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067-0508-00 CALIBRATION FIXTURE

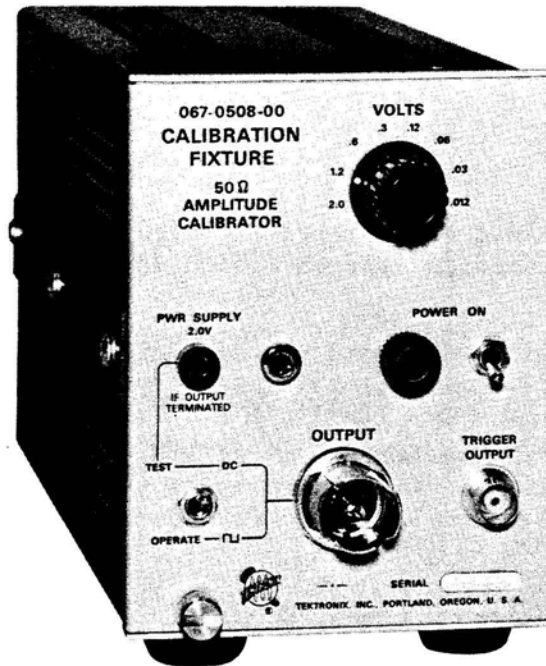
50 ohm Amplitude Calibrator



MANUFACTURERS OF CATHODE-RAY OSCILLOSCOPES

067-0508-00 CALIBRATION FIXTURE

50 ohm Amplitude Calibrator



This calibrator provides a source of voltage, the overall accuracy of which is $\pm 0.25\%$, from an accurate 50 ohm source resistance to calibrate equipment having a characteristic 50 ohm impedance. It may also calibrate a high impedance input provided the unit is accurately terminated in total load of 50 ohms.

GENERAL INFORMATION

Purpose

Provides an accurate source of voltage for the calibration of equipment having 50 Ω input impedance. It may also be used to calibrate equipment with high input impedance provided the unit is connected through an accurate 50 Ω termination.

Accuracy

Overall accuracy is $\pm 0.25\%$, enabling precision amplitude calibration of devices such as digital readout units or for precision comparison measurements.

Pretrigger

A pretrigger is provided sufficiently delayed to allow zero % zone levels to be established on Type 6R1 which does not have adjustable zero % zones.

Output Level

Output level is adjustable from 12 mV to 1.2 V in increments designed to provide a constant 6 division display as the attenuators of the system are changed. A 2 V level is provided to check linearity of a sampling bridge.

A test point is provided on the front panel to check the level into the attenuator.

Power Source

Normally operates on 115 or 230 VAC, 50 to 60 Hz. Additional taps are provided on the transformer primary to shift the design-center line voltage in 10 V increments from 105 to 125 V from 210 to 250 V.

Operating Instructions

1. Connect power cord to correct line voltage (factory wired for 115 volts unless otherwise indicated by rear panel decal).
2. Connect TRIG OUT to test-scope external trigger input jack.
3. Connect OUTPUT to test-scope vertical input.

NOTE: If test-scope vertical input is high impedance, terminate the cable in 50 Ω ($\pm 1\%$ accuracy required or better).

4. Control Settings (test scope)

Deflection factor	200 mV/cm
Trigger source	+ external
Sweep rate	10 μ s/cm
Dots (or samples)/cm	100 μ s/cm

Set calibrator for 1.2 V out and set TEST-OPERATE switch to OPERATE. Adjust test scope for stable display, centered on screen and displaying 1.5 to 3 cycles per 10 cm.

Special Information

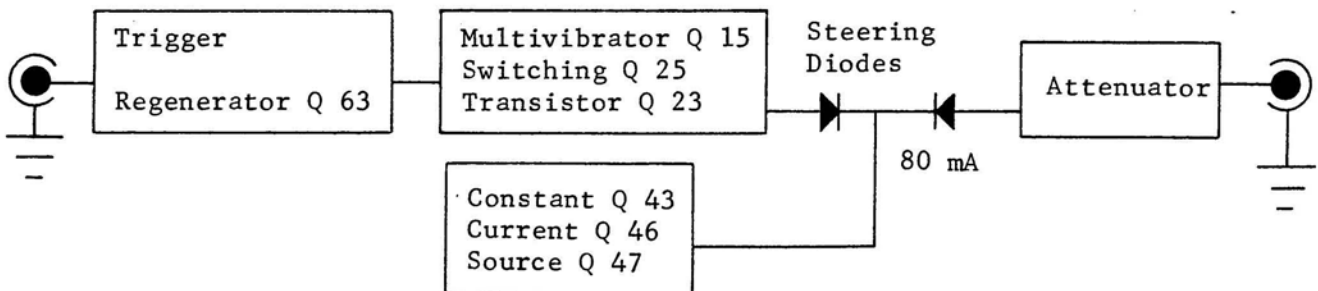
With a vertical unit having 50 Ω characteristic input impedance there is no need to compensate for the possible error due to the tolerance of front end components. This error is constant and can be ignored, since the same relative error exists in all measurements from a 50 Ω source. Therefore, if two units (or two inputs to the same unit) are not exactly 50 Ω but are calibrated to exactly the same voltage (1 volt for example), they will agree on all measurements from a 50 Ω source.

This does not apply to high impedance inputs such as cathode-follower probes or sampling probe units (3S3 and 4S3). These must be calibrated with the 50 Ω Amplitude Calibrator terminated accurately. Otherwise the output voltage will not be correct.

NOTE: If the calibrator is not terminated, the output voltage is twice the value indicated by the VOLTS setting.

The output waveform is negative going from zero. Therefore, the first portion of the signal on the screen is the negative level using + external triggering.

Circuit Description



The 50 Ω Amplitude Calibrator consists of a precision constant current source, precision 50 Ω termination, an attenuator, and a switch.

The constant current source generates 80 mA which is alternately switched, via the steering diodes, between the load and the emitter-follower switching transistor (in the multi & switch section).

The switching transistor is controlled by the free-running multi-vibrator. The emitter-follower level changes from about -5 to +5 volts. This insures that the steering network is well controlled, especially when the output is zero.

Precision attenuators maintain the 50 Ω environment while dividing the output levels.

A delayed trigger is obtained by slowing down the leading edge sufficiently (R60 and C60) and switching current into the trigger transformer for a short period of time.

Calibration Procedure

Equipment Required

- 1 Sampling Oscilloscope
- 1 Differential Voltmeter (0.05% accuracy or better with 0.001 V resolution)
- 1 Precision 50 Ω Termination (0.05% or better)

Equipment Connections

Terminate the OUTPUT in such a way that access to the leads at the GR connector is provided for connection of the differential voltmeter (to avoid combining the contact resistance of both the switch and the connector with the 50 Ω termination). Connect the voltmeter.

NOTE: The PWR SUPPLY jack on the front panel could be used for this connection. However, an error of approximately 0.05% will be introduced due to the contact resistance.

Control Settings and Adjustments

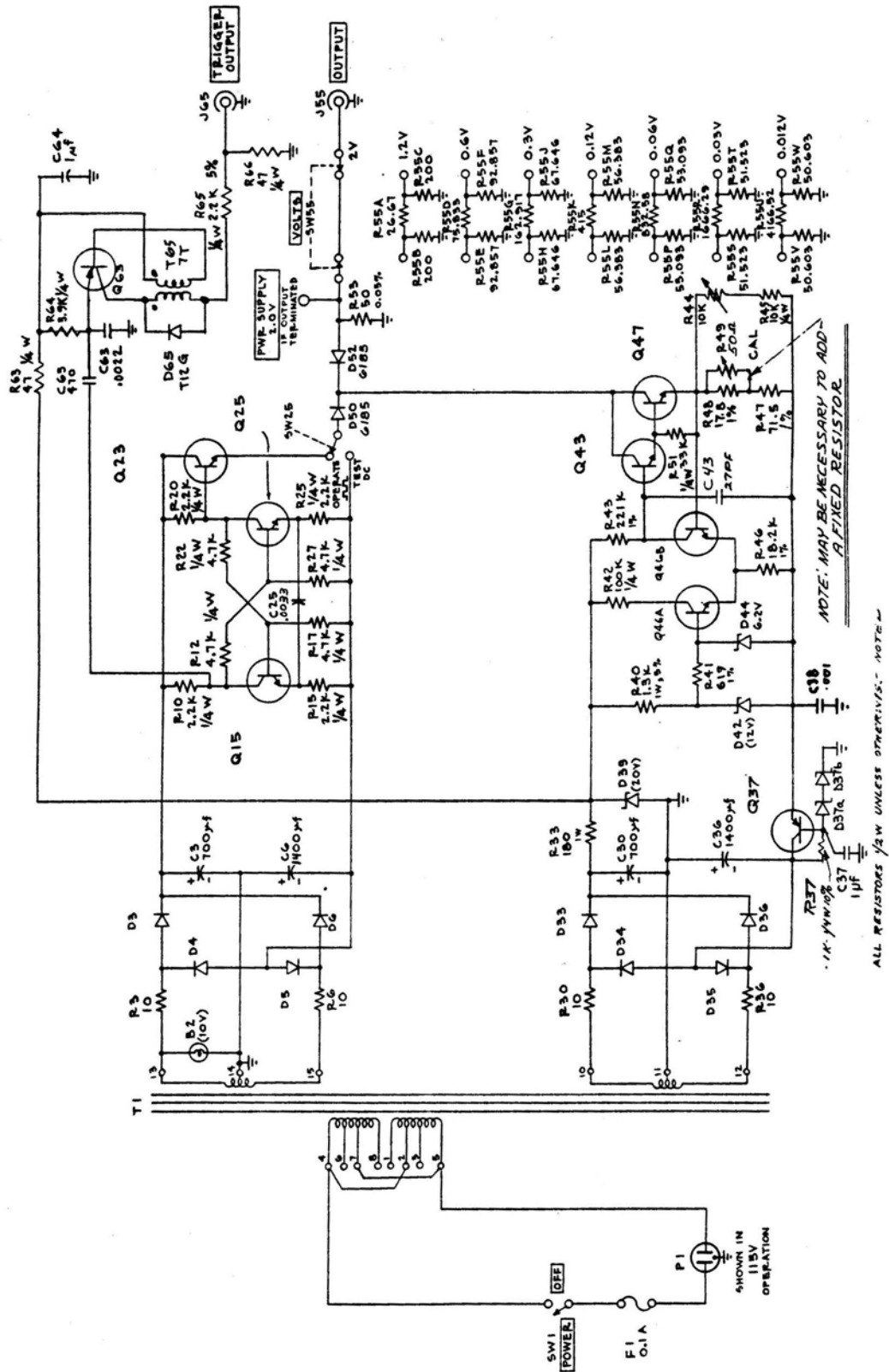
Set the Calibrator for 2 V and the voltmeter to a range which will properly measure 2 V. Set the TEST-OPERATE switch at TEST. Check line voltage for 115 volts and turn the POWER switch on.

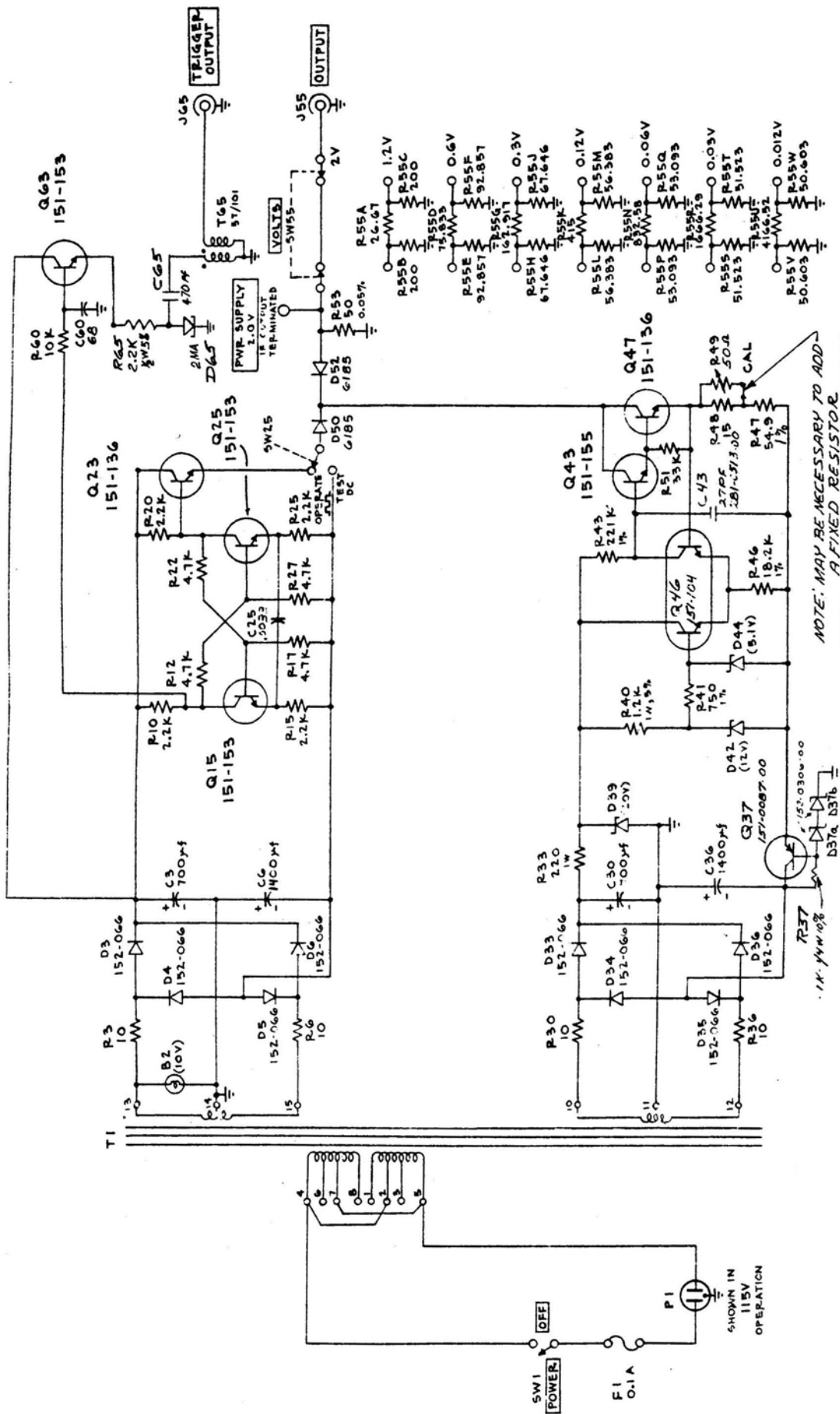
Adjust Cal (internal) for exactly 2 V. Check for $\pm 0.25\%$ or better regulation as line voltage is varied from 103.5 to 126.5 volts.

Return the line to 115 volts. Check each switch position for correct output voltage and for regulation between 103.5 and 126.5 VAC line voltage limits.

Check for presence of trigger pulse by following the operating procedure and checking the test scope for stable triggering. The trigger should be present in either position of the TEST-OPERATE switch.

Disconnect the 50 Ω termination. Connect the OUTPUT to the 50 Ω input of a sampling scope. Set the controls for a suitable display as indicated in Operating Instructions. Operate the TEST-OPERATE switch and note that in the TEST position the squarewave disappears but the trace remains on the screen at the - DC level corresponding to the setting of the front panel VOLTS control.





MODEL 1
50 Ω VOLTAGE CALIBRATOR

NOTE: MAY BE NECESSARY TO ADD A FIXED RESISTOR

ALL RESISTORS 1/2W UNLESS OTHERWISE NOTED

ELECTRICAL PARTS LIST

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
Bulb				
B2	150-0043-00	100	379	Incandescent, Assembly
B2	150-0065-00	380		Incandescent, Green Lens
Capacitors				
Tolerance $\pm 20\%$ unless otherwise indicated.				
C3 ¹	290-0256-00			700 μF Elect. 50 V
C6	290-0256-00			1400 μF Elect. 50 V
C25	283-0051-00			0.0033 μF Cer 100 V 5%
C30 ¹	290-0256-00			700 μF Elect. 50 V
C36	290-0256-00			1400 μF Elect. 50 V
C37	283-0059-00	X380		1 μF Cer 25 V +80%-20%
C38	283-0000-00	X380		0.001 μF Cer 500 V
C43	281-0513-00			27 pF Cer 500 V
C60	281-0549-00	100	379X	68 pF Cer 500 V 10%
C63	283-0028-00	X380		0.0022 μF Cer 50 V
C64	283-0059-00	X380		1 μF Cer 25 V +80%-20%
C65	281-0580-00			470 pF Cer 500 V 10%
Semiconductor Device, Diodes				
D3	152-0066-01			Silicon 400 V, 0.75 A
D4	152-0066-01			Silicon 400 V, 0.75 A
D5	152-0066-01			Silicon 400 V, 0.75 A
D6	152-0066-01			Silicon 400 V, 0.75 A
D33	152-0066-01			Silicon 400 V, 0.75 A
D34	152-0066-01			Silicon 400 V, 0.75 A
D35	152-0066-01			Silicon 400 V, 0.75 A
D36	152-0066-01			Silicon 400 V, 0.75 A
D37	152-0060-00	100	329	Zener 1N3027A 20 V, 1 W, 5%
D37A	152-0306-00	330		Zener 1N960B 9.1 V, 0.4 W, 5%

¹ C3 and C30 furnished as a unit.

ELECTRICAL PARTS LIST (cont)

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description
Semiconductor Device, Diodes (cont)				
VR37B	152-0306-00	330		Zener 1N960B, 9.1 V, 0.4 W, 5%
VR39	152-0060-00		529	Zener 1N3027A, 20 V, 1 W, 5%
VR39	152-0291-00	530		Zener 1N3027B, 20 V, 1 W, 5%
VR42	152-0168-00			Zener 1N963A, 12 V, 0.4 W, 20%
VR44	152-0139-00	100	379	Zener 1N751, 5.1 V, 0.4 W, 10%
VR44	152-0317-00	380		Zener 1N3497, 6.2 V, 0.4 W, 5%
CR50	*152-0185-00			Silicon Replaceable by 1N3605
CR52	*152-0185-00			Silicon Replaceable by 1N3605
CR65	152-0081-00	100	379	Tunnel TD-2 2.2 mA
CR65	152-0008-00	380		Germanium
Fuse				
F1	159-0048-00			0.1 A Slo-Blo
Connector				
J65	131-0106-00			1 contact, female
Transistors				
Q15	*151-0153-00			Silicon Replaceable by 2N2923
Q23	*151-0136-00			Silicon Replaceable by 2N3053
Q25	*151-0153-00			Silicon Replaceable by 2N2923
Q37	*151-0087-00	100	379	Silicon Replaceable by 2N1131
Q37	151-0208-00	380		Silicon 2N4036
Q43	*151-0155-00			Silicon Replaceable by 2N2925
Q46	*151-0104-00	100	379	Silicon Replaceable by 2N2913
Q46A	*151-0192-00	380		Silicon Replaceable by MPS-6521
Q46B	*151-0192-00	380		Silicon Replaceable by MPS-6521
Q47	*151-0136-00			Silicon Replaceable by 2N3053

ELECTRICAL PARTS LIST (cont)

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
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Transistors (cont)

Q63	*151-0153-00	100	379	Silicon	Replaceable by 2N2923 2N3906
Q63	151-0188-00	380		Silicon	

Resistors

Resistors are fixed, composition, $\pm 10\%$ unless otherwise indicated.

R3	302-0100-00			10 Ω	1/2 W	
R6	302-0100-00			10 Ω	1/2 W	
R10	301-0222-00	100	379	2.2 k Ω	1/2 W	5%
R10	315-0222-00	380		2.2 k Ω	1/4 W	5%
R12	301-0472-00	100	379	4.7 k Ω	1/2 W	5%
R12	315-0472-00	380		4.7 k Ω	1/4 W	5%
R15	301-0222-00	100	379	2.2 k Ω	1/2 W	5%
R15	315-0222-00	380		2.2 k Ω	1/4 W	5%
R17	301-0472-00	100	379	4.7 k Ω	1/2 W	5%
R17	315-0472-00	380		4.7 k Ω	1/4 W	5%
R20	301-0222-00	100	379	2.2 k Ω	1/2 W	5%
R20	315-0222-00			2.2 k Ω	1/4 W	5%
R22	301-0472-00	100	379	4.7 k Ω	1/2 W	5%
R22	315-0472-00	380		4.7 k Ω	1/4 W	5%
R25	301-0222-00	100	379	2.2 k Ω	1/2 W	5%
R25	315-0222-00	380		2.2 k Ω	1/4 W	5%
R27	301-0472-00	100	379	4.7 k Ω	1/2 W	5%
R27	315-0472-00	380		4.7 k Ω	1/4 W	5%
R30	302-0100-00			10 Ω	1/2 W	
R33	304-0221-00	100	379	220 Ω	1 W	
R33	304-0181-00	380		180 Ω	1 W	
R36	302-0100-00			10 Ω	1/2 W	
R37	316-0102-00			1 k Ω	1/4 W	
R40	304-0122-00	100	379	1.2 k Ω	1 W	
R40	303-0132-00	380		1.3 k Ω	1 W	5%

ELECTRICAL PARTS LIST (cont)

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description			
Resistors (cont)							
R41	323-0181-00	100	379	750 Ω	1/2 W	Prec	1%
R41	323-0173-00	380		619 Ω	1/2 W	Prec	1%
R42	316-0104-00	X380		100 k Ω	1/4 W		
R43	323-0418-00			221 k Ω	1/2 W	Prec	1%
R44	311-0245-00	X380		10 k Ω , Var			
R45	322-0289-00	X380		10 k Ω	1/4 W	Prec	1%
R46	323-0314-00			18.2 k Ω	1/2 W	Prec	1%
R47	323-0072-00	100	379	54.9 Ω	1/2 W	Prec	1%
R47	323-0083-00	380		71.5 Ω	1/2 W	Prec	1%
R48	323-0018-00	100	379	15 Ω	1/2 W	Prec	1%
R48	323-0025-00	380		17.8 Ω	1/2 W	Prec	1%
R49	311-0308-00			50 Ω , Var			
R51	301-0333-00	100	379	33 k Ω	1/2 W		5%
R51	315-0333-00	380		33 k Ω	1/4 W		5%
R53	*310-0627-00	100	379	50 Ω	2 W	Prec	0.05%
R53	*310-0663-00	380		50 Ω	2 W	Prec	0.05%
R55A	*310-0654-00			26.67 Ω	6 W	WW	0.05%
R55B				200 Ω	6 W	WW	0.05%
R55C				200 Ω	6 W	WW	0.05%
R55D	*310-0655-00			75.833 Ω	6 W	WW	0.05%
R55E				92.857 Ω	6 W	WW	0.05%
R55F				92.857 Ω	6 W	WW	0.05%
R55G	*310-0656-00			162.917 Ω	6 W	WW	0.05%
R55H				67.646 Ω	6 W	WW	0.05%
R55J				67.646 Ω	6 W	WW	0.05%
R55K	*310-0657-00			415 Ω	6 W	WW	0.05%
R55L				56.383 Ω	6 W	WW	0.05%
R55M				56.383 Ω	6 W	WW	0.05%
R55N	*310-0658-00			832.58 Ω	6 W	WW	0.05%
R55P				53.093 Ω	6 W	WW	0.05%
R55Q				53.093 Ω	6 W	WW	0.05%

ELECTRICAL PARTS LIST (cont)

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
Resistors (cont)				
R55R } R55S } R55T }	*310-0659-00		1666.29 Ω 51.523 Ω 51.523 Ω	6 W 6 W 6 W WW WW WW 0.05% 0.05% 0.05%
R55U } R55V } R55W }	*310-0660-00		4166.52 Ω 50.603 Ω 50.603 Ω	6 W 6 W 6 W WW WW WW 0.05% 0.05% 0.05%
R60	301-0103-00	100	379X 10 k Ω	1/2 W 5%
R63	316-0470-00	X380	47 Ω	1/4 W
R64	316-0392-00	X380	3.9 k Ω	1/4 W
R65	301-0222-00	100	379 2.2 k Ω	1/2 W 5%
R65	315-0222-00	380	2.2 k Ω	1/4 W 5%
R66	316-0470-00	X380	47 Ω	1/4 W

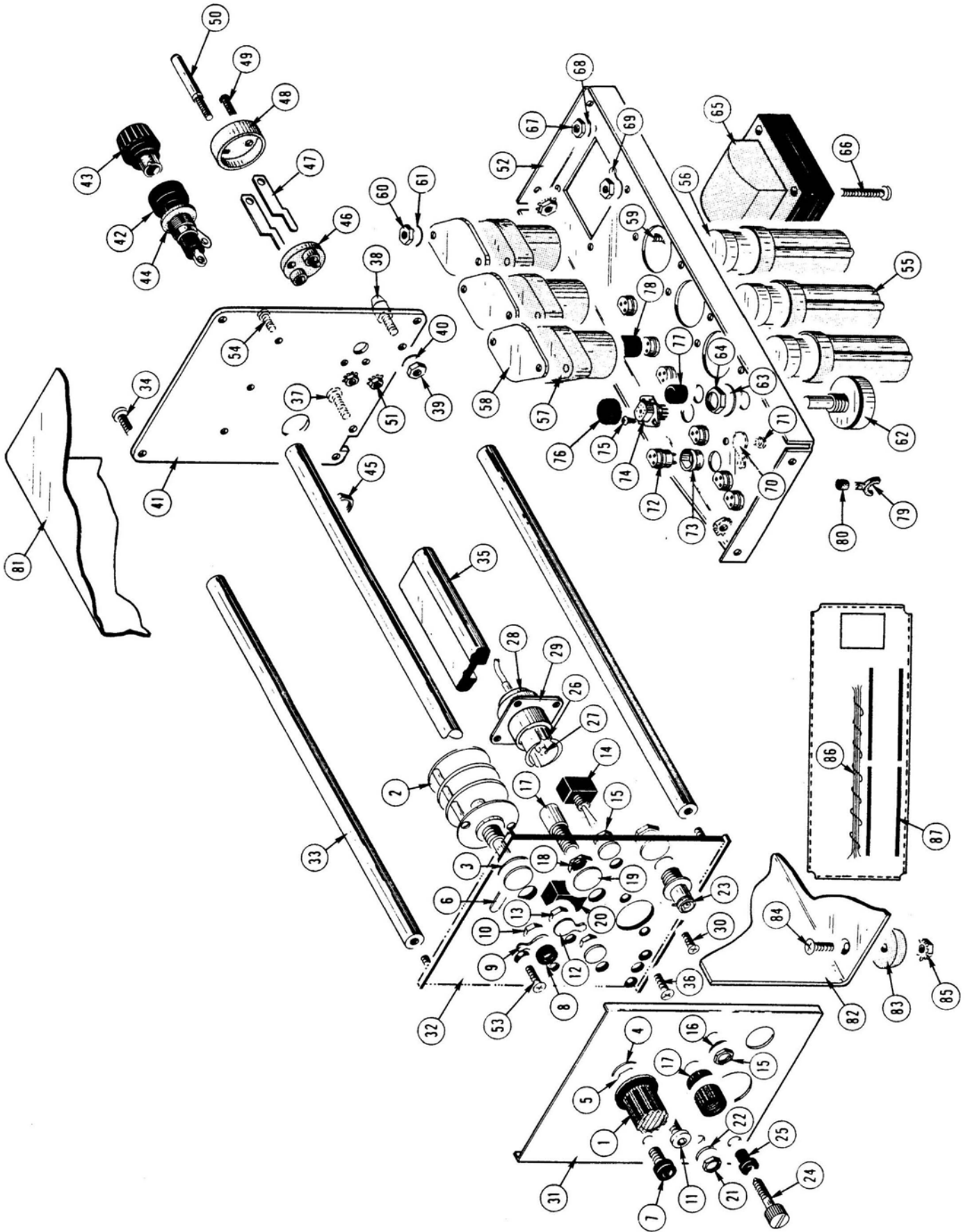
Switches

Wired or Unwired

SW1	260-0613-00	Toggle	POWER OFF
SW25	260-0613-00	Toggle	OPERATE TEST DC
SW55	262-0899-00	Rotary	VOLTS

Transformers

T1	*120-0494-00	Power	
T65	*120-0247-00	100	379 Toroid, 5 turns bifilar
T65	*120-0281-00	380	Toroid, 7 turns bifilar



MECHANICAL PARTS LIST

EXPLODED

Fig. & Index No.	Tektronix Part No.	Serial/Model Eff	No. Disc	Q † y						Description
					1	2	3	4	5	
1	366-0173-00			1						KNOB, charcoal--VOLTS
	- - - - -			-						knob includes:
	213-0004-00			1						SETSCREW, 6-32 x 0.188 inch, HSS
2	260-0884-00			1						SWITCH, wired--VOLTS
	- - - - -			-						mounting hardware: (not included w/switch)
3	210-0012-00			1						WASHER, lock, internal, 0.375 ID x
	- - - - -			-						0.50 inch OD
4	210-0840-00			1						WASHER, flat, 0.390 ID x 0.562 inch OD
5	210-0413-00			1						NUT, hex., 0.375-32 x 0.50 inch
6	210-0207-00	X380		1						LUG, solder, plain pot, 0.375 inch
7	136-0140-00			1						SOCKET, banana jack
	- - - - -			-						mounting hardware: (not included w/socket)
8	210-0895-00			1						WASHER, plastic insulating
9	210-0223-00			1						LUG, solder, locking, 0.25 inch
10	210-0465-00			1						NUT, hex., 0.25-32 x 0.375 inch x 0.094 inc
11	358-0054-00			1						BUSHING, banana jack
	- - - - -			-						mounting hardware: (not included w/bushing)
12	210-0223-00			1						LUG, solder, locking, 0.25 inch
13	210-0465-00			1						NUT, hex., 0.25-32 x 0.375 inch x 0.094 inc
14	260-0613-00			1						SWITCH, toggle--POWER ON
	- - - - -			-						mounting hardware: (not included w/switch)
15	210-0562-00		379X	2						NUT, hex., 0.25-40 x 0.313 inch
	210-0046-00	X380		1						WASHER, lock, internal, 0.261 ID x
	- - - - -			-						0.40 inch OD
16	210-0940-00			1						WASHER, flat, 0.25 ID x 0.375 inch OD
17	136-0164-00			1						SOCKET, lamp
	- - - - -			-						mounting hardware: (not included w/socket)
18	210-0413-00			1						NUT, hex., 0.375-32 x 0.50 inch
19	210-0012-00			1						WASHER, lock, internal, 0.375 ID x
	- - - - -			-						0.50 inch OD
20	260-0613-00			1						SWITCH, toggle--TEST OPERATE
	- - - - -			-						mounting hardware: (not included w/switch)
21	210-0562-00		379X	2						NUT, hex., 0.25-40 x 0.313 inch
	210-0046-00	X380		1						WASHER, lock, internal, 0.261 ID x
	- - - - -			-						0.40 inch OD
22	210-0940-00			1						WASHER, flat, 0.25 ID x 0.375 inch OD

EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Q					Description
				Y	1	2	3	4	
23	131-0106-00			1					CONNECTOR, coaxial, 1 contact, BNC, w/mounting hardware
24	214-0553-00			1					SCREW, latch
25	358-0255-00			1					BUSHING, latch screw
	132-0144-00			1					CONNECTOR, receptacle, electrical, GR connector includes:
26	132-0002-00			1					SLEEVE, outer conductor
	132-0001-00			1					NUT, coupling
	132-0007-00			1					RING, snap
	132-0026-00			1					OUTER TRANSITION
	132-0027-00			1					INNER TRANSITION
	132-0028-00			1					INSULATOR
27	132-0029-00			1					INNER CONDUCTOR
28	132-0121-00			1					NUT, panel adapter
29	132-0040-00			1					ADAPTER, panel mounting hardware: (not included w/adapter)
30	211-0038-00			4					SCREW, 4-40 x 0.313 inch, 100° csk, FHS
31	333-1021-00			1					PANEL, front
32	386-1302-00			1					PLATE, front sub-panel
33	385-0181-00			3					ROD, spacer mounting hardware for each: (not included w/rod)
34	212-0023-00			1					SCREW, 8-32 x 0.50 inch, PHS
35	351-0089-02			1					GUIDE, corner rail mounting hardware: (not included w/guide)
36	211-0512-00			2					SCREW, 6-32 x 0.50 inch, 100° csk, FHS
37	212-0023-00			1					SCREW, 8-32 x 0.50 inch, PHS
38	214-0561-00			2					PIN, locating, 0.25 x 0.712 inch long
	214-0680-00	330	329	2					PIN, locating, 0.225 x 0.712 inch long mounting hardware for each: (not included w/pin)
39	210-0409-00			1					NUT, hex., 8-32 x 0.313 inch
40	210-0008-00			1					WASHER, lock, internal, #8
41	386-1301-00			1					PANEL, rear
	352-0002-00			1					ASSEMBLY, fuse holder assembly includes:
42	352-0010-00			1					HOLDER, fuse
43	200-0582-00			1					CAP. fuse, black
44	210-0873-00			1					WASHER, rubber, 0.50 ID x 0.688 inch OD
45				1					NUT

EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Disc	Q					Description
			t	Y	1	2	3	
46	377-0041-00		1					INSERT, motor base
47	214-0078-00		2					PIN, connecting
48	200-0185-00		1					COVER, motor base
49	211-0015-00		1					SCREW, 4-40 x 0.50 inch, RHS
50	129-0060-00		1					POST, ground
51	210-0586-00		2					NUT, keps, 4-40 x 0.50 inch
52	441-0755-00		1					CHASSIS
	- - - - -		-					mounting hardware: (not included w/chassis)
53	211-0538-00		2					SCREW, 6-32 x 0.313 inch, 100° csk, FHS
	210-0457-00		5					NUT, keps, 6-32 x 0.313 inch
54	211-0507-00		3					SCREW, 6-32 x 0.313 inch, PHS
55	200-0256-00		3					COVER, capacitor, plastic, 1 ID x 2.031 inches long
	- - - - -		-					
56	- - - - -		3					CAPACITOR
	- - - - -		-					mounting hardware for each: (not included w/capacitor)
	- - - - -		-					
57	432-0047-00		1					BASE, plastic, capacitor mounting
58	386-0252-00		1					PLATE, fiber
59	211-0514-00		2					SCREW, 6-32 x 0.750 inch, PHS
60	210-0407-00		2					NUT, hex., 6-32 x 0.250 inch
61	210-0006-00		2					WASHER, lock, internal, #6
62	- - - - -		1					RESISTOR, variable
	- - - - -		-					mounting hardware: (not included w/resistor)
63	210-0846-00		1					WASHER, flat, 0.390 ID x 0.563 inch OD
64	210-0413-00		1					NUT, hex., 0.375-32 x 0.50 inch
65	- - - - -		1					TRANSFORMER
	- - - - -		-					mounting hardware: (not included w/transformer)
	- - - - -		-					
66	211-0516-00		4					SCREW, 6-32 x 0.875 inch, PHS
67	210-0407-00		4					NUT, hex., 6-32 x 0.25 inch
68	210-0006-00		3					WASHER, lock, internal, #6
69	210-0202-00		1					LUG, solder, SE #6
70	210-0201-00		2					LUG, solder, SE #4
	- - - - -		-					mounting hardware for each: (not included w/lug)
	- - - - -		-					
71	213-0044-00		1					SCREW, thread forming, 5-32 x 0.188 inch, PHS

EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Q					Description
				y	1	2	3	4	
72	136-0181-00			7					SOCKET, transistor, 3 pin
	- - - - -			-					mounting hardware for each: (not included w/socket)
73	354-0234-00			1					RING, socket mounting
74	136-0078-00			1					SOCKET, transistor, 8 pin
	- - - - -			-					mounting hardware: (not included w/socket)
75	213-0055-00			2					SCREW, thread forming, 2-32 x 0.188 inch, P
76	200-0715-00			1					COVER, transistor
77	348-0056-00			2					GROMMET, plastic, 0.375 inch diameter
78	214-0269-00			1					HEAT SINK
79	426-0121-00			1					HOLDER, toroid
	- - - - -			-					mounting hardware: (not included w/holder)
80	361-0007-00			1					SPACER, plastic, 0.188 inch long
81	390-0016-00			1					CABINET, top
	- - - - -			-					mounting hardware: (not included w/cabinet)
	210-0802-00			6					WASHER, flat, 0.150 ID x 0.313 inch OD
	211-0542-00			6					SCREW, 6-32 x 0.313 inch, THS
82	390-0017-00			1					CABINET, bottom
	- - - - -			-					cabinet includes:
83	348-0001-00			4					FOOT, rubber
	- - - - -			-					mounting hardware for each: (not included w/foot)
84	211-0559-00			1					SCREW, 6-32 x 0.375 inch, 100° csk, FHS
85	210-0457-00			1					NUT, keps, 6-32 x 0.313 inch
86	179-1195-00			1					CABLE HARNESS
87	124-0145-00			4					STRIP, ceramic, 0.438 inch h, w/20 notches
	- - - - -			-					each strip includes:
	355-0046-00			2					STUD, plastic
	- - - - -			-					mounting hardware for each: (not included strip)
	- - - - -			-					strip)
	361-0009-00			2					SPACER, plastic, 0.406 inch long
									STANDARD ACCESSORIES
	161-0010-00	X380		1					CORD, power, 3 conductor, 8 feet
	103-0013-00	X380		1					ADAPTER, power cord, 3 to 2 wire
	062-0812-00			2					MANUAL, instruction