Tektronix®

COMMITTED TO EXCELLENCE

A6701

18 BIT WORD RECOGNIZER

INSTRUCTION MANUAL

Tektronix, Inc.
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WARRANTY

Tektronix warrants to the original purchaser that this product is free from defects in materials and workmanship, under normal use, for a period of one (1) year from the date of shipment. Tektronix will, at its option, repair or replace the product if Tektronix determines it is defective within the warranty period, and it is returned, freight prepaid, to a Tektronix Service Center.

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WARNING

THE REMAINING PORTION OF THIS TABLE OF CONTENTS LISTS THE SERVICING INSTRUCTIONS. THESE 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.

LIST OF ILLUSTRATIONS

THE ILLUSTRATIONS IN SECTION 8 ARE LOCATED ON THE FOLDOUT PAGES AT THE REAR OF THE MANUAL.

LIST OF TABLES

OPERATORS SAFETY SUMMARY

The general safety information in this summary is for both operating personnel and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply and do 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.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates either a personal injury hazard not immediately accessible as you read the marking or a hazard to property, including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as you read the marking.

SYMBOLS

In This Manual

This symbol is used on schematic diagrams having static-sensitive components.

As Marked on Equipment

DANGER – High voltage.

Protective ground (earth) terminal.

ATTENTION – refer to manual.

PRECAUTIONS

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

For detailed information on power cords and connectors, see Installation instructions in Section 2 of this manual.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for this product and having identical type, voltage rating, and current rating characteristics.

Refer internal fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

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

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

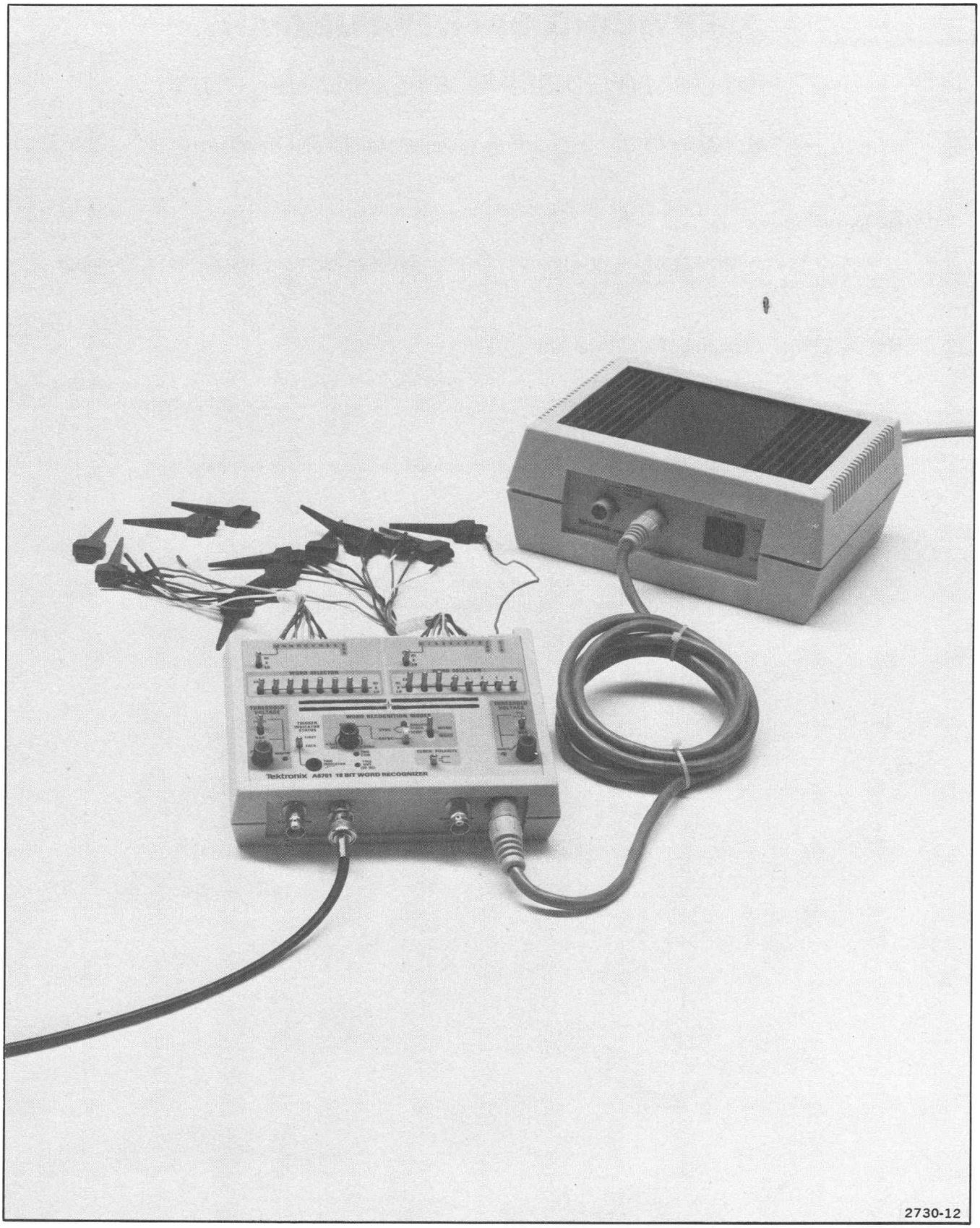
Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

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

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.



A6701 Word Recognizer System.

INTRODUCTION AND SPECIFICATION

INTRODUCTION

The Tektronix A6701 is an 18-bit parallel word recognizer (WR). It provides TTL-compatible, positive- or negative-going trigger output signals which may be used as an input to logic analyzers, oscilloscopes, or other external test instrumentation. Output pulses are generated upon instrument recognition of the preset digital word. By connecting a series of 18-bit WR units together, the A6701 system can accommodate recognition of digital words having more than 72 bits. The small lightweight packaging allows the user to position the A6701 system near the circuitry under test.

The preselected digital word to be recognized is determined by setting the 18 word selector switches (16 data channels and 2 qualifier channels) to either a high, low, or don't care position. A word-pattern match occurs whenever the data and qualifier inputs match the word selector switch settings.

Both asynchronous and synchronous modes of operation are selectable by the operator. In the asynchronous mode, word recognition occurs each time that a word-pattern match occurs. In the synchronous mode, word recognition occurs whenever there is coincidence of a clock edge with the occurrence of a word-pattern match. The operator may also choose either a level or a qualified clock output in the synchronous mode.

The basic A6701 system consists of one 18-bit WR unit, one Tektronix Power Supply unit, two 10-wide input signal lead sets, one clock lead, and other standard accessories listed at the end of the Replaceable Mechanical Parts list at the back of this manual. Each Power Supply unit is capable of powering two WR units.

SPECIFICATION

The electrical specifications listed in Table 1-1 are valid under the following conditions: the A6701 18-Bit Word Recognizer and its Power Supply (and expansion units if used) have been adjusted at an ambient temperature of +20° C to +30° C, instrument units are operating at an ambient temperature between 0° C and +50° C, and instrument units have had a warmup period of at least 20 minutes.

Environmental characteristics are presented in Table 1-2, and physical characteristics listed in Table 1-3.

Table 1-1

Electrical Characteristics

Characteristics	Performance Requirements	Supplemental Information
WORD RECOGNIZER UNIT		
Input R and C	1 MΩ ±50 kΩ, paralleled by 5 pF ±1 pF.	
Threshold Voltages		Referenced to probe tip.
TTL	Fixed at 1.4 V.	
Accuracy	±0.2 V.	Above 30° C accuracy is derated by 1.5 mV/°C.
VAR	−12 V or less to at least +12 V.	
Accuracy	±200 mV ±1% of the threshold voltage.	Above 30° C accuracy for above-ground threshold levels is derated by 1.5 mV/°C.

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
WORD RECOGNIZER UNIT (cont)		
Minimum Input Swing	500 mV p-p (plus 2% of threshold voltage) or less, centered about the threshold voltage.	
Maximum Logic Swing	–40 V to a maximum of 10 V above threshold level. For RS232 signals *only*, –40 V to a maximum of 30 V above threshold level.	
Maximum Nondestructive Input Voltage	–40 V to +40 V (dc plus peak ac).	
Minimum Clock Input Period (Maximum Clock Frequency)		
1-18 Channels	20 ns or less. (50 MHz)	
19-36 Channels	35 ns or less. (28 MHz)	
37-54 Channels	50 ns or less. (20 MHz)	
55-72 Channels	65 ns or less. (15 MHz)	
	All Clock input pulses must be at least 10 ns High and 10 ns Low.	
Data and Qualifier Inputs		
SYNC - QUALIFIED CLOCK or SYNC - LEVEL Modes		
Minimum Setup Time		Referenced to selected clock edge.
1-18 Channels	16 ns or less.	
19-36 Channels	28 ns or less.	
37-54 Channels	40 ns or less.	
55-72 Channels	52 ns or less.	
Minimum Hold Time (1-72 Channels)	0 ns.	Referenced to selected clock edge.
Delay Time for Output to Change States Following Occurrence of Word Recognition	**Maximum** / **Typical** / **Minimum** 17.0 ns / 13.5 ns / 10.0 ns	Referenced to selected clock edge.

Table 1-1 (cont)

Characteristics	Performance Requirements			Supplemental Information
WORD RECOGNIZER UNIT (cont)				
Data and Qualifier Inputs (cont)				
ASYNC—GLITCH FILTER OFF Mode				
Minimum Input Pulse Width for ⩾5 ns Output Pulse				
1-18 Channels	10 ns or less, any single channel; 15 ns or less, any combination of channels.			
19-36 Channels	30 ns or less, any combination of channels.			
37-54 Channels	45 ns or less, any combination of channels.			
55-72 Channels	60 ns or less, any combination of channels.			
Maximum Input Delay Difference Between Channels				
1-18 Channels	7 ns.			
19-36 Channels	19 ns.			
37-54 Channels	31 ns.			
55-72 Channels	43 ns.			
Delay Time From Probe Tip to Trigger Output Connectors	**Maximum**	**Typical**	**Minimum**	
1-18 Channels	20.0 ns	16.5 ns	10.0 ns	
19-36 Channels	32.0 ns	27.0 ns	17.5 ns	
37-54 Channels	45.0 ns	37.0 ns	25.0 ns	
55-72 Channels	58.0 ns	47.0 ns	32.5 ns	
ASYNC—GLITCH FILTER Mode				
Filter	Continuously variable from less than 5 ns to greater than 250 ns.			
Output at Trigger Output Connectors				
High Level	2.2 V or more (1.1 V into 50 Ω load).			
Low Level	0.6 V or less.			
Impedance	50 Ω ±10%.			

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
POWER SUPPLY UNIT		
Line Voltage Input (ac rms)		Selected by changing the Line Voltage Selector card.
115-Volt System		
Low Line Condition	100 V nominal (90 to 110 V range).	
High Line Condition	120 V nominal (108 to 132 V range).	
230- Volt System		
Low Line Condition	220 V nominal (198 to 242 V range).	
High Line Condition	240 V nominal (216 to 250 V range).	
Maximum Total Power Consumption	29 W.	For a system having two Word Recognizer units, 17.4 W are dissipated in the power supply, and 5.8 W are dissipated in each Word Recognizer unit.
Frequency	48 to 440 Hz.	
Regulated Output Voltages		Typical loads are given for each supply voltage and represent the typical current demands of one Word Recognizer unit.
+15-Volt Supply		
Accuracy	+15.0 V ±0.10 V.	Typical load ≈11.5 mA; load range ≈0 to 28 mA (plus the +5.0 V load).
Ripple		Less than 20 mV p-p.
−15-Volt Supply		
Accuracy	Track within 2% of the +15 V Supply.	Typical load ≈12 mA; load range ≈0 to 37 mA.
Ripple		Less than 20 mV p-p.
+5-Volt Supply		
Accuracy	+5.0 V ±0.25 V.	Typical load ≈50 mA; load range ≈0 to 100 mA.
Ripple		Less than 20 mV p-p.
−5-Volt Supply		
Accuracy	−5.05 V ±0.20 V.	Typical load ≈660 mA; load range 0.5 to 1.3 A (plus −2 V load).
Ripple		Less than 100 mV p-p.
−2-Volt Supply		
Accuracy	−2.0 V ±0.15 V	Typical load ≈620 mA; load range ≈0.375 to 1.27 A.
Ripple		Less than 50 mV p-p.

Table 1-2

Environmental Characteristics

Characteristics	Description
Temperature	
Operating	0° C to +50° C.
Nonoperating	−55° C to +75° C.
Relative Humidity	
Operating and Nonoperating	90% to 95%.
Altitude	
Operating	To 4.5 km (15,000 feet).
Nonoperating	To 15 km (50,000 feet).

Table 1-3

Physical Characteristics

Characteristics	Description
WORD RECOGNIZER UNIT	
Weight	0.45 kg (1 lb).
Dimensions	
Length	16.3 cm (6.5 in).
Height	4.3 cm (1.7 in).
Width	11.9 cm (4.75 in).
POWER SUPPLY UNIT	
Weight	2.0 kg (4.5 lb).
Dimensions	
Length	20.0 cm (8.0 in).
Height	8.0 cm (3.2 in).
Width	15.0 cm (6.0 in).

OPERATING INSTRUCTIONS

This section of the manual provides information on instrument installation and power requirements and describes the functions of controls, connectors, and indicators. In addition it includes information intended to familiarize the operator with use of the instrument.

INSTALLATION

PACKAGING INFORMATION

The A6701 system units are shipped in a carton along with the standard accessories. At installation time, save the shipping carton and packaging materials for reuse should reshipment become necessary. Refer to the Maintenance section for repackaging instructions.

PREPARATION FOR USE

Safety Considerations

CAUTION

This instrument may be damaged if operated with the Line Voltage Selector card set for the wrong applied line voltage or if the wrong line fuse is used.

The A6701 is designed to be used with a three-wire ac power system. Before connecting the instrument to a power source, verify that the Line Voltage Selector card is set for the line voltage being used, that the proper line fuse is installed, and that the line cord plug matches the power source to be used. Refer to the Safety Summary in the front of this manual for power source, grounding, and other safety considerations pertaining to use of the instrument.

Line Voltage Range Selection

WARNING

This instrument is designed for operation from a power source with its neutral at or near earth (ground) potential with a separate safety-earth conductor.

The A6701 WR operates from either a 115-volt or a 230-volt nominal line voltage source at 48 hertz to 440 hertz. Two voltage ranges may be selected for each nominal line voltage source (see Table 2-1).

Table 2-1

Line Voltage Selection

Line Voltage Range		Line Voltage Selector Card Position
115-Volt System	230-Volt System	
90 to 110 Volts		100
108 to 132 Volts		120
	198 to 242 Volts	220
	216 to 250 Volts	240

The power input module located on the rear panel of the Power Supply unit houses a Line Voltage Selector card, a line fuse, and a power line cord connector. To verify correct line voltage range selection (or to convert the instrument for operation to another line voltage range) perform the following procedure on the Power Supply unit (refer to Figure 2-1):

1. Ensure that the power line cord is disconnected from both the power source and the Power Supply unit.
2. Slide the clear plastic cover to its extreme left position to expose the line fuse.
3. Pull out the lever marked FUSE PULL and rotate it to the left, disengaging the fuse from its holder.
4. Using needle nose pliers, grasp the Line Voltage Selector card (located under the fuse holder) at its center hole and pull it straight out.
5. From Table 2-1 determine the range within which your average line voltage is approximately centered. Opposite that range read the correct Line Voltage Selector card position.

6. Orient the Line Voltage Selector card to its proper position (see Figure 2-1) and insert it into the selector module.

7. Insert the proper fuse (selected from Table 2-2) into its holder and slide the clear plastic cover to the extreme right position.

Table 2-2

Fuse Selection

System Line Voltage	Fuse Size (250 V)
115	0.4 A, 3AG, Slow-blow
230	0.2 A, 3AG, Slow-blow

8. Verify that you can read the proper voltage on the Line Voltage Selector card through the plastic window.

9. Verify that your power cord plug matches the power source being used.

10. Set POWER switch to OFF and connect the receptacle end of the power cord to the power input module.

Equipment Setup for Use

To prepare your A6701 WR system for use, perform the following procedure:

1. Connect a dc cable from one of the POWER OUTPUT sockets on the front panel of the Power Supply unit to the POWER INPUT socket on each WR unit being used. One Power Supply unit is capable of powering two WR units.

2. If only one WR unit is to be used, connect one end of a 50-ohm bnc cable to the TRIGGER OUTPUT connector at the front of the WR unit.

3. If two WR units are to be used, connect a 50-ohm bnc cable from the EXPANSION OUTPUT connector on one of the WR units (Unit 1) to the EXPANSION INPUT connector of the second WR unit (Unit 2). Then connect one end of another 50-ohm bnc connector to the TRIGGER OUTPUT connector on Unit 2.

4. The same connection scheme is used for adding a third WR unit (Unit 3). For example, the EXPANSION OUTPUT of Unit 1 is connected to the EXPANSION INPUT of Unit 2, and the EXPANSION OUTPUT of Unit 2 is connected to the EXPANSION INPUT of Unit 3. The Trigger Output is always taken from the last WR unit added. Figure 2-2 illustrates a four-unit (72-bit) expansion configuration.

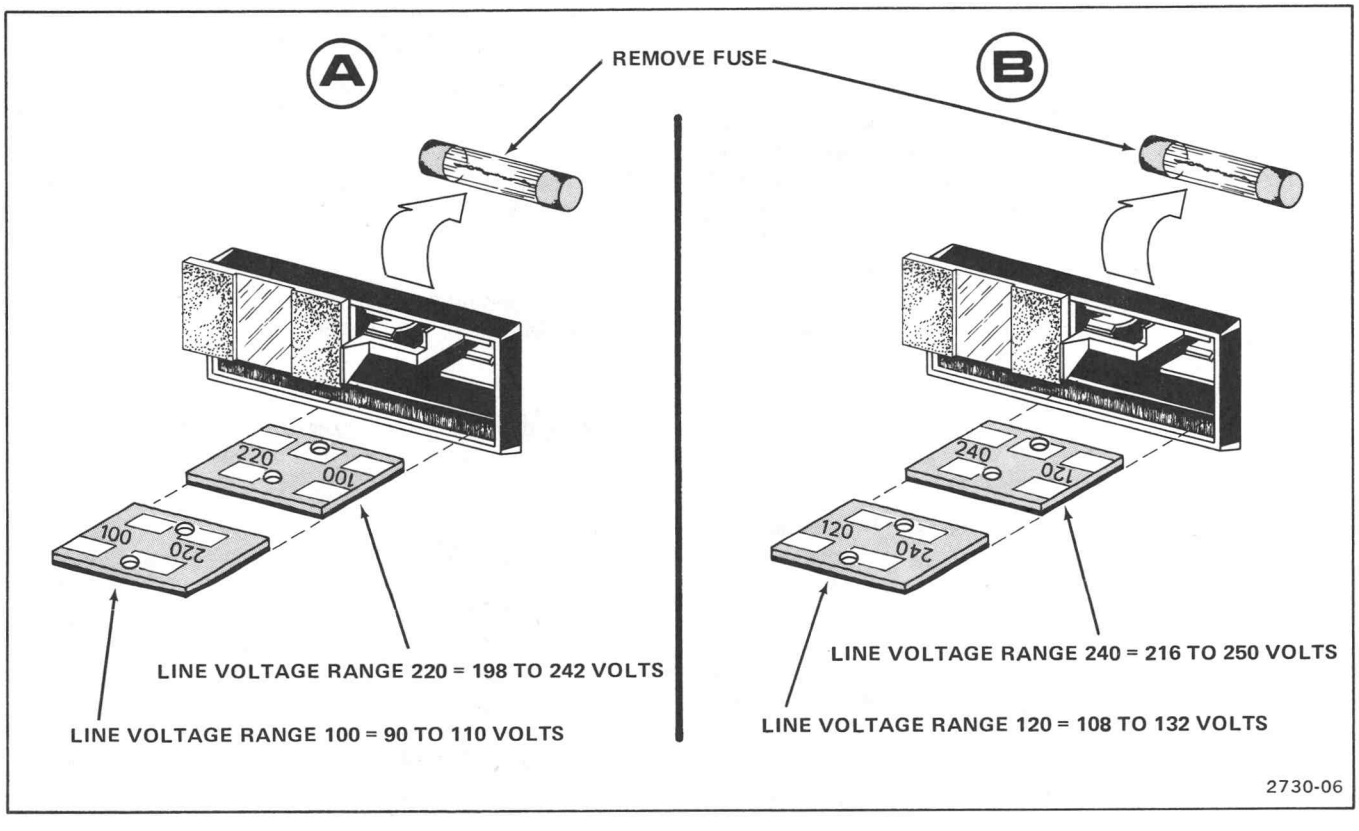


Figure 2-1. Line Voltage Selector card positioning.

@

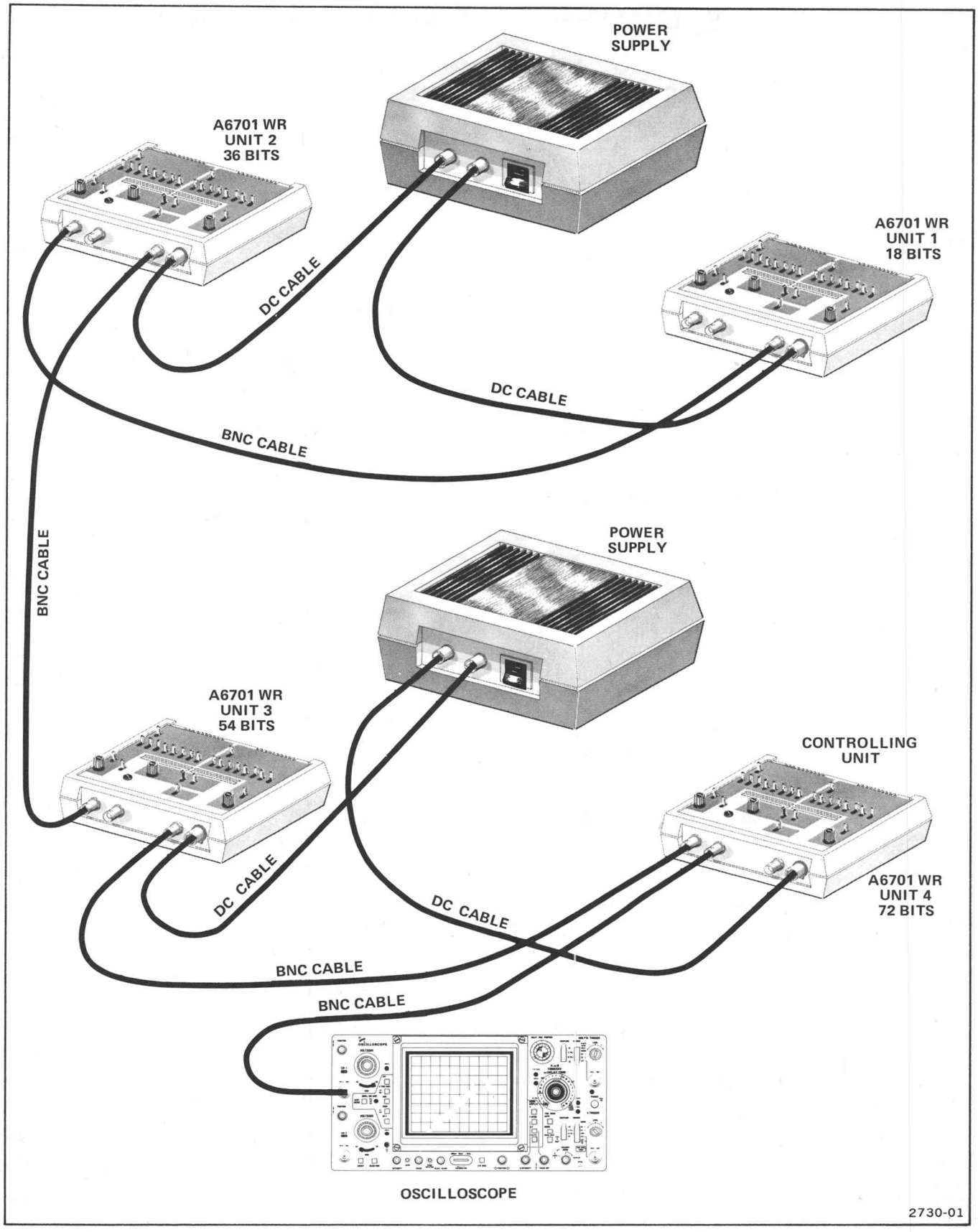


Figure 2-2. A6701 System configuration.

CONTROLS, CONNECTORS, AND INDICATORS

WORD RECOGNIZER UNIT

Refer to Figure 2-3 for location of items 1 through 17.

(1) **Input Connectors**—Twenty-one square-pin connectors used to connect logic inputs to the WR.

CLK—Single connector for clock input. In an expansion system the clock input must be connected to the last WR unit added (unit from which the Trigger Output is taken).

GND, 0-7, Q1—Ten-wide set of connectors for data Channels 0-7 and associated ground and qualifier inputs.

GND, 8-15, Q2—Ten-wide set of connectors for data Channels 8-15 and associated ground and qualifier inputs.

(2) **WORD SELECTOR, Q1, and Q2 Value Switches**—Three-position toggle switches used to select the logic level to which input signals from corresponding Input Connectors are compared. All incoming signals must match the HI or LO settings of their corresponding switches before a pattern-match signal is electronically switched to the word recognition circuitry for subsequent generation of trigger signal outputs. When any WORD SELECTOR switch is set to X (don't care), the corresponding input signal is ignored.

(3) **THRESHOLD VOLTAGE Switches**—Two-position toggle switches used to select logic threshold levels presented at the input circuitry. Right switch controls levels for Channels 0-7, Q1, and CLK; left switch controls levels for Channels 8-15 and Q2.

TTL—Logic threshold level is fixed at +1.4 volts.

VAR—Logic threshold level may be varied from +12 to −12 volts, as determined by the VAR control.

(4) **THRESHOLD VOLTAGE VAR Control**—Potentiometer used to vary the logic threshold level at the input circuitry whenever the respective THRESHOLD VOLTAGE toggle switch is set to VAR (±12 V).

(5) **THRESHOLD VOLTAGE MONITOR Jacks**—Permits monitoring of logic threshold levels with a digital voltmeter. Right jack monitors Channels 0-7, CLK, and Q1; left jack monitors Channels 8-15 and Q2.

(6) **WORD $\overline{\text{WORD}}$ Switch**—Permits enabling of trigger output circuit.

WORD—The trigger output circuit is enabled whenever there is a word-pattern match.

$\overline{\text{WORD}}$—The trigger output circuit is enabled whenever there is no word-pattern match. This switch position can also be used in conjunction with the SYNC ASYNC switch to invert the trigger output signal. When the SYNC ASYNC switch is set to either ASYNC or SYNC LEVEL and a word-pattern match occurs, a negative-going trigger output signal will result.

(7) **SYNC ASYNC Switch**—Three-position slide switch controlling trigger signal output and gating of clock input signal.

ASYNC—Permits trigger signal output immediately after the trigger output circuit is enabled. This trigger signal is TTL-compatible and is a low-to-high transition. The output remains high as long as the trigger output circuit remains enabled. The WORD $\overline{\text{WORD}}$ switch can be used to invert the the trigger output signal. When it is set to $\overline{\text{WORD}}$ and a word-pattern match occurs, a negative-going trigger output signal will result.

SYNC LEVEL—Permits a trigger signal output immediately following the coincidence of an enable condition with the selected clock edge (determined by the CLOCK POLARITY switch position). Both the rising and falling edges of the trigger signal are synchronized with the selected clock edge. Therefore, when the enable condition no longer exists, the next selected clock edge forces the output to go low. This switch position can also be used with the $\overline{\text{WORD}}$ switch position to invert the trigger output signal.

SYNC QUALIFIED CLOCK—Permits the clock input signal to be gated through to the output connectors after an enable condition occurs. The output clock signal begins at the coincidence of an enable condition with the selected clock and continues until the enable condition no longer exists. The internal clock qualifier circuit ensures whole clock pulses at the output connectors. Whenever the CLOCK POLARITY switch is set to the falling edge (⌝) position, the clock signal at the output will be the complement (inverted) of the input clock signal.

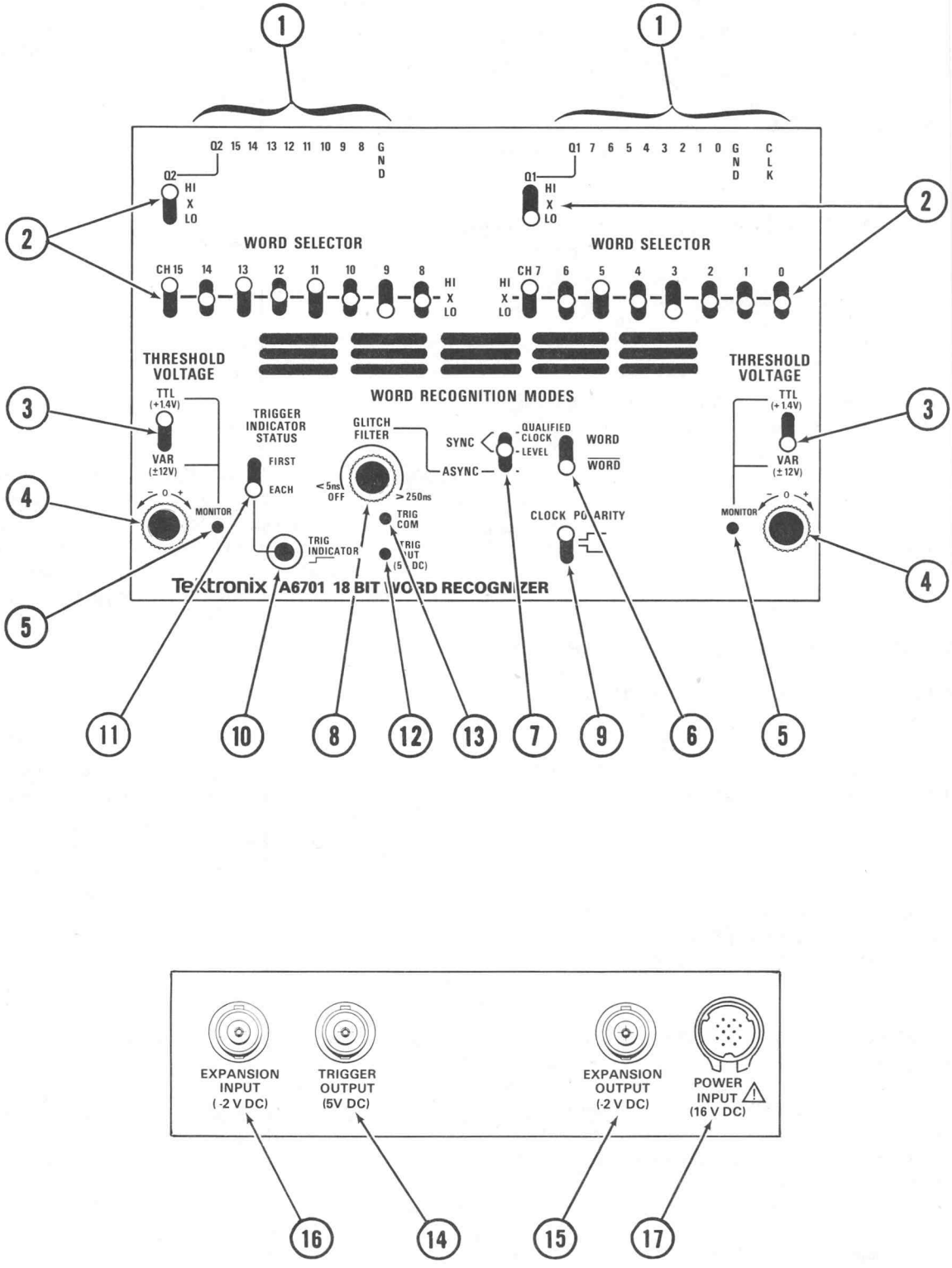


Figure 2-3. WR controls, connectors, and indicators.

(8) **GLITCH FILTER Switch and Control**—A variable pulse-width filter that operates only when the SYNC ASYNC switch is set to ASYNC. For word recognition to occur in this mode, a word pattern match must be of longer duration than the filter setting. With the GLITCH FILTER control the required duration can be varied from less than 5 nanoseconds to greater than 250 nanoseconds. Rotating the control fully counterclockwise switches the filter off.

(9) **CLOCK POLARITY Switch**—A two-position toggle switch used to select the desired edge of the external clock signal to be used for synchronizing the trigger output signal. This switch is active whenver the WR is operating in the SYNC LEVEL or SYNC QUALIFIED CLOCK modes.

⎍ —Causes a trigger signal to occur at the trigger output connectors on the positive-going edge of the clock signal (low-to-high transition).

⎎ —Causes a trigger signal to occur at the trigger output connectors on the negative-going edge of the clock signal (high-to-low transition).

(10) **TRIG INDICATOR**—A light-emitting diode (LED) that illuminates whenever a trigger signal is present at the TRIGGER OUTPUT bnc and TRIG OUT square-pin connector. The length of time it remains illuminated is dependent upon the position of the TRIGGER INDICATOR STATUS switch. Illumination begins on a low-to-high transition of the trigger output signal.

(11) **TRIGGER INDICATOR STATUS Switch**—A two position toggle switch used to control the conditions under which the TRIG INDICATOR LED will illuminate.

FIRST—Causes the TRIG INDICATOR LED to come on when the first trigger signal occurs. The LED will remain illuminated until either the TRIGGER INDICATOR STATUS switch is set to EACH or the test setup is changed. The FIRST position is normally used to determine whether a trigger ever occurs.

EACH—Causes the TRIG INDICATOR LED to momentarily illuminate for each trigger output pulse of at least five nanoseconds duration. The TRIG INDICATOR LED will remain on for the length of time the trigger output remains High plus 10 milliseconds.

(12) **TRIG OUT (5V DC) Connector**—The TTL-compatible trigger output signal is available at this square-pin connector after word recognition occurs. It is used to connect the trigger output signal to external test instrumentation via a Tektronix P6451 Data Acquisition Probe, or an equivalent device.

(13) **TRIG COM Connector**—A square-pin connector providing a ground point for the P6451 Data Acquisition Probe, or equivalent device.

(14) **TRIGGER OUTPUT (5V DC) Connector**—The TTL-compatible trigger output signal is also available at this bnc connector after word recognition occurs. It is used to connect the trigger signal (through a 50-ohm bnc cable) to a logic analyzer, oscilloscope, or other instrumentation requiring a trigger signal.

(15) **EXPANSION OUTPUT (–2V DC) Connector**—This bnc connector is used in conjuction with the EXPANSION INPUT bnc connector of another A6701 WR unit whenever more than 18 bits of word recognition is desired. A 50-ohm bnc cable is used to connect the two units (refer to Figure 2-3).

(16) **EXPANSION INPUT (–2V DC) Connector**—This bnc connector is used in conjunction with the EXPANSION OUTPUT connector of another A6701 WR unit whenever more than 18 bits of word recognition is desired.

(17) **POWER INPUT (16V DC) Connector**—Used to connect a dc power cable from the A6701 system Power Supply unit. The Power Supply provides required dc voltages for the WR unit.

POWER SUPPLY UNIT

Refer to Figure 2-4 for location of items 18 through 20.

(18) **POWER Switch**—Connects ac power line voltage to the Power Supply transformer when the switch is set to ON. Disconnects power from the transformer when set to OFF.

(19) **POWER OUTPUT (16V DC) Connectors**—Used to connect the dc power cables to either one or two A6701 WR units.

(20) **Power Input Module**—Houses the main power line fuse, the 110-220 V ac Line Voltage Selector card and mechanism, and the ac power line cord connector (refer to Figure 2-1).

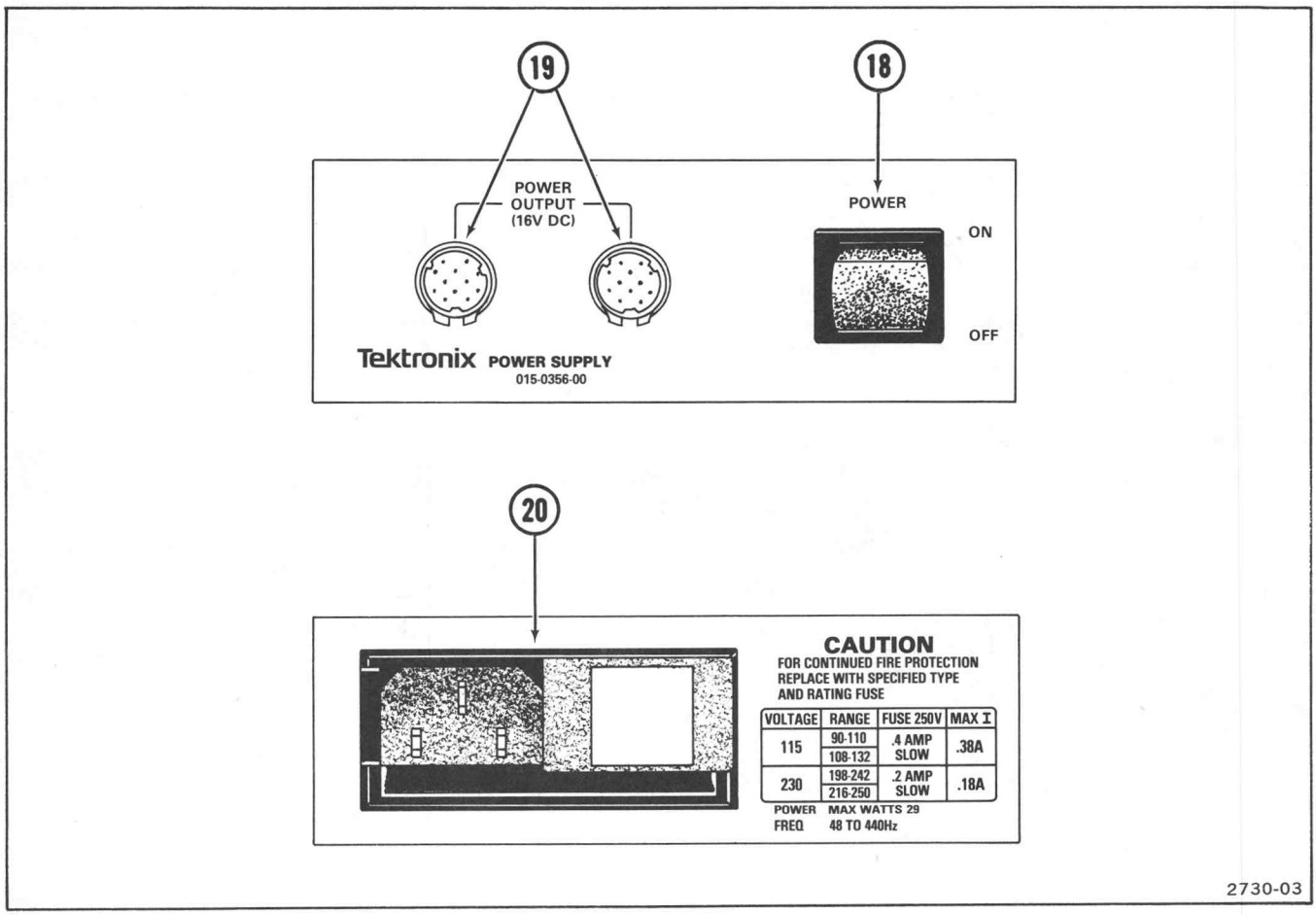


Figure 2-4. Power Supply controls and connectors.

OPERATION

After performing the installation instructions and becoming familiar with the controls and connectors, you are now ready to operate the A6701 Word Recognizer.

1. Connect the power cord to the voltage source and set the Power Supply POWER switch to ON.

2. Connect test inputs to the Input Connectors using either the 10-wide lead sets and microcircuit test probe tips or other accessories available for your instrument (see Figure 2-5).

3. Connect a 50-ohm bnc cable from the TRIGGER OUTPUT bnc to an external instrument requiring a trigger (see Figure 2-5).

NOTE

A longer 50-ohm bnc cable may be used to connect the trigger output to external instrumentation. A6701 propagation delays are specified from probe tips to the Trigger Output connector. Additional delays due to the bnc cable length are approximately 1.55 nanoseconds per foot.

4. Set the THRESHOLD VOLTAGE switches to either TTL or VAR, depending on the test input signals used. If set to VAR, adjust the VAR control to the desired logic threshold level.

5. Set WORD RECOGNITION MODES switches to desired positions. If ASYNC is selected, adjust GLITCH FILTER control as required. If either SYNC mode is selected, set CLOCK POLARITY switch to desired clock edge.

6. Set TRIGGER INDICATOR STATUS switch to either FIRST or EACH as desired.

7. Set WORD SELECTOR switches to the desired input word.

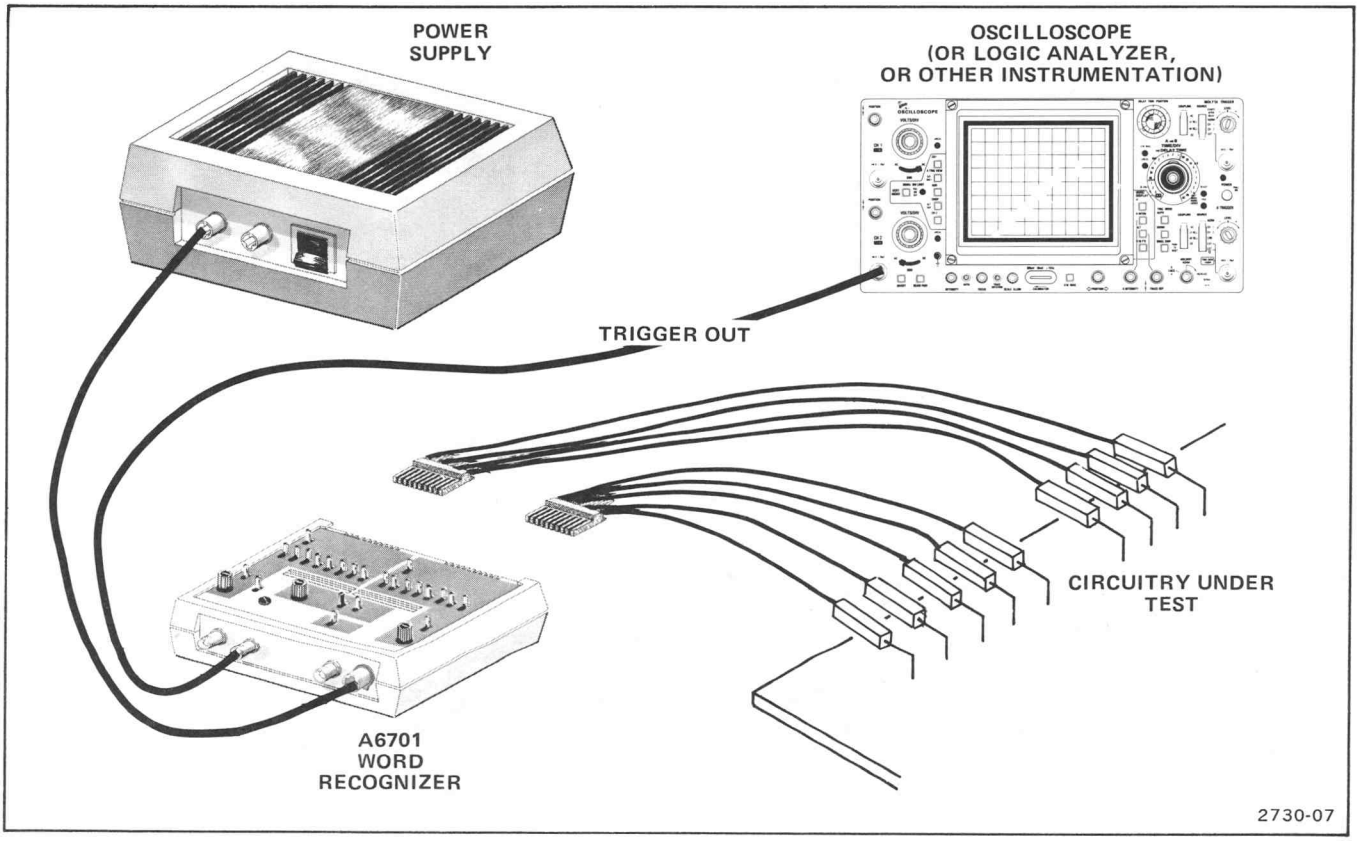


Figure 2-5. Operation setup (18-channel system).

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

INTRODUCTION

This section of the manual contains a functional description of the circuitry used in the A6701 Word Recognizer. It begins with a general summary of the instrument, using the basic block diagram shown in Figure 3-1. Each major circuit then is explained in detail, using additional functional block diagrams to show the interconnections between parts comprising the circuit, to indicate circuit components, and to identify interrelationships with front panel controls. Schematic diagrams also are provided in the Diagrams section of the manual and are keyed to their respective circuit descriptions by numbered diamond symbols. For optimum understanding of the circuit being described, you should refer to both the appropriate schematic diagram and functional block diagram.

The following amplifying information will assist you in understanding the descriptions presented in this section:

1. All Tektronix descriptions use positive logic. For the A6701, high is −0.8 volts and low is −1.8 volts unless otherwise specified.
2. The A6701 WR circuitry uses emitter-coupled logic (ECL) unless otherwise indicated. ECL allows the use of wired logic. For example, the outputs of several gates can be tied together to perform an OR function. Some ECL devices have both inverted and non-inverted outputs.
3. Inputs of most ECL devices used in the A6701 WR system have internal pull-down resistors. All unused inputs are low. Unless otherwise noted, it is not necessary for unused inputs to be tied to external voltages.
4. Schematic diagrams located in the Diagrams section at the back of this manual are drawn according to the functions that devices perform in a circuit.
5. To prevent ringing and noise from the open emitter outputs of the ECL devices, 100-ohm terminating resistors are used on all transmission lines except the Expansion Input line, which is terminated off its bnc connector into 50 ohms.

GENERAL SYSTEM DESCRIPTION

The basic A6701 WR system monitors up to 18 bits of information, recognizes a specific parallel digital word, and outputs a trigger signal. Figure 3-1 is a basic block diagram showing the overall configuration of the WR unit. The lines between the blocks are signal and data paths, with the blocks representing the main circuitry sections or switches.

Each Data and Qualifier Input Channel consists of a high input impedance comparator which compares the input signal level with a preselected threshold voltage and sends differential ECL output levels to Word Selector Switching circuits.

When input signal levels match the HI or LO settings of the WORD SELECTOR switches, a word-pattern match occurs. When a WORD SELECTOR switch is in the X (don't care) position, that channel input is ignored. In the ASYNC mode, the word-pattern match can be delayed from 5 to 250 nanoseconds by adjusting the GLITCH FILTER control. This gives the operator the ability to prevent unwanted short-duration glitches from causing false triggers.

The Clock Input signal is sent to the CLOCK POLARITY switch where the edge of the clock signal that will be used to synchronize the output trigger signal is selected. Opposite edges of the clock signal are used by the Sync Level and Sync Qualified Clock circuitry as shown in Figure 3-1.

When a word-pattern match occurs, a signal is sent through the WORD $\overline{\text{WORD}}$ switch to the Sync and Async circuitry. In the Async mode this signal is switched directly to the Trigger Output Level Converter and Trigger Indicator Circuits. In either SYNC mode, the signal is delayed by a few nanoseconds to ensure proper synchronization with the clock edges in the Sync Level and Sync Qualified Clock circuits. The SYNC ASYNC switch determines which trigger signal will be sent to the Trigger Output Level Converter and Trigger Indicator Circuits.

The Trigger Output Level Converter changes the ECL level trigger signals to TTL levels and presents them at the Trigger Output connectors. The Trigger Indicator Circuits control the LED illumination to show the presence of a trigger signal at the outputs.

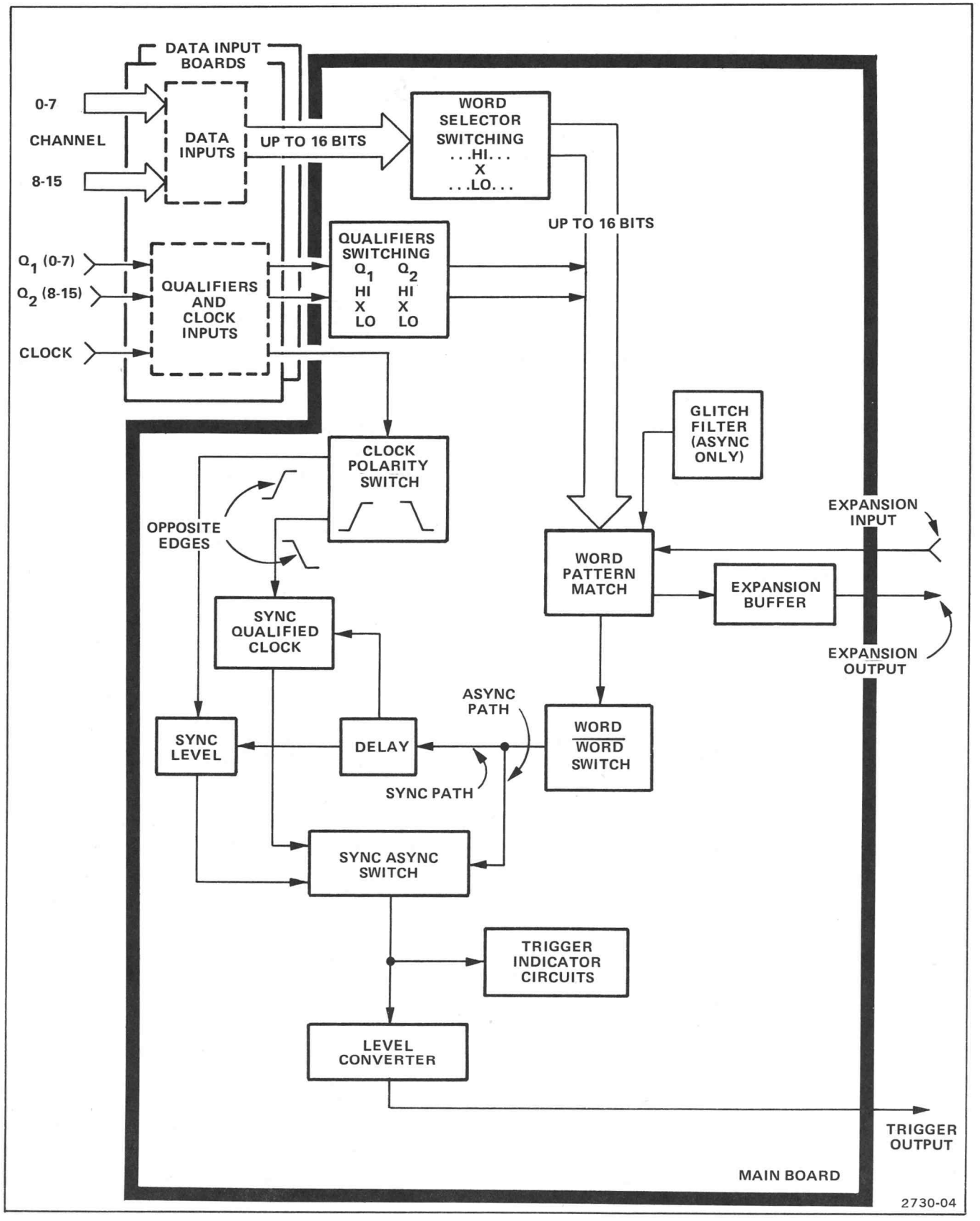


Figure 3-1. Block diagram.

DETAILED CIRCUIT DESCRIPTION

A6701 WORD RECOGNIZER UNIT

Data Inputs, Qualifiers, and Threshold Settings 1 and 3

Test points are probed with input leads which connect at J2408A and J2408B to two identical Data Input boards (A2). Active hybrid circuitry on the Data Input boards compares the test signal levels with offset voltages from the threshold voltage circuits and provides differential outputs for each input. These output signals are centered around −1.2 volts.

The threshold voltage circuits on the Main board (A1) set the dc offset voltage used by the Data Input boards. Figure 3-2 illustrates a typical threshold setting circuit. THRESHOLD VOLTAGE switch S1509 selects either TTL or VAR threshold voltage for its respective Data Input board. Pin 2 of S1509 is connected through R1401 to MONITOR jack J1615. The threshold voltage is inverted, divided, and offset by U1116. The approximate offset voltage at the output of U1116 can be calculated using the following formula:

$$\text{Offset Voltage} = \frac{\text{Reference Voltage} - \text{Threshold Voltage}}{4} + \text{Reference Voltage}$$

Example: The offset voltage for a +1.4-volt threshold level (TTL) will be approximately:

$$\text{Offset Voltage} = \frac{(-5 - 1.4)}{4} - 5 = -6.6 \text{ volts}$$

The offset voltage is connected through an attenuator network, R1 and R2, to hybrid circuitry to change the effective comparison voltage of the hybrid comparator (see Figure 3-2).

Example: Using the offset voltage of −6.6 volts from the previous example, the effective comparison voltage (threshold voltage) can be calculated as follows:

$$\text{Threshold Voltage} = \frac{R1}{R2}\left[\text{Reference Voltage} - \text{Offset Voltage}\right] + \text{Reference Voltage}$$

$$\text{Threshold Voltage} = \frac{800}{200}\left[-5 - (-6.6)\right] + (-5)$$

$$= 4\ (+1.6) - 5 = +1.4 \text{ volts}$$

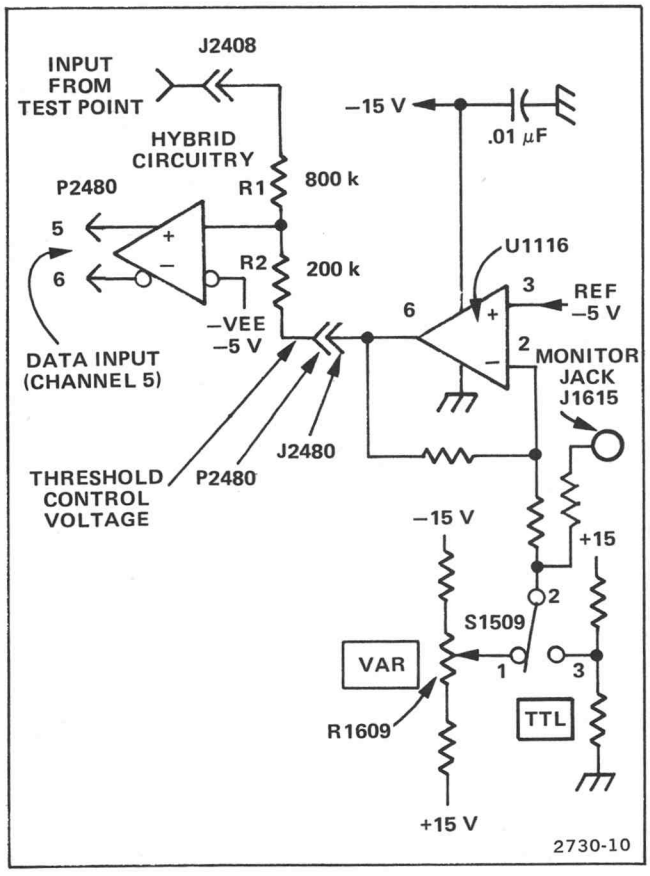


Figure 3-2. Threshold setting and one channel of input data.

Since all of the Data Input and Qualifier circuits are electrically identical, only one will be described in the remainder of this discussion. Channel 5 is used as the model (see Figures 3-2 and 3-3).

When the signal level at the Channel 5 input is high with respect to the threshold voltage, the differential output signal at P2480A will be high at pin 5 and low at pin 6.

Word Selector 2 and 4

Data input signals are connected to circuitry on the Main board through P2480A and B. The Channel 5 signal is sent to line receiver U1374B which provides a complementary ECL signal to WORD SELECTOR switch S1366. With U1374B pin 10 held high and pin 9 held low, output from pin 7 will be high and output from pin 6 will be low. Therefore, U1374B pin 7 will follow the input signal, and pin 6 will invert the input signal. With the WORD SELECTOR switch set to HI, U1167B pin 10 will be low whenever the input signal is high. Thus, whenever the input signal matches the WORD SELECTOR switch setting U1167B pin 10 will be low. If the WORD SELECTOR switch is set to X (don't care), U1167B pin 10 will be pulled low by termination resistor R1267C.

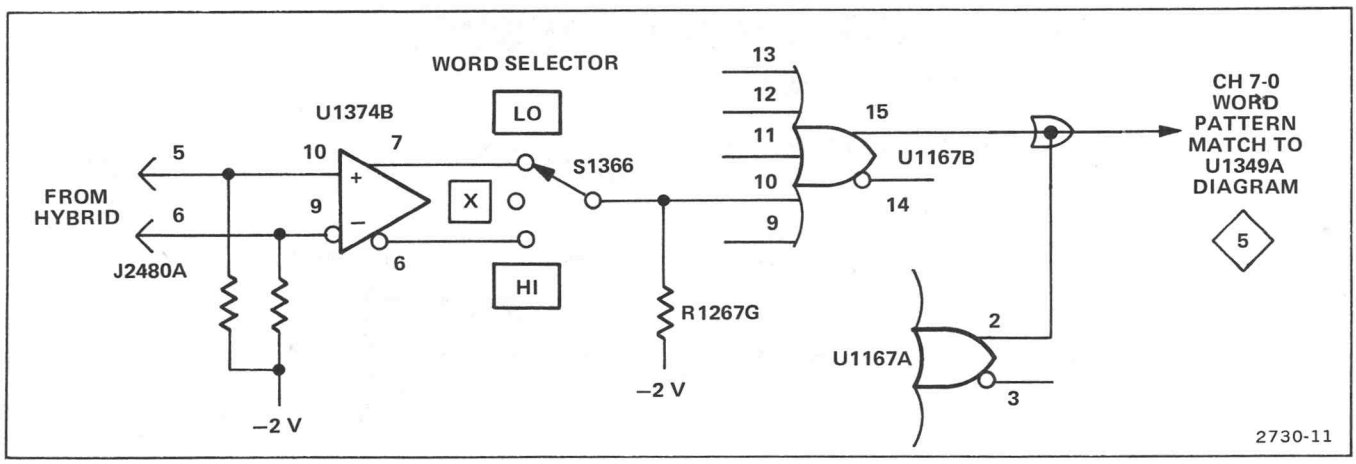


Figure 3-3. One channel of word pattern match and word selection.

Word Pattern Match ◇2◇ and ◇4◇

When all of the input signals to the Data Input board match their respective WORD SELECTOR switch settings, the wire-OR connection at the outputs of U1167A and B will go low, indicating a word-pattern match for Channels 0-7 and Q1. Similar action for Channels 8-15 and Q2 also causes the wire-OR connection at the outputs of U1135A and B to go low. When a word-pattern match condition exists for all data channels (0-15) and for Q1 and Q2, then U1349A pins 5 and 7 will go low.

For this description assume that the EXPANSION INPUT connector is not used. Then U1349A pin 6 will be pulled low via the internal pull-down resistor. Assume also that the GLITCH FILTER switch is OFF. This causes U1349A pin 4 also to be pulled low. The Glitch Filter circuit is explained in the next part of the Circuit Description.

When all U1349A inputs are low, the output from pin 2 will go low and the output from pin 3 will go high, indicating a total word-pattern match and enabling the trigger output circuitry.

NOTE

In the Async mode, output from U1349A pins 2 and 3 are both terminated and will change status as previously described. However, in the Sync modes, only one output will be terminated, depending on the position of the WORD $\overline{\text{WORD}}$ switch. The unterminated output will remain high regardless of word-pattern match status.

Glitch Filter ◇5◇

If either input of U1546A is high, the output at pin 2 will be low. When GLITCH FILTER switch S1536 is set to OFF, or when the SYNC ASYNC switch is set to either SYNC mode, U1546A pin 4 will be held high by resistor divider network R1785 and R1685. Therefore, output of U1349A at pin 2 will be held low, and the Glitch Filter circuit will not influence the Word-Pattern Match circuit.

When the GLITCH FILTER switch is rotated on and the SYNC ASYNC switch set to ASYNC, U1546A pin 4 is tied to −2 volts, and the U1546A output at pin 2 is dependent on the input signal at pin 5.

Word-pattern match conditions are also monitored at U1349B. Prior to word-pattern match, at least one of input pins 10, 11, or 12 will be high. The output at pin 14 will be low, and the output at pin 15 will be high. The input at U1349A pin 4 will then be high, therefore inhibiting the total word-pattern match signal at the outputs of U1349A until the glitch filter signal at pin 4 goes low.

When all word-pattern match conditions are true, U1349B pin 14 goes high. Pin 2 of U1546A tries to go low, but is held high until C1629 discharges through the current source made up of Q1626A and B and associated resistors. By adjusting GLITCH FILTER control R1636, U1349A pin 4 will be held high for a duration of 5 to 250 nanoseconds following the high level at U1546A pin 5. Therefore, glitches of shorter duration than the GLITCH FILTER control setting will not create a total word-pattern match condition. Current supplied to C1629 through R1625 and R1528 is necessary to compensate for the current drain caused by the internal pulldown resistor in U1349A.

Expansion Output and Input ◇5◇

Word-pattern match conditions cause U1349B pin 15 to go low as previously described. This signal is buffered by U1571C which acts as a line driver to provide a low level to the EXPANSION OUTPUT connector.

In an expanded system the expansion output signal from another WR unit is fed to the EXPANSION INPUT connector of the controlling unit. This signal line will be held high until a word-pattern match condition exists in the previous WR unit. Note that the WORD RECOGNITION MODES switches of the first WR unit have no influence on the expansion signal.

Clock Input 5

The clock signals (CLK) are received at a hybrid channel in the Data Channels 0-7 and Q1 section of the input circuitry. They are compared to the same threshold level setting seen by Channels 0-7 and Q1. Differential clock signals from Data Input board A2 are fed to the CLOCK POLARITY switch and to synchronizing circuits on Main board A1 through J2480A pins 23 and 24.

Clock Qualifier 5

Line receiver U1571A provides ECL level inverted and noninverted clock signals to CLOCK POLARITY switch S1762. Pin 3 of U1571A follows the clock input signal, and pin 2 inverts the clock signal. Assume the CLOCK POLARITY switch is set to the rising edge position, and the SYNC ASYNC switch is set to SYNC QUALIFIED CLOCK (see Figure 3-4). At T_0 a clock edge in the circuit under test will cause the trigger word to become true (word-pattern match). Assume the word stays true for two clock periods. At T_1 point A note the inverted edge which caused the trigger word to become true. At T_2, DL1671 pin 3 will go low, indicating word-pattern match, therefore U1671B pin 7 (point B) goes low. DL1671 ensures that $T_1 < T_2 < T_3$.

After point B (word-pattern match) goes low, a high at point A causes U1671B pin 3 to go high. One gate delay later, point C goes low and enables U1546D. The next clock pulses at T_3 and T_4 will be gated through U1546D (point D) as a differential signal to the SYNC ASYNC switch and finally to the Trigger Output circuits.

NOTE

The number of clock pulses gated through equals the number of clock periods that the trigger word is true.

The action of U1671A and U1671D ensures that whole clock pulses will be sent to the Trigger Output circuits. The A6701 WR therefore puts out a qualified clock pulse as long as there is a word-pattern match, assuming the WORD $\overline{\text{WORD}}$ switch is set to WORD. With the WORD $\overline{\text{WORD}}$ switch set to $\overline{\text{WORD}}$, the WR puts out a qualified clock pulse whenever there is not a word pattern match. With the CLOCK POLARITY switch in the falling edge position, the output clock pulse waveform is inverted.

Sync Level Flip-Flop 5

With the SYNC ASYNC switch set to SYNC LEVEL, the CLOCK POLARITY switch in the rising edge position, and the WORD $\overline{\text{WORD}}$ switch set to WORD, a clock edge in the circuit under test will cause the trigger word to come true (word-pattern match) at T_0 (see Figure 3-5). At T_1 point A note the clock edge which caused the word-pattern match. At T_2, pin 3 of DL1671 will go low, indicating word-pattern match; therefore U1750A pin 7 (point B) goes low. DL1671 ensures that $T_1 < T_2 < T_3$.

The next rising clock edge at T_3 will cause flip-flop U1750A to change states and provide a differential trigger signal to both the SYNC ASYNC switch and the Trigger Output circuits, point C. The trigger output level will stay high for as many periods as the word-pattern match remains true. At T_4 the signal at point B is high. The next rising clock edge at T_5 will cause the flip-flop to change states, and the trigger output level goes low (point C).

If the WORD $\overline{\text{WORD}}$ switch is set to $\overline{\text{WORD}}$, the trigger output will be high whenever there is no word-pattern match.

If the CLOCK POLARITY switch is in the falling edge position, the clock signal will be inverted at point A (see Figure 3-6). Therefore, the rising edge used to trigger U1750A is actually the falling edge of the input clock signal from the test circuit.

Trigger Output Level Converter 5

Word recognition output signals from either the Synchronized Clock Qualifier circuit, the Synchronized Level Flip-Flop circuit, or the Asynchronized circuit path are seen as differential inputs at the bases of Q1740 and Q1735 in the Level Converter circuit. When the base of Q1740 is high, the base of Q1735 is low (Q1740 conducts and Q1735 is cut off). In this state the +5-volt supply is divided across R1729 and R1735. The voltage level at the trigger output is about +2.5 volts, and trigger output is high.

When the base of Q1735 is high, the base of Q1740 is low (Q1740 is cut off and Q1735 conducts). Approximately 50 milliamps of current flows through Q1735, and five volts are dropped across R1729. The voltage at the trigger output is near zero, and the trigger output is low. These TTL levels are present at both Trigger Output connectors.

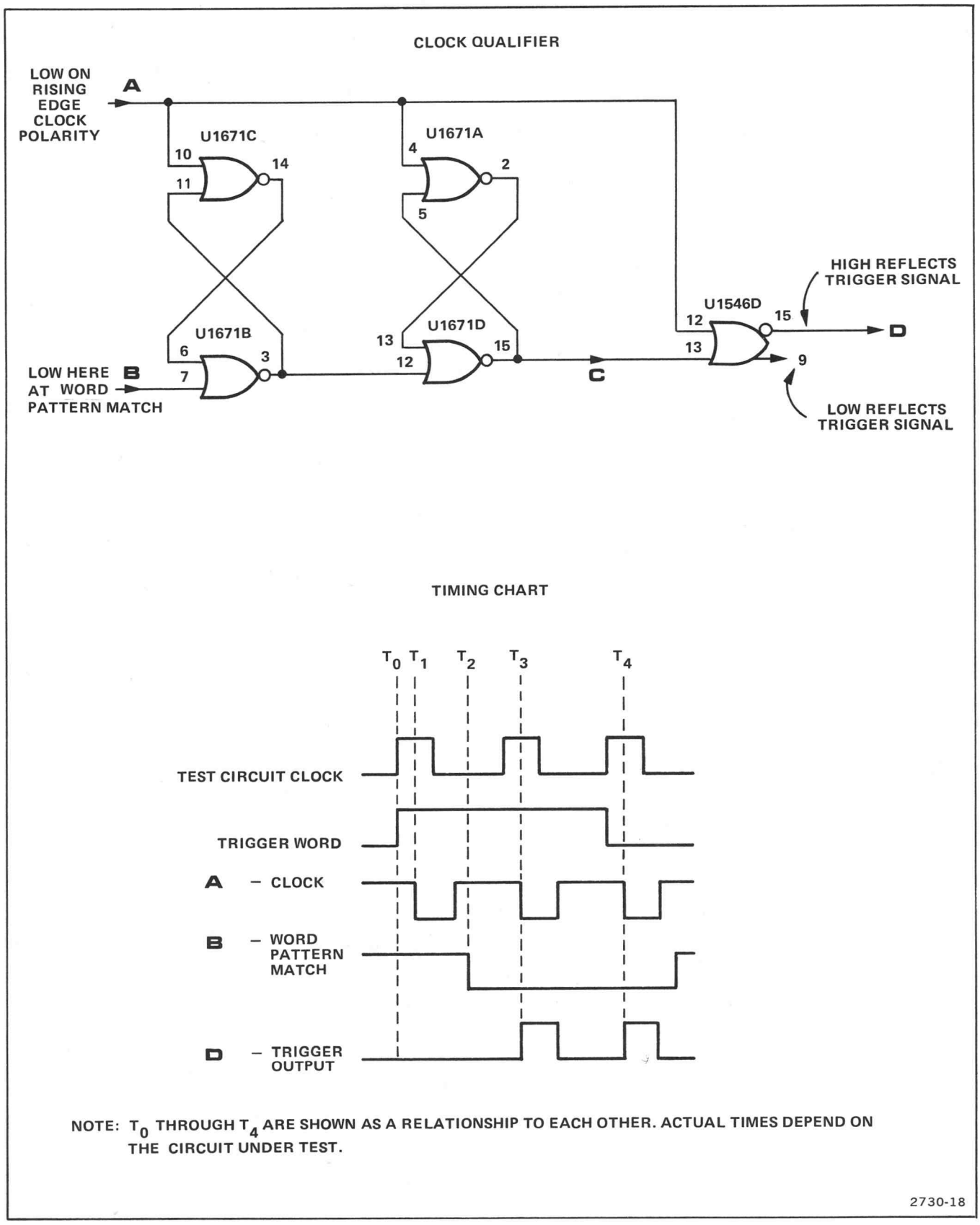


Figure 3-4. Clock Qualifier circuit analysis.

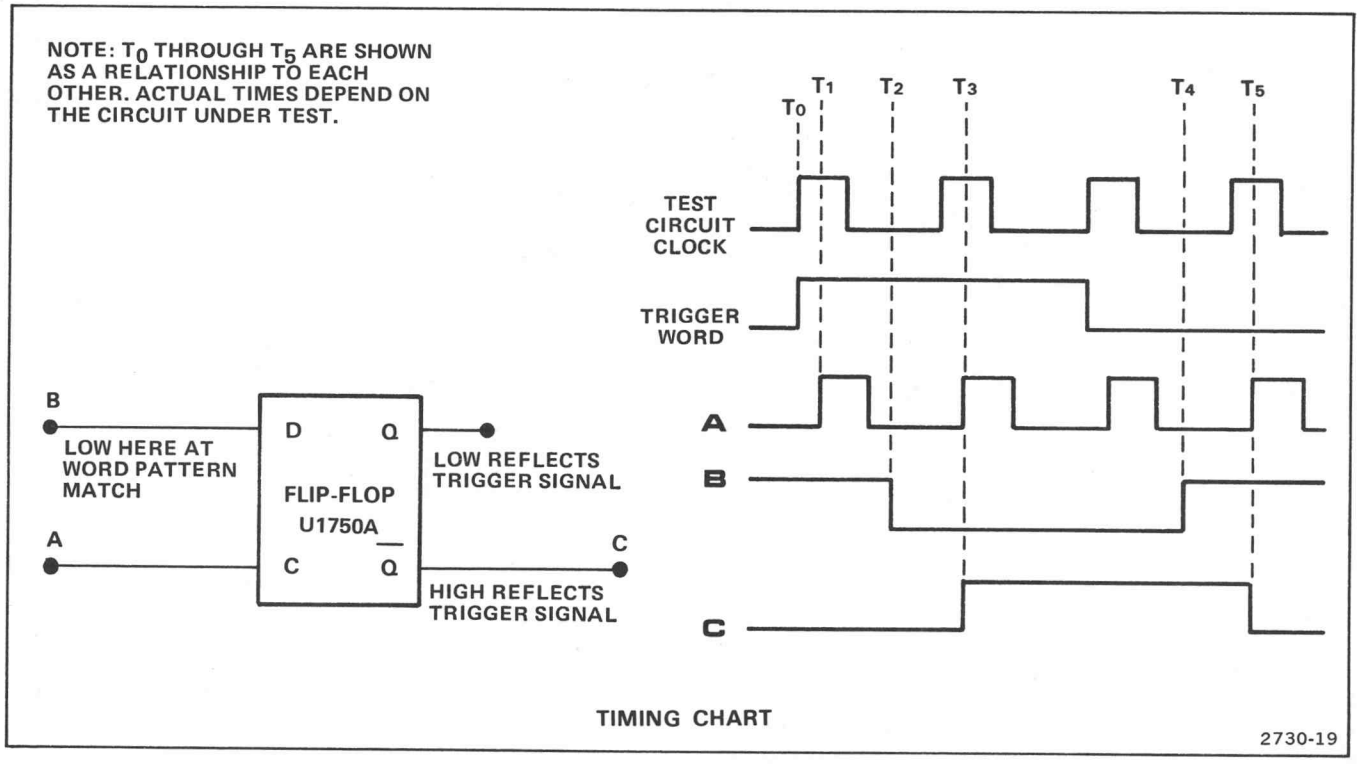


Figure 3-5. Sync Level Flip-Flop circuit analysis.

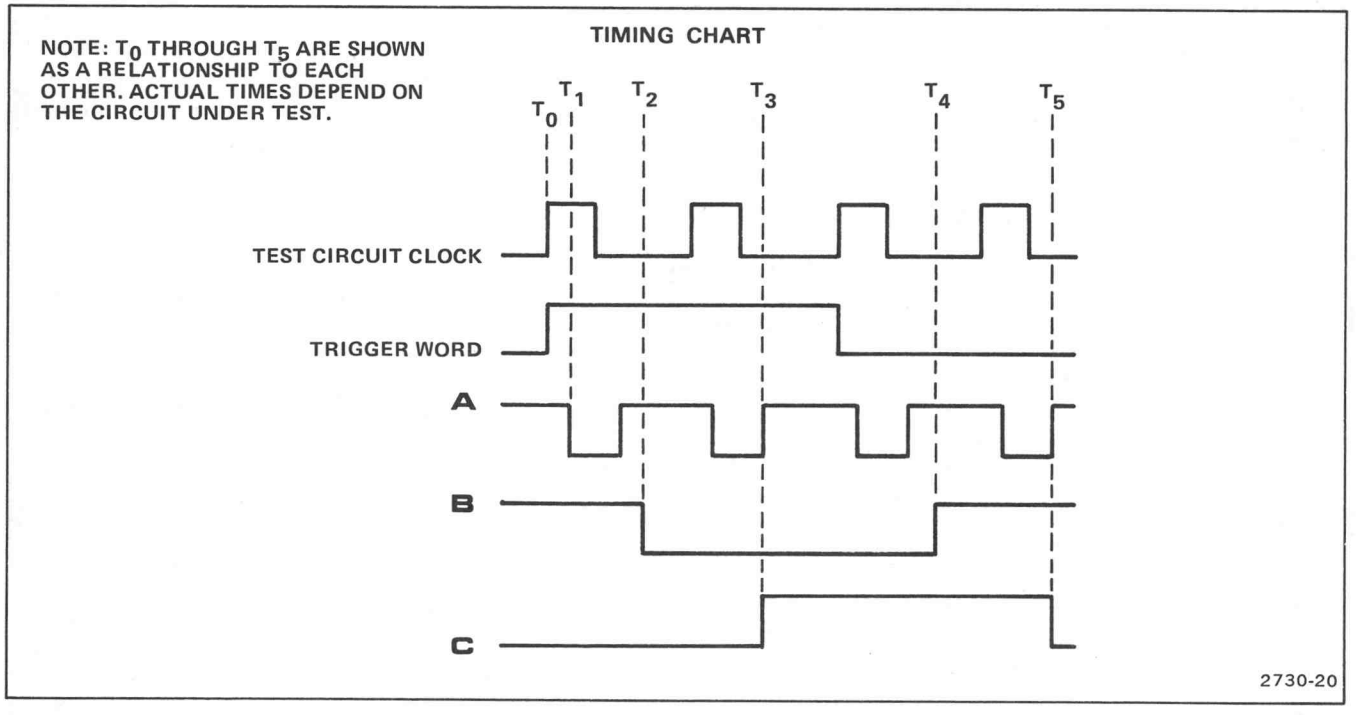


Figure 3-6. Timing chart, falling edge clock polarity.

Trigger Indicator Status Circuitry ◇5

The same differential word recognition signals seen at the bases of the level converter transistors are also sent to pin 7 of U1546B and to pin 10 of U1546C in the Trigger Indicator circuitry. Before word recognition occurs, pin 7 of U1546B is high and pin 10 of U1546C is low. With FIRST EACH switch S1620 set to EACH, pin 11 of U1546C is pulled low via the internal pulldown resistor. Pin 14 of U1546C is high; therefore, pin 13 of U1750B is high. Pin 12 of U1750B is low because of the high level at pin 7 of U1546B (NOR gate with internal pulldown resistor keeping pin 6 low) and output pin 3 is low.

With TRIGGER INDICATOR STATUS switch S1620 set to EACH, the Q output of flip-flop U1750B stays low until a word recognition trigger signal occurs to change the output of U1546B to high and the output of U1546C to low. Then the flip-flop output goes high.

A monostable multivibrator is made up of Q1512, Q1714, Q1515 and associated circuitry. When flip-flop U1750B pin 15 is high (word recognition trigger output), CR1721 is biased on, Q1714 is biased off, and Q1512 and Q1515 are turned on, providing current to drive DS1613. Capacitor C1621 is charged, and TRIG INDICATOR DS1613 will stay illuminated as long as the Q output of flip-flop U1750B is high. A low at the Trigger Output causes a low at U1750B pin 12 and a high at pin 13. This resets the flip-flop, and pin 15 goes low. With the flip-flop output at pin 15 low, C1621 discharges through R1706. In about 10 milliseconds C1621 discharges to a point where Q1714 conducts and Q1515 turns off; TRIG INDICATOR DS1613 then goes off. Therefore, the EACH position keeps the TRIG INDICATOR LED on for about 10 milliseconds plus the amount of time the trigger output is high.

With TRIGGER INDICATOR STATUS switch S1620 set to FIRST, pin 12 of U1546C is held high (via S1620). This holds U1750B pin 13 low. Therefore, the reset of flip-flop U1750B is disabled, and the first word recognition trigger pulse will set the Q output (pin 15) high. Transistor Q1515 will conduct, keeping the TRIG INDICATOR LED on until the TRIGGER INDICATOR STATUS switch is set to EACH or the A6701 system is turned off.

POWER SUPPLY UNIT ◇6

The A6701 system Power Supply unit provides regulated voltages for one or two A6701 WR units.

+15 and −15-Volt Supplies

Series bypass power transistors Q3493 and Q3889 provide additional current for each output (+15 and −15 volts) of dual-tracking voltage regulator U3383A. Current limiting for overload conditions is provided by Q3373 and Q3689. The magnitude of the output voltages can be adjusted via R3483.

+5-Volt Supply

Regulator U3740 uses the +15-volt regulated output at U3383A to derive the +5-volt supply voltage.

−2-Volt Supply

Power transistor Q3640 provides the −2-volt output. Biasing for Q3640 is provided by Q3622 and Q3629.

−5-Volt Supply

The −5-volt supply is a series-switching, regulated power supply. About 25 volts ac from input transformer T3254 is rectified by CR3054, then filtered by several capacitors and an inductor. The resulting voltage is then converted to −5 volts by associated circuitry as follows (see Figure 3-7).

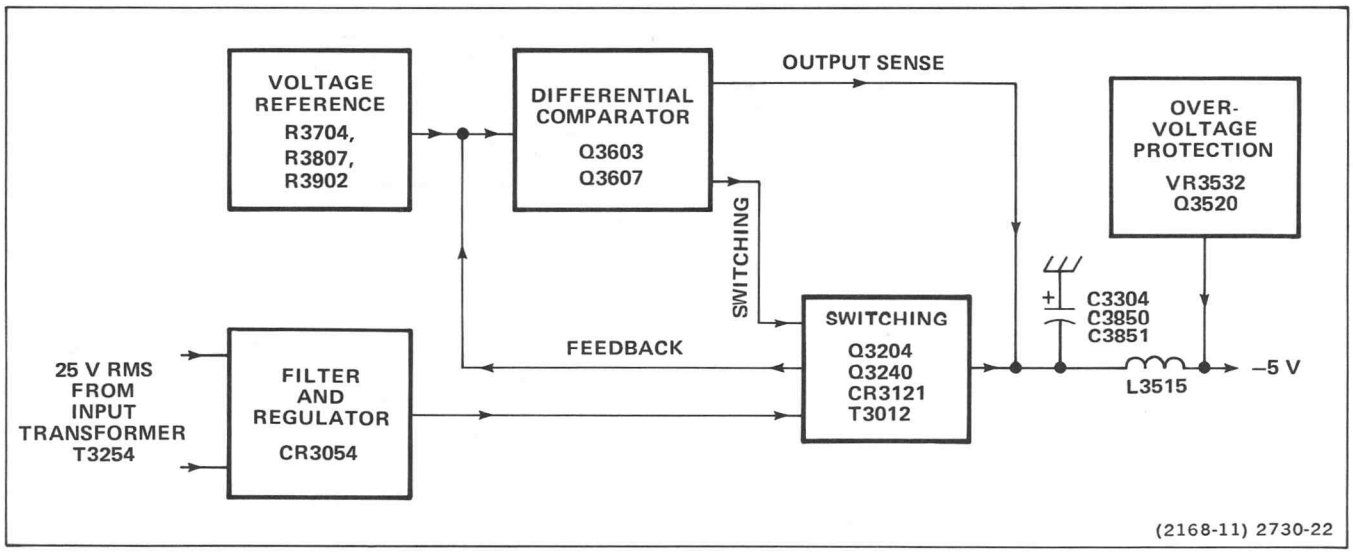


Figure 3-7. −5-Volt Supply block diagram.

The output voltage and current from Q3240 are held constant by capacitors and inductors as Q3240 is switched on and off. When it is off, CR3132 (a Schottky barrier diode) is on, providing the current path from T3012. The switching is sufficiently fast so that the output capacitors cannot discharge, thus enabling output voltage and current to remain constant.

A differential comparator, consisting of Q3603 and Q3607, compares the output voltage with a reference voltage. As the output voltage varies, Q3603 and Q3607 turn on and off. This switches the base current for Q3240, turning it on and off.

The reference voltage is provided by a voltage divider (consisting of R3807, R3704, and R3902) connected to the regulated −15-volt supply. Adjustment of the input for regulated output is provided by R3704.

The switching cycle (see Figure 3-8) starts with Q3240 on (saturated). With Q3240 on, both Q3603 and Q3204 are on. The collector of Q3240 is about −30 volts, and its collector current stores energy in the magnetic field of T3012. When the output voltage on the base of Q3607 is more negative than the reference voltage on the base of Q3603, Q3607 starts to turn on. As Q3607 turns on, Q3603 starts to turn off. This begins to turn off Q3204 and Q3240. As the collector of Q3240 starts to go more positive, the voltage change at pins 1 and 6 of T3012 is coupled back through C3611 and R3606 to the base of Q3603. This positive feedback turns Q3603 off at a faster rate. The base current from Q3240 and Q3204 is sinked by R3608 and R3236, turning them off faster. After Q3240 has turned off, the current in T3012 conducts through CR3132. With Q3240 off, Q3204 and Q3603 are also off. Now, when the output voltage on the base of Q3607 goes more positive than the reference voltage, Q3607 starts to turn off. As soon as Q3607 starts to turn off, Q3603 starts to turn on. The negative-going voltage at the collector of Q3240, as it turns on, is coupled back through T3012 via C3611 and R3606 to the base of Q3603. This positive feedback turns Q3603 on faster. Now Q3240 and Q3204 are on, and the current to T3012 is provided by Q3240. The cycle then repeats. The voltage is filtered by C3304, L3515, C3850 and C3751.

Overvoltage protection is provided by VR3532 and Q3520. As long as the output voltage is less negative than the Zener voltage of VR3532 (about 6 volts), (a SCR) Q3520 remains off. When the output voltage goes below −6 volts, VR3532 causes fuse F3435 to open, thus preventing damage to the rest of the circuitry.

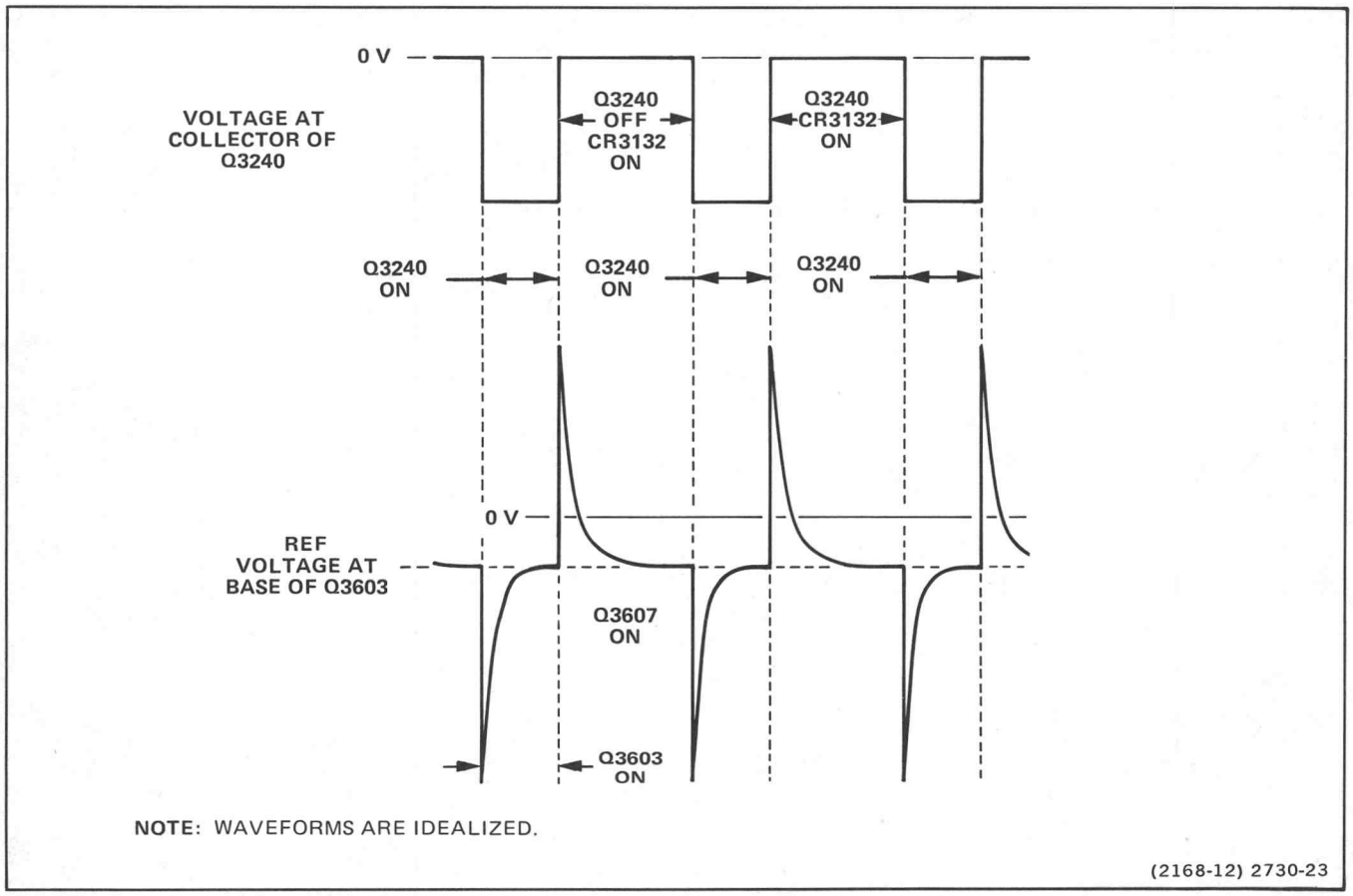


Figure 3-8. −5-Volt Supply timing diagram.

CALIBRATION

This section contains a Performance Check and an Adjustment Procedure. The Performance Check is used to verify instrument performance without removing its covers, while the Adjustment Procedure is used to restore the instrument to its original performance specification.

PERFORMANCE CHECK

LIMITS AND TOLERANCES

The limits and tolerances given in this procedure are valid for a calibrated instrument having a 20-minute warm-up period and when performed in an ambient temperature between 20° and 30° C. All limits and tolerances given are for the A6701 WR system and do not include test equipment error or tolerances. Except when listed as Specification Performance Requirements in Section 1, the limits and tolerances appearing in these check procedures are not instrument specifications.

TEST EQUIPMENT REQUIRED

Test equipment required to make the Performance Check and to accomplish the Adjustment Procedure is listed in Table 4-1. The capabilities of the test equipment listed are the minimum required to check instrument performance. If alternate equipment is used, it must meet or exceed the specification of the listed equipment.

Table 4-1

Test Equipment Required

Description	Minimum Specification	Use	Applicable Test Equipment
Precision dc Voltmeter with Two Test Leads	Range: 0 to ±16 V. Accuracy: within 0.1%. Digital voltmeter must have at least 3½-digit readout.	Check logic threshold levels.	Tektronix DM 502 Digital Multimeter (operates in a TM 500-series Power Module).
Pulse Generator with Cable	Frequency: 10 MHz. Pulse duration: 10 ns to 1 ms. Pulse period: 0.1 μs to 10 ms. Rise time: 2 ns or less. Pulse amplitude: −3 V to +3 V, with at least ±2 V dc offset. Internal back termination.	Check minimum input swing, setup and hold, qualifier, filter, and word.	Tektronix PG 502 Pulse Generator (operates in a TM 500-series Power Module).
Oscilloscope with Two 10X Probes	Bandwidth: dc to 200 MHz. Minimum deflection factor: 20 mV/div. Accuracy: within 3%.	Used to display pulse generator and A6701 system outputs.	Tektronix 475 Oscilloscope.
Two Probe tip-to-bnc Adapters		Signal interconnection.	Tektronix Part Number 013-0084-01.
One bnc T Adapter		Signal interconnection.	Tektronix Part Number 103-0030-00.
Special bnc Male Connector with Conductor Wire		Signal interconnection.	Tektronix Part Number 131-0602-00 with soldering lug and hex nut (0.375-32 x 0.500).

PRELIMINARY

1. Connect dc power cable from Power Supply to A6701 Word Recognizer unit.

2. Plug 10-wide lead sets and clock lead into WR Input Connectors.

CAUTION

Appropriate line fuse selection and Line Voltage Selector Card position must be checked prior to using Power Supply and WR units (see Installation Instructions, Section 2).

3. Plug power line cord into line voltage socket and set Power Supply POWER switch to ON.

4. Let system warm up for at least 20 minutes before starting the procedure. The Performance Check should be accomplished at an ambient temperature between 20° and 30° C.

5. Set WR switches as follows:

WORD SELECTOR	All to X
Q1 and Q2	Both to X
THRESHOLD VOLTAGE	Both to TTL
WORD $\overline{\text{WORD}}$	WORD
SYNC ASYNC	ASYNC
GLITCH FILTER	OFF
CLOCK POLARITY	⌐/
TRIGGER INDICATOR STATUS	EACH

PERFORMANCE CHECK PROCEDURE

Change control settings only as directed in the following procedures.

1. Trigger Indicator and Output Levels Check

a. Set test oscilloscope controls as follows:

Channel 2 Volts/Division	1
Time/Division	0.01 μs
Trigger Mode	Auto
Trigger Source	Channel 2

b. Set oscilloscope coupling to Ground and center trace on crt.

c. Set oscilloscope coupling to dc.

d. Connect a 10X probe from Channel 2 of the oscilloscope to the WR TRIGGER OUTPUT bnc through a probe tip-to-bnc adapter (see Figure 4-1).

e. Toggle the WORD $\overline{\text{WORD}}$ switch a few times and observe the following results:

SWITCH POSITION	TRIGGER LEVEL (crt reading)	TRIG INDICATOR LED
WORD	>2.2 V	ON
$\overline{\text{WORD}}$	<0.6 V	OFF

f. Set WORD $\overline{\text{WORD}}$ switch to $\overline{\text{WORD}}$ and verify that TRIG INDICATOR LED is off, with oscilloscope reading at less than 0.6 volt.

g. Set TRIGGER INDICATOR STATUS switch to FIRST.

h. Set WORD $\overline{\text{WORD}}$ switch to WORD and verify that TRIG INDICATOR LED is on, with oscilloscope reading at greater than 2.2 volts.

i. Set WORD $\overline{\text{WORD}}$ switch to $\overline{\text{WORD}}$ and verify that TRIG INDICATOR LED is on, with oscilloscope reading at less than 0.6 volt.

NOTE

TRIG INDICATOR LED should stay on after the first trigger pulse, even if the trigger level goes low.

j. Set TRIGGER INDICATOR STATUS switch to EACH and verify that TRIG INDICATOR LED goes off.

k. Set WORD $\overline{\text{WORD}}$ switch to WORD.

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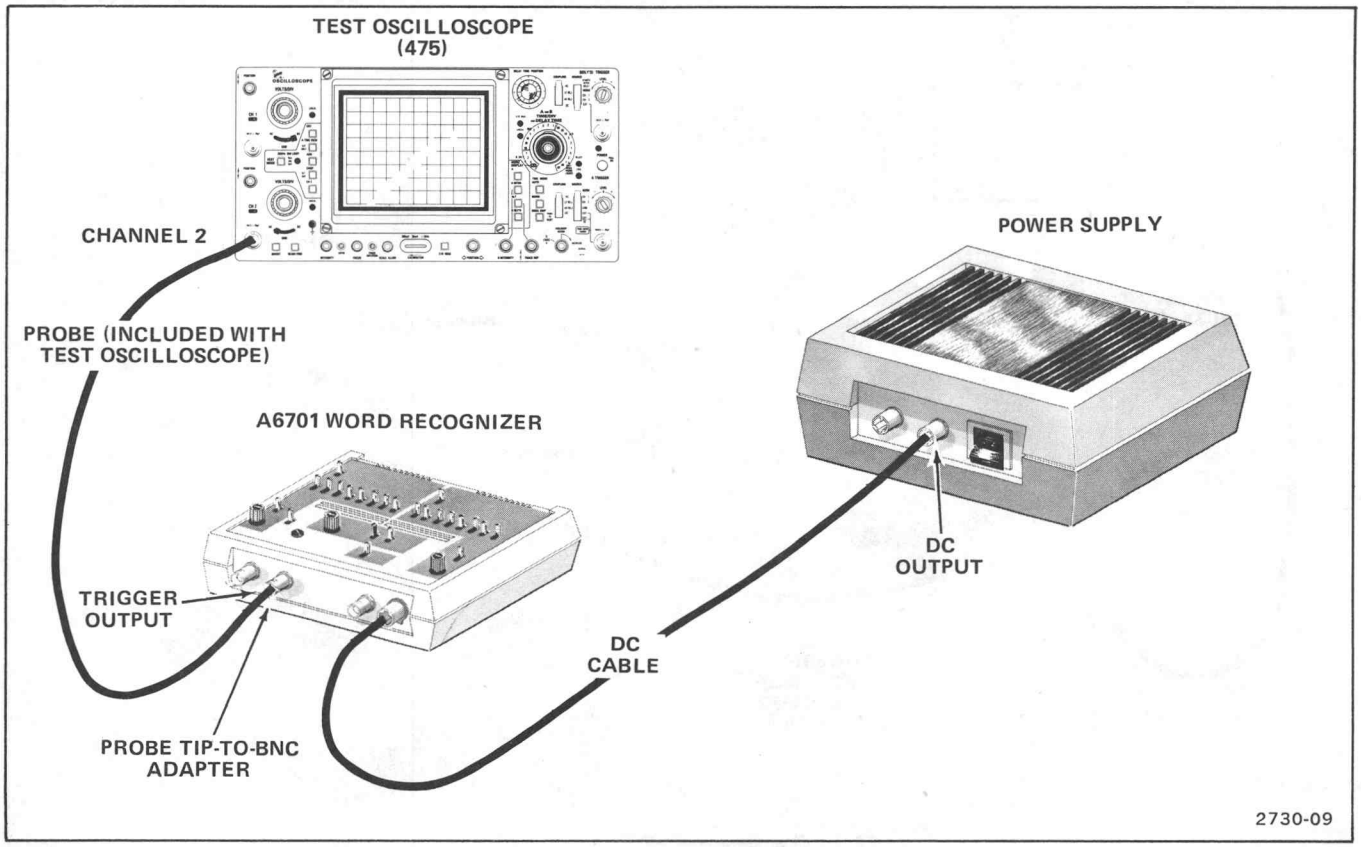

Figure 4-1. Trigger Indicator and Output Levels Check test setup.

2. Threshold Levels Check

This procedure checks threshold circuits by measuring voltage levels at both MONITOR jacks. For best accuracy, threshold voltage should be referenced to the circuit under test. When checking threshold voltage accuracies, the Trigger Output should be grounded through either a probe or a 50-ohm cable to a grounded oscilloscope, logic analyzer, or other test instrument.

a. Connect voltmeter Low test lead to voltmeter Ground and connect voltmeter High test lead to WR MONITOR jack for Channels 0-7 and Q1 (see Figure 4-2).

b. With voltmeter set at 2 dc Volts, verify that TTL threshold voltage level at the MONITOR jack is between +1.37 and +1.43 dc volts.

c. Remove the test lead from the MONITOR jack for Channels 0-7 and Q1 and connect it to the MONITOR jack for Channels 8-15 and Q2.

d. Verify that TTL threshold voltage level is between +1.37 and +1.43 dc volts.

e. Set voltmeter to 20 dc Volts and both WR THRESHOLD VOLTAGE switches to VAR.

f. Verify that VAR control for Channels 8-15 and Q2 varies the threshold voltage level from less than −12 to more than +12 dc volts. Adjust the VAR control to attain a level of −1.3 volts ±20 millivolts.

g. Remove the voltmeter test lead from the MONITOR jack for Channels 8-15 and Q2 and connect it to the MONITOR jack for Channels 0-7 and Q1.

h. Verify that VAR control for Channels 0-7 and Q1 varies the threshold voltage level from less than −12 to more than +12 dc volts. Adjust the VAR control to attain a level of −1.3 volts ±20 millivolts.

i. Disconnect the voltmeter High test lead from the WR MONITOR jack.

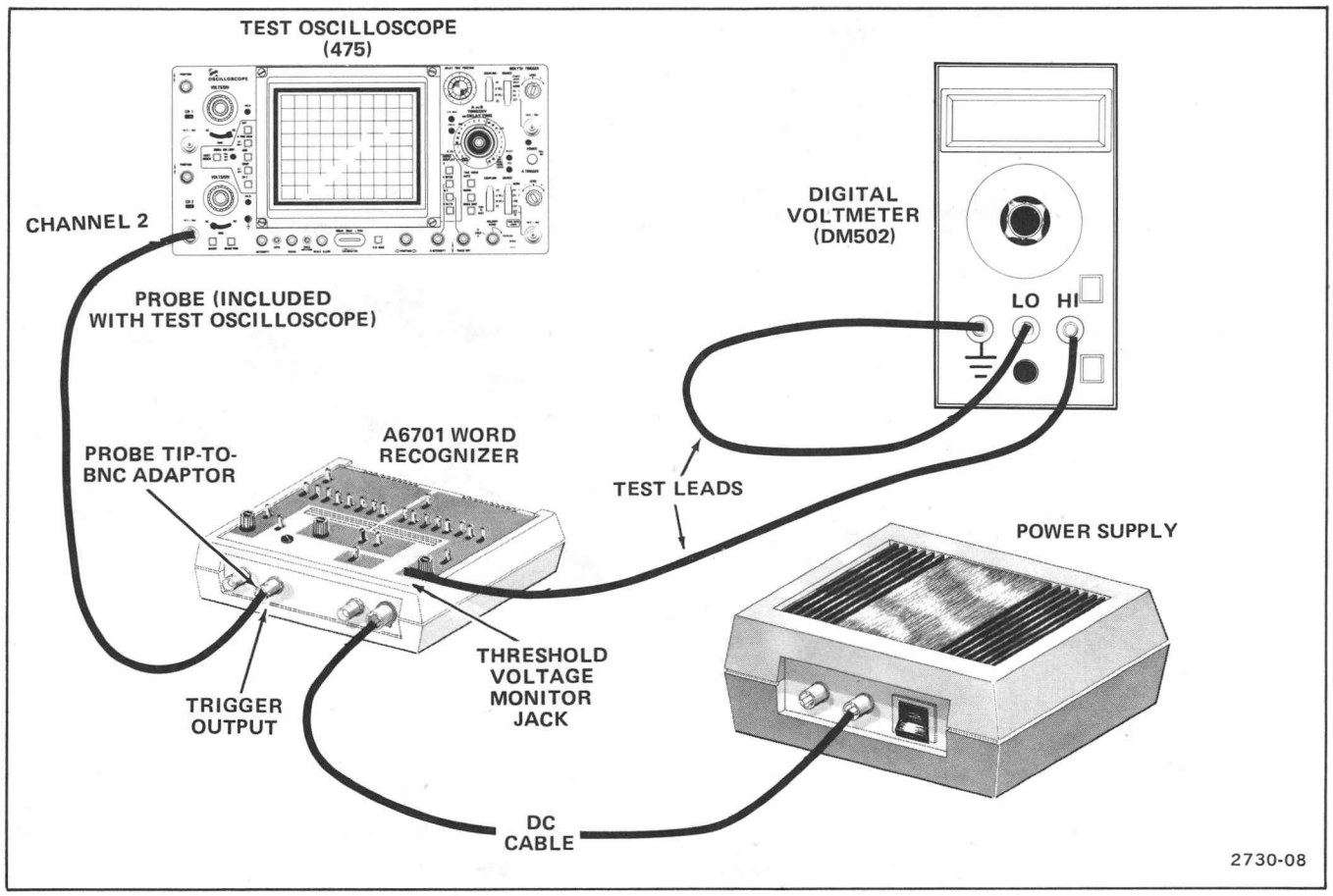

Figure 4-2. Threshold Levels Check test setup.

3. Minimum Input Swing, Pulse Width, and Propagation Delay Check

This procedure checks the following instrument parameters: minimum input swing and pulse width for a 5-nanosecond output pulse, trigger output levels, propagation delay through the instrument, and input delay difference between channels.

a. Set test oscilloscope controls as follows:

Channel 1 Volts/Division	0.2 V
Channel 2 Volts/Division	0.5 V
Time/Division	0.01 μs
Vertical Mode	Channel 1
Trigger Source	Channel 1
Trigger Slope	Positive (+) slope

b. Connect a probe (included with oscilloscope) from Channel 1 input of the oscilloscope to the WR THRESHOLD VOLTAGE MONITOR jack for Channels 0-7 and Q1.

c. Center the trace on the crt using Channel 1 Vertical Position control.

NOTE

The trace may appear noisy due to other circuits in the vicinity generating excessive electromagnetic interference (emi). This noise is a common mode signal and does not affect threshold accuracy. You may want to temporarily limit the oscilloscope bandwidth to 20 MHz to center the trace. Ensure that you return the oscilloscope to full bandwidth before proceeding to the next step.

d. Remove the probe from the MONITOR jack and connect it to the pulse generator Output through the probe tip-to-bnc adapter and bnc T adapter (see Figure 4-3).

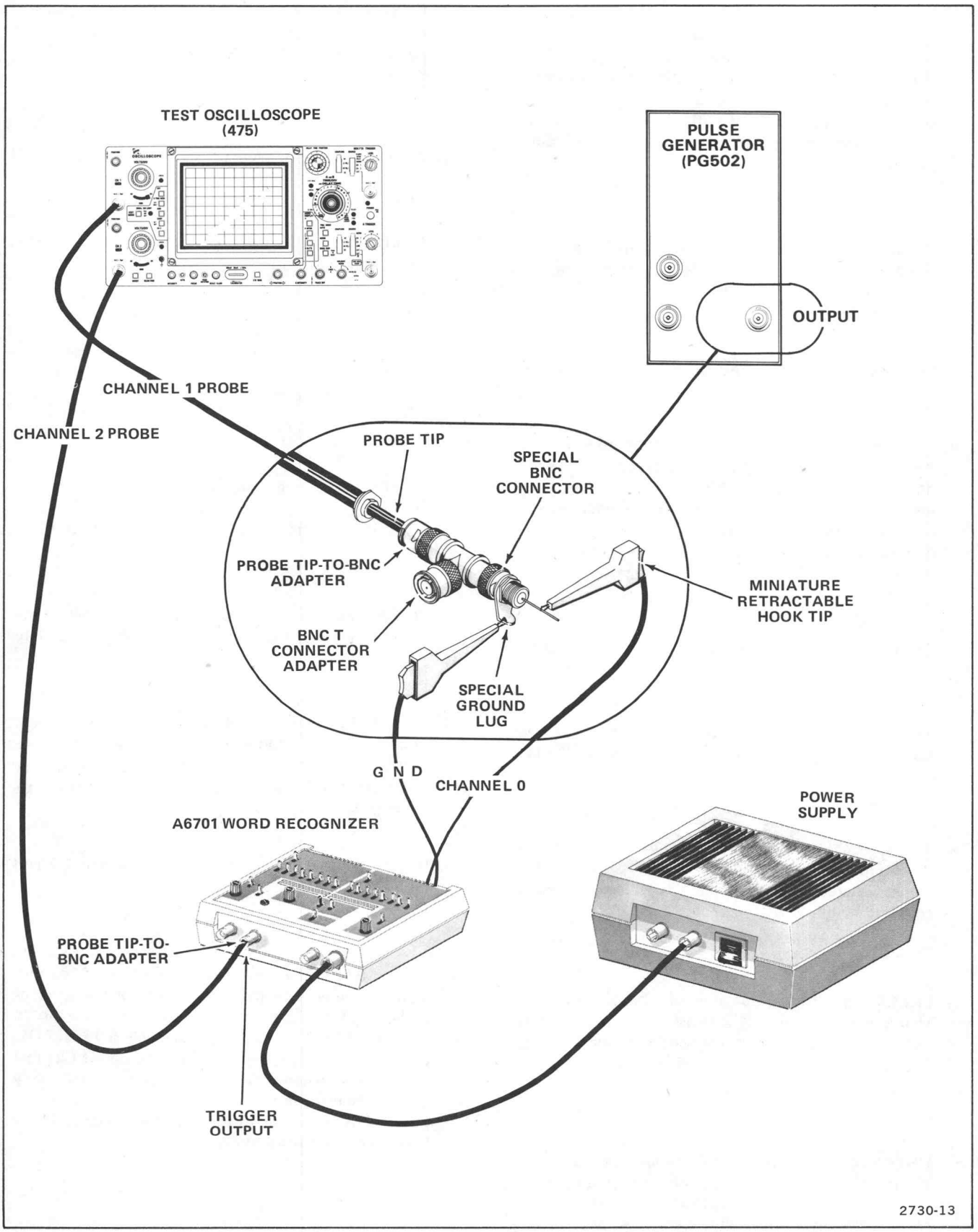

Figure 4-3. Minimum Input Swing, Pulse Width, and Propagation Delay Check test setup.

e. Set pulse generator frequency to 10 MHz and 5-nanosecond pulse duration with back termination. Set the Variable pulse duration control to its fully clockwise position. Using only the pulse generator voltage output controls, adjust the output for a peak-to-peak amplitude of 520 millivolts centered on the oscilloscope crt (1.3 divisions above and below centerline).

f. Adjust the Variable pulse duration control to obtain a 10-nanosecond pulse (1 division) measured at the centerline.

g. Set test oscilloscope Vertical Mode to Alternate.

h. Connect the special bnc connector with ground lug to the bnc T adapter. Connect a miniature retractable hook tip lead from the WR Channel 0 Input Connector to the special bnc connector. Connect another miniature retractable hook tip lead from the corresponding GND Input Connector to the ground lug (see Figure 4-3).

i. Set WR Channel 0 WORD SELECTOR switch to HI.

j. Using only the test oscilloscope Channel 2 Position control, center the WR output waveform on the crt.

k. Set test oscilloscope Channel 2 input coupling switch to Ground. Note and remember the location of the 0-volt reference line. Return oscilloscope input coupling switch to DC.

l. CHECK—that WR output waveform has a low voltage of less than 0.6 volts (1.2 divisions from the 0-volt reference line) and a high voltage of at least 2.2 volts (4.4 divisions from the 0-volt reference line).

m. CHECK—that width of WR trigger output pulse (Channel 2 waveform) at the 50% amplitude point is greater than 5 nanoseconds (½ division). If the waveform is centered vertically, read pulse width along center horizontal graticule line as shown in Figure 4-4A.

n. CHECK—that time from 50% point of leading edge of input pulse to 50% point of leading edge of output pulse is less than 20 nanoseconds (2 divisions). See Figure 4-4A.

o. Set WR Channel 0 WORD SELECTOR switch to LO.

p. CHECK—that WR trigger output waveform is inverted from input waveform (see Figure 4-4B).

q. CHECK—that width of the WR output pulse (Channel 2 waveform) at the 50% vertical point is greater than 5 nanoseconds (see Figure 4-4B).

r. CHECK—that time from 50% point of leading edge of input pulse to 50% point of leading edge of output pulse is less than 20 nanoseconds (see Figure 4-4B).

s. Record the time from step r. to the nearest nanosecond in the space provided in Table 4-2 for later reference.

t. Set WR Channel 0 WORD SELECTOR switch to X (don't care). Disconnect WR Channel 0 test lead from pulse generator output (at the special bnc connector) and connect Channel 1 test lead to the pulse generator output.

u. Repeat steps i. through t. for WR Channels 1-7 and Q1.

v. Disconnect probe tip leading from test oscilloscope Channel 1 to the probe tip-to-bnc adapter at pulse generator output and reconnect probe tip to the WR MONITOR jack for Channels 8-15 and Q2. Center the trace on oscilloscope crt using the Channel 1 Vertical Position control. Refer to NOTE following step c. Then move the Channel 1 probe tip from the MONITOR jack back to the probe tip-to-bnc adapter at pulse generator output.

w. Repeat steps h. through t. for WR Channels 8-15 and Q2.

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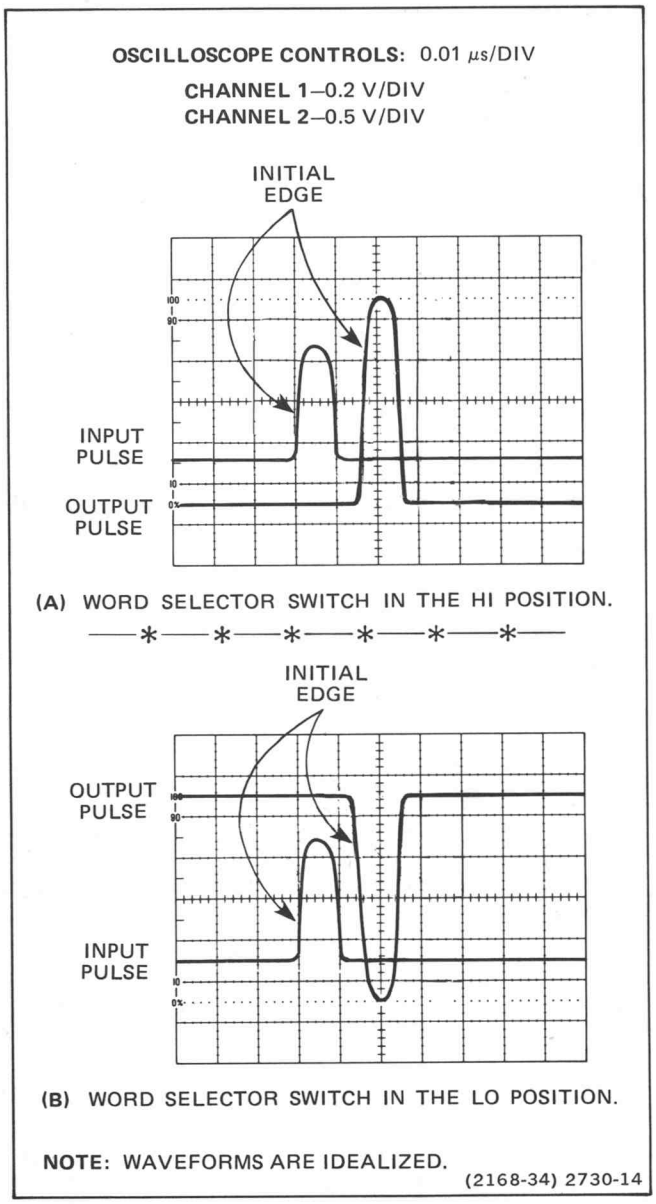

Figure 4-4. Test oscilloscope displays for Minimum Input Swing, Pulse Width, and Propagation Delay Check.

x. Review the propagation delay numbers recorded in Table 4-2 for each data and qualifier input channel. Find the minimum and maximum propagation delays.

y. CHECK—that the difference between the minimum and maximum propagation delays is less than or equal to 7 nanoseconds.

Table 4-2

Propagation Delay

Input Channel	Propagation Delay (ns)
0	
1	
2	
3	
4	
5	
6	
7	
Q1	
8	
9	
10	
11	
12	
13	
14	
15	
Q2	

4. Minimum Setup and Hold and Clock Period Check

This procedure checks the setup and hold times between the data and the clock in SYNC mode.

a. Return all WORD SELECTOR, Q1, and Q2 switches to X (don't care).

b. Set pulse generator controls for 100 MHz and internal square-wave output. Leave amplitude at 520 millivolts.

c. Adjust pulse generator variable period control to obtain a 25-MHz square wave (40-nanosecond period, 4 divisions/period) on Channel 1 of the test oscilloscope crt.

d. At the WR set the SYNC ASYNC switch to SYNC-QUALIFIED CLOCK.

e. Connect the WR Channel 0 Input lead and CLK (clock) Input lead to pulse generator output. Connect the Channel 0-7 GND lead to the ground lug of the special bnc connector (see Figure 4-5).

f. Set WORD SELECTOR switch for Channel 0 to HI.

g. CHECK—that WR trigger output signal displayed on test oscilloscope Channel 2 is low (0.6 volt or less).

h. Set CLOCK POLARITY switch to the falling edge position.

i. CHECK—that WR trigger output trace on test oscilloscope is 25-MHz signal.

j. Set the SYNC ASYNC switch to SYNC-LEVEL.

k. CHECK—that WR trigger output signal displayed on test oscilloscope Channel 2 is high (2.2 volts or more).

l. Slowly increase pulse generator output frequency, using its variable period control, until the period of the square-wave input to Channel 1 of the oscilloscope is between 30 and 32 nanoseconds (pulse of 16 nanoseconds or less duration, 1.6 divisions).

NOTE

For steps l. through o. check that minimum setup time is less than 16 nanoseconds (1.6 divisions).

m. CHECK—that WR trigger output signal remains high (2.2 volts or more).

n. Set SYNC ASYNC switch to SYNC-QUALIFIED CLOCK.

o. CHECK—that WR trigger output signal trace on test oscilloscope Channel 2 has a period equal to that of the input signal on oscilloscope Channel 1 trace.

p. Repeat steps e. through o. for each input channel of the A6701 WR.

5. Glitch Filter Check

a. Return all WORD SELECTOR, Q1, and Q2 switches to X (don't care).

b. Set SYNC ASYNC switch to ASYNC.

c. Adjust the pulse generator for a 1 MHz square-wave output. Leave amplitude at 520 millivolts.

d. Disconnect WR CLK (clock) Input lead.

e. Connect WR Channel 0 Input lead to the special bnc connector at the pulse generator output. Leave WR GND lead attached to the special bnc connector ground lug (see Figure 4-6).

f. Set WORD SELECTOR Channel 0 switch to HI.

g. Set the test oscilloscope Vertical Mode switch to Channel 2 only.

h. Horizontally center the leading edge of the waveform on the crt, using the oscilloscope Horizontal Position control.

i. Slightly rotate the GLITCH FILTER switch clockwise to a minimum setting (less than 5 nanoseconds).

j. CHECK—that leading edge of the oscilloscope Channel 2 waveform is delayed by 5 nanoseconds or less (2½ minor divisions on the crt).

k. Set test oscilloscope Time/Division switch to 0.1 μs and again horizontally center the leading edge of the waveform.

l. Rotate the GLITCH FILTER control fully clockwise to >250 ns.

m. CHECK—that leading edge of the oscilloscope Channel 2 waveform is delayed by 250 nanoseconds (2.5 divisions) or more.

This ends the Performance Check. If all CHECKS were not as specified, perform the appropriate Adjustment Procedures which follow.

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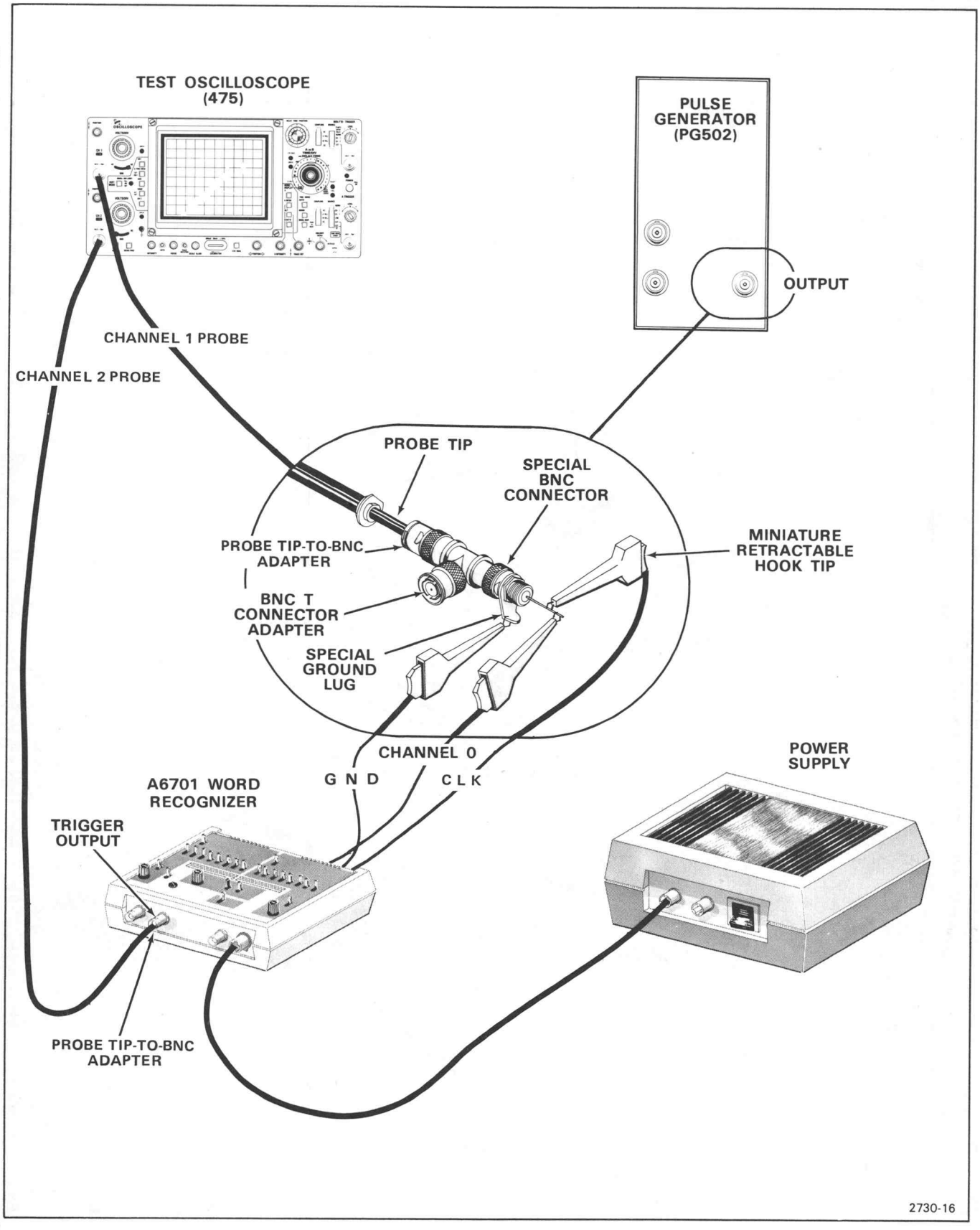

Figure 4-5. Minimum Setup and Hold and Clock Period Check test setup.

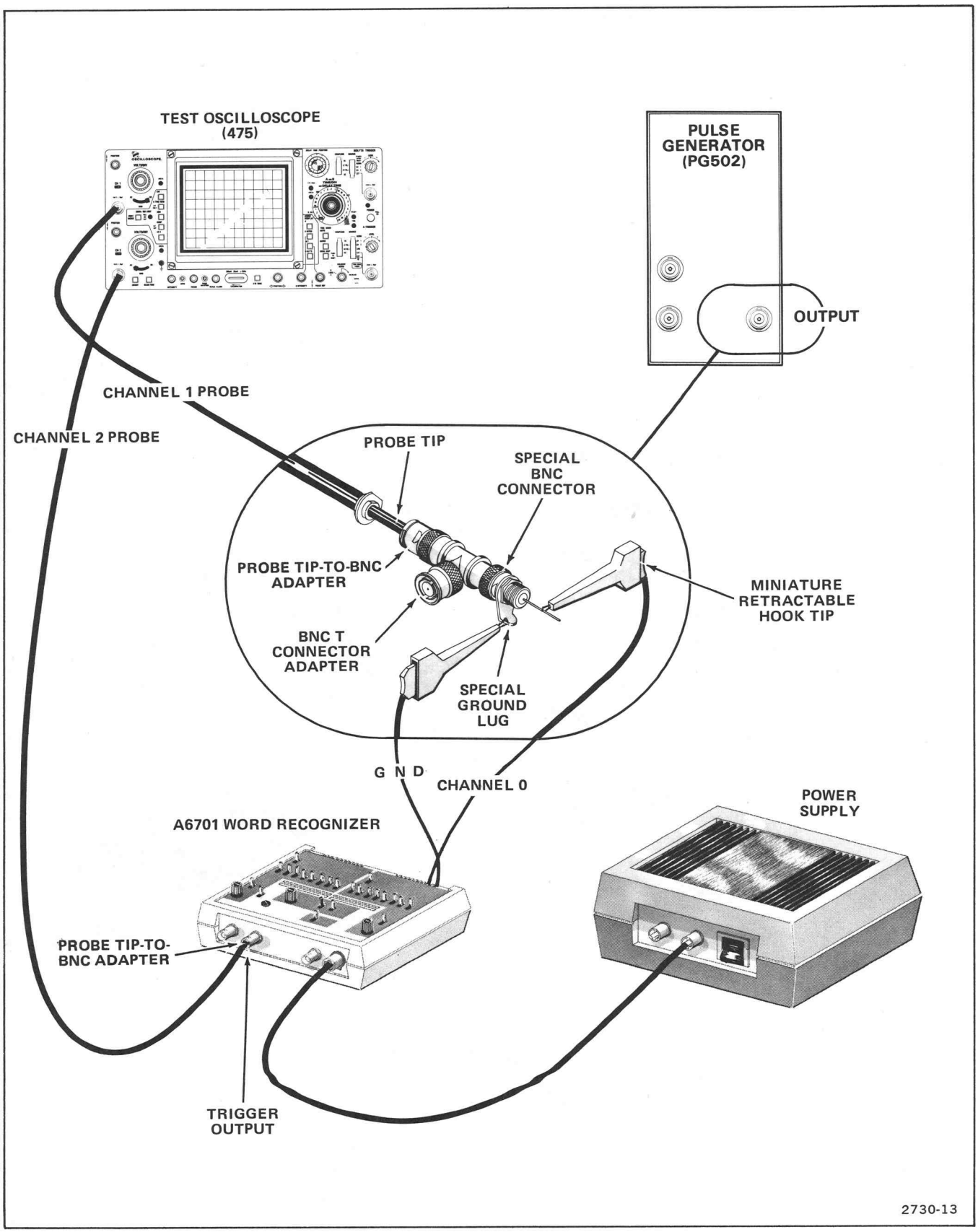

Figure 4-6. Glitch Filter Check test setup.

ADJUSTMENT PROCEDURE

INTRODUCTION

Adjustment is generally required after a repair has been made to the instrument or whenever completion of the Performance Check procedure reveals a deficiency. It may also be required after long time intervals in which normal aging of components can affect instrument accuracy. Before making any adjustments, carefully read this entire procedure.

The Adjustment Procedure permits restoration of the A6701 WR unit and the Power Supply unit to the original performance specification. Do not make any adjustment unless it is essential to satisfy a performance parameter.

Adjustments to the A6701 WR system must be performed at an ambient temperature between +20° and +30° C. Except when listed as Performance Requirements in the Specification, the limits and tolerances appearing in these adjustment procedures are not instrument specifications. All limits and tolerances given are for the A6701 WR system and do not include test equipment error or tolerances.

While performing the procedure, any fault discovered should be corrected before continuing. This procedure is not intended for use as a troubleshooting guide. For troubleshooting information refer to the Maintenance section.

TEST EQUIPMENT REQUIRED

Test equipment needed for performance of this procedure is listed in Table 4-1 at the beginning of this section.

PRELIMINARY

WARNING

Dangerous potentials exist at several points within the instrument units. To prevent electrical shock, do not touch exposed connections or components.

1. Remove instrument unit covers.
   a. Using a 1/16-inch Allen wrench to loosen the securing screws, remove the three control knobs from top of the WR unit.
   b. Set all WORD SELECTOR, Q1, and Q2 switches to X and set all other toggle switches to the same alignment (either all up or all down).
   c. With a Phillips screwdriver remove five screws from bottom of the WR unit and lift off top cover.
   d. Remove four screws from bottom of Power Supply unit and lift off its top cover.
2. Connect a dc power cable between the Power Supply POWER OUTPUT connector and the POWER INPUT CONNECTOR of one WR unit.

NOTE

Power Supply adjustment should be done with either one WR unit attached as a load or typical loads attached simultaneously.

3. Plug one 10-wide lead set into WR unit Input Connectors.

CAUTION

Appropriate line fuse selection and Line Voltage Selector card position must be verified before applying line voltage to the Power Supply.

4. Plug Power Supply line cord into line voltage socket and set POWER switch to ON.
5. Set Word Recognizer unit switches as follows:

WORD SELECTOR	All to X (don't care)
Q1, Q2	Both to X (don't care)
THRESHOLD VOLTAGE	Both to TTL
WORD $\overline{\text{WORD}}$	WORD
SYNC ASYNC	ASYNC
GLITCH FILTER	OFF
CLOCK POLARITY	⌐
TRIGGER INDICATOR STATUS	EACH

6. Allow system to warm up for at least 20 minutes.

POWER SUPPLY ADJUSTMENTS

NOTE

One A6701 WR unit provides a valid calibration load for the Power Supply. Do not adjust the Power Supply without a valid load. Refer to Specification (Section 1) for load information.

Power Supply voltages measured at the load may significantly differ from voltages measured at the Power Supply output due to voltage drops in the dc cable. Therefore, when making adjustments to the Power Supply, always measure voltages at the WR unit.

Always adjust the +15-Volt Supply and check the −15-Volt Supply before adjusting the −5-Volt Supply.

1. Adjust +15-Volt Supply

a. Set all WR WORD SELECTOR, Q1, and Q2 switches to HI.

b. Connect High lead of voltmeter to the 15.8-kilohm resistor (R1607) in the WR (see Figure 4-7, Point A).

c. Connect Low lead of voltmeter to ground at a bnc or at the outside of the connector shown in Figure 4-7, Point B.

d. Set voltmeter to 20 dc Volts.

e. ADJUST—R3483 in Power Supply until voltmeter reads +15 volts ±0.02 volts (see Figure 4-7).

f. Remove voltmeter High lead from R1607 and connect it to 510-ohm resistor R1601 (see Figure 4-7, Point D).

g. CHECK—that voltmeter reads −15 volts ±2% of the absolute value of the voltage adjusted in step e.

2. Adjust −5-Volt Supply

a. Retaining equipment setup from the preceding adjustment procedure, disconnect the voltmeter High lead from pin 4 of U1161 and connect it to pin 8 on any 16-pin DIP (see Figure 4-7, Point C).

b. ADJUST—R3704 in Power Supply until voltmeter reads −5.05 volts ±0.02 volts.

3. Check +5-Volt and −2-Volt Supplies

NOTE

Check the +5-Volt and the −2-Volt Supplies before performing A6701 WR Unit Adjustments.

a. Remove voltmeter High Lead from R1601 and connect it to 100-ohm resistor R1729 (see Figure 4-7, Point E).

b. CHECK—that voltmeter reads +5.0 volts ±0.25 volts.

c. Remove voltmeter High lead from R1629 and connect it to 100-ohm resistor R1583 (see Figure 4-7, Point F).

d. CHECK—that voltmeter reads −2.0 volts ±0.15 volts.

e. Remove voltmeter High and Low leads from the WR.

A6701 WR UNIT ADJUSTMENTS

1. Recheck Threshold Voltage Levels

If any CHECK requirement is not met while performing this procedure, refer to the Maintenance section of this manual and effect repairs before proceeding further.

a. Connect voltmeter Low lead to voltmeter Ground.

NOTE

For best accuracy, threshold voltage should be referenced to the circuit under test. When checking threshold voltage accuracies, the Trigger Output should be grounded through either a probe or a 50-ohm cable to a grounded oscilloscope, logic analyzer, or other test instrument.

b. Connect High lead of the voltmeter to the THRESHOLD VOLTAGE MONITOR jack for WR Channels 0-7 and Q1.

c. CHECK—that voltmeter reads +1.4 volts ±0.03 volts.

d. Set THRESHOLD VOLTAGE switch to VAR.

e. CHECK—that voltmeter reading varies between −12 and +12 volts while rotating VAR control.

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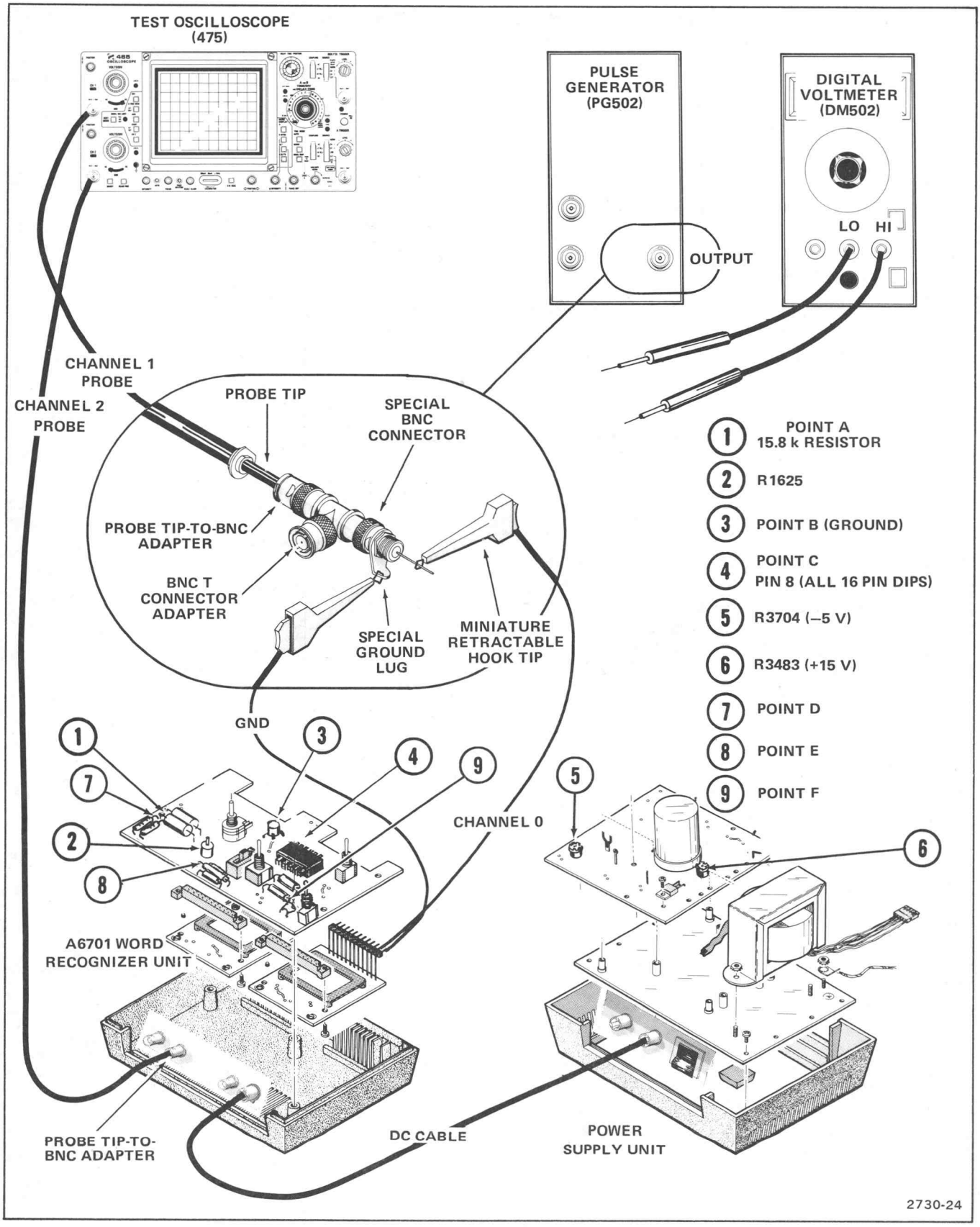

Figure 4-7. System adjustments setup and test points.

f. Remove the voltmeter High lead from the MONITOR jack for Channels 0-7 and Q1 and connect it to the MONITOR jack for Channels 8-15 and Q2.

g. Repeat steps c. through e.

h. Remove voltmeter leads from the WR and set both THRESHOLD VOLTAGE switches to TTL.

2. Adjust Glitch Filter

a. Connect WR Channel 0 Input to special bnc connctor at the output of pulse generator. Connect WR GND Input to ground lug on the special connector (see Figure 4-7).

b. Set the pulse generator for a pulse duration of 0.5 μs at a frequency of 1 MHz. Set test oscilloscope Time/Division switch to 0.1 μs and Channel 1 Volts/Division switch to 0.5 V.

c. Connect Channel 1 of the oscilloscope (using 10X probe supplied with the instrument) to the probe tip-to-bnc adapter at the output of pulse generator (see Figure 4-7). Adjust pulse generator for a pulse amplitude output of about 0 volt to +3 V with a pulse duration of 300 nanoseconds or greater.

d. Connect Channel 2 of the oscilloscope (using 10X probe supplied with the instrument) to the TRIGGER OUTPUT bnc using a probe tip-to-bnc adapter (see Figure 4-7). Set oscilloscope Vertical Mode switch to Channel 2. Trigger the oscilloscope from the Channel 1 signal, but check only the Channel 2 trace.

e. Set WR Channel 0 WORD SELECTOR switch to HI and set the GLITCH FILTER control to OFF (fully counterclockwise).

f. Adjust the oscilloscope Horizontal Position control so that the rising edge (low-to-high transition) of the waveform intersects a left side vertical graticule line for reference.

g. Rotate GLITCH FILTER control fully clockwise to >250 ns.

h. ADJUST—R1625 (see Figure 4-7) until leading edge of waveform is between 260 and 280 nanoseconds from reference graticule line noted in preceding step f.

i. Disconnect test setup.

This ends the Adjustment Procedure.

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MAINTENANCE

INTRODUCTION

This section of the manual contains information for conducting preventive maintenance, troubleshooting, and corrective maintenance on your A6701 Word Recognizer system.

STATIC-SENSITIVE COMPONENTS

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. See Table 5-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1 kilovolt to 30 kilovolts are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-senstive assemblies or components should be performed only at a static-free work station by qualified service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only special antistatic suction-type or wick-type desoldering tools.

Table 5-1

Relative Susceptibility to Static Discharge Damage

Semiconductor Classes	Relative Susceptibility Levels[a]
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs. (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFET	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

[a] **Voltage equivalent for levels:**

1 = 100 to 500 V
2 = 200 to 500 V
3 = 250 V
4 = 500 V
5 = 400 to 600 V
6 = 600 to 800 V
7 = 400 to 1000 V (est)
8 = 900 V
9 = 1200 V

Voltage discharged from a 100-pF capacitor through a resistance of 100 ohms.

PREVENTIVE MAINTENANCE

Preventive maintenance consists primarily of cleaning the WR and Power Supply units regularly and inspecting them occasionally for broken or damaged parts. Regular maintenance will improve reliability of the units and will help prevent failures. A convenient time to perform preventive maintenance is just before performing an adjustment procedure. If you use the A6701 in a severe environment, perform preventive maintenance more often.

CLEANING

Clean your A6701 instrument units as often as operating conditions require. Accumulations of dirt and dust on components act as an insulating blanket, preventing efficient heat dissipation and causing component breakdown. Dust on circuit boards and wires can cause arcing and short circuits, resulting in damage to components or instrument failure.

CAUTION

Avoid the use of chemical cleaning agents containing benzene, toluene, zylene, acetone or similar solvents. These chemicals may damage the plastics used in these instrument units. Use recommended cleaning materials.

Exterior

Dust front panel controls with a small soft camel-hair brush. Dust the covers with a soft cloth. Dirt clinging to the surfaces of covers may be removed with a soft cloth dampened with a mild detergent and water solution. Do not use abrasive cleaners, since they may scratch covers and front panels.

Interior

Dust in the interior of an instrument unit should be removed before it builds up sufficiently to cause arcing and short circuiting during periods of high humidity. Dust is best removed from the interior with dry, low-pressure air (approximately 9 pounds per square inch). Dirt clinging to surfaces may be removed with a soft camel-hair brush or a soft cloth dampened with a mild detergent and water solution. Use a cotton-tipped applicator for cleaning in narrow spaces and on the circuit boards.

SYNC ASYNC Switch

The SYNC ASYNC switch (S1556) may require occasional cleaning to remove dirt collected on switch contacts and Main board contact pads. Cleaning may be accomplished as follows:

1. Using a 1/16-inch Allen wrench to loosen the securing screws, remove the three control knobs from top of the WR unit.

2. Set all WORD SELECTOR, Q1, and Q2 switches to X and set all other toggle switches to the same alignment (either all up or all down).

3. Set SYNC ASYNC switch to SYNC LEVEL.

4. With a Phillips screwdriver remove five screws from bottom of the WR unit and lift off top cover.

5. Lift off the SYNC ASYNC switch extension lever.

NOTE

When disassembling the switch, exercise care to prevent accidental loss of any of the gold switch contacts on the switch body.

6. Remove switch body from its holding clips by pressing one clip away from the switch body with a small screwdriver (see Figure 5-1) and lifting it out.

7. Use a cotton-tipped applicator moistened with "No Noise" to clean and lubricate the switch contacts on both the board and the switch body.

8. Replace switch body and top cover of WR unit by performing reverse of this procedure.

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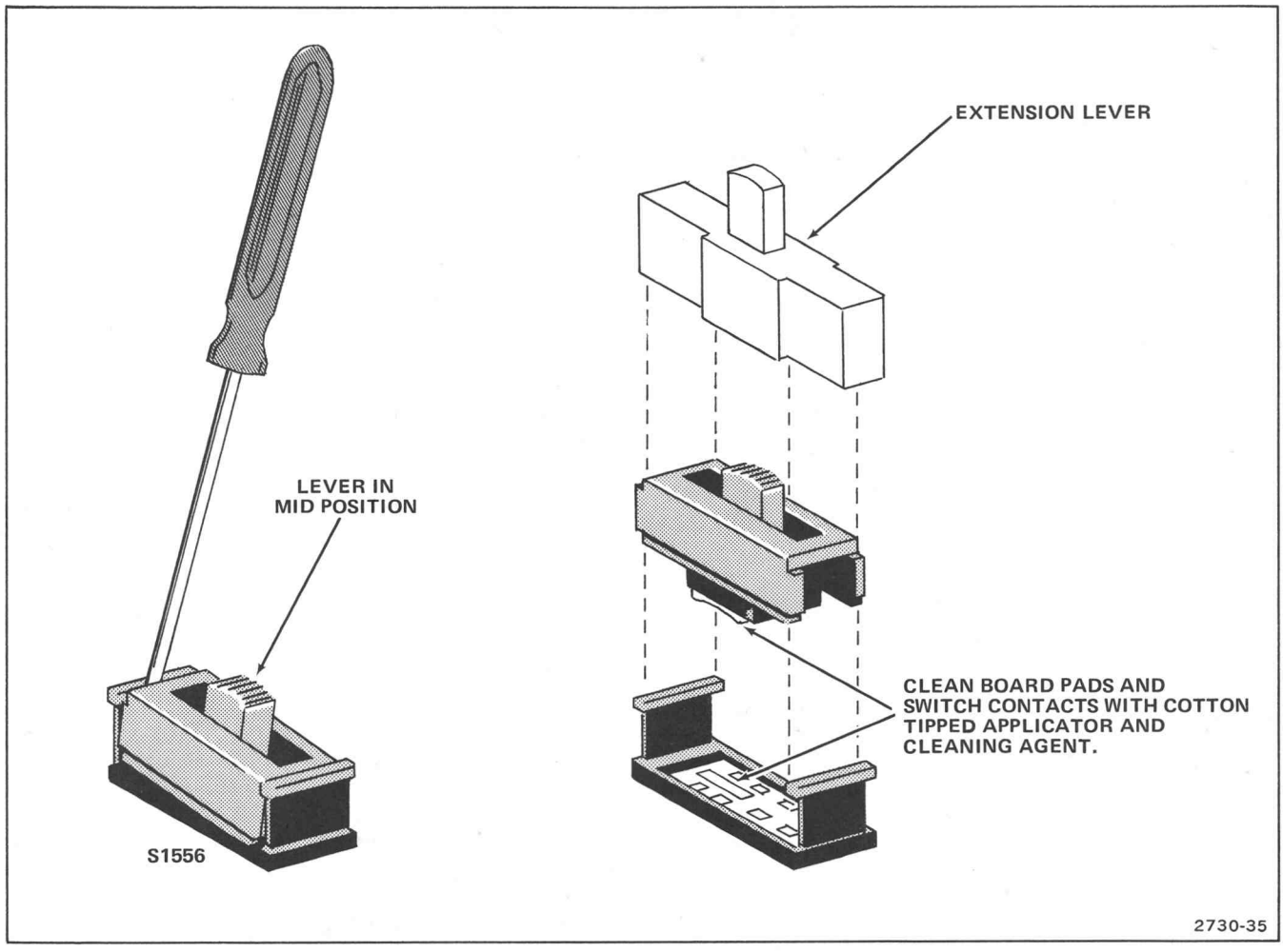

Figure 5-1. SYNC ASYNC switch cleaning.

VISUAL INSPECTION

Inspect the interior of each WR unit occasionally for broken connections, improperly seated semiconductors, damaged or improperly installed circuit boards, heat-damaged components, and similar indications. If heat-damaged components are found, determine the cause of excessive heat and take measures to prevent recurrence of such damage.

SEMICONDUCTOR CHECKS

Periodic checks of the semiconductor devices in the instrument units are not recommended. The best check of semiconductor performance is actual operation in the instrument units.

LUBRICATION

Most of the potentiometers used in the A6701 are permanently sealed. The toggle switches are installed with proper lubrication where necessary. Therefore, periodic lubrication is not recommended, and only rarely should lubrication be necessary.

ADJUSTMENT AFTER REPAIR

Conduct the Performance Check after any electrical component has been replaced. If adjustment is found to be necessary, perform the appropriate Adjustment Procedure. The Performance Check and Adjustment Procedure are contained in Section 4, Calibration.

TROUBLESHOOTING

Preventive maintenance performed on a regular basis should reveal most potential problems before an instrument unit malfunctions. However, should troubleshooting be required, the following information is provided to facilitate location of a fault. In addition, the technical material presented in the Theory of Operation and Diagrams sections of this manual may be helpful while troubleshooting.

RECOMMENDED TROUBLESHOOTING EQUIPMENT

The following equipment or the equivalent, may be useful when troubleshooting the A6701 WR system.

Multimeter

Description: Voltmeter, input impedance of 10 megohms and a range from 0 to at least 50 volts dc; accuracy, within 0.1%. Ohmmeter, 0 to 20 megohms. Test probes should be insulated to prevent accidental shorting.

Purpose: Checking voltage and resistance.

Test Oscilloscope

Description: Frequency response, dc to 100 MHz; deflection factor, 5 millivolts to 5 volts per division. A 10X, 10 megohm voltage probe should be used to reduce circuit loading.

Purpose: Checking operating waveforms.

Variable Autotransformer

Description: Output variable from 0 to 140 volts, 2 amperes minimum rating. Must have a three-wire power cord, plug, and receptacle.

Purpose: Varying input line voltage when troubleshooting the Power Supply unit.

TROUBLESHOOTING AIDS

Troubleshooting Chart

Use the troubleshooting chart located in the Diagrams section of this manual to assist in locating problem areas.

Diagrams

Complete circuit diagrams are located on the foldout pages in the Diagrams section. The component number and electrical value of each component in each instrument unit are shown on the diagrams for that unit (see the first page of the Diagrams section for definitions of reference designators used to identify components). Each main circuit is assigned a series of component numbers to assist in identifiying circuit location. Important voltages and waveforms are also shown on the diagrams. A heavy line encloses the portion circuits that are mounted on a circuit board.

Color Codes and Markings

Resistors used in this instrument are either composition or precision metal-film resistors. They are color-coded with the EIA color code (some metal-film resistors may have the value printed on the body). Refer to Figure 5-2.

The capacitance value of common disc and some small electrolytic capacitors is marked on the side of the component body.

The cathode end of each glass-encased diode is indicated by a stripe, a series of stripes, or a dot.

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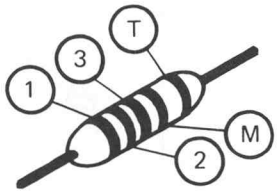
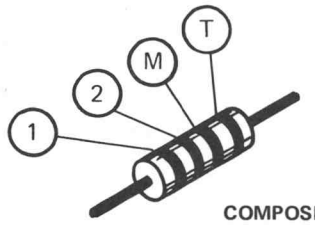
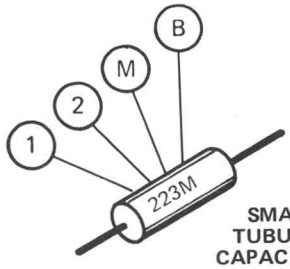


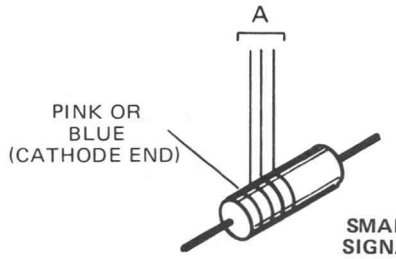
METAL-FILM RESISTORS



COMPOSITION RESISTORS



SMALL TUBULAR CAPACITORS



SMALL SIGNAL DIODES

(A) COLORS IDENTIFY SIGNIFICANT DIGITS IN TEKTRONIX PART NUMBER (E.G. BROWN, GRAY, GREEN STRIPES INDICATE PART NUMBER 152-0185-00)

(B) TOLERANCE; F=±1%, J=5%, K=10%, M=20%

(1) (2) and (3) 1ST, 2ND, AND 3RD SIGNIFICANT FIGS.

(T) AND/OR (TC) COLOR CODE MAY NOT BE PRESENT ON SOME CAPACITORS;

(M) MULTIPLIER (T) TOLERANCE;

(TC) TEMPERATURE COEFFICIENT.

COLOR	SIGNIFICANT FIGURES	RESISTORS (Ω)		CAPACITORS (pF)		
		MULTIPLIER	TOLERANCE	MULTIPLIER	TOLERANCE	
					Over 10 pF	Under 10 pF
BLACK	0	1	---	1	±20%	±2 pF
BROWN	1	10	±1%	10	±1%	±0.1 pF
RED	2	10^2 or 100	±2%	10^2 or 100	±2%	---
ORANGE	3	10^3 or 1 K	±3%	10^3 or 1000	±3%	---
YELLOW	4	10^4 or 10 K	±4%	10^4 or 10,000	+100% −9%	---
GREEN	5	10^5 or 100 K	±½%	10^5 or 100,000	±5%	±0.5 pF
BLUE	6	10^6 or 1 M	±¼%	10^6 or 1,000,000	---	---
VIOLET	7	---	±1/10%	---	---	---
GRAY	8	---	---	10^{-2} or 0.01	+80% −20%	±0.25 pF
WHITE	9	---	---	10^{-1} or 0.1	±10%	±1 pF
GOLD	–	10^{-1} or 0.1	±5%	---	---	---
SILVER	–	10^{-2} or 0.01	±10%	---	---	---
NONE	–	---	±20%	---	±10%	±1 pF

2168-22 (1982-31)

Figure 5-2. Color code for resistors and capacitors.

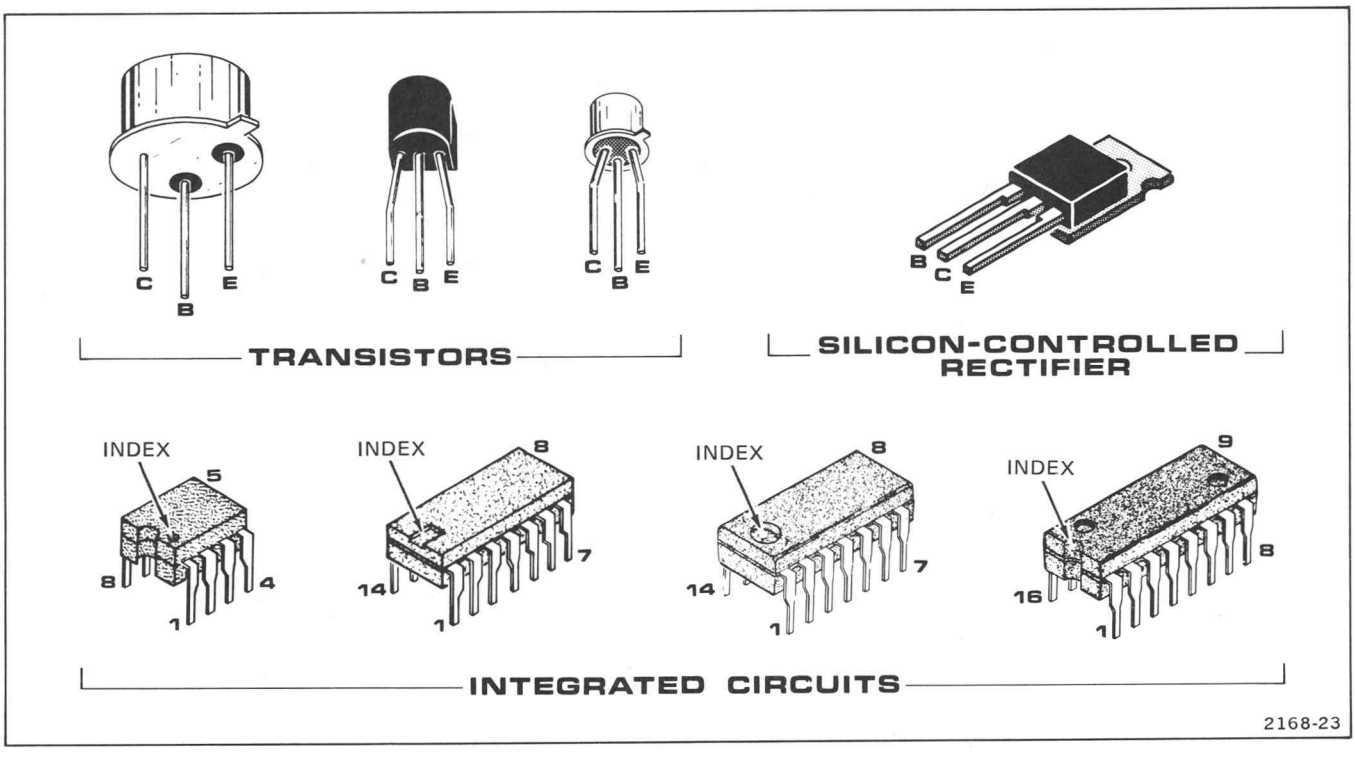


Figure 5-3. Lead configuration for semiconductor devices.

Semiconductor Lead Configuration

Figure 5-3 shows the lead configuration of semiconductor devices used in the A6701 WR system.

Multi-Connector Holders

The multi-connector holder is keyed with two triangles: one on the holder and one on the circuit board. Slot numbers are usually stamped on the holder. When a connection is made perpendicular to a circuit board surface, ensure that the triangle on the holder and the triangle on the circuit board are aligned pointing toward each other (see Figure 5-4).

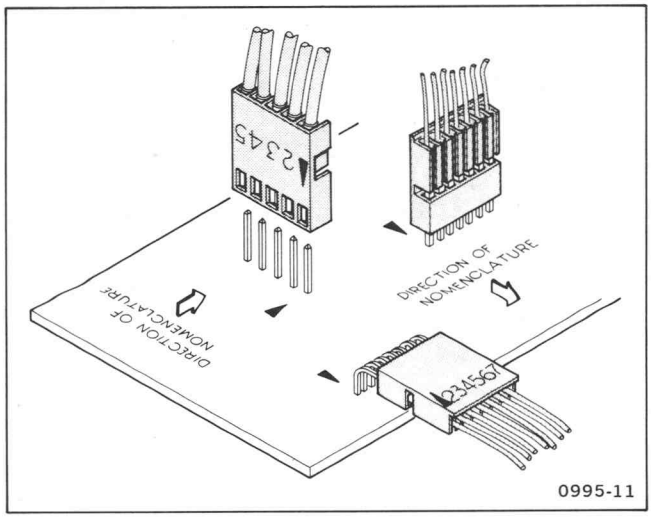


Figure 5-4. Multi-conductor holder orientation.

TROUBLESHOOTING TECHNIQUES

The following checklist is arranged to enable checking of basic functions before performing detailed troubleshooting. Starting at the beginning may help you to save time in locating a fault.

1. Check the control settings. Refer to the Operating Instructions section of the manual to determine correct control settings and indications.

2. Check associated equipment and connectors. Verify that the signal source is properly connected and that interconnecting cables are not defective. Also check the power cord plug and the power source for malfunctions.

3. Check the performance of WR units by going through the Performance Check in Section 4. If the unit does not meet a specification requirement, perform the Adjustment Procedure in Section 4.

4. Perform a visual inspection. This check may reveal broken connections, damaged components, semiconductors not firmly mounted, damaged circuit boards, or other clues.

5. Isolate the fault to a particular circuit. To isolate a fault, note its symptom; the symptom often identifies the circuit in which the trouble is located. For example, loss of –5 volts may indicate a failure of some kind in the –5-volt Power Supply circuit or interconnecting cables. When trouble occurs in more than one circuit, take voltage and waveform readings.

6. Incorrect operation of all circuits often indicates trouble in the Power Supply unit. Check first for correct voltage readings from individual supplies in the Power Supply. However, a defective component elsewhere in the A6701 system can appear as a Power Supply problem and may affect operation of the other circuits. Table 5-2 lists the Power Supply tolerances. Voltages must be read at the A6701 Word Recognizer unit. If a Power Supply voltage is within the listed tolerance, assume that the supply is operating correctly.

   The Power Supply unit may be disconnected from the WR unit to determine whether the problem is in the Power Supply or the WR. Keep in mind though that the no-load voltages may be out of tolerance from the Specification.

7. Check voltages and waveforms on circuit diagrams. Often a defective component can be located by checking for the correct voltages and waveforms in a circuit.

Table 5-2

Power Supply Tolerances

Supply Voltage	Accuracy (+20° to +30° C)	With Temperature Drift (0° to +50° C)	Ripple
+15	15.0 V ±0.10 V	+15.0 V ±0.1 V	Less than 20 mV p-p
–15	Track within 2% of the +15 V supply		
+5	5.0 V ±0.25 V	Included in overall specification	Less than 20 mV p-p
–5	–5.05 V ±0.20 V	Included in overall specification	Less than 100 mV p-p
–2	–2.0 V ±0.15 V	Included in overall specification	Less than 50 mV p-p

NOTE

Voltages and waveforms given on the diagrams are not absolute and may vary slightly between instrument units. To obtain operating conditions similar to those used to take these readings, see the voltage and waveform setup procedure in the Diagrams section. Individual deviations should be noted on schematics for future reference.

8. Check the individual components. Remember, the best check of semiconductors, thick-film resistors, and capacitors is actual operation in a circuit. If a component is suspect, substitute a new one. Before checking integrated circuits, read the part in the Theory of Operation section which explains that particular circuit.

WARNING

To prevent electrical shock or circuit damage, power must be turned off before any component or assembly is removed or replaced.

Check resistors for discoloration. Disconnect one end from the circuit and check with an ohmmeter. Check the Replaceable Electrical Parts list for the tolerance of resistors used in the A6701 WR system. Resistors normally need not be replaced unless the measured value varies widely from the specified value.

Check inductor continuity with an ohmmeter (it may be necessary to disconnect one end of the inductor). Shorted or partially-shorted inductors can also be found by checking the waveform response to high-frequency signals. Partial shorting often reduces high-frequency response (increases rolloff).

CAUTION

When checking capacitors with an ohmmeter, do not exceed the voltage rating of the capacitor. Some ohmmeters use a 30-volt source.

Check capacitors for leakage. A leaky or shorted capacitor can be detected by checking resistance with an ohmmeter (on the highest scale) after disconnecting one end of the capacitor from the circuit.

Ensure that you do not exceed the voltage rating of the capacitor (some ohmmeters use a 30-volt source). The resistance reading should be high after initial charge of the capacitor. An open capacitor can also be detected with a capacitance meter or by checking whether the capacitor passes ac signals.

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques and procedures required to replace components in the A6701 system units are described in this part of the manual. If it is necessary to ship your instrument to a Tektronix Service Center for repair or service, refer to the repackaging instructions at the end of this section.

OBTAINING REPLACEMENT PARTS

Standard Parts

Most electrical and mechanical parts can be obtained 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 the Replaceable Electrical Parts list for the proper value, rating, tolerance, and description.

NOTE

Physical size and shape of a component may affect instrument performance. Always use direct-replacement components, unless it is known that a substitute will not degrade instrument performance.

Special Parts

In addition to the standard electronic components, special parts used in the A6701 are manufactured or selected by Tektronix, Inc., to meet specific performance requirements or are manufactured for us in accordance with our specifications (see Cross Index-Manufacturers Code Number to Manufacturer in Replaceable Electrical Parts list). Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. Order all special parts directly from your local Tektronix Field Office or representative.

Ordering Parts

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

1. Instrument type (A6701 Word Recognizer or 012-0356-00 Power Supply).
2. Instrument serial number.
3. A description of the part (if electrical, include the circuit number).
4. Tektronix part number.

CIRCUIT BOARD REMOVAL AND REPLACEMENT

WARNING

To prevent electrical shock or damage to instrument units, always disconnect the Power Supply from the power source before removing circuit boards.

The following paragraphs describe removal and replacement of circuit boards in the A6701 Word Recognizer unit and the Power Supply unit. Refer to Figure 5-5 and 5-6 for circuit board locations.

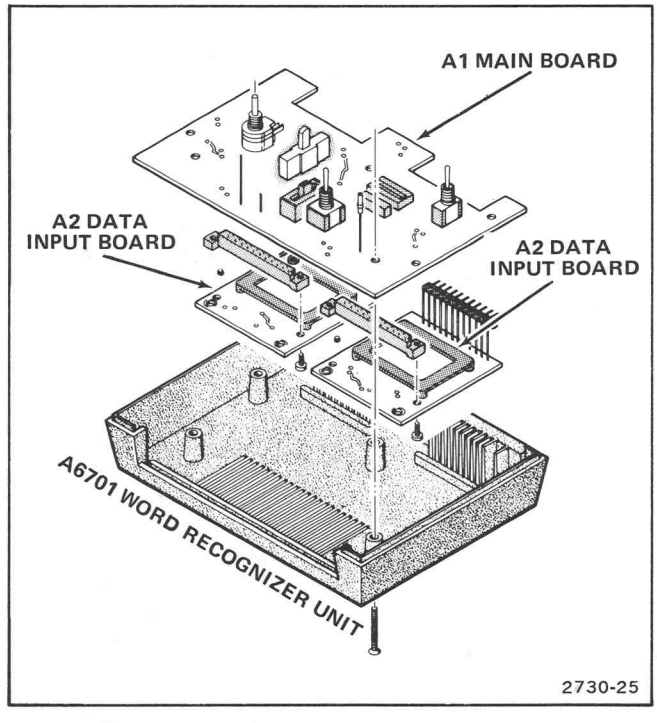


Figure 5-5. Word Recognizer unit circuit board locations.

A6701 WR Data Input Boards and Main Board

1. Using a 1/16-inch Allen wrench to loosen the securing screws, remove the three control knobs from top of the WR unit.
2. Set all WORD SELECTOR, Q1, and Q2 switches to X and set all other toggle switches to the same alignment (either all up or all down).
3. With a Phillips screwdriver remove five screws from bottom of the WR unit and lift off top cover.

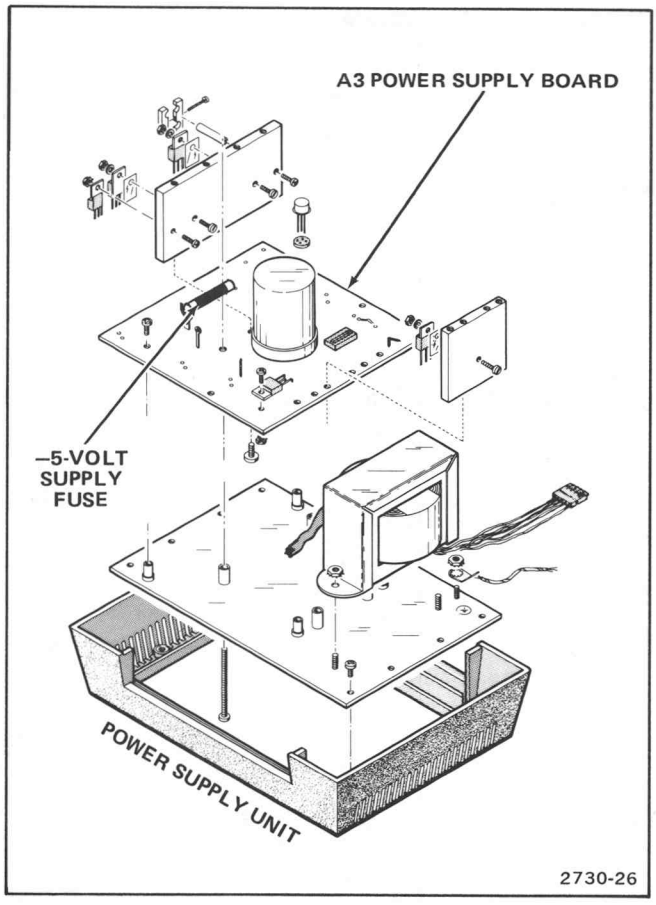


Figure 5-6. Power Supply unit circuit board location.

NOTE

Data Input boards must be handled gently and in a manner which results in minimum stress on the boards. The hybrid devices may be permanently damaged if dropped or put under stress.

4. The Main board (A1) with the two Data Input boards (A2) installed on it will lift easily from the bottom cover. Remove either Data Input board by first removing two retaining screws and pulling up firmly but gently from the Main board.

5. To replace Data Input boards, line up the pins and sockets and gently press in (see preceding Note). The two Data Input boards are identical and interchangeable. Replace the Main board by reversing the procedure.

Power Suppy Board

1. Remove four screws from bottom cover of Power Supply unit and lift off its top cover.

2. Remove four screws holding the Power Supply board (A3) to the bottom cover. Move side panels away from bottom cover.

3. Lift out the Power Supply board. Replace by reversing the procedure.

COMPONENT REMOVAL AND REPLACEMENT

WARNING

To prevent electrical shock or damage to instrument units, disconnect the Power Supply from power source before replacing any components.

In order to replace parts soldered to the circuit boards in your A6701 system, the appropriate board should first be removed from the instrument unit. Refer to the preceding Circuit Board Removal and Replacement procedures for detailed instructions. Refer to the following Soldering Techniques before attempting component replacement on multi-layer circuit boards.

Soldering Techniques

The A6701 system units use multi-layer etched circuit boards. Exercise care to prevent the layers from separating and to avoid breaking connections to the internal layer conductors.

For soldering, use ordinary 60/40 solder and a 15-watt pencil-type soldering iron. Using a soldering iron with a higher wattage rating on etched circuit boards can cause the etched circuit wiring to separate from the board base material.

Use the following techniques to replace a component on an etched circuit board:

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

2. When solder begins to melt, gently pull lead out. This operation should leave a clear hole in the board. If not, the hole can be cleared by reheating the solder and placing a sharp object (e.g., a toothpick) into the hole to clear it. A static-free vacuum-type desoldering tool or solder wick can be used also for this purpose.

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

4. Touch iron to the connection and apply a small amount of solder to make a firm solder joint. To protect heat-sensitive components, hold the lead between the component body and the solder joint with a pair of long-nosed pliers or other heat-sinking tool.

5. Clip any excess lead that protrudes through circuit board (if not clipped in step 3.).

6. Clean area around the solder connection with flux-remover solvent and air dry.

Semiconductor Replacement

Replacement semiconductors should be of the original types or direct replacements. Lead configurations of the semiconductors used in the instrument units are shown in the Troubleshooting portion of this section. Some plastic-case transistors have lead configurations which do not agree with those shown. If a replacement transistor is made by a manufacturer other than the original, check the manufacturer's basing diagram for correct basing. Some transistors are installed in miniature sockets. Power transistors and other semiconductors having heat radiators use silicone grease to increase heat transfer. Replace the silicone grease when replacing these parts.

WARNING

Handle silicone grease with care to avoid getting it in your eyes. Wash hands thoroughly after use.

Replacement of semiconductors may affect the adjustment of the A6701 system instrument units. After replacing semiconductors, especially if using parts other than those listed in the Replaceable Electrical Parts list, check the instrument units to ensure that performance has not been degraded. Refer to the Performance Check procedure in Section 4 of this manual.

Power Supply Switch Replacement

To remove and replace the Power Supply POWER switch, simply disconnect the four slide-on connectors at the back of the switch. Remove switch body by first pressing the top of the switch out from the rear of the front panel. Then pressing on its bottom, push the switch out. Replace the switch by reversing the removal procedure.

Power Supply Fuse Replacement

The Power Supply is fused at the line voltage input. The Operating Instructions (Section 2) contain procedures for replacing this fuse and for setting circuitry to desired line voltage operation.

An internal fuse is also located in the –5-volt supply. This fuse is a 1.5-ampere, 250-volt, 3AG, fast blow type and is installed as shown in Figure 5-6.

Word Recognizer Switch Replacement

NOTE

If possible, remove switches without destroying the static ground strap. If this is not possible, the static ground strap must be replaced.

Since panel switches are mounted on the Main board behind the front panel, their removal and replacement require removal of the Main board from the WR unit and removal of the Input Data boards from the Main board. After removing these boards, proceed as follows to replace any of the miniature toggle switches:

1. Unsolder all leads and pull switch from Main board. Note lead positions for later replacement on the new switch.

2. Insert replacement switch into correct holes on Main board. Ensure that the switches are aligned properly. If any of the toggle switches are out of alignment, the WR top cover will not fit into place.

3. Solder switch leads and trim if necessary.

Interconnecting Cable and Pin Connector Replacement

Most interconnecting cable assemblies (cables and connectors) are factory assembled. They must be replaced only as a complete unit.

Some cables have multi-connector holders. It is possible for pin connectors to become dislodged from the plastic holders. If this happens, the connector can be reinstalled as follows (see Figure 5-7):

1. Bend grooved portion of holder away from cable as shown.

2. Reinsert connector into its hole in the plug-in portion of the holder.

Some cables have wires soldered directly to board pads and to plug connections. It is important to note and remember wire positions when removing and replacing these cable assemblies.

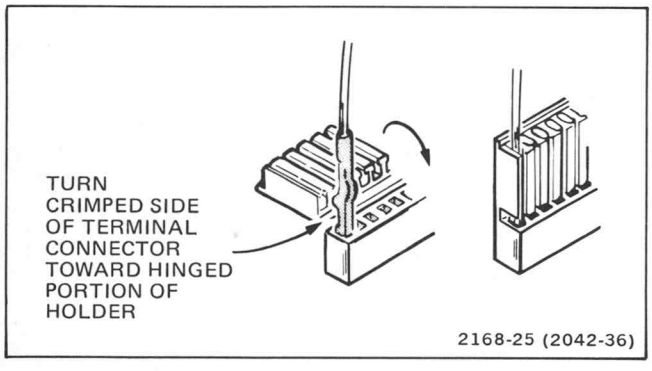


Figure 5-7. Pin connector replacement.

INSTRUMENT REPACKAGING

Should reshipment become necessary, reuse the original carton in which your instrument was shipped. If original packaging is unfit for use or is not available, repackage the instrument as follows:

1. Obtain a corrugated cardboard carton having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Use a carton having a test strength of at least 200 pounds.

2. Surround the instrument with protective polyethylene sheeting.

3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.

4. Seal carton with shipping tape or industrial stapler.

Required Reshipment Information

If the instrument is to be shipped to a Tektronix Service Center for service or repair, before packaging, attach a tag containing the followng information:

1. Owner's name and address, with the name of an individual at your firm that can be contacted.

2. Complete instrument serial number.

3. Description of the services required.

OPTIONS

The basic A6701 system, with 18 channels of word recognition, consists of one A6701 18 Bit Word Recognizer unit and a 015-0356-00 Power Supply unit. Optional purchases may be made as follows.

OPTION 1

One A6701 18 Bit Word Recognizer unit without the Power Supply unit.

POWER SUPPLY UNIT

The Power Supply may be purchased separately. Order 015-0356-00.

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.

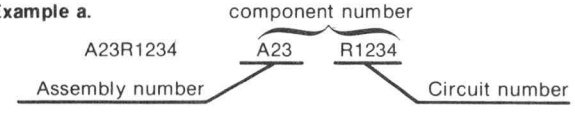
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

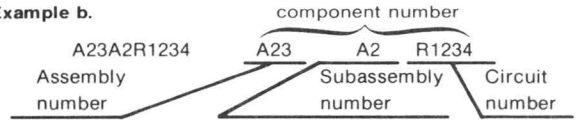
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

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
000FJ	MARCOM SWITCHES INC.	67 ALBANY STREET	CAZENDIA, N.Y. 13035
0000L	MATSUSHITA ELECTRIC	200 PARK AVENUE, 54TH FLOOR	NEW YORK, NY 10017
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
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
05245	CORCOM INC.	2635 N KILDARE AVENUE	CHICAGO, IL 60639
09161	PULSE ENGINEERING, INC.		SNA DIEGO, CA 92112
09353	C AND K COMPONENTS, INC.	103 MORSE STREET	WATERTOWN, MA 02172
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
32293	INTERSIL, INC.	10900 N. TANTAU AVE.	CUPERTINO, CA 95014
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
49956	RAYTHEON CO.	141 SPRING ST.	LEXINGTON, MA 02173
55680	NICHICON/AMERICA/CORP.	6435 N PROESEL AVENUE	CHICAGO, IL 60645
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-6026-00			CKT BOARD ASSY:MAIN BOARD	80009	670-6026-00
A2	670-6027-00			CKT BOARD ASSY:DATA INPUT MODULE	80009	670-6027-00
A3	670-6028-00			CKT BOARD ASSY:POWER SUPPLY	80009	670-6028-00
A1	670-6026-00			CKT BOARD ASSY:MAIN BOARD	80009	670-6026-00
A1C1044	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A1C1147	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10-T
A1C1052	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1057	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A1C1058	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1152	290-0776-00			CAP.,FXD,ELCTLT:22UF,+50-10%,10V	0000L	ECE-A10V22L
A1C1153	290-0776-00			CAP.,FXD,ELCTLT:22UF,+50-10%,10V	0000L	ECE-A10V22L
A1C1176	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1182	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1221	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1242	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1256	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1440	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1491	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1525	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1585	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1621	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
A1C1629	283-0331-00			CAP.,FXD,CER DI:43PF,2%,100V	72982	805-505A430G
A1C1641	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1657	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1681	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1C1721	283-0220-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N075X7R0103M
A1CR1629	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	80009	152-0141-02
A1CR1712	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	80009	152-0141-02
A1CR1721	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	80009	152-0141-02
A1DL1671	119-1088-00			DELAY LINE:4NS,100 OHM	09161	OBD
A1Q1512	151-0190-05			TRANSISTOR:SILICON,NPN	80009	151-0190-05
A1Q1515	151-0221-00			TRANSISTOR:SILICON,PNP	80009	151-0221-00
A1Q1626	151-0353-00			TRANSISTOR:SILICON,NPN	32293	ITS1251
A1Q1714	151-0221-00			TRANSISTOR:SILICON,PNP	80009	151-0221-00
A1Q1735	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A1Q1740	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A1R1008	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A1R1103	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
A1R1105	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
A1R1112	315-0155-00			RES.,FXD,CMPSN:1.5M OHM,5%,0.25W	01121	CB1555
A1R1179	315-0155-00			RES.,FXD,CMPSN:1.5M OHM,5%,0.25W	01121	CB1555
A1R1181	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
A1R1187	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A1R1233	307-0486-00			RES,NTWK,THK FI:100 OHM,20%,1.125W	91637	CSP10E01101J
A1R1267	307-0486-00			RES,NTWK,THK FI:100 OHM,20%,1.125W	91637	CSP10E01101J
A1R1294	321-0222-07			RES.,FXD,FILM:2K OHM,0.1%,0.125W	91637	MFF1816C20000B
A1R1298	321-0651-00			RES.,FXD,FILM:15.8K OHM,0.25%,0.125W	91637	MFF1816C15801C
A1R1354	307-0488-00			RES,NTWK,FXD,FI:100 OHM,20%,0.75W	32997	4406R001101
A1R1392	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
A1R1401	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A1R1415	307-0486-00			RES,NTWK,THK FI:100 OHM,20%,1.125W	91637	CSP10E01101J
A1R1430	307-0486-00			RES,NTWK,THK FI:100 OHM,20%,1.125W	91637	CSP10E01101J
A1R1465	307-0486-00			RES,NTWK,THK FI:100 OHM,20%,1.125W	91637	CSP10E01101J

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1R1484	307-0486-00			RES,NTWK,THK FI:100 OHM,20%,1.125W	91637	CSP10E01101J
A1R1507	321-0222-07			RES.,FXD,FILM:2K OHM,0.1%,0.125W	91637	MFF1816C20000B
A1R1517	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A1R1527	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
A1R1528	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A1S1536	311-2057-00			RES.,VAR,NONWW:PNL,25K OHM,20%,0.25W	01121	OBD
A1R1540	307-0487-00			RES,NTWK,FXD,FI:100 OHM,20%,0.50W	32997	4304R001101
A1R1582	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1583	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1593	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A1R1601	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A1R1602	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A1R1607	321-0651-00			RES.,FXD,FILM:15.8K OHM,0.25%,0.125W	91637	MFF1816C15801C
A1R1609	311-1845-00			RES.,VAR,NONWIR:PNL,5K OHM,0.50W	01121	W8355
A1R1616	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
A1R1625	311-0698-00			RES.,VAR,NONWIR:1M OHM,0.50W	73138	82-36-0
A1R1629	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1636	311-2057-00			RES.,VAR,NONWW:PNL,25K OHM,20%,0.25W	01121	OBD
A1R1636				* FURNISHED AS A UNIT WITH A1S1536		
A1R1645	307-0488-00			RES,NTWK,FXD,FI:100 OHM,20%,0.75W	32997	4406R001101
A1R1662	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1682	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1685	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A1R1690	311-1845-00			RES.,VAR,NONWIR:PNL,5K OHM,0.50W	01121	W8355
A1R1697	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A1R1698	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A1R1706	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A1R1722	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
A1R1727	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1728	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A1R1729	302-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.50W	01121	EB1011
A1R1735	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1742	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A1R1771	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1779	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A1R1785	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A1S1109	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1156	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1310	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1314	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1318	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1323	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1328	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1332	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1337	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1341	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1356	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1361	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1366	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1371	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1375	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1380	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1384	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1389	260-1809-00			SWITCH,TOGGLE:SPTT,0.4A,20V	09353	7103-SYCBE
A1S1509	260-1335-00			SWITCH,TOGGLE:SPDT,0.4A,20VDC	09353	7101SHCBE

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1S1536	311-2057-00			RES.,VAR,NONWW:PNL,25K OHM,20%,0.25W	01121	OBD
A1S1536				* FURNISHED AS A UNIT WITH A1R1636		
A1S1556	263-0049-00			SWITCH,SL,ASSY:B COUPLING	80009	263-0049-00
A1S1562	260-1947-00			SWITCH,TOGGLE:DPDT,0.4 VA,20V		
A1S1590	260-1335-00			SWITCH,TOGGLE:SPDT,0.4A,20VDC	09353	7101SHCBE
A1S1620	260-1335-00			SWITCH,TOGGLE:SPDT,0.4A,20VDC	09353	7101SHCBE
A1S1762	260-1947-00			SWITCH,TOGGLE:DPDT,0.4 VA,20V		
A1U1116	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
A1U1135	156-0229-00			MICROCIRCUIT,DI:DUAL 4-5 IN OR/NOR	04713	MC10109
A1U1167	156-0229-00			MICROCIRCUIT,DI:DUAL 4-5 IN OR/NOR	04713	MC10109
A1U1188	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
A1U1310	156-0369-01			MICROCIRCUIT,DI:TRIPLE LINE RECEIVER	80009	156-0369-01
A1U1324	156-0369-01			MICROCIRCUIT,DI:TRIPLE LINE RECEIVER	80009	156-0369-01
A1U1338	156-0369-01			MICROCIRCUIT,DI:TRIPLE LINE RECEIVER	80009	156-0369-01
A1U1349	156-0282-01			MICROCIRCUIT,DI:DUAL-INPUT OR-NOR	80009	156-0282-01
A1U1362	156-0369-01			MICROCIRCUIT,DI:TRIPLE LINE RECEIVER	80009	156-0369-01
A1U1388	156-0369-01			MICROCIRCUIT,DI:TRIPLE LINE RECEIVER	80009	156-0369-01
A1U1374	156-0369-01			MICROCIRCUIT,DI:TRIPLE LINE RECEIVER	80009	156-0369-01
A1U1546	156-0205-01			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	80009	156-0205-01
A1U1571	156-0369-01			MICROCIRCUIT,DI:TRIPLE LINE RECEIVER	80009	156-0369-01
A1U1671	156-0226-01			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	80009	156-0226-01
A1U1750	156-0880-00			MICROCIRCUIT,DI:DUAL D MASTER SLAVE FF	80009	156-0880-00
A2	670-6027-00			CKT BOARD ASSY:DATA INPUT MODULE	80009	670-6027-00
A2C2030	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
A1C2055	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
A2C2693	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
A2C2850	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	72982	8005H9AADW5R103K
A2CR2293	152-0075-00			SEMICOND DEVICE:GE,25V,40MA	80009	152-0075-00
A2R2811	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A2U2444	----- -----			* REPLACEABLE UNDER 670-6027-00 ONLY		
A2U2445	----- -----			* REPLACEABLE UNDER 670-6027-00 ONLY		
A3	670-6028-00			CKT BOARD ASSY:POWER SUPPLY	80009	670-6028-00
A3C3045	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
A3C3215	285-1153-00			CAP.,FXD,PLSTC:10UF,20%,100V	14752	230B1B106M
A3C3234	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A3C3304	290-0299-01			CAP.,FXD,ELCTLT:330UF,20%,10V	56289	OBD
A3C3365	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A3C3464	290-0577-00			CAP.,FXD,ELCTLT:2000UF,50V	56289	68D10504
A3C3579	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A3C3611	281-0786-00			CAP.,FXD,CER DI:150PF,10%,100V	72982	8035D2AADX5P151K
A3C3615	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A3C3667	290-0797-00			CAP.,FXD,ELCTLT:470UF,+50%-10%,50V	56289	D73403
A3C3751	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A3C3805	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A3C3825	290-0187-00			CAP.,FXD,ELCTLT:4.7UF,20%,35V	56289	150D475X0035B2
A3C3828	290-0187-00			CAP.,FXD,ELCTLT:4.7UF,20%,35V	56289	150D475X0035B2
A3C3834	290-0167-00			CAP.,FXD,ELCTLT:10UF,20%,15V	56289	150D106X0015B2
A3C3839	290-0167-00			CAP.,FXD,ELCTLT:10UF,20%,15V	56289	150D106X0015B2
A3C3850	290-0755-00			CAP.,FXD,ELCTLT:100UF,+50-10%,10V	56289	502D223

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A3C3944	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A3CR3054	152-0556-00			SEMICOND DEVICE:BRIDGE,50V,2.5A	04713	SDA10271K
A3CR3132	152-0636-00			SEMICOND DEVICE:RECT,SI,SCHOTTKY,35V,5A	80009	152-0636-00
A3CR3254	152-0488-00			SEMICOND DEVICE:SILICON,200V,1500MA	80009	152-0488-00
A3CR3625	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	80009	152-0066-00
A3CR3626	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	80009	152-0066-00
A3F3435	159-0016-00			FUSE,CARTRIDGE:3AG,1.5A,250V,FAST-BLOW	71400	AGC 1 1/2
A3L3227	108-0337-00			COIL,RF:25UH	80009	108-0337-00
A3L3515	108-0337-00			COIL,RF:25UH	80009	108-0337-00
A3Q3204	151-0183-00			TRANSISTOR:SILICON,NPN	80009	151-0183-00
A3Q3240	151-0621-01			TRANSISTOR:SILICON,NPN	80009	151-0621-01
A3Q3373	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
A3Q3493	151-0462-00			TRANSISTOR:SILICON,PNP	80009	151-0462-00
A3Q3520	151-0506-00			SCR:SILICON	03508	C106B2
A3Q3603	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
A3Q3607	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
A3Q3622	151-0188-00			TRANSISTOR:SILICON,PNP	80009	151-0188-00
A3Q3629	151-0188-00			TRANSISTOR:SILICON,PNP	80009	151-0188-00
A3Q3640	151-0464-00			TRANSISTOR:SILICON,NPN	80009	151-0464-00
A3Q3689	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
A3Q3889	151-0464-00			TRANSISTOR:SILICON,NPN	80009	151-0464-00
A3R3108	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
A3R3236	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
A3R3275	307-0110-00			RES.,FXD,CMPSN:3 OHM,5%,0.25W	01121	CB30G5
A3R3278	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A3R3483	311-1560-00			RES.,VAR,NONWIR:5K OHM,5%,0.50W	73138	91A R5K
A3R3508	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
A3R3581	315-0131-00			RES.,FXD,CMPSN:130 OHM,5%,0.25W	01121	CB1315
A3R3584	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	91637	MFF1816G71501F
A3R3588	321-0680-00			RES.,FXD,FILM:35.3K OHM,0.5%,0.125W	91637	MFF1816D35301D
A3R3525	315-0300-00			RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
A3R3606	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
A3R3704	311-1562-00			RES.,VAR,NONWIR:2K OHM,20%,0.50W	73138	91A R2K
A3R3708	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
A3R3711	321-0112-00			RES.,FXD,FILM:143 OHM,1%,0.125W	91637	MFF1816G143R0F
A3R3712	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A3R3802	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A3R3807	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
A3R3880	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A3R3902	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A3T3012	120-1086-00			TRANSFORMER,RF:SWITCHING REGULATOR	80009	120-1086-00
A3U3383	156-0496-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	49956	RC4194DC
A3U3740	156-1263-00			MICROCIRCUIT,LI:78MOS,TO-202 W/TAB	01295	A78M05CKF
A3VR3532	152-0280-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	80009	152-0280-00
DS1613	150-1001-03			DIO:RED,660BM,50MA,MAX	80009	150-1001-03
DS1613				* ASSEMBLY ONLY		
DS1613	150-1001-00			LT EMITTING DIO:RED,660NM,100MA MAX	50522	MV5024
DS1613				* LT EMITTING DIODE ONLY		
J3253	119-0802-00			SELECTOR,LINE V:100,200,220,240V,W/FUHLR	05245	F2112
S3254	260-1961-00			SWITCH,ROCKER:DPST,6(4)A,250V	000FJ	1802-1121
T3254	120-1226-00			XFMR,PWR,STPDN:	80009	120-1226-00

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

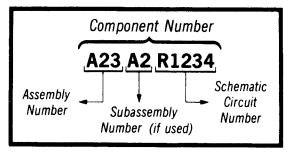
Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

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).

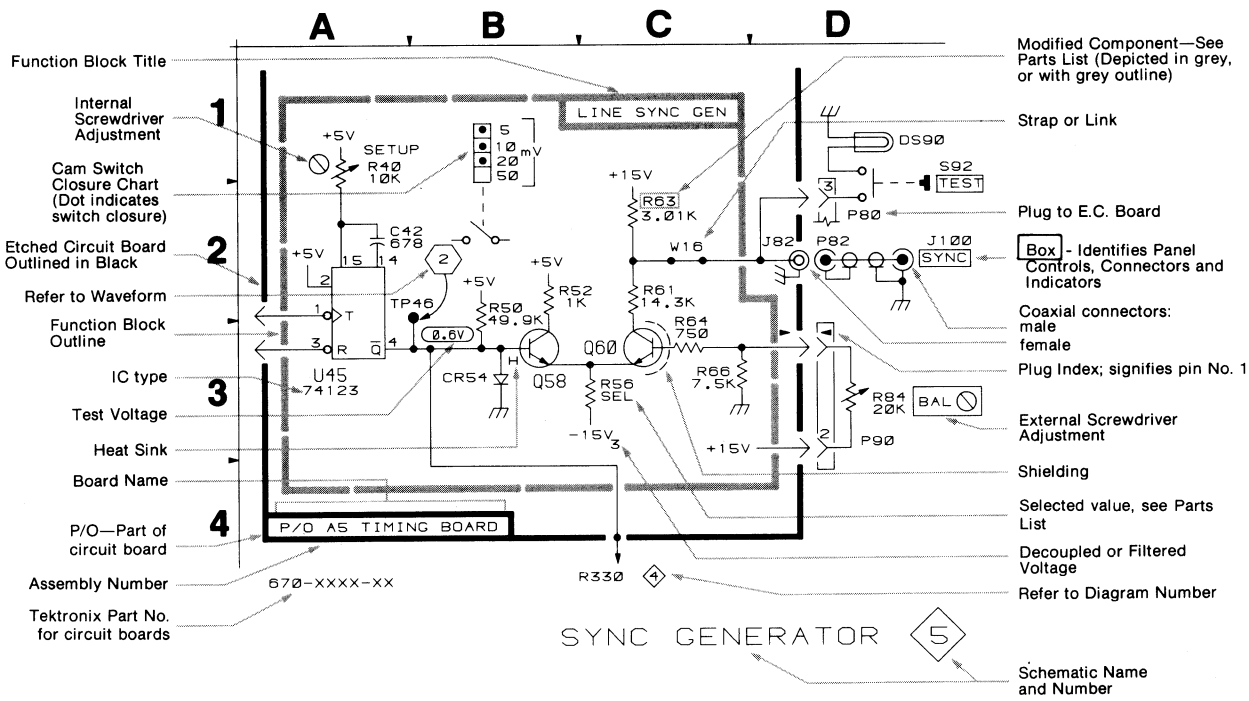
COMPONENT NUMBER EXAMPLE



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

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.

The following special symbols may appear on the diagrams:



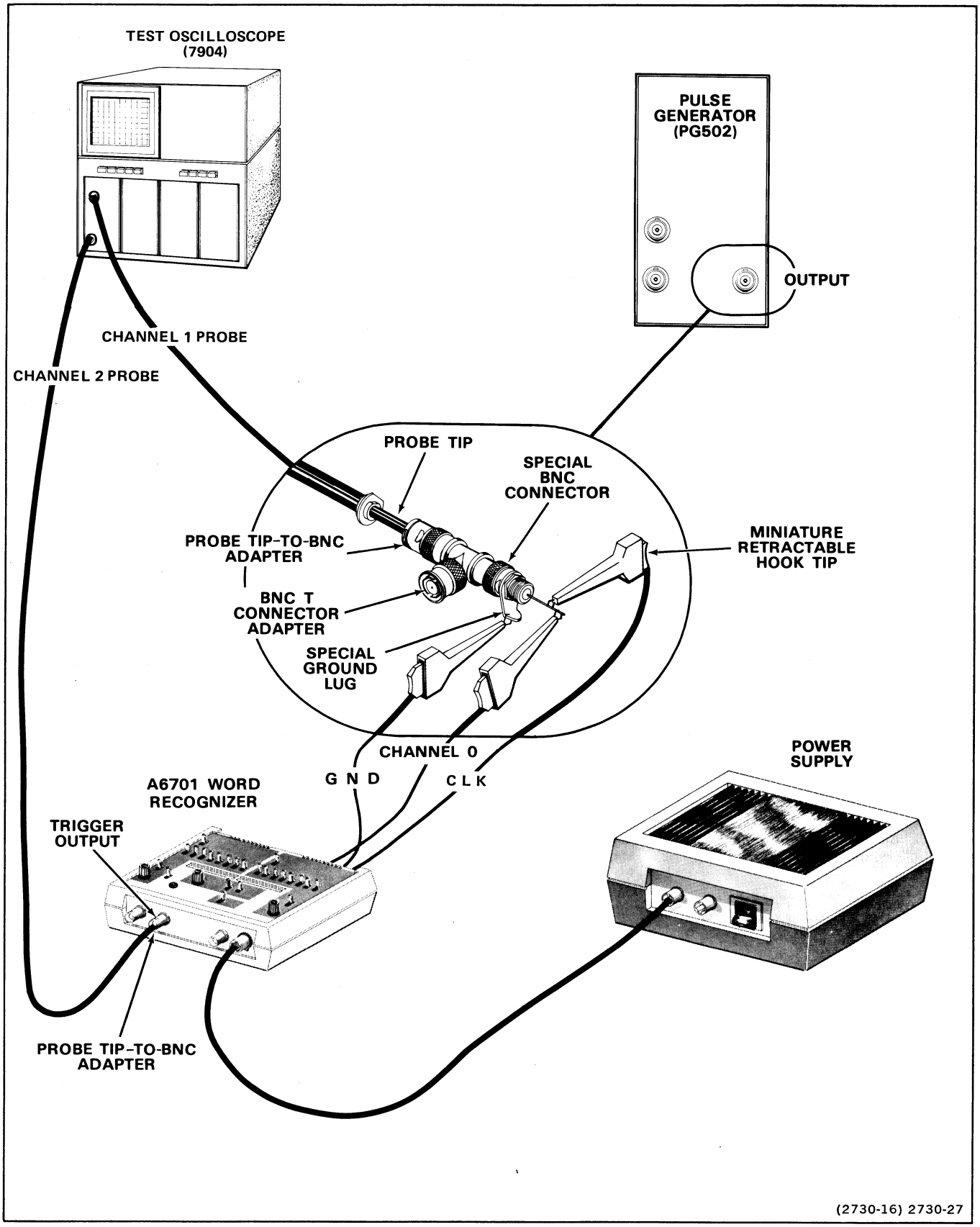
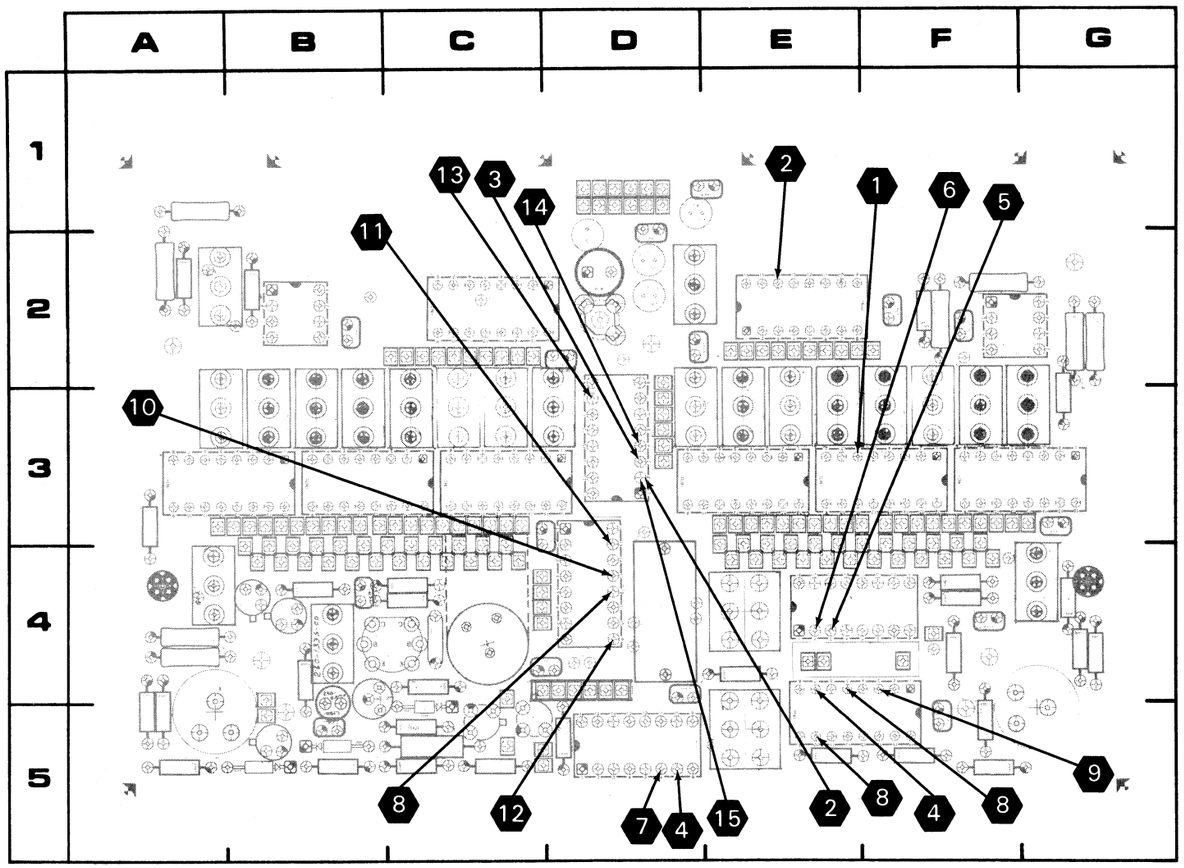


Figure 8-1. Troubleshooting test equipment setup.

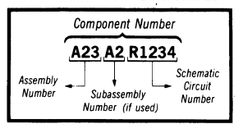


2730-43

Figure 8-2. Waveform test point locations.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

TROUBLESHOOTING TEST SETUPS

The troubleshooting diagram on the facing page will direct you to make certain test setups before proceeding to the next step. These test setups are identified as Parts I through IV and are described on this page. Make the appropriate test setup as directed by the troubleshooting diagram. Use the following Tektronix equipment, or the equivalent, when troubleshooting A6701 systems.

7904 Oscilloscope with two 10X probes
7A26 Vertical Amplifier
7B70 Time Base
PG 502 Pulse Generator
DM 502 Digital Voltmeter

NOTE

A Tektronix 7904 Oscilloscope is used with this troubleshooting procedure to display time relationships and vertical settings with characters on the crt along with the waveform displays. A Tektronix 475 oscilloscope, or equivalent, may also be used.

PART I

A. Connect the A6701 system units, the test oscilloscope, and pulse generator as shown in Figure 8-1.

B. Set the test oscilloscope switches as follows (with External Trigger connected to pulse generator trigger output):

Vertical Mode	Channel 1
Volts/Division	1 V
Time/Division	Refer to Waveform Display

NOTE

Input waveforms are TTL levels, while waveforms within the WR unit are ECL levels. To compare waveforms on the crt, center the traces around a horizontal graticule line using the vertical position control.

For cleanest waveforms, keep ground lead from the probe head as short as possible. If available, use a bayonet ground assembly, or similar apparatus, to probe test points. Whenever possible, use the ground pin of the integrated circuit from which the signal is probed.

C. Set WR unit switches as follows:

WORD SELECTOR	All to X
THRESHOLD VOLTAGE	TTL
SYNC $\underline{\text{ASYNC}}$	ASYNC
WORD $\overline{\text{WORD}}$	WORD
CLOCK POLARITY	⌐
GLITCH FILTER	OFF
TRIGGER INDICATOR STATUS	EACH

PART II

A. Adjust the pulse generator for an output signal of 20 MHz (16 nanoseconds high and 34 nanoseconds low), with an amplitude of between 0 and +3 volts.

B. Connect WR unit Channel 0 input to output of the pulse generator. Connect WR GND to ground lug on special connector (see Figure 8-1).

C. Set WR unit Channel 0 WORD SELECTOR switch to HI.

PART III

A. Connect WR unit CLK and Channel 0 inputs to pulse generator output. Connect WR GND to ground lug on special connector (see Figure 8-1).

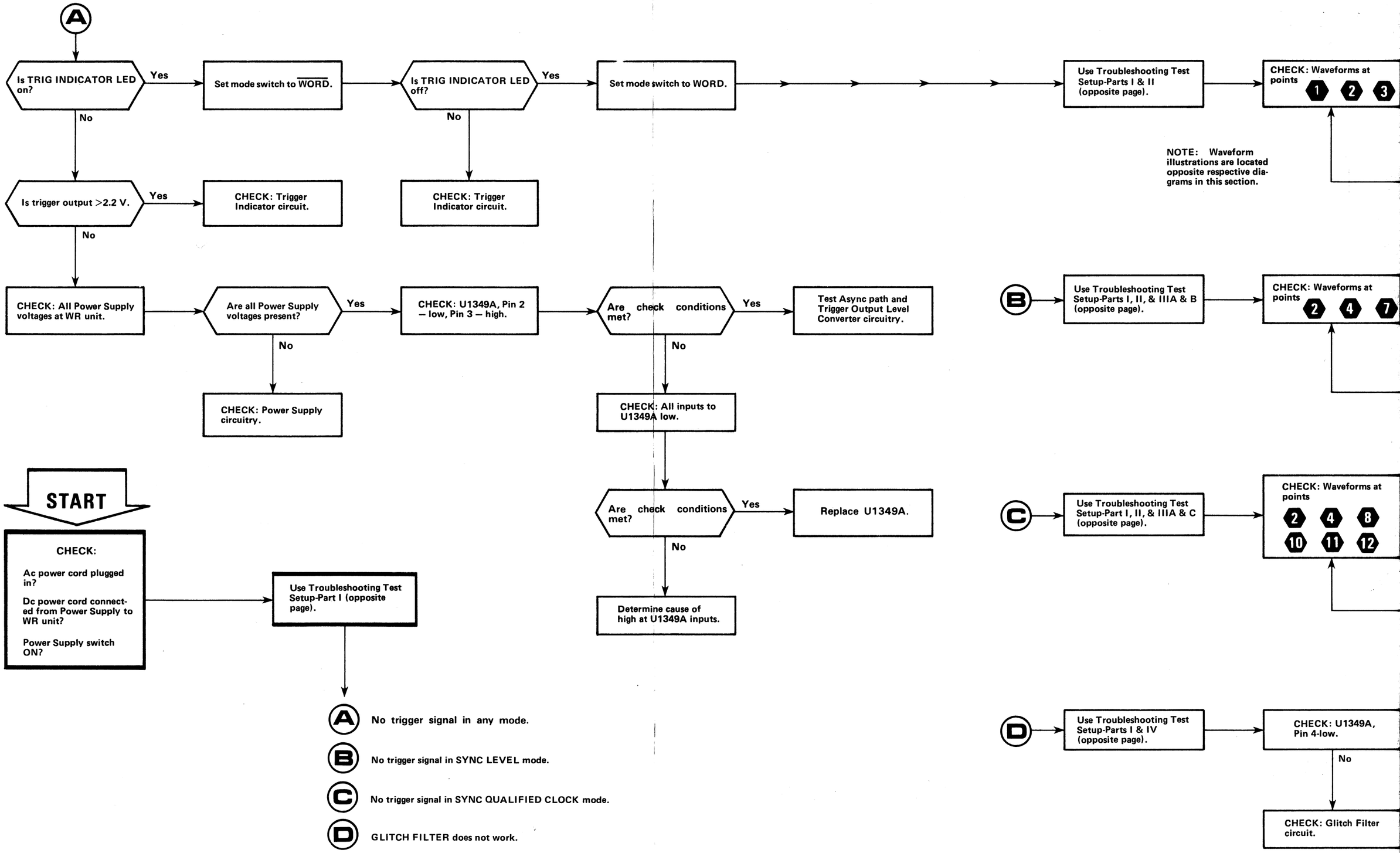
B. Set WR SYNC ASYNC switch to SYNC LEVEL.

C. Set WR SYNC ASYNC switch to SYNC QUALIFIED CLOCK.

PART IV

A. Adjust the pulse generator for a 1-MHz pulse, 400 nanoseconds wide (see Waveform 13, Diagram 5).

B. Connect WR Channel 0 input to pulse generator output and set Channel 0 WORD SELECTOR switch to HI.



@

A6701 TROUBLESHOOTING CHART

Yes

Set mode switch to WORD.

Use Troubleshooting Test Setup-Parts I & II (opposite page).

CHECK: Waveforms at points 1 2 3

Are waveforms present?

No

CHECK: MONITOR jack voltage ≈+1.4 V ±0.03 V and J2480A, B pin 3 ≈ −6.6 V±0.2 V.

No

CHECK: Threshold Voltage circuit.

Yes

Connect next channel to pulse generator. Reset Word Select switch HI, all others X.

Yes

Determine where waveforms are lost.

NOTE: Waveform illustrations are located opposite respective diagrams in this section.

Are check conditions met?

Yes

Test Async path and Trigger Output Level Converter circuitry.

No

CHECK: All inputs to U1349A low.

Are check conditions met?

Yes

Replace U1349A.

No

Determine cause of high at U1349A inputs.

B

Use Troubleshooting Test Setup-Parts I, II, & IIIA & B (opposite page).

CHECK: Waveforms at points 2 4 7

Are waveforms present?

No

CHECK: MONITOR jack voltage ≈+1.4 V ±0.03 V and J2480A, B pin 3 ≈ −6.6 V ± 0.2 V.

No

CHECK: Threshold Voltage circuit.

Yes

Connect next channel with clock to pulse generator. Reset Word Selector switch HI, all others X.

Yes

Determine where signal is lost.

C

Use Troubleshooting Test Setup-Part I, II, & IIIA & C (opposite page).

CHECK: Waveforms at points 2 4 8 10 11 12

Are waveforms present?

No

CHECK: MONITOR jack voltage ≈+1.4 V ±0.03 V and J2480A, B pin 3 ≈ −6.6 V ±0.2 V.

No

CHECK: Threshold Voltage circuit.

Yes

Connect next channel with clock to pulse generator. Reset Word Selector switch HI, all others X.

Yes

Determine where signal is lost.

D

Use Troubleshooting Test Setup-Parts I & IV (opposite page).

CHECK: U1349A, Pin 4-low.

Yes

Turn GLITCH FILTER control to >250 ms. CHECK: Waveforms at 13 14 15

Are waveforms ok?

No

CHECK: Glitch Filter circuit.

No

CHECK: Glitch Filter circuit.

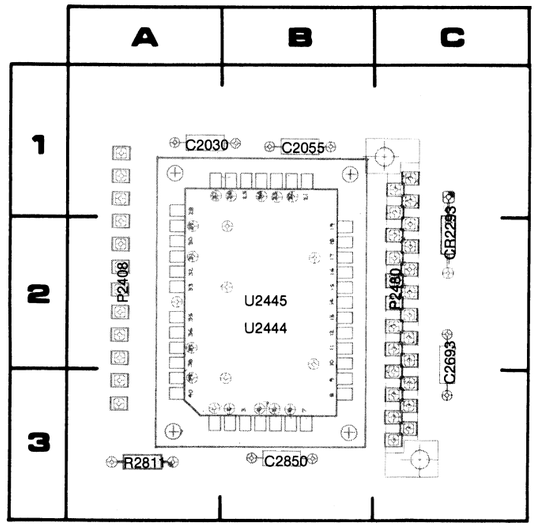
Yes

CHECK: Async path to output.

END

2730-28

A6701 TROUBLESHOOTING CHART

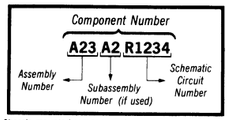


2730-40

Figure 8-3. Data Input circuit board component locations.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



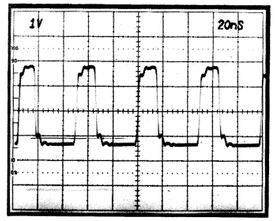
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

WAVEFORM CONDITIONS

The following waveforms were obtained using a Tektronix 7904 Oscilloscope with a 7B70 Time Base and a 7A26 Amplifier. The oscilloscope input coupling was set to DC. Waveforms may vary as much as ±20%.

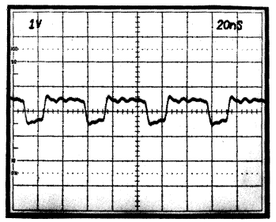
Refer to Troubleshooting Chart and Troubleshooting Test Setup at the beginning of this section for test equipment and A6701 system control positions.

Pulse Generator
Output



(Seen at probe tip-to-bnc adapter.)

1



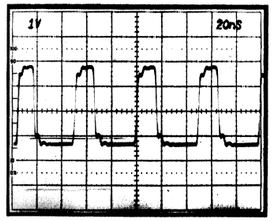
2730-44

WAVEFORM CONDITIONS

The following waveforms were obtained using a Tektronix 7904 Oscilloscope with a 7B70 Time Base and a 7A26 Amplifier. The oscilloscope input coupling was set to DC. Waveforms may vary as much as ±20%.

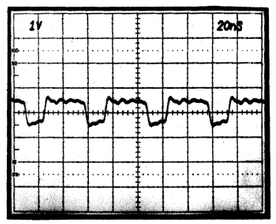
Refer to Troubleshooting Chart and Troubleshooting Test Setup at the beginning of this section for test equipment and A6701 system control positions.

Pulse Generator
Output



(Seen at probe tip-to-bnc adapter.)

1



2730-44

CHASSIS MOUNTED PARTS

CIRCUIT NUMBER	SCHEM NUMBER	SCHEM LOCATION
DS1613	5	7M
F3254	6	2A
J1044	5	1A
J1146	5	4A
J1147	5	4A
J1582	5	8G
J1741	5	3M
J3253	6	4A
J3875	6	4M
J3876	6	1M
P1147	5	4A
P1148	5	4A
P1581	5	8G
P1613	5	7M
P1740	5	3M
P3197	6	1C
P3862	6	3K
P3862	6	5K
P3872	6	4K
P3873	6	4K
P3873	6	7K
S3254	6	1A
T3254	6	1B
W3253	6	3A

DATA INPUT CHANNELS 0-7, Q1 DIAGRAM 1

P/O A2 ASSY

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2030	7B	1A
C2055	7D	1B
C2693	7E	2C
C2850	8B	3B
CR2293	7D	2C
J2408B	1A	2A
P2480A	1E	2C
P2480A	8B	2C
R2811	6B	3A
U2444	3E	2B
U2445	6E	2B

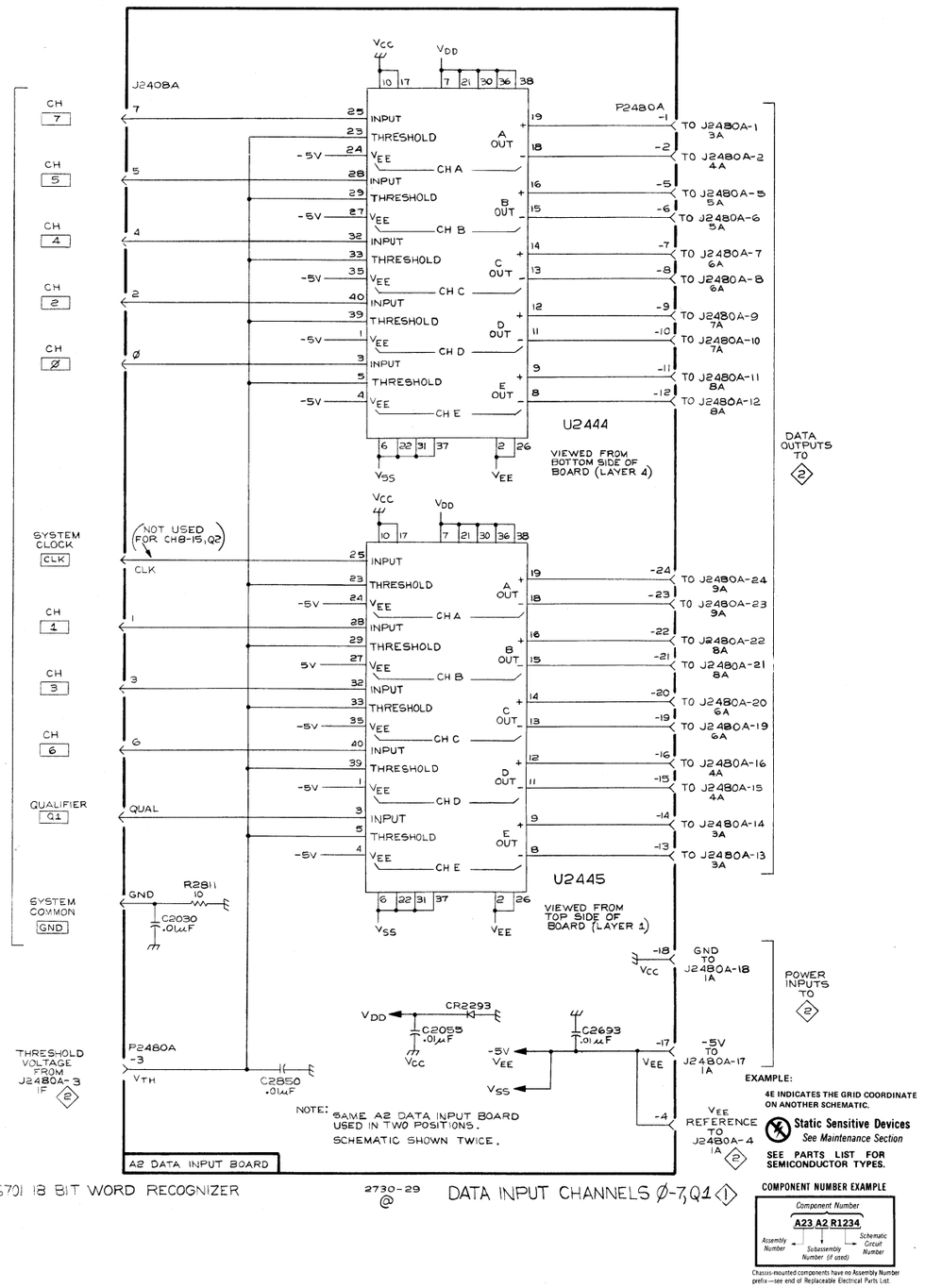
P/O A2 ASSY also shown on diagram 3

WORD SELECTOR CHANNELS 0-7, Q1, AND CLK DIAGRAM 2

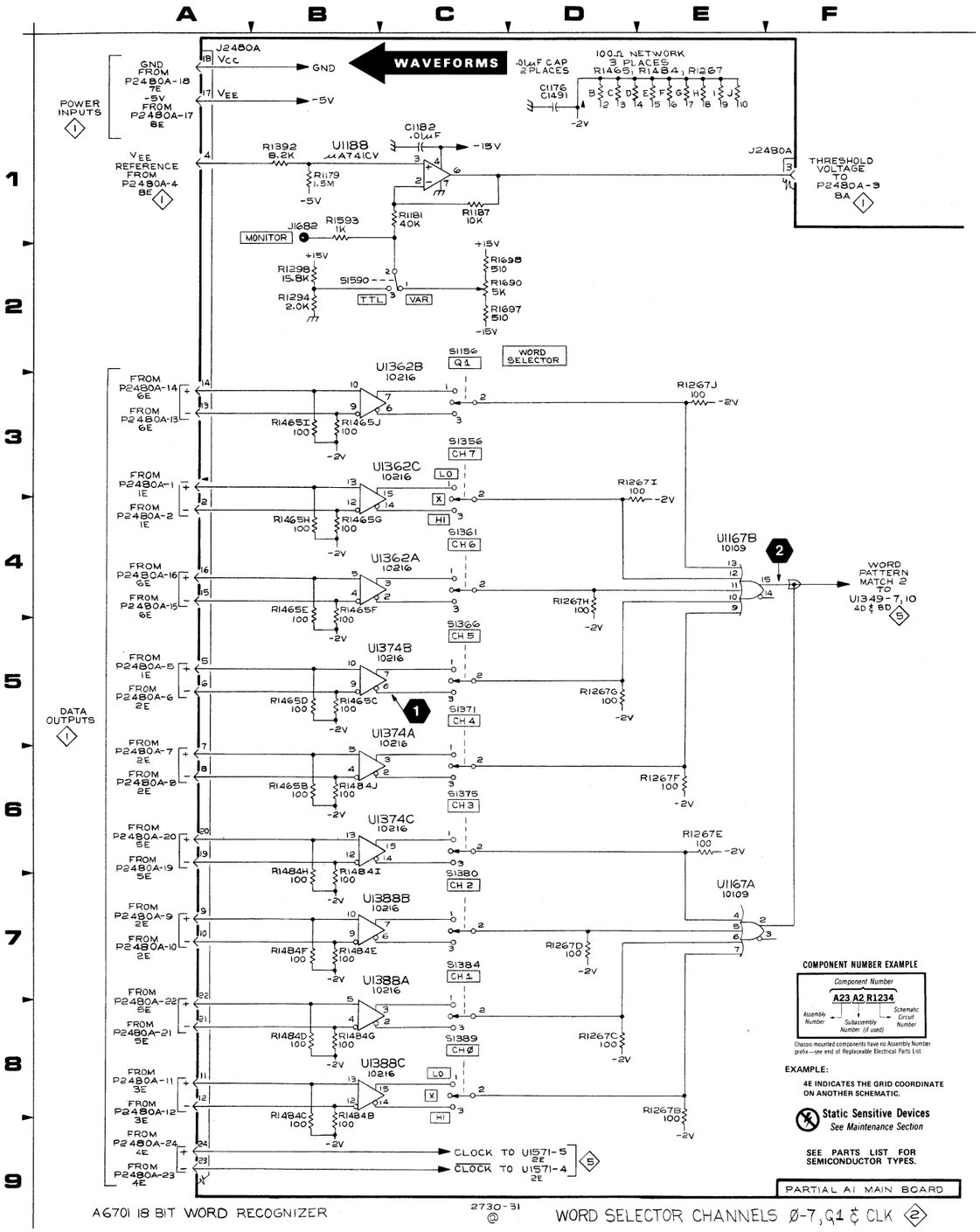
P/O A1 ASSY

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1176	1D	2F	R1484E	7B	3F
C1182	1C	2F	R1484F	7B	3F
C1491	1D	3G	R1484G	8B	3F
			R1484H	6B	3F
J1682	1B	5F	R1484I	6B	3F
J2480A	1A	4E	R1484J	6B	3F
			R1593	1B	4G
R1179	1B	2F	R1690	2C	4G
R1181	1C	2F	R1697	2C	4G
R1187	1C	2F	R1698	2C	4G
R1267B	8E	2E			
R1267C	8D	2E	S1156	2C	2D
R1267D	7D	2E	S1356	3C	3D
R1267E	6E	2E	S1361	4C	3E
R1267F	6E	2E	S1366	5C	3E
R1267G	5D	2E	S1371	5C	3E
R1267H	4D	2E	S1375	6C	3F
R1267I	3D	2E	S1380	7C	3F
R1267J	3E	2E	S1384	7C	3F
R1294	2B	2G	S1389	8C	3G
R1298	2B	2G	S1590	2B	4G
R1392	1B	3G			
R1465B	6B	3E	U1167A	7E	2E
R1465C	5B	3E	U1167B	4E	2E
R1465D	5B	3E	U1188	1B	2F
R1465E	4B	3E	U1362A	4C	3E
R1465F	4B	3E	U1362B	2C	3E
R1465G	4B	3E	U1362C	3C	3E
R1465H	4B	3E	U1374A	5C	3F
R1465I	3B	3E	U1374B	5C	3F
R1465J	3B	3E	U1374C	6C	3F
R1484B	8B	3F	U1388A	7C	3G
R1484C	8B	3F	U1388B	7C	3G
R1484D	8B	3F	U1388C	8B	3G

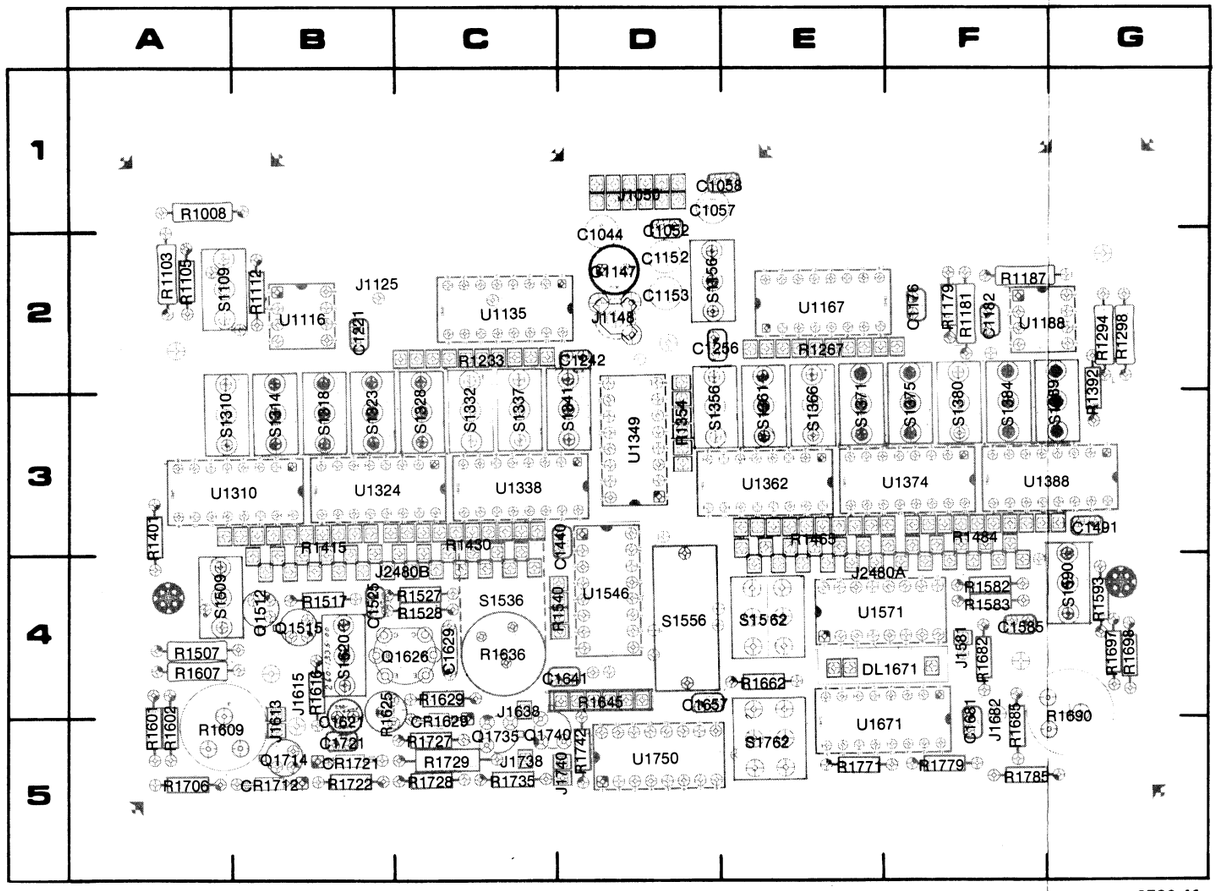
P/O A1 ASSY also shown on diagrams 4, and 5



A6701 18 BIT WORD RECOGNIZER 2730-29 @ DATA INPUT CHANNELS Ø-7,Q1 ◇1◇



A6701 18 BIT WORD RECOGNIZER 2730-31 @ WORD SELECTOR CHANNELS Ø-7,Q1 & CLK ◇2◇

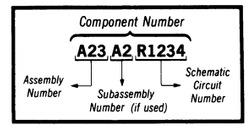


2730-41

Figure 8-4. Main circuit board component locations.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

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DATA INPUT CHANNELS 8-15, Q2 DIAGRAM 3

P/O A2 ASSY

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2030	7B	1A
C2055	7D	1B
C2693	7E	2C
C2850	8B	3B
CR2293	7D	2C
J2408B	1A	2A
P2480B	1E	2C
P2480B	8B	2C
R2811	6B	3A
U2444	3E	2B
U2445	6E	2B

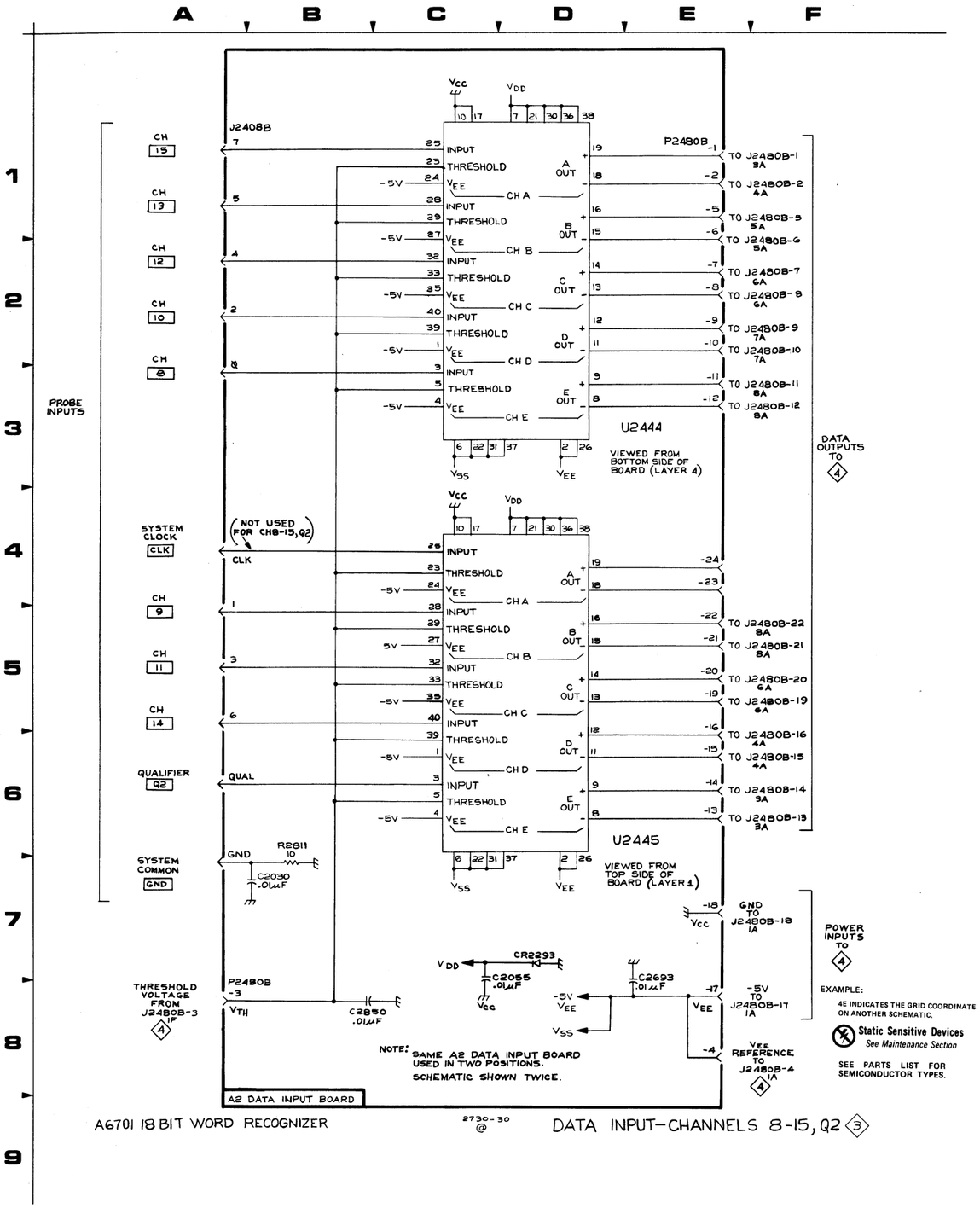
P/O A2 ASSY also shown on diagram 1

WORD SELECTOR CHANNELS 8-15, Q2 DIAGRAM 4

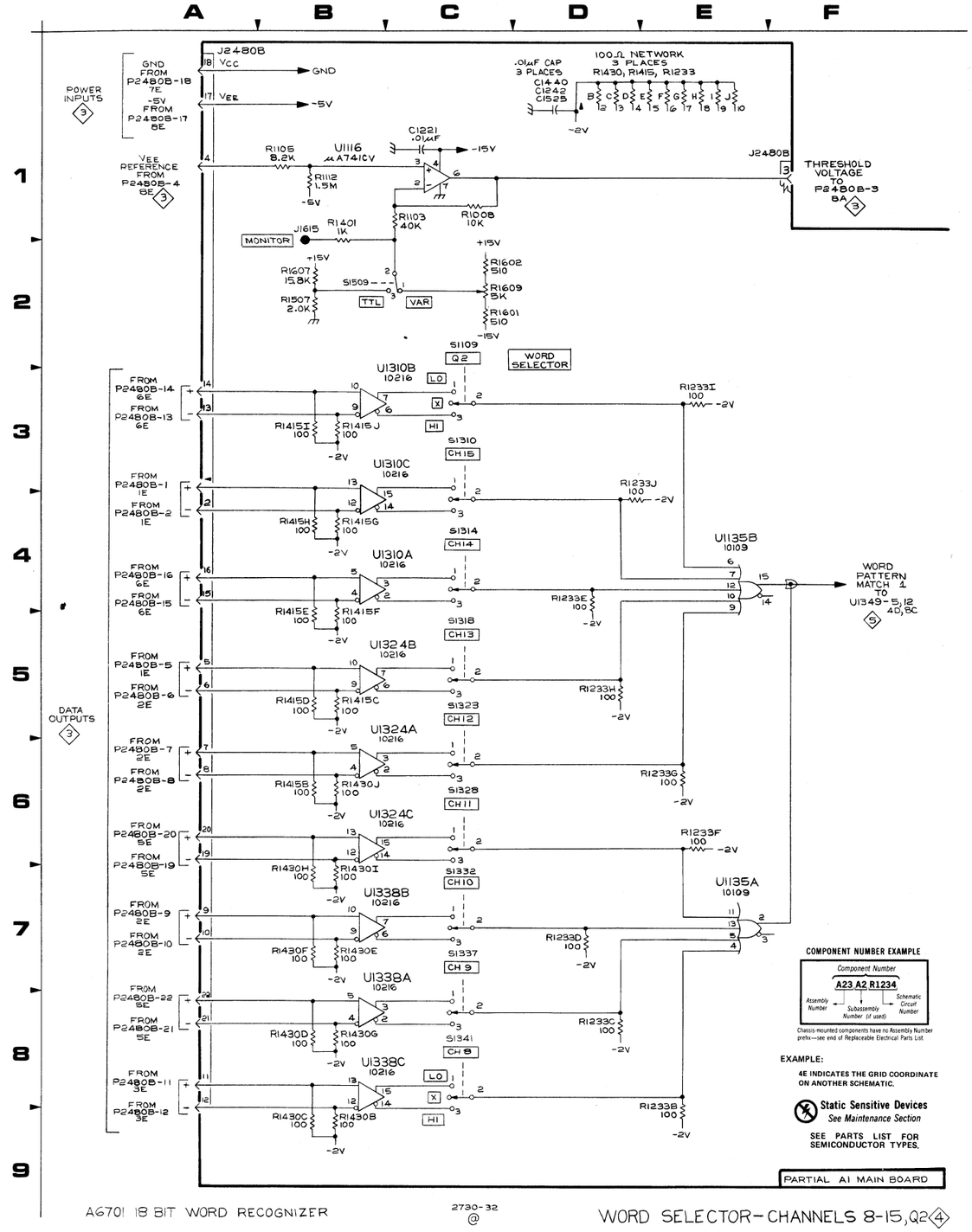
P/O A1 ASSY

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1221	1C	2B	R1430F	7B	3C
C1242	1D	2D	R1430G	8B	3C
C1440	1D	3D	R1430H	7B	3C
C1525	1D	4B	R1430I	7B	3C
			R1430J	6B	3C
J2480B	1A	4C	R1507	2B	4A
J2480B	1F	4C	R1601	2C	5A
			R1602	2C	5A
R1008	1C	1A	R1607	2B	4A
R1103	1C	2A	R1609	2C	5A
R1105	1B	2A			
R1112	1B	2B	S1109	2C	2A
R1233B	9E	4B	S1310	3C	3A
R1233C	8D	4B	S1314	4C	3B
R1233D	7D	4B	S1318	5C	3B
R1233E	4D	4B	S1323	5C	3B
R1233F	6E	4B	S1328	6C	3C
R1233G	6E	4B	S1332	7C	3C
R1233H	5D	4B	S1337	7C	3C
R1233I	3E	4B	S1341	8C	3D
R1233J	3E	4B	S1509	2B	4A
R1401	1B	3A			
R1415B	6B	3B	U1116	1B	2B
R1415C	5B	3B	U1135A	7E	2C
R1415D	5B	3B	U1135B	4E	2C
R1415E	4B	3B	U1310A	4C	3B
R1415F	4B	3B	U1310B	2C	3B
R1415G	4B	3B	U1310C	3C	3B
R1415H	4B	3B	U1324A	5C	3B
R1415I	3B	3B	U1324B	5C	3B
R1415J	3B	3B	U1324C	6C	3B
R1430B	9B	3C	U1338A	7C	3C
R1430C	9B	3C	U1338B	7C	3C
R1430D	8B	3C	U1338C	8C	3C
R1430E	7B	3C			

P/O A1 ASSY also shown on diagrams 2, and 5



A6701 18 BIT WORD RECOGNIZER 2730-30 @ DATA INPUT—CHANNELS 8-15, Q2 ◇3



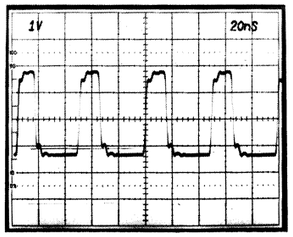
A6701 18 BIT WORD RECOGNIZER 2730-32 @ WORD SELECTOR—CHANNELS 8-15, Q2 ◇4

WAVEFORM CONDITIONS

The following waveforms were obtained using a Tektronix 7904 Oscilloscope with a 7B70 Time Base and a 7A26 Amplifier. The oscilloscope input coupling was set to DC. Waveforms may vary as much as ±20%.

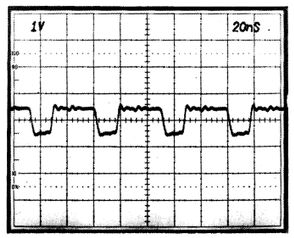
Refer to Troubleshooting Chart and Troubleshooting Test Setup at the beginning of this section for test equipment and A6701 system control positions.

Pulse Generator Output

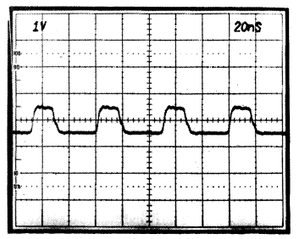


(Seen at probe tip-to-bnc adapter.)

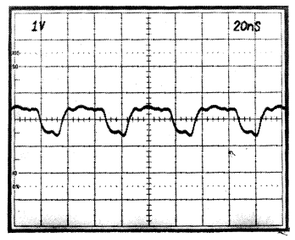
2



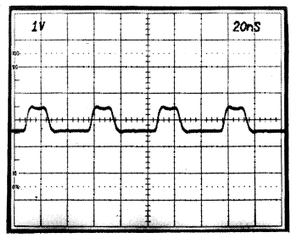
3



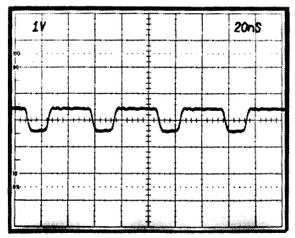
4



5



6



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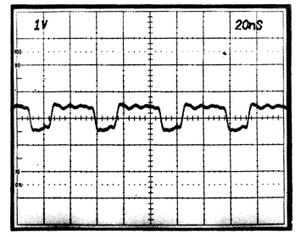
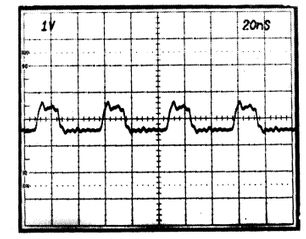
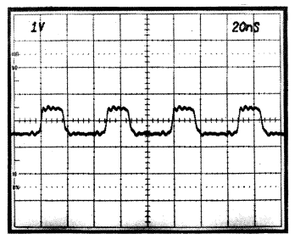
7



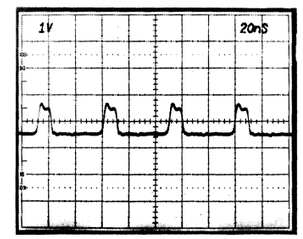
8



9

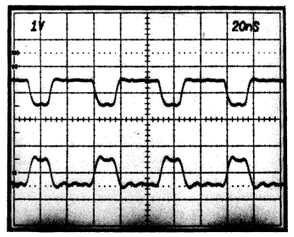


10



11

12



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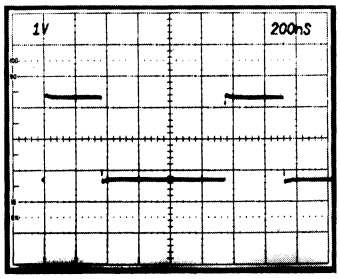
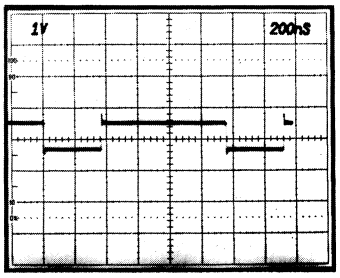
Pulse Generator
Output

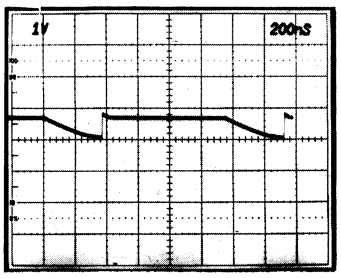


(Seen at probe tip-to-bnc adapter.)

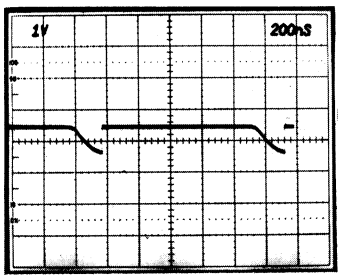
13



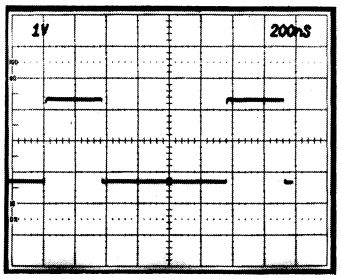
14



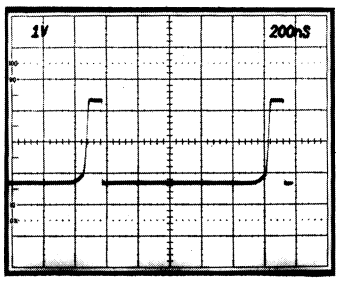
15



Trigger Output
Glitch Filter Off



Trigger Output
Glitch Filter On



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WORD RECOGNITION MODES DIAGRAM 5

P/O A1 ASSY

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1044	1B	2D	R1540D	3I	4D
C1052	2B	1D	R1582	2E	4F
C1057	3B	1D	R1583	2D	4F
C1058	2B	1D	R1616	6L	4B
C1147	3B	2D	R1625	5E	4B
C1152	2B	2D	R1629	4L	4C
C1153	3K	2D	R1636	6E	4C
C1256	1J	2D	R1645B	7J	4D
C1585	3E	4F	R1645C	4F	4D
C1621	7M	5B	R1645D	7K	4D
C1629	6D	4C	R1645E	7L	4D
C1641	8K	4D	R1645F	3G	4D
C1657	2F	4D	R1662	2F	4E
C1681	3G	5F	R1682	8D	4F
C1721	5E	5B	R1685	7D	5F
			R1706	7L	5A
CR1629	4L	5C	R1722	7M	5B
CR1712	7M	5B	R1727	7L	5C
CR1721	7L	5B	R1728	7M	5C
			R1729	4K	5C
DL1671	4E	4F	R1735	4L	5C
			R1742	5K	5D
J1148	4A	2D	R1771	3G	5E
J1581	8F	4F	R1779	3H	5F
J1613	7M	5B	R1785	7D	5F
J1615	1B	4B			
J1638	3M	4C	S1536	6G	4C
J1738	3M	5C	S1556	3I	4D
J1740	3M	5D	S1562	4E	4E
			S1620	6K	4B
Q1512	6M	4B	S1762	1F	5E
Q1515	7M	4B			
Q1626A	7F	4C	U1349A	4D	3D
Q1626B	6F	4C	U1349B	8D	3D
Q1714	6M	5B	U1546A	7D	4D
Q1735	5L	5C	U1546B	6K	4D
Q1740	4K	5C	U1546C	7K	4D
			U1546D	2I	4D
R1354B	8C	3D	U1571A	2E	4E
R1354C	8B	3D	U1571B	6F	4E
R1354D	8B	3D	U1571C	8E	4E
R1354E	8B	3D	U1671A	2H	5E
R1517	6L	4B	U1671B	2G	5E
R1527	6E	4C	U1671C	2G	5E
R1528	6E	4C	U1671D	3H	5E
R1540B	2H	4D	U1750A	4G	5D
R1540C	7D	4D	U1750B	6L	5D

P/O A1 ASSY also shown on diagrams 2, and 4

CHASSIS MOUNTED PARTS

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
DS1613	7M	CHASSIS	P1147	4A	CHASSIS
			P1148	4A	CHASSIS
J1044	1A	CHASSIS	P1581	8G	CHASSIS
J1146	4A	CHASSIS	P1613	7M	CHASSIS
J1147	4A	CHASSIS	P1740	3M	CHASSIS
J1582	8G	CHASSIS			
J1741	3M	CHASSIS			

WAVEFORMS

POWER INPUT
J1044

NOTE: POWER INPUT PIN LOCATIONS VIEWED FROM SIDE PANEL.

+15V C1044 4.7µF
+5V
C1058 .01µF
-2V C1152 22µF
C1052 .01µF
-5V C1147 10µF
-15V C1057 4.7µF

STATIC GROUND STRAP

NOTE: ALL SWITCHES AND POT HOUSINGS ARE CONNECTED TOGETHER WITH STATIC GROUND STRAP WHICH IS SOLDERED TO GROUND.

100Ω R1540

100Ω NETWORK 2 PLACES R1354, R1645

C1256 .01µF

S1556 SWITCH PAD LAYOUT
1 2 3 SYNC QUALIFIED CLOCK
4 5 6 SYNC LEVEL
7 8 9 } OUTPUTS
10 11 12 }
13 14 15 ASYNC

TYPE	V_{CC1}	V_{CC2}	V_{EE}	V_{BB}
10216	1	16	B	11
10231	1	16	B	
1660	1	16	B	
1662	1	16	B	
10102	1	16	B	

S1562 CLOCK POLARITY

CLOCK FROM J2480A-24 9A (2)
CLOCK FROM J2480A-23 9A (2)

U1571A 10216
R1583 100
R1582 100
C1585 .01µF

U1671C 1662
U1671A 1662
U1671B 1662
U1671D 1662
C1657 .01µF
R1682 100
R1645F 100
R1771 100
R1779 100
C1681 .01µF

U1546D 10102
R1540B 100
R1540D 100
S1556 SYNC ASYNC

WORD PATTERN MATCH 2 FROM U1167-15,2 4E, 7E (2)
WORD PATTERN MATCH 1 FROM U1135-15,2 4E, 7E (4)

U1349A 1660
WORD
DL1671 4nS 100Ω
R1645C 100

U1750A 10231
SYNC
QUALIFIED CLOCK
LEVEL
ASYNC
7,10 SYNC QUALIFIED CLOCK 3 SYNC LEVEL 6 ASYNC 15 9,12

EXPANSION INPUT
J1146 J1147 P1147 P1148 J1148

R1354E 100
R1354B 100
R1354D 100
R1354C 100
U1349B 1660
R1682 100

WORD
OFF
ON
S1536 GLITCH FILTER

+5V C1721 0.01µF
R1625 1M
R1528 15K
C1629 43
NOTE: Q1626 AS VIEWED FROM BOTTOM SIDE.
Q1626B
R1636 25K
R1527 270
Q1626A

U1546A 10102
R1785 1K
R1685 5.1K
R1540C 100

U1571B 10216
U1571C 10216
J1581 P1581 J1582 EXPANSION OUTPUT

SYNC QUALIFIED CLOCK
SYNC LEVEL
ASYNC 14 8,11

+5V C1153 22µF
C1729 .01µF
R1729 100
CR1629
R1735 100
J1740 P1740 J1741 TRIGGER OUTPUT
J1738 TRIG OUT
J1638 TRIG COM

Q1740
R1629 100
Q1735
R1742 68

U1546B 10102
S1620 TRIGGER INDICATOR STATUS
FIRST
EACH
U1750B 10231
R1645D 100
R1645E 100
R16458 100
U1546C 10102
CR1721
R1727
C1641 .01µF

R1616 220
Q1512
R1517 4.7K
Q1714
CR1712
Q1515
R1728 300
C1621 6.8µF
R1706 6.8K
J1613 P1613 TRIG INDICATOR
R1722 220
D51613

PARTIAL A1 MAIN BOARD

COMPONENT NUMBER EXAMPLE

Component Number: A23 A2 R1234
Assembly Number · Subassembly Number (if used) · Schematic Circuit Number

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

EXAMPLE:
4E INDICATES THE GRID COORDINATE ON ANOTHER SCHEMATIC.

Static Sensitive Devices See Maintenance Section

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

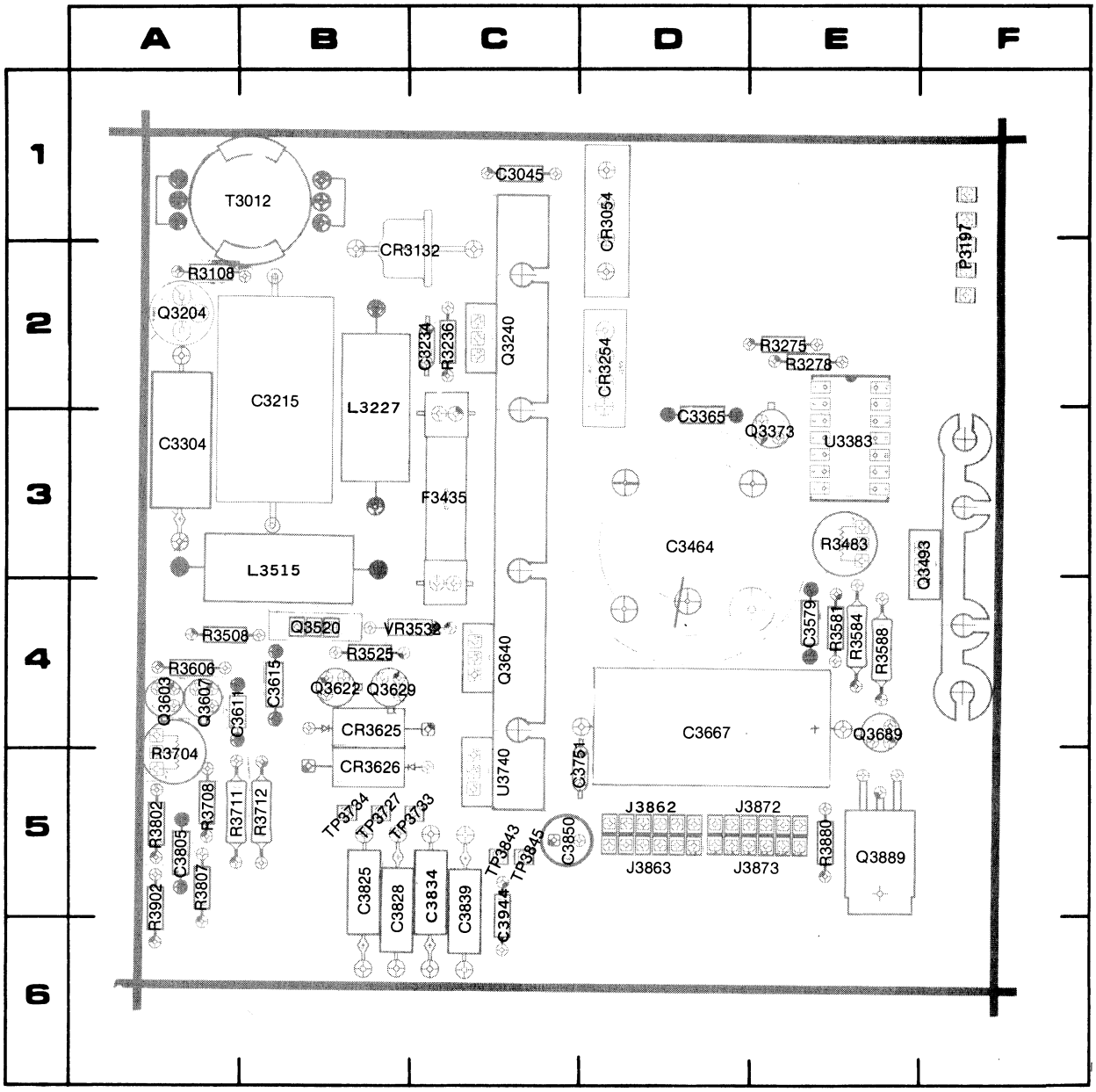

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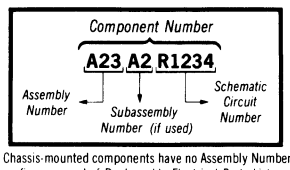
Figure 8-5. Power Supply circuit board component locations.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

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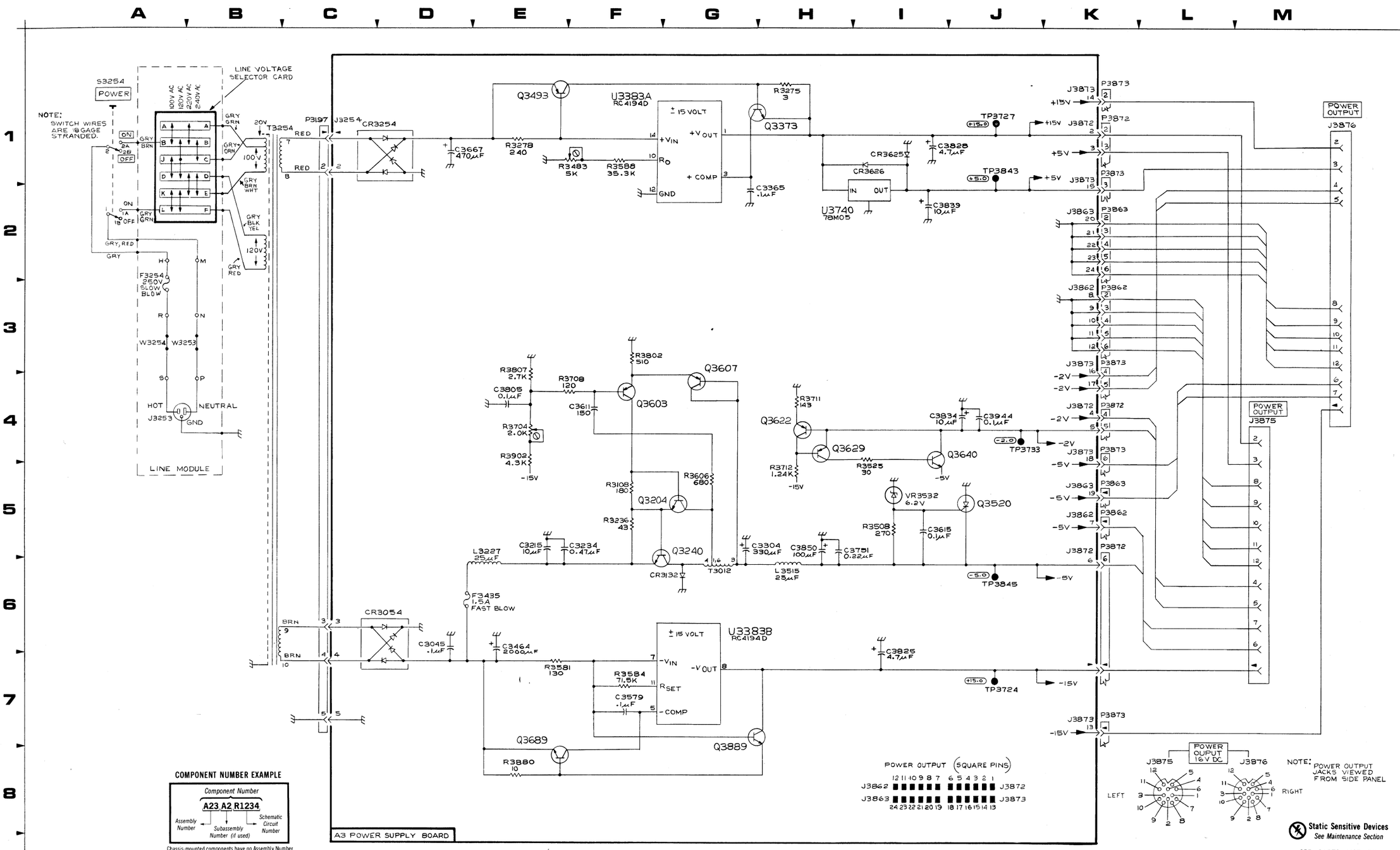
POWER SUPPLY DIAGRAM 6

P/O A3 ASSY

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C3045	6D	1C	Q3373	1H	3E
C3215	5E	2B	Q3493	1E	3F
C3234	5F	2C	Q3520	5J	4B
C3304	5H	3A	Q3603	4F	4A
C3365	1H	3D	Q3607	3G	4A
C3464	6E	3D	Q3622	4H	4B
C3579	7F	4E	Q3629	4H	4B
C3611	4F	4A	Q3640	4J	4C
C3615	5I	4B	Q3689	7E	4E
C3667	1D	4D	Q3889	7G	5E
C3751	5I	5C			
C3805	4E	5A	R3108	5F	2A
C3825	6I	5B	R3236	5F	2C
C3828	1J	5B	R3275	1H	2E
C3834	4J	5C	R3278	1E	2E
C3839	2J	5C	R3483	1F	3E
C3850	5H	5C	R3508	5I	4A
C3944	4J	6C	R3525	4I	4B
			R3581	7E	4E
CR3054	6D	1D	R3584	7F	4E
CR3132	6G	2C	R3588	1F	4E
CR3254	1D	2D	R3606	5G	4A
CR3625	1I	4B	R3704	4E	5A
CR3626	1I	5B	R3708	4F	5A
			R3711	4H	5A
F3435	6E	3C	R3712	5H	5B
			R3802	3F	5A
J3862	3K	5D	R3807	4E	5A
J3862	5K	5D	R3880	8E	5E
J3863	2K	5D	R3902	4E	5A
J3863	5K	5D			
J3872	1K	5E	T3012	6G	1B
J3872	4K	5E			
J3872	5K	5D	TP3724	7J	5B
J3873	1K	5D	TP3727	1J	5B
J3873	3K	5D	TP3733	4J	5C
J3873	4K	5D	TP3843	1J	5C
J3873	7K	5D	TP3845	6J	5C
L3227	5E	2B	U3383A	1F	3E
L3515	6H	3B	U3383B	6G	3E
			U3740	2H	5C
Q3204	5F	2A			
Q3240	5G	2C	VR3532	5I	4C

CHASSIS MOUNTED PARTS

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
F3254	2A	CHASSIS	P3873	4K	CHASSIS
			P3873	7K	CHASSIS
J3253	4A	CHASSIS			
J3875	4M	CHASSIS	S3254	1A	CHASSIS
J3876	1M	CHASSIS			
			T3254	1B	CHASSIS
P3197	1C	CHASSIS			
P3862	3K	CHASSIS	W3253	3A	CHASSIS
P3862	5K	CHASSIS	W3254	3A	CHASSIS
P3872	4K	CHASSIS			



COMPONENT NUMBER EXAMPLE

Component Number: A23 A2 R1234
- A23 — Assembly Number
- A2 — Subassembly Number (if used)
- R1234 — Schematic Circuit Number

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

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POWER SUPPLY 6

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

SPECIAL NOTES AND SYMBOLS

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

FIGURE AND INDEX NUMBERS

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

INDENTATION SYSTEM

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

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
#	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
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
05006	TWENTIETH CENTURY PLASTICS, INC.	415 E WASHINGTON BLVD.	LOS ANGELES, CA 90015
05574	VIKING INDUSTRIES, INC.	21001 NORDHOFF STREET	CHATSWORTH, CA 91311
06090	RAYCHEM CORPORATION	300 CONSTITUTION DRIVE	MENLO PARK, CA 94025
07111	PNEUMO DYNAMICS CORPORATION	4800 PRUDENTIAL TOWER	BOSTON, MA 02199
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
13103	THERMALLOY COMPANY, INC.	2021 W VALLEY VIEW LANE P O BOX 34829	DALLAS, TEXAS 75234
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23050	PRODUCT COMPONENTS CORP	30 LORRAINE AVE.	MT VERNON, NY 10553
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
50522	MONSANTO CO., ELECTRONIC SPECIAL PRODUCTS	3400 HILLVIEW AVENUE	PALO ALTO, CA 94304
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	P O BOX 2244, 40 BRISTOL ST.	WATERBURY, CT 06720
71279	CAMBRIDGE THERMIONIC CORP.	445 CONCORD AVE.	CAMBRIDGE, MA 02138
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
91886	MALCO A MICRODOT CO.	12 PROGRESS DRIVE	MONTGOMERYVILLE, PA 18936
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641

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		POWER SUPPLY:(SEE A3 EPL)		
-1	200-2331-00			2		COVER,PWR SUPPLY:PLASTIC	80009	200-2331-00
						(ATTACHING PARTS)		
-2	211-0571-00			4		SCREW,MACHINE:6-32 X 2.50 INCHES,PNH,STL	83385	OBD
						- - - * - - -		
-3	214-2874-00			1		HEAT SINK,XSTR:	80009	214-2874-00
						(ATTACHING PARTS)		
-4	211-0510-00			8		SCREW,MACHINE:6-32 X 0.375 INCH,PNH STL	83385	OBD
	210-0005-00			8		WASHER,LOCK:EXT #6	78189	1106-00
						- - - * - - -		
-5	333-2533-00			1		FRONT PANEL:	80009	333-2533-00
-6	175-2477-01			2		LEAD ASSY,ELEC:12,22 AWG,7.50 L	80009	175-2477-01
-7	131-0707-00			24		. CONNECTOR,TERM.:22-26 AWG,BRS CU BE GOLD	22526	47439
-8	352-0164-00			2		. CONN BODY,PL,EL:6 WIRE BLACK	80009	352-0164-00
	352-0164-01			2		. CONN BODY,PL,EL:6 WIRE BROWN	80009	352-0164-01
-9	----- -----			1		SWITCH ROCKER:DPST,6(R)A,250V(SEE S3254 EPL)		
-10	175-2551-00			1		CA ASSY,SP,ELEC:4,18 AWG,5.25 L	80009	175-2551-00
-11	131-2522-00			4		. TERM,QIK DISC:20-16 AWG,BRASS	00779	60196-2
-12	131-0677-00			4		. CONNECTOR,TERM:18 AWG	91886	122-0192-019
-13	333-2534-00			1		PANEL,REAR:	80009	333-2534-00
-14	----- -----			1		SELECTOR,LINE:100,220 240V/RUHLR		
	----- -----			-		(SEE J3254 EPL)		
	334-3688-00			1		MARKER,IDENT:MARKED LINE VOLTAGE SET	80009	334-3688-00
-15	386-4121-00			12		PANEL,BOTTOM:ALUMINUM	80009	386-4121-00
	334-3625-00			1		MARKER,IDENT:MRKED CAUTION	80009	334-3625-00
						(ATTACHING PARTS)		
-16	211-0504-00			8		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
	210-0005-00			8		WASHER,LOCK:EXT #6	78189	1106-00
						- - - * - - -		
-17	348-0187-00			4		FOOT,CABINET:0.780 X 1.650 INCH LONG	80009	348-0187-00
						(ATTACHING PARTS)		
	210-0504-00			4		NUT,PLAIN,HEX.:0-8 X 0.156 INCH,BRS	73743	3004-402
	210-0005-00			4		WASHER,LOCK:EXT #6	78189	1106-00
						- - - * - - -		
-18	----- -----			1		XFMR,PWR,STPDN:(SEE T3254 EPL)		
						(ATTACHING PARTS)		
-19	210-0458-00			2		NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
						- - - * - - -		
-20	195-0384-00			AR		LEAD,ELECTRICAL:18 AWG,3.0 L,5-4	80009	195-0384-00
						(ATTACHING PARTS)		
-21	210-0458-00			1		NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
-22	210-0205-00			1		TERMINAL,LUG:SE #8	78189	2104-08-00-2520N
						- - - * - - -		
-23	----- -----			1		CKT BOARD ASSY:POWER SUPPLY(SEE A3 EPL)		
						(ATTACHING PARTS)		
-24	211-0601-00			4		SCR,ASSEM WSHR:6-32 X 0.312 INCH,PNH BRS	80009	211-0601-00
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-25	----- -----			1		. TRANSISTOR:NPN,SI,2N2192(SEE Q3204 EPL)		
-26	342-0324-00			1		. INSULATOR,DISC:TO-5 TRANSISTOR	13103	7717-5N-BLUE
-27	214-0579-00			5		. TERM.,TEST PT:BRS CD PL	80009	214-0579-00
-28	344-0154-00			2		. CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE	80009	344-0154-00
-29	131-0608-00			24		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-30	----- -----			1		. TRANSISTOR:(SEE Q3889 EPL)		
						(ATTACHING PARTS)		
-31	211-0008-00			1		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-32	210-0586-00			1		. NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
						- - - * - - -		
-33	136-0269-02			1		. SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	01295	C95140
-34	131-1811-00			5		. TERM SET,PIN:10,0.025 SQ ON 0.15 CTR	22526	65595-110
-35	----- -----			1		. CAP.,FXD,ELECTLT:(SEE C3464 EPL)		
-36	214-2874-00			1		. HEAT SINK,XSTR:TO-220,AL	80009	214-2874-00
						(ATTACHING PARTS)		
-37	212-0087-00			2		. SCR,TPG,THD CTG:8-32 X 0.375 INCH,TRH,STL	83385	OBD
						- - - * - - -		
-38	----- -----			1		. TRANSISTOR:(SEE Q3493 EPL)		
						(ATTACHING PARTS)		
-39	211-0171-00			1		. SCREW,MACHINE:4-40 X 0.625,BDGH,NYL,SLOT	95987	OBD
-40	220-0665-00			1		. NUT,PLAIN,HEX.:SLFLKG,4-40 X0.25",PLSTC	23050	OBD
						- - - * - - -		

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 -41	214-2947-00			1		. HEAT SINK,ELEC:(2) TO 220,TC-202 DIO DE,AL	80009	214-2947-00
						(ATTACHING PARTS)		
-42	212-0087-00			2		. SCR,TPG,THD CTG:8-32 X 0.375,T,TRH,STL	83385	OBD
						- - - * - - -		
-43	200-1153-00			1		. COV HALF,HT STA:	80009	200-1153-00
-44	200-1155-00			1		. COV HALF,HT STA:	80009	200-1155-00
						(ATTACHING PARTS)		
-45	211-0185-00			1		. SCREW,MACHINE:2-56 X 0.438",PNH,STL	07111	OBD
						- - - * - - -		
-46	129-0273-00			1		. POST,ELEC-MECH:0.625 X 0.188 INCH OD	80009	129-0273-00
						(ATTACHING PARTS)		
-47	211-0014-00			1		. SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
-48	210-0054-00			1		. WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL	83385	OBD
						- - - * - - -		
-49	----- -----			1		. TRANSISTOR:(SEE Q3240 EPL)		
						(ATTACHING PARTS)		
-50	211-0171-00			1		. SCREW,MACHINE:4-40 X 0.625,BDGH,NYL,SLOT	95987	OBD
-51	220-0665-00			1		. NUT,PLAIN,HEX.:SLFLKG,4-40 X0.25",PLSTC	23050	OBD
						- - - * - - -		
-52	----- -----			1		. TRANSISTOR:(SEE Q3640 EPL)		
						(ATTACHING PARTS)		
-53	211-0171-00			1		. SCREW,MACHINE:4-40 X 0.625,BDGH,NYL,SLOT	95987	OBD
-54	220-0665-00			1		. NUT,PLAIN,HEX.:SLFLKG,4-40 X0.25",PLSTC	23050	OBD
						- - - * - - -		
-55	----- -----			1		. (SEE U3740 EPL)		
						(ATTACHING PARTS)		
-56	211-0014-00			1		. SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
-57	210-0586-00			1		. NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
						- - - * - - -		

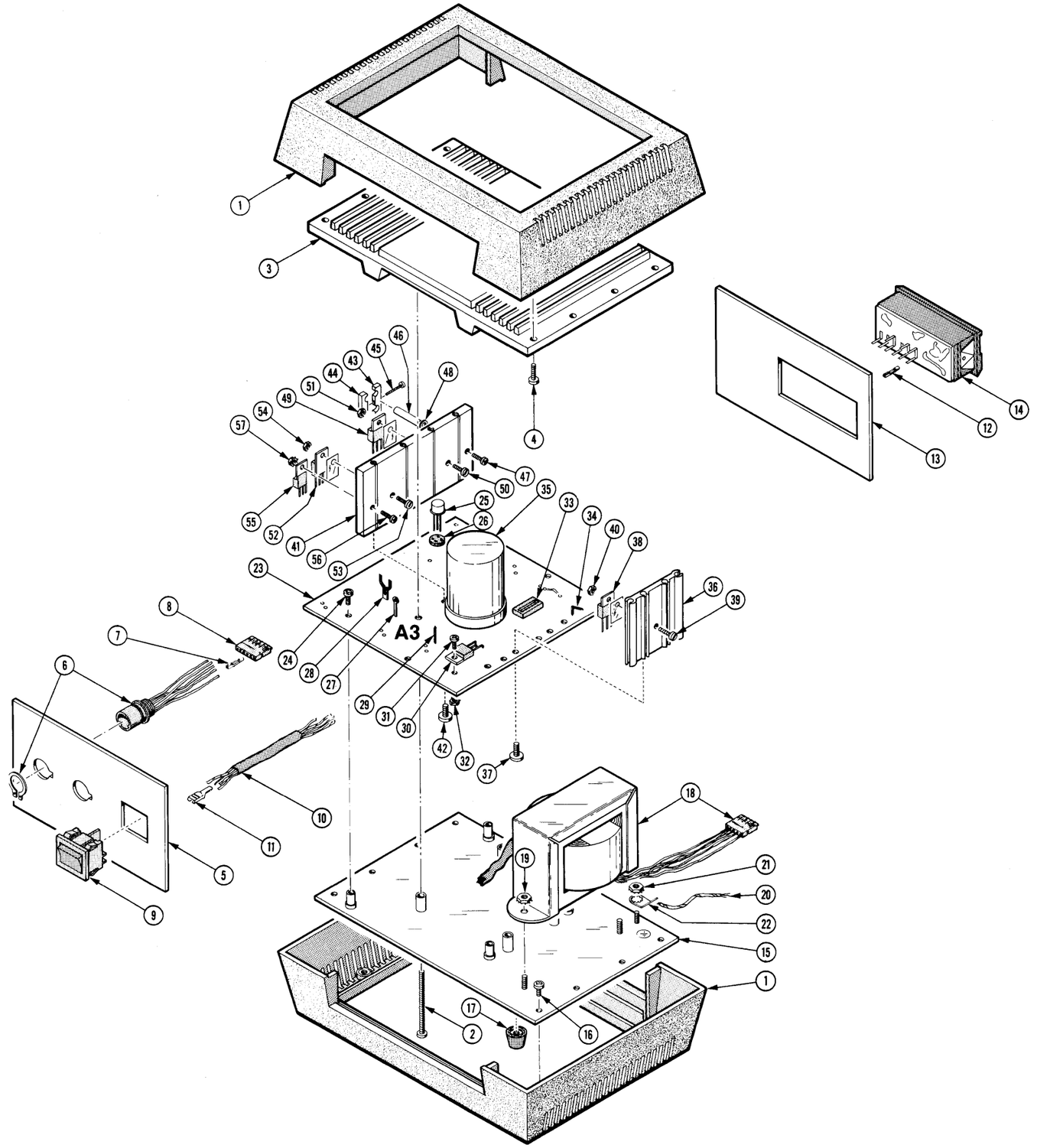
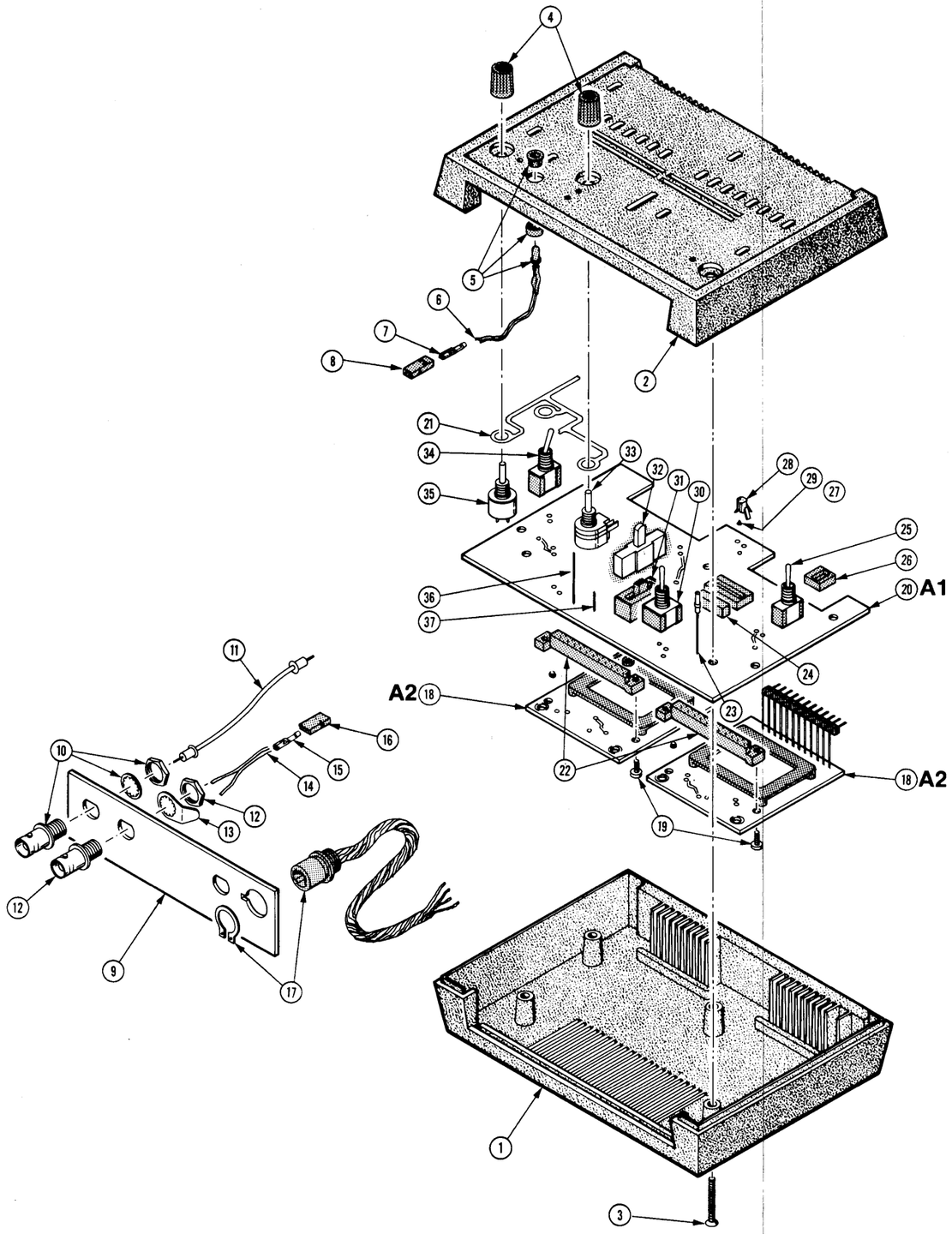

A3

FIG. 2 EXPLODED



A6701 18 BIT WORD RECOGNIZER

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
						A6701 OPTION 1		
2-1	200-2329-00			1		COVER BOTTOM:PLASTIC	80009	200-2329-00
-2	200-2328-00			1		COVER TOP:PLASTIC	80009	200-2328-00
						(ATTACHING PARTS)		
-3	211-0523-00			5		SCREW,MACHINE:6-32 X 0.875,FLH,100 DEG,STL	83385	OBD
						- - - * - - -		
-4	366-1146-00			3		KNOB:GRAY,IF GAIN	80009	366-1146-00
	213-0246-00			3		. SETSCREW:5-40 X 0.093 INCH L,HEX SOC	71159	OBD
-5	150-1001-03			1		DIO:RED,660NM,50MA,MAX	80009	150-1001-03
	150-1001-00			1		. LT EMITTING DIO:RED,660NM,100MA MAX	50522	MV5024
	162-0607-00			AR		. INSUL SLVG,ELEC:HT SHRINK,0.046 ID,BLACK	06090	RFR-046
-6	175-0863-00			AR		. WIRE,ELECTRICAL:2 WIRE RIBBON	08261	SS-0222-1910610C
-7	131-0707-00			2		. CONNECTOR,TERM.:22-26 AWG,BRS CU BE GOLD	22526	47439
-8	352-0169-00			1		. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
-9	333-2535-00			1		PANEL,REAR:	80009	333-2535-00
-10	131-1315-01			1		CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR235-1
-11	175-2423-00			1		CABLE ASSY,RF:50 OHM COAX,5.0 L	80009	175-2423-00
-12	131-0106-02			2		CONNECTOR,RCPT,:BNC	24931	28JR178-1
-13	210-0270-00			2		TERMINAL,LUG:0.375 INCH DIAMETER	12697	01136902
	175-0371-00			2		. CA ASSY,SP,ELEC:4,30 AWG,108.0L	80009	175-0371-00
-14	175-0863-00			AR		. WIRE,ELECTRICAL:2 WIRE RIBBON	08261	SS-0222-1910610C
-15	131-0707-00			2		. CONNECTOR,TERM.:22-26 AWG,BRS CU BE GOLD	22526	47439
-16	352-0169-01			1		. CONN BODY,PL,EL:2 WIRE BROWN	80009	352-0169-01
-17	175-2477-01			1		LEAD ASSY,ELEC:12,22 AWG,7.5 L W/HEAT SHRINK	80009	175-2477-01
-18	----- -----			2		CKT BOARD ASSY:DATA INPUT MODULE(SEE A2 EPL)		
						(ATTACHING PARTS)		
-19	213-0088-00			4		SCR,TPG,THD CTG:4-24 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-20	----- -----			1		. CKT BOARD ASSY:MAIN(SEE A1 EPL)		
-21	346-0167-00			1		. STRAP,GROUNDING:ALUMINUM	80009	346-0167-00
-22	131-2320-00			2		. TERM,FEEDTHRU:12 PIN,INSULATED	80009	131-2320-00
-23	131-2325-00			2		. JACK,TIP:PROBE W/0.025 SQ WIRE WRAP	71279	450-3325-03
-24	----- -----			1		. DELAY LINE:4NS,100 OHM(SEE DL1671 EPL)		
-25	----- -----			18		. SWITCH,TOGGLE:(SEE S1109,S1156,S1310,S1314,		
	----- -----			-		. S1318,S1323,S1328,S1332,S1337,S1341,S1356,		
	----- -----			-		. S1361,S1366,S1371,S1375,S1380,S1384,S1389 EPL)		
-26	136-0514-00			2		. SOCKET,PLUG IN:MICROCIRCUIT,8 CONTACT	73803	CS9002-8
-27	136-0260-02			13		. SOCKET,PLUG-IN:16 CONTACT,LOW CLEARANCE	82647	C9316-18
-28	131-1003-00			1		. CONNECTOR BODY,:CKT BD MT,2 PRONG	80009	131-1003-00
-29	136-0252-04			13		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-30	----- -----			2		. SWITCH,TOGGLE:(SEE S1562,S1762 EPL)		
-31	----- -----			1		. SWITCH SL ASSY:(SEE S1556 EPL)		
-32	200-2330-00			1		. COVER SWITCH:PLASTIC	80009	200-2330-00
-33	----- -----			1		. RES,VAR,NONWIR:(SEE R1636,S1536 EPL)		
-34	----- -----			3		. SWITCH TOGGLE:(SEE S1509,S1620,S1590 EPL)		
-35	----- -----			2		. RES.,VAR,NONWW:(SEE R1609,R1690 EPL)		
-36	131-0592-00			2		. CONTACT,ELEC:0.885 INCH LONG	22526	47353
-37	131-0608-00			6		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357

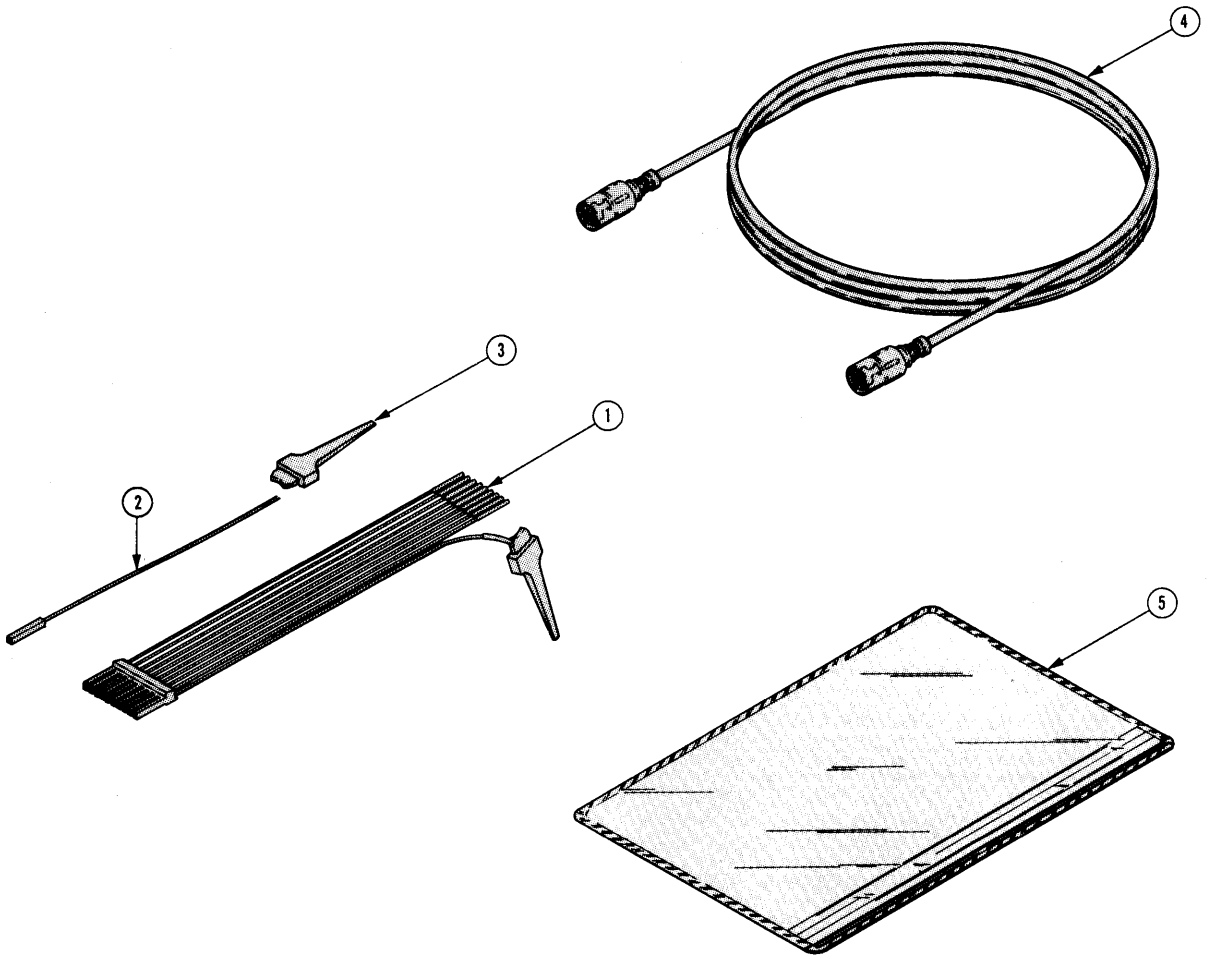


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty 1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
					STANDARD ACCESSORIES		
-1	012-0747-00			2	LEAD SET,ELEC:10 WIDE,25 CML	80009	012-0747-00
-2	195-0277-00			1	LEAD,ELECTRICAL:23 AWG,9.843L	80009	195-0277-00
-3	206-0222-00			21	TIP PROBE:MICROCIRCUIT TEST	80009	206-0222-00
-4	012-0848-00			1	CABLE,INTCON:2 METERS	05574	Y2E01A0200B3C
	012-0482-00			1	CABLE ASSY,RF:50 OHM,36 INCH LONG	80009	012-0482-00
-5	016-0537-00			1	POUCH,ACCESSORY:VINYL,W/ZIPPER	05006	OBD
	016-0451-00			1	CASE,CARRYING:BLUE VINYL (NOT SHOWN)	80009	016-0451-00
	159-0031-00			1	FUSE,CARTRIDGE:3AG,0.4A,250V,SLOW-BLOW	71400	MDL 4/10
	161-0066-00			1	CABLE ASSY,PWR,:3 WIRE,98 INCH LONG	80009	161-0066-00
	159-0044-00			1	FUSE,CARTRIDGE:3AG,0.2A,250V,SLOW-BLOW	71400	MDL 2/10
	070-2730-00			1	MANUAL,TECH:INSTRUCTION,A6701 (NOT SHOWN)	80009	070-2730-00
					OPTIONAL ACCESSORIES		
	012-0800-00			1	LEAD SET,ELEC:10 WIDE,9.843 L	80009	012-0800-00
	012-0209-00			1	CABLE,INTCON:20.0 FT L	80009	012-0209-00
	012-0655-01			1	LEAD SET,ELEC:INPUT W/10 40CM L WIRES	80009	012-0655-01
	012-0655-02			1	LEAD SET,ELEC:INPUT,W/10 7.874 L WIRES	80009	012-0655-02
	015-0330-00			1	ADPTR,TEST CLIP:16 DIP	80009	015-0330-00
	103-0209-00			1	ADAPTER,CONN:GRIB TO PROBE	80009	103-0209-00
	015-0339-00			1	ADPTR,TEST CLIP:40 DIP	80009	015-0339-00

MANUAL CHANGE INFORMATION

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

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

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

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108	PG 501 - 5 V output pulse; 3.5 ns Risetime	108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114	Performance of replacement equipment is the same or better than equipment being replaced.	
115		
2101		
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
191		
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
067-0650-00		
TG 501 replaces 180, 180A	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181		181 - Multiple time-marks
184	TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs.
2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.

Tektronix®

COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 8-13-79 Change Reference: C1/879

Product: A6701 ALL SERIAL NUMBERS Manual Part No.: 070-2730-00

DESCRIPTION

GENERAL

In addition to the electrical changes listed in this Manual Change Information insert, the A6701 Word Recognizer panel nomenclature and function have been changed. The switch shown in this manual as TRIGGER INDICATOR STATUS is now marked TRIGGER STATUS and the position shown as FIRST has been changed to LATCH (see Figure 1 below) all references and illustrations in text and elsewhere in this manual should be changed accordingly. Some of these references and illustrations appear on the following pages: i (first entry for page 3-8), vi (see Figure 1 below), page 2-5 and page 2-6 (callout 11, see revised text listed below), page 2-8 (step 6, see revised text), page 3-1 (last paragraph, see revised text), page 3-2 (see Figure 2 below), page 3-8 (change title in left column and revise paragraphs one, two, four and eight as itemized later in this insert), page 4-2 (remove word INDICATOR in Preliminary Step 5, and in Performance Check Procedure see revised text for Step 1 parts g, i, and j), page 4-11 (remove word INDICATOR in Step 5).

TEXT CHANGES

Page 2-5 Refer to Figure 1 below for TRIGGER STATUS switch details.

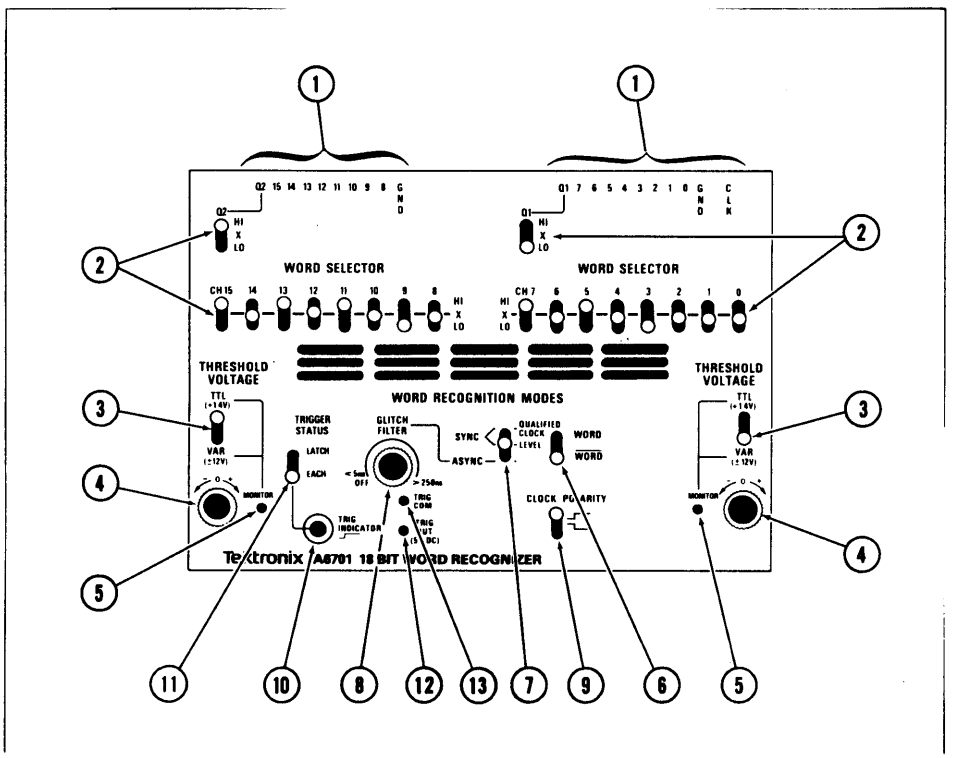


Figure 1, Partial WR controls (TRIGGER STATUS SWITCH changes).

DESCRIPTION

Page 2-6 Change callout 11 text as follows:

(11) TRIGGER STATUS Switch--A two-position toggle switch used to control the trigger output and the trigger indicator circuitry.

LATCH--Causes the trigger output to latch in the high state whenever a trigger condition occurs. The output will remain high until the TRIGGER STATUS switch is set to EACH, or until the test setup is changed. The TRIG INDICATOR LED will remain illuminated as long as the output signal is high.

EACH--Causes the trigger output circuitry to provide a trigger signal for "each" word recognition. The TRIG INDICATOR LED will momentarily illuminate for each trigger output and remain on for the length of time the trigger output remains high plus 10 milliseconds.

Page 2-8 Change step 6 to read as follows:

6. Set TRIGGER STATUS switch to either LATCH or EACH as desired.

Page 3-1 Change last sentence in right column to read:

.....The Trigger Indicator and Status circuits control the LED illumination to show the presence of a trigger signal at the outputs.

Page 3-2 Change a portion of Figure 3-1 as shown in Figure 2:

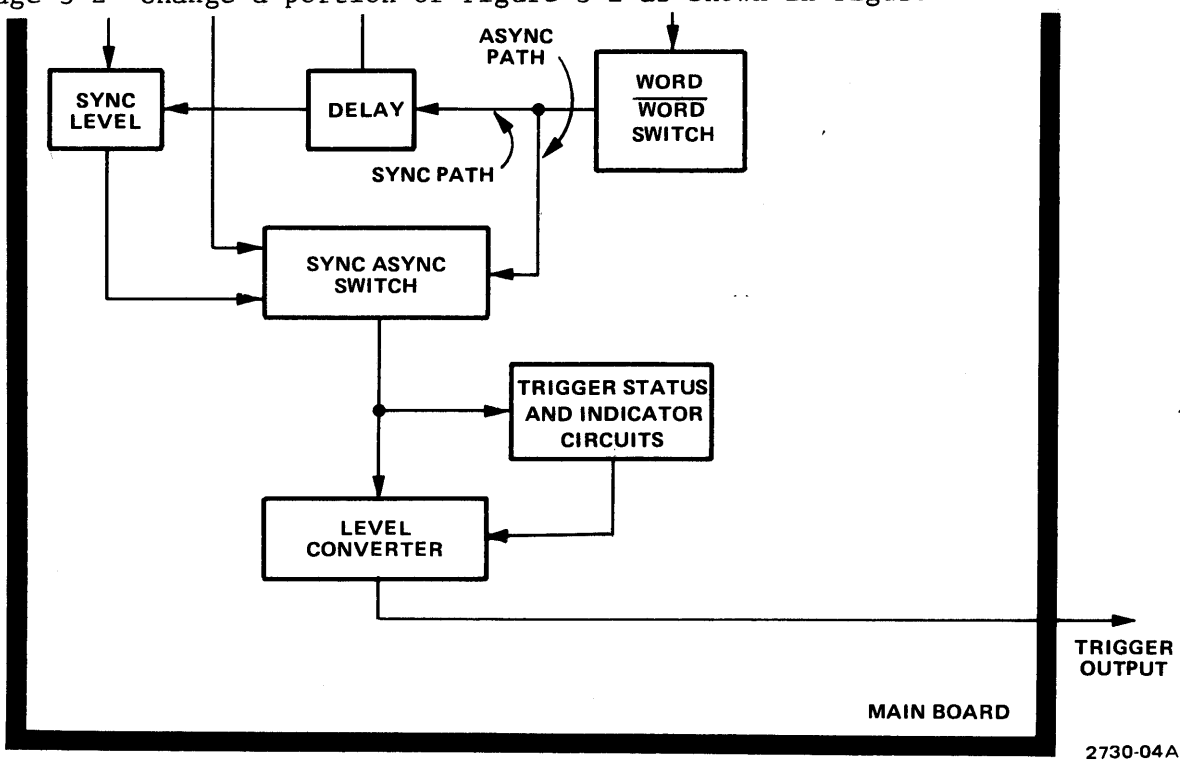


Figure 2. Partial block diagram (Trigger changes).

DESCRIPTION

Page 3-8

CHANGE: The title and the first three sentences at the start of the left column to read:

Trigger Status and Indicator Circuitry ◇5

The same differential word recognition signals seen at the bases of the level converter transistors are also sent to pin 7 of U1546B and to pin 10 of U1546C in the Trigger Status circuitry. Before word recognition occurs, pin 7 of U1546B is high and pin 10 of U1546C is low. With TRIGGER STATUS switch S1620 set to EACH, pin 11 of U1546C is pulled low via the internal pulldown resistor.....

REMOVE: The word INDICATOR in the second paragraph.

ADD: The following sentence at the end of the second paragraph:

.....In the EACH position, Q1631 is turned off and the LATCH circuit is disabled.

CHANGE: The fourth paragraph to read:

With TRIGGER STATUS switch S1620 set to LATCH, pin 12 of U1546C is held high (via S1620). This holds U1750B pin 13 low. Therefore, the reset of flip-flop U1750B is disabled, and the first word recognition trigger pulse will set the Q output (pin 15) high. In the LATCH position, Q1631 is driven into saturation when the first trigger occurs and the level converter is disabled, holding the Trigger OUTPUT signal high until it is reset. Transistor Q1515 will conduct, keeping the TRIG INDICATOR LED illuminated until the TRIGGER STATUS switch is set to EACH or the A6701 system is turned off.

Page 3-8 At end of the −2-Volt Supply description

ADD:

Zener diode VR3720 and Q3812 provide short circuit protection for the −2-Volt supply. If the −2-Volt supply is shorted to ground, as its output approaches zero volts VR3720 conducts, causing Q3520 to fire which increases current flow in the −5-Volt supply and opens fuse F3435.

If the −2-Volt and −5-Volt supplies are accidentally shorted together, Q3812 conducts and again causes Q3520 to fire and open F3435.

DESCRIPTION

Page 4-2 Step 1, parts g, and i; NOTE following part i, and part j.

CHANGE TO:

g. Set TRIGGER STATUS switch to LATCH.

i. Set WORD/$\overline{\text{WORD}}$ switch to $\overline{\text{WORD}}$ and verify that TRIG INDICATOR LED is illuminated with oscilloscope indication greater than 2.2 volts.

DELETE: The NOTE following part i.

CHANGE: Part j to read:

j. Set TRIGGER STATUS switch to EACH and verify that TRIG INDICATOR LED extinguishes with oscilloscope indication at less than 0.6 volts.

Page 4-3 Following Step 2, part b.

ADD:

NOTE

Discrepancies in threshold voltage readings may be due to a difference in ground potentials between the A6701 Power Supply ground and the ground for the system under test. A quick verification of the threshold voltage accuracy can be performed by connecting a voltmeter common lead to the grounded portion of a bnc connector on the A6701 Word Recognizer unit.

DESCRIPTION

ELECTRICAL PARTS LIST CHANGES

A1 MAIN BOARD

			DIAG	REF
ADD:				
A1C1121	283-0107-00	CAP.,FXD,CER DI:51PF,5%,200V		PC15
A1C1190	283-0107-00	CAP.,FXD,CER DI:51PF,5%,200V		PC15
A1CR1627	152-0322-00	SEMICOND DEVICE:SILICON,15V,5028		PC15
A1CR1722	152-0141-02	SEMICOND DEVICE:SILICON,30V,150MA		PC15
A1CR1736	152-0141-02	SEMICOND DEVICE:SILICON,30V,150MA		PC15
A1Q1631	151-0221-00	TRANSISTOR:SILICON,PNP,2N5771		PC15
A1Q1635	151-0472-00	TRANSISTOR:SILICON,NPN,FMT,5093		PC15
A1R1009	315-0510-00	RES.,FXD,CMPSN:51 OHM,5%,0.25W		PC15
A1R1293	315-0510-00	RES.,FXD,CMPSN:51 OHM,5%,0.25W		PC15
A1R1643	323-0081-00	RES.,FXD,FILM:68.1 OHM,1%,0.50W		PC19
A1R1721	315-0301-00	RES.,FXD,CMPSN:300 OHM,5%,0.25W		PC15
A1R1724	315-0221-00	RES.,FXD,CMPSN:220 OHM,5%,0.25W		PC15
A1R1730	302-0101-00	RES.,FXD,CMPSN:100 OHM,10%,0.50W		PC15
A1R1732	315-0101-00	RES.,FXD,CMPSN:100 OHM,5%,0.25W		PC18
REMOVE:				
A1CR1629	152-0141-02	SEMICOND DEVICE:SILICON,30V,150MA		PC15
A1CR1721	152-0141-02	SEMICOND DEVICE:SILICON,30V,150MA		PC15
A1Q1735	151-0472-00	TRANSISTOR:SILICON,NPN		PC15
A1R1629	315-0101-00	RES.,FXD,CMPSN:100 OHM,5%,0.25W		PC18
A1R1722	315-0221-00	RES.,FXD,CMPSN:220 OHM,5%,0.25W		PC15
A1R1729	302-0101-00	RES.,FXD,CMPSN:100 OHM,10%,0.50W		PC18
A1R1735	315-0101-00	RES.,FXD,CMPSN:100 OHM,5%,0.25W		PC15
A1R1742	315-0680-00	RES.,FXD,CMPSN:68 OHM,5%,0.25W		PC15
CHANGE TO:				
A1R1616	315-0361-00	RES.,FXD,CMPSN:360 OHM,5%,0.25W		PC15
A1R1727	315-0820-00	RES.,FXD,CMPSN:82 OHM,5%,0.25W		PC15
A1R1728	307-0487-00	RES.,NTWK,FXD,FI:100 OHM,20%,0.50W(3-SECTION)		PC18

DESCRIPTION

A3 POWER SUPPLY BOARD

ADD:			REF
A3Q3812	151-0188-03	TRANSISTOR:SILICON,PNP,2N3906	PC16
A3R3530	315-0300-00	RES.,FXD,CMPSN:30 OHM,5%,0.25W	PC16
A3R3716	321-0713-00	RES.,FXD,FILM:30 OHM,1%,0.125W	PC16
A3VR3720	152-0395-00	SEMICOND DEVICE:ZENER,0.4W,4.3V,5%,1N749A	PC16
REMOVE:			
A3R3525	315-0300-00	RES.,FXD,CMPSN:30 OHM,5%,0.25W	PC16
CHANGE TO:			
A3Q3373	151-0190-05	TRANSISTOR:SILICON,NPN,(SEL FROM 2N3904)	PC16
A3Q3622	151-0188-03	TRANSISTOR:SILICON,PNP	PC16
A3Q3629	151-0188-03	TRANSISTOR:SILICON,PNP	PC16
A3Q3689	151-0190-05	TRANSISTOR:SILICON,NPN	PC16
A3R3711	321-0102-00	RES.,FXD,FILM:113 OHM,1%,0.125W	PC16

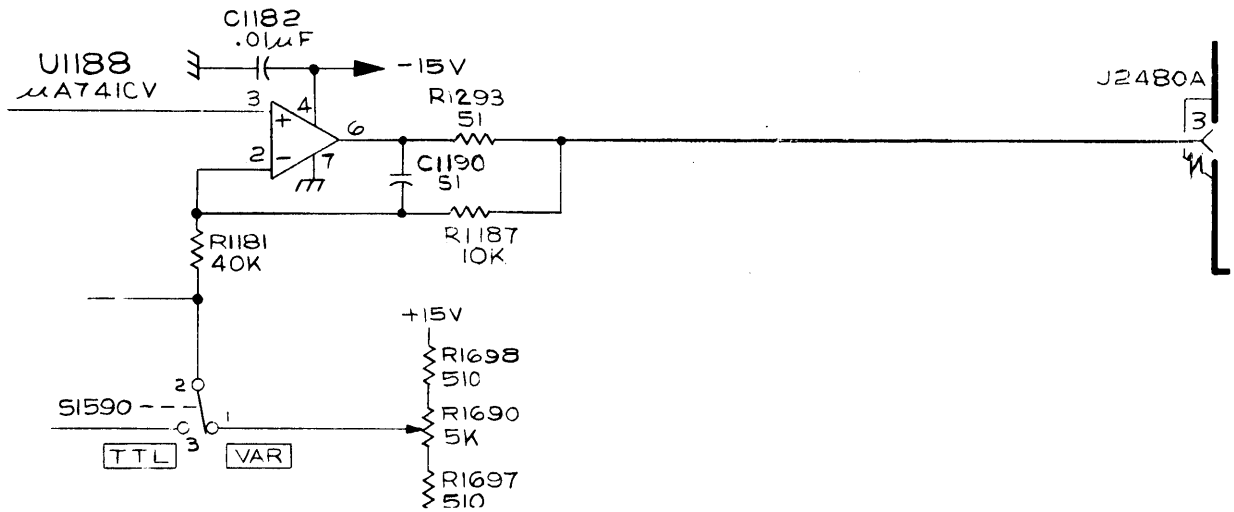
DIAGRAMS SECTION CHANGES

Back of DIAGRAMS tab page Troubleshooting Test Setups

REMOVE: The word INDICATOR in PART I, C.

Diagram 2 WORD SELECTOR CHANNELS Ø-7, Q1 & CLK

ADD: C1190 and R1293 as shown in partial 2 below:

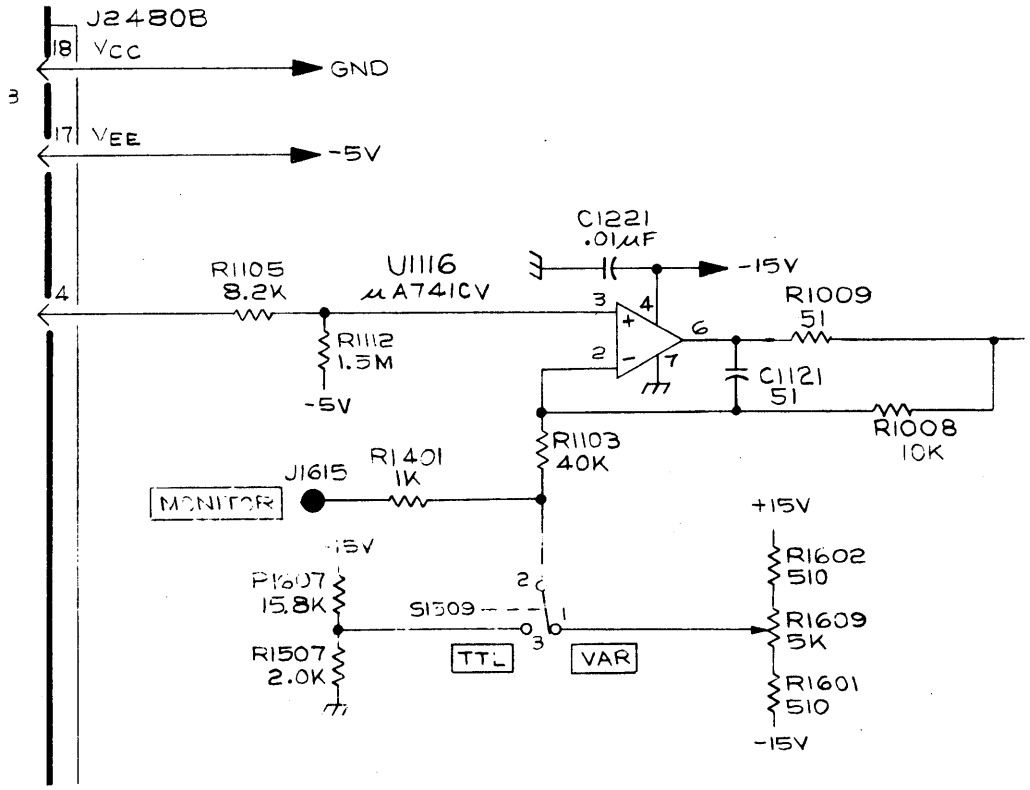


DESCRIPTION

DIAGRAM CHANGES

DIAGRAM ◇4◇ WORD SELECTOR - CHANNELS 8-15, Q2

ADD: C1121 and R1009 as shown in partial 4 below:



DESCRIPTION

DIAGRAMS SECTION CHANGES (cont.)

Figure 8-4: A1 MAIN circuit board component locations:

REPLACE: Existing Figure 8-4 with Figure 3 shown below:

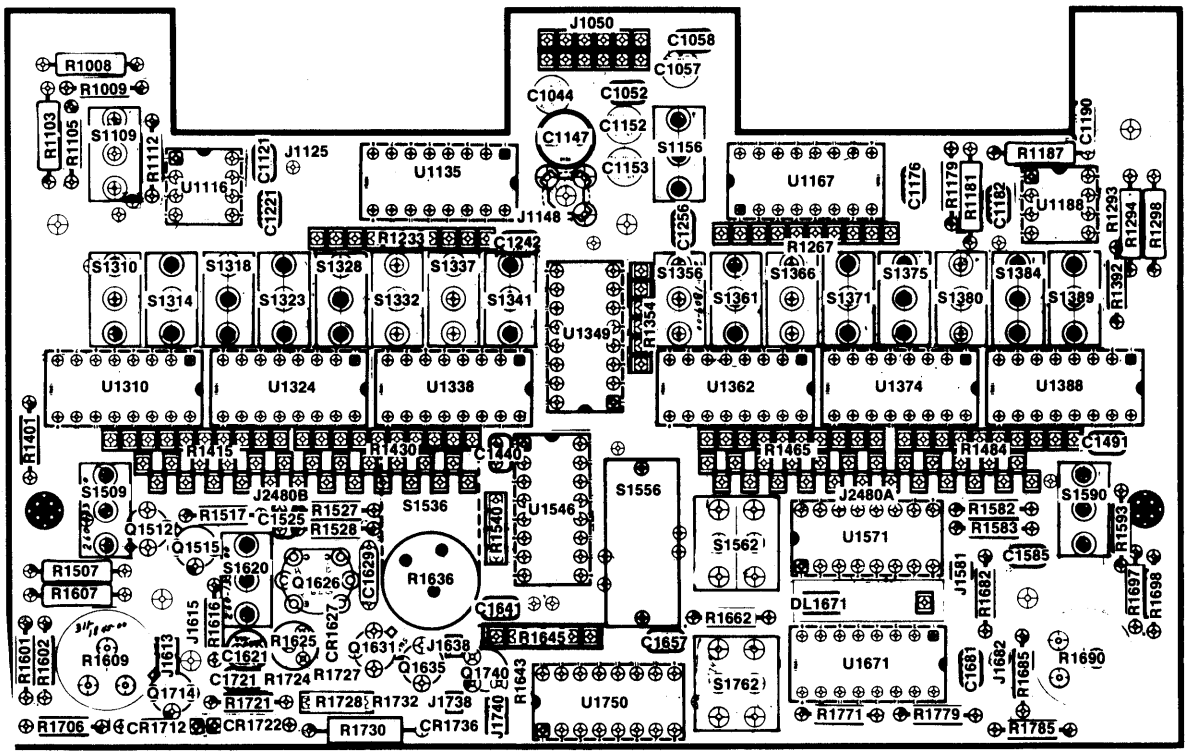


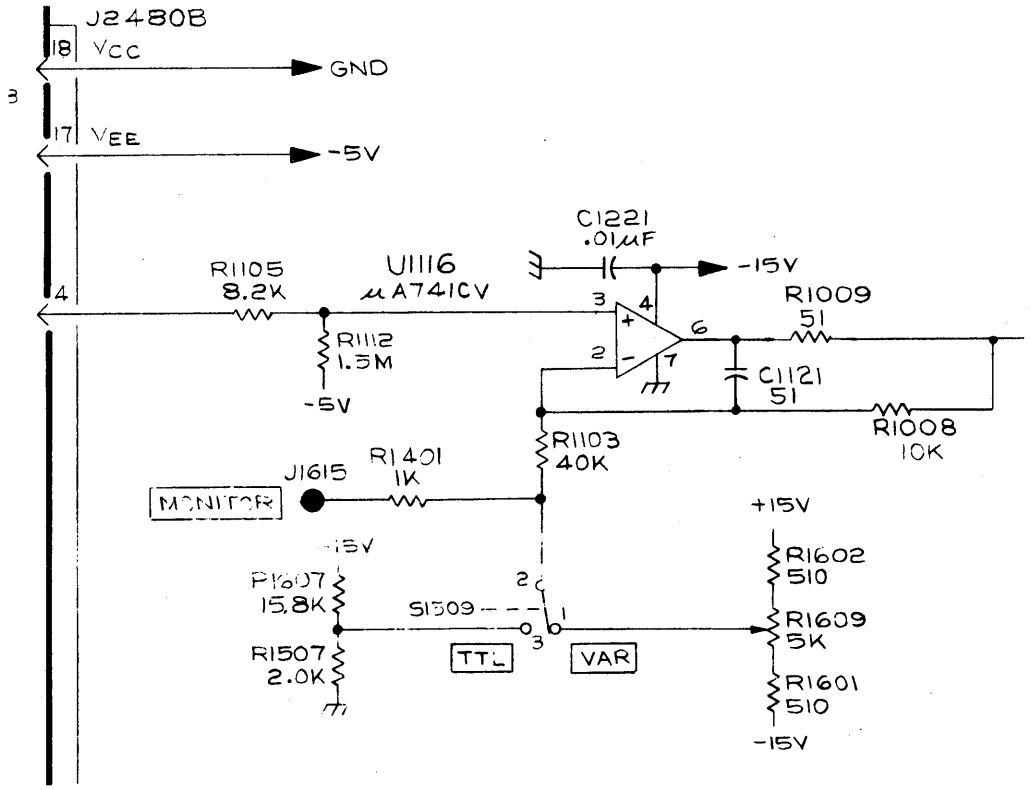
Figure 3. A1 Main circuit board component location changes.

DESCRIPTION

DIAGRAM CHANGES

DIAGRAM ◇4◇ WORD SELECTOR - CHANNELS 8-15, Q2

ADD: C1121 and R1009 as shown in partial 4 below:



DESCRIPTION

DIAGRAMS SECTION CHANGES (cont.)

Figure 8-4: A1 MAIN circuit board component locations:

REPLACE: Existing Figure 8-4 with Figure 3 shown below:

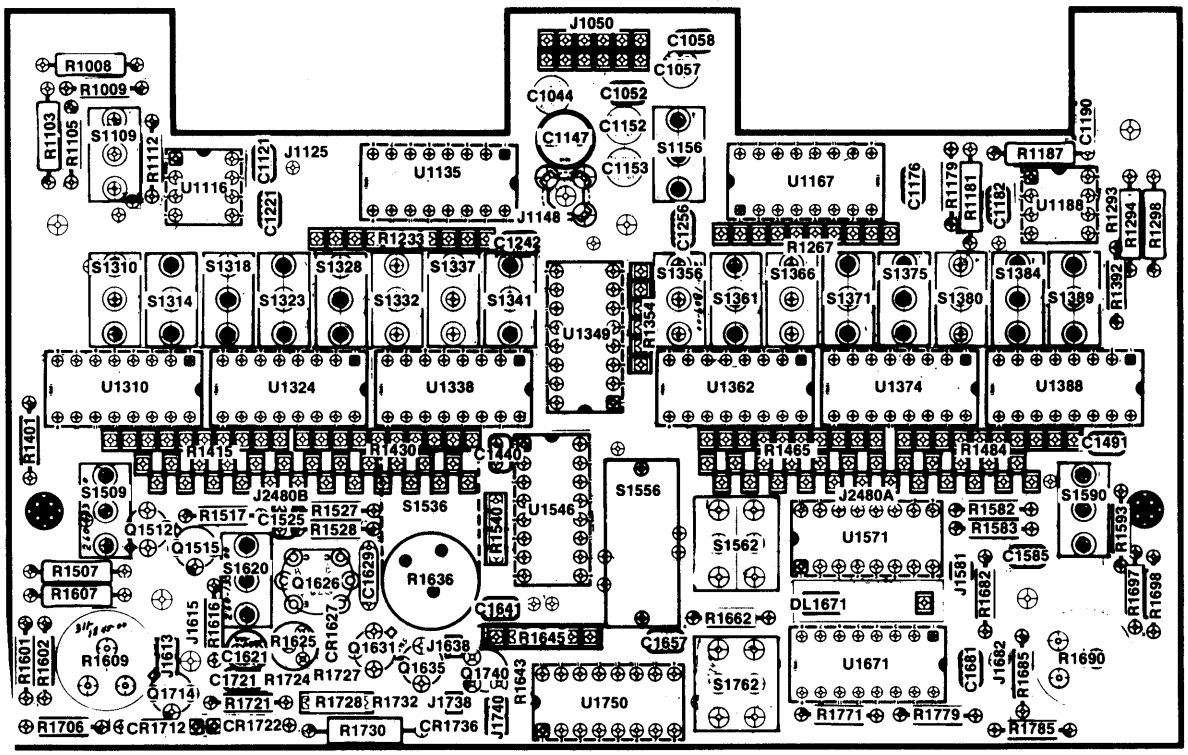


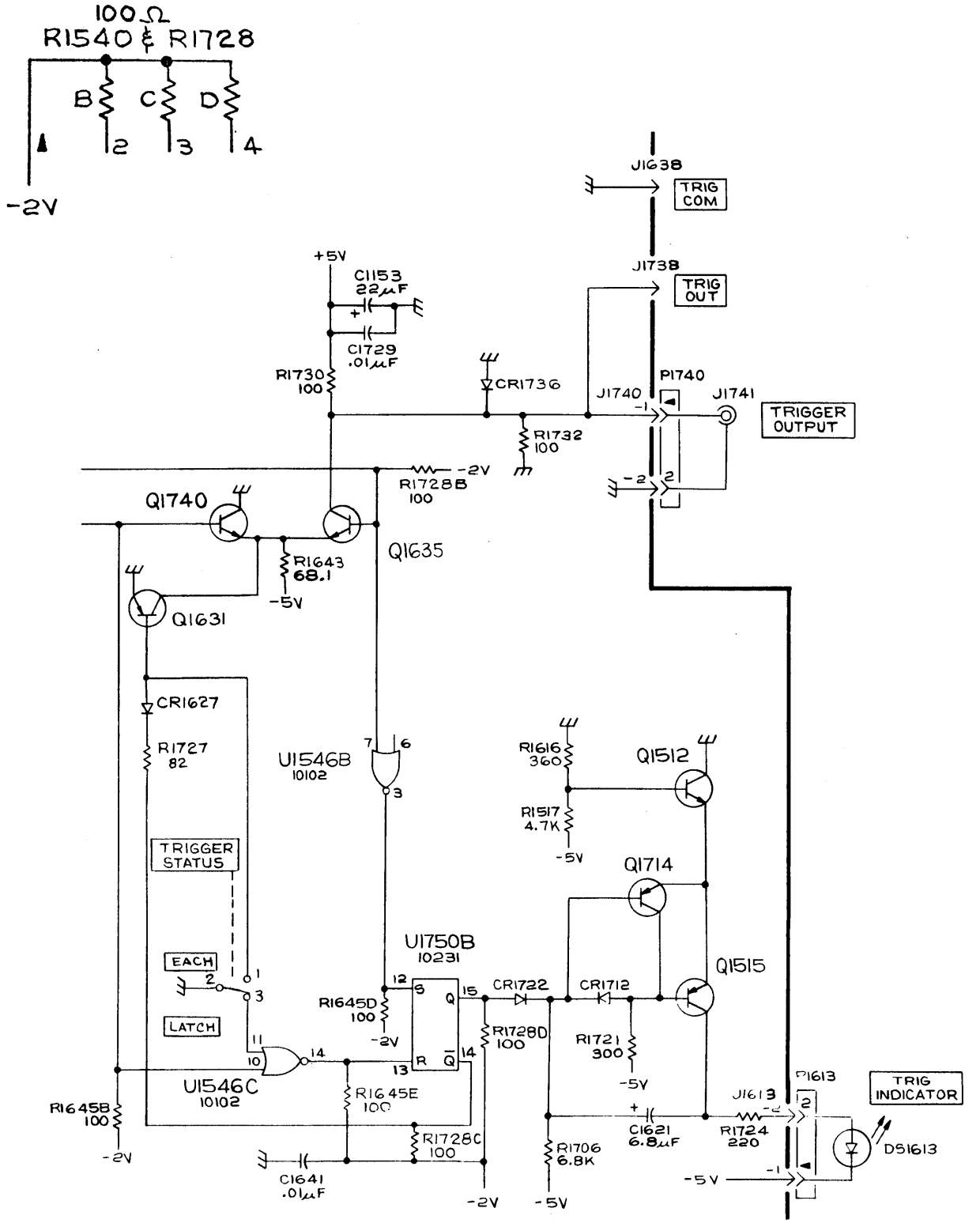
Figure 3. A1 Main circuit board component location changes.

DESCRIPTION

DIAGRAMS SECTION CHANGES (cont.)

DIAGRAM ◇5◇ WORD RECOGNITION MODES

REFER: To partial ◇5◇ below for circuitry changes:



DESCRIPTION

DIAGRAMS SECTION CHANGES (cont.)

Figure 8-5. A3 Power Supply circuit board component locations.

REPLACE: Existing Figure 8-5 with Figure 4 shown below.

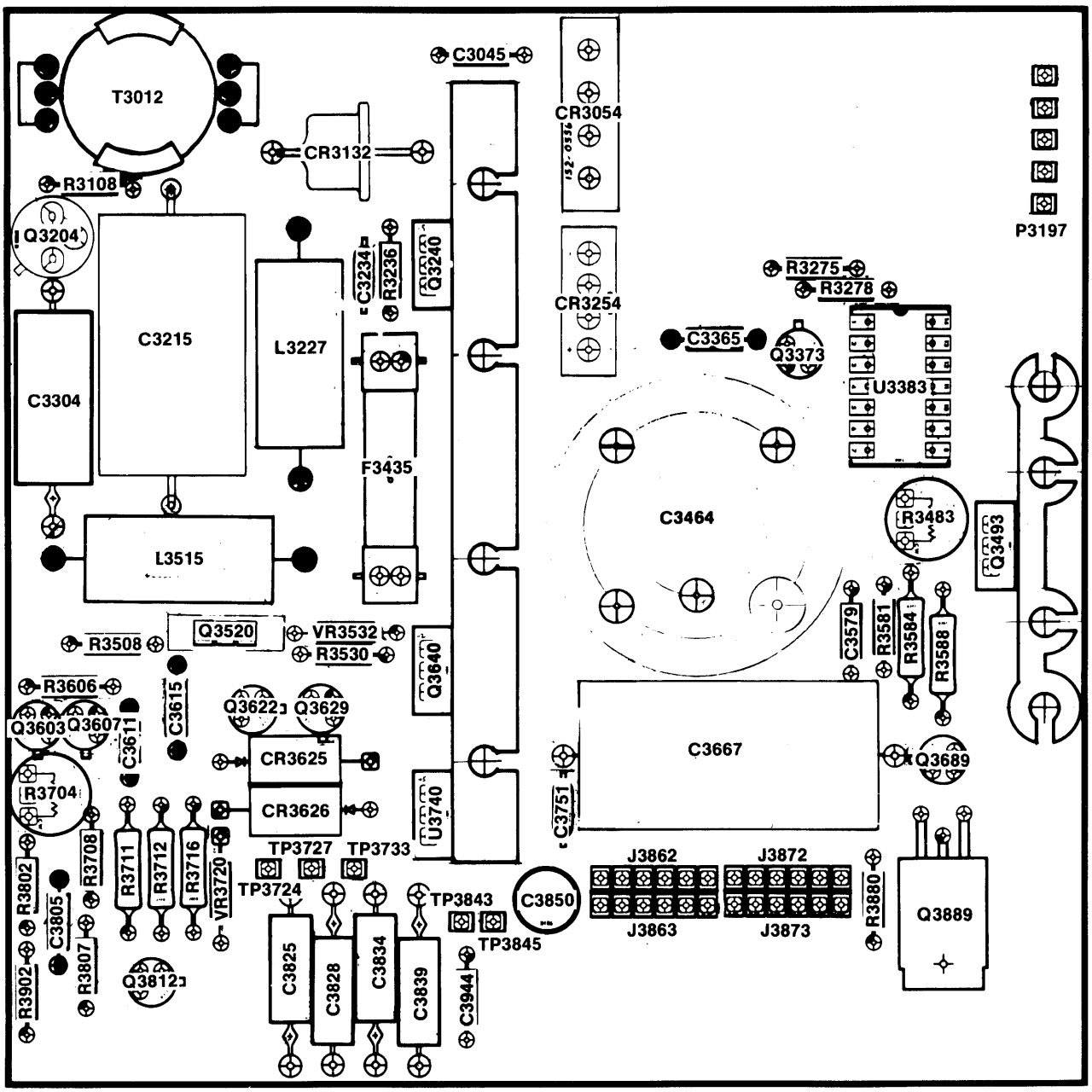


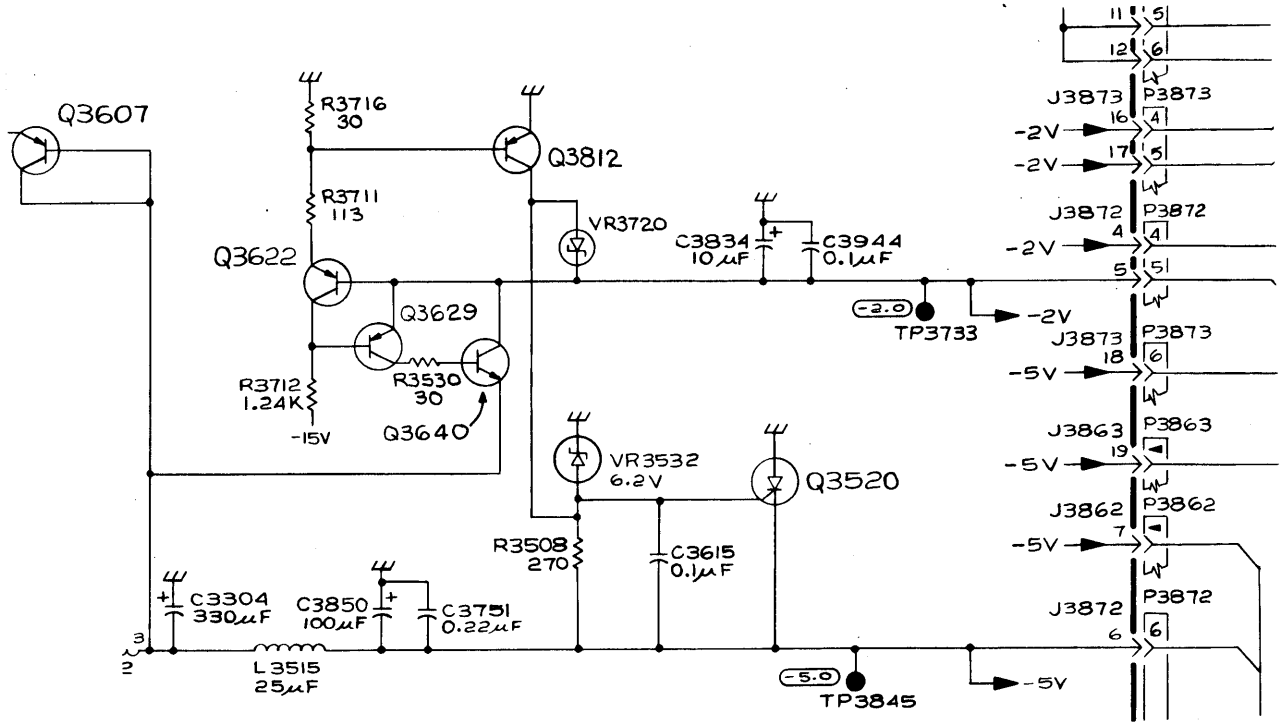
Figure 4. A3 Power Supply board component location changes.

DESCRIPTION

DIAGRAMS SECTION CHANGES (cont.)

DIAGRAM ◇6◇ POWER SUPPLY

REFER; To partial diagram ◇6◇ shown below for circuit change details:



MANUAL CHANGE INFORMATION

Tektronix® COMMITTED TO EXCELLENCE

Date: 10-16-79 Change Reference: C2/1079 REV.

Product: A6701 ALL SERIAL NUMBERS Manual Part No.: 070-2730-00

DESCRIPTION

TEXT CHANGES

MANUAL CHANGE INFORMATION C1/879

Page 3 Last paragraph

CHANGE TO READ:

If the -2 Volt and -5 Volt supplies are accidentally shorted together, Q3812 conducts and causes the -5 Volt supply to decrease to ≈ -3.3 V to protect the A6701 system.

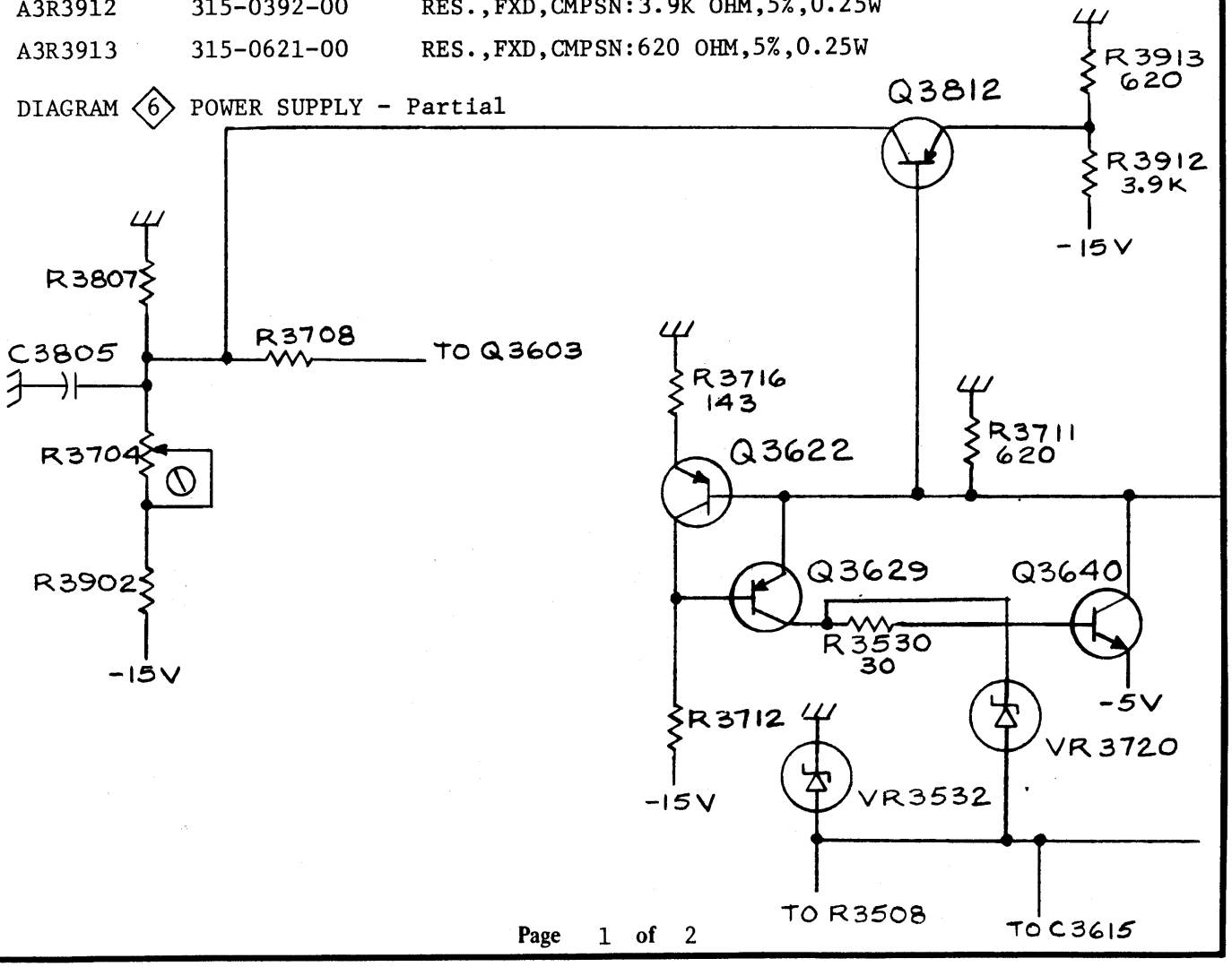
CHANGE TO: ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

A3R3711	315-0621-00	RES.,FXD,CMPSN:620 OHM,5%,0.25W
A3R3716	321-0112-00	RES.,FXD,FILM:143 OHM,1%,0.125W
A3R3880	307-0109-00	RES.,FXD,CMPSN:8.5 OHM,5%,0.25W

ADD:

A3R3912	315-0392-00	RES.,FXD,CMPSN:3.9K OHM,5%,0.25W
A3R3913	315-0621-00	RES.,FXD,CMPSN:620 OHM,5%,0.25W

DIAGRAM 6 POWER SUPPLY - Partial



DESCRIPTION

TROUBLESHOOTING CHART ADDITIONS