TEK Preliminary
Service Information

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11301
Programmable Oscilloscope

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Preliminary Service Manual

This package should not in any way be considered a permanent service manual. The information contained in this document is intended solely as an aid to the service person while the permanent service manuals are being completed.

INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag, or stamped on the chassis. The first number or letter designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

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100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
300000	Sony/Tektronix, Japan
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Part 1
Theory of Operation

Preliminary
Theory of Operation

NOTE

The following information is preliminary in nature and subject to change.
Descriptions for some circuitry was not yet available at the time of this printing.
Check below under Contents for the names of all circuits discussed in this printing.

Section headings appearing in the following discussion correspond with the titles of related schematic diagrams. The discussion for each circuit is further divided by headings coinciding with the names of major stages or components on the schematic diagram.

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Line Inverter, Rectifiers, & Control 2

The Line Inverter, Rectifiers & Control circuits provide semi-regulated DC voltages to the Regulators circuit.

Line Interface

Power is applied through line filter FL99, line fuse F99, and PRINCIPAL POWER switch S130. Line Filter FL99 prevents power-line interference from entering the instrument and noise (in the range of 1 MHz to 1 GHz) generated within the instrument from entering the line.

Resistor R99 serves to discharge the line capacitors in front of the line-frequency bridge rectifier and prevents a shock hazard from contact with the power connector pins when the power cord is disconnected.

Primary line fuse F99 prevents a fire hazard resulting from an improper setting of the LINE VOLTAGE SELECT switch, or from a major fault in the line-side circuitry.

PRINCIPAL POWER switch S130 disconnects both sides of the line. It is located on the rear panel and is not intended to be the primary means of switching the instrument on and off; this function is performed by the front-panel ON/STANDBY switch.

Capacitors C140 and C230 serve to bypass differential-mode noise generated by the reverse recovery of the line-frequency rectifiers. Thermistors RT130 and RT240 limit the initial surge current when charging line filter capacitors C200, C310, C220, and C320. The thermal time constant of these thermistors is matched to the discharge time of the line filter capacitors and is provided by bleeder resistor R220. This ensures continued surge current limiting when the instrument is switched off and on several times in succession. Once the thermistors warm up, they have negligible effect on the input current.

Spark gaps E231 and E230 prevent over-charging of the line filter capacitors due to improper setting of the LINE VOLTAGE SELECT switch or from high energy differential-mode line transients.

CR340 operates as a full-wave rectifier when S250 is set for 230-volt operation and as a voltage doubler when S250 is set for 115-volt operation. In doing so, 230 to 380 volts DC is maintained across R220 for either setting.

A neon flasher circuit consisting of R640, DS640, and C640 indicates when hazardous voltages are present on the line filter capacitors. R220 discharges these capacitors in about two minutes after power is removed.

Transformer T440 provides the line trigger signal and power for the Standby Power circuit when the front-panel ON/STANDBY switch is off and the rear-panel PRINCIPAL POWER switch is on.

Pulse Width Modulator

The primary means of controlling the output voltages from the Low-Voltage Rectifiers is the the Pulse Width Modulator (PWM). PWM transistors Q600 and Q601 are power MOSFET devices. They operate in conjunction with L520 and CR620 to form a negative buck switching regulator, operating at a fixed frequency of 100 kHz. By controlling the conduction time of either transistor, the DC voltage applied to

the 50 kHz Inverter (across C630 and C631) can be varied from 0 volts up to the maximum voltage available across the line filter capacitors. Each of the PWM transistors conducts current on alternate switching cycles; they never conduct at the same time. The control voltages for the gates of the PWM transistors are provided by T710. Resistors R600 and R610 set the switching speed of the PWM transistors.

The 100 kHz variable-duty square wave developed at the drains of the PWM transistors is filtered by L520, C630, and C631. CR620 provides a path for the continuous DC current flowing in L520 when neither PWM transistor is conducting current.

Capacitors C400, C401, and C500 provide a return path for common-mode current transients flowing in the chassis. Transients of this type are caused by stray capacitive-coupling of the switching waveforms to the chassis. T410 decouples these noise sources further. The leakage inductance of transformer T410 (appearing as a differential-mode inductance to the PWM), in conjunction with C500, forces a continuous DC current to be drawn from the line storage capacitors.

Primary Current Sense

Primary current-sense transformer T700 samples the instantaneous current flowing in each PWM transistor. Q800 and Q801 clamp the secondaries of T700 to one base-emitter drop, giving true current-transforming operation. Current sense signal +CS is used to control the current flowing in the PWM transistors. It is used for both protection and feedback control.

50 KHz Inverter

The primary function of the inverter is to convert the DC voltage provided by the Pulse Width Modulator into a 50 kHz square wave. The 50 kHz inverter MOSFET devices, Q610 and Q620, are driven by a 10-volt peak, 50 kilohertz square wave from gate drive transformer T720. Cross conduction (i.e., both transistors conducting at the same time) is prevented by R620 and R611 working into the gate-source capacitance of Q620 and Q601. During the 100 nanoseconds when neither transistor is conducting, diodes CR601 and CR620 provide a current path for mutual inductances and leakage current of the transformer. When the transformer primary current decays to zero, the respective MOSFET is biased on, ready to conduct; thus, no initial conduction losses are associated with the half-wave bridge.

In the event of an inverter over-voltage condition, spark gap E630 will fire and clamp the inverter input voltage to a safe level. If the over-voltage is caused by a shorted PWM transistor, the spark gap will continue to conduct current until fuse F410 is opened and inverter capacitors C630 and C631 discharge. If the over-voltage condition is caused by an open feedback path, the control circuit will limit the current to a level below that required to clear F410 and will then initiate a restart cycle, extinguishing the spark gap.

Rectifiers

Four separate sets of power transformer windings in T130 and T240 step the 50 kHz Inverter voltage down to the level required to generate eight semi-regulated outputs: +54, +17, +7, +5.2, –5.2, –7, –17, and –54. Both power transformers operate in parallel but have different volt-second/turn ratio values in order to establish the proper output voltages.

After rectification and filtering, the semi-regulated outputs pass through current sense resistors. These resistors are actually circuit board traces tapped at specific lengths. The voltage across these traces is

proportional to the current at the output terminals. These voltages (approximately 25 mV at the rated current) are used by the control circuit to limit fault currents in the mainframe or plug-in units and to provide a diagnostic feature. The exception to this type of sensing is the + and –50 volt outputs, whose currents are sensed by R535, R636, and R637. The current is then level-shifted by Q530 and Q630.

Inverter Voltage Sampler

CR250, CR251, C251, R240, and Q103 form a sample and hold circuit that provides a voltage proportional to the inverter input voltage. This voltage provides feedback the the Error Amplifier circuit.

Ramp Injection

The ramp injection circuit consists of Q210 and associated components. The ramp signal is generated by charging C216 through R313. This voltage ramp is converted to a current by Q210, with R312 setting the magnitude of the injected current and, therefore, the loop gain. The ramp generator is reset periodically by either the 100 kHz clock pulse or by the end of the Pulse Width Modulator "on" time, whichever comes first. (Normally, the PWM signal from pin 1 of U200A, acting through CR200 and Q213, occurs first.) CR311 prevents ramp capacitor C216 from discharging completely, leaving a small DC bias current in the ramp signal to hold off the converter during the power-up sequence.

Current Limit Comparator

The primary current sense signal and the injected ramp current are summed and converted to a voltage by R305. The voltage across R305 (proportional to the instantaneous current in the PWM switching transistors) is applied to current-limit comparator U410C. When the current in PWM inductor L520 rises to a level determined by the error signal, the comparator resets latch U200A and ends the switching cycle. A new switching cycle is initiated by the 100 kHz clock pulse, which sets the latch, turning "on" the alternate PWM transistor until it is again reset by the current limit comparator. The error signal at the non–inverting input to the current-limit comparator therefore establishes the magnitude of current flowing in PWM filter inductor L520 by controlling the "on" time of the PWM power switching transistors.

Error Amplifier

The +5.1S and +5.1I error signals are summed by error amplifier U400B. The output terminal voltage is set by the +5.2 REF voltage, which is generated by U800 and set with 5.2 Ref Adj adjustment R800

Soft Start

Shutdown of the converter is accomplished by ramping down the reference voltage input to the Error Amplifier. The RST(L) signal discharges soft start capacitor C411 through CR313, Q410, and R324. All supplies will track this signal down to zero, where they will stay until Fault Delay Latch U420C (diagram 3) times out. The RST(L) signal also pulls down the PFSET line, latching the POWERFAIL signal TRUE (high) and turning the LED's on for the duration of the time out. This occurs because the signal from the Current Limit Comparator ends.

After the 200 millisecond time out on the Fault Delay Latch, the clamp is removed from the 5.2 REF input to the Error Amplifier. This allows the output voltage to rise at the rate determined by R323, charging Soft-Start capacitor C411. The output voltages will track this rise, which has a time constant of approximately 10 milliseconds. After a delay of 20 milliseconds, as determined by the clamp network of R326, C323, and CR321 (diagram 3), Power Fail Detect comparator U420D (diagram 3) is reset, which turns of the voltage fault LED's and signals the mainframe that the output voltages are stable.

Standby Power

Components CR750 and C850 rectify and filter the secondary voltage of transformer T440, providing 17-30 volts to power the remote line switch and standby control. This voltage is regulated to 16 volts by a series-pass regulator composed of Q840, Q740, VR830, and associated components. Zener VR830 and divider R832-R833 are the positive and negative inputs to differential amplifier Q740. The output of the differential amplifier is the error voltage and is applied to the base of PNP series-pass transistor Q840. Stability compensation is provided by C730.

When the power conversion circuitry is started, power is supplied by the inverter through the +17 V line, acting through CR630. This shuts off Q840 and unloads the line trigger power transformer, which would otherwise cause distortion of the line trigger signal.

Power is applied to the control circuit by grounding the DCPWRSW line, which turns on Q100. This is done by the remote power switch, located on the front panel. Three-terminal regulator U300 sets the control circuit voltage to +12 volts.

100 KHz Clock

When power is first applied, the fault delay latch is set and prevents start-up of the power conversion circuitry. Meanwhile, the 100 kHz clock pulse generator, made up of comparator U410D and associated components, is allowed to stabilize. The frequency of the clock is set by R300, charging C310 to a voltage set by the divider R316-R301. The pulse duration is set by C312.

Gate Drive

The 100 kHz clock pulse toggles divide-by-two flip-flop U200B. This provides the balanced 50 kHz Inverter. U200 buffers both the PWM and 50 kHz Inverter signals, providing sufficient current to drive the gate transformers as well as the charge pumps formed by CR110, CR111, CR112, CR113, and C212, C213, C214, and C215. These charge pumps establish the +22 V and –10 V supplies. The input logic in Gate Drive IC U200 provides the alternating drive required by the PWM gate transformer. Dampening and blocking are provided by R212-R111 and C120-C121, respectively. R201 and C200 create a time delay that holds the PWM latch in U200A reset when power is first applied.

Line Trigger

The line trigger signal is applied to differential-to-single-ended amplifier U710A via the + and -LINE signals. R729 and R735 set the output impedance and magnitude of the line trigger signal, LTRIG, (used by the mainframe and plug-in units) to less than 470 ohms and from 1 volt to 3 volts peak to peak.

Fault Detection 3

The Fault Detection circuit provides protection and diagnostics for the Regulators circuit (diagram 4) and the Line Inverter, Rectifiers and Control circuit (diagram 3). The purpose of the protection circuitry is to prevent single faults in the power supply or mainframe power buses from becoming multiple faults. It accomplishes this by forcing an orderly shutdown of the power conversion circuitry, followed by restart attempts at regular intervals. Since all fault conditions have the same result (i.e., shutdown of the converter), diagnostic features have been added to assist in locating the source and cause of the fault condition. A fault is identified as a persistent condition of excessive current, voltage, or temperature in the power supply, mainframe, plug-in units, or accessories.

Digital Current Sense

The overload fault sequence begins when the voltage drop across one of the current-sense trace resistances exceeds a reference level (about 25 mV) for several switching cycles (20 microseconds), tripping one of the current sensing comparators, U610C, U610A, U610D, U610B, U410A, U620D, or U620B. The reference levels for the comparators are set by zener diode voltage divider networks (e.g., VR630, R635, and R630) which establish the reference and, therefore, the current limit point for the +5.1 outputs.

Once tripped, the first action of the comparator is to pull down the PFSET (Power Fail Set) line, which is an analog OR of all the comparator outputs. This signal trips Power Fail Detect comparator U420D, turning on Q730, which pulls the PWRUP line down to signal to the mainframe that a power failure is imminent. This signal also turns on Q430, supplying current to all diagnostic LED's via the LIGHTS(H) line. Meanwhile, the current sense comparator signal fires one of the PUT devices (e.g., Q721), which bypasses the LED current and extinguishes only the LED associated with the particular fault condition; all other LED's remain on.

Tripping the current sense comparator also begins a time delay, determined individually for the various outputs by discharging capacitor C324 through the individual resistors in the fault line (e.g., R513). During this delay, the LED's are lit, the PWRUP signal is FALSE (low), and the power conversion circuitry attempts to clear the fault by providing maximum available power to the load. This time delay is approximately one millisecond, allowing time to charge capacitors during transient loads. If the fault is cleared within this time, the LED's are extinguished and the PWRUP line is opened, resuming normal operation without disturbing the output voltages.

Analog Current Sense

The Analog Current Sense circuit operates in the same manner as described for the Digital Current Sense circuit.

Primary Current Limit Detect

The primary current is limited on a cycle-by-cycle basis by simply clamping the output of the error amplifier. VR300 does this by setting the peak current in the switching transistors. The zener clamps current flow through R303, turning on Q400, which, after a ten millisecond delay, trips the Power Fail Detect and Fault Delay Latch, initiating converter shutdown.

Fault Delay Latch

If a fault persists, the Fault Delay Latch formed by C324 and comparator U420C is set, pulling down restart line RST. This signal initiates shutdown of the power conversion circuitry, which will remain off for the duration of time determined by C325, R314, and R305 (approximately 200 milliseconds).

Fault LED Driver

This circuit completes the current path through LED's DS533, DS630, DS530, and DS531. Q720, Q721, Q432, and Q431 respectively determine which LED's are illuminated.

Digital Voltage Sense

Over-voltage and under-voltage faults are detected by the Digital Voltage Sense circuitry. The +5 and –5 volt supplies are sensed by VR700 and VR701, respectively. Exceeding the zener voltages causes Q700 and Q701 to turn on, tripping the DIGVF indicator, DS533. A voltage fault of the post-regulated analog supplies is sensed by a Regulator circuit whose output is OR'd with the fault line by CR722 and CR721 to generate a restart.

Thermal Fault Sense

An over-temperature condition, caused by inadequate air flow, is detected when thermal sensor U730 reaches 75°C. This is converted to a fault signal by comparator U710C. Shutdown of the converter will continue until the sensor has cooled to 50°C; only then initiating a restart cycle.

Power Fail Detect

Power fail detection is accomplished by monitoring the duty cycle of the pulse-width modulator (PWM). The PWM(L) signal is converted to a DC voltage by the integrator formed by R328, R320, R327, C320, and C321. Since the input to the integrator is the logical "NOT" of the PWM signal, the DC output of the integrator is directly proportional to the rectified AC line. When this voltage drops below a level set by divider R330-R329 (corresponding to a duty cycle of 95%), comparator U420D pulls down on the PWRUP signal and lights all diagnostic LED's. Power conversion continues until an under-voltage condition is detected, giving the mainframe time to prepare for a power failure. Once the rectified line voltage has dropped below the minimum regulation range (190 VDC), the converter is shut down by the under-voltage detect circuit, leaving a substantial stored charge in the line storage capacitors. This prevents large surge currents when the AC line is reapplied and the thermisters are still hot.

Fan Speed Controller

Transistor Q740 and associated components comprise the fan speed modulator. A 10 Hertz pulse-width modulated signal from the fan speed controller (FAN PWM) sets the DC fan speed by pulsing it on, then

allowing it to freewheel through diode CR840. Fuse F840 protects these devices from any faults on the fan line.

The fan speed controller, consisting of U730, U710B, and associated components, functions as a limited range feedback control system and attempts to keep the temperature of the exit air stream constant over a specified range of ambient temperatures. The exit air temperature is sensed by U730 and converted to a DC voltage (VTEMP) by R732. This voltage becomes the reference for a 10 hertz pulse width modulator formed by operational amplifier U710B. The frequency of oscillation is set by C821, which with R729, serves as an integrator to convert the fan output back into a DC voltage. This voltage is then compared to VTEMP. The action of the circuit is to maintain the two voltages at the same average DC level. When a temperature rise is sensed by U710B, the pulse width to the fan is increased, and the fan speed increases to decrease the exit air temperature and maintain closed-loop control. To prevent the fan from shutting off entirely at low temperatures, which would defeat the temperature sensing of the air stream, the duty cycle is prevented from dropping below approximately 25%. This is provided by a low gain redundant feedback loop made up of R725 and C820 that takes over control when the fan duty cycle drops low enough to turn on rectifier CR723. This keeps the fan spinning slowly even at very low temperatures.

Regulators 4

The Regulators convert semi–regulated voltages into stabilized low–ripple output voltages.

Local Regulator Power

The operational amplifiers used for the +50, +15, +5, –5, –15, and –50 Regulators require that the following special voltages be generated for their operation:

1. A +20 volt supply generated from the semi–regulated +54 V supply by reference zener diode VR732 and transistor Q720.

2. A –20 volt supply generated from the semi–regulated –54 V supply by reference zener diode VR720 and transistor Q820.

3. A +10 volt supply generated from the semi–regulated +54 V supply by zener diode VR730 and transistor Q730.

4. A –10 volt supply generated from the semi–regulated –17 V supply by zener diode VR731 and transistor Q830.

5. An adjustable reference supply (REF) generated from the semi–regulated +50 V supply by three–terminal regulator U730 and adjusted with R830.

+50 V Regulator

Semi–regulated +54 volts from the Line Inverter, Rectifier and Control circuit (diagram 2) is the the voltage source for this supply. Differential amplifier U220C compares the feedback voltage at pin 9 against the reference voltage at pin 10. The error output at pin 8 of U220C reflects a difference between these two inputs. A sample of the +50 V output is connected to pin 9 of U220C via divider network R241–R235. Notice that the feedback voltage of this divider is obtained from a line labeled +50 S (sense). If the feedback voltages were obtained at the supply, the voltage at the load would not stay constant, due to the resistance of the interconnecting cable between the supply and its load. The sense configuration overcomes this problem by sensing the voltage at the load. Because the current in the sense line is small and constant, the load voltage is held constant regardless of the load current.

Regulation of voltage occurs as follows: If the +50 V Regulator output decreases (becomes less positive) due to an increase in load or a decrease in input voltage (as a result of a line voltage change or ripple), the voltage across divider R235–R241 decreases also. This results in a less positive level at pin 9 of U220C than that established by the REF supply at pin 10. This decreases the current through VR510 and causes an increase in current through the base–emitter junction of Q501. The result is increased conduction of Q501, the series regulator device. The load current increases and, therefore, the voltage across the load also increases sufficiently to balance the input to differential amplifier U220C. REF ADJ adjustment R830 sets the output level of this supply.

–15 V Regulator

Basic operation of the –15 V Regulator is the same as for the +50 V Regulator. The reference level for this supply is established through R130 at pin 12 of U230D. The divider ratio of R122–R135 sets a level of zero volts at pin 13. Any change at the output of the –15 V supply appears at pin 13 of U230D as an error signal. The output voltage is regulated in the same manner as described for the +50 V Regulator. Diode CR433 keeps the output of this supply from going more positive than about –4.4 volts if it gets shorted to one of the more positive supplies.

+5 V Regulator

The operation of the +5 V Regulator is basically the same as described for the previous regulators. Error voltage is provided through R134 to pin 6 of U230B and pin 5 is reference to the REF supply. The divider ration of R138–R139 is 2:1, so pin 5 of U230B is at five volts when the supply is operating normally. Any change at the output of the +5 V Regulator appears at pin 6 of U230B as an error signal. Diode CR431 limits the output of this supply to about –0.6 volt if it gets shorted to one of the negative supplies.

+15 V Regulator

The +15 V Regulator operates in the same manner as the +50 V Regulator. Error feedback voltage to pin 13 of U220D is provided through R236. Pin 12 of U220D is referenced to the REF supply. The divider ratio of R237–R236 sets pin 13 of U220D at +15 volts. Any change in the output level of the +15 V Regulator appears at pin 13 as an error signal. This results in an opposite change at output pin 14, which is conveyed to series regulator transistor Q400 through Q220 and Q311 to correct the error in the output voltage of the supply. Diode CR2420 limits the output of this supply to about 4.6 volts if it becomes shorted to one of the negative supplies.

–50 V Regulator

Operation of the –50 V Regulator is basically the same as described for the +50 V Regulator. Error voltage to pin 9 of U230C is provided by divider R224–R223 and is referenced to the –50 S (sense) line. The divider ratio or R224–R223 sets the level at pin 9 of U230C to zero volts when the output of this supply is correct. Protection diode CR432 limits the output voltage of this supply to –14.4 volts should the supply be shorted to a positive supply.

Voltage Fault Defect

Over–voltage or under–voltage of any regulated supply is detected by the window comparators U220A, U220B, and associated resistors. These resistors set a hysteresis window that is 5% of the regulator sense line voltages. The output of the comparators are analog "OR'd" and sent to the Regulator Fault Indicator circuitry on the Control Rectifier board, where the signal is latched into an LED indicator and initiates an immediate shutdown of the entire power supply.

Front Panel Boards 5

The Front Panel Boards schematic includes circuitry found on the Top Front Panel board, A8 Center Front Panel board, and A5 Bottom Front Panel board. These circuits support the front–panel input devices and are divided into three functional groups: knobs, buttons, and LED's.

Knobs

The knob portion of the circuit consists of three knob encoders, two on the A5 Bottom Front Panel board (S110 Vertical and S810 Horizontal) and one physically attached to the front panel (S58 Intensity). Output from these three encoders is buffered through U700 (diagram 7) for input to Serial Data Interface (SDI) IC U1760 on the A11 Main Processor board (diagram 12).

The SDI IC monitors knob positions with a six–bit up–down counter. Debouncing and conversion from the encoder's quadrature output takes place within the SDI IC to provide the necessary signals to control the internal up–down counters.

Buttons

The front–panel buttons are momentary switches connected in a matrix read by the main processor (U860 on diagram 9). The buttons are arranged in electrical groups based largely on physical location. Each group is read by activating its associated key read signal (KEY0–KEY6), which is generated by address decoder U500 (diagram 7) under processor control. The results of the KEY read are put on the KEY bus (K00–K07), which is buffered by U400 and becomes part of the FD bus (diagram 7). The FD bus eventually becomes part of the ABUS monitoring system and is discussed in more detail under SDI AND ABUS 12.

LED's

The LED's on the Front Panel Boards are driven by shift registers formed by flip–flops A9U200, A8U100, A5U220 and A5U720. Eight successive writes to these shift registers by the processor are necessary to completely redefine the on–off state of all front–panel LED's. The shift register clock (LEDCLK) is produced by address decoder U401 (diagram 7) under control by the main processor. Each shift register is driven by an input from the FD bus to reflect push button or processor selections.

Sets of LED's representing features that are functional groups and will only be enabled together, such as DS200, DS201, DS220, DS300, and DS400, share a common current source resistor such as R101.

Self test of the LED circuit is provided by current sensing pickoffs on each of the Front Panel Boards, such as FPLED3 for the A9 Top Front Panel board. These lines are multiplexed by U801 (diagram 8) and become part of the ABUS signal (diagram 12).

Touch Panel 6

The Touch Panel circuit consists of four separate systems located on the A7 Touch Panel board: Touch Panel, Beam Detection, Camera Power, and Graticule Illumination.

Touch Panel

The touch panel system consists of 24 infrared emitting diodes in a common–anode matrix and 24 photo transistors in a common–collector matrix.

Ten pairs of photo devices are arranged along the horizontal axis and fourteen pairs along the vertical axis. These paired devices are scanned sequentially by a shift register driven by the SDI circuit. The main processor can read the resulting pattern of interrupted and non–interrupted pairs and determine finger positions on the screen. The output from the photodetectors is multiplexed and read by the Serial Data Interface (diagram 12). More details on the Touch Panel Drivers and Multiplexer are given later under FRONT PANEL CONTROL 7.

A lens frame of infrared–transparent plastic keeps out large dust particles, concentrates the infrared light "beams", and reduces ambient light and reflection.

Beam Detection

The beam detection circuit consists of four photo transistors (Q100, Q140, Q500, Q540) and a current limiting diode (CR610). The photo transistors are arranged around the CRT graticule to gather light and register fluctuations as the crt beam sweeps across portions of the graticule lines. Current limiting diode CR610 provides the bias for the phototransistors and enhances common mode rejection of noise. The output from this circuit is converted by the Photodetector Circuit (diagram 8) and used by the processor to determine beam position on the CRT.

Camera Power

The Bezel Camera Connector, J43, provides power and reset inputs for cameras mounted on the bezel. +15 volts is supplied to the camera on the connector's top pin. A ground closure on the middle pin provides a latched reset signal readable by the main processor from the same place as the front–panel RESET button (KEY3 read signal and KEY06 of the KEY bus). The Camera Reset circuit is explained in the discussion under FRONT PANEL CONTROL 7. The bottom pin of the bezel connector is referenced to the instrument power supply ground.

Graticule Illumination

The Graticule Illumination circuit consists of three parallel incandescent lamps, DS145, DS342, and DS542, connected between ground and a variable voltage source. The variable voltage is controlled by the ACVS circuit (diagram 18), based on the setting of front–panel INTENSITY knob S58 (when assigned to GRAT).

Front Panel Control 7

The Front Panel Control circuit includes the drivers and output multiplexer for the touch panel, address decoders for the touch panel read process, the Camera Reset latch circuit, and buffers for the front–panel knob and key busses.

Touch Panel

The Touch Panel portion of the circuit is divided into four major functions: SDI Latch, LED Drivers, Photodetector Multiplexers, and Photodetector Digitization.

SDI Latch

U221 derives eight control outputs for the Touch Panel circuit under the direction of three inputs from the Serial Data Interface IC (U1760 on diagram 12). U221 shifts in data from the SDI on the TPCNTRL input and is clocked by the TPCLK signal. When all eight bits are in, the TPSTROBE line signals U221 to present the new control state to the Touch Panel circuits.

LED Drivers

U320, U321, and U420 are flip–flops connected in a shift register configuration. These registers shift a 0 through a field of 1's to light the corresponding LED in the touch panel. The enable signal for the LED drivers is provided by latch 8 of SDI Latch U221. The enable signal has a 50% duty cycle so that half the time one LED is selected and the other half all three drivers are disabled.

Photodetector Multiplexers

U120, U121, and U220 multiplex the output from the phototransistors around the CRT graticule. The three IC's are eight–to–one multiplexers. The outputs from all three are wired together and are sequenced by SDI Latch U221 to create a single output. Sequencing is accomplished with the three chip select inputs on each IC and the 24 inputs are taken from the touch panel phototransistors (14 vertical and 10 horizontal, diagram 6). The output of the multiplexers provide the input signal for the Photodetector Digitization stage.

Photodetector Digitization

Photodetector Digitization takes place in the circuit of U110A and B. This circuit determines whether or not there is an adequate increase in detected infrared light (>5mV) to qualify as an unbroken beam when an photodetector pair is on. If the beam is unbroken, its TPDATA output goes high and if broken, low. Touch panel sensitivity is set by R120, Touch Panel Adjust.

Camera Reset

The Camera Reset circuit uses the center contact of the camera power connector to reset the instrument as if the front–panel RESET button were pressed. U501A and U501C are connected as a latch to store the Camera Reset request until it can be read by the KEY3 output from address decoder U500. KEY3 is the same read line used for the front–panel RESET button. When the latch has been set and the KEY3 line activated, the reset request will appear on KEY06 of the KEY bus. After the reset has been acknowledged, the PHOTORST(L) output from U500 will become activated and the latch will be cleared.

Address Decoders

Address Decoders U401 and U500 provide signals when a memory operation is taking place on a front panel function. These functions include: LED writes, ABUS channel select, photo/camera reset, and button reads.

U500 contains two one–to–four–line demultiplexers with the data inputs wired together. Data is supplied by line FA3 from the F bus on the A11 Main Processor board (diagram 10). The enable inputs are also wired together and are activated by either FEN(L), derived from the Chip Select Unit in the CPU, or FA4 from the F bus (diagram 10). Demultiplexer selection is performed with lines FA1 and FA2 of the F bus. The outputs include KEY0 through KEY6, used to read the front–panel buttons, and PHOTORST(L) to reset the Camera Reset latch (U501) and preset the Photodector Circuit flip–flops (U720 and U721).

U401A, B, and C are two–input OR gates receiving data from the CPU via the F bus (diagram 10). the output of U401A provides the enable input to demultiplexer U500 as previously described. U401B creates the ABUSFPEN(L) signal for clocking ABUS input latch U300 (diagram 8) with input from the CPU via FA4 or FEN(L). U401C creates the LEDCLK signal to clock the LED shift registers on the three Front Panel Boards (diagram 5) with input from the CPU via FA6 or FEN(L).

Key Buffer

Key Buffer U400 puts the output of the key matrix on the eight–bit FD data bus when the CPU performs a read on one of the key ports. U400 is an octal line driver with the eight 4.7k resistors in R410 pulling up inactive input lines. The inline resistors of R301 provide impedance matching between the buffer and bus. The buffer is enabled by the same signal from U401A that enables U500 for a key read.

Knob Buffer

Knob Buffer U700 provides a low impedance drive path to the SDI circuit from the high impedance environment of the knobs. The enable inputs are both tied to ground to keep the buffer permanently enabled.

Front Panel Calibrator and Photodetector Circuit 8

Front Panel Calibrator

The Front Panel Calibrator circuit provides the FPCAL signal and two types of square–wave signals to the front–panel connector. The square–wave and fast–rise square–wave signals are developed with three input signals: FPACCAL to set the operating level, FCLK as the clock, and FRCALEN(L) to select between square–wave and fast–rise output. The FPCAL signal, from the Calibrator Voltage Reference circuit (diagram 19) via the Kernel (diagram 9), is selected with the DCCALEN(L) signal from the Control, GPIB, and RS232 circuit (diagram 10).

Clock Buffer

The calibrator clock signal, FCLK, is derived from the CPU TMROUT1 signal on diagram 9. When FCLK is high, the calibrator square–wave output will be high.

FCLK drives a level shifter circuit consisting of transistors Q921 and Q1020. Capacitor C920 is connected between the base of Q1020 and the collector of Q921, providing high–frequency feedback to reduce edge transition time. The level–shifted output at the collector of Q1020 drives the input of differential pair Q1022–Q1021, which is biased to pull the voltage at the anode of diode CR930 below ground potential. Diode CR1031 is connected to the output of transistor Q1021 to prevent saturation, which could slow the positive transition of the fast–rise signal. Series resistor R1024 helps damp ringing in the output signal.

High Level Output Driver

Input signal FPACCAL is used to set the high level of the square–wave signal. FPACCAL originates in the Calibrator Voltage Reference circuit (diagram 19) and arrives at the input of the High Level Output Driver via the Kernel (diagram 9).

IC U910, transistor Q910, and FET Q920 operate as an inverting voltage amplifier with a gain of 0.894. Gain is measured from pin 16 of J78 to R1030 with both FRCALEN(L) and FCLK set low. Gain becomes 0.100 when FRCALEN(L) is low and FCLK is high. U910 acts as the main inverting amplifier, Q910 as a level shifter, and FET Q920 a source follower.

The inverting voltage gain of operational amplifier U910 is set by resistors R912 and R921. Feedback through capacitor C910 helps stabilize U910. Diode CR911 is also connected in a feedback configuration and holds the input of U910 (pin 2) at ground potential when the FPACCAL signal goes positive. This ensures constant loading on the FPACCAL signal. For temperature drift stability, diode CR910 is connected between feedback resistor R921 and the input to U910 to match the diode drop of CR930 in the output circuit.

Resistors R903, R904, R910, R911, and R917 inject some of the switching signal, FRCALEN(L), into U910 to cancel a small step voltage appearing at the source of FET Q920 when transistor Q1021 shuts off. This correction is only applied when square–wave mode is selected as that is when the most signal appears at the source of Q920.

Level shifter Q910 is protected from high reverse bias on its emitter by diode CR912. Capacitor C832, connected to its collector, helps to limit noise.

Resistors R914, R915, R916, and R922 act to reject noise in the +50 volt power supply to FET Q920 by making the source of Q920 appear as ground reference to the noise. The gate of Q920 is protected from excessive voltage by zener diode VR920. Resistor R920 at its collector helps prevent oscillation.

PROBEDIV Signal

Selftest of the square–wave signal is provided by the ABUS system via multiplexer U801. Resistors R1033 and R905 provide the PROBEDIV signal to U801 for this purpose. The PROBEDIV signal is 2/3 the square–wave signal.

50 Ohm Termination

When fast–rise square wave is selected by a low FPCALEN(L) signal, the square–wave signal is coupled through a 50 ohm output for faster rise time. A low FPCALEN(L) level sets the output of U1000C high and turns on FET Q1030. FPCALEN(L) is a TTL level signal and is compared to V_T to set the output of U1000C high or low. V_T is set by voltage divider R1010–R1011 to be +1.4 volts. Q1030 is a low–impedance FET which, when on, serves to short R1032 and make the output impedance 50 ohms. Resistor R1030 and capacitor C1030 reduce the initial overshoot on the fast–rise output signal.

When square–wave output is selected by a high FPCALEN(L) signal, FET Q1030 is off and the output impedance is approximately 450 ohms. FET Q1030 has off–state capacitance which could slow the rise and fall time of the square–wave signal. To ensure that Q1030 remains fully off, resistors R1028 and R1029 set an operating level that prevents the gate–to–drain capacitance from turning the FET on.

Output Selection

Relay K930 selects between FPCAL or square wave (or fast–rise square wave) output as directed by the FPCALEN(L) signal. When FPCALEN(L) is high, the output of operational amplifier U1000D is low. The output of U1000D is determined by comparing the TTL–level FPCALEN(L) signal to the 1.4 volt V_T level. The low output from U1000D saturates transistor Q1010 and turns on relay K930. In this condition, square wave (or fast–rise square wave) is selected. When FPCALEN(L) is low, Q1010 is turned off and K930 selects the FPCAL mode of operation.

Output Protection

The front–panel probe hook is protected from static voltages by diodes CR1030 and CR931. The diodes are normally biased by approximately 15 volts each. When a voltage greater than ±15.7 volts is applied to the probe hook, one of the diodes will turn on and clamp the probe hook voltage to ±15.7 volts.

Kernel 9

The Kernel consists of the CPU, Kernel Test Circuit, Address Latches, Read Only Memory, Address Decoders, and Emulation Jumpers. The Kernel serves as the control center for the entire oscilloscope system. The CPU uses software instructions stored in PROM memory to processes data, control activity on the bus, and direct the operation of other circuits throughout the instrument.

CPU

CPU U860 contains the Processor (Execution Unit), as well as Programmable Timers, a Programmable Interrupt Controller, a Bus Interface Unit, a programmable Chip Select Unit, a programmable DMA Unit, and an Internal Oscillator.

Microprocessor

The Microprocessor section is the control element that ultimately controls the entire operation of the oscilloscope.

Programmable Timers

The Timers are variable under the control of software stored in ROM. The external clocking inputs of the timers, TIMEIN0 and TIMEIN1, are not used and are tied high through resistors.

TIMEROUT0 (TMROUT0) is used to set the baud rate for serial communications. The frequency of TIMEROUT0 is user–selectable when setting baud rate at the front panel and sets the clock rate of the Transmit and Receive Control sections of the RS232 Controller (diagram 10).

TIMEROUT1 (TMROUT1) is inverted by U1170C and becomes the FCLK signal used by the Front Panel Calibrator circuit (diagram 8).

Programmable Interrupt Controller

The Programmable Interrupt Controller section is used to prioritize the interrupts from the power supply, GPIB controller, RS232 controller, Counter Timer, and Serial Data Interface.

The NMI (Non Maskable Interrupt) has highest priority and is used to alert the processor of a power supply failure. The PWRFAIL(L) signal applied to the NMI input is derived from the PWRUP signal produced on the A3 Control Rectifier board (diagram 3). The NMI input is gated by AND gate U830A, allowing the processor to service the interrupt request over the BA bus (diagram 12).

Chip Select Unit

Three types of Programmable Chip Select outputs are used: Memory Chip Select (MCS0–MCS3) and Peripheral Chip Select (PCS0–PCS6), and Upper/Lower Chip Select (UCS and LCS).

The Memory Chip Select (MCS) outputs are used as follows:

MCS1 is used to control the Ready circuit on diagram 10 and the SDI IC on diagram 12.MCS2 provides the RAMSEL input to Display Controller U440 on diagram 13.MCS3 provides one of the select inputs for the Real Time Clock and EEROM on diagram 11.

The Peripheral Chip Selects are used as follows:

PCS0 is used as one of the enable inputs to bus transceiver U540 and decoder U760 (diagram 10).PCS1 provides one of the chip enable inputs to the Sample and Hold A/D Converter, U160 on diagram 12.PCS2 is one of the two signals that become the FEN(L) signal on diagram 10.PCS6 is one of two signals to control the DSEL input of Display controller U440 on diagram 13.

LCS is used to select the dynamic (DRAM) portion of memory and UCS for the ROM portion.

Programmable DMA Unit

The Programmable DMA section is not used in the 11301 or 11302 but its capabilities are made available to the circuit board connector.

Internal Oscillator

The Internal Oscillator uses crystal Y870 to develop the 8 MHz clock, which is available at CLKOUT and used extensively within the CPU. The frequency of the crystal is 16 MHz, twice the resulting clock frequency. The timing of all signals originating from the CPU are relative to this clock.

Kernel Test Circuit

The Kernel Test Circuit is manually selected by moving the jumper of P1250 to the TEST position across pins 2 and 3 and by removing Diagnostic Jumpers R1060 and R1072. This forces the CPU to execute an STD instruction (FD) over and over (this instruction only sets the direction flag—essentially a no op instruction) with the data bus disconnected. A scope loop is thus provided which may be useful for debugging some types of catastrophic kernel failures, such as stuck bus lines.

Address Latches

Address Latches U1062, U1072, and U970 serve to separate the address information from the address/data bus of the CPU and to buffer the address lines for increased fanout.

Read Only Memory

The control software resides in eight 64k ROM IC's on the A11 Main Processor board. The ROM at U1000 contains low (even) bytes at addresses 80000 through 9FFFF, U1100 low bytes at A0000 through BFFFF, U1200 low bytes at C0000 through DFFFF, and U1300 low bytes at E0000 through FFFFF. Likewise, the ROM at U1230 contains high (odd) bytes at addresses 80000 through 9FFFF, U1330 high bytes at A0000

through BFFFF, U1430 high bytes at C0000 through DFFFF, and U1400 high bytes at E0000 through FFFFF.

Address Decoders

Address Decoders U930 and U1170 split programmed UCS (Upper Chip Select) space from the CPU into two individual spaces: C0000 through DFFFF and E0000 through FFFFF. They also provide two non–programmable spaces at 80000 through 9FFFF and A0000 through BFFFF for the individual upper/lower pairs.

Emulation Jumpers

The Emulation Jumpers on P852 function as address straps that allow the removal of ROM from address space for substitution of RAM in its place. The normal configuration for P852 is two jumpers shorting 1 to 2 and 3 to 4.

Control, GPIB, and RS232 10

The CONTROL, GPIB, AND RS232 circuit consists of Input Ports, Output Ports, Address and Data Buffers, GPIB, RS232, and Wait–State Generator.

Input Ports

The input ports at U730 are used by the CPU to sense display status, to determine whether or not EEROM U800 (diagram 11) is finished writing, and read data from the Photodetector Circuit (GRATDET(L) from diagram 8).

Output Ports

The output ports at U670 are used to control self test status LED's DS1080 and DS1081, the enable signal for the battery backed up RAM (SRAMEN to U900 and U1130 on diagram 11), front–panel Calibrator mode (DCCALEN and FRCALEN to diagram 8), the rear–panel TRIGGER OUT connector (READY OUT[NOT]), and the internal beeper enable signal.

Address and Data Buffers

Address and Data Buffers U470, U540, and U570 buffer the data bus to allow more widespread distribution.

GPIB

The GPIB interface consists of U520, U600, and U700 and is a straightforward implementation of the IEEE–488 standard.

RS-232-C

The RS232 interface consists of U420, U400, and U402. The baud rate clock is derived from the timer 0 output from the CPU (diagram 9). Maximum baud rate is 9600 baud with this arrangement.

Wait–State Generator and Ready Circuit

The Wait–State Generator and Ready circuit have the capability of inserting wait states (in MCS1 space, diagram 9) and holding off processor execution from the dynamic memory (diagram 11), the display circuit (diagram 15), and the ABUS D/A converter (diagram 12).

Memory and Clock 11

The MEMORY AND CLOCK circuit consists of the Volatile Memory (DRAM), Non–Volatile Memory, and Real Time Clock.

Volatile Memory (DRAM)

The DRAM consists of eight 64k X 4 IC's for a total of 256K bytes. Control is provided by DRAM controller U1500.

Non–Volatile Memory

EEROM

EEROM U800 provides 2K bytes of electrically erasable read mostly memory. The main use for this memory is the storage of calibration constants and instrument identification. An erase or write can take up to 30mS to complete and the EEROM has a limited durability of 10,000 erase/write cycles maximum.

BBRAM

The BBRAM (U900 and U1130) provides 16K bytes for saving data during power–down periods, whether accidental or planned. The main use for this memory is storage of front–panel settings. Special measures have been taken to prevent accidental writing to this memory on power–up and power–down by requiring the Reset signal and an enable signal to be activated before the memory can be accessed.

Reset

The Reset circuit is controlled by U1460 and provides a reset cycle of about 10mS on power up, power interruption, or external activation via P1450.

Battery Retention

The battery retention circuit (Q1268, Q1269, and BT1190) provides standby power to the BBRAM (U900 and U1130), and Real Time Clock (U1260) in the absence of power from the instrument power supply. This is accomplished by pulling the ground pins on the BBRAM and Real Time Clock down below the instrument ground and collapsed power supply. The circuit senses normal power availability from the instrument power supply and pulls the ground pins back near the instrument ground potential

Real Time Clock

The Real Time Clock (U1260) keeps track of the time and date, which are readable over a four bit bus by the CPU. The clock and its mode of operation are also setable over this same bus. A programmable clock output is also available to the Counter–Timer circuit (U1640B on diagram 12).

SDI and ABUS 12

The SDI and ABUS circuits on the A11 Main Processor board includes Output Ports, the Counter–Timer Multiplexer, the ON/STANDBY switch, ABUS, SDI, and beeper circuits.

Output Ports

The Output Ports at U770 are used to control the ABUS, the Counter–Timer Multiplexer, NMI/EN (power fail enable), and DISP/EN(L) (display enable). U770 uses 3 inputs from the BA bus to control the state of its 8 latches.

Counter–Timer Multiplexer

The Counter–Timer Multiplexer sends either the 2 MHz Clock from the CPU (via U660 on diagram 10) or the Real Time Clock output from U1260 (diagram 11) to the Counter–Timer (U520 on diagram 22), as determined by its assigned output port from U770.

ON/STANDBY Switch

Front–panel ON/STANDBY switch S60 connects to the power supply via the A11 Main Processor board and A10 Front Panel Interface board.

ABUS

The ABUS system consists of U1280 and U1380 used together as an analog multiplexer, a sample and hold circuit in U1590, and Analog to Digital Converter U1680. This circuit is primarily used to make analog measurements for self test and automatic calibration.

Analog Multiplexer

The two 8x1 multiplexer IC's are controlled by the output ports from U770 and select one of 16 inputs for digitizing. Many of these inputs come from other circuit boards and are previously multiplexed.

Sample and Hold

The multiplexer output is then sampled by Sample and Hold IC U1590 to provide a solid, steady, low impedance source necessary for the A/D Converter.

A/D Converter

The A/D Converter converts the multiplexed signal to an eight– or twelve–bit digital input for the CPU. The CPU is held off during this conversion by the Wait State Generator circuit (diagram 10). R1582 provides offset adjustment and R1580 provides gain adjustment.

Serial Data Interface

Serial Data Interface (SDI) IC U1760 performs several circuit functions. It contains an external microprocessor interface, an Analog Control Voltage System (ACVS) interface, front–panel knobs interface, touch panel interface, serial plug–in interface, and pulse–width modulated outputs for the display and beeper circuits.

External Microprocessor Interface

The External Microprocessor Interface is an eight–bit bidirectional bus with seven control signals.

ACVS Interface

The ACVS interface is a serial interface customized for Controller IC U740 (diagram 18), with data output signal ACVSDATA, clock input ACVSCLK, and a three–byte internal buffer.

Front–Panel Knob Interface

The Front–Panel Knob Interface portion of the SDI IC debounces, decodes, and monitors with a six digit up/down counter the knob position of all three front–panel knobs. These position counters are available for the CPU to read upon demand.

Touch Panel Interface

The Touch Panel Interface section provides control and timing signals to the touch panel, and decodes the data coming back. Decoding is accomplished by storing the data in latches which are readable by the CPU and correspond to the status of photodetector pairs (LED and phototransistor) on the touch panel.

Serial Plug–In Interface

The Serial Plug–In Interface section has a special bidirectional serial interface channel for each of the three plug–in compartments. The pulse–width modulated outputs are filtered to provide programmable analog voltages for controlling display position.

Beeper

The PW5 output is frequency programmable and is used by the circuit of U980A and Q1880 to drive speaker LS1890. The speaker circuit is enabled by BEEP EN signal from U670 (diagram 10).

Vertical Amplifier 14

The Vertical Amplifier circuit selects and amplifies input signals from the plug–in units under the control of the Real–time Oscilloscope Control System (diagram 15).

Vertical Channel Switch

The Vertical Channel Switch hybrid (U220) uses control signals from the Real–time Oscilloscope Control System (U270 on diagram 15) to select vertical signals for display. The control signals VS1, VS2, VS3, and VS4 are applied to pins 42, 43, 15, and 16 of the Channel Switch. These signals direct U220 to connect the selected input signal to the differential output (OUT+, pin 11 and OUT–, pin 1) according to the logic in the following table.

Channel Select Table

	Control Signals			
Display Signal	**–VS1**	**–VS2**	**–VS3**	**–VS4**
Left Plug–In Unit	0	1	0	1
Right Plug–In Unit	1	0	0	1
Left + Right	0	0	0	1
Counter View	1	1	0	1
Auto Cal	1	1	1	0
Readout	1	1	1	1

The Vertical Channel Switch provides additional common mode and differential outputs for the Left and Center Plug–In channels. For diagnostics, the common mode outputs (pins 32 and 21) are multiplexed through U660 to the ABUS. The negative sides of the differential outputs at pins 39 and 27 have 50 ohm terminations. The positive side of the Left signal (pin 40) goes to the Left Vertical Output BNC on the rear panel. The positive side of the Right signal (pin 28) drives the Horizontal Amplifier in X–Y mode.

Delay Line

Delay Line DL200 delays vertical deflection signals from the Channel Switch to the Vertical Amplifier by approximately 77 ns, allowing time for the Z–Axis and Sweep circuits to turn on before the CRT beam begins to deflect vertically. Doing so permits the operator to view the triggering event. The bridged T–network, composed of inductors and capacitors built into the circuit board, corrects phase distortion introduced by the delay line.

Dynamic Beam Alignment

The Dynamic Beam Alignment circuit of U600 is a balanced modulator. Its output at pin 6 is an intensity–dependent current. Applied to pin 39 of Vertical Output Hybrid U520, it prevents vertical shifts of the display induced by the CRT when the intensity varies over a wide range. Its input at pin 10 is the Spotshift signal from the Q–Axis output of the Z–Axis hybrid (U720 on diagram 15). U600 functions as an inverting or non–inverting amplifier.

Vertical Dynamic Centering adjustment R600 sets the gain and polarity of the amplifier. R504, connected between pins 2 and 3, determines the sensitivity of this adjustment.

High Speed Schmitt

The differential Counter View signal comes from the Counter Timer (U720 on diagram 22) through delay line DL27. A High Speed Schmitt Trigger (U700) squares it up and level shifts it for application to pins 48 and 13 of the Vertical Amplifier. An RC network with adjustments R700, C700, R605, and C710 balances the effects of the compensation circuit between pins 5 and 8.

Vertical Output Amplifier

The Vertical Output Amplifier hybrid (U520) receives the selected vertical signal from the Delay Line at pins 3 and 10 and increases its amplitude to the level required to drive the CRT deflection plates. The RCL network between pins 5 and 8 of U520 compensates the signal for skin–effect losses in the Delay Line.

On Screen Thermals adjustment R570 minimizes thermal distortion in the Output Amplifier to reduce vertical jitter in the display readout.

Center adjustment R610 allows correction of offsets in both the Amplifier hybrid and the CRT.

The differential output signal of the Vertical Amplifier (OUT+, pin 28 and OUT–, pin 33) drives the vertical deflection plates of the CRT through L630 and L620. A hybrid resistor network, including an adjustable portion for impedance matching, terminates the distributed–deflection structure of the CRT.

Both the differential and common mode signals are picked off at the CRT termination for diagnostics and self–cal. U670B/A converts the differential signal to a single–ended signal. U660 multiplexes the differential and the common mode signals to the ABUS.

Bandwidth Limiting

To make the readout character dots more distinct, high frequency noise is eliminated whenever readout is being displayed. The RCL networks connecting pin 18 to pin 19 and pin 44 to pin 45, along with capacitors integral to U520, form filters to limit the bandwidth of the Vertical Amplifier to 20 MHz. BWL(L), an active LO TTL–compatible signal from ROCS IC U270 on diagram 15, is connected to pin 16 of U520 to control this function.

Beam Find

While the BEAM FIND button on the front panel is depressed, an active HI TTL–compatible signal from the Analog Control Voltage System (diagram 18) is applied to pin 15 of Amplifier U520. This BEAMFIND signal reduces the dynamic range of the output, compressing the display so that all deflected traces are held within the vertical limits of the CRT graticule.

Output Protection Circuit

If the output of Vertical Amplifier U520 is short–circuited or loses its bias, excessive current flows into pins 30 and 31. Transistors Q650 and Q651 form a protection circuit against either of these fault conditions. Its purpose is to lower the voltage on pin 23 of U520. A fraction of this voltage is picked off and multiplexed through U660 to the ABUS for diagnostics.

Control System and Z Axis 15

8 MHz Oscillator

The 8 MHz oscillator provides the clock signal for the Real-time Oscilloscope Control System IC (U270) and the Analog Control Voltage System processor (U740 on diagram 18). The oscillator consists of Q670 and Q680 connected in an emitter-coupled bistable multivibrator (Bose oscillator) configuration, with an input through R684 to dither the clock frequency. Since this oscillator sets the Display Chop frequency, it must vary about 8MHz in a pseudo-random fashion to avoid Vertical Chop synchronization on screen.

The base of transistor Q680 is set at -3.04 V by the resistor divider R681-R682. Capacitor C680 is used to decouple the base of Q680. The base of transistor Q670 is controlled by the collector voltage of Q680, so only one of the two transistors will be conducting at a time. When Q680 is conducting, the base of Q670 is pulled low to turn Q670 off. The collector of Q670 will be pulled high by R671, making the oscillator output high. When Q680 is not conducting, the base of Q670 is pulled up to ground and turns Q670 on. The collector of Q670 will then go low, making the oscillator output low.

The dynamic operation of the oscillator is as follows: At power up, the base of Q680 is set to -3.04 volts and the emitters of Q680 and Q670 are pulled toward -15 volts. Since both transistors are off, the base of Q670 is effectively at ground. As the emitters drop towards -15 volts, Q670 turns on before Q680. The conduction of Q670 pulls its emitter up, which pulls the emitter of Q680 up through C681 and keeps Q680 turned off. This condition constitutes the first of the two states.

With Q670 holding the voltage at R673 and C681 constant, C681 begins to charge (through R680) toward -15 volts. When the voltage at the emitter of Q680 drops one diode drop below the base, Q680 begins to conduct and the voltage at the base of Q670 drops, turning Q670 off. This condition constitutes the second of the two states.

With Q680 now holding its emitter at a constant voltage, C681 begins to charge in the opposite direction through R673. When the voltage at the emitter of Q670 drops one diode drop below the base, Q670 begins to conduct. When Q670 begins to conduct, the emitter of Q680 is pulled up through C681 along with the emitter of Q670. This rise in emitter voltage turns Q680 off, allowing the base voltage of Q670 to rise toward ground and turn Q670 on harder. The oscillator has now returned to the first of the bistable states and the emitter of Q680 again starts its excursion towards -15 volts to repeat the cycle.

Capacitors C671 and C670 and resistor R670 form a decoupling network for the +5.1 volt power supply. R672 sets the output voltage "low" limit. Inductor L670 and capacitor C672 provide decoupling for the -15 volt power supply.

A TTL signal is applied to the base of Q670 through R674 to provide dithering of the oscillator. This input causes the base voltage to be switched between two levels in both bistable states, making Q670 turn on slightly sooner or later in the second state.

Real-time Oscilloscope Control System

The Real-time Oscilloscope Control System (ROCS) is comprised of ROCS IC U270, 8-bit DAC U630, Programmable Array Logic IC U581, hex latch U580, and a Holdoff Oscillator circuit.

The ROCS IC provides the control signals for coordinating the key elements to create a display on the instrument's CRT. This activity entails: (1) interaction with the Main Sweep, providing Sweep Holdoff

at the completion of the sweep, (2) supplying Select signals to the Vertical Channel Switch, Horizontal Output IC, Main and Delayed Trigger IC's, Intensity DAC, and Z–Axis IC on a trace–by–trace basis, (3) supporting the Alternate and Chop modes of trace display, (4) providing Z–axis blanking in Display Chop mode, (5) providing signals to the plug–in units and the Display IC to keep them synchronized with the ROCS.

Microprocessor Interface

Signals ED7–ED0 are an 8–bit latched–address bidirectional data bus from the SDI IC on the Main Processor board (diagram 12). The EAV signal at pin 61 of ROCS IC U270 is pulsed to latch the information on this bus as an address; the ROCSEL signal at pin 38 is pulsed to latch the information as data.

Sweep Control

The SHOA signal at pin 32 of U270 controls the operation of the Main and Delayed Sweeps. During normal sweep operation, SHOA is asserted by U270 upon the completion of a Main Sweep. A high on SGA(L) indicates the end of the sweep to U270. SHOA remains asserted for a time determined by two factors, the rate of the AHOCLK signal produced by the Holdoff Oscillator and the speed of the current Main Sweep. A programmable counter internal to U270 is programmed to release SHOA only after the correct number of AHOCLK pulses have occurred. This is to insure that the Main and Delayed Sweep have sufficient recovery time after they sweep. The main processor may also assert SHOA through U270 by asserting an internal bit, allowing it to inhibit the sweeps when necessary.

Trace Display and Plug–In Control

ROCS IC U270 contains a RAM–Based Sequencer used to support trace–by–trace display of waveforms. The RAM is used as a set of programmable addressable registers, with each register containing a full description of a given trace. The description of a trace includes the vertical and horizontal components, the Z–Axis intensity, Counter–Timer control, and Time Base information. In Display Alt mode, the data from one register is held at the output pins of U270 until the completion of the Main Sweep. Then it is changed to the data held by the register at the next address during holdoff, in preparation for the display of the next sweep. In Display Chop mode, the data from the Time Base Control and the MEASTRG1 and MEASTRG2 signals change in this same fashion, but the remaining signals change at the chop rate of approximately 1MHz.

The blanking circuitry in Programmable Array Logic IC U581 asserts the ROCSBLANK signal to Z–Axis Hybrid U720 as the switching from one trace to the next takes place. In either display mode, the RAM in U270 is accessed in a sequential manner until the last defined trace is displayed; then the first trace in the sequence is displayed again. The PICLK signal supplied by U581 is used to step the plug–in units and Display IC (U440 on diagram 13) as U270 steps through the display traces.

The POSSYNC (PISYNC) signal supplied by U270 synchronizes the plug–in units and the Display IC as the first of the traces is displayed by U270. The VSEL and ASEL signals from U270 to R350 and R354, respectively, are used to indicate to a plug–in unit that it is being displayed.

From the RAM–Based Sequencer, the ROCS provides signals used to control the Vertical Channel Switch, the Horizontal Output IC, the Z–Axis Hybrid, the Time Bases, the Counter–Timer, and the plug–in compartments so that these circuits work together correctly for the proper display of traces. The signals

from the Horizontal and Vertical Display Control sections of U270, as well as the signals from the Z-Axis Control section and CVSEL0-2 from the Counter-Timer Control section may be driven synchronous with the Time Base operation or by a 1 MHz chop clock derived from the 8MHz oscillator. These two conditions constitute the Display Alt and Display Chop modes, respectively.

The signals from the Time Base Control section and MEASTRG1 and MEASTRG2 from the Counter-Timer Control section of U270 change only at the completion of the Main and Delayed Sweeps, when SHOA is asserted.

Vertical Display Control

Signals VS1(L) through VS4(L) are used to select the vertical component of a display. the BWO output is used to turn on vertical bandwidth limiting in the Vertical Amplifier circuit (diagram 14). Resistors R165, R470, R471, R472, and R473 slow the edge speed of their associated signals to minimize crosstalk to neighboring signals.

Counter Timer Control

The CVSEL0-CVSEL2 signals select a signal from the Counter-Timer for viewing as a trace. The MEASTRG1 and MEASTRG2 signals indicate to the Counter-Timer which of the two Delayed Sweeps is currently running. The CVENABLE signal is used to enable measurements for Counter-View purposes.

Time Base Control

The Time Base control signals from U270 are used to control the Triggering Slope (SLPSEL), the Triggering Level (TLEVSELB), the Delay Reference (DLYSELA-C), and the Trigger Sources for the Main (SEL0A-SEL2A) and Delayed (SEL0B-SEL2B) Time Bases.

Display Control

The DISPRO signal into U270 is from Display IC U440 (diagram 13) forced U270 to select the readout source as the Vertical and Horizontal components of the display. The IRO(L) signal into U270 is also from the Display IC and is used to force signals IB0-IB7 of U270 to output data corresponding to the intensified state of readout display.

Holdoff Oscillator

The Holdoff Oscillator is a gateable, voltage-controlled oscillator which produces the AHOCLK signal periodically while gated on. The period of the AHOCLK signal is set by the HOADJA input at pin 2 of U650. Resistors R555, R554, R553, R552, and R542, transistor Q541, and op amp U650 act as a variable current source. The current through the emitter of Q541 is mirrored through the emitter of Q540, making the current in the collector of Q540 a function of the HOADJA level. The collector current of Q540 produces a negative-going ramp at C541, which is fed into the inverting input of comparator U640. The slope of the ramp, being a function of the collector current of Q540, is a function of the voltage at HOADJA. U640 is configured as a fed-back comparator with hysteresis, using R641 as the feedback element and R632-R640 as the comparator set-point divider network. When the ramp voltage drops to the comparison voltage at

pin 2 of U640, the output of U640 (AHOCLK) goes high. This increase in output voltage raises the voltage at pin 2 of U640, creating the comparison hysteresis. The AHOCLK signal is fed through CR550 to the divider network R556–R550, which then drives the base of Q542. Q542 is configured as an inverter–buffer with R543 as the collector pull–up resistor. The assertion of AHOCLK turns Q542 on, which turns Q543 on by pulling the base low. The collector of Q543 is pulled towards +5.1 volts, which discharges the ramp capacitor C541. Once the voltage at the collector of Q543 reaches the comparison voltage at pin 2 of U640, the output of U640 returns to a low state and restores the comparison point at pin 2 to its previous value. AHOCLK is now low, turning off Q542 and Q543, so the ramp capacitor is free to charge again for another cycle.

The free–running oscillator behavior described above may be gated off by the assertion of RAMPRST from pin 3 of ROCS IC U270. This signal is used to keep the Holdoff Oscillator in a reset condition when the AHOCLK is not needed (during sweep operation). RAMPRST is pulled high with R551 and is OR'd into the divider network of R556–R550 by CR551. The assertion of RAMPRST consequently causes the ramp capacitor C541 to be completely discharged in preparation for a holdoff cycle. This insures that the first pulse present on AHOCLK following the de–assertion of RAMPRST will occur after a full transition of the comparison ramp.

Intensity DAC

Bus IB0–IB7 is an 8–bit data bus from U270 feeding only the Intensity Digital–to–Analog converter, U630. The data on this bus will change to correspond to the current horizontal display source at all times. Each of the four horizontal display sources (Main Sweep, Delayed Sweep, X deflection, and Readout) has two associated registers within U270, corresponding to a "high" and "low" intensity setting; therefore, there are a total of eight different registers that may be multiplexed onto the intensity bus. A bit within U270 for each trace may be programmed to select between the two registers.

Programmable Array Logic

Programmable Array Logic IC U581 and Hex Latch U580 are used to realign signals to prevent erroneous displays on screen. U581 is also used to create CTSYNC and to buffer the DITHER signal before it is sent to the 8 MHz oscillator. CTSYNC is asserted during the display of the first in a sequence of traces and is used to synchronize the Counter–Timer IC (U520 on diagram 22) to the display of traces. The DITHER signal is a pseudo–random signal from the Counter–Timer IC used to dither the 8 MHz oscillator frequency.

Hex Latch

The HSA(L) and HSB(L) signals are used to select the horizontal component of a display after being delayed through Hex Latch U580. The HGAIN0 and HGAIN1 signals are used to select the horizontal gain of a display, after also being delayed through U580. Resistors RX102 through RX106 provide delay to match the hold time needs of U580, while resistors R571 and R580 slow the edge speed of their associated signals to minimize crosstalk to neighboring signals.

Z–Axis

The BRIGHT signal output from U630 is fed to Z–Axis IC U720 to control the intensity of traces and character readout. The SIZB signal from U270 is supplied to the Z–Axis circuitry through Q730 to suppress the display of a Delayed Sweep or the intensified zone on a Main Sweep. The ROCSBLANK

signal supplied by U581 is used to blank the CRT beam between traces in Display Chop mode, and to blank the CRT beam between Sweeps in Display Alt mode. The ROCSTXY signal from U270 is used to support Triggered X–Y waveforms in the instrument. When ROCSTXY is asserted, an X–Y waveform will be displayed only when the Main Sweep is running.

Analog Control Voltage System 18

The Analog Control Voltage System (ACVS) is located on the A13 Scope Logic board and provides programmable voltage sources to replace the function of front–panel potentiometers and some internal adjustments. A total of 28 programmable voltages are provided, 26 of which have 12 bit resolution and two of which have 14.6 bit resolution.

The ACVS includes a controller, single chip computer U740, which drives 12–bit Digital to Analog Converter (DAC) U750 and four 1x8 analog multiplexers, U1080, U1270, U1570, and U870.

[which are connected to the sample and hold capacitors and op amp buffers which drive the acvs outputs.]

Controller

U740 controls the ACVS system and receives requests for voltage changes from the CPU by a two–line serial port. This serial port is controlled on the A11 Main Processor board by SDI IC U1760 (diagram 12), which buffers all three bytes of an ACVS channel change request for rapid transfer upon demand. The first of the three bytes contains the channel number, from 0 to 31, for the standard analog channels, 32 for the ABUS control port, and 33 for the DAC test channel. The second byte contains the most significant bits of the requested new value (left justified), and the third byte contains the least significant bits of the new value. When a new value is received, a "fast update cycle" is executed to get the new value on the sample and hold capacitors much faster than if normal update cycles were used.

Eight of the controller outputs are used as a latch to control ABUS multiplexers U530 (diagram 19), U1330 (diagram 16), and U1280. This latch is set to the value of the third byte of the channel change request.

Digital to Analog Converter

The DAC is driven by 12 outputs from Ports 1 and 2 of Controller U740. The content of those outputs is determined by the SHDATA signal from the ACVS portion of SDI IC U1760 (diagram 12), for which the Controller provides the clock (SHCLK).

The DAC output is buffered with op amp U741 to provide a lower impedance source for faster updating of the sample and hold capacitors. ACVS Gain adjustment R854 sets the voltage swing of the ACVS DELYREF outputs to provide 20,000 points between +1.25 V and –1.25 V.

Receiving a channel 33 DAC Test sets DAC U750 to the value of the last two bytes and keeps it there while suspending the normal refresh cycles. The normal refresh cycle takes about 900 microseconds to refresh all 32 sample and hold capacitors when the CPU processor is not actively inputting changes to the ACVS.

Multiplexers

The four 1x8 multiplexers essentially form a 1x32 multiplexer that is controlled by U740 and chooses which channel to update or change. When one of the delay reference (DLYREF) signals is changed, three of these multiplexers are enabled at the same time to permit a faster change of the output values.

Sample and Hold Capacitors

The Sample and Hold capacitors on the outputs of the multiplexer store a given DAC voltage without significant change for almost 900 microseconds.

Sample and Hold Buffers

The 32 op amp Sample and Hold Buffers help preserve the high impedance environment for the sample and hold capacitors and provide adequate drive for the ACVS outputs. Some outputs have their voltage ranges adjusted by resistor combinations in the op amp circuits to meet specialized requirements. Outputs with 14.6–bit resolution are formed by summing the outputs of three standard 12–bit resolution channels through weighted resistors and controller algorithms to adjust each output within one LSB of each other in order to retain the monotonic characteristics of the dac. This summing and additional buffering takes place on the A14 Timebase board to reduce noise susceptibility.

+10 V Reference

A +10 V Reference is derived from the +15V1 supply by U850. The reference is used by the ACVS DAC in the Gain adjustment and also by the Control and Z Axis (diagram 15) and High Voltage (diagram 16) circuits.

Part 2
Performance Verification Procedure

NOTE

The Performance Verification Procedure is located in the User's Reference Manual (Part No. 070-6106-00).

Part 3
Adjustment Procedure

11301 Adjustment Procedure

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Preliminary
Adjustment Procedure

Note

This procedure is intended to provide a way to manually set all internal adjustments. Consult the User's Reference manual for more information about advertised specifications and instrument operation. Refer to the appropriate test equipment manuals for information concerning test equipment setup or interconnection.

A separate procedure is provided in the User's Reference manual to verify basic instrument operation without checking all features and performance requirements.

This document describes a method that can be used to perform a complete calibration of an 11301 mainframe using the equipment listed and an operator. The adjustments in this procedure are either hardware adjustments or software adjustments (i.e., cal constants). The flow and processes described herein can be automated in many cases.

Portions of this procedure can be very time consuming. Therefore, performance checks should be made on those portions of the instrument that have been worked on in order to first determine if adjustment is actually required.

This procedure should be performed in the sequence shown. The table of contents indicates the major modules of this procedure.

Test Equipment

- controller or terminal with keyboard and either RS-232 or GPIB communication ports
- 5 1/2 digit (or more) DVM with input impedance of greater than 100 MΩ on 10V range. Examples: Fluke 8842A
  HP 3478A
- high voltage dc probe, rated at 2 kV minimum
- test scope (>50 MHz), dual channel, with two probes (<20 pf)
- Tektronix 067-0587-02 cal fixture plug-in (modified for 11000-series installation)

- time mark generator, such as the Tektronix TG501
- counter/timer, such as a Tektronix DC503A (with Option 01)
- sine wave generator, 250 MHz to 600 MHz, with a reference frequency of 5 to 10 MHz, such as the Tektronix SG504
- sine wave generator, 10 MHz to 250 MHz (and a 50 kHz reference), with leveled amplitude, such as the Tektronix SG503
- two 11000-series plug-ins, such as the Tektronix 11A32
- jumper lead, clips on both ends
- precision time base, such as EFRATOM PTB-100
- coaxial cables with bnc connectors
- Tektronix 067-1320-00 (15 kHz low-pass filter) calibration fixture
- alignment tool

Preparation

The top and bottom covers need to be removed. The handle needs to be removed for access to the vertical amplifier board.

Note

Refer to the Maintenance section in this manual for disassembly and assembly procedures.

The instrument should be allowed to warm-up for 15-20 minutes before making most adjustments. One exception is setting the initial calibration constant values in "Battery Backed-up Random Access Memory" (BBRAM). This can be done directly after power-up for 11301's without cal constants (i.e., with changed Main Processor board or replaced BBRAMs).

Refer to the 11301/11302 User's Reference manual, Section 3 - GPIB and RS-232-C Interfaces, for GPIB and RS-232-C operating ("Getting Started") information.

Be sure the Counter Timer is turned off, otherwise, the instrument will continually report an operation complete, STBYTE 66, to the controller and not allow further input of calibration constants.

Adjustment requirements for board replacement

Replacing individual circuit boards may require some part(s) of the adjustment procedure to be performed. Specific recalibration steps are listed below for each circuit board, as appropriate (only the boards which can be recalibrated are listed).

Table 1
Board Replacement & Readjustments

Board Replaced:	Adjustment Step(s) to Perform:
All Power Supply Boards	**2**
A13 - Scope Logic Board	**Prep., 4, 6, 7, 8, 10-14, 16, 17, 19, 21, 22–25**
A11 - Main Processor Board	**Prep., 1, 5, 10–25**
A12 - Vertical Board	**Prep., 6, 11, 13, 14, 22**
A14 - Timebase Board	**Prep., 6, 9, 10, 12–17, 19–25**
A10 - Front Panel Interface Board	**Prep., 3, 8, 13, 14, 22–25**
A7 - Touch Panel Board	**Prep., 3, 13, 14, 22–25**

DIP Switches

Five DIP switch positions are used on the A11-Main Processor board. When the instrument is shipped to a customer, all switches are in the "open" position. During the calibration process, some of the switches need to be set to the "closed" position. These switches will be identified in the procedures that follows.

The functions of the switches are listed below with a brief description. The descriptions pertain to the closed positions of the switches.

1. Put out debug messages on the RS-232.

2. Load default ROM values into BBRAM at power up. This switch should not be used unless the instrument has "crashed" and can't be retrieved by powering down, then up. If used, the BBRAM will be corrupted.

3. Inhibit self-test at power up.

4. Permit using enhanced accuracy shortly after power up instead of having to wait 20 minutes.

5. Permit GPIB/RS-232 access to calibration commands. If not set correctly, calibration commands will be ignored.

Power up

- Connect a GPIB or RS-232-C controller/terminal to the 11301.
- Install an 067-0587-02 Calibration Fixture in the left compartment.
- Set DIP switch 1 and 2 to their "open" position.
- Set DIP switches 3, 4 and 5 to their closed positions.
- Power up the instrument.
- Wait 20 minutes for instrument to warm up. You are now ready to begin the 11301 adjustment procedure.

1. Initialization

Note

Do not initialize instrument calibration constants in BBRAM unless the A11 Main Processor board has been changed or the contents of EEROM and BBRAM have been corrupted. Unnecessarily changing constants will considerably lengthen the calibration time.

This instrument will not provide basic oscilloscope operation if critical calibration constants have been corrupted. If this situation occurs, numerous cal constants must be initialized to their nominal values. This will allow the oscilloscope to work well enough for calibration to be performed. These constants are entered one at a time or in strings by typing interface commands via a terminal or controller. To quickly enter the entire set of constants, generate a load file from the data in Table 2 and upload it to the 11301 via a controller. Table 2 gives the cal constant numbers (links) and their respective nominal values (arguments). The interface command (header), MCALCONSTANT, is used to set the constant's value. For example, to set cal constant number 3 to a value of 120, enter the following interface command:

mcalconstant 3:120

There are many values associated with sweep timing that the oscilloscope can generate, automatically, with a single interface command. If these values have been corrupted, they must be reset to ensure normal oscilloscope operation for calibration. Set these by giving the interface command:

AUTOCAL SWEEPS

This process takes about a minute. Then, you may proceed with instrument calibration.

TABLE 2

Name	Link	Nominal value (Argument)
beam detect values:		
grat	3	120
gratdet_offset	5	100
vgratdet_intens	6	170
hgrateet_intens	7	170
gratdet_len	8	300
hgratdet_pos	9	440
vgratdet_pos	10	400
vgratdet_width	11	15
hgratdet_width	12	16

gratdet_clock	13	156
gratdet_samples	14	17
gratdet_sweeps	15	5
vertical & horiz deflection amplifier gains:		
vgain	21	2300
hgx1	22	2300
hgx10a	23	2300
hgx10b	24	2300
x10_b_gain_offs	25	0
hgainc	26	2300
hgainr	27	2300
readout constants:		
vg_ro	28	256
vof_ro	29	256
hg_ro	30	256
hof_ro	31	256
trigger offsets:		
coupling	32 thru 41	-2047
slope	42,43	0
a_ct_of	44	-110
b_ct_of	45	-110
hysteresis	46 thru 49	0
a_tsens_l	50	2100
a_tsens_m	51	1500
a_tsens_h	52	1000
b_tsens_l	53	2100
b_tsens_m	54	1500
b_tsens_h	55	1000
tl_1_0_of	56	0
high-speed sweep cal:		
mcalconstant	63	-50
mcalconstant	64	0
mcalconstant	65	50
mcalconstant	66	0
mcalconstant	67	50
mcalconstant	68	0
mcalconstant	69	50
mcalconstant	70	0
mcalconstant	71	50
mcalconstant	72	0
mcalconstant	73	-50
mcalconstant	74	0

mcalconstant	75	50
mcalconstant	76	0
mcalconstant	77	50
mcalconstant	78	0
mcalconstant	79	50
mcalconstant	80	0
mcalconstant	81	50
mcalconstant	82	0
mcalconstant	83	–50
mcalconstant	84	0
mcalconstant	85	50
mcalconstant	86	0
mcalconstant	87	50
mcalconstant	88	0
mcalconstant	89	50
mcalconstant	90	0
mcalconstant	91	50
mcalconstant	92	0

Note: cal constants 93 thru 110 only affect external inputs & line trig ext trig gains

a_tg1	93	–11100
a_tg5	94	–11100
b_tg1	95	–11100
b_tg5	96	–11100
a_xtg1	97	3760
a_xtg5	98	752
b_xtg1	99	3760
b_xtg5	100	752
a_line_g	101	35
b_line_g	102	35

ext trig offsets:

a_tof1	103	0
a_tof5	104	0
b_tof1	105	0
b_tof5	106	0
a_xtof1	107	–2047
a_xtof5	108	–2047
b_xtof1	109	–2047
b_xtof5	110	–2047
a_line_of	111	0
b_line_of	112	0

reference cvr values:

vert_amp_pos_ref	113	3300

vert_amp_neg_ref	114	750	
x1_a_amp_pos_ref	115	3500	
x1_a_amp_neg_ref	116	850	
x10a_amp_pos_ref	117	3500	
x10a_amp_neg_ref	118	850	
x10b_amp_pos_ref	119	3500	
x10b_amp_neg_ref	120	850	
c_xy_amp_pos_ref	121	3500	
c_xy_amp_neg_ref	122	850	
r_xy_amp_pos_ref	123	3500	
r_xy_amp_neg_ref	124	850	
trace separation values:			
vof_ts_l	125	512	
vof_ts_c	126	512	
vof_ts_add	127	512	
hof_ts_c	128	512	
hof_ts_r	129	512	
selfcal intensity (of vert plug-in portion):			
pl-intens	130	155	
front panel calibrator:			
fp_cal1	191	–0.8333	
fp_cal2	192	–8.333	
fp_cal3	193	–8.333	
trace separation gains:			
vg_ts_l	194	100	
vg_ts_c	195	100	
vg_ts_add	196	50	
hg_ts_c	197	100	
hg_ts_r	198	100	
sweep position gain and offset:			
sg_posa	199	187	–0.0032
sg_posb	200	188	–0.0032
a_of_posx1	201	189	6
b_of_posx1	202	190	6
vertical input & plug-in offsets:			
	203 thru 220	0	
horiz input and plug-in offsets:			
	221 thru 229	0	

trigger gains for plug-ins:

main trig	230 thru 249	107
delayed trig	250 thru 269	–107

trigger offsets for plug-ins, main & dlyd trig:

	270 thru 325	0

counter timer offsets:

ct_ta_of	330	17.5 e-9
ct_ra_of	331	54 e-9
ct_2ns_of	332	27 e-9
ct_dly2_of	338	–1 e-9

autorange intensity:

autorange_intensity	337	1.9
5ns_timing	344	1

2. Power Supply

Adjustments

- 2 screwdriver,
  R800, +5.1V reference, located on the A2A2-Control Rectifier board
  R830, +10V reference, located on the A4-Regulator board

Procedure

WARNING

Extreme caution should be used when making the following adjustments due to the dangerous potentials within the power supply module.

Check the analog supply voltages, via the A11-Main Processor board, on the connector and pins listed below:

analog voltage	connector/pin #	tolerance
–50 V	J90/5	±1 V
+50 V	J90/3	±1 V
–15 V	J90/11	±0.3 V
+15 V	J90/9	±0.3 V
–5 V	J90/2	±0.15 V
+5 V	J90/26	±0.15 V

Now check the +5.1 V supply test pin located toward the bottom of the instrument, near the rear panel, on the A3 Control Rectifier board (6 pin, unused connector).

digital voltage	connector/pin #	tolerance
+5.1 V	J63/2	±50 mV

If the analog and digital supplies are within tolerance, then proceed with Step **3.**

If the digital supply is out of tolerance:

remove the power supply module.
install shorting jumper between TP830 and TP831 on the A2A2 Control Rectifier board.
connect the DVM (+) lead to TP701 and the (–) lead to TP221 on the A2A2 Control Rectifier board.
adjust R800 for +5.15 V ±50 mV.
remove the jumper and reinstall the power supply module.

If the analog supplies are out of tolerance:

connect the (–) lead of the DVM to the COM Test Point on the A4 Regulator board.
connect the (+) lead of the DVM to the REF Test Point on the A4 Regulator board.
adjust R830 for +10.00 V, within 9.95 to 10.05 V.
remove the test leads.

3. Touch Screen Sensitivity

Adjustment

- 1 screwdriver, located on the A10-Front Panel board
  R120, sensitivity

Connect probes to TP100 and TP222. The signal from TP222 should be selected as the trigger source and the signal from TP100 should be displayed.

Set graticule illumination to minimum. If room lights are exceptionally bright, partially shade the crt from the room lights. Display one full sequence of pulses on the test oscilloscope.

Adjust R120 so that the lowest amplitude of the pulses just reaches its maximum value before it makes a high-to-low transition. **Note:** Ignore the very short positive-going spike at the end of each pulse.

4. Set CVR (Calibrator Voltage Reference) Gain and Offset

Adjustments

- 2 screwdriver, both on the A13-Scope Logic board.
  R333, gain
  R330, offset

The SETCVR calibration command will be used here. This command allows selecting the CVR attenuation, the ground reference, and the DAC code.

The DVM used needs to be a 5 1/2 digit meter with an input impedance greater than 10 MΩ.

Procedure

Connect DVM leads to TP421 and TP420 (ground).
Set CVR attenuation.
    SETCVR ATTN/GND:0 (set 1-2-4 attenuator to 1)
    SETCVR ATTN/GND:3 (set 1-10-100-1000 attenuator to 1)
Set CVR ground ref to U430-5 on the Scope Logic board.
    SETCVR ATTN/GND:12
Set CVR DAC to minimum.
    SETCVR DAC:0
Adjust offset (R330) for exactly –10.000 volts.
Set CVR DAC to maximum.
    SETCVR DAC:4095
Adjust gain (R333) for 9.9951 volts. Set it as closely as possible.
Check voltage at minimum again, adjust if needed.
Check voltage at maximum if minimum voltage was re-adjusted.
Remove the test leads.

5. A/D Converter Gain and Offset

Adjustments

- 2 screwdriver, both on the A11-Main Processor board.
  R1580, gain
  R1582, offset

The test signal for this adjustment comes from the CVR and is routed via the ABUS to the sample and hold and A/D converter. The CVR is adjusted to a test value via the same command used when calibrating the CVR (SETCVR). Another command (FACTORYATOD) connects the CVR to the ABUS and performs an A/D conversion. The ATODRESULT? interface command is used to query the result. These commands are used in an iterative fashion in conjunction with the screwdriver adjustments until the desired accuracy is achieved.

Procedure

Set CVR attenuator.
SETCVR ATTN/GND:0 (set 1-2-4 atten to 1)
SETCVR ATTN/GND:3 (set 1-10-100-1000 atten to 1)
Set CVR ground ref to U430-5 on the Scope Logic board.
SETCVR ATTN/GND:12
Set CVR to 9.9951 V via interface command.
SETCVR DAC:4095

Use FACTORYATOD command to configure ABUS to select CALOUT1 at pin 1, U530, on the Scope Logic board and perform an A/D conversion
FACTORYATOD 6432
To get the result, type the following interface command
ATODRESULT?
Record the result that is returned (meas 1).
Set the CVR to –10.0000 V
SETCVR DAC:0

Ask for another A/D conversion
FACTORYATOD 6432
To get the result, type the following interface command
ATODRESULT?
Record the result that is returned (meas 2)

Offset may be measured by selecting input 7 of U1280, pin 4 on the Main Processor board and performing an A/D conversion.
FACTORYATOD 15136
To get the result, type the following interface command:

ATODRESULT?
Record the result as (meas 3).

Evaluate the results:
gain
(meas 1) – (meas2) = 2731 ±3
offset
(meas 3) = 2048 ±3

Check that gain and offset are in tolerance:
if yes, done.
if not, alter appropriate screwdriver adjustment(s):
to increase gain, rotate R1580 counterclockwise
to increase offset, rotate R1582 counterclockwise
Repeat interface commands and compute gain and offset again; interaction is expected.

6. CRT/High Voltage and Z-Axis

Adjustments

- 11 screwdriver,

A13-Scope Logic board:

grid bias	R1330
stigmator	R1331
geometry	R1325
triadic focus	R1445
top and bottom focus	R1540
y-axis	R1326
readout focus	R1442
readout edge focus	R1541
high drive focus	R800

other boards:

vert dynamic centering (A12-Vertical board)	R600
horiz dynamic centering (A14-Timebase board)	R1527

- 3 digital constants (BBRAM values)
focus

astigmatism
trace rotation

Two special display patterns provided by the readout system are used as adjustment aids. They are resident in the oscilloscope, available via the DISP ADJ menu. They are

- cross hatch, and
- spot shift adjust pattern.

Procedure

Note

The adjustments in this subsection are not necessary unless the oscilloscope has poor alignment of the readout display in relation to the faceplate. If the alignment is good, go to the "Grid bias adjust."

If oscilloscope has lost its calibration constants, the alignment of the readout display may be poor. Alignment does not need to be very good to perform the crt calibration. One annoyance, however, is that the touch screen areas on the crt screen are out of their proper registration (i.e., improperly located).

The alignment can be improved to make the adjustments easier, if desired. First, verify that the vertical and horizontal deflection amplifier gain cal constants and readout constants have reasonable (default) values. Then, assert the interface command:

mcalconstant? 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31

Compare the values that are returned to those listed in Table 2, previously. If changes are required, make them by using the mcalconstant command as indicated in the "initialization" section. Then, turn the instrument off, then on again. This causes the system to utilize the new values you set.

If alignment is still not satisfactory, changes in the readout gains and offsets can be made by using the following commands:

SETPWM HG:0 to 511	(horiz readout gain)
SETPWM HO:0 to 511	(horiz readout offset)
SETPWM VG:0 to 511	(vert readout gain)
SETPWM VO:0 to 511	(vert readout offset)

Note

If the instrument power is turned off, the SETPWM settings are lost.

Trace rotation may also need to be adjusted. This can be done via the DISP ADJ menu and the right knob.

This procedure assumes that:

1. the power supplies are within specification.
2. the display gain and offset settings will place the display on the screen.

DANGER: HIGH VOLTAGE

Dangerous voltages are accessible when the protective shield is removed to gain access to the circuitry that is checked and/or adjusted in this procedure.

Grid bias adjust:

Push the horizontal POS button below the screen and touch the center of the bottom division until ALT is selected.

Push the WAVEFORM menu button to the right of the screen. Eliminate any existing traces by touching the Clear label at the right of the screen. Touch the Scope label at the left of the screen. Then define a new trace, L vs R, with the appropriate touches, and touch the Enter label.

Push DISP ADJ and select the Focus/Astig label.

Use front panel knob to set intensity to minimum for XY, character, and graticule (The beeper will sound when the intensity is at minimum. Verify that the beeper is turned on. It is accessible in the Utility menu).

Adjust grid bias R1330 for a visible spot on the crt, focus the spot with front panel focus and astig adjustment.

Set the test scope to channel 1, DC coupled.
Adjust the test oscilloscope trace baseline to be at the bottom graticule line.
Set the vertical sensitivity to 5V/div.
Set the main time/div to be 10us/div.

Connect the channel 1 probe of the test scope to TP920 on the 11301.

Turn the front panel X-Y intensity down until the voltage at TP920 does not decrease and the 11301 beeper sounds. The voltage at TP920 should be between 8 and 11 volts.

Adjust grid bias R1330 until the spot is just extinguished with the crt face plate shielded from back ground illumination.

Leave the probe connected.

Trace rotation and Y axis adjustment:

Turn up the character intensity from the front panel.
Select Pattern 1 in the DISP ADJ menu.
Set character intensity via interface command:
    intensity character:60
Adjust the front panel focus and astig as required
Select the Trace Rot from the DISP ADJ menu.
Set the front panel trace rotation to align the horizontal trace with the horizontal graticule lines. The right-hand knob is used to make the adjustment.
Set the Y-axis R1326 to align the vertical trace with the graticule.

Clear traces.

Real time focus and geometry adjustment:

Turn the power off and install an 11000-series plug-in (or pulser- 067-0587-02) in the left compartment. Then turn power on and define the left plug-in trace with main sweep at 50 us/div.

Connect the sinewave generator to the left plug-in and set the amplitude for 6 divisions and a frequency of 50 kHz.

Set main and character intensities via the interface commands:
    intensity main:50
    intensity character:0
Check for a 10 to 15 volt square wave on the test oscilloscope.
(The probe was connected in the previous step).

Adjust to optimize the characteristics listed below in the order given.
Repeat the first two adjustments until no further improvement is available.
Complete the rest of the adjustments, repeating as required.
Note that there is interaction of the adjustments. The last three adjustments are preliminary adjustments and are finalized in the Readout Focus and Geometry adjustment. The front panel Focus and Astigmatism are accessible from the DISP ADJ menu.

Adjust for:	Using the following:
minimum overall vertical line width	Front panel Focus
minimum overall horizontal line width	Front panel Astigmatism
best edge focus	Top and Bottom Focus R1540
best edge Geometry	Geometry R1325
best Top and Bottom Focus Balance	Triadic focus R1445

Readout focus and geometry adjustment:

Select Pattern 1 in the DISP ADJ menu.
Set intensity character via interface command
intensity character:60
Make adjustments to the pots listed below to optimize the characteristics listed.
Perform the adjustments in the order given. Repeat the order of adjustments until no further improvement is available. Note that there is interaction of the adjustments.

Adjust for:	Using the following:
best overall focus	stigmator R1331
best Center horizontal line width	RO FOCUS R1442
best Edge horizontal line width	RO EDGE FOCUS R1541
best Edge Geometry	Geometry R1325
best Top and Bottom Focus Balance	Triadic focus R1445

Disconnect the probe.

Q axis adjustment:

Select Pattern 1 in the DISP ADJ menu.
Set character intensity via interface command
intensity character:100
Adjust R800 (HIGH DRIVE FOCUS on the Scope Logic board) for best focus of the characters.

Cathode voltage and over-voltage protection check:

Note

This test sequence does not need to be performed unless problems with the self-test (diagnostics) in the high voltage circuitry have been encountered. Proper operation of the overvoltage protection circuitry and the accuracy of the cathode supply is verified here. If any of the tests are not within tolerance, problems with circuit tolerances are indicated. There are no adjustments.

Turn off power and remove the high voltage section shield. Turn on power.
Using a hv probe and DVM, measure the voltage at pin 2 of U1010 on the Scope Logic board.
Check that the voltage is 1.91 kV ±1%.

Read the cathode voltage with the 11301 A/D converter.
Assert the external interface command:

factoryatod #h0e10
Get the result of the A/D conversion with the interface command:
atodresult?
Check that the returned value is between 142 and 204.

Using a jumper, connect pins 3 and 4 of U1340A.
Using the DVM and the hv probe, measure the voltage at pin 2 of U1010.
Check that the voltage is less than or equal to 1.97 kV.
Turn off power.
Remove the probe and jumper.
Replace the high voltage section shield.

Focus and astig Q– amp test sequence:

Note

This test sequence does not need to be performed unless problems with the self-test (diagnostics) in the high voltage circuitry have been encountered. The operation of the Q amplifier curcuitry is checked here. The focus and astigmatism will need to be readjusted after completion of this procedure by using the front panel knobs. If any of the tests are not within tolerance, problems with circuit tolerances are indicated.

Set focus (Q1) acvs channel 10 to 0
setacvs 10:0
Initiate the A/D conversion using the interface command and hex code:
factoryatod #h0b10
Get the result with interface command:
atodresult?
Check that this value is less than 460.

Set focus (Q1) acvs channel 10 to 4095
setacvs 10:4095
Initiate the A/D conversion:
factoryatod #h0b10
Get the result with interface command:
atodresult?
Check that this value is greater than 163

Set astigmatism (Q2) acvs channel 23 to 0
setacvs 23:0
Initiate the A/D conversion:
factoryatod #h0a10
Get the result with the interface command:
atodresult?

Check that this value is less than 933

Set astigmatism (Q2) acvs channel 23 to 4095
    setacvs 23:4095
Initiate A/D conversion:
    factoryatod #h0a10
Get the result with the interface command:
    atodresult?
Check that this result is greater than 563

Q3+ and Q3– amp test sequence:

Note

This test sequence does not need to be performed unless problems with self-test (diagnostics) in the high voltage circuitry have been encountered. Verification of proper operation of the self-testing feature of the Q3 amplifier is checked here. Performing this test results in misadjusting R1445 and R1540.

Set the character intensity to 0
    intensity character:0
Set R1445 and R1540 CCW
Initiate the (Q3–) A/D conversion:
    factoryatod #h0810
Get the result with the interface command:
    atodresult?
Check that this result is between 1741 and 1747.

Initiate the (Q3+) A/D conversion:
    factoryatod #h0910
Get the result with the interface command:
    atodresult?
Check that this result is between 3533 and 3548.

Set R1445 CW, leave R1540 CCW
Initiate the (Q3+) A/D conversion:
    factoryatod #h0910
Get the result with the interface command:
    atodresult?
Check that this result is between 3533 and 3548

Set R1540 CCW, leave R1445 CW
Initiate the (Q3–) A/D conversion:
    factoryatod #h0810
Get the result with the interface command:

atodresult?
Check that this result is between 1434 and 1446.

Initiate the (Q3+) A/D conversion:
factoryatod #h0910
Get the result with the interface command:
atodresult?
Check that this result is between 3038 and 3048.

Set R1445 and R1540 CCW
Initiate the (Q3+) A/D conversion:
factoryatod #h0910
Get the result with the interface command:
atodresult?
Check that this result is between 3038 and 3048.

Set R1445 and R1540 to mid-range.

7. Set ACVS (Analog Control Voltage System) Gain

Adjustment

- 1 screwdriver, located on the A13-Scope Logic board.
  R854, ACVS gain

Connect a precision, 5 1/2 digit or better, DVM to TP1531 and TP1530 (ground) on the A14-Timebase board.

Window 2 (delay reference #1) will be used to control the voltage at TP1531. Its adjustment range via the front panel knob is from –1.25 to +1.25 volts, plus a little offset that is common to all values in its range.

The proper ACVS gain adjustment is found by iteratively measuring the min and max voltages, finding the difference and adjusting the ACVS gain until a difference of 2.5000 volts is achieved.

Procedure

Connect DVM leads to TP1531 and TP1530 on the A14-Timebase broad.
Select a single delayed sweep (window 2) that uses delay ref#1
Push appropriate button to assign right knob to control delay
Set delay to maximum by rotating front panel knob clockwise
Record the voltage read by the DVM (about +1.25)
Set delay to minimum by rotating front panel knob CCW
Record the voltage read by the DVM (about –1.25)
Subtract the two DVM readings
    if the difference is not 2.500 volts ±2 mV, adjust gain, repeat
Remove test leads

8. Front Panel Calibrator

Adjustments

- 3 digital constants (BBRAM values)

The constants to be determined are used by the CVR to set the AC calibrator (which has square wave and fast rise modes) for accurate outputs for each user-selected state. There are three modes:

- square wave 5 V
- square wave 500 mV
- fast rise 500 mV

Procedure

Connect DVM leads to front panel binding post (ground) and the probe hook
Select the 5V square wave output of the calibrator via the UTILITY menu
(if already selected, select 500 mV amplitude then 5V)

Check the "low-state" output voltage:
connect a jumper from TP1020 to U801-16 (+5V) on the Front Panel board.
measure the voltage with DVM (meas 1).
check that the voltage is zero within ±1mV.
if yes, proceed. if not, fix the circuit.
record output voltage.

Check the "high-state" output voltage:
move the test lead from +5V to ground.
measure the voltage with the DVM (meas 2).
subtract the high and low state voltages.
perform subtraction
(meas 2) – (meas 1)
check that the difference is +5 V ±10 mV.
if yes, check the next calibrator setting.
if no, continue.
query the cal constant
MCALCONSTANT?192
more negative values for the cal constant result in more
positive output voltages
alter the cal constant value
MCALCONSTANT 192:value
change the amplitude to 500 mV, then back to 5 V via the menu
(changing amplitude or mode causes the system to use the new value).
repeat the steps above, beginning with meas 2.

Repeat the above procedure for an output of 500 mV ±2mV
adjust and query cal constant 191

Repeat above for the fast rise mode, 500 mV output
adjust and query cal constant 193
set output voltage for 555 mV, ±5mV
Remove test leads

9. Counter Timer Frequency

Adjustments

- 1 screwdriver,

  Either: C210 (frequency), on A14-Timebase board (standard), or oscillator module in crt cavity (Option 1T – rear panel must be removed)

If the instrument is equipped with Option 1T, skip the first procedure below and do the next procedure.

Standard 10 MHz Reference

An accurate counter/timer is needed to measure the frequency of the counter reference clock output of the 11301. Suitable instruments would include the Tektronix DC5010, or DC503A. These must be equipped with the high stability time base (Option 01), adjusted to within 0.1 ppm.

Allow the 11301 and test counter/timer at least fifteen minutes to warm up.

Push the UTILITY button to the right of the screen. Touch the I/O BNC area, then the Int area below REF CLOCK. Connect a bnc cable from the COUNTER REF CLOCK connector on the rear panel of the 11301 to the test counter/timer. Adjust the settings of the counter/timer to measure the frequency of the 10 MHz clock signal from the oscilloscope.

The counter/timer should measure a frequency in the range of 9.999 998 to 10.000 002 MHz.

Adjust C210 (on the Timebase board), if necessary, to get the frequency within tolerance.

Option 1T, High Stability 10 MHz Reference

Connect a 10 MHz frequency, with accuracy of at least 1 part in 10^8 , to a plug-in input installed in the 11301. This signal may originate from a high precision time base, such as the EFRATOM PTB-100. Select the plug-in input for display and adjust for a 6 division amplitude.

Push the COUNTER button below the screen and touch the area at the lower right until Frequency Measure is selected. Also, select 10^8 averages, Off Gating, Auto Update, and Main Trig Source.

Note

The high-stability time base in the 11301 has an oven that is powered whenever the oscilloscope is plugged in and the principal power switch (on the rear panel) is on. To achieve optimum adjustment performance results, the oven should be on for at least two days.

Remove the rear panel cover behind the crt for access to the reference module. Remove the adjustment cover on the module and set the period between 9.999 999 800 MHz and 10.000 000 20 MHz. (10.000 000 0 MHz, ±0.02 ppm adjustment resolution specification)

Turn the counter timer off when finished.

10. Sweeps

Adjustments

- numerous digital constants (BBRAM values)

Procedure

The slew rates of the sweep hybrids are to be adjusted at this time. This is an automatic process, invoked by the

AUTOCAL SWEEPS

interface command. The sweep timing, as seen on-screen, depends on this step, as do the gains of the horizontal amplifier and the cal constants for 5, 1, and 0.5 ns/div timing.

This command generates approximately 200 calibration constants to adjust the main and delayed sweep hybrids (U1150-main sweep and U1470-delayed sweep on diagram 23).

The previous front-panel settings of the oscilloscope are lost and not restored after this command is executed. This must be done manually.

The process here is the same as that used for normal self-cal, except that it is done by itself. It is necessary to do the slew-rate cal prior to setting the horizontal amplifier sweep gains.

11. Vertical (partial)

Adjustments

- 16 screwdriver, all on A12-Vertical board
  - 1 centering, R610
  - 1 dynamic centering (spot shift), R600
  - 1 readout thermals, R570
  - 3 transient response (that affects dc parameters)
    - R100
    - R(crt termination)
    - R510
  - 6 transient response,
    - R320
    - C320
    - C331
    - C330
    - R330
    - C501
    - crt termination adjustment capacitor
  - 4 counter view
    - R700
    - C700
    - R605
    - C710

- various digital constants (automatically determined)

Note

Check the vertical performance prior to this procedure in order to avoid unnecessary recalibration.

Set center pot

Short-out the delay line input to the vertical output amplifier. This is done by shorting the + and – signals together (but not to ground) at the location marked DL200 (at the top rear of the board). Adjust the center pot, R610, to put the trace at center screen ±0.2 div.

Spot shift adjustment

Call up a menu on screen so that there is text at the top, center,and bottom of the screen. While rapidly varying the readout intensity, adjust R600 until the varying intensity produces no vertical shift of the characters on screen.

Set vert gain

Turn off the instrument.
Insert a pulser (067-0587-02) plug-in unit in the left compartment, set it to COM MODE, and turn on the 11301. Select the left plug-in compartment for display in normal fashion. Set the 11301 Time/div to about 50 us. Adjust the mainframe position so the trace is at center screen. Set the pulser to GAIN with a 1 kHz rep-rate. Visually check the alignment of the gain steps to the graticule. Adjustments to the gain are made via RS-232-C or GPIB interface commands. If the oscilloscope has been previously calibrated, the current ACVS value can be found by typing:

MCALCONSTANT?21

If this is a first-time calibration, just try a mid-range value, such as 2300. To set a new value, type:

SETACVS 19: 0 to 4095

Adjust the value until the gain within the center 6 divs is within ±0.04 div.

Turn off the 11301 and put the pulser in the center hole. Turn on the 11301 and define a trace for the center compartment.

Reset the gain value from the left compartment check into mcalconstant 21.
Check the gain. If it is outside of the spec, compromise the mainframe gain setting so that both plug-in compartments have gains as specified.

If the gain that was set is satisfactory, save it with this command:

MCALCONSTANT 21: new value

The system incorporates the new value after a new power-up. When the "gratdetect" commands are used, as described later on, this gain value is used to determine the CVR values that will be used to set the gain whenever Enhanced Accuracy (EA) is performed.

Adjust readout thermals

Turn off the 11301 and install the pulser in the left compartment. Turn on the 11301. Set the mode to + Step Resp and the rep rate to 10 kHz. Select the left channel for display and leave the Waveform Select menu on screen. Adjust the position and amplitude of the pulser for an 8 division signal, centered vertically. Adjust R570, the readout thermal adjust pot (labled TADJ, located near the bottom center of the board), for minimum character movement.

Check bandwidth

Check the bandwidth of the mainframe. Preferably, you should use a leveled sweep generator. The sweep generator's sweep voltage output is used to drive the X axis for an X-Y display. The sweep generator's RF output should drive the CW IN on the 067-0587-02 Cal Fixture. Set the sweep range from 10 MHz to 500 MHz and the signal size at 10 MHz to 6 divs. Verify that the signal amplitude is not less than 5.2 divs below 300 MHz. Verify that the signal amplitude is not less than 4.2 divs below 450 MHz.

In lieu of a sweep generator, a Tektronix SG504 can be used to check frequency response. Be sure to check from 270 MHz to 300 MHz to see that the specification at 300 MHz is being met.

Adjust Transient Response

Note

Check the transient response prior to this adjustment with the 067-0587-02 signal standardizer, using a fast-rise pulse to measure the aberrations at ±4% p-p for the first 20 ns and ±1% p-p thereafter, in order to avoid a lengthy and, perhaps, unnecessary calibration procedure.

Delete the Waveform Select menu from the screen. Set the mode switch of the pulser to COM MODE. Adjust the mainframe position for a centered trace. Select + Step Resp from the pulser. Set the rep rate to 1 MHz and adjust the position and amplitude controls of the Calibration Fixture for a five division positive step centered vertically.

Note

If this is a recalibration do not use the initial pot settings below.

Set R100 (near the upper rear corner) to its maximum ccw setting.
Set R320 (near center of board) to midrange.
Set R330 (near center of board) to midrange.
Set R510 (above upper rear corner of Vertical Output Hybrid) to full cw setting.
Set the crt termination resistor to midrange.
Set the timebase to 50 nsec/div

Adjust R510 and C501 (variable cap below R510) for flatest response. These are relatively low frequency, long time constant adjustments and will affect only the slope of the step response in the first 100 or so nanoseconds.

Change the timebase setting to 20 nsec/div. Adjust the crt termination resistor and capacitor for flatest response. The resistor will affect the slope from the front corner of the step to about 6 nsec after the step. Next adjust the termination variable capacitor. This capacitor is used to null a glitch at about 6 nsecs. The lead dress (position) of the termination leads to the crt also affects glitches in this area. Space them closer or farther apart as required for the smoothest display in the 6 nsec region.

Set the time base back to 50 nsec/div and adjust C331(near center of board) for flatest slope (this is medium frequency adjustment and affects the slope in the first 20-40 nanosecs). Set the timebase to 20 nsec/div. Now, iteratively adjust the termination resistor and C331 for smoothness (minimum discontinuity) in the vicinity of the termination (around 6 nsec).

Next, adjust C320, C330, and C331 for flatest slope.

It should be noted that, at this point, these adjustments have placed you close to the final adjustment. From now on the adjustments, which are interactive, should be regarded as iterative.

Next, adjust R320, C320 (these adjustments work together and affect the same time constant), R330, C330 (these also are paired) and C331. In general the resistors affect ringing (i.e., damping the rings) while the capacitors affect the slopes. The adjustment should minimize the aberrations. Two other tweeks available are L320 and the lead dress of the peaking inductors into the crt. The inductance of L320 may be varied by changing its loop area (i.e. squeezing the sides of the wire loop togeather or stretching them further apart. The transient response is not terribly sensitive to this. The front corner may be made to be more peaked or more rolled off by spacing the crt input leads further apart or closer together, respectively. After you have tweeked the oscilloscope for minimum aberrations, check that the pk-pk amplitude of the aberrations is equal to or less than 3%.

You may have noticed that the signal size is no longer 5 divs. This is because the gain changed with the termination resistance adjustment. Readjust your signal size to 5 divs and verify the aberrations are less than 0.15 div (3/4 of a minor div). If you use the cursors, be aware that they are uncalibrated at this time and the aberrations measured with the cursors must be 3% or less than the cursor measurement of 5 divs.

If the aberrations are too large, make certain that you have truly minimized them with the tweeks. If you cannot reduce them by further tweeking, turn R100 cw until the aberrations just meet spec. On the other hand, if you have room to spare, peak up the very front corner (i.e. add just enough overshoot to retain aberrations within 3%.

Recheck the bandwidth, in the manner described earlier, to assure it still is within specifications.

Counterview adjustment

With the 067-0587-02 Cal fixture in the left compartment, set the fixture for + Step Response and the Rep-rate to 1 MHz. Select the left channel for display and adjust the cal fixture's position and amplitude controls for a 5 div step, centered about zero. Set the time base to 10 nsec/div. Using the Waveform Select menu, call up the counterview submenu (counterview selected at lower left screen). Select 'Count In' from this submenu, then turn off the Waveform Select menu. Next, call up the counter menu (button centered below screen). From the Counter menu, select Frequency for the measurement, Main Trigger for the source, Auto Update, Auto Average, and Gating Off. Now a one div step should be displayed on-screen, in addition to the left channel display. This is the counterview signal.

Counterview adjustments R700,C700,R605, and C710 are adjusted iteratively for best counterview response (compromise between a fast rise time and minimum aberrations).

Recheck vert centering and gain

Some of these adjustments interact, so the centering and gain adjustments made previously need to be verified and possibly altered. To do this, use the same modes that were used when the adjustments were set the first time. That is, to check centering, short the delay line, check that trace is at center screen. Adjust if necessary. To check gain, install pulser plug-ins in the left and center holes. Readjust gain via the appropriate interface commands, if necessary.

Clear the trace and turn off the counter timer.

12. Horizontal (partial)

Adjustments

- 5 screwdriver, all located on the A14-Timebase board
  horiz dynamic centering, R1527
  mag registration, R1411
  horiz readout jitter, R1302
  high speed timing, R1410
  x-y phasing, C1421

- various digital constants (BBRAM values)

Set center plug-in gain

Turn off the 11301 and insert the pulser in the center hole. Turn on the 11301. Enter the Waveform menu and select an L vs C display. Select COM MODE and adjust the mainframe position control for a centered signal. Select gain steps with 1 KHz rep-rate and adjust the pulser's position control to center the display horizontally.

Use a low intensity setting to avoid damage to the crt. Also, position the signal vertically so that the dots are near the center horizontal graticule line.

The gain is adjusted via interface commands. Adjust the gain for one dot per division within the center 8 divisions ±0.06 div.

query gain	MCALCONSTANT?26	(for board replacement, ignore this step and start with an initial value of 2000 for gain)
try new gain	SETACVS 18: new value	

Note that the gain increases when the value is decreased. This is true for all horizontal gains. When the gain has been set within tolerance, save the value:

MCALCONSTANT 26: new value

Clear the trace.

Set right plug-in gain

Turn off the 11301 and insert the pulser (067-0587-02) in the right hole. Turn on the 11301.

Perform the same adjustment, as above, except define L vs R trace and set cal constant 27.

query gain	MCALCONSTANT?27	(for board replacement, ignore this step and start with an initial value of 2000 for gain)
try new gain	SETACVS 18: new value	
save gain	MCALCONSTANT 27: new value	

Clear the trace.

Set X1 sweep gain

Turn off the 11301 and install a pulser or 11000-series plug-in in the left hole. Turn on the 11301. Define the trace and select a sweep rate of 1 µs/div. Connect the time mark generator to the plug-in input with 1 µs time marks selected.

Check the timing over the center 8 divisions relative to the graticule. The timing must be checked along the center horizontal grat line (to avoid crt geometry errors).

Adjust the gain via interface commands as indicated below. The timing must be set for ±0.02 div error in the center 8 divs.

query gain	MCALCONSTANT?22	(for board replacement, ignore this step and start with an initial value of 2000 for gain)
try new gain	SETACVS 16: new value	

When the gain has been set within tolerance, the delayed sweep timing must also be checked. Define delayed sweep Window 1. Use the same 1 µs time marks and run the delayed sweep at 1 µs/div, **not** magnified. The delayed sweep timing needs to be within ±0.03 div of the timing for the main sweep over the center 8 divisions. Adjust the gain value, if necessary, so that both main and delayed sweeps meet the ±0.02 division tolerance. When this has been done, save the gain value:

save gain	MCALCONSTANT 22: new value

Set X10 sweep gain, A sweep

This adjustment is similar to the X1 gain adjustment, except: use magnified gain and 100ns time marks. The tolerance is ±0.03 div in the center 8 divs. Note that A and B sweeps have independent constants for X10 gain and must be adjusted separately.

query gain	MCALCONSTANT?23	(for board replacement, ignore this step and start with an initial value of 2000 for gain)
try new gain	SETACVS 17: new value	
save gain	MCALCONSTANT 23: new value	

Set X10 sweep gain, B sweep

Define delayed sweep Window 1. Set the delayed sec/div to 1 µs/div, then magnify it for 100 ns/div. Proceed in the same fashion as for the X10 A sweep, above, but use the commands that follow.

query gain	MCALCONSTANT?24	(for board replacement, ignore this step and start with an initial value of 2000 for gain)
try new gain	SETACVS 2: new value	
save gain	MCALCONSTANT 24: new value	

Clear the delayed window.

Set magnified registration

This screwdriver adjustment may be made without using calibration commands. Use 1 µs time marks as the signal source. To adjust, position a time mark at center screen at 100 ns/div, magnified, and iteratively adjust R1411 and the sweep position so that the time mark stays at center screen, when changing between magnified and unmagnified sweeps (1 µs/div). Do this adjustment carefully because the accuracy of magnified positioning depends on it.

Remove the time mark signal.

Set horizontal readout jitter (thermals)

Set the pulser to + Step Resp with 1 kHz rep-rate. Adjust the signal size for 5 divisions. Select a magnified sweep of 500 µs/div. Turn on the delta-horizontal cursors and position them to the second and tenth graticule lines. Adjust horiz readout jitter (R1302) for minimum character and cursor jitter.

Set X-Y phasing

Turn off the 11301 and install 11000-series plug-ins in the left and center holes. **Do not use the pulser!** Turn on the 11301 and enter the Waveform menu. Select L vs C as the trace. Connect a 1 MHz signal from the same generator to both plug-ins. Adjust the display for 6 divs vertically and 8 divs horizontally. Adjust the variable capacitor C1421 for no opening in the ellipse.

13. Find CVR Values

Use the GRATDETECT command to find Calibrator Voltage Reference (CVR) values that will be used during normal calibration to set the gain of the vertical amplifier and several gains for the horizontal amplifier.

Adjustments

- 10 digital constants (BBRAM values)
  2 vertical
  8 horizontal

A link value is given for the GRATDETECT command that determines which of the ten values is to be found. The argument value is the starting value used by the CVR as it sweeps the beam across the graticule. If the starting value given is close enough, another CVR value will be automatically determined that will be the value used by the system during normal cal. If the starting value is not close enough, the system will not be able to find the graticule, and the results, if any, will be in error. The operator needs to observe the display to make sure the proper graticule line is being scanned. In addition, a display of the signal waveform is available by selecting "WFM 1". Wfm 1 is selected via the "Display" menu and the "Ref" selection.

It is important that the GRATDETECT commands be used only after the amplifier gains (1 vertical and 5 horizontal) have been determined and stored into cal constants 21, 22, 23, 24, 26, and 27. The process to do this has been described in previous sections. **Doing things in the proper order is important!**

The instrument should be in its normal operating position during these adjustments. That is, it should not be on its side. The position of the instrument can affect the beamdetect operation because of changes in phototransistor bias caused by ambient light. Abnormally bright ambient light conditions should also be avoided.

Procedure

First, give the DISPLAY VECTORS interface command. Then, give the first command in Table 3, using a nominal value within the range indicated:

GRATDETECT VPLUS3:3500

Now, try different values for the argument until the band of two lines is seen to sweep symmetrically across the graticule line one division below the top of the screen. When this is accomplished, observe the horizontal position of the sweep. It should be located such that the right edge of the sweep is a little to the left of the center vertical grat line. The right edge of the sweep should be from 0.1 to 0.3 division to the left of left edges of the minor division "tic" marks on the center vertical grat line. The horizontal position is adjusted by:

mcalconstant 10:value

After changing the above value, try the "GRATDETECT VPLUS3:XXX" command again to see if the result has been accomplished.

Observe the signal waveform displayed on the screen. Evaluate the waveform with the following criteria.

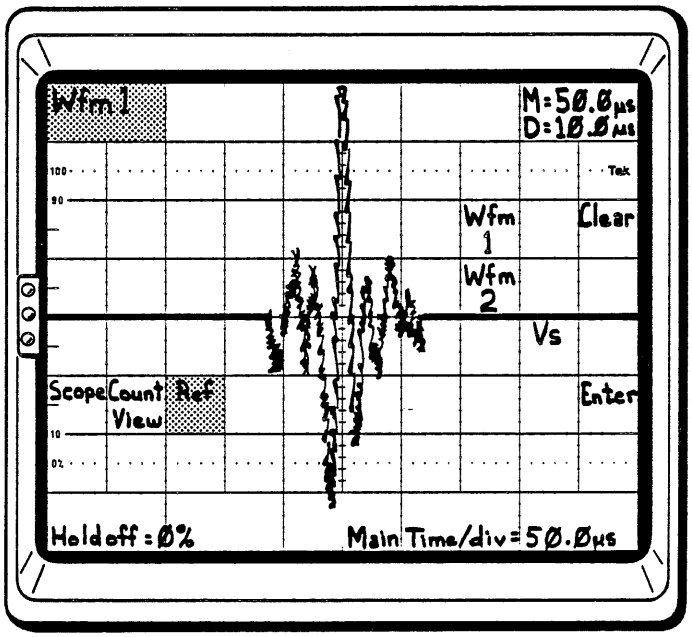


Fig. 1 - Grat-detect Signal.

Criteria for good signal (vertical or horizontal grat detect):

1. The positive peak needs to be at least 3.5 divisions when the grat detect command is exercised four times. If it clips at the top of the screen, that is good.

2. Any other positive peaks must be less than 2.5 divisions. Any negative peaks must be less than 4 divisions.

3. If the intensity is reduced by 10 points (i.e., first query VGRATDETECT and HGRATDETECT cal constants 6 and 7 for their current values, then subtract 10 from each), the peak should be from 2 to 4 divisions high, with the maximum not clipped. The reason for this check is to avoid excessive intensity, while assuring a strong enough signal. After checking this, **remember to set the intensity back to its original, higher value.**

4. The signal waveform should have the major positive peak situated so that the first positive peak on each side of the waveform is within the waveform record. In other words, keep the peak near the center of the waveform.

If this is not true, adjustments of other cal constants are needed. These adjustments are identified in Table 4. The text following Table 4 gives some tips on how to use them.

Proceed to the second command in Table 3 when satisfactory cal constants for Table 3 have been found. Again, check for adequate signal size. It is not necessary to check the signal size with reduced intensity (as mentioned in the criteria listed above) unless the signal is less than 3.5 divisions. In most cases, both vertical grat-detect cycles will work well with the same set of values determined in Table 4.

Proceed to the third command in Table 3. Try a nominal value for the argument:

GRATDETECT HX1PLUS4:3600

Adjust the argument until the sweep straddles the graticule line one division to the left of the the right edge of the screen.

When this is accomplished, observe the vertical position of the sweep. It should be located such that the top edge of the sweep is a little below the center horizontal grat line. The top edge should be from 0.1 to 0.3 division below the bottom edges of the minor division "tic" marks on the center horizontal grat line. The vertical position is adjusted by:

mcalconstant 9:value

After changing the above value, try the "GRATDETECT HX1PLUS4:xxx" command again to see if the result has been accomplished.

Observe the signal display and check for adequate peak amplitude and symmetry as noted above. If the signal is not satisfactory, adjustments of the values in Table 4 are needed. Note that some of the adjustment constants in Table 3 are different for the horizontal axis. Usually, only constants 7 and 9 will need to be optimized once the vertical axis has been set.

Repeat the step where intensity is reduced until the positive peak is within 2 to 4 divisions. Then add 10 points to the horizontal intensity.

When a satisfactory signal has been established, proceed with the rest of the commands in Table 3. Check for adequate signal size.

TABLE 3

Command (Header)	**Link**	**Range** (Argument)
vertical:		
GRATDETECT	VPLUS3:	(2200 to 4000)
GRATDETECT	VMINUS3:	(300 to 1200)
horizontal:		
GRATDETECT	HX1PLUS4:	(3000 to 4000)
GRATDETECT	HX1MINUS4:	(500 to 1400)
GRATDETECT	HX10APLUS4:	(3000 to 4000)
GRATDETECT	HX10AMINUS4:	(500 to 1400)
GRATDETECT	HGCPLUS4:	(3000 to 4000)
GRATDETECT	HGCMINUS4:	(500 to 1400)
GRATDETECT	HGRPLUS4:	(3000 to 4000)
GRATDETECT	HGRMINUS4:	(500 to 1400)

NOTE

Cal constant 25, x10_b_gain_offs, is determined when GRATDETECT HGCPLUS4" is used. This is important to note when partial calibrations are performed of the sweep gains. The required cal information for magnified delayed sweeps is not complete until the command mentioned has been asserted.

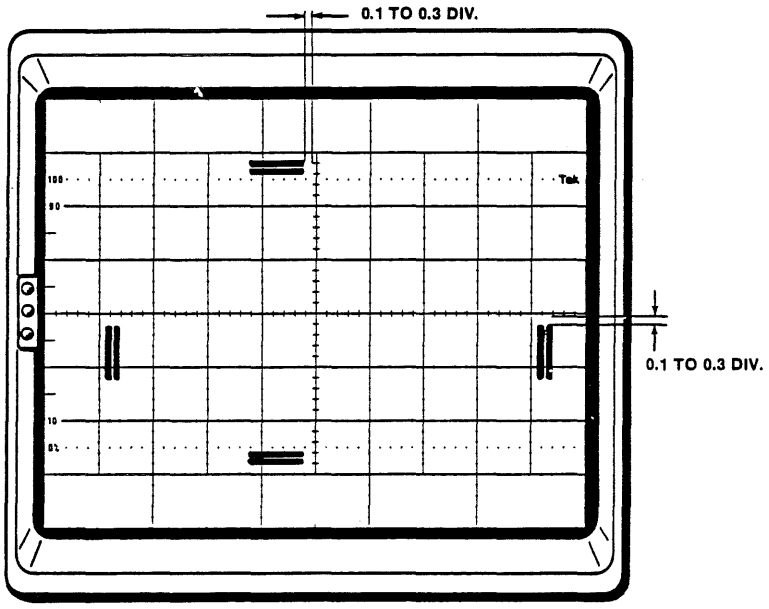


Fig. 2 - Standard positions for the sweeps.

Other adjustment values

The following information describes changes that may be made to get optimum signal size and shape when using the commands in Table 3. There are adjustments for such things as the vertical and horizontal position of the grat-detect sweep, the intensity of the grat lights, the number of sweeps and the sweep rate. They are listed below in Table 4 with typical values or ranges.

TABLE 4

Command (Header)	Link	Nom. Value (Argument)
GRAT	3	120
GRATDET_OFFSET	5	100
VGRATDETECT_INTENS	6	170
HGRATDETECT_INTENS	7	170
GRATDET_LEN	8	300
HGRATDET_POS	9	440
VGRATDET_POS	10	400
VGRATDET_WIDTH	11	15
HGRATDET_WIDTH	12	16
GRATDET_CLOCK	13	156
GRATDET_SAMPLES	14	17
GRATDET_SWEEPS	15	5

The first value in Table 4, GRAT, controls the brightness of the graticule lights during the beam registration process. The grat lights need to be on to assure that the grat detect circuit phototransistors have proper bias. This constant has a strong effect on the symmetry and amplitude of the signal. The argument range is 0 to 255 (0 = greatest intensity). The practical range is 50 to 200. There is an optimum value for each of constants listed above. This whole set of values is quite interactive.

Cal constants 6 and 7, in Table 4, control the intensity that is used by the system when finding the grat lines in the vertical or horizontal axis, respectively. Increasing these values will help increase signal size, but may cause problems with spot shift and resolution of position. If there are not two distinct lines visible during the sweep of the beam, the intensity is too bright. The signal size can be improved by changing the number of GRAT_SAMPLES to a larger number or optimizing the GRAT value.

GRATDET_LEN determines the length of the record of data accumulated during a sweep. This number will normally be 300. Changing it will not increase signal-to-noise ratio. It permits a larger range in which the system can find a graticule when the amplifiers have position drift. Leave it at 300.

VGRATDET_POS determines the horizontal position of the scan when the ±3 div vertical grat lines are being located. HGRATDET_POS determines the vertical position of the scan when the ± horizontal grat lines are being located. The scan should normally be positioned to the left of the center vertical grat line or below the center horizontal grat line. The scan should not touch either of these center grat lines. The reason for this is to avoid the large "tic" marks for each minor division.

VGRATDET_WIDTH and HGRATDET_WIDTH determine the spacing between the two "bars."

GRATDET_CLOCK has a value that has been selected to reject noise with the frequency of the power line.

GRATDET_SAMPLES determines the number of samples taken at each position of the scan. It can be changed at the expense of time to completion. This is a good one to try if signal size is poor. Odd values should be used.

GRATDET_SWEEPS determines the number of sweeps (or scans) that occur. The actual number of sweeps is (2n-1), where n is the value of the cal constant. It can be changed at the expense of time to completion.

GRATDET_OFFSET determines the balance of a comparator in the grat detect circuitry. The range is 0 to 1000. The practical range is 80 to 120. If this value is not right, the convolution waveform will by asymmetrical about the peak. However, the GRAT, VGRATDETECT_INTENS or HGRATDETECT_INTENS and GRAT_SAMPLES constants have stronger effects on this condition.

14. Display Cal (auto)

Automated routines that are built into the 11301 can be used to find the remaining cal constants for the vertical, horizontal, and readout systems. The systems that will be calibrated are:

- vertical and horizontal pickoffs
- vertical and horizontal gains
- vertical and horizontal position gains and offsets
- sweep positioning gains and offsets
- readout gains and offsets
- vertical plug-in paths
- horizontal plug-in paths

Adjustments

- numerous digital constants (BBRAM values)

Procedure

Turn off the 11301 and install an 11000-series plug-in unit in the left compartment. Then turn on the 11301.

Give the

AUTOCAL DISP_PATH

interface command to initiate the process.

Also, invoke the

AUTOCAL TRIGGERS

interface command in preparation for the step where trigger sensitivities are adjusted.

15. High-speed Sweep Timing

Note

Check the high-speed sweep timing with the performance procedure in the User's Reference manual in order to avoid a lengthy and, perhaps, unnecessary calibration procedure.

Adjustments

- 1 screwdriver, located on the A14-Timebase board.
  R1410, high-speed timing
- various digital constants (BBRAM values)

Procedure

Adjust the high speed timing pot, R1410. This pot has its greatest effect when a B sweep is displayed in X10 at 1ns/div and the horizontal position is between 20 and 40 divisions. When you have a trace set up under these conditions, a nonlinearity may be present around the second to fourth horizontal graticules. R1410 should be adjusted so as to minimize this nonlinearity. Do not, however, adjust this pot to either extreme! This may cause excessive nonlinearity at 500 ps/div.

Perform automatic sweep slew-rate calibration by issuing this interface command:

AUTOCAL SWEEPS

Note

The settings of the oscilloscope are not restored after this command has been executed.

Set 5ns cal constant

This calibration constant controls the 5 ns/div unmagnified timing relative to the rest of the main sweep settings. The range of cal constant 344 is ±10%. Fractional values are OK. Its nominal value is 1%. To adjust it, measure the timing error at 5 ns/div over the center 8 divsions on the center vertical graticule line. After AUTOCAL SWEEPS (or EA-enhanced accuracy) has been run, compare the value of the error, in per cent, to the present value of the cal constant as determined by the command:

MCALCONSTANT? 344

Set the cal constant to a new value as follows:

X = timing error + present value of constant #344

MCALCONSTANT 344:X

Verify the result by running **EA** at least three more times. There is some variance in the result. Also check the 5 ns/div delayed sweep timing. Compromise between these two, if necessary.

Perform breakpoint evaluation:

The purpose of this calibration routine is to correct a condition where the sweep timing varies with position when you are at high sweep speeds. This 'position effect' condition is most noticeable around the end of the sweep positions. The idea behind this calibration is to find certain breakpoints where the timing starts to deviate from being correct. It also finds at the end positions the amount of gain necessary to correct the timing. This information is then stored in BBRAM (via the MCALCONSTANT command) where it is used by an internal firmware routine that will automatically correct the timing as the position is varied.

The following procedure is divided into three parts: A sweep @ 1 nS/div, B sweep @ 1 nS/div, and B sweep @ 0.5 nS/div.

********** I M P O R T A N T N O T E **********

It is important to note that when setting the various breakpoints that you observe the following restriction:

$$P1 \leq P2 \leq P3 \leq P4 \leq P5$$

This restriction is saying that breakpoint position #1 (i.e. P1) must be less than or equal to breakpoint position #2 (i.e. P2), and that breakpoint position #3 must be less than . . . . etc. P1 is the -50 div position and P5 is the maximum positive position.

****

Part I

The following procedure is for calibrating the breakpoint positions for A sweep at 1ns/div.

1. Select A sweep, X1, 10ns/div.

2. Verify that timing is within spec.

3. If timing is not in spec, correct it and, then, proceed.

4. Select A sweep, X10, 1ns/div and input 2 ns time marks.

Note

Query and write down the existing cal constants from #63 through #92 before performing step 5 in case your current adjustments are unsatisfactory and you wish to return to the pre-existing adjustment settings.

5. Make the following mcalconstant assignments:

TABLE 5
Reset Condition If Timing Out of Spec

Cal Constant/Nominal Value	Breakpoint Position
MCALCONSTANT63:–50	this is position # 1
MCALCONSTANT64:0	this is offset # 1
MCALCONSTANT65:50	this is position # 2
MCALCONSTANT66:0	this is offset # 2
MCALCONSTANT67:50	this is position # 3
MCALCONSTANT68:0	this is offset # 3
MCALCONSTANT69:50	this is position # 4
MCALCONSTANT70:0	this is offset # 4
MCALCONSTANT71:50	this is position # 5
MCALCONSTANT72:0	this is offset # 5

6. Turn horizontal position to approximately 0 div.

7. Perform query: MCALCONSTANT?23 . Write down the value somewhere and call it 'TEMP1'.

8. If timing is right on, go to step 12 , else proceed with step 9. The spec allows for ±0.14 division of error over 8 divions.

9. Using the SETACVS command, find a value that will correct the timing. Use this command: SETACVS17:value. Apparently the command must be given twice in some cases for unknown reasons. Don't change the horizontal position or the system reverts to the original ACVS value.

10. When the right value is determined, perform the subtraction: value-TEMP1. Call the resulting answer 'TEMP2'. TEMP2 can be positive or negative.

11. Make the following mcalconstant assignments:

MCALCONSTANT64:TEMP2
MCALCONSTANT66:TEMP2
MCALCONSTANT68:TEMP2
MCALCONSTANT70:TEMP2
MCALCONSTANT72:TEMP2

12. Position sweep as close to –50 divisions as possible.

13. Use the command SETACVS17:value until a value is found that will correct the sweep timing over 8 divisions.

14. Subtract TEMP1 from the acvs value found in step 13, and call the result OFFS_P1.

15. Perform the following command: SETACVS17:value of TEMP1.

16. Move the horizontal position slowly towards 0 divisions and check the sweep timing as you go.

17. Stop when you reach a position where the timing is within spec, and make note of this position and call it POSX.

18. Make the following mcalconstant assignments:

    MCALCONSTANT64:value of OFFS_P1
    MCALCONSTANT65:POSX

19. Check timing from –50 divisions to the position POSX. If between these two positions the timing is in spec, go to step 24.

20. Position the trace between –50 divs and position POSX to where the timing is the furthest out of spec. Note this position as POS2.

21. Then, use the command SETACVS17:value to find a value that will put the timing over 8 divisions in spec. Then, subtract the value of TEMP1 from the ACVS value just determined and call the resulting answer OFFS_P2.

    Note

    Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

22. Make the following mcalconstant assignments:

    MCALCONSTANT65:POS2
    MCALCONSTANT66:OFFS_P2

MCALCONSTANT67:POSX

23. Now go back and check the timing from –50 divisions to 0 divisions. If the timing is still out of spec, you may have to repeat this procedure. However, by using an educated guess to adjust the offsets and breakpoint positions a little, it is likely that you will be able to get the timing in spec without having to start over.

24. Position sweep as close to +50 divisions (typically about 40) as possible, and make note of the position as 'TEMP4'. You should turn up the intensity so as to see as much of the trace as possible, but not so much as to cause the trace to bloom.

25. Using the SETACVS command, find a value that will correct the timing. Use this command: SETACVS17:value.

Note

Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

26. Subtract TEMP1 from this value and call the result OFFS_P4.

27. Issue the command SETACVS17:TEMP1

28. Slowly position the sweep towards 0 divisions, checking the timing as you go.

29. Stop when you reach a position where the timing is within spec, and make note of this position, and call it TEMP5.

30. If you performed steps 20 through 23, then make the following mcalconstant assignments:

    MCALCONSTANT69:TEMP5
    MCALCONSTANT71:TEMP4
    MCALCONSTANT72:OFFS_P4

31. If you did NOT perform steps 20 through 23, then make the following mcalconstant assignments:

    MCALCONSTANT67:TEMP5
    MCALCONSTANT69:TEMP4
    MCALCONSTANT70:OFFS_P4
    MCALCONSTANT72:OFFS_P4

32. Check timing from position TEMP4 to 0 divisions. If timing is out, you may have to repeat this procedure. However, by using an educated guess to adjust the offsets

and breakpoints a little, it is likely that you will be able to get the timing in spec without having to start over.

Part 2

The following procedure is for calibrating the B sweep breakpoint positions for 1ns/div.

1. Select B sweep, X1, 10ns/div.

2. Verify that timing is within spec.

3. If timing is not in spec, correct it and, then, proceed.

4. Select B sweep, X10, 1ns/div and input 2 ns time marks.

Note

Query and write down the existing cal constants from #73 through #82 before performing step 5 in case your current adjustments are unsatisfactory and you wish to return to the pre-existing adjustment settings.

5. Make the following mcalconstant assignments:

TABLE 6
Reset Condition If Timing Out of Spec

Cal Constant/Nominal Value	Breakpoint Position
MCALCONSTANT73:–50	this is position #1
MCALCONSTANT74:0	this is offset #1
MCALCONSTANT75:50	this is position #2
MCALCONSTANT76:0	this is offset #2
MCALCONSTANT77:50	this is position #3
MCALCONSTANT78:0	this is offset #3
MCALCONSTANT79:50	this is position #4
MCALCONSTANT80:0	this is offset #4
MCALCONSTANT81:50	this is position #5
MCALCONSTANT82:0	this is offset #5

6. Turn horizontal position to approximately 0 div.

7. Perform query: MCALCONSTANT?24 . Write down the value somewhere and call it 'TEMP1'.

8. If timing is right on, go to step 12. Else, proceed with step 9.

9. Using the SETACVS command, find a value that will correct the timing. Use this command: SETACVS2:value

Note

Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

10. When the right value is determined, perform the subtraction: value-TEMP1. Call the resulting answer 'TEMP2'. TEMP2 can be positive or negative.

11. Make the following mcalconstant assignments:

MCALCONSTANT74:TEMP2
MCALCONSTANT76:TEMP2
MCALCONSTANT78:TEMP2
MCALCONSTANT80:TEMP2
MCALCONSTANT82:TEMP2

12. Position sweep as close to –50 divisions as possible.

13. Use the command SETACVS2:value until a value is found that will correct the sweep timing over 8 divisions.

Note

Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

14. Subtract TEMP1 from the acvs value found in step 13, and call the result OFFS_P1.

15. Perform the following command: SETACVS2:value of TEMP1.

16. Move the horizontal position slowly towards 0 divisions and check the sweep timing as you go.

17. Stop when you reach a position where the timing is within spec, and make note of this position and call it POSX.

18. Make the following mcalconstant assignments:

MCALCONSTANT74:value of OFFS_P1
MCALCONSTANT75:POSX

19. Check timing from –50 divisions to the position POSX. If between these two positions the timing is in spec, go to step 24.

20. Position the trace between –50 divs and position POSX to where the timing is the furthest out of spec. Note this position as POS2.

21. Then, use the command SETACVS2:value to find a value that will put the timing over 8 divisions in spec. Then, subtract the value of TEMP1 from the ACVS value just determined and call the resulting answer OFFS_P2.

Note

Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

22. Make the following mcalconstant assignments:

MCALCONSTANT75:POS2
MCALCONSTANT76:OFFS_P2
MCALCONSTANT77:POSX

23. Now go back and check the timing from –50 divisions to 0 divisions. If the timing is still out of spec, you may have to repeat this procedure. However, by using an educated guess to adjust the offsets and breakpoint positions a little, it is likely that you will be able to get the timing in spec without having to start over.

24. Position sweep as close to +50 divisions as possible, and make note of the position as 'TEMP4'. You should turn up the intensity so as to see as much of the start of sweep as possible, but not so much as to cause the trace to bloom.

25. Using the SETACVS command, find a value that will correct the timing. Use this command: SETACVS2:value.

Note

Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

26. Subtract TEMP1 from this value and call the result OFFS_P4.

27. Issue the command SETACVS2:TEMP1

28. Slowly position the sweep towards 0 divisions, checking the timing as you go.

29. Stop when you reach a position where the timing is within spec, and make note of this position and call it TEMP5.

30. If you performed steps 20 through 23, then make the following mcalconstant assignments:

    MCALCONSTANT79:TEMP5
    MCALCONSTANT81:TEMP4
    MCALCONSTANT82:OFFS_P4

31. If you did NOT perform steps 20 through 23, then make the following mcalconstant assignments:

    MCALCONSTANT77:TEMP5
    MCALCONSTANT79:TEMP4
    MCALCONSTANT80:OFFS_P4
    MCALCONSTANT82:OFFS_P4

32. Check timing from position TEMP4 to 0 divisions. If timing is out, you may have to repeat this procedure. However, by using an educated guess to adjust the offsets and breakpoints a little, it is likely that you will be able to get the timing in spec without having to start over.

Part 3

The following procedure is to calibrate the sweep position breakpoints for B sweep at 0.5ns/div.

1. Select B sweep, X1, 5ns/div.

2. Verify that timing is within spec.

3. If timing is not in spec, correct it and, then, proceed.

4. Select B sweep, X10, 0.5ns/div and input 2 ns time marks.

Note

Query and write down the existing cal constants from #83 through #92 before performing step 5 in case your current adjustments are unsatisfactory and you wish to return to the pre-existing adjustment settings.

5. Make the following mcalconstant assignments:

TABLE 7
Reset Condition If Timing Out of Spec

Cal Constant/Nominal Value	Breakpoint Position
MCALCONSTANT83:–50	this is position # 1
MCALCONSTANT84:0	this is offset # 1
MCALCONSTANT85:50	this is position # 2
MCALCONSTANT86:0	this is offset # 2
MCALCONSTANT87:50	this is position # 3
MCALCONSTANT88:0	this is offset # 3
MCALCONSTANT89:50	this is position # 4
MCALCONSTANT90:0	this is offset # 4
MCALCONSTANT91:50	this is position # 5
MCALCONSTANT92:0	this is offset # 5

6. Turn horizontal position to approximately 0 div.

7. Perform query: MCALCONSTANT?24 . Write down the value somewhere and call it 'TEMP1'.

8. If timing is right on, go to step 12 , else proceed with step 9.

9. Using the SETACVS command, find a value that will correct the timing. Use this command: SETACVS2:value

Note

Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

10. When the right value is determined, perform the subtraction: value-TEMP1. Call the resulting answer 'TEMP2'. TEMP2 can be positive or negative.

11. Make the following mcalconstant assignments:

    MCALCONSTANT84:TEMP2
    MCALCONSTANT86:TEMP2
    MCALCONSTANT88:TEMP2
    MCALCONSTANT90:TEMP2
    MCALCONSTANT92:TEMP2

12. Position sweep as close to -50 divisions as possible.

13. Use the command SETACVS2:value until a value is found that will correct the sweep timing over 8 divisions.

14. Subtract TEMP1 from the ACVS value found in step 13, and call the result OFFS_P1.

15. Perform the following command: SETACVS2:value of TEMP1.

16. Move the horizontal position slowly towards 0 divisions and check the sweep timing as you go.

17. Stop when you reach a position where the timing is within spec, and make note of this position and call it POSX.

18. Make the following mcalconstant assignments:

    MCALCONSTANT84:value of OFFS_P1
    MCALCONSTANT85:POSX

19. Check timing from –50 divisions to the position POSX. If between these two positions the timing is in spec, go to step 24.

20. Position the trace between –50 divs and position POSX to where the timing is the furthest out of spec. Note this position as POS2.

21. Then, use the command SETACVS2:value to find a value that will put the timing over 8 divisions in spec. Then, subtract the value of TEMP1 from the ACVS value just determined and call the resulting answer OFFS_P2.

    Note

    Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

22. Make the following mcalconstant assignments:

    MCALCONSTANT85:POS2
    MCALCONSTANT86:OFFS_P2
    MCALCONSTANT87:POSX

23. Now go back and check the timing from –50 divisions to 0 divisions. If the timing is still out of spec, you may have to repeat this procedure. However, by using an educated guess to adjust the offsets and breakpoint positions a little, it is likely that you will be able to get the timing in spec without having to start over.

24. Position sweep as close to +50 divisions as possible, and make note of the position as 'TEMP4'. You should turn up the intensity so as to see as much of the sweep as possible, but not so much as to cause the trace to bloom.

25. Using the SETACVS command, find a value that will correct the timing. Use this command: SETACVS2:value.

Note

Do not change horizontal position. Use the vertical position control to position the trace until it crosses the horizontal centerline at the tic marks.

26. Subtract TEMP1 from this value and call the result OFFS_P4.

27. Issue the command SETACVS2:TEMP1

28. Slowly position the sweep towards 0 divisions, checking the timing as you go.

29. Stop when you reach a position where the timing is within spec, and make note of this position as TEMP5.

30. If you performed steps 20 through 23, then make the following mcalconstant assignments:

    MCALCONSTANT89:TEMP5
    MCALCONSTANT91:TEMP4
    MCALCONSTANT92:OFFS_P4

31. If you did NOT perform steps 20 through 23, then make the following mcalconstant assignments:

    MCALCONSTANT87:TEMP5
    MCALCONSTANT89:TEMP4
    MCALCONSTANT90:OFFS_P4
    MCALCONSTANT92:OFFS_P4

32. Check timing from position TEMP4 to 0 divisions. If timing is out, you may have to repeat this procedure. However, by using an educated guess to adjust the offsets and breakpoints a little, it is likely that you will be able to get the timing in spec without having to start over.

16. Trigger Sensitivity

Adjustments

- 6 digital constants (BBRAM values)

There is a choice of three trigger sensitivities (hystereses) for both main and delayed triggers. Each of these six settings has a cal constant to be determined.

The procedure for setting **high sensitivity** for the main trigger will be described as an example.

Procedure

Note

In most cases, these adjustments should be acceptable without being changed. Perform a verification check before calibration constants are altered.

Select a plug-in channel for a vertical display of 3 divisions amplitude of a sine wave of 50 MHz. Use an amplifier sensitivity of 500 mV/div. (This setting has low noise). Attenuate the signal by a factor of 10 by adjusting the vertical "size", giving a display amplitude of 0.3 div. Adjust the trigger level at the front panel and determine if stable triggering is possible. Query the existing value of constant 52 via mcalconstant?52. If the triggering is unstable, adjust the hysteresis constant (#52 for main trigger) for a smaller value than the existing value returned from the query. Then cycle through the Sensitivity menu so that the new value is then used.

Note

Use AUTO or NORM trigger modes. Do not use P-P.

Warning

Do not use function generators as the source of the sinewaves. Most of these generators produce noise spikes near the signal peaks that will result in incorrect adjustments.

Adjust the signal amplitude for 0.2 div and check that stable triggering is not possible. It is alright if triggering occurs, but it should be jittery and/or infrequent. Use the MCALCONSTANT command to input new control values if triggering is too sensitive or not sensitive enough. After this command has been given, the Sensitivity menu needs to be cycled through to pull in the new value.

Repeat a similar procedure for each of the other five conditions (2-6) shown below.

(Note: nominal values were set in the 'Initialization' section.)

main trigger:

1. high sensitivity (shown above)	MCALCONSTANT 52: 1000 ±200
2. medium sensitivity	MCALCONSTANT 51: 1500 ±200
3. low sensitivity	MCALCONSTANT 50: 2100 ±200

delayed trigger:

4. high sensitivity	MCALCONSTANT 55: 1000 ±200
5. medium sensitivity	MCALCONSTANT 54: 1500 ±200
6. low sensitivity	MCALCONSTANT 53: 2100 ±200

Adjustment Spec's:

high sensitivity	
stable triggering	0.3 div
no triggers or unstable triggers	0.2 div
medium sensitivity	
stable triggering	0.6 div
no triggers or unstable triggers	0.4 div
low sensitivity	
stable triggering	0.9 div
no triggers or unstable triggers	0.6 div

17. Triggers

Adjustments

- numerous digital constants (BBRAM values)

Procedure

Turn off the 11301 and install an 11000-series plug-in unit into the left compartment. Turn on the 11301. Now, the remaining trigger constants can be found with internal automated procedures by invoking the interface command:

AUTOCAL TRIGGERS

18. Intensities

Adjustments

- 2 digital constants (BBRAM values)
  autoset intensity
  EA plug-in cal intensity

Procedure

The autoset intensity cal constant determines the brightness of the trace after the autoset feature has been used. The range for the 11301 is 0 to 3.3 with a typical value of about 2. To adjust, connect a signal of 1 MHz or less and push the AUTOSET button. Use the following command, below, to alter the intensity to a viewable level. Push the AUTOSET button after each change in the cal constant to determine the effect of the change. If the value chosen for the 11301 is 2.2 or greater, the intensity is probably brighter than necessary.

Give the interface command:

MCALCONSTANT 337:value

to set the autoset intensity.

The second cal constant sets the intensity of the plug-in calibration portions of the enhanced accuracy cycle, both for vertical and trigger calibration involving the plug-ins. The trigger calibration part is the most critical, since it displays a dot that is objectionable and potentially damaging if it is too bright. The range of values is from 0 to 255, with typical values of 125 to 170.

Give the interface command:

MCALCONSTANT 130:value

to set the plug-in intensity.

To test this value, assert "AUTOCAL TRIGGERS" over the external interface. The dot on screen should be visible, but have no "halo."

19. External Inputs

Adjustments

- numerous digital constants (BBRAM values)

Note

Do not recalibrate the external inputs circuitry unless absolutely necessary! This circuitry is very stable and should not require recalibration, even when components have been changed. This calibration procedure is extremely lengthy and complex; avoid it, if possible!

The process of calibration requires altering the controlling cal constants directly. The amount of change in the cal constants can be calculated on a four-function calculator, such as the one built into the oscilloscope (available in the Numeric Entry menu), based upon measurements made with calibrated amplitude test signals.

The external inputs serve two different circuits: the triggers and the counter timer. The calibration constants for each system are independent.

Note

The following list of cal constants and nominal values may have been set in the "Initialization" section for raw instrument calibration. In that case, these values need not be entered. Instead, start the external inputs adjustment procedure with the existing cal constant values already stored in BBRAM. However, you may wish to record the existing settings in the event that new settings prove unsatisfactory and you wish to use the existing settings to start over.

Cal constants and values:

Counter Timer

A input
(gains)

MCALCONSTANT 97:value	nominal:3760
MCALCONSTANT 98:value	nominal:752

(offsets)

MCALCONSTANT 44:value	nominal:–100
MCALCONSTANT 107:value	nominal:–2047
MCALCONSTANT 108:value	nominal:–2047

B input
(gains)

MCALCONSTANT 99:value	nominal:3760
MCALCONSTANT 100:value	nominal:752

(offsets)

MCALCONSTANT 45:value	nominal:–100
MCALCONSTANT 109:value	nominal:–2047
MCALCONSTANT 110:value	nominal:–2047

Trigger path

A input
(gains)

MCALCONSTANT 93:value	nominal:–10600
MCALCONSTANT 94:value	nominal:–10600

(offsets)

MCALCONSTANT 103:value	nominal:0
MCALCONSTANT 104:value	nominal:0

B input
(gains)

MCALCONSTANT 95:value	nominal:–10600
MCALCONSTANT 96:value	nominal:–10600

(offsets)

MCALCONSTANT 105:value	nominal:0
MCALCONSTANT 106:value	nominal:0

Procedure

Connect bnc cables from the Front Panel Calibrator output through a 15 kHz low-pass filter (i.e., 067-1320-00 cal fixture) to both the A and B External inputs.

Make sure the instrument is fully warmed up, Enhanced Accuracy has been successfully performed, and the Calibrator Voltage Reference is calibrated.

Waveform selection

Delete all traces.
Using the Delay Select menu, select Delayed trace,
Window1 On, Triggered After Delay mode.

Trigger Source and Signal Conditioning

Main, A Ext input, DCHFR, High Sens, +Slope, Norm mode.

Dly1, B Ext input, DCHFR, High Sens, +Slope.

Counter Timer setup

In the Counter Menu select Total Measure, Off Gating, M&D1 Trig Source.

Press the RESET button.

Other considerations

Send the command "SETCVR ATTN/GND:15" to select the Calibration Voltage Reference as the voltage source to the Front Panel Calibrator output.

Calibrate A Ext Gain and Offset

1. Send the commands that set up the Calibration Voltage Reference to output +400mV and –400mV with maximum accuracy:

   SETCVR ATTN/GND:11
   SETCVR ATTN/GND:4
   SETCVR ATTN/GND:1

2. Select EXT/1 as the Main Trigger source.

3. Select +Slope.

4. Send the command "SETCVR DAC:3686" to output +400mV from the CVR.

5. Move the main trigger level control in the positive direction to about 450mV to 500mV to reset the trigger, then slowly move the trigger level control in the negative direction using the FINE setting until the Total M= display increments.

   Press RESET.

6. Repeat step 5. until you are confident you have found the trigger's trip point.

7. Record the trigger level readout at the trip point = TLH volts.

8. Select – Slope.

9. Send the command "SETCVR DAC:410" to output –400mV from the CVR.

10. Move the main trigger level control in the negative direction to about –450mV to –500mV to reset the trigger, then slowly move the trigger level control in the positive direction using the FINE setting until the Total M= display increments.

    Press RESET.

11. Repeat step 10. until you are confident you have found the trigger's trip point.

12. Record the trigger level readout at the trip point = TLL volts.

13. Calculate gain and offset adjustment terms:

$$GA = \frac{TLH - TLL}{0.800 \text{ volts}} \qquad OA = \frac{TLH + TLL}{2} * 2200 \text{ bits/volt}$$

14. Request from the mainframe the mcalconstants 93 and 103 using the command:

    mcalconstant?93,103

15. Multiply existing cal constant 93 by GA and subtract OA from existing cal constant 103, round off to the nearest integer, then send the new mcalconstants back to the mainframe:

    93 (new value) = round[93 (old value) * GA]

    103 (new value) = round[103 (old value) – OA]

    using the command:

    mcalconstant 93: new value, 103: new value

16. Repeat steps 3. through 15. until (1 – GA) is less than .001 and the absolute value of OA is less than 2.

Calibrate B Ext Gain and Offset

1. Select EXT/1 as the Delayed Trigger source.

2. Modify the mcalconstants #95 and #105 using a technique similar to the above.

Calibrate A Ext/5 Gain and Offset

1. Send the commands that set up the Calibration Voltage Reference to output +2.000V and –2.000V with maximum accuracy:

    SETCVR ATTN/GND:11
    SETCVR ATTN/GND:3
    SETCVR ATTN/GND:2

2. Select EXT/5 as the Main Trigger source.

3. Select +Slope.

4. Send the command "SETCVR DAC:3686" to output +2.000V from the CVR.

5. Move the main trigger level control in the positive direction to about 2.000V to 2.500V to reset the trigger, then slowly move the trigger level control in the negative direction using the FINE setting until the Total M= display increments.

Press RESET.

6. Repeat step 5. until you are confident you have found the trigger's trip point.

7. Record the trigger level readout at the trip point = TLH volts.

8. Select – Slope.

9. Send the command "SETCVR DAC:410" to output –2.000V from the CVR.

10. Move the main trigger level control in the negative direction to about –2.000V to –2.500V to reset the trigger, then slowly move the trigger level control in the positive direction using the FINE setting until the Total M= display increments.

    Press RESET.

11. Repeat step 10. until you are confident you have found the trigger's trip point.

12. Record the trigger level readout at the trip point = TLL volts.

13. Calculate gain and offset adjustment terms:

$$GA = \frac{TLH - TLL}{4.000 \text{ volts}} \qquad OA = \frac{TLH + TLL}{2} * 450 \text{ bits/volt}$$

14. Request from the mainframe the mcalconstants 94 and 104 using the command:

    mcalconstant?94,104

15. Multiply existing cal constant 94 by GA and subtract OA from existing cal constant 104, round off to the nearest integer, then send the new mcalconstants back to the mainframe:

    94 (new value) = round[94 (old value) * GA]

    104 (new value) = round[104 (old value) – OA]

    using the command:

    mcalconstant 94: new value, 104: new value

16. Repeat steps 3. through 15. until (1 – GA) is less than .001 and the absolute value of OA is less than 2.

Calibrate B Ext/5 Gain and Offset

1. Select EXT/5 as the Delayed Trigger source.

2. Modify the mcalconstants #96 and #106 using a technique similar to the above.

Calibrate CT A Ext/1 and CT A Ext/5 Gains and Offsets and Slope Offset

First, calibrate CT A Ext/1 gain, offset, and slope offset.

1. Using the Counter Menu select A&B Ext Trig Source.

2. Press the RESET button.

3. In the Trigger Source Menu, select Main Trig=A Ext and select Dly1 Trig=B Ext.

4. Send the commands that set up the Calibration Voltage Reference to output +400mV and –400mV with maximum accuracy:

   SETCVR ATTN/GND:11
   SETCVR ATTN/GND:4
   SETCVR ATTN/GND:1

5. Select Ext/1 as the Main Trigger source.

6. Select +Slope.

7. Send the command "SETCVR DAC:3686" to output +400mV from the CVR.

8. Move the main trigger level control in the positive direction to about 450mV to 500mV to reset the trigger, then slowly move the trigger level control in the negative direction using the FINE setting until the Total M= display increments.

9. Repeat step 8. until you are confident you have found the trigger's trip point.

10. Record the trigger level readout = TLHP volts.

11. Send the command "SETCVR DAC:2048" to output 0.000mV from the CVR.

12. Move the main trigger level control in the positive direction to about 50mV to 100mV to reset the trigger, then slowly move the trigger level control in the negative direction using the FINE setting until the Total M= display increments.

13. Repeat step 12. until you are confident you have found the trigger's trip point.

14. Record the trigger level readout = TL0P volts.

15. Send the command "SETCVR DAC:410" to output –400mV from the CVR.

16. Move the main trigger level control in the positive direction to about –350mV to –300mV to reset the trigger, then slowly move the trigger level control in the negative direction using the FINE setting until the Total M= display increments.

17. Repeat step 16. until you are confident you have found the trigger's trip point.

18. Record the trigger level readout = TLLP volts.

19. Select – Slope.

20. Send the command "SETCVR DAC:3686" to output +400mV from the CVR.

21. Move the main trigger level control in the negative direction to about 300mV to 350mV to reset the trigger, then slowly move the trigger level control in the positive direction using the FINE setting until the Total M= display increments.

22. Repeat step 21. until you are confident you have found the trigger's trip point.

23. Record the trigger level readout = TLHM volts.

24. Send the command "SETCVR DAC:2048" to output 0.000mV from the CVR.

25. Move the main trigger level control in the negative direction to about -100mV to –50mV to reset the trigger, then slowly move the trigger level control in the positive direction using the FINE setting until the Total M= display increments.

26. Repeat step 25. until you are confident you have found the trigger's trip point.

27. Record the trigger level readout = TL0M volts.

28. Send the command "SETCVR DAC:410" to output –400mV from the CVR.

29. Move the main trigger level control in the negative direction to about –450mV to –500mV to reset the trigger, then slowly move the trigger level control in the positive direction using the FINE setting until the Total M= display increments.

30. Repeat step 29. until you are confident you have found the trigger's trip point.

31. Record the trigger level readout = TLLM volts.

32. Perform the following calculations in the given order:

ZWT = 4
SY = TLLP + TL0P + TLHP
ZOFSTP = (TLLP + ZWT * TL0P + TLHP) / (2 + ZWT)
SXY = 0.4 * (TLHP – TLLP)
SX2 = 0.32
DNM = .96
OFSTP = (SY * SX2) / DNM
GAINP = (3 * SXY) / DNM

SY = TLLM + TL0M + TLHM
ZOFSTM = (TLLM + ZWT * TL0M + TLHM) / (2 + ZWT)
SXY = 0.4 * (TLHM – TLLM)
OFSTM = (SY * SX2) / DNM
GAINM = (3 * SXY) / DNM

GA = (GAINP + GAINM) / 2
OA = OFSTP * 3700 bits/volt
COA = OFSTM * 3700 bits/volt – OA

33. Request from the mainframe the mcalconstants 97, 107, and 44 using the interface command:

mcalconstant?97,107,44

34. Multiply existing cal constant 97 by GA, add OA to existing cal constant 107, subtract COA from existing cal constant 44, round off to the nearest integer, then send the new mcalconstants back to the mainframe:

97 (new value) = round[97 (old value) * GA]

107 (new value) = round[107 (old value) + OA]

44 (new value) = round[44 (old value) – COA]

using the command:

mcalconstant 97: new value, 107: new value, 44: new value

35. Repeat steps 6. through 34. until
GA = 1.000 ±0.001, OA = 0 bits ±2 bits, COA = 0 bits ±3 bits.

Note - if the above limits cannot be met there is a hardware failure.

36. Perform the following calculations:

T1 = ZOFSTP * 3700 bits/volt
T2 = ZOFSTM * 3700 bits/volt

Second, calibrate CT A Ext/5 gain and offset.

1. Keep all settings from the previous Ext/1 calibration step, except those specifically made here.

2. Press RESET.

3. In the Trigger Source Menu, select Main Trig=A Ext/5 and select Dly1 Trig=B Ext/5.

4. Send the commands that set up the Calibration Voltage Reference to output +2.000V and –2.000V with maximum accuracy:

SETCVR ATTN/GND:3
SETCVR ATTN/GND:2

5. In the Main Trigger Source menu select Main Trig=Ext /5.

6. Select +Slope.

7. Send the command "SETCVR DAC:3686" to output +2.000V from the CVR.

8. Move the main trigger level control in the positive direction to about 2.2V to 2.4V to reset the trigger, then slowly move the trigger level control in the negative direction using the FINE setting until the Total M= display increments.

9. Repeat step 8. until you are confident you have found the trigger's trip point.

10. Record the trigger level readout = TLHP volts.

11. Send the command "SETCVR DAC:2048" to output 0.000V from the CVR.

12. Move the main trigger level control in the positive direction to about .2V to .4V to reset the trigger, then slowly move the trigger level control in the negative direction using the FINE setting until the Total M= display increments.

13. Repeat step 12. until you are confident you have found the trigger's trip point.

14. Record the trigger level readout = TL0P volts.

15. Send the command "SETCVR DAC:410" to output –2.000V from the CVR.

16. Move the main trigger level control in the positive direction to about –1.6V to –1.8V to reset the trigger, then slowly move the trigger level control in the negative direction using the FINE setting until the Total M= display increments.

17. Repeat step 16. until you are confident you have found the trigger's trip point.

18. Record the trigger level readout = TLLP volts.

19. Select – Slope.

20. Send the command "SETCVR DAC:3686" to output +2.000V from the CVR.

21. Move the main trigger level control in the negative direction to about 1.6V to 1.8V to reset the trigger, then slowly move the trigger level control in the positive direction using the FINE setting until the Total M= display increments.

22. Repeat step 21. until you are confident you have found the trigger's trip point.

23. Record the trigger level readout = TLHM volts.

24. Send the command "SETCVR DAC:2048" to output 0.000V from the CVR.

25. Move the main trigger level control in the negative direction to about –.4V to –.2V to reset the trigger, then slowly move the trigger level control in the positive direction using the FINE setting until the Total M= display increments.

26. Repeat step 25. until you are confident you have found the trigger's trip point.

27. Record the trigger level readout = TL0M volts.

28. Send the command "SETCVR DAC:410" to output –2.000V from the CVR.

29. Move the main trigger level control in the negative direction to about –2.2V to –2.4V to reset the trigger, then slowly move the trigger level control in the positive direction using the FINE setting until the Total M= display increments.

30. Repeat step 29. until you are confident you have found the trigger's trip point.

31. Record the trigger level readout = TLLM volts.

32. Perform the following calculations in the given order:

ZWT = 4
SY = TLLP + TL0P + TLHP
ZOFSTP = (TLLP + ZWT * TL0P + TLHP) / (2 + ZWT)
SXY = 0.4 * (TLHP – TLLP)
SX2 = 0.32
DNM = .96
OFSTP = (SY * SX2) / DNM
GAINP = (3 * SXY) / DNM

SY = TLLM + TL0M + TLHM
ZOFSTM = (TLLM + ZWT * TL0M + TLHM) / (2 + ZWT)
SXY = 0.4 * (TLHM - TLLM)
OFSTM = (SY * SX2) / DNM
GAINM = (3 * SXY) / DNM

GA = (GAINP + GAINM) / 2
OA = OFSTP * 740 bits/volt
COA = OFSTM * 740 bits/volt – OA

33. Request from the mainframe the mcalconstants 98 and 108 using the command:

mcalconstant?98,108

34. Multiply existing cal constant 98 by GA and add OA to existing cal constant 108, round off to the nearest integer, then send the new mcalconstants back to the mainframe:

98 (new value) = round[98 (old value) * GA]

108 (new value) = round[108 (old value) + OA]

using the command:

mcalconstant 98: new value, 108: new value

35. Repeat steps 6. through 34. until
GA = 1.000 ±0.001, OA = 0 bits ±2 bits

Note - if the above limits cannot be met there is a hardware failure.

36. Perform the following calculations:

T3 = ZOFSTP * 740 bits/volt
T4 = ZOFSTM * 740 bits/volt

Third, adjust the Counter Timer External input offsets.

1. Perform the following calculations in the given order using the results of the previous steps:

OA1 = (3 * T1 + T2 + T3) / 4
OA5 = (T1 − T2 + 3 * T3 + T4) / 4
COA = (T1 − T2 + T3 − T4) / 2

If the absolute value of any of the above adjustment terms is greater than 100, abort this procedure and fix the problem.

2. Request from the mainframe the mcalconstants 107, 108, and 44 using the command:

mcalconstant?107,108,44

3. Add OA1 to existing cal constant 107, add OA5 to existing cal constant 108, and add COA to existing cal constant 44, round off to the nearest integer, then send the new mcalconstants back to the mainframe:

107 (new value) = round[107 (old value) + OA1]

108 (new value) = round[108 (old value) + OA5]

44 (new value) = round[44 (old value) + COA]

using the command:

mcalconstant 107: new value, 108: new value, 44: new value

Set the Main Trigger level to zero in preparation for the next step.

Calibrate CT B Ext/1 and CT B Ext/5 Gains and Offsets and Slope Offset

1. In the Trigger Source Menu, select Dly1 Trig=B Ext/1.
2. Modify the mcalconstants #99, #109, and #45 using techniques similar to those for the A Ext inputs.
3. In the Trigger Source menu, select Dly1 Trig=B Ext/5.
4. Modify the mcalconstants #100 and #110 using techniques similar to those for the A Ext inputs.
5. Adjust the offsets to #109, #110, and #45 using techniques similar to those for the A Ext inputs.

20. Line Trigger

Adjustments

- 4 digital constants (BBRAM values)

Note

Do not recalibrate the line trigger circuitry unless necessary. This circuitry is very stable and should not require recalibration, even when a few components have been changed. This calibration procedure is somewhat lengthy, so perform it only if significant repairs have been made to the circuitry.

There is one gain term and one offset term for each trigger hybrid. The gain and offset should be set so that triggering occurs for a readout level range of about 25% to 75% with nominal line voltage (115 V or 230 V). The gain term determines the range over which triggering occurs. Smaller numbers result in a larger range of triggering. More positive values of offset shift the entire triggering range down.

main trigger:

gain		
MCALCONSTANT 101:(25 to 55)	nom. value	35
offset		
MCALCONSTANT 111:(100 to –100)	nom. value	0

delayed trigger:

gain		
MCALCONSTANT 102:(25 to 55)	nom. value	35
offset		
MCALCONSTANT 112:(100 to –100)	nom. value	0

Procedure

If the timebase or processor boards have been replaced, set all mcalconstants related to the Line trigger to their nominal values. However, for a re-cal start with existing calibration constant values.

Note

The calibration tolerances given in this section are valid for an instrument line voltage in the range of 110 V to 120 V (or 220 V to 240 V).

Waveform selection

Select L1 trace at 500 mV/div or any other convenient setting. Note – some trace must be selected but you don't really care what the input signal, if any, is. A line signal source might be convenient if one is easily available. Press the Horizontal Delay button below the screen. Select: Trig'd After Dly, Main & Dly View, Window 1 On, and Window 2 Off. Then adjust the Delay 1 readout to be 0 seconds by turning the right knob. Set Main and Delayed sweeps to 2 mS/div, 10X magnifier Off. Now, select 'Line' as the Main and Dly 1 trigger source from the Trigger Source menu. Adjust Main and Dly 1 trigger levels to be 50%.

Other considerations

For viewing convenience, position the L1 trace to the top half of the screen. Position the L1,D1 trace in the bottom half of the screen.

Calibrate Main Line trigger Gain and Offset

1. Push the LEVEL button below the screen. Then touch the lower right area of the screen until Main Trigger is displayed. Select Norm mode, DCHFRej, and High Senstvty.

2. Select +Slope.

3. Move the main trigger level control to the positive level of the line signal to the point where triggering just about disappears, i.e., one more fine adjustment click toward positive kills triggering almost completely.

4. Record the trigger level readout = TLH %.

5. Select – Slope.

6. Move the trigger level control to the negative level of the line signal to the point where triggering just about disappears.

7. Record the trigger level readout = TLL %.

8. Evaluate the results. If TLL is in the range of 21% to 29% and TLH is in the range of 71% to 79%, no adjustment of the main line trigger is needed. If true, check the delayed line trigger as described below. If adjustments are needed, proceed to the next step.

9. Calculate gain and offset adjustment terms:

$$GA = \frac{TLH - TLL}{50\%}$$

$$OA = \left(50\% - \frac{TLH + TLL}{2}\right) * 7.9 \text{ bits/\%}$$

10. Request from the mainframe the mcalconstants 101 and 111 by sending the command:

    mcalconstant?101,111

11. Multiply the existing mcalconstant 101 by GA and subtract OA from existing mcalconstant 111,

    mcalconstant 101(new value) = mcalconstant 101(old value) * GA

    mcalconstant 111(new value) = mcalconstant 111(old value) – OA

    then send these new mcalconstants back to the mainframe by the command:

mcalconstant 101:new value, 111:new value

Note that these mcalconstants must be rounded off to integer values.

12. Repeat steps 2. through 11. until TLH = 71%to 79% and TLL = 21% to 29%.

Set Main Trigger level to 50% in preparation for the next step.

Calibrate Delayed Line trigger Gain and Offset

1. Push the LEVEL button below the screen. Touch the lower right area of the screen until Dly 1 Trigger is displayed. Touch the screen to make the following selections: DcHF Rej coupling, High Senstvty, and +Slope.

2. Follow the same process as described in steps 2 through 12 in the previous adjustment for main trigger, except that the Dly 1 Trig level will be adjusted and different cal constants will be modified.

3. The cal constants to modify are numbers 102 and 112. Query the current values of these constants with the external interface command:

   mcalconstant? 102, 112

   The modified versions of these constants may be entered into the mainframe with the command:

   mcalconstant 102:new value, 112:new value

4. The same calibration tolerances apply to the Main and Dly 1 trigger level range.

21. CT Offsets

Adjustments

- 4 digital constants (BBRAM values)

The digital constants are used to reduce offsets in the values registed by the counter timer as compared to the analog oscilloscope measurements. The four modes of interest are:

- holdoff by 2 ns
- time main to delayed, runs after
- time main to delayed, triggered after
- precision time

These constants represent propagation delay offsets in the system that will be subtracted from counter-timer results to give more pleasing numbers. The offsets can be found using normal operating modes. Use the MCALCONSTANT command to input new values.

Holdoff by Events, 2 ns clock

Purpose: To get good agreement between the counter timer results and the holdoff setting. The adjustment is made by changing the value of cal constant 332. A typical value is 27 ns.

Procedure

Turn the 11301 power off. Install an 11000 series plug-in in left compartment. Turn the power on.

Establish one trace on the 11301, but do not connect a signal to the selected plug-in input.

Set the Main Sweep Speed to 5 ns/div.

Push the LEVEL button below the screen. Touch the screen to select Auto Mode, DC Coupling, High Senstvty, and +Slope.

Set the Main Trigger Level to + full range. Be sure that an untriggered trace is on screen.

Push the HOLDOFF button below the screen. Touch the area at the lower right to select 2ns Step Holdoff. Set the holdoff knob value to its minimum setting, which is

about 3 us. A quick way to set the value is to use the numeric entry feature of the oscilloscope. Push the NUMERIC ENTRY button to the right of the screen. Touch the following areas: Left Knob, 0, Enter. The holdoff value should now be about 3 us.

Connect a bnc cable from the Gate Out connector on the rear panel of the instrument to the A External Trigger and Counter Timer input on the lower right front panel of the 11301.

Press the COUNTER button below the screen. Use the menu at the bottom of the crt screen to select Period Measure as the mode. Then select Auto Averages, Off Gating, Manual Update and A Ext Source as the other menu selections.

Press the UTILITY menu at the right of the screen. Touch the I/O BNC selection on the crt screen, then touch Main as the GATE OUT selection.

Press the LEVEL button below the screen. Make touch selections in the menu at the bottom of the screen as follows: Auto Mode, DC Coupling, High Senstvty, +Slope and Main Trigger. Touch the lower right area of the screen until CT Ext A appears on the screen in that area. Adjust the right knob for a CT Ext A trigger level of 1.0000 V.

Query the present value of cal constant 332 using an external interface command as follows:

mcalconstant?332

Record the value that is returned.

Press the COUNTER button below the screen. Start the counter timer by touching Auto Update.

Subtract the value shown on screen as the Holdoff value from the Period value measured in above. To this value, add the current value of cal constant 332 determined above. The resulting value becomes the new value of the cal constant. Ignore digits less than 100 ps.

new value = (period measured by counter) – (holdoff readout)
+ (current value of cal const. 332)

Stop the counter-timer by touching Manual Update. This stops status messages from being sent out on the external interface.

To set this new value, assert the external interface command:

mcalconstant 332:new value

Turn the counter timer on again by touching Auto Update.

Push the HOLDOFF button below the screen, then turn the holdoff knob clockwise, then counterclockwise again to the minimum level. This causes the new cal constant to be used. Check that the Holdoff readout displays a value that is within 0.9 ns of the period displayed by the counter timer.

Time M>D, Sweep source, Runs after

Purpose: To get good agreement between the counter timer results and the delay setting. The adjustment is made by changing the value of cal constant 331. A typical value is 54 ns.

Procedure

Turn the 11301 power off. Install an 11000-series plug-in on the left compartment. The plug-in unit needs to have at least 100 MHz of system bandwidth and a 50 ohm input impedance. Turn the power on.

Press the UTILITY menu button at the right of the screen. Touch the I/O BNC region near the center of the screen, then touch the Int region below REF CLOCK. Now, press the UTILITY menu button again to remove the menu from the screen.

Connect a bnc cable from the COUNTER REF CLOCK connector on the rear panel of the 11301 to an input of the left plug-in unit. Select full system bandwidth and 50 ohm impedance. Adjust the vertical sensitivity for at least 3 divisions of amplitude.

Set the main sec/div to 100 ns/div.

Push the LEVEL button below the screen. Touch the lower right area of the screen until Main Trigger selection is displayed. Then touch the screen to select Auto Mode, DC coupling, High Senstvty, and +Slope. Adjust the right knob for a stable, triggered display.

Press the DELAY button below the screen. Turn Window 1 on by touching the area at the center of the lower edge of the screen. Window 2 should be off. Also, select Runs After Dly by touching the region at the lower left of the screen.

Adjust Delay1 to be exactly 500 ns by rotating the right knob.

Press the horizontal SIZE button below the screen. Adjust the delayed sec/div to be 5 ns/div.

Press the COUNTER button below the screen. Touch the region at the lower right of the screen until the selection displayed is Time A>B Measure.

In the same menu within the bottom division of the screen, select 10^6 averages, Manual Update and Swp Start Source.

Query the current value of cal constant 331 by asserting the external interface command:

mcalconstant? 331

Turn the counter timer on by touching Auto Update on the screen.

Subtract 500 ns from the Time M>D value shown on the screen.

new value = [(Time M>D) – (500 e-9)] + (current value of cal constant 331)

Turn the counter timer off again by touching Manual Update. This stops status messages from being sent out on the external interface.

Change cal constant 331 by asserting the following external interface command:

mcalconstant 331:new value

Change the counter timer mode to Auto Update again.

Check that the value of Time M>D shown on the screen is 500 ns ±0.5 ns.

Time M>D, Sweep source, Triggered after

Purpose: To get good agreement between the counter timer results and the delay setting. The adjustment is made by altering the value of cal constant 330. The typical value of this constant is about 17.5 ns.

Procedure

The signal source for this adjustment needs to have a fast risetime pulse output and a frequency accuracy of 100 ppm or better, such as the Tektronix TG 501 Time Mark Generator. Check the frequency accuracy of the TG 501 by using the counter timer in the 11301 to measure the frequency of 100 ns time marks. The frequency should be 10 MHz ±1 kHz.

Note

It is required that the signal have a risetime of 10 ns or less to minimize the effect of trigger level tolerance. Do not use sinewave signals.

The 11000-series plug-in unit must meet the same requirements as specified for the previous step (Time M>D, runs after).

Adjust the vertical sensitivity for about 8 divisions of amplitude with 100 ns time marks. Use 50 ohm input impedance and full bandwidth. Note the vertical sensitivity. Change the sensitivity to a value that would double the amplitude. For example, from 200 mV/div to 100 mV/div. Adjust the offset or position so that the baseline of the timemarks are at the bottom of the screen. The displayed signal should now have very fast rising and falling transitions, with part of the signal driven off the top of the screen.

Adjust the main sec/div to be 100 ns/div.

Press the DELAY button below the screen. Turn Window 1 on by touching the area at the center of the lower edge of the screen. Window 2 should be off. Also, select Trig'd After Dly by touching the region at the lower left of the screen.

Adjust Delay1 to be exactly 400 ns by rotating the right knob.

Press the COUNTER button below the screen. Touch the region at the lower right of the screen until the selection displayed is Time A>B Measure.

In the same menu within the bottom division of the screen, select 10^6 averages, Manual Update and Swp Start Source.

Press the LEVEL button below the screen and touch the lower right area of the screen until the Main Trigger is selected. Touch the screen to get the following selections for main trigger: AC, High Senstvty and +Slope.

Rotate the right knob to find the most positive Main Trig level value that still triggers the sweep. If the trigger level reaches its maximum value and the oscilloscope is still triggered, consider the maximum to be 10 acdiv.

Next, find the minimum value of trigger level that still triggers the sweep. Adjust the Main Trigger level to a value that is half way between these two values.

Touch the lower right region of the screen to select Dly1 Trigger. Touch other regions along the lower division of the screen to get the following selections: AC, High Senstvty, and +Slope.

Query the current value of cal constant 330 by asserting the external interface command:

```
mcalconstant? 330
```

Turn the counter timer on by touching Auto Update on the screen.

Subtract 500 ns from the Time M>D value shown on the screen.

new value = [(Time M>D) – (500 e-9)] + (current value of cal constant 330)

Turn the counter timer off again by touching Manual Update. This stops the status messages from being sent out on the external interface.

Change cal constant 330 in the 11301 by asserting the following external interface command:

mcalconstant 330:new value

Check that the Time M>D readout is now 500 ns ±0.5 ns.

Time D1>D2, Sweep source, Triggered after

Purpose: To null the difference between Dly1 and Dly2. The adjustment is made by altering the value of cal constant 338. The typical value is –1 ns.

Procedure

Use the same signal source, plug-in unit, vertical signal amplitudes, and trigger levels as described in the previous adjustment (Time M>D, triggered after).

Adjust the main sec/div to be 100 ns/div.

Press the DELAY button below the screen. Turn Window 1 on by touching the area at the center of the lower edge of the screen. Window 2 should be off. Also, select Trig'd After Dly by touching the region at the lower left of the screen.

Adjust Delay 1 to be exactly 400 ns by rotating the right-hand knob.

Touch the screen to turn Window 2 on. Turn the right knob to adjust delta-delay to be exactly 0.

Press the horizontal SIZE button below the screen. Adjust the delayed time/div to be 5 ns/div.

Press the COUNTER button below the screen. Touch the region at the lower right of the screen until the selection displayed is Time A>B Measure.

In the same menu within the bottom division of the screen, select 10^6 averages, Manual Update and Swp Start Source.

Verify that the Main Trig and Dly 1 Trig levels are set on the same value as described for the previous adjustment. Also, adjust Dly 2 Trig level to be the same as the other two.

Query the current value of cal constant 338 by asserting the external interface command:

mcalconstant? 338

Start the counter timer by touching Auto Update.

Add the displayed Time M>D value shown from the current value of cal constant 338.

new value = (current value of cal const. 338) + (Time M>D)

Stop the counter-timer again by touching Manual Update. This stops status messages from going out over the external interface.

Change cal constant 338 by asserting the following external interface command:

mcalconstant 338:new value

Turn the counter-timer on again by touching Auto Update.

Check that the Time M>D readout is now 0 ns ±0.2 ns.

Turn off the counter timer.

22. Store Cal Constants

Invoking the "SAVEFACTORY" interface command saves the values that have been determined, previously, from BBRAM to EEROM. It would not hurt if this had been done several times during this procedure. If repair or board change (other than the Main Processor board) is done, only part of the full calibration may be needed. When that has been done, invoke interface command:

SAVEFACTORY

Note

It takes up to 1 minute for this process to complete. Do not touch any front panel controls or turn the power off until the readout display has returned, indicating the process is complete.

23. DIP Switches

Restore all DIP switches to their normal (open) states to prevent accidental access to cal constants in normal use and to restore other normal functions such as power-up, self-test, and 20 minute warm-up before enabling enhanced accuracy.

24. Cabinetize

Turn power off. Replace the handle. Replace the top and bottom covers. Be careful when replacing the bottom cover so that the coaxial cables plugged into the vertical amplifier board don't get pinched.

25. Final Check and Clock/Calandar

Turn the power on, check that the oscilloscope operates normally. Enter the Utility, Time/Date menu. Adjust for proper values. Turn the oscilloscope off.

Part 4
Maintenance

Maintenance

This section of the manual contains information for performing preventive maintenance, and corrective maintenance for the 11301 Programmable Oscilloscopes.

Preventive Maintenance

Preventive maintenance, performed regularly, can prevent instrument breakdown and may improve the reliability of the instrument. The severity of the environment to which the instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding electrical adjustment of the instrument.

Cabinet Panel Removal

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 power before cleaning the instrument or replacing parts.

The top and bottom cabinet panels (or covers) provide protection from operating potentials present within the instrument. In addition, they reduce radiation of electromagnetic interference from the instrument. Screws retain the cabinet panels. To remove the panels, remove the screws and lift the panels off. Operate the instrument with the panels in place to protect the interior from dust.

Cleaning

The 11302 should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket and prevents efficient heat dissipation. It also provides an electrical conduction path which may result in instrument failure. The side panels reduce the amount of dust reaching the interior of the instrument. Operation without the panels in place necessitates more frequent cleaning.

CAUTION

Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Exercise care when cleaning Hypcon connectors; see cleaning instructions under Hypcon Connectors in this section. Use a nonresidue type of cleaner, preferably isopropyl alcohol or totally denatured ethyl alcohol. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

Exterior

Loose dust accumulated on the outside of the instrument can be removed with a soft cloth or small brush. The brush is also useful for dislodging dirt on and around the front-panel controls. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Do not use abrasive cleaners.

Crt

Clean the crt faceplate with a soft, lint-free cloth dampened with denatured alcohol.

Interior

Cleaning the interior of the instrument should seldom be necessary. The best way to clean the interior is to blow off the accumulated dust with dry, low-velocity air (approximately 5 lb/in^2). 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, or for cleaning more delicate circuit components.

CAUTION

Circuit boards and components must be dry before applying power to prevent damage from electrical arcing.

The high-voltage circuits should receive special attention. Excessive dirt in this area may cause high-voltage arcing and result in improper instrument operation.

Visual Inspection

The 11401/11402 should be inspected occasionally for such defects as broken connections, improperly seated semiconductors, damaged or improperly installed circuit boards and heat-damaged parts. The corrective procedure for most visible defects is obvious; however, particular care must be taken if heat-damaged parts are found. Overheating usually indicates other trouble in the instrument; therefore, correcting the cause of overheating is important to prevent recurrance of the damage.

Semiconductor Checks

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

Periodic Electrical Adjustment

To ensure accurate measurements, check the electrical adjustment of this instrument after each 2000 hours of operation, or every 24 months if used infrequently. In addition, replacement of components may necessitate adjustment of the affected circuits. Complete adjustment instructions are given in Table 2-3, "Adjustments Requird after Circuit Board or Module Replacement", at the end of this section.

Corrective Maintenance

Corrective maintenance consists of component replacement and instrument repair. Special techniques required to replace components in the **11301 Oscilloscope mainframe** are given here.

Power Supply Voltage Hazard

If you must work inside the power supply with power applied, do **not** touch any metal part on the A2A1 Line Inverter Board. The metal frame of the power supply chassis itself should be safe to touch. However, a live circuit **could** short to the chassis, under certain conditions, and then the chassis would be dangerous to handle.

WARNING

All metal components, including any metal-faced ones, on the A2A1 Line Inverter Board should be considered hazardous. *This is because these components are at the AC line voltage potential.*

Always remove the line power cord before any disassembly.

An electric-shock hazard exists when the 11301 is not grounded. Do not remove the ground wire (green-yellow) which connects the power supply chassis to the mainframe.

Manually discharge the line storage capacitors on the A2A1 Line Inverter Board before beginning any work inside the power supply. *See the "Access to Components in the Power Supply" procedure, in this section.*

Selected Components Criteria Table

The A12 Vertical Board has L320, a selected component. Its part number is 108-0577-00. The part numbers of the components to replace it are 108-0578-00 or 108-0997-00. No other circuit boards in the 11301 have selected components.

Obtaining Replacement Parts

All electrical and mechanical part replacements for the 11301 can be obtained through your Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before purchasing or ordering replacement parts, check the parts list for value, tolerance, rating and description.

NOTE

When selecting replacement parts, remember that the size and shape of a component may affect its performance in the instrument. All replacement parts should be direct replacements unless you know a different component will not adversely affect instrument performance.

Special Parts

Some parts are manufactured or selected by Tektronix, Inc., to satisfy particular requirements. Some are manufactured for Tektronix, Inc., to satisfy our specifications. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. To determine the manufacturer of parts, refer to the Parts List, Cross Index Mfr. Code Number to Manufacturer (see Volume III, Diagrams and Parts Lists).

Ordering Parts

When ordering replacement parts from Tektronix, Inc., include the following information:

1. Instrument type.
2. Instrument serial number.
3. A description of the part (if electrical, include circuit number).
4. Tektronix Part Number.

Component Color Coding

This instrument contains composition resistors, metal-film resistors, and wire-wound resistors. The resistance values of wire-wound resistors are usually printed on the component body. The resistance values of composition resistors and metal-film resistors are color coded on the components, using the EIA color code (some metal-film resistors may have the value printed on the body). The color code is read starting with the stripe nearest the end of the resistor. Composition resistors have four stripes, which consist of two significant figures, a multiplier, and a tolerance value (see Fig. 6107-200).

Metal-film resistors have five stripes consisting of three significant figures, a multiplier, and a tolerance value.

The values of common disc capacitors and small electrolytics are marked on the side of the component body.

The cathode end of glass-encased diodes is indicated by a stripe, a series of stripes, or a dot. The cathode and anode ends of metal-encased diodes can be identified by the diode symbol marked on the body.

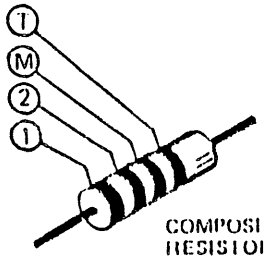
Figure 6107-200. Color code for resistors.

Static-Sensitive Device Classification

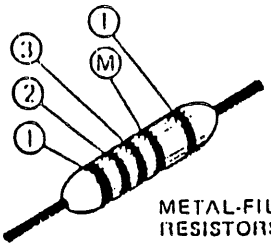
CAUTION

Static discharge can damage any semiconductor component in this instrument.

COLOR CODE



COMPOSITION RESISTORS



METAL-FILM RESISTORS

① ② and ③ - 1ST, 2ND, AND 3RD SIGNIFICANT FIGS.
Ⓜ - MULTIPLIER Ⓣ - TOLERANCE;

COLOR	SIGNIFICANT FIGURES	RESISTORS	
		MULTIPLIER (OHMS)	TOLERANCE
BLACK	0	1	---
BROWN	1	10	±1%
RED	2	10^2 or 100	±2%
ORANGE	3	10^3 or 1 K	±3%
YELLOW	4	10^4 or 10K	±4%
GREEN	5	10^5 or 100 K	±1/2%
BLUE	6	10^6 or 1 M	±1/4%
VIOLET	7	---	±1/10%
GRAY	8	---	---
WHITE	9	---	---
GOLD	---	10^{-1} or 0.1	±5%
SILVER	---	10^{-2} or 0.01	±10%
NONE	---	---	±20%

Figure 6107-200. Color code for resistors.

This instrument contains electrical components that are susceptible to damage from static discharge. See Table 2-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 ikV are common in unprotected environments.

TABLE 2-1
Relative Susceptibility to Damage from Static Discharge

Semiconductor Classes	Relative Susceptibility Levels[1]
MOS or CMOS microcircuits, and discrete or linear microcircuits with MOS inputs (most sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFETs	6
Linear Microcircuits	7
Low-power Schottky TTL	8
TTL (least sensitive)	9

[1]Voltage equivalent for levels.
1 = 100 to 500 V
2 = 200 to 500 V
3 = 250 V
4 = 500 V
5 = 400 to 600 V
6 = 600 to 800 V
7 = 400 to 1000 V (est.)
8 = 900 V
9 = 1200 V

(Voltage discharged from a 100 pF capacitor through a resistance of 100 ohms.)

Observe the following precautions to avoid damage:

1. Mimimize handling of static-sensitive components.

2. Transport and store static-sensitive components or assemblies in their original containers on a metal rail, or conductive foam. Label any package that contains static-sensitive assemblies or components.

3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static free work station by qualified service personnel. We recommend use of the Static Control Mat, Tektronix Part 006-3414-00, and Wrist Strap, Tektronix Part 006-3415-00.

4. Allow nothing capable of generating or holding a static charge on the work station surface.

5. Keep the component leads shorted together whenever possible.

6. Pick up components by the body, never by the leads.

7. Do not slide the components over any surface.

8. Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.

9. Use a soldering iron that is connected to earth ground.

10. Use only special antistatic suction type desoldering tools.

Soldering Techniques

WARNING

To avoid electric-shock hazard and instrument damage, disconnect the instrument from its power source before soldering.

The reliability and accuracy of the 11301 can be maintained only if proper soldering techniques are used when repairing or replacing parts.

The desoldering and removal of parts is especially critical and should be done only with an anti-static vacuum solder extractor; preferably one approved by a Tektronix, Inc., Service Center.

Use wire solder with rosin core, 63% tin, 37% lead. Contact your local Tektronix, Inc., representative or field office for approved solders.

All circuit boards used in the 11301 are multi-layer, with the exception of the A15 Counter/Timer Option Board. Conductive paths between the top and bottom layers may connect with one or any number of inner layers. If this inner conductive path is broken (due mainly to poor soldering practices), the board is unusable and must be replaced. **Damage can void warranty.**

CAUTION

Only an experienced maintenance person, proficient in the use of vacuum-type desoldering equipment, should attempt repair of any board in this instrument.

When soldering on circuit boards or small wiring, use only a 15-watt pencil type soldering iron. A higher wattage soldering iron can cause the etched circuit wiring to separate from the board base material. It can also melt the insulation from small wiring. Always keep the soldering-iron tip properly tinned to ensure the best heat transfer to the solder joint. Apply only enough heat to make a good solder joint. To protect heat-sensitive components, hold the component lead with a pair of long-nose pliers between the component body and the solder joint.

The following technique should be used to replace components on the circuit boards.

Touch the tip of the **vacuum desoldering tool** directly to the solder to be removed.

CAUTION

Excessive heat can cause the etched circuit wiring to separate from the board base material.

Excessive heat can cause the etched circuit wiring to separate from the board base material.

Never allow the solder extractor to remain on the board for more than three (3) seconds. Solder wick, spring-actuated or squeeze-bulb solder suckers, and heat blocks for multi-pin components must not be used. **Damage can void warranty.**

NOTE

Machine insertion of some components places a bend in both of the leads. These bent leads hold the component in position during a flow-solder manufacturing process which solders all of the components at once. ***Some components are difficult to remove due to their bent lead.*** *To make removal of machine-inserted components easier, first remove the solder from the joint. Then straighten the leads of the components on the back of the circuit board, using a small screwdriver or pliers. Next remove the component.*

When removing multi-pin components, do not heat adjacent conductors consecutively (see Fig. 6107-201). Pause a moment to allow the circuit board to cool before proceeding to the next pin.

Figure 6107-201. Recommended IC desoldering sequence.

Bend the leads of the replacement components to fit the holes in the circuit board. Insert the leads into the holes in the board, or as originally positioned.

Touch the iron to the connection and apply enough solder to make a firm solder joint.

Cut off any excess lead protruding through the board.

Clean the areas around the solder connection with a flux-removing solvent. Be careful not to remove the information printed on the circuit board.

CAUTION

Before cleaning around HYPCON connectors, read the instructions about them. See the "Semiconductors" procedure, in this section.

TABLE 2-2
Reference for Support Items

Purpose	Item	Qty. Req.	Location
Circuit Board Removal Tools	Straight-slot screwdriver, large	1	Removing and Replacing Parts, Circuit Boards
	Torx screwdriver, No.7	1	
	Torx screwdriver, No.8	1	
	Torx screwdriver, No.10	1	
	Torx screwdriver, No.15	1	

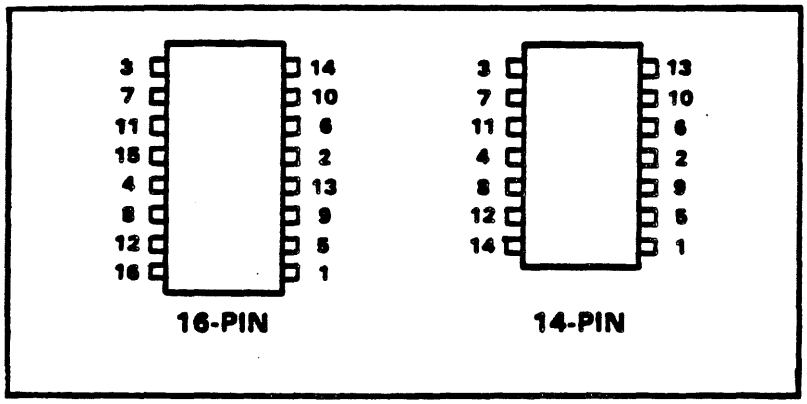


Figure 6107-201. Recommended IC desoldering sequence.

	Nutdriver, 7/16"	1	
	Pliers, needle-nose	1	
	Pliers, diagonal side-cutters	1	
	Soldering iron, 15W	1	
	Vacuum solder extractor, anti-static	1	
	Torque wrench, 0-10 inch pound range	1	
	Resistor, shorting	1	
Optional Tools	Flashlight, penlight size	1	Removing and Replacing Parts, Circuit Boards

Removing and Replacing Parts

WARNING

To avoid electric-shock hazard and instrument damage, always disconnect the instrument from its power source before removing or replacing components or plug-in units.

The exploded-view drawings associated with the Replaceable Mechanical Parts List (see Section 12 of Volume III, Diagrams and Parts Lists) may be helpful in the removal or disassembly of individual components or subassemblies.

The top and/or bottom cover will need to be removed for most repairs. Use a (nickel) coin or a straight-slot screwdriver with a large size tip to loosen the fasteners. Rotating the fasteners a quarter turn counter-clockwise will loosen them. These covers fit tightly around the chassis and sometimes will stick. They may have to be pried off.

A small cover fits over the access hole on the side of the plug in compartment. This access hole is for positioning wire cables inside the mainframe. A torx screw secures this cover.

Whenever a specific area is mentioned (such as the right side), it will usually be in reference to the front of the 11301. If another reference is intended, it will be so described, such as the left side as facing the rear.

NOTE

Refer to the "Adjustment After Repair" procedure, at the end of this section.

A2 Power Supply Removal

The power supply can be slid out of the rear of the 11301 for maintenance and troubleshooting. It may also be removed to gain better access to the A1 Plug-In Interface Board, the A2A1 Line Inverter Board, the A2A2 Control Rectifier Board or the A4 Regulator Board.

To remove the power supply from the mainframe, proceed as follows:

- Turn the mainframe on its left side (as facing the rear panel). The power supply will now be at the bottom of the instrument.

- Remove the eight Torx screws that secure the power supply (see Fig. 6107-202).

Figure 6107-202. Rear panel location of screws that secure the A2 Power Supply.

- Carefully pull the power supply part way out of the mainframe. Stop before the wires to the A2A2 Control Rectifier Board connectors begin to stretch taut or bind.

CAUTION

Excessive pulling on the power supply beyond this point may damage connector pins.

- The wires should be long enough to permit the power supply to be partially removed from the mainframe without disconnecting any wire connectors.

NOTE

Should disconnecting any wires be necessary, record their location. This will help you to replace them correctly. See Figure 6107-203.

Figure 6107-203. Bottom view of A2A2 Control Rectifier Board showing connector locations.

- Do not remove the chassis ground (green-yellow) wire. It should stay attached between the power supply and the mainframe.

The power supply may now be removed from the mainframe. First remove the wire connectors from their pins on the A2A2 Control Rectifier Board. Depending on the repair work to be done, it may be appropriate to set both the detached power supply and the mainframe right side up.

- To apply power, attach the A.C. power cord to the power plug receptacle.

NOTE

The fan will revolve slightly slower than normal when the instrument is connected this way.

This connection will allow troubleshooting the power supply and/or power-related problems in the mainframe.

NOTE

Before removing any of the power supply covers, read the warnings in the "Access to Components in the Power Supply" procedure of this section.

To replace the power supply, follow the previous procedure in reverse order.

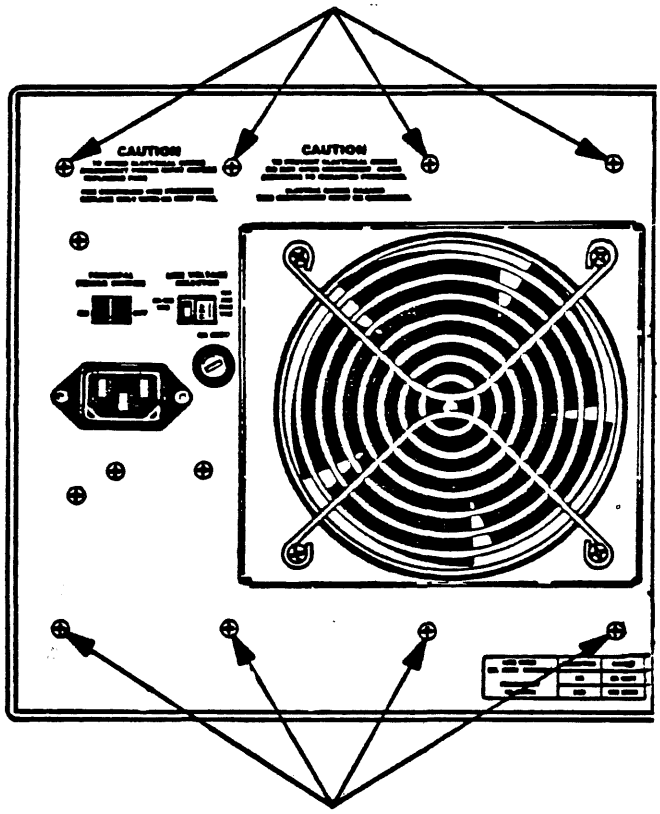


Figure 6107-202. Rear panel location of screws that secure the A2 Power Supply.

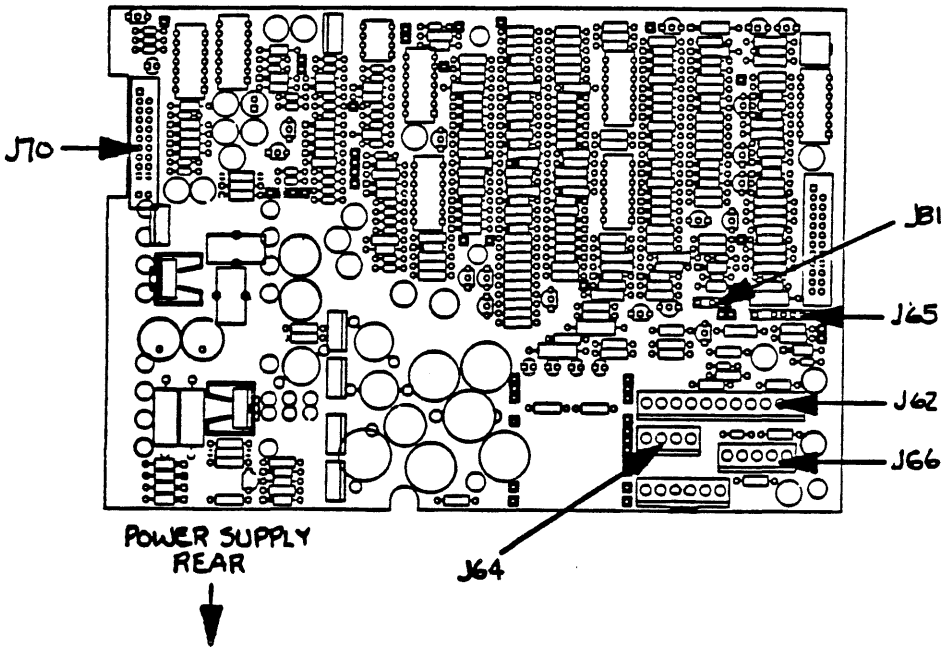


Figure 6107-203. Bottom view of A2A2 Control Rectifier Board showing connector locations.

NOTE

Check that the plastic cable protector along the left rear side (facing the rear) is out of the way. It should lie flat against the side. There is a hole near its rounded point (towards the rear) that fits over a pem nut. Align this hole before reinstalling the power supply.

Align the metal guides on the top of the power supply with the plastic grooves inside the upper part of the opening in the mainframe.

Be careful not to pinch any wires or interconnecting cables while reinstalling the power supply.

Replace the eight torx screws into the rear plate and tighten them securely.

Access to Components in the A2 Power Supply

To reach the components inside the power supply chassis for maintenance or repair, use the following procedure:

WARNING

Disconnect the 11301 from the power source. ***Allow the line storage capacitors to discharge before removing any cover from the power supply.*** *Unless they are manually discharged, these capacitors remain charged with a high dc voltage for several minutes after the line power is disconnected.* ***A warning-indicator (neon bulb) located on the A2A1 Line Inverter Board flashes when this stored voltage exceeds about 80 volts. Do not remove the power supply covers while this light is flashing.***

1. Remove the power supply as previously described.
   a. Disconnect the A.C. power cord before proceeding.
2. To reach the A2A1 Line Inverter board, first remove the protective cover from the power supply chassis. This is done by removing the four screws securing the cover.
   a. Carefully slide the protective cover off the power supply chassis.
   b. The A2A1 Line Inverter Board is now accessible for maintenance or repair. However, if the 11301 is to be operated with the cover removed, heed this:

WARNING

All metal components on the A2A1 Line Inverter Board should be considered hazardous.

Such components remain at the AC line voltage potential.

Once the power cord has been disconnected, manually discharge the line storage capacitors. *See Figure 6107-206.*

c. Before starting maintenance or taking resistance measurements, manually discharge the line storage capacitors (C200, C220, C310 and C320) as follows:

- Remove the protective cover as previously described.
- Locate the line storage capacitors on the A2A1 Line Inverter Board. Place a 100-200Ω, 400 volt, 1-watt insulated resistor in parallel with A2A1 R220 (470 kΩ) to discharge these capacitors, see Figure 6107-206. Glue a plastic rod to this resistor for safety.

Figure 6107-206. Manually discharging the line storage capacitors on the A2A1 Line Inverter Board.

3. To replace the power supply protective cover, follow the removal procedure in reverse order.

4. To reach the line voltage circuitry (Principal Power Switch, Line Voltage Selector, fuseholder, etc.), proceed as follows:

   a. Remove the two long screws from the right side of the fan housing (as facing the rear panel).

   b. Remove the screw above and left of the Principal Power Switch. Then remove the screw below and left of the power plug receptacle (the one closest to the left edge).

   c. Follow step 3 of the A2A1 Line Inverter Board Removal procedure, in this section.

      - Remove the overall cover from the power supply by lifting it off.

   d. To replace the overall cover, follow the removal procedure in reverse order.

5. Complete access to the A2A2 Control Rectifier Board or to the A2A1 Line Inverter Board may be obtained by following the procedures to remove these boards. See "Circuit Board Removal" in this section.

6. Replace the power supply as previously described.

NOTE

Check that no wires contact the fan blades.

Fan Motor Removal

Remove and replace the fan motor as follows:

1. Mark the top of the fan motor housing. (It reassembles only one way). Remove the four screws holding the assembly together.

   a. Hold the housing as the last screws are removed.

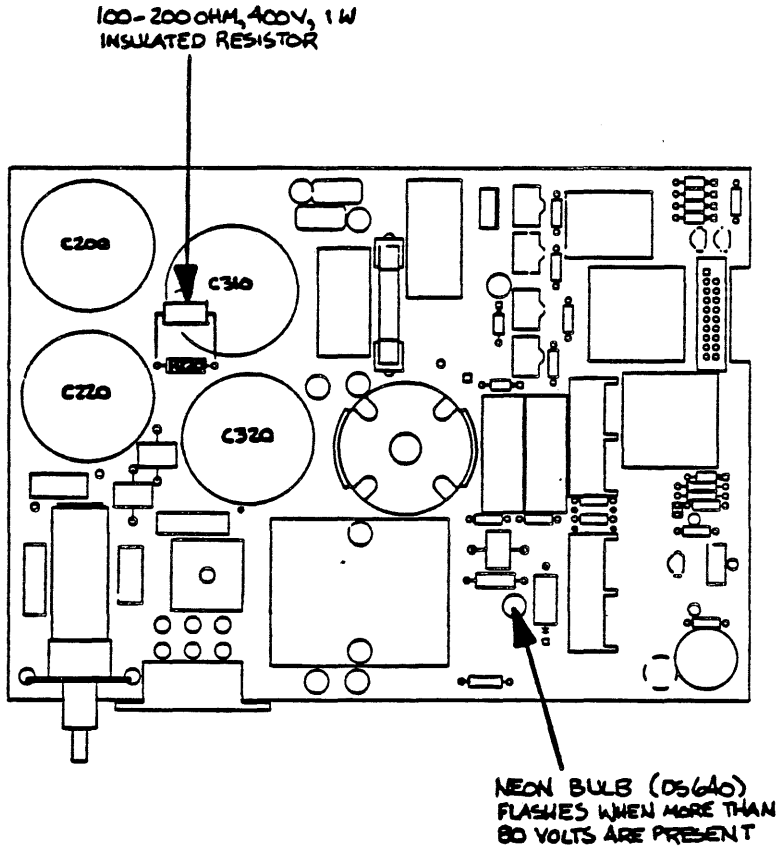


Figure 6107-206. Manually discharging the line storage capacitors on the A2A1 Line Inverter Board.

2. Separate the grill and the housing from the motor.

3. Remove the two wires at their motor connections.

   a. Note that the red wire is (+) and the brown wire is (–).

4. Remove the fan motor.

NOTE

Observe the position in which the motor was mounted. Replace it the same way, or the fan wires may not reach.

5. To replace the fan motor, follow the removal procedure in reverse order.

   a. Do not pinch the wires under the fan housing.

   b. Tighten screws securely. Erase the mark from the top of the housing.

   c. Check that no wires contact the fan blades.

Cathode-Ray Tube Removal

Remove the cathode-ray tube as follows:

WARNING

The crt may retain a dangerous (20 kV) charge. Before removing the crt, the anode must be fully discharged. Short the anode lead to the chassis. Wait approximately ten minutes and again firmly short this lead to the chassis. Then, remove the crt.

Use care when handling. Breakage of the crt causes a high-velocity scattering of glass fragments (implosion). Protective clothing and safety glasses should be worn. Avoid striking the crt on any object which might cause it to crack or implode.

When storing a crt, place it in a protective carton. Otherwise, set it face down in a protected location. Be certain it is on a smooth surface with a soft mat under the crt faceplate.

1. **Position the 11301 with its right side down, as facing the front.** Remove its top and bottom covers. Remove the access hole cover from the inner side of the plug in compartment.

2. Remove the six screws from the rear panel plate. Allow the plate to hang from its wires.

   a. Protect the surfaces underneath the plate from scratches.

3. Loosen the four screws (do not remove) on the crt rear retaining ring.

   a. Remove the clear plastic protective cover from over the left rear corner of the A13 Scope Logic Board. See Figure 6107-227.

Figure 6107-209. Rear view of crt base-pin socket and inside view of rear panel.

b. Remove the J53 connector from the latter area.

4. Open the clasp on the cable retainer which holds the J53 cable, the anode lead, and the crt base-pin socket cables.

   a. Remove the J53 cable and the anode lead from the cable retainer.

   b. Remove the anode lead from its keyhole recess. The recess is part of the crt support just below the crt base-pin socket.

WARNING

The crt anode voltage is 20kV. Ground the anode to the chassis to discharge any stored charge remaining in the crt.

Wait ten minutes and ground the anode lead again.

5. Disconnect the anode lead from its holder. Ground the anode to the chassis, as in the preceding instructions.

6. Disconnect the crt base-pin socket. Install a protective cap over the pins.

7. Remove the A7 Touch Panel Board, which retains the crt. Refer to "Circuit Board Removal" procedures in this section.

   a. **Leave the A5A5 Bottom Front Panel Board and the encoder knobs attached when removing the Touch Panel Board.**

8. Disconnect all six crt neck pin leads from the crt. Use care to avoid damaging the neck pins.

   a. Two leads connect to the A12 Vertical Board.

   b. Two leads connect to the passive network (crt termination res.).

   c. Two leads connect to the A14 Time Base Board.

9. Remove the crt by sliding it slowly through the front. Check that the anode lead and the J53 cable are trailing the crt.

   a. Guide the base-pin socket as far outward as possible.

   b. Pull the anode lead and the J53 cable through the grommet inside the crt shield.

NOTE

The rubber pads in the front casting (at the corners of the crt faceplate) may fall out. Reinstall them if necessary.

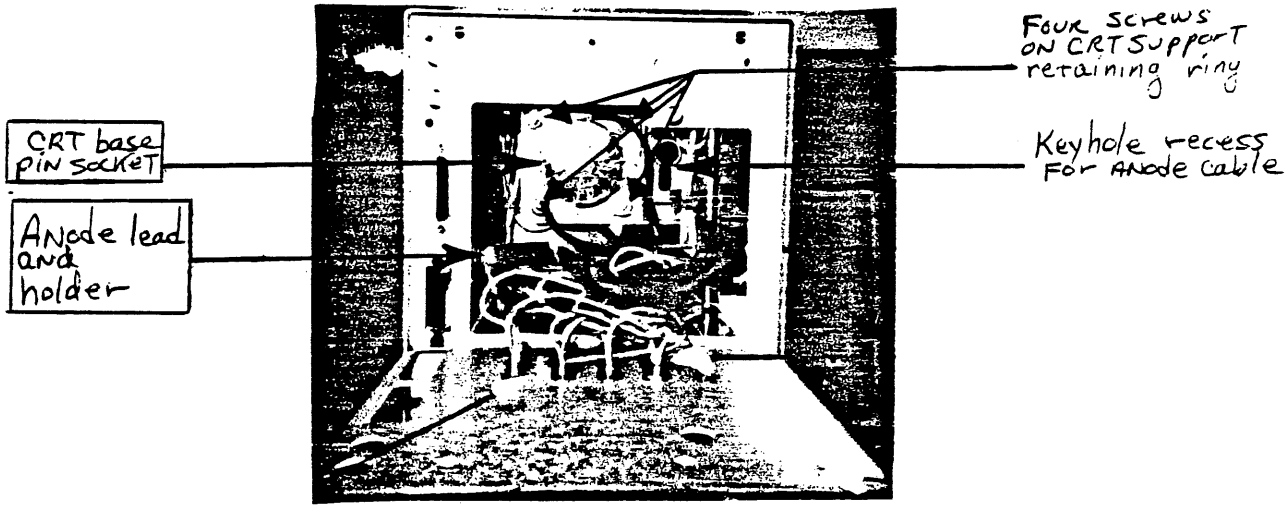


Figure 6107-209. Rear view of the crt base-pin socket and inside view of rear panel.

Cathode-Ray Tube Replacement

NOTE

Before replacing the crt, check that the grid scale numbers are on the left and the "Tek" logo is on the right of the faceplate.

Replace the cathode-ray tube as follows:

1. Route the anode lead and the J53 cable through the grommet (at the bottom inside right of the crt shield). Push the crt into place while routing the cables.

NOTE

Pull the cables through the rear of the 11301 so that they do not tangle inside the crt shield.

The base-pin socket may need to be moved around to insert the crt base into the retaining ring.

2. Reinstall the Touch Panel. Use the procedure to replace the A7 Touch Panel Board, in the Circuit Board Removal section.

CAUTION

Tighten the Crt Scale Cover screws only with a diagonal method. DO NOT TIGHTEN IN A CLOCKWISE DIRECTION. The latter will damage the corner of the crt faceplate.

For instructions on this diagonal method, read the "CAUTION" notice listed at the end of the A7 Touch Panel Board Removal (and Replacement) procedure, in this section.

NOTE

Check that the implosion shield and the lens frame are correctly seated.

Position the instrument on its right side, as facing the front.

3. Reconnect all six crt neck pin leads. Do not bend the neck pins.

4. Tighten the four screws around the crt rear retaining ring.

   a. Remove the protective cap and reinstall the crt base-pin socket.

   b. Reinstall the anode lead and the J53 cable into the cable retainer. Close the retainer's clasp.

5. Route the J53 cable through the middle grommet. Dress the J53 cable along the edge of the A13 Scope Logic Board.

a. Reconnect the J53 connector to the Scope Logic Board.

b. Reinstall the clear plastic protective cover.

6. Before reconnecting the anode lead, read this:

CAUTION

The anode lead may require greasing before it is reconnected. *The reason for applying grease is to prevent the anode lead from sticking inside its holder.*

The rule of thumb is:

- *If both the crt and the multiplier assembly have been replaced, apply the grease.*
- *If only one or the other part is replaced, grease should not be necessary.*

If the anode lead should stick inside the holder, the lead can be removed. However, doing so will be difficult and may prove hazardous.

To remove a stuck anode lead, *proceed as follows:*

Allow sufficient time to elapse for the 20kV anode charge to bleed off. *Then, using the thumb and fingertips, slowly work the end of the holder from the lead.*

WARNING

This process can be dangerous if a charge still remains on the anode. *By removing the lead a portion at a time, it could suddenly emerge without warning and become hazardous to your health!*

a. If grease is required, **use General Electric's "Silicone Lubricating Grease".** The Tektronix Part Number for this grease is 006-6949-00.

b. Grease the anode lead lightly.

c. Reconnect the anode lead to its holder.

7. Put the anode lead and holder into the keyhole-shaped recess. See Figure 6107-209. (The anode lead and holder fit into the round hole while the cable fits into the slot alongside it.)

8. Check that all cables are placed inside the grommets.

a. Check that all peltola connectors (inside the rear panel plate) are connected to their BNC sockets.

9. Replace the rear panel plate. Reinstall and tighten all six screws.

10. Reinstall the access hole cover on the side of the plug in compartment. Secure it with a torx screw.

11. Replace the top and bottom covers.

a. Set the instrument right side up.

NOTE

Refer to the "Adjustment After Repair" procedure, at the end of this section.

Lithium Battery Handling, Disposal, and First Aid

A Lithium battery (BT1190) is mounted on the A11 Main Processor Board. See Figure 6107-225.

Removal and Handling

NOTE

Record the polarity before removing the battery.

Remove the battery by grasping it between the thumb and fingertips. Pull it from its mounting bracket.

Do not drop the battery. Short circuits or other problems can be caused by dropping.

Do not place the battery on any metal surface.

WARNING

*To avoid personal injury, observe proper procedures for handling and disposal of Lithium batteries. **Improper handling may cause fire, explosion, or severe burns.** Do not recharge, crush, disassemble, or heat the battery above 212° F (100° C), incinerate, or expose contents of the battery to water.*

Storage

When storing a battery, separate it from all conductive or metal surfaces. Do not store batteries loosely nor dump them into bins.

Store them in their original shipping container or individually wrapped in plastic.

Board Cleaning

If present, battery salts will usually appear like a white powder upon contact with a circuit board. These salts may react with one or more layers of the board material, resulting in permanent damage and/or open traces.

Clean the salts from the board immediately with a brush and water. Any boards which were in contact with battery salts (for more than a few minutes) must be thoroughly tested for possible damage.

Disposal

Dispose of the Lithium battery in accordance with local, state and federal regulations.

NOTE

Typically, small quantities (less than 20) can be safely disposed of with ordinary garbage in a sanitary landfill.

*Larger quantities must be sent by surface transport to a Hazardous Waste Disposal Facility. The batteries should be individually packaged to prevent shorting. Pack them into a sturdy container that is clearly labeled, "**Lithium Batteries —DO NOT OPEN**".*

Replacement

Check the (+) polarity on the replacement battery matches the (+) mark on the circuit board. Replace the battery by inserting it into its mounting bracket.

Emergency & First Aid Information

Manufacturer:	**Panasonic**
Battery Type:	**Lithium Poly-Carbon Monoflouride, BR 2/3 A**
Solvent: (electrolyte)	**Gama Butyrlactone** is of low toxicity. It can cause some eye and respiratory irritation. The solvent may be released during venting, according to the manufacturer.
	Venting is an outgassing of battery material. This is usually caused by overheating or by short circuiting for more than a few seconds.
Solute:	**LIBF4**

SHOULD YOU COME IN CONTACT WITH BATTERY SOLVENT

By	**Do This**
Contact with skin	Wash promptly with plenty of water.
Contact with eyes	Flush immediately with plenty of water and use an emergency eye wash, if available. Report to a medical professional for treatment.
Inhalation	Leave the area and get fresh air. Report to a medical professional for treatment.
Ingestion	Non-toxic according to laboratory testing. However, report to a medical professional for advice.

IN CASE OF VENTING, CLEAR THE IMMEDIATE AREA. Venting will usually last only a few seconds.

Circuit Board Removal

Most of the circuit boards used in the 11301 Oscilloscope are multi-layer. (The only single-layer circuit board is the Counter/Timer Option Board). Conductive paths between the top and bottom layers may connect with one or any number of inner layers. If this inner layer conductive path is broken (due mainly to poor soldering practices), the board is unusable and must be replaced. **Damage can void warranty.**

If a circuit board is damaged beyond repair, replace the entire board module. Part numbers are given in Volume III, Replaceable Electrical Parts.

Circuit board locator illustrations are shown on the pages facing each schematic diagram in that section.

All of the circuit boards in the 11301 are mounted on the chassis. Pin connectors are used for electrical interconnection with chassis-mounted components and other circuit boards.

To determine the location of a circuit board, see the exploded view in Figure 6107-211.

CAUTION

After removing a circuit board from the instrument, place it upon a non-conducting surface. *This will minimize the chance of static charge damage to the integrated circuits and/or related circuitry.*

Some parts mounted on a board must be retained for use with the new assembly. These parts might include interconnecting plugs, support posts, and some wiring.

NOTE

Refer to the Adjustment After Repair Procedure, in this section.

Figure 6107-211. Location of circuit boards in the 11301.

A1 Plug-in Interface Board

Remove and replace the A1 Plug In Interface Board as follows:

1. Set the 11301 right side up. Remove its top cover.

2. Remove the plug in units.

3. Remove the nine torx screws securing the interface connector receptacles to the chassis. See Figure 6107-212.

4. Disconnect all connectors from the A11 Main Processor Board. See Figure 6107-225. Record their index triangles and locations so that the connectors can be correctly replaced.

   a. Remove the five board-retaining torx screws.

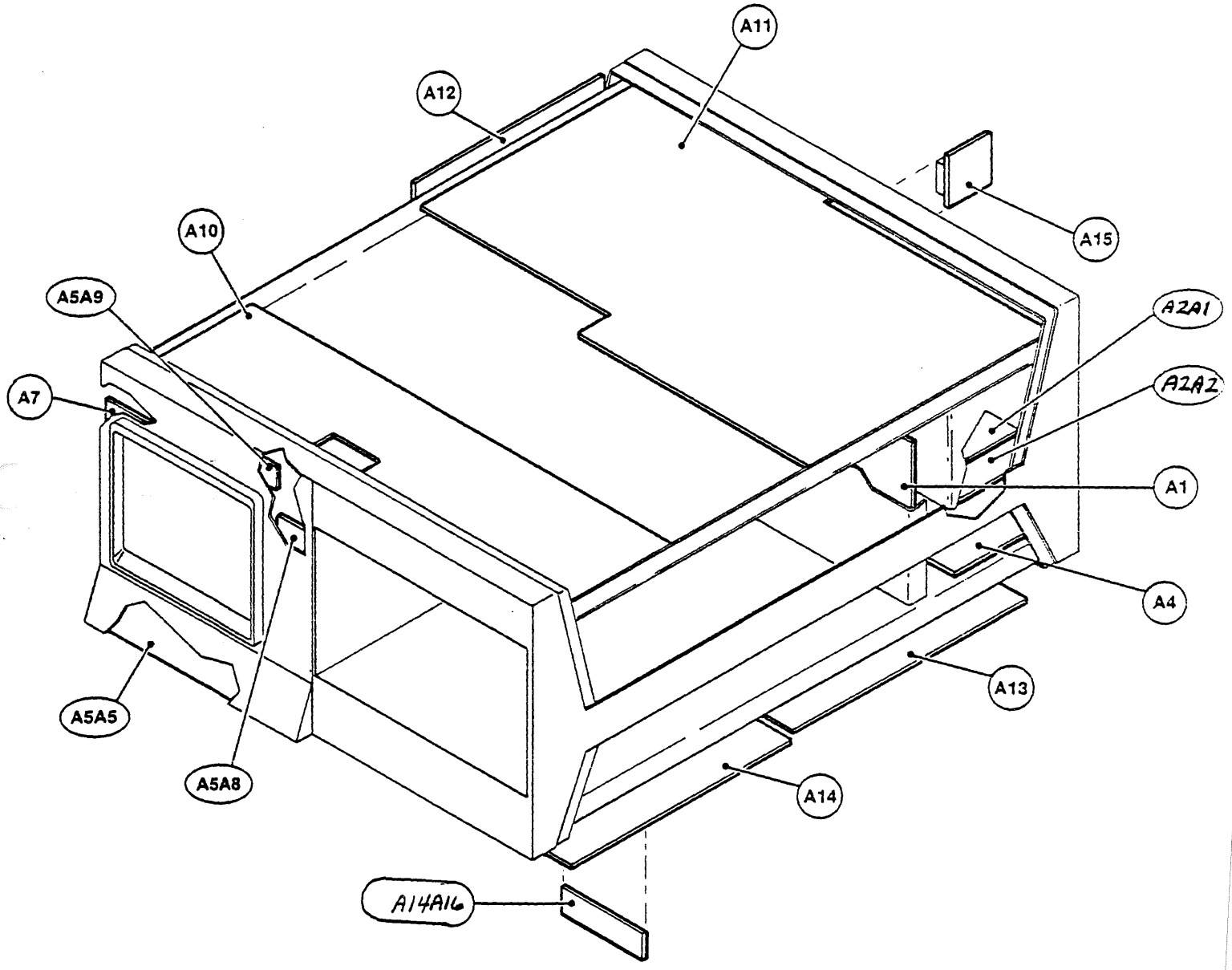


Figure 6107-211. Location of circuit boards in the 11301.

b. Remove the mounting posts from the RS-232 and GPIB connectors on the rear panel. Move the plastic cable protector flange off the right side of the chassis.

c. Gently **remove the A11 Main Processor Board** by lifting it.

NOTE

The J90 interconnecting pins from the A1 Plug In Interface Board hold the board firmly. Lift the board carefully so that neither this connector nor the Main Processor Board are damaged.

A plastic pin guide covers the Plug In Interface connector underneath the Main Processor Board. *This guide may come off when the board is removed. Replace the pin guide if it does.*

5. **Remove the Power Supply.** See the "A2 Power Supply Removal" procedure in this section.

a. Remove the connectors (except for J81) from the A2A2 Control Rectifier Board.

Figure 6107-212. Plug-in compartment showing mounting screws for the A1 Plug-In Interface Board.

NOTE

Record the locations of the connectors to replace them correctly.

6. Disconnect the J57 connector from the A4 Regulator Board. See Figure 6107-218.

NOTE

If the (optional) A15 Counter/Timer Reference Board is installed, the J40 connector needs to be removed. (See Figure 6107-218).

a. Remove the two torx screws from the metal heatsink at the rear of the board. There are holes provided in the chassis, across from these screws, to insert a screwdriver.

NOTE

The Regulator Board is now unfastened from the chassis. However, it still remains connected to the Plug In Interface Board.

b. Carefully disconnect the J95 and J96 interconnecting pins from the Plug In Interface Board by pulling the Regulator Board towards the rear.

c. **Remove the A4 Regulator Board.**

7. Position the 11301 on its right side, as facing the front. Remove the bottom cover.

8. **Disconnect the A13 Scope Logic Board,** see "Circuit Board Removal", in this section. The cables from the board to the crt do **not** need to be completely removed from the rear panel area. Allow the board to remain suspended from the chassis.

NOT AVAILABLE AT THIS TIME.

Figure 6107-212. Plug-in compartment showing mounting screws for the A1 Plug-In Interface Board.

9. The Plug In Interface Board can be removed from either side of the chassis.

NOTE

Mark each of the wire connectors so that they can be correctly replaced.

a. Cut the three plastic cable tiedowns attached to the bottom of the board. These tiedowns keep the wires separated between the connector receptacles.

b. Remove the J64 cable (from the A2A2 Control Rectifier Board) through the chassis opening beside the Plug In Interface Board. Remove the peltola connectors from the Plug In Interface Board.

c. **Remove the Plug In Interface Board.**

To replace the A1 Plug In Interface Board, follow the previous procedure in reverse order. Additional instructions follow:

1. Reconnect the peltola connectors to the board.

NOTE

Replace the three plastic cable tiedowns to the bottom of the Plug In Interface Board.

a. Return the J64 cable through the chassis opening to where the Control Rectifier Board will be installed.

b. Check that the plastic pin guides remain attached to the connectors on each side of the Plug In Interface Board.

c. Reinstall the nine torx screws when the board is replaced into the instrument. Tighten all the screws.

CAUTION

The (black) plug in guide rails (see Fig. 6107-212) must touch the chassis by the Plug In Interface Connector receptacles. If these guide rails have been removed or moved out of position, realign them against the chassis. Otherwise the plug ins may not seat fully into the connector receptacles.

The screws holding these rails are located under the A13 Scope Logic Board.

2. **To replace the A13 Scope Logic Board,** see the replacement procedure for that board in this section.

NOTE

Make certain that the plastic pin guide on P91 is in place before reinstalling the circuit board. The interconnecting pins usually align vertically. However, they may not always align horizontally. Check the pins before reinstalling the board.

3. Inspect the interconnecting pins of J95 and J96 on the A4 Regulator Board. Check that the pin tips are straight and evenly spaced.

   a. Reconnect the J57 connector to the board.

   b. **Reinstall the Regulator Board** by inserting the J95 and J96 interconnecting pins into their connectors on the A1 Plug In Interface Board.

   c. Reinstall the two torx screws to the metal heatsink at the rear of the Regulator Board. There are two holes provided in the chassis, across from these screws, to insert a screwdriver.

NOTE

If the power supply-mainframe, ground (green-yellow) wire was removed, reconnect it before the power supply reinstallation.

4. **Reinstall the Power Supply.** See the "A2 Power Supply Removal" procedure, in this section.

NOTE

The plastic (J71 cable) protector may interfere with the reinstallment of the power supply. Make certain that the cable protector is flat against the chassis. Guide the power supply across the cable protector.

   a. Replace the bottom cover on the instrument. Turn the instrument right side up.

5. Check that the plastic pin guide on the Plug In Interface Board connector is installed.

NOTE

The interconnecting pins of J90 usually align in a vertical direction. But, they may not always align horizontally. Check the pins before reinstalling the Main Processor Board.

   a. Move the flange of the cable protector out of the way. Move the J60 cable away from the chassis. Check that no wires will be pinched under the board.

   b. **Reinstall the A11 Main Processor Board.** Follow the replacement instructions given in the A11 Main Processor Board Removal procedure in this section.

6. Replace the top cover on the instrument.

A2A1 Line Inverter Board

Remove and replace the A2A1 Line Inverter Board as follows:

1. Remove the power supply. See "A2 Power Supply Removal" in this section.

2. Remove the protective cover from the power supply. See "Access to Components in the Power Supply" in this section. Follow the WARNING and steps 1 through 2a.

1. Remove the power supply. See "A2 Power Supply Removal" in this section.

2. Remove the protective cover from the power supply. See "Access to Components in the Power Supply" in this section. Follow the WARNING and steps 1 through 2a.

3. Remove the two screws that secure the Line Inverter Board. See Figure 6107-AA. Then remove the screw holding the front of the overall cover to the Line Inverter Board. Remove the two screws from the bottom of that cover.

4. Remove the two screws from the left side of the power supply rear plate, above and below the power plug receptacle. (See Figure 6107-AB.)

   a. Remove the two long screws from the right side of the fan motor housing. See Figure 6107-AB.

   b. Remove the overall cover from the power supply.

5. Remove the J70 connector from the right front edge of the Line Inverter Board. See Fig. 6107-AA. Gently separate the Line Inverter Board from the A2A2 Control Rectifier Board. The interconnecting pins of J97 and J98 hold them together.

6. Unsolder the (white) wire connecting the Line Inverter to the fuseholder, at the fuseholder.

NOTE

When removing a wire from a circuit board, always tag the wire and the corresponding connection point on the circuit board.

7. Remove the Line Inverter Board.

To replace the A2A1 Line Inverter Board, follow the removal instructions in reverse order. Match the index triangle on the pin connectors with the corresponding triangle on the board. Correct location of the pin connectors is shown in the circuit board illustrations. These are in Volume III, Diagrams and Circuit Board Illustrations.

CAUTION

Check that the circuit board is held in place by its plastic guides on both edges. These guides are mounted inside the overall power supply cover.

Figure 6107-AA. Connector locations for removal of the A2A1 Line Inverter Board.

Figure 6107-AB. Location of A2 rear panel screws securing the A2 Power Supply cover.

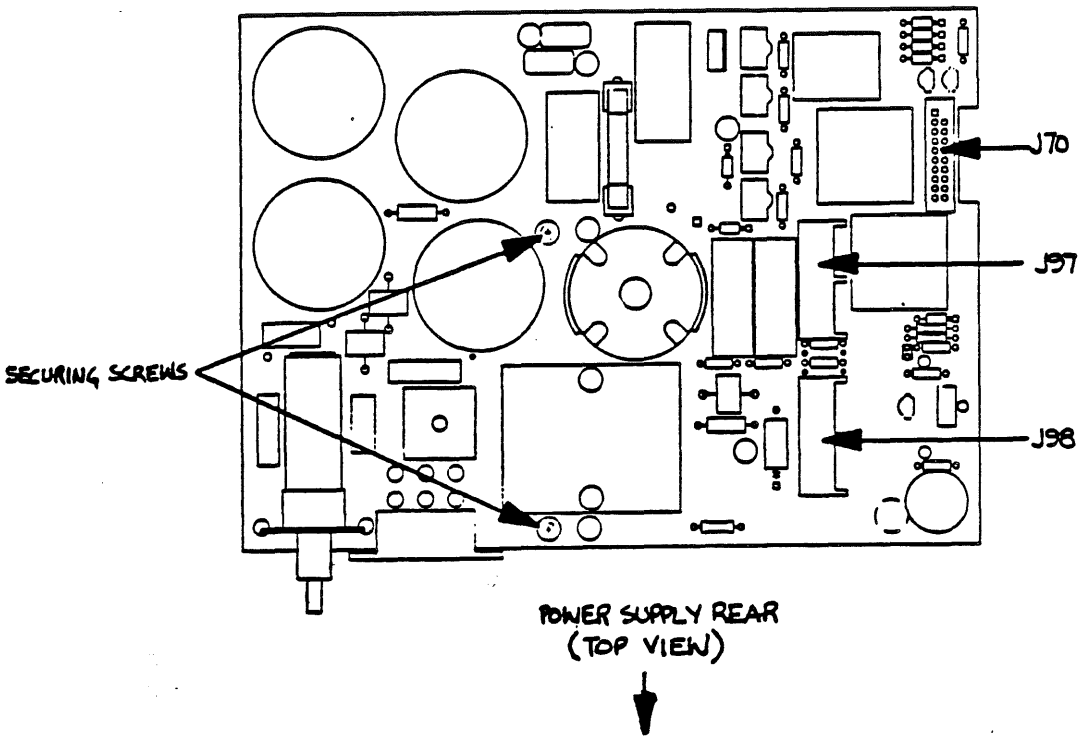


Figure 6107-AA. Connector locations for removal of the A2A1 Line Inverter Board.

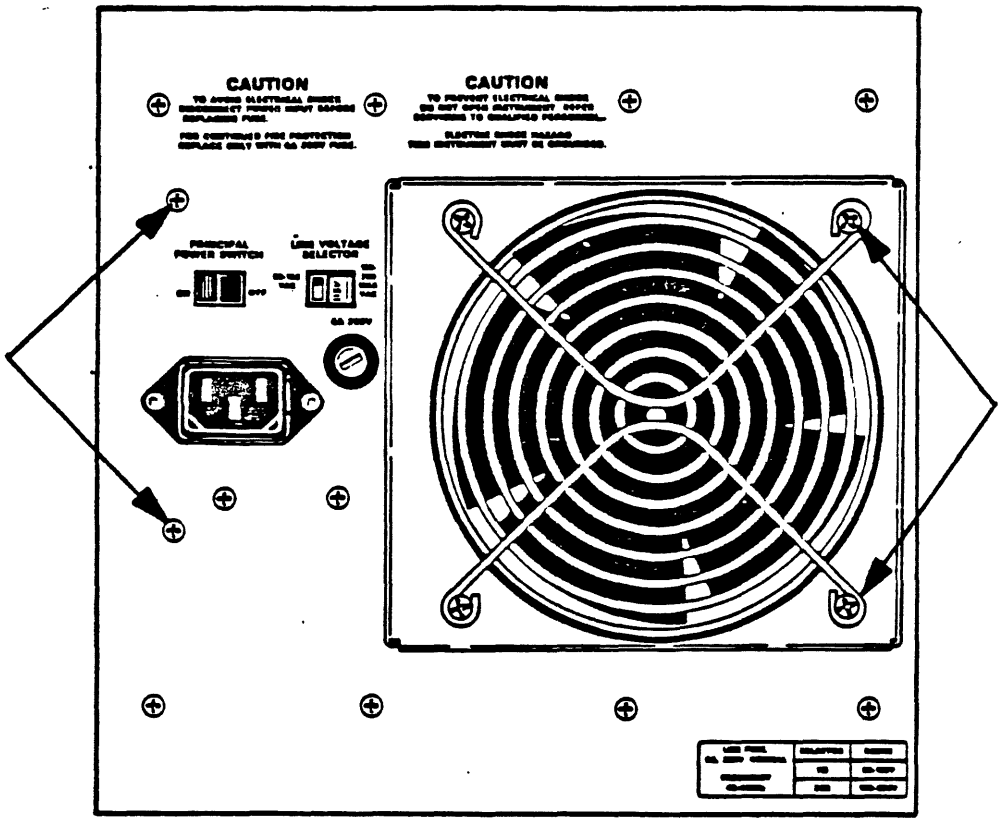


Figure 6107-AB. Location of A2 rear panel screws securing the A2 Power Supply cover.

A2A2 Control Rectifier Board

Remove and replace the A2A2 Control Rectifier Board as follows:

1. Remove the power supply. See the "A2 Power Supply Removal" in this section.

2. Remove the protective cover from the power supply. See "Access to Components in the Power Supply" in this section.

3. Follow steps 3 and 4 of the "A2A1 Line Inverter Board Removal" procedure in this section, to remove the overall cover from the power supply chassis.

4. With reference to Figure 6107-AC, remove the J70 connector at the upper front edge of the Control Rectifier Board. Remove the J81 connector to the fan motor, which is located near the lower right board area.

5. Remove the two screws below and to the right of the power plug receptacle. See Figure 6107-AD. Gently separate the Control Rectifier Board from the A2A1 Line Inverter Board. The interconnecting pins in J97 and J98 on the Line Inverter Board, are holding both boards together.

6. Remove the Control Rectifier Board.

CAUTION

The A2A1 Line Inverter Board is now unfastened. Support it so that it does not fall and become damaged.

To replace the A2A2 Control Rectifier Board, follow the removal instructions in reverse order. Match the index triangles on the pin connectors with the corresponding triangles on the board. The correct location of the pin connectors is shown in the Circuit board illustrations. See Diagrams and Circuit Board Illustrations, of Volume III.

CAUTION

Check that the circuit board is held in place by its plastic guides on both sides. These guides are mounted inside the overall power supply cover.

Figure 6107-AC. Connector locations for removal of the A2A2 Control Rectifier Board.

Figure 6107-AD. Rear panel mounting screws for the A2A2 Control Rectifier Board.

A4 Regulator Board

Remove and replace the A4 Regulator Board as follows:

1. Remove the power supply. See the "A2 Power Supply Removal" in this section.

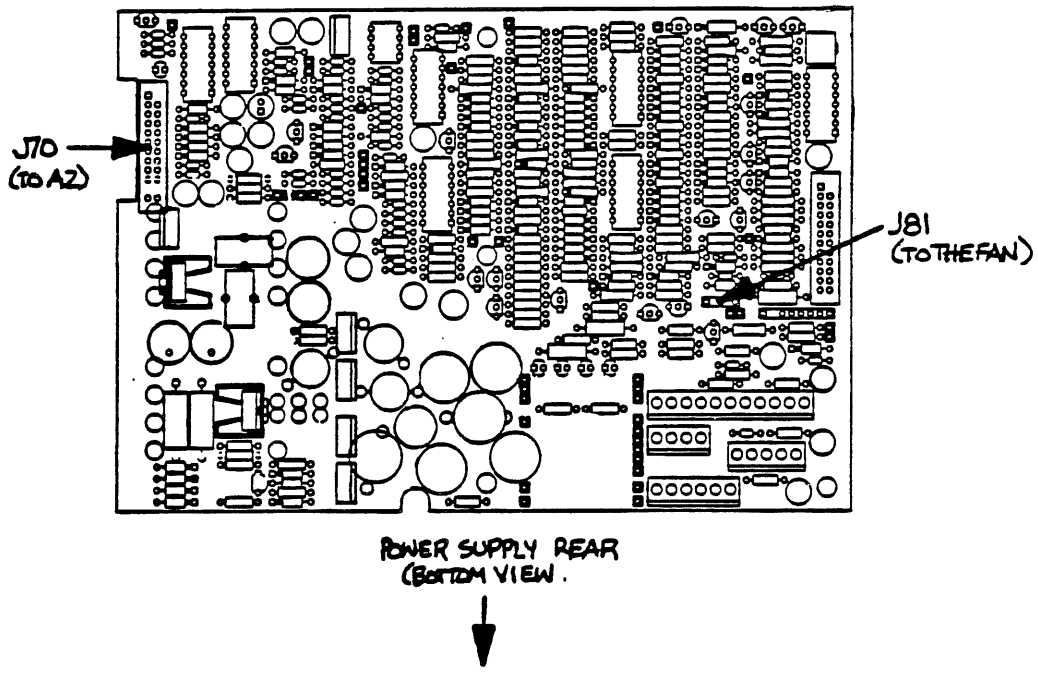


Figure 6107-AC. Connector locations for removal of the A2A2 Control Rectifier Board.

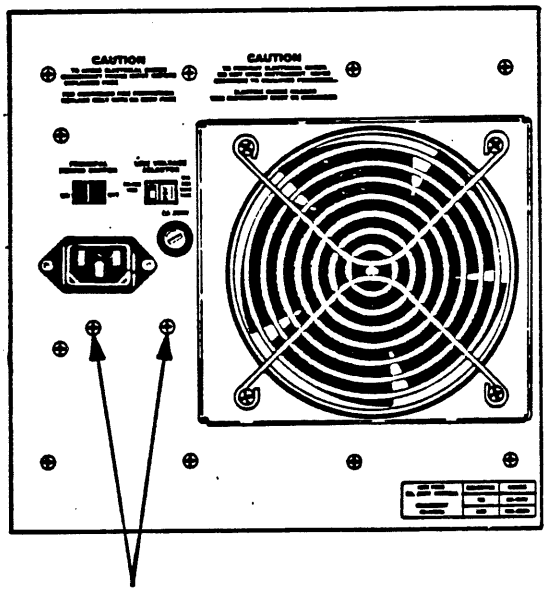


Figure 6107-AD. Rear panel mounting screws for the A2A2 Control Rectifier Board.

2. If it is on its side, set the 11301 right side up.

3. Disconnect J57 connector from the Regulator board. See Figure 6107-218. Note the index triangle locations for correct reconnection.

NOTE

If the (optional) A15 Counter/Timer Reference Board is installed, the J40 connector will need to be removed also. (See Figure 6107-218).

4. Remove the two torx screws from the metal heatsink attached to the rear of the board. See Figure 6107-218.

NOTE

The Regulator Board is now unfastened from the chassis. However, it remains connected to the A1 Plug In Interface Board through interconnecting pins.

5. Carefully disconnect pins J95 and J96 from the Plug In Interface Board by pulling the Regulator Board towards rear.

6. Remove the Regulator Board.

To replace the A4 Regulator Board, follow the removal instructions in reverse order.

CAUTION

Use care when reconnecting pins J95 and J96 to the A1 Plug In Interface Board. Should it become necessary, the A13 Scope Logic Board may be removed to view these pins through the mainframe chassis. See "A13 Scope Logic Board Removal" procedure in this section.

NOTE

Match the index triangle on the pin connectors with the corresponding triangle on the circuit board. Correct locations of the pin connectors are shown in the circuit board illustrations. See Diagrams and Circuit Board Illustrations of Volume III, Diagrams and Parts Lists.

Figure 6107-218. Connector and screw locations for the removal of the A4 Regulator Board.

A5A5 Bottom Front Panel Board

Remove the A5A5 Bottom Front Panel Board as follows:

1. Follow the procedure to remove the Front Subpanel Assembly in this section. Use steps 1 through 9.

CAUTION

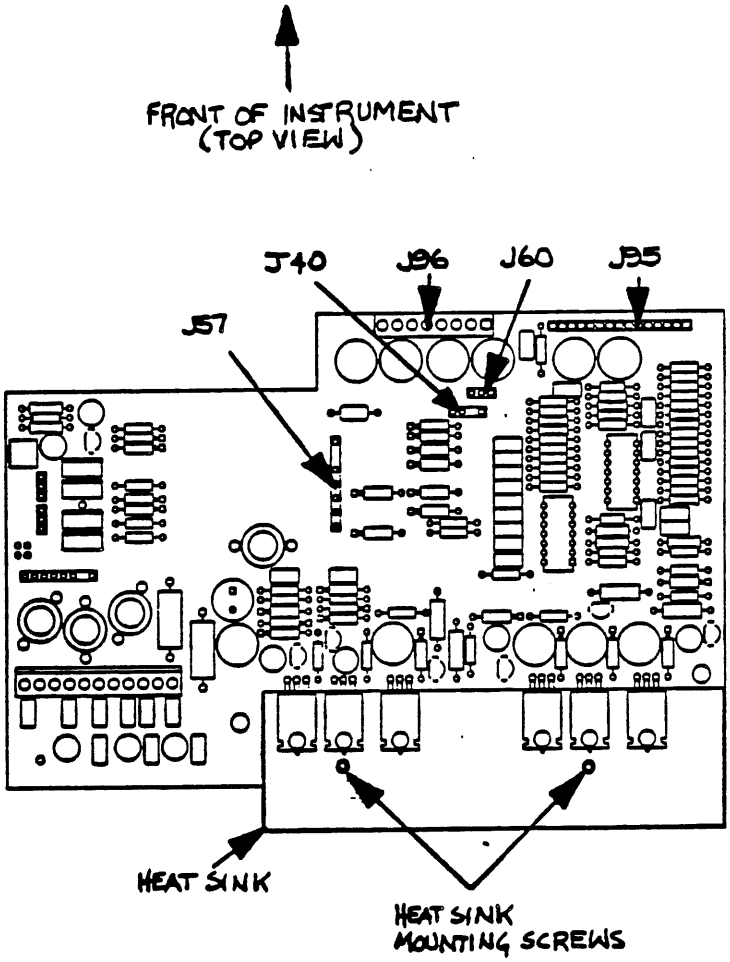


Figure 6107-218. Connector and screw locations for the removal of the A4 Regulator Board.

The light diffuser parts may fall out when the Bottom Front Panel Board is removed from the front panel. Reinstall any parts that do.

2. Lay the board flat with its pushbuttons on top. Remove the 7/16" nuts from the encoder shafts. Remove the flat washers and the (fluted) ground clips.

3. Hold the switch spacer against the board. Invert the board. Remove the A5A5 Bottom Front Panel Board from the switch spacer.

CAUTION

The pushbuttons will fall out if the switch spacer is inverted.

4. Record the location of the J73 cable's red line (#1 wire) on the circuit board.

   a. Remove connector J73. (See Fig. 6107-219.)

5. Remove the Bottom Front Panel Board.

To replace the A5A5 Bottom Front Panel Board, follow the previous procedure in reverse order.

NOTE

Check that all the light diffusers and pushbuttons are inserted into the switch spacer before reattaching the circuit board.

Should the pushbuttons not enter the Front Subpanel holes evenly, try the following remedy:

Hold the board and switch spacer against the Front Subpanel.

Stand the Front Subpanel upright so that its front is visible.

Use a tool, such as a pencil tip, to move the pushbuttons around until they enter their holes.

Figure 6107-219. Connector location for the removal of the A5A5 Bottom Front Panel Board.

A7 Touch Panel Board

Remove the A7 Touch Panel Board as follows:

1. Set the 11301 on its right side, as facing the front.

   a. Remove the top cover.

2. Follow the **removal (or replacement) procedure** for the "Front Subpanel Assembly" in this section.

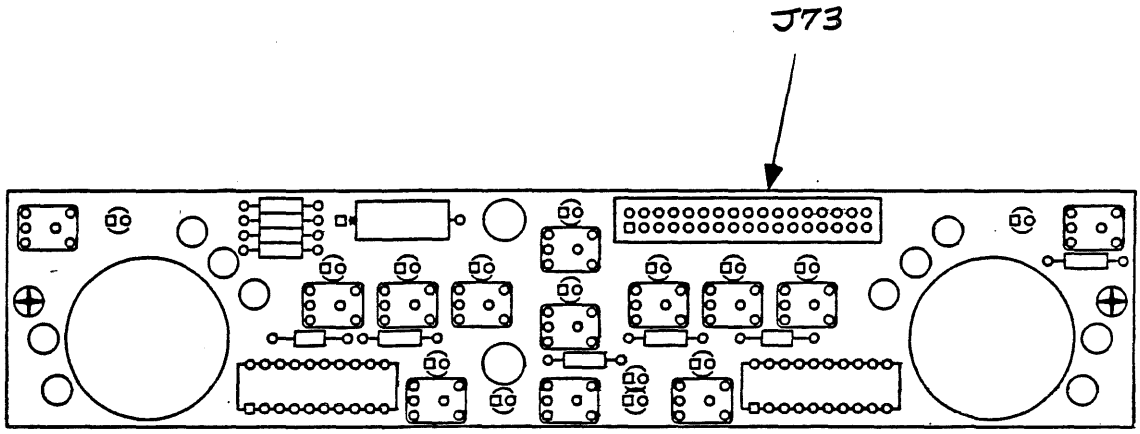


Figure 6107-219. Connector location for the removal of the A5A5 Bottom Front Panel Board.

a. **Leave the encoder knobs and the A5A5 Bottom Front Panel Board attached.**

b. Set the instrument right side up.

3. Disconnect connectors J87 and J88 from the A10 Front Panel Interface Board. See Figure 6107-224. (Start with the 1 screw and follow the arrows to 4.

a. Do not remove these cable connectors from the Touch Panel Board. The connectors are very difficult to reinstall on the latter board when it is in the instrument.

4. **Remove the four retaining screws from the crt scale cover (bezel) by using a diagonal method.** See Figure 6107-220.

CAUTION

Do not remove, nor reinstall these screws by using a clockwise method. This will damage the corners of the crt faceplate.

5. Remove the Crt Scale Cover.

NOTE

If the Crt Scale Cover is replaced because of a defect, reinstall the EMI gaskets on each side.

a. **The Crt Implosion Shield can be removed now.** See "Implosion Shield Removal" procedure in this section.

Figure 6107-220. The diagonal method to remove (and to reinstall) the retaining screws on the 11301 crt scale cover.

6. Remove the Touch Panel Board. (See Figure 6107-221.)

a. Withdraw cables J87 and J88 through the front casting.

CAUTION

The Crt Implosion Shield may be loose and could fall off. Hold it against the Touch Panel Board.

The Implosion Shield can easily be scratched. Protect it while it is removed.

NOTE

***Individual graticule bulbs can be removed and replaced.** Follow the instructions in the "Graticule Light Bulb Removal" procedure. (This procedure is located near the end of this section.)*

7. **The lens frame, the graticule light assembly and the Touch Panel make up a single part. They are ordered as such (P/N 670-8835-XX).**

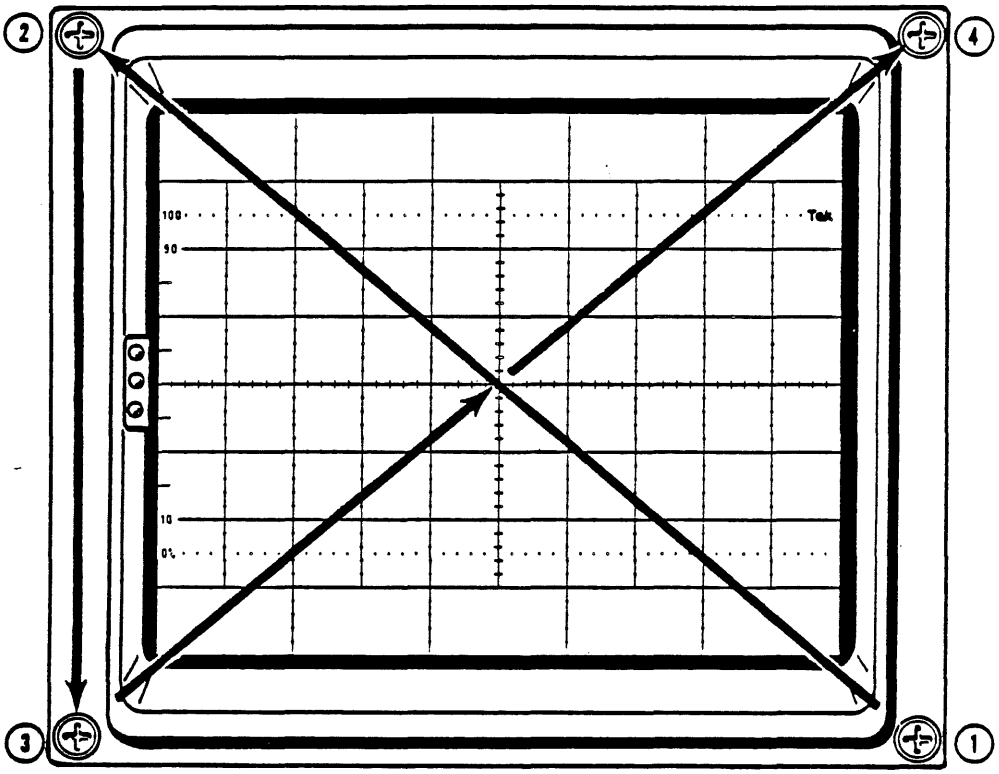


Figure 6107-220. The diagonal method to remove (and to reinstall) the retaining screws on the 11301 crt scale cover.

NOTE

The lens frame is press-fitted to the Touch Panel Board. The two can be separated, if desired.

***To remove the lens frame,** insert some thin, flat object, such as a metal rule, between the surfaces. Carefully pry the corners apart a little at a time.*

To replace the lens frame, match the notched area on its inside edge with the camera power terminal on the Touch Panel Board. Press the corner surfaces together.

Replace the A7 Touch Panel Board by following the previous procedure in reverse order. Read the following "NOTE" and "CAUTION" first.

Figure 6107-221. Connector locations for the removal of the A7 Touch Panel Board (inside view).

NOTE

Check to see that the lens frame and implosion shield are mounted correctly. They should be against the crt scale cover (bezel) and crt faceplate respectively.

CAUTION

***IMPORTANT: Reinstall the four retaining screws in the crt scale cover and tighten them diagonally.** See Figure 6107-220.*

Begin with the FIRST screw and tighten it lightly until it stops turning. Next, go diagonally across the cover to the SECOND screw. Tighten it lightly until it stops turning. Then drop down to the THIRD screw and tighten it firm. Go diagonally across the cover to the FOURTH screw. Tighten it firm.

Next, to the SECOND screw and tighten it firm. Then return to the FIRST screw and tighten it firm.

Do not use a clockwise method to tighten these crt scale cover screws. That will damage the corners of the crt faceplate. An unnecessary removal and replacement of the crt could be the result.

A5A8 Center Front Panel Board

Remove the A5A8 Center Front Panel Board as follows:

1. Use the removal procedure for the "Front Subpanel Assembly", in this section. Follow steps 1 through 7 excluding the removal of the encoder knobs in step 6.

NOTE

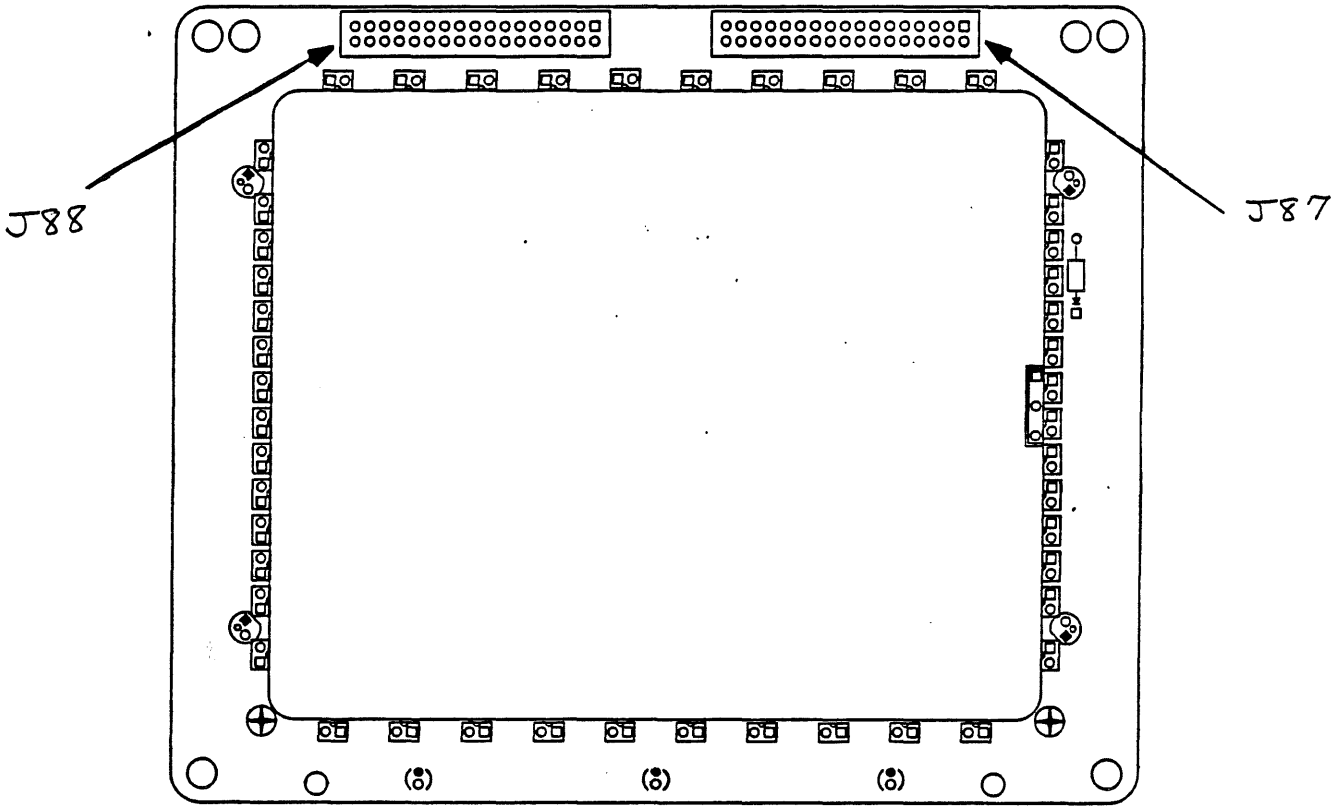


Figure 6107-221. Connector locations for the removal of the A7 Touch Panel Board (inside view).

The 11301 should be right side up and the Front Subpanel face down.

2. Remove the three torx screws from the Center Front Panel Board.

3. Hold the switch spacer against the Front Subpanel. Pull the Center Front Panel Board straight up to remove it.

NOTE

Mark the board beside the red line on cable J74 before removing its connector. This will aid reconnection. (See Figure 6107-222.)

The light diffusers may fall out if the switch spacer is removed. Reinstall any parts that do.

4. Remove connector J74 from the board.

NOTE

When reconnecting J74, attach the end of the cable ***without*** *the white pull-tab.*

To replace the A5A8 Center Front Panel Board, follow the previous procedure in reverse order.

NOTE

If the pushbuttons tend to keep the board from seating, they aren't entering the Front Subpanel holes correctly. To remedy this, hold the board and the switch spacer against the Front Subpanel. Stand the Front Subpanel upright so its front is visible. Use some tool, such as a pencil tip, to move the pushbuttons around until they enter their holes.

Figure 6107-222. Connector location for the removal of the A5A8 Center Front Panel Board.

A5A9 Top Front Panel Board

To remove the A5A9 Top Front Panel Board, proceed as follows:

1. Use the "Front Subpanel Assembly" removal procedure, in this section. Follow steps 1 through 7, excluding the removal of the encoder knobs in step 6.

NOTE

The 11301 should be right side up and the Front Subpanel face down.

2. Remove the three torx screws from the Top Front Panel Board.

3. Hold the switch spacer against the Front Subpanel. Pull up on the Top Front Panel Board to remove it.

NOTE

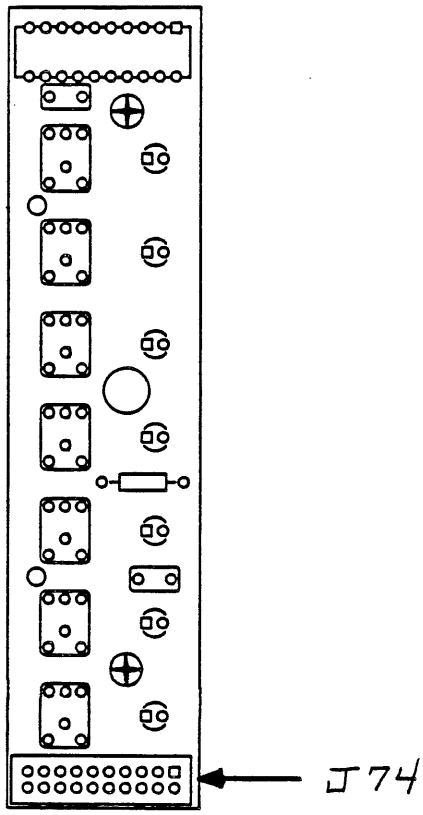


Figure 6107-222. Connector location for the removal of the A5A8 Center Front Panel Board.

If the switch spacer is removed, its pushbuttons may fall out. Reinstall any that do.

Mark the board beside the red line on cable J76 before removing its connector. This will aid in reconnection.

4. Remove connector J76 from the board. See Figure 6107-223.

NOTE

When reconnecting connector J76, attach the end of the cable ***without*** *the white pull-tab.*

Replace the A5A9 Top Front Panel Board by following the preceding procedure in reverse order.

NOTE

If the switch spacer was removed, be certain that its pushbuttons are seated when the spacer is reinstalled. If the pushbuttons tend to keep the board from seating, they are not entering the Front Subpanel holes correctly. To remedy this, hold the board and the switch spacer against the Front Subpanel. Stand the Front Subpanel upright so its front is visible. Use some tool, such as a pencil tip, to move the pushbuttons around until they enter their holes.

Figure 6107-223. Connector location for the removal of the A5A9 Top Front Panel Board.

A10 Front Panel Interface Board

Remove the A10 Front Panel Interface Board as follows:

1. Position the instrument right side up. Remove its top cover.

2. Remove connectors J59, J58, J88, J87, J57, J76, J72, J74, J73 and J78. See Figure 6107-224 for their locations.

3. A bracket is attached to the right front of the Front Panel Interface Board for the instrument's calibrator connections. Remove the 1/4" nut from this bracket. It is located **behind** the upper right front corner of this instrument.

4. Remove the four board-retaining screws.

5. Remove the Front Panel Interface Board.

To replace the A10 Front Panel Interface Board, follow the previous procedure in reverse order.

NOTE

When the circuit board is reinstalled and its retaining screws are reattached, do not tighten the screws yet.

First, reinstall and tighten the nut to the calibrator bracket. Then, tighten all the board-retaining screws.

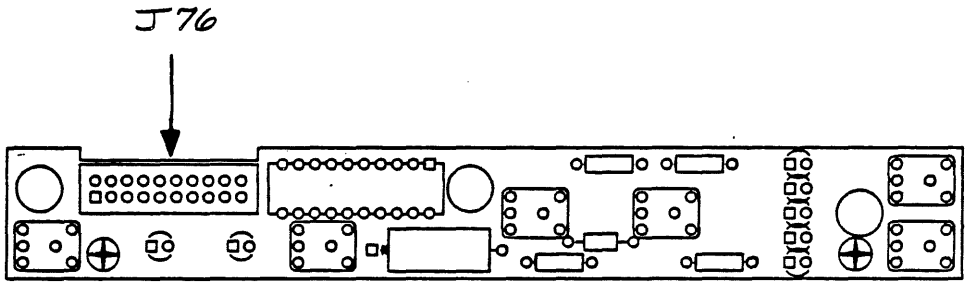


Figure 6107-223. Connector location for the removal of the A5A9 Top Front Panel Board.

Figure 6107-224. Connector locations for removal of the A10 Front Panel Interface Board.

A11 Main Processor Board

Remove the A11 Main Processor Board as follows:

1. Set the 11301 right side up. Remove the top cover.
2. Disconnect connectors J78, J66, J72, J56, J24, J25, J41, J42, J60 and J71. See Figure 6107-225.
3. Remove the hex mounting posts from the connectors on the rear panel as follows:
   a. For the RS-232 posts, use a 3/16" nutdriver.
   b. For the GPIB posts, use a 1/4" nutdriver.
4. Move the plastic (cable protector) flange off the right side edge of the frame.
5. Remove the five board-retaining torx screws.
6. Gently remove the Main Processor Board by lifting it from the chassis.

CAUTION

The J90 interconnecting pins (of the A1 Plug In Interface Board) securely hold the Main Processor Board. The latter board should be lifted cautiously to prevent damage to either the connector or the circuit board.

A plastic pin guide** covers the pins of the Plug In Interface Board connector underneath the Main Processor Board. **This guide may come off when the Main Processor Board is removed. Replace the guide if it does.

WARNING

*A Lithium battery (BT1190) is mounted on the Main Processor Board. **This battery requires special handling for disposal.** Read the instructions for the "Lithium Battery Handling, Disposal and First Aid" in this section.*

To replace the A11 Main Processor Board, follow the previous procedure in reverse order. Additional instructions follow:

1. Move the J60 connector cable away from the board's position. Be certain that all wires are out of the way. Check that the plastic flange is moved off the side. See that the pin guide is on the connector of the Plug In Interface Board.

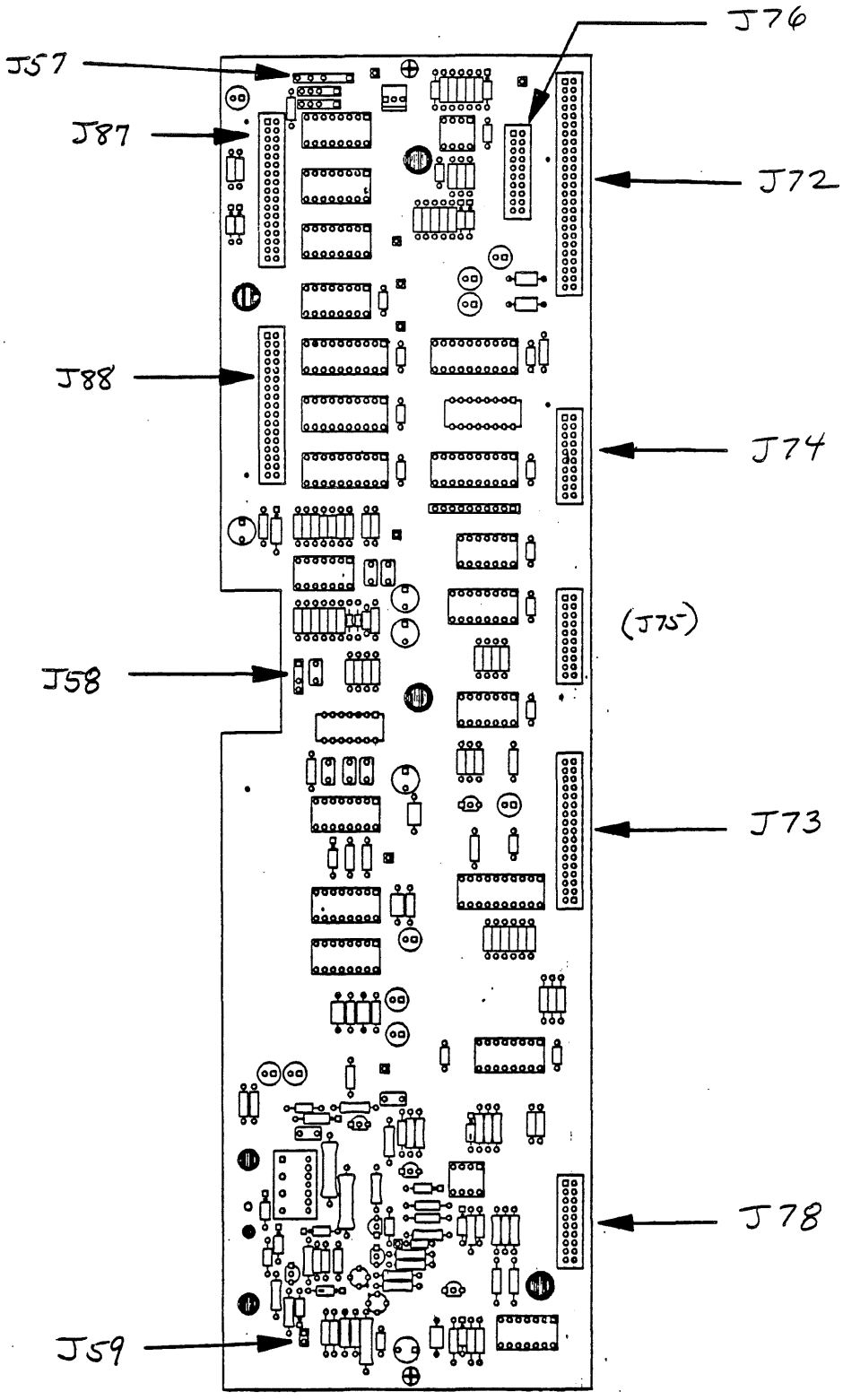


Figure 6107-224. Connector locations for removal of the A10 Front Panel Interface Board.

2. Set the board into the 11301 so that the rear panel connectors are installed first. Next, align the pin guides with the holes in the board, at either end of the J90 connector. Press down on the board to connect the pins.

   a. Check that all pins entered the J90 connector, and are about the same height.

3. **Loosely** reinstall the five board-retaining torx screws.

   a. Reinstall and tighten the hex posts on the rear panel connectors.

   NOTE

   The RS-232 hex posts have lockwashers which can be used to identify them.

   b. **Tighten** the screws.

4. Reconnect the ten connectors. See Figure 6107-225. Dress their cables.

   NOTE

   The J41 and J42 peltola cables are unmarked. To reconnect them, put the "outside" (Ready) peltola into the "outside" J41 socket. The "inside" (Reset) peltola plugs into the "inside" J42 socket.

   The-J60 connector cable is extra long. Dress it along and underneath the Main Processor Board and under the J71 connector.

5. Move the plastic (cable protector) flange towards the inside of the 11301.

6. Reinstall the top cover.

Figure 6107-225. Connector locations for removal of the A11 Main Processor Board.

A12 Vertical Board

Remove the A12 Vertical Board as follows:

1. Position the instrument on its right side, as facing the front. Remove its top and bottom covers.

2. Remove the torx screws from the (left side) front and rear decorative trim covers. **Read the following information before removing these covers.**

   CAUTION

   Do not lift the trim covers to remove them, they will break. *There is a clip on the back of the cover which slides over the end of the side frame section.*

   To remove the trim cover, move each cover towards the end of the instrument where it is located. (The front cover moves towards the front and the rear cover moves towards the rear). Moving the cover about 1/8 of an inch will release the clip. Then, the cover can be lifted from the instrument.

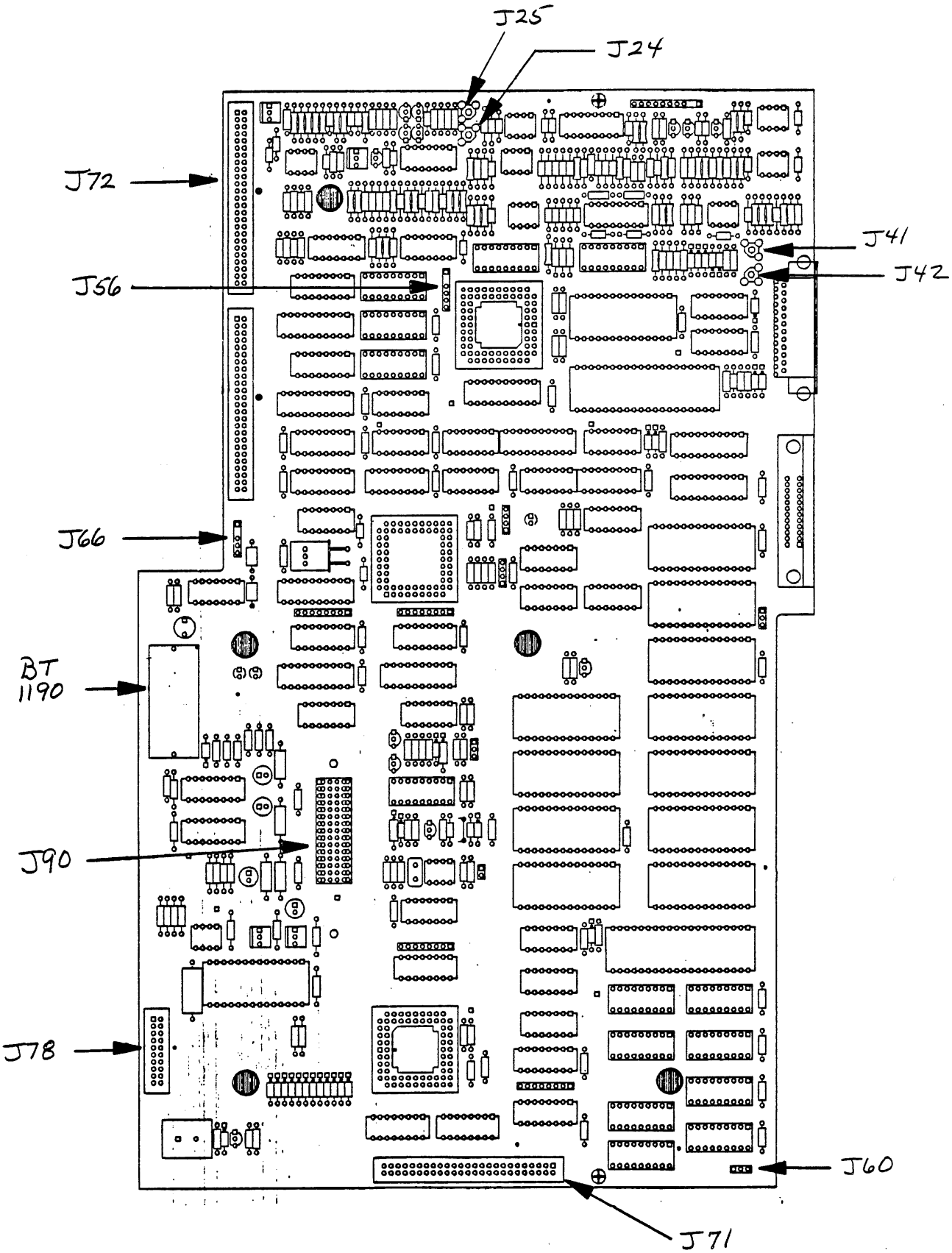


Figure 6107-225. Connector locations for removal of the A11 Main Processor Board.

3. Remove the single torx screw from the center of the left side frame section. Remove the other two screws from its ends. Remove the frame section.

4. Disconnect all connectors from the board. See Figure 6107-226.

   a. Remove the two crt deflection leads from the **(rear)** neck pinwires.

NOTE

Do not remove the two crt leads from the front neck pin wires.

5. Remove the two board-retaining torx screws.

6. Remove the Vertical Board. Lift the front end of the board outward and slide the rear part past the chassis frame.

NOTE

If the Vertical Board itself is defective and has to be replaced, the delay line (on its reverse side) must be removed. Reinstall the delay line assembly on the replacement Vertical Board before the board is reinstalled in the instrument.

To replace the A12 Vertical Board, proceed as follows:

1. Reinstall the Vertical Board. Insert its rear edge into the circuit board guide mounted on the rear casting. Lower the board into place over its spacer posts. Reinstall and tighten the board-retaining screws.

2. Reconnect all wire connectors. Reconnect the crt deflection leads to the rear neck pin wires.

NOTE

Use care when reconnecting the deflection leads. Do not bend their respective crt neck pins.

3. Reinstall the side frame section. Reinstall its screws and tighten them.

4. Reinstall the decorative trim covers to the front and rear of the side frame section. Slide their retaining clips (on the inside of each cover) into place. Reinstall the cover torx screws and tighten them.

5. Replace the top and bottom covers on the instrument. Return the instrument right side up.

Figure 6107-226. Connector locations for removal of the A12 Vertical Board.

A13 Scope Logic Board

Remove the A13 Scope Logic Board as follows:

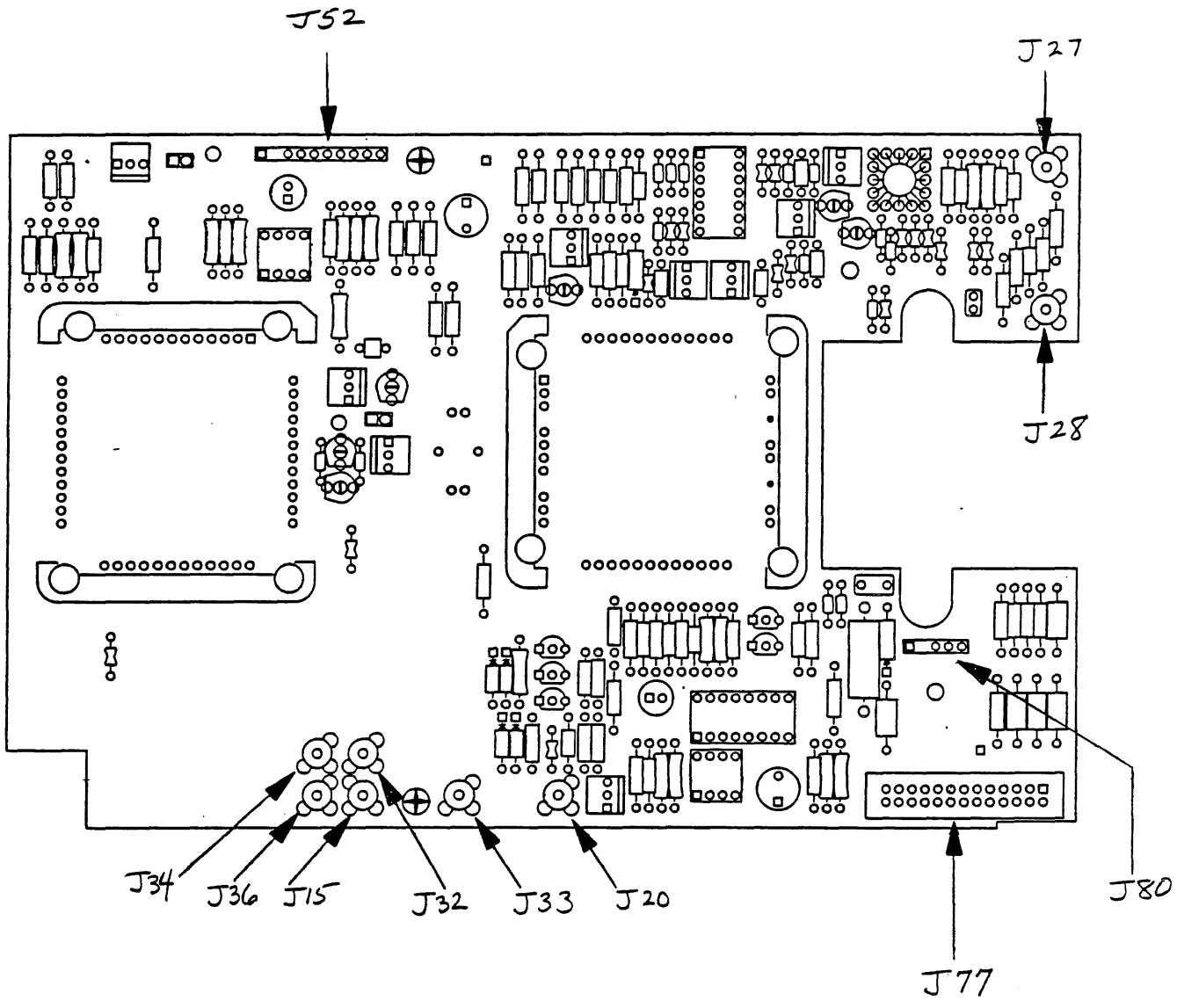


Figure 6107-226. Connector locations for removal of the A12 Vertical Board.

1. Position the 11301 on its right side, as facing the front. Remove its bottom cover.

2. Remove the screws from the rear panel plate. Allow the plate to hang from its wires. Protect the surfaces underneath the plate from scratches.

3. Remove the 4 5/16" x 3 1/4" plastic protective cover from the left rear corner area of the board. Disconnect connector J53 from that corner. Move the connector and cable inside the rear panel area.

   a. Remove the remaining connectors from the board. See Fig. 6107-227.

4. Pull the anode lead from its keyhole recess under the crt socket. See Figure 6107-209.

WARNING

The crt anode voltage is 20kV. The crt may retain a dangerous electrical charge. The anode lead must be fully discharged upon removal. Ground the anode lead to the chassis. Wait approximately ten minutes and again firmly ground this lead to the chassis.

   a. Remove the anode lead from its holder. Discharge it to the chassis via the preceding instructions.

5. Remove the crt base-pin socket from the crt. Remove its three cables held fast by a cable retainer. This retainer is located behind the middle grommet inside the rear panel plate.

   a. Turn the 11301 on its top, with the bottom side up.

6. Remove the torx screws from the metal high voltage shield. Remove the shield from the Scope Logic Board.

Figure 6107-227. Connector locations for removal of the A13 Scope Logic Board.

   a. Remove the seven board-retaining torx screws and the four 1/4" spacer posts from around the multiplier.

7. Push the plastic (cable protector) flange off the edge of the chassis. It is located over the side edge underneath connector J71. If left in place, the flange might catch the side of the circuit board.

CAUTION

The interconnecting pins (from the A1 Plug In Interface Board) firmly hold the Scope Logic Board's P91 connector. Therefore, the board should be lifted cautiously to prevent damage to either the connector or to the circuit board.

8. Remove the Scope Logic Board.

NOTE

A plastic pin guide covers the Plug In Interface Board connector. This guide may come off when the Scope Logic Board is removed. Reinstall the pin guide if it does.

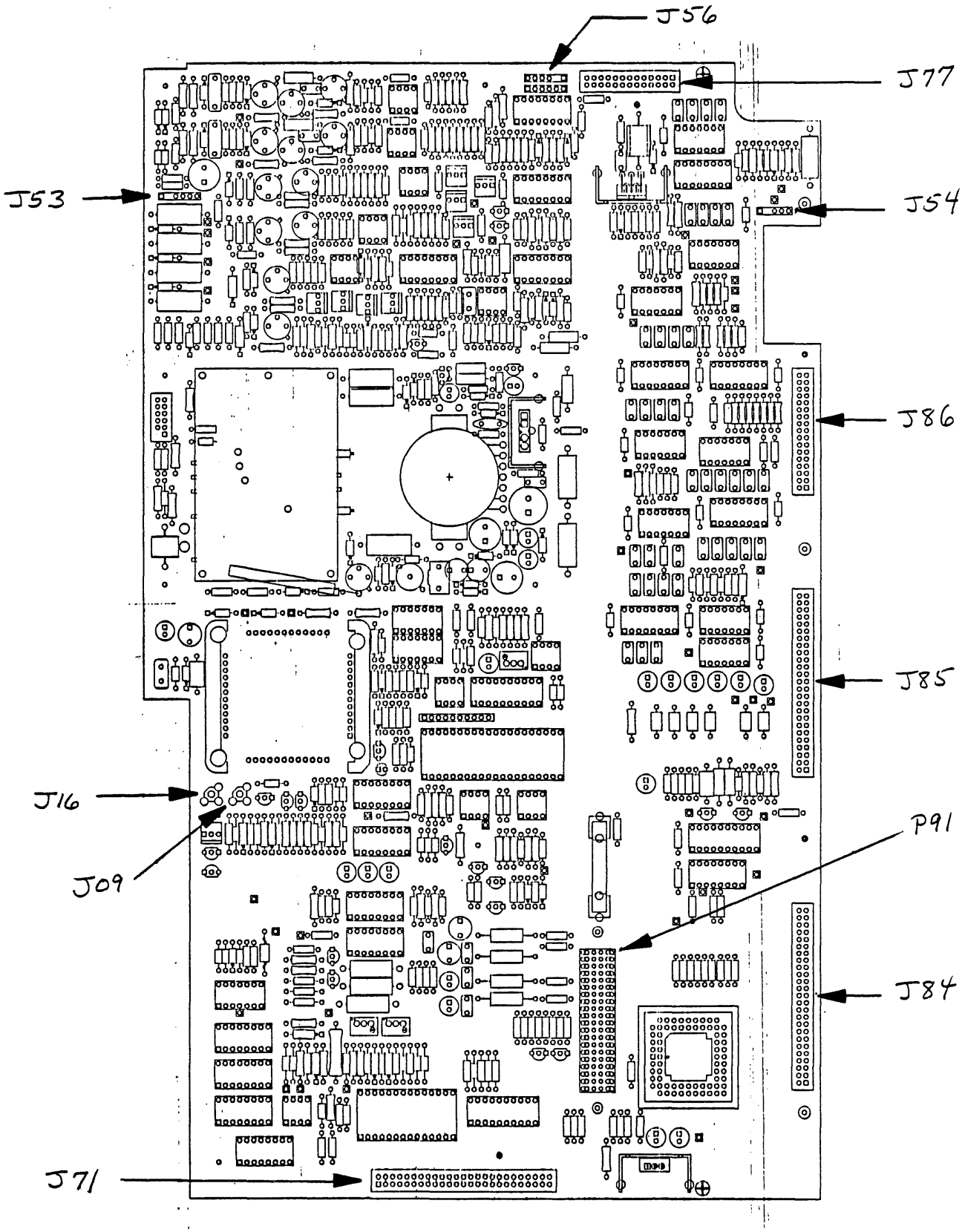


Figure 6107-227. Connector locations for removal of the A13 Scope Logic Board.

WARNING

There is a possibility of arcing if the U1010 Multiplier and/or the T1040 transformer has been replaced on the board. See the "Arcing Prevention" procedure for instructions. It is located near the end of this section.

To replace the A13 Scope Logic Board, proceed as follows:

NOTE

The 11301 should be laying on its top with its bottom side up.

1. Position the board over its approximate location.

   a. Thread the anode holder cable and the base-pin socket cables through their grommets into the rear panel.

   b. Check that no wires will be pinched under the board.

   c. **Align the pin guides with the board's pin holes at either end of connector P91.**

NOTE

The interconnecting pins from the Plug In Interface Board usually align vertically. However, they might not always align horizontally. Check the pins before reinstalling the board.

   d. Press down on the board to connect the pins. Check that all pins re-enter the connector and are about the same height.

   e. Check that cable J71 remains flat against its plastic cable protector.

2. Position the 11301 on its right side, as facing the front.

   a. Before reconnecting the anode lead, determine if it needs to be greased.

CAUTION

The anode lead may require greasing before it is reconnected. *If both the multiplier and the crt were replaced, grease the anode lead.*

However, if only the multiplier or the crt is replaced, grease should not be necessary.

The reason for applying grease is to prevent the anode lead from sticking to its holder. *Should sticking occur, the lead can be removed. But, doing so will be difficult and could be hazardous.*

To remove a sticking anode lead, proceed as follows:

Allow sufficient time for the 20kV anode charge to bleed off. Then, using the thumb and fingertips, slowly work the end of the rubber holder from the lead.

WARNING

This removal process can be dangerous if a charge still remains on the anode. By removing the lead a portion at a time, the lead could suddenly emerge without warning and become hazardous to your health!

b. **General Electric's "Silicone Lubricating Grease"** is the recommended grease to use. The Tektronix Part Number is 006-6949-00.

c. Grease the anode lightly.

d. Reconnect the anode lead into its holder. Slide the anode and cable into their keyhole recess of the crt support beneath the crt socket. See Figure 6107-209. Dress the other end of the anode cable into the uppermost grommet.

3. Reinstall the crt base-pin socket. Replace the three crt socket cables into their cable retainer.

a. Reconnect connector J53 to the Scope Logic Board. Route the cable into the center grommet. Dress the cable underneath the socket and anode cables along the edge of the board.

b. Check that all peltola connectors are inserted into their BNC sockets on the rear panel plate.

c. Plaee all cables into their grommets. Check that there won't be any wires caught behind the plate.

4. Reinstall the rear panel plate. Reinstall the six torx screws to the plate. Tighten the screws.

5. Reinstall the four 1/4" spacer posts around the multiplier on the Scope Logic Board. Tighten the posts.

a. Reinstall the seven board-retaining torx screws and tighten them.

b. Push the flange of the plastic cable protector into place underneath the J71 connector.

6. Reconnect all connectors to the board. See Figure 6107-227.

NOTE

The J23 and J26 peltola cables (to the A14 Time Base Board) are dressed alongside the J84 and J85 connectors on the front edge of the board. These cables lie near the adjoining edges of the circuit boards. Dress them in between the four holders of the J84 and J85 connectors.

If the (optional) A15 Counter/Timer Reference Board is ***not*** *installed, the J26 peltola cable will be removed.*

7. Replace the metal high voltage shield over the (multiplier) spacer posts.

a. Reinstall the four torx screws into the spacer posts and tighten.

b. Reinstall the plastic protective cover to the left rear corner of the board. Slots are provided in the shield and the chassis for the cover's tabs.

8. Replace the bottom cover. Set the 11301 right side up.

A14 Time Base Board

Remove the A14 Time Base Board as follows:

1. Set the 11301 on its right side, as facing the front. Remove the bottom cover.

2. Remove the 1/4" nut which holds the "External Trigger & Counter Inputs" bracket to the front casting. This nut is located behind the lower right front corner.

3. Disconnect the two leads from the crt horizontal neck pins. These are located on the upper rear edge of the board.

4. Disconnect all connectors. See Figure 6107-228.

5. Remove the seven board-retaining torx screws.

6. Remove the Time Base Board.

To replace the A14 Time Base Board, proceed as follows:

1. Check that all wires are out of the way.

2. Replace the Time Base Board.

   a. Align the BNC connectors on the "External Trigger and Counter Inputs" bracket with their respective holes in the front casting.

Figure 6107-228. Connector locations for removal of the A14 Time Base Board.

3. **Loosely** reinstall the seven board-retaining torx screws.

   a. Reinstall the 1/4" nut to the bracket and tighten it.

   b. **Tighten** the torx screws.

4. Reconnect all connectors and the crt neck pin leads.

NOTE

The J23 and J26 peltola cables are dressed alongside the J84 and J85 connectors on the rear edge of the board. These cables lie near the adjoining edges of the circuit boards. Dress them in between the four holders of the J84 and J85 connectors.

*If the (Optional) A15 Counter/Timer Reference Board is **not** installed, the J26 peltola cable will be removed.*

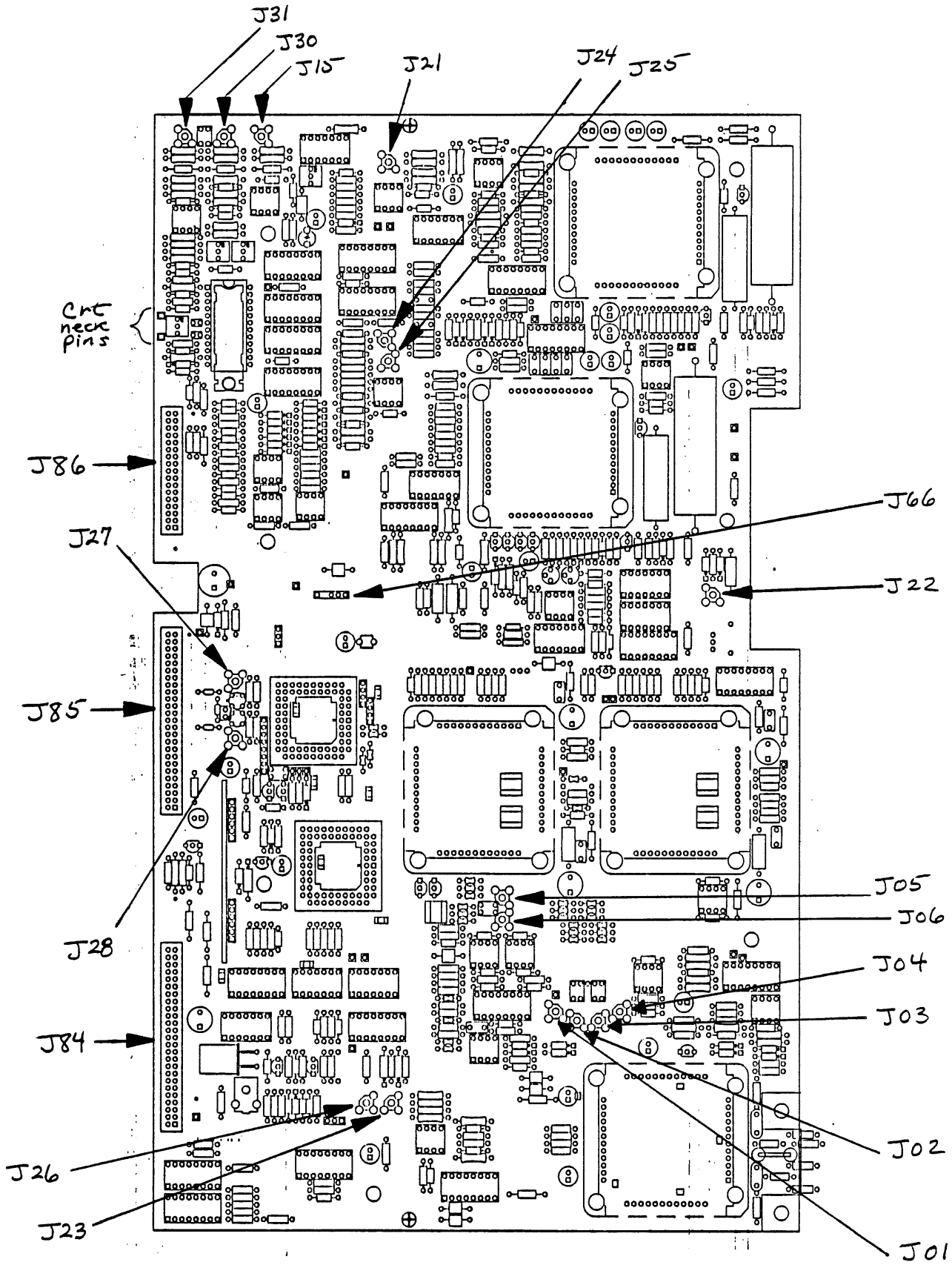


Figure 6107-228. Connector locations for removal of the A14 Time Base Board.

5. Replace the bottom cover. Set the 11301 right side up.

A14A16 CT PLL/VCO Board

The A14A16 CT PLL/VCO Board is a small "piggyback" circuit board that is soldered into the A14 Time Base Board. It is located near the right rear edge of the board, adjacent to the J84 and J85 connector holders.

Remove the CT PLL/VCO Board as follows:

1. Set the 11301 on its right side, as facing the front. Remove the bottom cover.

2. Remove the Time Base Board. Refer to its removal procedure listed under "Circuit Board Removal" in this section. (Follow steps 2 through 6.)

CAUTION

Place the detached circuit board upon a non-conducting surface. This minimizes the chance of static charge damage to the ICs and/or related circuitry.

3. Unsolder the CT PLL/VCO Board's J110 and J111 pin connections using an anti-static vacuum solder extractor.

NOTE

Refer to the "Soldering Techniques" procedure in this section for desoldering instructions.

4. Remove the CT PLL/VCO Board from the Time Base Board.

To replace the A14A16 CT PLL/VCO Board, proceed as follows:

1. Reinstall the board into the Time Base Board.

   a. IMPORTANT: Mount the board perpendicular and as close as possible to the Time Base Board.

NOTE

Be certain that the components on the A14A16 Board are facing toward the front of the 11301.

2. Resolder the J110 and J111 pin connections. Turn the Time Base Board over. Cut off any excess pin leads which protrude through the solder connections.

NOTE

Clean the solder connections with a flux-removing solvent. Be careful not to remove any information printed on the circuit board.

3. Reinstall the Time Base Board. Refer to its replacement procedure in the "Circuit Board Removal" part of this section. (Follow steps 1 through 4).

4. Replace the bottom cover. Set the 11301 right side up.

A15 Counter/Timer Reference Board

The A15 Counter/Timer Reference Board is an 11301 instrument option. If installed, it is mounted on the chassis inside the rear panel.

Remove the Counter/Timer Reference Board as follows:

1. Position the 11301 on its left side, as facing the rear.
2. Remove the six Torx screws from the rear panel plate. (See Fig. 6107-232.)
3. Ease the rear panel plate away from the rear casting. Allow the plate to hang from its wire connections.
   a. Protect the surfaces underneath the plate from scratches.
4. As viewed from the rear, the Counter/Timer Reference Board (see Fig. 6107-229) is located to the left of the crt socket. (For the approximate size of this board, see Fig. 6107-211.)
5. Remove the two connectors from the board.
   a. J26 originates on the A14 Time Base Board.
   b. J40 originates on the A4 Regulator Board.
6. Unfasten the retainers from the three circuit board supports.
7. Remove the Counter/Timer Reference Board.

To replace the A15 Counter/Timer Reference Board, follow the preceding procedure in reverse order.

NOTE

Be certain that all peltola connectors are reinstalled into their BNC sockets before reinstalling the rear panel plate.

Figure 6107-229. Connector locations for removal of the A15 Counter/Timer Reference Board (Option 1T).

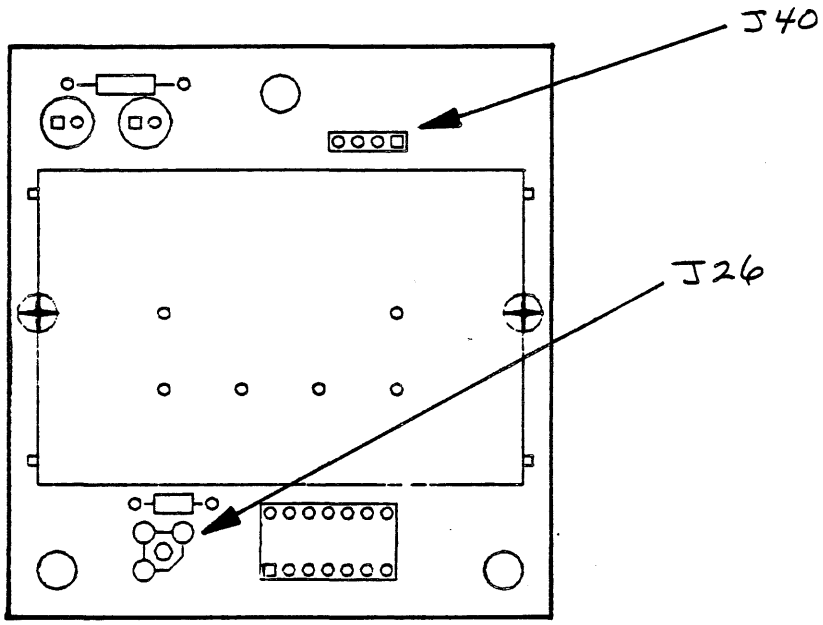


Figure 6107-229. Connector locations for removal of the A15 Counter/Timer Reference Board (Option 1T).

Front Subpanel Assembly Removal

Remove the Front Subpanel Assembly as follows:

1. Set the 11301 up on its right side, as facing the front. Remove the top and bottom covers. Remove the access hole cover from the side of the plug in compartment.

2. Pull off the intensity control knob. Remove the 7/16" nut and washer from its shaft.

3. Disconnect the J57, J74 and J76 connectors from the A10 Front Panel Interface Board. See Figure 6107-224.

4. Remove the 1/4" nut from **behind** the top left corner of the front casting.

NOTE

Removal of the J72 connector from the Front Panel Interface Board can help to reach this nut.

5. Remove the two torx screws from behind the left bottom of the front casting.

6. Remove the encoder knobs. Use a 1/16" allen wrench to loosen the knob's setscrews.

   a. Set the 11301 right side up.

7. Pull the Front Subpanel Assembly out until its bottom clears the front casting. Move its top outward about three inches away from the casting.

   a. Withdraw the J74 cable, via the access hole, through the upper chassis grommet and its slot in the front casting.

   b. Remove the J76 cable through the front casting. Lay the front panel down on its face.

8. Remove the two torx screws and the two 1/4" spacer posts from the A5A5 Bottom Front Panel Board.

CAUTION

The light diffuser parts might fall out when the Bottom Front Panel Board is removed from the front subpanel. Replace any parts that do.

9. Remove the Front Subpanel Assembly from the Bottom Front Panel Board.

Replace the Front Subpanel Assemblye as follows:

1. Hold the Bottom Front Panel Board against the Front Subpanel Assembly.

NOTE

Center the pushbuttons of the Bottom Front Panel Board into their respective front subpanel holes. Use a pencil tip to move any button that does not seat.

Another way to seat the pushbuttons is to invert the board and shake it.

2. When the pushbuttons are in place, reinstall the two spacer posts and the two torx screws on the Bottom Front Panel Board.

3. Reinstall both encoder knobs.

4. Route the J74 and J76 cables through the front casting to the A10 Front Panel Interface Board.

   a. Use the access hole to neatly dress the J73 cable slack underneath the crt shield and between the delay line and the crt shield.

   b. Keep the J73 cable as flat as possible where it passes through the front casting. The tubing around the cable helps to keep it flat.

NOTE

Check that the key on the intensity control encoder is put into its keyway in the front casting.

Check that the cables behind the front panel do not get trapped or pinched.

5. Reinstall the Front Subpanel Assembly.

   a. Reinstall the washer and 7/16" nut on the shaft of the intensity control. Tighten the nut. Replace the knob.

   b. Set the 11301 upon its right side.

6. Reinstall the 1/4" nut on the top left inside corner of the front casting.

   a. Reconnect the J72 connector, if it was removed.

7. Reinstall the two screws on the inside bottom of the front casting.

8. Reconnect the J57, J74 and J76 connectors to the A10 Front Panel Interface Board.

   a. Dress the J57 cable between the board and the chassis.

9. Reinstall the access hole cover.

   a. Replace the 11301 top and bottom covers.

   b. Set the instrument right side up.

Encoder Removal

To remove and replace the S110 (vertical) and/or the S810 (horizontal) encoders, proceed as follows:

1. Remove the Front Subpanel Assembly. Follow the "Front Subpanel Assembly Removal" procedure in this section. Use steps 1 through 9.

CAUTION

The light diffuser parts may fall out when the A5A5 Bottom Front Panel Board is removed from the Front Subpanel. Reinstall any parts that do.

2. Lay the Bottom Front Panel Board flat with its pushbuttons on top. Remove both 7/16" nuts from the encoder shafts. Remove both flat washers and (fluted) ground clips from these shafts.

3. Hold the board against the switch spacer. Invert the board. Remove the Bottom Front Panel Board from the switch spacer.

CAUTION

The pushbuttons will fall out if the switch spacer is inverted.

4. Unsolder the three connections of the encoder. Pull the retaining ring up over the shaft.

5. Remove the encoder.

To replace the S110 and/or the S810 Encoders, follow the previous procedure (up to removing the Front Subpanel Assembly) in reverse order.

1. Replace the Front Subpanel Assembly. Refer to the Front Subpanel Assembly **Replacement Procedure.** Follow steps 1 through 9.

Rear Panel Plate Removal

Remove the rear panel plate as follows:

1. Remove the six torx screws from the rear panel plate. See Figure 6107-232.

2. Place the 11301 on its right side, as facing the front.

3. Ease the rear panel plate away from the rear casting. Allow it to hang from its wire connections.

   a. Protect the surfaces underneath the plate from scratches.

4. Remove the 5/16" nut from the ground wire connection.

   a. Remove the ground wire.

NOTE

Record the locations of the peltola wires so that they can be correctly reconnected.

5. Remove the peltola connectors.

6. Remove the rear panel plate.

To replace the rear panel plate, follow the previous instructions in reverse order.

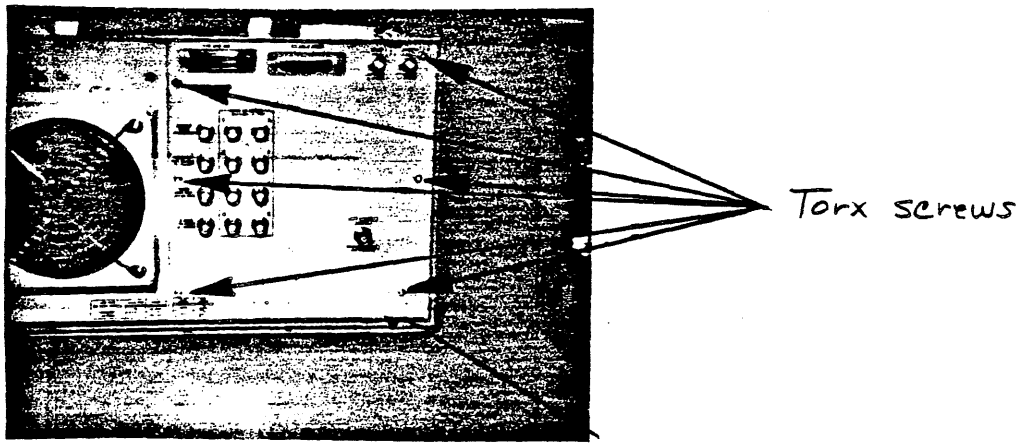


Figure 6107-232. Location of Rear Panel Plate mounting screws.

NOTE

Be certain that all wires are out of the way before reinstalling the rear panel plate.

Check that all peltola connectors are reinstalled into their BNC sockets.

Figure 6107-232. Location of Rear Panel Plate mounting screws.

Semiconductors

Semiconductors should not be replaced unless actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement of semiconductors may affect the adjustment of the instrument. When semiconductors are replaced, check the operation of circuits which may be affected.

WARNING

To avoid an electric-shock hazard, always disconnect the instrument from its power source before removing or replacing components.

Replacement semiconductors should be of the original type or a direct replacement. If a replacement transistor is made by a different manufacturer than the original, check the manufacturer's basing diagram for correct basing. When removing soldered-on transistors or integrated circuits, use an anti-static vacuum solder extractor (see "Soldering Techniques" procedure in this section) to remove the solder from the circuit board pads. Transistors which have heat radiators or are mounted on the chassis use silicone grease to increase heat transfer. Replace the silicone grease on both sides of the insulating washer when replacing these transistors.

WARNING

Handle silicone grease with care. Avoid getting the silicone grease in your eyes. Wash hands thorougly after use.

To replace one of the power transistors mounted on the metal heat-sink at the rear of the power supply (A4 Regulator Board), first remove the board. See the "A4 Regulator Board" removal procedure in this section. Then unsolder the transistor leads, remove the mounting screw from its heat radiator, and remove the transistor and its insulating washer. When replacing the transistor, be sure to reinstall the insulating washer between the transistor and the heat sink (use silicone grease as previously described). Reinstall the mounting screw and tighten it just enough to hold the transistor in place. Then solder the replacement transistor to the A4 Regulator Board. Replace the board by following the removal instructions in reverse order.

An extracting tool should be used to remove in-line integrated circuits to prevent damaging the pins. This tool is available from Tektronix, Inc. Order Tektronix Part 003-0619-00. If an extracting tool is not available, use care to avoid damaging the pins. Pull slowly and evenly on both ends of the integrated circuit. Try to avoid disengaging one end from the socket before the other end. **Most ICs will be soldered into the circuit board, rather than in sockets.**

CAUTION

Do not remove stickers affixed to the top of EPROMs. Removing such stickers will admit light into the chip, and may cause partial erasure of its data.

Hypcon Connectors

The Hypcon (hybrid-printed connector) is a precision made connector designed to provide low loss electrical and thermally-efficient connection between the printed circuit board and hybrid integrated circuits. An exploded view of the Hypcon connector is shown in Figure 6107-234. When replacing the hybrid ICs, be careful not to touch the elastomer gold-plated contacts with your fingers, or to use a cleaner which will lower contact reliability. **If it becomes necessary to use a cleaning solvent near the connector when replacing adjacent (within 1/2") circuit board components, the Hypcon connector and hybrid IC should be removed.**

IMPORTANT: Remove all traces of solder flux or foreign material contamination from the circuit board contact area before replacing the connector. **Contamination usually takes place during the soldering and cleaning process.** Even when the soldering is done carefully, flux, oil, or other contaiminants can be carried under the connector during the cleaning operation. When the solvent evaporates, nonconductive contaminants may remain on or near the contact interfaces.

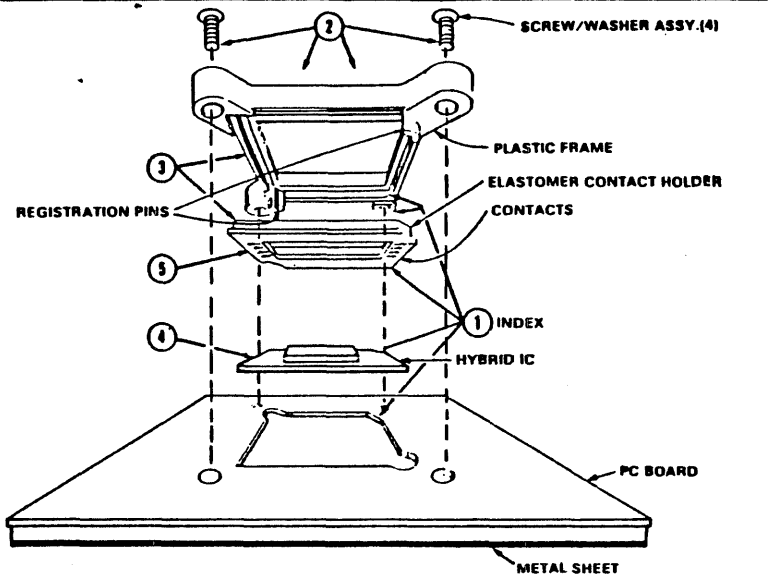
The cleaning process (either hand cleaning with a solvent or machine cleaning in an automatic detergent wash) is not recommended for boards containing Hypcon connectors.

If a component near a Hypcon connector must be replaced, the following steps are recommended:

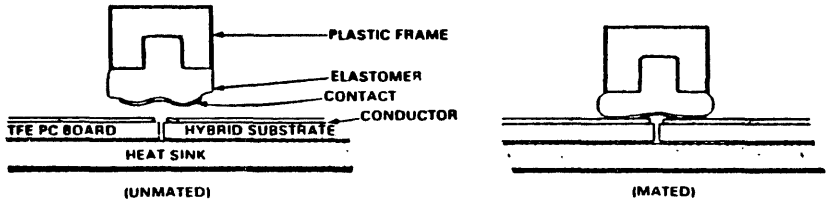
1. Remove the hybrid IC and Hypcon connector (see Disassembly and Removal Instructions) before any soldering or cleaning, and store in a dirt-free covered container. When several hybrids and Hypcon connectors are to be removed, keep parts together and replace as set; do not interchange parts.

Figure 6107-234. Hypcon assembly removal and replacement.

2. Hand Soldering:
   a. Use small diameter solder (0.030" - 0.040").
   b. Use low wattage soldering irons (15-20 watts).
   c. Use care with solder and placement.
3. Remove solder flux and contact contamination with isopropyl alcohol, denatured ethyl alcohol, or a FREON TF cleaner such as SPRAY-ON #2002.
4. Flush the hybrid and Hypcon connector mounting area with isopropyl alcohol. Do not scrub with a cotton-tipped applicator, as cotton fibers will adhere to edges and surfaces of contact area and cause open or intermittent connections. The elastomer should be examined under light for dust, hair, etc., before it is reinstalled. If the etched circuit board surfaces require more cleaning, scrub with a soft rubber eraser and blow or vacuum clean while dusting the surface with a small clean brush.



EXPLODED VIEW OF HYPCON CONNECTOR



FLUSH HYPCON



STEPPED HYPCON

DISASSEMBLY AND REMOVAL

(1) Note index on circuit board (arrow, triangle, or dot) and HYPCON plastic frame (pointed mounting ear).

(2) Unscrew and remove the 4 screw/washer assemblies. Where the HYPCON connector serves to heatsink the hybrid to the chassis, 2 of the 4 screws are longer. Note the location of the yellow tinted screws for proper replacement.

(3) Lift HYPCON connector from board.

(4) Note index location of hybrid and remove from board with tweezers.

(5) Note index location of elastomer contact holder and remove by grasping a corner of the contact holder with tweezers and lifting up. Do not touch the gold-plated contacts with your fingers.

REASSEMBLY AND REPLACEMENT

Grasp corner of elastomer contact holder with tweezers and place in plastic frame slot being careful to match the flat contact holder with the flat frame corner. Place a clean plastic envelope over finger and press with finger to seat contact holder into the frame. The contact holder must be evenly seated on all four sides.

Flush HYPCON: Match hybrid flat corner with board receptable flat corner and place hybrid in receptable. Match pointed mounting ear of HYPCON connector with flat corner of receptacle and guide registration pins into the board hold.

Stepped HYPCON: Using tweezers, match the hybrid corner index with the elastomer contact holder index and insert between the registration pins. Turn the assembly over, grasp the hybrid "hat" with the tweezers, and guide the registration pins into the board holes. Match the plastic frame pointed mounting ear with the circuit board arrow.

Insert mounting hardware and apply 2 inch-pounds of torque to secure the connector assembly.

Figure 6107-234. Hypcon assembly removal and replacement.

5. If the hybrid IC and elastomer contact holder are contaminated, clean by flushing or spraying with alcohol and oven dry at 50° C. Do not scrub with a cotton-tipped applicator or similar device. If the contact holder is excessively contaminated, replace it with a new one.

Tighten the Hypcon mounting screws to two-inch pounds of torque.

Make sure that the elastomer is properly seated in the contact holder before remounting the assembly to the circuit board. Exercise care when mounting the frame elastomer contact holder hybrid IC assembly to the circuit board to prevent misalignment between the connector and board.

CAUTION

Because of the close tolerances involved, special care must be taken to ensure correct index alignment of each Hypcon part during reassembly. Failure to do so can crack the hybrid substrate. See Figure 6107-234 for index locations.

If your instrument contains both the flush and stepped type of Hypcon connectors, be careful not to mix the elastomer contact holders during reassembly. Flush Hypcon connectors have green elastomer contact holders and the plastic frame is marked FLUSH. Stepped hypcons have neutral-colored elastomer contact holders with a slight ridge or step on the contact surface, the large frames are marked STEPPED. The registration pins on the stepped plastic frame are slightly longer than those on the flush frame. The elastomer contact holder in the small stepped connectors is indexed differently than the large connectors. Look for a small gold arrow in one corner of the holder instead of a flat corner. Match this corner arrow with the pointed corner of the plastic frame. Give close attention to this indexing, because elastomer contact holders can easily be inserted incorrectly.

Differences also exist between the large flush and the large stepped Hypcon circuit board receptacles. Figure 6107-234 shows the cross-sectional differences which must be observed when working with an instrument that contains both types of Hypcon connectors.

CAUTION

Damage to the elastomer contact holder can result if the connectors are not mated properly with the board receptacle.

When replacing the hybrid, insert it into the board opening and then position the Hypcon connector in the board registration holes for perfect alignment. The outer portion of the Hypcon frame should be flush with the circuit board before the four mounting screws are tightened. Avoid touching the hybrid and elastomer contact with your fingers, finger oils can lower reliability.

A procedure for removal and replacement is included in Figure 6107-234.

Hybrid Integrated Circuits

Hybrid ICs are located on the A12 Vertical Board, the A13 Scope Logic Board, and the A14 Time Base Board.

The IC is mounted on the inside of its heatsink cover. The cover is oriented to the circuit board in two ways. First, two of the socket screws are offset. This allows the cover to be reinstalled only one way.

Second, one corner of the cover is flat rather than rounded as the others are. This flat corner matches an etched design on the board.

To remove a Hybrid IC, proceed as follows:

1. Remove the four 1/4" retaining nuts from the heatsink cover.

2. Lift the cover (and the attached IC) from the socket.

CAUTION

Avoid touching the IC or the socket contacts with your fingers. Finger oils can lower reliability.

Replace the Hybrid IC as follows:

1. Align the flat corner of the cover with the flat corner design on the board. Set the cover down over the screws.

2. Press the cover toward the board to feel the spring tension of the contacts. **Move the cover around until the IC seats flush against the socket.**

3. While holding the IC in place, reinstall the four retaining nuts. **Tighten them finger-tight.**

4. **Tighten the nuts using a diagonal method only.** See the following CAUTION for diagonal tightening instructions.

   a. Use a torque wrench to tighten the nuts to 3 1/2 - 4" pounds.

CAUTION

Do not tighten these retaining nuts clockwise. *That will crack the heatsink cover.*

Use this diagonal method to tighten the nuts. *Begin at the lower right nut and tighten it. Go diagonally across the cover to the upper left nut. Tighten it. Next, drop down to the lower left nut and tighten it. Then go diagonally across the cover to the upper right nut. Tighten it.*

Check that all four nuts are diagonally tightened to the recommended torque. See step 4a.

Chip Carrier ("Slam-Pack") Integrated Circuits

Chip Carrier ICs are located on the A11 Main Processor Board, the A13 Scope Logic Board and the A14 Time Base Board.

Some of the IC covers have raised, ridged heatsinks. Others have flat covers without heatsinks. The IC is oriented to its socket by a flat corner. The other corners are notched to fit the edges of the socket. The flat-edged corner of the IC aligns with a "spring" (small metal tab) at one corner of the socket.

To remove a Chip Carrier IC, proceed as follows:

1. While holding the cover in place, unfasten its holding clip by pushing it aside. It may help to push down slightly on the cover.

2. Remove the cover slowly to prevent the IC from falling out.

NOTE

Observe the index of the IC before removing it.

3. Remove the IC with tweezers.

CAUTION

Avoid touching the IC or the socket contacts with your fingers. Finger oils can lower reliability.

Replace the Chip Carrier as follows:

1. Using tweezers put the flat edge of the replacement IC against its index spring.

CAUTION

Check that the spring does not get bent by the flat corner.

2. Arrange the other corners with tweezers to fit evenly at the edges of the socket.

3. Push the end tabs of the cover into the holders at one end of the socket.

4. Push down on the cover. Hold it there while moving the holding clip over the tabs on the opposite end of the cover.

5. Check that the cover is secure.

Interconnecting Pins

Two methods of interconnection are used to electrically connect circuit boards with other boards and components. When the interconnection is made with a coaxial cable, a special end-lead connector plugs into a socket on the board. Other interconnections are made with a pin soldered into the board.

Two types of connectors are used for these interconnecting pins. If the connector is mounted on a plug-on board, a special socket is soldered into the board. If the connector is on the end of a lead, an end-lead pin connector is used which mates with the interconnecting pin. The following information provides the removal and replacement procedure for the various types of interconnecting methods.

Coaxial-Type End-Lead Connectors (Peltolas)

Replacing of the coaxial-type end-lead connectors requires special tools and techniques. Only experienced maintenance personnel should attempt to remove or replace these connectors. We recommend that the damaged cable or wiring harness be replaced as a unit. For cable or wiring harness part numbers, see Replaceable Mechanical Parts of Volume III, Diagrams and Parts Lists. An alternative solution is to refer the replacement of the defective connector to your local Tektronix Field Office or representative. Figure 6107-235 gives an exploded view of a coaxial end-lead connector assembly.

Color coding of wires may be helpful to reconnect a Peltola connector to its socket on a circuit board. The wire insulation's color, or its color stripe, is the same as the color represented by the last digit of the JXX component number. (Example: a green wire would connect to a J05 socket number.)

Circuit-Board Pins

Replacing circuit-board pins on multi-layer boards is not recommended. All circuit boards in the 11301 are multi-layer boards, with the exception of the Counter/Timer Option Board.

Circuit-Board Pin Sockets

The pin sockets on the circuit boards are soldered to the back of the board. To remove or replace one of these sockets, first unsolder the pin (use an anti-static vacuum-type desoldering tool to remove excess solder). Then straighten the tabs on the socket and remove the socket from the board. Place the new socket in the circuit board hole and press the tabs down against the board. Solder the tabs of the socket to the circuit board; be careful not to get solder inside the socket.

Figure 6107-235. Coaxial End-Lead Connector assembly.

CAUTION

The spring tension of the pin sockets ensures a good connection between the circuit board and the pin. This spring tension can be destroyed by using the pin sockets as a connecting point for spring-loaded probe tips, alligator clips, etc.

Multi-pin Connectors

The pin connectors used to connect the wires to the interconnecting pins are clamped to the ends of the associated leads.

Some of the pin connectors are grouped together and mounted in a plastic holder. The overall result is that these connectors are removed and installed as a multi-pin connector. If the individual end-lead pin connectors are removed from the plastic holder, note the order of the individual wires for correct replacement into the holder.

To remove or replace damaged multi-pin connectors, remove the old pin connector from the end of the lead and clamp the replacement connector to the lead.

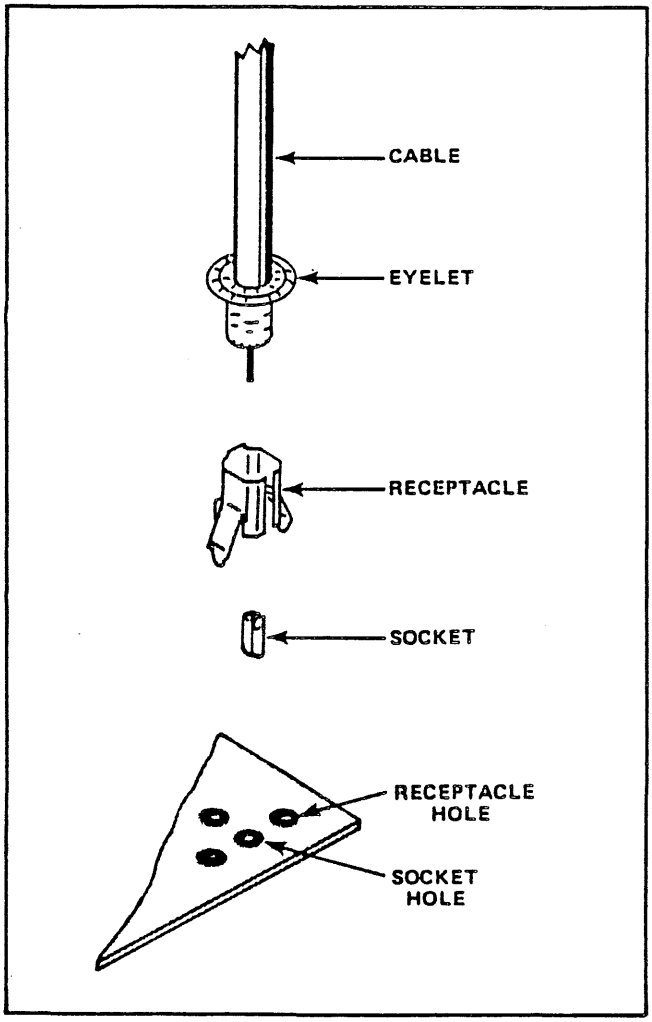


Figure 6107-235. Coaxial End-Lead Connector assembly.

Arrangement of pins in multi-pin connectors

Pin 1 on multi-pin connectors is designated with a triangle (or arrowhead). A triangle, dot or square printed on circuit boards denotes pin 1. When a connection is made to a circuit board, the orientation of the triangle on the multi-pin holder is determined by the index (triangle, dot or square) printed on the circuit board. See Figure 6107-236. Most circuit-board mounted connectors have a triangle index mark.

NOTE

Some multi-pin connectors are keyed by a gap between the pin 1 and 3 positions in the holder. A small plastic plug covers the pin 2 position on the end of the holder. There is a corresponding gap between pins 1 and 3 on the circuit board.

Align the gap in the multi-pin holder with the gap between the circuit board pins. The connector is then ready to be installed.

Figure 6107-236. Orientation of multi-pin connectors.

Many of the larger, gray-colored multi-pin ribbon connectors have a red line along one side of their attached wire cables. This red line indicates the location of pin 1 and 2 or the location of the triangle index mark.

Some of the gray-colored ribbon cables may have the number of their connectors stamped on them.

The ribbon connectors have two functions. The first is to provide a strain release for the wire connections. The ribbon is wrapped around a bar in between the wire connections and the top of the connector. Strain is then felt between the ribbon wires and the top of the connector. This releases most of the strain which would be felt on the wire connections.

The second function on most of the ribbon connectors is to provide a pull-tab to ease disconnection. A white-colored pull-tab is attached inside the connector. When the tab is pulled, even pressure is applied across the connector. The connector separates from its holder easily.

NOTE

To remove these gray-colored ribbon connectors, grasp the white pull-tab (fastened into the connector, if there) and pull it loose from the socket.

If there isn't a white pull-tab present in the connector, grasp the ends of the connector instead. Pull it straight out from the connector socket.

If a ribbon connector is found with an open or shorted wire, individual wires cannot be removed or replaced. The ribbon connector and cable must be replaced.

Delay Line Removal

Remove the Delay Line as follows:

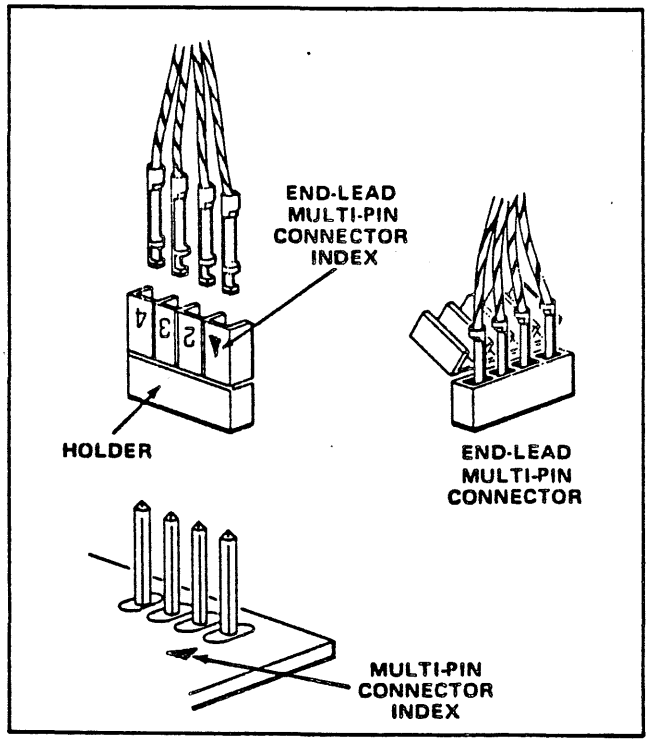


Figure 6107-236. Orientation of multi-pin connectors.

1. Set the 11301 on its right side, as facing the front.

   a. Remove the top and bottom covers and the access hole cover.

2. Disconnect the J27 (purple-white) and the J28 (gray-white) wire connectors from both the A12 Vertical and the A14 Time Base circuit boards. (These wires may be colored solid white with the numbers marked on bands around them).

3. Remove the torx screws that hold the rear panel. Allow the rear panel plate to hang from its wires. Cover the surfaces underneath the plate to protect them from scratches.

   a. Remove the Vertical Board wires from their cable retainer. This retainer is located inside the rear panel.

NOTE

If a Counter Timer Option Board (Tektronix Part Number 670-9124-00) is installed, remove it. The delay line will not clear this option board. (Use the A15 Circuit Board Removal procedure, in this section).

4. Remove the delay line torx mounting screw. It is on the inner side of the plug in compartment, directly behind the access hole.

   a. Locate the tab which holds the delay line to the upper chassis frame. The tab is in a slot just forward of the A11 Main Processor Board at about the center of the chassis.

5. Grasp the delay line from the rear of the 11301. Slide its tab from the slot in the frame.

6. Remove the delay line cautiously through the rear of the 11301.

   a. Pull the slack of the J73 and J74 cables, connected to the A10 Front Panel Interface Board, through the grommet on top of the chassis. This will keep these cables out of the way when the delay line is replaced.

Replace the Delay Line as follows:

NOTE

Start with the tab on the delay line facing the top of the 11301.

1. Reinstall the delay line through the rear panel. Watch its travel through the opening along the front edge of the Main Processor Board.

   a. **The J27 and J28 wires (to the Vertical and Time Base Boards) can be difficult to route through the chassis.**

NOTE

A tool with a hook at one end, or a piece of line would be helpful to route the wires through the chassis openings. Guide the wires through the openings while placing the delay line in position.

   b. Extract both pairs of wires **before** attaching the delay line.

2. Reconnect the J27 and J28 connectors to the Vertical and Time Base Boards.

   a. Reinstall the vertical wires into their cable retainer. Close the retainer's clasp.

   b. Reattach the delay line tab into its slot in the chassis.

3. Reinstall the torx mounting screw to the delay line through the inner side of the plug in compartment. Move the delay line around to seat the screw.

NOTE

Replace the Counter/Timer Option Board, if it was removed. Reattach its wires.

   a. Dress the slack of the J73 and J74 cables between the delay line and the crt shield. Use the side access hole to maneuver them.

4. Check that the peltola connectors are installed into their BNC connector sockets on the rear panel plate. Move all wires away from the plate.

   a. Reinstall the rear panel plate. Reinsert and tighten its torx screws.

5. Replace the 11301 top and bottom covers and the access hole cover.

   a. Set the instrument right side up.

NOTE

A small-sized delay line is mounted on the back side of the A12 Vertical Board. For removal information, see the NOTE in the "Vertical Board Removal" procedure, in this section.

Implosion Shield Removal

Remove the Implosion Shield as follows:

1. Follow steps 1 through 5 of the "A7 Touch Panel Board Removal" procedure, in this section.

2. Tilt the Touch Panel outward at its bottom. Do **not** remove the J87 or J88 cables through the front casting.

3. Remove the Implosion Shield from the bottom. No further disassembly of the Touch Panel is required.

CAUTION

Use care when handling the Implosion Shield. It can easily be scratched or marred. Protect the surfaces of the shield while it is out of the instrument.

To replace the Implosion Shield, proceed as follows:

NOTE

The Implosion Shield can be reinstalled either side out. But, it must align with the Touch Panel Board.

1. Reinstall the Implosion Shield to the Touch Panel Board.

2. Follow the procedure to replace the Touch Panel Board, in this section. After reading the replacement instructions, begin at step 5.

   a. **Be certain to heed the CAUTION regarding the instructions to reinstall the "crt scale cover screws".** It is located at the end of the "Touch Panel Board" replacement procedure.

Graticule Light Bulbs Removal

Remove the graticule light bulbs as follows:

1. Follow the A7 Touch Panel Board Removal procedure in this section. (Use steps 1 through 6).

NOTE

The lens frame need not be removed from the Touch Panel Board to change a graticule bulb.

2. Use a Torx screwdriver to remove the small screws which hold the light diffuser to the Touch Panel board. Remove the nuts and screws from the diffuser and circuit board.

3. Remove the light diffuser from the board.

4. Unsolder the leads of the defective bulb. Remove the bulb from the circuit board.

To replace a graticule light bulb, proceed as follows:

1. Pre-form the leads of the replacement bulb. Insert the bulb into the circuit board. Resolder the leads.

2. Reinstall the light diffuser. Reinstall and tighten its screws and nuts.

3. Follow the procedure to replace the Touch Panel Board, in this section.

CAUTION

Do not tighten the crt scale cover (bezel) screws in a clockwise direction. *Instead read and follow the screw replacement instructions. (See the Touch Panel Board Replacement procedure).*

Plug-In Interface Connectors

The individual contacts of the plug in interface connectors can be replaced. If several contacts are damaged, Tektronix, Inc. recommends replacing the entire A1 Plug In Interface Board. An alternative solution is to have your local Tektronix Field Office repair or replace the damaged board.

Use the following procedure to remove and replace an individual contact of the Plug In Interface Connector:

1. Remove the A1 Plug In Interface Board. Refer to the "Circuit Board Removal" procedures in this section.

NOTE

The board can be withdrawn far enough to repair individual contacts, without removing its connectors.

The board can be pulled out either side of the chassis to reach the contacts.

2. If complete removal of the Plug In Interface Board is necessary, record the location of all wire connectors. Remove all connectors.

   a. Remove the plastic wire fasteners from the holes at the bottom of the circuit board.

   b. Ease connector J64 from the A2A2 Control Rectifier Board through the chassis. Remove the Plug-In Interface board.

3. Snap the white plastic connector cover off the side of the plug in connector receptacle.

   a. Unsolder and remove the damaged contact.

CAUTION

Do not melt the connector with the soldering iron while unsoldering or soldering the contact.

   b. Install the replacement contact. Carefully position it to fit against the connector body. Resolder the new contact.

4. Place the white plastic cover over the side of the receptacle. Snap the cover on.

   a. Check that the replaced contact is aligned with the other contacts.

5. Replace the plastic wire fasteners at the bottom of the Plug In Interface Board. These fasteners keep the connector wires separated between the connector receptacles.

NOTE

If the board was replaced, be certain that the plastic pin guides were reinstalled on both the upper and lower connectors.

6. Replace the A1 Plug In Interface Board by following its removal directions in reverse order.

Power Transformer Removal

Replace the power transformer only with a direct replacement Tektronix transformer. Remove and replace the power transformer as follows:

1. Remove the A2A2 Control Rectifier Circuit Board as described under "Circuit Board Removal" in this section.

NOTE

Record the position of the transformer leads so they may be correctly replaced.

2. Unsolder the transformer leads from the A2A2 Control Rectifier Board. Remove any excess solder from the circuit-board pads. See "Soldering Techniques" in this section.

3. Remove the transformer.

To replace the Power Transformer, proceed as follows:

1. Place the new transformer in position and solder the leads to the A2A2 Control Rectifier circuit-board pads.

2. Replace the A2A2 Control Rectifier in the power supply as described under "Circuit Board Removal" in this section.

NOTE

Refer to the "Adjustment After Repair" Procedure, at the end of this section.

Arcing Prevention (A13 Scope Logic Board)

Arcing can occur between a lead on the U1010 Multiplier and the Scope Logic Board and/or its components. Application of a dope compound to this lead, and its connection, will prevent this problem.

The number 8 lead from the multiplier is soldered to a contact on the T1040 Transformer. (See Fig. 6107-239). **This connection must be coated with dope.**

If the multiplier or the transformer has been replaced, the B.T. (Corona) Dope must be re-applied. The **dope must completely surround the joint where the lead connects to the transformer.** Apply some dope around the lead's insulation to insure overall coverage.

The B.T. Dope may be ordered by its Tektronix, Inc. Part Number 006-0541-00.

Figure 6107-239. View of the A13 Scope Logic Board (under the high voltage shield) showing lead connection to be doped.

Line Fuse Removal

The Line Fuse used in the 11301 is located on the rear panel of the power supply. Replace the Line Fuse (F99) with one of a proper type and rating.

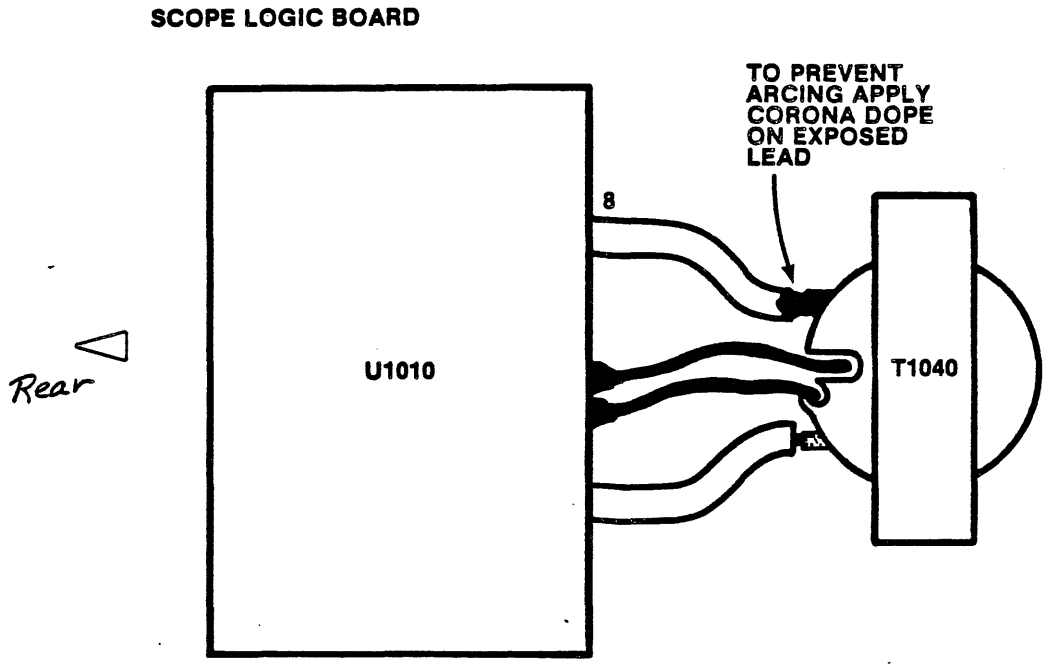


Figure 6107-239. View of the A13 Scope Logic Board (under the high voltage shield) showing lead connection to be doped.

NOTE

Line voltage fuse (F99) is used for both 110- and 220-volt operation. No change in the fuse is necessary when switching the LINE VOLTAGE SELECTOR switch between 110 volts and 220 volts.

Adjustment After Repair

After any electrical component has been replaced, the adjustment of that particular circuit should be checked, as well as the adjustment of any closely related circuits. Because the low-voltage supplies affect all circuits, adjustment should be checked if component replacements have been made in these supplies or if the power transformer has been replaced. See Section 3, "Adjustment Procedure," in this volume for the complete adjustment procedure.

Part 5
Diagnostics

11301 DIAGNOSTICS

The following discussion is an overview of the 11301 diagnostic system. The three diagnostic levels and their modes of communication are described, along with general hardware conditions dictating their use. Detailed troubleshooting information is not included here.

Terms

The following terms are used throughout this section.

Area	A partition of hardware that deals with a particular function or operation (e.g., "Touch Panel").
Block	Generally, refers to all circuitry contained on a given circuit board.
Kernel	The processor (80186), ROM, RAM, and interconnecting bus circuitry required for the processor to function. The Kernel does not include the Battery Backup RAM, ports, and external busses.
Routine	Generally, the smallest selectable test module. A Routine is the actual test activity performed on any given area.

LEVEL Ø: KERNEL DIAGNOSTICS

Level Ø diagnostics are designed to aid in troubleshooting a dead or wounded Kernel. The processor cannot execute code correctly with these types of problems so both hardware and software troubleshooting aids are provided. The low level diagnostic output is geared toward getting the Kernel operational. Once the Kernel is functioning, Level 1 and Level 2 diagnostics test the remainder of the instrument.

Hardware

For a dead kernel, jumpers are provided to force the processor to continually loop through the top memory segment. This loop is used to troubleshoot the Diagnostic PROM address and control signals.

Software

For a wounded kernel, software in PROM U13ØØ and U14ØØ will test the remainder of the Kernel ROM and RAM. If a fault is detected during this test, an attempt will be made to display an error code on the front-panel MENUS LED's. See the Kernel Verification discussion below for more information on the Kernel error code displays.

LEVEL 1: SELFTEST DIAGNOSTICS

Level 1 consists of power-up diagnostic software routines to verify instrument functionality. They are invoked (as a unit) automatically at power-up, manually with a front-panel menu, or externally through the RS-232-C and GPIB ports. Once invoked, these routines run automatically without operator intervention. If a test failure occurs, the instrument will cease testing and display the Extended Diagnostics Block menu with an error code adjacent to the faulty block name. See the GPIB/RS-232-C discussion below under Instrument Verification for external interface information.

Kernel Verification

Kernel verification is performed at power-up and can be invoked from the normal (nonpower-up) operating mode.

Power-Up

The instrument's resources may be severely limited at power up, so diagnostic error information will be output in a very simple form.

Diagnostic test errors are displayed with the front-panel MENUS LEDs. While the diagnostic tests are running without error, all LED's on the front panel are turned off. If a fault is detected, two MENUS LEDs will blink to identify the device in question.

Testing will be halted until any front-panel button is pressed. The two-LED device codes are given in Table 5-1 where a "*" indicates a lit LED.

TABLE 5-1
POWER UP FAILURE CODES

DEVICE BEING TESTED	MAJOR MENU LEDS: WAVEFORM	TRIGGER	MEASURE	UTILITY	STR/RECL	DISPLAY	NUMERIC
DRAM U1620	*	*	.	.	.	.	.
DRAM U1920	*	.	*	.	.	.	.
DRAM U1600	*	.	.	*	.	.	.
DRAM U1900	*	.	.	.	*	.	.
DRAM CTRL U1500	*	.	.	.	.	*	.
RAM Addr & data line shorts	*	.	.	.	.	.	*
DRAM U1720	.	.	.	.	.	*	*
DRAM U1820	.	.	.	.	*	.	*
DRAM U1700	.	.	.	*	.	.	*
DRAM U1800	.	*	.	.	.	.	*
ROM U1200	.	*	*	.	.	.	.
ROM U1430	.	*	.	*	.	.	.
ROM U1300	.	*	.	.	*	.	.
ROM U1400	.	*	.	.	.	*	.
ROM U1100	.	.	*	*	.	.	.
ROM U1330	.	.	*	.	*	.	.
ROM U1000	.	.	*	.	.	*	.
ROM U1230	.	.	*	.	.	.	*
BBRAM U1130	.	.	.	*	*	.	.
BBRAM U900	.	.	.	*	.	*	.

Normal (Non-Power Up)

In this mode, the instrument has been through power up and established that the Kernel is operational. Therefore, a higher level diagnostic interface is used.

When diagnostics are invoked in nonpower-up situations, the tests will run as described under the following Instrument Verification heading.

Instrument Verification

Instrument Verification diagnostics are run with a high level interface over one of the instrument's communication facilities.

Power-Up

While the tests are running, all LED's on the front panel are off except during the routine that tests their operation. If a fault is detected, the instrument will halt testing and display the block menu (see Test Menu Examples). The Block that failed will be highlighted in the menu.

When all tests are completed without a fault, the instrument will power-up normally.

Normal

While the diagnostic tests are running, all LED's on the front panel will be off except during the routine that tests their operation.

When all tests are completed without a fault, the instrument will respond to the invocation source (front panel, RS-232-C, or GPIB). Nonpower-up Instrument Verification may be invoked in the following ways:

Front Panel - Testing is invoked by touching the SELF TEST entry in the Utility menu.

If Selftest passes, the message "Self test completed successfully" is displayed. But, if Selftest fails, the message "Self test failure" is displayed.

GPIB/RS-232-C - Selftest is invoked by sending the "TEST" command to the instrument. The normal GPIB communication protocol of an SRQ with a status byte will follow when testing is complete.

If the controller requires more information, it may send the "TEST?" query command. The instrument will return either "TEST PASS" or "TEST <index>". For detailed information, see Extended Diagnostics, GPIB/RS-232-C, System mode.

LEVEL 2: EXTENDED DIAGNOSTICS

Extended Diagnostics are designed for troubleshooting and consist of all Level 1 routines plus many additional routines. The additional routines include those requiring operator intervention and those considered too lengthy for the power-up sequence. Extended Diagnostic routines are invoked individually or in groups by front-panel menu selections. Alternately, an ANSI 3.64 compatible terminal can be connected to the RS-232-C port and used to run the Extended Diagnostics. The same menu information is displayed on the terminal and single key commands provide control that parallels the touch panel interface.

External System control is also available from an RS-232-C or GPIB controller. With System control, all the automatic tests are invoked at once. The tests run like the Level 1 Selftests except that the testing continues after a fault is detected.

Index Code Conventions

Test Index codes are provided by the diagnostics for rapid identification of a failed test. This code is then used to reference the appropriate test description. Index codes are constructed using the following conventions:

1. Each code is prefaced with a source ID: M, L, C, or R. M identifies the mainframe and L, C, and R identify the Left, Center, and Right plug-in units, respectively.

2. The first hex digit identifies the test BLOCK.

3. The second hex digit identifies the test AREA.

4. The third hex digit identifies the test ROUTINE.

5. The fourth hex digit is used by Routines for additional fault information.

Front Panel

Extended Diagnostic menus are accessed by touching the EXTENDED DIAGNOSTIC entry in the Utility menu. Front panel diagnostic control is through the touch panel only. The display shows both test menus and test status information. See Test Menu Examples for typical displays.

Knobs and buttons are inactive during diagnostic operation except during the routine that tests their operation. It must also be noted that display integrity will be intermittent during testing as some tests will disrupt the display.

Test Menu Examples

Figures 5-1 and 5-2 show sample displays of the Block and Area menus Line numbers, 1 through 16, were added along the right side of each example to clarify the placement of features.

BLOCK MENU

```
                                                        line #

 BLOCK=Front Panel      AREA=All Areas        ROUTINE    1
                                                         2
 ALL BLOCKS                 INDEX            FAULTS     3
 Processor                   pass                      4
 Front Panel                M241Ø               1      5
 Scope Logic                 pass                      6
 Timebase                    pass                      7
 Vertical                    pass                      8
 Left 11axxx                 pass                      9
 Center 11axxx               pass                     1Ø
 Right plug-in               R????                    11
                                                      12
                                                      13
                                                      14
   on        off         off                  off    15
 VERBOSE    LOOP      HALT/ERR                RUN    16
```

Figure 5-1. Example of a Block Menu.

AREA MENU

```
                                                          line #
 BLOCK=Front Panel      AREA=Touch Panel      ROUTINE      1
                                                           2
 ALL AREAS                  INDEX             FAULTS      3
 Buttons                     pass                         4
 Leds                        pass                         5
 Knobs                       pass                         6
 Touch Panel                M2410               1         7
 FPCalibrator                pass                         8
                                                          9
                                                          10
                                                          11
                                                          12
                                                          13
                                                          14
   on         off            off                 off     15
 VERBOSE    LOOP         HALT/ERR                RUN     16
```

Figure 5-2. Example of an Area Menu.

Test Menu Area

The Test Menu Area is located from line 3 to line 14 on the display. This portion of the screen is used in different ways by the various menus.

Block & Area Menus

In Block and Area menus, each line on the display is divided into three fields which are:

1) Title 2) Failure Code 3) Failure Count

These fields are located on the display as shown in Figure 5-3.

```
                                                    
                                                    
  <    Field 1    >       < Field 2 >     < Field 3 >
                                                    
                                                    
```

Figure 5-3. Block and Area Menu fields.

The following is a brief summary for each field shown in Figure 5-3.

Field 1

Field 1 contains Block and Area titles, which become highlighted when touched (selected).

The default selection is at the top of the list (ALL <tests>).

Field 2

Field 2 is blank before a test is run. After the tests are complete, pass/fail code information is displayed. If no faults are detected, "pass" is displayed. Field 2 is not touch selectable.

If faults are detected, ZNNNN (first error code) is printed. Z will be M for a mainframe fault and L, C, or R for LEFT, CENTER, or RIGHT plug-in unit faults, respectively.

Z???? is displayed for plug-in units or options not installed.

Z---- is printed if a test returns NO pass or fail information.

Field 3

Field 3 displays the number of failures, nnnnn, that have accumulated since power up. This field is not touch-selectable.

For Block menus, the displayed number indicates the number of failures in the Block.

For Area menus, the displayed number indicates the number of failures in the Area.

Routine Menus

Routine menus vary according to the tests to be performed, but some common features of all routine menus are:

Field 1, the title field, is the only touch-selectable field. This field is used to select a routine as in the Block and Area menus. Highlighting indicates selection.

Fields 2, 3, 4, and 6 indicate the first error when an error occurs. If no error occurs, the information in these fields will be the last test performed.

Field 5 is a decimal number and contains an accumulation of all failures recorded by the test.

Although Routine menus vary by application, there are four basic configurations: One for analog tests, two for digital tests, and one for memory tests.

The unique features of each are given below, along with illustrations showing display layout.

Analog Test and Digital Test Menus (Figures 5-4 and 5-5):

Fields 2, 3, and 4 will either be hex or floating point numbers.

Field 6 contains an index code with the same format used by the Block and Area menus.

```
                                                          
                                                          
 All Rtns          Window        Read    Faults  Index    Line 3
 test name    nnnnn    nnnnn    nnnnn   nnnnn   znnnn    Lines 4
 <Field 1 >   <Fld2>   <Fld3>   <Fld4>  <Fld5>  <Fld6>   thru 14
                                                          
```

Figure 5-4. Display of Analog Test Menu showing field names and positions.

```
                                                          
                                                          
 All Rtns          Window        Read    Faults  Index    Line 3
 test name    nnnnn    nnnnn    nnnnn   nnnnn   znnnn    Lines 4
 <Field 1 >   <F2 >    <F3 >    <F4 >   <Fld5>  <F6 >    thru 14
                                                          
```

Figure 5-5. Display of a Plug-in Digital Test Menu showing field names and positions (plug-in unit diagnostics only).

Mainframe Digital Test Menu (Figure 5-6):

Field 2 is a hex number indicating the desired test results.

Field 3 is a hex number indicating the test deviation from the desired value (Field 2).

Field 4 is a hex number indicating the actual test result.

```
                                                                  
                                                                  
 All Rtns    Desired   +/-   Read      Faults  Index  | Line 3
 test name   nnnnnn    nnnn  nnnnnn    nnnnn   znnnn  | Lines 4
 <Field 1 >  <Fld 2 >  <F3>  <Fld 4 >  <Fld5>  <F6 >  | thru 14
                                                      
                                                      
```

Figure 5-6. Display of Mainframe Digital Test Menu showing field names and positions.

Memory Test Menu (Figure 5-7):

Field 2 is a hex number indicating the address of the test.

Field 3 is a hex number indicating the desired value. This is normally the value written.

Field 4 is a hex number indicating the actual value read.

```
                                                                  
                                                                  
 All Rtns    Address    Wrote  Read    Faults  Index  | Line 3
 test name    nnnnn     nnnnn  nnnnn   nnnnn   znnnn  | Lines 4
 <Field 1 >   <F2 >     <F3 >  <F4 >   <Fld5>  <F6 >  | thru 14
                                                      
                                                      
```

Figure 5-7. Display of Memory Test Menu showing field names and positions.

Test Status Area

The Test Status areas are located at the top and bottom of the display in lines 1, 15, and 16. This portion of the screen is used consistently by the various diagnostic menus. Figure 5-8 shows the display location of fields in the Test Status areas.

```
| BLOCK=front panel   AREA=touch panel      ROUTINE | Line 1
| <F1 > < Field 2 >   <F3> < Field 4 >      <Fld 5> |
|                                                   |
|                                                   |
|                                                   |
|                                                   |
|                                                   |
|                                                   |
|                                                   |
|                                                   |
|                                                   |
|                                                   |
|                                                   |
|  <F7>     <Field 9 >   <F11>                <F13> |
|   on      cnt(nnnnn)    off                  off  | Line 15
| VERBOSE     LOOP      HALT/ERR              RUN  | Line 16
| <Fld 8>     <F10>     <Fld 12>            <F14>  |
```

Figure 5-8. Test Status areas of the display showing field names and positions.

The display fields shown in Figure 5-8 are used as follows:

Field 1

Touching field 1 highlights the field and displays the diagnostic Block menu.

Field 2

Field 2 displays the name of the current Block Menu selection. The Block title is truncated if too long for the field.

Field 2 is not touch-selectable.

Field 3

Touching field 3 highlights the field and displays the selected Block's diagnostic Area menu. If no Block was previously selected, the first Block in the Block menu is selected and its Area menu displayed.

Field 4

Field 4 displays the name of the current Area Menu selection. The name is truncated if too long for the field.

Field 4 is not touch-selectable.

Field 5

Touching field 5 highlights the field and displays the selected Area's diagnostic Routine menu. If no Area was previously selected, the first Area in the Area menu will be selected and its Routine menu displayed.

NOTE

The Routine menu may have empty fields until the test has run.

Field 7

Field 7 displays the current selection of VERBOSE ("on" or "off").

Field 8

Field 8 is touch-selectable and causes VERBOSE to toggle between on and off.

If the current selection is "on", all test information is displayed in the Test Menu Area or output through a port, whichever is applicable.

If the current selection is "off", then no test information is displayed or output. This is useful when using a test as a scope loop.

Field 9

Field 9 displays the current selection of LOOP ("off" or "cnt nnnnn"). If the count is larger than 65535, "cnt *****" will be displayed.

Field 1Ø

Field 1Ø is touch-selectable and causes LOOP to toggle between on and off.

If "off" is displayed, the currently selected Block Area or Routine will run only once.

If "on" is displayed, the currently selected Block Area or Routine will run repeatedly when directed to run. The loop count will be displayed in field 9.

Field 11

Field 11 displays the current selection of HALT/ERR ("on" or "off").

Field 12

Field 12 is touch-selectable and causes HALT ON ERROR to toggle between on and off.

If "on" is displayed in field 11, the currently selected Block, Area, or Routine will stop running when an error is detected.

If "off" is displayed, the Block, Area, or Routine will flag the error and permit testing to continue.

Field 13

Field 13 displays the current selection of RUN ("on" or "off").

Field 14

Field 14 is touch-selectable and causes RUN to toggle between on and off.

If "on" is selected, the currently selected Block, Area, or Routine tests will run.

If "off" is selected, the currently selected Block, Area, or Routine tests will stop.

RS-232-C/GPIB

The RS-232-C interface can be used in either of two modes for Extended Diagnostics. The first is the System mode, where the RS-232-C emulates GPIB codes and formats. The second is the Diagnostic Terminal mode, where the RS- 232-C is used to drive a terminal, providing character echo, cursor control, ect. The GPIB interface can be used in the System Mode only.

Diagnostic Terminal mode provides fully functional diagnostics to the user while System mode excludes all interactive testing.

System Mode (GPIB and RS-232-C)

System mode communication follows GPIB codes and formats.

All interactive tests have been excluded from System operation mode; therefore, a method of aborting a test in progress is not provided.

Test Commands

The following command syntax is used in the System mode:

TEST TERMINAL

Redirects diagnostics menus to the RS-232-C interface.

TEST

Selftest of complete mainframe and plug-in unit combination. (Halt on Error)

TEST LEFT

Extended test of Left plug-in unit. (Non Halt on Error)

TEST CENTER

Extended test of Center plug-in unit. (Non Halt on Error)

TEST RIGHT

Extended test of Right plug-in unit. (Non Halt on Error)

TEST EXTENDED

Extended test of complete instrument. (Non Halt on Error)

TEST "<id><index>"

Extended test will be attempted on the indicated test index.

<id> = M,L,C, or R for Mainframe, Left, Center, or Right.

<index> = (hex string)

EXAMPLES:

TEST will perform system selftest (Halt on Error).

TEST EXTENDED will perform Mainframe Extended test (NO Halt on Error).

TEST "M2410" will perform the single mainframe test indexed by 2410.

TEST?

With this query, one of two ASCII strings will be returned:

either TEST PASS or

TEST "M<index>","L<index>","C<index>","R<index>"

Index numbers are in the order of occurrence.

EXAMPLE:

TEST "M2345","M2352","M4510","L1234", "R1234"

Diagnostic Terminal Mode (RS-232-C Only)

Diagnostic Terminal mode is the primary diagnostic I/O method used by a service technician. It closely parallels front panel operation through the test menus.

The diagnostic test menus are displayed on the terminal just as they appear on the instrument display. Menu selections are made with terminal keyboard commands to simulate display touches. The keyboard commands each require a single key stroke only instead of the full command words used with the System mode.

Terminal Interface

The Terminal Interface uses the ANSI X3.64 standard for cursor control.

Invocation Command

TEST TERMINAL

Switches the RS-232-C interface to Diagnostic Terminal mode and places the instrument in the Extended Test mode.

Terminal Diagnostic Commands

B!b - Equivalent to touching the BLOCK field on the display menu.

A!a - Equivalent to touching the AREA field on the display menu.

R!r - Equivalent to touching the ROUTINE field on the display menu.

L!l - Equivalent to touching the LOOP field in the status area.

V!v - Equivalent to touching the VERBOSE field in the status area.

H!h - Equivalent to touching the HALT/ERROR field in the status area.

S!s - Equivalent to touching the START/STOP field in the status area.

E - Equivalent to touching the front-panel UTILITY major menu button and takes the instrument out of Extended Test mode.

U!u - Equivalent to moving your finger UP the Left side of the display's test selection list.

D!d - Equivalent to moving your finger DOWN the Left side of the display's test selection list.

Board Swap Guide

This section correlates all possible error codes resulting from Diagnostic tests with the primary and secondary board(s) suspected of causing each error. The primary suspect board should be inspected for loose connections or components then, if the Diagnostic errors are repeated, it should be replaced with a known good board. Make sure that the new board is configured exactly like the old one and that any installed firmware matches the version in the old board. In addition, refer Preparation in Section 3, Adjustment Procedures, for necessary adjustments and calibration and for any precautions.

Diagnostics are composed of two stages. The first is the Kernel Diagnostics that verify the main processor and its associated hardware such as ROM, RAM and control signals. After all Kernel tests have passed without failure, the second-stage Self Tests will run.

The Self Tests verify the remainder of the instrument circuitry. Any Self Test fault will cause the instrument to enter Extended Diagnostics. The Extended Diagnostics are a superset of the instrument Self Tests. They allow selective, interactive testing.

Circuits that are not fully tested by Diagnostics are listed in this section under "Circuits Not Covered by Diagnostics".

POWER-UP KERNEL DIAGNOSTICS

The Power-Up Kernel Diagnostics test circuitry on the Main Processer Board (MPU) only.

EXTENDED DIAGNOSTICS

Abbreviations of Board Names

All active mainframe boards are listed here with the abbreviation used in in Table 5-2. Non-active boards and connecting cables are excluded from this list.

Abbreviations of Board Names

PIINTR	Plugin Interface Board	A1
BTFP	Bottom Front Panel Board	A5
TOUCH	Touch Panel Board	A7
CNFP	Center Front Panel Board	A8
TPFP	Top Front Panel Board	A9
FPINTR	Front Panel Interface Board	A10
MPU	Main Processor Board	A11
VERT	Vertical Board	A12
SCPLOG	Scope Logic Board	A13
TB	Time Base Board	A14
CTR	Counter Timer Reference Board(optional)	A15
CTVCO	Counter Timer PLL/VCO Board	A14A16

TABLE 5-2
Extended Diagnostics Error Codes

Error Index	Primary Suspect	Secondary Suspects (* - higher risk)
M11XX	MPU	
M121X - M123X	MPU	
M124X - M126X	MPU	PIINTR,(plug-in)
M127X	MPU	SCPLOG,TB
M13XX - M14XX	MPU	
M15XX	MPU	FPINTR,SCPLOG,TB,VERT
M161X - M163X	MPU	
M164X	MPU	*TOUCH,FPINTR
M17XX - M192X	MPU	
M193X - M194X (manual)	MPU	*SCPLOG
M195X	MPU	
M1AXX	MPU	
M211X	CNFP	*FPINTR,MPU
M212X - M213X	BTFP	*FPINTR,MPU
M214X - M215X	TPFP	*FPINTR,MPU
M221X	CNFP	*FPINTR,MPU
M223X - M224X	BTFP	*FPINTR,MPU
M25XX	FPINT	*SCPLOG,MPU

M31XX	SCPLOG	MPU
M321X	SCPLOG	MPU
M322X (manual)	SCPLOG	MPU
M323X M329X	SCPLOG	MPU
M33XX	SCPLOG	MPU
M34XX	SCPLOG	MPU
M41XX	TB	SCPLOG,MPU
M42XX	TB	*SCPLOG,MPU
M431X	TB	SCPLOG,MPU
M432X - M436X	TB	*SCPLOG,MPU
M441X	TB	SCPLOG,MPU
M442X - M444X	TB	*SCPLOG,MPU
M45XX - M46XX	TB	*SCPLOG,MPU
M481X	TB	*SCPLOG,MPU
M482X - M483X	TB	*MPU,SCPLOG
M484X - M488X	TB	*SCPLOG,MPU
M491X	CTVCO	*TB,SCPLOG,MPU
M492X - M492X	TB	SCPLOG,MPU
M51XX - M52XX	VERT	SCPLOG,MPU
M531X	VERT	*SCPLOG,MPU
M532X	VERT	*MPU,SCPLOG
M533X - M534X	VERT	*MPU,SCPLOG,(plug-in)
M535X	VERT	SCPLOG,MPU
M536X	VERT	*TB,SCPLOG,MPU

DIAGNOSTIC ERROR CODES

This section provides listings in numeric order of all test error codes generated by Kernel or Extended Diagnostic tests. The Kernel error codes are listed in Table 5-1 near the beginning of Section 5. The method of reading the Kernel error codes is described in the text prior to Table 5-1.

The Extended Diagnostic menu and the failure error codes appear on the screen after the first test failure. Beside the failed circuit block name will be the first error code encountered and the total number of faults in that circuit block. Selecting the label of the failed block then the Area label will give you a more complete list of error codes in a block. Selecting the Routine label shows the lowest level routines in the selected Area.

The error code indicates the first test that failed. Noting the test that passed before the failure can help isolate the problem.

TABLE 5-3
Diagnostic Error Codes

Block, Area or Routine Name and Error Code	Schematic Number(s)	Board Number(s)
Processor (M1XXX)		
Ram/Rom (M11XX)		
Ram 1 (M111X)	11	A11
Ram 2 (M112X)	11	A11
DRam Ctrl (M113X)	11	A11
Rom 1 (M114X)	9	A11
Rom 2 (M115X)	9	A11
Rom 3 (M116X)	9	A11
Rom 4 (M117X)	9	A11
Rom 5 (M118X)	9	A11
Rom 6 (M119X)	9	A11
Rom 7 (M11AX)	9	A11
Rom 8 (M11BX)	9	A11
SDI (M12XX)		
Left Bus (M121X)	12	A11
Cntr Bus (M122X)	12	A11
Rght Bus (M123X)	12	A11
Left com (M124X)	12	A11
Cntr com (M125X)	12	A11
Rght com (M126X)	12	A11
Extrn Bus (M127X)	12	A11

Non-Volatile Mem (M13XX)		
BBR Quick (M131X)	11	A11
BBR test (M132X)	11	A11
EER Chksm (M133X)	11	A11
EER Test (M134X)	11	A11
I/O Devices (M14XX)		
Usart (M141X)	10	A11
GPIB (M142X)	10	A11
A/D Converter (M15XX)		
A/D 8 bit (M151X)	12	A11
A/D 12bit (M152X)	12	A11
FPanel Ctrl (M16XX)		
Left Knob (M161X)	12	A11
Right Knob (M162X)	12	A11
Top Knob (M163X)	12	A11
Touch Ctrl (M164X)	6,7,12	A7,A10,A11
Display Memory (M17XX)		
Ram (M171X)	13	A11
Display Control (M18XX)		
Control (M181X)	13	A11
Display Output (M19XX)		
Hor Adjust (M191X)	12,13	A11
Vrt Adjust (M192X)	12,13	A11
Horiz Pos (M193X)	13,15	A11,A13
Vert Pos (M194X)	13,15	A11,A13
PWM Ramp (M195X)	12,13	A11
Storage Supply (M1AXX)		
Battery (M1A1X)	11	A11
Front Panel (M2XXX)		
Buttons (M21XX)		
Center (M211X)	5,7	A8,A10
Rght Lower (M212X)	5,7	A5,A10
Left Lower (M213X)	5,7	A5,A10
Left Top (M214X)	5,7	A9,A10
Right Top (M215X)	5,7	A9,A10
Leds (M22XX)		
Center (M221X)	5,8	A8,A10
Rght Lower (M222X)	5,8	A5,A10
Left Lower (M223X)	5,8	A5,A10
Top (M224X)	5,8	A9,A10
FP Calibrator (M25XX)		
DC Cal (M251X)	8,19	A10,A13
Sq Wave (M252X)	8,19	A10,A13

Scope Logic (M3XXX)		
Rocs (M31XX)		
Sequencer (M311X)	15	A13
Swp Intens(M312X)	15	A13
Dsp Intens (M313X)	15	A13
Swp Lckout (M314X)	15	A13
Chop Blank (M315X)	15	A13
Holdoff (M316X)	15	A13
Inhibit (M317X)	15	A13
Single Seq (M318X)	15	A13
ACVS (M32XX)		
ACVS D/A (M321X)	18	A13
D/A Exer (M322X)	18	A13
Swp Gain (M323X)	18	A13
Ext Offset (M324X)	18	A13
Horiz Pos (M325X)	18	A13
Trig Lev (M326X)	18	A13
Asti/Focus (M327X)	18	A13
Rot/Illum (M328X)	18	A13
Holdoff (M329X)	18	A13
Cal Voltage Ref (M33XX)		
DAC (M331X)	19	A13
1st Atten (M332X)	19	A13
Cal Out (M333X)	19	A13
Z-Axis (M34XX)		
87 volt (M341X)	16	A13
Z Axis (M342X)	15	A13
Cathode (M343X)	16	A13
Q3+ & Q3- (M344X)	15,17	A13
Q2- astig (M345X)	15,17	A13
Q1- focus (M346X)	15,17	A13
Q Axis (M347X)	15,17	A13
Timebase (M4XXX)		
Horizontal Mode (M41XX)		
Horiz Ctrl (M411X)	20,22	A14
Triggers (M42XX)		
Right Cmd (M421X)	21	A14
Center Cmd (M422X)	21	A14
Left Cmd (M423X)	21	A14
AExt Probe (M424X)	21	A14
BExt Probe (M425X)	21	A14
Main Triggers (M43XX)		
Trig Ctrl (M431X)	20,22	A14
Slow Comp (M432X)	21	A14
Holdoff (M433X)	15,21,22	A13,A14
Status Lat (M434X)	21,22	A14
Source Out (M435X)	21	A14
Line Trig (M436X)	21,22	A14

Dly Triggers (M44XX)		
Trig Ctrl (M441X)	20,22	A14
Slow Comp (M442X)	21	A14
Holdoff (M443X)	15,21,22	A13,A14
Status Lat (M444X)	21,22	A14
Sweeps (M45XX)		
Time Ref A (M451X)	18,23	A13,A14
Time Ref B (M452X)	18,23	A13,A14
Del Ref 0 (M453X)	18,23	A13,A14
Del Ref 1 (M454X)	18,23	A13,A14
Main Sweep (M46XX)		
Sweep (M461X)	23,24	A14
Main Gate (M462X)	23	A14
Dly Gate (M463X)	23	A14
Delayed Sweep (M47XX)		
Sweep (M471X)	23,24	A14
Dly Gate (M472X)	23	A14
Horizontal Amp (M48XX)		
Inputs (M481X)	13,19,24	A11,A13,A14
XY Mode (M482X)	24	A14
Readout (M483X)	24	A14
XCal/10 (M484X)	24	A14
XCal/1 (M485X)	24	A14
Main Swp (M486X)	24	A14
Dly Swp (M487X)	24	A14
Beamfind (M488X)	24	A14
Counter Timer (M49XX)		
PLL Locked (M491X)	22	A14,A14A16
Oven Clk (M492X)	22	A14
Interrupt (M493X)	22	A14
Vertical (M5XXX)		
Vertical CH SW (M51XX)		
Left CMI (M511X)	14	A12
Center CMI (M512X)	14	A12
Vertical Amp (M52XX)		
Protection (M521X)	14	A12
Terminator (M522X)	14	A12
Vertical System (M53XX)		
YCal Src (M531X)	14	A12
Readout (M532X)	14	A12
Left Pos (M533X)	14	A12
Center Pos (M534X)	14	A12
Beamfind (M535X)	14	A12
Cntr View (M536X)	14,22	A12,A14

CIRCUITS NOT COVERED BY DIAGNOSTICS

The following list shows those circuits and boards in the 113Ø1 Programmable Oscilloscope mainframe that are less than 5Ø% functionally verified (directly or indirectly) by the Extended Diagnostics menus tests. Boards and circuits not on this list are 5Ø to 1ØØ% functionally tested by the Diagnostic tests with or without installed plug-in units. To Further check the operation of the Trigger, Vertical, and Horizontal circuitry install three 11K generic plug-in amplifiers (i.e., 11A32, 11A34, 11A52) and run Enhanced Accuracy.

Numbers within "<>" indicate the associated schematic numbers.

Circuits Not Fully Covered by Diagnostic Tests:

- Plugin Interface Board <1>
- Front Panel Interface Board
  - Photodetector Circuit <8>
  - Knob Buffer Circuit <8>
- Main Processor Board
  - GPIB Controller and Bus Drivers <1Ø>
  - Rear Panel Trigger Ready <1Ø>
  - Rear Panel Trigger Reset <1Ø>
  - Real Time Clock Circuit <11>
- Vertical Board
  - Signal paths from plug-ins <14>
  - Vertical Spot Shift Circuit <14>
  - Left Vertical Output (Rearpanel) <14>
- Scope Logic Board
  - CRT Geometry,
    - Stigmator,
    - Yaxis Circuits <16><17>
  - CRT Focus,
    - Astig,
    - Sigmatism,
- Time Base Board
  - External Trigger and Counter timer A & B inputs <21>
  - Counter Timer Circuit <22>
  - Horizontal Spot Shift Circuit <24>
  - Signal paths from plug-ins <21><24>

Part 6
Replaceable Electrical Parts

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.

LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

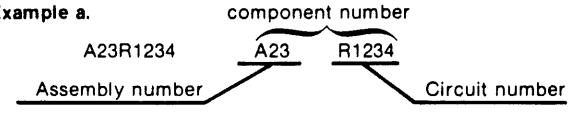
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

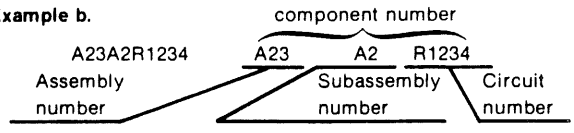
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.



Read: Resistor 1234 of Assembly 23

Example b.



Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

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.

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00136	MCCOY ELECTRONICS CO	MATTS AND CHESTNUT ST	MT HOLLY SPRINGS PA 17065
00779	AMP INC	P O BOX 3608	HARRISBURG PA 17105
01121	ALLEN-BRADLEY CO	1201 SOUTH 2ND ST	MILWAUKEE WI 53204
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49	DALLAS TX 75265
01807	PETERSEN RADIO CO INC	2800 WEST BROADWAY	COUNCIL BLUFFS IA 51501
02113	COILCRAFT INC	1102 SILVER LAKE RD	CARY IL 60013
02114	AMPEREX ELECTRONIC CORP FERROXCUBE DIV	5083 KINGS HWY	SAUGERTIES NY 12477
02735	RCA CORP SOLID STATE DIVISION	ROUTE 202	SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT	W GENESEE ST	AUBURN NY 13021
03888	KDI PYROFILM CORP	60 S JEFFERSON RD	WHIPPANY NJ 07981
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR GROUP	5005 E MCDOWELL RD	PHOENIX AZ 85008
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
05828	GENERAL INSTRUMENT CORP GOVERNMENT SYSTEMS DIV	600 W JOHN ST	HICKSVILLE NY 11802
06665	PRECISION MONOLITHICS INC SUB OF BOURNS INC	1500 SPACE PARK DR	SANTA CLARA CA 95050
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV	464 ELLIS ST	MOUNTAIN VIEW CA 94042
07716	TRW INC TRW ELECTRONICS COMPONENTS TRW IRC FIXED RESISTORS/BURLINGTON	2850 MT PLEASANT AVE	BURLINGTON IA 52601
08806	GENERAL ELECTRIC CO MINIATURE LAMP PRODUCTS DEPT	NELA PK	CLEVELAND OH 44112
09922	BURNDY CORP	RICHARDS AVE	NORWALK CT 06852
11236	CTS OF BERNE INC	406 PARR ROAD	BERNE IN 46711
12954	MICROSEMI CORP	8700 E THOMAS RD P O BOX 1390	SCOTTSDALE AZ 85252
12969	UNITRODE CORP	580 PLEASANT ST	WATERTOWN MA 02172
13919	BURR-BROWN RESEARCH CORP	6730 S TUCSON BLVD P O BOX 11400	TUCSON AZ 85706
14433	ITT SEMICONDUCTORS DIV		WEST PALM BEACH FL
14752	ELECTRO CUBE INC	1710 S DEL MAR AVE	SAN GABRIEL CA 91776
14936	GENERAL INSTRUMENT CORP DISCRETE SEMI CONDUCTOR DIV	600 W JOHN ST	HICKSVILLE NY 11802
15238	ITT SEMICONDUCTORS A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP	500 BROADWAY P O BOX 168	LAWRENCE MA 01841
15454	AMETEK INC RODAN DIV	2905 BLUE STAR ST	ANAHEIM CA 92806
17856	SILICONIX INC	2201 LAURELWOOD RD	SANTA CLARA CA 95054
18324	SIGNETICS CORP	811 E ARQUES	SUNNYVALE CA 94086
19396	ILLINOIS TOOL WORKS INC PAKTRON DIVISION	900 FOLLIN LANE S E	VIENNA VA 22180
19613	MINNESOTA MINING AND MFG CO TEXTOOL PRODUCTS DEPT ELECTRONIC PRODUCT DIV	1410 E PIONEER DR	IRVING TX 75061
19701	MEPCO/ELECTRA INC A NORTH AMERICAN PHILIPS CO	P O BOX 760	MINERAL WELLS TX 76067
20932	KYOCERA INC	11620 SORRENTO VALLEY RD	SAN DIEGO CA 92121
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS	30 HUNTER LANE	CAMP HILL PA 17011
22753	UID SWITCHES INC DIV OF ILLINOIS TOOL WORKS INC	6615 W IRVING PARK RD	CHICAGO IL 60634
24355	ANALOG DEVICES INC	RT 1 INDUSTRIAL PK P O BOX 280	NORWOOD MA 02062
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701
25088	SIEMENS CORP	186 WOOD AVE S	ISELIN NJ 08830
25403	AMPEREX ELECTRONIC CORP SEMICONDUCTOR AND MICROCIRCUITS DIV	PROVIDENCE PIKE	SLATERSVILLE RI 02876

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Mfr. Code	Manufacturer	Address	City, State, Zip Code
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051
27264	MOLEX INC CORPORATE HQ	2222 WELLINGTON COURT	LISLE IL 60532
31433	UNION CARBIDE CORP ELECTRONICS DIV	PO BOX 5928	GREENVILLE SC 29606
31785	ISOTEMP RESEARCH INC	916 PRESTON AVE P O BOX 3389	CHARLOTTESVILLE VA 22901
31918	ITT SCHADOW INC	8081 WALLACE RD	EDEN PRAIRIE MN 55343
32159	WEST-CAP ARIZONA	2201 E ELVIRA ROAD	TUCSON AZ 85706
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507
33297	NEC ELECTRONICS USA INC ELECTRONICS ARRAYS DIV	550 E MIDDLEFIELD RD	MOUNTAIN VIEW CA 94043
34335	ADVANCED MICRO DEVICES	901 THOMPSON PL	SUNNYVALE CA 94086
34371	HARRIS SEMICONDUCTOR DIV OF HARRIS CORP	P O BOX 883	MELBOURNE FL 32901
34479	RENCO CORP.	26 COROMAR DRIVE	GOLETA, CA 93117
34649	INTEL CORP	3065 BOWERS AVE	SANTA CLARA CA 95051
34899	FAIR-RITE PRODUCTS CORP	1 COMMERCIAL ROW	WALLKILL NY 12589
50434	HEWLETT-PACKARD CO OPTOELECTRONICS DIV	640 PAGE MILL RD	PALO ALTO CA 94304
51406	MURATA ERIE NORTH AMERICA INC GEORGIA OPERATIONS	1148 FRANKLIN RD SE	MARIETTA GA 30067
51642	CENTRE ENGINEERING INC	2820 E COLLEGE AVE	STATE COLLEGE PA 16801
53387	MINNESOTA MINING AND MFG CO ELECTRONIC PRODUCTS DIV	3M CENTER	ST PAUL MN 55101
54473	MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY	SECAUCUS NJ 07094
54583	TDK ELECTRONICS CORP	755 EASTGATE BLVD	GARDEN CITY NY 11530
55112	WESTLAKE CAPACITORS INC	5334 STERLING CENTER DRIVE	WESTLAKE VILLAGE CA 91361
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195
56289	SPRAGUE ELECTRIC CO	87 MARSHALL ST	NORTH ADAMS MA 01247
56845	DALE ELECTRONICS INC	2300 RIVERSIDE BLVD	NORFOLK NE 68701
57027	TRW INC TRW IRC RESISTORS	4222 S STAPLES	CORPUS CHRISTI TX 78411
57668	ROHM CORP	16931 MILLIKEN AVE	IRVINE CA 92713
58224	XENELL CORP	HWY 77 S P O BOX 726	WYNNEWOOD OK 73098
59660	TUSONIX INC	2155 N FORBES BLVD	TUCSON, ARIZONA 85705
60705	CERA-MITE CORPORATION	1327 6TH AVE	GRAFTON WI 53024
61429	FOX ELECTRONICS	P O BOX 1078	CAPE CORAL FL 33910
61964	OMRON ELECTRONICS INC		
71400	BUSSMANN MFG CO MCGRAW EDISION CO	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
74970	JOHNSON E F CO	299 10TH AVE S W	WASECA MN 56093
75042	TRW INC TRW ELECTRONIC COMPONENTS IRC FIXED RESISTORS PHILADELPHIA DIV	401 N BROAD ST	PHILADELPHIA PA 19108
75915	LITTELFUSE INC	800 E NORTHWEST HWY	DES PLAINES IL 60016
76493	BELL INDUSTRIES INC MILLER J W DIV	19070 REYES AVE P O BOX 5825	COMPTON CA 90224
77542	RAY-O-VAC DIV ESB INC	101 E WASHINGTON AVE	MADISON WI 53703
80009	TEKTRONIX INC	4900 S W GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
81073	GRAYHILL INC	561 HILLGROVE AVE P O BOX 373	LA GRANGE IL 60525
81483	INTERNATIONAL RECTIFIER	9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX	LOS ANGELES CA 90069
91637	DALE ELECTRONICS INC	P O BOX 609	COLUMBUS NE 68601
93410	HAMILTON STANDARD CONTROL ESSEX GROUP INC	45-55 PLYMOUTH ST P O BOX 1007	LEXINGTON OH 44904
96733	SAN FERNANDO ELECTRIC MFG CO	1501 FIRST ST	SAN FERNANDO CA 91341
05243	ROEDERSTEIN E SPEZIALFABRIK FUER KONDENSATOREN GMBH	LUDWILLASTRASSE 23-25	8300 LANDSHUT GERMANY
S4307	SCHAFFNER ELECTRONIK AG		LUTERBACH,SWITZERLAND
TK0020	UNITED CHEMI-CON INC	1128 LEXINGTON AVE	ROCHESTER NY 14606
TK0510	PANASONIC COMPANY DIV OF MATSUSHITA ELECTRIC CORP	ONE PANASONIC WAY	SECAUCUS NJ 07094

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Mfr. Code	Manufacturer	Address	City, State, Zip Code
TK0515	RIFA WORLD PRODUCTS INC	19678 8TH STREET EAST P O BOX 517	SONOMA CA 95476
TK0961	NEC ELECTRONICS USA INC	401 ELLIS ST	MOUNTAIN VIEW CA 94043
TK0987	SEMI PROCESSES INC	1971 N CAPITOL AVE	SAN JOSE CA 95132
TK1016	TOSHIBA AMERICA INC ELECTRONIC COMPONENTS DIV BUSINESS SECTOR	2692 DOW AVE	TUSTIN CA 92680
TK1262	MURPHY ELECTRONICS INC	2360 SW 170TH AVE	BEAVERTON OR 97006
TK1345	ZMAN AND ASSOCIATES	7633 S 180TH	KENT WA 98032
TK1356	MURATA/ERIE N AMERICA CORP	645 N 11TH AVE	ERIE PA 16512
TK1424	MARCON AMERICA CORP	700 LANDWEHR RD	NORTHBROOK IL 60062
TK1441	GFS MANUFACTURING INC	6 PROGRESS DR BOX 517	DOVER NH 03820
TK1450	TOKYO COSMOS ELECTRIC CO LTD	2-268 SOBUDAI ZAWA	KANAGAWA 228 JAPAN
TK1456	PAPST	AQUIDNECK INDUSTRIAL PARK	NEWPORT RI 02840
TK1461	MILL-MAX MFG CORP	P O BOX 300 190 PINE HOLLOW RD	OYSTER BAY NY 11771
TK1483	TEKA PRODUCTS INC	45 SALEM ST	PROVIDENCE RI 02907
TK1573	MILHELM WESTERMAN	PO BOX 2345 AUGUSTA-ANLAGE 56	6800 MANNHEIM 1 WEST GERMANY
TK1601	PULSE ENGINEERING INC	1680 THE ALAMEDA	SAN JOSE CA 95126
TK1856	VLSI TECHNOLOGY INC	1101 MCKAY DRIVE	SAN JOSE CA 95131
TK1869	ALPS	100 N CNTRE AVE	ROCKVILLE CENTRE NY 11570
TK1906	EMC INC	725 FEDERAL AVE	KENILWORTH NJ 07033
TK2038	MULTI COMP INC	3005 SW 154TH TERRACE #3	BEAVERTON, OR 97006
TK2042	ZMAN & ASSOCIATES	7633 SO. 180TH	KENT, WA 98032

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	670-8830-00			CIRCUIT BD ASSY:PLUG-IN INTERFACE	80009	670-8830-00
A2	620-0022-00			POWER SUPPLY:ET MAINFRAME	80009	620-0022-00
A2A1	670-9326-00			CIRCUIT BD ASSY:LINE INVERTER	80009	670-9326-00
A2A2	670-8839-00			CIRCUIT BD ASSY:CONTROL RECTIFIER	80009	670-8839-00
A4	670-8840-00			CIRCUIT BD ASSY:REGULATOR	80009	670-8840-00
A5	614-0722-00			SUBPANEL ASSY:FRONT	80009	614-0722-00
A5A5	670-8836-00			CIRCUIT BD ASSY:BOTTOM FRONT PANEL	80009	670-8836-00
A5A8	670-8834-00			CIRCUIT BD ASSY:CENTER FRONT PANEL	80009	670-8834-00
A5A9	670-8833-00			CIRCUIT BD ASSY:TOP FRONT PANEL	80009	670-8833-00
A7	670-8835-00			CIRCUIT BD ASSY:TOUCH PANEL	80009	670-8835-00
A10	670-8832-00			CIRCUIT BD ASSY:FRONT PANEL INTERFACE	80009	670-8832-00
A11	670-8831-00			CIRCUIT BD ASSY:MAIN PROCESSOR	80009	670-8831-00
A12	670-8829-00			CIRCUIT BD ASSY:VERTICAL	80009	670-8829-00
A13	670-8828-00			CIRCUIT BD ASSY:SCOPE LOGIC	80009	670-8828-00
A14	670-8827-00			CIRCUIT BD ASSY:TIMEBASE	80009	670-8827-00
A14A16	670-9975-00			CIRCUIT BD ASSY:COUNTER/TIMER PLL/VCO	80009	670-9975-00
A15	670-9124-00			CIRCUIT BD ASSY:COUNTER/TIMER REFERENCE (OPTION 1T ONLY)	80009	670-9124-00
A1	670-8830-00			CIRCUIT BD ASSY:PLUG-IN INTERFACE	80009	670-8830-00
A1C100	281-0913-00			CAP,FXD,CER DI:0.1UF,50V,AXIAL	04222	MA105E104ZAA
A1C101	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A1C102	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A1C103	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A1C104	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A1C200	281-0913-00			CAP,FXD,CER DI:0.1UF,50V,AXIAL	04222	MA105E104ZAA
A1C201	290-0766-00			CAP,FXD,ELCTLT:2.2UF,+50-10%,160VDC	54473	ECEA2CS2R2
A1C202	290-0766-00			CAP,FXD,ELCTLT:2.2UF,+50-10%,160VDC	54473	ECEA2CS2R2
A1C300	281-0913-00			CAP,FXD,CER DI:0.1UF,50V,AXIAL	04222	MA105E104ZAA
A1J01	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J02	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J03	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J04	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J05	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J06	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J09	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J30	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J31	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J32	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J33	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J34	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J36	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J90	131-3418-00			TERMINAL,PIN:RTANG,2 X 15,0.025 SQ,0.1 SPCG	TK1483	082-1543-RD02

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1J91	131-3417-00			TERMINAL,PIN:RTANG,2 X 20,0.025 SQ,0.1 SPCG	TK1483	082-2043-RD02
A1J92	131-3544-01			CONN,RCPT,ELEC:HEADER,2 X 38	80009	131-3544-01
A1J93	131-3544-01			CONN,RCPT,ELEC:HEADER,2 X 38	80009	131-3544-01
A1J94	131-3544-00			CONN,RCPT,ELEC:HEADER,2 X 38	80009	131-3544-00
A1J95	131-2089-00			TERM SET,QIK DI:15 TERM,14/22 AWG	27264	22-17-2152
A1J96	131-2088-00			CONN,RCPT,ELEC:CKT BD,8 CONTACTS	27264	09-62-3082
A1R100	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A1R200	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A1R300	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A2	620-0022-00			POWER SUPPLY:ET MAINFRAME	80009	620-0022-00
A2B50	119-1725-01			FAN,TUBEAXIAL:8 TO 14.5VDC,6W,3200RPM	TK1456	4112 KX
A2F99	159-0013-00			FUSE,CARTRIDGE:3AG,6A,250V,MEDIUM BLOW	71400	MTH-CM-6
A2FL99	119-2064-00			FILTER,RFI:6A,115-230V,48-440HZ	S4307	FN322R-6/05
A2J70	175-9856-00			CA ASSY,SP,ELEC:20,28 AWG,3.75 L	80009	175-9856-00
A2J81	175-9915-00			CA ASSY,SP,ELEC:2,22 AWG,4.0 L	80009	175-9915-00
A2R99	302-0105-00			RES,FXD,CMPSN:1M OHM,10%,0.5W	01121	EB1051
A2W96	196-3072-00			LEAD,ELECTRICAL:18 AWG,2.0 L,9-N	80009	196-3072-00
A2W97	196-3071-00			LEAD,ELECTRICAL:18 AWG,4.0 L,5-4	80009	196-3071-00
A2W99	196-3074-00			LEAD,ELECTRICAL:18 AWG,12.0 L,5-4	80009	196-3074-00
A2W130	196-3075-00			LEAD,ELECTRICAL:18 AWG,2.0 L,9-N	80009	196-3075-00
A2W131	196-3075-00			LEAD,ELECTRICAL:18 AWG,2.0 L,9-N	80009	196-3075-00
A2A1	670-9326-00			CIRCUIT BD ASSY:LINE INVERTER	80009	670-9326-00
A2A1C140	285-1252-00			CAP,FXD,PLASTIC:0.15UF,10%,250VAC	05243	F1772-415-2000
A2A1C200	290-1106-00			CAP,FXD,ELCTLT:470UF,20%,200WVDC	TK1424	CEFHW20471B#P
A2A1C220	290-1106-00			CAP,FXD,ELCTLT:470UF,20%,200WVDC	TK1424	CEFHW20471B#P
A2A1C230	285-1252-00			CAP,FXD,PLASTIC:0.15UF,10%,250VAC	05243	F1772-415-2000
A2A1C310	290-1106-00			CAP,FXD,ELCTLT:470UF,20%,200WVDC	TK1424	CEFHW20471B#P
A2A1C320	290-1106-00			CAP,FXD,ELCTLT:470UF,20%,200WVDC	TK1424	CEFHW20471B#P
A2A1C400	285-1192-00			CAP,FXD,PPR DI:0.0022 UF,20%,250VAC	TK0515	PME271Y510
A2A1C401	285-1192-00			CAP,FXD,PPR DI:0.0022 UF,20%,250VAC	TK0515	PME271Y510
A2A1C500	285-1336-00			CAP,FXD,MTLZD:1.5UF,20%,400VDC	TK1573	MKC4 1.5/400/20
A2A1C630	285-1347-00			CAP,FXD,MTLZD:2.2MFD,20%,250V	TK1573	MKC4 2.2 20% 250
A2A1C631	285-1347-00			CAP,FXD,MTLZD:2.2MFD,20%,250V	TK1573	MKC4 2.2 20% 250
A2A1C640	285-0572-00			CAP,FXD,PLASTIC:0.1UF,20%,200V	56289	192P10402
A2A1C730	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A2A1C850	290-0922-02			CAP,FXD,ELCTLT:1000UF,20%,50V	56289	513D108M050EN4G
A2A1CR340	152-0838-00			SEMICOND DVC,DI:BRDG RECT,SI,400V,8A	14936	RKBPC804-11
A2A1CR500	152-0839-00			SEMICOND DVC,DI:RECT,SI,400V,50A,TO-220	04713	SUR116A
A2A1CR600	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A1CR610	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A2A1CR611	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A1CR612	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A1CR620	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A2A1CR621	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A1CR750	152-0585-00			SEMICOND DVC,DI:RECT,SI,200V,1A	14936	W02M-30
A2A1CR800	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A1CR801	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A1CR802	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A1CR803	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A1DS640	150-0030-00			LAMP,GLOW:60-90V MAX,0.7MA,A2B-T,WIRE LEADS	58224	A2B-T
A2A1E230	119-0181-00			ARSR,ELEC SURGE:230,GAS FILLED	25088	B1-A230
A2A1E231	119-0181-00			ARSR,ELEC SURGE:230,GAS FILLED	25088	B1-A230
A2A1E630	119-0181-00			ARSR,ELEC SURGE:230,GAS FILLED	25088	B1-A230
A2A1F410	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST BLOW	71400	AGC-CM-2
A2A1F650	159-0248-00			FUSE,WIRE LEAD:1.5 A,AXIAL LEAD	75915	R25101.5 T1

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2A1J70	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 19)	22526	48283-036
A2A1J97	131-2088-00			CONN,RCPT,ELEC:CKT BD,8 CONTACTS	27264	09-62-3082
A2A1J98	131-2088-00			CONN,RCPT,ELEC:CKT BD,8 CONTACTS	27264	09-62-3082
A2A1L520	108-1290-00			COIL,RF:FIXED,1.7MH,2A,100KHZ,POT CORE	80009	108-1290-00
A2A1Q600	151-1141-00			TRANSISTOR:FE,N-CHANNEL,SI,TO-220	04713	STP3000
A2A1Q601	151-1141-00			TRANSISTOR:FE,N-CHANNEL,SI,TO-220	04713	STP3000
A2A1Q610	151-1137-00			TRANSISTOR:FE,N-CHANNEL,MOSFET,TO-220	80009	151-1137-00
A2A1Q620	151-1137-00			TRANSISTOR:FE,N-CHANNEL,MOSFET,TO-220	80009	151-1137-00
A2A1Q740	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2A1Q800	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A1Q801	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A1Q840	151-0647-00			TRANSISTOR:PNP,SI,TO-220	04713	MJE15031
A2A1R140	308-0874-00			RES,FXD,MM:10 OHM,5%,1M	57027	BM-20F-10-5%
A2A1R220	301-0474-00			RES,FXD,FILM:470K OHM,5%,0.5M	19701	5053CX470K0J
A2A1R600	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A1R610	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A1R611	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A1R620	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A1R630	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25M	57668	NTR25J-E100K
A2A1R631	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25M	57668	NTR25J-E100K
A2A1R640	302-0106-00			RES,FXD,CMPSN:10M OHM,10%,0.5M	01121	EB1061
A2A1R800	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25M	57668	NTR25J-E100K
A2A1R830	315-0911-00			RES,FXD,FILM:910 OHM,5%,0.25M	57668	NTR25J-E910E
A2A1R831	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25M	19701	5043CX22K00J92U
A2A1R832	321-0197-00			RES,FXD,FILM:1.10K OHM,1%,0.125M,TC=TO	07716	CEAD11000F
A2A1R833	321-0221-00			RES,FXD,FILM:1.96K OHM,1%,0.125M,TC=TO	19701	5043ED1K960F
A2A1R840	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A2A1RT130	307-0746-00			RES,THERMAL:5 OHM,10%,7A/DEG C	15454	SG200-5
A2A1RT240	307-0746-00			RES,THERMAL:5 OHM,10%,7A/DEG C	15454	SG200-5
A2A1S99	260-0907-02			SWITCH,THRMSTC:NC OPEN 97.8,15A,125VAC	93410	430-1607
A2A1S130	260-2116-01			SWITCH,SLIDE:DPDT,10A,125VAC,POWER	22753	SE1022SDCEPBLORA
A2A1S250	260-2116-00			SWITCH,SLIDE:DPDT,10A,125VAC,LINE SEL	22753	SE1022SCCEPRHKRA
A2A1T410	120-1654-00			TRANSFORMER,PWR:8MH,1.5A,COMMON MODE	TK1601	62911
A2A1T440	120-1647-00			XFMR,PWR,STU:ISOLATING,DUAL PRIME/SECONDARY	TK1906	DST5-20B15
A2A1T700	120-1670-00			TRANSFORMER:CURRENT SENSE,DUAL,TWO CORE	TK1441	85-801-4
A2A1T710	120-1655-00			TRANSFORMER,PWR:GATE DR,1:1:1,1.5MH,50KHZ	TK1441	85-404-2
A2A1T720	120-1655-00			TRANSFORMER,PWR:GATE DR,1:1:1,1.5MH,50KHZ	TK1441	85-404-2
A2A1VR830	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A1W400	196-3075-00			LEAD,ELECTRICAL:18 AWG,2.0 L,9-N	80009	196-3075-00
A2A1W401	196-3075-00			LEAD,ELECTRICAL:18 AWG,2.0 L,9-N	80009	196-3075-00
A2A1W520	108-1290-00			COIL,RF:FIXED,1.7MH,2A,100KHZ,POT CORE	80009	108-1290-00
A2A1W521	108-1290-00			COIL,RF:FIXED,1.7MH,2A,100KHZ,POT CORE	80009	108-1290-00
A2A2	670-8839-00			CIRCUIT BD ASSY:CONTROL RECTIFIER	80009	670-8839-00
A2A2C110	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C120	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2C121	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2C130	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A2A2C200	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C210	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C211	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C212	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C213	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C214	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C215	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C220	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C221	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA

Component No.	Tektronix Part No.	Serial/Assembly No: Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2A2C230	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A2A2C241	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C250	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C251	281-0786-00			CAP,FXD,CER DI:150PF,10%,100V	04222	MA101A151KAA
A2A2C300	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A2A2C301	281-0786-00			CAP,FXD,CER DI:150PF,10%,100V	04222	MA101A151KAA
A2A2C302	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C303	281-0786-00			CAP,FXD,CER DI:150PF,10%,100V	04222	MA101A151KAA
A2A2C304	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C305	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C310	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A2A2C311	281-0791-00			CAP,FXD,CER DI:270PF,10%,100V	04222	MA101C271KAA
A2A2C312	281-0811-00			CAP,FXD,CER DI:10PF,10%,100V	04222	MA101A100KAA
A2A2C320	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C321	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C322	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A2A2C323	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C324	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2C325	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2C330	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A2A2C331	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C400	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C401	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C410	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C411	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2C425	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A2A2C440	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A2A2C441	290-0800-00			CAP,FXD,ELCTLT:250UF,+100-10%,20V	56289	672D257H020DM5C
A2A2C450	290-0800-00			CAP,FXD,ELCTLT:250UF,+100-10%,20V	56289	672D257H020DM5C
A2A2C451	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C500	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C501	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C502	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C503	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C504	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C510	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C520	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C521	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C526	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C530	290-0800-00			CAP,FXD,ELCTLT:250UF,+100-10%,20V	56289	672D257H020DM5C
A2A2C532	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C550	290-0800-00			CAP,FXD,ELCTLT:250UF,+100-10%,20V	56289	672D257H020DM5C
A2A2C620	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C630	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C639	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C644	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C706	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C715	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C721	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C731	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C732	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C743	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2C744	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C745	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C746	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C750	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C757	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A2A2C758	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2C821	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2A2C840	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A2A2C841	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2C852	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A2A2CR110	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR111	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR112	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR113	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR120	152-0905-00			SEMICOND DVC,DI:DUAL RECT,SCHOTTKY,40V,16A	80009	152-0905-00
A2A2CR121	152-0794-00			SEMICOND DVC,DI:RECT,SI,DUAL SCHOTTKY,10A	81483	95-4269
A2A2CR150	152-0601-01			SEMICOND DVC,DI:RECTIFIER,SI,150V,1A,35NS	80009	152-0601-01
A2A2CR151	152-0601-01			SEMICOND DVC,DI:RECTIFIER,SI,150V,1A,35NS	80009	152-0601-01
A2A2CR152	152-0601-01			SEMICOND DVC,DI:RECTIFIER,SI,150V,1A,35NS	80009	152-0601-01
A2A2CR153	152-0601-01			SEMICOND DVC,DI:RECTIFIER,SI,150V,1A,35NS	80009	152-0601-01
A2A2CR200	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR240	152-0908-00			SEMICOND DVC,DI:DUAL RECT,20V,8A PER DIODE	80009	152-0908-00
A2A2CR250	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR251	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR300	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR310	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR311	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR312	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR313	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR315	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR320	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR321	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR330	152-0908-00			SEMICOND DVC,DI:DUAL RECT,20V,8A PER DIODE	80009	152-0908-00
A2A2CR331	152-0794-00			SEMICOND DVC,DI:RECT,SI,DUAL SCHOTTKY,10A	81483	95-4269
A2A2CR340	152-0827-00			SEMICOND DVC,DI:RECT,SI,45V,3A	04713	MBR2545CT
A2A2CR350	152-0827-00			SEMICOND DVC,DI:RECT,SI,45V,3A	04713	MBR2545CT
A2A2CR410	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR411	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR412	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR413	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR420	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR421	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR422	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR423	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR424	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR510	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR511	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR512	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR513	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR514	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR515	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR516	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR517	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR520	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR521	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR522	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR523	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR524	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR525	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR526	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR527	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR600	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR601	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR602	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR610	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR611	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2A2CR612	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR613	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR614	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR615	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR616	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR617	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR620	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR621	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR622	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR623	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR702	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR703	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR704	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR705	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR716	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR717	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR718	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR720	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR721	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A2A2CR740	152-0066-01			SEMICOND DVC,DI:SELECTED	80009	152-0066-01
A2A2CR841	152-0066-01			SEMICOND DVC,DI:SELECTED	80009	152-0066-01
A2A2DS100	150-1171-00			LT EMITTING DIO:RED	50434	HLMP1302OPT002
A2A2DS530	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP15400PT002
A2A2DS531	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP15400PT002
A2A2DS533	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP15400PT002
A2A2DS630	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP15400PT002
A2A2E240	276-0532-00			SHLD BEAD,ELEK:FERRITE	02114	56-590-65/4A6
A2A2E241	276-0532-00			SHLD BEAD,ELEK:FERRITE	02114	56-590-65/4A6
A2A2F740	159-0220-00			FUSE,WIRE LEAD:3A,125V,FAST	71400	TRA3
A2A2J44	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 23)	22526	48283-036
A2A2J62	131-2250-00			CONN,RCPT,ELEC:HEADER,1 X 5 0.156 CTR (J62A)	27264	09-61-1053
A2A2J62	131-2576-00			TERM SET,PIN:6 CONTACT,MALE	27264	09-61-1061
A2A2J63	131-2576-00			TERM SET,PIN:6 CONTACT,MALE	27264	09-61-1061
A2A2J64	131-2789-00			CONN,RCPT,ELEC:HEADER,1 X 4,0.156 SPACING	27264	09-61-1045
A2A2J65	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 8)	22526	48283-036
A2A2J66	131-2250-00			CONN,RCPT,ELEC:HEADER,1 X 5 0.156 CTR	27264	09-61-1053
A2A2J70	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 19)	22526	48283-036
A2A2J81	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A2A2L140	108-1144-00			COIL,RF:FIXED,27 UH,20%	34479	RL1284
A2A2L141	108-1144-00			COIL,RF:FIXED,27 UH,20%	34479	RL1284
A2A2L220	108-0925-00			COIL,RF:FIXED,21UH	80009	108-0925-00
A2A2L221	108-0925-00			COIL,RF:FIXED,21UH	80009	108-0925-00
A2A2L330	108-0554-00			COIL,RF:FIXED,5UH,+/-20%	TK1345	108-0554-00
A2A2L331	108-0554-00			COIL,RF:FIXED,5UH,+/-20%	TK1345	108-0554-00
A2A2L340	108-0554-00			COIL,RF:FIXED,5UH,+/-20%	TK1345	108-0554-00
A2A2L341	108-1289-00			COIL,RF:1UH,30ADC,1.2M,MAX FERRITE SPOOL	TK1345	Z-1289
A2A2L440	108-1289-00			COIL,RF:1UH,30ADC,1.2M,MAX FERRITE SPOOL	TK1345	Z-1289
A2A2Q100	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A2Q210	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A2Q213	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A2Q250	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A2Q410	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A2Q430	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2A2Q431	151-0508-00			TRANSISTOR:UJT,SI,TO-98	03508	X13T520

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2A2Q432	151-0508-00			TRANSISTOR:UJT,SI,TO-98	03508	X13T520
A2A2Q530	151-0453-00			TRANSISTOR:PNP,SI,TO-92	27014	ORDER BY DESCR
A2A2Q600	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2A2Q630	151-0432-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS8512
A2A2Q640	151-0716-00			TRANSISTOR:DARLINGTON,NPN,SI,TO-92	27014	92 PU45A
A2A2Q700	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2A2Q701	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A2Q702	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A2A2Q720	151-0508-00			TRANSISTOR:UJT,SI,TO-98	03508	X13T520
A2A2Q721	151-0508-00			TRANSISTOR:UJT,SI,TO-98	03508	X13T520
A2A2Q740	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A2A2R100	313-1221-00			RES,FXD,FILM:220 OHM,5%,0.2W	57668	TR20JE220E
A2A2R101	313-1332-00			RES,FXD,FILM:3.3K OHM,5%,0.2W	57668	TR20JE 03K3
A2A2R104	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A2A2R110	313-1100-00			RES,FXD,FILM:10 OHM,5%,0.2W	57668	TR20JE10E0
A2A2R111	313-1100-00			RES,FXD,FILM:10 OHM,5%,0.2W	57668	TR20JE10E0
A2A2R112	313-1100-00			RES,FXD,FILM:10 OHM,5%,0.2W	57668	TR20JE10E0
A2A2R200	313-1472-00			RES,FXD,FILMN:4.7K OHM,5%,0.2W	57668	TR20JE 04K7
A2A2R201	313-1472-00			RES,FXD,FILMN:4.7K OHM,5%,0.2W	57668	TR20JE 04K7
A2A2R202	313-1472-00			RES,FXD,FILMN:4.7K OHM,5%,0.2W	57668	TR20JE 04K7
A2A2R203	313-1473-00			RES,FXD,FILM:47K OHM,5%,0.2W	57668	TR20JE 47K
A2A2R240	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2A2R241	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A2A2R242	307-0113-00			RES,FXD,CMPSN:5.1 OHM,5%,0.25W	01121	CB51G5
A2A2R250	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A2A2R300	313-1104-00			RES,FXD,FILM:100K OHM,5%,0.2W	57668	TR20JE100K
A2A2R301	313-1473-00			RES,FXD,FILM:47K OHM,5%,0.2W	57668	TR20JE 47K
A2A2R302	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A2A2R304	313-1472-00			RES,FXD,FILMN:4.7K OHM,5%,0.2W	57668	TR20JE 04K7
A2A2R305	313-1221-00			RES,FXD,FILM:220 OHM,5%,0.2W	57668	TR20JE220E
A2A2R310	313-1472-00			RES,FXD,FILMN:4.7K OHM,5%,0.2W	57668	TR20JE 04K7
A2A2R311	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A2A2R312	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2W	57668	TR20JE100E
A2A2R313	313-1683-00			RES,FXD,FILM:68K OHM,5%,0.2W	57668	TR20JE 68K
A2A2R314	313-1472-00			RES,FXD,FILMN:4.7K OHM,5%,0.2W	57668	TR20JE 04K7
A2A2R315	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A2A2R316	313-1473-00			RES,FXD,FILM:47K OHM,5%,0.2W	57668	TR20JE 47K
A2A2R317	313-1472-00			RES,FXD,FILMN:4.7K OHM,5%,0.2W	57668	TR20JE 04K7
A2A2R318	313-1222-00			RES,FXD,FILM:2.2K OHM,5%,0.2W	57668	TR20JE 02K2
A2A2R319	315-0155-00			RES,FXD,FILM:1.5M OHM,5%,0.25W	19701	5043CX1M500J
A2A2R320	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2W	57668	TR20JE10K0
A2A2R321	313-1104-00			RES,FXD,FILM:100K OHM,5%,0.2W	57668	TR20JE100K
A2A2R322	313-1104-00			RES,FXD,FILM:100K OHM,5%,0.2W	57668	TR20JE100K
A2A2R323	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2W	57668	TR20JE10K0
A2A2R324	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A2A2R325	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A2A2R326	313-1332-00			RES,FXD,FILM:3.3K OHM,5%,0.2W	57668	TR20JE 03K3
A2A2R327	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2W	57668	TR20JE10K0
A2A2R328	313-1333-00			RES,FXD,FILM:33K OHM,5%,0.2W	57668	TR20JE 33K
A2A2R329	313-1153-00			RES,FXD,FILM:15K,5%,0.2W	57668	TR20JE15K0
A2A2R330	313-1333-00			RES,FXD,FILM:33K OHM,5%,0.2W	57668	TR20JE 33K
A2A2R331	307-0113-00			RES,FXD,CMPSN:5.1 OHM,5%,0.25W	01121	CB51G5
A2A2R400	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25W	19701	5043CX33R00J
A2A2R410	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A2A2R411	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A2A2R412	321-0052-00			RES,FXD,FILM:34.0 OHM,1%,0.125W,TC=TO	57668	CRB14 FXE 34 OHM
A2A2R413	315-0334-00			RES,FXD,FILM:330K OHM,5%,0.25W	57668	NTR25J-E 330K
A2A2R414	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A2A2R415	321-0052-00			RES,FXD,FILM:34.0 OHM,1%,0.125W,TC=TO	57668	CRB14 FXE 34 OHM

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2A2R420	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A2A2R421	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R422	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A2A2R423	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A2A2R424	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R430	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R500	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R501	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A2A2R502	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R503	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R504	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R505	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R506	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R507	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A2A2R508	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R509	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125M,TC=T0	19701	5043ED6K980F
A2A2R510	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25M	57668	NTR25J-E470E
A2A2R511	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25M	57668	NTR25J-E470E
A2A2R512	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25M	57668	NTR25J-E470E
A2A2R513	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25M	57668	NTR25J-E470E
A2A2R514	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A2A2R515	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R516	321-0052-00			RES,FXD,FILM:34.0 OHM,1%,0.125M,TC=T0	57668	CRB14 FXE 34 OHM
A2A2R517	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125M,TC=T0	19701	5043ED6K980F
A2A2R518	321-0052-00			RES,FXD,FILM:34.0 OHM,1%,0.125M,TC=T0	57668	CRB14 FXE 34 OHM
A2A2R519	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125M,TC=T0	19701	5043ED6K980F
A2A2R520	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A2A2R521	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A2A2R522	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A2A2R523	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A2A2R524	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A2A2R525	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R526	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A2A2R527	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R530	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A2A2R531	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A2A2R532	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R533	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25M	57668	NTR25J-E33K0
A2A2R534	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A2A2R535	307-0755-00			RES,FXD,CMPSN:0.5 OHM,5%,0.5M	57668	TR50J-E0E5E
A2A2R536	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R537	307-0889-00			RES,FXD,FILM:1 OHM,5%,0.25M	19701	5043CX1R000J
A2A2R540	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25M	57668	NTR25J-E220E
A2A2R600	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25M	57668	NTR25J-E470E
A2A2R601	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25M	57668	NTR25J-E100K
A2A2R610	315-0334-00			RES,FXD,FILM:330K OHM,5%,0.25M	57668	NTR25J-E 330K
A2A2R611	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A2A2R612	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25M	57668	NTR25J-E470E
A2A2R613	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A2A2R620	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R621	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A2A2R622	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A2A2R623	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A2A2R624	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A2A2R625	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A2A2R626	321-0052-00			RES,FXD,FILM:34.0 OHM,1%,0.125M,TC=T0	57668	CRB14 FXE 34 OHM
A2A2R627	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125M,TC=T0	19701	5043ED6K980F
A2A2R629	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125M,TC=T9	19701	5033RE10K00B
A2A2R630	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2A2R631	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25M	57668	NTR25J-E33K0
A2A2R635	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125M,TC=T0	19701	5043ED6K980F
A2A2R636	307-0093-00			RES,FXD,CMPSN:1.2 OHM,5%,0.5M	01121	EB12G5
A2A2R637	307-0113-00			RES,FXD,CMPSN:5.1 OHM,5%,0.25M	01121	CB51G5
A2A2R639	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25M	19701	5043CX22K00J92U
A2A2R640	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25M	57668	NTR25J-E220E
A2A2R643	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A2A2R644	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25M	19701	5043CX22K00J92U
A2A2R700	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R701	321-0253-00			RES,FXD,FILM:4.22K OHM,1%,0.125M,TC=T0	19701	5033ED 4K 220F
A2A2R702	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A2A2R703	321-0250-00			RES,FXD,FILM:3.92K OHM,1%,0.125M,TC=T0	07716	CEAD39200F
A2A2R704	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R705	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A2A2R706	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A2A2R707	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R710	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A2A2R711	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A2A2R712	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A2A2R713	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A2A2R714	321-0052-00			RES,FXD,FILM:34.0 OHM,1%,0.125M,TC=T0	57668	CRB14 FXE 34 OHM
A2A2R715	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125M,TC=T0	19701	5043ED6K980F
A2A2R716	315-0330-00			RES,FXD,FILM:33 OHM,5%,0.25M	19701	5043CX33R00J
A2A2R717	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A2A2R721	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A2A2R722	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R723	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A2A2R724	315-0155-00			RES,FXD,FILM:1.5M OHM,5%,0.25M	19701	5043CX1M500J
A2A2R725	321-0332-00			RES,FXD,FILM:28.0K OHM,1%,0.125M,TC=T0	07716	CEAD28001F
A2A2R726	321-0360-00			RES,FXD,FILM:54.9K OHM,1%,0.125M,TC=T0	19701	5033ED54K90F
A2A2R727	321-0380-00			RES,FXD,FILM:88.7K OHM,1%,0.125M,TC=T0	07716	CEAD88701F
A2A2R728	315-0155-00			RES,FXD,FILM:1.5M OHM,5%,0.25M	19701	5043CX1M500J
A2A2R731	313-1332-00			RES,FXD,FILM:3.3K OHM,5%,0.2M	57668	TR20JE 03K3
A2A2R733	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125M,TC=T0	19701	5033ED100K0F
A2A2R734	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125M,TC=T0	19701	5033ED100K0F
A2A2R735	321-0332-00			RES,FXD,FILM:28.0K OHM,1%,0.125M,TC=T0	07716	CEAD28001F
A2A2R737	313-1100-00			RES,FXD,FILM:10 OHM,5%,0.2M	57668	TR20JE10E0
A2A2R738	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A2A2R739	307-0755-00			RES,FXD,CMPSN:0.5 OHM,5%,0.5M	57668	TR50J-E0E5E
A2A2R740	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2M	57668	TR20JE01K0
A2A2R743	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A2A2R744	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2M	57668	TR20JE01K0
A2A2R750	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2M	57668	TR20JE01K0
A2A2R800	311-2257-00			RES,VAR,NONWM:TRMR,500 OHM,20%,0.5M	TK1450	GF06VT 500 OHM
A2A2R841	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25M	57668	NTR25J-E470E
A2A2R842	313-1100-00			RES,FXD,FILM:10 OHM,5%,0.2M	57668	TR20JE10E0
A2A2T130	120-1672-00			TRANSFORMER,PWR:HIGH FREQUENCY	TK2038	120-1672-00
A2A2T140	120-1673-00			TRANSFORMER,PWR:HIGH FREQUENCY	TK2038	120-1673-00
A2A2TP100	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP121	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP201	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP202	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP210	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP211	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP220	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP221	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP300	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP301	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP310	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A2A2TP311	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP312	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP320	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP321	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP400	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP410	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP420	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP500	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP540	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP541	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP542	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP543	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP550	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP551	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP600	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP630	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP640	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP641	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP642	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP643	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP644	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP645	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP646	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP647	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP650	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP651	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP652	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP701	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP730	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP731	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP732	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP830	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2TP831	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A2A2U100	156-2462-00			MICROCKT,DGTL:CMOS,HIGH CURRENT QUAD POWER	17856	D469 CJ OR CK
A2A2U200	156-0366-02			MICROCKT,DGTL:DUAL D FLIP-FLOP,SCREENED	02735	CD4013BFX
A2A2U300	156-0285-00			MICROCKT,LINEAR:VOLTAGE REGULATOR	04713	MC7812CT
A2A2U400	156-0853-00			MICROCKT,LINEAR:OPNL AMPL,DUAL	04713	LM358N
A2A2U410	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A2A2U420	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A2A2U610	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A2A2U620	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A2A2U723	156-2461-00			MICROCKT,LINEAR:TEMP SENSOR,CURRENT OUTPUT	24355	AD592AN
A2A2U800	156-1631-00			MICROCKT,LINEAR:ADJUSTABLE SHUNT REGULATOR	01295	TL431C-LP
A2A2U810	156-0495-00			MICROCKT,LINEAR:OPNL AMPL	01295	LM324N
A2A2VR500	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A2VR510	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A2VR511	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A2VR620	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A2VR630	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A2VR700	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A2VR701	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A2VR704	152-0055-00			SEMICOND DVC,DI:ZEN,SI,11V,5%,0.4W,DO-7	14433	Z5407
A2A2VR710	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A2A2VR731	152-0055-00			SEMICOND DVC,DI:ZEN,SI,11V,5%,0.4W,DO-7	14433	Z5407
A4	670-8840-00			CIRCUIT BD ASSY:REGULATOR	80009	670-8840-00
A4C110	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A4C111	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A4C120	283-0330-00			CAP,FXD,CER DI:100PF,5%,50V	05397	C320C101J5R5CA
A4C121	283-0220-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	3429 050C 103M
A4C130	283-0330-00			CAP,FXD,CER DI:100PF,5%,50V	05397	C320C101J5R5CA
A4C210	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A4C211	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A4C230	283-0330-00			CAP,FXD,CER DI:100PF,5%,50V	05397	C320C101J5R5CA
A4C231	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C240	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A4C241	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A4C242	283-0159-00			CAP,FXD,CER DI:18PF,5%,50V	04222	SR155A180JAA
A4C310	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A4C320	283-0330-00			CAP,FXD,CER DI:100PF,5%,50V	05397	C320C101J5R5CA
A4C321	283-0220-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	3429 050C 103M
A4C322	283-0159-00			CAP,FXD,CER DI:18PF,5%,50V	04222	SR155A180JAA
A4C323	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C324	283-0220-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	3429 050C 103M
A4C330	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C331	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C332	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C333	283-0220-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	3429 050C 103M
A4C340	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A4C341	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A4C342	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C410	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A4C411	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A4C412	283-0220-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	3429 050C 103M
A4C440	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A4C441	290-0942-00			CAP,FXD,ELCTLT:100UF,+100-10%,25V	55680	UPA1E101MAH
A4C510	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A4C511	283-0220-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	3429 050C 103M
A4C600	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C601	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C602	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C603	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C604	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A4C610	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A4C611	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A4C700	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C701	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C702	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A4C703	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C704	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C705	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A4C706	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	04222	3430-100C-104K
A4C732	290-0782-01			CAP,FXD,ELCTLT:4.7UF,20%,35VDC	55680	ULB1V4R7MPA1TD
A4C739	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A4CR420	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR421	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR430	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR431	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR432	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR433	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A4CR434	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A4CR435	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A4CR510	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A4CR511	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A4CR512	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A4CR513	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A4F430	159-0220-00			FUSE,WIRE LEAD:3A,125V,FAST	71400	TRA3

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A4J40	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A4J57	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 6)	22526	48283-036
A4J60	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A4J62	131-2250-00			CONN,RCPT,ELEC:HEADER,1 X 5 0.156 CTR	27264	09-61-1053
A4J62	131-2576-00			TERM SET,PIN:6 CONTACT,MALE (J62A)	27264	09-61-1061
A4J65	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 7)	22526	48283-036
A4J95	131-0591-00			TERMINAL,PIN:0.835 L X 0.025 SQ PH BRZ (QUANTITY OF 15)	22526	47332
A4J96	131-3588-00			CONN,RCPT,ELEC:1 X 8 RT ANGLE,0.156 SPACING	27264	09-71-1081
A4J820	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 4)	22526	48283-036
A4L600	108-1144-00			COIL,RF:FIXED,27 UH,20%	34479	RL1284
A4L601	108-1144-00			COIL,RF:FIXED,27 UH,20%	34479	RL1284
A4L700	108-0554-00			COIL,RF:FIXED,5UH,+/-20%	TK1345	108-0554-00
A4L701	108-0554-00			COIL,RF:FIXED,5UH,+/-20%	TK1345	108-0554-00
A4L710	108-0554-00			COIL,RF:FIXED,5UH,+/-20%	TK1345	108-0554-00
A4L711	108-0554-00			COIL,RF:FIXED,5UH,+/-20%	TK1345	108-0554-00
A4P820	131-0993-00			BUS,CONDUCTOR:SHUNT ASSEMBLY,BLACK	22526	65474-005
A4Q100	151-1199-00			TRANSISTOR:NOSFET,PWR,50V,0.06 OHM,TO-220	80009	151-1199-00
A4Q110	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A4Q200	151-1199-00			TRANSISTOR:NOSFET,PWR,50V,0.06 OHM,TO-220	80009	151-1199-00
A4Q201	151-1171-00			TRANSISTOR:FET,MOS,12A,50V,TO-220	25088	BUZ71A
A4Q210	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A4Q310	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A4Q311	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A4Q400	151-1171-00			TRANSISTOR:FET,MOS,12A,50V,TO-220	25088	BUZ71A
A4Q500	151-0657-00			TRANSISTOR:PNP,SI,TO-220	04713	SJE1973
A4Q501	151-0656-00			TRANSISTOR:NPN,SI,TO-220	02735	2N6044
A4Q510	151-0432-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS8512
A4Q511	151-0453-00			TRANSISTOR:PNP,SI,TO-92	27014	ORDER BY DESCR
A4Q720	151-0464-00			TRANSISTOR:NPN,SI,TO-220	04713	SJE412
A4Q730	151-0464-00			TRANSISTOR:NPN,SI,TO-220	04713	SJE412
A4Q820	151-0462-00			TRANSISTOR:PNP,SI,TO-220	04713	SJE491
A4Q830	151-0462-00			TRANSISTOR:PNP,SI,TO-220	04713	SJE491
A4R110	301-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.5W	19701	5053CX6K800J
A4R111	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A4R120	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A4R121	315-0163-00			RES,FXD,FILM:16K OHM,5%,0.25W	57668	NTR25J-E 16K
A4R122	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE20K00BCM
A4R130	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A4R131	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A4R132	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A4R133	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A4R134	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A4R135	321-0685-07			RES,FXD,FILM:30K OHM,0.1%,0.125W,TC=T9	07716	CEAE30001B
A4R136	321-0603-07			RES,FXD,FILM:15K OHM,0.1%,0.125W,TC=T9	19701	5033RE15K00B
A4R137	321-0685-07			RES,FXD,FILM:30K OHM,0.1%,0.125W,TC=T9	07716	CEAE30001B
A4R138	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE20K00BCM
A4R139	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE20K00BCM
A4R140	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A4R141	315-0303-00			RES,FXD,FILM:30K OHM,5%,0.25W	19701	5043CX30K00J
A4R142	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A4R143	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A4R144	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A4R210	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A4R220	301-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.5W	19701	5053CX6K800J
A4R221	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A4R222	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A4R223	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE20K00BCM
A4R224	321-0385-07			RES,FXD,FILM:100K OHM,0.1%,0.125W,TC=T9	19701	5033RE100K0B
A4R225	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A4R230	315-0163-00			RES,FXD,FILM:16K OHM,5%,0.25W	57668	NTR25J-E 16K
A4R231	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A4R232	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A4R233	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A4R234	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	57668	NTR25J-E06K8
A4R235	321-0385-07			RES,FXD,FILM:100K OHM,0.1%,0.125W,TC=T9	19701	5033RE100K0B
A4R236	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE10K00B
A4R237	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE20K00BCM
A4R238	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A4R239	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A4R240	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A4R241	321-0986-07			RES,FXD,FILM:25K OHM,0.1%,0.125W,TC=T9	19701	5033RE25K00B
A4R242	315-0303-00			RES,FXD,FILM:30K OHM,5%,0.25W	19701	5043CX30K00J
A4R243	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A4R244	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A4R245	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A4R310	301-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.5W	19701	5053CX6K800J
A4R311	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A4R320	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A4R321	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A4R322	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A4R410	301-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.5W	19701	5053CX6K800J
A4R411	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A4R412	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A4R510	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A4R511	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A4R512	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A4R520	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A4R720	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A4R721	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A4R730	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A4R731	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A4R830	311-2257-00			RES,VAR,NONWW:TRMR,500 OHM,20%,0.5W	TK1450	GF06VT 500 OHM
A4R831	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A4R832	321-0197-00			RES,FXD,FILM:1.10K OHM,1%,0.125W,TC=T0	07716	CEAD11000F
A4R840	321-0254-00			RES,FXD,FILM:4.32K OHM,1%,0.125W,TC=T0	07716	CEAD43200F
A4TP820	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A4TP821	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A4TP822	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A4TP830	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A4TP831	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A4TP832	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A4U220	156-2614-00			MICROCKT,LINEAR:OP AMP,QUAD,BIFET	04713	MC34085AP
A4U230	156-2614-00			MICROCKT,LINEAR:OP AMP,QUAD,BIFET	04713	MC34085AP
A4U730	156-1631-00			MICROCKT,LINEAR:ADJUSTABLE SHUNT REGULATOR	01295	TL431C-LP
A4VR110	152-0149-00			SEMICOND DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	15238	Z5406
A4VR121	152-0590-00			SEMICOND DVC,DI:ZEN,SI,18V,5%,0.4W,DO-7	04713	SZG35014K2
A4VR210	152-0590-00			SEMICOND DVC,DI:ZEN,SI,18V,5%,0.4W,DO-7	04713	SZG35014K2
A4VR211	152-0590-00			SEMICOND DVC,DI:ZEN,SI,18V,5%,0.4W,DO-7	04713	SZG35014K2
A4VR310	152-0304-00			SEMICOND DVC,DI:ZEN,SI,20V,5%,0.4W,DO-7	15238	Z5411
A4VR410	152-0590-00			SEMICOND DVC,DI:ZEN,SI,18V,5%,0.4W,DO-7	04713	SZG35014K2
A4VR510	152-0283-00			SEMICOND DVC,DI:ZEN,SI,43V,5%,0.4W,D-07	04713	SZ14257KRL
A4VR520	152-0283-00			SEMICOND DVC,DI:ZEN,SI,43V,5%,0.4W,D-07	04713	SZ14257KRL

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A4VR720	152-0304-00			SEMICOND DVC,DI:ZEN,SI,20V,5%,0.4W,DO-7	15238	Z5411
A4VR730	152-0149-00			SEMICOND DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	15238	Z5406
A4VR731	152-0149-00			SEMICOND DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	15238	Z5406
A4VR732	152-0304-00			SEMICOND DVC,DI:ZEN,SI,20V,5%,0.4W,DO-7	15238	Z5411
A5	614-0722-00			SUBPANEL ASSY:FRONT	80009	614-0722-00
A5J74	175-9932-00			CA ASSY,SP,ELEC:20,26 AWG,16.5 L,RIBBON	80009	175-9932-00
A5J76	175-9933-00			CA ASSY,SP,ELEC:20,28 AWG,5.15 L,RIBBON	80009	175-9933-00
A5A5	670-8836-00			CIRCUIT BD ASSY:BOTTOM FRONT PANEL	80009	670-8836-00
A5A5C200	290-1123-00			CAP,FXD,ELCTLT:68MF,20%,10V	TK1424	CEUST1A680 (T-7)
A5A5C210	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A5A5C710	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A5A5DS100	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS200	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS201	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS220	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS300	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS320	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS400	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS410	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS500	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS520	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS521	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS522	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS600	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS700	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5DS800	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A5J73	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 34)	22526	48283-036
A5A5R100	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A5R101	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A5R102	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A5R103	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A5R210	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
A5A5R420	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A5R510	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A5R800	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A5S100	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S110	311-2320-00			ENCODER,DIGITAL:INCREMENTAL,50PPR,50 DETENT	TK1869	LA22661
A5A5S210	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S211	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S220	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S310	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S400	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S410	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S420	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S510	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S520	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S610	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S710	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S800	260-2280-01			SW,PUSH BUTTON:SPRT,NORMALLY OPEN,LOW	31918	211100
A5A5S810	311-2320-00			ENCODER,DIGITAL:INCREMENTAL,50PPR,50 DETENT	TK1869	LA22661
A5A5U220	156-0982-03			MICROCKT,DGTL:OCTAL-D-EDGE TRIG FF	01295	SN74LS374N3
A5A5U720	156-0982-03			MICROCKT,DGTL:OCTAL-D-EDGE TRIG FF	01295	SN74LS374N3
A5A8	670-8834-00			CIRCUIT BD ASSY:CENTER FRONT PANEL	80009	670-8834-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A5A8C100	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A5A8C400	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A5A8DS100	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A8DS200	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A8DS300	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A8DS301	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A8DS400	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A8DS401	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A8DS500	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A8J74	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 20)	22526	48283-036
A5A8R400	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A8S100	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A8S200	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A8S300	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A8S301	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A8S400	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A8S401	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A8S500	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A8U100	156-0982-03			MICROCKT,DGTL:OCTAL-D-EDGE TRIG FF	01295	SN74LS374N3
A5A9	670-8833-00			CIRCUIT BD ASSY:TOP FRONT PANEL	80009	670-8833-00
A5A9C300	290-1123-00			CAP,FXD,ELCTLT:68MF,20%,10V	TK1424	CEUST1A680 (T-7)
A5A9C400	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A5A9DS200	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A9DS201	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A9DS500	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A9DS501	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A9DS502	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A9DS503	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A9DS504	150-1163-00			LT EMITTING DIO:GREEN	50434	HLMP1540OPT002
A5A9J76	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 20)	22526	48283-036
A5A9R400	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
A5A9R401	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A9R500	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A9R501	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A5A9S100	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A9S300	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A9S400	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A9S500	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A9S600	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A9S601	260-2280-01			SM,PUSH BUTTON:SPRT,NORMALLY OPEN,LOM	31918	211100
A5A9U200	156-0982-03			MICROCKT,DGTL:OCTAL-D-EDGE TRIG FF	01295	SN74LS374N3
A7	670-8835-00			CIRCUIT BD ASSY:TOUCH PANEL	80009	670-8835-00
A7CR100	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR101	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR200	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR201	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR300	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR301	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR400	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR401	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR500	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR501	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR502	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR503	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A7CR510	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR511	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR512	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR520	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR521	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR522	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR530	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR531	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR532	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR540	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR541	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR542	151-0848-00			TRANSISTOR:PHOTO	TK0961	PH108A-T
A7CR610	152-0460-00			SEMICOND DVC,DI:FE,SI,25V,1MA,TO-7	04713	SCL072
A7DS100	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS101	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS110	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS111	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS112	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS120	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS121	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS122	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS130	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS131	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS132	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS140	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS141	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS142	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS143	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS144	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS145	150-0077-01			LAMP,INCAND:14V,0.08A,#2282D,WIRE LEADS	08806	2162D
A7DS240	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS241	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS340	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS341	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS342	150-0077-01			LAMP,INCAND:14V,0.08A,#2282D,WIRE LEADS	08806	2162D
A7DS440	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS441	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS540	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS541	150-1168-00			LT EMITTING DIO:IR	80009	150-1168-00
A7DS542	150-0077-01			LAMP,INCAND:14V,0.08A,#2282D,WIRE LEADS	08806	2162D
A7J43	131-3558-00			TERM,FEEDTHRU:0.700 L X 0.072,BRS GLD PL (QUANTITY OF 3)	TK1461	1010305210000010
A7J87	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 34)	22526	48283-036
A7J88	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 34)	22526	48283-036
A7Q100	151-0252-00			SEMICOND DVC,PH:NPN,SI,TO-106	07263	FPT100A
A7Q140	151-0252-00			SEMICOND DVC,PH:NPN,SI,TO-106	07263	FPT100A
A7Q500	151-0252-00			SEMICOND DVC,PH:NPN,SI,TO-106	07263	FPT100A
A7Q540	151-0252-00			SEMICOND DVC,PH:NPN,SI,TO-106	07263	FPT100A
A10	670-8832-00			CIRCUIT BD ASSY:FRONT PANEL INTERFACE	80009	670-8832-00
A10C110	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C111	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A10C112	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C130	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A10C131	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A10C132	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A10C200	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A10C210	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A10C211	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A10C221	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C300	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C320	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C321	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C400	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C401	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C420	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C421	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A10C422	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A10C423	283-0167-02			CAP,FXD,CER DI:0.1UF,10%,100V,0.2 SPACING	54583	FK26X5R2A104K-T
A10C424	283-0167-02			CAP,FXD,CER DI:0.1UF,10%,100V,0.2 SPACING	54583	FK26X5R2A104K-T
A10C430	290-0973-01			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA1TA
A10C500	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C501	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C520	290-0973-01			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA1TA
A10C521	290-0973-01			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA1TA
A10C522	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A10C523	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A10C524	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A10C530	283-0339-00			CAP,FXD,CER DI:0.22UF,10%,50V	05397	C330C224K5R5CA
A10C600	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A10C620	290-0973-01			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA1TA
A10C621	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A10C622	283-0167-02			CAP,FXD,CER DI:0.1UF,10%,100V,0.2 SPACING	54583	FK26X5R2A104K-T
A10C623	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A10C700	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C720	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A10C721	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A10C801	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C810	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C820	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A10C821	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A10C822	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A10C823	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A10C824	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A10C830	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A10C831	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A10C832	283-0114-00			CAP,FXD,CER DI:1500PF,5%,200V	59660	805-534-Y5D0152J
A10C910	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A10C920	281-0788-00			CAP,FXD,CER DI:470PF,10%,100V	04222	MA101C471KAA
A10C930	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C931	283-0114-00			CAP,FXD,CER DI:1500PF,5%,200V	59660	805-534-Y5D0152J
A10C1010	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C1020	290-0973-01			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MPA1TA
A10C1021	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10C1030	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A10C1031	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A10CR110	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A10CR210	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR211	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR230	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR231	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR720	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR910	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A10CR911	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR912	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A10CR930	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A10CR931	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR1010	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR1030	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10CR1031	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A10CR1032	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A10E200	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A10E201	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A10E620	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A10E720	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A10E820	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A10E821	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A10E1010	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A10J57	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 4)	22526	48283-036
A10J58	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A10J59	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 2)	22526	48283-036
A10J67	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 5)	22526	48283-036
A10J68	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 5)	22526	48283-036
A10J72	131-3147-00			CONN,RCPT,ELEC:HEADER,2 X 25,0.1 SPACING	53387	3596-6002
A10J73	131-3364-00			CONN,RCPT,ELEC:HEADER,STRAIGHT,34 PIN	53387	3594-6002
A10J74	131-3360-00			CONN,RCPT,ELEC:HEADER,RTANG,20 PIN	53387	3592-6002
A10J75	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 20)	22526	48283-036
A10J76	131-3360-00			CONN,RCPT,ELEC:HEADER,RTANG,20 PIN	53387	3592-6002
A10J78	131-3360-00			CONN,RCPT,ELEC:HEADER,RTANG,20 PIN	53387	3592-6002
A10J87	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 34)	22526	48283-036
A10J88	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL ((QUANTITY OF 34)	22526	48283-036
A10K930	148-0176-00			RELAY,ARMATURE:40MA,5VDC,COIL,125 OHM DC	61964	G5Y-154P 5VDC
A10Q610	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A10Q910	151-0347-02			TRANSISTOR:NPN,SI,TO-92	56289	CT7916(AMMOPACK)
A10Q920	151-1121-01			TRANSISTOR:MOSFET,N-CHAN,60V,TO-92	80009	151-1121-01
A10Q921	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A10Q1010	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A10Q1020	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A10Q1021	151-0212-00			TRANSISTOR:NPN,SI,TO-72	04713	SRF 518
A10Q1022	151-0212-00			TRANSISTOR:NPN,SI,TO-72	04713	SRF 518
A10Q1030	151-1121-01			TRANSISTOR:MOSFET,N-CHAN,60V,TO-92	80009	151-1121-01
A10R110	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A10R111	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A10R112	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A10R113	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A10R114	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25M	57668	NTR25J-E47E0
A10R115	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A10R116	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
A10R117	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A10R120	311-2231-00			RES,VAR,NONWW:TRMR,1K OHM,20%,0.5M	TK1450	GF06UT 1K
A10R130	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A10R210	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A10R211	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A10R212	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A10R213	315-0121-00			RES,FXD,FILM:120 OHM,5%,0.25M	19701	5043CX120R0J
A10R214	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A10R300	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7

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A10R301	307-0649-00			RES NTWK,FXD,FI:8,33 OHM,2%,0.125W	01121	316B330
A10R410	307-0445-00			RES NTWK,FXD,FI:4.7K OHM,20%,(9)RES	32997	4310R-101-472
A10R420	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R421	315-0912-00			RES,FXD,FILM:9.1K OHM,5%,0.25W	57668	NTR25J-E09K1
A10R422	315-0683-00			RES,FXD,FILM:68K OHM,5%,0.25W	57668	NTR25J-E68K0
A10R423	315-0113-00			RES,FXD,FILM:11K OHM,5%,0.25W	19701	5043CX11K00J
A10R430	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A10R431	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R432	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R433	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R500	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A10R501	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R510	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A10R511	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A10R520	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A10R521	322-3287-00			RES,FXD,FILM:9.53K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 9K53
A10R522	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A10R523	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A10R524	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A10R525	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A10R526	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A10R527	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A10R530	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A10R531	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R532	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A10R600	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R610	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A10R611	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R612	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A10R630	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A10R700	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A10R701	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A10R702	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A10R703	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A10R704	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A10R705	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A10R710	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A10R720	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A10R721	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25W	57668	NTR25J-E01K3
A10R802	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A10R803	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A10R804	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A10R830	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A10R831	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A10R900	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25W	57668	NTR25J-E27K0
A10R901	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A10R903	321-0466-00			RES,FXD,FILM:698K OHM,1%,0.125W,TC=T0	19701	5043ED698K0F
A10R904	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A10R905	321-0631-03			RES,FXD,FILM:12.5K OHM,0.25%,0.125W,TC-T2	19701	5033RC12K500C
A10R910	321-0468-00			RES,FXD,FILM:732K OHM,1%,0.125W,TC=T0	19701	5043ED732K0F
A10R911	321-0368-00			RES,FXD,FILM:66.5K OHM,1%,0.125W,TC=T0	07716	CEAD66501F
A10R912	321-0272-00			RES,FXD,FILM:6.65K OHM,1%,0.125W,TC=T0	19701	5043ED6K650F
A10R914	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0	19701	5033ED100K0F
A10R915	321-0284-00			RES,FXD,FILM:8.87K OHM,1%,0.125W,TC=T0	19701	5043ED8K870F
A10R916	321-0304-00			RES,FXD,FILM:14.3K OHM,1%,0.125W,TC=T0	19701	5033ED14K30F
A10R917	315-0183-00			RES,FXD,FILM:18K OHM,5%,0.25W	19701	5043CX18K00J
A10R918	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A10R920	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A10R921	321-0775-00			RES,FXD,FILM:45K OHM,1%,0.125W,TC=T0	19701	5033RD45K00F

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A10R922	321-0410-00			RES,FXD,FILM:182K OHM,1%,0.125M,TC=T0	19701	5033ED182K0F
A10R923	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125M,TC=T0	19701	5033ED1K00F
A10R924	323-0216-00			RES,FXD,FILM:1.74K OHM,1%,0.5M,TC=T0	75042	CECT0-1741F
A10R925	323-0214-00			RES,FXD,FILM:1.65K OHM,1%,0.5M,TC=T0	19701	5053RD1K650F
A10R1000	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25M	57668	NTR25J-E01K3
A10R1001	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25M	57668	NTR25J-E01K3
A10R1010	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25M	19701	5043CX3K600J
A10R1011	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25M	57668	NTR25J-E01K3
A10R1012	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
A10R1013	321-0187-00			RES,FXD,FILM:866 OHM,1%,0.125M,TC=T0	07716	CEAD866R0F
A10R1020	321-0207-00			RES,FXD,FILM:1.40K OHM,1%,0.125M,TC=T0	19701	5033ED1K400F
A10R1021	321-0167-00			RES,FXD,FILM:536 OHM,1%,0.125M,TC=T0	07716	CEAD536R0F
A10R1022	321-0228-00			RES,FXD,FILM:2.32K OHM,1%,0.125M,TC=T0	19701	5043ED2K32F
A10R1023	321-0211-00			RES,FXD,FILM:1.54K OHM,1%,0.125M,TC=T0	07716	CEAD15400F
A10R1024	315-0430-00			RES,FXD,FILM:43 OHM,5%,0.25M	19701	5043CX43R00J
A10R1025	322-0102-00			RES,FXD,FILM:113 OHM,1%,0.25M,TC=T0	19701	5043RD113R0F
A10R1026	321-0139-00			RES,FXD,FILM:274 OHM,1%,0.125M,TC=T0	07716	CEAD274R0F
A10R1027	321-0122-00			RES,FXD,FILM:182 OHM,1%,0.125M,TC=T0	19701	5033ED182R0F
A10R1028	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A10R1029	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A10R1030	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A10R1031	321-0909-01			RES,FXD,FILM:49.5 OHM,0.5%,0.125M,TC=T0	91637	CMF55116G49R500
A10R1032	321-0609-07			RES,FXD,FILM:480 OHM,0.1%,0.125M,TC=T9	19701	5033RE480R0B
A10R1033	321-1612-07			RES,FXD,FILM:4.455K OHM,0.1%,0.125M,TC=T9	19701	5033RE4K455B
A10TP100	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10TP120	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10TP220	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10TP221	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10TP222	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10TP420	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10TP720	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10TP820	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10TP1020	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A10U110	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A10U120	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A10U121	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A10U220	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A10U221	156-0796-01			MICROCKT,DGTL:8 STG SHF & STORE BUS RGTR	02735	CD4094BFX
A10U300	156-0865-02			MICROCKT,DGTL:OCTAL D FF W/CLEAR	01295	SN74LS273NP3
A10U320	156-0982-03			MICROCKT,DGTL:OCTAL-D-EDGE TRIG FF	01295	SN74LS374N3
A10U321	156-0982-03			MICROCKT,DGTL:OCTAL-D-EDGE TRIG FF	01295	SN74LS374N3
A10U400	156-0914-02			MICROCKT,DGTL:OCT ST BFR W/3 STATE OUT	01295	SN74LS240NP3
A10U401	156-0479-02			MICROCKT,DGTL:QUAD 2-INP OR GATE	01295	SN74LS32NP3
A10U420	156-0982-03			MICROCKT,DGTL:OCTAL-D-EDGE TRIG FF	01295	SN74LS374N3
A10U421	156-1200-00			MICROCKT,LINEAR:OPERATIONAL AMP,QUAD BI-FET	01295	TL074CN
A10U500	156-1432-02			MICROCKT,DGTL:DUAL 2/4 LINE DECODER/DEMUX	01295	SN74LS156 NP3
A10U501	156-0384-02			MICROCKT,DGTL:QUAD 2-INP NAND GATE	07263	74LS03PCQR
A10U620	156-1200-00			MICROCKT,LINEAR:OPERATIONAL AMP,QUAD BI-FET	01295	TL074CN
A10U621	156-2571-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,TRIPLE,2	80009	156-2571-00
A10U700	156-2184-00			MICROCKT,DGTL:INVERTING OCTAL TRI STATE	01295	SN74HCT240N
A10U720	156-1258-01			MICROCKT,DGTL:DUAL J-K NEG-EDGE-TRIG FF	01295	SN74LS112(NP3)
A10U721	156-1258-01			MICROCKT,DGTL:DUAL J-K NEG-EDGE-TRIG FF	01295	SN74LS112(NP3)
A10U801	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A10U910	156-1149-00			MICROCKT,LINEAR:OPERATIONAL AMP,JFET INPUT	27014	LF351N/GLEA134
A10U1000	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A10VR430	152-0514-00			SEMICOND DVC,DI:ZEN,SI,10V,1%,0.4W,DO-7	04713	SZG15RL
A10VR920	152-0280-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	1N753A
A11	670-8831-00			CIRCUIT BD ASSY:MAIN PROCESSOR	80009	670-8831-00

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A11BT1190	146-0050-00			BATTERY,DRY:3V,1200MA,2/3A LITHIUM	77542	BR-2/3A
A11C100	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C120	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C126	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C127	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C130	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C140	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C142	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C150	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C151	281-0809-00			CAP,FXD,CER DI:200 PF,5%,100V	04222	MA101A201JAA
A11C152	281-0798-00			CAP,FXD,CER DI:51PF,1%,100V	04222	MA101A510GAA
A11C164	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C166	281-0865-00			CAP,FXD,CER DI:1000PF,5%,100V	04222	MA101A102JAA
A11C170	281-0811-00			CAP,FXD,CER DI:10PF,10%,100V	04222	MA101A100KAA
A11C171	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C172	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C174	281-0811-00			CAP,FXD,CER DI:10PF,10%,100V	04222	MA101A100KAA
A11C175	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C180	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C181	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C184	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C200	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C209	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C212	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A11C215	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A11C220	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C224	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C225	281-0811-00			CAP,FXD,CER DI:10PF,10%,100V	04222	MA101A100KAA
A11C226	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A11C230	281-0798-00			CAP,FXD,CER DI:51PF,1%,100V	04222	MA101A510GAA
A11C231	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V	04222	MA106A2R2DAA
A11C232	281-0809-00			CAP,FXD,CER DI:200 PF,5%,100V	04222	MA101A201JAA
A11C233	281-0809-00			CAP,FXD,CER DI:200 PF,5%,100V	04222	MA101A201JAA
A11C234	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V	04222	MA106A2R2DAA
A11C236	281-0798-00			CAP,FXD,CER DI:51PF,1%,100V	04222	MA101A510GAA
A11C237	281-0811-00			CAP,FXD,CER DI:10PF,10%,100V	04222	MA101A100KAA
A11C238	281-0811-00			CAP,FXD,CER DI:10PF,10%,100V	04222	MA101A100KAA
A11C240	281-0798-00			CAP,FXD,CER DI:51PF,1%,100V	04222	MA101A510GAA
A11C241	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C242	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C243	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C244	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C245	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C246	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A11C247	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A11C248	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A11C249	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A11C250	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C251	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C260	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C262	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C264	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C268	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C270	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C280	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C282	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C327	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C328	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T

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A11C330	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C340	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C342	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C344	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C350	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C360	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C370	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C380	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C382	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C420	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M T
A11C460	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C504	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A11C506	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A11C520	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C680	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C700	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C750	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C856	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C870	281-0758-00			CAP,FXD,CER DI:15PF,20%,100V	04222	MA101A150MAA
A11C872	281-0758-00			CAP,FXD,CER DI:15PF,20%,100V	04222	MA101A150MAA
A11C1000	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C1072	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C1090	290-0944-01			CAP,FXD,ELCTLT:220UF,20%,10V	55680	ULB1A221MA1TD
A11C1280	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A11C1282	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1290	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A11C1294	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1330	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M T
A11C1350	281-0758-00			CAP,FXD,CER DI:15PF,20%,100V	04222	MA101A150MAA
A11C1360	281-0758-00			CAP,FXD,CER DI:15PF,20%,100V	04222	MA101A150MAA
A11C1380	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A11C1390	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1450	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1460	283-0059-02			CAP,FXD,CER DI:1UF,20%,50V	05397	ORDER BY DESCR
A11C1482	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A11C1490	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1492	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A11C1570	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1580	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A11C1582	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1590	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1600	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1690	285-0862-00			CAP,FXD,PLASTIC:0.001,10%,100V	19396	DU490/74-28219
A11C1700	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1750	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C1752	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C1800	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1840	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A11C1880	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11C1900	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A11CR320	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR322	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR324	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR326	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR327	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR400	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR500	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR502	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR630	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)

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A11CR632	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1262	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1292	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V (QUANTITY OF 2)	50434	5082-2672
A11CR1350	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1364	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1540	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1860	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1861	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1862	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1863	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1870	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1871	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1872	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1873	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1880	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1881	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1882	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1883	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11CR1890	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A11DS846	150-1171-00			LT EMITTING DIO:RED	50434	HLMP1302OPT002
A11DS1080	150-1171-00			LT EMITTING DIO:RED	50434	HLMP1302OPT002
A11DS1081	150-1171-00			LT EMITTING DIO:RED	50434	HLMP1302OPT002
A11E880	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A11E980	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A11J24	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A11J25	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A11J41	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A11J42	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A11J50	131-3410-00			CONN,RCPT,ELEC:IEEE RT ANGLE 0.085 SPACING	00779	553811-2
A11J51	131-3406-00			CONN,RCPT,ELEC:25 CONTACT,RA,RS232 CONN	59422	H4R25RA29C
A11J52	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 9)	22526	48283-036
A11J56	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 5)	22526	48283-036
A11J60	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A11J66	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 4)	22526	48283-036
A11J71	131-3147-00			CONN,RCPT,ELEC:HEADER,2 X 25,0.1 SPACING	53387	3596-6002
A11J72	131-3147-00			CONN,RCPT,ELEC:HEADER,2 X 25,0.1 SPACING	53387	3596-6002
A11J78	131-3360-00			CONN,RCPT,ELEC:HEADER,RTANG,20 PIN	53387	3592-6002
A11J79	131-3147-00			CONN,RCPT,ELEC:HEADER,2 X 25,0.1 SPACING	53387	3596-6002
A11J90	131-2089-00			TERM SET,QIK DI:15 TERM,14/22 AWG (QUANTITY OF 2)	27264	22-17-2152
A11J850	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 4)	22526	48283-036
A11J852	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 4)	22526	48283-036
A11J1250	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A11J1450	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 2)	22526	48283-036
A11L230	108-0800-00			COIL,RF:FIXED,820MH	04072	9230-90
A11L234	108-0800-00			COIL,RF:FIXED,820MH	04072	9230-90
A11L240	108-0800-00			COIL,RF:FIXED,820MH	04072	9230-90
A11LS1890	119-2101-00			XDCR,AUDIO:6V,40MA,2-2.5KHZ,WATER WASHABLE	TK1066	SMX-06
A11P852	131-0993-00			BUS,CONDUCTOR:SHUNT ASSEMBLY,BLACK (QUANTITY OF 2)	22526	65474-005
A11P1250	131-0993-00			BUS,CONDUCTOR:SHUNT ASSEMBLY,BLACK	22526	65474-005

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A11Q125	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A11Q127	151-0216-04			TRANSISTOR:PNP,SI,TO-92	04713	SPS8803RL
A11Q128	151-0216-04			TRANSISTOR:PNP,SI,TO-92	04713	SPS8803RL
A11Q160	151-0216-04			TRANSISTOR:PNP,SI,TO-92	04713	SPS8803RL
A11Q161	151-0216-04			TRANSISTOR:PNP,SI,TO-92	04713	SPS8803RL
A11Q162	151-0216-04			TRANSISTOR:PNP,SI,TO-92	04713	SPS8803RL
A11Q163	151-0216-04			TRANSISTOR:PNP,SI,TO-92	04713	SPS8803RL
A11Q172	151-1121-01			TRANSISTOR:MOSFET,N-CHAN,60V,TO-92	80009	151-1121-01
A11Q1040	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A11Q1268	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A11Q1269	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A11Q1360	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A11Q1880	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A11R120	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125M,TC=TO	07716	CEAD402ROF
A11R122	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125M,TC=TO	07716	CEAD402ROF
A11R125	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25M	57668	NTR25J-E33K0
A11R130	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R131	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R132	321-0206-00			RES,FXD,FILM:1.37K OHM,1%,0.125M,TC=TO	07716	CEAD13700F
A11R133	321-0206-00			RES,FXD,FILM:1.37K OHM,1%,0.125M,TC=TO	07716	CEAD13700F
A11R150	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A11R152	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A11R160	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A11R161	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A11R162	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A11R163	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A11R164	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25M	19701	5043CX240R0J
A11R165	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A11R170	321-0246-00			RES,FXD,FILM:3.57K OHM,1%,0.125M,TC=TO	19701	5043ED3K570F
A11R171	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R172	321-0164-00			RES,FXD,FILM:499 OHM,1%,0.125M,TC=TO	19701	5033ED499R0F
A11R173	321-0248-00			RES,FXD,FILM:3.74K OHM,1%,0.125M,TC=TO	19701	5043ED3K740F
A11R174	321-0246-00			RES,FXD,FILM:3.57K OHM,1%,0.125M,TC=TO	19701	5043ED3K570F
A11R175	321-0248-00			RES,FXD,FILM:3.74K OHM,1%,0.125M,TC=TO	19701	5043ED3K740F
A11R176	321-0164-00			RES,FXD,FILM:499 OHM,1%,0.125M,TC=TO	19701	5033ED499R0F
A11R180	321-0164-00			RES,FXD,FILM:499 OHM,1%,0.125M,TC=TO	19701	5033ED499R0F
A11R181	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125M,TC=TO	19701	5033ED2K00F
A11R182	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A11R183	311-2233-00			RES,VAR,NONWW:TRMR,3.0K OHM,20%,0.5M LINEAR	TK1450	GF06UT3K
A11R184	311-2233-00			RES,VAR,NONWW:TRMR,3.0K OHM,20%,0.5M LINEAR	TK1450	GF06UT3K
A11R210	315-0822-00			RES,FXD,FILM:8.2K OHM,5%,0.25M	19701	5043CX8K200J
A11R211	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A11R212	321-0481-00			RES,FXD,FILM:1M OHM,1%,0.125M,TC=TO	19701	5043ED1M000F
A11R213	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125M,TC=TO	03888	PME55D20003F
A11R214	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125M,TC=TO	03888	PME55D20003F
A11R215	321-0414-00			RES,FXD,FILM:200K OHM,1%,0.125M,TC=TO	07716	CEAD20002F
A11R220	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125M,TC=TO	07716	CEAD402ROF
A11R221	321-0155-00			RES,FXD,FILM:402 OHM,1%,0.125M,TC=TO	07716	CEAD402ROF
A11R222	315-0133-00			RES,FXD,FILM:13K OHM,5%,0.25M	19701	5043CX13K00J
A11R223	321-0414-00			RES,FXD,FILM:200K OHM,1%,0.125M,TC=TO	07716	CEAD20002F
A11R224	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A11R225	321-0173-00			RES,FXD,FILM:619 OHM,1%,0.125M,TC=TO	07716	CEAD619ROF
A11R226	321-0173-00			RES,FXD,FILM:619 OHM,1%,0.125M,TC=TO	07716	CEAD619ROF
A11R227	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25M	57668	NTR25J-E33K0
A11R228	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25M	57668	NTR25J-E12K0
A11R229	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A11R230	321-0481-00			RES,FXD,FILM:1M OHM,1%,0.125M,TC=TO	19701	5043ED1M000F
A11R231	321-0481-00			RES,FXD,FILM:1M OHM,1%,0.125M,TC=TO	19701	5043ED1M000F
A11R232	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A11R233	315-0155-00			RES,FXD,FILM:1.5M OHM,5%,0.25M	19701	5043CX1M500J
A11R234	321-0221-00			RES,FXD,FILM:1.96K OHM,1%,0.125M,TC=TO	19701	5043ED1K960F
A11R235	315-0364-00			RES,FXD,FILM:360K OHM,5%,0.25M	57668	NTR25J-E360K
A11R236	321-0221-00			RES,FXD,FILM:1.96K OHM,1%,0.125M,TC=TO	19701	5043ED1K960F
A11R238	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25M	19701	5043CX1M000J
A11R240	321-0227-00			RES,FXD,FILM:2.26K OHM,1%,0.125M,TC=TO	01121	RNK2261F
A11R250	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25M	57668	NTR25J-E01K3
A11R251	321-0208-00			RES,FXD,FILM:1.43K OHM,1%,0.125M,TC=TO	19701	5033ED1K43F
A11R252	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A11R253	321-0236-00			RES,FXD,FILM:2.80K OHM,1%,0.125M,TC=TO	07716	CEAD28000F
A11R254	321-0205-00			RES,FXD,FILM:1.33K OHM,1%,0.125M,TC=TO	19701	5033ED1K330F
A11R255	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25M	57668	NTR25J-E01K3
A11R256	321-0311-00			RES,FXD,FILM:16.9K OHM,1%,0.125M,TC=TO	07716	CEAC16901F
A11R258	321-0277-00			RES,FXD,FILM:7.50K OHM,1%,0.125M,TC=TO	24546	NA55D7501F
A11R259	321-0201-00			RES,FXD,FILM:1.21K OHM,1%,0.125M,TC=TO	19701	5043ED1K210F
A11R260	321-0186-00			RES,FXD,FILM:845 OHM,1%,0.125M,TC=TO	19701	5043ED845R0F
A11R262	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25M	19701	5043CX430R0J
A11R263	321-0164-00			RES,FXD,FILM:499 OHM,1%,0.125M,TC=TO	19701	5033ED499R0F
A11R264	321-0186-00			RES,FXD,FILM:845 OHM,1%,0.125M,TC=TO	19701	5043ED845R0F
A11R266	321-0201-00			RES,FXD,FILM:1.21K OHM,1%,0.125M,TC=TO	19701	5043ED1K210F
A11R268	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25M	19701	5043CX430R0J
A11R270	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R272	321-0334-00			RES,FXD,FILM:29.4K OHM,1%,0.125M,TC=TO	07716	CEAD29401F
A11R274	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125M,TC=TO	19701	5033ED20K00F
A11R280	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R282	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R320	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A11R321	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A11R327	315-0514-00			RES,FXD,FILM:510K OHM,5%,0.25M	19701	5043CX510K0J
A11R330	321-0272-00			RES,FXD,FILM:6.65K OHM,1%,0.125M,TC=TO	19701	5043ED6K650F
A11R344	321-0277-00			RES,FXD,FILM:7.50K OHM,1%,0.125M,TC=TO	24546	NA55D7501F
A11R360	321-0334-00			RES,FXD,FILM:29.4K OHM,1%,0.125M,TC=TO	07716	CEAD29401F
A11R370	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125M,TC=TO	19701	5033ED20K00F
A11R372	307-0648-00			RES NTWK,FXD,FI:8,100 OHM,2%,0.125 W	01121	316B101
A11R380	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R382	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R400	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R440	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A11R442	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A11R443	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A11R444	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A11R445	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A11R520	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A11R560	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A11R570	307-0648-00			RES NTWK,FXD,FI:8,100 OHM,2%,0.125 W	01121	316B101
A11R572	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A11R620	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A11R660	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A11R670	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A11R720	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R730	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A11R760	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A11R780	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A11R800	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R840	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R842	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R844	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A11R850	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R852	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3

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A11R853	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R854	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R856	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A11R857	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R858	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R880	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A11R960	307-0741-00			RES NTWK,FXD,FI:7,3.3K OHM,2%,0.19M EACH	11236	750-81-R3.3K
A11R970	307-0741-00			RES NTWK,FXD,FI:7,3.3K OHM,2%,0.19M EACH	11236	750-81-R3.3K
A11R990	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A11R991	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A11R1040	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1042	315-0112-00			RES,FXD,FILM:1.1K OHM,5%,0.25M	19701	5043CX1K100J
A11R1050	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1060	307-1137-00			RES NTWK,FXD,FI:8,0.005 OHM,+150-50%,0.125M	00779	435704-8
A11R1070	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1072	307-1137-00			RES NTWK,FXD,FI:8,0.005 OHM,+150-50%,0.125M	00779	435704-8
A11R1150	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1152	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1251	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1252	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1253	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R1254	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1262	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A11R1264	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A11R1266	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
A11R1268	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1280	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1282	301-0100-00			RES,FXD,FILM:10 OHM,5%,0.50M	80009	301-0100-00
A11R1290	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A11R1294	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R1360	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A11R1362	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A11R1364	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A11R1380	301-0100-00			RES,FXD,FILM:10 OHM,5%,0.50M	80009	301-0100-00
A11R1450	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1462	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1464	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A11R1466	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A11R1480	301-0100-00			RES,FXD,FILM:10 OHM,5%,0.50M	80009	301-0100-00
A11R1482	301-0100-00			RES,FXD,FILM:10 OHM,5%,0.50M	80009	301-0100-00
A11R1492	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
A11R1494	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R1530	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1540	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1562	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A11R1564	307-0741-00			RES NTWK,FXD,FI:7,3.3K OHM,2%,0.19M EACH	11236	750-81-R3.3K
A11R1580	311-2227-00			RES,VAR,NONWW:TRMR,100 OHM,20%,0.5M LINEAR	TK1450	GF06UT 100
A11R1582	311-2227-00			RES,VAR,NONWW:TRMR,100 OHM,20%,0.5M LINEAR	TK1450	GF06UT 100
A11R1592	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A11R1594	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25M	57668	NTR25J-E24K0
A11R1596	315-0134-00			RES,FXD,FILM:130K OHM,5%,0.25M	57668	NTR25J-E130K
A11R1598	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11R1660	307-0648-00			RES NTWK,FXD,FI:8,100 OHM,2%,0.125 W	01121	316B101
A11R1670	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A11R1740	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1742	307-0741-00			RES NTWK,FXD,FI:7,3.3K OHM,2%,0.19M EACH	11236	750-81-R3.3K
A11R1750	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A11R1752	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A11R1780	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3

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A11R1782	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A11R1850	307-0648-00			RES NTWK,FXD,FI:8,100 OHM,2%,0.125 M	01121	316B101
A11R1860	307-0648-00			RES NTWK,FXD,FI:8,100 OHM,2%,0.125 M	01121	316B101
A11R1880	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A11R1890	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A11S1740	260-1721-00			SWITCH,ROCKER:8,SPST,125MA,30VDC	81073	765B08S
A11TP420	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP560	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP562	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP630	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP860	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP1390	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP1570	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP1590	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP1630	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11TP1760	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A11U105	156-1338-00			MICROCKT,LINEAR:OPERATIONAL AMPLIFIER	01295	NE5534P
A11U130	156-2571-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,TRIPLE,2	80009	156-2571-00
A11U140	156-0742-02			MICROCKT,LINEAR:OPNL AMPL,SELECTED	27014	LM318N/A+
A11U160	156-1226-00			MICROCKT,LINEAR:DUAL COMPARATOR	18324	LM319F
A11U170	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A11U205	156-1338-00			MICROCKT,LINEAR:OPERATIONAL AMPLIFIER	01295	NE5534P
A11U220	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A11U230	156-1303-00			MICROCKT,LINEAR:QUAD ANALOG SWITCH ARRAYS	TK0987	SD5000N
A11U240	156-0742-02			MICROCKT,LINEAR:OPNL AMPL,SELECTED	27014	LM318N/A+
A11U242	156-0742-02			MICROCKT,LINEAR:OPNL AMPL,SELECTED	27014	LM318N/A+
A11U330	156-1638-00			MICROCKT,LINEAR:10 BIT HS,MULTIPLYING	06665	DAC-10GX
A11U340	156-1638-00			MICROCKT,LINEAR:10 BIT HS,MULTIPLYING	06665	DAC-10GX
A11U360	156-0382-02			MICROCKT,DGTL:QUAD 2 INP NAND GATE BURN	18324	N74LS00NB
A11U362	156-1859-00			MICROCKT,DGTL:MOS,DYNAMIC RAM,SCRN	01295	TMS4416-15
A11U370	156-2027-00			MICROCKT,DGTL:CMOS,HEX INVERTER	27014	MM74HC04N
A11U400	156-0879-01			MICROCKT,DGTL:QUAD LINE DRIVER	04713	MC1488LD
A11U402	156-0878-01			MICROCKT,DGTL:QUAD LINE RCVR	04713	MC1489LDS
A11U420	156-0877-01			MICROCKT,DGTL:USART,SCREENED	34649	Q P OR D 8251A
A11U440	156-2624-00			MICROCKT,DGTL:HMOS,SEMI CUSTOM,STANDARD	80009	156-2624-00
A11U460	156-1859-00			MICROCKT,DGTL:MOS,DYNAMIC RAM,SCRN	01295	TMS4416-15
A11U470	156-1111-02			MICROCKT,DGTL:OCTAL BUS XCVR W/3 ST OUT	01295	SN74LS245N3
A11U520	156-1444-01			MICROCKT,DGTL:NMOS,GPIB INTFC CONTROLLER	01295	TMS9914A (NL
A11U540	156-1111-02			MICROCKT,DGTL:OCTAL BUS XCVR W/3 ST OUT	01295	SN74LS245N3
A11U560	156-1859-00			MICROCKT,DGTL:MOS,DYNAMIC RAM,SCRN	01295	TMS4416-15
A11U562	156-0479-02			MICROCKT,DGTL:QUAD 2-INP OR GATE	01295	SN74LS32NP3
A11U572	156-0956-02			MICROCKT,DGTL:OCTAL BFR W/3 STATE OUT	01295	SN74LS244NP3
A11U600	156-1415-01			MICROCKT,DGTL:OCTAL GPIB XCVR-MANAGEMENT	27014	DS75161A NA+
A11U630	156-0385-02			MICROCKT,DGTL:HEX INVERTER	07263	74LS04PCQR
A11U640	156-0956-02			MICROCKT,DGTL:OCTAL BFR W/3 STATE OUT	01295	SN74LS244NP3
A11U650	156-0479-02			MICROCKT,DGTL:QUAD 2-INP OR GATE	01295	SN74LS32NP3
A11U660	156-1172-01			MICROCKT,DGTL:DUAL 4 BIT BIN CNTR	01295	SN74LS393NP3
A11U670	156-0874-02			MICROCKT,DGTL:8 BIT ADDRESSABLE LATCH	04713	SN74LS259NDS
A11U700	156-1414-02			MICROCKT,DGTL:OCTAL GPIB BUS XCVR,SCRN	27014	DS75160A N
A11U730	156-0470-00			MICROCKT,DGTL:8-INP DATA SEL W/3-STATE OUT	04713	74LS251(N OR J)
A11U740	156-0385-02			MICROCKT,DGTL:HEX INVERTER	07263	74LS04PCQR
A11U750	156-0382-02			MICROCKT,DGTL:QUAD 2 INP NAND GATE BURN	18324	N74LS00NB
A11U760	156-0469-02			MICROCKT,DGTL:3/8 LINE DCDR	01295	SN74LS138NP3
A11U770	156-0874-02			MICROCKT,DGTL:8 BIT ADDRESSABLE LATCH	04713	SN74LS259NDS
A11U800	156-2192-00			MICROCKT,DGTL:2K X 8,PROM	34649	2817A-3
A11U830	156-0481-02			MICROCKT,DGTL:TRIPLE 3-INP & GATE	01295	SN74LS11NP3
A11U842	156-0479-02			MICROCKT,DGTL:QUAD 2-INP OR GATE	01295	SN74LS32NP3
A11U860	156-1841-00			MICROCKT,DGTL:16 BIT MICROPROCESSOR	34335	RB0186
A11U870	156-0479-02			MICROCKT,DGTL:QUAD 2-INP OR GATE	01295	SN74LS32NP3

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A11U900	156-2473-00			MICROCKT,DGTL:8192 X 8 CMOS,SRAM,LOW	TK0961	uPD4464C-20
A11U930	156-0479-02			MICROCKT,DGTL:QUAD 2-INP OR GATE	01295	SN74LS32NP3
A11U940	156-0479-02			MICROCKT,DGTL:QUAD 2-INP OR GATE	01295	SN74LS32NP3
A11U970	156-1065-01			MICROCKT,DGTL:OCTAL D TYPE TRANS LATCHES	04713	SN74LS373 ND/JD
A11U980	156-0382-02			MICROCKT,DGTL:QUAD 2 INP NAND GATE BURN	18324	N74LS00NB
A11U1000	160-4294-00			MICROCKT,DGTL:NMOS,65536 X 8 EPROM,M/3	80009	160-4294-00
A11U1062	156-1065-01			MICROCKT,DGTL:OCTAL D TYPE TRANS LATCHES	04713	SN74LS373 ND/JD
A11U1072	156-1065-01			MICROCKT,DGTL:OCTAL D TYPE TRANS LATCHES	04713	SN74LS373 ND/JD
A11U1100	160-4207-00			MICROCKT,DGTL:NMOS,65536 X 8 EPROM M/3	80009	160-4207-00
A11U1130	156-2473-00			MICROCKT,DGTL:8192 X 8 CMOS,SRAM,LOW	TK0961	uPD4464C-20
A11U1160	156-0384-02			MICROCKT,DGTL:QUAD 2-INP NAND GATE	07263	74LS03PCQR
A11U1170	156-0385-02			MICROCKT,DGTL:HEX INVERTER	07263	74LS04PCQR
A11U1200	160-4208-00			MICROCKT,DGTL:NMOS,65536 X 8 EPROM M/3	80009	160-4208-00
A11U1230	160-4295-00			MICROCKT,DGTL:NMOS,65536 X 8 EPROM,M/3 STATE OUT,PRGM	80009	160-4295-00
A11U1260	156-2642-00			MICROCKT,DGTL:CMOS,CLOCK,REAL TIME,YEAR,	80009	156-2642-00
A11U1280	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A11U1300	160-4209-00			MICROCKT,DGTL:NMOS,65536 X 8 EPROM M/3	80009	160-4209-00
A11U1330	160-4204-00			MICROCKT,DGTL:NMOS,65536 X 8 EPROM,M/3	80009	160-4204-00
A11U1380	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A11U1400	160-4206-00			MICROCKT,DGTL:NMOS,65536 X 8 EPROM M/3 STATE OUT,PRGM	80009	160-4206-00
A11U1430	160-4205-00			MICROCKT,DGTL:NMOS,65536 X 8 EPROM M/3	80009	160-4205-00
A11U1460	156-2396-00			MICROCKT,DGTL:RESET GENERATOR,5V SUPPLY	01295	TL7705 ACP
A11U1500	156-2573-00			MICROCKT,DGTL:NMOS,DYNAMIC RAM CONTROLLER	TK1856	VL4500A-20PC
A11U1540	156-0388-03			MICROCKT,DGTL:DUAL D FLIP-FLOP	01295	SN74LS74ANP3
A11U1560	156-0385-02			MICROCKT,DGTL:HEX INVERTER	07263	74LS04PCQR
A11U1590	156-2686-00			MICROCKT,LINEAR:AMPLIFIER,BIFET	80009	156-2686-00
A11U1600	156-2372-00			MICROCKT,DGTL:NMOS 65536 X 4 DRAM	33297	UPD41254D/C
A11U1620	156-2372-00			MICROCKT,DGTL:NMOS 65536 X 4 DRAM	33297	UPD41254D/C
A11U1640	156-0479-02			MICROCKT,DGTL:QUAD 2-INP OR GATE	01295	SN74LS32NP3
A11U1680	156-2572-00			MICROCKT,LINEAR:12 BIT ANALOG TO DIGITAL	13919	ADC574AKH
A11U1700	156-2372-00			MICROCKT,DGTL:NMOS 65536 X 4 DRAM	33297	UPD41254D/C
A11U1720	156-2372-00			MICROCKT,DGTL:NMOS 65536 X 4 DRAM	33297	UPD41254D/C
A11U1740	156-0385-02			MICROCKT,DGTL:HEX INVERTER	07263	74LS04PCQR
A11U1760	156-2622-00			MICROCKT,DGTL:HMOS,SEMI CUSTOM,STANDARD	80009	156-2622-00
A11U1800	156-2372-00			MICROCKT,DGTL:NMOS 65536 X 4 DRAM	33297	UPD41254D/C
A11U1820	156-2372-00			MICROCKT,DGTL:NMOS 65536 X 4 DRAM	33297	UPD41254D/C
A11U1840	156-0470-00			MICROCKT,DGTL:8-INP DATA SEL M/3-STATE OUT	04713	74LS251(N OR J)
A11U1900	156-2372-00			MICROCKT,DGTL:NMOS 65536 X 4 DRAM	33297	UPD41254D/C
A11U1920	156-2372-00			MICROCKT,DGTL:NMOS 65536 X 4 DRAM	33297	UPD41254D/C
A11VR1260	152-0744-00			SEMICOND DVC,DI:ZEN,SI,3.6V,5%,0.4W,DO-7	15238	IN747ATK
A11VR1364	152-0744-00			SEMICOND DVC,DI:ZEN,SI,3.6V,5%,0.4W,DO-7	15238	IN747ATK
A11W1280	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A11W1281	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A11W1282	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A11W1350	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A11W1480	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A11X440	136-0813-00			SKT,PL-IN ELEK:CHIP CARRIER,68 CONTACTS	19613	268-5400-00-1102
A11X760	136-0813-00			SKT,PL-IN ELEK:CHIP CARRIER,68 CONTACTS	19613	268-5400-00-1102
A11X860	136-0813-00			SKT,PL-IN ELEK:CHIP CARRIER,68 CONTACTS	19613	268-5400-00-1102
A11X1000	136-0755-00			SKT,PL-IN ELEK:MICROCIRCUIT,28 DIP	09922	DILB28P-108
A11X1060	136-0729-00			SKT,PL-IN ELEK:MICROCKT,16 CONTACT	09922	DILB16P-108T
A11X1072	136-0729-00			SKT,PL-IN ELEK:MICROCKT,16 CONTACT	09922	DILB16P-108T
A11X1100	136-0755-00			SKT,PL-IN ELEK:MICROCIRCUIT,28 DIP	09922	DILB28P-108
A11X1200	136-0755-00			SKT,PL-IN ELEK:MICROCIRCUIT,28 DIP	09922	DILB28P-108
A11X1230	136-0755-00			SKT,PL-IN ELEK:MICROCIRCUIT,28 DIP	09922	DILB28P-108
A11X1300	136-0755-00			SKT,PL-IN ELEK:MICROCIRCUIT,28 DIP	09922	DILB28P-108
A11X1330	136-0755-00			SKT,PL-IN ELEK:MICROCIRCUIT,28 DIP	09922	DILB28P-108

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A11X1400	136-0755-00			SKT,PL-IN ELEK:MICROCIRCUIT,28 DIP	09922	DILB28P-108
A11X1430	136-0755-00			SKT,PL-IN ELEK:MICROCIRCUIT,28 DIP	09922	DILB28P-108
A11Y870	158-0115-00			XTAL UNIT,QTZ:16MHZ,0.01%,SERIES	01807	Z-13P
A11Y1350	158-0305-00			XTAL UNIT,QTZ:32.768 HZ,PARALLEL RESONANCE	61429	FX1V
A12	670-8829-00			CIRCUIT BD ASSY:VERTICAL	80009	670-8829-00
A12C100	281-0785-00			CAP,FXD,CER DI:68PF,10%,100V	04222	MA101A680KAA
A12C101	281-0785-00			CAP,FXD,CER DI:68PF,10%,100V	04222	MA101A680KAA
A12C110	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A12C111	281-0809-00			CAP,FXD,CER DI:200 PF,5%,100V	04222	MA101A201JAA
A12C200	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A12C300	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C301	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C302	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C320	281-0266-00			CAP,VAR,CER DI:1.5-5PF,100V	TK1356	TZ03Z050FR169
A12C330	281-0254-00			CAP,VAR,CER DI:3-11PF,100V	TK1356	TZ03T110FR169
A12C331	281-0266-00			CAP,VAR,CER DI:1.5-5PF,100V	TK1356	TZ03Z050FR169
A12C400	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MEA
A12C410	281-0826-00			CAP,FXD,CER DI:2200PF,5%,100V	20932	401EM100AD222K
A12C411	281-0826-00			CAP,FXD,CER DI:2200PF,5%,100V	20932	401EM100AD222K
A12C440	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C500	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A12C501	281-0265-00			CAP,VAR,CER DI:5.2-30PF,100V	TK1356	TZ03R300FR169
A12C510	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A12C550	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V	04222	MA106A2R2DAA
A12C551	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C552	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A12C561	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A12C562	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C600	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A12C601	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A12C610	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A12C650	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A12C651	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C700	281-0265-00			CAP,VAR,CER DI:5.2-30PF,100V	TK1356	TZ03R300FR169
A12C710	281-0266-00			CAP,VAR,CER DI:1.5-5PF,100V	TK1356	TZ03Z050FR169
A12C740	283-0057-00			CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A12C800	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A12C801	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A12C810	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C811	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A12C812	283-0220-02			CAP,FXD,CER DI:0.01UF,20%,50V	05397	C320C103M2R5CA
A12C850	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C851	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C852	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C870	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MEA
A12CR450	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR451	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR460	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR461	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12DL200	119-1984-00			DELAY LINE:77NS	80009	119-1984-00
A12E760	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A12E850	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A12E860	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A12E861	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A12E862	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A12J15	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A12J20	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00

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A12J27	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A12J28	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A12J32	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A12J33	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A12J34	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A12J36	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A12J52	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 9)	22526	48283-036
A12J77	131-3362-00			CONN,RCPT,ELEC:HEADER,STR,26 PIN	53387	3593-6002
A12J80	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 4)	22526	48283-036
A12L320	108-0577-00			COIL,RF:FIXED,30NH	TK1345	108-0577-00
A12L320	108-0578-00			COIL,RF:FIXED,19NH	TK1345	108-0578-00
A12L320	108-0997-00			COIL,RF:FIXED,52NH (L320 IS SELECTABLE)	TK1345	108-0997-00
A12L400	108-1355-00			COIL,RF:FXD,0.82UH,10%	80009	108-1355-00
A12L410	108-1339-00			COIL,RF:FXD,330NH	80009	108-1339-00
A12L500	108-0509-00			COIL,RF:FIXED,2.45UH	TK2042	ORDER BY DESCR
A12L501	108-0509-00			COIL,RF:FIXED,2.45UH	TK2042	ORDER BY DESCR
A12L502	108-1355-00			COIL,RF:FXD,0.82UH,10%	80009	108-1355-00
A12L510	108-1339-00			COIL,RF:FXD,330NH	80009	108-1339-00
A12L511	108-1313-00			COIL,RF:FXD,0.68UH	56845	IR2 - .68 UH
A12L550	108-1313-00			COIL,RF:FXD,0.68UH	56845	IR2 - .68 UH
A12L620	108-1371-00			COIL ASSY:48NH,W/CONTACT & INSULATION	80009	108-1371-00
A12L630	108-1371-00			COIL ASSY:48NH,W/CONTACT & INSULATION	80009	108-1371-00
A12L810	108-1312-00			COIL,RF:FXD,0.1UH	56845	IR2 - .1 UH
A12Q450	151-0427-03			TRANSISTOR:NPN,SI	07263	S39287
A12Q451	151-0427-03			TRANSISTOR:NPN,SI	07263	S39287
A12Q460	151-0427-03			TRANSISTOR:NPN,SI	07263	S39287
A12Q650	151-1025-00			TRANSISTOR:FET,N-CHAN,SI,TO-92	04713	SPF3036
A12Q651	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12R100	311-2235-00			RES,VAR,NONWW:TRMR,10K OHM,20%,0.5W LINEAR	TK1450	GF06UT B10K-OHM
A12R110	315-0561-00			RES,FXD,FILM:560 OHM,5%,0.25W	19701	5043CX560R0J
A12R111	321-0131-00			RES,FXD,FILM:226 OHM,1%,0.125W,TC=TO	19701	5043ED226R0F
A12R112	321-0131-00			RES,FXD,FILM:226 OHM,1%,0.125W,TC=TO	19701	5043ED226R0F
A12R140	322-3068-00			RES,FXD,FILM:49.9 OHM,1%,0.2W,TC=TO	80009	322-3068-00
A12R200	321-0126-07			RES,FXD,FILM:200 OHM,0.1%,0.125W,TC=T9	19701	5033RE200R0B
A12R201	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=TO	19701	5033ED2K00F
A12R202	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=TO	19701	5033ED2K00F
A12R300	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A12R301	321-0126-07			RES,FXD,FILM:200 OHM,0.1%,0.125W,TC=T9	19701	5033RE200R0B
A12R302	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A12R303	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A12R310	321-0202-00			RES,FXD,FILM:1.24K OHM,1%,0.125W,TC=TO	24546	NA55D1241F
A12R320	311-2229-00			RES,VAR,NONWW:TRMR,250 OHM,20%,0.5W LINEAR	TK1450	GF06UT 250
A12R330	311-2230-00			RES,VAR,NONWW:TRMR,500 OHM,20%,0.5W LINEAR	TK1450	GF06UT 500
A12R331	313-1271-00			RES,FXD,FILM:270 OHM,5%,0.2W	57668	TR20JE 270E
A12R332	313-1271-00			RES,FXD,FILM:270 OHM,5%,0.2W	57668	TR20JE 270E
A12R340	322-3068-00			RES,FXD,FILM:49.9 OHM,1%,0.2W,TC=TO	80009	322-3068-00
A12R400	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A12R410	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A12R411	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25W	57668	NTR25J-E75E0
A12R450	321-0771-01			RES,FXD,FILM:50 OHM,0.5%,0.125W,TC=TO	57668	RB14DXE 50E
A12R460	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A12R461	322-3068-00			RES,FXD,FILM:49.9 OHM,1%,0.2W,TC=TO	80009	322-3068-00
A12R500	307-0106-00			RES,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB 47G5
A12R502	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A12R503	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2W	57668	TR20JE10K0
A12R504	313-1222-00			RES,FXD,FILM:2.2K OHM,5%,0.2W	57668	TR20JE 02K2

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A12R505	313-1151-00			RES,FXD,FILM:150 OHM,5%,0.2W	57668	TR20JE150E
A12R506	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2W	57668	TR20JE10K0
A12R507	322-3284-00			RES,FXD,FILM:8.87K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 8K87
A12R508	322-3085-00			RES,FXD,FILM:75 OHM,1%,0.2W,TC-T0	57668	CRB20 FXE 75E0
A12R510	311-2227-00			RES,VAR,NONWW:TRMR,100 OHM,20%,0.5W LINEAR	TK1450	GF06UT 100
A12R511	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A12R512	322-3147-00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=T0	80009	322-3147-00
A12R550	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A12R551	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A12R552	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A12R553	315-0301-00			RES,FXD,FILM:300 OHM,5%,0.25W	57668	NTR25J-E300E
A12R554	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A12R560	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A12R561	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A12R562	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A12R563	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125W,TC=T0	19701	5033ED1K00F
A12R564	321-0385-07			RES,FXD,FILM:100K OHM,0.1%,0.125W,TC=T9	19701	5033RE100K0B
A12R570	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5W	TK1450	GF06UT 5K
A12R600	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5W	TK1450	GF06UT 5K
A12R601	322-3190-00			RES,FXD,FILM:931 OHM,1%,0.2W,TC=T0	80009	322-3190-00
A12R602	313-1560-00			RES,FXD,FILM:56 OHM,5%,0.2W	57668	TR20JE 56E
A12R603	313-1200-00			RES,FXD,FILM:20 OHM,5%,0.2W	57668	TR20JE20E
A12R605	311-2229-00			RES,VAR,NONWW:TRMR,250 OHM,20%,0.5W LINEAR	TK1450	GF06UT 250
A12R610	311-2230-00			RES,VAR,NONWW:TRMR,500 OHM,20%,0.50 LINEAR	TK1450	GF06UT 500
A12R611	322-3190-00			RES,FXD,FILM:931 OHM,1%,0.2W,TC=T0	80009	322-3190-00
A12R612	313-1560-00			RES,FXD,FILM:56 OHM,5%,0.2W	57668	TR20JE 56E
A12R650	321-0226-00			RES,FXD,FILM:2.21K OHM,1%,0.125W,TC=T0	01121	RNK2211F
A12R651	321-0816-00			RES,FXD,FILM:5K OHM,1%,0.125W,TC=T0	24546	NA55D5001F
A12R652	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A12R653	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR0J
A12R654	313-1112-00			RES,FXD,FILM:1.1K,5%,0.2W	80009	313-1112-00
A12R655	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2W	57668	TR20JE100E
A12R660	315-0622-00			RES,FXD,FILM:6.2K OHM,5%,0.25W	19701	5043CX6K20J
A12R700	311-2227-00			RES,VAR,NONWW:TRMR,100 OHM,20%,0.5W LINEAR	TK1450	GF06UT 100
A12R703	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A12R710	313-1200-00			RES,FXD,FILM:20 OHM,5%,0.2W	57668	TR20JE20E
A12R711	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2W	57668	TR20JE100E
A12R712	322-3068-00			RES,FXD,FILM:49.9 OHM,1%,0.2W,TC=T0	80009	322-3068-00
A12R713	322-3068-00			RES,FXD,FILM:49.9 OHM,1%,0.2W,TC=T0	80009	322-3068-00
A12R714	322-3171-00			RES,FXD,FILM:590 OHM,1%,0.2W,TC=T0	80009	322-3171-00
A12R715	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A12R716	313-1123-00			RES,FXD,FILM:12K OHM,5%,0.2W	57668	TR20JE12K0
A12R717	322-3160-00			RES,FXD,FILM:453 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 453E
A12R750	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A12R751	303-0101-00			RES,FXD,CMPSN:100 OHM,5%,1W	01121	GB1015
A12R760	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A12R761	321-0385-07			RES,FXD,FILM:100K OHM,0.1%,0.125W,TC=T9	19701	5033RE100K0B
A12R800	321-0189-00			RES,FXD,FILM:909 OHM,1%,0.125W,TC=T2	19701	5033ED909R0F
A12R801	321-0189-00			RES,FXD,FILM:909 OHM,1%,0.125W,TC=T2	19701	5033ED909R0F
A12R802	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A12R810	322-3210-00			RES,FXD,FILM:1.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K50
A12R811	322-3485-00			RES,FXD,FILM:5.0K OHM,1%,0.2W,TC=T0	91637	CCF501G50000F
A12R812	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A12R813	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A12R850	315-0183-00			RES,FXD,FILM:18K OHM,5%,0.25W	19701	5043CX18K00J
A12R860	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A12RT110	307-0250-00			RES,THERMAL:390 OHM,10%,0.125W	01295	TG1/8 391K
A12TP400	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A12TP860	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036

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A12U210	156-1272-01			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	80009	156-1272-01
A12U220	165-2119-00			MICROCKT,HYBRID:CHAN SW & AMPL,H2119	80009	165-2119-00
A12U520	165-2053-00			MICROCKT,LINEAR:VERTICAL OUTPUT AMP	80009	165-2053-00
A12U600	156-0130-03			MICROCKT,LINEAR:MODULATOR/DEMODULATOR,SCRN	04713	MC1496 P
A12U660	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A12U670	156-0158-00			MICROCKT,LINEAR:DUAL OPNL AMPL	04713	MC1458P1/MC1458U
A12U700	155-0253-00			MICROCKT,LINEAR:HIGH SPEED SCHMITT TRIGGER	80009	155-0253-00
A12VR510	152-0227-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ13903
A12VR750	152-0683-00			SEMICOND DVC,DI:ZEN,SI,7.5V 5%,1.0W	12954	DZ8503210
A12X220	136-0764-00			SKT,PL-IN ELEK:48 LINE CONT IMPD HYBRID	00779	ORDER BY DESCR
A12X520	136-0764-00			SKT,PL-IN ELEK:48 LINE CONT IMPD HYBRID	00779	ORDER BY DESCR
A13	670-8828-00			CIRCUIT BD ASSY:SCOPE LOGIC	80009	670-8828-00
A13C120	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C121	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C170	290-0782-01			CAP,FXD,ELCTLT:4.7UF,20%,35VDC	55680	ULB1V4R7MPA1TD
A13C171	290-0782-01			CAP,FXD,ELCTLT:4.7UF,20%,35VDC	55680	ULB1V4R7MPA1TD
A13C210	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C220	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C221	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C222	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C230	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C231	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C232	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C240	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C260	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C340	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C341	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C342	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C410	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C411	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C412	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C431	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C432	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C440	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MEA
A13C441	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C442	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C443	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MEA
A13C520	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A13C524	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C530	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A13C531	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A13C532	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C533	281-0772-00			CAP,FXD,CER DI:4700PF,10%,100V	04222	MA201C472KAA
A13C534	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C535	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C536	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C540	281-0772-00			CAP,FXD,CER DI:4700PF,10%,100V	04222	MA201C472KAA
A13C541	281-0786-00			CAP,FXD,CER DI:150PF,10%,100V	04222	MA101A151KAA
A13C550	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C551	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C570	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C571	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C610	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C611	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C620	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C621	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C622	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA

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A13C623	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C640	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C641	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C650	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C670	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C671	281-0913-00			CAP,FXD,CER DI:0.1UF,50V,AXIAL	04222	MA105E104ZAA
A13C672	281-0913-00			CAP,FXD,CER DI:0.1UF,50V,AXIAL	04222	MA105E104ZAA
A13C680	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C681	281-0864-00			CAP,FXD,CER DI:430PF,5%,100V	54583	MA12C0G2A431J
A13C730	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C731	281-0765-00			CAP,FXD,CER DI:100PF,5%,100V	04222	MA101A101JAA
A13C750	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C761	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C800	283-0057-00			CAP,FXD,CER DI:0.1UF,+80-20%,200V	04222	SR306E104ZAA
A13C801	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C802	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C803	290-1131-00			CAP,FXD,ELCTLT:2.2UFD,20%,100VDC	56289	513D225M100JAE-2
A13C830	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A13C831	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C832	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C840	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C841	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C842	281-0861-00			CAP,FXD,CER DI:270PF,5%,50V	54583	MA12C0G1H271J
A13C843	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C862	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C863	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C864	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C870	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C871	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C872	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C873	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C874	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C880	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C881	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C882	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A13C883	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C884	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C920	283-0120-00			CAP,FXD,CER DI:0.015UF,+80-30%,2500V	60705	564CZA252EZ153ZA
A13C931	281-0826-00			CAP,FXD,CER DI:2200PF,5%,100V	20932	401EM100AD222K
A13C932	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C940	290-1131-00			CAP,FXD,ELCTLT:2.2UFD,20%,100VDC	56289	513D225M100JAE-2
A13C941	290-1131-00			CAP,FXD,ELCTLT:2.2UFD,20%,100VDC	56289	513D225M100JAE-2
A13C950	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A13C951	290-0782-01			CAP,FXD,ELCTLT:4.7UF,20%,35VDC	55680	ULB1V4R7MPA1TD
A13C960	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C961	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C970	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C971	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C972	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C973	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C974	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C975	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C976	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C977	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C978	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C980	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C981	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C982	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C983	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA

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A13C984	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1000	281-0797-00			CAP,FXD,CER DI:15PF,10%,100V	04222	MA106A150KAA
A13C1030	285-1236-00			CAP,FXD,PLASTIC:0.022UF,20%,400V	14752	230D1E223M
A13C1040	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	56289	672D106H100CG2C
A13C1050	290-0782-00			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULB1V4R7TAAANA
A13C1051	290-0919-00			CAP,FXD,ELCTLT:470UF,+50-10%,35V	TK0510	ECEA1VV471SC
A13C1052	283-0339-01			CAP,FXD,CER DI:0.22UF,10%,50V,SQUARE	31433	ADVISE
A13C1060	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1070	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C1071	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1072	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1073	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1080	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1081	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1082	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1083	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1084	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1100	283-0084-00			CAP,FXD,CER DI:270PF,5%,1000V	59660	838533X5F02715
A13C1140	283-0078-00			CAP,FXD,CER DI:0.001UF,20%,500V	59660	0801 547X5F0102M
A13C1150	281-0765-00			CAP,FXD,CER DI:100PF,5%,100V	04222	MA101A101JAA
A13C1160	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1161	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1170	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1171	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1172	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1173	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1175	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C1180	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1220	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1221	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1230	285-1236-00			CAP,FXD,PLASTIC:0.022UF,20%,400V	14752	230D1E223M
A13C1231	285-1236-00			CAP,FXD,PLASTIC:0.022UF,20%,400V	14752	230D1E223M
A13C1232	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A13C1240	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A13C1241	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1242	290-0778-01			CAP,FXD,ELCTLT:1UF,+20%,50V	55680	UEB1H010MAA1TD
A13C1243	281-0758-00			CAP,FXD,CER DI:15PF,20%,100V	04222	MA101A150MAA
A13C1250	290-0782-01			CAP,FXD,ELCTLT:4.7UF,20%,35VDC	55680	ULB1V4R7MPA1TD
A13C1260	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1270	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1271	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1272	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1273	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1274	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1280	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1300	285-1236-00			CAP,FXD,PLASTIC:0.022UF,20%,400V	14752	230D1E223M
A13C1301	285-1236-00			CAP,FXD,PLASTIC:0.022UF,20%,400V	14752	230D1E223M
A13C1320	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1321	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1322	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1330	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1331	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1340	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1341	283-0164-00			CAP,FXD,CER DI:2.2UF,20%,25V	04222	SR402E225MAA
A13C1342	281-0765-00			CAP,FXD,CER DI:100PF,5%,100V	04222	MA101A101JAA
A13C1343	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1344	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1345	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1350	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T

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A13C1351	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1352	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A13C1360	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1380	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1400	285-1236-00			CAP,FXD,PLASTIC:0.022UF,20%,400V	14752	230D1E223M
A13C1401	285-1236-00			CAP,FXD,PLASTIC:0.022UF,20%,400V	14752	230D1E223M
A13C1410	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1420	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1421	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1430	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1440	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1460	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1470	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C1471	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A13C1472	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1473	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1474	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1475	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1480	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1481	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1500	281-0788-00			CAP,FXD,CER DI:470PF,10%,100V	04222	MA101C471KAA
A13C1501	281-0788-00			CAP,FXD,CER DI:470PF,10%,100V	04222	MA101C471KAA
A13C1502	290-0758-00			CAP,FXD,ELCTLT:2.2UF,+50-10%,200V	56289	502D227
A13C1503	285-1242-00			CAP,FXD,PLASTIC:0.033UF,10%,250V	55112	171/.033/K/250/C
A13C1510	281-0861-00			CAP,FXD,CER DI:270PF,5%,50V	54583	MA12C0G1H271J
A13C1520	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1521	283-0100-00			CAP,FXD,CER DI:0.0047UF,10%,200V	04222	SR306A472KAA
A13C1530	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1531	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A13C1532	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1533	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1534	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1540	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1541	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1550	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A13C1560	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1561	283-0339-00			CAP,FXD,CER DI:0.22UF,10%,50V	05397	C330C224K5R5CA
A13C1562	285-1097-00			CAP,FXD,PLASTIC:0.47UF,10%,50V	14752	230B1A474K
A13C1570	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1571	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1600	285-1242-00			CAP,FXD,PLASTIC:0.033UF,10%,250V	55112	171/.033/K/250/C
A13C1610	281-0861-00			CAP,FXD,CER DI:270PF,5%,50V	54583	MA12C0G1H271J
A13C1620	283-0100-00			CAP,FXD,CER DI:0.0047UF,10%,200V	04222	SR306A472KAA
A13C1630	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A13C1631	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1632	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1633	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C1634	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1660	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A13C1670	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1671	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1672	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C1673	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13C9842	285-1300-01			CAP,FXD,MTLZD:0.1UF,10%,63V	55112	185/0.1/K/63/ABA
A13CR220	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR230	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR231	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR320	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR410	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A13CR550	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR551	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR610	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR611	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR620	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR730	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR800	152-0574-00			SEMICOND DVC,DI:SM,SI,120V,0.15A,DO-35	12969	NDP566
A13CR830	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR831	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR910	152-0574-00			SEMICOND DVC,DI:SM,SI,120V,0.15A,DO-35	12969	NDP566
A13CR911	152-0574-00			SEMICOND DVC,DI:SM,SI,120V,0.15A,DO-35	12969	NDP566
A13CR920	152-0574-00			SEMICOND DVC,DI:SM,SI,120V,0.15A,DO-35	12969	NDP566
A13CR921	152-0061-00			SEMICOND DVC,DI:SM,SI,175V,0.1A,DO-35	07263	FDH2161
A13CR930	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR940	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR941	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR942	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR1050	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR1051	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR1052	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR1140	152-0061-00			SEMICOND DVC,DI:SM,SI,175V,0.1A,DO-35	07263	FDH2161
A13CR1200	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1230	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR1231	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR1240	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR1300	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1313	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1314	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1340	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR1350	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A13CR1351	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A13CR1400	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1401	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1410	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1460	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1500	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR1510	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1511	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR1520	152-0061-00			SEMICOND DVC,DI:SM,SI,175V,0.1A,DO-35	07263	FDH2161
A13CR1551	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A13CR1552	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A13CR1570	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A13CR1580	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A13CR1600	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR1601	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR1602	152-0400-00			SEMICOND DVC,DI:RECT,SI,400V,1A	04713	SR1977K
A13CR1610	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR1620	152-0061-00			SEMICOND DVC,DI:SM,SI,175V,0.1A,DO-35	07263	FDH2161
A13DS100	150-0030-00			LAMP,GLOW:60-90V MAX,0.7MA,A2B-T,WIRE LEADS	58224	A2B-T
A13DS200	150-0030-00			LAMP,GLOW:60-90V MAX,0.7MA,A2B-T,WIRE LEADS	58224	A2B-T
A13DS630	150-1171-00			LT EMITTING DIO:RED	50434	HLMP1302OPT002
A13E770	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A13E771	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A13E772	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A13E773	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A13E780	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A13E781	276-0752-00			CORE,EM:FERRITE	34899	2743001111
A13E900	119-0430-00			ARSR,ELEC SURGE:90+40-0V,AXIAL WIRE LEADS	25088	B1-C90/20
A13F560	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST BLOW	71400	AGC-CM-2

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A13J09	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A13J16	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A13J53	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 5)	22526	48283-036
A13J54	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A13J55	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 11)	22526	48283-036
A13J56	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 5)	22526	48283-036
A13J71	131-3147-00			CONN,RCPT,ELEC:HEADER,2 X 25,0.1 SPACING	53387	3596-6002
A13J77	131-3362-00			CONN,RCPT,ELEC:HEADER,STR,26 PIN	53387	3593-6002
A13J84	131-3147-00			CONN,RCPT,ELEC:HEADER,2 X 25,0.1 SPACING	53387	3596-6002
A13J85	131-3825-00			CONN,RCPT,ELEC:HEADER,50 CONTACT,4 SIDED	53387	3433-6202
A13J86	131-3364-00			CONN,RCPT,ELEC:HEADER,STRAIGHT,34 PIN	53387	3594-6002
A13J91	131-2090-00			TERM SET,QIK DI:10 TERM,14/22 AWG	27264	22-17-2102
A13L350	108-0317-00			COIL,RF:FIXED,15 UH	32159	71501M+10PERCENT
A13L351	108-0317-00			COIL,RF:FIXED,15 UH	32159	71501M+10PERCENT
A13L430	108-0800-00			COIL,RF:FIXED,820MH	04072	9230-90
A13L450	108-0317-00			COIL,RF:FIXED,15 UH	32159	71501M+10PERCENT
A13L451	108-0317-00			COIL,RF:FIXED,15 UH	32159	71501M+10PERCENT
A13L670	108-1251-00			COIL,RF:FXD,2.7UH,10%	54583	SPT 0406-2R7K-6
A13L800	108-0538-00			COIL,RF:FIXED,2.7UH	76493	JWM#B7059
A13L930	108-0959-00			COIL,RF:FIXED,150UH	TK1345	108-0959-00
A13L940	108-1089-00			COIL,RF:FIXED,620UH,5%	02113	ES3-5-624-.250
A13L1050	108-0422-00			COIL,RF:FIXED,80UH	80009	108-0422-00
A13L1150	108-0422-00			COIL,RF:FIXED,80UH	80009	108-0422-00
A13Q250	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q251	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q420	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A13Q421	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q501	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q540	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q541	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q542	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q543	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A13Q610	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A13Q611	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q620	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A13Q670	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q680	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q730	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A13Q930	151-0444-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS797
A13Q1150	151-0816-00			TRANSISTOR:PNP,SI,TO-3P	TK1016	2SA1264R
A13Q1240	151-0622-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS8956(MPSW51A)
A13Q1250	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A13Q1310	151-0443-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS7950
A13Q1311	151-0443-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS7950
A13Q1350	156-1381-00			MICROCKT,LINEAR:3 NPN,2 PNP,XSTR ARRAY	02735	CA3096AE-17
A13Q1410	151-0444-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS797
A13Q1420	151-0443-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS7950
A13Q1440	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A13Q1441	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q1510	151-0444-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS797
A13Q1511	151-0862-00			TRANSISTOR:PNP,SI,TO-92 PLUS	80009	151-0862-00
A13Q1520	151-0443-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS7950
A13Q1521	151-0861-00			TRANSISTOR:PNP,SI,TO-92 PLUS	80009	151-0861-00
A13Q1522	151-0861-00			TRANSISTOR:PNP,SI,TO-92 PLUS	80009	151-0861-00
A13Q1550	156-1381-00			MICROCKT,LINEAR:3 NPN,2 PNP,XSTR ARRAY	02735	CA3096AE-17

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A13Q1610	151-0862-00			TRANSISTOR:PNP,SI,TO-92 PLUS	80009	151-0862-00
A13Q1620	151-0861-00			TRANSISTOR:PNP,SI,TO-92 PLUS	80009	151-0861-00
A13Q1621	151-0861-00			TRANSISTOR:PNP,SI,TO-92 PLUS	80009	151-0861-00
A13R150	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R160	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R161	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R162	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R163	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R164	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R165	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R166	321-0159-00			RES,FXD,FILM:442 OHM,1%,0.125M,TC=T0	07716	CEAD442R0F
A13R200	315-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.25M	57668	NTR25J-E02K4
A13R211	307-1252-00			RES NTWK,FXD,FI:(3) 9K,(2) 6K,(2) 1.1K,(1) 12K,(1) 1K OHMS	34707	HC8106
A13R221	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R222	321-0189-00			RES,FXD,FILM:909 OHM,1%,0.125M,TC=T2	19701	5033ED909R0F
A13R223	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A13R224	321-0243-00			RES,FXD,FILM:3.32K OHM,1%,0.125M,TC=T0	19701	5033ED3K32F
A13R225	323-0626-01			RES,FXD,FILM:50 OHM,0.5%,0.5M,TC=T0	91637	CMF65116G50R000
A13R226	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A13R227	321-1696-07			RES,FXD,FILM:6K OHM,0.1%,0.125M,TC=T9	19701	5033RE6K00B
A13R228	321-0256-00			RES,FXD,FILM:4.53K OHM,1%,0.125M,TC=T9	19701	5033ED4K530F
A13R230	321-0256-07			RES,FXD,FILM:4.53K OHM,0.1%,0.125M,TC=T9	19701	5033RE4K530B
A13R231	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25M	19701	5043CX1M000J
A13R232	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A13R233	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A13R234	315-0395-00			RES,FXD,FILM:3.9M OHM,5%,0.25M	01121	CB3955
A13R240	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A13R241	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A13R242	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A13R243	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A13R320	321-0189-00			RES,FXD,FILM:909 OHM,1%,0.125M,TC=T2	19701	5033ED909R0F
A13R321	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R322	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A13R323	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A13R330	311-1897-00			RES,VAR,NONWM:TRMR,25K OHM,10%,0.5M,LIN	32997	3299M-R27-253
A13R331	303-0510-00			RES,FXD,CMPSN:51 OHM,5%,1M	01121	GB5105
A13R332	303-0151-00			RES,FXD,CMPSN:150 OHM,5%,1M	24546	FP1 150 OHM 5%
A13R333	311-1897-00			RES,VAR,NONWM:TRMR,25K OHM,10%,0.5M,LIN	32997	3299M-R27-253
A13R350	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A13R351	315-0432-00			RES,FXD,FILM:4.3K OHM,5%,0.25M	57668	NTR25J-E04K3
A13R352	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A13R353	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25M	57668	NTR25J-E47E0
A13R354	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A13R355	315-0432-00			RES,FXD,FILM:4.3K OHM,5%,0.25M	57668	NTR25J-E04K3
A13R356	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25M	57668	NTR25J-E47E0
A13R357	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A13R410	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25M	19701	5043CX1M000J
A13R411	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25M	57668	NTR25J-E03K3
A13R420	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125M,TC=T9	19701	5033RE10K00B
A13R421	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125M,TC=T9	19701	5033RE20K00BCM
A13R422	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R430	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A13R431	303-0151-00			RES,FXD,CMPSN:150 OHM,5%,1M	24546	FP1 150 OHM 5%
A13R432	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R433	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R440	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R470	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R471	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A13R472	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R473	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R474	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R475	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R480	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R481	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R482	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R521	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125M,TC=T9	19701	5033RE10K00B
A13R522	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A13R523	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A13R530	321-1696-07			RES,FXD,FILM:6K OHM,0.1%,0.125M,TC=T9	19701	5033RE6K00B
A13R540	321-0256-07			RES,FXD,FILM:4.53K OHM,0.1%,0.125M,TC=T9	19701	5033RE4K530B
A13R541	321-0254-00			RES,FXD,FILM:4.32K OHM,1%,0.125M,TC=T0	07716	CEAD43200F
A13R542	321-0254-00			RES,FXD,FILM:4.32K OHM,1%,0.125M,TC=T0	07716	CEAD43200F
A13R543	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R550	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A13R551	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R552	321-0265-00			RES,FXD,FILM:5.62K OHM,1%,0.125M,TC=T0	19701	5043ED5K620F
A13R553	321-0277-00			RES,FXD,FILM:7.50K OHM,1%,0.125M,TC=T0	24546	NA55D7501F
A13R554	321-0243-00			RES,FXD,FILM:3.32K OHM,1%,0.125M,TC=T0	19701	5033ED3K32F
A13R555	321-0284-00			RES,FXD,FILM:8.87K OHM,1%,0.125M,TC=T0	19701	5043ED8K870F
A13R556	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A13R570	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R571	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R580	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25M	57668	NTR25J-E330E
A13R600	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5M	TK1450	GF06UT 5K
A13R610	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A13R611	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R612	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R613	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125M,TC=T0	19701	5033ED1K00F
A13R614	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
A13R615	321-0926-07			RES,FXD,FILM:4K OHM,0.1%,0.125M,TC=T9	19701	5033RE4K00B
A13R620	321-0966-03			RES,FXD,FILM:40K OHM,0.25%,0.125M,TC=T2	19701	5033RC40K00C
A13R621	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125M,TC=T9	19701	5033RE10K00B
A13R623	321-0926-07			RES,FXD,FILM:4K OHM,0.1%,0.125M,TC=T9	19701	5033RE4K00B
A13R624	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A13R625	321-0273-00			RES,FXD,FILM:6.81K OHM,1%,0.125M,TC=T0	07716	CEAD68100F
A13R626	321-0273-00			RES,FXD,FILM:6.81K OHM,1%,0.125M,TC=T0	07716	CEAD68100F
A13R627	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A13R628	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
A13R630	321-0273-00			RES,FXD,FILM:6.81K OHM,1%,0.125M,TC=T0	07716	CEAD68100F
A13R631	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R632	321-0360-00			RES,FXD,FILM:54.9K OHM,1%,0.125M,TC=T0	19701	5033ED54K90F
A13R640	321-0297-00			RES,FXD,FILM:12.1K OHM,1%,0.125M,TC=T0	07716	CEAD12101F
A13R641	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125M,TC=T0	19701	5033ED4K990F
A13R670	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
A13R671	315-0161-00			RES,FXD,FILM:160 OHM,5%,0.25M	57668	NTR25J-E 160E
A13R672	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25M	57668	NTR25J-E270E
A13R673	322-0184-00			RES,FXD,FILM:806 OHM,1%,0.25M,TC=T0	75042	CEBT0-8060F
A13R680	322-0184-00			RES,FXD,FILM:806 OHM,1%,0.25M,TC=T0	75042	CEBT0-8060F
A13R681	321-0666-00			RES,FXD,FILM:3.04K OHM,0.5%,0.125M,TC=T2	07716	CEAC30400D
A13R682	321-0221-00			RES,FXD,FILM:1.96K OHM,1%,0.125M,TC=T0	19701	5043ED1K960F
A13R683	321-0091-00			RES,FXD,FILM:86.6 OHM,1%,0.125M,TC=T0	91637	CMF55116G86R60F
A13R684	321-0150-00			RES,FXD,FILM:357 OHM,1%,0.125M,TC=T0	07716	CEAD357R0F
A13R730	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25M	57668	NTR25J-E390E
A13R731	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A13R732	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A13R733	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A13R734	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0

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A13R740	307-0446-00			RES NTWK,FXD,FI:10K OHM,20%,(9)RES	11236	750-101-R10K
A13R760	321-0097-00			RES,FXD,FILM:100 OHM,1%,0.125M,TC=T0	91637	CMF55116G100R0F
A13R830	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25M	57668	NTR25J-E47E0
A13R831	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A13R832	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A13R833	315-0133-00			RES,FXD,FILM:13K OHM,5%,0.25M	19701	5043CX13K00J
A13R834	321-0386-00			RES,FXD,FILM:102K OHM,1%,0.125M,TC=T0	07716	CEAD10202F
A13R840	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25M	57668	NTR25J-E270E
A13R841	315-0301-00			RES,FXD,FILM:300 OHM,5%,0.25M	57668	NTR25J-E300E
A13R842	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A13R843	321-0153-07			RES,FXD,FILM:383 OHM,0.1%,0.125M,TC=T9	19701	5033RE383R0B
A13R844	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A13R850	321-0153-07			RES,FXD,FILM:383 OHM,0.1%,0.125M,TC=T9	19701	5033RE383R0B
A13R851	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125M,TC=T9	19701	5033RE10K00B
A13R852	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125M,TC=T9	19701	5033RE10K00B
A13R853	321-0431-00			RES,FXD,FILM:301K OHM,1%,0.125M,TC=T0	07716	CEAD30102F
A13R854	311-1896-00			RES,VAR,NONWW:TRMR,5K OHM,10%,0.5M,LINEAR	32997	3299W-R27-502
A13R911	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A13R912	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A13R920	321-0891-00			RES,FXD,FILM:800K OHM,1%,0.125M,TC=T0	19701	5043ED800K0F
A13R921	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A13R930	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25M	57668	NTR25J-E150K
A13R931	321-0386-00			RES,FXD,FILM:102K OHM,1%,0.125M,TC=T0	07716	CEAD10202F
A13R970	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A13R971	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A13R980	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A13R981	315-0303-00			RES,FXD,FILM:30K OHM,5%,0.25M	19701	5043CX30K00J
A13R1000	321-0275-00			RES,FXD,FILM:7.15K OHM,1%,0.125M,TC=T0	07716	CEAD71500F
A13R1001	321-0891-00			RES,FXD,FILM:800K OHM,1%,0.125M,TC=T0	19701	5043ED800K0F
A13R1060	321-0256-00			RES,FXD,FILM:4.53K OHM,1%,0.125M,TC=T9	19701	5033ED4K530F
A13R1070	321-0251-00			RES,FXD,FILM:4.02K OHM,1%,0.125M,TC=T0	19701	5033ED4K020F
A13R1071	315-0303-00			RES,FXD,FILM:30K OHM,5%,0.25M	19701	5043CX30K00J
A13R1072	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A13R1073	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25M	57668	NTR25J-E 20K
A13R1100	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A13R1101	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A13R1102	321-0237-00			RES,FXD,FILM:2.87K OHM,1%,0.125M,TC=T0	07716	CEAD 28700F
A13R1103	322-0671-00			RES,FXD,FILM:4 MEG OHM,1%,0.25M,TC=T0	07716	CCAC40003F
A13R1140	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25M	19701	5043CX15K00J
A13R1141	315-0393-00			RES,FXD,FILM:39K OHM,5%,0.25M	57668	NTR25J-E39K0
A13R1150	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25M	19701	5043CX22R00J
A13R1151	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A13R1152	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A13R1180	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A13R1181	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125M,TC=T0	07716	CEAD51101F
A13R1182	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125M,TC=T0	07716	CEAD51101F
A13R1183	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125M,TC=T0	07716	CEAD51101F
A13R1184	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125M,TC=T0	07716	CEAD51101F
A13R1185	321-0285-00			RES,FXD,FILM:9.09K OHM,1%,0.125M,TC=T0	07716	CEAD90900F
A13R1186	321-0268-00			RES,FXD,FILM:6.04K OHM,1%,0.125M,TC=T0	19701	5043ED6K040F
A13R1187	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125M,TC=T0	07716	CEAD51101F
A13R1188	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A13R1200	321-0496-00			RES,FXD,FILM:1.43 MEG OHM,1%,0.125M,TC=T0	01121	ORDER BY DESCR
A13R1210	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125M,TC=T0	03888	PME55D20003F
A13R1220	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25M	57668	NTR25J-E47K0
A13R1221	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25M	57668	NTR25J-E47K0
A13R1222	321-0414-00			RES,FXD,FILM:200K OHM,1%,0.125M,TC=T0	07716	CEAD20002F
A13R1223	315-0226-00			RES,FXD,FILM:22M OHM,5%,0.25M	80009	315-0226-00
A13R1224	321-0891-00			RES,FXD,FILM:800K OHM,1%,0.125M,TC=T0	19701	5043ED800K0F

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A13R1225	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W	57668	NTR25J-E150K
A13R1230	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A13R1231	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A13R1232	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A13R1233	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A13R1234	321-0739-01			RES,FXD,FILM:1.68K OHM,0.5%,0.125W,TC=T0	19701	5033RD1K680D
A13R1235	321-0720-02			RES,FXD,FILM:60K OHM,0.5%,0.125W,TC=T2	91637	MFF1816D60001D
A13R1236	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1240	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1241	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A13R1242	301-0431-00			RES,FXD,FILM:430 OHM,5%,0.5W	19701	5053CX430R0J
A13R1243	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
A13R1244	301-0331-00			RES,FXD,FILM:330 OHM,5%,0.5W	19701	5053CX330R0J
A13R1251	308-0836-00			RES,FXD,MM:1.2 OHM,5%,1W FUSIBLE	75042	BW-20F-1.20HM 5%
A13R1252	308-0836-00			RES,FXD,MM:1.2 OHM,5%,1W FUSIBLE	75042	BW-20F-1.20HM 5%
A13R1253	308-0836-00			RES,FXD,MM:1.2 OHM,5%,1W FUSIBLE	75042	BW-20F-1.20HM 5%
A13R1270	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1271	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1280	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1281	321-0285-00			RES,FXD,FILM:9.09K OHM,1%,0.125W,TC=T0	07716	CEAD90900F
A13R1282	321-0285-00			RES,FXD,FILM:9.09K OHM,1%,0.125W,TC=T0	07716	CEAD90900F
A13R1300	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1301	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1302	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1303	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1304	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1310	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1311	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1312	315-0824-00			RES,FXD,FILM:820K OHM,5%,0.25W	19701	5043CX820K0J
A13R1313	315-0244-00			RES,FXD,FILM:240K OHM,5%,0.25W	19701	5043CX240K0J
A13R1314	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125W,TC=T0	03888	PME55D20003F
A13R1315	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125W,TC=T0	03888	PME55D20003F
A13R1325	311-2238-00			RES,VAR,NONWW:TRMR,50K OHM,20%,0.5W LINEAR	TK1450	GF06UT 50 K
A13R1326	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5W	TK1450	GF06UT 5K
A13R1327	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A13R1328	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A13R1329	315-0475-00			RES,FXD,FILM:4.7M OHM,5%,0.25W	01121	CB4755
A13R1330	311-2239-00			RES,VAR,NONWW:TRMR,100K OHM,20%,0.5W LINEAR	TK1450	GF06UT 100K
A13R1331	311-2239-00			RES,VAR,NONWW:TRMR,100K OHM,20%,0.5W LINEAR	TK1450	GF06UT 100K
A13R1332	321-0356-00			RES,FXD,FILM:49.9K OHM,1%,0.125W,TC=T0	19701	5033ED49K90F
A13R1333	321-0356-00			RES,FXD,FILM:49.9K OHM,1%,0.125W,TC=T0	19701	5033ED49K90F
A13R1334	321-0358-00			RES,FXD,FILM:52.3K OHM,1%,0.125W,TC=T0	07716	CEAD52301F
A13R1335	321-0382-00			RES,FXD,FILM:93.1K OHM,1%,0.125W,TC=T0	07716	CEAD93101F
A13R1336	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0	19701	5033ED100K0F
A13R1340	321-0790-00			RES,FXD,FILM:990K OHM,1%,0.125W,TC=T0	07716	CEAD99002F
A13R1341	321-0360-00			RES,FXD,FILM:54.9K OHM,1%,0.125W,TC=T0	19701	5033ED54K90F
A13R1342	315-0756-00			RES,FXD,FILM:75MEG,5%,0.25W	01121	CB7565
A13R1343	315-0124-00			RES,FXD,FILM:120K OHM,5%,0.25W	19701	5043CX120K0J
A13R1344	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A13R1345	315-0561-00			RES,FXD,FILM:560 OHM,5%,0.25W	19701	5043CX560R0J
A13R1346	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1350	315-0624-00			RES,FXD,FILM:620K OHM,5%,0.25W	19701	5043CX620K0J
A13R1351	321-0164-00			RES,FXD,FILM:499 OHM,1%,0.125W,TC=T0	19701	5033ED499R0F
A13R1352	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A13R1353	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=T0	19701	5033ED4K990F
A13R1354	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=T0	19701	5033ED4K990F
A13R1355	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A13R1370	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1371	321-0285-00			RES,FXD,FILM:9.09K OHM,1%,0.125W,TC=T0	07716	CEAD90900F

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A13R1372	321-0285-00			RES,FXD,FILM:9.09K OHM,1%,0.125W,TC=T0	07716	CEAD90900F
A13R1380	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1410	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	57668	NTR25J-E01K2
A13R1411	315-0475-00			RES,FXD,FILM:4.7M OHM,5%,0.25W	01121	CB4755
A13R1412	315-0822-00			RES,FXD,FILM:8.2K OHM,5%,0.25W	19701	5043CX8K200J
A13R1420	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125W,TC=T0	03888	PME55D20003F
A13R1421	321-0510-07			RES,FXD,FILM:2.00 MEG OHM,0.1%,0.125W,TC=T0	19701	5033RE2M00B
A13R1422	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A13R1423	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A13R1424	315-0205-00			RES,FXD,FILM:2M OHM,5%,0.25W	01121	CB2055
A13R1425	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125W,TC=T0	03888	PME55D20003F
A13R1426	321-0510-07			RES,FXD,FILM:2.00 MEG OHM,0.1%,0.125W,TC=T0	19701	5033RE2M00B
A13R1430	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A13R1431	315-0433-00			RES,FXD,FILM:43K OHM,5%,0.25W	19701	5043CX43K00J
A13R1432	321-0335-00			RES,FXD,FILM:30.1K OHM,1%,0.125W,TC=T0	57668	RB14FXE30K1
A13R1433	321-0327-00			RES,FXD,FILM:24.9K OHM,1%,0.125W,TC=T0	07716	CEAD24901F
A13R1440	321-0335-00			RES,FXD,FILM:30.1K OHM,1%,0.125W,TC=T0	57668	RB14FXE30K1
A13R1441	321-0335-00			RES,FXD,FILM:30.1K OHM,1%,0.125W,TC=T0	57668	RB14FXE30K1
A13R1442	311-2236-00			RES,VAR,NONWM:TRMR,20K OHM,20%,0.5W LINEAR	TK1450	GF06UT 20K
A13R1443	321-0644-00			RES,FXD,FILM:100K OHM,0.25%,0.125W,TC=T9	19701	5043ED100K0C
A13R1444	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A13R1445	311-2239-00			RES,VAR,NONWM:TRMR,100K OHM,20%,0.5W LINEAR	TK1450	GF06UT 100K
A13R1450	308-0836-00			RES,FXD,WW:1.2 OHM,5%,1W FUSIBLE	75042	BW-20F-1.20HM 5%
A13R1451	315-0681-00			RES,FXD,FILM:680 OHM,5%,0.25W	57668	NTR25J-E680E
A13R1452	315-0681-00			RES,FXD,FILM:680 OHM,5%,0.25W	57668	NTR25J-E680E
A13R1453	321-0164-00			RES,FXD,FILM:499 OHM,1%,0.125W,TC=T0	19701	5033ED499R0F
A13R1454	315-0184-00			RES,FXD,FILM:180K OHM,5%,0.25W	19701	5043CX180K0J
A13R1455	321-0335-00			RES,FXD,FILM:30.1K OHM,1%,0.125W,TC=T0	57668	RB14FXE30K1
A13R1456	315-0113-00			RES,FXD,FILM:11K OHM,5%,0.25W	19701	5043CX11K00J
A13R1457	321-0231-00			RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=T0	19701	5033ED2K49F
A13R1458	315-0363-00			RES,FXD,FILM:36K OHM,5%,0.25W	57668	NTR25J-E36K0
A13R1460	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A13R1461	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A13R1462	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A13R1463	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25W	19701	5043CX470K0J92U
A13R1470	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE10K00B
A13R1471	321-0343-00			RES,FXD,FILM:36.5K OHM,1%,0.125W,TC=T0	07716	CEAD36501F
A13R1472	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A13R1473	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25W	19701	5043CX470K0J92U
A13R1474	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1475	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1500	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1501	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1502	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A13R1503	321-0289-01			RES,FXD,FILM:10.0K OHM,0.5%,0.125W,TC=T0	07716	CEAD100010
A13R1504	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125W,TC=T0	03888	PME55D20003F
A13R1510	315-0623-00			RES,FXD,FILM:62K OHM,5%,0.25W	19701	5043CX62K00J
A13R1511	315-0822-00			RES,FXD,FILM:8.2K OHM,5%,0.25W	19701	5043CX8K200J
A13R1512	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A13R1513	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A13R1514	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0	19701	5033ED100K0F
A13R1520	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A13R1521	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A13R1522	321-0646-00			RES,FXD,FILM:200K OHM,0.5%,0.125W,TC=T2	07716	CEAC20002D
A13R1523	321-0720-02			RES,FXD,FILM:60K OHM,0.5%,0.125W,TC=T2	91637	MFF1816D60001D
A13R1524	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0	19701	5033ED100K0F
A13R1525	301-0203-00			RES,FXD,FILM:20K OHM,5%,0.5W	19701	5053CX20K00J
A13R1526	321-0299-00			RES,FXD,FILM:12.7K OHM,1%,0.125W,TC=T0	19701	5033ED12K70F
A13R1527	315-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4

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A13R1528	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	01121	CB1065
A13R1530	321-0756-01			RES,FXD,FILM:50K OHM,0.5%,0.125W,TC=T0	07716	CEA 50K0HM 0.5%
A13R1531	321-0370-00			RES,FXD,FILM:69.8K OHM,1%,0.125W,TC=T0	07716	CEAD69801F
A13R1532	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0	19701	5033ED100K0F
A13R1533	315-0200-00			RES,FXD,FILM:20 OHM,5%,0.25W	19701	5043CX20R00J
A13R1540	311-2239-00			RES,VAR,NONWW:TRMR,100K OHM,20%,0.5W LINEAR	TK1450	GF06UT 100K
A13R1541	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5W	TK1450	GF06UT 5K
A13R1542	321-0719-01			RES,FXD,FILM:6.667K OHM,0.5%,0.125W,TC=T0	91637	MFF1816G66670D
A13R1543	321-0992-01			RES,FXD,FILM:33.33K OHM,0.5%,0.125W,T=T0	01121	ADVISE
A13R1544	321-0992-01			RES,FXD,FILM:33.33K OHM,0.5%,0.125W,T=T0	01121	ADVISE
A13R1545	321-0285-01			RES,FXD,FILM:9.09K OHM,0.5%,0.125W,TC=T0	07716	CEAD90900D
A13R1546	321-0318-02			RES,FXD,FILM:20.0K 0.5%,0.125W,TC=T2	19701	5033RC20K00D
A13R1547	321-0924-02			RES,FXD,FILM:40K OHM,0.5%,0.125W,TC=T2	19701	5033RC40K00D
A13R1548	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0	19701	5033ED100K0F
A13R1549	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A13R1550	321-0205-00			RES,FXD,FILM:1.33K OHM,1%,0.125W,TC=T0	19701	5033ED1K330F
A13R1551	321-0227-00			RES,FXD,FILM:2.26K OHM,1%,0.125W,TC=T0	01121	RNK2261F
A13R1552	321-0256-00			RES,FXD,FILM:4.53K OHM,1%,0.125W,TC=T9	19701	5033ED4K530F
A13R1553	321-0346-00			RES,FXD,FILM:39.2K OHM,1%,0.125W,TC=T0	19701	5043ED39K20F
A13R1554	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=T0	19701	5033ED4K990F
A13R1555	321-0323-00			RES,FXD,FILM:22.6K OHM,1%,0.125W,TC=T0	07716	CEAD22601F
A13R1556	321-0452-00			RES,FXD,FILM:499K OHM,1%,0.125W,TC=T0	19701	5043ED499K0F
A13R1557	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=T0	19701	5033ED4K990F
A13R1560	307-0110-00			RES,FXD,CMPSN:3 OHM,5%,0.25W	80009	307-0110-00
A13R1563	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R1580	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1581	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1582	321-0268-00			RES,FXD,FILM:6.04K OHM,1%,0.125W,TC=T0	19701	5043ED6K040F
A13R1583	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125W,TC=T0	07716	CEAD51101F
A13R1584	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A13R1585	321-0293-00			RES,FXD,FILM:11.0K OHM,1%,0.125W,TC=T0	07716	CEAD11001F
A13R1590	321-0724-00			RES,FXD,FILM:13.6K OHM,1%,0.125W,TC=T0	19701	5033RD13K60F
A13R1591	307-0590-00			RES,FXD,CMPSN:2.7 OHM,5%,1W	01121	GB27G5
A13R1600	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A13R1601	321-0289-01			RES,FXD,FILM:10.0K OHM,0.5%,0.125W,TC=T0	07716	CEAD10001D
A13R1602	321-0510-00			RES,FXD,FILM:2.00M OHM,1%,0.125W,TC=T0	03888	PME55D20003F
A13R1610	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A13R1611	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A13R1612	321-0645-00			RES,FXD,FILM:100K OHM,0.5%,0.125W,TC=T2	19701	5033RC1003D
A13R1620	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0	19701	5033ED100K0F
A13R1621	321-0299-00			RES,FXD,FILM:12.7K OHM,1%,0.125W,TC=T0	19701	5033ED12K70F
A13R1622	315-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
A13R1623	301-0203-00			RES,FXD,FILM:20K OHM,5%,0.5W	19701	5053CX20K00J
A13R1640	321-0337-00			RES,FXD,FILM:31.6K OHM,1%,0.125W,TC=T0	07716	CEAD31601F
A13R1641	321-0277-03			RES,FXD,FILM:7.50K OHM,0.25%,0.125W,T=T2	01121	ORDER BY DESCR
A13R1642	321-0368-00			RES,FXD,FILM:66.5K OHM,1%,0.125W,TC=T0	07716	CEAD66501F
A13R1643	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE10K00B
A13R1644	321-0318-02			RES,FXD,FILM:20.0K 0.5%,0.125W,TC=T2	19701	5033RC20K00D
A13R1645	321-0414-00			RES,FXD,FILM:200K OHM,1%,0.125W,TC=T0	07716	CEAD20002F
A13R1646	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A13R1647	321-0231-00			RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=T0	19701	5033ED2K49F
A13R1650	321-0185-00			RES,FXD,FILM:825 OHM,1%,0.125W,TC=T0	07716	CEAD825R0F
A13R1651	307-0542-00			RES NTWK,FXD,FI:(5)10K OHM,5%,0.125W	01121	106A1030R706A103
A13T1040	120-1674-00			TRANSFORMER,PWR:HIGH FREQUENCY	80009	120-1674-00
A13TP170	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP210	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP220	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP221	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP310	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036

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A13TP320	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP420	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP421	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP470	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP510	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP550	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP571	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP580	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP630	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP640	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP670	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP680	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP780	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP781	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP782	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP870	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP910	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP920	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP960	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP980	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1160	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1300	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1360	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1380	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1381	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1382	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1400	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1401	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1402	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1440	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1441	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1442	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1470	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1480	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1510	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1580	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13TP1610	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A13U110	156-0541-02			MICROCKT,DGTL:DUAL 2-TO 4-LINE DCDR/DEMUX	04713	SN74LS139NDS
A13U170	156-1451-00			MICROCKT,LINEAR:3-TERM NEG VOLT RGLTR,ADJ	27014	LM337T
A13U210	156-1850-00			MICROCKT,LINEAR:CMOS,QUAD SPST ANALOG SW	17856	SDG21107
A13U220	156-2619-00			MICROCKT,DGTL:OP AMP SINGLE,LOW OFFSET VOLTAGE	34371	HA7-5135-5
A13U230	156-2621-00			MICROCKT,LINEAR:12 BIT DAC,VOUT,MPU COMP	80009	156-2621-00
A13U250	156-0865-02			MICROCKT,DGTL:OCTAL D FF W/CLEAR	01295	SN74LS273NP3
A13U270	156-2623-00			MICROCKT,DGTL:HMOS,CUSTOM,REALTIME SCOPE	80009	156-2623-00
A13U310	156-1850-00			MICROCKT,LINEAR:CMOS,QUAD SPST ANALOG SW	17856	SDG21107
A13U311	156-2620-00			MICROCKT,LINEAR:OP AMP DUAL,LOW OFFSET,WIDE	80009	156-2620-00
A13U430	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U500	156-2461-00			MICROCKT,LINEAR:TEMP SENSOR,CURRENT OUTPUT	24355	AD592AN
A13U530	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U531	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U580	156-0391-02			MICROCKT,DGTL:HEX LATCH W/CLEAR	01295	SN74LS174NP3
A13U581	160-3739-01			MICROCKT,DGTL:STTL,LOGIC DEVICE,PRGM	80009	160-3739-01
A13U630	156-1255-01			MICROCKT,LINEAR:D/A CONVERTER,BURN-IN	06665	DAC0801156Q
A13U640	156-1126-00			MICROCKT,LINEAR:VOLTAGE COMPARATOR	01295	LM311P
A13U650	156-1149-01			MICROCKT,LINEAR:OPNL AMPL JFET INPUT,SCRN	27014	AL160307
A13U720	165-2180-00			MICROCKT,LINEAR:Z AXIS AUTO FOCUS	80009	165-2180-00
A13U740	160-4282-00			MICROCKT,DGTL:8 BIT MICROCONTROLLER 4K	80009	160-4282-00
A13U741	156-1338-01			MICROCKT,LINEAR:OPNL AMPL,SELECTED	18324	NE5534AN

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A13U750	156-1589-00			MICROCKT,LINEAR:D/A CNVRTR,12 BIT,HS	06665	DAC312FR
A13U830	156-0724-02			MICROCKT,DGTL:HEX INV W/OC OUT,SCRN,	01295	SN74LS05MS
A13U831	156-0739-02			MICROCKT,DGTL:QUAD 2 INP OR GATE	18324	N74S32(NB OR FB)
A13U850	156-2842-00			MICROCKT,LINEAR:VOLTAGE REFERENCE,10V,0.05%	80009	156-2842-00
A13U870	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U880	156-1200-01			MICROCKT,LINEAR:OPERATIONAL AMPL,QUAD BIFET	80009	156-1200-01
A13U881	156-1200-01			MICROCKT,LINEAR:OPERATIONAL AMPL,QUAD BIFET	80009	156-1200-01
A13U1010	152-0805-02			SEMICOND DVC,DI:HV,22KV OUTPUT	51406	MSR8506A
A13U1070	156-1200-01			MICROCKT,LINEAR:OPERATIONAL AMPL,QUAD BIFET	80009	156-1200-01
A13U1080	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U1170	156-1200-01			MICROCKT,LINEAR:OPERATIONAL AMPL,QUAD BIFET	80009	156-1200-01
A13U1180	156-1200-01			MICROCKT,LINEAR:OPERATIONAL AMPL,QUAD BIFET	80009	156-1200-01
A13U1241	156-1631-00			MICROCKT,LINEAR:ADJUSTABLE SHUNT REGULATOR	01295	TL431C-LP
A13U1270	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U1280	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U1320	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A13U1330	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U1340	156-2985-00			MICROCKT,LINEAR:OP-AMP,DUAL,BIFET,DECOMP	80009	156-2985-00
A13U1370	156-1200-01			MICROCKT,LINEAR:OPERATIONAL AMPL,QUAD BIFET	80009	156-1200-01
A13U1430	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A13U1470	156-1200-01			MICROCKT,LINEAR:OPERATIONAL AMPL,QUAD BIFET	80009	156-1200-01
A13U1530	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A13U1531	156-0742-00			MICROCKT,LINEAR:OPNL AMPL	01295	LM318P
A13U1560	156-1760-02			MICROCKT,LINEAR:PWR AMPLIFIER	80009	156-1760-02
A13U1570	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13U1571	156-1200-01			MICROCKT,LINEAR:OPERATIONAL AMPL,QUAD BIFET	80009	156-1200-01
A13U1630	156-0742-00			MICROCKT,LINEAR:OPNL AMPL	01295	LM318P
A13U1650	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A13VR980	152-0278-00			SEMICOND DVC,DI:ZEN,SI,3V,5%,0.4W,DO-7	04713	SZG35009K20
A13VR1230	152-0282-00			SEMICOND DVC,DI:ZEN,SI,30V,5%,0.4W,DO-7	04713	SZG35009K13
A13VR1310	152-0289-00			SEMICOND DVC,DI:ZEN,SI,180V,5%,0.4W,DO-7	04713	SZ12484KRL
A13VR1311	152-0289-00			SEMICOND DVC,DI:ZEN,SI,180V,5%,0.4W,DO-7	04713	SZ12484KRL
A13W55	174-0009-00			CA ASSY,SP,ELEC:6,26 AWG TO CRT SOCKET	80009	174-0009-00
A13W350	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13W351	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13W450	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13W451	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13W660	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13W690	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13W850	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13W1281	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13W1341	131-0566-00			BUS,CNDCT:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A13X270	136-0848-00			SKT,PL-IN ELEK:68 PIN 5162-2	00779	55162-2
A13X720	136-0764-00			SKT,PL-IN ELEK:48 LINE CONT IMPD HYBRID	00779	ORDER BY DESCR
A13X740	136-0757-00			SKT,PL-IN ELEK:MICROCIRCUIT,40 DIP	09922	DILB40P-108
A14	670-8827-00			CIRCUIT BD ASSY:TIMEBASE	80009	670-8827-00
A14C120	281-0772-00			CAP,FXD,CER DI:4700PF,10%,100V	04222	MA201C472KAA
A14C140	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C150	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C160	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C170	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C180	283-0912-00			CAP,FXD,CER DI:2.7PF,1000V	60705	561CRE501EE2R7CA
A14C200	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C210	281-0198-00			CAP,VAR,AIR DI:1.7-11PF,250V	74970	187-0306-105
A14C220	281-0864-00			CAP,FXD,CER DI:430PF,5%,100V	54583	MA12C0G2A431J
A14C221	281-0864-00			CAP,FXD,CER DI:430PF,5%,100V	54583	MA12C0G2A431J
A14C222	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14C230	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C240	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	MA105A471KAA
A14C241	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	MA105A471KAA
A14C250	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C251	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C252	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C253	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C280	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C281	283-0912-00			CAP,FXD,CER DI:2.7PF,1000V	60705	561CRE501EE2R7CA
A14C282	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C290	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C300	290-1115-00			CAP,FXD,ELCTLT:10UF,10%,100V	55680	ULB2A100MPA1TD
A14C311	281-0934-00			CAP,FXD,CER DI:24PF,5%,100V	04222	MA101A240JAA
A14C320	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C322	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C323	281-0864-00			CAP,FXD,CER DI:430PF,5%,100V	54583	MA12C0G2A431J
A14C325	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C340	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C341	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A14C350	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C351	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A14C370	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C371	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C380	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C400	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C440	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C441	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A14C442	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A14C443	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C444	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C450	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C451	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C460	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C461	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C462	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C470	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C510	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C520	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C521	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C531	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C540	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C541	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C542	283-0209-00			CAP,FXD,CER DI:1UF,20%,50V	96733	T-1825BZ105MN
A14C550	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C600	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C601	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C610	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C611	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C660	290-0246-00			CAP,FXD,ELCTLT:3.3UF,10%,15V	12954	03R3EA15K1
A14C661	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-10%,10V	55680	ULB1A221TPAANA
A14C662	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A14C663	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C670	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C671	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C680	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-10%,10V	55680	ULB1A221TPAANA
A14C681	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A14C682	290-0246-00			CAP,FXD,ELCTLT:3.3UF,10%,15V	12954	03R3EA15K1
A14C683	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C684	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA

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A14C700	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C710	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C720	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C721	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C730	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C731	283-5004-00			CAP,FXD,CER DI:0.1UF,10%,25V	54583	C3216X7R1E104K
A14C760	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C761	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	04222	MA101A101KAA
A14C781	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C782	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-10%,10V	55680	ULB1A221TPAANA
A14C810	283-0260-00			CAP,FXD,CER DI:5.6PF,+/-0.25PF,200V	51642	150 200NP0569C
A14C840	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	04222	MA101A101KAA
A14C860	290-0944-00			CAP,FXD,ELCTLT:220UF,+50-10%,10V	55680	ULB1A221TPAANA
A14C861	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A14C880	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C881	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR302E105ZAATR
A14C890	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C920	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C940	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C951	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C960	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C961	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C962	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1000	290-0766-02			CAP,FXD,ELCTLT:2.2UF,20%,160V,MI	TK0020	KM160VB2R2M
A14C1040	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1041	281-0777-00			CAP,FXD,CER DI:51PF,5%,100V	04222	MA101A510JAA
A14C1050	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1051	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1056	281-0786-00			CAP,FXD,CER DI:150PF,10%,100V	04222	MA101A151KAA
A14C1060	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A14C1061	281-0797-00			CAP,FXD,CER DI:15PF,10%,100V	04222	MA106A150KAA
A14C1062	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1063	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1110	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1111	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1112	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1113	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1114	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1115	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1120	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A14C1131	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1140	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1141	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	MA105A471KAA
A14C1170	285-0676-01			CAP,FXD,PLASTIC:0.1UF,3,5%,35V	80009	285-0676-01
A14C1171	285-1060-00			CAP,FXD,PLASTIC:10UF,3%,25V	80009	285-1060-00
A14C1200	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1201	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1210	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1211	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1212	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1213	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1214	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1220	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1230	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A14C1231	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A14C1240	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1241	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1270	281-0808-00			CAP,FXD,CER DI:7 PF,20%,100V	04222	MA101A7R04AA
A14C1271	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA

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A14C1300	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A14C1301	283-0921-00			CAP,FXD,ELCTLT:10PF,5%,200V	31433	C320C100J2G5CA
A14C1302	283-0913-00			CAP,FXD,CER DI:1000PF,200V	04222	SR156C102MAATR
A14C1303	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1304	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A14C1310	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1321	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1330	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1331	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1341	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1343	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	55680	ULB1E101MEA
A14C1350	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1351	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1352	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1353	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1354	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1355	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1357	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1358	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1359	283-0203-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
A14C1360	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1361	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1362	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1363	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1364	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1365	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1366	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1367	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1370	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1380	281-0797-00			CAP,FXD,CER DI:15PF,10%,100V	04222	MA106A150KAA
A14C1400	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	MA105A471KAA
A14C1401	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	MA101A5R6DAA
A14C1410	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C1420	281-0816-00			CAP,FXD,CER DI:82 PF,5%,100V	04222	MA106A820JAA
A14C1421	281-0270-00			CAP,VAR,CER DI:9-90PF,50V	51406	TZ03R900E
A14C1430	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1440	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1441	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1450	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1451	281-0797-00			CAP,FXD,CER DI:15PF,10%,100V	04222	MA106A150KAA
A14C1480	285-0676-01			CAP,FXD,PLASTIC:0.1UF,3,5%,35V	80009	285-0676-01
A14C1481	281-0808-00			CAP,FXD,CER DI:7 PF,20%,100V	04222	MA101A7R04AA
A14C1500	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1511	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1512	281-0797-00			CAP,FXD,CER DI:15PF,10%,100V	04222	MA106A150KAA
A14C1513	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A14C1514	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A14C1520	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1521	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1522	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1530	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1531	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1532	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1540	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1544	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1550	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1551	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A14C1552	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	MA101C102MAA
A14C1580	285-1060-00			CAP,FXD,PLASTIC:10UF,3%,25V	80009	285-1060-00

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A14C1640	281-0909-00		CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14C1660	290-0943-00		CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1661	290-0943-00		CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1662	290-0943-00		CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14C1663	290-0943-00		CAP,FXD,ELCTLT:47UF,+50-10%,25V	55680	ULB1E470TAAANA
A14CR220	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR330	152-0066-00		SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A14CR331	152-0066-00		SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A14CR340	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR341	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR350	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR351	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR380	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR381	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR382	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR383	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR510	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR511	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR720	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR900	152-0574-00		SEMICOND DVC,DI:SW,SI,120V,0.15A,DO-35	12969	NDP566
A14CR1050	152-0322-00		SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A14CR1070	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1080	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1081	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1110	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1111	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1120	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1210	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1211	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1212	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1213	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1220	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1221	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1222	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1223	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1224	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1300	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1340	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1341	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1342	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1343	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1360	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1380	152-0141-02		SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14E140	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E141	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E250	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E251	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E440	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E850	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E900	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E951	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E1020	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14E1520	276-0752-00		CORE,EM:FERRITE	34899	2743001111
A14J01	131-1003-00		CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J02	131-1003-00		CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J03	131-1003-00		CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J04	131-1003-00		CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J05	131-1003-00		CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J06	131-1003-00		CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00

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A14J15	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J21	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J22	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J23	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J24	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J25	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J26	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J27	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J28	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J30	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J31	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A14J66	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 4)	22526	48283-036
A14J84	131-3147-00			CONN,RCPT,ELEC:HEADER,2 X 25,0.1 SPACING	53387	3596-6002
A14J85	131-3825-00			CONN,RCPT,ELEC:HEADER,50 CONTACT,4 SIDED	53387	3433-6202
A14J86	131-3364-00			CONN,RCPT,ELEC:HEADER,STRAIGHT,34 PIN	53387	3594-6002
A14J220	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A14L150	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L250	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L380	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L400	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L500	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L501	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L600	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L660	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L680	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L860	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L880	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L900	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L930	120-0407-00			XFMR,TOROID:	80009	120-0407-00
A14L940	108-0317-00			COIL,RF:FIXED,15 UH	32159	71501M+10PERCENT
A14L941	108-0317-00			COIL,RF:FIXED,15 UH	32159	71501M+10PERCENT
A14L1100	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1240	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1380	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1381	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1382	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1500	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1510	108-1286-00			COIL,RF:FIXED,12UH,10%	80009	108-1286-00
A14L1511	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1640	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1670	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1680	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14L1681	108-0538-02			COIL,RF:FXD,2.7UH,1A	76493	JWM#B7059
A14P220	131-0993-00			BUS,CONDUCTOR:SHUNT ASSEMBLY,BLACK	22526	65474-005
A14Q311	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A14Q320	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A14Q370	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A14Q540	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A14Q541	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A14Q600	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A14Q611	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A14Q710	151-0367-00			TRANSISTOR:NPN,SI,X-55	04713	SPS 8811
A14Q711	151-0367-00			TRANSISTOR:NPN,SI,X-55	04713	SPS 8811
A14Q810	151-0434-00			TRANSISTOR:PNP,SI,TO-72	04713	SS7144
A14Q811	151-0434-00			TRANSISTOR:PNP,SI,TO-72	04713	SS7144
A14Q860	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A14Q1050	151-0221-08			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-08

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A14Q1051	151-0221-08			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-08
A14Q1052	151-0221-08			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-08
A14Q1053	151-0367-00			TRANSISTOR:NPN,SI,X-55	04713	SPS 8811
A14Q1060	151-1021-00			TRANSISTOR:FET,N-CHAN,SI,TO-18	80009	151-1021-00
A14Q1061	151-1021-00			TRANSISTOR:FET,N-CHAN,SI,TO-18	80009	151-1021-00
A14Q1063	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A14Q1130	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY	02735	CA3046
A14Q1270	151-0736-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0736-00
A14Q1370	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A14Q1450	156-1294-01			MICROCKT,DGTL:NPN,5 TRANSISTOR ARRAY H FREQ	02735	CA3127E
A14Q1580	151-0736-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0736-00
A14R110	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R111	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R112	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R113	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R114	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R115	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R116	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A14R120	315-0911-00			RES,FXD,FILM:910 OHM,5%,0.25W	57668	NTR25J-E910E
A14R121	315-0751-00			RES,FXD,FILM:750 OHM,5%,0.25W	57668	NTR25J-E750E
A14R180	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R190	315-0240-00			RES,FXD,FILM:24 OHM,5%,0.25W	57668	NTR25J-E24E0
A14R191	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R200	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A14R210	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R211	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A14R212	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A14R213	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R220	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R230	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R240	321-0614-00			RES,FXD,FILM:10.1K OHM,1%,0.125W,TC=T0	19701	5043ED10K10F
A14R241	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R242	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R243	321-0614-00			RES,FXD,FILM:10.1K OHM,1%,0.125W,TC=T0	19701	5043ED10K10F
A14R244	321-0269-00			RES,FXD,FILM:6.19K OHM,1%,0.125W,TC=T0	07716	CEAD61900F
A14R245	321-0269-00			RES,FXD,FILM:6.19K OHM,1%,0.125W,TC=T0	07716	CEAD61900F
A14R246	321-0269-00			RES,FXD,FILM:6.19K OHM,1%,0.125W,TC=T0	07716	CEAD61900F
A14R247	321-0269-00			RES,FXD,FILM:6.19K OHM,1%,0.125W,TC=T0	07716	CEAD61900F
A14R248	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A14R250	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R251	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R290	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R291	315-0240-00			RES,FXD,FILM:24 OHM,5%,0.25W	57668	NTR25J-E24E0
A14R320	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A14R321	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A14R322	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	57668	NTR25J-E01K2
A14R323	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A14R324	315-0133-00			RES,FXD,FILM:13K OHM,5%,0.25W	19701	5043CX13K00J
A14R327	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R328	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A14R330	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A14R331	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R332	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R340	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R341	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R342	322-3330-00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K7
A14R343	322-3330-00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K7
A14R370	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K

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A14R371	321-1700-04			RES,FXD,FILM:10.44K OHM,0.1%,0.125W,TC=T2	19701	5033RC10K440B
A14R372	315-0301-00			RES,FXD,FILM:300 OHM,5%,0.25W	57668	NTR25J-E300E
A14R380	321-1700-04			RES,FXD,FILM:10.44K OHM,0.1%,0.125W,TC=T2	19701	5033RC10K440B
A14R381	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
A14R382	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R383	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A14R384	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
A14R385	321-0285-00			RES,FXD,FILM:9.09K OHM,1%,0.125W,TC=T0	07716	CEAD90900F
A14R386	321-0285-00			RES,FXD,FILM:9.09K OHM,1%,0.125W,TC=T0	07716	CEAD90900F
A14R440	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 10K0
A14R441	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 10K0
A14R442	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R443	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A14R444	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R445	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R446	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A14R447	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A14R450	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R460	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R461	322-3121-00			RES,FXD,FILM:178 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 178E
A14R462	322-3268-00			RES,FXD,FILM:6.04K OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 6K04
A14R463	322-3121-00			RES,FXD,FILM:178 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 178E
A14R464	322-3268-00			RES,FXD,FILM:6.04K OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 6K04
A14R480	315-0562-00			RES,FXD,FILM:5.6K OHM,5%,0.25W	57668	NTR25J-E05K6
A14R481	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A14R482	321-0160-00			RES,FXD,FILM:453 OHM,1%,0.125W,TC=T0	19701	5033ED453R0F
A14R483	321-0241-00			RES,FXD,FILM:3.16K OHM,1%,0.125W,TC=T0	07716	CEAD31600F
A14R484	315-0622-00			RES,FXD,FILM:6.2K OHM,5%,0.25W	19701	5043CX6K200J
A14R485	321-0160-00			RES,FXD,FILM:453 OHM,1%,0.125W,TC=T0	19701	5033ED453R0F
A14R486	321-0241-00			RES,FXD,FILM:3.16K OHM,1%,0.125W,TC=T0	07716	CEAD31600F
A14R487	315-0622-00			RES,FXD,FILM:6.2K OHM,5%,0.25W	19701	5043CX6K200J
A14R510	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A14R511	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A14R512	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A14R513	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A14R514	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R522	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A14R523	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A14R524	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A14R525	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A14R526	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R540	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R541	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A14R542	322-3268-00			RES,FXD,FILM:6.04K OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 6K04
A14R543	322-3121-00			RES,FXD,FILM:178 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 178E
A14R544	322-3201-00			RES,FXD,FILM:1.21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K21
A14R545	322-3201-00			RES,FXD,FILM:1.21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K21
A14R546	322-3268-00			RES,FXD,FILM:6.04K OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 6K04
A14R547	322-3121-00			RES,FXD,FILM:178 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 178E
A14R560	322-3201-00			RES,FXD,FILM:1.21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K21
A14R561	322-3121-00			RES,FXD,FILM:178 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 178E
A14R562	322-3268-00			RES,FXD,FILM:6.04K OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 6K04
A14R563	322-3201-00			RES,FXD,FILM:1.21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K21
A14R566	322-3201-00			RES,FXD,FILM:1.21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K21
A14R567	322-3121-00			RES,FXD,FILM:178 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 178E
A14R568	322-3268-00			RES,FXD,FILM:6.04K OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 6K04
A14R569	322-3201-00			RES,FXD,FILM:1.21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K21
A14R600	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A14R601	321-0248-00			RES,FXD,FILM:3.74K OHM,1%,0.125W,TC=T0	19701	5043ED3K740F

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A14R602	321-0254-00			RES,FXD,FILM:4.32K OHM,1%,0.125M,TC=T0	07716	CEAD43200F
A14R612	313-1122-00			RES,FXD,FILM:1.2K OHM,5%,0.2M	57668	TR20JE01K2
A14R613	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R680	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A14R681	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A14R710	313-1122-00			RES,FXD,FILM:1.2K OHM,5%,0.2M	57668	TR20JE01K2
A14R711	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25M	57668	NTR25J-E01K2
A14R720	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A14R721	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A14R722	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A14R723	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25M	57668	NTR25J-E03K0
A14R760	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2M,TC=T0	57668	CR820 FXE 100E
A14R761	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25M	57668	NTR25J-E03K9
A14R763	322-3128-00			RES,FXD,FILM:210 OHM,1%,0.2M,TC=T0	57668	CR820 FXE 210E0
A14R766	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A14R767	315-0393-00			RES,FXD,FILM:39K OHM,5%,0.25M	57668	NTR25J-E39K0
A14R780	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25M	57668	NTR25J-E03K9
A14R781	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R810	313-1182-00			RES,FXD,FILM:1.8K OHM 5%,0.2M	57668	TR20JT681K8
A14R811	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A14R812	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A14R813	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25M	19701	5043CX130R0J
A14R814	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A14R815	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30M	32997	4308R-102-330
A14R816	313-1182-00			RES,FXD,FILM:1.8K OHM 5%,0.2M	57668	TR20JT681K8
A14R817	313-1511-00			RES,FXD,FILM:510 OHM,5%,0.2M	57668	TR20JT68 510E
A14R832	313-1750-00			RES,FXD,FILM:75 OHM,5%,0.2M	57668	TR20JE 75E
A14R833	313-1750-00			RES,FXD,FILM:75 OHM,5%,0.2M	57668	TR20JE 75E
A14R834	313-1750-00			RES,FXD,FILM:75 OHM,5%,0.2M	57668	TR20JE 75E
A14R835	313-1750-00			RES,FXD,FILM:75 OHM,5%,0.2M	57668	TR20JE 75E
A14R836	307-1318-00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,	32997	4604X-4M1-000
A14R837	307-1318-00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,	32997	4604X-4M1-000
A14R840	315-0393-00			RES,FXD,FILM:39K OHM,5%,0.25M	57668	NTR25J-E39K0
A14R841	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A14R842	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
A14R843	315-0300-00			RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
A14R844	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A14R845	315-0300-00			RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
A14R846	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A14R847	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25M	19701	5043CX820R0J
A14R848	315-0300-00			RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
A14R850	315-0300-00			RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
A14R851	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25M	19701	5043CX820R0J
A14R860	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25M	57668	NTR25J-E390E
A14R861	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25M	57668	NTR25J-E390E
A14R869	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R870	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
A14R871	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A14R872	315-0300-00			RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
A14R873	315-0300-00			RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
A14R874	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25M	19701	5043CX510R0J
A14R875	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25M	19701	5043CX820R0J
A14R876	315-0300-00			RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
A14R877	315-0300-00			RES,FXD,FILM:30 OHM,5%,0.25M	19701	5043CX30R00J
A14R878	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25M	19701	5043CX820R0J
A14R880	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25M	57668	NTR25J-E 2K
A14R900	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R930	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R931	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14R940	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R941	315-0301-00			RES,FXD,FILM:300 OHM,5%,0.25M	57668	NTR25J-E300E
A14R942	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R943	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R950	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R960	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R961	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R962	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R970	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R1031	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R1032	321-0209-00			RES,FXD,FILM:1.47K OHM,1%,0.125M,TC=T0	19701	5033ED1K47F
A14R1033	321-0255-00			RES,FXD,FILM:4.42K OHM,1%,0.125M,TC=T0	19701	5033ED4K420F
A14R1040	321-0302-00			RES,FXD,FILM:13.7K OHM,1%,0.125M,TC=T0	07716	CEAD 13701F
A14R1041	321-0186-00			RES,FXD,FILM:845 OHM,1%,0.125M,TC=T0	19701	5043ED845R0F
A14R1042	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125M,TC=T0	19701	5033ED2K00F
A14R1044	321-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.125M,TC=T0	19701	5033ED1K50F
A14R1051	321-0162-00			RES,FXD,FILM:475 OHM,1%,0.125M,TC=T0	19701	5033ED475R0F
A14R1052	321-0041-00			RES,FXD,FILM:26.1 OHM,1%,0.125M,TC=T0	91637	CMF55116G26R10F
A14R1053	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25M	57668	NTR25J-E200E
A14R1054	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1055	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1056	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R1057	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25M	57668	NTR25J-E01K5
A14R1058	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25M	57668	NTR25J-E02K7
A14R1059	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25M	19701	5043CX51R00J
A14R1060	315-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.25M	57668	NTR25J-E02K4
A14R1061	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25M	19701	5043CX10RR00J
A14R1062	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A14R1063	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R1064	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1065	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25M	19701	5043CX1M000J
A14R1066	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25M	19701	5043CX1M000J
A14R1070	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R1071	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25M	57668	NTR25J-E01K2
A14R1072	315-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.25M	57668	NTR25J-E02K4
A14R1074	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R1080	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1081	301-0360-00			RES,FXD,FILM:36 OHM,5%,0.5M	01121	EB3605
A14R1100	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25M	19701	5043CX820R0J
A14R1101	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7
A14R1110	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R1111	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R1112	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R1113	315-0183-00			RES,FXD,FILM:18K OHM,5%,0.25M	19701	5043CX18K00J
A14R1114	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R1115	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1116	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R1120	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R1121	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R1122	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R1123	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R1124	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R1125	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25M	57668	NTR25J-E 100E
A14R1130	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1131	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25M	19701	5043CX3K600J
A14R1140	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25M	57668	NTR25J-E27K0
A14R1141	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25M	57668	NTR25J-E220E
A14R1170	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R1200	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25M	57668	NTR25J-E04K7

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14R1201	315-0561-00			RES,FXD,FILM:560 OHM,5%,0.25W	19701	5043CX560R0J
A14R1210	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R1211	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R1220	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A14R1221	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A14R1222	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A14R1223	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
A14R1224	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A14R1225	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1226	321-0193-07			RES,FXD,FILM:1K OHM,0.1%,0.125W,TC=T9	19701	5033RE1K000B
A14R1227	321-0754-07			RES,FXD,FILM:900 OHM,0.1%,0.125W,TC=T9	19701	5033RE900R0B
A14R1228	321-0097-07			RES,FXD,FILM:100 OHM,0.1%,0.125W,TC=T9	91637	CMF55116C100R0B
A14R1240	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25W	19701	5043CX3K600J
A14R1241	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A14R1242	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	57668	NTR25J-E06K8
A14R1243	321-0245-00			RES,FXD,FILM:3.48K OHM,1%,0.125W,TC=T0	19701	5033ED3K48F
A14R1244	321-0680-00			RES,FXD,FILM:35.3K OHM,0.5%,0.125W,TC=T2	19701	5033RC35K30D
A14R1271	315-0396-00			RES,FXD,FILM:39M OHM,5%,0.25W	01121	CB3965
A14R1300	321-0481-07			RES,FXD,FILM:1M OHM,0.1%,0.125W,TC=T9	19701	5033RE1M000B
A14R1301	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A14R1302	311-2240-00			RES,VAR,NONWM:TRMR,200K OHM,20%,0.5W LINEAR	TK1450	GF06UT 200K
A14R1303	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A14R1320	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125W,TC=T0	19701	5033ED1K00F
A14R1321	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125W,TC=T0	19701	5033ED1K00F
A14R1322	315-0183-00			RES,FXD,FILM:18K OHM,5%,0.25W	19701	5043CX18K00J
A14R1323	321-0220-00			RES,FXD,FILM:1.91K OHM,1%,0.125W,TC=T0	19701	5033ED1K91F
A14R1324	321-0097-00			RES,FXD,FILM:100 OHM,1%,0.125W,TC=T0	91637	CMF55116G100R0F
A14R1325	315-0183-00			RES,FXD,FILM:18K OHM,5%,0.25W	19701	5043CX18K00J
A14R1331	315-0301-00			RES,FXD,FILM:300 OHM,5%,0.25W	57668	NTR25J-E300E
A14R1332	315-0301-00			RES,FXD,FILM:300 OHM,5%,0.25W	57668	NTR25J-E300E
A14R1333	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A14R1334	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R1335	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A14R1336	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R1337	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1340	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A14R1341	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1342	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A14R1350	315-0240-00			RES,FXD,FILM:24 OHM,5%,0.25W	57668	NTR25J-E24E0
A14R1351	315-0240-00			RES,FXD,FILM:24 OHM,5%,0.25W	57668	NTR25J-E24E0
A14R1352	315-0240-00			RES,FXD,FILM:24 OHM,5%,0.25W	57668	NTR25J-E24E0
A14R1353	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1354	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R1355	315-0240-00			RES,FXD,FILM:24 OHM,5%,0.25W	57668	NTR25J-E24E0
A14R1360	315-0396-00			RES,FXD,FILM:39M OHM,5%,0.25W	01121	CB3965
A14R1370	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A14R1371	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A14R1372	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25W	57668	NTR25J-E75E0
A14R1373	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A14R1374	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A14R1375	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
A14R1376	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A14R1377	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A14R1378	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A14R1380	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25W	57668	NTR25J-E75E0
A14R1382	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A14R1383	315-0124-00			RES,FXD,FILM:120K OHM,5%,0.25W	19701	5043CX120K0J
A14R1384	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A14R1385	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	57668	NTR25J-E01K2

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14R1386	315-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.25M	57668	NTR25J-E02K4
A14R1400	321-0481-07			RES,FXD,FILM:1M OHM,0.1%,0.125M,TC=T9	19701	5033RE1M000B
A14R1401	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25M	19701	5043CX200K0J
A14R1402	321-0385-07			RES,FXD,FILM:100K OHM,0.1%,0.125M,TC=T9	19701	5033RE100K0B
A14R1403	321-0385-07			RES,FXD,FILM:100K OHM,0.1%,0.125M,TC=T9	19701	5033RE100K0B
A14R1404	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125M,TC=T0	19701	5033ED2K00F
A14R1405	321-0217-00			RES,FXD,FILM:1.78K OHM,1%,0.125M,TC=T0	19701	5043D1K780F
A14R1410	311-2234-00			RES,VAR,NONWM:TRMR,5K OHM,20%,0.5M	TK1450	GF06UT 5K
A14R1411	311-2230-00			RES,VAR,NONWM:TRMR,500 OHM,20%,0.50 LINEAR	TK1450	GF06UT 500
A14R1412	321-0275-00			RES,FXD,FILM:7.15K OHM,1%,0.125M,TC=T0	07716	CEAD71500F
A14R1413	321-0147-00			RES,FXD,FILM:332 OHM,1%,0.125M,TC=T0	07716	CEAD332R0F
A14R1414	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25M	57668	NTR25JE01K0
A14R1421	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25M	19701	5043CX240R0J
A14R1430	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1431	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
A14R1432	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1433	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
A14R1435	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1442	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1443	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1444	315-0183-00			RES,FXD,FILM:18K OHM,5%,0.25M	19701	5043CX18K00J
A14R1450	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25M	57668	NTR25J-E27K0
A14R1451	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25M	57668	NTR25J-E220E
A14R1452	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25M	19701	5043CX3K600J
A14R1500	321-0239-00			RES,FXD,FILM:3.01K OHM,1%,0.125M,TC=T0	19701	5043ED3K010F
A14R1501	321-0239-00			RES,FXD,FILM:3.01K OHM,1%,0.125M,TC=T0	19701	5043ED3K010F
A14R1502	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125M,TC=T0	19701	5033ED2K00F
A14R1503	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125M,TC=T0	19701	5033ED1K00F
A14R1510	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125M,TC=T0	19701	5033ED1K00F
A14R1511	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125M,TC=T0	19701	5033ED1K00F
A14R1512	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125M,TC=T0	19701	5033ED2K00F
A14R1513	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125M,TC=T0	19701	5033ED1K00F
A14R1514	321-0146-00			RES,FXD,FILM:324 OHM,1%,0.125M,TC=T0	07716	CEAD324R0F
A14R1520	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25M	57668	NTR25J-E05K1
A14R1521	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1522	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1523	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25M	57668	NTR25J-E02K2
A14R1524	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25M	57668	NTR25J-E12K0
A14R1525	315-0750-00			RES,FXD,FILM:75 OHM,5%,0.25M	57668	NTR25J-E75E0
A14R1526	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25M	57668	NTR25J-E150E
A14R1527	311-2234-00			RES,VAR,NONWM:TRMR,5K OHM,20%,0.5M	TK1450	GF06UT 5K
A14R1531	321-0287-00			RES,FXD,FILM:9.53K OHM,1%,0.125M,TC=T0	19701	5033ED9K530F
A14R1532	321-0354-00			RES,FXD,FILM:47.5K OHM,1%,0.125M,TC=T0	19701	5043ED47K50F
A14R1533	321-0638-00			RES,FXD,FILM:7.96K OHM,1%,0.125M,TC=T0	24546	NA55D7961F
A14R1534	321-0217-00			RES,FXD,FILM:1.78K OHM,1%,0.125M,TC=T0	19701	5043D1K780F
A14R1535	321-0299-00			RES,FXD,FILM:12.7K OHM,1%,0.125M,TC=T0	19701	5033ED12K70F
A14R1540	321-0324-00			RES,FXD,FILM:23.2K OHM,1%,0.125M,TC=T0	07716	CEAD23201F
A14R1541	321-0303-00			RES,FXD,FILM:14.0K OHM,1%,0.125M,TC=T0	07716	CEAD 14001F
A14R1542	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25M	19701	5043CX10K00J
A14R1543	315-0183-00			RES,FXD,FILM:18K OHM,5%,0.25M	19701	5043CX18K00J
A14R1550	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25M	57668	NTR25J-E06K8
A14R1551	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25M	19701	5043CX15K00J
A14R1552	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125M,TC=T0	07716	CEA051101F
A14R1553	321-0295-00			RES,FXD,FILM:11.5K OHM,1%,0.125M,TC=T0	07716	CEAD11501F
A14R1554	321-0315-00			RES,FXD,FILM:18.7K OHM,1%,0.125M,TC=T0	19701	5043ED18K70F
A14R1555	321-0357-00			RES,FXD,FILM:51.1K OHM,1%,0.125M,TC=T0	07716	CEA051101F
A14R1600	321-0069-00			RES,FXD,FILM:51.1 OHM,1%,0.125M,TC=T0	91637	CMF55116G51R10F
A14R1610	321-0069-00			RES,FXD,FILM:51.1 OHM,1%,0.125M,TC=T0	91637	CMF55116G51R10F
A14R1611	321-0069-00			RES,FXD,FILM:51.1 OHM,1%,0.125M,TC=T0	91637	CMF55116G51R10F

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14R1620	321-0284-00			RES,FXD,FILM:8.87K OHM,1%,0.125W,TC=T0	19701	5043ED8K870F
A14R1630	321-0191-00			RES,FXD,FILM:953 OHM,1%,0.125W,TC=T0	07716	CEAD953R0F
A14R1650	321-0325-00			RES,FXD,FILM:23.7K OHM,1%,0.125W,TC=T0	07716	CEAD23701F
A14T460	120-0444-00			XFMR,TOROID:	80009	120-0444-00
A14T461	120-0444-00			XFMR,TOROID:	80009	120-0444-00
A14T540	120-0444-00			XFMR,TOROID:	80009	120-0444-00
A14T710	120-0444-00			XFMR,TOROID:	80009	120-0444-00
A14T1600	120-0444-00			XFMR,TOROID:	80009	120-0444-00
A14TP100	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP330	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP460	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP480	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP481	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP530	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP531	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP720	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP721	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP722	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP760	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP780	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP840	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP860	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP861	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP900	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP901	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP910	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1120	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1170	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1180	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1350	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1370	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1371	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1410	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1530	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14TP1531	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14U100	156-0469-02			MICROCKT,DGTL:3/8 LINE DCDR	01295	SN74LS138NP3
A14U101	156-0682-02			MICROCKT,DGTL:HEX D FLIP-FLOP,SEL	27014	MM74C174NA+/JA+
A14U140	156-0796-01			MICROCKT,DGTL:8 STG SHF & STORE BUS RGTR	02735	CD4094BFX
A14U170	155-0238-00			MICROCKT,LINEAR:TRIGGER PREAMP	80009	155-0238-00
A14U220	156-0682-02			MICROCKT,DGTL:HEX D FLIP-FLOP,SEL	27014	MM74C174NA+/JA+
A14U240	156-1191-01			MICROCKT,LINEAR:DUAL BI-FET OP-AMP,8 DIP	80009	156-1191-01
A14U310	156-0382-02			MICROCKT,DGTL:QUAD 2 INP NAND GATE BURN	18324	N74LS00NB
A14U330	156-2571-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,TRIPLE,2	80009	156-2571-00
A14U340	156-1272-01			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	80009	156-1272-01
A14U410	156-1351-01			MICROCKT,DGTL:STTL,QUAD 2-1 LINE DATA, SEL	01295	SN74S158NP3
A14U420	156-0382-02			MICROCKT,DGTL:QUAD 2 INP NAND GATE BURN	18324	N74LS00NB
A14U430	156-0721-02			MICROCKT,DGTL:QUAD ST 2-INP NAND GATES	18324	N74LS132(NBORFB)
A14U440	156-2571-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,TRIPLE,2	80009	156-2571-00
A14U441	156-1338-00			MICROCKT,LINEAR:OPERATIONAL AMPLIFIER	01295	NE5534P
A14U442	156-1338-00			MICROCKT,LINEAR:OPERATIONAL AMPLIFIER	01295	NE5534P
A14U460	156-1338-00			MICROCKT,LINEAR:OPERATIONAL AMPLIFIER	01295	NE5534P
A14U480	156-0067-00			MICROCKT,LINEAR:OPNL AMPL,SEL	04713	MC1741CP1
A14U481	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A14U520	156-2644-00			MICROCKT,DGTL:HMOS,SEMI CUSTOM,STD CELL,	80009	156-2644-00
A14U680	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U720	230-0022-50			INTEGRATED CKT:COUNTER,TIMER,TRIGGER	80009	230-0022-50
A14U750	165-2049-00			MICROCKT,HYBRID:TRIGGER,DIGITAL	80009	165-2049-00
A14U780	165-2049-00			MICROCKT,HYBRID:TRIGGER,DIGITAL	80009	165-2049-00
A14U880	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14U950	156-1743-00			MICROCKT,DGTL:ASTTL,QUAD 2-INPUT NOR GATE	18324	74F02 NB OR FB
A14U951	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U960	156-0796-01			MICROCKT,DGTL:8 STG SHF & STORE BUS RGTR	02735	CD40948FX
A14U961	156-1722-00			MICROCKT,DGTL:HEX INVERTER	04713	MC74F04ND
A14U962	156-1723-00			MICROCKT,DGTL:QUAD 2 INPUT & GATE	04713	MC74F08 ND OR JD
A14U1020	156-1272-01			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	80009	156-1272-01
A14U1030	156-0796-01			MICROCKT,DGTL:8 STG SHF & STORE BUS RGTR	02735	CD40948FX
A14U1110	156-1272-01			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	80009	156-1272-01
A14U1111	156-1272-01			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	80009	156-1272-01
A14U1150	155-0240-00			MICROCKT,LINEAR:SWEEP	80009	155-0240-00
A14U1210	156-2476-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,DUAL,4	80009	156-2476-00
A14U1230	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U1310	156-2476-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,DUAL,4	80009	156-2476-00
A14U1311	156-2476-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,DUAL,4	80009	156-2476-00
A14U1350	156-2571-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,TRIPLE,2	80009	156-2571-00
A14U1370	156-1191-01			MICROCKT,LINEAR:DUAL BI-FET OP-AMP,8 DIP	80009	156-1191-01
A14U1410	156-2476-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,DUAL,4	80009	156-2476-00
A14U1411	155-0241-02			MICROCKT,DGTL:HORIZONTAL AMP SYS	80009	155-0241-02
A14U1420	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A14U1421	156-2605-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,8 CHANNEL	80009	156-2605-00
A14U1470	155-0240-00			MICROCKT,LINEAR:SWEEP	80009	155-0240-00
A14U1500	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U1510	156-1338-00			MICROCKT,LINEAR:OPERATIONAL AMPLIFIER	01295	NE5534P
A14U1520	156-0130-03			MICROCKT,LINEAR:MODULATOR/DEMODULATOR,SCRN	04713	MC1496 P
A14U1530	156-1200-00			MICROCKT,LINEAR:OPERATIONAL AMP,QUAD BI-FET	01295	TL074CN
A14U1531	156-1149-00			MICROCKT,LINEAR:OPERATIONAL AMP,JFET INPUT	27014	LF351N/GLEA134
A14U1540	156-1191-01			MICROCKT,LINEAR:DUAL BI-FET OP-AMP,8 DIP	80009	156-1191-01
A14VR510	152-0149-00			SEMICOND DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	15238	Z5406
A14VR1520	152-0166-00			SEMICOND DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ11738RL
A14X170	136-0764-00			SKT,PL-IN ELEK:48 LINE CONT IMPD HYBRID	00779	ORDER BY DESCR
A14X520	136-0848-00			SKT,PL-IN ELEK:68 PIN 5162-2	00779	55162-2
A14X720	136-0813-00			SKT,PL-IN ELEK:CHIP CARRIER,68 CONTACTS	19613	268-5400-00-1102
A14X750	136-0764-00			SKT,PL-IN ELEK:48 LINE CONT IMPD HYBRID	00779	ORDER BY DESCR
A14X780	136-0764-00			SKT,PL-IN ELEK:48 LINE CONT IMPD HYBRID	00779	ORDER BY DESCR
A14X1150	136-0764-00			SKT,PL-IN ELEK:48 LINE CONT IMPD HYBRID	00779	ORDER BY DESCR
A14X1470	136-0764-00			SKT,PL-IN ELEK:48 LINE CONT IMPD HYBRID	00779	ORDER BY DESCR
A14Y310	158-0129-00			XTAL UNIT,QTZ:10MHZ 0.001%,PARALLEL	00136	20-9-1
A14A16	670-9975-00			CIRCUIT BD ASSY:COUNTER/TIMER PLL/VCO	80009	670-9975-00
A14A16C110	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14A16C300	283-0339-00			CAP,FXD,CER DI:0.22UF,10%,50V	05397	C330C224K5R5CA
A14A16C301	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14A16C310	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14A16C311	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14A16C400	281-0909-00			CAP,FXD,CER DI:0.022UF,20%,50V	54583	MA12X7R1H223M-T
A14A16C500	283-0260-01			CAP,FXD,CER DI:5.6PF,+/- 0.25PF,200V	04222	SR156A5R6CTR
A14A16C510	283-0260-01			CAP,FXD,CER DI:5.6PF,+/- 0.25PF,200V	04222	SR156A5R6CTR
A14A16CR100	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14A16CR510	152-0422-00			SEMICOND DVC,DI:VVC,SI,25V,7PF,DO-7	80009	152-0422-00
A14A16J110	131-1425-00			CONN,RCPT,ELEC:RTANG HEADER,1 X 36,0.1 SP	22526	65521-136
A14A16J111	131-1425-00			CONN,RCPT,ELEC:RTANG HEADER,1 X 36,0.1 SP	22526	65521-136
A14A16L500	108-1198-00			COIL,RF:FXD,14NH	TK1345	108-1198-00
A14A16Q400	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A14A16Q401	151-0752-00			TRANSISTOR:NPN,SI,MARCO T	25403	BFR96
A14A16R200	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2W	57668	TR20JE10K0
A14A16R210	313-1105-00			RES,FXD,FILM:1M OHM,5%,0.2W	57668	TR20JE1M
A14A16R300	313-1512-00			RES,FXD,CMPSN:5.1K OHM,5%,0.2W	57668	TR20JE 5K1
A14A16R310	313-1393-00			RES,FXD,FILM:39K OHM,5%,0.2W	57668	TR20JE 39K

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14A16R311	313-1132-00			RES,FXD,FILM:1.3K OHM,5%,0.2W	57668	TR20JE01K3
A14A16R312	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2W	57668	TR20JE10K0
A14A16R400	313-1201-00			RES,FXD,FILM:200 OHM,5%,0.2W	57668	TR20JE200E
A14A16R410	313-1132-00			RES,FXD,FILM:1.3K OHM,5%,0.2W	57668	TR20JE01K3
A14A16R500	313-1201-00			RES,FXD,FILM:200 OHM,5%,0.2W	57668	TR20JE200E
A14A16U100	156-0388-03			MICROCKT,DGTL:DUAL D FLIP-FLOP	01295	SN74LS74ANP3
A14A16U200	156-0382-02			MICROCKT,DGTL:QUAD 2 INP NAND GATE BURN	18324	N74LS00NB
A14A16U300	156-0067-00			MICROCKT,LINEAR:OPNL AMPL,SEL	04713	MC1741CP1
A15	670-9124-00			CIRCUIT BD ASSY:COUNTER/TIMER REFERENCE (OPTION 1T ONLY)	80009	670-9124-00
A15C100	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15C101	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A15C102	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULA1E100TEA
A15J26	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A15J40	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 4)	22526	48283-036
A15U100	156-0382-02			MICROCKT,DGTL:QUAD 2 INP NAND GATE BURN	18324	N74LS00NB
A15U101	119-0894-01			OSCILLATOR,RF:10MHZ,18V	31785	OCXO-44-12
A15W26	175-9951-00			CABLE ASSY,RF:50 OHM COAX,22.0 L,9-6	80009	175-9951-00
A15W40	174-0011-00			CA ASSY,SP,ELEC:3,26 AWG,12.0 L,RIBBON	80009	174-0011-00
DL27	119-2344-00			DELAY LINE,ELEC:50 OHM COAX W/CNTR VIEW,TRI	80009	119-2344-00
DS59	150-0121-05			LAMP,CARTRIDGE:5V,0.06A,GREEN LENS	80009	150-0121-05
J52	174-0010-00			CA ASSY,SP,ELEC:9,26 AWG,3.25 L,RIBBON	80009	174-0010-00
J56	174-0008-00			CA ASSY,SP,ELEC:5,26 AWG,17.8 L,RIBBON	80009	174-0008-00
J57	174-0007-00			CA ASSY,SP,ELEC:4,26 AWG,28.25 L,RIBBON	80009	174-0007-00
J58	175-9943-00			CA ASSY,SP,ELEC:3,26 AWG,3.5 L,RIBBON	80009	175-9943-00
J62	175-9857-00			CA ASSY,SP,ELEC:11,18 AWG,7.25 L,RIBBON	80009	175-9857-00
J65	175-9803-00			CA ASSY,SP,ELEC:7,26 AWG,7.5 L,RIBBON	80009	175-9803-00
J66	174-0004-00			CABLE ASSY,RF:50 OHM COAX,24.0 L,6-1	80009	174-0004-00
J71	175-9929-00			CA ASSY,SP,ELEC:50,28 AWG,9.0 L,RIBBON	80009	175-9929-00
J72	175-9930-00			CA ASSY,SP,ELEC:50,26 AWG,7.5 L,RIBBON	80009	175-9930-00
J73	175-9931-00			CA ASSY,SP,ELEC:34,26 AWG,23.0 L,RIBBON	80009	175-9931-00
J77	175-9934-00			CA ASSY,SP,ELEC:26,28 AWG,2.25 L,RIBBON	80009	175-9934-00
J78	175-9935-00			CA ASSY,SP,ELEC:20,28 AWG,6.25 L,RIBBON	80009	175-9935-00
J84	175-9937-00			CA ASSY,SP,ELEC:50,28 AWG,1.5 L,RIBBON	80009	175-9937-00
J85	174-0450-00			CA ASSY,SP,ELEC:50,26 AWG,0.94 L,RIBBON	80009	174-0450-00
J86	175-9939-00			CA ASSY,SP,ELEC:34,28 AWG,1.5 L,RIBBON	80009	175-9939-00
J87	175-9940-00			CA ASSY,SP,ELEC:34,26 AWG,4.5 L,RIBBON	80009	175-9940-00
J88	175-9940-00			CA ASSY,SP,ELEC:34,26 AWG,4.5 L,RIBBON	80009	175-9940-00
L53	108-1310-00			HLDR,TERM CONN:TRACE ROTATOR	TK2038	108-1310-00
LR80	----- -----			(PART OF R80)		
LR81	----- -----			(PART OF R80)		
P58	----- -----			(PART OF S58)		
R80	307-2091-00			RES NTWK,FXD,FI:CRT TERM(ASSEMBLED)H2091	80009	307-2091-00
S58	311-2320-00			ENCODER,DGTL:INCREMENTAL,50PPR,50 DETENT	TK1869	LA22661
S60	260-2275-00			SWITCH,ROCKER:SPST,30MA,12V	TK1262	ME010-D
V53	154-0883-00			CRT ASSEMBLY:FINISHED	80009	154-0883-00
W16	175-9956-00			CABLE ASSY,RF:50 OHM COAX,12.0 L,9-6	80009	175-9956-00
W20	175-9957-00			CABLE ASSY,RF:50 OHM COAX,8.0 L,9-0	80009	175-9957-00
W41	175-9941-00			CABLE ASSY,RF:50 OHM COAX,3.05 L,9-N	80009	175-9941-00
W42	175-9941-00			CABLE ASSY,RF:50 OHM COAX,3.05 L,9-N	80009	175-9941-00

Part 7
Replaceable Mechanical Parts

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.

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.

FIGURE AND INDEX NUMBERS

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

INDENTATION SYSTEM

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

1 2 3 4 5 *Name & Description*

Assembly and/or Component
Attaching parts for Assembly and/or Component
****END ATTACHING PARTS****
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
****END ATTACHING PARTS****
Parts of Detail Part
Attaching parts for Parts of Detail Part
****END ATTACHING PARTS****

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.

Attaching parts must be purchased separately, unless otherwise specified.

ABBREVIATIONS

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

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00261	GENERAL ELECTRIC CO FOOD SERVICE EQUIPMENT BUSINESS DEPT	14TH AND ARNOLD STS	CHICAGO HEIGHTS IL 60411
01536	TEXTRON INC CAMCAR DIV SEMS PRODUCTS UNIT	1818 CHRISTINA ST	ROCKFORD IL 61108
04348	LAWRENCE ENGINEERING AND SUPPLY INC	500 S FLOWER ST P O BOX 30	BURBANK CA 91503
06383	PANDUIT CORP	17301 RIDGELAND	TINLEY PARK IL 60477
06915	RICHCO PLASTIC CO	5825 N TRIPP AVE	CHICAGO IL 60646
09772	WEST COAST LOCKWASHER CO INC	16730 E JOHNSON DRIVE P O BOX 3588	CITY OF INDUSTRY CA 91744
11897	PLASTIGLIDE MFG CORP	2701 W EL SEGUNDO BLVD	HAWTHORNE CA 90250
12327	FREEWAY CORP	9301 ALLEN DR	CLEVELAND OH 44125
12697	CLAROSTAT MFG CO INC	LOWER WASHINGTON ST	DOVER NH 03820
13103	THERMALLOY CO INC	2021 W VALLEY VIEW LANE P O BOX 34829	DALLAS TX 75234
13511	AMPHENOL CADRE DIV BUNKER RAMO CORP		LOS GATOS CA
16428	BELDEN CORP ELECTRONIC DIV	2200 US HWY 27 SOUTH P O BOX 1980	RICHMOND IN 47374
17856	SILICONIX INC	2201 LAURELWOOD RD	SANTA CLARA CA 95054
18677	SCANBE MFG CO	3445 FLETCHER AVE	EL MONTE CA 91731
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS	30 HUNTER LANE	CAMP HILL PA 17011
24931	SPECIALTY CONNECTOR CO INC	2620 ENDRESS PLACE P O BOX D	GREENWOOD IN 46142
28520	HEYCO MOLDED PRODUCTS	147 MICHIGAN AVE P O BOX 160	KENILWORTH NJ 07033
30161	AAVID ENGINEERING INC	30 COOK COURT	LACONIA NH 03246
31785	ISOTEMP RESEARCH INC	916 PRESTON AVE P O BOX 3389	CHARLOTTESVILLE VA 22901
53387	MINNESOTA MINING AND MFG CO ELECTRONIC PRODUCTS DIV	3M CENTER	ST PAUL MN 55101
55285	BERGQUIST CO INC THE	5300 EDINA INDUSTRIAL BLVD	MINNEAPOLIS MN 55435
70903	BELDEN CORP	2000 S BATAVIA AVE	GENEVA IL 60134
73743	FISCHER SPECIAL MFG CO	446 MORGAN ST	CINCINNATI OH 45206
75915	LITTELFUSE INC	800 E NORTHWEST HWY	DES PLAINES IL 60016
77900	SHAKEPROOF DIV OF ILLINOIS TOOL WORKS	SAINT CHARLES RD	ELGIN IL 60120
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIVISION	ST CHARLES ROAD	ELGIN IL 60120
80009	TEKTRONIX INC	4900 S W GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
81041	HOWARD INDUSTRIES DIV OF HSL INDUSTRIES INC	P O BOX 287	MILFORD IL 60953
81483	INTERNATIONAL RECTIFIER	9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX	LOS ANGELES CA 90069
83486	ELCO INDUSTRIES INC	1101 SAMUELSON RD	ROCKFORD IL 61101
83553	ASSOCIATED SPRING BARNES GROUP INC	15001 S BROADWAY P O BOX 231	GARDENA CA 90248
85471	BOYD INDUSTRIAL RUBBER DIV OF A B BOYD CO	2527 GRANT AVE	SAN LEANDRO CA 94579
86928	SEASTROM MFG CO INC	701 SONORA AVE	GLENDALE CA 91201
93410	HAMILTON STANDARD CONTROL ESSEX GROUP INC	45-55 PLYMOUTH ST P O BOX 1007	LEXINGTON OH 44904
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61101
95987	WECKESSER CO INC	4444 WEST IRVING PARK RD	CHICAGO IL 60641
S3109	FELLER ASA ADOLF AG C/O PANEL COMPONENTS CORP	355 TESCONI CIRCLE	SANTA ROSA CA 95401
S3629	SCHURTER AG H C/O PANEL COMPONENTS CORP	2015 SECOND STREET	BERKELEY CA 94170
S4307	SCHAFFNER ELECTRONIK AG		LUTERBACH,SWITZERLAND
TK0861	H SCHURTER AG DIST PANEL COMPONENTS	2015 SECOND STREET	BERKELEY CA 94170
TK1373	PATELEC-CEM (ITALY)	10156 TORINO	VAICENTALLO 62/45S ITALY
TK1456	PAPST	AQUIDNECK INDUSTRIAL PARK	NEWPORT RI 02840
TK1493	MEMORY PROTECTION DEVICES INC	320 BROAD HOLLOW ROAD	FARMINGDALE NY 11735
TK1869	ALPS	100 N CNTRE AVE	ROCKVILLE CENTRE NY 11570

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	348-0875-00			1	FLIPSTAND,CAB.:	80009	348-0875-00
-2	200-3133-00			1	COVER,TOP:	80009	200-3133-00
-3	214-0603-02			4	.PIN ASSY,SECRG:W/SPRING WASHER	80009	214-0603-02
-4	386-1151-00			4	.CLAMP,RIM CLENC:	83553	ORDER BY DESCR
-5	386-0227-00			4	.STOP,CLP,RIM CL:	80009	386-0227-00
-6	200-3134-00			1	COVER,BOTTOM:	80009	200-3134-00
-7	214-0603-02			4	.PIN ASSY,SECRG:W/SPRING WASHER	80009	214-0603-02
-8	386-1151-00			4	.CLAMP,RIM CLENC:	83553	ORDER BY DESCR
-9	386-0227-00			4	.STOP,CLP,RIM CL:	80009	386-0227-00
-10	348-0596-00			4	PAD,CAB.FOOT:0.69 X 0.255 X 0.06,PU	80009	348-0596-00
-11	348-0879-00			4	FOOT,CABINET:BOTTOM,BLUE,POLYCARBONATE	80009	348-0879-00
					(ATTACHING PARTS)		
-12	211-0722-00			4	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-13	101-0106-00			2	TRIM,DECORATIVE:LEFT SIDE,FRONT CASTING	80009	101-0106-00
					(ATTACHING PARTS)		
-14	211-0722-00			4	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-15	101-0107-00			2	TRIM,DECORATIVE:RIGHT SIDE,FRONT CASTING	80009	101-0107-00
					(ATTACHING PARTS)		
-16	211-0722-00			4	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-17	426-2099-00			1	FRAME SECT,CAB.:RIGHT SIDE	80009	426-2099-00
					(ATTACHING PARTS)		
-18	211-0718-00			1	SCREW,MACHINE:6-32 X 0.312,FLH,100 DEG,STL	83486	ORDER BY DESCR
-19	212-0685-00			2	SCREW,MACHINE:10-32 X 0.281,PNH,STL	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-20	348-0886-00			4	SHLD GSKT,ELEK:FINGER TYPE,18.310 L	80009	348-0886-00
-21	200-2191-00			2	CAP,RETAINER:PLASTIC	80009	200-2191-00
-22	367-0248-01			1	HANDLE,CARRYING:16.341 L,W/CLIP	80009	367-0248-01
-23	426-2098-00			1	FRAME SECT,CAB.:LEFT SIDE	80009	426-2098-00
					(ATTACHING PARTS)		
-24	211-0718-00			1	SCREW,MACHINE:6-32 X 0.312,FLH,100 DEG,STL	83486	ORDER BY DESCR
-25	212-0685-00			2	SCREW,MACHINE:10-32 X 0.281,PNH,STL	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
2-1	366-0582-00			2	KNOB:ENCODER	80009	366-0582-00
-2	366-0586-01			1	KNOB:ENCODER,GRAY,W/RETAINING RING	80009	366-0586-01
-3	333-3223-00			1	PANEL,FRONT:LEFT	80009	333-3223-00
					(ATTACHING PARTS)		
-4	210-0586-00			1	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					(END ATTACHING PARTS)		
-5	----- -----			1	CIRCUIT BD ASSY:BOTTOM FRONT PANEL		
					(SEE A5A5 REPL)		
					(ATTACHING PARTS)		
-6	211-0409-00			2	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL	93907	ORDER BY DESCR
-7	129-1088-00			2	SPACER,POST:0.64 L,4-40 THD ONE END,BRS,NI	80009	129-1088-00
					(END ATTACHING PARTS)		
					BOTTOM FRONT PANEL BOARD ASSY INCLUDES:		
-8	----- -----			2	.ENCODER,DGTL:INCREMENTAL,50PPR,50 DETENT		
					.(SEE A5A5S110,S810 REPL)		
-9	210-0207-00			2	.TERMINAL,LUG:0.385 OD,PLAIN,BRS CD PL	12697	01136902
-10	366-0578-00			13	.PUSH BUTTON:SILVER GRAY,ABS	80009	366-0578-00
-11	344-0403-00			2	.CLIP,GROUND:BE,CU	80009	344-0403-00
-12	361-1328-01			1	.SPACER,PUSH SW:W/LIGHT DIFFUSER BOTTOM	80009	361-1328-01
-13	----- -----			1	CIRCUIT BD ASSY:CENTER FRONT PANEL		
					(SEE A5A8 REPL)		
					(ATTACHING PARTS)		
-14	211-0409-00			3	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-15	366-0580-00			7	PUSH BUTTON:ENTER	80009	366-0580-00
-16	361-1326-01			1	SPACER,PUSH SW:W/LIGHT DIFFUSER CENTER	80009	361-1326-01
-17	348-0967-00			1	SHLD GSKT,ELEK:SOLID TYPE,5.8 L	80009	348-0967-00
-18	361-1327-01			1	SPACER,PUSH SW:W/LIGHT DIFFUSER	80009	361-1327-01
-19	366-0578-00			6	PUSH BUTTON:SILVER GRAY,ABS	80009	366-0578-00
-20	----- -----			1	CIRCUIT BD ASSY:TOP FRONT PANEL		
					(SEE A5A9 REPL)		
					(ATTACHING PARTS)		
-21	211-0409-00			3	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-22	348-0939-00			4	GASKET:EMI,4.62 X 0.212,SST	80009	348-0939-00
-23	200-3135-02			1	COVER,CRT:SCALE,FINISHED	80009	200-3135-02
					(ATTACHING PARTS)		
-24	211-0752-00			4	SCREW,MACHINE:6-32 X 0.75,PNH,TORX	80009	211-0752-00
					(END ATTACHING PARTS)		
-25	----- -----			1	CIRCUIT BD ASSY:TOUCH PANEL		
					(SEE A7 REPL)		
-26	426-2118-00			1	.FRAME,LENS:TOUCH PANEL	80009	426-2118-00
-27	204-1006-00			1	.BODY,TERMINAL:POLYETHYLENE	80009	204-1006-00
					(ATTACHING PARTS)		
-28	386-5274-00			1	.DIFFUSER,LIGHT:GRATICULE	80009	386-5274-00
-29	211-0391-00			2	.SCREW,MACHINE:2-56 X 0.437,P4,STL CD PL	80009	211-0391-00
-30	210-0405-00			2	.NUT,PLAIN,HEX:2-56 X 0.188,BRS CD PL	73743	12157-50
					(END ATTACHING PARTS)		
-31	337-3281-00			1	SHLD,IMPLOSION:5.97 X 4,78 X 0.062	80009	337-3281-00
-32	131-1315-01			15	CONN,RCPT,ELEC:BNC,FEMALE	80009	131-1315-01
					(FRONT AND BACK)		
	131-1315-01			23	CONN,RCPT,ELEC:BNC,FEMALE	80009	131-1315-01
					(FRONT AND BACK,OPTION 1C ONLY)		
	174-0252-00			1	CABLE ASSY,RF:(4),50 OHM COAX,30.5 L W/	80009	174-0252-00
					(FROM FRONT BNC'S TO REAR BNC'S)		
					(OPTION 1C ONLY)		
-33	333-3221-00			1	PANEL,FRONT:LOWER	80009	333-3221-00
	333-3314-00			1	PANEL,FRONT:LOWER,11302	80009	333-3314-00
					(OPTION 1C ONLY)		
-34	337-3414-00			1	SHIELD,ELEC:CIRCUIT	80009	337-3414-00
					(ATTACHING PARTS)		
-35	210-0586-00			2	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					(END ATTACHING PARTS)		
-36	348-0878-00			1	SHLD GSKT,ELEK:SOLID TYPE,7.646 L	80009	348-0878-00
-37	348-0877-00			1	SHLD GSKT,ELEK:SOLID TYPE,1.860 L	80009	348-0877-00
-38	348-0876-00			2	SHLD GSKT,ELEK:SOLID TYPE,2.480 L	80009	348-0876-00
-39	386-5332-00			4	SUPPORT,CRT:FRONT	80009	386-5332-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
2-40	333-3222-00			1	PANEL,FRONT:UPPER	80009	333-3222-00
					(ATTACHING PARTS)		
-41	210-0586-00			3	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					(END ATTACHING PARTS)		
-42	129-0103-00			1	POST,BDG,ELEC:ASSEMBLY	80009	129-0103-00
					(ATTACHING PARTS)		
-43	210-0583-00			1	NUT,PLAIN,HEX:0.25-32 X 0.312,BRS CD PL	73743	2X-20319-402
-44	210-0046-00			1	WASHER,LOCK:0.261 ID,INTL,0.018 THK,STL	77900	1214-05-00-0541C
					(END ATTACHING PARTS)		
-45	386-5275-02			1	SUBPANEL,FRONT:FINISHED	80009	386-5275-02
					(ATTACHING PARTS)		
-46	211-0718-00			4	SCREW,MACHINE:6-32 X 0.312,FLH,100 DEG,STL	83486	ORDER BY DESCR
-47	211-0409-00			2	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL	93907	ORDER BY DESCR
-48	211-0718-00			2	SCREW,MACHINE:6-32 X 0.312,FLH,100 DEG,STL	83486	ORDER BY DESCR
					(END ATTACHING PARTS)		
-49	----- -----			1	ENCODER,DGTL:INCREMENTAL,50PPR,50 DETENT		
					(SEE S58 REPL)		
-50	214-1712-00			1	SPRING,FLAT:1.625 X 0.4,CU BE	80009	214-1712-00
					(ATTACHING PARTS)		
-51	211-0408-00			1	SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
-52	210-0586-00			1	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					(END ATTACHING PARTS)		
-53	337-3307-00			1	SHIELD,CRT:	80009	337-3307-00
	334-1379-00			1	MARKER,IDENT:MKD HI VACUUM	80009	334-1379-00
-54	358-0566-00			4	GROMMET,PLASTIC:BLACK,ROUND,0.625 ID	28520	2103 (SB 812-10)
-55	351-0744-00			3	GUIDE,PLUG-IN:POLYAMIDE	80009	351-0744-00
					(ATTACHING PARTS)		
-56	211-0722-00			3	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-57	200-3295-00			1	COVER,HOLE:CABLE,4.0 X 3.5	80009	200-3295-00
					(ATTACHING PARTS)		
-58	211-0722-00			1	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-59	358-0166-00			1	GROMMET,PLASTIC:BLACK,U-SHAPE,0.656 ID	80009	358-0166-00
-60	348-0158-00			1	GROMMET,PLASTIC:BLACK,U-SHAPE,2.91 ID	80009	348-0158-00
-61	343-1301-00			3	CLAMP,SADDLE:0.715,NYLON	80009	343-1301-00
-62	343-1302-00			5	CLAMP,SADDLE:1.070,NYLON	80009	343-1302-00
-63	255-0334-00			1	PLASTIC CHANNEL:12.75 X 0.175 X 0.155	11897	122-37-2500
-64	348-0253-00			1	GROMMET,PLASTIC:BLACK,OBLONG,3.0 X 0.925	80009	348-0253-00
-65	385-0013-00			1	SPACER,POST:0.75 L W/6-32 THD THRU,NYL	80009	385-0013-00
-66	----- -----			1	DELAY LINE,ELEC:50 OHM COAX W/CNTR VIEW,TRI		
					(SEE DL27 REPL)		
					(ATTACHING PARTS)		
-67	211-0722-00			1	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-68	131-0799-00			4	CONTACT,ELEC:PLUG-IN GND,BE NI CD PL	80009	131-0799-00
					(ATTACHING PARTS)		
-69	211-0408-00			4	SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-70	131-0800-03			2	CONTACT,ELEC:PLUG-IN GND,BE NI HT TR	80009	131-0800-03
					(ATTACHING PARTS)		
-71	211-0408-00			4	SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-72	210-0457-00			1	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
					(ATTACHES GROUND WIRE)		
-73	348-0966-00			1	GROMMET,PLASTIC:BLACK,ROUND,0.625 ID	80009	348-0966-00
-74	343-1303-00			1	CLAMP,CABLE:ROUND,0.437,NYLON	80009	343-1303-00
					(ATTACHING PARTS)		
-75	210-0457-00			1	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
-76	210-0863-00			1	WSHR,LOOP CLAMP:0.187 ID U/W 0.5 W CLP	95987	C191
					(END ATTACHING PARTS)		
-77	358-0215-00			2	GROMMET,PLASTIC:BLACK,U-SHAPED,0.524ID	80009	358-0215-00
-78	386-5271-00			1	SPRT,CRT SHIELD:REAR	80009	386-5271-00
					(ATTACHING PARTS)		
-79	211-0722-00			4	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-80	386-5331-00			1	SUPPORT RING:CRT,REAR,POLYCARBONATE	80009	386-5331-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345	Name & Description	Mfr. Code	Mfr. Part No.
2-						(ATTACHING PARTS)		
-81	211-0721-00			4		SCREW,MACHINE:6-32 X 0.375,PHN,STL	83486	ORDER BY DESCR
-82	210-0949-00			4		WASHER,FLAT:0.141 ID X 0.5 OD X 0.062,BRS	12327	ORDER BY DESCR
						(END ATTACHING PARTS)		
-83	351-0702-00			1		GUIDE,CKT BOARD:MOLDED NYLON,4.5 L	18677	11633-22
-84	210-0457-00			1		NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
						(ATTACHES GROUND WIRE)		
	196-3074-00			1		LEAD,ELECTRICAL:18 AWG,12.0 L,5-4	80009	196-3074-00
						(FROM REAR PANEL TO CHASSIS)		
-85	333-3224-00			1		PANEL,REAR:	80009	333-3224-00
	333-3315-00			1		PANEL,REAR:	80009	333-3315-00
						(OPTION 1C ONLY)		
						(ATTACHING PARTS)		
-86	211-0721-00			6		SCREW,MACHINE:6-32 X 0.375,PHN,STL	83486	ORDER BY DESCR
						(END ATTACHING PARTS)		
-87	386-5273-02			1		SUBPANEL,REAR:FINISHED	80009	386-5273-02
						(ATTACHING PARTS)		
-88	211-0718-00			8		SCREW,MACHINE:6-32 X 0.312,FLH,100 DEG,STL	83486	ORDER BY DESCR
						(END ATTACHING PARTS)		
-89	386-5283-00			2		SUPPORT,CHASSIS:POWER SUPPLY,POLYCARBONATE	80009	386-5283-00
-90	343-0549-00			1		STRAP,TIEDOWN,E:0.091 W X 4.0 L,ZYTEL	06383	PLT1M
-91	337-3340-00			1		SHIELD,ELEC:CABLE,POLYCARBONATE	80009	337-3340-00
-92	211-0721-00			1		SCREW,MACHINE:6-32 X 0.375,PHN,STL	83486	ORDER BY DESCR
-93	210-0006-00			1		WASHER,LOCK:#6 INTL,0.018 THK,STL	77900	1206-00-00-0541C
						(2-91 AND 2-92 ATTACHES GROUND WIRE)		
-94	610-0752-00			1		CHASSIS ASSY:	80009	610-0752-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
3-1	337-3341-00			1	SHIELD,ELEC:HV,POLYCARBONATE	80009	337-3341-00
-2	----- -----			1	CIRCUIT BD ASSY:TIMEBASE (SEE A14 REPL) (ATTACHING PARTS)		
-3	211-0711-00			7	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX	01536	ORDER BY DESCR
-4	210-0586-00			1	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL (END ATTACHING PARTS) TIMEBASE BOARD ASSEMBLY INCLUDES:	78189	211-041800-00
-5	----- -----			1	.CIRCUIT BD ASSY:COUNTER/TIMER PLL/VCO .(SEE A14A16 REPL)		
-6	210-0586-00			20	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-7	344-0406-00			2	.CLIP,RETAINING:CHIP CARRIER	80009	344-0406-00
-8	136-0252-07			17	.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-9	386-5329-00			6	.SUPPORT,CKT BD:0.385 L,WHITE POLYAMIDE	80009	386-5329-00
-10	210-0586-00			2	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-11	210-0994-00			1	.WASHER,FLAT:0.125ID X 0.250D X 0.022	86928	A371-283-20
-12	210-0003-00			2	.WASHER,LOCK:#4 EXT,0.015 THK,STL	78189	1104-00-00-0541C
-13	348-0631-00			1	.PAD,CUSHIONING:0.375 X 0.5 X 0.062	85471	ORDER BY DESCR
-14	131-0679-02			2	.CONN,RCPT,ELEC:BNC,MALE,3 CONTACT (ATTACHING PARTS)	24931	28JR270-1
-15	220-0947-00			2	.NUT,PLAIN,HEX:6-32 X 0.312 HEX,NYLON,94V-0	80009	220-0947-00
-16	210-1039-00			2	.WASHER,LOCK:0.521 ID,INT,0.025 THK,SST (END ATTACHING PARTS)	24931	ORDER BY DESCR
-17	407-3356-01			1	.BRKT,TRIG INPUT:ALUMINUM (ATTACHING PARTS)	80009	407-3356-01
-18	211-0408-00			2	.SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX (END ATTACHING PARTS)	93907	ORDER BY DESCR
-19	337-3396-00			1	.SHIELD,ELEC:TRIGGER INPUT (ATTACHING PARTS)	80009	337-3396-00
-20	211-0408-00			1	.SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX (END ATTACHING PARTS)	93907	ORDER BY DESCR
-21	214-3853-00			1	.HEAT SINK,ELEC:MICROCKT,ALUMINUM	80009	214-3853-00
	196-3091-01			1	.LEAD,ELEC:26 AWG,3.5 L W/POLYCOVERING .(FROM TIMEBASE BOARD MARKED CRT1,CRT2 .TO THE CRT)	80009	196-3091-01
-22	337-3244-00			1	SHIELD,ELEC:HIGH VOLTAGE (ATTACHING PARTS)	80009	337-3244-00
-23	211-0711-00			4	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX (END ATTACHING PARTS)	01536	ORDER BY DESCR
-24	129-1074-00			4	SPACER,POST:1.350 L,6-32 ONE END,BRS,HEX NI	80009	129-1074-00
-25	----- -----			1	CIRCUIT BD ASSY:SCOPE LOGIC (SEE A13 REPL) (ATTACHING PARTS)		
-26	211-0711-00			7	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX (END ATTACHING PARTS) SCOPE LOGIC BOARD ASSEMBLY INCLUDES:	01536	ORDER BY DESCR
-27	344-0326-00			2	.CLIP,ELECTRICAL:FUSE,BRASS	75915	102071
-28	136-0252-07			2	.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-29	344-0406-00			1	.CLIP,RETAINING:CHIP CARRIER	80009	344-0406-00
-30	343-0549-00			1	.STRAP,TIEDOWN,E:0.091 W X 4.0 L,ZYTEL	06383	PLT1M
-31	162-0435-00			1	.INSUL SLVG,ELEC:0.5 ID,BLACK,0.562 OD	80009	162-0435-00
-32	210-0586-00			4	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-33	386-5329-00			5	.SUPPORT,CKT BD:0.385 L,WHITE POLYAMIDE	80009	386-5329-00
-34	214-3841-00			3	.HEAT SINK,XSTR:TO-220 W/SOLDERABLE TABS,AL (ATTACHING PARTS)	13103	6021PB
-35	211-0410-00			3	.SCR,ASSEM WSHR:4-40 X 0.437,PNH,STL	93907	ORDER BY DESCR
-36	210-0586-00			3	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-37	210-1178-00			2	.WASHER,SHLDR: (END ATTACHING PARTS)	13103	7721-7PPS
-38	342-0355-00			3	.INSULATOR,PLATE:TRANSISTOR,SILICONE RUBBER	55285	7403-09FR-51
-39	----- -----			1	CIRCUIT BD ASSY:FRONT PANEL INTERFACE (SEE A10 REPL) (ATTACHING PARTS)		
-40	211-0711-00			4	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX	01536	ORDER BY DESCR
-41	210-0586-00			1	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL (END ATTACHING PARTS) FRONT PANEL INTERFACE BOARD ASSY INCLUDES:	78189	211-041800-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
3-42	386-5329-00			6	.SUPPORT,CKT BD:0.385 L,WHITE POLYAMIDE	80009	386-5329-00
-43	407-3358-00			1	.BRKT,CALIBRATOR:0.062 AL,5005 H34	80009	407-3358-00
					(ATTACHING PARTS)		
-44	211-0409-00			2	.SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-45	131-2716-01			1	.TERMINAL,CAL:	80009	131-2716-01
-46	131-0955-00			1	.CONN,RCPT,ELEC:BNC,FEMALE	13511	31-279
					(ATTACHING PARTS)		
-47	220-0495-00			1	.NUT,PLAIN,HEX:0.375-32 X 0.438 HEX,BRS	73743	ORDER BY DESCR
-48	210-0012-00			1	.WASHER,LOCK:0.384 ID,INTL,0.022 THK,STL	09772	ORDER BY DESCR
					(END ATTACHING PARTS)		
	196-3117-00			1	.LEAD,ELECTRICAL:18 AWG,1.5 L,0-N	80009	196-3117-00
					.(FROM BNC TO FRONT PANEL INTERFACE BOARD)		
-49	361-0348-00			1	.SPACER,RING:0.12 L X 0.375 ID,AL	80009	361-0348-00
-50	----- -----			1	CIRCUIT BD ASSY:VERTICAL		
					(SEE A12 REPL)		
					(ATTACHING PARTS)		
-51	211-0711-00			2	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
					VERTICAL BOARD ASSEMBLY INCLUDES:		
-52	136-0252-07			8	.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-53	210-0586-00			8	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-54	----- -----			1	.DELAY LINE:77NS		
					.(SEE A12DL200 REPL)		
					(ATTACHING PARTS)		
-55	211-0409-00			2	.SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-56	----- -----			1	RES NTWK,FXD,FI:CRT TERM(ASSEMBLED)H2091		
					(SEE R80 REPL)		
					(ATTACHING PARTS)		
-57	211-0711-00			2	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
-58	----- -----			1	CIRCUIT BD ASSY:COUNTER/TIMER REFERENCE		
					(SEE A15 REPL)		
-59	386-5366-00			3	.SUPPORT,CKT BD:NYLON	06915	TEHCBS-4R
					(ATTACHING PARTS)		
-60	211-0718-00			3	.SCREW,MACHINE:6-32 X 0.312,FLH,100 DEG,STL	83486	ORDER BY DESCR
					(END ATTACHING PARTS)		
-61	136-0252-07			1	.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-62	119-0894-01			1	.OSCILLATOR,RF:10MHZ,18V	31785	OCXO-44-12
					(ATTACHING PARTS)		
-63	211-0409-00			2	.SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-64	361-0122-00			2	.SPACER,SLEEVE:0.125 L X 0.12 ID,BRS	80009	361-0122-00
-65	----- -----			1	CIRCUIT BD ASSY:MAIN PROCESSOR		
					(SEE A11 REPL)		
					(ATTACHING PARTS)		
-66	211-0711-00			5	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX	01536	ORDER BY DESCR
-67	129-1003-00			2	SPCR,POST:0.705L,6-32EXT/M3.5X6-6G INT,BRS	80009	129-1003-00
-68	214-3106-00			1	HARDWARE KIT:JACK SOCKET	53387	3341-1S
					(END ATTACHING PARTS)		
					MAIN PROCESSOR BOARD ASSEMBLY INCLUDES:		
-69	211-0396-00			4	.SCREW,MACHINE:4-40 X 0.312 PNH,TORX	93907	829-06893
-70	210-0586-00			2	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-71	136-0252-07			4	.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-72	386-5329-00			7	.SUPPORT,CKT BD:0.385 L,WHITE POLYAMIDE	80009	386-5329-00
-73	348-0631-00			1	.PAD,CUSHIONING:0.375 X 0.5 X 0.062	85471	ORDER BY DESCR
-74	352-0742-00			1	.HOLDER,BATTERY:2/3A LITHIUM,94V-0 POLYEST	TK1493	BH2/3A
-75	214-3637-01			3	.HT SK,MICROCKT:ALUMINUM,BLACK ANODIZE	80009	214-3637-01
-76	----- -----			1	CIRCUIT BD ASSY:PLUG-IN INTERFACE		
					(SEE A1 REPL)		
					(ATTACHING PARTS)		
-77	211-0408-00			9	SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
					PLUG-IN INTERFACE BOARD ASSY INCLUDES:		
-78	----- -----			3	.CONN,RCPT,ELEC:HEADER,2 X 38		
					.(SEE A1J94,J92,J93 REPL)		

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
3-					(ATTACHING PARTS)		
-79	213-0984-00			3	.SCREW,TPG,TR:2-28 X 0.312 PNH,STL	80009	213-0984-00
-80	211-0396-00			3	.SCREW,MACHINE:4-40 X 0.312 PNH,TORX	93907	829-06893
					(END ATTACHING PARTS)		
-81	136-0252-07			13	.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-82	343-0549-00			3	.STRAP,TIEDOWN,E:0.091 W X 4.0 L,ZYTEL	06383	PLT1M
-83	351-0766-00			2	.GUIDE,PIN:2.65 X 0.3	80009	351-0766-00
	179-2968-00			1	.WIRING HARNESS:PLUG-IN INTERFACE	80009	179-2968-00
					.(FROM PLUG-IN INTERFACE BOARD TO BNC'S)		
	175-9800-00			1	.CA ASSY,SP,ELEC:12.0 L	80009	175-9800-00
					.(FROM A1 TO A3J64)		
-84	----- -----			1	CIRCUIT BD ASSY:REGULATOR		
					(SEE A4 REPL)		
					(ATTACHING PARTS)		
-85	211-0721-00			2	SCREW,MACHINE:6-32 X 0.375,PHN,STL	83486	ORDER BY DESCR
					(END ATTACHING PARTS)		
					REGULATOR BOARD ASSEMBLY INCLUDES:		
-86	386-5289-00			2	.SUPPORT,CKT BD:POLYWIDE,WHITE	80009	386-5289-00
-87	386-5286-00			1	.SUPPORT,ECB:REGULATOR	80009	386-5286-00
					(ATTACHING PARTS)		
-88	211-0408-00			2	.SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-89	211-0408-00			6	.SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
-90	210-1171-00			6	.WASHER,SHLDR:0.12 ID X 0.143 OD X 0.07 D	00261	A7148516P2
-91	342-0755-00			2	.INSULATOR,FILM:THERMAL CONDUCTIVE SILICONE	80009	342-0755-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
4-1	200-3237-00			1	COVER,PWR SPLY:TOP,AL 5005-H34	80009	200-3237-00
					(ATTACHING PARTS)		
-2	211-0722-00			2	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
-3	211-0734-00			2	SCREW,MACHINE:6-32 X 0.25,FLH,100 DEG,STL	83486	ORDER BY DESCR
					(END ATTACHING PARTS)		
-4	200-3236-00			1	COVER,PWR SPLY:ALUMINUM	80009	200-3236-00
					(ATTACHING PARTS)		
-5	211-0722-00			4	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-6	351-0702-00			4	GUIDE,CKT BOARD:MOLDED NYLON,4.5 L	18677	11633-22
-7	----- -----			1	CIRCUIT BD ASSY:CONTROL RECTIFIER		
					(SEE A2A2 REPL)		
					(ATTACHING PARTS)		
-8	211-0408-00			4	SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
-9	211-0722-00			2	SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
-10	211-0408-00			1	SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
					CONTROL RECTIFIER BOARD ASSEMBLY INCLUDES:		
-11	386-5285-00			1	.SUPPORT,CHASSIS:POWER SUPPLY,LEFT	80009	386-5285-00
-12	214-3796-00			2	.HEAT SINK,XSTR:ALUMINUM,TO-220	30161	59688
-13	129-1086-00			1	.SPACER,POST:1.505 L,W 4-40 THD BOTH ENDS,	80009	129-1086-00
					.NYLON,0.312		
-14	----- -----			4	.SEMICOND DVC,DI:RECT,SI,DUAL SCHOTTKY,10A		
					.(SEE A2A2 CR330,CR331,CR340,CR350 REPL)		
					(ATTACHING PARTS)		
-15	211-0411-00			4	.SCR,ASSEM WSHR:4-40 X 0.5,PNH,STL	93907	ORDER BY DESCR
-16	210-0586-00			4	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-17	210-1171-00			4	.WASHER,SHLDR:0.12 ID X 0.143 OD X 0.07 D	00261	A7148516P2
					(END ATTACHING PARTS)		
-18	342-0755-00			1	.INSULATOR,FILM:THERMAL CONDUCTIVE SILICONE	80009	342-0755-00
-19	214-3827-00			1	.HEAT SINK,ELEC:POWER SUPPLY	80009	214-3827-00
					(ATTACHING PARTS)		
-20	211-0722-00			2	.SCREW,MACHINE:6-32 X 0.25,PNH,STL	80009	211-0722-00
					(END ATTACHING PARTS)		
-21	407-3492-00			1	BRACKET,ANGLE:ALUMINUM	80009	407-3492-00
					(ATTACHING PARTS)		
-22	211-0734-00			1	SCREW,MACHINE:6-32 X 0.25,FLH,100 DEG,STL	83486	ORDER BY DESCR
					(END ATTACHING PARTS)		
-23	----- -----			1	CIRCUIT BD ASSY:LINE INVERTER		
					(SEE A2A1 REPL)		
					(ATTACHING PARTS)		
-24	211-0408-00			1	SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
-25	211-0409-00			1	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
					LINE INVERTER BOARD ASSEMBLY INCLUDES:		
-26	214-3796-00			2	.HEAT SINK,XSTR:ALUMINUM,TO-220	30161	59688
-27	344-0326-00			2	.CLIP,ELECTRICAL:FUSE,BRASS	75915	102071
-28	----- -----			4	.TRANSISTOR:FE PAIR		
					.(SEE A2A1 Q600,Q601,Q610,Q620 REPL)		
					(ATTACHING PARTS)		
-29	211-0411-00			4	.SCR,ASSEM WSHR:4-40 X 0.5,PNH,STL	93907	ORDER BY DESCR
-30	342-0536-00			4	.INSULATOR,XSTR:TO-220,POLYENELENE	80009	342-0536-00
					(END ATTACHING PARTS)		
-31	342-0755-00			1	.INSULATOR,FILM:THERMAL CONDUCTIVE SILICONE	80009	342-0755-00
-32	214-3784-00			1	.HT SK,PWR SPLY:ALUMINUM	80009	214-3784-00
					(ATTACHING PARTS)		
-33	211-0408-00			2	.SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
					(END ATTACHING PARTS)		
-34	----- -----			1	.SWITCH,THRMSTC:NC OPEN 97.8,15A,125VAC		
					.(SEE A2A1S99 REPL)		
					(ATTACHING PARTS)		
-35	211-0408-00			2	.SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL TORX	93907	ORDER BY DESCR
-36	210-0586-00			2	.NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					(END ATTACHING PARTS)		
-37	200-2222-00			1	GUARD,FAN:	81041	6-182-033
					(ATTACHING PARTS)		
-38	211-0744-00			4	SCREW,MACHINE:6-32 X 2.0,PNH,TORX,STL,CD	04348	ORDER BY DESCR

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
4-					(END ATTACHING PARTS)		
-39	407-3362-00			1	BRACKET,FAN:0.050 5005 H-34	80009	407-3362-00
-40	----- -----			1	FAN,TUBEAXIAL:8 TO 14.5VDC,6W,3200RPM (SEE A2B50 REPL)		
-41	200-2264-00			1	CAP,FUSEHOLDER:3AG FUSES	S3629	FEK 031 1666
-42	204-0832-00			1	BODY,FUSEHOLDER:3AG & 5 X 20MM FUSES	TK0861	031 1673
-43	----- -----			1	FILTER,RFI:6A,115-230V,48-440HZ (SEE A2FL99 REPL) (ATTACHING PARTS)		
-44	211-0721-00			2	SCREW,MACHINE:6-32 X 0.375,PHN,STL (END ATTACHING PARTS)	83486	ORDER BY DESCR
-45	358-0216-00			1	GROMMET,PLASTIC:GRAY,ROUND,0.257 ID	80009	358-0216-00
-46	----- -----			2	LEAD,ELECTRICAL:18 AWG,12.0 L,5-4 (SEE A2M97,M99 REPL) (ATTACHING PARTS)		
-47	210-0457-00			2	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL (END ATTACHING PARTS)	78189	511-061800-00
-48	386-5287-00			1	PLATE,REAR:AL (ATTACHING PARTS)	80009	386-5287-00
-49	211-0721-00			8	SCREW,MACHINE:6-32 X 0.375,PHN,STL (END ATTACHING PARTS)	83486	ORDER BY DESCR
					WIRE ASSEMBLIES		
	179-2969-00			1	WIRING HARNESS:MPU,J24/25 (FROM A11J24 TO A14J24) (FROM A11J25 TO A14J25)	80009	179-2969-00
	179-2970-00			1	WIRING HARNESS:TIME BASE,J15,21/23 (FROM A14J21,J22,J23 TO BNC'S) (FROM A14J15 TO A12J15)	80009	179-2970-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
5-1	161-0066-00			1	CABLE ASSY,PWR,:3,18AWG,115V,98.0 L	16428	CH8481, FH8481
-2	161-0066-09			1	CABLE ASSY,PWR,:3,0.75MM SQ,220V,99.0 L (OPTION A1 ONLY)	S3109	86511000
-3	161-0066-10			1	CABLE ASSY,PWR,:3,0.75MM SQ,240V,96.0 L (OPTION A2 ONLY)	TK1373	24230
-4	161-0066-11			1	CABLE ASSY,PWR,:3,0.75MM,240V,96.0 L (OPTION A3 ONLY)	S3109	ORDER BY DESCR
-5	161-0066-12			1	CABLE ASSY,PWR,:3,18 AWG,250V,99.0 L NORTH AMERICAN (OPTION A4 ONLY)	70903	CH-77893
-6	161-0154-00			1	CABLE ASSY,PWR,:3,0.75MM SQ,240V,6A,2.5M L SAFETY CONTROLLED (OPTION A5 ONLY)	S3109	86515000
	070-6104-00			1	MANUAL,TECH:OPERATORS,11301	80009	070-6104-00
	070-6105-00			1	MANUAL,TECH:OPERATORS,11301	80009	070-6105-00
	070-6106-00			1	MANUAL,TECH:USERS REFERENCE,11301 & 11302	80009	070-6106-00
	070-6274-00			1	MANUAL,TECH:INSTR,11401/11402 (OPTION 1R ONLY)	80009	070-6274-00
					OPTIONAL ACCESSORIES		
	016-0154-00			1	VISOR,CRT:GENERAL USAGE	80009	016-0154-00
	016-0260-00			1	VISOR,CRT:	80009	016-0260-00
	016-0829-00			1	PANEL,BLANK:PLUG-IN HOUSING,11K SERIES	80009	016-0829-00
	070-6107-00			1	MANUAL,TECH:SVCE VOL 1,11301 THEORY,CHK ADJ	80009	070-6107-00
	070-6108-00			1	MANUAL,TECH:SVCE VOL II,11301	80009	070-6108-00
	070-6109-00			1	MANUAL,TECH:SVCE VOL 3,11301	80009	070-6109-00

Part 8
Schematic Diagrams & Circuit Board Locator

FIG. 1 CABINET

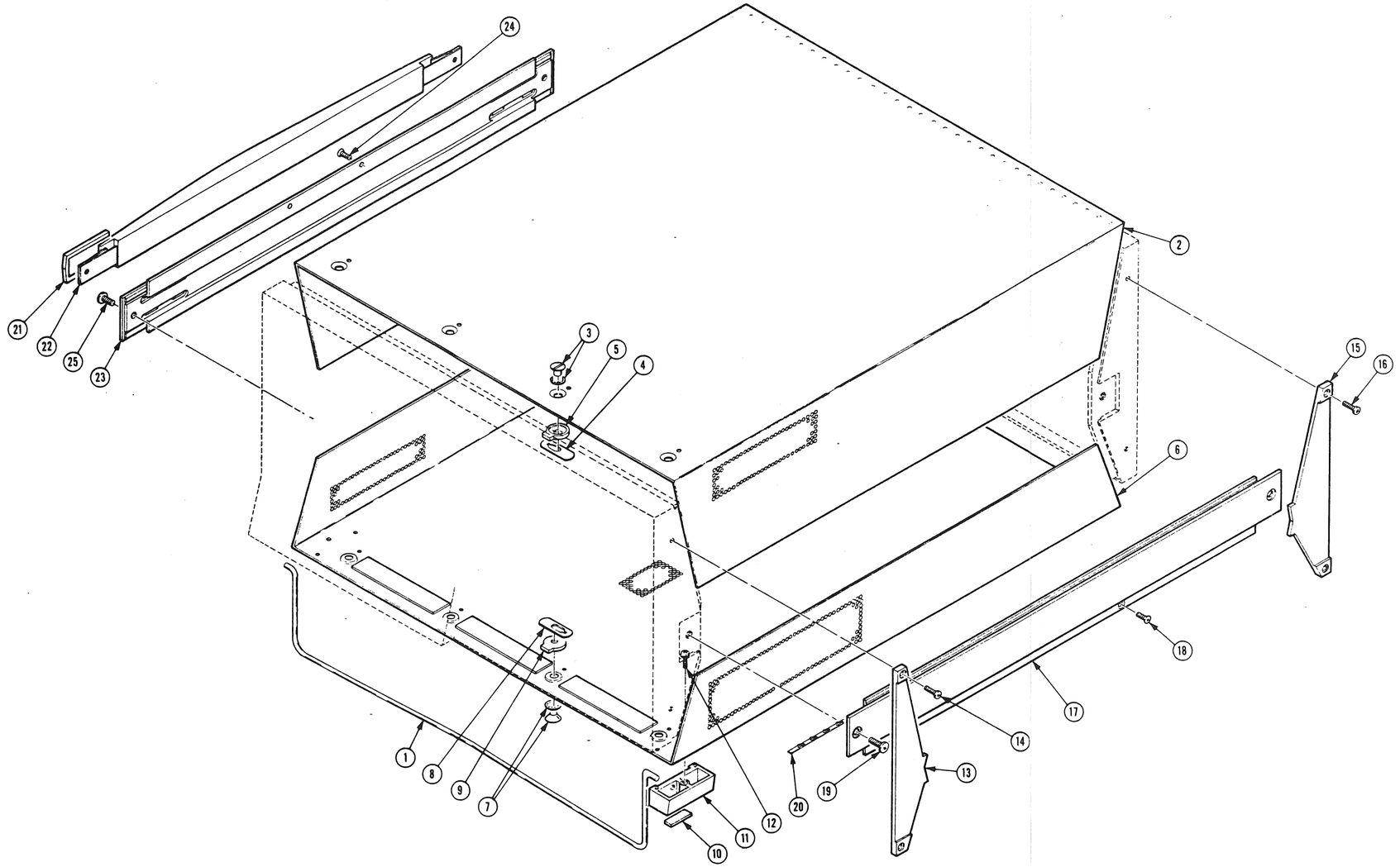


FIG. 2 FRONT, CHASSIS, REAR

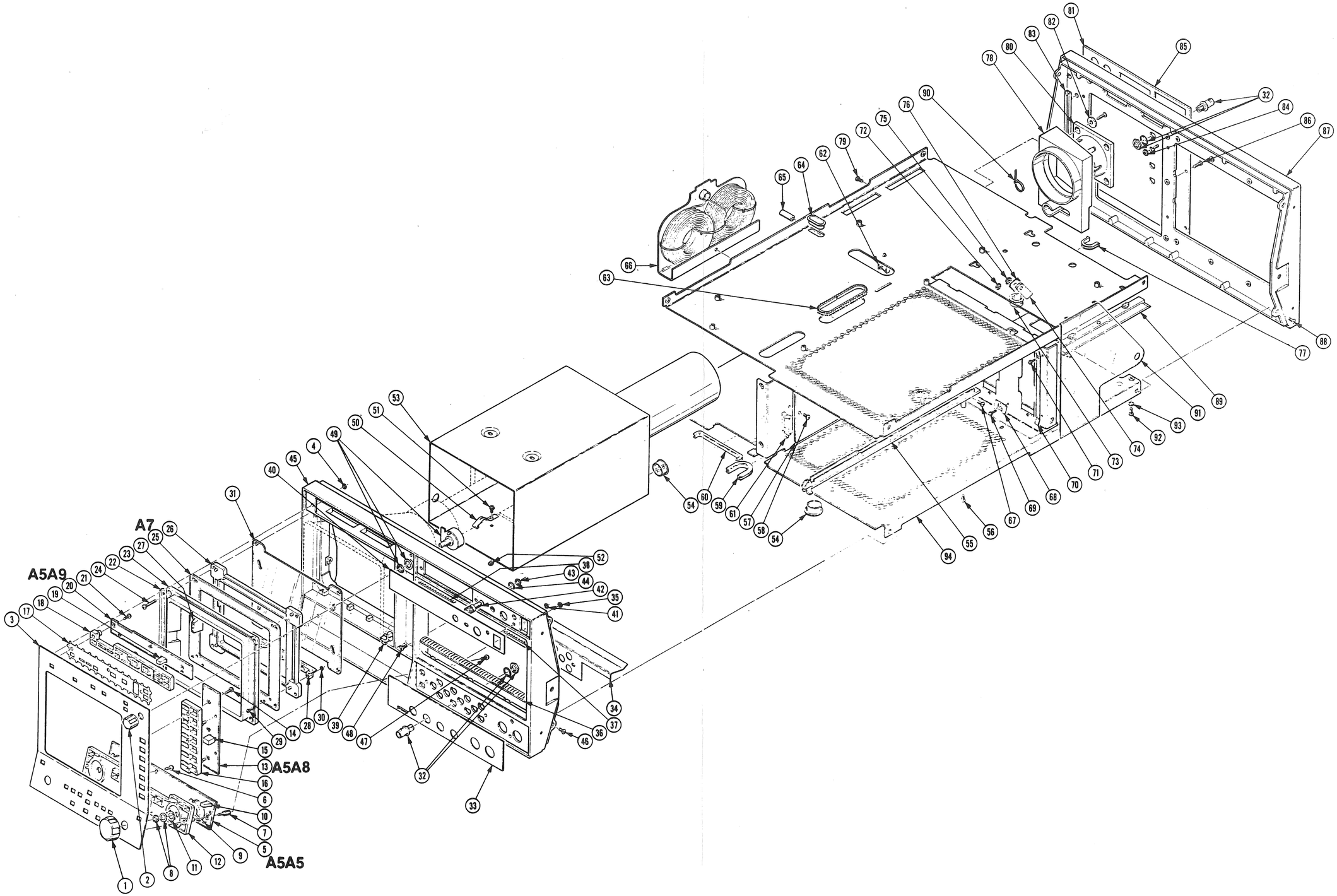


FIG. 3 CIRCUIT BOARDS

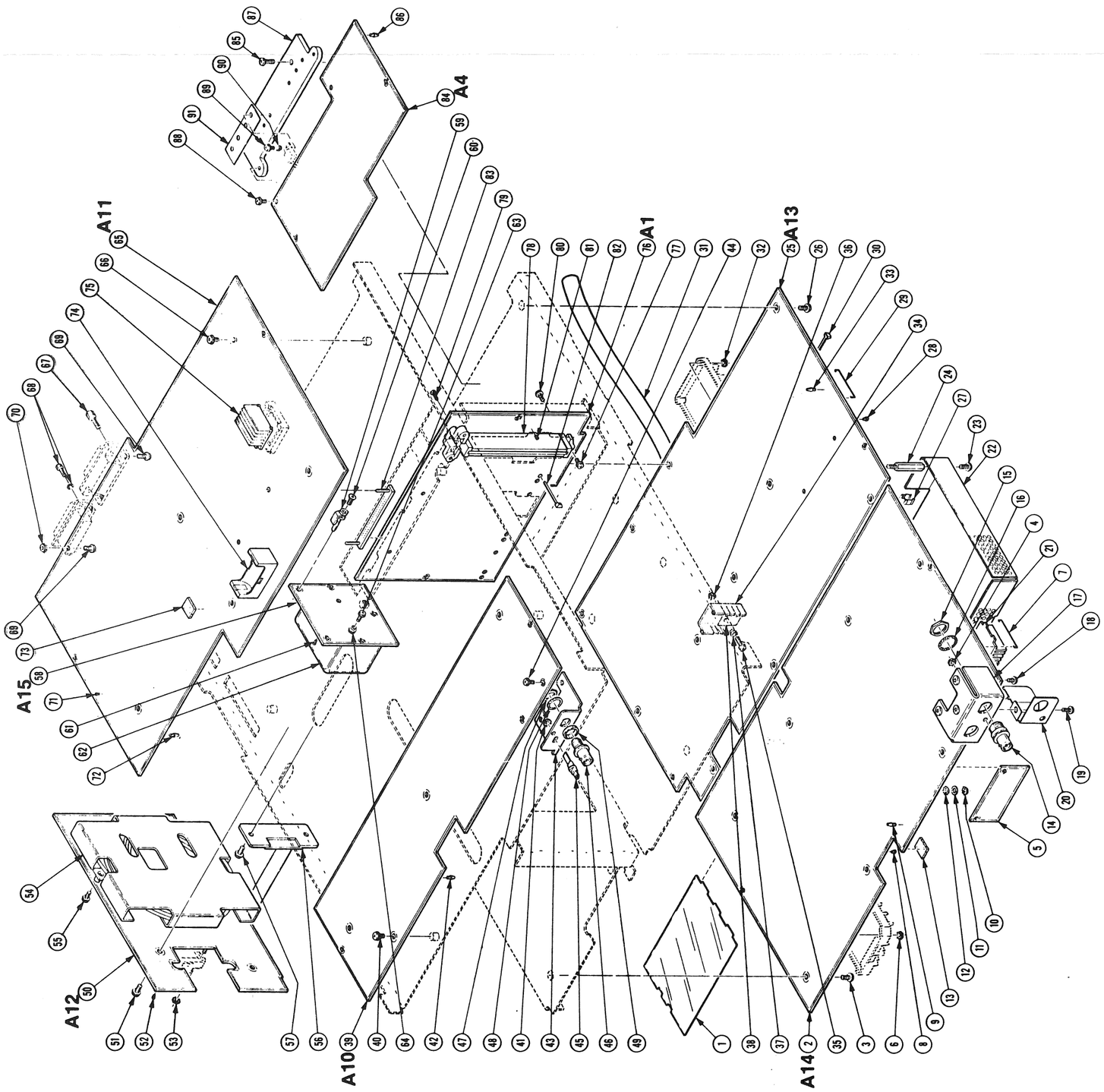
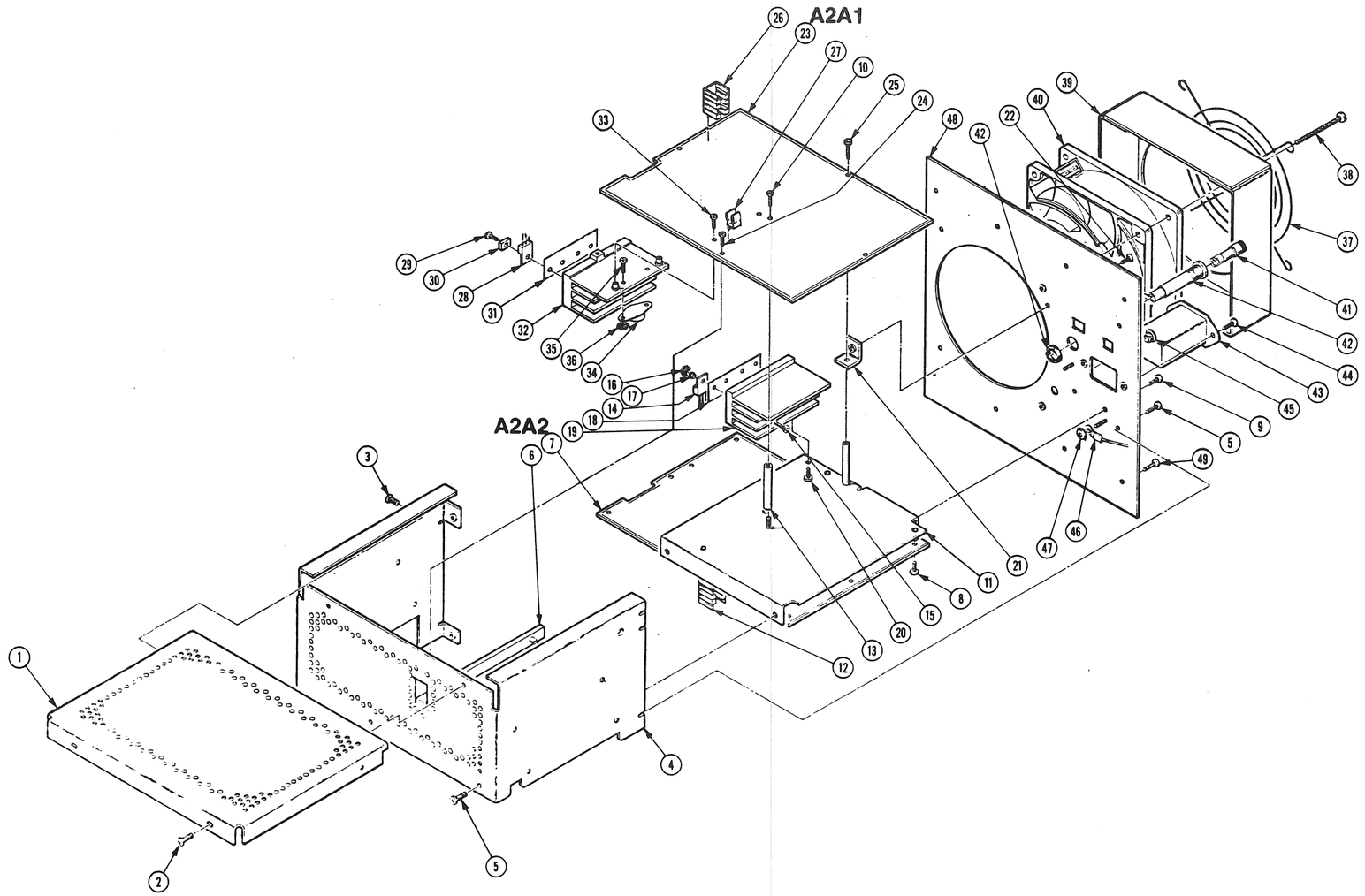


FIG. 4 POWER SUPPLY



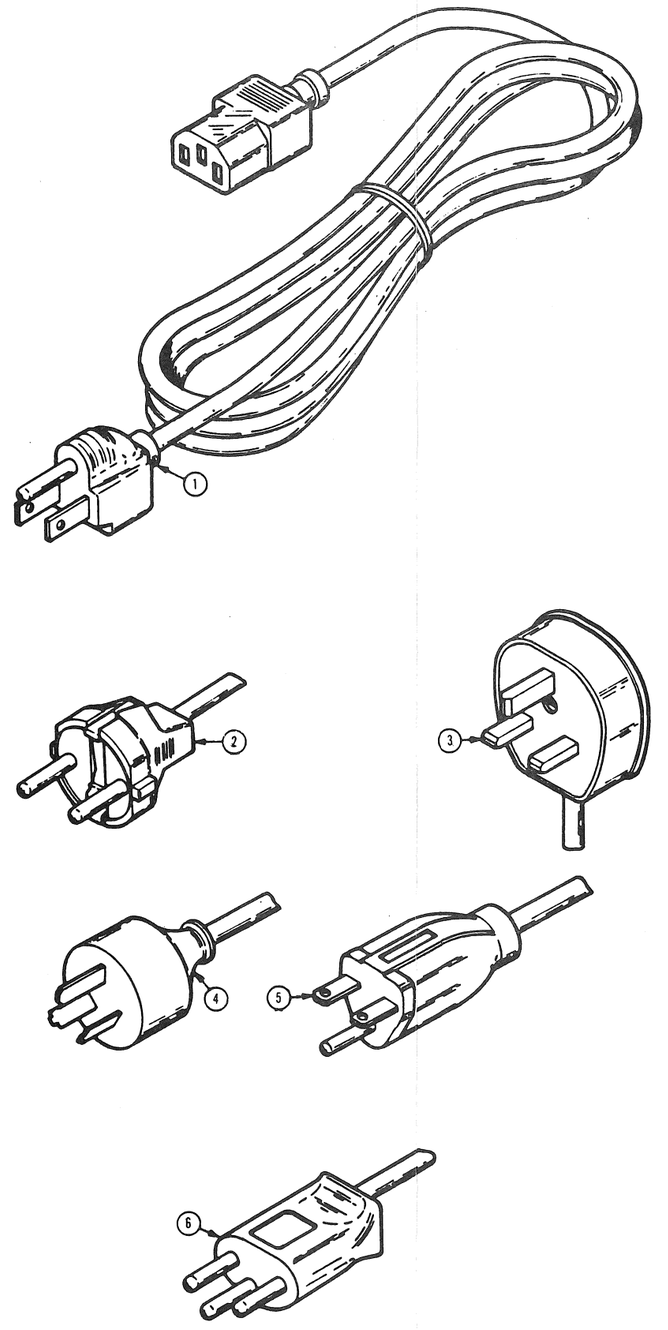
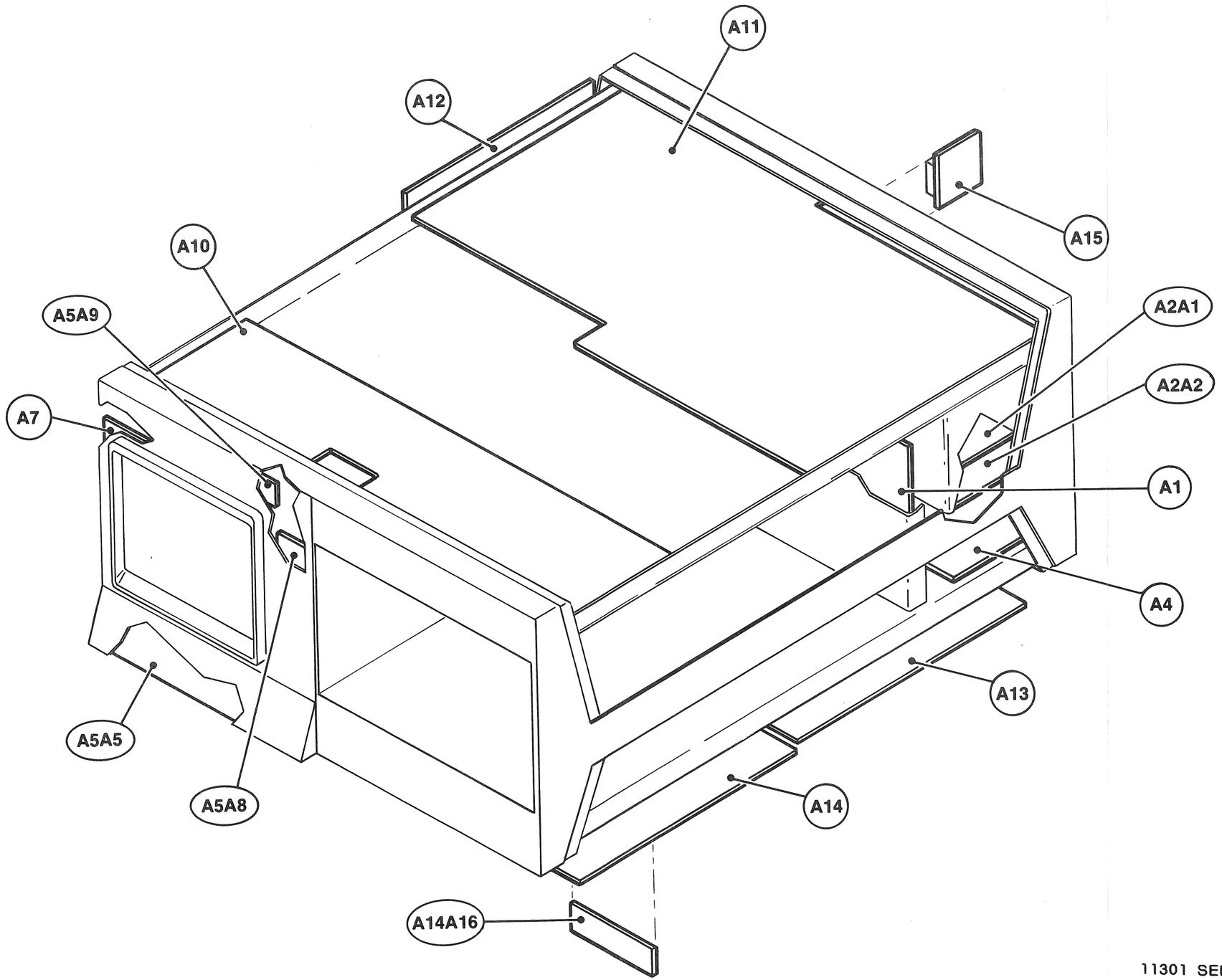
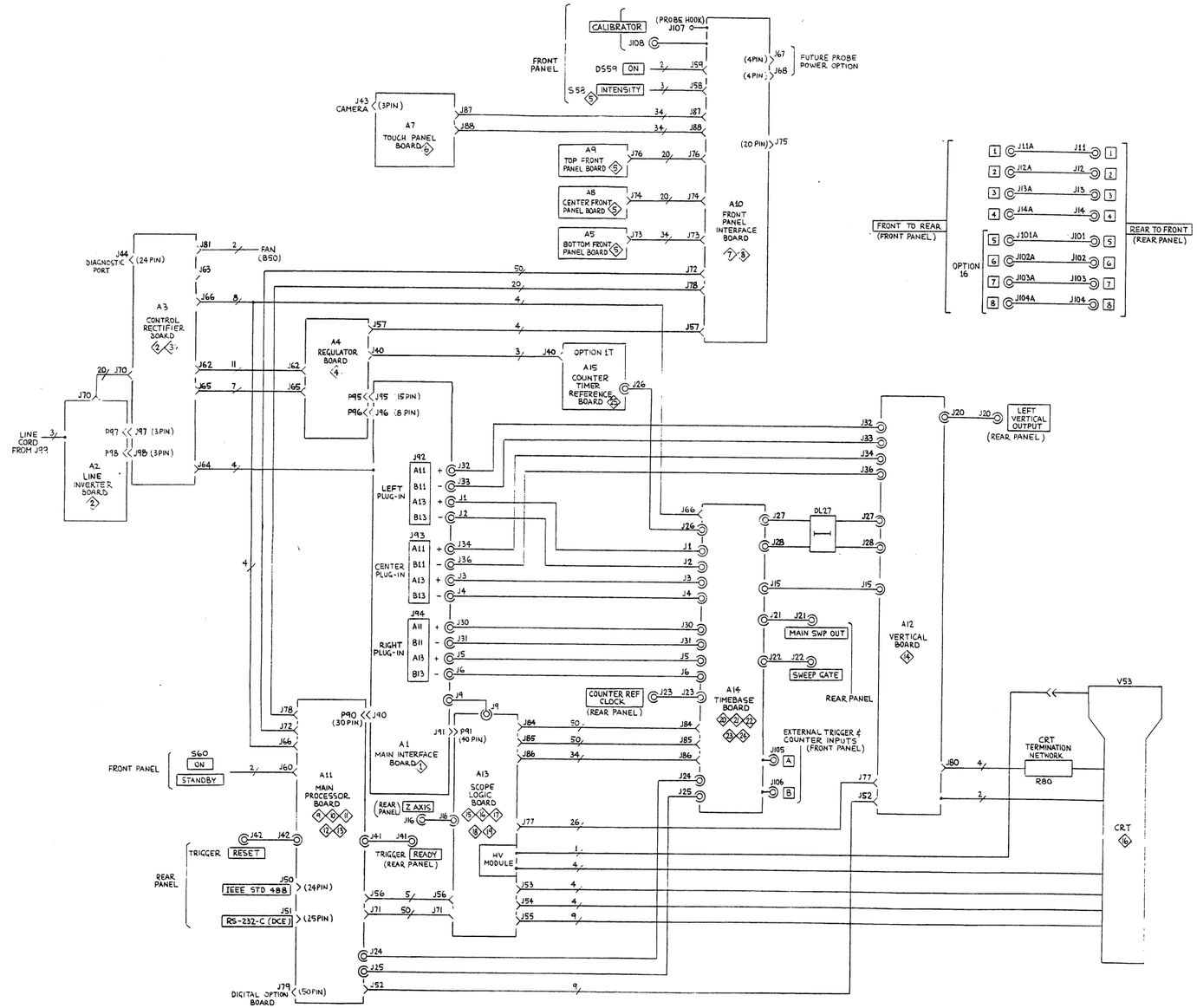


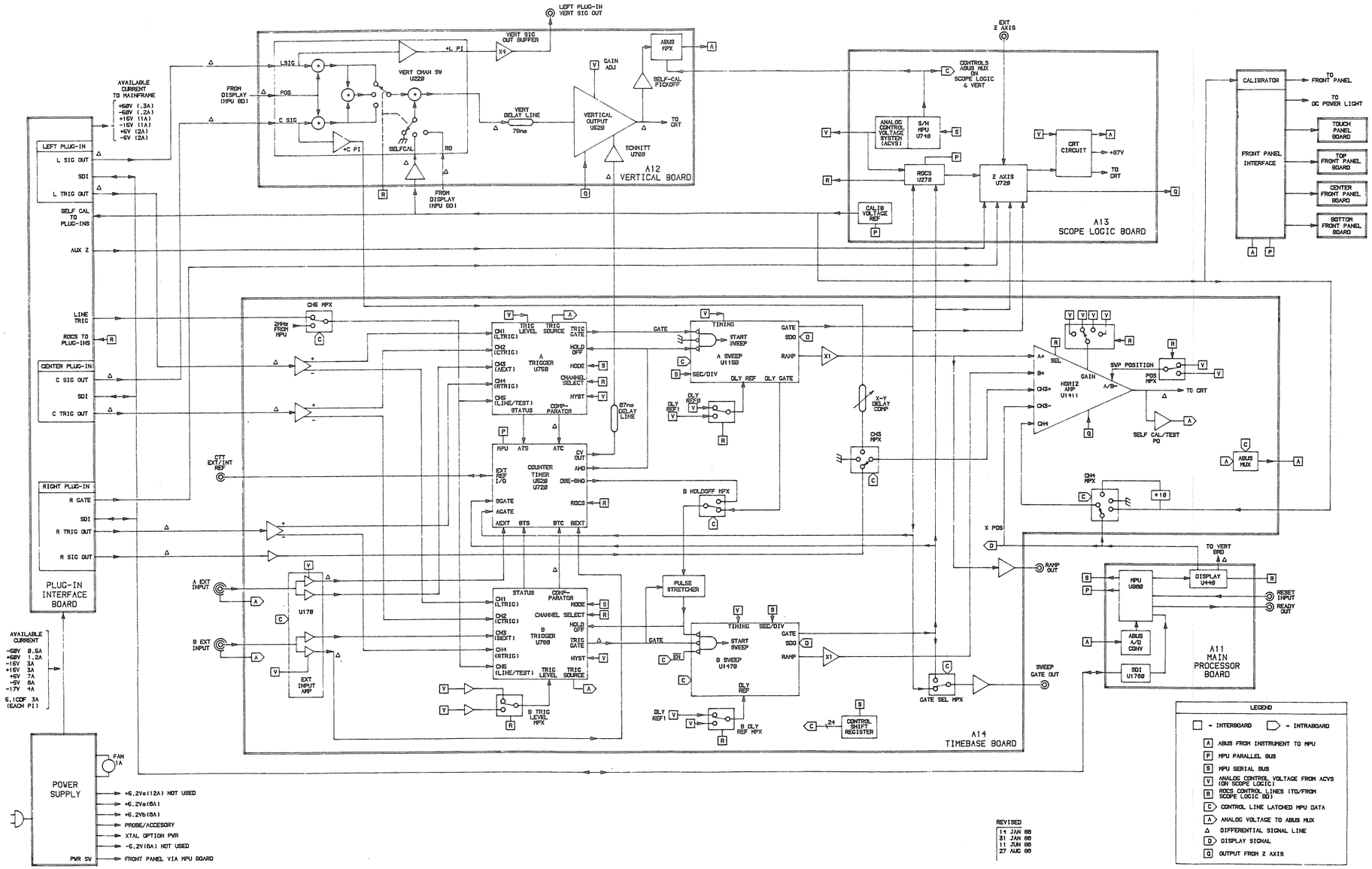
FIG. 5 ACCESSORIES


A11
A12
A15
A10
A5A9
A2A1
A2A2
A7
A1
A4
A13
A5A5
A5A8
A14
A14A16



11301

INTERCONNECTIONS



REVISED
14 JAN 88
31 JAN 88
11 JUN 88
27 AUG 88

11301

BLOCK DIAGRAM

TO P08-13 MAIN PROCESSOR BOARD 6
TO/FROM P98 MAIN PROCESSOR BOARD 12
J98
PWRFAIL
DCPVRSV
PVRCOM
J02 LEFT
J03 CENTER
J04 RIGHT
+5V POWER
-5V POWER
+15V POWER
-15V POWER
+58V POWER
-58V POWER
GROUND
CH1 AUXILIARY TRIGGER OUT+
CH1 AUXILIARY TRIGGER OUT-
CH2 AUXILIARY TRIGGER OUT+
CALIBRATION VOLTAGE
CH2 AUXILIARY TRIGGER OUT-
CALIBRATION GROUND SENSE
CH3 AUXILIARY TRIGGER OUT+
CH3 AUXILIARY TRIGGER OUT-
CH4 AUXILIARY TRIGGER OUT+
CH4 AUXILIARY TRIGGER OUT-
-5V POWER FROM J05-1
SHIELD
SDI CLOCK
SDI DATA,PI TO MF
SDI DATA,MF TO PI
11K DETECTOR
+58V POWER
-58V POWER
+15V POWER
-15V POWER
AUX Z AXIS
MAINFRAME MODE INFO
MAINFRAME CHAN SWITCH
SEQUENCE SYNC
SEQUENCE CLOCK
SAMPLE CLOCK
LINE TRIGGER
SWEEP GATE
LEFT SDI CLOCK
LEFT DATA IN,PI TO MF
LEFT DATA OUT,PI TO MF
LEFT 11K DETECTOR
CENTER SDI CLOCK
CENTER DATA IN,PI TO MF
CENTER DATA OUT,PI TO MF
CENTER 11K DETECTOR
RIGHT 11K DETECTOR
RIGHT DATA OUT,PI TO MF
RIGHT DATA IN,PI TO MF
RIGHT SDI CLOCK
NOTE
50 Ω LINES
FROM P05 REGULATOR BOARD 4
P05 J05
C101 1 µF
C102 1 µF
C103 1 µF
C104 1 µF
C201 2.2 µF
C202 2.2 µF
TO/FROM P05 REGULATOR BOARD 4
TO/FROM P04 CONTROL RECTIFIER BOARD 2
+5.1 LEFT
+5.1 CENTER
+5.1 RIGHT
R100 51
R200 51
R300 51
C100 0.1
C200 0.1
C300 0.1
MOUNTING SCREW
TO TIMEBASE BOARD 21
TO VERTICAL BOARD 14
REFCOM FROM J05-9
+5 POWER FROM J05-4
+5V SENSE FROM J05-8
-5V SENSE FROM J05-1
+15V SENSE FROM J05-6
A1 PLUG-IN INTERFACE BOARD
J01
J80
AUX Z-AXIS TO J80 SCOPE LOGIC BOARD 15
TO/FROM SCOPE LOGIC BOARD
PLUG-IN INTERFACE 1
11301

PULSE WIDTH MODULATOR

50KHz INVERTER

INVERTER VOLTAGE SAMPLER

ISOLATION BARRIER

PRIMARY CURRENT SENSE

LOCAL POWER

STANDBY POWER

GATE DRIVE

RAMP INJECTION

LINE TRIGGER

SOFT START

CURRENT LIMIT COMPARATOR

ERROR AMPLIFIER

PRINCIPAL POWER

LINE VOLTAGE SELECT

GROUNDED AT MAINFRAME CHASIS

HEAT SINK

1 SENSE RESISTORS ARE INTEGRAL PART OF ETCHED CIRCUIT BOARD

TYPE	+22V	+12V	GND	-17S
4013		14	7	
LM324		4		11
LM339	3		12	
LM358		8	4	

SEE PARTS LIST FOR SEMICONDUCTOR TYPES

TO/FROM TIMEBASE AND MAIN PROCESSOR BOARD

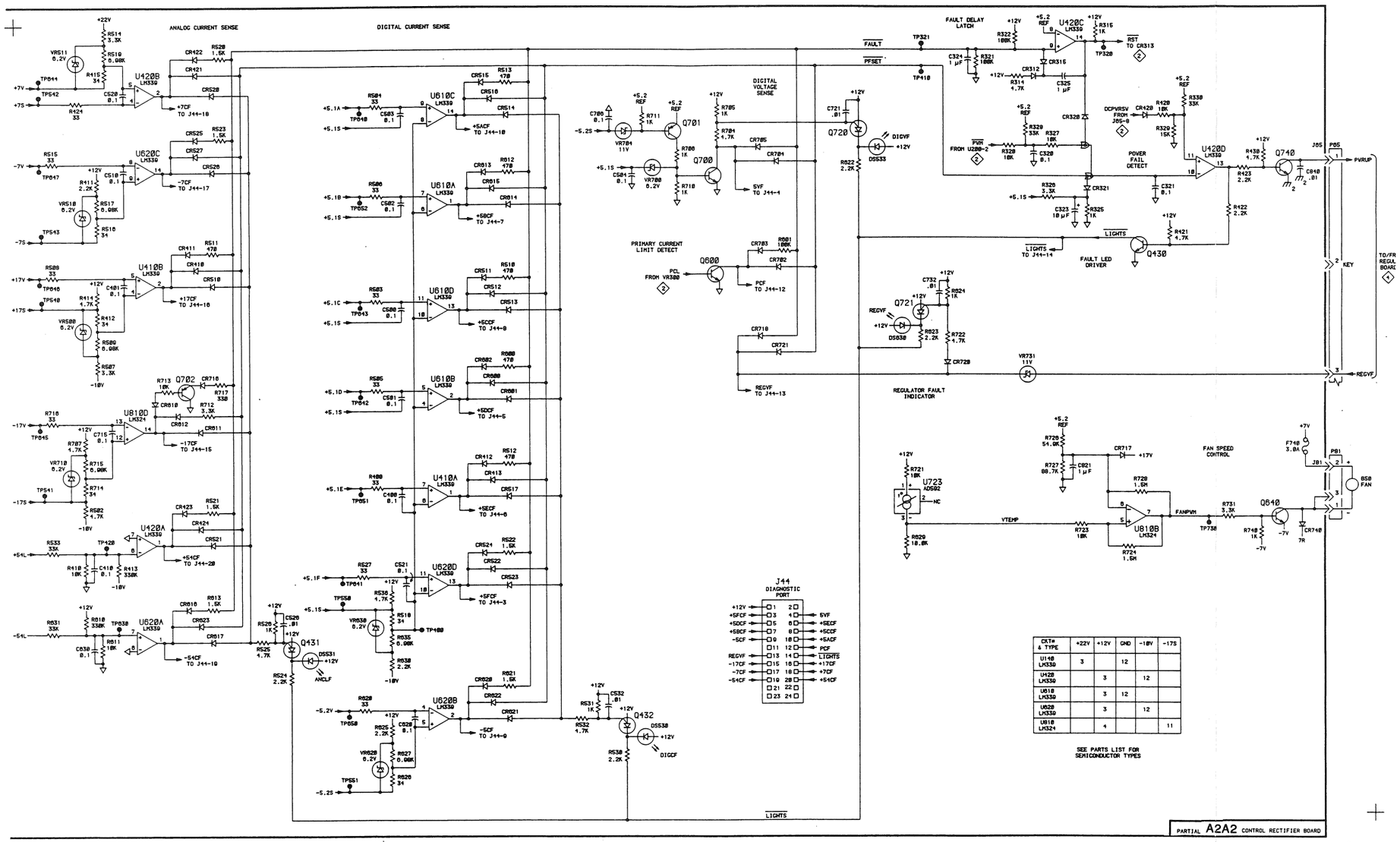
TO/FROM PLUG-IN INTERFACE BOARD

TO/FROM REGULATOR BOARD

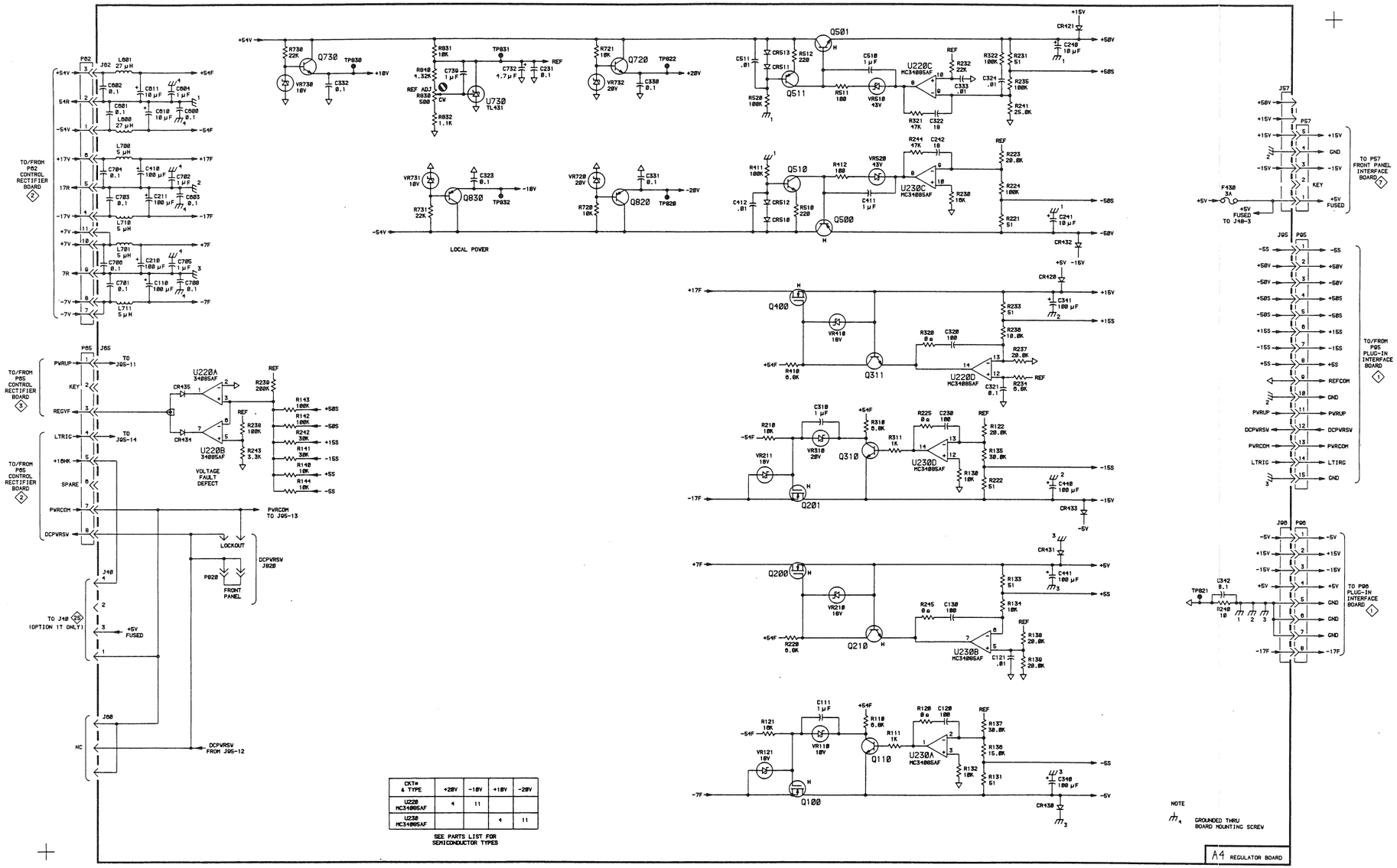
A2A1 LINE INVERTER BOARD

PARTIAL A2A2 CONTROL RECTIFIER BOARD

LINE INVERTER, RECTIFIERS & CONTROL

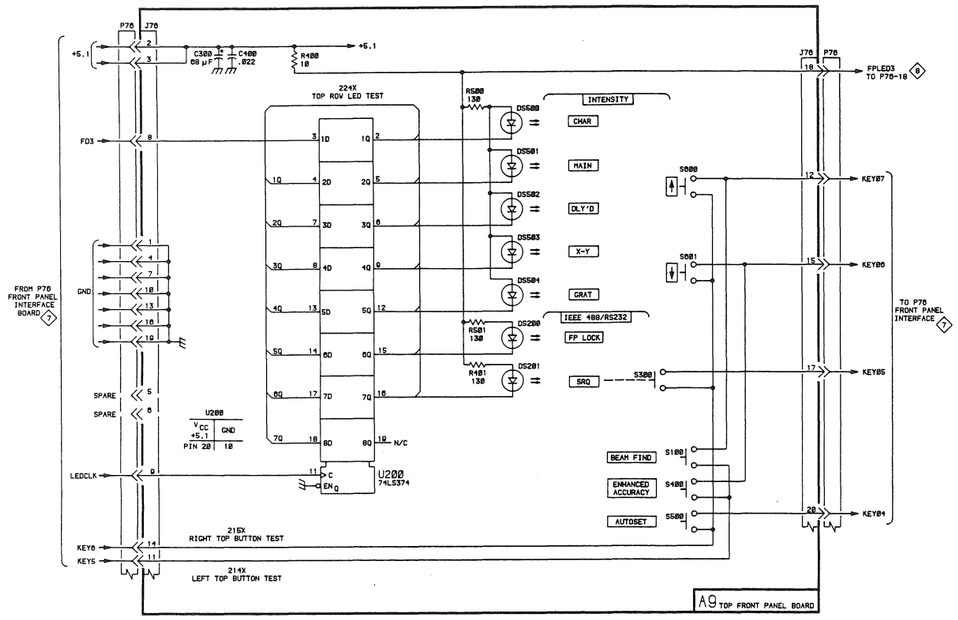


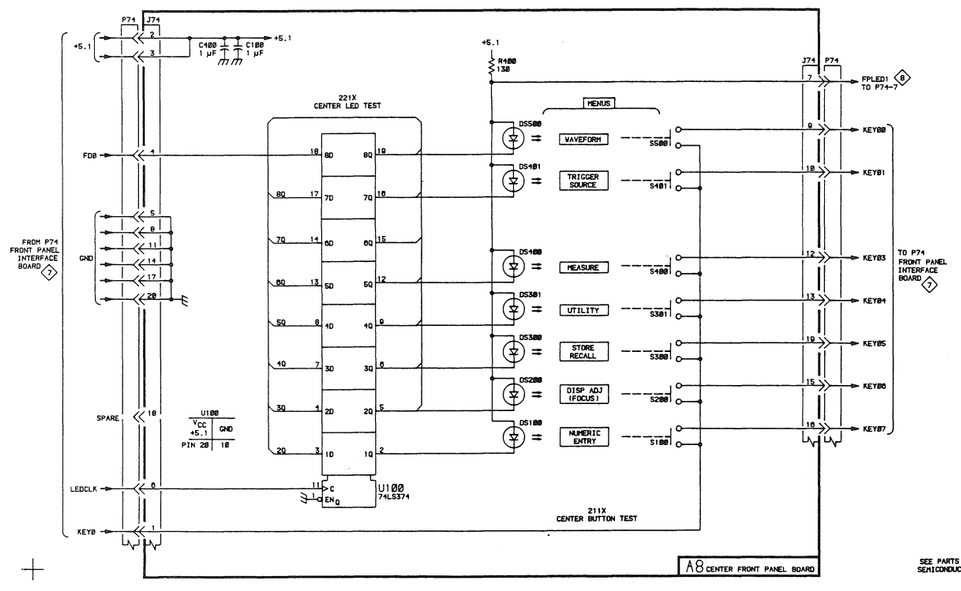
CKT# & TYPE	+22V	+12V	GND	-10V	-17S
U410 LM339	3		12		
U420 LM339		3		12	
U610 LM339		3	12		
U620 LM339		3		12	
U810 LM324		4			11



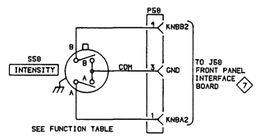
CKT# & TYPE	+28V	-18V	+18V	-28V
U220 MC3408SAF	4	11		
U230 MC3408SAF			4	11

SEE PARTS LIST FOR SEMICONDUCTOR TYPES





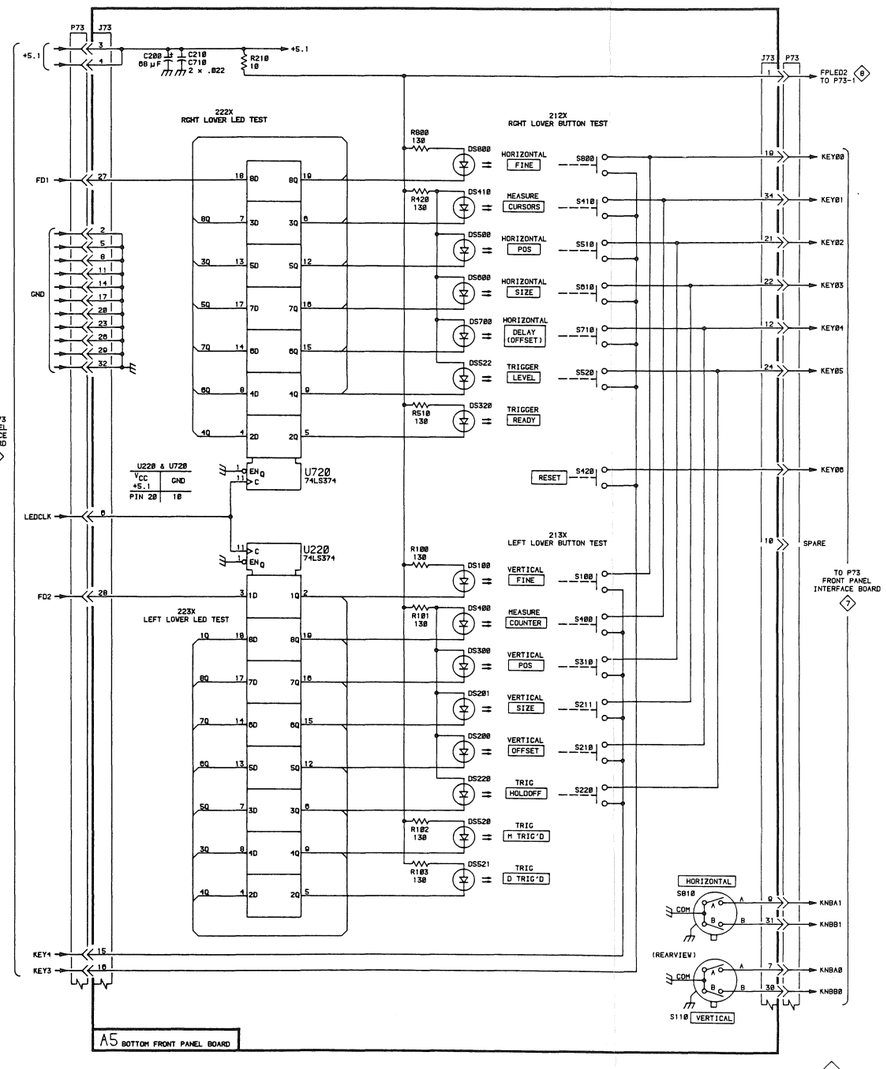
SEE PARTS LIST FOR SEMICONDUCTOR TYPES

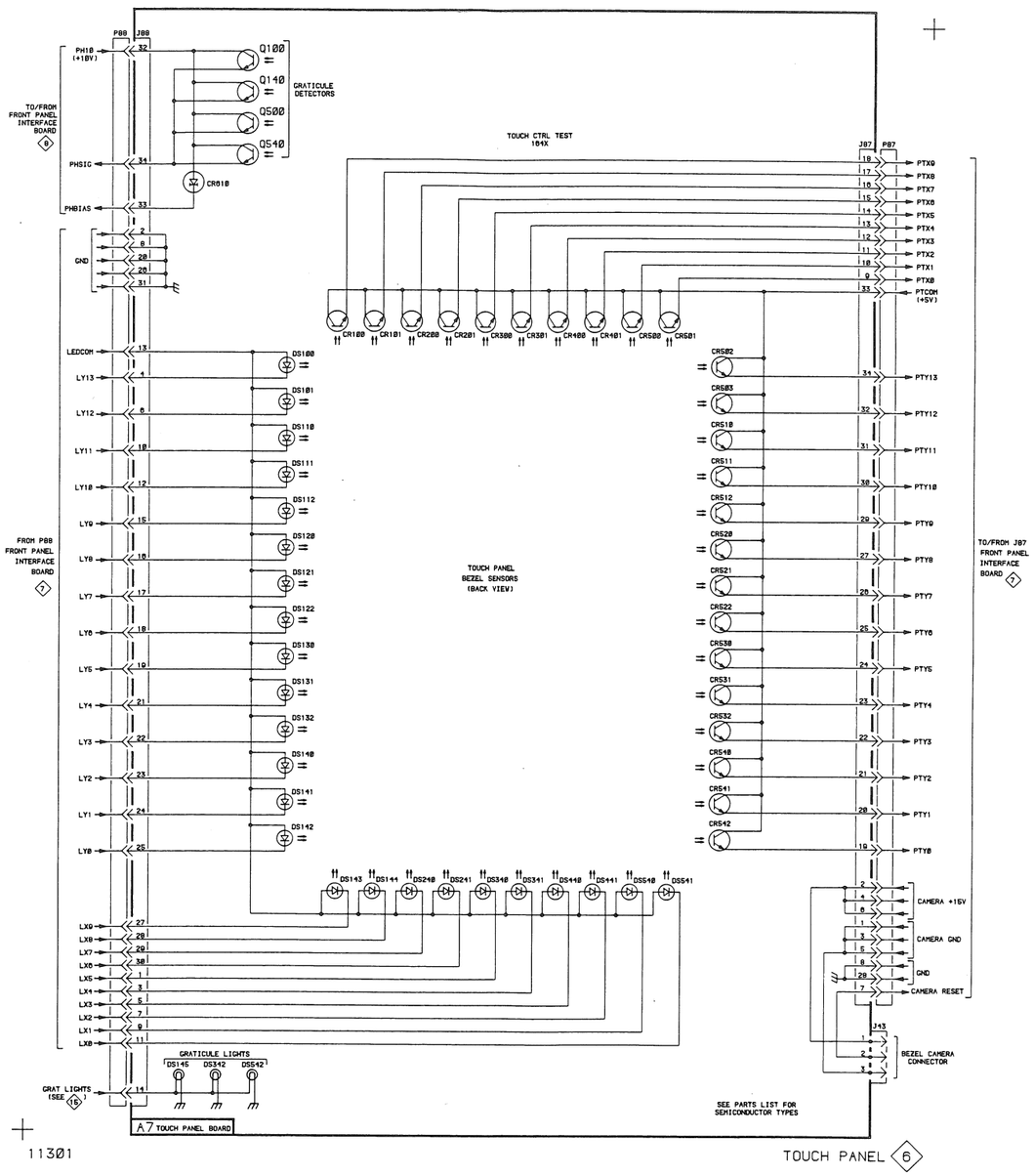


S50, S110, S010 FUNCTION TABLE

	A	B	
	1	1	DETENT
	0	1	
	0	0	
	1	0	DETENT
CW (INCREASE)	1	1	

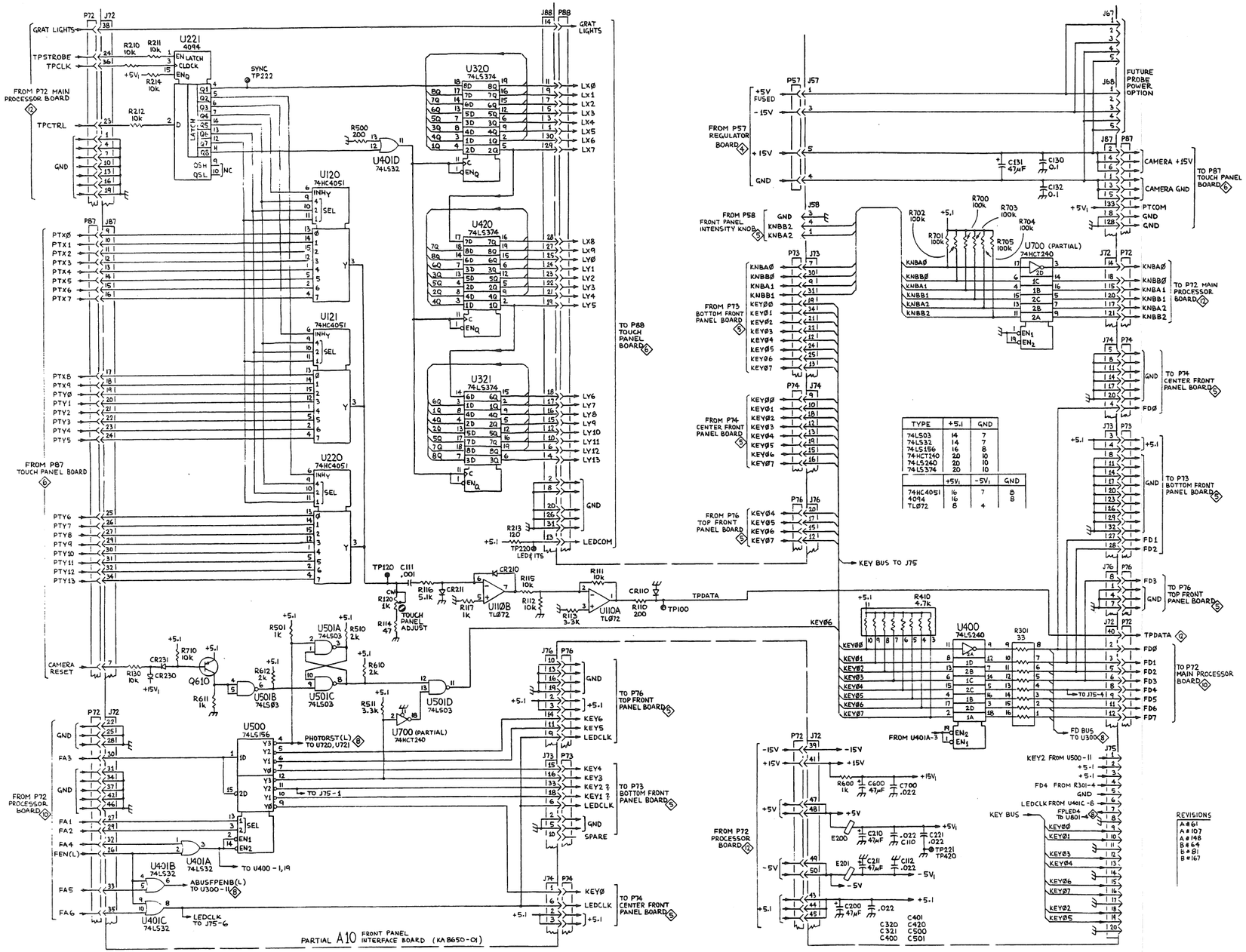
NOTE: 1 = H = OPEN



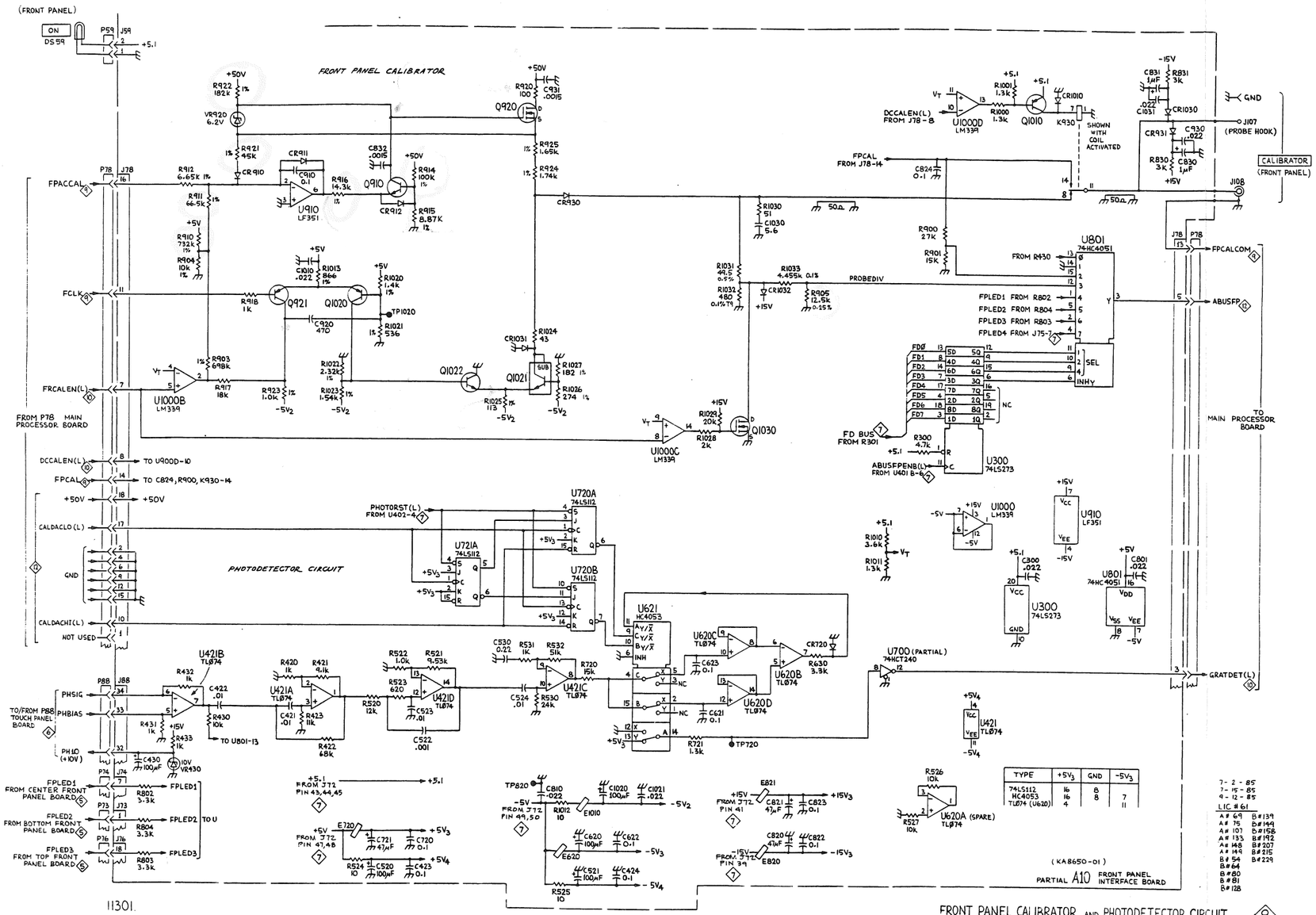


11301

TOUCH PANEL 6


GRAT LIGHTS
TPSTROBE
TPCLK
FROM P72 MAIN PROCESSOR BOARD
TPCTRL
GND
U221 4096
R210 10k
R211 10k
R214 10k
R212 10k
SYNC TP222
U320 74LS374
U420 74LS374
U321 74LS374
U401D 74LS32
R500 220
U120 74HC4051
U121 74HC4051
U220 74HC4051
PTX0
PTX1
PTX2
PTX3
PTX4
PTX5
PTX6
PTX7
PTX8
PTX9
PTY0
PTY1
PTY2
PTY3
PTY4
PTY5
FROM P87 TOUCH PANEL BOARD
PTY6
PTY7
PTY8
PTY9
PTY10
PTY11
PTY12
PTY13
R213 120
TP220 LED LT5
LEDCOM
TO P88 TOUCH PANEL BOARD
LX0
LX1
LX2
LX3
LX4
LX5
LX6
LX7
LY0
LY1
LY2
LY3
LY4
LY5
LY6
LY7
LY8
LY9
LY10
LY11
LY12
LY13
TP120
C111 .001
R120 1k
TOUCH PANEL ADJUST
R114 47
R116 5.1k
R117 1k
CR210
CR211
U110B TL072
R115 10k
R112 10k
R111 10k
U110A TL072
R113 3.3k
CR110
R110 200
TP100
TPDATA
KEY06
CAMERA RESET
CR231
R130 10k
CR230
Q610
R710 10k
R612 2k
R611 1k
U501A 74LS03
U501B 74LS03
U501C 74LS03
U501D 74LS03
R501 1k
R510 2k
R610 2k
R511 3.3k
U700 (PARTIAL) 74HCT240
U500 74LS156
PHOTORST(L) TO U720, U721
TO J75-1
FROM P72 PROCESSOR BOARD
FA1
FA2
FA3
FA4
FEN(L)
FA5
FA6
U401B 74LS32
U401A 74LS32
U401C 74LS32
TO U400 - 1, 19
ABUSFPENB(L) TO U300-11
LEDCLK TO J75-6
KEY4
KEY3
KEY2 ?
KEY1 ?
LEDCLK
SPARE
KEY0
TO P73 BOTTOM FRONT PANEL BOARD
TO P76 TOP FRONT PANEL BOARD
TO P34 CENTER FRONT PANEL BOARD
PARTIAL A10 FRONT PANEL INTERFACE BOARD (KA8650-01)
11301
FUTURE PROBE POWER OPTION
+5V FUSED
-15V
+15V
FROM P57 REGULATOR BOARD
C131 47µF
C130 0.1
C132 0.1
CAMERA +15V
CAMERA GND
PTCOM
TO P87 TOUCH PANEL BOARD
FROM P58 FRONT PANEL INTENSITY KNOB
KNBA2
KNBB2
KNBA1
KNBB1
KNBA0
KNBB0
R700 100k
R701 100k
R702 100k
R703 100k
R704 100k
R705 100k
U700 (PARTIAL) 74HCT240
TO P72 MAIN PROCESSOR BOARD
FROM P73 BOTTOM FRONT PANEL BOARD
KEY07
KEY06
KEY05
KEY04
KEY03
KEY02
KEY01
KEY00
FROM P74 CENTER FRONT PANEL BOARD
FROM P76 TOP FRONT PANEL BOARD
KEY BUS TO J75
TO P74 CENTER FRONT PANEL BOARD
FD0
TO P73 BOTTOM FRONT PANEL BOARD
FD1
FD2
TO P76 TOP FRONT PANEL BOARD
FD3
TO P72 MAIN PROCESSOR BOARD
FD4
FD5
FD6
FD7
FD BUS TO U300
TYPE | +5.1 | GND
74LS03 | 14 | 7
74LS32 | 14 | 7
74LS156 | 16 | 8
74HCT240 | 20 | 10
74LS240 | 20 | 10
74LS374 | 20 | 10
+5V1 | -5V1 | GND
74HC4051 | 16 | 7 | 8
4094 | 16 | 8 | 8
TL072 | 8 | 4
R410 4.7k
U400 74LS240
R301 33
FROM U401A-3
-15V
+15V
R600 1k
C600 47µF
C700 .022
+5V
E200
C210 47µF
C110 .022
C221 .022
TP221 TP420
-5V
E201
C211 47µF
C112 .022
C200 47µF
C320 C321 C400
C401 C420 C500 C501
FROM P72 PROCESSOR BOARD
KEY2 FROM U500-11
FD4 FROM R301-4
LEDCLK FROM U401C-8
KEY BUS
REVISIONS
A # 61
A # 107
A # 148
B # 64
B # 81
B # 167
FRONT PANEL CONTROL 7

FRONT PANEL CALIBRATOR AND PHOTODETECTOR CIRCUIT



FRONT PANEL CALIBRATOR AND PHOTODETECTOR CIRCUIT 8

KERNEL TEST CIRCUIT

DIAGNOSTIC JUMPERS

PROGRAMMABLE INTERRUPT CONTROLLER

PROGRAMMABLE INTERVAL TIMERS

BUS INTERFACE UNIT

CHIP SELECT UNIT

PROGRAMMABLE DMA UNIT

OSCILLATOR

CUT STRAP PIN 1 & 2 FOR 27512

TEST POINT (FOR SIGNAL ANALYSIS)

CIRCUIT BOARD TOP VIEW

CIRCUIT BOARD BOTTOM VIEW

SEE PARTS LIST FOR SEMICONDUCTOR TYPES

TYPE	+5.1	GND
74LS03	14	7
74LS04	14	7
74LS32	14	7
74LS373	20	10
27512	28	14

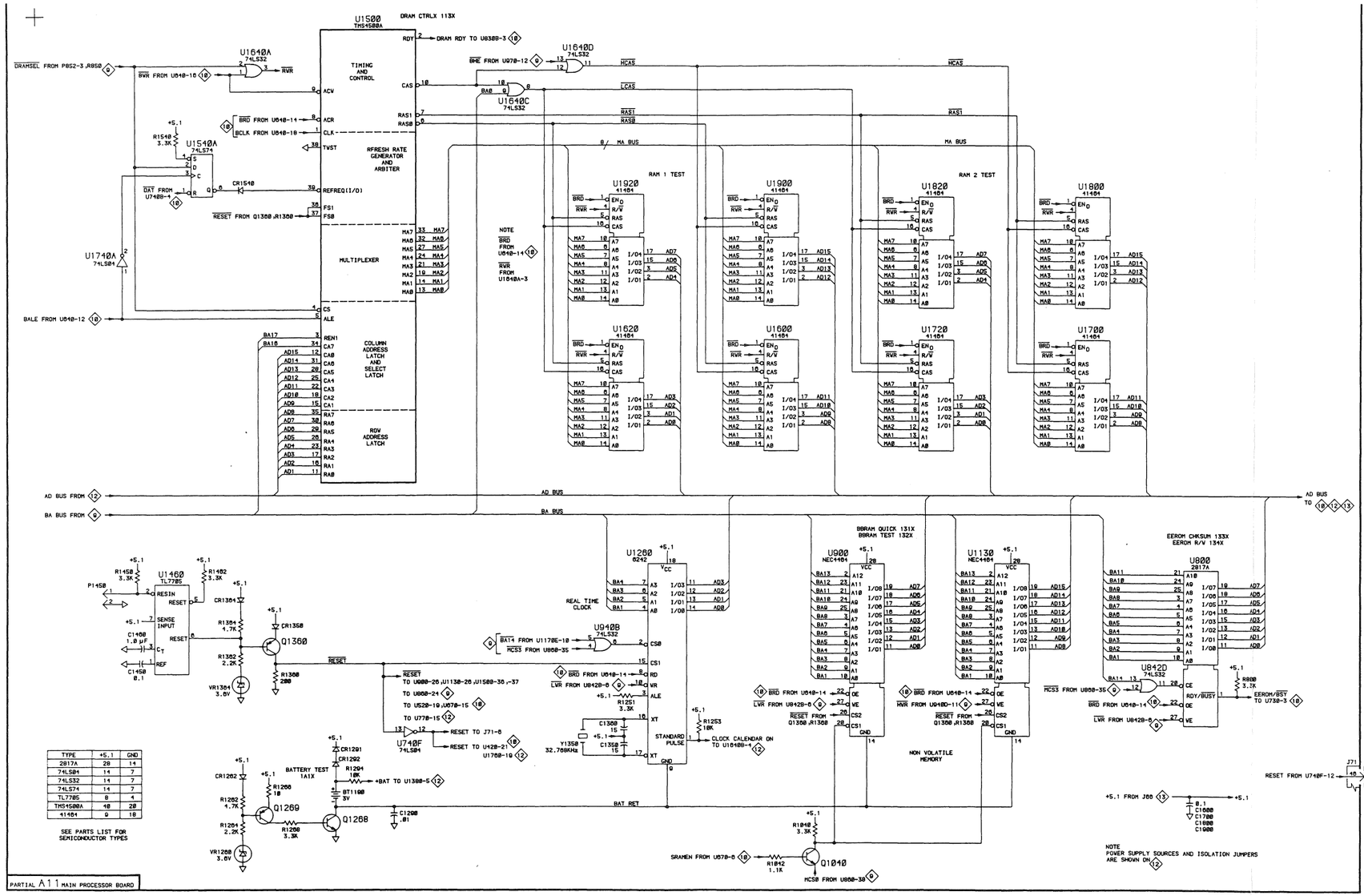
NOTE: POWER SUPPLY SOURCES AND ISOLATION JUMPERS ARE SHOWN ON (12)

PARTIAL A11 MAIN PROCESSOR BOARD

11301

KERNEL (9)

TYPE	+5.1	
1488	14	7
74LS00	14	7
74LS04	14	7
74LS11	14	7
74LS32	14	7
74LS74	14	7
74LS138	16	8
74LS244	20	10
74LS245	20	10
74LS251	16	8
74LS259	16	8
74LS393	14	7
75188A	20	10
75161A	20	10
8251A	26	4
TMS9914A	40	20



TYPE	+5.1	GND
2817A	28	14
74LS04	14	7
74LS32	14	7
74LS74	14	7
TL7705	8	4
TMS4500A	40	20
41464	9	18

TP1420
TP1520
TP1630
TP1570
P98
-58V
NC
+15V
V1201
R1402 10
C1580 47 µF
C1582 0.1
+15V1
+5V
V1350
R1380 10
C1380 47 µF
C1400 0.1
+5V1
FROM J88 PLUG-IN INTERFACE BOARD 1
V1280
R1202 10
C1280 47 µF
C1300 0.1
-5V1
R1402 10
C1482 47 µF
C1500 0.1
-15V1
V1202
-15V
J70
TO DIGITAL OPTION BOARD
+5.1 FROM J88 13
J72 P72
TO P72 FRONT PANEL INTERFACE BOARD 7
U1700
CIRCUIT BOARD TOP VIEW
CIRCUIT BOARD BOTTOM VIEW
SDI TEST 12XX
TO/FROM P71 SCOPE LOGIC BOARD 10
SHCLK 8
F PANEL CTRL TEST 16XX
FROM P72 FRONT PANEL INTERFACE BOARD 7
KNBA8
KNBB8
KNBA1
KNBB1
KNBA2
KNBB2
TPDATA
FROM P98 PLUG-IN INTERFACE BOARD 1
RIGHT SDI PI TO MF
CENTER SDI PI TO MF
LEFT SDI PI TO MF
PARTIAL R1504 3.3K
PARTIAL R1508 100
CR1872
CR1882
CR1870
CR1883
CR1873
CR1871
+5.1
U1760 SDI
HEATSINK
Vcc
ED7
ED6
ED5
ED4
ED3
ED2
ED1
ED0
ACVSCLK
ACVSDATA
KNBA8
KNBB8
KNBA1
KNBB1
KNBA2
KNBB2
TPDATA
ATOMFSDI
RTOMFSDI
LTOMFSDI
EAV
CTRLDATA
EXTSEL
CALDACHI
CALDACLO
CALRANGE
ROCSEL
ACVSDATA
TPCLK
TPCTRL
TPSTROBE
MFTOLSDI
MFTORSDI
MFTOASDI
SDIDLK
CLKIOUT
R1752 100
U1560A 74LS04
U1560F 74LS04
2MHz FROM R870
R1850 100
J71 P71
2MHz
EAV
CTRLDATA
EXTSEL
CALDACHI
CALDACLO
CALRANGE
ROCSEL
SHDATA
TP P71 SCOPE LOGIC BOARD
J76 P70
CALDACHI 8
CALDACLO
TO FRONT PANEL INTERFACE BOARD
J72 P72
TPCLK
TPCTRL
TPSTROBE
7
P98
LEFT SDI MF TO PI
CENTER SDI MF TO PI
RIGHT SDI MF TO PI
R1502 200
R1504 200
R1505 200
U1560B 74LS04
U1560E 74LS04
U1560C 74LS04
RIGHT SDI CLK
LEFT SDI CLK
CENTER SDI CLK
TO/FROM J88 PLUG-IN INTERFACE BOARD 1
+5V
DCPWRSV
PWRCOM
J88 P88
ON
STANDBY
(FRONT PANEL)
J78 P78
+5BV
GND 8
TO FRONT PANEL INTERFACE BOARD
J72 P72
GND 7
BA BUS FROM 9
BA1
BA2
BA3
SEL
U770 74LS259
RESET FROM Q1360,R1360 11
R
LATCH2SEL FROM U788-12 10
LWR FROM U842B-6 9
EN
D
U870D 74LS32
CDB FROM U540-18 13
D0
D1
D2
D3
D4
D5
D6
D7
AMUX0
AMUX1
AMUX2
AMUX3
NM1/EN TO U838A 6
DISP/EN TO U838A 4
2MHz FROM U588-4 10
U1740C 74LS04
U870B 74LS32
U1640B 74LS32
U980D 74LS00
R870 100
2MHz TO J71-58
COUNTER-TIMER MUX
CLOCK CALENDAR ON FROM U1200-1,R1253 11
SAMPL HLD
TP1500
U980B 74LS00
U1280 74HC4051
SEL
INH
Y
LEFT 11K DETECTOR
CENTER 11K DETECTOR
RIGHT 11K DETECTOR
L11KDET
C11KDET
R11KDET
XPOS FROM R158
XRO FROM R152
PLUS POS FROM R138
MINUS POS FROM R131
R1200 1K
R1404 10K
FROM J98 PLUG-IN INTERFACE BOARD 1
GND
FROM P71 SCOPE LOGIC BOARD
ABUSTB
ABUSCAL
ABUSCRT
ABUSTB
ABUSCAL
ABUSCRT
FROM P78 FRONT PANEL INTERFACE BOARD 8
NOT USED
ABUSFP
ABUSFP
ABUSV FROM P52-5 VERTICAL BOARD 14
ABUSV
+BAT FROM R1204 11
R1402 10
TP1300
C1402 .047
SAMPLE AND HOLD
U1590 LF398AN
V OFF
V+
V-
IN
LREF
R1502 510
R1504 24K
R1506 130K
R1508 10K
C1600 1000
U1380 74HC4051
U1600 AD574
A0
R/C
VLOGIC
12/8
CONTROL
CS
CE
3-STATE OUTPUT BUFFERS
(LSB)DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
DB8
DB9
DB10
(MSB)DB11
10V IN
20V IN
ANALOG COMMON
DIGITAL COMMON
DAC AND VOLTAGE REFERENCE
BIP OFF
REF OUT
REF IN
VSS
OFFSET R1502 100
R1500 100 GAIN
A/D CONVERTER TEST 15XX
U1560D 74LS04
STS
R1708 3.3K
ADC RDY TO U838-5 10
R1702 3.3K
PCS1 FROM U888-27
DAT FROM U748-1 10
U650D 74LS32
U1170A 74LS04
BALE FROM U648-12
DVR FROM U758-5
BRD FROM U648-14
BCLK FROM U648-18
MCS1 FROM U888-37
RESET FROM U748F-12 11
ALE
WR
RD
CLK
SEL
RESET
INT
AD BUS TO/FROM 10 11 12
TP1700 SDIINT
SDIINT TO U888-41 9
PV1 TO U378F-13
PV2 TO U378E-11
PV3 TO U378C-5
PV4 TO U378D-9
AD BUS TO 11 12
BEEP EN FROM U578-12 10
U980A 74LS00
R1888 1K
C1888 0.1
Q1888
LS1888
CR1888
R1898 10K
+5.1 FROM J66 12
C1578 0.1
U1380 74HC4051
U1280 74HC4051
C1292 0.1
C1294 0.1
-5V1
TYPE | +5.1 | ⏚
74LS00 | 14 | 7
74LS04 | 14 | 7
74LS32 | 14 | 7
74LS259 | 16 | 8
SEE PARTS LIST FOR SEMICONDUCTOR TYPES
PARTIAL A11 MAIN PROCESSOR BOARD
11301
SDI AND ABUS 12

DISPLAY CONTROL TEST
18XX

DISPLAY MEMORY TEST
17XX

DISPLAY OUTPUT TEST
19XX

NOTE: POWER SUPPLY SOURCES AND ISOLATION JUMPERS ARE SHOWN ON (12)

SEE PARTS LIST FOR SEMICONDUCTOR TYPES

TYPE	+5.1	⏚
4418	9	18
74LS00	14	7
74LS32	14	7
74HC84	14	7

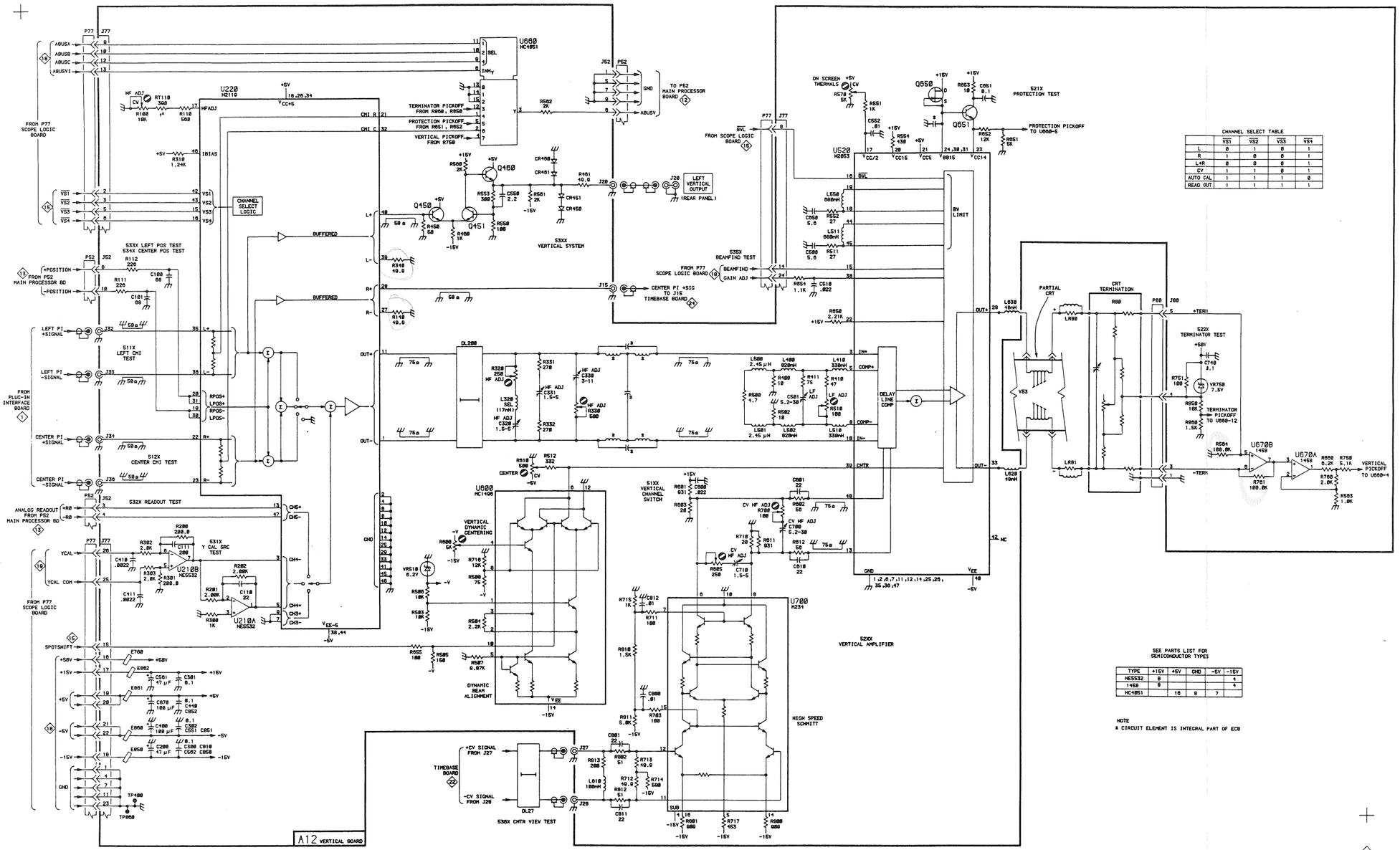
CIRCUIT BOARD TOP VIEW

CIRCUIT BOARD BOTTOM VIEW

PARTIAL A11 MAIN PROCESSOR BOARD

11301

READOUT 13



CHANNEL SELECT TABLE

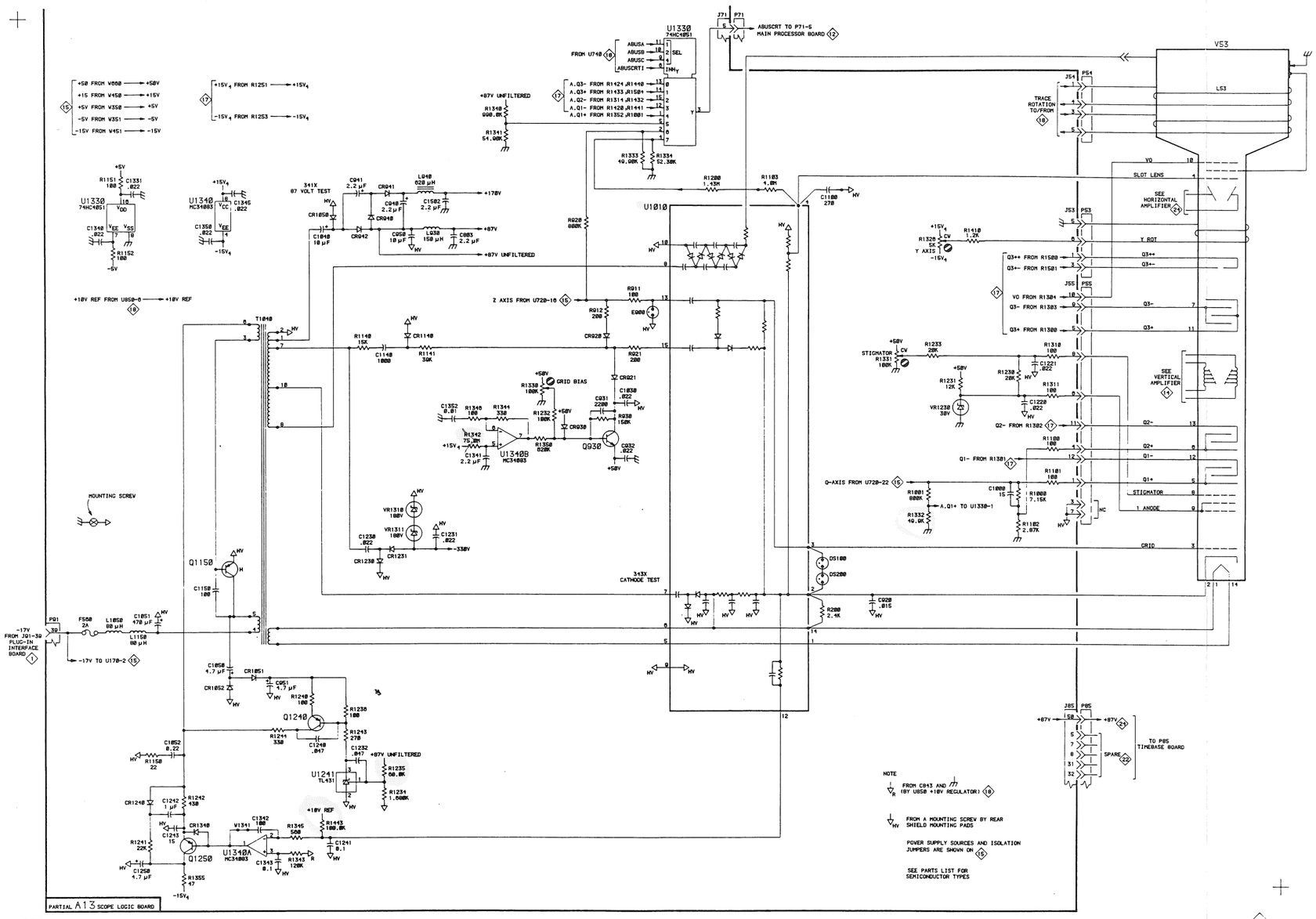
	VS1	VS2	VS3	VS4
L	0	1	0	1
R	1	0	0	1
L+R	0	0	0	1
CV	1	1	0	1
AUTO CAL	1	1	1	0
READ OUT	1	1	1	1

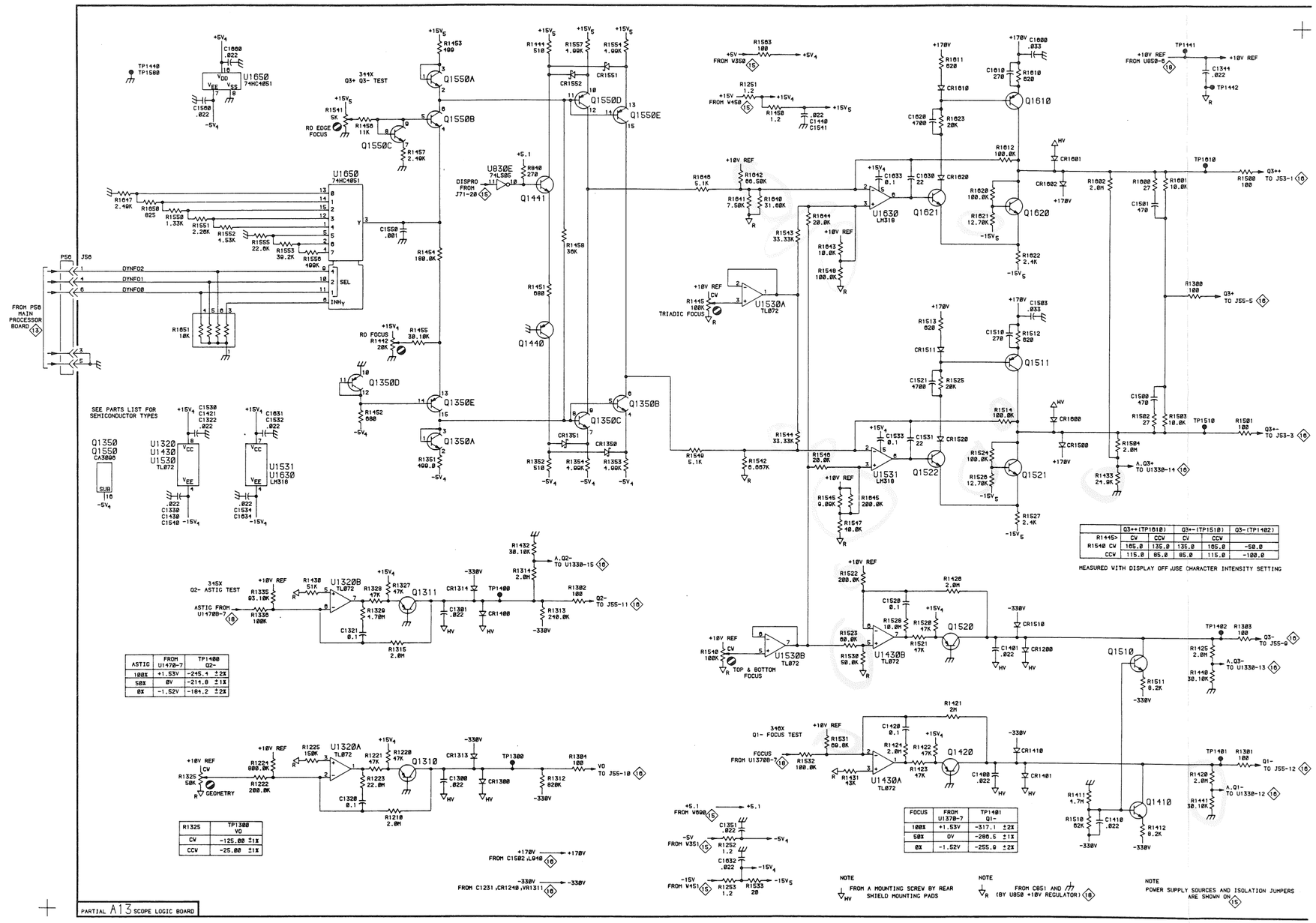
SEE PARTS LIST FOR SEMICONDUCTOR TYPES

TYPE	+15V	+5V	GND	-5V	-15V
NE5532	8				4
1458	8				4
HC4051		16	8	7	

NOTE
& CIRCUIT ELEMENT IS INTEGRAL PART OF ECB

Z AXIS
U720
Z-AXIS HYBRID
EXP AMPS
REALTIME OSCILLOSCOPE CONTROL SYSTEM
8MHz OSCILLATOR
U270
M381A
8MHz CLOCK INPUT
NOT USED
2-AXIS CONTROL
U630
DAC80
INTENSITY DAC
U581
PAL16R4
U580
74LS174
U650
LF351
U830
74LS05
U831
74S32
U831
74LS32
U530
74HC4051
HORIZONTAL DISPLAY CONTROL
VERTICAL DISPLAY CONTROL
COUNTER TIMER CONTROL
TIMEBASE CONTROL
TRIGGER SELECT CONTROL
PLUG-IN CONTROL
DISPLAY CONTROL
MICROPROCESSOR INTERFACE
SWEEP CONTROL
U270 SOCKET TOP VIEW
U270 CIRCUIT BOARD BOTTOM VIEW
SEE PARTS LIST FOR SEMICONDUCTOR TYPES
PARTIAL A13 SCOPE LOGIC BOARD
PARTIAL A11 MAIN PROCESSOR BD
PARTIAL A10 FRONT PANEL INTERFACE BD
PARTIAL A7 TOUCH PANEL BD
CONTROL SYSTEM AND Z AXIS 15


+5V FROM V6S8 → +5V
+15 FROM V4S8 → +15V
+5V FROM V3S8 → +5V
-5V FROM V3S1 → -5V
-15V FROM V4S1 → -15V
+15V4 FROM R12S1 → +15V4
-15V4 FROM R12S3 → -15V4
U1330 74HC4051
U1340 MC34083
+10V REF FROM U8S8-6 → +10V REF
MOUNTING SCREW
-17V FROM J01-39 PLUG-IN INTERFACE BOARD
-17V TO U17B-2
+87V UNFILTERED
+178V
-338V
+87V
-15V4
+15V4
+5V
-5V
+10V REF
Z AXIS FROM U72B-16
Q-AXIS FROM U72B-22
A.Q3- FROM R1424,R1440
A.Q3+ FROM R1433,R1584
A.Q2- FROM R1311,R1432
A.Q1- FROM R1428,R1441
A.Q1+ FROM R1352,R1881
FROM U74B
ABUSCRT TO P71-6 MAIN PROCESSOR BOARD
TRACE ROTATION TO/FROM
SLOT LENS
SEE HORIZONTAL AMPLIFIER
SEE VERTICAL AMPLIFIER
Y ROT
Y AXIS
STIGMATOR
1 ANODE
GRID
Q3++ FROM R1580
Q3+- FROM R1581
VD FROM R1324
Q3- FROM R1303
Q3+ FROM R1300
Q2- FROM R1302
Q1- FROM R1301
A.Q1+ TO U1330-1
GRID BIAS
341X 07 VOLT TEST
343X CATHODE TEST
TO P85 TIMEBASE BOARD
SPARE
NOTE
FROM C843 AND (BY U85B +10V REGULATOR)
FROM A MOUNTING SCREW BY REAR SHIELD MOUNTING PADS
POWER SUPPLY SOURCES AND ISOLATION JUMPERS ARE SHOWN ON
SEE PARTS LIST FOR SEMICONDUCTOR TYPES
PARTIAL A13 SCOPE LOGIC BOARD



ASTIG	FROM U1470B-7	TP1400 Q2-
100X	+1.53V	-245.4 ±2%
50X	0V	-211.0 ±1%
0X	-1.52V	-184.2 ±2%

R1325	TP1300 VO
CV	-125.00 ±1%
CCV	-26.00 ±1%

FOCUS	FROM U1370-7	TP1401 Q1-
100X	+1.53V	-317.1 ±2%
50X	0V	-286.5 ±1%
0X	-1.52V	-255.9 ±2%

R1445>	Q3++(TP1610) CV	Q3++(TP1610) CCV	Q3+-(TP1510) CV	Q3+-(TP1510) CCV	Q3-(TP1402)
R1540 CV	165.0	135.0	135.0	165.0	-50.0
CCV	115.0	85.0	85.0	115.0	-100.0

MEASURED WITH DISPLAY OFF,USE CHARACTER INTENSITY SETTING

PARTIAL A13 SCOPE LOGIC BOARD

11301

FOCUS CIRCUIT 17

U740
8751
PORT 0
PORT 1
PORT 2
PORT 3
ABUSA
ABUSB
ABUSC
ABUSCRT1
ABUSVI
ABUSA1
BEAMFIND
U750
DAC0812
321X
ACVS D/A TEST
ACVS GAIN ADJUST
+18V REF
CURRENT SWITCHES
REFCOM2
TO J8S-26
MULTIPLEXERS
U1000
U1270
U1570
U870
U880
U881
U1070
U1170
U1180
U1370
U1470
U1571
74HC4051
SEE PARTS LIST FOR SEMICONDUCTOR TYPES
SAMP HOLD SECTION
U1571B
U1070C
U880A
U880C
U1070D
U1070A
U880B
U880D
U1470A
U1560
TDA2030A
U1470D
U1470C
U1470B
U1370A
GRAT ILLUM
TRACE ROTATION
HOADJA
ASTIC
FOCUS
HYSTERESIS A
HYSTERESIS B
Z CONT
U881B
U881D
U881A
U881C
U1070B
U1370C
U1370D
U1170A
U1170C
U1180D
U1180B
U1180A
U1180C
U1370B
U1170D
U1170B
U1571C
U1571D
U1571A
U1280
VR980
3V
-1.25V
TIMREFA
TIMREFB
TRIGLEVA
TRIGLEVB
TRIGLEVB1
HORPOSA
HORPOSB
A EXT OS
B EXT OS
X1 SWP GAIN
X10 SWP GAIN
X10 HOR GAIN
DLYREFA-H
DLYREFB-H
DLYREF1-H
DLYREFB-X
DLYREFB-L
DLYREF1-L
SPARE
X10 SWP GAIN B
TO P77 VERTICAL BOARD
TO P80 TIMEBASE BOARD
TO/FROM P71 MAIN PROCESSOR BOARD
TIMING AND CONTROL
U830C
74LS86
ACVS TROUBLE
DS838
U850
LT1021CCH8-10
+18V REF
NOTE: POWER SUPPLY SOURCES AND ISOLATION JUMPERS ARE SHOWN ON
FROM C843 AND (BY U850 +18V REGULATOR)
FROM J80-25
U1560
TDA2030A
ACVTEST1
PARTIAL A13 SCOPE LOGIC BOARD
11301
ANALOG CONTROL VOLTAGE SYSTEM 18

ED BUS

ED BUS TO U270 (15)

CAL VOLTAGE REFERENCE D TO A

TO P84 TIMEBASE BOARD (22, 28)

U250 74LS273

CAL VOLTAGE REFERENCE ATTENUATORS

331X DAC TEST

U230 DAC811

U110B 74LS139

332X 1ST ATTEN TEST

U210 DG211

U110A 74LS139

333X CAL OUT TEST

U310 DG211

U220 HA5315

U311 OP-227

U230 DAC811

U220 HA5135

U430 74HC4051

FROM MAIN PROCESSOR BOARD (3)

SPARE

CALDACLO (12)

CALDACHI (12)

FPCALCOM (9)

CALRANGE

INPUT LATCH

D/A LATCH

12-BIT D/A CONVERTER

18V RANGE .25

VOLTAGE REFERENCE

OFFSET

GAIN

U430 74HC4051

FROM J01 PLUG-IN INTERFACE BOARD (1)

LEFT CAL COM

CENTER CAL COM

RIGHT CAL COM

FROM U250

U311B OP-227

NOTE
POWER SUPPLY SOURCES AND ISOLATION JUMPERS ARE SHOWN ON (15)

U311A OP-227

Q421

Q420

CR320

CR220

TP320

R331 51

C431 .01

R430 10K

L430 820 µH

TP421

CAL TO J01-3 PLUG-IN INTERFACE BOARD (1)

R220 4.53K

R225 50.8

R224 3.32K

C121 .022

C120 .001

FPCAL

FPACCAL

TO P71 MAIN PROCESSOR BOARD (6)

R328 200

R323 51

R321 1K

R322 51

R431 150

R332 150

C210 .01

R411 3.3K

R421 20.00K

R420 18.00K

U530 74HC4051

GND REF

ACOM

DAC OUT

PROG AMP OUT

CALOUT1

U500 AD592

TEMP SENSE

R521 10.00K

FROM U748 (18)

ABUSCI

ABUSA

ABUSB

ABUSC

ABUSCAL FROM U128B-3 (18)

ABUSCAL TO P71 MAIN PROCESSOR BOARD (12)

R538 5.00K

R227 5.00K

R238 1.530K

R540 1.530K

C533 .047

C540 .047

YCAL COM

YCAL

XCAL

XCAL COM

TO P77 VERTICAL BOARD (14)

TO P85 TIMEBASE BOARD (24)

R223 20K

R523 10K

R220 20K

R522 10K

TP518

L458 15 µH

C448 100 µF

C442 0.1

C443 100 µF

C432 0.1

L451 15 µH

L358 15 µH

C348 47 µF

C341 0.1

C342 47 µF

C441 0.1

C240 .022

L351 15 µH

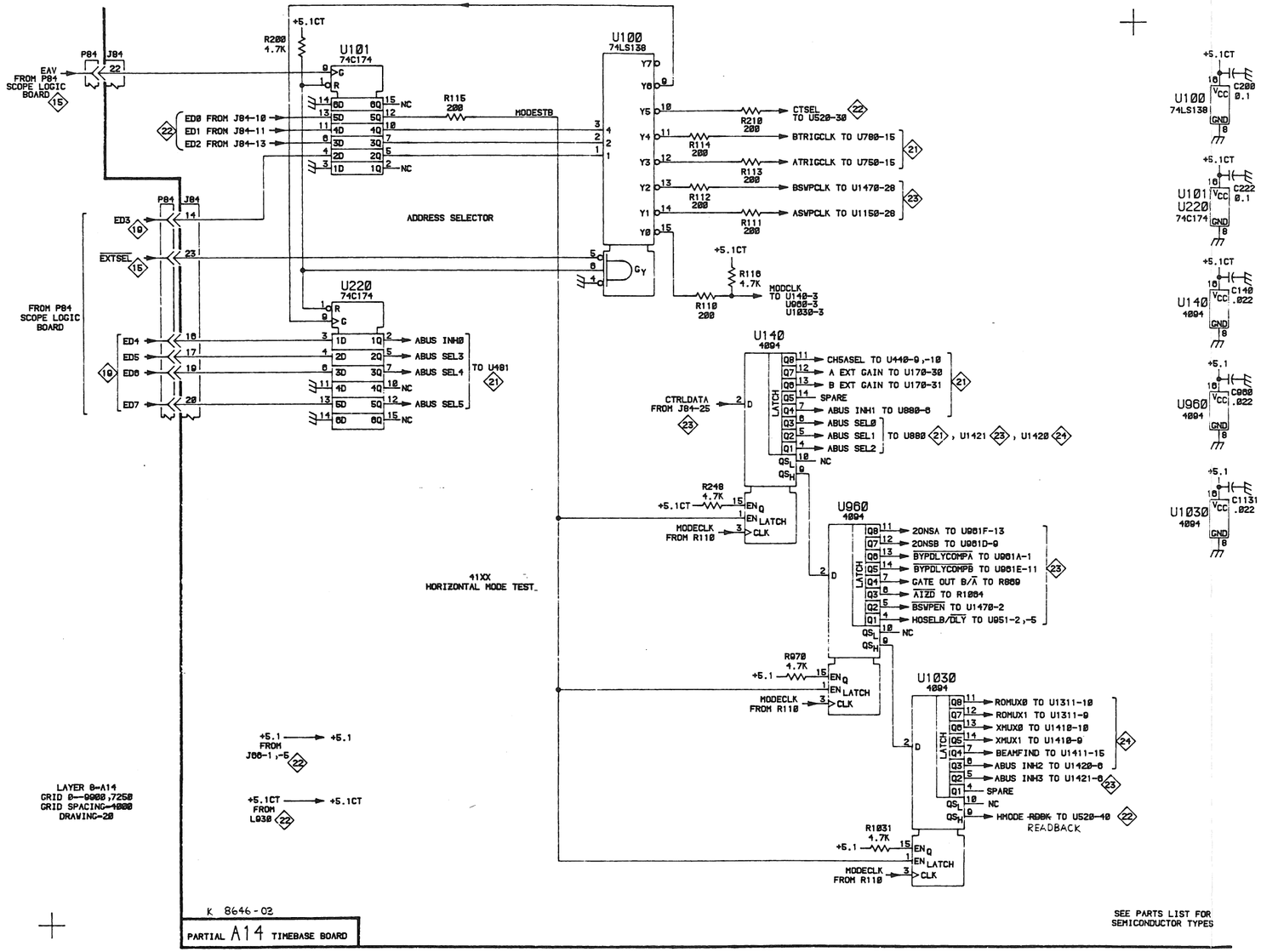
TYPE	+5V$_S$	GND	+15V$_S$	-15V$_S$	-5V$_S$
DG211	12	5	13	4	
74LS139	16	8			
74LS273	20	10			
74HC4051	16	8			7

SEE PARTS LIST FOR SEMICONDUCTOR TYPES

PARTIAL A13 SCOPE LOGIC BOARD

11301

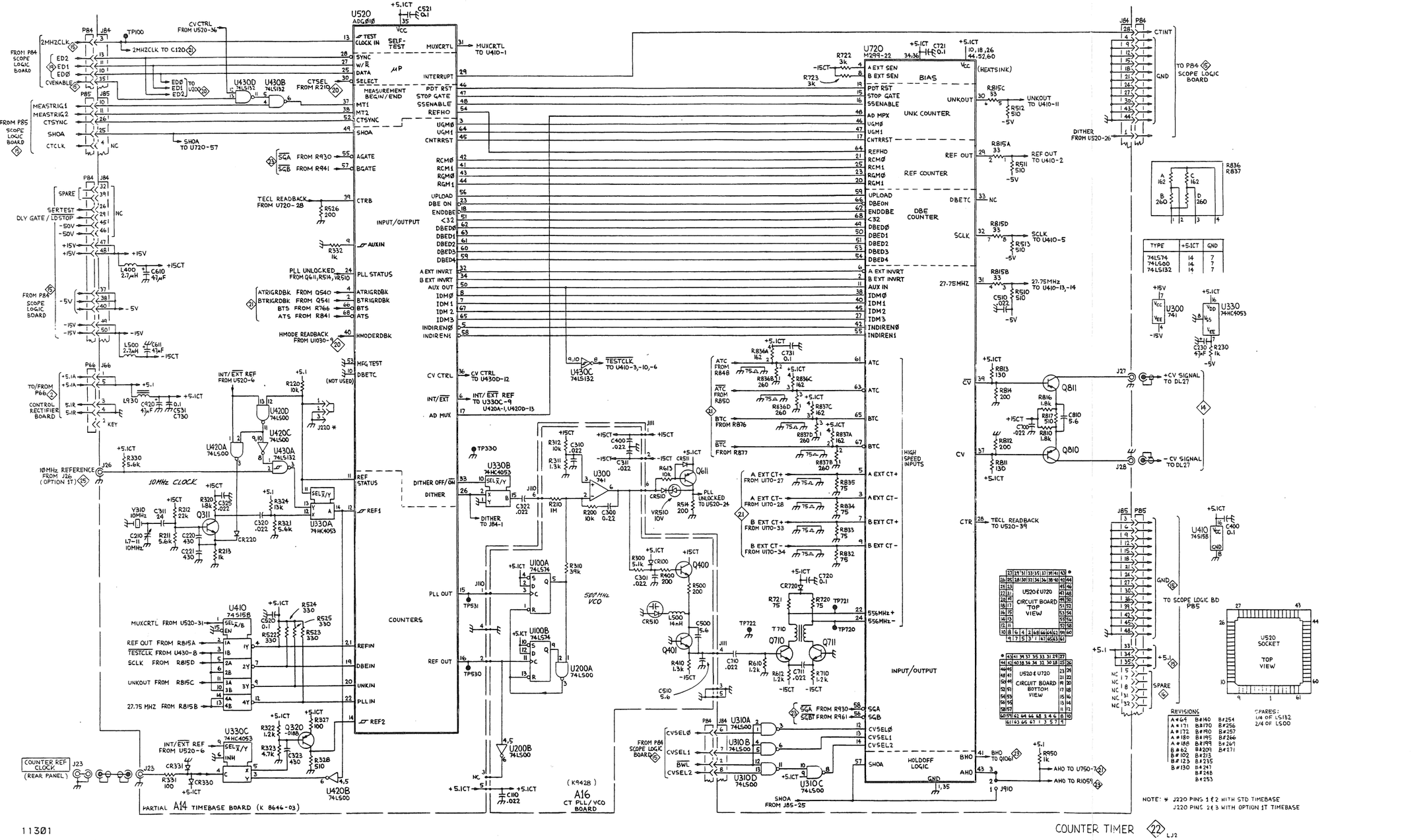
CALIBRATOR VOLTAGE REFERENCE (19)



11301

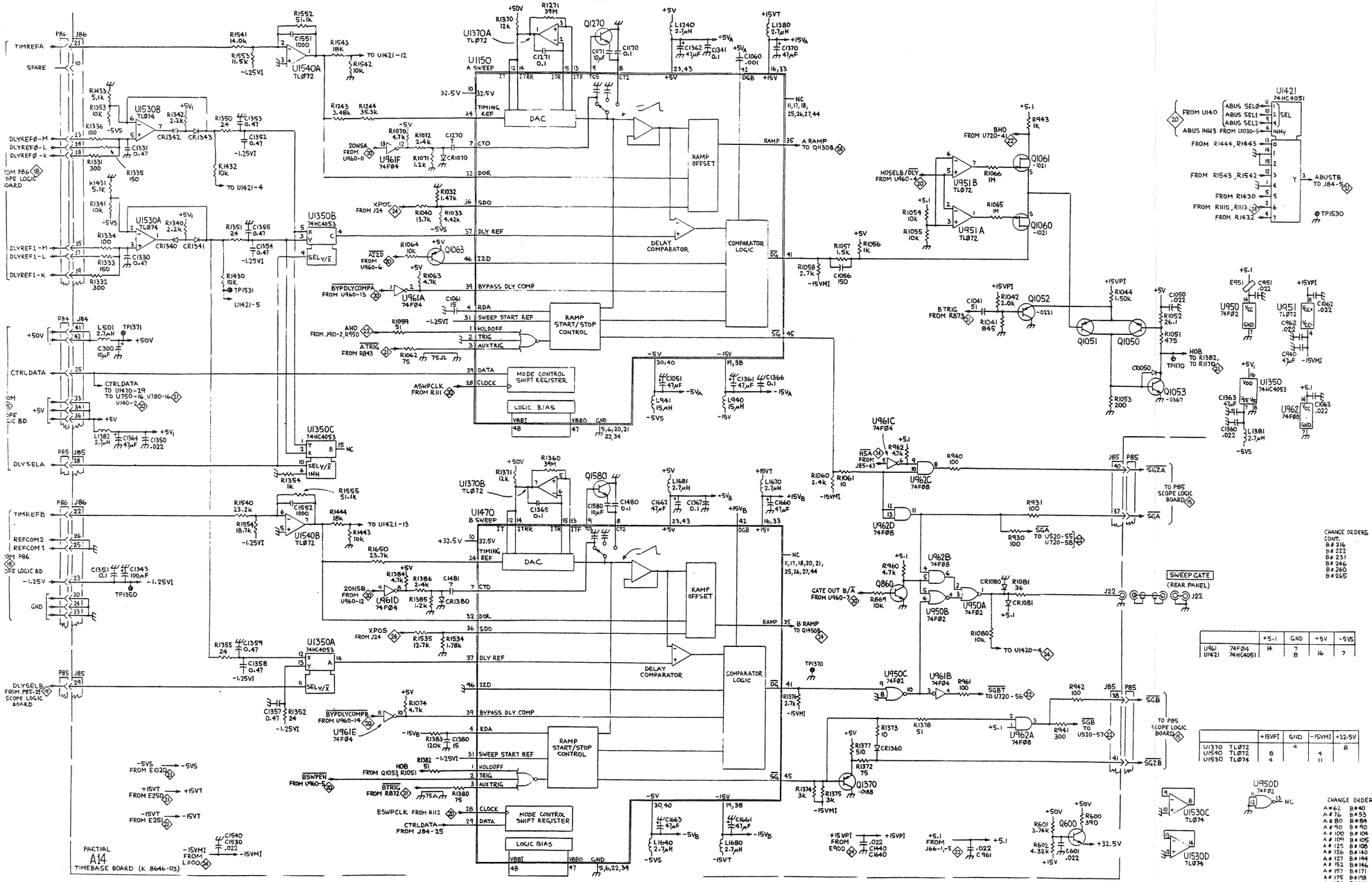
TIMEBASE MODE CONTROL 20

P86 J86
GND
GND
GND
GND
+1.5356V
+1.53V
FROM P86 (SCOPE LOGIC BD)
A EXT OS
R247 6.19k 1%
R246 6.19k 1%
C241 4700
R243 10.1k
R251 100
C252 0.1
U240B TL072
R242 10k
+1.53V
A
(EVENT START)
J105
+5VT
R386 9.09k
CR383
R384 5.1k
CR380
R290 100
C280 0.1
A EXT PRB CODE TO U481-1
R291 24
C281 2.7
R382 100
U480 741
R371 10.44k
R380 10.44k
C380 0.1
-5VT
+15VT
R381 7.5k
R480 5.6k
Q3705
R372 300
R370 2k
C371 0.1
C370 0.1
C370 47µF
+5VF
+5VT
L250 2.7µH
C253 0.1
C250 47µF
-5VT
L150 2.7µH
C160 0.1
C350 47µF
+5V
+5V
+5V
A OFFSET
A EXT CT+
A EXT CT-
TO U720-5
TO U720-3
A IN
1M
÷1
÷5
-5V
A TRIG OUT-
75Ω
U170 EXTERNAL INPUTS PREAMP
GAIN LOGIC
FROM U140
A EXT GAIN
B EXT GAIN
A GAIN
B GAIN
P86 J86
TRIGLEVA
TO R760
FROM P86 (SCOPE LOGIC BD)
B EXT OS
+1.53V
R245 ∞.196 1%
R244 0.196 1%
C240 4700
R240 10.1k
R250 100
U240A TL072
R241 10k
C251 0.1
B
(EVENT DELAY)
J106
+5VT
R385 9.09k
CR382
R383 5.1k
CR381
R191 100
C290 0.1
B EXT PRB CODE TO U481-15
R190 24
C180 2.7
R180 100
B OFFSET
B EXT CT+
B EXT CT-
TO U720-7
TO U720-9
B IN
1M
B TRIG OUT-
NC
2,11
-5V
GND
C470 47µF
C282 0.1
L380 2.7µH
-5VT
3,4,5,6,8,9,10,18,19,20,21,22,23,24, 37,38,39,40,41,42,43,13,14,15,16,45,46,47,48
P85 J85
FROM P85 (SCOPE LOGIC BD)
SELØA
SEL1A
SEL2A
TO U750-18
TO U750-20
TO U750-21
+TRIGGER FROM J05
-TRIGGER FROM J06
RIGHT PI
J05
J06
T540
R546 6.04k
R542 6.04k
U441 NE5534
R545 1.21k
R544 1.21k
R547 178
R543 178
R540 10k
C541 .022
RT TRIG COMMD TO U880-14
+TRIGGER FROM J01
-TRIGGER FROM J02
LEFT PI
J01
J02
T461
R464 6.04k
R462 6.04k
U442 NE5534
R466 1.21k
R460 1.21k
R463 178
R461 178
R450 10k
C451 .022
LFT TRIG COMMD TO U880-13
TP460
+TRIGGER FROM J03
-TRIGGER FROM J04
CENTER PI
J03
J04
T460
R568 6.04k
R562 6.04k
U460 NE5534
R569 1.21k
R563 1.21k
R567 178
R561 178
R460 10k
C462 .022
CTR TRIG COMMD TO U880-12
FROM (PLUG-IN INTERFACE BOARD)
P85 J85
SELØB
SEL1B
SEL2B
SLPSEL
TLEVSELB
TO U750-17
P86 J86
TRIGLEVB
HYSTERSIS A
TRIGLEVB1
HYSTERSIS B
FROM P86 (SCOPE LOGIC BOARD)
HYSTERSIS A TO U750-45
R860 390
R861 390
U340A NE5532
R440 10.0k
C441 .001
R342 26.7k
R340 100
CR340
CR350
VM5BT
U340B NE5532
R441 10.0k
C442 .001
R343 26.7k
R341 100
CR341
CR351
VM5BT
R444 10k
SELY/X
U440A 74HC4053
TP780
R781 100
PARTIAL A14 TIMEBASE BOARD (K 8646-03)
11301
P84 J84
LINE TRIG FROM P84-31
(SCOPE LOGIC BOARD)
2MHZCLK FROM J84-3
R121 750
C120 4700
R120 410
R445 100
C341 1µF
R442 1K
INH
SELY/X
U440C 74HC4053
CH5ASEL FROM U140-11
U440B 74HC4053
R446 47
R443 47
C351 .001
TO U780-27
+5VABT
L860 2.7µH
C860 220µF
C861 1µF
VP5AT
6,8,39
+5V
U750
A TRIGGER
NC
25,47
AHO FROM U720-43
7 HOLDOFF
SLPSEL FROM J85-22
17 SLOPE
HYSTERSIS A FROM R860
45 HYST
R761 3.9k
C760 0.1
TRIGLEVA FROM J86-5
R760 100.0
TP760
C663 0.1
R763 210
44 TRIG LEV
ATRIGCLK FROM R113
15 CLK
CTRLDATA FROM J84-25
16 DATA
MODE CONTROL SHIFT REGISTER
SEL0A FROM J85-13
SEL1A FROM J85-14
SEL2A FROM J85-16
18 SELØ
20 SEL1
21 SEL2
CHANNEL SELECT LOGIC
C660 3.3µF
42 AC
26 CH5
27 CH5
28 CH4
24 CH4
34 CH3
35 CH3
30 CH2
31 CH2
32 CH1
33 CH1
COUPLING & FILTERS
COMPARATOR
TRIGGER LATCH
TG 10
TG 11
TS 14
TRIGGER LATCH
TC 2
TC 4
R-S LATCH
R845 30
R846 510
R843 30
R844 510
R841 75
R840 39k
C840 100
R850 30
R851 820
R848 30
R847 820
TP840
ATRIG TO R1062
R842 5.1k
TP860
ATS
ATC
ATC
DATA OUT 23
VP5AT
Q540
ATRIG RDBK
R541 2.2k
SOURCE OUT 40
R680 75
C683 0.1
U680A TL072
TP481
R484 6.2k
R483 3.16k
R482 453
A EXT PRB CODE FROM R384
B EXT PRB CODE FROM R383
FROM U140
ABUS SEL0
ABUS SEL1
ABUS SEL2
ABUS INH1
SEL
INHY
FROM U250
ABUS SEL3
ABUS SEL4
ABUS SEL5
ABUS INHØ
SEL
INHY
U481 74HC4051
U880 74HC4051
CTR TRIG COMMD FROM R460
RT TRIG COMMD FROM R540
LFT TRIG COMMD FROM R450
R880 2k
R481 2k
TPII80
ABUSTB FROM U420, U421
ABUSTB
TO P86
SCOPE LOGIC BOARD
-5V
13,37,48
C661 220µF
C662 1µF
L660 2.7µH
VM5AT
-5VABT
GND
1,3,5,9,12,19,22,24,36,38,41,43,46
+5VABT
L880 2.7µH
C782 220µF
C881 1µF
VP5BT
U780
B TRIGGER
NC
25,47
+5V
SOURCE OUT 40
R681 75
C684 0.1
U680B TL072
TP480
R487 6.2k
R486 3.16k
R485 453
DATA OUT 23
VP5BT
Q541
BTRIG RDBK
R447 2.2k
R877 30
R878 820
R876 30
R875 820
R768 75
R767 39k
C761 100
VP5BT
BTC
BTC
BTS
TS 14
TG 11
TG 10
TRIGGER LATCH
R-S LATCH
TC 2
TC 4
R871 510
R872 30
R874 510
R873 30
B TRIG TO C104
TP861
R870 5.1k
BTRIG TO R1380
R780 3.9k
C781 0.1
HOB FROM R1051
R1170 1K
-5V
13,37,48
220µF C680
L680 2.7µH
-5VABT
C681 1µF
VM5BT
GND
1,3,5,9,12,19,22,24,36, 38,41,43,46
+5VT
U880 74HC4051
C880 .022
C890 .022
-5VT
E250 +15VT
FROM J84-47-48
E140 +5VT
E440 +5VABT
C542 1µF
FROM J84-33,-34,-36
E141 -5VT
E1020 -5VS
E850 -5VABT
FROM J84-37,-38,-40
E251 -15VT
FROM J84-49-50
U340 NE5532
U440 74HC4066
U441 NE5534
U442 NE5534
U460 NE5534
U680 TL072
C340 .022
C350 .022
C444 .022
C450 .022
C460 .022
C670 .022
C440 .022
C443 .022
C540 .022
C550 .022
C461 .022
C671 .022
+15VT
-15VT
VM5BT
+15VT
-15VT
+15VT
-15VT
+15VT
-15V



11301

COUNTER TIMER 22 LJ2



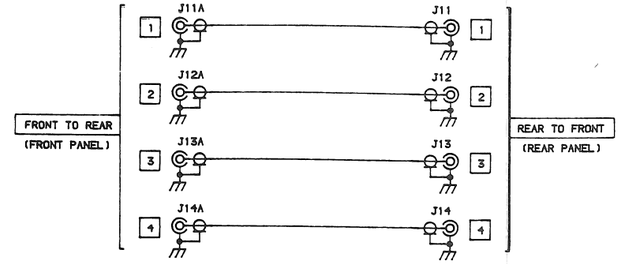
		+5.1	GND	+5V	-5VS
U961 U1421	74F04 74HC4051	14	7 8	16	7

		+15VPI	GND	-15VMI	+32.5V
U1370	TLØ72	8	4	4	8
U1540	TLØ72	8		4	
U1530	TLØ74	4		11	

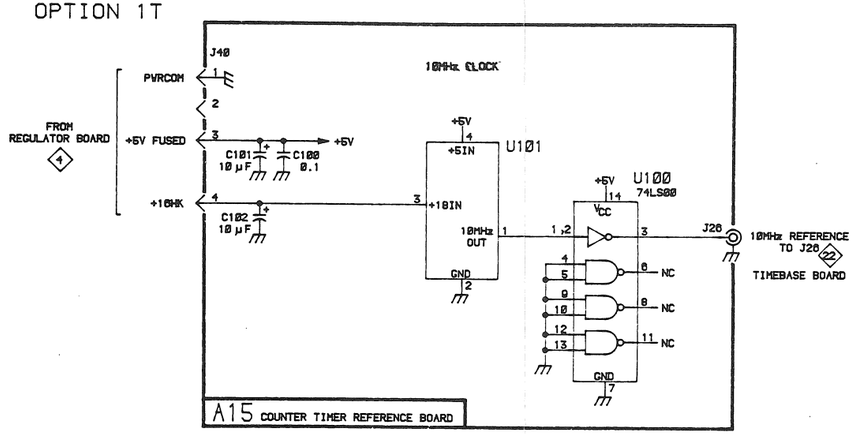
CHANGE ORDERS CONT.
B# 216
B# 222
B# 231
B# 246
B# 260
B# 265

CHANGE ORDER
A#62 B#40
A# 76 B# 53
A# 80 B# 84
A# 90 B# 90
A# 100 B# 104
A# 109 B# 105
A# 125 B# 106
A# 126 B# 140
A# 127 B# 144
A# 152 B# 146
A# 157 B# 171
A# 175 B# 198
A# 190 E# 208

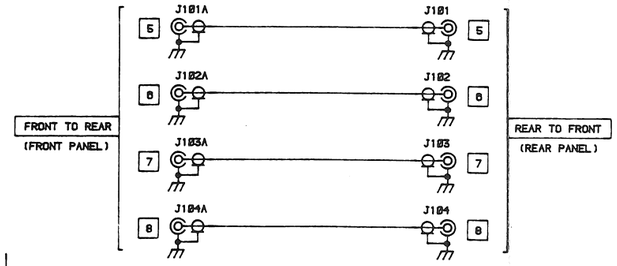
HGAIN1
FROM SCOPE LOGIC BOARD
HGAIN1 TO R900, U1310-9
+87V
TP910
SPOTSHIFT
SPOTSHIFT TO U1520-10
B RAMP FROM U1470-35
TP1410
TO U1420-14
TO U1420-15
XPOS FROM J24 (MAIN PROCESSOR BOARD)
XPOS TO R1040 R1535
TO U1420-12
FROM P85 (SCOPE LOGIC BD)
HSA TO U961C-5
HGAIN0
HORP05B
HORP05A
FROM P86 (SCOPE LOGIC BOARD)
X10 HOR GAIN
X10 SWP GAIN A
X1 SWP GAIN
X10 SWP GAIN B
U1111A NE5532
U1111B NE5532
U1110A NE5532
U1110B NE5532
U1020B NE5532
U1020A NE5532
U1210 74HC4052
U1310 74HC4052
U1410 74HC4052
U1311 74HC4052
U1230B TL072
U1230A TL072
RIGHT P1 + SIGNAL FROM J7
RIGHT P1 - SIGNAL FROM J8
PLUG-IN INTERFACE BOARD
T1600
J30
J31
TO U1421-2
TO U1420-2
CENTER P1 + SIG FROM J15 (VERTICAL BOARD)
J15
XRO FROM J25 (MAIN PROCESSOR BOARD)
J25
TO U1420-1
FROM SCOPE LOGIC BOARD
XCAL COM
XCAL
XY PHASING
FROM U1030
XMUX0 TO J85-49
HGAIN1 FROM J85-47
TO U1420-5
ROMUX0
ROMUX1
FROM U1030
Q1450C Q1450E Q1450B Q1450A Q1450D
Q1130B Q1130A Q1130D Q1130E Q1130C
A RAMP FROM U1150-35
B RAMP FROM U1470-35
U1411 HORIZONTAL AMP
CHANNEL SELECT LOGIC
BEAMFIND FROM U1030-7
HI-SPEED TIMING
MAG REG
MREG
BOOT STRAP
HORIZ READOUT JITTER
40VOLTS COMMON MODE
3.69V/DIV
WIRE LEADS
CRT1
CRT2
PARTIAL CRT (V53)
SEE 16
U1500A TL072
U1500B TL072
U1420 74HC4051
FROM U1130
FROM R1442
FROM R1325, R1435
FROM R1322, R1337
FROM R1225
FROM R1502, R1512
FROM R1080
ABUSTB TO J84-5
FROM U1402
ABUS SEL0
ABUS SEL1
ABUS SEL2
ABUS INH2 FROM U1030-6
U1520 1496
SPOTSHIFT FROM J86-9
HORIZONTAL DYNAMIC CENTERING
VR1520 6.2V
NC 7,9,11,13
XMUX0 FROM U1410-3
XMUX0 TO P85-49 (SCOPE LOGIC) BOARD
U1510 NE5534
U1111 NE5532
U1110 NE5532
U1020 NE5532
Q1130 RCA3046
Q1450 CA3127E
74HC4052 LF351 TL072
+15VPI -15VMI GND +5V -5V
7 8 4 4 8 16 7
FROM J84-47
FROM J84-49, -50
FROM J84-33,-34,-35
FROM J66-1,-5
FROM E1020
FROM U1150
FROM U1470
+15VA → +15VA
+5VA → +5VA
-5VA → -5VA
-15VA → -15VA
+15VB → +15VB
+5VB → +5VB
-5VB → -5VB
-15VB → -15VB
8-14-85
8-28-85
9-9-85
LIC # 61
A#62 B#164
A#64 B#171
A#74 B#197
A#80 B#198
A#90 B#206
A#102 B#226
A#127 B#231
A#165 B#245
A#177 B#267
A#186 B#270
B#40
B#42
(K 8646-03)
PARTIAL A14 TIMEBASE BOARD
HORIZONTAL AMPLIFIER 24 LM2
11301



OPTION 1T



OPTION 16



REVISION
B # 217

11301

FRONT TO REAR PANEL CABLING
AND OPTION 1T & OPTION 16