TEK Preliminary
Service Information

Part Number 061-3383-00
Product Group 47

11A52
Two Channel Amplifier

January 7, 1987

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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 11A52 Two 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 11A52 Two Channel Amplifier before individual circuits are explained in detail. Figure 2-1 is a block diagram of the 11A52. 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 11A52 Two Channel Amplifier is given here.

Attenuators 1

The 11A52 attenuators consist of thick-film resistor networks and hermetically sealed DPDT relays. Each attenuator also contains a 2.2 µF AC coupling capacitor and a high-frequency-compensation skin-loss network. Defective attenuator modules are not repairable and should be replaced.

Caution

When removing or inserting attenuator modules, take care to unbolt the attenuator-mounting bracket from the main circuit board first. The attenuator-mounting bracket is designed as an integral part of the attenuator and supports the large AC coupling capacitor. To promote heat dissipation from the relay coils, the attenuators are not covered. Handle the attenuator modules carefully.

Each attenuator has four relays. In this discussion, we assume that the #1 relay (Cal/Norm) passes a signal to the #2 relay (AC/DC). From the #2 relay, the signal goes to the #3 relay (X1Ø/X1), then to the #4 relay (X1Ø/X1). The #3 and #4 relays and associated resistor networks are identical in function, though the #3 relay resistor network can dissipate slightly more power. Each relay function is explained below:

1. Calibrate/Normal (#1 relay)

With the Cal/Norm relay in the Cal position (relay deenergized), the front panel input signal is disconnected and the attenuator input comes from pin 2 of the attenuator socket on the main circuit board. With the Cal/Norm relay in the Norm position (relay energized), the front panel input signal is connected to the input of the #2 relay on the attenuator. The signal voltage at pin 2 of the attenuator socket on the main ECB is disconnected from the input of the #2 relay on the attenuator. The Cal/Norm relay applies the accurate calibration voltage signal (CALSIG) to the very front end of the 11A52 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.

2. AC/DC Coupling (#2 relay)

The AC/DC relay inserts an coupling capacitor into the input signal path between the input bnc and the remainder of the attenuator. When the AC/DC relay is set to AC position (relay energized), the #1 relay is AC coupled to the #3 relay. Alternately, with the AC/DC relay set to DC (relay deenergized), the #1 relay is DC coupled to the #3 relay. The network of resistors surrounding the AC/DC relay serves to charge the coupling capacitor while Coupling is set to Off, and to discharge the coupling capacitor when the input signal is removed from the input connector.

3. X10/X1 (#3 relay)

With the #3 relay in the X10 position (relay de-energized), the signal from the #2 relay is attenuated by a factor of 10. With the #3 relay in the X1 position (relay energized), the signal from the #2 relay is not attenuated and proceeds to the skin-loss network (the resistor/capacitor network between the #3 and #4 relays).

*** The skin loss network compensates for high-frequency losses in the relays and the two cables connected to the attenuator.

4. X10/X1 (#4 relay)

With the #4 relay in the X10 position (relay de-energized), the signal from the skin-loss network is attenuated by a factor of 10. When the #4 relay is set to the X1 position (relay energized), the signal from the skin loss network is not attenuated and proceeds to the attenuator output.

The attenuation factors of the two X10 attenuator networks are correct when the output of the attenuators drive a 50 Ω termination (the main amplifiers incorporate 50 Ω terminations at their inputs).

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 two X10/X1 relays are set for the required attenuation factors. Whenever X10 attenuation is required, the #3 relay does the X10 function and the #4 relay is set to X1. (This is because the #3 relay can dissipate more power than the #4 relay.)

2. OFF
   In the Off mode the #1 relay selects Cal (disconnects the input signal), the #2 relay selects DC (allows precharge of the AC coupling capacitor), and both the X1Ø/X1 relays (#3 and #4) are set to X1Ø attenuation (X1ØØ total attenuation).

3. AC
   In the AC mode the #1 relay selects Norm (connects the input signal), the #2 relay selects AC, and the X1Ø/X1 relays are set for the required attenuation factors. Whenever X1Ø attenuation is required, the #3 relay does the X1Ø function and the #4 relay is set to X1. (This is because the #3 relay can dissipate more power than the #4 relay.)

4. Calibration
   During calibration, the #1 relay selects Cal (disconnects the input signal), the #2 relay selects DC, and the two X1Ø/X1 relays turn on and off until calibration is complete.

Input Overload Sensing 1

The Input Overload Sensing circuit gives the 11A52 the ability to detect input voltages in excess of 5 Vrms.

The OVERLOAD SENSE signals for channels 1 and 2 are TTL level signals from U945 and U94Ø. ICs U945 and U94Ø are RMS signal detectors; they produce a high on the CH1 OVERLOAD SENSE or CH 2 OVERLOAD SENSE line whenever the respective input exceeds 5 Vrms. In the event of an overload, the processor reads the overload signal through U91Ø (diagram 2) and disconnects the input signal. Capacitors C94Ø and C83Ø average a current that is proportional to the rms level of the input signals. Capacitors C949 and C941 bypass U945 and U94Ø's internal references. The Detect outputs of U945 and U94Ø are open collectors with R948 and R939 serving as pullup resistors. Resistors R84Ø, R841, R842 and R94Ø, along with U84Ø, are used to selftest U94Ø and U945.

With the signal RMSTEST high and RMSINV low, each RMS detect IC receives a simulated +1Ø V overload (as if each input channel was overdriven by a +1Ø V power supply). With RMSTEST high and RMSINV high, the simulated overload would appear to be -1Ø V.

Fuse Check Circuit 1

The Fuse Check Circuit produces +1.18 V for Digital-to-Analog Converter (DAC) U941 when fuses F1001, F1002, F1003, and F1004 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 CR1045 and VR975 limit the FUSE CHECK voltage to -0.3 V minimum and +5.1 V maximum.

Relay Fast Power On (RFPO) 1

The RFPO circuit controls operating power to U850, the IC that drives the attenuator relays. At power-up, U850 receives operating power when the +15A supply reaches +13.6 V. At power-down, power to U850 is turned off when the output of the +15A supply falls below +12.9 V.

IC U350 detects that both the +15A and +5D power supplies have attained a large enough voltage to guarantee proper attenuator relay state changes. Also, at power-down U350 rapidly shuts off the relay supply current when the +15A supply begins to drop. VR452 sets the +15A "supply up" trip point. Resistors R344 and R345 divide the +15A voltage so it can be compared to the VR452 voltage. The relay power is turned on when +15A = +13.6 V (double the voltage across VR452). The relay power is turned off when +15A = +12.9 V [2(VR452)]. The difference in the "relay power on" and "relay power off" voltage trip points (0.7 V) ensures that U350 does not oscillate during power-up or power-down.

Positive feedback through C350 to U350 causes U350 to make fast on/off transitions. Capacitor C450 filters digital noise. Diode VR451 lengthens the RESET(L) pulse at power-down. IC U350 drives Q449 through R448. Normally pin 7 of U350 is near zero V, which saturates Q449. When saturated, Q449 furnishes current to U850 through CR449 and L755. Diode CR449 drops 0.7 V to lower the power dissipated in the attenuator relays. Inductor L755 and C850 bypass the relay power to reduce digital noise at the attenuators.

Analog Control Voltage System 2

The Analog Control Voltage System (ACVS) generates dc voltage levels used to set input offsets, balance and amplifier gains. The ACVS also nulls the input current and adjusts the high frequency response of each channel. The main ACVS components are the seneschal IC (U600), digital-to-analog converter (DAC) U630, and the sample/hold modules (A1A1, A1A2).

Circuitry in U600 drives both the DAC and the sample/hold modules. Every 30 µs U630 is driven to one of 16 voltage levels stored in U600's memory. Each A1A1 output is updated every 300 µs, while each A1A2 output is updated every 1200 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. U600 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 ARA0, ARA1, and ARA2; then strobed with the signals MAJSTB (L) and MINSTB (L). The DAC is internally set to produce precisely +5.0 volts maximum and -5.0 volts minimum. Resistors R527 and R525 divide the DAC output to ±1.136 volts to create the VDAC signal, which drives the sample/hold modules directly. Resistors R649 and R620 level-shift the DAC output and drive A/D converter U941 to self-test the DAC.

Analog-to-Digital Converter 2

The Analog-to-Digital converter (A/D) 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 A/D converter signal lines are described below:

Name	pin#	Description
A0	1	(not used)
A1	2	(not used)
A2	3	Analog input for Fuse check.
A3	4	(not used)
A4	5	Analog input for CH1 Probe data.
A5	6	Analog input for CH2 Probe data.
A6	7	(not used)
A7	8	(not used)
A8	9	Analog input for MINTST (A1A2 selftest).
A9	11	Analog input for DAC selftest.
A10	12	Analog input for MAJTST (A1A1 selftest).
A11	--	(internal self-test of A/D = 1/2[(REF+)+(REF-)] voltage).

Name	pin#	Description
Address in	17	Serial address input used to select A/D input AØ-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 AØ-A11 inputs.
REF-	13	Negitive reference for the AØ-A11 inputs.

The AØ-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 ØØ (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 8Ø (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 (U8Ø1). 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 AØ-A1Ø are the address lines, and the pins labeled DØ-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 (AØ-A1Ø) 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 U8Ø1 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.Ø V, the power-switching circuit connects the lithium energy source to the RAM. During power-up, when +5D rises above approximately 3.Ø 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 volts.

Calibration Buffer Amplifier 2

Calibration Buffer Amplifier U841 provides unity-gain voltage following of the VCAL signal (B36 at edge connector). To reduce gain errors, the voltage is sensed inside each attenuator; U84Ø selectively switches the sensed voltage between channels 1 and 2. The internal sense line is available at pin 3 of each attenuator. IC U841B, Q831, and Q83Ø provide power amplification of the VCAL signal while U841A senses the CALSENSE feedback signal. Diodes CR83Ø and CR831 eliminate latchup that could occur because Q83Ø and Q831 are powered by ±5 V. Q83Ø and Q831 are off during normal instrument operation. During calibration K74Ø selects the calibration buffer amplifier, which requires Q83Ø and Q831 to produce up to ±4.Ø V into 25 Ω (two 5Ø Ω attenuators driven in parallel). L965, C965, and C842 filter out low-level digital noise in the calibration signal. C836, C841, C935, R832 and R935 stabilize the amplifiers. R843 and R1Ø41 (see schematic 1) connect the CALSENSE line to the attenuator sense points. The values of R843 and R1Ø41 were chosen to be high enough to prevent bleeding the AC coupling precharge signal voltage when the input coupling is changed from Off to AC.

CPU 2

The CPU (U700) is an 8052 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
P0.0	Bi	Output for the adrs latch & bidirectional data bus
P0.1	Bi	"
P0.2	Bi	"
P0.3	Bi	"
P0.4	Bi	"
P0.5	Bi	"
P0.6	Bi	"
P0.7	Bi	"
P1.0	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
P2.0	O	Address bit 8 of the RAM
P2.1	O	Address bit 9 of the RAM
P2.2	O	Address bit 10 of the RAM
P2.3	O	(not used)
P2.4	O	Address bit used to enable the output latch (U820)
P2.5	O	Address bit used to enable RAM U801 and U600
P2.6	O	(not used)
P2.7	O	Address bit use to enable the output latch (U821)
P3.0	O	Attenuator shift data (serially encoded)
P3.1	O	Attenuator shift clock
P3.2	I	(not used)
INT	I	(P3.3) Interrupt from seneschal (U600)
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 2

Microprocessor U700 contains circuitry to drive a 12-MHz ceramic resonator (Y640). All oscillator circuitry is inside U700 except the 30 pF capacitance etched into the circuit board runs to Y640.

Seneschal IC 2

Because U600 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 both plug-in channels.

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)	20	I	The PSEN signal when low, allows CPU execution of instructions stored in RAM (U801)
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-AD0 pins, onto those same AD7-AD0 pins.
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.

Signal	Pin	Desc	Usage
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.
BPØ	47	O	Bandwidth bit Ø.
BP1	48	O	Bandwidth bit 1.
GPØ	49	O	Gain bit 1.
GP1	5Ø	O	Gain bit 1.
GP2	51	O	Gain bit 1.
DØ	61	O	DAC data bit Ø.
D1	6Ø	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.
ARAØ	52	O	Sample/Hold module output select address bit Ø.
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.
TRIGON1	31	O	Channel 1 trigger path on.
TRIGINV1	32	O	Channel 1 trigger path invert.
DISPON1	28	O	Channel 1 display path on.
DISPINV1	4	O	Channel 1 display path invert.
TRIGON2	34	O	Channel 2 trigger path on.
TRIGINV2(L)	35	O	Channel 2 trigger path invert.
DISPON2	33	O	Channel 2 display path on.
DISPINV2(L)	2	O	Channel 2 display path invert.
RMSTEST	39	Ø	Self-test of RMS detector; on=high, off=low.
RMSINV	4Ø	Ø	Self-test of RMS detector polarity.
P-M	7	O	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 11A52 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 0 the total output voltage will be -5 V (at pin 2 and 9) and for a code of 4095 the output will be +5 V. R530 drops a small amount of the reference voltage to help center the output between ±5 V.

Address Buffer Latch 2

Eight-bit transparent latch U800 buffers the address bits from the MPU (U700) to the battery RAM (U801). When U800 pin 1 is high, the latch inputs drive the outputs. When the latch enable input goes low, U800 latches its outputs. The outputs are constantly on because the EN(L) input is wired low.

Output Latches 2

Eight-bit transparent latch U1001 serves as an eight-bit output port from MPU U700. When pin 11 of U1001 is high, the latch inputs drive the outputs. When the latch-enable input goes low, U820 latches its outputs. The outputs are constantly on because the EN(L) input is wired low. IC U1001 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.

U1005 2

The C and D sections of hex-inverter U1005 are wired as a two-input NOR gate and used to address eight-bit output port U1001. U1005A and U1005B serve as output drivers for the probe data lines (from the 11A52 to any attached probes). Because U1005 is an open-collector part, the probes can also pull down on the probe data lines to send messages to the 11A52. Diodes VR757 and VR759 protect the probe data lines from static voltages.

Reset Circuit 2

Reset IC U660 disables the CPU while the instrument is powering up or down. The reset circuit keeps the RESET input of microprocessor U700 low 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 ±50 mV, U841 will produce a low on RESET after 13 ms. Capacitor C660 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, U660 sets RESET high.

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 input 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 U1Ø1 provides a readback path for self-testing analog voltage outputs V1 through V8, which are normally in the range of ±1.15 V. The READ Ø, READ 1, and READ 2 lines contain the address of the voltage to be read; 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 both main amplifiers (U31Ø and U41Ø) and any external TEKPROBE accessory.

Input offset voltages for the main amplifier are generated by the ACVS and are divided by resistors R542, R544, R547, R546, R543, and R545. Probe-offset voltages are also generated by the ACVS; they are divided by R663, R662, R661, and R66Ø. Diodes CR665, CR651, CR656, and CR652 clamp any static voltages introduced at the TEKPROBE connector.

In the 11A52 the main amplifier offset and the probe offset are driven by separate ACVS outputs. When an active probe with a TEKPROBE connector is used, the probe offset output is driven by the ACVS and the main amplifier receives no offset voltage. When a non-active probe is used, the offset voltage is applied only to the main amplifier input; the probe offset output is not driven.

In each amplifier channel the COARSE offset is designed to be 2Ø times larger than the FINE offset. The 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 L21Ø and L53Ø are as follows:

COARSE = +/- 1.Ø178 volts
FINE = +/- Ø.Ø5Ø6 volts
BALANCE = +/- Ø.Ø629 volts

Components L21Ø, C21Ø, LR21Ø , L53Ø, C52Ø, and LR52Ø filter noise generated by the Sample/Hold module (A1A1).

High-Frequency Adjust Signals 3

The HF Adjust outputs from A1A2 control the transient response of the two main amplifiers. An incremental positive voltage at A1A2 pin 15 or 17 will cause more overshoot in the transient response. The HF Adjust signals are set for optimal transient response of the display signal path at each gain setting. The trigger signal path is identical to the display path; their High-Frequency Adjust inputs are both connected to the same node in the adjustment

network. (See pins 21 and 24 on U31Ø and pins 24 and 27 on U41Ø.) The auxiliary signal paths require slightly reduced peaking, obtained by resistors R326, R327, R328 and R329. Also, CR235 and U335 add a temperature-dependent voltage to the HF Adjust signals. Inverters U335A and U335B send the Ch 1 HF Adjust and Ch 2 HF Adjust signals to U31Ø and U41Ø, respectively.

Main Amplifiers 3

Main amplifiers U31Ø and U41Ø are shown on schematic 3. The main amplifiers do the all the voltage amplification required. Input signals come from the individual attenuators through shielded cables into J21Ø and J521. The nominal gain of the main amplifier is 1.Ø9 (at 5Ø mV/div); the attenuator gain is Ø.915 (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 with the +Vin terminated in 5Ø Ω and overvoltage protected to ±25 V (pin 4). The -Vin is not terminated and has no overvoltage protection (pin 8).

b. Three separate differential outputs (pins 19-2Ø, 22-23, and 25-26) that can be individually turned on, 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 2Ø MHz 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, 10 mV, 20 mV, and 50 mV per division. See Table 2-2.

TABLE 2-2
Gain Set by GP0, GP1, and GP2 Bits

Gain Setting	GP2	GP1	GP0
1 mV	0	0	0
2 mV	0	0	1
5 mV	0	1	0
10 mV	0	1	1
20 mV	1	0	X
50 mV	1	1	X

The GP0, GP1, GP2; plus BP0 and BP1 connect to pins 1, 36, 35, 34, and 33 of both U310 and U410. The GP and BP signals are latched by strobes GS1(L) and GS2(L).

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

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 volt and maximum at +1 volt.

h. An input current null used to cancel input base current and the protection bridge offset current (pin 6).

The input current null signal can correct for up to ±280 µA of offset current caused by both the main amplifier input current and mismatches in the bridge protection network. During Enhanced Accuracy calibration, the 11A52 operates the X10 attenuators with the Cal/Norm relay in Cal and K960 in the open position. This is effectively the same as first placing a 50 Ω resistor across the input, then replacing that 50 Ω resistor with an open circuit. The input current is detected by measuring the resulting change

in input voltage; it is corrected by adjusting the input current null voltage at pins 19 and 20 on Sample/Hold module A1A2. U540 inverts the input current null signals and aids in ±15 V power supply rejection of noise picked up in the protection bridge biasing network in the main amplifiers. R650, R651, R652, and R653 provide additional power supply noise rejection.

The outputs of the main amplifiers are reverse terminated in 100 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 going to the edge connector.

Power Supplies

All power for the 11A52 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 four decoupled power supplies in the instrument are:

+15A, +5A, -5A, -15A	Standard supplies for analog control circuits, on diagrams 1, 2, and 3.
+15B, +5B, -5B, -15B	Power for U310, U330, U335, U410, U430, and U540, on diagram 3.
+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 supplies are separately filtered to reject noise from digital circuits.

Part 2
Performance Verification Procedure

NOTE

The Performance Verification Procedure is located in the 11A52 User's Reference Supplement (Part No. 070-6114-00).

Part 3
Adjustment Procedure

11A52 Preliminary
Adjustment Procedure

NOTE

This procedure is intended to provide a way to 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 11A52 User's Reference supplement (Part No. 070-6114-00) 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 11402 mainframe.

2. **Test Terminal.** Compaq Portable II Pc with Pro Comm software. Any ANSI 3.64 standard terminal will serve as an alternate test terminal.

3. **Calibration Generator.** Tektronix PG 506 with power mainframe.

4. **Signal Standardizer.** Tektronix 067-0587-02 Signal Standardizer Calibration Fixture with the interface connector modified for 11000-series use.

5. **Pulser.** Tektronix 067-0681-01 Tunnel Diode Pulser Calibration Fixture.

6. **Attenuators.** Tektronix 2X (011-0069-02), 5X (011-0060-02), and 10X (011-0059-02) in-line bnc attenuators.

7. **50-ohm Coaxial cable.**

Power-Up Sequence

1. Insert the Signal Standardizer into the Oscilloscope RIGHT plug-in compartment.

2. Connect a test terminal to the appropriate rear-panel connector.

3. Connect the 11402 to a suitable power source and switch the rear-panel PRINCIPAL POWER SWITCH to ON.

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

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

6. Press the 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 11A52 step response.

b. Set oscilloscope On/Standby switch to Standby.

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

A2. EXAMINE/ADJUST CH 1 and CH 2 Signal Step Response

Signal step response in the 11A52 is adjusted by setting calibration (cal) constants that reside in nonvolatile RAM. The cal constant values are entered with a test terminal over the RS-232-C interface.

Each channel must be checked at six deflection factors. Associated with each deflection factor is a unique address at which the cal constant is stored. Table 3-1 lists the deflection factors and the associated cal constant addresses for each channel. The Pulser produces a constant pk-pk output when properly triggered so bnc attenuators are used to reduce the signal level to the plug-in for the lower deflection factors.

Cal constants are entered at the appropriate step in the following procedure by typing:

RCAL <address from Table 3-1>: number _

The number must be a decimal fraction between -1.0000 and +1.0000. A value of -1.00 produces the most damping and +1.00 produces the most peaking. Normally, a value with two decimal places gives adequate resolution.

TABLE 3-1

Deflection Factor	CH1 Cal Address	CH2 Cal Address	Pulser-to Plug-in Attenuator	Aberrations[1] Peak	Pk-Pk
50 mV/div	58	186	none	4%	7%
20 mV/div	57	185	X2	4%	7%
10 mV/div	56	184	X5	4%	7%
5 mV/div	55	183	X10	4%	7%
2 mV/div	54	182	X10+X2	4%	7%
1 mV/div	53	181	X10+X5	4%	7%

[1]This aberration percentage does not include the mainframe aberration, which is characterized in step A.

NOTE

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

SETUP CONDITIONS

Perform the following settings in the order listed:

1. Remove the bottom cover of the 11402 and install a Term Conn Link (shorting strap) on the CAL-LOCK terminals located on the bottom of the A6 Time Base board (See Fig. A at the end of this procedure for the location)
2. Remove the left side cover of the 11A52 and change jumper J611 to its horizontal position (see Fig. B at the end of this procedure for the location).
3. Connect the test terminal to the 11402 rear-panel RS-232-C connector. The terminal should be configured for 8 bit characters and 9600 baud. To view all current RS-232-C parameters on the 11402, press the Utility menu button then the RS232C Parameters label in the Utility major menu.
4. Insert the 11A52 into the Oscilloscope Right plug-in compartment.
5. Connect the 067-0681-01 Pulser to the CH 1 input connector.
6. 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
- Menus button ..... Utility
- Utility menu ..... Instr Options
- Instrument Options menu ..... Waveform Scaling (Forced)
- Utility menu ..... RS232C Parameters
- Echo ..... On
- Verbose ..... On
- Baud 9600

11A52
- CH 1 button ..... on (lighted)

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

*Pulser
- TD Triggered Level ..... Fully clockwise
- Install Pulser-to-plug-in attenuator ..... Attenuator for next deflection factor setting from Table 3-1

Oscilloscope
- Icon ..... vertical
- Vert Size: R1 control knob ..... Next deflection factor from Table 3-1
- 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 Mag: R1.....touch
Numeric Entry & Knob Res menu.....Fine
Vert Mag: R1 control knob.....Five div display
Vert Mag: R1 control knob.....set readout for 10% of present readout
Vert Offset: R1.....position top of pulse at right side of graticule to center horizontal graticule line

a. **EXAMINE**—compare the displayed waveform with the waveform recorded in step A1. The difference between the two waveform aberrations should not exceed 4% peak (2 divisions), and 7% (3.5 divisions) peak-to-peak (1 major graticule division = 2%).

b. **ADJUST**—To adjust the signal step response, enter a new cal constant with the test terminal. It should be a decimal fraction between +1.00 and -1.00. The cal constant address is found across from the deflection factor in Table 3-1. A -1.00 provides the most damping and +1.00 produces the most peaking. Note that excessive damping will adversely affect the bandwidth.

To enter a new cal constant and install it in the current channel's amplifier, enter the following test terminal commands:

RCAL? <address>	Returns the present cal constant for the deflection factor aberration being adjusted.
RCAL <address>:<new cal constant>	Writes new cal constant into nonvolatile RAM.
CHR1 SENS: <deflection factor being set>	Sets the new cal constant into the amplifier circuitry and causes the waveform aberrations to change accordingly. This is not a value read from the Control knob label, but is the deflection factor for which aberrations are being adjusted.
RCAL? <address>	Verifies that the new cal constant has been incorporated in nonvolatile RAM.

For example, to enter a cal constant for CH 1 at the 50 mV setting you would enter:

RCAL? 58	to get the current cal constant. Then
RCAL 58:-.4	which sets the 50 mV cal constant to -.4. Next,
CHR1 SENS:.05	to set the new cal constant into the amplifier. And finally,
RCAL? 58	to verify that the new cal constant is stored in nonvolatile RAM.

Verify that the CH 1 aberrations are within 4% peak (2 divisions), and 7% peak-to-peak (3.5 division) as in the step above: EXAMINE. If not, try another cal constant from within the allowed range.

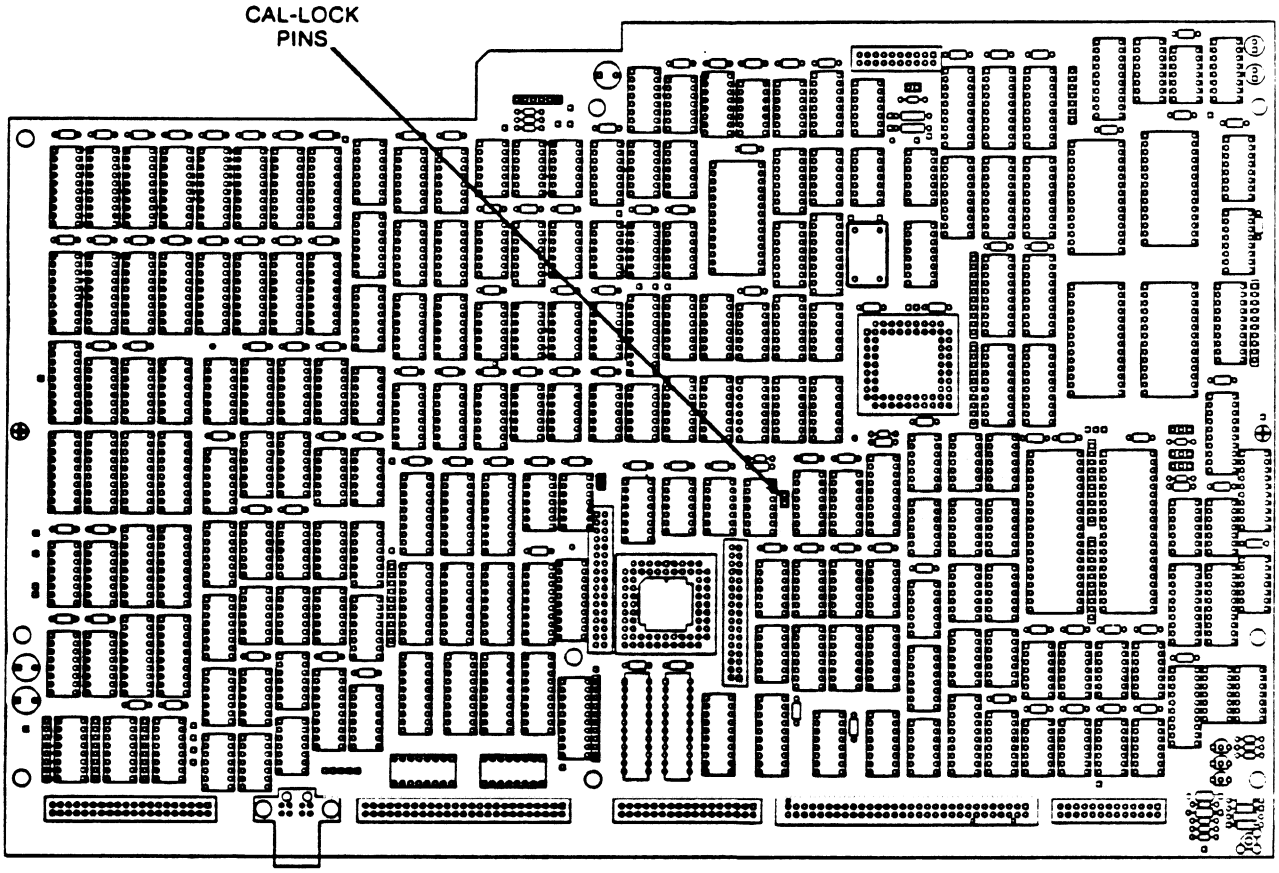
c. Return to the stared (*) entry in the procedure above and set the cal constant for the next deflection factor in Table 3-1. Do this loop until all CH 1 deflection factor entries in the table have been checked for aberrations and adjusted as necessary.

d. Repeat step A2 for the CH 2 input, except that the adjustment is performed using the CH2 entries in Table 3-1 and the command to install the new constant is CHR2 SENS:<current deflection factor being set>.

e. Return the 11A52 jumper J611 to its normal vertical position to prevent the cal constants from being inadvertently changed.

f. Remove the Term Conn Link (shorting strap from the CAL -LOCK terminals on the A6 Time Base board.

e. This completes the Signal Step Response adjustment procedure.



A6-Time Base board.

FIGURE A

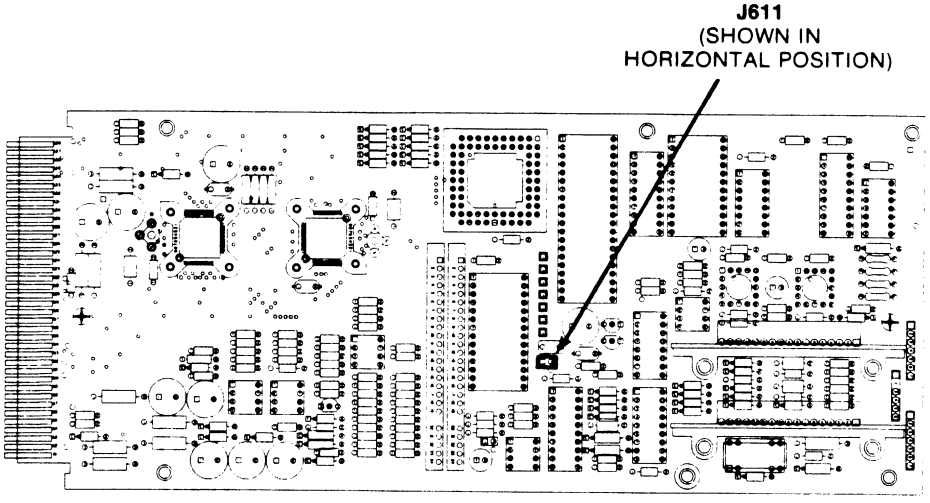


FIGURE B

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 Dummer	

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 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. 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 1140l/1140Z

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.

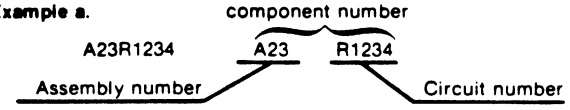
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

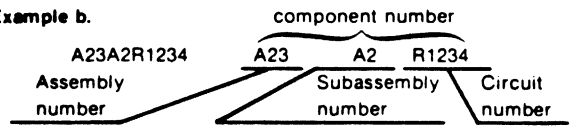
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

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
59660	TUSONIX INC	2155 N FORBES BLVD	TUCSON, ARIZONA 85705
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

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	670-9404-00			CIRCUIT BD ASSY:MAIN	80009	670-9404-00
A2	670-9336-00			CIRCUIT BD ASSY:FRONT PANEL (NO REPLACEABLE SUBPARTS)	80009	670-9336-00
A1	670-9404-00			CIRCUIT BD ASSY:MAIN	80009	670-9404-00
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
A1C118	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C119	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C210	281-0921-00			CAP,FXD,CER DI:0.68UF,+80-20%,25V	80009	281-0921-00
A1C230	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C235	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C310	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C315	283-0028-00			CAP,FXD,CER DI:0.0022UF,20%,50V	59660	0805585Y5S0222M
A1C340	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C341	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C350	281-0791-00			CAP,FXD,CER DI:270PF,10%,100V	04222	MA101C271KAA
A1C420	283-0028-00			CAP,FXD,CER DI:0.0022UF,20%,50V	59660	0805585Y5S0222M
A1C440	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C450	281-0791-00			CAP,FXD,CER DI:270PF,10%,100V	04222	MA101C271KAA
A1C520	281-0921-00			CAP,FXD,CER DI:0.68UF,+80-20%,25V	80009	281-0921-00
A1C600	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C620	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A1C630	290-1157-00			CAP,FXD,ELCTLT:220UF,20%,25DVC	80009	290-1157-00
A1C640	283-0028-00			CAP,FXD,CER DI:0.0022UF,20%,50V	59660	0805585Y5S0222M
A1C650	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C651	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C652	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C653	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C660	290-0778-00			CAP,FXD,ELCTLT:1UF,+50 -10%,50V,NPLZD	54473	ECE-A50N1
A1C830	290-0776-01			CAP,FXD,ELCTLT:22UF,+50%-10%,10V	55680	ULB1A220MAA1TD
A1C836	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C841	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A1C842	281-0791-00			CAP,FXD,CER DI:270PF,10%,100V	04222	MA101C271KAA
A1C850	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
A1C935	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C940	290-0776-01			CAP,FXD,ELCTLT:22UF,+50%-10%,10V	55680	ULB1A220MAA1TD
A1C941	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C949	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C950	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C960	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1C965	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A1CR131	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817
A1CR230	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR235	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR310	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
A1CR341	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817
A1CR440	152-0581-00			SEMICOND DVC,DI:RECT,SI,20V,1A,A59	04713	1N5817
A1CR449	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A1CR450	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
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)

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
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)
A1CR651	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR652	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR655	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR656	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR830	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)
A1CR850	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR851	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR960	152-0141-02			SEMICOND DVC,DI:SM,SI,30V,150MA,30V	03508	DA2527 (1N4152)
A1CR1045	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARRIER,SI,15V	50434	5082-2672
A1F1001	159-0253-00			FUSE,CARTRIDGE:0.250A,125V,FAST,SUBMIN	75915	251.250 T & R T1
A1F1002	159-0235-00			FUSE,WIRE LEAD:0.75A,125V,FAST	80009	159-0235-00
A1F1003	159-0235-00			FUSE,WIRE LEAD:0.75A,125V,FAST	80009	159-0235-00
A1F1004	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
A1J521	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
A1J660	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 3)	22526	48283-036
A1J1110	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 5)	22526	48283-036
A1J1141	131-3798-00			CONN,RCPT,ELEC:7 POSITION,0.1 SPACING	80009	131-3798-00
A1J1151	131-3798-00			CONN,RCPT,ELEC:7 POSITION,0.1 SPACING	80009	131-3798-00
A1K960	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
A1L117	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L119	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L129	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
A1L210	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L235	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L240	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1L530	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L755	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L950	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L960	108-1354-00			COIL,RF:FXD,3.3UH,10%	80009	108-1354-00
A1L965	108-1315-00			COIL,RF:FXD,440NH,+/-10%	80009	108-1315-00
A1LR210	108-0408-00			COIL,RF:FIXED,100NH	80009	108-0408-00
A1LR520	108-0408-00			COIL,RF:FIXED,100NH	80009	108-0408-00
A1Q449	151-0622-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS8956(MPSM51A)
A1Q830	151-0622-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS8956(MPSM51A)
A1Q831	151-0710-00			TRANSISTOR:NPN,SI,TO-92 PLUS	04713	MPSM01A
A1R115	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=TO	57668	CR820 FXE 10K0
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
A1R230	322-3301-00			RES,FXD,FILM:13.3K OHM,1%,0.2M,TC=TO	80009	322-3301-00
A1R235	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=TO	57668	CR820 FXE 20K0
A1R304	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2M	57668	TR20JE100E
A1R305	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2M	57668	TR20JE100E
A1R306	313-1101-00			RES,FXD,FILM:100 OHM,5%,0.2M	57668	TR20JE100E

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R310	321-0097-00			RES,FXD,FILM:100 OHM,1%,0.125M,TC=T0	91637	CMF55116G100R0F
A1R311	321-0097-00			RES,FXD,FILM:100 OHM,1%,0.125M,TC=T0	91637	CMF55116G100R0F
A1R312	321-0097-00			RES,FXD,FILM:100 OHM,1%,0.125M,TC=T0	91637	CMF55116G100R0F
A1R326	322-3276-00			RES,FXD,FILM:7.32K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 7K32
A1R327	322-3170-00			RES,FXD,FILM:576 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 576E
A1R328	322-3276-00			RES,FXD,FILM:7.32K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 7K32
A1R329	322-3170-00			RES,FXD,FILM:576 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 576E
A1R330	322-3295-00			RES,FXD,FILM:11.5K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 11K5
A1R333	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R335	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R344	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 100K
A1R345	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 100K
A1R350	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R410	321-0097-00			RES,FXD,FILM:100 OHM,1%,0.125M,TC=T0	91637	CMF55116G100R0F
A1R441	322-3295-00			RES,FXD,FILM:11.5K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 11K5
A1R443	322-3289-02			RES,FXD,FILM:10K OHM,0.5%,0.2M,TC=T2	57668	CRB 20 DYE 10K0
A1R444	322-3289-02			RES,FXD,FILM:10K OHM,0.5%,0.2M,TC=T2	57668	CRB 20 DYE 10K0
A1R445	322-3295-00			RES,FXD,FILM:11.5K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 11K5
A1R446	322-3295-00			RES,FXD,FILM:11.5K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 11K5
A1R447	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2M,TC=T0	80009	322-3220-00
A1R448	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2M,TC=T0	80009	322-3220-00
A1R453	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R530	322-3039-00			RES,FXD,FILM:24.9 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 24E9
A1R531	322-3289-02			RES,FXD,FILM:10K OHM,0.5%,0.2M,TC=T2	57668	CRB 20 DYE 10K0
A1R534	322-3289-02			RES,FXD,FILM:10K OHM,0.5%,0.2M,TC=T2	57668	CRB 20 DYE 10K0
A1R535	322-3295-00			RES,FXD,FILM:11.5K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 11K5
A1R542	322-3198-00			RES,FXD,FILM:1.13K OHM,1%,0.2M,TC=T0	80009	322-3198-00
A1R543	322-3189-00			RES,FXD,FILM:909 OHM,1%,0.2M,TC=T0	57668	CRB 20 FXE 909E
A1R544	322-3073-00			RES,FXD,FILM:56.2 OHM,1%,0.2M,TC=T0	80009	322-3073-00
A1R545	322-3189-00			RES,FXD,FILM:909 OHM,1%,0.2M,TC=T0	57668	CRB 20 FXE 909E
A1R546	322-3198-00			RES,FXD,FILM:1.13K OHM,1%,0.2M,TC=T0	80009	322-3198-00
A1R547	322-3073-00			RES,FXD,FILM:56.2 OHM,1%,0.2M,TC=T0	80009	322-3073-00
A1R548	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R549	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R550	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R551	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R620	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R631	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R632	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 20K0
A1R640	322-3244-00			RES,FXD,FILM:3.4K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 3K40
A1R641	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R645	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R647	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R649	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 499E
A1R650	322-3301-00			RES,FXD,FILM:13.3K OHM,1%,0.2M,TC=T0	80009	322-3301-00
A1R651	322-3301-00			RES,FXD,FILM:13.3K OHM,1%,0.2M,TC=T0	80009	322-3301-00
A1R652	322-3301-00			RES,FXD,FILM:13.3K OHM,1%,0.2M,TC=T0	80009	322-3301-00
A1R653	322-3301-00			RES,FXD,FILM:13.3K OHM,1%,0.2M,TC=T0	80009	322-3301-00
A1R655	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R660	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R661	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 499E
A1R662	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R663	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 499E
A1R760	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R761	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R830	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 4K99
A1R831	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 10K0
A1R832	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00
A1R833	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CRB20 FXE 1K00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1R840	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2M,TC=T0	80009	322-3220-00
A1R841	322-3068-00			RES,FXD,FILM:49.9 OHM,1%,0.2M,TC=T0	80009	322-3068-00
A1R842	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2M,TC=T0	80009	322-3220-00
A1R843	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 4K99
A1R913	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 1K00
A1R935	322-3072-00			RES,FXD,FILM:54.9 OHM,1%,0.2M,TC=T0	57668	CR820 FXE 54E9
A1R939	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 10K0
A1R940	322-3068-00			RES,FXD,FILM:49.9 OHM,1%,0.2M,TC=T0	80009	322-3068-00
A1R948	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 10K0
A1R1001	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 1K00
A1R1005	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 1K00
A1R1041	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 4K99
A1R1046	322-3430-00			RES,FXD,FILM:294K OHM,1%,0.2M,TC=T0	80009	322-3430-00
A1R1047	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 100K
A1R1048	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 100K
A1R1049	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 100K
A1R1050	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2M,TC=T0	57668	CR820 FXE 100K
A1TP118	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
A1TP604	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP605	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP606	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A1TP607	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	165-2129-00			MICROCKT,LINEAR:VERTICAL PREAMP	80009	165-2129-00
A1U335	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072ACP
A1U350	156-1225-00			MICROCKT,LINEAR:DUAL COMPARATOR	01295	LM393P
A1U410	165-2129-00			MICROCKT,LINEAR:VERTICAL PREAMP	80009	165-2129-00
A1U540	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072ACP
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/+
A1U660	156-2396-00			MICROCKT,DGTL:RESET GENERATOR,5V SUPPLY	01295	TL7705 ACP
A1U700	156-2962-00			MICROCKT,DGTL:NMOS,MICROCOMPUTER,8 BIT W/ SOCKET,EPROM	80009	156-2962-00
A1U700	160-4010-01			MICROCKT,DGTL:HMOS,16385 X 8 EPROM,PRGM (U700A)	80009	160-4010-00
A1U750	156-2455-00			MICROCKT,LINEAR:8 BIT A/D PERIPHERALS W/ SERIAL CONTROL & 11 INPUTS,SCRN	01295	TLC541IN3
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
A1U840	156-2571-00			MICROCKT,DGTL:HCMOS,ANALOG MUX,TRIPLE,2 CHANNEL	80009	156-2571-00
A1U841	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072ACP
A1U850	156-2669-00			MICROCKT,INTFC:RELAY DRVR,8 OUTPUT SERIAL INPUT W/LATCHES	80009	156-2669-00
A1U910	156-2370-00			MICROCKT,DGTL:CMOS,QUAD 2 TO 1 SELECTOR/ MULTIPLEXER	02735	QHCT257EX98
A1U940	155-0076-00			MICROCKT,LINEAR:INPUT PROTECTION	80009	155-0076-00
A1U945	155-0076-00			MICROCKT,LINEAR:INPUT PROTECTION	80009	155-0076-00
A1U1001	156-1065-01			MICROCKT,DGTL:OCTAL D TYPE TRANS LATCHES	04713	SN74LS373 N0/JD
A1U1005	156-0724-02			MICROCKT,DGTL:HEX INV W/OC OUT,SCRN,	01295	SN74LS05NP3
A1VR451	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4M,DO-7	14552	TD3810976
A1VR452	152-0647-00			SEMICOND DVC,DI:ZENER,SI,6.8V,5%,400MM,DO-7	04713	SZG35014K3RL
A1VR757	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4M,DO-7	14552	TD3810976
A1VR759	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4M,DO-7	14552	TD3810976

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1VR975	152-0195-00			SEMICOND DVC,DI:ZEN,SI,5.1V,5%,0.4W,DO-7	04713	SZ11755RL
A1VR1001	152-0175-00			SEMICOND DVC,DI:ZEN,SI,5.6V,5%,0.4W,DO-7	14552	TD3810976
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

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

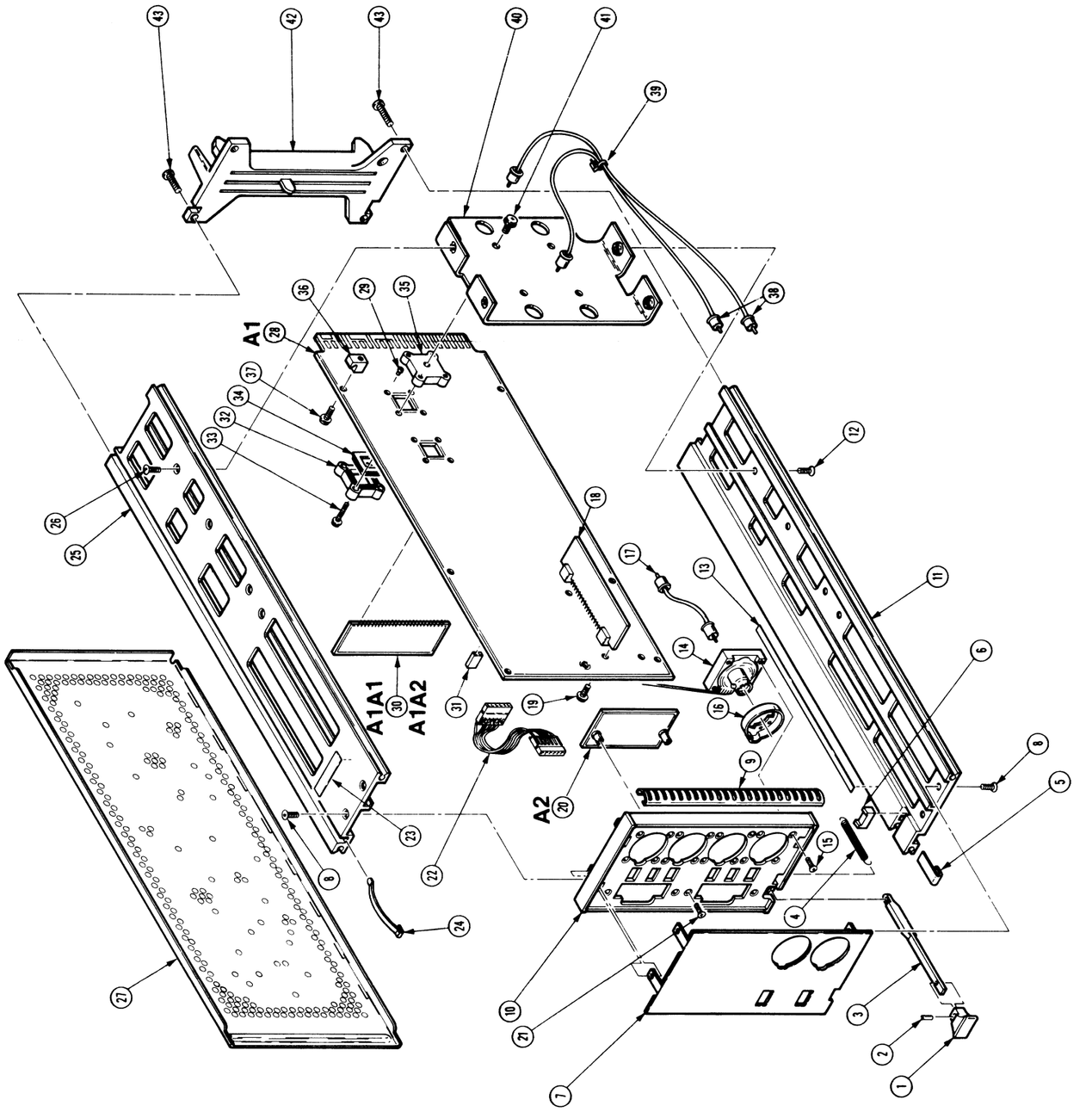
CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00779	AMP INC	P O BOX 3608	HARRISBURG PA 17105
01536	TEXTRON INC		ROCKFORD IL 61108
	CAMCAR DIV	1818 CHRISTINA ST	
	SEMS PRODUCTS UNIT		
06383	PANDUIT CORP	17301 RIDGELAND	TINLEY PARK IL 60477
22526	DU PONT E I DE NEMOURS AND CO INC	30 HUNTER LANE	CAMP HILL PA 17011
	DU PONT CONNECTOR SYSTEMS		
22599	AMERACE CORP ESNA DIV	15201 BURBANK BLVD SUITE C	VAN NUYS CA 91411
80009	TEKTRONIX INC	4900 S W GRIFFITH DR	BEAVERTON OR 97077
		P O BOX 500	
83385	MICRODOT MANUFACTURING INC	3221 W BIG BEAVER RD	TROY MI 48098
	GREER-CENTRAL DIV		

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	333-3350-00			1	PANEL,FRONT:	80009	333-3350-00
					(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	426-2061-00			1	FR SECT,PLUG-IN:LOWER,ALUMINUM	80009	426-2061-00
					(ATTACHING PARTS)		
-12	211-0392-00			2	SCREW,MACHINE:4-40 X 0.25,FLH,82 DEG,STL	80009	211-0392-00
					(END ATTACHING PARTS)		
-13	334-3540-00			1	MARKER,IDENT:MARKED WARNING	80009	334-3540-00
-14	131-3589-00			2	CONN ASSY,ELEC:FRONT PNL	80009	131-3589-00
					(ATTACHING PARTS)		
-15	211-0413-00			8	SCREW,MACHINE:2-56 X 0.375,FLH,82 DEG,STL	80009	211-0413-00
					(END ATTACHING PARTS)		
-16	354-0654-00			2	RING,CONN ALIGN:BNC	80009	354-0654-00
-17	174-0205-00			2	CABLE ASSY,RF:50 OHM COAX,3.5 L	80009	174-0205-00
-18	119-2214-00			2	ATTENUATOR ASSY:750MHZ,50 OHM	80009	119-2214-00
					(ATTACHING PARTS)		
-19	211-0304-00			4	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL,T9 TORX	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
-20	----- -----			1	CIRCUIT BD ASSY:FRONT PANEL		
					(SEE A2 REPL)		
					(ATTACHING PARTS)		
-21	211-0413-00			2	SCREW,MACHINE:2-56 X 0.375,FLH,82 DEG,STL	80009	211-0413-00
					(END ATTACHING PARTS)		
-22	174-0159-00			1	CA ASSY,SP,ELEC:6,26 AWG,3.0 L,RIBBON	80009	174-0159-00
-23	334-3438-00			1	MARKER,IDENT:MARKED TURN OFF POWER	80009	334-3438-00
-24	214-1061-00			1	CONTACT,ELEC:GROUNDING,CU BE	80009	214-1061-00
-25	426-2060-00			1	FR SECT,PLUG-IN:UPPER,ALUMINUMM	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	337-1064-12			2	SHIELD,ELEC:SIDE FOR PLUG-IN UNIT	80009	337-1064-12
-28	----- -----			1	CIRCUIT BD ASSY:MAIN		
					(SEE A1 REPL)		
-29	136-0252-07			36	.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-30	670-8986-00			2	.CIRCUIT BD ASSY:SAMPLE/HOLD	80009	670-8986-00
					.(SEE A1A1,A1A2 REPL)		
-31	131-0993-07			2	.BUS,CONDUCTOR:SHUNT ASSEMBLY,VIOLET	00779	850100-7
-32	426-1337-00			2	.FRAME,MICROCKT:1.22 CM	80009	426-1337-00
					.(ATTACHING PARTS)		
-33	211-0391-00			8	.SCREW,MACHINE:2-56 X 0.437,PH,STL CD PL	80009	211-0391-00
					.(END ATTACHING PARTS)		
-34	131-3511-00			2	.CONTACT,ELEC:1.22 CM FLAT HYPCON	80009	131-3511-00
-35	214-3785-00			2	.HEAT SINK,ELEC:ALUMINUM	80009	214-3785-00
-36	220-0022-00			6	NUT BLOCK:0.4 X 0.25 X 0.33,4-40 THRU,NI	80009	220-0022-00
					(ATTACHING PARTS)		
-37	211-0304-00			6	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL,T9 TORX	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
-38	174-0206-00			2	CABLE ASSY,RF:50 OHM COAX,8.0 L	80009	174-0206-00
-39	343-0549-00			1	STRAP,TIEDOWN,E:0.091 W X 4.0 L,ZYTEL	06383	PLT1M
-40	407-3363-00			1	BRACKET,HEAT SK:ALUMINUM	80009	407-3363-00
					(ATTACHING PARTS)		
-41	211-0711-00			2	SCR,ASSEM WSHR:6-32 X 0.25,PNH,STL,TORX	01536	ORDER BY DESCR
					(END ATTACHING PARTS)		
-42	386-5296-00			1	PANEL,REAR:	80009	386-5296-00
					(ATTACHING PARTS)		
-43	213-0904-00			4	SCREW,TPG,TR:6-32 X 0.5,PNH,STL	83385	ORDER BY DESCR

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-					(END ATTACHING PARTS)		
					STANDARD ACCESSORIES		
	070-6114-00			1	MANUAL,TECH:USERS,11A52	80009	070-6114-00
					OPTIONAL ACCESSORIES		
	070-6117-00			1	MANUAL,TECH:SERVICE,11A52	80009	070-6117-00

FIG. 1 EXPLODED VIEW



11A52

Part 7
Diagrams

IC TYPE	+15A	+5A	+5A	ANALOG GND	-5A
4066		14			7
M94		2			4
LM393	8			4	
74HC4053			16	8	7

RELAY "FAST POWER ON"

+15A
VR452 6.8V
C350 270
R483 10k
R350 10k
R344 100k
R345 100k
R447 1.91k
Q449
R448 1.91k
RESET FROM U660-5 (2)
C450 270
U350 LM393
VR451 5.6V
+5D
L755 3.3uH
CR449
CR450
+5A
C850 0.1
U850 UNC5810
Vpp Vss
Vdd

J930
CH 1
* FRONT PANEL PROBE CONNECTOR

FLEX CABLE
J1141
+15P
+5P
-5P
-15P
PROBE OFFSET 1 FROM CR681 (3)
PROBE DATA 1 TO U750-5 (2)
PROBE CLOCK FROM U1001-7 (2)

CHANNEL 1 ATTENUATORS
AT 950
J950
CAL SIG FROM BELOW
.01
CAL
NORM
.0056 64.8
.0022 15.9
.018 143.5
R843 4.99k
J949
DC
AC
2.2uF
500k
5k
61.4
249
61.24
X10
X1
4.17
.0019
1.2k
J951
J210
CH 1 VERT SIG TO U310-4 (3)
50Ω
L950 3.3uH
C950 0.1
J950

RELAY DISABLE FROM U700-9 (2)
ATTEN SHIFT CLOCK FROM U700-11 (2)
RELAY CONTROL FROM U700-3 (2)
ATTEN SHIFT DATA FROM U700-10 (2)
U850 UNC5810A
CLOCK
STROBE
SIN
SOUT
Q1 CH 1 NORM
Q2 CH 1 AC
Q3 CH 1 X1/X10
Q4 CH 1 X1/X10
Q8 CH 2 X1/X10
Q7 CH 2 X1/X10
Q6 CH 2 AC
Q5 CH 2 NORM
ATTEN CHECKBACK DATA TO U700-1 (2)

FLEX CABLE
J1151
+15P
+5P
-5P
-15P
PROBE OFFSET 2 FROM CR652 (3)
PROBE DATA 2 TO U750-6 (2)
PROBE CLOCK FROM U1001-9 (2)

J940
CH 2
* FRONT PANEL PROBE CONNECTOR

L960 3.3uH
C960 0.1
J960
J959
NORM
CAL
J961
J521
CH 2 VERT SIG TO U410-4 (3)
R1041 4.99k
CAL SIG FROM K740-14 (2)
-5A
CR850
CR851
+5A
L965 440nH
C965 0.1
CAL SIG TO ABOVE
+01

AT960
CHANNEL 2 ATTENUATORS

* FRONT PANEL PROBE CONNECTOR
1 PROBE DATA
3 -15P
4 -5P
5 PROBE OFFSET VERTICAL SIG
9 +15P
3 +5P
2 PROBE CLOCK

PARTIAL A1 MAIN BOARD

11A52

INPUT ATTENUATORS / RELAY DRIVERS (1)

U840
74HC4053
CH1 SENSE FROM U1001-2
RMS TEST FROM U600-39
RMS INV FROM U600-40
CH2 FEEDBACK
CH1 FBSDBACK
CAL SENS TO R830 (2)

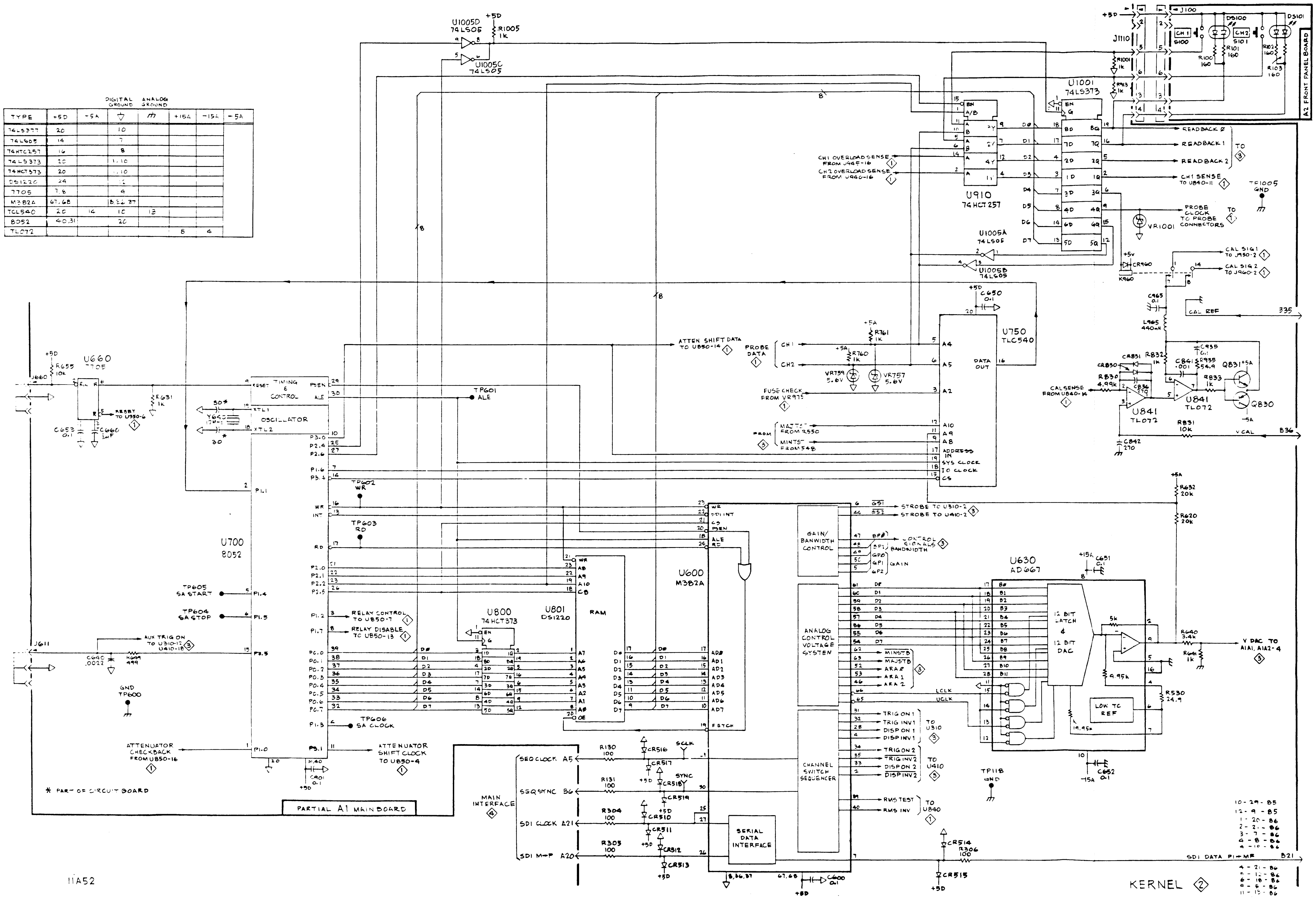
U945
M94
C940 22uF
+5A
+5D
R948 10k
CH1 OVERLOAD SENS TO U910-14 (2)
R840 1.91k
R940 49.9
C949 0.1
6,7,8,9,10,11
12,14,15

F1004 0.25
F1003 0.75
+15P
+15A
R1050 100k
+5P
R1049 100k
R1046 294k
CR1045
FUSE CHECK TO UT50-3 (2)
VR975 5.1V
R1047 100k
F1002 0.75
-5P
-5A
R1048 100k
F1001 0.25
-15P
-15A

U940
M94
C830 22uF
R939 10k
CH2 OVERLOAD SENS TO U910-2 (2)
R842 1.91k
R841 49.9
C941 0.1

1-19-86
2-21-86
3-7-86
3-31-86
4-8-86
4-10-86
4-21-86
5-9-86
5-12-86
6-18-86
9-5-86 THRU C-14

TYPE	+5D	+5A	DIGITAL GROUND	ANALOG GROUND	+15A	−15A	−5A
74LS377	20		10				
74LS05	14		7				
74HCT257	16		8				
74LS373	20		1, 10				
74HCT373	20		1, 10				
DS1220	24		12				
7705	7, 8		4				
M382A	67, 68		8, 36, 37				
TCL540	20	14	10	13			
8052	40, 31		20				
TL072					8	4	



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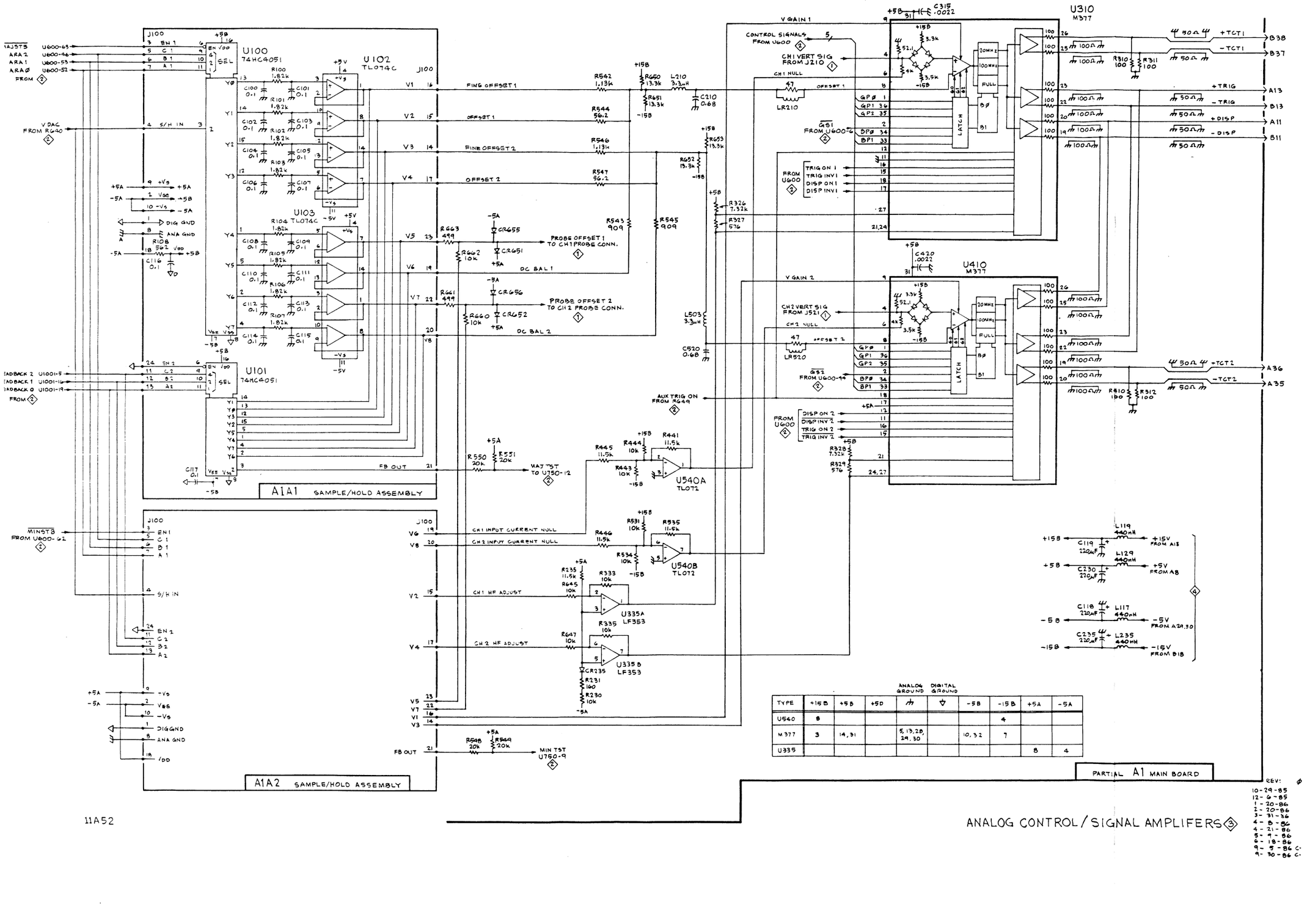
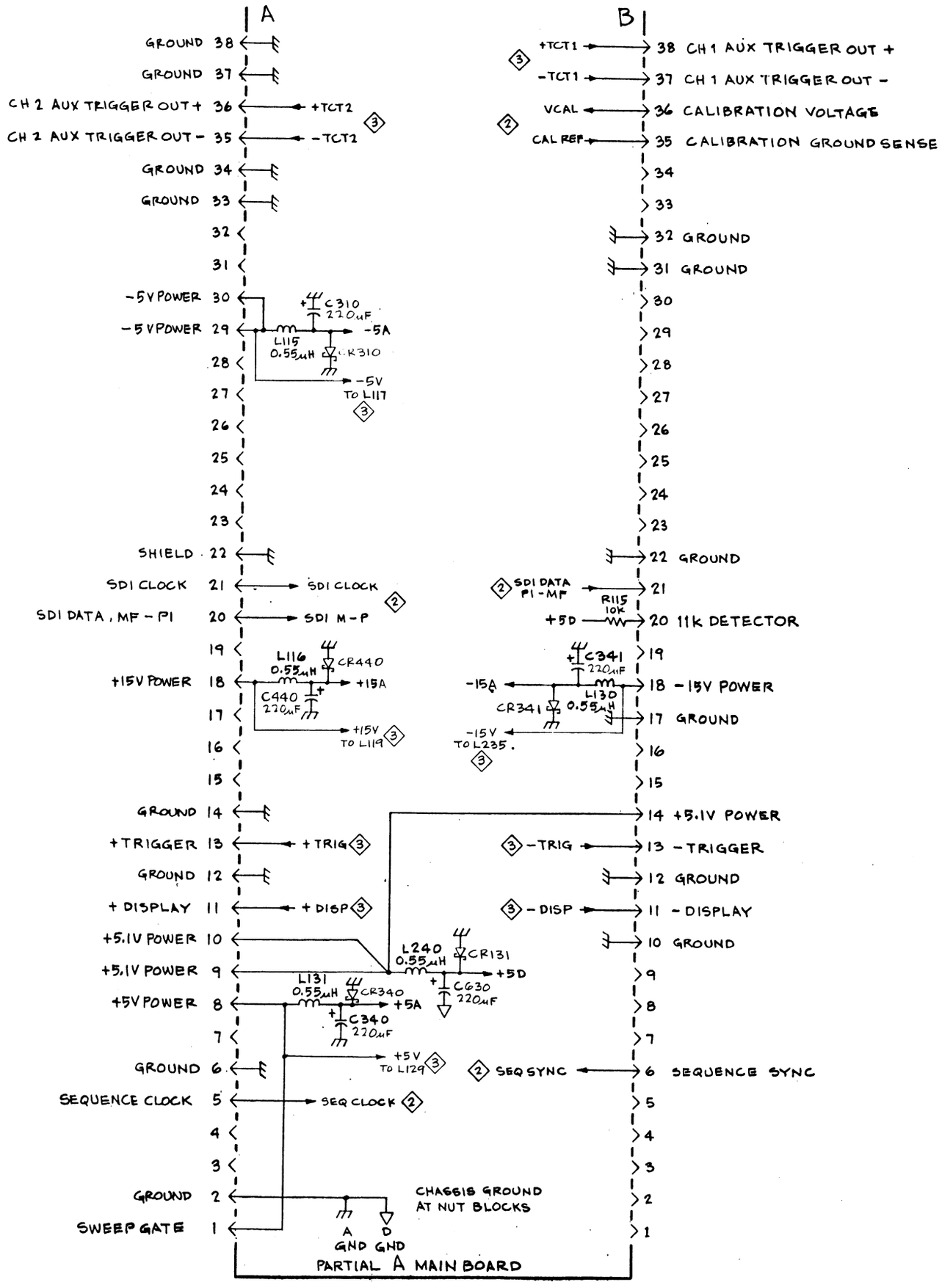
KERNEL 2



TYPE	+15B	+5B	+5D	ANALOG GROUND	DIGITAL GROUND	-5B	-15B	+5A	-5A
U540	8						4		
M377	3	14, 31		5, 13, 28, 29, 30		10, 32	7		
U335								8	4

REV: ø
10-29-85
12-6-85
1-20-86
2-20-86
3-31-86
4-8-86
4-21-86
5-9-86
6-18-86
9-5-86 C.
9-30-86 C.



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MAIN INTERFACE 4

10-28-85
3-10-86
4-21-86
5-20-86
6-18-86