

OPERATING INSTRUCTIONS

INTRODUCTION

INSTRUMENT DESCRIPTION

The 5A45 is a general-purpose, medium-bandwidth, single-channel plug-in unit for use with the Tektronix 5400-series oscilloscopes. An illuminated VOLTS/DIV knob skirt directly indicates deflection sensitivities. The plug-in unit also has readout encoding capabilities. When used in a main frame with readout capabilities, the deflection sensitivities are displayed directly on the crt. When used with Tektronix probes with readout capabilities, the plug-in indicates the decreased deflection sensitivity on the knob skirt, as well as on the crt. When operating in the two most sensitive positions, the reduced bandwidth is visible through the VOLTS/DIV knob skirt.

PREPARATION FOR USE

Your 5A45 is calibrated and ready for use when received. Fig. 1-1 shows the installation and removal procedure.

The 5A45 will operate in the horizontal compartment for X-Y displays. When using X-Y displays, remember that the vertical channel is delayed approximately 150 nanoseconds (3° phase shift at 50 kHz) by the vertical delay line.

Refer to the Front Panel Controls and Connectors illustration, in the foldout pages at the rear of this manual, for a complete description of the front panel.

BASIC OPERATION

Push the DISPLAY ON button in the blue area. Set the time base plug-in unit to two milliseconds per division sweep rate, and the trigger on automatic. Set the display module intensity control to midrange. Turn the 5A45 POSITION control until a trace appears on the crt. Set the VOLTS/DIV switch to .2. Make certain the slide switch is in the DC position.

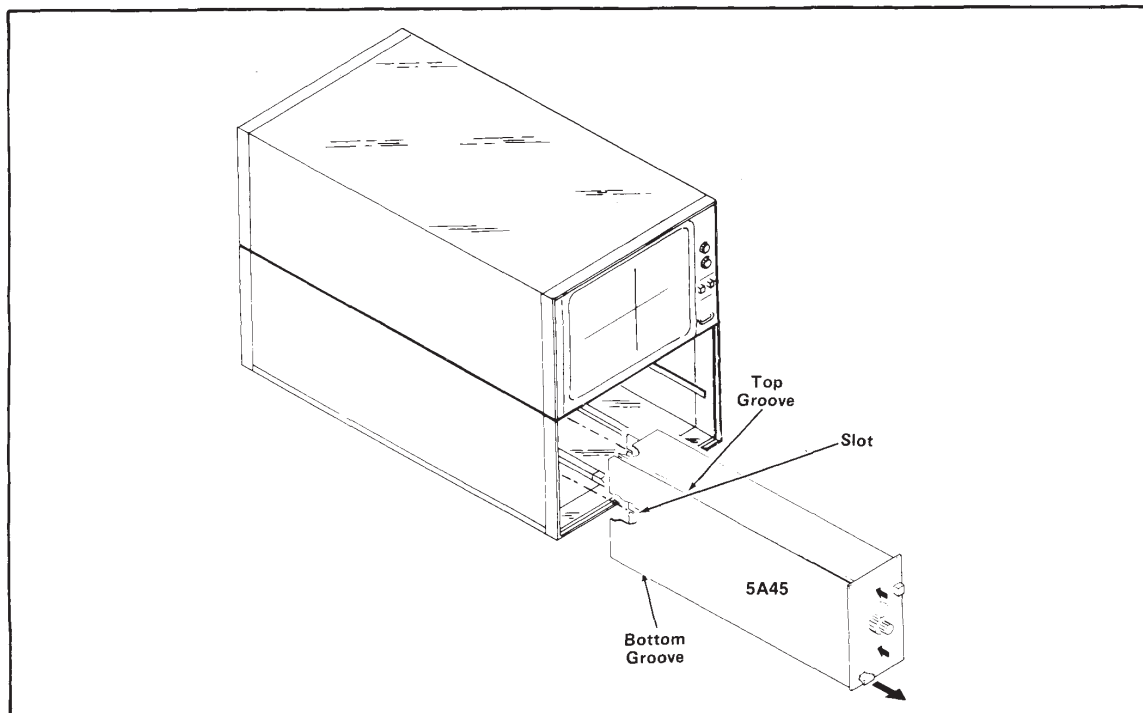


Fig. 1-1. 5A45 Installation-removal Procedure.

Operating Instructions—5A45

Apply the calibrator signal to the input connector. Adjust the triggering of the time base, if necessary, for a stable square wave display, approximately two major divisions in amplitude. Move the slide switch to the GND position and position the single trace to the graticule center. Now move the slide switch to the AC position. Notice that the square wave centers around the graticule

center, and shows a slight slope. This indicates that the signal is capacitively coupled to the input. The slope indicates low frequency rolloff due to the ac coupling.

If any of the above displays cannot be obtained, refer to the Service section of this manual.

GENERAL OPERATING INFORMATION

APPLYING SIGNALS

When making measurements of unknown voltages, use the highest deflection factor first. If the deflection is too small, switch to a lower deflection factor. In general, probes offer the most convenient method of applying signals to the 5A45. Tektronix probes are shielded to prevent pickup of electrostatic and electromagnetic interference. A 10X probe offers a relatively high input impedance and minimum loading to the circuit under test. The 5A45 is compatible with readout coded probes, such as the P6065 passive probe. The Tektronix catalog lists other probes compatible with the 5A45. The input connector has an outer ring to which the coding ring on the probe connector makes contact. This allows the deflection factor (indicated on the knob skirt and the crt readout) to correspond with the actual deflection factor at the probe tip. Notice the notation WITH PROBE on the front panel.

Sometimes unshielded test leads can be used to connect the 5A45 to a signal source. This method works best when measuring high-level signals with relatively low source impedances. Coaxial cable with bnc connectors works well in certain applications. When using unterminated coaxial cable, use the shortest possible lengths to prevent unnecessary capacitive loading of the signal source. A common ground between the signal source and 5A45 is required. The

probe ground connection or the shield of a coaxial cable works well as a ground return.

INPUT COUPLING

Dc coupling can be used in most applications. If the dc component of the measured signal is large compared to the ac component, ac coupling should be used. Use dc coupling for ac signals below about 10 hertz, to avoid signal attenuation in the ac position.

The GND position provides a ground reference at the 5A45 input. The amplifier input is grounded, and the signal is connected to ground through a 1 M Ω resistor. Obtain a ground reference in this manner.

PRE-CHARGING

This feature prevents surge currents, due to charging the ac coupling capacitor, from damaging the circuit under test. When using deflection factors of 20 mV/div through 1 mV/div with a test lead or 1X probe, place the slide switch in the GND position. Connect the 5A45 input to the circuit under test and wait about one second. This allows the coupling capacitor to charge to the dc input voltage. Then move the slide switch to the AC position.

SPECIFICATIONS

ELECTRICAL

BANDWIDTH: In the 5403, 6 division reference signal, dc-coupled, 1 mV/DIV and 2 mV/DIV \geq 25 MHz; 5 mV/DIV through 10 V/DIV, \geq 60 MHz. Lower end response ac-coupled, \leq 10 Hz (\leq 1.0 Hz with 10X probe) at all deflection factors.

RISETIME: \leq 14 ns, 1 mV/DIV and 2 mV/DIV. \leq 5.8 ns, 5 mV/DIV through 10 V/DIV.

DEFLECTION FACTOR ACCURACY: \leq 5% at 1 mV/DIV and 2 mV/DIV, \leq 3% from 5 mV/DIV to 10 V/DIV from 15°C to 35°C, \leq 4% from 5 mV/DIV to 10 V/DIV from 0°C to 50°C. A continuously variable control provides \geq 2.5X additional attenuation on each range.

ABERRATIONS: +2%, -2%, total of 3% of displayed step amplitude.

Operating Instructions—5A45

STABILITY: ≤ 0.3 mV vertical shift in any one minute after one hour warmup, ambient temperature and line voltage held constant. ≤ 0.2 mV/ $^{\circ}$ C vertical shift with line voltage held constant.

INPUT RESISTANCE AND CAPACITANCE: 1 M Ω , within 0.5% shunted by approximately 20 pF.

MAXIMUM SAFE INPUT VOLTAGE: DC coupled, 250 V (dc + peak ac), ac component 500 V peak-to-peak maximum, 1 kHz or less. AC coupled, 500 V (dc + peak ac), ac component 500 V peak-to-peak maximum, 1 kHz or less.

PHYSICAL

TEMPERATURE RANGE: 0 $^{\circ}$ C to 50 $^{\circ}$ C operating, -40 $^{\circ}$ C to +70 $^{\circ}$ C nonoperating.

ALTITUDE RANGE: $\leq 15,000$ feet operating, $\leq 50,000$ feet nonoperating.

DIMENSIONS: 5.0 in (12.5 cm) H. 2.6 in (6.7 cm) W. 12.0 in (30.5 cm) L.

WEIGHT: ≈ 1.5 lbs (0.7 kg).

SUPPLEMENTAL INFORMATION

DISPLAYED NOISE: ≤ 300 μ V at 5 mV/DIV tangentially measured in a 5400 series mainframe.

STEP ATTENUATOR BALANCE: ≤ 2 division vertical trace movement as VOLTS/DIV switch is rotated through its range.

POSITION RANGE: $\geq \pm 7$ major divisions from graticule center.

THEORY OF OPERATION

INTRODUCTION

Refer to the complete schematic diagram and the block diagram located in the pullout pages at the back of this manual, along with this discussion, to understand the operation of the 5A45.

INPUT COUPLING

Signals applied to the front panel bnc connector pass to the attenuators through the input coupling circuitry. C105 serves as the ac-coupling capacitor and R105 connects this capacitor to ground when the slide switch is in the GND position. The coupling capacitor is then precharged to the input dc level, and the input to the attenuators is grounded for reference. C102 sets the plug-in input capacity to the correct value.

The outer ring on the bnc connector is connected to the base of Q140 in the readout circuit, and to the base of Q128, which operates the WITH PROBE neon behind the VOLTS/DIV switch skirt. The readout probes have various resistances to ground. The resistance values are determined by the attenuation ratio of the probe. With no probe (or a 1X probe) connected to the input bnc connector, voltage levels are such that the voltage drop across DS128 is insufficient to light the neon. However, the drop across DS130

through Q130 is sufficient to illuminate this neon, showing the normal attenuation ratio.

ATTENUATORS

The attenuators are ac-compensated thick-film hybrid circuits on ceramic substrates. C108 sets the proper input capacitance, and C110 provides the correct series compensation for the 100X chip. C112 and C114 perform identical functions for the 10X attenuator chip. The combination of these attenuators, switched according to the charts shown on the schematics, attenuate the signals to the 5A45 amplifiers.

MAIN AMPLIFIER

The signal is fed to fet Q170A paired with Q170B. The STEP ATTEN BAL control, connected to the gate of Q170B sets the dc balance for the amplifier. Signals flow past the protective diode CR170 to the base of Q180. Signals at the emitter of Q180 follow signals at the gate of Q170A. A divider string consisting of R189, R191, R193 and R194 attenuates signals to Q200. Attenuation is 1X through R188, 2X through R189, and 4X through R193. The gain of Q180 and Q185 does not change; only the signal driving Q200 is attenuated. See Fig. 2-1 for a simplified diagram of this attenuation circuit. R182 sets the correct dc operating point for Q180 and Q185.

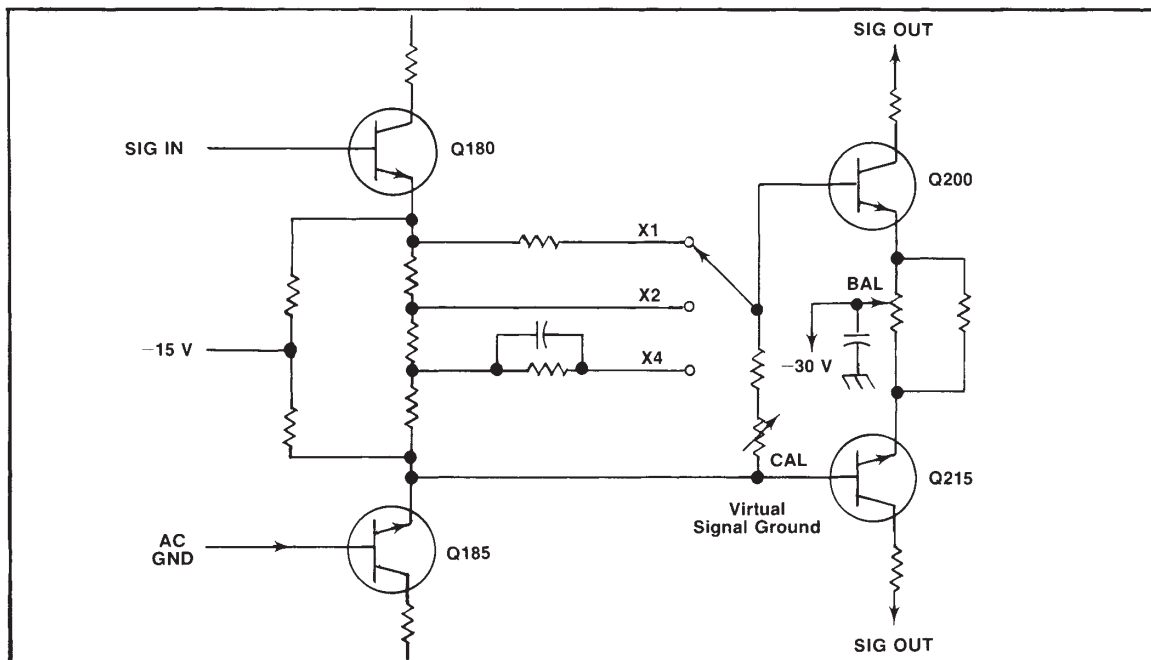


Fig. 2-1. Simplified diagram of attenuation network and single ended to paraphase transition.

Theory of Operation—5A45

Q200 and Q215 form an emitter-coupled paraphase amplifier. Their collectors drive Q202 and Q217. RT208 changes resistance with temperature so that the gain of Q200 and Q215 remains constant with temperature. This portion of the circuit provides a gain of about three. Q200 and Q215 current drive the emitters of Q202 and Q217. The current drive configuration improves high frequency response. R249 is switched from the circuit in the two most sensitive positions of the VOLTS/DIV switch, increasing the circuit gain to about fifteen.

Q220 and Q240 provide additional amplification. C229 affects high-frequency gain. The collectors of Q220 and Q240 drive the bases of the output transistors Q270 and Q280. R255, with constant current source Q250, varies the current division between Q270 and Q280, positioning the trace. The collectors of the output transistors drive the vertical amplifier in the main frame through the rear interface connector.

TRIGGER AMPLIFIER

The paraphase trigger signal from the emitter of Q220 is applied to the base of Q290; the same occurs for Q240 and Q295. The collector current of Q290 drives the emitter of

Q300, and the collector current of Q295 drives the emitter of Q305. The collectors of Q300 & Q305 drive the bases of Q310 and Q320 respectively. Q320 drives Q325, whose output is the trigger signal. This signal is transferred to the horizontal plug-in through the rear interface connector. Q310 drives Q315, an additional transistor used as a phase inverter. The output signal at the collector of Q315 is now in phase with the collector signal of Q325. This circuitry provides single-ended output for differentially applied signals, providing cancellation of common mode signals.

READOUT

The DISPLAY, CAL, and VOLTS/DIV switches have contacts wired into the readout circuitry. A 0 V to -15 V pulse, approximately 125 μ s in length, is applied at different times (in proper sequence) to all of the rear interface connectors associated with the readout circuitry, except the column and row lines (pins 28A and 28B). These are the output lines. The switches and resistances in the 5A45 allow the correct amount of current to the row and column lines during the prescribed pulse time for the particular character desired. See the main frame manual for more details concerning operation of the readout circuitry, including time slots and current required for each character displayed. Q140 applies the correct readout current for the attenuation of the probe used.

SERVICE INFORMATION

SYMBOLS AND REFERENCE DESIGNATORS

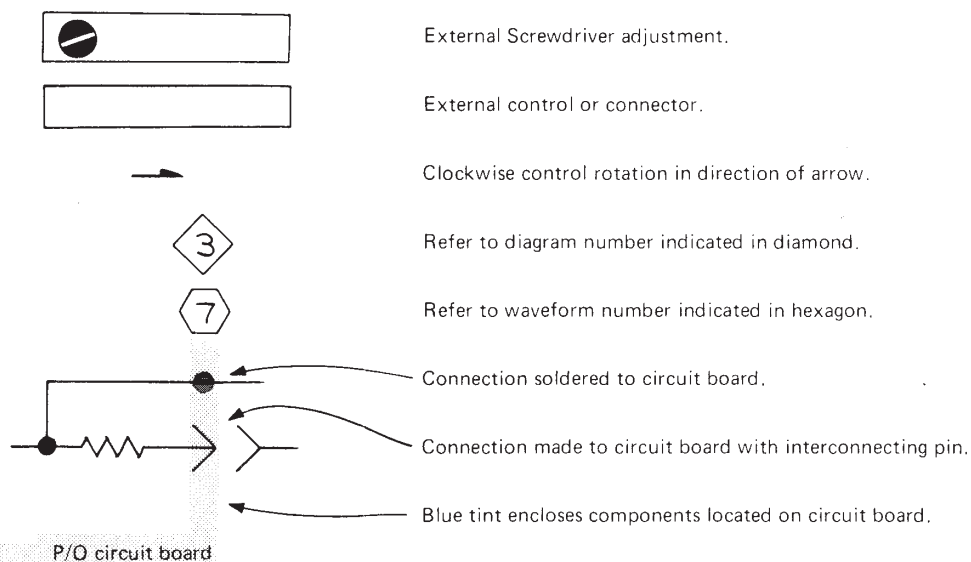
Electrical components shown on the diagrams are in the following units unless noted otherwise:

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

Symbols used on the diagrams are based on ANSI Y32.2 – 1970.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



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

Electrical Parts List—5A45

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
03508	GENERAL ELECTRIC CO., SEMI-CONDUCTOR PRODUCTS DEPT.	ELECTRONICS PARK	SYRACUSE, NY 13201
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPT.	NELA PK.	CLEVELAND, OH 44112
13715	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	4300 REDWOOD HWY.	SAN RAFAEL, CA 94903
17856	SILICONIX, INC.	2201 LAURELWOOD RD.	SANTA CLARA, CA 95054
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
34553	AMPEREX ELECTRONIC CORP., COMPONENT DIV.	35 HOFFMAN AVE.	HAPPAUGE, NY 11787
50157	N. L. INDUSTRIES, INC., ELECTRONICS DEPT.	P. O. BOX 787	MUSKEGON, MI 49443
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	5757 N. GREEN BAY AVE.	MILWAUKEE, WI 53201
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97077
80031	ELECTRA-MIDLAND CORP., MEPCO DIV., A NORTH AMERICAN PHILLIPS CO.	22 COLUMBIA RD.	MORRISTOWN, NJ 07960
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601

Electrical Parts List—5A45

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr	
		Eff	Dscont		Code	Mfr Part Number
A1	670-3295-00			CKT BOARD ASSY:MAIN	80009	670-3295-00
A2	670-3210-01			CKT BOARD ASSY:ATTENUATOR	80009	670-3210-01
C100	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C102	281-0213-00			CAP.,VAR,CER DI:8-3.8PF,400V	80031	C004JA/3E
C105	285-0816-01			CAP.,FXD,PLSTC:0.19UF,10%,600V	80009	285-0816-01
C108	307-1014-01	B010100	B010348	ATTENUATOR,FXD:100X	80009	307-1014-01
C110						
C108	307-1014-02	B010349		ATTENUATOR,FXD:100X	80009	307-1014-02
C110						
C112	307-1013-01	B010100	B010348	ATTENUATOR,FXD:10X	80009	307-1013-01
C114						
C112	307-1013-00	B010349		ATTENUATOR,FXD:10X	80009	307-1013-00
C114						
C116	281-0557-00			CAP.,FXD,CER DI:1.8PF,10%,500V	72982	301-000COK0189B
C120	283-0001-00			CAP.,FXD,CER DI:0.005UF,+100-0%,500V	72982	831-559E502P
C125	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C152	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C168	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C170	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C175	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C176	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C180	281-0630-00			CAP.,FXD,CER DI:390PF,5%,500V	72982	301-000Y5D0391J
C183	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C187	281-0630-00			CAP.,FXD,CER DI:390PF,5%,500V	72982	301-000Y5D0391J
C188	281-0658-00			CAP.,FXD,CER DI:6.2PF,+/-0.25PF,500V	72982	301-000COH0629C
C193	281-0540-00			CAP.,FXD,CER DI:51PF,5%,500V	72982	301-000U2J0510J
C195	281-0187-00			CAP.,VAR,PLSTC:4-40PF,250V	34553	2222-809-08002
C200	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C206	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000COH0569D
C208	281-0564-00			CAP.,FXD,CER DI:24PF,5%,500V	72982	301-000COG0240J
C215	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C220	281-0525-00			CAP.,FXD,CER DI:470PF,+/-94PF,500V	72982	301-000X5U0471M
C223	281-0604-00			CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	72982	301-000COJ0229C
C227	281-0512-00			CAP.,FXD,CER DI:27PF,+/-2.7PF,500V	72982	308-000COG0270K
C229	281-0207-00			CAP.,VAR,PLSTC:2-18PF,100V	80031	HT10EA-218
C230	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C240	281-0525-00			CAP.,FXD,CER DI:470PF,+/-94PF,500V	72982	301-000X5U0471M
C250	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C255	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C293	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C304	281-0600-00			CAP.,FXD,CER DI:35PF,10%,500V	72982	308-000COG0350K
C327	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C350	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C355	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C360	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C365	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C370	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C375	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
CR168	152-0367-00			SEMICONV DEVICE:SILICON,20V,20PA	07263	FSA1540
CR170	152-0153-00			SEMICONV DEVICE:SILICON,15V,50MA	13715	FD7003
CR220	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152
CR240	152-0141-02			SEMICONV DEVICE:SILICON,30V,150MA	07910	1N4152

Electrical Parts List—5A45

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont			
DS128	150-0111-00			LAMP,GLOW:NEON,1.2MA	08806	2AC-AT
DS130	150-0111-00			LAMP,GLOW:NEON,1.2MA	08806	2AC-AT
J100	131-0679-00	B010100	B010149	CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JRL68-1
J100	131-0679-02	B010150		CONNECTOR,RCPT,:BNC W/HARDWARE	24931	28JR270-1
K220	148-0034-00			RELAY,ARMATURE:DPDT,15VDC,600 OHM	80009	148-0034-00
L350	108-0245-00			COIL,RF:3.9UH	80009	108-0245-00
L370	108-0245-00			COIL,RF:3.9UH	80009	108-0245-00
L375	108-0245-00			COIL,RF:3.9UH	80009	108-0245-00
Q128	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q130	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q140	151-0254-00			TRANSISTOR:SILICON,NPN	03508	2N5308
Q170A,B	151-1032-00			TRANSISTOR:SILICON,FET,DUAL	17856	DN399
Q180	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00
Q185	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00
Q200	153-0624-00			SEMICON DVC SE:SILICON,NPN,MATCHED PAIR	80009	153-0624-00
Q202	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q215	153-0624-00			SEMICON DVC SE:SILICON,NPN,MATCHED PAIR	80009	153-0624-00
Q217	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q220	153-0610-00			SEMICON DVC SE:SILICON,PNP,MTCHD PAIR	80009	153-0610-00
Q240	153-0610-00			SEMICON DVC SE:SILICON,PNP,MTCHD PAIR	80009	153-0610-00
Q250	151-0341-00			TRANSISTOR:SILICON,NPN	07263	2N3565
Q270	151-0434-00			TRANSISTOR:SILICON,PNP	80009	151-0434-00
Q280	151-0434-00			TRANSISTOR:SILICON,PNP	80009	151-0434-00
Q290	153-0610-00			SEMICON DVC SE:SILICON,PNP,MTCHD PAIR	80009	153-0610-00
Q295	153-0610-00			SEMICON DVC SE:SILICON,PNP,MTCHD PAIR	80009	153-0610-00
Q300	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q305	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q310	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q315	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q320	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q325	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
R100	315-0101-00			RES.,FXD,CMPNSN:100 OHM,5%,0.25W	01121	CB1015
R102	315-0510-00			RES.,FXD,CMPNSN:51 OHM,5%,0.25W	01121	CB5105
R105	315-0105-00			RES.,FXD,CMPNSN:1M OHM,5%,0.25W	01121	CB1055
R114	315-0431-00			RES.,FXD,CMPNSN:430 OHM,5%,0.25W	01121	CB4315
R116	321-0481-01			RES.,FXD,FILM:1M OHM,0.5%,0.125W	75042	CEATO-1004D
R120	315-0474-00			RES.,FXD,CMPNSN:470K OHM,5%,0.25W	01121	CB4745
R125	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEATO-2001F
R126	315-0104-00			RES.,FXD,CMPNSN:100K OHM,5%,0.25W	01121	CB1045
R128	315-0105-00			RES.,FXD,CMPNSN:1M OHM,5%,0.25W	01121	CB1055
R130	315-0105-00			RES.,FXD,CMPNSN:1M OHM,5%,0.25W	01121	CB1055
R132	315-0134-00			RES.,FXD,CMPNSN:130K OHM,5%,0.25W	01121	CB1345
R140	321-0299-00			RES.,FXD,FILM:12.7K OHM,1%,0.125W	75042	CEATO-1272F
R142	315-0753-00			RES.,FXD,CMPNSN:75K OHM,5%,0.25W	01121	CB7535
R143	315-0154-00			RES.,FXD,CMPNSN:150K OHM,5%,0.25W	01121	CB1545
R145	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	75042	CEATO-3742F
R146	315-0753-00			RES.,FXD,CMPNSN:75K OHM,5%,0.25W	01121	CB7535
R148	315-0154-00			RES.,FXD,CMPNSN:150K OHM,5%,0.25W	01121	CB1545
R149	315-0154-00			RES.,FXD,CMPNSN:150K OHM,5%,0.25W	01121	CB1545
R152	315-0753-00			RES.,FXD,CMPNSN:75K OHM,5%,0.25W	01121	CB7535
R154	315-0513-00			RES.,FXD,CMPNSN:51K OHM,5%,0.25W	01121	CB5135

Electrical Parts List—5A45

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr	
		Eff	Dscont		Code	Mfr Part Number
R155	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R157	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	75042	CEATO-3742F
R158	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R160	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R168	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R170	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R172	322-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.25W	75042	CEBTO-6041F
R173	322-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.25W	75042	CEBTO-6041F
R175	311-0546-00			RES.,VAR,NONWIR:10K OHM,20%,0.75W	01121	W-8154
R177	321-0353-00			RES.,FXD,FILM:46.4K OHM,1%,0.125W	75042	CEATO-4642F
R178	321-0138-00			RES.,FXD,FILM:267 OHM,1%,0.125W	75042	CEATO-2670F
R180	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R181	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R182	311-1564-00			RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A-500ROM
R183	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R185	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R187	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R188	321-0078-00			RES.,FXD,FILM:63.4 OHM,1%,0.125W	75042	CEATO-63R40F
R189	321-0114-03			RES.,FXD,FILM:150 OHM,0.25%,0.125W	91637	MF1816D15OROC
R191	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	75042	CEATO-75ROOF
R192	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R193	321-0033-00			RES.,FXD,FILM:21.5 OHM,1%,0.125W	75042	CEATO-21R50F
R194	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	75042	CEATO-75ROOF
R195	311-1564-00			RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A-500ROM
R196	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	75042	CEATO-75ROOF
R198 ¹	311-1364-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	01121	10M321A
R199	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	75042	CEATO-49R90F
R200	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R202	321-0170-00			RES.,FXD,FILM:576 OHM,1%,0.125W	75042	CEATO-5760F
R203	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R206	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R208	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R209	321-0067-00			RES.,FXD,FILM:48.7 OHM,1%,0.125W	75042	CEATO-48R70F
R210	311-1565-00			RES.,VAR,NONWIR:250 OHM,20%,0.50W	73138	91A250ROM
R211	323-0245-00			RES.,FXD,FILM:3.48K OHM,1%,0.50W	75042	CECTO-3481F
R213	323-0245-00			RES.,FXD,FILM:3.48K OHM,1%,0.50W	75042	CECTO-3481F
R215	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R217	321-0170-00			RES.,FXD,FILM:576 OHM,1%,0.125W	75042	CEATO-5760F
R220	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R223	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	75042	CEATO-2490F
R227	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R229	315-0390-00			RES.,FXD,CMPSN:39 OHM,5%,0.25W	01121	CB3905
R230	323-0189-00			RES.,FXD,FILM:909 OHM,1%,0.50W	75042	CECTO-9090F
R231	321-0065-00			RES.,FXD,FILM:46.4 OHM,1%,0.125W	75042	CEATO-46R40F
R232	321-0065-00			RES.,FXD,FILM:46.4 OHM,1%,0.125W	75042	CEATO-46R40F
R235	311-1565-00	B010100	B010199	RES.,VAR,NONWIR:250 OHM,20%,0.50W	73138	91A250ROM
R235	311-1564-00	B010200		RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A-500ROM
R236	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	75042	CEATO-2000F
R240	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R250	321-0246-00			RES.,FXD,FILM:3.57K OHM,1%,0.125W	75042	CEATO-3571F
R251	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R252	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
R255	311-0546-00			RES.,VAR,NONWIR:10K OHM,20%,0.75W	01121	W-8154

¹Furnished as a unit with S160.

Electrical Parts List—5A45

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R257	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
R270	321-0143-00			RES.,FXD,FILM:301 OHM,1%,0.125W	75042	CEATO-3010F
R271	322-0187-00			RES.,FXD,FILM:866 OHM,1%,0.25W	75042	CEBTO-8660F
R273	321-0088-00			RES.,FXD,FILM:80.6 OHM,1%,0.125W	75042	CEATO-80R60F
R275	321-0099-00			RES.,FXD,FILM:105 OHM,1%,0.125W	75042	CEATO-1050F
R277	323-0177-00			RES.,FXD,FILM:680 OHM,1%,0.50W	75042	CECTO-6810F
R280	321-0143-00			RES.,FXD,FILM:301 OHM,1%,0.125W	75042	CEATO-3010F
R281	322-0187-00			RES.,FXD,FILM:866 OHM,1%,0.25W	75042	CEBTO-8660F
R283	321-0088-00			RES.,FXD,FILM:80.6 OHM,1%,0.125W	75042	CEATO-80R60F
R285	321-0099-00			RES.,FXD,FILM:105 OHM,1%,0.125W	75042	CEATO-1050F
R290	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R291	321-0055-00			RES.,FXD,FILM:36.5 OHM,1%,0.125W	75042	CEATO-36R50F
R293	322-0191-00			RES.,FXD,FILM:953 OHM,1%,0.25W	91637	MFF1421G953R0F
R295	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R296	321-0055-00			RES.,FXD,FILM:36.5 OHM,1%,0.125W	75042	CEATO-36R50F
R300	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R302	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R304	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	75042	CEATO-4320F
R310	321-0130-00			RES.,FXD,FILM:221 OHM,1%,0.125W	75042	CEATO-2210F
R311	321-0065-00			RES.,FXD,FILM:46.4 OHM,1%,0.125W	75042	CEATO-46R40F
R313	321-0146-00			RES.,FXD,FILM:324 OHM,1%,0.125W	75042	CEATO-3240F
R315	321-0225-00			RES.,FXD,FILM:2.15K OHM,1%,0.125W	75042	CEATO-2151F
R320	321-0130-00			RES.,FXD,FILM:221 OHM,1%,0.125W	75042	CEATO-2210F
R321	321-0065-00			RES.,FXD,FILM:46.4 OHM,1%,0.125W	75042	CEATO-46R40F
R323	322-0197-00			RES.,FXD,FILM:1.1K OHM,1%,0.25W	75042	CEBTO-1101F
R325	321-0146-00			RES.,FXD,FILM:324 OHM,1%,0.125W	75042	CEATO-3240F
R327	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R355	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R360	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R365	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R380	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R385	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
RT208	307-0125-00			RES.,THERMAL:500 OHM,10%,25 DEG C	50157	2D1595
S105 ¹						
S110	263-1076-00			ACTUATOR ASSY,CAM SW:ATTEN FOR 5A45	80009	263-1076-00
S160 ²						
S165	260-1209-00			SWITCH,PUSH:4PDT	71590	2KAB001000-358

¹Furnished as a unit with S110.

²Furnished as a unit with R198.

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.

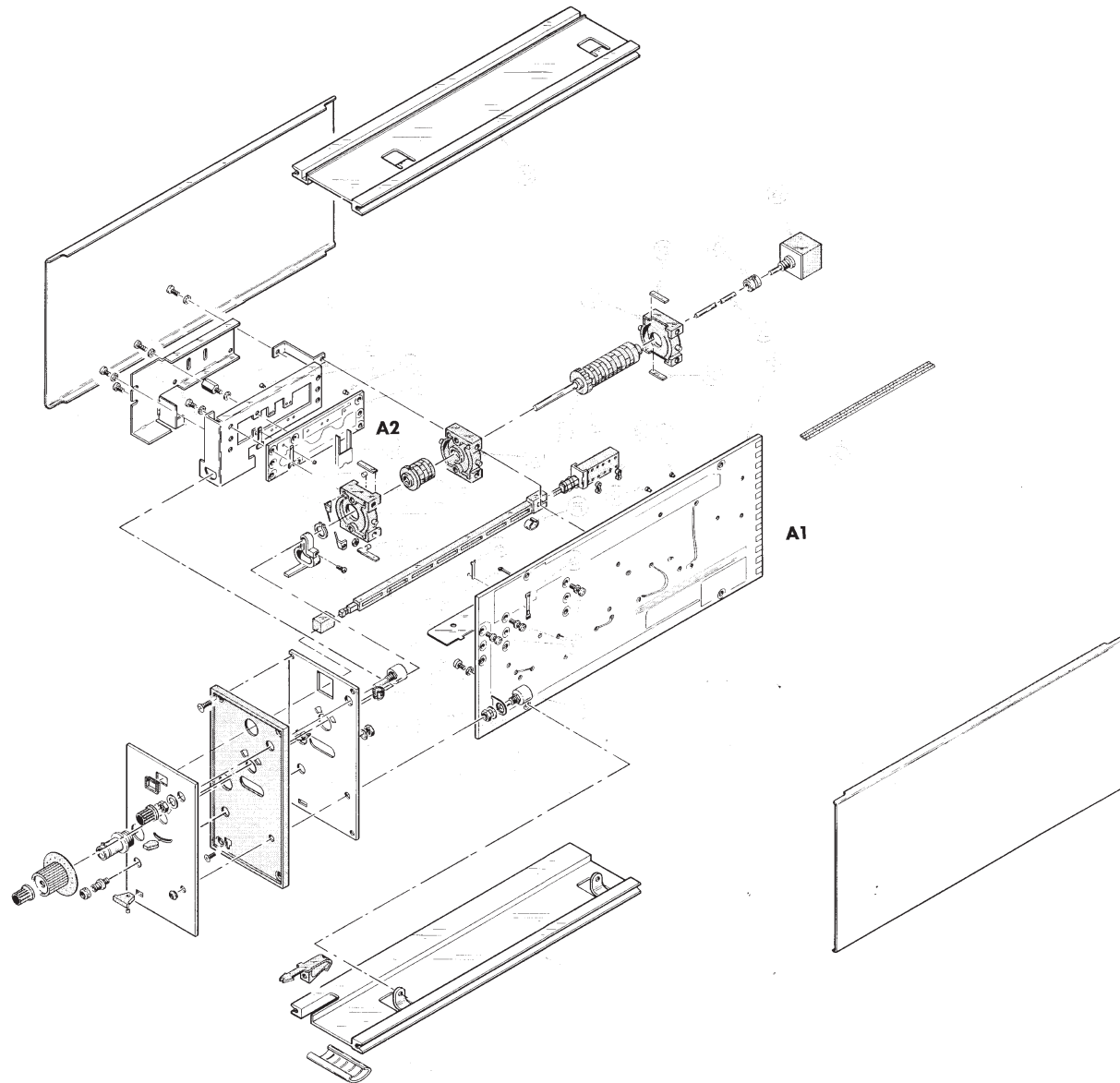
ABBREVIATIONS

"	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELECTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OD	ORDER BY DESCRIPTION	SQ	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	HLCP	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	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

Mechanical Parts List—5A45

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00779	AMP, INC.	P. O. BOX 3608	HARRISBURG, PA 17105
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12327	FREEWAY CORP.	9301 ALLEN DR.	CLEVELAND, OH 44125
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
42838	NATIONAL RIVET AND MFG. CO.	1-21 EAST JEFFERSON ST.	WAUPUN, WI 53963
45722	USM CORP., PARKER-KALON FASTENER DIV.	1 PEEKAY DRIVE	CLIFTON, NJ 07014
70278	ALLIED STEEL AND CONVEYORS, DIV. OF SPARTON CORP.	17333 HEALY	DETROIT, MI 48212
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	5757 N. GREEN BAY AVE.	MILWAUKEE, WI 53201
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
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
97464	INDUSTRIAL RETAINING RING CO.	57 CORDIER ST.	IRVINGTON, NJ 07111



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ACCESSORIES

REPACKAGING

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscnt	Qty	1 2 3 4 5					Name & Description	Mfr Code	Mfr Part Number
2-	070-1698-00			1						MANUAL, TECH: INSTRUCTION	80009	070-1698-00

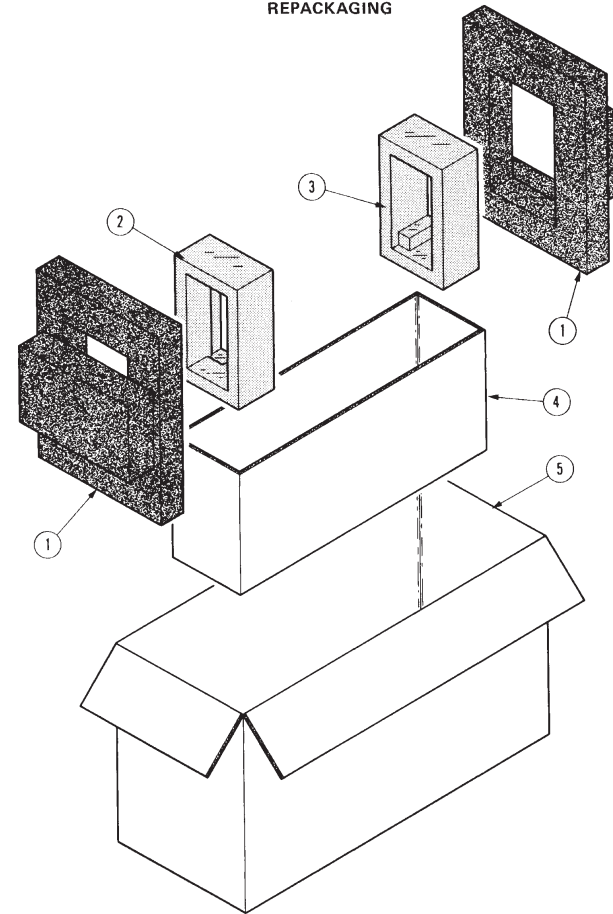


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscnt	Qty	1 2 3 4 5					Name & Description	Mfr Code	Mfr Part Number
2-	065-0151-00			1						CARTON ASSEMBLY:	80009	065-0151-00
-				-						. CARTON ASSEMBLY INCLUDES:		
-1	004-0282-00			2						. FRAME:PLASTIC FOAM	80009	004-0282-00
-2	004-0243-00			1						. PAD,CUSHIONING:FRONT	80009	004-0423-00
-3	004-0242-00			1						. PAD,CUSHIONING:REAR	80009	004-0242-00
-4	004-1093-00			1						. PAD,CUSHIONING:13.375 X 3.25 X 5.625"	80009	004-1093-00
-5	004-0612-00			1						. CARTON:16.50 X 6.625 X 9.125 INCHES	80009	004-0612-00

INTERNAL ADJUSTMENT PROCEDURE

SERVICES AVAILABLE

Tektronix, Inc. provides complete instrument repair and adjustment at local Field Service Centers and at the Factory Service Center. Contact your local Tektronix Field Office or Representative for further information.

MAINTENANCE

Refer to the power supply/amplifier manual for general service information. The attenuator circuit boards are made from polyphenylene oxide, because of its electrical characteristics. Do not clean these boards using acetone, trichloroethylene, chloroethane or methyl ethyl ketone. Clean circuit board with isopropyl alcohol and dry with low-velocity compressed air. Use special care when soldering or replacing components on these boards. Do not apply mechanical stress to the board. Use a small soldering iron, not over 15 watts, and low temperature solder. Apply only the necessary amount of heat. Use a desoldering tool when removing multi-lead devices.

TEST EQUIPMENT

For calibration, and a complete accuracy check of the 5A45, the following equipment is required:

Tektronix 5403 oscilloscope or equivalent,

Tektronix 5B42, or equivalent, time base,

Tektronix PG 506 Calibration Generator or equivalent,

Tektronix 20 pF Input Normalizer, 067-0538-00,

50 Ω BNC Termination, 011-0049-01,

50 Ω 5X BNC Attenuator, 011-0060-01,

50 Ω coaxial cable, 012-0057-01,

Voltmeter, $\geq 20,000 \Omega/V$ sensitivity, Tektronix DM 501 or equivalent.

REV. B, OCT. 1974

PREPARATION

This instrument should be adjusted at an ambient temperature between +20°C and +30°C (+68°F and +86°F) for best accuracy. Remove the left side plug-in cover and install the 5A45 in a vertical plug-in compartment of the 5400 series mainframe that allows access to the left side of the circuit board.

1. 5B42 PRESETS:

POSITION	midrange
MAIN SEC/DIV	1 m
MAIN TRIG LEVEL	cw
AUTO TRIG	in
SOURCE & SLOPE	in
TRIG SOURCE RIGHT or LEFT	in
MAIN SWP MODE	in

all other 5B42 pushbuttons must be out.

2. 5A45 PRESETS:

VOLTS/DIV	10 m
CAL	cw (detent)
POSITION	midrange
DISPLAY	in
SLIDE SWITCH	GND

3. ADJUST DC LEVELS

Connect the positive lead of the dc voltmeter to TP + and the negative lead to TP -. Adjust R182, 7.5 V Adj., for a reading of 7.5 V on the voltmeter.

4. ADJUST DC BALANCE

Position the trace to the graticule center with the POSITION control. Set the VOLTS/DIV selector to the 1 m position. Reposition the trace to the graticule center by adjusting the front panel STEP ATTEN BAL control. Next adjust the STEP ATTEN BAL control for no trace shift while switching the VOLTS/DIV switches between the 2 m and 1 m positions. Finally adjust R210, 2.5 mV Bal, for no trace shift while switching the VOLTS/DIV selector between positions 5 m and 2 m.

5. ADJUST GAIN

Set the VOLTS/DIV switch to position 10 m. Move the slide switch to the DC position. Connect the calibration

generator, set for a 50-mV square-wave output, to the input of the 5A45 through a coaxial cable. Adjust the time base triggering for a stable display. Adjust R235, Gain Adj., for five major divisions of display.

6. ADJUST INPUT CAPACITANCE and COMPENSATE ATTENUATOR

Set the VOLTS/DIV switch to the 20 m position. Connect the calibration generator through a 50 Ω cable, 5X attenuator, 50 Ω termination, and the 20 pF normalizer in that order to the 5A45 input connector. Set the calibration generator frequency to 1 kHz. Adjust the output amplitude of the calibration generator for a square-wave display of five major divisions. Proceed to Table 3-1 and perform the adjustments as indicated. Adjust the calibration generator for an output amplitude of five major divisions for each position of the VOLTS/DIV switch. The square-wave level, rolloff, or overshoot must not exceed 0.1 major division in any position of the VOLTS/DIV switch.

ATTENUATOR COMPENSATION

TABLE 3-1

VOLTS/DIV	Adjust Level	Adjust Front Corner
20 m	C102	
50 m	C112	C114
.1	Check front corner	
.2	Check front corner	
Remove 5X attenuator		
.5	C108	C110
1	Check front corner	
2	Check front corner	
5	Check front corner	
10	Check front corner	

7. CHECK VOLTS/DIV ACCURACY

Remove the 20 pF normalizer. Connect the amplitude calibration portion of the calibration generator to the input connector. Set the VOLTS/DIV switch to the 1 m position. The slide switch should be in the DC position. Set the calibration generator for a square-wave output of 5 mV. Follow the directions listed in Table 3-2, noting the maximum error.

DEFLECTION FACTOR TOLERANCES

TABLE 3-2

CALIBRATION AMPLITUDE	5A45 VOLTS/DIV	Display Amplitude	Max Error
5 mV	1 m	5 div	.25 div (5%)
10 mV	2 m	5 div	.25 div (5%)
20 mV	5 m	4 div	.12 div (3%)
50 mV	10 m	5 div	.15 div (3%)
.1 V	20 m	5 div	.15 div (3%)
.2 V	50 m	4 div	.12 div (3%)
.5 V	.1	5 div	.15 div (3%)
1 V	.2	5 div	.15 div (3%)
2 V	.5	4 div	.12 div (3%)
5 V	1	5 div	.15 div (3%)
10 V	2	5 div	.15 div (3%)
20 V	5	4 div	.12 div (3%)
50 V	10	5 div	.15 div (3%)

8. ADJUST TRANSIENT RESPONSE

Connect the calibration generator set for a 500 kHz square wave through a 50 Ω cable and 50 Ω termination to the input connector. Set the VOLTS/DIV switch to the 10 m position. Adjust the amplitude of the calibration generator for a five major division display. Set the time base for a 0.1 sweep speed and obtain a stable triggered display. Center the display using the vertical and horizontal position controls. Then adjust C195, Ring Comp A, and R195, Ring Comp B, for the least amount of ringing on the front corner of the waveform. Then adjust C229, Hf Adj, for the best square corner on the waveform.

INTERNAL ADJUSTMENT PROCEDURE

generator, set for a 50-mV square-wave output, to the input of the 5A45 through a coaxial cable. Adjust the time base triggering for a stable display. Adjust R235, Gain Adj., for five major divisions of display.

6. ADJUST INPUT CAPACITANCE and COMPENSATE ATTENUATOR

Set the VOLTS/DIV switch to the 20 m position. Connect the calibration generator through a 50 Ω cable, 5X attenuator, 50 Ω termination, and the 20 pF normalizer in that order to the 5A45 input connector. Set the calibration generator frequency to 1 kHz. Adjust the output amplitude of the calibration generator for a square-wave display of five major divisions. Proceed to Table 3-1 and perform the adjustments as indicated. Adjust the calibration generator for an output amplitude of five major divisions for each position of the VOLTS/DIV switch. The square-wave level, rolloff, or overshoot must not exceed 0.1 major division in any position of the VOLTS/DIV switch.

ATTENUATOR COMPENSATION

TABLE 3-1

VOLTS/DIV	Adjust Level	Adjust Front Corner
20 m	C102	
50 m	C112	C114
.1	Check front corner	
.2	Check front corner	
Remove 5X attenuator		
.5	C108	C110
1	Check front corner	
2	Check front corner	
5	Check front corner	
10	Check front corner	

7. CHECK VOLTS/DIV ACCURACY

Remove the 20 pF normalizer. Connect the amplitude calibration portion of the calibration generator to the input connector. Set the VOLTS/DIV switch to the 1 m position. The slide switch should be in the DC position. Set the calibration generator for a square-wave output of 5 mV. Follow the directions listed in Table 3-2, noting the maximum error.

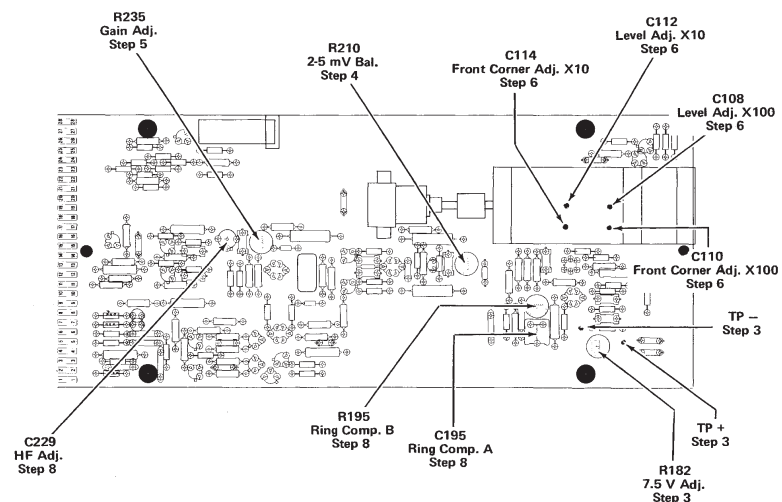
DEFLECTION FACTOR TOLERANCES

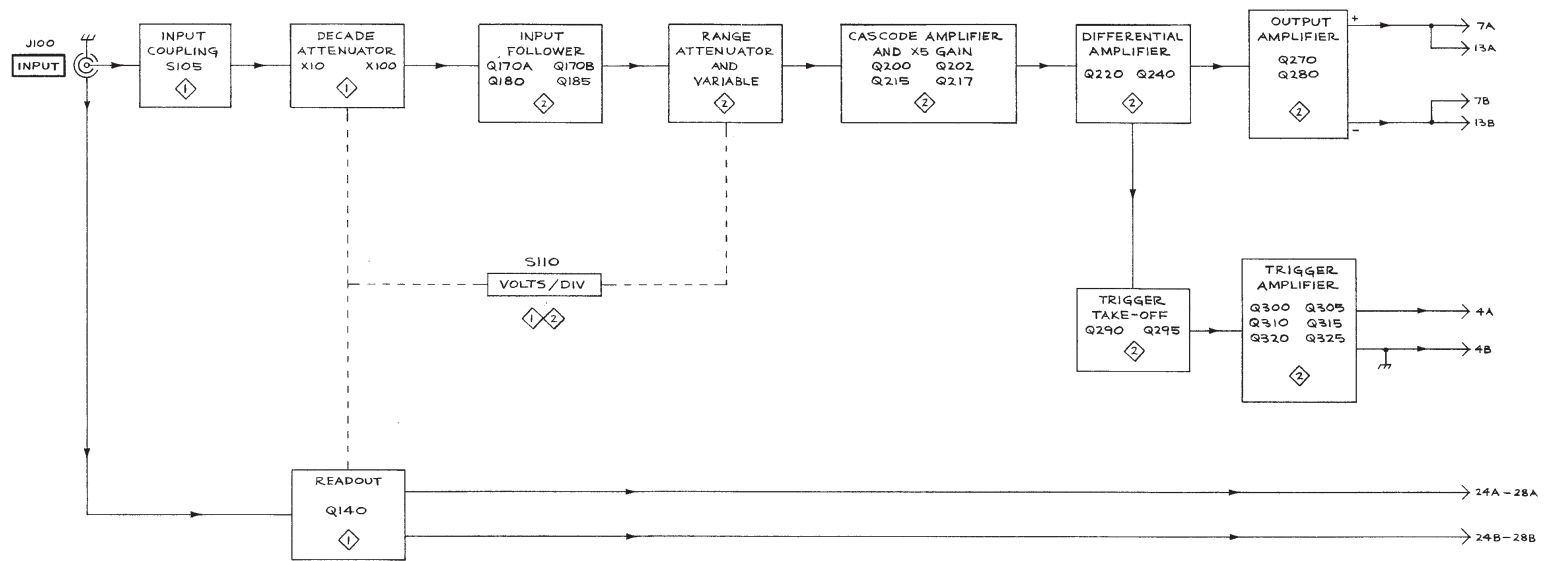
TABLE 3-2

CALIBRATION AMPLITUDE	5A45 VOLTS/DIV	Display Amplitude	Max Error
5 mV	1 m	5 div	.25 div (5%)
10 mV	2 m	5 div	.25 div (5%)
20 mV	5 m	4 div	.12 div (3%)
50 mV	10 m	5 div	.15 div (3%)
.1 V	20 m	5 div	.15 div (3%)
.2 V	50 m	4 div	.12 div (3%)
.5 V	.1	5 div	.15 div (3%)
1 V	.2	5 div	.15 div (3%)
2 V	.5	4 div	.12 div (3%)
5 V	1	5 div	.15 div (3%)
10 V	2	5 div	.15 div (3%)
20 V	5	4 div	.12 div (3%)
50 V	10	5 div	.15 div (3%)

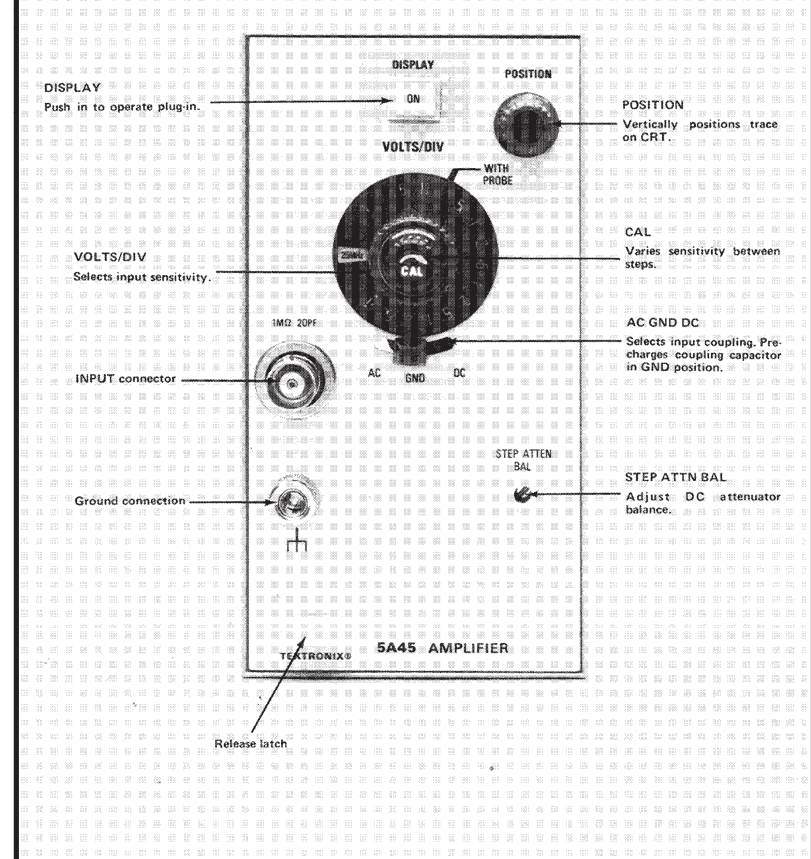
8. ADJUST TRANSIENT RESPONSE

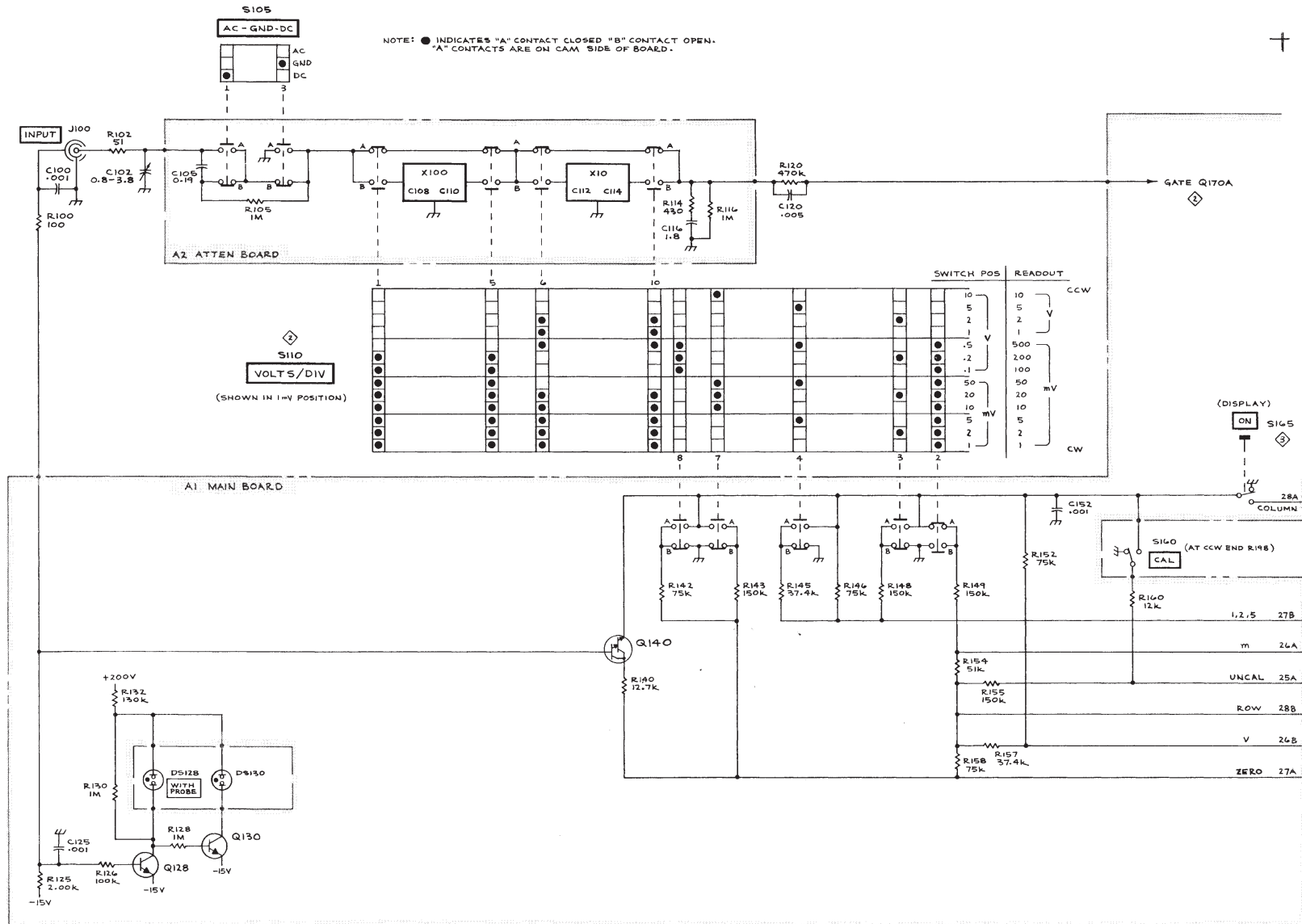
Connect the calibration generator set for a 500 kHz square wave through a 50 Ω cable and 50 Ω termination to the input connector. Set the VOLTS/DIV switch to the 10 m position. Adjust the amplitude of the calibration generator for a five major division display. Set the time base for a 0.1 sweep speed and obtain a stable triggered display. Center the display using the vertical and horizontal position controls. Then adjust C195, Ring Comp A, and R195, Ring Comp B, for the least amount of ringing on the front corner of the waveform. Then adjust C229, Hf Adj, for the best square corner on the waveform.





CONTROLS & CONNECTORS





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. Sections of the manual are often printed at different times, so some of the information on the change pages may already be in your manual. 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 in this section, your manual is correct as printed.



MANUAL CHANGE INFORMATION

PRODUCT 5A45
EFF SN B010528-up

CHANGE REFERENCE M23,960
DATE 10-15-75

CHANGE:	DESCRIPTION
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070-1698-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGE

CHANGE TO:

CR168 152-0323-00 SEMICOND DEVICE:SILICON,50V,20PA,SE365

CR170 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA,1N4152

Above parts are located on diagram  AMPLIFIER & TRIGGER SCHEMATICS



MANUAL CHANGE INFORMATION

PRODUCT 5A45
EFF SN B010528-up

CHANGE REFERENCE M23,960
DATE 10-15-75

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

070-1698-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGE

CHANGE TO:

- CR168 152-0323-00 SEMICOND DEVICE:SILICON,50V,20PA,SE365
- CR170 152-0141-02 SEMICOND DEVICE:SILICON,30V,150MA,1N4152

Above parts are located on diagram  AMPLIFIER & TRIGGER SCHEMATICS

MANUAL CHANGE INFORMATION

PRODUCT 5A45
EFF SN B020618-up

CHANGE REFERENCE M24,849
DATE 2-27-76

CHANGE:	DESCRIPTION
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070-1698-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGE

ADD:

CR162 152-0141-02 SEMICOND DEVICE:SILICON,30V, 150MA,1N4152

R164 315-0203-00 RES.,FXD,CMPSN:20K OHM,5%,0.25W

DIAGRAM 1 INPUT & READOUT SCHEMATICS - Partial

