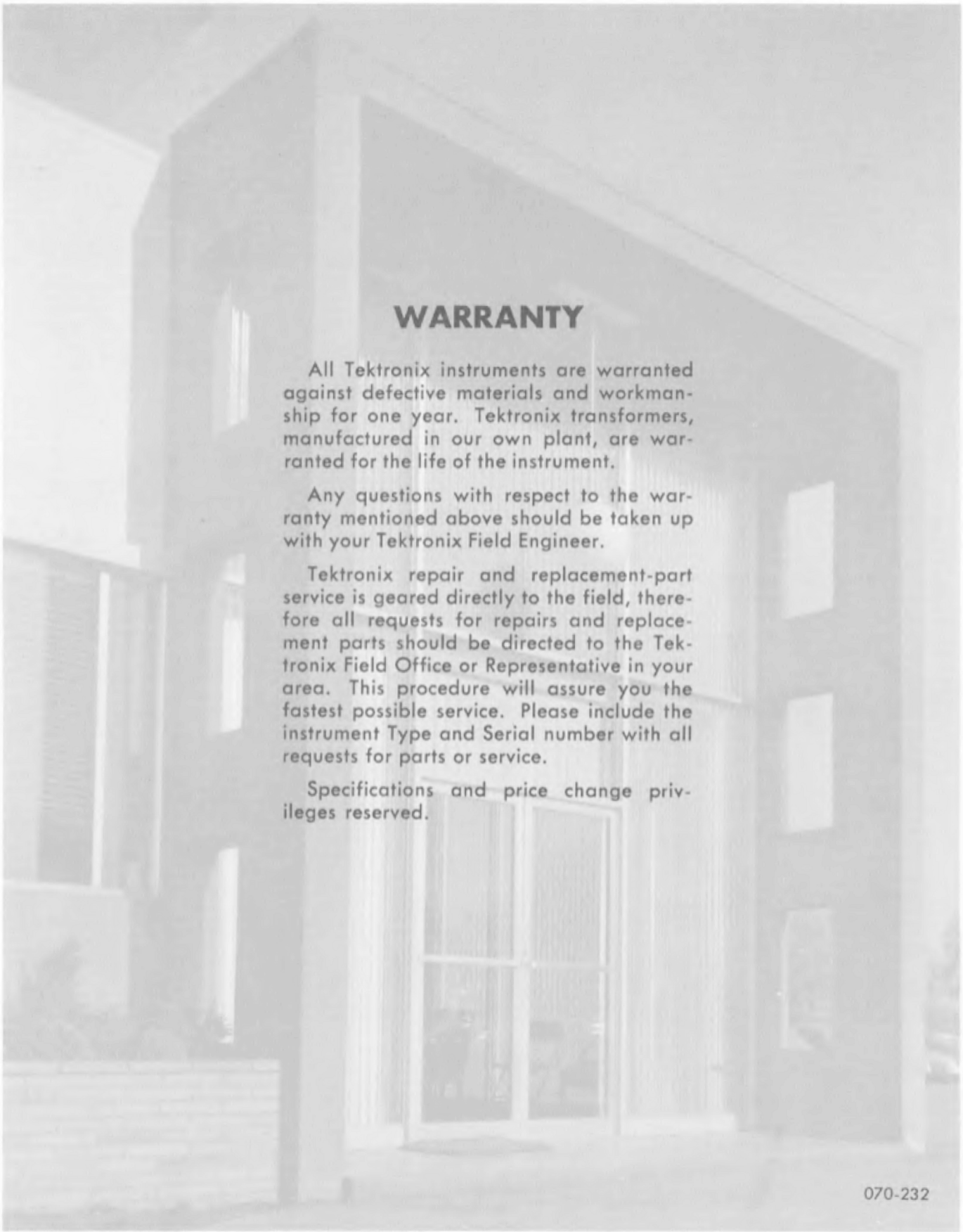
INSTRUCTION MANUAL

TYPE 81 PLUG-IN ADAPTER

MANUFACTURERS OF CATHODE-RAY OSCILLOSCOPES



WARRANTY

All Tektronix instruments are warranted against defective materials and workmanship for one year. Tektronix transformers, manufactured in our own plant, are warranted for the life of the instrument.

Any questions with respect to the warranty mentioned above should be taken up with your Tektronix Field Engineer.

Tektronix repair and replacement-part service is geared directly to the field, therefore all requests for repairs and replacement parts should be directed to the Tektronix Field Office or Representative in your area. This procedure will assure you the fastest possible service. Please include the instrument Type and Serial number with all requests for parts or service.

Specifications and price change privileges reserved.

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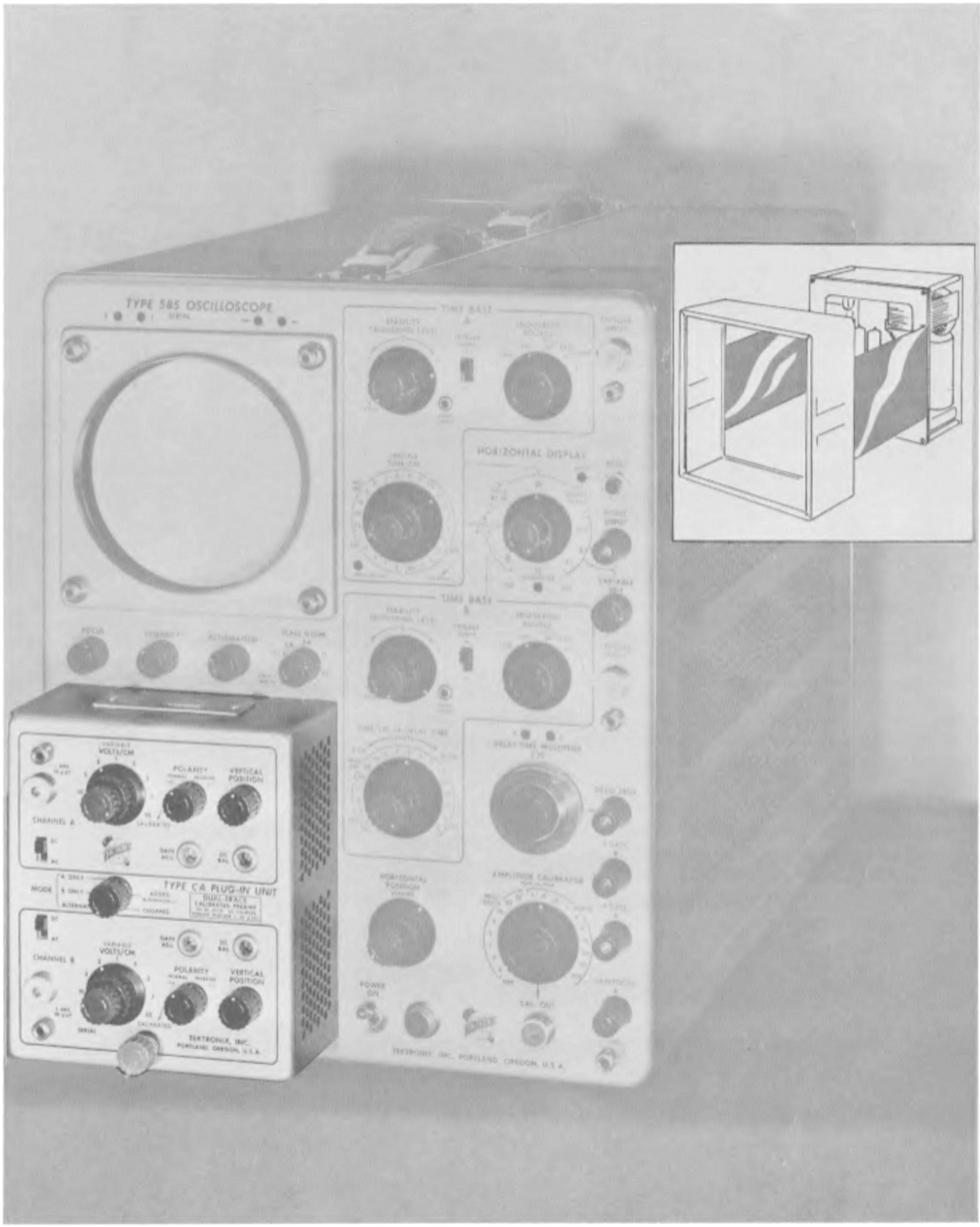


Fig. 1. Type 81 Plug-In Adapter with Type 585 Oscilloscope.

TYPE 81

GENERAL INFORMATION

General

The Type 81 Plug-In Adapter lets you install plug-ins other than the Type 80 in your Type 581 or Type 585 Oscilloscope. With the Type 81 you can use any Tektronix letter-series plug-in. Correct connections, gain and impedance are provided automatically. For performance specifications of letter-series plug-ins with the Type 81 and the Type 581 or Type 585 Oscilloscopes, refer to Table A below, or for some of the new special-purpose plug-ins, to the explanatory paragraphs following.

Probe Information

The Type P410 and Type P6000 Series probes may be used with letter designated plug-ins. Before using any probe with your Type 81 Adapter and letter-series plug-in, be sure the probe is properly compensated for operation with the particular oscilloscope it is to be used with.

Probe Compensation

To check compensation of the probe, attach the UHF connector at the cable end to the INPUT of the Plug-In Unit, and touch the probe tip to the CAL. OUT connector of the oscilloscope. Observe the square-wave display on the crt, and compensate the probe so that you get a perfect flat top with no rolloff or overshoot at the leading edge.

To compensate the P410 probe, a small hole in the body of the probe near the nose permits adjustment of the compensating trimmer capacitor. Compensation of the P6000 is done by rotating the probe barrel while observing the displayed waveform from the calibrator. To allow the probe barrel to turn freely, the locking ring must first be loosened by turning it counterclockwise. After the probe is compensated, tighten the locking ring very carefully, to avoid disturbing the probe adjustment.

SPECIAL PURPOSE PLUG-IN UNITS

Type N

The Type N Sampling Unit is designed for use with Tektronix plug-in type Oscilloscopes. The sampling system thus formed permits the display of repetitive signals with fractional nanosecond (10^{-9} second or nsec), risetime. By taking successive samples at a slightly later time at each recurrence of the pulse under observation, the Type N reconstructs the pulse on a relatively long time-base. Specifications of the Type N include a risetime of 0.6 nsec, corresponding to a maximum bandpass of approximately 600 mc; a sensitivity of 10 mv/cm with 2 mv or less noise; and a dynamic range of ±120 mv minimum linear range before overloading occurs.

Accidental overload of ±4 volts is permissible.

Type P

The Type P Plug-In Unit generates a fast-rise step-function test signal of known waveform, simulating the output of an ideally compensated Type K Unit driven with a Tektronix

TABLE A

Risetime and Bandwidth Specifications for letter-series Plug-Ins with Type 81 Adapter and Type 581 or 585 Oscilloscope.

PLUG-IN	CALIBRATED DEFLECTION FACTOR	RISETIME	PASBAND	PLUG-IN	CALIBRATED DEFLECTION FACTOR	RISETIME	PASSBAND
Type A Wide-Band DC	0.05 v/cm to 20 v/cm	.018 μsec	dc to 20 mc	Type G Wide-Band DC Differential	0.05 v/cm to 20 v/cm	.018 μsec	dc to 20 mc
Type B Wide-Band	5 mv/cm to 0.05 v/cm	.03 μsec	2 c to 12 mc	Type H DC Coupled	.005 v/cm to 20 v/cm	.023 μsec	dc to 15 mc
High Gain	0.05 v/cm to 20 v/cm	.018 μsec	dc to 20 mc	High Gain Wide-Band			
Type CA Dual-Trace DC	0.05 v/cm to 20 v/cm	.015 μsec	dc to 24 mc	Type K Fast-Rise DC	0.05 v/cm to 20 v/cm	.012 μsec	dc to 30 mc
Type D High Gain DC Differential	1 mv/cm to 50 v/cm	.018 μsec	dc to 2 mc	Type L Fast-Rise High Gain	5 mv/cm to 2 v/cm 0.05 v/cm	.015 μsec .012 μsec	3 c to 24 mc dc to 30 mc
Type E Low Level AC Differential	50 μv/c m to 10 mv/cm	6 μsec	.06 cycles to 50 kc		to 20 v/cm		

Type 107 Square-Wave Generator. The Type P permits the standardization of the main-unit vertical amplifier transient response of a Tektronix convertible oscilloscope. Risetime of the Type P when used with a Type 581 or 585 Oscilloscope is less than 12 nanoseconds. Pulse repetition rate is 240 step functions per second, with either positive or negative polarity. Step function amplitude is continuously adjustable between 0 and 3 major graticule divisions.

Type Q

The Type Q Plug-In Unit permits any Tektronix convertible oscilloscope to be operated with strain gages and other transducers. Excitation voltages for the strain gages and transducers are provided by the plug-in unit. The unit provides high gain, low noise, and extremely low drift. Frequency response of the Type Q Plug-In is DC to 6 kc; risetime is approximately 60 microseconds. Strain sensitivity is calibrated in 10 steps from 10 microstrain per major graticule division to 10,000 microstrain per division, and is continuously variable between steps.

Type R

The Type R Plug-In Unit is a combined power supply and pulse generator which is used to measure the high-frequency characteristics of junction transistors by the pulse-response method. When the Type R Unit is used in an oscilloscope incorporating a delay line, a display may be obtained which shows delay time, risetime, storage time and falltime simultaneously. In addition, operation of a push-button switch connects a front-panel terminal directly to the input of the oscilloscope. This connection permits you to observe other waveforms, such as the input waveform of the transistor under test.

Specifications of the Type R include a pulse risetime of less than 5 nanoseconds; pulse amplitudes in 8 fixed, calibrated steps from .05 to 10 volts, adjustable between steps—and pulse recurrence frequency of 120 pulses/sec.

Type S

The Type S Plug-In Unit is designed for use with Tektronix Wide-Band convertible oscilloscopes, with its primary application being as a diode tester. The crt switching display depicts voltage across a test diode as a function of time. Certain diode parameters, such as junction resistance, junction capacitance, and the stored charge at the junction, can be measured readily and reliably from the display. Performance of a diode in a particular circuit can be predicted by analyzing the recovery and "turn-on" characteristics. Since it is essentially a means for plotting voltage across an element whiile passing constant current through it, the unit can be used for other applications as well . . . for example, observing the junction characteristics of transistors, or to measure the resistance, capacitance or inductance of circuit components. The Type S offers calibrated forward currents in five fixed steps from 1 to 20 milliamps, and reverse currents calibrated in six steps from 0 to 2 milliamps. Diode Shunt capacitance is 9 picofarads, and amplifier sentivity measures 0.05 v/cm and 0.5 v/cm, calibrated.

Type Z

The Type Z Plug-In Unit extends the accuracy of oscilloscope voltage measurements. It can be used in three modes of operation: (1) as a conventional preamplifier, (2) as a differential input preamplifier, or (3) as a calibrated differential comparator. With sensitivity of 50 mv/cm and dynamic range of ±100 volts, the effective scale length is ±2000 cm; hence, the resolution of the Type Z Unit is a maximum of .005%. As a conventional preamplifier, the Type Z Unit offers a risetime of 24 nanoseconds for signals that do not overscan the screen, a passband of dc to 13 mc with Type 81 Adapter and Type 581 or 585 Oscilloscope; and sensitivities of 0.05 volts/cm to 25 volts/cm in 9 fixed, calibrated steps.

As a differential Input Preamplifier, the Type Z accepts a common mode Signal Level ±100 volts with input attenuation X1, and offers a common-mode rejection ratio of 40,000 to 1. Input signals must not exceed +1 volt/7 nsec, or —1 volt/5 nsec.

As a calibrated differential comparator, the Type Z makes available three comparison voltage ranges; from zero to ±1 volt, zero to ±10 volts, and zero to ±100 volts.

CIRCUIT DESCRIPTION

The Type 81 Plug-In Adapter matches gain impedance and connections to allow the use of letter-designated plug-ins with the Type 581 and Type 585 Oscilloscopes.

The normal signal connections for letter designated plug-ins are pins 1 and 3. The Type 81 transposes these so that the output from the amplifier is connected to pins 9 and 11. The input signal from the plug-in connects to the grid of the Input Amplifiers V514A and B. The gain of this stage is slightly greater than 1. L513 and L514 provide peaking in the plate circuit of the Input Amplifier. This helps to equalize the gain at high frequencies. R518, a variable resistor in the cathode circuit of the input amplifiers is the GAIN ADJ. control. The signal from the Input Amplifiers is coupled to the cathode-follower output stage through an RC network. C521 and C527 compensate for the capacitance to ground of the grids of V533A and B. R524, a variable resistor, adjusts the dc level present at the grid of the cathode followers. This is the POSITION ADJ. control which allows the calibrator to set the dc level for vertical positioning of the trace on the screen.

The termination network for the oscilloscope delay line is located in the Type 80 plug-in. When the Type 81 is used with another plug-in, a termination within the Type 81 (connected to output pins 14 and 16) replaces the normal termination.

Synchronizing pulses for the dual-trace are coupled from the oscilloscope circuitry through Q554. Pentode V554 fixes

the voltage on the collector of amplifying Q554 so that there is no polarity change when the CA unit conducts in the chopped or alternate mode. The Type 81 transposes the dual trade synchronizing pulses to output pin 7.

The transistorized power supply circuit in the Type 81 provides regulated filament voltages for the probe and plug-in units. The plate and suppressor voltages for the output amplifier tubes, the grid voltages for the output cathode followers, the dc balance control, the vertical position and the vertical range controls are usually directly controlled by this source of power. The power supplied is +75 volts at 150 ma current.

CALIBRATION PROCEDURE

The Type 81 Plug-In adapter is a stable instrument and should not require frequent calibration. However, it will be necessary to calibrate certain parts of the instrument when tubes or components are changed, and periodic calibration is desirable from the standpoint of preventive maintenance.

Equipment Required

The following equipment is necessary for a complete calibration of the Type 81 Plug-In Adapter::

(1) Tektronix Type 581 or 585 Oscilloscope.

(2) Tektronix Type K Plug-In Preamplifier.

(3) Tektronix Type P Plug-In Unit.

(4) Type TU-2 Test Load Unit.

(5) Square-Wave generator such as Tektronix Type 105, with frequency of 50 kc, with accuracy of 3% or better and a risetime no poorer than .02 μsec.

(6) DC voltmeter having a sensitivity of at least 5000 Ω/volt and accuracy within 1% at 75 volts.

(7) Dependable test oscilloscope.

(8) Calibration Tools (see Fig. 2).

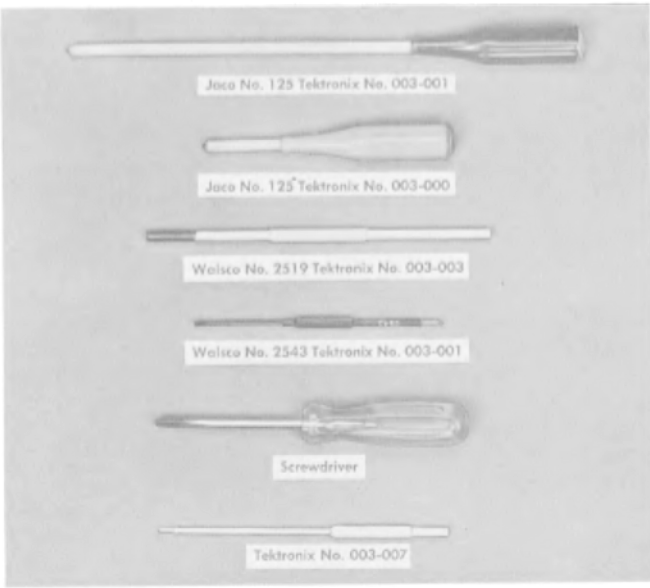


Fig. 2. Calibration tools for use with Type 81.

Preliminary

Install the Type 81 in a calibrated Type 581 or 585 oscilloscope with left side and bottom panels removed. Install the Type TU-2 Test Load Unit in the Type 81, turn on the oscilloscope and allow at least 5 minutes warmup time.

1. Check 75-volt supply.

Check between pin 15 of the Type 81 amphenal input connector and ground for a reading of 75 volts dc within ±3%. With the test scope check the amount of ripple on the 475 volt supply. This should not exceed 50 millivolts.

2. Set Position Adj.

Press the ZERO REFERENCE button on the TU-2 Test Load Unit and observe the vertical location of the oscilloscope trace. This is the "Electrical Center". Hold down the ZERO REFERENCE button, and adjust R524, Position Adj. on the Type 81 to center the trace on the "Electrical Center".

3. Set GAIN ADJ.

From the CALIBRATOR of the Type 581 or 585, supply a 50-volt signal to the INPUT of the Type TU-2. Set the INPUT SWITCH of the Type TU-2 to 250:1. Adjust R518, GAIN ADJ. on the Type 81 for 2 cm of vertical deflection of the crt display.

4. Set Square-Wave Response.

Turn the Type 581 or 585 on its right side. Remove the TU-2 Test Load Unit and replace it in the Type 81 with a Type K Plug-In. After allowing the Type K to warm up enough for the display to stabilize, supply a 10 kc Square Wave from the Type 105 to the INPUT of the Type K. Set 105 and oscilloscope amplitude controls for a display of 2 cm. Adjust C521 and C527 to obtain optimum fast rise and square leading corner to the square-wave display. C521 and C527 should be set at about the same capacitance when this adjustment is completed.

5. Set Square-Wave Presentation.

Remove the Type K Unit and replace it in the Type 81 with a Type P Plug-In. Adjust amplitude controls for 2 cm of display. Adjust L513 and L514 for optimum square corners and flat top on the square wave presentation.

6. Check Rise Time.

With all other controls as in the previous step, set the oscilloscope TIME/CM control to .1 μSEC and turn the MAGNIFIER ON. Measure the horizontal spread of the rising portion of the square wave display between the 10% and 90% points. It should cover slightly less than one-third cm, indicating a rise time of 7 nanoseconds or less.

Fig. 3. Type 81, Left Side View.

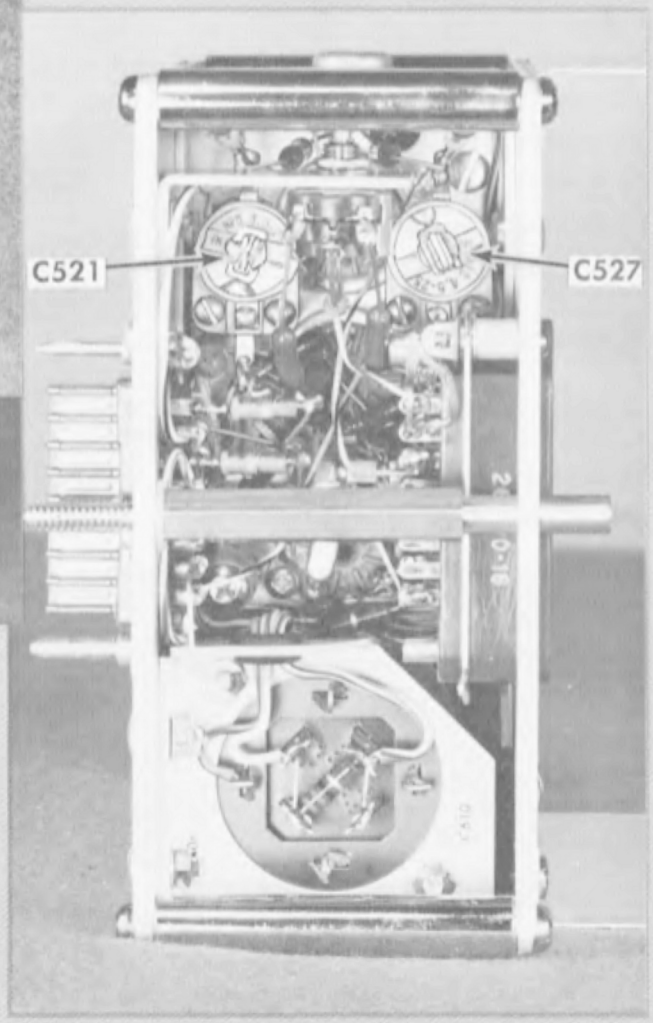


Fig. 4. Type 81, Bottom View.

PARTS LIST

Capacitors

Tektronix Part No.
*000-000 Asterisk Preceeding Tektronix Part Number indicates manufactured by or for Tektronix, also reworked or checked components.

Values fixed unless marked Variable.

Tolerance ±20% unless otherwise indicated

Ckt. No.		Description				Tektronix Part Number
C519	X431-up	4.7 μμf	Cer.		500 v	281-501
C520		10 μμf	Cer.		500 v	281-504
C521		4.5-25 μμf	Cer.	Var.		281-010
C526		10 μμf	Cer.			281-504
C527		4.5-25 μμf	Cer.		500 v	281-010
C533	X2680-up	.005 μf	Discap		500 v	283-001
C534	X2680-up	.005 μf	Discap		500 v	283-001
C535	X2680-up	18 μμf	Cer.		500 v	281-542
C549	X700-up	.01 μf	Discap		150 v	283-003
C610 ABCD		4 x 75 μf	EMC		150 v	290-071
C640		20 μf	EMT		150 v	290-008

Inductors

L513	101-430	1.2-2.4 μh	Var.	core 276-506		*114-114
L513	431-up	1.8-3.9 μh	Var.	core 276-506		*114-112
L514	101-430	1.2-2.4 μh	Var.	core 276-506		*114-114
L514	431-up	1.8-3.9 μh	Var.	core 276-506		*114-112
L530	101-430	0.45 μh				*108-062
L530	431-up	0.3 μh				*108-112
L531	101-430	0.45 μh				*108-062
L531	431-up	0.3 μh				*108-112
L545	X2680-up	.3 μh				*108-112
L546	X2680-up	.3 μh				*108-112
L547	101-26789X	0.12 μh				*108-210
L548	101-26789X	0.12 μh				*108-210

Resistors

Resistors are fixed, composition, ±10% unless otherwise indicated.

R513	101-430	500 Ω	½ w		Prec.	1%	309-250
R513	431-up	670 Ω	½ w		Prec.	1%	309-082
R514	101-430	500 Ω	½ w		Prec.	1%	309-250
R514	431-up	670 Ω	½ w		Prec.	1%	309-082
R517	101-430	20 k	10 w		WW	5%	308-025
R517	431-up	25 k	10 w		WW	5%	308-154
R518	101-430	10 k		Var.		Gain Adj.	311-016
R518	431-up	20 k		Var.		Gain Adj.	311-018
R520		100 k	½ w		Prec.	1%	309-260
R522		400 k	½ w		Prec.	1%	309-126
R524	101-2419	10 k		Var.		Pos. Adj.	311-153
R524	2420-up	20 k		Var.		Pos. Adj.	311-159
R525	101-430	8.2 k	½ w				302-822
R525	431-2419X	2.7 k	½ w				302-272
R526		100 k	½ w		Prec.	1%	309-260

Resistors *(continued)*

						Tektronix Part Number
R528		400 k	½ w	Prec.	1%	309-126
R532	101-699	4.7 k	1 w			Use 306-472
R532	700-up	4.7 k	2 w		10%	306-472
R533	X2680-up	4 Ω	½ w	Prec.	1%	309-060
R534	X2680-up	4 Ω	½ w	Prec.	1%	309-060
R545	X2680-up	2 Ω	½ w	Prec.	1%	309-058
R546	X2680-up	2 Ω	½ w	Prec.	1%	309-058
R547		93.1 Ω	½ w	Prec.	1%	309-266
R548		93.1 Ω	½ w	Prec.	1%	309-266
R549		3 k	5 w	WW	5%	308-082
R550		1.8 meg	½ w			302-185
R554		1 k	½ w			302-102
R610		18 Ω	½ w			302-180
R627		200 Ω	10 w	WW	5%	308-013
R634		22 k	½ w			302-223
R640		13.5 k	½ w	Prec.	1%	309-263
R641		4.21 k	½ w	Prec.	1%	309-105
R643		30 k	1 w	Prec.	1%	310-072
R650		180 Ω	1 w			304-181

Diodes

D601A,B,C,D	Silicon Diode	Use 152-047
D641	Germanium Diode	152-008

Transistors

Q554	2N212	151-005
Q627	2N250	151-018
Q634	2N226	151-025

Transformer

T601	Power	*120-168

Electron Tubes

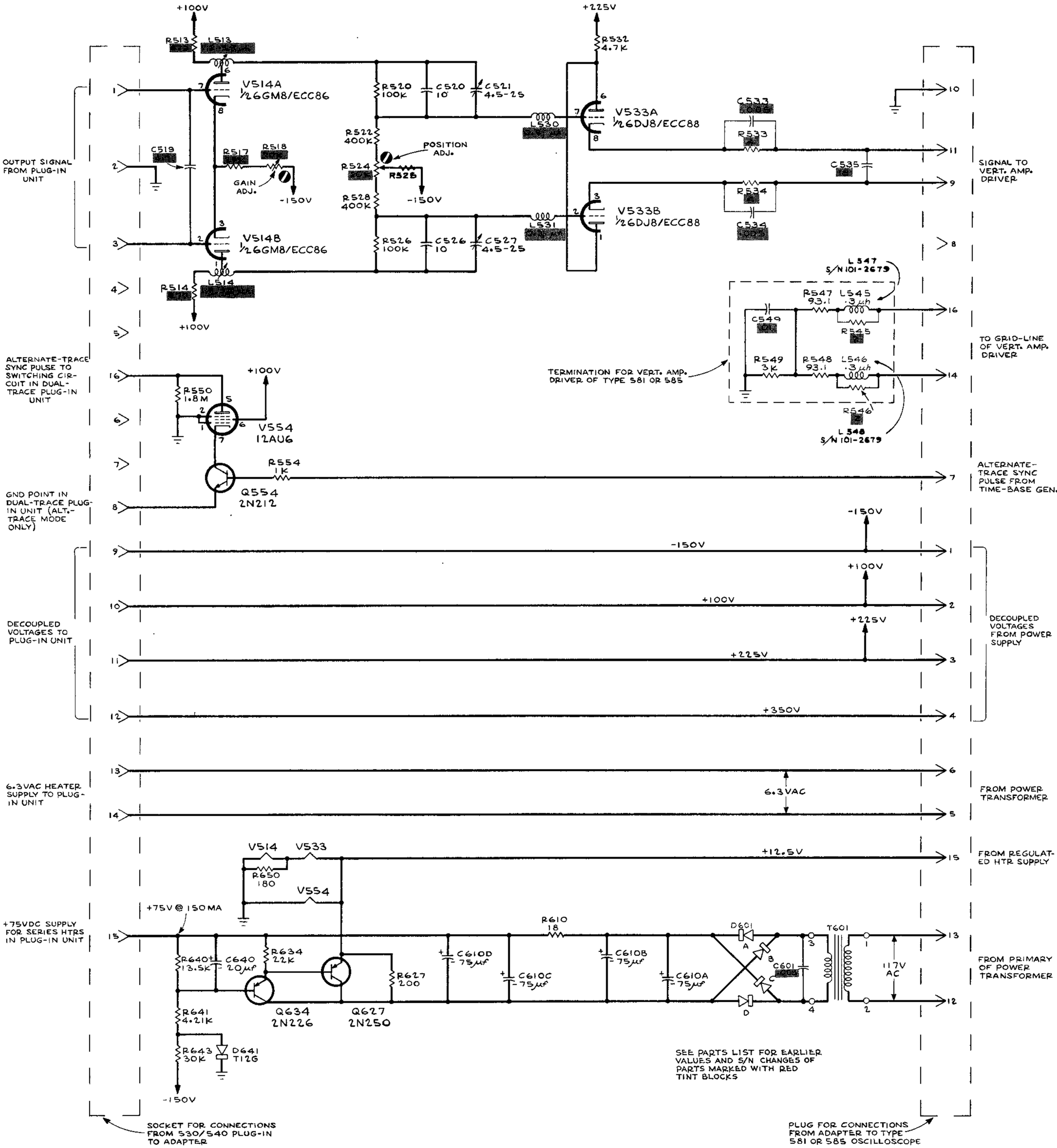
V514	6GM8/ECC86	154-259
V533	6DJ8/ECC88	154-187
V554	12AU6	154-040

Type 81
Mechanical Parts List

	Tektronix Part Number
BRACKET $1\frac{1}{2} \times 1\frac{3}{16}$	406-567
BRACKET $2 \times 1\frac{3}{4}$	406-568
BUSHING, ALUM. $\frac{3}{8}$-32 x $\frac{9}{16}$ x .412	358-010
CERAMIC STRIP $\frac{3}{4} \times 2$ notches, clip-mounted	124-086
CERAMIC STRIP $\frac{7}{16} \times 5$ notches, clip mounted	124-093
CERAMIC STRIP $\frac{7}{16} \times 9$ notches, clip mounted	124-095
CHASSIS, POWER	441-314
CHASSIS, AMP.	441-315
CONNECTOR, CHASSIS MT., 16-contact, male	131-017
CONNECTOR, CHASSIS MT., 16-contact, female	131-018
EYELET, TAPERED BARREL	210-601
GROMMET, RUBBER $\frac{1}{4}$"	348-002
GROMMET, RUBBER $\frac{5}{16}$"	348-003
GROMMET, RUBBER $\frac{3}{8}$"	348-004
HOUSING, PLUG-IN	380-022
LOCKWASHER #2 EXT	210-004
LOCKWASHER #6 INT	210-006
LOCKWASHER #8 INT	210-008
LOCKWASHER POT INT $\frac{3}{8} \times \frac{1}{2}$	210-012
LUG, SOLDER, SE4	210-201
LUG, SOLDER, SE6 w/2 wire holes	210-202
NUT, HEX 4-40 x $\frac{3}{16}$	210-406
NUT, HEX 6-32 x $\frac{1}{4}$	210-407
NUT, HEX 8-32 x $\frac{5}{16}$	210-409
NUT, HEX 6-32 x $\frac{5}{16}$ x .194, 5-10 w resistor mtg.	210-478
NUT, HEX $\frac{3}{8}$-32 x $\frac{1}{2}$ x $\frac{11}{16}$	210-494
POST, TERMINAL TRANSISTOR MTG.	129-049
PLATE, MICA .002 x 1.170 x 1.70, TRANSISTOR INSUL.	386-978
PLATE, FRONT $5\frac{11}{32} \times 6\frac{11}{32}$	387-195
PLATE, BACK $5\frac{11}{32} \times 6\frac{11}{32}$	387-196
ROD, FRAME $\frac{3}{8} \times 2\frac{1}{8}$ tapped 8-32 both ends	384-561
ROD, FRAME SECURING $\frac{5}{16} \times 3\frac{29}{64}$ tapped 10-24, both ends male, female	384-603
RING, SECURING tru arc 5555-25 for $\frac{1}{4}$" shaft	354-184
SCREW 4-40 x $\frac{3}{16}$ BHS	211-007
SCREW 4-40 x $\frac{5}{16}$ BHS	211-011
SCREW 4-40 x $\frac{3}{8}$ RHS	211-013
SCREW 4-40 x $\frac{5}{8}$ RHS	211-016

Mechanical Parts List *(continued)*

	Tektronix Part Number
SCREW 4-40 x 1¼ RHS	211-021
SCREW 6-32 x 3/16 BHS	211-503
SCREW 6-32 x ¼ BHS	211-504
SCREW 6-32 x 5/16 BHS	211-507
SCREW 6-32 x ½ BHS	211-511
SCREW 6-32 x 5/16 FHS 100° CSK, Phillips	211-538
SCREW 6-32 x 5/16 Truss HS Phillips	211-542
SCREW 6-32 x 5/16 RHS	211-543
SCREW 6-32 x ¾ Truss HS Phillips	211-544
SCREW 6-32 x 1½ RHS Phillips	211-553
SCREW 8-32 x 1½ RHS Phillips	212-044
SCREW THREAD CUTTING 5-32 x 3/16 Pan HS Phillips	213-044
SOCKET, STM7G	136-008
SOCKET, 9-pin UHF MINIATURE	136-072
SPACER TUBE .180 ID x ¼ OD x ¼	166-031
SPACER, NYLON for ceramic strip	361-008
SPACER ROD, NYLON ¼ x 5/8 tapped 4-40 thru	385-149
TAG, SERIAL NUMBER INSERT	334-679
TAG, TYPE 81 PLUG-IN ADAPTOR	334-730
WASHER, POLY .190 ID x 7/16 OD x 1/32	210-894
WASHER, BAKELITE .129 x ½ shoulder ⅜	210-900
WASHER, STEEL 10s x 7/16 x .036 Cad plated	210-805



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TYPE 81 AC PLUG-IN ADAPTER