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**Tektronix®**

**A6741**  
**RS-449**  
**INTERFACE ADAPTER**

**INSTRUCTION MANUAL**





**PLEASE CHECK FOR CHANGE INFORMATION  
AT THE REAR OF THIS MANUAL.**

**A6741  
RS-449  
INTERFACE ADAPTER**

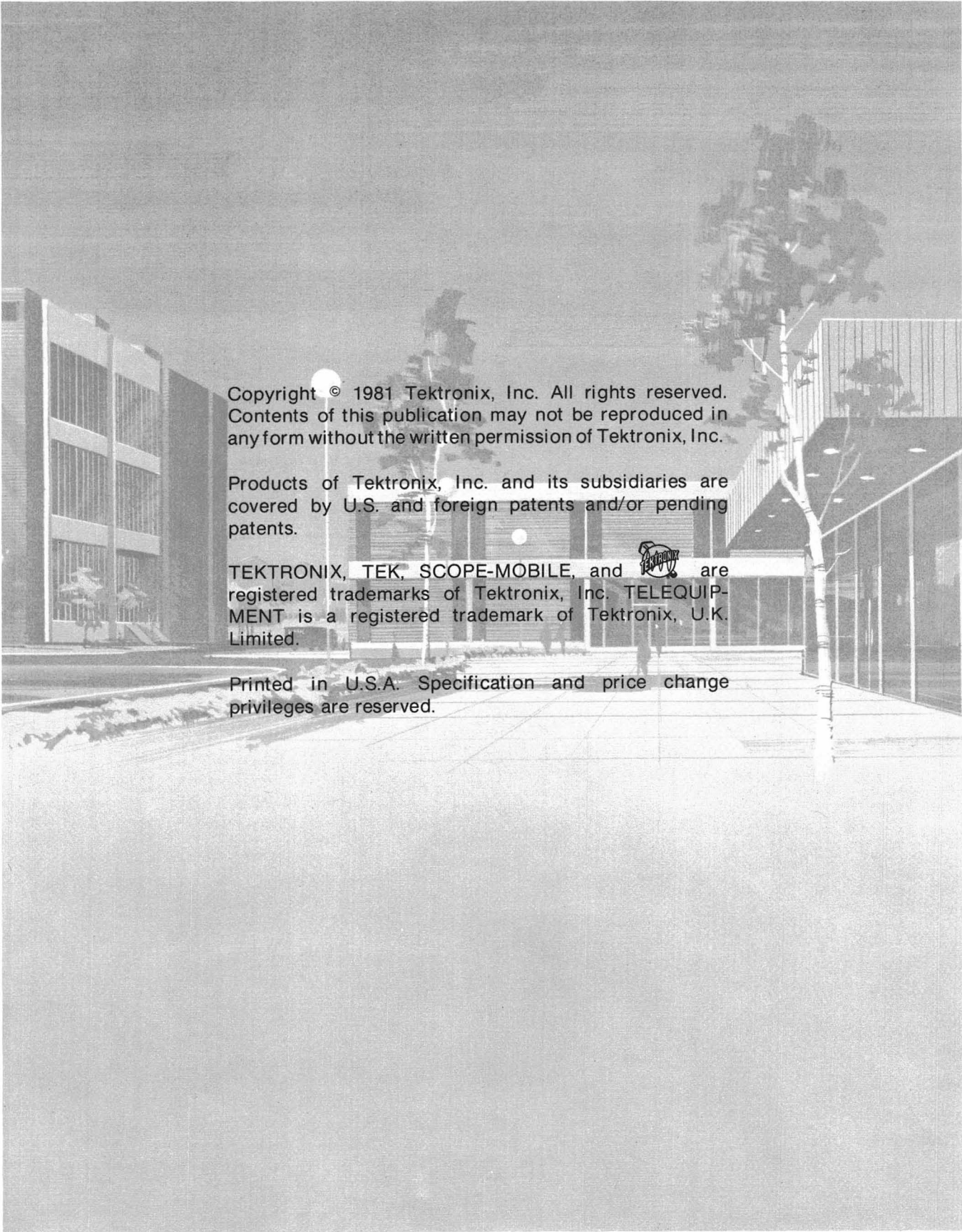
**INSTRUCTION MANUAL**

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**WARNING**

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



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## OPERATOR'S SAFETY SUMMARY

The information in this summary is for both operating and servicing personnel. Specific cautions will be found throughout the manual where they apply, but may not appear in this summary.

### Terms In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

### Grounding the Product

This product receives power from the data communications tester to which it is attached. Ground is provided through the grounding conductor of the tester's power cord. To avoid electrical shock, connect the A6741 to the data communications tester then plug the tester's power cord into a properly wired receptacle before connecting the A6741 to another piece of equipment. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

### Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

### Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such use.

### Do Not Operate Without Covers

Do not operate this product without covers or panels installed.



## **SERVICE SAFETY SUMMARY**

*FOR QUALIFIED SERVICE PERSONNEL ONLY*

*Refer also to the preceding Operator's Safety Summary*

Disconnect power before removing protective panels, soldering, or replacing components.



A6741 RS-449 Interface Adapter



## GENERAL INFORMATION

### ABOUT THIS MANUAL

This manual describes the A6741 RS-449 Interface Adapter. This instrument allows Tektronix data communications testers (834 and future products) to monitor and simulate signals using the RS-449 interface.

This section provides a brief overview of the RS-449 interface standard. For complete information, a copy of the standard can be obtained from:

EIA Engineering Department  
Standards Sales  
2001 Eye Street, N.W.  
Washington, D.C. 20006

Sections 2 and 3 of this manual contain A6741 Specifications and Operating Instructions. Sections 4 through 9 contain servicing information.

### RS-449 BACKGROUND

The Electronic Industries Association (EIA) developed the RS-449 interface standard as a successor to RS-232. RS-449 overcomes the speed and distance limitations of RS-

232. Data rates are increased from 20K bps in RS-232 to 2M bps in RS-449. Maximum transmission distances are also significantly increased. RS-449 also supports remote loopback testing, standby channel selection, and other control functions unavailable with RS-232.

RS-449 includes specifications for differential and single-ended circuits. The RS-449 standard specifies the mechanical configuration and pin function for a serial interface; the electrical levels are defined by RS-422 (differential) and RS-423 (single-ended). A differential (balanced) circuit uses differential signalling over a wire pair (see Figure 1-1). The single-ended (unbalanced) circuit uses a single conductor to carry the signal with generator electrical ground serving as the return path.

To economize on connector pins and wires, RS-449 restricts the differential configuration to circuits that must support high data rates. These circuits are labeled Category I; all other circuits (Category II) must use the single-ended setup. RS-449 also adds 10 new interface functions and deletes three rarely used in RS-232. Different function names and mnemonics are also used. Refer to Table 1-1.

RS-449 uses a 37-pin main connector and permits use of a 9-pin connector for secondary channels.

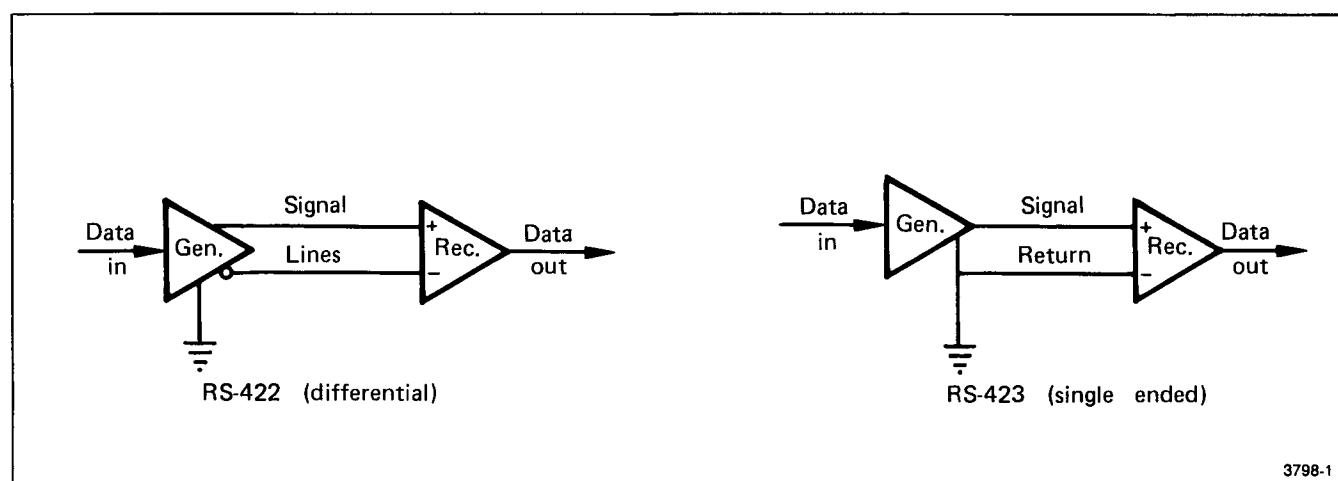


Figure 1-1. Differential and single-ended circuits.

Table 1-1  
RS-449 CIRCUIT SPECIFICATIONS

Mnemonic	Circuit Name	Category	Pin #	Closest RS-232 Equivalent
<b>Circuits on the 37-pin connector</b>				
SG	Signal Ground	--	19	Signal Ground
<sup>a</sup> SC	Send Common	II	37	---
<sup>a</sup> RC	Receive Common	II	20	---
<sup>a</sup> IS	Terminal In Service	II	28	---
IC	Incoming Call	II	15	Ring Indication
TR	Terminal Ready	I	12,30	Data Terminal Ready
DM	Data Mode	I	11,29	Data Set Ready
SD	Send Data	I	4,22	Transmitted Data
RD	Receive Data	I	6,24	Received Data
TT	Terminal Timing	I	17,35	Transmit Signal Element Timing (DTE Source)
ST	Send Timing	I	5,23	Transmit Signal Element Timing (DCE Source)
RT	Receive Timing	I	8,26	Receive Signal Element Timing
RS	Request to Send	I	7,25	Request to Send
CS	Clear to Send	I	9,27	Clear to Send
RR	Receiver Ready	I	13,31	Carrier Detect
SQ	Signal Quality	II	33	Signal Quality Detector
<sup>a</sup> NS	New Signal	II	34	---
<sup>a</sup> SF	Select Frequency	II	16	---
SR	Signalling Rate Selector	II	16	Data Signal Rate Selector (DTE Source)
SI	Signalling Rate Indicator	II	2	Data Signal Rate Selector (DCE Source)
<sup>a</sup> LL	Local Loopback	II	10	---
<sup>a</sup> RL	Remote Loopback	II	14	---
<sup>a</sup> TM	Test Mode	II	18	---
<sup>a</sup> SS	Select Standby	II	32	---
<sup>a</sup> SB	Standby Indicator	II	36	---
-	Shield	--	1	---
-	Spares	--	3,21	---
<b>Circuits on the 9-pin connector</b>				
SG	Signal Ground	--	5	Signal Ground
SC	Send Common	II	9	---
RC	Receive Common	II	6	---
SSD	Secondary Send Data	II	3	Secondary Transmitted Data
SRD	Secondary Receive Data	II	4	Secondary Received Data
SRS	Secondary Request to Send	II	7	Secondary Request to Send
SCS	Secondary Clear to Send	II	8	Secondary Clear to Send
SRR	Secondary Receiver Ready	II	2	Secondary Received Line Signal Detect
--	Shield	--	1	---

<sup>a</sup>New circuits not in RS-232.



# SPECIFICATIONS

## INTRODUCTION

Tables 2-1 through 2-3 list the electrical, environmental, and physical characteristics of the A6741.

Items listed in the Performance Requirements column are verified by completing the procedures in the Performance Verification section of this manual.

Items listed in the Supplemental Information column are either explanatory notes or statements that describe secondary characteristics of the instrument in terms of verifiable limits. Procedures may be provided in the manual to verify performance within these limits, but procedures may be omitted if they require unique or expensive test equipment, are mathematically complex or time-consuming, or are not necessary to assure that the product performs within the stated limits.

**Table 2-1**  
**A6741 ELECTRICAL SPECIFICATIONS**

Characteristics	Performance Requirements	Supplemental
<b>RS-449 CONNECTOR, MONITOR MODE</b>		
Inputs Pin 4 and 22 Send Data 5 and 23 Send Timing 6 and 24 Receive Data 7 and 25 Request to Send 8 and 26 Receive Timing 9 and 27 Clear to Send 11 and 29 Data Mode 12 and 30 Terminal Ready 13 and 31 Receiver Ready 17 and 35 Terminal Timing  Outputs None  Other Pin 19 Signal Ground 1-3,10,14-16,18,20,21,28, 32-34,36,37		Over a common-mode voltage range of $\pm 7\text{ V}$ HIGH: $(V^+ - V^-) > 200\text{ mV}$ LOW: $(V^- - V^+) > 200\text{ mV}$  Input impedance: $Z_{in} \geq 4\text{ k}\Omega$          Connected to instrument ground. Connected only to RS-449 access panel.
<b>RS-449 CONNECTOR, DCE SIMULATE MODE</b>		
Inputs Pin 4 and 22 Send Data 7 and 25 Request to Send 12 and 30 Terminal Ready 17 and 35 Terminal Timing		Over a common-mode voltage range of $\pm 7\text{ V}$ HIGH: $(V^+ - V^-) > 200\text{ mV}$ LOW: $(V^- - V^+) > 200\text{ mV}$  Input impedance: $Z_{in} \geq 4\text{ k}\Omega$

Table 2-1 (cont)

Characteristics	Performance Requirements	Supplemental
<b>RS-449 CONNECTOR, DTE SIMULATE AND BERT MODES</b>		
<p>Outputs</p> <p>Pin</p> <p>5 and 23 Send Timing</p> <p>6 and 24 Receive Data</p> <p>8 and 26 Receive Timing</p> <p>9 and 27 Clear to Send</p> <p>11 and 29 Data Mode</p> <p>13 and 31 Receiver Ready</p> <p>Other</p> <p>Pin</p> <p>19 Signal Ground</p> <p>1-3,10,14-16,18,20,21,28</p> <p>32-34,36,37</p>	<p>RS-422: Differential output voltage <math>\geq 2.0</math> V</p> <p>RS-423: <math>V^+ \geq 3.6</math> V</p> <p><math>V^- \leq -3.6</math> V</p>	<p><math>R_L \geq 100 \Omega</math> between output terminals</p> <p><math>R_L \geq 450 \Omega</math></p> <p>Connected to instrument ground.</p> <p>Connected only to RS-449 access panel.</p>
<p>Inputs</p> <p>Pin</p> <p>5 and 23 Send Timing</p> <p>6 and 24 Receive Data</p> <p>8 and 26 Receive Timing</p> <p>9 and 27 Clear to Send</p> <p>11 and 29 Data Mode</p> <p>13 and 31 Receiver Ready</p> <p>Outputs</p> <p>Pin</p> <p>4 and 22 Send Data</p> <p>7 and 25 Request to Send</p> <p>12 and 30 Terminal Ready</p> <p>17 and 35 Terminal Timing</p> <p>Other</p> <p>Pin</p> <p>19 Signal Ground</p> <p>1-3,10,14-16,18,20,21,28</p> <p>32-34,36,37</p>	<p>RS-422: Different output voltage <math>\geq 2.0</math> V</p> <p>RS-423: <math>V^+ \geq 3.6</math> V</p> <p><math>V^- \leq -3.6</math> V</p>	<p>Over a common-mode voltage range of <math>\pm 7</math> V</p> <p>HIGH: <math>(V^+ - V^-) &gt; 200</math> mV</p> <p>LOW: <math>(V^- - V^+) &gt; 200</math> mV</p> <p>Input impedance: <math>Z_{in} \geq 4</math> k<math>\Omega</math></p> <p><math>R_L \geq 100 \Omega</math> between output terminals</p> <p><math>R_L \geq 450 \Omega</math></p> <p>Connected to instrument ground.</p> <p>Connected only to RS-449 access panel.</p>
<b>RS-449 CONNECTOR FOR SECONDARY CHANNELS</b>		
<p>Pin</p> <p>5 Signal Ground</p> <p>1-4,6-9</p>		<p>Connected to instrument ground.</p> <p>Connected only to RS-449 access panel.</p>

Table 2-1 (cont)

Characteristics	Performance Requirements	Supplemental
<b>RS-449 ACCESS PANEL</b>		
Probe  "ON" LED lit "OFF" LED lit  Marker  On Off  Open Detect Off +5 V Source  -5 V Source	$V_{in} \geq -7.0 \text{ V}$ $+5 \text{ V} \pm 0.5 \text{ V (no load)}$  $-5 \text{ V} \pm 0.5 \text{ V (no load)}$	Over a common-mode voltage range of $\pm 7 \text{ V}$ $\text{Probe}^+ > \text{Probe}^-$ by 200 mV $\text{Probe}^- > \text{Probe}^+$ by 200 mV Input impedance: $Z_{in} \geq 4 \text{ k}\Omega$ LED status undefined for differential $< 200 \text{ mV}$  Over a common-mode voltage range of $\pm 7 \text{ V}$ $\text{Marker}^+ > \text{Marker}^-$ by 200 mV $\text{Marker}^- > \text{Marker}^+$ by 200 mV LED status undefined for differential $< 200 \text{ mV}$  LED status undefined for $V_{in} < -7.0 \text{ V}$ Output impedance: approximately $1.2 \text{ k}\Omega$ (each pin) Peak-to-peak ripple $\leq 100 \text{ mV}$ Output impedance: approximately $1.2 \text{ k}\Omega$ (each pin) Peak-to-peak ripple $\leq 100 \text{ mV}$
<b>DATA TRANSFER RATE</b>		
Data Transfer Rate	Determined by data communications tester.	Up to 100,000 bps

## Specifications—A6741

**Table 2-2**  
**A6741 ENVIRONMENTAL SPECIFICATIONS**

Characteristics	Description
Temperature	
Operating	0°C to +50°C (+32°F to +122°F)
Non-operating	−40°C to +74°C (−40°F to +167°F)
Humidity	5 cycles (120 hours), 30°C to 60°C, 95% relative humidity
Altitude	
Operating	To 4500 meters (15,000 ft.)
Non-operating	To 15,000 meters (50,000 ft.)
Vibration	Cycle the vibration frequency from 10 to 55 to 10 Hz (linear or logarithmic sweep) for a duration of 15 minutes in each major axis at a displacement of 0.025 inches (0.64 mm) peak-to-peak. Dwell for 10 minutes in each major axis at a resonant frequency.
Shock	50 Gs, 1/2 sine, 11 ms duration, 3 shocks in each major axis for a total of 18 shocks

**Table 2-3**  
**A6741 PHYSICAL SPECIFICATIONS**

Characteristics	Description
Overall Dimensions	
Length	20.3 cm (8.0 inches)
Width	12 cm (4.7 inches)
Height	4.8 cm (1.9 inches)
Weight	.77 kg (approximately 1.7 lbs) with cables
Cable Lengths (approximate, connector to instrument case)	
37 conductor (primary)	145.8 cm (57.4 inches)
26 conductor (to data communications tester)	41 cm (16 inches)
9 conductor (secondary, fixed)	2.5 cm (1 inch)
9 conductor (secondary, detachable)	
Connector to connector	135 cm (53.1 inches)
When connected to fixed secondary cable	145 cm (57 inches)

## ACCESSORIES

### Standard Accessories

- 070-3798-00 A6741 Instruction Manual
- 175-4742-00 9-pin cable adapter
- 198-4006-00 One set of jumper leads (5 leads per set)

### Optional Accessories

There are no optional accessories to the A6741 at this time.

## COMPATIBILITY

The A6741 is compatible with the TEKTRONIX 834 Data Communications Tester (and future products), including options that do not attach by the same connector as the A6741.

The A6741 is not operationally compatible with the TEKTRONIX 832 or 833 Data Communications Testers, but is non-destructive.



## OPERATING INSTRUCTIONS

The A6741 is an adapter to Tektronix Data Communications Testers (834 and future products) to allow the testers to monitor and simulate signals using the RS-449 interface. The A6741 is attached between a data communications tester and the equipment under test and is capable of operating in the same modes (Monitor, DCE Simulate, etc.) as the tester.

Figure 3-1 shows the A6741 front panel.

The A6741 is compatible with the TEKTRONIX 834 Data Communications Tester (and future products) including options that do not attach by the same connector.

The A6741 is not operationally compatible with the TEKTRONIX 832 or 833 Data Communications Testers, but is non-destructive.

Only one interface can be used with the data communications tester at one time.

### CONNECTING THE A6741

The A6741 attaches to the data communications tester's options connector (26 pins, male, polarized) with a 26-wide cable. Refer to the tester's operator's manual for the location of this connector.

The A6741 attaches to the RS-449 instrument under test by a 37-wide, T-cable assembly. The A6741 is also equipped with a 9-pin connector for secondary channels.

Nothing should be connected to the data communications tester's RS-232 connector while the A6741 is in use.

### A6741 OPERATION

RS-422 and RS-423 signals enter the A6741 from the equipment under test and are converted to TTL-level signals compatible with the data communications tester's option connector. The A6741 also receives signals from the tester, converts them to RS-422 or RS-423 signals, and passes them on to the equipment under test. The mode switch on the A6741 must be in the same mode as the tester. There is also a switch to select RS-422 or RS-423.

The ten main RS-449 signal pairs (+, -) pass through DIP switches on the access panel. These switches, plus ground and the +5 V and -5 V supplies, allow the user to fix the status of any interface line and adapt to non-standard interfaces.

All incoming signals to the A6741 from the equipment under test can be accessed at the left side of the RS-449 access panel or from the secondary access section. The 10 Category I signal pairs (refer to Table 1-1) equipped with DIP switches are those monitored or driven by the data communications tester. These signals are routed from the RS-449 cable to the access panel pins, to the driver/receiver circuitry of the A6741, and then on to the tester. The RS-449 mnemonics for these primary signals are on the left side of the switches. The RS-232 mnemonics are on the right side. Refer to Figure 3-1.

In normal operation, the 10 DIP switches are closed (switch position ON); however, the user can open any or all of the switches and patch in other RS-449 signals to the right side of the switches. In this way, the A6741 (and through it, the data communications tester) can be configured to non-standard interfaces.

Each of the 10 primary lines has a + pin and a - pin. In both RS-422 and RS-423, the voltage difference between the two pins determines the high or low status of the line. As seen in the Specifications, if the + pin is at least 200 mV more positive than the - pin, the line status is high. If the - pin is at least 200 mV more positive than the + pin, the line status is low.

The user can also patch signals to the following pins: Marker, Probe, +5 V, -5 V, ground, and Open Detect.

- The Marker input may be used to monitor the status of any interface line. Status is indicated by the Marker LED on the display panel of the data communications tester. The status of the Marker signal is stored by the tester with each received character.

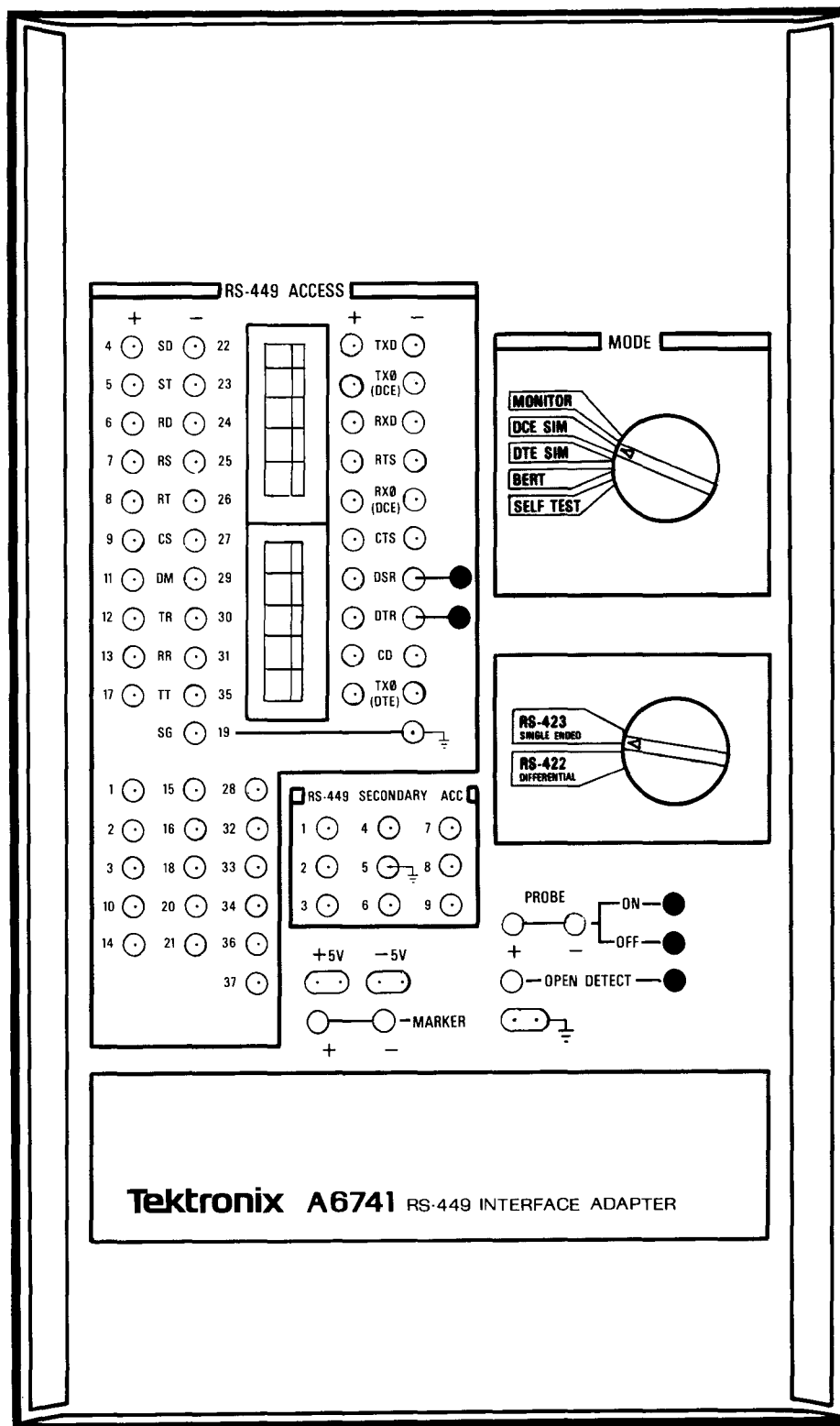
To monitor a Category I signal, connect Marker + to the signal's + pin and Marker - to the signal's - pin.

To monitor a Category II signal, connect Marker - to one of the ground pins on the access panel and Marker + to the signal's + pin.

- Probe is equipped with two LEDs (ON, OFF) for determining if a channel is high (ON lit), low (OFF lit), or toggling (both LEDs lit).

For a Category I signal, connect Probe + to the signal's + pin and Probe - to the signal's - pin.

For a Category II signal, connect Probe - to one of the ground pins on the access panel and Probe + to the signal's + pin.



3798-3

Figure 3-1. A6741 front panel. All incoming RS-449 signals from the equipment under test can be monitored at pins on the left side of the panel or at the secondary access section. DIP switches allow you to disconnect one or all of the 10 main signal pairs. RS-232 mnemonics for the 10 main signals are provided on the right side of the panel.

- Open Detect may be used to check for open lines (LED on = open circuit). The Open Detect pin may be connected to any interface line.

To check Category I signals, the associated DIP switches on the RS-449 access panel must be opened (switch position OFF). If the circuit is open, the LED remains ON. If the circuit is not open, the LED turns OFF.

- +5 V, -5 V, and ground may be used to force lines high or low.

DTR and DSR are provided with LEDs. When the A6741 is connected to a data communications tester, the DTR and DSR LEDs on the tester do not indicate the true status of the RS-449 interface. The status of these two lines is correctly reflected in the LEDs on the A6741.

The A6741 adds no new menu items, messages or other displays to the operation of the data communications tester to which it is attached.

## OPERATOR'S CHECKOUT PROCEDURE

All test equipment should be checked for proper operation before it is used in the field. You can quickly verify most of the operating characteristics of the A6741 by running the

self test routines available in the SELF TEST mode of the data communications tester. All self tests, with the exception of mode switch tests, operate with the A6741 connected to the tester.

For a fast, comprehensive test, set the mode switches of the A6741 and the data communications tester to SELF TEST. Select RS-422 or RS-423 on the A6741. Turn on the tester. The tester's display is: SELF TEST. Press START. If the test is successful, the tester displays SELF TEST again. Rotate the RS-422/RS-423 switch and repeat the test.

### NOTE

*When rotating the mode switches on the A6741 and the data communications tester during a self test, always rotate the A6741's mode switch first. This ensures that the correct conditions are present for the next phase of the test.*

If the self test locates a problem, an error message is displayed. To determine if the error originated in the A6741 or the data communications tester, turn the tester off, disconnect the A6741, then repeat the self test for the tester alone. If the error is not repeated (tester displays SELF TEST), there may be a problem with the A6741. Refer the adapter to qualified service personnel for repair. If the error repeats, the problem is in the tester. Refer to the tester's operator's manual for explanations of error messages; some conditions can be corrected by the operator.



## **WARNING**

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



## THEORY OF OPERATION

The A6741 contains three etched circuit boards: the Breakout Board, the Main Board, and the Switch Board. Circuit descriptions of the Breakout and Main Boards are provided below. The Switch Board is described as part of the Main Board.

Refer to Section 7 for schematic diagrams of the Breakout and Main Boards. Switch Board circuitry is shown as a part of the Main Board schematic.

Figure 4-1 illustrates the flow of signals between the RS-449 equipment under test, the Breakout and Main Boards in the A6741, and the data communications tester.

### BREAKOUT BOARD

All pins, LEDs, and switches visible from the front panel of the A6741 are mounted on the Breakout Board. The main (37-wide) and secondary channel (9-wide) RS-449 connectors attach to this board (at P4010 and P4040, respectively). The Breakout Board connects to the Main Board at four points: P2010, P1010, P1040, and P2040.

RS-449 signals enter the A6741 via P4010 and can be monitored at the square pins in the access panel. The ten main signal pairs (+ and -) pass through the DIP switches, the RS-232-labeled pins on the other side of the switches, and on to the Main Board via P2040, P1010, and P1040. (SG does not pass through a switch.) These plugs also receive signals from the Main Board that originated in the data communications tester. These signals pass through the RS-449 access panel and on to the equipment under test.

The remaining RS-449 lines (16 from the main connector, 9 from the secondary connector) terminate in square pins on the RS-449 access panel. These are all Category II signals (see Table 1-1).

The Marker, Probe, +5 V, -5 V, and Open Detect square pins on the Breakout Board are connected to the Main Board through P2010 and P1010. The DSR, DTR, Probe ON, Probe OFF, and Open Detect LEDs are mounted on the Breakout Board but are controlled by circuitry on the Main Board.

### MAIN BOARD

The 26-wide cable between the A6741 and the data communications tester attaches to the Main Board at J6020.

**Receivers.** The RS-449 signal pairs reach the Main Board from the Breakout Board via J1010, J1040, and J2040. These signals pass through receivers U4035, U5030, and

U6030 and are converted to TTL levels. The signals then pass to the tester through J6020.

**Generators and Switches.** Signals originating in the data communications tester enter the Main Board through J6020. Generators U3030, U3035, and U4030 convert these signals from TTL inputs to RS-449 outputs. S3040 determines whether these outputs are RS-422 (balanced differential) or RS-423 (unbalanced, single-ended). Part of S5040 is on the Switch Board, and part is on the Main Board. This switch routes signals to the correct RS-449 line according to the mode setting. Signals are then routed to the Breakout Board via J1010, J1040, and J2040.

**+5 V and -23 V Unregulated.** The A6741 receives +5 V and -23 V Unregulated from the data communications tester. Pins 4, 5, and 23 of J6020 connect to the +5 V plane of the Main Board. Pin 26 of J6020 carries -23 V Unreg; this supply is used by the -5 V and Open Detect circuitry on the Main Board.

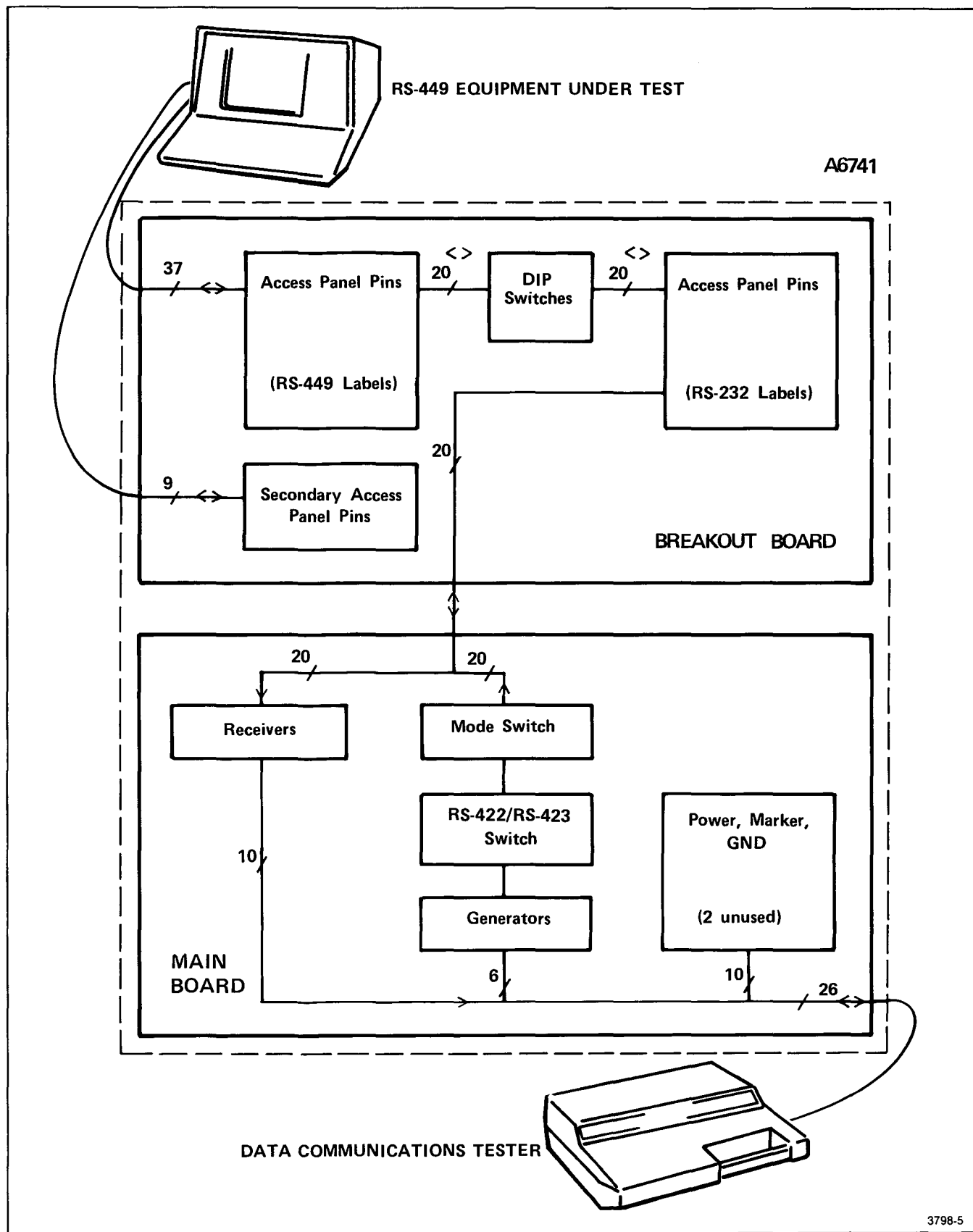
**-5 V.** The -5 V switching power supply operates at a stabilized frequency of approximately 30 kHz. Comparator U2020B regulates the conduction time of Q2030. The -5 V supply can be monitored at TP1040.

Q2020 provides current limiting protection. When current through sense resistor R2024 exceeds approximately 130 mA, Q2020 turns on, simulating excessive output voltage. U2020B then limits conduction of Q2030 and current protection is achieved.

**Marker.** Marker signals are generated on the RS-449 access panel by connecting the Marker + and - pins to other signals. Marker signals are converted to TTL levels by U4035B then pass to the data communications tester on J6020. The Marker LED is part of the tester's display panel.

**Open Detect.** VR3010 sets a reference voltage on pin 3 of U4010A of approximately -8.2 V. When the Open Input Probe signal from J1010 pin 2 exceeds -7 V, the output of U4010A (pin 1) goes low turning off diode CR4020 and the Open Detect LED (DS2040 on the Breakout Board).

**Probe.** When the Probe + pin is more positive than the Probe - pin, the output of U4035A is low and turns on PROBE HI LED (DS2042). U4010B is tied to the output of U4035A and provides isolation between the PROBE HI and PROBE LO LEDs.



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Figure 4-1. Flow of signals between RS-449 equipment, A6741, and data communications tester.

## PERFORMANCE VERIFICATION

The following procedure is designed to confirm that an A6741 is operating within the limits stated in the Performance Requirements column of the Specifications. Procedures are also provided for verifying the operation of the Probe and Marker LEDs and the RS-449 receivers and drivers.

### EQUIPMENT REQUIRED

The test equipment required for the performance verification procedures is listed below. Test equipment is assumed to be correctly calibrated and operating within its design specifications. Operating instructions for the test equipment is not given in the following procedures. Refer to the instruction manual for the test equipment if information is needed.

1. TEKTRONIX 834 Data Communications Tester
2. Dual channel, general purpose oscilloscope, such as the TEKTRONIX 465B, with two probes (10X attenuation)
3. Digital multimeter, such as the TEKTRONIX DM 501A
4. Self test adapter; to be built by the user. Instructions are provided under the Cables, RS-449 Receivers and Drivers test.
5. Jumper leads; standard accessory to the A6741.

### PROCEDURES

#### General

Connect the A6741 26-wide cable to the options connector of the 834. Nothing should be attached to the 834's RS-232 connector.

Ignore the DTR and DSR LEDs on the 834's RS-232 access panel.

Set the A6741 and 834 mode switches to SELF TEST. If mode switch settings must be changed during a test, always rotate the A6741 switch first. Certain self tests resume immediately after the 834's mode switch is changed, and will generate an error message if the A6741's mode switch is in a different position.

#### +5 V and -5 V Supplies

1. Set the A6741 to RS-423.
2. Turn on the 834.
3. Use the digital multimeter to check the voltages of the +5 V and -5 V pins on the RS-449 access panel of the A6741.

These voltages should be:  $+5\text{ V} \pm 0.5\text{ V}$

$-5\text{ V} \pm 0.5\text{ V}$

#### Output Voltages

1. Select the INT DATA (Internal Data) self test on the 834. Press 0 then START to run the test continuously.
2. Set the oscilloscope to display 2.0 V/division, 5 ms/division, channel 2 inverted. Set the vertical mode to ADD and make sure both channels are dc-coupled.
3. Select RS-422.
4. Successively connect the channel 1 probe to the + pins and the channel 2 probe to the - pins of SD, ST, RD, RS, RT, CS, DM, TR, RR, and TT.

The output voltage of each signal should be  $\geq \pm 2\text{ V}$  ( $\pm 1$  division).

5. Select RS-423.
  6. Set the oscilloscope vertical mode to channel 1.
  7. Successively connect the channel 1 probe to the + pins of SD, ST, RD, RS, RT, CS, DM, TR, RR, and TT.
- The output voltage of each signal should be  $\geq \pm 3.6\text{ V}$  ( $\pm 1.8$  division)
8. Disconnect the oscilloscope probes.
  9. Turn the 834 off to stop the Internal Data test.

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**Open Detect LED**

1. Turn on the 834.
2. Using jumper leads, connect a 180 kΩ, 5%, 1/4 W resistor between the Open Detect pins and -5 V on the A6741 access panel.

The Open Detect LED should be off.

3. Remove the connection. The LED should be on.

**Probe and Marker LEDs**

1. Select RS-423.
2. Connect the Probe - and Marker - pins to ground with jumper leads.
3. Use jumper leads to make the following sequence of connections:

Connect Probe + to:	Desired Result
+5 V	ON LED on OFF LED off
-5 V	ON LED off OFF LED on
TT +	ON and OFF LEDs on

4. The Marker LED is on the 834's display panel. Use jumper leads to make the following connections:

Connect Marker + to:	Desired Result
+5 V	Marker on
-5 V	Marker off

**RS-449 Receivers**

The Self Test routine in the 834 contains sub-tests that exercise the A6741's receiver circuitry plus the DTR and DSR LEDs.

If this test is completed successfully, you can be reasonably confident of the A6741's performance. If any receiver outputs are stuck high, the test will find the failure. Open circuit errors are not detected.

1. The A6741 should be set to RS-423.
2. Select the Self Test routine on the 834. (The 834 display should be: SELF TEST.) Press START.

3. During the test, watch the DTR and DSR LEDs on the A6741 access panel.

Before the test, both LEDs should be on. They should be off during the test and go on again when it is complete. (The LEDs may flicker during the test.)

If the test is completed successfully, the 834 again displays SELF TEST. Any other display signifies an error.

4. Repeat this procedure for RS-422.

**Cables, RS-449 Receivers and Drivers**

This procedure uses the 834's External Data self test to test the 37-wide RS-449 cable and the RS-449 receivers and drivers.

1. Build the self test adapter by connecting pins on a male RS-449 connector (Tektronix part number 131-0422-00) in the following manner:

- SD + (pin 4) to: RD + (pin 6), and pins 14, 15, 16, 20, 21, 28, 36, 37
- RS + (pin 7) to: CS + (pin 9), RR + (pin 13)
- TR + (pin 12) to: DM + (pin 11)
- TT + (pin 17) to: ST + (pin 5), RT + (pin 8), and pins 1, 2, 3, 10, 18, 32, 33, 34
- SD - (pin 22) to: RD - (pin 24)
- RS - (pin 25) to: CS - (pin 27), RR - (pin 31)
- TR - (pin 30) to: DM - (pin 29)
- TT - (pin 35) to: ST - (pin 23), RT - (pin 26)

2. Attach the self test adapter to the end of the RS-449 cable.

3. The A6741 should be set to RS-423.

4. Connect Marker + to DTR + and Marker - to DTR -.

5. Select the EXT DATA (External Data) self test on the 834. Press START. The 834 displays: TEST STARTED 1 then SET MODE=BERT.

6. Turn both mode switches (A6741 first, then 834) to the BERT setting.

The 834 displays: SET MODE=SLFTTEST.

7. Return both mode switches to the SELF TEST mode.
8. Set the A6741 to RS-422 and repeat the test.
9. Remove the self test adapter when the test is complete.



# MAINTENANCE AND TROUBLESHOOTING

## GENERAL MAINTENANCE

### Repair

Properly handled and cared for, your A6741 will give years of dependable service. Should repair be needed, however, remember that Tektronix, Inc. provides complete instrument repair at local Field Service Centers and at the Factory Service Center in Beaverton, Oregon. Contact your local Tektronix Field Office or representative for further information.

### Obtaining Replacement Parts

Electrical and mechanical parts can be ordered through your local Tektronix Field Office or representative. However, you should be able to obtain many of the standard electronic components from a local commercial source in your area. Before you purchase or order a part from a source other than Tektronix, Inc., please check Replaceable Electrical and Mechanical Parts, Section 8, for the proper value, rating, tolerance, and description.

### Ordering Parts

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

- Instrument type (include modification or option numbers)
- Instrument serial number
- A description of the part (if electrical, include component number from the Replaceable Electrical Parts list)
- The Tektronix part number

### Cleaning Instructions

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

**Exterior.** Loose dust on the A6741 can be brushed off. Dirt that remains can be removed with a soft cloth dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

### CAUTION

*Use only enough water to dampen the cloth or swab. Prevent water from getting inside the instrument case.*

*DO NOT use chemical cleaning agents, as they may damage the plastics used in the instrument. In particular, avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.*

**Interior.** Dust in the interior should be removed with a jet of low-pressure air and a soft brush. After major repairs, clean the board carefully with clean isopropyl alcohol. Make sure soldering rosin and dirt are removed from the board.

### Disassembly Instructions

#### To disassemble the A6741:

1. Six inside-hex screws (4-40 x 1.125) hold the two halves of the case together and secure the cables. To remove the top cover, unscrew the inner four screws with a 3/32 hex wrench.
2. Lift off the top cover. The Breakout Board is now accessible.
3. To access all circuit boards at once, remove the nuts from the screws securing the cable strain-relief bar. Lift the connected boards out of the lower case half. Be sure to place them on an insulating surface.
4. If it is necessary to separate the Breakout and Main Boards, first lift off both plastic switch knobs. Four sets of square pins connect the Main and Breakout Boards. Brace both boards carefully while you gently pull up on the Breakout Board. Take care not to bend the pins.

#### To reassemble the A6741:

1. Replace any cables. The 37- and 9-wide cables attach to the Breakout Board. The 26-wide cable is soldered to the Main Board.
2. Make sure there is a plastic washer and spacer on each of the four support shafts in the bottom housing.
3. Place the Main Board over the support shafts, component side down.

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4. Place an aluminum sleeve spacer over the portion of each support shaft remaining above the Main Board. Place the spacers with the smaller hole facing the Main Board.
5. Align the Breakout Board over the Main Board. Brace both boards and carefully insert the four sets of square pins on the Breakout Board into the receptacles on the Main Board.
6. Replace the plastic switch knobs, the strain relief bar, and the top half of the case.

**Replacement Switch Assemblies**

To replace the A6741's mode switch, order replacement assembly 263-0096-00. To replace the RS-422/RS-423 switch, order 263-0095-00.

The switch replacement assemblies are mounted on acrylic spacers for shipment. The mode switch assembly uses two spacers; the RS-422/RS-423 assembly has one. The spacers are discarded when the assemblies are installed in the A6741. The positions occupied by the spacers are assumed by circuit boards.

Figure 6-1 shows an exploded view of both switch assemblies as they appear when installed in the A6741.

**NOTE**

*The switch assemblies contain delicate components that must be handled properly to prevent damage. Read the installation instructions through completely before starting the procedure.*

**To install the mode switch replacement assembly:**

1. Disassemble the A6741. Place the Main Board (with attached Switch Board) on an insulating work surface.
2. Remove the three pan-head POZIDRIV screws from the mode switch assembly. Hold the switch pieces firmly together as you remove the screws.



*Do not allow the switch contacts to scrape the switch pads on the circuit board. The gold contacts are easily damaged.*

3. When you have removed the screws, remove the front bearing, shaft, and top contact holder. These are parts 1, 2, and 3 in Figure 6-1; they can be removed as a unit.

4. Next, remove the rear bearing and contact holder.
5. Carefully pull the Switch Board away from the Main Board. Take care not to bend the eight pins that connect the two boards. Remove the center spacer and contact holder.

**NOTE**

*As you remove the switch parts, study their placement with respect to each other and the circuit boards. This will help you install the replacement assembly accurately and quickly.*

6. Clean the switch pads on the circuit boards with clean isopropyl alcohol and a lintless cloth.
7. Lubricate all circuit board switch pads with New Improved No Noise.
8. Remove the three pan-head POZIDRIV screws from the replacement switch assembly. Again, hold all pieces firmly while removing the screws.

**NOTE**

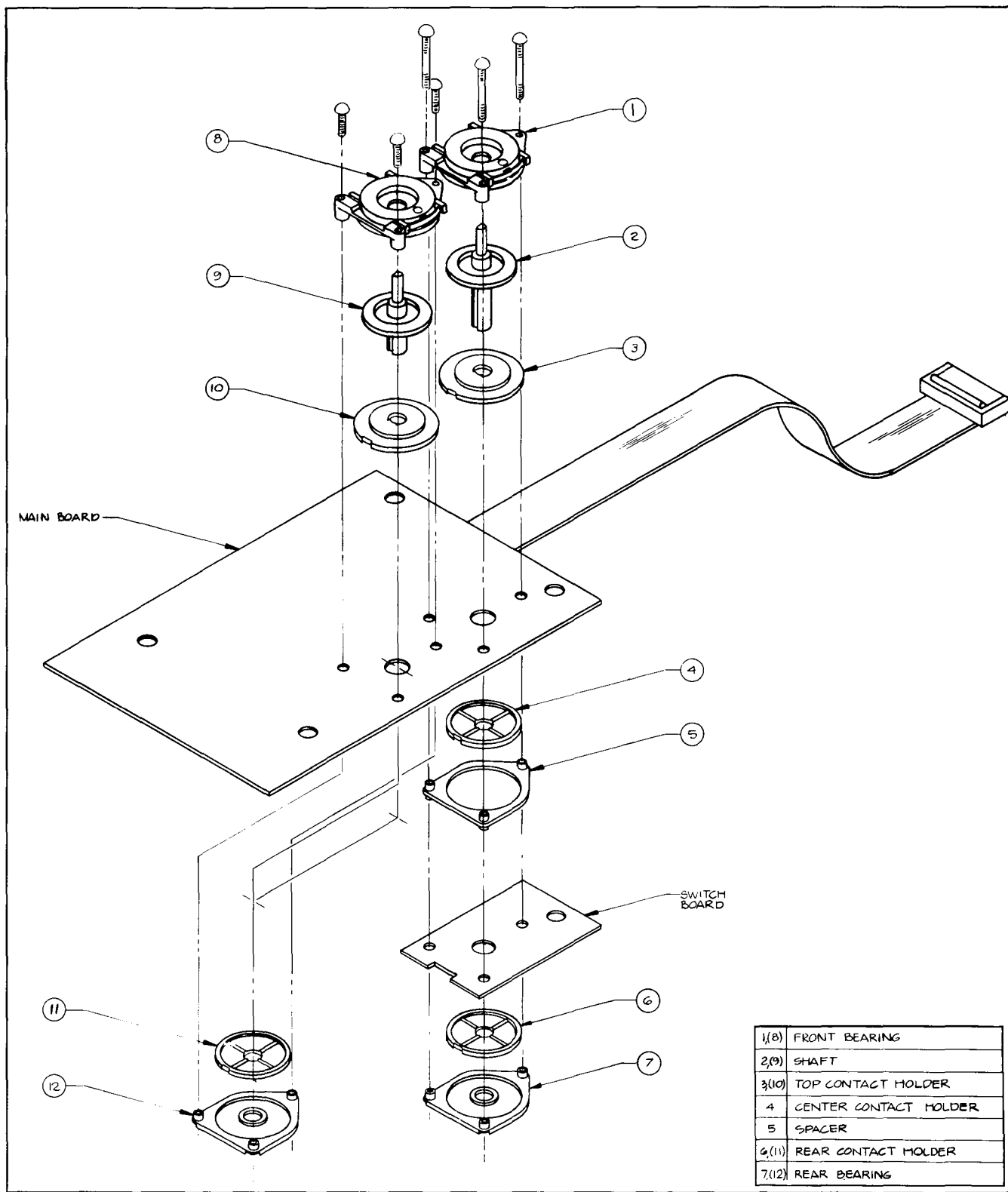
*Take care not to mix replacement switch parts with parts from the faulty assembly.*

9. Lift the front bearing, shaft, and contact holder from the top acrylic spacer as a unit. Lay the parts down carefully.

**NOTE**

*If the parts happen to become separated, the front bearing and the shaft should be positioned so that the stop on the under side of the front bearing is between the two small stops on the detent.*

10. Lift off and discard the top acrylic spacer. Remove the center contact holder and spacer (parts 4 and 5 in Figure 6-1) and the rear contact holder and rear bearing (parts 6 and 7). Carefully lay the parts on the work surface.
11. Mount the front bearing, shaft, and top contact holder (parts 1, 2, and 3) on the back of the Main Board (the side without components). Have the screw holes in the bearing aligned with the holes in the board before pressing down on the parts. Do not allow the switch contacts to scrape over the pads on the circuit board.
12. Slip the center contact holder just over the end of the shaft -- contacts toward the board. Position the center spacer over the contact holder; align the screw holes with the holes in the Main Board. Carefully press both



1,(8)	FRONT BEARING
2,(9)	SHAFT
3,(10)	TOP CONTACT HOLDER
4	CENTER CONTACT HOLDER
5	SPACER
6,(11)	REAR CONTACT HOLDER
7,(12)	REAR BEARING

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Figure 6-1. Exploded view of switch assemblies.

**Maintenance and Troubleshooting—A6741**

parts down the shaft until the contacts meet the pads on the circuit board. Be sure to hold the parts in place once they are in position.

13. Align the Switch Board over the center parts. Insert the pins on the Main Board through the Switch Board and into the receptacles on the far side. Make sure screw holes are aligned.
14. Place the rear contact holder and bearing (parts 6 and 7 in Figure 6-1) over the end of the shaft.
15. Hold the entire assembly together while replacing the three screws. Tighten the screws only until the parts are secure. Do not overtighten the screws.

**To install the RS-422/RS-423 switch:**

1. Disassemble the A6741. Place the Main Board and Switch Board on an insulating surface.
2. Remove the three pan-head POZIDRIV screws from the RS-422/RS-423 assembly. Hold the switch pieces firmly together as you remove the screws.

**CAUTION**

*Do not allow the switch contacts to scrape over the switch pads on the circuit board. The gold contacts are easily damaged.*

3. Remove the front bearing, shaft, and top contact holder (parts 8, 9, and 10 in Figure 6-1) from the back of the Main Board. These parts can be removed as a unit. Also remove the rear contact holder and bearing.

**NOTE**

*As you remove the switch parts, study their placement with respect to each other and the circuit board. This will help you install the replacement assembly accurately and quickly.*

4. Clean the switch pads on the circuit boards with clean isopropyl alcohol and a lintless cloth.
5. Lubricate all circuit board switch pads with New Improved No Noise.
6. Remove the three pan-head POZIDRIV screws from the replacement switch assembly. Again, hold all pieces firmly while removing the screws.

**NOTE**

*Take care not to mix replacement switch parts with parts from the faulty assembly.*

7. Carefully separate the parts from the acrylic spacer. Remove the front bearing, shaft, and top contact holder as a unit.

**NOTE**

*If the parts happen to become separated, the front bearing and the shaft should be positioned so that the stop on the under side of the front bearing is between the two small stops on the detent.*

8. Mount the front bearing, shaft, and top contact (parts 8, 9, and 10) on the back of the Main Board (the side without components). Have the screw holes in the bearing aligned with the holes in the board before pressing down on the parts. Do not allow the switch contacts to scrape over the pads on the circuit board.
9. Slip the rear contact holder just over the end of the shaft -- contacts toward the board. Position the rear bearing over the contact holder. Align screw holes. Carefully push both parts down the shaft until the contacts meet the pads on the circuit board. Be sure to hold the parts in place once they are in position.
10. Hold the entire assembly together while replacing the three screws. Tighten the screws only until the parts are secure. Do not overtighten the screws.

**TROUBLESHOOTING****Introduction**

Troubleshooting methods for the A6741 rely on the diagnostic self tests resident in the Tektronix 834 Data Communications Tester and the Diagnostic ROM Pack. The following troubleshooting procedures use the 834 self tests as the starting point for tracing errors to the component level. Refer to the 834 Instruction Manual for detailed information on the operation of the tests.

The routines resident in the 834 alone are used for performance verification and for initial problem diagnosis. The Diagnostic ROM Pack contains more exhaustive service routines.

This section discusses six self test routines. Error messages that may be generated by A6741 error conditions are listed with each test. Following each error message is an item labeled "Action". This paragraph lists what circuitry was being tested when the error occurred plus possible actions that may be taken to pinpoint and correct the problem.



The six self test routines are:

1. Internal Data (834 only)
2. External Data (834 only)
3. Service Internal Data (834 plus Diagnostic ROM Pack)
4. Service External Data Test (834 plus Diagnostic ROM Pack)
5. Service XOR Gate Test (834 plus Diagnostic ROM Pack)
6. Service DIP Switch Test (834 plus Diagnostic ROM Pack)

#### NOTE

All line names in this manual are followed by (H) or (L) to indicate active high or active low signals. For example: TCDA(H), RDO(L).

### Equipment Required

TEKTRONIX 834 Data Communications Tester with Diagnostic ROM Pack

General purpose oscilloscope

Self test adapter (used with the External Data Test; see General Troubleshooting Procedures for instructions on wiring an adapter)

Jumper leads

### General Troubleshooting Procedures

- All 834 diagnostic tests, except the mode switch tests, function while the A6741 is attached.
- The mode switches on the A6741 and the data communications tester should always be in the same position. If rotation of this switch is required during a test, the A6741 mode switch should be rotated first.
- When the A6741 is connected to the data communications tester, nothing should be connected to the tester's RS-232 port or access panel.
- The DTR and DSR LEDs on the tester's access panel do not reflect the true state of the RS-449 interface. Refer instead to the LEDs on the A6741 access panel.
- Self tests should be run in both RS-422 and RS-423.

- When an error occurs, the general approach for troubleshooting is to follow the transmission path from the driver, through the switches, to the receiver. This circuitry is contained on the Main Board; refer to schematic diagram 2.
- The external data tests require that a self test adapter be fitted to the end of the 37-wide RS-449 cable. Build the self test adapter by connecting pins on a male RS-449 connector (131-0422-00) in the following manner:

SD + (pin 4) to: RD + (pin 6), and pins 14, 15, 16, 20, 21, 28, 36, 37

RS + (pin 7) to: CS + (pin 9), RR + (pin 13)

TR + (pin 12) to: DM + (pin 11)

TT + (pin 17) to: ST + (pin 5), RT + (pin 8), and pins 1, 2, 3, 10, 18, 32, 33, 34

SD - (pin 22) to: RD - (pin 24)

RS - (pin 25) to: CS - (pin 27), RR - (pin 31)

TR - (pin 30) to: DM - (pin 29)

TT - (pin 35) to: ST - (pin 23), RT - (pin 26)

- Refer to the 834 Instruction Manual for instructions concerning the self test menu setup and more information on each of the following self test routines.

### Internal Data Test

Attach the A6741 to the 834. Nothing should be connected to the 834's RS-232 port or to the A6741's RS-449 cable.

Set both mode switches to SELF TEST. Turn on the 834 and select the INT (Internal Data) Test.

The Internal Data Test makes two checks that can diagnose errors in the A6741:

1. EIA Control Line Test. The 834 writes codes out on lines RDYOA(L), RTSOA(L), CTSOA(L) and reads them back on the corresponding receivers (control lines): DSRA(L) and DTRA(L), RTSA(H) and CDA(H), CTSA(H).

#### Error Message: CTL LEAD ERROR

Action: This error might be caused by a defective driver, mode switch, or receiver.

Initiate the Service XOR Gate Test (Diagnostic ROM Pack) to continuously exercise the control lines. Trace lines from the driver inputs to receiver outputs and use an oscilloscope to check that lines are active. If the Diagnostic ROM Pack is not available, program the INT Test to run repeatedly by pressing 0 START.

You can also use the Service Dual 834 Test (Diagnostic ROM Pack) to continuously exercise the control lines. This test, however, requires two 834s and two A6741s.

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2. Bisynchronous Mode Test. This test exercises the data and clock lines.

Data lines: RDA(L), TDA(H) (both driven by RDO(L);  
Clock lines: TC24A(H) (driven by TCDA(H)), RC17A(H)  
(driven by RCDA(H))

**Error Message: NO RCVR SYNC**

Action: Check the transmission path of RDO(L) using the procedure described in the previous error message.

**Error Message: NO SYNC RCVR <A or B>**

Action: Initiate the Service Internal Data Test (Diagnostic ROM Pack) for a more definite error message. Refer to the Service Internal Data Test paragraphs later in this section for a discussion of these error messages.

If the Diagnostic ROM Pack is unavailable, program the INT Data Test to run continuously by pressing 0 START. Use an oscilloscope to check the paths indicated:

NO SYNC RCVR <A> - RCDA(H) to RD17A(H),  
RDO(L) to RDA(L)  
NO SYNC RCVR <B> - TCDA(H) to TC24A(H),  
RDO(L) to TDA(H)

**External Data Test**

The External Data Test checks the signal path from the RS-449 access panel to the end of the RS-449 cable. A self test adapter must be fitted to the end of the cable and all DIP switches on the access panel must be closed. The Marker input (+ and -) must be jumpered to TR (+ and -) at the RS-449 access panel.

This test performs three checks that can diagnose errors in the A6741:

1. The 834 writes on the RDYOA(L) line and checks the MKRA(L) input.

**Error Message: MARKER ERROR**

Action: Check the path from RDYOA(L) to the MKRA(L) receiver.

2. The 834 writes on the RTSOA(L) and RDYOA(L) lines and checks the corresponding receivers.

**Error Message: EXT ERROR - CTL n**

Action: Check the indicated paths:

- CTL 1: RDYOA(L) to DSRA(L)
- CTL 2: RTSOA(L) to RTSA(H), CTSA(H), CDA(H)

3. The 834 writes on the data and clock lines and checks the corresponding receivers.

**Error Message: EXT ERROR**

Action: Initiate the Service External Data Test (Diagnostic ROM Pack) for a more definite error message.

If the Diagnostic ROM Pack is not available, check TCDA(H) to TC15A(H) and RC17A(H). Also check RDO(L) to RDA(L) and TDA(H).

**Service Internal Data Test**

This test is available only when the Diagnostic ROM Pack is installed in the 834.

The Service Internal Data Test contains all the tests performed in the Internal Data Test (834 only) plus an asynchronous data path test to check data paths independently of clock paths.

**Error Message: CTL LEAD ERROR** (See Internal Data Test)**Error Message: AS:DEAD:RCVR <A or B>**

Action: The 834 wrote asynchronously on both data lines. One receiver (A or B) did not see the data.

RCVR <A> - Check the path between RDO(L) and RDA(L).

RCVR <B> - Check the path between RDO(L) and TDA(H).

**Error Message: AS:XMIT:NO CHAR**

Action: The 834 wrote asynchronously on both data lines. Neither receiver saw the data. Check the paths between RDO(L) and RDA(L) and TDA(H).

**Error Message: BI:1:SYNC:RCVR <B>**

Action: The 834 writes synchronously on the data lines using the TC24A(H) clock and checks both receivers. Check the path between TCDA(H) and TC24A(H).

**Error Message: BI:2:SYNC:RCVR <A>**

Action: The 834 writes synchronously on the data lines using the RC17A(H) clock. Check the path between RCDA(H) and RD17A(H).

### Service External Data Test

This test is available only when the Diagnostic ROM Pack is installed in the 834.

The Service External Data Test contains all the tests in the External Data Test (834 only) plus an asynchronous test that checks the data paths independently of the clock paths.

**Error Message: EXT ERROR CTL n** (See External Data Test)

**Error Message: EXT ERROR CLK**

Action: This message occurs due to an error on the clock lines. Check the clock paths from TCDA(H) to TC15A(H) and RC17A(H).

**Error Message: EXT ERROR DATA**

Action: This message occurs due to an error on the data lines. Check data paths RDO(L) to TDA(H) and RDA(L).

### Service XOR Gate Test

The Service XOR Gate Test is only available when the Diagnostic ROM Pack is installed in the 834. This test exercises all the RS-449 interface lines. Follow these steps:

1. Select RS-422. The self test adapter should not be connected to the end of the RS-449 cable.
2. Initiate the XOR Gate Test. If the test is successfully completed, the 834 displays XOR GOOD. If an error message is displayed, use the Service Internal Data Test to clear the error.
3. Connect the self test adapter to the end of the RS-449 cable.
4. Open the DIP switches on the access panel for ST, RD, RT, and CS.
5. Change the RS-422/RS-423 switch to RS-423.
6. Repeat the XOR Gate Test.

XOR GOOD means that there are no shorts between adjacent lines of the interface. To find open lines, check the frequencies on the pins at the left side of the RS-449 access panel against the values in Table 6-1. Use RS-422.

XOR BAD means that there are shorts between two or more adjacent interface lines.

### Service DIP Switch Test

The Service DIP Switch Test is only available when the Diagnostic ROM Pack is installed in the 834. This test exercises the DIP switches on the RS-449 access panel.

Connect the self test adapter to the end of the RS-449 cable. Start the test and follow the prompting messages displayed on the 834. The test stops when any key is pressed.

**Error Message: SWITCH OPEN**

Action: One or more of the DIP switches appear to be open because data is unable to loop back to the receivers. Check that all switches are closed and the self test adapter is connected to the end of the RS-449 cable.

**Error Message: SWITCHES GOOD**

Action: All switches appear to be closed. If this message persists when one of the switches is moved to the open position, then the switch is not opening.

**Table 6-1**  
**FREQUENCIES ON RS-449 ACCESS PANEL DURING**  
**SERVICE XOR GATE TEST (RS-422)**

Pin	Frequency	Pin	Frequency
1	19.2 kHz	20	9.6 kHz
2	19.2 kHz	21	9.6 kHz
3	19.2 kHz	22	9.6 kHz
<sup>a</sup> 4	9.6 kHz	23	19.2 kHz
5	19.2 kHz	24	9.6 kHz
6	9.6 kHz	25	HIGH
7	LOW	26	19.2 kHz
8	19.2 kHz	27	HIGH
9	LOW	28	9.6 kHz
10	19.2 kHz	29	HIGH
11	LOW	30	HIGH
12	LOW	31	HIGH
13	LOW	32	19.2 kHz
14	9.6 kHz	33	19.2 kHz
15	9.6 kHz	34	19.2 kHz
16	9.6 kHz	35	19.2 kHz
<sup>a</sup> 17	19.2 kHz	36	9.6 kHz
18	19.2 kHz	37	9.6 kHz
19	Ground		

<sup>a</sup>Source of clock frequencies

# DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

## Symbols

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

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

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

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

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

American National Standard Institute  
1430 Broadway  
New York, New York 10018

## Component Values

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

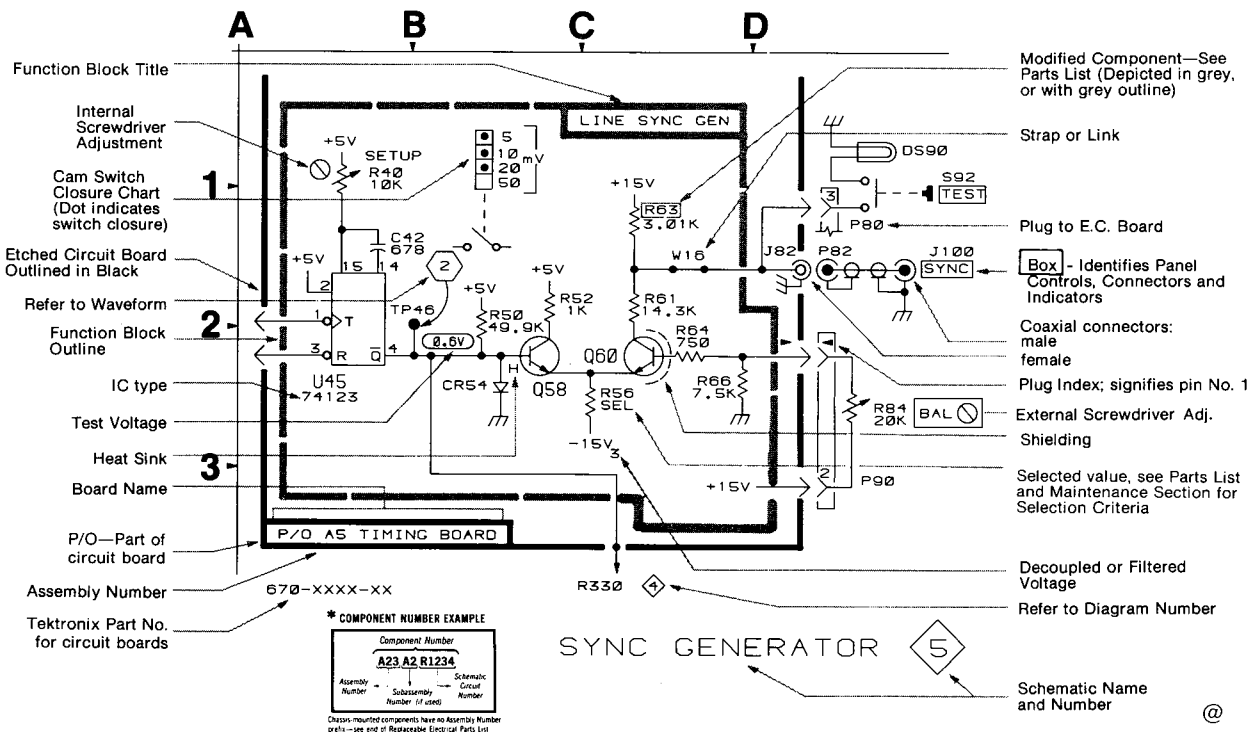
- Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads ( $\mu$ F).
- Resistors = Ohms ( $\Omega$ ).

————— The information and special symbols below may appear in this manual. —————

## Assembly Numbers and Grid Coordinates

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number \*(see following illustration for constructing a component number).

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.



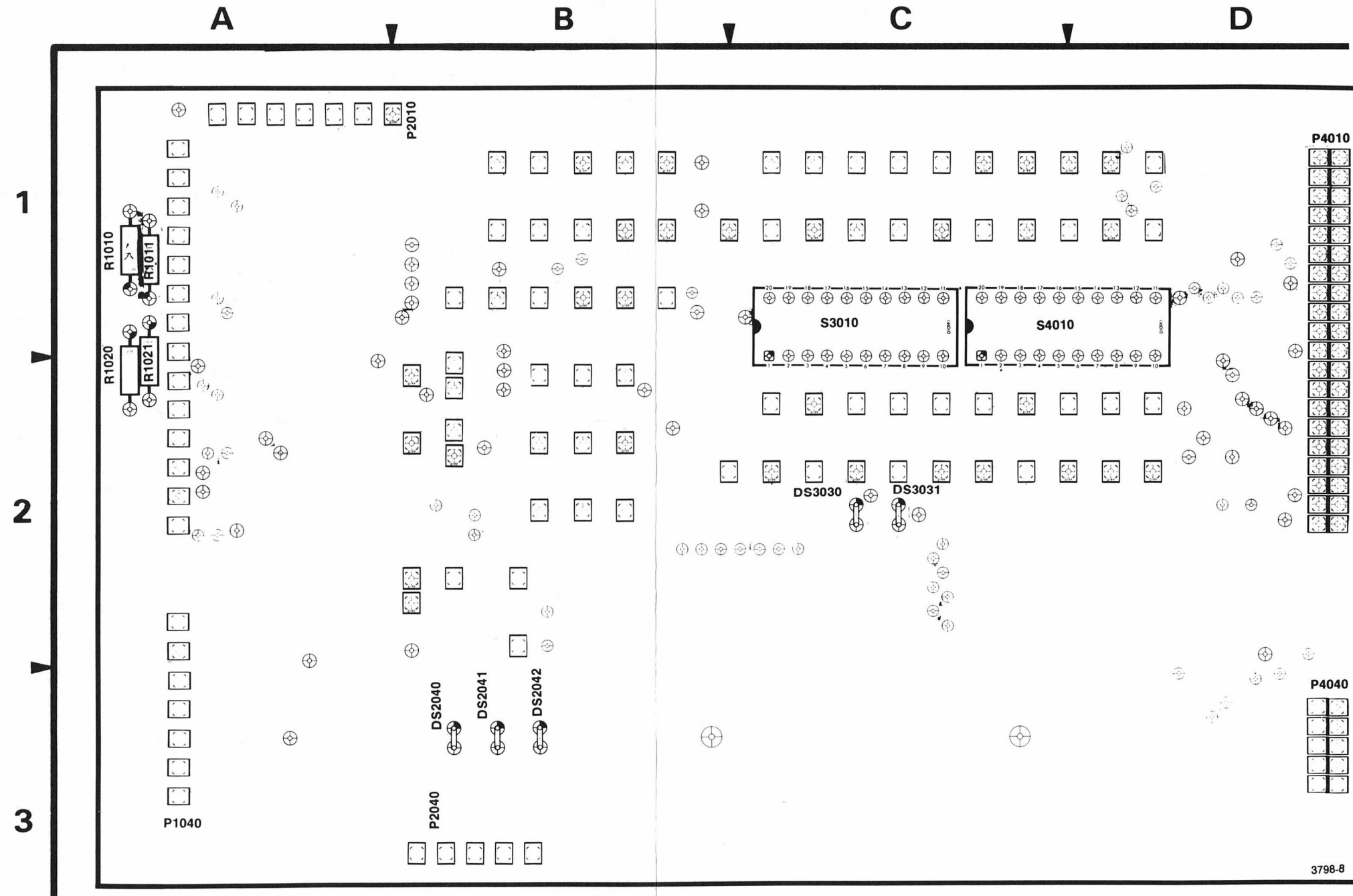


Figure 7-1. Breakout Board Component Locations.


Static Sensitive Devices  
See Maintenance Section

Scan by Zenith  
Table 7-1

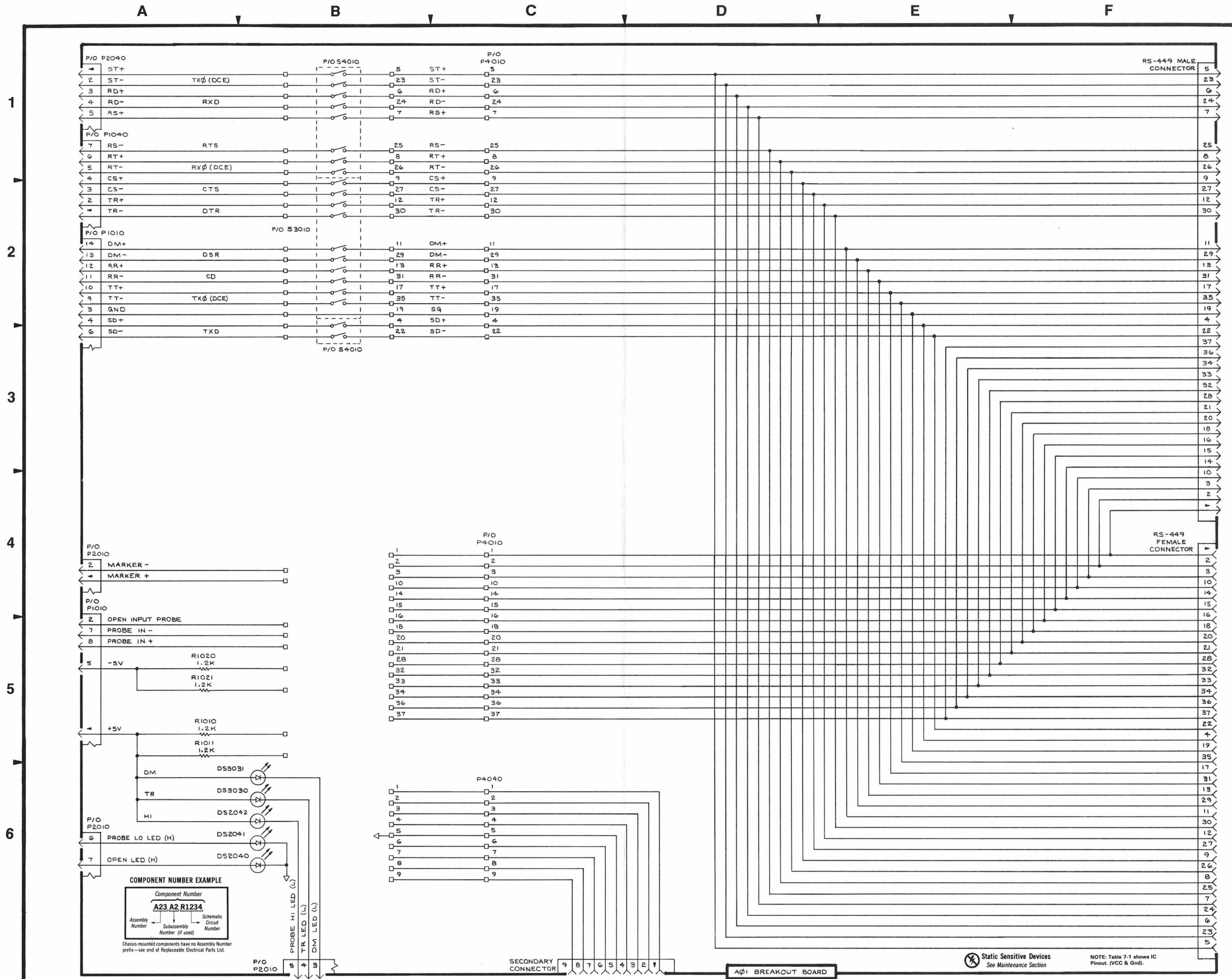
IC Pin Information

Device Type	VCC (+5 V)	VEE (-23 V)	GND
26LS30	1	8	5
26LS32	16	-	8
LM358	8	4	-
LM393	-	4	8
7404	14	-	7

Table 7-2

BREAKOUT BOARD 		
ASSEMBLY A01		
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
DS2040	B6	B3
DS2041	B6	B3
DS2042	B6	B3
DS3030	B6	C2
DS3031	B6	C2
P1010	A2	A1
P1010	A5	A1
P1040	A1	A3
P2010	B6	A1
P2010	A6	A1
P2010	A4	A1
P2040	A1	B3
P4010	C1	D1
P4010	C4	D1
P4040	C6	D3
R1010	A5	A1
R1011	A5	A1
R1020	A5	A1
R1021	A5	A1
S3010	B2	C1
S4010	B1	C1
S4010	B3	C1





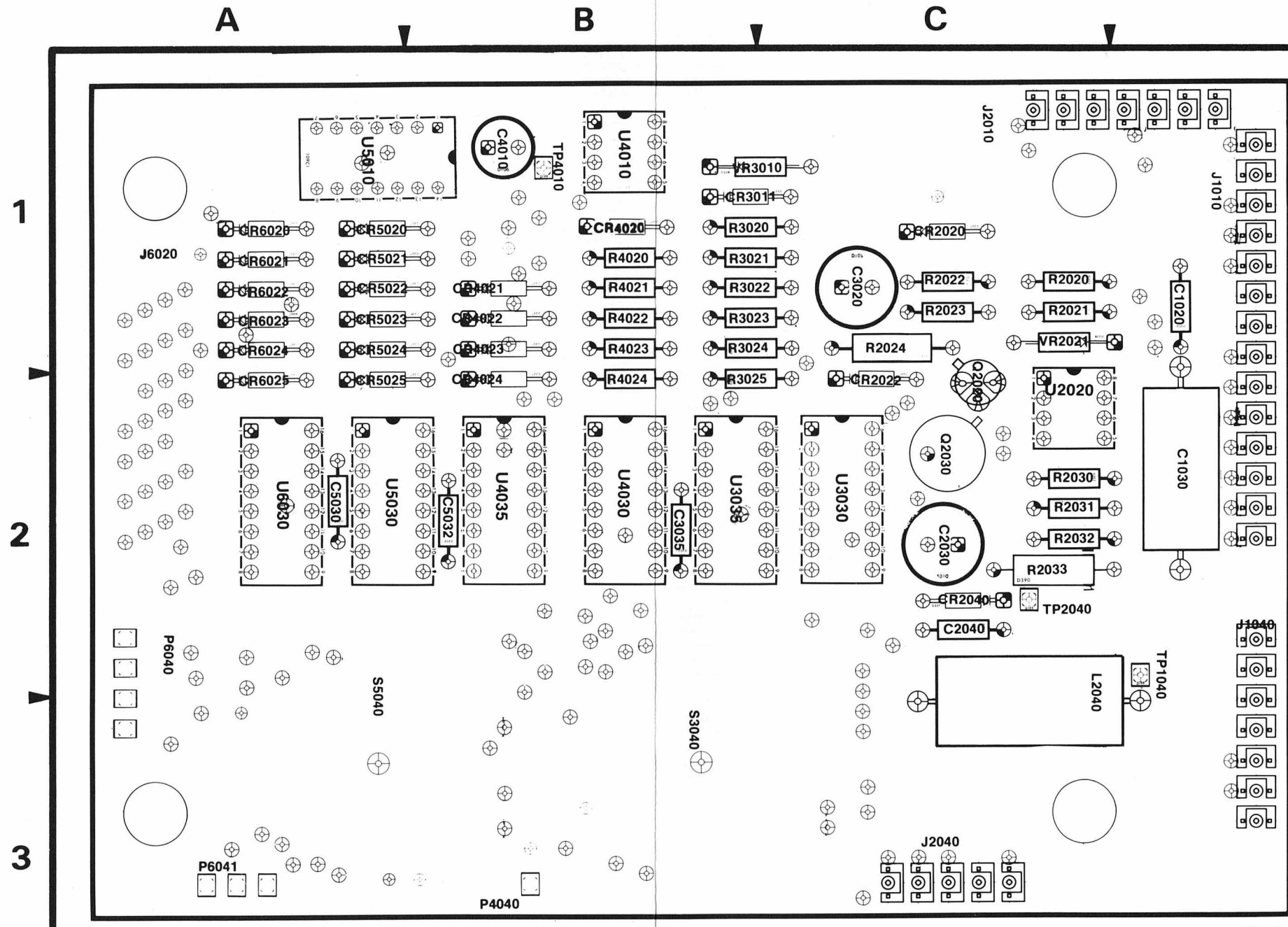
BREAKOUT BOARD 1

Static Sensitive Devices See Maintenance Section

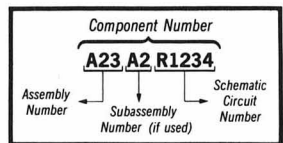
NOTE: Table 7-1 shows IC Pinout. (VCC & Gnd)

A6741

MAIN BOARD  
COMPONENT LOCATIONS



COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

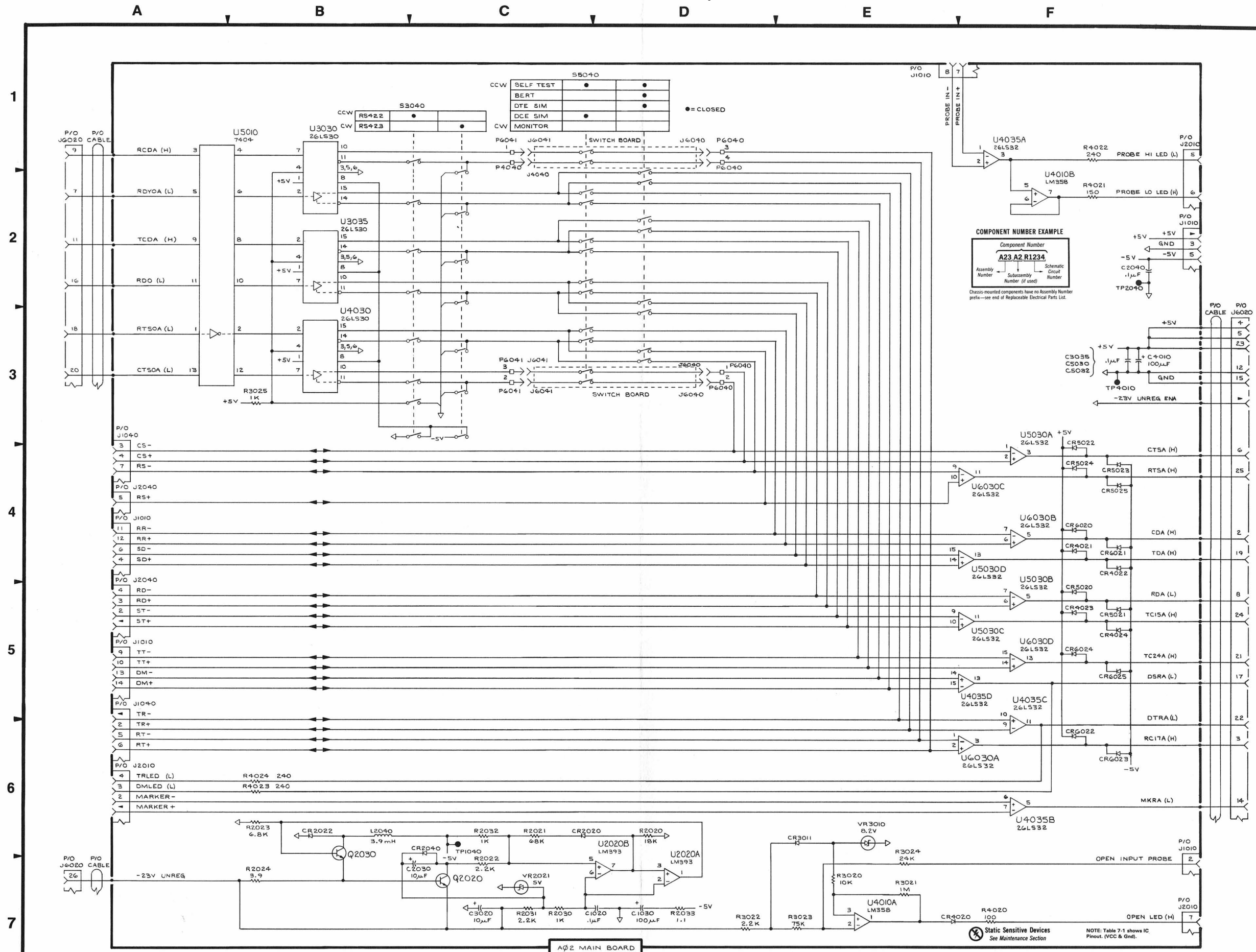
⚡ Static Sensitive Devices  
See Maintenance Section

Figure 7-2. Main Board Component Locations.

3798-9

Table 7-3

MAIN BOARD <span style="border: 1px solid black; padding: 2px;">2</span>					
ASSEMBLY A02					
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1020	D7	D1	P6041	C3	A3
C1030	D7	D1	P6041	C1	A3
C2030	B7	C2	Q2020	C7	C2
C2040	F2	C2	Q2030	B6	C2
C3020	C7	C1	R2020	D6	C1
C3035	F3	B2	R2021	C6	C1
C4010	F3	B1	R2022	C7	C1
C5030	F3	A2	R2023	B6	C1
C5032	F3	B2	R2024	B7	C1
CR2020	C6	C1	R2030	C7	C2
CR2022	B6	C2	R2031	C7	C2
CR2040	C6	C2	R2032	C6	C2
CR3011	E6	B1	R2033	D7	C2
CR4020	E7	B1	R3020	E7	B1
CR4021	F4	B1	R3021	E7	B1
CR4022	F4	B1	R3022	D7	B1
CR4023	F5	B1	R3023	E7	B1
CR4024	F5	B2	R3024	E7	B1
CR5020	F5	A1	R3025	B3	B2
CR5021	F5	A1	R4020	F7	B1
CR5022	F4	A1	R4021	F2	B1
CR5023	F4	A1	R4022	F1	B1
CR5024	F4	A1	R4023	B6	B1
CR5025	F4	A2	R4024	B6	B2
CR6020	F4	A1	S3040	C1	B3
CR6021	F4	A1	S5040	D1	A3
CR6022	F6	A1	TP1040	C6	D1
CR6023	F6	A1	TP2040	F2	C2
CR6024	F5	A1	TP4010	F3	B1
CR6025	F5	A2	U2020A	D7	C2
J1010	F2	D1	U2020B	D7	C2
J1010	F7	D1	U3030	B1	C2
J1010	A4	D1	U3035	B2	B2
J1010	E1	D1	U4010A	E7	B1
J1010	A5	D1	U4010B	F2	B1
J1040	A4	D1	U4030	B3	B2
J1040	A6	D1	U4035A	F1	B2
J2010	A6	C1	U4035B	F6	B2
J2010	F7	C1	U4035C	F6	B2
J2010	F1	C1	U4035D	F5	B2
J2040	A4	C3	U5010	A2	A1
J2040	A5	C3	U5030A	F4	A2
J4040	C1	ON SWITCH BD	U5030B	F5	A2
J6020	A2	A1	U5030C	F5	A2
J6020	F3	A1	U5030D	F4	A2
J6020	A7	A1	U6030A	F6	A2
J6040	D1	ON SWITCH BD	U6030B	F4	A2
J6041	C3	ON SWITCH BD	U6030C	F4	A2
L2040	B6	C2	U6030D	F5	A2
P4040	C1	B3	VR2021	C7	C1
P6040	D3	A2	VR3010	E6	B1
P6040	D1	A2			



**COMPONENT NUMBER EXAMPLE**

Component Number			
A23	A2	R	1234
Assembly Number	Subassembly Number (if used)	Schematic Number	Circuit Number

Chassis mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

MAIN BOARD

2

# REPLACEABLE PARTS

## PARTS ORDERING INFORMATION

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

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

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

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

## SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number  
00X Part removed after this serial number

## FIGURE AND INDEX NUMBERS

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

## INDENTATION SYSTEM

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

```

1 2 3 4 5           Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
    ---*---
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
    ---*---
Parts of Detail Part
Attaching parts for Parts of Detail Part
    ---*---
  
```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---\*--- indicates the end of attaching parts.

**Attaching parts must be purchased separately, unless otherwise specified.**

## ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

## ABBREVIATIONS

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

Replaceable Parts—A6741

## CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000BK	STAUFFER SUPPLY	105 SE TAYLOR	PORTLAND, OR 97214
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
11237	CTS KEENE, INC.	3230 RIVERSIDE AVE.	PASO ROBLES, CA 93446
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
34335	ADVANCED MICRO DEVICES	901 THOMPSON PL.	SUNNYVALE, CA 94086
56289	SPRAGUE ELECTRIC CO.	87 MARSHALL ST.	NORTH ADAMS, MA 01247
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
76493	BELL INDUSTRIES, INC., MILLER, J. W., DIV.	19070 REYES AVE., P O BOX 5825	COMPTON, CA 90224
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83294	ARROW FASTENER CO., INC.	271 MAYHILL ST.	SADDLE BROOK, NJ 07662
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscnt	Name & Description	Mfr Code	Mfr Part Number
A1	670-7343-00		CKT BOARD ASSY: BREAKOUT	80009	670-7343-00
A2	670-7344-00		CKT BOARD ASSY: MAIN	80009	670-7344-00
A3	670-7345-00		CKT BOARD ASSY: SWITCH	80009	670-7345-00
A1	670-7343-00		CKT BOARD ASSY: BREAKOUT	80009	670-7343-00
A1DS2040	150-1061-00		LT EMITTING DIO: RED, 660NM, 50MA MAX	27014	SJ62775
A1DS2041	150-1061-00		LT EMITTING DIO: RED, 660NM, 50MA MAX	27014	SJ62775
A1DS2042	150-1061-00		LT EMITTING DIO: RED, 660NM, 50MA MAX	27014	SJ62775
A1DS3030	150-1061-00		LT EMITTING DIO: RED, 660NM, 50MA MAX	27014	SJ62775
A1DS3031	150-1061-00		LT EMITTING DIO: RED, 660NM, 50MA MAX	27014	SJ62775
A1P1010	131-0591-00		CONTACT, ELEC: 0.835 INCH LONG	22526	47352
A1P1040	131-0591-00		CONTACT, ELEC: 0.835 INCH LONG	22526	47352
A1P2010	131-0591-00		CONTACT, ELEC: 0.835 INCH LONG	22526	47352
A1P4010	131-0591-00		CONTACT, ELEC: 0.835 INCH LONG	22526	47352
A1R1010	315-0122-00		RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
A1R1011	315-0122-00		RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
A1R1020	315-0122-00		RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
A1R1021	315-0122-00		RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
A1S3010	260-2098-00		SWITCH, SLIDE: 5 POS, DPST, 50VDC ON/OFF	11237	CTS 206-215
A1S4010	260-2098-00		SWITCH, SLIDE: 5 POS, DPST, 50VDC ON/OFF	11237	CTS 206-215
A2	670-7344-00		CKT BOARD ASSY: MAIN	80009	670-7344-00
A2C1020	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A2C1030	290-0747-00		CAP., FXD, ELCTLT: 100UF, +50-10%, 25V	56289	500D148
A2C2030	290-0779-00		CAP., FXD, ELCTLT: 10UF, +50-10%, 50VDC	56289	502D237
A2C2040	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A2C3020	290-0779-00		CAP., FXD, ELCTLT: 10UF, +50-10%, 50VDC	56289	502D237
A2C4010	290-0755-00		CAP., FXD, ELCTLT: 100UF, +50-10%, 10V	56289	502D223
A2C5030	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A2C5032	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A2C5035	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A2CR2020	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR2022	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR2040	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR3011	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR4020	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR4021	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR4022	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR4023	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR4024	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR5020	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR5021	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR5022	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR5023	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR5024	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR5025	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR6020	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR6021	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR6022	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR6023	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R
A2CR6024	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 150MA	01295	1N4152R



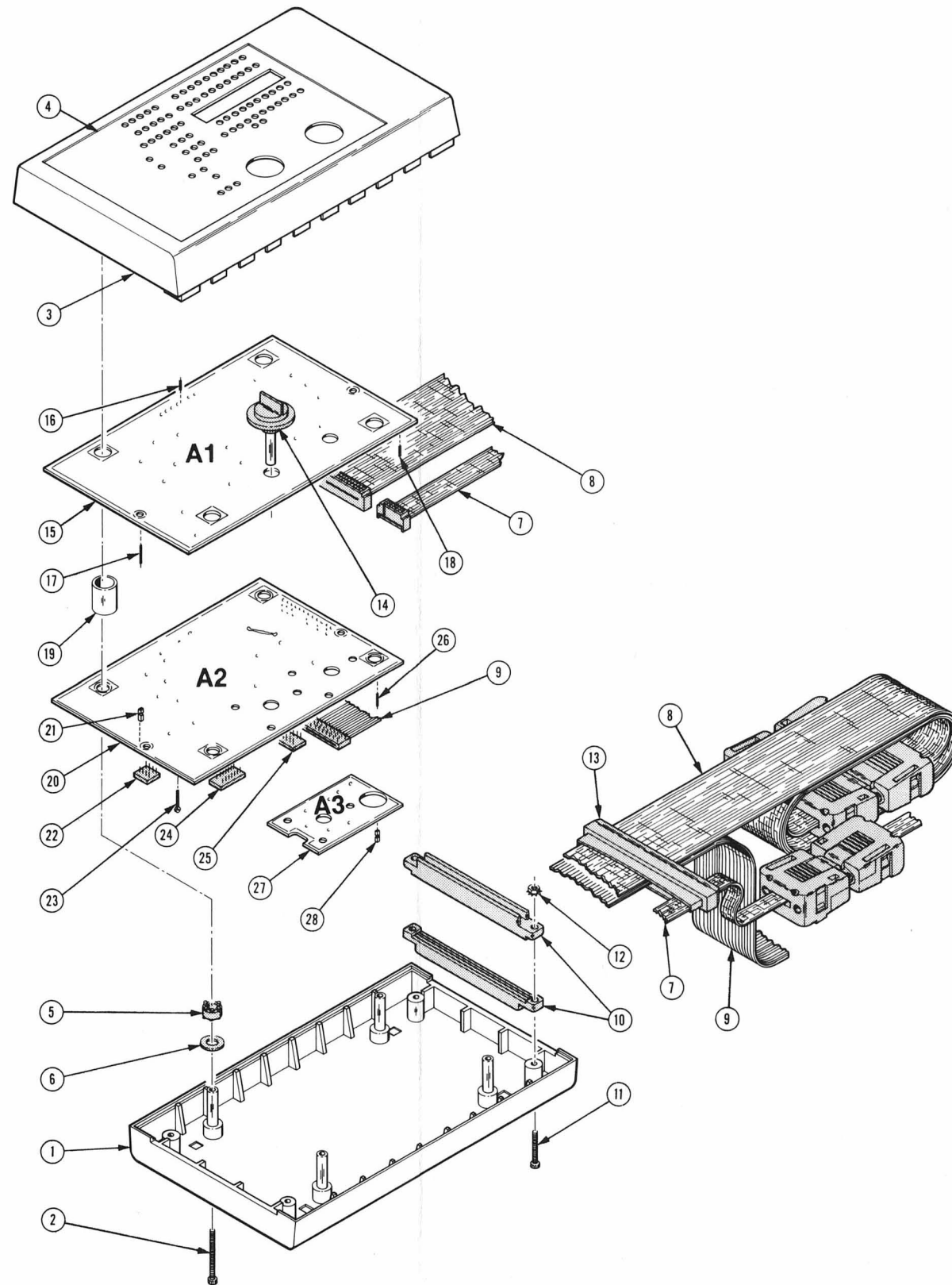
## Replaceable Electrical Parts—A6741

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A2CR6025	152-0141-02		SEMICONV DEVICE:SILICON,30V,150MA	01295	1N4152R
A2J1010	136-0263-04		SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
A2J1040	136-0263-04		SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
A2J2010	136-0263-04		SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
A2J2040	136-0263-04		SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
A2L2040	108-0224-00		COIL,RF:FIXED,3.9MH	76493	108-0224-00
A2P4040	131-0590-00		CONTACT,ELEC:0.71 INCH LONG	22526	47351
A2P6040	131-0590-00		CONTACT,ELEC:0.71 INCH LONG	22526	47351
A2P6041	131-0590-00		CONTACT,ELEC:0.71 INCH LONG	22526	47351
A2Q2020	151-0190-00		TRANSISTOR:SILICON,NPN	07263	S032677
A2Q2030	151-0260-00		TRANSISTOR:SILICON,NPN	80009	151-0260-00
A2R2020	315-0183-00		RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
A2R2021	315-0683-00		RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
A2R2022	315-0222-00		RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A2R2023	315-0682-00		RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A2R2024	307-0055-00		RES.,FXD,CMPSN:3.9 OHM,5%,0.50W	01121	EB39G5
A2R2025	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A2R2030	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A2R2031	315-0222-00		RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A2R2032	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A2R2033	308-0767-00		RES.,FXD,WW:1.1 OHM,5%,1W	75042	BW20-1R100J
A2R3020	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A2R3021	315-0105-00		RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A2R3022	315-0222-00		RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A2R3023	315-0753-00		RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
A2R3024	315-0243-00		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A2R4020	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A2R4021	315-0151-00		RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A2R4022	315-0241-00		RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A2R4023	315-0241-00		RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A2R4024	315-0241-00		RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A2U2020	156-1225-00		MICROCIRCUIT,LI:DUAL COMPARATOR,8 DIP	27014	LM393N
A2U3030	156-1316-00		MICROCKT,INTFC:QUAD 3 STATE SINGLE ENDED	80009	156-1316-00
A2U3035	156-1316-00		MICROCKT,INTFC:QUAD 3 STATE SINGLE ENDED	80009	156-1316-00
A2U4010	156-0853-00		MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER,DUAL	27014	LM358N
A2U4030	156-1316-00		MICROCKT,INTFC:QUAD 3 STATE SINGLE ENDED	80009	156-1316-00
A2U4035	156-1315-00		MICROCKT,INTFC:QUAD DIFFERENTIAL RECEIVER	34335	AM26LS32
A2U5010	156-0058-00		MICROCIRCUIT,DI:HEX.INVERTER	80009	156-0058-00
A2U5030	156-1315-00		MICROCKT,INTFC:QUAD DIFFERENTIAL RECEIVER	34335	AM26LS32
A2U6030	156-1315-00		MICROCKT,INTFC:QUAD DIFFERENTIAL RECEIVER	34335	AM26LS32
A2VR2021	152-0662-00		SEMICONV DEVICE:ZENER,0.4W,5V,1%	04713	SZG195
A2VR3010	152-0217-00		SEMICONV DEVICE:ZENER,0.4W,8.2V,5%	04713	SZG20
A3	670-7345-00		CKT BOARD ASSY:SWITCH	80009	670-7345-00
A3J4040	136-0263-04		SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
A3J6040	136-0263-04		SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
A3J6041	136-0263-04		SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001

## CHASSIS PARTS

S3040	263-0095-00		SWITCH,ROTARY:422-423	80009	263-0095-00
S5040	263-0096-00		SWITCH,ROTARY:MODE	80009	263-0096-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-1	380-0652-00			1						HSG HALF,CKT BD:BOTTOM (ATTACHING PARTS)	80009	380-0652-00
-2	211-0306-00			4						SCREW,CAP:4-40 X 1.125,HEX,SKT HD - - - * - - -	83294	OBD
-3	380-0686-00			1						HSG HALF,CKT BD:TOP	80009	380-0686-00
-4	333-2870-00			1						PANEL,FRONT:	80009	333-2870-00
-5	361-0998-00			4						SPACER,CKT BD:0.245 ID X 0.380 OD X 0.23 H	80009	361-0998-00
-6	210-0963-00			4						WASHER,FLAT:0-25 ID X 0.500 INCH OD,PLSTC	80009	210-0963-00
-7	175-4743-00			1						CA ASSY,SP,ELEC:9,28 AWG,4.0 L,RIBBON	80009	175-4743-00
-8	175-4369-00			1						CA ASSY,SP,ELEC:37,28 AWG,60.0 L,RIBBON	80009	175-4369-00
-9	175-2322-00			1						CA ASSY,SP,ELEC:26,28 AWG,18.0 L	80009	175-2322-00
-10	343-0836-00			2						CLAMP,CABLE:3.72 L,ALUMINUM (ATTACHING PARTS)	80009	343-0836-00
-11	211-0093-00			2						SCR,CAP,SOC HD:4-40 X 0.75 INCH L,STL	000BK	OBD
-12	210-0586-00			2						NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL - - - * - - -	83385	OBD
-13	200-2412-00			1						CABLE NIP,ELEC:3.45 L X 0.05ID,PLASTIC	80009	200-2412-00
-14	366-1761-02			2						KNOB:GY,1.0 H X 0.722 OD,W/SHAFT & INDEX	80009	366-1761-02
-15	-----			1						CKT BOARD ASSY:BREAKOUT(SEE A1 REPL)		
-16	131-0608-00			78						. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-17	131-0591-00			33						. CONTACT,ELEC:0.835 INCH LONG - . (INCLUDES P1010,P1040,P2040,P4010 A1 REPL)	22526	47352
-18	131-0608-00			50						. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-19	361-1167-00			4						SPACER,SLEEVE:0.43 X 0.621,ALUMINUM	80009	361-1167-00
-20	-----			1						CKT BOARD ASSY:MAIN(SEE A2 REPL)		
-21	136-0263-04			33						. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN - . (INCLUDES J1010,J1040,J2010,J2040 A2 REPL)	22526	75377-001
-22	136-0514-00			2						. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-23	214-0579-00			3						. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-24	136-0269-02			6						. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-25	136-0260-02			6						. SKT,PL-IN ELEC:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-26	131-0590-00			8						. CONTACT,ELEC:0.71 INCH LONG - . (INCLUDES P4040,P6040,P6041, A2 REPL)	22526	47351
-27	-----			1						CKT BOARD ASSY:SWITCH(SEE A3 REPL)		
-28	136-0263-04			8						. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN - . (INCLUDES J4040,J6040,J6041 A3 REPL)	22526	75377-001



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A6741 RS-449 ADAPTER

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## **MANUAL CHANGE INFORMATION**

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

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COMMITTED TO EXCELLENCE

**MANUAL CHANGE INFORMATION**Date: 10-7-81Change Reference: M44543Product: A6741 RS-449 Interface AdapterManual Part No.: 070-3798-00**DESCRIPTION**

EFF ALL SN

TEXT, REPLACEABLE ELECTRICAL PARTS LIST AND SCHEMATIC DIAGRAM CHANGES

**SECTION 6 MAINTENANCE AND TROUBLESHOOTING****Internal Data Test**

page 6-5

paragraph 6 should read:

Using the Diagnostic ROM Pack, initiate the Service Dual 834 Test (select THIS 834 XMT) to continuously exercise the control lines. Trace lines from the driver inputs to receiver outputs and use an oscilloscope to check that lines are active. If the Diagnostic ROM Pack is not available, run the Internal Data Test repeatedly and monitor each line for activity.

DELETE paragraph 7 (last paragraph on page).

page 6-6

paragraph 5 should read:

If the Diagnostic ROM Pack is unavailable, repeatedly run the Internal Data Test. Use an oscilloscope to check the paths indicated:

NO SYNC RCVR <A> - RCDA(H) to RD17A(H), RDO(L) to RDA(L)  
 NO SYNC RCVR <B> - TCDA(H) to TC24A(H), RDO(L) to TDA(H)

**SECTION 7 DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS**

ADD 6 resistors (560 ohm, 5%, 0.25 Watt) to the Main Board (A02) as indicated on the following updated schematic. Resistors are added on the outputs of U5030 (pins 3,11) and U6030 (pins 3,5,11,13).

ADD to Table 7-3, between R4025 and S3040:

R4025	F5	B2
R5022	F4	BACK OF BRD.
R5025	F4	A2
R6021	F4	A2
R6022	F6	BACK OF BRD.
R6024	F5	BACK OF BRD.

DESCRIPTION

SECTION 8 REPLACEABLE ELECTRICAL PARTS

page 8-3

CHANGE TO:

A2 670-7344-01 CKT BOARD ASSY: MAIN

page 8-4

ADD:

R4025	315-0561-00	RES., FIXED, CMPSN: 560 OHM, 5%, 0.25W
R5022	315-0561-00	RES., FIXED, CMPSN: 560 OHM, 5%, 0.25W
R5025	315-0561-00	RES., FIXED, CMPSN: 560 OHM, 5%, 0.25W
R6021	315-0561-00	RES., FIXED, CMPSN: 560 OHM, 5%, 0.25W
R6022	315-0561-00	RES., FIXED, CMPSN: 560 OHM, 5%, 0.25W
R6024	315-0561-00	RES., FIXED, CMPSN: 560 OHM, 5%, 0.25W

page 8-4

ADD:

CHASSIS PARTS

S3040	263-0095-00	SWITCH, ROTARY: 422-423
S5040	263-0096-00	SWITCH, ROTARY: MODE

Partial diagram 2, MAIN BOARD

