NOTE

The 5110 Oscilloscope formerly was known under another nomenclature, the 5103N/D10. This manual contains information that applies to all of these instruments.

TEKTRONIX®

5110 OSCILLOSCOPE

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INSTRUCTION MANUAL

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TABLE OF CONTENTS

OPERATING INSTRUCTIONS TABLE OF CONTENTS

SECTION 1	OPERATING INSTRUCTIONS	Page
		1-1
	Oscilloscope Features	1-1
	Safety Information	1-1
	OPERATING POWER	1-1
	OPERATING TEMPERATURE	1-1
	PLUG-IN UNITS	1-2
	Installation	1-2
	Selection	1-2
	CONTROLS AND CONNECTORS	1-2
	FIRST TIME OPERATION	1-2
	CHECKOUT PROCEDURE	1-4
	GENERAL OPERATING INFORMATION	1-5
	Intensity Control	1-5
	Display Focus	1-5
	Trace Alignment	1-5
	Beam Finder	1-5
	Graticule	1-5
	Calibrator Signal	1-5
	Intensity Modulation	1-6
	X-V Operation	1-6
	Poster Display	1-6
	Option 7 Boar Banel Signal Outpute	1_6
	Dianlau Photography	1.0
	Display Photography	1-0
	Visitial Diaday Made	1-0
		1-7
	BASIC OSCILLOSCOPE APPLICATIONS	1-7
	Peak-to-Peak voltage measurements—AC	1-7
	Instantaneous voltage measurement—DC	1-8
	Time Deried Measurements	1-9
	Determining Frequency	1-10
	Determining Frequency	1-11
	Time Difference Measuremente	1-11
	Multi-trace Phase Difference Measurement	1-12
	High Resolution Phase Measurement	1-13
	X-Y Phase Measurements	1_14
		1 14
SECTION 2	SPECIFICATION AND PERFORMANCE CHECK	
	SPECIFICATION	2-1
	ELECTRICAL CHARACTERISTICS	2-1
	ENVIRONMENTAL CHARACTERISTICS	2-3
	PHYSICAL CHARACTERISTICS	2-4
	POWER TO EXTERNAL EQUIPMENT	2-4
	PERFORMANCE CHECK	2-5
	PERFORMANCE CHECK INTERVAL .	2-5
	TEST EQUIPMENT REQUIRED	2-5
	SPECIAL TEST EQUIPMENT	2-5
	PRELIMINARY PROCEDURE FOR PERFORMANCE CHECK	2-6
	PERFORMANCE CHECK PROCEDURE	2-7

TABLE OF CONTENTS (cont)

SERVICING INSTRUCTIONS TABLE OF CONTENTS

WARNING

The remaining portion of this Table of Contents lists servicing instructions that expose personnel to hazardous voltages. These instructions are for qualified service personnel only. To avoid personal injury, do not perform any servicing other than that contained in Operating Instructions unless you are qualified to do so.

	F	age'
SECTION 3	ADJUSTMENT	-
	Introduction Tektronix Field Service Test Equipment Required PRELIMINARY PROCEDURE FOR ADJUSTMENT Initial Control Settings ADJUSTMENT PROCEDURE	3-1 3-1 3-2 3-2 3-2 3-3
SECTION 4	MAINTENANCE	
	PREPARATION FOR USE AND RESHIPMENT DETAILED OPERATING POWER INFORMATION Power Cord Information Line-Voltage and Regulating-Range Selection INSTRUMENT CONVERSION RACKMOUNTING Mounting Method Mounting Method Rack Dimensions Installing The Slide-Out Tracks Installing The Slide-Out Tracks Installation and Adjustment Slide-Out Track Maintenance Ventilation Requirements REPACKAGING FOR RESHIPMENT PREVENTIVE MAINTENANCE CABINET REMOVAL CLEANING Exterior Interior Switch Contacts VISUAL INSPECTION LUBRICATION Cam Switch Lubrication SEMICONDUCTOR CHECKS PERFORMANCE CHECK AND ADJUSTMENT INTERVAL TROUBLESHOOTING TROUBLESHOOTING AIDS Diagrams Circuit-Board Illustrations Wiring Color Code Semiconductor Basing MultI-Pin Connector Holders TROUBLESHOOTING GTECHNIQUIES	4-1 4-1 4-1 4-2 4-3 4-3 4-3 4-3 4-3 4-3 4-6 4-6 4-6 4-6 4-6 4-7 4-7 4-7 4-7 4-7 4-7 4-7 4-7 4-7 4-7 4-8 4-8 4-8 4-8 4-8 4-8 4-9 4-10 4-9 4-10 4-9 4-10
	Troubleshooting Procedure	4-10

TABLE OF CONTENTS (cont)

SECTION 4	MAINTENANCE (cont)	ge
	CORRECTIVE MAINTENANCE 4-1 OBTAINING REPLACEMENT PARTS 4-1 Standard Parts 4-1 Special Parts 4-1 Ordering Parts 4-1 Ordering Parts 4-1 SOLDERING TECHNIQUES 4-1 COMPONENT REMOVAL AND REPLACEMENT 4-1 Semiconductor Replacement 4-1 Switch Replacement 4-1 Circuit Board Replacement 4-1 Circuit-Board Pin Replacement 4-1 Cathode-Ray Tube Replacement 4-1 Power Transformer Replacement 4-1 ADJUSTMENT AFTER REPAIR 4-1 MODIFICATIONS TO PRE-OPTION 7 AMPLIFIER 4-1 PLUG-INS (OPTION 7 ONLY) 4-1	1111223334456666666
SECTION 5		
	BLOCK DIAGRAM DESCRIPTION 5-1 INTERFACE 5-1 Clock Generator 5-1 Countdown Circuit 5-1 Vertical Amplifier 5-2 Horizontal Amplifier 5-2 AUXILIARY BOARD 5-2 VERTICAL AND HORIZONTAL DEFLECTION AMPLIFIERS 5-2 Vertical Deflection Amplifier 5-2 Horizontal Deflection Amplifier 5-2 Vertical Deflection Amplifier 5-2 Vertical Deflection Amplifier 5-2 Ream Finder 5-2 X-Y Phasing 5-2 Z-Axis Amplifier 5-3 High-Voltage Regulator 5-3 High Voltage Outputs 5-3 Crt Control Circuits 5-3 LOW-VOLTAGE POWER SUPPLY AND CALIBRATOR 5-4 Power Input 5-4 Low-Voltage Regulators 5-4 Low-Voltage Regulators 5-4 Low-Voltage Regulators 5-4 Low-Voltage Rectifiers and Unregulated Outputs 5-4 Low-Voltage Regulators 5-4 Line Trigger 5-4 Calibrator 5-4 <td></td>	
SECTION 6	REPLACEABLE ELECTRICAL PARTS	
	INSTRUMENT OPTIONS	
SECTION 7	DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS	
SECTION 8	REPLACEABLE MECHANICAL PARTS	
CHANGE INFOR	MATION AND TEST EQUIPMENT REPLACEMENT	



Fig. 1-1. 5110 Oscilloscope.

OPERATING INSTRUCTIONS

This instruction manual provides both operating and servicing information for the 5110 Oscilloscope. The manual is divided into nine sections. Operating, specification, and performance check information is covered in the first two sections, and is intended for operating and service personnel. Servicing information is covered in the remaining sections of the manual, and is intended for qualified service personnel only.

PRELIMINARY INFORMATION

Oscilloscope Features

The oscilloscope is a solid state, light weight instrument designed for general-purpose measuring applications. This instrument has three plug-in compartments that accept plug-in units to form a complete measurement system. The two-plug-in compartments on the left are connected to the vertical deflection system. The right plug-in compartment is connected to the horizontal deflection system. Electronic switching between the vertical plug-in compartments allows a multitrace vertical display. The flexibility of this plug-in feature and the variety of plug-in units available allow this system to be used for many measurement applications.

This instrument features a large-screen, 8 X 10 division display; each division equals 0.5 inch (1.27 centimeter). Regulated dc power supplies ensure that performance is not affected by variations in line voltage and frequency, or by changes in the load due to the varying power requirements of the plug-in units.

Safety Information

This instruction manual contains warning information which the user must follow to ensure safe operation of the instrument. Warning information is intended to protect the operator and Caution information is intended to protect the instrument.



High voltage is present inside the instrument. To avoid electric-shock hazard, operating personnel must not remove the protective instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

OPERATING POWER

This instrument can be operated from either a 120-volt or 240-volt nominal line-voltage source, 48 to 440 hertz. In addition, three regulating ranges are provided for each nominal line-voltage source.



To prevent damage to the instrument, always check the line-voltage information recorded on the rear panel before applying power to the instrument.



This instrument is intended to be operated from a single-phase earth-referenced power source having one current-carrying conductor (the Neutral Conductor) near earth potential. Operation from power sources where both current-carrying conductors are live with respect to earth (such as phase-to-phase on a three-wire system) is not recommended, since only the Line Conductor has over-current (fuse) protection within the instrument.

This instrument has a three-wire power cord with a polarized two-pole, three-terminal plug for connection to the power source and safety-earth. The safety-earth terminal of the plug is directly connected to the instrument frame. For electric-shock protection, insert this plug only in a mating outlet with a safety-earth contact.

Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Before making external connections to this instrument, always ground the instrument first by connecting the power-cord to a proper mating power outlet.

OPERATING TEMPERATURE

The instrument 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 oscilloscope is designed to accept up to three Tektronix 5000-series plug-in units (use only "N" suffix plug-in units unless otherwise specified). 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 should not 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 oscilloscope is adjusted in accordance with the adjustment procedure given in this 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 plug-in unit manual for verification procedure.

Selection

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

NOTE

Use only "N" suffix plug-in units with the oscilloscope unless otherwise specified. To produce a single-trace display, install a singlechannel vertical unit (or dual-channel unit set for singlechannel 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; however, if used in the right vertical (center) compartment, internal triggering is provided.

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.

CONTROLS AND CONNECTORS

Controls and connectors necessary for operation of the oscilloscope are located on the front and rear panels of the instrument. To make full use of the capabilities of this instrument, the operator should be familiar with the function and use of each external control and connector. A brief description of the controls and connectors is given here. More detailed information is given under General Operating Information (later in this section). See Fig. 1-2 for the location and description of the controls and connectors.

FIRST TIME OPERATION

The following procedure provides an operational checkout as a means of verifying instrument operation and basic calibration without removing the cabinet or making internal adjustments. Since it demonstrates the use of front-panel controls and connectors, it can also be used to provide basic training on the operation of this instrument. If recalibration of the oscilloscope or plug-ins appears to be necessary, refer the instrument system to qualified service personnel. If more familiarization with a plug-in unit is needed, see the instruction manual for the appropriate plug-in unit. Refer to Fig. 1-2 for the oscilloscope control and connector locations.



Fig. 1-2. Front-and rear-panel controls and connectors.

CHECKOUT PROCEDURE

1. For the following procedure, an amplifier plug-in should be in one of the vertical (left or center) plug-in compartments and a time-base plug-in should be in the horizontal (right) compartment.

2. Set the POWER switch to off (pushed in) and connect the oscilloscope to a power source that meets the voltage and frequency requirements of this instrument.

3. Turn the INTENSITY control counterclockwise and pull the POWER switch out to turn the instrument on.

Initial Control Settings

Set the front-panel controls as follows:

NOTE

Titles for external controls of the oscilloscope are capitalized in this procedure (e.g. INTENSITY, POWER).

AMPLIFIER PLUG-IN

Display	On
Position	Centered
Volts/Div	.1
Volts/Div Cal	Fully clockwise
Input coupling	dc

TIME-BASE PLUG-IN

Display	Chop
Position	Centered
Seconds/Div	2 ms
Seconds/Div Cal	Fully clockwise
Swp Mag	Off
Triggering	+ Slope, Auto Trig,
	ac Coupl
Triggering Source	Composite

Intensity Adjustment

4. Advance the INTENSITY control until the trace is at the desired viewing level. Set the trace near the graticule center line.

Focus Adjustment

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

Trace Alignment Adjustment

6. If a free-running trace is not parallel with the horizontal graticule lines, set the TRACE ROTATION control (rear-panel adjustment) as follows: Position the trace to the center horizontal line and adjust the TRACE ROTATION control so that the trace is parallel with the horizontal graticule lines.

Calibration Check

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

8. Set the time-base unit triggering level for a stable triggered display. Adjust the vertical and horizontal position controls so that the display is centered vertically and starts at the left edge of the graticule.

9. The display should be four divisions in amplitude with approximately 2.5 complete cycles over 10 divisions (for 60-hertz line frequency) shown horizontally. An incorrect display indicates that the Oscilloscope or plug-ins need to be recalibrated.

Beam Finder Check

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

11. 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. Disconnect the 1X probe or test lead.

External Intensity Input

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

13. 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 signal input waveform.

14. Disconnect the signal setup.

This completes the checkout procedure for the oscilloscope. Instrument operations not explained here, or operations that need further explanation, are discussed under General Operating Information.

GENERAL OPERATING INFORMATION

Intensity Control

The setting of the INTENSITY control may affect the correct focus of the display. Slight adjustment of the FOCUS control may be necessary when the intensity level is changed. To protect the crt phosphor, do not turn the INTENSITY control higher than necessary to provide a satisfactory display.



Damage to the crt phosphor can occur under adverse conditions. Avoid any condition where an extremely bright, sharply focused spot exists on the crt.

Apparent trace intensity can be improved by reducing the ambient light level or using a viewing hood. Also, be careful that the INTENSITY control is not set too high when changing the time-base unit sweep rate from a fast to a slow sweep rate, or when changing to the X-Y mode of operation.

Display Focus

If a well-defined display cannot be obtained with the FOCUS control, even at low INTENSITY control settings, re-setting of the internal astigmatism adjustment may be required (adjustment must only be made by qualified service personnel).

To check for proper setting of the astigmatism adjustment, slowly turn the FOCUS control through the optimum setting with a signal displayed on the crt screen. If the astigmatism adjustment 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 Allgnment

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

Beam Finder

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

1. Press the BEAM FINDER switch, hold it in, then increase the vertical and horizontal deflection factors until the display is within the graticule area.

2. Adjust the vertical and horizontal position controls to center the display about the vertical and horizontal centerlines.

3. Release the BEAM FINDER switch; the display should remain within the viewing area.

Graticule

The graticule of the oscilloscope is marked on the inside of the faceplate of the crt providing accurate, noparallax measurements. The graticule is divided into eight vertical and ten horizontal divisions; each division is 0.5inch (1.27 centimeters) square. In addition, each major division is divided into five minor divisions. The vertical gain and horizontal timing of the plug-in units are calibrated to the graticule so accurate measurements can be made from the crt.

When making time measurements from the graticule, the center eight divisions provide the most accurate time measurements. Position the start of the timing area to the second vertical graticule line and set the time-base unit so the end of the timing area falls between the second and tenth vertical graticule lines.

Calibrator Signal

The internal calibrator of the oscilloscope 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.

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 ±50 volts. Usable frequency range of the Z-Axis circuit is dc to one 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.

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 oscilloscope 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.

Another method of obtaining an X-Y display is to install amplifier units in vertical and horizontal compartments (check amplifier unit gain as given in the amplifier unit instruction manual to obtain calibrated horizontal deflection factors). This method provides the best X-Y display, particularly if two identical amplifier units are used, since both the X and Y input systems will have the same delay time, gain characteristics, input coupling, etc.

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 sawtooth signals, and is accomplished by installing a 5Bseries 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.

Option 7 Rear Panel Signal Outputs

Option 7 provides cathode-ray tube-related signals to standard connectors at the rear of the instrument. This option is particularly well suited for use in the physical life sciences. By using differential amplifiers, the oscilloscope can become a signal conditioner for other devices. Outputs may be used for driving counters or X-Y plotters in conjunction with the oscilloscope.

Display Photography

A permanent record of the crt display can be obtained with an oscilloscope camera system (see the current Tektronix catalog for a complete listing of oscilloscope cameras and mounting adapters). The instruction manuals for the Tektronix oscilloscope cameras include complete instructions for obtaining waveform photographs.

The crt bezel of the oscilloscope provides integral mounting for a Tektronix oscilloscope camera. However, no voltage is provided at the bezel for camera power. The camera selected for use with the oscilloscope may require battery operation.

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.

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 plugins 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 plugins 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.

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, alternatemode 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 millisecond/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 oscilloscope 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 timebase. This results in two displays that have completely independent vertical deflection and chopped or alternate sweep switching.

BASIC OSCILLOSCOPE APPLICATIONS

The 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.

John D. Lenk, "Handbook of Oscilloscopes, Theory, and Application", Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1968.

J. Czech, "Oscilloscope Measuring Techniques", Springer-Verlag, New York, 1965.

J.F. Golding. "Measuring Oscilloscopes", Transatlantic Arts, Inc., 1971.

Charles H. Roth Jr., "Use of the Oscilloscope", A programmed Text, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1970.

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.

Operating Instructions-5110

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 Seconds/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. 1-3).

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.

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.



Fig. 1-3. Measuring peak-to-peak voltage of a waveform.

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 Postion 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 dc level is to be measured. For example, in Fig. 1-4 the measurement is made between the reference line and point A.



Fig. 1-4. Measuring instantaneous dc voltage with respect to a reference voltage.

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 _	4.6 、	, 2	_	+9.2
Voltage 👘 🗏	(divisions)	(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 Seconds /Div switches. This is useful for comparing signals to a reference voltage amplitude or period. To establish a new set of deflection factors based on 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 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	=	reference signal amplitude (volts)			
Factor		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.

Modified		Volte/Div		Deflection
Deflection	=	VUI(S/DIV	х	Conversion
Factor			setting	

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

Signal = Modified Deflection X (divisions)

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:

(2 V) (1.5) = 3 volts/division

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):

Sweep Rate

1. Apply a reference signal of known frequency to the vertical input connector. Using the Seconds/Div switch and variable Seconds/Div control, adjust the display so that one cycle of the signal covers an exact number of horizontal divisions. Do not change the variable Seconds/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 Seconds/Div switch. This is the Deflection Conversion Factor.

Deflection	reference signal peri	od (seconds)
Conversion	=	
Factor	horizontal	Sec/Div
	deflection X	switch
	(divisions)	setting

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

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

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

Modified	Л	Seconds/Div		Deflection	
Deflection		\cong	Seconds/Div	х	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 Seconds/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 Seconds/Div switch setting of 50 μ s, the Modified Deflection Factor (step 5) is:

(50 μ 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 Seconds/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. 1-5.



Fig. 1-5. Measuring time duration (period) between points on a waveform.

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 Seconds/Div control is in the Cal position.

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

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

horizontal Sec/Div Period = distance x 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. 1-5, which has a period of 0.5 millisecond is:

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

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 Seconds/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. 1-6).



Fig. 1-6. Measuring risetime.

Operating Instructions-5110

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 Seconds/Div control is in the Cal position.

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

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

Using the period formula to find risetime:

Risetime period = $\frac{\text{horizontal}}{(\text{divisions})} = \frac{\text{Sec/Div}}{\text{switch}} = (4) (1 \ \mu\text{s}) = 4 \ \mu\text{s}$

The risetime is 4 microseconds.

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 Seconds/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. 1-7).

Time Difference Measurements

When used in conjunction with a calibrated time-base plug-in unit, the multi-trace feature of the 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 lowfrequency 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).



Fig. 1-7. Measuring time difference between two pulses.

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

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

Time Sec/Div horizontal Detay switch X distance = $(50 \ \mu s) (4) = 200 \ \mu s$ setting (divisions)

The time delay is 200 microseconds.

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 follow-ing 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 lowfrequency 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 Seconds/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 Seconds/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. 1-8). Each division of the graticule represents 45° of the cycle (360° \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. 1-8. Use the formula:

Phase horizontal sweep rate Difference = difference X (degrees/ = (0.6) (45°)=27° (divisions) division)

The phase difference is 27°.



Fig. 1-8. Measuring phase difference.

High Resolution Phase Measurement

More accurate dual-trace phase measurements can be made by increasing the sweep rate (without changing the variable Seconds/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.

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. Figure 1-9 shows the same signals as used in Figure 1-8, but with the Swp Mag button pushed in. With a horizontal difference of six divisions the phase difference is:

		borizontal		magnified		
Phase Difference	=	difference (divisions)	x	sweep rate (degrees/	(6)	(4.5°)=27°
				uivisioni		

The phase difference is 27°.



Fig. 1-9. High-resolution phase difference measurement with increased sweep rate.

X-Y Phase Measurements

The X-Y phase measurement method can also be used to measure the phase difference between two signals of the same frequency. The phase angle is determined from the Lissajous pattern as outlined in the following steps:

1. Insert an amplifier plug-in unit into one of the vertical plug-in compartments and an amplifier of the same type into the horizontal plug-in compartment.

2. Set each amplifier unit input coupling switch to dc, and set the position controls of the selected X and Y channels for a spot display at graticule center.

3. Connect low-frequency sine-wave signals of the same frequency to the selected X and Y inputs.

4. Advance the INTENSITY control until the display is at the desired viewing level. Set the amplifier deflection factors and variable Volts/Div controls for six divisions of vertical and horizontal deflection, and set the position controls to center the display on the graticule as shown in Fig. 1-10.

5. Measure and record the overall vertical deflection (A) and the opening of the Lissajous display (B), measuring vertically at the graticule horizontal center line (see Fig. 1-10).

6. Divide B by A to obtain the trigonometric sine of the phase angle difference between the two signals. Obtain the phase angle from a trigonometric table to determine the phase angle between the X and Y signals. If the display appears as a diagonal straight line, the two signals are either in phase (tilted upper right to lower left), or 180° out of phase (tilted upper left to lower right). If the display is a circle, the signals are 90° out of phase. Fig. 1-11 shows the Lissajous displays produced between 0° and 360°. Notice that above 180° phase shift, the resultant display is the same as at some lower angle.

EXAMPLE: Assume a display as shown in Fig. 1-10 where A is 6 divisions and B is 0.4 division.



Fig. 1-10. Phase difference measurement from an X-Y display.

Using the formula:

From the trigonometric tables:

$$\Phi = \arcsin 0.0667 = 3.82^{\circ}$$

Sin
$$\Phi$$
 = $\frac{B}{A}$ = $\frac{0.4}{6}$ = 0.0667

The phase angle difference between the X and Y signals is 3.82° .



Fig. 1-11. Phase of a Lissajous display. (A) 0° or 360°, (B) 30° or 330°, (C) 90° or 270°, (D) 150° or 210°, and (E) 180°.

SPECIFICATION AND PERFORMANCE CHECK

SPECIFICATION

The following electrical characteristics are valid only if the instrument has been calibrated at an ambient temperature between $+20^{\circ}$ C and $+30^{\circ}$ C, the instrument is operating at an ambient temperature between 0° C and $+50^{\circ}$ C (unless otherwise noted), and each plug-in must be operating (fully installed) in a calibrated system. Items listed in the Performance Requirements column of the Electrical Characteristics are verified by completing the Performance Check in this manual. Items listed in the Supplemental Information column are not verified in this manual; they are either explanatory notes or performance characteristics for which no limits are specified.

ELECTRICAL CHARACTERISTICS

Table 2-1

VERTICAL AMPLIFIER

Characteristics	Performance Requirements	Supplemental Information
Input Signal Amplitude (Differential Input)		50 mV/displayed division.
Bandwidth	Dc to at least 2 MHz with a calibrated 5A18N.	
Channel Switching Chop Time Segment/Channel		Approximately 5 μ s (~3 μ s displayed, ~2 μ s blanked).
Mainframe Compartment Chop Switching Sequence		Left, left, center, center
Amplifier Channel Chop Switching Sequence		2 channel amplifier: Ch 1, Ch 2 4 channel amplifier: Ch 1, Ch 2, off, off, Ch 3, Ch 4, off, off
Alternate Frequency	Sweep rate (once each sweep).	
Mainframe Compartment Alternate Rate	One-half sweep rate (once every two sweeps).	
Amplifier Channel Alternate Rate	One-fourth sweep rate (once every four sweeps).	
Signal Outputs (Option 7)		
Left Out, Center Out Signals	Crt-related vertical signals	Derived from interface signal output pins
Sensitivity	0.5 V/crt div, ±3% into ≥100 kΩ	
DC Offset		±500 mV max
Output Impedance	Approximately 1 kΩ	
Dynamic Range		±4 V max
Amplifier Bandwidth	≥500 kHz up to ±2 V output into ≤50 pF	
Common Mode Rejection Ratio		≥28 dB at 1 kHz
Noise and Chop Breakthrough	≤100 mV at each output connector	

^a If excessive noise and chop breakthrough occur, refer to Modifications To Pre-Option 7 Amplifler Plug-Ins in Section 4 Maintenance.

Specification and Performance Check-5110

	Performance	Supplemental	
Characteristics	Requirements	Information	
Input Signal Amplitude (Differential Input)		50 mV/displayed division.	
Horizontal Centering		0.5 division or less.	
Bandwidth	Dc to at least 2 MHz with a calibrated 5A18N.		
X-Y Phase Difference Between Vertical and Horizontal Compartments	1° or less to 100 kHz.	Checked with two plug-ins of the same type.	
Signal Outputs (Option 7) Right Out Signal	Crt-related sweep signal	Derived from interface signal output pins	
Sensitivity	0.5 V/crt div, ±3% into ≥100 kΩ		
Polarity and Output Voltage	Positive-going ramp, ≥5 V	DC offset provided by timebase position control	
Output Impedance	Approximately 1 kΩ		
Gate Out Signal	Crt-related Z-axis signal	Selected by timebase	
Output Levels	TTL compatible	Low: Sinking 1.6 mA, \leq 0.4 V High: Supplying 40 μ A, \geq 2.4 V	
Risetime		≪1 μs into ≪50 pF	
Falltime		≤200 ns into ≤50 pF	
	Table 2-3 Z-AXIS AMPLIFIER		
Characteristics	Performance Requirements	Supplemental Information	
External Intensity Input Useful Input Voltage	+5 V will turn on display to a normal brightness level from an off level; -5 V will turn off display from a normal brightness level.		
Useable Frequency Range	Dc to 1 MHz.		
Input R and C		Approximately 10 kΩ, paralleled by approximately 40 pF.	

Table 2-2 IORIZONTAL AMPLIFIER

DISPLAY			
Characteristics	Performance Requirements	Supplemental Information	
Cathode-Ray Tube Deflection		Electrostatic.	
Phosphor		P31 standard; P7 or P11 optional.	

Table 2-4 (cont) DISPLAY		
Characteristics	Performance Requirements	Supplemental Information
Accelerating Voltage		3.5 kV.
Orthogonality		90°, within 1°.
Geometry		0.1 division or less.
Beam Finder		Limits display to within graticule area and intensifies display if brightness level is low.

Table 2-5 CALIBRATOR AND POWER INPUT

Characteristics	Performance Requirements	Supplemental Information
Calibrator		
Voltage		400 mV, within 1%.
Current		4 mA, within 1%.
Frequency		Twice the line frequency.
Power Input Line Voltage (RMS)		Nominal 100 V, 110 V, 120 V, 200 V, 220 V, 240 V ±10% (250 V maximum).
Fuse Data	- E -	1.6 A slow blow (120 V ac). 1 A slow blow (240 V ac).
Line Frequency		48 to 440 Hz.
Power Consumption		Typical: 53 W. Maximum: 75 W.
Insulation Voltage		1500 V (RMS) minimum at 50 to 60 Hz for 10 seconds duration minimum.
Ground Continuity (Between Safety Ground and Instrument)		Less than 0.1 Ω.

ENVIRONMENTAL CHARACTERISTICS

Table 2-6

ENVIRONMENTAL

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

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

Table 2-6 (cont) ENVIRONMENTAL

PHYSICAL CHARACTERISTICS

Table 2-7

PHYSICAL

Parameter	Bench Oscilloscope Rack	
Overall Dimensions Height	12.0 in. (30.5 cm).	5.2 in. (13.2 cm).
Length	20.4 in. (51.8 cm).	20.4 in. (51.8 cm). Rack depth required: 19.0 in. (48.3 cm).
Width	8.4 in (21.4 cm).	19.0 in (48.3 cm).
Net Weight	Approximately 19.1 lbs. (8.7 kg).	Approximately 23.1 lbs. (10.5 kg).
Shipping Weight	Approximately 30.0 lbs. (13.6 kg).	Approximately 39.0 lbs. (17.7 kg).
Export Weight	Approximately 45.0 lbs. (20.4 kg).	Approximately 59.0 lbs. (26.8 kg).
Finish	Anodized aluminum panel and chassis. Blue-vinyl coated cabinet.	

POWER TO EXTERNAL EQUIPMENT

With the plug-in units removed from the oscilloscope, the unused power capability of the oscilloscope power supplies may be used to operate external electronic equipment. The recommended access to the power supplies is through the Interface circuit board. Special equipment is available from Tektronix, Inc. to facilitate connection to the individual power supply voltages. Order the equipment through your local Tektronix Field Office or representative.

Table 2-8 lists the maximum current draw and interface pin assignment for only those power supply voltages recommended for operating external electronic equipment.

Table 2-8

POWER AVAILABLE TO EXTERNAL EQUIPMENT

Power Supply Voltage	Maximum Current/ Compartment	Maximum Total Current	Interface Pin No.
+200 V	10 mA	30 mA	A1
+30 V	80 mA	240 mA	A5
+5 V	130 mA	390 mA	B2
-30 V	80 mA	240 mA	B5

PERFORMANCE CHECK

Introduction

This procedure checks the oscilloscope for measurement accuracy against the tolerances listed as Performance Requirements that appear under Electrical Characteristics at the beginning of this section. If the instrument falls to meet the requirements given in this Performance Check, the Adjustment procedure (Section 3 in this manual) should be performed. The Performance Check can be used by an incoming inspection facility to determine acceptability of performance. It is not necessary to remove the instrument cabinet to perform this procedure, since all checks are made from the front panel.

The Electrical Characteristics in this section are valid only if the oscilloscope has been calibrated at an ambient temperature between $+20^{\circ}$ C to $+30^{\circ}$ C and is operating at an ambient temperature between 0° C to $+50^{\circ}$ C.

Tolerances that are specified in this Performance Check procedure apply to the instrument under test and do not include test equipment error. Limits and tolerances in this procedure are instrument performance requirements only if listed in a Performance Requirements column that appears under Electrical Characteristics at the beginning of this section; information given in the Supplemental Information column is provided for user information only, and should not be interpreted as performance requirements.

PERFORMANCE CHECK INTERVAL

To ensure instrument accuracy, check the performance of the oscilloscope every 1000 hours of operation, or every 6 months if used infrequently.

TEST EQUIPMENT REQUIRED

The following test equipment, or equivalent, is required to perform a performance check of the oscilloscope. The test equipment performance requirements listed are the minimum required to verify the performance of the equipment under test. Substitute equipment must meet or exceed the stated requirements. All test equipment is assumed to be operating within tolerance.

SPECIAL TEST EQUIPMENT

Special test equipment is used where necessary to facilitate the procedure. Most of this equipment is available from Tektronix, Inc. and can be ordered through your local Tektronix Field Office or representative.

Description	Performance Requirements	Application	Example
Amplifier Plug-in unit ⁱ	Bandwidth, dc to 2 MHz; display modes, channel 1 and dual-trace; deflection factor, 5 mV to 5 V/div.	One required for all tests. Two required for steps 6, 7, 12.	a. TEKTRONIX 5A18N Dual-Trace Amplifier.
Time-base Plug-in unit	Sweep rate, at least 2 µs/div.	Steps 1 through 11, 13, 14.	a. TEKTRONIX 5B10N Time-Base.
Calibration generator	Amplitude calibration, 5 mV to 5V; accuracy, \pm 0.25% into 1 m Ω ; output, square wave at approximately 1 kHz.	Steps 8, 10.	a. TEKTRONIX PG 506 Calibration Generator ² .
Sine-wave generator	Frequency, 50 kHz to 2 MHz; output amplitude, variable from 250 mV to 6 V into 50 Ω.	Steps 9, 11, 12, 13.	a. TEKTRONIX FG 503 Function Generator ² .

Table 2-9 LIST OF TEST EQUIPMENT REQUIREMENTS FOR PERFORMANCE CHECK

¹Two dual-trace amplifiers are required to check vertical alternate and chop operation. Two identical amplifiers are required to check x-y phase difference.

²Requires a TM 500-series power module.

Description	Performance Requirements	Application	Example
Coaxial cable	Impedance, 50 Ω; length, 42 inch; connectors, bnc.	Steps 8 through 13.	a. TEKTRONIX part 012-0057-01.
Coaxial cable	Impedance, 50 Ω, length, 18 inch; connectors, bnc.	Steps 12, 13.	a. TEKTRONIX part 012-0076-00.
1X passive probe	Compatible with 5A-series amplifiers used in the Oscilloscope.	Step 14.	a. TEKTRONIX P6101 Probe. b. TEKTRONIX P6062B Probe.
Termination	Impedance, 50 Ω; accuracy within 2%; connectors, bnc.	Steps 9, 11, 12.	a. TEKTRONIX part 011-0049-01.
Tee connector	Connectors, bnc.	Steps 12, 13.	a. TEKTRONIX part 103-0030-00.
Screwdriver	Length, 3-inch shaft; bit size, 3/32 inch.	Step 1.	a. Xcelite R3323.

Table 2-9 (cont)

LIST OF TEST EQUIPMENT REQUIREMENTS FOR PERFORMANCE CHECK

PRELIMINARY PROCEDURE FOR PERFORMANCE CHECK

1. Ensure that all power switches are off.

2. Check the rear panel of the oscilloscope to ensure the indicated line voltage and the line voltage source are the same.

3. Ensure that all test equipment is suitably adapted to the line voltage to be applied.

4. If applicable, install the TM 500-series test equipment into the test equipment power module.

5. Install a dual-trace vertical amplifier unit into the left vertical compartment of the oscilloscope.

6. Install a time-base unit into the horizontal compartment of the oscilloscope.

7. Connect the equipment under test and the test equipment to a suitable line voltage source. Turn all equipment on and allow at least 20 minutes for the equipment to stabilize.

NOTE

Titles for external controls of the oscilloscope are capitalized in this procedure (e.g. INTENSITY, POWER).

INITIAL CONTROL SETTINGS

Set the following controls during warm-up time:

OSCILLOSCOPE

INTENSITY, FOCUS	Set for well-defined trace
	and normal brightness.

AMPLIFIER PLUG-IN

On
Centered
1
Fully clockwise
dc
CH 1
CH 1

TIME BASE PLUG-IN

Display Position Seconds/Div Seconds/Div Cal Swp Mag Triggering Triggering Source Chop Centered 1 ms Fully clockwise Off + Slope, Auto Trig, ac Couple Composite

PERFORMANCE CHECK PROCEDURE

1. Check Trace Alignment

a. Position the horizontal trace over the center horizontal graticule line.

b. Check-that the trace is parallel to the graticule line.

c. Adjust—the TRACE ROTATION control (rear-panel screwdriver adjustment) to align the trace horizontally.

2. Check Geometry

a. Press the POWER switch to turn off the oscilloscope.

b. Interchange the amplifier and time-base units in their respective compartments. Pull the POWER switch to on.

c. Position the vertical trace over the center vertical graticule line, extending vertically above and below the graticule area, and set the FOCUS and INTENSITY controls for a well-defined trace.

d. Check—that vertical bowing and tilt of the trace display is less than 0.1 division at the center line and when positioned horizontally across the entire graticule area.

e. Press the POWER switch to turn off the oscilloscope and interchange the amplifier and time-base units back to their usual compartments.

f. Pull the POWER switch to on.

3. Check Beam Finder

a. Set the INTENSITY control for a dim trace.

b. Press and hold the BEAM FINDER pushbutton in, then rotate the position control of the vertical amplifier and time-base units fully clockwise and counterclockwise.

c. Check-that the display is intensified, compressed, and remains within the graticule area.

d. Release the BEAM FINDER pushbutton and return the INTENSITY control to a normal setting.

4. Check Amplifier Alternate Operation

a. Push both CH 1 and CH 2 pushbuttons in and position the traces about two divisions apart.

b. Set the time-base unit Display pushbutton to Alternate.

c. Turn the time-base Seconds/Div switch throughout its range.

d. Check—for trace alternation at all sweep rates (except in amplifier positions). At faster sweep rates, alternation is not apparent; instead, the display appears as two traces on the screen.

e. Press the POWER switch to turn off the oscilloscope and change the amplifier from the vertical compartment to the center compartment.

f. Pull the POWER switch on and repeat parts c and d of this step.

5. Check Amplifier Chop Operation

a. Set the time-base unit Display pushbutton to Chop.

b. Turn the time-base Seconds/Div switch throughout its range.

c. Check—for a dual-trace display at all sweep rates (except in amplifier positions) without alternation.

d. Press the POWER switch to turn off the oscilloscope and change the amplifier from the center compartment to the left vertical compartment.

e. Pull the POWER switch to on and repeat parts b and c of this step.

6. Check Chop Operation Between Amplifiers

a. Press the POWER switch to turn off the oscilloscope. Install a second vertical dual-trace plug-in unit in the center plug-in compartment and set its controls for dual-trace operation. Pull the POWER switch to on.

b. Turn the time-base Seconds/Div switch throughout its range.

c. Check—for two traces for each amplifier (one for each channel) at all sweep rates.

NOTE

If single-channel amplifier is used instead of the second dual-trace amplifier, the single-channel trace will appear once per sweep.

7. Check Alternate Operation Between Amplifiers

a. Set the time-base Display pushbutton to Alternate and the Seconds/Div switch to 50 ms.

b. Check—for two traces for the left amplifier (one for each channel), then two traces for the right amplifier, alternately between amplifier units.

Specification and Performance Check-5110

NOTE

If a single-channel amplifier is used instead of a second dual-trace amplifier in the right vertical compartment, the single channel trace will appear twice for each alternation between amplifier units. To check alternate operation for the right vertical compartment, press the POWER switch to turn off the oscilloscope and interchange the two vertical amplifiers in their respective compartments. Pull the POWER switch to on and check for two traces from the dual-trace amplifier in the right vertical compartment.

c. Press the POWER switch to turn off the oscilloscope.

d. Remove the vertical amplifier from the center compartment. A dual-trace amplifier should remain installed in the left vertical compartment (install if necessary).

e. Pull the POWER switch to turn on the oscilloscope.

Set the equipment controls as follows:

AMPLIFIER PLUG-IN

Display	On
CH 1 Volts/Div	1
CH 1 Cal	Fully Clockwise
CH 1 Input Coupling	dc
Trigger	CH 1
Mode	CH 1

TIME BASE PLUG-IN

Seconds/Div	1 ms
Seconds/Div Cal	Fully clockwise
Swp Mag	Off
Triggering	+ Slope, Auto Trig, ac couple
Triggering Source	Composite

8. Check Vertical Gain

a. Connect a 5 volt, 1 kilohertz square wave signal of standardized amplitude from the calibration generator to the CH 1 amplifier input, using a 42-inch coaxial cable.

b. Position the resultant 5-division display to a convenient, centered location on the graticule. Set the INTENSITY and FOCUS controls for a well-defined display of normal brightness.

c. Check—the display for a vertical deflection of 5 divisions ± 0.15 division ($\pm 3\%$).

d. Press the POWER switch to turn off the oscilloscope and remove the amplifier from the left vertical compartment and install it in the center compartment. Pull the POWER switch to on.

e. Check—the display for a vertical deflection of 5 divisions ± 0.15 division ($\pm 3\%$).

f. Disconnect the coaxial cable between the amplifier and calibration generator.

9. Check Vertical Bandwidth

a. Connect the sine-wave generator to the amplifier input with a 42-inch coaxial cable and 50 ohm termination.

b. Adjust the sine-wave generator controls for a 6division display at a frequency of 50 kHz. Center the display on the graticule.

c. Without changing the output amplitude, increase the sine-wave generator frequency until the displayed amplitude is reduced to 4.2 divisions.

d. Check-the generator for a reading of at least 2 MHz.

e. Press the POWER switch to turn off the oscilloscope and install the amplifier in the left vertical compartment. Pull the POWER switch to on.

f. Repeat parts b through d for the left vertical compartment.

g. Disconnect the coaxial cable and termination from the amplifier input connector.

10. Check Horizontal Gain

a. Press the POWER switch to turn off the oscilloscope and interchange the amplifier and the time-base units in their respective compartments. Pull the POWER switch to on.

b. Connect a 5 volt, 1 kilohertz square-wave signal of standardized amplitude from the calibration generator to the amplifier input connector, using a 42-inch coaxial cable.

c. Position the 5-division display between the second and seventh vertical graticule lines.

d. Check—the display for a horizontal deflection of 5 divisions ± 0.15 division ($\pm 3\%$).

e. Disconnect the coaxial cable between the amplifier and the calibration generator.

11. Check Horizontal Bandwidth

a. Connect the sine-wave generator to the amplifier input, using a 42-inch coaxial cable and 50 ohm termination.

b. Adjust the sine-wave generator controls for a 6division display at a frequency of 50 kHz. Position the display between the second and eighth vertical graticule lines.

c. Without changing the output amplitude, increase the sine-wave generator frequency until the displayed amplitude is reduced to 4.2 divisions.

d. Check-the generator for a reading of at least 2 MHz.

e. Disconnect the coaxial cable and termination from the amplifier input connector.

12. Check X-Y Phase Difference

a. Press the POWER switch to turn off the oscilloscope.

b. Remove the time-base unit from the vertical compartment and install the second amplifier unit in the left vertical compartment.

NOTE

Identical amplifier units should be installed in the oscilloscope.

c. Connect the sine-wave generator through a 42-inch coaxial cable, 50 ohm termination, and a tee connector, to an amplifier input. Connect an 18-inch coaxial cable from the tee connector to the other amplifier input.

d. Pull the oscilloscope POWER switch to on.

e. Set both amplifier units for a deflection factor of 1 volt/division and dc input coupling.

f. Set the sine-wave generator for a 100-kilohertz output.

g. Adjust the vertical and horizontal position controls to center the diagonal display, then adjust the sine-wave generator for a display amplitude of 6 divisions vertically and horizontally.

h. Check—the opening of the diagonal-loop display at the graticule center line is 0.07 division or less (measure horizontally). This indicates a phase difference of 1° or less between the vertical and horizontal systems. a. Press the POWER switch to turn off the oscilloscope.

b. Disconnect the coaxial cables, termination and tee connector between the amplfiers and sine-wave generator.

c. Remove the vertical amplifier from the horizontal compartment and install the time-base unit in that compartment. Pull the oscilloscope POWER switch to on.

d. Set the time-base unit for auto, internal triggering at a sweep rate of 20 μ s/division and set the amplifier for a deflection factor of 2 V/division.

e. Connect a 50 kHz sine-wave signal from the sinewave generator through a 42-inch coaxial cable and a tee connector to the amplifier input.

f. Set the amplifier and sine-wave generator controls to obtain a calibrated 10 volt reference display (5 divisions of display).

g. Set the oscilloscope INTENSITY control for a dim display.

h. Connect the signal from the output of the tee connector at the amplifier input, to the EXT INTENSITY INPUT connector on the front panel.

i. Check—the top of the waveform is intensified and the bottom portion is blanked out.

j. Temporarily disconnect the coaxial cable at only the EXT INTENSITY INPUT connector.

k. Set the time-base unit for a sweep rate of $2 \mu s$ /division, and increase the output frequency of the sine-wave generator to 1 MHz.

I. Reconnect the coaxial cable to the EXT INTENSITY INPUT connector.

m. Check—for a noticeable effect of intensification in the top portion of the displayed waveform and blanking in the bottom portion of the waveform.

n. Disconnect the coaxial cables and tee connector from the amplifier and oscilloscope.

14. Check Calibrator Signal

a. Connect the 1X probe to the CH 1 input of the amplifier. Connect the probe tip to the CALIBRATOR loop.

Specification and Performance Check-5110

b. Set the amplifier CH 1 Volts/Div switch to .1, and set the time-base sweep rate to 2 ms/division.

c. Check-the display for a vertical deflection of approximately 4 divisions.

d. Check-the display for approximately 2.5 cycles in 10 divisions (based on a line frequency of 60 Hz).

e. Disconnect the 1X probe.

This completes the Performance Check of the oscilloscope. If the instrument has performed as given in this procedure, it is correctly calibrated and within specifications.

8.11

WARNING

10

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.



ADJUSTMENT

Introduction

This adjustment procedure is to be used to restore the oscilloscope to original performance specifications. Adjustment need not be performed unless the instrument fails to meet the requirements listed in the Specification section of this manual, or the Performance Check cannot be completed satisfactorily.

Completion of all adjustment steps in this procedure ensures that the instrument will meet the performance requirements listed in the Specification section. However, to fully ensure satisfactory performance, it is recommended that the Performance Check be performed after any adjustment is made.

Tektronix Field Service

Tektronix, Inc. provides complete Instrument repair and recalibration at local Field Service Centers and the Factor Service Center. Contact your local Tektronix Field Office or representative for further information.

Test Equipment Required

The following test equipment, or equivalent, is required for complete adjustment of the oscilloscope. The test equipment performance requirements listed are the minimum necessary for accurate adjustment. Substitute equipment must meet or exceed the stated requirements. All test equipment is assumed to be operating within tolerance.

Description	Performance Requirements	Application	Example
Amplifier plug-in unit ⁱ	Bandwidth, dc to 2 MHz; deflection factor, 5 mV to 5 V/div.	One required for all tests. Two re- quired for step 13.	a. TEKTRONIX 5A15N Amplifier. b. TEKTRONIX 5A18N Dual-Trace Amplifier.
Time-base plug-in unit	Sweep rate, at least 2 μ s/div.	Steps 1 through 12.	a. TEKTRONIX 5B10N Time-Base.
Calibration generator	Amplitude calibration, 5 mv to 5 V; accuracy, $\pm 0.25\%$ into 1 M Ω ; output, square wave at approximately 1 kHz.	Steps 10 and 12.	a. TEKTRONIX PG 506 Calibration Generator. ²
Sine-wave generator	Frequency, 100 kHz; output amplitude, variable from 250 mV to 6 V into 50 Ω.	Step 13.	a. TEKTRONIX FG 503 Function Generator. ²
Digital voltmeter	Range, zero to 250 volts; accuracy, within 0.1%.	Steps 1 through 4.	a. TEKTRONIX DM 501 Digital Multimeter.2
DC voltmeter (vom) ³	Range, zero to 4000 volts; accuracy, checked to within 1% at 3400 volts.	Step 5.	a. Triplett Model 630-NA. b. Simpson Model 262.
Coaxial cable	Impedance, 50 Ω; length, 42 inch; connectors, bnc.	Steps 10, 12, and 13.	a. TEKTRONIX part 012-0057-01.

Table 3-1
LIST OF TEST EQUIPMENT REQUIREMENTS FOR ADJUSTMENT

'Two identical amplifiers are required to adjust x-y phase difference.

²Requires a TM 500-series power module.

³A high-voltage probe can be used with the DM 501 Digital Multimeter in lieu of the DC voltmeter. See the Tektronix Catalog for a list of DM 501 optional accessories.

Description	Performance Requirements	Application	Example
Coaxial cable	Impedance, 50 Ω, length, 18 inch; connectors, bnc.	Step 13.	a. TEKTRONIX part 012-0076-00.
Termination	Impedance, 50 Ω; accuracy, within 2%, connectors, bnc.	Step 13.	a. TEKTRONIX part 011-0049-01.
Tee connector	Connectors, bnc.	Step 13.	a. TEKTRONIX part 103-0030-00.
Insulated Screwdriver	Length, 1 1/2-inch shaft or longer; plastic shaft and handle with metal screwdriver tip.	Recommended for all adjustments.	a. TEKTRONIX part 003-0000-00.

Table 3-1 (cont) LIST OF TEST EQUIPMENT REQUIREMENTS FOR ADJUSTMENT

PRELIMINARY PROCEDURE FOR ADJUSTMENT

NOTE

The oscilloscope must be adjusted within an ambient temperature range of +20°C to +30°C for best overall accuracy and to meet the electrical characteristic tolerances given as Performance Requirements in the Specification section of this manual. Information given as Supplemental Information in the Specification section is provided for user information only, and should not be interpreted as Performance Requirements.

1. Remove the cabinet sides and bottom from the oscilloscope (refer to Cabinet Removal in the Maintenance section of this manual).

2. Check the rear panel of the oscilloscope to ensure that the indicated line voltage and the line voltage source are the same (refer to Operating Voltage in the Maintenance section of this manual).

3. Ensure that all test equipment is suitably adapted to the line voltage to be applied.

4. If applicable, install the TM 500-series test equipment into the test equipment power module.

Install a vertical amplifier unit into the left vertical compartment of the oscilloscope. 6. Install a time-base unit into the horizontal compartment of the oscilloscope.

7. Connect the equipment under test and the test equipment to a suitable line voltage source. Turn all equipment on and allow at least 20 minutes for the equipment to stabilize.

NOTE

Titles for external controls of the oscilloscope are capitalized in this procedure (e.g. INTENSITY, POWER). Internal adjustments are initial capitalized only (e.g. Intensity Range, Vertical Gain).

Initial Control Settings

Set the following controls during warm-up time:

OSCILLOSCOPE

INTENSITY, FOCUS Set for well defined trace and normal brightness.

AMPLIFIER PLUG-IN

Display Position Volts/Div Volts/Div Cal Input coupling On Centered 1 Fully clockwise dc
TIME-BASE PLUG-IN

Display	Chop
Position	Centered
Seconds/Div	1 ms
Seconds/Div Cal	Fully clockwise
Swp Mag	Off
Triggering	+ Slope, Auto Trig,
	ac Coupl
Triggering Source	Composite

ADJUSTMENT PROCEDURE

1. Adjust -- 30 Volt Power Supply

a. Turn over the oscilloscope to lay on its left side to gain access to the LV Power Supply circuit board.

b. Connect the digital voltmeter between the -30 V test point and ground. See Fig. 3-1 for voltage test point location.

c. Check—for a meter reading of -29.89 to -30.11 volts.

NOTE

If the -30 volt supply is within the specified tolerance, proceed with step 2. If the -30 volt adjustment is to be made, all circuits will be affected and the entire power supply adjustment procedure should be performed to verify the accuracy of the supplies.

d. Adjust—-30 V Adj R878 for a meter reading of exactly -30 volts. See Fig. 3-1 for adjustment location.

2. Adjust +30 Volt Power Supply

a. Connect the digital voltmeter between the ± 30 V test point and ground. See Fig. 3-1 for voltage test point location.

b. Check-for a meter reading of ± 29.82 to ± 30.18 volts.

NOTE

If the +30 volt supply is within the specified tolerance, proceed with step 3. If the +30 volts adjustment is to be made, all circuits will be affected and the entire power supply adjustment procedure should be performed to verify the accuracy of the supplies.

c. Adjust-+30 V Adj R858 for a meter reading of exactly +30 volts. See Fig. 3-1 for adjustment location.

3. Check Remaining Power Supply Voltages

a. Connect the digital voltmeter between the +5 V test point and ground. See Fig. 3-1 for voltage test point location.

b. Check-for a meter reading of +4.89 to +5.11 volts.

c. Connect the digital voltmeter between the +200 V test point and ground. See Fig. 3-1 for voltage test point location.

d. Check-for a meter reading of +175 to +247.5 volts.

NOTE

Ripple and regulation of the individual supplies can be checked using the procedure given under Troubleshooting Techniques in the Maintenance section of this manual.

4. Check Calibrator Output Voltage

a. Connect the digital voltmeter between the CALIBRATOR current loop on the front panel, and a ground test point. See Fig. 3-1 for ground test point location.



Fig. 3-1. Locations of power-supply test points and adjustments.

Adjustment-5110

b. Apply a ground connection (short circuit) between the junction of R885 and C890, and a ground test point. See Fig. 3-1 for the junction and ground test point locations.

c. Check—for a meter reading of +395 to +405 millivolts.

d. Disconnect the ground connection (short circuit) from the junction and ground test point.

e. Disconnect the digital voltmeter.

5. Adjust High-Voltage Power Supply

a. Press the POWER switch to turn off the oscilloscope and return the oscilloscope to its normal upright position.

b. On the rear panel of the instrument, remove the two cap nuts securing the cover over the crt socket, then remove the cover (a 5/16-inch nutdriver may be needed to remove the cap nuts).

c. Set the dc voltmeter (vom) to measure at least -4000 volts dc. Remove the insulating sleeve from the probe tip of the test lead to be used for measuring the negative voltage. Connect the voltmeter leads between a convenient chassis ground and the high-voltage test point. See Fig. 3-2 for test point location. (The high-voltage lead should be fully inserted through the crt socket cover so that the lead connects to the test point without having to hold it by hand).

d. Pull the POWER switch to turn on the oscilloscope.

e. Check—for a meter reading of -3400 volts, ± 170 volts.



Fig. 3-2. Location of high-voltage lest point.

NOTE

If the high-voltage power supply is within the specified tolerance, proceed with part g. If the adjustment is to be made, all remaining adjustments in this procedure could be affected and should be performed to verify the accuracy of all adjustments.



An insulated screwdriver must be used to adjust variable components in this instrument, especially in the high-voltage area, to prevent shorting voltages to ground and damaging the instrument.

f. Adjust—High Volts Adjust R275, using an insulated screwdriver, for a meter reading of exactly -3400 volts. See Fig. 3-3 for adjustment location.

g. Press the POWER switch to turn off the oscilloscope before disconnecting the voltmeter.

h. Disconnect the dc voltmeter and replace the cover over the crt socket, reversing the procedure given in part b of this step.

6. Adjust Intensity Range

- a. Pull the POWER switch to turn on the oscilloscope.
- b. Set the INTENSITY control fully counterclockwise.



Fig. 3-3. Locations of high-voltage, intensity, and display adjustments.

c. Set the time-base unit Seconds/Div switch to an amplifier position or for the slowest sweep rate.

d. Turn the INTENSITY control slowly clockwise and check for a visible spot display. Note that the spot appears when the control is between its 10 and 11 o'clock position. If the spot appears when the control is within the given position, proceed with step 7a.

e. Set the INTENSITY control to its 10 o'clock position.

f. Adjust—Intensity Range R245, using an insulated screwdriver, for a very dim spot display. See Fig. 3-3 for adjustment location.

7. Adjust Astigmatism

a. Set the INTENSITY control for a spot display at normal viewing level.

b. Turn the FOCUS control through its range.

c. Check—for a spot display that is nearly round in shape when defocused, and well defined when focused.

d. Adjust—Astig R286 and FOCUS control together, using an insulated screwdriver, to obtain the best definition round-spot display. See Fig. 3-3 for adjustment location.

8. Adjust Trace Alignment

a. Set the time-base unit for a sweep rate of 1 millisecond/division.

b. Set the INTENSITY control for a trace of normal brightness.

c. Position the horizontal trace over the center horizontal graticule line.

d. Check-that the trace is parallel to the graticule line.

e. Adjust—the TRACE ROTATION control (rear-panel screwdriver adjustment) to align the trace horizontally.

9. Adjust Geometry

a. Press the POWER switch to turn off the oscilloscope.

b. Interchange the amplifier and time-base units in their respective compartments. Pull the POWER switch to on.

c. Position the vertical trace over the center vertical graticule line, extending vertically above and below the graticule area, and set the FOCUS and INTENSITY controls for a well-defined trace, if necessary.

@

d. Check—that vertical bowing and tilt of the trace display is less than 0.1 division at the center line and when positioned horizontally across the entire graticule area.

e. Adjust—Geom R285 for minimum bowing and tilt of the trace display at the left and right edges of the graticule. Adjustment may have to be compromised to obtain less than 0.1 division bowing and tilt everywhere within the graticule area. See Fig. 3-3 for adjustment location.

f. Press the POWER switch to turn off the oscilloscope and interchange the amplifier and time-base units back to their usual compartments.

g. Pull the POWER switch to on and check that horizontal bowing and tilt of the trace display is less than 0.1 division at the center line and when positioned vertically across the entire graticule area.

Set the equipment controls as follows:

AMPLIFIER PLUG-IN

DisplayOnPositionCenteredVolts/Div1Volts/Div CalFully clockwiseInput Couplingdc

TIME-BASE PLUG-IN

Position	Centered
Seconds/Div	1 ms
Seconds/Div Cal	Fully clockwise
Swp Mag	Off
Triggering	+ Slope, Auto Trig,
	ac Coupl
Triggering Source	Composite

10. Adjust Vertical Gain

a. Connect a 5-volt, 1-kilohertz square-wave signal of standardized amplitude from the calibration generator to the amplifier input, using a 42-inch coaxial cable.

NOTE

Use an amplifier plug-in known to be accurately calibrated, or verify correct calibration by applying a known signal and measuring the differential output at pins A7 and B7 of the plug-in connector. The deflection factor at the output is 50 millivolts/division.

Adjustment-5110

b. Position the resultant 5-division display to a convenient, centered location on the graticule. Set the INTENSITY and FOCUS controls for a well-defined display of normal brightness.

c. Check—the display for a vertical deflection of 5 divisions, ± 0.15 division ($\pm 3\%$).

d. Adjust-Vert Gain R116 for exactly 5 divisions of deflection. See Fig. 3-4 for adjustment location.

e. Press the POWER switch to turn off the oscilloscope and remove the amplifier from the left vertical compartment and install it in the center compartment. Do not disconnect the signal from the amplifier input. Pull the POWER switch to on.

f. Check—the display for a vertical deflection of 5 divisions, ± 0.15 division ($\pm 3\%$). If necessary, readjust Vertical Gain R116 for the optimum gain setting. Compromise for both vertical compartments.

g. Disconnect the coaxial cable between the amplifier and calibration generator.

h. Press the POWER switch to turn off the oscilloscope and remove the amplifier from the center compartment and return it to the left vertical compartment. Pull the POWER switch to on.

11. Adjust Horizontal Centering

a. Set the time-base unit Swp Mag control for a magnified sweep and position the sweep start to the center vertical graticule line.

b. Return the time-base unit Swp Mag control to unmagnified sweep position.

c. Check—that the start of the unmagnified sweep is within 0.2 division of the center vertical graticule line. If the sweep start is within the given tolerance and no adjustment is to be made, proceed with step 12 a.

d. Turn over the oscilloscope to lay on its left side to gain access to the bottom of the interface board.

e. Adjust—Hor Cent R675 to set the start of the unmagnified sweep at the center vertical graticule line. See Fig. 3-5 for adjustment location.

f. Return the oscilloscope to its normal upright position.



Fig. 3-4. Locations of vertical and horizontal adjustments.



Fig. 3-5. Location of horizontal centering adjustment.

12. Adjust Horizontal Gain

a. Press the POWER switch to turn off the oscilloscope and interchange the amplifier and the time-base units in their respective compartments. Pull the POWER switch to on.

b. Connect a 5-volt, 1-kilohertz square-wave signal of standardized amplitude from the calibration generator to the amplifier input connector, using a 42-inch coaxial cable.

NOTE

Use an amplifier plug-in known to be accurately calibrated, or verify correct calibration by applying a known signal and meauring the differential output at pins A7 and B7 of the plug-in connector. The deflection factor at the output is 50 millivolts/division.

c. Position the 5-division display between the second and seventh vertical graticule lines.

d. Check—the display for a horizontal deflection of 5 divisions, ± 0.15 division ($\pm 3\%$).

e. Adjust—Hor Gain R136 for exactly 5 divisions of deflection. See Fig. 3-4 for adjustment location.

f. Disconnect the coaxial cable between the amplifier and the calibration generator.

13. Adjust X-Y Phase Difference

a. Press the POWER switch to turn off the os-cilloscope.

b. Remove the time-base unit from the vertical compartment and install a second amplifier in the left vertical compartment.

NOTE

Identical amplifier units should be installed in the oscilloscope.

c. Connect the sine-wave generator through a 42-inch coaxial cable, 50 ohm termination, and a tee connector, to an amplifier input. Connect an 18-inc coaxial cable from the tee connector to the other amplifier input.

d. Pull the oscilloscope POWER switch to on.

e. Set both amplifier units for a deflection factor of 1 volt/division and dc input coupling.

f. Set the sine-wave generator for a 100-kilohertz output.

g. Adjust the vertical and horizontal position controls to center the diagonal display, then adjust the sine-wave generator for a display amplitude of 6 divisions vertically and horizontally.

h. Check—that any opening of the diagonal-loop display at the graticule center line is 0.07 division or less (measured horizontally). This indicates a phase difference of 1° or less between the vertical and horizontal systems.

i. Adjust—Phase C116 for minimum loop opening (a straight line) in the diagonal-loop display. See Fig. 3-4 for adjustment location.

j. Press the POWER switch to turn off the oscilloscope.

k. Disconnect the coaxial cables, termination and tee connector between the amplifiers and sine-wave generator.

I. Remove the vertical amplifier from the horizontal compartment and install the time-base unit in that compartment. Pull the oscilloscope POWER switch to on. This completes the Adjustment procedure for the oscilloscope.

MAINTENANCE

This section of the manual contains information on preparation for use and reshipment, information for performing preventive maintenance, troubleshooting, and corrective maintenance for this instrument.

PREPARATION FOR USE AND RESHIPMENT

The following information provides detailed installation and operating voltage instructions for the oscilloscope.

DETAILED OPERATING POWER INFORMATION

This instrument can be operated from either a 120-volt or 240-volt nominal line-voltage source, 48 to 440 hertz. In addition, three regulating ranges are provided for each nominal line-voltage source.



To prevent damage to the instrument, always check the line-voltage information recorded on the rear panel before applying power to the instrument.

Power Cord Information

WARNING

This instrument is intended to be operated from a single-phase earth-referenced power source having one current-carrying conductor (the Neutral Conductor) near earth potential. Operation from power sources where both current-carrying conductors are live with respect to earth (such as phase-to-phase on a three-wire system) is not recommended, since only the Line Conductor has over-current (fuse) protection within the instrument.

This instrument has a three-wire power cord with a polarized two-pole, three-terminal plug for connection to the power source and safety-earth. The safety-earth terminal of the plug is directly connected to the instrument frame. For electric-shock protection, insert this plug only in a mating outlet with a safety-earth contact. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Before making external connections to this instrument, always ground the instrument first by connecting the power-cord to a proper mating power outlet.

The color coding of the cord conductors may be in accordance with the following table.

Table 4-1

POWER CORD CONDUCTOR IDENTIFICATION

Conductor	Color	Alternate Color			
Ungrounded (Line)	Brown	Black			
Grounded (Neutral)	Blue	White			
Grounding (Earthing)	Green-Yellow	Green-Yellow			

Line-Voltage and Regulating-Range Selection

This instrument can be operated from either a 120-volt or a 240-volt nominal line-voltage source with power-line frequencies of 48 to 440 hertz. In addition, three operating ranges can be selected within each nominal line-voltage source. This permits the oscilloscope transformer to operate from 100-volt, 110-volt, 120-volt, 200-volt, 220volt, and 240-volt sources. The nominal voltage and regulating range for which the instrument is currently set, is marked on the rear panel of the instrument. Before connecting the oscilloscope to line-voltage power, always check the rear panel to see if the voltage marked there complies with the expected line-voltage usage. If the voltage marked is proper, a change of line voltage or regulating range will not be necessary.

To select a different operating range, use the following procedure to obtain correct instrument operation from the line voltage available:

1. Disconnect the instrument from the power source.

2. Remove the bottom cabinet panel of the instrument (see Cabinet Removal in this section) to gain access to the LV Power Supply circuit board.

Maintenance-5110

3. In Table 4-2, select the desired regulating range for the nominal line voltage that will operate the oscilloscope. For that voltage, note the recommended primary-tap pins from Table 4-2 (note L, M, or H).

Table 4-2

REGULATING RANGE AND FUSE DATA

Primary Tap	Regulating Range			
Pins Selected	120-V Nominal (Brown Plug)	240-V Nominal (Red Plug)		
L (low)	100 V ±10%	200 V ±10%		
M (medium)	110 V ±10%	220 V ±10%		
H (high, typical setting)	120 V ±10%	240 V ±10%		
Line Fuse	1.6 A slow-blow	1 A slow-blow		

4. In the instrument, select the proper line-voltage selector block (see Fig. 4-1 for line-selector block locations). Select the brown block for 120-volt operation or select the red block for 240-volt operation. Install the block on the row of primary-tap pins noted from Table 4-2 in the previous step (either L, M, or H).



Damage to the instrument may result if the lineselector block is used incorrectly (e.g., if the 120-volt



Fig. 4-1. Locations of the line-selector blocks on the LV Power Supply circuit board.

block is used and the instrument is then connected to 240-volt power).

5. Install the unused block on the unused line-selector block pins (see Fig. 4-1 for pin location).

6. Remove the line fuse from the fuse holder and check for the correct rating. Replace it with one having the correct rating, if necessary. Refer to Table 4-2 for line fuse information.

NOTE

An unused line fuse, intended for the line-voltage source for which the oscilloscope was not set when shipped from the factory, is clipped to the LV Power Supply circuit board (see Fig. 4-1). Return the resultant unused fuse to the unused fuse clips.

7. If appropriate, change the line-cord plug to match the power source receptacle or use a suitable adapter.

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

9. Replace the bottom cabinet panel and apply power to the oscilloscope.

INSTRUMENT CONVERSION

The oscilloscope can be separated into two parts; a power supply/amplifier module, and a display module. These 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.

NOTE

Before attempting to operate the oscilloscope after an instrument conversion, be sure the module wiring interconnections are correct. If display modules have been changed, check that the correct auxiliary board is installed in the socket on the plug-in interface board.

RACKMOUNTING

The rackmount version of the 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 2 of this manual.

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 slideout 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 oscilloscope, 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 the untapped front rail as shown in Fig. 4-2A. If the front rails are tapped, and the stationary section is mounted in front of the front rail as shown in Fig. 4-2B, 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 oscilloscope 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 rack rails having this compatibility.

NOTE

1. Front and rear rails holes must be large enough to allow inserting a 10-32 screw through the rail mounting hole if the rails are untapped (see Fig. 4-2A).

2. Or, front and rear rail holes must be tapped to accept a 10-32 screw if Fig. 4-2B mounting method is used. Note in Fig. 4-2B 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. 4-2 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. 4-3 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. 4-2A 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. 4-2B 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.



Fig. 4-2. Mounting the left stationary section (with its matched intermediate section, not shown in illustrations A and B) to the rack ralls.



Fig. 4-3. Dimensional diagram.

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

(a) If the rear 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. 4-2A. 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. 4-2A 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. 4-2B. Note that the rear mounting bracket can be installed either way so the slide-out tracks will fit a deep or shallow cabinet rack stationary section. Make sure the stationary sections are horizontally aligned so they are level and parallel with each other. 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. 4-3. Using the hardware (not furnished) indicated in Fig. 4-3, secure the instrument 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.

Ventilation Requirements

When the oscilloscope is mounted in a rack with other equipment, it is important that the ambient temperature surrounding it does not exceed $+50^{\circ}$ C. Additional clearance or forced ventilation methods (fan) may need to be employed to maintain ambient temperatures below $+50^{\circ}$ C. Reliability and performance of the oscilloscope will be affected if the ventilation holes in the protective panels are obstructed, or If it is operated at an ambient temperature higher than $+50^{\circ}$ C.

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.

REPACKAGING FOR RESHIPMENT

If the Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm that can be contacted. Include complete instrument serial number and a description of the service required.

Save and re-use the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

Surround the instrument with polyethylene sheeting to protect the finish of the instrument. Obtain a carton of corrugated cardboard of the correct carton strength and having inside dimensions of no less than six inches more than the instrument dimensions. Cushion the instrument by tightly packing three inches of dunnage or urethane foam between carton and instrument, on all sides. Seal carton with shipping tape or industrial stapler.

The carton test strength for your instrument is 275 pounds.

PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, lubrication, etc. Preventive maintenance performed on a regular basis may prevent instrument breakdown and will improve the reliability of the instrument. The severity of the environment to which this instrument is subjected determines the frequency of maintenance. A convenient time to perform preventive maintenance is preceding adjustment of the instrument.

CABINET REMOVAL

WARNING

Dangerous voltages exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect power before cleaning the instrument or replacing parts.

The cabinet sides are held in place by four latches. To remove the cabinet sides, turn the latches 90 degrees and pull the sides away from the carrying handle; then, lift the cabinet sides away from the instrument. The cabinet bottom is held in place with four latches and four screws.

The cabinet sides protect this instrument from dust in the interior, and also provide protection to personnel from the operating voltages present. They also reduce the electromagnetic radiation from this instrument or interference to the display due to other equipment.

CLEANING

This instrument should be cleaned as often as operating conditions require. Accumulation of dirt on components acts as an insulating blanket and prevents efficient heat dissipation which can cause overheating and component breakdown.



Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Use a non-residue type of cleaner, preferably isopropyl alcohol, total denatured ethyl alcohol, or TP35. Exterior

Loose dust accumulated on the front panel can be removed with a soft cloth or small brush. Dirt that remains can be removed with a soft cloth dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

Interior

Dust in the interior of the instrument should be removed occasionally due to its electrical conductivity under high-humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry, lowpressure air. Remove any dirt which remains with a soft brush or a cloth dampened with a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces.

Switch Contacts

Switch contacts and pads are designed to operate dry for the life of the switch. However, as the switches are not sealed, dust attracted to the contact area may cause switch contacts to become electrically noisy. Cleaning may be accomplished by flushing the contact area with isopropyl alcohol or kelite (1 part kelite to 20 parts water). Do not use chemical cleaning agents that leave a film or that might damage plastic parts. Do not use cotton swabs or similar applicators to apply cleaning agents, as they tend to snag and leave strands of cotton on switch contacts. Should it become necessary to remove a switch for replacement or cleaning, refer to Component Removal and Replacement in this section.

VISUAL INSPECTION

This instrument should be inspected occasionally for such defects as broken connections, improperly seated semiconductors, damaged circuit boards, and heatdamaged parts.

The corrective procedure for most visible defects is obvious; however, particular care must be taken if heatdamaged components are found. Overheating usually indicates other trouble in the instrument; therefore, it is important that the cause of overheating be corrected to prevent recurrence of the damage.

LUBRICATION

Generally, there are no components in this instrument that require a regular lubrication program during the life of the instrument.

Cam Switch Lubrication

In most cases, factory lubrication should be adequate for the life of the instrument. However, if the switch has been disassembled for replacement of switch sub-parts, a lubrication kit containing the necessary lubricating materials and instructions is available through any Tektronix Field Office. General Electric Versilube® is a recommended silicone grease and should be applied sparingly so that the lubricant does not get on the contacts. Refer to Fig. 4-4 for lubrication instructions.

SEMICONDUCTOR CHECKS

Periodic checks of the semiconductors in this instrument are not recommended. The best check of semiconductor performance is actual operation in the instrument. More details on checking semiconductor operation are given under Troubleshooting.



Fig. 4-4. Lubrication procedure for a typical cam switch.

PERFORMANCE CHECK AND ADJUSTMENT INTERVAL

To ensure accurate measurements, perform the Performance Check procedure on this instrument after each 1000 hours of operation or every 6 months if used infrequently. In addition, replacement of components may necessitate performing the Adjustment procedure to calibrate the affected circuits. The Adjustment procedure can also be helpful in localizing certain troubles in the instrument. In some cases, minor troubles may be revealed or corrected by performing the Adjustment procedure.

TROUBLESHOOTING

The following information is provided to help troubleshoot this instrument. Information contained in other sections of this manual should be used along with the following information to aid in locating a defective component. An understanding of the circuit operation is very helpful in locating troubles.

TROUBLESHOOTING AIDS

Diagrams

Circuit diagrams are given on foldout pages in Section 7. The component number and electrical value of each component in this instrument is shown on the diagrams.

Circuit-Board Illustrations

Circuit-board illustrations are shown on a foldout page preceding the associated diagram. Each board-mounted electrical component is identified by its circuit number, as are interconnecting wires and connectors.

Wiring Color Code

Insulated wire and cable used in this instrument is color-coded to facilitate circuit tracing.

Semiconductor Basing

Figure 4-5 illustrates the basing configurations for semiconductors that may appear in this instrument. Some plastic-case transistors have lead configurations that do not agree with those shown here. If a replacement transistor is made by a different manufacturer than the original, check the manufacturer's basing diagram. All transistor sockets in this instrument are wired for the standard basing used for metal-case transistors.



Fig. 4-5. Lead configuration data for semiconductor devices.

Multi-Pin Connector Holders

Multi-pin connectors mate with groups of pins soldered to circuit boards. Pln number 1 is indicated with a triangular mark on the holder and is indexed with a triangular mark on the circuit board, as shown in Fig. 4-6. Recommended Type: TEKTRONIX 576 Curve Tracer or TEKTRONIX 577/177 Curve Tracer system, 7CTIN Curve Tracer unit and a 7000-series oscilloscope system, or a 5CTIN Curve Tracer unit and a 5000-series oscilloscope.

TROUBLESHOOTING EQUIPMENT

The following equipment, in addition to that listed in Table 2-9 (list of test equipment required for performance check in Section 2 of this manual) is useful for troubleshooting.

Semiconductor Tester

Description: Dynamic-type tester.

Purpose: To test the semiconductors used in this instrument.



Fig. 4-6. Multi-pin connector holder orientation.

Multimeter

Description: Voltmeter, 10 megohm input impedance and 0 to 250 volts range; accuracy, within 0.1%. Ohmmeter, 0 to 20 megohms; accuracy, within 3%. Test probes must be insulated to prevent accidental shorting.

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

Recommended Type: TEKTRONIX DM 501 Digital Multimeter (requires a TM 500-series power module).

Test Oscilloscope

Description: Frequency response, dc to 2 megahertz minimum; deflection factor, 1 millivolt to 5 volts/division. A 10X, 10 megohm voltage probe should be used to reduce circuit loading.

Purpose: To check operating waveforms and for general troubleshooting.

Recommended Type: TEKTRONIX 5110, 5A13N, 5B10N oscilloscope system or equivalent. Use a TEKTRONIX P6108 or P6062A Probe.

TROUBLESHOOTING TECHNIQUES

The following troubleshooting procedure is arranged to check the simple trouble possibilities before proceeding with extensive troubleshooting. The first few checks ensure proper connection, operation, and adjustment. If the trouble is not located by these checks, the remaining steps aid in locating the defective component. When the defective component is located, it should be replaced using the replacement procedure given under Corrective Maintenance.

Troubleshooting Procedure

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 Fig. 1-2 in the Operating Instructions section.

2. Check Associated Equipment. Before troubleshooting, check that the equipment used with this instrument is properly connected and that the interconnecting cables are not defective. Also, check the power source. 3. Visual Check. Visually check the portion of the instrument in which the trouble is located. Many troubles can be located by visible indications such as unsoldered connections, broken wires, damaged circuit boards, damaged components, etc.

4. Isolate Trouble to a Circuit. To isolate trouble to a circuit, note the trouble symptom. The symptom often Identifies the circuit in which the trouble is located. When trouble symptoms appear in more than one circuit, check the affected circuits by taking voltage and waveform readings. Incorrect operation of all circuits often indicates trouble in the power supply. Check first for correct voltages of the individual supplies. See Table 4-3. 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 4-3

POWER SUPPLY OUTPUT VOLTAGES					
Power Supply	Output Voltage Range	Typical 120 Hz Ripple			
+200 V	+175 V to +247.5 V	3 V or less			
+30 V	+29.82 V to +30.18 V	3 mV or less			
+5 V	+4.89 V to +5.11 V	2 mV or less			
-30 V	-29.89 V to -30.11 V	2 mV or less			

5. Check Voltages and Waveforms. Often the defective component can be located by checking for the correct voltages and waveforms in the circuit.

6. Check Instrument Adjustment. Check the adjustment of this instrument, or the affected circuit if the trouble appears in one circuit. The apparent trouble may be the result of misadjustment. Complete adjustment instructions are given in Section 3.

7. Check Individual Components. The following procedures describe methods for checking individual components. Two-lead components that are soldered in place are best checked by first disconnecting one end. This isolates the measurement from the effects of surrounding circuitry.

To avoid component damage, disconnect the power source before removing or replacing semiconductors. TRANSISTORS. The best check of transistor operation is actual performance under operating conditions. A transistor can be most effectively checked by substituting a new component or one that 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.

INTEGRATED CIRCUITS. IC's can be checked with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of circuit operation is desirable when troubleshooting circuits using IC's. 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 IC's is with an IC test clip. This device also serves as an extraction tool.



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

DIODES. A diode can be checked for an open or shorted condition by measuring the resistance between terminals with an ohmmeter scale having a low internal source current, such as the R X 1K scale. The resistance should be very high in one direction and very low when the meter leads are reversed.

RESISTORS. Check resistors with an ohmmeter. See the Replaceable Electrical Parts list for the tolerance of the resistors used in this instrument. Resistors normally do not need to be replaced unless the measured value varies widely from that specified.

INDUCTORS. Check for open inductors by checking continuity with an ohmmeter. Shorted or partially shorted inductors can usually be found by checking the waveform response when high-frequency signals are passed through the circuit. Partial shorting often reduces highfrequency response.

CAPACITORS. A leaky or shorted capacitor can usually be detected by checking resistance with an ohmmeter on the highest scale. Do 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 that the capacitor passes ac signals. 8. Repair and Adjustment. If any defective parts are located, follow the replacement procedures given in Corrective Maintenance. Be sure to check the performance of any circuit that has been repaired or had any electrical components replaced.

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques required to replace components in this instrument are given here.

OBTAINING REPLACEMENT PARTS

Standard Parts

All electrical and mechanical part replacements can be obtained through your local Tektronix Field Office or representative. However, many of the 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 Replaceable Electrical Parts list in Section 6 for value, tolerance, rating and description. To determine the manufacturer of a part, note the number listed under Mfg. Code in the Parts List and refer to a Cross Index Mfr. Code Number to Manufacturer listing at the beginning of the Parts List.

NOTE

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

Special Parts

In addition to the standard electronic components, some special parts are used in this instrument. These parts are manufactured or selected by Tektronix, Inc. in accordance with our specifications. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. Order all special parts directly from your local Tektronix Field Office or representative.

Ordering Parts

When ordering replacement parts from Tektronix, Inc., it is imperative that all of the following information be included in the order to ensure receiving the proper parts.

- 1. Instrument type (5110, 5A18N, 5B10N, etc.).
- 2. Instrument serial number.

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

4. Tektronix part number.



High voltage and current levels are present in this instrument. To avoid electrical shock, disconnect the instrument from the power source before soldering.

The reliability and accuracy of this instrument can be maintained only if proper soldering techniques are used when repairing or replacing parts. General soldering techniques, which apply to maintenance of any precision electronic equipment, should be used when working on this instrument. Use only 60/40 rosin-core, electronicgrade solder. The choice of soldering iron is determined by the repair to be made. When soldering on circuit boards, use a 15- to 40-watt pencil-type soldering iron with a 1/8-inch wide, wedge-shaped tip. Keep the tip properly tinned for best heat transfer to the solder joint. A higher wattage soldering iron may separate the wiring from the base material. Avoid excessive heat; apply only enough heat to remove the component or to make a good solder joint. Also, apply only enough solder to make a firm solder joint; do not apply too much solder.

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Some circuit boards in this instrument are multilayer boards with a conductive path(s) laminated between the top and bottom board layers. All soldering on these boards should be done with extreme care to prevent breaking the connections to the center conductor(s); only experienced maintenance personnel should attempt repair on these boards.

For metal terminals (e.g., switch terminals, potentiometers, etc.) a higher wattage-rating soldering iron may be required. Match the soldering iron to the work being done. For example, if the component is connected to the chassis or other large heat-radiating surface, it will require a 75-watt or larger soldering iron. The following technique should be used to replace a component on a circuit board. Most components can be replaced without removing the boards from the instrument.

1. Grip the component lead with long-nose pliers. Touch the soldering iron to the lead at the solder connection. Do not lay the iron directly on the board, as it may damage the board.

2. When the solder begins to melt, pull the lead out gently. If unable to pull the lead without using force, try removing the other end of the component as it may be more easily removed.

NOTE

The reason some component leads are troublesome to remove is due to a bend placed on each lead during the manufacturing process. The bent leads hold components in place during a process that solders many components at one time.

If a component lead is extremely difficult to remove, it may be helpful to straighten the leads on the back side of the board with a small screwdriver or pliers while heating the solder connection.

Unsolder the component from the circuit board, using heat on the component lead so that the solder will stay behind the board. If it is desired to remove solder from a circuit-board hole for easier installation of a new component, use a vacuum-type desoldering tool or a solderremoving wick.

3. Bend the leads of the new component to fit the holes in the board. If the component is replaced while the board is mounted in the instrument, cut the leads so they will just protrude through the board. Insert the leads into the holes in the board so the component is firmly seated against the board (or as positioned originally). If it does not seat properly, heat the solder and gently press the component into place.

4. Touch the iron to the connection and apply a small amount of solder to make a firm solder joint. To protect heat-sensitive components, hold the lead between the component body and the solder joint with a pair of longnose pliers or other heat sink. 5. Clip the excess lead that protrudes through the board (if not clipped in step 3).

6. Clean the area around the solder connection with a flux remover solvent. Be careful not to remove information printed on the board.

COMPONENT REMOVAL AND REPLACEMENT

WARNING

To avoid electrical shock, disconnect the instrument from the power source before replacing components.

Semiconductor Replacement

Transistors should not be replaced unless actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement of transistors may affect the calibration of this instrument. When transistors are replaced, check the performance of the part of the instrument which may be affected.



Power must be disconnected before removing or replacing semiconductors to avoid component damage.

Replacement semiconductors should be of the original type or a direct replacement. The lead configuration of most semiconductors used in this instrument are shown in Fig. 4-5. Some plastic case transistors have lead configurations which do not agree with those shown here. If a replacement transistor is made by a different manufacturer than the original, check the manufacturer's basing diagram for correct basing. All transistor sockets in this instrument are wired for the standard basing used for metal-case transistors. Transistors which have heat radiators, or are mounted on the chassis, use silicone grease to increase heat transfer. Replace the silicone grease when replacing these transistors.



Handle silicone grease with care. Avoid getting silicone grease in eyes. Wash hands thoroughly after use. An extraction 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 through your local field office or representative. If an extraction tool is not available when removing one of these integrated circuits, pull slowly and evenly on both ends of the device. Try to avoid having one end of the integrated circuit disengage from the socket before the other, as the pins may be damaged.

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 that clamps the transistor to the chassis. Remove the defective transistor. When replacing the transistor, use silicone grease on the metal tab to increase heat transfer from the transistor to the chassis.

Switch Replacement

Two types of switches are used in this instrument. Contact alignment and spacing are critical to the operation of the pushbutton and cam switches. Therefore, defective switches should either be replaced as a unit or repaired only by personnel experienced with these types of switches. Your local Tektronix Field Office or representative can provide additional information. The following special maintenance information is provided for switch replacement.



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

Cam switch repair kits are available from Tektronix, Inc. Order through your local field office or representative.

One switch kit is used to repair the cam switches in most time-base plug-in units and some vertical plug-in units. Another kit is used to repair the cam switches using the high-frequency contact, which is used in several vertical plug-in units.

The cam-type switches consist of rotating cam drums which are turned by front-panel knobs, and sets of springleaf contacts mounted on adjacent circuit boards. The contacts are actuated by lobes on the cams. In the

Maintenance-5110

oscilloscope system, the Volts/Div and Seconds/Div switches are of the carn type. These switches can be disassembled for inspection, cleaning, repair, or replacement as follows:

1. Remove the screws which hold the metal cover on the switch, and lift the cover off the switch. The switch is now open for inspection or cleaning.

2. To completely remove a switch from the circuit board, first remove any knobs or shaft extensions. Loosen the coupling at the potentiometer at the rear of the switch, and pull the long shaft (with red knob attached) out of the switch assembly.

3. Remove the screws (from the opposite side of the circuit board) which hold the cam drum to the board.

4. To remove the cam drum from the front support block, remove the retaining ring from the shaft on the front of the switch and slide the cam drum out of the support block. Be careful not to lose the small detent roller.

5. To replace defective switch contacts, follow the instructions given in the switch repair kit.

6. To re-install the switch assembly, reverse the above procedure.

B. PUSHBUTTON SWITCHES

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

Circuit Board Replacement

If a circuit board is damaged beyond repair, replace the entire board assembly. Part numbers for completely wired boards are given in the Replaceable Electrical Parts list.

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 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, the pin connectors may be damaged.

Circuit-Board Pin Replacement

CAUTION

Some circuit boards in this instrument are multilayer type boards with a conductive path(s) laminated between the top and bottom board layers. All soldering on these boards should be done with extreme care to prevent breaking the connection to the center conductor(s); only experienced maintenance personnel should attempt repair of these board.

A circuit-board pin replacement kit including the necessary tools, instructions, and replacement pins is available from Tektronix, Inc. Order through your local Tektronix Field Office or representative. Replacement of circuit-board pins on multi-layer boards is not recommended; refer such repairs to your local Tektronix Field Office or representative.

To replace a pin which is mounted on a circuit board, first disconnect any pin connectors. Unsolder the damaged pin and pull it out of the circuit board with a pair of pliers (see Soldering Techniques, in this section, for recommended soldering and unsoldering procedures). Be careful not to damage the wiring on the board with too much heat. The ferrule on the pin may or may not disconnect from the hole with the damaged pin. If the ferrule remains in the circuit board, remove the ferrule from the replacement pin and press the new pin into the hole in the circuit board. If the original ferrule is removed with the damaged pin, clean out the hole using solderingiron heat, a solder-removing wick, and a scribe. Press the replacement pin with attached ferrule into the circuitboard hole. Position the replacement pin in the same manner as the removed pin. Solder the pin to the circuit board on each side of the board. If the removed pin was bent at an angle to mate with a connector, carefully bend the new pin to the same angle. Replace the pin connector.

Cathode-Ray Tube Replacement

The following procedure outlines the removal and replacement of the cathode-ray tube. Refer to Fig. 4-7.

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.)



Fig. 4-7. Replacing the cathode-ray tube.

Remove the crt base cover on the rear panel of the instrument.

3. Remove the crt base socket.

4. Loosen the crt clamp. The crt and neck portion of the shield will be removed as a unit, and to facilitate removal, it may be best to remove all hardware from the crt clamp (bracket and positioning screws, and clamptightening hardware).

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.

5. With one hand on the crt faceplate, push on the crt base (and neck shield). Slide the crt and neck shield forward, and pull the crt out of the instrument from the front, then remove the neck shield.

B. REPLACEMENT

1. Slide the neck shield onto the crt neck.

2. Make sure the soft plastic crt faceplate supports are in place, then insert the crt into the main shield. Before the crt is completely inserted, slide the crt clamp over the neck shield.

3. With the crt fully inserted and loose in the shield, mount the bezel assembly into place and tighten the bezel screws.

4. Mount the crt clamp and positioning hardware, temporarily leaving it loose.

5. Position the rear of the crt (socket end) so there is no tilt of the faceplate in relation to the bezel assembly. Tighten the positioning screws, then tighten the clamp hardware.

6. Place the crt base socket onto the crt base pins. Replace the cover.

7. Replacing the crt will require partial instrument adjustment. Refer to the Adjustment section of 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.

Power Transformer Replacement

Replace the power transformer only with a direct replacement transformer. When removing the transformer, be sure to mark the leads to aid in connecting the new transformer. After the transformer has been replaced, check the performance of the complete instrument using the procedure given in the Adjustment section.

Fuse Replacement

Table 4-4 gives the rating, location, and function of the fuses used in this instrument.

Table 4-4

FUSE RATING, LOCATION AND FUNCTION

Circuit Number	it Rating Function		Location
F201	1.6 A Slow- blow	110 V Line- voltage input	Rear panel
F201	1 A Slow- blow	220 V Line- voltage input	Rear panel
F810	0.25 A Fast- blow	+200 V Unrgitd supply	Rear, LV Power Supply board
F835	0.5 A Fast- blow	+38 V Unrgitd supply	Rear, LV Power Supply board

ADJUSTMENT AFTER REPAIR

After any electrical component has been replaced, the adjustment of that particular circuit should be checked, as well as other closely related circuits. See Section 3 for a complete adjustment procedure.

MODIFICATIONS TO PRE-OPTION 7 AMPLIFIER PLUG-INS (OPTION 7 ONLY)

The channel switching amplifier plug-ins that are recommended for use with 5100-series mainframes (5A14N, 5A18N, 5A26) have been modified to reduce display noise and chop breakthrough when used in an Option 7 mainframe. If any of the mentioned amplifier plug-ins cause the noise and chop breakthrough specification to be exceeded, an earlier version (before Option 7) of the plug-in is probably being used. The following information is provided to explain how to modify earlier version plug-ins for reduced display noise and chop breakthrough.

To modify a 5A14N (SN B063288 and below only) change R513, R523, and R533 on the Main circuit board to a 100 k Ω , 5%, 0.25 W composition resistor, Tektronix Part No. 315-0104-00. Cut the board run (at both components) that connect Q540 and R542, so as to remove electrically, the run from the front side of the board. Connect an insulated wire strap between Q540 and R542, on the back side of the board so as to replace the board run removed from the front.

To modify a 5A18N (SN B050000 to SN B099999 only) change R301 on the Main Amplifier circuit board to a 20 k Ω , 5%, 0.25 W composition resistor, Tektronix Part No. 315-0203-00.

To modify a 5A18N (SN B049999 and below only) change R301 on the Main Amplifier circuit board to a 20 k Ω , 5%, 0.25 W composition resistor, Tektronix Part No. 315-0203-00. Also, change R302 and R303 to a 10 k Ω , 1%, 0.125 W film resistor, Tektronix Part No. 321-0289-00.

To modify a 5A26 (SN B029000 and below only) change R289 on the Main circuit board to a 20 k Ω , 5%, 0.25 W composition resistor, Tektronix Part No. 315-0203-00. Also, change Q386 to a NPN silicon transistor, 2N3565, TO-106 case, Tektronix Part No. 151-0341-00.

CIRCUIT DESCRIPTION

This section of the manual contains a description of the circuitry used in the oscilloscope. Individual descriptions are separated into the following parts: Block Diagram, Interface, Auxiliary Board, Vertical and Horizontal Deflection Amplifiers, CRT Circuit, and last, Low-Voltage Power Supply and Calibrator. Refer to the appropriate diagrams in the Diagrams section of this manual while reading the circuit descriptions.

BLOCK DIAGRAM DESCRIPTION

Vertical signals to be displayed on the cathode-ray tube are applied through the Interface circuit to the Auxiliary board from both vertical plug-in compartments. The Interface circuit determines whether the signal from the left or right vertical unit is displayed. The Vertical Amplifier circuit provides intermediate amplification between the vertical plug-in units and the Vertical Deflection Amplifier.

Time-base and external signals for horizontal display on the crt are connected to the Interface circuit from the horizontal plug-in compartment. The Horizontal Amplifier circuit provides intermediate amplification between the horizontal plug-in unit and the Horizontal Deflection Amplifier.

Additionally, the Interface circuit provides an interconnection of logic levels, time-base triggering signals, display-related signals, and power-supply voltages between the plug-in units and the oscilloscope.

The Vertical and Horizontal Deflection Amplifiers provide final amplification for the signals from the plug-in units. They produce push-pull outputs suitable to drive the crt vertical and horizontal deflection plates. Beam-finding circuitry is incorporated to limit the display within the screen area when the front-panel BEAM FINDER button is pressed.

The CRT circuit produces the high voltage (about -3.4 kilovolts) and contains the controls necessary for operation of the cathode-ray tube. The CRT circuit also contains the Z-Axis Amplifier, which provides the drive signal to control the intensity level of the display.

The Low-Voltage Power Supply Regulator circuits provide the voltage necessary for operation of the oscilloscope system. These voltages are connected to all circuits within the instrument. Also included in this circuit is the Calibrator, which produces a square wave output signal at the front panel. The output has an accurate amplitude which can be used to check vertical deflection factor accuracy and probe compensation.

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 labelled on the Interface diagram.

Clock Generator

The Clock Generator stage produces a 200-kilohertz timing signal (clock) for chopping between vertical plugins and amplifier channels within the plug-ins. This circuit consists of Q620, Q626, and their associated passive components, which are connected as a multivibrator. When the multivibrator receives a chop actuate level (+5 volts), it free runs at a 200-kilohertz rate. (The chop actuate level is routed through the vertical plug-ins to the time-base unit, and is present at contact A20 of J603 when a multi-trace display is required and the time-base Display switch is set to Chop.) The chop actuate level also disables Q630, locking out alternate-drive pulses. The Clock Generator has two outputs; one is sent to the Countdown circuit as a timing signal, and the other is sent to the crt circuit to blank the chop-switching transients.

Countdown Circuit

The Countdown circuit produces the display switching signal for both the Alternate and Chopped switching modes. This circuit is composed of U640 and its discrete passive components, which are connected as a pair of RS flip-flops. Each flip-flop is a divide-by-two counter, and the first one drives the second. The Countdown circuit is activated by a negative-going transition, which can come from either the Clock Generator or from the time-base plug-in unit via grounded-base amplifier Q630. The Clock Generator 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 Countdown circuit (U640A-U640B) is sent via contacts B21 of J601 and J602 to the channelswitching circuits incorporated within dual-trace vertical plug-in units. The outputs from the divide-by-four portion of the Countdown circuit (U640C-U640D) are used for plug-in switching; one output is sent to contact A15 of J604 to produce plug-in switching on the single-beamdisplay auxiliary board, and the other output is sent via contact B21 of J603 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 under General Operating Information in the Operating Instructions section of this manual.

Vertical Amplifier

The Vertical Amplifier circuit provides approximately 10X amplification of the vertical signal before passing it to the vertical deflection amplifier in the display unit. The Vertical Amplifier consists of Q650, Q658, Q660, Q668, and their associated passive components, connected in a differential configuration. The output signal is in phase with the output of the vertical plug-in.

Horizontal Amplifier

The Horizontal Amplifier consists of Q670, Q678, Q680, Q688, and their associated passive components. The circuit is nearly identical to the Vertical Amplifier just described. It receives a push-pull input directly from the horizontal plug-in compartment via contacts A7, A13, B7, and B13 of J603. The two halves of this amplifier are balanced in the quiescent condition by adjustment of R675, Hor. Cent. The output of the Horizontal Amplifier Is sent to the horizontal deflection amplifier.

AUXILIARY BOARD

An auxiliary board plugs into J604 on the Interface circuit board, and becomes part of the Interface circuit, The single-beam auxiliary board accepts the push-pull signal outputs from both vertical plug-ins. Emitter followers Q701, Q703, Q711, and Q713 provide a highimpedance input to two pairs of grounded-gate FET amplifiers, Q702-Q704 and Q712-Q714. The switching circuit consists of Q721 and Q722, connected as a comparator. Plug-in "on" logic levels are applied to the switching circuit in addition to the switching signal from the Countdown circuit. The switching circuit permits only one pair of amplifiers to be on at a time, thus permitting only one of the two vertical plug-in signals to pass to the Vertical Amplifier. In the chopped switching mode, the switching between pairs of amplifiers occurs at a 50kilohertz 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 no "on" logic level is applied to the switching circuit from either vertical plug-in, Q702 and Q704 will remain on, passing any signal from the left vertical plug-in.

VERTICAL AND HORIZONTAL DEFLECTION AMPLIFIERS

Vertical Deflection Amplifier

The Vertical Deflection Amplifier provides the final amplification of signals applied to the vertical plug-in units. It produces a push-pull output sufficient to drive the crt vertical deflection plates. The amplifier consists of Q104, Q106, Q114, and Q116, connected in a differential configuration. The input signal arrives via P612 from the Interface circuit. The output signal is developed across the collector-load resistors, R104 and R114, and is about 50 times the magnitude of the input signal. Resistor R116 Vert Gain, provides Q106-Q116 emitter degeneration to set the gain of the stage to provide a calibrated vertical display.

Horizontal Deflection Amplifier

The Horizontal Deflection Amplifier consists of Q124, Q126, Q134, and Q136, and is basically the same as the Vertical Deflection Amplifier just described. It provides final amplification of signals from the horizontal plug-in unit, which arrive via P6II. The gain of the stage is set by Hor. Gain R136 to provide a calibrated horizontal display.

Beam Finder

If a high-amplitude signal or a misadjusted control has deflected the trace or display off screen, it can be located by pressing the front-panel BEAM FINDER pushbutton. This opens S125, allowing current through R125 into the emitter circuits of both deflection amplifiers. R125 limits the current available to the transistor, and hence, to the collector-load resistors. Thus, the dynamic range of the deflection plates is limited to an on-screen level, and the display is compressed within the viewing area.

Also, when the BEAM FINDER switch is pressed, the Z Axis Amplifier in the crt circuit senses the slight increase in voltage level at the R108-R118-R128-R138 junction. The Z Axis Amplifier produces a slight increase in crt beam intensity, allowing the trace to be displayed even though the INTENSITY control may be fully counterclockwise.

X-Y Phasing

Variable capacitor C116, Phase, is connected across the Input emitters of the Vertical Deflection Amplifier. This capacitor is adjusted to eliminate the inherent phase difference between the vertical and horizontal deflection systems when operating in the X-Y mode.

CRT CIRCUIT

The crt circuit produces the high-voltage potential and provides the control circuits necessary for operation of the cathode-ray tube (crt). This circuit also includes the Z-Axis Amplifier stage to set 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, and consists of Q222, Q226, and Q234. The feedback path is from the collectors of Q226 and Q234 through R227-C227 to the base of Q222. Q226 and Q234 are connected as a collector-coupled complementary amplifier to provide a fast, linear output signal while consuming minimum quiescent power. The output voltage provides the drive signal to control the crt intensity level through the Control-Grid Supply.

The output level of the Z-Axis Amplifier is established by the voltage drop across R227 in reference to virtual ground at the base of Q222 (the operational amplifier summing point). The current through R227 is determined by the input current from any combination of several sources, such as from the front-panel INTENSITY control, plug-in interface (blanking intensification, etc.), and from Q214. Q214 is an operational amplifier with two inputs; one from the front-panel EXT INTENSITY INPUT connector and the other from the front-panel BEAM FINDER switch. It sets those input signals to a level suitable for proper response by the Z-Axis Amplifier.

High-Voltage Regulator

High-Voltage Primary. A repetitive, non-sinusoidal signal is produced by a phase-modulated switching circuit in the primary of T240 and induced into the secondaries. Current drive for the primary winding is furnished by Q252 in its conduction state. Q252 is turned on by positive-going feedback applied through C259 and L259 from the feedback winding, and then turned off by switching action from Q262. A sample of the output dc voltage is modulated by the ac voltage from another feedback winding at the gate of Q278 to establish the conduction time of Q252 and thus maintain the proper output level. Q252 delivers energy to T240 only once each cycle.

Assuming Q262 and Q264 are off initally, R262 provides base drive for Q252, causing it to deliver current to T240 primary. As Q252 conducts, the increasing current through the primary winding induces a voltage into the secondaries. The gate of Q278 is driven negative by the voltage from the feedback winding, switching Q264 and Q262 on. With conduction of Q262, base drive for Q252 is removed.

With Q252 off, the transformer field collapses, reversing the polarity of the voltage induced into the secondaries. When the gate of Q278 is driven sufficiently positive to switch Q264 and Q262 off, Q252 is switched on again. Q252 again delivers energy to the primary winding and the action is repeated. **High-Voltage Regulation.** Regulation is accomplished as follows: Feedback from the -3400-volt cathode supply is summed with low-voltage levels through the voltage divider consisting of resistors R272B-E, R275, and R276 to establish the dc level at the gate of Q278. The ac component, which is the switching signal, is derived from the transformer as described previously. If the output level of the cathode supply drops below the nominal -3400 volts (becomes more positive), the level at the gate of Q278 rises.

A new point is selected on the varying ac component to cause switching of Q262-Q264 later and hence increase conduction time of Q252. This allows more energy to be delivered to the primary winding of T240, resulting in an increase of voltage in the secondaries. Conversely, if the output level increases, Q252 is allowed to conduct for a shorter length of time. The dc level at the gate of Q278 is adjusted by High Volts Adjust R275 to set the output at exactly -3400 volts.

High Voltage Outputs

Transformer T240 has two high-voltage output windings which provide the potentials required for the crt cathode and control grid supplies. The -3400-volt accelerating potential for the cathode is supplied by halfwave rectifier CR247. The cathode heater is elevated to the cathode potential through R273.

Half-wave rectifier CR241 provides about -3450 volts to establish bias voltage on the crt control grid. This voltage (and hence the crt beam current) is dynamically controlled by the Z-Axis Amplifier, which contains the INTENSITY control, blanking inputs, and intensification inputs. Intensity Range R245 provides a fine adjustment of the quiescent grid voltage to bias the crt just below cutoff when the Z-Axis Amplifier output is at its minimum quiescent level (INTENSITY control counterclockwise and no intensifying or blanking inputs).

Neon bulbs DS271, DS272, and DS273 provide protection to the crt if the voltage difference between the control grid and the cathode exceeds about 180 volts.

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 R295 provides the correct voltage for the second anode in the crt. Proper voltage for the third anode is obtained by adjusting Astig control R286. 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.

Circuit Description-5110

The Geometry adjustment R285 varies the positive level on the horizontal deflection plate shields to control the overall geometry of the display. The TRACE ROTATION control R291, permits adjustment of the dc current through beam-rotation coil L291 to align the display with the horizontal graticule lines.

LOW-VOLTAGE POWER SUPPLY AND CALIBRATOR

The Low-Voltage Power Supply circuit provides the low-voltage operating power for the oscilloscope system from three regulated supplies and three unregulated supplies. Electronic regulation is used to provide stable, low-ripple output voltages. The circuit also includes the Calibrator circuit to produce an accurate-amplitude square-wave output.

Power Input

Power is applied to the primary of transformer T801 through fuse F201, thermal cutout S200, and Power switch S201, and the line-selector block, P801. The line-selector block allows changing the primary-winding taps of T801 to fit different line requirements.

Low-Voltage Rectifiers and Unregulated Outputs

The full-wave bridge rectifiers and associated filter components in the secondaries of T801 provide filtered dc voltages for operation of the oscilloscope system or for regulation by the Low-Voltage Regulators. The unregulated outputs are ± 200 volts, ± 38 volts, and ± 38 volts. The ± 200 -volt and ± 38 -volt outputs to the instrument are fuse-protected by F810 and F835 respectively.

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 +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, Q860 and the supply voltage is established by the drop across R877, R878, and R879. The feedback path is through R875, Q875, and Q865 to the base of Q860. Any variation in output voltage due to ripple, change of current through the load, etc, is immediately transmitted to the base of Q860 and nullified by a change in Q860 conduction, thus maintaining a steady output. The output of the supply is set to exactly -30 volts by adjustment of R878, -30 V Adj. This control sets the conduction of Q870, which controls the bias levels of Q865 and Q860. CR865 and Q865 provide short-circuit protection by limiting the current through Q860.

+30-Volt Supply. The regulator for the +30-Volt Supply consists of series-pass transistor Q840 and error amplifier Q850. This is a feedback amplifier system similar to that just described for the --30-Volt Supply. R858, +30 V Adj, provides an adjustment to set the output of the supply at exactly +30 volts. Q845 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, Q845 is biased off.

+5-Volt Supply. The regulator for the +5-Volt Supply consists of series-pass transistor Q815 and error amplifier Q820. Operation of this feedback amplifier system is similar to that described for the -30-Volt Supply. The short-protection transistor, Q825, functions as described for Q845 in the +30-Volt Supply.

Line Trigger

A line-frequency signal is obtained from the secondary of T801 and attenuated by R830, R832, and R834 to provide a line-trigger source for the time-base plug-in unit.

Calibrator

The Calibrator circuit composed of Q885, Q890, and their associated passive components produces a squarewave 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 4milliampere (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 Q885 receives a pulsating dc voltage from full-wave rectifier CR835-CR836 and produces a nearly symmetrical switching signal for Q885 and Q890. As Q890 is alternately switched on and off at twice the line frequency, current through R890 is alternately switched through the transistor or through CR890, the probe test loop, and R891, producing the required test signal.

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
00213	NYTRONICS, COMPONENTS GROUP, INC.,		
	SUBSIDIARY OF NYTRONICS, INC.	ORANGE STREET	DARLINGTON, SC 29532
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR	P O BOX 5012, 13500 N CENTRAL	
	GROUP	EXPRESSWAY	DALLAS, TX 75222
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR		
	PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF		
	FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
08806	GENERAL ELECTRIC CO., MINIATURE		
	LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112
09023	CORNELL-DUBILIER ELECTRONIC DIVISION		
	FEDERAL PACIFIC ELECTRIC CO.	2652 DALRYMPLE ST.	SANFORD, NC 27330
10582	CTS OF ASHEVILLE, INC.	MILLS GAP ROAD	SKYLAND, NC 28776
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
12954	SIEMENS CORPORATION, COMPONENTS GROUP	8700 E THOMAS RD, P O BOX 1390	SCOTTSDALE, AZ 85252
12969	UNITRODE CORPORATION	580 PLEASANT STREET	WATERTOWN, MA 02172
13511	AMPHENOL CARDRE DIV., BUNKER RAMO CORP.		LOS GATOS, CA 95030
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY	
		P O BOX 3049	WEST PALM BEACH, FL 33402
14552	MICRÓ SEMICONDUCTOR CORP.	2830 F FAIRVIEW ST.	SANTA ANA, CA 92704
14936	GENERAL INSTRUMENT CORP., SEMICONDUCTOR		
	PRODUCTS GROUP	P.O. BOX 600,600 W. JOHN ST.	HICKSVILLE, NY 11802
23880	STANFORD APPLIED ENGINEERING, INC.	340 MARTIN AVE.	SANTA CLARA, CA 95050
24546	CORNING GLASS WORKS, ELECTRONIC		
	COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
31514	STANFORD APPLIED ENGINEERING, INC.		
	ADVANCED PACKAGING DIV.	3080 AIRWAY DRIVE	COSTA MESA, CA 92626
50434	HEWLETT-PACKARD COMPANY	640 PAGE MILL ROAD	PALO ALTO, CA 94304
52769	SPRAGUE GOODMAN ELEC., INC.	134 FULTON AVENUE	GARDEN CITY PARK, NY 11040
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW-		om Louiso No (2107
	EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71450	CTS CORP.	905 N. WEST BLVD	ELKHAKI, IN 40314
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. IZTH ST.	EXIE, FA 10012 RULLEDTON CA D2626
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOK BLVD.	FULLERION, CA 92034
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED		
	RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD SI.	PHILADELPHIA, PA 19100
80009	TEKTRONIX, INC.	P U BOX SUU	BEAVERION, OK 97077
81073	GRAYHILL, INC.	1200 D WALK R O BOX 1529	LA GRANGE, IL 00323
81439	THERM-O-DISC, INC.	1520 S MAIN, P U BUX 1538	MANJIILLD, UN 4490/
90201	MALLORY CAPACITOR CO., DIV. OF	JUZY E. WASHINGTON STREET	
	P. K. MALLORY AND CO., INC.	r. U. BUX 3/2	TURTUALOTIS' IN 40500
91637	DALE ELECTRONICS, INC.	P. U. BUX BUY	DOLUMBUS, MC 00001 Perfort II 61030
91929	HONEYWELL, INC., MICKO SWITCH DIV.	UNICAGU & BERING 313.	GOODSIDE NY 11377
95238	CONTINENTAL CONNECTOR CORP.	34-03 JOIN SI.	WOODSIDE, MI 11377

	Tektronix	Serial/Mod	el No.		Mfr	
Ckt No	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
0111111						
Al	670-1433-00	B010100	B029999	CKT BOARD ASSY: HIGH VOLTAGE DEFLECTION	80009	670-1433-00
Al	670-1433-01	B030000	B049999	CKT BOARD ASSY:HIGH VOLTAGE DEFLECTION	80009	670-1433-01
A1	670-1433-02	8050000	B119999	CKT BOARD ASSY:HIGH VOLTAGE DEFLECTION	80009	670-1433-02
Al	670-1433-03	B120000		CKT BOARD ASSY:HIGH VOLTAGE DEFLECTION	80009	670-1433-03
A7	670-1454-00			CKT BOARD ASSY: SINGLE BEAM AUX	80009	670-1454-00
A3	670-1340-00			CKT BOARD ASSY: INTERFACE	80009	670-1340-00
113	070 1940 00					
A4	670-1339-00			CKT BOARD ASSY: LV POWER SUPPLY	80009	670-1339-00
45	670-5757-00	XB109310		CKT BOARD ASSY:SIGNAL OUT	80009	670-5757-00
nj	010 5757 00	A0109910		(OPTION 7 ONLY)		0.0 0.00
				(or riow / owni)		
C106	283-0684-00	B010100	8049999	CAP FXD MICA D:620PF.20% 300V	00853	D153E621G0
C106	283-0596-00	8050000	0047777	CAP EXE MICA $D \cdot 528 PF \cdot 1\% 300V$	00853	D153F5280F0
C105	201-017-00	B010100	BU/ 0000X	CAP VAR PISTCO 7-3PF 350V	72982	535-017
0116	201-0027-00	B010100	B0499997	CAD EVD MICA D.253DE 59 300V	09023	CD15EC(253)103
	203-0390-00	BOIUIUU	BU47777	CAD WAR MICA D.19-115DE 175V	52760	CMD20600
CIIG	281-0180-00	8020000		CAP., VAR, MICA D: 10"113FF, 173V	00052	D153E5380E0
C126	283-0596-00			CAP., FXD, MICA D: 528FF, 1%, 500V	00000	D133F3280F0
					00053	D1 55 010 000
0136	283-06/2-00	8010100		CAP., FAD, MICA D: 200PF, 1%, 500V	20000	DIJJF2010FU
C224	283-0065-00	B010100	R113888	CAP., FXD, CER DI:U.UUIUF, 5%, 100V	72982	000-010-2000102J
C224	283-0051 - 00	B120000		CAP., FXD, CER DI:0.0033UF, 5%, 100V	72982	8131N145C0G033AJ
C227	281-0537-00	B010100	B119999X	CAP.,FXD,CER DI:0.68PF,20%,600V	80009	281-0537-00
C236	285-0526-00			CAP.,FXD,PLSTC:0.1UF,20%,400V	56289	410P10404
C241	283-0270-00	B010100	B119999	CAP.,FXD,CER DI:0.0068UF,+80/-20%,4000V	56289	45017
C241	283-0071-00	B120000		CAP.,FXD,CER DI:0.0068UF,+80-30%,5000V	56289	45C10A1
C242	283-0261-00	B010100	B119999	CAP., FXD, CER DI:0.010F, 20%, 4000V	56289	575C1A1
C242	283-0071-00	B120000		CAP., FXD, CER DI:0.0068UF, +80-30%, 5000V	56289	45C10A1
C248	283-0270-00	B010100	B119999	CAP., FXD, CER DI:0.0068UF, +80/-20%, 4000V	56289	45C17
C248	283-0071-00	B120000		CAP., FXD.CER DI:0.0068UF.+80-30%,5000V	56289	45C10A1
C249	283-0270-00	B010100	B119999	CAP. FXD.CER DI:0.0068UF.+80/-20%,4000V	56289	45C17
C249	283-0071-00	B120000		CAP., FXD.CER DI:0.0068UF,+80-30%,5000V	56289	45C10A1
C251	290-0194-00			CAP., FXD.ELCTLT: 10UF.+50-10%.100V	56289	30D106F100DC4
C252	283-0617-00			CAP., FXD.MICA D: 4700PF, 10%, 300V	00853	D193F472K0
6253	283-0003-00			CAP FXD CER DI: 0 01UF $+80-20\%$ 150V	72982	855-558250-1032
0255	283-0059-00			CAP FYD CFR DI $100 + 80 - 207 - 25V$	72982	8131N03125001052
C258	283-0059-00			CAP FYD CER DI: $10F + 80 - 70\%$ 25V	72982	8131N031Z500105Z
0290	203 0033 00			011.,112,00k 01.101,00 20%,297	/2/02	0191809189001095
C259	283-0198-00	B010100	B120979	CAP FED CER DI-0 22117 20% 50V	72987	8121N0837500224M
C259	283-0164-00	B120979	5120717	CAP FYD CFR DI 2 201 207 75V	72982	8141N0372500225M
C272	283-0021-00	5120373		CAP FYD CER DI'O OOLUF 207 5000V	72982	848-556-Y5S-102M
C273	283-0208-00			CAP EXD CEP DI-0 220E 107 200V	72987	8151N230 C 224K
0275	283-0104-00	B010100	8020000	CAR EVD OFD DI 2000DE 57 5000	72982	811-56582021
C274	283-0142-00	B010100	BUJJJJJJ	CAD EVD CER DI-2000FF, 5%, 5004	72902	875-571-V5F0272T
0217	£03 0142-00	1040000	UL137778	UNI 1 TAD OUR DITO OVE/ OF J/6,2004	12702	0, <i>3 9/1 1380212</i> 3
C279	281_0065_00	8010100	#110000V	CAR EVE CER DIAD 00111E 59 1000	72082	805-518-75001021
0219	203-0003-00	0010100	0117777X	CAL TAD OF DIAL AND ADD ADD ADD ADD ADD ADD ADD ADD ADD	72702	855-5587511-1027
0201	203-0003-00			UAR., FAD, GER DI:U.UIUF, +80-206, IDUV	12902	QJJ-JJ06270-1036
0622	283-0032-00			CAP., WXD, CER DI: 470PF, 5%, 500V	72902	083108525E00471J
0628	283-0060-00			CAP., FXD, CER D1: 100PF, 5%, 200V	72982	855-5350ZJ101J
C6 32	283-0002-00			CAP., FXD, CER DI:0.010F, +80-20%, 500V	72982	811-546E103Z
C634	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-53502J101J
					_	
C636	283-0060-00			CAP., FXD, CER DI: 100PF, 5%, 200V	72982	855-53502J101J
C640	281-0519-00			CAP., FXD, CER DI: 47PF, +/-4.7PF, 500V	72982	308-000C0G0470K
C642	281-0519-00			CAP., FXD, CER DI:47PF,+/-4.7PF,500V	72982	308-000C0G0470K
C659	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C671	281-0593-00	B010100	B029999X	CAP., FXD, CER DI: 3.9PF, 10%, 500V	72982	301-000C0J0399C
C679	283-0000-00			CAP., FXD, CER DI:0.0010F, +100-0%, 500V	72982	831-516E102P
C712	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C714	281-0628-00			CAP., FXD, CER DI:15PF, 5%, 500V	72982	301-000C0G0150J
C716	281-0628-00			CAP.,FXD,CER DI:15PF,5%,500V	72982	301-000C0G0150J
C721	281-0628-00			CAP., FXD, CER D1:15PF, 5%, 500V	72982	301-000C0G0150J
C810	290-0511-00			CAP., FXD, ELCTLT: 250UF, +75-10%, 250V	90201	20-35958
C815	290-0510-00			CAP., FXD, ELCTLT: 6000UF, +100-10%, 15V	56289	68D10473

	Tektronix	Serial/Mode	el No.		Mfr	
Ckt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
C820	290-0134-00			CAP., FXD, ELCTLT: 22UF, 20%, 15V	56289	150D226X0015B2
C822	281-0512-00			CAP., FXD, CER DI: 27PF, +/-2.7PF, 500V	72982	308-000C0G0270K
C830	285-0629-00			CAP., FXD. PLSTC: 0.0470F.20%, 100V	56289	410P47301
C837	290-0509-00			CAP., FXD. FLCTLT: 3060UF. $\pm 100 - 10\%$. 50V	56289	68D10454
C839	200-0500-00			CAP = EVD ELCTIT: 300000 + 100 - 10% 50V	56280	68D10454
0017	290-0175-00			CAP, FAD, BLCILI: JOUDUF, TIUTIUA, JUV	56209	150010494
6842	290-0175-00			CAP., FXD, ELCTLT: 100F, 20%, 35V	20209	12001002003282
0954	001 0550 00			CAR FUR OFF BILLON FOOT	04000	7001 1272
0052	281-0550-00			CAP., FXD, CER DI: 120PF, 10%, 500V	04222	/001-13/3
C857	283-0003-00			CAP., FXD, CER D1:0.010F, +80-20%, 150V	/2982	855-558250-1032
C860	290-0175-00			CAP., FXD, ELCTLT: IOUF, 20%, 35V	56289	150D106X0035R2
C865	281-0550-00	8010100	B039999	CAP.,FXD,CER DI:120PF,10%,500V	04222	7001-1373
C865	281-0543-00	B040000		CAP., FXD, CER DI: 270PF, 10%, 500V	72982	301055X5P271K
C870	290-0134-00			CAP., FXD, ELCTLT: 22UF, 20%, 15V	56289	150D226X0015B2
C872	281-0572-00			CAP.,FXD,CER DI:6.8PF,+/-0.5PF,500V	72982	301-000с0н0689D
C875	283-0003-00			CAP., FXD, CER DI:0.010F,+80-20%,150V	72982	855-55825U-1032
C881	290-0267-00			CAP. FXD.ELCTLT: 10F.20%.35V	56289	162D105X0035CD2
C883	290-0267-00			CAP. FXD. ELCTLT: LUF, 20%, 35V	56289	1620105X0035CD2
C890	281-0549-00			CAP FYD CEP DI 68PF 107 500V	77987	301-00012 106808
0020	282 0002-00	V0100310		CAR EVD CER DI-0 0100 +80-208 5000	72082	811-546F1037
6930	263-0002-00	X0109310		(APTION 7 ON W)	12902	011-940E1032
				(OPIION / UNLI)		
C021	101 0504-00	VB100210		CAD EVD CER DI. 1000 + /-100 5000	77082	301-0550000100E
6731	201-0304-00	XD103010		(ODTION 7 ONLY)	12302	501 05500001001
2010	000 0000 00	WD100310		(OPIION / UNLI)	72002	911-546-1037
C960	283-0002-00	XB109310		CAP., FXD, GER D1:0.010F, +80-20%, 500V	12902	011-34061032
				(OPTION 7 ONLY)		
C961	281-0504-00	XB109310		CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
				(OPTION 7 ONLY)		
C980	283-0002-00	XB109310		CAP., FXD, CER DI:0.01UF, +80-20%, 500V	72982	811-546E1032
				(OPTION 7 ONLY)		
C981	281-0504-00	XB109310		CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
				(OPTION 7 ONLY)		
					07040	0012161
CR209	152-0061-00			SEMICOND DEVICE: SILICON, 1/5V, 100MA	07263	
CR211	152-0061-00			SEMICOND DEVICE:SILICON, 175V, 100MA	07263	FDH2161
CR214	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR215	152-0061-00			SEMICOND DEVICE: SILICON, 175V, 100MA	07263	FDH2161
CB222	152-0141-02	XB120000		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR224	152-0061-00			SEMICOND DEVICE: SILICON, 175V, 100MA	07263	FDH2161
CR226	152-0061-00	XB120000		SEMICOND DEVICE: SILICON, 175V, 100MA	07263	FDH2161
CR234	152-0061-00	XB120000		SEMICOND DEVICE: STLICON, 175V, 100MA	07263	FDH2161
00239	152-0061-00	XB120000		SENTCOND DEVICE STITCON 175V 100MA	07263	FDH2161
CR230	152-0001-00	B010100	110000	SEMICOND DEVICE.STLLCON 175V 100MA	07263	RDH2161
08239	152-0001-00	B010100	D117777A	SEMICOND DEVICE. SILICON 375V, TOOMA	07263	FDH5004
GR240	152-0242-00	X8120000		SEMICOND DEVICE: SILICON, 22 JV, 200FA	07203	152-0600-00
CR241	152-0409-00			SEMICOND DEVICE: SILICON, 12,0000, 3MA	00003	132-0409-00
C 02/ 7	152_0/00 00			SENICOND DEVICE-STITCON 12 DOOV 5MA	80009	152-0409-00
CRZ47	152-0409-00			SEMICOND DEVICE SILICON, 12,000V, JMA	12060	152 0405 00
CR253	152-0414-00			SEMICOND DEVICE: SILICON, ZOUV, 0.75A	12909	U1K300
CR255	152-0141-02			SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152K
CR256	152-0061 - 00			SEMICOND DEVICE: SILICON, 175V, 100MA	07263	FDHZ161
CR262	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR264	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
					07640	7002171
CR269	152-0061-00	B010100 I	B119999	SEMICOND DEVICE: SILICON, 175V, 100MA	0/263	FDHZ161
CR269	152-0586-00	B120000		SEMICOND DEVICE: SILICON, 600V, 500MA	14936	RGPIOJ
CR270	152-0586-00	XB120000		SEMICOND DEVICE: SILICON, 600V, 500MA	14936	RGP10J
CR620	152-0141-02			SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR658	152-0141-02			SEMICOND DEVICE: SILICON. 30V. 50NA	01295	1N4152R
CR668	152-0141-02			SEMICOND DEVICE; SILICON, 30V. 50NA	01295	1N4152R
CR678	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 50NA	01295	1N4152R
CR688	152-0141-02			SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR702	152-0141-02			SEMICOND DEVICE; SILICON. 30V. 50NA	01295	1N4152R
CR704	152-0141-02			SEMICOND DEVICE: SILICON. 30V. 50NA	01295	1N4152R

Ckt No. Part No. Eff. Descrit Name & Description Code Mrt Part Number CR114 152-0141-02 SEXICOM DEVICE: SILICON, 30V, 50%A 01295 114/1528 CR214 152-0141-02 SEXICOM DEVICE: SILICON, 30V, 50%A 01295 114/1528 CR212 152-0141-02 SEXICOM DEVICE: SILICON, 30V, 50%A 01295 114/1528 CR311 152-0107-00 SEXICOM DEVICE: SILICON, 40V, 400%A 01295 6727 CR813 152-0107-00 SEXICOM DEVICE: SILICON, 40V, 400%A 01295 6727 CR813 152-0107-00 SEXICOM DEVICE: SILICON, 40V, 400%A 01295 6727 CR813 152-0107-00 SEXICOM DEVICE: SILICON, 40V, 400%A 01295 6727 CR813 152-0107-00 SEXICOM DEVICE: SILICON, 40V, 400%A 01295 6727 CR836 152-0107-00 SEXICOM DEVICE: SILICON, 40V, 400%A 01295 6727 CR841 152-0066-00 SEXICOM DEVICE: SILICON, 40V, 400%A 01295 1787 CR842 152-0017-00 SEXICOMD DEVICE: SILICON, 40V, 750%A 14433		Tektronix	Serial/Mod	el No		Mfr	
Ont total Tendes Description Description CR12 132-0141-02 SEMICOND DEVICE: SILICON, 30V, 50AA 01295 1841528 CR212 132-0141-02 SEMICOND DEVICE: SILICON, 30V, 50AA 01295 1841528 CR212 132-0141-02 SEMICOND DEVICE: SILICON, 30V, 50AA 01295 1841528 CR22 132-0107-00 SEMICOND DEVICE: SILICON, 400V, 400AA 01295 6727 CR811 132-0107-00 SEMICOND DEVICE: SILICON, 400V, 400AA 01295 6727 CR813 132-0107-00 SEMICOND DEVICE: SILICON, 400V, 400AA 01295 6727 CR813 132-0066-00 SEMICOND DEVICE: SILICON, 400V, 400AA 01295 6727 CR835 132-0107-00 SEMICOND DEVICE: SILICON, 400V, 400AA 01295 6727 CR835 132-0107-00 SEMICOND DEVICE: SILICON, 400V, 400AA 01295 6727 CR835 132-0107-00 SEMICOND DEVICE: SILICON, 400V, 1500AA 01295 1841528 CR836 132-0107-00 SEMICOND DEVICE: SILICON, 707, 50AA 04135 14431124 CR836 </td <td>Ckt No</td> <td>Part No.</td> <td>Fff</td> <td>Oscont</td> <td>Name & Description</td> <td>Code</td> <td>Mfr Part Number</td>	Ckt No	Part No.	Fff	Oscont	Name & Description	Code	Mfr Part Number
C3712 132-014-02 SEXICOND DEVICE: SILICON, 307, 50NA 0.1295 184/1528 C8714 132-014-02 SEXICOND DEVICE: SILICON, 307, 50NA 0.1295 184/1528 C8722 132-014-02 SEXICOND DEVICE: SILICON, 307, 50NA 0.1295 184/1528 C8810 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 400AA 0.1295 6727 C8811 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 400AA 0.1295 6727 C8813 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 400AA 0.1295 6727 C8813 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 400AA 0.1295 6727 C8813 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 400AA 0.1295 6727 C8814 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 400AA 0.1295 6727 C8815 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 400AA 0.1295 184/1528 C8816 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 50NA 0.1295 184/1528 C8810 132-0167-00 SEXICOND DEVICE: SILICON, 4007, 50NA 0.1295	UKCHU.	Tart No.	LII	000011			
Carpet 1 SERICOND DEVICE: SILICON, 30V, 50NA 0.1295 1MA152R CR721 152-014-02 SERICOND DEVICE: SILICON, 30V, 50NA 0.1295 1MA152R CR722 152-014-02 SERICOND DEVICE: SILICON, 30V, 50NA 0.1295 1MA152R CR810 152-0107-00 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 C727 CR811 152-0107-00 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 C727 CR813 152-0107-00 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 C727 CR813 152-0088-00 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 C727 CR824 152-0088-00 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 G727 CR824 152-0107-00 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 G727 CR835 152-0107-00 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 G727 CR836 152-0106-00 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 G727 CR841 152-014-02 SERICOND DEVICE: SILICON, 400V, 400NA 0.1295 G727 <t< td=""><td>CR712</td><td>152-0141-02</td><td></td><td></td><td>SEMICOND DEVICE: SILICON, 30V, 50NA</td><td>01295</td><td>1N4152R</td></t<>	CR712	152-0141-02			SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R
Circle 112-014-02 DERICOND DEVICE: STLICON, 30V, 50NA 0.1295 1N4:1528 CR310 132-0107-00 SERICOND DEVICE: STLICON, 400V, 400NA 0.1295 G727 CR311 132-0107-00 SERICOND DEVICE: STLICON, 400V, 400NA 0.1295 G727 CR313 132-0107-00 SERICOND DEVICE: STLICON, 400V, 400NA 0.1295 G727 CR313 132-0107-00 SERICOND DEVICE: STLICON, 400V, 400NA 0.1295 G727 CR313 132-0107-00 SERICOND DEVICE: STLICON, 400V, 400NA 0.1295 G727 CR313 132-0107-00 SERICOND DEVICE: STLICON, 400V, 400NA 0.1295 G727 CR324 152-014-02 SERICOND DEVICE: STLICON, 400V, 400NA 0.1295 G727 CR325 152-014-02 SERICOND DEVICE: STLICON, 400V, 400NA 0.1295 G727 CR325 152-014-02 SERICOND DEVICE: STLICON, 400V, 750NA 1433 LAGAIS CR441 152-0066-00 SERICOND DEVICE: STLICON, 30V, 50NA 0.1295 IA4132 R CR451 152-014-02 SERICOND DEVICE: STLICON, 30V, 50NA 0.1295 IA4152 R <	CR714	152-0141-02			SEMICOND DEVICE: SILICON. 30V. 50NA	01295	1N4152R
Chr222 ISENICOND DWVICE: SILICON, 300, 300A 0.1295 144.152R CR810 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR811 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR812 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR813 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR813 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR824 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR835 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR836 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR837 152-0107-00 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR837 152-0101-02 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 C727 CR841 152-0141-02 SENICOND DWVICE: SILICON, 4007, 400MA 0.1295 IA4152R	CR721	152-0141-02			SEMICOND DEVICE: SILICON, 30V. 50NA	01295	1N4152R
Display Display <t< td=""><td>08721</td><td>152-0141-02</td><td></td><td></td><td>SEMICOND DEVICE: STLLCON, 30V, 50NA</td><td>01295</td><td>1N4152R</td></t<>	08721	152-0141-02			SEMICOND DEVICE: STLLCON, 30V, 50NA	01295	1N4152R
CHART 152-0107-00 EPHICOND DEVICE:SILICOR,4007,400MA 01295 C727 CRB13 152-0177-00 SEMICOND DEVICE:SILICOR,4007,400MA 01295 C727 CRB13 152-0187-00 SEMICOND DEVICE:SILICOR,4007,400MA 01295 C727 CRB13 152-0488-00 SEMICOND DEVICE:SILICOR,4007,500MA 01295 C727 CRB20 152-0167-00 SEMICOND DEVICE:SILICOR,4007,500MA 01295 C777 CRB35 152-0167-00 SEMICOND DEVICE:SILICOR,4007,500MA 01295 C777 CRB35 152-0167-00 SEMICOND DEVICE:SILICOR,4007,500MA 01295 C777 CRB36 152-0167-00 SEMICOND DEVICE:SILICOR,4007,500MA 14433 L64016 CRB47 152-0161-02 SEMICOND DEVICE:SILICOR,4007,500MA 14433 L64016 CRB450 152-0161-02 SEMICOND DEVICE:SILICOR,4007,500MA 14433 L64016 CRB450 152-0141-02 SEMICOND DEVICE:SILICOR,307,500MA 01295 IM4152R CRB450 152-0141-02 SEMICOND DEVICE:SILICOR,307,500MA 01295 IM4152R <td>CR810</td> <td>152-0107-00</td> <td></td> <td></td> <td>SEMICOND DEVICE STLICON 400V 400MA</td> <td>01295</td> <td>G727</td>	CR810	152-0107-00			SEMICOND DEVICE STLICON 400V 400MA	01295	G727
Lasti 1 12-010-00 Delification by the field of the f	CROID	152-0107-00			SEWICOND DEVICE-STITCON 400V 400MA	01295	G727
cs812 152-0107-00 SEMICOND DEVICE: SILICOM, 400Y, 400MA D1295 C727 cs813 153-007-00 SEMICOND DEVICE: SILICOM, 400Y, 400MA D1295 C727 cs813 153-0164-02 SEMICOND DEVICE: SILICOM, 200Y, 1500MA D4713 3M55 FAMLLY cs820 152-017-00 SEMICOND DEVICE: SILICOM, 200Y, 50MA D1295 C727 cs835 152-017-00 SEMICOND DEVICE: SILICOM, 200Y, 50MA D1295 C727 cs841 152-0167-00 SEMICOND DEVICE: SILICOM, 400Y, 400MA D1295 C727 cs841 152-0167-00 SEMICOND DEVICE: SILICOM, 400Y, 500MA D1295 C727 cs841 152-0167-00 SEMICOND DEVICE: SILICOM, 400Y, 750MA D4433 LCA016 cs842 152-0164-02 SEMICOND DEVICE: SILICOM, 400Y, 750MA D1295 H4132 cs845 152-014-02 SEMICOND DEVICE: SILICOM, 30V, 50MA D1295 H4152R cs845 152-014-02 SEMICOND DEVICE: SILICOM, 30V, 50MA D1295 H4152R cs845 152-014-02 XENOND DEVICE: SILICOM, 30V, 50MA D1295 H4152R	CROIT	152-0107-00			SEMICOND DEVICE. SILICON, 4001, 40012	01275	0721
135-0107-00 SENICOND DEVICE: SILCON, 2007, 40084, 40084, 40084, 40743, 1855 PANLLY 02815 152-068-00 SENICOND DEVICE: SILCON, 4007, 50044, 4433, L4016 02824 152-0167-00 SENICOND DEVICE: SILCON, 4007, 40084, 01295 6727 02835 152-0167-00 SENICOND DEVICE: SILCON, 4007, 40084, 01295 6727 02836 152-017-00 SENICOND DEVICE: SILCON, 4007, 40084, 01295 6727 02835 152-017-00 SENICOND DEVICE: SILCON, 4007, 40084, 01295 6727 02836 152-017-00 SENICOND DEVICE: SILCON, 4007, 40084, 01295 6727 02842 152-0167-00 SENICOND DEVICE: SILCON, 4007, 40084, 004, 73084, 14433 164135 02842 152-0161-02 SENICOND DEVICE: SILCON, 4007, 75084, 14433 16433 02851 152-0141-02 SENICOND DEVICE: SILCON, 4007, 75084, 14433 16433 02855 152-0141-02 SENICOND DEVICE: SILCON, 307, 5084, 01295 1841528 02850 152-0141-02 SENICOND DEVICE: SILCON, 307, 5084, 01295 1841528 02850 152-0141-02 SENICOND DEVICE: SILCON, 307, 5084, 01295 1841528 02800 152-0141-02	00010	150 0103 00			CENTCOND DEVICE. STITCON 4000 400MA	01295	6727
USAB 1 12-010/-00 SERICOND DW UG: SILLON-000, 1900A 07.75 3555 FARLEY 02010 132-0488-00 SERICOND DEVICE: SILLON, 400Y, 500A 01.295 67.77 02010 132-0488-00 SERICOND DEVICE: SILLON, 400Y, 500A 01.295 67.77 02025 132-0468-00 SERICOND DEVICE: SILLON, 400Y, 400A 01.295 67.77 02037 132-0468-00 SERICOND DEVICE: SILLON, 400Y, 500A 01.295 67.77 02037 132-0468-00 SERICOND DEVICE: SILLON, 400Y, 500A 01.295 67.77 02037 132-0468-00 SERICOND DEVICE: SILLON, 400Y, 500A 01.295 67.77 02037 132-0468-00 SERICOND DEVICE: SILLON, 400Y, 500A 01.295 144.33 1.64016 02042 SEMICOND DEVICE: SILLON, 400Y, 50A 01.295 184.132R 184.132R 02045 132-0141-02 SEMICOND DEVICE: SILLON, 400Y, 50A 01.295 184.132R 02045 132-0141-02 SEMICOND DEVICE: SILLON, 30Y, 50A 01.295 184.132R 02045 132-0141-02 SEMICOND DEVICE: SILLON, 30Y, 50A 01.295 </td <td>CROIZ</td> <td>152-0107-00</td> <td></td> <td></td> <td>SEWICOND DEVICE: SILICON, 400V, 400MA</td> <td>01295</td> <td>C727</td>	CROIZ	152-0107-00			SEWICOND DEVICE: SILICON, 400V, 400MA	01295	C727
CH815 172-0488-00 SSHLOND B&VICESILLON, 2007, 1500A 077.13 10201 FAILLI CR820 152-0066-00 SSHLOND B&VICESILLON, 2007, 500A 01295 G727 CR835 152-0107-00 SSHLOND B&VICESILLON, 2007, 500A 01295 G727 CR836 152-0107-00 SSHLOND B&VICESILLON, 2007, 500A 01295 G727 CR836 152-0107-00 SSHLOND B&VICESILLON, 2007, 500A 047.13 H357 HALLY CR842 152-0066-00 SSHLOND B&VICESILLON, 2007, 500A 144.33 L64016 CR843 152-0066-00 SSHLOND B&VICESILLON, 4007, 750A 144.33 L64016 CR850 152-0041-02 SSHLOND B&VICESILLON, 4007, 500A 01295 1N4152R CR850 152-0141-02 SSHLOND B&VICESILLON, 307, 500A 01295 1N4152R CR851 152-0141-02 SSHLOND B&VICESILLON, 307, 500A 01295 1N4152R CR850 152-0141-02 SSHLOND B&VICESILLON, 307, 500A 01295 1N4152R CR850 152-0141-02 SSHLOND B&VICESILLON, 307, 500A 01295 1N4152R	CKOLD	152-0107-00			SEMICOND DEVICE: SILICON, 4000, 4000M	04717	SNSS PANTLY
CH820 152-006-00 SBH1CMD DFV1CE:S1L1CDR,30V,50NA 17433 120010 CH824 152-0141-02 SBH1CMD DFV1CE:S1L1CDR,30V,50NA 01295 6737 CH836 152-0107-00 SBH1CMD DFV1CE:S1L1CON,400M,400MA 01295 6737 CH836 152-0107-00 SBH1CMD DFV1CE:S1L1CON,400M,400MA 04713 M555 FANLLY CH836 152-0161-00 SBH1CMD DFV1CE:S1L1CON,400M,750MA 04713 M555 FANLLY CH830 152-0161-02 SBH1CMD DFV1CE:S1L1CON,400V,750MA 01295 184152R CH850 152-0141-02 SBH1CMD DFV1CE:S1L1CON,30V,50MA 01295 184152R CH850 152-0141-02 SBH1CMD DFV1CE:S1L1CON,30V,50NA 01295 184152R </td <td>CK815</td> <td>152-0488-00</td> <td></td> <td></td> <td>SEMICOND DEVICE: SILICON, 2007, ISOOMA</td> <td>16622</td> <td>106016</td>	CK815	152-0488-00			SEMICOND DEVICE: SILICON, 2007, ISOOMA	16622	106016
CR825 152-0141-02 SBMICOND DEVICE:SILICON,4007,400A 01295 IN*12A CR836 152-0107-00 SBMICOND DEVICE:SILICON,4007,400A 01295 G727 CR836 152-0107-00 SBMICOND DEVICE:SILICON,4007,400A 01295 G777 CR836 152-0107-00 SBMICOND DEVICE:SILICON,4007,750A 1403 1105 CR841 152-0066-00 SBMICOND DEVICE:SILICON,4007,750A 1403 1L6016 CR8450 152-0141-02 SBMICOND DEVICE:SILICON,4007,750A 1443 1L6016 CR851 152-0141-02 SBMICOND DEVICE:SILICON,4007,50NA 01295 1N4132R CR851 152-0141-02 SBMICOND DEVICE:SILICON,4007,50NA 01295 1N4132R CR851 152-0141-02 SBMICOND DEVICE:SILICON,4007,50NA 01295 1N4132R CR850 152-0141-02 SBMICOND DEVICE:SILICON,307,50NA 01295 1N4132R CR850 152-0141-02 SBMICOND DEVICE:SILICON,307,50NA 01295 1N4132R CR850 152-0141-02 SBMICOND DEVICE:SILICON,307,50NA 01295 1N4132R	CR820	152-0066-00			SEMICOND DEVICE: SILICON, 400V, / 50MA	14433	104010
CR835 152-0107-00 SENICOND DEVICE:SILICON,400W,400HA 01295 6727 CR836 152-0107-00 SENICOND DEVICE:SILICON,400V,400HA 0171 M755 FARLLY CR837 152-0488-00 SENICOND DEVICE:SILICON,400V,750MA 01713 M755 FARLLY CR842 152-0488-00 SENICOND DEVICE:SILICON,400V,750MA 01433 LAOH 5 CR842 152-0141-02 SENICOND DEVICE:SILICON,30V,50MA 01295 IM4132R CR851 152-0141-02 SENICOND DEVICE:SILICON,30V,50MA 01295 IM4152R CR850 152-0141-02 KB109310 SENICOND DEVICE:SILICON,30V,50MA	CR824	152-0141-02			SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152K
CR836 152-0107-00 SEMICOND DEVICE:SILICON,400V,400MA 01295 G727 CR831 152-0066-00 SEMICOND DEVICE:SILICON,400V,1500MA 04713 MISF FARILY CR830 152-0066-00 SEMICOND DEVICE:SILICON,400V,750MA 1433 L44016 CR841 152-0066-00 SEMICOND DEVICE:SILICON,400V,750MA 1433 L44016 CR8450 152-0141-02 SEMICOND DEVICE:SILICON,400V,750MA 1433 L44016 CR851 152-0141-02 SEMICOND DEVICE:SILICON,30V,50MA 01295 1M152R CR850 152-0141-02 KB109310 SEMICOND DEVICE:SILICON,30V,50MA 01295 1M152R CR850 152-0141-02 KB109310 SEMICOND DEVICE:SILICON,30V,50MA 01295 1M152R CR850 152-0141-02 KB109310 SEMICOND DEVICE:SILICON,30V,50MA<	CR835	152-0107-00			SEMICOND DEVICE: SILICON, 400V, 400MA	01295	6727
CR836 152-0107-00 SEMICOND DEVICE:SILICON, 3007, 40094, 40094, 40143 01295 6727 CR837 152-0046-00 SEMICOND DEVICE:SILICON, 3007, 5004A 14433 LC4016 CR842 152-0066-00 SEMICOND DEVICE:SILICON, 3007, 5004A 14433 LC4016 CR845 152-0141-02 SEMICOND DEVICE:SILICON, 3007, 5004A 01295 144132 CR860 152-0161-02 SEMICOND DEVICE:SILICON, 307, 5004A 01295 144132 CR860 152-0161-02 SEMICOND DEVICE:SILICON, 307, 500A 01295 144152 CR861 152-0141-02 SEMICOND DEVICE:SILICON, 307, 500A 01295 144152 CR870 152-0141-02 SEMICOND DEVICE:SILICON, 307, 500A 01295 144152 CR885 152-0141-02 SEMICOND DEVICE:SILICON, 307, 500A 01295 144152 CR885 152-0141-02 KE109310 SEMICOND DEVICE:SILICON, 307, 500A 01295 144152 CR890 152-0141-02 KE109310 SEMICOND DEVICE:SILICON, 307, 500A 01295 144152 CR890 152-0141-02 KE109310 SE							
CR837 152-048-00 SEMICOND DEVICE:SILLCON, 3007, 1500A 04713 JAM55 FAMILY CR841 152-0066-00 SEMICOND DEVICE:SILLCON, 4007, 750AA 14433 LC4016 CR845 152-0141-02 SEMICOND DEVICE:SILLCON, 4007, 750AA 14433 LC4016 CR851 152-0141-02 SEMICOND DEVICE:SILLCON, 307, 50AA 01295 184/137R CR865 152-0141-02 SEMICOND DEVICE:SILLCON, 307, 50AA 01295 184/157R CR865 152-0141-02 SEMICOND DEVICE:SILLCON, 307, 50AA 01295 184/157R CR875 152-0141-02 SEMICOND DEVICE:SILLCON, 307, 50AA 01295 184/157R CR880 152-0141-02 SEMICOND DEVICE:SILLCON, 307, 50AA 01295 184/157R CR890 152-0141-02 SEMICOND DEVICE:SILLCON, 307, 50AA 01295 184/157R CR890 152-0141-02 KB109310 SEMICOND DEVICE:SILLCON, 307, 50AA 01295 184/157R CR890 152-0141-02 KB109310 SEMICOND DEVICE:SILLCON, 307, 50AA 01295 184/157R CR890 152-0141-02 KB109	CR836	152-0107-00			SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR842 152-0066-00 SEMICOND DEVICE:SILLCON, 400V, 750MA 14433 LC4016 CR851 152-0141-02 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR850 152-0141-02 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR850 152-0141-02 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR850 152-0141-02 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR851 152-0141-02 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR851 152-0141-02 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR850 152-0141-02 RE109310 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR830 152-0141-02 KE109310 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR830 152-0141-02 KE109310 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR930 152-0141-02 KE109310 SEMICOND DEVICE:SILLCON, 30V, 50MA 01295 184/152R CR930 152-	CR837	152-0488-00			SEMICOND DEVICE: SILICON, 200V, 1500MA	04713	3N55 FAMILY
CR842 152-0056-00 SEMICOND DEVICS:SILICON, 400Y, 750MA 14433 LC4016 CR850 152-0141-02 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR851 152-0141-02 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR850 152-0141-02 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR875 152-0141-02 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR875 152-0141-02 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR850 152-0141-02 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR850 152-0141-02 XB109310 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR860 152-0141-02 XB109310 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR960 152-0141-02 XB109310 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR960 152-0141-02 XB109310 SEMICOND DEVICS:SILICON, 30V, 50NA 01295 184152R CR850 152-0141-02 <td>CR841</td> <td>152-0066-00</td> <td></td> <td></td> <td>SEMICOND DEVICE:SILICON,400V,750MA</td> <td>14433</td> <td>LG4016</td>	CR841	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR850 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 184152R CR850 152-0141-02 KB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 184152R CR850 152-0141-02 KB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 184152R CR960 152-0141-02 KB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 184152R CR960 152-0141-02 KB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 184152R CR960 152-0141-02 KB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 184152R CR960	CR842	152-0066-00			SEMICOND DEVICE: SILICON, 400V, 750MA	14433	LG4016
CR851 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR850 152-0164-02 SEMICOND DEVICE:SILICON, 30V, 50NA 10295 1M4152R CR857 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR875 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR875 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR875 152-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR870 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR890 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR890 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR990 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1M4152R CR990	CR850	152-0141-02			SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR860 152-0066-00 SEMICOND DEVICE: SILICON, 400V, 750MA 14433 LC4016 CR850 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR870 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR850 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR850 152-0141-02 XB109310 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR930 152-0141-02 XB109310 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR970 152-0322-00 XB109310 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR980 152-0322-00 XB109310 SEMICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR900 152-0322-00 XB109310 SEMICOND DEVICE: SILICON, 30V, 50NA 01295	CR851	152-0141-02			SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR860 152-066-00 SEMICOND DEVICE:SILICON,4007,750MA 14433 L64016 CR865 152-0141-02 SEMICOND DEVICE:SILICON,307,50MA 01295 1N4152R CR875 152-0141-02 SEMICOND DEVICE:SILICON,307,50MA 01295 1N4152R CR853 152-0141-02 SEMICOND DEVICE:SILICON,307,50MA 01295 1N4152R CR853 152-0141-02 SEMICOND DEVICE:SILICON,307,50MA 01295 1N4152R CR854 152-0141-02 KB109310 SEMICOND DEVICE:SILICON,307,50MA 01295 1N4152R CR930 152-0322-00 XB109310 SEMICOND DEVICE:SILICON,157,00MA 01295 1N4152R CR930 152-0322-00 XB109310 SEMICOND DEVICE:SILICON,307,50MA 01295 1N4152R CR930 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
CR850 152-0141-02 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR870 152-0141-02 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR875 152-0141-02 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR895 152-0141-02 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR895 152-0141-02 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR895 152-0141-02 XB109310 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR950 152-0141-02 XB109310 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR970 152-0141-02 XB109310 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR980 152-0141-02 XB109310 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR990 152-032-00 XB109310 SENTCOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R	CR860	152-0066-00			SEMICOND DEVICE: SILICON, 400V, 750MA	14433	LG4016
CR870 IS2-0141-02 SEMICOND DEVICE:SILICON 130V;50AA 01295 INAI52R CR871 IS2-0141-02 SEMICOND DEVICE:SILICON, 30V,50AA 01295 INAI52R CR880 IS2-0141-02 SEMICOND DEVICE:SILICON, 30V,50AA 01295 INAI52R CR880 IS2-0141-02 SEMICOND DEVICE:SILICON, 30V,50NA 01295 INAI52R CR880 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V,50NA 01295 INAI52R CR930 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V,50NA 01295 INAI52R CR960 IS2-032-00 XB109310 SEMICOND DEVICE:SILICON, 30V,50NA 01295 INAI52R CR970 IS2-032-00 XB109310 SEMICOND DEVICE:SILICON, 30V,50NA 01295 INAI52R	CR865	152-0141-02			SEMICOND DEVICE: SILICON, 30V. 50NA	01295	1N4152R
CR875 IS2-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR805 IS2-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR805 IS2-0141-02 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR930 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR960 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR960 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR960 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR960 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR960 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR960 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 INAIS2R CR960 IS2-041-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01	CR870	152-0141-02			SEMICOND DEVICE: STLICON, 30V, 50NA	01295	1N4152R
CABB5 132-0141-02 Semiconb Bevice: Silicon, Jov, Sona C1295 1M:152R CR850 132-0141-02 SEMICOND DEVICE: SILICON, 30V, SONA C1295 1M:152R CR900 152-0141-02 SEMICOND DEVICE: SILICON, 30V, SONA C1295 1M:152R CR900 152-0141-02 XB109310 SEMICOND DEVICE: SILICON, 30V, SONA C1295 1M:4152R CR900 152-0141-02 XB109310 SEMICOND DEVICE: SILICON, 30V, SONA C1295 1M:4152R CR900 152-0141-02 XB109310 SEMICOND DEVICE: SILICON, 30V, SONA C1295 1M:4152R CR900 152-0322-00 XB109310 SEMICOND DEVICE: SILICON, 15V, HOT CARRIER 50434 5082-2672 CR900 152-0322-00 XB109310 SEMICOND DEVICE: SILICON, 15V, HOT CARRIER 50434 5082-2672 DS271 150-0030-00 LAMP, GLOW: NEON, T-2, 60 T0 90 VOLTS 08806 A2B-T DS274 150-0030-00 LAMP, GLOW: NEON, T-2, 60 T0 90 VOLTS 08806 A2B-T F201 159-0003-00 LAMP, GLOW: NEON, T-2, 60	00075	152-0141-02			SENTCOND DEVICE: STITCON 30V 50NA	01295	(N4152R
CR890 132-0141-02 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR890 152-0141-02 XB109310 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR930 152-0141-02 XB109310 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR970 152-0322-00 XB109310 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR990 152-0322-00 XB109310 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR990 152-0322-00 XB109310 SENICOND DEVICE: SILICON, 30V, 50NA 01295 1N4152R CR990 152-0322-00 LAMP, GLOW: NEON, T-2, 60 09 VOLTS 08806 A28-T DS271 150-0030-00 LAMP, GLOW:	CR075	152-0141-02			SEMICOND DEVICE-STITCON 30V 50NA	01295	1N4152R
CR830 11/2-0141-02 SERICOND DEVICE: STLICON, 30V, 50NA 01295 1N4152R CR930 152-0141-02 XB109310 SENICOND DEVICE: STLICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SENICOND DEVICE: STLICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SEMICOND DEVICE: STLICON, 30V, 50NA 01295 1N4152R CR960 152-0322-00 XB109310 SEMICOND DEVICE: STLICON, 15V, BOT CARRIER 50434 5082-2672 CR970 152-0322-00 XB109310 SEMICOND DEVICE: STLICON, 15V, BOT CARRIER 50434 5082-2672 CR970 152-0322-00 XB109310 SEMICOND DEVICE: STLICON, 15V, BOT CARRIER 50434 5082-2672 DS271 150-0030-00 LAMP, GLOW: MEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 LAMP, GLOW: MEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 159-0025-00 LAMP, GLOW: MEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F810 159-0028-00 FUSE, CARTRIDGE: 3AG, 0.5A, 250V, SLOW BLOW 71400 <td>CROOJ</td> <td>152-0141-02</td> <td></td> <td></td> <td>SENICOND DEVICE.SILICON 30V 50NA</td> <td>01295</td> <td>IN4152R</td>	CROOJ	152-0141-02			SENICOND DEVICE.SILICON 30V 50NA	01295	IN4152R
CR930 152-0141-02 XB109310 SENICOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SENICOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SENICOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR960 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON, 15V, HOT CARRIER 50434 5082-2672 CR990 152-0302-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2E-T DS271 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2E-T DS274 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2E-T DS274 150-0030-00 KB120000 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2E-T DS274 150-0030-00 KB120000 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2E-T DS274 150-0030-00 KB120000 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS </td <td>CK090</td> <td>152-0141-02</td> <td></td> <td></td> <td>SEMICORD DEVICE. SILICON, SOV, SOWA</td> <td>01295</td> <td>141528</td>	CK090	152-0141-02			SEMICORD DEVICE. SILICON, SOV, SOWA	01295	141528
CR930 122-01-01-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 IMM15XR CR960 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 IN4152R CR960 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 IN4152R CR960 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 15V, HOT CARRIER 50434 5082-2672 CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON, 15V, HOT CARRIER 50434 5082-2672 DS271 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS272 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS273 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 159-0023-00 FUSE, CARTRIDCE: 3AG, 1. 6A, 250V, SLOW-BLOW 71400 MDX 1 6/10	00030	154 0141 03	WD100710		CENTCOND DEVICE. STLLCON 200 SONA	01205	1841520
CR960 IS2-0141-02 XB109310 COPTION 7 ONLY O1295 IN4152R CR960 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, JOV, 50NA D1295 IN4152R CR960 IS2-0141-02 XB109310 SEMICOND DEVICE:SILICON, JOV, 50NA D1295 IN4152R CR960 IS2-0322-00 XB109310 SEMICOND DEVICE:SILICON, JOV, 50NA D1295 IN4152R CR990 IS2-0322-00 XB109310 SEMICOND DEVICE:SILICON, JOV, 50NA D1295 IN4152R CR990 IS2-0322-00 XB109310 SEMICOND DEVICE:SILICON, 15V, HOT CARRIER 50434 5082-2672 DS271 IS0-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 IS0-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 IS9-0003-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 IS9-0003-00 FUSE, CARTRIDCE: 3AC, I.6A, 250V, SLOW BLOW 71400 MDL1 F201 IS9-0019-00 FUSE, CARTRIDCE: 3AC, I.6A, 250V, FAST-BLOW 71400 MCC 1/2	CR930	152-0141-02	XB103310		(OPTION 7 ON R)	01295	IN4IJZK
CR960 152-0141-02 XB109310 SENICOND DEVICE:SLICON, 30V, 50NA 01293 1N41528 CR960 152-0141-02 XB109310 SENICOND DEVICE:SLICON, 30V, 50NA 01295 1N41528 CR960 152-0141-02 XB109310 SENICOND DEVICE:SLICON, 30V, 50NA 01295 1N41528 CR960 152-0322-00 XB109310 SENICOND DEVICE:SLICON, 15V, HOT CARRIER 50434 5082-2672 D5271 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5273 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 KB120000 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 KB120000 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 150-0020-00 FUSE, CARTRIDCE: 3AG, 1.6A, 250V, SLOW BLOW 71400 MDL1					(OPTION / UNLY)	01005	18/1525
CR980 I52-0141-02 XB109310 CMPTION 7 ONLY Oligibility CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON, 30V, 50MA 01295 IN4152R CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON, 15V, HOT CARRIER 50434 5082-2672 DS271 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS273 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 159-0028-00 FUSE, CARTRIDCE: 3AG, 1.6A, 250V, SLOW-BLOW 71400 MDL1 F810 159-0028-00 FUSE, CARTRIDCE: 3AG, 0. 25A, 250V, FAST-BLOW 71400 ACC 1/4 F835 159-0025-00 FUSE, CARTRIDCE: 3AG, 0. 5A, 250V, FAST-BLOW 71400 ACC 1/2 J210 131-078-00 B100000	CR960	152-0141-02	XB109310		SEMICOND DEVICE: SILICON, 30V, 50NA	01232	1041528
CR980 152-0141-02 XB109310 SEMICOND DEVICE:SILICON, 30V, 50NA 01295 1N4152R CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON, 15V, HOT CARRIER (OPTION 7 ONLY) 50434 5082-2672 D5271 150-0030-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5272 150-0030-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 159-0003-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 159-0019-00 FUSE, CARTRIDCE: 3AG, 1. 6A, 250V, SLOW BLOW 71400 MDX 1 6/10 T000 FUSE, CARTRIDCE: 3AG, 0. 25A, 250V, FAST-BLOW 71400 AGC 1/4 F810 159-0028-00 FUSE, CARTRIDCE: 3AG, 0. 5A, 250V, FAST-BLOW 71400 AGC 1/2 J210 131-078-00 B100000 B106747 CONNECTOR, RCPT, :CKT D2, 24/56 CONTACT 13511 31-279 J601					(OPTION 7 ONLY)		
(OPTION 7 ONLY) CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON,15V,HOT CARRIER (OPTION 7 ONLY) 50434 5082-2672 DS271 150-0030-00 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS273 150-0030-00 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 FUSE,CARTRIDGE:3AG,1.6A,250V,SLOW-BLOW 71400 MDX 1 6/10	CR980	152-0141-02	XB109310		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON,15V,HOT CARRIER (OPTION 7 ONLY) 50434 5082-2672 D5271 150-0030-00 D5273 150-0030-00 D5274 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 D5273 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 D5273 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 D5070 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 D50-003-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 D50-0025-00 FUSE,CARTRIDCE:3AG,1.6A,250V,SLOW-BLOW 71400 MDL1 F810 159-0025-00 FUSE,CARTRIDCE:3AG,0.25A,250V,FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE,CARTRIDCE:3AG,0.25/6 CONTACT 13511 31-279 J601 131-1078-00 B100000 B106746 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00					(OPTION 7 ONLY)		
CR990 152-0322-00 XB109310 SEMICOND DEVICE:SILICON, 15V, HOT CARRIER 50434 5082-2672 DS271 150-0030-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS273 150-0030-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 XB120000 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 XB120000 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 XB120000 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T PS275 159-0019-00 FUSE, CARTRIDCE:3AG, J. 6A, 250V, SLOW BLOW 71400 MDL1 F201 159-0028-00 FUSE, CARTRIDCE:3AG, D. 25A, 250V, FAST-BLOW 71400 AGC 1/4 F8150 159-0028-00 FUSE, CARTRIDCE:3AG, D. 25A, 250V, FAST-BLOW 71400 AGC 1/2 J210 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 13511 31-279 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238							
(OPTION 7 ONLY) DS271 150-0030-00 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS272 150-0030-00 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS273 150-0030-00 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 KB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 KB120000 FUSE,CARTRIDGE:3AG,1.6A,250V,SLOW-BLOW 71400 MDL1 (EXPORT (240V NOMINAL LINE) 71400 MDL1 F810 159-0028-00 FUSE,CARTRIDGE:3AG,0.5A,250V,FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 CONNECTOR,RCPT,:2KT BD,28/56 CONTACT 13511 31-279 J601 131-1078-00 B106747 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30	CR990	152-0322-00	XB109310		SEMICOND DEVICE:SILICON, 15V, HOT CARRIER	50434	5082-2672
D5271 150-0030-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5272 150-0030-00 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5273 150-0030-00 XB120000 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T D5274 150-0030-00 XB120000 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 XB120000 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 XB120000 LAMP, GLOW:NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 159-0019-00 FUSE, CARTRIDCE:3AG, 1.6A, 250V, SLOW-BLOW 71400 MDX 1 6/10 F810 159-0028-00 FUSE, CARTRIDCE:3AG, 0. 25A, 250V, FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE, CARTRIDCE:3AG, 0. 5A, 250V, FAST-BLOW 71400 AGC 1/2 J210 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 13511 31-279 J601 131-1078-00 B100000 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00					(OPTION 7 ONLY)		
DS271 150-0030-00 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS272 150-0030-00 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 VB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 FUSE,CARTRIDGE:3AG,1.6A,250V,SLOW-BLOW 71400 MDL1 F810 159-0028-00 FUSE,CARTRIDGE:3AG,0.25A,250V,FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE,CARTRIDGE:3AG,0.25/6 CONTACT 13511 31-279 J601 131-1078-00 B010100 B099999 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR,RCPT,:28/56 CONTAC							
DS272 150-0030-00 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS273 150-0030-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T DS274 150-0030-00 XB120000 LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 XB120000 FUSE,CARTRIDGE:3AG,1.6A,250V,SLOW-BLOW 71400 MDX 1 6/10 F201 159-0019-00 FUSE,CARTRIDGE:3AG,0.25A,250V,FAST-BLOW 71400 MDL1 F701 159-0028-00 FUSE,CARTRIDGE:3AG,0.25A,250V,FAST-BLOW 71400 AGC 1/4 F835 159-0028-00 FUSE,CARTRIDGE:3AG,0.25A,250V,FAST-BLOW 71400 AGC 1/2 J210 131-078-00 B010100 B099999 CONNECTOR,RCPT,:CKT BD,28/56 CONTACT 95238 600-11562256DF30 J601 131-1078-00 B106747 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-11562256DF30 J602 131-1078-00 B106746 CONN, RCPT, 28/56 CONTACT 95238 600-11562256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, 28/56 CONTACT 95238 600-11562256DF30 <	D5271	150-0030-00			LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS	08806	A2B-T
DS273 150-0030-00 XB120000 LAMP, GLOW: NEON, T-2, 60 TO 90 VOLTS 08806 A2B-T F201 159-0003-00 XB120000 FUSE, CARTRIDGE: 3AG, 1. 6A, 250V, SLOW-BLOW 71400 MDX 1 6/10 F201 159-0019-00 FUSE, CARTRIDGE: 3AG, 1. 6A, 250V, SLOW BLOW 71400 MDX 1 6/10 F201 159-0028-00 FUSE, CARTRIDGE: 3AG, 0. 25A, 250V, SLOW BLOW 71400 MDL1 F810 159-0028-00 FUSE, CARTRIDGE: 3AG, 0. 25A, 250V, FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE, CARTRIDGE: 3AG, 0. 5A, 250V, FAST-BLOW 71400 AGC 1/2 J210 131-078-00 B010100 B099999 CONNECTOR, RCPT, :CKT BD, 28/56 CONTACT 13511 31-279 J601 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B100000 B106746 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B100000 B106746 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B100000 <t< td=""><td>DS272</td><td>150-0030-00</td><td></td><td></td><td>LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS</td><td>08806</td><td>A2B-T</td></t<>	DS272	150-0030-00			LAMP,GLOW:NEON,T-2,60 TO 90 VOLTS	08806	A2B-T
DS274 150-0030-00 XB120000 LAMP,GLOW:NEON,T-Z,GO TO 90 VOLTS 08806 A2B-T F201 159-0003-00 FUSE,CARTRIDGE:3AG,1.6A,250V,SLOW-BLOW 71400 MDX 1 6/10 F201 159-0019-00 FUSE,CARTRIDGE:3AG,1.6A,250V,SLOW BLOW 71400 MDL1 F810 159-0028-00 FUSE,CARTRIDGE:3AG,0.5A,250V,FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE,CARTRIDGE:3AG,0.5A,250V,FAST-BLOW 71400 AGC 1/2 J210 131-0955-00 CONNECTOR,RCPT,:CKT BD,28/56 CONTACT 13511 31-279 J601 131-1078-00 B010100 B099999 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B100000 B106746 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B100000 B105746 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B100000 B105856 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30	DS273	150-0030-00			LAMP.GLOW:NEON.T-2,60 TO 90 VOLTS	08806	A2B-T
F201 159-0003-00 	DS274	150-0030-00	XB120000		LAMP.GLOW:NEON.T-2.60 TO 90 VOLTS	08806	A2B-T
F201 159-0003-00 FUSE, CARTRIDGE: 3AG, 1. 6A, 250V, SLOW-BLOW 71400 MDX 1 6/10 F201 159-0019-00 FUSE, CARTRIDGE: 3AG, 1. 6A, 250V, SLOW-BLOW 71400 MDX 1 F810 159-0028-00 FUSE, CARTRIDGE: 3AG, 0. 25A, 250V, FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE, CARTRIDGE: 3AG, 0. 25A, 250V, FAST-BLOW 71400 AGC 1/2 J210 131-078-00 B010100 B099999 CONNECTOR, RCPT, :CKT BD, 28/56 CONTACT 13511 31-279 J601 131-1078-00 B106746 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B100000 B106746 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B100000 B106746 CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B100000 B106746 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B100000 B105856 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 <					,,,,,,,,		
1201 159-0019-00 (DOMESTIC (120V NOMINAL LINE) 11100 111000 11100000	F201	159-0003-00			FUSE CARTRIDGE : 3AG. 1.6A. 250V. SLOW-BLOW	71400	MDX 1 6/10
F201 159-0019-00 FUSE, CARTRIDGE : 3AG, 1A, 250V, SLOW BLOW 71400 MDL1 F810 159-0028-00 FUSE, CARTRIDGE : 3AG, 0. 25A, 250V, FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE, CARTRIDGE : 3AG, 0. 5A, 250V, FAST-BLOW 71400 AGC 1/2 J210 131-078-00 B010100 B099999 CONNECTOR, RCPT, :CKT BD, 28/56 CONTACT 13511 31-279 J601 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857	- 201				(DOMESTIC (120V NOMINAL LINE)		
131 1	F201	150-0010-00			FUSE CARTRIDGE - 3AC 1A 250V SLOW BLOW	71600	MDI 1
F810 159-0028-00 FUSE, CARTRIDGE: 3AG, 0. 25A, 250V, FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE, CARTRIDGE: 3AG, 0. 25A, 250V, FAST-BLOW 71400 AGC 1/2 J210 131-0955-00 CONNECTOR, RCPT, :CKT BD, 28/56 CONTACT 13511 31-279 J601 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J601 131-1078-00 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603	1201	139 0019-00			(EVDORT (2600 NOWINAL LING)	/1400	NBE1
FB10 139-0020-00 FD2E,CARRIDGE:SAG,0.25A,250V,FAST-BLOW 71400 AGC 1/4 F835 159-0025-00 FUSE,CARRIDGE:SAG,0.5A,250V,FAST-BLOW 71400 AGC 1/2 J210 131-0955-00 CONNECTOR,RCPT,:CKT BD,28/56 CONTACT 13511 31-279 J601 131-1078-00 B010100 B099999 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J601 131-1078-00 B106747 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B100000 B106746 CONN, RCPT,ELEC:CKT CARD,28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106746 CONN, RCPT,ELEC:CKT CARD,28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR,RCPT,:28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONN, RCPT,ELEC:CKT CARD,28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B1005856 CONN,RCPT,ELEC:CKT CARD,28/5	E910	150-0029-00			ENCE CARTELOCE. 3AC O 354 3500 FACT_BION	71600	ACC 1/4
F833 139-0023-00 F0SE, CARTRIDGE: 3AC, 0. 5A, 250V, FAST-BLOW 71400 ACC 172 J210 131-0955-00 CONNECTOR, RCPT, :CKT BD, 28/56 CONTACT 13511 31-279 J601 131-1078-01 B100000 B06746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J601 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B1008000 CONN, RCPT, ELEC:CKT CARD, 28/56 CO	F010 F025	159-0026-00			PUGE CARTRIDGE: SAG, 0.23A, 230V, FAST-BLOW	71400	AGC 1/4
J210 131-0955-00 CONNECTOR, RCPT, :CKT BD, 28/56 CONTACT 13511 31-279 J601 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J601 131-1078-00 B100000 B106746 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106745 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B1000000 CONN,	F833	159-0025-00			FUSE, CARTRIDGE: JAG, 0. 5A, ZOUV, FAST-BLOW	/1400	AGC 1/2
J210 131-0955-00 CONNECTOR, RCPT, :CKT BD, 28/56 CONTACT 13511 31-279 J601 131-1078-00 B00000 B106746 CONN, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J601 131-1078-01 B100000 B106746 CONN, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105856 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B100000 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238	-010						
J601 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J601 131-1078-01 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J601 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603	3210	131-0955-00			CONNECTOR, RCPT, :CKT BD, 28/56 CONTACT	13511	31-279
J601 131-1078-01 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J601 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J602 131-1078-01 B106747 CONNECTOR, RCPT, :28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-01 B105856 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-01 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B1000000 CONNE	J601	131-1078-00	B010100	B099999	CONNECTOR, RCPT, :28/56 CONTACT	95238	600-1156Y256DF30
J601 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106746 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 31514 SAM28D/2-TX J604 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 31514 SAM28D/2-TX J604 131-1043-00 CONNECTOR, RCPT, :18/36 <t< td=""><td>J601</td><td>131-1078-01</td><td>B100000</td><td>B106746</td><td>CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT</td><td>31514</td><td>SAM28D/2-TX</td></t<>	J601	131-1078-01	B100000	B106746	CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT	31514	SAM28D/2-TX
J602 131-1078-00 B010100 B099999 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J602 131-1078-01 B100000 B106746 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105856 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-01 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J604 131-1043-00 CONNECTOR, RCPT, :18/36 CONTACT 23880 SAC18D/4-2 L259 108-0564-00 COIL, RF: FIXED, 740H 80009 108-0564-00	J601	131-1078-00	B106747		CONNECTOR, RCPT, :28/56 CONTACT	95238	600-1156Y256DF30
J602 131-1078-01 B100000 B106746 CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B105856 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-01 B105857 B099999 CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B100000 CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J604 131-1043-00 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J604 131-1043-00 CONNECTOR, RCPT, :18/36 CONTACT 23880 SAC18D/4-2 L259 108-0564-00 COIL, RF: FIXED, 740H 80009 108-0564-00 80009 108-0564-00 L291 108-0644-00 COIL, TUBE DEFLE-TRACE ROTATOR 80009 108-0564-00 <td< td=""><td>J602</td><td>131-1078-00</td><td>B010100</td><td>B099999</td><td>CONNECTOR, RCPT, :28/56 CONTACT</td><td>95238</td><td>600-1156Y256DF30</td></td<>	J602	131-1078-00	B010100	B099999	CONNECTOR, RCPT, :28/56 CONTACT	95238	600-1156Y256DF30
J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B010100 B105856 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-01 B105857 B099999 CONN, RCPT, ELEC: CKT CONNECTOR, RCPT, :28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 31514 SAM28D/2-TX J604 131-1043-00 B100000 CONNECTOR, RCPT, :18/36 CONTACT 23880 SAC18D/4-2 L259 108-0564-00 COIL, RF: FIXED, 740H 80009 108-0564-00 80009 108-0564-00 L291 108-0644-00 COIL, TUBE DEFLE-TRACE ROTATOR 80009 108-0564-00	J602	131-1078-01	B100000	B106746	CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT	31514	SAM28D/2-TX
J602 131-1078-00 B106747 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-00 B010100 B105856 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-01 B105857 B099999 CONN, RCPT, ELEC:CKT CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J604 131-1043-00 CONNECTOR, RCPT, :18/36 CONTACT 95238 600-1156Y256DF30 J604 131-1043-00 CONNECTOR, RCPT, :18/36 CONTACT 23880 SAC18D/4-2 L259 108-0564-00 COIL, RF: FIXED, 740H 80009 108-0564-00 L291 108-0644-00 COIL, TUBE DEFLE-TRACE ROTATOR 80009 108-0564-00							
J603 131-1078-00 B010100 B105856 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J603 131-1078-01 B105857 B099999 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONN, RCPT, ELEC:CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J604 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J604 131-1043-00 CONNECTOR, RCPT, :18/36 CONTACT 23880 SAC18D/4-2 L259 108-0564-00 COIL, RF: FIXED, 740H 80009 108-0564-00 L291 108-0644-00 COIL, TUBE DEFLE-TRACE ROTATOR 80009 108-0564-00	J602	131-1078-00	B106747		CONNECTOR, RCPT, :28/56 CONTACT	95238	600-1156Y256DF30
J603 131-1078-01 B105857 B099999 CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT 31514 SAM28D/2-TX J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J604 131-1043-00 CONNECTOR, RCPT, :18/36 CONTACT 23880 SAC18D/4-2 L259 108-0564-00 COIL, RF: FIXED, 740H 80009 108-0564-00 L291 108-0644-00 COIL, TUBE DEFLE-TRACE ROTATOR 80009 108-0564-00	J603	131-1078-00	B010100	B105856	CONNECTOR, RCPT, :28/56 CONTACT	95238	600-1156Y256DF30
J603 131-1078-00 B100000 CONNECTOR, RCPT, :28/56 CONTACT 95238 600-1156Y256DF30 J604 131-1043-00 CONNECTOR, RCPT, :18/36 CONTACT 23880 SAC18D/4-2 L259 108-0564-00 COIL, RF: FIXED, 740H 80009 108-0564-00 L291 108-0644-00 COIL, TUBE DEFLETTRACE ROTATOR 80009 108-0564-00	J603	131-1078-01	B105857	в099999	CONN, RCPT, ELEC: CKT CARD, 28/56 CONTACT	31514	SAM28D/2-TX
J604 131-1043-00 CONNECTOR, RCPT, :18/36 CONTACT 23880 SAC18D/4-2 L259 108-0564-00 COIL, RF: FIXED, 740H 80009 108-0564-00 L291 108-0644-00 COIL, TUBE DEFLE: TRACE ROTATOR 80009 108-0564-00	J603	131-1078-00	B100000		CONNECTOR, RCPT, :28/56 CONTACT	95238	600-1156Y256DF30
L259 108-0564-00 COIL, RF: FIXED, 740% 80009 108-0564-00 L291 108-0644-00 COIL, TUBE DEFLE-TRACE ROTATOR 80009 108-0644-00	J604	131-1043-00			CONNECTOR, RCPT, :18/36 CONTACT	23880	SAC18D/4-2
L259 108-0564-00 COLL, RF: FIXED, 740K 80009 108-0564-00 L291 108-0644-00 COLL, TUBE DEFLE: TRACE ROTATOR 80009 108-0644-00					· · · · · · · · · · · · · · · · · · ·		
	L259	108-0564-00			COIL, RF: FIXED, 740H	80009	108-0564-00
OVINION OVINION OVOV ING-UN-	L291	108-0644-00			COIL, TUBE DEFLE: TRACE ROTATOR	80009	108-0644-00

	Tektronix	Serial/Model No.			Mtr	
Çkt No.	Part No.	Eff	Dscont	Name & Description	Code	Mfr Part Number
				······································		
Q104	151-0279-00	B010100	B079999	TRANSISTOR:SILICON, NPN	80009	151-0279-00
Q104	151-0150-00	B080000	B119999	TRANSISTOR: SILICON, NPN	80009	151-0150-00
Q104	151-0615-00	B120000		TRANSISTOR:SILICON,NPN	80009	151-0615-00
Q106	151-0190-02	B010100	B069999	TRANSISTOR: SILICON, NPN	80009	151-0190-02
Q106	151-0190-00	B070000		TRANSISTOR:SILICON, NPN	07263	\$032677
Q114	151-0279-00	B010100	B079999	TRANSISTOR:SILICON, NPN	80009	151-0279-00
			-110000			
Q114	151-0150-00	8080000	B119999	TRANSISTOR: SILICON, NPN	80009	151-0150-00
Q114	151-0615-00	B120000		TRANSISTOR: SILICON, NPN	80009	151-0615-00
Q116	151-0190-02	B010100	B069999	TRANSISTOR: SILICON, NPN	80009	151-0190-02
Q116	151-0190-00	B070000		TRANSISTOR: SILICON, NPN	07263	\$032677
Q124	151-0279-00	B010100	B079999	TRANSISTOR:SILICON, NPN	80009	151-0279-00
Q124	151-0150-00	B080000	B119999	TRANSISTCR: SILICON, NPN	80009	151-0150-00
0126	151-0615-00	120000		TRANSFERRAD.STITCON NEW	80000	151-0615-00
0126	151-0100-02	B120000	8060000	TRANSISION, SILICON, NEW	80009	151-0190-02
0126	151-0190-02	B010100	D0099999	TRANSISION, SILLON, NEN	07263	S032677
0126	151-0190-00	B070000	8070000	TRANSISION: SILICON MEN	80009	151-0279-00
0134	151-0279-00	8010100	BU/3333	TRANSISION, SILICON, NEN	80009	151-0150-00
0134	151 0615 00	B120000	D113337	TRANSISTOR, SILICON, NEW	80000	151-0615-00
Q134	151-0615-00	B120000		IRANSIBIOR BILICON, NEW	00009	191 0019 00
0136	151-0190-02	B010100	8069999	TRANSISTOR: SILICON, NPN	80009	151-0190-02
0136	151-0190-00	B070000		TRANSISTOR: STLICON, NPN	07263	8032677
0138	151-0341-00	XB050000	8119999X	TRANSISTOR'SILLCON NPN	07263	\$040065
0214	151-0341-00	ABOJOOOO	011 <i>77777</i> K	TRANSISTOR STLICON NPN	07263	\$040065
0222	151-0190-00			TRANSISTOR: STLICON, NPN	07263	5032677
0226	151-0179-00	B010100	B069999	TRANSISTOR: SILICON, NPN	80009	151-0179-00
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Q226	151-0347-00	B070000	B119999	TRANSISTOR: SILICON, NPN	04713	SPS7951
Q226	151-0407-00	B120000		TRANSISTOR: SILICON, NPN	04713	SS2456
Q234	151-0228-00	B010100	B069999	TRANSISTOR: SILICON, PNP, SEL FROM 2N4888	80009	151-0228-00
Q234	151-0350-00	B070000	B072987	TRANSISTOR: SILICON, FNP	04713	SPS6700
Q234	151-0406-00	B072988		TRANSISTOR: SILICON, PNP	01295	SGC7282
Q252	151-0256-00			TRANSISTOR: SILICON, NPN	80009	151-0256 - 00
Q262	151-0207-00			TRANSISTOR: SILICON, NPN	80009	151-0207-00
Q264	151-0342-00			TRANSISTOR: SILICON, PNP	07263	S035928
Q278	151-1005-00	B010100	B119999	TRANSISTOR:SILICON, JFE, N-CHANNEL	80009	151-1005-00
Q278	151-0254-00	B120000		TRANSISTOR: SILICON, NPN	80009	151-0254-00
Q620	151-0190-00			TRANSISTOR: SILICON, NPN	07263	S032677
Q626	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
				TRANSFORME OF LOON NOW	07263	00/0045
Q630	151-0341-00			TRANSISTOR: SILICON, NPN	0/203	5040000 CBC8801
Q650	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	04713	5750001
Q658	151-0220-00			TRANSISTOR: SILICON, PNP	0/203	6B68801
0000	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS0321	07263	\$136001
Q658	151-0220-00			TRANSISION: SILICON, PNP TRANSISTOR, SILICON NEW SEL FROM MD86521	04713	SPS8801
U 070	151-0192-00			TRANSISTUR: STLICON, NEW, SEL FROM MESOJZI	04/15	0100001
0678	151-0220-00			TRANSISTOR: SILICON, PNP	07263	S036228
0680	151-0102-00			TRANSISTOR STILLCON NPN. SEL FROM MPS6521	04713	SPS8801
0688	151-0192-00			TRANSISTOR STLLCON, PNP	07263	S036228
0701	151-0220-00			TRANSISTOR SILICON, NPN	07263	s040065
0702	151-0041-00			TRANSISTOR SILICON, JFE, N-CHANNEL	80009	151-1005-00
0703	151-0361-00			TRANSISTOR: SILLCON, NPN	07263	\$040065
4105	191 0941 00			1.4		
Q704	151-1005-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	80009	151-1005-00
0711	151-0341-00			TRANSISTOR: SILICON, NPN	07263	S040065
Q712	151-1005-00			TRANSISTOR:SILICON, JFE, N-CHANNEL	80009	151-1005-00
Q713	151-0341-00			TRANSISTOR: SILICON, NPN	07263	\$040065
Q714	151-1005-00			TRANSISTOR: SILICON, JFE, N-CHANNEL	80009	151-1005-00
Q721	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	04713	SPS8801
					o/ = • •	0000001
Q722	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	02500	5r58801 x/00115
Q815	151-0331-00	B010100	B070028	TKANSISTOR: SILICON, NPN	03200	151_0/06_00
Q815	151-0496-00	B070029		TRANSISTOR: SILICON, NPN	00009	101 0430-00

	Tektronix	Serial/Mod	el No.		Mfr	
Ckt No	Part No	Fff	Dscont	Name & Description	Code	Mfr Part Number
0	1 011 110.					
0820	151-0341-00			TRANSISTOR: SILICON, NPN	07263	S040065
0825	151-0341-00			TRANSISTOR: SILICON, NPN	07263	\$040065
0840	151-0331-00	BOL0100	8070078	TRANSISTOR STLICON NPN	03508	X40C115
0040	151-0551-00	8070029	0010020	TRANSISTOR STLICON NON	80009	151-0496-00
0040	151-0490-00	8070029		TRANSISION, SILION, NEW	07263	\$040065
Q845	151-0341-00			TRANSISIOR: SILICON, NPN	07203	2020677
Q850	151-0190-00			TRANSISTOR: SILICON, NPN	0/203	5032077
						W/ 0.01 1 F
Q860	151-0331-00	B010100	B070028	TRANSISTOR: SILICON, NPN	03008	
Q860	151-0496-00	B070029		TRANSISTOR: SILICON, NPN	80009	151-0496-00
Q865	151-0341-00			TRANSISTOR: SILICON, NPN	07263	5040065
Q870	151-0220-00			TRANSISTOR:SILICON, PNP	07263	\$036228
Q875	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q885	151-0341-00			TRANSISTOR:SILICON, NPN	07263	S040065
-						
0890	151-0341-00			TRANSISTOR: SILICON, NPN	07263	S040065
0910	151-0190-00	XB109310		TRANSISTOR: SILICON, NPN	07263	S032677
~				(OPTION 7 ONLY)		
0915	151-0190-00	XB109310		TRANSISTOR: SILICON.NPN	07263	8032677
Q				(OPTION 7 ONLY)		
0920	151-0190-00	XB109310		TRANSISTOR: SILICON, NPN	07263	\$032677
Q / 20		AD107310		(OPTION 7 ONLY)		
0025	151-0190-00	VR100310		TRANSISTOR STLLCON NPN	07263	5032677
Q725	101-0190-00	VD103210		(OPTION 7 ONLY)	0.200	
0030	151-0199-00	VB100210		TRANSISTOR STITCON DND	04713	SPS6868K
Q930	101-0100-00	ADIU9JIU		(OPTION 7 ANN)	04/19	bibbbbbk
		wa100310		(OFILON / ONLI)	07263	5029677
Q940	121-0100-00	XB109310		(OPPICE 2 ON 2)	07203	3032077
				(OPTION / ONLY)		
/ -				TRANSFORMER AND ADDR	07963	0022677
Q945	151-0190-00	XB103310		TRANSISTOR: SILICON, NPN	07263	5032077
		S		(OPTION / ONLY)	070/0	8039(33
Q950	151-0190-00	XB109310		TRANSISTOR: SILICON, NPN	07263	5032677
				(OPTION 7 ONLY)		
Q955	151-0190-00	XB109310		TRANSISTOR:SILICON, NPN	07263	5032677
				(OPTION 7 ONLY)		
Q960	151-0188-00	XB109310		TRANSISTOR: SILICON, PNP	04713	SPS6868K
				(OPTION 7 ONLY)		
Q967	151-0190-00	XB109310		TRANSISTOR:SILICON, NPN	07263	S032677
				(OPTION 7 ONLY)		
Q970	151-0190-00	XB109310		TRANSISTOR: SILICON, NPN	07263	S032677
				(OPTION 7 ONLY)		
0972	151-0190-00	XB109310		TRANSISTOR: SILICON, NPN	07263	5032677
				(OPTION 7 ONLY)		
0975	151-0190-00	XB109310		TRANSISTOR: SILICON, NPN	07263	\$032677
••••				(OPTION 7 ONLY)		
0980	151-0188-00	XB109310		TRANSISTOR: SILICON, PNP	04713	SPS6868K
4 , - - -				(OPTION 7 ONLY)		
0990	151-0190-00	XB109310		TRANSISTOR: SILICON, NPN	07263	\$032677
.				(OPTION 7 ONLY)		
R101	315-0101-00			RES. FXD. CMPSN: 100 OHM. 5%.0.25W	01121	CB1015
R102	316-0470-00	8010100	R079999	RES FXD CMPSN·47 OFM 10% 0 25W	01121	CB4701
P102	316-0221-00	8030000	8110000	PES END CHESK 220 OHM 10% 0 25W	01121	CB7711
P102	315-0221-00	B120000	0	PFC FYD CMDSN-770 OUM 57 0 75W	01121	CB2215
P103	316_0200_00	X8030000	B110000	DEC EVEL CHECK-30 OUM 10% D 350	01121	CB3901
R103	315_0300 00	00000LG	B117777	DEC EVE CHECK. JO CHE, TUK, U.ZJW	01121	003001
K103	212-0340-00	P120000		ADD., FAD, UMPON: 39 UMP, 36, U. ZOW	01121	COSCED
P104	200-0((0.00			BEC BUD 171. (OF AIL OF TH	00013	1600060000
R104	308-0668-00			REG., FAD, WW: O. ZK UHM, JZ, /W	00213	1000502000H
K106	321-0128-00			RES., FXD, FILM: 210 OHM, 1%, 0.125W	91637	MFF1816G210ROF
K108	308-0539-00			KES., FXD, WW: 2.25K OHM, 0.5%, 3W	91637	RS2BK22500D
R112	316-0470-00	B010100	B029999	RES., FXD, CMPSN: 47 OHM, 10%, 0.25W	01121	CB4701
R112	316-0221-00	B030000	B119999	RES., FXD, CMPSN: 220 OHM, 10%, 0.25W	01121	CB2211
R112	315-0221-00	B120000		RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215

	Tektronix	Serial/Mod	el No.		Mfr	
Ckt No	Part No	Fff	Dscont	Name & Description	Code	Mfr Part Number
R113	316-0390-00	XB030000	B119999	RES.,FXD,CMPSN:39 OHM,10%,0.25W	01121	CB3901
R113	315-0390-00	B120000		RES., FXD. CMPSN: 39 OHM. 5%.0.25W	01121	CB3905
R114	308-0668-00			RES. FXD. WW:6.2K OHM. 32.7W	00213	16008620008
R115	316-0470-00	X8030000	8049999X	RES FXD CMPSN: 47 OHM 10% 0 25W	01121	CB4701
B116	311-1132-00	B010100	B110000	DES VAR NONLITE TEMP 100 OWN 0 500	73138	91-66-0
D116	211 1667-00	B010100	5117777	NES, WAR, NOWWIR: INTR, 100 OHI, 0. JOW	73130	91-06-0
0117	511-1507-00	B120000		RES., VAR, NORWER: INTR, TOU OHM, 0.00W	/3130	91-89-0
D110	200-0520 00			DEC EVE LEL 9 25V ALM A 5V 2V	01427	DE38732500D
R110	306-0339-00	2010100		RES., FAD, WW; Z.ZOK UAM, U. 56, 5W	91037	KSZBKZZJOUD
R122	316-04/0-00	BUIUIUU	B029999	RES., FAD, CMPSN:47 OHM, 10%, 0.25W	01121	084701
RIZZ	316-0221-00	B030000	B119999	RES., FXD, CMPSN: 220 OHM, 10%, 0.25W	01121	CB2211
R122	315-0221-00	B120000		RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R123	316-0390-00	XB030000	B119999	RES.,FXD,CMPSN:39 OHM,10%,0.25W	01121	CB3901
R123	315-0390-00	B120000		RES.,FXD,CMPSN:39 OHM,5%,0.25W	01121	CB3905
R124	308-0668-00			RES.,FXD,WW:6.2K OHM,3%,7W	00213	1600S62000H
R125	303-0751-00			RES, ,FXD, CMPSN: 750 OHM, 5%, 1W	01121	GB7515
R126	321-0128-00			RES., FXD, FILM: 210 OHM, 1%, 0.125W	91637	MFF1816G210ROF
R128	308-0539-00			RES. FXD.WW:2.25K OHM.0.5%.3W	91637	RS2BK22500D
R132	316-0470-00	8010100	B029999	RES. FXD. CMPSN: 47 OHM. 10%.0.25W	01121	CB4701
R132	316-0221-00	8030000	B110009	RES FED CHPSN 220 OHM 10% 0.25W	01121	CB2211
M132	510 0221 00	000000	511,7777	Kabi ji Kbi oli oli i zeo oli i ji oli jo zeoli	01111	0
R132	315-0221-00	B120000		RES FED CHRSN-220 OFM 57 0 254	01121	CB2215
0133	316-0300-00	VB030000	9110000	DES EVD CMDSN: 20 OHM 10° 0 254	01121	CB3901
133	316 0390 00	AB030000	D1199999	$\mathbf{RE3., FAD, OMPON.30} OMP, \mathbf{106, 0.25W}$	01121	CB 3005
R133	315-0390-00	B120000		RES., FAD, CAPSR: 39 ORA, J&, U.2.)W	01121	16000630000
K134	308-0668-00			KES., FXD, WW:0.2K OHM, 3%, /W	00213	1000802000M
R135	316-04/0-00	XB030000	B049999X	RES., FXD, CMPSN:47 OHM, 102, 0.25W	01121	084701
R135	316-0390-00	XE080000	BI19999	RES., FXD, CMPSN: 39 OHM, 102, 0.25W	01121	083901
						00 2005
R135	315-0390-00	B120000		RES., FXD, CMPSN: 39 OHM, 52, 0.25W	01121	CB3902
R136	311-1132-00	B010100	B119999	RES., VAR, NONWIR: TRMR, 100 OHM, 0.50W	73138	91-66-0
R136	311-1567-00	B120000		RES., VAR, NONWIR: TRMR, 100 OHM, 0.50W	73138	91-89-0
R138	308-0539-00			RES.,FXD,WW:2.25K OHM,0.5%,3W	91637	RS2BK22500D
R140	316-0225-00	XB050000	B119999X	RES., FXD, CMPSN: 2.2M OHM, 10%, 0.25W	01121	CB2251
R200	311-1160-00	B010100	B108289	RES. VAR. NONWIR: 100K OHM, 20%, 1W	80009	311-1160-00
				, ,		
R200	311-1961-00	B108290		RES., VAR, NONWIR: PANEL, LOOK OHM, 20%, 0.75W	01121	17M025
				(FURNISHED AS A UNIT WITH \$125)		
R202	315-0563-00			RES. FXD. CMPSN: 56K OHM. 5%. 0. 25W	01121	CB5635
R202	316-0103-00	8010100	B110000	RES EXD CMPSN-10K OHM 10% 0 75W	01121	CB1031
R203	315-0103-00	¥120000		DES EVE CHERNICK OHM 57 0 25W	01121	CB1035
R203	315 0407 00	B120000		DEC EVD CADEN-6 BE OUN 57 () 25W	01121	CB6825
R200	313-0002-00			RES., PAD, CHESR. C.OK OHH, 5%, 0125%	GIILI	++
8207	216-0822-00	8010100	p110000	ם בים באים האספאי-8 2 היא 10% היא 25W	01121	CB8221
N207	310-0022-00	B010100	B117777	DEC DED ONDOULO 2V OUN 5% 0 250	01121	CB8225
K207	315-0622-00	B120000	-110000	$\mathbf{RED}_{i} \mathbf{FAD}_{i} \mathbf{O} \mathbf{FSN}_{i} \mathbf{O}_{i} \mathbf{Z} \mathbf{K} \mathbf{O} \mathbf{I} \mathbf{M}_{i} \mathbf{J} \mathbf{A}_{i} \mathbf{O}_{i} \mathbf{Z} \mathbf{M}$	01121	CB4731
KZU6	316-04/3-00	ROIOIOO	B113333	RES., FAD, OMPSN: 47K ONM, 104, 0.20W	01121	CD4731
R208	315-0473-00	B120000		RES., FXD, CMPSN: 4/K OHM, 5%, 0.25W	01121	GB4733
R209	316-0224-00	XB050000	B119999	RES., FXD, CMPSN: 220K OHM, 10%, 0.25W	01121	002241
R209	315-0224-00	B120000		RES., FXD, GMPSN: 220K OHM, 5%, 0.25W	UIIZI	GB224)
1 -					01121	CB1031
R211	316-0103-00	B010100	B119999	RES., FXD, CMPSN: 10K OHM, 10%, 0. 25W	01121	CB1031
R211	315-0103-00	B120000		RES., FXD, CMPSN: IOK OHM, 5%, 0.25W	01121	CB1035
R213	315-0623-00			RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB0235
R215	316-0103-00	B010100	B119999	RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CB1031
R215	315-0103-00	B120000		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R216	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R217	316-0103-00	B010100	B119999	RES.,FXD,CMPSN:10K OHM,10%,0.25W	01121	CB1031
R217	315-0103-00	B120000		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R218	316-0183-00	B010100	B119999	RES., FXD. CMPSN: 18K OHM. 10%.0.25W	01121	CB1831
R718	315-0183-00	B120000		RES. FXD. CMPSN: 18K OHM. 5%. 0.25W	01121	CB1835
0210	315_0683_00	B120000		PES EVD CMPSN-68K OHM 5% 0 25W	01121	CB6835
NZ17 N000	318_0103-00	8010100	8110000	DEC EVE CHECKILE CHM 10% C 250	01121	CB1021
R222	210-0105-00	0010100	2112422	RED. JEAD, OH DR. IK OHH, 106, 0.20		
0777	315-0102 00	B120000		DES END CHESNILL OHM 57 0 250	01121	CB1025
R\$\$2 D222	214-0472-00	B120000	p110000	NEC. JEAN CHECKIIK CHELJAJULZIN DEC. EVIN CHECKILA 70 AUM 107 A 250	01121	CB4721
KZZJ D222	315 0/72 00	BUIUIUU	6466119	NEG., FAD, OFFOR.4. / N OFF, 108, 0.23W	01121	CB4725
RZZJ	317-04/2-00	D120000		NDO., FAD, OTFOR, 4.7K VIN, J&, V.42W	OTTET	

Ckt No	Tektronix Part No	Serial/Mod	el No. Dscont	Name & Description	Mfr Code	Mfr Part Number
	rait NO.		Datom			
R226	316-0101-00	XB050000	B119999	RES., FXD, CMPSN: 100 OHM, 10%, 0.25W	01121	CB1011
R226	315-0101-03	B120000		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R227	321-0399-00			RES., FXD, FILM: 140K OHM, 1%, 0.125W	9163/	MFF1815G14002F
R231	316-0472-00	B010100	B119999	RES., FXD, CMPSN: 4.7K OHM, 10%, 0.25W	01121	CB4721
R231	315-0103-00	B120000		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R232	316-0274-00	B010100	B119999	RES.,FXD,CMPSN:270K OHM,10%,0.25W	01121	CB2741
R232	315-0154-00	B120000		RES., FXD.CMPSN: 150K OHM. 5%, 0, 25W	01121	CB1545
R234	304-0223-00	B010100	B119999	RES. FXD.CMPSN: 22K OHM. 10%. 1W	01121	GB2231
R234	305-0223-00	B120000		RES. FXD. CMPSN: 22K OHM. 5%. 2W	01121	HB2235
R236	315-0101-00	B010100	B119999	RES. FXD. CMPSN:100 OHM 5%.0.25W	01121	CB1015
8736	315-0152-00	B120000	B121979	RES. FXD. CMPSN: 1.5K OHM. 5% 0.25W	01121	CB1525
R736	315-0871-00	8121980	5121777	RES. FXD. CMPSN: 820 OHM. 5%.0.25W	01121	CB8215
K250	515-0021-00	5121,00				
R239	315-0101-00	в010100	B119999X	RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R240	315-0335-03	XB120000		RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
R242	316-0223-00	B010100	B119999	RES.,FXD,CMPSN:22K OHM,10%,0.25W	01121	CB2231
R242	315-0223-03	B120000		RES., FXD, CMPSN: 22K OHM, 5%, 0, 25W	01121	CB2235
R243	316-0105-00	B010100	B119999	RES., FXD, CMPSN: 1M OHM, 10%, 0.25W	01121	CB1051
R243	315-0105-03	B120000		RES., FXD, CMPSN: IM OHM, 5%, 0.25W	01121	CB1055
R244	315-0331-03	XB120000		RES., FXD. CMPSN: 330 OHM. 5%.0.25W	01121	CB3315
R745	311-1135-00	B010100	B029999	RES. VAR. NONWIR: TRMR. 1M OHM. 0.25W	71450	¥A5535
R245	311-1205-00	8030000	B119999	RES. VAR. NONWIR TRMR. 2M OHM. 0. 25W	71450	¥A5545
R245	311-1135-00	B170000	5.17777	RES VAR NONWER TRMR. IM OHM. 0.25W	71450	YA5535
R242	316-0223-00	B010100	R110000	RES FYD CMPSN \cdot 22K OHM 10% 0 25W	01121	CB2231
R248	315-0103-03	B120000	B120979	RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
50/0	216 0570 03	-		DES STR OVERN F OF ATTY FY A 251	01121	095425
KZ48	315-0562-03	B120980		KES, FXD, CMPSN: J.OK UHM, JA, U. 23W	01121	CB/02J
R249	315-04/1-03	XB120000		RES., FXD, CMPSN: 4/O OHM, 5%, 0.25W	01121	CB4/13
R251	307-0058-00			RES, FXD, CMPSN: 5.6 OHM, 5%, 0.5W	01121	LB36G3
R252	308-0075-00			RES., FXD, WW: TOU OHM, 5%, 3W	91037	CW2B-IUURUJ
R254	308-0690-00	BOIDIOU	B120979	RES., FXD, WW: 3 OHM, TU%, 3W	91037	CW2B-3RUUUA
X254	308-0365-00	B120980		RES.,FXD,WW:1.5 OHM,5%,3W	91037	CW2B-IK500J
R257	306-0104-00	B010100	B119999	RES., FXD, CMPSN: 100K OHM, 10%, 2W	01121	HB1041
R257	305-0104-00	B120000	B120979X	RES. FXD. CMPSN: 100K OHM. 5%, 2W	01121	HB1045
R262	302-0472-00	B010100	B119999	RES. FXD. CMPSN: 4.7K OHM. 10%.050W	01121	EB4721
R262	301-0472-00	B120000		RES. FXD. CMPSN: 4.7K OHM. 5%.0.50W	01121	£B4725
R263	316-0183-00	B010100	B119999	RES. FXD. CMPSN: 18K OHM. 107.0.25W	01121	CB1831
R263	315-0183-00	B120000	B121803	RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835
8763	315-0912-00	B121804		DES EXD CMDSN-9 LZ OHM 57 0 25W	01121	CB9125
R266	316-0334-00	R010100	B119999	RES. FYD CMPSN-330K OHM 107 0 25W	01121	CB3341
R766	315-0334-00	8120000	0119999	DEC EVD CHICK. 330V OLM 57 0 250	01121	CB3345
R200	316-0333-00	B010100	B110000	DEE EVD (MDCN-3)K (MM 10% 0 350	01121	CB3331
R267	315-0333-00	B120000	D119999	DEC EVD (MDCN. 33K OHM, 10%, 0, 25H	01121	CB3335
R268	316-0103-00	8010100	B110000	DES EVE CHESNION OF A 107 0 250	01121	CB1031
REOU	510 0105 00	0010100	0119993	MEG., FAD, OHISK, TOK OHI, TOK, U. 20W	01121	051031
R268	315-0103-03	B120000		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R269	315-0101-00	B010100	B119999X	RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R270	316-0223-00	XB060000	B119999X	RES., FXD, CMPSN: 22K OHM, 10%, 0.25W	01121	CB2231
R271	316-0395-00	B010100	B119999	RES., FXD, CMPSN: 3.9M OHM, 107, 0.25W	01121	CB3951
R271	315-0395-00	B120000		RES., FXD, CMPSN: 3.9M OHM, 5%, 0.25W	01121	CB 3955
R272A R272B R272C > R272D	307-0296-00			RES.,FXD,FILM:FOR D10 & D11	80009	307-0296-00
KZ/2E)	DIE 0101 CT					
R273 R273	315-0104-00 315-0104-02	B010100	B119999	RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
1613	JIJ-0104-03	0120000		REG., FAD CHEAN: TOUR UNH, 34, U. 23W	01121	681043
R274	316-0105-00	B010100	B119999	RES., FXD, CMPSN: 1M OHM, 10%, 0.25W	01121	CB1051
R274	315-0105-03	B120000		RES., FXD, CMPSN: 1M OHM, 5%, 0, 25W	01121	CB1055
R275	311-1136-00			RES., VAR, NONWIR: 100K OHM, 30%, 0.25W	71450	201-YA5536

	Tektronix	Serial/Model No.			Mfr	
Ckt No	Part No	Fff	Dscont	Name & Description	Code	Mitr Part Number
	runno.		000011		0006	WITT ATT NUMBER
R276	316-0105-00	B010100	B119999	RES., FXD, CMPSN: 1M OHM, 10%, 0, 25W	01121	CB1051
R276	315-0105-03	B120000		RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R278	316-0562-00	B010100	B119999	RES., FXD, CMPSN: 5, 6K OHM, 10%, 0.25W	01121	CB5621
R278	315-0562-00	B120000		RES., FXD. CMPSN: 5.6K OHM. 5% 0.25W	01121	CB5625
R279	315-0104-00	B010100	B119999X	RES., FXD. CMPSN: 100K OHM. 5%.0.25W	01121	CB1045
R282	315-0163-00	B010100	B119999	RES., FXD. CMPSN: 16K OHM. 5%.0.25W	01121	CB1635
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R282	315-0163-01	B120000		RES., FXD, CMPSN: 16K OHM, 5%, 0.25W	01121	CB1635
R285	311-1136-00	B010100	B119999	RES., VAR, NONWIR: 100K OHM. 30%, 0.25W	71450	201-YA5536
R285	311-1555-00	B120000		RES., VAR, NONWIR: 100K OHM, 20%, 0, 5W	73138	91-77-0
R286	311-1136-00	B010100	B119999	RES., VAR, NONWIR: 100K OHM, 30%, 0.25W	71450	201-YA5536
R286	311-1555-00	B120000		RES., VAR, NONWIR: 100K OHM, 20%, 0.5W	73138	91-77-0
R287	301-0183-00			RES. FXD, CMPSN: 18K OHM, 5%, 0.50W	01121	EB1835
R291	311-1189-00			RES., VAR, WW: PNL, 5K OHM, 2W	10582	AW3349
R295	311-0254-00			RES. VAR, NONWIR: 5M OHM, 10%, 1W	12697	СМ29709
R620	316-0102-00	B010100	8121189	RES., FXD, CMPSN: 1K OHM, 10%, 0.25W	01121	CB1021
R620	315-0102-00	B121190		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R621	316-0222-00	B010100	B121189	RES. FXD, CMPSN: 2.2K OHM, 10%, 0, 25W	01121	CB2221
R621	315-0222-00	B121190		RES. FXD.CMPSN: 2.2K OHM. 5%.0.25W	01121	CB2225
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R622	315-0223-00	8010100	B029999	RES. FXD.CMPSN:22K OHM.5%.0.25W	01121	CB2235
R622	315-0163-00	8030000		RES. FXD. CMPSN: 16K OHM. 5%, 0. 25W	01121	CB1635
R626	316-0102-00	B010100	B121189	RES., FXD, CMPSN: 1K OHM, 10%, 0, 25W	01121	CB1021
R626	315-0102-00	B121190	DILIIO	RES. FXD. CMPSN: 1K OHM. 5%.0.25W	01121	CB1025
R628	315-0223-00	BD10100	B029999	RES. FXD. CMPSN: 22K OHM. 5%. 0.25W	01121	CB2235
R628	315-0183-00	8030000	5027777	RES. FXD CMPSN-18K OHM 5% 0.25W	01121	C81835
NOLO	515 0105 00	2030000		ALL STADJOIL OUTTON GALLS AJOI CON		
R630	316-0474-00	8010100	B121189	RES., FXD. CMPSN:470K OHM. 10%.0.25W	01121	CB4741
R630	315-0474-00	B12490		RES., FXD. CMPSN: 470K OHM. 5%. 0.25W	01121	CB4745
R631	316-0332-00	B010100	B121189	RES., FXD. CMPSN: 3. 3K OHM, 10%.0.25W	01121	CB3321
R631	315-0332-00	B121190		RES. FXD. CMPSN: 3. 3K OHM. 5%. 0. 25W	01121	CB3325
8632	315-0273-00	2.2.1.70		RES EXD CMPSN-27K OHM 5%.0.25W	01121	CB2735
R634	316-0103-00	8010100	B121189	RES., FXD, CMPSN: 10K, OHM, 10%, 0, 25W	01121	CB1031
	510 0105 00	2010100	5121107			
8634	315-0103-00	B121190		RES., FXD. CMPSN: 10K 08M. 5%.0.25W	01121	CB1035
R635	316-0102-00	B010100	B121189	RES. EXD CMPSN-1K OHM 10%,0.25W	01121	CB1021
R635	315-0102-00	B121190	5121107	RES., FXD, CMPSN: 1K OHM, 5%, 0, 25W	01121	CB1025
R636	316-0103-00	B010100	B121189	RES. FXD. CMPSN: 10K OHM. 10%. 0.25W	01121	CB1031
R636	315-0103-00	B121190	2121109	RES., FXD, CMPSN: 10K OHM, 5%, 0, 25W	01121	CB1035
R637	316-0102-00	B010100	B121189	RES. FXD. CMPSN: 1K OHM. 10%. 0.25W	01121	CB1021
	510 0102 00	5010100	2121107			
R637	315-0102-00	B121190		RES. FXD. CMPSN: 1K OHM. 5%.0.25W	01121	CB1025
R640	316-0562-00	B010100	B121189	RES., FXD, CMPSN: 5,6K, OHM, 10%, 0,25W	01121	CB5621
R640	315-0562-00	B121190	0121107	RES. FXD. CMPSN: 5.6K OHM. 5%.0.25W	01121	CB5625
R641	316-0561-00	B010100	B121189	RES., FXD, CMPSN: 560 OBM, 10%, 0, 25W	01121	CB5611
R641	315-0561-00	8121190	5121147	RES., FXD, CMPSN: 560 OHM, 5%, 0, 25W	01121	CB5615
R647	316-0103-00	B010100	B121189	RES. FXD. CMPSN: 10K OHM. 10%.0.25W	01121	CB1031
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R642	315-0103-00	8121190		RES. FXD. CMPSN: 10K OHM. 5%.0.25W	01121	CB1035
R643	316-0102-00	B010100	B121189	RES., FXD, CMPSN: 1K OHM, 10%, 0, 25W	01121	CB1021
R643	315-0102-00	8121190	0.2	RES., FXD, CMPSN: 1K OHM, 5%, 0, 25W	01121	CB1025
R650	315-0393-00	5121170		RES. FXD. CMPSN: 39K OHM. 5%.0.25W	01121	CB3935
R651	316-0103-00	8010100	R171189	RES. FXD CMPSN: 10K OHM. 10%. 0.25W	01121	CB1031
P651	315-0103-00	8121100	DILIIV	RES FXD CMPSN: 10K OHM. 5%.0.25W	01121	CB1035
N031	JIJ 0105 00	0121190		ABDI JEND, ON DALLON DELLONJOLESN		
8652	315-0273-00			RES. FXD CMPSN: 27K OHM 5% 0.25W	01121	CB2735
R656	371=0273-00			RES. FXD FILM:2K OHM. 1% 0.175W	91637	MFF1816G20000F
R657	315-02222-00			RES. FXD CMPSN-8 2K OHM 5Z 0 25W	01121	СВ8225
8659	316-0101-00	8010100	B121190	RES FED CMPSN-100 OHM 10% 0 25W	01121	CB1011
R650	315-0101-00	B010100	0121107	RES FXD CMPSN: 100 OHM 52 0 25W	01121	CB1015
R660	315-0203-00	0121190		RES. FXD CMPSN: 39K OHM 5% 0.75W	01121	CB3935
1000	212-0323-00			aborgeneyen bersyn older ywydrasw		
R662	315-0273-00			RES. FXD.CMPSN:27K OHM.5%.0.25W	01121	CB2735
R665	321-0159-00			RES. FXD.FILM:442 OHM.1%.0.125W	91637	MFF1816G442R0F
R666	321-0222-00			RES. FXD. FILM: 2K OHM. 1%.0.125W	91637	MFF1816G20000F
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6-10
	Tektronix	Serial/Mod	el No.		Mfr	
Ckt No	Part No	Fff	Dscont	Name & Description	Code	Mfr Part Number
one no.	141110.					
R667	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R669	316-0101-00	B010100	B121189	RES., FXD, CMPSN: 100 OHM, 10%, 0.25W	01121	CB1011
R669	315-0101-00	B121190		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R670	315-0393-00			RES., FXD. CMPSN: 39K OHM. 5%.0.25W	01121	СВ3935
R670 R671	316-0331-00	B010100	B121190	RES. FXD. CMPSN: 330 OHM. 10%.0.25W	01121	CB3311
R671	315-0331-00	B121190	2121170	RES., FXD. CMPSN: 330 OHM. 5%, 0, 25W	01121	CB3315
N071	515 0551 00	D 121170				
8672	315-0223-00			RES. FXD. CMPSN: 22K OHM. 5%.0.25W	01121	CB2235
R675	311-1133-00			RES., VAR, NONWIR: 10K OHM, 30%, 0, 25W	71450	201-YA5534
R676	321-0222-00			RES. FXD. FILM: 2K OHM. 1%.0.125W	91637	MFF1816G20000F
R677	315-0822-00			RES. FXD. CMPSN: 8.2K OHM. 5%.0.25W	01121	CB8225
R679	316-0101-00	B010100	B121189	RES., FXD, CMPSN: 100 OHM, 10%, 0, 25W	01121	CB1011
R679	315-0101-00	B121190		RES., FXD. CMPSN: 100 OHM. 5%.0.25W	01121	CB1015
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R680	315-0393-00			RES., FXD. CMPSN: 39K OHM. 5%.0.25W	01121	CB3935
8681	316-0331-00	B010100	B121189	RES. FXD. CMPSN: 330 OHM. 10%-0.25W	01121	CB331)
P681	315-0331-00	B121190		RES. FXD. CMPSN: 330 OHM. 52. 0. 25W	01121	CB3315
D697	315-0223-00	DILIIJO		RES FYD CMPSN-22K OHM 5% 0 25W	01121	CB2235
R002 D685	321-0150-00			RES FYD FILM-442 OWN 17 0 1250	91637	MEE1816G442R0F
NDOJ D606	321-0139-00			AE3.,FAD,FILM.442 ONA, 18,0.1258	01637	MEE1816C20000F
A000	321-0222-00			KEA., FRD, FILH. 2K OHH, 18, 0.120W	11037	
7697	315 0933 00			DEC EVE CADEN.9 27 OUN 5% 0 2513	01121	CB8225
K00/	315-0822-00			$RES., FAD, OFFSN. 0.2K OFN, J_{A}, 0.25W$	01121	CB1031
R/01	316-0103-00			RES., FAD, CHPSN: IOK OHM, IOK, 0.25W	01121	CB1031
R702	316-0103-00			RES., FXD, CMPSN: IOK OHM, IOK, U.2.3W	01121	CB1031
R703	316-0103-00			RES., FXD, CMPSN: TOK OHM, 10%, 0.25W	01121	CBIUJI
R704	316-0103-00			RES., FXD, CMPSN: IOK OHM, IOZ, U.25W	01121	CBIOSI
R/06	316-0103-00			RES., FXD, CMPSN: FUK OHM, TU%, U. ZOW	01121	CBIUJI
					01101	(102)
R707	316-0103-00			RES., FXD, CMPSN: IUK OHM, 10%, 0.25W	01121	CBIU31
R709	316-0103-00			RES., FXD, CMPSN: IOK OHM, IO%, 0.25W	01121	CB1031
R710	316-0103-00			RES., FXD, CMPSN: 10K OHM, 10%, 0.25W	01121	CB1031
R712	316-0472-00			RES., FXD, CMPSN: 4.7K OHM, 10%, 0.25W	01121	CB4/21
R713	316-0332-00			RES., FXD, CMPSN: 3.3K OHM, 10%, 0.25W	01121	CB3321
R715	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
						VER101(0(000)E
R716	321-0356-00			RES., FXD, F1LM:49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R717	321-0350-00			RES., FXD, FILM: 43.2K OHM, 1%, 0.125W	91637	MFF1816G43201F
R718	316-0153-00			RES., FXD, CMPSN: 15K OHM, 10%, 0.25W	01121	CB1531
R720	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R721	321-0356-00			RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R722	321-0365-00			RES.,FXD,FILM:61.9K OHM,1%,0.125W	91637	MFF1816G61901F
R723	316-0153-00			RES.,FXD,CMPSN:15K OHM,10%,0.25W	01121	CB1531
R724	316-0272-00			RES.,FXD,CMPSN:2.7K OHM,10%,0.25W	01121	CB2721
R810	302-0150-00			RES.,FXD,CMPSN:15 OHM,10%,0.50W	01121	EB1501
R812	304-0683-00			RES.,FXD,CMPSN:68K OHM,10%,1W	01121	GB6831
R815	308-0685-00			RES.,FXD,WW:1.5 OHM,5%,1W	75042	BW20-1R500J
R818	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R820	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R822	316-0681-00	B010100	8121189	RES.,FXD,CMPSN:680 OHM,10%,0.25W	01121	CB6811
R822	315-0681-00	B121190		RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R824	316-0822-00	B010100	B121189	RES.,FXD,CMPSN:8.2K OHM,10%,0.25W	01121	CB8221
R824	315-0822-00	B121190		RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R826	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R827	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R830	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R832	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R834	315-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835
R841	307-0300-00			RES., FXD, FILM: 150 OHM, 5%, 10W	24546	FP10 150 OHM 5%
R842	308-0686-00			RES., FXD, WW:2.2 OHM, 5%, 2W	75042	BWH-2R200J
R846	316-0391-00	B010100	B121189	RES., FXD, CMPSN: 390 OHM, 10%.0.25W	01121	CB3911
R846	315-0391-00	B121190		RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R847	315-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835

	Tektronix	Serial/Mod	el No.		Mfr	
Ckt No	Part No.	Fff	Dscont	Name & Description	Code	Mfr Part Number
R850	316-0823-00	B010100	B121189	RES. FXD. CMPSN: 82K OHM. 10%. 0. 25W	01121	CB8231
R850	315-0823-00	B121190		RES FXD CMPSN 82K OHM 52.0.25W	01121	CB8235
R851	302-0333-00	5121170		PES EXD CHPEN: 33V OHM 10% 0 50W	01121	FB3331
0957	316-0691-00	8010100	B121180	DEC EVD CHDEN. 690 OUM 107 0 250	01121	CP6911
D951	215-0681-00	B010100	8121109	NES, FAD, GHESN, 000 UNH, 106, 0.25W	01121	CD6011
ROJZ DOGO	315-0081-00	8121190		RES., FAD, CMPSN: 000 OHM, 5%, 0.25W	01121	00001035
R033	313-0103-00			RES., FAD, CMPSN: TOK OHM, 56, 0.25W	01121	081035
8857	221-0260 00			DEC EVE ELLM.C O/K ODM 19 O 1950	01637	MERI 916060400F
NOJ/	321-0200-00			RES, FAD, FILM; 0.04K 000, 16, 0.125W	71657	201 VASE 21
ROJD	311-1120-00			KES., VAR, NONWIR: TOU OHM, 50%, 0.25W	/1450	201-143531
8839	321-0268-00			RES., FXD, FILM: 6.04K OHM, 1%, 0.125W	91637	MFF1816G60400F
R860	308-0686-00			RES., FXD, WW: 2.2 OHM, 5%, 2W	75042	BWH-ZKZUUJ
K861	307-0301-00			RES., FXD, FILM: 120 OHM, 5%, 10W	24546	FP10 120 OHM 5%
8863	316-0273-00	ROIDIOO	B121189	RES., FXD, GMPSN: 27K OHM, 10%, 0.25W	01121	CB2731
5943	ALE 0070 00	D 101100			01101	002735
R863	315-02/3-00	B121190		RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R865	315-0131-00	B010100	B039999	RES., FXD, CMPSN: 130 OHM, 5%, 0.25W	01121	CB1315
R865	315-0301-00	B040000		RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R867	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R868	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R869	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R870	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R872	316-0221-00	B010100	B121189	RES., FXD, CMPSN: 220 OHM, 10%, 0.25W	01121	CB2211
R872	315-0221-00	B121190		RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R873	316-0102-00	B010100	B121189	RES., FXD, CMPSN; 1K OHM, 10%, 0.25W	01121	CB1021
R873	315-0102-00	B121190		RES. FXD. CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R875	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R877	321-0256-00			RES., FXD, FILM: 4.53K OHM, 1%, 0.125W	91637	MFF1816G45300F
R878	311-1124-00			RES. VAR, NONWIR: 250 OHM, 30%, 0.25W	71450	201-YA5533
R879	321-0202-00			RES. FXD. FTLM: 1.24K OHM. 1%.0.125W	91637	MFF1816G12400F
R880	316-0272-00	B010100	B121189	RES. FXD. CMPSN: 2.7K OHM. 10%.0.25W	01121	CB2721
R880	315-0777-00	B121190	5101107	RES. FXD. CMPSN: 2.7K OHM. 5%.0.25W	01121	CB2725
P881	315-0562-00	D121170		RES FXD CMPSN-5 6K OHM. 5% 0.25W	01121	CB5625
ROOT	515 0502 00					
P883	316-0102-00	8010100	B121189	RES FXD CMPSN-1K OHM. 10%.0.25W	01121	CB1021
P883	315-0102-00	8121100	5121707	RES EVD CMPSN+1K OHM 5% 0.25W	01121	CB1025
1005	216-0102-00	B010100	B121180	DEC EVE CHESN 15K OHM 10% 0 25W	01121	CB1531
R00J	215-0153-00	B010100	8121107	DEC EVD CHESN ISK OHM 5% 0 25W	01121	CB1535
ROOJ BOOO	313-0133-00	D121190		DEC EVE FILM 7 237 OHM 0 257 0 250	91637	MFF1421D72300C
R090	322-0000-03			PEC = FVD FTIM (100 OHM 0.25% 0.125W)	91637	MFF1816D100R0C
K0 9 1	221-0097-02			RES., FAD, FILM. TOU ONM, 0.25%, 0.125%	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
7010	215-0221-00	VP100210		DEC EVD CHDCN-330 AWM 57 A 25W	01121	CB3315
RYIU	313-0331-00	XPI03210		(OPTION 7 ONLY)	VII	020010
7011	215-0222 00	V=100210		COTION = ONDER - 77K OHM 57 0 25W	01121	CB2735
RALI	315-02/3-00	XD109310		(approx 7 ONLY)		002.00
0012	221-0107-00	VE100210		DEC EVALUATION $1000000000000000000000000000000000000$	91637	MFF1816G10000F
K912	321-0193-00	VPIOAPIO		(ADTION 7 ONLY)	,	
				(OFIION 7 ONLY)		
D015	201 0000 00	V0100310		DEC EVD FILM. 102 AUM 19 A 1250	91637	MFF1816G10001F
K915	321-0289-00	X8103310		(OPERION 7 ONLY)	/10//	Millologiovoli
				(UPIION / UNLI)	01121	CB1835
RAIP	315-0183-00	XB109310		RES., FXD, CMPSN: TOK OHM, 56, 0.25W	01121	001000
				(OPIION / UNLI)	01121	CR3315
R920	315-0331-00	XB109310		RES., FXD, CMPSN: 550 Ohm, 5%, 0.25W	01121	003515
				(OPTION / UNLY)		
					01121	CB2735
R921	315-0273-00	XB109310		RES., FXD, GMPSN: 27K OHM, 5%, 0.25W	01121	052755
				(OPTION / ONLY)	01627	MET1816C10000F
R922	321-0193-00	XB109310		RES., FXD, FILM: IK OHM, 12, 0.125W	91037	MFF1810610000F
				(OPTION / ONLY)	01101	000015
R925	315-0221-00	XB109310		RES., FXD, CMP5N: 220 OHM, 5%, 0.25W	01121	UB221J
				(OPTION 7 ONLY)		
					01627	NEE1916010201E
R926	321-0290-00	XB109310		RES., FXD, FILM: 10.2K ORM, 1%, 0.125W	1011	fif F 1010610201F
				(OFTION / UNLY)	01121	CR7735
R930	315-0273-00	XB109310		RES., FXD, CMPSN: 2/K OHM, 5%, 0.25W	01121	12122
				(OPTION 7 ONLY)		

REV C, JUL 1980

	Tektronix Part No	Serial/Mode	el No.	Name & Description	Mfr Code	Mfr Part Number
GKI NO.	Part No.		USCOIL			
R931	315-0622-00	XB109310		RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	Св6225
R932	315-0102-00	XB109310		RES., FXD, CMPSN:1K OHM, 5%, 0.25W	01121	СВ1025
R933	315-0101-00	XB109310		RES., FXD, CMPSN:100 OHM, 5%, 0.25W (OPTION 7 ONLY)	01121	CB1015
R940	315-0331-00	XB109310		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R941	315-0273-00	XB109310		(OPTION / ONLY) RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	СВ2735
R942	321-0193-00	XB109310		RES., FXD, FILM: 1K OHM, 1%, 0.125W (OPTION 7 ONLY)	91637	MFF1816G10000F
R945	321-0289-00	XB109310		RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R946	315-0183-00	XB109310		RES., FXD, GMPSN:18K OHM, 5%, 0.25W	01121	CB1835
R950	315-0331-00	XB109310		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W (OPTION 7 ONLY)	01121	CB3315
R951	315-0273-00	XB109310		RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	СВ2735
R952	321-0193-00	XB109310		RES., FXD, FILM: IK OHM, 1%, 0.125W	91637	MFF1816G10000F
R955	315-0221-00	XB109310		RES., FXD, CMPSN: 220 OHN, 5%, 0.25W (OPTION 7 ONLY)	01121	CB2215
R956	321-0290-00	XB109310		RES., FXD, FILM: 10.2K OHM, 1%, 0.125W	91637	MFF1816G10201F
R960	315-0273-00	XB109310		RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R961	315-0622-00	XB109310		RES., FXD, CMPSN:6.2K OHM, 5%, 0.25W (OPTION 7 ONLY)	01121	CB6225
R962	315-0102-00	XB109310		RES.,FKD,CMPSN:1K OHM,5%,0.25W	01121	СВ1025
R963	315-0101-00	XB109310		RES., FXD, CMPSN:100 OHM, 5%, 0.25W	01121	CB1015
R967	315-0331-00	XB109310		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W (OPTION 7 ONLY)	01121	CB3315
R968	315-0273-00	XB109310		RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R969	321-0193-00	XB109310		RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R970	315-0331-00	XB109310		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W (OPTION 7 ONLY)	01121	CB3315
R971	315-0273-00	XB109310		RES., FXD, CMPSN: 27K OHM, 57, 0.25W	01121	CB2735
R972	321-0289-00	XB109310		(OPTION / ONL) RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R973	315-0183-00	XB109310		RES., FXD, CMPSN: 18K OHM, 5%, 0.25W (OPTION 7 ONLY)	01121	CB1835
R974	321-0193-00	XB109310		RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R975	315-0221-00	XB109310		(OF110W / ONL) RES., FXD, CMFSN: 220 OHM, 5%, 0.25W	01121	CB2215
R976	321-0290-00	XB109310		RES.,FXD,FILM:10.2K OHM,1%,0.125W (OPTION 7 ONLY)	91637	MFF1816G10201F
R980	315-0273-00	XB109310		RES.,FXD,CMPSN:27K OHM,5%,0.25W (OPTION 7 ONLY)	01121	CB2735

REV B, JUL 1980

Ckt No.	Tektronix Part No.	Serial/Mod Eff	el No. Dscont	Name & Description	Mfr Code	Mfr Part Number
R981	315-0622-00	XB109310		RES. FXD. CMPSN: 6.2K OHM. 57.0.25W	01121	CB6225
				(OPTION 7 ONLY)		
R982	315-0102-00	XB109310		RES.,FXD,CMPSN:1K OHM,5%,0.25W (OPTION 7 ONLY)	01121	CB1025
R983	315-0101-00	XB109310		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W (OPTION 7 ONLY)	01121	CB1015
R990	315-0273-00	XB109310		RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R991	315-0222-00	XB109310		RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W (OPTION 7 ONLY)	01121	CB2225
\$125	260-1238-00	B010100	B108289	SWITCH, PUSH: 0.5A AT 115VAC	81073	3 9 YY2084
S125	311-1961-00	B108290		RES.,VAR,NONWIR:PANEL,100K OHM,20%,0.75W (FURNISHED AS A UNIT WITH R200)	01121	17M025
S200	260-0227-00			SWITCH, THRMSTC:NC, OPEN 73.9, CL 51.7, 10 A	81439	36T21 S#3776
S201	260-1222-00			SWITCH, PUSH-PUL: 10A, 250VAC	91929	2DM301
T240	120-0705-01	B010100	B049999	XFMR, PWR, STU:	80009	120-0705-01
T240	120-0761-00	B050000	B119999	XFMR, PWR, STU: HV	80009	120-0761-00
T240	120-1230-00	B120000		XFMR, PWR, STU: HIGH VOLTAGE	80009	120-1230-00
T801	120-0692-00	B010100	B049999	XFMR, PWR, STPDN:	80009	120-0692-00
T801	120-0704-00	B050000		XFMR, PWR, SDN&SU:	80009	120-0704-00
U64 0	156-0057-00			MICROCIRCUIT, DI:QUAD 2-INPUT NAND GATE	01295	SN7401N OR J
V291	154-0633-00	B010100	B069999	ELECTRON TUBE: CRT, P31, INT SCALE	80009	154-0633-00
V291	154-0633-05	B070000	B103610	ELECTRON TUBE: CRT, P31, INT SCALE	80009	154-0633-05
V291	154~0633-10	B103611		ELECTRON TUBE: CRT, P31, INT SCALE	80009	154-0633-10
V291	154-0633-08	B010100	B103610	ELECTRON TUBE: CRT, P7, INT SCALE	80009	154-0633-08
V291	154-0633-13	B103611		ELECTRON TUBE: CRT, P7 (OPTION 76 ONLY)	80009	154-0633-13
V291	154-0633-09	B010100	B103610	ELECTRON TUBE: CRT, P11, INT SCALE	80009	154-0633-09
V291	154-0633-14	B103611		ELECTRON TUBE:CRT,P11 (OPTION 78 ONLY)	80009	154-0633-14
VR237	152-0283-00	B010100	B119999	SEMICOND DEVICE: ZENER, 0, 4W, 43V, 5%	12954	DZ750903B1N976B
VR237	152-0284-00	B120000		SEMICOND DEVICE: ZENER, 0.4W, 47V, 5%	80009	152-0284-00
VR239	152-0101-00	XB120000		SEMICOND DEVICE: ZENER, 1W, 75V, 5%	04713	1N3041B
VR258	152-0438-00			SEMICOND DEVICE: ZENER, 3W, 9.1V, 5%	12969	UZ1364
VR281	152-0357-00	B010100	B119999	SEMICOND DEVICE: ZENER, 0.4W, 82V, 5%	04713	SZ12461KRL
VR281	152-0285-00	B120000		SEMICOND DEVICE:ZENER, 0.4W, 62V, 5%	80009	152-0285-00
VR282	152-0255-00	B010100	B119999	SEMICOND DEVICE:ZENER.0.4W,51V,5%	80009	152-0255-00
VR282	152-0285-00	B120000		SEMICOND DEVICE: ZENER. 0.4W. 62V, 5%	80009	152-0285-00
VR720	152-0149-00			SEMICOND DEVICE: ZENER. 0.4W. 10V.5%	80009	152-0149-00
VR850	152-0357-00			SEMICOND DEVICE: ZENER, 0.4W, 82V, 5%	04713	SZ12461KRL
VR865	152-0243-00			SEMICOND DEVICE: ZENER, 0.4W, 15V, 5%	14552	1N965B
VR870	152-0227-00			SEMICOND DEVICE: ZENER, 0.4W, 6.2V, 5%	04713	SZ13903

6-14

INSTRUMENT OPTIONS

Your instrument may be equipped with one or more options. A brief description of each available option is given in this section.

Conversion kits (cabinet-to-rackmount, rackmount-to-cabinet), for most options, are available and can be installed at a later time. For further information on instrument options, see your Tektronix Catalog or contact your Tektronix Field Office.

REV. A SEP 1977

OPTION 2

PROTECTIVE PANEL COVER

The purpose of OPTION 2 is to provide a protective front-panel cover for bench cabinet models only. The cover protects the front panel and knobs during transportation and storage. The cabinet sides have been modified by the addition of a retaining hook for the protective cover. The Tektronix part number for the cabinet sides are listed in Section 8, Replaceable Mechanical Parts (see the listing for bench cabinet).

OPTION 7 REAR PANEL SIGNAL OUTPUTS

The purpose of OPTION 7 is to provide cathode-ray tube-related signals to standard connectors at the rear of the instrument. This option is particularly well suited for use in the physical life sciences. By using differential amplifiers, the oscilloscope can become a signal conditioner for other devices. Outputs may be used for driving counters or X-Y plotters in conjunction with the oscilloscope. The Tektronix part numbers for the electrical parts are listed in Section 6, Replaceable Electrical Parts.

OPTION 76

P7 PHOSPHOR

The purpose of OPTION 76 is to provide a cathode-ray tube with P7 phosphor, which is excellent for long-persistence display requirements. The Tektronix part number for the tube is listed in Section 6, Replaceable Electrical Parts (see V291).

OPTION 78

P11 PHOSPHOR

The purpose of OPTION 78 is to provide a cathode-ray tube with P11 phosphor, which is best suited for waveform photography. The Tektronix part number for the tube is listed in Section 6, Replaceable Electrical Parts (see V291).

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DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

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

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966Drafting Practices.Y14.2, 1973Line Conventions and Lettering.Y10.5, 1968Letter Symbols for Quantities Used in Electrical Science and
Electrical Engineering.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.



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(1143)(H32) 2134-15 @ BLOCK DIAGRAM





WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

RECOMMENDED TEST EQUIPMENT

ltem	Specifications	Recommended Type				
Test oscilloscope system	Deflection factor, 1 mV to 50 V/div; input impedance, 1 megohm; frequency response, dc to 2 MHz. Probe: 10X attenuation probe compatible with vertical input.	Tektronix 5110, 5A13N, 5B10N oscilloscope system or equiv. Use Tektronix P6108 or P6062A Probe.				
Voltmeter (Non-loading digital multimeter)	Range, 0 to 250 V; input Impedance, 10 megohms.	Tektronix DM 501 Digital Multimeter with power module.				

VOLTAGE CONDITIONS

Voltage measurements on this diagram were made under the following conditions:

An amplifier unit is installed in the left vertical compartment (for power supply loading). INTENSITY control is set fully ccw. Voltmeter common is connected to chassis ground.

WAVEFORM CONDITIONS

OSCILLOSCOPE UNDER TEST. Install an amplifier unit in the left vertical compartment and a time-base unit in the horizontal compartment. Connect the CALIBRATOR output signal to the amplifier unit (set vertical input coupling to dc and volts/div for a 2-division display). Set the time-base unit for internal auto-trigger, 2 ms/division sweep rate.

TEST OSCILLOSCOPE. Set the test oscilloscope triggering for auto mode with ac coupling from the internal source and set vertical input coupling to ac. Connect a 10X Probe to the vertical input. Position the display as necessary.

NOTE















INTERFACE

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Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

RECOMMENDED TEST EQUIPMENT

Item	Specifications	Recommended Type			
Test oscilloscope system	Deflection factor, 1 mV to 50 V/div; input impedance, 1 megohm; frequency response, dc to 2 MHz. Probe: 10X attenuation probe compatible with vertical input.	Tektronix 5110, 5A13N, 5B10N oscilloscope system or equiv. Use a Tektronix P6108 or P6062A Probe.			
Voltmeter (Non-loading digital multimeter)	Range, 0 to 250 V; input impedance, 10 megohms.	Tektronix DM 501 Digital Multimeter with power module.			

VOLTAGE CONDITIONS

Voltage measurements on this diagram were made under the following conditions:

An amplifier unit is installed in the left vertical compartment (for power supply loading). INTENSITY control is set fully ccw. Voltmeter common is connected to chassis ground.

WAVEFORM CONDITIONS

OSCILLOSCOPE UNDER TEST. Install an amplifier unit in the left vertical compartment and a time-base unit in the horizontal compartment. Connect the CALIBRATOR output signal to the amplifier unit (set vertical input coupling to dc and volts/div for a 2-division display). Set the time-base unit for internal auto-trigger, 2 ms/division sweep rate.

TEST OSCILLOSCOPE. Set the test oscilloscope triggering for auto mode with ac coupling from the internal source and set vertical input coupling to ac. Connect a 10X Probe to the vertical input. Position the display as necessary.

NOTE









A в С 1 -R712 C712 R713 CR721 VR720 CR722 O 8715 O R715 R720 C716 C716 R712 C716 R722 R722 R722 R722 R722 R721 C721 C721 2 R721 R724 R721 R723 C721 CR714 0701 R710 CR712 0714 R700 R707 0712 R700 R707 0712 R702 CR704 0702 R703 R704 0702 R703 R704 0702 R704 0704 1 2 3 3 4 4 2134-19

VOLTAGE & WAVEFORM CONDITIONS

A2-Single E	Beam Auxiliary	circuit	board.
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CKT	GRID	СКТ	GRID
NO	LOC	NO	LOC
C712	C-1	0721	8-2
C714†	C-3	0722	C-2
C716	B-2		
C721	C-2	R701	B-3
		R 702	B-3
C 9702	C-3	R703	B-3
CR704	C-3	R704	B-4
CR712	B-3	R706	в-з
CR714	B-3	R707	B-3
CR721	C-2	8709	B-4
CR722	C-2	R710	В-3
		R712	C-1
VR720	C-2	R713	C-1
		R715	B- 1
Q701	B-3	R716	B-2
Q702	C-3	R717	8-2
0703	8-3	R718	8-4
Q704	C-4	R720	∃-2
Q711	8-3	8721	C-2
0712	C-3	R722	8-2
Q713	8-4	8723	B-2
Q714	C-3	R724	B-2

+Located on back of board.





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A2-Single Beam Auxiliary circuit board.

CKT	GRID	СКТ	GRID
NO_	LOC	NO	LOC
C712	C-1	0721	B-2
C714†	C-3	0722	C-2
C716	B-2	1	
C721	C-2	R701	8-3
		R702	8-3
CR702	C-3	8703	B-3
CR704	C-3	A704	8-4
CR712	8-3	A706	8-3
CR714	8-3	R707	8-3
CR721	C-2	R709	B-4
CR722	C-2	A710	8-3
		R712	C-1
VR720	C-2	8713	C-1
		R716	B-1
Q701	B-3	R716	B-2
Q702	C-3	R717	B-2
0703	8-3	R718	B-4
0704	C-4	R720	B-2
0711	B-3	R721	C-2
0712	C-3	R722	B-2
0713	B-4	R723	B-2
0714	C-3	R724	8-2

tLocated on back of board.



AUXILIARY BOARD

(1143)2134-18

AUXILIARY BOARD



A1-High Voltage-Deflection circuit board (SN B120000 & above).

CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID	CKT	GRID
NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO		NO	LOC
C106 C116 C126 C224 C236 C241 C242 C248 C249 C251 C252 C253	C3 E3 E5 E5 E5 E5 C3 E5 E5 E5 E5 E5 E5 E5 E5 E5 E5 E5 E5 E5	C254 C258 C259 C272 C273 C281 CR20 CR21 CR21 CR21 CR21 CR21 CR21 CR22 CR22	H5 H5 F3 F5 E4 1 C5 5 D4 2 D4 4 D5	CR226 CR234 CR238 CR240 CR241 CR247 CR253 CR255 CR255 CR255 CR256 CR262 CR269 CR269 CR270	D5 E4 D5 F4 I2 I2 H5 G5 G5 F5 F5	DS271 DS272 DS273 DS274 L259† C104 Q106 Q114 Q116 Q124 Q126	G2 G2 F2 I4 B3 C2 C3 C3 D2 D3	Q134 Q136 Q138 Q214 Q222 Q226 Q234 Q252 Q262 Q264 Q278	E3 E4 B4 C5 C5 E5 E5 I5 G5 G5 G5	R101 R102 R103 R104f R106 R108 R112 R113 R114f R114 R116 R118 R122 R123	D4 B3 C4 B2 C3 C3 C3 C3 C2 C2 C2 C2 C3 E3 D4	R1241 R125 R126 R128 R132 R133 R1341 R135 R136 R138 R138 R1404 R202	D2 B4 E3 D3 E3 D4 E3 E3 E3 E3 E3 E3 E3	R203 R206 R207 R208 R209 R211 R213 R215 R216 R216 R217 R218 R219	C4 C4 C4 C4 C4 B5 B5 C5 C5 C4 C4 C5	R222 R223 R226 R227 R231 R232 R234 R236 R240 R242 R242 R243 R244 R243 R244	D5 D5 E5 E4 E5 D4 F4 H4 H2 H4 H2	R248 R249 R251 R252 R254 R263 R266 R266 R267 R267 R267 R267 R268 R271	G2 F4 G5 H5 J2 G5 G5 G5 F5 F5	R272 R273 R274 R275 R276 R278 R282 R285 R285 R286 R286 R287	G3 F5 11 F4 F3 E3 E2 E4	T240 VR237 VR239 VR258 VR281 VR282	13 F4 14 F3 F3

REV B JUL 1980

*See Parts List for serial number ranges. † Localed on back of board.

WARNING

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RECOMMENDED TEST EQUIPMENT

ltem	Specifications	Recommended Type				
Test oscilloscope system	Deflection factor, 1 mV to 50 V/div; input impedance, 1 megohm; frequency response, dc to 2 MHz. Probe: 10X attenuation probe compatible with vertical input.	Tektronix 5110, 5A13N, 5B10N oscilloscope system or equiv. Use a Tektronix P6108 or P6062A Probe.				
Voltmeter (Non-loading digital multimeter)	Range, 0 to 250 V; input impedance, 10 megohms.	Tektronix DM 501 Digital Multimeter with power module.				

VOLTAGE CONDITIONS

Voltage measurements on this diagram were made under the following conditions:

An amplifier unit is installed in the left vertical compartment (for power supply loading). INTENSITY control is set fully ccw. Voltmeter common is connected to chassis ground.

WAVEFORM CONDITIONS

OSCILLOSCOPE UNDER TEST. Install an amplifier unit in the left vertical compartment and a time-base unit in the horizontal compartment. Connect the CALIBRATOR output signal to the amplifier unit (set vertical input coupling to do and volts/div for a 2-division display). Set the time-base unit for internal auto-trigger, 2 ms/division sweep rate.

TEST OSCILLOSCOPE. Set the test oscilloscope triggering for auto mode with ac coupling from the internal source and set vertical input coupling to ac. Connect a 10X Probe to the vertical input. Position the display as necessary.

NOTE



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WARNING

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RECOMMENDED TEST EQUIPMENT

ltem	Specifications	Recommended Type
Test oscilloscope system	Deflection factor, 1 mV to 50 V/div; input impedance, 1 megohm; frequency response, dc to 2 MHz. Probe: 10X attenuation probe compatible with vertical input.	Tektronix 5110, 5A13N, 5B10N oscilloscope system or equiv. Use a Tektronix P6108 or P6062B Probe.
Voltmeter (Non-loading digital multimeter)	Range, 0 to 250 V; input impedance, 10 megohms.	Tektronix DM 501A Option 02 Digital Multimeter with power module.

VOLTAGE CONDITIONS

Voltage measurements on this diagram were made under the following conditions:

An amplifier unit is installed in the left vertical compartment (for power supply loading). INTENSITY control is set fully ccw. Voltmeter common is connected to chassis ground.

WAVEFORM CONDITIONS

OSCILLOSCOPE UNDER TEST. Install an amplifier unit in the left vertical compartment and a time-base unit in the horizontal compartment. Connect the CALIBRATOR output signal to the amplifier unit (set vertical input coupling to dc and volts/div for a 2-division display). Set the time-base unit for internal auto-trigger, 2 ms/division sweep rate.

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NOTE

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A1-High Voltage-Deflection circuit board(SN 8050000 to B119999).

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СКТ	GRID	СКТ	GRIE	CKT	GRID	СКТ	GRID	СКТ	GRID	СКТ	GRID	СКТ	GRID	СКТ	GRID	СКТ	GRID	скт	GRID	СКТ	GRID	скт	GRID	СКТ	GRID	CKT	GRID	скт
NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO	LOC	NO
C106 C116 C126 C136 C224 C227 C236 C241 C242	C-3 C-2 E-3 E-5 E-5 F-5 G-3 F-3	C252 C253 C254 C258 C259 C272 C273 C274 C279 C274	I-5 I-5 I-5 J-4 G-3 G-4 G-4 H-4	CR209 CR211 CR214 CR215 CR224 CR239 CR241 CR247 CR247 CR247	E-5 C-5 D-5 E-5 F-5 F-4 I-2 I-2 H-6	CR269 VR237 VR237	F-4 E-5 (-4	DS271 DS272 DS273	G-2 G-2 G-2 J-4	0104 0106 0114 0116 0124 0126 0134 0136 0138	B-2 B-3 C-2 C-3 D-2 D-3 F-2 E-3 C-4	0234 0252 0262 0264 0278	F-5 J-5 G-5 G-5 G-4	R 101 R 102 R 103 R 1047 R 106 R 108 R 112 R 113 R 1147 R 116	E-4 B-3 C-4 B-2 B-2 B-3 C-3 C-4 C-2 B-2	R124† R125 R126 R128 R132 R133 R134† R135 R136 R136	D-2 B-4 E-2 D-3 E-3 E-4 E-2 E-3 E-2 E-3	R206 R207 R208 R209 R211 R213 R215 R216 R217 R219	C-5 C-5 D-5 C-5 D-6 D-6 D-5 D-5 D-5	R 223 R 226 R 227 R 231 R 232 R 234 R 236 R 239 R 242 R 242	E-5 F-4 F-5 F-5 F-5 F-4 F-4 G-4	R 251 R 252 R 254 R 257 R 262 R 263 R 266 R 266 R 267 R 268 R 269	G-5 H-5 J-2 G-5 G-5 G-5 G-5 G-5	R273 R274 R275 R276 R278 R279 R282 R285 R285 R286 R287	G-2 G-4 J-1 H-4 G-5 H-4 F-3 E-4 E-2 E-3	C106 C115 C116 C126 C136 C224 C227 C236 C241 C242	8-3 A-2 C-3 E-3 E-5 E-5 F-5 G-3 F-3	C251 C252 C253 C254 C258 C259 C259 C272 C273 C274 C279
C248 C249 C251	H-3 G-3 H-5	C281	F-4	CR255 CR256 CR262 CR264	J-4 H5 G-5 G-5	VR281 VR282	F-3 F-3			0214 0222 0226	D-5 E-5 F-5			R 1 18 R 1 22 R 1 23	C-3 D-3 D-4	R 140 R 202 R 203	C-4 C-5 D-5	R219 R222	C-5 E-5	R245 R248	H-2 H-2	R270 R271 R272	G-2 G-4 H-3	T240	J-2	C248 C249 REV A JU	H-3 G-3	C281

-2 C252 H-5 CR211 C-5 CR264 G-5 CR269 F-4 CR214 D-5 -3 C253 1-5 C254 H-5 CR215 D-5 -3 C258 1-6 CR224 F-5 3 -5 C259 J-4 CR239 F-4 -5 C272 G-3 CR241 1.2 C273 G-4 CR247 I-2 -5 1-3 C274 G-3 CR252 H-5 CR253 H-5 -3 C279 H-4 4-3 C281 3-3 F-3 CR255 J-4 CR256 H-5

GRID CKT

CR209

H-5

GRID CKT

LOC NO

E-5

GRIC

CR262 G-5

tLocated on back of board.



to B119999).

GRIDCKT GRID GRID CKT IRID CKT GRID CKT GRID CKT GRID CKT GRID CKT GRID GRID CKT GRID CKT GRID CKT GRID CKT GRID CKT GRIDCKT СКТ GRID CKT GRID CKT GRIDICKT GRID CKT GRID CKT LOC NO LOC NO LOC LOC NO NO LOC NO OC NO LOC NO LOC NO LOC NO LOC G-2 B251 G-5 **B273** R273 R222 E-5 G-2 C106 8.3 C251 H-5 CR209 E-5 CB262 G-5 VR237 E-5 DS271 G-2 O104 B-2 Q252 J-5 R101 D-4 R122 D-3 R 202 C-5 -4 D-2 8251 G-5 R1241 8206 C-5 R223 E-5 R252 H-5 R274 R223 E-5 F-4 R102 B-3 R123 D-4 R203 D-5 R274 G-4 Ç115 A-2 C252 H-5 CR211 C-5 CR264 G-5 VR258 |-5 DS272 G-2 O106 B-3 0262 G-5 -3 R125 8-4 R207 C-5 R226 F-4 FI 252 H-5 R254 H-5 R275 J-1 **R206** R227 E-5 R275 J-1 C253 VR281 F-3 0264 G-5 8103 C-4 R124 D-2 C-5 C116 C-3 1-5 CR214 D-5 CR269 F-4 DS273 G-2 Q114 C-2 -4 R 126 E-2 B208 C-5 R 227 E-5 **R254** H-5 R 257 J-2 R276 H-4 **R231** F-4 R207 C-5 R276 H-4 C126 E-3 C254 H-5 CR215 D-5 VR282 F-3 Q116 C-3 Q278 G-4 R104 B-2 R125 B-4 -2 R231 R257+ R 128 R209 D-5 F-4 J-2 D-3 F-5 **B278** B126 E-2 R208 C-5 R232 F-5 R 262 G-5 R278 G-5 B106 C-2 C136 E-3 C258 1-5 CR224 F-5 Q124 D-2 -2 R 132 E-3 R211 C-5 R232 F-5 R262 G-5 R234 F-5 R263 G-5 R279 G-4 R279 R108 B-3 **B128** D-3 R211 C-5 H-4 C224 E-5 C259 .1.4 CR239 E.4 -4 Q126 D-3 L259 -3 R 133 B213 D-6 R234 F-5 **FI 263** E-4 G-5 F-3 **FI28**2 H132 E-3 R213 D-5 R236 F-4 R 266 G-5 R282 F-3 R112 C-3 C227 E-5 C272 G-3 CR241 1-2 Q134 E-2 -3 R1341 E-2 R215 D-5 R 236 F-4 R266 G-5 R239 F-4 R267 G-5 R285 E-4 R285 E-4 R113 C-4 R133 D-4 R215 D-5 C236 F-5 C273 G-4 CR247 1-2 Q136 E-3 R136 B239 R267 -4 -2 E-3 B216 D-5 F-4 G-5 B216 R242 F-4 R 268 G-4 R 286 E-2 R286 E-2 C241 C274 0214 D-5 R114 C-2 R134 E-2 D-5 G-3 G-3 CR252 H-5 R136 E-2 R217 D-5 R242 G-4 R268 G-4 G-4 R287 R287 E-3 R217 D-5 R243 G-2 R 269 E-3 C242 C279 Q222 E-5 R115 C-3 R135 -2 R138 F-3 H-4 CR253 H-5 E-3 R218 D-5 B243 G-2 R269 G-4 D-5 R245 H-2 R271 G-4 E-2 R218 C248 H-3 C281 F-3 CB255 J-4 Q226 F-5 R116 B-1 R136 -3 1-3 R 140 C-4 **R219 H245** H-2 **H270** C-5 G-2 T240 J-2 R118 C-3 R138 E-3 R219 C-5 R248 H-2 R272 H-3 T240 J-3 R 202 C-5 C249 G-3 CR256 H-5 0234 F-4 R 222 E-6 B 248 H-2 B271 G-4 -4 R203 D-5 R272 H-3

†Located on back of board.

REV A JUL 1980



Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

RECOMMENDED TEST EQUIPMENT

 Item	Specifications	Recommended Type
Test oscilloscope system	Deflection factor, 1 mV to 50 V/div; input impedance, 1 megohm; frequency response, dc to 2 MHz. Probe: 10X attenuation probe compatible with vertical input.	Tektronix 5110, 5A13N, 5B10N oscilloscope system or equiv. Use a Tektronix P6108 or P6062B Probe.
Voltmeter (Non-loading digital multimeter)	Range, 0 to 250 V; input Impedance, 10 megohms.	Tektronix DM 501A Option 02 Digital Multimeter with power module.

VOLTAGE CONDITIONS

Voltage measurements on this diagram were made under the following conditions:

An amplifier unit is installed in the left vertical compartment (for power supply loading). INTENSITY control is set fully ccw. Voltmeter common is connected to chassis ground.

WAVEFORM CONDITIONS

OSCILLOSCOPE UNDER TEST. Install an amplifier unit in the left vertical compartment and a time-base unit in the horizontal compartment. Connect the CALIBRATOR output signal to the amplifier unit (set vertical input coupling to dc and volts/div for a 2-division display). Set the time-base unit for internal auto-trigger, 2 ms/division sweep rate.

TEST OSCILLOSCOPE. Set the test oscilloscope triggering for auto mode with ac coupling from the internal source and set vertical input coupling to ac. Connect a 10X Probe to the vertical input. Position the display as necessary.

NOTE















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CRT CIRCUIT SN B119999 & BELOW

LV POWER SUPPLY & CALIB COMPONENTS



74888282222222335680 44 B-2 G-3 CKT NO 0875 0885 0890 Rational Control Contr GRID E-4 F-4

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WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

RECOMMENDED TEST EQUIPMENT

item	Specifications	Recommended Type				
Test oscilloscope system	Deflection factor, 1 mV to 50 V/div; input impedance, 1 megohm; frequency response, dc to 2 MHz. Probe: 10X attenuation probe compatible with vertical input.	Tektronix 5110, 5A13N, 5B10N oscilloscope system or equiv. Use a Tektronix P6108 or P6062A Probe.				
Voltmeter (Non-loading digital multimeter)	Range, 0 to 250 V; input impedance, 10 megohms.	Tektronix DM 501 Digital Multimeter with power module.				

VOLTAGE CONDITIONS

Voltage measurements on this diagram were made under the following conditions:

An amplifier unit is installed in the left vertical compartment (for power supply loading). INTENSITY control is set fully ccw. Voltmeter common is connected to chassis ground.

WAVEFORM CONDITIONS

OSCILLOSCOPE UNDER TEST. Install an amplifier unit in the left vertical compartment and a time-base unit in the horizontal compartment. Connect the CALIBRATOR output signal to the amplifier unit (set vertical input coupling to dc and volts/div for a 2-division display). Set the time-base unit for internal auto-trigger, 2 ms/division sweep rate.

TEST OSCILLOSCOPE. Set the test oscilloscope triggering for auto mode with ac coupling from the internal source and set vertical input coupling to ac. Connect a 10X Probe to the vertical input. Position the display as necessary.

NOTE









L.Y. POWER SUPPLY & CALIBRATOR 5 873

LV POWER SUPPLY & CALIBRATOR

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(1143) 2134-24 REV.A, JUL 1979

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WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

RECOMMENDED TEST EQUIPMENT

ltem	Specifications	Recommended Type				
Test oscilloscope system	Deflection factor, 1 mV to 50 V/div; input impedance, 1 megohm; frequency response, dc to 2 MHz. Probe: 10X attenuation probe compatible with vertical input.	Tektronix 5110, 5A13N, 5A18N, 5B10N oscilloscope system or equiv. Use a Tektronix P6108 or P6062B Probe.				
Voltmeter (Non-loading digital multimeter)	Range, 0 to 250 V; input impedance, 10 megohms.	Tektronix DM 501 Digital Multimeter with power module.				

VOLTAGE CONDITIONS

Voltage measurements on this diagram were made under the following conditions:

An amplifier unit is installed in both vertical compartments. A time-base unit is installed in the horizontal compartment (set for external volts/div). INTENSITY control is set fully ccw.

Voltmeter common is connected to chassis ground.

WAVEFORM CONDITIONS

OSCILLOSCOPE UNDER TEST. Install an amplifier unit in both vertical compartments and a time-base unit in the horizontal compartment. Connect the CALIBRATOR output signal to the amplifier units (set vertical input coupling to dc and volts/div for a 2-division display). Set the time-base unit for internal auto-trigger, 2 ms/division sweep rate.

TEST OSCILLOSCOPE. Set the test oscilloscope triggering for auto mode with ac coupling from the internal source and set vertical input coupling to ac. Connect a 10X Probe to the vertical input. Position the display as necessary.

NOTE





A5-Signals Out circuit board

CKT GRID CKT GRID CKT GRID CKT	GRID
NO LOC NO LOC NO LOC NO	LUG
C930 4D 0972 1D 8950 68 8991	2B
C931 5E 0975 2D R951 6B	
C960 4C 0980 2D R952 58 P914	1D
C961 5B 0990 1B R955 5B	
C980 3E R956 5B	
C981 2C R910 3E R960 3C	
A911 4E R961 5B	
CR930 3D R912 4E R962 5B	
CR960 4C R915 4E R963 4C	
CH980 2E H916 4E R967 28	
CH990 28 H920 6E H968 1C	
R921 5E H969 2C	
Q910 3E R922 5E R970 3B	
Q910 4E K925 4E K971 2G	
0920 DD N926 5E N972 2C	
0930 AD 8931 AD 8973 2E	
0940 38 0031 40 0075 25	
0945 AB 0022 AD 0076 20	
0950 60 8040 40 8080 15	
Q955 5A 8941 4A 8991 3C	
0960 4C 8947 AA 8992 3C	
Q967 18 8945 44 8983 2F	
Q970 28 R946 5A R990 18	

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VOLTAGE & WAVEFORM CONDITIONS



SIGNALS OUT (OPTION 7 ONLY)

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REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number

00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

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

INDENTATION SYSTEM

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

12345

Assembly and/or Component

Name & Description

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

140	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	FOPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SUDE
ASSY	ASSEMOLY	FII	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
80	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	so	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BAS	BRASS	FSTNA	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	т	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	тык	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	v	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	REL1EF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XEMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR
CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000CY	NORTHWEST FASTENER SALES, INC.	7923 SW GIRRUS DRIVE	BEAVERTON, OREGON 97005
00779	AMP, INC.	P 0 BOX 3608	HARRISBURG, PA 17105
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
06666	GENERAL DEVICES CO., INC.	525 S. WEBSTER AVE.	INDIANAPOLIS, IN 46219
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12136	PHILADELPHIA HANDLE COMPANY, INC.	1643 HADDON AVENUE	CAMDEN, NJ 08103
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
13511	AMPHENOL CARDRE DIV., BUNKER RAMO CORP.		LOS GATOS, CA 95030
16428	BELDEN CORP.	P. O. BOX 1331	RICHMOND, IN 47374
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23880	STANFORD APPLIED ENGINEERING, INC.	340 MARTIN AVE.	SANTA CLARA, CA 95050
24618	TRANSCON MFG. CO.	2655 PERTH ST.	DALLAS, TX 75220
28520	HEYMAN MFG, CO.	147 N. MICHIGAN AVE.	KENILWORTH, NJ 07033
31514	STANFORD APPLIED ENGINEERING, INC.		
	ADVANCED PACKAGING DIV.	3080 AIRWAY DRIVE	COSTA MESA, CA 92626
45722	USM CORP., PARKER-KALON FASTENER DIV.		CAMPBELLSVILLE, KY 42718
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
57771	STIMPSON, EDWIN B., CO., INC.	900 SYLVAN AVENUE	BAYPORT, NY 11705
70318	ALLMETAL SCREW PRODUCTS CO., INC.	821 STEWART AVE.	GARDEN CITY, NY 11530
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL		
	MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
74921	ITEN FIBRE CO.,	4001 BENEFIT AVE., P O BOX 9	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
77820	BENDIX CORP., THE, ELECTRICAL		
	COMPONENTS DIVISION	SHERMAN AVE.	SIDNEY, NY 13838
78189	ILLINOIS TOOL WORKS, INC.		
	SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
/9807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80710	ALLEGHENY LUDLUM STEEL CORP., A DIVISION		
00005	OF ALLEGHENY LUDLOM INDUSTRIES, INC.	BRACKENRIDGE WORKS, RIVER AVE.	BRACKENRIDGE, PA 15014
83385	CENTRAL SCREW CO.	2530 GRESCENT DR.	BROADVIEW, IL 60153
86445	PENN FIBRE AND SPECIALTY CO., INC.	ZU3Z E. WESTMORELAND ST.	PHILADELPHIA, PA 19134
86928	SEASTROM MFG, COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
90484	ITT, SURPRENANT DIV.	172 STERLING STREET	CLINTON, MA 01510
91886	MALCO A MICRODOT CO.	12 PROGRESS DRIVE	MONTGOMERYVILLE, PA 18936
A 2 4 0 1	CAMCAR SCREW AND MFG, CO,	OUU IOTH AVE.	KUGKFORD, IL 0IIUI

Fig. & Index No.	Tektronix S Part No. E	Gerial/Model No. Iff Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
1 -1 -2	200-1218-00		i L	CKT BOARD ASSY: RTNR, CRT SCALE:	SINGLE BEAM AUX(SEE A2 EPL) 6.814 X 5.125,NYLON ATTACHING DAPTS)	80009	200-1218-00
-3 -4	211-0188-00 354-0233-00	B010100 B072526X	2 2	SCREW, MACHINE:4 RING, RETAINING:	-40 X 0.30 INCH, SST 0.100 ID X 0.203 INCH OD	83385 79136	OBD 5133-14PP
-5	337-1440-00 337-1440-00	B010100 B104588	i 1	SHLD, IMPLOSION: SHLD, IMPLOSION:		80009 80009	337-1440-00 337-1440-00
	337-1440-01	B104589	1	(OPTION 76 INST SHLD, IMPLOSION: (OPTION 76 INST	RUMENTS ONLY) GREEN RUMENTS ONLY)	80009	337-1440-01
-6 -7	386-1946-00 348-0279-00		1 2	SUPPORT, CRT: FRO PAD, CUSHIONING:	NT G (CUT TO FIT)	80009 80009	386-1946-00 348-0279-00
-8 -9 -10	348-0070-01 348-0145-00 334-1379-00		3 2	PAD, CUSHIONING: GROMMET, PLASTIC	0.69 INCH, RUBBER U-SHP,1.0 X 0.42 INCH	80009 80009 80009	348-0070-01 348-0145-00 334-1379-00
-11	337-1419-00 337-1419-05	B010100 B069999 B070000	1	SHIELD, CRT: SHIELD SECT, CRT	: :	80009 80009	337-1419-00 337-1419-05
-12 -13	337-1420-00 354-0409-00		1 1	SHIELD SECT, CRT R, CLP, CRT SHLD:	: U/O 2.375 OD SHIELD	80710 80009	337-1420-00 354-0409-00
-14 -15	211-0632-00 343-0123-01		1 2	SCREW, MACHINE: 6 CLAMP, RET., ELEC	-32X2.250 INCH, FILH, STL :CRT, REAR	83385 80009	OBD 343-0123-01
-16 -17 -18	220-0444-00 211-0507-00 407-0922-00		1 2 1	NUT, PLAIN, SQ:6- SCREW, MACHINE:6 BRACKET, CRT, CLP	32 X 0.250 INCH, STL -32 X 0.312 INCH, PNH STL :ALUMINUM	70318 83385 80009	OBD OBD 407-0922-00
-19	384-1064-00		1	KNOB:10.185 L X	0.125 OD,5-40 THD	80009	384-1064-00
-20	119-0238-00 119-0373-00	B010100 B090724 B090725	1	COIL,CAL: COIL,CAL:	ATTACHING PARTS)	80009 80009	119-0238-00 119-0373-00
	210-0442-00 210-0004-00 210-0994-00 210-0935-00		2 2 2 2	NUT, PLAIN, HEX.: WASHER, LOCK: #4 WASHER, FLAT: 0.1 WASHER, NONMETAL	3-48 X 0.187 INCH,CD PL BRS INTL,0.015THK,STL CD PL 25 ID X 0.25" OD,STL FIBER 0 14 IDX D.375"OD	73743 78189 86928 74921	3014-402 1204-00-00-0541C 5714-147-20N 0BD
-21 -22	361-0059-01 210-0593-00		1 2	INSULATOR, PLATE NUT, FINISHING:0	:1.093 X 0.343 X 0.125 INCH .25 HEX X 0.312" LONG, BRS	80009 80009	361-0059-01 210-0593-00
-23 -24	358-0216-00 366-0494-00 366-1059-00 366-1077-00 213-0153-00	B010100 B108289 B108290 XB108290	1 1 1	BUSHING, PLASTIC KNOB:GRAY WITH PUSH BUTTON:GRA KNOB:GRAY	:0.257 ID X 0.412 INCH OD SETSCREW Y	80009 80009 80009 80009 80009	358-0216-00 366-0494-00 366-1059-00 366-1077-00
-25	366-0494-00 213-0153-00		1	KNOB:GRAY WITH SETSCREW:5-40	X 0.125,STL BK OXD,HEX X 0.125,STL BK OXD,HEX	80009 000CY	366-0494-00 OBD
-27	210-0255-00		1	TERMINAL, LUG:0.	ATTACHING PARTS) 391" ID INT TOOTH	80009	210-0255-00
-28 -29			1 2	SWITCH, PUSH: (SE RESISTOR, VAR: (S	* E S125 EPL) EE R200 AND R295 EPL)		
-30	210-0583-00		2	(NUT, PLAIN, HEX. : WASNER FLAT:0.2	ATTACHING PARTS) 0.25-32 X 0.312 INCH, BRS	73743	2X20317-402
-32	210-0046-00		2	WASHER, LOCK: 0.2	61 ID, INTL,0.018 THK, BRS	78189	1214-05-00-0541C
-33 -34	200-0608-00 333-1409-00 333-1409-01	B010100 B099999 B100000 B108289	1	COVER, VAR RES.: PANEL, FRONT: PANEL, FRONT:	PLASTIC	80009 80009 80009	200-0608-00 333-1409-00 333-1409-01
-35	333-1409-03 337-1421-00	B108290	1 1	PANEL, FRONT: SHIELD, ELEC: HI-	VOLTAGE	80009 80009	333-1409-03 337-1421-00
-36	211-0504-00		3	() SCREW, MACHINE:6	ATTACHING PARTS) -32 X 0.25 INCH,PNH STL	83385	OBD

Fig. & Index No.	Tektronix Part No. – I	Serial/Model No. Eff Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
	3/8 0115 00					00000	
-38	348-0115-00 407-0896-00		3	GROMMET, PLASTIC BRACKET, CHASSIS	:U-SHP,0.548 X0.462 INCH :ALUMINUM	80009 80009	348-0115-00 407-0896-00
-39	211-0541-00		1	(SCREW, MACHINE:6	ATTACHING PARTS) -32 X 0.25"100 DEG,FLH STL	83385	OBD
-40				CUITCH DUCH DU	*		
-40	407-0895-00	8010100 8091615	1	BRACKET. ELEC SW	· ALIMINIM	80009	407-0895-00
	407-0895-01	B091616	ī	BRACKET, ELEC SW	ALUMINUM	80009	407-0895-01
-41	376-0127-00		1	COUPLER, SHAFT : P	LASTIC	80009	376-0127-00
-42			1	RESISTOR, VAR: (S	EE R291 EPL) ATTACHING PARTS)		
-43	358-0029-00		1	BSHG, MACH. THD: H	EX,0.375-32 X 0.438"LONG	80009	358-0029-00
-44	210-0978-00		1	WASHER, FLAT: 0.3	75 ID X 0.50 INCH OD, STL	78471	OBD
-45	210-0421-00		1	NUT, PLAIN, HEX.:	0.375-32 X 0.50 INCH,AL	80009	210-0421-00
-46	210-0012-00		2	WASHER, LOCK: INT	L,0.375 ID X 0.50" OD STL	78189	1220-02-00-0541C
-47	210-0207-00		1	TERMINAL, LUG:0.	375 INCH DIAMETER	12697	01136902
-48	200-1204-01		1	COVER, CRT: REAR	ALUMINUM, PTD BLUE ATTACHING PARTS)	80009	200-1204-01
-49	210-0401-00		2	NUT, PLAIN, HEX. :	6-32 X 0.312 INCH, CD PLATED	73743	93262-02
	006-0531-00	XB108068	1	STRAP TIFDOWN F	BUT PLASTIC BEADED	24618	700-3688
-50	161-0033-08	AD100000	1	CARLE ASSY PWR		16428	080 080
-51	358-0366-00		Ĩ	BSHG. STRAIN RLF		80009	358-0366-00
	358-0365-00		1	BSHG.STRAIN RLF	:	80009	358-0365-00
-52	200-1004-00		1	CABLE, NIP., ELEC	:0.265 ID X 0.38"OD W/FLG	80009	200-1004-00
-53	352-0076-00	B010100 B0105881	1	FUSEHOLDER: W/HA	RDWARE	75915	342012-L
	352-0362-00	B0105882	1	FUSEHOLDER: W/M	OUNTING HARDWARE ATTACHING PARTS)	75915	345001
-54	210-0873-00		1	WASHER, NONMETAL	:0.5 ID X 0.688 INCH OD, NPRN	70485	OBD
-55	210-0201-00	B010100 B106650	1	TERMINAL, LUG: SE	#4	86928	A373-157-2
	210-0202-00	B106651	1	TERMINAL, LUG:0.	146 ID, LOCKING, BRZ TINNED ATTACHING PARTS)	78189	2104-06-00-2520N
-56	210-0586-00	B010100 B106650	1	NUT, PL, ASSEM WA	:4-40 X 0.25, STL CD PL	83385	211-041800-00
	210-0457-00	B106651	1	NUT, PL, ASSEM WA	:6-32 X 0.312 INCH, STL	83385	OBD
-57	333-1429-00	B010100 B099999	1	PANEL.REAR:		80009	333-1429-00
	333-1429-01	B100000 B109889	1	PANEL, REAR:		80009	333-1429-01
	333-1429-02	B109890	1	PANEL, REAR:		80009	333-1429-02
	334-2154-01	XB122930	1	MARKER, IDENT: MK	D CAUTION	80009	334-2154-01
-58	441-0991-00	B010100 B107632	1	CHAS, DSPL UNIT:	MAIN	80009	441-0991-00
	441-0991-02	B107633 B119999	1	CHAS, DSPL UNIT:	MAIN	80009	441-0991-02
	441-0991-03	B120000	1	CHAS, DSPL UNIT:	MAIN	80009	441-0991-03
	407-2270-00	XB120000	1	BRACKET, CHASSIS	:ALUMINUM ATTACHING PARTS)	80009	407-2270-00
	211-0504-00	XB120000	3	SCREW, MACHINE: 6	-32 X 0.25 INCH, PNH STL	83385	OBD
	210-0005-00	XB120000	1	WASHER, LOCK: EXT	#6	78189	1106-00
	210-0457-00	XB120000	2	NUT, PL, ASSEM WA	:6-32 X 0.312 INCH, STL *	83385	OBD
-59	210-0659-01		4	. EYELET, METALL	IC:0.121 OD X 0.156 INCH LONG	80009	210-0659-01
-60	344-0131-00		4	. CLIP, SPG TENS	CIRCUIT CARD MOUNTING	80009	344-0131-00
-61	211-0504-00		2	SCREW, MACHINE: 6	-32 X 0.25 INCH, PNH STL	83385	OBD
-62	211-0538-00		2	SCREW, MACHINE: 6	-32 X 0.312"100 DEG,FLH STL	83385	OBD
-63	210-0457-00		2	NUT, PL, ASSEM WA	:6-32 X 0.312 INCH, STL	83385	OBD
-64			1	SWITCH, THERMOST	ATIC:(SEE S200 EPL) ATTACHING PARTS)		
-65	210-0586-00		2	NUT, PL, ASSEM WA	:4-40 X 0.25, STL CD PL	83385	211-041800-00
-66	344-0225-00		2	CLIP.CABLE:		80009	344-0225-00
-67	348-0067-00	B010100 B104185	1	GROMMET, PLASTIC	:0.312 INCH DIA	80009	348-0067-00
	348-0516-00	B104186	1	GROMMET, PLASTIC	BLACK, ROUND, 0.188 ID	28520	SB312-3

Fig. & Index	Tektronix	Serial/Mo	del No.					Mfr	
No.	Part No.	Eff	Dscont	Qty	12345	Name & Description	on	Code	Mfr Part Number
1 ~68 ~69	343-0088-00			3	CLAMP,LOOP:0	.062 INCH DIA		80009	343-0088-00
-70	131-0566-00	B010100	B030000X	4	. BUS CONDUCT	TOR: DUMMY RES, 2.375, 22	AWG	55210	L-2007-1
	131-0566-00	xB050000	B119999X	4	. BUS CONDUCT	TOR: DUMMY RES, 2.375, 22	AWG	55210	L-2007-1
-/1	131-0589-00	P010100	8040000	2	. TERM, PIN:0	.46 L X 0.025 SQ.PH BRZ	5 GL	22526	47350
-72	136-0183-00	B010100	BU499999	2	SOCKET, PLU	G-IN:3 PIN, KOUND		80009	136-0183-00
	136-0183-00	B120000		2	. SOCKET, PLU	G-IN:3 PIN.ROUND		80009	136-0183-00
-73	136-0220-00	B010100	B049999	10	. SKT,PL-IN I	ELEK:TRANSISTOR 3 CONTA	CT, PCB MT	71785	133-23-11-034
	136-0220-00	B050000	B119999	11	. SKT,PL-IN	ELEK: TRANSISTOR 3 CONTA	CT, PCB MT	71785	133-23-11-034
	136-0220-00	B120000	B121392	10	. SKT, PL-IN	ELEK: TRANSISTOR 3 CONTA	CT, PCB MT	71785	133-23-11-034
-74	136-0220-00	B121393	2100030	5	. SKT,PL-IN I	ELEK: TRANSISTOR 3 CONTA	CT, PCB MT	71785	133-23-11-034
-74	136-0254-00	BU10100	BI20979	2	- SOCKET, PIN	TERM: U. U88 OD X 0.145	INCH LONG	00779	1-331892-5
	136-0252-04	XB050000	B070000X	12	. SOCKET, FIN	TERM-11/W 0 016-0 018 D	TA PINS	22526	75060-007
-75				1	. TRANSISTOR	(SEE Q252 EPL) (ATTACHING PARTS)		21920	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
-76	210-0407-00			2	. NUT, PLAIN, I	HEX.:6-32 X 0.25 INCH, B	IRS	73743	3038-0228-402
-77	210-0055-00			2	. WASHER, LOCK	K:SPLIT,0.145 ID X 0.25	3 OD,STL	83385	OBD
-/8	210-0801-00			2	. WASHER, FLAT	I:0.14 ID X 0.281 OD NP	' STL	12327	OBD
-79	214-1010-00			1	UASHED NON	CLEU:IKANSISIUK WETAI-0 1/2 ID V 0 25"0	N FTREP	86645	214-1010-00 OBD
-81	214-1536-00			1	. HEAT SINK.	DIODE: TO=3. AI.	D FIBER	80009	214-1536-00
-82	214-1610-00			1	. HEAT SINK,	ELEC:TRANSISTOR		80009	214-1610-00
-83	211-0511-00			2	. SCREW, MACH	INE:6-32 X 0.500, PNH, ST	L,CD PL	83385	OBD
-84	214-1291-00	B010100	B119999	4	. HEAT SINK.	CLEC:XSTR.0.72 OD X 0.3	75"H	05820	207-AB
	214-2811-00	B120000		4	. HEAT, SINK, N	KSTR: TO-202 ALUMINUM		80009	214-2811-00
-85	337-1179-00			1	. SHIELD, ELEC	C:DEFLECTION AMP	CKT BOARD)	80009	337-1179-00
-86	211-0510-00			1	SCREW, MACHINI	E:6-32 X 0.375 INCH.PNH	I STL	83385	OBD
-87	210-0975-00			1	WSHR, SHOULDEI	RED:0.14 ID X 0.247" OD	, PLSTC	80009	210-0975-00
-88	343-0254-00	B010100	B069999X	1	CLP, ELCTRN TU	JBE :		80009	343-0254-00
-89	367-0117-00	B010100	B069999X	1	PULL, SOCKET:			80009	367-0117-00
-90	200-0917-02	B010100	B069999X	1	COVER, CRT SKT	F:2.052 OD X 0.291 H,PL	ASTIC	80009	200-0917-02
-91	136-0450-00	B010100	B069999	1	SKT, PL-IN ELH	SK: ELCTRN TUBE, 14 CONT	W/LEAD	80009	136-0450-00
	136-0723-00	BU/0000	8119999	1	SKT, PL-IN EL	SKIELGTEN TUBE, 14 CONT	W/LEAD	80009	136-0492-01
	198-4223-00	XB120000		1	. WIRE SET.E	URC	W/LEAD	80009	198-4723-00
-92	136-0304-02	B010100	B069999	î	. SOCKET.PLUC	G-IN:CRT.14 PIN SOCKET.	W/PINS	80009	136-0304-02
	136-0301-01	B070000		1	. SKT, PL-IN H	ELEK: ELCTN TUBE, 14CONTA	CT	80009	136-0301-01
	195-0086-00	XB070000		I	. LEAD SET,EI	LEC:CRT DEFLECTION		80009	195-0086-00
0.0	200-0616-01	XB070000		1	. COV, ELECTRO	ON TU:		80009	200-0616-01
-93	200-10/5-00			4	COVER, TERM: QU	JICK DISCONNECT	0.9 7012	00779	1-480435-0
-94	191-0801-00	8010100	1060000	1	IERM, QIK DISU	CET DEFIECTION	UZ THK	80009	42017-2
-96	426-0740-00	0010100	DUUJJJJX	1	FR ASSY. DSPL	UN:		80009	426-0740-00
-97	175-0863-00			FT	WIRE, ELECTRIC	CAL:2 WIRE RIBBON		08261	SS-0222-1910610C
-98	175-0862-00			FT	WIRE, ELECTRIC	CAL: 3 WIRE RIBBON		08261	SS-0322-1910610C
-99	175-0859-00			FT	WIRE, ELECTRIC	CAL:6 WIRE RIBBON		08261	SS-0622-1910610C
-100	175-0855-00			FT	WIRE, ELECTRIC	CAL:10 WIRE RIBBON		08261	SS-1022(1061)0C
-101	131-0621-00			22	CONNECTOR, TEN	RM:22-26 AWG, BRS& CU BE	GOLD	22526	46231
-102	352-0198-00			1	CONN BODY PI	NIC WINE BLACK		80009	352-0198-00
-104	352-0204-00			1	HLDR TROM CON	NILLO WIRE BLACK		80009	352-0204-00
104	175-1453-00			1	LEAD ASSY. ELE	C:		80009	175-1453-00
	131-0861-00			2	. TERM.OIK DI	ISC:16-20 AWG.0.22 W X	0.02 THK	00779	42617-2
	200-1075-00			2	. COVER, TERM:	QUICK DISCONNECT		00779	1-480435-0
	131-0707-00			2	. CONNECTOR, T	ERM.: 22-26 AWG, BRS& CU	BE GOLD	22526	47439
	352-0161-00			1	. HLDR, TERM (CONN: 3 WIRE BLACK		80009	352-0161-00

Replaceable Mechanical Parts-5110

Fig. & Index No.	Tektronix S Part No. E	Serial/Mo Eff	del No. Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
1-	198-2028-00	8010100	8108289	1	WIRE SET FLEC.		80009	198-2028-00
-	198-3879-00	B108290	R110000	1	WIRE SET RIFC.		80009	198-1970-00
	198-3879-01	B120000	9113333	1	WIRE SET, ELEC.		80009	198-3970-01
	131-0677-00	DILDQQQ		2	CONNECTOR TERM.	18 400	91886	122-0102-010
	131-0621-00			2	CONNECTOR TERM	22-26 AUG BRSS CH BE COLD	22526	46731
	131-0707-00			2	. CONNECTOR TERM.	-22-26 AWC BRS& CU BE COLD	22526	47439
	131-2065-00			3	. TERM. OTK DISC . 1	8-77 AWG BRASS TIN PLATED	00779	2-350799-2
	175-0828-00			гт	WIRE ELECTRICAL	S WIRE RIBBON	08261	88-0526-7106100
	175-0863-00			FT	. WIRE, ELECTRICAL	.: 2 WIRE RIBBON	08261	SS-0222-1910610C
	175-1020-00			FT	. CABLE, RF: 50 OHM	COAX. WHT POLYTHN .IKT	90484	DAB70.JAAAWHITE
	352-0161-00			1	. HLDR. TERM CONN:	3 WTRE BLACK	80009	352-0161-00
	352-0198-00			ī	. HLDR. TERM CONN:	2 WIRE BLACK	80009	352-0198-00
	198-2752-00	B010100	B104832	ĩ	WIRE SET. ELEC:		80009	198-2752-00
	198-2752-01	B014833		ī	WIRE SET, ELEC:		80009	198-2752-01
	131-0621-00			18	. CONNECTOR. TERM:	22-26 AWG, BRS& CU BE GOLD	22526	46231
	175-0855-00			FT	. WIRE, ELECTRICAL	.: 10 WIRE RIBBON	08261	SS-1022(1061)0C
	175-0859-00			FT	WIRE ELECTRICAL	.: 6 WIRE RIBBON	08261	\$\$-0622-1910610C
	175-0863-00			FT	. WIRE, ELECTRICAL	2 WIRE RIBBON	08261	SS-0222-1910610C
	352-0198-00			1	. HLDR. TERM CONN:	2 WIRE BLACK	80009	352-0198-00
	352-0204-00			1	CONN BODY PL EI		80009	352-0204-00
	352-0206-00			1	. HLDR. TERM CONN:	10 WIRE BLACK	80009	352-0206-00





5110 OSCILLOSCOPE

FIG. 1 DISPLAY

FIG. 2 MAINFRAME



5110 OSCILLOSCOPE



Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
2 -1			1	CKT BOARD ASSY .I	NTEDEACH(CEE A2 EDI)		·
-2	131-0608-00		12	TERMINAL DIN.O	365 I V O O25 DU BD7 COLD	22526	67057
	131-0000-00		12	CONNECTOR DOUT	19/36 CONTACT	22320	4/33/ chalep// a
-4	131-1043-00		3	CONNECTOR RCPT	(CEE 1601 1602 AND 1602 PDL)	23880	SAC18D/4-2
-4	136-0260-00		1	SOCKET DING-IN	14 CONTACT LOU CLEADANCE	72002	000000 1/
-6	214-1503-00	8010100 8105856	6	VEV CONN DIZN.	OFT BD CONN	73803	014 1502 07
v	214-1393-02	BU10100 B105050	6	VEV CONN DIZN.	CIRCUIT CARD CONNECTOR	2161/	214-1595-02
	214-2027-00	B105057 B100740	6	KEY CONN DI 7N.	CIRCUIT CARD CONNECTOR	90000	QU/900 216-1502-02
-7	386-1938-00	D100/47	1	PEINE CUT BD-1	GNI DD GUNN NTROCACE	80009	214-1393-02
'	300-1930-00		1	. ADIME, OKI DD. I	TTACUINC DADTE)	00009	00-1930-00
-8	210-0777-00		6	DIVET SIINDIO	125 NIA CDID AI	45799	4042485
Ŭ	210 0777-00		-	. KIVEL, DELNO. V.	*	43722	AD4ZAD)
				(ATTAC	HING PARTS FOR CKT BD ASSY)		
-9	213-0146-00		4	SCR, TPG, THD FOR:	6-20 X 0.313 INCH, PNH STL	83385	OBD
					*		
		XB109310	1	CKT BOARD ASSY:S	IGNAL OUT(SEE A5 EPL)		
			-	(OPTION 7 ONLY)			
	129-0259-00	XB109310	3	. POST, ELEC-MECH	:4-40 X 0.187 OD X 0.39" LG	80009	129-0259-00
	131-0589-00	XB109310	20	. TERM, PIN: 0.46	L X 0.025 SQ.PH BRZ GL	22526	47350
	198-4025-00	XB109310	1	. WIRE SET, ELEC:		80009	198-4025-00
	131-0707-00	XB109310	12	CONNECTOR, TE	RM.:22-26 AWG, BRS& CU BE GOLD	22526	47439
	175-0825-00	XB109310	FT	WIRE, ELECTRI	CAL:2 WIRE RIBBON	80009	175-0825-00
	175-0829-00	XB109310	FT	WIRE, ELECTRI	CAL:6 WIRE RIBBON	08261	SS-0626-710610C
	352-0164-00	XB109310	1	CONN BODY, PL	,EL:6 WIRE BLACK	80009	352-0164-00
	352-0169-02	XB109310	1	CONN BODY, PL	,EL:2 WIRE RED	80009	352-0169-00
	352-0169-03	XB109310	1	CONN BODY, PL	,EL:2 WIRE ORANGE	80009	352-0169-03
	352-0169-09	XB109310	1	CONN BODY, PL	,EL:2 WIRE WHITE	80009	352-0169-09
				(ATTAC	HING PARTS FOR CKT BD ASSY)		
	211-0116-00	XB109310	3	SCR, ASSEM WSHR:4	-40 X 0.312 INCH, PNH BRS	83385	QBD
-10			1	CKT BOARD ASSY: L	V POWER SUPPLY(SEE A4 EPL)		
-11	131-0608-00		14	. TERMINAL, PIN: 0	.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-0589-00		14	. TERM, PIN:0.46	L X 0.025 SO.PH BRZ GL	22526	47350
-12	200-0293-00		1	. SHLD, CAPACITOR	2.563 INCHES LONG	80009	200-0293-00
-13	200-0294-00	B01010 B043669	2	. SHLD, CAPACITOR	:	80009	200-0294-00
	200-0294-00	B043670	1	. SHLD, CAPACITOR	:	80009	200-0294-00
-14	214-0579-00		4	. TERM, TEST POIN	T:BRS CD PL	80009	214-0579-00
-15	344-0154-00		6	. CLIP, ELECTRICA	L:FUSE,CKT BD MT	80009	344-0154-00
				(ATTAC	HING PARTS FOR CKT BD ASSY)		
-16	211-0504-00		6	SCREW, MACHINE: 6-	32 X 0.25 INCH, PNH STL	83385	OBD
-17			1	TRANSFORMER: (SEE	T801 EPL)		
-18	352-0198-00		1	. HLDR, TERM CONN	:2 WIRE BLACK	80009	352-0198-00
-19	131-0622-00		2	. CONTACT, ELEC:0 (ATTAC	.577"L,28-32 AWG WIRE HING PARTS FOR XFMR)	22526	46241
-20	212-0516-00	B010100 B049999	4	SCREW, MACHINE: 10	-32 X 2 INCH, HEX HD STL	77250	OBD
	212-0522-00	B050000	4	SCREW, MACHINE:10	-32 X 2.50", HEX HD STL	83385	OBD
	210-0812-00	XB062200	4	WASHER, NONMETAL:	#10,FIBER	86445	OBD
-21	166-0226-00	B010100 B049999	4	INS SLV, ELEC:1.1	25 INCHES LONG	80009	166-0226-00
	166-0457-00	B050000	4	INSUL SLVG, ELEC:	0.19 ID X 1.875"LONG MYLAR	80009	166-0457-00
-22	220-0410-00		4	NUT, EXTENDED WA:	10-32 X 0.375 INCH, STL	83385	OBD
-23	200-0772-02		1	COVER, ELEC XFMR:	3.125 X 3.75 X 0.875	80009	200-0772-02
	131-0126-00	XB109310	4	CONNECTOR, RCPT, :	BNC, FEMALE	77820	9663-1 NT-34
			_	(OPTION 7 ONLY)			
-24	333-1425-00	B010100 B099999	1	PANEL, REAR:		80009	333-1425-00
	333-1425-06	B100000 B121189	1	PANEL, REAR:		80009	333-1425-06
	333-1425-08	B121190	1	PANEL, REAR		80009	333-1425-08
	333-1425-07	XB109310 B121189	1	PANEL, REAR:		80009	333-1425-07
			-	(OPTION 7 ONLY)			
	333-1425-09	B121190	1	PANEL, REAR:		80009	333-1425-09
			-	(OPTION 7 ONLY)			
-25	343-0315-00		2	CLAMP, XSTR:		80009	343-0315-00
~ /			,	(A)	TTACHING PARTS)	303/0	2020 0000 / 00
-26	210-0407-00		6	NUT, PLAIN, HEX.:6	-32 X U.25 INCH, BRS	13143	5038-0228-402

REV F, JUL 1980

Fig. & Index No.	Tektronix Part No.	Serial/Mc Eff	del No. Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
2 -27	342-0082-00	•		3	TNSILATOR PLA	TE:0.52 SO X 0.015 INCH THK.AL	80009	342-0082-00
-28	351-0293-00)		3	GUIDE SLIDE: B	LUE	80009	351-0293-00
-29	351-0286-00	B010100	воз9999	3	GUIDE PL-IN U	NI:	80009	351-0286-00
	351-0286-01	B040000) B062225	3	GUIDE PL-IN U	NI:	80009	351-0286-01
	351-0286-02	B062226	5 B065347	3	GUIDE, PL-IN U	NI:	80009	351-0286-02
	351-0286-04	B065348	3 B111019	3	GUIDE, PL-IN U	NI:LOWER, BLACK NYLON	80009	351-0286-04
	351-0286-07	B111020)	3	GUIDE, PL-IN U	NI:LOWER, NYLON	80009	351-0286-07
						(ATTACHING PARTS)		
-30	211-0105-00	B010100	B111019	3	SCREW, MACHINE	:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
	213-0813-00	B111020)	6	SCREW, TPG, TR:	4-20,0.312 L,PLASTITE	93907	OBD
	213-0814-00	XB111020	נ	3	SCREW, TPG, TR:	4-20,0.25 L,PLASTITE	93907	OBD
						*		
-31	426-0738-00	•		1	FR ASSY, PWR-A	MP:	80009	426-0738-00
	210-0617-00	XB030000)	3	. EYELET, META	LLIC:0.089 OD X 0.125" L,BRASS	57771	2245
	131-1254-01	XB030000)	3	. CONTACT, ELE	C: GROUNDING	80009	131-1254-01
-32	175-0826-00)		FT	WIRE, ELECTRIC	AL:3 WIRE RIBBON	80009	175-0826-00
-33	175-0829-00	1		FΤ	WIRE, ELECTRIC.	AL:6 WIRE RIBBON	08261	SS-0626-710610C
	131-1896-00	1		1	LINK, TERM. CO	NN:8,22 AWG,1.5 L	80009	131-1896-00
-34	131-0707-00)		2	. CONNECTOR, T	ERM.:22-26 AWG, BRS& CU BE GOLD	22526	47439
-35	352-0166-02			1	. HLDR, TERM C	ONN:8 WIRE, RED	80009	352-0166-02
	131-1895-00)		1	LINK, TERM. CO	NN:8,22 AWG,1.5 L	80009	131-1895-00
	131-0707-00)		2	. CONNECTOR, T	ERM.:22-26 AWG, BRS& CU BE GOLD	22526	47439
	352-0166-01	144		1	. CONN BODY, P	L,EL:8 WIRE BROWN	80009	352-0166-01
	198-4024-00) XB10931()	1	WIRE SET,ELEC	:	80009	198-4024-00
		•		-	(OPTION 7 ONL	Y)		
	131-0707-00)		8	. CONNECTOR, T	ERM.:22-26 AWG, BRS& CU BE GOLD	22526	47439
	175-0857-00)		FT	. WIRE, ELECTR	ICAL:8 WIRE RIBBON	08261	SS-0822-1910610C
	352-0166-04	F		1	. CONN BODY, PL	L,EL:8 WIRE YELLOW	80009	352-0166-04

Fig. & Index No.	Tektronix Part No.	Serial/Model No. If Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
3-	200-1375-00		1	COVER, SCOPE: FR	ONT	80009	200-1375-00
-1	200-0728-01	B010100 B099999	1	COV, HANDLE END	:	80009	200-0728-01
	200-0728-06	B100000	1	COVER, HDL END:		80009	200-0728-06
-2	200-0728-00		1	COV, HANDLE END	:	80009	200-0728-00
-3	367-0116-00		1	HANDLE, CARRY IN	G: (ATTACHING PARTS)	12136	OBD
-4	212-0597-00		4	SCREW.MACHINE:	10-37 X 0.50 INCH. STL	93907	OBD
-5	386-1624-00		2	PLATE, HDL RTNG	STAINLESS STEEL	80009	386-1624-00
-6	386-1283-00		2	PLATE, HDL MTG:	FRONT	80009	386-1283-00
-	200 0102 00	2010100 2105003	,		*	*****	200 0100 00
-7	390-0193-00	B010100 B105297	1	COVER, SCOPE: LE	FT SIDE	80009	390-0193-00
	390-0489-00	B103290 B010100 B106863	1	CAB.SIVE, DSPL:	SIDE FT SIDE	80009	390-0409-00
		PO10100 P104042		(OPTION 2 ONLY)	00009	390-0193-01
	390-0471-00	B104844	1	COVER, DISPLAY:	LEFT SIDE BENCH W/LATCH	80009	390-0471-00
				(OPTION 2 ONLY)		
	214-0812-00		4	. FASTENER, PAW	L:	80009	214-0812-00
o	196 1151 00		-	. EACH ASSY IN	CLUDES:	00400	004 1151 00
-0	386-0227-00		1	CLAMP, KIM	ULENC:SPG STL CD PL	80009	380-1101-00
-10	714-0604-00		1	WACH SDC	IN CLIACEIAL TNSN-0 26 ID V 0 67 INCH OD	80009	214-0604-00
-11	214-0603-01		î	PIN SECHET	NG 0 27 INCH LONG	80009	214-0603-01
-12	390-0192-00	B010100 B105297	1	COVER. SCOPE : RU	GHT SIDE	80009	390-0192-00
	390-0469-00	B105298	1	CAB.SIDE.DSPL:	SIDE	80009	390-0469-00
	390-0192-01	B010100 B104843	1	COVER, SCOPE: RI	GHT SIDE	80009	390-0192-01
			-	(OPTION 2 ONLY)		
	390-04/1-01	BI04844	1	COVER, DISPLAY:	RIGHT SIDE BENCH W/LATCH	80009	390-0471-01
	214-0812-00		4	. FASTENER. PAW		80009	214-0812-00
-13	386-1151-00		1	CLAMP.RIM	CLENC:SPG STL CD PL	80009	386-1151-00
-14	386-0227-00		1	STOP, CLP, R	IM CL:ACETAL	80009	386-0227-00
-15	214-0604-00		1	WASH., SPG	INSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-16	214-0603-01		1	PIN, SECURI	NG:0.27 INCH LONG	80009	214-0603-01
-17	390-0190-00	B010100 B105297	1	COVER, SCOPE: BO	TTOM	80009	390-0190-00
	390-0470-00	B105298	1	CAB.BOT,DSPL:B	OTTOM	80009	390-0470-00
10	214-0812-00		4	. FASTENER, PAW	L:	80009	214-0812-00
-10	385-1151-00		1	CLAMP,RIM	CLENC:SPG STL CD PL	80009	386-1151-00
-20	216-022/-00		1	. STOP, GLP, K	IM GLIAGETAL	80009	386-022/-00
-20	214-0603-01		1	DTN SECURI	NC-0 27 INCH LONC	80009	214-0603-01
-22	348-0073-00		2	HINGE BLOC	K,STA:L FR,R REAR,BLACK ACETAL	80009	348-0073-00
-23	211-0532-00		4	SCREW, MACH	INE:6-32 X 0.75 INCH, FILH STL	83385	OBD
-24	210-0457-00		4	NUT, PL, ASS	EM WA: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	. HINGE BLOCK,	STA:R FR,L REAR,BLACK ACETAL (ATTACHING PARTS)	80009	348-0074-00
-27	211-0532-00		4	. SCREW, MACHIN	E:6-32 X 0.75 INCH, FILH STL	83385	OBD
-28	210-0457-00		4	. NUT, PL, ASSEM	WA:6-32 X 0.312 INCH, STL	83385	OBD
-29	348-0207-00		2	FOOT, CABINET: R	IGHT FRONT AND LEFT REAR	80009	348-0207-00
-30	348-0275-00		1	FLIPSTAND, CAB.	:	80009	348-0275-00
-31	212-0105-00		2	SCREW, EXT RLV:	3-32 X 0.312 INCH, HEX HD STL	80009	212-0105-00
-32	212-0008-00		2	SCREW, MACHINE:	3-32 X 0.500 INCH, PNH STL	83385	OBD
-33	210-0008-00		2	WASHER, LOCK: IN	rL,0.172 ID X 0.331"OD,STL	78189	1208-00-00-05410
-34	361-0388-00		2	SPACER, PLATE:		80009	361-0388-00
-37	343-0230-00		2	KINK DLK, SCOPE	(ATTACHING DADTE)	80009	343-0256-00
-36	211-0531-00		4	SCREW, MACHINE:	5-32 X 0.375,FIL,STL	83385	OBD





5110 OSCILLOSCOPE

FILL & BENCH LABINET

FIG. 4 RACKMOUNT CABINET



5110 OSCILLOSCOPE



Fig. & Index No.	Tektronix Part No.	Serial/Mc Eff	del No. Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
4 -1 -2	351-0195-00 351-0104-00			$\frac{1}{1}$	SLIDE, DWR, EXT: SI SLIDE SECT, DWR:]	.IDE, PAIR(RACKMOUNT ONLY) 2.625 X 2.25	06666 06666	C719 C-720-2
-3	212-0004-00			6	SCREW.MACHINE:8-	-32 X 0.312 INCH. PNH STL	83385	OBD
	210-0858-00			6	WASHER, FLAT: 0.50	00 OD X 0.171 ID X 0.063 THK	80009	210-0858-00
-4	407-0899-02	B010100	B099999	1	BRACKET, RACK MT:	RIGHT, ALUMINUM	80009	407-0899-02
	407-0899-00	B100000)	1	BRACKET, RACK MT:	ALUMINUM TTACHING PARTS)	80009	407-0899-00
-5	212-0040-00			2	SCREW, MACHINE:8-	32 X 0.375 100 DEG, FLH STL	83385	OBD
~6	407-0899-00			1	BRACKET, RACK MT:	ALUMINUM TTACHING PARTS)	80009	407-0899-00
-7	212-0040-00			2	SCREW, MACHINE: 8-	32 X 0.375 100 DEG,FLH STL	83385	OBD
-8	390-0191-00	B010100	B105297	1	COVER, SCOPE : RIGH	IT SIDE	80009	390-0191-00
	390-0502-00	B105298	l -	1	CAB.SIDE,DSPL:RI	GHT, RACK	80009	390-0502-00
	390-0192-01	B010100	B104843	1	COVER, SCOPE : RIGE	IT SIDE	80009	390-0192-01
				-	(OPTION 2 ONLY)			
	390-0471-01	B104844	ŀ	1	COVER, DISPLAY: RI (OPTION 2 ONLY)	GHT SIDE BENCH W/LATCH	80009	390-0471-01
	214-0812-00			4	. FASTENER, PAWL:		80009	214-0812-00
-9	386-1151-00			1	CLAMP,RIM CL	ENC:SPG STL CD PL	80009	386-1151-00
-10	386-0227-00			1	STOP, CLP, RIM	CL:ACETAL	80009	386-0227-00
-11	214-0604-00			1	WASH., SPG TN	ISN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-12	214-0603-01			1	PIN, SECURING	:0.27 INCH LONG	80009	214-0603-01
-13	390-0194-00	B010100	B105297	1	COVER, SCOPE: LEFT	SIDE	80009	390-0194-00
	390-0503-00	B105298	5	1	CAB.SIDE, DSPL:LE	FT, RACK	80009	390-0503-00
	390-0193-01	R010100	B104843	L -	(OPTION 2 ONLY)	SIDE	80009	390-0193-01
	390-0471-00	B104844	ŀ	1	COVER, DISPLAY: LE (OPTION 2 ONLY)	FT SIDE BENCH W/LATCH	80009	390-0471-00
	214-0812-00			2	. FASTENER, PAWL:		80009	214-0812-00
-14	386-1151-00			1	CLAMP, RIM CL	ENC:SPG STL CD PL	80009	386-1151-00
-15	386-0227-00			1	STOP, CLP, RIM	CL:ACETAL	80009	386-0227-00
-16	214-0604-00			1	WASH.,SPG TN	ISN: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	B010100	B105297	2	COVER, SCOPE: BOTT	OM	80009	390-0222-00
	390-0505-00	B105298	£	T	CAB.BOT, SCOPE:	ting .	80009	390-0505-00
	214_0912_00				- EACH ASSY INCL	UDES:	80000	01/ 0010 00
	214-0812-00			4	FACH ASSV INCL	IDES.	00009	214-0812-00
-19	386-1151-00			1	CIAND DIM CI	ENCISC STL CD DI	80008	386-1151-00
-20	386-0227-00			1	. STOP.CLP.RIM	CL:ACETAL	80009	386-0227-00
-21	214-0604-00			1	WASHSPG TN	ISN: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
-23	212-0103-00			3	SCREW, MACHINE: 8-	32 X 0.375 HEX HD.STL	77250	OBD
	212-0104-00			3	SCREW, MACHINE: 8-	32,0.75 HEX STL	80009	212-0104-00
-24	210-0008-00			10	WASHER, LOCK: INTL	.,0.172 ID X 0.331"OD,STL	78189	1208-00-00-05410
-25	361-0389-00			L	SPACER, PLATE: 0.1	25 AL,L-SHAPE	80009	361-0389-00

ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/N Eff	Model No. Dscont	Qty	12345	Name & Description	Mfr Code	Mfr Part Number
	070-2134-	D1		1 1	MANUAL, TECH: I	NSTRUCTION	80009	070-2134-01

5110 OSCILLOSCOPE

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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 Charact	eristics
DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than	107 - Risetime less than
	3.5 ns into 50 Ω.	3.0 ns into 50 Ω.
108	PG 501 - 5 V output pulse;	108 - 10 V output pulse
	3.5 ns Risetime	1 ns Risetime
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output
111	PG 502 - Bisetime less than	111 - Bisetime 0.5 ns: 30
	1 ns: 10 ns	to 250 ns
	Pretrigger pulse	Pretrigger pulse
	delay	delay
PG 508 replaces 114		
	Performance of replacement equipm	ent is the same or
115	better than equipment being replace	d.
2101		
PG 506 replaces 106	PG 506 - Positive-going	106 - Positive and Negative-
	trigger output sig-	going trigger output
	nal at least 1 V;	signal, 50 ns and 1 V;
	High Amplitude out-	High Amplitude output,
	put, 60 V.	100 V.
067-0502-01	PG 506 - Does not have	0502-01 - Comparator output
	chopped feature.	can be alternately
		chopped to a refer-
		ence voltage.
SG 503 replaces 190,		
190A, 190B	SG 503 - Amplitude range	1908 - Amplitude range 40 mV
101	5 mV to 5.5 V p-p.	to 10 V p-p.
067-0532-01	SG 503 - Frequency rende	0522-01 - Erzeureeur range
007-0002-01	250 kHz to 250 MHz	65 MHz to 500 MHz
SG 504 replaces		
067-0532-01	SG 504 - Frequency range	0532-01 - Frequency range
	245 MHz to 1050 MHz.	65 MHz to 500 MHz.
067-0650-00		
TG 501 replaces 180,		
180A	TG 501 - Trigger output-	180A - Trigger pulses 1, 10,
	slaved to marker	100 Hz; 1, 10, and
	output from 5 sec	100 KHZ. MUITIPIE
	time-mark can be	ume-marks can be
	dependent at a time	generated sinditan-
181	generated at a time.	181 - Multiple time-marks
184	TG 501 - Trigger output-	184 - Separate tringer
101	slaved to market	pulses of 1 and 0.1
	output from 5 sec	sec: 10, 1, and 0,1
	through 100 ns. One	ms; 10 and 1 µs.
	time-mark can be	
	generated at a time.	
2901	TG 501 - Trigger output-	2901 - Separate trigger
	slaved to marker	pulses, from 5 sec
	output from 5 sec	to 0.1 µs. Muitiple
	through 100 ns.	time-marks can be
	One time-mark can	generated simultan-
	be generated at	eously.
	a time.	

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in Instruments require TM 500-Series Power Module. REV B, JUN 1978