



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

**7912AD
CALIBRATION KIT**

067-0854-00

INSTRUCTION MANUAL

**Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077**

Serial Number _____

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SAFETY SUMMARY

This manual contains safety information which the user must follow to ensure safe operation of this instrument. WARNING information is intended to protect the operator. The following are general safety precautions that must be observed during all phases of operation and maintenance.

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.

Ground the Instrument

To reduce electrical-shock hazard, the 7912AD chassis must be properly grounded. Refer to the 7912AD Service Manual for grounding information.

Do Not Operate in Explosive Atmosphere

Do not operate this instrument in an area where flammable gases or fumes are present. Such operation could cause an explosion.

Do Not Service or Adjust Alone

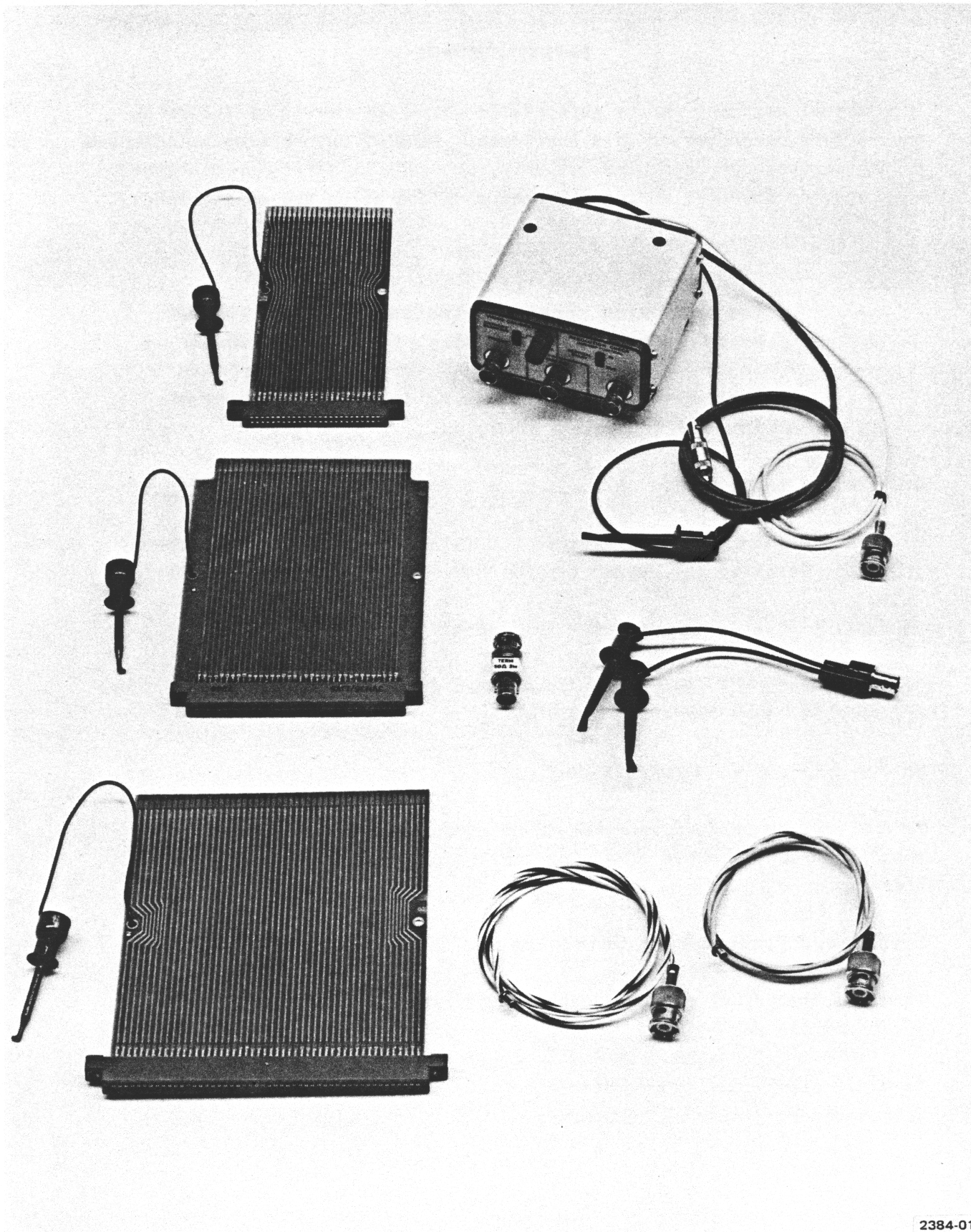
Do not service or make internal adjustments to this instrument unless another person, capable of giving first aid and resuscitation, is present.

Disconnect Power Before Servicing

To avoid electrical shock, disconnect the instrument from the power source before soldering.

To avoid electrical shock, disconnect the instrument from the power source before replacing components.

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The 7912AD Calibration Kit

SECTION 1**OPERATION**

The TEKTRONIX 7912AD Calibration Kit provides signals and makes signal connections for calibration and repair of the TEKTRONIX 7912AD Programmable Digitizer. For these purposes, the kit contains a calibration signal source, cables, and extender cards. The calibration signal source is the same one supplied with the R7912 Calibration Kit; however, new cables and extenders have been substituted as necessary.

Calibration Aid

The Calibration Aid is a calibration signal source that is used during several steps in the 7912AD calibration procedure. Also called the Video Calibrator, it provides special-purpose signals used to adjust the 7912AD video preamplifier and processor and to check the horizontal resolution of data acquired by the 7912AD. Specific operating instructions for the Calibration Aid are not given in this manual because these instructions are part of the 7912AD calibration procedure. More general operating information is given here, however, to describe the controls and connectors and to specify performance of the Calibration Aid.

Controls and Connectors

Power Connector: Mates with the 7912AD PROBE POWER outlet to power the Calibration Aid.

VIDEO CALIBRATION Connector: Provides either the CATHODE BLANKING or PREAMP signal (selected by switch).

CATHODE BLANKING: A negative-going pulse used to blank a small area in the center of the 7912AD scan converter target.

PREAMP: A standard-amplitude signal to check the gain of the 7912AD video preamplifier.

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RESOLUTION CHECK Connector: Provides a fast-rise signal as selected by the VERTICAL DELAY switch. This signal is used to check the 7912AD data resolution. When the VERTICAL DELAY switch is set to the IN position, the signal is delayed by about 1.25 nanoseconds from the triggering signal.

TRIG OUT Connector: Provides a triggering signal for the other outputs. The CATHODE BLANKING/PREAMP switch must be set to PREAMP to get either the PREAMP or RESOLUTION CHECK triggering signal.

CAL Connector: Provides input for a clock signal from the 7912AD.

SYNC IN Probe: Provides input for a sync signal from the 7912AD.

Specifications

The electrical specifications listed in Table 1-1 are valid within the environmental limits in Table 1-2. Also, the Calibration Aid must be calibrated within each 1000 hours of operation or each six-month period if operated infrequently; it should be calibrated at an ambient temperature of +20 to +30 degrees C after a five-minute warm-up. Statements in the Performance Requirements column are verified by performing the calibration procedure. Statements in the Supplemental Information column are not to be construed as performance requirements, but indicate expected performance.

TABLE 1-1
CALIBRATION AND ELECTRICAL CHARACTERISTICS

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
<p>PREAMP signal output (CAL input connected to 7912AD TP28302)</p> <p>Amplitude</p> <p>Rise time</p> <p>Pulse duty factor</p> <p>Frequency</p>	<p>20 millivolts $\pm 1\%$ into 50 ohms</p> <p>6 nanoseconds or less</p>	<p>50%</p> <p>250 kilohertz</p>
<p>CATHODE BLANKING out- put (SYNC input con- nected to 7912AD TP28402)</p> <p>Amplitude</p> <p>Fall time</p> <p>Pulse width</p> <p>Frequency</p>	<p>-5 volts $\pm 10\%$</p>	<p>Approximately 300 nanoseconds</p> <p>3.2 microseconds $\pm 10\%$</p> <p>60 hertz (50 hertz for 7912AD Option 13)</p>
<p>TRIG OUT</p> <p>Amplitude</p> <p>PREAMP or RESO- LUTION CHECK</p>		<p>Approximately 600 millivolts into 50 ohms</p>

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CATHODE BLANKING Frequency		Approximately 4.8 volts (unterminated) Divided by two from frequency of main output
RESOLUTION CHECK (CAL input connected to 7912AD TP28302) Amplitude Pulse duty factor Frequency		Approximately 200 millivolts 50% 250 kilohertz
VERTICAL DELAY IN	Pulse is delayed 1.25 nanoseconds $\pm 10\%$ compared to VERTICAL DELAY OUT	

TABLE 1-2
ENVIRONMENTAL CHARACTERISTICS

CHARACTERISTICS	PERFORMANCE REQUIREMENTS
Temperature	
Operating	+20 to +30 degrees C.
Storage	-55 to +75 degrees C.
Altitude	
Operating	Up to 4570 meters (15,000 feet)
Nonoperating	Up to 15,200 meters (50,000 feet)

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Cables and Connectors

In addition to the cables and connectors attached to the Calibration Aid and extender cards, some other cables and connectors are supplied in the 7912AD Calibration Kit. These are shown in Fig. 1-1. The use of the cables is called out in the 7912AD calibration procedure.

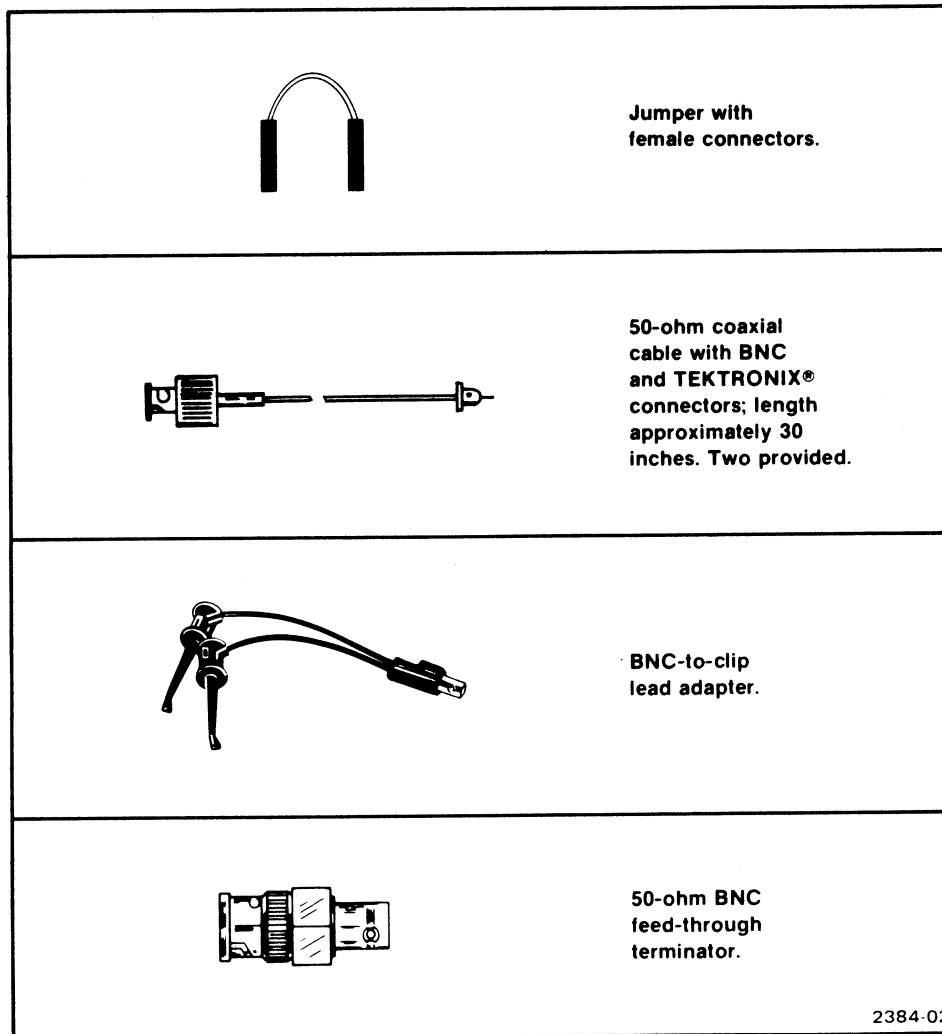


Fig. 1-1. 7912AD Calibration Kit cables and connectors.

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Extender Boards

Three extender boards are supplied in the 7912AD Calibration Kit to accommodate the several sizes of circuit boards in the 7912AD. These extenders are used to make 7912AD boards accessible for service while the 7912AD is in an operating condition. Each extender board includes a ground clip; connect the clip to the 7912AD chassis ground to reduce noise while operating the instrument with the extenders.

CAUTION

Turn power off before removing or inserting any of the 7912AD plug-in boards while using the extenders.

SECTION 2**SERVICING**

This section contains the Calibration Aid circuit description and servicing instructions for the Calibration Kit.

Circuit Description

The Calibration Aid converts two internal 7912AD signals into test signals for calibration of the 7912AD. The Calibration Aid provides four kinds of signals: blanking, calibrated square wave, fast-rise pulse, and triggering.

Cathode Blanking

The CATHODE BLANKING output is used to blank a small portion of the 7912AD TV frame during calibration. The output is synchronized so that the blanked portion appears in the middle of the center TV scanning line. To do this, the SYNC IN probe is connected to TP402 on the 7912AD Video Processor and Scan Control board (A28). The negative transition of the sync signal marks the beginning of the center TV scan line. This transition triggers one-shot U101A, which is adjusted to delay the CATHODE BLANKING output pulse about 30 microseconds. Thus, blanking occurs at the center of the TV line. After the delay, U101B is triggered by the trailing (low-to-high) edge of the U101A O output pulse. The output pulse width of U101B is approximately 3.2 microseconds, setting the width of the blanking pulse.

The blanking pulse is inverted and amplified by Q111. R115 is a front-panel control that varies the baseline of the blanking pulse as needed to match the 7912AD circuit.

Since the 7912AD scans in the standard interlaced format, the Calibration Aid is triggered to produce two blanking pulses per frame as shown in Fig. 2-1. The normal adjustment of R101, however, positions the blanking pulse for field 2 offscreen so only the blank spot in the center of the screen is visible.

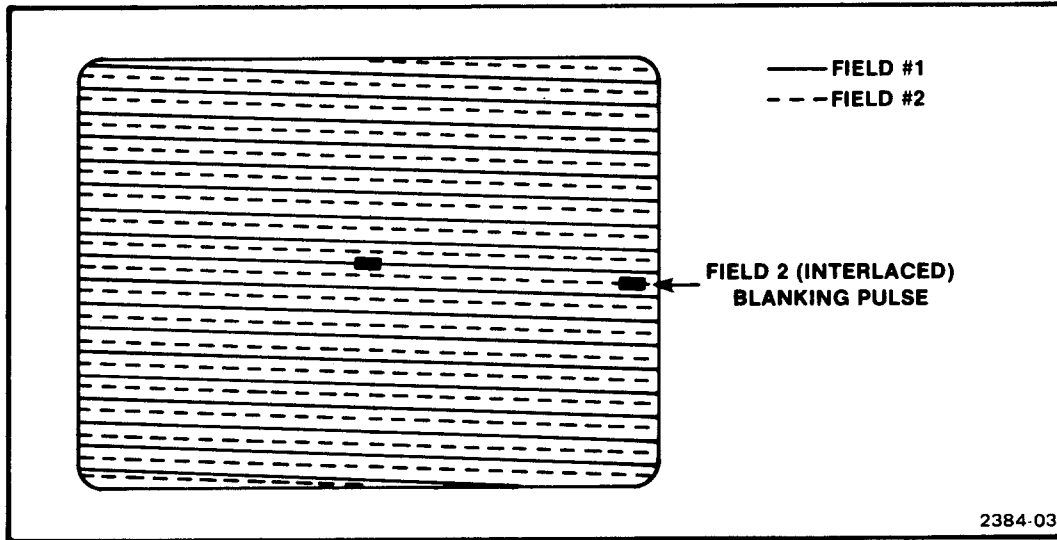


Fig. 2-1. A TV scan showing both CATHODE BLANKING pulses; normally the field 2 pulse is off-screen when R101 is adjusted correctly.

The TRIG OUT signal supplied in the CATHODE BLANKING mode comes from flip/flop U212A, which divides the CATHODE BLANKING output frequency by two. This eliminates double-triggering when looking at an oscilloscope display of the CATHODE BLANKING pulse while triggered on the TRIG OUT signal.

Preamp

The PREAMP output provides a calibration signal for the 7912AD video preamplifier. This square-wave output is used for adjustment of both gain and transient response of the video preamplifier. The CAL input of the Calibration Aid is connected to a 500 kilohertz signal from TP302 on the 7912AD Video Processor and Scan Control board (A28). The CAL input on the Calibration Aid is marked 1 MHz only because that was the frequency used with the R7912 Transient Digitizer. U121B operates on the CAL input as a divide-by-two in the same manner as U121A. The 250 kilohertz square wave from U121B's 0 output drives amplifier Q131 through an RC network that sets the PREAMP output gain and transient response. Low-frequency signal

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drive to Q131 is adjusted by R135 and high-frequency drive by C136. The output is AC-coupled through C139. R140 and C140 compensate for the inductance in the output switch, S101.

The PREAMP triggering signal is provided through Q141, driven by the 1 output of U111B. The PREAMP trigger signal is in phase with the PREAMP signal even though the two outputs of U121B are complementary. The phase inversion is cancelled by the two output transistors, one of which is inverting (Q131), and one of which is not (Q141).

Resolution Check

The RESOLUTION CHECK output provides a fast-rise signal used to check the horizontal resolution of data acquired by the 7912AD. To do this, two pulses, one delayed 1.25 nanoseconds from the other, are digitized. They are then displayed on a monitor and compared. If the rising edge of each pulse is distinct, the 7912AD has adequate resolution; if not distinct, the resolution is inadequate.

The RESOLUTION CHECK output provides a fast-rise pulse, either delayed, or not delayed with respect to the trigger, according to the position of S102.

As in the case of the PREAMP output, the CAL input signal from the 7912AD is divided by two by U121B. Q141 provides both the output and the trigger signal; the two signals are isolated by R146. To get the trigger signal, S101 must be in the PREAMP position. DL161 provides the delay if inserted in the output circuit by S102.

Maintenance

Although some specific maintenance is described here, more general maintenance information can be found in the 7912AD Service Manual.

Preventative

Cleaning and visual inspection of the Calibration Aid and items in the 7912AD Calibration Kit are recommended when the time comes to recalibrate the Calibration Aid. Cleaning should be done more often, if required. Exterior surfaces can be cleaned with a soft cloth. If necessary, use a small brush to dislodge dirt on and around front-panel controls. A mild detergent and water solution can also be used, but do not use abrasive cleaners.

Dust can be removed from the inside of the Calibration Aid by clean, dry, low-pressure air. To clean etched circuit boards, wash with warm water and a mild detergent solution such as Kelite mixed at a ratio of about one 1 part detergent to 20 parts water. Keep water and detergent out of potentiometers and switches. Special products are available from Tektronix Field Service Centers to clean these parts. Dry the card thoroughly before operating.

CAUTION

Do not use chemicals that can damage the components in the Calibration Kit. Such chemicals as benzene, toluene, zylene, acetone, and similar solvents are especially harmful and should never be used.

Troubleshooting

For troubleshooting, an understanding of the circuit description is helpful. A component locator diagram is printed adjacent to the schematic diagram in Section 4 as an aid in finding components shown on the schematic or mentioned in the circuit description. Before beginning to troubleshoot Calibration Aid circuitry, recheck front-panel settings, then check the power supply voltages, and then inspect circuit components for clues to any malfunction.

If the instrument is operable, but is not performing correctly in some respects, the calibration procedure can be a troubleshooting aid. By attempting to complete the procedure, the source of a malfunction may become evident.

Corrective Maintenance

Parts in the electrical and mechanical parts list can be ordered from Tektronix, Inc., or purchased through field service centers. If parts other than those purchased through Tektronix are to be used, carefully check that they are adequate as replacements by noting the descriptions in the parts list and the use of the parts in the instrument. When ordering replacement parts from Tektronix, Inc., include the instrument type, instrument serial number, a description of the part including circuit number if an electrical part, and the Tektronix part number.

Use care if electrical parts are soldered or unsoldered to prevent damage due to heat. Use a small soldering iron: 15 to 35 watts is recommended. Apply only enough heat and apply it directly to the solder connection either to unsolder if removing a part, or to form a good bond if installing a part. Use a heat sink where needed. Use only rosin core solder.

Calibration

Introduction

Perform the calibration procedure as required by repair or at the intervals stated in the specifications in Section 1. The test equipment required is listed in Table 2-1. All equipment used must be operating within its own specifications. The calibration procedure is written to use the equipment suggested; if other equipment is substituted, different setup or operation may be needed. Refer to the instruction manual for the test equipment if you need more operating instructions than those given in this procedure.

TABLE 2-1
TEST EQUIPMENT USED IN CALIBRATION PROCEDURE

Equipment	Description	Suggested Equipment
Test Oscilloscope	TEKTRONIX 7000-Series oscilloscope with probe power connector, 100 MHz bandwidth, 5 millivolt/division sensitivity, and two vertical channels.	TEKTRONIX 7603 Oscilloscope with 7A26 Dual Trace Amplifier and 7B53A Dual Time Base.
Pulse Generator	Pulse repetition rates from 60 hertz to 500 kilohertz with output amplitude up to +4 volts.	TEKTRONIX PG501 Pulse Generator with TM500 power module.

In addition to a terminator in the Calibration Kit, the following items are used in the calibration procedure. These items are available from Tektronix, Inc. They are:

Item	Tektronix Part No.
Coaxial cable (2), 50-ohm, BNC connectors	012-0057-01
BNC-to-post adapter	012-0092-00
BNC T connector	103-0030-00
Feedthrough terminator, 50-ohm, BNC connectors	011-0049-01

It is not necessary to make an adjustment if a previous CHECK step in the procedure is within limits. A checkmark indicates those steps that check Performance Requirements as listed in the specifications in Section 1.

Calibration Procedure

1. Preliminary

a. Connect the Calibration Aid power cable to the Probe Power connector on the test oscilloscope.

b. Allow the Calibration Aid to warm up for at least five minutes. Allow the test equipment to warm up as long as needed for specified performance.

c. Using a calibrated signal, such as the test oscilloscope Calibrator signal, check the oscilloscope front-panel vertical Gain and Sweep Calibration adjustments.

d. Remove the Calibration Aid covers to expose the adjustments. See Fig. 4-1 for the location of the adjustments.

2. Preamp gain check/adjust

a. Set the pulse generator for:

Pulse repetition rate:	500 kilohertz
Pulse width:	Square wave
Amplitude:	4 volts, peak-to-peak with baseline within 0.5 volts of ground, terminated into 50 ohms

b. Set the Calibration Aid for:

Switch:	PREAMP
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c. Set the test oscilloscope for:

Volts/division:	5 millivolts
Time/division:	1 microsecond

d. Connect the Calibration Aid VIDEO CALIBRATION output to the test oscilloscope vertical input; terminate with the 50-ohm feedthrough terminator supplied in the Calibration Kit.

e. Connect the Calibration Aid CAL input to the pulse generator output through a 50-ohm terminator.

√ f. **CHECK** - The test oscilloscope display for a vertical amplitude of 20 millivolts \pm 0.2 millivolts.

g. **ADJUST** - Gain, R135, for a vertical display amplitude of 20 millivolts.

3. Preamp transient response check/adjust

a. Change the test oscilloscope for:

Time/division:	5 nanoseconds
Triggering:	Positive slope
Position (time base):	Display positive transition of the pulse

√ b. **CHECK** - The rise time should be 6 nanoseconds or less with aberrations during the first 20 nanoseconds less than or equal to ± 3 percent -- total 3% (\pm 0.12 divisions -- total 0.12 division).

c. **ADJUST** - C136 for best compromise between aberrations and rise time within the limits of step 3.b.

d. Disconnect the CAL input from the pulse generator.

e. Disconnect the VIDEO CALIBRATION output from the test oscilloscope.

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4. Cathode blanking delay check/adjust

a. Change the pulse generator for:

Pulse repetition rate: 60 hertz

b. Change test oscilloscope for:

Channel 1 volts/division: 1 volt

Channel 2 volts/division: 1 volt

Vertical display: Chopped

Time/division: 10 microseconds

Trigger source: Channel 1

Trigger slope: Negative

c. Connect the Calibration Aid SYNC IN probe to the pulse generator output via a 50-ohm terminator, BNC T connector, and BNC post adapter.

d. Change Calibration Aid for:

Switch: CATHODE BLANKING

DC LEVEL: Midrange

e. Connect the pulse generator output from the BNC T connector to the test oscilloscope channel 1 input.

f. Connect the VIDEO CALIBRATION output to the test oscilloscope channel 2 input (without 50-ohm terminator).

g. Use the test oscilloscope triggering and position controls to get a stable display of the two negative pulses.

h. **CHECK** - The test oscilloscope display for a 31.7 microsecond delay between the input and output pulses; the delay is observed between the leading (negative-going) edges of both pulses.

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i. **ADJUST** - Blanking, R101, for a delay of 31.7 microseconds between the negative transitions of the SYNC input and the CATHODE BLANKING output pulses.

5. Cathode blanking amplitude check

√ a. **CHECK** - The amplitude of the CATHODE BLANKING output pulse connected to channel 2 of the test oscilloscope should be -5 volts, ± 10 percent.

b. Disconnect all test equipment. Reinstall the Calibration Aid cover.

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.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number

00X Part removed after this serial number

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

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
01002	GENERAL ELECTRIC COMPANY, INDUSTRIAL AND POWER CAPACITOR PRODUCTS DEPARTMENT	JOHN STREET	HUDSON FALLS, NY 12839
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
05091	TRI-ORDINATE CORPORATION	343 SNYDER AVENUE	BERKELEY HEIGHTS, NJ 07922
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
79727	C-W INDUSTRIES	550 DAVISVILLE RD., P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E WASHINGTON STREET	INDIANAPOLIS, IN 46206
91418	RADIO MATERIALS COMPANY, DIV. OF P.R. MALLORY AND COMPANY, INC.	P O BOX 372	
91637	DALE ELECTRONICS, INC.	4242 W BRYN MAWR	CHICAGO, IL 60646
		P. O. BOX 609	COLUMBUS, NE 68601

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-3501-00			CKT BOARD ASSY:VIDEO CALIBRATOR	80009	670-3501-00
	670-4962-00			CKT BOARD ASSY:50 PIN EXTENDER	80009	670-4962-00
	670-4963-00			CKT BOARD ASSY:36 PIN EXTENDER	80009	670-4963-00
	670-5501-00			CKT BOARD ASSY:25/50 PIN EXTENDER	80009	670-5501-00
C102	285-0598-00			CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
C103	285-0862-00			CAP.,FXD,PLSTC:0.001,10%,100V	56289	410P10291
C105	283-0023-00			CAP.,FXD,CER DI:0.1UF,+80-20%,12V	91418	MX0104Z1205R5
C125	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C136	281-0151-00			CAP.,VAR,CER DI:1-3PF,100V	72982	518-600A1-3
C138	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055COG0100F
C139	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C140	281-0564-00			CAP.,FXD,CER DI:24PF,5%,500V	72982	301-000COG0240J
C145	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C151	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C152	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C153	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C154	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C156	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C157	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
J107	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	05091	31-279
J108	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	05091	31-279
J109	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	05091	31-279
L151	105-0551-00			ACTUATOR,CAM SW:FREQUENCY SPAN	80009	105-0551-00
Q111	151-0133-00			TRANSISTOR:SILICON,PNP	80009	151-0133-00
Q131	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q141	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
R101	311-1268-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	32997	3329P-L58-103
R102	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
R103	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R105	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R106	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R108	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R109	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R111	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R112	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R115	311-1064-00			RES.,FXD,COMP:500 OHM,10%,0.5W	01121	WA1G0325501VA
R121	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R122	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R132	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R133	321-0261-00			RES.,FXD,FILM:5.11K OHM,1%,0.125W	91637	MFF1816G51100F
R134	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100ROF
R135	311-1260-00			RES.,VAR,NONWIR:250 OHM,10%,0.50W	32997	3329P-L58-251
R136	321-0258-00			RES.,FXD,FILM:4.75K OHM,1%,0.125W	91637	MFF1816G47500F
R137	321-0285-00			RES.,FXD,FILM:9.09K OHM,1%,0.125W	91637	MFF1816G90900F
R138	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R139	321-0162-00			RES.,FXD,FILM:475 OHM,1%,0.125W	91637	MFF1816G475ROF
R140	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R141	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R142	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
R143	321-0204-00			RES.,FXD,FILM:1.3K OHM,1%,0.125W	91637	MFF1816G13000F
R144	321-0258-00			RES.,FXD,FILM:4.75K OHM,1%,0.125W	91637	MFF1816G47500F

Replaceable Electrical Parts—067-0854-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R145	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R146	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249ROF
R147	321-0077-00			RES.,FXD,FILM:61.9 OHM,1%,0.125W	91637	MFF1816G61R9OF
R152	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R153	131-0566-00			LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
R154	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R156	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
S101	260-0583-00			SWITCH,SLIDE:DPDT,0.5A,125VAC,BLACK	79727	G126MOD6860
S102	260-0583-00			SWITCH,SLIDE:DPDT,0.5A,125VAC,BLACK	79727	G126MOD6860
U101	156-0405-00			MICROCIRCUIT,DI:DUAL RETRIG MONOSTABLE MV	07263	9602PC
U121	156-0039-00			MICROCIRCUIT,DI:DUAL J-K FLIP FLOP	01295	SN7473N

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

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 (μ F).
- Resistors = Ohms (Ω).

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 goes to the low state.

Abbreviations are based on ANSI Y1.1-1972.

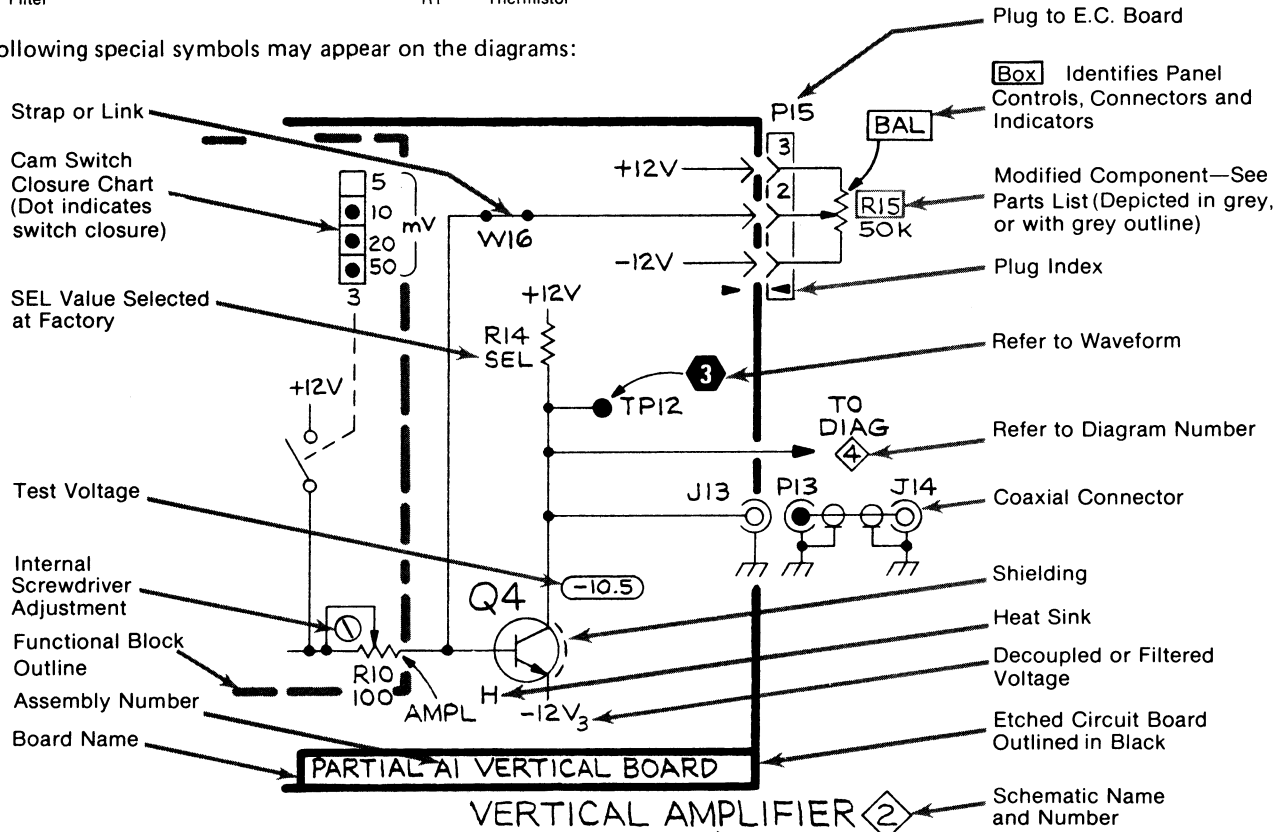
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

- 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.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc)	H	Heat dissipating device (heat sink, heat radiator, etc)	S	Switch or contactor
AT	Attenuator, fixed or variable	HR	Heater	T	Transformer
B	Motor	HY	Hybrid circuit	TC	Thermocouple
BT	Battery	J	Connector, stationary portion	TP	Test point
C	Capacitor, fixed or variable	K	Relay	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CB	Circuit breaker	L	Inductor, fixed or variable	V	Electron tube
CR	Diode, signal or rectifier	M	Meter	VR	Voltage regulator (zener diode, etc.)
DL	Delay line	P	Connector, movable portion	W	Wirestrap or cable
DS	Indicating device (lamp)	Q	Transistor or silicon-controlled rectifier	Y	Crystal
E	Spark Gap, Ferrite bead	R	Resistor, fixed or variable	Z	Phase shifter
F	Fuse	RT	Thermistor		
FL	Filter				

The following special symbols may appear on the diagrams:



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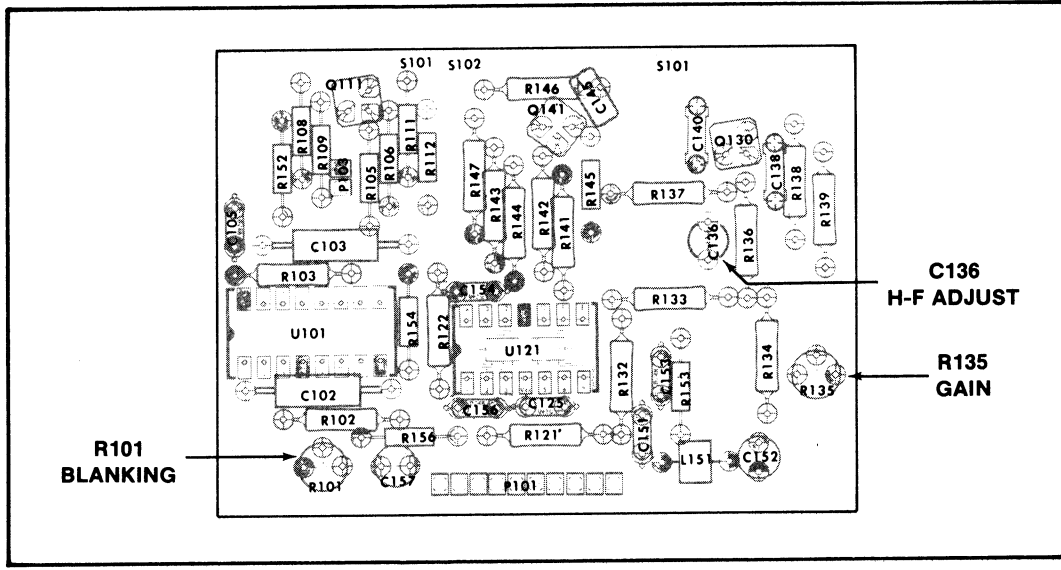
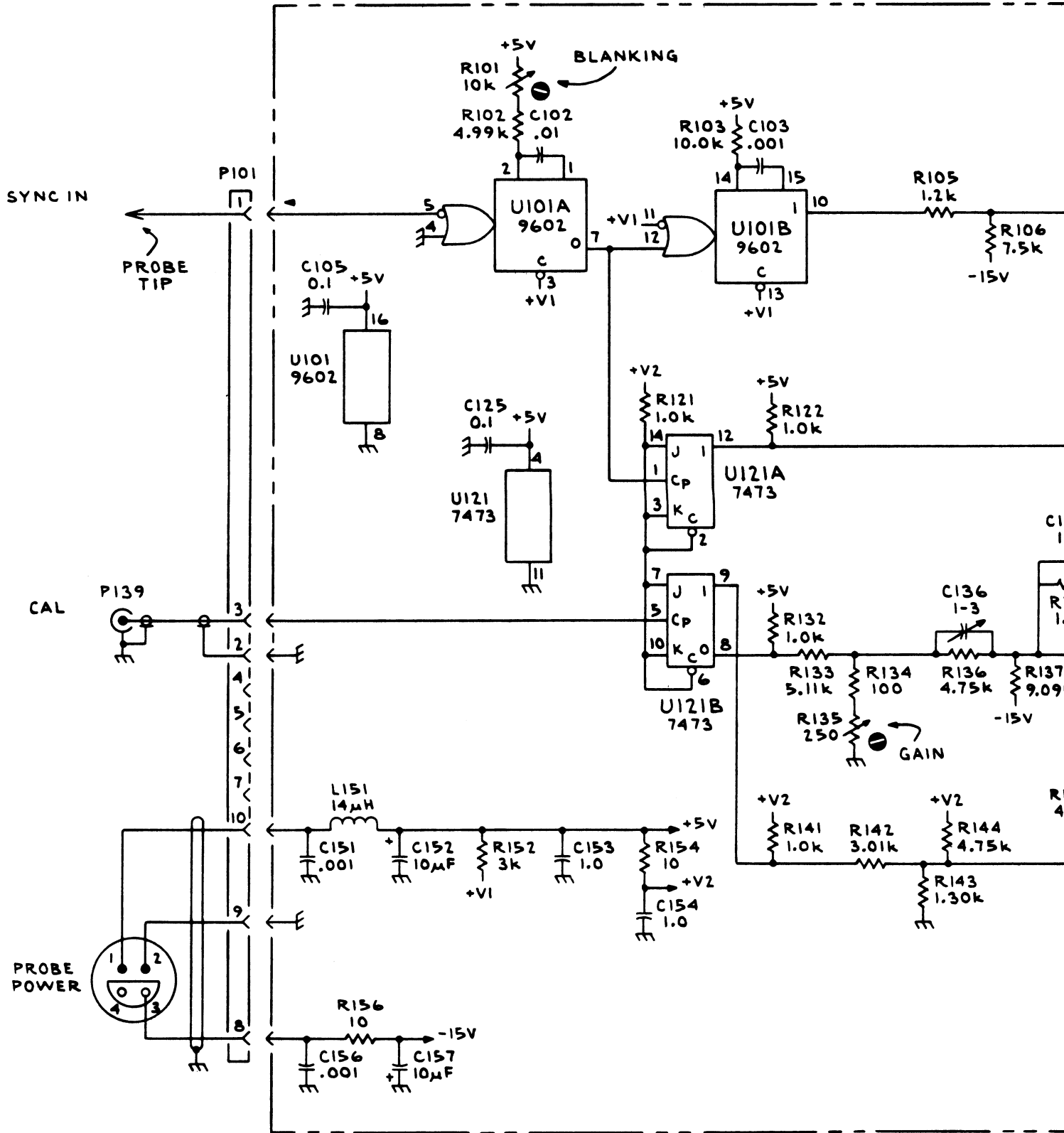
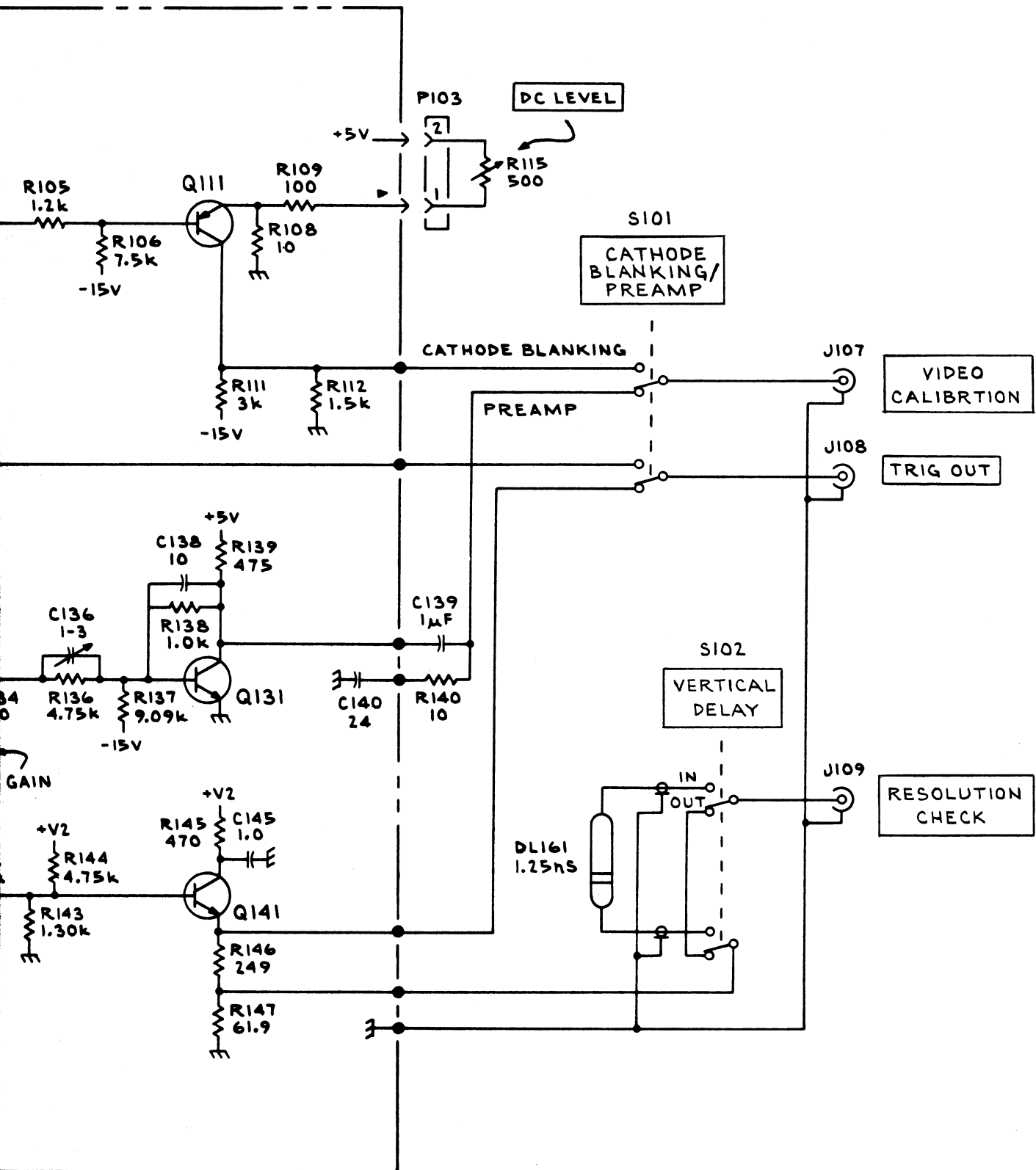


Fig. 4-1. Calibration Aid component locations.



067-0710-00

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CALIBRATION AID 1

CALIBRATION AID

NLL

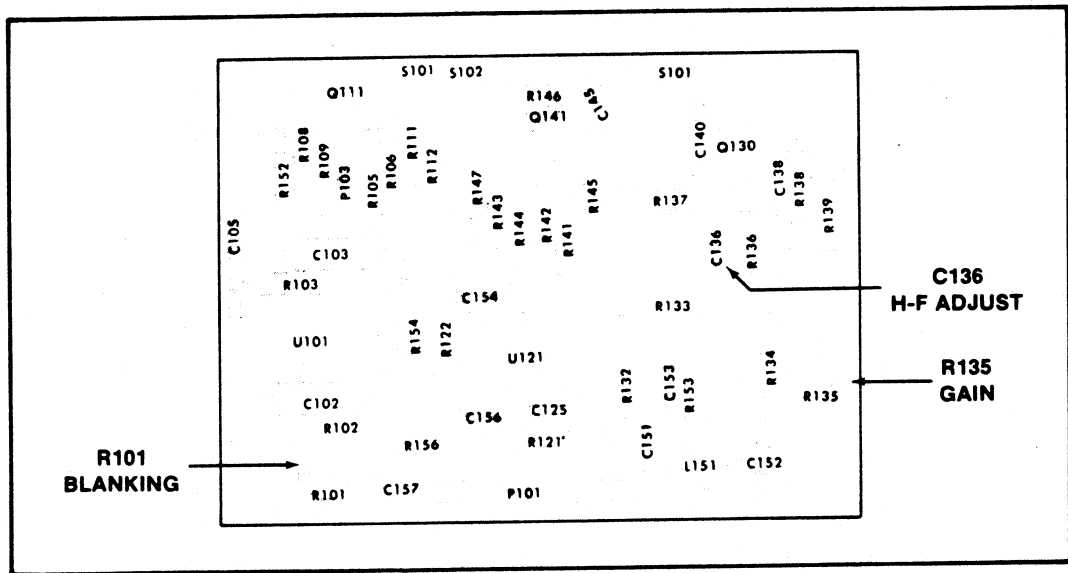


Fig. 4-1. Calibration Aid component locations.

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

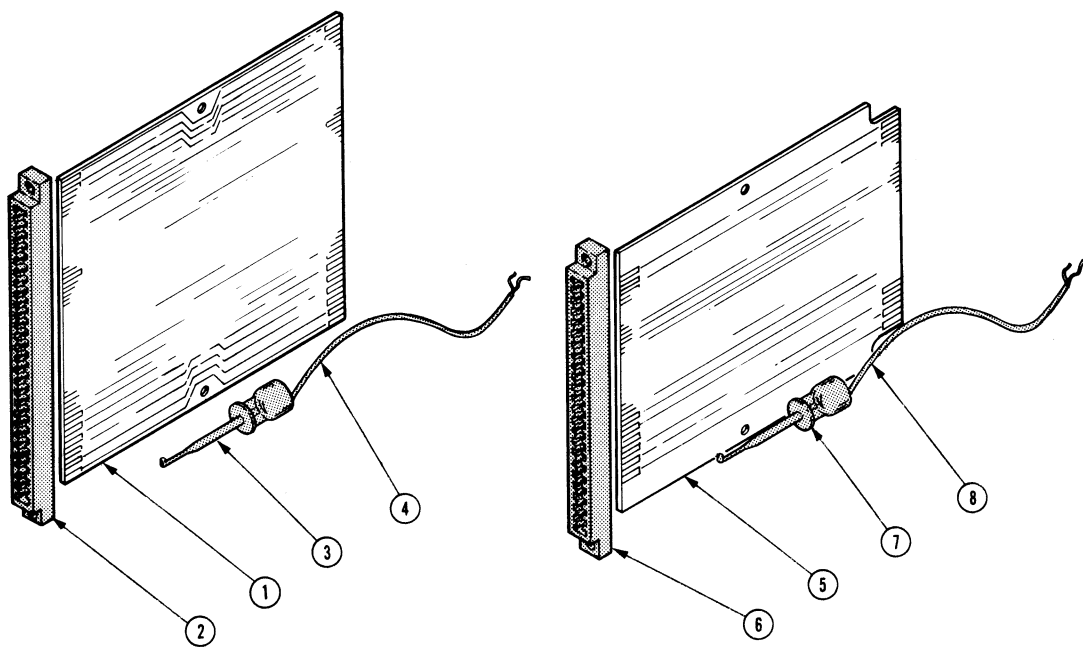
CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
0000A	LEMO USA	2015 2ND STREET	BERKLEY, CA 94710
05091	TRI-ORDINATE CORPORATION	343 SNYDER AVENUE	BERKELEY HEIGHTS, NJ 07922
05276	ITT, POMONA ELECTRONICS DIVISION	P O BOX 2767, 1500 E 9TH ST.	POMONA, CA 91766
05574	VIKING INDUSTRIES, INC.	21001 NORDHOFF STREET	CHATSWORTH, CA 91311
18203	ENGELMANN MICROWAVE CO.	SKYLINE DR.	MONTVILLE, NJ 07045
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
70318	ALLMETAL SCREW PRODUCTS CO., INC.	821 STEWART AVE.	GARDEN CITY, NY 11530
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
74868	BUNKER-RAMO CORP., THE AMPHENOL RF DIV.	33 E. FRANKLIN ST.	DANBURY, CT 06810
79727	C-W INDUSTRIES	550 DAVISVILLE RD., P O BOX 96	WARMINISTER, PA 18974
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
90484	ITT, SURPRENANT DIV.	172 STERLING STREET	CLINTON, MA 01510

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	067-0854-00		1						FIXTURE,CAL:KIT	80009	067-0854-00
	067-0710-00		1						. . FIXTURE CAL:CALIBRATION AID	80009	067-0710-00
-1	380-0419-00		1						. . HSG,WRAPAROUND:TOP (ATTACHING PARTS)	80009	380-0419-00
-2	211-0007-00		4						. . SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL - - - * - - -	83385	OBD
-3	348-0048-00		4						. . FOOT:W/6-32 X 0.350 INCH STUD	80009	348-0048-00
-4	380-0420-00		1						. . HSG,WRAPAROUND:BOTTOM (ATTACHING PARTS)	80009	380-0420-00
	211-0007-00		4						. . SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL - - - * - - -	83385	OBD
-5	366-1023-00		1						. . KNOB:GRAY	80009	366-1023-00
	213-0153-00		1						. . SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-6	-----		1						. . RES.,VAR,NONWIR:(SEE R115 EPL) (ATTACHING PARTS)		
-7	210-0583-00		1						. . NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-8	210-0940-00		1						. . WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL - - - * - - -	79807	OBD
-9	333-1945-00		1						. . PANEL,FRONT:	80009	333-1945-00
-10	131-0955-00		3						. . CONNECTOR,RCPT.:BNC,FEMALE,W/HARDWARE	05091	31-279
-11	210-0255-00		1						. . TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
-12	260-0583-00		2						. . SWITCH,SLIDE:DPDT,0.5A,125 VAC,BLK (ATTACHING PARTS FOR EACH)	79727	612MOD6860
-13	210-0405-00		2						. . NUT,PLAIN,HEX.:0.25-32 X 0.188 INCH,BRS	73743	2X12157-402
-14	211-0087-00		2						. . SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST - - - * - - -	70318	OBD
-15	200-0327-10		1						. . SUBPANEL,FRONT:	80009	200-0327-10
-16	384-0519-00		4						. . POST,ELEC-MECH:HEX,0.25 X 0.562 INCH (ATTACHING PARTS FOR EACH)	80009	384-0519-00
-17	211-0008-00		1						. . SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	OBD
-18	210-0255-00		1						. . TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
-19	-----		1						. . CKT BOARD ASSY:VIDEO CALIBRATOR(SEE EPL)		
-20	131-0608-00		8						. . CONTACT,ELEC:0.365L X 0.25 PH BRZ GOLD PL	22526	47357
-21	136-0220-00		3						. . SOCKET,PLUG-IN:3 PIN,SQUARE	71785	133-23-11-034
-22	136-0260-00		1						. . SOCKET,PLUG-IN:16 CONTACT,RECT SHAPE	71785	133-51-92-008
-23	136-0269-00		1						. . SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	71785	133-59-02-073
-24	131-0566-00		1						. . LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
-25	348-0031-00		2						. . GROMMET,PLASTIC:0.156 INCH DIA	80009	348-0031-00
-26	348-0055-00		1						. . GROMMET,PLASTIC:0.25 INCH DIA	80009	348-0055-00
-27	333-1992-00		1						. . PANEL,REAR:	80009	333-1992-00
-28	200-0327-11		1						. . SUBPANEL,REAR:	80009	200-0327-11
-29	131-0778-00		1						. . CONNECTOR,PLUG:QUICK DISCONNECT	0000A	F0304
-30	175-0250-00		FT						. . CABLE,SP,ELEC:4 COND,34" LONG	80009	175-0250-00
-31	131-0297-01		1						. . CON,PLUG,ELEC:MALE BNC,CRIMP-ON	74868	31315-1050
-32	175-1020-00		FT						. . CABLE,RF:50 OHM COAX	90484	DAB70JAAAWHITE
-33	131-0707-00		5						. . CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-34	352-0168-00		1						. . CONN BODY,PL,EL:10 WIRE BLACK	80009	352-0168-00
-35	352-0169-00		1						. . CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
-36	344-0267-00		1						. . CLIP,ELECTRICAL:HOOK TIP	05276	4011
-37	175-0997-00		1						. . LEAD,ELECTRICAL:AWG22 STRD,BLACK,18 INCH L	80009	175-0997-00

Replaceable Mechanical Parts—067-0854-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
2-1	-----	-----	1						CKT BOARD ASSY:50 PIN EXTENDER(SEE EPL)		
-2	131-0931-00		1						. CONN,RCPT,ELEC:CKT BD,50/100 CONTACT	80009	131-0931-00
-3	003-0625-00		1						. TIP,HOOK:E-Z HOOK,MINI BLACK	80009	003-0625-00
-4	198-3883-00		1						. WIRE SET,ELEC:	80009	198-3883-00
-5	-----	-----	1						CKT BOARD ASSY:36 PIN EXTENDER(SEE EPL)		
-6	131-1178-00		1						. CONN,RCPT,ELEC:CKT CARD TYPE,36/72 CONT	05574	3VH36/LJV5
-7	003-0625-00		1						. TIP,HOOK:E-Z HOOK,MINI BLACK	80009	003-0625-00
-8	198-3883-00		1						. WIRE SET,ELEC:	80009	198-3883-00
-9	-----	-----	1						CKT BOARD ASSY:25/50 PIN EXTENDER(SEE EPL)		
-10	131-1359-00		1						. CONNECTOR,RCPT,:CKT CARD,25/50CONTACT	05574	3VH25/LJN5
-11	003-0625-00		1						. TIP,HOOK:E-Z HOOK,MINI BLACK	80009	003-0625-00
-12	198-3883-00		1						. WIRE SET,ELEC:	80009	198-3883-00
	020-0317-00		1						COMPONENT KIT:	80009	020-0317-00
-13	013-0076-01		1						. ADAPTER,CONN;BNC TO ALLIGATOR CLIP	80009	013-0076-01
-14	011-0049-01		1						. TERMN,COAX:50 OHM,2W,BNC	18203	T-153-BS
-15	131-1270-00		1						. BUS,CONDUCTOR:WIRE,TERM CONN AND HOLDER	80009	131-1270-00



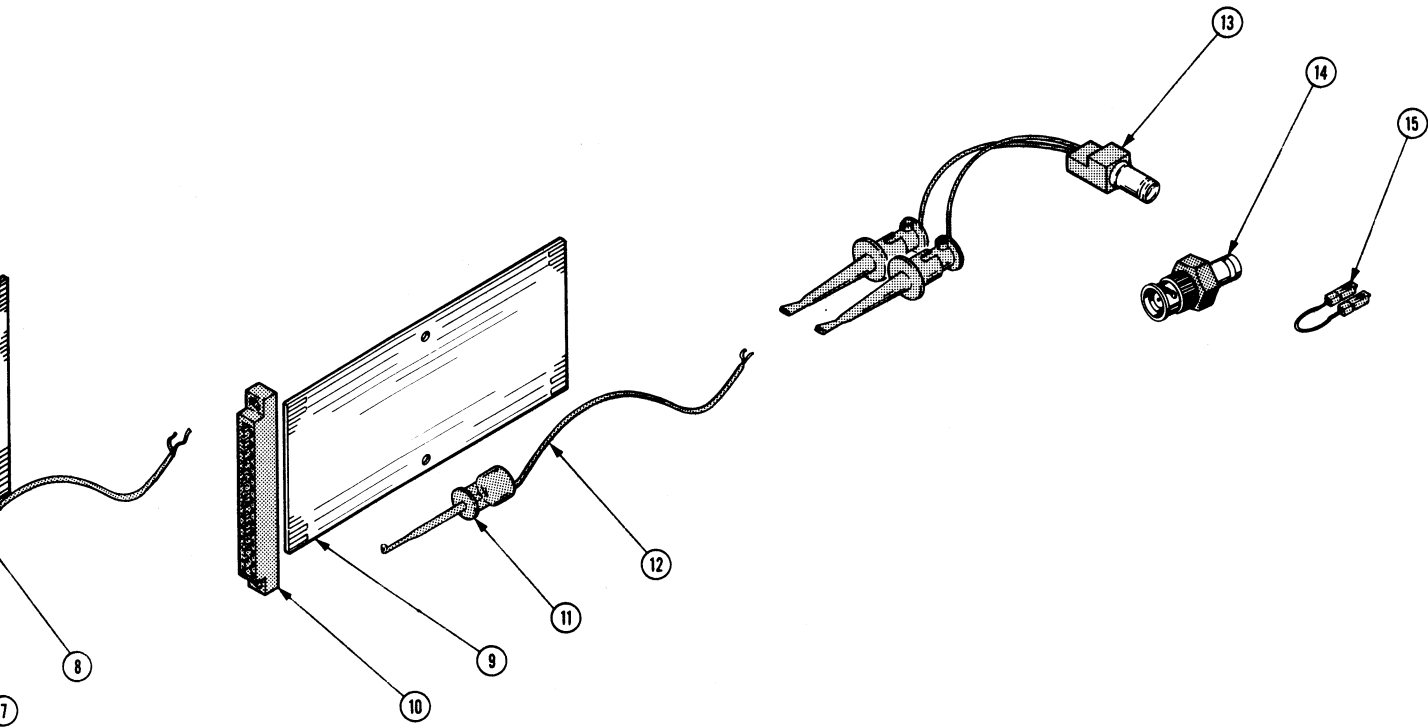


Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty						Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont		1	2	3	4	5			

070-2490-00

1 MANUAL, TECH: INSTRUCTION

80009 070-2490-00

ACCESSORIES

7912AD CALIBRATION KIT—067-0854-00

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MANUAL CHANGE INFORMATION

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

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

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

MANUAL CHANGE INFORMATION

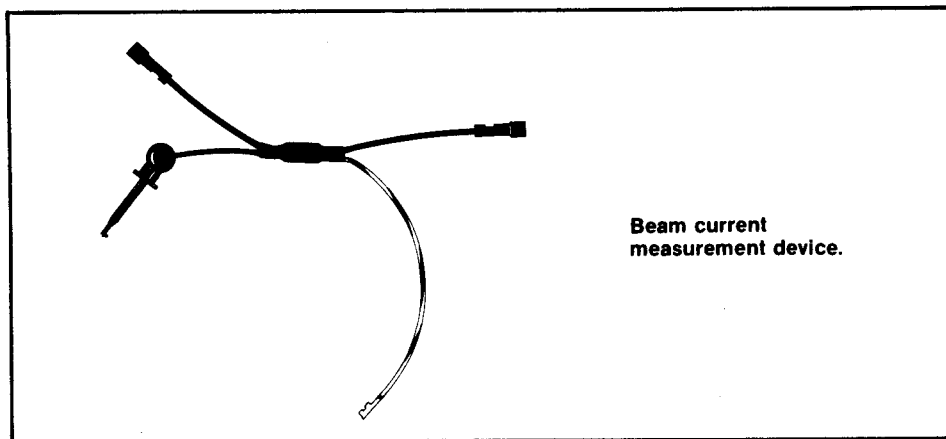
PRODUCT 7912AD
070-2490-00

CHANGE REFERENCE C1/778
DATE 6 July 1978

CHANGE:

DESCRIPTION

Add the following artwork to the existing Fig. 1-1.



Add the following to FIG. 2 in the Mechanical Parts List as part of
020-0317-00:

Tektronix Part No.	Qty	Description
012-0840-00	1	Beam Current Measurement Device



MANUAL CHANGE INFORMATION

PRODUCT 7912AD
CALIBRATION KIT 067-0854-00

CHANGE REFERENCE C2/878
DATE 8-15-78

CHANGE:	DESCRIPTION
---------	-------------

070-2490-00

TEXT CORRECTION

Page iii Frontis Photograph

The short jumper and the beam current measurement device included in the kit are not shown on the frontis photograph opposite page 1-1.

MECHANICAL PARTS LIST CORRECTION

Page 5-4 Fig. 2

ADD:

067-0709-00 2 FIXTURE,CAL:30" LONG,CABLE ASSEMBLY

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Typically the scans in our manuals are done as follows;

- 1) Typed text pages are typically scanned in black and white at 300 dpi.
- 2) Photo pages are typically scanned in gray scale mode at 600 dpi
- 3) Schematic diagram pages are typically scanned in black and white at 600 dpi unless the original manual had colored high lighting (as is the case for some 70's vintage Tektronix manuals).

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