TEK Preliminary
Service Information

Part Number 061-3382-00
Product Group 47

11A34
Four Channel Amplifier

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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:

B000000	Tektronix, Inc. Beaverton, Oregon, USA
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
300000	Sony/Tektronix, Japan
700000	Tektronix Holland, NV, Heerenveen, The Netherlands

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THEORY OF OPERATION

This section describes the circuitry used in the 11A34 Four Channel Amplifier. First we discuss the instrument at the block diagram level, using the block diagram shown in Figure 2-1. The description then continues with details of relationships among major blocks and their subparts. Schematics of all major circuits are given in Section 7, Diagrams and Circuit Board Illustrations. Stages are outlined on the schematics with wide shaded lines. Refer to the schematics throughout the following descriptions for specifics.

BLOCK DIAGRAM

The following discussion should aid in understanding the overall concept of the 11A34 Four Channel Amplifier before individual circuits are explained in detail. Figure 2-1 is a block diagram of the 11A34. Each major circuit in the instrument is represented; only basic interconnections among individual blocks are shown. The number in each block is the number of the schematic on which the block is shown.

DETAILED CIRCUIT OPERATION

A detailed description of the electrical operation and relationship of circuits in the 11A34 Four Channel Amplifier is given here.

Attenuators 1

The 11A34 attenuators each contain a hybrid integrated circuit with thick-film resistor networks, surface-mount components, a high-frequency, unity-gain buffer amplifier and magnetically latching relays. Each attenuator also contains a thermistor which senses large temperature increases at the 50 Ω termination resistor. The pin connections to the attenuators are made at the back layer of the circuit board under the attenuator modules.

Each attenuator has five magnetically latching relays. In this discussion, we assume that the Cal/Norm relay passes a signal to the AC/DC relay, thence to the X100 relay, and out to the X10 relay. The 1M/50 relay adds a parallel 50 Ω termination resistor to the input signal at the output of the Cal/Norm relay.

The "maglatch" relays are cycled at every mainframe power-up to confirm low contact resistance.

Each relay function is listed below:

1. Calibrate/Normal (Cal/Norm)

   The Cal/Norm relay selects either the CalSig from the mainframe or the front-panel input signal for the attenuator. When the Cal/Norm relay is set to Cal position, the front panel input signal is disconnected and the attenuator receives the CalSig voltage from pin 22 of the attenuator socket on the main circuit board. When the Cal/Norm relay is set to Norm, the inputs of the 1M/50 and AC/DC relays are connected to the input signal and disconnected from pin 22 of the attenuator socket. The Cal/Norm relay applies the accurate calibration voltage signal (CALSIG) to the front end of the 11A34 signal path during Enhanced Accuracy calibration. To optimize calibration accuracy, the calibration signal follows a signal path nearly identical to that of the signal applied at the input connector. The Cal/Norm relay is also used in the Off coupling mode.

   Do you mean that the Cal/Norm relay is set to Cal when the instrument is set to Off Coupling?

2. 1 Meg/50

The 1M/50 relay connects the input termination resistance. When the 1M/50 relay is in the 1 M position, the 50 Ω input termination is disconnected. Conversely, when the 1M/50 relay is set to the 50 Ω position, it connects the 50 Ω input termination resistor to the output of the Cal/Norm relay and ground.

3. AC/DC Coupling

The AC/DC relay couples the output of the Cal/Norm relay to the X100 relay. When so directed, the AC/DC relay inserts a coupling capacitor into the input signal path between the input and the remainder of the attenuator. When the 11A34 is set to AC coupling and 50 Ω input impedance, the input connector is still loaded by the 50 Ω termination resistor.

4 & 5. X100 and X10 Relays

The X100 relay is used with the X10 relay as follows:

Required attenuation	X100	X10
X1	off	off
X10	off	on
X100	on	on

The terms "on" and "off" mean the last state to which the relay was pulsed. Maglatch relays can "remember" either the "on" or "off" states even while the instrument power is off. Both relays are X10 divider networks, but each was optimized with concern for its order on the attenuator hybrid.

Attenuator States

1. DC
This is the most used attenuator state. Here the Cal/Norm relay is set to select the input signal. The AC/DC relay selects DC and the X100 and X10 relays are set for the required attenuation factors.

2. Off
In the Off mode the Cal/Norm relay selects Cal (disconnects the input signal), and the AC/DC relay selects DC.

3. AC
In the AC mode the Cal/Norm relay selects Norm (connects the input signal), the AC/DC relay selects AC, and the X100 and X10 relays are set for the required attenuation factors.

4. Calibration
   During calibration the Cal/Norm relay selects Cal (disconnects the input signal), the AC/DC relay selects DC, and the X1ØØ and X1Ø relays turn on and off as needed.

5Ø-Ohm Disconnect 1

The 5Ø-Ohm Disconnect circuit (Q1Ø21, Q1Ø25, Q1Ø27, Q1Ø41, Q1Ø45, and Q1Ø47) disconnects the 5Ø Ω termination resistor in each attenuator on power down. While the instrument power is on, the transistors are all turned off. When the mainframe power is shut off, reset IC U841 turns on Q1Ø27, which then turns on Q1Ø21, Q1Ø25, Q1Ø41, and Q1Ø47. These four transistors turn on the "1 MEG" MEG" relay in each attenuator, disconnecting the 5Ø Ω terminations. Capacitors C1ØØ1 and C1Ø11 store the extra current required to drive the "1 MEG" relays when the instrument is shutting off. Resistor R842 and diode VR842 keep Q1Ø27 on during power down, because the +5D supply voltage drops in less than 2 ms and the "1 MEG" relays require about 6 ms of drive time. Diode CR9ØØ charges C1ØØ1 and C1Ø11 while the instrument power is on. Resistor R9Ø1 provides a discharge path for C1ØØ1 and C1Ø11 when power is off. Transistor Q1Ø45 disables the "1 MEG" relays during power up to reduce the initial current surge from the +15A supply.

Relay Driver ICs 1

The relay driver ICs (U911, U921, U931, U947, and U1Ø25) are serial input, parallel output devices. The "Atten Shift Data," "Atten Shift Clock," and "Atten Checkback Data" lines set the internal latches for the five ICs. Also, the "Relay Control" line is used to enable the internal latches for the five ICs. The relay driver outputs have open collectors that pulse a low of +1.Øv on a selected output when a maglatch relay is to change state. The pulse period is Ø.ØØ6 seconds. Because large currents are needed to drive the relays, only two relays are driven at a time. Resistors R1ØØ1, R1Ø11, R1Ø35, and R1Ø49 are chosen to apply 7.1 V across a driven relay.

Reset IC U841 disables the CPU while the instrument is powering up or down. The reset circuit keeps the RESET input of microprocessor U7ØØ at a low logic level unless the output of the +5D supply falls below +4.55 V. At power-up, the pin 2 input of U841 (Rin) holds RESET high. When the +5D supply reaches +4.55 V ±5Ø mV, U841 will produce a low level on RESET after 13 ms. Capacitor C74Ø sets this delay time. When RESET goes low, the CPU can begin executing stored instructions.

At power-down, when the +5D supply decays to +4.55 V, U841 sets RESET high.

FET Buffer Amplifier 1

Directly off the X1Ø relay output is a FET buffer amplifier with Ø.95 gain. This amplifier is a high-frequency integrated device with a high input impedance and a low output impedance capable of driving the 5Ø Ω cable that connects the attenuator to the input channel's main amplifier.

Fuse Check Circuit 1

The Fuse Check Circuit produces +1.18 V for Digital-to-Analog Converter (DAC) U941 when fuses F1Ø41, F1Ø42, F1Ø43, and F1Ø44 are intact. In normal operation, the +1.18 V indicates that the probe power supplies are all functioning properly. If any fuse fails, the FUSE CHECK output will change by at least ±1V and the DAC, as directed by the processor, will acquire the new signal level. If the FUSE CHECK signal is not close to +1.18 V, U941 will send an error message to the mainframe display after power-up or after an Enhanced Accuracy calibration is performed. Diodes CR1Ø6Ø and VR1Ø55 limit the FUSE CHECK voltage to -Ø.3 V minimum and +5.1 V maximum.

Analog Control Voltage System 2, 3

The Analog Control Voltage System (ACVS) generates dc voltage levels used to set input offsets, balance and amplifier gains. The main ACVS components are the seneschal IC (U6ØØ), digital-to-analog converter (DAC) U63Ø, and the Sample/Hold modules (A1A1, A1A2).

Circuitry in U6ØØ drives both the DAC and the sample/hold modules. Every 3Ø µs U63Ø is driven to one of 16 voltage levels stored in U6ØØ's memory. Each A1A1 output is updated every 3ØØ µs, while each A1A2 output is updated every 12ØØ µs, or 1/4 as often. The DAC is a two-byte, latched-data unit, which means that the high and low data bytes are loaded separately into the DAC. U6ØØ produces LCLK and UCLK, which together control the latching of the individual high and low data bytes. The upper byte is latched in first by UCLK pulsing low. Then the signal LCLK pulses low, which transfers in the lower byte and tells the DAC that the 12-bit value is valid.

While the DAC is being driven, the Sample/Hold modules are given the address of a selected output using signals ARAØ, ARA1, and ARA2; then strobed with the signals MAJSTB(L) and MINSTB(L). The DAC is internally set to produce precisely +5.Ø V maximum and 5.Ø V minimum. Resistors R527 and R525 divide the DAC output to ±1.136 V to create the VDAC signal, which drives the sample/hold modules directly. Resistors R649 and R62Ø level-shift the DAC output and drive ADC U941 to self-test the DAC.

Analog-to-Digital Converter 2

The Analog-to-Digital converter (ADC) is contained in the TLC540 (U941). The TLC540 is a complete eight-bit, switched-capacitor, successive-approximation A/D converter. It has a serial interface to the microprocessor with a 12-channel analog multiplexer that can be used to sample any one of 11 inputs or an internal "selftest" voltage. The sample/hold operates under microprocessor control.

The ADC signal lines are described below:

Name	pin#	Description
A0	1	Analog input for CH1 50 Ω overload sense
A1	2	Analog input for CH2 50 Ω overload sense
A2	3	Analog input for CH3 50 Ω overload sense
A3	4	Analog input for CH4 50 Ω overload sense
A4	5	Analog input for CH1 Probe data
A5	6	Analog input for CH2 Probe data
A6	7	Analog input for CH3 Probe data
A7	8	Analog input for CH4 Probe data
A8	9	Analog input for Fuse check
A9	11	Analog input for DAC selftest
A10	12	Analog input for MAJTST (A1A1, A1A2 selftest)
A11	--	(internal selftest of A/D = 1/2[(REF+)+(REF-)] voltage)
Address in	17	Serial address input used to select A/D input A0-A11
Sys clock	19	Runs the A/D conversion hardware.
I/O clock	18	Serial I/O clock input.
CS(L)	15	Enables A/D converter I/O and conversion
Data out	16	Serial data output.
REF+	14	Positive reference for the A0-A11 inputs.
REF-	13	Negative reference for the A0-A11 inputs.

The A0-A11 inputs are referenced to the input signal lines REF+ and REF-. The REF+ line is connected to +5A and the REF- line is connected to ground. Therefore, inputs near GND potential will convert to values near the digital value 00 (Hex) and inputs near +5A potential will convert to values near the digital value FF (Hex). A correctly operating A/D converter will give a self-test value of near 80 (Hex) for the A11 internal input shown above.

Battery Backed Up RAM 2

The Random Access Memory (RAM) is contained in the DS1220 battery backed up static RAM (U801). The DS1220 is a 16,384 bit, fully static, nonvolatile memory module organized as 2048 words by eight bits. The nonvolatile memory module has a self-contained lithium

energy source and control circuitry that constantly monitors +5D (+5 volt digital supply) for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent garbled data. An unlimited number of write cycles can be executed and no additional support circuitry is required for microprocessor interface. The pins labeled A0-A10 are the address lines, and the pins labeled D0-D7 are the data lines.

Read Mode

The static RAM executes a read cycle when WR(L) is (high) and CS(L) low. The unique address specified by the 11 address inputs (A0-A10) defines which of the 2048 bytes of data is to be accessed. Valid data will be available to the eight data-output drivers within the access time after the last address input signal is stable.

Write Mode

The static RAM is in the write mode when WR(L) and CS(L) are both low) after the address inputs are stable. The latter occurring falling edge of CS(L) or WR(L) will determine the start of the write cycle, which is terminated by the earlier rising edge of CS(L) or WR(L). All address inputs must be kept valid throughout the write cycle.

Data Retention Mode

The nonvolatile RAM module provides full functional capability as long as +5D is greater than 4.5 V, and write-protects at 4.25 V nominal. Data is maintained in the absence of +5D with no additional support circuitry. RAM U801 constantly monitors +5D. Should the supply voltage decay, the RAM will automatically write-protect itself; all RAM inputs become "don't care," and all outputs are high impedance. As +5D falls below approximately 3.0 V, the power-switching circuit connects the lithium energy source to the RAM. During power-up, when +5D rises above approximately 3.0 volts, the power switching circuit connects external +5D to the RAM, and disconnects the lithium energy source. Normal RAM operation can resume after +5D exceeds 4.5 V.

CPU 2

The CPU (U7ØØ) is an 8Ø52 single-chip, eight-bit microcontroller. It contains an on-chip oscillator and clock circuitry, 32 I/O lines, 64 k address space for external data memory, 64 k address space for external program memory, three 16-bit timer/counters, a six-source interrupt structure, full-duplex serial port, and a Boolean processor.

Port bit descriptions (I=Input, O=Output, Bi=Bidirectional) and usage

Bit#	Desc	Usage
PØ.Ø	Bi	Output for the adrs latch & bidirectional data bus
PØ.1	Bi	"
PØ.2	Bi	"
PØ.3	Bi	"
PØ.4	Bi	"
PØ.5	Bi	"
PØ.6	Bi	"
PØ.7	Bi	"
P1.Ø	I	Attenuator checkback data (serially encoded)
P1.1	I	A-D converter data (serially encoded)
P1.2	O	(not used)
P1.3	Bi	Channel 1 identify and Signature Analyzer Clock
P1.4	Bi	Channel 2 identify and Signature Analyzer Start
P1.5	Bi	Channel 3 identify and Signature Analyzer Stop
P1.6	I	Channel 4 Identify
P1.7	O	A-D I/O clock
P2.Ø	O	Address bit 8 of the RAM
P2.1	O	Address bit 9 of the RAM
P2.2	O	Address bit 1Ø of the RAM
P2.3	O	(not used)
P2.4	O	Address bit used to enable the output latch (U82Ø)
P2.5	O	Address bit used to enable RAM U8Ø1 and U6ØØ
P2.6	O	(not used)
P2.7	O	Address bit use to enable the output latch (U821)
P3.Ø	O	Attenuator shift data (serially encoded)
P3.1	O	Attenuator shift clock
P3.2	I	(not used)
INT	I	(P3.3) Interrupt from seneschal (U6ØØ)
P3.4	O	A-D converter enable (U941)
P3.5	O	Auxiliary trigger on
WR(L)	O	(P3.6) Write (L)
RD(L)	O	(P3.7) Read (L)

Misc pins on the 8052:

Reset	I	Resets the CPU, all port bits are set high on reset
XTL1	I	Input to the crystal oscillator
XTL2	O	Output from the crystal oscillator
PSEN	O	Program store enable
ALE	O	Address latch enable

Oscillator

Microprocessor U7ØØ contains circuitry to drive a 12-MHz ceramic resonator (Y64Ø). All oscillator circuitry is inside U7ØØ except the 3Ø pF capacitance etched into the circuit board runs to Y64Ø.

Seneschal IC 2

Because U6ØØ has at least four functions, seneschal, which means "steward in charge of a lord's estate," is a fitting name. The seneschal chip is a multi-function integrated circuit that provides a serial communication path to the mainframe, a channel switch sequencer, control circuits for an ACVS system with up to 16 analog outputs, and multiplexed output drivers for setting the gain and bandwidth control bits for up to four channels in a plug-in unit.

As is conventional, the schematic shows inputs on the left (except for ALE and INT, which are outputs) and outputs on the right.

Signal descriptions (I=Input, O=Output, Bi=Bidirectional) and usage.

Signal	Pin	Desc	Usage
WR (L)	23	I	Writes data into the Seneschal chip.
INT	22	O	Interrupt to processor (communication from mainframe).
CS	21	I	Allows writes or reads to the Seneschal chip only when high.
PSEN (L)	2Ø	I	The PSEN signal when low, allows CPU execution of instructions stored in RAM (U8Ø1)
ALE	18	I	Latches the address inputs on falling edge.
RD (L)	24	I	The RD (read strobe) signal when low, allows the reading of data stored in RAM by the CPU. The RD input also causes the seneschal to send the data specified by the last address it captured with ALE from its AD7-ADØ pins, onto those same AD7-ADØ pins.

Signal	Pin	Desc	Usage
AD0	17	Bi	Address input, data input, and data output.
AD1	16	Bi	Address input, data input, and data output.
AD2	15	Bi	Address input, data input, and data output.
AD3	14	Bi	Address input, data input, and data output.
AD4	13	Bi	Address input, data input, and data output.
AD5	12	Bi	Address input, data input, and data output.
AD6	11	Bi	Address input, data input, and data output.
AD7	10	Bi	Address input, data input, and data output.
FETCH (L)	19	O	The FETCH output is the "AND" of RD and PSEN. When FETCH is low, the RAM (U801) can send data to the data bus if the RAM chip select is enabled.
SCLK	29	I	Sequence clock, positive edge increments the channel switch sequencer.
SYNC	30	I	Sequence sync, high level applied during SCLK high clears the channel switch sequence counter.
CLK	5,27	I	Serial communications clock input.
M-P	26	I	Mainframe to plugin serial data input.
GS1 (L)	6	O	Channel 1 gain/bandwidth setting strobe.
GS2 (L)	44	O	Channel 2 gain/bandwidth setting strobe.
GS3 (L)	5	O	Channel 3 gain/bandwidth setting strobe.
GS4 (L)	45	O	Channel 4 gain/bandwidth setting strobe.
BP0	47	O	Bandwidth bit 0.
BP1	48	O	Bandwidth bit 1.
GP0	49	O	Gain bit 1.
GP1	50	O	Gain bit 1.
GP2	51	O	Gain bit 1.
D0	61	O	DAC data bit 0.
D1	60	O	DAC data bit 1.
D2	59	O	DAC data bit 2.
D3	58	O	DAC data bit 3.
D4	57	O	DAC data bit 4.
D5	56	O	DAC data bit 5.
D6	55	O	DAC data bit 6.
D7	54	O	DAC data bit 7.
MINSTB (L)	62	O	Sample/Hold module #2 sample strobe.
MAJSTB (L)	63	O	Sample/Hold module #1 sample strobe.
ARA0	52	O	Sample/Hold module output select address bit 0.
ARA1	53	O	Sample/Hold module output select address bit 1.
ARA2	46	O	Sample/Hold module output select address bit 2.
LCLK (L)	66	O	DAC data latch strobe low byte.
UCLK (L)	65	O	DAC data latch strobe high byte.

Signal	Pin	Desc	Usage
TRIGON1	31	0	Channel 1 trigger path on.
TRIGINV1	32	0	Channel 1 trigger path invert.
DISPON1	28	0	Channel 1 display path on.
DISPINV1	4	0	Channel 1 display path invert.
TRIGON2	34	0	Channel 2 trigger path on.
TRIGINV2 (L)	35	0	Channel 2 trigger path invert.
DISPON2	33	0	Channel 2 display path on.
DISPINV2 (L)	2	0	Channel 2 display path invert.
TRIGON3	39	0	Channel 3 trigger path on.
TRIGINV3	40	0	Channel 3 trigger path invert.
DISPON3	3	0	Channel 3 display path on.
DISPINV3	38	0	Channel 3 display path invert.
TRIGON4	42	0	Channel 4 trigger path on.
TRIGINV4 (L)	43	0	Channel 4 trigger path invert.
DISPON4	1	0	Channel 4 display path on.
DISPINV4 (L)	41	0	Channel 4 display path invert.
P-M	7	0	Plugin to mainframe serial data.

Digital-to-Analog Converter 2

The Digital to Analog Converter (DAC) is contained in the AD667 (U630). The AD667 is a complete, voltage output, 12-bit DAC including a high-stability, buried-zener voltage reference and double-buffered input latch on a single chip. The converter uses 12 precision high-speed bipolar current-steering switches and a laser-trimmed thin-film resistor network to provide fast settling time and high accuracy.

Latching in data

The DAC latch control lines are described below:

Name	pin#	Description
CS(L)	11	Enables latching inside DAC
A3(L)	12	Enables final latching of 12 bit value to DAC
A2(L)	13	Enables initial latching of upper four MSBs of DAC value
A1(L)	14	Enables initial latching of middle four bits of DAC value
A0(L)	15	Enables initial latching of lowest four LSBs of DAC value

A low on any pin shown above will enable the described function. The latches are transparent when the control signals are low and latch when the control signals go high. In the 11A34 the CS(L) signal is tied low so the DAC is always receptive to having the latches loaded.

Once the 12-bit digital value is loaded, that value is converted to an analog current at the minus input of the on-chip operational amplifier. The op-amp adjusts its output such that the minus input of the op-amp is always at GND potential. In this manner the DAC current is converted to an output voltage that represents the digital input code minus an offset voltage. The offset is generated by the on-chip reference circuit, which is connected so that for a digital code of Ø the total output voltage will be -5 V (at pins 2 and 9) and for a code of 4Ø95 the output will be +5 V. R635 drops a small amount of the reference voltage to help center the output between ±5 V.

5Ø-Ohm Overload Sensing 2

The 5Ø-Ohm Overload Sensing circuit is the 11A34's means of detecting input voltages that exceed 5 Vrms.

The "5Ø OHM OVERLOAD SENS" signal lines for Channels 1 through 4 are biased by R92Ø, R921, R922, and R923. Normally the voltage at AØ, A1, A2, and A3 of U941 is 4.Ø volts. When a large input signal is applied to a channel while that channel is in 5Ø Ω input impedance mode, the voltage at AØ (A1, A2, A3) will drop below 3.Ø V. The processor will then recognize that a input overload has occurred and disconnect the 5Ø Ω termination, leaving the channel on but in 1 MΩ mode.

Address Buffer Latch 2

Eight-bit transparent latch U8ØØ buffers the address bits from the MPU (U7ØØ) to the battery RAM (U8Ø1). When U8ØØ pin 1 is high, the latch inputs drive the outputs. When the latch enable input goes low, U8ØØ latches its outputs. The outputs are constantly on because the EN(L) input is wired low.

Output Latches 2

Eight-bit transparent latch U82Ø serves as an eight-bit output port from MPU U7ØØ. When pin 11 of U82Ø is high, the latch inputs drive the outputs. When the latch-enable input goes low, U82Ø latches its outputs. The outputs are constantly on because the EN(L) input is wired low. IC U821 is an eight-bit, edge-clocked latch with constantly on outputs. When low, the EN(L) input allows the data inputs to be latched in whenever the CP input goes high.

U831 2

The C and D sections of hex-inverter U831 are wired as a two-input NOR gate and used to address eight-bit output port U820. U831A, B, E, and F serve as output drivers for the probe data lines (from the 11A34 to any attached probes). Because U831 is an open-collector part, the probes can also pull down on the probe data lines to send messages to the 11A34. Diodes VR841, VR843, VR845 and VR847 protect the probe data lines from static voltages.

Sample/Hold Assemblies 3

This part discusses the two Sample/Hold (S/H) assemblies as components in the instrument. The S/H boards contain only surface-mounted components; they are coated with insulating material to minimize leakage current. A defective S/H assembly is not repairable and should be replaced.

One-of-eight analog multiplexer U100 periodically updates the voltages on C100 through C115. Inputs A1, B1, and C1 of U100 are the avenue through which U100 receives the address of the selected holding capacitor, while the S/H IN input receives the voltage to be applied to that capacitor. Amplifiers U102 and U103, which have very high impedance and unity gain, are used to buffer the voltages on holding capacitors C100 through C115 while U100 is updating those voltages. The holding capacitors can be charged only when the U100's EN1 input is low.

Analog multiplexer U101 provides a readback path for self-testing analog voltage outputs V1 through V8, which are normally in the range of ±1.15 V. The READ0, READ1, and READ 2 lines contain the address of the voltage to be read; and the analog readback is the FBOUT signal. Readback is possible only when the EN2 line is low.

Assembly A1A1 provides offset voltages for each channel; A1A2 provides balance and variable gain voltages.

Coarse and Fine Offsets 3

Coarse and Fine Offset voltages are available for the four main amplifiers U310, U410, U330, and U430 and any external TEKPROBE accessory.

The main amplifier input offset voltages are generated by the ACVS and are divided by the resistor networks preceding U641 and U649 The probe offset voltages are also generated by the ACVS and are divided by R833, R831, R836, R835, R838, R832, R837, and R834. Diodes CR832, CR831, CR834, CR833, CR836 and CR835 clamp any static voltages introduced at the TEKPROBE connector.

In the 11A34, U641 and U649 disconnect each main amplifier input offset when an active probe with a TEKPROBE connector is used. Both U641 and U649 contain two low-resistance, individually controlled, electronic SPDT analog switches. These switches select the main amplifier to receive the offset voltage when the probe offset controls are high (pins 15 and 10 on U641 and U649). When an active probe is used, the offset voltage is applied directly to the probe input.

In each amplifier channel the COARSE offset is designed to be 20 times larger than the FINE offset. BALANCE lines are used to correct both input and output offset voltage errors in the main amplifiers. The typical maximum voltages available to the main amplifiers from the COARSE, FINE, and BALANCE controls, measured at pin 16 and 9 of U641 and U649, are as follows:

COARSE = ± 1.0253 V
FINE = ± 0.0512 V
BALANCE = ± 0.0635 V

Components L210, C210, LR210, L520, C520, LR520, L230, C230, LR230, L530, C530 and LR530 filter noise generated by the analog switches (U641 and U649) and the Sample/Hold module (A1A1).

High Frequency Adjustment 3

Each 11A34 channel has one high frequency adjustment (R1027, R1029, R1041 and R1047). Each potentiometer is adjusted for optimal transient response of the display signal path. The trigger signal path is identical to the display path; they both have their high frequency adjust inputs connected to the same node in the adjustment network (see pins 21 and 24 on channels 1 and 4, and pins 24 and 27 on channels 2 and 3). The auxiliary signal paths require less peaking than the display and trigger paths, so the auxiliary high frequency adjust inputs are level-shifted to a higher voltage. This level shifting is accomplished by R315 and R309 for channel 1, R415 and R414 for channel 2, R329 and R333 for channel 2, R430 and R433 for channel 4.

Main Amplifiers 3

The Main Amplifiers (U31Ø, U33Ø, U41Ø, and U43Ø) do the all the voltage amplification required in the 11A34. Input signals come from the individual attenuators through shielded cables into J21Ø, J52Ø, J22Ø, and J53Ø. The nominal gain of the main amplifier is 1.Ø5 (at 5Ø mV/div); the gain of the attenuator is Ø.95 (in X1 attenuation). The combined gain from the plug-in bnc connector to the plug-in edge connector is 1.ØØ. Each main amplifier is a hybrid that contains:

a. A differential high-speed input.

b. Three separate differential outputs (pins 19-2Ø, 22-23, and 25-26) that can be individually turned on, turned off, or inverted using the OUTPUT INVERT and OUTPUT ON control lines (pins 11-12, 15-16, 17-18).

c. Two four-pole bandwidth-limit filters: one at 2ØMHz and another at 1ØØ MHz. See Table 2-1.

Table 2-1
Bandwidth Limit vs. BPØ & BP1 Bits

Bandwidth	BP1	BPØ
2Ø MHz	Ø	Ø
1ØØ MHz	Ø	1
Maximum	1	X

d. Six gain settings of 1 mV, 2 mV, 5 mV, 1Ø mV, 2Ø mV, and 5Ø mV per division. See Table 2-2.

TABLE 2-2
Gain Set by GPØ, GP1, and GP2 Bits

Gain Setting	GP2	GP1	GPØ
1 mV	Ø	Ø	Ø
2 mV	Ø	Ø	1
5 mV	Ø	1	Ø
1Ø mV	Ø	1	1
2Ø mV	1	Ø	X
5Ø mV	1	1	X

The signals GPØ, 1, 2 and BPØ, 1 are shown on pins 1, 36, 35, 34, and 33 of U31Ø, U33Ø, U41Ø, and U43Ø. The GP and BP lines are latched using the strobe lines GS1(L), GS2(L), GS3(L), and GS4(L).

e. On-chip, TTL-compatible latch circuitry to store the bandwidth and gain settings. The latches are loaded when the strobe input is low. See the GS1(L), GS2(L), GS3(L), GS4(L) signal lines on the schematic 3.

f. Three separate high-frequency adjust inputs per channel, one for each output amplifier.

g. A variable gain control input which linearly adjusts the overall gain (pin 9). The gain is zero at -1 V and maximum at +1 V.

The outputs of the main amplifiers are reverse-terminated in 200 Ω impedances matching the output transmission lines leaving the hybrids. The Display and Trigger signal paths for both channels separately sum before reaching the edge connector, at the summation points the line impedance becomes 50 Ω. The auxiliary signals, which are not summed, require external resistive loads to match the 50 Ω line to the edge connector (see R310, R311, R410, R312, R330, R331, R332, and R432).

Power Supplies

All power for the 11A34 is furnished by the host mainframe and referenced to chassis ground. Each supply is protected by a reverse-biased Schottky diode to help prevent damage to the circuitry in the event of a power supply fault.

The five decoupled power supplies in the 11A34 are:

+15A, +5A, -5A, -15A	Standard supplies for analog control circuits, on diagrams 1, 2, and 3.
+15B, +5B, -5B	Power for U310, U330, U410, and U430, on diagram 3.
+15C, +5C, -5C, -15C	Attenuator preamplifier supplies, on diagram 1.
+5D	Digital power, used on diagrams 2, 3, and 4.
+15P, +5P, -5P, -15P	Probe power, fused, from +15A, +5A, -5A, and -15A supplies; diagram 1.

The B and C supplies are separately filtered to reject noise from digital circuits.

Part 2
Performance Verification Procedure

NOTE

The Performance Verification Procedure is located in the 11A34 User's Reference Supplement (Part No. 070-5921-00).

Part 3
Adjustment Procedure

11A34 Preliminary
Adjustment Procedure

NOTE

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

An incoming Inspection procedure is provided in the 11A34 User's Reference Supplement (P/N 070-5921-00) to verify basic instrument operation without checking all features and performance requirements.

Using This Procedure

In this procedure, bold and italicized letters identify menu labels and display messages. Initial capital letters identify connectors, controls, and indicators (e.g., Position) on associated test equipment.

A heading system is used to readily identify the steps that contain performance check and/or adjustment instructions. For example, if ADJUST is the first word in the title, the step contains one or more internal adjustments. If EXAMINE is the first word in the step title, the step concerns measurement limits that indicate whether the instrument is operating properly; these limits are not to be interpreted as electrical specifications.

The alphabetical instructions under each step (a, b, c, etc.) may also contain **EXAMINE** or **ADJUST** as the first word of the instruction. These terms are defined as follows:

ADJUST—describes which adjustment to make and the desired result. We recommend that the adjustment not be made if a previous EXAMINE instruction indicates that no adjustment is necessary.

EXAMINE—usually precedes an ADJUST instruction and indicates that the instruction determines whether adjustment is necessary. If no ADJUST instruction appears in the same step, the EXAMINE instruction concerns measurement limits that have no related adjustment. Measurement limits following the word EXAMINE are not to be interpreted as specifications. They are provided as indicators of a properly functioning instrument and to aid in the adjustment process.

Menu Selections

Although brief instructions are included in the procedure for making menu selections, detailed descriptions of those menus as well as instructions on how to exit menus after selections are made are generally not included. Comprehensive descriptions of menus and instrument features are found in the 11401/11402 User's Reference Manual.

Vertical and Horizontal Settings

In this procedure, instructions are not provided for selecting the required vertical and horizontal settings. Detailed instructions for operating the 11401/11402 display are given in the User's Reference manual. Familiarity with these operating principles is essential to perform the Adjustment procedure.

Plug-in Unit Installation and Removal

The front-panel ON/STANDBY switch should be set to STANDBY before installing or removing plug-in units. After the plug-in unit is installed, the switch may be set back to ON. The instrument will first perform its normal diagnostic and self-test sequence, then restore the front-panel settings in effect at the time of the power-down.

Required Test Equipment

The following equipment is required for the adjustment procedure:

1. **Oscilloscope.** Tektronix 11401/11402 mainframe.
2. **Calibration Generator.** Tektronix PG 506 with power mainframe.
3. **Signal Standardizer.** Tektronix 067-0587-02 Signal Standardizer Calibration Fixture with the interface connector modified for 11000-series use.
4. **Pulser.** Tektronix 067-0681-01 Tunnel Diode Pulser Calibration Fixture.
5. **50-ohm Coaxial cable.**
6. **Small screwdriver.**

Power-Up Sequence

1. Insert the Signal Standardizer into the Oscilloscope Right plug-in compartment.
2. Connect the 11401/11402 to a suitable power source and switch the rear-panel PRINCIPAL POWER SWITCH to ON.

3. Switch the front-panel ON/STANDBY switch to ON.

4. Allow the instrument to warm-up for at least 20 minutes.

5. Press the 11401/11402 ENHANCED ACCURACY button.

A. Step Response

A1. EXAMINE Oscilloscope Mainframe Step Response (Provides comparison reference)

NOTE

Refer to Power-Up Sequence on previous page. Also, all instrument settings not listed under SETUP CONDITIONS are default upon initialization.

SETUP CONDITIONS

Settings:

Oscilloscope
- Menus buttons ..... Utility
- Utility menu ..... Initialize
- Utility menu ..... Inst Options
- Instrument Options menu ..... Waveform Scaling (Forced)
- Icon ..... Def Wfm
- Vertical Description menu ..... R (right)
- ..... Enter Desc
- Menus buttons ..... Trigger
- Trigger menu ..... Source Desc
- Main Trigger Source Description menu ..... R (right)
- ..... Enter Desc

Signal Standardizer
- Test (Vert or Horiz) ..... +Step Resp
- Rep Rate ..... 100 kHz
- Position ..... 12 o'clock
- Amplitude ..... 9 o'clock

Oscilloscope
- Main Size control knob ..... 2 ns/div
- Icon ..... Trig'd
- Trig Level control knob 40%
- Icon ..... horizontal
- Main Pos ..... position positive pulse transition one division from left edge of graticule
- Menus buttons ..... Waveform
- Waveform menu ..... Acquire Desc
- Acquire Description menu ..... Average N (on)
- ..... Set AvgN
- Average N control knob 8

Signal Standardizer
- Amplitude ..... 5 div vertical step

Oscilloscope
- Icon ..... vertical
- Vert Pos: Wfm control knob ..... top of step on center horizontal graticule line
- Vert Mag: Wfm control knob ..... 100 m

a. Record the oscilloscope step response on graph paper or run a hardcopy of the display. This waveform will be used later for comparison against the 11A32/11A34 step response.

b. Set oscilloscope On/Standby switch to Standby.

c. Remove Signal Standardizer from Right plug-in compartment.

A2. EXAMINE/ADJUST CH 1, CH 2, CH 3 and CH 4 Signal Step Response (A1R1027, A1R1029, A1R1041, A1R1043)

NOTE

All instrument settings not listed under SETUP CONDITIONS are default upon initialization.

SETUP CONDITIONS

Perform the following settings in the order listed:

Remove the left side cover from the 11A34. Insert the 11A34 into the Oscilloscope Right plug-in compartment. Connect the 067-0681-01 Pulser to the CH 1 input connector. Connect a 50-ohm coaxial cable from the Calibration Generator Ampl Output connector to the Pulser.

Oscilloscope
- On/Standby switch.....On
- Wait for calibration cycle to complete
- Menus buttons.....Utility
- Utility menu.....Initialize
- Waveform menu.....Impedance
- Channel Impedance.....50Ω

11A34
- CH 1 button.....on (lighted)

Calibration Generator
- Function switch.....High Ampl
- Period.....0.1 ms
- Pulse Amplitude.....Max

Pulser
- TD Triggered Level.....Fully clockwise

Oscilloscope
- Icon.....vertical
- Vert Size: R1 control knob.....50 mV/div
- Icon.....horizontal
- Main Size control knob.....10 µs/div
- Main Pos control knob.....position positive-going edge to first graticule line from left edge of graticule.

Pulser
- TD Triggered Level.....Rotate control ccw to the point where a step just starts to appear on the lower part of the positive-going edge.

Oscilloscope
- Waveform menu.....Acquire Desc
- Acquire Description menu.....Average N (on)
- .....Set Avg N
- Average N control knob.....8
- Icon.....horizontal
- Main Size control knob.....2 ns/div
- Icon.....vertical
- Vert Offset: R1 control knob.....position top of step to center horizontal graticule line
- Vert Size: R1.....touch
- Numeric Entry & Knob Res menu.....Fine
- Vert Size: R1 control knob.....Five div display

Vert Size: R1 control knob.....set readout for 10% of present readout (~4 mV/div).
Vert Offset: R1.....position right side of trace to center horizontal graticule line

a. **EXAMINE**—compare the displayed waveform with the waveform recorded in step A1.

NOTE

1 major graticule division = 2%.

The difference between the two waveform aberrations should not exceed 4% peak (2 divisions), and 7% (3.5 divisions) peak-to-peak.

b. **ADJUST**—HF1, R1027 on the A1 Main circuit board, so that the CH 1 aberrations are within 4% peak (2 divisions), and 7% peak-to-peak (3.5 division).

c. Repeat step A2 for the CH 2 input, except that the adjustment is performed using the HF2 adjustment, R1029.

d. Repeat step A2 for the CH 3 input, except that the adjustment is performed using the HF3 adjustment, R1041.

e. Repeat step A2 for the CH 4 input, except that the adjustment is performed using the HF4 adjustment, R1043.

f. This completes the adjustment procedure.

Part 4
Diagnostics

Troubleshooting with Diagnostics

At power-up, 11000-series instruments perform a series of self-tests to verify correct operation. These tests may be performed individually at any time as part of Extended Diagnostics.

Diagnostic tests are significant aids in troubleshooting digital parts of this instrument. In troubleshooting analog parts of the instrument, diagnostic tests can provide a starting place.

For example, diagnostic routines can exercise and test the following parts of the instrument:

Group I	Group II	Group III
Relay Drvr	ADC Test	ACVS Test
Probecodes	Fuse Test	ExplainCal
Cksm Plug		
Cksm Probe		
Walk Ones		

Ch. N Cal	Meas Sys
Probe Gain	CalMeasure
Atten Gain	Cal Sigpath
Step Gain	
BWL Match	
Gain	
Output Err	
Balance	
Coarse Dac	
Fine Dac	
Spare Gain	
CC Dumper	

If an attenuator or M377 output amplifier is replaced the transient response for that channel should be readjusted. Refer to Part 2 of the service manual for information about calibrating the instrument.

Diagnostics in 11301/11302

Diagnostic tests are accessed through the Utility major menu. To display the Utility major menu, press the UTILITY button on the front panel of the host oscilloscope. The mainframe will then display its Utility menu, with an entry entitled Ext Test. Touch the Ext Test entry, then touch Run to access the Blocks menu. The Blocks menu contains entries for installed plug-in units.

To select a plug-in unit for diagnosis you must make the following three choices:

- Choose the plug-in entry in the Block column;
- Choose which area of the plug-in is to be tested; and
- Choose the test routine to be performed.

If an 11A32 is installed in the Left plug-in compartment, it can be diagnostically tested by using the following steps:

1. Touch the Left 11A32 menu item in the Block column.

2. Touch the AREA entry at the top of the crt.

3. Touch the name of the area you wish to test (entries are Group 1, Group II, Group III, Ch. 1 Cal, Ch. 2 Cal, and Meas. Sys., as listed previously).

For example, if you want to test the 11A32 A/D Converter, touch Group II; if you want to test Ch. 2 Attenuator Gain, touch Ch. 2 Cal.

4. Touch the ROUTINE entry at the top right of the crt. A list of test routines will be displayed.

5. Touch the name of the desired test.

For example, if you selected Ch. 2 Cal so that you can test Atten Gain, touch the Atten Gain entry in the list at the left side of the crt.

6. To perform the Atten Gain (or other selected) test, touch RUN at the lower right corner of the crt.

The Atten Gain test will be performed and the results will be displayed in the Window, Read, Faults, and Index columns. For example, the Atten Gain test produced these results:

Window	Read	Faults	Index
-2.00 2.00	0.42		pass

For more detail about Diagnostics refer to the mainframe manual.

Diagnostics in 11401/11402

Diagnostic tests are available through the Utility major menu. To display the Utility major menu, press the UTILITY button on the front panel of the host oscilloscope. The mainframe will then display its Utility major menu, which will contain an Extended Diagnostics entry. Touch the Extended Diagnostics entry to access the extended Diagnostics menu, which contains entries for installed plug-in units.

To select a plug-in unit for diagnosis you must make the following three choices:

- Choose the desired plug-in entry in the BLOCK column;
- Choose which area of the plug-in is to be tested; and
- Choose the test routine to be performed.

If an 11A32 is installed in the Left plug-in compartment, it can be diagnostically tested by using the following steps:

1. Touch the Left 11A32 menu item in the BLOCK column.

2. Touch the (2) AREA entry in the major menu area at the bottom of the crt. The Area selections will be displayed in a vertical column.

3. Touch the Area entry you wish to test (entries are Group I, Group II, Group III, Ch. 1 Cal, Ch. 2 Cal, and Meas. Sys., as listed previously).

For example, if you want to test the 11A32 A/D Converter, touch Group II; if you want to test Ch. 2 Attenuator Gain, touch Ch. 2 Cal.

4. In the major menu area at the bottom of the crt, touch (3) Routine. A list of test routines will be displayed.

5. Touch the name of the desired test.

For example, if you selected Ch. 2 Cal so that you can test Atten Gain, touch the Atten Gain entry in the list at the left side of the crt.

6. To perform the Atten Gain (or other selected) test, touch (r) Run at the lower right corner of the crt.

The Atten Gain test will be performed and the results will be displayed in the Index, Faults, Min, Max and Actual columns. For example, the Atten Gain test produced these results:

ROUTINE	INDEX	FAULTS	MIN	MAX	ACTUAL
b) Atten Gain	pass		-2.000	2.000	0.073

To exit the extended diagnostic mode, touch (E) Exit in the lower right corner of the crt.

For further detail about Diagnostics refer to the mainframe manual.

Attenuators

Diagnostics are only one way of testing circuitry. The attenuators can also be tested by having the oscilloscope mainframe perform an Enhanced Accuracy calibration. To use this method, press the Enhanced Accuracy button on the front panel of the mainframe oscilloscope. Although the Enhanced Accuracy calibration does not comprehensively test the attenuators, if the calibration takes place successfully the attenuators used in the Enhanced Accuracy calibration function correctly. Enhanced Accuracy calibration does not check the trigger path. If Enhanced Accuracy calibration does not run successfully, individual attenuators may be tested with the Atten Gain tests in the Ch. 1 Cal., Ch. 2 Cal, etc., group(s).

Front-Panel Board(s) and LEDs

You can use either of the following two methods to check Front-Panel Board(s) and LEDs:

1. With plug-in unit installed and mainframe turned on, press each plug-in display on/off button.

   If button-presses cause a) the associated CH n light to come on and a trace to appear on the crt, and b) the trace to disappear and the CH n light to go off, the Front-Panel Board and the LEDs are working correctly.

2. Run diagnostic test CCDumper. If the instrument passes the test the Front-Panel Board and LEDs are working correctly.

Latch Testing

The walking-one's test (Group I: Walk Ones) can be run to check the operation of the instrument's latches. A test oscilloscope or logic analyzer must be used to confirm that the latches function correctly.

Seneschal IC, Nonvolatile RAM, and ROM

Explain Cal for 11A32, 11A34, or 11A52

If a plug-in unit fails the Attenuator Gain, Amplifier Gain, Balance, BandWidth Limit Gain, or Gain test(s), you can request Explain Cal. To select Explain Cal, select Group III, then touch b. ExplainCal.

Explain Cal will present the following two four-bit nibbles for the last executed test that failed:

Address	Expected
h i j k	W X Y Z

The meanings of the k, Z, j, and Y characters in the Address and Expected nibbles are as follows:

Last Test Executed	**Meaning]**
Attengain	"k" encodes the index of the attenuator with the most negative (i.e., lowest) gain error. "z" encodes the index of the attenuator with the most positive (i.e., highest) gain error. k or z: Attenuator Range Ø: X1 1: X1Ø 2: X1ØØ
Ampgain	"k" encodes the index of the M377 gain range with the lowest gain-error. "z" encodes the index of the M377 gain range with the highest gain-error. k or z: M377 Range Ø: 1 mV/div 1: 2 mV/div 2: 5 mV/div 3: 1Ø mV/div 4: 2Ø mV/div 5: 5Ø mV/div

Test	Meaning
Balance	"k" encodes the index of the M377 gain range with the lowest (most negative) imbalance. "z" encodes the index of the M377 gain range with the highest (most positive) imbalance.
BWLgain	"k" encodes the index of the bandwidth limit (BWL) range that has the lowest BWL gain error. "z" encodes the index of the BWL range that has the highest BWL gain error. k or z: BWL Range Ø: 2Ø MHz 1: 1ØØ MHz 2: Full
Gain	"k" encodes the index of the lowest bandwidth limit (BWL) gain error. "z" encodes the index of the highest BWL gain error. k or z: BWL Range Ø: 2Ø MHz 1: 1ØØ MHz 2: Full "j" encodes the index of the lowest gain-error gain range of the plug-in unit. "y" encodes the index of the highest gain-error gain range of the plug-in unit. j or y: Gain Range Ø: 1 mV/division 1: 2 mV/division 2: 5 mV/division 3: 1Ø mV/division 4: 2Ø mV/division 5: 5Ø mV/division 6: 1ØØ mV/division 7: 2ØØ mV/division

Part 5
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.

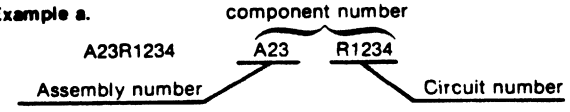
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

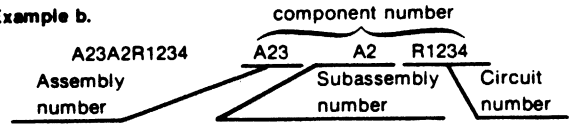
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

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
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49	DALLAS TX 75265
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
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
05828	GENERAL INSTRUMENT CORP GOVERNMENT SYSTEMS DIV	600 W JOHN ST	HICKSVILLE NY 11802
09922	BURNDY CORP	RICHARDS AVE	NORWALK CT 06852
14552	MICRO/SEMICONDUCTOR CORP	2830 S FAIRVIEW ST	SANTA ANA CA 92704
15636	ELEC-TROL INC	26477 N GOLDEN VALLEY RD	SAUGUS CA 91350
19613	MINNESOTA MINING AND MFG CO TEXTOOL PRODUCTS DEPT ELECTRONIC PRODUCT DIV	1410 E PIONEER DR	IRVING TX 75061
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS	30 HUNTER LANE	CAMP HILL PA 17011
24355	ANALOG DEVICES INC	RT 1 INDUSTRIAL PK P O BOX 280	NORWOOD MA 02062
50434	HEWLETT-PACKARD CO OPTOELECTRONICS DIV	640 PAGE MILL RD	PALO ALTO CA 94304
54473	MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY	SECAUCUS NJ 07094
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195
57668	ROHM CORP	16931 MILLIKEN AVE	IRVINE CA 92713
60705	CERA-MITE CORPORATION	1327 6TH AVE	GRAFTON WI 53024
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
80009	TEKTRONIX INC	4900 S W GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
91637	DALE ELECTRONICS INC	P O BOX 609	COLUMBUS NE 68601
TK1450	TOKYO COSMOS ELECTRIC CO LTD	2-268 SOBUDAI ZAMA	KANAGAWA 228 JAPAN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	670-8976-00			CIRCUIT BD ASSY:MAIN	80009	670-8976-00
A2	670-9336-00			CIRCUIT BD ASSY:FRONT PANEL (NO REPLACEABLE SUBPARTS)	80009	670-9336-00
A3	670-9336-00			CIRCUIT BD ASSY:FRONT PANEL (NO REPLACEABLE SUBPARTS)	80009	670-9336-00
A1	670-8976-00			CIRCUIT BD ASSY:MAIN	80009	670-8976-00
A1A1	670-8986-00			CIRCUIT BD ASSY:SAMPLE/HOLD	80009	670-8986-00
A1A2	670-8986-00			CIRCUIT BD ASSY:SAMPLE/HOLD	80009	670-8986-00
A1C207	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C209	283-0028-00			CAP,FXD,CER DI:0.0022UF,20%,50V	80009	283-0028-00
A1C210	281-0921-00			CAP,FXD,CER DI:0.68UF,+80-20%,25V	80009	281-0921-00
A1C230	281-0921-00			CAP,FXD,CER DI:0.68UF,+80-20%,25V	80009	281-0921-00
A1C307	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C330	283-0028-00			CAP,FXD,CER DI:0.0022UF,20%,50V	80009	283-0028-00
A1C340	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C341	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C420	283-0028-00			CAP,FXD,CER DI:0.0022UF,20%,50V	80009	283-0028-00
A1C440	283-0028-00			CAP,FXD,CER DI:0.0022UF,20%,50V	80009	283-0028-00
A1C520	281-0921-00			CAP,FXD,CER DI:0.68UF,+80-20%,25V	80009	281-0921-00
A1C525	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C530	281-0921-00			CAP,FXD,CER DI:0.68UF,+80-20%,25V	80009	281-0921-00
A1C538	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C539	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C540	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C600	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C630	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C631	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C632	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C635	283-0028-00			CAP,FXD,CER DI:0.0022UF,20%,50V	80009	283-0028-00
A1C740	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A1C820	281-0563-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	MA405E474MAA
A1C840	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C901	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C940	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C1000	290-0845-00			CAP,FXD,ELCTLT:330UF,+50-10%,25V	54473	ECE-A25V330L
A1C1011	290-0845-00			CAP,FXD,ELCTLT:330UF,+50-10%,25V	54473	ECE-A25V330L
A1C1049	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A1C1105	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C1107	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C1109	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1C1111	290-0943-01			CAP,FXD,ELCTLT:47UF,20%,25V	55680	ULB1E470MPAANA1T
A1CR131	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817
A1CR340	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817
A1CR441	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817
A1CR510	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR511	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR512	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR513	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR514	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR515	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR516	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR517	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR518	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR519	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR531	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817

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A1CR541	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817
A1CR741	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR831	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR832	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR833	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR834	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR835	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR836	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR837	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR838	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR841	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR900	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A1CR1060	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A1F1041	159-0253-00			FUSE,CARTRIDGE:0.250A,125V,FAST,SUBMIN	75915	251.250 T & R T1
A1F1042	159-0235-00			FUSE,WIRE LEAD:0.75A,125V,FAST	80009	159-0235-00
A1F1043	159-0235-00			FUSE,WIRE LEAD:0.75A,125V,FAST	80009	159-0235-00
A1F1044	159-0253-00			FUSE,CARTRIDGE:0.250A,125V,FAST,SUBMIN	75915	251.250 T & R T1
A1J210	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J220	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J520	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J530	131-1003-00			CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
A1J611	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A1J740	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A1J1121	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 5)	22526	48283-036
A1J1141	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 5)	22526	48283-036
A1K740	148-0086-00			RELAY,REED:FORM C,100MA,100VDC,150 OHM	15636	R8149-1
A1L115	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L116	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L130	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L131	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L207	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L210	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L230	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L240	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L440	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L441	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L520	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L530	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L931	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L1121	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L1123	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L1125	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L1127	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1LR210	108-0408-00			COIL,RF:FIXED,100NH	80009	108-0408-00
A1LR230	108-0408-00			COIL,RF:FIXED,100NH	80009	108-0408-00
A1LR520	108-0408-00			COIL,RF:FIXED,100NH	80009	108-0408-00
A1LR530	108-0408-00			COIL,RF:FIXED,100NH	80009	108-0408-00
A1Q1021	151-0736-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0736-00
A1Q1025	151-0736-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0736-00
A1Q1027	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A1Q1041	151-0736-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0736-00
A1Q1045	151-1059-00			TRANSISTOR:FET,N-CHAN,TO-106	04713	ORDER BY DESCR
A1Q1047	151-0736-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0736-00
A1R104	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2W	57668	TR20JE100E
A1R105	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2W	57668	TR20JE100E

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A1R106	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2M	57668	TR20JE100E
A1R115	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2M	57668	TR20JE10K0
A1R130	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2M	57668	TR20JE100E
A1R131	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2M	57668	TR20JE100E
A1R310	321-0080-00			RES,FXD,FILM:66.5 OHM,1%,0.125M,TC=T0	91637	CMF55116G66R50F
A1R311	321-0080-00			RES,FXD,FILM:66.5 OHM,1%,0.125M,TC=T0	91637	CMF55116G66R50F
A1R312	321-0080-00			RES,FXD,FILM:66.5 OHM,1%,0.125M,TC=T0	91637	CMF55116G66R50F
A1R330	321-0080-00			RES,FXD,FILM:66.5 OHM,1%,0.125M,TC=T0	91637	CMF55116G66R50F
A1R331	321-0080-00			RES,FXD,FILM:66.5 OHM,1%,0.125M,TC=T0	91637	CMF55116G66R50F
A1R332	321-0080-00			RES,FXD,FILM:66.5 OHM,1%,0.125M,TC=T0	91637	CMF55116G66R50F
A1R410	321-0080-00			RES,FXD,FILM:66.5 OHM,1%,0.125M,TC=T0	91637	CMF55116G66R50F
A1R432	321-0080-00			RES,FXD,FILM:66.5 OHM,1%,0.125M,TC=T0	91637	CMF55116G66R50F
A1R525	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R527	322-3244-00			RES,FXD,FILM:3.4K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 3K40
A1R543	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2M,TC=T0	80009	322-3220-00
A1R545	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2M,TC=T0	80009	322-3220-00
A1R620	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R625	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 499E
A1R626	322-3050-00			RES,FXD,FILM:32.4 OHM,1%,0.2M,TC=T0	80009	322-3050-00
A1R627	322-3175-00			RES,FXD,FILM:649 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 649E
A1R628	322-3166-00			RES,FXD,FILM:523 OHM,1%,0.2M,TC=T0	80009	322-3166-00
A1R629	322-3166-00			RES,FXD,FILM:523 OHM,1%,0.2M,TC=T0	80009	322-3166-00
A1R630	322-3166-00			RES,FXD,FILM:523 OHM,1%,0.2M,TC=T0	80009	322-3166-00
A1R631	322-3166-00			RES,FXD,FILM:523 OHM,1%,0.2M,TC=T0	80009	322-3166-00
A1R632	322-3050-00			RES,FXD,FILM:32.4 OHM,1%,0.2M,TC=T0	80009	322-3050-00
A1R633	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R634	322-3175-00			RES,FXD,FILM:649 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 649E
A1R635	322-3039-00			RES,FXD,FILM:24.9 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 24E9
A1R636	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R641	322-3050-00			RES,FXD,FILM:32.4 OHM,1%,0.2M,TC=T0	80009	322-3050-00
A1R642	322-3166-00			RES,FXD,FILM:523 OHM,1%,0.2M,TC=T0	80009	322-3166-00
A1R643	322-3048-00			RES,FXD,FILM:30.9 OHM,1%,0.2M,TC=T0	57668	CRB20FXE20K0
A1R644	322-3048-00			RES,FXD,FILM:30.9 OHM,1%,0.2M,TC=T0	57668	CRB20FXE20K0
A1R645	322-3175-00			RES,FXD,FILM:649 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 649E
A1R646	322-3175-00			RES,FXD,FILM:649 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 649E
A1R647	322-3050-00			RES,FXD,FILM:32.4 OHM,1%,0.2M,TC=T0	80009	322-3050-00
A1R648	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2M	57668	TR20JE01K0
A1R649	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R650	322-3166-00			RES,FXD,FILM:523 OHM,1%,0.2M,TC=T0	80009	322-3166-00
A1R651	322-3048-00			RES,FXD,FILM:30.9 OHM,1%,0.2M,TC=T0	57668	CRB20FXE20K0
A1R652	322-3166-00			RES,FXD,FILM:523 OHM,1%,0.2M,TC=T0	80009	322-3166-00
A1R653	322-3166-00			RES,FXD,FILM:523 OHM,1%,0.2M,TC=T0	80009	322-3166-00
A1R820	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2M	57668	TR20JE01K0
A1R831	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 499E
A1R832	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 499E
A1R833	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R834	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 499E
A1R835	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 499E
A1R836	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R837	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R838	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R840	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2M	57668	TR20JE10K0
A1R841	313-1472-00			RES,FXD,FILMN:4.7K OHM,5%,0.2M	57668	TR20JE 04K7
A1R843	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R845	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R847	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R849	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R850	322-3048-00			RES,FXD,FILM:30.9 OHM,1%,0.2M,TC=T0	57668	CRB20FXE20K0
A1R901	313-1103-00			RES,FXD,FILM:10K OHM,5%,0.2M	57668	TR20JE10K0

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A1R902	313-1204-00			RES,FXD,FILM:200K,5%,0.2W	57668	TR20JE 200K
A1R920	322-3373-00			RES,FXD,FILM:75K OHM,1%,0.2W,TC=T0	80009	322-3373-00
A1R921	322-3373-00			RES,FXD,FILM:75K OHM,1%,0.2W,TC=T0	80009	322-3373-00
A1R922	322-3373-00			RES,FXD,FILM:75K OHM,1%,0.2W,TC=T0	80009	322-3373-00
A1R923	322-3373-00			RES,FXD,FILM:75K OHM,1%,0.2W,TC=T0	80009	322-3373-00
A1R1001	322-0051-00			RES,FXD,FILM:33.2 OHM,1%,0.25W,TC=T0	75042	CEBT0-33R20F
A1R1003	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1005	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1007	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1009	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1011	322-0051-00			RES,FXD,FILM:33.2 OHM,1%,0.25W,TC=T0	75042	CEBT0-33R20F
A1R1013	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1015	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1017	313-1821-00			RES,FXD,FILM:820 OHM,5%,0.2W	57668	TR20JE 820E
A1R1025	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1027	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5W	TK1450	GF06UT 5K
A1R1029	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5W	TK1450	GF06UT 5K
A1R1031	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1033	313-1104-00			RES,FXD,FILM:100K OHM,5%,0.2W	57668	TR20JE100K
A1R1035	322-0051-00			RES,FXD,FILM:33.2 OHM,1%,0.25W,TC=T0	75042	CEBT0-33R20F
A1R1037	313-1102-00			RES,FXD,FILM:1K OHM,5%,0.2W	57668	TR20JE01K0
A1R1041	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5W	TK1450	GF06UT 5K
A1R1045	311-2234-00			RES,VAR,NONWW:TRMR,5K OHM,20%,0.5W	TK1450	GF06UT 5K
A1R1049	322-0051-00			RES,FXD,FILM:33.2 OHM,1%,0.25W,TC=T0	75042	CEBT0-33R20F
A1R1050	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A1R1051	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A1R1052	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A1R1053	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A1R1054	322-3430-00			RES,FXD,FILM:294K OHM,1%,0.2W,TC=T0	80009	322-3430-00
A1R1101	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2W,TC=T0	80009	322-3220-00
A1R1105	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2W,TC=T0	80009	322-3220-00
A1TP118	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP600	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP601	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP602	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP603	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP901	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP902	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP903	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP904	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP905	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP906	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP907	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP908	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP1005	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1U310	165-2089-02			MICROCKT,LINEAR:VERT PL-IN AMPLIFIER,200 OHM	80009	165-2089-02
A1U330	165-2089-02			MICROCKT,LINEAR:VERT PL-IN AMPLIFIER,200 OHM	80009	165-2089-02
A1U410	165-2089-02			MICROCKT,LINEAR:VERT PL-IN AMPLIFIER,200 OHM	80009	165-2089-02
A1U430	165-2089-02			MICROCKT,LINEAR:VERT PL-IN AMPLIFIER,200 OHM	80009	165-2089-02
A1U600	156-2625-00			MICROCKT,DGTL:NMOS,CUSTOM,SENESCHAL	80009	156-2625-00
A1U630	156-2459-00			MICROCKT,LINEAR:12 BIT D TO A CONVERTER	24355	AD667JN/+
A1U641	156-2668-00			MICROCKT,DGTL:CMOS,ANALOG SW,DUAL SPDT	80009	156-2668-00
A1U649	156-2668-00			MICROCKT,DGTL:CMOS,ANALOG SW,DUAL SPDT	80009	156-2668-00
A1U700	156-2962-00			MICROCKT,DGTL:NMOS,MICROCOMPUTER,8 BIT W/ SOCKET,EPROM	80009	156-2962-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1U700	160-4009-01			MICROCKT,DGTL:HMOS,16384 X 8 EPROM,PRGM (U700A)	80009	160-4009-00
A1U800	156-2134-00			MICROCKT,DGTL:CMOS,OCTAL D-TYPE TRANSPARENT LATCH	02735	CD74HCT373E
A1U801	156-2671-00			MICROCKT,DGTL:CMOS,2048 X 8 SRAM MDL W/ INTEGRAL BATTERY DS1220,24	80009	156-2671-00
A1U820	156-2134-00			MICROCKT,DGTL:CMOS,OCTAL D-TYPE TRANSPARENT LATCH	02735	CD74HCT373E
A1U821	156-0913-02			MICROCKT,DGTL:OCTAL D FF W/ENABLE,SCRN	01295	SN74LS377NP3
A1U831	156-0724-02			MICROCKT,DGTL:HEX INV W/OC OUT,SCRN,	01295	SN74LS05NP3
A1U841	156-2396-00			MICROCKT,DGTL:RESET GENERATOR,5V SUPPLY	01295	TL7705 ACP
A1U911	156-2670-00			MICROCKT,INTFC:RELAY DRVR,8 OUTPUT,SERIAL INPUT W/LATCHES	80009	156-2670-00
A1U921	156-2670-00			MICROCKT,INTFC:RELAY DRVR,8 OUTPUT,SERIAL INPUT W/LATCHES	80009	156-2670-00
A1U931	156-2670-00			MICROCKT,INTFC:RELAY DRVR,8 OUTPUT,SERIAL INPUT W/LATCHES	80009	156-2670-00
A1U941	156-2455-00			MICROCKT,LINEAR:8 BIT A/D PERIPHERALS W/ SERIAL CONTROL & 11 INPUTS,SCRN	01295	TLC541IN3
A1U947	156-2670-00			MICROCKT,INTFC:RELAY DRVR,8 OUTPUT,SERIAL INPUT W/LATCHES	80009	156-2670-00
A1U1025	156-2670-00			MICROCKT,INTFC:RELAY DRVR,8 OUTPUT,SERIAL INPUT W/LATCHES	80009	156-2670-00
A1VR741	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR841	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR843	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR845	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR847	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR931	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR933	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR935	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR937	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR1033	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
A1VR1055	152-0195-00			SEMICOND DVC,DI:ZEN,SI,5.1V,5%,0.4W,DO-7	04713	SZ11755RL
A1X600	136-0813-00			SKT,PL-IN ELEK:CHIP CARRIER,68 CONTACTS	19613	268-5400-00-1102
A1X700	136-0757-00			SKT,PL-IN ELEK:MICROCIRCUIT,40 DIP	09922	DILB40P-108
A1Y640	119-2395-00			RESONATOR,CER:12MHZ,CMOS,5%	80009	119-2395-00
A2	670-9336-00			CIRCUIT BD ASSY:FRONT PANEL (NO REPLACEABLE SUBPARTS)	80009	670-9336-00
A3	670-9336-00			CIRCUIT BD ASSY:FRONT PANEL (NO REPLACEABLE SUBPARTS)	80009	670-9336-00

Part 6
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

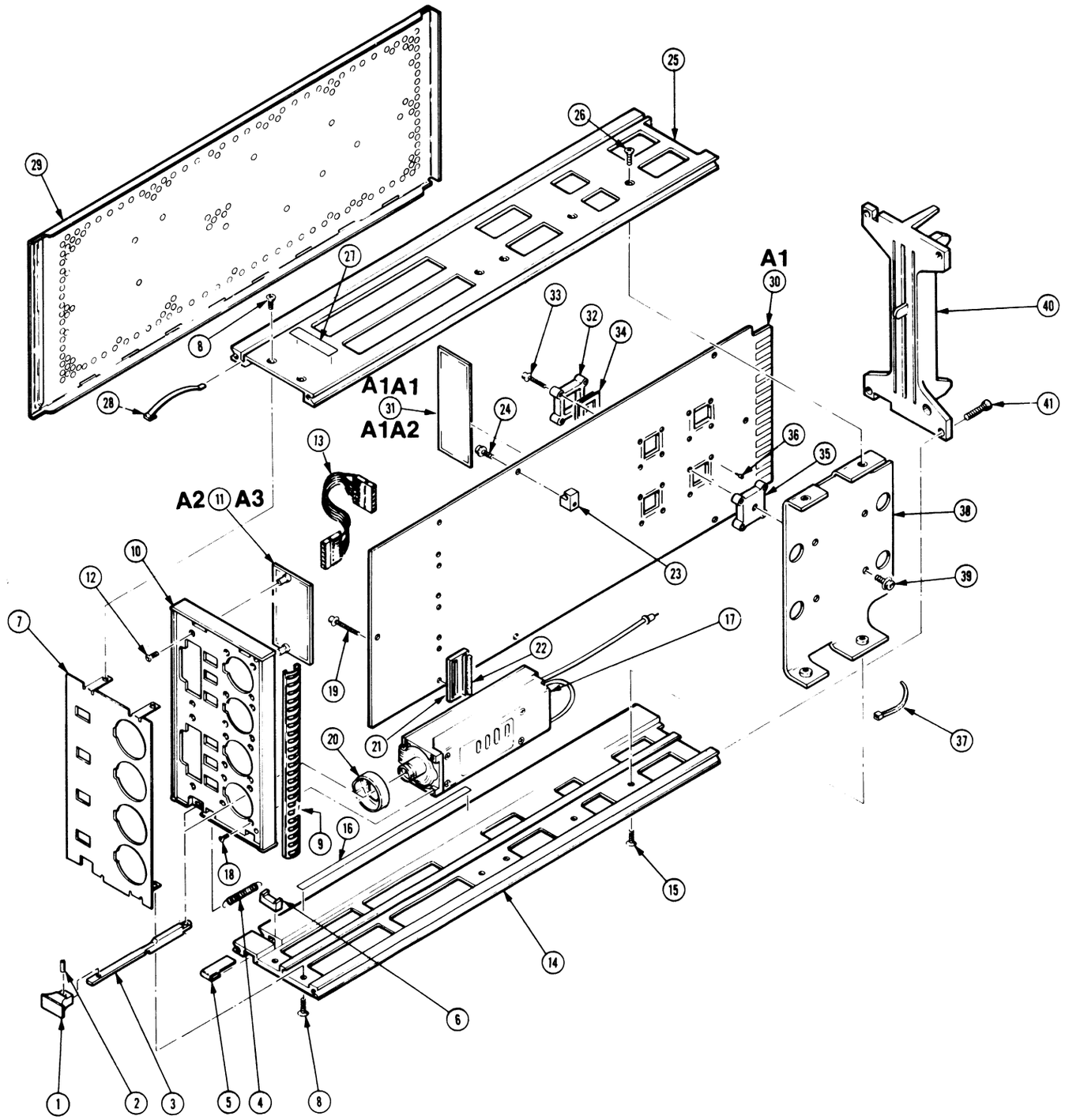
CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
01536	TEXTRON INC CAMCAR DIV SEMS PRODUCTS UNIT	1818 CHRISTINA ST	ROCKFORD IL 61108
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS	30 HUNTER LANE	CAMP HILL PA 17011
22599	AMERACE CORP ESNA DIV	15201 BURBANK BLVD SUITE C	VAN NUYS CA 91411
80009	TEKTRONIX INC	4900 S W GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
83385	MICRODOT MANUFACTURING INC GREER-CENTRAL DIV	3221 W BIG BEAVER RD	TROY MI 48098
TK1918	SHIN-ETSU POLYMER AMERICA INC	1181 NORTH 4TH ST	SAN JOSE CA 95112

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	366-1058-00			1	KNOB:GRAY,0.625 X 0.255 X 0.485	80009	366-1058-00
					(ATTACHING PARTS)		
-2	214-1095-00			1	PIN,SPRING:0.187 L X 0.094 OD,STL,CD PL	22599	52-022-094-0187
					(END ATTACHING PARTS)		
-3	105-0076-04			1	RELEASE BAR,LCH:PLUG-IN UNIT	80009	105-0076-04
-4	214-1280-00			1	SPRING,HLCPS:0.14 OD X 1.126 L,TWIST LOOP	80009	214-1280-00
-5	214-1054-00			1	SPRING,FLAT:0.825 X 0.322,SST	80009	214-1054-00
-6	105-0075-00			1	BOLT,LATCH:	80009	105-0075-00
-7	333-3164-00			1	PANEL,FRONT:	80009	333-3164-00
					(ATTACHING PARTS)		
-8	211-0392-00			4	SCREW,MACHINE:4-40 X 0.25,FLH,82 DEG,STL	80009	211-0392-00
					(END ATTACHING PARTS)		
-9	348-0235-00			2	SHLD GSKT,ELEK:FINGER TYPE,4.734 L	92101	ORDER BY DESCR
-10	386-5219-00			1	SUBPANEL,FRONT:	80009	386-5219-00
-11	670-9336-00			2	CIRCUIT BD ASSY:FRONT PANEL	80009	670-9336-00
					(SEE A2,A3 REPL)		
					(ATTACHING PARTS)		
-12	211-0390-00			4	SCREW,MACHINE:2-56 X 0.188,FH,STL CD PL	80009	211-0390-00
					(END ATTACHING PARTS)		
-13	174-0159-00			2	CA ASSY,SP,ELEC:6,26 AWG,3.0 L,RIBBON	80009	174-0159-00
-14	426-2061-00			1	FR SECT,PLUG-IN:LOWER,ALUMINUM	80009	426-2061-00
					(ATTACHING PARTS)		
-15	211-0392-00			2	SCREW,MACHINE:4-40 X 0.25,FLH,82 DEG,STL	80009	211-0392-00
					(END ATTACHING PARTS)		
-16	334-3540-00			1	MARKER,IDENT:MARKED WARNING	80009	334-3540-00
-17	119-2000-00			4	ATENUATOR:ACTIVELY TRIMMED NOVAR ATTENUATOR & BUFFER AMPLIFIER	80009	119-2000-00
					(ATTACHING PARTS)		
-18	211-0390-00			16	SCREW,MACHINE:2-56 X 0.188,FH,STL CD PL	80009	211-0390-00
-19	211-0391-00			8	SCREW,MACHINE:2-56 X 0.437,P4,STL CD PL	80009	211-0391-00
					(END ATTACHING PARTS)		
-20	354-0654-00			4	RING,CONN ALIGN:BNC	80009	354-0654-00
-21	352-0780-00			4	HOLDER,CNDCT:ELASTOMERIC	80009	352-0780-00
-22	131-3383-01			8	CONN ASSY,ELEC:ELASTOMERIC,3.8MM X 3.0MM X 24.0MM,0.4MM L CONTACT PT	TK1918	.4PX24X3.8X3.0
-23	220-0022-00			4	NUT BLOCK:0.4 X 0.25 X 0.33,4-40 THRU,NI	80009	220-0022-00
					(ATTACHING PARTS)		
-24	211-0304-00			4	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL,T9 TORX	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
-25	426-2060-00			1	FR SECT,PLUG-IN:UPPER,ALUMINUMN	80009	426-2060-00
					(ATTACHING PARTS)		
-26	211-0392-00			2	SCREW,MACHINE:4-40 X 0.25,FLH,82 DEG,STL	80009	211-0392-00
					(END ATTACHING PARTS)		
-27	334-3438-00			1	MARKER,IDENT:MARKED TURN OFF POWER	80009	334-3438-00
-28	214-1061-00			1	CONTACT,ELEC:GROUNDING,CU BE	80009	214-1061-00
-29	337-1064-12			2	SHIELD,ELEC:SIDE FOR PLUG-IN UNIT	80009	337-1064-12
-30	----- -----			1	CIRCUIT BD ASSY:MAIN		
					(SEE A1 REPL)		
-31	----- -----			2	.CIRCUIT BD ASSY:SAMPLE/HOLD		
					.(SEE A1A1,A1A2 REPL)		
-32	426-1337-00			4	.FRAME,MICROCKT:1.22 CM	80009	426-1337-00
					.(ATTACHING PARTS)		
-33	211-0391-00			16	.SCREW,MACHINE:2-56 X 0.437,P4,STL CD PL	80009	211-0391-00
					.(END ATTACHING PARTS)		
-34	131-3511-00			4	.CONTACT,ELEC:1.22 CM FLAT HYPCON	80009	131-3511-00
-35	214-3785-00			4	.HEAT SINK,ELEC:ALUMINUM	80009	214-3785-00
-36	136-0252-07			4	.SOCKET,PIN CONN:M/O DIMPLE	22526	75060-012
-37	343-0543-00			2	RETAINER,MIRROR:LEFT & RIGHT,ABS BLACK	80009	343-0543-00
-38	407-3363-00			1	BRACKET,HEAT SK:ALUMINUM	80009	407-3363-00
					(ATTACHING PARTS)		
-39	211-0711-00			4	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
-40	386-5296-00			1	PANEL,REAR:	80009	386-5296-00
					(ATTACHING PARTS)		
-41	213-0904-00			4	SCREW,TPG,TR:6-32 X 0.5,PNH,STL	83385	ORDER BY DESCR
					(END ATTACHING PARTS)		

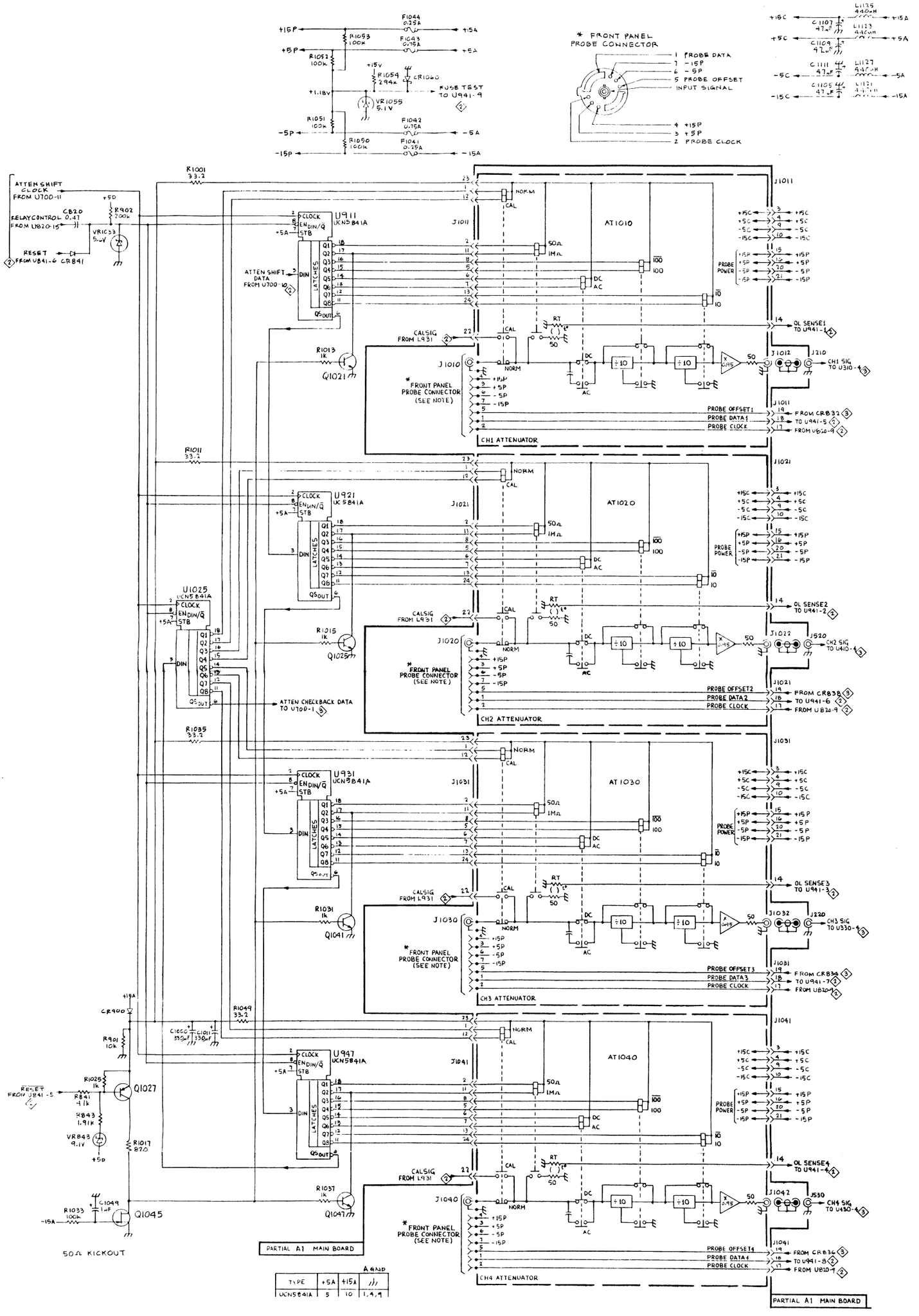
Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345	Name & Description	Mfr. Code	Mfr. Part No.
1-						STANDARD ACCESSORIES		
	070-5921-00			1		MANUAL,TECH:USERS,11A34	80009	070-5921-00
						OPTIONAL ACCESSORIES		
	070-6116-00			1		MANUAL,TECH:SERVICE,11A34	80009	070-6116-00

FIG. 1 EXPLODED VIEW



11A34

Part 7
Diagrams


INPUT ATTENUATORS 1
11A34
* FRONT PANEL PROBE CONNECTOR
1 PROBE DATA
7 -15P
6 -5P
5 PROBE OFFSET
INPUT SIGNAL
4 +15P
3 +5P
2 PROBE CLOCK
ATTEN SHIFT CLOCK FROM U700-11
ATTEN SHIFT DATA FROM U700-10
RESET FROM U841-6 CR841
RELAY CONTROL FROM U820-15
ATTEN CHECKBACK DATA TO U700-1
CALSIG FROM L931
PROBE POWER
CH1 ATTENUATOR
CH2 ATTENUATOR
CH3 ATTENUATOR
CH4 ATTENUATOR
PROBE OFFSET1
PROBE DATA1
PROBE CLOCK
PROBE OFFSET2
PROBE DATA2
PROBE OFFSET3
PROBE DATA3
PROBE OFFSET4
PROBE DATA4
CH1 SIG TO U310-4
CH2 SIG TO U410-4
CH3 SIG TO U330-4
CH4 SIG TO U430-4
OL SENSE1 TO U941-1
OL SENSE2 TO U941-2
OL SENSE3 TO U941-3
OL SENSE4 TO U941-4
50Ω KICKOUT
PARTIAL A1 MAIN BOARD
PARTIAL A1 MAIN BOARD
TYPE +5A +15A ⏚
UCN5841A 5 10 1,4,9
8-19-85
11-4-85
11-15-85
11-18-86
1-30-86
2-17-86
3-28-86
4-3-86
4-25-86
5-28-86
6-12-86

TYPE	+5D	+5A	DIGITAL GND	ANALOG GND
74LS377	20		10	
74LS373	20		10	
74LS05	14		7	
74HCT373	20		10	
TLC54C	20	14	10	13
DS1220	24		12	
8052	40		20	
TL7705	7,8		4	
M382	67,68		8,36,37	

U831D 74LS05 +5D R820 1k

U831C 74LS05

TP901 TP902 TP905 TP906 5A +TOP

TP903 TP904 TP907 TP908 5A START 5A CLK

R1003 1k R1007 1k R1005 1k R1009 1k

U821 74LS377

PROBE OFFSET CONTROL 5

U831B 74LS05

U831A 74LS05

U831E 74LS05

U831F 74LS05

U820 74LS373

J1141 P1141

CH4ID CH3ID CH4LED CH3LED +5D

TO CH3, CH4 FRONT PANEL BOARD 4

J1121 P1121

CH2ID CH1ID CH2LED CH1LED +5D

TO CH1, CH2 FRONT PANEL BOARD 4

READ Ø TO A1A1, A1A2-13

READ 1 TO A1A1, A1A2-12

READ 2 TO A1A1: A1A2-11

READBACK 2 DISAB TO A1A1-24

TP1005 GND 3

PROBE CLOCK TO AT1011, 1021, C31, 1041-17 1

RELAY CONTROL TO CR820 1

READBACK DISABLE TO A1A1-14 8

VR741 5.6V CR741 K740 +5D

C940 0.1 +5D

U941 TLC540

CH1 +4.0V R923 75k +15A VR 931 5.6V

CH2 +4.0V R922 75k VR933 5.6V

CH3 +4.0V R921 75k VR935 5.6V

CH4 +4.0V R920 75k VR937 5.6V

50Ω OVERLOAD SENS 1

CH1 R847 1k +5A VR 847 5.6V

CH2 R849 1k VR845 5.6V

CH3 RB43 1k VR843 5.6V

CH4 VR841 5.6V

PROBE DATA 1

5 MAJTST FROM R636

FUSE TEST FROM VR805 1

DATA OUT 16

ADDRESS IN

SYS CLOCK

IO CLOCK

CS

CAL REF

.033 3.3mH

CAL SIG 1 B36

CAL REF B35

RESET TO CR841 1

RESET TO P541 1

+5D R840 10k

U841 TL7705

R648 1k

C84C 0.1

C74C 1µF

J740

+5D C901 0.1

TIMING & CONTROL

RESET PSEN ALE

OSCILLATOR

50* Y604C 12MHz 50*

XTL1 XTL2

TP601 ALE

ATTEN SHIFT DATA TO U911-3 1

P2.4 P3.0 P2.7 P1.6 P3.4

TP605 WR

TP603 RD

WR INT RD

P2.0 P2.1 P2.2 P2.5 P1.3 P1.4 P1.5 P1.6

P0.0 P0.1 P0.2 P0.3 P0.4 P0.5 P0.6 P0.7

U700 8052

P600 GND

AUX TRIG ON TO U310, U430-12 U410, U530-18 3

J611 R625 499 C635 .0022 P3.5

ATTENUATOR CHECKBACK FROM U1025-6 1

P1.0 P1.1 P3.1

ATTENUATOR SHIFT CLOCK TO U911, U921, U931, U947, U925-2 1

U800 74HCT373

U801 DS1220

U600 M382

WR INT CS PSEN ALE RD

AB A9 A10 CS

FETCH

MAIN INTERFACE 4

SEQCLOCK A5 SEQSYNC B6 SDI CLOCK A21 SDI M→P A20

R130 100 R131 100 R104 100 R105 100

CR516 CR517 CR518 CR519 CR510 CR511 CR512 CR513 SCLK SYNC CLK M→P

SERIAL DATA INTERFACE

GAIN BANWIDTH CONTROL

ANALOG CONTROL VOLTAGE SYSTEM

CHANNEL SWITCH SEQUENCER

STROBES 3

CONTROL SIGNALS 3

BP1 GPD GP1 GP2

MINSTB MAJSTB ARA Ø ARA 1 ARA 2 LCLK UCLK 3

TRIG ON 1 TRIG INV 1 DISP ON 1 DISP INV 1 TO U310 3

TRIG ON 2 TRIG INV 2 DISP ON 2 DISP INV 2 TO U410 3

TRIG ON 3 TRIG INV 3 DISP ON 3 DISP INV 3 TO U330 3

TRIG ON 4 TRIG INV 4 DISP ON 4 DISP INV 4 TO U430 3

U630 AD667

12 BIT LATCH & 12 BIT DAC

+15A C631 .1 B

-5A R649 20k R620 20k

5k 9.95k 19.95k

R627 3.9k ±1.14V R625 1k VDAC TO A1A1, A1A2-4 3

R635 24.9

LOW TC REF +10.0V

C632 0.1 A -15A

TP11B GND

F-M CR514 R106 100 CR515 +5D

SDI DATA PI-MF B21

B-19-B5 11-5-B5 11-13-B5 11-18-B5 2-17-B6 4-3-B6 4-25-B6 5-7-B6 5-23-B6 8-9-B6 8-21-B6

C600 D .022 67,68 +5D

* PART OF ETCHED CIRCUIT BOARD

11A34

KERNEL 4

670-8986-00

U100 74HC4051

U101 74HC4051

U102 TL074C

U103 TL074C

U641 1H5151

U649 1H5151

U310 M377

U410 M377

U330 M377

U430 M377

A1A1 SAMPLE/HOLD ASSEMBLY

A1A2 SAMPLE/HOLD ASSEMBLY

PROBE OFFSET 1
PROBE OFFSET 2
PROBE OFFSET 3
PROBE OFFSET 4

PROBE OFFSET CONTROL FROM U821

U641 & U649 SHOWN WITH LOGIC 1 APPLIED TO PROBE OFFSET CONTROLS.

AUX TRIG ON FROM R625

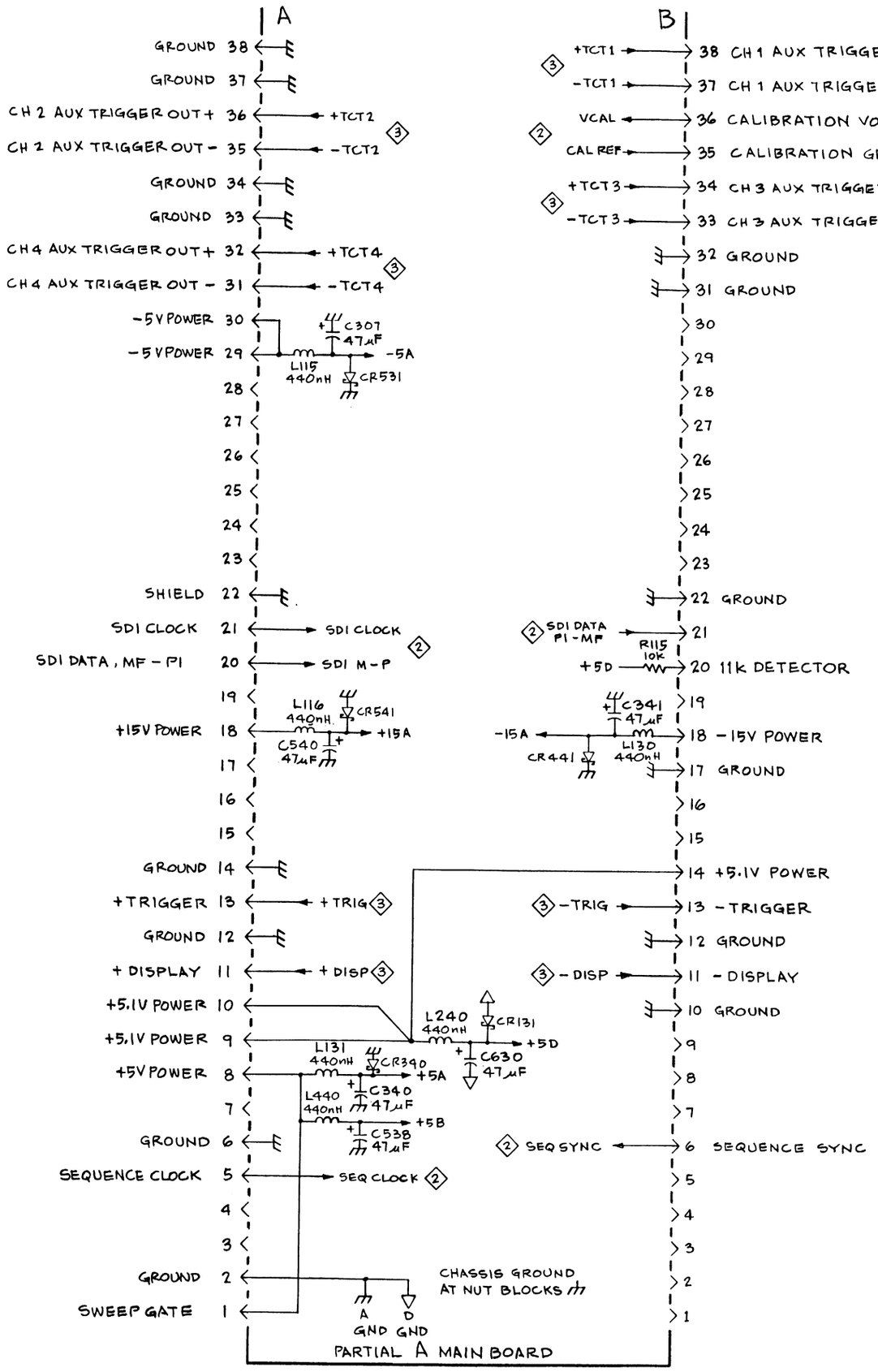
TYPE	+15A	+5B	+5D	A GND	D GND	-5B	-15A	+15B
1H5151	11		12		13		14	
M377		14,31		7,13,28, 24,30,5		9,10,32		3

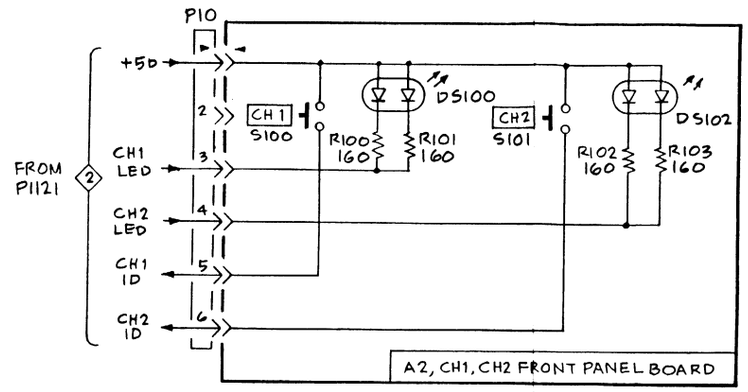
REVISED:
8 - 5 - 85 B - 21 - 86
11 - 5 - 85 B - 28 - 86
11 - 13 - 85 1 - 12 - 86
11 - 18 - 85 12 - 24 - 86
1 - 23 - 86
2 - 17 - 86
4 - 3 - 86
4 - 25 - 86
5 - 28 - 86

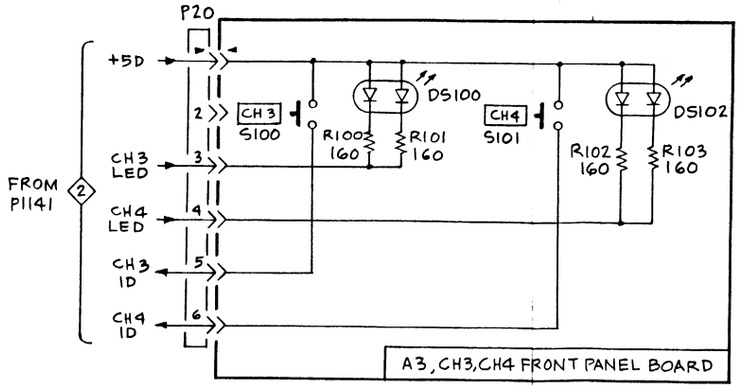
PARTIAL A1 MAIN BOARD

11A34

ANALOG CONTROL / SIGNAL AMPLIFIERS 3


A
B
GROUND 38
GROUND 37
CH 2 AUX TRIGGER OUT + 36
CH 2 AUX TRIGGER OUT - 35
GROUND 34
GROUND 33
CH 4 AUX TRIGGER OUT + 32
CH 4 AUX TRIGGER OUT - 31
-5V POWER 30
-5V POWER 29
28
27
26
25
24
23
SHIELD 22
SDI CLOCK 21
SDI DATA, MF - P1 20
19
+15V POWER 18
17
16
15
GROUND 14
+TRIGGER 13
GROUND 12
+ DISPLAY 11
+5.1V POWER 10
+5.1V POWER 9
+5V POWER 8
7
GROUND 6
SEQUENCE CLOCK 5
4
3
GROUND 2
SWEEP GATE 1
+TCT2
-TCT2
+TCT4
-TCT4
C307 47µF
L115 440nH
CR531
-5A
SDI CLOCK
SDI M-P
L116 440nH
CR541
+15A
C540 47µF
+TRIG
+DISP
L240 440nH
CR131
+5D
L131 440nH
CR390
+5A
C340 47µF
L440 440nH
+5B
C538 47µF
SEQ CLOCK
CHASSIS GROUND AT NUT BLOCKS
A GND
D GND
PARTIAL A MAIN BOARD
+TCT1
-TCT1
VCAL
CAL REF
+TCT3
-TCT3
38 CH 1 AUX TRIGGER OUT +
37 CH 1 AUX TRIGGER OUT -
36 CALIBRATION VOLTAGE
35 CALIBRATION GROUND SENSE
34 CH 3 AUX TRIGGER OUT +
33 CH 3 AUX TRIGGER OUT -
32 GROUND
31 GROUND
30
29
28
27
26
25
24
23
22 GROUND
SDI DATA P1-MF
21
R115 10K
+5D
20 11k DETECTOR
C341 47µF
-15A
CR441
L130 440nH
18 -15V POWER
17 GROUND
16
15
14 +5.1V POWER
-TRIG
13 -TRIGGER
12 GROUND
-DISP
11 -DISPLAY
10 GROUND
9
8
7
SEQ SYNC
6 SEQUENCE SYNC
5
4
3
2
1


P10
FROM P1121
+5D
CH1 LED
CH2 LED
CH1 ID
CH2 ID
CH1 S100
CH2 S101
DS100
DS102
R100 160
R101 160
R102 160
R103 160
A2, CH1, CH2 FRONT PANEL BOARD


P20
FROM P1141
+5D
CH3 LED
CH4 LED
CH3 ID
CH4 ID
CH3 S100
CH4 S101
DS100
DS102
R100 160
R101 160
R102 160
R103 160
A3, CH3, CH4 FRONT PANEL BOARD