contact your local Tektronix Field Office or representative.

A. CAM SWITCHES

Two cam switch repair kits are available, they are: Cam Switch Repair Kit, Tektronix Part No. 040-0541-00; High Frequency Cam Switch Repair Kit, Tektronix Part No. 003-0708-00.

Service Information-5403

The first kit, Part No. 040-0541-00 is used to repair the cam switches in most time-base plug-in units and some vertical plug-in units. The second kit, Part No. 003-0708-00 is used to repair the cam switches using the high-frequency contact, which is used in several vertical plug-in units.

The cam switches consist of a rotating drum with lobes, whose position is controlled by the front-panel knobs, which actuates spring-leaf contacts.

The following instructions have been generalized to fit all instruments. Detailed instructions for cam switch repair, where required, will be found in the appropriate manual.

(1) Remove any shields, switch shafts, interfering wires, components, or circuit boards which prevent access to the circuit board with the bad cam switch contact.

NOTE

Cam switch bearing blocks which attach to more than one circuit board should not be separated from both boards during disassembly, unless absolutely necessary, as proper bearing alignment will be difficult.

(2) Completely remove from the instrument the circuit board having the defective cam switch contact.

(3) To replace the defective cam switch contacts, follow the instructions given in the switch repair kit.

(4) To reassemble the instrument, reverse the disassembly procedure.

B. PUSHBUTTON SWITCHES

The pushbutton switches are not repairable and should be replaced as a unit if defective. Use a de-soldering tool to remove solder from the holes in the circuit board when unsoldering the switches.

D40 Cathode-Ray Tube Replacement. The following procedure outlines the removal and replacement of the tube. Refer to Figs. 3-3- and 3-4.

WARNING

Use care when handling a CRT. Protective clothing and safety glasses should be worn. Avoid striking it on any object which might cause it to crack or implode. When storing a CRT, place it in a protective carton or set it face down in a protected location on a smooth surface with a soft mat under the faceplate to protect it from scrathces.

A. REMOVAL

(1) Remove the bezel assembly, which is held in place with two screws. (The bezel assembly includes a snap-in implosion shield.)

(2) Disconnect deflection leads from CRT neck pin receptacles. For storage CRT's, disconnect the storage-element cable connector from the Storage circuit board.

NOTE

The red and black wires entering the CRT shield are connected to the trace-rotation coil inside the shield. They will not hamper CRT removal and need not be unsoldered.

(3) Remove the rear panel holding nuts, then move the rear panel away from the instrument by sliding it along the power cord.

(4) Remove the CRT base socket.



6-inch steel ruler, or equivalent, not over 0.020 inch thick, inserted between graticule light reflector and CRT faceplate.

Fig. 3-3. Illustration showing equipment and method used to correctly align light reflector with CRT faceplate.



Fig. 3-4. Illustration showing location of CRT mounting hardware described in CRT replacement instructions.

Service Information-5403

(5) With one hand on the CRT faceplate, push on the CRT base. Slide the CRT forward until the CRT anode plug can be disconnected. For storage CRT's, be sure to feed the storage-element cable through the slot in the main portion of the CRT shield as the CRT slides forward. Pull the CRT out of the instrument from the front.

B. REPLACEMENT

(1) Make sure the soft plastic CRT faceplate supports are in place, then insert the CRT into the shield while feeding the storage-element cable through the slot in the shield. Before the CRT is completely inserted, reconnect the anode plug and place the steel rulers for the light reflector alignment.

(2) With the CRT fully inserted and the shield hardware loose, mount the bezel assembly into place and tighten the bezel screws.

(3) Position the rear of the CRT (socket end) so that there is no tilt of the faceplate in relation to the bezel assembly, then tighten the positioning screws. Check that the four deflection CRT neck pin receptacles are centered in the neck shield cutout, then tighten the clamp hardware.

(4) Place the CRT base socket onto the CRT base pins. Replace the rear panel. If applicable, connect the storage-element cable to the pin connectors on the Storage circuit board, and connect the deflection leads to the CRT neck pins.

(5) Replacing the CRT will require partial instrument adjustment. Refer to the Service Information section of the display unit manual.

D41 Cathode-Ray Tube Replacement. The following procedure outlines the removal and replacement of the cathode-ray tube.

WARNING

Use care when handling a CRT. Protective clothing and safety glasses should be worn. Avoid striking it on any object which might cause it to crack or implode. When storing a CRT, place it in a protective carton or set it face down in a protected location on a smooth surface with a soft mat under the faceplate to protect it from scratches.

A. REMOVAL

(1) Remove the bezel assembly, which is held in place with two screws. (The bezel assembly includes a snap-in implosion shield.)

(2) Disconnect deflection leads from CRT neck pin receptacles and disconnect the storage-element cable connector from the Storage circuit board.

NOTE

The red and black wires entering the CRT shield are connected to the trace-rotation coil inside the shield. They will not hamper CRT removal and need not be unsoldered.

(3) Remove the CRT base cover on the rear panel of the instrument. Remove the CRT base-pin socket.

(4) Disconnect the CRT anode plug from the jack located on the panel adjacent to the left side of the CRT shield. Ground the CRT anode plug to the chassis momentarily to dissipate any stored charge.

(5) With one hand on the CRT faceplate, push on the CRT base being sure to feed the storage-element cable and the anode lead through the slot and hole in the bottom and rear of the main portion of the CRT shield as the CRT slides forward. Pull the CRT out of the instrument from the front.

B. REPLACEMENT

(1) Make sure the soft plastic CRT faceplate supports are in place, then insert the CRT into the shield while feeding the storage-element cable and the anode lead through the slot and hole in the bottom and rear of the CRT shield.

(2) With the CRT fully inserted and the shield hardware loose, mount the bezel assembly into place and tighten the bezel screws.

NOTE

If the CRT support ring has come out of the CRT shield, place over rear of CRT and position inside CRT shield between CRT and CRT shield.

(3) Position the rear of the CRT (socket end) so that there is no tilt of the faceplate in relation to the bezel assembly, then tighten the positioning screws. Check that the four deflection CRT neck pin receptacles are centered in the neck shield cutout, then tighten the clamp hardware.

(4) Place the CRT base socket onto the CRT base pins. Replace the CRT base cover on the rear panel. Connect the storage-element cable to the pin connectors on the Storage circuit board, and connect the deflection leads to the CRT neck pins. Reconnect the CRT anode plug to the jack from the high-voltage circuit board.

(5) Replacing the CRT will require partial instrument adjustment. Refer to the Adjustments information later in this manual.

Bulb Replacement. To replace the knob-skirt deflection-factor readout bulbs, proceed as follows:

NOTE

To gain access to bulbs on some instruments, it may be necessary to remove circuit boards and pushbutton switch extension shafts. Extension shafts are removed and installed by pulling straight off and pushing straight on.

1. Remove the light shield.

2. Unsolder the defective bulb, and install its replacement.

3. Replace the light shield.

To replace the D40 graticule lights, proceed as follows:

1. Remove the control knobs and nuts that hold the front-panel circuit board to the display unit front-panel.

2. Unplug the wires going to the board and remove the board from the display unit.

3. Replace the burned out light(s).

4. Remove the CRT bezel assembly and disconnect the CRT neck pins. Remove the display unit rear-panel, then push the CRT forward until its faceplate is about one-half inch out of the instrument.

5. Install the front-panel circuit board, replacing all nuts and knobs.

6. Install CRT into display unit using CRT Replacement instructions.

To replace the D41 graticule lights, proceed as follows:

1. Remove the CRT bezel assembly.

2. Pull out the light reflector assembly slightly.

3. Replace the burned out light(s).

4. Replace the light reflector assembly back into its original position.

5. Re-install the CRT bezel assembly.

Power Transformer Replacement. Replace the power transformer only with a direct replacement Tektronix transformer. After the transformer has been replaced, check the power supply output voltages as outlined in the Service Information section of this manual. Also, check the CRT operation as outlined in the Service Information section of the display unit manual.

Fuse Replacement. Table 3-2 gives the rating, location, and function of the fuses used in this instrument system.

TABLE 3-2

Circuit Number	Rating	Function	Location
F300	120 VAC –1.25 A Slow 240 VAC –0.7 A Slow	Line-Voltage Input	Display unit rear panel
F800	0.25 A Fast	+200 V Unreg supply	5403 L.V. Power Supply board
F410	0.3 A Slow	+38 V Unreg supply	Display Unit H.V. Power Supply board

OPTION INFORMATION

Your instrument may be equipped with one or more options. This section describes those options, or directs the reader to where the option is documented.

Option 1	Removes Readout Circuitry	Described in this section.	Pages 1
Option 3	External Readout Input	Described in this section.	6
Option 4	Protective Front Panel Cover	Described in this section.	1

OPTION 1

This modification removes the Readout circuitry from the 5403.

ELECTRICAL PARTS LIST

Ckt. No.	Tektronix Part No.	Description
	670-2413-00	READOUT Circuit Board Assembly
	155-0015-01	Monolithic Analog Data Switch
	155-0015-01	Monolithic Analog Data Switch
	131-1398-00	Contact, Elect. 16 Pin, dip, gnd
	131-1398-00	Contact, Elect. 16 Pin, dip, gnd
	Ckt. No.	Ckt. Tektronix Part No. 670-2413-00 155-0015-01 155-0015-01 131-1398-00 131-1398-00

(131-1398-00 are installed where the 155-0015-01 are removed)

OPTION 3 EXTERNAL READOUT INPUT

The External Readout Input option provides access to the two readout display words which cannot be programmed via plug-ins in the 5403. This option does not alter the display or words that are programmed from plug-ins.

The words that are accessed by this option appear at the bottom of the screen as shown in Fig. 1. These words are designated EXT. 1 and EXT. 2.

LEFT VERT	RIGHT VERT	HORIZ	HORIZ
CHAN 1	CHAN 1	A SWP	B SWP
LEFT VERT	RIGHT VERT	EXTERNAL	EXTERNAL
CHAN 2	CHAN 2	WORD 1	WORD 2

Fig. 1. Readout Word Location

CONNECTOR DESCRIPTION

The connector provided for the External Readout Input is a 25 pin female connector located on the rear panel of the 5403. The connector mates with an ITT - Cannon DB - 25P or equivalent connector (TEK PN 131-0570-00). Refer to Fig. 2 for connector pin assignments.

)		
			/	\sim			
		$\left(\right)$		0		13	TS4
GROUND	25		0	0		12	TS1
+5V PWR SUPPLY	24		0			14	TCO
+15V PWR SUPPLY	23		0	0			129
	22		0	0		10	TS8
-15V FWR SUFFLY	22		0	0		9	TS2
EXT. ROW 2	21		0	0		8	TS3
EXT. ROW 1	20		0	0		7	TSE
EXT. COLUMN 2	19		0			'	135
EXT COLUMN 1	10		0	0		6	TS10
EXT. COLOWIN T	10		0	0		5	TS6
	17		0	0		4	TS7
NOT USED	16		0	õ		•	
	15		0	0		3	TRAPEZOID
	(~	0		2	END-OF-WORD
40V LINE FREQ.	14	(\sim	0		1	TRIGGER
					'		
				~			

Fig. 2. Connector pin assignments (View looking at rear panel of 5403)

GROUND	Readout System Ground.
+5 V, ∓15 V, 15 V	Power supply connections. Maximum allowable currents; ±5: 100 mA; ±15: 20 mA; = 15: 20 mA.
EXT. COLUMN 1	Column data input for External word 1.
EXT. COLUMN 2	Column data input for External word 2.
EXT. Row 1	Row data input for External word 1.
EXT. Row 2	Row data input for External word 2.
40 V Line FREQ	Line frequency signal approx. 40 V P-P. 10 mA maximum.
TS1-TS10	Time Slot signals.
TRAPEZOID	Trapezoid signal from pin 10 of Timer, U1000, on Readout Board.
END-OF-WORD	End-of-word pulse from pin 2 of Time Slot counter, U1025, on Readout Board.
TRIGGER	Pulse from pin 5 of Timer, U1000, on Readout Board.

PROGRAMMING

The 5403 Readout system is programmed by resistors, which are connected between Time Slot lines and Row or Column lines. The resistors are chosen according to the character displayed or the operation performed. For the values of programming resistors, see Fig. 2-6 (the Character Selection Matrix) in the 5403 Manual. All programming resistors smaller than 51K and larger than 13K should be 1% tolerance or better; all others can be 5% or less.

To illustrate resistor selection, consider the display "TEST 1" in EXT. 1. Required resistor values are shown.

CHARACTER	COLUMN	COLUMN RESISTOR	ROW	ROW RESISTOR
Т	9	16.5 K	4	51 K
E	10	13 K	5	37.4 K
S	1	150 K	5	37.4 K
Т	9	16.5 K	4	51 K
(Space)	0	Open	10	16.5 K
1	2	75 K	1	Open

Fig. 3. RESISTOR PROGRAM for "TEST 1".

In Fig. 3 the Matrix indicates, for example, that the character "T" is programmed by column 9 and Row 4. The Selection Matrix also indicates that a 16.5K resistor is required for column 9 while 51K is required for Row 4. To obtain the space before the "1", the "ADD SPACE" operation is used.

The choice of Time Slots depends on the desired position of the character within the word. Programming the first character from TS1 displays that character in the left-most character position of the display word. Similarly, programming the first character from TS2, TS3, or TS4 displays that character in the second, third, or fourth position within the display word respectively. Programming the first character from TS5 to TS10, however, displays the character as if it is programmed from TS4. To move the character further right requires programming "ADD SPACE" (column 0, Row 10) in Time Slots after TS3.

Once the Time Slot for the first character is chosen, succeeding characters are programmed in succeeding Time Slots. If, however, a Time Slot other than TS1, TS2, or TS3 is left unprogrammed, character position is unchanged during that Time Slot. For example, if TS6 and TS8 are programmed and TS7 is not, then the character displayed in TS8 is displayed in the same position as if it were programmed in TS7.

Tc further clarify the programming concepts outlined here, a complete circuit diagram for programming a word is given in Fig. 4. This circuit displays "TEST n" where "n" is a number from 0 to 99 selectable by the user. Time Slots TS1 to TS5 are used to program "TEST (space)." Time Slot 6 with Switch S1 and R10 through R19 programs the tens digit of the number. S1 selects the number displayed. Similarly, S2 selects the units digit programmed in TS7. There are several choices for the format of the number when the number is less than 10. If it is desirable to display the number "8" as "08", then R10B is used to program a "0" in the tens digit and R10A is not used. If a space is desired in the tens digit (in addition to the space in TS5) so that the location of the units digit does not shift when changing from "9" to "10", then R10A is used and R10B is not. If neither R10A nor R10B is used, the units digit in numbers less than 10 is displayed in the display location of the tens digit.

Column and Row connections are chosen according to the display location of the word on the screen. Connection of programming resistors of Row 1 and Column 1 displays in the location of EXT 1. Likewise, connection to Row 2 and Column 2 displays in the location of EXT 2.

ADDITIONAL CONSIDERATIONS

The connections to the External Readout Input connector are not short-circuit protected. Shorts may damage the Readout System.

The Trapezoid, End-of-Word, and Trigger signals are for special processing applications. They have very limited driving capability and should be emitter follower buffered if used for any purpose.



Fig. 4. PROGRAMMING "TEST n"

MECHANICAL PARTS LIST

Tektronix Part No.	Quantity	Description
Add:		
131-0569-00	1	Connector, 25 Pin Female
131-0570-00	1	Connector, 25 Pin Male
210-0004-00	2	Washer, Lock No. 4
210-0406-00	2	Nut, 4-40 🗹 3/16
129-0370-00	2	Post, Metallic (Stud)
200-1055-00	1	Cover, Connector
Change to:		
333-1775-00	1	Rear Panel

A

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OPTION 4

The purpose of OPTION 4 is to provide a protective front panel cover. The cabinet sides have been modified by the addition of a retaining hook for the protective cover.

MECHANICAL PARTS LIST

Fig. & Index No.	Tektronix Part No.	Qty	Description
Change to:			
2-7	390-0193-01	1	CABINET SIDE (left)
2-12	390-0192-01	1	CABINET SIDE (right)
Add:			
	200-1375-00	1	COVER FRONT (oscilloscope)

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
ELCTLT	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 CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC.,		
	SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
02735	RCA CORP., SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC CO., SEMI-CONDUCTOR		
	PRODUCTS DEPT.	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMIC CORP.	P.O. BOX 867	MURTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR		
	PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF		
	FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
12040	NATIONAL SEMICONDUCTOR CORP.	COMMERCE DRIVE	DANBURY, CT 06810
50157	N. L. INDUSTRIES, INC., ELECTRONICS		
	DEPT.	P. O. BOX 787	MUSKEGON, MI 49443
54294	SHALLCROSS, A CUTLER-HAMMER CO.	PRESTON STREET	SELMA, NC 27576
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
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
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
90201	MALLORY CAPACITOR CO., DIV. OF		
	P. R. MALLORY CO., INC.	3029 E. WASHINGTON ST.	INDIANAPOLIS, IN 46206
91418	RADIO MATERIALS CO.	4242 W. BRYN MAWR	CHICAGO, IL 60646
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601
95238	CONTINENTAL CONNECTOR CORP.	34-63 56TH ST.	WOODSIDE, NY 11377

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		lektronix	Serial/M	odel No.		Mtr	
	Ckt_No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
	Al	670-2335-00	B010100	B053530	CKT BOARD ASSY: INTERFACE	80009	670-2335-00
L	Al	670-2335-01	B053531	B053858	CKT BOARD ASSY: INTERFACE	80009	670-2335-01
	Al	670-2335-02	B053859		CKT BOARD ASSY: INTERFACE	80009	670-2335-02
7	A2	670-2336-00			CKT BOARD ASSY: POWER SUPPLY	80009	670-2336-00
	A3	670-2413-00			CKT BOARD ASSY: READOUT	80009	670-2413-00
		0.0 0.20 00				00005	070 2415 00
-	C608	283-0023-00			CAP. FXD.CEB DI:0.10F.+80-20%.10V	91418	MX1047120180
	C610	283-0003-00			CAP. FXD.CER DI:0.010F.+80-20%.150V	72982	855-547E103Z
}	C619	283-0023-00			CAP., FXD.CER DI:0.1UF, +80-20%,10V	91418	MX104Z1201R0
	C620	283-0023-00			CAP., FXD.CER DI:0.1UF, +80-20%, 10V	91418	MX104Z1201R0
	C621	281-0534-00			CAP., FXD, CER DI:3.3PF, +/-0.25PF, 500V	72982	301-000C0J0339C
١	C622	290-0527 - 00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020NLF
	C624	290-0527-00			CAP. FXD.ELCTLT: 15UF.20%.20V	90201	TDC156M020NLF
	C626	290-0534-00			CAP., FXD, ELCTLT: 1UF, 20%, 35V	56289	196D105X0035HA1
-	C627	281-0547-00	B010100	в053799	CAP., FXD, CER DI:2.7PF, 10%, 500V	72982	301-000C0J0279C
	C627	281-0534-00	в053800		CAP., FXD, CER DI: 3.3PF, (NOM VALUE), SEL	72982	301-000C0J0339C
7							
	C628	290-0534-00			CAP., FXD, ELCTLT: 1UF, 20%, 35V	56289	196D105X0035HA1
_	C629	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020NLF
	C630	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
3	C637	281-0503-00	B010100	в054023	CAP., FXD, CER DI:8PF, +/-0.5PF, 500V	72982	301-000C0H0809D
	C637	281-0604-00	в054024		CAP., FXD, CER DI:2.2PF, (NOM VALUE), SEL	72982	301-000C0J0229C
7							
-	C639	283-0023-00			CAP., FXD, CER DI:0.1UF, +80-20%, 10V	91418	MX104Z1201R0
	C640	281-0546-00			CAP., FXD, CER DI: 330PF, 10%, 500V	04222	7001-1380
]	C652	283-0023-00			CAP., FXD, CER DI:0.1UF, +80-20%, 10V	91418	MX104Z1201R0
	C660	281-0546-00			CAP., FXD, CER DI: 330PF, 10%, 500V	04222	7001-1380
	C704	281-0604-00			CAP., FXD, CER DI:2.2PF, +/-0.25PF, 500V	72982	301-000C0J0229C
1 65	C724	281-0604-00			CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	72982	301-000C0J0229C
1()	C766	281-0509 - 00			CAP., FXD, CER DI:15PF, +/-1.5PF, 500V	72982	301-000C0G0150K
	C770	283-0023-00			CAP.,FXD,CER DI:0.1UF,+80-20%,10V	91418	MX104Z1201R0
	C775	283-0150-00			CAP.,FXD,CER DI:650PF,5%,200V	72982	835-515B651J
	C780	283-0150-00			CAP.,FXD,CER DI:650PF,5%,200V	72982	835-515B651J
]							
1	C784	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
	C790	281-0524-00	B010100	B010180	CAP.,FXD,CER DI:150PF,+/-30PF,500V	04222	7001-1381
	C790	283-0054-00	B010181		CAP.,FXD,CER DI:150PF,5%,200V	72982	855-535U2J151J
1	C800	290-0587-00			CAP., FXD, ELCTLT: 170UF, +50-10%, 275V	56289	68D10496
	C820	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
1							
	C821	283-0167-00	XB040000		CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N147W5R104K
·	C822	283-0114-00	B010100	B039999X	CAP., FXD, CER DI:0.0015UF, 5%, 200V	72982	805-509B152J
1	C825	290-0535-00			CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1
	C832	283-0000-00	B010100	B039999X	CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
-	C834	281-0550-00	B010100	B039999	CAP.,FXD,CER DI:120PF,10%,500V	04222	7001-1373
		001 0501 00	5040000			70000	201 00000004705
1	C834	281-0201-00	B040000	D000000	CAP., FXD, CER D1:4./PF,+/-IPF,500V	72982	JUL-UUUS2HU4/9F
	0836	281-0546-00	8010100	B0333333	CAP., FXD, CER DI:330PF, 10%, 500V	72002	/001-1380
_	0836	283-0000-00	B040000		CAP., FXD, CER DI:0.0010F, +100-0%, 500V	72982	831-516E102P
	0845	283-0003-00			CAP., FXD, CER DI:0.010F, +80-20%, 150V	72982	855-547EIU32
	0848	290-0645-00			CAP., FXD, ELCTLT: 10,0000F, +100-10%	56289	68D10548
(0050	200 0527 00				00203	mpc] E6M020MT B
1	C850	290-0527-00			CAR FYD CER DI.O Olir 120-204 1500 CAR FYD CER DI.O Olir 120-204 1500	7202	855-547F1027
-	C867	283-0003-00			CAD FYD.CFR DI.O. Oliv #80-208,1500	72902	855-54781032
	C871	281-0580-00			CAPFXD.CER DI:470PF.10%.500V	04222	7001-1374
)	C875	290-0636-00			CAPFXD.ELCTLT:7500UF.+100-10%.25V	56289	68D10501
}							
-A	C876	290-0636-00			CAP., FXD, ELCTLT: 7500UF, +100-10%, 25V	56289	68D10501
	C880	290-0527-00			CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020NLF
)	C890	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
1	C897	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
1							

Chi No. Peri No. Eff Dscont Name & Description Code Mit Part Number 001 290-0538-00 CAP., FXXD, CER D1:6007, 54, 5007 9923 72320 72320 023 290-0538-00 CAP., FXXD, CER D1:1007F, 54, 5007 72382 301.000253171J 023 290-0597-00 CAP., FXXD, CER D1:1007F, 54, 5007 72382 301.000253171J 0234 290-0597-00 CAP., FXXD, EECTLT1:5000F, FX1-504, 507 56289 6601.0454 0235 290-0537-00 CAP., FXXD, EECTLT1:5000F, FX1-504, 507 72628 5527871033 0255 290-0517-00 CAP., FXXD, EECTLT1:50, 507 72628 562781033 0255 281-0564-00 CAP., FXXD, EECTLT1:50, 507 72628 56371033 0255 281-0564-00 CAP., FXXD, EECTLT1:50, 5007 72628 301-055000100F 0255 281-0564-00 CAP., FXXD, EECTLT1:107, 704, 557 56289 19606530035811 0264 281-0504-00 CAP., FXXD, CER D1:10007, F3, 5007 72628 301-0550000000 0264 281-051-00 CAP., FXXD, CER D1:		Tektronix	Serial/Model No.		Mfr	
col 281-0633-00 CRN _ FXD _ CRN _ D1650FF _ 54,500 0412 Z 7001-152 C310 290-0538-00 CRN _ FXD _ CRN _ FXD _ CRN _ FXD _ CNN _ FXD _ F	Ckt No.	Part No.	Eff Dscont	Name & Description	Code	Mfr Part Number
Contage Contage <t< td=""><td>C001</td><td>291-0622-00</td><td></td><td>CND EVD CEP DT.650DE 5% 5000</td><td>04222</td><td>7001-1362</td></t<>	C001	291-0622-00		CND EVD CEP DT.650DE 5% 5000	04222	7001-1362
1300 203-001-00 CDF, FXD, CDF 11:00169, F100-10, 500 772:00 772:00 C932 201-0589-00 CDF, FXD, CDF 11:707, FX, 500 79282 201000251717 C932 201-0589-00 CDF, FXD, CDF 11:707, FX, 500 79282 201000251717 C932 290-0589-00 CDF, FXD, CDF 11:707, FX, 500 79282 20100025171 C934 280-0528-00 CDF, FXD, CDF 10:0017, FXD, 500 56289 6810454 C935 290-0517-00 CDF, FXD, CDF 10:0017, FXD, 500 79282 201-051600017 C935 291-0546-00 CDF, FXD, CDF 10:0017, FXD, 500 79282 201-050000100F C935 291-0546-00 CDF, FXD, CDF 10:1007, FYD, 500 79282 201-050000100F C936 291-0546-00 CDF, FXD, CDF 11:107, 204, 35V 56289 1060105X003FRA1 C982 290-0534-00 CDF, FXD, CDF 11:4079, FY, 500V 72829 10-000020660X C1012 281-0535-00 CDF, FXD, CDF 11:4707, FY, 500V 72829 10-000020602X C1022 281-0525-00 CDF, FXD, CDF 11:4707, FY, -10F, 500V 72929 101-	C901	201-0023-00		CAP.,FAD,CER DI:050FF,5%,500V	04222	TDC156M050WTC
2030 2030-0037-00 CDP., FXD, CER. D. 12: 1000F, FX, NOO 7289 1010005010171J 2030 2030-037-00 CDP., FXD, ELCTLF: 13000UF, +75-104, 50V 56289 6BD10527 2030 2030-0537-00 CAP., FXD, ELCTLF: 1300CUF, +75-104, 50V 56289 6BD10527 2030 2030-0537-00 CAP., FXD, ELCTLF: 1300CUF, +75-104, 50V 56289 6BD10544 2030-0538-00 CAP., FXD, CER DI: 10.1UF, 400-204, 150V 56289 6D066500015KAI 2055 221-0544-00 CAP., FXD, CER DI: 100F, 4/-1PF, 500V 7282 10510550031KAI 2055 221-0544-00 CAP., FXD, CER DI: 100F, 4/-1PF, 500V 7282 10-10500003KAI 2081 200-0534-00 CAP., FXD, CER DI: 100FF, 104, 500V 7282 301-0000230680X 2011 283-0103-00 CAP., FXD, CER DI: 100FF, 50V 56289 400033KAI 2012 281-051-00 CAP., FXD, CER DI: 407F, 4/-1PF, 500V 7282 301-0000230680X 2012 281-052-00 CAP., FXD, CER DI: 407F, 4/-4/-2PF, 500V 7282 801-0500200K 2012 281-052-00 CAP., FXD, CER DI: 407F, 4/-4/-2PF, 5	C910	290-0528-00		CAP., FAD, ELCTET: ISUF, 208, SUV	56201	272C20
Carbon Carbon <thcarbon< th=""> <thcarbon< t<="" td=""><td>C920 C925</td><td>283-0010-00</td><td></td><td>CAP., FXD, CER DI:0.030F, F100-208, 500</td><td>72023</td><td>273020</td></thcarbon<></thcarbon<>	C920 C925	283-0010-00		CAP., FXD, CER DI:0.030F, F100-208, 500	72023	273020
C-30 Z-90-063/-00 C.R., FXD, ELT.II: 100001, F/9-10.4, 30V SERUP GBID0654 C312 Z290-0639-00 CR., FXD, FXD, FXD, FXD, T00-016, 50V SERUP GBID0654 C342 Z290-0532-00 CR., FXD, FXD, FXD, FXD, T00-016, 50V S0201 TCCL5805050KL C344 Z290-0537-00 CR., FXD, FXD, FXD, FXD, T10, 01UP, +80-204, 150V 7392 S55-37121032 C355 Z290-0537-00 CR., FXD, FXD, FXD, TLT, 10, 70, 4, 35V 56289 J060655X003F8A1 C355 Z290-0534-00 CR., FXD, FXD, FXD, TLT, 10F, 70, 4, 35V 56289 J060105X003F8A1 C382 Z90-0534-00 CR., FXD, FXD, FXD, TLT, 10F, 70, 4, 50V 73922 J01-050200100F C382 Z90-0534-00 CR., FXD, FXD, TCTT, 110F, 70, 4, 50V 73922 J01-00020100K C1012 Z28-008-00 CR., FXD, CRE D11407F, FX, 50V 73922 J01-000200022K C1012 Z28-0010-00 CR., FXD, CRE D114, 70FF, FV, 20FY, 500V 73922 J01-000200022K C1012 Z28-000-00 CR., FXD, CRE D114, 70FF, FV, 10FF, 500V 73922 J01-000200022K C1022 Z81-05	C925	281-0589-00		CAP., FXD, CER DI: 170PF, 58, 500V	72982	69D10527
C32 290-0509-00 CAP., FXD, FECTLF. 3000T, +100-10, 500 56289 401047301 C944 290-0528-00 CAP., FXD, FECTLG. 047UP, 204, 100 72926 855-547E1037 C950 290-0517-00 CAP., FXD, FECTLG. 047UP, 204, 100 72926 855-547E1037 C950 290-0517-00 CAP., FXD, CER D1: 0.0UP, +40-204, 1500 72927 855-547E1037 C953 281-0564-00 CAP., FXD, CER D1: 30UP, F10, 500V 04227 7001-1380 C981 290-0534-00 CAP., FXD, CER D1: 30UP, F10, 500V 04227 7001-1380 C981 291-0649-00 CAP., FXD, CER D1: 400P, 40, 500V 56289 40610350013841 C984 281-0649-00 CAP., FXD, CER D1: 100P, 54, 500V 56289 400623214 C1024 281-0525-00 CAP., FXD, CER D1: 102P, 74, -12P, 500V 72922 301-000200220K C1027 281-0525-00 CAP., FXD, CER D1: 400P, 74-94P, 500V 42227 7001-1344 C1036 283-0000-00 CAP., FXD, CER D1: 600F, 74-94P, 500V 72928 310-0002002104394 C1047 281-0525-00 CAP., FXD, CER D1: 60.010F, 74-0	C930	290-0637-00		CAP., FXD, ELCTLT: 50000F, +75-10%, 50V	50285	00010527
C335 285-0629-00 CAP., FXD, PLSTC: 0.47UF, 204, 100V 56289 41047301 C344 230-0632-00 CAP., FXD, LECTLT: 100, 010F, 480-204, 150V 7292 855-537E1032 C355 230-0637-00 CAP., FXD, CER DI: 100F, 4/-18F, 500V 7292 855-537E1032 C355 231-0564-00 CAP., FXD, CER DI: 10FP, 4/-18F, 500V 7292 301-055C060100F C355 231-0544-00 CAP., FXD, CER DI: 1300F, 104, 500V 7292 301-055C060100F C355 231-0544-00 CAP., FXD, CER DI: 1300F, 104, 500V 72932 301-055C060100F C382 200-0534-00 CAP., FXD, CER DI: 1300F, 104, 500V 72982 301-000C0000000 C4P., FXD, CER DI: 108FP, 104, 500V 72982 301-000C000000 CAP., FXD, CER DI: 108FP, 15, 100V 56289 4006334 C1027 281-051-00 X003000 CAP., FXD, CER DI: 100F, 15, 500V 72982 301-0002CM079F C1032 281-052-00 CAP., FXD, CER DI: 100F, 104, 500V 72982 301-000C000220K C1042 281-052-00 CAP., FXD, CER DI: 1470FF, 4/-24FP, 500V 72982 301-000C000020K <t< td=""><td>C932</td><td>290-0509-00</td><td></td><td>CAP., FXD, ELCTLT: 3000UF, +100-10%, 50V</td><td>56289</td><td>68D10454</td></t<>	C932	290-0509-00		CAP., FXD, ELCTLT: 3000UF, +100-10%, 50V	56289	68D10454
C344 290-0528-00 CAP., FXD, ELCTLT:15UP, 200, 50V 7292 TDC15640500LC C350 290-0517-00 CAP., FXD, ELCTLT:6, EUF, 1:00V 7292 301-055C00100F C353 281-0544-00 CAP., FXD, ELCTLT:6, EUF, 1:00V 0422 7001-1380 C352 290-0534-00 CAP., FXD, CER D1:3,01UP, 40, 50V 0422 7001-1380 C364 281-0544-00 CAP., FXD, CER D1:3,01UP, 40, 50V 56289 1960105X0035RA1 C364 281-0544-00 CAP., FXD, CER D1:180PF, 54, 500V 72982 301-0052C00035RA1 C364 281-0549-00 CAP., FXD, CER D1:180PF, 54, 500V 72982 301-0000270600X C1010 283-0510-00 CAP., FXD, CER D1:180PF, 54, 500V 7282 301-000027060220K C1021 281-0521-00 CAP., FXD, CER D1:1470F, H-24FF, 500V 7282 301-00027060220K C1032 281-0521-00 CAP., FXD, CER D1:1470FF, H-24FF, 500V 7282 301-00027060220K C1032 283-0000-00 CAP., FXD, CER D1:0.001FF, H-1070F, H-24FF, 500V 7282 383-5166129 C1042 283-0110-00 CAP., FXD, CER D1:0.00	C935	285-0629-00		CAP., FXD, PLSTC: 0.047UF, 20%, 100V	56289	410P47301
C946 283-0003-00 CAP., FXD, CER DI:0, OLUE , 400-204, LSOV 72962 855-547EL032 C950 290-0517-00 CAP., FXD, CER DI:10PF, 4/-1PF, 500V 72962 301-055C00100P C951 281-0546-00 CAP., FXD, CER DI:10PF, 4/-1PF, 500V 72962 301-055C00100P C952 290-0534-00 CAP., FXD, CER DI:10PF, 1/0, 550V 72982 301-055C00100P C984 281-0549-00 CAP., FXD, CER DI:10PF, 1/0, 550V 72982 301-000230680K C1010 283-0103-00 CAP., FXD, CER DI:16PF, 1/4, 550V 72982 301-000230680K C1022 285-0698-00 CAP., FXD, CER DI:140PF, 1/4, 22PF, 500V 72982 301-000260220K C1022 281-0525-00 CAP., FXD, CER DI:1470PF, 1/-94PF, 500V 04222 7001-1364 C1032 281-0525-00 CAP., FXD, CER DI:1670P, 1/4-94PF, 500V 04222 7001-1364 C1032 281-0525-00 CAP., FXD, CER DI:1670P, 1/4-94PF, 500V 04222 7001-1364 C1032 281-0525-00 CAP., FXD, CER DI:10,001P, 1/0-04, 500V 72982 831-516E102P C1032 281-052-00 CAP.	C944	290-0528-00		CAP., FXD, ELCTLT: 15UF, 20%, 50V	90201	TDC156M050WLC
C950 290-0517-00 CAP., FXD, ELCTLT:6.SUF, 204, 35V 56289 1960665X0035KA1 C955 281-0564-00 CAP., FXD, CER DI 10FF, 4/-IFF, 500V 72982 301-055C000100F C981 290-0534-00 CAP., FXD, CER DI 330F, VO, 50V 6228 1960105X0035KA1 C982 291-0534-00 CAP., FXD, CER DI 130F, VO, 35V 56289 1960105X0035KA1 C984 291-0544-00 CAP., FXD, CER DI 168PF, 104, 5500V 56289 1960105X0035KA1 C1010 283-0103-00 CAP., FXD, CER DI 168PF, 104, 5500V 56289 400638 C1021 284-0691-00 CAP., FXD, CER DI 1470F, 4/-22 FF, 500V 72882 301-0002X0479P C1022 281-0511-00 XB30000 CAP., FXD, CER DI 1470F, 4/-22 FF, 500V 72882 301-0002X0479P C1032 281-0527-00 CAP., FXD, CER DI 1470F, 4/-24 FF, 500V 72882 301-0002X0479P C1042 281-0527-00 CAP., FXD, CER DI 10.001F, +100-04, 500V 72882 301-0002X0479P C1042 283-0010-00 CAP., FXD, CER DI 10.001F, +100-04, 500V 72882 831-516E102P C1043 283-	C948	283-0003-00		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
C953 281-0504-00 CAP.,FXD,CER DI:10PF,+/-1PF,500V 72982 301-055C000100F C955 281-0546-00 CAP.,FXD,CER DI:300F,106,500V 04222 7001-1380 C982 290-0534-00 CAP.,FXD,CER DI:300F,106,500V 72982 301-055C000120F C982 281-0549-00 CAP.,FXD,CER DI:190F,54,500V 72982 301-005X0035HA1 C1010 283-0103-00 CAP.,FXD,CER DI:190F,54,500V 56289 400638 C1024 281-0511-00 CAP.,FXD,CER DI:190F,54,500V 56289 400638 C1027 281-0521-00 CAP.,FXD,CER DI:140FF,4/-24P,500V 72982 301-000200220K C1037 281-0525-00 CAP.,FXD,CER DI:140FF,4/-42P,500V 72982 301-00022104799 C1041 281-0525-00 CAP.,FXD,CER DI:10.001F,4100-46,500V 72982 301-0052104799 C1053 283-0000-00 CAP.,FXD,CER DI:0.005F,460-204,150V 72982 301-0052104792 C1030 283-0110-00 CAP.,FXD,CER DI:0.005F,460-204,150V 72982 301-0052104792 C1102 283-0110-00 CAP.,FXD,CER DI:0.005F,460-204,150V 72982 <td>C950</td> <td>290-0517-00</td> <td></td> <td>CAP., FXD, ELCTLT: 6.8UF, 20%, 35V</td> <td>56289</td> <td>196D685X0035KA1</td>	C950	290-0517-00		CAP., FXD, ELCTLT: 6.8UF, 20%, 35V	56289	196D685X0035KA1
Case 244-0504-00 CAP., F20, CER D1:300F, F4-T4F, 500V 72362 200-0534-00 CAP., F20, ECR D1:300F, 104, 500V 6222 7001-1380 CS32 281-0543-00 CAP., F20, ECTTF:117, 204, 35V 55289 196105X0035Ball CS32 281-0543-00 CAP., F20, ECTTF:117, 204, 35V 55289 400530035Ball CS32 281-0543-00 CAP., F20, ECTTF:117, 204, 35V 55289 400533 C1010 283-0698-00 CAP., F20, ECR D1:180F, 54, 500V 55289 400538 C1021 283-0698-00 CAP., F20, CER D1:22F, 4/-22, 2F, 500V 72822 301-00020060X C1022 281-0525-00 CAP., F20, CER D1:470F, 4/-94F, 500V 72822 301-00023060V C1032 281-0525-00 CAP., F20, CER D1:470F, 4/-94F, 500V 72822 813-518460X C1041 281-0525-00 CAP., F20, CER D1:0.001F, 410-04, 500V 7282 813-51840X C1052 283-0110-00 CAP., F20, CER D1:0.001F, 410-04, 500V 7282 813-5184102F C1052 283-0110-00 CAP., F20, CER D1:0.001F, 410-04, 500V 7282 813-5184102F <td>0050</td> <td>201 0504 00</td> <td></td> <td></td> <td>72002</td> <td>201 05500001007</td>	0050	201 0504 00			72002	201 05500001007
233 240-034-00 CHP.,FXD,CER.D113.00F,119.204,1500 00222 104210500035HA1 2381 230-0534-00 CHP.,FXD,CER.D11:10F,204,35V 56289 196010500035HA1 2384 281-0531-00 CHP.,FXD,CER.D11:10F,204,35V 56289 106010500035HA1 C101 285-0638-00 CHP.,FXD,CER.D11:06F,54,500V 72962 301-0000020620X C1021 285-0638-00 CAP.,FXD,CER.D1:100F,54,500V 72962 301-0000020020X C1022 281-0511-00 ME030000 CAP.,FXD,CER.D1:470F,+/-94F,500V 72962 301-00000206220X C1023 281-0525-00 CAP.,FXD,CER.D1:470F,+/-94F,500V 72962 301-00000206220X C1041 281-0525-00 CAP.,FXD,CER.D1:470F,+/-94F,500V 72962 835-538460K C1042 281-0525-00 CAP.,FXD,CER.D1:0.001F,+100-04,500V 72962 835-538460K C1040 283-0000-00 CAP.,FXD,CER.D1:0.005UF,+400-204,150V 72962 835-538460K C1040 283-0010-00 CAP.,FXD,CER.D1:0.001F,+100-04,500V 72982 801-54786112 C1120 283-0110-00 CAP.,FXD,CER.D1:0.00	C953	281-0504-00		CAP.,FXD,CER DI: 10PF, +/-1PF, 500V	72982	301-03500001001
Case 1 229-0534-00 CHP., XX, JLLT.110 (20, 35V 36281 196.103.00.30h.1 CS82 280-0534-00 CHP., XX, JLLT.110 (20, 35V 36281 196.103.00.30h.1 CS84 281-0549-00 CHP., XX, JLLT.110 (20, 35V 36281 196.103.00.30h.1 CS84 281-0549-00 CHP., XX, JLLT.110 (20, 35V 56289 400638 CL101 283-0698-00 CHP., XX, JLLT.110, 200, 35V 56289 400638 CL212 281-0511-00 XB030000 CHP., XXD, CER D1:4100F, 1/4-32FF, 1/2017 72982 301-0000200020K CL222 281-0525-00 CHP., XXD, CER D1:470FF, 1/4-94FF, 500V 72982 311-516102P CL041 281-0525-00 CHP., XXD, CER D1:60.001TF, +100-04, 500V 72982 813-516102P CL052 281-0525-00 CHP., XXD, CER D1:0.001TF, +100-04, 500V 72982 813-516102P CL052 281-054-00 CHP., XXD, CER D1:0.001TF, +100-04, 500V 72982 813-516102P CL052 283-0110-00 CHP., XXD, CER D1:0.001TF, +100-04, 500V 72982 801-547801J CL052 283-0110-00 CHP., XXD,	C993	201-0546-00		CAP., FAD, CER DI: 550PF, 108, 500V	56200	1001-1300
Comparison Char, FXD, ELETIFIE (P, 204, 130 Sold B 19000330H1 Comparison Char, FXD, CER DI: 180PF, 54, 500V 56289 4000330H1 C1010 283-0103-00 Char, FXD, CER DI: 180PF, 54, 100V 56289 4000330H1 C1021 281-0531-00 Char, FXD, CER DI: 180PF, 54, 100V 56289 400F2231 C1022 281-0531-00 Char, FXD, CER DI: 470PF, +/-1PF, 500V 72982 301-000820040479 C1021 281-0525-00 Char, FXD, CER DI: 470PF, +/-1PF, 500V 04222 7001-1364 C1041 281-0555-00 Char, FXD, CER DI: 470PF, +/-94PF, 500V 72982 831-516E102P C1042 283-0000-00 Char, FXD, CER DI: 500V 72982 831-516E102P C1063 283-0010-00 CAP, FXD, CER DI: 500V 72982 831-516E102P C1140 283-0010-00 CAP, FXD, CER DI: 500V 72982 813-516E102P C1140 283-0010-00 CAP, FXD, CER DI: 500V 72982 813-516E102P C1140 283-0000-00 CAP, FXD, CER DI: 500V 72982 813-516E102P C1140	C901	290-0534-00		CAP.,FXD,ELCTLT:10F,20%,35V	56289	196D105X0035HA1
Case ZB1-OSA-00 CAP., FXD, CER DI:BOPF, J08, S000 72962 S01-00020000X C1010 283-0639-00 CAP., FXD, CER DI:BOPF, J58, 100V 56289 400638 C1021 283-0639-00 CAP., FXD, CER DI:ATT, TFF, 47-LPF, 500V 72992 301-00005020X C1022 281-0551-00 CAP., FXD, CER DI:ATT, TFF, 47-LPF, 500V 72992 301-0000520479F C1022 281-0525-00 CAP., FXD, CER DI:ATTOFF, 47-94PF, 500V 04222 7001-1364 C1041 281-0525-00 CAP., FXD, CER DI:ATOFF, 47-94PF, 500V 72922 281-516E102P C1052 283-0000-00 CAP., FXD, CER DI:0.001UF, 410-0-08, 500V 72928 855-5335660X C1060 283-0010-00 CAP., FXD, CER DI:0.001UF, 410-0-08, 500V 72928 813-516E102P C1100 283-0110-00 CAP., FXD, CER DI:0.001UF, 410-0-08, 500V 72928 301-000C066699 C1112 283-0010-00 CAP., FXD, CER DI:0.001UF, 410-004, 500V 72928 301-516E102P C1120 283-0010-00 CAP., FXD, CER DI:0.001UF, 410-004, 500V 72928 301-516E102P C1140 283-0000-00	C962	290-0534-00		CAP., FXD, ELCTLT: 10F, 208, 35V	20289	1960105X0035HAT
C1010 283-0103-00 CAP , FXD, CER DI: 180PF, 5%, 500V 56289 4005331 C1021 281-0511-00 XE030000 CAP , FXD, CER DI: 22F , H= 1, H=	0984	281-0549-00		CAP., FXD, CER DI:68PF, 10%, 500V	12982	301-000020080K
C1021 285-0688-00 CAP., FXD, FLSTC: 0.0022UP, 54, 100V 56289 410782251 C1024 281-0511-00 XB03000 CAP., FXD, CER D1:4.7FF, +/-1FF, 500V 72982 301-000C3020X C1032 281-0525-00 CAP., FXD, CER D1:4.7FF, +/-1FF, 500V 72982 301-000C3020X C1032 281-0525-00 CAP., FXD, CER D1:4.7FF, +/-4FF, 500V 04222 7001-1364 C1065 283-0000-00 CAP., FXD, CER D1:0.01UF, +100-04, 500V 72982 831-516E102P C1065 283-0000-00 CAP., FXD, CER D1:0.01UF, +100-04, 500V 72982 831-516E102P C1063 283-0010-00 CAP., FXD, CER D1:0.001UF, +100-04, 500V 72982 831-516E102P C1100 283-0110-00 CAP., FXD, CER D1:0.005UF, +80-204, 150V 56289 196242B C1100 283-0010-00 CAP., FXD, CER D1:0.001UF, +100-04, 500V 72982 301-506C00B C1114 281-0541-00 CAP., FXD, CER D1:0.001UF, +100-04, 500V 72982 301-506C00B C1114 281-0541-00 CAP., FXD, CER D1:0.001UF, +100-04, 500V 72982 301-506C00B C1114	C1010	283-0103-00		CAP.,FXD,CER DI:180PF,5%,500V	56289	40C638
C1024 281-0511-00 XB030000 CAP., FXD, CER D1:22FF, Y-2.2FF, 500V 72922 301-000C060220K C1027 281-0552-00 CAP., FXD, CER D1:470FF, +/-94PF, 500V 72922 301-000C36079E C1032 281-0525-00 CAP., FXD, CER D1:470FF, +/-94PF, 500V 04222 7001-1364 C1041 281-0525-00 CAP., FXD, CER D1:470FF, +/-94PF, 500V 04222 7001-1364 C1041 281-0525-00 CAP., FXD, CER D1:0.00UF, +100-04, 500V 72922 831-5168102P C1030 283-0000-00 CAP., FXD, CER D1:0.00UF, +100-04, 500V 72922 831-5168102P C1040 283-0110-00 CAP., FXD, CER D1:0.005UF, +400-204, 150V 56289 196242B C1100 283-0110-00 CAP., FXD, CER D1:0.001UF, +100-04, 500V 72922 831-5168102P C1130 283-0110-00 CAP., FXD, CER D1:0.001UF, +100-04, 500V 72922 831-5168102P C1140 283-0010-00 CAP., FXD, CER D1:0.001UF, +100-04, 500V 72922 831-5168102P C1140 283-0000-00 CAP., FXD, CER D1:0.001UF, +100-04, 500V 72922 831-5168102P C1140	C1021	285-0698-00		CAP., FXD, PLSTC: 0.0082UF, 5%, 100V	56289	410P82251
C1027 281-0501-00 CAP., FXD, CER DI:4, TFF, F/-1PF, 500V 72962 301-00052H0479F C1032 281-0525-00 CAP., FXD, CER DI:470FF, F/-94PF, 500V 04222 7001-1364 C1041 281-0525-00 CAP., FXD, CER DI:470FF, F/-94PF, 500V 04222 7001-1364 C1055 283-0000-00 CAP., FXD, CER DI:0.001LF, +100-08, 500V 72982 831-516E102P C1060 283-0100-00 CAP., FXD, CER DI:0.005UF, +80-208, 150V 56289 19C242B C1003 283-0116-00 CAP., FXD, CER DI:0.005UF, +80-208, 150V 56289 19C242B C1100 283-0100-00 CAP., FXD, CER DI:0.005UF, +80-208, 150V 72982 831-516E102P C1130 283-010-00 CAP., FXD, CER DI:0.001UF, +100-08, 500V 72982 831-516E102P C1141 283-0000-00 CAP., FXD, CER DI:0.001UF, +100-08, 500V 72982 831-516E102P C1180 290-0534-00 CAP., FXD, ECTT1:1UF, 204, 35V 56289 196D105X0035HA1 C1181 290-0534-00 CAP., FXD, FUNCTI:1UF, 204, 35V 56289 196D105X0035HA1 C1182 290-0534-00 CA	C1024	281-0511-00	XB030000	CAP., FXD, CER DI:22PF, +/-2.2PF, 500V	72982	301-000C0G0220K
C1032 281-0525-00 CAP.,FXD,CER DI:470FF,+/-94FF,500V 04222 7001-1364 C1041 281-0525-00 CAP.,FXD,CER DI:470FF,+/-94FF,500V 04222 7001-1364 C1052 283-0000-00 CAP.,FXD,CER DI:470FF,+/-94FF,500V 72962 831-516E102P C103 283-0005-00 CAP.,FXD,CER DI:6.001UF,+100-00,500V 72962 831-516E102P C1060 283-0110-00 CAP.,FXD,CER DI:0.005UF,+80-204,150V 56289 19C242B C1100 283-0110-00 CAP.,FXD,CER DI:0.05UF,540-204,150V 56289 19C242B C1100 283-0110-00 CAP.,FXD,CER DI:0.005UF,540-204,150V 72982 831-516E102P C1131 281-0541-00 CAP.,FXD,CER DI:0.005UF,540-204,150V 72982 831-516E102P C1140 283-0000-00 CAP.,FXD,CER DI:0.001UF,4100-04,500V 72982 831-516E102P C1150 283-0000-00 CAP.,FXD,ECR DI:0.001UF,4100-04,500V 72982 831-516E102P C1180 290-0534-00 CAP.,FXD,ECR DI:0.001UF,4100-04,500V 72982 831-516E102P C1181 290-0534-00 CAP.,FXD,ECR DI:0.001UF,4100-04,550V<	C1027	281-0501-00		CAP., FXD, CER DI:4.7PF, +/-1PF, 500V	72982	301-000S2H0479F
C1041 281-0525-00 CAP.,FXD,CER DI:470FF,+/-94PF,500V 04222 7001-1364 C1065 283-0005-00 CAP.,FXD,CER DI:50,010V,F,100-08,500V 72982 853-5535560K C1080 283-0010-00 CAP.,FXD,CER DI:50,100V 72982 853-553560K C1080 283-0010-00 CAP.,FXD,CER DI:0.001UF,+100-08,500V 72982 831-516E102P C1000 283-0116-00 CAP.,FXD,CER DI:0.005UF,+80-208,150V 72982 801-516E102P C1120 283-0116-00 CAP.,FXD,CER DI:0.005UF,+80-208,150V 72982 801-516E102P C1130 283-0000-00 CAP.,FXD,CER DI:0.01UF,+100-08,500V 72982 831-516E102P C1140 283-0000-00 CAP.,FXD,CER DI:0.01UF,+100-08,500V 72982 831-516E102P C1150 283-0000-00 CAP.,FXD,CER DI:0.01UF,+100-08,500V 72982 831-516E102P C1180 290-0534-00 CAP.,FXD,ELTT:1UF,204,35V 56289 196D105X0035HA1 C1181 290-0534-00 CAP.,FXD,ELTT:1UF,204,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELTT:1UF,204,35V 56289 </td <td>C1032</td> <td>281-0525-00</td> <td></td> <td>CAP.,FXD,CER DI:470PF,+/-94PF,500V</td> <td>04222</td> <td>7001-1364</td>	C1032	281-0525-00		CAP.,FXD,CER DI:470PF,+/-94PF,500V	04222	7001-1364
C1041 281-052-00 CAP., FXD, CER D1:4, OPF, 4, -9424, 500V 04222 7001-1364 C1055 283-0000-00 CAP., FXD, CER D1:6, 001UF, 4100-05, 500V 72982 855-5353.560K C1063 283-0010-00 CAP., FXD, CER D1:0, 000UF, 480-205, 150V 72982 831-516E102P C1083 283-0110-00 CAP., FXD, CER D1:0, 005UF, 480-205, 150V 56289 19C242B C1100 283-0110-00 CAP., FXD, CER D1:0, 005UF, 480-205, 150V 56289 19C242B C1101 283-0110-00 CAP., FXD, CER D1:0, 005UF, 480-205, 150V 72982 801-547B821J C1134 281-0541-00 CAP., FXD, CER D1:0, 001UF, 4100-05, 500V 72982 831-516E102P C1140 283-0000-00 CAP., FXD, CER D1:0, 001UF, 4100-05, 500V 72982 831-516E102P C1150 283-0000-00 CAP., FXD, CER D1:0, 001UF, 4100-05, 500V 72982 831-516E102P C1180 290-0534-00 CAP., FXD, CER D1:0, 001UF, 4100-05, 500V 72982 831-516E102P C1180 290-0534-00 CAP., FXD, CER D1:0, 001UF, 4100-05, 500V 72982 831-516E102P C1181 2	61043					7007 7064
CLOBS 283-0000-00 CAP.,FXD,CER DI:0.0010P,+100-0,500V 72982 851-535850X C103 283-0005-00 CAP.,FXD,CER DI:56P,104,200V 72982 851-535850X C1080 283-010-00 CAP.,FXD,CER DI:0.001UP,+100-20,500V 72982 851-535850X C1100 283-0110-00 CAP.,FXD,CER DI:0.005UP,+400-204,150V 56289 19C242B C1100 283-0116-00 CAP.,FXD,CER DI:0.005UP,+400-204,150V 72982 801-547B82LJ C1134 281-016400 CAP.,FXD,CER DI:0.005UP,+400-204,150V 72982 801-547B82LJ C1140 283-0000-00 CAP.,FXD,CER DI:0.001UP,+100-04,500V 72982 831-516E102P C1150 283-0000-00 CAP.,FXD,CER DI:0.001UP,+100-04,500V 72982 831-516E102P C1181 290-0534-00 CAP.,FXD,CER DI:0.001UP,+100-04,500V 72982 831-516E102P C1182 290-0534-00 CAP.,FXD,CER DI:0.001UP,+100-04,500V 72982 831-516E102P C1182 290-0534-00 CAP.,FXD,CER DI:0.001UP,+100-04,500V 72982 831-516E102P C1182 290-0534-00 CAP.,FXD,CER DI:0.001UP,+100-0		281-0525-00		CAP., FXD, CER D1:4/0PF, +/~94PF, 500V	04222	/001-1364
CLD73 283-0095-00 CAP.,FXD,CER D1:0.0010F,+100-00,500V 7292 283-534500K CL080 283-0010-00 CAP.,FXD,CER D1:0.005UF,+00-20\$,150V 55299 19C242B CL100 283-0110-00 CAP.,FXD,CER D1:0.005UF,+00-20\$,150V 55299 19C242B CL1120 283-0116-00 CAP.,FXD,CER D1:0.005UF,+00-20\$,150V 72982 801-547B82LJ CL120 283-0116-00 CAP.,FXD,CER D1:0.001F,+100-0\$,500V 72982 801-547B82LJ CL134 281-00541-00 CAP.,FXD,CER D1:0.001F,+100-0\$,500V 72982 831-516E102P CL150 283-0000-00 CAP.,FXD,CER D1:0.001F,+100-0\$,500V 72982 831-516E102P CL180 290-0534-00 CAP.,FXD,CER D1:0.001F,+100-0\$,500V 72982 831-516E102P CL181 290-0534-00 CAP.,FXD,CER D1:0.001F,+100-0\$,500V 72982 811-516E102P CL182 290-0534-00 CAP.,FXD,CER D1:0.001F,+100-0\$,500V 72982 811-516E102P CR666 152-0141-02 XB050000 SEMICOND DEVICE:S1LICON,30V,150MA 07910 1N4152 CR666 152-0141-02 SEMICOND DEV	C1065	283-0000-00		CAP.,FXD,CER DI:0.0010F,+100-0%,500V	/2982	831-516E102P
CL080 283-0000-00 CAP.,FXD,CER D1:0.001DF,+100-04,500v 7292 831-516E102P C1000 283-0110-00 CAP.,FXD,CER D1:0.005UF,+80-204,150v 56289 19C242B C1100 283-0110-00 CAP.,FXD,CER D1:0.005UF,+80-204,150v 72982 801-547B82LJ C1120 283-0110-00 CAP.,FXD,CER D1:0.005UF,+80-204,150v 72982 801-547B82LJ C1140 283-0000-00 CAP.,FXD,CER D1:0.001UF,+100-04,500v 72982 831-516E102P C1150 283-0000-00 CAP.,FXD,CER D1:0.001UF,+100-04,500v 72982 831-516E102P C1180 290-0534-00 CAP.,FXD,CER D1:0.001UF,+100-04,500V 72982 831-516E102P C1180 52-0141-02 XBMICOND DEVICE:S111	C1073	283-0095-00		CAP., FXD, CER DI: 56PF, 10%, 200V	72982	855-535A560K
CLUG3 283-0110-00 CAP.,FXD,CER DI:0.0050F,480-208,150V 56289 192242B C1100 283-0116-00 CAP.,FXD,CER DI:0.0050F,480-208,150V 56289 192242B C1120 283-0116-00 CAP.,FXD,CER DI:8.09F,58,500V 72982 301-5000060689D C1140 283-000-00 CAP.,FXD,CER DI:8.09F,168,500V 72982 831-516E102P C1150 283-000-00 CAP.,FXD,CER DI:0.001UF,4100-08,500V 72982 831-516E102P C1180 290-0534-00 CAP.,FXD,ELCTLT:1UF,204,35V 56289 196D105X0035HA1 C1181 290-0534-00 CAP.,FXD,ELCTLT:1UF,204,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELCTLT:1UF,204,35V 56289 196D105X0035HA1 C1182 290-0534-00 SEMICOND DEVICE:SLILCON,30V,150MA 07910 1N4152 CR660 152-0141-02 XB050000 SEMICOND DEVICE:SLILCON,30V,150MA 07910 1N4152 CR666 152-0141-02 SEMICOND DEVICE:SLILCON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SLILCON,30V,150MA 079	C1080	283-0000-00		CAP., FXD, CER DI:0.0010F, +100-0%, 500V	72982	831-516E102P
C1100 283-0110-00 CAP.,FXD,CER DI:0.005UF,+80-20%,150V 56289 19C242B C1120 283-0116-00 CAP.,FXD,CER DI:620PF,5%,500V 72982 801-5478821J C1140 283-0000-00 CAP.,FXD,CER DI:0.001UF,+100-0%,500V 72982 831-516E102P C1150 283-0000-00 CAP.,FXD,CER DI:0.001UF,+100-0%,500V 72982 831-516E102P C1160 290-0534-00 CAP.,FXD,CECT DI:0.001UF,+100-0%,500V 72982 831-516E102P C1182 290-0534-00 CAP.,FXD,EECTT:1UF,20%,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,EECTT:1UF,20%,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,EECTT:1UF,20%,35V 56289 196D105X0035HA1 C1182 290-0534-00 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR602 152-0141-02 XB050000 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02	C1083	283-0110-00		CAP., FXD, CER DI:0.0050F, +80-20%, 150V	56289	19C242B
C1120 283-0116-00 CAP.,FXD,CER DI:620PF,58,500V 72982 801-5478821J C1134 281-0541-00 CAP.,FXD,CER DI:6.8PF,108,500V 72982 801-506809D C1140 283-0000-00 CAP.,FXD,CER DI:0.001UF,+100-08,500V 72982 831-516E102P C1150 283-0000-00 CAP.,FXD,CER DI:0.001UF,+100-08,500V 72982 831-516E102P C1180 290-0534-00 CAP.,FXD,EECTLT:1UF,208,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELCTLT:1UF,208,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELCTLT:1UF,208,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELCTLT:1UF,208,35V 56289 196D105X0035HA1 C1182 290-0534-00 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR608 152-0141-02 XB050000 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR667 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR742 152-0141-02 S	C1100	283-0110-00		CAP.,FXD,CER DI:0.005UF,+80-20%,150V	56289	19C242B
C1134 281-0541-00 CAP.,FXD,CER DI.6.8FP.100.500V 72982 301-000C0H0689D C1140 283-0000-00 CAP.,FXD,CER DI.0.001UF,+100-0%,500V 72982 831-516E102P C1150 283-0000-00 CAP.,FXD,CER DI.0.001UF,+100-0%,500V 72982 831-516E102P C1180 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 C182 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 C182 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 CR608 152-0141-02 XB050000 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR608 152-0141-02 XB050000 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR761 152-010	C1120	283-0116-00		CAP., FXD, CER DI:820PF, 5%, 500V	72982	801-547B821J
C1140 283-0000-00 CAP.,FXD,CER DI:0.001UF,+100-0%,500V 72982 831-516E102P C1150 283-0000-00 CAP.,FXD,CER DI:0.001UF,+100-0%,500V 72982 831-516E102P C1180 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 C1862 152-0141-02 XB050000 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR668 152-0141-02 XB050000 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR687 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON,375V,400MA </td <td>C1134</td> <td>281-0541-00</td> <td></td> <td>CAP., FXD, CER DI:6.8PF, 10%, 500V</td> <td>72982</td> <td>301-000C0H0689D</td>	C1134	281-0541-00		CAP., FXD, CER DI:6.8PF, 10%, 500V	72982	301-000C0H0689D
C1150 283-0000-00 CAP.,FXD,CER DI:0.0010F,+100-0%,500V 72982 831-516E102P C1180 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP.,FXD,ELCTLT:1UF,20%,35V 56289 196D105X0035HA1 CR608 152-0141-02 XB050000 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR686 152-0141-02 XB050000 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR772 152-0107-00 SEMICOND DEVICE:SILICON,30V,150MA	C1140	283-0000-00		CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C1180 290-0534-00 CAP., FXD, ELCTLT: 1UF, 20%, 35V 56289 196D105X0035HA1 C1181 290-0534-00 CAP., FXD, ELCTLT: 1UF, 20%, 35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP., FXD, ELCTLT: 1UF, 20%, 35V 56289 196D105X0035HA1 C1182 290-0534-00 SEMICOND DEVICE: SILICON, 30V, 150MA 07910 1N4152 CR602 152-0141-02 XB050000 SEMICOND DEVICE: SILICON, 30V, 150MA 07910 1N4152 CR666 152-0141-02 XB050000 SEMICOND DEVICE: SILICON, 30V, 150MA 07910 1N4152 CR667 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 150MA 07910 1N4152 CR711 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 150MA 07910 1N4152 CR770 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 150MA 07910 1N4152 CR801 152-0107-00 SEMICOND DEV	C1150	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
CH180 290-0534-00 CAP., FXD, ELCTLT:1UF, 204, 35V 56289 196D105X0035HA1 C1181 290-0534-00 CAP., FXD, ELCTLT:1UF, 204, 35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP., FXD, ELCTLT:1UF, 204, 35V 56289 196D105X0035HA1 C1182 290-0534-00 CAP., FXD, ELCTLT:1UF, 204, 35V 56289 196D105X0035HA1 CR602 152-0141-02 XE050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR668 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR671 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR770 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA	a1100	200 0524 00			56200	100010520025031
CH161 290-0534-00 CAP., FXD, ELCTLT:10F, 204, 35v 56289 196D105X0035HA1 CR602 152-0141-02 XE050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR608 152-0141-02 XE050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR608 152-0141-02 XE050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR6867 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR751 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR801 152-0107-00 SEMICO	C1180	290-0534-00		CAP., FXD, ELCTLT: IUF, 20%, 35V	56289	196D105X0035HA1
CH182 290-0534-00 CAP., FAD, ELCHPTIO, 200, 350 50289 1960105A00535A1 CR602 152-0141-02 XB050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR608 152-0141-02 XB050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR686 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR687 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR761 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V	C1101	290-0534-00		CAP., FXD, ELCTLT: IUF, 208, 35V	56289	196D105X0035HA1
CR602 152-0141-02 XB050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR608 152-0141-02 XB050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR667 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR671 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR761 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 4	C1182	290-0534-00		CAP., FXD, ELCTLT: 10F, 208, 35V	56289	1900102X0022HM1
CR608 152-0141-02 XB050000 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR666 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR742 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR761 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA	CR602	152-0141-02	хв050000	SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR686 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR687 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR742 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR770 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR771 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 <td>CR608</td> <td>152-0141-02</td> <td>XB050000</td> <td>SEMICOND DEVICE:SILICON, 30V, 150MA</td> <td>07910</td> <td>1N4152</td>	CR608	152-0141-02	XB050000	SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR687 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR740 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR742 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR761 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR770 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR771 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-017-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 800	CR686	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR740 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR742 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR761 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR770 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR820 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR821 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 02735 </td <td>CR687</td> <td>152-0141-02</td> <td></td> <td>SEMICOND DEVICE:SILICON, 30V, 150MA</td> <td>07910</td> <td>1N4152</td>	CR687	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR742 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR761 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR770 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR771 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR804 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR820 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 02735 37304 CR821 152-0141-02	CR740	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR701 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR702 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR804 152-0107-00 SEMICOND DEVICE:SILICON, 30V, 150MA 02735 37304 CR821 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR832 152-0141-02	CR741	152-0141-02		SEMICOND DEVICE STLTCON 2007 150MA	07910	1N4152
CR741 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR761 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 37V, 400MA 80009 152-0107-00 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR804 152-0107-00 SEMICOND DEVICE:SILICON, 30V, 150MA 02735 37304 CR820 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR821 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR832 152-0141-02 S	CR741	152-0141-02		SEMICOND DEVICE: SILICON, SOV, ISOMA	07910	1N4152
CR701 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR770 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR820 152-0107-00 SEMICOND DEVICE:SILICON, 30V, 150MA 02735 37304 CR821 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 02735 37304 CR832 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR833 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR833 152-0141-02 SEMICON	CR761	152-0141-02		SEMICOND DEVICE: SILICON, SOV, ISOMA	07910	184152
CR770 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR772 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR820 152-0107-00 SEMICOND DEVICE:SILICON, 30V, 750MA 02735 37304 CR821 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR832 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR839 152-0141-02 SEMICO	CP770	152-0141-02		SEMICOND DEVICE: SILICON, SOV, ISOMA	07910	1N4152
CR800 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 01910 1N4152 CR800 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON, 375V, 400MA 80009 152-0107-00 CR820 152-0107-00 SEMICOND DEVICE:SILICON, 30V, 750MA 02735 37304 CR821 152-0141-02 SEMICOND DEVICE:SILICON, 400V, 750MA 02735 37304 CR832 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152	CR770	152-0141-02		SEMICOND DEVICE: SILICON, SUV, ISOMA	07910	1N4152
CR800 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR801 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR820 152-0066-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR821 152-0141-02 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR832 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152	CR/72	152-0141-02		SEMICOND DEVICE: SILICON, SOV, ISOMA	0/910	104152
CR801 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR802 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR820 152-0066-00 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR821 152-0141-02 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR825 152-0066-00 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR832 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152	CR800	152-0107-00		SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR802 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR803 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR804 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR820 152-0066-00 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR821 152-0141-02 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR832 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 02735 37304 CR838 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152	CR801	152-0107-00		SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR803 152-0107-00 SEMICOND DEVICE:SILICON,375V,400MA 80009 152-0107-00 CR820 152-0066-00 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR821 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR825 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 02735 37304 CR832 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152	CR802	152-0107-00		SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR820 152-0066-00 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR821 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR832 152-0141-02 SEMICOND DEVICE:SILICON,30V,750MA 02735 37304 CR832 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152	CR803	152-0107-00		SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR821 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR825 152-0066-00 SEMICOND DEVICE:SILICON, 400V, 750MA 02735 37304 CR832 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152	CR820	152-0066-00		SEMICOND DEVICE:SILICON,400V,750MA	02735	37304
CR825 152-0141-02 SEMICOND DEVICE:SILICON,400V,750MA 02735 37304 CR838 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA 07910 1N4152	CR821	152-0141-02		SEMICOND DEVICE:SILICON.30V.150MA	07910	1N4152
CR832 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR838 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152	CR825	152-0066-00		SEMICOND DEVICE: SILICON. 400V. 750MA	02735	37304
CR838 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152 CR839 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152	CR832	152-0141-02		SEMICOND DEVICE: SILICON. 30V. 150MA	07910	1N4152
CR839 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 150MA 07910 1N4152	CR838	152-0141-02		SEMICOND DEVICE:SILICON.30V.150MA	07910	1N4152
	CR839	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152

Electrical Parts List—5403

		Tektronix	Serial/Model No.		Mfr	
	Ckt No.	Part No.	Eff Dscont	Name & Description	Code	Mfr Part Number
	CR848	152-0556-00		SEMICOND DEVICE: BRIDGE, 50V, 2.5A	04713	MDA960-1
	CR850	152-0066-00		SEMICOND DEVICE:SILICON,400V,750MA	02735	37304
	CR851	152-0066-00		SEMICOND DEVICE: SILICON, 400V, 750MA	02735	37304
	CR863	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	07910	1N4152
	CR864	152-0141-02		SEMICOND DEVICE STLICON, 30V. 150MA	07910	1N4152
	01:004	152-0141 02		SERVICEND DEVICENDED CORFS OF VESSAL	0,910	211.1000
	0075	152-0556-00		CEMTCOND DEVICE BOTDEE 500 2 55	04713	MDA960-1
	CRO75	152-0550-00		CENTCOND DEVICE.CILICON 400V 750MA	02725	27304
	CROOL	152-0066-00		SEMICOND DEVICE: SILICON, 400V, 750MA	02735	37304
	CR881	152-0066-00		SEMICOND DEVICE: SILICON, 400V, 750MA	02735	37304
	CR893	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	07910	IN4152
	CR894	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
					07010	124150
	CR903	152-0141-02		SEMICOND DEVICE:SILICON, 30V, ISOMA	07910	104152
	CR910	152-0066-00		SEMICOND DEVICE: SILICON, 400V, 750MA	02735	37304
	CR911	152-0066-00		SEMICOND DEVICE:SILICON,400V,750MA	02735	3/304
	CR925	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	07910	1N4152
	CR927	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
	CR930	152-0488-00		SEMICOND DEVICE:SILICON,200V,1500MA	80009	152-0488-00
	CR944	152-0066-00		SEMICOND DEVICE:SILICON,400V,750MA	02735	37304
	CR950	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
	CR955	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
	CR980	152-0107-00		SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
	CR981	152-0107-00		SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
	CR982	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
	CR986	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	07910	1N4152
	CR1002	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
	CR1003	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
	CR1005	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
	CR1010	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	07910	1N4152
1	CR1012	152-0141-02		SEMICOND DEVICE: STLICON, 30V. 150MA	07910	1N4152
	CR1013	152-0141-02		SEMICOND DEVICE STLICON, 30V. 150MA	07910	1N4152
	CR1018	152-0141-02		SEMICOND DEVICE: STLICON, 30V, 150MA	07910	1N4152
		100 0111 00				
	CR1024	152-0141-02		SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
	CR1025	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	07910	1N4152
	CR1040	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	07910	1N4152
	CR1041	152-0141-02		SEMICOND DEVICE: STLICON, 30V, 150MA	07910	1N4152
	CR1052	152-0141-02		SEMICOND DEVICE:STLICON, 30V, 150MA	07910	1N4152
	0112002	152 0141 02			0.010	2
	F800	159-0028-00		FUSE.CARTRIDGE: 3AG.0.25A.250V.FAST-BLOW	71400	AGC 1/4
	J610	131-1078-00		CONNECTOR, RCPT, :28/56 CONTACT	95238	K600-11-56Y25
	J620	131-1078-00		CONNECTOR, RCPT, :28/56 CONTACT	95238	K600-11-56Y25
	J630	131-1078-00		CONNECTOR, RCPT, :28/56 CONTACT	95238	K600-11-56¥25
	LR1100	108-0212-00		COIL, RF:0.5UH	80009	108-0212-00
	Q600	151-0192-00		TRANSISTOR:SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
	Q604	151-0192-00		TRANSISTOR:SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
	Q610	151-0192-00		TRANSISTOR:SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
	Q614	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
	Q630	151-0220-00		TRANSISTOR:SILICON, PNP	80009	151-0220-00
	Q640	151-0220-00		TRANSISTOR: SILICON, PNP	80009	151-0220-00
	Q650	151-0220-00		TRANSISTOR:SILICON, PNP	80009	151-0220-00
	Q660	151-0220-00		TRANSISTOR:SILICON, PNP	80009	151-0220-00
	Q670	151-0341-00		TRANSISTOR: SILICON, NPN	07263	2N3565
	Q674	151-0341-00		TRANSISTOR:SILICON, NPN	07263	2N3565
	Q680	151-0342-00		TRANSISTOR:SILICON, PNP	07263	2N4249

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Electrical Parts List-5403

Scan by Zenith

	Tektronix	Serial/Ma	odel No.		Mfr		(
Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Numbe	er `
0700	151 0222 00					151 0222 00	
0700	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00	
0710	151-0223-00			TRANSISTOR: SILICON, NEN MELNEIGEOR. CILICON DND GEL EROM 2N4259	80009	151-0225-00	
0715	151-0325-00			TRANSISTOR: SILICON, PNP, SEL FROM 2N4258	80009	151-0325-00	
0720	151-0325-00			TRANSISTOR: SILICON, FNP, SEL FROM 2N4256	80009	151-0323-00	
Q720	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00	
0728	151-0223-00			TRANSTSTOR STLICON NON	80009	151-0223-00	
0730	151-0225 00			TRANSISTOR STLICON, PNP. SEL FROM 2N4258	80009	151-0325-00	
0735	151-0325-00			TRANSISTOR STLICON, PNP. SEL FROM 2N4258	80009	151-0325-00	
0740	151-0192-00			TRANSISTOR: STLICON, NPN, SEL FROM MPS6521	80009	151-0192-00	
Q744	151-0192-00			TRANSISTOR: SILICON.NPN.SEL FROM MPS6521	80009	151-0192-00	
Q748	151-0333-00			TRANSISTOR:SILICON, NPN, SEL FROM MPS918	80009	151-0333-00	
Q752	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00	
Q770	151-0341-00			TRANSISTOR: SILICON, NPN	07263	2N3565	
Q820	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00	
Q824	151-0342-00			TRANSISTOR:SILICON, PNP	07263	2N4249	
Q830	151-0188-00			TRANSISTOR:SILICON, PNP	01295	2N3906	
Q832	151-0341-00			TRANSISTOR: SILICON, NPN	07263	2N3565	
Q838	151-0342-00			TRANSISTOR: SILICON, PNP	07263	2N4249	
Q850	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00	
Q855	151-0190-00			TRANSISTOR:SILICON, NPN	80009	151-0190-00	
Q864	151-0341-00			TRANSISTOR:SILICON, NPN	07263	2N3565	
Q866	151-0341-00			TRANSISTOR:SILICON, NPN	07263	2N3565	
Q870	151-0341-00			TRANSISTOR:SILICON, NPN	07263	2N3565	
Q880	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00	
Q885	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00	
0004					07060	0111010	
Q894 0896	151-0342-00			TRANSISTOR: SILICON, PNP	07263	2N4249	
Q896	151-0342-00			TRANSISTOR: SILICON, PNP	07263	2N4249	(
0910	151-0341-00	DOIO100	PO40000	TRANSISTOR: SILICON, NPN	07263	2N3505	
0910	151-0496-00	B010100	B0499999	TRANSISTOR: SILICON, NEW	03509	131-0331-00	
2910	101-0490-00	B030000		INANSISION.SILCION, NEW	03008	DHORZ	
0915	151-0190-00			TRANSTSTOR STLTCON, NPN	80009	151-0190-00	
0925	151-0190-00			TRANSISTOR • STLICON NPN	80009	151-0190-00	
0940	151-0331-00	B010100	B049999	TRANSISTOR STLICON , NPN	80009	151-0331-00	
0940	151-0496-00	B050000	2013333	TRANSISTOR: STLCION, NPN	03508	D40K2	
0950	151-0342-00	2000000		TRANSISTOR: SILICON, PNP	07263	2N4249	
~	202 0010 00			111110101010010010010010010	0/200		
0955	151-0342-00			TRANSISTOR:SILICON, PNP	07263	2N4249	
Q958	151-0341-00			TRANSISTOR: SILICON, NPN	07263	2N3565	
Q982	151-0341-00			TRANSISTOR:SILICON, NPN	07263	2N3565	
Q984	151-0341-00			TRANSISTOR:SILICON, NPN	07263	2N3565	
Q1010	151-0410-00			TRANSISTOR: SILICON, PNP	04713	SPS6765	
Q1015	151-0220-00			TRANSISTOR:SILICON, PNP	80009	151-0220-00	
Q1018	151-0221-00			TRANSISTOR:SILICON, PNP	07263	SN4258	
Q1040A,B	151-0232-00			TRANSISTOR:SILICON,NPN,DUAL	12040	NS7348	
Q1048	151-0341-00			TRANSISTOR:SILICON, NPN	07263	2N3565	
Q1050	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565	
					_		
Q1052	151-0410-00			TRANSISTOR: SILICON, PNP	04713	SPS6765	
Q1056	151-0341-00			TRANSISTOR: SILICON, NPN	07263	2N3565	
01110 01100	151-0410-00			TRANSISTOR: SILICON, PNP	04713	SPS6765	
STTT0	151-0410-00			TRANSISTOR: SILICON, PNP	04713	SPS6/65	
211401 011501	T23-028/-00			SEMICOND DVC SE:SILICON, PNP	80009	103-009/-00	
Δττο <u>)</u>							
R600	315-0220-00			RES. FXD.CMPSN:22 OHM.5% 0.25W	01121	CB2205	
	-10 0120 00			······································	~~~~		

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	Ckt No.	Tektronix Part No.	Serial/M Fff	odel No. Dscont	Name & Description	Mfr Code	Mfr Part Number
	R601	315-0474-00			PES EVD CMPSN. 470r OHM 5% 0.25W	01121	CD4745
ل						01121	CB4745
1	Q602	315-0331-00	XB050000		RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
	R603	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
1	R604	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
	R605	315-0474-00			RES., FXD, CMPSN:470K OHM, 5%, 0.25W	01121	CB4745
	R607	315-0123-00			RES. FXD.CMPSN:12K OHM.5%.0.25W	01121	CB1235
}	R608	315-0331-00	XB050000		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
ر	R610	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	Св2205
	R611	315-0474-00			RES., FXD. CMPSN: 470K OHM. 5%.0.25W	01121	CB4745
	R613	315-0123-00			RES EXD CMPSN-12K OHM 5% 0 25W	01121	CB1235
	D614	215-0220-00			DEE EVD CHDCN-22 OUM 54 0 25M	01121	CD1235
	R014	315-0220-00			RES., FAD, CMPSN: 22 OHM, 5%, 0.25W	01121	CB2205
_	ROTO	315-04/4-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
_	R617	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
1	R619	315-0182-00			RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825
	R620	321-0091-03			RES., FXD, FILM:86.6 OHM.0.25%, 0.125W	91637	MFF1816D86R60C
	R621	315-0222-00			RES. FXD. CMPSN: 2. 2K OHM. 5% 0 25W	01121	CB2225
	R622	315-0222-00			RES FYD CMDSN+2 2K OHM 5% 0 25W	01121	CP22225
7		310 0222 00				01121	002220
	R626	321-0091-03			RES.,FXD,FILM:86.6 OHM,0.25%,0.125W	91637	MFF1816D86R60C
	R627	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
	R628	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
	R630	315-0101-00			RES., FXD, CMPSN:100 OHM, 5%, 0, 25W	01121	CB1015
-}	R632	315-0392-00			RES. FXD. CMPSN: 3.9K OHM. 5%.0.25W	01121	CB3925
{	P634	315-0391-00			DES EVE CHESNIGION 58 0 25W	01121	CP3015
	1034	515 0552 00				01121	665915
	R636	315-0390-00			RES.,FXD,CMPSN:39 OHM,5%,0.25W	01121	CB3905
1 < 1	R637	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
$\left \left(\right) \right\rangle$	R638	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
	R640	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
	R641	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
	R643	321-0097-00	B010100	B053530	RES.,FXD,FILM:100 OHM,1%,0.125W	75042	CEATO-1000F
	R643	321-0114-00	B053531		RES.,FXD,FILM:150 OHM,1%,0.125W	75042	CEATO-1500F
	R650	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
2	R651	315-0101-00	в010100	B053445X	RES. FXD. CMPSN: 100 OHM. 5%.0.25W	01121	CB1015
	R652	315-0102-00	2020200		RES. FXD. CMPSN 1K OHM 5% 0.25W	01121	CB1025
	R654	315-0391-00			RES FXD CMPSN+390 OHM 5% 0 25W	01121	CB3915
_	R656	315-0390-00			RES., FXD, CMPSN: 39 OHM, 5%, 0.25W	01121	CB3905
T	R660	315-0152-00			RES., FXD, CMPSN: 1.5K OHM. 5%.0.25W	01121	CB1525
	R670	315-0562-00			RES. FXD. CMPSN: 5.6K OHM. 5%.0.25W	01121	CB5625
_	P671	315-0154-00			$PES = FYD CMDSN \cdot 150r OHM 58 0 25W$	01121	CB1545
	N071	315-0134-00			RES., TRD, CMPSN. ISON ONA, 55, 0.25W	01121	CB1045
	R672	315-0103-00			RES., FXD, CMPSN: LOK ONM, 58, 0.25W	01121	CB1035
7	R673	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 58, 0.25W	01121	CB1225
1	R674	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
-	R677	315-0103-00	B010100	B053858	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
	R677	315-0102-00	B053859		RES., FXD, CMPSN: 1K OHM, 5%.0.25W	01121	CB1025
1	R680	315-0332-00	2000000		RES. FXD. CMPSN: 3. 3K OHM. 5%.0.25W	01121	CB3325
	P681	315-0693-00			RES FXD CMPSN-68K OHM 5% 0 25W	01121	CB6835
	ROOT	315 0133 00			RES. FIND CHIPSN. JOK OHN 58 0 25W	01121	CB1225
-	1003	212-0123-00			ALS. JEAD JOIE SHILLS UNHIJSIJU. 23W	01121	001000
1	R684	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
1	R686	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
	R688	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
	R689	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
	R700	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
1	R702	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	СВ2425

	Tektronix	Serial/Model No.		Mfr			
Ckt No.	Part No.	Eff Dscont	Name & Description	Code	Mfr Part Number		
D703	215 0242 00			01101	GD2405		
R702	315-0242-00		RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425		
R703	315-0302-00		RES., FXD, CMPSN: 3K OHM, 5%, U.25W	01121	CB3025		
R704	315-0222-00		RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225		
R705	321-01//-00		RES.,FXD,FILM:681 OHM,1%,0.125W	75042	CEATO-6810F		
R706	315-0302-00		RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025		
R708	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015		
R709	315-0242-00		RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425		
R710	321-0146-00		RES.,FXD,FILM:324 OHM,1%,0.125W	75042	CEAT0-3240F		
R712	315-0112-00		RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125		
R713	321-0103-00		RES.,FXD,FILM:115 OHM,1%,0.125W	75042	CEATO-1150F		
R714	315-0112-00		RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125		
R715	315-0152-00		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525		
R720	315-0473-00		RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735		
R722	315-0242-00		RES., FXD, CMPSN:2.4K OHM, 5%, 0.25W	01121	CB2425		
R723	315-0302-00		RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025		
R724	315-0222-00		RES EXD CMPSN-2 2K OHM 5% 0 25W	01121	CB2225		
R725	321-0177-00		RES EXD ETIM.68] OUM 19 0 125W	750/2	CEATO=6810E		
R726	315-0302-00		DES EXD CMDEN. 2K OFM 5% 0 25W	01121	CB3025		
8720	315-0101-00		RES.,FAD,CMPSN:SK ONM, 5%, 0.25W	01121	CB3025		
N/20 P720	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015		
R/29	315-0242-00		RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425		
R 7 30	321-0146-00		RES.,FXD,FILM:324 OHM,1%,0.125W	75042	CEAT0-3240F		
R732	315-0112-00		RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125		
R733	321-0103-00		RES.,FXD,FILM:115 OHM,1%,0.125W	75042	CEATO-1150F		
R734	315-0112-00		RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125		
R735	315-0152-00		RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525		
R737	315-0241-00		RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415		
R738	315-0241-00		RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415		
R740	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035		
R741	315-0151-00		RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515		
R742	315-0123-00		RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235		
R744	315-0151-00		RES., FXD.CMPSN:150 OHM.5%.0.25W	01121	CB1515		
R746	315-0123-00		RES. FXD. CMPSN: 12K OHM. 5%.0.25W	01121	CB1235		
R748	315-0331-00		RES. FXD. CMPSN: 330 OHM. 5%.0.25W	01121	CB3315		
R750	321-0069-00		RES_FXD,FTLM.51_1_OHM_18_0_125W	75042	CEATO-51810F		
R 7 52	315-0331-00		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315		
R754	315-0911-00		RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115		
	207 0125 00			50157	201505		
RT754 9756	307-0125-00		RES., THERMAL: SUU OHM, 108, 25 DEG C	50157	2D1395		
N750	315-0751-00		RES.,FAD,CMPSN:/50 OHM,5%,0.25W	01121	CB/315		
R757	315-0911-00		RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115		
R761	315-0183-00		RES., FXD, CMPSN: 18K OHM, 5%, 0.25W RES., FXD, CMPSN: 560 OHM, 5%, 0.25W	01121	CB1835 CB5615		
			,,,,,,,,,,,,,,,,,,				
R763	315-0223-00		RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235		
R764	321-0291-00		RES.,FXD,FILM:10.5K OHM,1%,0.125W	75042	CEATO-1052F		
R776	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025		
R768	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025		
R770	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025		
R772	315-0391-00		RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915		
R774	315-0224-00		RES., FXD, CMPSN: 220K OHM, 5%, 0.25W	01121	CB2245		
R775	315-0622-00		RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225		
R776	315-0102-00		RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025		
R778	315-0562-00		RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	СВ5625		
R779	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025		
\mathbf{i}		Tektronix	Serial/M	odel No.		Mfr	
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)	Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
	R781	315-0472-00			RES., FXD. CMPSN: 4.7K OHM. 5%.0.25W	01121	CB4725
	R782	315-0102-00			RES., FXD. CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
	R784	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
	R786	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
	R787	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
	R789	315-0102-00			RES. FXD.CMPSN:1K OHM.5%,0.25W	01121	CB1025
	R790	315-0201-00			RES. FXD.CMPSN:200 OHM.5%.0.25W	01121	CB2015
	R800	301-0150-00			RES., FXD. CMPSN:15 OHM. 5%, 0.50W	01121	EB1505
	R802	304-0683-00			RES., FXD, CMPSN:68K OHM, 10%, 1W	01121	GB6831
	R820	316-0471-00			RES., FXD, CMPSN: 470 OHM, 10%, 0.25W	01121	CB4711
	R822	316-0822-00	B010100	в039999	RES.,FXD,CMPSN:8.2K OHM,10%,0.25W	01121	CB8221
	R822	316-0472-00	в040000		RES., FXD, CMPSN: 4.7K OHM, 10%, 0.25W	01121	CB4721
	R823	315-0150-00	хв040000		RES., FXD, CMPSN:15 OHM, 5%, 0.25W	01121	CB1505
	R824	316-0271-00			RES., FXD, CMPSN: 270 OHM, 10%, 0.25W	01121	CB2711
	R827	308-0742-00			RES.,FXD,WW:0.24 OHM,5%,2W	75042	BWH-R2400J
	R829	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
	R832	316-0102-00	B010100	B039999	RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021
	R832	315-0271-00	в040000		RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
	R833	315-0102-00	хв040000		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
	R834	315-0162-00	B010100	в039999	RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
	R834	316-0472-00	в040000		RES.,FXD,CMPSN:4.7K OHM,10%,0.25W	01121	CB4721
	R836	316-0682-00			RES.,FXD,CMPSN:6.8K OHM,10%,0.25W	01121	CB6821
	R838	316-0682-00			RES.,FXD,CMPSN:6.8K OHM,10%,0.25W	01121	CB6821
	R839	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
	R840	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
	R842	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
	R845	321-0764-01			RES.,FXD,FILM:5.09K OHM,0.5%,0.125W	75042	CEATO-5091D
)	R846	321-0685-00			RES.,FXD,FILM:30K OHM,0.5%,0.125W	75042	CEAT2-3002D
/	R850	307-0405-00			RES.,FXD,FILM:82 OHM,5%,7W	91637	FP-34G82R00J
	R851	308-0679-00			RES.,FXD,WW:0.51 OHM,5%,2W	75042	BWH-R5100J
	R853	316-0470-00			RES.,FXD,CMPSN:47 OHM,10%,0.25W	01121	CB4701
	R855	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
	R856	316-0153-00			RES.,FXD,CMPSN:15K OHM,10%,0.25W	01121	CB1531
	R860	321-0816-03			RES.,FXD,FILM:5K OHM,0.25%,0.125W	75042	CEAT2-5KC
	R861	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
	R863	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CBI011
	R866	315-0113-00			RES., FXD, CMPSN:11K OHM, 5%, 0.25W	01121	CB1135
	R86 /	316-0101-00			RES., FXD, CMPSN: 100 OHM, 10%, 0.25W	01121	CBIUII
	R870	316-0392-00	2010100	DOJO050	RES., FXD, CMPSN: 3.9K OHM, 10%, 025W	01121	CB3921
	K8/1	316-04/1-00	B010100	B010220	RES., FXD, CMPSN:470 OHM, 10%, 0.25W	01121	CB4/11
	0071	215 0271 00	DO10251		DEC EVE CAECH. 270 OUM ES 0 2EM	01101	CP2715
	R0/1 R072	315-0122-00	BUIUZDI		RES., FAD, CMPSN: 270 OFM, 5%, 0.25W	01121	CB122E
	1073	313-0133-00			RES., FAD, CMPSN: LSK OHM, 5%, 0.25W	01121	CB1335 ED-25C53D00T
	R881	307-0404-00			RED., FAD, FILM: DI OHM, DO, IOW	75042	PHU-251001
	R883	316-0470-00			$\frac{1}{100} \frac{1}{100} \frac{1}$	01121	CB4701
	1005	310-0470-00			RES., FAD, CHPSN:47 OHH, 108, 0.25W	01121	CB4701
	PRRF	316-0101-00				01121	CB1013
	R886	316-0153-00			RES FYD CMESN: ICO OHN 10% 0 25W	01121	CB1531
	R890	321-0816-03			RES FYD FILM-5K OHM O 258 O 125W	75042	CEAT2-5KC
	R891	321-0289-03			RES. FXD.FTIM:10K OHM.0.25%.0.125W	75042	CEAT2-1002C
	R893	316-0101-00			RES., FXD, CMPSN: 100 OHM. 10%.0.25W	01121	CB1011
	R896	315-0133-00			RES., FXD, CMPSN: 13K OHM. 5%.0.25W	01121	CB1335
	R897	316-0101-00			RES., FXD, CMPSN: 100 OHM. 10%.0.25W	01121	CB1011
	R900	316-0392-00			RES., FXD, CMPSN: 3.9K OHM, 10%, 025W	01121	CB3921
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	Tektronix	Serial/M	odel No.		Mfr		
<u>Ckt No.</u>	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Numbe	er 🔤
R901	315-0561-00	B010100	B010250	RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615	
R901	315-0271-00	B010251		RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715	
R903	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615	
R910	308-0686-00			RES.,FXD,WW:2.2 OHM,5%,2W	75042	BWH-2R200J	
R911	307-0301-00			RES.,FXD,FILM:120 OHM,5%,10W	91637	FP-35G120R0J	
R913	316-0391-00			RES.,FXD,CMPSN:390 OHM,10%,0.25W	01121	CB3911	
R915	316-0153-00			RES.,FXD,CMPSN:15K OHM,10%,0.25W	01121	CB1531	
R917	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	75042	CEATO-6041F	
R920	311-1120-00			RES.,VAR,NONWIR:100 OHM,30%,0.25W	71450	201-YA5531	
R922	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	75042	CEATO-6041F	
R924	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011	
R925	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315	
R927	316-0103-00			RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CB1031	
R929	316-0823-00			RES.,FXD,CMPSN:82K OHM,10%,0.25W	01121	CB8231	
R930	302-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.50W	01121	EB3331	
R935	316-0104-00			RES.,FXD,CMPSN:100K OHM,10%,0.25W	01121	CB1041	
R936	316-0473-00			RES.,FXD,CMPSN:47K OHM,10%,0.25W	01121	CB4731	
R937	316-0183-00			RES., FXD, CMPSN: 18K OHM, 10%, 0.25W	01121	CB1831	
R940	307-0007-00	B010100	B049999	RES., FXD, CMPSN: 2.7 OHM, 10%, 2W	01121	GB27G1	
R940	308-0730-00	в050000		RES.,FXD,WW:1000 OHM,0.025%,0.25W	54294	VA120110000G	
R942	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011	
R943	316-0472-00			RES.,FXD,CMPSN:4.7K OHM,10%,0.25W	01121	CB4721	
R944	307-0384-00	B010100	B049999	RES.,FXD,FILM:270 OHM,2%,4W	91637	FP-33G270R0G	
R944	308-0110-00	в050000		RES.,FXD,WW:	91637	RS1088K100R0J	
R948	321-0256-00			RES.,FXD,FILM:4.53K OHM,1%,0.125W	75042	CEAT0-4531F	
R949	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011	
R950	311-1124-00			RES., VAR, CMPSN: 250 OHM, 30%, 0.25W	71450	201-YA5533	
R951	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625	1
R952	321-0202-00			RES., FXD, FILM: 1.24K OHM, 18, 0.125W	75042	CEATO-1241F	
R953	316-0221-00			RES.,FXD,CMPSN:220 OHM,10*,0.25W	01121	CB2211	
R954	316-0102-00			RES., FXD, CMPSN:1K OHM, 10%, 0.25W	01121	CB1021	
R955	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015	
R956	316-0273-00			RES.,FXD,CMPSN:27K OHM,10%,0.25W	01121	CB2731	
R957	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215	
R980	316-0272-00			RES.,FXD,CMPSN:2.7K OHM,10%,0.25W	01121	CB2721	
R981	316-0562-00			RES.,FXD,CMPSN:5.6K OHM,10%,0.25W	01121	CB5621	
R982	316-0102-00			RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021	
R984	316-0153-00			RES, FXD, CMPSN: 15K OHM, 10%, 0.25W	01121	CB1531	
R986	322-0686-03			RES.,FXD,FILM:7.23K OHM,0.25%,0.25W	91637	MFF1421D72300C	
R987	321-0097-03			RES.,FXD,FILM:100 OHM,0.25%,0.125%	91637	MFF1816G100R0C	
R1002	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325	
R1003	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	СВ6235	
R1004	315-0103-00			RES.,FXD,CMPSN:LOK OHM,5%,0.25W	01121	CB1035	
R1005	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025	
R1006	311-1572-00			RES.,VAR,CMPSN:1K OHM,10%,0.5W	73138	91W-10000M	
R1007	315-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835	
R1010	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525	
R1012	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425	
K1015	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB/525	
LT0T0	316-0102-00			KES., FXD, CMPSN: IK OHM, IU%, 0.25W	01121	CBTOXY	
R1018	316-0561-00			RES.,FXD,CMPSN:560 OHM,10%,0.25W	01121	CB5611	
R1019	316-0103-00			RES.,FXD,CMPSN:10K OHM,10%,0.25W	01.121	CB1031	
R1020	316-0103-00			RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CBT03T	

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)		Tektronix	Serial/M	odel No.		Mfr	
	Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
	R1021	316-0393-00			RES.,FXD,CMPSN:39K OHM,10%,0.25W	01121	CB3931
	R1023	316-0103-00			RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CB1031
	R1024	316-0391 - 00			RES.,FXD,CMPSN:390 OHM,10%,0.25W	01121	CB3911
	R1025	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
	R1027	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEATO-1003F
	R1030	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
	R1032	321-0262-00			RES.,FXD,FILM:5.23K OHM,1%,0.125W	75042	CEATO-5231F
	R1040	321-0277-00	B010100	B010199	RES.,FXD,FILM:7.5K OHM,1%,0.125W	75042	CEATO-7501F
	R1040	321-0269-00	B010200		RES., FXD, FILM: 6.19K OHM, 1%, 0.125W	75042	CEAT0-6191F
	R1041	321-0261-00			RES.,FXD,FILM:5.11K OHM,1%,0.125W	75042	CEAT0-5111F
	R1043	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
	R1044	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
	R1046	321-0181-00			RES.,FXD,FILM:750 OHM,1%,0.125W	75042	CEATO-7500F
	R1047	321-0294-00			RES.,FXD,FILM:11.3K OHM,1%,0.125W	75042	CEATO-1132F
	R1048	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
	R1050	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	СВ3325
	R1052	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
	R1053	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	75042	CEAT0-6041F
	R1056	321-0329-00			RES.,FXD,FILM:26.1K OHM,1%,0.125W	75042	CEAT0-2612F
	R1060	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	СВ3035
	R1062	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	Св2035
	R1063	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
	R1064	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
	R1065	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
	R1070	316-0561-00			RES.,FXD,CMPSN:560 OHM,10%,0.25W	01121	CB5611
	R1071	316-0561-00			RES.,FXD,CMPSN:560 OHM,10%,0.25W	01121	CB5611
Ϊ)	R1072	316-0561-00			RES.,FXD,CMPSN:560 OHM,10%,0.25W	01121	CB5611
	R1073	316-0563-00			RES.,FXD,CMPSN:56K OHM,10%,0.25W	01121	CB5631
/	R1080	316-0823-00			RES.,FXD,CMPSN:82K OHM,10%,0.25W	01121	CB8231
	R1082	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	Св2725
	R1083	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
	R1084	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
	R1086	321-0296-00			RES.,FXD,FILM:11.8K OHM,1%,0.125W	75042	CEAT0-1182F
	R1088	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
	R1092	321-0146-00			RES.,FXD,FILM:324 OHM,1%,0.125W	75042	CEATO-3240F
	R1093	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	75042	CEAT0-3921F
	R1095	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
	R1097	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	75042	CEAT0-1401F
	R1098	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEATO-2001F
	R1101	321-0167-00			RES.,FXD,FILM:536 OHM,1%,0.125W	75042	CEATO-5360F
	R1103	321-0255-00			RES.,FXD,FILM:4.42K OHM,1%,0.125W	75042	CEAT0-4421F
	R1105	321-0230-00			RES.,FXD,FILM:2.43K OHM,1%,0.125W	75042	CEAT0-2431F
	R1106	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
	R1110	311-1571-00			RES., VAR, CMPSN: 500 OHM, 10%, 0.5W	73138	91W-500ROM
	R1111	316-0681-00			RES.,FXD,CMPSN:680 OHM,10%,0.25W	01121	CB6811
	R1113	321-0125-00			RES.,FXD,FILM:196 OHM,1%,0.125W	75042	CEAT0-1960F
	R1115	321-0242-00			RES., FXD, FILM: 3.24K OHM, 1%, 0.125W	75042	CEATO-3241F
	R1117	315-0102-00			RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	CB1025
	RTIT8	311-1571-00	5010100		RES., VAR, CMPSN: 500 OHM, 10%, 0.5W	73138	91W-500ROM
	R1120	315-0512-00	B010100	B010220	RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
	R1120	315-0432-00	B010251		RES., FXD, CMPSN:4.3K OHM, 5%, 0.25W	01121	CB4325
	KL122	321-0229-00			KED., FAD, FILM: 3/4 UHM, 18, 0.125W	75042	CEATU-3740F
	VTTC4	JET-0220-00			NEG. JIAD JI LET Z. SZK OMIJISJU. 123W	/ 5042	CERTO-SOSTE

	Tektronix	Serial/M	odel No.		Mfr		ť
Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number	,
R1125	321-0228-00			PES EXD ETTM. 2 32K OHM 1% 0 125W	75042	CEATO-2321E	
R1127	321-0141-00			RES. FID FILM.287 OHM $190125W$	75042	CEATO-29211	
R1129	315-0220-00	XB030000		RES. FXD. CMPSN-22 OHM. 5% 0.25W	01121	CB2205	
R1130	321-0069-00			RES., FXD, FILM: 51.1 OHM, 1%.0.125W	75042	CEATO-51R10F	
R1131	321-0069-00			RES. FXD. FTLM: 51.1 OHM. 18.0.125W	75042	CEATO-51R10F	
					,5012		
R1132	315-0220-00	XB030000		RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205	
R1133	321-0143-00	B010100	B010250	RES., FXD, FILM: 301 OHM, 1%, 0.125W	75042	CEAT0-3010F	
R1133	321-0141-00	B010251		RES., FXD, FILM: 287 OHM, 1%, 0.125W	75042	CEAT0-2870F	
R1134	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815	
R1136	321-0228-00			RES.,FXD,FILM:2.32K OHM,1%,0.125W	75042	CEATO-2321F	
R1137	321-0228-00			RES., FXD, FILM: 2.32K OHM, 1%, 0.125W	75042	CEATO-2321F	
R1140	315-0910-00	B010100	B010250	RES.,FXD,CMPSN:91 OHM,5%,0.25W	01121	CB9105	
R1140	315-0121-00	B010251		RES., FXD, CMPSN:120 OHM, 5%, 0.25W	01121	CB1215	
R1141	321-01/8-00			RES.,FXD,F1LM:698 OHM,1*,0.125W	75042	CEATO-6980F	
R1142	321-0187-00			RES.,FXD,F11M:866 OHM,1%,0.125W	/5042	CEAT0-8660F	
רות	221.0157-00	P010100	010250	DEC EVE HTTN 400 OTH 10 C 10EM	75040	CENTO 4000E	
R1143	321-0137-00	B010100	B010250	RES., FAD, FILM: 422 OHM, 18, 0.125W	75042	CEAT0-4220F	
D11//	321-0120-00	B010251		RES., FAD, FILM: 200 OHM, 18, 0.125W	75042	CEATO~2000F	
R1144	322-0159-00			DES EVD ETIM.442 OHM 19 0 125W	91637	MEE1421C442POF	
R1140	321-0099-00	B010100	B010250	RES. FXD.FTLM.105 OHM.18.0 125W	75042	CEATO-1050F	
112241	521 0055 00	2010100	2010230		,0012	0,1110 20001	
R1147	321-0069-00	B010251		RES. FXD.FILM:51.1 OHM.1%.0.125W	75042	CEATO-51R10F	
R1148	322-0159-00			RES. FXD.FILM:442 OHM.1%.0.125W	91637	MFF1421G442R0F	
R1150	315-0910-00	B010100	B010250	RES., FXD, CMPSN: 91 OHM, 5%, 0.25W	01121	CB9105	
R1150	315-0121-00	B010251		RES. FXD.CMPSN:120 OHM.5%.0.25W	01121	CB1215	
R1151	323-0178-00			RES. FXD.FTIM:698 OHM.1%.0.50W	75042	CECT0-6980F	
R1155	316-0681-00			RES., FXD, CMPSN:680 OHM, 10%, 0.25W	01121	CB6811	
R1156	316-0333-00			RES., FXD, CMPSN: 33K OHM, 10%, 0.25W	01121	CB3331	,
R1157	315-0182-00			RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825	(
т800	120-0821-00			XFMR, PWR:	80009	120-0821-00	
U620	155-0022-00			MICROCIRCUIT, DI: A AND B LOGIC ML, CHANNEL SW	01295	SN7410N	
0770	156-0057-00			MICROCIRCUIT, DI:QUAD 2-INPUT NAND GATE	07263	7401PC	
0780	156-0039-00	DO10100	DO00700	MICROCIRCUIT, DI:DUAL J-K FLIP FLOP	01295	SN/4/3N	
01000	155-0021-00	BOIUIUU	B020733	MICROCIRCUIT, DI:ML, TIMING GENERATOR	80009	155-0021-00	
01000	155-0021-01	B020734		MICROCIRCUIT, DI:ML, TIMING GENERATOR	80009	155-0021-01	
111025	155-0017-00			NTODOCTDOUTE DT. MI KEDO LOCTOCOUNEED	00000	155-0017-00	
01020	155-0015-01			MICROCIRCUIT, DI ML 2020 LOGICCOUNTER	80009	155-0015-01	
11030	155-0014-01			MICROCIRCUIT, DI ML, ANALOG DAIA SWITCH	80009	155-0014-01	
11040	155-0015-01			MICROCIRCUIT, DI MIL, ANALOG TO DECLIALI CONV	80009	155-0015-01	
U1040	155-0018-00			MICROCIRCUIT, DI-ZERO LOGIC	80009	155-0018-00	
01000	100 0010 00			Michoeinebii/bi.bhko bosie	00000	200 0020 00	
v1070	155-0014-01			MICROCIRCUIT, DI:ML, ANALOG TO DECIMAL CONV	80009	155-0014-01	
u1075	156-0032-00			MICROCIRCUIT.DI:4-BIT BINARY COUNTER	01295	SN7493AN	
U1080	155-0019-00			MICROCIRCUIT, DI:ML, DECIMAL POINT AND SPACE	80009	155-0019-00	
U1090	155-0023-00			MICROCIRCUIT, DI:ML, CHAR GEN NUMERALS	80009	155-0023-00	
U1092	155-0024-00			MICROCIRCUIT, DI:ML, CHAR GEN SPCL SYMBOLS	80009	155-0024-00	
u1094	155-0025-00			MICROCIRCUIT, DI:ML, CHAR GEN PREFIXES	80009	155-0025-00	
U1096	155-0026-00			MICROCIRCUIT, DI:ML, CHAR GEN LETTERS	80009	155-0026-00	
U1098	155-0027-00			MICROCIRCUIT, DI:ML, CHAR GEN SPCL ALPHA	80009	155-0027-00	
U1100	155-0020-00			MICROCIRCUIT, DI:ML, CHANNEL SW OUTPUT ASSY	80009	155-0020-00	
U1130	155-0022-00			MICROCIRCUIT, DI: A AND B LOGIC ML, CHANNEL SW	01295	SN7410N	
	150				0477.0	1 100 2 10	
VR930	152-0357-00			SEMICOND DEVICE: ZENER, 0.4W, 82V, 5%	04713	TNA83R	
VR940	152-0243-00			SEMICOND DEVICE: ZENER, 0.4W, 15V, 5%	81483	TN2028	
VK950	192-0227-00			SEMICOND DEVICE:ZENER, 0.4W, 0.2V, 33	01403	05-0505	
	100 0010 00			CENTCOND DEVICE VENED (AM 151 59	81483	1N965B	
VR1080	152-0243-00			SEMILOUND DEVICE: ZENER, U.4W, 15V, 5%	81483	1N965B	
AMT08T	152-0243-00			SENTCOND DEVICE.ZENER.0 4W.15V.5%	81483	1N965B	(
AKT085	102-0243-00			STRITCOUP DEVICE. SEREN (0.78/10/00			

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ADJUSTMENTS, DIAGRAMS AND ILLUSTRATIONS

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 (μ F).
Resistors =	Ohms (Ω)

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:



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ADJUSTMENTS

Before making adjustments, thoroughly clean and inspect this instrument as outlined in the service information section of this manual.

NOTE

This procedure facilitates checking and adjusting the Low-Voltage Power Supply ONLY. For complete oscilloscope mainframe calibration (plug-in interface, deflection amplifiers, CRT circuits, etc.), refer to the calibration procedure given in the manual for the display unit.

Services Available

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

Equipment Required

For power-supply calibration, proper loading must be established to ensure correct operation and regulation of the low-voltage supplies. For best results, the 5403 should be operated with a display unit and plug-in units as this provides actual operating-condition loads for the supplies.

For measurement of the supply voltages, a precision DC voltmeter is required. The voltmeter must have an accuracy of within $\pm 0.1\%$, and a measurement range from about -35volts to +250 volts. For example, a DM 501 Digital Multimeter (operated in a TM 500-Series Power Module), or any DC voltmeter meeting the listed requirements may be used.

Preliminary Procedure

NOTE

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

a. Remove the bottom dust cover of the 5403 to gain access to the LV power supply circuit board.

instructions.

c. Connect the 5403 to the line voltage source. Turn the Intensity control on the display unit counterclockwise and pull the Power switch out to turn the instrument on.

d. Allow a 20 minute warm up time before performing the calibration procedure.

1. LV Power Supply Checks

Connect the precision DC voltmeter between each lowvoltage test point and ground. Check that each supply is within the tolerance listed below.

Supply	Tolerance
0 V	-29.925 V to -30.075 V
-15 V	-14.85 V to -15.15 V
+5 V	+4.9 V to +5.1 V
+15 V	+14.85 V to +15.15 V
+30 V	+29.95 V to +30.075 V
+200 V	+180 V to +240 V

2. LV Power Supply Voltage Adjustments

Connect the precision DC voltmeter between each test point (-30 V and +30 V) and ground. First, adjust R950, -30 V Adj, and then adjust R920, +30 V Adj using the appropriate test point for voltmeter readings of exactly 30 volts.



b. Check that the correct nominal line-selector block (120 VAC or 240 VAC) has been installed on the lineselector pins and that the regulating range selected includes the input line voltage, see Installation section for complete

ADJUSTMENTS LV POWER SUPPLY CIRCUIT BOARD

5403

ADJUSTMENTS

Equipment Required

A display unit must be connected to the 5403. It is not necessary to install any plug-in units.

Preliminary Procedure

a. Remove the cabinet panels covering the 5403 access to the readout circuit board.

b. With the power to the 5403 turned off, remove Q1052. Turn on the 5403 and display unit.

c. Observe a eight word (four words on bottom graticule and four words on top), ten-characters/word readout.

1. Top Row Vertical Spacing, R1118

Adjust R1118 so all of top row of readout is within the top division of graticule. Now adjust vertical centering R135 (located on display unit vertical circuit board) so all of the bottom row of readout is within the bottom division of the graticule.



2. Horizontal Positioning, R1110

Adjust until the first character of the first and second words, and the last character of the seventh and eight words are just inside the graticule area.

3. Character Scan, R1006

While observing the readout words, adjust R1006 for no blank areas in the characters.

(Aī





BLOCK DIAGRAM

PARTS LOCATION GRID



*See Parts List for serial number ranges.

PARTS LOCATION GRID INTERFACE

CKT NO	GRID LOC	CKT NO	GRID	CKT NO	GRID LOC	CKT NO	GRID LOC
C608	B-3	CB686	G-4	0600	D-4	R600	D-4
C610	B-3	CR687	G-4	Q604	D-4	R601	D-5
C619	B-6	CR740	H-4	Q610	F-3	R602	C4
C620	E-3	CR741	1-4	Q614	F-4	R603	D-5
C621	D-5	CR742	1-3	Q630	D-4	R604	C-4
C622	F-5	CR770	H-2	Q640	D-4	R605	D-5
C624	F-5	CR772	G-2	Q650	C-4	R607	C-5
C626	G.5			Q660	D-4	R608	F3
C627	G-5 E-6	J610	C-3	Q670	B-4	R610	E-3
0627	E-3	J620	F-3	Q674	E-3	R611	E-3
C628	G-6	J630	1-3	Q680	G-3	R613	E-3
C629	G-6			Q700	D-6	R614	F-4
C630	1-2			Q708	D-6	R615	E-3
C637	E-4			Q710	E-6	R617	E-4
C639	J-6			Q715	E-5	R619	E-4
C640	D-4			Q728	G-5	R620	D-5
C652	E-3			Q730	H-5	R621	E-5
C660	D.4			Q735	H-5	R622	D-5
0704	D-4	1		Q740	1-4	R626	E-4
C704	D-0			Q744	1-3	R627	E-5
C724	G-5	{		Q748	H-4	R628	E-5
C766	J-3			0752	H-3	R630	D-3
C770	H-2			Q770	G-1	R632	D-3
C775	G-3				_	R634	D-3
C780	G-3					R636	E-4
C784	H-2					R637	E-4
0/04						R638	D-3
		1				R640	D-3
CR602	C4					R641	D-3
CR608	F3					R643	D-3
	-	1		l		B650	D-3

СКТ	GRID	скт	GRID	скт	GRID	скт	GRID
NO	LOC	NO	LOC	NO	LOC	NO	LOC
R651	D-3	D-3 R715 F-6		R764	J-4	RT754	G-4
R652	D-3	R720	F-5	R766	J-3		
R654	D-3	R722	G-5	R768	J-3	U620	E-4
R656	D-4	R723	G-5	R770	H-2	U770	G-2
R660	D-3	R724	G-5	R772	G-2	U780	H-2
R670	B-4	R725	G-5	R774	G-2	U1030	E-2
R671	B-5	R726	G-5	R775	G-2	U1040	D-2
R672	B-5	R728	H-5	R776	G-2		
R673	E-3	R729	G-5	R778	G-2		
R674	D-3	R730	H-5	R779	G-2		
R677	E-3	R732	H-5	R781	G-2		
R680	G-3	R733	H-5	R782	H-3		
R681	G-3	R734	H-5	R784	J-3		
R683	G-4	R735	1-5	R786	H-2		
R684	H-3	R737	1-6	R787	H-2		
R686	G-4	R738	1-5	R789	1-2		
R688	G-3	R740	H-4				
R689	G-4	R741	H-4				
R700	C-6	R742	Н-4				
R702	D-6	R744	H-3				
R703	D-6	R746	H-3	Į			
R704	D-6	R748	H-4	1			
R705	D-6	R750	H-3				
R706	D-6	R752	H-3				
R708	D-6	R754	H-3				
R709	E-5	R756	H-4				
R710	E-6	R757	H-3				
R712	E-6	R760	J-4				
R713	E-6	R761	J-4				
R714	E-6	R763	J-4				
		1		1		•	





CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C800	 F-4	C982	F-2	CB800	F -5	CR982	F-2
C820	G-7	C984	E-2	CR801	F-5	CR986	F-2
C821	H-7			CR802	E-5	1	
C822	E-5			CR803	E-5	F800	C-1
C825	F-2			CR820	G-7		
C834	F-6			CR821	F-7		
C836	F-6			CR825	G-5		
C845	G-6			CR832	F-7		
C848	1-6			CR838	G-6		
C850	F-2			CR839	F-6		
C860	B-6			CR848	H-7		
C867	C-5			CR850	D-5		
C871	B-7	1		CR851	C-7		
C875	B-4			CR863	C-5		
C876	C-3			CR864	C-5		
C880	F-2			CR875	D-4		
C890	E-6			CR880	E-6		
C897	D-6			CR881	E-7		
C901	E-7			CR893	D-6		
C910	D-1			CR903	D-7		
C920	C-2			CR910	B-2		
C925	B-2			CR911	B-4		
C930	G-3			CR925	B-3		
C932	1-3			CR927	C-2		
C935	E-3			CR930	G-5		
C944	G-1			CR944	H-3		
C948	H-1			CR950	H-2		
C950	H-2			CR955	1-2		
C953	H-2			CR980	E-3		
C955	H-1			CR981	E-3		
C981	F-3						

СКТ	GRID	скт	GRID	скт	GRID	скт	GRID
NO	LOC	NO	LOC	NO	LOC	NO	LOC
Q820	1-7	R800	E-5	R883	E-7	R944	1-3
Q824	F-6	R802	E-4	R885	D-7	R948	G-1
Q830	F-6	R820	G-7	R886	D-7	R949	1-2
Q832	F-6	R822	F-7	R890	E-6	R950	G-2
Q838	F-6	R823	H-7	R891	E-6	R951	H-2
Q850	B-7	R824	F-5	R893	D-6	R952	G-2
Q855	C-6	R827	G-5	R894	D-6	R953	H-2
Q864	C-6	R829	F-5	R896	E-6	R954	1-1
Q866	C-6	R832	F-7	R897	E-6	R955	1-2
Q870	C-6	R833	F-6	R900	E-7	R956	1-1
Q880	E-7	R834	G-6	R901	E-7	R957	1-2
Q885	D-6	R836	F-7	R903	E-6	R980	E-2
Q894	D-6	R838	G-6	R910	B-3	R981	F-2
Q896	D-6	R839	G-6	R911	B-2	R982	F-2
Q900	D-6	R840	F-5	R913	B-2	R984	E-2
Q910	A-2	R842	F-6	R915	C-2	R986	E-2
Q915	B-2	R845	G-6	R917	C-2	R987	F-2
Q92 5	B-2	R846	G-6	R920	D-2		
Q940	J-2	R850	A-6	R922	C-2		
Q950	1-2	R851	C-7	R924	C-2	VR930	B-3
Q955	1-2	R853	B-6	R925	B-2	VR940	H-1
Q958	1-2	R855	C-6	R927	C-2	VR950	H-2
Q982	E-2	R856	C-7	R929	B-3		
Q984	E-2	R861	B-6	R930	B-3	1	
		R863	C-6	R935	E-2		
		R866	B-6	R936	F-2		
		R867	B-6	R937	F-2		
		R870	B-6	R940	1-3		
		R871	B-6	R942	1-2		
		R873	B-6	R943	H-2		
		R880	D-5	•			
		B881	D-7				







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PARTS LOCATION GRID



*See	Parts	List	for
serial	numb	er ra	inges.

		1011-																		1		laur-	
CKT	GRID	скт	GRID	СКТ	GRID	скт	GRID	СКТ	GRID	скт	GRID	скт	GRID	скт	GRID	скт	GRID	скт	GRID	скт	GRID	CKT	GRID
NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC
C1010	F-4	C1180	J-2	LR110	D-4	R1002	F-1	R1023	D-3	R1052	G-4	R 1083	D-4	R1110	A-2	R1133	B-2	R1151	C-2	U1000	E-3	U1130	B-3
C1021	F-3	C1181	J-2			R1003	F-2	R1024	D-3	R1053	G-3	R 1084	D-4	R1111	A-3	R1134	A-3	R1155	B-4	U1025	H-1		
C1024	F-1	C1182	J-3	Q1015	E-2	R1004	E-3	R1025	G-1	R1056	G-2	R 1086	C-4	R1113	B-2	R1136	A-2	R1156	A-4	U1035	1-4		
C1027	G-1			Q1018	E-2	R1005	H-2	R1027	F-2	R1060	G-3	R 1088	H-3	R1115	D-3	R1137	B-2	R1157	B-2	U1060	1-3	VR1080	1-2
C1032	H-4	CR1002	F-3	Q1040	G-2	B1006	1.2	R1030	G-2	R1062	H-2	R1092	A-3	R1117	D-3	R1140	C-2			U1070	1-5	VR1081	H-2
C1041	H-2	CR1003	G-3	Q1048	G-3	B1007	F.3	R1032	H-3	R1063	1-2	F11093	A-3	R1118	D-2	R1141	C-2			U1075	E-1	VR1082	1-2
C1065	H-2	CR1005	G-2	Q1050	G-2	D1010	E 2	R1041	H-3	R1064	1-2	R1095	A-4	R1120	C-2	R1142	B-2			U1080	B-4		
C1073	G-1	CR1010	F-4	Q1052	G-4		F-2	R1043	G-1	R1065	H-2	R1097	C-3	R1122	C-3	R1143	B-2			U1090	C-5		
C1080	C-3	CR1012	F-3	Q1056	G-3	RIUIZ	F-2	R1044	F-2	R1070	E-1	R1098	D-3	R1124	C-4	R1144	B-2			U1092	B-5		
C1083	H-4	CR1013	G-4	Q1100	C-4	R1015	F-2	R1046	H-2	R1071	E-1	R1101	A-3	R1125	B-2	R1146	E-3			U1094	H-5		
C1100	04	CB1018	E-2	Q1110	C-3	R1016	F-1	R1047	G-3	R1072	E-1	R1103	J-4	R1127	C-2	R1147	D-3			U1096	F-5		
01100	14	CR1024	G-1	Q1140	C-3	R1018	E-2	R1048	F-3	R1073	G-1	R1105	D-3	R1129	B-1	R1148	D-3			U1098	D-5	}	
01120	J-4	CB1040	H-2	Q1150	C-2	R1019	F-2	R1050	G-2	B1080	E-4	R1106	D-4	R1130	A-1	R1150	C-2			U1100	E-4	{	
C1134	A-2	CB1041	н.2			B1020	H.2			01092	5.4			B1131	B-1								
C1140	C-2	001041	C 4	I		D1001	F 0	1		IN 1002	1			B1132	B.1	1		I		•			
C1150	D-2	UN 1092	G-4			R 1021	E-2							,	51								

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REV. JULY 1974

B



Readout System 3 Deh

1974



REV. C, DEC. 1974



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INTERCONNECT AND VOLTAGE DISTRIBUTION

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

ELCTRN

ELEC

ELEM

EQPT

EPL

EXT

FLEX

FLTR

FSTNR

FXD

HDL

HEX

HEX HD

HLCPS

HLEXT

IDENT

IMPLR

ΗV

IC

ID

HEX SOC

GSKT

FLH

FR

FΠ

ELCTI 1

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

NIP

OD

PL

ΡN

PNH

RES

RLF

SCR

OVH

INCH NUMBER SIZE ACTR ACTUATOR ADPTR ADAPTER ALIGN ALIGNMENT ALUMINUM AL ASSEM ASSEMBLED ASSEMBLY ASSY ATTENUATOR ATTEN AWG AMERICAN WIRE GAGE BD BOARD BRKT BRACKET BRASS BRONZE BRS BRZ BSHG BUSHING CAB CABINET CAP CAPACITOR CER CERAMIC CHAS CHASSIS СКТ CIRCUIT сомр COMPOSITION CONN CONNECTOR cov COVER COUPLING CPLG CRT CATHODE RAY TUBE DEG DEGREE

DRAWER

#

ELECTROLYTIC ELEMENT ELECTRICAL PARTS LIST EQUIPMENT EXTERNAL FILLISTER HEAD FLEXIBLE FLAT HEAD FILTER FRAME or FRONT FASTENER FOOT FIXED GASKET HANDLE HEXAGON HEXAGONAL HEAD HEXAGONAL SOCKET HELICAL COMPRESSION HELICAL EXTENSION INTEGRATED CIRCUIT INSIDE DIAMETER **IDENTIFICATION** IMPELLER

ELECTRON

ELECTRICAL

INCH INCANDESCENT INCAND INSULATOR INSUL INTERNAL INTE LAMPHOLDER LPHLDR MACHINE MACH MECHANICAL MECH MOUNTING MTG NIPPLE NOT WIRE WOUND ORDER BY DESCRIPTION NON WIRE OBD OUTSIDE DIAMETER OVAL HEAD PHOSPHOR BRONZE PH BRZ PLAIN or PLATE PLSTC PLASTIC PART NUMBER PAN HEAD PWR POWER RCPT RECEPTACLE RESISTOR RGD RIGID RELIEF RTNR RETAINER SCH SCOPE SOCKET HEAD OSCILLOSCOPE SCREW

SE SINGLE END SECT SECTION SEMICOND SEMICONDUCTOR SHLD SHIELD SHLDR SHOULDERED SKT SOCKET SLIDE SL SLFLKG SELF-LOCKING SLEEVING SLVG SPR SPRING SQUARE SQ SST STAINLESS STEEL STL STEEL SWITCH sw TUBE TERM TERMINAL THD THREAD тнк THICK TENSION TNSN TPG TAPPING TRH TRUSS HEAD v VOLTAGE VAR VARIABLE WITH W/ WASHER WSHR TRANSFORMER XEMR XSTR TRANSISTOR

DWR



Mechanical Parts List—5403

Scan by Zenith

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00779	AMP, INC.	P. O. BOX 3608	HARRISBURG, PA 17105
01295	TEXAS INSTRUMENTS, INC.,		
	SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
06666	GENERAL DEVICES CO., INC. BUSINESS DISCONTINUED, USE: 12954	525 S. WEBSTER AVE.	INDIANAPOLIS, IN 46219
06982	MOORE, HOWARD J., CO.	105 E. 16TH ST.	NEW YORK, NY 10003
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
45722	USM CORP., PARKER-KALON FASTENER DIV.	1 PEEKAY DRIVE	CLIFTON, NJ 07014
57771	STIMPSON, EDWIN B., CO., INC.	900 SYLVAN AVE.	BAYPORT, NY 11705
71400	BUSSMAN MFG., DIVISION OF MCGRAW-		
	EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71785	TRW ELECTRONIC COMPONENTS, CINCH		
	CONNECTOR OPERATIONS	1501 MORSE AVE.	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
77250	PHEOLL MANUFACTURING CO., DIVISION		
	OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650
78189	ILLINOIS TOOL WORKS, INC.		
	SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
95238	CONTINENTAL CONNECTOR CORP.	34-63 56TH ST.	WOODSIDE, NY 11377

Index	Tektronix Serial/	Model No.	Qty		Mfr	
No.	Part No. Ett	Dscont	~./	Name & Description	Code	Mtr Part Num
1-1			1	CKT BOARD ASSY: INTERFACE (SEE A1 EPL)	00506	47051
-2	131-0590-00		29	. CONTACT, ELEC: 0.71 INCH LONG	22526	47351
-3	131-1078-00		3	. CONNECTOR, RCPT, :28/56 CONTACT	95238	K600-11-56Y25
-4	136-0252-04		2	. CONTACT, ELEC: 0.188 INCH LONG	22526	75060
-5	136-0260-02		3	. SOCKET, PLUG-IN: 16 CONTACT, LOW CLEARANCE	01295	C931602
	136-0269-00		2	. SOCKET, PLUG-IN: 14 CONTACT, LOW CLEARANCE	71785	133-59-02-073
-6	214-1593-02		3	. KEY, CONN PLZN:	80009	214-1593-02
-7	351-0188-00		2	. GUIDE-POST, LOCK: 0.65 INCH LONG	80009	351-0188-00
-8	386-1938-00		1	. BRACKET, REINF: (ATTACHING PARTS)	80009	386-1938-00
-9	210-0777-00		4	. RIVET, BLIND: 0.125 DIA GRIP, AL	45722	AD42AB5
- 10	386-1557-00		3	. SPACER, CKT BD: PLASTIC	80009	386-1557-00
	211 2222 22		-	(ATTACHING PARTS FOR CAT BD)	02205	000
-11	211-0008-00		T	SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
-12	213-0146-00		4	SCR, TPG, THD FOR: 6-20 X 0.313 INCH, PNH STL	83385	OBD
-13			1	CKT BOARD ASSY: READOUT (SEE A3 EPL)		
-14	129-0285-00		1	. POST,ELEC-MECH:0.281 L X 0.188 HEX BRS (ATTACHING PARTS)	80009	129-0285-00
-15	211-0007-00		1	. SCREW,MACHINE:4-40 X 0.188 INCH, PNH STL	83385	OBD
-16	136-0220-00		1	. SOCKET, PLUG-IN: 3 PIN. SOUARE	71785	133-23-11-034
-17	136-0235-00		7	SOCKET PLUC-IN:6 CONTACT BOUND	71785	133-96-12-062
_18	136-0260-02		13	SOCKET DINC-IN-16 CONTACT ION CLEADANCE	01295	C031602
-10	136-0260-02		13	COCKET, FLUG-IN: 10 CONTACT, LOW CLEARANCE	71705	122 50 02 072
10	138-0289-00		T	SOURT, PLUG-IN:14 CONTACT, LOW CLEARANCE	71785	133-39-02-073
-19	131-0589-00		9	. CONTACT, ELEC: 0.46 INCH LONG	22526	4/350
-20	136-0263-03		25	. CONTACT, ELEC: FOR 0.025 INCH SQUARE PIN	00779	86250-2
-21	214-0579-00		2	. TERM., TEST PT:0.40 INCH LONG	80009	214-0579-00
-22	361-0238-00		2	. SPACER, SLEEVE: 0.25 OD X 0.34 INCH LONG (ATTACHING PARTS FOR CKT BD)	80009	361-0238-00
-23	211-0155-00		2	SCREW,EXT,RLV B:4-40 X 0.375 INCH,SST	80009	211-0155-00
-24			1	CKT BOARD ASSY: POWER SUPPLY (SEE A2 EPL)		
-25	131-0608-00		23	. CONTACT, ELEC: 0.365 INCH LONG	22526	47357
	131-0589-00		16	CONTACT.ELEC: 0.46 INCH LONG	22526	47350
-26	214-1804-00		1	. HEAT SINK, ELEC:	80009	214-1804-00
				(ATTACHING PARTS)		
-27	210-0457-00		1	. NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-28	211-0578-00		1	. SCREW, MACHINE: 6-32 X 0.438 1NCH, PNH STL	83385	OBD
-29	214-0579-00		7	. TERM., TEST PT:0.40 INCH LONG	80009	214-0579-00
-30	344-0154-00		4	. CLIP, ELECTRICAL: FOR 0.25 INCH DIA FUSE	80009	344-0154-00
	159-0040-00		1	FUSE.CARTRIDGE: 3A6.0.7A.250V.SLOW-BLOW	71400	MDL7/10
-31	131-1199-00		1	LINK TERM CONNE:	80009	131-1199-00
	352-0166-02		ĩ	CONN BODY DI FI-8 WIDE DED	80009	352=0166=02
	131-0707-00		2	CONTROL FIELO ARIA 22-26 AND MIDE	22526	17139
	131-1200 00		2	I THE WERM CONNER	22320	121-1200 00
	101-1200-00		, ,	· LINK, IERM. CONNET	80009	101-1200-00
	227-0766-0T		1	CONN BODY, PL, EL:8 WIRE BROWN	80009	327-0100-01
_	131-0707-00		2	CONTACT, ELEC: 0.48"L, 22-26 AWG WIRE	22526	4/439
-32	175-0860-00		IN	. WIRE, ELECTRICAL: 5 WIRE RIBBON, 3 IN L	23499	TEK-175-0860-0
-33	175-0859-00		IN	. WIRE,ELECTRICAL:6 WIRE RIBBON,3 IN L (ATTACHING PARTS FOR CKT BD)	23499	TEK-175-0859-0
-34	211-0504-00		6	SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
-35	210-0457-00		1	NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL	83385	OBD
-36	211-0008-00		ī	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-37			1	TRANSFORMER: (SEE T800 EPL)		
-38	352-0198-00		1	. CONN BODY, PL, EL:2 WIRE BLACK	80009	352-0198-00
-39	131-0622-00		2	. CONTACT, ELEC: 0.577"L, 28-32 AWG WIRE (ATTACHING PARTS FOR XEMP)	22526	46241
-40	212-0515-00		٨	SCREW MACHINE 10-32 X 2 250" HEY HD ST	83385	OBD
-40	212-0313-00		4	THE CIN FIRCTO 197 TO V 1 50 THEM ONG	03303	166-0227 00
-41	100-0227-00		4	INS STA'ETEC: 0.18/ ID X 1.20 INCH TONG	00009	100-022/-00

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Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	2345	Name & Description	Mfr Code	Mfr Part Number (
1-42	210-0812-00		4	WASHER, NONMETA	L:#10,FIBER	06982	OBD
-43	220-0410-00		4	NUT, EXTENDED W	A:10-32 X 0.375 INCH,STL	83385	OBD
-44	200-0772-02		1	COVER, ELEC XFM	R:	80009	200-0772-02
-45	333-1682-00		1	PANEL, REAR:		80009	333-1682-00
-46	343-0315-00		2	CLAMP, XSTR:		80009	343-0315-00
					(ATTACHING PARTS FOR EACH)		
-47	210-0407-00		3	NUT, PLAIN, HEX.	:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-48	342-0082-00		1	INSULATOR, PLAT	E:0.52 SQ X 0.015 INCH THK,	AL 80009	342-0082-00
-49	343-0403-00		3	CLAMP, RIM, CLEN	C:TRANSISTOR (ATTACHING PARTS FOR EACH)	80009	343-0403-00
-50	211-0025-00		1	SCREW, MACHINE:	4-40 X 0.375 100 DEG,FLH STI	3385	OBD
-51	342-0082-00		1	INSULATOR, PLAT	E:0.52 SQ X 0.015 INCH THK,	L 80009	342-0082-00
-52	351-0293-00		3	GUIDE, SLIDE: BL	UE, UPPER	80009	351-0293-00
-53	351-0286-01	B010100 B010443	3	GUIDE, PL-IN UN	I:BLACK, LOWER	80009	351-0286-01
	351-0286-02	B010444 B041135	3	GUIDE, PL-IN UN	I:BLACK,LOWER	80009	351-0286-02
	351-0286-04	B041136	3	GUIDE,PL-IN UN	I:BLACK,LOWER (ATTACHING PARTS)	80009	351-0286-04
-54	211-0038-00		2	SCREW, MACHINE:	4-40 X 0.312"100 DEG,FLH STH	83385	OBD
-55	211-0101-00		1	SCREW, MACHINE:	4-40 X 0.25" 100 DEG,FLH ST	83385	OBD
-56	426-0934-00		1	FRAME ASSY, CAB	:	80009	426-0934-00
-57	129-0266-00		1	. POST, ELEC-ME	CH:0.515 L X 0.219 OD,0.219	BRS 80009	129-0266-00
-58	131-1254-01		3	. CONTACT, ELEC	GROUNDING (ATTACHING PARTS FOR EACH)	80009	131-1254-01
-59	210-0617-00		1	. EYELET, METAL	LIC:0.089 OD X 0.125" LONG	57771	G53-4
-60	131-0707-00		17	CONTACT, ELEC:0	.48"L,22-26 AWG WIRE	22526	47439
-61	131-0621-00		17	CONTACT, ELEC: 0	.577"L,22-26 AWG WIRE	22526	46231

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FIG. 1 EXPLODED

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5403 POWER SUPPLY/AMPLIFIER MODULE



Fig. & Index No.	Tektronix Serial/Model No Part No. Eff Dscon	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
2-1	200-0728-04	1	COV, HANDLE END: FRONT	80009	200-0728-04
-2	200-0728-00	1	COV, HANDLE END: REAR	80009	200-0728-00
-3	367-0116-00	1	HANDLE, CARRYING:	80009	367-0116-00
			(ATTACHING PARTS)		
-4	212-0597-00	4	SCREW, MACHINE: 10-32 X 0.50 INCH, STL	80009	212-0597-00
-5	386-1624-00	2	PL, RET., HANDLE:	80009	386-1624-00
-6	386-1283-00	2	PLATE, HDL MTG: PLASTIC	80009	386-1283-00
-7	390-0193-00	1	COVER SCOPE · LEET	80009	390-0193-00
	214-0812-00	4	FASTENER PAWL:	80009	214-0812-00
		_	EACH FASTENER INCLUDES:	00000	EET COLL CO
-8	386-0226-00	1	PL.LATCH LKG.FOR 0.080 INCH THICKNESS	80009	386-0226-00
-9	386-0227-00	1	PL.LATCH INDEX:	80009	386-0227-00
-10	214-0604-00	ī	WASH SPG TNSN:0.26 TD X 0.47 INCH OD	80009	214-0604-00
-11	214-0603-01	1	PIN SECURING:0.27 INCH LONG	80009	214-0603-01
-12	390-0192-00	ĩ	COVER. SCOPE : RIGHT	80009	390-0192-00
	214-0812-00	2	FASTENER PAWL:	80009	214-0812-00
		2	(EACH FASTENER INCLUDES)	00000	LLI OOLD OO
-13	386-0226-00	1	PL,LATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-14	386-0227-00	1	PL.LATCH INDEX:	80009	386-0227-00
-15	214-0604-00	1	. WASH. SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-16	214-0603-01	1	PIN. SECURING: 0.27 INCH LONG	80009	214-0603-01
-17	390-0190-00	1	COVER SCOPE BOTTOM	80009	390-0190-00
	214-0812-00	4	FASTENER PAWL:	80009	214-0812-00
			(EACH FASTENER INCLUDES)	00000	EFI OOTE OO
-18	386-0226-00	1	PLATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-19	386-0227-00	1	PL.LATCH INDEX:	80009	386-0227-00
-20	214-0604-00	1	WASH. SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-21	214-0603-01	1	PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
-22	348-0073-00	2	. SPT PIVOT, FLIP: LEFT FRONT AND RIGHT REAR (ATTACHING PARTS FOR EACH)	80009	348-0073-00
-23	211-0532-00	2	. SCREW, MACHINE: 6-32 X 0.75 INCH, FILH STL	83385	OBD
-24	210-0457-00	2	. NUT.PLAIN.EXT W:6-32 X 0.312 INCH.STL	83385	OBD
		_	*		
-25	348-0208-00	2	. FOOT, CABINET: LEFT FRONT AND RIGHT REAR	80009	348-0208-00
-26	348-0074-00	2	. SPT PIVOT,FLIP:RIGHT FRONT AND LEFT REAR (ATTACHING PARTS FOR EACH)	80009	348-0074-00
-27	211-0532-00	2	. SCREW, MACHINE: 6-32 X 0.75 INCH, FILH STL	83385	OBD
-28	210-0457-00	2	. NUT, PLAIN, EXT W:6-32 X 0.312 INCH, STL	83385	OBD
-29	348-0207-00	2	. FOOT, CABINET: RIGHT FRONT AND LEFT REAR	80009	348-0207-00
-30	348-0275-00	1	FLIPSTAND, CAB.: (ATTACHING PARTS FOR EACH SPACER)	80009	348-0275-00
-31	212-0105-00	2	SCREW, MACHINE: 8-32 X 0.312 INCH, HH, STL	80009	212-0105-00
-32	212-0008-00	2	SCREW, MACHINE: 8-32 X 0.312 INCH, PNH STL	83385	OBD
-33	210-0008-00	2	WASHER,LOCK:INTL,0.172 ID X 0.331"OD,STL	78189	1208-00-00-0541C
-34	361-0388-00	2	SPACER, PLATE:	80009	361-0388-00
-35	343-0256-00	2	RTNR BLK, SCOPE:	80009	343-0256-00
-36	211-0531-00	2	(ATTACHING PARTS FOR EACH) SCREW.MACHINE:6-32 X 0.375.FIL.STL	83385	OBD
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Fig. &				
Index	Tektronix	Serial/Model	No.	0

Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
3-1	351-0195-00		1	SLIDE, DWR, EXT: PAIR	06666	C719
-2	351-0104-00		1	SLIDE SECT, DWR: PAIR	80009	351-0104-00
				(ATTACHING PARTS)		
-3	212-0004-00	1	6	SCREW, MACHINE: 8-32 X 0.312 INCH, PNH STL	83385	OBD
	210-0858-00		6	WASHER,FLAT:0.500 OD X 0.171 ID X 0.063 THK	80009	210-0858-00
-4	407-0899-03	i	1	BRACKET, RACK MT:RIGHT (ATTACHING PARTS)	80009	407-0899-03
-5	212-0040-00	1	2	SCREW, MACHINE: 8-32 X 0.375 100 DEG, FLH STL	83385	OBD
-6	407-0899-00		1	BRACKET,RACK MT:LEFT (ATTACHING PARTS)	80009	407-0899-00
-7	212-0040-00	1	2	SCREW, MACHINE: 8-32 X 0.375 100 DEG, FLH STL	83385	OBD
-8	390-0191-00		1	COVER, SCOPE:RIGHT	80009	390-0191-00
	214-0812-00	l.	2	. FASTENER, PAWL:	80009	214-0812-00
				(EACH FASTENER INCLUDES)		
-9	386-0226-00		1	PL, LATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-10	386-0227-00		1	PL, LATCH INDEX:	80009	386-0227-00
-11	214-0604-00		1	WASH., SPG TNSN: 0.26 ID X 0.47 INCH OD	80009	214-0604-00
-12	214-0603-01	e de la companya de l	1	PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
-13	390-0194-00		1	COVER, SCOPE:LEFT	80009	390-0194-00
	214-0812-00		2	. FASTENER, PAWL:	80009	214-0812-00
				(EACH FASTENER INCLUDES)	2 x 12 2 12	
-14	386-0226-00	6	1	PL, LATCH LKG: FOR 0.080 INCH THICKNESS	80009	386-0226-00
-15	386-0227-00		1	PL, LATCH INDEX:	80009	386-0227-00
-16	214-0604-00		1	WASH., SPG TNSN: 0.26 ID X 0.47 INCH OD	80009	214-0604-00
-17	214-0603-01		1	PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
-18	390-0222-00	1	2	COVER, SCOPE: BOTTOM	80009	390-0222-00
	214-0812-00		4	. FASTENER, PAWL:	80009	214-0812-00
				(EACH FASTENER INCLUDES)		
-19	386-0226-00		1	PL, LATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-20	386-0227-00	i.	1	PL, LATCH INDEX:	80009	386-0227-00
-21	214-0604-00		1	WASH., SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-22	214-0603-01		1	PIN, SECURING: 0.27 INCH LONG	80009	214-0603-01
				(ATTACHING PARTS FOR SPACER)		
-23	212-0103-00		6	SCREW, MACHINE: 8-32 X 0.375 HEX HD, STL	77250	OBD
-24	210-0008-00		10	WASHER,LOCK:INTL,0.172 ID X 0.331"OD,STL	78189	1208-00-00-0541C
-25	361-0389-00		1	SPACER, PLATE:	80009	361-0389-00

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FIG. 3 RACKMOUNT CABINET

5403 POWER SUPPLY/AMPLIFIER MODULE

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
	070-1449-00		1	MANUAL, TECH:	INSTRUCTION (NOT SHOWN)	80009	070-1449-00

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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 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108 111	PG 501 - 5 V output pulse; 3.5 ns Risetime. PG 501 - Risetime less than 3.5 ns; 8 ns Pretrigger pulse delay	108 - 10 V output pulse; 1 ns Risetime. 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger Pulse delay.
114 115	PG 501 - ±5 V output. PG 501 - Does not have Paired, Burst, Gated, or Delayed pulse mode; ±5 V dc Offset. Has ±5 V output.	 114 - ±10 V output. Short proof output. 115 - Paired, Burst, Gated, and Delayed pulse mode; ±10 V output. Short-proof output.
PG 502 replaces 107		
108 111	PG 502 - 5 V output PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay.	108 - 10 V output. 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay.
114 115	PG 502 - ±5 V output PG 502 - Does not have Paired, Burst, Gated, Delayed & Undelayed pulse mode; Has ±5 V output.	 114 - ±10 V output. Short proof output. 115 - Paired, Burst, Gated, Delayed & Undelayed pulse mode; ±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 out- put, 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 alter- nately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz. SG 503 - Frequency range 250 kHz to 250 MHz.	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 μ 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. Sine- wave available at 5, 2, and 1 ns.	181 - Marker outputs, 1, 10, 100, 1000, and 10,000 μs, plus 10 ns sinewave.
184	TG 501 - Marker outputs, 5 sec to 1 ns. Sine- wave 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 μs. 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 μs.
2901	TG 501 - Marker outputs, 5 sec to 1 ns. Sine- wave 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 μ s. Sinewave available to 50, 10, and 5 ns. Separate trigger pulses, from 5 sec to 0.1 μ s. Multiple time-marks can be gene- rated 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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