

**Tektronix**

**2213**  
**OSCILLOSCOPE**  
**SERVICE**

**INSTRUCTION MANUAL**

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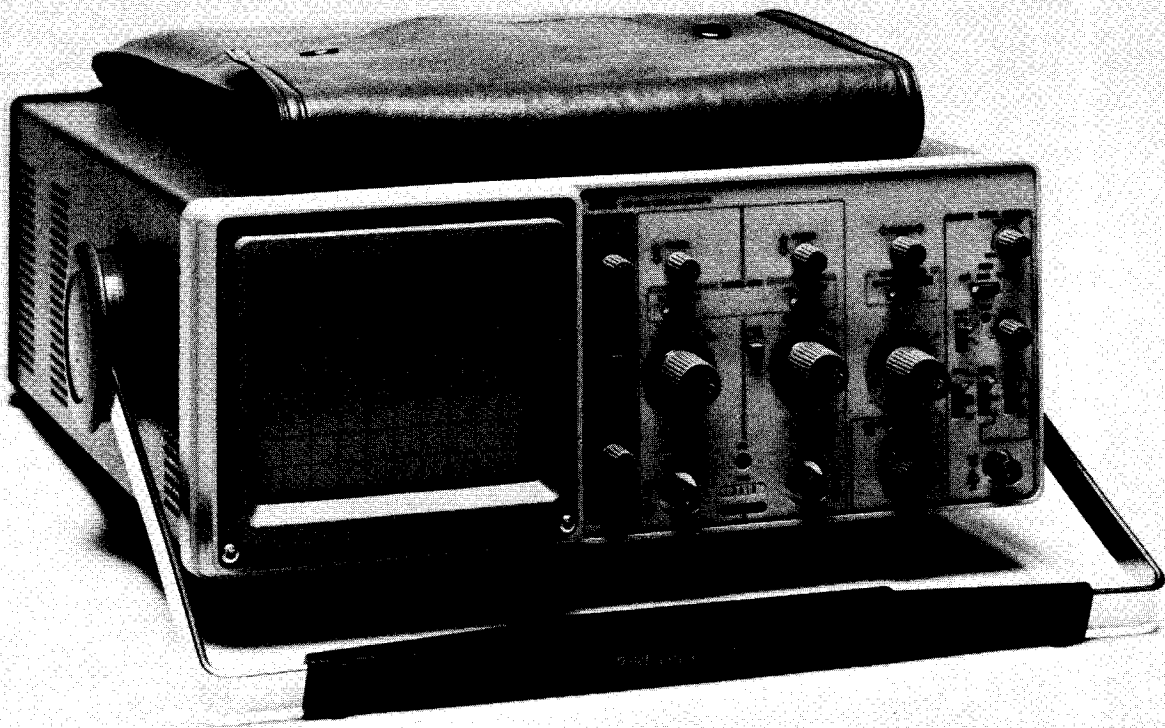
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The 2213 Oscilloscope.

3827-01

# SPECIFICATION

## INTRODUCTION

The TEKTRONIX 2213 Oscilloscope is a rugged, lightweight, dual-channel, 60-MHz instrument that features a bright, sharply defined trace on an 80- by 100-mm cathode-ray tube (crt). Its vertical system provides calibrated deflection factors from 2 mV per division to 10 V per division. Trigger circuits enable stable triggering over the full bandwidth of the vertical system. The horizontal system provides calibrated sweep speeds from 0.5 s per division to 50 ns per division along with a delayed-sweep feature. A X10 magnifier extends the maximum sweep speed to 5 ns per division.

## ACCESSORIES

The instrument is shipped with the following standard accessories:

- |                    |                      |
|--------------------|----------------------|
| 1 Operators manual | 2 Probe packages     |
| 1 Service manual   | 2 Probe grabber tips |

For part numbers and further information about both standard and optional accessories, refer to the "Accessories" page at the back of this manual. Your Tektronix representative, your local Tektronix Field Office, or the Tektronix product catalog can also provide accessories information.

## PERFORMANCE CONDITIONS

The following electrical characteristics (Table 1-1) are valid for the 2213 when it has been adjusted at an ambient temperature between +20°C and +30°C, has had a warm-up period of at least 20 minutes, and is operating at an ambient temperature between 0°C and +50°C (unless otherwise noted).

Items listed in the "Performance Requirements" column are verifiable qualitative or quantitative limits, while items listed in the "Supplemental Information" column are either explanatory notes, calibration setup descriptions, performance characteristics for which no absolute limits are specified, or characteristics that are impractical to check.

Environmental characteristics are given in Table 1-2. The 2213 meets the requirements of MIL-T-28800B, Class 5 equipment, except where otherwise noted.

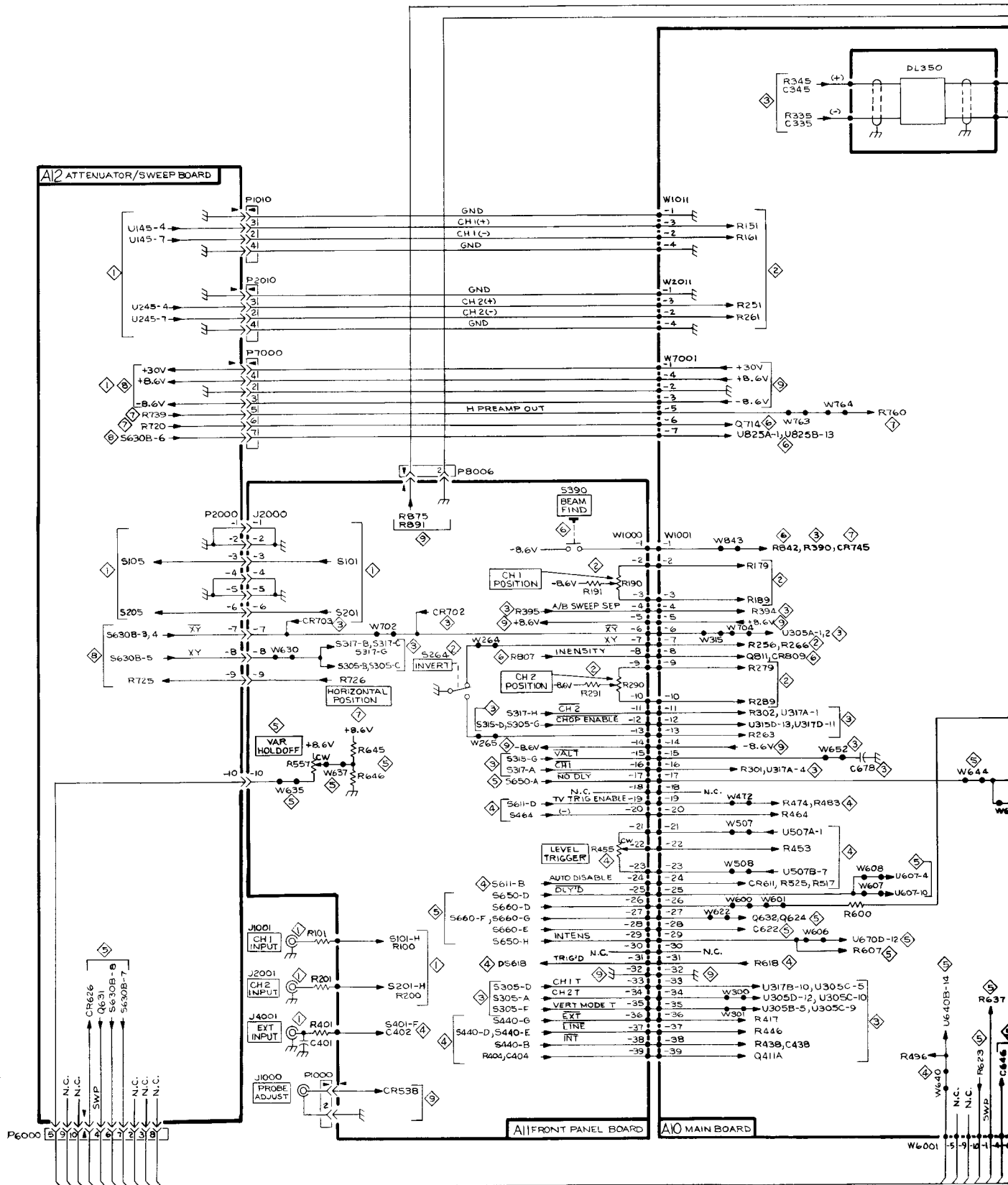
Physical characteristics of the instrument are listed in Table 1-3.

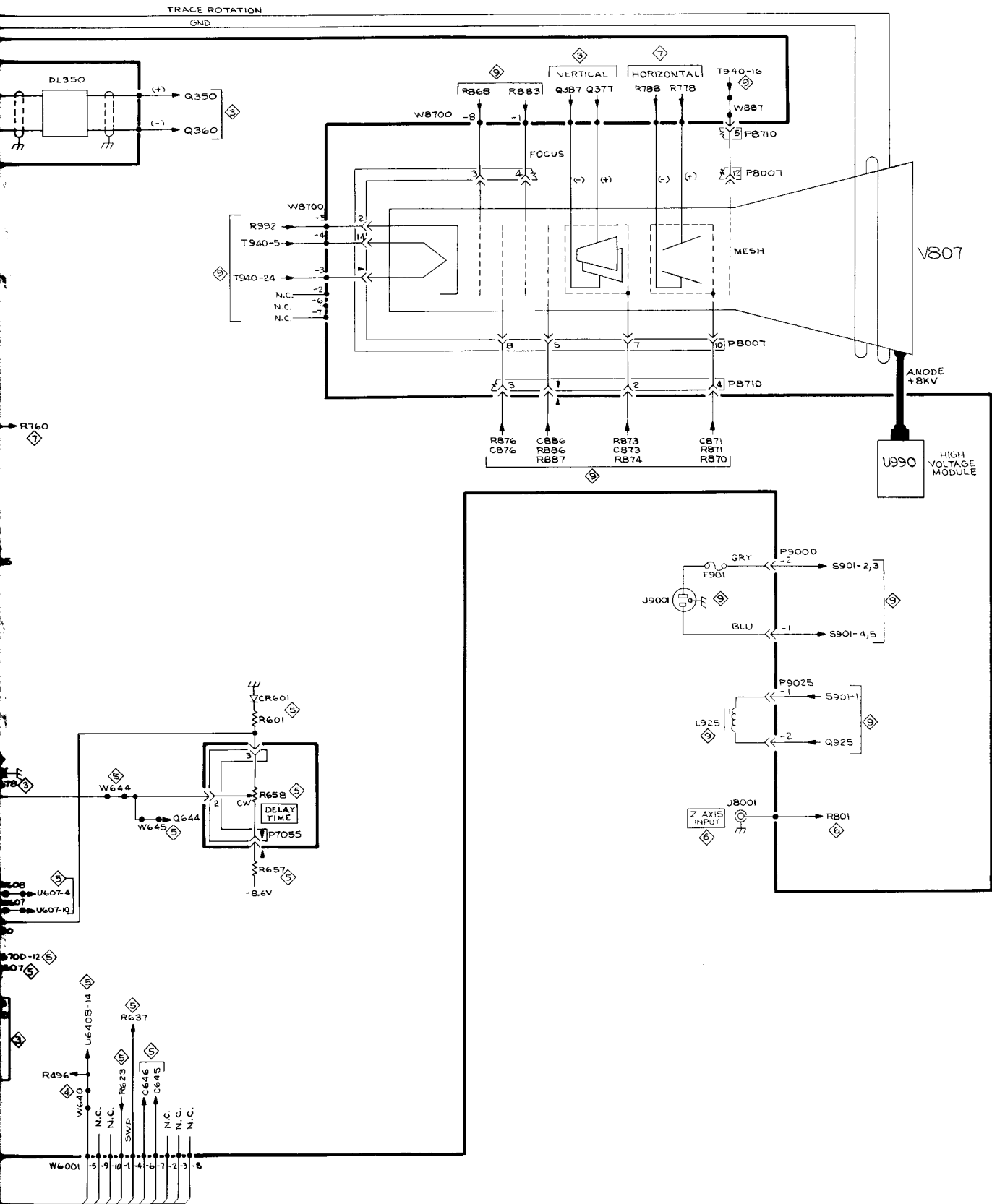


Replaceable Electrical Parts—2213 Service

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A11	670-6864-00	B010100 B016349	CKT BOARD ASSY:FRONT PANEL	80009	670-6864-00
A11	670-6864-01	B016350	CKT BOARD ASSY:FRONT PANEL	80009	670-6864-01
A11C101	281-0862-00		CAP., FXD, CER DI:0.001UF,+80-20%,100V	20932	401-ES-100AD102Z
A11C102	285-0515-00		CAP., FXD, PLSTC:0.022UF,20%,400V	56289	192P22304M434
A11C202	285-0515-00		CAP., FXD, PLSTC:0.022UF,20%,400V	56289	192P22304M434
A11C265	281-0773-00		CAP., FXD, CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A11C313	281-0773-00		CAP., FXD, CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A11C314	281-0773-00		CAP., FXD, CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A11C315	281-0773-00		CAP., FXD, CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A11C402	283-0006-00		CAP., FXD, CER DI:0.02UF,+80-20%,500V	72982	084154525V00203Z
A11C403	283-0331-00		CAP., FXD, CER DI:43PF,2%,100V	72982	805-505A430G
A11C404	283-0342-00		CAP., FXD, CER DI:6.5PF,0.5%,2000V	91418	HV6R5D2024R0
A11C531	281-0773-00		CAP., FXD, CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A11C650	281-0773-00		CAP., FXD, CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A11C690	290-0804-00		CAP., FXD, ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A11C725	290-0745-00		CAP., FXD, ELCTLT:22UF,+50-10%,25V	56289	502D225
A11C726	281-0775-00		CAP., FXD, CER DI:0.1UF,20%,50V	04222	SA205E104MAA
A11CR536	152-0141-02		SEMICONV DEVICE:SILICON,30V,150MA	01295	1N4152R
A11CR538	152-0141-02		SEMICONV DEVICE:SILICON,30V,150MA	01295	1N4152R
A11CR701	152-0141-02		SEMICONV DEVICE:SILICON,30V,150MA	01295	1N4152R
A11CR702	152-0141-02		SEMICONV DEVICE:SILICON,30V,150MA	01295	1N4152R
A11CR703	152-0141-02		SEMICONV DEVICE:SILICON,30V,150MA	01295	1N4152R
A11CR705	152-0141-02		SEMICONV DEVICE:SILICON,30V,150MA	01295	1N4152R
A11CR706	152-0141-02		SEMICONV DEVICE:SILICON,30V,150MA	01295	1N4152R
A11DS618	150-1029-00		LT EMITTING DIO:GREEN,565NM,35MA	53184	XC209G
A11J2001	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2002	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2003	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2004	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2005	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2006	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2007	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2008	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2009	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11J2010	131-0787-00		CONTACT,ELEC:0.64 INCH LONG	22526	47359
A11P1000	131-0608-00		TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD (QTY 2)	22526	47357
A11P8006	131-0608-00		TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD (QTY 2)	22526	47357
A11R100	307-0107-00		RES.,FXD,CMPSN:5.6 OHM,5%,0.25W	01121	CB56G5
A11R101	315-0750-00		RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
A11R102	315-0105-00		RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A11R190	311-2147-00		RES.,VAR, NONWIR:P NL,5K OHM,20%,0.50W	01121	W8615
A11R191	321-0257-00		RES.,FXD,FILM:4.64K OHM,1%,0.125W	91637	MFF1816G46400F
A11R200	307-0107-00		RES.,FXD,CMPSN:5.6 OHM,5%,0.25W	01121	CB56G5
A11R201	315-0750-00		RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
A11R202	315-0105-00		RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A11R290	311-2147-00		RES.,VAR, NONWIR:P NL,5K OHM,20%,0.50W	01121	W8615
A11R291	321-0257-00		RES.,FXD,FILM:4.64K OHM,1%,0.125W	91637	MFF1816G46400F
A11R401	315-0820-00		RES.,FXD,CMPSN:82 OHM,5%,0.25W	01121	CB8205
A11R402	321-0807-00		RES.,FXD,FILM:900K OHM,1%,0.125W	91637	HFF1104F90002F
A11R403	321-0617-00		RES.,FXD,FILM:111K OHM,1%,0.125W	91637	MFF1816G11102F
A11R404	321-0468-00		RES.,FXD,FILM:732K OHM,1%,0.125W	24546	NA4D7323F
A11R405	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A11R455	311-2149-00		RES.,VAR, NONWIR:P NL,250 OHM,20%,0.50W	01121	W8612
A11R530	315-0124-00	B010100 B016099	RES.,FXD,CMPSN:120K OHM,5%,0.25W	01121	CB1245
A11R530	315-0114-00	B016100	RES.,FXD,CMPSN:110K OHM,5%,0.25W	01121	CB1145

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A11R531	315-0124-00		RES.,FXD,CMPSN:120K OHM,5%,0.25W	01121	CB1245
A11R532	315-0434-00		RES.,FXD,CMPSN:430K OHM,5%,0.25W	01121	CB4345
A11R536	315-0182-00		RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A11R537	321-0239-00		RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
A11R538	321-0126-00		RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A11R556	315-0102-00	XB012481	RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A11R557	311-2135-00		RES.,VAR,NONWIR:PNL,50K OHM,20%,0.5W	01121	W8600
A11R645	315-0912-00	B010100 B012480	RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
A11R645	315-0682-00	B012481	RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A11R646	315-0123-00	B010100 B012480	RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
A11R646	315-0103-00	B012481	RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A11R694	321-0451-00		RES.,FXD,FILM:487K OHM,1%,0.125W	91637	MFF1816G48702F
A11R726	311-2147-00		RES.,VAR,NONWIR:PNL,5K OHM,20%,0.50W	01121	W8615
A11R807	311-2147-00		RES.,VAR,NONWIR:PNL,5K OHM,20%,0.50W	01121	W8615
A11R808	315-0512-00		RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A11R891	311-1562-00		RES.,VAR,NONWIR:2K OHM,20%,0.50W	73138	91-84-0
A11R975	301-0131-00		RES.,FXD,CMPSN:130 OHM,5%,0.50W	01121	EB1315
A11S101	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S201	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S264	260-2075-00		SWITCH,PUSH:SPDT,50VDC,500M AMP	80009	260-2075-00
A11S305	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S315	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S317	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S390	260-2076-00		SWITCH,PUSH:SPST,MOMENTARY,50VDC,500M AMP	80009	260-2076-00
A11S401	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S440	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S464	260-2032-00		SWITCH,SLIDE:DPDT,125V,0.5A	82389	OBD
A11S611	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S650	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11S660	260-2033-00		SWITCH,SLIDE:DPTT,125V,0.5A	82389	OBD
A11U535	156-0067-00		MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	01295	MICROA741CP
A11W264	131-0566-00		BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	57668	JWW-0200EO
A11W265	131-0566-00		BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	57668	JWW-0200EO
A11W630	131-0566-00		BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	57668	JWW-0200EO
A11W635	131-0566-00	B010100 B012480X	BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	57668	JWW-0200EO
A11W637	131-0566-00		BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	57668	JWW-0200EO
A11W702	131-0566-00		BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	57668	JWW-0200EO





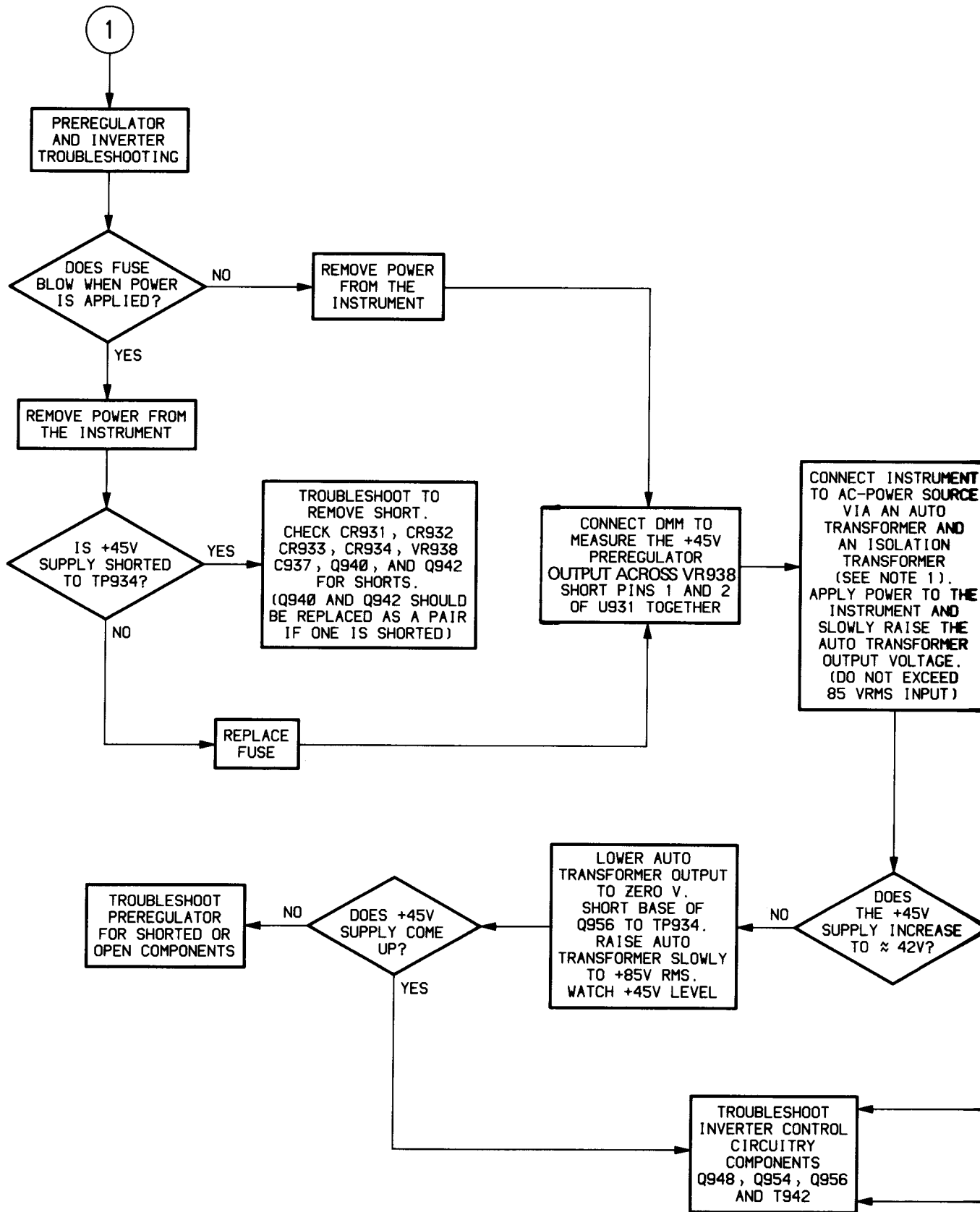
3827-20  
REV FEB 1982

CIRCUIT BOARD INTERCONNECTIONS

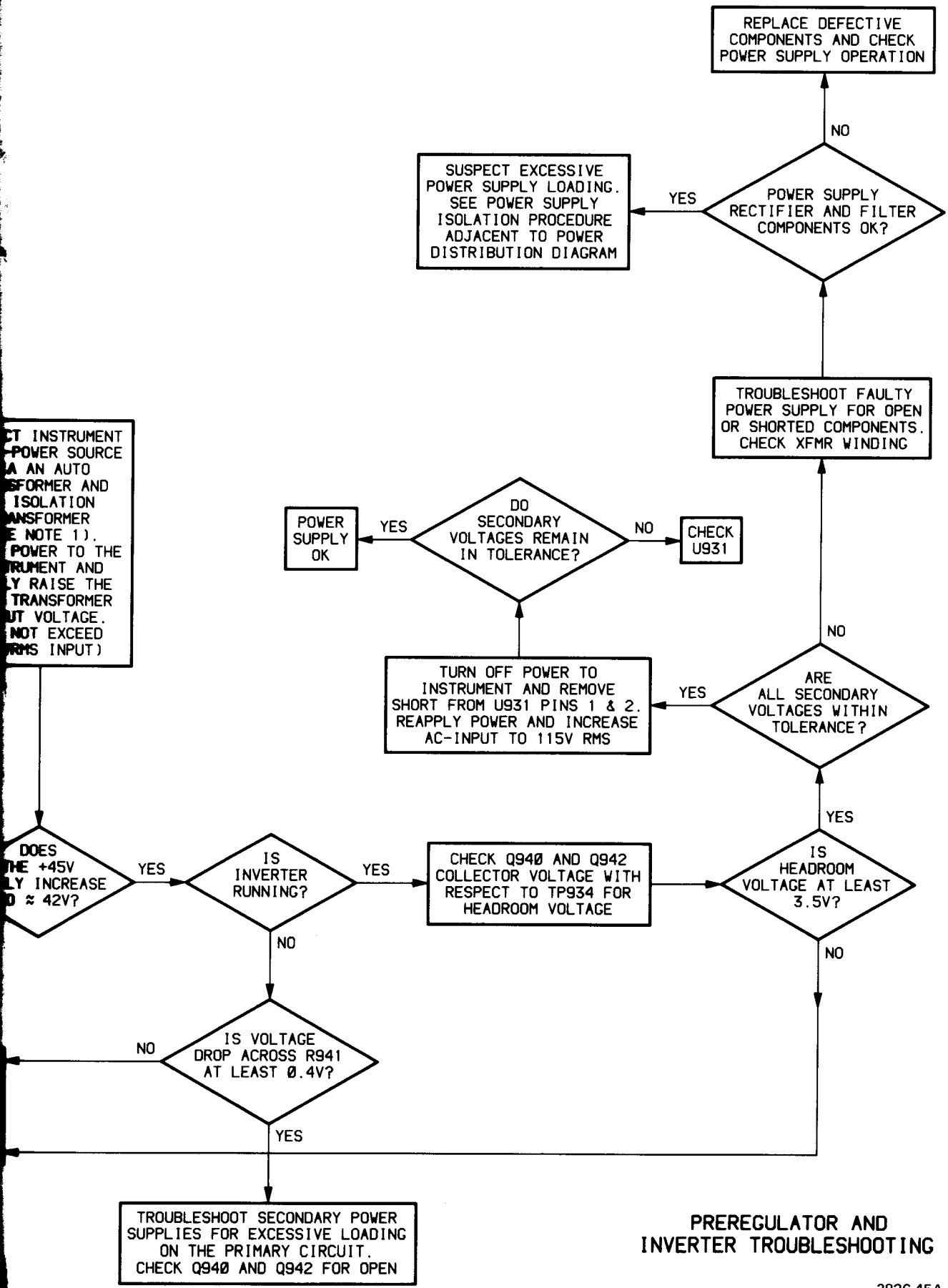
**TIMING SWITCH**



<b>ASSEMBLY A11</b>					
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
J2000-7	1M	3D	J2000-8	1M	3D
<i>Partial A11 also shown on diagrams 1, 2, 3, 4, 5, 6, 7 and 9.</i>					
<b>ASSEMBLY A12</b>					
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C625	3L	4E	R625	4F	4E
C626	3L	4E	R626	3E	4E
C628A	2K	4D	R627	7C	1E
C628B	2L	4E	R628	2L	4E
C636	6L	2E	R629	6C	1E
C677	7L	3F	R636	6L	2E
C679	8L	3F	R677	7L	2E
C738	8L	2E	R679	8L	2E
C741	7L	2E	R686	5C	1F
			R691	6C	1E
P2000-7	1M	4D	R738	8M	2D
P2000-8	1M	4D	R741	7M	1E
P7000-1	6M	1D			
P7000-2	7M	1D	S630A	2K	3D
P7000-3	8M	1D	S630B	2G	3D
P7000-4	7M	1D	S630	6E	3D
P7000-7	1M	1D			
Q629	6C	1F	VR629	6C	1F
<i>Partial A12 also shown on diagrams 1, 5 and 7.</i>					



TEST INSTRUMENT POWER SOURCE AS AN AUTO TRANSFORMER AND ISOLATION TRANSFORMER (SEE NOTE 1)). POWER TO THE INSTRUMENT AND ONLY RAISE THE TRANSFORMER OUTPUT VOLTAGE. DO NOT EXCEED RMS INPUT)



**PREREGULATOR AND INVERTER TROUBLESHOOTING**

DESCRIPTION

DIAGRAM CHANGES (Cont'd)

DIAGRAM 4 TRIGGER

REMOVE--R496 (Location 5L).

ADD --Q502, R500, Q505, and R502 (see partial schematics).

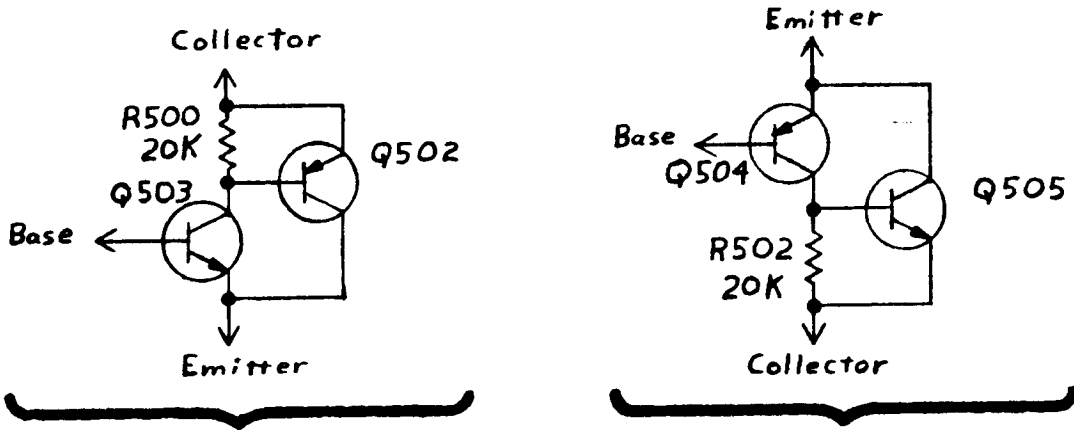


DIAGRAM 5 SWEEP GENERATOR & LOGIC

CHANGE--C645 (Location 4D) to a 2.2  $\mu$ F capacitor.

--C647 (Location 4D) to an 1800 pF capacitor.

REMOVE--CR626, CR630; ADD--C619, Q626; CHANGE--R619, R623 (see partial schematic).

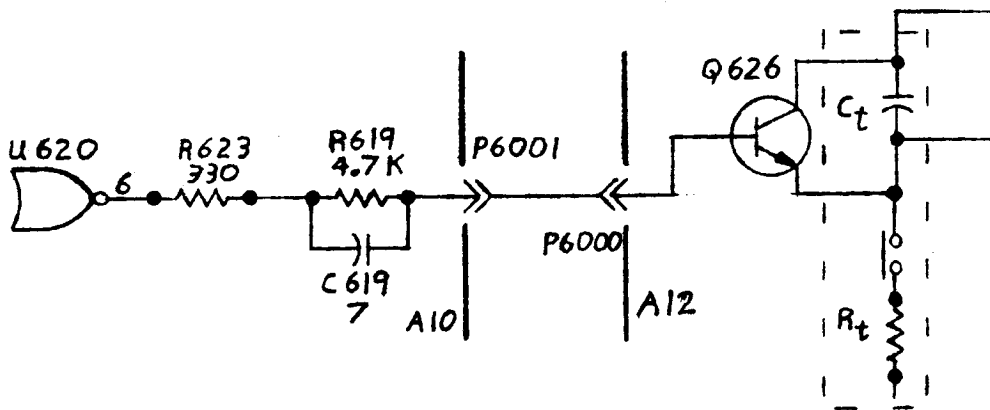


DIAGRAM 8 TIMING SWITCH

CHANGE--R627 (Location 7C) to a 200 $\Omega$  resistor.



Date: 7-5-83 Change Reference: M51750

Product: 2213 SERVICE, 2215 SERVICE Manual Part No.: See Below

**DESCRIPTION**

<u>Manual #</u>	<u>EFF SN</u>
2213 - - 070-3827-00	B031685
2215 - - 070-3826-00	B034666

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

CHANGE TO:

(2213)  
A10 670-6863-03 CKT BOARD ASSY: MAIN

(2215)  
A10 670-6866-03 CKT BOARD ASSY: MAIN

REMOVE:

(2213 & 2215)  
A10C454 281-0773-00 CAP,FXD,CER DI: 0.01UF,10%,100V

DIAGRAM CHANGES

(2213 & 2215)

DIAGRAM  TRIGGER

Remove C454 (location 6K) from the schematic.



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