tektronix

Oscilloscopes and associated instruments

CATALOG 24 MID 1965 · MID 1966

OUR CONTINUING CREED IS THAT OF SERVING TEKTRONIX CUSTOMERS WITH PRODUCTS AND POLICIES THAT ARE UNEXCELLED IN THE ELECTRONICS INDUSTRY AND LIMITED ONLY BY THE CURRENT STATE OF THE ART.

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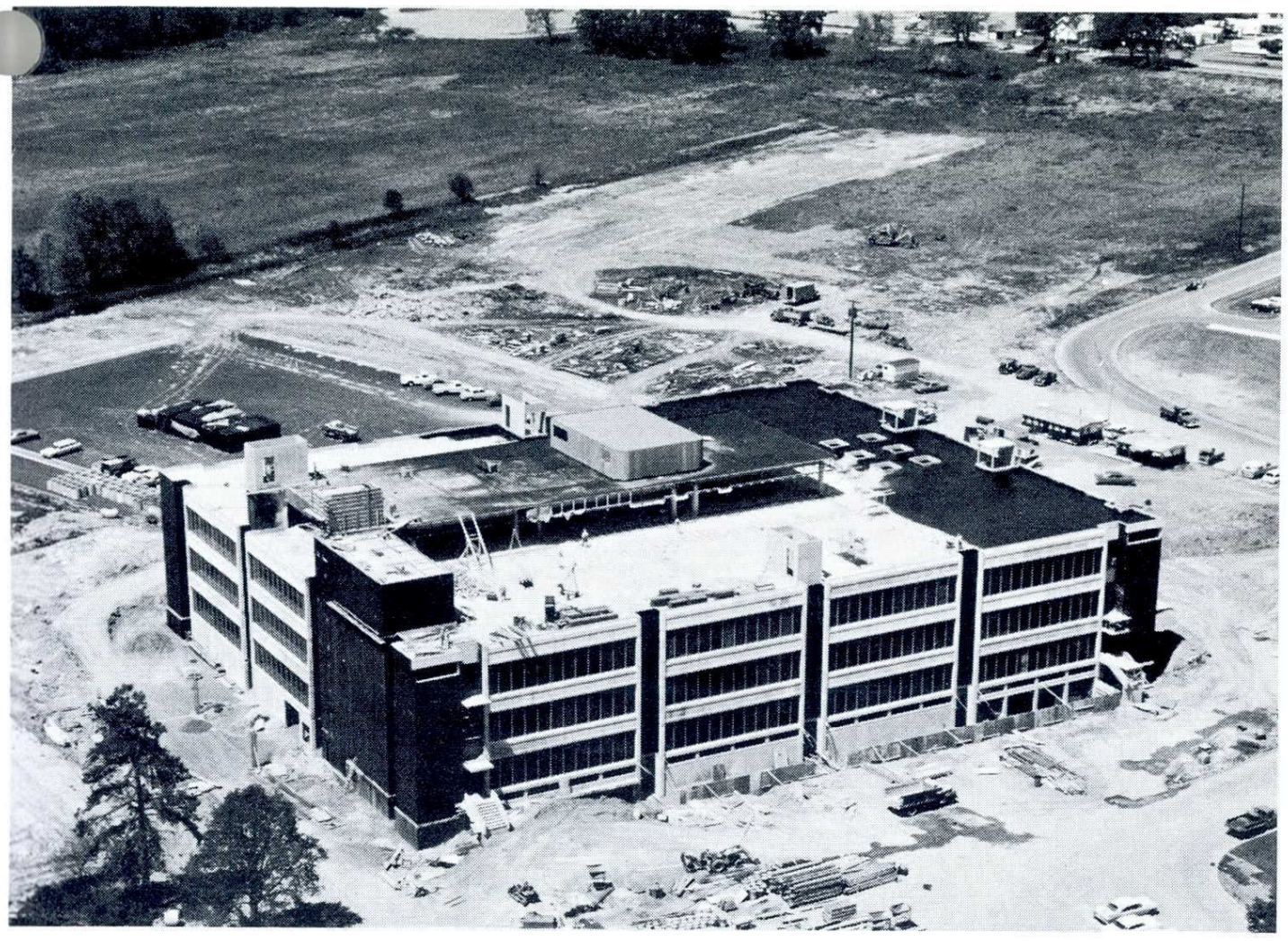

This new 4-floor Technical Center, now nearing completion, is part of our continuing effort to maintain a high level of Research and Development . . . . . part of the Tektronix commitment to progress in electronic measurement.

This aerial photograph shows 10 of the 15 buildings in the Tektronix industrial park. The two buildings in the left foreground, separated by the cafeteria, are Assembly East and Assembly West where the oscilloscope circuits are wired and assembled into the finished product. The Metals buildings and Ceramics building are in the distance.

The right side of the photograph shows the Technical Center, described above. The Cathode-Ray Tube building, located behind the Technical Center, houses the manufacturing facilities for the "heart of the oscilloscope." In the distance are the Utilities building, the Maintenance building, and the Electrochemical building where such processes as electroplating, photo etching and anodizing, and electrochemical etching occur.

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Information in this catalog supersedes all previously published material. Specification and price change privileges reserved.

Reference Chart

Due to the wide range of capabilities of Tektronix Oscilloscopes, some instruments appear more than once in the Reference Section. A more complete description can be found in the individual instrument discussion.

For help in selection of the instrument for your particular application, feel free to call your Tektronix Field Office.

TEKTRONIX OSCILLOSCOPES
(According to Passband Capabilities)

Oscilloscope	Vertical‡ Passband	Risetime	Calibrated Sensitivity	Vertical Signal Delay	Calibrated Sweep Delay	Calibrated Sweep Range	Magnifier Max. Calib. Sweep Rate	Accel. Potential	Price	Page
Type 661 Ⓐ	Equivalent to DC to 3500 MC	0.1 nsec	2 mv/cm to 200 mv/cm	No	through full time base	1 nsec/cm to 100 μsec/cm	2, 5, 10, 20, 50, 100X 10 psec/cm	3 kv	$1150†	142
Type 661 Ⓑ	Equivalent to DC to 1000 MC	0.35 nsec	2 mv/cm to 200 mv/cm	Yes	through full time base	1 nsec/cm to 100 μsec/cm	2, 5, 10, 20, 50, 100 X 10 psec/cm	3 kv	$1150†	142
Type 519	DC to 1000 MC	0.35 nsec	less than 10 v/cm	Yes	0 to 35 nsec	2 nsec/cm to 1 μsec/cm	None	24 kv	$3900	43
***Type 561A** Ⓒ	Equivalent to DC to 875 MC	0.4 nsec	2 mv/cm to 200 mv/cm	Yes	through 100 nsec	0.2 nsec/cm to 10 μsec/cm	10X 20 psec/cm	3.5 kv	$ 500†	87
***Type 564** Ⓒ **Storage**		0.4 nsec	Same features as Type 561A (above) plus SPLIT-SCREEN STORAGE of signal information.						$ 950†	91
***Type 567** Ⓒ **Readout**		0.4 nsec	Same features as Type 561A (above) plus DIGITAL READOUT of pulse risetime, pulse width, time differences (with Type 6R1A Digital Unit).						$ 700†	100
Type 581A Ⓓ	DC to 85 Mc	4 nsec	100 mv/cm to 50 v/cm	Yes	None	50 nsec/cm to 2 sec/cm	5X 10 nsec/cm	10 kv	$1425†	124
***Type 585A** Ⓓ		4 nsec	100 mv/cm to 50 v/cm	Yes	2 μsec to 10 sec	50 nsec/cm to 2 sec/cm	5X 10 nsec/cm	10 kv	$1725†	124
Type 517A High-Speed		7 nsec	>50 mv/cm at 24 kv	Yes	None	5 nsec/cm to 20 μsec/cm	None	12 kv or 24 kv	$3400	234
***Type 544** Ⓔ	DC to 50 MC	7 nsec	50 mv/cm to 20 v/cm	Yes	None	0.1 μsec/cm to 5 sec/cm	2, 5, 10 20, 50, 100X 10 nsec/cm	10 kv	$1550†	68
***Type 546** Ⓔ		7 nsec	50 mv/cm to 20 v/cm	Yes	0.1 μsec to 50 sec	0.1 μsec/cm to 5 sec/cm	2, 5, 10X 10 nsec/cm	10 kv	$1750†	75
***Type 547** Ⓔ **Display-Switching**		7 nsec	50 mv/cm to 20 v/cm	Yes	0.1 μsec to 50 sec	0.1 μsec/cm to 5 sec/cm	2, 5, 10X 10 nsec/cm	10 kv	$1875†	75
***Type 647** Ⓕ **Environmentalized**		7 nsec	10 mv/cm to 20 v/cm	Yes	1 μsec to 50 sec	0.1 μsec/cm to 5 sec/cm	10X 10 nsec/cm	14 kv	$1350†	131
***Type 541A** Ⓖ	DC to 33 MC	10.5 nsec	50 mv/cm to 20 v/cm	Yes	None	0.1 μsec/cm to 5 sec/cm	5X 20 nsec/cm	10 kv	$1225†	234
***Type 543B** Ⓖ		10.5 nsec	50 mv/cm to 20 v/cm	Yes	None	0.1 μsec/cm to 5 sec/cm	2, 5, 10, 20, 50, 100 X 20 nsec/cm	10 kv	$1300†	65
***Type 545B** Ⓖ		10.5 nsec	50 mv/cm to 20 v/cm	Yes	2 μsec to 10 sec	0.1 μsec/cm to 5 sec/cm	5X 20 nsec/cm	10 kv	$1550†	71
Type 555 Ⓗ **Dual-Beam**		10.5 nsec	50 mv/cm to 20 v/cm	Yes	0.1 μsec to 50 sec	0.1 μsec/cm to 5 sec/cm	5X 20 nsec/cm	10 kv	$2650†	83

‡ Frequency Specifications are at 3-db down.
† Price does not include Plug-In Units.
* Rack-Mount models are available.
Ⓐ When used with Types 4S2 and 5T1A Sampling Plug-In Units.
Ⓑ When used with Types 4S1 and 5T1A Sampling Plug-In Units.
Ⓒ When used with Types 3S76 and 3T77 Sampling Plug-In Units.
Ⓓ When used with Type 82 or 86 Plug-In Units. 10 mv/cm at dc to 80 Mc.
Ⓔ When used with Type 1A1 Plug-In Preamplifier. 5 mv/cm at dc to 28 Mc.
Ⓕ When used with Type 10A2 Amplifier and Type 11B2 Time Base Unit.
Ⓖ When used with Type 1A1 Plug-In Preamplifier. 5 mv/cm at dc to 23 Mc.
Ⓗ When used with Type 1A1 Plug-In Preamplifier. 5 mv/cm at dc to 23 Mc. Type 555 is designed for 2 Plug-In Preamplifiers.

Reference Chart

TEKTRONIX OSCILLOSCOPES
(According to Passband Capabilities)

Oscilloscope	Vertical ‡ Passband	Risetime	Calibrated Sensitivity	Vertical Signal Delay	Calibrated Sweep Delay	Calibrated Sweep Range	Magnifier Max. Calib. Sweep Rate	Accel. Potential	Price	Page
Type 551 Ⓘ Dual-Beam	DC to 27 MC	13 nsec	50 mv/cm to 20 v/cm	Yes	None	0.1 μsec/cm to 5 sec/cm	5X 20 nsec/cm	10 kv	$1850†	79
Type 506 Ⓙ	DC to 23 MC	15 nsec	10 mv/cm to 10 v/cm	Yes	0.5 μsec to 10 sec	0.5 μsec/cm to 1 sec/cm	5X 0.1 μsec/cm	3.5 kv	$ 525†	234
***Type 515A**	DC to 15 MC	23 nsec	50 mv/cm to 20 v/cm	Yes	None	0.2 μsec/cm to 2 sec/cm	5X 40 nsec/cm	4 kv	$ 875	38
Type 516 Dual-Trace		23 nsec	50 mv/cm to 20 v/cm	Yes	None	0.2 μsec/cm to 2 sec/cm	5X 40 nsec/cm	4 kv	$1070	41
***Type 531 Ⓚ**		23 nsec	50 mv/cm to 20 v/cm	Yes	None	0.1 μsec/cm to 5 sec/cm	5X 20 nsec/cm	10 kv	$ 995†	55
***Type 533A Ⓚ**		23 nsec	50 mv/cm to 20 v/cm	Yes	None	0.1 μsec/cm to 5 sec/cm	2, 5, 10, 20, 50, 100 X 20 nsec/cm	10 kv	$1125†	59
***Type 535A Ⓚ**		23 nsec	50 mv/cm to 20 v/cm	Yes	2 μsec to 10 sec	0.1 μsec/cm to 5 sec/cm	5X 20 nsec/cm	10 kv	$1400†	55
Type 422 Dual-Trace Portable	DC to 15 Mc 5 cps to 5 Mc	23 nsec 70 nsec	10 mv/div to 20 v/div 1 mv/div	Yes	None	0.5 μsec/div to 0.5 sec/div	10X 50 nsec/div	6 kv	$1325	25
Type 536 Ⓛ X-Y Curve Tracer	DC to 11 MC	31 nsec	50 mv/div to 20 v/div	No	None	0.2 μsec/div to 2 sec/div	5X 40 nsec/div	4 kv	$1085†	62
Type 317 Daylight 3" Portable	DC to 10 MC	35 nsec	10 mv/div to 50 v/div	Yes	None	0.2 μsec/div to 2 sec/div	5X 40 nsec/div	9 kv	$ 875	234
***Type 561A Ⓜ**		35 nsec	10 mv/cm to 10 v/cm	Yes	0.5 μsec to 10 sec	0.5 μsec/cm to 1 sec/cm	5X 0.1 μsec/cm	3.5 kv	$ 500†	87
***Type 564 Ⓜ Storage**		Same features as Type 561A (above) plus SPLIT-SCREEN STORAGE of signal information.							$ 950†	91
***Type 565 Ⓝ Dual-Beam**		35 nsec	10 mv/cm to 10 v/cm	No	10 μsec to 50 sec	1 μsec/cm to 5 sec/cm	10X 0.1 μsec/cm	4 kv	$1400†	96
Type 321A Transistorized 3" Portable	DC to 6 MC	58 nsec	10 mv/div to 20 v/div	No	None	0.5 μsec/div to 0.5 sec/div	5X 0.1 μsec/div	4 kv	$ 900	20
Type 310A 3" Portable	DC to 4 MC	0.1 μsec 90 nsec	10 mv/div to 0.1 v/div 0.1 v/div to 50 v/div	No	None	0.5 μsec/div to 0.2 sec/div	5X 0.1 μsec/div	1.8 kv	$ 675	15
***Type 503 Differential and X-Y**	DC to 450 KC	0.75 μsec	1 mv/cm to 20 v/cm	No	None	1 μsec/cm to 5 sec/cm	2, 5, 10, 20, and 50X 0.1 μsec/cm	3 kv	$ 640	31
***Type 504**		0.75 μsec	5 mv/cm to 20 v/cm	No	None	1 μsec/cm to 0.5 sec/cm	None	3 kv	$ 540	33
***Type 502A Dual-Beam and X-Y**	DC to 50 KC increasing to DC to 1 MC		100 μv/cm to 20 v/cm	No	None	1 μsec/cm to 5 sec/cm	2, 5, 10, and 20X 1 μsec/cm	3 kv	$1050	28

‡ Frequency Specifications are at 3-db down.

† Price does not include Plug-In Units.

* Rack-Mount models are available.

Ⓘ When used with Type 1A1 Plug-In Preamplifier, 5 mv/cm at dc to 21 Mc. Type 551 is designed for 2 Plug-In Preamplifiers.

Ⓙ When used with Type 9A2 Plug-In Amplifier and Type 3B3 Plug-In Time Base.

Ⓚ When used with Type 1A1 Plug-In Preamplifier, 5 mv/cm at dc to 14 Mc.

Ⓛ When used with Type 1A1 Plug-In Preamplifier and Type T Plug-In Time Base.

Ⓜ When used with Type 3A6 Plug-In Amplifier and Type 3B3 Plug-In Time Base.

Ⓝ When used with Type 3A1 Plug-In Amplifier. Type 565 is designed for 2 Plug-In Amplifiers.

Reference

CHARACTERISTICS OF TEKTRONIX OSCILLOSCOPES

PLUG-IN	UNIT TYPE	PRICE	PAGE	CALIBRATED SENSITIVITY	RISETIME AND PASSBAND OF OSCILLOSCOPE AND PLUG-IN UNIT	
					*** Type 531A** *General Purpose Oscilloscope*	*** Type 533A** *General Purpose Oscilloscope* / *** Type 535A** *Sweep Delay Oscilloscope* / **Type 536** *X-Y Curve Tracer Oscilloscope*
1A1	*Wide-Band High-Gain Dual-Trace Unit*	$600	179	≈500 μv/cm	35 nsec 2 cps to 10 Mc	44 nsec 2 cps to 8 Mc
				5 mv/cm 50 mv/cm to 20 v/cm	25 nsec dc to 14 Mc	33 nsec dc to 10.5 Mc
					23 nsec dc to 15 Mc	31 nsec dc to 11 Mc
1A2	*Wide-Band Dual-Trace Unit*	$325	179	50 mv/cm to 20 v/cm	23 nsec dc to 15 Mc	31 nsec dc to 11 Mc
1S1	*Sampling Unit*	$1100	181	2 mv/cm to 200 mv/cm	350-psec risetime (corresponding to an equivalent frequency response of 1 Gc), equivalent sweep rates of 100 psec/cm to 50 μsec/cm, 50-Ω input.	
B	*High-Gain Unit*	$145	157	5 mv/cm to 20 mv/cm 50 mv/cm to 20 v/cm	35 nsec 2 cps to 10 Mc	40 nsec 2 cps to 9 Mc
					25 nsec dc to 14 Mc	35 nsec dc to 10 Mc
C-A	*Dual-Trace DC Unit*	$260	158	50 mv/cm to 20 v/cm	26 nsec dc to 13.5 Mc	35 nsec dc to 10 Mc
D	*High-Gain DC Differential*	$170	159	1 mv/cm to 50 v/cm	0.18 μsec dc to 300 kc, increasing to 2 Mc	
E	*Low-Level AC Differential*	$190	160	50 μv/cm to 10 mv/cm	6 μsec 0.06 cps to 20 kc, increasing to 60 kc	
G	*Wide-Band DC Differential*	$190	161	50 mv/cm to 20 v/cm	25 nsec dc to 14 Mc	35 nsec dc to 10 Mc
H	*Wide-Band High-Gain DC Unit*	$185	162	5 mv/cm to 20 v/cm	31 nsec dc to 11 Mc	37 nsec dc to 9 Mc
K	*Fast-Rise DC Unit*	$145	163	50 mv/cm to 20 v/cm	23 nsec dc to 15 Mc	31 nsec dc to 11 Mc
L	*Fast-Rise High-Gain Unit*	$210	164	5 mv/cm to 2 v/cm	23 nsec 3 cps to 15 Mc	35 nsec 3 cps to 10 Mc
				50 mv/cm to 20 v/cm	23 nsec dc to 15 Mc	31 nsec dc to 11 Mc
M	*Four-Trace Unit*	$525	165	20 mv/cm to 10 v/cm	25 nsec dc to 14 Mc	35 nsec dc to 10 Mc
O	*Operational Amplifier Unit*	$525	166	50 mv/cm to 20 v/cm	25 nsec dc to 14 Mc	35 nsec dc to 10 Mc
					Performs precise operations of integration, differentiation, function generation, and linear or nonlinear amplification.	
Q	*Strain Gage Unit*	$325	168	10 μstrain/div to 10,000 μstrain/div	60 μsec risetime, dc to 6 kc. Measures force, displacement, acceleration, strain . . . any mechanical quantity that can be converted to a change in resistance, capacitance, or inductance.	
R	*Transistor Risetime Unit*	$325	170	0.5 ma/cm to 100 ma/cm	Supplies 5-nsec risetime pulse, 400-ma collector supply, 100-ma bias supply, risetime and passband same as with K Unit.	
S	*Semiconductor Diode-Recovery Unit*	$260	172	50 mv/cm and 0.5 v/cm	1 to 20 ma forward current, 0 to 2 ma reverse current, risetime and passband same as with K Unit.	
T	*Time-Base Generator Unit*	$240	174		Generates 22 calibrated sweep rates from 0.2 μsec/div to 2 sec/div plus 5X magnifier. Triggering facilities include Manual, Automatic, H. F. Sync and Line, either ac or dc coupled.	
W	*High-Gain Differential Comparator Unit*	$575	175	1 mv/cm to 50 v/cm	50 nsec dc to 7 Mc	54 nsec dc to 6.5 Mc
					26 nsec dc to 13.5 Mc	34 nsec dc to 10.5 Mc
					Calibrated continuously variable (0 to ±1.1 v or 0 to ±11 v) dc comparison voltage. ±11,000 cm effective scale length at maximum sensitivity. 0.001% maximum resolution. 20,000 to 1 common mode rejection ratio at dc.	
Z	*Differential-Comparator Unit*	$525	177	50 mv/cm to 25 v/cm	35 nsec dc to 10 Mc	40 nsec dc to 9 Mc
					Vertical "magnification" up to 500 times. Calibrated continuously variable (0 to ± 100 v) dc comparison voltages. ± 2000 cm effective scale length. 0.005% maximum resolution. 40,000 to 1 common-mode rejection ratio.	

* Rack-Mount Models are available.

Chart

WITH '1' SERIES AND LETTER SERIES PLUG-IN PREAMPLIFIERS

* Type 541A *Fast-Rise Oscilloscope*	* Type 543B *Fast-Rise Oscilloscope*	* Type 545B *Sweep Delay Oscilloscope*	* Type 544 *Fast-Rise Oscilloscope*	* Type 546 *Sweep Delay Oscilloscope*	* Type 547 *Display Switching Oscilloscope*	Type 551 *Dual-Beam Oscilloscope*	Type 555 *Dual-Beam Oscilloscope*	† Type 581A *Fast-Rise Oscilloscope*	† * Type 585A *Sweep Delay Oscilloscope*
RISETIME AND PASSBAND OF OSCILLOSCOPE AND PLUG-IN UNIT									
25 nsec 2 cps to 14 Mc			23 nsec 2 cps to 15 Mc			26 nsec 2 cps to 13 Mc		25 nsec 2 cps to 14 Mc	
15 nsec dc to 23 Mc			12.5 nsec dc to 28 Mc			16.5 nsec dc to 21 Mc		15 nsec dc to 23 Mc	
10.5 nsec dc to 33 Mc			7 nsec dc to 50 Mc			13 nsec dc to 27 Mc		10.5 nsec dc to 33 Mc	
10.5 nsec dc to 33 Mc			7 nsec dc to 50 Mc			13 nsec dc to 27 Mc		10.5 nsec dc to 33 Mc	
350-psec risetime (corresponding to an equivalent frequency response of 1 Gc), equivalent sweep rates of 100 psec/cm to 50 μsec/cm, 50-Ω input.									
30 nsec 2 cps to 12 Mc						30 nsec 2 cps to 12 Mc		30 nsec 2 cps to 12 Mc	
18 nsec dc to 20 Mc						20 nsec dc to 18 Mc		18 nsec dc to 20 Mc	
15 nsec dc to 24 Mc						16 nsec dc to 22 Mc		15 nsec dc to 24 Mc	
0.18 μsec dc to 300 kc, increasing to 2 Mc									
6 μsec 0.06 cps to 20 kc, increasing to 60 kc									
18 nsec dc to 20 Mc						20 nsec dc to 18 Mc		18 nsec dc to 20 Mc	
23 nsec dc to 15 Mc						25 nsec dc to 14 Mc		23 nsec dc to 15 Mc	
12 nsec dc to 30 Mc						14 nsec dc to 25 Mc		12 nsec dc to 30 Mc	
15 nsec 3 cps to 24 Mc						16 nsec 3 cps to 22 Mc		15 nsec 3 cps to 24 Mc	
12 nsec dc to 30 Mc						14 nsec dc to 25 Mc		12 nsec dc to 30 Mc	
17 nsec dc to 20 Mc						18 nsec dc to 19 Mc		17 nsec dc to 20 Mc	
14 nsec dc to 25 Mc						16 nsec dc to 22 Mc		14 nsec dc to 25 Mc	
Performs precise operations of integration, differentiation, function generation, and linear or nonlinear amplification.									
60 μsec risetime, dc to 6 kc. Measures force, displacement, acceleration, strain . . . any mechanical quantity that can be converted to a change in resistance, capacitance, or inductance.									
Supplies 5-nsec risetime pulse, 400-ma collector supply, 100-ma bias supply, risetime and passband same as with K Unit.									
1 to 20 ma forward current, 0 to 2 ma reverse current, risetime and passband same as with K Unit.									
Generates 22 calibrated sweep rates from 0.2 μsec/div to 2 sec/div plus 5X magnifier. Triggering facilities include Manual, Automatic, H. F. Sync and Line, either ac or dc coupled.									
44 nsec dc to 8 Mc						44 nsec dc to 8 Mc		44 nsec dc to 8 Mc	
15 nsec dc to 23 Mc						17 nsec dc to 20.5 Mc		15 nsec dc to 23 Mc	
Calibrated continuously variable (0 to ±1.1 v or 0 to ±11 v) dc comparison voltage. ±11,000 cm effective scale length at maximum sensitivity. 0.001% maximum resolution. 20,000 to 1 common mode rejection ratio at dc.									
27 nsec dc to 13 Mc									
Vertical "magnification" up to 500 times. Calibrated continuously variable (0 to ± 100 v) dc comparison voltages. ± 2000 cm effective scale length. 0.005% maximum resolution. 40,000 to 1 common-mode rejection ratio.									

† Uses '1' Series and Letter-Series Plug-In Units with Type 81 Adapter.

Reference Chart

HIGH-VOLTAGE SURGE-TEST OSCILLOSCOPES

Oscilloscope	Risetime	Calibrated Sensitivity	Signal Delay	Sweep Delay	Calibrated Sweep Range	Sweep Magnifier	Accel. Potential	Price	Page
Type 507	10 nsec	Approximately 50 v/cm to 500 v/cm	No	None	20 nsec/cm to 50 μsec/cm	None	24 kv	$2900	35

TELEVISION OSCILLOSCOPES

Instrument	Risetime	Calibrated Sensitivity	Signal Delay	Vertical Response	Calibrated Sweep Range	Sweep Magnifier	Accel. Potential	Price	Page
Type 524AD Oscilloscope	35 nsec	15 mv/cm to 50 v/cm	Yes	Normal, Flat, IRE	0.1 μsec/cm to 0.01 sec/cm	3 and 10X	4 kv	$1300	46
Type 526 Vectorscope	Dual Channel displays, with either vector or linear-sweep presentation of demodulated chroma signal.						4 kv	$1665	49
Type RM529 Waveform Monitor		120 mv to 1.5 v for 6 cm	No	Flat, IRE, Low-Pass, Chroma	0.25 H/cm, 0.125 H/cm, Field and Line Rates	5 and 25X	5.5 kv	$1100	52

Type 561A, RM561A, 564, and RM564 Oscilloscopes use any of these Plug-In Units.

Type 567 and RM567 Readout Oscilloscopes use Digital and these units for digital readout. Other Amplifier and Time Base Units can be used without digital readout.

TIME-BASE UNITS

Plug-In Type	Sweep Rate *	Magnifier	Triggering	Price	Page
2B67 Single Sweep	1 μsec/cm to 5 sec/cm, 1-2-5 sequence.	5X	Internal, External, Line; amplitude-level selection; ac or dc-coupled; automatic or free run; ± slope.	$ 210	189
3B1 Sweep Delay	0.5 μsec/cm to 1 sec/cm, 1-2-5 sequence (for both normal and delayed sweeps).	5X	Internal, External; amplitude-level selection; ac or dc-coupled; automatic (normal sweep only) or free-run; ± slope.	$ 535	195
3B2 Calibrated Sweep Delay	2 μsec/cm to 1 sec/cm, 1-2-5 sequence. Continuously variable calibrated delay from 5 μsec to 10.5 sec.	No	Internal, External, Line; Amplitude-level selection; ac or dc coupled; ± slope.	$ 650	234
3B3 Calibrated Sweep Delay Single Sweep	0.5 μsec/cm to 1 sec/cm, 1-2-5 sequence (for both normal and delayed sweeps). Continuously variable calibrated delay from 0.5 μsec to 10 sec.	5X	Internal, External; amplitude-level selection, ac or dc coupled, ± slope. Normal sweep has in addition: automatic and line plus single sweep.	$ 585	196
3B4 Direct-Reading Magnifier Single Sweep	0.2 μsec/cm to 5 sec/cm, 1-2-5 sequence. Magnifier reads sweep rate directly up to 50 nsec/cm.	up to 50X	Internal, External, External ÷10, Line; amplitude level selection; ac, ac low-frequency reject or dc coupling; free-run, automatic, or normal modes; ± slope.	$ 400	197
3T4 Programmable Sampling Sweep (use with 3S3 or 3S76)	Equivalent sweep rates 1 nsec/cm to 200 μsec/cm, 1-2-5 sequence, Programmable through front-panel connector.	10X	Internal (3S76 only) or External, ±slope.	$1300	202
3T77 Sampling Sweep (use with 3S3 or 3S76)	Equivalent sweep rates 0.2 nsec/cm to 10 μsec/cm, 1-2-5 sequence.	10X	Internal or External, ± slope.	$ 650	205

* Variable between steps, uncalibrated.

Reference Chart

Type 561A, RM561A, 564, and RM564 Oscilloscopes use any of these Plug-In Units.

Type 565 and RM565 Oscilloscopes use Plug-In Units for vertical deflection only.

Type 567 and RM567 Readout Oscilloscopes use Digital and these units for digital readout. Other Amplifier and Time Base Units can be used without digital readout.

AMPLIFIER UNITS

Plug-In Type	Passband (3-db down)	Calibrated Sensitivity *	Input (ac or dc coupled)	Price	Page
2A60	dc — 1 Mc.	50 mv/cm—50 v/cm in 4 steps.	1 megohm shunted by 47 pf, 600 volts max.	$ 105	188
2A61 Low-Level Differential	0.06 cps—300 kc	10 μv/cm—20 mv/cm, 1-2-5 sequence.	10 meg—50 pf; ±5 v (ac—coupled only)	$ 385	188
2A63 Differential 50:1 rejection ratio	dc — 300 kc.	1 mv/cm—20 v/cm, 1-2-5 sequence.		$ 150	189
3A1 Dual-Trace (Identical Channels)	dc — 10 Mc.	10 mv/cm—20 v/cm, 1-2-5 sequence.		$ 450	190
3A2 Dual-Trace (Identical Channels)	dc—500 kc	10 mv/cm—10 v/cm, 1-2-5 sequence.		$ 500	234
3A3 Dual-Trace Differential	Selectable dc—5 kc or dc—500 kc	100 μv/cm—10 v/cm, 1-2-5 sequence.	1 megohm shunted by 47 pf, 600 volts max.	$ 790	191
3A6 Dual-Trace (Identical Channels)	dc—10 Mc.	Identical to Type 3A1 above but with internal delay line.		$ 540	190
3A72 Dual-Trace (Identical Channels)	dc — 650 kc	10 mv/cm—20 v/cm, 1-2-5 sequence.		$ 275	193
3A74 Four-Trace (Identical Channels)	dc — 2 Mc.	20 mv/cm—10 v/cm, 1-2-5 sequence.		$ 590	194
3A75	dc — 4 Mc.	50 mv/cm—20 v/cm, 1-2-5 sequence.		$ 175	193
3C66 Strain Gage	dc—5 kc	10 μstrain/div—10,000 μstrain/div, 1-2-5 sequence.	120 Ω strain gage bridge	$ 400	198
3S3 Dual-Trace Sampling (Use with 3T77 and 3T4)	dc to equivalent 1 Gc. (0.35 nsec risetime)	5 mv/cm—100 mv/cm, 1-2-5 sequence.	100 k, 2 pf ±3 v max	$1500 (with probes)	200
3S76 Dual-Trace Sampling (Use with 3T77 and 3T4)	dc to equivalent 875 Mc (0.4 nsec risetime)	2 mv/cm—200 mv/cm, 1-2-5 sequence.	50 Ω, 2 volts pk-to-pk. max. dc-coupled	$1100	201

*Variable between steps, uncalibrated.

DIGITAL READOUT SYSTEMS

Digital plus analog displays are simultaneously presented on the Type 567 Oscilloscope and Type 6R1A Digital Unit. A Digital Readout System consists of a Type 567/6R1A and any of 5 combinations of vertical and horizontal Plug-In Units: Type 3S3/3T77, 3S76/3T77, 3A2/3B2, 3S3/3T4, or 3S76/3T4. Other 2-Series and 3-Series Plug-In Units can be used for normal crt display, but do not provide digital readout. See the Type 262 Programmer for these systems.

X & Y Plug-Ins	Risetime	Calibrated Sensitivity	Input Impedance	Calibrated Sweep Range	Sweep Delay	Digital Resolution	Trigger	System Price
3S3/3T77*	0.35 nsec	5 mv/cm to 100 mv/cm	100 k, 2 pf	equiv. 0.2 nsec/cm to 10 μsec/cm plus 10X magnifier	Through approx. 100 nsec	10 or 100 dots per cm	External	$5450 (including 2 probes)
3S76/3T77*	0.4 nsec	2 mv/cm to 200 mv/cm	50 Ω				Internal or External	$5050
3A2/3B2	0.7 μsec	10 mv/cm to 10 v/cm	1 Meg, 47 pf	2 μsec/cm to 1 sec/cm	5 μsec to 10.5 sec	1 μsec to 10 msec clock rate in decades		$4450

***The Type 3T4** Programmable Sampling Sweep can be programmed through a front panel connector. Programmable functions include sweep rates (1 nsec/cm to 200 μsec/cm), 3 calibrated sweep delay ranges (1 μsec to 1 msec), samples per sweep (100 or 1000 or alternately 100 or 1000), and single display for real-time measurements. Type 3T4 . . . $1300.

Reference Chart

CHARACTERISTIC-CURVE TRACERS

Instrument	Vertical Axis	Horizontal Axis	Variable Drive Parameters	Accel. Potential	A-B Comparison	Price	Page
Type 570 presents an accurate graphic analysis of electron-tube characteristics under almost any conceivable operating condition.	20 μa/div to 50 ma/div 1-2-5 sequence	1 v/div to 50 v/div 1-2-5 sequence	Plate, screen, or grid current vs. plate or grid voltage.	4 kv	Yes	$1100	116
Type 575 traces characteristic curves for both PNP and NPN transistors and diodes on the face of a crt.	1 μa/div to 2 a/div 10 mv/div to 0.5 v/div	10 mv/div to 20 v/div 10 mv/div to 0.5 v/div	Collector current & voltage, Base current & voltage.	4 kv	Yes	$1075	119

Instrument	Collector Supply	Base Supply	Calibrated Display	A-B Comparison	Price	Page
Type 175 adapts the Type 575 to measurement of high power (NPN and PNP) apply ONLY when used with Type 575 Curve Tracer.	0 to 20 v or 0 to 100 v, or 0 to 100 v with 300-Ω series load resistor.	± stepping, 4 to 12 steps per family, either repetitive or single family. 10 current positions—1 ma to 1 amp/step; 5 voltage positions — 0.02 to 0.5 v/step	Vertical Axis— Collector Current Horizontal Axis— Collector Voltage Base Voltage	Yes	$1475	119

SPECTRUM ANALYZERS

	HIGH FREQUENCY GENERAL PURPOSE	MULTI-BAND GENERAL PURPOSE	
CHARACTERISTICS	**1L10**	**L-20**	**L-30**
FREQUENCY COVERAGE (Mc)	1-36	10-4000	1000-10400
SENSITIVITY (dbm)	—100	—110 to —90	—105 to —75
DISPERSION	.01 kc/cm to 2 kc/cm calibrated, plus uncalibrated Search.	(Narrow) 15 kc to 5 Mc; (Wide) 100 kc to 60 Mc	Oscilloscope 5X Magnifier usable to 3 kc; up to 100X Magnifier on some oscilloscopes
DISPLAY FLATNESS	± 1 db	± 3 db (over 60 Mc Dispersion)	
RESOLUTION BANDWIDTH	10 cps to 1 kc Coupled to Dispersion	1 kc to 100 kc, continuously variable	
INCIDENTAL FM	IF 5 cps LO 26-61 cycles	800 cps to 1800 cps at local oscillator fundamental	
SWEEP RATE (Provided by Oscilloscope)	As low as 0.02 cps (5 sec/cm) to beyond practical analyzer range, flexible triggering		
ATTENUATOR (1-db Step)	(RF) 51 db ± 0.1 db per db	(IF) 51 db ± 0.1 db per db	
IF GAIN CONTROL	60 db (Variable)	50 db (Variable)	
MARKERS	NA	Single or picket fence, continuously variable ± 30 Mc. Picket fence — 100 kc and 1 Mc spacing	
DISPLAY Log	50 db	40 db	6-cm vertical display
DISPLAY Linear	26 db	26 db	6-cm vertical display
DISPLAY Square Law	NA	13 db	6-cm vertical display
DISPLAY Video	100 mv/cm (var.) 10 cps to oscilloscope vert. bandwidth. 50 Ω input resistance.	100 mv/cm (variable) 10 cps to oscilloscope vertical bandwidth. 100 Ω input resistance	
INSTRUMENT	**1L10**	**L-20**	**L-30**
PRICE	$1200	$1995	$1995
PAGE	184	186	186

Reference Chart

SAMPLING SYSTEMS

Type 661 with Types 5T1A and 4S2 Units	50 Ω	0.1 nsec	2-200 mv/cm 1-2-5 sequence	No	through full time base	1 nsec/cm to 100 μsec/cm plus magnifier	5, 10, 20, 50, 100 or 1000	External	$3500	142
Type 661 with Types 5T1A and 4S1 Units	50 Ω	0.35 nsec		Yes				Internal or External	$3330	142
Type 661 with Types 5T1A and 4S3 Units	100 k, 2 pf	0.35 nsec		No				External	$3500 (with probes)	142

SAMPLING SYSTEMS FOR TYPE 560-SERIES OSCILLOSCOPES

Instrument	*Input Impedance*	*Risetime*	*Calibrated Sensitivity*	*Signal Delay*	*Sweep Delay*	*Equivalent Sweep Time*	*Samples Per Centimeter*	*Trigger*	*System Price*	*Page*
***Type 561A** with Types 3S76 and 3T77 Units	50 Ω	0.4 nsec	2-200 mv/cm 1-2-5 sequence	Yes	Through 100 nsec	0.2 nsec/cm to 10 μsec/cm plus 10X mag.	10 or 100	Internal or External	$2250	87
***Types 561A** with Types 3S3 and 3T77 Units	100 k, 2 pf	0.35 nsec	5-100 mv/cm 1-2-5 sequence	No				External	$2650 (with probes)	87
***Type 564** with Types 3S76 and 3T77 Units	50 Ω	0.4 nsec	Same features as Types 561A, 3S76, 3T77 (above) plus SPLIT-SCREEN STORAGE of signal information.						$2700	91
***Type 564** with Types 3S3 and 3T77 Units	100 k, 2 pf	0.35 nsec	Same features as Types 561A, 3S3, 3T77 (above) plus SPLIT-SCREEN STORAGE of signal information.						$3100 (with probes)	91
***Type 567** with Types 3S76, 3T77, and 6R1A Units	50 Ω	0.4 nsec	Same features as Types 561A, 3S76, 3T77 (above) plus DIGITAL READ-OUT of pulse risetime, pulse amplitude, pulse width, time differences.						$5050	100
***Type 567** with Types 3S3, 3T77, and 6R1A Units	100 k, 2 pf	0.35 nsec	Same features as Types 561A, 3S3, 3T77 (above) plus DIGITAL READOUT of pulse risetime, pulse amplitude, pulse width, time differences.						$5450 (with probes)	100

The Type 3T4 Programmable Sampling Sweep is similar to the Type 3T77 except it can be programmed through a front-panel connector. Programmable functions include sweep rate (1 nsec/cm to 200 μsec/cm), 3 calibrated sweep delay ranges (1 μsec to 1 msec), samples per sweep (100 or 1000), and single display for real-time measurements. Type 3T4 — $1300.

* Rack Mount models are available

SAMPLING SYSTEMS FOR TYPE 661 OSCILLOSCOPES

Plug-In	*Input Impedance*	*Risetime*	*Calibrated Sensitivity*	*Signal Delay*	*Trigger*	*Price*	*Page*
4S1	50 Ω	0.1 nsec	2-200 mv/cm 1-2-5 sequence	No	External	$1600	145
4S2	50 Ω	0.35 nsec		Yes	Internal or External	$1430	144
4S3	100 k, 2 pf	0.35 nsec		No	External	$1600	146

Plug-In	*Sweep Delay*	*Equivalent Sweep Time*	*Samples per Centimeter*	*Price*	*Page*
5T1A	Through full time base	1 nsec/cm to 100 μsec/cm plus magnifier	5, 10, 20, 50, 100 or 1000	$750	147
5T3*		10 nsec/cm to 100 μsec/cm		$900	148

*Also real-time sampling from 0.2 nsec/cm to 5 sec/cm.

SAMPLING SYSTEM ACCESSORIES

Instrument	*Description*	*Price*	*Page*
Type 280 Trigger Countdown	Allows timing systems to be synced up to 5 Gc. Output repetition rate variable from 15 to 45 Mc.	$ 265	228
Type 290 Transistor Switching-Time Tester	Measures fast transistors, short duty cycle measurements of delay time, risetime, storage time, and fall time.	$ 290	229
Type 291 Diode Switching-Time Tester	Measures fast-switching diodes, forward and reverse recovery. Response better than 0.35 nsec.	$ 185	230
Type 292 Semiconductor Tester and Power Supply	Furnishes dc power and provides sub-nanosecond environments for reading out time and charge information about fast semiconductor diodes and transistors.	$325	231

Reference Chart

INDUCTANCE AND CAPACITANCE METER

Instrument	Ranges	Accuracy	Guard Voltage	Price	Page
Type 130	0 to 3, 10, 30, 100, 300 μh 0 to 3, 10, 30, 100, 300 $\mu\mu$f	within 3% of full scale	Permits measuring an unknown capacitance while eliminating effects of other capacitances.	$ 225	218

SQUARE-WAVE GENERATORS

Instrument	Risetime	Frequency Range	Output Voltage	Price	Page
Type 105	13 nsec	25 cps to 1 Mc	10 v to 100 v across the internal 600-Ω load	$ 435	204
Type 107	3 nsec	400 kc to 1 Mc	0.1 v to 0.5 v with 52-Ω termination	$ 190	205

AMPLIFIERS

Instrument	Gain	Frequency Response‡	Noise Level	Differential Input	Input Impedance	Output Impedance	Price	Page
***Type 122**	100X or 1000X	0.2 cps to 40 kc	1-5 μv, rms, grounded	Yes	10 megohms, 50 pf.	1000 ohms	$ 135	210
Type 123	100X	3 cps to 25 kc	7.5 μv, rms, or less grounded	No	10 megohms	31 kilohms	$ 75	212
Type 1121	100X	5 cps to 17 Mc 21-nsec risetime	50 μv or less pk-to-pk, grounded	No	1 megohm, 22 pf.	93 ohms	$ 465	232

‡ Frequency Specifications are at 3-db down.

* Rack-Mount models are available.

PULSE GENERATORS

Instrument	Frequency	Main Pulse Width	Risetime	Delay	Output Amplitude	Output Impedance	Trigger Req.	Price	Page
Type 109	275 to 700 cps	0.5 nsec to 300 nsec	$<$0.25 nsec	None	0 to 50 v	50 Ω	None	$360	206
Type 111	0 to 100 kc	2 nsec to 0.1 μsec	0.5 nsec	30 to 250 nsec	$\pm$5 v	50 Ω	+5 v	$365	207
Type 114	1 μsec to 10 msec	Square Wave and 100 nsec to 1 msec	$\leq$10 nsec	None	$\pm$1 v to $\pm$10 v	16—84 Ω	+2 v to +20 v	$350	209
† **Type 161**	0 to 50 kc	10 μsec to 0.1 sec	0.5 μsec	Variable	0 to $\pm$50 v	1—5 kΩ	+3 v	$130	222
† **Type 162**	0 to 10 kc	100 μsec to 10 sec	1 μsec	None	50 v	1 kΩ	+15 v	$130	223
† **Type 163**	0 to 500 kc	1 μsec to 10 msec	0.2 μsec	Variable	0 to +25 v	100 Ω—3.5 kΩ	+2 v	$130	224

† Type 160A Power Supply provides power for up to 7 Type 161 or 162 Generators, 5 Type 163 Generators, or 5 Type 360 Indicators. $190

TIME-MARK GENERATORS

Instrument	Time-Mark Interval	Sine-Wave Frequency	Accuracy	Stability††	Price	Page
Type 180A	2 per decade from 1 μsec to 5 sec, separately or in timing combination.	5 Mc, 10 Mc or 50 Mc	within 0.001%	3 parts per million for 24 hr. period	$ 625	225
***Type 181**	1 per decade from 1 μsec to 10 msec.	10 Mc	about 0.03%	0.005% per hour	$ 265	234

* Rack-Mount models are available.

†† All outputs are derived from a 1 Mc crystal-controlled oscillator. Type 180A uses temperature-stabilized oven which is also available as accessory for the Type 181, or as MOD110 installed in the instrument. This provides stability of 3 parts per million.

CONSTANT AMPLITUDE SINE-WAVE GENERATOR

Instrument	Output Frequency	Output Amplitude	Harmonic Content	Output Impedance	Price	Page
Type 190B	Continuously variable from 350 kc to 50 Mc.	Continuously variable from 40 mv to 10 volts, pk-to-pk.	Typically less than 5%.	Nominally 25 Ω	$ 330	227

Reference Information

DESCRIPTIONS AND SPECIFICATIONS

All present regular-production Tektronix Instruments and Accessories are listed and described in this catalog. We hope that it contains the right kind and amount of information for *you*.

The principal Tektronix instrument is the cathode-ray oscilloscope, which is a three-dimensional display device. These three axes are designated: X (time-base or horizontal plane), Y (amplitude or vertical plane), and Z (brightness range of display). The X and Y axes convey precise quantitative information and are usually specified as TIME per division and/or VOLTS per division. The Z axis is usually modulated by blanking or unblanking voltages in order to eliminate retrace time from the presentation. Time markers can also be used to modulate the trace in most Tektronix Oscilloscopes.

Characteristics other than X-axis sweep rates and Y-axis sensitivities are usually not of primary importance in describing the accuracy of the display, but are often pertinent when selecting an oscilloscope for a particular application. While specifications on these other features are less stringent, relative values in areas such as trigger sensitivity, CRT accelerating potential, amplitudes of output waveforms, etc., are quite meaningful.

We have tried to describe all of the more significant features, capabilities, and limitations of Tektronix instruments in a way that will be of the most value to most customers. This cannot be done without knowingly omitting some things meaningful to only a few.

If you have specific questions about any instruments that are not answered here, you should consult your Tektronix Field Engineer or Engineering Representative; he can probably provide a ready answer. Occasionally, however, questions are asked about specific performance limitations that we have never investigated. If the questions are of general interest to many customers, an investigation will be made. However, such questions usually imply a desire to use the instruments in applications for which they are not intended. When such is clearly the case, a special investigation can seldom be justified. The burden of testing or calibrating instruments to assure conformance to such a specification would not be one which we could, with clear conscience, pass on to all customers.

Questions may arise about the exact meaning of such words as "approximately", "typically", and our intent when using them to describe an instrument. For instance, the square-wave voltage calibrators in many Tektronix Oscilloscopes are typically described as having a frequency of approximately 1 kc. The frequency is relatively unimportant. If we specified the acceptable frequency limits, it would be misleading; the primary purpose of the calibrator in most cases is to provide an accurate ***voltage*** reference, not an accurate ***frequency*** reference. In other cases, a characteristic might be stated in what seems to be absolute values (for example, + Gate Out). In most instances, the accuracy of the value is unimportant, and the acceptable limits would again be misleading. The availability of the waveform at a front-panel connector is a characteristic of the instrument and does not contribute to the accuracy of X and Y measurements.

Your Tektronix Field Engineer or Overseas Distributor will welcome your discussion on descriptions and specifications of Tektronix Oscilloscopes and associated instrumentation.

PASSBAND AND RISETIME MEASUREMENTS

Frequency-response quotations are at the 3-db-down points unless otherwise stated.

Equipment for measuring frequency response (passband) must be carefully selected to assure accurate readings. A generator which is correct in amplitude at just the low frequency and high frequency check points could prove misleading. Uniform frequency response measurements require a generator with "flat" output amplitude characteristics over its entire frequency range. Loading placed on the generator must also be considered. High frequency sine-wave generators must usually be terminated to match their output impedance. For oscilloscopes having an upper frequency response in the area from 350 kilocycles through 50 megacycles, Tektronix uses Type 190B Constant Amplitude Sine-Wave Generator to check for high frequency roll-off characteristics.

A characteristic of importance to the pulse-measurement field is risetime. This parameter is generally a good indication of relative passband. In short, faster risetime means greater passband (in the direction of higher frequencies). Several factors must be considered in making risetime measurements. For reasonably accurate readings of risetime, the oscilloscope should be approximately 5 times faster than the signal to be measured. When risetime of the signal approaches risetime of the oscilloscope, the true signal risetime can be computed. Risetime of cascaded signals is calculated by taking the square root of the sum of the squares (of signal and oscilloscope risetimes). For example, a signal with a risetime of one nanosecond viewed on an oscilloscope with a risetime capability of one nanosecond will appear as approximately 1.414 nanoseconds.

In order to measure actual risetime of the oscilloscope, the input pulse should be free of overshoot and ringing, since risetime is generally measured between the 10% and 90% amplitude points on a waveform. Proper termination of the input-pulse source must also be considered. Tektronix uses Type 105 Square-Wave Generator (approximately 13 nsec risetime), Type 107 Square-Wave Generator (less than 3 nsec risetime), or Type 109 Pulse Generator (less than 0.25 nsec risetime) for checking risetime of general purpose oscilloscopes. For faster oscilloscopes, specially constructed generators are employed.

In general, peak-to-peak input voltage ratings are for dc and low-frequency values. Because of possible damage to input components, especially solid-state devices, continuous derating is required as frequency is increased. This is especially true with rf at high-sensitiveity settings.

MECHANICAL CONSIDERATIONS

VENTILATION—In general, a standard oscilloscope using 250 watts of power or more will have filtered forced-air cooling.
CLEARANCE—Under normal conditions, at least two inches of unobstructed space around the oscilloscope should be maintained to assure safe operating temperature. Should the chassis temperature become excessive, at typically 120°, a thermal-cutout switch will interrupt the power and keep it off until a safe operating temperature is reached.
CONSTRUCTION—The oscilloscope chassis and cabinet are of aluminum alloy for lightweight durability.
FINISH—The oscilloscope front panel is anodized and the cabinet has blue-vinyl finish.

Specifications continued on next page.

Reference Information

TEKTRONIX-MANUFACTURED COMPONENTS

When standard commercially-available components do not meet rigid requirements of Tektronix Oscilloscopes and associated instruments, and suppliers cannot fulfill adequately this demand for these specialized components, Tektronix manufactures them.

Some of these special components manufactured by Tektronix for exclusive use in its own equipment include cathode-ray tubes, transformers, ceramic terminal strips, and etched circuitry—in addition to precision potentiometers, capacitors, wire-wound resistors, inductors, semiconductor and solid-state devices.

Designed compactly for reliability and efficiency these Tektronix-manufactured components incorporate the highest standards of craftsmanship in meeting the special needs of particular instruments.

CATHODE-RAY-TUBE PHOSPHOR DATA

The catalog description of each oscilloscope indicates the phosphor normally supplied. However, for specific applications, you may want to specify another phosphor. The phosphor data chart will help in your selection.

For more specific information regarding the best-suited phosphor for your particular application, please confer with your Tektronix Field Engineer. He will know the factors that must be considered in selection of a phosphor for any given application. For example, Type P11 is excellent for waveform photography but due to its short persistence, it is not well suited for applications requiring visual observation of low speed phenomena.

Phosphors are rated in several parameters, such as color of fluorescence or phosphorescence, persistence, etc. The following table describes the more commonly used phosphors.

PHOSPHOR DATA CHART

Phosphor	*Fluorescence*	*Phosphorescence*	*Relative Ⓐ Brightness*	*Persistence Ⓑ*	*Crystal Ⓒ Size*	*Principal Use*	*Comments*
P1	Yellowish-Green	Yellowish-Green	150	Medium	Fine	Slow Repetition Rate Oscilloscope Displays	Used to keep down flicker apparent at low rep. rates such as 60 cps.
P2	Blueish-Green	Green	230	Medium Short*	Coarse	General Purpose Displays	Good compromise for high and low speed applications.
P4	White	White	250	Medium Short	Coarse	Television Pictures (Image Displays)	
P7	Blue-White	Yellow-Green	128	Medium Long*	Coarse	Slow Speed Displays	
P11	Purplish-Blue	Purplish-Blue	100	Medium Short	Medium	Oscilloscope Photography	High blue light content and small spot size conducive to sharp photographs.
P15	Blueish-Green	Blueish-Green	50	Short	Fine	Moving Film Photography Flying Spot Scanner Displays	Poor for high-speed photography.
P20	Yellow-Green	Yellow-Green	250	Medium	Medium	General Purpose Displays	
P31	Green	Green	390	Medium Short	Coarse	Oscilloscope Displays In High Ambient Light	Bright sharp image.

Ⓐ Taken with a Spectra Brightness Spot Meter, which incorporates a C.I.E. standard eye filter. Representative of 10 kv aluminized screens.

Ⓑ JEDEC classification (to 10% level).

Ⓒ FINE = up to 4.9 μ, MEDIUM = 5.0 μ to 9.9 μ, COARSE = 10.0 μ and up.

* Low-level persistence may last for minutes.

UNITS and ABBREVIATIONS used in this Catalog

Unit	Name	Abbreviation	Unit	Name	Abbreviation	Unit	Name	Abbreviation
10^9 cycles	gigacycles	Gc	10^{-2} meter	centimeter	cm	10^{-6} farad	microfarad	μf
10^6 cycles	megacycles	Mc	10^{-3} second	millisecond	msec	10^{-9} second	nanosecond	nsec
10^6 ohms	megohms	meg	10^{-3} meter	millimeter	mm	10^{-12} farad	picofarad	pf
10^3 cycles	kilocycles	kc	10^{-6} second	microsecond	μsec	10^{-12} second	picosecond	psec
10^3 ohms	kilohms	k						

DC-to-4 MC OSCILLOSCOPE Type 310A

SMALL IN SIZE

LOW IN WEIGHT

ELECTRONICALLY-REGULATED DC SUPPLIES

CHARACTERISTIC SUMMARY

VERTICAL

CALIBRATED SENSITIVITY—
Dc-coupled, 0.1 v/div to 50 v/div.
Ac-coupled only, 0.01 v/div to 0.05 v/div.

PASSBAND—0.1 v/div to 50 v/div, dc to 4 Mc.
0.01 v/div to 0.05 v/div, 2 cps to 3.5 Mc.

INPUT—1 meghom, 40 pf

HORIZONTAL

CALIBRATED SWEEP RANGE—0.5 μsec/div to 0.2 sec/div.

SWEEP MAGNIFIER—5X, extends sweep range to 0.1 μsec/div.

TRIGGER REQUIREMENTS—Internal: 0.5 div deflection at 1 kc, increasing to 2 div deflection at 5 Mc. External: 0.2 v pk-to-pk at 1 kc, increasing to 2 v pk-to-pk at 5 Mc.

EXTERNAL INPUT—1.5 v/div.

CRT

DISPLAY AREA—8 x 10 div. Each div equal to ¼ inch.

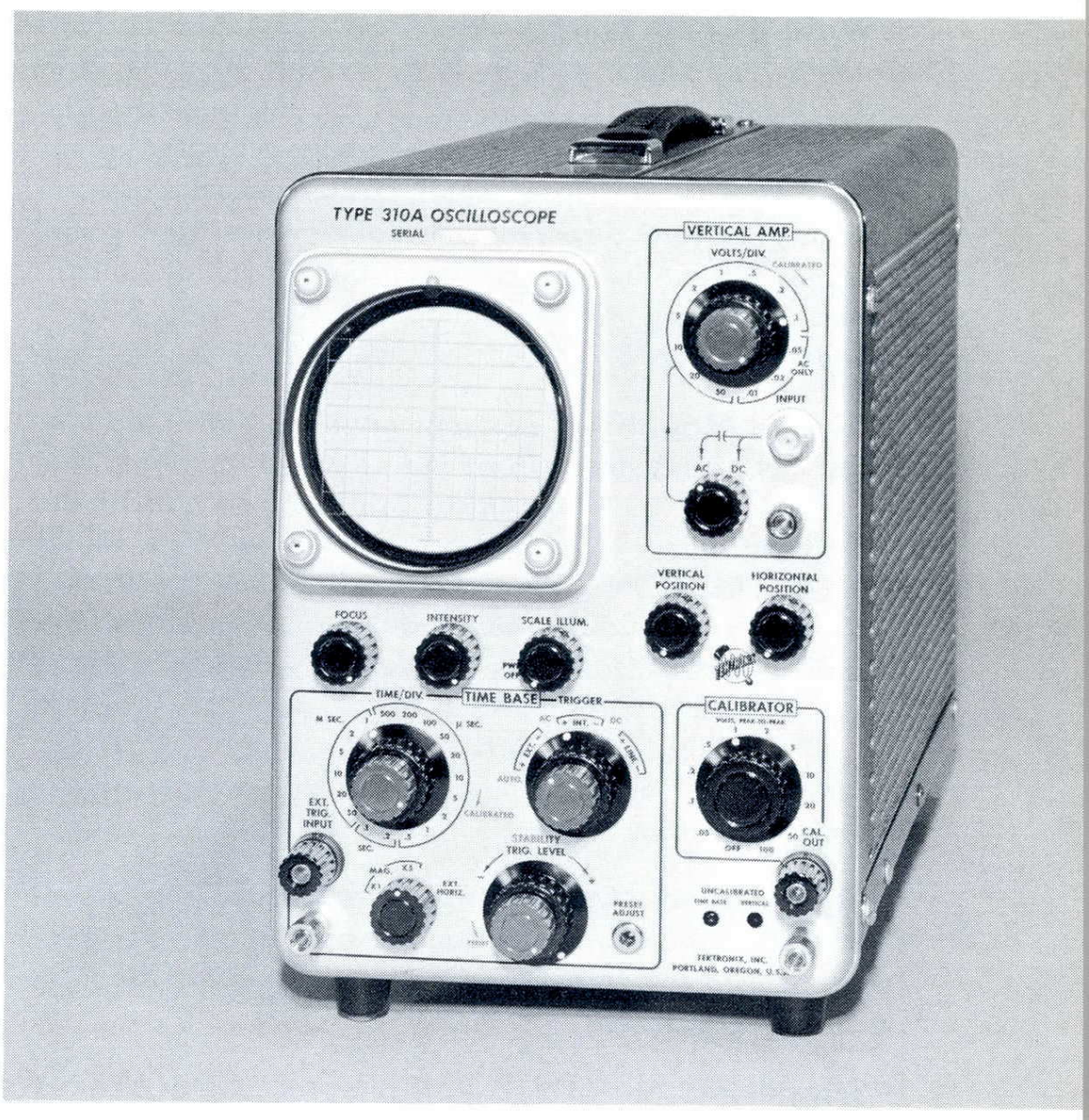
ACCELERATING POTENTIAL—1.85 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—50 mv to 100 v, 1-kc square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 175 watts.

The Type 310A Oscilloscope is an instrument you can take with you—easily, comfortably. Small size and low weight combined with operation on 50 to 800-cycle line frequency make this an ideal instrument for maintenance and calibration of specialized measuring and recording instruments at their point of use. Accurate calibration and excellent linearity assure faithful displays and precise time and amplitude measurements either in the laboratory or in the field. Functional panel design and versatile control systems contribute to operator convenience.



VERTICAL-DEFLECTION SYSTEM

Frequency specifications are at 3-db down

DC-Coupled Vertical Amplifier—Main amplifier passband is dc to 4 Mc. Vertical deflection is calibrated in steps of 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 v/div. When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X Probe. An ac-coupled preamplifier switched in by the VOLTS/DIV control provides three additional calibrated steps of 0.01, 0.02, and 0.05 v/div, at a frequency response of 2 cycles to 3.5 mc. In addition, a 2.5-to-1 vernier (uncalibrated) control provides for continuously-variable adjustment from 0.01 v/div to 125 v/div. A light on the front panel indicates when the control is in the variable (uncalibrated) position. Vertical amplifier is factory-adjusted for optimum transient response. Rise-time is less than 90 nsec. Input impedance is 1 megohm paralleled by approximately 40 pf.

Calibration Accuracy—Internal adjustments are provided for setting the gain of the vertical amplifier. When these adjustments are accurately set with the VOLTS/DIV switch in the 0.1 and 0.01 v/div positions, the vertical deflection factor for any other position of the switch will be within 3% of the panel reading for that switch position.

Probe—A low-capacitance probe (10-x atten.) is supplied with the instrument. Input capacitance with the probe is approximately 9.5 pf paralleled by 10 megohms.

310A

HORIZONTAL-DEFLECTION SYSTEM

Wide Sweep Range—The Type 310A has 18 calibrated sweep rates: 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500 μsec/div, ... 1, 2, 5, 10, 20, 50 millisec/div, 0.1, 0.2 sec/div. In addition, a vernier (uncalibrated) control provides sweep rates continuously adjustable from 0.5 μsec/div to 0.6 sec/div. A light in the front panel indicates when the control is in the variable (uncalibrated) position. Calibration accuracy of the 18 fixed sweeps is within 3%.

Sweep Magnifier—Sweep magnification is obtained by increasing the gain of the sweep-output amplifier by a factor of 5. The center 2-division portion of the normal trace is expanded to 10 divisions. The HORIZONTAL POSITION control has sufficient range to display any one-fifth of the magnified sweep. The 5-x magnifier applied to the 0.5-μsec/div sweep extends the calibrated range to 0.1 μsec/div. Accuracy is within 3% of the displayed portion of the magnified sweep on all ranges except the 0.5 μsec/div range, where accuracy is within 5%.

DC-Coupled Unblanking—The unblanking waveform is dc-coupled to the control grid of the cathode-ray tube. This assures uniform bias for all sweep rates and repetition rates.

Triggering Facilities—Versatile triggering circuitry provides for complete manual control, preset stability control, and fully-automatic triggering.

Amplitude-Level Selection—Adjustable amplitude-level and stability controls provide for triggering the sweep at a selected amplitude level on the triggering waveform. Trigger source can be internal, external, or the line frequency, either ac-coupled or dc-coupled. The triggering point can be on either the rising or falling slope of the triggering waveform.

Automatic Triggering—Provided by an automatic level-seeking trigger circuit which is useful for triggering between 60 cps and approx. 2 Mc. In the absence of an input signal the sweep is automatically triggered at about a 50-cycle rate, providing a reference trace on the screen.

Trigger Requirements—Internal triggering—a signal large enough to produce a 0.5 div deflection at 1 kc, increasing to 2 div deflection at 5 Mc. External Triggering—0.2 v pk-to-pk at 1 kc increasing to 2 v pk-to-pk at 5 Mc.

Horizontal Input—A back-panel terminal permits use of an external signal to drive the horizontal amplifier. Deflection factor is 1.5 v/div. The gain can be reduced by a gain control on the back panel.

OTHER CHARACTERISTICS

Amplitude Calibrator—A square-wave voltage is available through a front-panel binding post. Eleven fixed voltages—0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 volts peak-to-peak—are provided. Accuracy is within 3%. Square-wave frequency is about 1 kc.

Illuminated Graticule—The edge-lighted graticule has 8 vertical and 10 horizontal ¼-inch divisions. Illumination is controlled by a front-panel knob. An appropriate filter is provided to increase contrast when viewing in a brightly-lighted room.

Cathode-Ray Tube—Flat-faced mono-accelerator crt operates at 1.85-kv accelerating potential. A P31 phosphor is normally supplied.

Power Requirement—Wired for 115-v, the electronically-regulated power supplies permit a line-voltage variation between 103.5 and 126.5 v (115 v ±10%). Changing transformer taps also permits regulated power supply operation at 108, 122, 216, 230, or 244 v ±10%. The Type 310A requires 175 watts and will operate over the range of 50 to 800 cps, but requires about 4% higher line voltage at 800 cps.

Hinged Chassis—The Type 310A opens up to permit easy accessibility to all tubes and components.

Mechanical Specifications—Dimensions are 10⅜" high by 7" wide by 17⅝" deep. Net weight is 23 pounds. Shipping weight is 34 pounds, approx.

TYPE 310A OSCILLOSCOPE $675

Each instrument includes: 1—P6006 probe (010-0127-00); 1—patch cord, 18'', BNC-to-BNC (012-0087-00); 1—patch cord, 18'', BNC-to-banana plug (012-0091-00); 1—post jack, BNC (012-0092-00); 1—3-conductor power cord (161-0022-00); 1—3 to 2-wire adapter (103-0013-00); 1—light filter (378-0509-00); 2—instruction manual (070-0244-00).

FAN BASE

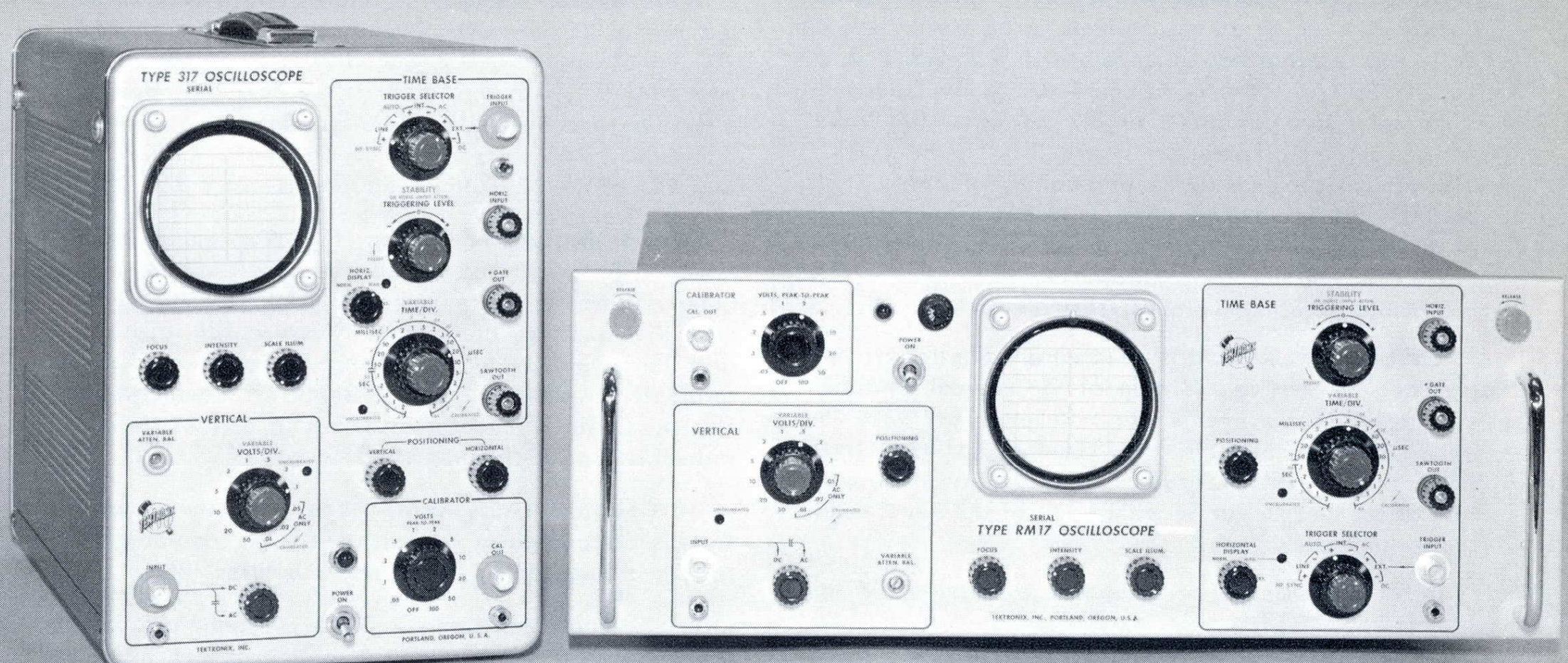
A Fan Base is available to provide filtered forced-air ventilation. This will reduce operating temperature when the Type 310A is used continuously for prolonged periods of time or in a hot or limited-ventilation area. For convenience, the Fan Base tilts the oscilloscope to a convenient viewing angle.

For use on 105-125 v, 50 to 60 cps only:
Order Part Number 016-0012-00 . . . . . $50

For use on 210-250 v, 50 to 60 cps only:
Order Part Number 016-0013-00 . . . . . $50

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-10 MC—9-KV OSCILLOSCOPE Type 317 / RM17



BRIGHT TRACE

ELECTRONICALLY-REGULATED DC SUPPLIES

COMPACT CABINET OR RACK-MOUNT MODELS

The Type 317 is an excellent oscilloscope for the daylight conditions often encountered in the field and at production test stations. Its brilliant trace, provided by 9-kv accelerating potential on a Tektronix 3-inch cathode-ray tube, is easily readable in bright areas... even at low sweep-repetition rates. And its dc-to-10 mc vertical response and wide sweep range easily take care of most of today's complex field and test station applications. Of course, these fine characteristics make it an excellent laboratory oscilloscope, too.

CHARACTERISTIC SUMMARY

VERTICAL

CALIBRATED SENSITIVITY—
Dc-coupled, 0.1 v/div to 50 v/div.
Ac-coupled, 0.01 v/div to 50 v/div.
PASSBAND—DC-coupled, dc to 10 Mc.
AC-coupled, 2 cps to 10 Mc.
RISETIME—35 nsec.
INPUT—1 megohm, 40 pf.

HORIZONTAL

CALIBRATED SWEEP RANGE—0.2 μsec/div to 2 sec/div.
SWEEP MAGNIFIER—5X, extends sweep range to 0.04 μsec/div.
TRIGGER REQUIREMENTS—Internal: 0.5-div deflection.
External: 0.5 to 20 v.
EXTERNAL INPUT—1.4 v/div maximum sensitivity, dc to 400 kc.

CRT

DISPLAY AREA—8 x 10 div. Each div equal to ¼ inch.
ACCELERATING POTENTIAL—9 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—50 mv to 100 v, 1-kc square wave.
POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 260 watts.

317
RM17

VERTICAL-DEFLECTION SYSTEM

Frequency Specifications are at 3-db down

DC-Coupled Vertical Amplifier — Main amplifier passband is dc to 10 Mc, risetime is 35 nsec. Vertical deflection is calibrated in steps of 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 v/div. When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X Probe. An ac-coupled preamplifier switched in by the VOLTS/DIV control provides three additional calibrated steps of 0.01, 0.02 and 0.05 v/div at a frequency response of 2 cycles to 10 Mc, risetime 35 nsec. In addition, a 2½-to-1 vernier (uncalibrated) control provides for continuous adjustment from 0.01 v/div to 125 v/div.

Calibration Accuracy — Internal adjustments are provided for setting the gain of the vertical amplifier. When these adjustments are accurately set with the VOLTS/DIV switch in the 0.1 v/div and 0.01 v/div positions, the vertical deflection factor for any other position of the switch will be within 3% of the panel reading for that position.

Input Impedance—1 megohm paralleled by approximately 40 pf.

Delay Network—A signal delay of 0.25 μsec is introduced by the balanced delay network. Permits observation of the leading edge of the waveform that triggers the sweep.

Probe—The vertical sensitivity of the Type 317 is reduced by a factor of ten by use of the 10-x attenuator probe supplied with the instrument. The probe presents an input impedance of 10 megohms paralleled by approximately 9.5 pf.

Under daylight conditions, the trace is easily readable . . . even at low sweep-repetition rates on this portable Type 317.

HORIZONTAL-DEFLECTION SYSTEM

Wide Sweep Range—A single knob is used to select any of 22 calibrated sweep rates: 0.2, 0.5, 1, 2, 5, 10, 20, 50 μsec/div, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 msec/div, 0.1, 0.2, 0.5, 1, and 2 sec/div. In addition, a vernier (uncalibrated) control provides for continuous adjustment from 0.2 μsec/div to 6 sec/div. Calibration accuracy of the 22 fixed sweep rates is within 3%.

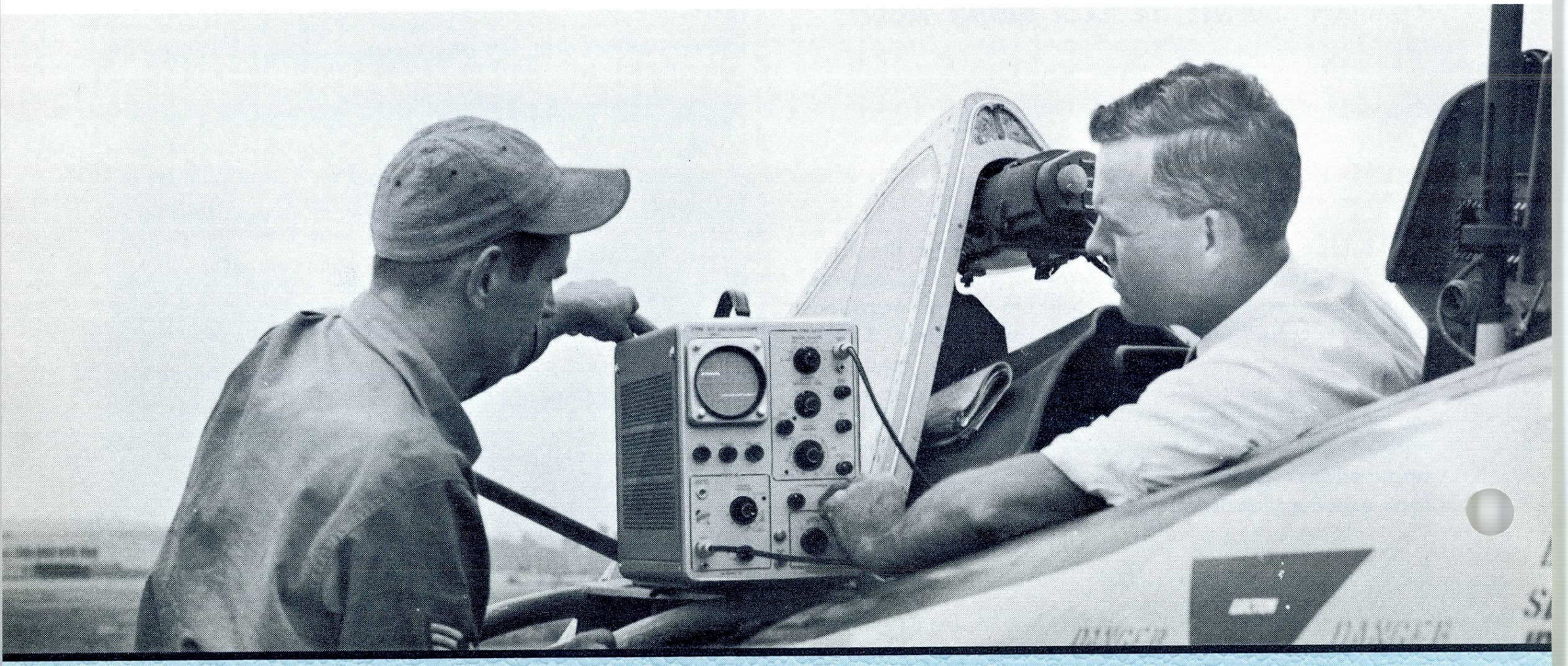
Sweep Magnifier—When the 5-x magnifier is switched in, calibrated sweep rates are read from the outer ring of numbers circling the TIME/DIV knob. The magnifier expands the normal sweep to fifty divisions, and the HORIZONTAL positioning control has sufficient range to display any ten divisions of the magnified sweep. Calibration accuracy is within 5% of the displayed portion of the magnified sweep.

DC-Coupled Unblanking—The unblanking waveform is dc-coupled to the grid of the crt, assuring uniform grid bias for all sweep and repetition rates.

Triggering Facilities—Versatile triggering circuitry provides for complete manual control, preset stability control, and fully-automatic triggering.

Amplitude-Level Selection—Adjustable amplitude-level and stability controls provide for triggering the sweep at a selected amplitude level on the triggering waveform. Trigger source can be internal, external, or the line frequency, either ac-coupled or dc-coupled. The triggering point can be on either the rising or falling slope of the triggering waveform.

Preset Stability—Same as above, except the stability control is preset to the optimum triggering point and requires no readjustment.



Automatic Triggering—Automatic level-seeking trigger circuit provides dependable triggering for most applications. One simple setting assures positive sweep-triggering by signals of widely differing amplitudes, shapes, and repetition rates. No trigger controls need be touched until a different type of operation is desired. Range of automatic operation is between 60 cycles and 2 megacycles, approximately. In the absence of an input signal the sweep is automatically triggered at about a 50-cycle rate, providing a reference trace on the screen.

High-Frequency Sync—Assures a steady display of sine-wave signals up to approximately 15 Mc. Requires a signal large enough to cause a deflection of 0.2 div at 5 Mc, 2 div at 15 Mc, or an external signal of about 2 v.

Trigger Requirements—An internal signal causing deflections of 0.2 div increasing to 2 div at 5 Mc in AC MODE, 0.3 div increasing to 2 div at 5 Mc in DC MODE, and 0.5 div increasing to 2 div at 2 Mc in AUTO MODE, or an external signal of 0.5 v to 20 v.

Horizontal Input Amplifier—DC-coupled external connection to the sweep amplifier is through a front-panel connector. Deflection factor is approximately 1.4 v/div. Frequency response is dc to 500 kc.

OTHER CHARACTERISTICS

Calibrator—A square wave calibration voltage is available through a front-panel coaxial connector. Eleven fixed peak-to-peak voltages are provided: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 and 100 volts. Accuracy is within 3%. Square-wave frequency is about 1 kc.

Cathode-Ray Tube—A new Tektronix flat-faced 3" cathode-ray tube with helical post-accelerating anode is used in the Type 317. Accelerating potential is 9 kv. A P31 phosphor is normally supplied.

Illuminated Graticule—The edge-lighted graticule is divided into 8 vertical and 10 horizontal ¼" divisions. Illumination is controlled by a front-panel knob.

Output Waveforms—A 20 v (approx.) positive-gate waveform of the same duration as the sweep, and a 150 v (approx.) positive-going sweep sawtooth waveform are available at front-panel connectors.

Warning Indicators for Uncalibrated Settings—Separate front-panel neon lights indicate when the vertical-attenuator and sweep-rate controls are not in their calibrated positions.

Regulated Power Supplies—Electronic regulation compensates for line-voltage and load variations between 105 and 125 v, or 210 and 250 v.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 260 watts. Type 317 MOD101 operates on 50 to 400 cps supply, uses dc fan motor.

Unless otherwise specified, the instrument will be shipped wired for operation within the line-voltage range of 105 v to 125 v. The Type 317 can be ordered wired for operation on several nominal line voltages as follows:

Nominal Line Voltage	Operating Range
(Figures taken at 60 cps)	
110	99 to 117 volts
117	105 to 125 volts
124	111 to 132 volts
220	198 to 235 volts
234	210 to 250 volts
248	223 to 265 volts

A decal on the transformer gives complete instructions for changing the operating range.

Cabinet Model—Dimensions are 12⅜" high by 8⅝" wide by 19½" deep. Net weight is 33¼ pounds. Shipping weight is 47 pounds, approx.

TYPE 317 (50 to 60 cps operation) $875

Each instrument includes: 1—P6006 probe (010-0127-00); 1—patch cord, 18'', BNC-to-BNC (012-0087-00); 1—patch cord, 18'', BNC-to-banana plug (012-0091-00); 1—post jack, BNC (012-0092-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—light filter (378-0509-00); 2—instruction manual (070-0297-00).

TYPE 317MOD101 (50 to 400 cps operation) . . $935

Each instrument includes: 1—P6006 probe (010-0127-00); 1—patch cord, 18'', BNC-to-BNC (012-0087-00); 1—patch cord, 18'', BNC-to-banana plug (012-0091-00); 1—post jack, BNC (012-0092-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—light filter (378-0509-00); 2—instruction manual (070-0297-00).

Rack-Mount Model—Dimensions are 7" high by 19" wide by 17-5/8" deep. The instrument mounts to the standard 19" rack on slide-out tracks and can be pulled forward, tilted, and locked in any of 7 positions for easy servicing. Net weight is 35 pounds. Shipping weight is 66 pounds, approx.

For more mounting information, please refer to the catalog Mounting Dimension page.

TYPE RM17 (50 to 60 cps operation) $950

Each instrument includes: 1—P6006 probe (010-0127-00); 1—patch cord, 18'', BNC-to-BNC (012-0087-00); 1—patch cord, 18'', BNC-to-banana plug (012-0091-00); 1—post jack, BNC (012-0092-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—light filter (378-0509-00); 1—pair mounting tracks (351-0083-00); 2—instruction manual (070-0297-00).

TYPE RM17MOD101 (50 to 400 cps operation) . $1010

Each instrument includes: 1—P6006 probe (010-0127-00); 1—patch cord, 18'', BNC-to-BNC (012-0087-00); 1—patch cord, 18'', BNC-to-banana plug (012-0091-00); 1—post jack, BNC (012-0092-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—light filter (378-0509-00); 1—pair mounting tracks (351-0083-00); 2—instruction manual (070-0297-00).

SUPPORTING CRADLES

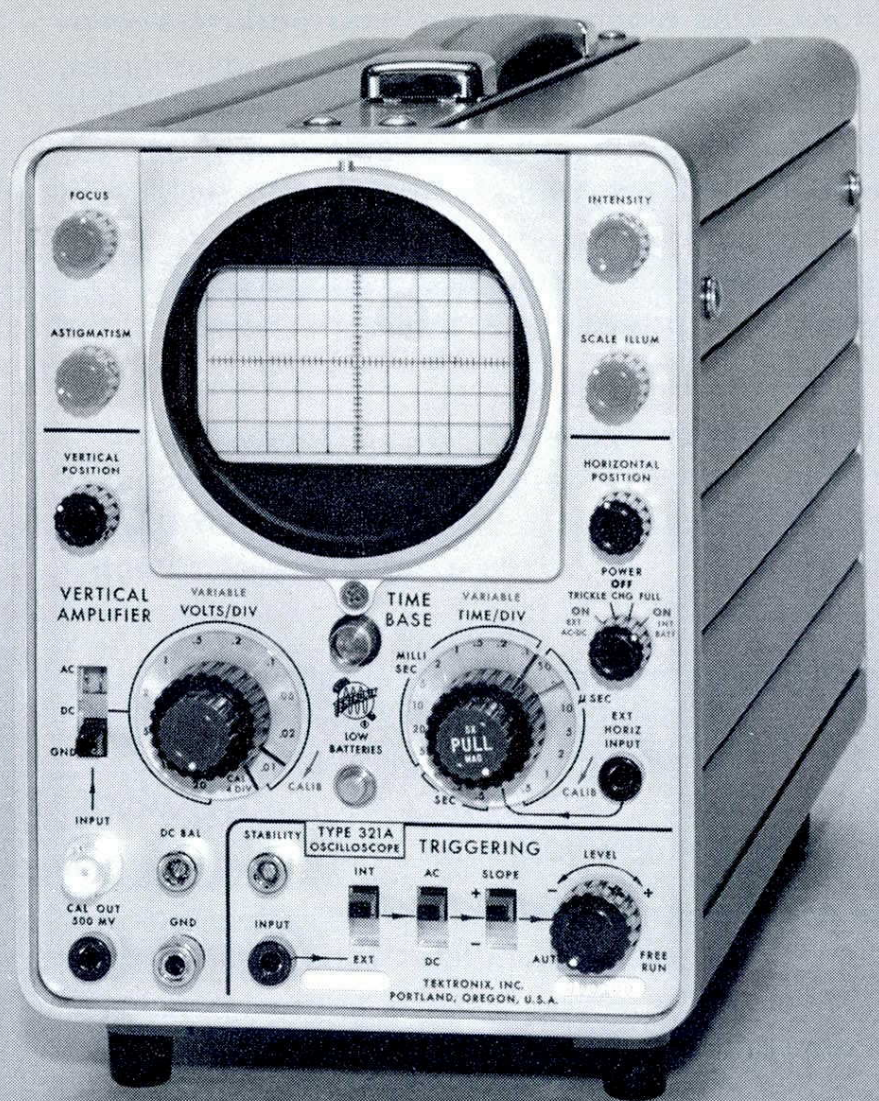
When the RM17 or RM17MOD101 is mounted in a backless rack, these supporting cradles are necessary for rear-slide support.

Order Part Number 040-0345-00 . . . . . $11.45

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 321A PORTABLE OSCILLOSCOPE

LOW WEIGHT
SMALL SIZE
TRANSISTORIZED
BATTERY POWERED



The Type 321A is an improved model of the Type 321, and is intended for applications where a completely portable instrument is desired.

The "A" version has extended the vertical amplifier passband from 5 Mc to 6 Mc, increased the trigger amplifier passband, improved both vertical and horizontal linearity, changed the CRT filament to a lower power type for added operating time on batteries, and provided a power switch compatible with the power source versatility of the instrument. For the operator's convenience a low-battery indicator light has been added to the front panel. This light will also indicate if an external dc source voltage or line voltage is too low.

Small size and low weight make the Type 321A Oscilloscope truly portable. It is capable of operating on its own internal battery pack, on the dc systems on boats, airplanes, cars, etc., or from an ac line.

CHARACTERISTIC SUMMARY

VERTICAL

CALIBRATED SENSITIVITY—0.01 v/div to 20 v/div, DC coupled.

PASSBAND—DC to at least 6 Mc.

INPUT IMPEDANCE—1 megohm paralleled by approx. 35 pf.

HORIZONTAL

CALIBRATED SWEEP RATES—0.5 μsec/div to 0.5 sec/div.

SWEEP MAGNIFIER—5X, extends sweep rate to 0.1 μsec/div.

TRIGGER REQUIREMENTS—Internal: AC, DC, Auto—0.2 major div. display at 1 kc increasing to 1 major div. display at 6 Mc.
External: AC, DC, Auto—1 v peak-to-peak at 1 kc increasing to 3 v peak-to-peak at 6 Mc.

EXTERNAL INPUT—Sensitivity: With 5X MAG on, 1 v/div ±10%.
Bandwidth: DC to at least 1 Mc.
Impedance: 100 k paralleled by approx. 30 pf.

PRINTED IN U.S.A.

CRT

DISPLAY AREA—6 x 10 div. Each div equal to ¼ inch.

ACCELERATING POTENTIAL—4 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—500-mv square wave peak-to-peak and internal 40-mv square wave peak-to-peak at approx. 2 kc.

POWER REQUIREMENTS—Approx. 700 ma from 10 size D batteries or a dc supply of 11.5 v to 35 v. Approx. 20 watts from an ac supply of 115 v ±10% or 230 v ±10%, 50-800 cycles.

VERTICAL-DEFLECTION SYSTEM

FREQUENCY SPECIFICATIONS are at 3-db down.

DC COUPLED VERTICAL AMPLIFIER has a main vertical passband of dc to 6 Mc. Vertical deflection is calibrated in 11 steps from 0.01 to 20 v/div in a 1, 2, 5, sequence. A vernier control provides for continuously variable adjustment from 0.01 v/div to 50 v/div, uncalibrated. In addition, the fully-clockwise position of the VOLTS/DIV switch marked CAL 4 DIV, allows observation of an internally-coupled 40-mv peak-to-peak square-wave signal.

CALIBRATION ACCURACY is adjusted internally for setting the gain of the vertical amplifier. When this adjustment is set, the vertical deflection factor is within 3% for any v/div switch position.

INPUT IMPEDANCE is 1 megohm paralleled by approximately 35 pf.

MAXIMUM INPUT VOLTAGE RATING is 600 volts combined dc and ac peak.

PROBE providing 10X attenuation is supplied with the instrument and presents an input impedance of 10 megohms paralleled by approximately 8.5 pf. The probe reduces the vertical sensitivity by a factor of ten.

HORIZONTAL-DEFLECTION SYSTEM

SWEEP RATE is calibrated in 19 steps from 0.5 μsec/div to 0.5 sec/div in a 1, 2, 5, sequence. A vernier control provides for continuously variable adjustment from 0.5 μsec/div to approximately 1.5 sec/div, uncalibrated. Accuracy of 19 fixed sweep rates is within 3%.

DC COUPLED UNBLANKING provides uniform brightness at all sweep rates.

TRIGGERING FACILITIES provide for complete manual control or fully-automatic triggering.

AMPLITUDE-LEVEL SELECTION is accomplished with adjustable amplitude-level and stability controls for triggering the sweep at a selected amplitude level on the triggering waveform. Trigger source can be internal or external, ac-coupled or dc-coupled. Trigger point can occur anywhere on the rising slope or falling slope of the triggering waveform.

AUTOMATIC TRIGGERING is provided by an automatic level-seeking trigger circuit which is useful for triggering above 50 cycles. The sweep is triggered automatically at about a 50-cycle rate in the absence of an input signal to provide a convenient reference trace on the screen.

TRIGGER REQUIREMENTS for internal triggering: a signal large enough to produce 0.2 major divisions of vertical deflection at 1 kc is required, increasing to 1 major division of vertical deflection at 6 Mc. For external triggering: a signal of 1 v peak-to-peak at 1 kc is required, increasing to 3 v peak-to-peak at 6 Mc.

HORIZONTAL INPUT is provided by a dc-coupled external connection to the sweep amplifier through a front-panel connector. Passband is dc to at least 1 Mc. The horizontal deflection factor is 1 v/div ±10% with the 5X MAG on. Input impedance is 100 kilohms ±10% paralleled by approximately 30 pf.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR provides a 500 mv peak-to-peak square-wave voltage through a front-panel connector. In addition, an internally coupled 40-mv peak-to-peak square-wave voltage is available in the fully clockwise position (CAL 4 DIV) of the VOLTS/DIV switch. Accuracy is within 3%. Frequency of the square wave is approximately 2 kc.

INTENSITY MODULATION of the cathode-ray tube display is provided by an external signal connected to the crt grid terminal on the back panel of the oscilloscope. A negative signal of approximately 30 volts peak is required to cut off the beam from maximum brightness. Less voltage is required with low intensity settings.

CATHODE-RAY TUBE is a Tektronix flat-faced, 3-inch post accelerator cathode-ray tube which provides a bright trace and utilizes low heater power. Accelerating potential is 4 kv. Deflection blanking of the beam is used. A P31 phosphor is normally supplied.

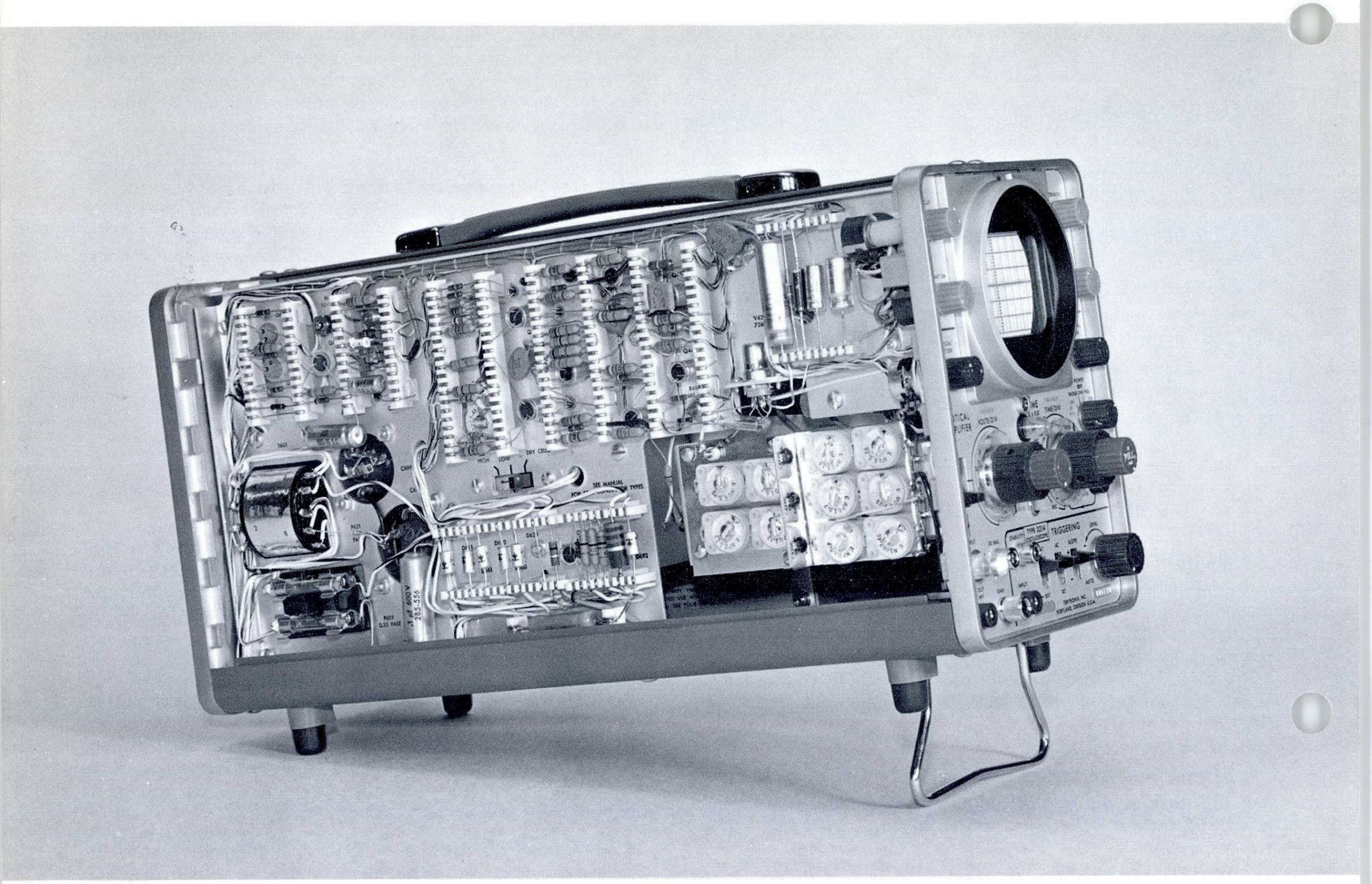
ILLUMINATED GRATICULE is edge lighted. Adjustment is provided by the SCALE ILLUM control when operating from an ac line only. Display area of the graticule is marked in six vertical and ten horizontal one-fourth inch major divisions. Centerlines are marked in five minor divisions per major division.

ELECTRONICALLY REGULATED DC POWER SUPPLY insures stable operation over line variations between 11.5 to 35 volts dc or 115 volts ±10% or 230 volts rms ±10%, 50 to 800 cycles.

POWER REQUIREMENTS are satisfied either from ten size D flashlight cells (approximately ½ hour continuous operation, more on intermittent operation); from ten size D alkaline cells, such as Eveready E95, Burgess A1-2, or Mallory MN-1300 (approximately 2½ hours continuous operation), or from ten size D NiCd rechargeable cells (up to 5 hours continuous operation depending on type used).

The current drain on external dc or on internal batteries is approximately 700 ma regardless of supply voltage. The power consumption from any ac source is approximately 20 watts. A thermal cutout protects the instrument against operation at temperatures in excess of about 55°C.

321A



BATTERY CHARGER is built-in and provides two different charging currents to the internal batteries, or no charging current in the case of dry cells. The mode is selected with an internal switch. A 4-position front-panel switch provides for operation from external ac or dc, or from the internal batteries. It also provides a trickle charge or a full charge to the internal batteries when the instrument is turned off but is connected to the ac line.

DIMENSIONS are 8¼" high by 5¾" wide by 16" deep.

NET WEIGHT is 14 pounds without batteries, 16 pounds with batteries.

SHIPPING WEIGHTS are approx. 22 pounds without batteries and 26 pounds with batteries.

TYPE 321A OSCILLOSCOPE (without batteries) $900

Each instrument includes: 1—P6006 probe (010-0127-00); 2—patch cord, 18'', BNC-to-banana plug (012-0091-00); 1—dc power cord (161-0016-00); 1—3-conductor ac power cord (161-0015-00); 1—3 to 2-wire adapter (103-0013-00); 1—light filter (378-0547-00); 2—instruction manual (070-0425-00).

Set of ten rechargeable NiCd cells will operate the Type 321A for approximately 5 hours.

Order 10 — Part Number 146-0005-00, $9.15 each
Total $91.50

CARRYING CASE

Attractive carrying case for the Type 321A provides in-transit protection as well as a convenient accessory storage compartment.

Order Part Number 016-0026-00 . . . . . $30

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

INDICATOR UNIT Type 360

Vertical-Deflection System

Frequency Response—dc to 500 kc.
Sensitivity—
0.05 volts/div to 50 volts/div.
4 calibrated steps.
Continuously variable between steps, and to approximately 500 volts/div.
Maximum Input Voltage—
600 volts (dc plus peak ac).

Horizontal-Deflection System

Waveforms Required—
Positive or negative-going sawtooth, 110 to 150 volts excursion within the limits of —95 volts to +170 volts.
Gate, 45 to 75 volts positive same duration as the sawtooth.
Frequency Response—dc to 100 kc.

Power Requirements—

DC Power
+300 volts at 20 ma (unregulated)
+225 volts at 35 ma (regulated)
—170 volts at 23 ma (regulated).
AC Power
6.3 volts at 3.5 amps.

The Type 360 Indicator Unit in combination with the Type 160-Series Instruments becomes an integral building block in a complex sequence control and monitoring system.

The compact indicator contains a flat-faced, 3-inch cathode-ray tube, accelerating-voltage supply, horizontal amplifier, vertical amplifier and a calibrated vertical attenuator, among other features. It is designed to receive its sweep and unblanking voltages from a Type 162 Waveform Generator.

Any source of proper voltage and waveforms can power the indicator. The Type 160A Power Supply is recommended for applications that require a compact rack-mounted combination. In system use, up to 5 Type 360 Indicator Units can operate from a single Type 160A Power Supply.

VERTICAL-DEFLECTION SYSTEM

Frequency Specifications are at 3-db down

DC-Coupled Amplifier—Main vertical passband is dc to 500 kc. Frequency-compensated rc attenuators are switched into the amplifier input circuit by the VOLTS/DIV switch. Two attenuators are used singly or cascaded to produce four calibrated sensitivities in steps of 0.05, 0.5, 5, and 50 volts/div. A vernier control provides for continuously variable adjustment between steps, and to approximately 500 volts/div.

Signal Input—A front-panel coaxial connector is provided for the input signal. Input impedance is 1 megohm paralleled by approximately 40 pf.

AC-DC Switches—A toggle switch is provided to insert or remove coupling capacitor for ac-coupled or dc-coupled operation.

Probe—One low-capacitance probe is supplied with the indicator. It provides an additional ten-times attenuation and reduces the loading on the circuit under test.

Vertical Gain—A screwdriver front-panel adjustment is provided to calibrate the gain of the vertical amplifier.

360

HORIZONTAL-DEFLECTION SYSTEM

The Type 162 Waveform Generator, any Tektronix oscilloscope that has gate and sweep voltages available at the front panel, or any other source of proper waveforms at the necessary dc levels, is required to supply the waveforms for the horizontal deflection system.

Input Waveforms—The horizontal amplifier will accommodate either a positive-going or a negative-going sawtooth and the total sawtooth excursion and dc level can vary within limits. The minimum sawtooth excursion is about 110 volts, and the excursion must be within the range of —95 volts to +170 volts. The maximum practical sawtooth excursion is about 150 volts, and the excursion must be within the range of —90 volts to +160 volts. Necessary for unblanking is a 50-volt positive pulse with the same duration as the sweep waveform.

Horizontal Calibration—A screwdriver front-panel adjustment is provided to calibrate the sweep.

OTHER CHARACTERISTICS

Cathode-Ray Tube—A flat-faced, 3-inch cathode-ray tube provides a bright trace. Accelerating potential is 1.5 kv. A P2 phosphor is normally supplied.

DC-Coupled Unblanking—The external unblanking waveform, dc-coupled to the grid of the crt, assures uniform bias for all sweep speeds and repetition rates at any setting of the intensity control.

Illuminated Graticule—Edge-lighting of the graticule is adjusted by the SCALE ILLUM. control. Display area of the graticule is marked in eight vertical and ten horizontal one-fourth inch major divisions. Centerlines are further marked in five minor divisions per major division.

Positioning Controls—Separate knobs for vertical and horizontal positioning are provided on concentric controls.

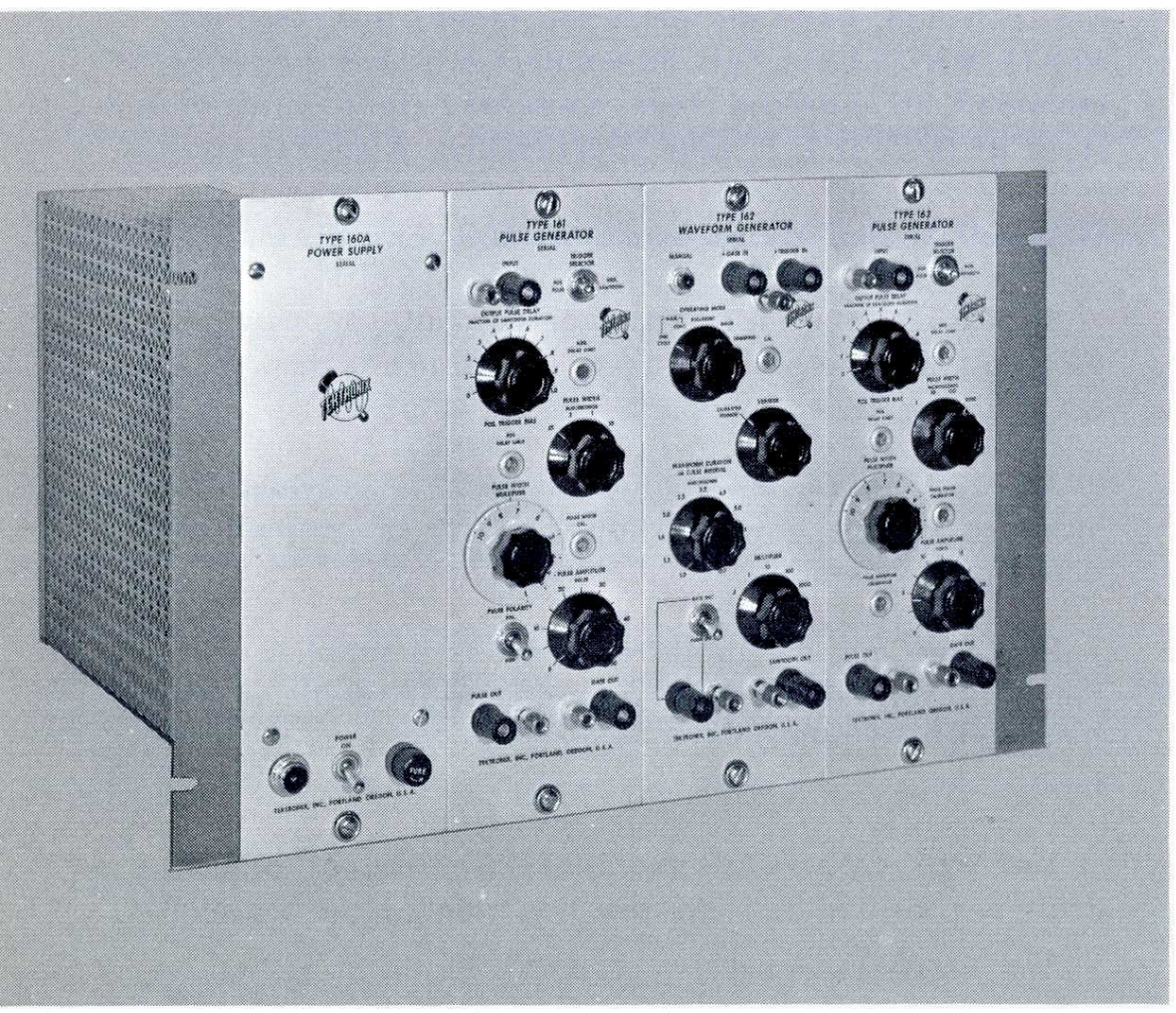
Mounting—The Type 360 Indicator Unit and up to 3 Type 160 Series Instruments can be secured quickly and easily to a Mounting Frame which bolts directly to a standard 19" rack.

Mechanical Specifications—Dimensions are 12¼" high by 4⅛" wide by 14" deep. Net weight is 10 pounds. Shipping weight is 17 pounds, approx.

TYPE 360 INDICATOR $270

Each instrument includes: 1—P6006 probe (010-0125-00), 1—inter-unit power cable (012-0016-00), 1—green filter (378-0509-00), 1 set—mounting hardware, 1—instruction manual (070-0220-00).

SEQUENCE CONTROL and MONITORING SYSTEM



This system consists of the Tektronix Type 160-Series Instruments. In conjunction with the Type 360 Indicator Unit, the system fits a wide variety of applications, including nerve stimulation, component testing, and data recording.

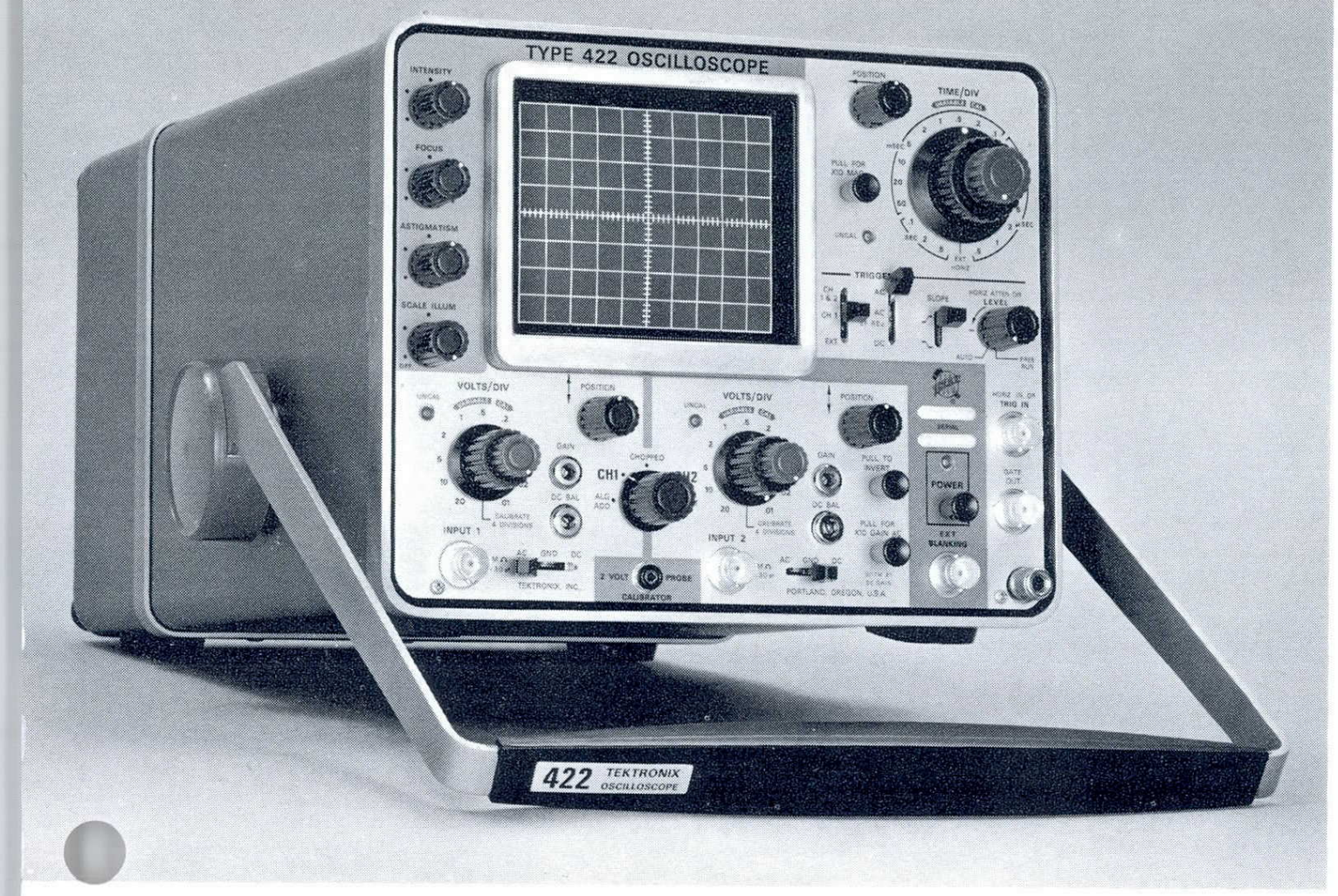
The Type 360 Indicator Unit and Type 160-Series Instruments can be secured quickly and easily to a Mounting Frame which bolts to a standard 19" rack.

TYPE 160A POWER SUPPLY $190
TYPE 161 PULSE GENERATOR $130
TYPE 162 WAVEFORM GENERATOR $130
TYPE 163 FAST-RISE PULSE GENERATOR $130
MOUNTING FRAME (Order Part Number 014-0002-00) $7

See appropriate catalog pages for complete information on Type 160-Series Instruments.

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-15 MC PORTABLE OSCILLOSCOPE Type 422



NEW

- *SMALL SIZE—LIGHT WEIGHT*
- *DUAL TRACE*
- *SHARP, BRIGHT DISPLAYS*
- *DESIGNED FOR RUGGED ENVIRONMENTS*
- *AC, DC, OR BATTERY OPERATED*
- *VERSATILE PERFORMANCE*

The Type 422 is a HIGH-PERFORMANCE, dual-trace instrument especially designed for operating convenience. It packs more all-around performance in less space than any comparable oscilloscope. It WEIGHS LESS THAN 21 POUNDS, including covers and accessories, and its SMALL SIZE permits easy carrying. It also requires very little storage space, facilitating transportation. It's a HARD-TO-BEAT instrument in an EASY-TO-CARRY package!

This instrument is RUGGEDLY CONSTRUCTED and will handle shocks, vibrations, and extreme temperatures often encountered in industrial environments, transit and storage. It is ideally suited for use in crowded areas such as might be found in laboratories, computer rooms and others. Its PORTABILITY enhances its use on shipboard, aviation flight lines and at remote communication repeater stations. It finds application in research under adverse field conditions, such as geophysics, meteorology and oceanography.

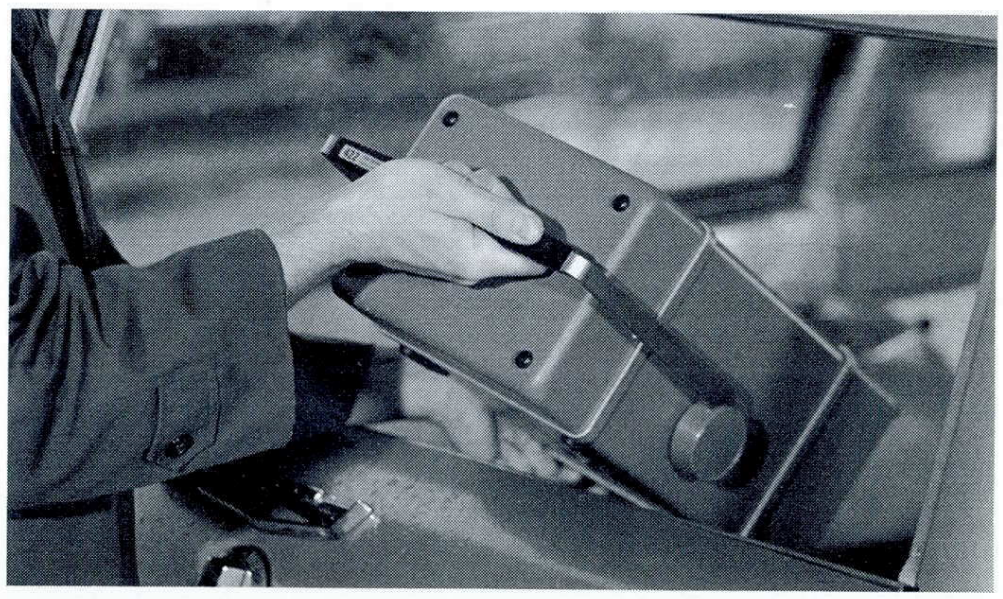
The Type 422 is constructed to the same high quality standards built into all Tektronix Oscilloscopes. Advanced design, careful manufacture and world-wide field engineering support assure top value in this widely versatile instrument.

The Type 422 features a 15-Mc, 23-NSEC RISETIME for both channels. There are 11 CALIBRATED INPUT SENSITIVITIES, ranging from 10 mv/div to 20 v/div. Accuracy is ±3%. Channel 2 has 10X gain (AC only) for 1 mv/div sensitivity at a bandwidth of 5 cps to 5 Mc, 70-nsec risetime.

The horizontal sweep system covers a range of 0.5 μSEC/DIV TO 0.5 SEC/DIV, in 19 calibrated rates. Accuracy is ±3% (5% on 10X magnifier). Full-range triggering to 15 Mc is featured. An AMPLIFIER FOR EXTERNAL HORIZONTAL INPUTS is incorporated into the instrument.

The new Tektronix 4-inch crt is rectangular and gives an 8 x 10-div display area. It has an ILLUMINATED INTERNAL GRATICULE. The display is sharp and bright, even under high ambient light conditions.

There are two models available. One operates on AC; the other on AC or DC, with an optional battery pack for completely portable operation. The power-on light blinks when batteries are low. The CARRYING HANDLE ADJUSTS for various tilt positions. The front cover serves as an accessory and storage case.



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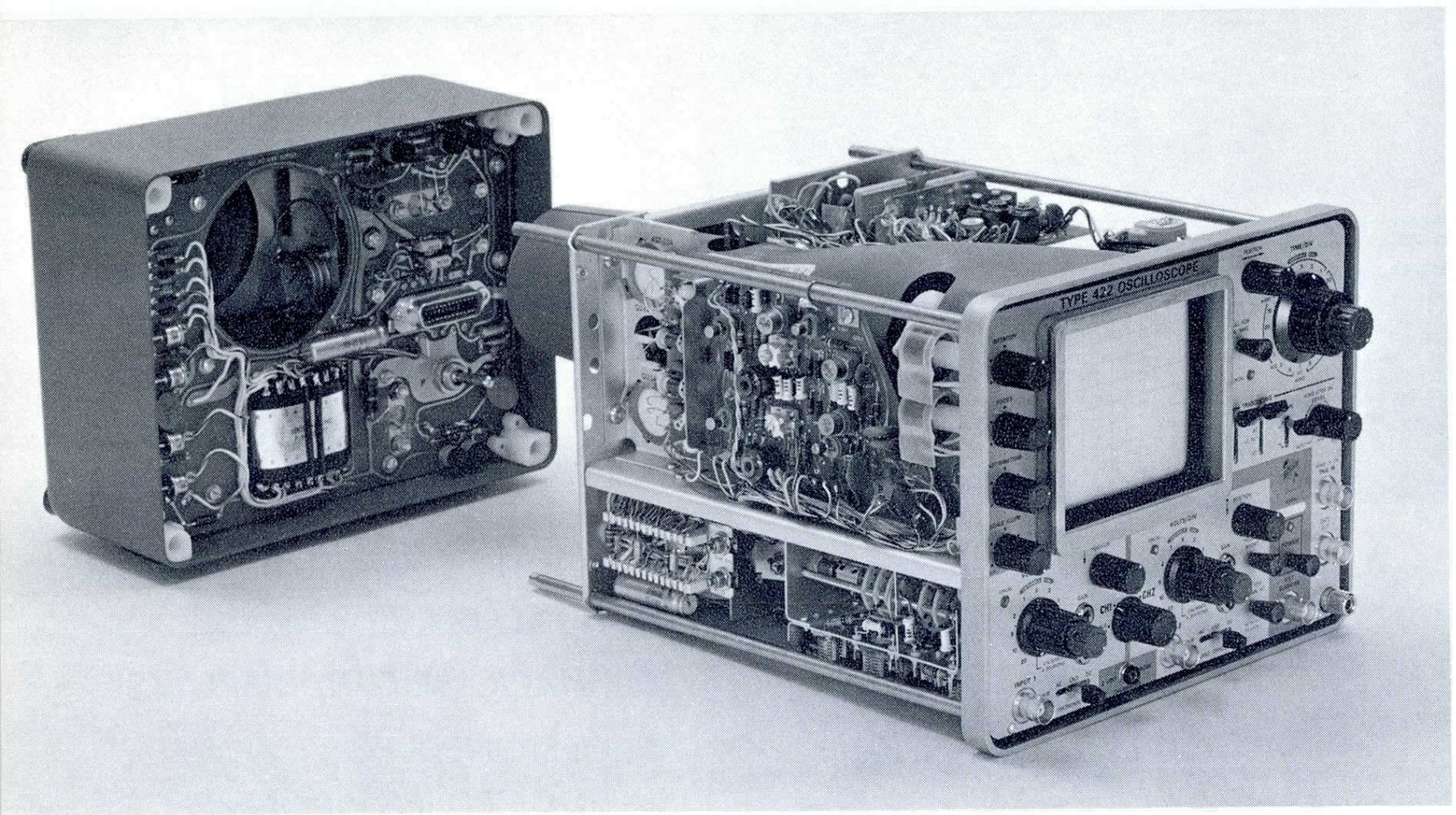
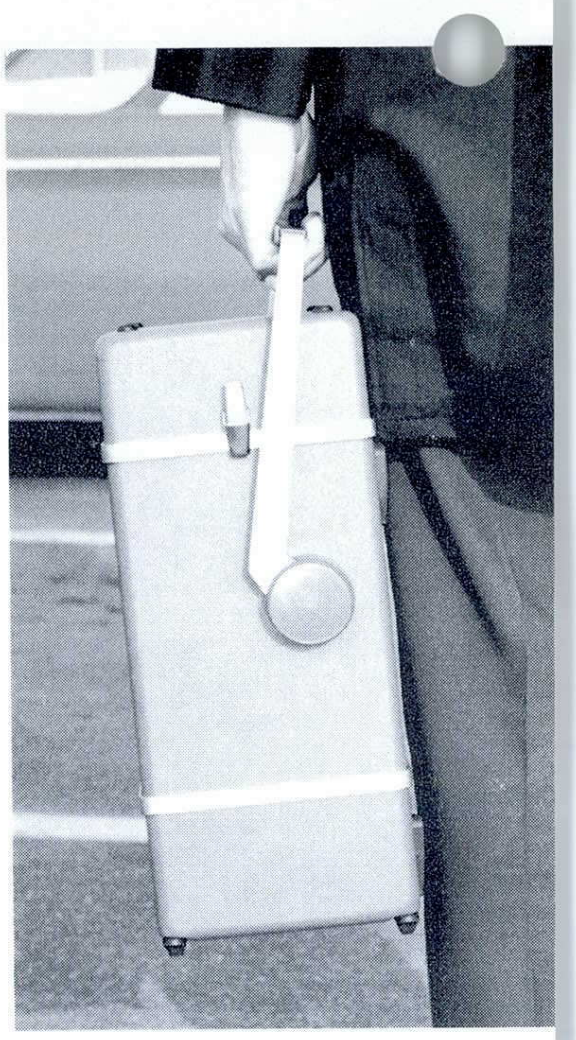
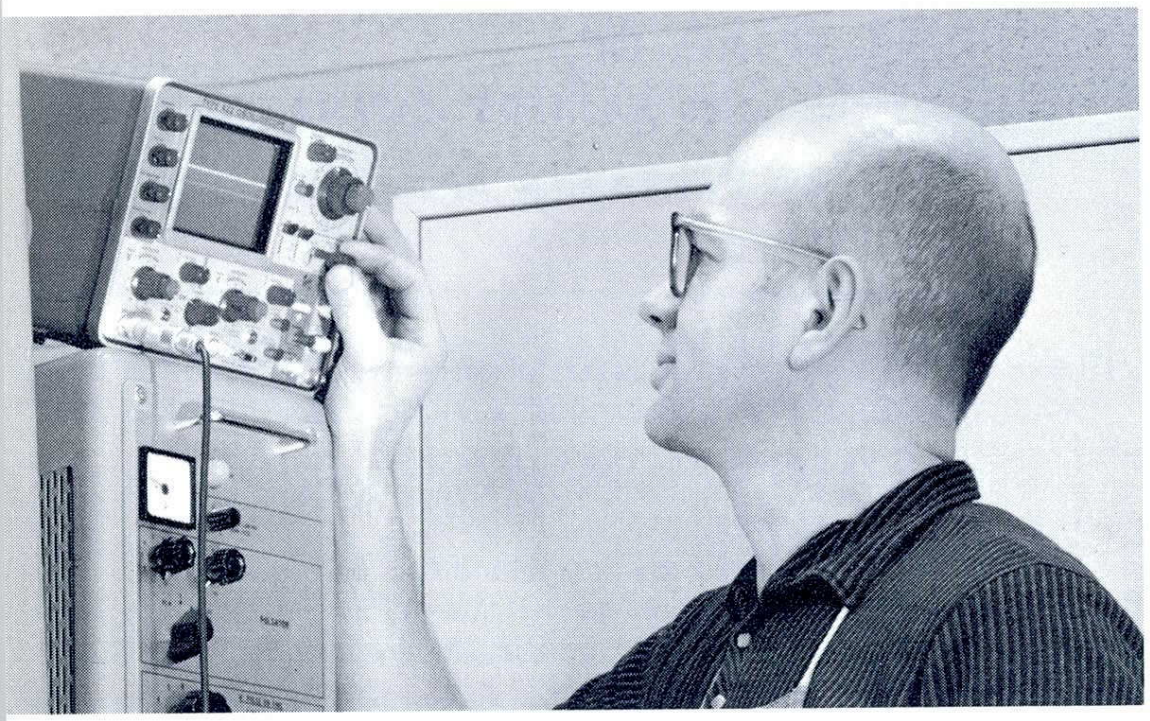
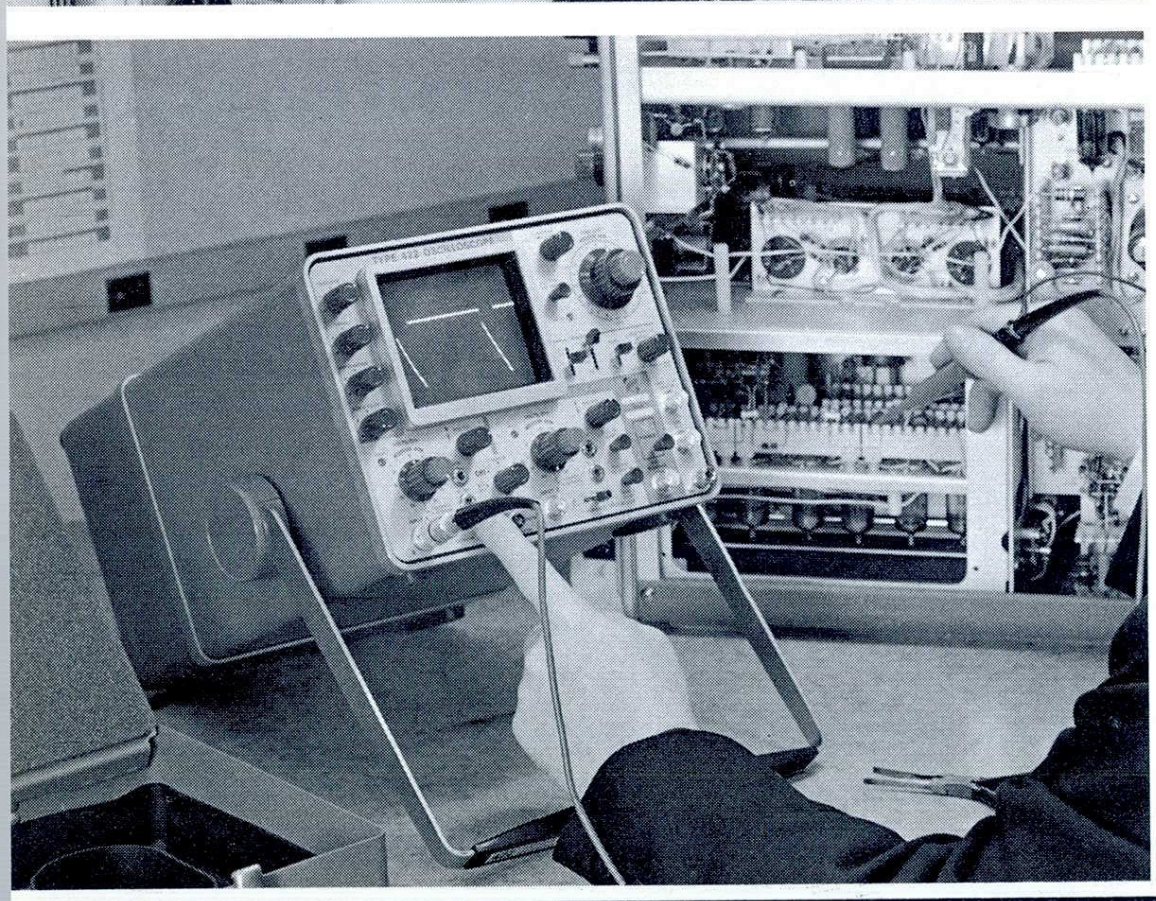








VERTICAL DEFLECTION SYSTEM

FREQUENCY RESPONSE AND RISETIME

DC to 15 Mc, each channel; 23-nsec risetime. AC or dc-coupled. 5 cps to 5 Mc, 70-nsec risetime, on 10X gain (channel 2).

SENSITIVITY

10 mv/div to 20 v/div in 11 calibrated steps (each channel). Sensitivity extended to 1 mv/div in 10X position. 2.5:1 vernier allows continuous range (uncalibrated) between steps and extends range (uncalibrated) to 50 v/div. Neon light indicates uncalibrated setting of sensitivity. Accuracy is within ±3% of indicated deflection; within ±7.5% on 10X ac gain.

INPUT RC

1 megohm paralleled by approx. 30 pf. Channel 1 and 2 time constants matched to within 1%.

MAXIMUM INPUT VOLTAGE

300 v combined dc and peak ac.

OPERATING MODES

Channel 1 only; Channel 2 only; Channels 1 and 2 added algebraically; dual-trace chopped; dual-trace alternate. Chopping rate is 100 kc. Channel 2 has polarity inversion. Common-mode rejection ratio is 100:1 at 50 kc, with optimized gain setting. Between channel isolation is 100,000 to 1, or greater, at 1 kc, with a 500-v test signal.

DELAY LINE

Approx. 150 nsec.

HORIZONTAL DEFLECTION SYSTEM

SWEEP RATES

0.5 μsec/div to 0.5 sec/div, in 19 calibrated rates. Accuracy is within ±3%. 2.5:1 vernier gives variable and continuous sweep rates, uncalibrated, between steps. It also extends slowest sweep rates to 1.25 sec/div, uncalibrated. Neon light indicates uncalibrated sweep settings. 10X magnifier extends all sweep rates, with fastest extended to 0.005 μsec/div; accuracy is within ±5%.

EXTERNAL HORIZONTAL INPUTS

10 v/div (1 v/div on 10X mag); uncalibrated. 10:1 attenuator; uncalibrated. DC to 500 kc (10X mag). Input RC is 300 k paralleled by approx. 35 pf.

TRIGGERING SYSTEM

MODE	TRIGGER SENSITIVITY INTERNAL
DC	0.2 div up to 5 Mc, increasing to 1 div at 15 Mc.
AC	0.2 div up to 5 Mc, increasing to 1 div at 15 Mc. Low frequency response 30% down at approx. 25 cps.
AUTOMATIC	0.8 div from 50 cps to 4 Mc, increasing to 2.5 div at 15 Mc.
AC LOW FREQ REJECT	0.2 div up to 5 Mc, increasing to 1 div at 15 Mc. Low frequency response 30% down at approx. 25 cps.
	EXTERNAL
DC	125 mv up to 5 Mc, increasing to 0.6 v at 15 Mc.
AC	125 mv up to 5 Mc, increasing to 0.6 v at 15 Mc. Low frequency response 30% down at approx. 25 cps.
AUTOMATIC	0.6 v from 50 cps to 7 Mc, increasing to 1.2 v at 15 Mc.
AC LOW FREQ REJECT	0.2 div up to 5 Mc, increasing to 1 div at 15 Mc. Low frequency response 30% down at approx. 25 cps.

MISCELLANEOUS

FRONT-PANEL OUTPUTS

Amplitude Calibrator: 1-kc square wave, negative-going. Provides 0.2 v, internally, ±0.7%, and 2 v, ±2.7%, at Probe Cal jack on front panel.

Gate Signal: Rectangular pulse, negative-going; 0.5 v minimum, duration same as sweep. Approx. 600-ohm source resistance.

TEKTRONIX CRT

Rectangular, 4-inch, with 0.8-cm divisions; 8 x 10-div display area. Illuminated internal graticule. 6-kv accelerating potential. External blanking, dc-coupled. Phosphor is P31.

MECHANICAL

NET WEIGHT: ac model—22 lbs; ac-dc model—22 lbs, 6 oz. Shipping Weight: (Including accessories, manuals, and packaging) ac model—28 lbs; ac-dc model—28 lbs, 6 oz., without batteries (with batteries: 35 lbs, 12 oz). Overall height, including feet: 7⅛". Overall width, including handle: 10". Length, including rear feet and front-panel knobs: 14". (To front of panel cover: 16".) To front edge of carrying handle, in forward position: 17 4/5". (With ac/dc Power Supply, add 2.5" to length measurements.)

ENVIRONMENTAL FEATURES—AC MODEL

Temperature: Operating: —15°C to +55°C.
Non-operating: —55°C to +75°C.

Altitude: Operating: 15,000 ft., maximum.
Non-operating: 50,000 ft., maximum.

Humidity: Non-operating: Meets electrical performance specification after exposure to five cycles (120 hrs.) of MIL-STD-202B, Method 106A (omit freezing and vibration, and allow a 24-hr. post-test drying period at room ambient conditions of 25, ±5°C and 20 to 80% relative humidity).

Vibration: Operating: 0.025" pk-to-pk displacement (3.9 g's at 55 cps) 10-55-10 cps.

Shock: Operating: 20 g's, ½ sine, 11-msec duration, 12 shocks total.
Non-operating: 60 g's, ½ sine, 11-msec duration, 6 shocks total.

RFI Test: Radiated broadband 14 kc-1000 Mc. Conducted broadband 150 kc- 25 Mc. Per Mil-I-6181D and Mil-I-16910A. (All tests with Mesh filter installed).

Transportation: Nat'l Safe Transit, 1 hour at 1 g. Package drop test: 30" drops on all corners, edges, flat surfaces; total of 10 drops.

ENVIRONMENTAL FEATURES—AC/DC MODEL, with batteries

Same as AC MODEL, except,

Temperature: Operating:—15°C to +40°C
Non-operating:—40°C to +60°C

Humidity: With batteries, derate temperature to 60°C.

POWER REQUIREMENTS

AC Model: 115 v or 230 v ±10%, 50 to 400 cps, ±10%. Requires approx. 40 watts.

AC/DC Model: AC mode: 115 v or 230 v ±20% 50-60 cps. DC mode: 11.5 v—35 v, approx. 23 watts (CONSTANT POWER—2 amps max, 650 ma min). Accepts 24 v battery pack, listed below.

TYPE 422 OSCILLOSCOPE (AC MODEL) $1325

Each instrument includes: 2—P6006 probe (010-0127-00); 1—patch cord, BNC to BNC (012-0084-00); 1—jack, BNC to post (012-0092-00); 1—ring, ornamental (354-0248-00); 1—filter, light, graticule, smoke gray (378-0549-00); 1—plate, protector, clear, CRT (386-0118-00); 1—mesh filter, installed (378-0571-00); 1—ac power supply (016-0072-00); 1—adapter, 3 to 2-wire (103-0013-00); 1—power cord, 117 v, 3 conductor right-angle, female w/straight male plug (161-0024-00); 2—instruction manual, for ac supply (070-0471-00); 2—instruction manual, for Type 422 (070-0434-00).

TYPE 422 OSCILLOSCOPE (AC/DC MODEL) $1625

Each instrument includes: 2—P6006 probe (010-0127-00); 1—patch cord, BNC to BNC (012-0084-00); 1—jack, BNC to post (012-0092-00); 1—ring, ornamental (354-0248-00); 1—filter, light, graticule, smoke gray (378-0549-00); 1—plate, protector, clear, CRT (386-0118-00); 1—mesh filter installed (378-0571-00); 1—ac/dc power supply (016-0073-00; 1—adapter, 3 to 2-wire (103-0013-00); 1—power cord, 3-wire ac w/female connector and male plug (161-0015-00); 1—power cord, 3-wire dc w/female connector (161-0016-00); 2—instruction manual for ac/dc power supply (070-0471-00); 2—instruction manual, for Type 422 (070-0434-00).

BATTERY PACK for Type 422 AC/DC POWER SUPPLY $125

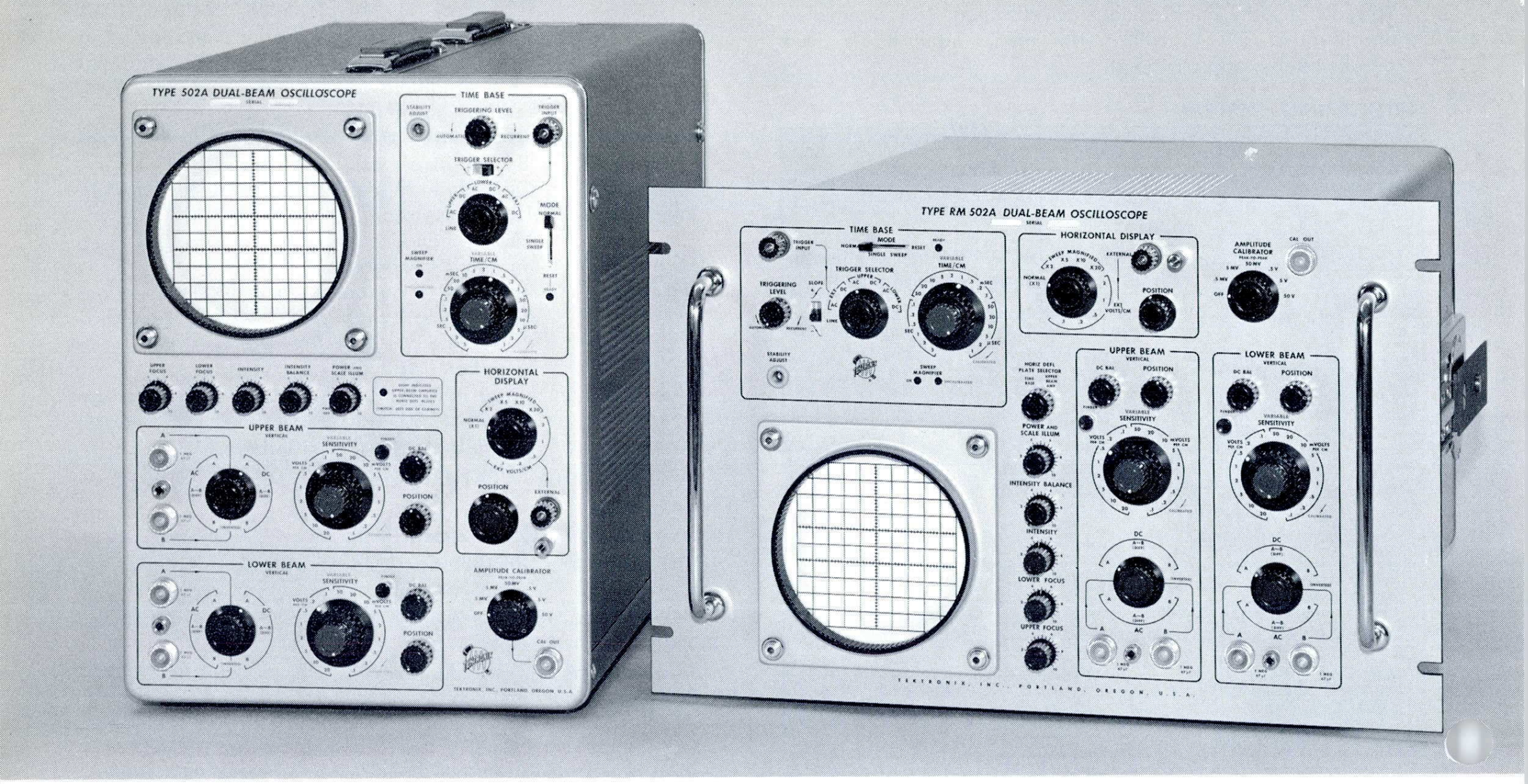
Order Part No. 016-0066-00. Provides 24 volts; rechargeable internally from ac line. Powers the Type 422 Oscilloscope for approximately 4 hours.

AC/DC POWER SUPPLY. Order Part No. 016-0073-00 . . . . . $525

Each supply includes: 1—adapter, 3-wire to 2-wire (103-0013-00); 1—power cord, 3-wire AC w/female connector and male plug (161-0015-00); 1—power cord, 3-wire DC w/female connector (161-0016-00); 2—instruction manual (070-0471-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 502A / RM 502A — 100 μv/cm DUAL-BEAM OSCILLOSCOPE



2 IDENTICAL VERTICAL AMPLIFIERS

DIFFERENTIAL INPUT AT ALL SENSITIVITIES

X-Y CURVE TRACING WITH 1 OR 2 BEAMS

SINGLE SWEEP OPERATION

BEAM FINDERS

The new Tektronix Type 502A and RM 502A retains the popular dual-beam design of the Type 502, and adds these extremely useful features: 100 μv/cm sensitivity, single-sweep operation, variable sensitivity and sweep-time controls, intensity balance, beam finders, and other refinements.

CHARACTERISTIC SUMMARY

VERTICAL

CALIBRATED SENSITIVITY—100 μv/cm to 20 v/cm.
PASSBAND—DC to 50 kc thru 1 Mc.
COMMON-MODE REJECTION—Up to 40,000 to 1.
PHASE DIFFERENCE—Less than 5 degrees, at —3 db.
INPUT—1 megohm, 47 pf.

HORIZONTAL

CALIBRATED SWEEP RANGE—1 μsec/cm to 5 sec/cm.
SWEEP MAGNIFIER—X2, X5, X10, X20; 3% accuracy to 1 μsec/cm.
TRIGGER REQUIREMENTS—Internal: 2 mm or greater.
External: 0.2 to 10 v.
EXTERNAL INPUT—0.1, 0.2, 0.5, 1 and 2 v/cm.

CRT

DISPLAY AREA—8 x 10 cm (each beam).
ACCELERATING VOLTAGE—3 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.5 mv to 50 v, 1-kc square wave.
POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 305 watts, maximum.

PRINTED IN U.S.A.

APPLICATIONS

Here are just a few of the many possible uses for this versatile new oscilloscope:

1. *Compare and measure the waveforms at two points in a circuit simultaneously.*
2. *Compare and measure the outputs of two transducers on the same time base.*
3. *Display X-Y curves with one or both beams in a variety of applications.*
4. *Plot one transducer output against another—pressure against volume or temperature, for instance.*
5. *Compare and measure stimulus and reaction on the same time base.*
6. *Use the differential-input feature for cancellation of common-mode signals, and to eliminate the need for a common terminal, in both single and dual displays.*
7. *Measure phase angles and frequency differences.*

VERTICAL DEFLECTION SYSTEMS

IDENTICAL VERTICAL AMPLIFIERS provide an accurate means of displaying dual-beam waveforms on a linear time base, single-beam X-Y curves at up to 100 μv/cm sensitivity, or dual-beam X-Y curves at up to 0.1 v/cm sensitivity.

CALIBRATED SENSITIVITY from 100 μv/cm to 20 v/cm is in 17 calibrated steps with 1-2-5 sequence, and accurate within 3% of panel reading. Variable controls permit continuous adjustment uncalibrated from 100 μv/cm to approximately 50 v/cm.

PASSBANDS are dc to 50 kc at 100 μv/cm, increasing to dc to 100 kc at 200 μv/cm, dc to 200 kc at 1 mv/cm, dc to 400 kc at 50 mv/cm, and dc to 1 Mc at 0.2 v/cm. Passbands at lower sensitivities are dc to 300 kc at 0.5 v/cm and 5 v/cm, dc to 500 kc at 1 v/cm and 10 v/cm, dc to 1 Mc at 2 v/cm and 20 v/cm.

DIFFERENTIAL INPUT provides an effective means of eliminating unwanted common-mode signals. Common-mode rejection ratios vary according to sensitivity and frequency, and are measured using a direct-coupled sinewave. Common-mode signals should not exceed 2 v pk-to-pk at the input grid. With a 1-kc sinewave, rejection ratios are 40,000:1 at 0.1 mv/cm, 20,000 :1 at 0.2 mv/cm, 100:1 at 0.2 v/cm, and 50:1 at 5 v/cm. Rejection ratios at higher frequencies are 2000:1 at 50 kc with 0.1 mv/cm sensitivity, 1000:1 at 100 kc with 0.2 mv/cm sensitivity, and 50:1 at 400 kc with 0.2 v/cm sensitivity. Measurements are made with a common signal applied to both A and B inputs.

AC or DC COUPLING, or inversion of the signal to the oscilloscope, is controlled from the front panel. An inverted display on one beam is sometimes desirable in comparison measurements. With ac-coupling, the low-frequency 3-db point is 2 cps direct or 0.2 cps with 10X probe.

INPUT IMPEDANCE is 1 megohm paralleled by 47 pf.

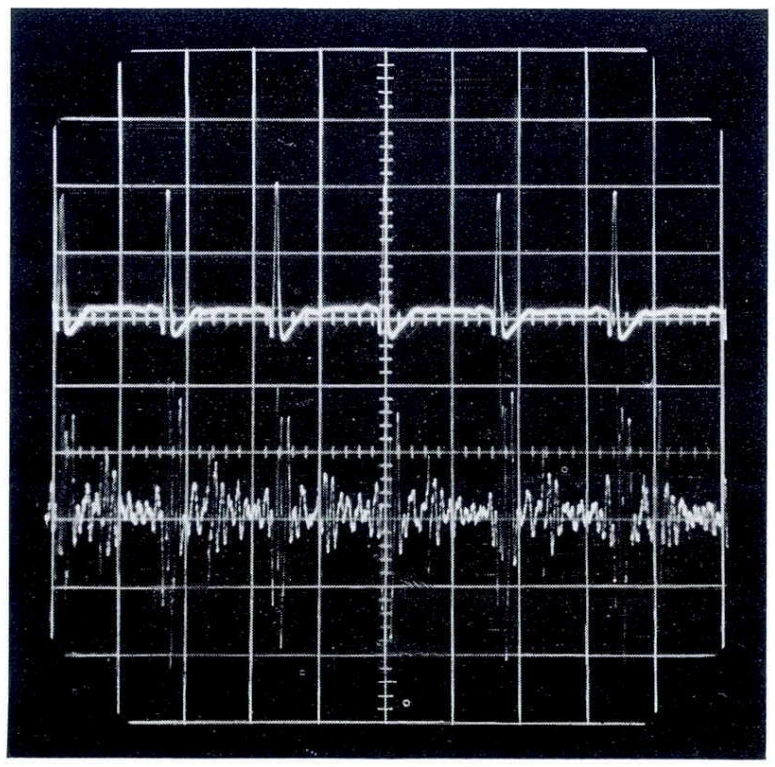
PASSIVE PROBES supplied with the Type 502A and RM502A reduce loading on the circuit under test and attenuate the signal by a factor of 10. Input impedance becomes 10 megohms paralleled by approximately 9.5 pf.

HORIZONTAL-DEFLECTION SYSTEM

SWEEP RANGE from 1 μsec/cm to 5 sec/cm is in 21 calibrated steps with 1-2-5 sequence and is accurate within 3% of panel reading. Sweep rate is continuously variable uncalibrated from 1 μsec/cm to over 12 sec/cm. Sweep rate selected deflects both beams simultaneously.

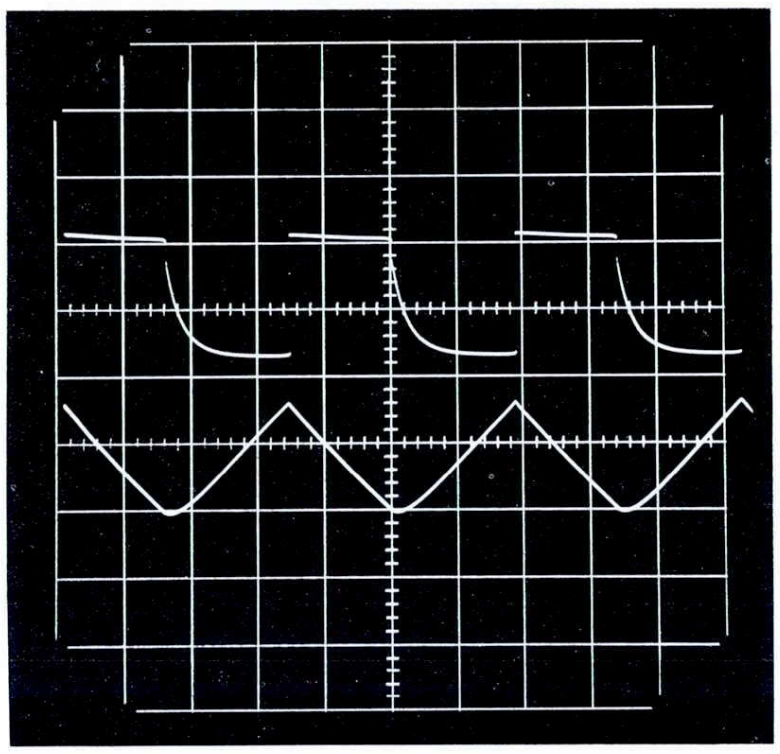
SWEEP MAGNIFIER expands the center portion of the normal sweep to fill 10 cm. X2, X5, X10, or X20 magnification is available. When the magnified sweep does not exceed the maximum calibrated rate of 1 μsec/cm, accuracy is within 5% of the displayed portion of the magnified sweep. A panel light indicates when the maximum calibrated rate is being exceeded, or sweep rate variable is in use.

SINGLE SWEEP OPERATION facilitates photographic recording of waveforms. Lockout-reset circuitry provides for one-shot recording. After a single sweep is triggered, the sweep circuit is automatically locked out until manually reset. When reset, the sweep will fire on the next trigger received, then automatically lock out until reset or returned to normal operation.



Dual-beam presentation of electrocardiogram vs. heart sounds (upper beam is ECG, lower beam is heart sound). Heart sound was picked up by microphone taped to chest.

502A
RM502A



Comparison of input and output waveforms. Lower trace is result of passing upper waveform through an integrating network. Lower trace is inverted.

CRT AND DISPLAY FEATURES

TEKTRONIX 5" CRT is a dual-gun tube with two pairs of vertical and one pair of horizontal-deflection plates. A P2 phosphor is normally supplied. Accelerating potential is 3 kv. Display area for each beam is 8 cm by 10 cm. Beams overlap in the center 6-cm vertical area.

CRT CONTROLS include a separate focus adjustment for each beam, a common intensity control, and an intensity balance. The balance control provides an effective method of identifying upper and lower beams, especially when they are superimposed for comparison.

PUSH-BUTTON BEAM FINDERS indicate the relative position of the trace when it is deflected off the crt screen. This feature is especially useful at the higher sensitivities.

ILLUMINATED GRATICULE with variable edge lighting is accurately ruled in centimeter squares. Viewing area is 10 by 10 centimeters. Vertical centerline and horizontal centerlines for each beam are further marked in 5 minor divisions per cm.

X-Y OPERATION

SINGLE BEAM X-Y CURVE TRACING at equal horizontal and vertical sensitivities can be accomplished when the upper-beam vertical amplifier is switched to the crt horizontal-deflection plates. A panel light indicates when the upper-beam amplifier is connected in this manner. The full 100 μv/cm sensitivity can be used with either single-ended or differential input.

PHASE DIFFERENCE between vertical amplifiers, when both are set at equal sensitivities, is typically less than 5 degrees up to the specified 3-db point.

DUAL-BEAM X-Y CURVE TRACING can be accomplished when a signal source is applied to the external horizontal amplifier. Horizontal deflection is calibrated in steps of 0.1, 0.2, 0.5, 1, and 2 v/cm, and is accurate within 5%.

TRIGGER

AUTOMATIC OPERATION assures positive sweep triggering by signals of different amplitudes, shapes, and repetition rates. In the absence of an input signal, automatic triggering occurs at about a 50-cps rate to provide a convenient reference trace.

RECURRENT OPERATION provides a convenient reference at a frequency dependent on the sweep time per centimeter.

TRIGGER LEVEL is adjustable to allow sweep triggering at any selected point on either the rising or falling portion of the waveform.

SOURCE can be internal from either amplifier (2-mm deflection), external (0.2 v to 10 v), or line, and can be ac or dc coupled.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR provides 6 square-wave voltages at the front panel. Peak-to-peak amplitude is 0.5 mv, 5 mv, 50 mv, 0.5 v, 5 v or 50 v, and is accurate within 3%. Frequency is about 1 kc.

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable operation between 105 and 125 volts, or 210 and 250 volts. Input stage dc heaters of both vertical amplifiers are transistor regulated.

POWER REQUIREMENT is 105 to 125 volts, or 210 to 250 volts, 50 to 60 cps, typically 280 watts.

CABINET MODEL dimensions are 15¾" high by 11½" wide by 23¾" deep. Net weight is 60 pounds. Shipping weight is 65 pounds, approximately.

RACK MOUNT MODEL dimensions are 12¼" high by 19" wide by 22¾" deep. Net weight is 58½ pounds. Shipping weight is 86 pounds approximately. Instrument mounts on tilt-lock slide-out tracks to a standard 19" rack.

TYPE 502A OSCILLOSCOPE $1050

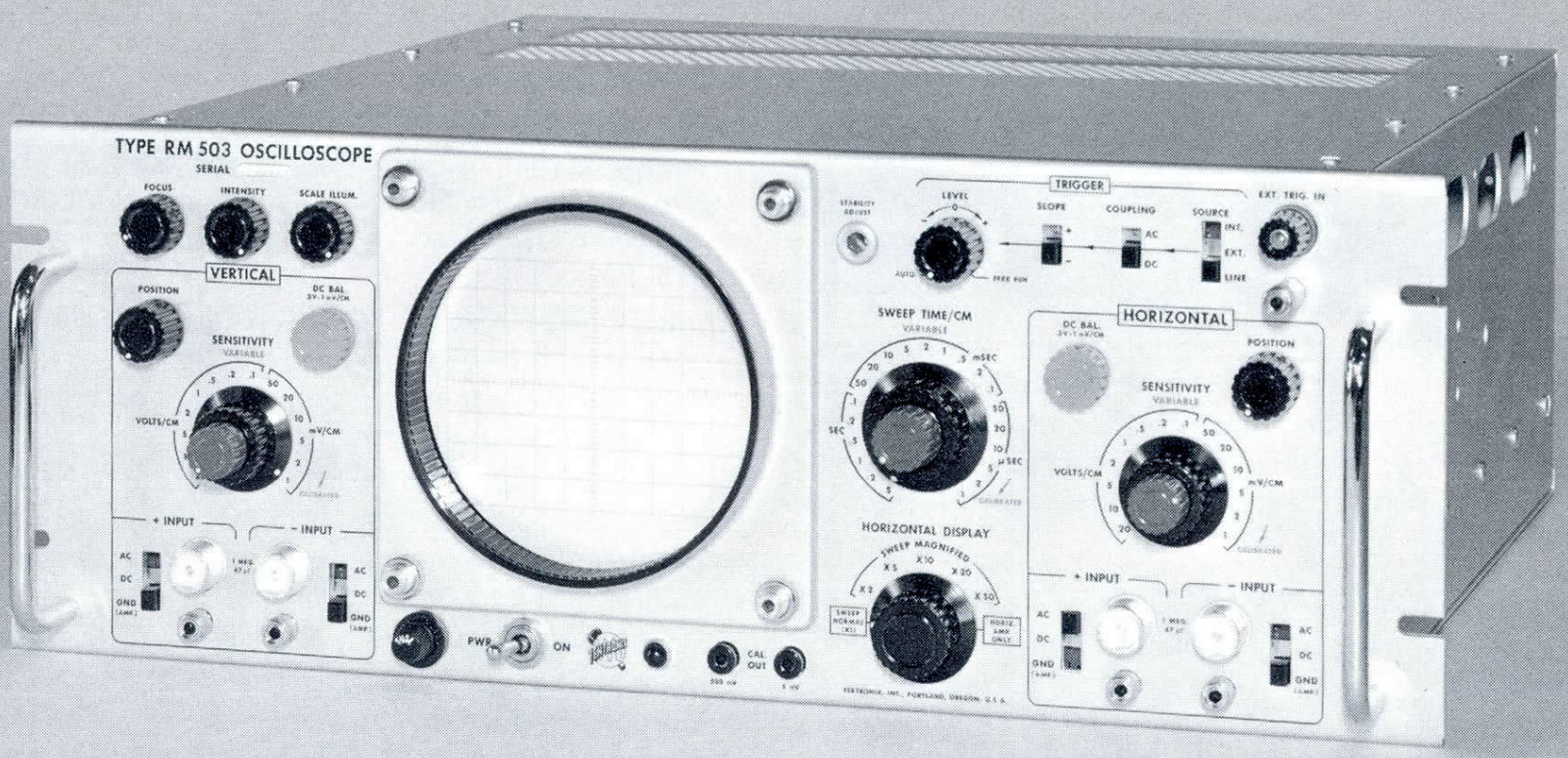
Each instrument includes: 2—P6006 probe (010-0125-00); 1—Test lead (012-0031-00); 2—A510 binding post adapter (013-0004-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Polarized light filter (378-0539-00); 2—Instruction Manual (070-0382-00).

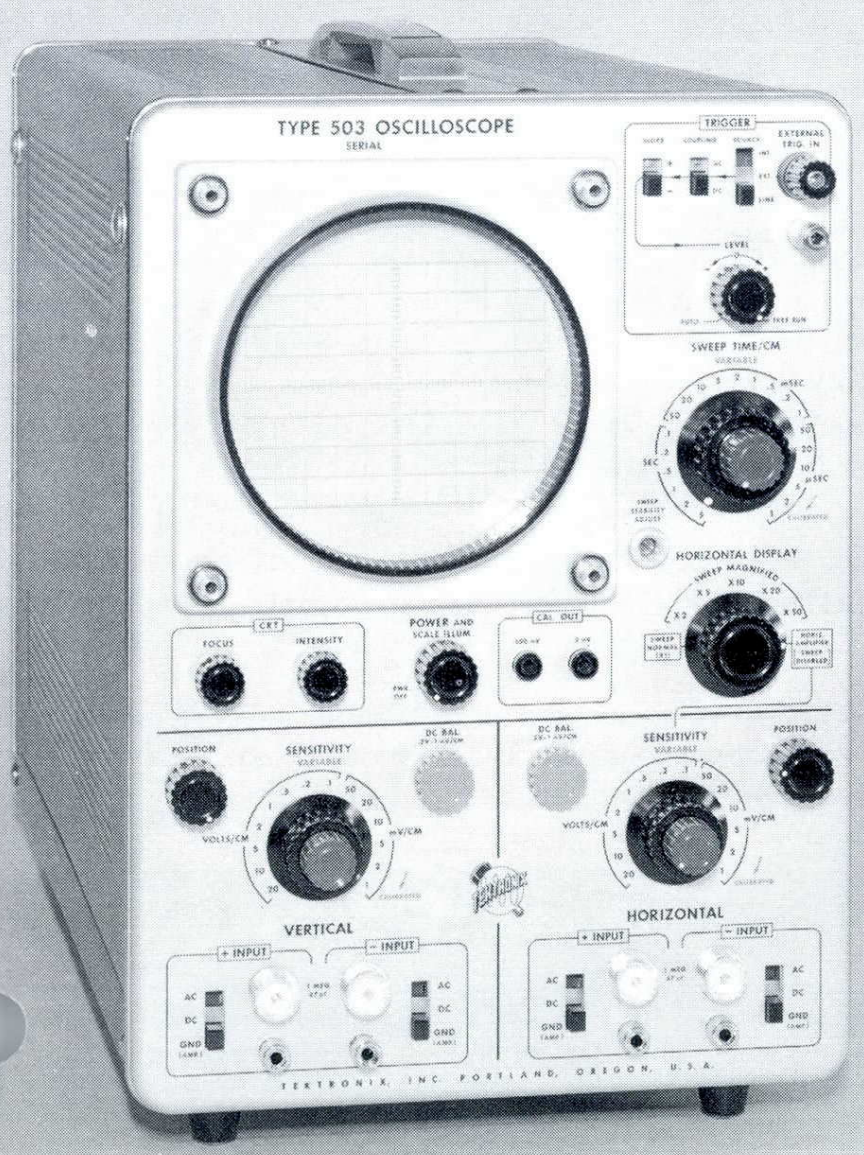
TYPE RM502A OSCILLOSCOPE $1150

Each instrument includes: 2—P6006 probe (010-0125-00); 1—Test lead (012-0031-00); 2—A510 binding post adapter (013-0004-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Polarized light filter (378-0539-00); 1—Pr. Mounting tracks 351-0085-00); 1—Set mounting hardware; 2—Instruction Manual (070-0382-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-450 KC X-Y OSCILLOSCOPE Type 503 / RM503





IDENTICAL VERTICAL & HORIZONTAL AMPLIFIERS

DIFFERENTIAL INPUT AT ALL SENSITIVITIES

ELECTRONICALLY-REGULATED DC SUPPLIES

COMPACT CABINET OR RACK-MOUNT MODELS

CHARACTERISTIC SUMMARY

VERTICAL & HORIZONTAL

CALIBRATED SENSITIVITY—1 mv/cm to 20 v/cm.

PASSBAND—DC to 450 kc.

COMMON-MODE REJECTION—100:1 at 1 mv/cm sensitivity. Up to 50 kc, 4 v p-p, max.

INPUT—1 megohm, 47 pf.

SWEEP GENERATOR

CALIBRATED SWEEP RANGE—1 μsec/cm to 5 sec/cm.

SWEEP MAGNIFIER—X2, X5, X10, X20 X50.

TRIGGER REQUIREMENTS—Internal: 0.5-cm deflection.
External: 0.5 to 10 v.

CRT

DISPLAY AREA—8 x 10 cm.

ACCELERATING VOLTAGE—3 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—5 mv and 0.5 v, 300 to 500-cps square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 110 watts, max.

503
RM503

VERTICAL AND HORIZONTAL AMPLIFIERS

PASSBAND of the dc-coupled amplifiers extends to 450 kc at 3-db down.

SENSITIVITY from 1 mv/cm to 20 v/cm is in 14 calibrated steps with 1-2-5 sequence, and is accurate within 3%. A variable control permits continuous adjustment uncalibrated from 1 mv/cm to approximately 50 v/cm.

COMMON-MODE REJECTION

REJECTION RATIO	SENSITIVITY	CMR SIGNAL	FREQUENCY
At least 100:1	1 mv to 0.2 v/cm	4 v p-p, max	dc to 50 kc
At least 30:1	0.5 v to 2 v/cm	40 v p-p, max	dc to 50 kc
At least 30:1	5 v to 20 v/cm	400 v p-p, max	dc to 50 kc

AC or DC COUPLING of the signal to the oscilloscope, or grounding of the input stage grid is controlled from the front panel. With ac coupling, the low-frequency 3-db point is 10 cps direct or 1 cps with optional 10X probe.

INPUT IMPEDANCE is 1 megohm paralleled by 47 pf, and remains constant with varying sensitivities.

X-Y OPERATION

IDENTICAL VERTICAL and HORIZONTAL AMPLIFIERS provide an accurate means of displaying X-Y curves at up to 1 mv/cm sensitivity.

PHASE SHIFT is 1°, or less, at a sensitivity of 1 mv to 0.2 v/cm, up to a frequency of 450 kc. It is 2°, or less, at a sensitivity of 0.5 v to 20 v/cm, up to a frequency of 50 kc.

SWEEP GENERATOR

SWEEP RANGE from 1 μsec/cm to 5 sec/cm is in 21 calibrated steps with 1-2-5 sequence, and accurate within 3%. Sweep speed is variable between steps uncalibrated from 1 μsec/cm to over 12 sec/cm.

SWEEP MAGNIFIER expands any portion of the normal sweep. Magnification of 2X, 5X, 10X, 20X, or 50X is available. When the magnified sweep does not exceed the maximum calibrated rate of 0.1 μsec/cm, accuracy is within 5% of the displayed portion of the magnified sweep.

TRIGGER

AUTOMATIC OPERATION assures positive sweep triggering by signals of different amplitudes, shapes, and repetition rates. In the absence of an input signal, automatic triggering occurs at about a 50-cps rate to provide a convenient reference trace.

FREE-RUNNING OPERATION provides a convenient reference trace at a frequency dependent on the sweep time per centimeter.

TRIGGER LEVEL is adjustable to allow sweep triggering at any selected point on either the rising or falling portion of the waveform. When signal risetimes are faster than 20 μs/cm, it becomes difficult to select a triggering point with the trigger level control.)

SOURCE can be internal (½-cm deflection), external (½-volt), or line, and can be ac or dc coupled.

CRT & DISPLAY FEATURES

TEKTRONIX 5" CRT provides a high-contrast trace for easy reading under high ambient light conditions. An improved P2 phosphor is normally supplied with the instrument, and offers distinct advantages for oscilloscope photography. Accelerating potential is 3 kv.

DEFLECTION BLANKING assures uniform beam current for all sweep and repetition rates. The system consists in part of two pairs of cross-connected deflection plates which intercept the beam current, and blank the crt screen except during sweep time.

INTENSITY MODULATION can be accomplished by using the crt grid-input terminal at the rear of the oscilloscope.

ILLUMINATED GRATICULE with variable edge lighting is accurately ruled in centimeter squares. Viewing area is 8 x 10 centimeters. Vertical and horizontal centerlines are marked in 5 minor divisions per centimeter.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR provides 2 square-wave voltages at the front panel. Peak-to-peak amplitudes are 500 mv and 5 mv, accurate within 3%. Frequency is between 300 and 500 cps.

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable operation between 105 and 125 volts, or 210 and 250 volts. Input stage heaters of the vertical and horizontal amplifiers are supplied with regulated dc.

POWER REQUIREMENT is 105 to 125 volts, or 210 to 250 volts, 50 to 800 cps, typically 107 watts at 117 volts. The low-line voltage requirement increases about 10% at 400 cps, and about 15% at 800 cps.

CABINET MODEL dimensions are 14¾" high by 10" wide by 21⅝" deep. Net weight is 29½ pounds. Shipping weight is approximately 38 pounds.

RACK MOUNT MODEL dimensions are 7" high by 19" wide by 17" deep. The instrument mounts directly to a standard 19" rack. Optional rack slides are available. Net weight is 27 pounds. Shipping weight is approximately 51 pounds.

TYPE 503 OSCILLOSCOPE $640

Each instrument includes: 2—A510 binding-post adapter (013-0004-00); 1—3 to 2-wire adapter (103-0013-00); 1—Green filter (378-0514-00); 2—Instruction Manual (070-0218-00).

TYPE RM503 OSCILLOSCOPE $655

Each instrument includes: 2—A510 binding post adapter (013-0004-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0022-00); 1—Set mounting hardware; 1—Green filter (378-0514-00); 2—Instruction Manual (070-0314-00).

SLIDE-OUT TRACKS FOR TYPE RM503

Slide-out tracks can be used to mount the Type RM503 Oscilloscope to a standard 19" rack. These tracks provide tilting and locking convenience in any of 7 positions. Slide-out tracks can be ordered separately, or as MOD 171 installed at the factory.

TYPE RM503 MOD 171 ..... $705

Each instrument includes: 2—A510 binding post adapter (013-0004-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0022-00); 1—Set mounting hardware; 1—Green filter (378-0514-00); 2—Instruction Manual (070-0314-00).

SLIDE-OUT TRACK KIT (Part No. 351-0050-00) $45

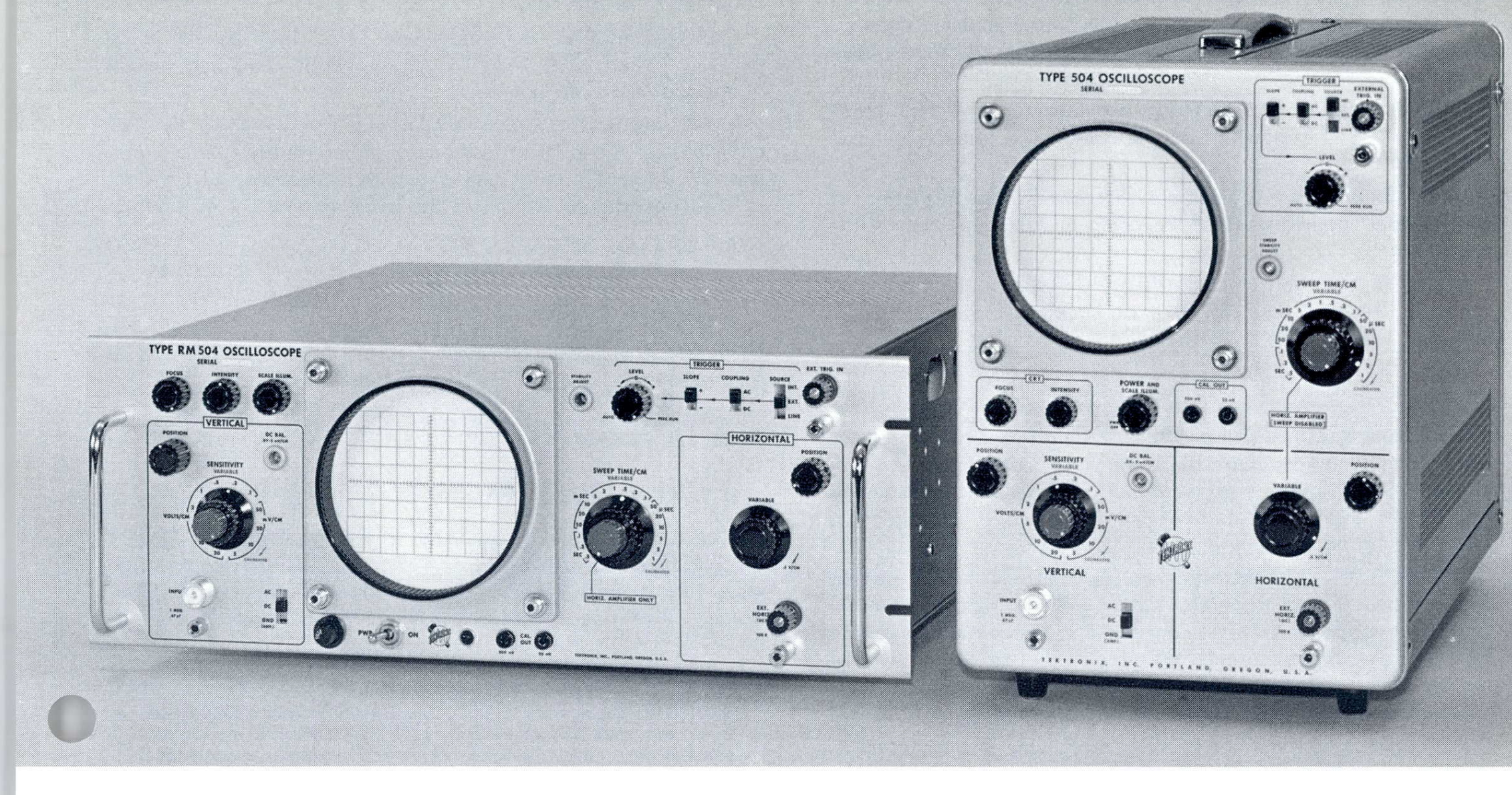
PROBES

For minimum loading on the circuit under test, RC attenuator probes are recommended. These probes, each with a 42" cable, are ideally suited for use with the Type 503 or RM503 Oscilloscope.

Probe	Atten. Ratio	Input Impedance: Resistance	Input Impedance: Capacitance	Voltage Rating	Part No.	Price
P6006	10:1	10 meg Ω	9.5 pf	600 v	010-0125-00	$22.00
P6023	10:1	8 meg Ω	12 pf	1000 v	010-0065-00	$40.00
P6027	1:1	1 meg Ω	87 pf	600 v	010-0070-00	$12.50

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-450KC X-Y OSCILLOSCOPE Type 504 / RM504



CONSTANT INPUT IMPEDANCE

ELECTRONICALLY-REGULATED DC SUPPLIES

COMPACT CABINET OR RACK-MOUNT MODELS

CHARACTERISTIC SUMMARY

VERTICAL

CALIBRATED SENSITIVITY—5 mv/cm to 20 v/cm.

PASSBAND—DC to 450 kc.

INPUT—1 megohm, 47 pf.

HORIZONTAL

CALIBRATED SWEEP RANGE—1 μsec/cm to 0.5 sec/cm.

TRIGGER REQUIREMENTS—Internal: 0.5-cm deflection.
External: 0.5 to 10 v.

EXTERNAL INPUT—0.5 v/cm maximum sensitivity.

CRT

DISPLAY AREA—8 x 10 cm.

ACCELERATING VOLTAGE—3 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—25 mv and 0.5 v, 300 to 500-cps square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 93 watts.

VERTICAL-DEFLECTION SYSTEM

PASSBAND of the dc-coupled amplifier extends to 450 kc at 3-db down.

SENSITIVITY from 5 mv/cm to 20 v/cm is in 12 calibrated steps with 1-2-5 sequence, and is accurate within 3%. A variable control permits continuous adjustment uncalibrated from 5 mv/cm to approximately 50 v/cm.

AC or DC COUPLING of the signal to the oscilloscope, or grounding of the input stage grid is controlled from the front panel. With ac coupling, the low-frequency 3-db point is 10 cps direct or 1 cps with optional 10X probe.

INPUT IMPEDANCE is 1 megohm paralleled by about 47 pf, and remains constant with varying sensitivities.

HORIZONTAL-DEFLECTION SYSTEM

SWEEP RANGE from 1 μsec/cm to 0.5 sec/cm is in 18 calibrated steps with 1-2-5 sequence, and is accurate within 3%. Sweep rate is variable between steps uncalibrated from 1 μsec/cm to over 1.2 sec/cm.

EXTERNAL HORIZONTAL INPUT provides for horizontal deflection using an external source. Sensitivity is variable from a maximum of 0.5 v/cm.

504
RM504

TRIGGER

AUTOMATIC OPERATION assures positive sweep triggering by signals of different amplitudes, shapes, and repetition rates. In absence of an input signal, automatic triggering occurs at about a 50-cps rate to provide a convenient reference trace.

FREE-RUNNING OPERATION provides a convenient reference trace at a frequency dependent on the sweep time per centimeter.

TRIGGER LEVEL is adjustable to allow sweep triggering at any selected point on either the rising or falling portion of the waveform.

SOURCE can be internal (½-cm deflection), external (½-volt), or line, and can be ac or dc coupled.

CRT & DISPLAY FEATURES

TEKTRONIX 5" CRT provides a high-contrast trace for easy reading under high ambient light conditions. An improved P2 phosphor is normally supplied with the instrument, and offers distinct advantages for oscilloscope photography. Accelerating potential is 3 kv.

DEFLECTION BLANKING assures uniform beam current for all sweep and repetition rates. The system consists in part of two pairs of cross-connected deflection plates which intercept the beam current, and blank the crt screen except during sweep time.

INTENSITY MODULATION can be accomplished by using the crt grid-input terminal at the rear of the oscilloscope.

ILLUMINATED GRATICULE with variable edge lighting is accurately ruled in centimeter squares. Viewing area is 8 x 10 centimeters. Vertical and horizontal centerlines are marked in 5 minor divisions per centimeter.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR provides 2 square-wave voltages at the front panel. Peak-to-peak amplitudes are 500 mv and 25 mv, accurate within 3%. Frequency is between 300 and 500 cps.

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable operation between 105 and 125 volts, or 210 and 250 volts. Input stage heaters are supplied with regulated dc.

POWER REQUIREMENT is 105 to 125 volts, or 210 to 250 volts, 50 to 800 cps, typically 93 watts at 117 volts. The low-line voltage requirement increases about 10% at 400 cps, and about 15% at 800 cps.

CABINET MODEL dimensions are 14¾" high by 10" wide by 21⅝" deep. Net weight is 27¼ pounds. Shipping weight is approximately 43 pounds.

RACK MOUNT MODEL dimensions are 7" high by 19" wide by 17" deep. The instrument mounts directly to a standard 19" rack. Optional rack slides are available. Net weight is 25½ pounds. Shipping weight is approximately 48 pounds.

TYPE 504 OSCILLOSCOPE **$540**

Each instrument includes: 1—A510 binding-post adapter (013-0004-00); 1—3 to 2-wire adapter (103-0013-00); 1—Green filter (378-0514-00); 2—Instruction Manual (070-0224-00).

TYPE RM504 OSCILLOSCOPE **$550**

Each instrument includes: 1—A510 binding-post adapter (013-0004-00); 1—3- to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0022-00); 1—Set mounting hardware; 1—Green filter (378-0514-00); 2—Instruction Manual (070-0315-00).

SLIDE-OUT TRACKS FOR TYPE RM504

Slide-out tracks can be used to mount the Type RM504 Oscilloscope to a standard 19" rack. These tracks provide tilting and locking convenience in any of 7 positions. Slide-out tracks can be ordered separately, or as MOD 171 installed at the factory.

TYPE RM504 MOD 171 ..... **$600**

Each instrument includes: 1—A510 binding-post adapter (013-0004-00); 1—3- to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0022-00); 1—Set mounting hardware; 1—Green filter (378-0514-00); 2—Instruction Manual (070-0315-00).

SLIDE-OUT TRACK KIT (Part No. 351-0050-00) ... $45

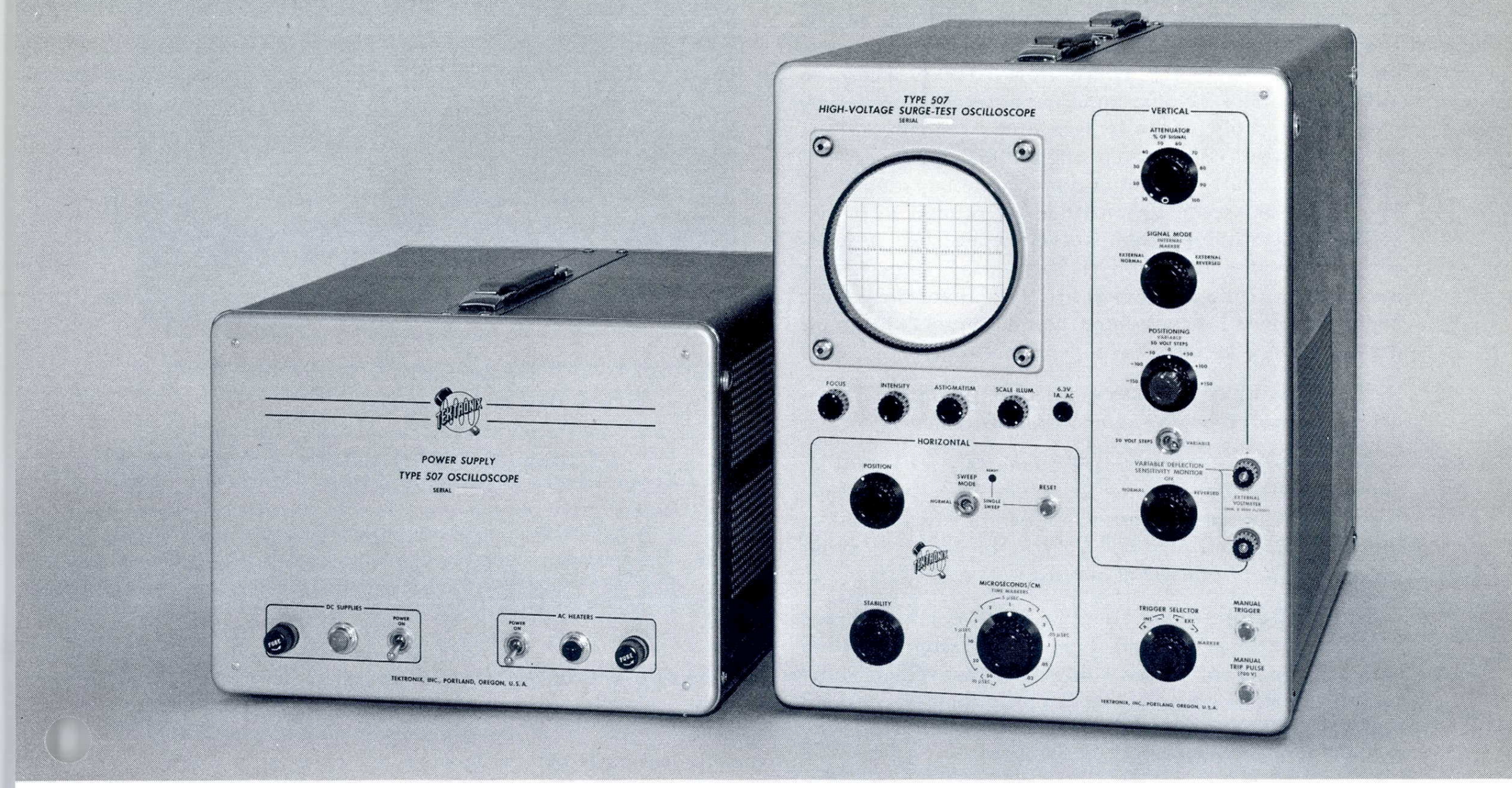
PROBES

For minimum loading on the circuit under test, RC attenuator probes are recommended. These probes, each with a 42" cable, are ideally suited for use with the Type 504 or RM504 Oscilloscope.

Probe	Atten. Ratio	Input Impedance: Resistance	Input Impedance: Capacitance	Voltage Rating	Part No.	Price
P6006	10:1	10 meg Ω	9.5 pf	600 v	010-0125-00	$22.00
P6027	1:1	1 meg Ω	94 pf	600 v	010-0070-00	$12.50

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and shipment, General information page.

SURGE-TESTING OSCILLOSCOPE Type 507



SURGE GROUND-CURRENT EFFECTS ON DISPLAY MINIMIZED

BRIGHT SINGLE TRANSIENT DISPLAYS

The Tektronix Type 507 is a specialized oscilloscope, designed primarily for high-voltage surge testing as applied to power transformers, high-voltage insulators, lightning arresters, and their associated design and acceptance tests.

CHARACTERISTIC SUMMARY

VERTICAL

SENSITIVITY—Approximately 50 v/cm to 500 v/cm.

INPUT STEP-ATTENUATOR—10% steps from 10% to 100%.

INPUT—72 ohms (optional down to 50 ohms).

CALIBRATED POSITIONING—At 50 v steps from —150 v to +150 v.

CREST VOLTAGE INPUT—Up to 3 kv.

HORIZONTAL

CALIBRATED SWEEP RANGE—20 nsec/cm to 50 μsec/cm.

TRIGGER REQUIREMENTS—Internal and external: 100 v to 3 kv.

SINGLE SWEEP CAPABILITY

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—24 kv.

OTHER CHARACTERISTICS

TIME MARKERS—0.05 μsec to 10 μsec.

POWER REQUIREMENTS—105 v to 125 v or 210 v to 250 v; 50 to 60 cps; typically 600 watts.

VERTICAL-DEFLECTION SYSTEM

Risetime—10 nsec.

Sensitivity—Approximately 50 v/cm to 500 v/cm.

507

Step Attenuator—The input signal is connected to a series voltage-divider chain of ten equal resistors (normally 7.2 ohms each) mounted on a tap switch. The ratio of signal applied to the deflection plates can be selected by the tap switch from 10% to 100% in 10% steps. The 72-ohm input impedance presented by the divider chain properly terminates Amphenol Type 21-025 coaxial cable. Step attenuator impedances designed to properly terminate other cable impedances as low as 50 ohms can be provided on request.

The vertical-input system will withstand crest voltages of 3 kv of the standard 1.5 x 40 μsec surge-testing waveform. Voltage-breakdown and heat-dissipation limitations must be considered before impressing signals greater than 3 kv and/or longer than 40 μsec.

Vertical Input —A standard UHF signal-input connector is located on the rear of the instrument.

Connectors—Standard UHF connectors for Signal In, Signal Out To Delay Line, Signal In From Delay Line, Trip Pulse Out, and External Trigger In are located at the rear of the instrument. 6.3 v ac at 1 amp is available through a front-panel pin jack.

Signal Delay—Two standard UHF connectors are provided on the rear of the Type 507 for insertion of an external length of delay cable into the vertical-input signal circuit. Choice of the appropriate length and type of cable is at the discretion of the user. No delay cable is furnished with the Type 507.

Polarity Switch—A three-position switch reverses the deflection-plate polarity. The center position is used to apply markers for photographing time references.

Positioning Switch—The Type 507 has a seven-step vertical-position switch with 50 v steps of —150 v, —100 v, —50 v, 0, +50 v, +100 v, and +150 v. A two-position switch selects either 50 v steps or continuously variable adjustment.

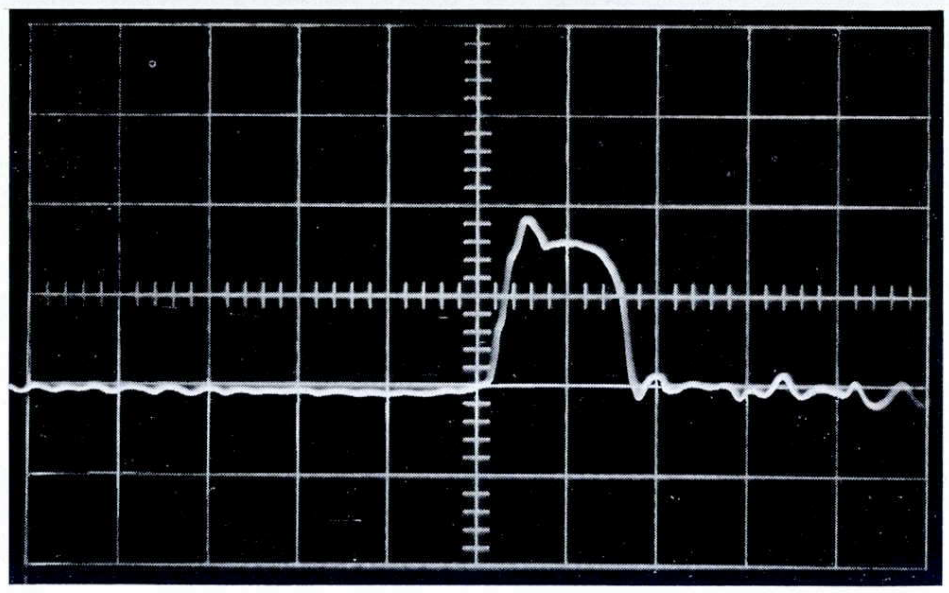
External Voltmeter Connectors—Terminals are provided for a high-impedance (5000 Ω/volt) dc voltmeter, permitting vertical calibration when using the variable positioning.

HORIZONTAL DEFLECTION SYSTEM

Calibrated Linear Sweep Rates—The sweep waveform is generated by a boot-strap circuit and an inverter stage for balanced deflection. Eleven fixed, calibrated sweep rates. . . 20, 50, 100, 200, 500, nanoseconds/cm, 1, 2, 5, 10, 20, and 50 μsec/cm are provided.

Trigger Selection—A five-position front-panel switch selects a trigger, external or internal of either positive or negative polarity. The marker position is used when time markers are desired.

Trigger Amplitude—A signal of 100 v to 3 kv amplitude is required for both internal triggering and triggering with an external signal.



QUALITY CONTROL TEST ON FLASH X-RAY SYSTEM
using x-ray tube with T-F emission cathode.

One-shot waveform depicts one of many photographs recorded—in adjusting for impedance match of high-current T-F emission tube to square-wave pulse of Flash X-Ray System. In testing the System, the Type 507 was used to monitor the output from a 1200 Megawatt Pulser to the x-ray tube. The Tektronix C-12 Camera was used to record critical timing and amplitude measurements of pulses up to 600 kilovolts at 2000 amperes, 0.2-microsecond duration.

Sweep Mode—When the switch is in the single-sweep position, pressing the RESET button arms the sweep circuit. The sweep then can be triggered internally, by MANUAL TRIGGER, or by an external trigger.

POWER SUPPLY

Low Voltage—The low-voltage power supply is separate from the indicator unit, supplying power to it by an interconnecting cable. All dc supplies are electronically regulated.

High Voltage—Accelerating potentials for the crt are obtained from an oil-filled oscillator-type supply, all voltages are electronically regulated.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 600 watts.

OTHER CHARACTERISTICS

Cathode-Ray Tube—The Type 507 uses a 5-inch flat-faced tube. A P11 phosphor is normally furnished.

Accelerating Potential—With its 24 kv accelerating potential and high-speed sweeps, the Type 507 is well suited to single-sweep applications involving transients of very short duration.

Time Markers—Markers are available as a function of the MICROSECONDS/CM switch for convenient calibration of the sweep. The 0.05-μsec time mark is available at sweep speeds from 0.02 μsec/cm to 0.2 μsec/cm; 0.5 μsec, from 0.5 μsec/cm to 2 μsec/cm; 5 μsec, from 5 μsec/cm to 20 μsec/cm; and 10 μsec, at 50 μsec/cm. These are useful as references when photographing pulses.

Trip Pulse For Manual Triggering—This is intended for use in triggering a trip-pulse generator. A pulse of approximately 700 v amplitude and 5 μsec width is available at the output connector. Pulse amplitude and width may be affected somewhat by the length of the cable used.

Illuminated Graticule—An edge-lighted graticule is marked in centimeter squares, 6 vertical and 10 horizontal, for convenience in making time and amplitude measurements. This graticule is removable. Illumination is controlled by a front-panel knob.

Mechanical Specifications—Dimensions are 16 7/8" high by 13 1/8" wide by 23 3/4" deep for the indicator unit and 10 3/8" high by 13 1/2" wide by 17 3/8" deep for the power-supply unit. Net weight of the indicator unit is 54 pounds, and of the power-supply unit is 40 1/2 pounds. Total shipping weight is 120 pounds approx. (with indicator unit weighing 72 pounds approx., with power-supply unit weighing 48 pounds approx.)

TYPE 507 OSCILLOSCOPE $2900

Each instrument includes: 1—Interconnecting cable (012-0032-00); 1—Power Supply for Type 507; 1—507 ground connector (013-0011-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Blue filter (378-0515-00); 2—Instruction Manual (070-0091-00).

SCOPE-MOBILE® CART

Tektronix Scope-Mobile carts are available for the Type 507 Oscilloscope to provide convenient moving in your work area. Two carts are available: The Type 500A with stationary tray, and the Type 202-1 with a tray that tilts and locks in any of 9 positions.

TYPE 500A CART . . . . . $ 99.50
TYPE 202-1 TILT-LOCK CART 120.00

Tektronix Type C-12 Camera

Used with a Type 507 Oscilloscope for high-current and high-voltage applications, the Type C-12 Camera enables convenient recording of power-surge measurements—such as high-voltage breakdown tests of power transformers, insulators, allied components . . . pinch-effect studies . . . other experiments in plasma research. See Camera Section for complete description.

Rack Mount Adapter

A cradle mount to adapt the Type 507 Oscilloscope and its power supply for rack mounting is available. It consists of two cradles and two masks. The cradles, one each for the indicator and power supply units, support the instruments in any standard 19" relay rack. The two masks fit around the regular instrument panels of the two units. Rack height requirements: Indicator mask 17 1/2", Power Supply mask 12 1/4".

Order Part Number 040-0279-00 . . . . . $72.80

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

GROUND CIRCUIT TRANSIENTS

Due to the physical configurations and electrical parameters of apparatus used in surge testing, large voltage transients are often induced into the grounding system. Since the oscilloscope signal-cable shield must be connected to some point in this ground system for potential and current measurements, the ground-voltage transients will be impressed upon the oscilloscope chassis.

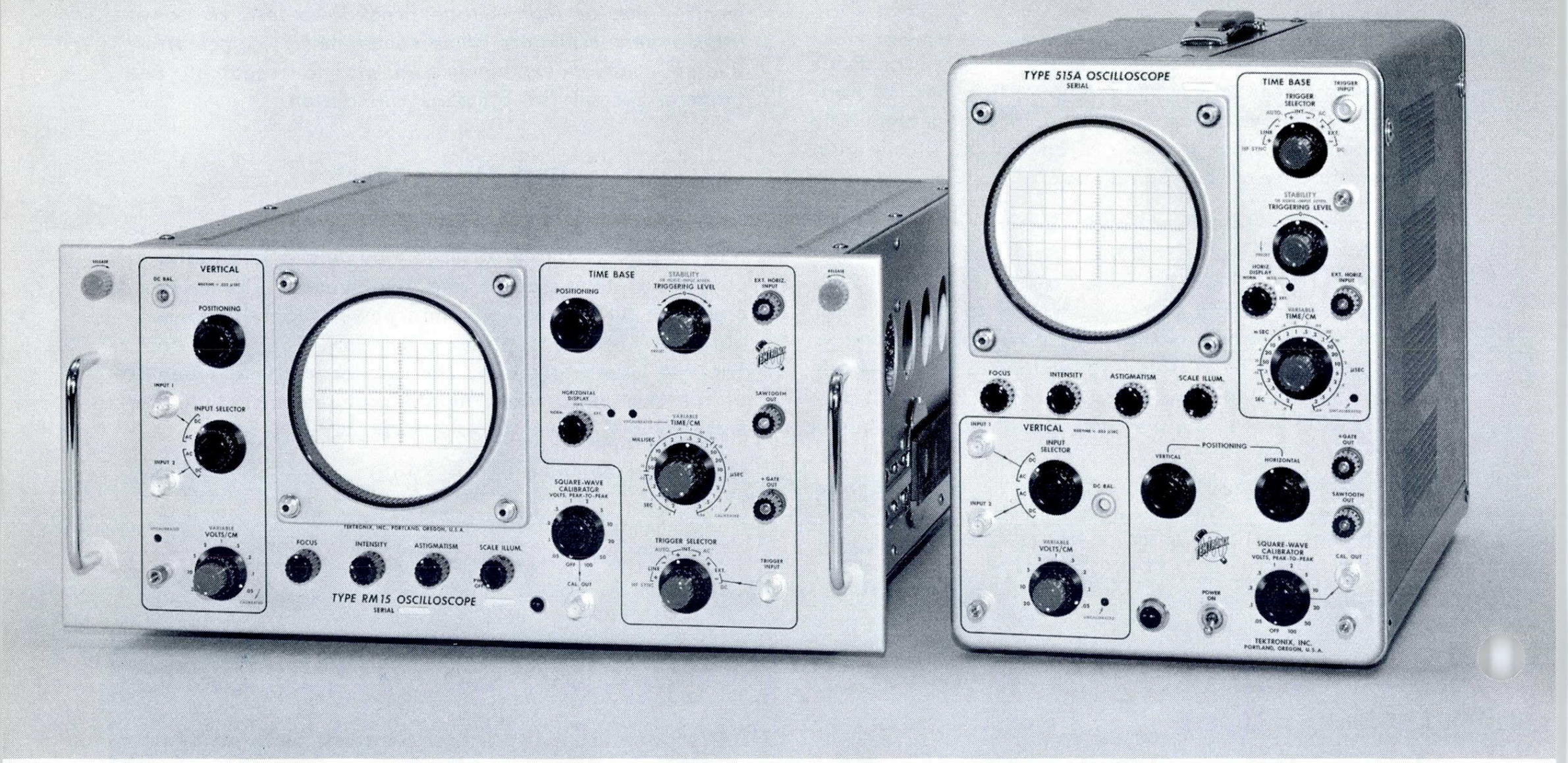
Two undesirable consequences may arise from these ground transients. The oscilloscope power-transformer insulation may be overstressed, causing break-down. Current flow set up through chassis capacity to earth, power source, and any ground conductor connected to the instrument may affect proper operation of sweep circuitry, crt-unblanking circuitry, other circuitry.

The Type 507 has been designed to ensure minimum sensitivity to extraneous disturbances and can withstand a limit of 2000 crest volts to ground for transformer break-down.

However, once the ground-voltage limit is approached in a particular surge-testing apparatus, the engineer must employ means exterior to the Type 507 to reduce the impressed voltages. Techniques in use for isolating the oscilloscope from circulating ground currents range from power line isolation with motor generators to multiple-shielded enclosures that surround the oscilloscope, operator, and 60-cps power generator.

To arrange a demonstration of this specialized oscilloscope in your application, please call your Tektronix Field Engineer.

Type 515A / RM15 DC-to-15 MC OSCILLOSCOPE



The Tektronix Type 515A is a dc-coupled general-purpose cathode-ray oscilloscope combining reliable Tektronix oscilloscope circuitry in a compact instrument. Wide sweep range of 0.04 μsec/cm to 6 sec/cm, dc to 15 Mc passband, and calibrated sensitivity to 0.05 v/cm qualify the Type 515A for general-purpose laboratory work and for many field applications.

Accurate calibration of both sweep and vertical amplifiers permit reliable quantitative measurements directly from the screen. Functional panel arrangement and versatile control system makes the Type 515A an easy-to-use oscilloscope for the field and laboratory.

CHARACTERISTIC SUMMARY

VERTICAL

CALIBRATED SENSITIVITY—50 mv/cm to 20 v/cm.

RISETIME—23 nsec.

PASSBAND—DC to 15 Mc.

INPUT—1 megohm, approx. 36 pf.

HORIZONTAL

CALIBRATED SWEEP RANGE—0.2 μsec/cm to 2 sec/cm.

SWEEP MAGNIFIER—5X, extends sweep range to 40 nsec/cm.

TRIGGER REQUIREMENTS—Internal: 2-mm deflection.
External: 0.2 v to 20 v.

EXTERNAL INPUT—1.4 v/cm, dc to 500 kc.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—4 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—50 mv to 100 v, 1-kc square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 300 watts.

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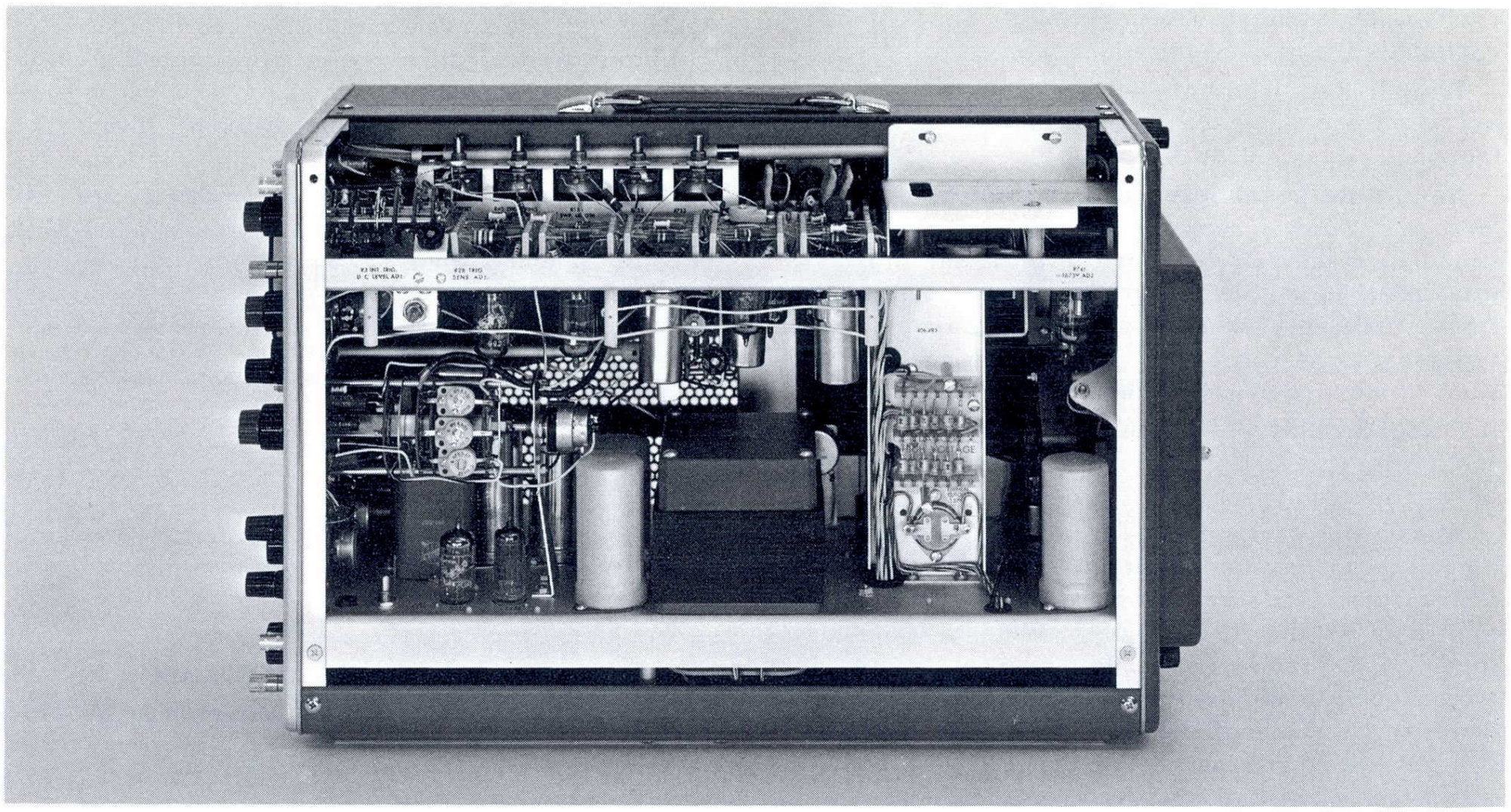


VERTICAL-DEFLECTION SYSTEM

Frequency Specifications are at 3-db down

DC-Coupled Vertical Amplifier—The Type 515A vertical passband is dc to 15 mc, risetime is 23 nsec. The vertical attenuator is calibrated in VOLTS/CM of deflection. Nine calibrated steps are provided: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, and 20 v/cm. In addition, a vernier (uncalibrated) control provides for continuously-variable adjustment from 0.05 v/cm to 50 v/cm. A front-panel neon light indicates when the control is in the variable (uncalibrated) position.

Calibration Accuracy—An internal adjustment is provided for setting the gain of the vertical amplifier. When this adjustment is accurately set with the VOLTS/CM switch in the 0.05 v/cm position, the vertical sensitivity for any other position of the switch will be within 3% of the panel reading for that position.

Two Signal Inputs—Two coaxial signal input connectors with more than 60-db isolation are controlled by a four-position switch. The INPUT SELECTOR switch selects ac-coupling or dc-coupling. When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X Probe.

Input Impedance—1 megohm paralleled by approximately 36 pf.

Probe—The vertical sensitivity is reduced by a factor of 10 by use of a 10-x attenuator probe supplied with the instrument. The probe presents an input impedance of 10 megohms paralleled by approximately 9.5 pf.

Balanced Delay Network—A signal delay of 0.25 μsec is introduced by the balanced (push-pull) delay network. Permits observation of the leading edge of the waveform that triggers the sweep.

HORIZONTAL-DEFLECTION SYSTEM

Wide Sweep Range—The Type 515A has 22 calibrated sweep rates: 0.2, 0.5, 1, 2, 5, 10, 20, 50 μsec/cm; 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 millisec/cm; 0.1, 0.2, 0.5, 1, 2 sec/cm. A single 22-position sweep-rate switch is used. In addition, a vernier (uncalibrated) control provides sweep rates continuously variable between ranges. A front-panel neon light indicates when the control is in the variable (uncalibrated) position. Calibration accuracy of the fixed sweep rates is within 3%.

Sweep Magnifier—When the 5X magnifier is switched in, the center two-centimeter portion of the normal sweep is expanded to left and right of center to fill ten centimeters. The HORIZONTAL POSITION control has sufficient range to display any one-fifth of the magnified sweep. Magnifier increases the calibrated sweep rate to 0.04 μsec/cm. TIME/CM of the magnified sweep is indicated by a second blue-colored figure at each position of the sweep-rate switch. Accuracy is within 5% of the displayed portion of the magnified sweep. An indicator light reminds the operator when the magnifier is in use.

DC-Coupled Unblanking—The unblanking waveform is dc-coupled to the control grid of the crt assuring uniform grid bias for all sweep and repetition rates.

515A
RM15

Triggering Facilities—Versatile triggering circuitry provides for complete manual control, preset stability control, and fully-automatic triggering.

Trigger Requirements—Internal triggering—a signal large enough to cause 2 mm deflection. External triggering—a signal of 0.2 to 20 v.

Amplitude-Level Selection—Adjustable amplitude-level and stability controls provide for triggering the sweep at a selected amplitude level on the triggering waveform. Trigger source can be internal, external, or the line frequency, either ac-coupled or dc-coupled. The triggering point can be on either the rising or falling slope of the triggering waveform.

Preset Stability—Same as above, except the stability control is preset to the optimum triggering point and requires no readjustment.

Automatic Triggering—Automatic level-seeking trigger circuit provides dependable triggering for most applications. One simple setting assures positive sweep-triggering by signals of widely differing amplitudes, shapes, and repetition rates. No trigger controls need be touched until a different type of operation is desired. Range of automatic operation is between 60 cycles and 2 megacycles, approximately. In the absence of an input signal the sweep is automatically triggered at about a 50-cycle rate, providing a reference trace on the screen.

High-Frequency Sync—Assures a steady display of sine-wave signals up to approximately 20 megacycles. Requires a signal large enough to cause about 2 cm deflection, or an external signal of about 2 v.

Horizontal Input Amplifier—DC-coupled external connection to the sweep amplifier is through a front-panel connector. Deflection factor is 1.4 v/cm. Frequency response is dc to 500 kc at maximum sensitivity.

OTHER CHARACTERISTICS

Amplitude Calibrator—A square-wave calibration voltage is available through a front-panel coaxial connector. Eleven fixed voltages—0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 volts peak-to-peak are provided. Accuracy is within 3%. Square-wave frequency is about 1 kc.

Cathode-Ray Tube—4-kv accelerating potential is applied to a Tektronix 5" flat-faced precision tube with a helical post-accelerating anode. A P31 phosphor is normally supplied.

Output Waveforms—A 20-v positive-gate waveform of the same time duration as the sweep, and a 150-v positive-going sweep-sawtooth waveform are available at front-panel connectors.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, wired for 117 v. The Type 515 draws 300 watts. Changing taps insures regulation as follows:

110	99 to 117 volts
124	105 to 125 volts
220	111 to 132 volts
234	210 to 250 volts
248	223 to 265 volts

For 50/60 **and** 400 cps operation, a different fan must be installed (at extra cost). See prices below.

Illuminated Graticule—An edge-lighted graticule is marked in 6 vertical and 10 horizontal centimeter-divisions with 2-millimeter baseline divisions. Illumination is controlled by a front-panel knob.

Mechanical Specifications—Dimensions are 14" high by 9 7/8" wide by 21 3/4" deep. Net weight is 42 1/4 pounds. Shipping weight is 52 pounds, approx.

TYPE 515A (50 to 60 cps operation) $875

Each instrument includes: 1—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (012-0092-00); 2—Instruction Manual (070-0247-00).

TYPE 515A MOD101 (50 to 400 cps operation) . $935

Each instrument includes: 1—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (012-0092-00); 2—Instruction Manual (070-0247-00).

RACK-MOUNT OSCILLOSCOPE

The Type RM15 is a mechanically rearranged Type 515A Oscilloscope. It mounts in a standard 19-inch rack on slideout tracks. It can be pulled forward, tilted, and locked in any of seven positions for servicing convenience. Except for no Z-axis input, electrical characteristics of the instrument are the same as described for the Type 515A Oscilloscope.

Mechanical Specifications—Dimensions are 8 3/4" high by 19" wide by 22 3/4" deep. Net weight is 57 pounds. Shipping weight is 75 pounds, approx.

For more mounting information, please refer to the Mounting Dimensions page in the catalog.

TYPE RM15 OSCILLOSCOPE $950

Each instrument includes: 1—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (012-0092-00); 1—Pr. Mounting tracks (351-0085-00); 2—Instruction Manual (070-0242-00).

TYPE RM15 MOD101 OSCILLOSCOPE $1010

Each instrument includes: 1—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (012-0092-00); 1—Pr. Mounting tracks (351-0085-00); 2—Instruction Manual (070-0242-00).

SUPPORTING CRADLES

When the Type RM15 or Type RM15MOD101M is used in a backless rack, these supporting cradles are necessary for real-slide support.

Order Part Number 040-0344-00 . . . . . $11.45

FAN MOTOR KIT

A fan motor kit is available for converting a Type 515A Oscilloscope for use on 50 to 400 cps line frequency (Type 515AMOD101M). The kit contains brackets, rectifier, and motor.

Order Part Number 040-0140-00 . . . . . $58.50

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-15 MC DUAL-TRACE OSCILLOSCOPE Type 516

2 IDENTICAL INPUT CHANNELS

CHOPPED OR ALTERNATE SWITCHING

CHARACTERISTIC SUMMARY

VERTICAL

CALIBRATED SENSITIVITY—50 mv/cm to 20 v/cm.
RISETIME—23 nsec.
PASSBAND—DC to 15 Mc.
INPUT—1 megohm, 20 pf.

HORIZONTAL

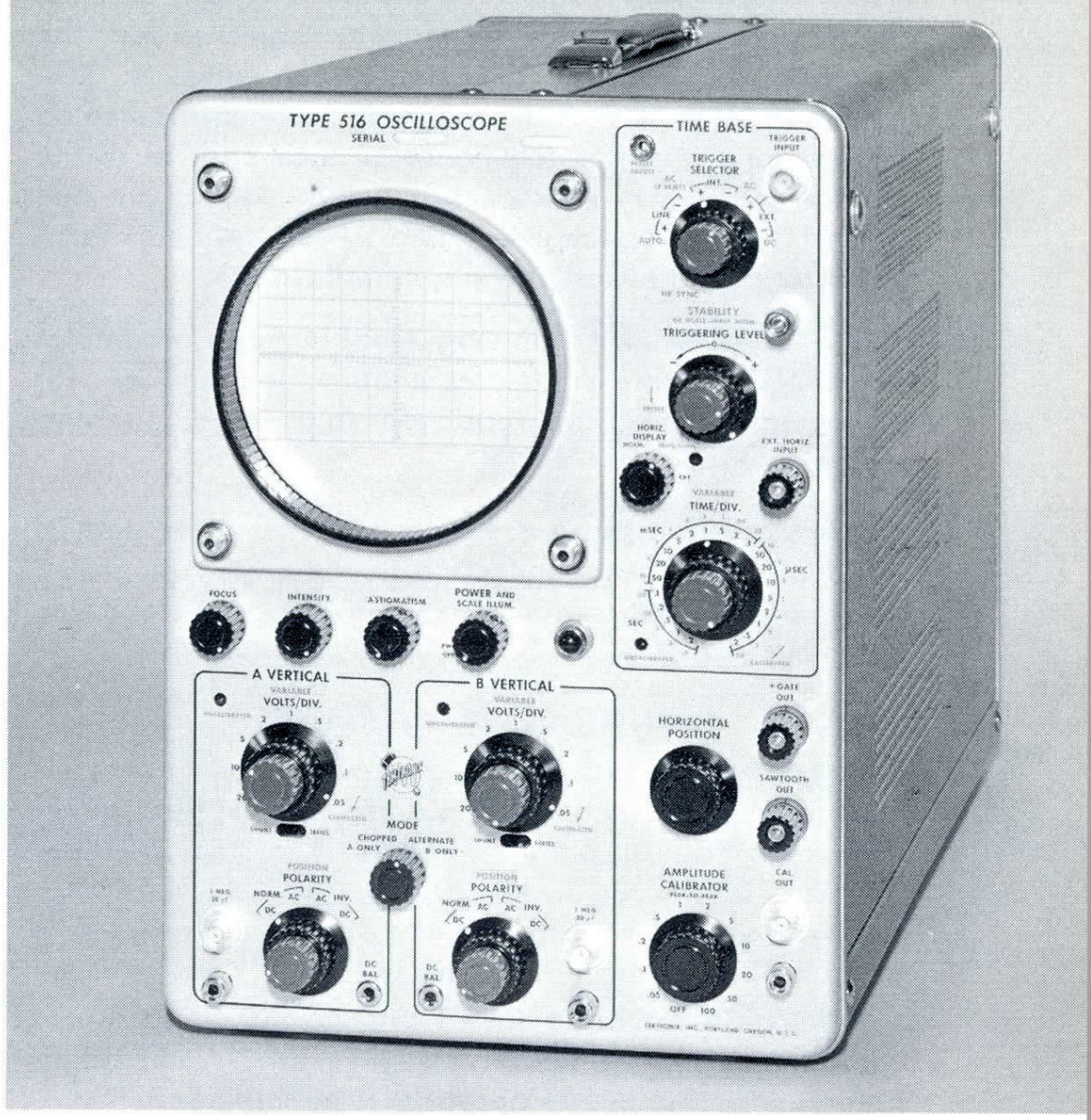
CALIBRATED SWEEP RANGE—0.2 μsec/cm to 2 sec/cm.
SWEEP MAGNIFIER—5X, extends sweep range to 40 nsec/cm.
TRIGGER REQUIREMENTS—Internal: 2-mm deflection.
External: 0.2 v to 25 v.
EXTERNAL INPUT—1.5 v/cm, dc to 500 kc.

CRT

DISPLAY AREA—6 x 10 cm.
ACCELERATING VOLTAGE—4 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—50 mv to 100 v, 1-kc square wave.
POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 300 watts.



The Type 516 is a dual-trace, semi-portable instrument ideally suited to bench work applications. Vertical calibrated sensitivity is 0.05 v/cm for each channel, with four operating modes. Small size and light weight combined with simple operation and reliable performance fit the Type 516 Oscilloscope for many laboratory and field applications.

VERTICAL-DEFLECTION SYSTEM

Frequency Specifications are at 3-db down

DC-Coupled Vertical Amplifier—Both channels have identical input characteristics. Passband is dc to 15 mc (at 3 db down). Risetime is 23 nsec. Deflection is calibrated in steps of: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, and 20 v/div. A vernier control permits continuous adjustments between steps, and to about 50 v/div, uncalibrated.

Calibration Accuracy—Internal adjustments set the gain of each channel. When these adjustments are set accurately the sensitivity will be within 3% of the indicated switch position.

Positioning Control—Each channel has a separate vertical-position control.

Mode Selection—A switch selects one of four operating modes: each channel separately, or successive 3.3-μsec segments of each channel are displayed at an approx. 150-kc rate per channel. Chopped transient blanking is provided.

AC-DC Switches—When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X Probe.

Polarity Control—Each channel has a separate polarity control (for comparison of signals 180 degrees out of phase).

Input Impedance—1 megohm paralleled by 20 pf.

Probes—The vertical sensitivity is reduced by a factor of 10 by use of the 10X attenuator probes supplied with the Type 516. The probes present an input impedance of 10 megohms paralleled by approximately 7 pf.

Signal Delay—A balanced delay network permits observation of the leading edge of the waveform that triggers the sweep.

HORIZONTAL-DEFLECTION SYSTEM

Sweep Range—Sweep time is calibrated in steps of 0.2, 0.5, 1, 2, 5, 10, 20, 50 μsec/div...0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 msec/div...0.1, 0.2, 0.5, 1, and 2 sec/div. Calibration accuracy is within 3% of the indicated switch position. A vernier control permits continuous adjustment between the 22 steps, and to over 6 sec/div, uncalibrated.

Sweep Magnifier—When the 5X magnifier is switched in, the center two-division portion of the normal sweep is expanded to left and right of center

516

to fill ten divisions. The HORIZONTAL POSITION control has sufficient range to display any one-fifth of the magnified sweep. Used with the fastest sweep, the magnifier extends the calibrated sweep range to 0.04 μsec/div. TIME/DIV of the magnified sweep is indicated by a second blue-colored figure at each position of the sweep-rate switch. Accuracy is within 5% of the displayed portion of the magnified sweep. A neon lamp lights to indicate when the magnifier is in use.

DC-Coupled Unblanking—Unblanking waveform dc-coupled to the crt assures uniform beam current for all sweep speeds and repetition rates at any setting of the intensity control.

Horizontal Input—A front-panel connector permits dc-coupled external connection to the sweep amplifier. Horizontal deflection factor is 1.5 v/div, and bandpass extends from dc to 500 kc at maximum sensitivity.

OTHER CHARACTERISTICS

Amplitude Calibrator—Eleven square-wave calibration voltages are available through a front-panel connector. Peak-to-peak amplitude is in steps of 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 volts. Accuracy is within 3%. Frequency of the square-wave is approximately 1 kc.

Tektronix Cathode-Ray Tube—A flat-faced 5-inch cathode-ray tube provides a bright trace. Accelerating potential is 4 kv. A P31 phosphor is normally supplied.

Dual-Trace Blanking—A blanking voltage is available to eliminate switching transients from the display when the instrument is operated in its chopped mode. The blanking voltage can be supplied to the crt cathode by a switch on the back of the instrument.

Graticule—Usable viewing area is marked in six vertical and ten horizontal one-centimeter divisions. Center lines are further marked in five minor divisions per centimeter. Convenient control from the SCALE ILLUM. knob provides adjustable edge-lighting.

Output Waveforms—Two output waveforms are available from front-panel connectors. Approximate amplitude of the peak-to-peak voltages are 150 volts from the SAWTOOTH OUT connector and 25 volts from the +GATE OUT connector.

Warning Indicators for Uncalibrated Settings—Separate front-panel neon lights indicate when the vertical-attenuator and sweep-rate controls are not in their calibrated positions.

Regulated Power Supplies—Electronically-regulated dc supplies insure stable operation over line fluctuations between 105 and 125 volts or 210 and 250 volts.

TRIGGER FACILITIES

Trigger Requirements—Triggering internally requires a signal large enough to produce one minor division of vertical deflection. Triggering externally requires a signal of from 0.2 to 25 volts.

Amplitude-Level Selection—Adjustable amplitude-level and stability controls allow sweep triggering at any selected amplitude level on the triggering waveform. Trigger source can be internal, external, or the line frequency, either ac-coupled or dc-coupled. Trigger point can occur anywhere on the rising or falling slope of the triggering waveform.

Preset Stability—The STABILITY control locks at the optimum triggering point and requires no adjustment in the fully counter-clockwise, PRESET position.

Automatic Triggering—Automatic level-seeking trigger circuit eliminates triggering readjustments—provides dependable triggering for most applications. One setting assures positive sweep triggering by signals of widely differing amplitudes, shapes, and repetition rates. Automatic triggering of the sweep occurs at about a fifty-cycle rate in the absence of an input signal, and provides a convenient reference trace.

High-Frequency Sync—Assures steady display of sine-wave signals to at least 15 megacycles. Requires a signal large enough to cause about 2 div deflection, or an external signal of about 2 volts.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 300 watts at 117 v. Type 516MOD101M operates on 50 to 400 cps supply, uses dc fan motor. If requested the instrument will be wired for any of the following nominal line voltages.

Nominal Line Voltage (Figures taken at 60 cps)	Operating Range
110	99 to 117 volts
117	105 to 125 volts
124	111 to 132 volts
220	198 to 235 volts
234	210 to 250 volts
248	223 to 265 volts

Mechanical Specifications—Dimensions are 14" high by 9⅞" wide by 21¾" deep. Net weight is 44¼ pounds. Shipping weight is 54 pounds, approx.

TYPE 516 (50 to 60 cps operation) $1070

Each instrument includes: 2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (013-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0225-00).

TYPE 516 MOD101 (50 to 400 cps operation) . $1130

Each instrument includes: 2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0225-00).

RACK MOUNT ADAPTER

A cradle mount to adapt the Type 516 Oscilloscope for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Rack height requirement is 15¾".

Order Part Number 040-0277-00 . . . . . $45

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-1 GIGACYCLE OSCILLOSCOPE Type 519

SINGLE-SHOT PHOTOGRAPHS AT 2 NSEC/CM

0.004-INCH SPOT SIZE

SENSITIVE WIDEBAND TRIGGER SYSTEM

SYNCHRONIZATION TO OVER 1 GIGACYCLE

VSWR 1.25, OR LESS, TO 1 GIGACYCLE

DISTRIBUTED-DEFLECTION CRT

BUILT-IN DELAY LINE

CHARACTERISTIC SUMMARY

VERTICAL

SENSITIVITY—less than 10 v/cm.
RISETIME—less than 0.35 nsec.
PASSBAND—DC to 1000 Mc.
INPUT—125 Ω ±2%.

HORIZONTAL

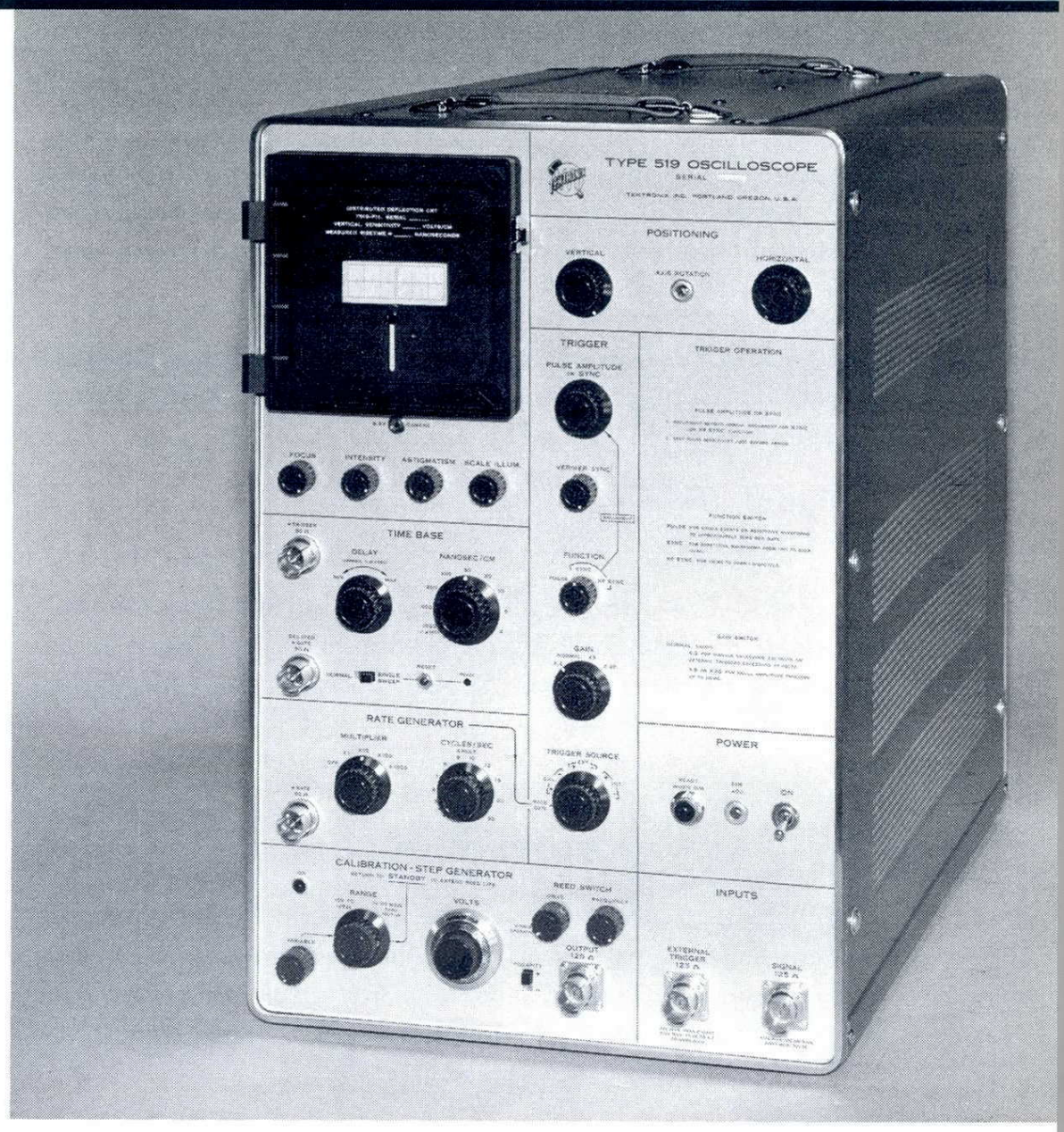
CALIBRATED SWEEP RANGE—2 to 1000 nsec/cm.
SWEEP DELAY—0 to 35 nsec.
TRIGGER REQUIREMENTS—
Internal: 2 trace widths, 1-nsec duration.
External: 20 mv, 1-nsec duration.
TRIGGER GAIN—X0.2, X1, X5, and X20.

CRT

DISPLAY AREA—2 x 6 cm.
ACCELERATING VOLTAGE—24 kv.

OTHER CHARACTERISTICS

CALIBRATION-STEP GENERATOR—0 to 10 v into 125 Ω or 0 to 1 v into 50 Ω, approx. 0.1-nsec risetime, calibrated and continuously variable. Approximately 750 cps repetition rate.
POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 650 watts.

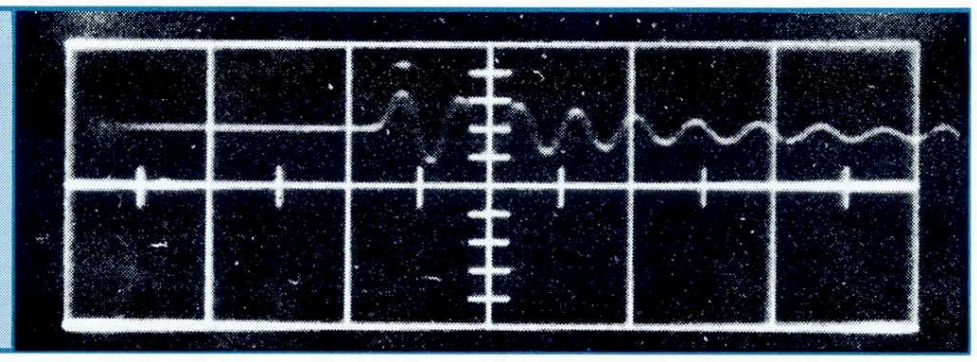


The Tektronix Type 519 Oscilloscope is a calibrated, high-speed, laboratory instrument designed for observation, measurement, and photographic recording of fractional nanosecond risetimes. A 2 x 6 cm viewing area, coupled with 24-kv accelerating potential, affords bright displays with excellent definition. Performance features include: passband from dc to beyond 1 gigacycle, risetime less than 0.35 nsec, sensitivity less than 10 v/cm, linear sweeps to 2 nsec/cm, sweep delay through 35 nsec, and a wideband trigger system. The single unit houses a fixed signal delay line, a convenient sweep-delay control, a pulse-rate generator, a standard amplitude and waveshape generator, and regulated power supplies and high-voltage supply. Only one connection is necessary for normal operation—signal input.

Combining simple operation with laboratory precision and reliability, the Type 519 ideally suits single-shot or random nuclear events. In addition, the passband permits applications to general measurements where oscilloscope risetime must be faster than signal risetime.

SINGLE-SHOT PHOTOGRAPHY

A single-shot exposure was used to take the picture at the right. The display shows a 1 gigacycle damped wave (approximately) on the fastest rate of the oscilloscope.



519

VERTICAL DEFLECTION SYSTEM

Frequency Specifications are at 3-db down

Distributed Deflection System—The signal passes through a trigger-energy take-off, then through a 45 nsec delay cable to the distributed vertical deflection plates of the crt. Passband is dc to 1 gigacycle and risetime is less than 0.35 nsec.

Sensitivity—Basic sensitivity is less than 10 v/cm. Sensitivity is quickly and accurately checked by means of the CALIBRATION-STEP GENERATOR.

Signal Delay—An internal delay line provides a fixed delay of 45 nsec.

Input—The dc-coupled signal input has an impedance of 125 Ω ±2%. Maximum signal input is ± 15 volts dc or rms, or ±100 volts pulse. Maximum power input is 1.8 watts.

TRIGGERING FACILITIES

Trigger Selection—A front-panel switch permits selection of trigger from the following sources: (1) displayed waveform, (2) externally derived waveform, (3) CALIBRATION-STEP GENERATOR waveform, (4) RATE GENERATOR waveform.

Trigger Function—Three modes of operation are provided: (1) PULSE—Permits choice of a free-running sweep or a stable sweep which can be triggered on random or uniform repetition rates up to approximately 50 mc, (2) SYNC—Permits stable displays of waveforms occurring at a constant repetition rate to over 100 mc, (3) HF SYNC—Permits the sweep to be synchronized with signals from approximately 100 mc to over 1 Gigacycle.

Trigger Requirements—Internally, a vertical signal deflection of two trace-widths or more, and 1 nsec duration. Externally, a waveform 20 mv in amplitude and duration of 1 nsec or more. Sweep triggers on either the rising or falling portion of the triggering waveform.

Trigger Gain—Four gain settings of X0.2, NORMAL, X5, and X20 provide for attenuation or amplification of trigger signals.

HORIZONTAL DEFLECTION SYSTEM

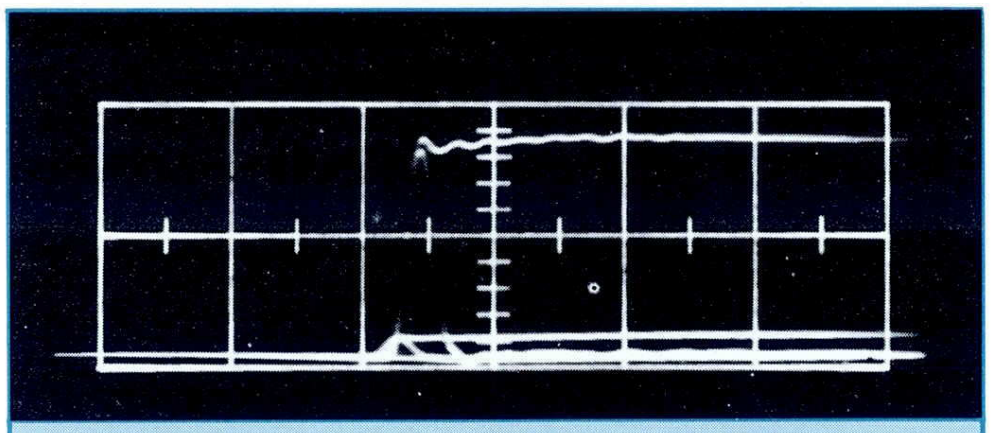
Calibrated Sweep—Nine calibrated rates: 2, 5, 10, 20, 50, 100, 200, 500, and 1000 nsec/cm are provided by a linear, push-pull, time-base generator. Accuracy is typically within 3% for the 2 nsec/cm position and within 2% for slower rates. For the fastest time-base range, only 2.5 μsec elapses between sweeps.

Sweep Delay—Provides sweep start delay through 35 nsec, permitting access to transients before and after the main event.

Single Sweep—Permits single-sweep presentation to be obtained. After a single sweep is triggered, the sweep circuit is locked out until the RESET button is pressed; sweep will then fire on the next trigger received. An external jack and included plug provide for remote control of single-sweep operation.

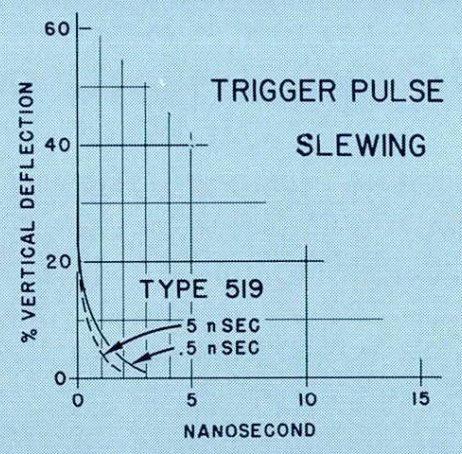
Synchroscope Operation—The output signal from either the +TRIGGER 50 Ω, the DELAYED +GATE, or the +RATE 50 Ω connector can be used to initiate the input waveform.

Rate Generator—Output pulse is approximately +15 volts, with risetime of less than 0.8 nsec and duration of 10 nsec. Repetition rate is variable between 3 cps and 30 kc.



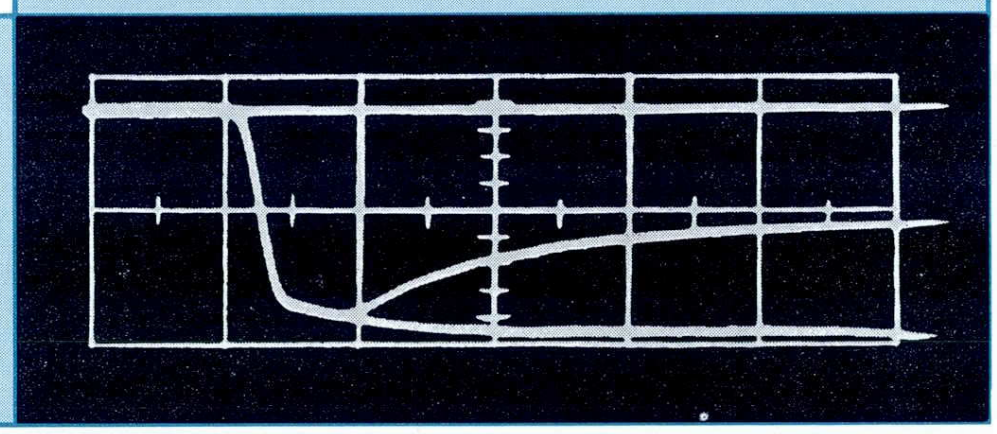
Negligible Trigger-Pulse Slewing for Sweep Speed of 2 nsec/cm

High-frequency synchronization permits locking to sine waves or constant-repetition-rates to over 1 gigacycle. Triggering circuits count down from triggers faster than 400 kc.



DIODE CHARACTERISTICS

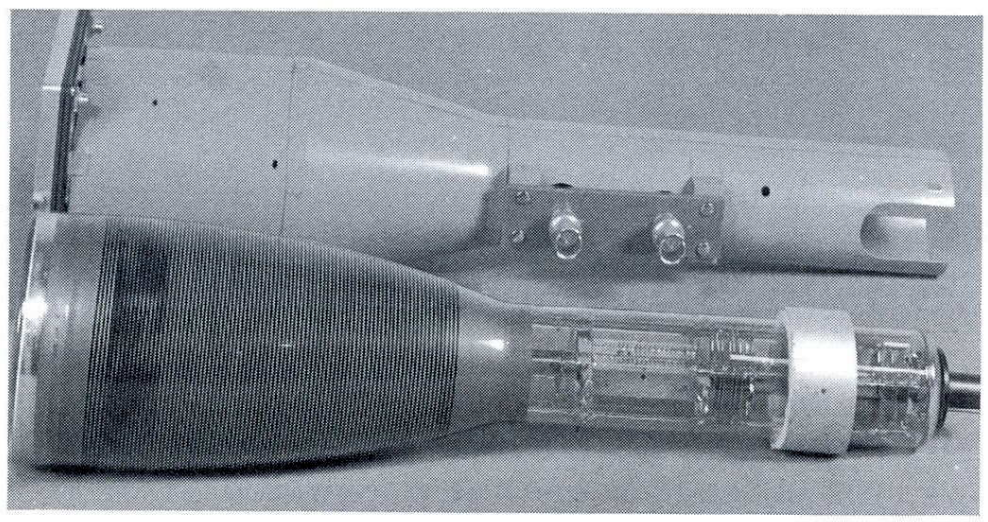
Switching and storage times in fast transistors and diodes can be measured using the outstanding characteristics of the Type 519. In the typical diode recovery-time waveform, the upper trace is a reference trace, the middle trace shows the diode turned on, and the lower trace shows the diode shorted. Sweep speed 2 nsec/cm.



Calibration-Step Generator—A step-waveform of approximately 750 cps, continuously variable and calibrated from 0 to 10 volts into 125 ohms, or 0 to 1 volt into 50 ohms through a T50/T125 adapter, is available at a front-panel 125 ohm connector. Risetime is approximately 0.1 nsec and either positive or negative polarity can be selected. Continuously variable uncalibrated amplitudes of 0 to 50 volts into 125 ohms are also available. The step-waveform can be used to drive a device under test or check the sensitivity and transient response of the oscilloscope itself.

OTHER CHARACTERISTICS

Tektronix Cathode-Ray Tube—A metallized, flat-faced precision tube, with a fine-grain P11 phosphor, provides a spot diameter of 0.004 inch at normal intensity. Accelerating potential is 24 kv. Tube construction completely prevents any possible x-ray hazard. Usable viewing area is 2 x 6 cm.



Shielded Construction—Electrostatic and electromagnetic shielding minimize disturbance of spot by power transformers and other hum sources.

Graticule—The graticule is accurately marked in 6 horizontal and 2 vertical 1-centimeter divisions. The horizontal centerline markings are 5 millimeters apart, vertical centerline markings are 2 mm apart. Illumination is controlled by a front-panel knob. The graticule drops out of view if desired.

Camera Mounting—A special camera-mounting bezel with swing-away hinging easily accepts a Tektronix Trace-Recording Camera. Several lenses, viewing system, and film-back options are available. Please refer to the Camera Section for complete description.

Regulated Power Supply—Electronically-regulated dc supplies assure stable operation over line variations between 105 and 125 volts or 210 and 250 volts, 50 to 60 cycles.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 650 watts.

Mechanical Specifications—Dimensions are 22¼" high by 14⅝" wide by 25¼" deep. Net weight is 103¾ pounds. Shipping weight is 136 pounds, approx.

TYPE 519 OSCILLOSCOPE $3900

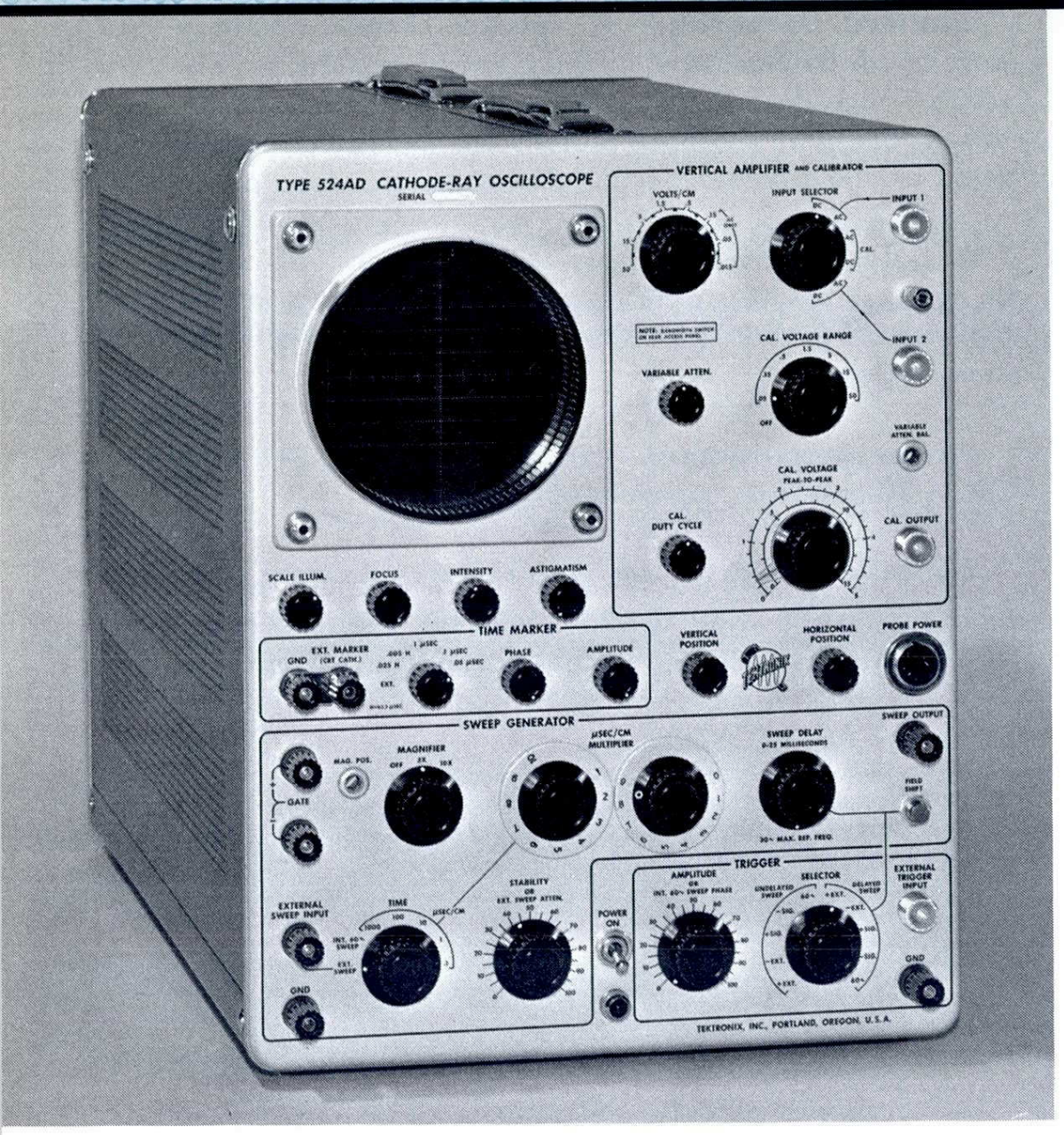
Each instrument includes: 1—Viewing hood (016-0025-00); 2—125 Ω termination (017-0051-00); 2—125 Ω insertion unit (017-0013-00); 1—125 Ω coupling capacitor (017-0013-00); 1—125 Ω, 1-Gc timing standard (017-0019-00); 1—Double-button contact assembly (017-0032-00); 1—Panel adapter assembly (017-0033-00); 1—Cable connector (017-0035-00); 1—125 Ω min loss attenuator, T50/T125 (017-0052-00); 1—125 Ω adapter N50/N125 (017-0053-00); 1—125 Ω adapter, T50/N125 (017-0055-00); 1—Delay-line equalizer (017-0057-00); 1—1-nsec cable (017-0507-00); 1—2-nsec cable (017-0508-00); 1—5-nsec cable (017-0509-00); 1—10-nsec cable (017-0510-00); 1—3 to 2-wire adapter (103-013-00); 1—Phone jack plug (134-0069-00); 1—3-conductor power cord (161-0010-00); 1—Walnut box (202-0083-00); 2—Reed switch (260-0693-00); 1—Accessory box tray (436-0030-00); 2—Instruction Manual (070-0243-00).

OPTIONAL ACCESSORIES

Accessory	Part No.	Price
125-Ω 2:1 attenuator	017-0071-00	$25.00
125-Ω 5:1 attenuator	017-0049-00	30.00
125-Ω 10:1 attenuator	017-0050-00	30.00
125-Ω N50/T125 adapter	017-0054-00	17.50
125-Ω 90° elbow assembly	017-0043-00	15.00
125-Ω 20-nsec cable	017-0511-00	24.00

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 524AD TELEVISION OSCILLOSCOPE



Frequency Response

Normal—dc to 10 mc from 0.15 v/cm to 50 v/cm.
2 cycles to 10 mc from 15 mv/cm to 50 v/cm.

Flat—within 1% from 60 cycles to 5 mc.

IRE—meets IRE standards for level measurements.

Transient Response—35 nsec risetime.

Sweep Range

Continuously variable, 0.1 μsec/cm to 0.01 sec/cm.

Time Markers

Five markers—0.05 μsec, 0.1 μsec, 1.0 μsec, 200 pips per television line, and 40 pips per television line.

Sweep Delay

Permits detailed observation of any portion of a single television line.

DC-Coupled Unblanking

Variable Duty-Cycle Amplitude Calibrator

The Tektronix Type 524AD Oscilloscope is a self-contained instrument with the characteristics desirable for maintenance and adjustment of television transmitter and studio equipment. The Type 524AD will prove itself invaluable in enabling the engineer to observe any portion of the television picture — from complete frames to small portions of individual lines.

Features contributing to the versatility of this oscilloscope include—accurate time markers to facilitate sync-pulse timing, normal response of dc to 10 mc, flat response within 1% from 60 cycles to 5 mc for color-television work, variable-duty-cycle amplitude calibrator, and two steps of sweep magnification, 3x and 10x, for detailed observations.

VERTICAL DEFLECTION SYSTEM

Frequency Specifications are at 3-db down

DC-Coupled Vertical Amplifier—The main vertical amplifier has a passband of dc to 10 mc for deflection factors from 0.15 v/cm to 50 v/cm. When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X probe. An ac-coupled preamplifier switched in by the VOLTS/CM control provides additional deflection factors from 0.015 v/cm to 0.15 v/cm. A variable attenuator control fills in between steps and provides continuously variable adjustment from 0.015 v/cm to 50 v/cm. The vertical amplifier is factory adjusted for optimum transient response. Risetime is less than 35 nsec and the input impedance is 1 megohm paralleled by approximately 45 pf.

Frequency Response—A switch on the access panel selects the desired bandwidth of the vertical amplifier. The NORMal position provides a passband of dc to 10 mc. The FLAT position provides a vertical-amplifier response flat within 1% from 60 cycles to 5 mc. About 5% overshoot will occur on extremely sharp waveforms when the switch is in the FLAT position; however, TV signals within the 5 mc passband are not affected. Response of the amplifier meets the IRE standards for level measurements when the access-panel switch is in the IRE position. EXTernal position provides ac-coupled external connections to the vertical-deflection plates, bypassing the main vertical amplifier but retaining the function of the vertical-position control.

Two Signal Inputs—Two coaxial connectors are controlled by a front-panel switch. Each input can be either ac or dc-coupled to the vertical amplifier.

Probe—The vertical sensitivity is reduced by a factor of 10 by use of a 10x attenuator probe supplied with the instrument. The probe presents an input impedance of 10 megohms paralleled by approximately 7 pf.

Delay Network—A 0.25 μsec signal-delay network is incorporated in the vertical amplifier to permit observation of the waveform that triggers the sweep.

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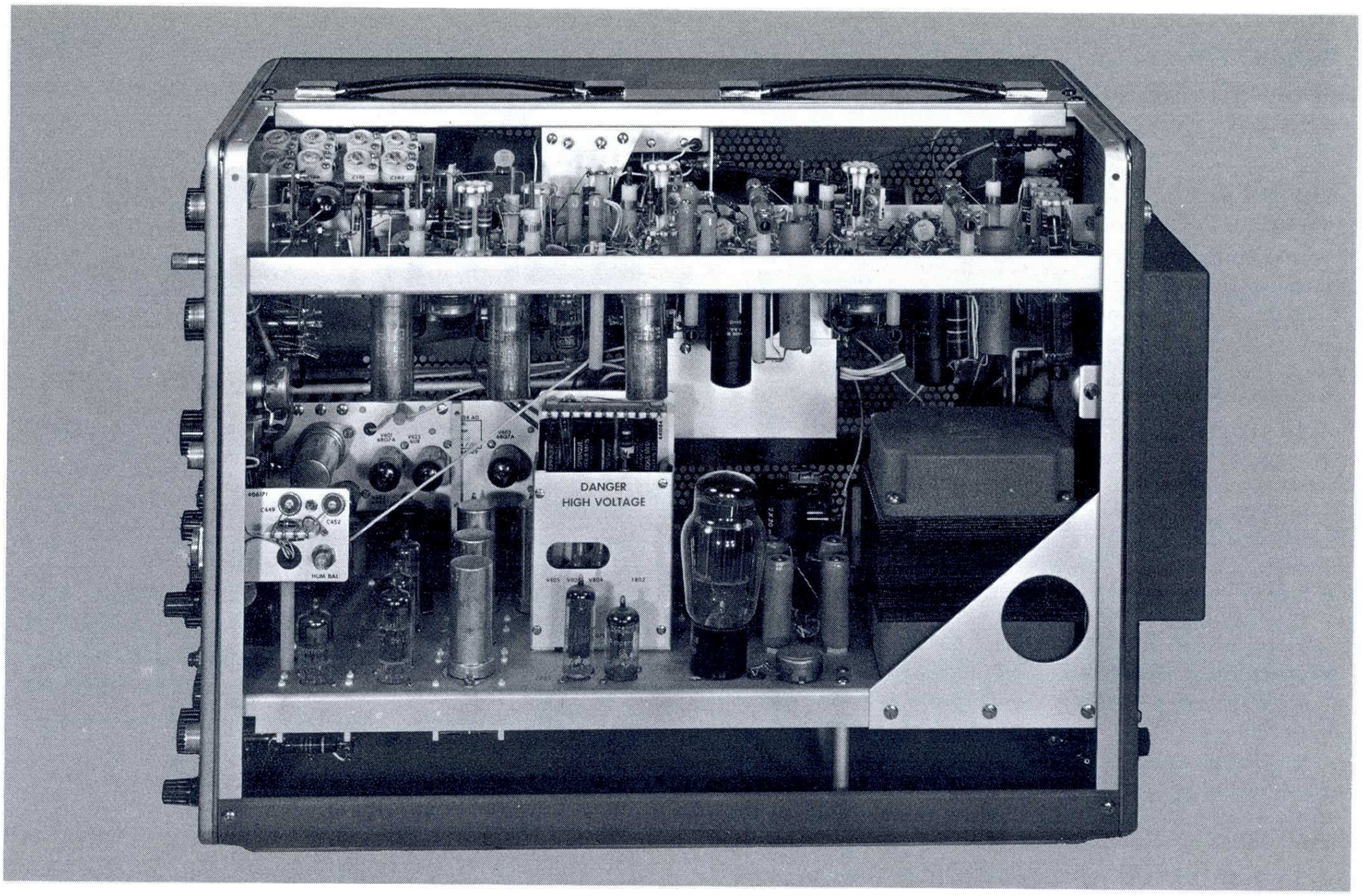
524AD



HORIZONTAL DEFLECTION SYSTEM

Calibrated Sweeps—The Type 524AD has a continuously variable, linear, triggered time base covering the range of 0.1 μsec/cm to 0.01 sec/cm in five fixed-range steps. Dual sweep-time multiplier dials cover the range between steps. Calibration accuracy is within 5%.

DC-Coupled Unblanking—The unblanking waveform is dc-coupled to the grid of the cathode-ray tube assuring uniform bias for all sweep times and repetition rates.

Sweep Delay—Detailed observation of any portion of the television picture is accomplished by continuous sweep delay from 0 to 25 milliseconds. After the desired delay, the sweep is triggered by one of the line sync pulses. The sweep delay is adjustable with a 3-turn potentiometer through about 1½ fields, and operates at the frame rate of 30 cycles so only consecutive lines of one field are observed at any time. A field-shift button permits switching to the corresponding interlaced lines in the other field.

Sweep Magnifier—Sweep magnification is obtained by increasing the drive to the sweep-output amplifier by a factor of either 3 or 10. The center portion of the normal sweep is expanded equally to left and right of center. Accuracy is within 7%.

Trigger Selector—Both normal and delayed sweeps can be triggered by an external signal of either polarity, or internally by either the positive or negative portion of the signal under observation, or by the power-line frequency.

Trigger Requirements—Internal triggering—a signal large enough to produce a one-half centimeter deflection. External—a signal of 0.5 v to 50 v. Composite waveform—a signal large enough to produce a 1.5-centimeter deflection.

OTHER CHARACTERISTICS

Amplitude Calibrator—A variable-duty-cycle square-wave calibration voltage is continuously variable from zero to 50 volts in seven ranges. Full-scale calibration is accurate within 3%; variable control is linear within 1% of full scale. Square-wave frequency is approximately 1 kc, but the frequency will vary somewhat as duty cycle is varied to 1% or 99%.

Time-Mark Generator—Time markers are inserted as intensification pips on the crt trace at time intervals of 0.025H, 0.005H, 1.0 μsec, 0.1 μsec, and 0.05 μsec. Since H is 63.5 μsec, 0.025H will give 40 pips per television line and 0.005H will give 200 pips per television line. These markers provide a means of accurately timing the sync pulses of a composite signal. Pips spaced at 40 or 200 per television line are useful for adjusting both color and monochrome equipment.

A phasing control permits markers to be positioned on any desired point of the waveform under observation.

524AD

Output Waveforms—Positive and negative-gate waveforms of the same time duration as the sweep, and the sweep sawtooth waveform are available at front-panel connectors.

Line-Indicating Video—When a picture monitor is connected to the coaxial connector at the rear of the cabinet, the picture appearing on the monitor will be brightened during the time of the oscilloscope sweep. This technique is useful when it is desired to know what portion of the picture is being displayed on the oscilloscope.

60 CPS Sweep—A 60 cps sweep with variable amplitude and phasing through approximately 150° aids in making bandwidth measurements with a video-sweep generator.

Cathode-Ray Tube—A flat-faced cathode-ray tube with a 4-kv electronically-regulated accelerating potential is used in the Type 524AD. A P1 phosphor is normally supplied.

Illuminated Graticule—An edge-lighted graticule is marked in centimeters. Viewing area is 6 x 10 cm. Illumination is controlled by a front-panel knob. A graticule marked for modulation measurements is also supplied with the instrument.

Regulated Power Supply—All dc supplies are electronically regulated to insure stable operation over line-voltage and load variations between 105 and 125 v or 210 and 250 v, 50 to 60 cps.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 500 watts.

Probe Power Socket—A front-panel socket will provide power for a cathode-follower probe or auxiliary amplifier circuitry. 6.3 v dc at 1 amp and 120 v regulated dc at 15 ma are available at the socket.

Mechanical Specifications—Dimensions are 16¾" high by 13" wide by 25" deep. Net weight is 61 pounds. Shipping weight is 82 pounds, approx.

TYPE 524AD OSCILLOSCOPE $1300

Each instrument includes: 1—P6006 probe (010-0125-00); 2—binding post adapter (013-0004-00); 1—viewing hood assembly (016-0001-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—TV graticule (331-0009-00); 1—Green filter (installed) (378-0514-00); 2—Instruction manual (070-0236-00).

RACK MOUNT ADAPTER

Rack Mount Adapter for the Type 524AD Oscilloscope consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular panel. Rack height requirement is 17½".

Order Part Number 040-0281-00 . . . . . $45

SCOPE-MOBILE® CARTS

TYPE 202-1 TILT-LOCK CART with storage drawer and locking front wheels $120.00

TYPE 500A CART with storage drawer and locking front wheels $99.50

See Catalog accessory pages for complete information.

CATHODE-FOLLOWER PROBE

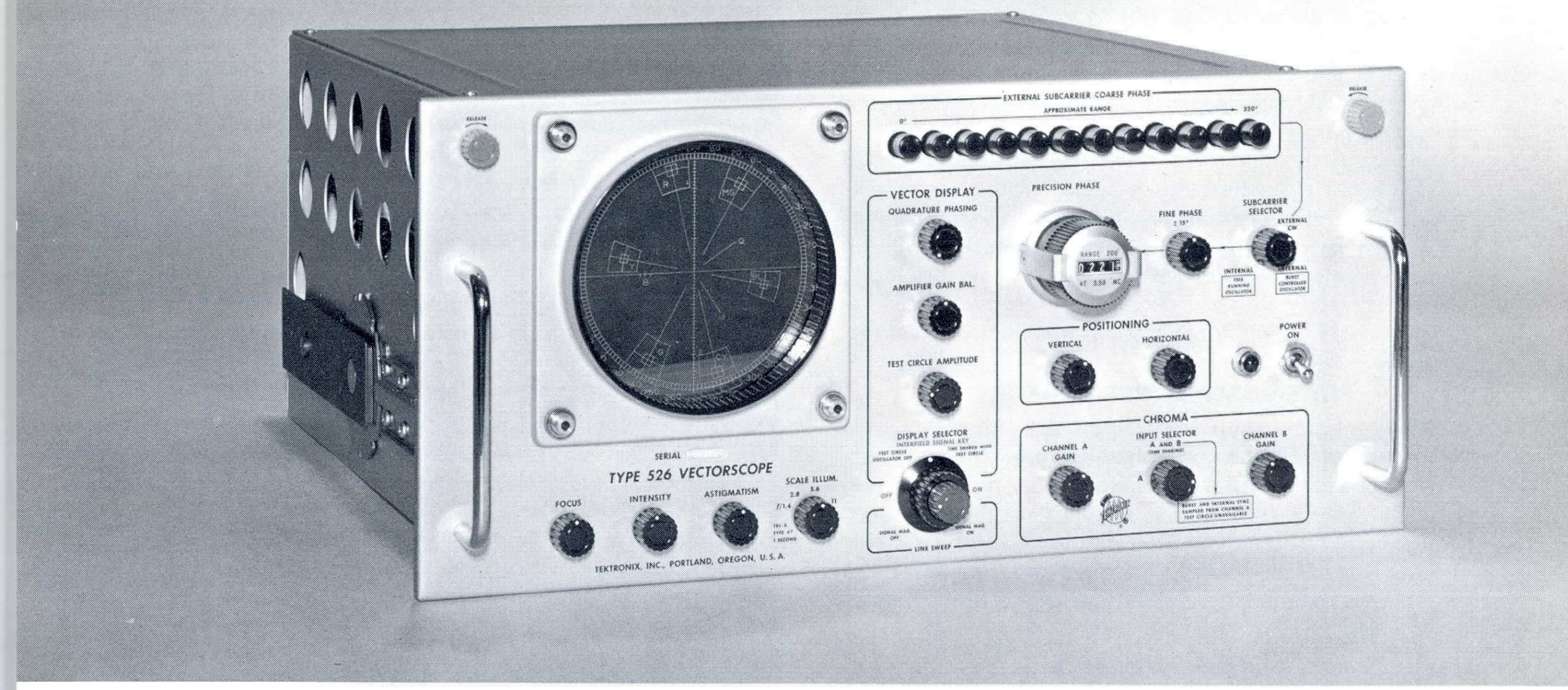
The P500CF Cathode-Follower Probe has input impedance of 40 megohms paralleled by 4 pf and gain of 0.8 to 0.85. With 10X attenuator head, input impedance is 10 megohms paralleled by 2 pf. Amplitude distortion is less than 3% on unidirectional signals up to 5 v.

Order Part Number 010-0109-00 . . . . . $85

Please refer to Catalog accessory pages for 75-ohm coaxial cables, attenuators, and terminating resistors.

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

COLOR-TELEVISION VECTORSCOPE Type 526



Differential Phase and Differential Gain Measurements—To 0.1° and under 1%.

Vertical Interval Testing—A keying circuit permits measurements of differential gain and differential phase during color broadcasts, on test signals transmitted during vertical blanking interval.

Linear Time Base—Operates at line rate, synchronized by horizontal sync pulse.

Burst Brightening—Positive identification of burst pulse.

Push-Pull Synchronous Demodulators — DC-coupled to crt.

Self-Checking Circuitry

Subcarrier Regenerator

The Tektronix Type 526 Vectorscope greatly reduces the time and effort involved in making extremely-accurate relative phase and amplitude measurements of chrominance information in the N.T.S.C. color signal. Electronically-switched dual signal channels facilitate matching equipment such as encoders, cameras, etc.

The Type 526 presents either a vector display of the demodulated chroma signal, or a display of the demodulated chroma signal on a linear time base. DC-Coupled signal circuits permit monitoring program signals as well as industry test signals such as 75% saturated color bars, interfield test signals, linearity stair step, and the Bell Kelly Set tests for differential phase and amplitude. A built-in subcarrier regenerator facilitates operation remote from the subcarrier source.

PHASE MEASUREMENT

Phase measurements are made by demodulating the chroma signal with a subcarrier signal which can be shifted in phase relative to burst phase in the signal. High accuracy is obtained with the 20-turn precision calibrated phase shifter. This control reads out directly in degrees and tenths of degrees. It has a range of 200°, and the 180° point can be verified within the instrument. Random phase shifts in the subcarrier signal due to cable length can be cancelled out with a pushbutton operated phase-shift network covering 0° to 330° in twelve steps. A fine-phase control (±20°) provides for variable adjustment between steps, and fine phase adjustment when using the burst-controlled oscillator.

526

VECTOR PRESENTATION

The vector presentation is a graphic display for operational measurements with a color-bar, interfield-test signal, other industry test signals, or with program material. Signal circuits are dc-coupled, preventing changes in chroma signal composition from affecting the positioning of the display.

An internally generated test circle matched with the graticule circle verifies the accuracy of the vector display. The test circle can also be used to verify the accuracy of the complementary-color relationships. Phase measurements accurate within ±1.5° can be made using the vector display. Accuracy of saturation measurements will be within ±2% on graticule, closer when comparing two signals.

LINEAR-SWEEP PRESENTATION

Phase measurements are simplified by displaying the demodulated chroma signals vertically on a linear horizontal sweep, which is terminated by the horizontal sync pulse and restarts just prior to the burst packet. Using the null technique, differential phase can be measured to an accuracy of 0.1%. A signal magnifier can be used to expand the vertical deflection approximately 7 times.

DUAL DISPLAYS

In dual-channel operation, succesive 2-msec segments of each channel are displayed at an approx. 500-cycle rate per channel. For example, the input signal to a portion of the broadcast plant can be compared to the output signal to measure any phase and/or amplitude distortion caused by the broadcast equipment. Also, the outputs of any two portions of the broadcast plant can be compared.

When using the vector display, either channel can be turned off to provide a zero reference point for the other channel. The reference point is a sharply defined spot in the center of the display. Any drift in the Vectorscope circuit will change the position of the spot, therefore the drift is easily detected and corrected.

When using the linear-sweep display, turning off one channel while the other remains in use provides a zero reference line against which signals can be nulled. This technique eliminates the possibility of measurement errors due to parallax.

BURST BRIGHTENING

The burst amplifier in the burst-controlled oscillator circuit is keyed on during the first 3 μsec of the linear sweep. During the 3-μsec interval the crt trace is brightened for positive identification of the burst packet. Trace brightening during the burst-sampling interval also facilitates adjustment of burst-amplifier gating.

VERTICAL INTERVAL TEST SIGNAL OBSERVATION

Line 18 of Field 2 has been reserved for a color test signal, as yet unspecified. Line 19 of Field 2 will carry a linearity test signal. The Type 526 can measure differential gain quite accurately by means of the later test signal. Differential phase measurements may also be made, provided that the same subcarrier source is used for both color burst and the linearity test signal subcarrier. Color burst must be present (during color-casting).

The difficulty in seeing these two lines of test signals amidst the program signals—which hinders measurements—is eliminated by the Interfield Signal Key. Trace intensification during these test lines modulates the crt display so that by adjusting the Intensity Control, only these two lines per field may be seen.

The resulting display, while dim, is quite usable.

OTHER CHARACTERISTICS

DC-Coupled Signal Circuits—DC-coupling from the push-pull synchronous demodulators to the cathode-ray tube prevents changes in chroma signal composition from affecting the positioning of the display, making possible the detection and measurement of color carrier present during blanking time. Carrier-balance corrections can be made even while on the air, because the vector display shows the direction and magnitude of the required adjustments.

Video Inputs—Channel A and channel B inputs are compensated for 75-ohm loop-through operation. Input stages are cathode followers. Sufficient gain is provided to allow use of a compensated probe rather than loop-through input.

The gain controls of each channel have a range of 40 db and produce virtually no phase-shift effects.

Sync Input—External, 1 v sync-negative composite video signal or 3.5 v to 8 v negative-going composite sync signal can be used . Also, horizontal drive pulses can be used if interfield keying feature is not used. With external sync, channels A and B can display non-composite video or chroma signals. External input is high-impedance compensated, loop-through connector for 75-ohm coaxial cable (R = 1 megohm, C = 25 pf).

Internal sync is available.

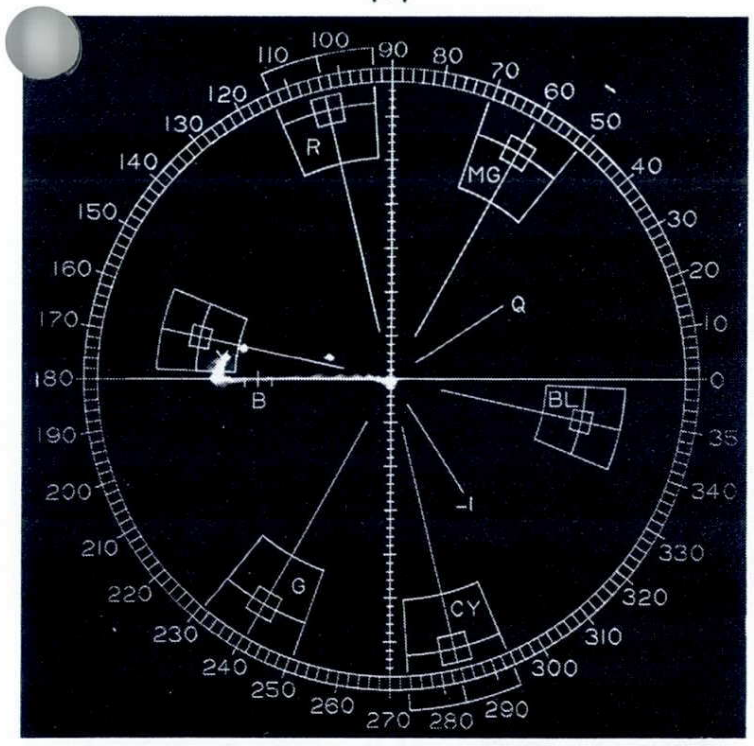
External Subcarrier Input—High-impedance compensated loop-through connector for 75-ohm coaxial cable (R=1 megohm, C=20 pf). Input has buffer-amplifier stage and requires a signal level of 2 volts peak-to-peak minimum.

Vertical Signal Output—The demodulated vertical signal is available at a binding post, dc-coupled, for feeding remote indicators.

Trace Intensification Input—A jack (PL-55) is provided for external trace-brightening pulses. Internal blanking circuitry is disconnected when an external signal is being applied. Signal required for trace brightening is an ac-coupled positive-going 20-volt pulse, which can be obtained from the + GATE terminal of any Tektronix Oscilloscope that is being triggered by the vertical-signal output of the Type 526. This type of trace brightening is useful for determining the time limits over which a phase shift is occurring.

Cathode-Ray Tube—The Type 526 uses a 5" flat-faced monoaccelerator tube with similar vertical and horizontal sensitivities, excellent linearity. Accelerating potential is 4 kv. A P1 phosphor is normally supplied.

(1)



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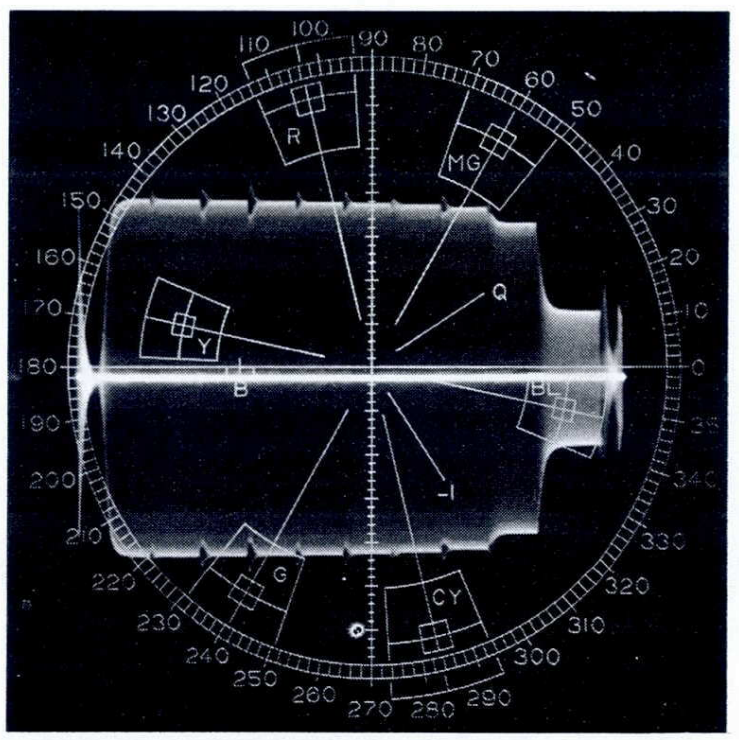

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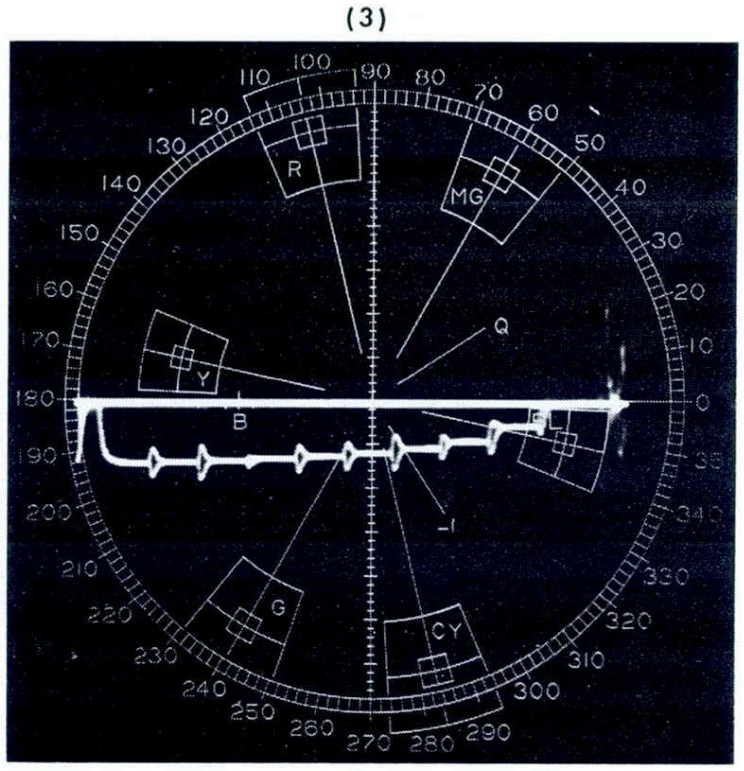

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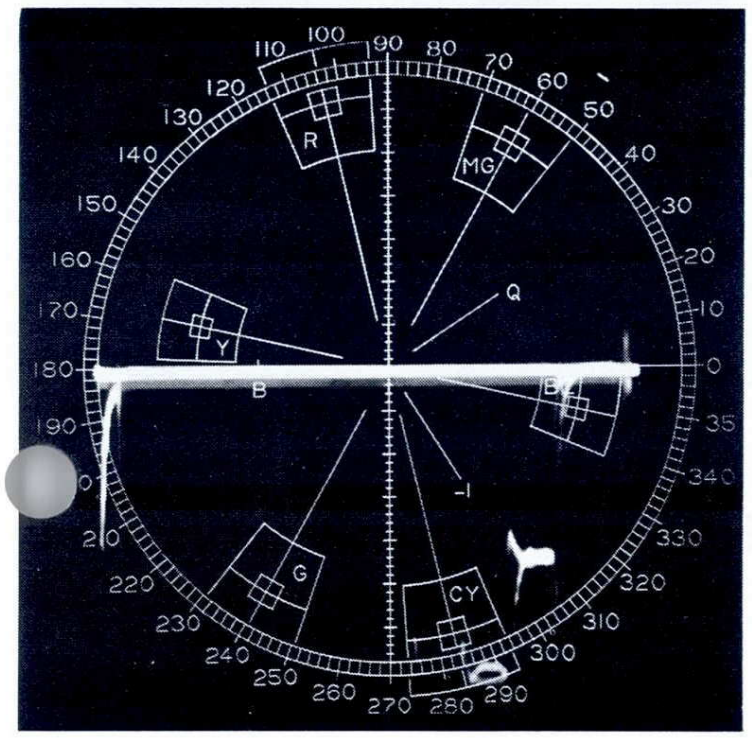

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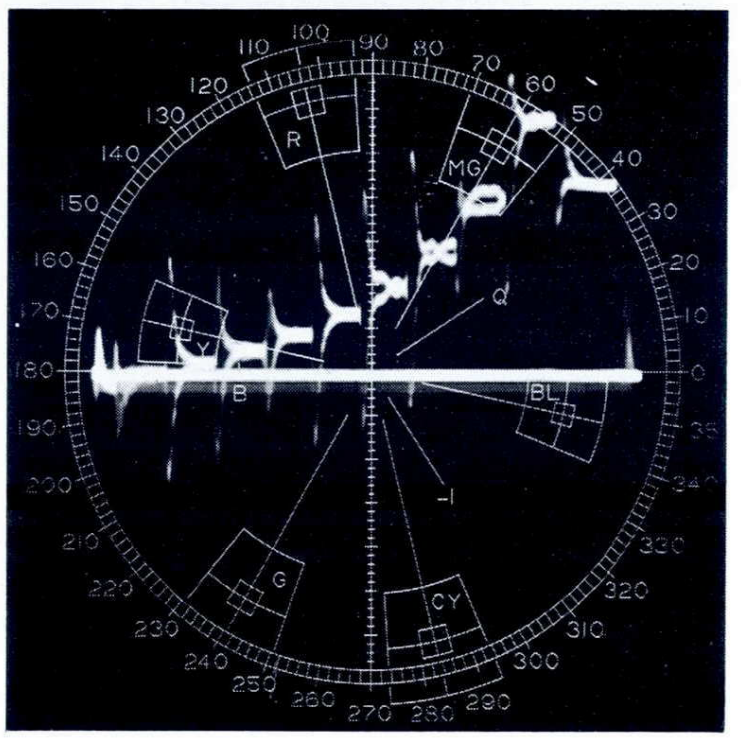


Figure 1. VECTOR DISPLAY
Modulated Stairstep Signal showing differential gain (differing radial distance from center), and differential phase (rotation of dots around center).

Figure 2. LINE SWEEP DISPLAY
Modulated Stairstep Signal. Subcarrier regenerator is free running to show only differential gain or change in amplitude of subcarrier with changing luminance signal.

Figure 3. LINE SWEEP DISPLAY
Modulated Stairstep Signal. Subcarrier regenerator is locked to color burst to synchronously demodulate the subcarrier. Differential phase is shown by variations in synchronously demodulated subcarriers.

Figure 4. LINE SWEEP DISPLAY
Modulated Stairstep Signal with increased sensitivity and subcarrier phasing adjusted to be in quadrature with the last step of modulated stairstep.

Figure 5. LINE SWEEP DISPLAY
Modulated Stairstep Signal with increased vertical sensitivity and subcarrier phasing adjusted to be in quadrature with first step of the modulated stairstep.

Illuminated Graticule—The edge-lighted graticule is marked with polar coordinates for hue and saturation of the chrominance signals, and with vectors for the Q, —I, and burst signals. Good broadcast and NTSC limits are indicated. Graticule illumination is controlled by a front-panel knob.

Regulated Power Supplies—The self-contained low-voltage and crt-high-voltage power supplies are electronically regulated against changes in load and line-voltage fluctuations between 105 and 125 volts or 210 and 250 volts.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 240 watts.

Accessibility—The Type 526 is designed for standard rack mounting. Chassis attaches to rack with slide-out mounting that permits it to be tilted vertically, providing easy access to all components.

Mechanical Specifications—Dimensions are 8¾" high by 19" wide by 18" rack depth. Net weight is 45¼ pounds. Shipping weight is 74 pounds, approx.

TYPE 526 VECTORSCOPE $1665

Each instrument includes: 3—Terminating resistor (011-0023-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Pr mounting tracks (351-0084-00); 2—Instruction Manual (070-0121-00).

SUPPORTING CRADLES

Supporting Cradles—for rear slide support when the instrument is to be mounted in a backless rack. Two cradles with necessary mounting hardware.

Order Part Number 040-0344-00 . . . . . $11.45

SPECIAL MODEL

The Type 526 MOD 158B is engineered for the C.C.I.R. color subcarrier frequency of 4.4296875 mc/sec. The Precision Phase Shift dial reads directly in degrees at the C.C.I.R. frequency. All other specifications are identical to those for the Type 526.

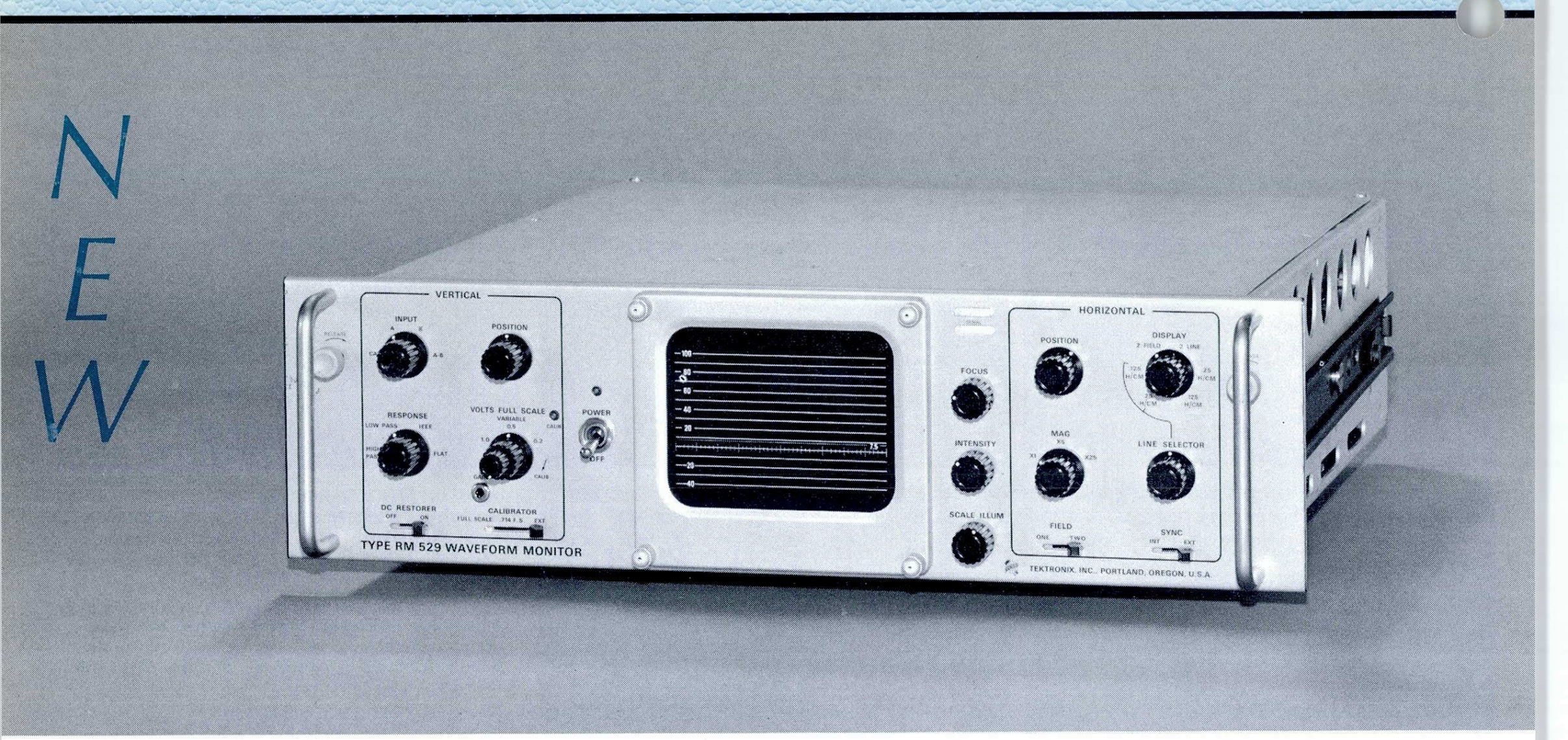
TYPE 526 MOD 158B VECTORSCOPE $1750

Each instrument includes: 3—Terminating resistor (011-0023-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Pr mounting tracks (351-0084-00); 2—Instruction Manual (070-0121-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type RM529 WAVEFORM MONITOR

NEW



- *LINE SELECTOR*
- *FLAT TO 8 MC*
- *4 FREQUENCY RESPONSES*
- *POSITIVE FIELD SELECTOR*
- *45 TRANSISTORS—7 TUBES*
- *COOL—QUIET—CLEAN*
- *NO FAN—ONLY 80 WATTS*

Newest of the Tektronix line of Television Instruments, the RM529 brings to the Industry a new flexibility in waveform monitoring: signal-level monitoring, bandwidth and differential gain measurements, sine^2-pulse and bar testing, monitoring Vertical Interval Test signals, transmitter percent-of-modulation measurements, RGB or YRGB displays (in conjunction with color-processing amplifiers) and others. Included are four video response characteristics, HIGH-PASS, LOW-PASS, IEEE, and FLAT. The RM529 features FLAT RESPONSE to 8 Mc, assuring excellent waveform fidelity and is ideally suited for sine-squared testing.

DC RESTORATION maintains the back porch at an essentially constant level despite changes in signal amplitude, APL, and color burst, and may be turned off for viewing other than video signals. The circuit can easily be modified for sync-tip restoration.

Sensitivity range is 0.12 volts to 1.5 volts for full-scale deflection. Full-scale calibration at 0.714 v or 1.00 v is provided.

BRIGHT WAVEFORM DISPLAYS in line selector operation are obtained with a new, highly efficient 5" ALUMINIZED CRT, operating at increased accelerating potential. The instrument uses the best of both solid-state and vacuum-tube circuitry resulting in improved stability and reliability. The RM529 uses NO FAN, resulting in cleaner operation and complete freedom from noise.

HORIZONTAL SELECTION provides 2-field or 2-line displays, plus calibrated sweep rates of 0.125 H/cm or 0.25 H/cm. Either calibrated rate may be delayed for line selection. SWEEP MAGNIFICATION extends the sweep rate by X5 or X25, offering calibrated sweep rates from 0.250 H/cm to 0.005 H/cm. POSITIVE FIELD SELECTION assures stable displays in the presence of random noise bursts and video switching. The LINE SELECTOR permits detailed study of any portion of any desired line(s), including VIT signals. A VIDEO-OUTPUT AMPLIFIER supplies video and a brightening pulse to the associated picture monitor, intensifying the same line, or lines, displayed on the instrument when using the LINE SELECTOR. The amplifier has excellent frequency response and linearity.

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VIDEO FEATURES

INPUTS
Two unbalanced inputs may be used with either 75 Ω loop-through or bridging connection (input R & C is 1 Meg and 24 pf). Alternatetively, one balanced, differential input may be used for 124 Ω circuits.

DEFLECTION FACTOR
120 mv to 1.5 v full scale. Continuously variable between ranges. Calibrated full-scale sensitivity: 1.0, 0.50 and 0.20 v.

FREQUENCY RESPONSE
4 response characteristics provided: FLAT— ±1% to 5 Mc; ±3% to 8 Mc. IRE-Spec 23S-1 of 1958 (amended): 3.58 Mc—20 db. HIGHPASS —3.58 Mc ±400 kc at —3 db. LOW PASS —18 db at 500 kc.

LOW FREQUENCY TILT
Less than 1% tilt on 60 cps window.

LINEARITY
Differential gain and multiburst axis shift: 1% or less.

DC RESTORER
Keyed back porch* type eliminates drift in dc-coupled vertical amplifier. Does not distort color burst. Blanking level shift due to color burst less than 1 IRE unit. Waveform will remain on screen if there is a loss of sync pulses for dc restorer keying. DC restorer may be disabled by front-panel switch.

VERTICAL AMPLIFIER
May be dc-coupled to diode demodulator as in % Video Modulation Monitoring. Details are available in manual.

GAIN STABILITY
±1% over rated line voltage and ambient temperature ranges.

*Sync tip restoration available by simple modification.

SWEEP FEATURES

CALIBRATED SWEEP RATES
0.250 H/cm and 0.125 H/cm. 0.125 H/cm used for observing T pulse; 0.25 H/cm used for 2T pulse testing with graticule furnished. A magnifier for all sweep rates provides X5 and X25 expansion.
MAGNIFIER-SWEEP ACCURACY: X5 is within 3%; X25 is within 5%.

UNCALIBRATED SWEEP RATES
2-LINE and 2-FIELD displays respectively show two complete lines or fields with sync pulse at center of screen. MAGNIFIER will expand centered sync pulse X5 or X25 for detailed examination. See Fig. 5.

COLOR CAMERA YRGB AND RBG DISPLAYS
Can be used with color camera processing amplifiers providing these sequential signals and the staircase signal. To provide RBG display directly, switching is done in the color processing amplifier. Receptacle to interconnect color processing amplifier (relay control, staircase signal input, and ground) is provided on rear panel.

LINE SELECTOR
Variable delay over entire field.

FIELD SELECTOR
Positive-acting field selection. Noise impulses will not shift the field.

TRIGGER SELECTION
Stable triggering on composite video signals. INTERNAL: 200 mv to 1 volt or more, pk-to-pk. EXTERNAL: 250 mv to 1 volt or more, pk-to-pk.

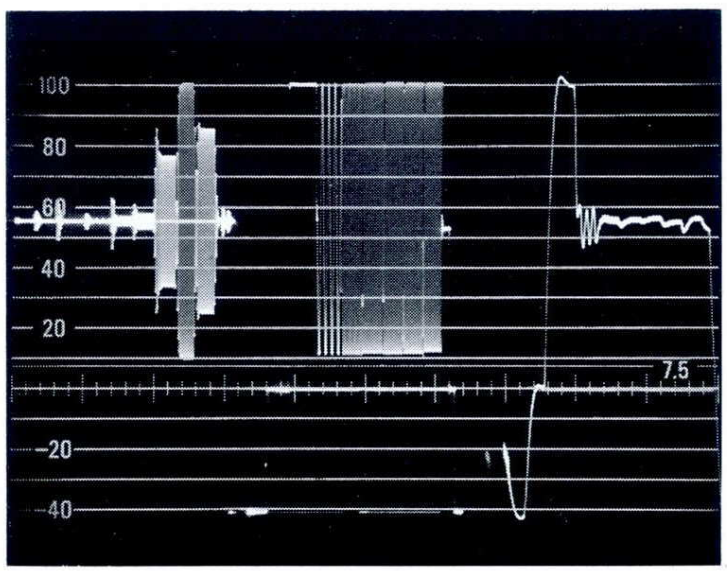


Fig. 1.—Multiburst Signal. Multiple exposure photograph. Left: High-pass response position. Center: Flat-frequency response position. Right: Low-pass response position.

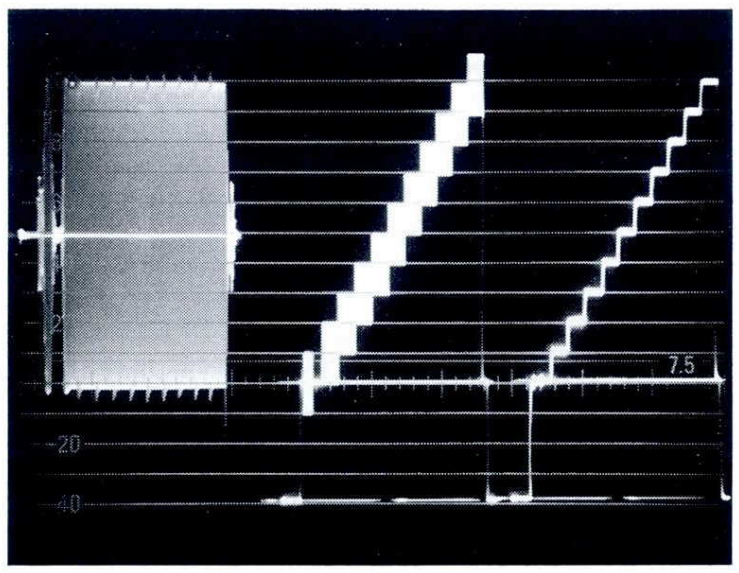


Fig. 2.—Modulated Stair-Step Signal. Multiple exposure. Left: High-pass position, showing gain increased to X5 for measuring differential gain. Center: Flat-response position. Stair-step signal shows 20 IEEE units of color sub-carrier. Right: IEEE response position showing sub-carrier substantially eliminated for accurate level measurements.

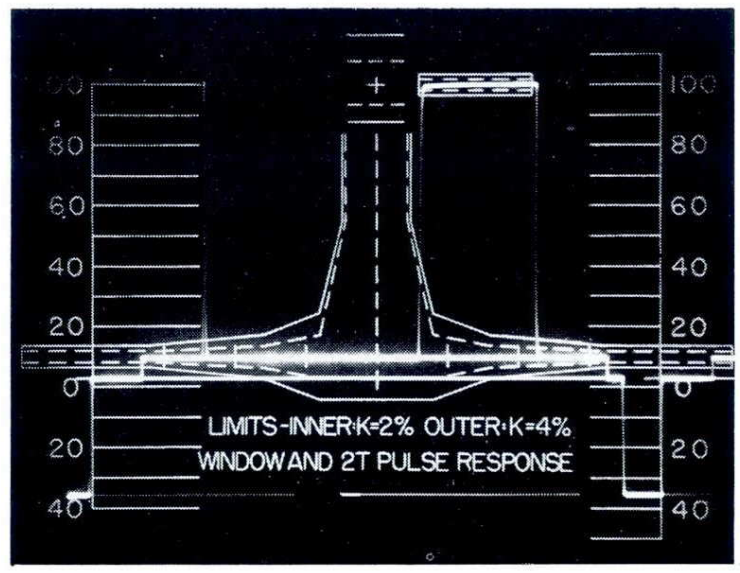


Fig. 3.—Sine² Pulse and Bar Signal. 0.125 μsec HAD T-Pulse and Bar.

RM529

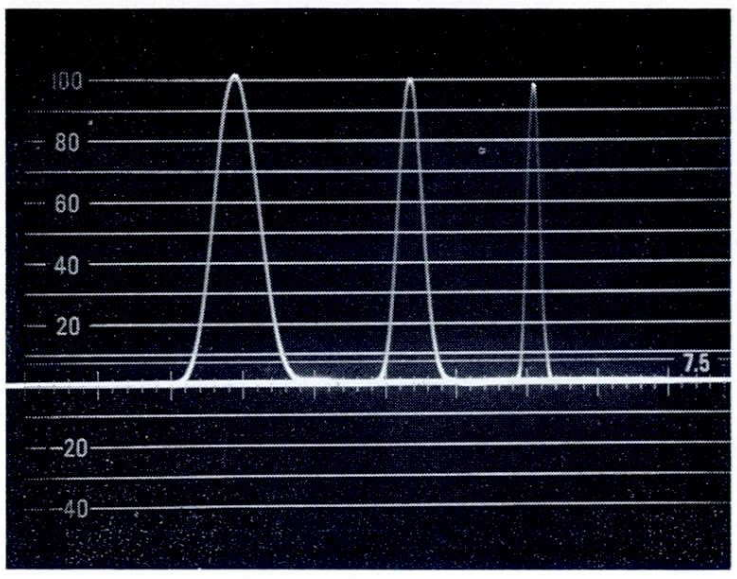


Fig. 4—2T Signal. Multiple exposure. Left: 2T. Center: T. Right: ½ T Sine² , 0.25, 0.125, 0.0625 μsec HAD.

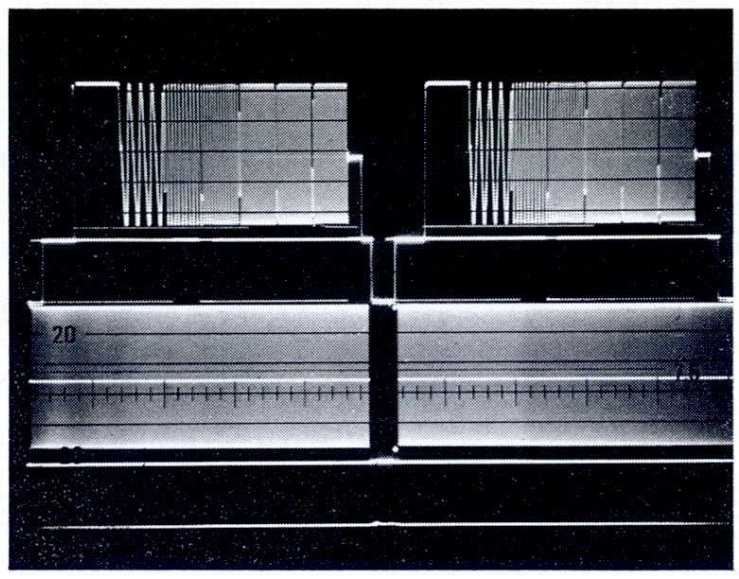


Fig. 5.—Double exposure showing complete two-field displays and two-line displays.

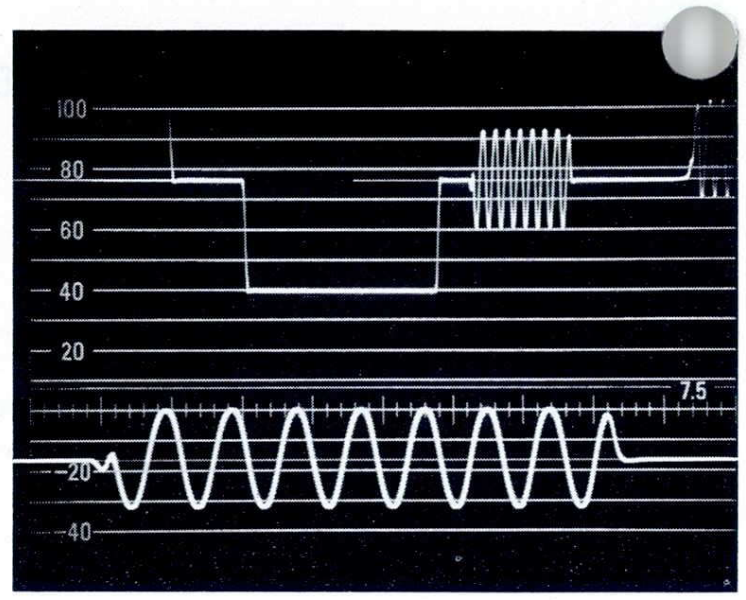


Fig. 6.—Color-Burst Signal. Double exposure. Top: X5 magnification. Horizontal display. 0.125 H/cm. Sweep: 0.025 H/cm. Bottom: X25 magnification. Horizontal display: 0.125 H/cm. Sweep: 0.005 H/cm.

OTHER FEATURES

REGULATED POWER SUPPLY

Operates on 115 v or 230 v line ±10% rms. LINE FREQUENCY: 50-60 cps. POWER CONSUMPTION: Approx. 80 w at 115 v, 60 cps.

TEKTRONIX CATHODE-RAY TUBE

Flat-faced, 5" rectangular crt, operating at 5.5 kv accelerating potential. Calibrated viewing area, 6 x 10 cm. Electrical beam rotator provides trace alignment. Standard phosphor furnished (P-31). Scale illumination: Variable edge-lighting.

CALIBRATOR

Two internal calibration voltages of 0.714 v and 1.00 v on 1-volt full-scale range of VERTICAL GAIN switch. An external calibration signal may be used. Internal calibration pulse amplitude ±1% over ambient temperature range and line-voltage range. Reference is a Zener diode.

MECHANICAL FEATURES

VENTILATION

Convection air-cooled. Operating Temperature Range: 0° C to +50° C.

CONSTRUCTION

Aluminum-alloy chassis.

FINISH

Anodized front panel.

DIMENSIONS

5¼" high x 19" wide x 20" deep overall. Fits standard 19" rack. Instrument can be pulled forward and tilted 90°.

NET WEIGHT

Approximately 27 lbs. Shipping weight: 57 lbs.

FOR 525 LINE, 30 FRAME TELEVISION STANDARDS, PLEASE ORDER TYPE RM529 WAVEFORM MONITOR $1100

Each instrument includes: 1—light filter, gray (378-0560-00); 1—graticule, composite: —50 to +110 IRE Scale (installed) (331-0156-00); 1—graticule, noncomposite: 0 to 100 IRE Scale (331-0077-00); 1—graticule, dual scale: —50 to +120 IRE and 0% to 100% Modulation Scales (331-0157-00); 1—graticule, Sine² pulse & bar 2% & 4% K factor for 0.125 μsec and 0.250 μsec HAD, also —50 to +100 IRE Scale (331-0161-00); 1—3 to 2-wire adapter (103-0013-00); 1—Pr. rack-mounting tracks (351-0040-00); 2—instruction manual (070-0466-00).

FOR 625 LINE, 25 FRAME TELEVISION STANDARDS, PLEASE ORDER TYPE RM529 MOD. 158E, CALIBRATED WITH CCIR SIGNALS $1100

HORIZONTAL DISPLAYS changed to: 2 FIELD, 2 LINE, 0.1 H/cm and 10 μsec/cm. LINE SELECTOR SWEEP RATES: 0.2 H/cm and 0.1 H/cm. CALIBRATION VOLTAGES: 0.700 and 1.00 v are provided. HIGH PASS RESPONSE: 4.43 mHz center frequency; bandpass ±0.4 mHz at —3 db. LINE VOLTAGE: Fused and wired for 230 v operation. Each instrument includes the same accessories listed above.

The RM529 can be adapted for use on other television system standards. Please consult with your Tektronix Field Engineer or Representative.

OPTIONAL ACCESSORIES

Filter, Mesh Assembly with Graticule Cover. Order Part No. 378-0575-00 . . . . . $15.00

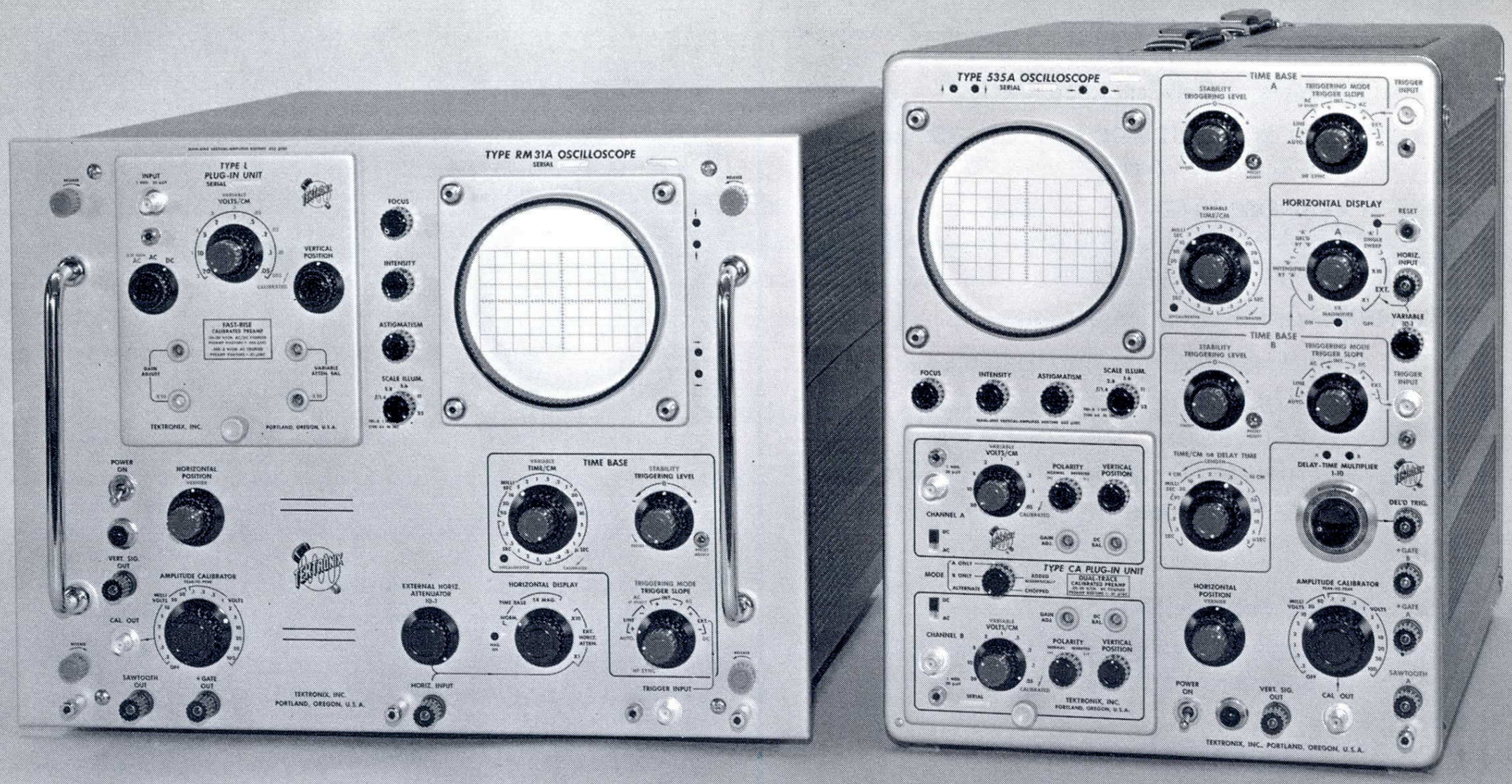
Graticule, Film, 7 cm HAD Sine², 2% and 4% K Factor, projected, Order Part No. 331-0161-00. . . . . $3.45

Connector. Use with color processing amplifiers for RBG, etc. displays. Order Part No. 134-0049-00 . . . . . $3.90

Camera Mounting Bezels. For Tektronix Cameras, see Cameras Section. For Fairchild and DuMont Cameras, order Part No. 014-0016-00 . . . . . $4.50

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-15 MC OSCILLOSCOPES Type RM31A 531A RM35A 535A



All information in color describes the additional capabilities of the Type 535A and RM35A Oscilloscopes.

HIGH INTENSITY TRACE

ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS

DELAYED SWEEP

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of Letter-Series, 1-Series, and Spectrum Analyzer Plug-In Units.

HORIZONTAL

CALIBRATED SWEEP RANGE—Time Base A: 0.1 μsec/cm to 5 sec/cm. Time Base B (In 535A only): 2 μsec/cm to 1 sec/cm.

SWEEP MAGNIFIER—5X, extends sweep range to 0.02 μsec/cm.

TRIGGER REQUIREMENTS—Internal: 2-mm deflection. External: 0.2 v to 10 v.

SINGLE SWEEP—(In 535A only) Time Base A.

CALIBRATED SWEEP DELAY—(In 535A only) 2 μsec to 10 sec, continuously variable.

EXTERNAL INPUT—0.2 v/cm to 15 v/cm; dc to 240 kc; 1 megohm, 47 pf.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—10 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR — 0.2 mv to 100 v, 1-kc square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 455 watts maximum for 531A, 550 watts maximum for 535A.

VERTICAL PLUG-IN UNITS

Frequency Specifications are at 3-db down

For Multiple-Trace Operation—

TYPE 1A1 DUAL-TRACE UNIT—DC to 15 MC, 23-nsec risetime at 50 mv/cm to 50 v/cm—DC to 14 Mc, 25-nsec risetime at 5 mv/cm, increasing to 15 Mc, 23-nsec risetime at 50 mv/cm.

TYPE 1A2 DUAL-TRACE UNIT—DC to 15 Mc, 23-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE C-A DUAL-TRACE UNIT—DC to 13.5 Mc, 26-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE M FOUR-TRACE UNIT—DC to 14 Mc, 25-nsec risetime at 20 mv/cm to 25 v/cm.

RM31A 531A
RM35A 535A

For Wide Band Applications—

TYPE B WIDE-BAND UNIT—DC to 14 Mc, 25-nsec risetime at 50 mv/cm to 50 v/cm—2 cps to 10 Mc, 35-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE K FAST-RISE UNIT—DC to 15 Mc, 23-nsec risetime at 50 mv/cm to 40 v/cm.

TYPE L FAST-RISE UNIT—DC to 15 Mc, 23-nsec risetime at 50 mv/cm to 40 v/cm—3 cps to 15 Mc, 23-nsec risetime at 5 mv/cm to 4 v/cm.

For Differential Input Applications—

TYPE D HIGH-GAIN UNIT—DC to 300 kc at 1 mv/cm, increasing to 2 Mc at 50 mv/cm.

TYPE E LOW-LEVEL UNIT—0.06 cps to 20 kc at 50 μv/cm, increasing to 60 kc at 0.5 mv/cm to 25 mv/cm.

TYPE G WIDE-BAND UNIT—DC to 14 Mc, 25-nsec risetime at 50 mv/cm to 50 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 11 Mc, 31-nsec risetime at 5 mv/cm to 50 v/cm.

For Spectrum Analysis—

TYPE L-SERIES UNITS—Present Units cover 1-10,400 Mc

For Operations of Integration, Differentiation, Function Generation, and Linear or Nonlinear Amplification—

TYPE O OPERATIONAL AMPLIFIER—DC to 14 Mc, 25-nsec risetime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μsec risetime at 10 μstrain/div to 10,000 μstrain/div.

For Transistor-Risetime Checking—

TYPE R UNIT—23-nsec risetime.

For Diode Recovery-Time Measurements—

TYPE S UNIT—23-nsec risetime

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE W DIFFERENTIAL COMPARATOR UNIT—DC to 13.5 Mc, at 50 mv/cm, decreasing to 7 Mc at 1 mv/cm. 26-nsec risetime at 50 mv/cm increasing to 50-nsec at 1 mv/cm.

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 10 Mc, 35-nsec risetime at 50 mv/cm to 25 v/cm.

For High-Frequency Sampling Applications—

TYPE 1S1 SAMPLING UNIT—350 psec risetime.

APPLICATIONS

In addition to the usual applications for highly versatile DC-to-15 Mc Oscilloscopes, sweep delay makes it possible to:

1. *Make accurate incremental measurements along a complex waveform.*
2. *Make accurate phase-angle measurements between two signals, up to frequencies of 1 Mc.*
3. *Display separate channels of a PTM system with effects of time jitter removed, determining pulse amplitude and shape under modulation conditions.*
4. *Measure pulse-to-pulse interval and amount of jitter on computer signals or any train of pulses.*
5. *Make accurate time-difference measurements between pulse-in and pulse-out through an amplifying system.*
6. *Display any selected individual line of a television composite signal.*
7. *Measure time displacement, wave-shape, and amplitude of individual channels in a telemetering system.*
8. *Utilize calibrated sweep magnification up to the highest practical limit.*

Plus many more-specialized applications.

VERTICAL-DEFLECTION SYSTEM

DC-Coupled Output Amplifier—The wide-band dc-coupled amplifier has a risetime of 23 nsec with a Type 1A1, 1A2, C-A, K, L, or R Unit plugged in. It is factory adjusted for optimum transient response.

HORIZONTAL-DEFLECTION SYSTEM

A Miller runup sweep generator is used in the Type 531A and Type 535A. Inverse feedback in the timing circuitry assures excellent linearity. Characteristics of the circuitry make possible the wide range of 0.02 μsec/cm to 12 sec/cm.

The Type 535A has two time-base generators. TIME BASE A is identical to the time-base generator in the Tektronix Type 531A. TIME BASE B functions as a delay generator. The signal to be observed can be displayed on either time base in the following ways: TIME BASE B normal, TIME BASE B with trace brightening during the period that TIME BASE A is running, TIME BASE A delayed by TIME BASE B, TIME BASE A normal, and TIME BASE A single sweep.

Calibrated Sweep Rates—Twenty-four direct-reading calibrated sweep rates are provided: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 μsec/cm, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 msec/cm, 0.1, 0.2, 0.5, 1, 2, 5 sec/cm. In addition, a vernier (uncalibrated) control provides for continous adjustment from 0.1 μsec/cm to approx. 12 sec/cm. An indicator light warns the operator when the sweep is uncalibrated. Calibration of the fixed sweep rates will typically be within 1% of full scale, and in all cases within 3%

TIME BASE B Calibrated Sweeps—Eighteen direct-reading calibrated steps are provided: 2, 5, 10, 20, 50 μsec/cm, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 msec/cm, 0.1, 0.2, 0.5, and 1 sec/cm. A sweep-length control adjusts the sweep length from 4 cm to 10 cm for the purpose of changing the sweep repetition rate. Variable sweep repetition rate makes TIME BASE B useful as a repetition-rate generator over the range of 0.1 cycle to 40 kc.

Single Sweep—(TIME BASE A only in Type 535A) A RESET pushbutton arms the sweep to fire on the next trigger to arrive. After firing once, the sweep is locked out and cannot fire again until rearmed by pressing the RESET button. The READY light indicates when the sweep is armed to fire on the next trigger.

Sweep Magnifier—5-x magnifier increases the calibrated sweep time to 0.02 μsec/cm. Sweep magnification is obtained by increasing the gain of the sweep output amplifier by a factor of five. The center 2 cm of the normal trace is expanded to fill the screen. Any one-fifth of the magnified sweep can be displayed on the screen by rotating the HORIZONTAL POSITION control. Accurate 5-x magnification is obtained on all ranges, for both time bases.

Triggering Facilities—Versatile triggering circuitry provides for complete manual control, preset stability control, and fully-automatic triggering. Triggering facilities are identical for both time bases, except that TIME BASE A has two additional modes: H.F. SYNC and AC LF (low-frequency) REJECT.

Amplitude-Level Selection—Adjustable amplitude-level and stability controls provide for triggering the sweep at a selected amplitude level on the triggering waveform. Triggering source can be internal, external, or the line frequency, either ac-coupled or dc-coupled. The triggering point can be on either the rising or falling slope of the triggering waveform.

Preset Stability—Same as above, except the stability control is preset to the optimum triggering point and requires no readjustment.

Automatic Triggering—Automatic level-seeking trigger circuit provides dependable triggering for most applications. One simple setting assures positive sweep-triggering by signals of widely differing amplitudes, shapes, and repetition rates. No trigger control need be touched until a different type of operation is desired. Range of automatic operation is between 60 cycles and 2 megacycles, approximately. In the absence of an input signal the sweep is automatically triggered at about a 50-cycle rate, providing a reference trace.

Low-Frequency Reject—(TIME BASE A only in Type 535A) Prevents low-frequency components, such as hum, from interfering with stable triggering.

High Frequency Sync—(TIME BASE A only in Type 535A) Assures a steady display of sine-wave signals up to approximately 30 megacycles. Requires a signal large enough to cause about 2 cm deflection, or an external signal of about 2 v.

Trigger Requirements—Internal Triggering—a signal large enough to cause 2-mm deflection. External triggering—a signal of 0.2 v to 10 v.

DC-Coupled Unblanking—DC coupling is provided for the unblanking waveforms, assuring uniform bias on the crt for all sweep times and repetition rates.

Horizontal Input Amplifier—DC-coupled external connection to the sweep-output amplifier is through a front-panel connector. Combination of a step attenuator and variable attenuator makes the horizontal deflection factor continuously variable from 0.2 v/cm to approximately 15 v/cm. Passband is dc to 240 kc or better at maximum gain. Input impedance is approximately 47 pf paralleled by 1 megohm.

SWEEP DELAY

Sweep delay for TIME BASE A over the range of 2 μsec to 10 sec is derived from TIME BASE B by means of a pick-off circuit. A delayed trigger is generated at the pick-off point, which can be adjusted to any point on the sawtooth waveform generated by TIME BASE B. The DELAY-TIME MULTIPLIER, a ten-turn calibrated control, is used in conjunction with the TIME/CM switch for TIME BASE B to select the pick-off point and indicate the amount of delay. Accuracy of the fifteen calibrated delay steps from 2 μsec to 0.1 sec is within 1%. Accuracy of the three remaining steps, 0.2, 0.5, and 1 sec is within 3%. For extreme accuracy any or all steps can be adjusted to an external standard. Incremental accuracy of the ten-turn control is within 0.2%

Triggered Operation—When the triggering controls of TIME BASE A are adjusted so that the delayed trigger from TIME BASE B arms the sweep but does not start it, the next signal to arrive will start the sweep. Thus the delayed sweep is actually started by the signal under observation, resulting in a steady display even when time jitter or time modulation is present in the signal.

Conventional Operation—When the triggering controls of TIME BASE A are adjusted to permit the delayed trigger to start the sweep, the delayed sweep starts precisely at the pick-off point, its start delayed the amount of time indicated by the TIME BASE B time/cm switch and the DELAY-TIME MULTIPLIER. Any time modulation or time jitter on the signal will be magnified in proportion to the amount of sweep expansion.

The time jitter in the delayed trigger or delayed sweep will not exceed one part in 20,000 of the maximum available delay interval (where the maximum available delay interval is 10 times the Time/Cm or Delay-Time setting).

Trace Brightening—When the signal is displayed on TIME BASE B with the HORIZONTAL DISPLAY switch in the "B" INTENSIFIED BY "A" position, the unblanking pulse of TIME BASE A is added to that of TIME BASE B. Therefore the period of operation of TIME BASE A appears as a brightened portion on the display. This trace brightening serves to indicate both the point-in-

RM 31A 531A
RM 35A 535A

time relationship between the delayed sweep and the original display, and the degree of magnification that will be achieved when the display is transferred to TIME BASE A.

OTHER CHARACTERISTICS

Amplitude Calibrator—A square-wave calibration voltage is available through a front-panel coaxial connector. Eighteen direct-reading fixed steps—0.2, 0.5, 1, 2, 5, 10, 20, 50 millivolts, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100 volts peak-to-peak are provided by the single knob control. Accuracy is within 3%. Square-wave frequency is approximately 1 kc.

Accelerating Potential—10-kv accelerating potential assures bright display when using fast sweeps at low repetition rates. The Tektronix cathode-ray tube is a 5" flat-faced metallized precision tube with a helical post-accelerating anode. For best results, a cathode-ray tube with a P2 phosphor is normally furnished.

Beam Position Indicators—Two pairs of indicator lights show direction of the electron beam when the spot is not on the screen.

Illuminated Graticule—For convenience in making time and amplitude measurements, the edge-lighted graticule has 6 x 10 centimeters marked in centimeter squares with centerline markings every 2 millimeters. Illumination is controlled by a front-panel knob.

Multi-Trace Blanking—A blanking voltage is available to eliminate switching transients from the display when a multiple-trace plug-in unit is operated in its chopped mode. The blanking voltage can be applied to the crt cathode by means of a switch located on the back panel of the instrument.

Output Waveforms—A 20-v positive gate of the same duration as the sweep and a 150-v sweep-sawtooth waveform are available at front-panel binding posts via cathode followers. A 20-v positive gate and the delayed trigger from TIME BASE B are also available at front-panel connectors. The vertical signal is brought out to a front-panel terminal, amplitude is approximately 1.5 v/cm of signal on screen.

Balanced Delay Network—Ample signal delay is provided by a balanced (push-pull) delay network to permit observation of the leading edge of the waveform that triggers the sweep.

Direct Input to CRT—An aperture in the side of the cabinet permits direct connection to the cathode-ray-tube deflection plates.

Access to Interior—Three-piece cabinet design provides easy access to the interior of the instrument. Cabinet sides are held in place by two quick-opening fasteners, and can be removed in a matter of seconds.

Probes—Two low capacitance probes (10-X atten.) are supplied with the instrument. Input capacitance is 7 pf with probes and either Type 531A - Type K or Type 535A - Type K combinations. Maximum deflection factor is 0.5 v/cm. Excellent transient response is retained, as the probes introduce no overshoot or ringing.

Power Requirement—Wired for 115 v, 50 to 60 cps, the electronically-regulated power supplies permit a line voltage variation between 103.5 and 126.5 v (115 v ±10%). Changing transformer taps permits operation at 108, 122, 216, 230, or 244 v regulated within 10%, each range. The Type 531A draws 455 watts maximum; the Type 535A draws 550 watts maximum. For 50 to 60 **and** 400 cps operation, a different fan must be installed (at extra cost). Order MODIFICATION 101M.

Cabinet Models—Type 531A and 535A dimensions are 16⅞" high by 13⅛" wide by 23⅞" deep. Type 531A net weight is 57¾ pounds; shipping weight is 78 pounds, approx. Type 535A net weight is 61½ pounds; shipping weight is 83 pounds, approx.

Rack-Mount Models—Type RM31A and RM35A cabinets mount to a standard 19" rack. They withdraw from the cabinet on slide-out tracks and can be tilted and locked in any of 7 positions for servicing convenience. Dimensions are 14" high by 19" wide by 22¾" deep. For further mounting information, refer to the Catalog instrument dimension page. Type RM31A net weight is 75 pounds; shipping weight is 101 pounds, approx. Type RM35A net weight is 78¼ pounds; shipping weight is 105 pounds, approx.

TYPE 531A, without plug-in units $995

Each instrument includes: 2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (012-0092-00); 2—Instruction Manual (070-0130-00).

TYPE 535A, without plug-in units $1400

Each instrument includes: 2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (012-0092-00); 2—Instruction Manual (070-0145-00).

TYPE RM31A, without plug-in units $1095

Each instrument includes: 2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18", (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (012-0092-00); 1—Set mounting hardware; 2—Instruction Manual (070-0301-00).

TYPE RM35A, without plug-in units $1500

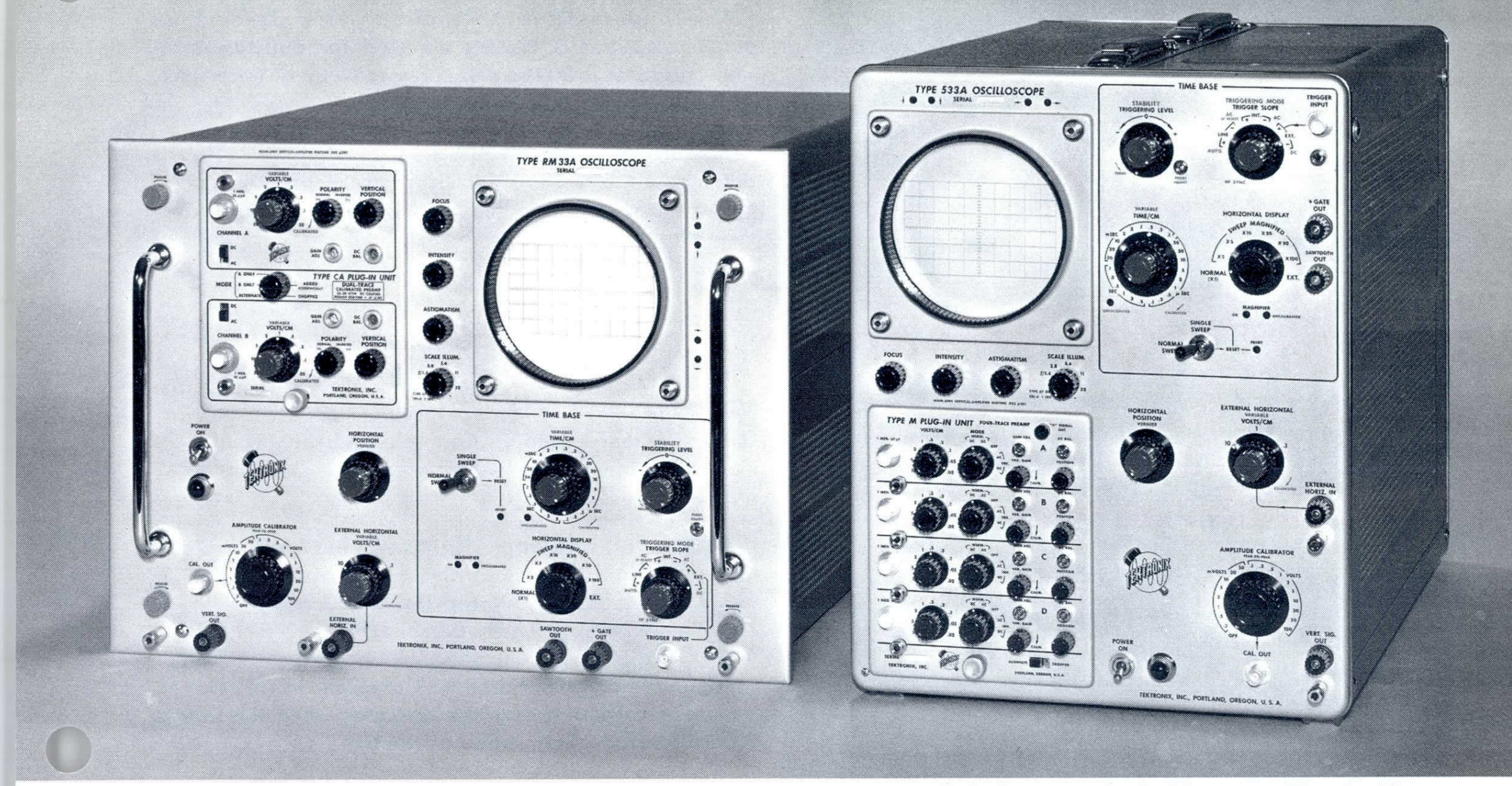
Each instrument includes: 2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18", (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (012-0092-00); 1—Set mounting hardware; 2—Instruction Manual (070-0306-00).

CUSTOM SPECIALS

Special modifications for the Type 531A, 535A and Rack Mount models are available as factory-installed options. Instruments can be ordered for operation from 50-400 cps in either normal or high-altitude environments, with single-sweep capability, or 12-kv accelerating potential. Consult your Field Engineer to learn about the advantages, limitations, and delivery time of these or other modified instruments.

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-15 MC OSCILLOSCOPE Type 533A / RM33A
with 100X MAGNIFIER



HIGH-INTENSITY TRACE

WIDE RANGE SWEEP MAGNIFICATION

ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of the 1-Series, Spectrum Analyzer, and all Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED SWEEP RANGE—0.1 μsec/cm to 5 sec/cm.

SWEEP MAGNIFIER—X2 to X100, extends sweep range, accurately, to 0.02 μsec/cm.

TRIGGER REQUIREMENTS—Internal: 2-mm deflection. External: 0.2 v to 10 v.

EXTERNAL INPUT—0.1 v/cm to 10 v/cm (calibrated) dc to 240 kc; 1 megohm, 47 pf.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—10 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v; 1-kc square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 500 watts max.

VERTICAL PLUG-IN UNITS

Frequency Specifications are at 3-db down

For Multiple-Trace Operation—

TYPE 1A1 DUAL-TRACE UNIT—DC to 15 Mc, 23-nsec risetime at 50 mv/cm to 50 v/cm—DC to 14 Mc, 25-nsec risetime at 5 mv/cm, increasing to 15 Mc, 23-nsec risetime at 50 mv/cm.

TYPE 1A2 DUAL-TRACE UNIT—DC to 15 Mc, 23-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE C-A DUAL-TRACE UNIT—DC to 13.5 Mc, 23-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE M FOUR-TRACE UNIT—DC to 14 Mc, 25-nsec rise-time at 20 mv/cm to 25 v/cm.

533A
RM33A

For Wide Band Applications—

TYPE B WIDE-BAND UNIT—DC to 14 Mc, 25-nsec risetime at 50 mv/cm to 50 v/cm—2 cps to 10 Mc, 35-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE K FAST-RISE UNIT—DC to 15 Mc, 23-nsec risetime at 50 mv/cm to 40 v/cm.

TYPE L FAST-RISE UNIT—DC to 15 Mc, 23-nsec risetime at 50 mv/cm to 40 v/cm—3 cps to 15 Mc, 23-nsec risetime at 5 mv/cm to 4 v/cm.

For Spectrum Analysis—

TYPE L-SERIES UNITS—Present units cover 1-10,400 Mc

For Differential Input Applications—

TYPE D HIGH-GAIN UNIT—DC to 300 kc at 1 mv/cm, increasing to 2 Mc at 50 mv/cm.

TYPE E LOW-LEVEL UNIT—0.06 cps to 20 kc at 50 μv/cm, increasing to 60 kc at 0.5 mv/cm to 25 mv/cm.

TYPE G WIDE-BAND UNIT—DC to 14 Mc, 25-nsec risetime at 50 mv/cm to 50 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 11 Mc, 31-nsec risetime at 5 mv/cm to 50 v/cm.

For Operations of Integration, Differentiation, Function Generation, and Linear or Nonlinear Amplification—

TYPE O OPERATIONAL AMPLIFIER—DC to 14 Mc, 25-nsec risetime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μsec risetime at 10 μstrain/div to 10,000 μstrain/div.

For Transistor Risetime Checking—

Type R Unit—23-nsec risetime.

For Diode Recovery-Time Measurements

Type S Unit—23-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE W DIFFERENTIAL COMPARATOR UNIT—DC to 13.5 Mc, at 50 mv/cm, decreasing to 7 Mc at 1 mv/cm. 26-nsec risetime at 50 mv/cm increasing to 50 nsec at 1 mv/cm.

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 10 Mc, 35-nsec risetime at 50 mv/cm to 25 v/cm.

For High-Frequency Sampling Applications—

TYPE 1S1 SAMPLING UNIT—350 psec risetime.

The Type 533A is a dc-to-15 mc oscilloscope with wide range of application coverage through versatile Tektronix Plug-In Units. Six different degrees of sweep magnification are available. Sweep lockout and high writing rate are combined for best results in one-shot recording.

Operating convenience results from functionally-grouped controls, a single-knob direct-reading sweep selector, and fiddle-free triggering settings. Other useful features are warning lights for uncalibrated sweep-rate and sweep-magnifier settings, beam-position indicators, and built-in blanking for switching transients in multi-trace operation.

VERTICAL-DEFLECTION SYSTEM

DC-Coupled Output Amplifier—The dc-to-15 mc output amplifier is factory adjusted for optimum transient response. Risetime is 23 nsec with a Type 1A1, 1A2, C-A, K, L, or R Unit plugged in.

Balanced Delay Network—Ample signal delay is provided by a balanced (push-pull) delay network to permit observation of the leading edge of the waveform that triggers the sweep.

HORIZONTAL-DEFLECTION SYSTEM

A Miller runup type sweep generator is used in the Type 533A. Inverse feedback in the timing circuitry assures excellent linearity. Characteristics of this circuitry make possible the wide range of 0.02 μsec/cm to 12 sec/cm.

Calibrated Sweep Rates—Twenty-four direct-reading calibrated sweep rates are provided: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 μsec/cm, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 msec/cm, 0.1, 0.2, 0.5, 1, 2, 5 sec/cm. In addition, a vernier (uncalibrated) control provides for continuous adjustment from 0.1 μsec/cm to 12 sec/cm. An indicator light warns the operator when the sweep is uncalibrated. Calibration of the fixed sweeps is within 3%.

Sweep Magnifier—Six degrees of sweep magnification are provided: 2, 5, 10, 20, 50, and 100 times. Any ten centimeters of a magnified sweep can be displayed. When the magnified sweep does not exceed the maximum calibrated rate of 0.02 μsec/cm, accuracy is within 5% of the displayed portion. An indicator light warns the operator when the maximum calibrated rate is being exceeded.

Single-Sweep Operation—Lockout-reset circuitry provides for one-shot recording. After a single sweep is triggered, the sweep circuit is automatically locked out until manually reset. When reset, the sweep will fire on the next trigger received, then automatically lock out until the operator activates the RESET lever.

Triggering Facilities—Versatile triggering circuitry provides for complete manual control, preset stability control, and fully-automatic triggering.

Amplitude-Level Selection—Adjustable amplitude-level and stability controls provide for triggering the sweep at a selected amplitude level on the triggering waveform. Triggering source can be internal, external or the line frequency, either ac-coupled or dc-coupled. The triggering point can be on either the rising or falling slope of the triggering waveform.

Preset Stability—Same as above, except the stability control is preset to the optimum triggering point and requires no readjustment.

Automatic Triggering—Automatic level-seeking trigger circuit provides dependable triggering for most applications. One simple setting assures positive sweep-triggering by signals of widely differing amplitudes, shapes, and repetition rates. No trigger control need be touched until a different type of operation is desired. Range of automatic operation is between 60 cycles and 2 megacycles, approximately. In the absence of an input signal the sweep is automatically triggered at about a 50-cycle rate, providing a reference trace on the screen.

Low Frequency Reject—Prevents low-frequency components, such as hum, from interfering with stable triggering.

High-Frequency Sync—Assures a steady display of sine-wave signals up to approximately 30 megacycles. Requires a signal large enough to cause about 2 cm of deflection, or an external signal of about 2 v.

Trigger Requirements—Internal triggering—a signal large enough to cause 2-mm deflection. External triggering—a signal of 0.2 v to 10 v.

DC-Coupled Unblanking—DC coupling is provided for the unblanking waveform, assuring uniform bias on the cathode-ray tube for all sweep times and repetition rates.

Horizontal Input—An external signal can be applied to the horizontal deflection plates through the dc-coupled horizontal amplifier via a front-panel connector. Three calibrated sensitivity steps are provided: 0.1, 1, and 10 v/cm. A variable control provides for continuous adjustment from 0.1 to approximately 100 v/cm. Horizontal amplifier passband is dc to 500 kc or better at maximum gain. Input impedance is approximately 1 megohm paralleled by 45 pf.

OTHER CHARACTERISTICS

Amplitude Calibrator—A square-wave calibration voltage is available through a front-panel connector. Eighteen fixed steps— 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100 millivolts, 0.2, 0.5, 1, 2, 5, 10, 20, 50 and 100 volts peak-to-peak are provided. Accuracy is within 3%. Square-wave frequency is approximately 1 kc.

Accelerating Potential—10-kv accelerating potential assures bright display when using fast sweeps at low repetition rates, and in single-sweep applications. The Tektronix cathode-ray tube is a 5" flat-faced metallized precision tube with helical post-accelerating anode. For best results over a wide sweep range of the Type 533A, a P2 phosphor is normally furnished.

Illuminated Graticule—For convenience in making time and amplitude measurements, the edge-lighted graticule has 6 x 10 centimeters marked in centimeter squares with centerline markings every 2 millimeters. Illumination is controlled by a front-panel knob.

Beam-Position Indicators—Two pairs of indicator lights show direction of the electron beam when the spot is not on the screen.

Multi-Trace Blanking—A blanking voltage is available to eliminate switching transients from the display when a multiple-trace plug-in unit is operated in its chopped mode. The blanking voltage can be applied to the crt cathode by means of a switch located on the back panel of the instrument.

Output Waveforms—A 20-v positive gate of the same duration as the sweep and a 150-v sweep-sawtooth waveform are available at front-panel binding posts via cathode followers. The vertical signal is brought out to a front-panel terminal, amplitude is approximately 1.5 v/cm of signal on screen.

Direct Input To CRT—An opening in the side of the cabinet permits direct connection to the cathode-ray tube deflection plates.

Probes—Two low capacitance probes (10-X atten.) are supplied with the instrument. Input capacitance of the Type 533A - Type K combination with probes, 7 pf; maximum deflection factor is 0.5 v/cm. Excellent transient response is retained, as the probes introduce no overshoot or ringing.

Power Requirement—Wired for 115 v, 50 to 60 cps, the electronically-regulated power supplies permit a line-voltage variation between 103.5 and 126.5 v (115 v ±10%). Changing transformer taps permits operation at 108, 122, 216, 230, or 244 v, regulated within 10%, each range. The Type 533A draws 455 watts, maximum. For 50 to 60 **and** 400 cps operation, a different fan must be installed (at extra cost). Order MODIFICATION 101M.

Cabinet Model—Type 533A dimensions are 16⅞" high by 13⅛" wide by 23⅞" deep. Net weight is 62¼ pounds. Shipping weight is 78 pounds, approx.

Rack-Mount Model—Type RM33A cabinet mounts to a standard 19" rack. It withdraws from the cabinet on slide-out tracks and can be tilted and locked in any of 7 positions for servicing convenience. Dimensions are 14" high by 19" wide by 22¾" deep. For further mounting information, refer to the Catalog instrument dimension page. Net weight is 74½ pounds, approx. Shipping weight is 100 pounds, approx.

TYPE 533A, without plug-in units $1125

Each instrument includes: 2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0258-00).

TYPE RM33A, without plug-in units $1225

Each instrument includes: 2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 1—Set mounting hardware; 2—Instruction Manual (070-0303-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 536 DC-to-10 MC X-Y OSCILLOSCOPE

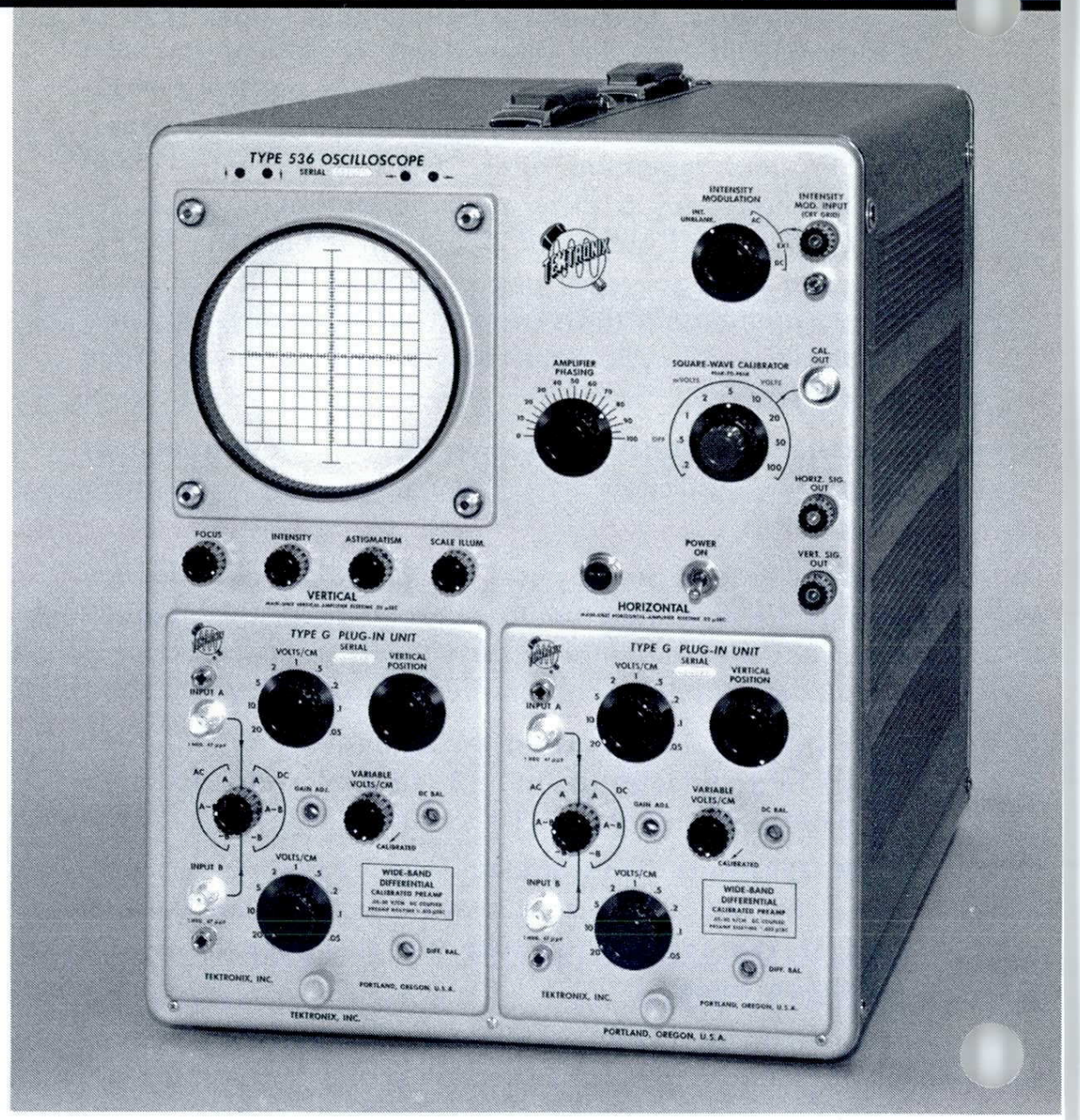
ACCURATE PHASE BALANCE

WIDE BAND "X-Y" DISPLAY

ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS

The Type 536 represents a combination of wide-band "X-Y" and general-purpose laboratory oscilloscopes. Identical main amplifiers and a Tektronix crt with equal X and Y deflection characteristics are the basic components. Using identical wide-band Plug-In Units, horizontal and vertical deflection systems are almost identical. Relative phase shift is less than 1° to 15 Mc, and phase balance can be obtained at any frequency to over 25 Mc.

With the Type T utilized in the horizontal deflection, and a Type 1A1, 1A2, or Letter-Series units in the vertical, the Type 536 functions as a general-purpose instrument. In order to view the leading edge of a fast-rising waveform, a pre-trigger signal occurring approx. 0.2 μsec in advance of the signal to be viewed must be applied to the external trigger input of the Type T Unit.



APPLICATIONS

In curve-tracing applications the Type 536 extends the range of familiar techniques to today's higher-frequency problems. Differential input, a feature that eliminates the need for a common XY terminal, is available in the wide-band Type G Plug-In Preamplifier. A pair of Type G Units provide accuracy needed in many curve-tracing applications.

Some applications for a wide-band "X-Y" oscilloscope:

1. Examination of semiconductor diode characteristics—volts vs. amperes plot.
2. Determination of ferromagnetic material characteristics.
3. Linear amplifier distortion measurement.
4. Limiting or expanding-amplifier performance measurements.
5. Displaying pressure vs. volume diagrams.
6. Analyzing amplitude selector type circuits such as Schmitt, diode pick-off, etc.
7. Checking regulated power supply performance.
8. Measurement of voltage coefficient of resistors.
9. Performance tests of various modulation systems such as AM, suppressed carrier, FM, PTM, PAM, etc.
10. Performance tests of demodulators for above modulation systems.
11. Determining gating circuit characteristics.
12. Function generator — $y = f(x)$.

CHARACTERISTIC SUMMARY
VERTICAL AND HORIZONTAL

Both vertical and horizontal deflection characteristics extremely flexible through use of the 1-Series, Spectrum Analyzer, and all Letter-Series Plug-In Units.

TIME-BASE DEFLECTION
(with Type T TIME-BASE GENERATOR)

CALIBRATED SWEEP RANGE—0.2 μsec/div to 2 sec/div.

SWEEP MAGNIFIER—5X, extends sweep range to 0.04 μsec/div.

TRIGGER REQUIREMENT—0.2 v to 10 v.

CRT

DISPLAY AREA—10 x 10 divisions (3-⅛ x 3-⅛ inches).

ACCELERATING VOLTAGE—4 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v; 1 kc square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v; typically 625 watts, with two Type K Units.

PRINTED IN U.S.A.

AMPLIFIER PLUG-IN UNITS

Frequency Specifications are at 3-db down

Type 1A1—DC to 11 mc, 31 nsec at 0.05 v/div to 50 v/div . . . . . dc to 10.5 mc, 33 nsec at 0.005 v/div, increasing to 11 mc, 31 nsec at 0.05 v/div.

Type 1A2—DC to 11 mc, 31 nsec at 0.05 v/div to 50 v/div.

Type B—DC to 10 mc, 35 nsec at 0.05 v/div to 50 v/div. . . .2 cycles to 9 mc, 0.04 μsec at 5 mv/div to 0.05 v/div.

Type C-A—DC to 10 mc, 35 nsec.

Type D—DC to 300 kc at 1 mv/div, increasing to 2 mc at 50 mv/div, 0.18 μsec.

Type E—0.06 cycles to 20 kc, increasing to 60 kc at 0.5 mv/cm.

Type G—DC to 10 mc, 35 nsec.

Type H—DC to 9.5 mc, 37 nsec.

Type K—DC to 11 mc, 31 nsec.

Type L—DC to 11 mc, 31 nsec at 0.05 to 40 v/div . . . .3 cycles to 10 mc, 35 nsec at 0.005 to 4 v/div.

Type M—DC to 10 mc, 35 nsec.

For operations of integration, differentiation, function generation, and linear or nonlinear amplification—

Type O—DC to 10 mc, 35 nsec.

For transducer and strain gage applications—

Type Q—Sensitivity 10 microstrain/div., dc to 6 kc.

For precise amplitude measurements via the slide-back technique—Type W and Type Z Units.

ADDITIONAL PLUG-IN UNITS

Type T—Must be plugged into horizontal for conventional operation. Specifications of horizontal-deflection system with Type T Unit:

Calibrated Sweep Rates—Twenty-two sweep rates from 0.2 μsec/div to 2 sec/div.

5-x Sweep Magnifier—Increases calibrated sweep rate to 0.04 μsec/div.

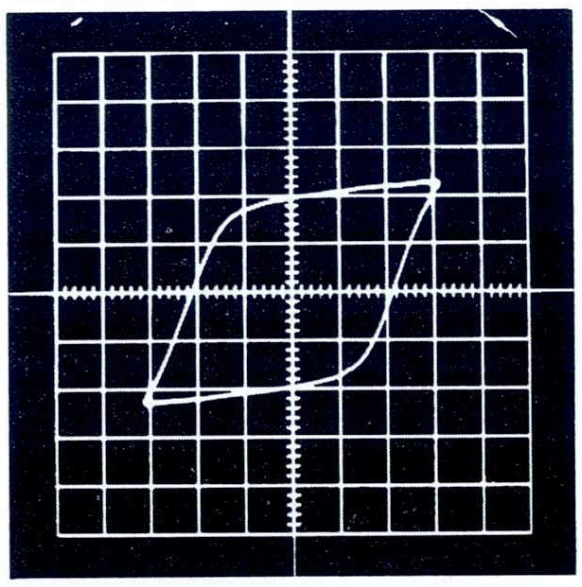
Versatile Trigger Selection—Positive or negative slope, external or line voltage, ac-coupling or dc-coupling through triggering circuits.

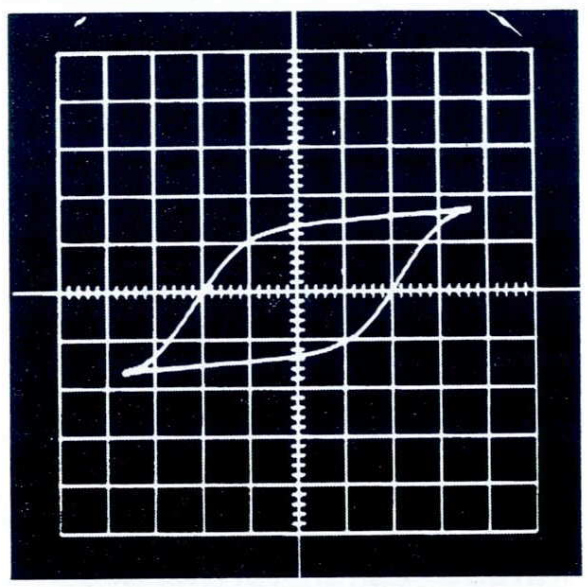
Amplitude-Level Selection—With preset or manual stability control.

Automatic Triggering—No trigger control adjustment necessary for trigger signals between 60 cps and approx. 2 mc.

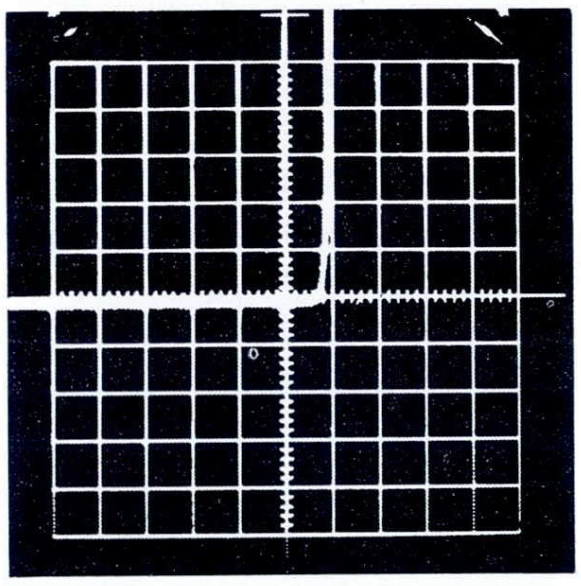
High-Frequency Sync—Synchronizes with sine-wave signals in frequency range of 5 mc to 15 mc.

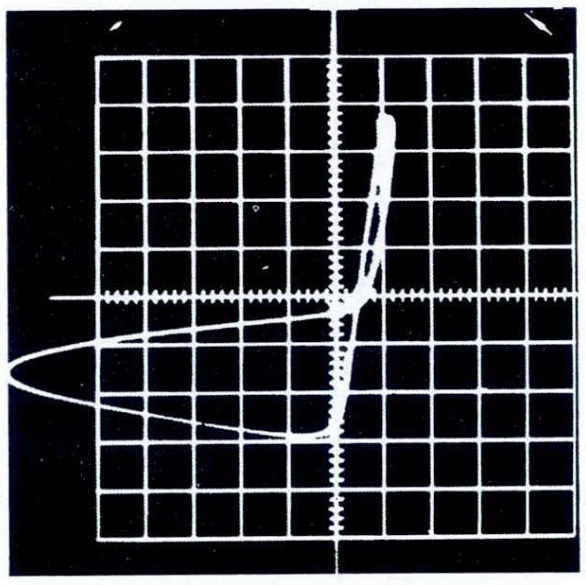
Please refer to the description of the Type T Time-Base Generator for complete characteristics.





Ferrite bead characteristics at two different temperatures—left, at 25°C; right, at equilibrium temperature due to self heating. Type 536 with two Type G Units, driving frequency 1 mc.





High-condition diffused silicon diode characteristics—left, at 60 cycles; right, at 2 mc. Type 536 with two Type G Units, horizontal calibration 1 v/div; vertical calibration 100 ma/div;

536

Type R Plug-In, for transistor risetime measurements, and Type S Plug-In, for diode-recovery measurements, are electrically compatible with the Type 536, but because of the matched X-Y delay of the instrument (no vertical system delay line) and its 35-nsec amplifier risetime, utility of these plug-ins is severely restricted.

For Spectrum Analysis—
Type L-Series Units—Present Units cover 1-10,400 Mc.

For High-Frequency Sampling Applications—
Type 1S1 Sampling Unit—350-psec risetime.

VERTICAL AND HORIZONTAL DEFLECTION SYSTEMS

All characteristics of the horizontal deflection systems are identical to those of the vertical deflection system when identical Plug-In Units are used. Both main amplifiers have excellent transient response. Following are typical specifications using the K and G Units. (All specifications are valid providing amplifiers are not overdriven by input signal).

Type 536 used with Type K Units: RISETIME—31 nsec. PASSBAND—dc to 11 Mc. RELATIVE PHASE-SHIFT—less than 1 degree from dc to 15 Mc. PHASE-SHIFT BALANCE—obtainable at any frequency to 30 Mc, using the front-panel Amplifier Phasing Control.

Type 536 used with Type G Units: RISETIME—35 nsec. PASSBAND—dc to 10 Mc. RELATIVE PHASE SHIFT—less than one degree to 15 Mc, less than two degrees to 17 Mc, less than five degrees to 23 Mc. PHASE-SHIFT BALANCE—obtainable at any frequency to over 25 Mc.

Following are applicable to both K and G Units used with Type 536: DEFLECTION FACTORS—0.05 v/div max, 9 calibrated steps from 0.05 v/div to 20 v/div; continuously variable adjustment between steps. DEFLECTION CAPABILITY—five divisions of deflection can be obtained at 20 Mc without overdriving the input amplifiers.

OTHER CHARACTERISTICS

Amplitude Calibrator—A square-wave voltage is available through a front-panel coaxial connector. Eighteen fixed voltage steps—0.2, 0.5, 1, 2, 5, 10, 20, 50, 100 millivolts, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 volts peak-to-peak are provided. Accuracy is within 3%. Square-wave frequency is approximately 1 kc.

Cathode-Ray Tube—A Tektronix cathode-ray tube provides a 10-by-10 division (3⅛" x 3⅛") viewing area. Deflection factor is approximately the same for both horizontal and vertical deflection plates. Accelerating potential is approx. 4 kv. For best results over the wide sweep range, a P31 phosphor is normally supplied.

Beam-Position Indicators—Two pairs of indicator lights show direction of the electron beam when the spot is not on the screen.

Output Waveforms—The vertical and horizontal signals are brought out to front-panel terminals for external applications. Output signals are dc coupled and are nominally one volt per division of deflection on crt face.

Intensity Modulation—A front-panel switch selects the desired method of intensity modulation . . . internal dc-coupled unblanking (for T unit) or external ac-coupling or dc-coupling to the crt grid. The visually perceptible input level is typically 1 v. Positive 20 v signal will provide complete "black to white" unblanking.

Illuminated Graticule—The edge-lighted graticule is marked in 10 by 10 divisions (3⅛ by 3⅛ inches total area), with centerlines marked every one-fifth of a division. Illumination is controlled by a front-panel knob.

Probes—Two low capacitance probes (10-X atten.) are supplied with the instrument. Input capacitance of the Type 536 - Type K combination with probes is 7 pf, maximum deflection factor is 0.5 v/cm. Excellent transient response is retained, as the probes introduce no overshoot or ringing.

Power Requirement—Wired for 115 v, 50 to 60 cps, the electronically-regulated power supplies permit a line voltage variation between 103.5 and 126.5 v (115 v ±10%). Changing transformer taps permits operation at 108, 122, 216, 230, or 244 v, regulated within 10%, each range. The Type 536 draws 625 watts, typically, with two Type K Units. For 50 to 60 **and** 400 cps operation, a different fan must be installed (at extra cost). Order MODIFICATION 101M.

Mechanical Specifications—Dimensions are 16⅞" high by 13⅛" wide by 23⅞" deep. Net weight is 55¾ pounds. Shipping weight is 76 pounds, approx.

TYPE 536, without plug-in units $1085

2—P6006 probe (010-0127-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Graticule (331-0057-00); 1—Green filter (378-0514-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0270-00).

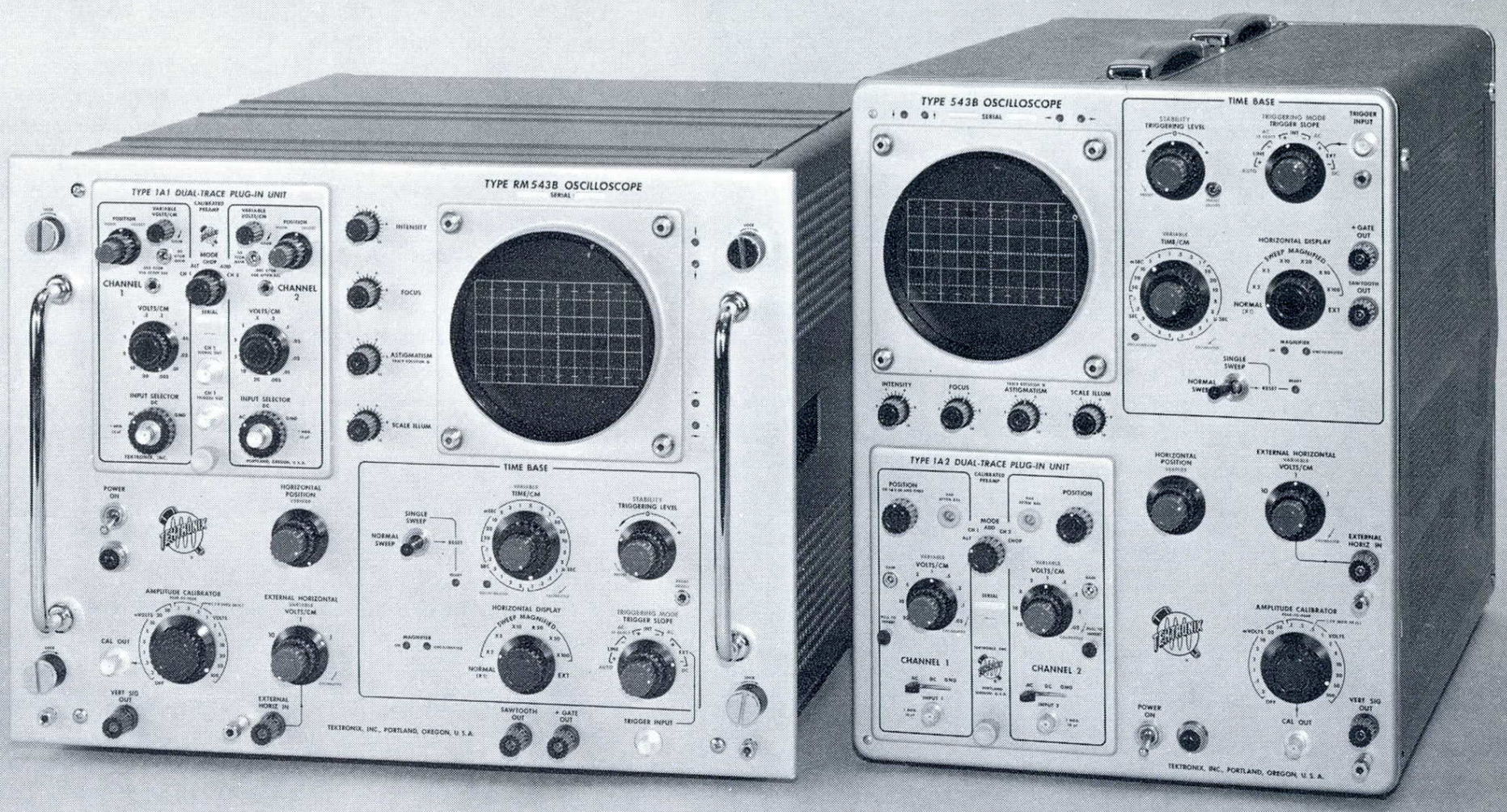
Rack Mount Adapter

A cradle mount to adapt the Type 536 Oscilloscope for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Tektronix blue vinyl finish. Rack height requirements 17½".

Order Part Number 040-0281-00 . . . . . $45

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-33 MC OSCILLOSCOPE Type 543B / RM 543B
with 100X MAGNIFIER



ILLUMINATED NO-PARALLAX GRATICULE

SIMPLIFIED VERTICAL AMPLIFIER

PUSH-PULL DELAY CABLE (NO ADJUSTMENTS)

FULL-PASSBAND TRIGGERING

ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS

DUAL-TRACE, DC-TO-33 MC PERFORMANCE WITH TYPES 1A1 AND 1A2 PLUG-IN UNITS

The Type 543B Oscilloscope is a versatile laboratory instrument designed for use with all Tektronix 1-Series, Letter-Series, and Spectrum Analyzer Plug-In Units.

CHARACTERISTIC SUMMARY
VERTICAL

Vertical deflection characteristics extremely flexible through use of all 1-Series, Letter-Series, or Spectrum Analyzer Plug-In Units.

HORIZONTAL

CALIBRATED SWEEP RANGE—0.1 μsec/cm to 5 sec/cm.
SWEEP MAGNIFIER—X2 to X100, extends calibrated sweep range to 0.02 μsec/cm.
TRIGGER REQUIREMENTS—Internal: Less than 1-cm deflection to 30 Mc.
External: 0.2 v to 10 Mc, 1 v at 30 Mc.

EXTERNAL INPUT—0.1 to 10 v/cm. DC to 500 kc; 1 megohm, 55 pf.

CRT

ILLUMINATED NO-PARALLAX GRATICULE
DISPLAY AREA—6 x 10 cm.
ACCELERATING VOLTAGE—10 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v; 1-kc square wave.
POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 v (±10% on each range,) 600 watts maximum.

VERTICAL PLUG-IN UNITS

For Multiple-Trace Operation—

TYPE 1A1 DUAL-TRACE UNIT—DC to 33 Mc, 10.5 nsec risetime at 50 mv/cm to 50 v/cm—DC to 23 Mc, 15-nsec risetime at 5 mv/cm to 50 mv/cm.
TYPE 1A2 DUAL-TRACE UNIT—DC to 33 Mc, 10.5-nsec risetime at 50 mv/cm to 50 v/cm.
TYPE C-A DUAL-TRACE UNIT—DC to 24 Mc, 15-nsec risetime at 50 mv/cm to 50 v/cm.
TYPE M FOUR-TRACE UNIT-DC to 20 Mc, 17-nsec risetime at 20 mv/cm to 25 v/cm.

For Differential Input Applications—

TYPE D HIGH-GAIN UNIT—DC to 300 kc at 1 mv/cm, increasing to 2 Mc at 50 mv/cm.
TYPE E LOW-LEVEL UNIT—0.06 cps to 20 kc at 50 μv/cm, increasing to 60 kc at 0.5 mv/cm to 25 mv/cm.
TYPE G WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm.

543B
RM543B

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 15 Mc, 23-nsec risetime at 5 mv/cm to 50 v/cm.

For Wide Band Applications—

TYPE B WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm—2 cps to 12 Mc, 30-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE K FAST-RISE UNIT-DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm.

TYPE L FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm—3 cps to 24 Mc, 15-nsec risetime at 5 mv/cm to 4 v/cm.

For Spectrum Analysis—

TYPE L-SERIES UNITS—Present Units cover 1-10,400 Mc.

For Operations of Integration, Differentiation, Function Generation, and Linear or Nonlinear Amplification—

TYPE O OPERATIONAL AMPLIFIER—DC to 25 Mc, 14-nsec riestime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μsec risetime at 10 μstrain/div. to 10,000 μstrain/div.

For Transistor-Risetime Checking—

TYPE R UNIT-12-nsec risetime.

For Diode Recovery-Time Measurements—

TYPE S UNIT-12-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE W DIFFERENTIAL COMPARATOR UNIT—DC to 23 Mc, at 50 mv/cm, decreasing to 8 Mc at 1 mv/cm. 15-nsec risetime at 50 mv/cm increasing to 44-nsec at 1 mv/cm.

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27-nsec risetime at 50 mv/cm to 25 v/cm.

For High-Frequency Sampling Applications—

TYPE 1S1 SAMPLING UNIT—350 psec risetime.

VERTICAL-DEFLECTION SYSTEM

FREQUENCY RESPONSE with these Plug-in Units extends from dc to 30 Mc, depending on the unit used. Specialized Plug-In Units adapt the 543B to strain-gage, operational-amplifier, multi-channel, spectrum analysis and other applications. Dual-Trace dc-to-33 Mc displays at 50 mv/cm are achieved with either the Type 1A1, or Type 1A2 Plug-In Units. The Type 1A1 offers 5 mv/cm sensitivity from dc to 23 Mc plus triggering from channel 1 signal for dual-trace applications.

SIGNAL DELAY permits observation of the leading edge of the waveform that triggers the sweep. The specially-braided 200-nsec delay cable requires no tuning.

SIGNAL OUTPUT from the front panel provides 1.2 volts or more for each centimeter of displayed signal.

HORIZONTAL-DEFLECTION SYSTEM

SWEEP RANGE from 0.1 μsec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence, accuracy within ±3%. Sweep rates are also continuously variable uncalibrated between steps and to approximately 12 sec/cm. A front-panel lamp indicates uncalibrated sweep rates.

X2 to X100 SWEEP MAGNIFIER expands the center portion of a displayed signal so that it covers a full 10 centimeters. Magnified sweep accuracy is ±5% up to the fastest calibrated rate of 20 nsec/cm. An indicator light warns the operator when the maximum calibrated rate is exceeded.

SINGLE-SWEEP OPERATION facilitates photographic recording of waveforms. The front-panel reset control arms the sweep to fire on the next received trigger. After firing once, the sweep is locked out until reset. A lamp indicates when the time base is ready to fire.

EXTERNAL HORIZONTAL INPUT provides for horizontal beam deflection with an external source. Horizontal Amplifier passband is dc to at least 500 kc (3-db down). Sensitivity is 0.1, 1, or 10 v/cm with step attenuation. Sensitivity can also be reduced by at least 10:1 with variable attenuation. Input impedance is 1 megohm paralleled by approximately 45 pf.

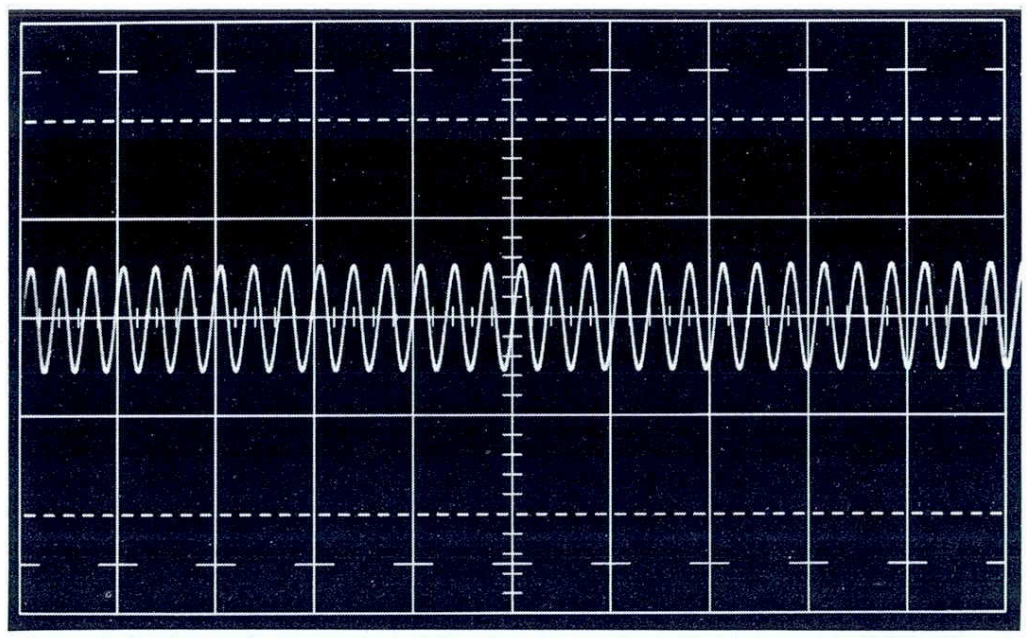
FRONT PANEL OUTPUTS include a +Gate (0 to at least +20 volts), and a sawtooth (typically 0 to at least +130 volts), from the time base.

CRT AND DISPLAY FEATURES

The Tektronix Type 543B uses a T5470 crt which is a new flat-faced tube with electrostatic focus and deflection, and a helical post accelerator operated at a 10-kv total potential. A longer envelope, careful gun design, and a low 5:1 post-to-gun accelerating-voltage ratio provide several characteristics which contribute directly to the many advanced performance features achieved in the Type 543B.

The crt produces a small 9-mil nominal spot diameter at 2-μa beam current (2-μa provides a bright display under average ambient light for repetitive signals even at high sweep-rates). Focus of the spot is very uniform over the full 6 x 10-cm viewing area. In flat-faced electrostatically-focused tubes, the spot size varies most at the ends of the horizontal axis. In the T5470, a centered 9-mil spot measures no more than 12 mils at either end; a change ratio of only 1:1.3 compared with a typical change of 1:4 in comparable crt's operated at 10 kv. Even with 6 cm of vertical scan, high deflection sensitivity is maintained, deflection-plate input capacity is low, and linearity and overall pattern geometry is superior. P31 phosphor is standard.

INTERNAL 6 x 10-CM GRATICULE with variable edge-lighting provides a no-parallax display for viewing or for photographic recording. The graticule is marked in centimeter squares with 2-mm divisions on the vertical and horizontal center lines. Two special horizontal lines have been added to the graticule for convenience in making accurate risetime measurements.



Small spot size and uniform focus provide fine trace definition across the entire 6 x 10-cm viewing area. Risetime and falltime measurements (10 to 90%) are easily made using the dashed graticule lines. A 30-Mc sine wave (internally triggered) is displayed.

FRONT-PANEL CONTROLS include trace rotation (a screwdriver adjustment), intensity, focus, and astigmatism.

DC-COUPLED UNBLANKING to the crt grid assures uniform beam current for all sweep speeds and repetition rates at any setting of the intensity control.

BEAM-POSITION INDICATORS show the direction of the crt beam when it is deflected from the center-screen area.

Z-AXIS INPUT through a terminal at the rear of the instrument permits external modulation of the crt cathode. The input is ac coupled and requires approximately 15 volts, peak-to-peak for visible modulation.

TRIGGER

	TRIGGER MODE	TRIGGER REQUIREMENTS
INTERNAL	AC	2-mm deflection from 150 cps to 10 Mc, increasing to 1 cm at 30 Mc. Will trigger below 150 cps with increased deflection.
	AC LF REJECT	2-mm deflection from 30 kc to 10 Mc, increasing to 1 cm to 30 Mc. Will trigger below 30 kc with increased deflection.
	DC	6-mm deflection to 10 Mc.
	AUTOMATIC	5-mm deflection at 150 cps. With increasing deflection, to 10 Mc. Will trigger to 50 cps with increased deflection.
EXTERNAL	AC	0.2 v from 150 cps to 10 Mc, increasing to 1 v at 30 Mc. Will trigger below 150 cps with increased signal.
	AC LF REJECT	0.2 v from 30 kc to 10 Mc, increasing to 1 v at 30 Mc. Will trigger below 30 kc with increased signal.
	DC	0.2 v to 10 Mc, increasing to 1 v at 30 Mc.
	AUTOMATIC	0.5 v at 150 cps. With increasing deflection, to 10 Mc. Will trigger to 50 cps with increased deflection.

The trigger circuits offer complete manual control, preset stability, and fully-automatic triggering. AC Low-Frequency Reject prevents low-frequency components such as hum from interfering with stable triggering.

TRIGGER SOURCE can be internal, external, or line, either ac or dc coupled. The Type 543B can be externally triggered from Channel 1 only of the Type 1A1 Dual-Trace Unit.

TRIGGERING LEVEL adjusts to allow sweep triggering at any selected point on either the rising or falling portion of the waveform.

STABILITY can be preset at an optimum triggering point to eliminate further adjustment, and is also used to obtain free-running displays.

AUTOMATIC TRIGGERING provides normal triggering on signals with repetition rates higher than about 50 cps. With no trigger signal, or with a lower repetition rate, the trigger circuit free runs at about 40 cps and triggers the time base at this rate, providing a reference trace.

OTHER CHARACTERISTICS

POWER REQUIREMENT is 115 v, 50 to 60 cps. The electronically- regulated power supplies permit a line-voltage variation between 103.5 and 126.5 v (115 v ±10%). Changing transformer taps permits operation at 108, 122, 216, 230, or 244 v, regulated within 10% each range. The Type 543B draws 535 watts, maximum. For 50 to 60 *and* 400 cps operation, a different fan must be installed (at extra cost). Order MODIFICATION 101M.

AMPLITUDE CALIBRATOR provides 18 square-wave voltages from 0.2 mv to 100 volts in a 1-2-5 sequence, accuracy within ±3%. Square-wave frequency is approximately 1 kc. A special output, useful in calibrating sampling plug-ins, provides 0.1 v ±3% into 50 Ω.

DIMENSIONS are 16⅞" high by 13⅛" wide by 23⅞" deep. Net weight is approximately 64 pounds, without plug-in units.

TYPE 543B OSCILLOSCOPE, without plug-in units .. **$1300**

Each instrument includes: 2—P6006 Probe (BNC) (010-0127-00); 1—Power Cord (161-0010-00); 1—3 to 2-Wire Adapter (103-0013-00); 1—50 Ω Cable BNC to BNC 18" (012-0076-00); 1—Adapter, BNC to UHF (103-0015-00); 1—Plate, protector, CRT, clear (387-0918-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00), 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (021-0092-00); 2—Instruction Manual (070-0429-00).

THE TYPE RM543B RACK-MOUNT OSCILLOSCSOPE

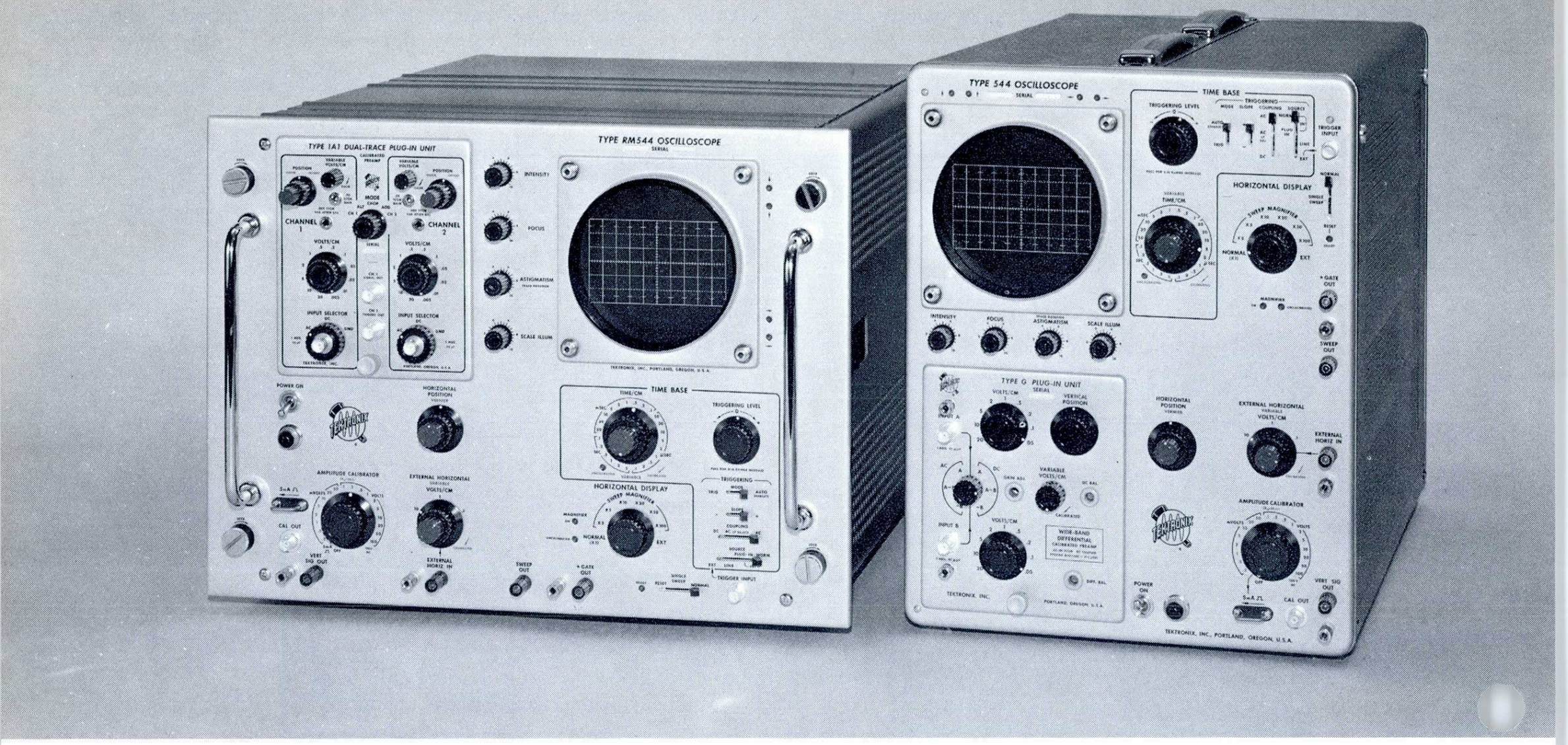
The Type RM543B is electrically identical to the Type 543B, but is mechanically rearranged to fit a standard 19-inch rack. It withdraws from its cabinet on slide-out tracks and can be tilted and locked in any of 7 positions. Dimensions are 14" high by 19" wide by 22¾" deep. Net weight is 81 pounds, without plug-in units.

TYPE RM543B OSCILLOSCOPE, less plug-in units **$1400**

Each instrument includes: 2—P6006 Probe (BNC) (010-0127-00); 1—Power Cord (161-0010-00); 1—3 to 2-Wire Adapter (103-0013-00); 1—50 Ω Cable BNC to BNC 18" (012-0076-00); 1—Adapter, BNC to UHF (103-0015-00); 1—Plate, protector, CRT, clear (387-0918-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC, (021-0092-00); 1—Set mounting hardware; 2—Instruction Manual (070-0437-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 544 / RM544 DC-to-50 MC OSCILLOSCOPE with 100X MAGNIFIER



UNIFORM-FOCUS 6 x 10-CM DISPLAY

ILLUMINATED NO-PARALLAX GRATICULE

SIMPLIFIED VERTICAL AMPLIFIER

WIDE-RANGE SWEEP MAGNIFIER

FULL-PASSBAND TRIGGERING

ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS

CHARACTERISTIC SUMMARY

VERTICAL

Plug-In Preamplifiers adapt the Type 544 to a wide range of measurement capabilities. The oscilloscope vertical system accepts all Tektronix Letter-Series, 1-Series, and Spectrum Analyzer Plug-In Units.

HORIZONTAL

CALIBRATED SWEEP RANGE—0.1 μsec/cm to 5 sec/cm.

SWEEP MAGNIFIER—X2, X5, X10, X20, X50, X100 (extends calibrated sweep rate to 10 nsec/cm).

TRIGGER REQUIREMENTS—Internal: 2-mm deflection.
External: 0.2 v, ac or dc.

EXTERNAL INPUT—0.1 v/cm to 10 v/cm; dc to 400 kc; 1 megohm, $\approx$55 pf.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—10 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v (1-kc square wave), 100 v dc, 5 ma dc, 5-ma 1-kc square wave.

POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 ($\pm$10% on each range), typically 400 watts.

VERTICAL PLUG-IN UNITS

Frequency specifications are at 3-db down

For Differential Input Applications—

TYPE D HIGH-GAIN UNIT—DC to 300 kc at 1 mv/cm, increasing to 2 Mc at 50 mv/cm.

TYPE E LOW-LEVEL UNIT—0.06 cps to 20 kc at 50 μv/cm, increasing to 60 kc at 0.5 mv/cm to 25 mv/cm.

TYPE G WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm.

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For Multiple-Trace Operation—

TYPE 1A1 DUAL-TRACE UNIT—DC to 50 Mc, 7-nsec risetime at 50 mv/cm to 50 v/cm—DC to 28 Mc, 12.5-nsec risetime at 5 mv/cm, increasing to 50 Mc at 50 mv/cm.

TYPE 1A2 DUAL-TRACE UNIT—DC to 50 Mc, 7-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE C-A DUAL-TRACE UNIT—DC to 24 Mc, 15-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE M FOUR-TRACE UNIT—DC to 20 Mc, 17-nsec risetime at 20 mv/cm to 25 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 15 Mc, 23-nsec risetime at 5 mv/cm to 50 v/cm.

For Wide Band Applications—

TYPE B WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm—2 cps to 12 Mc, 30-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE K FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm.

TYPE L FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm—3 cps to 24 Mc, 15-nsec risetime at 5 mv/cm to 4 v/cm.

For Spectrum Analysis—

TYPE L SERIES UNITS—Present Units cover 1-10,400 Mc.

For Operations of Integration, Differentiation, Function Generation, and Linear or Nonlinear Amplification—

TYPE O OPERATIONAL AMPLIFIER—DC to 25 Mc, 14-nsec risetime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μsec risetime at 10 μstrain/div. to 10,000 μstrain/div.

For Transistor-Risetime Checking—

TYPE R UNIT—12-nsec risetime.

For Diode Recovery-Time Measurements—

TYPE S UNIT—12-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE W DIFFERENTIAL COMPARATOR UNIT—DC to 23 Mc at 50 mv/cm, decreasing to 8 Mc at 1 mv/cm. 15-nsec risetime at 50 mv/cm, increasing to 44 nsec at 1 mv/cm.

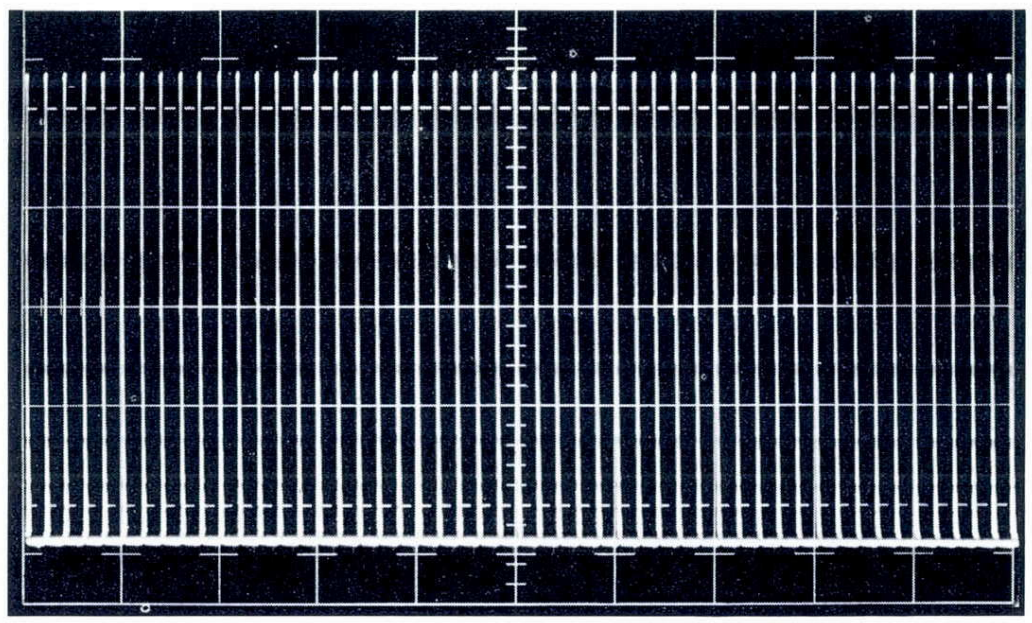
TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27 nsec risetime at 50 mv/cm to 25 v/cm.

For High-Frequency Sampling Applications—

TYPE 1S1 SAMPLING UNIT—350 psec risetime.

VERTICAL DEFLECTION

FREQUENCY RESPONSE with the Type 1A1 Plug-In Unit is dc-to-50 Mc from 50 mv/cm to 20 v/cm, dc-to-28 Mc at 5 mv/cm. Letter-Series Plug-In Units provide response from dc-to-30 Mc, depending on the unit used. Specialized Letter-Series Units adapt the Type 544 to strain-gage, operational amplifier, multi-channel, and other applications.



UNIFORM-FOCUS 6 x 10-CM DISPLAY.

SIGNAL DELAY permits observation of the leading edge of the waveform that triggers the sweep. The specially-braided 170-nanosecond delay line requires no tuning.

SIGNAL OUTPUT from the front panel provides approximately 0.4 v/cm of displayed signal. This ac-coupled signal output has a risetime capability of 20 nsec.

HORIZONTAL DEFLECTION

SWEEP RANGE from 0.1 μsec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence, accuracy within ±2%. Sweep rates are also continuously variable uncalibrated between steps and to approximately 12 sec/cm. A front-panel lamp indicates uncalibrated sweep rates.

X2 to X100 SWEEP MAGNIFIER expands the center portion of a displayed signal so that it covers a full 10 centimeters. Magnified sweep accuracy is within ±5% up to the fastest calibrated rate of 10 nsec/cm. An indicator light warns the operator when the maximum calibrated rate is exceeded.

SINGLE-SWEEP OPERATION facilitates photographic recording of waveforms. A front-panel reset control arms the sweep to fire on the next received trigger. After firing once, the sweep is locked out until reset at the front panel, or with a +20-volt pulse applied through a rear-panel connector. A front-panel lamp indicates when the time base is ready to fire. It extinguishes as soon as the sweep starts.

EXTERNAL HORIZONTAL INPUT provides for horizontal beam deflection with an external source. Horizontal Amplifier passband is dc to at least 400 kc (3-db down). Sensitivity is 0.1, 1, or 10 v/cm with step attenuation. Sensitivity potentiometer is continuously variable over a 10:1 range. Input impedance is 1 megohm paralleled by approximately 55 pf.

FRONT-PANEL OUTPUTS include a +20-v gate having the same duration as the sweep and a 100-v sawtooth (both voltages are approximate).

TRIGGER

Wide-range trigger circuits allow triggering to beyond 50 Mc. The Trigger signal is selected and processed by a series of four lever switches. The control logic of these switches has been human-engineered for operator ease.

TRIGGER SOURCE can be internal, external, or line. The internal source can be selected from the oscilloscope vertical amplifier, or direct from Channel 1 of the Type 1A1 Dual-Trace

544
RM544

Plug-In Unit, or Channel 1 or 2 of Type 1A2. With a Type 1A1 operating in one of its channel-switching modes, the internal trigger signal can be selected from Channel 1 before switching occurs, or from the composite signal after the two channels have been combined. When triggering from Channel 1, the true time relationship between Channel 1 and 2 signals is displayed. With the Type 1A1 Unit, or 1A2, in "Alternate" switching mode, triggering internally from Channels 1 and 2 composite signal allows observation of 2 signals which are not harmonically related.

TRIGGER COUPLING can be direct or ac-coupled. AC Low-Frequency Reject (approximately 3-db down at 1.5 kc) prevents low-frequency components such as 60-cps hum from interfering with stable operation.

TRIGGER MODE selects either Triggered or Automatic operation. Automatic triggering provides a bright reference trace (regardless of sweep speed) when no input signal is applied, or when the trigger-signal repetition rate is less than 20 cps. Above 20 cps, the time base can be triggered at the repetition rate of the incoming trigger signal to achieve jitter-free displays to beyond 50 Mc.

TRIGGER LEVEL adjusts to allow sweep triggering at any selected point on either the rising or falling portion of the waveform. A two-position control permits trigger-level selection between ±2 or ±20 volts.

TRIGGER REQUIREMENTS for internal triggering are a minimum of 2 mm of displayed signal, increasing to 1 cm at approximately 50 Mc (either ac-coupled mode) and 5 mm at dc with direct coupling. External triggering requires 0.2 v, ac or dc.

CRT AND DISPLAY FEATURES

The Tektronix T5470 crt is a new flat-faced tube with electrostatic focus and deflection, and a helical post accelerator operated at a 10-kv total potential. A longer envelope, careful gun design, and a low 5:1 post-to-gun accelerating-voltage ratio provide several characteristics which contribute directly to the many advanced performance features achieved in the Type 544 and RM544: 6-cm vertical scan with 50 Mc passband, 10 nsec/cm maximum sweep rate, bright displays with high resolution and read-out accuracy.

The crt produces a small 9-mil (nominal) spot diameter at 2 μa beam current (2 μa provides a bright display under average ambient light for repetitive signals even at high sweep rates). Focus of the spot is very uniform over the full 6 x 10-cm viewing area. In flat-faced electrostatically-focused tubes, the spot size varies most at the ends of the horizontal axis. In the T5470, a centered 9-mil spot measures no more than 12 mils at either end; a change ratio of only 1:1.3 compared with a typical change of 1:4 in comparable tubes operated at 10 kv. Even with 6 cm of vertical scan, high deflection sensitivity is maintained, deflection-plate input capacitance is low, and linearity and overall pattern geometry is superior. P31 phosphor is standard.

INTERNAL 6 x 10-CM GRATICULE with variable edge-lighting provides a no-parallax display for viewing or for photographic recording. The graticule is marked in centimeter squares with 2-mm divisions on the vertical and horizontal center lines. Two special horizontal lines have been added to the graticule for convenience in making accurate risetime measurements.

FRONT-PANEL CONTROLS include trace rotation (a screwdriver adjustment), intensity, focus, and astigmatism. Internal screwdriver adjustments control display geometry and the high-voltage supply level.

BEAM-POSITION INDICATORS show the direction of the crt beam when it is deflected away from the center-screen area.

DC-COUPLED UNBLANKING to the crt grid assures uniform beam current for all sweep speeds and repetition rates at any setting of the intensity control.

Z-AXIS INPUT, ac-coupled, through terminal at rear of instrument, permits external modulation of crt cathode. Requires 15 volts, pk-to-pk.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR provides 18 square-wave voltages from 0.2 mv to 100 volts in a 1-2-5 sequence, accuracy within 3%. Output resistance is 50 ohms from 0.2 mv to 0.2 v. Frequency is approximately 1 kc. Risetime and falltime is 0.5 μsec from 0.2 mv to 5 v, and 1.0 μsec from 10 v to 100 v. A 100-volt dc output is also provided. Reference currents supplied through the front-panel loop are 5-ma dc and a 5-ma, 1 kc square wave. Current probes can be slipped directly over the loop for calibration.

POWER REQUIREMENT is 115 v, 50 to 60 cps. The electronically-regulated power supplies permit a line-voltage variation between 103.5 and 126.5 v (115 v ±10%). Changing transformer taps permits operation at 108, 122, 216, 230, or 244 v, regulated within 10%, each range. The Type 543B draws 400 watts, typically. For 50 to 60 *and* 400 cps operation, a different fan must be installed (at extra cost). Order MODIFICATION 101M.

CABINET MODEL DIMENSIONS are 16⅞" high by 13⅛" wide by 23⅞" deep. Net weight is 59¾ pounds. Shipping weight is approximately 80 pounds.

RACK-MOUNT MODEL DIMENSIONS are 14" high by 19" wide by 22¾" deep. The Type RM544 is electrically identical to the Type 544, but mechanically rearranged to fit a standard 19-inch rack. They withdraw from their cabinet on slide-out tracks and can be tilted and locked in any of 7 positions. Net weight is 80½ pounds. Shipping weight is approximately 109 pounds.

TYPE 544 OSCILLOSCOPE, without plug-in units $1550

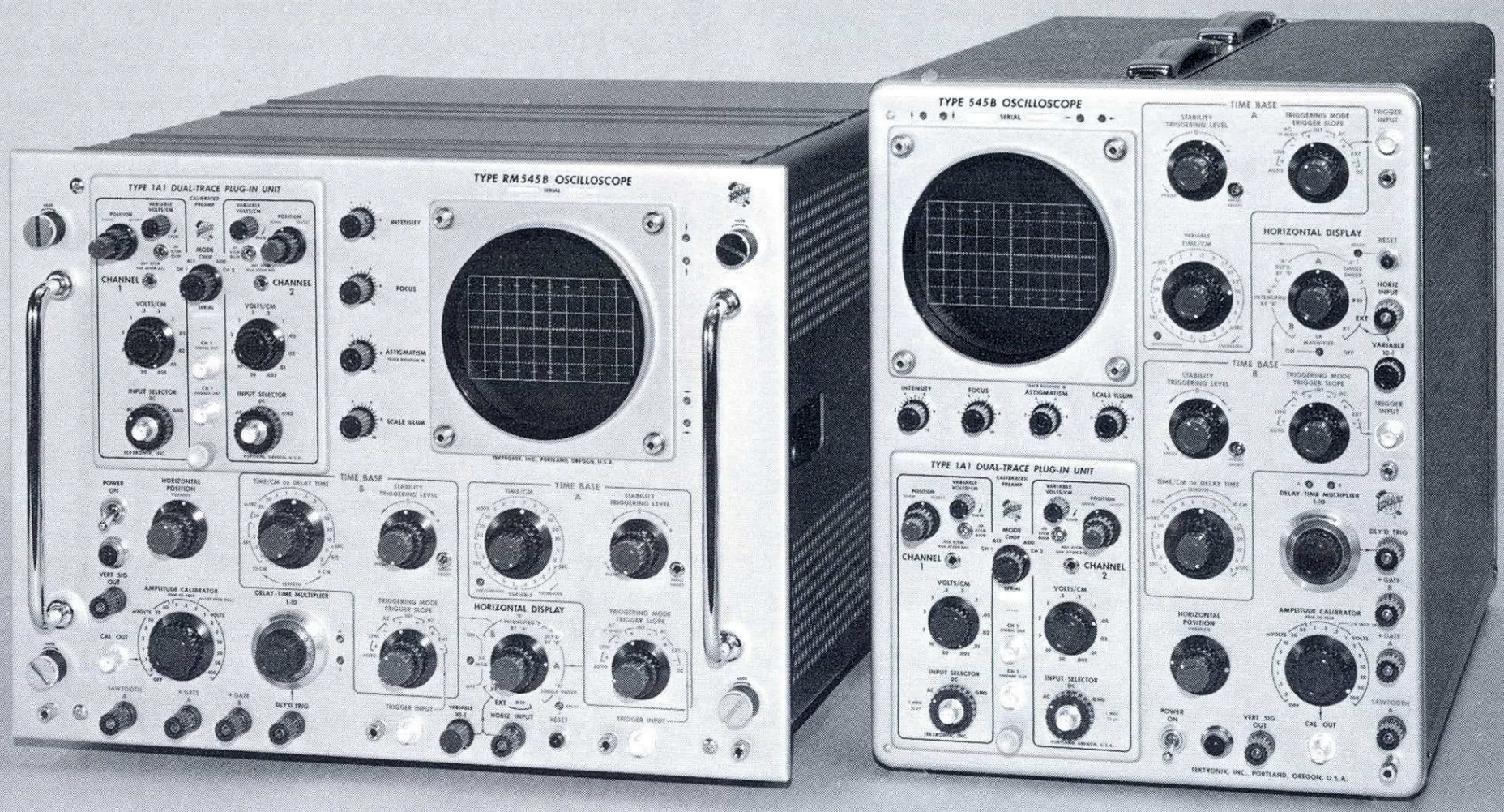
Each instrument includes: 2—P6008 probe (010-0129-00); 1—Plate, protector, CRT (387-0918-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—Light filter, polarized (installed) (378-0545-00); 2—Patch cord, BNC-to-BNC, 18" (012-0087-00) 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0418-00)

TYPE RM544 OSCILLOSCOPE, without plug-in units .. $1650

Each instrument includes: 2—P6008 probe (010-0129-00); 1—Plate, protector, CRT (387-0918-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—Light filter, polarized (installed) (378-0545-00); 2—Patch cord, BNC-to-BNC, 18" (012-0087-00) 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 1—Set mounting hardware; 2—Instruction Manual (070-0422-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-33 MC OSCILLOSCOPE Type 545B / RM545B



UNIFORM-FOCUS 6 x 10-CM DISPLAY

ILLUMINATED NO-PARALLAX GRATICULE

SIMPLIFIED VERTICAL AMPLIFIER

PUSH-PULL DELAY CABLE, (NO ADJUSTMENTS)

FULL-PASSBAND TRIGGERING

CALIBRATED SWEEP DELAY

ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS

DUAL-TRACE, DC-TO-33 MC PERFORMANCE WITH TYPES 1A1 AND 1A2 PLUG-IN UNITS

The Type 545B Oscilloscope is a versatile laboratory instrument designed for use with all Tektronix 1-Series, Letter-Series, or Spectrum Analyzer Plug-In Units. The instrument features two time base generators which can be used in "delaying" and "delayed" sweep operation for highly accurate time measurements.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of all 1-Series, Letter-Series, or Spectrum Analyzer Plug-In Units.

HORIZONTAL

CALIBRATED SWEEP RANGE—0.1 μsec/cm to 5 sec/cm.
SWEEP MAGNIFIER—5X, extends sweep range to 0.02 μsec/cm.
TRIGGER REQUIREMENTS—Internal: Less than 1-cm deflection to 30 Mc.
External: 0.2 v to 10 Mc, 1 v at 30 Mc.
CALIBRATED SWEEP DELAY—1 μsec to 10 sec.
EXTERNAL INPUT—0.2 v/cm, maximum. DC to 350 kc; 1 megohm, 55 pf.

CRT

ILLUMINATED NO-PARALLAX GRATICULE
DISPLAY AREA—6 x 10 cm.
ACCELERATING VOLTAGE—10 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v; 1-kc square wave.
POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 v (±10% on each range,) 535 watts maximum.

545B
RM545B

VERTICAL PLUG-IN UNITS

Frequency specifications are at 3-db down

For Multiple-Trace Operation—

TYPE 1A1 DUAL-TRACE UNIT—DC to 33 Mc, 10.5-nsec risetime at 50 mv/cm to 50 v/cm—DC to 23 Mc, 15-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE 1A2 DUAL-TRACE UNIT—DC to 33 Mc, 10.5-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE C-A DUAL-TRACE UNIT—DC to 24 Mc, 15-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE M FOUR-TRACE UNIT—DC to 20 Mc, 17-nsec risetime at 20 mv/cm to 25 v/cm.

For Differential Input Applications—

TYPE D HIGH-GAIN UNIT— DC to 300 kc at 1 mv/cm, increasing to 2 Mc at 50 mv/cm.

TYPE E LOW-LEVEL UNIT—0.06 cps to 20 kc at 50 μv/cm, increasing to 60 kc at 0.5 mv/cm to 25 mv/cm.

TYPE G WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 15 Mc, 23-nsec risetime at 5 mv/cm to 50 v/cm.

For Wide Band Applications—

TYPE B WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm—2 cps to 12 Mc, 30-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE K FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm.

TYPE L FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm—3 cps to 24 Mc, 15-nsec risetime at 5 mv/cm to 4 v/cm.

For Operations of Integration, Differentiation, Function Generation, and Linear or Nonlinear Amplification—

TYPE O OPERATIONAL AMPLIFIER—DC to 25 Mc, 14-nsec risetime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μsec risetime at 10 μstrain/div. to 10,000 μstrain/div.

For Transistor-Risetime Checking—

TYPE R UNIT—12-nsec risetime.

For Diode Recovery-Time Measurements—

TYPE S UNIT—12-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE W HIGH-GAIN DIFFERENTIAL COMPARATOR UNIT—DC to 23 Mc, 15-nsec risetime at 50 mv/cm—DC to 8 Mc, 44-nsec risetime at 1 mv/cm.

TYPE Z DIFFERENTIAL COMPARATOR UNIT— DC to 13 Mc, 27 nsec risetime at 50 mv/cm to 25 v/cm.

For Spectrum Analysis—

TYPE L-SERIES UNITS—Present units cover the range of 1 Mc to 10,400 Mc.

For High-Frequency Sampling Applications—

TYPE 1S1 SAMPLING UNIT—350 psec risetime.

VERTICAL-DEFLECTION SYSTEM

FREQUENCY RESPONSE with these Plug-in Units extends from dc to 30 Mc, depending on the unit used. Specialized Plug-In Units adapt the Types 545B to strain-gage, operational-amplifier, multi-channel, and other applications. Dual-Trace dc-to-33 Mc displays at 50 mv/cm are achieved with either the Type 1A1, or Type 1A2 Plug-In Units. The Type 1A1 offers 5 mv/cm sensitivity from dc-to-23 Mc.

SIGNAL DELAY permits observation of the leading edge of the waveform that triggers the sweep. The specially-braided 200-nsec delay cable requires no tuning.

SIGNAL OUTPUT from the front panel provides 1.2 volts or more for each centimeter of displayed signal.

HORIZONTAL-DEFLECTION SYSTEM

Two separate time bases are featured in the Type 545B. Either time base can be used alone, or Time Base B can be used to accurately delay the start of Time Base A.

TIME BASE A SWEEP RANGE from 0.1 μsec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence, accuracy within ±3%. Sweep rates are also continuously variable uncalibrated between steps and to approximately 12 sec/cm. A front-panel lamp indicates uncalibrated sweep rates.

TIME BASE B SWEEP RANGE from 2 μsec/cm to 1 sec/cm is in 18 calibrated steps with 1-2-5 sequence, accuracy within ±3%. A control for varying the sweep length from 4 to 10 cm allows maximum duty cycle which allows maximum brightness when using delaying sweep and also permits use of Time Base B as a repetition-rate generator from 0.1 cps to 40 kc.

5X SWEEP MAGNIFIER expands the center 2-cm of a signal displayed on either time base so that it covers a full 10 centimeters. The magnifier can be used to extend the Time Base A calibrated sweep rate to 20 nsec/cm, and the Time Base B calibrated sweep rate to 0.4 μsec/cm. Sweep accuracy when using the magnifier is within ±5%.

SINGLE-SWEEP OPERATION facilitates photographic recording of waveforms displayed on Time Base A. The front-panel reset control arms the sweep to fire on the next received trigger. After firing once, the sweep is locked out until reset. A lamp indicates when the time base is ready to fire.

EXTERNAL HORIZONTAL INPUT provides for horizontal beam deflection with an external source. Horizontal Amplifier passband is dc to at least 350 kc (3-db down). Sensitivity is at least 0.2 v/cm or 2 v/cm with 10X step attenuation. Sensitivity can also be reduced by at least 10:1 with variable attenuation. Input impedance is 1 megohm paralleled by approximately 45 pf.

FRONT PANEL OUTPUTS include gates from both time bases (0 to at least +20 volts), sawtooth from Time Base A (typically 0 to at least +130 volts), and a delayed-trigger pulse (at least 5 volts).

SWEEP DELAY

Highly-accurate time measurements can be made with the 2 time bases used for sweep delay. Two modes of delay are available: triggered and conventional.

CALIBRATED DELAY RANGE is continuously variable from 1 μsec to 10 sec, accuracy within 1%. Incremental accuracy of the Delay-Time Multiplier is 0.2%.

TRIGGERED OPERATION holds off the start of the delayed sweep until the arrival of the first trigger signal following the selected delay time. Because the delayed sweep is actually triggered by the signal under observation, the display is completely jitter free. A steady display is thus provided for time-modulated pulses and signals with inherent jitter.

CONVENTIONAL OPERATION holds off the start of the delayed sweep for the precise amount of the selected delay time. Any time-modulation or jitter on the signal will be magnified in proportion to the amount of sweep expansion. Time jitter in the delayed trigger pulse or delayed sweep is less than one part in 20,000 of maximum available delay time.

WIDE-RANGE MAGNIFICATION is readily accomplished when Time Base A is operated at a faster rate than Time Base B. For example, if Time Base A is operating at 1 μsec/cm and Time Base B is operating at 50 μsec/cm, the magnification is 50 times.

TRACE BRIGHTENING indicates the exact portion of the signal that will appear on the magnified display, and also the point-in-time relationship of the magnified display to the original display.

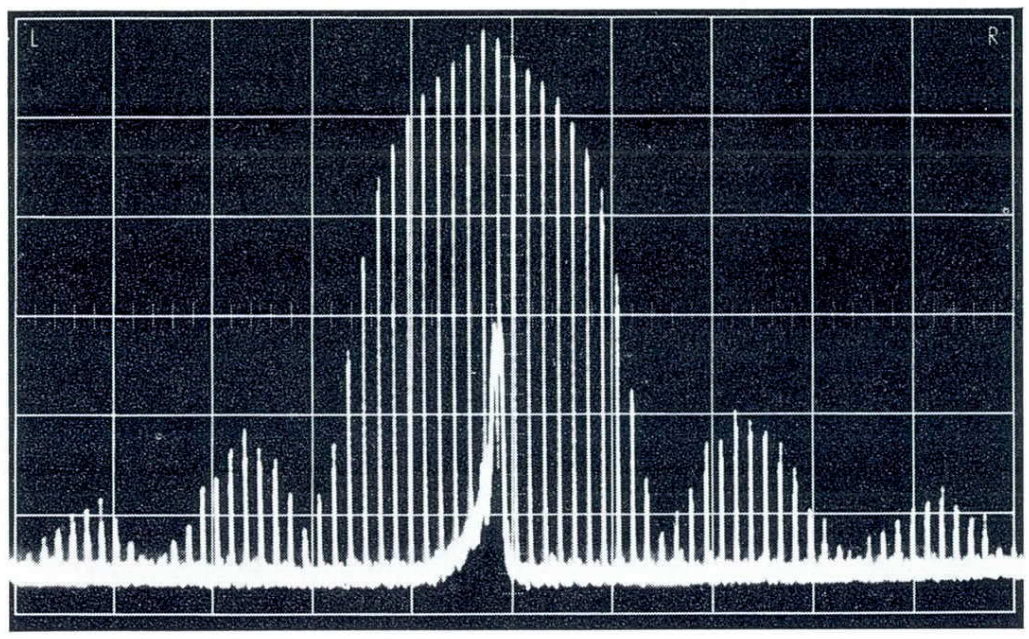
CRT AND DISPLAY FEATURES

The Tektronix Type 545B uses a T5470 crt which is a new flat-faced tube with electrostatic focus and deflection, and a helical post accelerator operated at a 10-kv total potential. A longer envelope, careful gun design, and a low 5:1 post-to-gun accelerating-voltage ratio provide several characteristics which contribute directly to the many advanced performance features achieved in the Type 545B.

The crt produces a small 9-mil nominal spot diameter at 2-μa beam current (2-μa provides a bright display under average ambient light for repetitive signals even at high sweep-rates). Focus of the spot is very uniform over the full 6 x 10-cm viewing area. In flat-faced electrostatically-focused tubes, the spot size varies most at the ends of the horizontal axis. In the T5470, a centered 9-mil spot measures no more than 12 mils at either end; a change ratio of only 1:1.3 compared with a typical change of 1:4 in comparable crt's operated at 10 kv. Even with 6 cm of vertical scan, high deflection sensitivity is maintained, deflection-plate input capacity is low, and linearity and overall pattern geometry is superior. P31 phosphor is standard.

INTERNAL 6 x 10-CM GRATICULE with variable edge-lighting provides a no-parallax display for viewing or for photographic recording. The graticule is marked in centimeter squares with 2-mm divisions on the vertical and horizontal center lines. Two special horizontal lines have been added to the graticule for convenience in making accurate risetime measurements.

FRONT-PANEL CONTROLS include trace rotation (a screwdriver adjustment), intensity, focus, and astigmatism.



Small spot size and uniform focus over the full 6 x 10-cm viewing area make the Type 545B ideal for accurate spectrum analysis waveform measurements. Photo taken with Standard C-12 using projected graticule accessory; crt is T5470-31 (identical to standard crt, but with no internal graticule). Spectrograph is a pulsed 200-Mc carrier; spectral lines are separated by 4 kc (PRF). Spectrum Analyzer is the Type L-20.

BEAM-POSITION INDICATORS show the direction of the crt beam when it is deflected from the center-screen area.

DC-COUPLED UNBLANKING to the crt grid assures uniform beam current for all sweep speeds and repetition rates at any setting of the intensity control.

Z-AXIS INPUT through a terminal at the rear of the instrument permits external modulation of the crt cathode. The input is ac coupled and requires approx. 15 volts, pk-to-pk for visible modulation.

TRIGGER

Triggering system is separate but similar for both time bases. The trigger circuits offer complete manual control, preset stability, and fully-automatic triggering. Time base A provides an additional trigger mode: AC Low-Frequency Reject prevents low-frequency components such as hum from interfering with stable triggering.

TRIGGER SOURCE can be internal, external, or line, either ac or dc coupled. The Type 545B can be externally triggered from Channel 1 only of the Type 1A1 Dual-Trace Unit.

TRIGGERING LEVEL adjusts to allow sweep triggering at any selected point on either the rising or falling portion of the waveform.

STABILITY can be preset at an optimum triggering point to eliminate further adjustment, and is also used to obtain free-running displays.

AUTOMATIC TRIGGERING provides normal triggering on signals with repetition rates higher than about 50 cps. With no trigger signal, or with a lower repetition rate, the trigger circuit free runs at about 40 cps and triggers the time base at this rate, providing a reference trace.

545B
RM545B

TRIGGER REQUIREMENTS

	TRIGGER MODE	TIME BASE A	TIME BASE B
INTERNAL	AC	2-mm deflection from 150 cps to 10 Mc, increasing to 1 cm at 30 Mc. Will trigger below 150 cps with increased deflection.	2-mm deflection from 300 cps to 5 Mc, increasing to 1 cm at 10 Mc. Will trigger below 300 cps with increased deflection.
	AC LF REJECT	2-mm deflection from 30 kc to 10 Mc, increasing to 1 cm to 30 Mc. Will trigger below 30 kc with increased deflection.	
	DC	6-mm deflection to 10 Mc.	6-mm deflection to 5 Mc.
	AUTOMATIC	5-mm deflection at 150-cps. With increasing deflection, to 10 Mc. Will trigger to 50 cps with increased deflection.	5-mm deflection from 300 cps to 5 Mc. Will trigger to 50 cps with increased deflection.
EXTERNAL	AC	0.2 v from 150 cps to 10 Mc, increasing to 1 v at 30 Mc. Will trigger below 150 cps with increased signal.	0.5 v at 300 cps to 5 Mc, increasing to 1 v at 10 Mc. Will trigger below 300 cps with increased signal.
	AC LF REJECT	0.2 v from 30 kc to 10 Mc, increasing to 1 v at 30 Mc. Will trigger below 30 kc with increased signal.	
	DC	0.2 v to 10 Mc, increasing to 1 v at 30 Mc.	0.2 v to 5 Mc, increasing to 1 v at 10 Mc.
	AUTOMATIC	0.5 v at 150 cps. With increasing deflection, to 10 Mc. Will trigger to 50 cps with increased deflection.	0.5 v at 300 cps to 5 Mc. Will trigger to 50 cps with increased signal.

OTHER CHARACTERISTICS

POWER REQUIREMENT is 115 v, 50 to 60 cps. The electronically-regulated power supplies permit a line-voltage variation between 103.5 and 126.5 (115 v ±10%). Changing transformer taps permits operation at 108, 122, 216, 230, or 244 v, regulated within 10%, each range. The Type 545B draws 535 watts, maximum. For 50 to 60 cps *and* 400 cps operation, a different fan must be installed (at extra cost). Order MODIFICATION 101M.

AMPLITUDE CALIBRATOR provides 18 square-wave voltages from 0.2 mv to 100 volts in a 1-2-5 sequence, accuracy within ±3%. Square-wave frequency is approximately 1 kc. A special output, useful in calibrating sampling plug-ins, provides 0.1 v ±3% into 50 Ω.

DIMENSIONS are 16⅞" high by 13⅛" wide by 23⅞" deep. Net weight is approximately 65 pounds, without plug-in units.

TYPE 545B OSCILLOSCOPE, without plug-in units .. $1550

Each instrument includes: 2—P6006 Probe (BNC) (010-0127-00); 1—Power Cord (161-0010-00); 1—3 to 2-Wire Adapter (103-0013-00); 1—Plate, protector, CRT, clear (387-0918-00); 1—50 Ω Cable BNC to BNC, 18" (012-0076-00); 1—Adapter, BNC to UHF (103-0015-00); 2—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0428-00).

THE TYPE RM545B RACK-MOUNT OSCILLOSCOPE

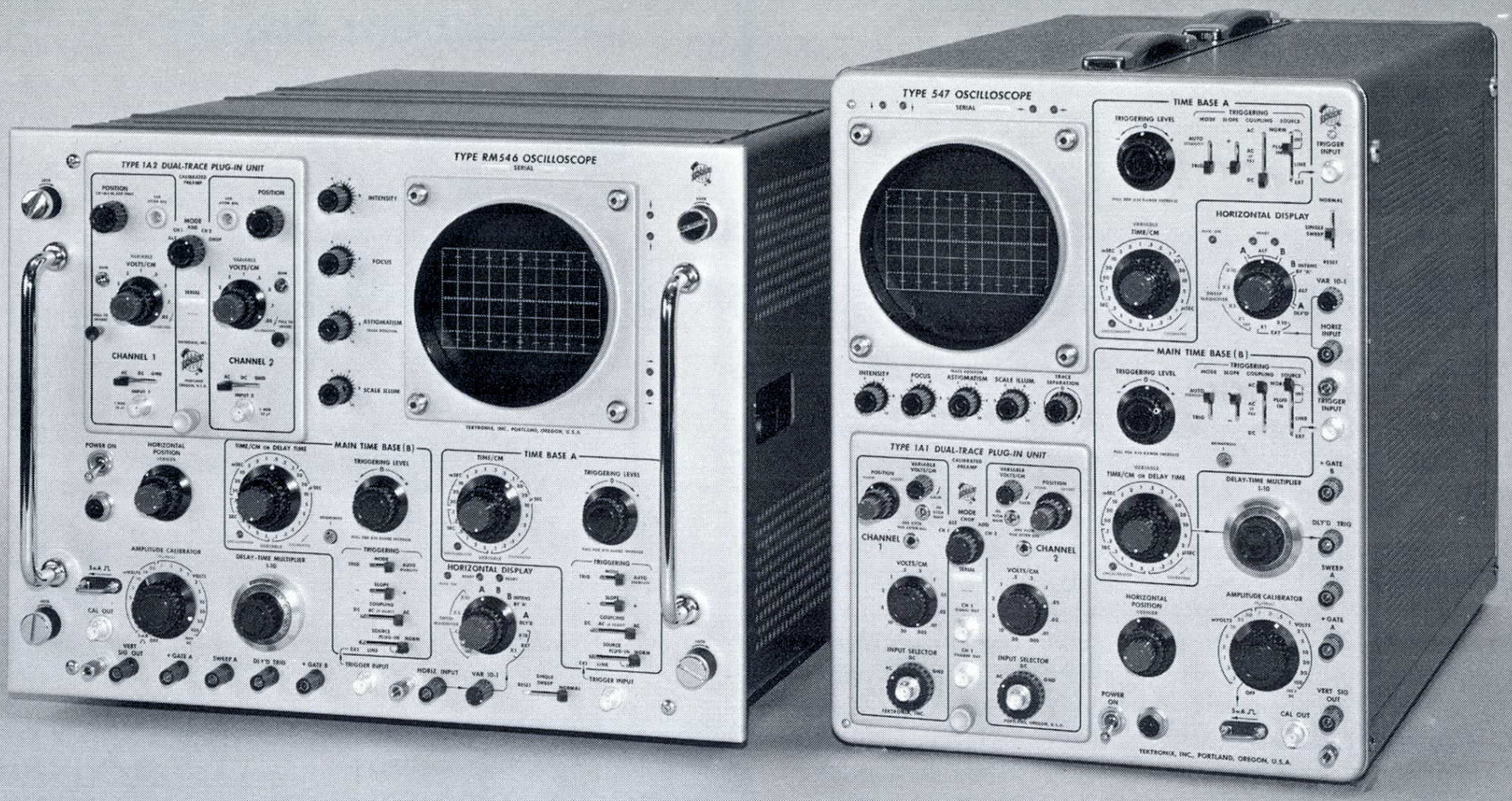
The Type RM545B is electrically identical to the Type 545B, but is mechanically rearranged to fit a standard 19-inch rack. It withdraws from its cabinet on slide-out tracks and can be tilted and locked in any of 7 positions. Dimensions are 14" high by 19" wide by 22¾" deep. Net weight is 86 pounds, without plug-in units.

TYPE RM545B OSCILLOSCOPE, less plug-in units .. $1650

Each instrument includes: 2—P6006 Probe (BNC) (010-0127-00); 1—Power Cord (161-0010-00); 1—3 to 2-Wire Adapter (103-0013-00); 1—Plate, protector, CRT, clear (387-0918-00); 1—50 Ω Cable BNC to BNC, 18" (012-0076-00); 1—Adapter, BNC to UHF (103-0015-00); 2—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); Set mounting hardware; 2—Instruction Manual (070-0438-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-50 MC OSCILLOSCOPE Type 546 RM546 547 RM547



- *FULL-PASSBAND TRIGGERING*
- *ILLUMINATED NO-PARALLAX GRATICULE*
- *ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS*
- *CALIBRATED SWEEP DELAY*
- *AUTOMATIC DISPLAY SWITCHING (Type 547)*

The 546 and 547 are essentially identical instruments. Type 547 features AUTOMATIC DISPLAY SWITCHING which provides general dual-beam performance without the additional cost of a dual-beam oscilloscope. With appropriate Plug-In units, both instruments are adaptable to a wide variety of applications such as WIDE-BAND RESPONSE (up to 50 Mc with Type 1A1 Plug-In Unit), DIFFERENTIAL INPUT, OPERATIONAL, TRANSDUCER AND STRAIN-GAGE, TRANSISTOR-RISETIME CHECKING, and others. See Plug-In Unit chart.

Both the Type 546 and 547 feature two separate and IDENTICAL TIME BASES, SWEEP MAGNIFICATION to 10X and SINGLE-SWEEP operation for photographic trace-recording. Both time bases can be triggered separately to beyond 50 Mc. Versatile triggering is accomplished at any selected point on rising or falling portion of input waveform.

Internal circuitry interconnects Time Base A and B. One switch position allows any portion of the observed trace to be brightened. The other position allows this brightened portion to be displayed and expanded to the full width of the crt for closer observation. Thus, any desired area of the waveform may be magnified many times. CALIBRATED DELAY is variable from 0.1 μsec to 50 sec. One important use of the combined time bases is the measuring of time and frequency with an accuracy greater than that possible by reading the graticule alone. Lockout-reset circuitry permits single-shot use of the calibrated delay features.

The Type 547 features AUTOMATIC DISPLAY SWITCHING which, in many applications, provides equivalent dual-beam operation. Switching allows an alternate presentation of two different signals at the same or different sweep rates with a dual-trace unit such as the Type 1A1, or an alternate presentation of the same signal at two different sweep rates with single-input Plug-In units. Full control of dual displays assures accuracy and brightness comparable to the finest single-beam displays.

The new Tektronix T5470 crt insures advanced scope performance by featuring a 6-CM VERTICAL SCAN AT 50 MC, 10 NSEC/CM MAXIMUM SWEEP RATE and BRIGHT TRACE with HIGH RESOLUTION, SMALL SPOT size, LOW BEAM CURRENT and UNIFORM FOCUS over the full 6 x 10 cm viewing area. Linearity and overall pattern geometry are superior. Crt features internal, NO-PARALLAX GRATICULE. Beam-position indicators on front panel locate beam when off screen.

AMPLITUDE CALIBRATOR provides 1-kc square-wave voltages and reference currents. Power supplies are ELECTRONICALLY-REGULATED and are normally wired to operate from a 115 v line ±10%, but can be altered for operation up to 244 v.

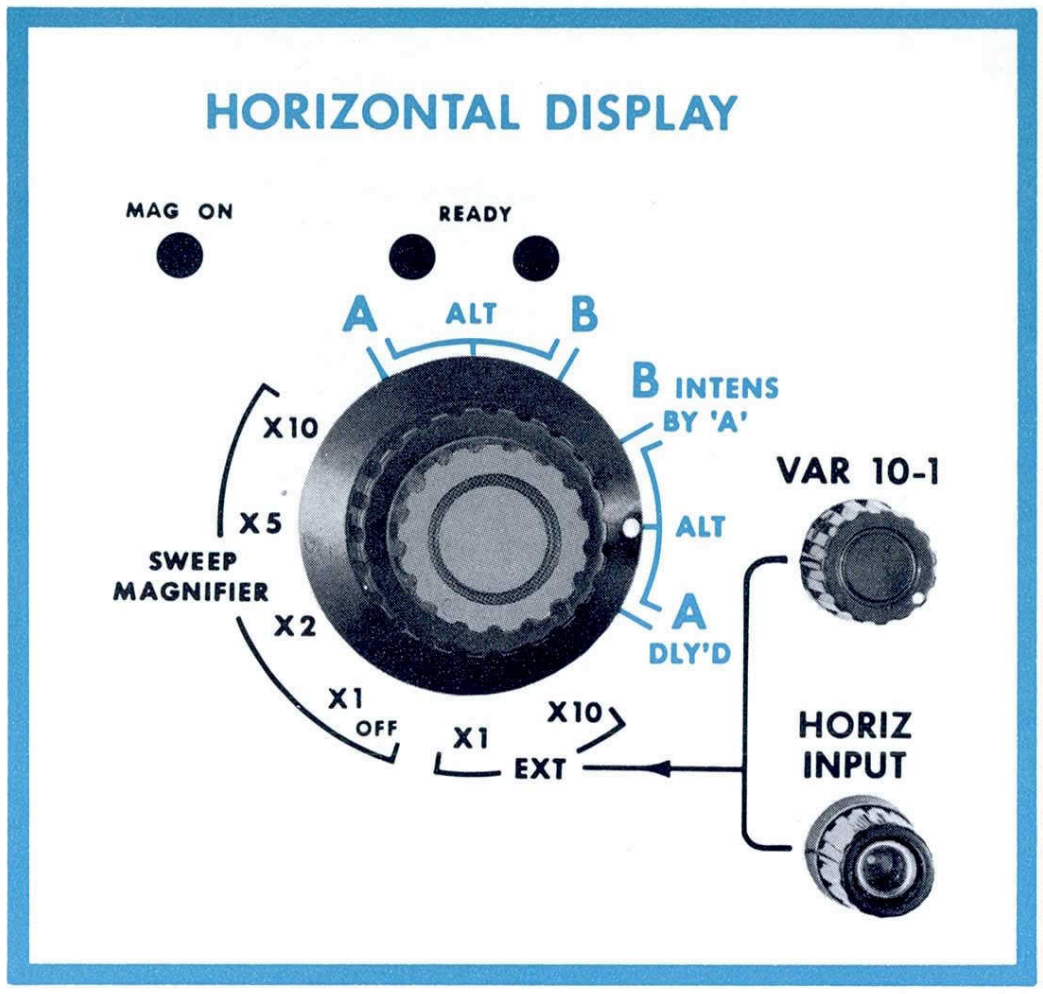
546 RM546
547 RM547

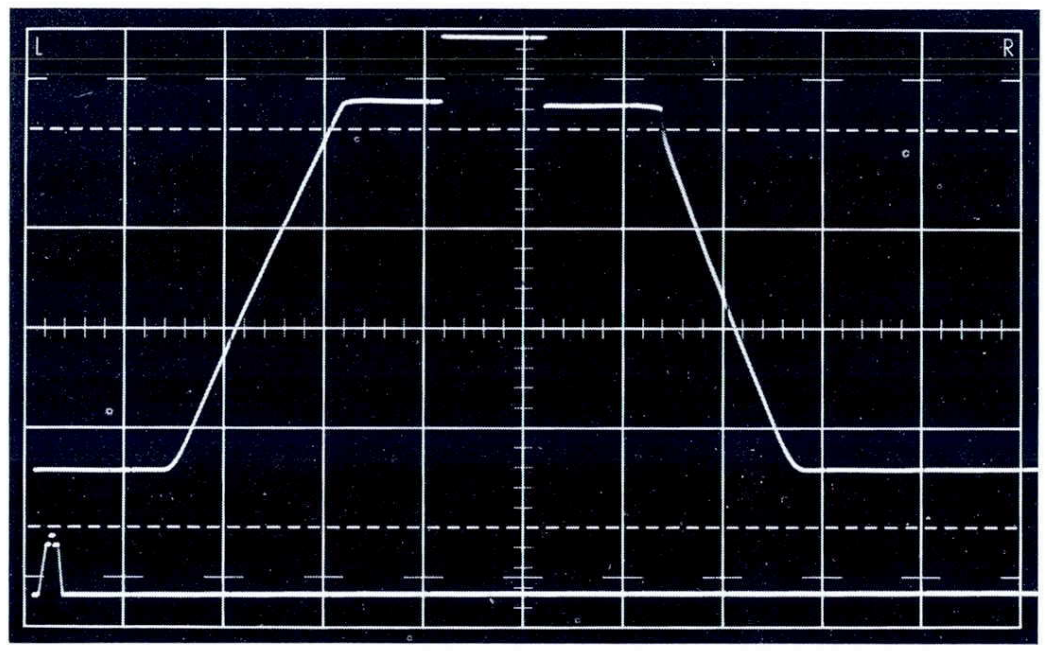
AUTOMATIC DISPLAY SWITCHING

featured in the Type 547 and RM547 Oscilloscopes

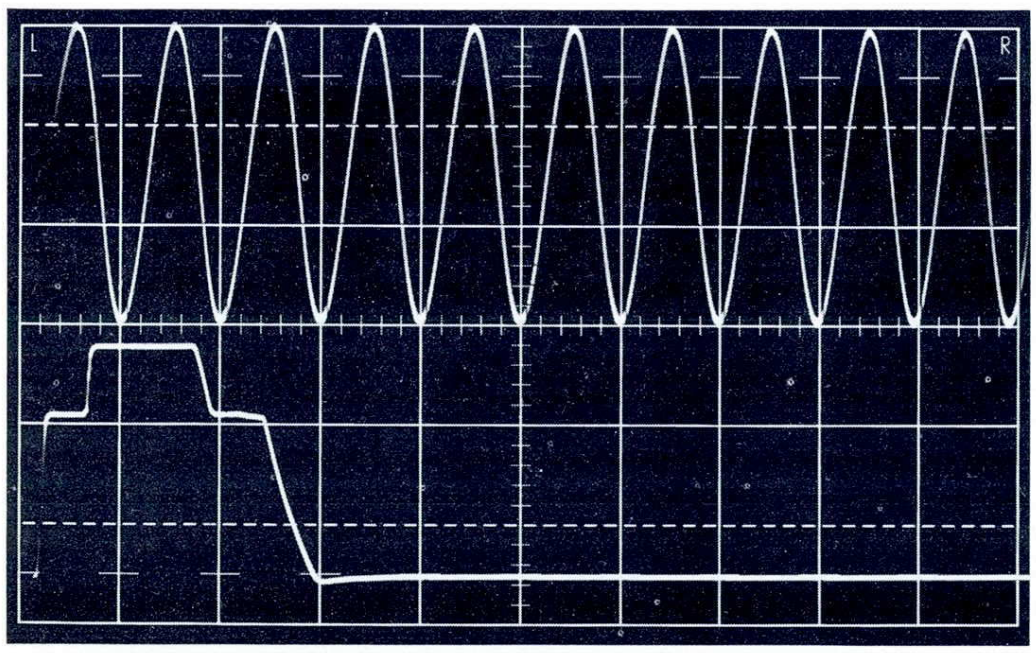
Electronic switching between 2 wide-range time bases allows an alternate presentation of the same signal at 2 different sweep rates. Gallium Arsenide diodes in the switching circuit provide fast switching between time bases, and insure that only the desired time base is displayed at one time.

Two different signals can be alternately displayed at the same or different sweep rates with a dual-trace unit such as the new Type 1A1 or 1A2. In many applications, this provides equivalent dual-beam operation without the additional cost and complexity of a dual-beam oscilloscope. Dual displays are equal in quality to the finest single presentations. Also, the full 6 x 10-cm screen area can be used to display signals on either time base. A trace separation control operates in conjunction with the normal vertical position to allow full control of dual displays.

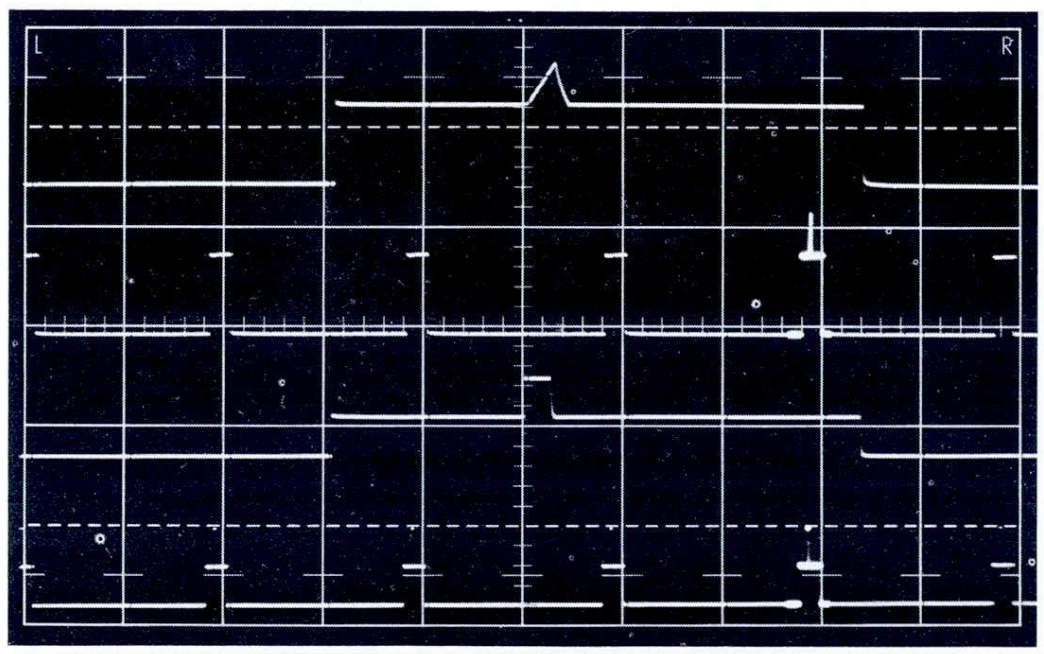




Vertical and Horizontal Expansion—same signal applied to both channels of the Type 1A1 Dual-Trace Unit with independent control of sensitivity and sweep rate in each channel.



Dual-Scope Operation—independent control of each signal with Channel 1 of the Type 1A1 Dual-Trace Unit locked to Time Base A, and Channel 2 locked to Time Base B.



Calibrated Sweep Delay—alternate presentation of 2 signals brightened over a selected portion, and the selected portions expanded to fill 10 cm.

546 RM546
547 RM547

VERTICAL PLUG-IN UNITS Frequency specifications are at 3-db down			
PLUG-IN UNIT	CALIBRATED DEFLECTION FACTOR	BANDPASS	RISETIME
For Wide-Band, Multiple Trace Applications			
1A1 Dual Trace	50 mv/cm to 50 v/cm	dc to 50 Mc	7 nsec
	5 mv/cm 500 μv/cm	dc to 28 Mc 2 cps to 15 Mc	12.5 nsec 23 nsec
1A2 Dual-Trace	50 mv/cm to 50 v/cm	dc to 50 Mc	7 nsec
C-A Dual-Trace	50 mv/cm to 50 v/cm	dc to 24 Mc	15 nsec
M Four-Trace	20 mv/cm to 25 v/cm	dc to 20 Mc	17 nsec
For Wide-Band Applications			
B	50 mv/cm to 50 v/cm	dc to 20 Mc	18 nsec
	5 mv/cm to 50 mv/cm	2 cps to 12 Mc	30 nsec
K	50 mv/cm to 40 v/cm	dc to 30 Mc	12 nsec
L	50 mv/cm to 40 v/cm	dc to 30 Mc	12 nsec
	5 mv/cm to 4 v/cm	3 cps to 24 Mc	15 nsec
For Differential Input Applications			
D High-Gain	1 mv/cm (to 50 mv/cm)	dc to 300 kc (dc to 2 Mc)	0.18 μsec
E Low-Level	50 μv/cm (to 10 mv/cm)	0.06 cps to 20 kc (to 60 kc)	6 μsec
G Wide-Band	50 mv/cm to 50 v/cm	dc to 20 Mc	18 nsec
For High DC Sensitivity Applications			
H Wide-Band	5 mv/cm to 50 v/cm	dc to 15 Mc	23 nsec
For Spectrum Analysis			
Type L Series Units-Present Units cover 1-10,400 Mc.			
For Integration, Differentiation, Function Generation, Linear and Non-Linear Uses			
O Operational Amplifier	50 mv/cm to 50 v/cm	dc to 25 Mc	14 nsec
For Transducer & Strain Gage Uses			
Q	10 μstrain/div to 10 k μstrain/div	dc to 6 kc	60 μsec
For Transistor-Risetime Checks			
R	0.5 ma/cm to 100 ma/cm		12 nsec
For Diode Recovery Time Measurements			
S	0.05 v/cm & 0.5 v/cm		12 nsec
For Precise Amplitude Measurements Via Slide-back			
W	1 mv/cm to 50 mv/cm at 1 mv/cm	dc to 23 Mc dc to 8 Mc	15.5 nsec to 44 nsec
Z	50 mv/cm to 25 v/cm	dc to 13 Mc	27 nsec
High-Frequency Sampling Applications			
1S1	350 psec risetime		

VERTICAL DEFLECTION SYSTEM

FREQUENCY RESPONSE
DC to 50 Mc with Type 1A1 or 1A2 Plug-In Unit. See Plug-In Chart for other combinations.

DELAY LINE
170-nsec

SIGNAL OUT AT FRONT PANEL
0.5 v/cm of displayed signal; risetime 20 nsec.

HORIZONTAL DEFLECTION SYSTEM

TIME BASE A
0.1 μsec/cm to 5 sec/cm; 24 calibrated steps accurate to ±2%, 1-2-5 sequence. Range continuously variable between steps, uncalibrated. Range extended from 5 to 12 sec/cm, uncalibrated.

TIME BASE B
Identical to Time Base A.

SWEEP DELAY
Calibrated Delay Range variable from 0.1 μsec to 50 sec. Accuracy from 50 μsec to 50 sec is within ±1% of indicated delay ±2 minor dial divisions of Delay-Time Multiplier control. For delays less than 50 μsec, accuracy is the same plus 75-100 nsec (inherent circuit delay) . Delay Range extended to 120 sec, uncalibrated. Time jitter in delayed trigger or delayed sweep less than one part in 20,000.

SWEEP MAGNIFICATION
2, 5, or 10X; accuracy ±5%, extends sweep to 10 nsec/cm.

SINGLE-SWEEP OPERATION
Locked out after firing until reset at front panel, or with 20 v at rear. Time Base A and B reset by same switch.

EXTERNAL HORIZONTAL INPUT
DC to at least 400 kc; sensitivity 0.1 v/cm or 1 v/cm with 10X step attenuation. Sensitivity continuously variable over 10 to 1 range. Impedance: 1 Megohm paralleled with 55 pf.

FRONT-PANEL OUTPUTS
+20 v gates from both time bases; 100 v sawtooth from Time Base A; 10 v delayed trigger pulse.

TRIGGER
Separate and identical for both Time Bases. Trigger circuits respond to beyond 50 Mc.

TRIGGER SOURCE
Internal, external, or line. Internal source selected from scope vertical amp, or direct from certain Plug-In Units such as the Type 1A1 Dual-Trace. Coupling is direct or ac. Features ac Low-Frequency Reject (3 db down at 1.5 kc).

TRIGGER MODE
Triggered or Automatic. Latter provides bright reference trace with no input (or input less than 20 cps). Above 20 cps, time base can be triggered at repetition rate of incoming signal. Display is jitter-free to beyond 50 Mc.

TRIGGER LEVEL
Adjustable to provide triggering at desired point on input waveform (rising or falling portion). Switch provides either ±2 or ±20 volt trigger-level selection.

TRIGGER REQUIREMENTS
Internal: Minimum of 2 mm of displayed signal; increasing to 1 cm at approx. 50 Mc, ac-coupled, or 5 mm, dc input, directly coupled. External: 0.2 v, ac or dc.

546 RM546
547 RM547

OTHER CHARACTERISTICS

CRT

Tektronix T5470, flat-faced, electrostatic focus and deflection. Helical post accelerator. 5:1 post-to-post accelerating-voltage ratio. 6 cm vertical scan; bright display with high resolution. 9-mil spot diameter (nominal) at 2 μa beam current provides bright display under average ambient light even at high sweep rates. Uniform focus over full cm viewing area. P31 Phosphor. Centered 9-mil spot expands to not more than 12 mils at either end (ratio of 1:1.3 as compared to typical change of 1:4 in comparable tubes operated at 10 kv.) Throughout full 6 cm of vertical scan, high deflection sensitivity is maintained. Deflection-plate input capacitance is low; linearity and over-all pattern geometry is superior.

GRATICULE

Internal, 6 x 10 cm; no parallax; variable edge-lighting. Graduated in centimeter squares with 2-mm divisions scribed on vertical and horizontal center lines. Has two additional horizontal lines to aid in risetime measurements.

DISPLAY FEATURES

Front-panel controls: trace rotation (screwdriver adjustment), intensity, focus, astigmatism. Internal screwdriver adjustments control display geometry and high-voltage supply level. Beam-position indicators show direction of crt beam when off screen. DC-coupled unblanking to crt grid assures uniform beam current for all sweep speeds and repetition rates at any setting of intensity control. Z-Axis input for external modulation of crt beam is ac coupled; requires 15 v, pk-to-pk.

AMPLITUDE CALIBRATOR

Provides 18 square-wave voltages, 0.2 mv to 100 v, $\pm$3%, 1-2-5 sequence. Output Z is 50 ohms, 0.2 mv to 0.2 v. Frequency approx. 1 kc. Risetime and falltime: 0.5 μsec from 0.2 mv to 5 v, and 1.0 μsec from 10 v to 100 v. 100 v dc output also provided. Reference currents supplied through front-panel loop: 5 ma dc and 5 ma, 1-kc square wave.

POWER REQUIREMENT

Wired for 115 v, 50 to 60 cps, the electronically-regulated power supplies permit a line-voltage variation between 103.5 and 126.5 v (115 v $\pm$10%). Changing transformer taps permits operation at 108, 122, 216, 230, or 244 v, regulated within 10%, each range. The Type 546/547 draws 510 watts, typically. For 50 to 60 **and** 400 cps operation, a different fan must be installed (at extra cost). Order MODIFICATION 101M.

CABINET MODEL DIMENSIONS

16 7/8" high by 13 1/8" wide by 23 7/8" deep. Net weight: 65 3/4 lbs.; ship. wt.: approx. 85 lbs.

RACK-MOUNT MODEL DIMENSIONS

14" high by 19" wide by 22 3/4" deep. Type RM 546 and RM547 are elecrically identical to Type 546 and 547. Can be withdrawn from cabinet on slide-out tracks and tilted and locked in 7 positions. Net weight: 87 lbs. ea. Ship. wt.: approx. 114 and 116 lbs., respectively.

TYPE 546 OSCILLOSCOPE, without plug-in units ... **$1750**

Each instrument includes: 2—P6008 probes (010-0129-00); 1—Plate, Protector, CRT (387-0918-00); 1— 3-conductor poweer cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—Light filter polarizer (installed) (378-0545-00); 3—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manuals (070-367).

TYPE 547 OSCILLOSCOPE, without plug-in units ... **$1875**

Each instrument includes: 2—P6008 probes (010-0129-00); 1—Plate, Protector, CRT (387-0918-00); 1— 3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—Light filter, polarized, (installed) (378-0545-00); 3—Patch cords, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manuals (070-0398-00).

TYPE RM546 OSCILLOSCOPE, without plug-in units .. **$1850**

Each instrument includes: 2—P6008 probes (010-0129-00); 1—Plate, Protector, CRT (387-0918-00); 1— 3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—Light filter polarized (installed) (378-0545-00); 3—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 1—Set mounting hardware; 2—Instruction Manuals (070-0421-00).

TYPE RM547 OSCILLOSCOPE, without plug-in units .. **$1975**

Each instrument includes: 2—P6008 probes (010-0129-00); 1—Plate Protector, CRT (387-0918-00); 1— 3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 1—Light filter, polarized, (installed) (387-0545-00); 3—Patch cords, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 1—Set mounting hardware; 2—Instruction Manuals (070-0420-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-27 MC DUAL-BEAM OSCILLOSCOPE Type 551

HIGH-INTENSITY TRACE

DUAL-BEAM CRT

ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS

The Type 551 uses a Tektronix two-gun cathode-ray tube with two pairs of vertical-deflection plates. A single pair of horizontal-deflection plates is common to both electron beams. The two wide-band main amplifiers in the Type 551 are designed for Tektronix Letter-Series, 1-Series, and Spectrum Analyzer Plug-In Units, providing a high degree of signal-handling versatility in both channels. Both electron beams are simultaneously deflected horizontally at any one of many sweep rates provided by an accurately-calibrated time-base generator.

The Type 551 can be used as a single-beam oscilloscope as well as a dual-beam instrument. In addition, a three-channel or four-channel display is available through use of the time-sharing characteristics of Type C-A Dual-Trace Plug-In Units in one or both amplifiers. Other available Plug-In Units extend the working range of the Type 551 into applications requiring high dc-coupled sensitivity, differential input, and narrow-band microvolt sensitivity.

CHARACTERISTIC SUMMARY

VERTICALS

2 identical vertical-deflection systems

Letter-Series, 1-Series, and Spectrum Analyzer Plug-In Units offer wide selection of vertical-deflection characteristics for both beams.

HORIZONTAL

CALIBRATED SWEEP RANGE—0.1 μsec/cm to 5 sec/cm.

SWEEP MAGNIFIER—5X, extends sweep range to 0.02 μsec/cm.

TRIGGER REQUIREMENTS—Internal: 2-mm deflection. External: 0.2 v to 10 v.

EXTERNAL INPUT—0.2 v to 50 v/cm; dc to 400 kc.

CRT

DISPLAY AREA—4 x 10 cm (each beam), 2-cm overlap.

ACCELERATING VOLTAGE—10 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v, 1-kc square wave.

POWER REQUIREMENTS—105 v to 125 v or 210 v to 250 v, 900 watts maximum.

551

VERTICAL PLUG-IN UNITS

Frequency specifications are at 3-db down

For Wide Band Applications—

TYPE B WIDE-BAND UNIT—DC to 18 Mc, 20-nsec risetime at 50 mv/cm to 50 v/cm—2 cps to 12 Mc, 30-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE K FAST-RISE UNIT—DC to 25 Mc, 14-nsec risetime at 50 mv/cm to 40 v/cm.

TYPE L FAST-RISE UNIT—DC to 25 Mc, 14-nsec risetime at 50 mv/cm to 40 v/cm—3 cps to 22 Mc, 16-nsec risetime at 5 mv/cm to 4 v/cm.

For Multiple-Trace Operation—

TYPE 1A1 DUAL-TRACE PLUG-IN UNIT—DC to 27 Mc, 13-nsec risetime at 50 mv/cm to 20 v/cm. DC to 21 Mc, 16.5-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE 1A2 DUAL-TRACE PLUG-IN UNIT—DC to 27 Mc, 13-nsec risetime at 50 mv/cm to 20 v/cm.

TYPE C-A DUAL-TRACE UNIT—DC to 22 Mc, 16-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE M FOUR-TRACE UNIT—DC to 19 Mc, 18-nsec risetime at 20 mv/cm to 25 v/cm.

For Spectrum Analysis

TYPE L-SERIES UNITS—Present Units cover 1-10,400 Mc.

For Differential Input Applications—

TYPE D HIGH-GAIN UNIT—DC to 350 kc at 1 mv/cm, increasing to 2 Mc at 50 mv/cm.

TYPE E LOW-LEVEL UNIT—0.06 cps to 20 kc at 50 μv/cm, increasing to 60 kc at 0.5 mv/cm to 25 mv/cm.

TYPE G WIDE-BAND UNIT—DC to 18 Mc, 20-nsec risetime at 50 mv/cm to 50 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 14 Mc, 25-nsec risetime at 5 mv/cm to 50 v/cm.

For Operations of Integration, Differentiation, Function Generation, and Linear or Nonlinear Amplification—

TYPE O OPERATIONAL AMPLIFIER—DC to 22 Mc, 16-nsec risetime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μsec risetime at 10 μstrain/div to 10,000 μstrain/div.

For Transistor-Risetime Checking—

TYPE R UNIT—14-nsec risetime.

For Diode Recovery-Time Measurements—

TYPE S UNIT—14-nsec risetime.

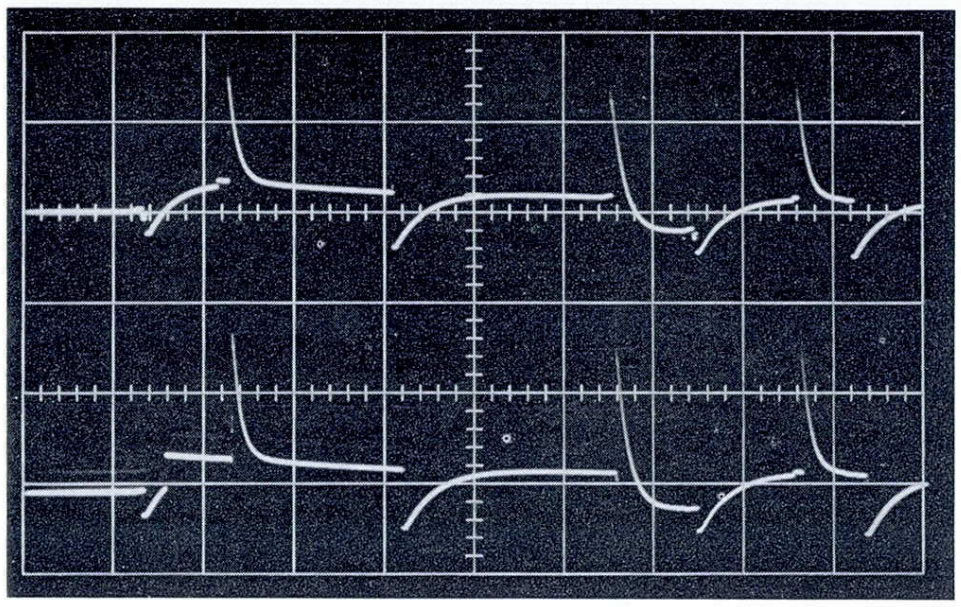
For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE W DIFFERENTIAL COMPARATOR UNIT—DC to 20.5 Mc, at 50 mv/cm, decreasing to 8 Mc at 1 mv/cm. 17-nsec risetime at 50 mv/cm, increasing to 44-nsec at 1 mv/cm.

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27-nsec risetime at 50 mv/cm to 25 v/cm.

For High-Frequency Sampling Applications

TYPE 1S1 SAMPLING UNIT—350 psec risetime.



DUAL-BEAM OPERATION SHOWING SWITCHING FUNCTIONS

VERTICAL-DEFLECTION SYSTEMS

Two DC-Coupled Main Amplifiers — Risetime of both main amplifiers is 14 nsec with Type K, L, or R Units plugged in. They are factory adjusted for optimum transient response. Any Letter- or 1-Series Plug-In Unit can be plugged into both channels for instrument operation.

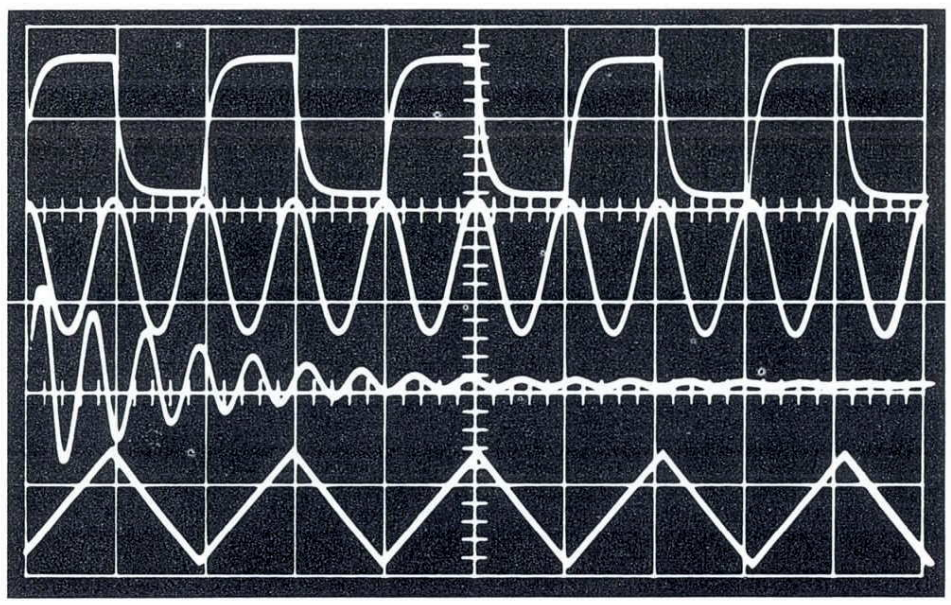
Balanced Delay Network — A signal delay of 0.2 μsec is introduced into each channel by the balanced (push-pull) delay networks. Permits observation of the leading edge of the waveform that triggers the sweep.

HORIZONTAL-DEFLECTION SYSTEM

Both electron beams of the Type 551 are simultaneously deflected by the same sweep sawtooth voltage. Sweep generator used in the Type 551 is the Miller runup type. Inverse feedback in the timing circuitry assures excellent linearity. Characteristics of this circuitry provide an extremely wide sweep range of 0.02 μsec/cm to 12 sec/cm.

Calibrated Sweeps—The Type 551 has single-knob selection of 24 calibrated sweeps: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 μsec/cm, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 msec/cm, 0.1, 0.2, 0.5, 1, 2, and 5 sec/cm. In addition, a vernier (uncalibrated) control provides for continuous adjustment of the sweep rate from 0.1 μsec/cm to 12 sec/cm. Calibration accuracy of the fixed sweeps is within 3%.

Sweep Magnifier—5X magnifier increases the calibrated sweep time to 0.02 μsec/cm. Sweep magnification is obtained by increasing the gain of the sweep output amplifier by a factor of five. The center 2 cm of the normal display is expanded to the left and right of center to fill the screen. Any one-fifth of the magnified sweep can be displayed on the screen by rotating the HORIZONTAL POSITION control. Accuracy is within 5% of the displayed portion of the magnified sweep.



DUAL-BEAM OPERATION WITH
DUAL-TRACE PLUG-IN UNITS

Single Sweep — The Type 551 has a single-sweep mode of operation. A front-panel RESET pushbutton arms the sweep to fire on the next received trigger. After firing once, the sweep is locked out until rearmed by pressing the RESET pushbutton. The READY light indicates when the sweep is armed to fire on the next received trigger.

Unblanking — DC-Coupled Unblanking to the grid of the cathode-ray tube assures uniform bias for all sweep and repetition rates.

Triggering Facilities — Versatile triggering circuitry provides for complete manual control, preset stability control, and fully-automatic triggering. The sweep can be triggered internally from either channel.

Amplitude-Level Selection — Adjustable amplitude-level and stability controls are provided for triggering the sweep at a selected amplitude level on the triggering waveform. Trigger source can be internal, external, or the line frequency, either ac-coupled or dc-coupled. The triggering point can be on either the rising or falling slope of the triggering waveform.

Preset Stability — Same as above, except the stability control is preset to the optimum triggering point and requires no readjustment.

Automatic Triggering — Automatic level-seeking trigger circuit provides dependable triggering for most applications. One simple setting assures positive sweep-triggering by signals of widely differing amplitudes, shapes, and repetition rates. No trigger controls need be touched until a different type of operation is desired. Range of automatic operation is between 60 cycles and 2 megacycles, approximately. In the absence of an input signal the sweep is automatically triggered at about a 50-cycle rate, providing a reference trace on the screen.

Low-Frequency Reject—Prevents low-frequency components, such as hum, from interfering with stable triggering.

High Frequency Sync — Assures a steady display of sine-wave signals up to approximately 30 megacycles. Requires a signal large enough to cause about 2 cm of deflection, or an external signal of about 2 v.

Trigger Requirements — Internal triggering — a signal large enough to cause a 2 mm deflection. External triggering—a signal of 0.2 v to 10 v.

Horizontal Input Amplifier—DC-coupled external connection to the sweep-output amplifier is through a front-panel connector. An attenuator makes the horizontal deflection factor continuously variable from approximately 0.2 v/cm to 50 v/cm. Passband is dc to approximately 400 kc at maximum sensitivity.

OTHER CHARACTERISTICS

Amplitude Calibrator — A square-wave calibration voltage is available through a front-panel coaxial connector. Eighteen fixed voltages — 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100 millivolts, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 volts peak-to-peak are provided. Accuracy is within 3%. Square-wave frequency is about 1 kc.

Cathode-Ray Tube — 10 kv accelerating potential assures bright displays when using fast sweeps at low repetition rates, and in single-sweep applications. The Tektronix cathode-ray tube is a 5" flat-faced metallized precision dual-beam tube with helical post-accelerating anode. It provides a linear 4 cm x 10 cm viewing area, each beam, with at least 2 cm overlap. For best results over the wide screen range of the Type 551, a P2 screen is normally furnished.

Beam Position Indicators—Indicator lights show the direction of each electron beam when it is not on the screen.

Illuminated Graticule — An edge-lighted graticule is marked in centimeter squares with two-millimeter centerline divisions for convenience in making measurements in time and amplitude. Viewing area is 6 x 10 cm. Illumination of the graticule is controlled by a front-panel knob.

Output Waveforms—A 20 v positive gate voltage of the same duration as the sweep, and a 150 v sweep sawtooth waveform are available at front-panel binding posts via cathode followers.

Direct Input to CRT—An opening in the side of the cabinet permits direct connection to the deflection plates.

Access to Interior—Three-piece cabinet design provides easy access to the interior of the instrument. Cabinet sides are held in place by two quick-opening fasteners, and can be removed in a matter of seconds.

Probes — Four 10X attenuation low-capacitance probes are supplied with the instrument. Input capacitance of the Type 551-K combination with probes is 7 pf. Excellent transient response is retained, as the probes introduce no overshoot or ringing, but frequency response is down an additional 1 db at 25 Mc.

551

Power Requirement—A separate unit supplies power to the Type 551 indicator unit through an inter-unit cable. Wired for 117 v, 50 to 60 cps, the electronically-regulated power supplies permit a line-voltage variation between 105 and 125 v. Changing transformer taps permits operation at 107, 127, 214, 234, or 254 v. The Type 551 draws 850 watts, typically, with two Type C-A Plug-In Preamplifiers.

Mechanical Specifications—Dimensions for Indicator Unit are 16⅞" high by 13⅛" wide by 23⅞" long. Dimensions for the Power Unit are 10⅜" high by 13½" wide by 17½" long.

Net Indicator Unit weight is 52½ pounds. Shipping weight is 74 pounds, approx. Net Power Unit weight is 44¼ pounds. Shipping weight is 52 pounds, approx.

TYPE 551, without plug-in units $1850

Each instrument includes: 4—P6006 probe (010-0127-00); 1—Inter-unit cable (012-0032-00); 1—Power Supply for Type 551; 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 2—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0245-00).

12-KV HIGH VOLTAGE MODIFICATION

For increased brightness and writing rate, the crt accelerating voltage can be increased from 10 to 12 kv. This modification can be ordered as MOD 108A installed at the factory. Consult your Field Engineer to learn about the advantages, limitations, and delivery time of this or other modified instruments.

TYPE 551 MOD 108A, without plug-in units . . . $1875

Each instrument includes: 4—P6006 probe (010-0127-00); 1—Inter-unit cable (012-0032-00); 1—Power Supply for Type 551; 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 2—Patch cord, BNC-to-BNC, 18" (102-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0245-00).

RACK MOUNT ADAPTER

A cradle mount to adapt the Type 551 Oscilloscope and its power supply for rack mounting is available. It consists of two cradles and two masks. The cradles, one each for the indicator and power supply units, support the instruments in any standard 19" relay rack. The two masks fit around the regular instrument panels of the two units. Rack height requirements; Indicator mask 17½", Power Supply mask 12¼". Tektronix blue vinyl finish.

Order Part Number 040-0279-00 . . . . . $72.80

SCOPE-MOBILE® CARTS

TYPE 202-1 TILT-LOCK CART with storage drawer and locking front wheels $120

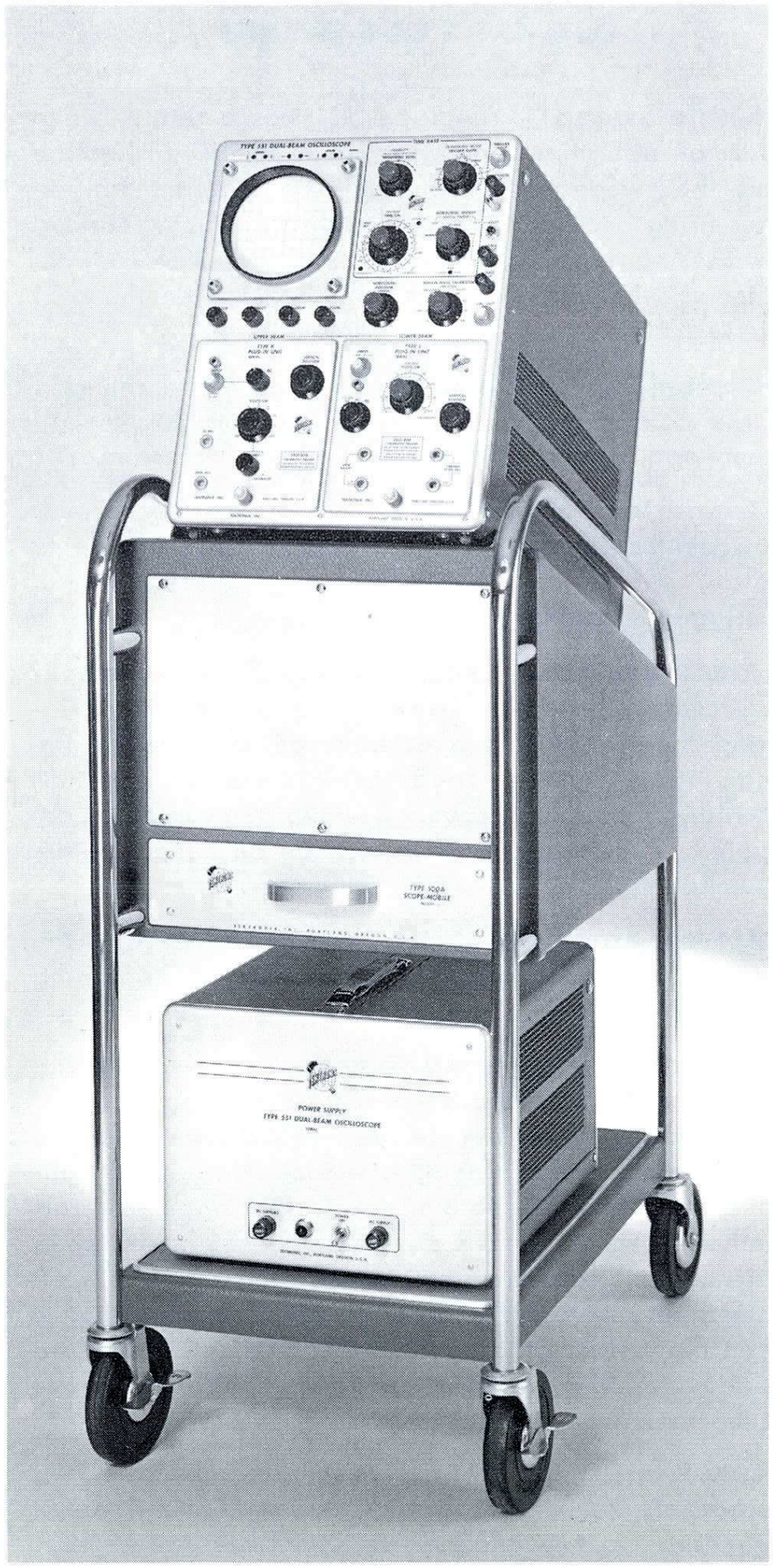
TYPE 202-2 TILT-LOCK CART with storage drawer, plug-in unit carrier, and locking front wheels $130

TYPE 500A CART with storage drawer and locking front wheels $99.50

TYPE 500/53A CART with storage drawer, plug-in unit carrier, and locking front wheels $110

See Catalog accessory pages for complete information.

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.



DC-to-33 MC DUAL BEAM OSCILLOSCOPE with SWEEP DELAY Type 555

ILLUMINATED NO-PARALLAX GRATICULE

INDEPENDENT ELECTRON BEAMS

ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, AND SPECIAL-PURPOSE PLUG-INS

CALIBRATED SWEEP DELAY

2 PLUG-IN TIME BASES

HIGH-INTENSITY TRACE

The Type 555 Oscilloscope is a dual-beam laboratory instrument for accurate measurements in the dc to 33 Mc range. Two complete horizontal-deflection systems and two independent vertical amplifiers provide for completely independent deflection of the two beams.

Either of two plug-in time base units can control the sweep of either or both electron beams. In addition, a continuously-variable calibrated sweep delay allows expansion of a selected portion of the undelayed sweep for precise time measurements. Delayed and undelayed sweeps can be presented simultaneously.

The wide-band main amplifiers in the Type 555 are designed to accept Letter-Series, 1-Series, and Spectrum Analyzer Plug-In Units for a high degree of signal-handling versatility.

CHARACTERISTIC SUMMARY

VERTICALS

2 identical vertical-deflection systems

Letter-Series, 1-Series, and Spectrum Analyzer Plug-In Units offer wide selection of vertical-deflection characteristics for both beams.

HORIZONTALS

2 independent horizontal-deflection systems

CALIBRATED SWEEP RANGE—0.1 μsec/cm to 5 sec/cm.

SWEEP MAGNIFIER—5X, extends sweep range to 0.02 μsec/cm.

CALIBRATED SWEEP DELAY—0.1 μsec to 50 sec.

TRIGGER REQUIREMENTS—
Internal: 1-cm deflection to 33 Mc.
External: 0.2 v to 10 Mc, 0.5 v to 33 Mc.

EXTERNAL INPUT—0.2 to 20 v/cm; dc to 350 kc; 1 megohm, 47 pf.

CRT

ILLUMINATED NO-PARALLAX GRATICULE

DISPLAY AREA—4 x 10 cm (each beam), 2-cm overlap.

ACCELERATING VOLTAGE—10 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v, 1-kc square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 50 to 60 cps, 1050 watts maximum.

555

VERTICAL PLUG-IN UNITS

Frequency specifications are at 3-db down

For Multiple-Trace Operation—

TYPE 1A1 DUAL-TRACE UNIT—DC to 33 Mc, 10.5-nsec risetime at 50 mv/cm to 50 v/cm—DC to 23 Mc, 15-nsec risetime at 5 mv/cm increasing to 33 Mc at 50 mv/cm.

TYPE 1A2 DUAL-TRACE UNIT—DC to 33 Mc, 10.5-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE C-A DUAL-TRACE UNIT—DC to 24 Mc, 15-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE M FOUR-TRACE UNIT—DC to 20 Mc, 17-nsec risetime at 20 mv/cm to 25 v/cm.

For Wide Band Applications—

TYPE B WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm—2 cps to 12 Mc, 30-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE K FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm.

TYPE L FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm—3 cps to 24 Mc, 15-nsec risetime at 5 mv/cm to 4 v/cm.

For Spectrum Analysis—

TYPE L-SERIES UNITS—Present Units cover 1-10,400 Mc.

For Differential Input Applications—

TYPE D HIGH-GAIN UNIT—DC to 300 kc at 1 mv/cm, increasing to 2 Mc at 50 mv/cm.

TYPE E LOW-LEVEL UNIT—0.06 cps to 20 kc at 50 μv/cm, increasing to 60 kc at 0.5 mv/cm to 25 mv/cm.

TYPE G WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 15 Mc, 23-nsec risetime at 5 mv/cm to 50 v/cm.

For Operations of Integration, Differentiation, Function Generation, and Linear or Nonlinear Amplification—

TYPE O OPERATIONAL AMPLIFIER—DC to 25 Mc, 14-nsec risetime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μsec risetime at 10 μstrain/div. to 10,000 μstrain/div.

For Transistor-Risetime Checking—

TYPE R UNIT—12-nsec risetime.

For Diode Recovery-Time Measurements—

TYPE S UNIT—12-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE W DIFFERENTIAL COMPARATOR UNIT—DC to 23 Mc, at 50 mv/cm, decreasing to 8 Mc at 1 mv/cm. 15-nsec risetime at 50 mv/cm, increasing to 44-nsec at 1 mv/cm.

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27 nsec risetime at 50 mv/cm to 25 v/cm.

For High-Frequency Sampling Applications—

TYPE 1S1 SAMPLING UNIT—350 psec risetime.

VERTICAL-DEFLECTION SYSTEMS

IDENTICAL MAIN AMPLIFIERS provide 10.5-nsec risetime and dc-to-33 Mc (3-db down) when used with the Type 1A1 or 1A2 Plug-In Units. In addition, any Tektronix Letter-Series or Spectrum Analyzer Plug-In Units can be used in the Type 555 Oscilloscope.

PASSIVE PROBES supplied with the Type 555 reduce loading on the circuit under test and attenuate the signal by a factor of 10. Input impedance becomes 10 megohms paralleled by approximately 7 pf with Type 555 and Type 1A1 or 1A2 Unit. Excellent transient response is retained, as the probes introduce no overshoot or ringing, but frequency response is down an additional 1 db at 33 Mc.

SIGNAL DELAY permits observation of the leading edge of the waveform that triggers the sweep. A 0.2 μsec delay is introduced into each channel by the balanced (push-pull) delay networks.

HORIZONTAL-DEFLECTION SYSTEMS

PLUG-IN TIME-BASE UNITS incorporate Miller runup type sweep generators and inverse feedback in the timing circuits to assure excellent sweep linearity. The plug-in design of the Type 21A and 22A Time-Base Units provides easy access to all components for ease in maintenance. The Type 22A Time Base is identical to the Type 21A Time Base except for additional sweep-delay capabilities.

SWEEP RANGE from 0.1 μsec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence. Accuracy is typically within 1% of full scale, and in all cases within 3%. Sweep range is continuously variable uncalibrated from 0.1 μsec/cm to 12 sec/cm. An indicator light warns the operator when the sweep is uncalibrated.

5X SWEEP MAGNIFIER expands the center 2-cm portion of the normal display to fill 10 cm, and can be used to increase the calibrated sweep time to 0.02 μsec/cm. Any one-fifth of the magnified sweep can be displayed. Accuracy is within 5% of the displayed portion of the magnified sweep.

SINGLE SWEEP OPERATION facilitates photographic recording of waveforms. A RESET pushbutton arms the sweep to fire on the next received trigger. After firing once the sweep is locked out until rearmed by pressing the RESET button. The READY light indicates when the sweep is armed to fire on the next received trigger.

AUTOMATIC BASELINE SWEEP MODE provides a bright reference trace (regardless of sweep speed) when no input signal is applied, or when the input signal repetition rate is less than 20 cps. Above 20 cps, the time base is triggered at the repetition rate of the incoming trigger signal to achieve jitter-free displays to beyond 33 Mc.

EXTERNAL HORIZONTAL INPUTS provide for horizontal deflection of either beam with an external source. Inputs are at the rear of the oscilloscope. Horizontal sensitivity is continuously variable from 0.2 v/cm to approximately 20 v/cm. Passbands are dc to 350 kc at maximum sensitivity. Input impedances are 1 megohm paralleled by approximately 47 pf.

TRIGGER

TRIGGER LEVEL adjusts to allow sweep triggering at any selected point on either the rising or falling portion of the waveform. Main level control operates over a ±10 v range; fine control adjusts over ±1 v range.

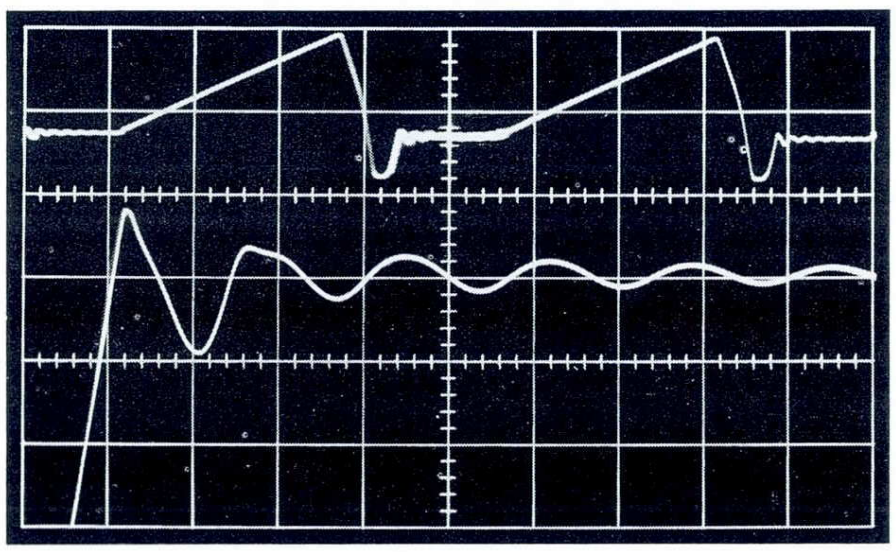
TRIGGER SOURCE can be internal, external, or line, and can be ac or dc coupled. Internally, either sweep can be triggered from the upper or lower beam, or directly from either vertical plug-in unit. The latter permits direct triggering from a single channel of Types 1A1 and 1A2 Tektronix multi-trace plug-in units.

TRIGGER REQUIREMENT is 0.2-cm deflection for internal signals from dc to 5 Mc (approx. 20 cps to 5 Mc using Automatic Baseline), 1-cm deflection to 33 Mc (using Type 1A1 or 1A2 Plug-In Preamplifier). For external signals, 0.2 v is required for reliable triggering to 10 Mc, and 0.5 v is required to 33 Mc. When ac coupled, the low-frequency 3-db point is approximately 160 cps.

SWEEP DELAY

CALIBRATED DELAY RANGE from 0.1 μsec to 50 sec is derived from the TIME BASE A Plug-In Unit and can be used to delay the start of any TIME BASE B sweep . The 24 calibrated steps are those described for the Type 21A and 22A Time Base Units, and are accurate within 3% of panel reading and within 3% of each other. A ten-turn precision potentiometer permits calibrated delay-time adjustments to any value from 0.1 μsec to 50 sec with accuracy within 3%. Incremental accuracy of this control is within 0.2% on all ranges. For extreme accuracy, any of the calibrated steps can be adjusted to the accuracy of an external standard.

TRIGGERED OPERATION holds off the start of the delayed sweep until the arrival of the first trigger signal following the selected delay time. Because the delayed sweep is actually triggered by the signal under observation, the display is completely jitter free. A steady display is thus provided for time-modulated pulses and signals with inherent jitter.



Same signal displayed simultaneously on slow sweep (upper beam) and fast sweep (lower beam) shows both coarse and fine structure of waveform.

CONVENTIONAL OPERATION holds off the start of the delayed sweep for the precise amount of selected delay time. Any time-modulation or jitter on the signal will be magnified in proportion to the amount of sweep expansion.

The time jitter in the delayed trigger or delayed sweep will not exceed one part in 20,000 of maximum available delay interval (where this interval is 10 times the Time/Cm or Delay-Time setting).

HIGH SWEEP MAGNIFICATION is readily accomplished when TIME BASE B is operated at a faster rate than TIME BASE A. For example, if TIME BASE A is operating at 50 μsec/cm and TIME BASE B is operating at 1 μsec/cm, the magnification is 50 times. Both the original and magnified displays can be viewed simultaneously when the signal is introduced into both vertical channels, so that both beams are deflected.

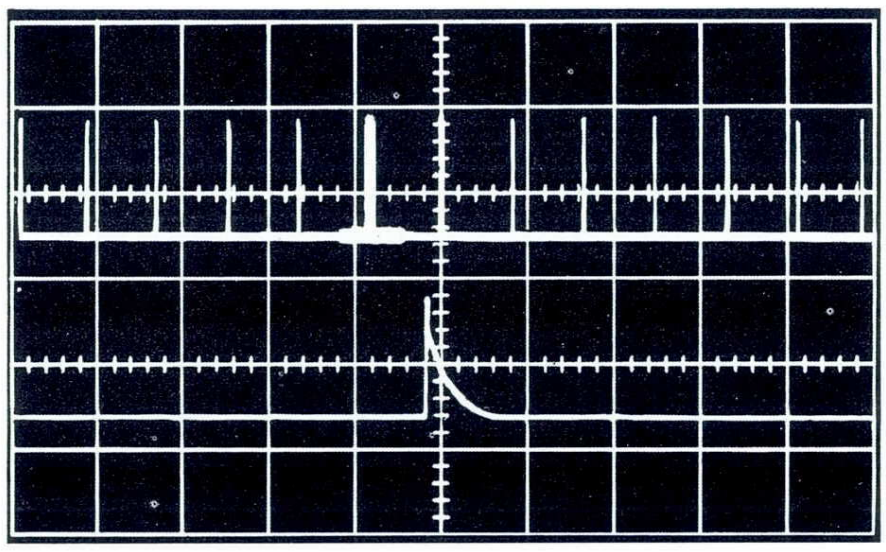
TRACE BRIGHTENING indicates the exact portion appearing on the magnified display, and shows the point-in-time relationship of the magnified display to the original display.

DELAYED TRIGGER used to start the delayed sweep is available at the front panel, and can be used to trigger external equipment at any delay from 0.1 μsec to 50 sec. Amplitude is approximately 5 volts.

CRT AND DISPLAY FEATURES

TEKTRONIX DUAL-BEAM CRT is a 5" metalized tube with separate vertical and horizontal deflection plates for each beam. Each beam has a linear display area of 4 by 10 cm, with at least 2-cm overlap. For best results over the wide sweep range of the Type 555, a P2 phosphor is normally supplied. 10-kv accelerating potential assures bright displays when using fast sweeps at low repetition rates, and in single-sweep applications.

ILLUMINATED NO-PARALLAX GRATICULE is edge lighted and is marked in 6 vertical and 10 horizontal centimeters.



Simultaneous display of pulse chain (upper beam) and sixth pulse on expanded delayed sweep (lower beam). Portion of original display that appears on faster delayed sweep is identified by trace brightening.

555

CRT CONTROLS include separate focus and intensity adjustments for each beam. A screw-driver adjustment is provided for magnetic alignment of the traces to the graticule.

BEAM POSITION INDICATORS light to show the direction of each electron beam when it is not on the screen.

ILLUMINATED GRATICULE with variable edge lighting is accurately ruled in centimeter squares. Viewing area is 6 by 10 cm. Vertical and horizontal centerlines for each beam are further marked in 2-mm divisions for convenience in making time and amplitude measurements.

MULTI-TRACE BLANKING eliminates switching transients from the display when a multiple-trace plug-in unit is operated in its chopped mode. The blanking voltage can be applied to the crt cathode by means of a switch located at the rear of the oscilloscope.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR provides 18 square-wave voltages at the front panel. Peak-to-peak amplitude from 0.2 mv to 100 v is in 1-2-5 sequence and accurate within 3%. Square-wave frequency is approximately 1 kc.

OUTPUT WAVEFORMS available at the front panel include 2 positive gates of approximately 20 volts, 2 positive-going sawtooths of approximately 150 volts, and a delayed trigger of approximately 5 volts.

POWER REQUIREMENT—A separate unit supplies power to the Type 551 indicator unit through an inter-unit cable. Wired for 117 v, 50 to 60 cps, the electronically-regulated power supplies permit a line-voltage variation between 105 and 125 v. Changing transformer taps permits operation at 107, 127, 214, 234, or 254 v. All heaters in the indicator unit and amplifier heaters in the power supply are regulated for stable operation and long tube life. The Type 555 draws 1050 watts, maximum.

INDICATOR UNIT is 20⅛" high by 13⅛" wide by 24" deep. Net weight is 66 pounds. Shipping weight is 89 pounds, approx.

POWER SUPPLY UNIT is 10⅜"high by 13½" wide by 17½" deep. Net weight is 50¼ pounds. Shipping weight is 61 pounds, approx.

TYPE 555, without preamplifier plug-in units $2650

Each instrument includes: 1—Type 21A Time-Base Plug-In Unit; 1—Type 22A Time-Base Plug-In Unit; 4—P6006 probe (010-0127-00); 1—Inter-unit cable (012-0032-00); 1—Power Supply for Type 555; 1—Time base extension (013-0013-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Polarized light filter (378-0545-00); 1—Plate, Protector, CRT, clear (387-0918-00); 2—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0165-00).

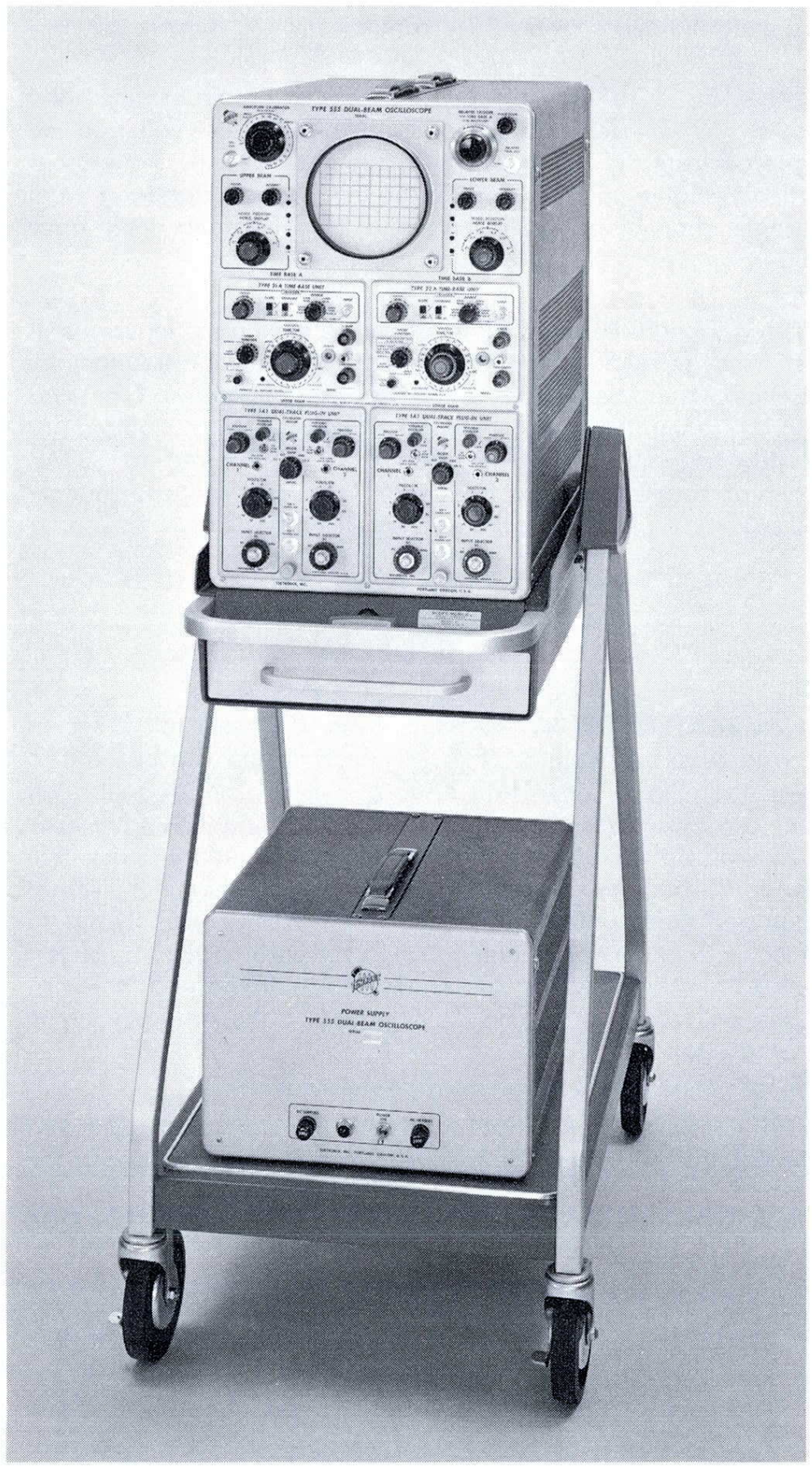
EXTRA TIME-BASE PLUG-IN UNITS

Net weight of each Type 21A and Type 22A Time Base Unit is 4¼ pounds, shipping weight of each is 6 pounds, approx.

TYPE 21A TIME-BASE UNIT $275
TYPE 22A TIME-BASE UNIT $285

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Scope-Mobile® Carts are available for the Type 555 Oscilloscope and Power Supply Unit to provide easy moving in your work area.



SCOPE-MOBILE® CARTS

TYPE 202-1 TILT-LOCK CART with storage drawer and locking front wheels $120

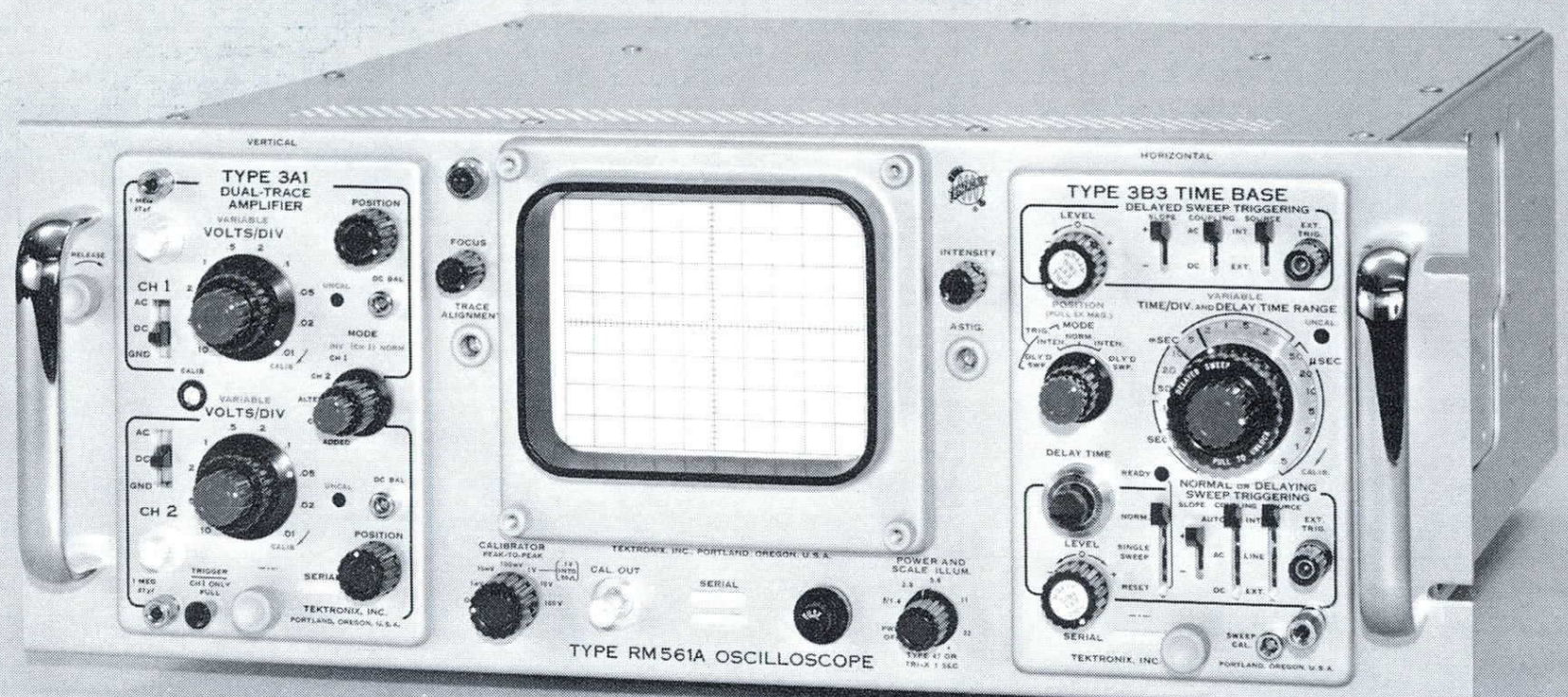
TYPE 202-2 TILT-LOCK CART with storage drawer, plug-in unit carrier, and locking front wheels $130

TYPE 500A CART with storage drawer and locking front wheels $99.50

TYPE 500/53A CART with storage drawer, plug-in unit carrier, and locking front wheels $110

See Catalog accessory pages for complete information.

OSCILLOSCOPE Type 561A / RM561A



ILLUMINATED NO-PARALLAX GRATICULE

X-Y DISPLAYS

ACCEPTS 2-SERIES AND 3-SERIES PLUG-IN UNITS

COMPACT SIZE

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of 2-Series and 3-Series Plug-In Units.

HORIZONTAL

Horizontal deflection characteristics extremely flexible through use of versatile time-base units and amplifiers of the 2-Series and 3-Series Plug-In Units.

CRT

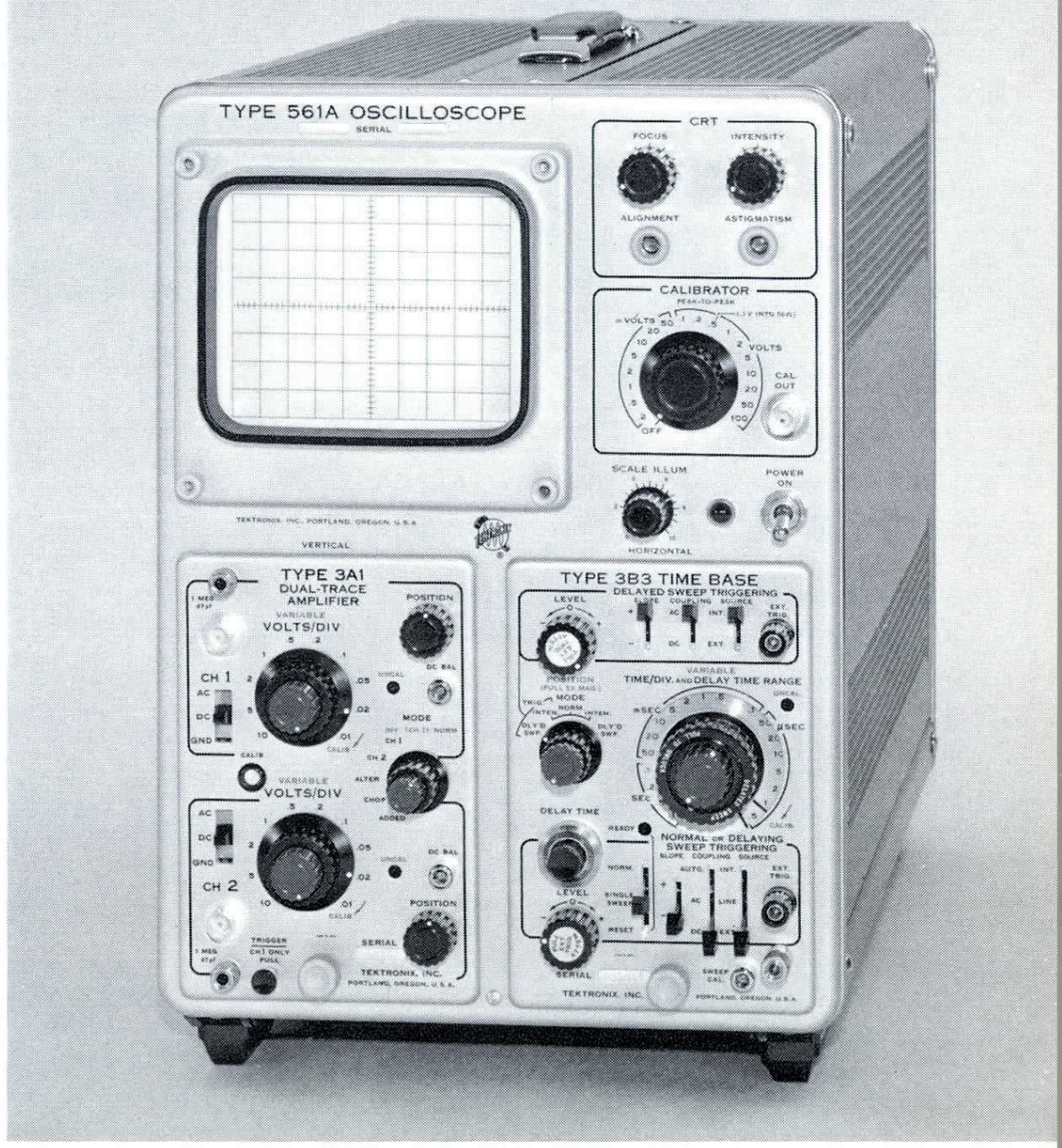
DISPLAY AREA—8 x 10 cm.

ACCELERATING VOLTAGE—3.5 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v (561A), 1 mv to 100 v (RM561A), and 0.1 v into 50 Ω, power-line frequency.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 50 to 400 cps (561A), 50 to 60 cps (RM561A), 240 watts maximum.



561A
RM561A

2-SERIES AND 3-SERIES PLUG-IN UNITS

AMPLIFIER UNITS

TYPE	INPUT (ac or dc coupled)	PASSBAND (3-db down)	CALIBRATED SENSITIVITY	PRICE
2A60-Single Trace	1 megohm—47 pf, 600 v max.	dc—1 Mc.	50 mv/div—50 v/div, 4 decade steps, with variable control.	$105
2A61—Differential (low level)	10 megohm—50 pf, ±5 v (ac-coupled only)	0.06 cps—300 kc	10 μv/div—20 mv/div, 1-2-5 sequence, with variable control.	$385
2A63—Differential (50:1 rejection ratio)	1 megohm—47 pf, 600 volts max.	dc—300 kc.	1 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$150
3A1—Dual Trace (identical channels)		dc—10 Mc.	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$450
3A2*—Dual Trace		dc—500 kc	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$500
3A3—Dual Trace Differential		dc—500 kc	100 μv/div—10 v/div, 1-2-5 sequence, with variable control.	$790
3A6—Dual Trace (identical channels)		dc—10 Mc (has delay line)	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$540
3A72—Dual Trace (identical channels)		dc—650 kc.	10 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$275
3A74—Four Trace (identical channels)		dc—2 Mc.	20 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$590
3A75—Single trace		dc—4 Mc.	50 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$175
3C66—Carrier Amplifier	120-Ω strain-gage bridge	dc—5 kc (70-μsec risetime)	10 μstrain/div—10,000 μstrain/div, 1-2-5 sequence, with variable control.	$400
3S3—Dual Trace Sampling (for use with 3T77)	100 K—2 pf, ±3 volts max.	equivalent dc—1 Gc. (0.35 nsec risetime)	5 mv/div—100 mv/div, 1-2-5 sequence, with variable control.	$1500 (with probes)
3S76—Dual Trace Sampling (for use with 3T77)	50 ohms dc-coupled	equivalent dc—875 Mc. (0.4-nsec risetime)	2 mv/div—200 mv/div, 1-2-5 sequence, with variable control.	$1100

TIME-BASE UNITS

TYPE	SWEEP FEATURES	TRIGGERING	PRICE
2B67	1 μsec/div to 5 sec/div, 1-2-5 sequence, variable between rates uncalibrated. 5X Magnifier. Single Sweep.	Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Automatic or Free-Run; ± Slope.	$210
3B1	Normal and Delayed Sweeps—0.5 μsec/div to 1 sec/div, 1-2-5 sequence. 18 calibrated delay settings, 0.5 μsec to 10 sec, variable between rates uncalibrated.	Internal, External; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same features (except no Automatic) for Delayed Sweep.	$535
3B2*	2 μsec/div to 1 sec/div, 1-2-5 sequence, variable between rates uncalibrated. Variable sweep delay.	Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Free-Run; ± Slope.	$650
3B3	Normal and Delayed Sweeps—0.5 μsec/div to 1 sec/div, 1-2-5 sequence. Continuously variable calibrated delay from 0.5 μsec to 10 sec. Single Sweep for main sweep.	Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same features (except no Line or Automatic) for Delayed Sweep.	$585
3B4	0.2 μsec/div to 5 sec/div, 1-2-5 sequence, variable between rates uncalibrated. 1X to 50X Magnifier, direct reading. Single sweep.	Internal, External, Line; Amplitude-level selection; AC or DC-Coupling; Automatic or Free Run; ± Slope.	$400
3T4 Programmable Sampling Sweep (for use with 3S3 or 3S76)	Equivalent to 1 nsec/div to 200 μsec/div, 1-2-5 sequence, variable between rates, uncalibrated. 10X Magnifier.	Internal, External; ±Slope.	$1300
3T77 Sampling Sweep (for use with 3S3) or 3S76)	Equivalent to 0.2 nsec/div to 10 μsec/div, 1-2-5 sequence, variable between rates uncalibrated. 10X Magnifier.	Internal, External; ± Slope.	$650

* Designed primarily for the Type 567 Digital Readout Oscilloscope.

561A
RM561A

High in performance, low in cost, the Type 561A and Type RM561A Oscilloscopes represent an advance in value and versatility in the Type 560-Series Oscilloscopes.

Conventional operation extends to the 10-Mc range, with sub-nanosecond capabilities available through the use of sampling plug-in units.

The Type 561A and RM561A use plug-in units for both the vertical and horizontal deflection systems. Thus you can adapt them to meet your present requirements and easily and economically expand their range of operations when needed. The deflection plug-in units used are fully compatible with the companion instruments in the entire Type 560-Series.

Both the Type 561A and Type RM561A use a cathode-ray tube that features an internal graticule with controllable illumination. Thus you can take photographs with the same ease provided by external graticules and make parallax-free measurements.

Occupying only 7 inches of standard rack height, the Type RM561A bolts directly to the rack but may be ordered with optional slide-out tracks at additional cost.

CONVENTIONAL DISPLAYS: A wide range of non-sampling sensitivity and passband characteristics are available by choosing from eight 2-Series and 3-Series Amplifier Plug-In Units. Both single-trace and multi-trace display amplifiers are available. Selection of the Type 2A61, 2A63, or 3A3 will give differential amplifier operation, while strain gage and other transducer operations are available with the Type 3C66.

Desired sweep operation can be selected by choosing from 2-Series and 3-Series Time-Base Plug-In Units.

SAMPLING DISPLAYS: The Type 3T77 and 3T4 Sampling Sweep Units with either a Type 3S3 or Type 3S76 Amplifier Unit and 3T4 give a dual-trace sampling system with risetimes in the subnanosecond region. The Type 3S3 provides a system with a high impedance low capacity input while the Type 3S76 provides a 50-ohm input system.

X-Y DISPLAYS: Types 2A60, 2A63, 3A3, 3A72, 3A74 and 3A75 Amplifier Units operate equally well in the vertical and horizontal compartments of the Type 561A and RM561A, permitting X-Y displays using any combination of these plug-in units.

For medium and high-frequency X-Y operation, use of two units of the same type is recommended. Deflection-circuit capacitances of the 561A and RM561A are carefully standardized to minimize high frequency phase-shift between two plug-ins of the same type when operated X-Y.

MULTIPLE X-Y DISPLAYS: Using two Type 3A72 or two Type 3A74 Plug-In Units, both synchronization and automatic pairing are provided. With two 3A72's operated X-Y in the dual-trace mode, Channel 1 of the left-hand plug-in is always plotted against Channel 1 of the right-hand plug-in. With two Type 3A74's, two, three, or four independent displays may be obtained, properly paired: Channel 4 versus Channel 4, Channel 3 versus Channel 3, etc . . .

Using two Type 3A1 or two Type 3A6 Plug-In Units, dual-trace switching is not synchronized. Dual X-Y displays within the center 8 x 8 area of the graticule may be obtained, but one plug-in or the other must usually be limited to single-trace operation unless four displays are wanted.

Using two Type 3A3 Plug-In Units, dual-trace switching is synchronized, so one Y Channel remains plotted against the same Y Channel once the display is set up. There is no provision for consistent pairing each time the system is operated.

As with single X-Y displays, two plug-ins of the same type should always be used where X-Y phase relationships are to be preserved.

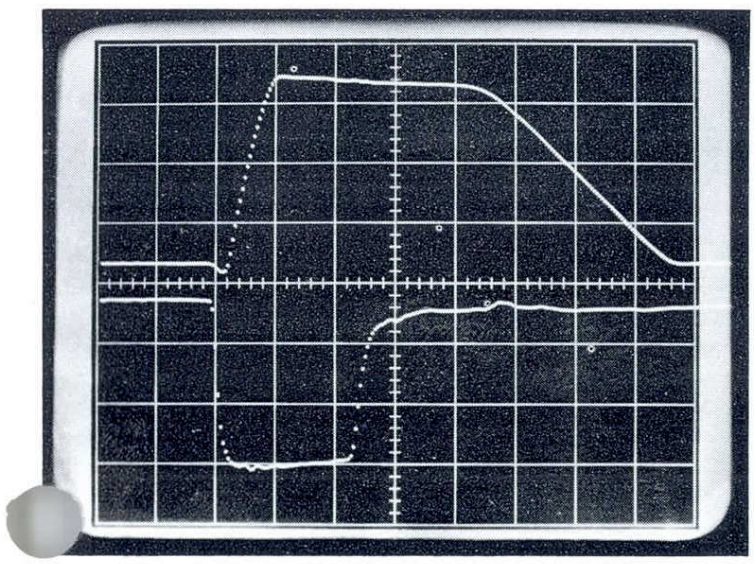
PARALLAX-FREE MEASUREMENTS—CONVENIENT PHOTOGRAPHY—

The internal graticule eliminates parallax, a common cause of erroneous readings. Parallax is an apparent displacement of the trace in relationship to the graticule. It occurs when the trace is on a different plane than the graticule and is not viewed from exactly the same angle for all readings.

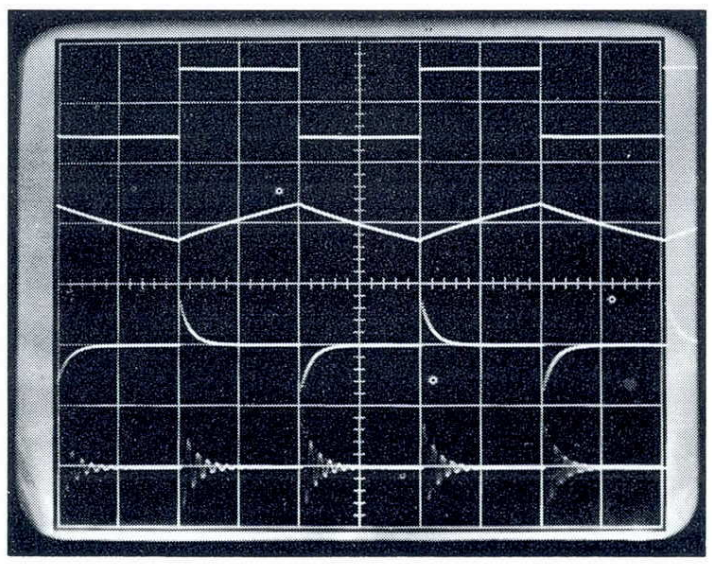
When the trace and graticule are on the same plane, as on the cathode-ray tube of the Type 561A and RM561A Oscilloscope, parallax is eliminated.

Controllable illumination of the internal graticule enables you to easily take waveform photographs in which the graticule rulings are sharply delineated. This was formerly possible only with oscilloscopes using external graticules.

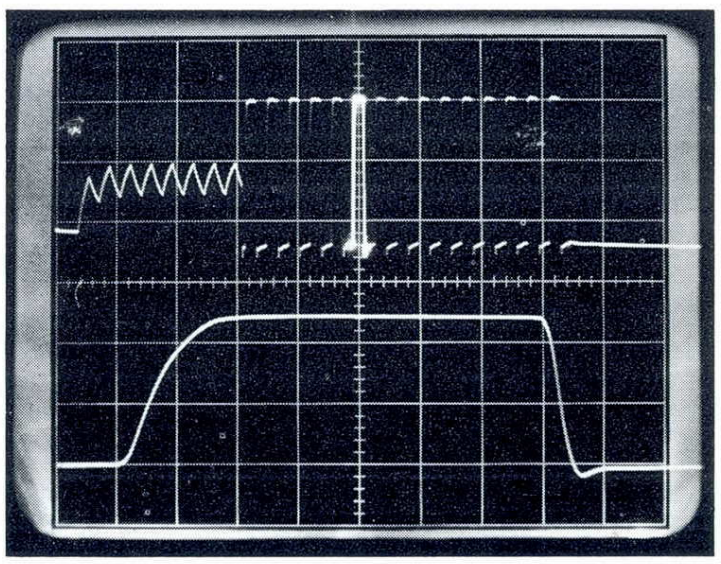
Adding to the convenience of operation are numbered settings of the illumination control that serve as an approximate exposure guide.



SAMPLING
Transistor turn-on and turn-off (upper trace). Driving pulse (lower trace).



MULTIPLE TRACES
Four traces photographed simultaneously.



DELAYING SWEEP (Double exposure)
Intensified portion of waveform (upper trace) expanded (lower trace) by means of delayed sweep.

561A
RM561A

TYPE 561A CHARACTERISTICS

PLUG-IN COMPARTMENTS accept all 2-Series and 3-Series Amplifier and Time-Base Units.

TEKTRONIX CRT is a flat-faced tube with internal "no parallax" graticule, controllable edge-lighting, 3.5-kv mono-accelerator, beam-deflection unblanking. A P31 Phosphor is normally supplied.

DISPLAY CONTROLS on the front-panel include Focus, Intensity, and Scale Illumination (of the 8-cm by 10-cm display area), in addition to screwdriver adjustments for Astigmatism and Trace Alignment.

ILLUMINATED INTERNAL GRATICULE is edge lighted and is marked in 8 vertical and 10 horizontal cm divisions. The centerlines are marked every 2 mm. Illumination is controlled by a front-panel knob.

Z-AXIS INPUT through a terminal at the rear of the instrument permits external modulation of the crt cathode.

CALIBRATOR has 18 calibrated square-wave voltages available, from 0.2 mv to 100 v, pk-to-pk—approximately 5 μsec risetime, at line frequency. The 0.5 calibrator voltage provides 0.1 volts into 50 ohms, for convenient amplitude calibration of sampling units.

ELECTRONICALLY-REGULATED SUPPLIES furnish all voltages required for proper operation of the Indicator and the plug-in units. Regulated dc-supply operates with line voltage between 105 v to 125 v or 210 v to 250 v, 50 to 400 cps . . . provides 85 watts for powering the 2-Series and 3-Series Plug-In Units. Supplies operate normally with or without plug-ins.

POWER REQUIREMENT is 105 v to 125 v; 50 to 400 cps; 240 watts maximum.

CABINET MODEL (561A) is 14½" high, 10" wide, and 21⅛" deep. Net weight is 28 pounds. Shipping weight is 39 pounds, approx.

TYPE 561A, without plug-in units $500

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Plate, protector, crt, clear (387-0935-00); 1—Filter, smoke gray (installed) (378-0544-00); 1—Patch cord, BNC-to-BNC, 18", red (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18", red (012-0091-00); 1—Post jack, BNC, red (012-0092-00); 2—Instruction Manual (070-0342-00).

RACK MOUNT MODEL

THE TYPE RM561A is electrically identical to the 561A except the calibrator range is from 1 mv to 100 v and the line frequency range is 50 to 60 cps. The RM561A mounts on a standard 19" rack; is 7" high and 18⅜" deep. (Additional mounting information on the Catalog Instrument Dimensions page.) Net weight is 30½ pounds. Shipping weight is 54 pounds, approx.

TYPE RM561A, without plug-in units $550

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Plate, protector, crt, clear (387-0935-00); 1—Filter, smoke gray (installed) (378-0544-00); 1—Patch cord, BNC-to-BNC, 18", red (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18", red (012-0091-00); 1—Post jack, BNC, red (012-0092-00); 1—Set mounting hardware; 2—Instruction Manual (070-0352-00).

TYPE RM561A WITH SLIDE-OUT TRACKS

A slide-out track kit can be used to mount the RM561A to a standard 19" rack. When mounted this way, the RM561A can be pulled out from the rack, tilted, and locked in any of 7 positions for convenient servicing. An RM561A with a slide-out track kit attached is available as MOD 171. Slide-out track kits can also be ordered separately.

TYPE RM561A MOD 171, without plug-in units $600

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Plate, protector, crt, clear (387-0935-00); 1—Filter, smoke gray (installed) (378-0544-00); 1—Patch cord, BNC-to-BNC, 18", red (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18", red (012-0091-00); 1—Post Jack, BNC, red 012-0902-00); 1—Set mounting hardware; 1—Pr. Mounting Tracks (315-0027-00); 2—Instruction Manual (070-0352-00).

SLIDE-OUT TRACK KIT (Part No. 351-0050-00) $45

ACCESSORIES

SCOPE-MOBILE® CARTS

The Type 561A can be given in-plant portability through use of proper Scope-Mobile® Carts. Scope-Mobile Carts for the Type 561A have an adjustable tray that tilts and locks in any of nine positions for best oscilloscope viewing angle, 5-inch rubber wheels, two-wheel brakes, and a linoleum-topped shelf on the bottom.

Two carts are available for the Type 561A Oscilloscope. One cart, the Type 201-1, has a drawer installed. Installed in the other cart, the Type 201-2, is both a drawer and a plug-in carrier that provides dust-free storage for two plug-in units.

See Catalog Accessory pages for additional information.

TYPE 201-1, with drawer $120
TYPE 201-2, with drawer-carrier $130

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BLANK PLUG-IN CHASSIS

This chassis contains necessary mechanical parts for construction of a custom plug-in for Type 560-Series Oscilloscopes—including frame, blank front panel, blank chassis, 24-pin connector, latch, and small hardware. Instructions are included on permissible power-supply loading and crt signal requirements. Electrical components are not included.

Blank Plug-In Chassis, Part No. 040-0245-00 . . . . . $25

PROBES

Attenuator probes are not included with the Type 561A or RM561A Oscilloscopes. Tektronix probes are recommended when minimum loading of the circuit is required.

The following probes are recommended for use with the Type 2-Series and 3-Series Amplifier Plug-In Units.

See Accessory pages for complete information on the probes.

STANDARD PROBES

Use	Input Inductance R	Input Inductance C	Rating	Probe No.	Price
1:1 Attenuator	1 meg Ω	97 pf	600 v max	P6028	$12.50
10:1 Attenuator	10 meg Ω	9.5 pf	600 v max	P6006	22.00
1000:1 High Voltage	100 meg Ω	3 pf	12 kv max	P6013	75.00
1000:1 High Voltage	100 meg Ω	2.7 pf	40 kv max	P6015	200.00
Current			15 amps max	P6016	75.00

SAMPLING PROBES

Use	Input Inductance R	Input Inductance C	Rating	Probe No.	Price
10:1 Attenuator	500 Ω	0.7 pf	16 vdc-500 vac	P6034	$35.00
100:1 Attenuator	5 k Ω	0.6 pf	50 vdc-500 vac	P6035	35.00
10:1 to 1000:1 C.F.	10 meg Ω	varies	varies	P6032	220.00
Current			500 ma	CT1/P6040	31.00

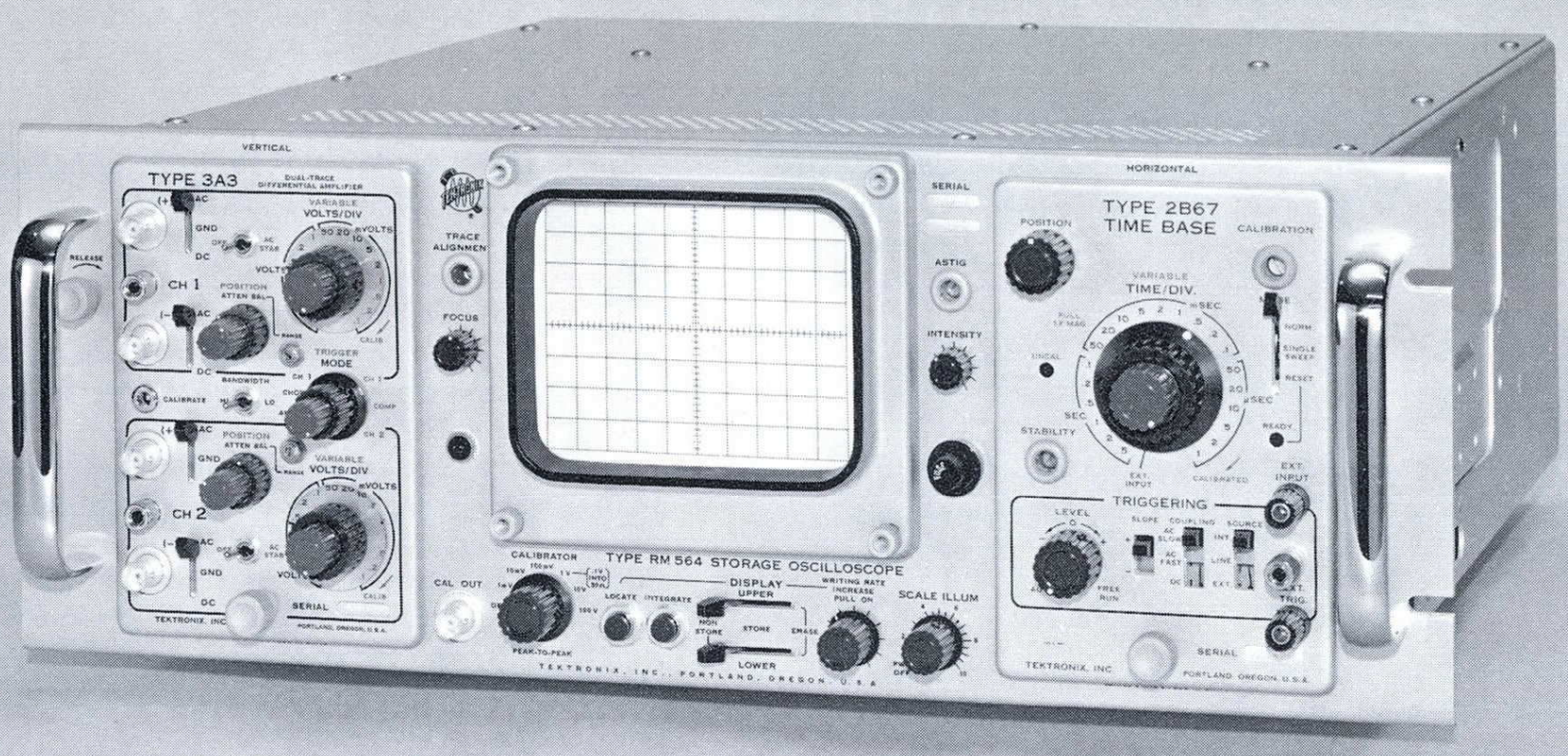
POLARIZED VIEWER

Permits easier viewing of oscilloscope traces of normal to low intensity under high ambient light conditions. Slips on the instrument in seconds.

Rectangular Polarized Viewer (Part No. 016-0039-00) $10

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

STORAGE OSCILLOSCOPE Type 564 / RM564



MULTI-PURPOSE

ACCEPTS 2-SERIES AND 3-SERIES PLUG-IN UNITS

X-Y DISPLAYS

CONVENTIONAL AND STORED DISPLAYS

The Type 564 and RM564 are versatile general-purpose oscilloscopes with storage capabilities. Plug-in units for both vertical and horizontal deflection systems of the Type 564 and RM564 adapts these oscilloscopes to meet your present requirements and easily and economically expand their range of operation when needed.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of 2-Series and 3-Series Plug-In Units. Full pass-band capabilities of plug-in units available in conventional operation.

HORIZONTAL

Horizontal deflection characteristics extremely flexible through use of versatile Time-Base Units and Amplifiers of the 2-Series and 3-Series Plug-In Units.

564
RM564

CRT

DISPLAY AREA—8 x 10 cm.
ACCELERATING VOLTAGE—3.5 kv.
SPLIT SCREEN STORAGE—Store on either upper or lower half of screen with non-storage on other half; store on entire screen; or non-store on entire screen.
STORAGE TIME—Up to one hour.
ERASE TIME—Approximately 0.25 second.
LOCATE BUTTON—Determines vertical position of next trace.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v (564), 1.0 mv to 100 v (RM564), and 0.1 v into 50 Ω, power line frequency.
POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 50 to 400 cps (564), 50 to 60 cps (RM564), 240 watts max.

STORAGE OPERATION

Features of the Type 564 as a storage oscilloscope include—
Long-term storage with short-time erasure.
Storage of single shot signals.
Split-screen with individual controls for each half.

SOME THINGS YOU CAN DO WITH TYPE 564 STORED DISPLAYS

1. *Observe single-shot phenomena.*
2. *Study, for long periods of time, a waveform without having to photograph it.*
3. *Photograph only those stored waveforms you want.*
4. *Compare waveforms to a stored waveform, each displayed on half of the crt face.*
5. *Change the stored standard while viewing other waveforms on the non-stored half.*
6. *Photograph a multi-event stored display with only one exposure.*
7. *Store fast recurrent phenomena by using the integrate feature.*
8. *Store X-Y displays.*

AVAILABLE DISPLAYS

With the wide-range sensitivity and passband of the Type 564, several storage and conventional-operation displays are obtainable. (Deflection characteristics of stored displays are limited by stored-mode writing characteristics of crt).

Single-trace and multi-trace displays are obtained by selecting either sampling or non-sampling amplifier plug-in units. Selection of the Type 2A61, 2A63, or 3A3, gives differential amplifier operation, while strain gage and other transducer operations are available with the Type 3C66.

Single X-Y displays result from using any combination of the Type 2A60, 2A63, 3A3, 3A72, 3A74, and 3A75 Units in both the vertical and horizontal compartments of the Type 564.

For medium and high-frequency X-Y operation, however, use two units of the same type. Careful standardization of deflection-circuit capacitance in the Type 564, minimizes high frequency phase-shift between two of the same type plug-in units when operated X-Y.

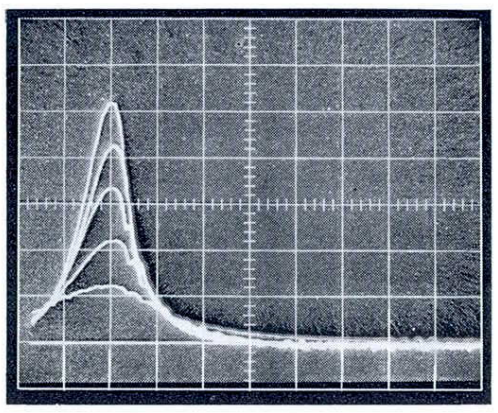
Multiple X-Y displays: Using two Type 3A72 or two Type 3A74 Plug-In Units, both synchronization and automatic pairing are provided. With two 3A72's operated X-Y in the dual trace mode, Channel 1 of the left-hand plug-in is always plotted against Channel 1 of the right-hand plug-in. With two Type 3A74's, two, three, or four independent displays may be obtained, properly paired: Channel 4 versus Channel 4, Channel 3 versus Channel 3, etc. . . .

Using two Type 3A1 or two Type 3A6 Plug-In Units, dual-trace switching is not synchronized. Dual X-Y displays within the center 8 x 8 area of the graticule may be obtained, but one plug-in or the other must usually be limited to single-trace operation unless four displays are wanted.

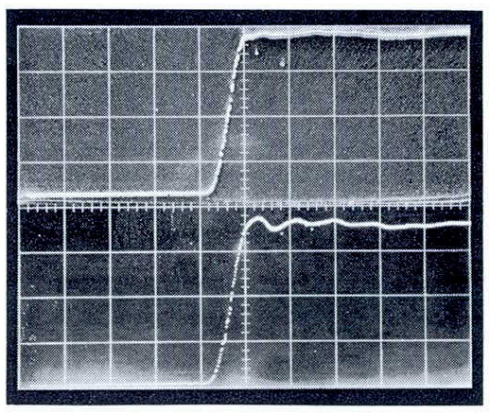
Using two Type 3A3 Plug-In Units, dual-trace switching is synchronized, so one Y Channel remains plotted against the same Y Channel once the display is set up. There is no provision for consistent pairing each time the system is operated.

As with single X-Y displays, two plug-ins of the same type should always be used where X-Y phase relationships are to be preserved.

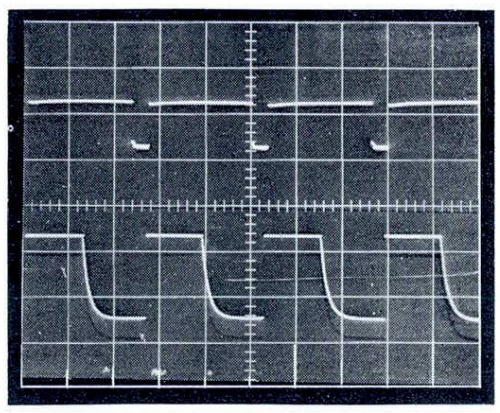
Sampling displays with risetimes in the sub-nanosecond region are obtained by using Type 3T77, or 3T4, Sampling Sweep Unit with either a Type 3S3 or Type 3S76 Amplifier Unit. Either combination will provide a dual-trace display or a single display. The Type 3S3 provides a system with a high impedance low capacitance input while the Type 3S76 provides a 50-ohm input system.



SHOCK TEST
Display shows ability of the Type 564 to store consecutive events for comparison or photography. Waveforms indicate shock imparted by dropping sub-table weight of 5 lbs. from different heights. Drop of 5″ = 50.5 g's; 10″ = 92.5 g's; 15″ = 142 g's; 20″ = 181 g's; 25″ = 214 g's. Sweep Rate is 2 msec/cm.



LOW-REPETITION RATE SAMPLING
Display shows ability of the Type 564 (with sampling plug-in units) to record complete sampling waveforms at low repetition rates. Upper trace is stored. Lower trace is not stored. This capability for storing low-repetition-rate waveforms allows observation and analysis of the entire sampled display at one time.



INPUT-OUTPUT WAVEFORMS
Display shows ability of the Type 564 to store similar waveforms for easy comparison.

Upper trace shows the trigger input to a multivibrator.

Lower trace shows the output.

2-SERIES AND 3-SERIES PLUG-IN UNITS

AMPLIFIER UNITS

TYPE	INPUT (ac or dc coupled)	PASSBAND (3-db down)	CALIBRATED SENSITIVITY	PRICE
2A60-Single Trace	1 megohm—47 pf, 600 v max.	dc—1 Mc.	50 mv/div—50 v/div, 4 decade steps, with variable control.	$105
2A61—Differential (low level)	10 megohm—50 pf, ±5 v (ac-coupled only)	0.06 cps—300 kc	10 μv/div—20 mv/div, 1-2-5 sequence, with variable control.	$385
2A63—Differential (50:1 rejection ratio)	1 megohm—47 pf, 600 volts max.	dc—300 kc.	1 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$150
3A1—Dual Trace (identical channels)		dc—10 Mc.	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$450
3A2*—Dual Trace		dc—500 kc	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$500
3A3—Dual Trace Differential		dc—500 kc	100 μv/div—10 v/div, 1-2-5 sequence, with variable control.	$790
3A6—Dual Trace (identical channels)		dc—10 Mc (has delay line)	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$540
3A72—Dual Trace (identical channels)		dc—650 kc.	10 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$275
3A74—Four Trace (identical channels)		dc—2 Mc.	20 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$590
3A75—Single trace		dc—4 Mc.	50 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$175
3C66—Carrier Amplifier	120-Ω strain-gage bridge	dc—5 kc (70-μsec risetime)	10 μstrain/div—10,000 μstrain/div, 1-2-5 sequence, with variable control.	$400
3S3—Dual Trace Sampling (for use with 3T77)	100 K—2 pf, ±3 volts max.	equivalent dc—1 Gc. (0.35 nsec risetime)	5 mv/div—100 mv/div, 1-2-5 sequence, with variable control.	$1500 (with probes)
3S76—Dual Trace Sampling (for use with 3T77)	50 ohms dc-coupled	equivalent dc—875 Mc. (0.4-nsec risetime)	2 mv/div—200 mv/div, 1-2-5 sequence, with variable control.	$1100

TIME-BASE UNITS

TYPE	SWEEP FEATURES	TRIGGERING	PRICE
2B67	1 μsec/div to 5 sec/div, 1-2-5 sequence, variable between rates uncalibrated. 5X Magnifier. Single Sweep.	Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Automatic or Free-Run; ± Slope.	$210
3B1	Normal and Delayed Sweeps—0.5 μsec/div to 1 sec/div, 1-2-5 sequence. 18 calibrated delay settings, 0.5 μsec to 10 sec, variable between rates uncalibrated.	Internal, External; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same features (except no Automatic) for Delayed Sweep.	$535
3B2*	2 μsec/div to 1 sec/div, 1-2-5 sequence, variable between rates uncalibrated. Variable sweep delay.	Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Free-Run; ± Slope.	$650
3B3	Normal and Delayed Sweeps—0.5 μsec/div to 1 sec/div, 1-2-5 sequence. Continuously variable calibrated delay from 0.5 μsec to 10 sec. Single Sweep for main sweep.	Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same features (except no Line or Automatic) for Delayed Sweep.	$585
3B4	0.2 μsec/div to 5 sec/div, 1-2-5 sequence, variable between rates uncalibrated. 1X to 50X Magnifier, direct reading. Single sweep.	Internal, External, Line; Amplitude-level selection; AC or DC-Coupling; Automatic or Free Run; ± Slope.	$400
3T4 Programmable Sampling Sweep (for use with 3S3 or 3S76)	Equivalent to 1 nsec/div to 200 μsec/div, 1-2-5 sequence, variable between rates, uncalibrated. 10X Magnifier.	Internal, External; ±Slope.	$1300
3T77 Sampling Sweep (for use with 3S3) or 3S76)	Equivalent to 0.2 nsec/div to 10 μsec/div, 1-2-5 sequence, variable between rates uncalibrated. 10X Magnifier.	Internal, External; ± Slope.	$650

* Designed primarily for the Type 567 Digital Readout Oscilloscope.

564
RM564

CRT PERFORMANCE

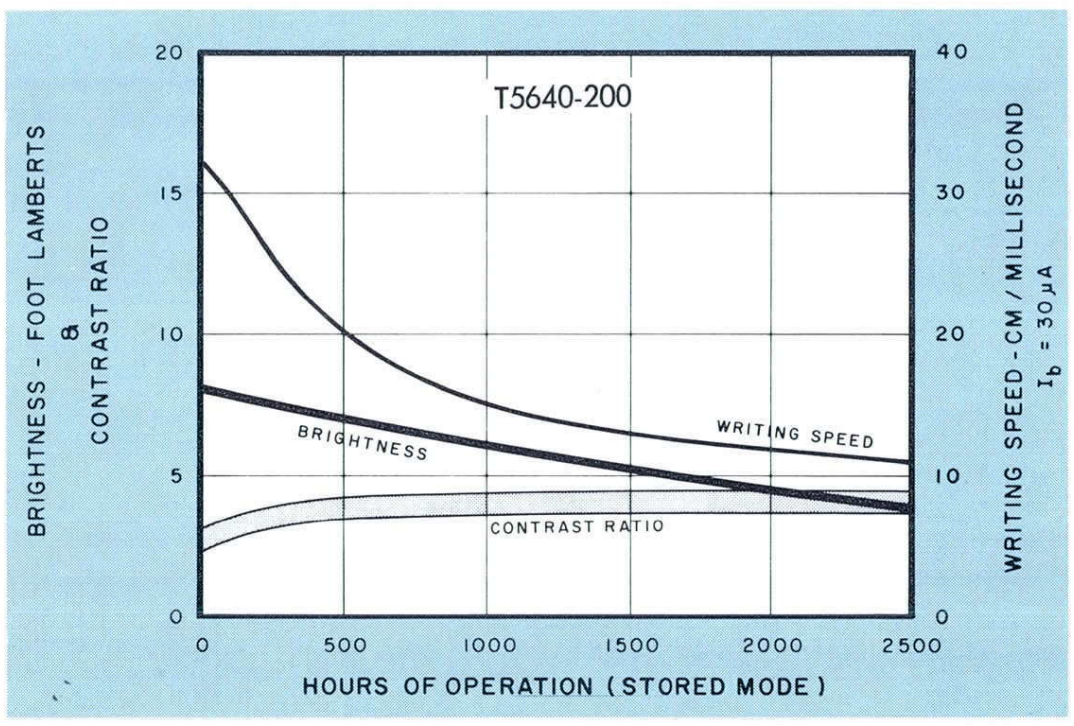
There are two storage tubes available for use in the Type 564 Oscilloscope. Both tubes exhibit characteristics of a conventional crt when used in the non-stored mode. One tube, the Type T5640-200, has the brightest stored display. The other tube, the Type T5640-201, has the fastest writing speed.

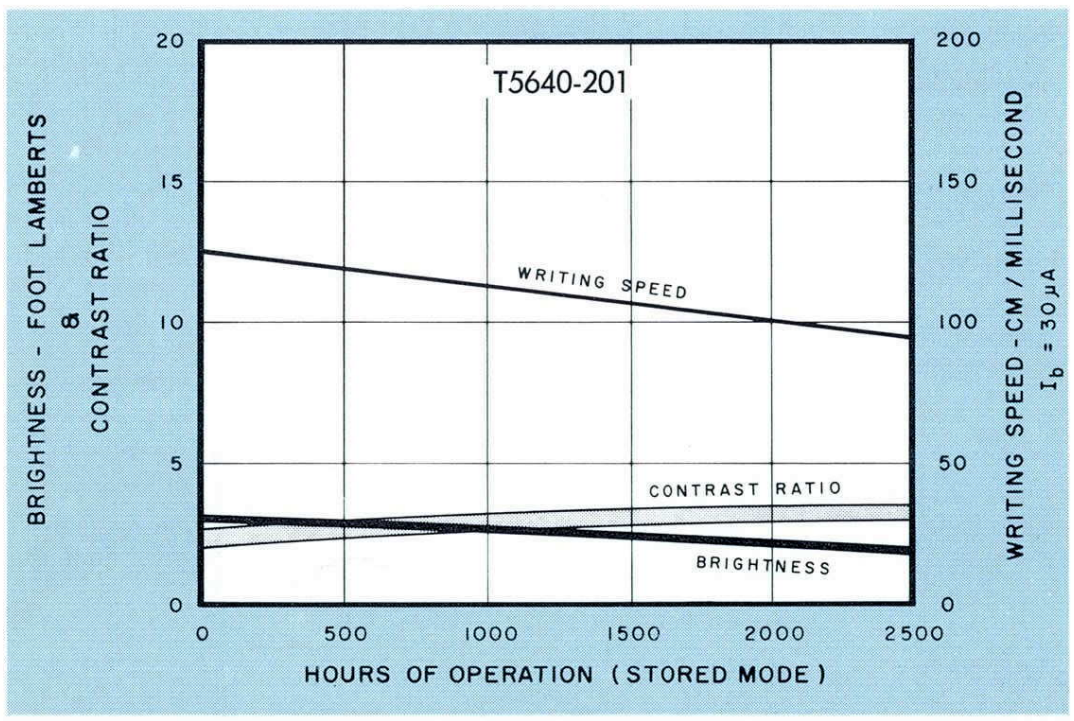
By selecting the proper tube, you can obtain optimum oscilloscope performance for your particular application. Such selection is important because each tube has its own maximum writing speed and brightness for stored-mode operation. The brightness of a stored display for an individual tube is one value regardless of the intensity of the beam that generated it.

The brightness curves on the graph represent values measured with a Spectra Spot Brightness Meter at operating level with the entire screen faded positive. The writing speed curve was obtained with a crt beam of 30 μamps. The hours shown are the actual hours the crt is used in the stored mode with repetitive writing, storing, and erasing.

It should be noted that non-storage operation of the crt has little effect on the stored-mode brightness and writing speeds shown. Therefore to obtain maximum crt performance and service, the oscilloscope should be in the non-stored mode when stored displays are not needed.

TYPICAL LIFE CHARACTERISTICS





TYPE 564 CHARACTERISTICS

STORAGE TIME is up to 1 hour. Longer times may be obtained, but tend to reduce target sensitivity in the stored areas.

ERASURE TIME is only 0.25 second.

SINGLE SHOT SIGNALS at slow or medium speeds are easily stored for extended viewing time (within writing-rate capabilities of crt selected).

REPETITIVE SIGNALS at high-speeds can be stored with the integrate technique. Using the integrate feature provides an increase in stored writing rate by 10 times on 12 repetitive traces thus permitting storage of displays much faster than the stated writing rate of the crt.

STORED WRITING-RATE ENHANCEMENT controls the single-sweep storage capabilities of the storage crt. Through adjustment of the front-panel Writing-Rate Increase control, single-trace spot velocities up to 250 cm/msec using the T5640-200 crt or up to 500 cm/msec using the T5640-201 crt can be stored with minimal loss of resolution and contrast in the center 7 x 9 cm.

SPLIT SCREEN allows the operator to store on one-half of the screen and non-store on the other half of the crt screen. Also the entire screen may be used for either storage or conventional displays.

TWO CRTS available for optimum performance in your application. Please read CRT PERFORMANCE that appears later for stored-writing speed and intensity of each tube.

PLUG-IN COMPARTMENTS accept 2-Series and 3-Series Amplifier and Time-Base Units.

CRT is a flat-faced tube with beam-deflection blanking and an accelerating voltage of 3.5 kv. It has split-screen storage capabilities with individual storage controls for each half of the screen. Storage time to over one hour with an erase time of 0.25 sec, approx.

LOCATE BUTTON, when depressed, causes a spot or spots to appear at the left of the crt screen at the vertical position of the next sweep.

GRATICULE is edge lighted and is marked in 8 vertical and 10 horizontal cm divisions. The centerline is marked every 2 mm. Illumination is controlled by a front-panel knob.

Z-AXIS INPUT through a terminal at the rear of the instrument permits external modulation of the crt cathode.

CALIBRATOR has 18 amplitude-calibrated square-wave voltages available, from 0.2 mv to 100 v, pk-to-pk; approximately 5 μsec risetime, at line frequency. The 0.5 v calibrator switch position provides 0.1 volts (pk-to-pk) into 50 ohms, for convenient calibration of sampling units.

ELECTRONICALLY-REGULATED SUPPLIES furnish all voltages required for proper operation of the Indicator and the plug-in units. Regulated dc supply operates with line voltage between 105 v to 125 v or 210 v to 250 v, 50 to 400 cps. . . max. 240 watts, approx.

MECHANICAL FEATURES include dimensions of 13½" high by 9¾" wide by 21½" deep. Net weight is 33 pounds. Shipping weight is 41 pounds, approx.

ORDERING INFORMATION

The Type 564 has the storage tube T5640-200 (stored display of highest intensity).

TYPE 564 (without plug-in units) $950

Each instrument includes: 1—Polarized viewer (016-0039-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00; 1—Post jack, BNC (012-0092-00); 2——Instruction manual (070-0351-00).

The Type 564 MOD 08 has the storage tube T5640-201 (fastest stored writing speed).

TYPE 564 MOD 08 (without plug-in units) $950

Each instrument includes: 1—Polarized viewer (016-0039-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00; 1—Post jack, BNC (012-0092-00); 2——Instruction manual (070-0351-00).

RACK MOUNT MODEL

The TYPE RM564 OSCILLOSCOPE, only 7" in height, is suited for applications where panel space might be at a premium. The Type RM564 is electrically identical to the Type 564 except the amplitude calibrator range is from 1.0 mv to 100 v and the instrument operates on power line frequency of 50 to 60 cps. The Type RM564 provides for remote erase of the stored waveform on either or both halves of the split screen storage tube. The Type RM564 mounts in a 19" rack, is 7" high, and is 18 3/8" deep. (Additional mounting information on the catalog instrument dimension page). Net weight is 31 pounds. Shipping weight is 41 pounds, approx.

ORDERING INFORMATION

The Type RM564 has the storage tube T5640-200 (stored display of highest intensity).

TYPE RM564 (without plug-in units) $1035

Each instrument includes: 1—Polarized viewer (016-0039-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 1—Set mounting hardware; 2—Instruction manual (070-0415-00).

The Type RM564 MOD 08 has the storage tube T5640-201 (fastest stored writing speed).

TYPE RM564 MOD 08 (without plug-in units) $1035

Each instrument includes: 1—Polarized viewer (016-0039-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Patch cord, BNC-to-BNC, 18" (012-0037-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 1—Set mounting hardware; 2—Instruction manual (070-0415-00).

TYPE RM564 WITH SLIDE-OUT TRACKS

RM564 or RM564 MOD 08 with slide-out track kit can be used to mount the RM564 or RM564 MOD 08 in a standard 19" rack to allow the instrument to be pulled out from the rack, tilted and locked in any of 7 positions for convenient servicing. An RM564 or RM564 MOD 08 is available with the track kit installed as MOD 171, or the tracks may be ordered separately (below). A cradle assembly 040-0344-00 should be ordered separately if the instrument is to be mounted on slide-out tracks in a backless rack.

RM564 MOD 171 or RM564 MOD 08, MOD 171 . . $1085

Each instrument includes: 1—Polarized viewer (016-0039-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 1—Set mounting hardware; 2—Instruction manual (070-0415-00).

RM564 ACCESSORIES

Slide-out Track Kit (Part No. 351-0050-00) **$45**

Cradle Assembly — For use when slide-out tracks are installed in a rack without rear-support rails (not required when slide-out tracks are not used).

Cradle Assembly (Part No. 040-0344-00) **$11.45**

Remote-Erase Connector—Mates with connector on RM564—Cable not included (Part No. 134-0049-00) **$3.90**

ACCESSORIES

PROBES

Attenuator probes are not included with the Type 564 Oscilloscope. Tektronix probes are recommended when minimum loading of the circuit is required.

The following probes are recommended for use with the Type 2-Series and 3-Series Amplifier Plug-In Units. See Catalog Accessory pages for complete information on the probes.

STANDARD PROBES

Use	Input Impedance R	Input Impedance C	Rating	Probe No.	Price
1:1 Attenuator	1 meg Ω	97 pf	600 v max	P6028	$12.50
10:1 Attenuator	10 meg Ω	9.5 pf	600 v max	P6006	22.00
1000:1 High Voltage	100 meg Ω	3 pf	12 kv max	P6013	75.00
1000:1 High Voltage	100 meg Ω	2.7 pf	40 kv max	P6015	200.00
Current			15 amps max	P6016	75.00

SAMPLING PROBES

Use	Input Impedance R	Input Impedance C	Rating	Probe No.	Price
10:1 Attenuator	500 Ω	0.7 pf	16 vdc-500 vac	P6034	$35.00
100:1 Attenuator	5 k Ω	0.6 pf	50 vdc-500 vac	P6035	35.00
10:1 to 1000:1 C.F.	10 meg Ω	varies	varies	P6032	220.00
Current			500 ma	CT1/P6040	31.00

SCOPE-MOBILE® CARTS

Two Scope-Mobile® carts are available for the Type 564 Oscilloscope. One cart, the Type 201-1, has a drawer installed. Installed in the other cart, the Type 201-2, is both a drawer and a plug-in carrier that provides dust-free storage for two plug-in units.

See Catalog Accessory pages for additional information.

TYPE 201-1, with drawer $120

TYPE 201-2, with drawer-carrier $130

®Registered Trademark, Tektronix, Inc.

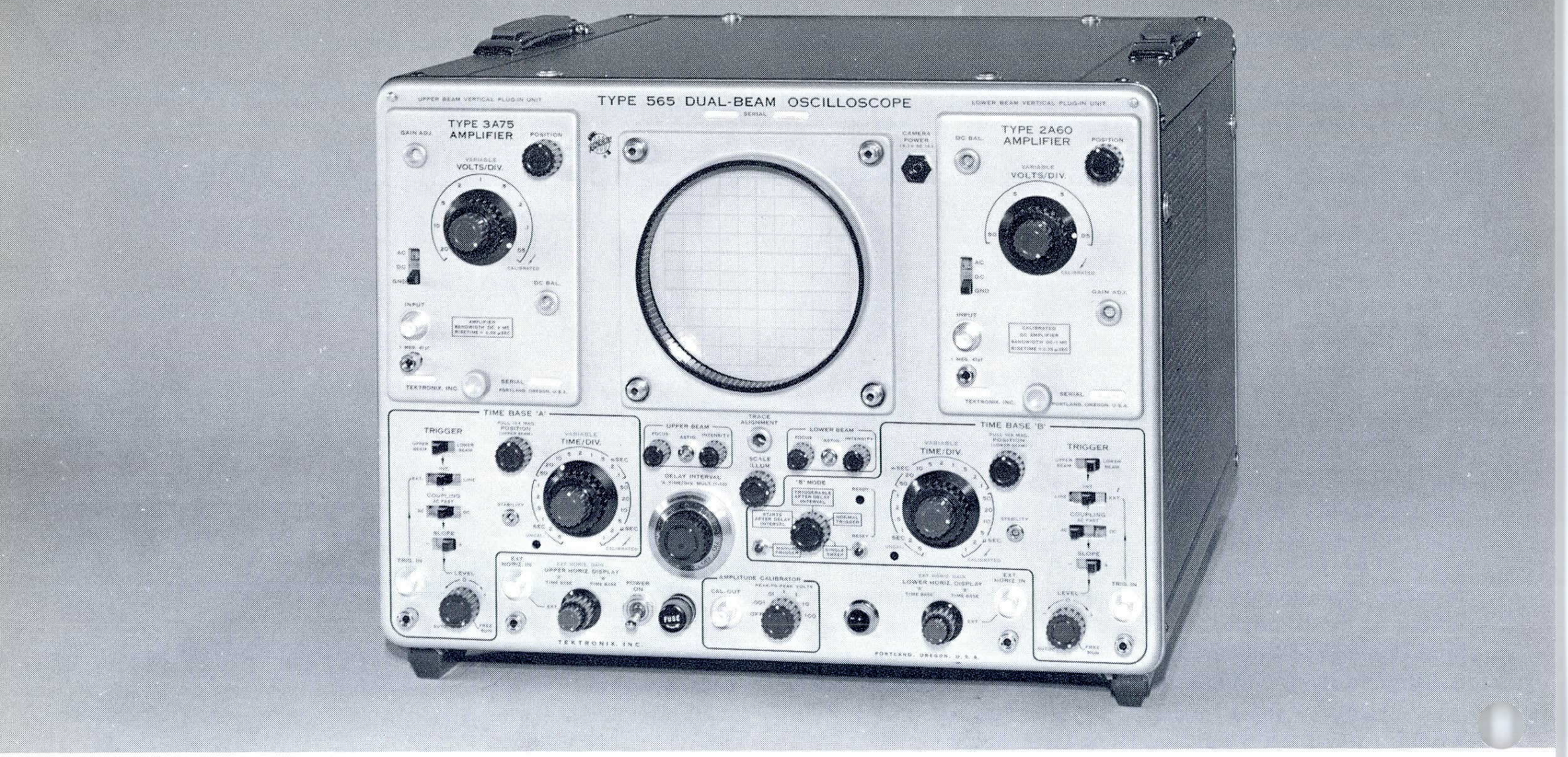
BLANK PLUG-IN CHASSIS

This chassis contains necessary mechanical parts for construction of a custom plug-in for Type 560-Series Oscilloscopes—including frame, blank front panel, blank chassis, 24-pin connector, latch, and small hardware. Instructions are included on permissible power-supply loading and crt signal requirements. Electrical components are not included.

BLANK PLUG-IN CHASSIS (Part No. 040-0245-00) $25

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 565 / RM565 DUAL-BEAM OSCILLOSCOPE



TWO COMPLETELY INDEPENDENT BEAMS
ILLUMINATED NO-PARALLAX GRATICULE
TWO INDEPENDENT SWEEP SYSTEMS
PLUG-IN VERTICAL AMPLIFIERS
DELAYING-SWEEP OPERATION
SINGLE-SWEEP OPERATION
REAR-PANEL OUTPUT CONNECTORS

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of 2-Series and 3-Series Plug-In Units.

HORIZONTAL

CALIBRATED SWEEP RANGE—1 μsec/div to 5 sec/div.

SWEEP MAGNIFIER—10X, extends sweep range to 0.1 μsec/div.

TRIGGER REQUIREMENTS—

Internal: 2 minor divisions of deflection up to 50 kc, increasing to 1 major division at 2 Mc.
External: 0.5 v up to 50 kc, increasing to 1 v at 2 Mc.

CALIBRATED SWEEP DELAY—10 μsec to 50 sec, continuously variable.

EXTERNAL INPUT—Approx. 100 mv/div to 300 v/div: dc to 350 kc; 100 kilohms, ±20%.

CRT

DISPLAY AREA—10 x 10 cm (each beam scans 8 cm vertical, overlap of the two beams is 6 cm). Major graticule division equals 1 cm, minor division equals 2 mm. Illuminated no-parallax graticule.

ACCELERATING VOLTAGE—4 kv.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—1 mv to 100 v, 1-kc square wave, in six steps.

REAR-PANEL PULSE AND SIGNAL OUTPUTS—Output impedance approx. 500 ohms; max. load 2 ma.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 600 watts max.

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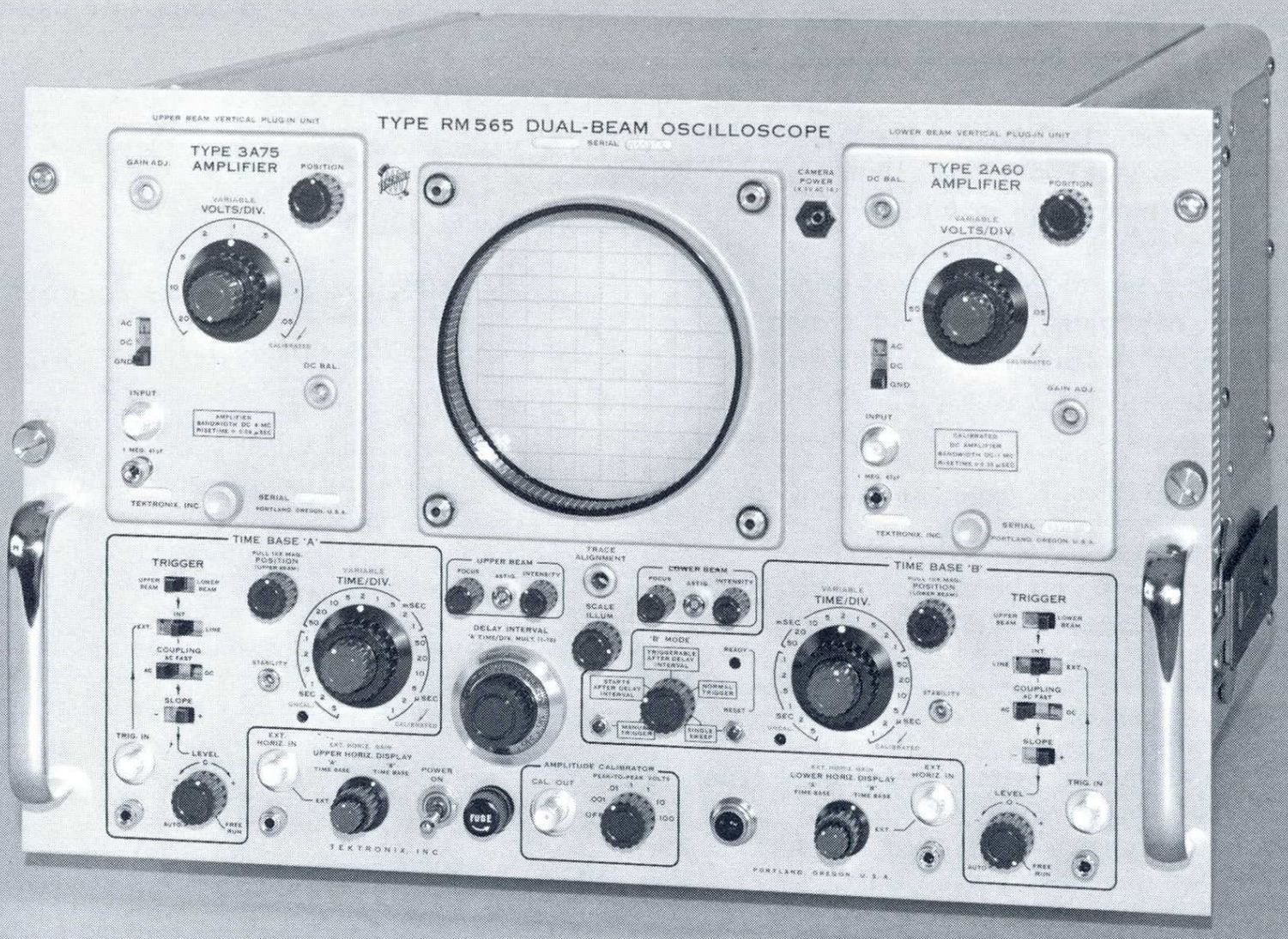
RM565



2-SERIES AND 3-SERIES PLUG-IN UNITS

AMPLIFIER UNITS

TYPE	INPUT (ac or dc coupled)	PASSBAND (3-db down)	CALIBRATED SENSITIVITY	PRICE
2A60-Single Trace	1 megohm—47 pf, 600 v max.	dc—1 Mc.	50 mv/div—50 v/div, 4 decade steps, with variable control.	$105
2A61—Differential (low level)	10 megohm—50 pf, ±5 v (ac-coupled only)	0.06 cps—300 kc	10 μv/div—20 mv/div, 1-2-5 sequence, with variable control.	$385
2A63—Differential (50:1 rejection ratio)	1 megohm—47 pf, 600 volts max.	dc—300 kc.	1 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$150
3A1—Dual Trace (identical channels)		dc—10 Mc.	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$450
3A2*—Dual Trace		dc—500 kc	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$500
3A3—Dual Trace Differential		dc—500 kc	100 μv/div—10 v/div, 1-2-5 sequence, with variable control.	$790
3A6—Dual Trace (identical channels)		dc—10 Mc (has delay line)	10 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$540
3A72—Dual Trace (identical channels)		dc—650 kc.	10 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$275
3A74—Four Trace (identical channels)		dc—2 Mc.	20 mv/div—10 v/div, 1-2-5 sequence, with variable control.	$590
3A75—Single trace		dc—4 Mc.	50 mv/div—20 v/div, 1-2-5 sequence, with variable control.	$175
3C66—Carrier Amplifier	120-Ω strain-gage bridge	dc—5 kc (70-μsec risetime)	10 μstrain/div—10,000 μstrain/div, 1-2-5 sequence, with variable control.	$400

* Designed primarily for the Type 567 Digital Readout Oscilloscope.

565
RM565

A Type 565—or rack-mount counterpart, Type RM565—is essentially two single-beam oscilloscopes sharing a common cathode-ray tube, power supply and housing. Each beam has separate vertical and horizontal, deflection systems, focus, and intensity controls.

The vertical amplifiers can be any of the 2-Series or 3-Series Plug-In Units, except Sampling Units.

The horizontal amplifiers are built-in and can be driven by either of two sweep systems, simultaneously or independently, or from their external inputs. Front-panel controls permit using "A" sweep as a delaying sweep and "B" as the delayed sweep. In this mode of operation the upper beam is intensified for the duration of the "B" sweep. "B" sweep may also be used for single-sweep operation.

There are rear-panel outputs of: Vertical Signals, Horizontal Signals, +Gates, and Delayed Trigger.

ELECTRICAL CHARACTERISTICS
(pertain to circuitry for each of the two beams)

VERTICAL DEFLECTION SYSTEMS

Characteristics of the two vertical systems depend upon the 2-Series or 3-Series Amplifier Units used. Please refer to the plug-in chart for more information on these vertical amplifier units. (The 565 does not use Sampling Plug-In Units.)

TRIGGER

SENSITIVITY—0.5 volts or 2 minor divisions up to 50 kc, decreasing to 1 volt or 1 cm at 2 Mc.

"AC" coupling time constant—approx. 10^{-2} sec (.01 μf and 1 meg).

"AC FAST" coupling time constant—10^{-5} sec (100 pf and 100 k).

HORIZONTAL SWEEP GENERATORS

RANGE—1 μsec/div to 5 sec/div in 21 calibrated steps, 1-2-5 sequence. Accuracy within 3%.

VARIABLE—Control permits continuous adjustment uncalibrated from 1 μsec/div to 12 sec/div.

MAGNIFIER—10X Magnifier permits expanding any 1 division portion of the display a full 10 divisions, accuracy within 5%. The magnifier can be used to extend the sweep rate to 0.1 μsec/div.

HORIZONTAL AMPLIFIERS

SENSITIVITY—Approximately 100 mv/div to 300 v/div, continously adjustable. Maximum input voltage: 300 v rms.

INPUT RESISTANCE—100 kilohms, ±20%.

PASSBAND—dc-to-350 kc, at maximum sensitivity.

DELAY INTERVAL

RANGE—10 μsec to 50 sec calibrated and continuously adjustable.

INCREMENTAL ACCURACY—Within 0.5%.

JITTER—1 part in 20,000.

CALIBRATOR

RANGE—1 mv to 100 v pk-to-pk in 6 decade steps, positive-going square wave.

ACCURACY—Within 3%.

FREQUENCY—Approximately 1 kc.

REAR-PANEL OUTPUTS

OUTPUT IMPEDANCE—500 ohms, approximately.

MAXIMUM LOAD CURRENT—2 ma.

VERTICAL OUTPUT—Signal amplitude, dc level, and transient response are dependent upon the vertical plug-in unit used. Typical signal amplitude, 2 v/div to 4 v/div of display; dc level, ±20 volts.

HORIZONTAL OUTPUT—Signal amplitude, at least 50 mv/div of display in External position and 0.5 v/div of display in Sweep position; dc level, 0 to +5 volts.

+ GATE—Pulse height, 20 v minimum; dc level, zero volts.

DELAYED TRIGGER—Fast-rise pulse amplitude, +8 v minimum; dc level, zero volts.

REAR PANEL POWER PLUG

OUTPUTS—Power supply outputs for future accessories.

POWER REQUIREMENT

OPERATION—105 v to 125 v, 50 to 60 cps.

VOLTAGE—99 v to 132 v or 198 v to 265 v (through use of selectable transformer taps).

WATTAGE—600 watts maximum (depends upon plug-in combination).

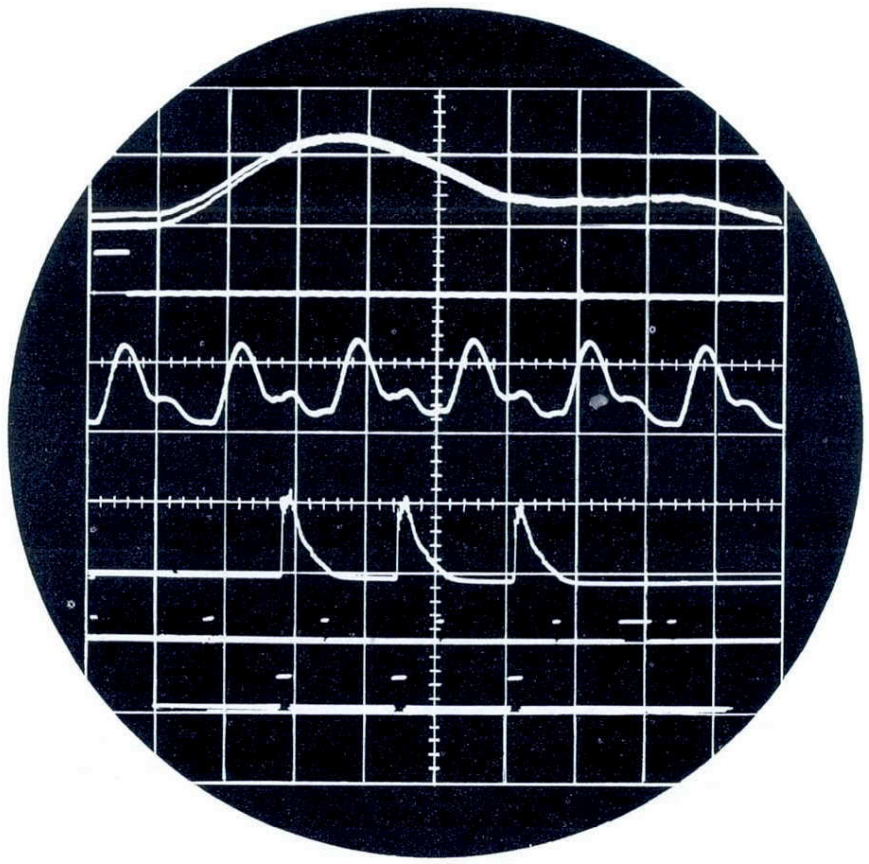
OPERATIONAL FEATURES
(pertain to both sweep systems except as indicated for "B" sweep)

TRIGGER FACILITIES

Trigger selection is accomplished by slide-switch logic. This arrangement allows quick selection and quick visual checks. Sequence is as follows:

1. EXTERNAL, INTERNAL (upper or lower beam), or LINE frequency triggering.
2. COUPLING can be AC, AC FAST, or DC.
3. SLOPE can be + or — for triggering on the positive-going or negative-going portion of the selected waveform.
4. The Level control permits triggering on the desired portion of the waverform. At the CCW stop of this control, the trigger is in the Automatic Mode. The sweep free runs at about a 50-cps rate (in the absence of a signal) giving a reference trace but will automatically trigger on incoming trigger signals of a higher frequency. At the CW stop of this control, the sweep free runs.

565
RM565



The Type 565 is used in exploring methods of measuring blood flow by angiography. Investigators initiate and evaluate angiographic injectors in a wide variety of exploratory techniques with artificial arteries and photography. The dual-beam capability of the Type 565 and multi-channel plug-in units permit investigators to monitor injection time and injection pressure in addition to most parameters of interest in the artificial artery such as flow, EKG, pulse, and pressure.

Waveform display shows first and second traces on the upper beam and third through sixth traces on the lower beam. Upper Beam sweep rate is 0.15 sec/div. Lower Beam sweep rate is 0.5 sec/div. The configurations show:

1. *Arterial Pressure at 50 mm Hg/cm*
2. *Simulated R wave of EKG*
3. *Artificial Arterial Pressure*
4. *Injection Pressure*
5. *Simulated EKG with delayed camera pulse*
6. *Delay and duration of injector solenoid*

SWEEP GENERATORS "A" AND "B"

Independent operation of the two generators; delaying sweep operation; single-sweep operation on "B" time base only, single control selection of sweep Time/Div in a 1-2-5 sequence, Variable control, light indicating "uncalibrated" sweep, and a 10X Magnifier.

"B" time base mode switch positions: (1) Manual Trigger, (2) Starts After Delay Interval, (3) Triggerable After Delay Interval, (4) Normal Trigger, (5) Single Sweep.

With the "B" time base switch in the "Normal Trigger" position, each sweep operates independently. In the "Starts After Delay Interval" and "Triggerable After Delay Interval" positions, time base "A" operates as a delay timing sweep and time base "B" operates as the delayed sweep. The upper beam is intensified for the duration of the "B" sweep.

In the "Single-Sweep" position, the "B" sweep is armed by pressing a button. A ready light shows that the sweep is ready for the first incoming trigger. Single-sweep operation facilitates photographic recording of waveforms.

HORIZONTAL DISPLAY SWITCH (horizontal amplifier input selector).

Positions include those for external horizontal input, "A" sweep, and "B" sweep. In the external horizontal input position, the horizontal amplifier is connected to the front panel input connector through the Ext Horiz Gain control. In the other two positions, the amplifier is connected to the output of either sweep generator.

CRT AND DISPLAY FEATURES

CATHODE-RAY TUBE—Round, flat-faced aluminized 5-inch dual-beam tube with an illuminated, internal, no-parallax graticule. Accelerating potential is 4 kv.

VERTICAL SCAN—8 cm (each beam), overlap of the two beams is 6 cm.

HORIZONTAL SCAN—10 cm.

CONTROLS—Focus, Intensity, and Astigmatism (separate controls for each beam).

INTERNAL CONTRAST CONTROL—for the intensified section of the "A" sweep. (Internal adjustment)

DEFLECTION-AXIS ROTATER—(front panel screw driver adjustment) for electro magnetically rotating the deflection axis to match the graticule lines.

SCALE ILLUMINATION CONTROL—With controllable edge lighting.

PHOSPHOR—P2 is normally supplied. See phosphor chart for others available.

RETRACE BLANKING—dc coupled.

Z-AXIS MODULATION—Of both crt beam grids through rear panel connector. Time constant 3.5 milliseconds, nominally.

CHOPPED TRACE BLANKING

CABINET MODEL

TYPE 565—Dimensions are 13½" high by 17" wide by 23⅜" deep. Net weight is 62 pounds. Shipping weight is 92 pounds, approx.

RACK-MOUNT MODEL

TYPE RM565—Mounts on tilt-lock slide-out tracks to a standard 19" rack. Dimensions are 12¼" high by 19" wide by 22" deep. Net weight is 67 pounds. Shipping weight is 101 pounds, approx. For more mounting information, please refer to the Mounting Dimension page in the catalog.

TYPE 565, without plug-in units $1400

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Polarized light filter (378-0545-00); 1—Plate, protector, CRT, clear (378-0918-00); 2—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0269-00).

TYPE RM565, without plug-in units $1500

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Polarized light filter (378-0545-00); 1—Plate, protector, CRT, clear (378-0918-00); 2—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Post jack, BNC (012-0092-00); 1—Pair Mounting Slides (351-0086-00); 2—Instruction Manual (070-0353-00).

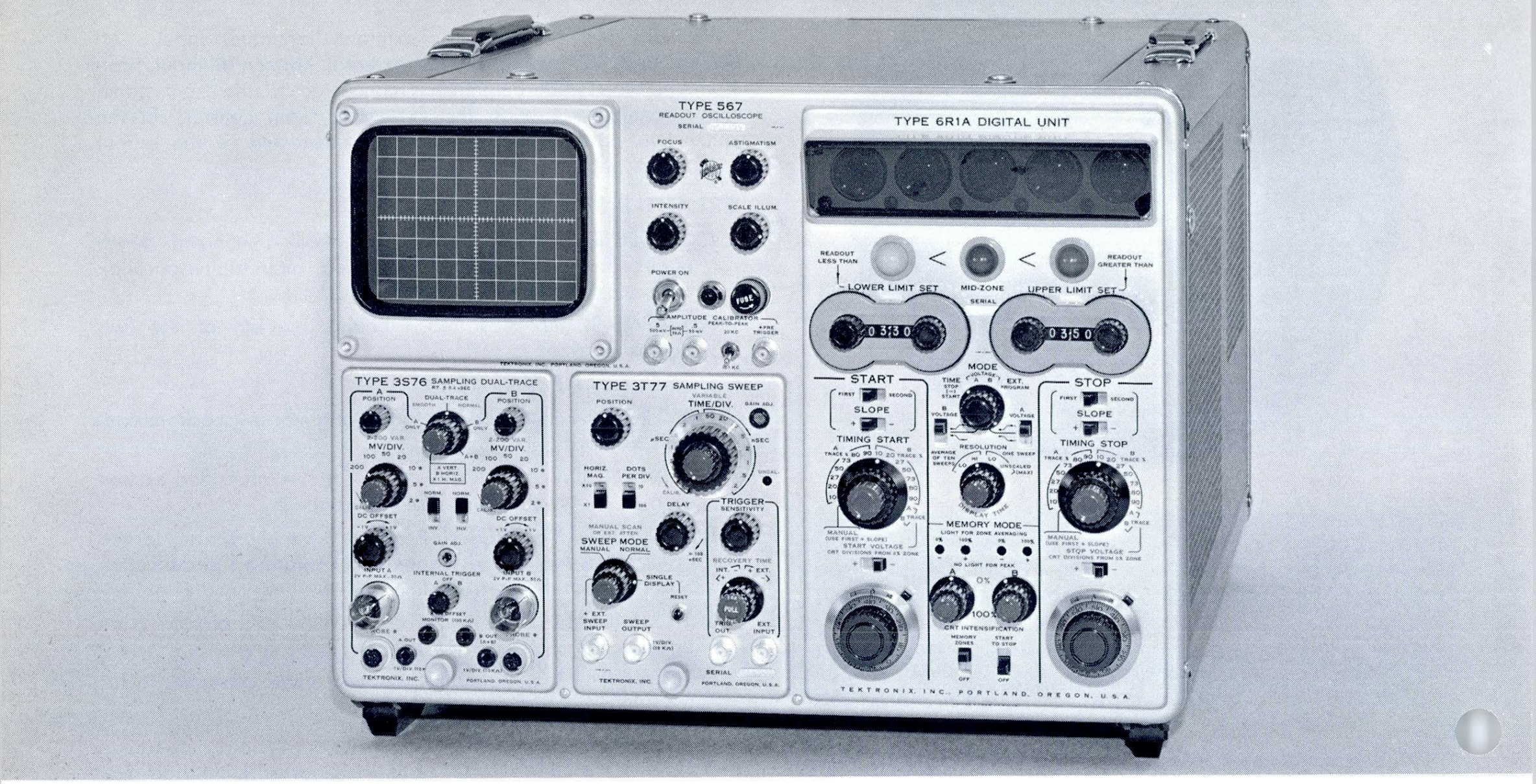
SUPPORTING CRADLES

When the Type RM565 is used in a backless rack, these supporting cradles are necessary for rear-slide support.

Order Part Number 040-0346-00 ..... $11.45

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 567 DIGITAL READOUT OSCILLOSCOPE



DIGITAL READOUT PLUS ANALOG DISPLAYS

DIGITAL READOUT OF RISETIME, AMPLITUDE AND TIME DIFFERENCES

SELECTABLE HIGH AND LOW NO-GO LIMITS

EXTERNALLY PROGRAMMABLE

DIGITAL AND GO/NO-GO OUTPUTS

ILLUMINATED NO-PARALLAX GRATICULE

The Type 567 Readout Oscilloscope introduces a new concept in oscilloscopes—DIGITAL READOUT of signal information in addition to a conventional cathode-ray oscilloscope display.

With the Type 567 you can make measurements with greater accuracy, speed, and convenience than possible when interpreting just a cathode-ray oscilloscope display.

To make measurements, you select measurement points on the displayed waveform, then read data directly in four-digit resolution. Decimal point and unit of measure (nsec, μsec, msec, sec, mv, v) are automatically presented when time/div, amplitude/div, or program is changed. Indicator lights show instantly whether a measurement is IN, ABOVE, or BELOW preset limits.

Many accessories and associated instruments are available to add to the operational versatility of the system. For example, with the new Tektronix Type 262 Programmer you can very conveniently externally program the Type 567—with completely automatic or manual sequencing of programs.

On a production line or in a laboratory, the Type 567 Readout Oscilloscope can speed-up and simplify your measurement applications.

HOW THE TYPE 567 READOUT OSCILLOSCOPE AND TYPE 6R1A DIGITAL UNIT MEASURE TIME

SAMPLING PROCESS

With each repetition of a signal, the circuit measures one point (sample) at a time a little later than the last sample. This process of advancing the sampling time in fixed increments is called strobing. A reconstructed signal, much slower than the original signal, is reproduced on the crt as an amplitude vs. time, point-to-point graph.

EQUIVALENT TIME BASE CLOCK

The equivalent time between each sample depends upon the number of samples per centimeter and the sweep time per centimeter. For instance, 1 nsec/cm and 100 samples/cm = 10 psec/sample. By counting the number of samples between two selected portions of a waveform, the time between these portions can be measured.

AUTOMATIC REFERENCE ZONES

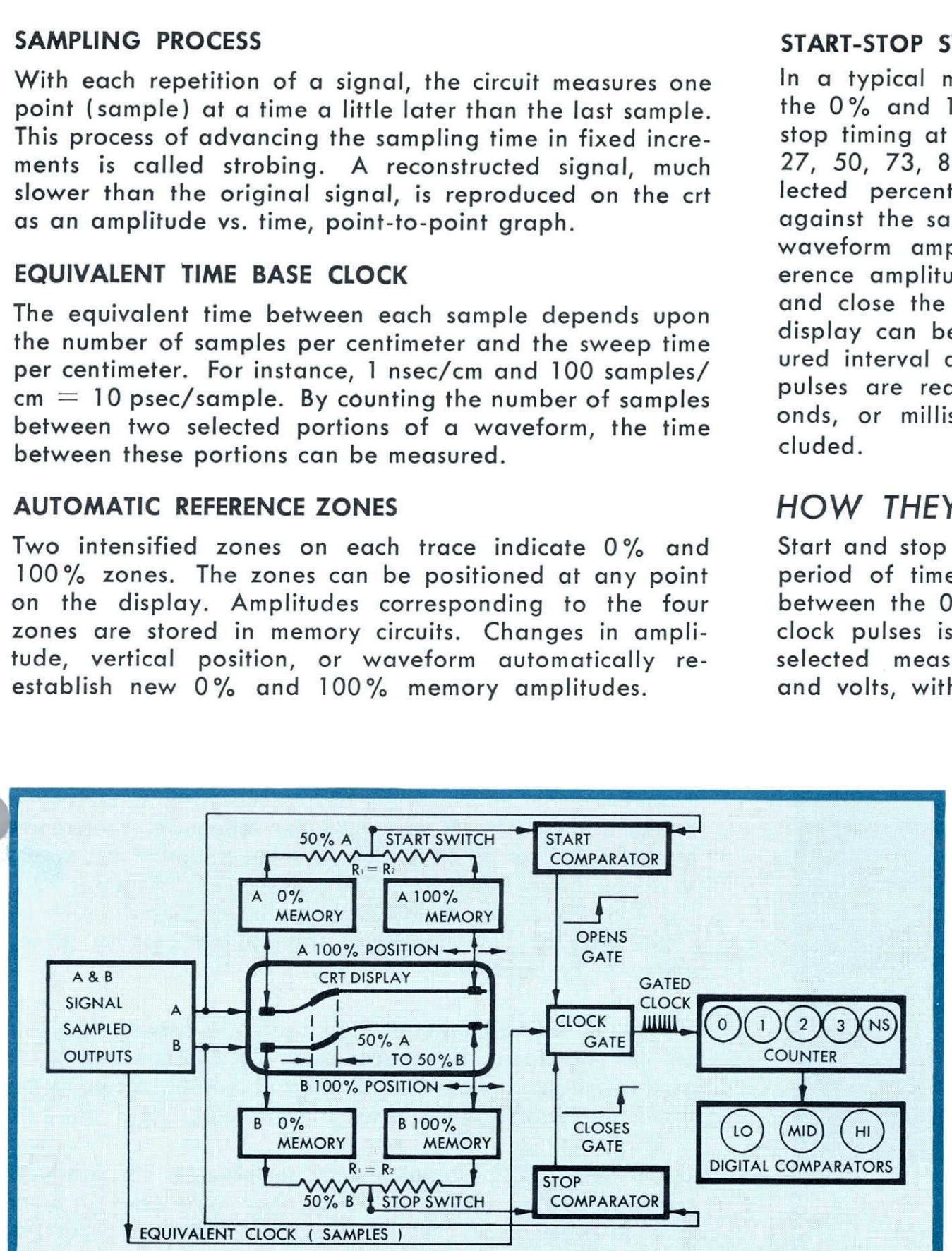
Two intensified zones on each trace indicate 0% and 100% zones. The zones can be positioned at any point on the display. Amplitudes corresponding to the four zones are stored in memory circuits. Changes in amplitude, vertical position, or waveform automatically re-establish new 0% and 100% memory amplitudes.

START-STOP SYSTEM

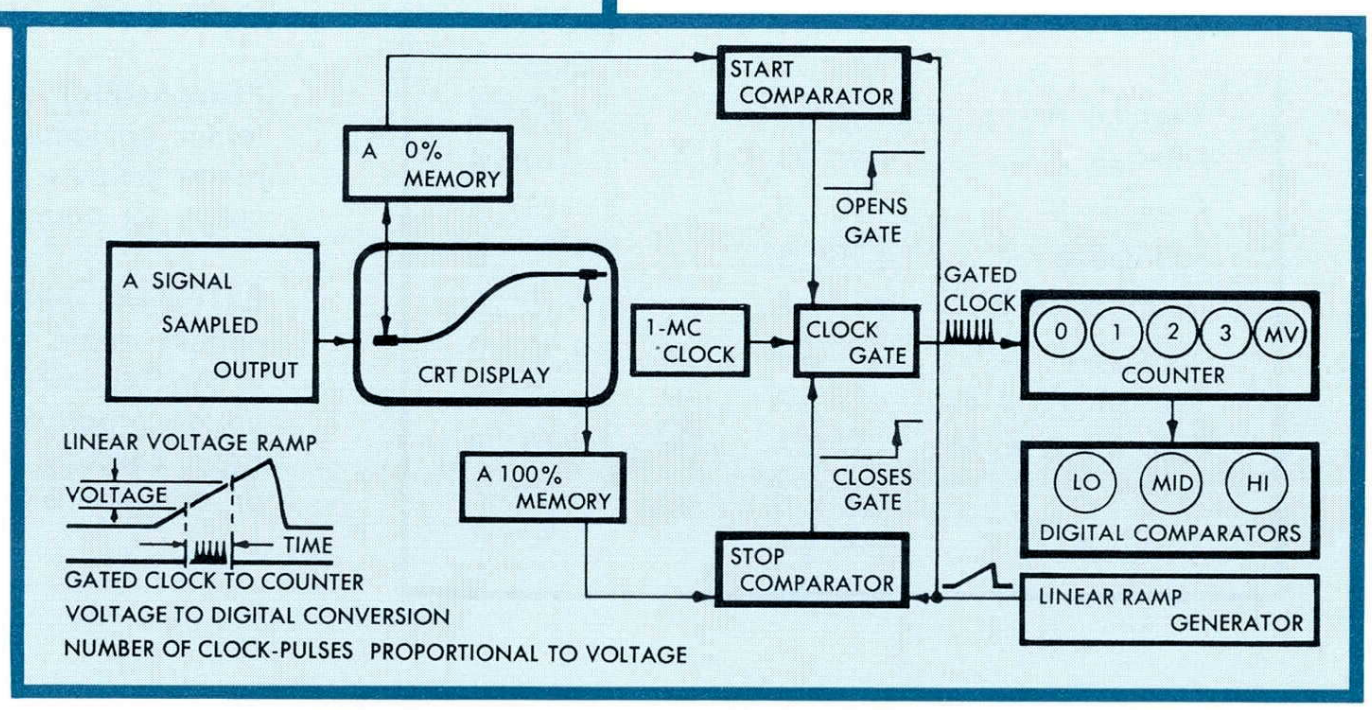
In a typical measurement, voltage divider taps between the 0% and 100% memory outputs are set for start and stop timing at selected percentage points such as 10, 20, 27, 50, 73, 80, and 90% of either waveform. The selected percentage reference levels are then compared against the sampled input waveform. Coincidence of the waveform amplitudes with the selected percentage reference amplitudes is sensed by comparators which open and close the clock gate to the digital counter. The crt display can be intensified for the duration of the measured interval as a reference check. The number of clock pulses are read out digitally in nanoseconds, microseconds, or milliseconds, seconds, with decimal points included.

HOW THEY MEASURE VOLTAGE

Start and stop comparators gate 1-mc clock pulses for the period of time that a linear ramp voltage is at values between the 0% and 100% amplitudes. The number of clock pulses is proportional to the voltage between the selected measurement points. Readout is in millivolts and volts, with decimal points included.



TYPES 567/6R1A
BLOCK DIAGRAM
MEASURING TIME



TYPES 567/6R1A
BLOCK DIAGRAM
MEASURING VOLTAGE

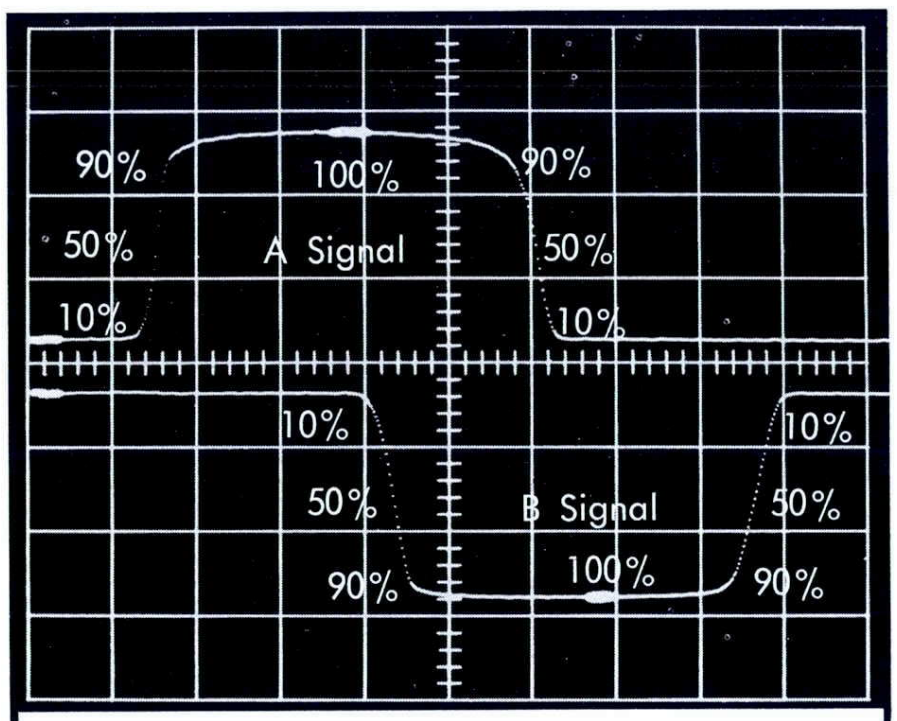
567

DIGITAL READOUT SYSTEMS

Digital plus analog displays are simultaneously presented on the Type 567 Oscilloscope and Type 6R1A Digital Unit. A Digital Readout System consists of a Type 567/6R1A and any of 5 combinations of vertical and horizontal Plug-In Units: Type 3S3/3T77, 3S76/3T77, 3A2/3B2, 3S3/3T4, or 3S76/3T4. Other 2-Series and 3-Series Plug-In Units can be used for normal crt display, but do not provide digital readout. See the Type 262 Programmer for these systems.

X & Y Plug-Ins	Risetime	Calibrated Sensitivity	Input Impedance	Calibrated Sweep Range	Sweep Delay	Digital Resolution	Trigger	System Price
3S3/3T77*	0.35 nsec	5 mv/cm to 100 mv/cm	100 k, 2 pf	equiv. 0.2 nsec/cm to 10 μsec/cm plus 10X magnifier	Through approx. 100 nsec	10 or 100 dots per cm	External	$5450 (includes 2 probes)
3S76/3T77*	0.4 nsec	2 mv/cm to 200 mv/cm	50 Ω					$5050
3A2/3B2	0.7 μsec	10 mv/cm to 10 v/cm	1 Meg, 47 pf	2 μsec/cm to 1 sec/cm	5 μsec to 10.5 sec	1 μsec to 10 msec clock rate in decades	Internal or External	$4450

***The Type 3T4** Programmable Sampling Sweep can be programmed through a front panel connector. Programmable functions include sweep rates (1 nsec/cm to 200 μsec/cm), 3 calibrated sweep delay ranges (1 μsec to 1 msec), samples per sweep (100 or 1000 or alternately 100 or 1000), and single display for real-time measurements. Type 3T4 . . . $1300.



DUAL-TRACE DISPLAY SHOWING TYPICAL MEASUREMENTS

MEASUREMENT	6R1A PROGRAM Start	Stop
Risetime A	+10%A	+90%A
Falltime A	−90%A	−10%A
Risetime B	−10%B	−90%B
Falltime B	+90%B	+10%B
Delay A to B	+10%A	−10%B
Storage A to B	−90%A	+90%B
Turn on A to B	+10%A	−90%B
Turn off A to B	−90%A	+10%B
Width A	+50%A	−50%A
Width B	−50%B	+50%B

SYSTEM CAPABILITIES

TIME MEASUREMENTS can be made between 2 points on the same waveform, or between separate points on Channel A and Channel B. Points are determined (1) as a percentage of signal amplitude, (2) as a particular voltage level referenced to the signal, or (3) at a desired interval during the sweep. With the Types 3S3/3T77 or 3S76/3T77 time differences ranging from 20 psec up to 100 μsec can be displayed. With the Types 3A2/3B2 time differences from a few μsec to 10 seconds can be displayed.

VOLTAGE MEASUREMENTS can be made between 2 points on the waveform: (1) peak-to-peak, (2) average-to-peak, (3) peak-to-average. Also, the average dc level occurring between positionable limits can be measured.

LIMIT SELECTION presets digital comparators for automatic readings in three categories: (1) less than lower limit, (2) greater than upper limit, and (3) mid-zone — between upper and lower limits.

PERMANENT RECORDS of each test can be made with external equipment. The Type 6R1A provides digital and go/no-go outputs for use with (1) electric typewriters, (2) punch cards, (3) perforated tape, and (4) numerical printers.

EXTERNAL PROGRAMMING with the Type 262 Programmer permits rapid sequencing of measurements without changes in the Type 6R1A front-panel controls. Test parameters are set up on program controls. Test parameters are set up on program cards in the Type 262, and can be selected manually or automatically (with optional accessory).

567

AMPLITUDE CALIBRATOR, completely redesigned, provides front-panel selection of squarewave outputs of 20 kc, crystal-controlled, or 1 kc, RC time-constant controlled. Output voltages are 5 v and 0.5 v into an impedance of 100 kc, or greater, or 0.5 v and 0.05 v into 50 Ω. Both connectors are BNC.

DC-VOLTAGE SUPPLIES are electronically regulated to compensate for widely varying line conditions. Separate regulated heater supply is provided.

POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 60 cps, (approximately 405 watts with Type 3S76, 3T77, 6R1A Units). A thermal cutout switch prevents overheating of the instrument.

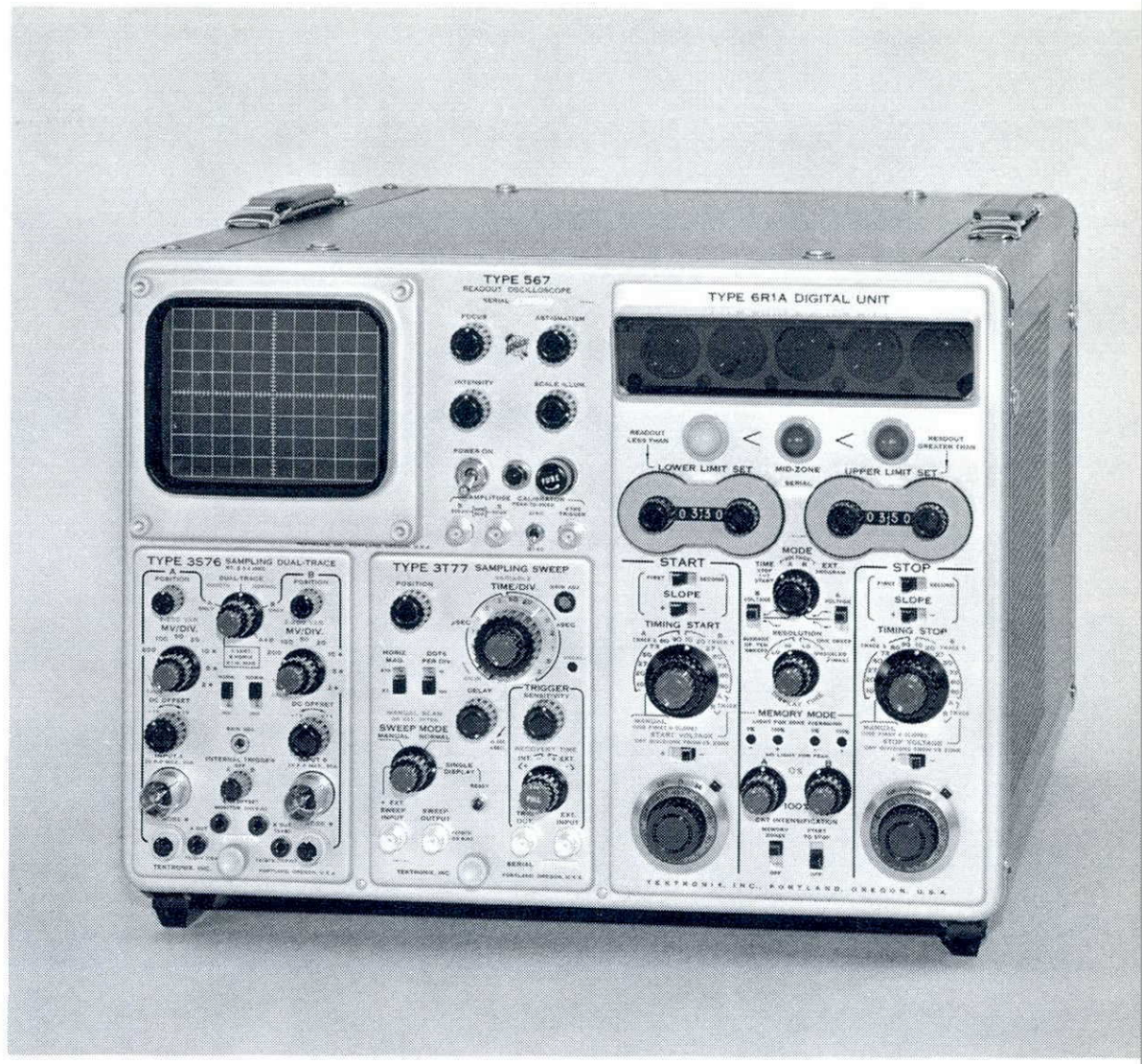
CATHODE-RAY TUBE is a 5-inch rectangular crt using 3.5-kv accelerating potential. A P2 phosphor is normally supplied.

ILLUMINATED, NO-PARALLAX, INTERNAL GRATICULE has controlled edge-lighting and is marked in 8 vertical and 10 horizontal cm divisions.

MECHANICAL SPECIFICATIONS: Dimensions are 13⅝" high by 17" wide by 23" deep. Net weight is 49 pounds. Shipping weight is 76 pounds, approx.

TYPE 567, without plug-in units $700

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Plate, protector, crt, clear (387-0935-00); 1—Filter, smoke gray (installed) (378-0544-00); 2—Instruction Manual (070-0322-00).



RACK MOUNT Type RM567

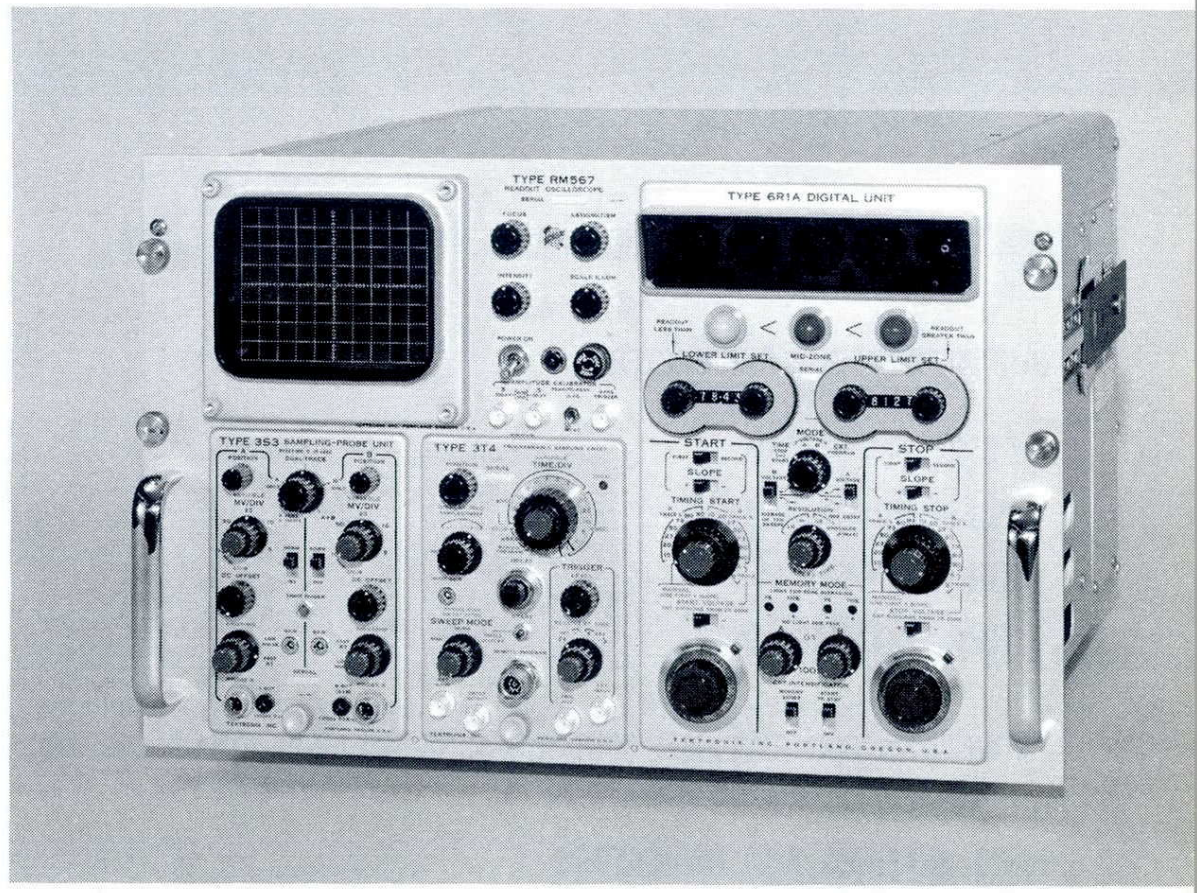
The Type RM567 Readout Oscilloscope is electrically identical to the Type 567 but adapted to rack mounting in a standard 19-inch rack. The instrument mounts to the rack on slide-out tracks. For more mounting information, please refer to the Mounting Dimension page in the catalog.

MECHANICAL SPECIFICATIONS: Dimensions are 12¼" high by 19" wide by 22" deep. Net weight is 50½ pounds. Shipping weight is 85 pounds, approx.

TYPE RM567, without plug-in units $800

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Plate, protector, crt, clear (387-0935-00); 1—Filter, smoke gray (installed) (378-0544-00); 1—Pair mounting slides (351-0086-00); 1—Set mounting hardware; 2—Instruction Manual (070-0348-00).

SUPPORTING CRADLES: When Type RM567 is used in a backless rack, these cradles are necessary for rear slide support.
Order Part Number 040-0346-00 . . . . . $11.45

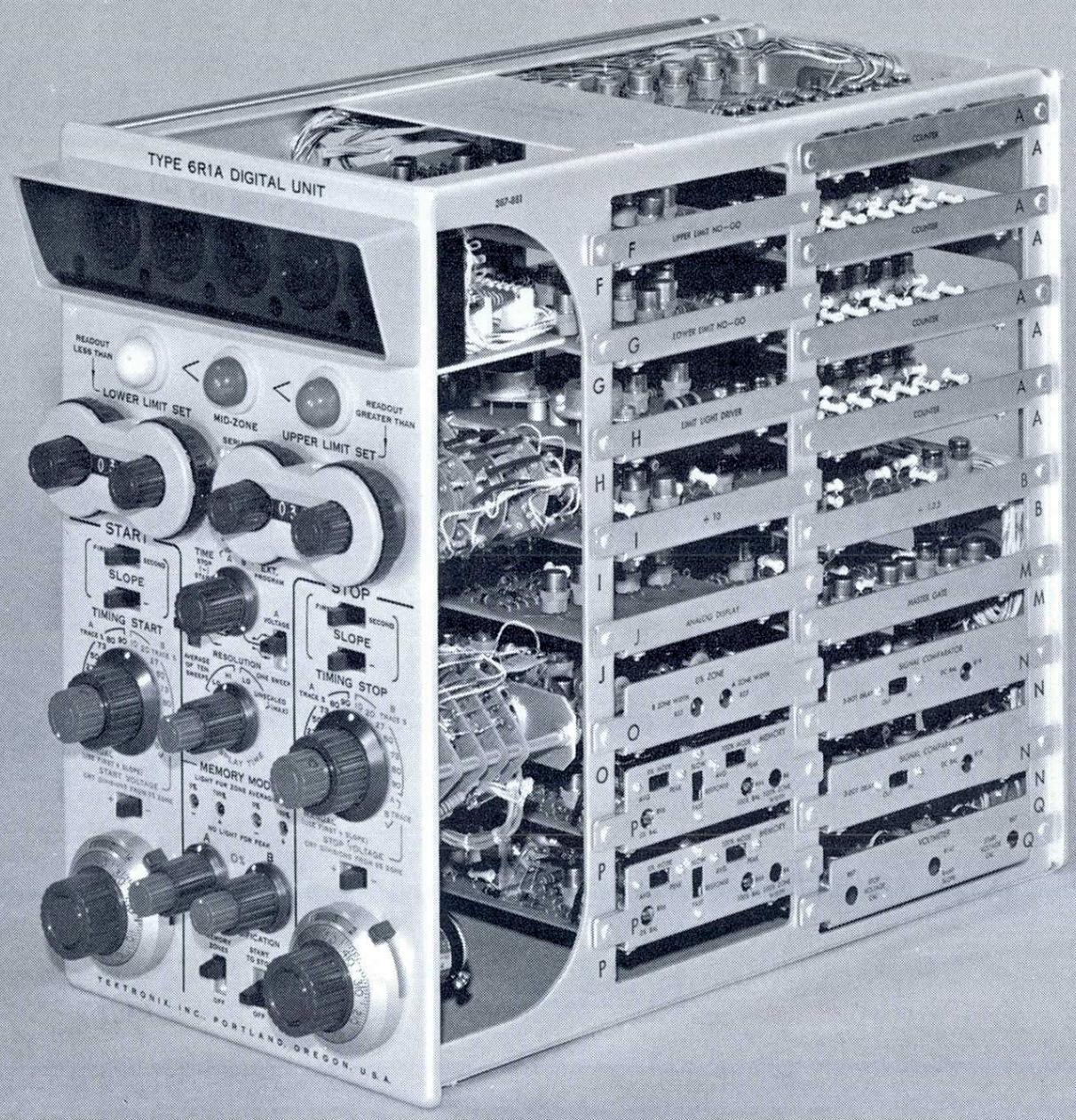


MAINTENANCE of the Type 567 or RM567 and the plug-in units will require these items:

Plug-In Extension for Sampling and Digital Units.
Order Part Number 012-0066-00 (24-pin extension) $23.00
Circuit-Board Extensions for Digital Unit
Order Part Number 012-0068-00 (20-pin extension) $25.00
Order Part Number 012-0067-00 (15-pin extension) $20.00

These items are offered for the convenience of companies with in-plant facilities. If your company has this facility, or if you intend performing your own maintenance, please include 2 plug-in extensions and 2 circuit-board extensions (one each of 15-pin and 20-pin extensions). One set of 4 will usually be adequate for maintenance of several instruments.

Type 6R1A DIGITAL UNIT



PRESENTS OSCILLOSCOPE MEASUREMENTS IN DIGITAL FORM

DIGITAL READOUT PARAMETERS

PULSE AMPLITUDE

PULSE RISE AND FALL

PULSE WIDTH

TIME INTERVAL

PROVISIONS FOR EXTERNAL PROGRAMMING AND READOUT

LIMIT SETTINGS AND INDICATORS

NOTE: *In this presentation, any reference to A or B Channel or A or B trace designates use of a dual-trace unit in the vertical channel of the Type 567 Readout Oscilloscope (along with a sweep unit in the horizontal channel).*

The Type 6R1A Digital Unit equips a Tektronix Type 567 or Type RM567 Oscilloscope for digital readout. Used with vertical and timing units, the Type 6R1A enables presentation of digital data for a wide variety of repetitive-pulse measurements. The digital presentations can designate voltage measurements, time-difference measurements between similar pulses, and time-difference measurements between percentages of pulse amplitudes. In addition, the Type 6R1A has provision for external programming to facilitate automatic sequential operations. The Type 6R1A enables these time and amplitude measurements to be read directly with up to 4 digit units of measurement.

The 6R1A contains the circuitry for the analog to digital and digital readout functions of the Type 567 Readout Oscilloscope. The characteristics are described by giving the purpose of each front-panel control.

GO/NO-GO CONTROLS

LOWER LIMIT SET presets the lower limit. Any digital reading less than the lower limit causes the LOWER LIMIT indicator to light.

UPPER LIMIT SET presets the upper limit. Any digital reading greater than the upper limit causes the UPPER LIMIT indicator to light. Readings between the lower and upper limits cause the MID-ZONE indicator to light.

PRINTED IN U.S.A.

MODE SWITCH

The type of measurement to be made (time or voltage) is selected by the Mode Switch.

TIME STOP (—) START sets the 6R1A to measure time durations set between the start and stop of timing circuits.

VOLTAGE A sets the Type 6R1A to measure voltage between A Channel 0% and 100% memory zones. Polarity is selected by an adjacent slide switch.

VOLTAGE B sets the Type 6R1A to measure voltage between B Channel 0% and 100% memory zones. Polarity is selected by an adjacent slide switch.

EXTERNAL PROGRAM sets the Types 6R1A to accept programming from an external source, such as the Tektronix Type 262 Programmer. The variety and flexibility of measurements possible with external programming are even greater than those possible through use of the Type 6R1A front-panel controls and measurements and limits can be changed more rapidly.

RESOLUTION SWITCH

Time measurements are performed by gating clock-pulses during the measurement interval. The clock in the case of sampling is the samples per unit equivalent time. For instance, sweep speed = 10 nsec/div, samples/div = 100, then equivalent time/sample = 0.1 nsec. If a measurement interval occupied 2.5 cm, 250 samples would be registered in the digital readout counter. Reading would be 25.0 nsec on the readout indicator.

AVERAGE 10 SWEEPS-LO minimizes random noise that could be associated with a measurement. The digital readout counter registers 10 timing intervals (sweeps) and automatically divides the reading by 10. The units numerical readout indicator is rendered inoperative so no reading shows even though its scalar is operating. For sweep speed with multipliers of 2 or 5 the counter only registers 1 out of 2 or 5, respectively, clock-pulses and repositions the decimal point to give the correct reading.

AVERAGE 10 SWEEPS-HI permits obtaining reading to high resolution using all four decades. Same as LO except that the units numerical readout indicator is restored to operation.

ONE SWEEP-LO registers one sweep only in the digital readout counter.

ONE SWEEP-UNSCALED enables obtaining maximum resolution in just one sweep in the 2 and 5 multiplier positions. Only one sweep is used to fill the digital counter. The reading on the indicator will only be relative on the 2 and 5 multiplier positions of the plug-ins. Decimal points and units of measurement are not indicated in this position to show that readings are only proportional to time.

DISPLAY TIME CONTROL

A control, continuously variable between approximately 5 sec and 0.1 sec, holds the display for the time needed to observe readings or operate peripheral equipment. (Can be modified for variable control between 1 sec and 10 msec for use with high-speed automatic testing).

MEMORY MODES

The Type 6R1A has 2 internally-selected memory modes: averaging and peak-to-peak. The mode of operation is made apparent by neon indicators on the front panel. When Types 3A2 and 3B2 Plug-In Units are used, digital readout of amplitude requires an input waveform with constant amplitude for at least 5 μsec, in order to establish a 100% reference level.

AVERAGE MODE stores the average dc level of the signal occurring during the 0% and 100% memory zones, to develop TIMING START and TIMING STOP percentage levels. Zones are adjustable in width and positionable on the sweep.

PEAK-TO-PEAK MODE stores the most negative and most positive levels of the signal occuring during the 0% and 100% memory zones, respectively. Zones are adjustable in width from 1 mm to 10 cm and positionable on the sweep.

ZONE POSITIONING CONTROLS

A 0% and 100% controls position the 0% and 100% references on the displayed waveform. Each zone representing a selected portion of the total sweep is positionable throughout 9 cm or more of the A sweep.

B 0% and 100% controls duplicate on Channel B the functions of A 0% and 100% positioning.

0% AND 100% INTENSIFICATION turns on and off two intensity markers on each trace at 0% and 100% zones.

START-TO-STOP INTENSIFICATION turns on and off the start-to-stop zone on the displayed waveform which allows verifying start-to-stop interval.

START-TIMING CONTROLS

These controls program the initiation of timing.

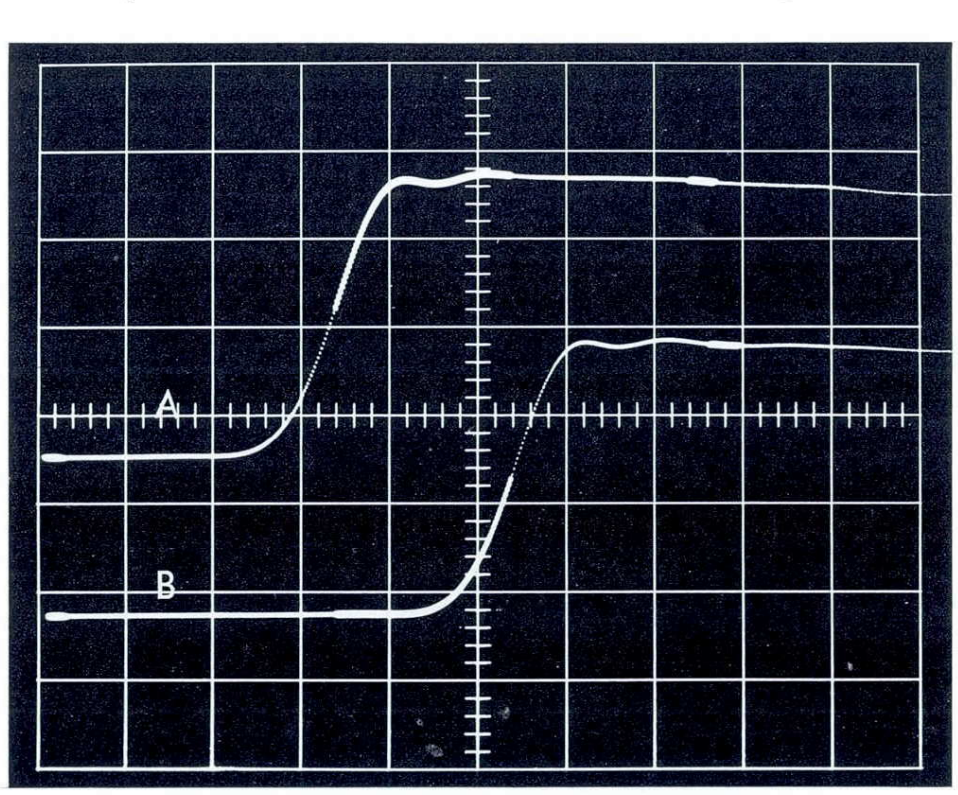
+SLOPE,—SLOPE selects which direction of the waveform will be used to start the timing.

FIRST, SECOND (Cycle) allows selecting start-timing on either the first or second cycle of the waveform through the selected start-timing setting.

TIMING START provides 7 calibrated percentage steps at 10, 20, 27, 50, 73, 80 and 90% from either A or B trace (in reference to 0% and 100% zone amplitude). Automatically starts timing at the selected percentage. The 27% and 73% positions correspond to 1 time constant and are useful for TC readings without resorting to slide rule.

MANUAL START enables start-timing at any point on the waveform. Continuously variable over 9 cm or more of the sweep.

START VOLTAGE + OR — selects which polarity from 0% zone the waveform will start timing after reaching the amplitude as set by the START VOLTAGE 10-turn dial setting.



DELAY-TIME INTERVAL MEASUREMENT
Start: +50% A Trace Stop: +50% B Trace

6R1A

START VOLTAGE 10-turn dial permits start-timing continuously variable between 0-10 crt divisions of amplitude from 0% zone reference.

STOP-TIMING CONTROLS

Program the termination of the timing interval. Identical in capability and operation to the start-timing controls in all other respects.

OTHER CHARACTERISTICS

READOUT is in a numerical range from 0.0001 to 9999. Display time is variable between approximately 5 sec and 0.1 sec. Units of measure include: microvolts, millivolts, and volts; nanoseconds, microseconds, milliseconds, and seconds.

DIGITAL READOUT ACCURACY of the 6R1A, in addition to providing measurement results in fast, convenient digital form, reduces the magnitude of measurement errors that are attributable to the visual resolution difficulties of a cathode-ray tube display. For assistance in determining system accuracy in specific applications, consult your Field Engineer.

INPUT is internally connected from horizontal and vertical plug-in units.

MECHANICAL FEATURES include an aluminum-alloy chassis and anodized front panel. Net weight is 13¾ pounds. Shipping weight is 21 pounds, approx.

TYPE 6R1A DIGITAL UNIT $2600

Each instrument includes: 2—instruction manuals (070-0411-00).

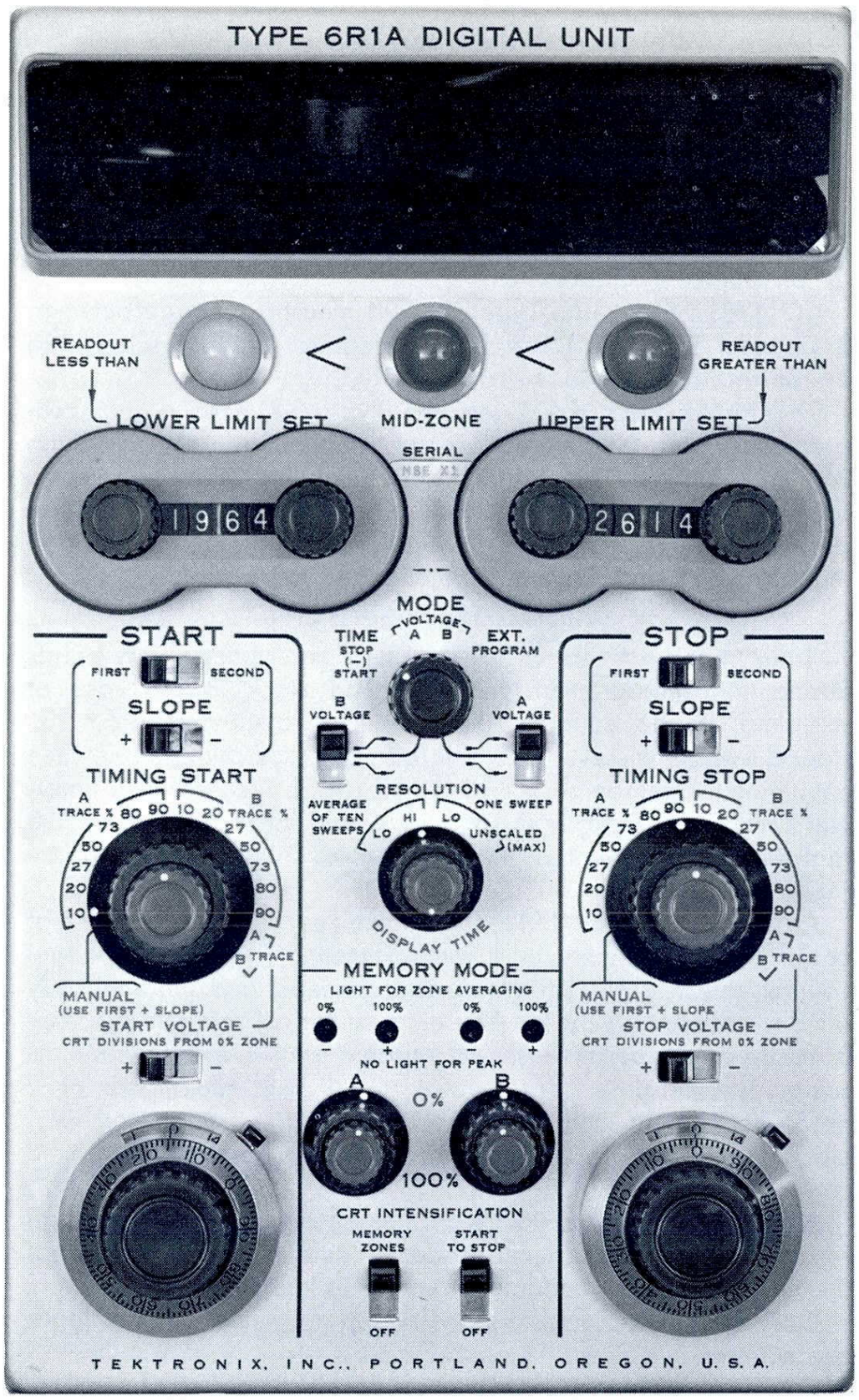
EXTERNAL PROGRAMMING

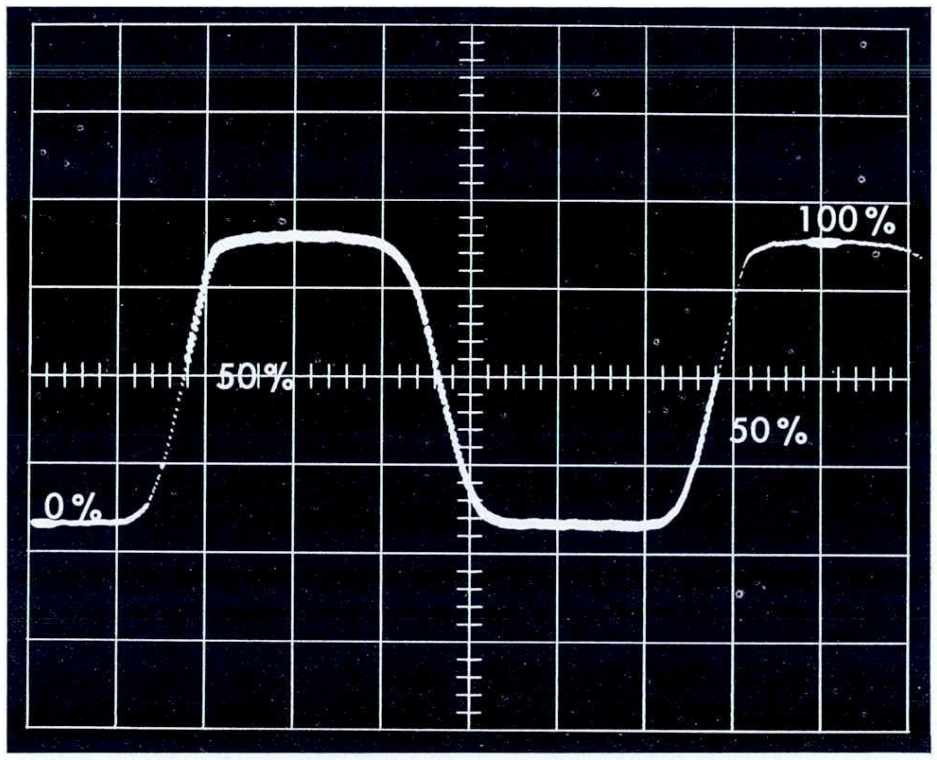
See information on Type 261 Coaxial Switch, Type 262 Programmer, and associated accessories. For custom arrangements, one or both of the following connectors will be necessary.

41-pin Connector for external programming and control.
Part No. 131-0239-00 ..... $13.40

55-pin Connector for external read-out (limit lamps, etc.).
Part No. 131-0240-00 ..... $18.00

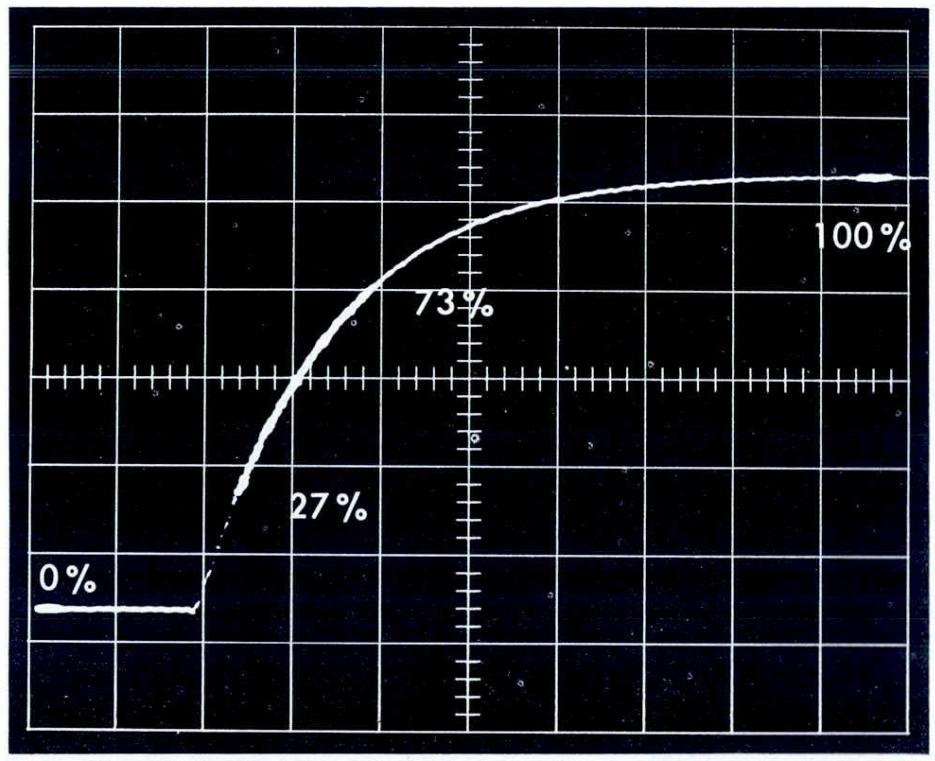
U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.





PERIOD (1 CYCLE) MEASUREMENT

Start: 50% A Trace, 1st +slope
Stop: 50% A Trace, 2nd +slope



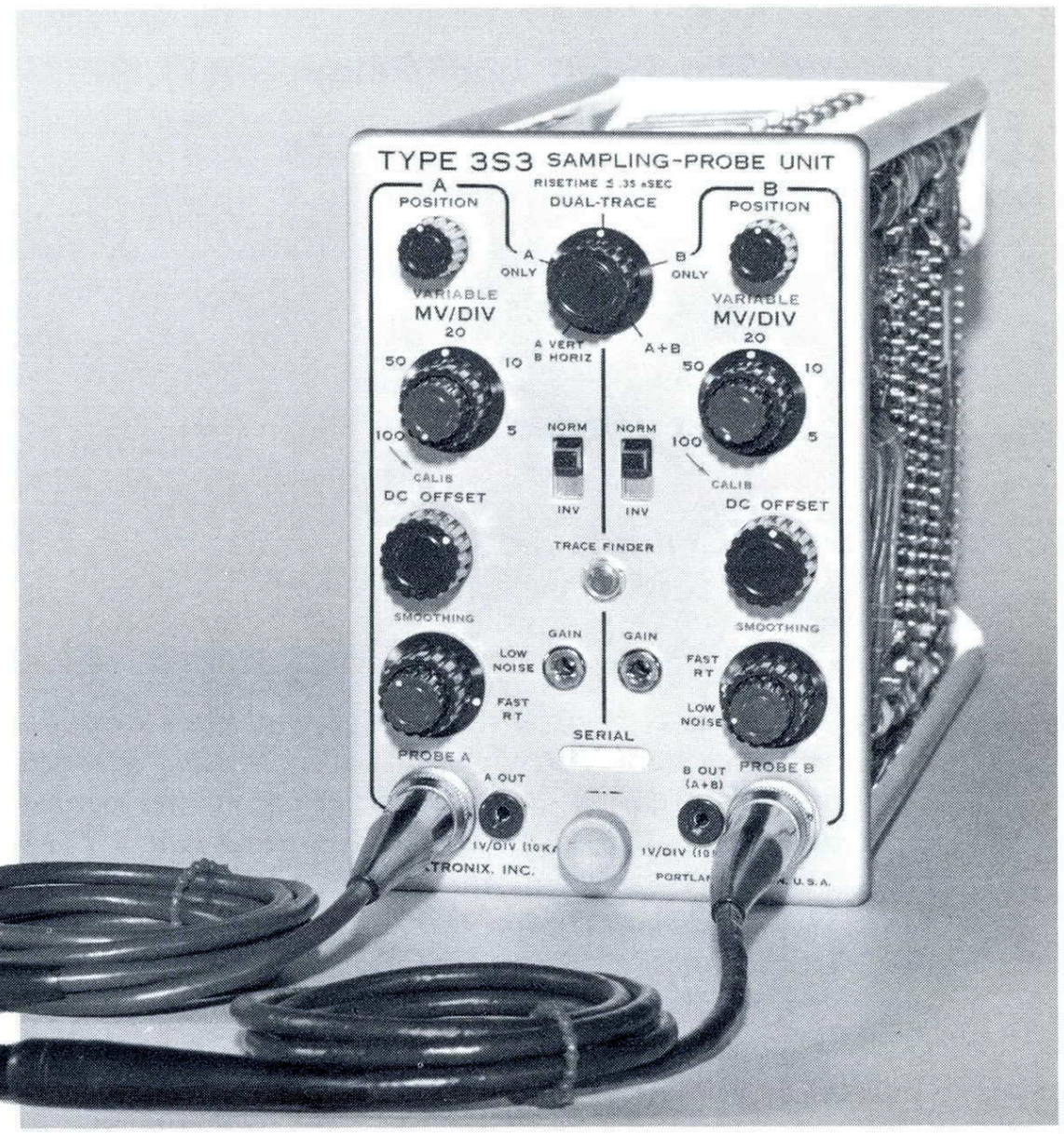
TIME-CONSTANT MEASUREMENT

Start (from) 27% A Trace
Stop (to) +73% A Trace

SAMPLING-PROBE DUAL-TRACE UNIT Type 3S3

EXTREMELY COMPACT PROBES
DUAL-TRACE DISPLAYS
0.35 NSEC OR LESS RISETIME
100 K, 2 pf INPUT
LOW NOISE
RECORDER OUTPUTS

The Type 3S3 Sampling-Probe Unit is a low-noise dual-trace amplifier employing extremely compact sampling probes. It has two separate channels with identical characteristics and can operate in any one of five modes for a variety of single, dual-trace and X-Y displays. The Type 3S3 is designed to operate in conjunction with a Type 3T77 Sampling Sweep Unit in the Type 561A, 564, or 567 Oscilloscopes. In the Type 567, information can be presented in digital as well as analog form.*



OPERATING MODES include Channel A only; Channel B only; Alternate Dual Trace—Channels A and B switched electronically; A + B Outputs of Channel A and B added algebraically; A Vertical/B Horizontal—Channel A deflected vertically and B horizontally for X-Y displays. Independent controls for each channel provide for trace positioning and polarity inversion.

CALIBRATED SENSITIVITY is 5 mv/div, 10 mv/div, 20 mv/div, 50 mv/div, and 100 mv/div; accuracy within 3%. An uncalibrated continuous control extends the sensitivity to approximately 2 mv/div.

RISETIME AND SMOOTHING controls, while maintaining correct dot transient response, adjusts the instrument for: least noise, best risetime, or a compromise of the two, with signal source from below 25 ohms to beyond 300 ohms. A Fast-RT/Low-Noise switch in conjunction with the Smoothing control allows the operator to select optimum risetime at a sacrifice in noise level. Or, he may elect for a low noise level at some sacrifice in risetime.

At low signal repetition rates the trace may take up to several seconds to traverse the crt screen. A Type 3S3 in a Type 564 Storage Oscilloscope offers the most advantageous combination for visually displaying these signals.

RISETIME (with a 50-ohm input source impedance) is 0.35 nsec with the switch set at the FAST RT position and 1 nsec at the LOW NOISE position.

NOISE (with 50-ohm-input source impedance) can be adjuted to a minimum value equal to an input signal of less than 0.5 mv peak-to-peak.

CORRECT DOT TRANSIENT RESPONSE can be achieved with source impedances of less than 25 ohms to at least 300 ohms.

INPUT IMPEDANCE is 100 k paralleled by approx. 2 pf.

DYNAMIC RANGES is ±1.5 v with Risetime control set to LOW NOISE and ±3 v when the control is set to FAST RISETIME. Safe overload is ±10 v.

*For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-0267-00.

EXTERNAL TRIGGER is required, approximately 50 nsec prior to signal. Minimum repetition rate is 50 cps.

RECORDER SIGNAL OUTPUT of Channel A, Channel B, or Channel (A + B) is 1 v/div (through 10 kilohms), dc-coupled at +10 volt level.

DC OFFSET provides a means of displaying selected portions of signals having off-screen amplitudes. A control permits displaying of signals riding on a dc voltage as high as ±0.5 v.

TRACE FINDER button returns the trace to crt screen to aid in vertical positioning when the trace is driven off the screen by a large signal.

PROBE (Type P6038) used with the Type 3S3 is extremely compact. The sampling bridge is contained in the probe head to obtain optimum results with the input impedance of 100 k paralleled by 2 pf. Probe can be changed from channel to channel with only minor recalibration.

NET WEIGHT is 6¾ pounds. Shipping weight is 9 pounds, approx.

TYPE 3S3 AMPLIFIER UNIT
(with two Type P6038 Probes) $1500
Each instrument includes: 2—instruction manuals (070-0374-00)

REPLACEMENT P6038 PROBE PACKAGE (Part Number 010-0156-00) **$225**

Each package includes: 2—P6038 Probe Package (010-0156-00), which includes; 1—P6038 probe (010-0157-00); 1—Response normalizer (011-0070-00); 1—X10 attenuator (011-0071-00); 2—Test point jack (131-0258-00); 1—Coupling capacitor (011-0072-00); 1—Hook tip assembly (206-0114-00); 1—Ground clip (175-0249-00); 1—Probe holder (352-0024-00); 1—Instruction Manual (070-0400-00).

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 3S76 DUAL-TRACE SAMPLING UNIT

Internal Triggering and Delay Lines

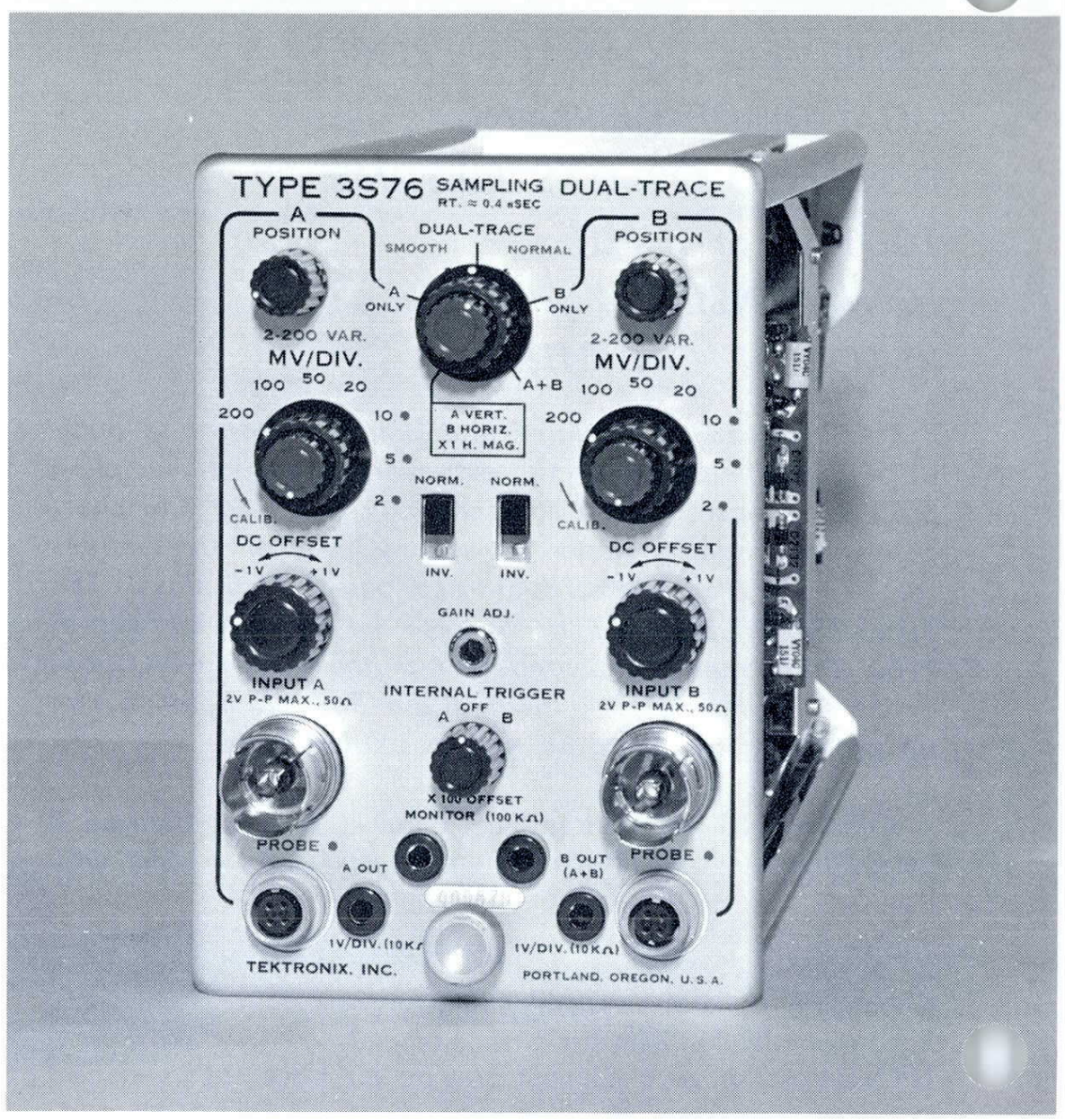
0.4-nsec or less Risetime

2 Identical Channels

5 Operating Modes

Recorder Outputs

The Type 3S76 Sampling Unit is a dual-trace amplifier containing two separate channels which possess identical characteristics. The unit can perform in any of five operating modes for a variety of single, dual-trace and X-Y displays. It is designed to operate in conjunction with a Type 3T77 Sampling Sweep Unit in Type 561A, 564 and 567 Oscilloscopes. In the Type 567, information will be presented in digital as well as analog form.*



OPERATING MODES include Channel A only; Channel B only; Dual-Trace—Channels A and B switched electronically on alternate samples; A+B—outputs of Channels A and B added algebraically; A Vertical/B Horizontal—Channel A deflected vertically and B horizontally for X-Y displays. Independent controls for each channel provide for trace positioning and polarity inversion.

CALIBRATED SENSITIVITY is from 2 mv/div to 200 mv/div in 7 calibrated steps, accuracy within 3%, except on the 2 mv/div. and 5 mv/div. steps, which have accuracy within 5%. A variable control permits continuous adjustment between steps.

FREQUENCY RESPONSE is equivalent to dc-to-3-db down at 875 Mc.

RISETIME is 0.4 nsec or less, with less than ±3% peak overshoot and undershoot.

NOISE is equivalent to an input signal of 2 mv pk-to-pk with Smooth-Normal Switch in NORMAL position and 1 mv pk-to-pk with Smooth-Normal Switch in SMOOTH position.

DC OFFSET is ±1 v, referred to input, and monitorable at the front panel at 100X magnitude.

INPUT IMPEDANCE is 50 ohms.

DYNAMIC RANGE is ±2 v. Full sensitivity can be used with signals up to ±2 v in amplitude. Safe overload is ±4 v (higher with reduced duty factor).

***For optimum operation,** Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit—Tektronix No. 040-0267-00.

SIGNAL DELAY through 55-nsec internal delay line for each channel allows viewing of leading edge of input waveform.

TRIGGER SOURCE selects built-in trigger takeoff signal from either channel.

RECORDER SIGNAL OUTPUT is 1 v/div (through 10 kilohms) dc-coupled at +10 volt level, both channels.

PROBE POWER is provided on both channels for cathode-follower probes.

NET WEIGHT is 7½ pounds. Shipping weight is 12 pounds, approx.

TYPE 3S76 DUAL-TRACE SAMPLING UNIT $1100

Each instrument includes: 2—10X attenuator, 50 Ω (017-0044-00); 2—5-nsec cable (017-0502-00); 2—Instruction Manual (070-0332-00).

PROBES

The following Tektronix probes are recommended for use with the Type 3S76. See Catalog Accessory pages for complete information on the probes.

Use	Input Impedance R	Input Impedance C	Rating	Prob. No.	Price
10:1 Attenuator	500 Ω	0.7 pf	16 vdc-500 vac	P6034	$ 35
100:1 Attenuator	5 k Ω	0.6 pf	50 vdc-500 vac	P6035	35
Selectable Attenuator	10 meg Ω	varies	varies	P6032	220
Current	—	—	500 ma	CTI/P6040	31

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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PROGRAMMABLE SAMPLING UNIT Type 3T4

- *CALIBRATED SWEEP RATES*
- *CALIBRATED SWEEP DELAY*
- *100 OR 1000 SAMPLES-PER SWEEP*
- *NORMAL OR SINGLE DISPLAY*
- *SINGLE DISPLAY START*

The 3T4 Sampling Unit adds great convenience to the operation of the Type 567 Digital Readout System by providing remote control of the horizontal time base. This unit is compatible with the following equipment: 3S76, 3S3, and other 3-series sampling units; 561, 561A, 564, and 567 Indicator Units; 6R1 and 6R1A Digital Units, and the 262 Programmer.

The multiple-pin connector on the front panel affords external control of equivalent-time sweep rates, delay time, samples per sweep, normal or single-display modes, and single-display start. These operations are obtained through the grounding of certain pins of the front-panel connector.

Front-panel outputs are TRIGGER OUT, which provides a 500-mv, negative pulse coinciding with the input trigger, and SWEEP OUTPUT which provides a staircase ramp. The unit also can be triggered internally and responds to input signals up to 1000 Mc. The SINGLE DISPLAY feature permits photographic trace recording. The 10X MAGNIFIER extends the on-screen calibrated sweep rate. A dual-purpose front-panel control permits manual or external scanning of the display, thus providing convenient operation of either X-Y or Y-T recorders.

SWEEP RATES

Equivalent-Time Sampling—1 nsec/div to 200 μsec/div, ±3%, in 2-5-10 sequence.

Real-Time Sampling—External clock, trigger, and single-display start inputs are required.

DELAY RANGE

1 nsec/div through 0.1 μsec/div—1000 nsec delay range.
0.2 μsec/div through 10 μsec/div—100 μsec delay range.
20 μsec/div through 100 μsec/div—1000 μsec delay range.
(No delay range for 200 μsec/div sweep rate, or in real-time sampling mode).

SWEEP MODES

+External Input—Scanning accomplished by external signal. Deflection factor adjustable from 5 to 20 volts/horizontal division.

Manual Scan—Display scanned by front-panel control.

Normal—Repetitive sweep.

Single Display—One sweep each time START button is depressed.

OTHER SWEEP CHARACTERISTICS

Samples per sweep—100 or 1000.
Magnification of crt display—X1 and X10.
Front-panel sweep output—Staircase ramp, 1 volt/horizontal division.

NEW

TRIGGERING

Trigger Inputs—Internal or External + and —. Trigger responds to inputs up to 1000 Mc.
Trigger Output—500 mv, negative polarity.

REMOTELY PROGRAMMABLE FUNCTIONS

Equivalent-Time Sweep Rates.
Delay Time.
Samples per Sweep (Digital read-out decimal information correct only on 1,000 samples/sweep).
Normal or Single-Display Modes.
Single-Display Start (When remotely programmed for SINGLE DISPLAY).

DIMENSIONS AND WEIGHT

Instrument is 16½" long by 4¼" wide by 6¼" high. Net weight is 5¾ lbs.; shipping weight is 11¾ lbs.

TYPE 3T4 SAMPLING SWEEP UNIT $1300
Each instrument includes: 2—Instruction Manual (070-0439-00).

OPTIONAL ACCESSORIES

Connector, 19-Pin, Male, Micro-Dot. Mates with front-panel connector of 3T4 Unit for external programming.
(131-0388-00) $32.30

Extender Card, 56-Pin (Modified 262). The card is a rigid extension which enables the printed-circuit cards to operate out of the Type 3T4 for servicing convenience.
(012-0078-00) $20.00

Remote Program Cable, 10 ft. long, 19-Pin Microdot, Male to 36-Pin Male Micro-Ribbon Connector.
(012-0101-00) $85.00

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 3T77 SAMPLING SWEEP UNIT

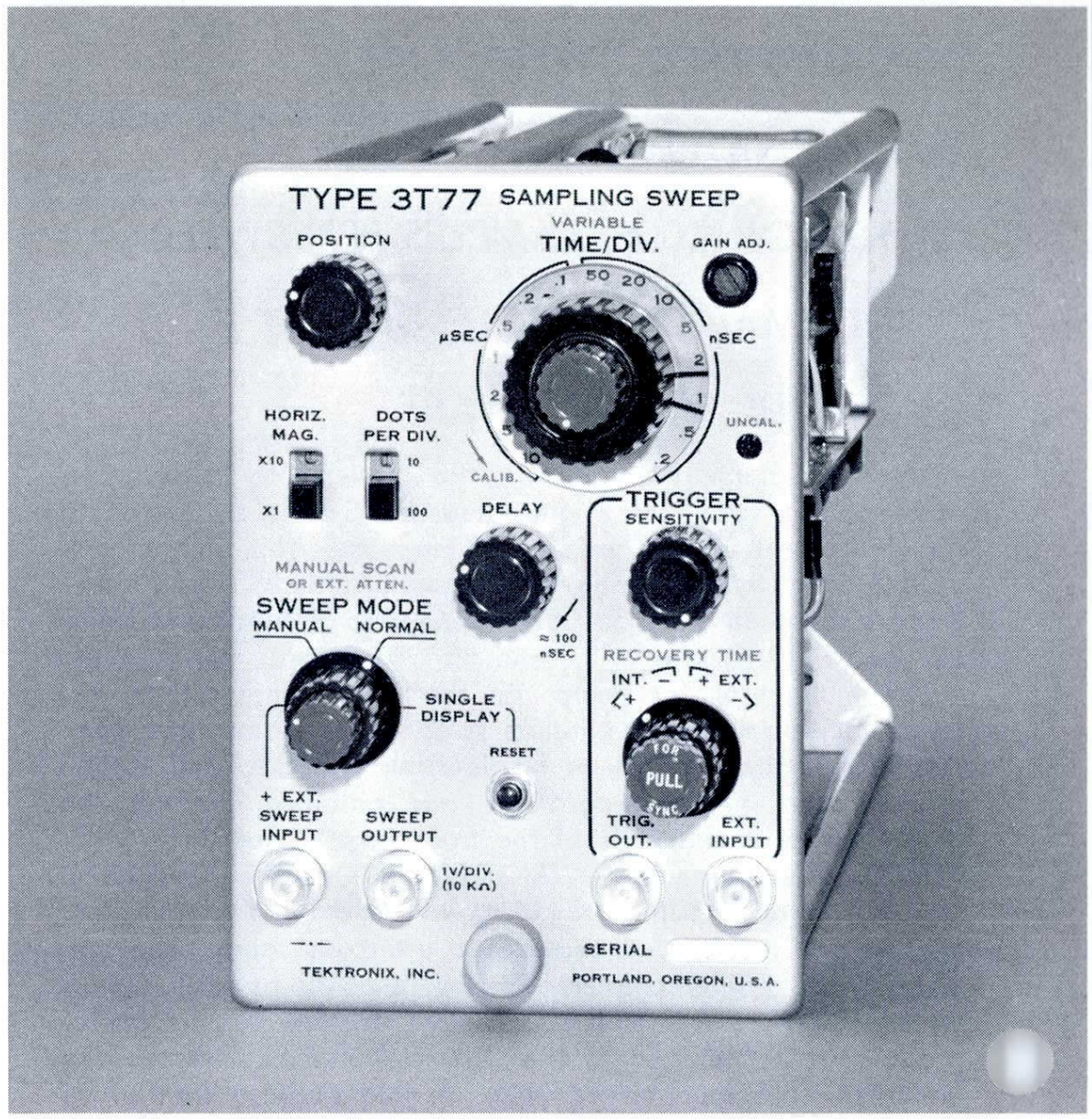
Triggering Through 1 Gigacycle

10 μsec/div to 0.02 nsec/div Sweep Rates

Variable Sweep Delay

Single-Display Provision

Recorder Output



The Type 3T77 is a Sampling Sweep Unit. It provides subnanosecond capabilities when used in conjunction with a Type 3S3 or 3S76 Sampling Unit in a Type 561A, 564 or 567 Oscilloscope. In the Type 567, information can be presented in digital as well as analog form.*

TRIGGERING CHARACTERISTICS

SINEWAVE TRIGGERING

FREQUENCY RANGE is from 100 kc through 1 Gc.

AMPLITUDE RANGE is from 10 mv to 800 mv pk-to-pk for external triggering. Five times more trigger amplitude is required for equivalent internal triggering. Optimum trigger amplitude for least jitter may depend on frequency. Damaging overload can occur at 5 v or greater.

JITTER varies with trigger amplitude, frequency and TIME/DIV setting. Typical figures are less than 50 psec jitter for 100 mv p-p of 30-Mc to 50-Mc sinewave. A special synchronizing mode may be used above 30 Mc for extra stability.

PULSE TRIGGERING

REPETITION RATE RANGE is from 10 pps (limited by memory drift in the vertical plug-in) through 10^9 pps (1 Gc).

AMPLITUDE RANGE is from 10 mv to 800 mv p-p for external triggering. Minimum trigger rise rate is approx. 150 mv/μsec. Optimum trigger amplitude for least jitter may depend on rise rate and rep rate. Damaging overload can occur at 5 v or greater.

JITTER is typically 50 psec or 0.1% of fast ramp duration, whichever is greater, for pulses of 50-mv amplitude, 2-nsec width (or 10 mv, 10-nsec width).

OTHER CHARACTERISTICS

DOT DENSITY can be either 10 or 100 dots/div.

* For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-0267-00.

CALIBRATED SWEEP RANGE is from 0.2 nsec/div to 10 μsec/div in 15 calibrated steps, 1-2-5 sequence. Accuracy is within 3%. A variable control permits continuous adjustment uncalibrated between calibrated rates.

10X MAGNIFIER permits a close-up view of any part of the display horizontally and extends the calibrated sweep rate to 0.02 nsec/div. Dot density remains constant when display is magnified.

MANUAL OR EXTERNAL SCANNING of the display provides convenient operation of remote recorders. At least 5 v/div (positive-going) is required for an external sweep.

SINGLE DISPLAYS useful for photography or storage can be initiated by a reset button.

RECORDER SWEEP OUTPUT is 1 v/div (through 10 kilohms), useful for driving recorders and other devices.

SWEEP DELAY of at least 100 nsec or one unmagnified screen diameter (whichever is greater) permits wide-range time positioning of the display.

NET WEIGHT is 5½ pounds. Shipping weight is 9 pounds, approx.

TYPE 3T77 SAMPLING SWEEP UNIT $650

Each instrument includes: 2—10X attenuator, 50 Ω (017-0044-00); 1—Adapater, BNC-to-GR (017-0064-00); 2—10-nsec GR cable (017-0501-00); 1—Adapter, BNC-to-UHF (103-0032-00); 2—Instruction Manual (070-0333-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
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COAXIAL SWITCH Type 261

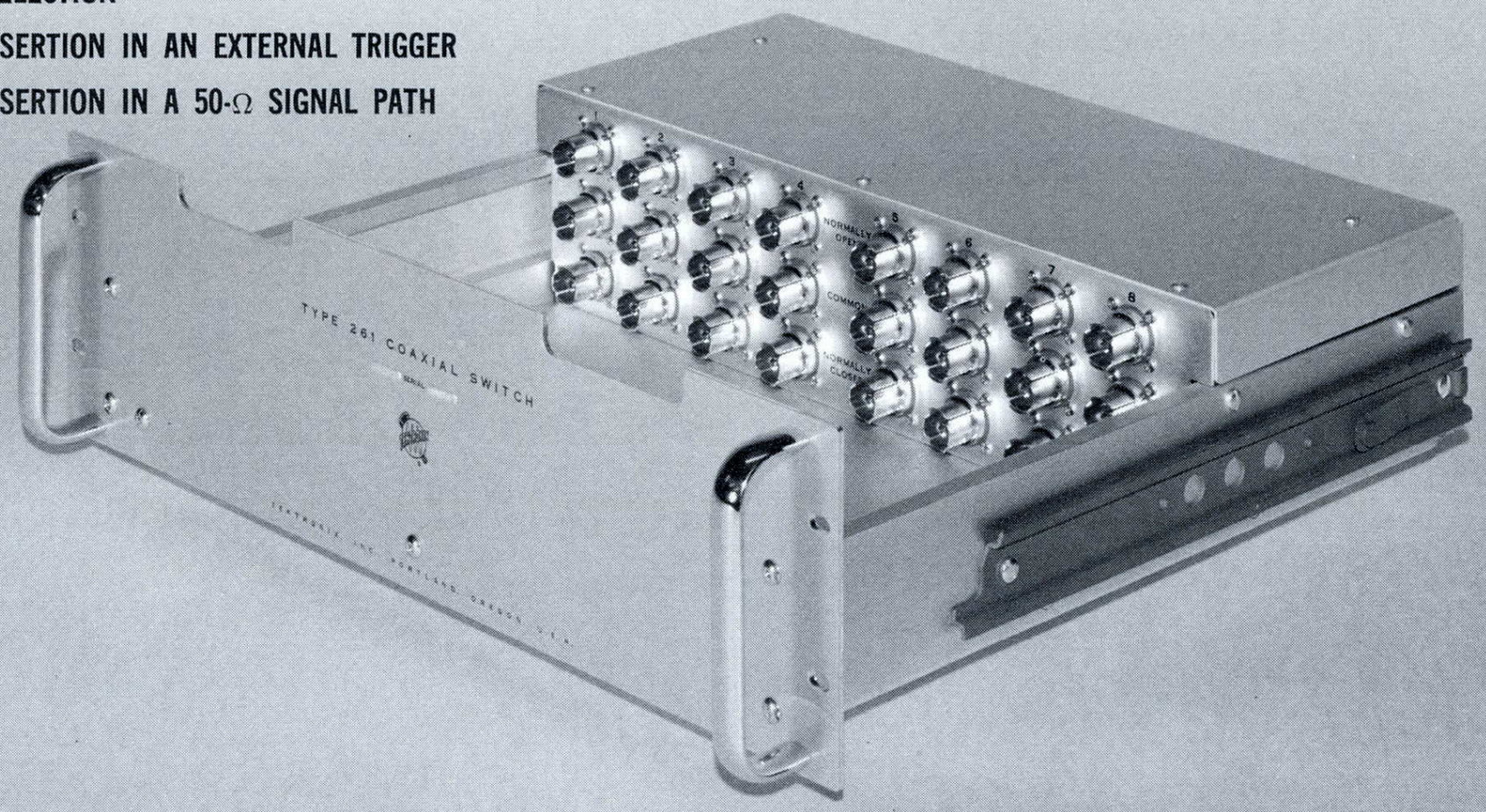
TRIGGER SELECTION

SIGNAL SELECTION AND ROUTING

ATTENUATOR SELECTION

DELAY LINE INSERTION IN AN EXTERNAL TRIGGER

DELAY LINE INSERTION IN A 50-Ω SIGNAL PATH



The Type 261 Coaxial Switch is designed primarily for use as a rack-mounted instrument of the Type 567 Oscilloscope Digital Readout System, but can be used for signal switching in other 50-ohm systems.

The Type 261 will switch signal offset voltages, trigger signals, loads, attenuators, signal delays and provide ground references for fractional nanosecond measurements in a 50-ohm environment.

The switching functions in the Type 261 are performed by eight single-pole double-throw mercury wetted relays. Each relay is in a 50-ohm environment; signal connections are made with 50-ohm coaxial cables having General Radio Type 874 connectors. Each relay is permanent-magnet biased to its normally closed position. Switching operation is by relay coil current applied through a rear panel connector.

The relays are intended to be driven and controlled primarily by the auxiliary programming feature of the Type 262 Programmer (an external programming unit in the Type 567/6R1A digital readout system). The relays can also operate from other sources that supply the required current.

Switching unit assemblies with one complete relay and three cables attached between the relay and three GR874 connectors are available for quick, easy and direct replacement of any switching unit within the Type 261. 50-ohm delay cables for connections between the Type 261 and external signal sources are also available.

CHARACTERISTICS

RELAY pull-in time or drop-out time is from 1 to 2 milliseconds when using a nominal drive current of 10 milliamps. Relay will accurately follow driving signal up to 100 cycles per second.

SIGNAL REFLECTIONS are less than 5% and CROSSTALK is typically 6% when terminated in 50 ohms, when operated in a 0.4-nanosecond risetime system.

SIGNAL DELAY of each switch is 2 nanoseconds, ±100 picoseconds, from input connector to either output connector and is compatible with standard 2-nanosecond delay lines.

RELAY COILS have an approximate dc resistance of 160 ohms and are permanent-magnet biased into the normally closed position. Maximum allowable current is 35 milliamps.

MECHANICAL

The Type 261 Coaxial Switch has non-tilting slides for mounting a standard 19-inch relay rack. Slides permit the instrument to be extended at least 18½ inches out from mounting rack. The Coaxial Switch uses 5¼ inches of rack height.

Ample space has been allotted for cable access at the front and rear of the Coaxial Switch.

DIMENSIONS of the front panel are 19 inches wide by 5 7/32 inches high. Chassis is 18 13/32 inches deep plus 1½ inch handles. Mounting depth, including cable, about 20¼ inches. Minimum rack opening is 17 11/16 inches.

WEIGHT is approximately 17½ pounds, net and approximately 28 pounds, shipping.

TYPE 261 COAXIAL SWITCH **$700**

Includes: 1—24-pin male connector (131-0325-00); 1—Guide track (pair, guide portion only, installed) (351-0040-00); 2—Instruction Manual (070-0423-00).

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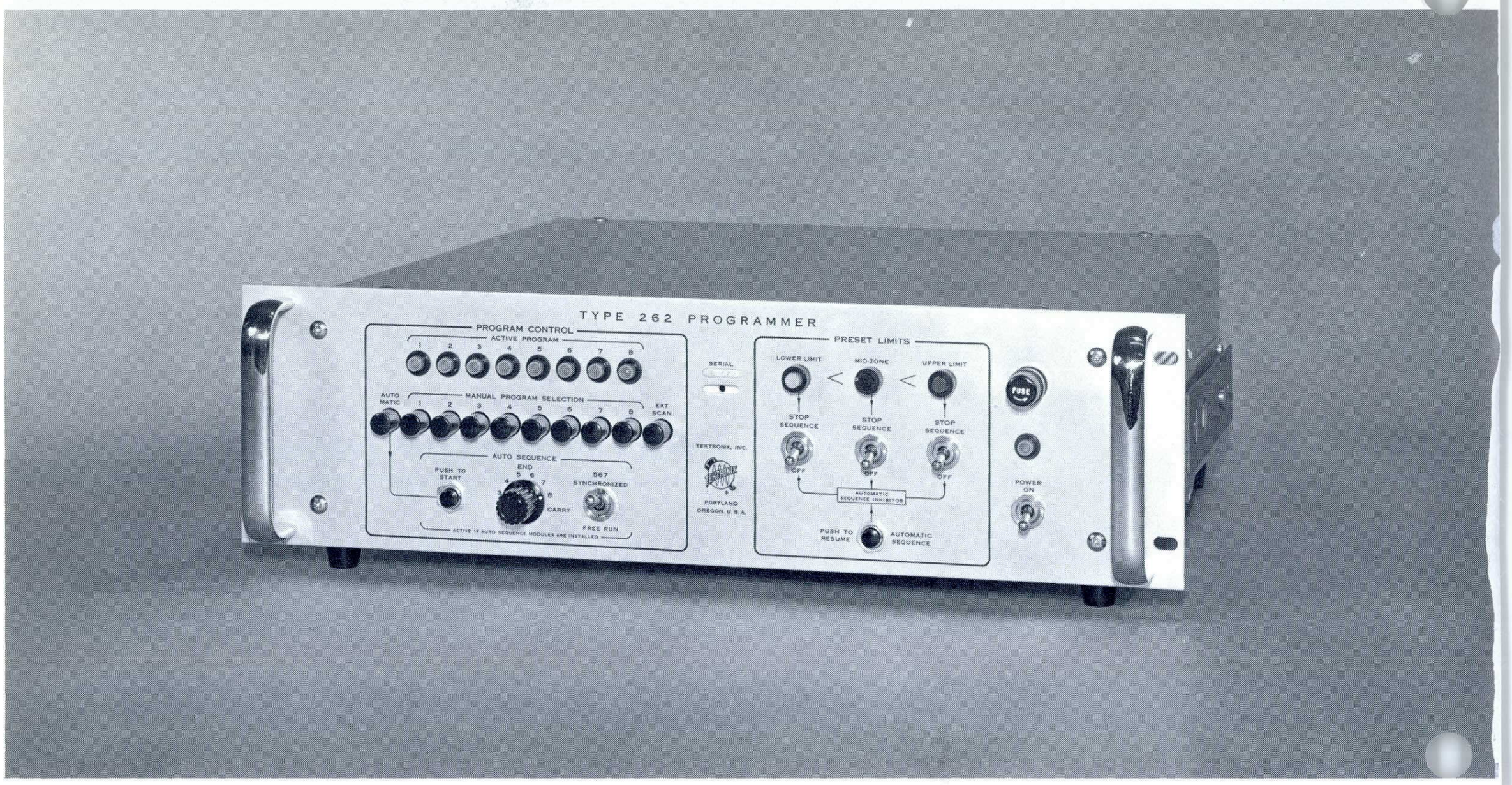
Please refer to Terms and Shipment, General Information page.

Type 262 PROGRAMMER



8 DIFFERENT MEASUREMENT PROGRAMS PER TYPE 262

UP TO 3 TYPE 262's OPERATE IN SERIES

UP TO 8 PROGRAMS PER SECOND

MANUAL PUSH-BUTTON PROGRAM SELECTION

REMOTE PROGRAM SELECTION

OPTIONAL AUTOMATIC SEQUENCING

The Type 262 Programmer functions as an auxiliary piece of equipment in Tektronix Type 567/6R1A measurement systems. Any measurement made manually through use of the Type 567/6R1A front-panel controls can be externally programmed with the Type 262.

The Programmer provides the Type 567/6R1A system with an outlet to faster measurement methods and a way to become involved with more complex systems. For example, a faster measurement method is one that programs digital readout on the Type 6R1A without having to resort to the Type 6R1A start-stop switches. Setting of the Type 6R1A start-stop switches is replaced by merely pressing a single push-button switch on the Type 262. Auxiliary programming cards allow the Type 262 to program additional equipment within a complex system, such as signal attenuators and generators.

All information required to program the Type 567/6R1A, including upper and lower test limits, is contained in the program cards. Each Type 262 holds up to eight program cards. By cascading three Type 262's a sequence of twenty-four test programs becomes available in either manual or automatic operation modes.***

PROGRAM CARDS

Plug-in program cards come ready for programming. Cards are programmed by soldering in appropriate jumpers and values of resistors. This manner of program connection assures maximum electrical and mechanical reliability.

Each Type 262 holds up to 8 program cards. Each card can be programmed for a particular time or amplitude measurement such as risetime, delay time, period, pulse amplitude, time interval between percentage or voltage points on either A or B signal waveforms of either polarity, 1st or 2nd pulse selection. Upper and lower test limits can also be programmed on the cards.

If a change of a measurement program is desired, the plug-in program cards can be removed and other pre-wired programs inserted in a matter of seconds, or the cards can be easily re-wired.

* Cable capacitance and environmental noise limits the number of Programmers that can be used in series.

** Automatic sequencers are required.

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AUXILIARY PROGRAMMING

The Type 262 also accommodates 8 auxiliary plug-in programming cards. The connectors from the auxiliary cards have parallel connections to 54 control lines available at the rear-panel of the Type 262 for programming signal attenuators, signal generators, trigger source switches, signal switches, and power supplies.

MANUAL CONTROL

Front-panel push-buttons allow selection of measurements. The sequence is determined by the operator and any program can be held for as long a period as needed. The measurement rate is determined by the Type 6R1A.

EXTERNAL SCAN

Programs can be selected externally through the control lines available at the rear-panel connector. Selection is by contact closure to ground.

AUTOMATIC SEQUENCER ACCESSORY

The Type 262 is pre-wired to facilitate the installation of an automatic sequencer consisting of a synchronizer board and a counter board. This accessory will automatically scan up to 8 programs per Type 262.

Front-panel switches, in conjunction with the Automatic Sequencer, allow for interrupting the automatic sequence in accordance with pre-established upper and lower limits. Any combination of the upper, middle, or lower limits can be used.

The position of the boards can be interchanged to achieve any particular sequence of measurements wanted.

The automatic sequencer can be synchronized with data recording devices such as printers, card punches, or with various test fixtures.

Both manual push-button control and external control are still available when the automatic sequencer is installed.

Up to three Type 262 Programmers can be used in series for a total of 24 different measurement programs. For automatic sequencing, each individual Type 262 requires an automatic sequencer accessory.

MEASUREMENT RATE

WITHOUT AUTOMATIC SEQUENCER

The measurement rate is governed by the Type 6R1A display time of 0.1 to 6 seconds, and is also dependent upon the sweep time.

WITH AUTOMATIC SEQUENCER

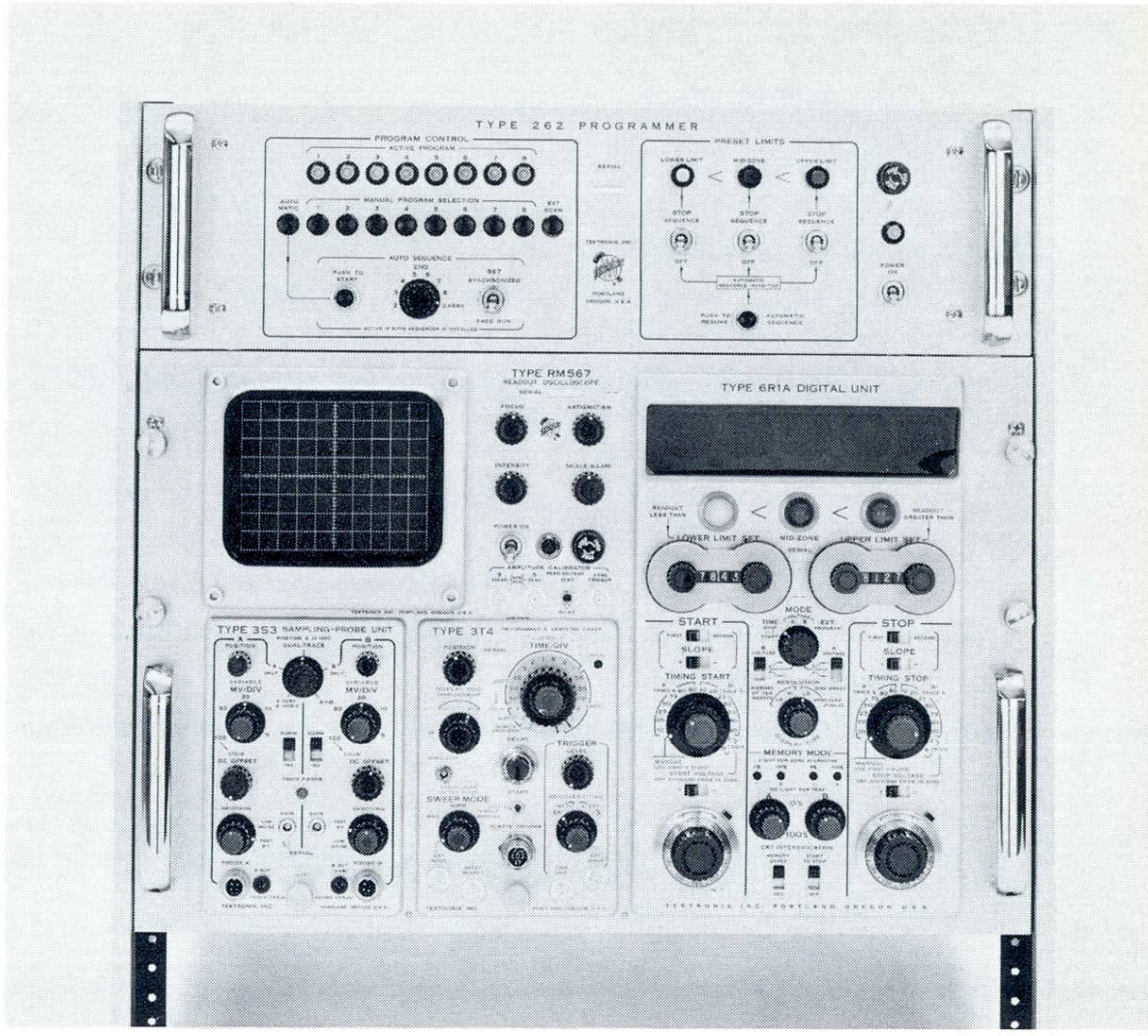
With the Automatic Sequencer installed, the measurement rate can be synchronized with auxiliary equipment or can be determined by the Type 567 and Type 262.

In a non-synchronized mode of operation, the measurement rate is determined by the sum of the Type 6R1A display time and the Type 262 display time. Display time of the Type 262 is continuously variable within the range of 50 to 500 milliseconds. In this mode, up to 8 measurements per second can be made.

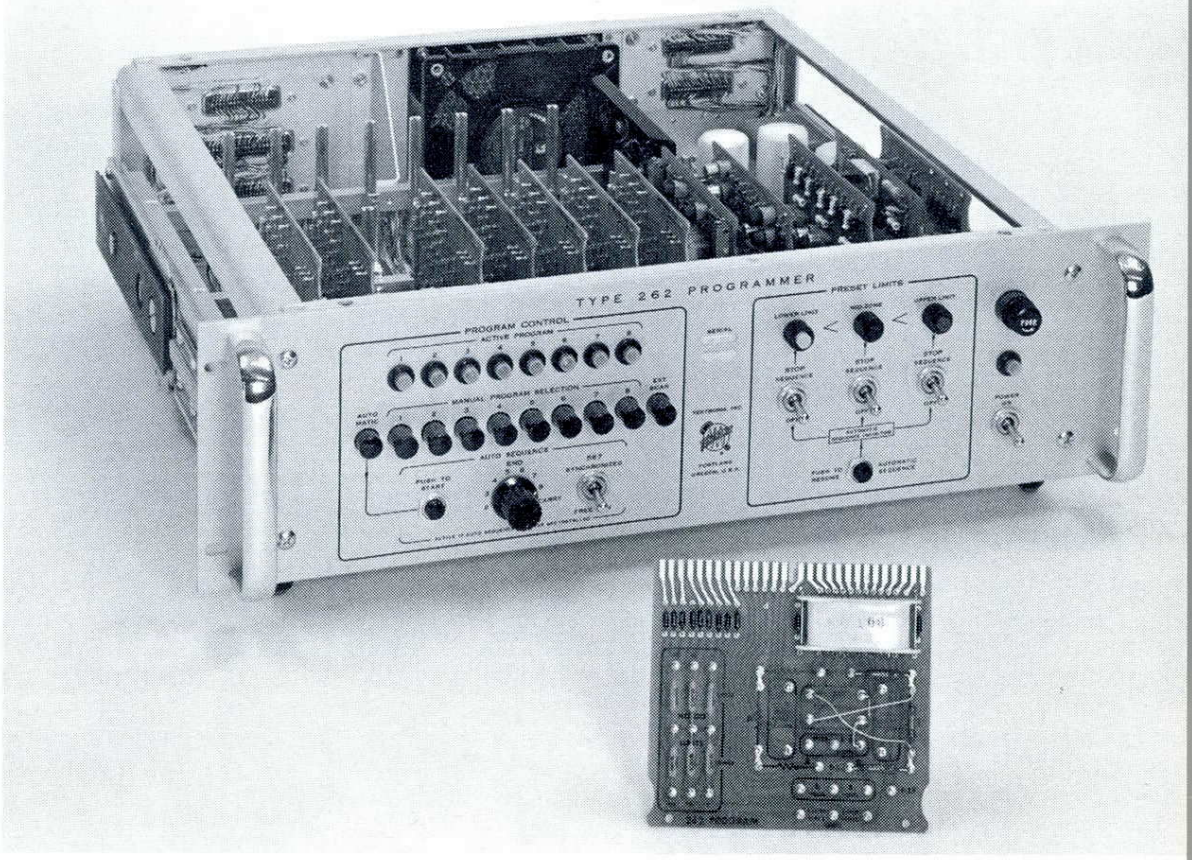
In a synchronized mode of operation, the display is held, upon completion of a measurement, until an external completion pulse is received. In the synchronized mode, up to 6 measurements per second can be made.

MECHANICAL FEATURES

The Type 262 mounts in a standard 19" rack and occupies only 5¼" of rack height. It has slide-out tilt-lock tracks that permit it to be pulled forward, tilted, and locked in any of five positions for convenient programming and servicing. Cabinet feet are included for installation when not rack-mounted.



Type 262 programming the Type RM567/6R1A in a sequence of transistor switching measurements.



TYPE 262 PROGRAMMER $1350

Each instrument includes: 1—Cabinet feet kit (016-0052-00); 4—Washer (210-0833-00); 4—Washer (210-0917-00); 4—Screw (212-0512-00); 4—Screw (212-0561-00); 1—Pr Mounting tracks (351-0085-00); 1—Power cord (161-0022-00); 1—3 to 2-wire adapter (103-0013-00); 1—6R1A to 262 cable (012-0081-00); 2—Instruction Manual (070-0399-00).

*If the Type 262 is to be connected to another Type 262, indicate on your order that you need a 262/262 cable (012-0082-00) rather than a 262/6R1A cable (012-081-00),

262

NECESSARY ACCESSORIES FOR BASIC OPERATION

For basic operation of the Type 262, at least one program card is required.

PROGRAM CARD (Part No. 018-0007-00) each $25

PROGRAM CARD EXTENSION

A 56-pin rigid extension enables the program cards to operate out of the type 262 housing for servicing convenience.

56-PIN RIGID CARD EXTENSION (Part No. 012-0078-00) $20

OPTIONAL RESISTOR KIT

A resistor kit containing 176, 1/4 w, 1% resistors is available for use with program cards.

RESISTOR KIT (Part No. 016-0056-00) $50

Complete instructions to program the cards are included in the instruction manual.

AUTOMATIC SEQUENCER ACCESSORY

A sequencer, composed of a synchronizer board and a counter board, provides for automatic scan of up to 8 programs per Type 262.

AUTOMATIC SEQUENCER (Part No. 040-0331-00) $215
SYNCHRONIZER BOARD Only (Part No. 018-0005-00) 95
COUNTER BOARD Only (Part No. 018-0006-00) 120

AUXILIARY PROGRAMMING CARDS (not furnished with Type 262)

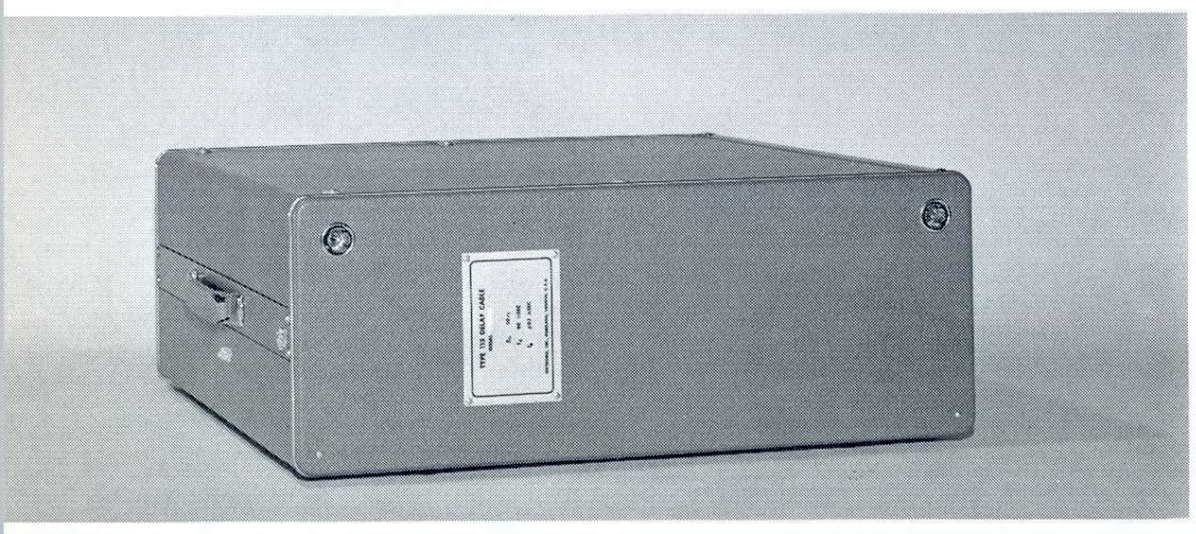
The Type 262 accommodates 8 auxiliary plug-in programming cards. Each card has gold, through-hole plating for best possible electrical contact.

CARD with 11 reed relay assy. (Part No. 018-0003-00) $25
CARD only (Part No. 018-0004-00) $18

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

SAMPLING ACCESSORIES

The usefulness of the Type 567 and Type RM567 Oscilloscope is further augmented by a wide range of accessories and associated instruments. Brief descriptions of some of these are given here. For full specifications, please refer to each instrument on the page listed in the index.



TYPE 109 PULSE GENERATOR

The Type 109 produces 0.25-nsec risetime pulses of either equal or alternately different time duration. Pulse width is 0.5 to a maximum of 40 nsec at the full repetition rate of typically 550 to 720 pulses/sec; to 300 nsec at half repetition rate.

Pulse amplitude can be selected from three calibrated ranges extending from 0 v through 50 v, accuracy within 3%. Polarity can be either positive or negative.

External dc charge voltage inputs permit alternate pulses of different amplitudes and/or polarity.

TYPE 109 PULSE GENERATOR $360

TYPE 111 PULSE GENERATOR

The Type 111 is a high-repetition rate, fast-rise pulse generator that provides two pulse outputs:

OUTPUT PULSE has a risetime equal to or less than 0.5 nsec for positive pulses; slightly longer for negative pulses. Repetition rate is continuously adjustable from 10 pps to 100 kc. Pulse duration is 2 nsec minimum to 100 nsec maximum with an external charge line. Pulse amplitude is over $\pm$ 5 volts.

PRETRIGGER PULSE amplitude is 10 v, duration is 250 nsec, and half-amplitude risetime is 4 nsec. (Approximately).

Time delay between pretrigger and output pulse is continuously variable from 30 nsec to 250 nsec.

TYPE 111 PULSE GENERATOR $365

TYPE 113 DELAY CABLE

The Type 113 Delay Cable is a transmission line of the transverse electric and magnetic fields mode type with a 60-nsec delay. The Type 113 is used in sampling applications where a trigger is derived from and fed ahead of a signal to a sampling plug-in unit. The cable has approximately a 1.5 db loss per 100 feet at 1000 Mc. Risetime is approximately 0.1 nsec.

TYPE 113 DELAY CABLE $250

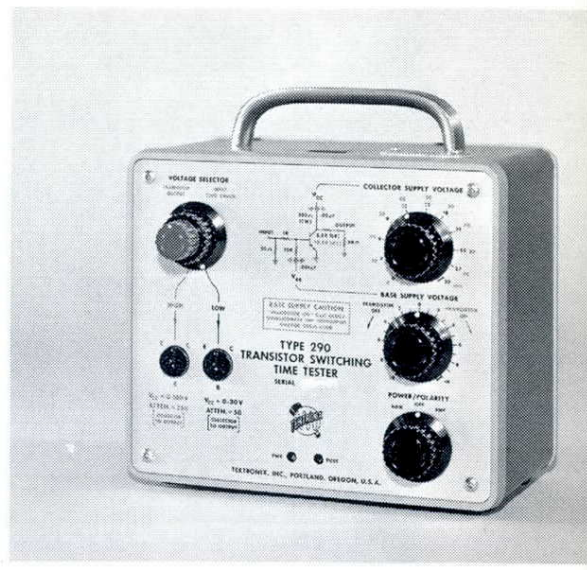
SAMPLING ACCESSORIES

TYPE 280 TRIGGER COUNTDOWN UNIT

The Type 280, used with the Type 567/3S76/3T77 or Type 567/3S3/3T77, allows synchronization on frequencies up to 5 Gc. The Type 280 can be used to lower the frequency of the triggering signals to within a range of 15 to 45 Mc. This permits the trigger circuit of the sampling system to lock in solidly with a much higher input signal frequency.

Input frequency is from 30 Mc to 5 Gc; input signal range is 50 mv to 4 v, peak-to-peak. Output repetition rate is continously variable from 15 to 45 Mc. Fast-rise trigger output is 150 mv with less than 0.4-nsec risetime and 1.5 v with less than 4-nsec risetime.

TYPE 280 TRIGGER COUNTDOWN UNIT $265



TYPE 290 TRANSISTOR SWITCHING-TIME TESTER

The Type 290, driven by a Tektronix fast rise pulse generator and combined with a Tektronix sampling system, provides a transistor testing system with an over-all transient response of less than 1 nsec. This system tests fast transistors on a short duty-cycle basis for delay time, risetime, storage time, and fall time.

Two continuously variable collector voltages are available: 0-to-30 v and 0-to-100 v. Base supply voltage is continuously variable from 0 to ± 10 v.

When using a single-trace oscilloscope, the input signal can be switched to the output for observation; when using a dual-trace oscilloscope, the input and output signal can be viewed simultaneously.

TYPE 290 . . . . . $290

TYPE 291 DIODE SWITCHING-TIME TESTER and TEST FIXTURE

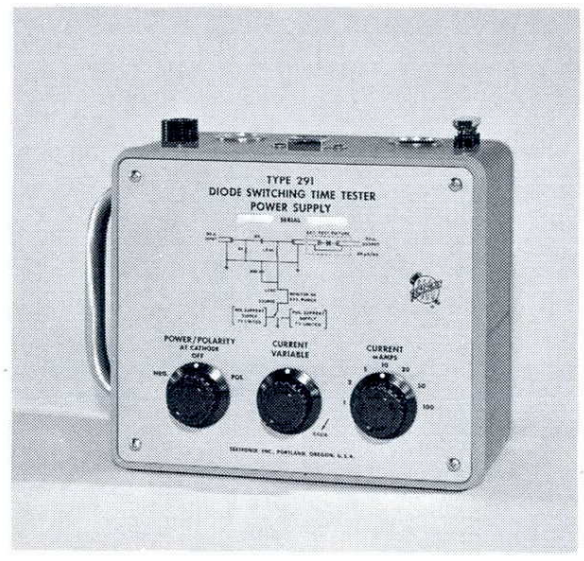
The Type 291 enables measurement of fast-switching diode characteristics. The diode under test is magnetically held in the Test Fixtures.

The Type 291 provides a range of dc test currents to 100 ma—with provision for external current supply to 500 ma and an external current monitor. The Type 291 and Test Fixture response is less than 0.35 nsec. The input pulse should be supplied from a fast-rise generator such as the Tektronix Type 109.

TYPE 291 (without test fixture) $185

TEST FIXTURES:

Diode Test Jig (Part No. 013-0080-00) $40
Adapter for Jig (Part No. 017-0075-00) $55



TYPE 292 SEMICONDUCTOR TESTER POWER SUPPLY

The Type 292 Semiconductor Tester Power Supply furnishes dc power and connection for a sub-nanosecond environment test fixture. The fixture can be wired for measuring time and charge characteristics of diodes and transistors.

The Type 292 is normally used between a sub-nanosecond pulse generator and a 50-ohm input sampling oscilloscope. Signal connections are made directly to the test fixture through miniature coaxial cables. The Type 292 provides a range of test voltages from 1 to 20 volts and bias currents from 0.1 to 200 ma. External power supplies may be used for other currents and voltages. Leads from the external jacks to the test fixture limit externally supplied current to 1 ampere.

TYPE 292 . . . . . $325

OPTIONAL TEST FIXTURES AVAILABLE:

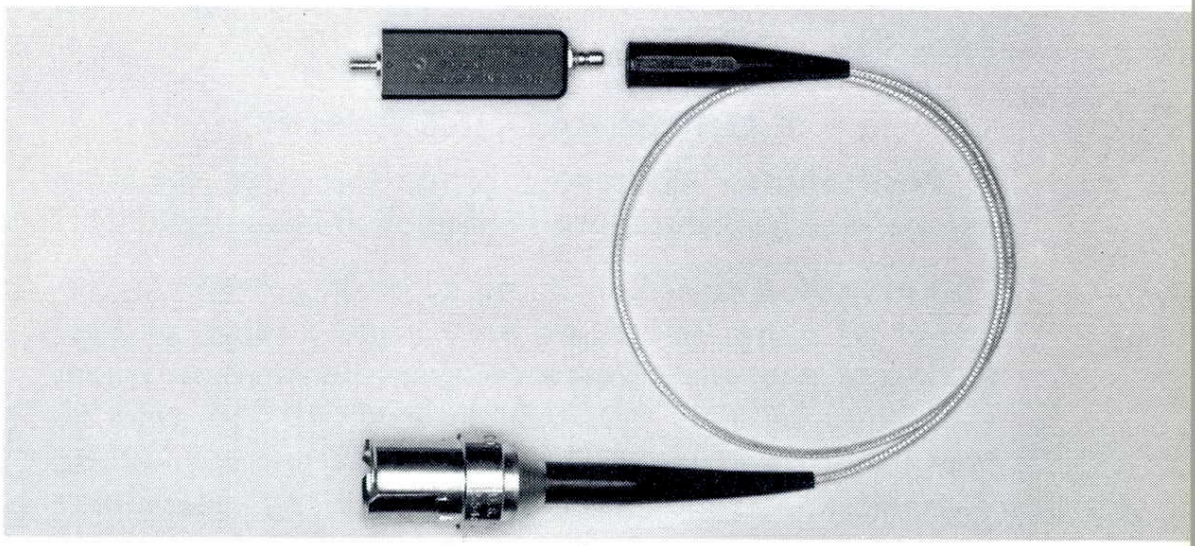
Diode Test Jig (Part No. 013-0080-00) . . . . . $ 40
Adapter for Diode Test Jig (Part No. 016-0059-00) . . . $ 21

TYPE CT-1 CURRENT TRANSFORMER AND P6040 PROBE

The Type CT-1 Current Transformer and P6040 Probe, used with the Type 567, will measure milliampere currents at frequencies beyond 1 Gc. Sensitivity of the Type CT-1/P6040 is 5 mv/ma into a 50-Ω load. Risetime is less than 0.35 nsec, and accuracy is ± 3%.

The Type CT-1/P6040 gives true readings of current flow while keeping loading effects to a minimum. The P6040 Probe is used as a convenient plug-on inter-connecting cable for the Type CT-1.

TYPE CT-1 and P6040 (Part No. 015-0041-00) $31
Type CT-1 only (Part No. 015-0040-00) $17
TYPE P6040 only (Part No. 010-0133-00) $14



U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 570 ELECTRON-TUBE-CURVE TRACER

Displays Family of Curves on CRT Screen

Four to twelve characteristic curves per family.

Plots All Important Characteristics

Plate current against plate or grid voltage.
Screen current against plate or grid voltage.
Grid current against plate or grid voltage.

Positive-Bias Curves

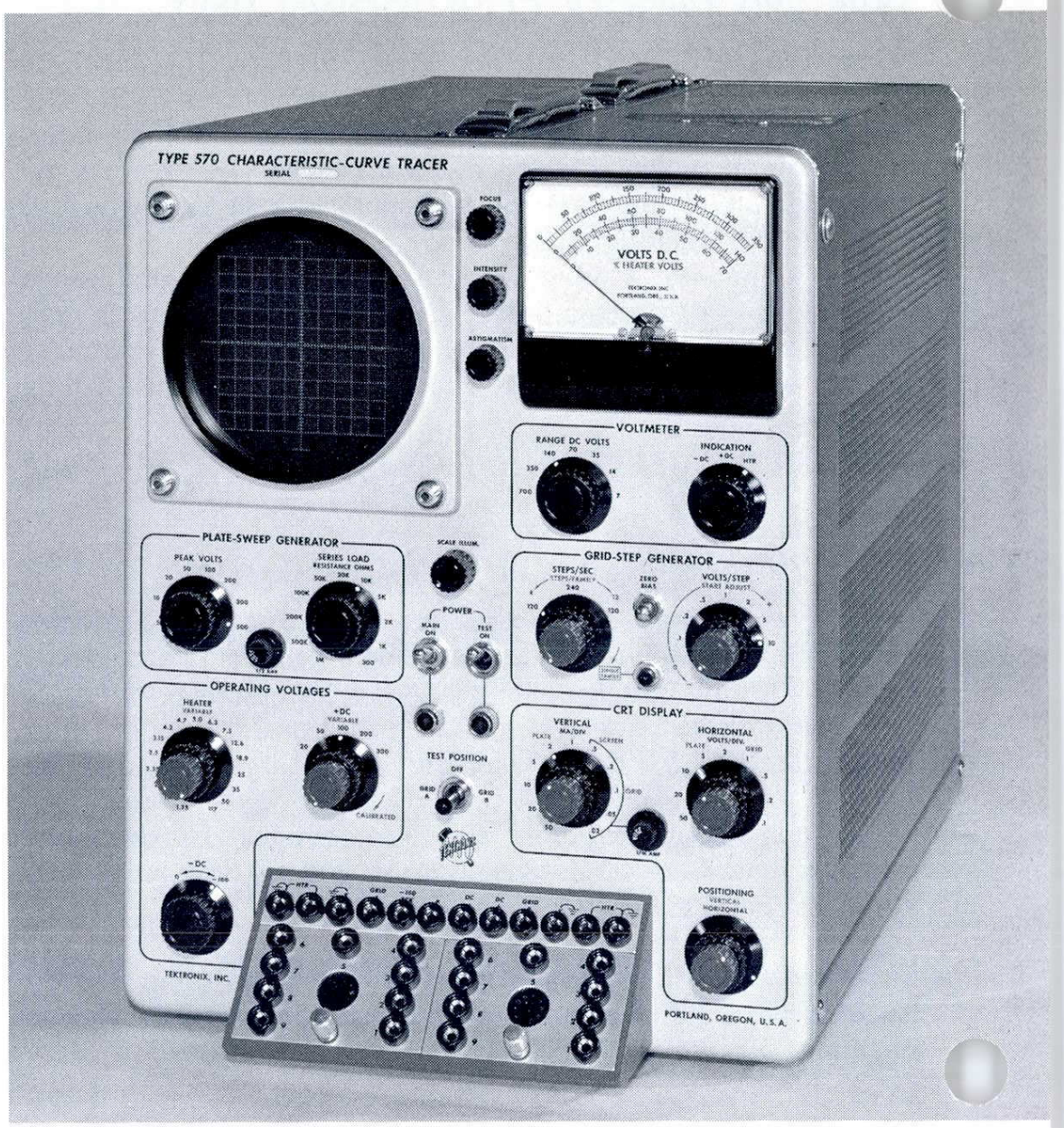
Plots up to 8 positive-bias curves per family.
(up to 12 negative-bias curves)

Calibrated Controls

Accurate current and voltage readings directly from the crt screen.

Wide Display Range

11 current ranges from 0.02 ma/div to 50 ma/div.
9 voltage ranges from 0.1 v/div to 50 v/div.
11 series-load resistors from 300 ohms to 1 megohm.
7 grid-step values from 0.1 v/step to 10 v/step.



The Tektronix Type 570 Characteristic-Curve Tracer presents an accurate graphic analysis of electron-tube characteristics under almost any conceivable operating conditions. Circuit design can now be tailored to more closely fit the operating characteristics of available tubes. Tubes can be selected faster and more accurately for circuits requiring other than average electron-tube characteristics. Two-socket arrangement with front-panel switching permits rapid comparisons between two tubes, or two sections of the same tube. Rapid comparisons can be made with preselected curves outlined on a crt mask. Patch-cord connector system with socket-adapter plates enables complete control of operating-condition setup.

The Type 570 is also an excellent tool for the instructor in electronics, both in the classroom and in the laboratory.

CATHODE-RAY-TUBE DISPLAY

Positioning—Concentric controls provide for both vertical and horizontal positioning of the display.

Vertical Axis—Concentric controls provide for selection of plate, screen, or grid current display; and selection of any one of eleven current-per-division values —0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, and 50 ma/div. A graticule divides the screen into ten vertical divisions. Calibration accuracy is within 3%, permitting accurate current readings directly from the screen.

Horizontal Axis—Either plate or grid voltage can be displayed on the horizontal axis, and nine voltage-per-division values are available—0.1, 0.2, 0.5, 1, 2, 5, 10, 20, and 50 v/div. Ten horizontal divisions are scribed on the graticule. Calibration accuracy is within 3%, permitting accurate voltage readings directly from the screen.

GRID-STEP GENERATOR

Family of Curves—A variable control is provided to adjust the number of curves in the display. As few as four and as many as twelve curves can be selected. A single family can be safely displayed with the tube under heavy overload conditions by means of a position on the STEPS/FAMILY control and a push button. With the STEPS/FAMILY control in the single-family position, pressing the button applies the selected conditions to the tube for only a fraction of second. Use of the SINGLE FAMILY push button permits observation or photography of tube characteristics under unusual conditions without danger of damage to the tube under test.

The STEPS/SEC switch controls the switching-rate of the step generator. A 120 or 240-steps/sec rate can be selected. The extra 120-steps/sec position causes switching to occur at the opposite end of the characteristic curve, for convenience when the area of interest is at either end of the curves displayed. (When the Type 570 is used with a 50-cycle supply frequency, the step/sec rate will be either 100 or 200.)

Bias voltage applied to the grid of the tube under test is impressed in a series of steps to produce the number of curves desired in the display. The voltage difference between steps is selected by a seven-position switch. Calibrated switch positions are: 0.1, 0.2, 0.5, 1, 2, 5, and 10 volts/step, accurate within 3%. Up to 150 ma peak grid current is available. A variable control is provided to adjust the starting point to a positive voltage, zero, or a negative voltage. Pressing the ZERO BIAS push button causes the display of the zero-bias curve only, to use as a reference in adjusting the starting point. As many as eight positive-bias curves can be included in the display.

PLATE-SWEEP GENERATOR

An eleven-position switch selects the desired series-load resistance for the plate circuit of the tube under test. Series-load values are: 300 ohms, 1 k, 2 k, 5 k, 10 k, 20 k, 50 k, 100 k, 200 k, 500 k, and 1 megohm. Power-handling capacity of all load resistors is sufficient to dissipate the maximum power available in the plate circuit.

The peak voltage applied to the plate through the series-load resistance is selected by an eight-position switch. Peak voltages are: 5, 10, 20, 50, 100, 200, 300, and 500 volts.

OPERATING VOLTAGES

Heater voltage is available in 17 fixed steps: 1.25, 1.4, 2.0, 2.35, 2.5, 3.15, 4.2, 4.7, 5.0, 6.3, 7.5, 12.6, 18.9, 25, 35, 50, and 117 volts ac. A control permits adjusting the selected heater voltage approximately ±20% for simulating the effects of low or high line voltage. The variable control provides sufficient spread between steps to supply the proper heater voltage for practically all receiving-type vacuum tubes. Maximum power available from the heater transformer is 30 watts.

Positive dc voltage is available in five calibrated steps: 20, 50, 100, 200, and 300 volts, accurate within 3%. The positive voltage is also continuously variable from approximately 10 to 300 v. Up to 50 ma steady current is supplied. An adequate reserve is available for higher peak currents.

Negative dc voltage is available, continuously variable from 0 to —100 v. The negative dc supply is capable of delivering up to 1 watt.

ADAPTER PLATES

Eight quick-changing adapter plates are furnished with the Type 570 — 2 with octal sockets, 2 with nine-pin miniature sockets, 2 with seven-pin miniature sockets, and 2 with pilot holes only. Plate receptacle holds any two adapter plates at the same time. Small banana jacks connect to each socket terminal thus making it possible to patch any tube element to any voltage supplied by the instrument.

Other adapter plates are available as optional accessories.

VOLTMETER

The built-in voltmeter indicates the positive and negative operating voltages in seven ranges: 0 to 7, 14, 35, 70, 140, 350, 700 volts. The voltmeter can be switched to show the percent of heater voltage indicated by the heater-voltage selector switch.

OTHER FEATURES

Tube-Socket Switching—The TEST POSITION switch in the center of the front panel is used to switch in either of two vacuum tubes during comparison tests. It has an OFF position for changing tubes and for establishing a reference trace on the screen. Control-grid potential drops to —150 v in the off position.

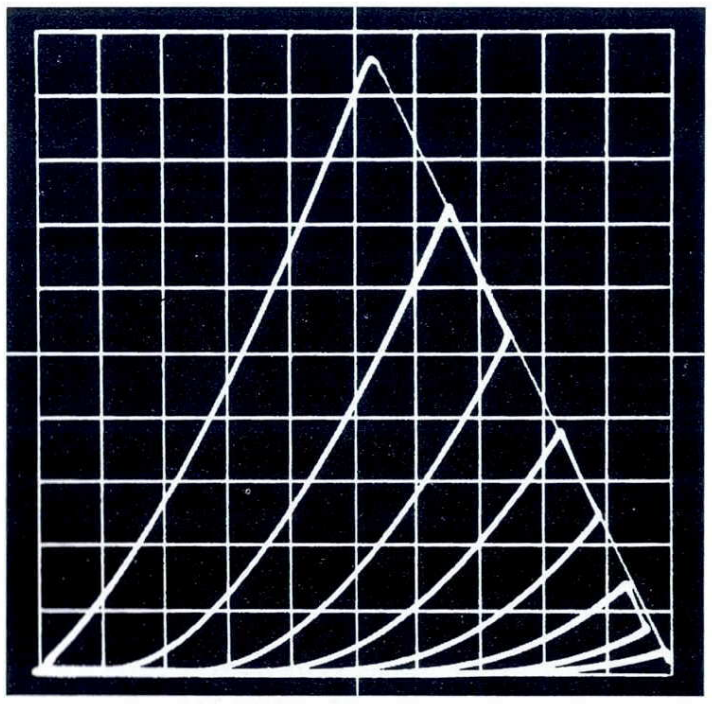


Fig. 1—Plate current plotted against plate voltage for one triode section of a 12AU7. Plate load is 5 k, peak plate-supply voltage is 500 v. Grid voltage is changed 5 v between curves, from —35 v to zero. Vertical sensitivity is 5 ma/div, horizontal sensitivity 50 v/div. Calibrated controls permit accurate current and voltage readings directly from the screen.

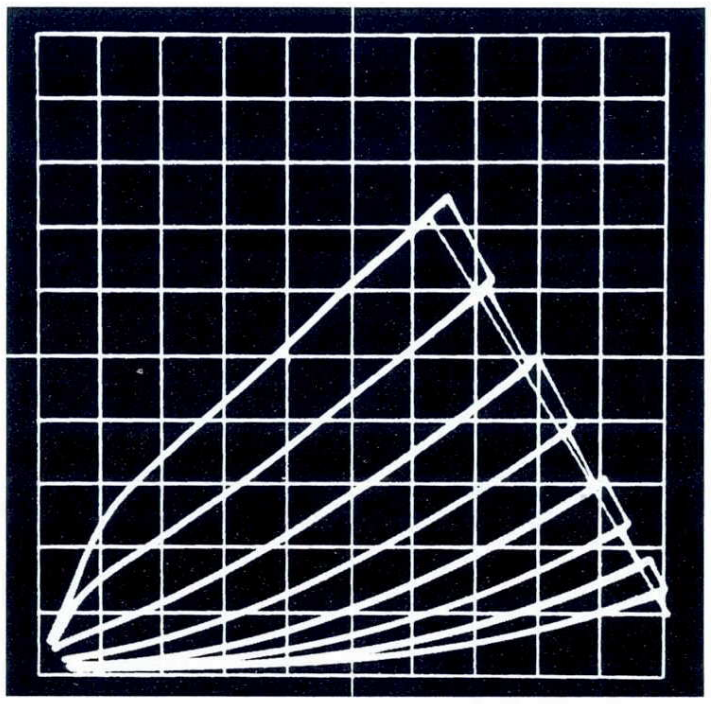


Fig. 2.—Same triode section of 12AU7 with only 20-v peak plate supply and sensitivities increased to 0.2 ma/div vertical and 2 v/div horizontal. Grid voltage is changed 2 v between curves, from —14 v to zero. This is essentially a 25-times magnification of the lower left portion of Fig. 1, showing the operating characteristics at low plate-supply voltage.

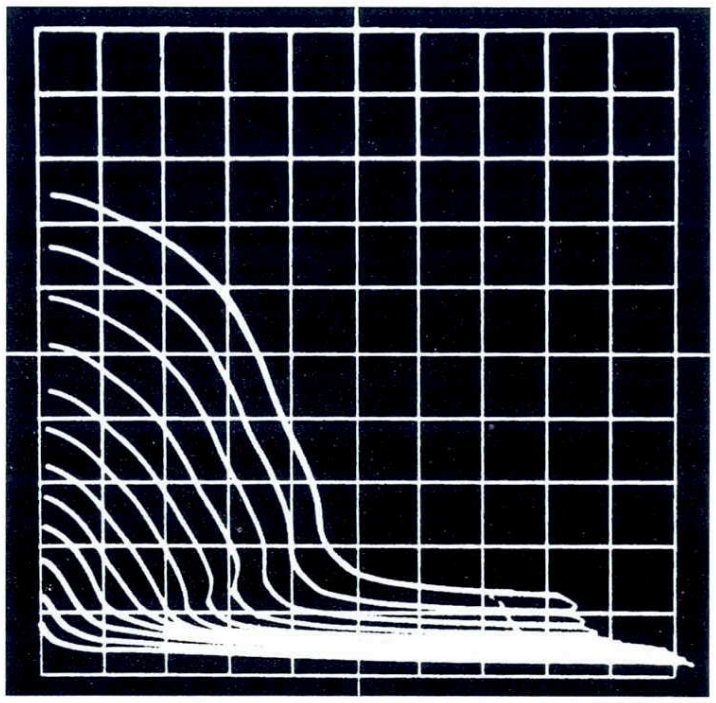


Fig. 3—Screen current plotted against plate voltage with positive grid bias on a 6AQ5. Plate load is 300 ohms, peak plate voltage is 100 v, screen-grid voltage is 100 v, with grid voltage changing 2 v/step from +16 v to below zero. Vertical scale is 10 ma/div, horizontal scale is 10 v/div.

570

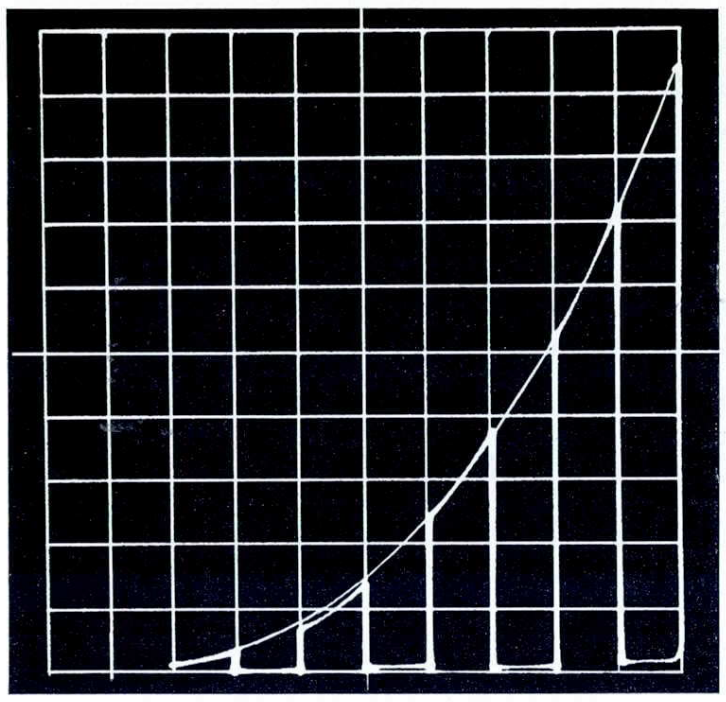


Fig. 4—Typical 12AU7 Eg-Ip curves. Plate load 5 k, peak plate-supply voltage 500 v, grid voltage changing 5 v/step from —35 v to zero, vertical sensitivity 5 ma/div, horizontal sensitivity 5 v/div.

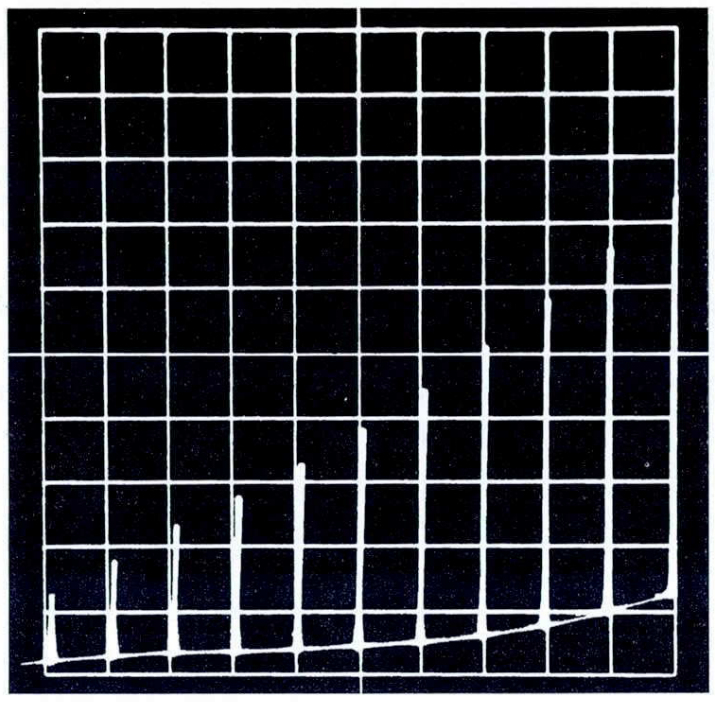


Fig. 5—Another family of curves with positive grid bias. Screen current is plotted against grid voltage. Operating conditions of the 6AQ5 are identical to Fig. 3, except horizontal sensitivity is 2 v/div.

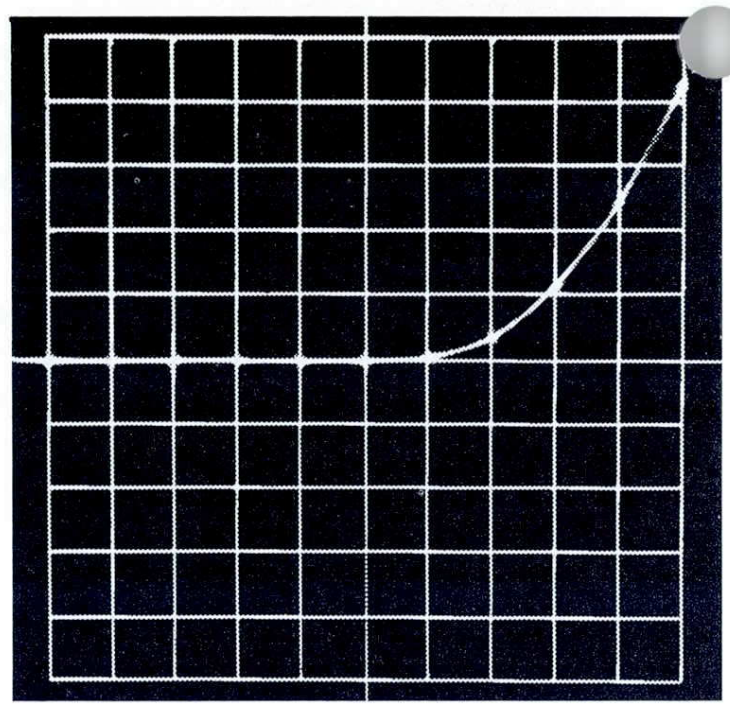


Fig. 6—Typical GERMANIUM DIODE curve. Inherent flexibility of the Type 570 permits accurate evaluation of diode characteristics and detailed examination of any part of the curve. Calibrated scales above are 0.2 v/div horizontal, 0.5 ma/div vertical, with zero points at center of screen.

Safety Switch—The extremely flexible operational-setup facility of the Type 570 requires that potentially dangerous voltages be present at the patch panel. These voltages can be removed by a front panel switch for safety and convenience. A jewel light indicates when power is present at the patch panel.

Regulated Power Supply—Electronic voltage regulation is used to compensate for line-voltage changes and variations in loading. All voltages affecting calibrations are fully regulated. Heater, negative-dc, and peak-plate supplies are unregulated.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 400 watts maximum, 300 watts standby. Note: For 50 cps supply, the switching rate will be either 100 steps/sec or 200 steps/sec.

Cathode-Ray Tube—The Tektronix crt uses 4-kv accelerating potential. A P1 phosphor is normally supplied.

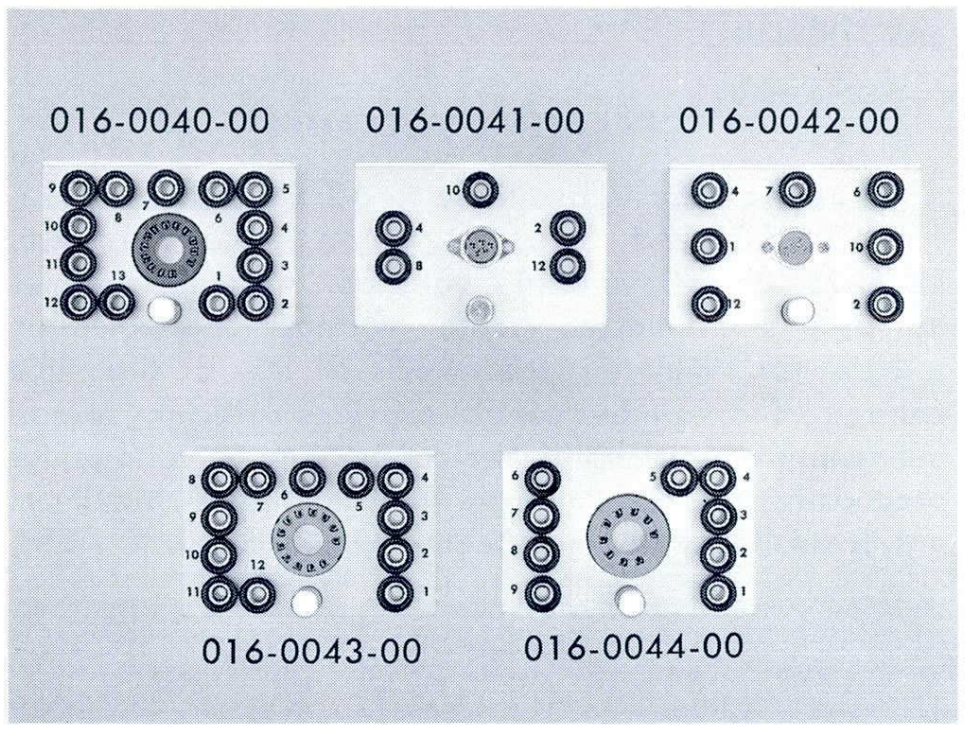
Illuminated Graticule—The 10 x 10-division graticule is edge-lighted. Illumination of the graticule is controlled by a front-panel knob.

Mechanical Specifications—Dimensions are 17" high by 13⅛" wide by 23¼" deep. Net weight is 74¾ pounds. Shipping weight is 94 pounds, approx.

TYPE 570 CURVE TRACER $1100

Each instrument includes: 5—Double patch cord, black, 6'' (012-0023-00); 5—Double patch cord, red, 6'' (012-0024-00); 2—Suppressor cord, 100 Ω, 6'' (012-0025-00); 2—Suppressor cord, 300 Ω, 6'' (012-0026-00); 2—Suppressor cord, 1 k, 6'' (012-0027-00); 5-Single patch cord, black, 6'' (012-0028-00); 5—Single patch cord, 6'' (012-0029-00); 2—7-pin adapter plate (016-0004-00); 2—8-pin adapter plate (016-0005-00); 2—9-pin adapter plate (016-0006-00); 2—Blank adapter plate (016-0007-00); 1—3 to 2-wire adapter (103-0013-00); 1—6U8 (154-0033-00); 5—1/16 amp 3-AG Fast-Blo fuse (159-0024-00); 5 1/2 amp 3-AG Fast-Blo fuse (159-0025-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 2—Instruction Manual (070-0167-00).

Optional Adapter Plates



Optional adapter plates with various sockets are available.

13 Pin Nixie* Base (016-0040-00) $12.50
5 Pin Nuvistor Twelvar Base (016-0041-00) .. $10.00
7 Pin Nuvistor Twelvar Base (016-0042-00) .. $10.00
12 Pin Compactron Base (016-0043-00) $12.50
9 Pin Novar Base (016-0044-00) $10.00

* Burroughs Registered Trademark

Rack Mount Adapter

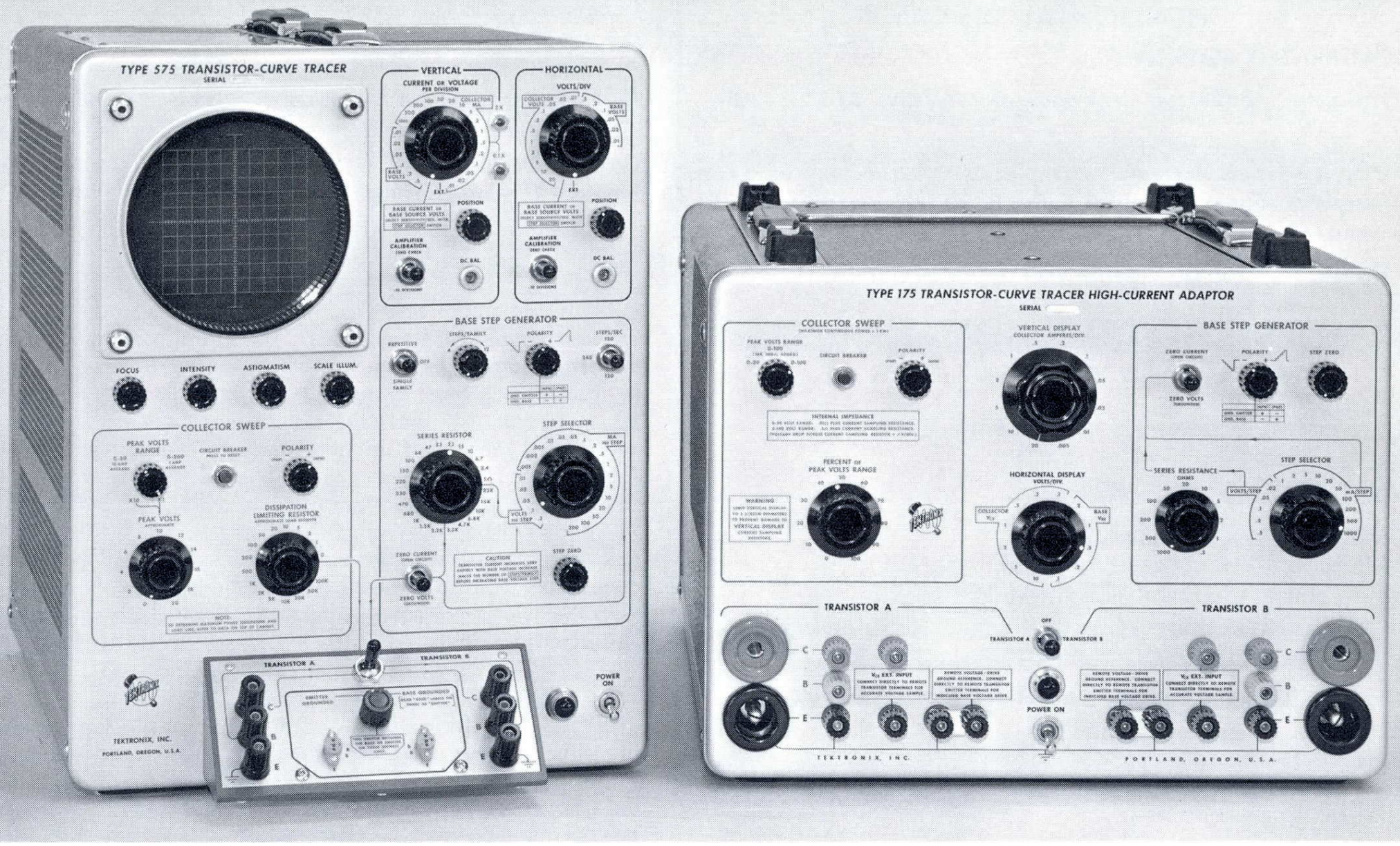
A cradle mount to adapt the Type 570 Characteristic-Curve Tracer for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Rack height requirements 17½".

Order Part No. 040-0281-00 ..... $45

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

TRANSISTOR-CURVE TRACER HIGH-CURRENT ADAPTER

Type 575/175



In most instances the operation of the Type 175 is the same as that of the Type 575. The added capabilities of the Type 575 when used with the Type 175 are shown in color.

CHARACTERISTIC SUMMARY

SEMI-CONDUCTOR DRIVING CAPABILITIES

BASE OR EMITTER STEP GENERATOR—

Stepping Rate—2 or 4 times line frequency.

Number of Steps—Continuously variable from 4 to 12 steps per family of characteristic curves.

Single or Repetitive—Stops after a single family of curves is generated, or repeatedly generates the family of curves.

Type of Steps—Steps are increments of voltage or current and are either positive or negative.

Voltage Increments—Selectable values from 0.01 v/step to 0.2 v/step ±3% with 2.4-ampere current capability.
—Selectable values from 0.02 v/step to 0.5 v/step with 12-ampere current capability.

Current Increments—Selectable values from 0.001 ma/step to 200 ma/step, ±3%.
—Selectable values from 1 ma/step to 1000 ma/step.

COLLECTOR SWEEP GENERATOR—

Frequency—2 times line frequency.

Peak Sweep Voltage—Continuously variable from 0 v to 20 v minimum with 10-ampere current capability and from 0 v to 200 v minimum with 1-ampere current capability. —Continuously variable from 0 v to 20 v with 200-ampere current capability and 0 v to 100 v with 40-ampere current capability.

Polarity—Positive or negative.

VERTICAL DISPLAY

CALIBRATED SENSITIVITY—

Transistor Collector Current—0.001 ma/div to 1000 ma/div, ±3%.
—0.005 amp/div to 20 amp/div.

Transistor Base or Emitter Current—0.001 ma/div to 200 ma/div, ±3%.

Transistor Base or Emitter Voltage—0.01 v/div to 0.5 v/div, ±3%.

Base or Emitter Source Voltage—0.01 v/div to 0.2 v/div, ±3%.

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HORIZONTAL DISPLAY

CALIBRATED SENSITIVITY—

Transistor Collector Voltage—0.01 v/div to 20 v/div, ±3%.
—0.1 v/div to 10 v/div.

Transistor Base or Emitter Current—0.001 ma/div to 200 ma/div, ±3%.

Transistor Base or Emitter Voltage—0.01 v/div to 0.5 v/div, ±3%.
—0.1 v/div to 2 v/div.

Base or Emitter Source Voltage—0.01 v/div to 0.2 v/div, ±3%.

CRT

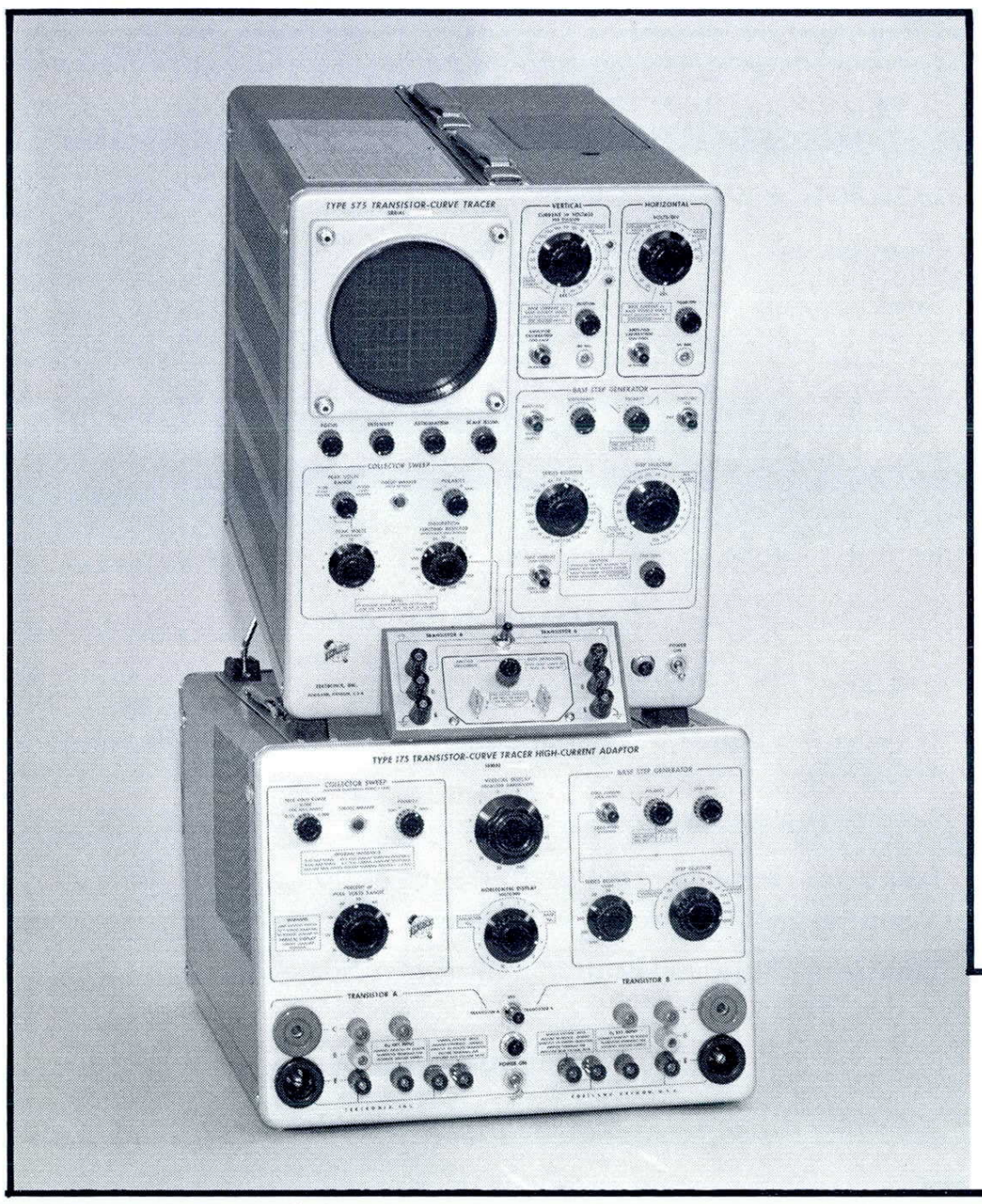
DISPLAY AREA—10 x 10 div.

ACCELERATING VOLTAGE—4 kv.

OTHER CHARACTERISTICS

COMPARISON SWITCH—Switch allows switching between two semi-conductors for comparison.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 50 to 60 cps, 410 watts max.
—105 to 125 v, 50 to 60 cps, 1100 watts max.



The Type 575 Transistor-Curve Tracer displays the dynamic characteristic curves of both NPN and PNP transistors on the screen of a 5-inch cathode-ray tube. Several different transistor characteristic curves may be displayed, including the collector family in the common-base and common-emitter configuration. In addition to the transistor characteristic curves, the Type 575 is used to display dynamic characteristics of a wide range of semi-conductor devices.

Transistors under test are inserted into either a common-base or common-emitter test circuit. The transistor collector has a sweep voltage applied to it while a step voltage or current is applied to either the base or emitter (whichever is ungrounded). Voltage, for the collector, sweeps between zero and a selectable value and is generated by the Collector Sweep Generator. The Base or Emitter Step Generator applies steps to the base or emitter that start at zero and build up to a value determined by the number of steps and value of each step as selected with front-panel controls. Each sequence of steps, from zero to the maximum attained value, in conjunction with the sweep voltage on the collector produces one family of characteristic curves.

Signals used for vertical and horizontal deflection on the crt are either current or voltage values selected from various points in the transistor test circuit. Thus, a selected vertical signal can be plotted against a selected horizontal signal to trace the desired semi-conductor characteristic curve. Selection of the deflection signal source is accomplished with front panel controls. Vertical deflection signal sources include: transistor collector current, transistor base or emitter current, transistor base or emitter voltage, and source voltage for the base or emitter. Horizontal deflection signal sources include: transistor collector voltage, transistor base or emitter current, transistor base or emitter voltage, and source voltage for the base or emitter.

The Type 175 Transistor-Curve Tracer High-Current Adapter enables the Type 575 to plot and display characteristic curves of high-current semi-conductors. Basically the Type 175 contains a high-current Collector Sweep Generator, a high-current Base or Emitter Step Generator and high-current test circuits that are used in place of those in the Type 575. The 175 also contains the necessary circuits to convert these high currents into deflection signals suitable for display on the Type 575 crt. There is one source for the vertical deflection signal: the transistor collector current. There are two sources for the horizontal deflection signal: transistor collector voltage and transistor base or emitter voltage.

TYPE 575 MOUNTING

The Type 575 can be secured atop the Type 175 with two hinge bolts. A brace attached to the top rear of the Type 175 allows the Type 575 to be raised for more convenient viewing.

BASE OR EMITTER STEP GENERATOR

The Step Generator develops current or voltage steps to drive the base or emitter (whichever is ungrounded) of the transistor under test. These steps are used to generate either repetitive or single-family (as selected) characteristic curves for display. The steps are adjustable in number from 4 to 12 and move in a positive or negative direction depending on the polarity switch setting. Step repetition rate is selectable as either 120 steps/sec or 240 steps/sec (values equal to 2X or 4X the line frequency). A control is available to set, to zero, the starting point of a series of steps.

Each step has a rise that is selected as either a value of current or a value of voltage. The value of each step rise in current ranges from 0.001 ma/step to 200 ma/step and is selected from 17 values that are in a 1-2-5 sequence. The value of each step rise in voltage is from 0.01 v/step to 0.2 v/step and is selected from 5 values that are in a 1-2-5 sequence. Also a switch is provided for grounding the transistor input to give a zero drive-voltage reference check, and opening the transistor input to give a zero drive-current reference check.

The driving resistance of the step generator is selected from 24 values that range from 1 ohm to 22 kilohms ±5%. Any other value can be added externally.

The Type 175 Step Generator output is basically the same as that of the Type 575. However, the current steps are selected from 10 values ranging from 1 ma/step to 1000 ma/step and the voltage steps are selected from 5 values ranging from 0.5 v/step to 10 v/step. In addition, the driving resistance is selected from 11 values ranging from 0.5 ohm to 1 kilohm. Any other resistance value can be added externally.

COLLECTOR SWEEP GENERATOR

The Collector Sweep Generator provides the sweep voltages that drive the collector of the transistor under test. These voltages sweep between zero and a peak value selected with a front-panel control. The peak voltage is either positive or negative depending on the setting of the polarity switch to allow the collector voltages to sweep between zero and positive peak values or zero and negative peak values. The repetition rate of the sweep is 2 times the line frequency; thus the collector voltage sweeps between zero and the peak value at least once for each step applied to the transistor base or emitter.

The peak sweep voltage is continuously adjustable from zero to 20 v with 10-ampere capability or from zero to 200 v with 1-ampere current capability.

The collector current limiting resistance is selected from 16 valuse ranging from 1 ohm to 100 kilohms ±5%.

The Type 175 Collector Sweep Generator output is basically the same as that of the Type 575. However, the peak sweep voltage is continuously adjustable from zero to 20 v with 200-ampere capability of from zero to 100 v with 40-ampere capability. Also, in the 0-100 v range a 300-ohm collector current-limiting resistor can be switched in. Any other desired resistance can be added externally.

VERTICAL-DEFLECTION SYSTEM

Signals used for vertical deflection are selected from various points in the transistor test circuit. Each point has several selectable deflection sensitivities available.

CALIBRATED SENSITIVITY—

Transistor Collector Current—0.01 ma/div to 1000 ma/div in 16 steps, 1-2-5 sequence. Pushbuttons are provided for multiplying each step by 2 or 0.1 thus extending the sensitivity from 0.001 ma/div to 2000 ma/div.
—0.005 amp/div to 20 amp/div in 12 steps, 1-2-5 sequence.

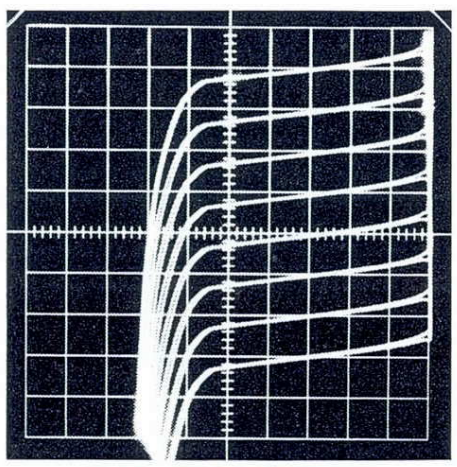
Transistor Base or Emitter Current—0.001 ma/div to 200 ma/div in 17 steps, 1-2-5 sequence.

Transistor Base or Emitter Voltage—0.01 v/div to 0.5 v/div in 6 steps, 1-2-5 sequence.

Base or Emitter Source Voltage—0.01 v/div to 0.2 v/div in 5 steps, 1-2-5 sequence.

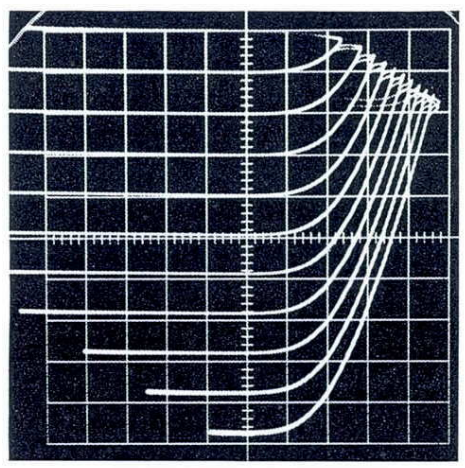
HORIZONTAL-DEFLECTION SYSTEM

Signals used for horizontal deflection are selected from various points in the transistor test circuit. Each point has several selectable deflection sensitivities available.



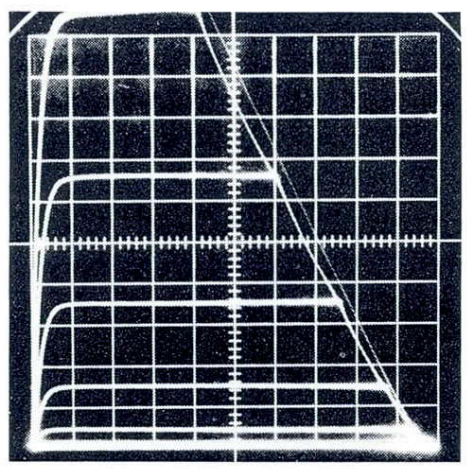
PNP TRANSISTOR

Collector current vs collector voltage with base grounded and constant-current emitter steps. Collector sweep is 0 to 120 v through a 5 k load resistor, emitter current 1 ma/step. Vertical deflection is 1 ma/div, horizontal deflection 10 v/div.



PNP TRANSISTOR

Collector current vs collector voltage with base grounded and constant-current emitter steps. Collector sweep is 0 to 1.5 v, emitter current 200 ma/step. Vertical deflection is 200 ma/div, horizontal deflection 0.1 v/div.



NPN TRANSISTOR

Collector current vs collector voltage with constant-voltage base steps. Collector sweep is 0 to 2 v, base voltage 0.02 v/step, vertical deflection is 5 ma/div, horizontal deflection 0.2 v/div.

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175

CALIBRATED SENSITIVITY—

Transistor Collector Voltage—0.01 v/div to 20 v/div in 11 steps, 1-2-5 sequence.
—0.1 v/div to 10 v/div in 7 steps, 1-2-5 sequence.

Transistor Base or Emitter Current—0.001 ma/div to 200 ma/div in 17 steps, 1-2-5 sequence.

Transistor Base or Emitter Voltage—0.01 v/div to 0.5 v/div in 6 steps, 1-2-5 sequence.
—0.1 v/div to 2 v/div in 5 steps, 1-2-5 sequence.

Base or Emitter Source Voltage—0.01 v/div to 0.2 v/div in 5 steps, 1-2-5 sequence.

OTHER CHARACTERISTICS

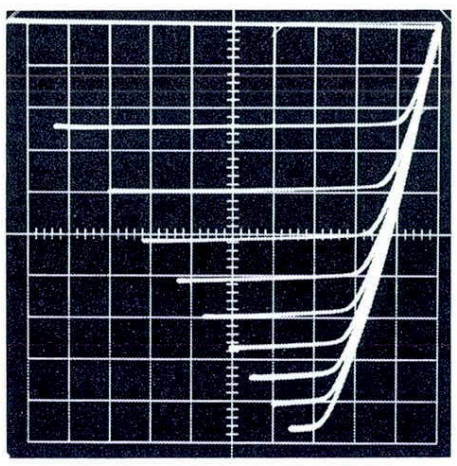
TRANSISTOR TEST PANEL—The transistor test panel has provisions for two transistors at the same time. Two sockets accept low-power transistors with short leads and three binding posts along side the sockets accept other transistor and semiconductors. One switch will change the sockets from the common-emitter to the common-base test circuit configuration. A second switch allows two transistors inserted into the test circuit to be rapidly compared by switching the test conditions from one to the other.

The Type 175 Transistor Test Panel is basically the same as that of the Type 575. Special connectors and cables are provided for high-current applications and for eliminating measurement errors due to voltage drops in high-current carrying leads.

CATHODE-RAY TUBE—The crt used has an accelerating voltage of 4 kv and is supplied with a P1 phosphor unless another phosphor is requested.

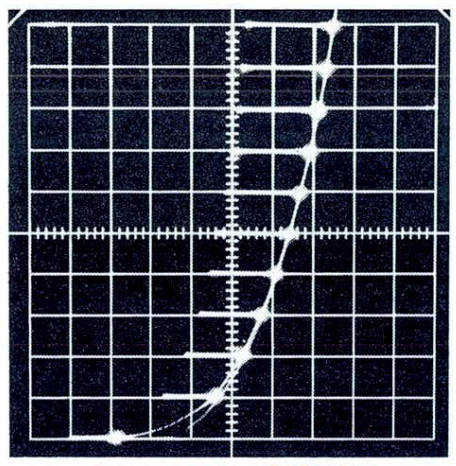
ILLUMINATED GRATICULE—The 3⅛" x 3⅛" edge-lighted graticule is marked in 10 by 10 cm divisions, with centerlines marked every one-fifth of a division. Illumination is controlled by a front-panel knob.

REGULATED POWER SUPPLY—Electronic voltage regulation is used to compensate for line-voltage changes and for variations in loading. All voltages affecting calibrations are fully regulated.



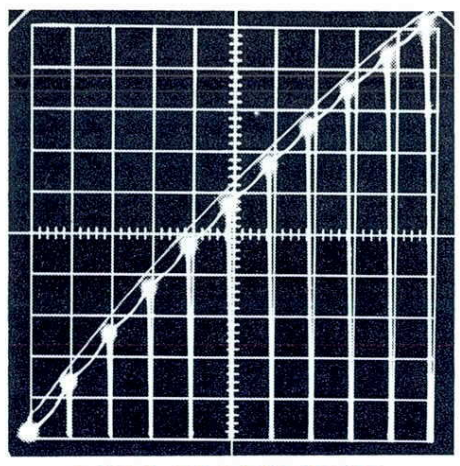
PNP TRANSISTOR

Collector current vs collector voltage with constant-current base steps. Collector sweep is 0 to 5 v with a 0.25-ohm load, base current is 50 ma/step. Vertical deflection is 1000 ma/div, horizontal deflection 0.5 v/div.



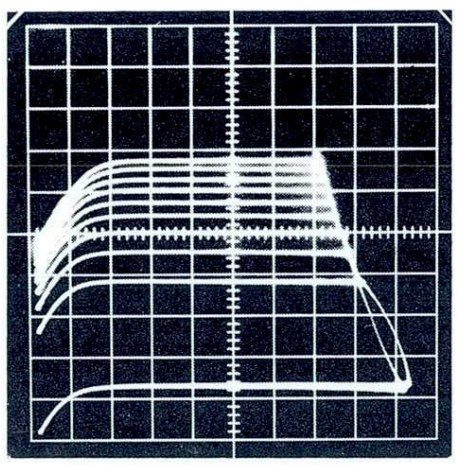
NPN TRANSISTOR

Base current vs base voltage with constant-current base steps. Collector sweep is 0 to 1 v, base current 0.1 ma/step. Vertical deflection is 0.1 ma/div, horizontal deflection 0.05 v/div. Dots represent equal increments of base current. Dynamic base impedance can be determined from this display.



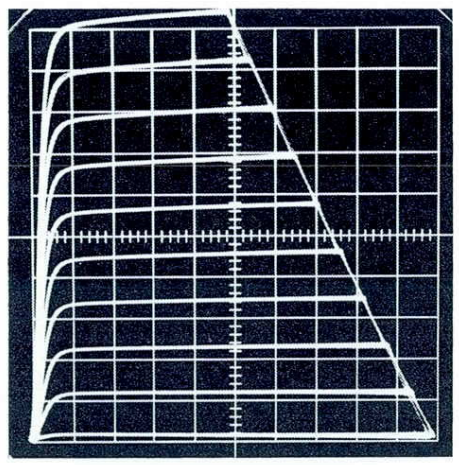
NPN TRANSISTOR

Collector current vs base current with constant-current base steps. Collector sweep is 0 to 1.5 v, base current 0.1 ma/step. Vertical deflection is 5 ma/div collector current, horizontal deflection 0.1 ma/div base current. Incremental and dc current gain can be determined from this display.



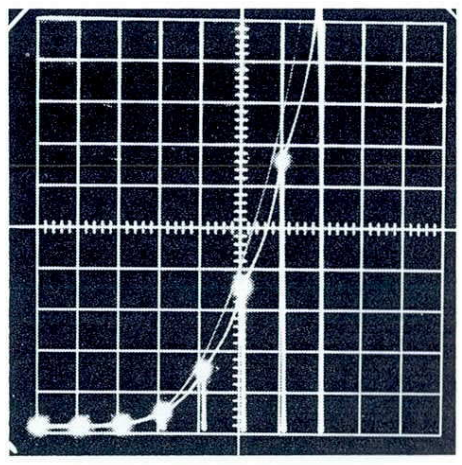
NPN TRANSISTOR

Base voltage vs collector voltage with constant-current base steps. Collector sweep is 0 to 1 v, base current 0.1 ma/step. Vertical deflection is 0.05 v/div base voltage, horizontal deflection 0.1 v/div collector voltage.



NPN TRANSISTOR

Collector current vs collector voltage with constant-current base steps. Collector sweep is 0 to 2 v, base current 0.01 ma/step. Vertical deflection is 0.5 ma/div, horizontal deflection 0.2 v/div.



NPN TRANSISTOR

Collector current vs base voltage with constant-voltage base steps. Collector sweep is 0 to 1.5 v, base voltage 0.05 v/step with a 1-ohm source impedance. Vertical deflection is 0.5 ma/div, horizontal deflection 0.05 v/div.

POWER REQUIREMENT—The Type 575 is wired for 117 v, 50 to 60 cps. The electronically-regulated power supplies permit a line-voltage variation between 105 and 125 v. Changing transformer taps permits operation at 107, 127, 214, 234, or 254 v. The Type 575 draws 220 watts standby, 410 watts maximum. The Type 175 requires 117 v, 50 to 60 cps, and regulates between 105 and 125 v. It draws 1100 watts maximum.

MECHANICAL—Dimensions are 16⅞" high by 13⅛" wide by 23⅜" deep. Net weight is 66 pounds. Shipping weight is 85 pounds, approx. Type 175—Dimensions are 12¼"high by 15¼" wide by 23⅜" deep. Net weight is 93 pounds. Shipping weight is 118 pounds, approx.

TYPE 575 TRANSISTOR CURVE-TRACER $1075

Each instrument includes: 2—Transistor adapter, long (013-0069-00); 2—Transistor adapter, short (013-0070-00); 1—3 to 2-wire adapter (103-0013-00); 2—2N1381 transistor (151-0039-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 2—Instruction Manual (070-0169-00).

TYPE 175 HIGH CURRENT ADAPTER $1475

Each instrument includes: 2—Black output lead (012-0014-00); 2—Red output lead (012-0015-00); 1—Interconnecting cable (012-0042-00); 2—Red test cable (012-0043-00); 2—Black test cable (012-0044-00); 1—575 adapter cable (012-0045-00); 2—Blue test lead (012-0056-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—3-conductor power cord, 20" (161-0014-00); 2—Lock washer (210-0010-00); 2—Nut (210-0410-00); 2—Screw (212-0520-00); 2—Bolt hinge (214-0152-00); 2—Instruction Manual (070-0169-00).

INCREASED COLLECTOR VOLTAGE

Although similar to the Type 575 Transistor Curve-Tracer, a special model, Type 575 MOD 122C, provides much higher diode breakdown test voltage (variable from zero to 1500 volts, maximum short circuit current of 1 milliampere) and also much higher Collector Supply (up to 400 volts, at 0.5 ampere).

TYPE 575 MOD 122C $1325

Each instrument includes: 2—Transistor adapter, long (013-0069-00); 2—Transistor adapter, short (013-0070-00); 1—3 to 2-wire adapter (103-0013-00); 2—2N1381 transistor (151-0039-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 2—Instruction Manual (070-0169-00).

RACK MOUNT ADAPTER

A cradle mount to adapt the Type 575 Transistor-Curve tracer for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Tektronix blue vinyl finish. Rack height requirements 17½".

Order Part No. 040-0281-00 . . . . . $45

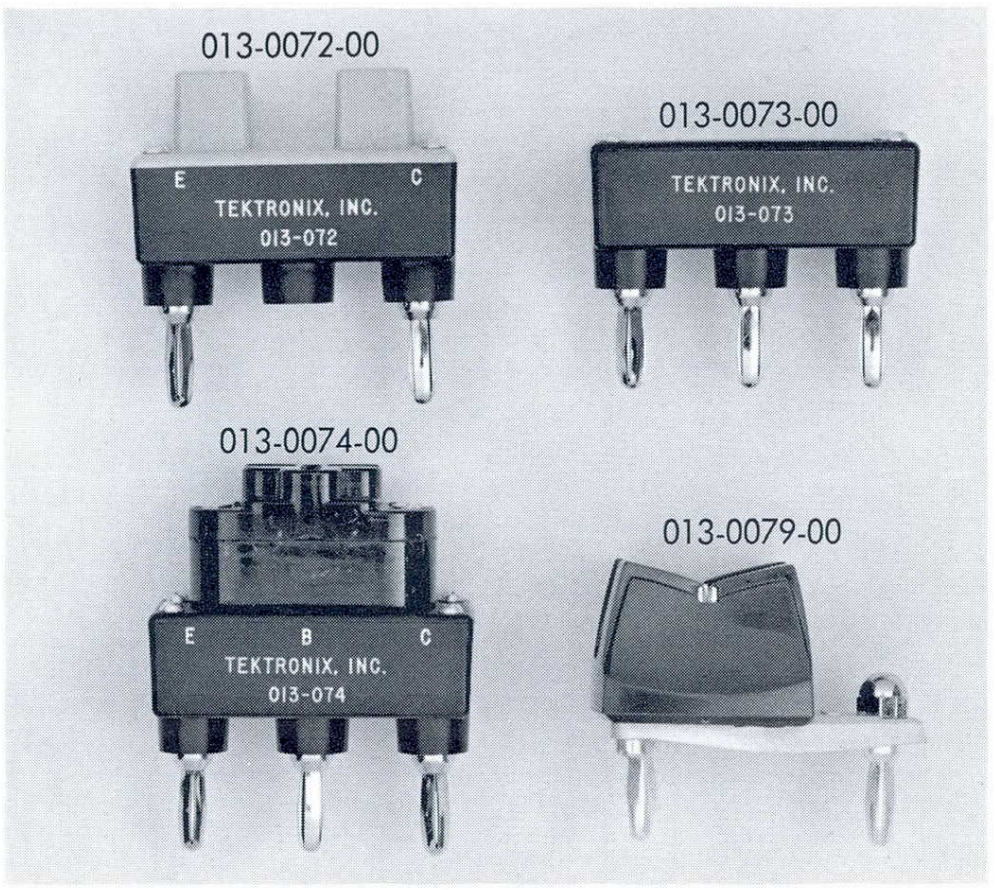
TYPE 175 MOD 167C

Modified Type 175 operates from 210 v to 250 v, 50 to 60 cps.

TYPE 175 MOD 167C HIGH CURRENT ADAPTER . . $1475

Each instrument includes: 2—Black output lead (012-0014-00); 2—Red output lead (012-0015-00); 1—Interconnecting cable (012-0042-00); 2—Red test cable (012-0043-00); 2—Black test cable (012-0044-00); 1—575 adapter cable (012-0045-00); 2—Blue test lead (012-0056-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—3-conductor power cord, 20" (161-0014-00); 2—Lock washer (210-0010-00); 2—Nut (210-0410-00); 2—Screw (212-0520-00); 2—Bolt hinge (214-0152-00); 2—Instruction Manual (070-0169-00).

TYPE 575 OPTIONAL TEST BOARDS



DIODE TEST JIG (013-0072-00)—holds axial-lead diodes $5.00

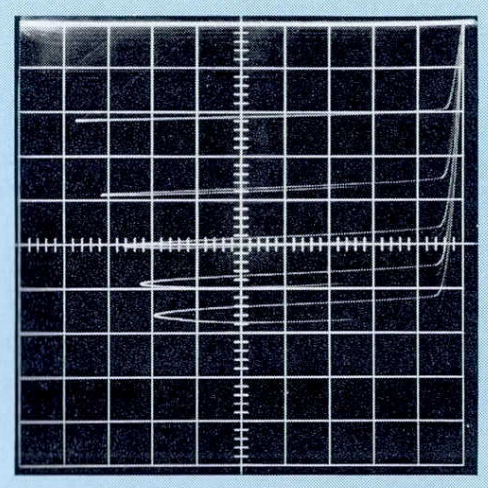
ADAPTER BOX (013-0073-00)—allows you to mount your own semiconductor socket on the box 4.00

POWER TRANSISTOR JIG (013-0074-00)—for power transistors with hook leads 5.00

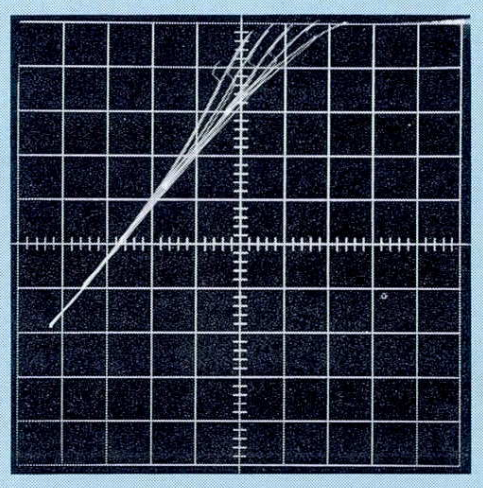
DIODE TEST JIG (013-0079-00)—production test jig for rapid handling 25.00

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

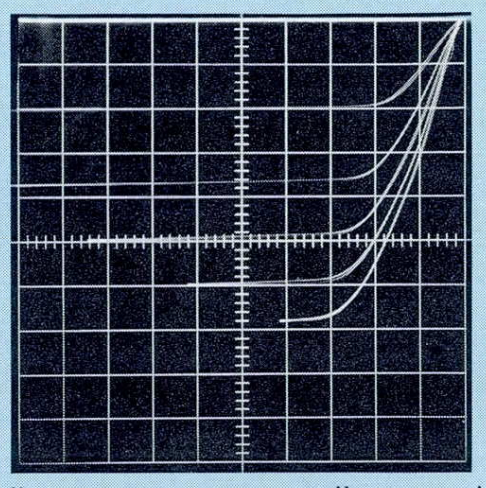
CHARACTERISTIC CURVE DISPLAYS WITH TYPE 175



Collector current vs. collector voltage (emphasis on saturation resistance). Vertical deflection is 10 amp/div, horizontal deflection is 0.2 v/div. Base drive is 500 ma/step (top curve is 2.5 amp).



Collector current vs. base voltage (collector sweep voltage is 4.2 v). Vertical deflection is 10 amp/div, horizontal deflection is 0.1 v/div. Base drive is 500 ma/step.



Collector current vs. collector voltage. Vertical deflection is 10 amp/div, horizontal deflection is 1.0 v/div. Base drive is 500 ma/step (top curve is 2.5 amp).

Type 581A / 585A RM585A DC-to-85 MC OSCILLOSCOPE

All information in color describes the additional capabilities of the Type 585A and RM585A.

ILLUMINATED NO-PARALLAX GRATICULE

TUNNEL DIODE TRIGGERING TO BEYOND 150 MC

SYNCHRONIZATION TO 250 MC

CALIBRATED SWEEP DELAY

SINGLE-SWEEP PHOTOGRAPHY AT 10 NSEC/CM

2 FAST-RISE VERTICAL PLUG-IN UNITS

16 OTHER VERTICAL PLUG-IN UNITS (with adapter)

SMALL BRIGHT CRT SPOT

Dual-trace dc-to-85 Mc (approx. 3-db down) displays at 100 mv/cm or dc-to-80 Mc (approx. 3-db down) displays at 10 mv/cm are now available with the Type 82 Dual-Trace Plug-In Unit.

The Type 585A and RM585A incorporate all the features of the Type 581A, but have an additional time base and the capability of calibrated sweep delay.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of a wide selection of plug-in units.

HORIZONTAL

CALIBRATED SWEEP RANGE—Time Base A: 0.05 μsec/cm to 2 sec/cm; Time Base B (Type 585A and RM585A only): 2 μsec/cm to 1 sec/cm.

SWEEP MAGNIFIER—5X, extends Time Base A sweep range to 0.01 μsec/cm.

CALIBRATED SWEEP DELAY—2 μsec to 10 sec, continuously variable.

TRIGGER REQUIREMENTS—
Internal: 2-mm deflection, ac coupled.
External: 0.2 v to ±15 v, ac or dc coupled.

EXTERNAL INPUT—0.2 v/cm to 15 v/cm; dc to 350 kc; 1 megohm, approx. 47 pf.

CRT

ILLUMINATED NO-PARALLAX INTERNAL GRATICULE

DISPLAY AREA—4 x 10 cm.

ACCELERATING VOLTAGE—10 kv.

PRINTED IN U.S.A.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v, 1-kc square wave.

POWER REQUIREMENT—105 to 125 v or 210 to 250 v, 50 to 60 cps, 560 watts maximum for Type 581A, 630 watts maximum for Type 585A.

TYPE 80-SERIES VERTICAL PLUG-IN UNITS

Frequency specifications are at approximately 3-db down

HIGH GAIN DUAL TRACE—

TYPE 82 DUAL-TRACE UNIT—DC to 80 Mc at 10 mv/cm, DC to 85 Mc at 100 mv/cm. Risetime at 100 mv/cm is nominally 4 nsec, always less than 4.2 nsec. Risetime at 10 mv/cm is nominally 4.3 nsec, always less than 4.5 nsec.

HIGH GAIN SINGLE TRACE—

TYPE 86 PLUG-IN UNIT—DC to 80 Mc at 10 mv/cm, DC to 85 Mc at 100 mv/cm. Risetime at 100 mv/cm is nominally 4 nsec, always less than 4.2 nsec. Risetime at 10 mv/cm is nominally 4.3 nsec, always less than 4.5 nsec.

SWEEP DELAY APPLICATIONS

In addition to the usual applications of the dc-to-85 Mc Type 581A Oscilloscope, the calibrated sweep delay of the Type 585A and RM585A Oscilloscopes enables the user to:

1. *Make accurate incremental measurements along a complex waveform.*
2. *Display separate channels of a PTM system, with effects of time jitter removed, determining pulse amplitude and shape under modulation conditions.*
3. *Measure pulse-to-pulse intervals and amount of jitter on computer signals or any train of pulses.*
4. *Determine accurate time-difference measurements between amplifier input and output pulses.*
5. *Select any individual line of a television composite signal.*
6. *Show time displacement, wave shape, and amplitude of individual channels in a telemetering system.*
7. *Utilize effective calibrated sweep magnification up to the highest practical limit. Actual magnification is the ratio of Time Base A sweep speed to Time Base B sweep speed.*

VERTICAL-DEFLECTION SYSTEM

DC-COUPLED MAIN AMPLIFIER consists of a two-stage distributed amplifier, a balanced, fixed delay line, and a twin-pentode output stage.

BALANCED DELAY NETWORK permits observation of the leading edge of the waveform that triggers the sweep.

RISETIME and PASSBAND depend on the plug-in unit and probe used with the oscilloscope.

Oscilloscope used with	Risetime		Passband
	nominally	always less than	at 3db, approx.
Type 82 or 86 Plug-In Unit at 10 mv/cm	4.3 nsec	4.5 nsec	80 Mc
Type 82 or 86 Plug-In Unit at 100 mv/cm	4.0 nsec	4.2 nsec	85 Mc

Risetime of the Oscilloscope, Type 82 or 86 Plug-In Unit, and supplied probe, at an overall sensitivity of 0.1 v/cm, is approx. 4.5 nsec.

TYPE 81 ADAPTER equips the oscilloscope to accept any Tektronix Letter-Series Plug-In Unit. Applications include sampling . . . transistor-risetime test . . . semiconductor-diode recovery-time studies . . . strain gage and other transducer measurements . . . differential-comparator displays . . . operational amplifier functions . . . multi-trace work . . . as well as many other general-purpose laboratory measurements.

HORIZONTAL-DEFLECTION SYSTEM

TIME BASE A SWEEP RANGE from 50 nsec/cm to 2 sec/cm is in 24 calibrated steps with 1-2-5 sequence. Accuracy is typically within 2%, and in all cases within 3% of panel reading. Sweep speed is continuously variable uncalibrated from 50 nsec/cm to over 5 sec/cm.

TIME BASE B SWEEP RANGE from 2 μsec/cm to 1 sec/cm is in 18 calibrated steps with 1-2-5 sequence. Accuracy is typically within 1%, and in all cases within 3% of panel reading. A control for varying the sweep length from 4 to 10 cm permits Time Base B to be used as a repetition-rate generator from 0.1 cps to 40 kc.

5 DISPLAY MODES include Time Base A normal, Time Base B normal, Time Base A single sweep, Time Base A delayed by Time Base B, and Time Base B with trace brightening during the period that Time Base A runs.

5X SWEEP MAGNIFIER expands the center 2-cm portion of the normal display to fill 10 cm and operates on all ranges for both time bases. It can be used to extend the calibrated sweep time of Time Base A to 10 nsec/cm, and Time Base B to 0.4 μsec/cm. Any one-fifth of the magnified sweep can be displayed. Accuracy of the displayed portion of the magnified sweep is within 5% of the figured sweep rate.

SINGLE SWEEP OPERATION facilitates photographic recording of waveforms. The time base can be made to run immediately when the RESET button is pressed, or can be made to wait after the button is pressed until a proper trigger signal occurs. The READY light indicates when the sweep is armed to fire on the next received trigger. Using a Tektronix C-19 Camera and Polaroid Type 410 film, 4-cm single transients at 10 nsec/cm sweep speed can be recorded in their entirety.

EXTERNAL HORIZONTAL INPUT provides for horizontal beam deflection with an external source. Horizontal sensitivity is continuously variable from 0.2 v/cm to over 15 v/cm. Passband is dc to 350 kc or better at maximum gain. Input impedance is 1 megohm paralleled by approximately 47 pf.

581A / 585A RM585A

TRIGGER

TRIGGER LEVEL adjusts to allow sweep triggering at any selected point on either the rising or falling portion of the waveform, and up to ± 15 v (external) in amplitude.

TRIGGER STABILITY can be locked at an optimum triggering point to eliminate further adjustment.

TRIGGER SOURCE can be internal, external, or line. Internal sources are ac coupled; external sources can be ac or dc coupled.

HIGH-FREQUENCY SYNC provides steady displays of signals from 5 Mc to 250 Mc, with a fraction of a cm of displayed amplitude. This mode operates from internal and external sources on the Type 581A, and Time Base A of the Type 585A and RM585A.

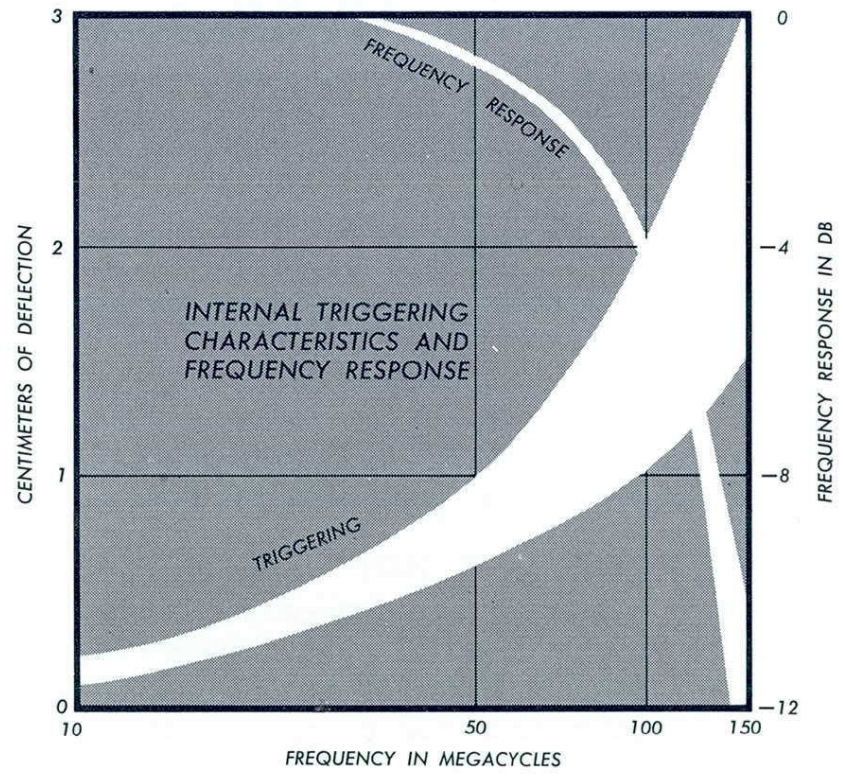
LOW-FREQUENCY REJECT operates above 15 kc to prevent low-frequency components, such as 60-cycle hum, from interfering with stable triggering. This mode also allows bright trace displays when a multiple-channel plug-in unit is operated in its alternate mode.

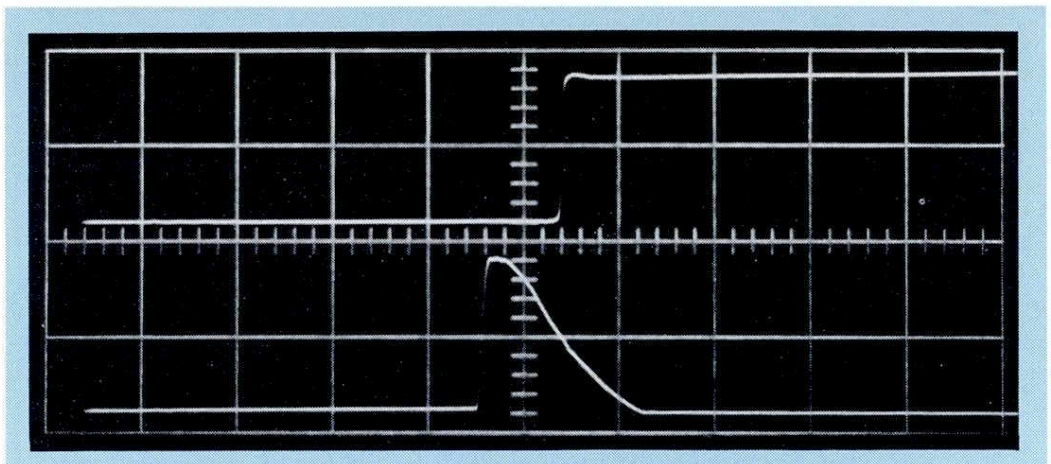
TRIGGER REQUIREMENTS for Type 581A and Time Base A and RM585A are as follows:

	INTERNAL			EXTERNAL	
FREQUENCY	AC	AC LF REJ	HF SYNC	AC/DC	HF SYNC
15 cps to 15 kc	2 mm	—	—	0.3 v	—
15 kc to 5 Mc	2 mm	2 mm	—	0.3 v	
5 Mc to 10 Mc	4 mm	4 mm	4 mm	0.3 v	0.2 v pk-pk
10 Mc to 50 Mc	1 cm	1 cm	4 mm	0.5 v	0.2 v pk-pk
50 Mc to 100 Mc	2 cm	2 cm	4 mm	1.5 v	0.2 v pk-pk
100 Mc to 150 Mc	3 cm	3 cm	4 mm	2.0 v	0.2 v pk-pk
150 Mc to 250 Mc	—	—	4 mm	—	0.2 v pk-pk

TRIGGER REQUIREMENTS for Time Base B of Type 585A and RM585A are as follows:

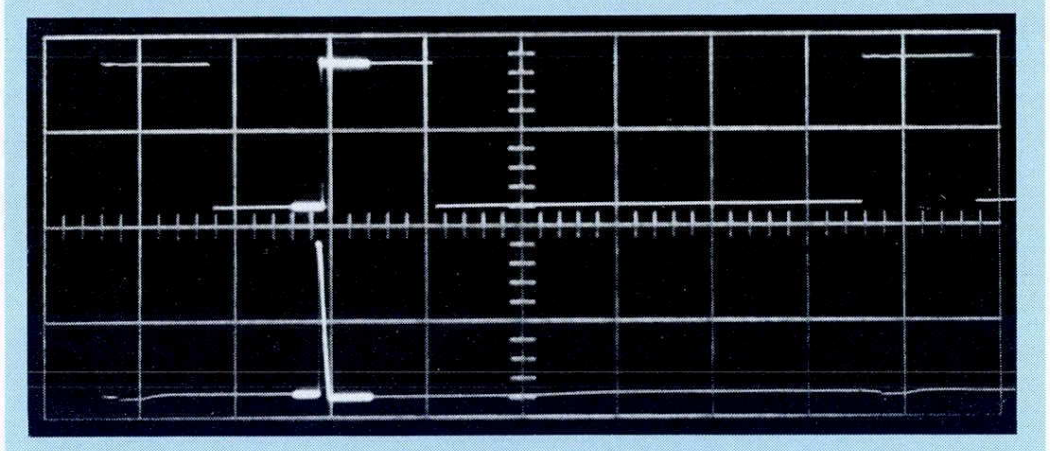
	INTERNAL		EXTERNAL
FREQUENCY	AC	AC LF REJ	AC/DC
15 cps—15 kc	4 mm	—	0.5 v pk-pk
15 kc—1 Mc	4 mm	4 mm	0.5 v pk-pk
1 Mc—5 Mc	2 cm	2 cm	1.5 v pk-pk





SWEEP DELAY

Waveforms above are brightened portions (expanded) of waveforms below. Waveforms above are displayed in the 'A' DEL'D BY 'B' mode. Waveforms below are displayed in the 'B' INTENSIFIED BY 'A' mode.



SWEEP DELAY

CALIBRATED DELAY RANGE from 2 μsec to 10 seconds can be used to delay the start of any Time Base A sweep. Time Base B provides accurate time delay and Time Base A presents normal sweep at the end of the delay period. Accuracy of the 15 calibrated delay steps from 2 μsec to 0.1 sec is within 1% of the indicated delay. Accuracy of the 3 remaining calibrated steps from 0.2 sec to 1 sec is within 3% of the indicated delay. A 10-turn precision potentiometer permits calibrated delay-time adjustments to any value from 2 μsec to 10 seconds. Incremental accuracy of this control is within 0.2% of the indicated setting.

TRIGGERED OPERATION holds off the start of the delayed sweep until the arrival of the first trigger signal following the selected delay time. Because the delayed sweep is actually triggered by the signal under observation, the display is completely jitter free. A steady display is thus provided for time-modulated pulses and signals with inherent jitter.

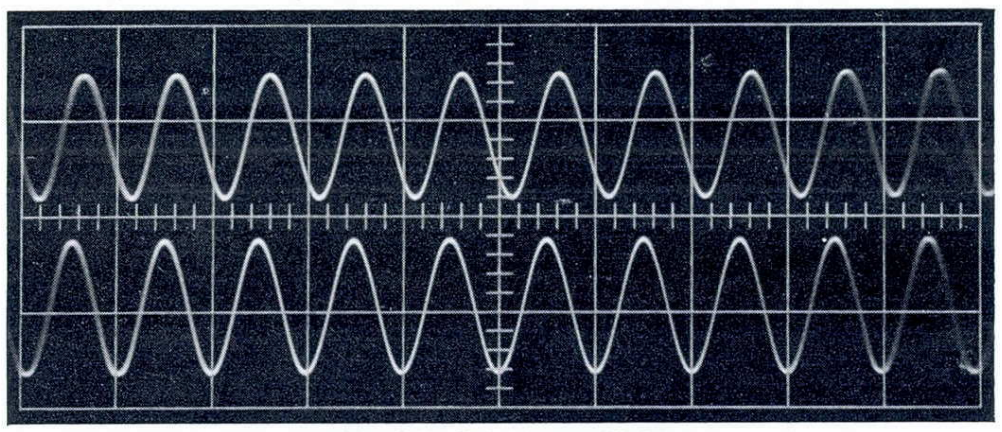
CONVENTIONAL OPERATION holds off the start of the delayed sweep for the precise amount of the selected delay time. Any time-modulation or jitter on the signal will be magnified in proportion to the amount of sweep expansion.

The time jitter in the delayed trigger or delayed sweep will not exceed one part in 20,000 of the maximum available delay interval (where this interval is 10 times the Time/Cm or Delay-Time setting).

SWEEP MAGNIFICATION is readily accomplished when Time Base A is operated at a faster rate than Time Base B. For example, if TIME BASE A is operating at 1 μsec/cm and TIME BASE B is operating at 50 μsec/cm, the magnification is 50 times.

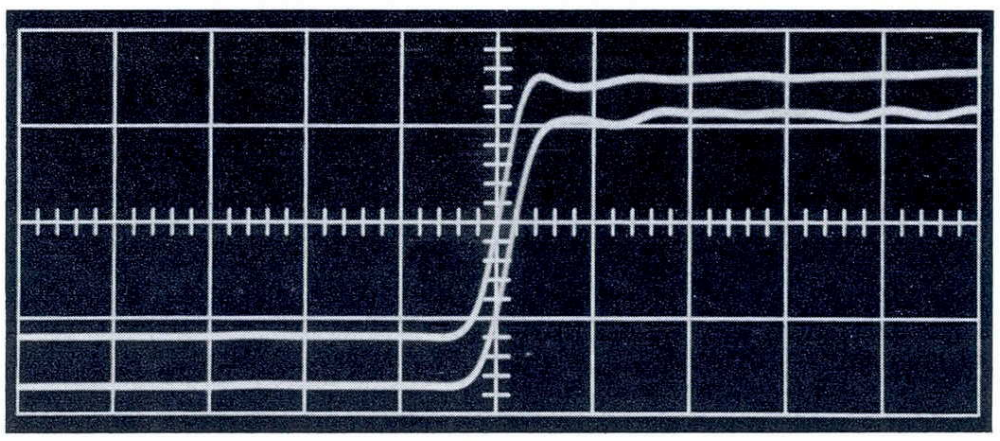
TRACE BRIGHTENING indicates the exact portion appearing on the magnified display, and shows the point-in-time relationship of the magnified display to the original display.

581A / 585A RM585A



PHASE COMPARISON

Dual-trace display of 100 Mc sine waves at 10 nsec/cm. Phase difference is approximately 55 degrees. Phase comparison and similar measurements are possible with the stable high-frequency triggering system of the Type 581A and 585A.



TIME COINCIDENCE

Dual-trace display of input and output pulses of a transistor amplifier at 10 nsec/cm. Lower trace delayed 1 nsec by the amplifier under observation. Note time resolution. The Type 581A or 585A Oscilloscope—with 82 Unit—can display time coincidence between input channels with no measurable difference at 10 nsec/cm.

CRT AND DISPLAY FEATURES

TEKTRONIX 5" CRT is a metalized, lumped constant traveling wave tube incorporating a helical post accelerating anode and achieving a small, bright crt spot. Accelerating potential is 10 kv. A P31 phosphor is normally supplied.

BEAM POSITION INDICATORS light to show the direction of the beam when it is not on the screen.

ILLUMINATED NO-PARALLAX GRATICULE with variable edge lighting is accurately ruled in centimeter squares. Viewing area is 4 by 10 cm. Vertical and horizontal centerlines are further marked in 2-mm divisions.

UNBLANKING WAVEFORM is dc coupled to the crt grid. This assures uniform beam intensity for all sweep speeds and repetition rates at any setting of the intensity control.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR provides 18 square-wave voltages at the front panel. Peak-to-peak amplitudes from 0.2 mv/cm to 100 v are in 1-2-5 sequence and accurate within 3%. Square-wave frequency is aproximately 1 kc.

DELAYED TRIGGER used to start the delayed sweep is available at the front panel. This can be used to trigger external equipment at any delay from 0.05 μsec to 10 sec. When used with the delayed sweep, the resulting waveform can be observed. Amplitude is approximately +5 volts. A positive gate of the same duration as B sweep (approximately 20 volts) is also available at the front panel.

OUTPUT WAVEFORMS available at the front panel via cathode followers are a positive gate of approximately 20 v, and a positive-going sawtooth of approximately 150 v.

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable operation between 105 and 125 v, or 210 and 250 v. Heaters in the vertical plug-in unit and in the oscilloscope vertical amplifier are regulated for stable operation and long life.

POWER REQUIREMENT is 105 to 125 v or 210 to 250 v, 50 to 60 cps. Maximum power consumption is 560 watts for the Type 581A, and 630 watts for the Type 585A and RM585A.

CABINET MODEL dimensions are 16⅞" high by 13⅛" wide by 23⅞" deep. Type 581A net weight is 71 pounds. Shipping weight is 80 pounds, approx. Type 585A net weight 74 pounds. Shipping weight is 84 pounds, approx.

RACK-MOUNT MODEL dimensions are 14" high by 19" wide by 22¾" deep. Type RM585A net weight is 81 pounds. Shipping weight is 110 pounds, approx.

TYPE 581A, without plug-in units $1425

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Smoke gray filter (installed) (378-0546-00); 1—Plate, protector, crt, clear (387-0918-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0390-00).

TYPE 585A, without plug-in units $1725

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Smoke gray filter (installed) (378-0546-00); 1—Plate, protector, crt, clear (387-0918-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 2—Instruction Manual (070-0390-00).

TYPE RM585A, without plug-in units $1825

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Smoke gray filter (installed) (378-0546-00); 1—Plate, protector, crt, clear (387-0918-00); 1—Patch cord, BNC-to-BNC, 18" (012-0087-00); 1—Patch cord, BNC-to-banana plug, 18" (012-0091-00); 1—Post jack, BNC (012-0092-00); 1—Set mounting hardware; 2—Instruction Manual (070-0392-00).

MAINTENANCE AIDS

Please refer to catalog accessory pages
for more-complete information

TU-5 PULSER generates a flat-top square wave to aid in adjustment of transient response of the Type 80-Series Plug-In Units. The TU-5 connects between the Type 581A/585A calibrator output and the plug-in unit. Risetime is 1.0 ns, maximum (typically 0.5 ns).

Order Part Number 015-0043-00 (includes accessories) . . $46.50
Order Part Number 015-0038-00 (TU-5 only) $25.00

6" PLUG-IN EXTENSION allows a Type 82, 84, or 86 Plug-In Unit to be serviced while partially removed from the oscilloscope.

Order Part Number 013-0055-00 . . . . . $14.50

FREQUENCY DOUBLER, for timing the fast sweep of the Type 580-Series Oscilloscopes, converts the 50-Mc output of a Type 180A Time Mark Generator to 100 Mc.

Order Part Number 015-0013-00 (UHF connector) $29.50
Order Part Number 015-0056-00 (BNC connector) $29.50

RACK-MOUNT ADAPTER

A cradle mount adapts the Type 581A or Type 585A Oscilloscope for rack mounting. It consists of a cradle to support the instrument in any standard 19" relay rack, and a mask to fit around the regular instrument panel. Finish is blue vinyl. Rack height requirement is 17½".

Order Part Number 040-0281-00 . . . . . $45.00

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 81 PLUG-IN ADAPTER

The Tektronix Type 81 Adapter makes possible the use of any Tektronix Letter-Series Plug-In Unit with any Type 580-Series Oscilloscope. The Type 81 Adapter and appropriate plug-in unit expand the versatility of the 580-Series Oscilloscopes to fields including differential-comparator displays, sampling, stress analysis, transistor-risetime studies, semiconductor-diode-recovery-time studies, operational amplifiers, and multiple-trace displays, as well as other general and special-purpose applications.

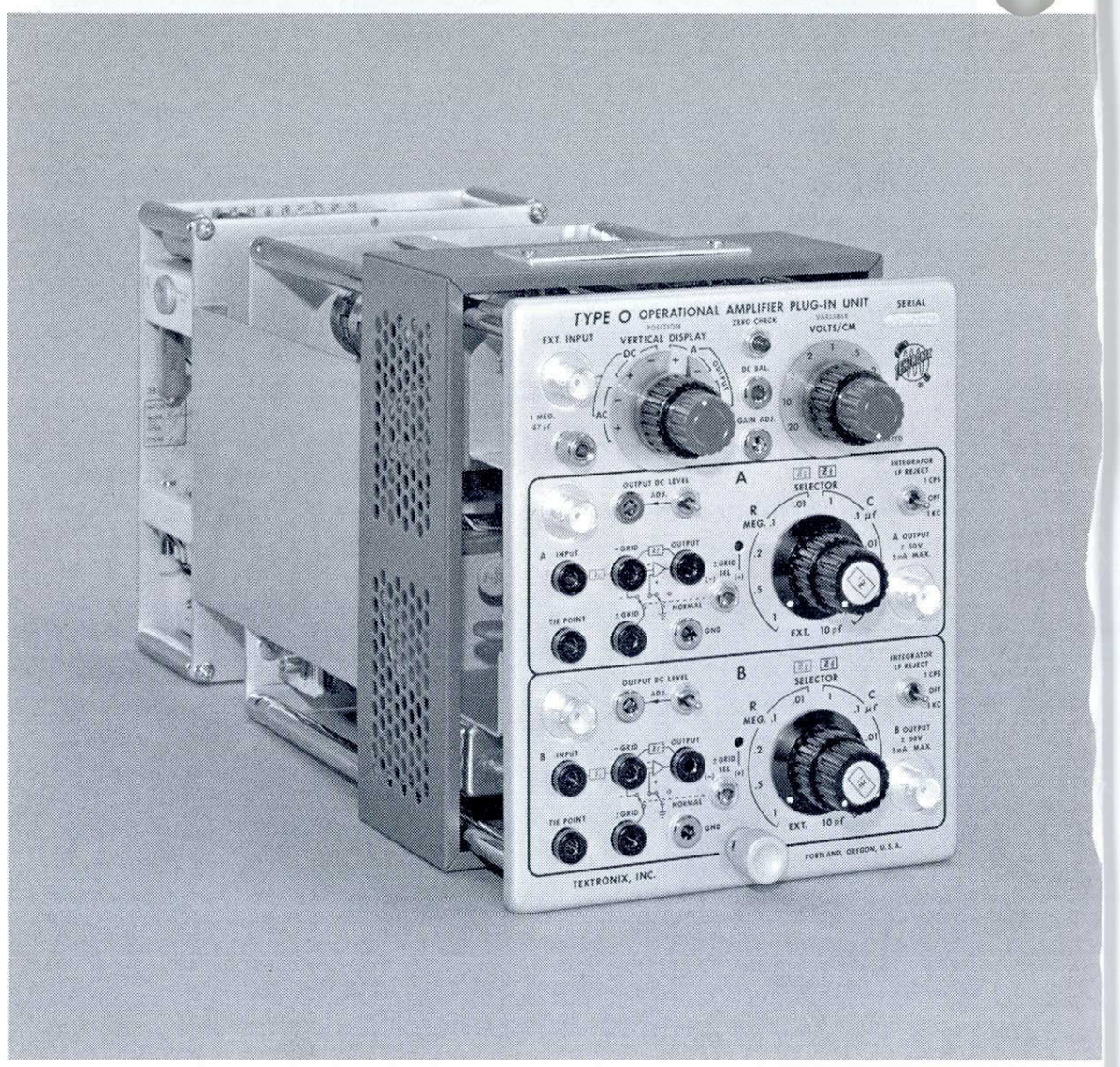
The Type 81 Adapter is extremely easy to use. The Adapter is simply inserted into the Type 580-Series plug-in compartment. The Letter-Series Unit is then plugged into the Adapter. No cabling or switching is required.

Dimensions are 6½" high by 5½" wide by 12½" deep. Net weight is 4 pounds. Shipping weight is 6 pounds, approx.

TYPE 81 PLUG-IN ADAPTER $135

Each Adapter includes: 2—instruction manuals (070-0232-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.



EXTEND CAPABILITIES OF TYPE 580-SERIES OSCILLOSCOPES TO THESE AREAS

For Multiple-Trace Operation—

TYPE 1A1 DUAL-TRACE UNIT—DC to 33 Mc, 10.5-nsec risetime at 50 mv/cm to 50 v/cm—DC to 23 Mc, 15-nsec risetime at 5 mv/cm increasing to 33 Mc at 50 mv/cm.

TYPE 1A2 DUAL-TRACE UNIT—DC to 33 Mc, 10.5-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE C-A DUAL-TRACE UNIT—DC to 24 Mc, 15-nsec risetime at 50 mv/cm to 50 v/cm.

TYPE M FOUR-TRACE UNIT—DC to 20 Mc, 17-nsec risetime at 20 mv/cm to 25 v/cm.

For Wide Band Applications—

TYPE B WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm—2 cps to 12 Mc, 30-nsec risetime at 5 mv/cm to 50 mv/cm.

TYPE K FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm.

TYPE L FAST-RISE UNIT—DC to 30 Mc, 12-nsec risetime at 50 mv/cm to 40 v/cm—3 cps to 24 Mc, 15-nsec risetime at 5 mv/cm to 4 v/cm.

For Spectrum Analysis—

TYPE L-SERIES UNITS—Present Units cover 1-10,400 Mc.

For Differential Input Applications—

TYPE D HIGH-GAIN UNIT—DC to 300 kc at 1 mv/cm, increasing to 2 Mc at 50 mv/cm.

TYPE E LOW-LEVEL UNIT—0.06 cps to 20 kc at 50 μv/cm, increasing to 60 kc at 0.5 mv/cm to 25 mv/cm.

TYPE G WIDE-BAND UNIT—DC to 20 Mc, 18-nsec risetime at 50 mv/cm to 50 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 15 Mc, 23-nsec risetime at 5 mv/cm to 50 v/cm.

For Operations of Integration, Differentiation, Function Generation, and Linear or Nonlinear Amplification—

TYPE O OPERATIONAL AMPLIFIER—DC to 25 Mc, 14-nsec risetime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μsec risetime at 10 μstrain/div to 10,000 μstrain/div.

For Transistor-Risetime Checking

TYPE R UNIT—12-nsec risetime.

For Diode Recovery-Time Measurements—

TYPE S UNIT—12-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE W DIFFERENTIAL COMPARATOR UNIT—DC to 23 Mc, at 50 mv/cm, decreasing to 8 Mc at 1 mv/cm. 15-nsec risetime at 50 mv/cm, increasing to 44-nsec at 1 mv/cm.

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27 nsec risetime at 50 mv/cm to 25 v/cm.

For High-Frequency Sampling Applications—

TYPE 1S1 SAMPLING UNIT—350 psec risetime.

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DUAL TRACE UNIT Type 82

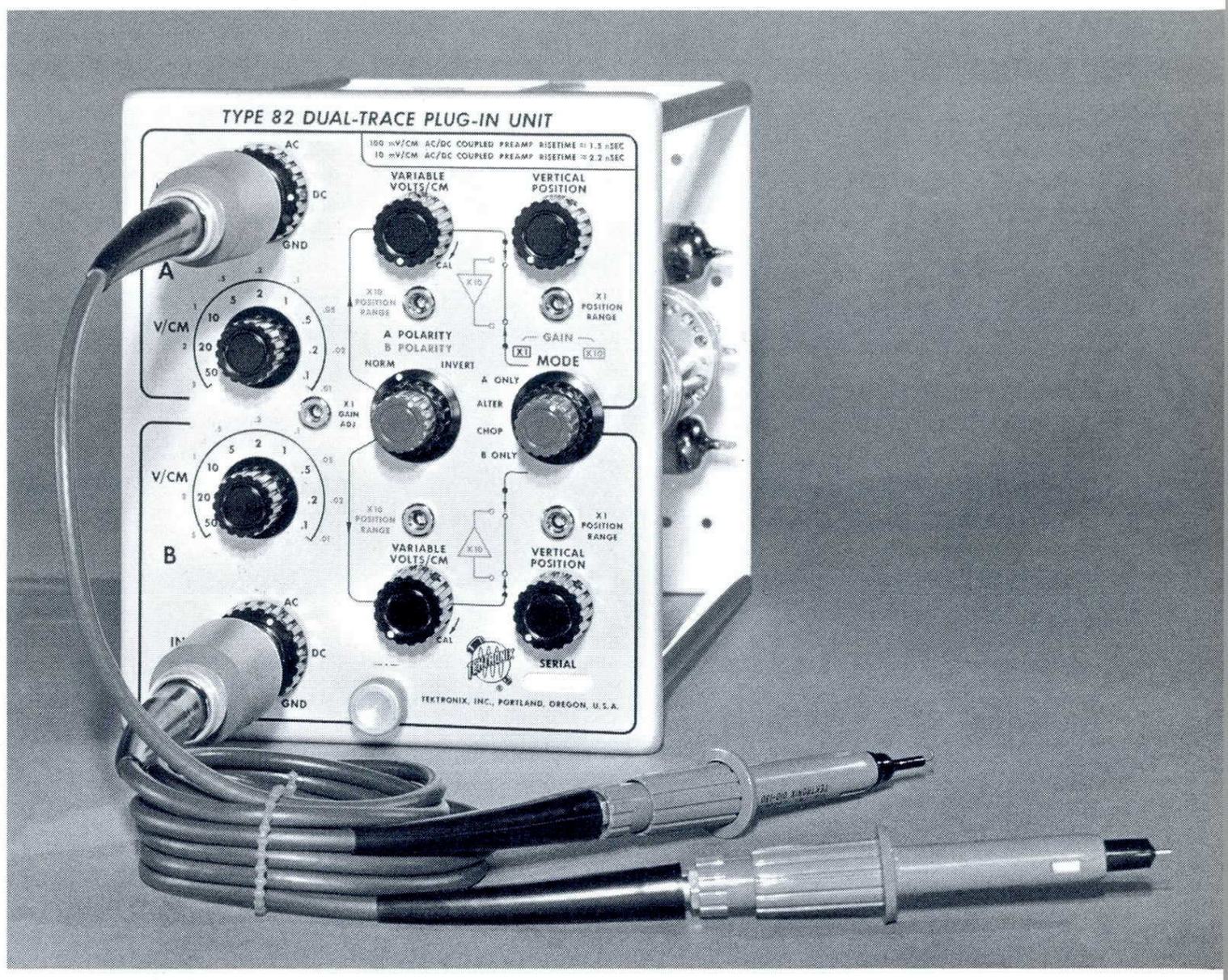
10 MV/CM SENSITIVITY

*DC TO 85 MC AT 100 MV/CM**

*DC TO 80 MC AT 10 MV/CM**

CHOPPED OR ALTERNATE SWITCHING

The Type 82 Dual-Trace Plug-In Unit adds dual-trace facility to the Tektronix Type 580-Series Oscilloscopes through its 2 identical input channels.



With the Type 82 Plug-In Unit, a 580-Series Oscilloscope can display the time difference between two signals, the response of two circuits to the same pulse, the input and output waveforms of a circuit, and many other dual-trace operations—quickly and easily.

RISETIME of the Type 82 with Type 580-Series Oscilloscope is nominally 4 nsec at 100 mv/cm, always less than 4.2 nsec. At 10 mv/cm, using the 10X Amplifier, risetime is nominally 4.3 nsec, always less than 4.5 nsec. 100 mv/cm 12-db point is approximately 150 Mc.

4 OPERATING MODES include Channel A only, Channel B Only, Alternate (triggered electronic switching between channels, at the end of each sweep), and chopped. In chopped operation, successive 5-μsec segments are displayed at an approx. 100-kc rate per channel, or 500-nsec segments at an approx. 1-Mc rate per channel.

CALIBRATED SENSITIVITY from 100 mv/cm to 50 v/cm is in 9 steps with 1-2-5 sequence, and is accurate within 3%. A variable control permits uncalibrated adjustment from 100 mv/cm to approximately 100 v/cm.

10X AMPLIFIER, dc-coupled, extends sensitivity to 10 mv/cm. Sensitivity is then in 9 calibrated steps from 10 mv/cm to 5 v/cm, 1-2-5 sequence. The variable control provides uncalibrated adjustment from 10 mv/cm to approximately 10 v/cm.

POLARITY INVERSION can be used to compare signals 180° out of phase.

AC or DC COUPLING is possible. When ac-coupled, the low-frequency 3-db point is 15 cps direct or 1.5 cps with the P6008 10X Probe.

*** Approximate 3-db points.**

INPUT IMPEDANCE is 1 megohm paralleled by approximately 15 pf.

P6008 10X PASSIVE PROBES increase the input resistance to 10 megohms and decrease the input capacitance to approximately 7 pf. The risetime of a Type 580-Series Oscilloscope, a Type 82 Plug-In Unit, and a P6008 Probe, at an overall sensitivity of 100 mv/cm is approximately 4.5 nsec.

WEIGHT: Net—4¾ pounds. Shipping—10 pounds, approx.

TYPE 82 DUAL-TRACE PLUG-IN UNIT $650

Each instrument includes: 2—P6008 probes (010-0129-00), 2—instruction manuals (070-0349-00).

MODIFICATION FOR EARLY INSTRUMENTS

TYPE 581/585 VERTICAL STANDARDIZATION MOD KIT improves and standardizes the transient response of early Type 580-Series Oscilloscopes. The Mod Kit is essential for the use of a Type 82 Plug-In Unit in the early instruments and also improves the performance of these instruments when used with the Type 80/P80 combination.

Tektronix Type 580-Series Oscilloscopes with serial numbers prior to #950 for Type 581 and #2585 for Type 585 may require this modification. Please consult your Field Engineer.

Each kit includes components to change delay-line impedance, standardize crt termination, modify crt and distributed-amplifier circuitry, and modify Type 80/P80 combination.

Order Part Number 040-0275-00 . . . . . $25

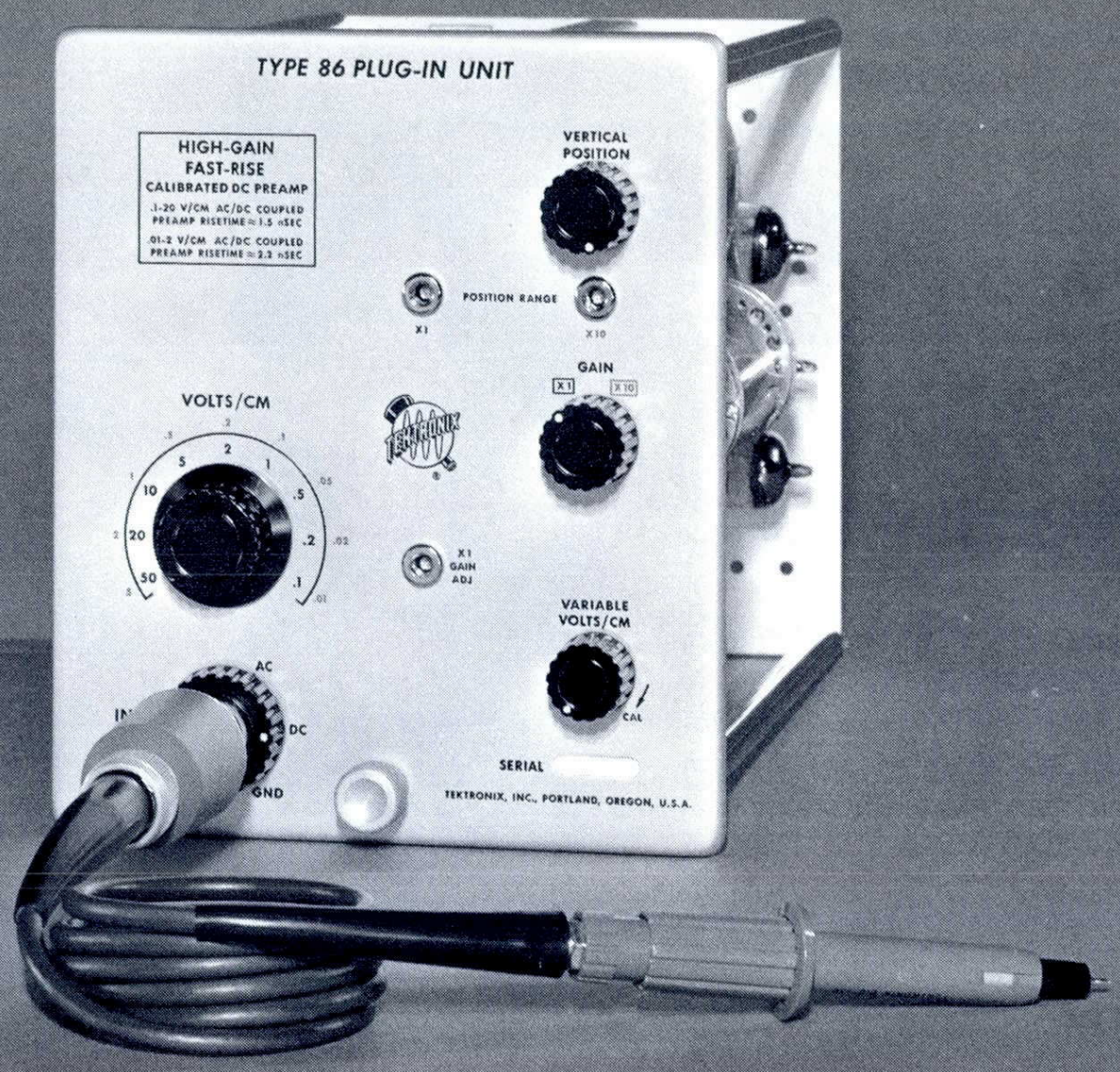
U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 86 PLUG-IN UNIT

10 MV/CM SENSITIVITY

*DC TO 85 MC AT 100 MV/CM **

*DC TO 80 MC AT 10 MC/CM **



RISETIME of the Type 86 and Type 580-Series Oscilloscope is nominally 4 nsec at 100 mv/cm, always less than 4.2 nsec. At 10 mv/cm, using the 10X Amplifier, risetime is nominally 4.3 nsec, always less than 4.5 nsec. 100 mv/cm 12 db point is at approximately 150 Mc.

CALIBRATED SENSITIVITY from 100 mv/cm to 50 v/cm is in 9 calibrated steps with 1-2-5 sequence, accuracy within 3%. A variable control permits uncalibrated adjustment from 100 mv/cm to approximately 100 v/cm.

10X AMPLIFIER, dc-coupled, extends sensitivity to 10 mv/cm. Sensitivity is then in 9 calibrated steps from 10 mv/cm to 5 v/cm, 1-2-5 sequence. The variable control provides uncalibrated adjustment from 10 mv/cm to approximately 10 v/cm.

INPUT can be ac or dc-coupled. When ac-coupled, the low-frequency 3-db point is 15 cps direct or 1.5 cps with the P6008 10X Probe.

INPUT IMPEDANCE is 1 megohm paralleled by approximately 15 pf.

P6008 10X PASSIVE PROBE increases the input resistance to 10 megohms and decreases the input capacitance to approximately 7 pf. The risetime of a Type 580-Series Oscilloscope, a Type 86 Plug-In Unit, and a P6008 Probe, at an overall sensitivity of 100 mv/cm is approximately 4.5 nsec.

*** Approximate 3-db points.**

WEIGHT: Net—3¼ pounds
Shipping—7 pounds, approx.

TYPE 86 PLUG-IN UNIT **$350**
Each instrument includes: 1—P6008 probe (010-0129-00), 2—instruction manuals (070-0364-00).

MODIFICATION FOR EARLY INSTRUMENTS

TYPE 581/585 VERTICAL STANDARDIZATION MOD KIT improves and standardizes the transient response of early Type 580-Series Oscilloscopes. The Mod Kit is essential for the use of a Type 82 or 86 Plug-In Unit in the early instruments and also improves the performance of these instruments when used with the Type 80/P80 combination.

Tektronix Type 580-Series Oscilloscope with serial numbers prior to #950 for Type 581 and #2585 for Type 585 may require this modification. If in doubt about instrument modification, please consult your Field Engineer.

Each kit includes components to change delay-line impedance, standardize crt termination, modify crt and distributed-amplifier circuitry and modify Type 80 Plug-In Unit/Type P80 Probe combination.

Order Part Number 040-0275-00 ..... $25

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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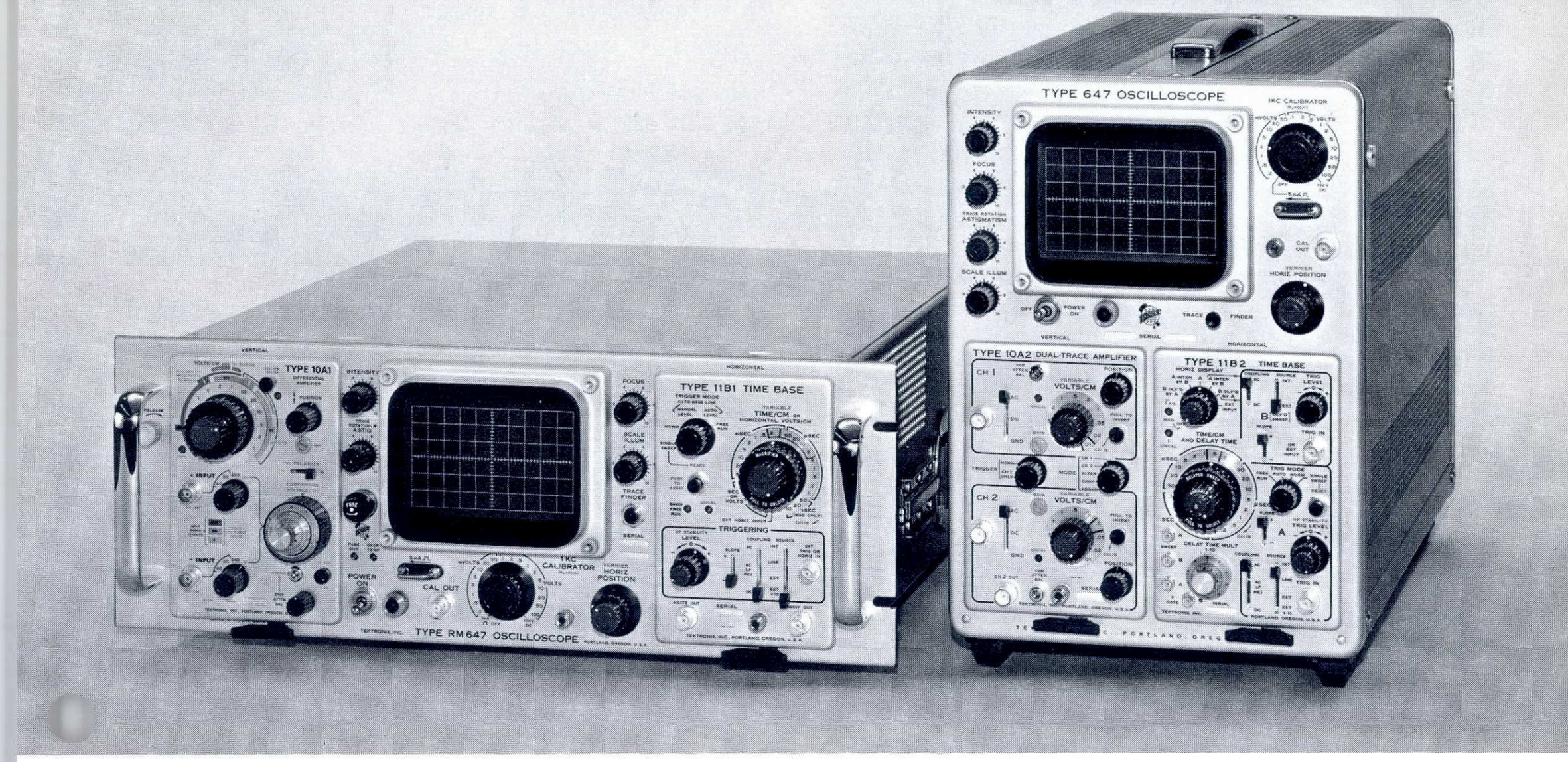
DC-to-50 MC OSCILLOSCOPES Type 647 / RM647



The Type 647 and RM647 Oscilloscopes are the result of research and design toward compact, high-performance instruments capable of accurate measurement in severe environments (—30°C to +65°C) and offering an extra margin of dependability and even greater accuracy in normal environments (0°C to +40°C).

Design goals placed these "most wanted" features in a ruggedized oscilloscope: dc-to-50 Mc dual-trace capability, choice of horizontal plug-ins for calibrated sweep delay or wide-range magnification, bright 6 x 10 cm no-parallax displays, low power requirements, ease of maintenance . . . . all in a compact easily-handled package.

VERTICAL DEFLECTION

VERTICAL SYSTEM accepts a 10-Series Plug-In Unit.

SIGNAL DELAY permits observation of the leading edge of the waveform that triggers the sweep. The 140 nsec (approx.) delay line requires no tuning.

HORIZONTAL DEFLECTION

HORIZONTAL SYSTEM accepts an 11-Series Plug-In Unit.

CRT AND DISPLAY FEATURES

TEKTRONIX CRT is a new rectangular flat-faced tube. Accelerating potential is 14 kv. A P31 phosphor is normally supplied.

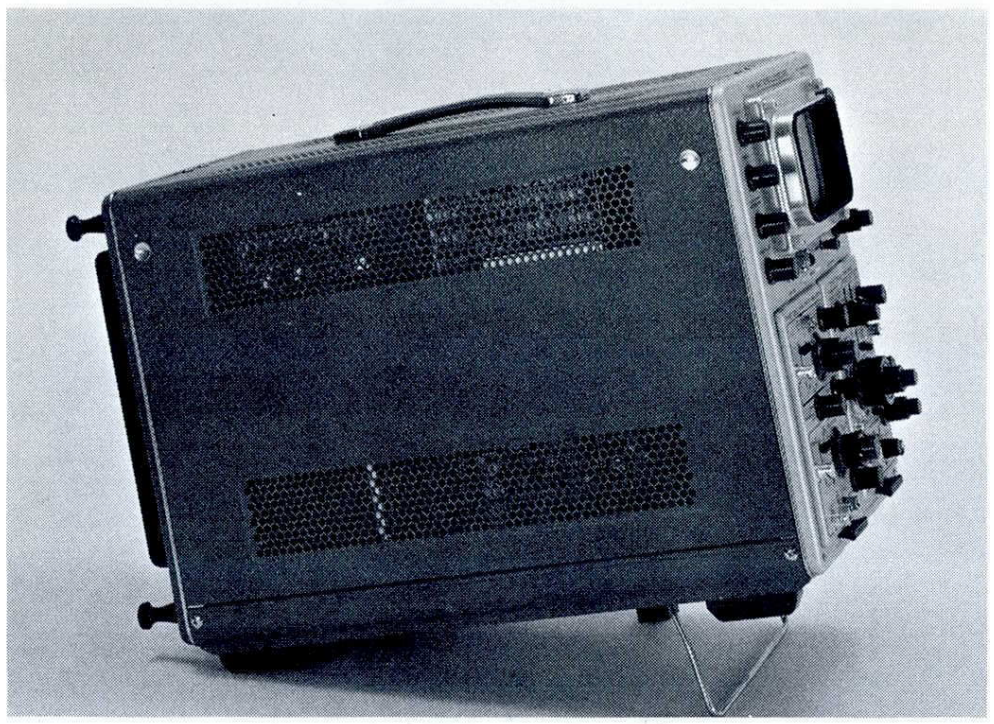
INTERNAL GRATICULE with variable edge lighting is accurately ruled in centimeter squares. Viewing area is 6 x 10 cm. Vertical and horizontal centerlines are marked in 2-mm divisions.

TRACER FINDER attenuates both horizontal and vertical voltages to aid in positioning the display.

DC-COUPLED UNBLANKING to the crt grid assures uniform beam intensity for all sweep speeds and repetition rates at any setting of the intensity control.

EXTERNAL CRT INPUTS are located at the rear of the oscilloscope. Grid Z-axis input has 22-kΩ input resistance. Unblanking amplifier passband (for small signals) is dc to 10 Mc. Gain is 1.5. Cathode Z-axis input is ac coupled (0.015 μfd and 22 kΩ).

647
RM647



OTHER CHARACTERISTICS

1-KC CALIBRATOR provides 18 square-wave voltages from 0.2 mv to 100 v, 1-2-5 sequence.

AMPLITUDE ACCURACY	0°C to +40°C	−30°C to +65°C
100 v and 100 mv	±1%	±1.5%
All other positions	±2%	±3%

Frequency is crystal controlled, and is accurate within ±0.1% from −30°C to +65°C. Output resistance is 50 ohms from 0.2 mv to 0.2 v. Square-wave symmetry is accurate within ±0.1%. Risetime and falltime are approximately 2 μsec. The calibrator also provides a 100 v dc output. For Current Probe calibration, a 5-ma square-wave output is available through a front panel loop.

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable, low-drift operation. All supplies are protected against accidental short circuit. Supply voltages are available at the rear panel for external application. 45 to 440-cps line frequency can be used with either 100 to 130 v ac, or 200 to 260 v ac line. A multi-tap transformer provides a selection of operating voltages within these ranges. Power consumption is approximately 185 watts at 117 v ac (with Type 10A2 and 11B2 Units).

CONVECTION COOLING provides adequate ventilation to +65°C, when the Type 647 is not tipped by more than 20° on any axis from the normal position. A thermal cutout protects the instrument from overheating.

DIMENSIONS are 14¼" high by 10" wide by 23" deep. Net indicator weight is 40½ pounds. Net weight with Type 10A2 and 11B2 Plug-In Units is 52 pounds.

TYPE 647 OSCILLOSCOPE, without plug-in units . . . **$1350**

Each instrument includes: 1—smoke grey light filter, installed (378-0548-00), 1—clear implosion shield (337-0573-00), 1—20-inch 50-Ω cable, BNC male to BNC male (012-0076-00), 1—18-inch patch cord, BNC to BNC (012-0087-00), 1—18-inch patch cord, BNC to banana plug (012-0091-00), 1—post jack, BNC (012-0092-00), 1—3-conductor power cord (161-0022-00), 1—3 to 2-wire adapter (103-0013-00), 2—instruction manuals (070-0370-00).

RUGGED RACK MOUNT

The Type RM647 Oscilloscope provides the electrical and environmental capabilities of the Type 647 in only 7" of rack height. The instrument mounts on slide-out tracks to a standard 19" rack. Depth is 19". Power consumption is approximately 200 watts at 117 volts (with Type 10A2 and 11B2 Plug-In Units).

The Type RM647 is forced-air cooled.

The standard model operates from a 50 to 60-cycle line (100 to 130 volts or 200 to 260 volts). An extra-cost option (MOD 101K) allows operation from 50 to 60 and 400-cycle line. Net indicator weight (with track assembly) is 50 pounds. Net weight with Type 10A2 and 11B2 Plug-In Units (and track assembly) is 61½ pounds.

TYPE RM647 OSCILLOSCOPE, without plug-in units . . **$1500**

Each instrument includes: 1—smoke grey light filter, installed (378-0548-00), 1—clear implosion shield (337-0573-00), 1—20-inch 50-Ω cable, BNC male to BNC male (012-0076-00), 1—18-inch patch cord, BNC to BNC (012-0087-00), 1—18-inch patch cord, BNC to banana plug (012-0091-00), 1—post jack, BNC (012-0092-00), 1—3-conductor power cord (161-0022-00), 1—3 to 2-wire adapter (103-0013-00), 1 set—mounting tracks (351-0085-00) and hardware, 2—instruction manuals (070-0435-00).

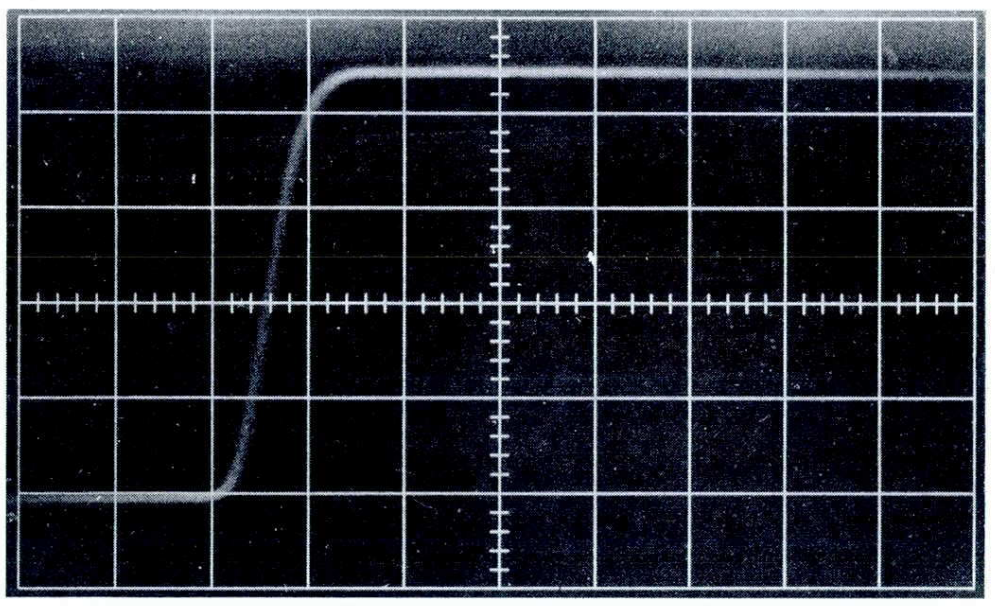
RACK MOUNT REAR SUPPORT KIT

The kit is recommended where maximum capabilities regarding vibration and shock are desired in a rack installation. It rigidly secures the rear of the Type RM647 to the rear rack members, to minimize amplification of vibration and shock forces, yet through use of a guide-pin system, allows easy withdrawal on the slide-out tracks.

Order Part Number 040-0394-00 ..... $10

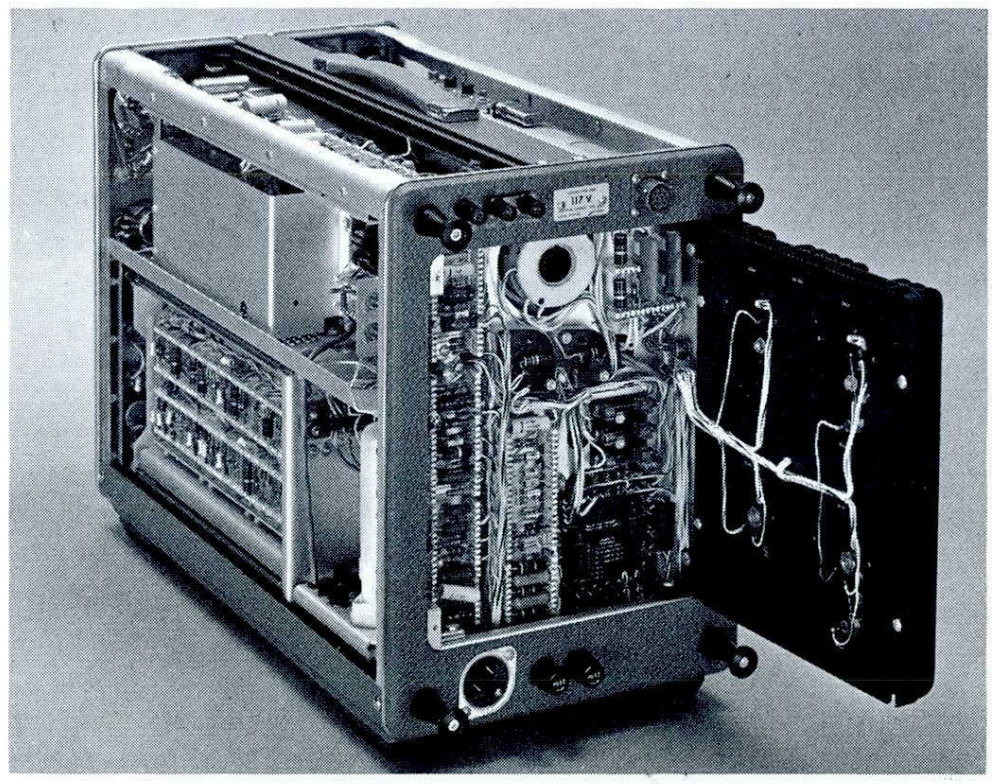
U.S. Sales Price f.o.b. Beaverton, Oregon

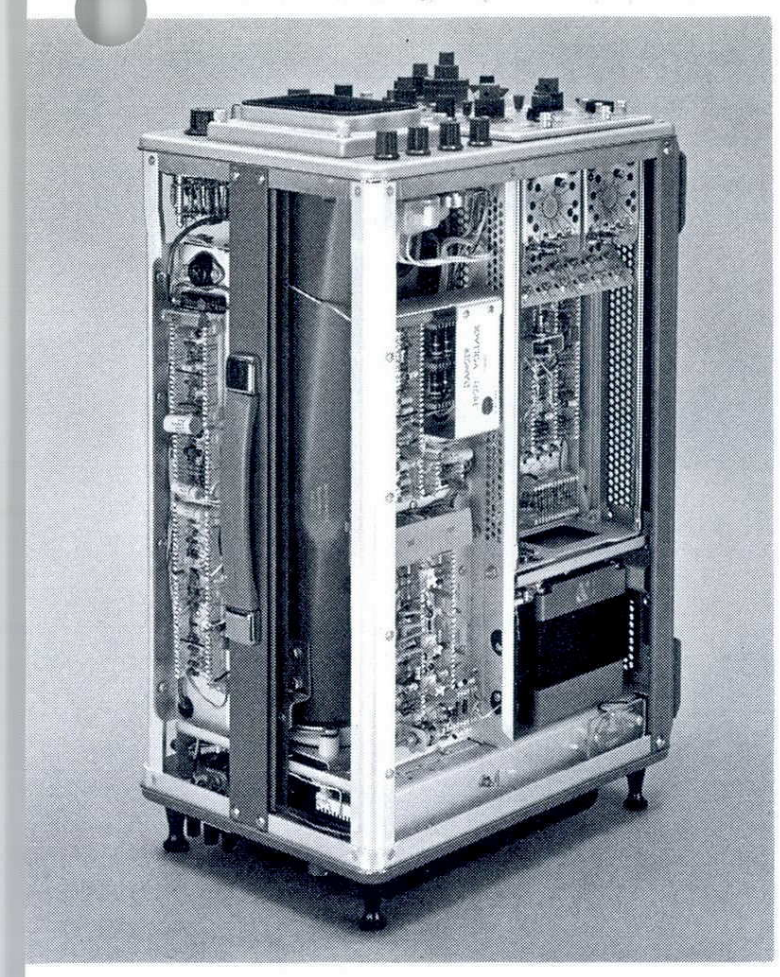
Please refer to Terms and Shipment, General Information page.

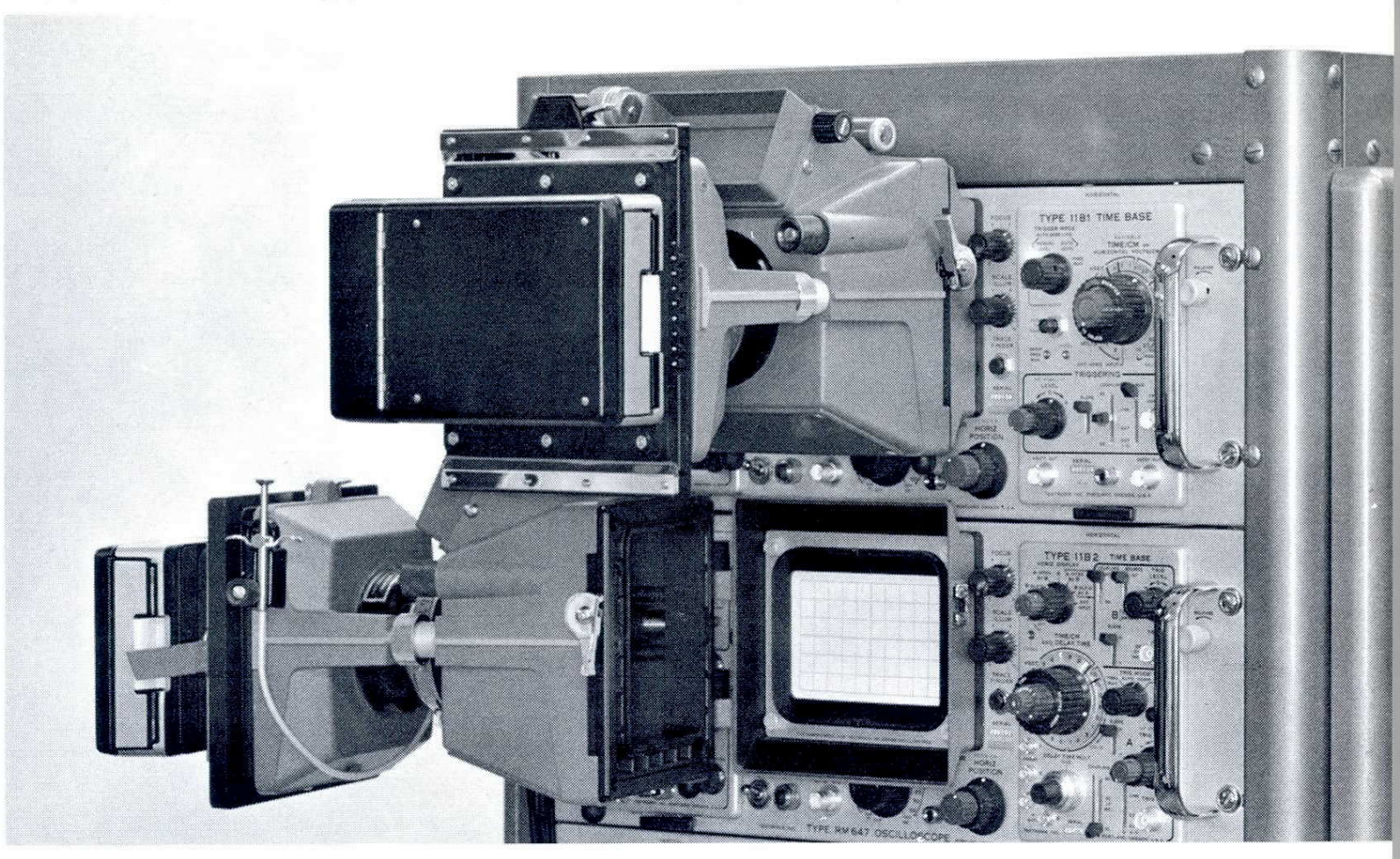


SINGLE-SHOT at 10 NSEC/CM

*High writing-rate index of the new T6470-31-1 crt allows permanent records of fast single-shot displays. Photographed with Tektronix C-27 Camera and Polaroid * Land 10,000 speed film. (*Registered Trade-Mark, Polaroid Corporation)*







ENVIRONMENTAL CHARACTERISTICS

TEMPERATURE	OPERATING Type RM647: —30°C to +65°C. Type 647: —30°C to +65°C, continuous, when instrument is not tipped more than 20° in any direction from level position. When instrument is operated vertically (with front panel up), the maximum ambient temperature is +55°C. NON-OPERATING —55°C to +75°C.
VIBRATION	OPERATING AND NON-OPERATING 0.025 inch peak-to-peak, 10 to 55 to 10 cps in 1 minute sweeps (4G's) for 15 minutes on each axis. 3 minute vibration at resonance or 55 cps (each axis).
ALTITUDE	OPERATING 15,000 feet maximum. Maximum operating temperature of the Type 647 at 130 v line reduced by 10°C. NON-OPERATING 50,000 feet, maximum.
SHOCK	NON-OPERATING 20 G's, one-half sine, 11-millisecond duration. Two shocks each direction along each of the three major axes; total of 12 shocks.
HUMIDITY	NON-OPERATING Meets electrical performance specifications after exposure to five cycles (120 hours) of Mil-Std-202B, method 106A (omit freezing and vibration, and allow 24-hour post-test drying period before operating).
TRANSIT	NON-OPERATING Meets National Safe Transit test when factory-packaged: Vibration for one hour at slightly greater than one G. 18-inch drops on corners, edges, and flat surfaces, total of 10 drops.

Type 10A1 HIGH-GAIN DIFFERENTIAL COMPARATOR

A CONVENTIONAL AMPLIFIER

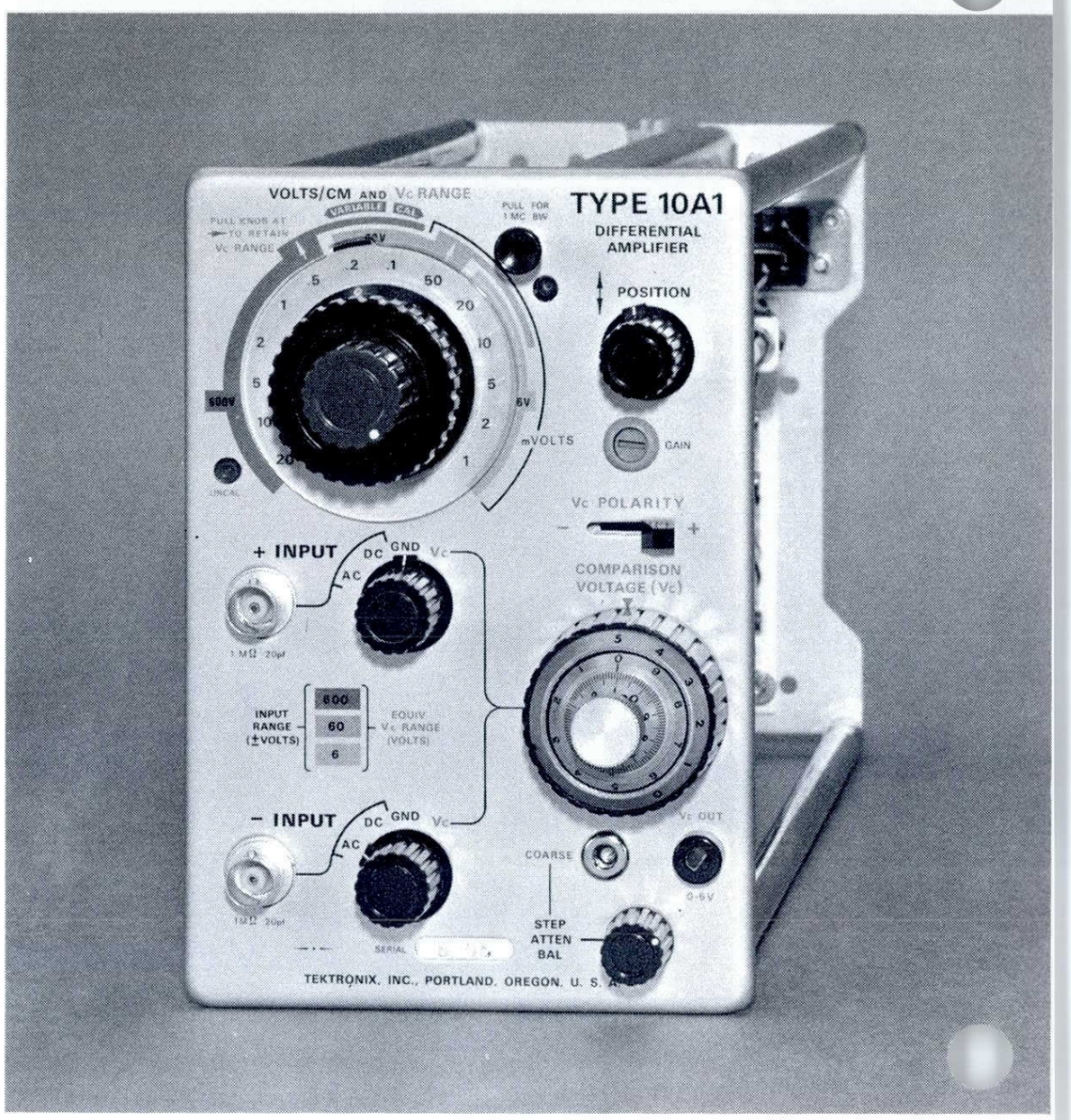
DC to 45 Mc at 5 mv/cm
DC to 35 Mc at 1 mv/cm

A DIFFERENTIAL AMPLIFIER

20,000:1 CMR to 100 kc
10,000:1 CMR to 1 Mc

A CALIBRATED COMPARATOR

6, 60 and 600-volt equivalent V_c range
6,000-cm slide-back scale
±(0.1% + 5 mv) V_c accuracy



The Type 10A1 combines high-gain dc, differential, wide-band, and calibrated comparator features in a single high-performance plug-in unit for Type 647 and RM647 Oscilloscopes. With dc to 35-Mc bandwidth at 1 mv/cm (dc to 45 Mc at 5 mv/cm) the Type 10A1 provides the greatest 1 mv/cm real-time bandwidth presently available in the Tektronix line. Rapid recovery from large differential overload allows detailed study of pulse-top flatness, as well as comparator measurement of transient amplitudes. Its effective 6,000 cm slideback scale and 20,000:1 common-mode rejection ratio permit high-accuracy measurements and comparisons; rugged design insures accuracy even outside the laboratory, where environmental extremes often preclude accurate results.

CONVENTIONAL AMPLIFIER

SENSITIVITY from 1 mv/cm to 20 v/cm is in 14 calibrated steps with 1-2-5 sequence. An uncalibrated vernier allows continuous variation between steps and to at least 50 v/cm. Sensitivity at any one step can be adjusted to zero error with the front-panel gain control. When gain has been accurately adjusted at 5 mv/cm, accuracies are as follows:

VOLTS/CM ACCURACY		
SENSITIVITY	0°C to +40°C	−30°C to +65°C
1 mv/cm (also 10 mv/cm and 0.1 v/cm with V_c range extended)	±2.5%	±4%
2 mv/cm through 2 v/cm (except 10 mv/cm and 0.1 v/cm with V_c range extended)	±1.5%	±2.5%
5 v/cm through 20 v/cm	±3%	±4%

BANDWIDTH/RISETIME performance is given for the Type 10A1 installed in a Type 647 or RM647 Oscilloscope. Bandwidth is specified at −3 db; risetime is measured between the 10% and 90% amplitude points. Bandwidth can be limited to 1 Mc ±10%, when desired, for noise reduction at higher sensitivities.

BANDWIDTH/RISETIME CAPABILITIES		
SENSITIVITY	0°C to +40°C	−30°C to +65°C
5 mv/cm to 20 v/cm	≥ 45 Mc ≤ 7.8 nsec	≥ 40 Mc ≤ 8.7 nsec
1 mv/cm and 2 mv/cm	≥ 35 Mc ≤ 10 nsec	≥ 30 Mc ≤ 11.7 nsec

INPUTS are direct or ac coupled. Low-frequency response with ac coupling is 2 cps.

INPUTS R & C is 1 megohm paralleled by 20 pf.

STABILITY		
	0°C to +40°C	−30°C to +65°C
DC Thermal Drift	≤ 0.5 mv/degree	≤ 0.5 mv/degree
Thermal Gain Variations	≤ ±3%	≤ ±5%

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10A1

DIFFERENTIAL AMPLIFIER

COMMON-MODE REJECTION RATIOS apply throughout the range of 0°C to +40°C. Sensitivity is 1 mv/cm for all values in the chart. At 10 mv/cm, using the internal 10X attenuator, CMR $\geq$ 2,000:1 for a 20-v pk-to-pk 10-kc sinewave.

COMMON-MODE REJECTION		
FREQUENCY	REJECTION RATIO	SINEWAVE AMPLITUDE
DC to 100 kc	$\geq$ 20,000:1	10 v pk-to-pk
100 kc to 1 Mc	$\geq$ 10,000:1	10 v pk-to-pk
1 Mc to 10 Mc	$\geq \frac{10{,}000:1}{\text{frequency in Mc}}$	$\frac{10\text{ v}}{\text{frequency in Mc}}$
20 Mc	$\geq$ 100:1	1 v pk-to-pk
60 cps ac coupled	$\geq$ 2,000:1	10 v pk-to-pk

INPUT VOLTAGE		
SENSITIVITY	LINEAR DYNAMIC RANGE and EQUIVALENT Vc RANGE	MAXIMUM COMBINED DC AND PEAK AC
1 mv/cm through 20 mv/cm	±6 v	±20 v
10 mv/cm through 0.2 v/cm*	±60 v	±600 v
0.1 v/cm through 20 v/cm*	±600 v	±600 v
*Pull knob to retain range at two highest sensitivities.		

RECOVERY TIME after differential offset $\leq$ 0.3 μsec for a return to within ±2 mv. Recovery dc error $\leq$ 0.5 mv after 1-msec recovery time. Characteristics apply from 0°C to +40°C.

CALIBRATED DIFFERENTIAL COMPARATOR

COMPARISON VOLTAGE (Vc) can be added differentially to the input waveform via the slideback technique. The internal Vc source allows measurement of signals up to 600 volts in amplitude, with 4-digit resolution. Equivalent Vc range is selected simultaneously with sensitivity, unless the operator chooses to extend the Vc range for a limited number of steps. Bandwidth/risetime in the extended positions is the same as at 1 mv/cm and 2 mv/cm.

Vc CHARACTERISTICS			
EQUIVALENT Vc RANGE	SLIDEBACK MEASUREMENT ACCURACY		SENSITIVITY V/CM
	0°C to +40°C	−30°C to +65°C	
6 volts	±(0.1% + 5 mv)	±(0.15% + 8 mv)	1 mv through 20 mv
60 volts	±(0.225% + 50 mv)	±(0.4% + 80 mv)	10 mv through 0.2 v*
600 volts	±(0.35% + 0.5 v)	±(0.65% + 0.8 v)	0.1 v through 20 v*
*Pull knob to retain Vc range at two highest sensitivities.			

Vc OUTPUT is available at the front panel as well as internally. Output is continuously variable from 0 to ±6 volts. Accuracy is within ±(0.1% + 5 mv) from 0°C to +40°C and within ±(0.15% + 8 mv) from −30°C to +65°C.

Vc CHARACTERISTICS WITH P6023 PROBE			
EQUIVALENT Vc RANGE	SLIDEBACK MEASUREMENT ACCURACY		SENSITIVITY V/CM
	0°C to +40°C	−30°C to +65°C	
60 volts	±(0.225% + 50 mv)	±(0.4% + 80 mv)	10 mv through 0.2 v
600 volts	±(0.5% + 0.5 v)	±(0.95% + 0.8 v)	0.1 v through 2 v*
6000 volts**	+(1% + 5 v)	±(2% + 8 v)	1 v through 200 v*
**Pull knob to retain Vc range at two highest sensitivities.			
**Probe rating is 1000 volts maximum.			

WEIGHT: Net—4¾ pounds, shipping—11 pounds, approx.

TYPE 10A1 DIFFERENTIAL AMPLIFIER $900

Each instrument includes: 2—instruction manuals (070-0464-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

Type 10A2 DUAL-TRACE AMPLIFIER UNIT

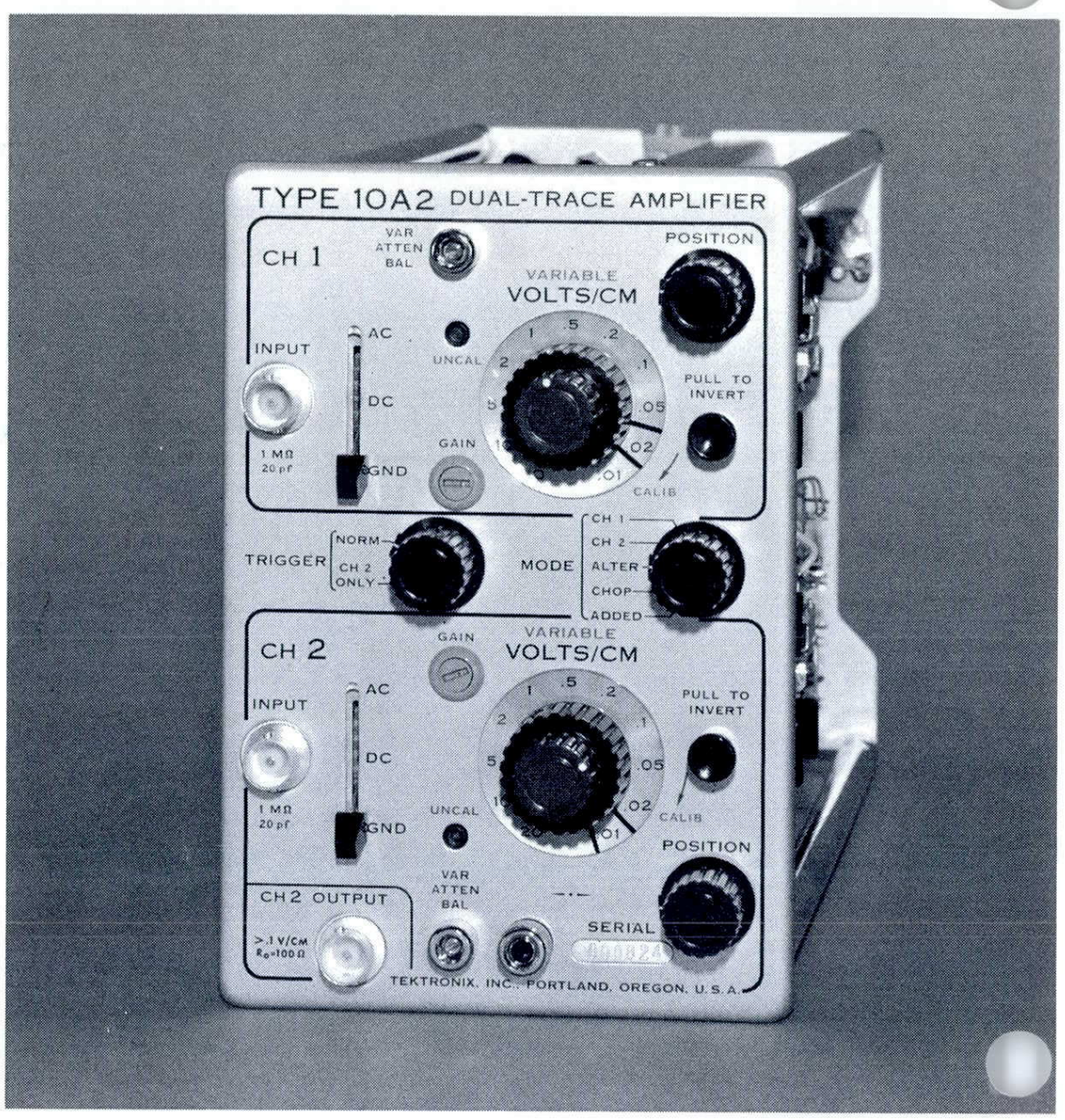
DC to 50 MC PASSBAND

5 OPERATING MODES

10 MV/CM SENSITIVITY

CHANNEL 2 OUTPUT

TRIGGER SELECTION



The Type 10A2 Amplifier is a ruggedized, dual-trace plug-in unit, giving the Type 647 Oscilloscope a dc-to-50 Mc passband. Solid-state design has made possible the construction of this compact high-performance unit. The Type 10A2 is environmentalized to operate under adverse extremes, and provides even greater reliability under normal operating conditions.

IDENTICAL CHANNELS can be added algebraically, operated singly with either polarity, or dual-trace with either alternate or chopped switching. In alternate operation, electronic switching occurs at the end of each sweep. In chopped operation, successive 500-nsec segments of each channel are displayed at a 1-Mc (±20%) rate per channel. Chopped transient blanking is provided.

FREQUENCY RESPONSE with the Type 647 Oscilloscope is dc to at least 50 Mc (3-db down) from 0°C to +40°C.

RISETIME with the Type 647 Oscilloscope is less than 7 nsec from 0°C to +40°C.

SENSITIVITY from 10 mv/cm to 20 v/cm is in 11 calibrated steps with 1-2-5 sequence. Sensitivity at any one position can be adjusted to 0% error with the front-panel gain adjustment. Attenuator accuracy at all other positions is within ±2% from —30°C to +65°C. A variable control permits continuous uncalibrated adjustment from 10 mv/cm to 50 v/cm.

POLARITY INVERSION for both channels can be used to compare signals 180° out of phase.

COMMON-MODE REJECTION in the added-algebraically mode is at least 20:1 up to 25 Mc for common-mode signals up to 10 cm.

CHANNEL ISOLATION is at least 80-db up to 25 Mc.

INTERNAL TRIGGER is obtained from the common output amplifier, or can be switched to Channel 2 only. Triggering from Channel 2 provides the correct time relationship between channels in Alternate and Chopped operation.

CHANNEL 2 OUTPUT is available at the front panel for external triggering or driving other equipment. This ≥ 10X output, when fed into Channel 1, provides 1 mv/cm sensitivity at a dc-to-20 Mc bandwidth.

AC or DC COUPLING or grounding of the input is controlled from the front panel. With ac coupling, the low-frequency 3-db point is 2 cps.

MAXIMUM INPUT is 600 volts (dc + peak ac).

INPUT IMPEDANCE is 1 megohm paralleled by 20 pf.

WEIGHT: Net—5 pounds. Shipping—7pounds, approx.

ENVIRONMENTAL		
CHARACTERISTICS	0°C to +40°C	—30°C to +65°C
AC Gain Stability Display Signal CH 2 OUT Signal	 ±1.5% ±1%	 ±3% ±2%
3-db Bandwidth	50 Mc, minimum	40 Mc, minimum
DC Trace Displacement	<1 cm/20°C	

TYPE 10A2 AMPLIFIER $725

Each instrument includes: 2—instruction manuals (070-0376-00).

U.S. Sales Price f.o.b. Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

PRINTED IN U.S.A.

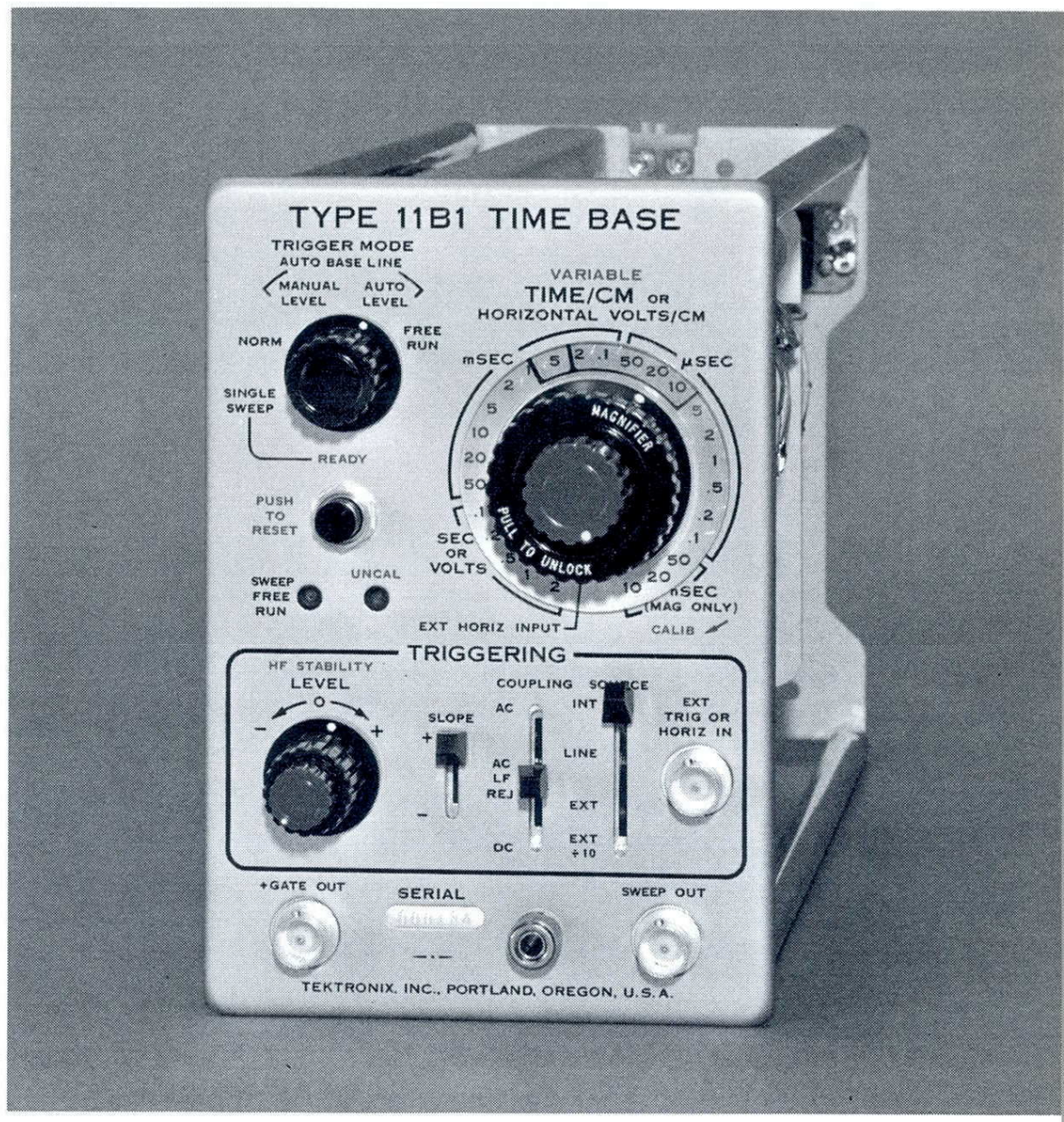
TIME-BASE UNIT Type 11B1

WIDE SWEEP RANGE

DIRECT-READING MAGNIFIER

FLEXIBLE TRIGGERING

SINGLE-SWEEP OPERATION



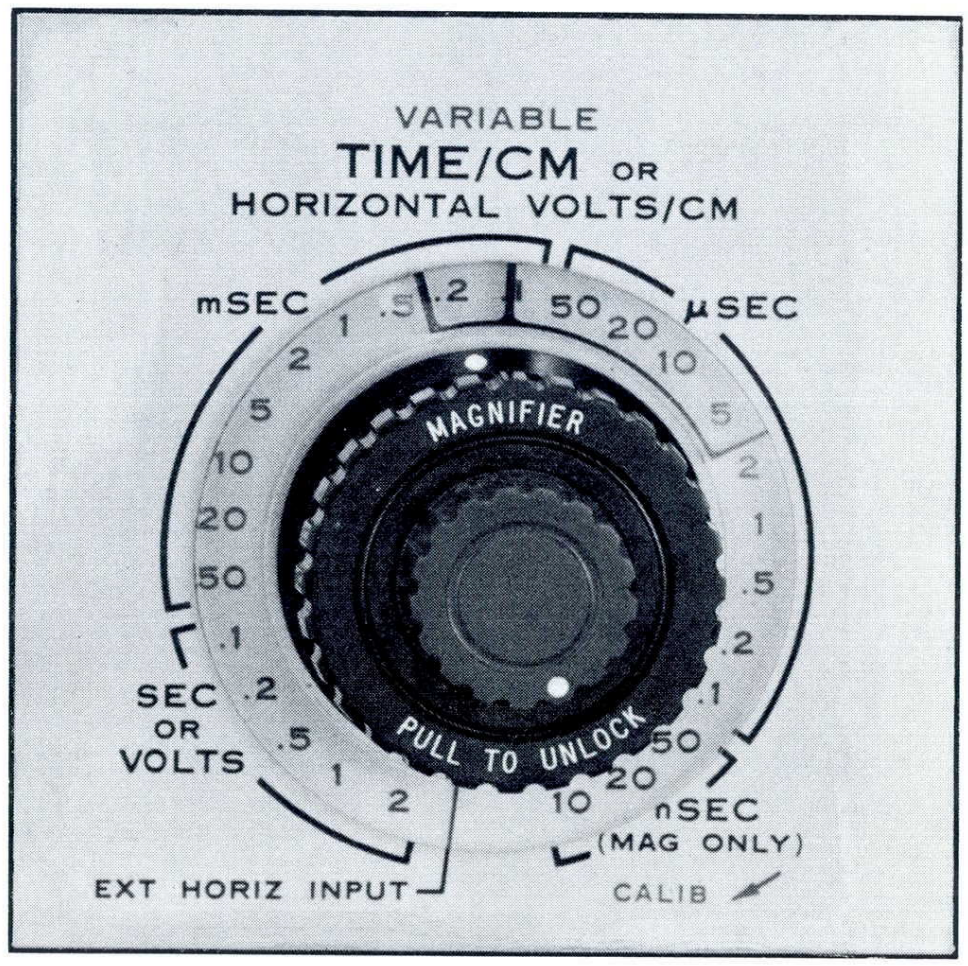
The Type 11B1 is a ruggedized time-base unit for the Type 647 Oscilloscope. It features a single wide-range time base and a direct-reading 1X to 50X sweep magnifier.

SWEEP RANGE from 0.1 µsec/cm to 2 sec/cm is in 23 calibrated steps with 1-2-5 sequence. Sweep rates are continuously variable uncalibrated from 0.1 µsec/cm to approx. 5 sec/cm. A front-panel lamp indicates uncalibrated sweep rates.

DIRECT-READING SWEEP MAGNIFIER provides up to 50X expansion, depending on the basic sweep rate. The magnifier knob indicates directly the TIME/CM rate of the magnified sweep. With the magnifier, the calibrated sweep rate can be extended to 10 nsec/cm.

ACCURACIES	0°C to +40°C	−30°C to +65°C
2 sec/cm to 0.1 sec/cm	±3%	+4%, −6%
50 msec/cm to 0.1 µsec/cm	±1.5%	±2.5%
Magnifier additional:		
Up to 50 nsec/cm	±1%	±1.5%
20 or 10 nsec/cm	±2%	±2.5%

SINGLE SWEEP OPERATION facilitates photographic recording of waveforms. A Reset pushbutton arms the sweep to fire on the next received trigger. The sweep can also be remotely reset, through a rear-panel jack on the Type 647 or RM647 Oscilloscope. After firing once, the sweep is locked out until rearmed by pressing the Reset button. The button lights to indicate when the sweep is armed to fire on the next received trigger.



11B1

+GATE and SAWTOOTH OUTPUTS are available at the front panel. Output is 15 volts from the + gate and +10 volts from the sweep.

EXTERNAL HORIZONTAL INPUT provides for horizontal beam deflection with an external source. Horizontal sensitivity is 0.1 v/cm to 2 v/cm in 5 steps, accuracy within ±2%, or 1 v/cm to 20 v/cm in 5 steps, accuarcy within ±5% using the ÷10 input attenuator. Sensitivity is continuously variable uncalibrated between steps. Passband is dc to at least 3 Mc (3-db down). With ac coupling the low-frequency 3-db point is approximately 16 cps. With AC Low-Frequency Reject the low-frequency 3-db point is 17 kc. Input impedance is 1 megohm paralleled by approximately 35 pf in the "Ext" input position, or 10 megohms paralleled by approximately 6 pf in the "Ext ÷10" position.

TRIGGER MODES include Free-Running, Single-Sweep, Normal, and 2 types of Automatic Base Line operation (manual or fixed trigger level). The Automatic Base Line provides a bright reference trace (regardless of sweep speed) when no input signal is applied, and provides stable triggered-sweeps for triggering signal repetition rates above 20 cps.

FIXED-LEVEL AUTOMATIC OPERATION presets the trigger level to near zero. It offers the most triggering convenience for high duty-cycle waveforms.

MANUAL-LEVEL AUTOMATIC OPERATION offers full operator control of trigger level for both + and — slope triggering, even on signals of very low duty cycle.

TRIGGER LEVEL adjusts to allow sweep triggering at any selected point on either the rising or falling portion of the waveform. Level range for internal triggering covers the entire screen; for external triggering it is ±5 v, or ±50 v using the external ÷10 trigger attenuator.

TRIGGER SOURCE can be internal, external, external ÷10, or line.

TRIGGER COUPLING can be dc, ac (—3 db at 16 cps), or ac low-frequency reject (—3 db at 17 kc).

TRIGGER REQUIREMENTS are a 2-mm deflection or 125-mv external signal to 50 kc, increasing to a 1-cm deflection or 250-mv external signal to 50 Mc. These requirements apply to Normal triggering, and also Automatic Base Line when using manual-level control.

HIGH-FREQUENCY STABILITY changes the time base recovery time to reduce high frequency jitter.

FREE-RUN LIGHT warns the operator when the sweep is free running. The indicator is particulary useful when setting up triggering in the automatic mode from a high repetition-rate external trigger source.

WEIGHT: Net—4½ pounds. Shipping—7 pounds, approx.

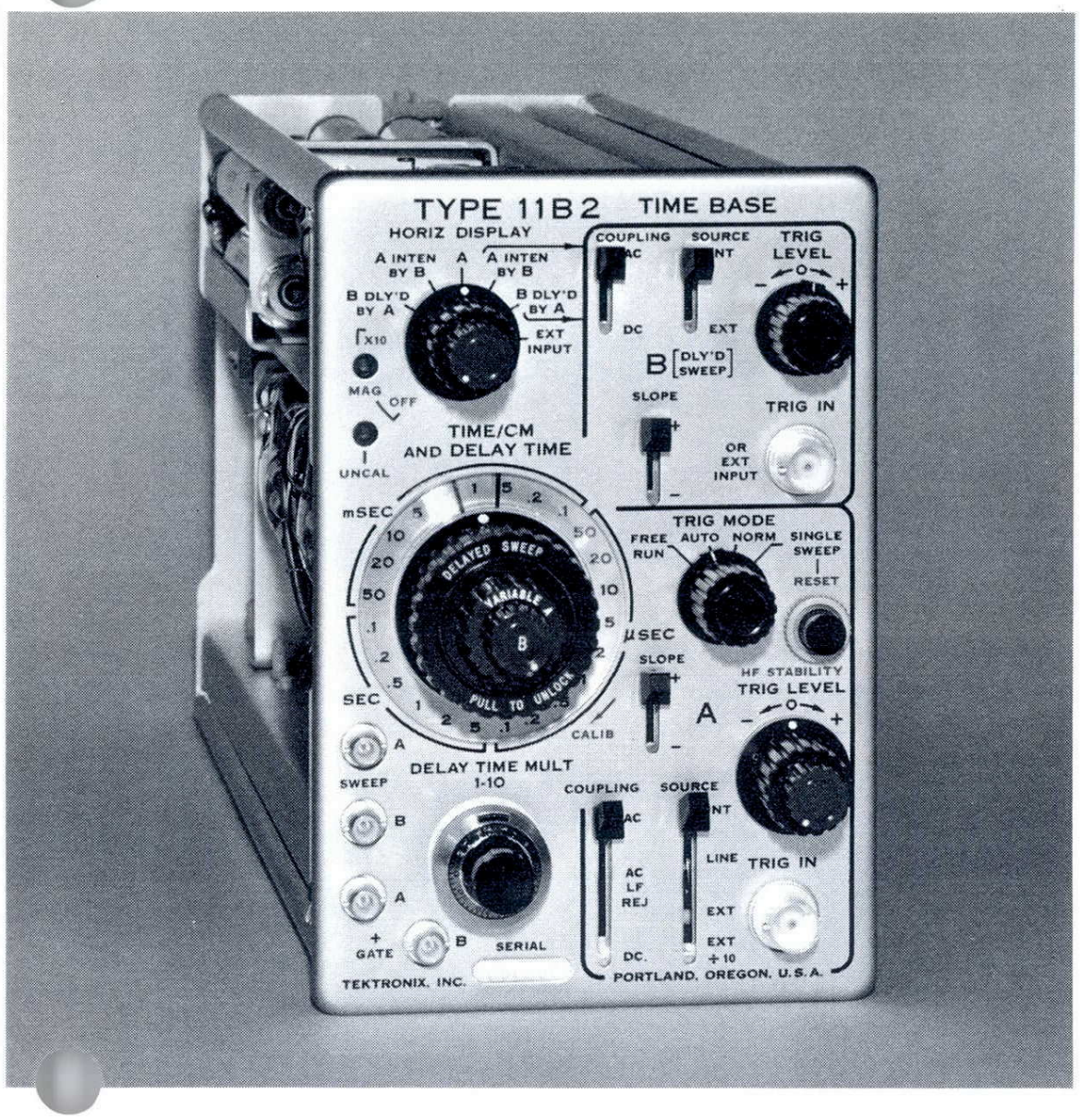
TYPE 11B1 TIME BASE $650

Each instrument includes: 2-instruction manuals (070-0424-00).

U.S. Sales Price f.o.b. Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

TIME-BASE UNIT Type 11B2



NORMAL AND DELAYED SWEEPS

10X SWEEP MAGNIFIER

FLEXIBLE TRIGGERING

SINGLE-SWEEP OPERATION

The Type 11B2 is a ruggedized time-base unit for the Type 647 Oscilloscope. Two separate time-base generators provide for calibrated sweep delay. Time Base A is the normal sweep and is also used to delay the start of Time Base B. This high performance unit is designed for severe operating and storage conditions.

TIME BASE A and B SWEEP RANGE from 0.1 μsec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence. Sweep rates are continuously variable uncalibrated from 0.1 μsec/cm to approximately 12 sec/cm. A front-panel lamp indicates uncalibrated sweep rates.

10X SWEEP MAGNIFIER expands the center portion of the unmagnified display to fill 10 cm. It can be used to extend the calibrated sweep time to 10 nsec/cm.

ACCURACIES	0°C to +40°C	−30°C to +65°C
5 sec/cm to 0.1 sec/cm	±3%	+4%, −6%
50 msec/cm to 0.1 μsec/cm	±1.5%	±2.5%
10X Magnifier additional:		
Up to 50 nsec/cm	±1%	±1.5%
20, 10 nsec/cm	±2%	±2.5%

DISPLAY MODES include Time Base A only, A intensified by B, or B delayed by A. In the 2 latter modes, Time Base B can be started automatically at the end of the delay period, or is triggerable at the end of the delay period.

SINGLE SWEEP OPERATION facilitates photographic recording of waveforms displayed on Time Base A. A RESET pushbutton arms the sweep to fire on the next received trigger. The sweep can also be remotely reset, through a rear-panel jack on the Type 647 Oscilloscope. After firing once, the sweep is locked out until rearmed by pressing the RESET button. The button lights to indicate when the sweep is armed to fire on the next received trigger.

+ GATE and SAWTOOTH OUTPUTS from each time base are available at the front panel. Output is +15 v from A and B gate, and +10 v from A and B sweep.

EXTERNAL HORIZONTAL INPUT provides for horizontal beam deflection with an external source. Horizontal sensitivity is 1 v/cm ±10% without magnification or 0.1 v/cm ±10% with 10X magnifier. Passband is dc to at least 3 Mc (3-db down). With ac coupling, the low-frequency 3-db point is approximately 16 cps. Input impedance is 1 megohm paralleled by approximately 30 pf.

TRIGGER

TRIGGER MODE includes free-running, normal, single-sweep, or automatic operation.

AUTOMATIC TRIGGERING provides a bright reference trace (regardless of sweep rate) in the absence of an input signal, provides a free-running display until triggering is achieved, and permits stable triggering from 20 cps to above 50 Mc.

11B2

TRIGGER LEVEL adjusts to allow sweep triggering at any selected point on either the rising or falling portion of the waveform, and up to ±5 or ±50 v (Time Base A), or ±10 v (Time Base B) external.

TRIGGER SOURCE can be internal or external (Time Base B), internal, external, external ÷10, or line (Time Base A). Time Base B is ac or dc coupled. Time Base A has ac or dc coupling plus ac low-frequency reject.

LOW-FREQUENCY REJECT (—3 db at 17 kc) enables triggering on high-frequency components of waveforms, with reduced interference from low-frequency components such as line-frequency hum.

HIGH-FREQUENCY STABILITY changes Time Base A recovery time to reduce high-frequency jitter.

TIME BASE A and B TRIGGER REQUIREMENTS for internal triggering are 2-mm deflection to 50 kc, 1-cm deflection at 50 Mc. External triggering requires 125 mv to 50 kc, 250 mv to 50 Mc.

SWEEP DELAY

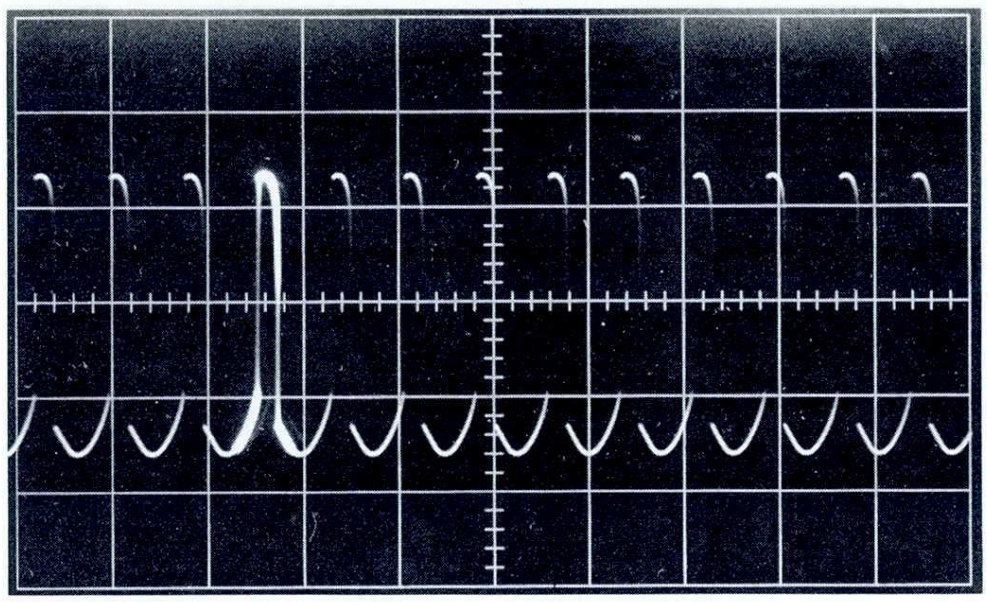
CALIBRATED DELAY RANGE from Time Base A is continuously variable, 1 μsec to 50 sec. A ten-turn precision potentiometer permits accurate delay time multiplication of the Time Base A delay steps. The 3 fastest Time Base A rates are not normally used for delay generation.

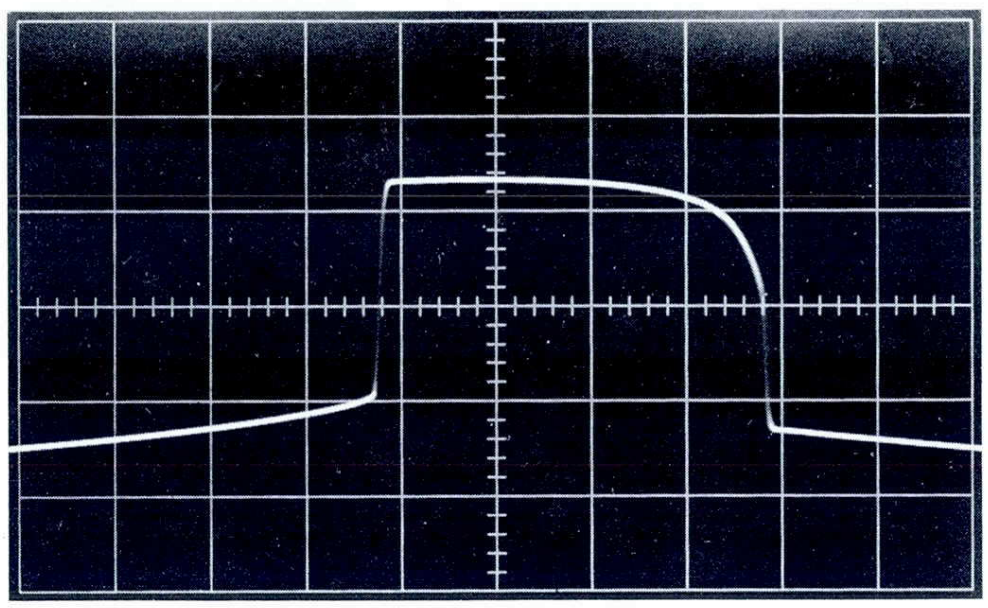
DELAY ACCURACIES	0°C to +40°C	—30°C to +65°C
5 sec/cm to 0.1 sec/cm	±2.5%	+3%, —6%
50 msec/cm to 1.0 μsec/cm	±1.0%	±2%
Multiplier Incremental Linearity	±0.15%	±0.2%
Jitter, Parts in 10^5 of Maximum Available Delay Period	<5	<5

TRIGGERED OPERATION holds off the start of the delayed sweep until the arrival of the first trigger signal following the selected delay time. Because the delayed sweep is actually triggered by the signal under observation, the display is jitter free. A steady display is thus provided for time-modulated pulses and signals with inherent jitter.

CONVENTIONAL OPERATION holds off the start of the delayed sweep for the precise amount of the selected delay time. Any time-modulation or jitter on the signal will be magnified in proportion to the amount of sweep expansion.

The time jitter in the delayed trigger or delayed sweep will not exceed one part in 20,000 of the maximum available delay interval (where this interval is 10 times the Time/Cm or Delay-Time setting).





CALIBRATED SWEEP DELAY

Above waveform (A intensified by B) indicates by trace brightening the portion expanded 20X below (B delayed by A). Time Base A — 2 μsec/cm, Time Base B — 0.1 μsec/cm.

WIDE-RANGE MAGNIFICATION is readily accomplished, when Time Base B is operated at a faster rate than Time Base A. For example, if TIME BASE B is operating at 1 μsec/cm and TIME BASE A is operating at 50 μsec/cm, the magnification is 50 times.

TRACE BRIGHTENING indicates the portion that will appear on the magnified display, and shows the point-in-time relationship of the magnified display to the original display.

WEIGHT: Net —6½ pounds, Shipping—9 pounds, approx.

TYPE 11B2 TIME BASE **$850**

Each instrument includes: 1—BNC female to BSM female adapter (103-0036-00), 2—instruction manuals (070-0377-00).

U.S. Sales Price f.o.b. Beaverton, Oregon

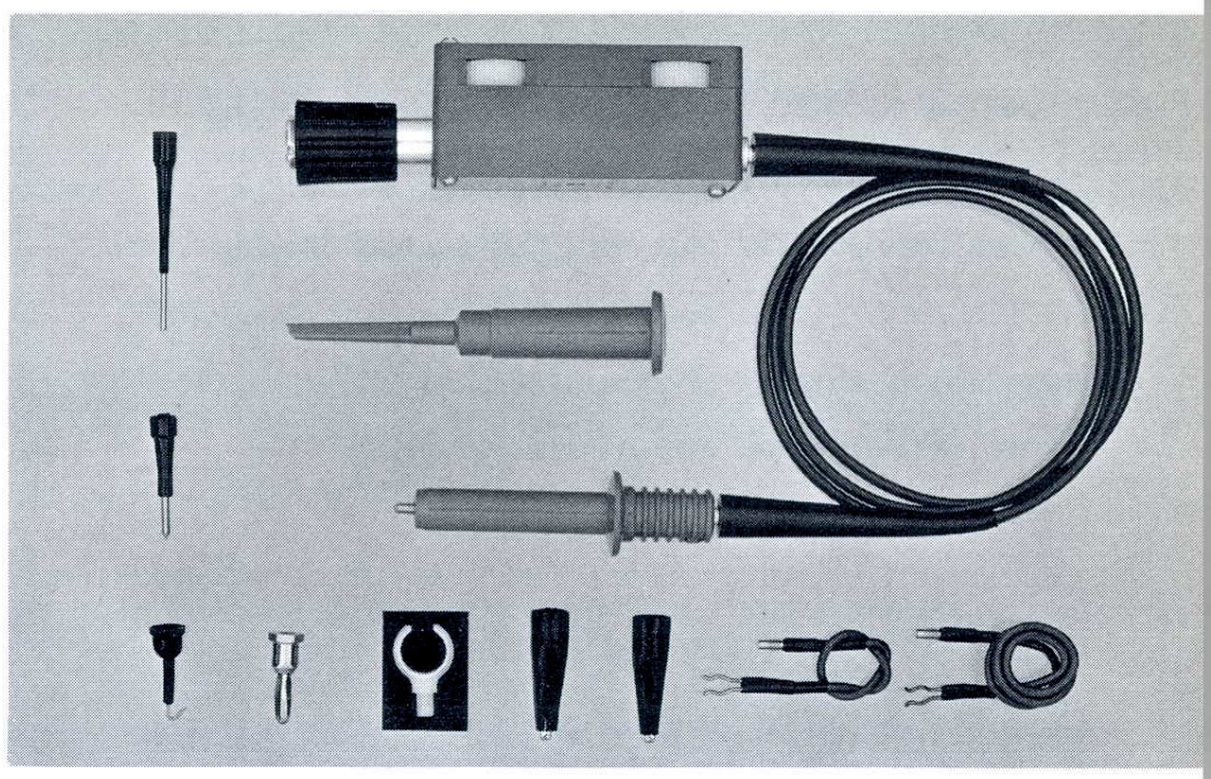
Please refer to Terms and Shipment, General Information page.

Type 647 ACCESSORIES

ATTENUATOR PROBES

Attenuator Probes reduce loading on the circuit under test, and increase the input resistance of the measuring system. All probes include a variety of tips for easy access to components, even in crowded circuit conditions.

The P6023 Probe is recommended for accurate slideback measurements and for differential measurements where common-mode rejection is important. P6008 and P6009 Probes are recommended where maximum bandwidth of the Type 10A2 must be retained, or where the differential-input capability of the Type 10A1 will not be used. P6006 and P6007 Probes can be used for lower-frequency applications, or where reduced cost is a factor.



CHARACTERISTICS OF PROBES WITH TYPE 10A1 AND 10A2 AMPLIFIERS					
PROBE	P6006	P6007	P6008	P6009	P6023
ATTENUATION RATIO	10X	100X	10X	100X	10X
INPUT RESISTANCE	10 megohms	10 megohms	10 megohms	10 megohms	8 megohms
INPUT CAPACITANCE (typical)	6.7 pf	2.1 pf	7.7 pf	2.6 pf	12 pf
TOTAL RISETIME—10A1	< 10.6 nsec	< 10.6 nsec	< 8.8 nsec	< 7.9 nsec	< 10.5 nsec
—10A2	< 10 nsec	< 10 nsec	< 8.1 nsec	< 7.1 nsec	< 10 nsec
VOLTAGE RATING	600 volts dc or ac pk-to-pk	1.5 kv dc or ac RMS, 4.2 kv ac pk-to-pk	600 volts dc or ac pk-to-pk	1.5 kv dc or ac RMS, 4.2 kv ac pk-to-pk	1000 volts dc or ac pk-to-pk
VOLTAGE DERATING*	5.7 Mc	200 kc	20 Mc	200 kc	5 Mc
CABLE LENGTH	3.5′ †	3.5′ †	3.5′	9′	3.5′
PART NUMBER	010-0127-00	010-0150-00	010-0129-00	010-0170-00	010-0167-00
PRICE	$22	$22	$35	$55	$40

*Peak-to-peak voltage derating is necessary for CW frequencies higher than those listed.
†P6006 and P6007 Probes can be ordered in 6, 9, or 12-foot lengths at no additional cost. Longer lengths increase input capacitance and risetime.

PLUG-IN EXTENSIONS

12″ Rigid Extension (Part No. 013-0077-00) $20.75
30″ Flexible Extension (Part No. 012-0080-00) 24.00

REAR-PANEL CONNECTOR

10-Pin Connector for remote single sweep reset and external use of power supply voltages (Part No. 131-0300-00) .. $13.30

BNC to BSM ADAPTER

Converts front-panel outputs on the Type 11B2 to accept BNC cables (Part No. 103-0036-00) $5.00

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 661 SAMPLING OSCILLOSCOPE

2 mv/cm to 200 mv/cm Calibrated Sensitivity

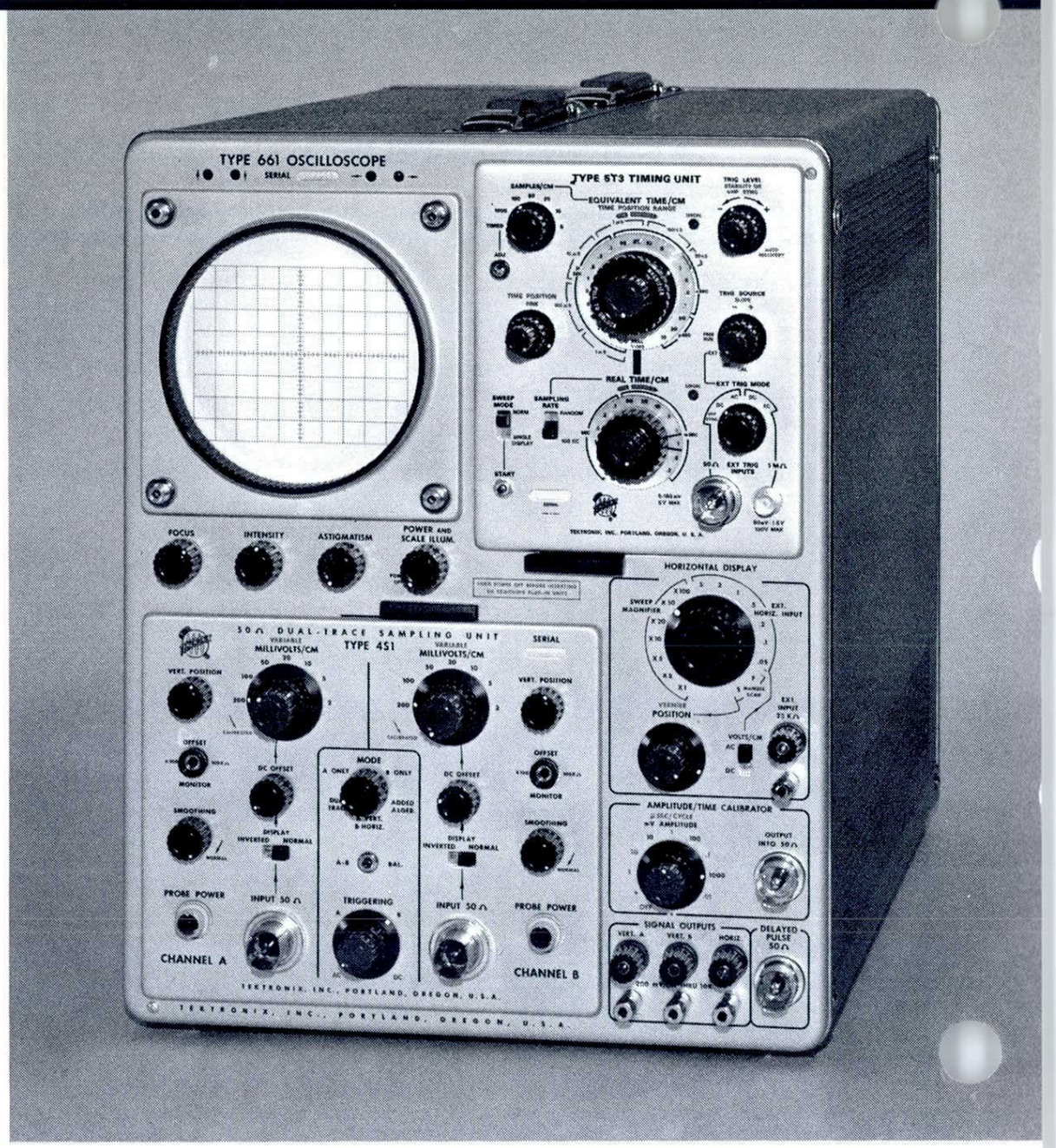
Monitorable Dc Offset

1 nsec/cm to 100 μsec/cm Calibrated Sweep Rate

X1 to X100 Time Expander (constant dots/cm)

Repetitive, single, or Timed Displays

Delay through Full Time Base Duration



This compact and complete sampling system consists of either a Type 5T1A or Type 5T3 Timing Plug-In Unit and any of three Vertical Plug-In Units used with the Type 661 Oscilloscope.

The 2 mv/cm sensitivity of the vertical units, in conjuction with their dc offset capability, allows 1000-to-1 vertical resolution. X100 time expansion and wide-range time position allows 1000-to-1 time resolution. To help make these features applicable to your problem, Tektronix offers a wide variety of probes, test fixtures, and accessories.

Some Of The Things Possible With The Type 661, Type 4S1, And Type 5T3 Combination

1. *Trigger internally—observe fast leading edges of both A and B traces. Matched internal delay lines in both vertical channels assure accurate time comparisons.*
2. *Measure pulse risetime wth 0.35-nanosecond response in both channels.*
3. *Display repetitive signals on 22 calibrated equivalent-time sampling sweep rates from 10 psec/cm to 100 μsec/cm, accurate within 3%.*
4. *Display either repetitive or non-repetitive signals on 14 calibrated real-time sampling sweep rates from 0.2 msec/cm to 5 sec/cm.*
5. *Magnify any portion of the display up to 100 times on sweep rates from 1 nsec/cm to 100 μsec/cm. Magnification occurs about a fixed time-reference point while maintaining a constant number of samples/cm.*
6. *Time position the magnified equivalent-time display anywhere on the unmagnified time-base duration. Time position range is at least 20 nsec or 1 screen diameter, whichever is greater, and is indicated directly at the sweep-rate control.*
7. *Change signal source impedance without affecting dot transient response or dc reference.*
8. *Reduce random system time jitter and amplitude noise by means of a smoothing control.*
9. *Measure millivolt signals in the presence of a substantial dc component by means of a dc-offset voltage monitorable at the front panel.*
10. *Calibrate with amplitude signals available from the front panel. Calibrate with timing signals traceable to National Bureau of Standards.*
11. *Show lissajous patterns in addition to single and dual-trace displays and signals added algebraically.*
12. *Drive X-Y plotters or similar readout accessories, manually or automatically. Slow speed scan nominally set at 7.5 sec/cm.*
13. *Drive external equipment, with fast-rise delayed pulse output.*

PLUG-IN UNIT COMPARTMENTS

VERTICAL SYSTEM accepts any 4-series plug-in unit.
HORIZONTAL SYSTEM accepts any 5-series plug-in unit.

HORIZONTAL DISPLAY CONTROLS

HORIZONTAL POSITION controls provide either coarse or fine adjustment-shift of display over 10 centimeters unmagnified or 1000 centimeters fully magnified.

FAST or SLOW MANUAL SCAN permits detailed analysis of any portion of the display. This mode of operation facilitates driving external recorders.

SWEEP MAGNIFICATION of X1, X2, X5, X10, X20, X50, or X100, symmetrical about the screen center, reduces the number of dots/cm and keeps time/dot uniform.

EXTERNAL HORIZONTAL INPUT permits externally scanning the sampled display. 50 mv/cm to 5 v/cm sensitivity (into 25-K impedance) is in 7 steps, 1-2-5 sequence, either ac or dc-coupled. Equivalent time per centimeter remains calibrated.

AMPLITUDE/TIME CALIBRATOR

CALIBRATED AMPLITUDES range from 1 mv to 1000 mv in 4 decade steps. Accuracy with 50-ohm load is within 2% at 1000 mv.

CALIBRATED TIMES range from 0.01 μsec/cycle to 10 μsec/cycle in 4 decade steps. Accuracy with 50-ohm load is within 0.2%, except within 2% at 0.01 μsec/cycle.

DELAYED-PULSE AND SIGNAL OUTPUTS

DELAYED PULSE 50-ohm output permits the Type 661 (with 4S1 or 4S2 and 5T1A Units) to serve as a rate generator to trigger external circuitry. Pulses occur nominally 50 nsec after the equivalent sweep start with a Type 4S1 Unit, or 10 nsec after sweep start with a Type 4S2 Unit. Amplitude is at least —350 mv and risetime is less than 70 psec.

SIGNAL OUTPUTS include those for Vertical A, Vertical B, and Horizontal Outputs through an impedance of 10 kilohms, at an amplitude of 200 mv/cm referred to the crt display.

CATHODE-RAY TUBE DISPLAY

TEKTRONIX CRT is a flat-faced, 5" tube with an 8-cm by 10-cm viewing area and 2.7-kv accelerating potential. A P2 phosphor will be supplied with the instrument unless another phosphor is specified.

BEAM-POSITION INDICATORS show the direction of the crt beam when it is deflected away from the center-screen area.

ILLUMINATED GRATICULE with variable edge lighting is accurately ruled in centimeter squares. Viewing area is 8 by 10 cm. Vertical and horizontal centerlines are further marked in 2-mm divisions for convenience in making time and amplitude measurements.

ELECTRONICALLY-REGULATED POWER SUPPLIES

TEMPERATURE COMPENSATED AND REFERENCE ISOLATED SUPPLIES provide adequate power for stable operation of the oscilloscope with plug-in units. Line voltage changes within the operating range cause imperceptible changes in the display. Thermal cutout interrupts the power if chassis temperature becomes excessive.

POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 450 watts.

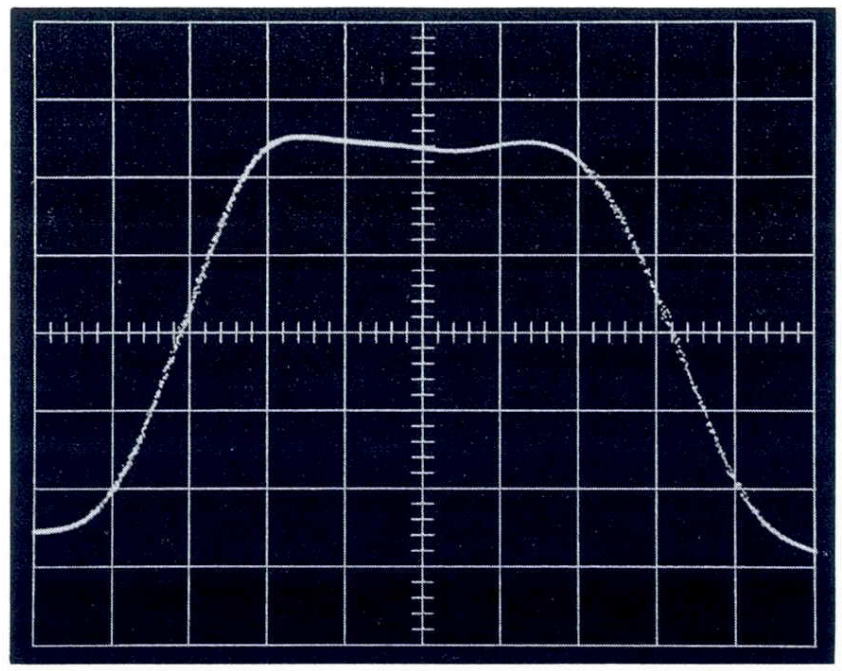
MECHANICAL FEATURES

Dimensions are 16⅞" high by 13⅛" wide by 23¾" deep. Net weight is 49½ pounds. Shipping weight is ≈ 67 pounds.

TYPE 661 OSCILLOSCOPE, without plug-in units $1150

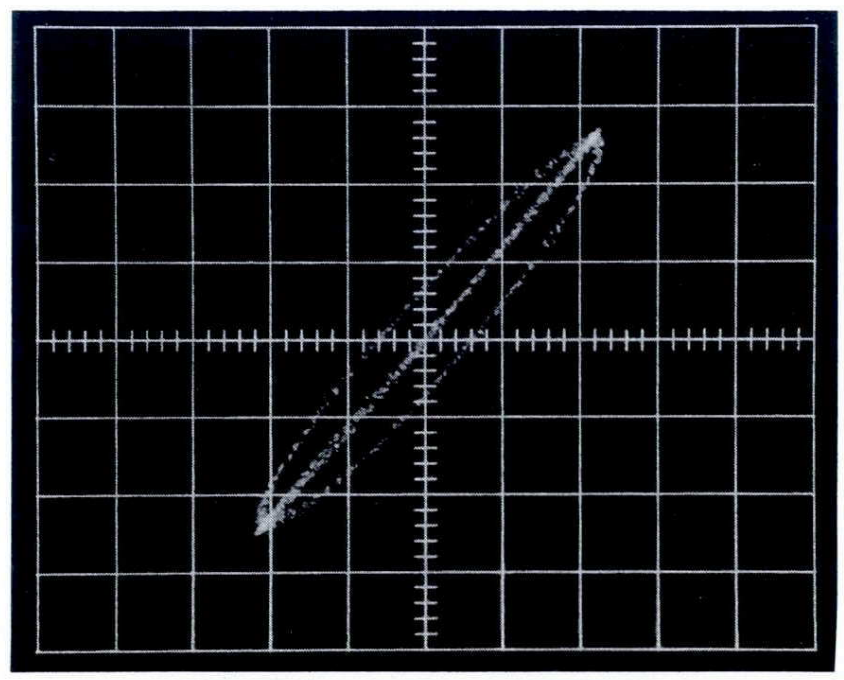
Each instrument includes: 1—3- to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0010-00); 1—Green filter (378-0514-00); 2—Instruction Manual (070-0324-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.



TIME JITTER

A 250 mv, 1.0 nsec-wide pulse internally triggering the 4S1/5T3 system. Vertical sensitivity is 50 mv/cm; sweep rate is 0.2 nsec/cm. Note very small amount of jitter.



TYPICAL APPLICATION

2 gigacycle sine-wave driving inputs to 4S2 for X-Y operation. Diagonal line shows in-phase characteristics. Ellipse is caused by insertion of 8 millimeters of air-line to one input, resulting in approximately 20 degrees of phase shift. Resolution below one degree is possible.

Type 4S1 DUAL-TRACE SAMPLING UNIT

0.35-nsec Risetime

Internal Delay Lines

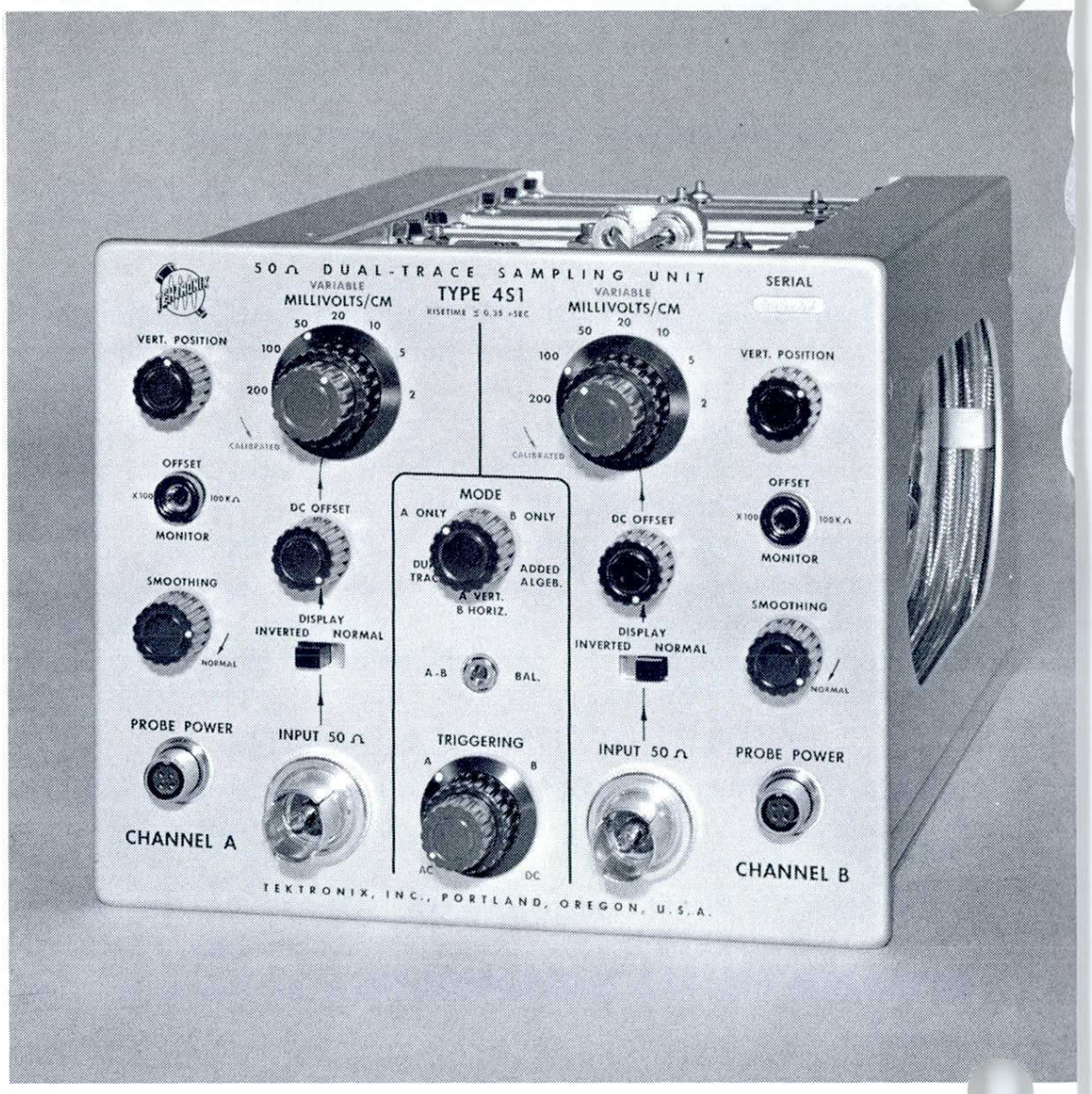
2 mv/cm to 200 mv/cm Calibrated Sensitivity

2-volt Dynamic Range

±1 volt DC Offset

Less than 1 mv noise (unsmoothed, ½ mv smoothed)

The Type 4S1 Dual-Trace Sampling Unit is a general-purpose sampling plug-in unit for the Type 661 Sampling Oscilloscope. Separate internal trigger takeoffs, delay lines, and terminations are provided, which permit triggering on either A or B input signals.



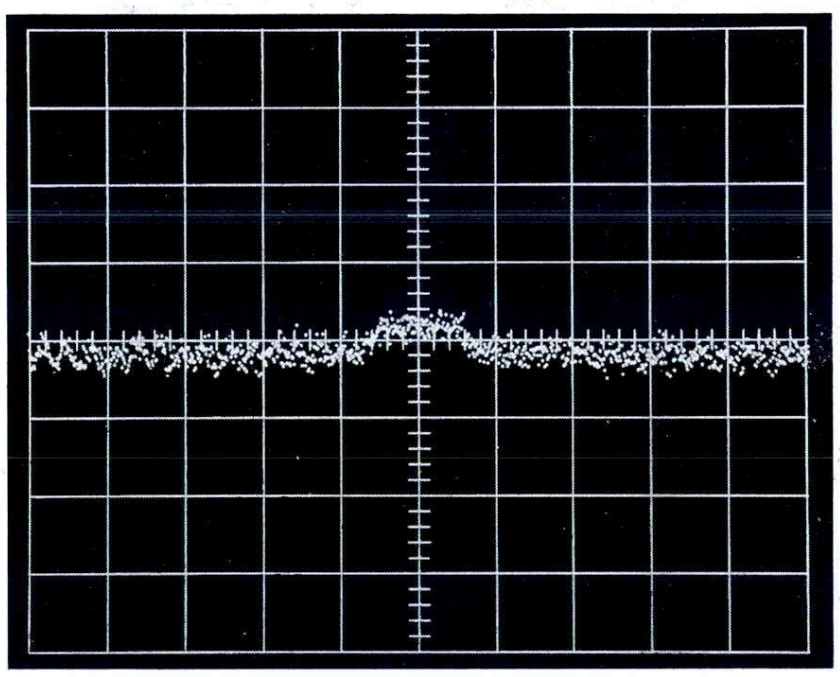
DISPLAY MODES include ±A only, ±B only, Dual-Trace, Algebraic Addition, and an X-Y display of A—vertically and B—horizontally (for observation of hysteresis loops, phase shift, similar displays). Independent controls for each channel permit positioning and inverting input signals as desired.

RISETIME is 0.35 nsec or less, measured from 10% to 90% amplitude points on an input step.

FREQUENCY RESPONSE is equivalent to dc-to-1000 Mc.

SENSITIVITY is in 7 calibrated steps from 2 mv/cm to 200 mv/cm, 1-2-5 sequence, accuracy within 3%. A variable control permits continuous adjustment uncalibrated from 200 mv/cm to 0.67 mv/cm.

SMOOTHING CONTROL reduces system time jitter and amplitude noises, if needed when there is sufficient dot density.



TANGENTIAL NOISE

A 0.8-millivolt 2.5 nsec pulse externally triggering the 4S1/5T3 system. Vertical sensitivity is 2 mv/cm. This displays a typical tangential noise of the Type 4S1 (specification: 1 millivolt). A tangential noise measurement is more useful than an RMS noise measurement, when taking a visual reading, as the eye easily interprets a quasi peak-to-peak noise value. A peak-to-peak value of 3 times the RMS value contains approximately 90% of the trace dot. Most observers agree that the tangential noise displayed is 0.8 millivolt (4 mm quasi peak-to-peak); thus the RMS noise is approximately 270 microvolts (unsmoothed). Random noise decreases 2X with smoothing.

NOISE LEVEL is equivalent to an input signal of 1 mv or less (tangential noise) unsmoothed, or 0.5 mv smoothed. (Tangential noise is approximately 3 times the RMS amplitude, and is the level "seen" on sampling oscilloscopes. Only approximately 10% of the random noise dots are outside this level).

DC OFFSET through ±1 volt, for signal levels exceeding "on screen" sensitivity settings, allows utilization of full sensitivity to display and accurately measure small signals.

DYNAMIC RANGE is ±2 v. Full sensitivity can be used with signals up to 1 ± 2 volts in amplitude. Safe overload is ±10 volts dc (higher with reduced duty factor).

TRIGGERING can be either internal or external. Separate internal delay lines and trigger takeoffs permit triggering on either A or B input signals. The trigger takeoffs deliver to the timing unit approximately ⅛ the input signal amplitude. Risetime of the trigger amplifier system is nominally 0.6 nsec (600 Mc bandwidth).

INPUT IMPEDANCE is 50 ohms. Input connectors are GR 874. Special 2% Tektronix 45-nsec delay lines terminate in 2 pf and 50-ohm 1% resistor.

PROBE POWER is available at the front panel for cathode-follower probes. See Accessory pages.

WEIGHT: Net—15¼ pounds. Shipping—21 pounds, approx.

TYPE 4S1 DUAL-TRACE SAMPLING UNIT $1430

Each instrument includes: 2—X10 50-Ω attenuators (017-0044-00), 2—5-nsec 50-Ω cables (017-0502-00). 2—instruction manuals (070-0329-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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DUAL-TRACE SAMPLING UNIT Type 4S2

0.1-nsec Risetime

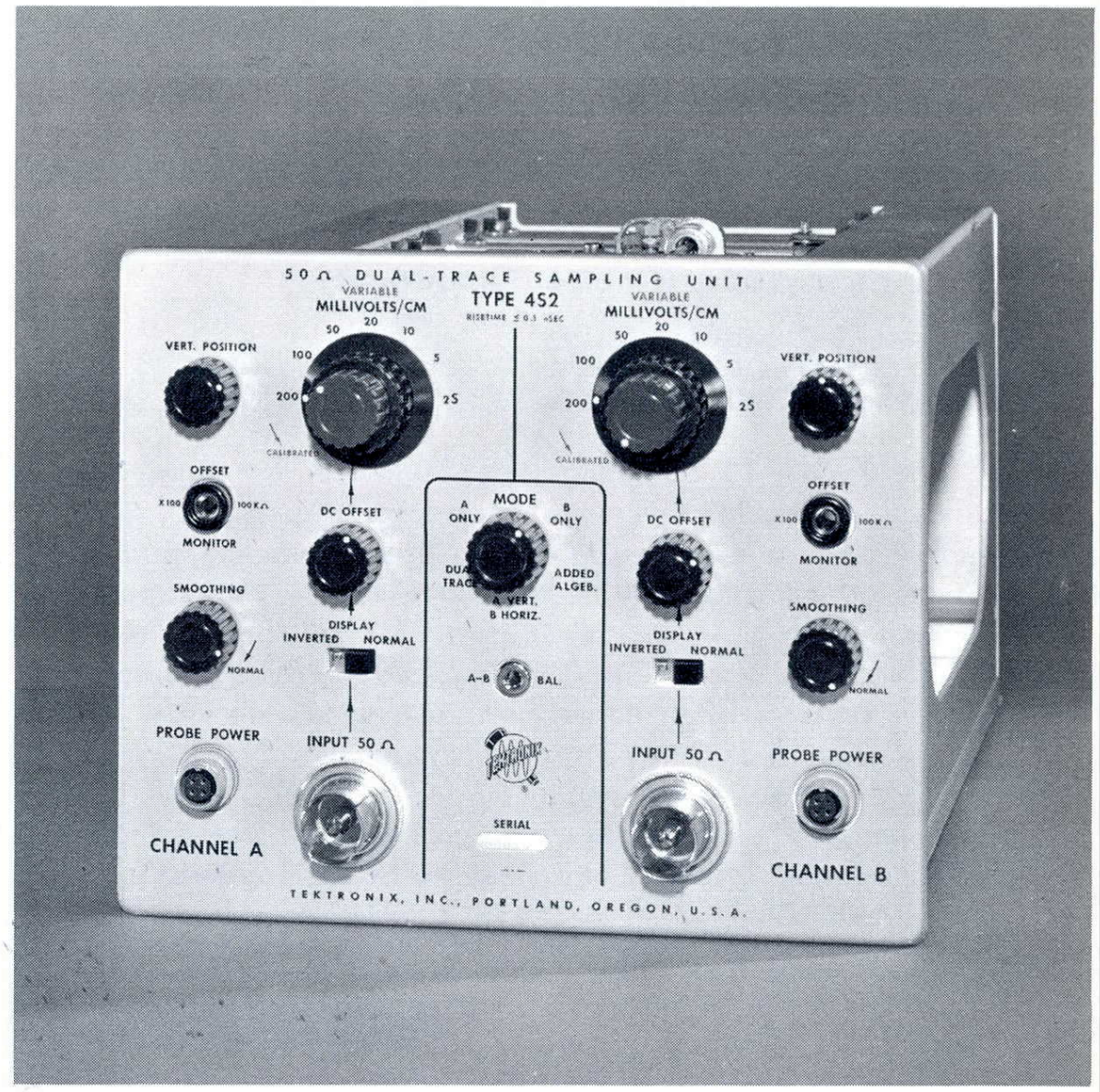
2 mv/cm to 200 mv/cm Calibrated Sensitivity

±1 volt Dynamic Range

±1 volt DC Offset

4 mv noise (unsmoothed, 2 mv smoothed)

The Type 4S2 Dual-Trace Sampling Unit is a special-purpose sampling plug-in unit which makes possible a new degree of time resolution. This vertical plug-in unit retains most features of the general-purpose Type 4S1 when used in a Type 661 Sampling Oscilloscope, except for delay lines and internal triggering.



661/5T3/4S2 CAPABILITIES

DISPLAY 0.1% system discontinuities as reflectometer with centimeter separation capability (limited by external pulse generators, delay lines, attenuators).

DISPLAY millivolts of information on top of signals hundreds of millivolts in amplitude (not limited by the usual amplifier overload problem).

DISPLAY fastest present switching transistor risetimes, including commercially available avalanche types (usually limited by the transistor or the transistor case).

DISPLAY most tunnel diode switching times. (Only diodes with better than 3 ma/pf are faster).

DISPLAY stored charge in switching diodes to the 0.01 picocoulomb/milliampere region (generally limited by diode capacity and turn-on capability).

DISPLAY fractions of a degree of relative phase shift to over 3 gigacycle frequency with lissajous-mode operation (usually limited by harmonic content or residual reflections to a few degrees absolute).

DISPLAY MODES include ±A only, ±B only, Dual-Trace, Algebraic Addition, and an X-Y display of A—vertically and B—horizontally (for observation of hysteresis loops, phase shift, similar displays). Independent controls for each channel permit positioning and inverting input signals as desired.

RISETIME is 0.1 nsec or less, measured from 10% to 90% amplitude points on an input step. Transient abberations are within ±5%.

FREQUENCY RESPONSE is equivalent to dc-to-3500 Mc.

SENSITIVITY is in 7 calibrated steps from 2 mv/cm to 200 mv/cm, 1-2-5 sequence, accuracy within 3%. A variable control permits continuous adjustment uncalibrated from 200 mv/cm to 0.67 mv/cm.

SMOOTHING CONTROL reduces system time jitter and amplitude noises, if needed when there is sufficient dot density.

NOISE LEVEL is less than 4 mv (tangential noise) unsmoothed or 2 mv smoothed. (Tangential noise is approximately 3 times the RMS amplitude and is the level "seen" on sampling oscilloscopes. Only 10% of the random noise dots are outside this level).

DC-OFFSET through ±1 volt, for signal levels exceeding "on screen" sensitivity settings, allows utilization of full sensitivity to display and accurately measure small order signal discontinuities.

DYNAMIC RANGE is ±1 volt. Full sensitivity can be used with overloads up to ±1 volt in amplitude. Safe overload is ±10 volts dc (higher with reduced duty factor).

TRIGGERING is external (required 50-nsec prior to signal). No internal delay lines included. Please refer to Timing Plug-In Unit specifications.

INPUT IMPEDANCE is 50 ohms. Input connectors are GR 874. Termination is 50-ohm ±1% resistor and approximately 3 pf.

PROBE POWER is available at the front panel for cathode-follower probes. See accessory pages.

WEIGHT: Net—9 pounds. Shipping—15 pounds, approx.

TYPE 4S2 DUAL-TRACE SAMPLING UNIT $1600

Each instrument includes: 2—X10 attenuator, 50-Ω (017-0044-00); 2—5 nsec cable, 50-Ω (017-0502-00); 2—Instruction Manual (070-0356-00).

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 4S3 SAMPLING-PROBE DUAL-TRACE UNIT

0.35-nsec Risetime

Miniature Direct Sampling Probes

100 k, 2 pf Input Impedance

2 mv/cm to 200 mv/cm Calibrated Sensitivity

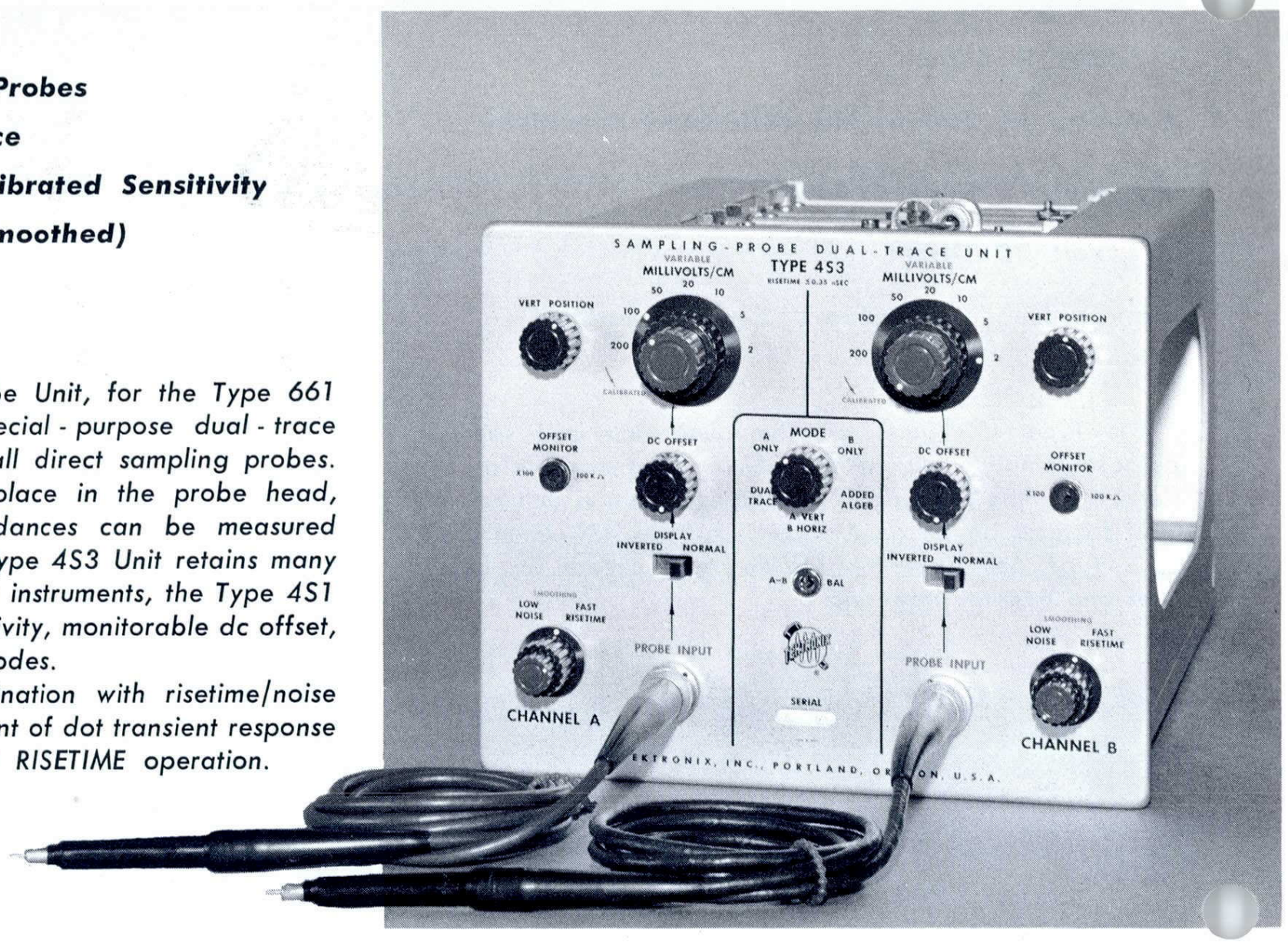
Less than 300 μv noise (smoothed)

±2-volt Dynamic Range

±1-volt DC Offset

The Type 4S3 Sampling Probe Unit, for the Type 661 Sampling Oscilloscope is a special-purpose dual-trace unit incorporating extremely small direct sampling probes. Since sampling actually takes place in the probe head, signals with high source impedances can be measured at a very low noise level. The Type 4S3 Unit retains many of the features of its companion instruments, the Type 4S1 and 4S2, such as 2 mv/cm sensitivity, monitorable dc offset, signal inversion, and 5 display modes.

Smoothing controls, in combination with risetime/noise selection, permit correct adjustment of dot transient response for either LOW-NOISE or FAST RISETIME operation.



DISPLAY MODES include ±A only, ±B only, Dual-Trace, Algebraic Addition, and an X-Y display of A—vertically and B—horizontally (for observation of hysteresis loops, phase shift, similar displays). Independent controls for each channel permit positioning and inverting input signals as desired. Time coincidence between channels is within 60 picoseconds.

SENSITIVITY from 2 mv/cm to 200 mv/cm is in 7 calibrated steps with 1-2-5 sequence, and is accurate within 3%. A variable control permits continuous adjustment uncalibrated from 200 mv/cm to approximately 0.67 mv/cm.

FREQUENCY RESPONSE is equivalent to dc-to-1000 Mc.

RISETIME AND SMOOTHING controls, while maintaining correct dot transient response, adjust the instrument for: least noise or best risetime, or a compromise of the two, with signal sources from below 25 ohms to beyond 300 ohms. A Fast-Risetime/Low-Noise switch in conjunction with the smoothing control allows the operator to select optimum risetime at a sacrifice in noise level. Or, he may select for a low noise level at some sacrifice in risetime.

RISETIME is 0.35 nsec or less (FAST RISETIME) and approximately 0.5 nsec (LOW NOISE) with a 50-Ω source.

NOISE is less than 0.5 mv unsmoothed (LOW NOISE), 1 mv (FAST RISETIME), or approximately 300 μv smoothed, when using a 50-ohm source.

DC OFFSET through ±1 volt for signal levels exceeding "on screen" sensitivity settings allows utilization of full sensitivity to display and accurately measure small discontinuities.

DYNAMIC RANGE is ±2 volts. Full sensitivity can be used with signals up to ±2 volts in amplitude. Safe overload is 1 ± 10 volts.

TRIGGERING is external (required approximately 50 nsec prior to signal). Please refer to Timing Unit specifications.

SAMPLING PROBES included with the Type 4S3 are extremely compact. The sampling bridge is contained in the probe head to obtain optimum results with the input impedance of 100 k paralleled by 2 pf. Low-frequency response is approximately 3-db down at 1.5 kc with the blocking capacitor; approximately 3-db down at 150 cps with the blocking capacitor and 10X attenuator. Probes can be changed from channel to channel with only minor recalibration.

RECOMMENDED OPTIONAL ACCESSORIES include probe-to-GR adapter, probe-to-BNC adapter, and 50-ohm voltage pickoff. See catalog Accessories pages for additional information.

WEIGHT: Net—13 pounds. Shipping—16 pounds, approx.

TYPE 4S3/P6038 SAMPLING PROBE DUAL-TRACE UNIT $1600

Each instrument includes: 2—P6038 probe package (010-0156-00); 2—Instruction Manual (070-0397-00).

P6038 DIRECT SAMPLING PROBE (010-0156-00) . $225

Each Probe Package includes: 1—P6038 probe (010-0157-00); 1—Response normalizer (011-0070-00); 1—X10 attenuator (011-0071-00); 2—Test point jack (131-0258-00); 1—Coupling capacitor (011-0072-00); 1—Hook-tip assembly (206-0114-00); 1—Ground clip (175-0249-00); 1—Probe holder (352-0024-00); 1—Instruction Manual (070-0400-00).

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TIMING UNIT Type 5T1A

1 nsec/cm to 100 μsec/cm Calibrated Sweep Rates

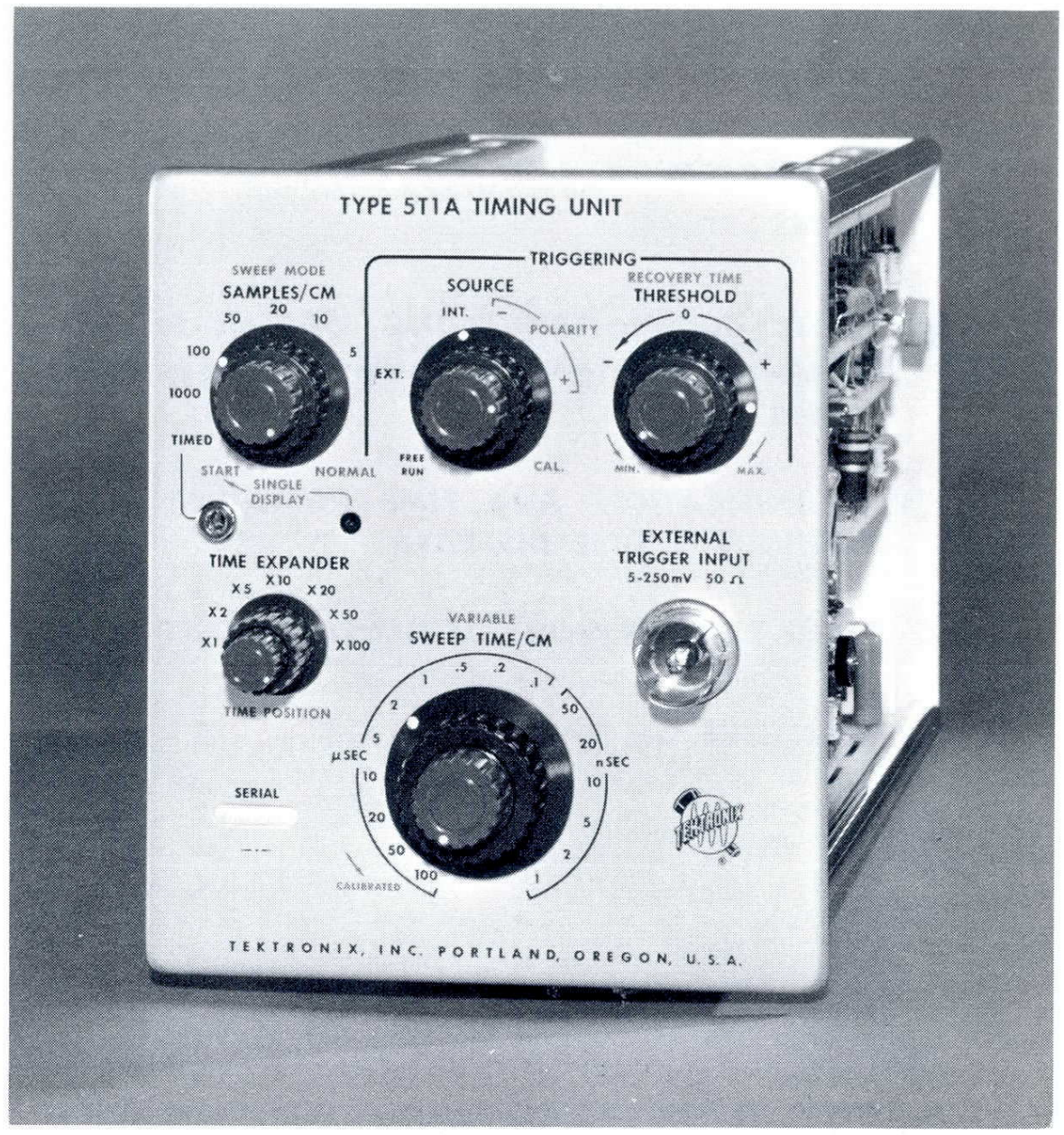
X1 to X100 Time Expander (constant dots/cm)

Time position provides delay through full time base duration

Versatile Triggering

5 to 1000 Samples/cm

Repetitive Single or Timed Displays



The Type 5T1A Timing Plug-In Unit, for the Type 661 Sampling Oscilloscope, provides flexible triggering and generates the time base. External trigger sensitivity is 5 mv, for pulses 2 nsec or wider. Triggers larger than 250 mv can be accommodated with external attenuators. External input is ac coupled, approximately 3-db down at 300 kc (sine-wave) at the low end.

SAMPLING DISPLAY is in 5 calibrated steps of 5, 10, 20, 50, 100, (accuracy within 3%), and nominal 1000 samples/cm.

SWEEP MODE selects either NORMAL (repetitive), SINGLE, or TIMED displays. A timed slow scan is provided for those applications requiring the connection of a Y-T or X-Y Recorder. The slow scan is nominally 7.5 sec/cm and adjustable from 5 sec/cm to approximately 10 sec/cm.

EQUIVALENT SWEEP RANGE from 1 nsec/cm to 100 μsec/cm is in 16 calibrated rates with 1-2-5 sequence, accuracy within 3%. A variable control permits continuous adjustment uncalibrated from approximately 0.33 nsec/cm (3.3 psec/cm time expanded) to 100 μsec/cm.

TIME EXPANDER provides X1, X2, X5, X10, X20, X50, and X100 expansion that maintains a constant number of samples per centimeter. Full time expansion extends calibrated sweep range to 10 psec/cm.

TIME POSITION allows time "windowing" over the full time base duration when expanded.

INTERNAL TRIGGERING, with the Type 4S1 vertical plug-in unit, allows triggering from the vertical input signal. This feature facilitates observation of the leading edge of fast-rise input-signals. Nominally, the leading edge of a fast-rise signal will appear more than 8 nsec after the equivalent sweep start. Sensitivity is 40 mv for a 2-nsec wide pulse.

FREE RUN TRIGGERING provides stable displays when using the Type 661 delayed-pulse generator.

EXTERNAL 50-OHM TRIGGER INPUT is ac coupled (1 μsec time constant) and allows direct connection of the Type 5T1A to the trigger signal. Sensitivity is 5 mv for a fast-rise 2-nsec wide pulse. An isolation stage reduces kickout to 5 mv or less, with less than ½ nsec decay time constant.

TRIGGER THRESHOLD is continuously variable, ±200 mv.

RECOVERY TIME may be varied from nominally 10 μsec to 13 μsec on sweep rates faster than 0.1 μsec/cm, longer on slower sweep rates. This normally permits triggering from irregularly spaced pulses.

TRIGGER POLARITY can be either positive or negative.

TIME JITTER is less than 10 psec at 1 nsec/cm, and less than 30 psec (or 0.01% of fast ramp, whichever is larger) at 2 nsec/cm or slower. This is under optimum conditions of 100 kc or less repetition rate, and fast-rise triggers of 40 mv, 1 nsec duration. Jitter increases with reduced trigger rise rate, amplitude, or duration, and increased repetition rate. Internal triggering with the Type 4S1, on a 50 mv signal of 1 nsec duration, will display typically less than 100 psec of jitter. Internal triggering on a 100 Mc sine wave, 1 v pk-to-pk, displays less than 50 psec of jitter. Synchronizing at 1000 Mc (100 mv pk-to-pk external or 1 v internal) displays typically 80% of dots within 100 psec.

WEIGHT: Net—6 pounds. Shipping—12 pounds, approx.

TYPE 5T1A TIMING PLUG-IN UNIT $750

Each instrument includes: 2—X10 50-Ω attenuators (017-0044-00), 1—10-nsec 50-Ω cable (017-0501-00), 2—instruction manuals (070-0387-00).

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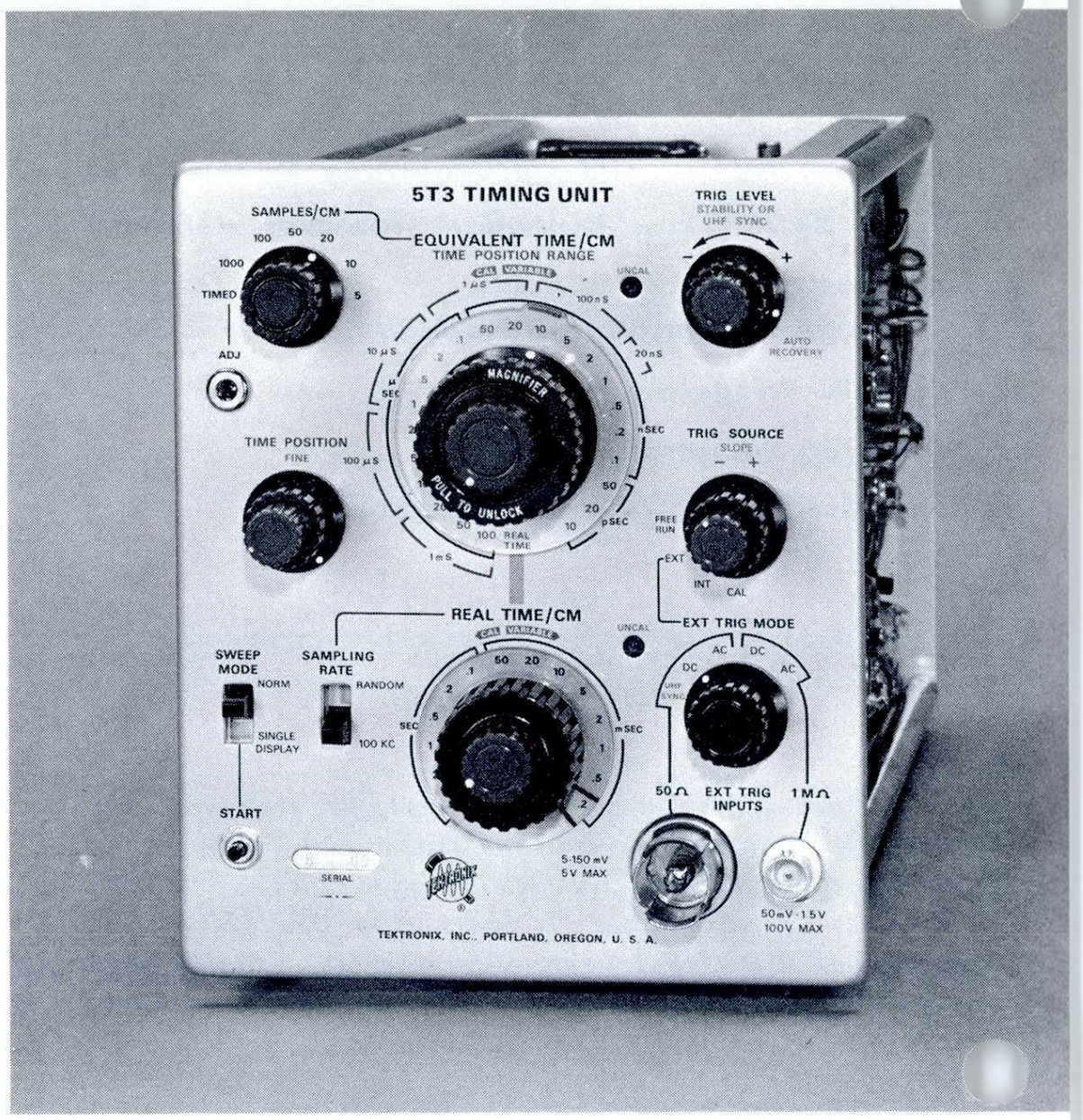
Please refer to Terms and Shipment, General Information page.

Type 5T3 TIMING UNIT

- ***10 PSEC/CM to 5 SEC/CM CALIBRATED SWEEP RATES***
- ***DC to 500-Mc TRIGGERING, 500-Mc to 5-Gc SYNCHRONIZATION—AT LEVELS OF A FEW MILLIVOLTS***
- ***MAGNIFICATION AND TIME POSITIONING OF EQUIVALENT-TIME DISPLAYS***
- ***THREE TRIGGER MODES, FOUR TRIGGER SOURCES***
- ***REPETITIVE OR SINGLE DISPLAYS***



The Type 5T3 Timing Unit for Type 661 Oscilloscopes incorporates both EQUIVALENT-TIME and REAL-TIME SAMPLING, to provide an extremely wide range of sweep rates. THREE TRIGGER MODES together with FOUR TRIGGER SOURCES including 50-ohm and 1-megohm external trigger inputs offer convenient and flexible wide-range triggering. Trigger kick-out using external modes is reduced to less than 10 mv by isolation amplifiers.

TIMING SECTION

REAL-TIME SAMPLING

0.2 msec/cm to 5 sec/cm, 14 calibrated rates (1-2-5 sequence), accuracy within 3%. Uncalibrated continuous variation between steps and to ≈ 80 μsec/cm. The Sweep Magnifier in the Type 661 Oscilloscope allows up to X100 magnification of the crt display. The 100-kc sampling rate can be frequency modulated to easily detect and correct false displays.

EQUIVALENT-TIME SAMPLING

10 psec/cm to 100 μsec/cm, 22 calibrated rates (1-2-5 sequence), accuracy within 3%. Uncalibrated continuous variation between steps and to ≈ 4 psec/cm. Sweep rates from 1 nsec/cm to 100 μsec/cm can be magnified up to X100 while maintaining a constant number of samples/cm. Magnification occurs from a fixed time-reference point at the left edge of the screen. Equivalent-time sweep rates, whether magnified or not, are read out directly. Coarse and fine controls position the displayed time window and set the time-reference point for magnification.

SAMPLING DISPLAY

Real-time displays are in the form of dots; the number of samples/cm depends on sweep rate. Equivalent-time displays can be viewed at 5, 10, 20, 50, 100, or 1000 samples/cm, or a timed slow scan (≈ 0.5 sec/cm to ≈ 5 sec/cm) for chart recorder use.

SWEEP MODES

Normal (repetitive) and Single Display.

TRIGGER SECTION

NORMAL MODE

Triggering from dc to several hundred megacycles at 5-mv sensitivity. Schmitt-type tunnel-diode logic, operation similar to conventional real-time oscilloscope. Stability and level controls; free-running displays possible.

AUTOMATIC RECOVERY MODE

Easy triggering on fast, short pulses or synchronizing on high-frequency signals up to 500-Mc repetition rate—at 5-mv sensitivity. One-knob adjustment for a wide variety of trigger signals.

UHF SYNC MODE

Stable synchronization on low-amplitude signals from 500 Mc to 5 Gc. 50-ohm input connected directly (by-passing transistor amplifiers) through high-pass filter to very fast tunnel-diode multivibrator.

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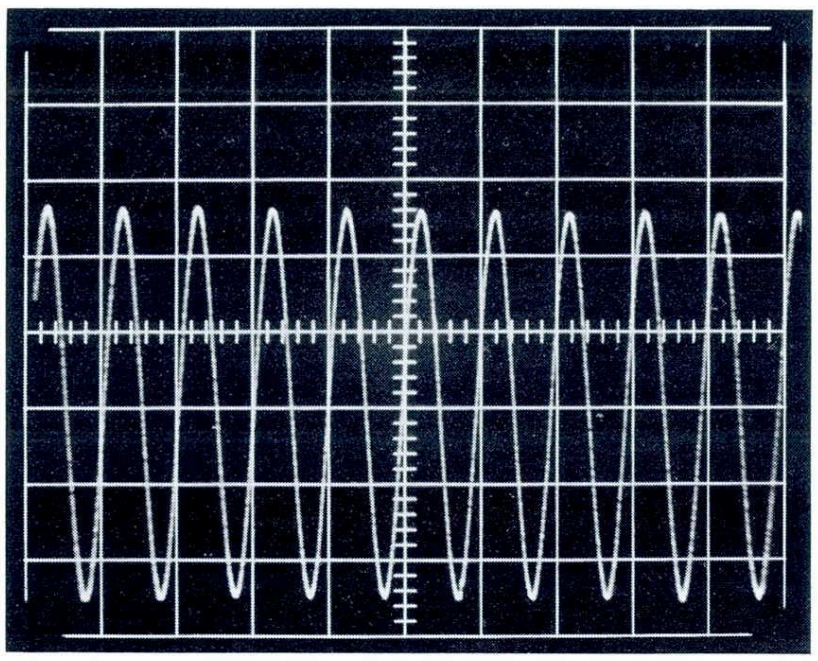
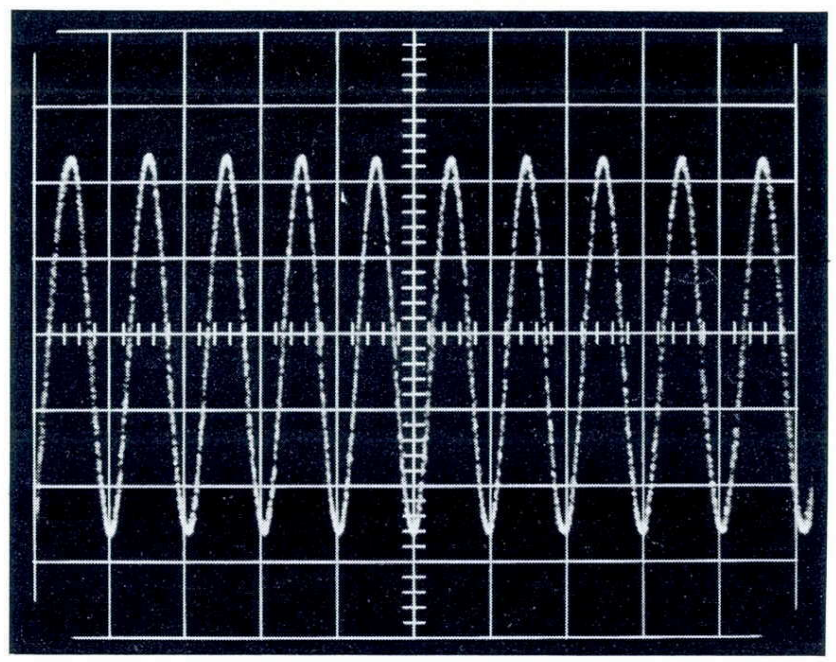
5T3

VIEWS THESE 2 SIGNALS WITH THE TYPE 661/5T3/4S2



50-CPS REAL-TIME DISPLAY
Horiz: 20 msec/cm; Vert: 100 mv/cm
External trigger, 1-megohm input



5-GC EQUIVALENT-TIME DISPLAY
Horiz: 0.2 nsec; Vert: 100 mv/cm
External trigger, UHF Sync Mode

TRIGGER CAPABILITIES				
TRIGGER SOURCE	FREQUENCY COVERAGE†	COUPLING	DYNAMIC RANGE	MAXIMUM OVERLOAD
External 1-megohm input	DC to 20 Mc	DC	±50 mv to 1.5 v	±100 v
	160 cps to 20 Mc	AC		
External 50-ohm input	DC to 500 Mc	DC	±5 mv to 150 mv	±5 v
	500 kc to 500 Mc	AC		
	500 Mc to 5 Gc	UHF Sync		
Internal from Sampling Plug-In Unit	DC to ≈ 1 Gc	DC coupled in Type 5T3	Trigger takeoffs in the Type 4S1 Sampling Unit deliver ≈ 1/8 of input signal amplitude	
Internal from Oscilloscope Calibrator		AC	100-mv signal from Amplitude/Time Calibrator	

† AC lower-frequency limits refer to sinewaves only.

TRIGGER JITTER			
MODE	JITTER	FREQUENCY	PK-TO-PK VOLTAGE
NORMAL	≤ 30 psec	2 nsec pulse width (50% points)	50 mv at 50-Ω input or 400 mv internal
AUTO RECOVERY	≤ 70 psec	500 Mc	50 mv at 50-Ω input or 400 mv internal
	≤ 30 psec	2-nsec pulse width (50% points)	
UHF SYNC	≤ 30 psec	2 Gc	10 mv at 50-Ω input
		5 Gc	50 mv at 50-Ω input

WEIGHT

Net—6¾ pounds, shipping—13 pounds approx.

TYPE 5T3 TIMING UNIT $900

Each instrument includes: 2—10X 50 Ω attenuators (017-0044-00), 1—10-nsec 50-Ω cable (017-0501-00), 1—BNC-to-banana plug patch cord (012-0090-00), 2—instruction manuals (070-0470-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 280 TRIGGER COUNTDOWN UNIT

INPUT SIGNAL FREQUENCIES—*30 megacycles to 5 gigacycles.*

OUTPUT SIGNAL FREQUENCIES—*Continuously variable from 15 to 45 megacycles.*

The Tektronix Type 280 Trigger Countdown Unit allows timing systems to be synchronized on frequencies up to 5 gigacycles. It can be used to lower the frequency of the triggering signals to within a range of 15 to 45 megacycles. This permits triggering circuits of timing systems to lock in solidly with high-frequency signals.

By using the Type 280 with a Tektronix sampling oscilloscope, microwave engineers can observe rf signals in the gigacycle range.

CHARACTERISTICS

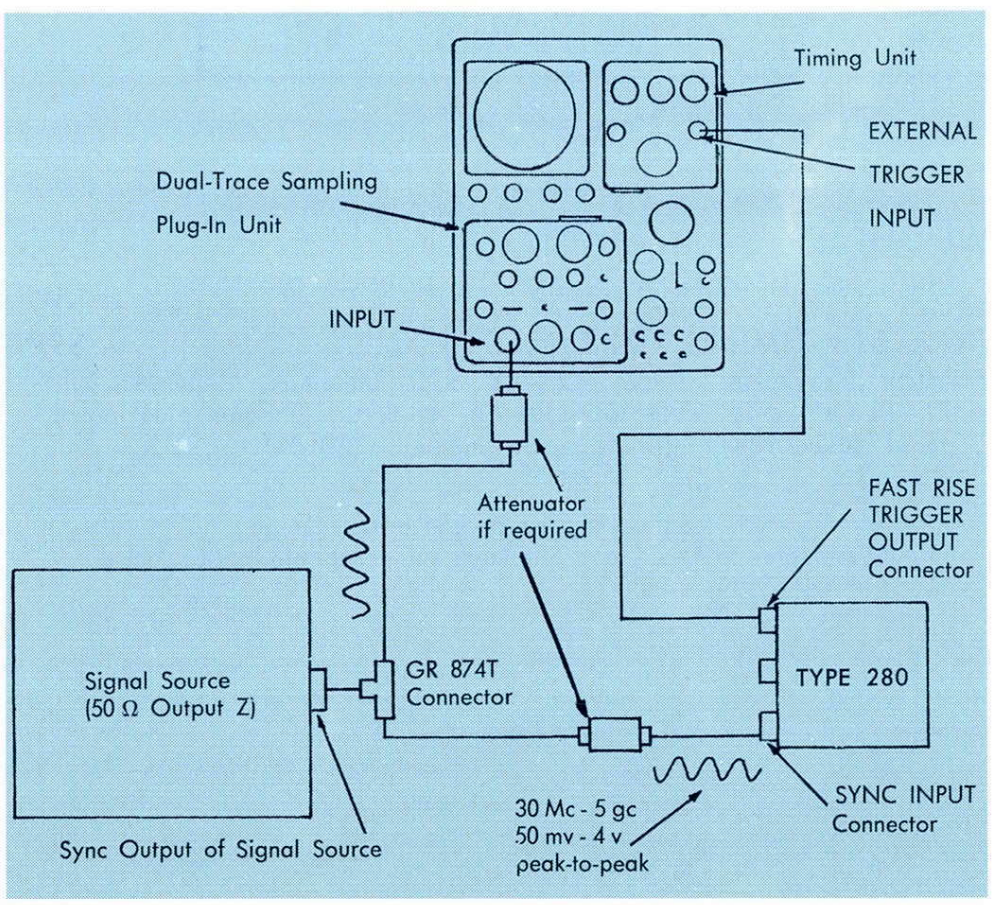
INPUT FREQUENCY is from 30 megacycles to 5 gigacycles.

INPUT SIGNAL VOLTAGE is 50 millivolts to 4 volts peak-to-peak.

INPUT IMPEDANCE is approximately 50 ohms.

OUTPUT REPETITION is continuously variable from 15 to 45 megacycles.

JITTER is 10 psec, or less than 1% of input signal period, whichever is larger.



Type 280 connected for use with Type 661 Oscilloscope.

TWO OUTPUTS—

LARGE AMPLITUDE TRIGGER OUTPUT is 1.5 volts, nominally 8-nsec long, with less than 4-nsec risetime, (for use with Type N Sampling Plug-In and high-speed conventional oscilloscopes).

FAST-RISE TRIGGER OUTPUT (terminated in 50 ohms) is 150 millivolts, with less than 0.4-nsec risetime, decaying with 2-nsec time constant, (for use with Type 1S1, 5T1, 5T1A, 3T4, or 3T77 and other high-speed sampling oscilloscopes).

AMPLITUDE OF TRIGGER OUTPUT as seen at input connector is approximately ±100 millivolts decaying with a 4-nsec time constant.

SHIELDING of the Type 280 is adequate to permit operation in areas that have significant rf radiation levels.

POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 800 cps, 10 watts.

MECHANICAL FEATURES include an aluminum-alloy chassis, die-cast aluminum-alloy top and bottom covers, and steel wrap-around housing. Overall dimensions are 7⅜" high by 7⅝" wide by 4⅝" deep. Net weight is 4½ pounds. Shipping weight is 9 pounds, approx.

TYPE 280 TRIGGER COUNTDOWN UNIT $265

Each instrument includes: 1—5-nsec cable (017-0512-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord, AC (161-0015-00); 2—Instruction Manual (070-0350-00).

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TRANSISTOR SWITCHING-TIME TESTER Type 290

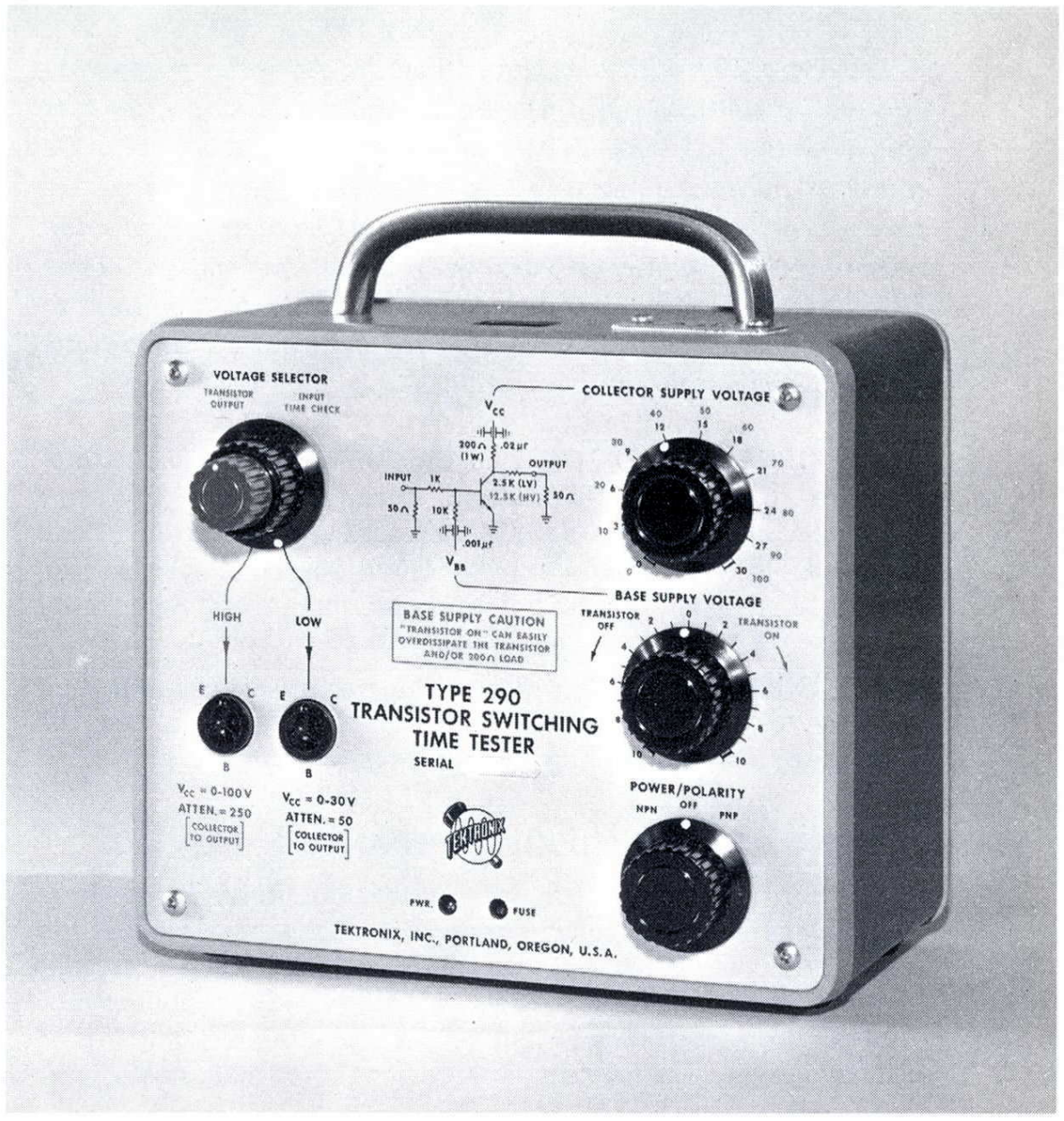
TESTS FAST-SWITCHING TRANSISTORS

RESPONSE TO LESS THAN 1 NSEC

WIDE RANGE OF TEST VOLTAGES

The Tektronix Type 290 Transistor Switching-Time Tester permits dc-coupled pulse-response characteristics of fast-switching transistors to be observed and measured on Tektronix oscilloscopes. Driven by a Tektronix fast-rise pulse generator and combined with a Tektronix fast-rise sampling oscilloscope, the Type 290 becomes an integral part of a transistor testing system with an over-all transient response of less than 1 nanosecond. (When a non-sampling oscilloscope is used, transient response is limited by the risetime of the oscilloscope.) This system can test fast NPN or PNP transistors on a short duty-cycle basis for delay, rise, storage, and fall times. Since these characteristics vary considerably with operating conditions, the Type 290 supplies a wide range of operating voltages.

The Type 290 does not use speedup capacitors or catching diodes. Use of these capacitors and diodes tends to test a circuit rather than a transistor.



TWO TRANSISTOR TEST SOCKETS (HIGH and LOW) are mounted on the Type 290 to provide for easy insertion of the transistor into grounded-emitter test circuit. The HIGH socket connects to a collector supply of 0-100 v and the LOW to a collector supply of 0-30 v.

INPUT SIGNALS from the pulse generator go to the base of the transistor under test. For each volt of the input pulse in excess of V_{be} there is 1 ma base current.

The input signal is attenuated 50-to-1 and appears at the Type 290 INPUT MONITOR connector. A similar input signal can be switched to the OUTPUT connector.

OUTPUT SIGNALS originate at the transistor collector and appear at the Type 290 OUTPUT connector. The collector circuit provides a resistive load of 200 ohms monitored by an internal dc-coupled passive probe. A transistor in the HIGH test socket has a passive probe output attenuation of 250-to-1 from the collector to the OUTPUT connector. A transistor in the LOW socket has an attenuation of 50-to-1 from the collector to the OUTPUT connector.

SIGNAL TRANSIT TIMES in the Type 290 are matched so the input pulse is compared to the transistor collector signal on a dual-trace oscilloscope using one trace attached to the INPUT MONITOR connector and the other attached to the OUTPUT connector. To compare the two signals on a single-trace oscilloscope, the trace is attached to the OUTPUT connector and the signals are switched with a front panel control.

LEAD LENGTH of the transistor test, up to approximately 2 inches, is unimportant at speeds slower than 2 nsec.

CONNECTORS are terminated in 50 ohms.

REGULATED SUPPLIES provide the collector and base voltage. Collector voltage is continuously variable from zero to 30 volts in the LOW position and from zero to 100 volts in the HIGH position. Base supply voltage is continuously variable from zero to ± 10 volts.

POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 800 cps, 15 watts.

MECHANICAL FEATURES include dimensions of 7 3/8" high by 7 5/8" wide by 5" deep. Net weight is 6 pounds. Shipping weight is 9 pounds, approx.

TYPE 290 TRANSISTOR SWITCHING-TIME TESTER . . $290

Each instrument includes: 1—10-nsec cable (017-0501-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0015-00); 2—Instruction Manual (070-0285-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 291 DIODE SWITCHING-TIME TESTER

The Type 291 with associated Test Jig Adapter in conjunction with a suitable pulse generator and oscilloscope, permits measurement of fast-switching diode characteristics. Dc coupling permits direct reading of forward and reverse recovery current on the oscilloscope crt screen. Since the switching characteristics vary with diode current, the Type 291 Power Supply provides a range of dc test current to 100 milliamperes—with provision for external current supply to 500 milliamperes.

THE PULSE GENERATOR used should have a fast rise output; such as the Type 109. Pulse risetime should be short compared to the diode reverse-recovery time expected. Pulse width should be longer than the diode reverse-recovery time. Amplitude is called out in the diode test specifications but should not exceed half the diode-breakdown voltage.

THE OSCILLOSCOPE used should have a risetime faster than the expected reverse-recovery time, such as either the 560-Series, or Type 661 with sampling plug-in units, or 1S1 in 530-540-550 Series.

DIODE RECOVERY LOOP IMPEDANCE is 100 ohms.

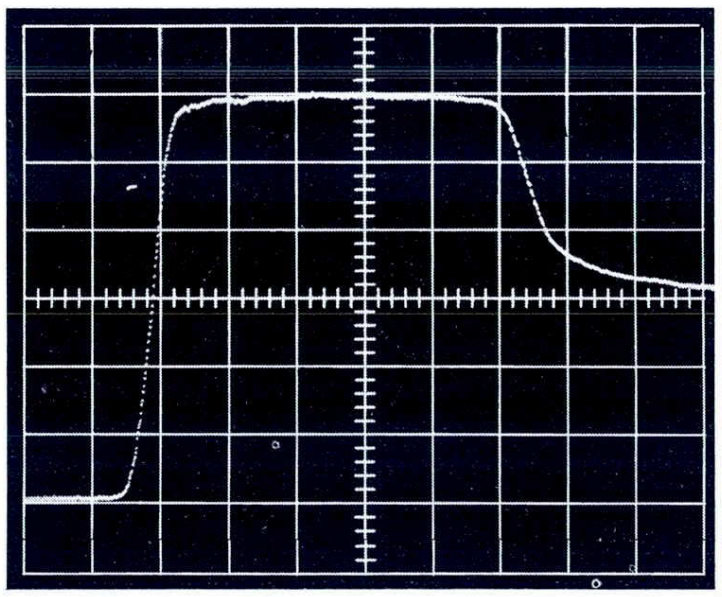
SUPPLY CURRENT is provided in seven calibrated steps from 1 milliampere to 100 milliamperes 1-2-5 sequence. Calibration accuracy is within ± 2% for all steps except the 100-milliamperes step, which is ± 3%. Uncalibrated, continuous adjustment from less than 1 milliampere to 100 milliamperes is also available. The current may be monitored externally.

POWER REQUIREMENT is 105 to 125 v or 210 v to 250 v, 50 to 400 cps, 6 watts.

MECHANICAL FEATURES include dimensions of 4 11/16" high by 6 9/16" wide by 8 1/8" deep. Net weight is 6 pounds. Shipping weight is 9 pounds, approx.

TYPE 291 DIODE SWITCHING-TIME TESTER POWER SUPPLY (without test fixture) $185

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0015-00); 2—Instruction Manual (070-0361-00).

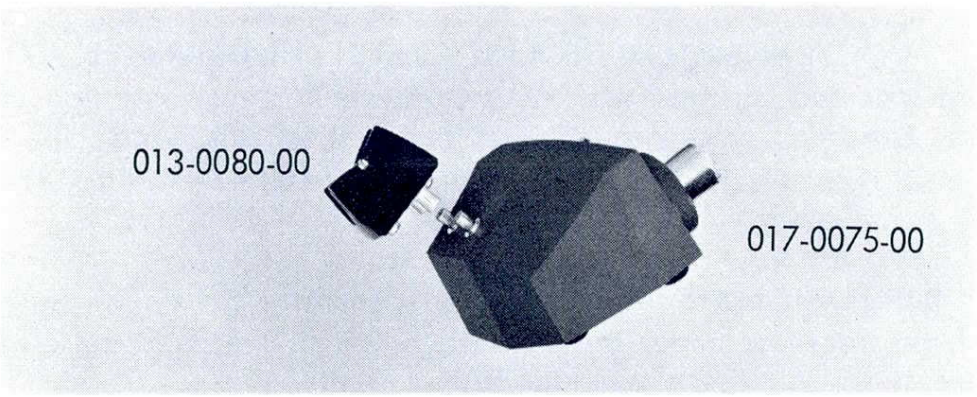


Horizontal — 1 nsec/div Vertical — 10 ma/div

Diode Reverse Recovery Waveform

In this diode-recovery waveform (displayed on a Tektronix Type 661 Sampling Oscilloscope), the diode shows a stored charge of approximately 6 picocoulombs per milliampere. Note the freedom from ringing and overshoot of the recovery waveform, owing to strip-line testing environment of the Diode Switching-Time Tester.

DIODE TEST JIG AND ADAPTER



The Diode Test Jig and Adapter provide for easy and rapid testing of diodes with the Type 291. The Jig-Adapter combination is matched to a 50-ohm line. Risetime response with the Type 291 is less than 0.35 nanosecond and less than 2% ringing is introduced in a 0.35 nanosecond system. Contact-to-contact capacitance is less than 0.004 pf.

V-shaped field-replaceable contacts with a life expectancy of 10 million insertions assure electrical continuity during a test.

Approximate weights are: Test Jig—2 ounces net, 4 ounces shipping; Adapter—10 ounces net, 1 1/2 pounds shipping; Adapter and Jig—12 ounces net; 1 pound, 11 ounces shipping.

Approximate dimensions are: Test Jig—1 1/2" high by 1 1/4" wide by 1 1/4" deep; Adapter—2" high by 5" wide and 3 1/2" deep.

DIODE TEST JIG (Part Number 013-0080-00) $40

ADAPTER (Part Number 017-0075-00) $55

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

PRINTED IN U.S.A.

SEMICONDUCTOR TESTER POWER SUPPLY Type 292

Type 292, with a test fixture, furnishes dc power and provides sub-nanosecond environment for reading out time and charge information about fast semiconductor diodes and transistors. A Type 292 is used between a sub-nanosecond pulse generator and the 50-Ω input of a sampling oscilloscope. Two variable electronically-regulated power supplies, TEST VOLTS and BIAS CURRENT, are electrically connected through a supporting platform to the test fixture in use. Polarity of either power supply can be inverted from the front panel; both supplies are short-circuit and open-circuit protected.

A general-purpose unwired plug-in transistor test fixture is shipped with each Type 292. The fixture consists of an etched-circuit board with a transistor socket mounted in the center. Signal connections to the fixture are made through coaxial connectors mounted on the circuit board. A number of isolated tie points are provided on the test fixture board to facilitate wiring of experimental circuits.

Banana-pin jacks at the rear of the Type 292 can be used for two purposes:

1. *Monitoring either the internal TEST VOLTS or BIAS CURRENT supply, or*
2. *Connecting external sources of current and voltage to the test fixture in use.*

Leads from the banana-pin jacks to the test fixture limit externally-supplied currents to 1 ampere or less.

TEST VOLTS POWER SUPPLY supplies fixed dc voltages of 1, 2, 5, 10 and 20 volts, accuracy within ±3% when the variable control is fully clockwise. An uncalibrated variable control allows the voltage of a fixed step to be divided by any factor between 1 and at least 10. Ripple voltage (either polarity) is equal to, or less than, 4 mv pk-to-pk at any voltage, over a current range of 0-200 ma, for line voltages from 105 to 125 v ac, or 230 to 250 v ac. Maximum short-circuit current is about 400 ma on all ranges.

BIAS CURRENT POWER SUPPLY supplies fixed dc currents in 11 calibrated steps from 0.1 ma to 200 ma, 1-2-5 sequence, accuracy within ±3% when the variable control is fully clockwise. An uncalibrated variable control allows the current of a fixed step to be divided by any factor between 1 and at least 10. Ripple current (either polarity), listed below, applies for any current from about 2 μa to 200 ma, for line voltages from 105 to 125 v ac or 230 to 250 v ac, providing the load on the current supply limits the output voltages to less than 20 volts.

RANGE	RIPPLE
0.1 to 20 ma	less than 5 μa
50 ma	less than 10 μa
100 ma	less than 20 μa
200 ma	less than 100 μa

POWER REQUIREMENTS are from 105 v to 125 v or 210 v to 250 v, 50 to 60 cycles, 30 watts.

MECHANICAL SPECIFICATIONS include dimensions of 4⅝" high by 8" wide by 10" deep. Net weight is 6¼ pounds, approx. Shipping weight is 12 pounds, approx.

TYPE 292 SEMICONDUCTOR TESTER POWER SUPPLY $325

Each instrument includes: 1—Adapter, 3-wire (103-0013-00); 3—P6040 probe (010-0133-00); 1—transistor test fixture, unwired (016-0057-00); 1—Power cord (161-0015-00); 2—Instruction Manual (070-0410-00).

OPTIONAL TEST ACCESSORIES

TRANSISTOR TEST FIXTURE, UNWIRED, Part Number 016-0057-00 ..... $16

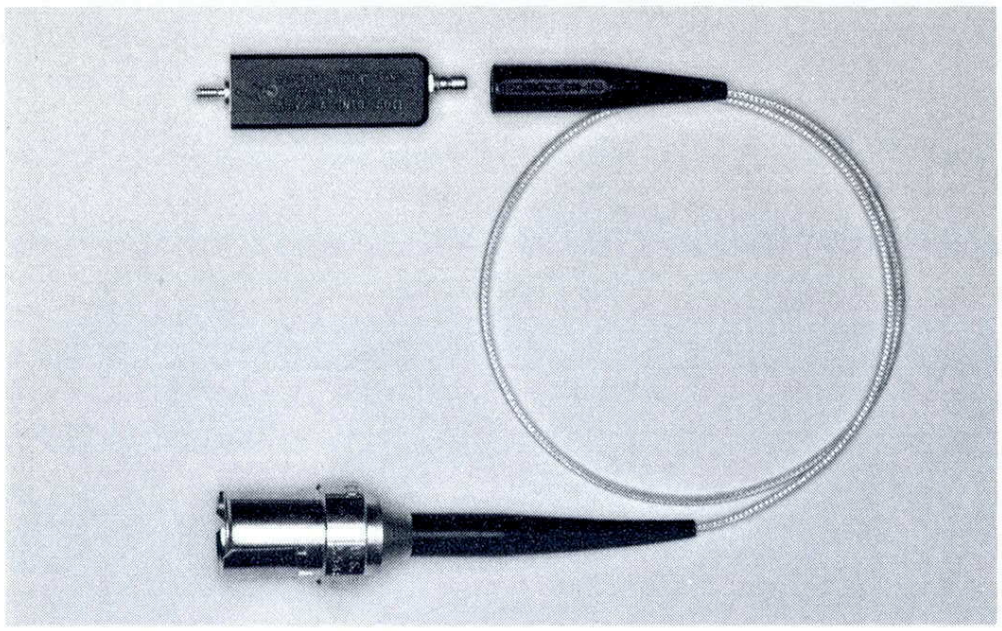
A special jig is available for testing axial-lead diodes. Contact-resistance problems are minimized by the use of V-shaped jig contacts.

An adapter will be required to mechanically support and electrically connect the diode test jig to the Type 292 platform.

Careful design of the jig and adapter provides high-quality 50-ohm coaxial connections to the diode leads.

TEST JIG ADAPTER, Part Number 016-0059-00 ..... $21
DIODE TEST JIG, Part Number 013-0080-00 ..... $40

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.



TYPE CT-1 CURRENT TRANSFORMER

The Type CT-1 Current Transformer provides for accurate measurement of current flow in a circuit, while keeping loading effects to a minimum. One or several Type CT-1 Transformers can monitor critical points in a circuit. One or more P6040 Probes can then be used to feed the resultant voltages to the oscilloscope.

Sensitivity is 5 mv/ma into a 50-ohm load, accuracy within 35 kc (low end) and 1 Gc (high end). Pulse response risetime is less than 0.35 nsec. Decay time constant is 5 μsec, approximated by 1% per 50 nsec, limit 1 μsec. Maximum voltage is 1000 v, dc. Current ratings are 500 ma maximum RMS, 100 amp peak pulse (1 amp microsecond).

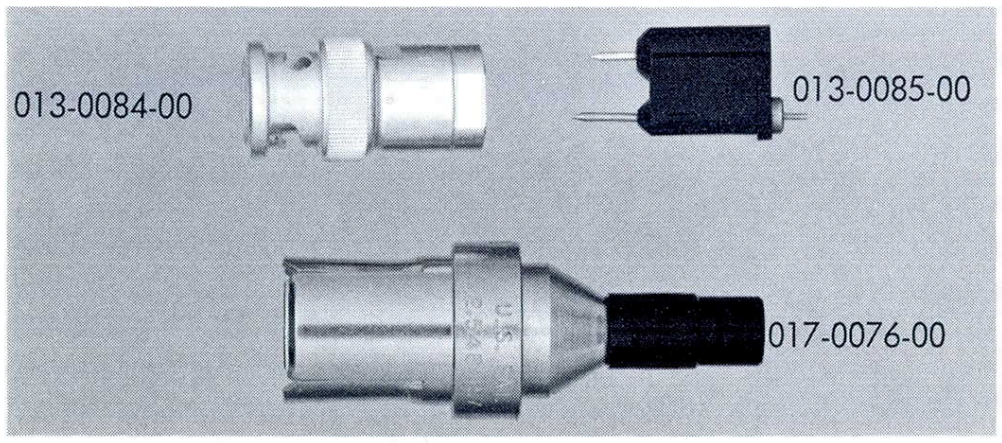
Order Part Number 015-0040-00 ..... $17

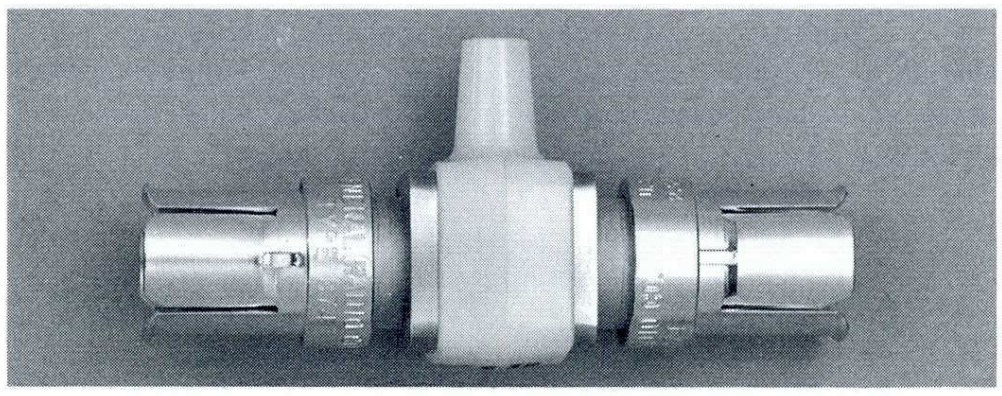
TYPE P6040 PROBE

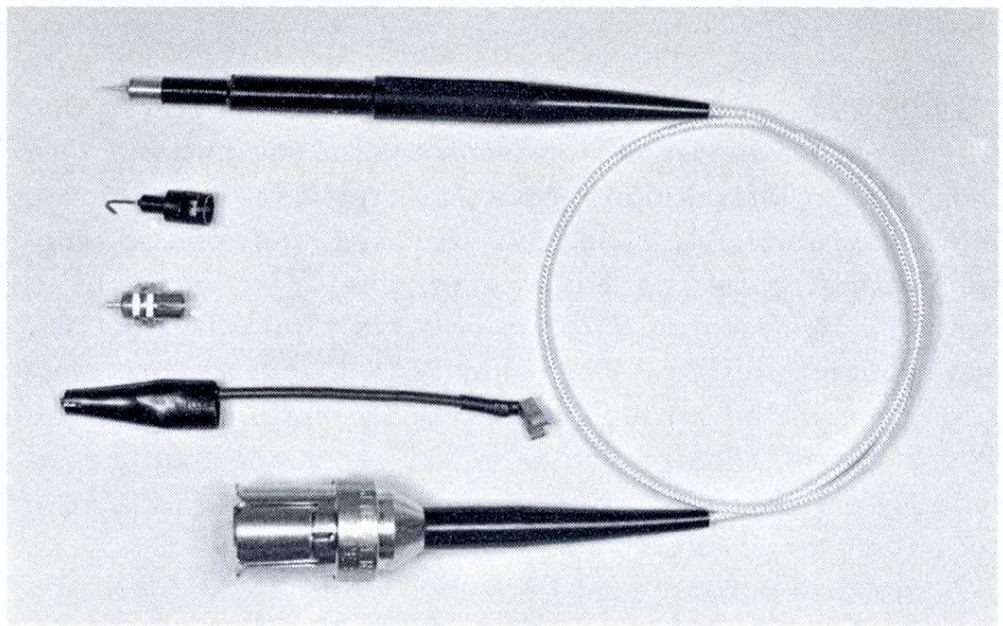
The Type P6040 is used as an inter-connecting cable for the Type CT-1 Transformer or other monitoring points using Amphenol series 27 Sub-Minax or Selectro Sub-Miniature RF connectors. The plug-on feature provides a quick means of connection to the CT-1. The 18"cable terminates in a GR type connector.

Type P6040 Probe (Order Part No. 010-0133-00) $14

Type CT-1 and P6040 (Order Part No. 015-0041-00) $31







MINIATURE PASSIVE PROBES

for use with 50 ohm systems

TYPE P6034—10X Attenuation

The Type P6034 provides accurate measurements of high-speed pulses. Input resistance is 500 ohms at dc and approximately 300 ohms at 1.0 gigacycle. Input capacitance is 0.7 pf $\pm$ 0.1 pf at 1.0 Mc to 1.0 gc. Risetime of the probe is less than 100 picoseconds. Maximum dc input, dc-coupled, is 16 v and ac-coupled, is 500 v. Ringing and overshoot is 2% or less on pulses from 25-ohm or more source. Peak-to-peak voltage derating is necessary for CW sine waves higher than 800 Mc.
Order Part Number 010-0110-00 ..... $35

TYPE P6035—100X Attenuation

The Type P6035 provides accurate measurements of high-speed pulses. Input resistance is 5000 ohms at dc and approximately 1500 ohms at 1.0 gigacycle. Input capacitance is 0.6 pf $\pm$ 0.1 pf at 1.0 Mc to 1.0 gc. Risetime of the probe is less than 200 picoseconds. Maximum dc input, dc-coupled, is 50 v and, ac-coupled, is 500 v. Ringing and overshoot is 2% or less on pulses from 25-ohm or more source. Peak-to-peak voltage derating is necessary for CW sine waves higher than 500 Mc.
Order Part Number 010-0111-00 ..... $35

PROBE NOSE ADAPTERS

P6034, P6035, P6038 Probe Nose to BNC connector, Part Number 013-0084-00 ..... $3.00

P6034, P6035, P6038 Probe Nose to GR connector, Part Number 017-0076-00 ..... $4.50

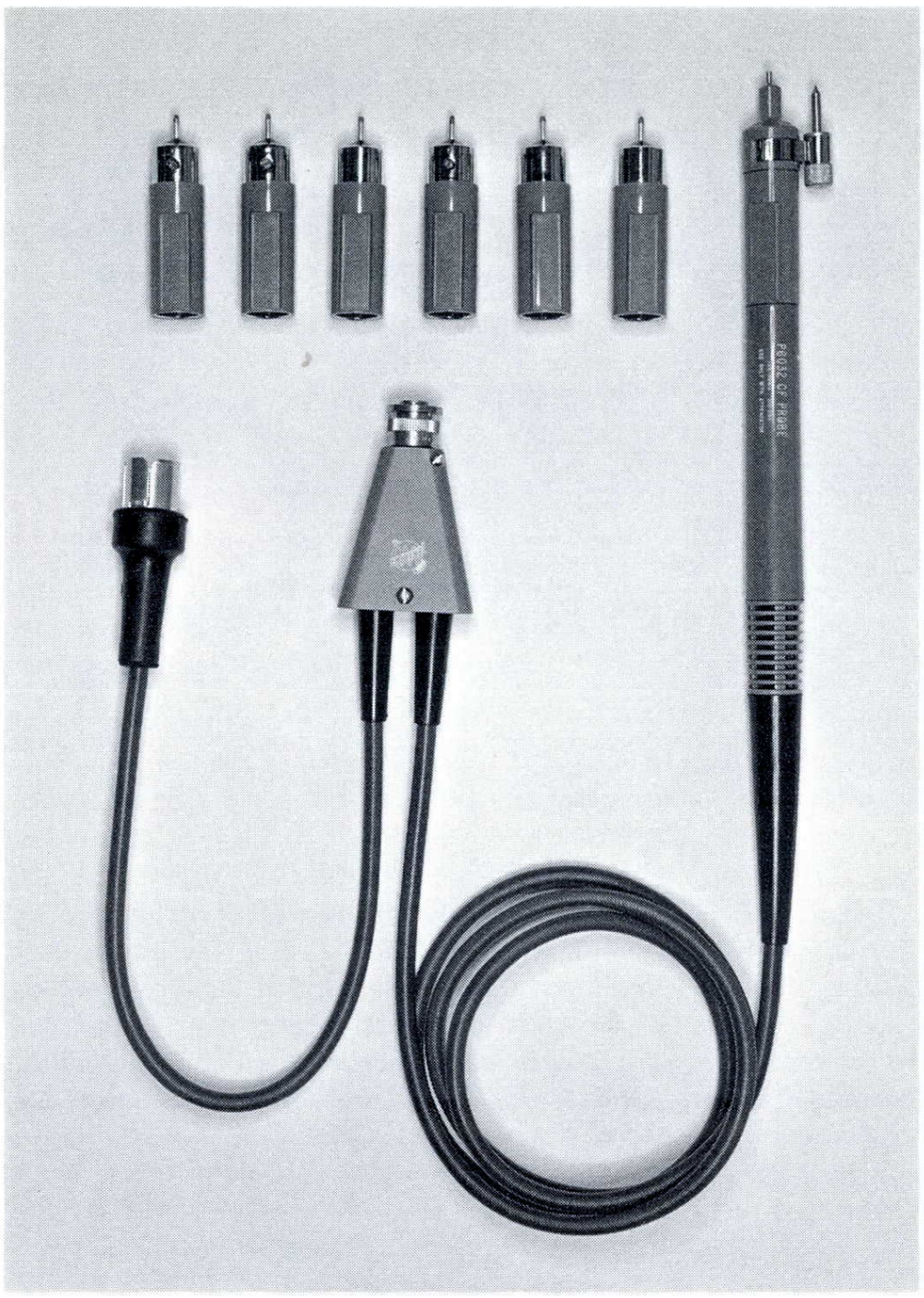
P6034, P6035, P6038 Probe Nose bayonet ground assembly, Part Number 013-0085-00 ..... $2.50

VOLTAGE PICKOFF

The VP-1 and VP-2 are 50-ohm "T" type voltage pickoffs for use with Tektronix probes while introducing minimum disturbance of the system characteristics. The in-line portion is fitted with GR connectors and the plastic center collar forms the receptacle for the probe tip. The VP-1 fits the P6034 and P6035 probes, while the VP-2 fits the P6038 probe.

VP-1—Order Part Number 017-0073-00 ..... $25

VP-2—Order Part Number 017-0077-00 ..... $30



CATHODE-FOLLOWER PROBE

for use with Type 4S1, 4S2 or 3S76 Plug-In Units

Type P6032—10X to 1000X Attenuation

Attenuator Head	Max. Input Voltage*	Input Capacitance at DC (±10%)	Input Resistance at DC (±2%)
10X	±1.5 v	3.6 pf	10 meg
20X	±3.0 v	2.6 pf	10 meg
50X	±7.5 v	1.8 pf	10 meg
100X	±15 v	1.5 pf	10 meg
200X	±30 v	1.4 pf	10 meg
500X	±75 v**	1.3 pf	10 meg
1000X	±150 v**	1.3 pf	10 meg

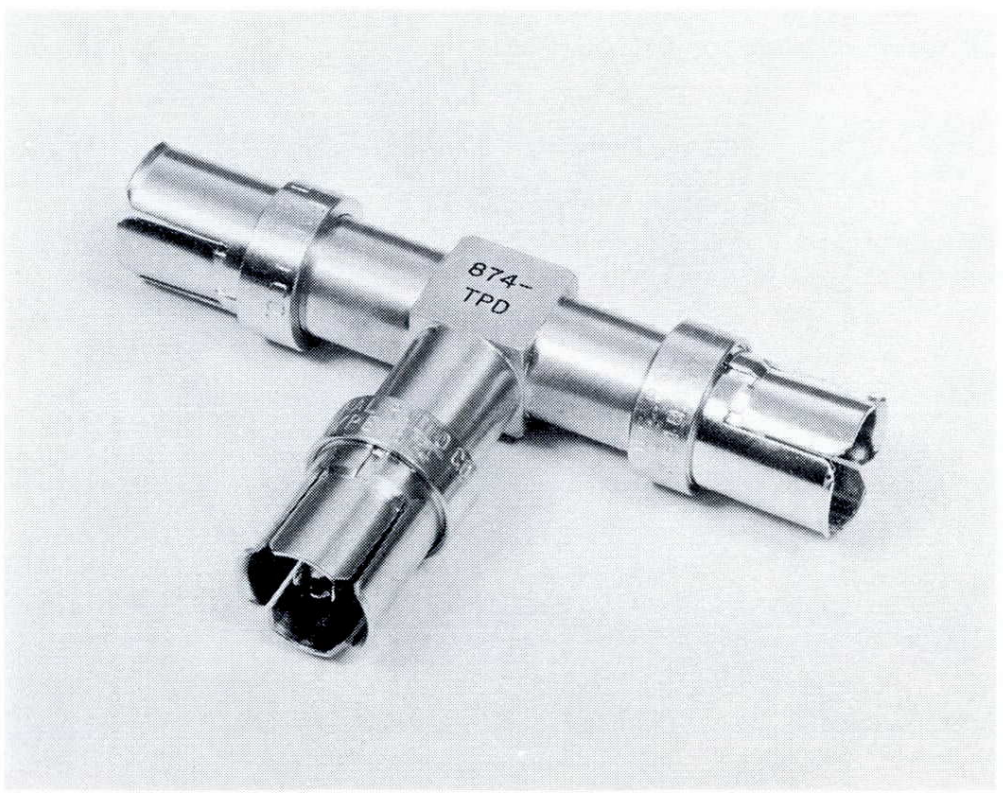
Attenuator Head	Max. Input Voltage (peak-to-peak) (at 100% duty factor)			
	500 Mc	750 Mc	1000 Mc	1250 Mc
500X	150 v	150 v	150 v	125 v
1000X	300 v	200 v	150 v	125 v

* Limited by linearity of cathode follower. This value may be exceeded by more than 50% for pulses without damage to probe components.

** Must be derated for continuous-wave use. Peak-to-peak voltage derating is necessary with CW sine waves higher than 500 Mc for the 1000X attenuator head and 1000 Mc for the 500X attenuator head.

The Type P6032 with a bandwidth greater than 800 Mc, provides accurate measurements of high-speed repetitive pulses. The dc-coupled probe uses 7 plug-in attenuator heads. Risetime is typically 0.4 nsec for probe and attenuator head. Maximum output is ± 150 mv into a 50-ohm load. Signal delay is approximately 10 nsec.

Order Part Number 010-0108-00 ..... $220



GENERAL RADIO 50-Ω POWER DIVIDER, TYPE 874-TPD

This divider is designed for use in broad-band 50-Ω systems where the mismatch introduced by ordinary "Tee" connectors is undesirable. It is especially useful in a time-domain reflectometer set-up where test line, pulser, and oscilloscope must be coupled with a minimum of reflection-producing discontinuities.

SPECIFICATIONS

FREQUENCY RANGE: 0-7 Gc.

VSWR: (At any port, when remaining ports are terminated in matched 50-ohm terminations) $1.0 + 0.05\, f_{Gc}$ to 7 Gc.

CHARACTERISTIC IMPEDANCE: 50 ohms, nominal (other two ports terminated in 50 ohms).

INSERTION LOSS: (Between any two ports, when remaining port is terminated in a matched 50-ohm termination) 6 db, X2 voltage atten., nominal. Dc Resistance: (At any port, when remaining ports are terminated in 50.00-ohm resistors) 50.00 +0.25 ohms.

INPUT POWER: 1 watt, CW.

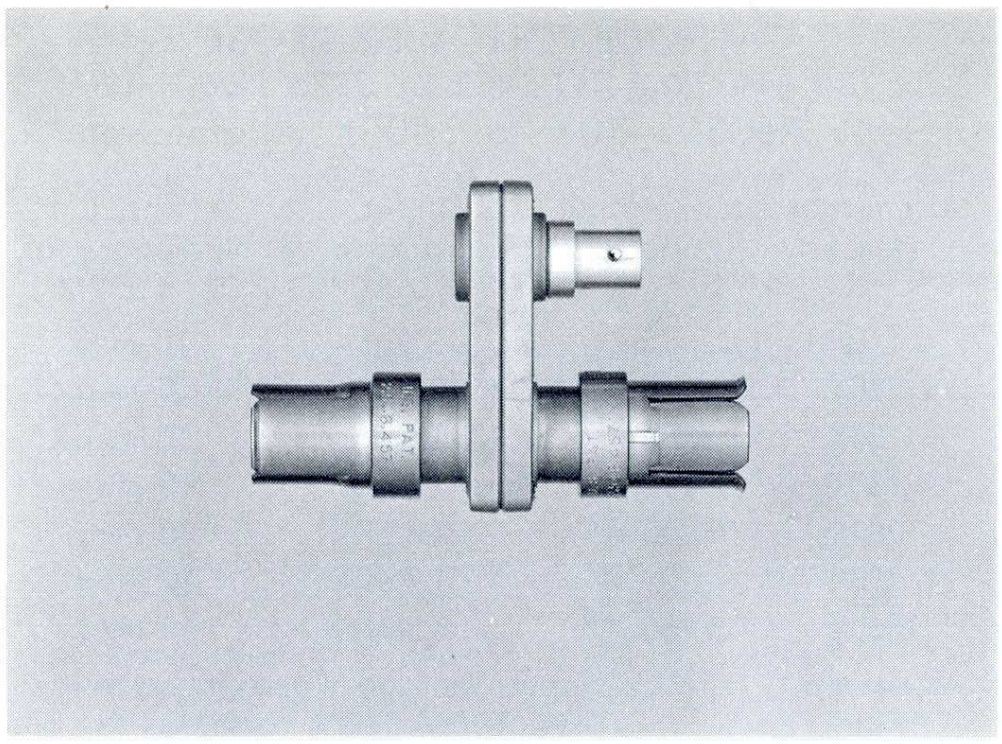
OUTPUT CHARACTERISTICS: (When driven from center port of "Tee" into matched 50-ohm loads).
Equality of output signals: Within 0.03 db.
Output levels below input level: 6 db, + 2 or — 0.05 db.
Phase difference between output signals: 0° nominal.

DIMENSIONS: Height—$2\frac{5}{16}$", width —4", depth—$1\frac{3}{16}$".

NET WEIGHT: 5 ounces

TYPE 874-TPD POWER DIVIDER
Order Part No. 017-0082-00 ..... $70.

SAMPLING ACCESSORIES



TYPE CT-3 50-OHM SIGNAL PICKOFF

Designed for use with high-frequency Oscilloscopes, the CT-3 Pickoff provides a convenient means of picking off a signal in a 50-ohm system. Used with any of the Tektronix Sampling Instruments, the CT-3 provides the link for use as a trigger source.

The CT-3 inductively meters the current in a circuit, developing a proportional output voltage. Used in a 50-ohm system, the output voltage of the CT-3 is 10% of the voltage at the center conductor.

SENSITIVITY is 10% of the voltage under test, into a 50-ohm load.

DECAY TIME CONSTANT is 4.5 μsec at 0 dc current.

RISETIME is less than 0.4 nsec.

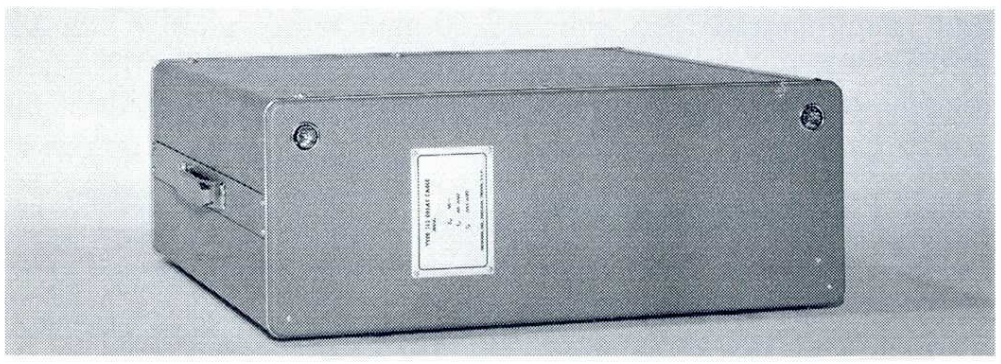
FREQUENCY RESPONSE is 50 kc to 875 Mc at 0 dc current.

INSERTION IMPEDANCE with a 50-ohm termination is 1 ohm shunted by 4.5 μh; 2 ohms shunted by 4.5 μh without a 50-ohm termination.

VSWR is less than 1.2 at 1.5 Gc.

VOLTAGE RATING at 0 v dc is 25 v RMS, 1 kv pulse pk. The volts-sec product is 100 v μsec. If exceeded, the L/R decay will decay rapidly toward zero.

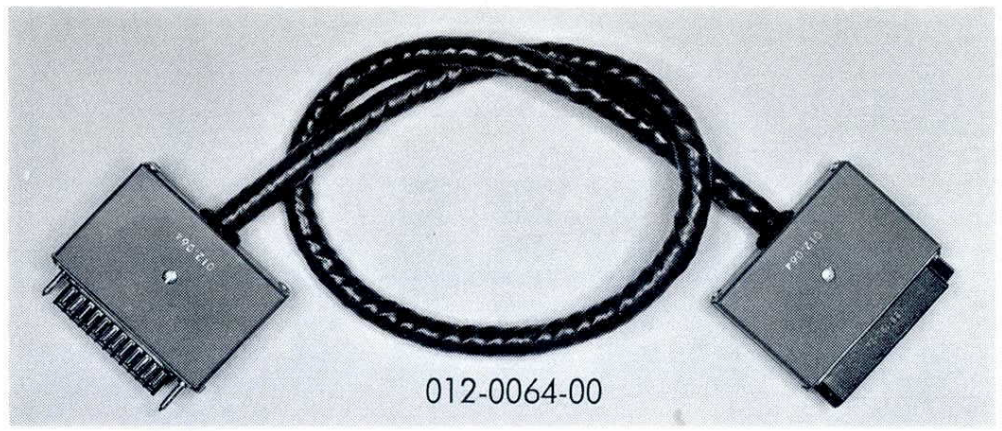
ORDER PART NUMBER 017-0061-00 ..... $30.00

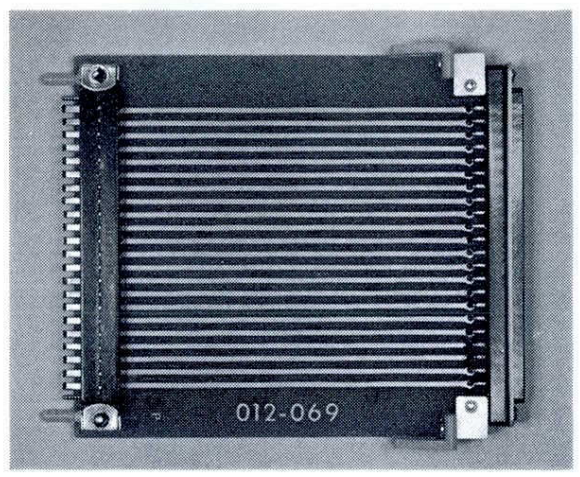


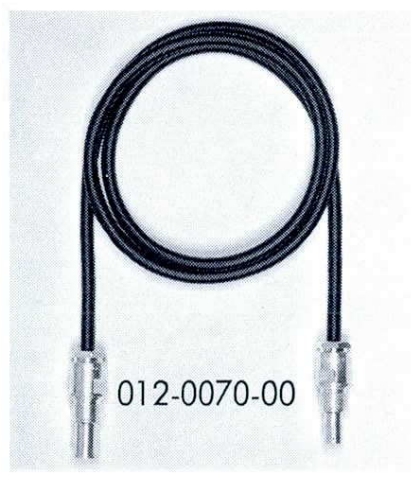
TYPE 113 DELAY CABLE

The Type 113 Delay Cable provides 60 nsec delay so trigger signals can arrive ahead of the vertical deflection signal. The Type 113 has a 0 to 50% risetime of about 0.0025 nsec, and 10 to 90% risetime of better than 0.1 nsec.

TYPE 113 DELAY CABLE $250







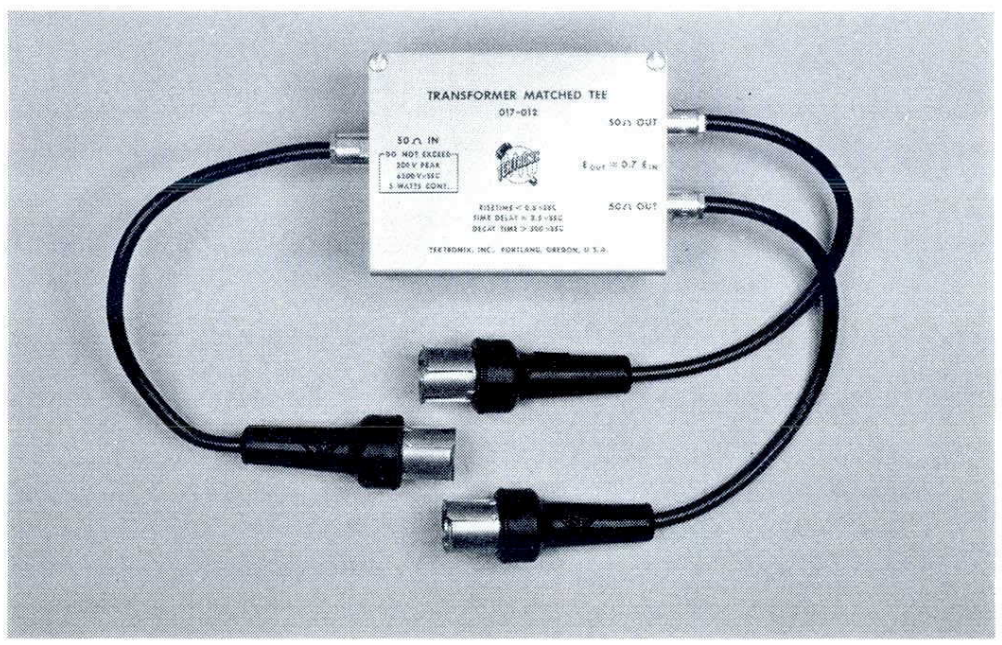
MAINTENANCE AIDS

These items are offered for the convenience of companies with in-plant instrument-maintenance facilities. If you intend performing your own maintenance, please include 2 plug-in extensions (one each for the dual-trace and timing units), 1 circuit-board extension, and 2 coaxial trigger cables with your initial instrument order. One set of 5 will usually be adequate for maintenance of several instruments.

Plug-In Extension for Dual-Trace and Timing Units
Order Part Number 012-0064-00 (24-pin extension) $23.00

Circuit-Board Extension for Dual-Trace Unit
Order Part Number 012-0069-00 (22-pin extension) $25.00

Coaxial Cable for Coupling Trigger Signals
Order Part Number 012-0070-00 ..... $10.50



TRANSFORMER MATCHED "T"

This unit provides two 50-ohm outputs from one 50-ohm input and divides the regenerated trigger for simultaneous triggering of two sampling-sweep systems.

Order Part Number 017-0012-00 ..... $45

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

WIDE-BAND HIGH-GAIN UNIT Type B

Sensitivity

AC-Coupled Only—0.005 v/cm to 0.05 v/cm.
AC or DC-Coupled—0.05 v/cm to 50 v/cm.
Calibrated—0.005 v/cm to 20 v/cm.
Continuously Variable—0.005 v/cm to 50 v/cm.

Frequency Response and Risetime (0.05 to 20 v/cm)

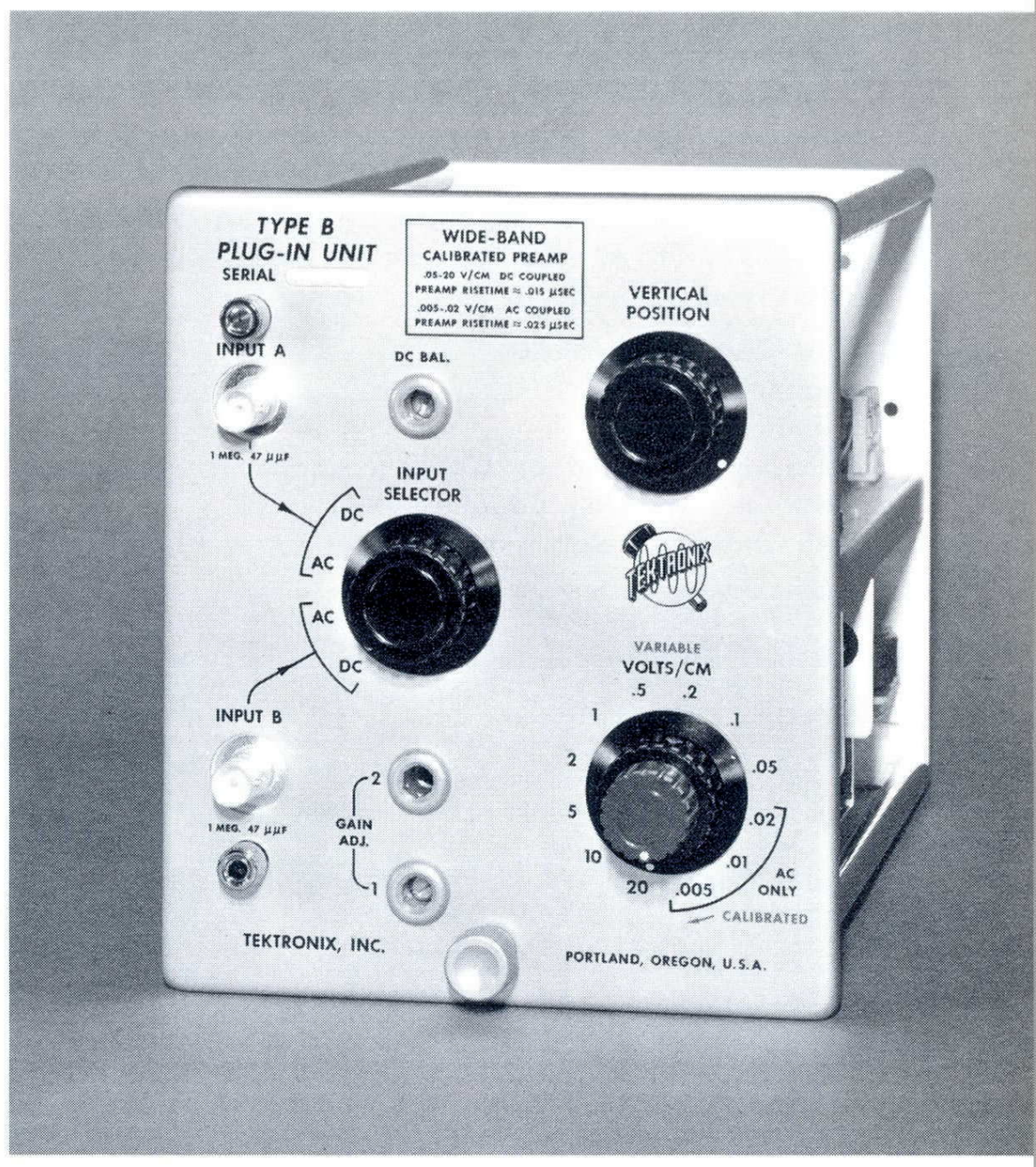
Frequency specifications are at 3-db down

With Types 531A, 533A, 535A—dc to 14 mc, 25 nsec.
With Types 536—dc to 10 mc, 35 nsec.
With Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—dc to 20 Mc, 18 nsec.
With Type 551—dc to 18 mc, 20 nsec.

Frequency Response and Risetime (0.005 to 0.05 v/cm)

Frequency specifications are at 3-db down

With Types 531A, 533A, 535A—2 cycles to 10 mc, 35 nsec.
With Type 536—2 cycles to 9 mc, 40 nsec.
With Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—2 cycles to 12 mc, 30 nsec.
With Type 551—2 cycles to 12 mc, 30 nsec.



The Type B Plug-In Preamplifier meets the requirements of many wide-band applications. Wide passband, excellent transient response, dc-coupling, and calibrated sensitivity are qualities most users require in an oscilloscope vertical amplifier. The Type B gives all of these qualities to Tektronix Type 530, 540, 550 and 580* Series Oscilloscopes.

CHARACTERISTICS

Calibrated Sensitivity—The vertical attenuator is calibrated in VOLTS/CM of deflection. Twelve calibrated steps are provided: 0.005, 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10 and 20 v/cm. In addition, a vernier (uncalibrated) control provides for continuously-variable adjustment from 0.005 v/cm to 50 v/cm.

* A Type 81 Adapter is required.

Calibration Accuracy—Two adjustments are provided for setting the gain of the unit. When these adjustments are accurately set with the VOLTS/CM switch in the 0.05 v/cm and 0.005 v/cm positions, the sensitivity at any other position of the switch will be within 3% of the panel for that position.

Signal Inputs—Two signal input connectors with more than 60-db isolation are controlled by a four-position switch. The INPUT SELECTOR provides for ac-coupling or dc-coupling through either input. When ac coupled, the low-frequency 3-db point is 2 cps direct or 0.2 cps with 10X Probe.

Input Impedance—1 megohm paralleled by approximately 47 pf.

Weight: Net—4 pounds
Shipping—6 pounds, approx.

TYPE B PLUG-IN UNIT $145
Each instrument includes: 2—instruction manuals (070-0219-00).

For low-capacitance accessory probes, please see the Catalog Acessory pages.

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type C-A DUAL-TRACE DC UNIT

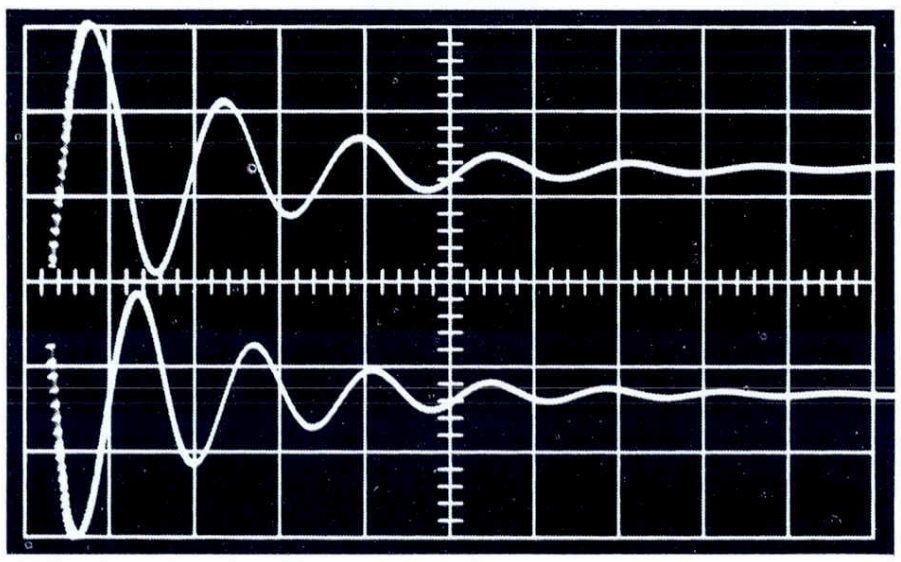
Frequency Response and Risetime

Frequency specifications are at 3-db down

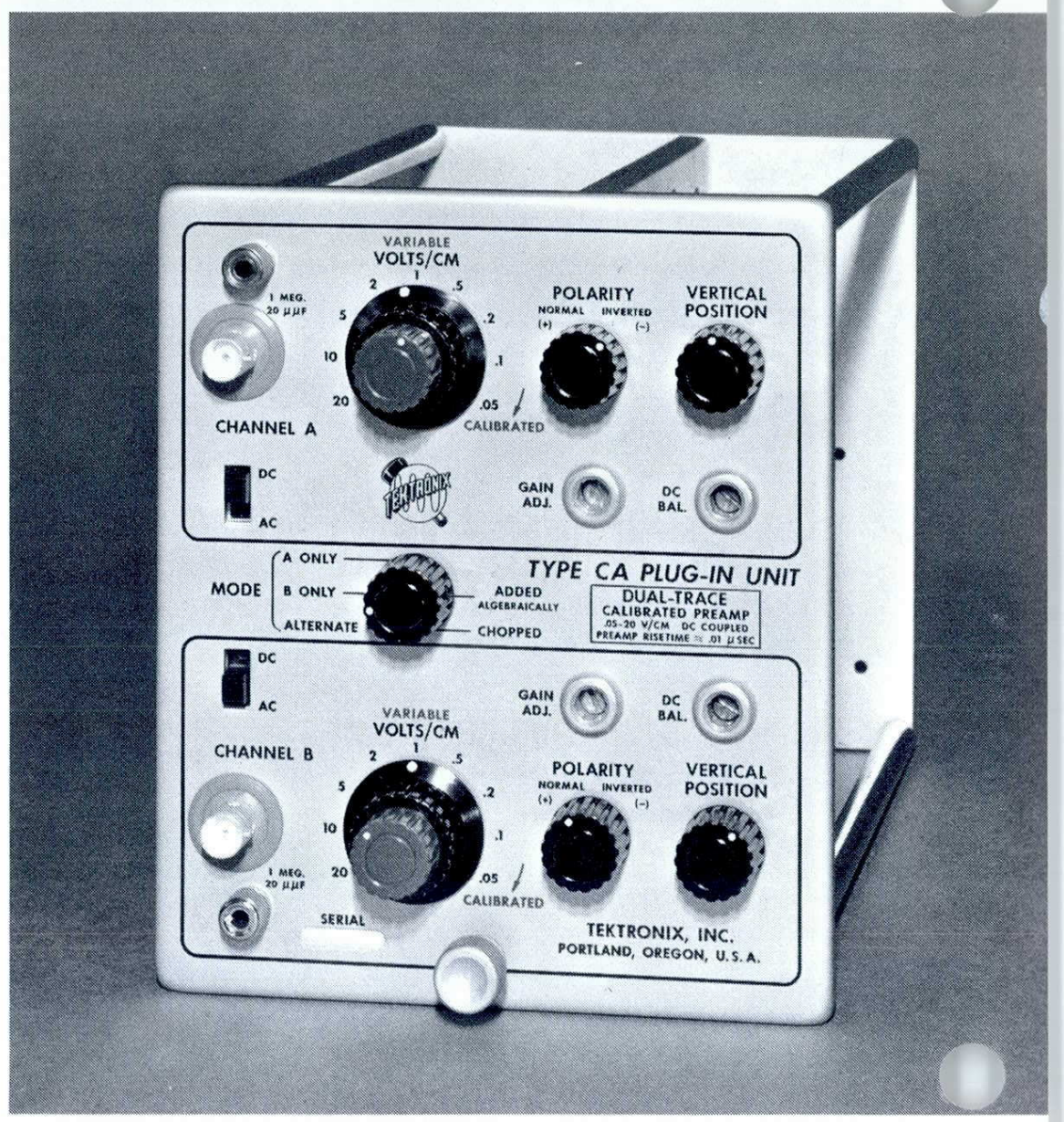
With Types 531A, 533A, 535A—dc to 13.5 mc, 26 nsec.
With Type 536—dc to 10 mc, 35 nsec.
With Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—dc to 24 mc, 15 nsec.
With Type 551—dc to 22 mc, 16 nsec.

Five Operating Modes

Channel A only.
Channel B only.
Electronic switching at 100 kc (chopped).
Electronic switching on alternate sweeps.
Both channels combined at output (A ± B).



TYPICAL DUAL-TRACE DISPLAY using Chopped Mode of Type C-A Unit. The waveform depicts a display of the response of two ringing circuits to the same pulse. In this mode, transients as small as 1 msec can be observed and measured readily.



The Tektronix Type C-A Unit contains two identical input channels. Either channel can be operated separately. The two channels can be electronically switched, either at a chopped rate of about 100 kc, or triggered by the oscilloscope sweep. In addition both channels can be combined at the output, adding or subtracting according to the settings of the polarity switches.

When operated A—B or B—A, common-mode rejection is at least 20 to 1 over the entire passband for signals up to 1-v amplitude. Rejection can be improved, especially at low frequencies, by adjusting the vernier attenuator controls and/or the GAIN ADJ. controls. Separate attenuator controls for each channel permit rejection of a common-mode signal of a different amplitude.

CHARACTERISTICS

Calibrated Sensitivity—The vertical attenuators are calibrated in VOLTS/CM of deflection. Nine calibrated steps are provided for each channel: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10 and 20 v/cm. In addition, vernier (uncalibrated) controls provide for continuously-variable adjustments from 0.05 v/cm to 50 v/cm.

Vertical Position Controls—Separate positioning controls are provided for each channel.

* A Type 81 Adapter is required.

Calibration Accuracy — Adjustments are provided for setting the gain of each channel. When accurately set, the sensitivity will be within 3% of the panel reading for all switch positions.

Operating Mode Selection—A five-position switch provides for electronic switch operation either triggered or chopped, separate use of either channel, and both channels combined at the output of the unit.

In chopped operation, successive 5-μsec segments of each channel are displayed at an approx. 100-kc rate per channel. Chopped transient blanking is provided, except when C-A Unit is used in the Type 536, 551, 581A, 585A Oscilloscopes.

AC-DC Switches—When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X Probe.

Polarity Inversion—Polarity can be inverted on either channel for comparisons of signals 180 degrees out of phase, and A—B or A+B mixing.

Input Impedance—1 megohm paralleled by approximately 20 pf.

Weight: Net—4 ¾ pounds
Shipping—9 pounds, approx.

TYPE C-A PLUG-IN UNIT $260

Each instrument includes: 2—instruction manuals (070-0318-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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HIGH-GAIN DC DIFFERENTIAL UNIT Type D

Sensitivity

Calibrated—1 mv/cm to 50 v/cm.

Continuously Variable—1 mv/cm to 125 v/cm.

Frequency Response

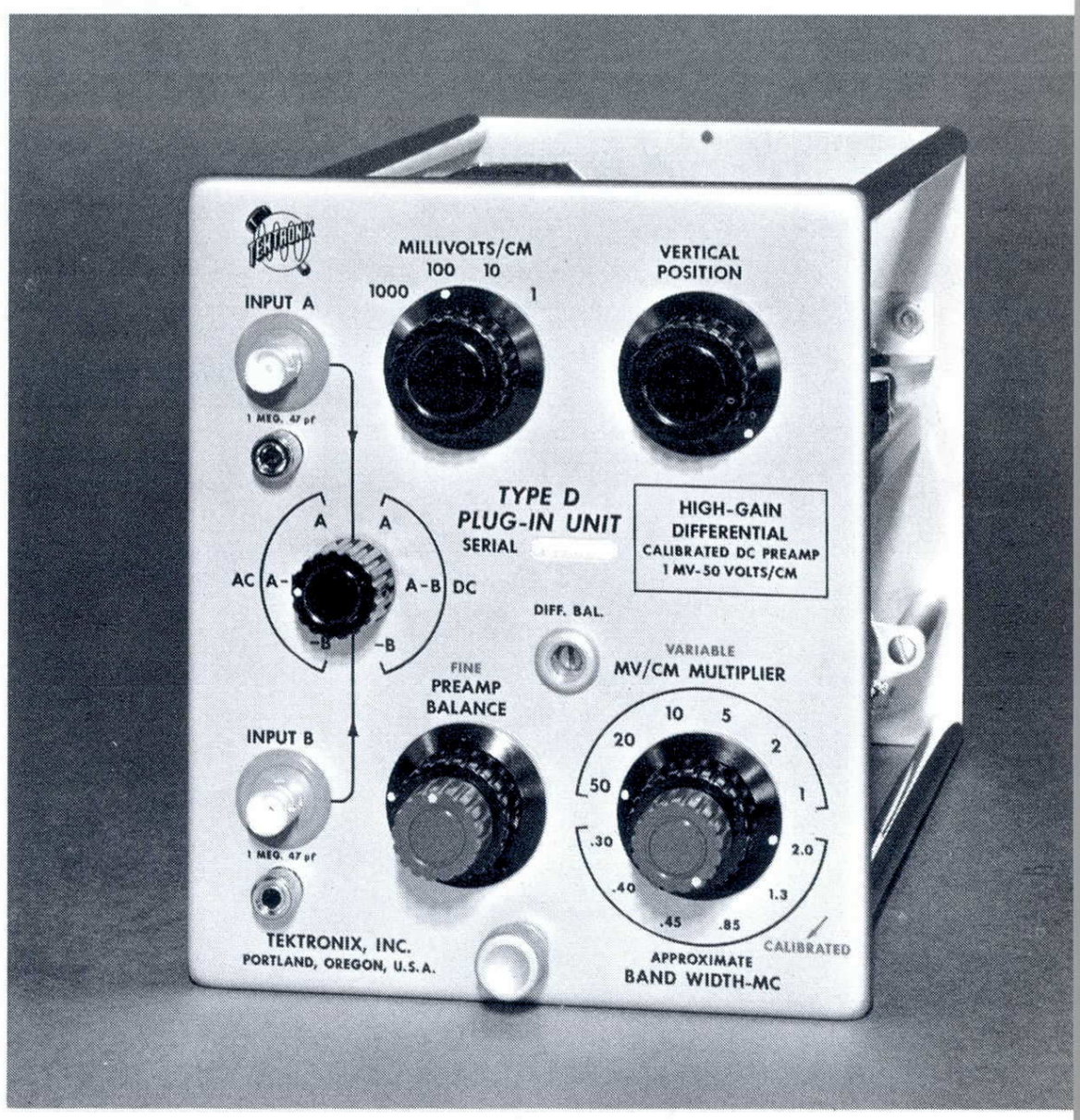
DC to 300 kc at 1 mv/cm sensitivity . . . increasing to DC to 2 mc at 50 mv/cm and lower sensitivity. Frequency specifications are at 3-db down.

Differential Input

10,000-to-1 common mode rejection ratio for in-phase signals.

Stability—Normal drift is from 2 to 5 mv/hr.

The Type D equips Tektronix Type 530, 540, 550 and 580 Series Oscilloscopes for work requiring dc-coupling at a sensitivity of 1 mv/cm. Differential input with high rejection ratio for in-phase signals permits cancellation of unwanted or interfering signals.*



Input Selector—A six-position switch provides for use of either input separately, or both together differentially, either ac-coupled or dc-coupled. When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X probe.

Differential Input—in the A-minus-B position of the input selector switch, the Type D operates as a differential amplifier whose output is proportional to the difference between signals applied to input A and input B. The differential feature is useful in making voltage measurements between two above-ground points, and for cancelling in-phase signals such as hum pickup in connecting leads. By careful adjustment of the differential-balance control, 10,000-to-1 rejection ratio for in-phase signals up to 20 kc can be achieved at all positions of the MV/CM MULTIPLIER switch. Common mode signal should not exceed 5 volts at the input grid. Thus, at 10 mv/cm and 100 mv/cm, it should not exceed 50 volts and 500 volts respectively.

Calibrated Sensitivity—The MILLIVOLTS/CM switch has four calibrated positions: 1, 10, 100, and 1000 mv/cm. A MV/CM MULTIPLIER switch provides for multiplication by 1, 2, 5, 10, 20, and 50. Approximate 3-db point of amplifier high frequency response for each position is also indicated by this switch. The MV/CM MULTIPLIER, by attenuating within the amplifier, reduces drift and increases bandpass in applications that require less than maximum sensitivity. A vernier (uncalibrated) control provides for continuously-variable adjustment from 1 mv/cm to 125 v/cm.

* A Type 81 Adapter is required.

Regulated Heater Voltage — Heaters of all electron tubes in the Type D are operated from the regulated dc voltage supplies in the main oscilloscope unit.

Calibration Accuracy—An adjustment is provided for setting the gain of the unit. When this adjustment is accurately set with the MILLIVOLTS/CM switch in the 1 mv/cm position and the MV/CM MULTIPLIER in the 50 mv/cm position, the sensitivity at any other position of the switches will be within 3% of the panel reading for that position.

Input Impedance—1 megohm paralleled by approximately 47 pf.

Weight: Net—4 ½ pounds
Shipping—8 pounds, approx.

TYPE D PLUG-IN UNIT $170
Each instrument includes: 2—instruction manuals (070-0228-00).

Variable Attenuation Probe

Type P6023 10X Probe compensates for normal attenuator differences between two channels. An adjustable potentiometer compensates the 10:1 attenuation ratio, and two adjustable capacitors compensate for input capacitances between 20 pf and 47 pf.
Order Part Number 010-0167-00 . . . . . $40

For other low-capacitance probes, please refer to the Catalog Accessory pages.

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type E LOW-LEVEL AC DIFFERENTIAL UNIT

Sensitivity

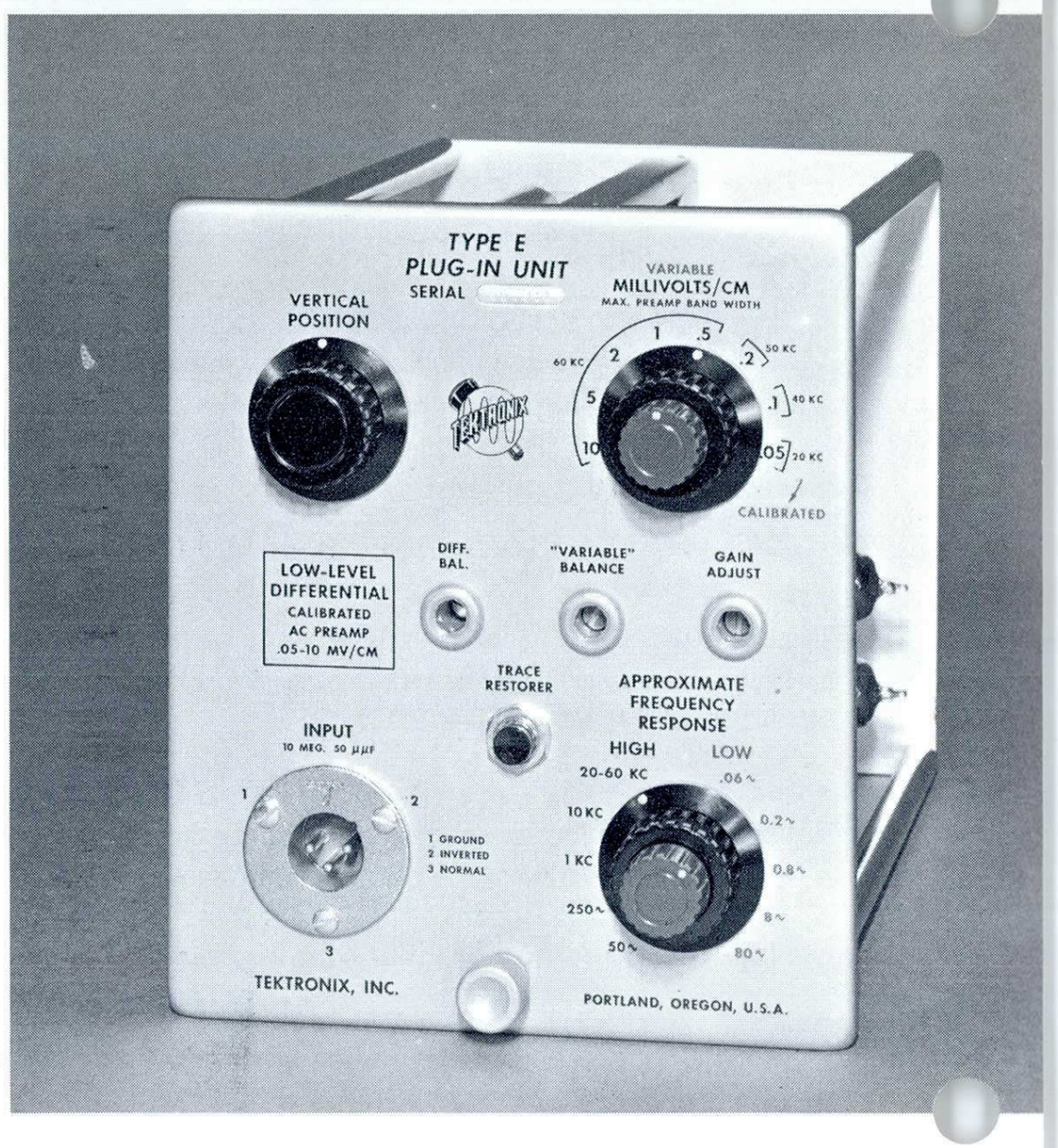
Calibrated—50 microvolts/cm to 10 millivolts/cm.
Continuously Variable—50 microvolts/cm to 25 millivolts/cm.

Frequency Response

0.06 cycles to 20 kc at full gain, increasing to 60 kc at 0.5 mv/cm. Frequency specifications are at 3 db down.

Differential Input

50,000-to-1 rejection ratio for in-phase signals up to 1 kc of ±2 v or less.



The Type E Plug-in Unit provides Tektronix Type 530, 540, 550 and 580* Series Oscilloscopes with a calibrated sensitivity of 50 microvolts/cm for low-level applications. Maximum combined noise and hum is 5 μv, rms, with input grids grounded at the input connector. Separate high-frequency and low-frequency response controls permit restricting the bandwidth to further increase the signal-to-noise ratio. A rejection ratio of 50,000 to 1 for in-phase 1-kc sine wave signals with amplitudes of 2 v pk-to-pk or less can be achieved by careful adjustment of the front-panel differential-balance control. Use of the internal attenuators has a negligible effect on the rejection figure.

CHARACTERISTICS

Calibrated Sensitivity—The vertical attenuator is calibrated in MILLIVOLTS/CM of deflection. Eight calibrated steps are provided: 0.05, 0.1, 0.2, 0.5, 1, 2, 5 and 10 millivolts/cm. In addition, a vernier (uncalibrated) control provides for continuously-variable adjustment from 50 microvolts/cm to 25 millivolts/cm.

Calibration Accuracy—An adjustment is provided for setting the gain of the unit. When this adjustment is accurately set with the MILLIVOLTS/CM switch in the 5 millivolts/cm position, the sensitivity at any other position of the switch will be within 3% of the panel reading for that position.

* A Type 81 Adapter is required.

Bandwidth Control—A five-position switch provides for approximate high-frequency 3-db points of 60, 10, and 1 kc; 250 and 50 cycles. Another five-position switch selects the approximate low-frequency 3-db points of 0.06, 0.2, 0.8, 8 and 80 cycles. Restricting the bandwidth to the requirements of the particular application will provide an increase in the signal-to-noise ratio. Input to grids is dc-coupled to provide good rejection at low frequencies.

Trace Restorer—If the trace should be driven from the screen by a large transient, it can be returned to its normal position immediately by pressing the trace restorer button.

Input Impedance—10 megohms paralleled by approximately 50 pf for single-ended applications and 20 megohms paralleled by approximately 50 pf for differential applications.

Weight: Net—4 ¼ pounds
Shipping—8 pounds, approx.

TYPE E PLUG-IN UNIT $190

Each instrument includes: 1—2-conductor cable (012-0022-00), 2—instruction manuals (070-0226-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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WIDE-BAND DC DIFFERENTIAL UNIT Type G

Common-mode Rejection
100 to 1 at full gain.

Sensitivity
Calibrated—0.05 v/cm to 20 v/cm.
Continuously Variable—0.05 v/cm to 50 v/cm.

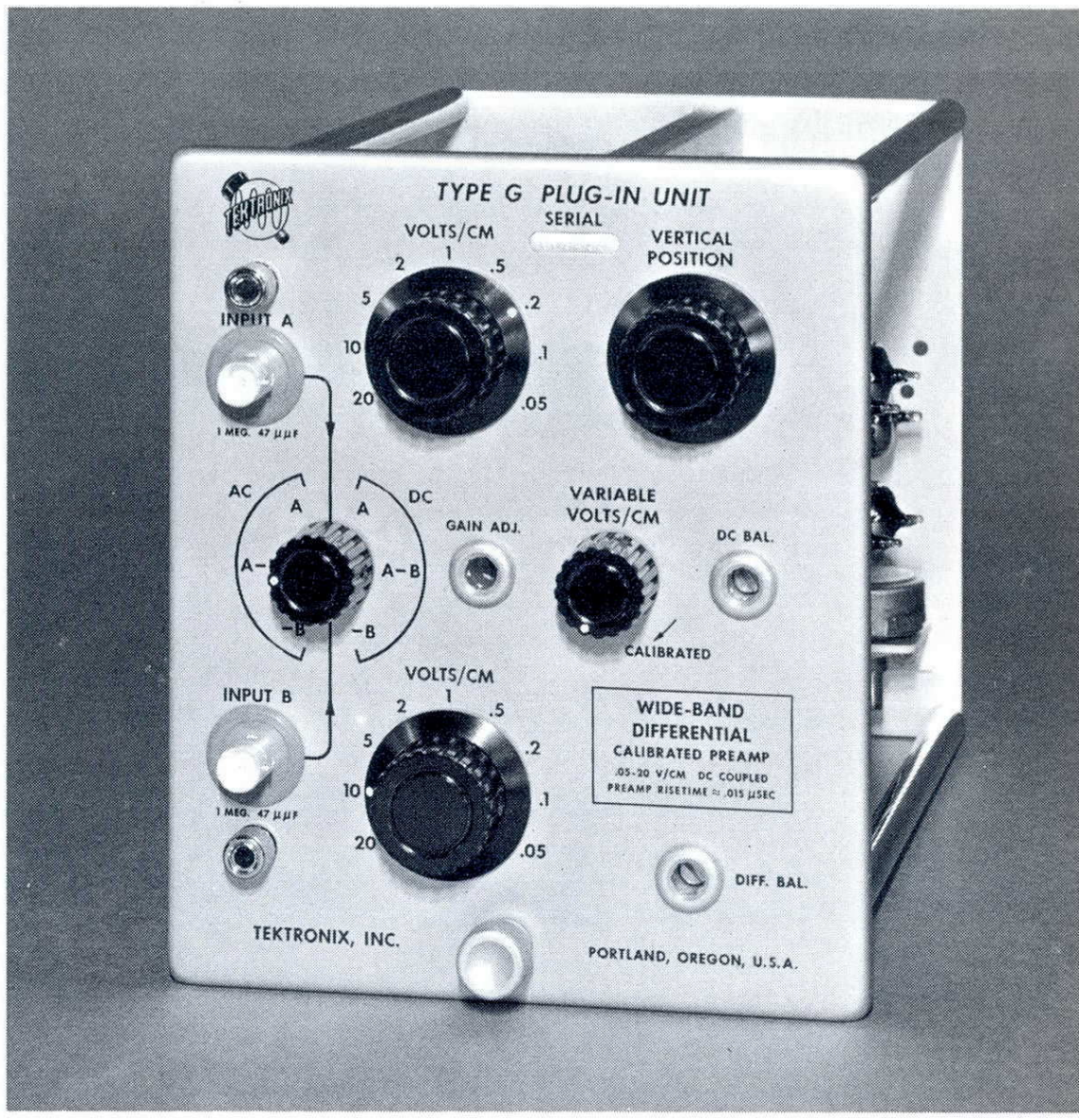
Frequency Response and Risetime
Frequency specifications are at 3-db down

With Types 531A, 533A, 535A—
dc to 14 mc, 25 nsec.

With Type 536 —
dc to 10 mc, 35 nsec.

With Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—dc to 20 mc, 18 nsec.

With Type 551 —
dc to 18 mc, 20 nsec.



The Type G Plug-In Unit equips Tektronix Type 530, 540, 550 and 580* Series Oscilloscopes for wideband differential-input applications. Common-mode rejection is better than 100 to 1 for the entire passband at full gain, better than 300 to 1 at 60 cycles. Maximum amplitude handling capability is 2 volts pk-to-pk between input grids. At 0.5 v/cm and 5 v/cm, the input signal should not exceed 20 volts and 200 volts respectively. Independent step attenuators in each input with 80-db isolation permit mixing signals of wide amplitude difference. Either input can be used separately, INPUT B giving a polarity-inverted display.

CHARACTERISTICS

Input-Selector—A six-position switch provides for use of either input separately, or both together differentially, either ac-coupled or dc-coupled. When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X Probe.

Calibrated Sensitivity—Each of the two attenuators has 9 calibrated positions: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10 and 20 v/cm. A variable attenuator fills in between steps making the adjustment continuously variable from 0.05 v/cm to 50 v/cm. The variable attenuator affects the gain of both inputs at the same time.

* A Type 81 Adapter is required.

Calibration Accuracy—An adjustment is provided for setting the gain of the unit. When this adjustment is accurately set with the VOLTS/CM switch in the 0.05 v/cm position, the sensitivity at any other position of the switch will be within 3% of the panel reading for that position.

Input Impedance—1 megohm paralleled by approximately 47 pf.

Weight: Net—4 ¼ pounds.
Shipping—6 pounds approx.

TYPE G PLUG-IN UNIT $190
Each instrument includes: 2—instruction manuals (070-0241-00).

Variable Attenuation Probe

Type P6023 10X Probe compensates for normal attenuator differences between two channels. An adjustable potentiometer compensates the 10:1 attenuation ratio, and two adjustable capacitors compensate for input capacitances between 20 pf and 47 pf.

Order Part Number 010-0167-00 . . . . . $40

For other low-capacitance probes, please refer to the Catalog Accessory pages.

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type H WIDE-BAND HIGH-GAIN DC UNIT

Sensitivity

AC or DC-Coupled —

Calibrated — 0.005 to 20 v/cm.

Continuously Variable — 0.005 to 50 v/cm.

Frequency Response and Risetime

Frequency specifications are at 3-db down

With Types 531A, 533A, 535A—

dc to 11 mc, 31 nsec.

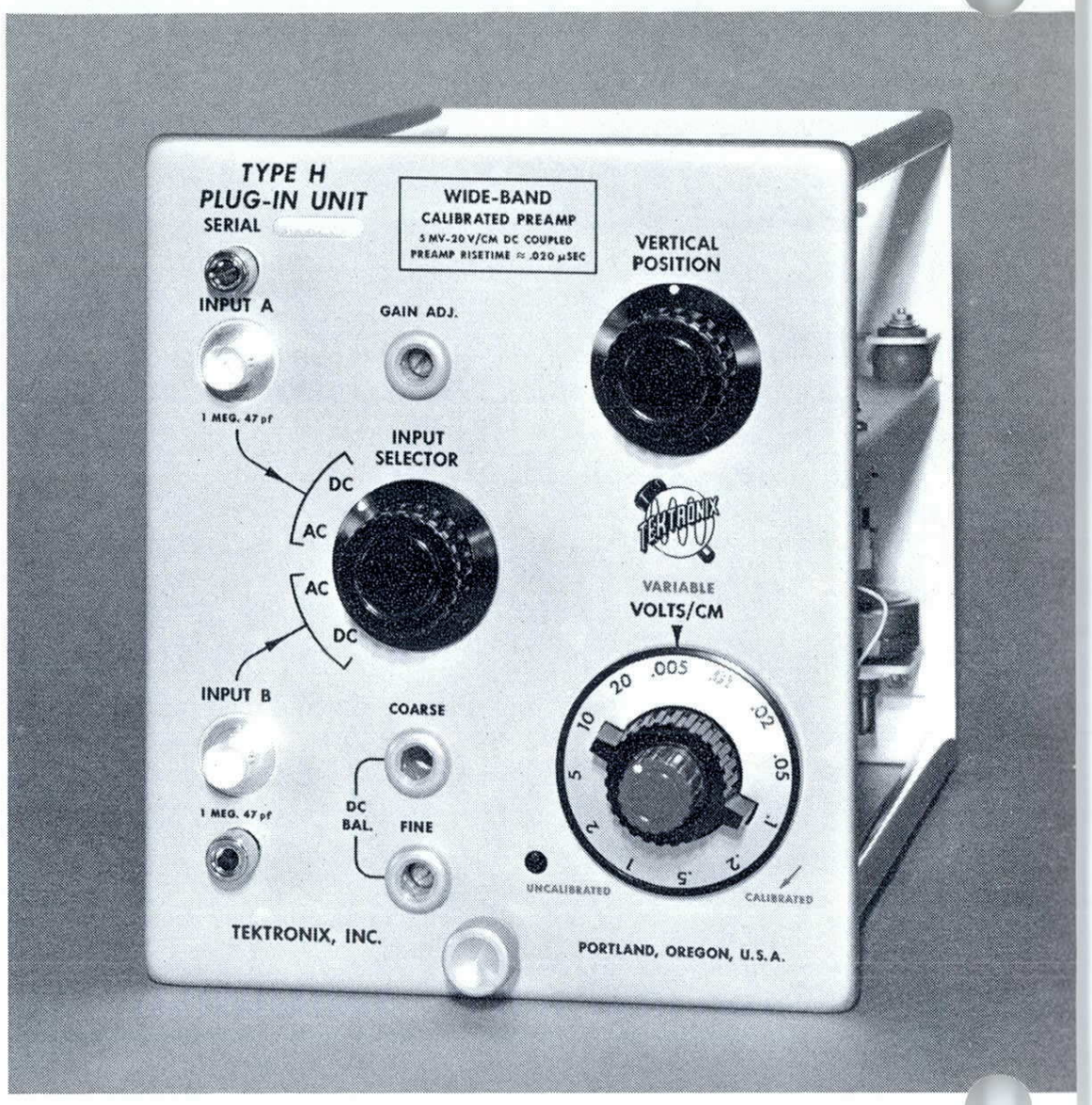
With Type 536 —

dc to 9.5 mc, 37 nsec.

With Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—dc to 15 mc, 23 nsec.

With Type 551 —

dc to 14 mc, 25 nsec.



The Type H is a wide-band preamplifier with dc-coupling over its full sensitivity range. It provides a maximum sensitivity of 5 mv/cm, dc-coupled, in Types 530, 540, 550 and 580* Oscilloscopes, with excellent transient-response characteristics.

CHARACTERISTICS

Calibrated Sensitivity—The vertical attenuator is calibrated in VOLTS/CM of deflection. Twelve calibrated steps are provided: 0.005, 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10 and 20 v/cm. In addition, a vernier (uncalibrated) control provides for continuously-variable adjustment from 0.005 v/cm to 50 v/cm.

* A Type 81 Adapter is required.

Calibration Accuracy—A front-panel adjustment is provided for setting the gain of the unit. When this adjustment is accurately set with the VOLTS/CM switch in the 0.005 v/cm position, the sensitivity for any other position of the switch will be within 3% of the panel reading for that position.

Signal Inputs—Two signal input connectors with more than 60 db isolation are controlled by a four-position switch. The INPUT SELECTOR provides for ac-coupling or dc-coupling through either input. When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X Probe.

Input Impedance—1 megohm paralleled by approximately 47 pf.

Weight: Net—4 pounds
Shipping—9 pounds, approx.

TYPE H PLUG-IN UNIT $185

Each instrument includes: 2—instruction manuals (070-0272-00).

For low-capacitance accessory probes, please see the Catalog Accessory pages.

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

FAST-RISE DC UNIT Type K

Sensitivity

Calibrated—0.05 v/cm to 20 v/cm.

Frequency Response and Risetime

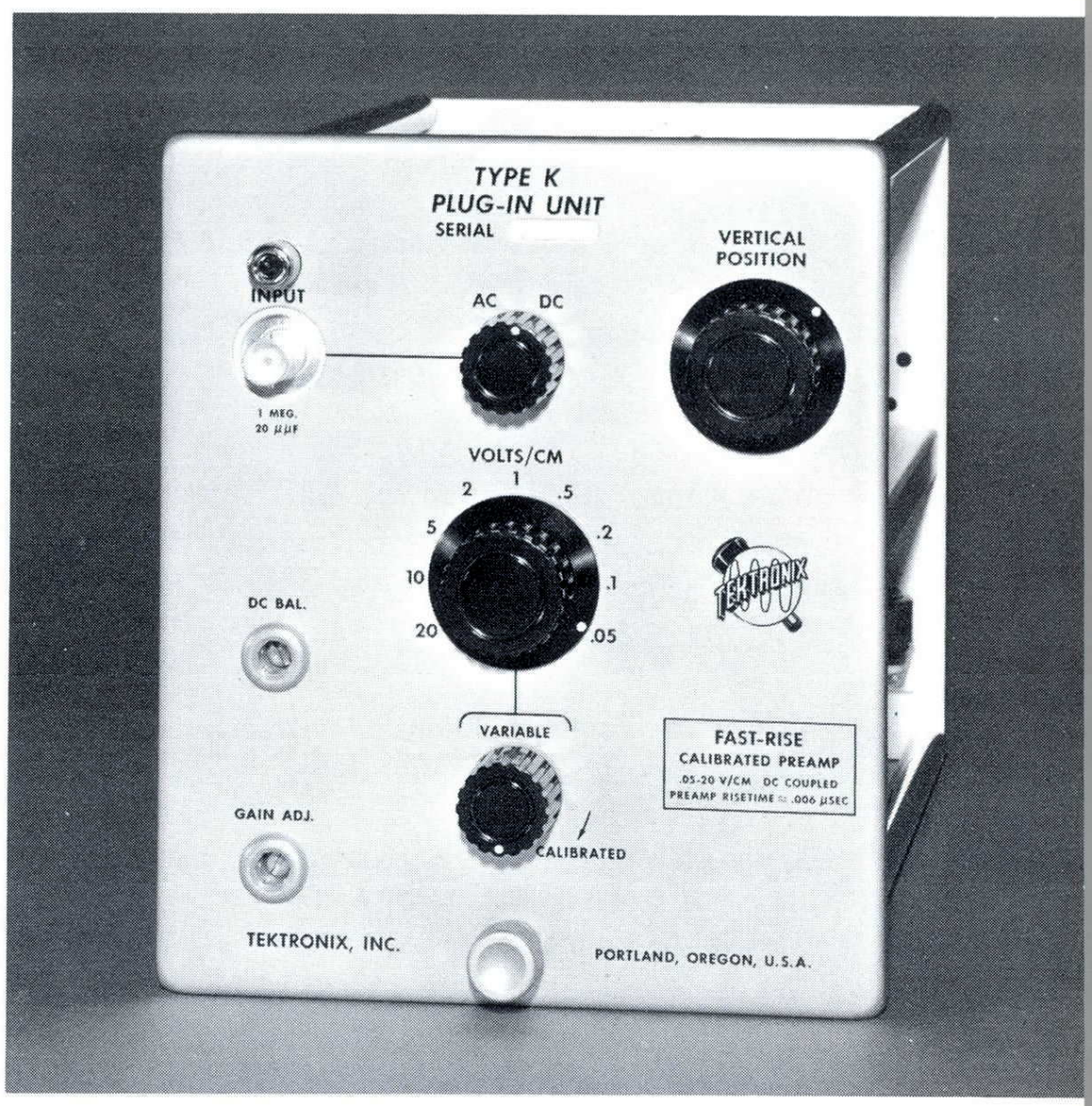
Frequency specifications are at 3-db down

With Types 531A, 533A, 535A—
dc to 15 mc, 23 nsec.

With Type 536 —
dc to 11 mc, 31 nsec.

With Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—dc to 30 mc, 12 nsec.

With Type 551 —
dc to 25 mc, 14 nsec.



The Type K Fast-Rise Unit provides Types 540, 550 and 580 Series Oscilloscopes with calibrated sensitivity at low input capacitance, taking maximum advantage of the excellent transient response and wide frequency range of the oscilloscope vertical-deflection system. The Type K combined with a fast-rise oscilloscope makes a 12-nanosecond risetime combination, ideal for applications involving fast-rising waveforms. The combined vertical-amplifier system is dc-coupled. When ac coupled, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X probe. The Type K can be used in all Tektronix Type 530, 540, 550 and 580 * Series Oscilloscopes.

CHARACTERISTICS

Calibrated Sensitivity—The vertical attenuator is calibrated in VOLTS/CM of deflection. Nine calibrated steps are provided: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10 and 20 v/cm. In addition, a vernier (uncalibrated) control provides for variable adjustment over a 2-to-1 range on each step.

* A Type 81 Adapter is required.

Calibration Accuracy—An adjustment is provided for setting the gain of the unit. When this adjustment is accurately set with the VOLTS/CM switch in the 0.05 v/cm position, the vertical sensitivity for any other position of the switch will be within 3% of the panel reading for that position.

Input Impedance—1 megohm paralleled by approximately 20 pf. A 10X attenuator probe increases input impedance to 10 megohms paralleld by approximately 7 pf.

Weight: Net—3 ¾ pounds.
Shipping—8 pounds, approx.

TYPE K PLUG-IN $145

Each instrument includes: 2—instruction manuals (070-0336-00).

For low-capacitance accessory probes, please see the Catalog Accessory pages.

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type L FAST-RISE HIGH-GAIN UNIT

Sensitivity

AC or DC-Coupled—0.05 v/cm.
9 calibrated steps from 0.05 v/cm to 20 v/cm.
AC-Coupled Only—0.005 v/cm.
10x gain amplifier switched in provides 9 calibrated steps from 0.005 v/cm to 2 v/cm.

Frequency Response and Risetime (0.05 to 40 v/cm)

Frequency specifications are at 3-db down

With Types 531A, 533A, 535A—
dc to 15 mc, 23 nsec.

With Type 536—dc to 11 mc, 31 nsec.

With Type 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—dc to 30 mc, 12 nsec.

With Type 551—dc to 25 mc, 14 nsec.

Frequency Response and Risetime (0.005 to 4 v/cm)

Frequency specifications are at 3-db down

With Types 531A, 533A, 535A—
3 cycles to 15 mc, 23 nsec.

With Type 536—3 cycles to 10 mc, 35 nsec.

With Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—3 cycles to 24 mc, 15 nsec.

With Type 551—3 cycles to 22 mc, 16 nsec.

The Type L Fast-Rise High-Gain Unit, duplicates the performance of the Type K and offers increased sensitivity, ac-coupled, to 5 mv/cm. An ac-coupled amplifier increases the sensitivity by a factor of 10 with slightly reduced frequency response and increased risetime. When used with Type 530-Series Oscilloscopes the unit has somewhat reduced frequency response and increased risetime.

CHARACTERISTICS

Calibrated Sensitivity—Nine steps are provided: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, and 20 v/cm. When the additional amplifier stage is switched in, the steps are changed to 0.005, 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, and 2 v/cm. In addition, a vernier (uncalibrated) control provides for variable adjustment between ranges.

*A Type 81 Adapter is required.

Calibration Accuracy—Front-panel adjustments are provided for setting the gain of the unit. When these adjustments are accurately set with the VOLTS/CM switch in the 0.05 v/cm position, the sensitivity at any other position of the switch will be within 3% of the panel reading for that switch position.

Input Impedance—1 megohm paralleled by approximately 20 pf. A 10X attenuator probe increases input impedance to 10 megohms paralleled by approximately 7 pf.

Weight: Net 4½ pounds
Shipping—8 pounds, approx.

TYPE L PLUG-IN UNIT $210
Each instrument includes: 2—instruction manuals (070-0336-00)

For low-capacitance accessory probes, please see the Catalog Accessory pages.

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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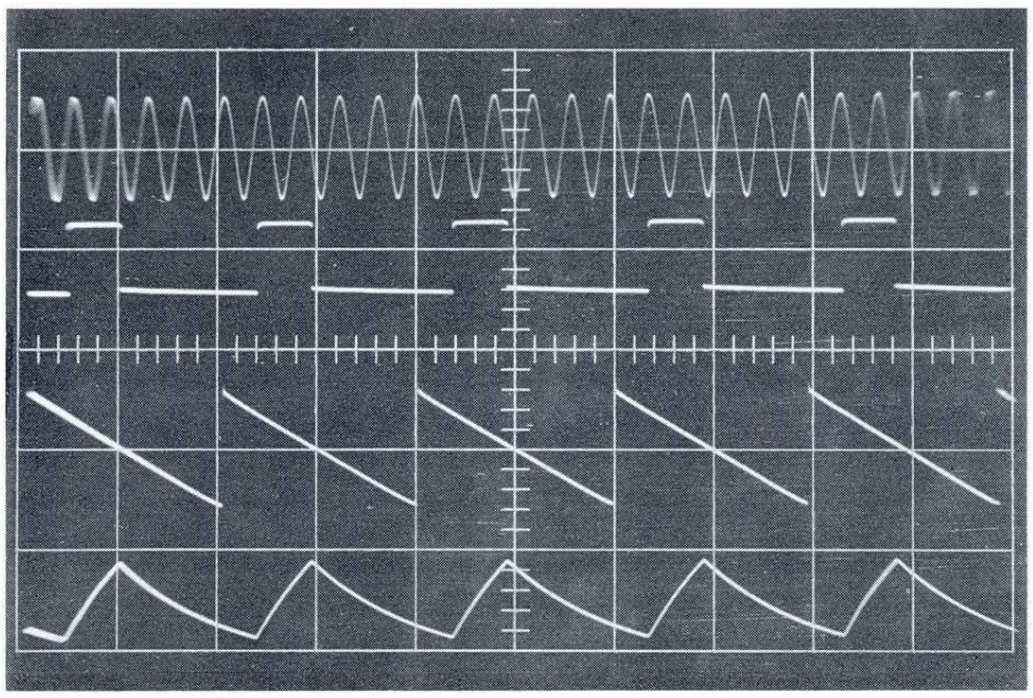
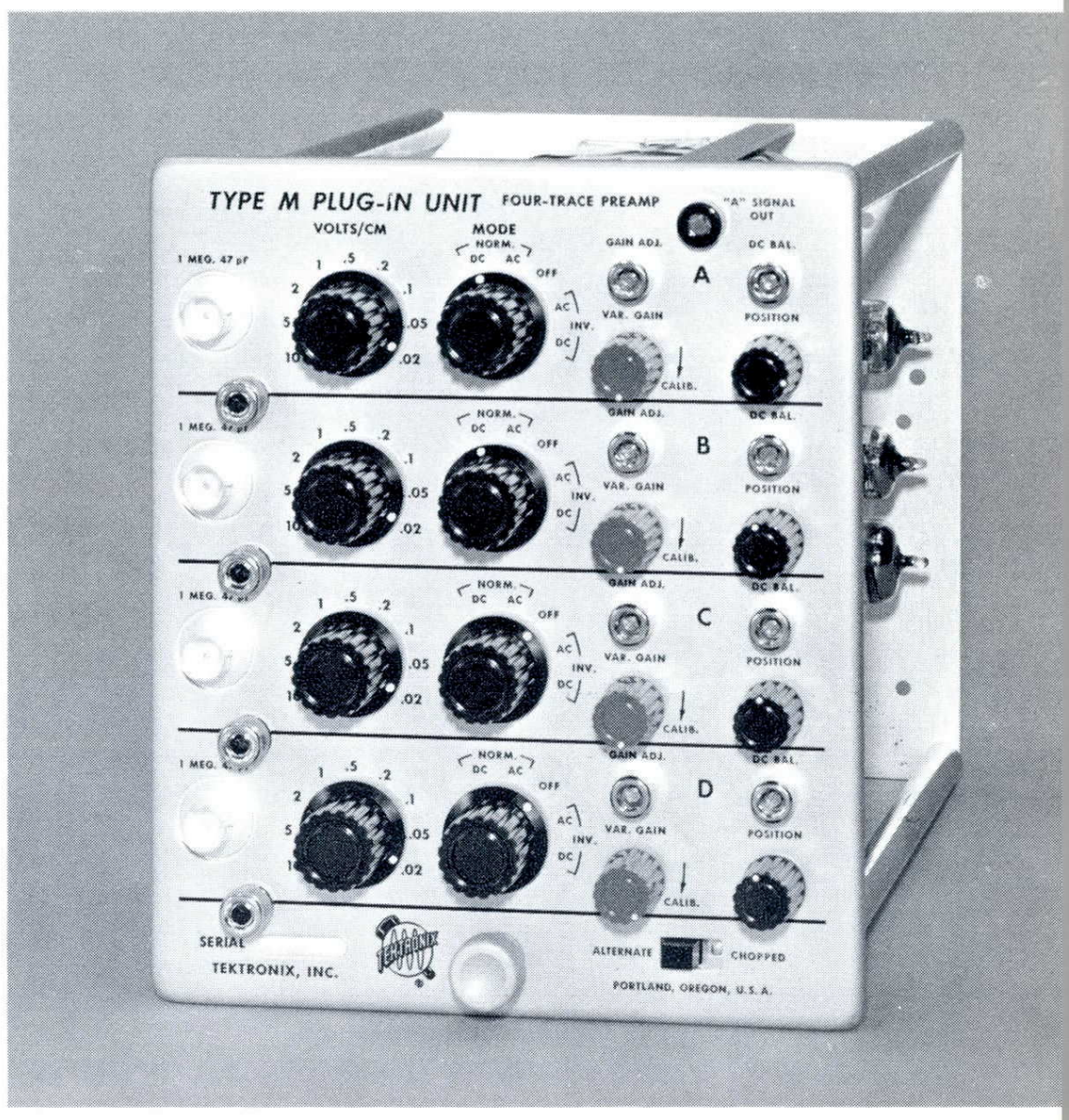
FOUR-TRACE UNIT Type M

ELECTRONIC SWITCHING

DC-TO-20 MC PASSBAND

20 MV/CM MAXIMUM SENSITIVITY





In a Tektronix Oscilloscope that accepts letter-series plug-ins, the Type M Four-Trace Unit provides four channels for viewing one to four signals, separately or in any combination. When a Type M Unit is used in a Tektronix Plug-In Unit Power Supply, such as a Type 127, 132, or 133, the output can be used to provide most oscilloscopes with multiple-channel displays at increased gain. The Type M Unit can be used in Tektronix Type 530, 540, 550, or *580*-Series Oscilloscopes.*

Each of the four channels has identical characteristics.

SENSITIVITY is from 20 mv/cm to 10 v/cm in 9 calibrated steps; accuracy is 3%. A variable control permits uncalibrated adjustment from 20 mv/cm to 25 v/cm.

INPUT COUPLING is either ac or dc. With ac, the low frequency 3-db point is 2 cps direct or 0.2 cps with 10X probe.

INPUT IMPEDANCE is 1 megohm paralleled by approx. 47 pf.

POLARITY of the signal from each channel can be inverted by a front-panel switch.

OPERATING MODES include: any one of the four channels separately; Alternate—any combination of two or more channels switched electronically on alternate sweeps; Chopped—In chopped operation, successive 1 μsec (approx.) segments of each channel are displayed at an approx. rate per channel of: 500 kc when using two channels; 333 kc when using three channels; and, 250 kc when using four channels.

CHANNEL A SIGNAL available at front panel can be connected to oscilloscope external trigger input for stable triggering in the Chopped or Alternate Mode—enabling display of all input signals in true time or phase relationship.

MULTI-TRACE TRANSIENT blanking is provided in all Tektronix Oscilloscopes that accept letter-series plug-in units, except Type 532, 536, 551, 581, 581A, 585, and 585A.

WEIGHT: Net—5¼ pounds. Shipping—8 pounds, approx.

TYPE M PLUG-IN UNIT $525

Each instrument includes: 4—BNC-to-binding post adapters (103-0033-00); 1—BNC-to-BNC, 18″ red patch cord (102-0087-00); 1—BNC-to-banana plug, 18″ red patch cord (012-0091-00); 2—instruction manuals (070-0295-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Transient Response Characteristics

Type M Unit and Oscilloscope	Passband (at 3-db down)	Risetime
531A, 533A, 535A	dc — 14 Mc	25 nsec
536	dc — 10 Mc	35 nsec
541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*	dc — 20 Mc	17 nsec
551	dc — 19 Mc	18 nsec

* Requires a Type 81 Adapter

Type O OPERATIONAL AMPLIFIER UNIT

1 Vertical Preamplifier

2 Operational Amplifiers

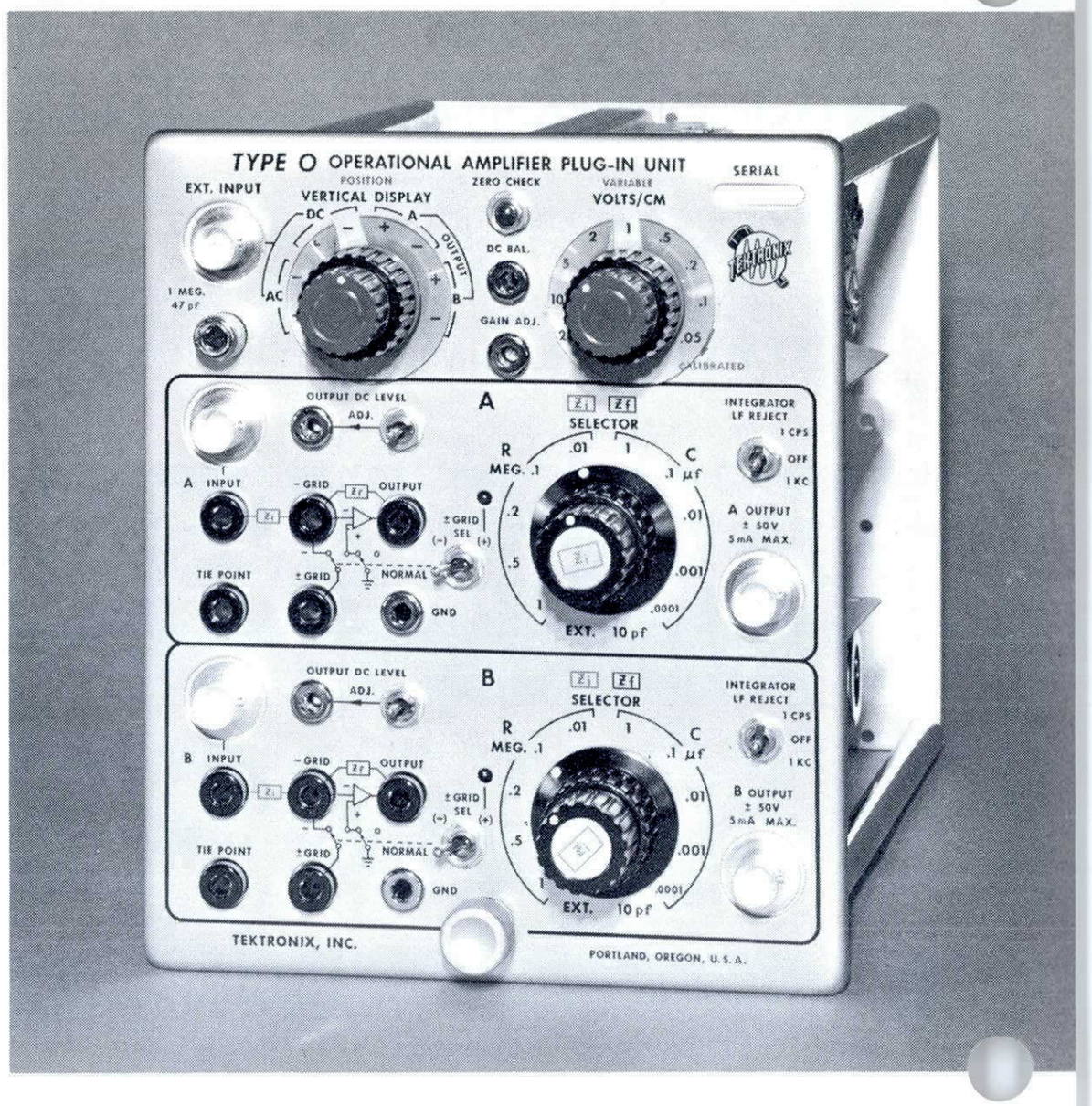
3 Basic Modes of Operation

Selection of Precision Input and Feedback Components

Provision For Use of External Input and Feedback Impedances

In a Tektronix Oscilloscope that accepts letter-series plug-ins, the Type O Operational Amplifier Unit can be used to perform precise operations of integration, differentiation, function generation, linear and nonlinear amplification.

The results can be displayed on the oscilloscope crt or can be fed to other circuitry. In addition, through use of the Type 127, 132, or 133 Plug-In Power Supplies, the Type O can also be used for various other applications. The Type O Unit can be used in any Tektronix Type 530, 540, 550, or 580*-Series Oscilloscopes.



VERTICAL PREAMPLIFIER

Frequency specifications are at 3-db down

PASSBAND AND RISETIME depend upon the oscilloscope with which the unit is used. With Type 540, 550, and 580*-Series, the passband is dc to 25 Mc, the risetime is 14 nsec, except in the Type 551, passband is dc to 23 Mc, risetime is 16 nsec. With Type 530-Series, the passband is dc to 14 Mc, the risetime is 25 nsec (except Types 532 and 536).

SENSITIVITY is in 9 calibrated steps from 50 mv/cm to 20 v/cm, 1-2-5 sequence, accuracy within 3%. A variable control permits continuous adjustment uncalibrated from 50 mv/cm to 50 v/cm.

INPUT IMPEDANCE is 1 megohm paralleled by approximately 47 pf.

SWITCHING FACILITIES permit the vertical amplifier to be used independently or to monitor the output of either operational amplifier.

OPERATIONAL AMPLIFIERS

OPEN-LOOP GAIN-BANDWIDTH PRODUCT is 15 Mc or greater. (Checked at 10 Mc for open-loop gain greater than 1.5.)

CLOSED-LOOP BANDWIDTH is 750 kc or more at unity gain with internal input and feedback resistors, and to 10 Mc with external compensation.

OPEN-LOOP DC GAIN is 2500 minimum. With external input and feedback components, the gain is governed by the ratio of feedback to input values.

* A Type 81 Adapter is required.

OUTPUT RANGE is ±50 v, ±5 ma.

OUTPUT DC LEVEL can be adjusted to ground potential from front panel.

OUTPUT IMPEDANCE is approximately 30 ohms at 1 Mc for compensated unity-gain amplifier.

NOISE is typically less than 0.5 mv pk-to-pk (equivalent input noise), approximately 3 mv pk-to-pk additional output-noise when R_f = 1 megohm.

INPUT IMPEDANCES can be selected from the following: 5 resistance values—10, 100, 200, 500 kilohms, and 1 megohm; 6 capacitance values from 10 picofarads to 1 microfarad, in decade steps. All values within ±1%, except for 10 pf and 100 pf values, which are adjustable.

FEEDBACK IMPEDANCES can be selected from the same range of values as the input impedances.

EXTERNAL COMPONENTS can be used independently or in combination with the internal resistor-capacitor combinations.

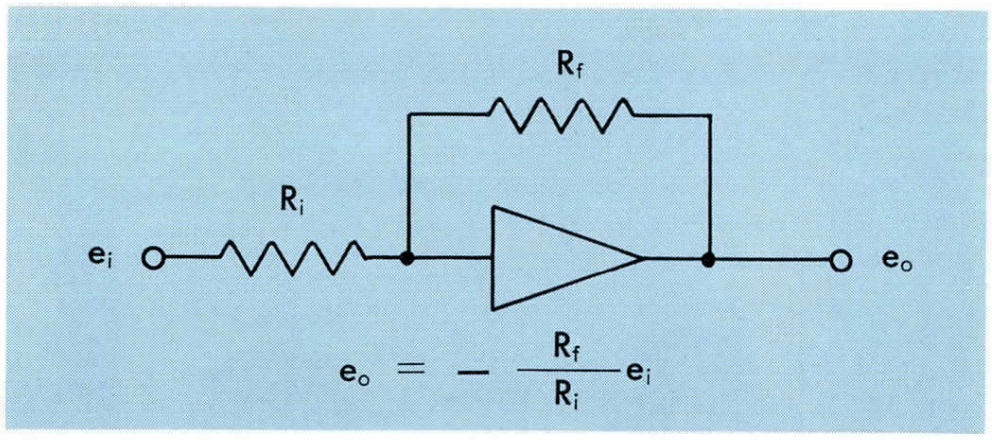
POSITIVE OR NEGATIVE FEEDBACK is possible.

VOLTAGE REJECTION (with 1 kc square wave) is at least 300 to 1 between operational amplifiers.

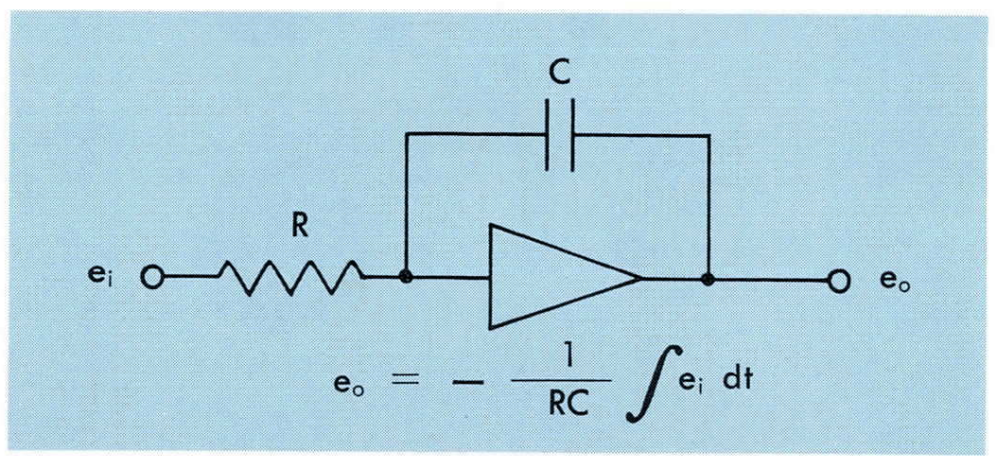
GRID CURRENT is less than 0.5 nanoampere for each input grid. Can be adjusted to less than 0.3 nanoampere for —grid and less than 0.15 nanoampere for + grid.

DRIFT is typically less than 10 mv/hr, referred to input, after warmup.

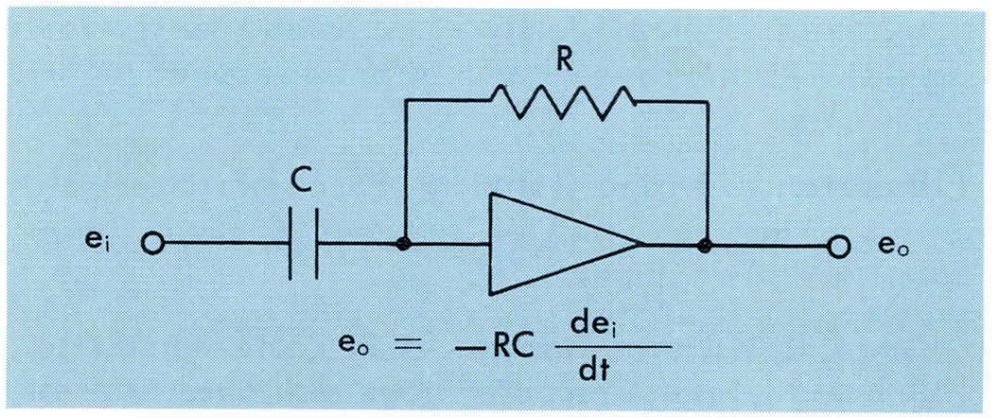
BASIC OPERATING MODES



AMPLIFICATION is determined by the ratio of input to feedback resistors. This provides convenient signal step-up or step-down, with low output impedances, to over 750 kc. Use of external compensation extends the closed-loop gain-bandwidth product to 10 Mc or more.



INTEGRATION is obtained by placing a capacitor in the feedback loop. Unlike the RC integrator, this circuitry permits loading of the output, and integration without loss of signal level. Integration at repetition rates of approximately 5 Mc is possible. Low-frequency rejection allows drift-free repetitive-waveform integration.



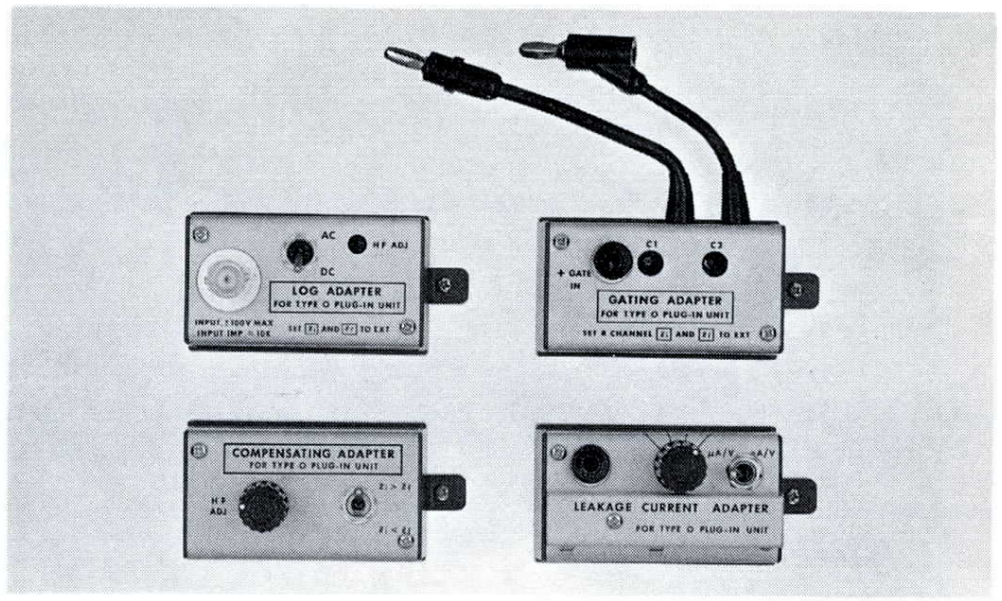
DIFFERENTIATION is accomplished by placing a capacitor in the input circuit. The unique characteristic of differentiation is its ability to extract higher frequency waveform components. It can advantageously detect minute information such as transients and slope changes. Differentiation of waveforms with significant components as high as 1.5 Mc is possible.

LOW FREQUENCY REJECTION for repetitive integration is possible at either 1 cps or 1 kc, approximately, and can be switched in or out as desired.

WEIGHT: Net—5½ pounds.
Shipping—9 pounds, approx.

TYPE O OPERATIONAL AMPLIFIER UNIT $525

Each instrument includes: 2—terminal adapter assemblies (103-0048-00), 2—terminal shields (013-0049-00), 2—BNC to binding-post adapters (103-0033-00), 2—BNC-to-BNC, 18″ red patch cords (012-0087-00), 2—instruction manuals (070-0323-00).



COMPENSATING ADAPTER

The Compensating Adapter extends the high-frequency performance of either operational amplifier of the Type O Plug-In Unit when the internal Z_i and Z_f resistors are used in any combination for either gain or attenuation.

Without the Compensating Adapter, stray capacitance associated with the internal Z_i and Z_f resistors limits the operational amplifiers high-frequency performance. The adapter can be plugged into the front panel of the Type O Plug-In Unit.

Order Part Number 013-0081-00 . . . . . $35

LOG ADAPTER

The Log Adapter with the Type O Plug-In Unit allows the display and measurement of high-amplitude signals mixed with low-amplitude signals. Pulses and transient waveforms differing in amplitude by up to 1000 to 1 can be displayed and measured on the same trace.

The Log Adapter is a logarithmic feedback network that converts the A or B operation amplifier in a Type O Plug-In Unit from a linear amplifier to essentially a logarithmic amplifier. The adapter can be plugged directly into the jacks on the front panel of the Type O Plug-In Unit.

Order Part Number 013-0067-00 . . . . . $75

GATING ADAPTER

The Gating Adapter allows repetitive signals with an integral other than zero to be integrated and displayed using the Type O Plug-In Unit. Without the Gating Adapter, true integration of such repetitive signals is impossible since the integral will accumulate to a voltage beyond the range of the Type O Plug-In Unit.

The adapter can be plugged directly into the jacks on the front panel of the Type O Plug-In Unit.

Order Part Number 013-0068-00 . . . . . $75

LEAKAGE CURRENT ADAPTER

Used with the Type O Plug-In Unit, the Leakage Current Adapter provides the facility for measuring leakage current of semiconductor diodes and small signal transistors.

The adapter plugs into the operational jacks located on the front panel of the Type O Unit. A positive-going sawtooth voltage is required for driving the adapter. Tektronix Oscilloscopes that accept the Type O Plug-In Unit have a Sawtooth or Sweep-Out jack conveniently located on the front panel for supplying the required sawtooth voltage.

Order Part Number 013-0086-00 . . . . . $85

Please refer to the catalog accessory pages for complete information on the above adapters.

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type Q TRANSDUCER & STRAIN GAGE UNIT

Carrier Frequency—25 kilocycles.

Risetime—60 μseconds, (approximately).

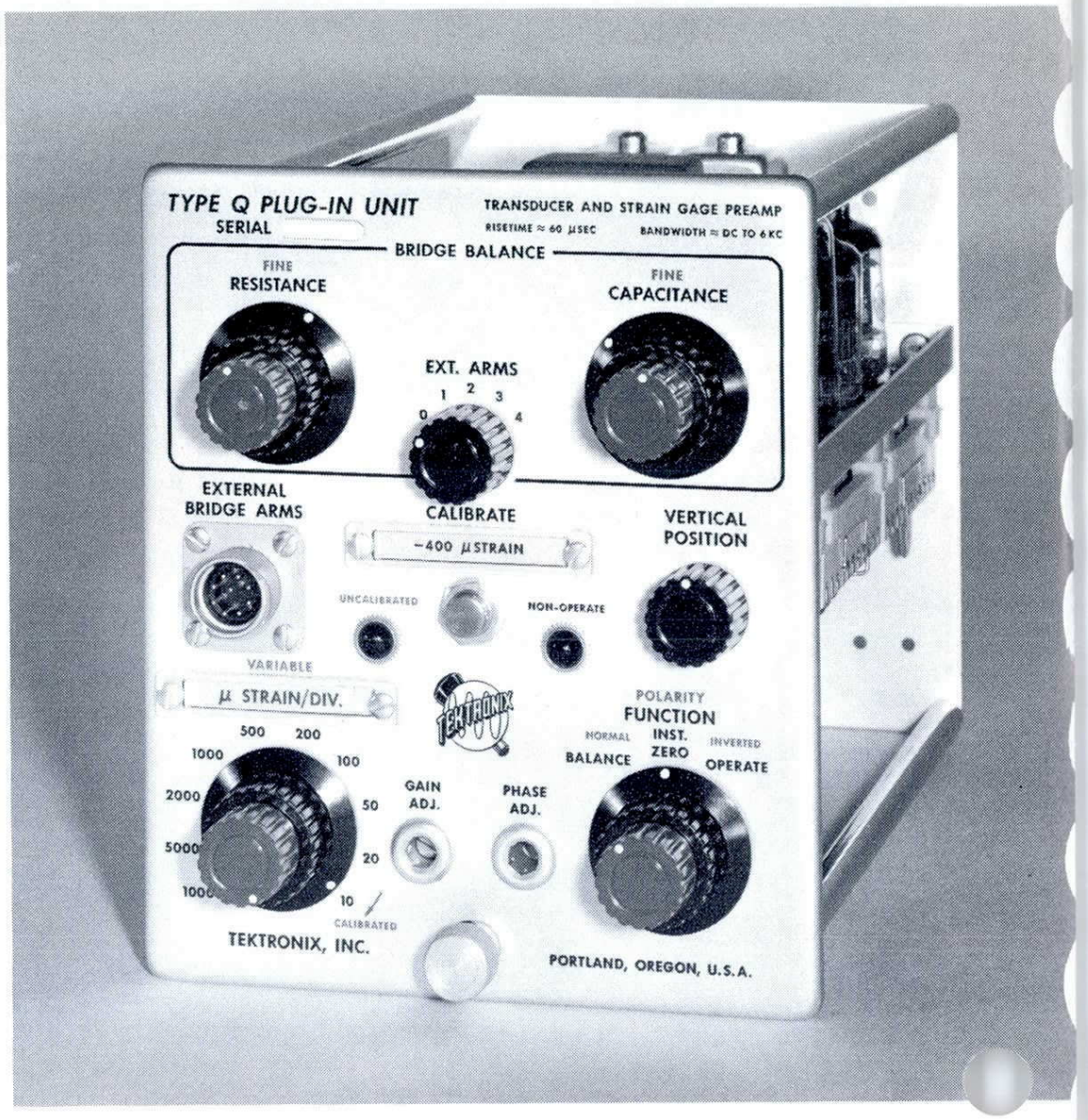
Frequency Response—DC to 6 kilocycles.

Strain Sensitivity—Calibrated in ten steps from 10 to 10,000 microstrain (microinches per inch) per major graticule division ± 2%. Uncalibrated, the sensitivity is variable between steps. The above condition applies to the Type Q Unit when used with a single strain gage having a gage factor of approximately 2. With four active arms and a gage factor of 2, the maximum sensitivity is 2.5 microstrain per division.

Attenuator Accuracy—When set accurately in any one step, the accuracy in any other position is within two percent of the panel reading.

Noise—The peak-to-peak noise is typically equivalent to 1.5 microstrain at maximum calibrated sensitivity. This approximates an rms noise of 0.5 microstrain.

Drift—The amplification system is essentially drift free. The overall system drift is primarily a function of the transducer stability.



The Type Q Plug-In Unit permits any Tektronix Type 530, 540, 550, or 580* Series Oscilloscopes to be operated with strain gages and other transducers. Designed to measure any mechanical quantity that can be converted to a change in resistance, capacitance, or inductance—through use of a suitable transducing device—this versatile unit provides high gain, low noise, and extremely low drift. Suppressed-carrier amplitude modulation is produced by unbalancing an ac bridge with the strain gages or other transducers. Phase-sensitive demodulation produces the proper deflected-trace direction.

Completely self-contained and requiring no external equipment other than the strain gages or transducers operated with it, the Tektronix Type Q Plug-In Unit bridges the gap between mechanical engineering and electronic instrumentation. Total range of applications is as broad as the mechanical field itself. Applications include stress analysis, vibration studies, and fatigue tests. Typical quantities that can be measured with the unit are force, displacement, acceleration, and strain.

* A Type 81 Adapter is required.

CHARACTERISTICS

Equivalent DC Sensitivity—The Type Q Unit is an impedance sensing preamplifier rather than a voltage sensing device. A comparable dc amplification system would require approximately 10 microvolts per division sensitivity for the same amount of power applied to the input bridge.

Resistance Bridge Balance—Range of control allows sufficient compensation for most standard transducers and strain gages.

Gage Resistance Range—With cable lengths to 100 feet, the useful range of gage resistance extends from approximately 50 ohms to 2000 ohms. For optimum performance, the recommended range is between 120 ohms and 500 ohms.

Transducer Cable—In most applications, either 3-wire or 4-wire shielded microphone cable gives the best results.

Capacitance Bridge Balance—Range of control allows sufficient compensation for an unbalance of 250 pf across any external resistive arm of the input bridge.

Polarity Inversion—For convenience in reading the display, the two-position switch allows the demonstration to appear normal or inverted.

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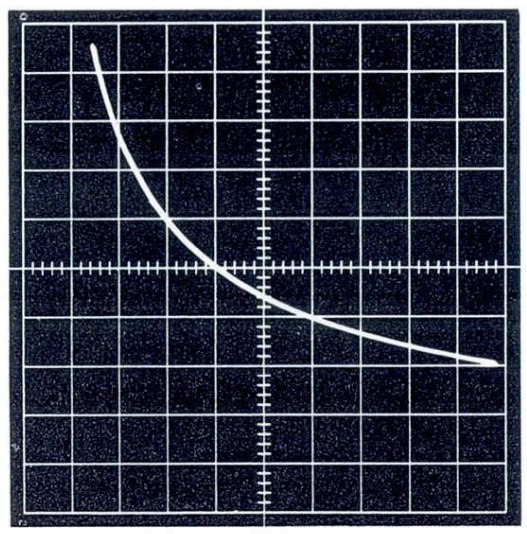
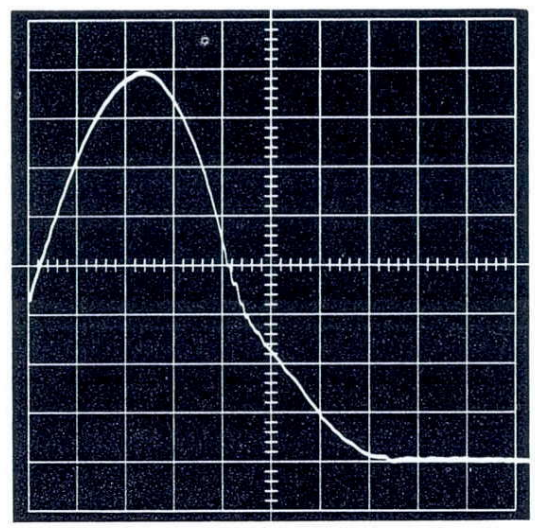
Q

Dynamic plot of the depletion-layer capacitance of a back-biased diode.



Pressing force can be accurately controlled by using the Type Q Unit.



Calibration—A push-button switch connects a calibrator resistor across the strain gage electrically to simulate an external mechanical strain. The calibration resistor supplied with the Type Q Unit simulates a—400 μstrain unbalance of the bridge, suitable for most strain gage applications. As with the 120-ohm internal bridge resistor, the 150-k calibration resistor is mounted on a handy plug-in receptacle.

To aid in calibration, a nomograph is included in the instruction manual. This nomograph relates calibration of the supplied resistor to gage factors and strain gage resistances.

No special gage dial is necessary for the unit.

To include the gage factor in the calibration, merely increase or decrease the amplifier gain proportionally.

Phase Adjustment—To increase versatility of the unit, the control permits either resistive or reactive transducer applications to be displayed.

Capacitance Measurement—The Type Q Unit can be calibrated for direct reading in capacitance from 1 pf per division to a maximum value of 1000 pf without using a correction curve. Using a correction curve, the range can be extended to 10,000 pf per division. These specifications apply when using the internal 120-ohm bridge circuit. With a 1000-ohm external circuit, the lower limit can be extended to 0.2 pf per division.

Please note that the standard capacitor and test jig are not supplied with the unit.

Capacitance Transducers—Using a capacitance transducer in conjunction with a four-arm resistive bridge results in the following maximum useful sensitivities:

120-ohm bridge (available internally) . . . 1 pf/div

1000-ohm bridge . . . . . 0.2 pf/div

Useful sensitivities are slightly lower when using long cables.

Inductive Transducers—Inductive transducers must have characteristics compatible with the 25-kc carrier frequency to function properly. Linear-variable-differential transformers designed for nominal carrier frequencies of 2 kc and higher usually operate satisfactorily without additional circuitry.

External Bridge—The number of external resistive arms required for strain gage and transducer applications varies from one to four. The versatile Type Q Unit can be used for any of these applications. The input circuit for the Type Q Unit is an ac bridge. The number of external arms required for strain gage and transducer applications varies from one to four. These external transducers become one or more of the input bridge arms. Excitation voltage for the bridge is obtained from a 25-kc oscillator in the Q unit. Total bridge voltage is approximately 5 v rms, regulated.

A five-position switch allows selection of the number of external arms from zero to four. The zero position of the switch permits a quick check of the instrument under normal operation without an external transducer. In addition, the zero position completes the resistive bridge for capacitive transducer applications.

The one-arm position of the switch is used for the simplest type of strain gage application. In this position, an internal bridge resistor is needed to match the value of the single external bridge arm. Standard value of this resistor supplied with the Type Q Unit is 120 ohms. The two-arm and four-arm positions of the switch are used for transducer applications necessitating temperature stability.

Weight: Net—5 ¼ pounds
Shipping—8 pounds, approx.

TYPE Q PLUG-IN UNIT $325

Each instrument includes: 1 — 120-Ω internal bridge resistor assembly (013-0025-00), 1—150-k calibration resistor assembly (013-0026-00), 1—4-wire 15' shielded connecting cable (012-0040-00), 2—instruction manuals (070-0199-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type R TRANSISTOR-RISETIME UNIT

Collector Supply

1 to 15 v continuously variable, positive or negative.

Current Capability—400 ma.

Mercury-Switch Pulse Generator

Risetime—less than 5 nsec.

Amplitude—0.02 to 10 v across 50 ohms, positive or negative.

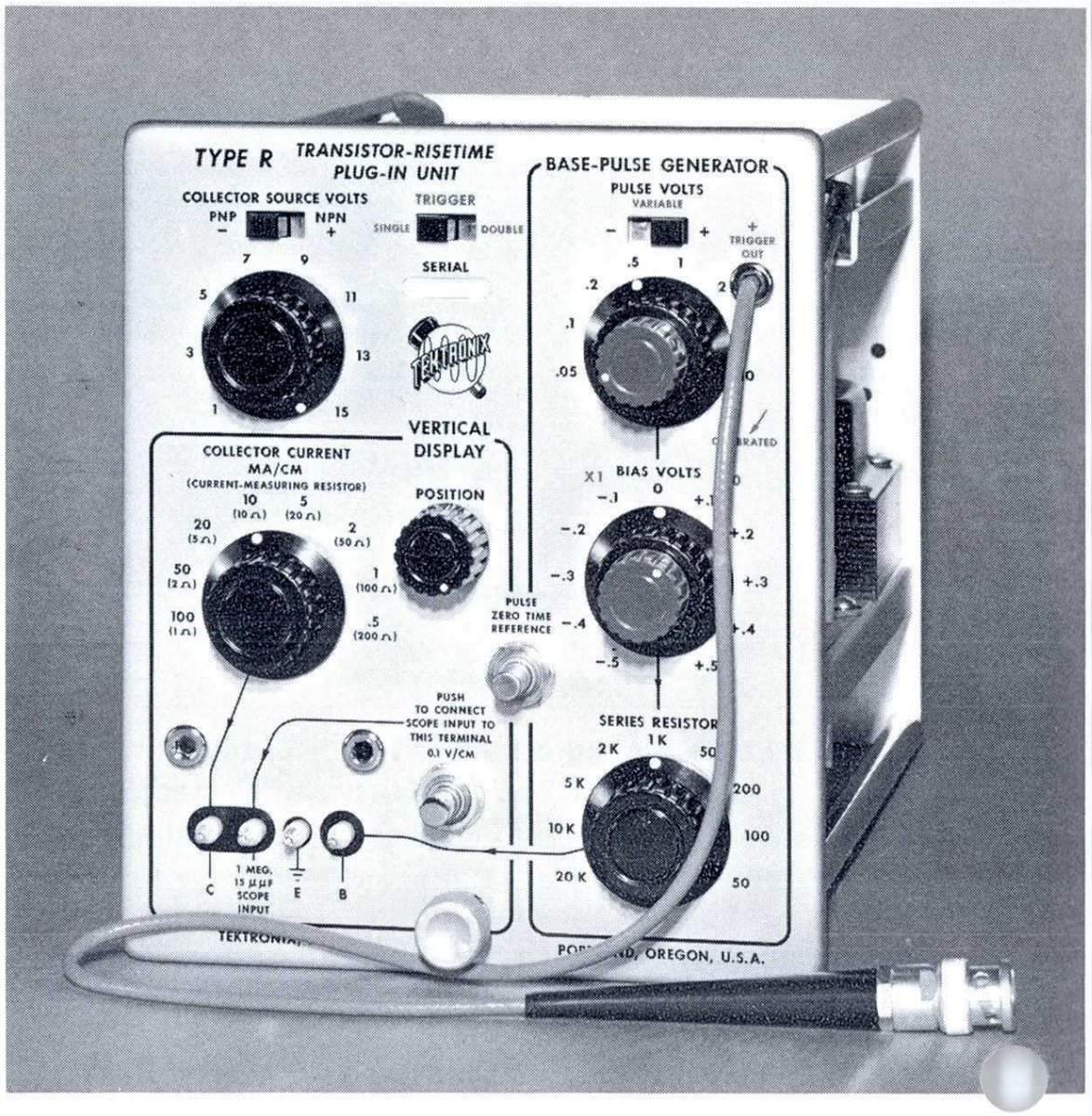
Bias Supply

—0.5 v to +0.5 v and —5 v to +5 v, continuously variable.

Current Capability—±100 ma.

Calibrated Vertical Deflection

0.5, 1, 2, 5, 10, 20, 50, and 100 ma/cm collector current.



The Type R Transistor Risetime Unit can be used in all Tektronix Type 530, 540, 550 and 580* Series Oscilloscopes when operated on 50 to 60 cycle line frequency. It supplies a fast-rising pulse and the required supply and bias voltages for measurement of transistor rise, fall, delay, and storage times.

Risetime of the pulse supplied by the Type R is less than 5 nanoseconds, therefore measurement limitations will depend mainly on the risetime of the oscilloscope used. Overall risetimes with the oscilloscopes are as follows:

Type 551—14 nsec

Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A,* 585A* — 12 nsec.

Types 531A, 533A, 535A—23 nsec

Type 536—35 nsec (Type 536 has an additional limitation in the lack of signal delay in the main vertical amplifier).

* A Type 81 Adapter is required for use with 580 Series.

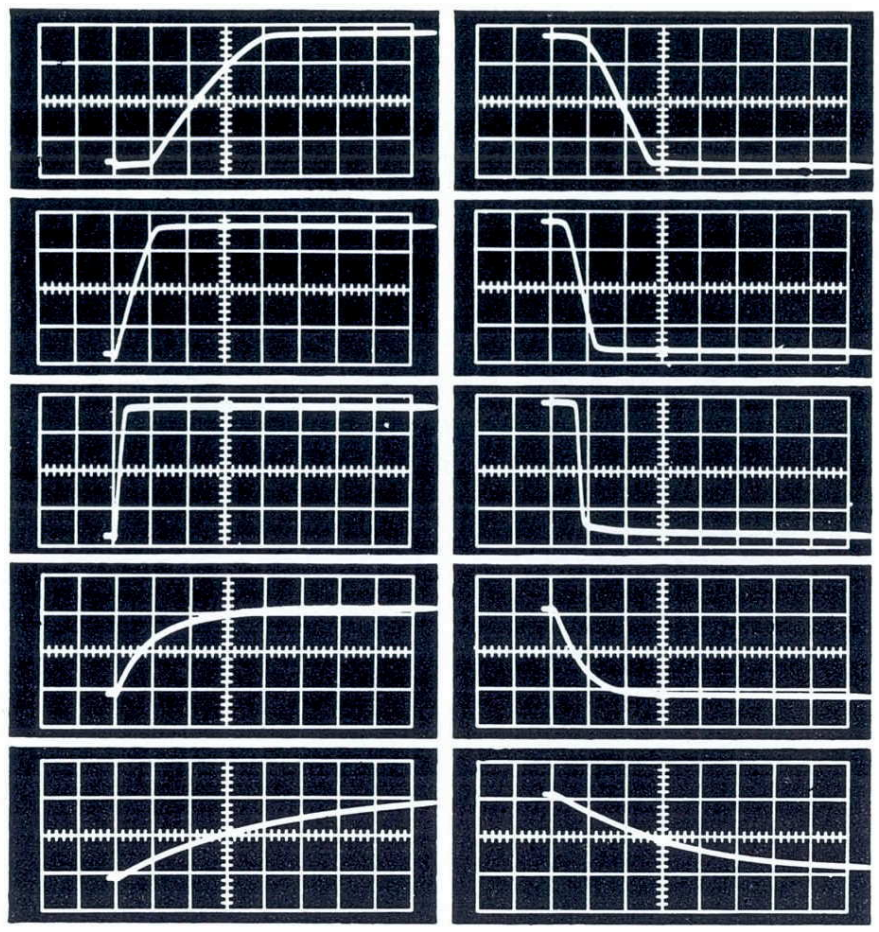
CHARACTERISTICS

Collector Supply—Positive and negative voltage, 1 v to 15 v continuously adjustable is available from a transistor-regulated supply. Vertical display is calibrated in ma/cm of collector current, 0.5, 1, 2, 5, 10, 20, 50, and 100 ma/cm, accuracy within 3%. Connectors are provided for inserting an external resistor in series with the collector.

Pulse Generator—A transistor-regulated 10 v dc power supply is chopped by a mercury switch, providing a 120-c/sec test pulse with a risetime of less than 0.005 μsec. The pulse is applied to the transistor under test through a π attenuator with an output impedance of 50 ohms. Sixteen amplitude steps are provided: +0.05, +0.1, +0.2, +0.5, +1, +2, +5, +10v and —0.05, —0.1, —0.2, —0.5, —1, —2, —5, —10v. A vernier (uncalibrated) control fills in between steps.

Bias Supply—Bias voltage is available for base or emitter in two ranges, —0.5 v through zero to +0.5 v and —5 v through zero to +5 v. Bias supply is transistor regulated.

Base Series Resistors—The base driving resistance can be selected from nine values—50, 100, 200, 500 ohms, 1, 2, 5, 10, and 20 kilohms, accuracy within 3%.



Drive voltage: 10 v through 20 kilohms.

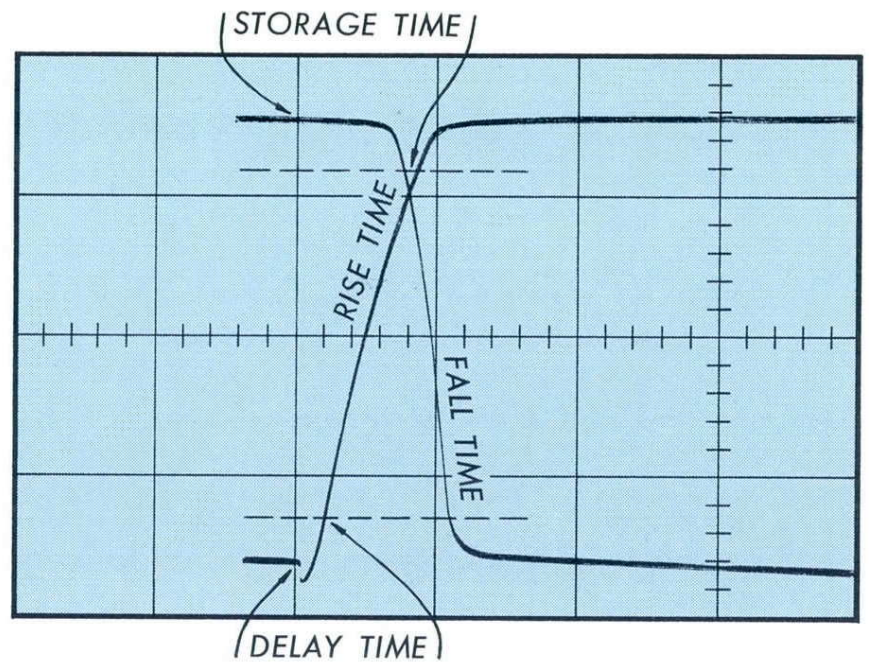
Drive voltage: 2 v through 1 kilohm.

Drive voltage: 0.5 v through 50 ohms.

Class A drive: 0.05 v through 50 ohms.

Class A drive: 0.1 v through 1 kilohm.

High-frequency characteristics of a transistor under five different conditions of drive. In each pair, the photograph at left shows delay time and rise time, the start of the driving pulse coinciding with the 2-cm graticule line. The second photograph of each pair shows storage time and fall time, the end of the pulse coinciding with the 2-cm line. The Type R Unit plugged into a Tektronix Type 543A Oscilloscope—3.5-v collector supply, 500-ohm collector load, 2-ma/div vertical calibration, 0.5-μsec/div sweep rate. Driving conditions at left of each pair.



The Type R Unit can trigger the Oscilloscope sweep either on the start of the test pulse only, or on both the start and finish to display delay, rise, storage, and fall times simultaneously.

Reference Displays—Zero time reference can be displayed by means of a pushbutton. Another pushbutton permits observation of the voltage on the transistor collector or base, through use of external connections. Amplifier sensitivity for these displays is 0.1 v/cm.

Triggering—A positive constant-amplitude trigger for the oscilloscope sweep is furnished through a short coaxial cable permanently attached to the Type R Unit.

Weight: Net—7 ¼ pounds
Shipping—9 pounds, approx.

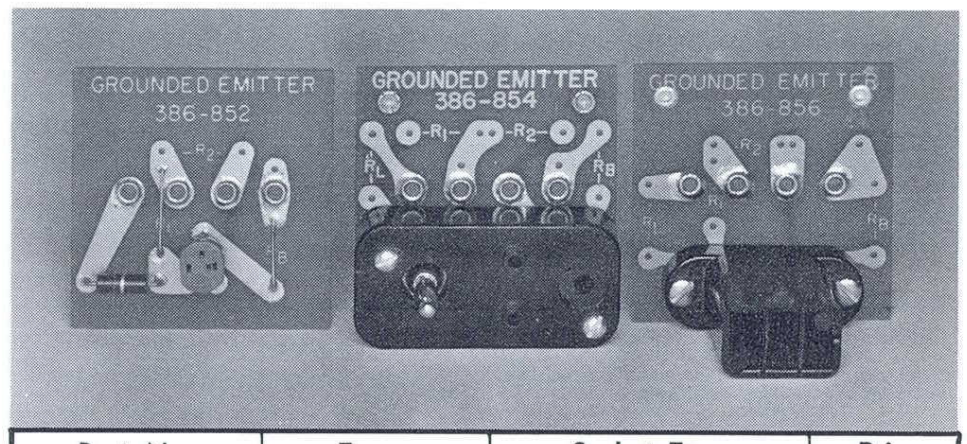
TYPE R PLUG-IN UNIT $325

Each instrument includes: 1 — grounded emitter small transistor socket (386-0852-00), 1—grounded base small transistor socket (386-0853-00), 10—adapter springs (344-0023-00), 2—instruction manuals (070-0286-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

TRANSISTOR MOUNTING BOARDS

Convenient for checking large quantities of different types of transistors. Collector-load, voltage dividing, and base or emitter-driving resistors are not supplied with the boards.



Part No.	Type	Socket Type	Price
386-0852-00	Gnd. Emitter	4-pin	$5.00
386-0853-00	Gnd. Base	4-pin	5.00
386-0854-00	Gnd. Emitter	For power transistors such as 2N301 or 2N307	6.00
386-0855-00	Gnd. Base	Same as above	6.00
386-0856-00	Gnd. Emitter	Funnel type for long leads	6.00
386-0857-00	Gnd. Base	Same as above	6.00

Type S DIODE RECOVERY UNIT

Diode Measurement Applications

Recovery characteristics are displayed by applying calibrated forward-current through the diode, then abruptly turning off this current and establishing a calibrated, constant, reverse current.

Recovery-Time Measurement

Accurate—to 30 nsec.
Comparative—to 15 nsec.
Predicted—limited only by the forward-reverse current ratio.

Calibrated Forward Currents

1, 2, 5, 10, and 20 milliamps.

Calibrated Reverse Currents

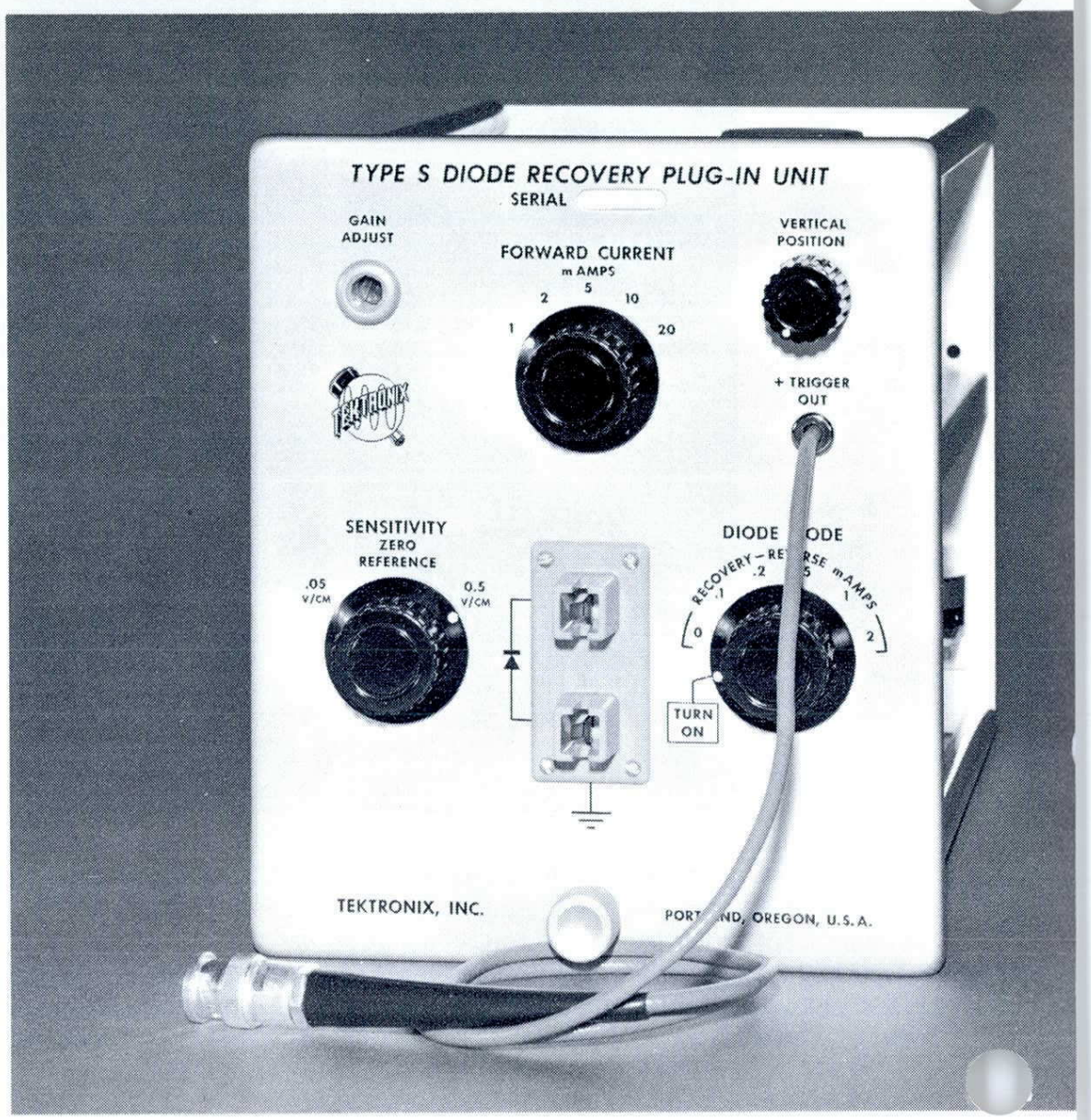
0, 0.1, 0.2, 0.5, 1, and 2 milliamps.

Diode Shunt Capacitance

9 picofarads at 0.5 v/cm.

Amplifier Sensitivity

0.05 v/cm and 0.5 v/cm, calibrated.



The Type S Unit enables you to display semiconductor-diode switching characteristics on your Tektronix Plug-In Oscilloscope. With Tektronix Type 540, 550, and 580-Series* Oscilloscopes you can find:

Carrier Recombination—Effective lifetimes to 2 nanoseconds.

Stored Charge—To 10 picocoulombs.

Capacitance—Junction capacitance to 2 picofarads.

Resistance—Bare (bulk) resistance to about ¼ ohm.

The Type S Unit describes the diode in terms of its parameters, while most other currently employed methods describe the diode in terms of its performance in a particular circuit—not necessarily the one in which it will be used. With the Type S method you can predict the behavior of many diodes in many circuits, as well as compare diodes for performance in a particular circuit.

Since the Type S method is a means for plotting voltage across an element while passing constant current through that element, it can also be used to observe the junction characteristics of transistors and to measure the resistance, capacitance, and inductance of other circuit components.

Note: Risetime of the Type S Unit depends on the capabilities of the oscilloscope with which it is used, therefore the ability to analyze fast diodes with Tektronix Type 530-Series Oscilloscopes will be affected by the lower risetimes of these instruments.

Switching Transient—A large switching transient occurs in the voltage waveform appearing across a semiconductor diode when the diode is abruptly switched from non-conduction to forward conduction. This transient indicates an initial high impedance across the diode as well as the steady-state low impedance well after turn on. A further deviation in the device action (from that of an ideal diode) occurs when the diode is switched from forward conduction to a reverse-bias condition. Instead of an immediate high impedance across the diode, a momentary low impedance condition exists. These switching characteristics are readily apparent with the Type S Plug-In Unit installed in a Tektronix fast-rise oscilloscope, and the contributing factors can be separated and analyzed.

* A Type 81 Adapter is required.

Base (or Bulk) Resistance—The curves in Figures 3 & 4 show a sudden decrease in diode terminal voltage when forward current is switched off. This decrease occurs with disappearance of the voltage drop across the diode due to ohmic base resistance. The value of this base resistance can be determined, since the voltage drop across it for a given forward current can be measured. As shown in Figures 3 &4, this base resistance decreases as forward current increases.

Stored Charge at the Junction—After the initial terminal-voltage drop, the voltage remaining is due to minority carriers stored in the junction. These stored carriers must be removed before the diode can assume its steady-state reverse characteristics. When this stored charge is cleared, the reverse diode voltage increases rapidly, as long as reverse current flows, at a rate determined only by the reverse current and the capacitance at the terminals.

Recombination of Current Carriers—As shown in Figures 1 & 2, the time required to clear the stored charge at reverse current of 2 ma is half the time it takes at 1 ma. Simply multiplying reverse current by the time it flows before removal of the charge yields the amount of stored charge. However, as reverse current decreases, the time required to remove the charge does not increase proportionally. Some other agent—namely, recombination of current carriers—removes part of the charge.

CHARACTERISTICS

Fast-Rise Mercury Switch—Inherent risetime of the mercury switch in the unit is 3 nsec. The switching transient is applied to a fast vacuum tube circuit which shapes the waveform for use as the actual switching signal. Repetition rate is approximately 300 pps for turn-on measurements and approximately 600 pps for recovery measurements.

External Triggering Signals—The Type S Unit supplies an external triggering signal to the associated oscilloscope through its attached coaxial cable. This signal remains constant in polarity and amplitude at +4 v for all conditions.

Vertical Deflection Factors—Two calibrated SENSITIVITY switch positions are provided on the unit: 0.5 v/cm and 0.05 v/cm. In the 0.5 v/cm position, the total diode shunt capacitance is approximately 9 pf. In the 0.05 v/cm position, the total diode shunt capacitance is approximately 16 pf. In addition, a ZERO REFERENCE position is provided to establish a true zero voltage reference trace.

Eleven Calibrated Currents—Two switches, FORWARD CURRENT and DIODE MODE, provide eleven calibrated currents: the forward currents range from 1 to 20 milliamps, and the reverse currents range from zero to 2 milliamps, accuracy within 3%.

Weight: Net—4 ¼ pounds
Shipping—6 pounds approx.

TYPE S PLUG-IN UNIT $260

Each instrument includes: 2—instruction manuals (070-0223-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

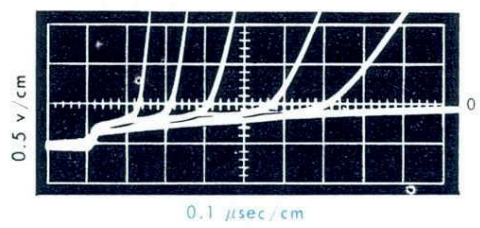


Fig. 1—Diode A

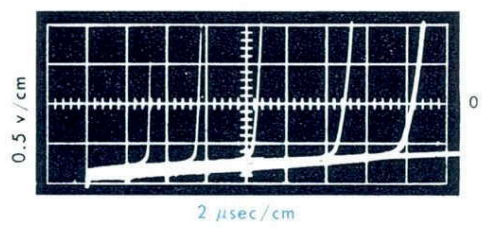


Fig. 2—Diode B

I forward—10 ma. I reverse—2, 1, 0.5, 0.2, 0.1, 0 ma.

Observation of the recovery curves of Figures 1 & 2 shows both reverse current and recombination accounting for removal of the stored charge. It is thus possible to determine not only the stored charge for any of the five forward currents available, but also the rate of recombination. With this information, it is possible to predict diode action to fast transients in any circuit.

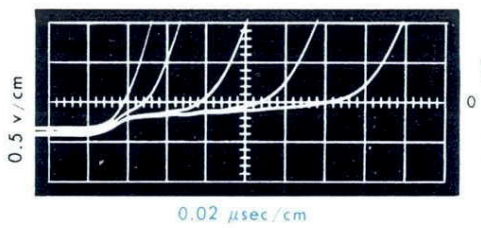


Fig. 3—Diode A

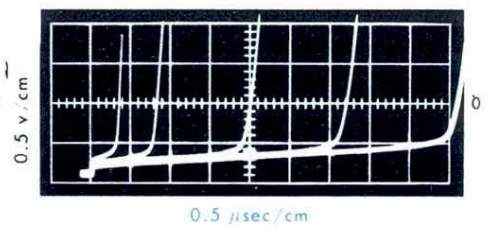


Fig. 4—Diode B

I forward—1, 2, 5, 10, 20 ma. I reverse—2 ma.

Observation of the recovery curves of Figures 3 & 4 shows that the amount of stored charge is proportional to forward current while the recovery time is so short that negligible recombination occurs. Under this condition, after the stored charge is cleared the reverse bias increase is limited only by the diode capacitance (and the shunt capacitance of the instrument). This rate of increase is easily measured at a particular reverse voltage, and thus, the diode capacitance at that voltage can also be determined.

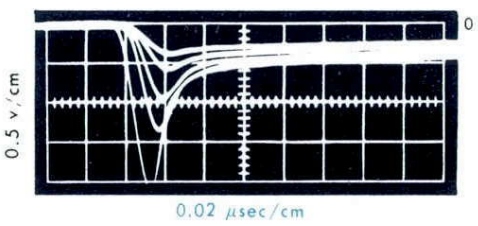


Fig. 5—Diode A

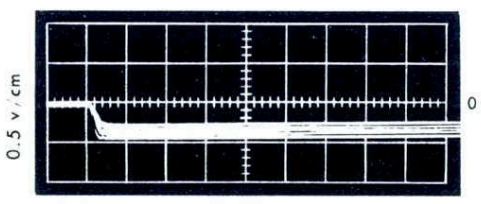


Fig. 6—Diode C

Turn-on—magnified. I forward—1, 2, 5, 10, 20 ma.

Observation of the turn-on characteristics of Figures 5 & 6 shows that the voltage drop across a diode suddenly switched on is not always initially as low as the steady-state drop. It is important to remember that the leading edge of any fast transient passed by a diode may be modified by this phenomenon.

NOTE: The above waveform photos are multiple exposures.

Type T TIME-BASE GENERATOR UNIT

Wide Sweep Range

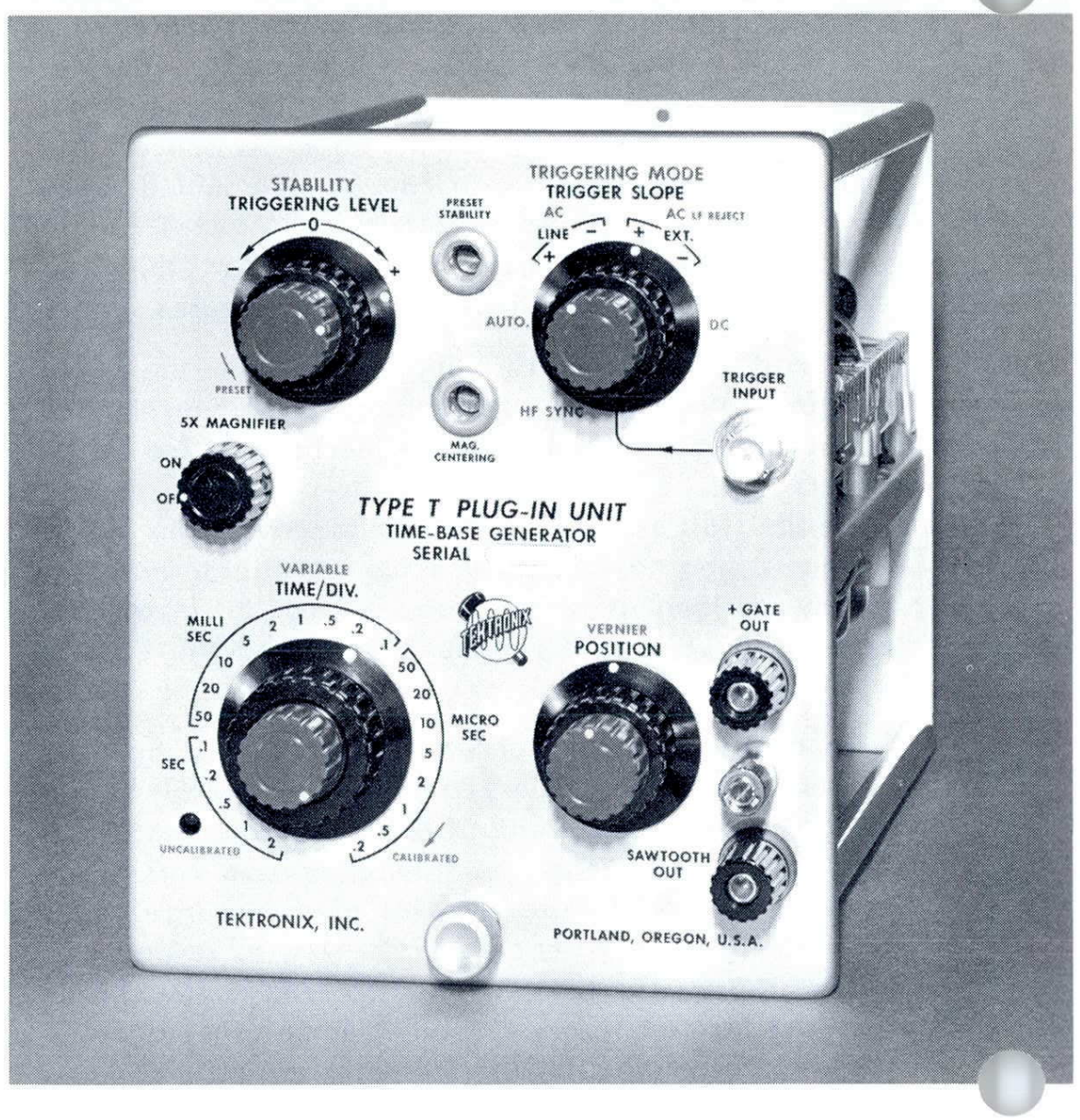
Twenty-two calibrated sweep rates from 0.2 μsec/div to 2 sec/div.

5X magnifier, accurate on all ranges.

Versatile Triggering

Line, external, ac or dc-coupled, automatic triggering, high-frequency sync.

The Type T Time-Base Generator Plug-In Unit is intended to provide sawtooth sweep voltages to drive the horizontal-deflection system and the unblanking gate for the crt in the Type 536 Cathode-Ray Oscilloscope. This plug-in unit can also be used in the vertical-deflection system of any of the Tektronix Type 530, 540, 550 and 580* Series Oscilloscopes. The Type T unit provides the Type 536 with a wide range of sweep rates for use in the usual oscilloscope applications. Trigger shaping and dc-coupled unblanking circuits are included in the Type T Unit.



HORIZONTAL-DEFLECTION SYSTEM

Calibrated Sweep Rates—The Type T Unit has 22 calibrated sweep rates: 0.2, 0.5, 1, 2, 5, 10, 20, 50 μsec/div—0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 millisec/div—0.1, 0.2, 0.5, 1, and 2 sec/div. A single 22-position switch is used. In addition, a vernier (uncalibrated) control provides continuously variable sweep rates from 0.2 μsec/div to 6 sec/div. Calibration accuracy of the fixed sweep rates will be within 3%.

Output Waveforms—A 20-v (approx.) positive-gate waveform of the same time duration as the sweep, and a 150-v (approx.) positive-going sawtooth waveform are available at front-panel connectors.

Sweep Magnifier—When the 5X magnifier is switched in, the center two-division portion of the normal sweep is expanded to the left and right of center to fill ten divisions. The POSITION control has sufficient range to display any one-fifth of the magnified sweep. Magnifier increases the maximum calibrated sweep rate to 0.04 μsec/div. Accuracy is within 5% of the displayed portion of the magnified sweep.

Triggering Facilities—Versatile triggering circuitry provides for complete manual control, preset stability control, and fully automatic triggering.

* A Type 81 Adapter is required.

DC-Coupled Unblanking—This assures uniform bias for all sweep speeds and repetition rates when used in horizontal channel of a Type 536 Oscilloscope.

Preset Stability—The stability control can be set at a predetermined optimum triggering point.

Amplitude-Level Selection—Adjustable amplitude-level and stability controls provide triggering the sweep at a selected amplitude on the triggering waveform, either on the rising or falling slope of the waveform. Trigger source can be external or line frequency.

Automatic Triggering—In this mode of operation, no trigger control adjustment is necessary for most applications. Range of operation is between 60 cps and 2 Mc, approximately. In the absence of a signal a reference trace is displayed at approximately a 50-cps rate.

High-Frequency Sync—Assures a steady display of sine-wave signals up to approximately 15 megacycles. Requires an external signal of about 2 v.

Trigger Requirements—A signal of 0.2 v to 10 v is required.

Weight: Net 4 ¾ pounds
Shipping—7 pounds, approx.

TYPE T PLUG-IN UNIT $240

Each instrument includes: 2—instruction manuals (070-0337-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

PRINTED IN U.S.A.

HIGH-GAIN DIFFERENTIAL COMPARATOR Type W

- *CALIBRATED DIFFERENTIAL COMPARATOR*
- *DIFFERENTIAL-INPUT PREAMPLIFIER*
- *CONVENTIONAL PREAMPLIFIER*
- *20,000:1 COMMON-MODE REJECTION*
- *EFFECTIVE SCREEN HEIGHT OF 11,000 CM*

NEW

The Type W High-Gain Differential Comparator adds to the measurement capabilities of all Tektronix Oscilloscopes using Letter-Series and 1-Series Plug-In Units. Used as a DIFFERENTIAL-INPUT PREAMPLIFIER, the Type W will display a differential signal of 1 mv on a common-mode voltage up to 15 volts peak-to-peak in amplitude, amplifying it for crt display. A front-panel attenuator permits the acceptance of common-mode voltages up to 500 v.

As a CALIBRATED DIFFERENTIAL COMPARATOR, a highly accurate and stable comparison voltage is added differentially to an unknown input signal to precisely measure its amplitude. In this mode of operation, using the slide-back technique, the Type W Unit has an effective screen height of ±11,000 cm. This assumes a ±11-v dynamic signal at the maximum sensitivity of 1 mv/cm, which allows a resolution of 100 μv per mm.

The versatility of the Type W Unit is further enhanced by its CONVENTIONAL PREAMPLIFIER capability. As such, it features high input-sensitivity coupled with frequency response to 23 Mc.

INPUT ATTENUATION is accomplished on both inputs simultaneously. INPUTS are direct or ac-coupled. LOW-FREQUENCY RESPONSE, in ac mode, is down no more than 3 db at 2 cps.

CONVENTIONAL PREAMPLIFIER

OVERALL SENSITIVITY

1 mv/cm to 50 v/cm, depending on gain and attenuator setting.

AMPLIFIER SENSITIVITY

6 calibrated steps from 1 mv/cm to 50 mv/cm. A continuously variable control provides uncalibrated sensitivities between steps, and extends the input sensitivity range to 125 mv/cm.

BANDWIDTH

OSCILLOSCOPE TYPE	SENSITIVITY	BANDWIDTH	RISETIME
531A; 535A	1 mv 50 mv	7 Mc 13.5 Mc	50 nsec 26 nsec
536	1 mv 50 mv	6.5 Mc 10.5 Mc	54 nsec 34 nsec
541A; 543B; 544; 545B; 546; 547; 555; 581A; 585A	1 mv 50 mv	8 Mc 23 Mc	44 nsec 15 nsec
551	50 mv 1 mv	20.5 Mc 8 Mc	17 nsec 44 nsec

ATTENUATORS

4 decade steps covering range of 1 to 1,000. X10 position accurate within ±0.05%; X100 within ±0.15%; X1000 within ±3%.

INPUTS

DC or ac-coupled. Low-frequency response in ac mode is down no more than 3 db at 2 cps. INPUT RESISTANCE is 1 megohm paralleled by 20 pf (except in additional X1 attenuation position ($R \approx \infty$) where $R > 10{,}000$ megohm). Input resistance of X10 and X1 attenuators are matched within ±0.1%.

W

DIFFERENTIAL-INPUT PREAMPLIFIER

COMMON-MODE REJECTION

At least 20,000:1 at dc, and at 20 kc with 30-v peak to peak, dc-coupled. AC COMMON-MODE REJECTION: at least 1,000:1 at 60 cps, with 30-v peak to peak, ac-coupled.

MAXIMUM PEAK INPUT

±15 volts, increasing to ±150 volts with X10 attenuation and +500 volts with X100 or X1000 attenuation.

CALIBRATED DIFFERENTIAL COMPARATOR

COMPARISON VOLTAGE

0 to ±1.1 v, or 0 to ±11 v. Accuracy: ±(0.15% of indicated value plus 0.05% of V_c range).

V_c SUPPLY RESOLUTION

0 to ±1.1 v range: 100 μv per minor dial div; 0 to ±11 v range: 1 mv per minor dial div.

MAXIMUM PEAK INPUT

Same as for Differential-Input.

OVERDRIVE RECOVERY

Occurs within 300 nsec after a signal has been driven from the screen. Returns to within 10 mv of the reference signal (referred to the comparison voltage). Certain overdrive signals can cause an additional slow (thermal) shift of up to 5 mv in the reference level.

Type W PLUG-IN UNIT $575

Each instrument includes: 2—instruction manual (070-0432-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

HIGH-RESOLUTION VOLTAGE MEASUREMENT
using the slide-back technique

A 150-volt sawtooth waveform is applied and clipped with a zener diode, shown in Figure 1. The knee of the curve is shown expanded vertically and horizontally in Figures 2 and 3. This resolution is made possible in the Type W Unit by using the slide-back technique. Figure 3 clearly shows zener noise. 10X more "vertical magnification", to 1 mv/cm, could be used, if desired.

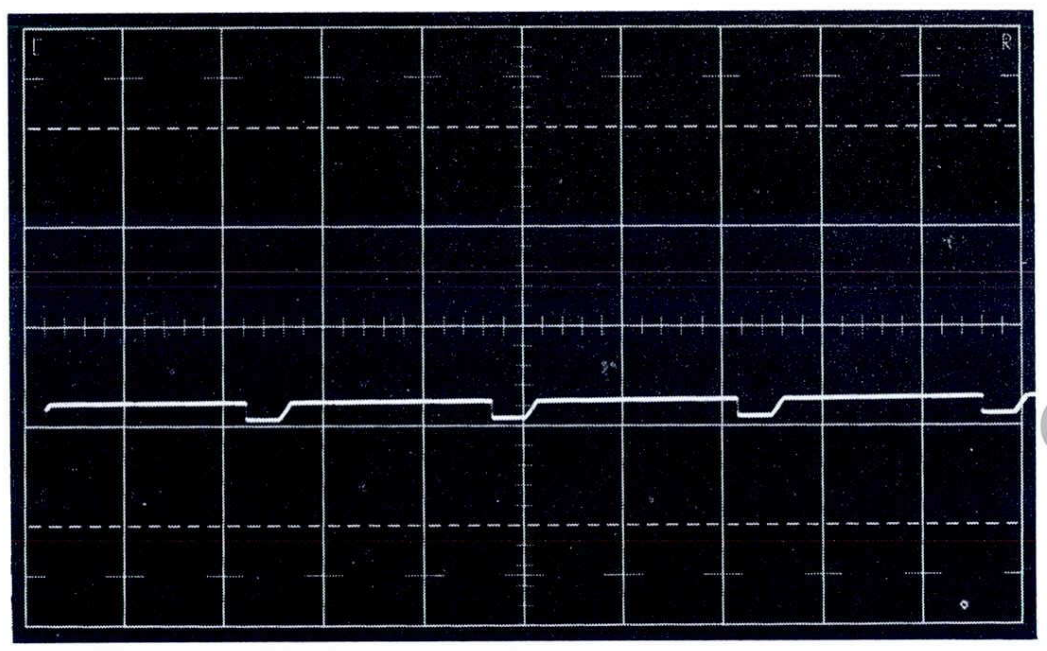


Figure 1—50 v/cm, 5 msec/cm.

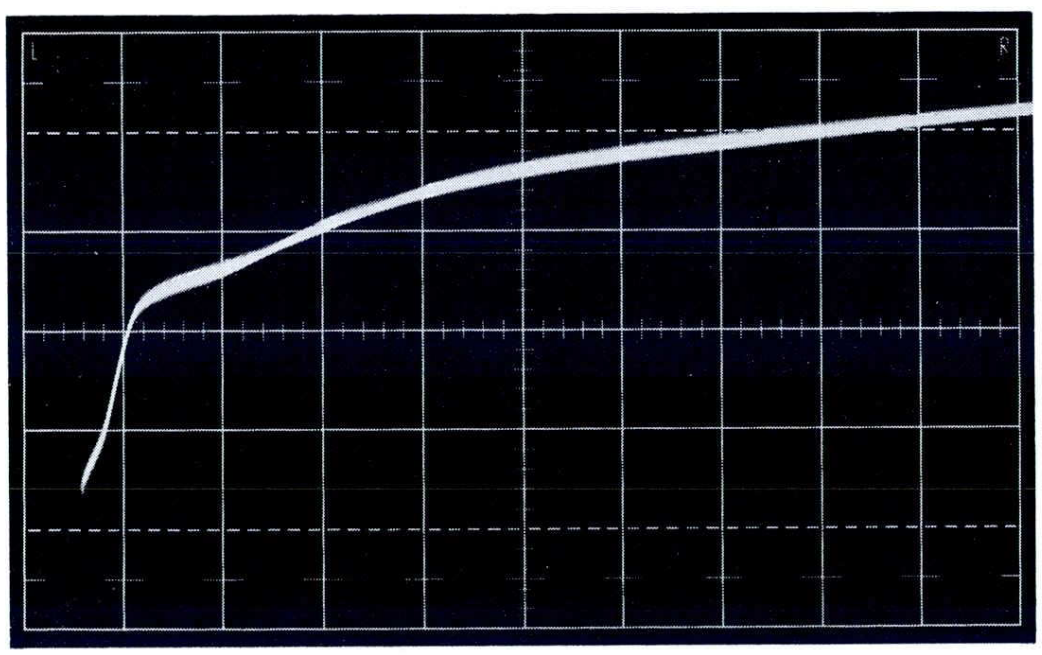


Figure 2—50 mv/cm, 0.2 msec/cm.

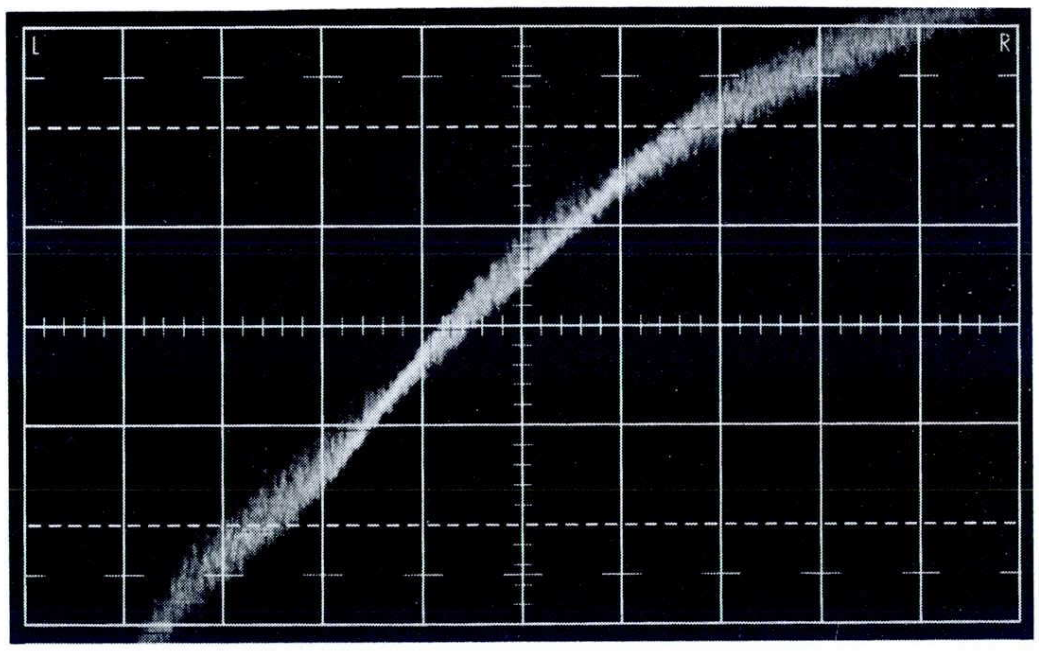


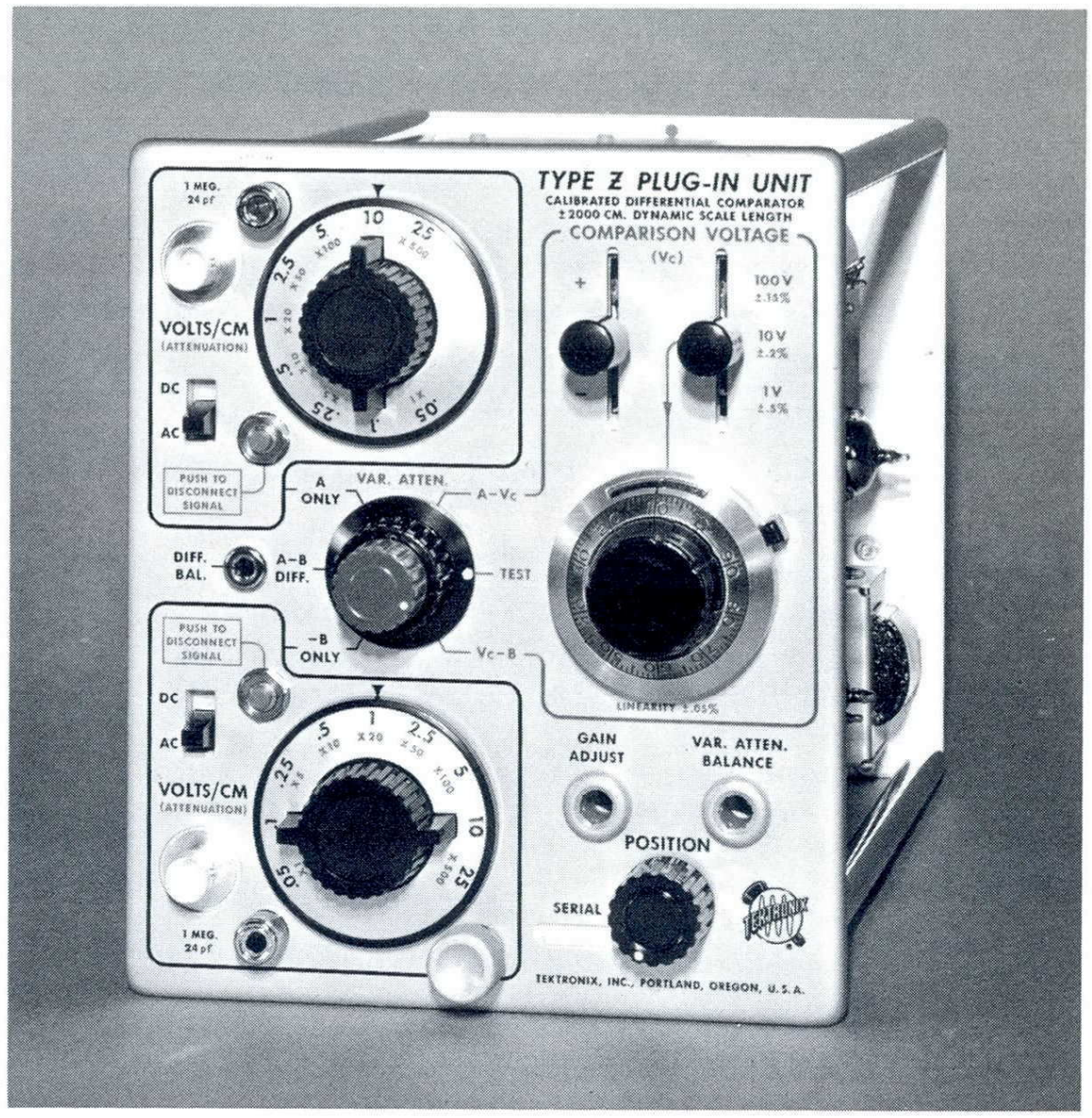
Figure 3—(Single sweep), 10 mv/cm, 100 μsec/cm.

DIFFERENTIAL COMPARATOR UNIT Type Z

The Type Z Plug-In Unit is designed to extend the accuracy of oscilloscope voltage measurements. Highly adaptable, the unit 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. Sensitivity is 50 mv/cm. Dynamic range is ±100 volts. The effective scale length is ±2000 cm—hence, the resolution is a maximum of 0.005%. The high accuracy of the dc comparison voltage assures precise voltage measurements.

With the Type Z in a Tektronix plug-in oscilloscope, calibrated ±dc comparison voltages can be added differentially to the input waveform via the slide-back technique. The comparator can follow an input waveform having an instantaneous rate of rise to 1 volt in 7 nsec, and an instantaneous rate of fall to 1 volt in 5 nsec. A 100-volt waveform can be displayed incrementally with high resolution (of 0.05 v/cm).

The dynamic range of the unit permits common-mode signals up to 100 volts to be applied to the amplifier without attenuation. The common-mode rejection ratio of 40,000 to 1 at dc or low frequencies allows measurement of differential signals less than 50 millivolts. Larger signals can be attenuated if they do not exceed the dynamic range of the unit.



MEASUREMENT APPLICATIONS

AC and DC VTVM—

Measures audio-frequency signals with the same accuracy as dc signals.

DC-Coupling—

Eliminate "floating oscilloscope" operation.

Observe small ac signals in the presence of large dc components—for example, low-frequency signals on plate amplifiers or power-supply fluctuations to 0 cps.

Measure both dc and signal levels.

Semiconductor Characteristics—

Measure Zener diode ac admittances and Zener voltage together.

Measure transistor output impedance h_{oe} or h_{ob}.

High Amplitude Hum Rejection—

Reject up to 200 volts peak-to-peak common-mode hum.

Pulse-Height Analysis—

Reject any pulse below a preset dc level.

Fast-Recovery Amplifier—

Monitor wide dynamic range signals.

Observe small signals present, during, or following a large pulse—for example, ultrasonic delay line testing or amplifier overload testing.

Modulation Monitor—

Measure residual amplitude modulation on a carrier, hum noise, etc., or incidental amplitude modulation on an FM or PM signal.

Component Matching—

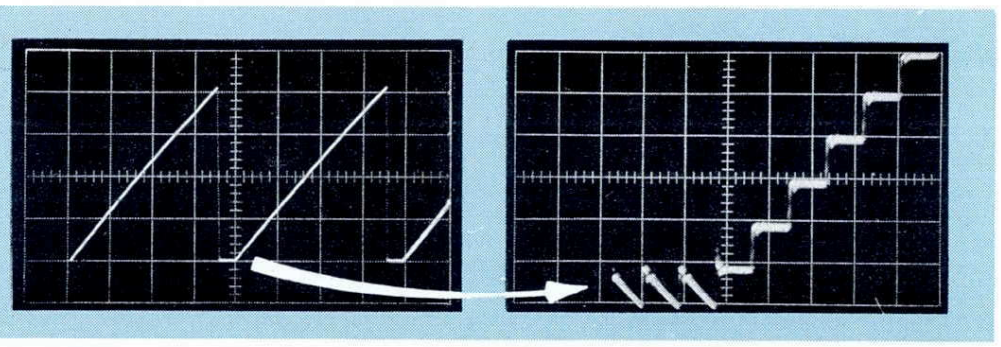
Use differentially as a null detector in bridge setups, with high resolution of the null.

Time-Base or Staircase Comparisons—

Compare incremental linearity of ramps and staircases with high precision.

WAVEFORM DETAILS OF A 100 V STAIRCASE

The Type Z rejects up to 100 v of an input signal and accepts 100 v waveforms for display at 50 mv/cm sensitivity. It provides an equivalent vertical scale length of ±2000 centimeters.



Z

AS A CONVENTIONAL PREAMPLIFIER

Sensitivity—
0.05 volts/cm to 25 volts/cm in 9 calibrated steps.

Attenuation—
Constant input impedance turret attenuators.
9 turret positions provide attenuation of X1, X2, X5, X10, X20, X50, X100, X200, and X500.
Frequency-compensating adjustment provided on the front panel.

Variable Gain—
The 2.5 to 1 ratio control extends sensitivity to over 60 volts/cm.

Frequency Response and Risetime—
Frequency specifications are at 3-db down (for signals that do not overscan the screen)
With Types 531A, 533A, 535A—dc to 10 Mc, 35 nsec.
With Types 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 555, 581A*, 585A*—dc to 13 Mc, 27 nsec.

Input Impedance—
1 megohm paralleled by approximately 24 pf.

Signal Disconnect Control—
Pushbutton switch allows momentary removal of the signal to establish a zero level.

AS A DIFFERENTIAL INPUT PREAMPLIFIER
(at full sensitivity—50 mv/cm)

Common-mode Signal Level—
±100 volts.

Common-mode Rejection—
Ratio is 40,000 to 1 at 0.05 volt per centimeter with a 1-kc sine wave, lower at other sensitivities and higher frequencies.
200 volts peak-to-peak or ±100 volts common-mode signal produces a maximum of 1 mm of vertical deflection, equal to 5 mv of differential input signal.

Rate of Change—
The input signals must not exceed +1 volt in 7 nsec (to avoid grid current), or —1 volt in 5 nsec.

AS A CALIBRATED DIFFERENTIAL COMPARATOR

Comparison Voltages—
Three voltage ranges are provided: from zero to ±1 volt, from zero to ±10 volts, and from zero to ±100 volts.

Internal Regulator—
Maintains voltage essentially independent of the actual power-supply voltages furnished by the oscilloscope or the Type 127 or 132 Preamplifier Power Supply.

Comparison Voltage Accuracy—
Within 0.5% on the ±1-volt scale.
Within 0.2% on the ±10-volt scale.
Within 0.15% on the ±100-volt scale.

DC Drift—
Maximum of ±0.1% in 100-hour drift test of comparison voltages.

Precision Potentiometer—
Zero-based linearity of ±0.05%.

Resolution—
1.0 mm (5 mv) resolution equals 0.005% for 100 v signals.

Transient Response—
Rate of rise: The input cathode follower can handle a signal with a rate of rise of less than +1 volt in 7 nanoseconds without the flow of grid current. Grid-current flow will generally distort the waveform.
Rate of fall: The amplifier will be cut off whenever the rate of fall of the input signal exceeds —1 volt in 5 nanoseconds. The amplifier will then "run down" linearily at this rate until it "catches up" with the input signal, and then will resume conduction.
Large fast signals can be attenuated to reduce the switching rate.

Attenuator Accuracy—
Input attenuators are the constant-input-impedance, frequency-compensated type.
Resistor tolerance is nominally 1%.
Attenuation accuracy is within 2%.

Weight: Net—5¾ pounds.
Shipping, 10 pounds, approx.

TYPE Z PLUG-IN UNIT $525
Each instrument includes: 2—instruction manuals (070-0251-00).

Variable Attenuation Probe

The Type P6023 10X Probe compensates for normal attenuator differences between two channels allowing increased input-signal-level swing with minimum loss of slideback accuracy and (used in pairs) optimum common mode rejection at Type Z Unit attenuator settings other than 0.05 v/cm. An adjustable potentiometer compensatets the 10:1 attenuation ratio, and two adjustable capacitors compensate for input capacities between 20 pf and 47 pf.

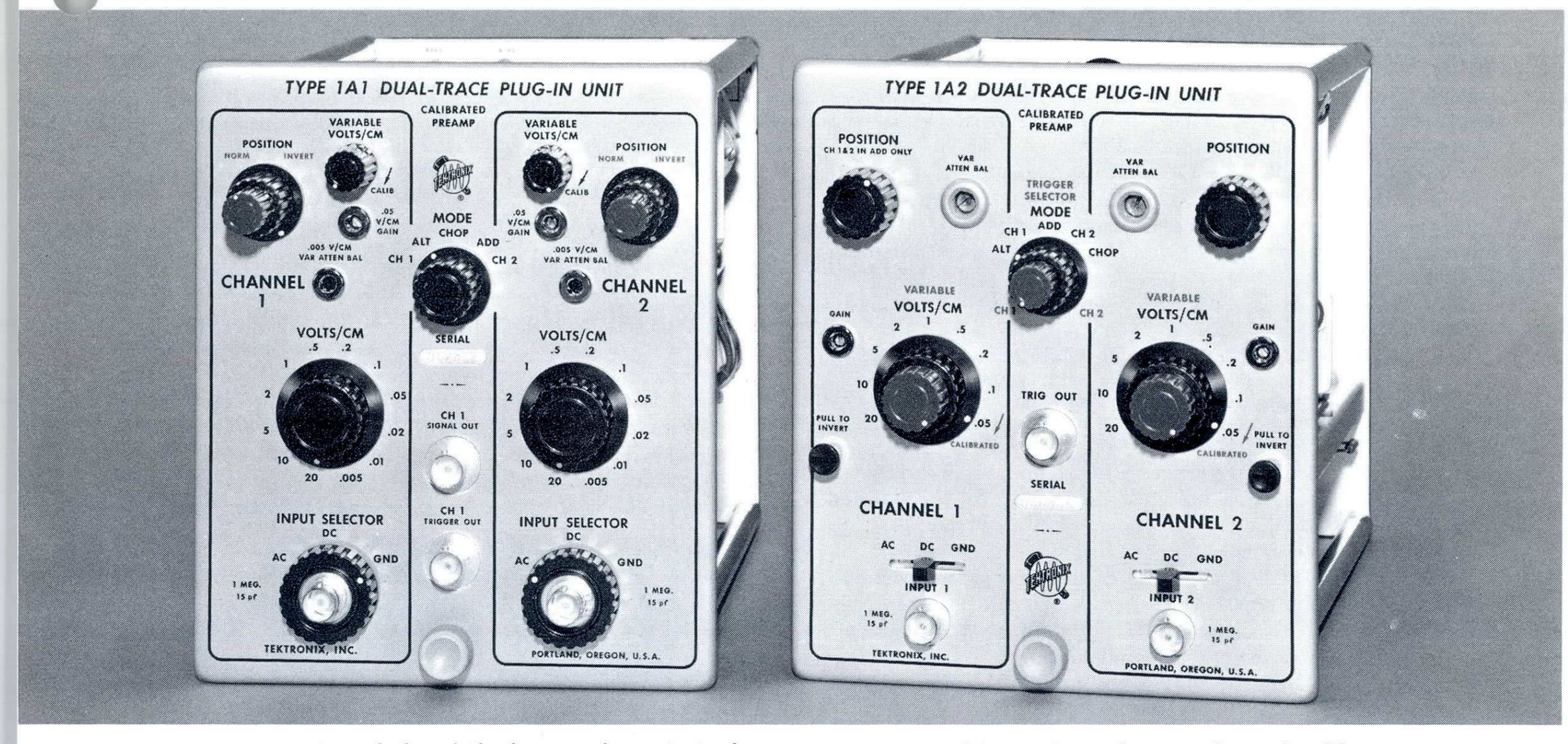
Order Part Number 010-0167-00 ..... $40

Please refer to Catalog Accessory Section for additional information.

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

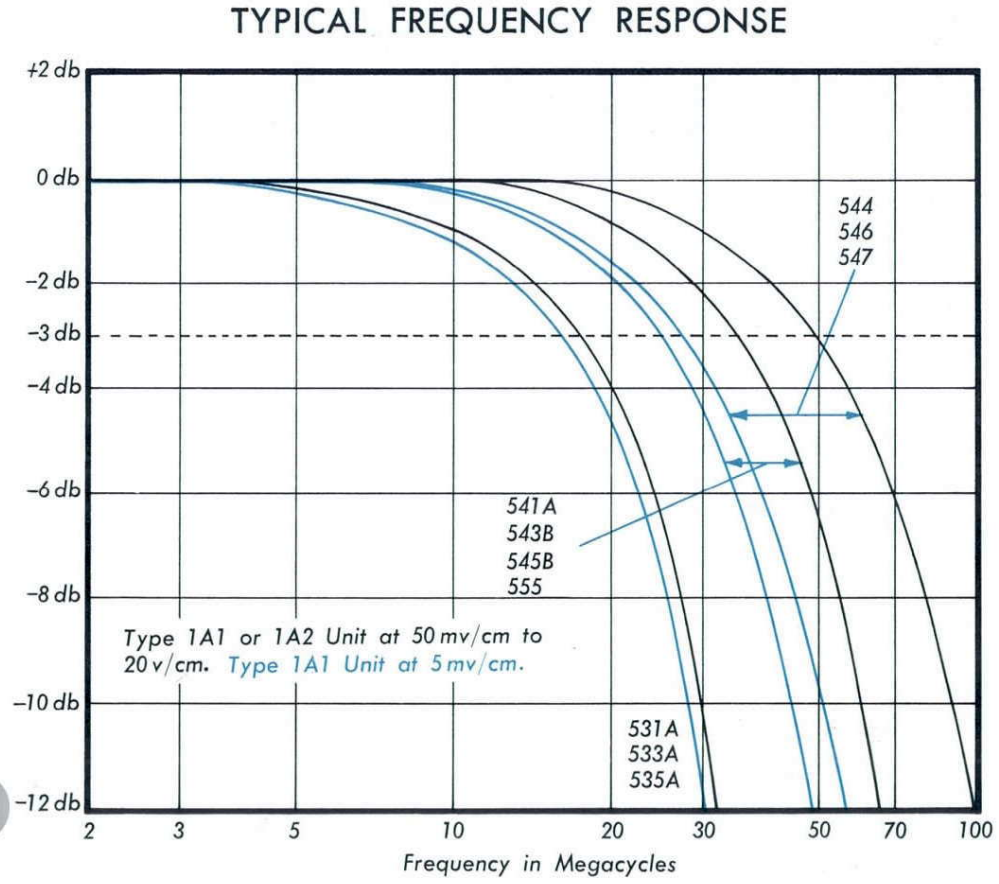
* A Type 81 Adapter is required.

WIDE-BAND DUAL-TRACE DC UNITS Type 1A1 / 1A2



Here are two new wide-band dual-trace plug-in units for Tektronix Type 530, 540 and 550-Series Oscilloscopes. Both Types 1A1 and 1A2 provide optimum passband capabilities in the Type 544, 546, and 547 Oscilloscopes, and also extend the measurement capabilities of all other Tektronix Oscilloscopes that accept Letter-Series Plug-in Units. The Type 1A1 offers these outstanding additional features: 5 mv/cm sensitivity (dc coupled), and front-panel signal output. This Channel 1 Output, when cascaded into Channel 2, provides ≈ 500μv/cm sensitivity (ac coupled).*

TYPICAL FREQUENCY RESPONSE



*Type 580-Series Oscilloscopes require a Type 81 Adapter.

COMMON CHARACTERISTICS

TWO SIGNALS can be added algebraically, displayed singly, or together, using either chopped or alternate-trace modes. To extend the usefulness of chopped mode at faster sweep rates, chopping in the Type 1A1 occurs at an approx. 1-Mc rate to show successive 500-nsec segments of each trace. In the Type 1A2, electronic switching occurs at an approx. 220-kc rate to show successive 2-μsec segments of each trace. Chopped transient blanking is provided in all Type 530, 540, and 550-Series Oscilloscopes except Types 536 and 551. When either plug-in unit is used with the Type 547 or RM547, the alternate switching circuit in the plug-in can be slaved to the Display Switching circuit in the oscilloscope, thus locking Channel 1 to Time Base A and Channel 2 to Time Base B. For many applications, this provides equivalent dual-beam operation without the additional complexity and cost of a dual-beam oscilloscope.

POLARITY INVERSION can be used to closely compare signals 180° out of phase.

AC or DC COUPLING or grounding of the input is conveniently controlled at the front panel. With ac coupling the low-frequency 3-db point is 2 cps direct, 0.2 cps with a 10X Probe.

INPUT RC is 1 megohm paralleled by approximately 15 pf. P6008 10X Passive Probes (included with the Type 544, 546 and 547 Oscilloscopes) increase the input resistance to 10 megohms and decrease the input capacitance to approximately 7.5 pf.

MAXIMUM INPUT VOLTAGE is 600 volts (dc plus peak ac).

TYPE 1A1

SENSITIVITY from 5 mv/cm to 20 v/cm is in 12 calibrated steps with 1-2-5 sequence, accuracy within 3%. An uncalibrated control permits continuous adjustment between steps and to approximately 50 v/cm.

1A1
1A2

CHANNEL 1 SIGNAL OUTPUT is available at the front panel with up to 10X amplification. Output is at a source impedance of $\simeq$ 50 Ω. The Channel 1 output may be ac coupled into Channel 2, providing approximately 500 μv/cm sensitivity at passbands indicated in the chart. A suitable noise or frequency filter can be inserted between channels, if desired. Passband of the Channel 1 output alone is dc to 35 Mc.

CHANNEL 1 TRIGGER OUTPUT is available at the front panel and also at the rear plug-in connector*. Triggering directly from Channel 1 conveniently permits viewing the true time relationship between 2 signals when using either alternate or chopped mode.

NET WEIGHT is 5½ pounds. Shipping weight is approximately 10 pounds.

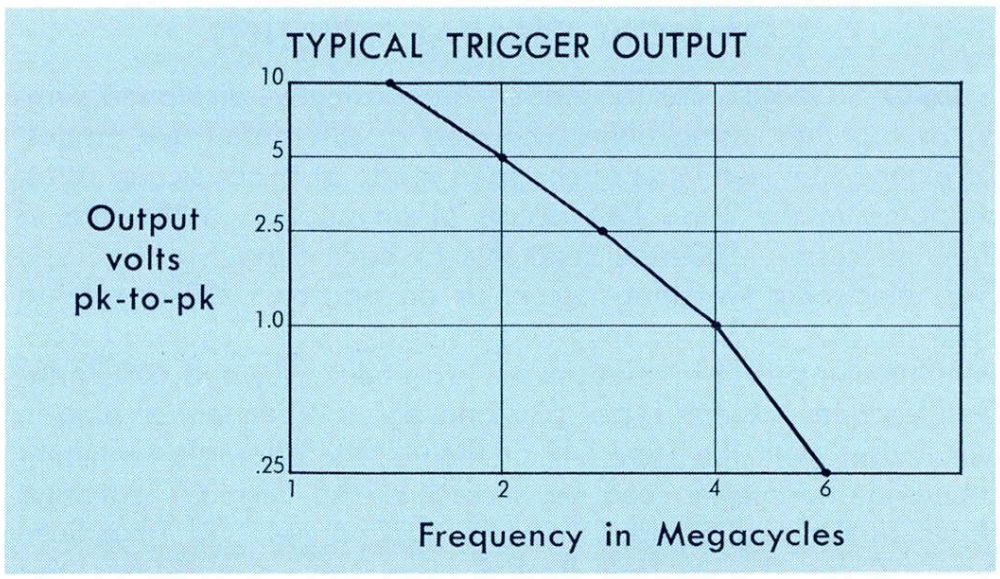
TYPE 1A1 DUAL-TRACE PLUG-IN UNIT $600

Each instrument includes: 1—50-Ω male BNC to male BNC cable (012-0076-00), 2—instruction manuals (070-0378-00).

TYPE 1A2

SENSITIVITY from 50 mv/cm to 20 v/cm is in 9 calibrated steps with 1-2-5 sequence, accuracy within 3%. An uncalibrated control permits continuous adjustment between steps and to approximately 50 v/cm.

TRIGGER OUTPUT is available at the front panel and also at the rear plug-in connector*. The output can be taken from either Channel 1 or Channel 2. Triggering directly from one of the channels conveniently permits viewing the true time relationship between two signals when using either alternate or chopped mode.



*The internal output is utilized in Type 544, 546, 547, and (with Type 21A and 22A Time Base Units) Type 555 Oscilloscopes.

COMMON-MODE REJECTION is at least 20:1 throughout the full instrument passband for signals up to ½ v pk-to-pk amplitude (measured at 50 mv/cm with variable attenuator in calibrated position).

NET WEIGHT is 4¼ pounds. Shipping weight is approximately 8 pounds.

TYPE 1A2 DUAL-TRACE PLUG-IN UNIT $325

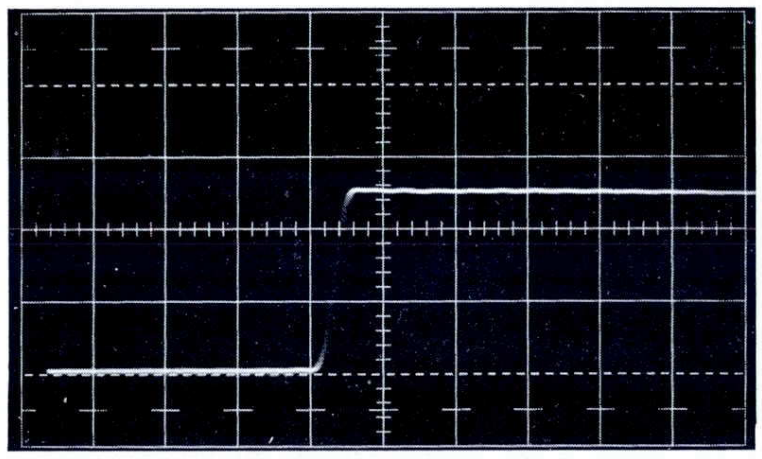
Each instrument includes: 2—instruction manuals (070-0430-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

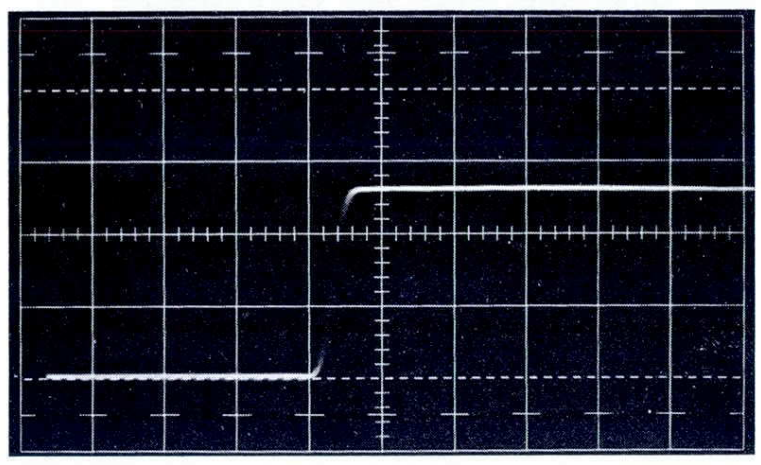
CLEAN HIGH-FREQUENCY RESPONSE

A significant improvement in built-in step attenuator design is realized in the Type 1A1 and 1A2 Dual-Trace Units. The severest test of any step attenuator is at its maximum setting where feed through, lead inductance and inadequate grounding techniques have the most effect.

Response of the Types 1A2/547 to the output of a Tektronix Type 109 Pulse Generator (risetime less than 0.25 nsec) indicates no appreciable change between minimum (50 mv/cm) and maximum (20 v/cm) calibrated attenuator settings.



MAXIMUM ATTENUATION (20 v/cm), 20 nsec/cm sweep rate.



MINIMUM ATTENUATION (50 mv/cm), 20 nsec/cm sweep rate.

GAIN/PASSBAND CHARACTERISTICS

OSCILLOSCOPE TYPE	Type 1A1 Only		Type 1A1 and 1A2
	Single-Channel Passband and Risetime at 500 μV/CM	Dual-Channel Passband and Risetime at 5 MV/CM	Dual-Channel Passband and Risetime at 50 MV/CM
544, 546, 547	2 cps to 15 Mc 23 nsec	dc to 28 Mc 12.5 nsec	dc to 50 Mc** 7 nsec
541, 541A, 543, 543A, 543B, 545, 545A, 545B, 555, 581*, 581A*, 585*, 585A*	2 cps to 14 Mc 25 nsec	dc to 23 Mc 15 nsec	dc to 33 Mc 10.5 nsec
551	2 cps to 13 Mc 26 nsec	dc to 21 Mc 16.5 nsec	dc to 27 Mc 13 nsec
531A, 533, 533A, 535A	2 cps to 10 Mc 35 nsec	dc to 14 Mc 25 nsec	dc to 15 Mc 23 nsec
531, 535, 536	2 cps to 8 Mc 44 nsec	dc to 10.5 Mc 33 nsec	dc to 11 Mc 31 nsec

* Type 580-Series Oscilloscopes require a Type 81 Adapter.

** Passband with P6008 10X Passive Probes (included with the Types 544, 546, and 547) is 45 Mc or greater at 3-db down. Risetime is approximately 8 nsec.

WIDE-BAND SAMPLING UNIT Type 1S1

- *INTERNAL TRIGGERING*
- *INTERNAL DELAY LINE*
- *DIRECT-READING MAGNIFIER*
- *LOW DISPLAY NOISE*

Used with any of the Type 530, 540, 550 or 580*-Series Oscilloscopes, the new Type 1S1 Sampling Unit extends the measuring capabilities to 1 gigacycle. Operation is like a conventional oscilloscope—but with a combination of bandwidth and sensitivity possible only through sampling.

The Type 1S1 features internal triggering with a built-in delay line—no need for pretriggers or external delay lines. The tunnel-diode trigger circuit insures stable triggering through 1 gigacycle. Calibrated sweep rates are from 100 psec/cm to 50 μsec/cm. A single control is used to select the sweep rate and magnify the display up to X100 when desired. This single-control feature allows direct read out of the sweep rate even when magnified.

Calibrated vertical sensitivities range from 2 mv/cm to 200-mv/cm. Noise in the display is less than 1 mv, and can be reduced by a smoothing control. A dc-offset control permits observation of millivolt signals in the presence of up to $\pm$1 volt input levels. Output signals are available at the front panel for driving chart recorders.

VERTICAL SYSTEM

RISETIME
Less than or equal to 0.35 nsec.

SENSITIVITY
7 calibrated steps from 2 mv/cm through 200 mv/cm. Variable between steps extending maximum sensivitiy to 500 μv/cm (uncalibrated).

NOISE
Less than 1 mv. Can be reduced to less than 500 μv with smoothing control.

INPUT IMPEDANCE
50 Ω

DYNAMIC RANGE
$\pm$2 v. Full sensitivity can be used with signals up to $\pm$2 volts in amplitude. Safe overload is $\pm$5 v (higher with reduced duty factor).

DC OFFSET
Range is greater than $\pm$1 v. OUTPUT: (for monitoring the dc-offset level) ten times actual offset through 10 k.

VERTICAL OUTPUT
200 mv per displayed centimeter through 10 k.

* Type 81 Plug-In Adapter required.

HORIZONTAL SYSTEM

SWEEP RATES
18 calibrated steps from 100 psec/cm to 50 μsec/cm. ACCURACY: $\pm$3% normal or magnified. Variable between steps, extending sweep rate to 33 psec/cm (uncalibrated).

MAGNIFIER
Allows display to be magnified around a fixed time-reference point while maintaining a constant number of samples/cm.

TIME POSITION
Moves the displayed time window and positions the time-reference point for magnification.

SAMPLES/CM
Continuously variable, allowing optimum adjustment of display rate and dot density.

TRIGGERING
3 trigger modes, ac-coupled: $\pm$internal, $\pm$external, and free run. EXTERNAL SENSITIVITY: 5 mv to 200 mv. RESPONSE: Sine-wave triggering or synchronizing from 100 kc through 1 Gc. Pulse triggering down to 10 pps.

DISPLAY MODES
Repetitive, single display, manual scan, or external scan. Front-panel START button for single-display operation.

HORIZONTAL OUTPUT
1 v per displayed centimeter through 10 k.

1S1

PROBE POWER OUTPUT

Front-panel connector for use with cathode-follower type probes.

DIMENSIONS AND WEIGHT

DIMENSIONS—11½" long by 5⅞" wide by 6 15/16" deep.

NET WEIGHT:—8 lbs.

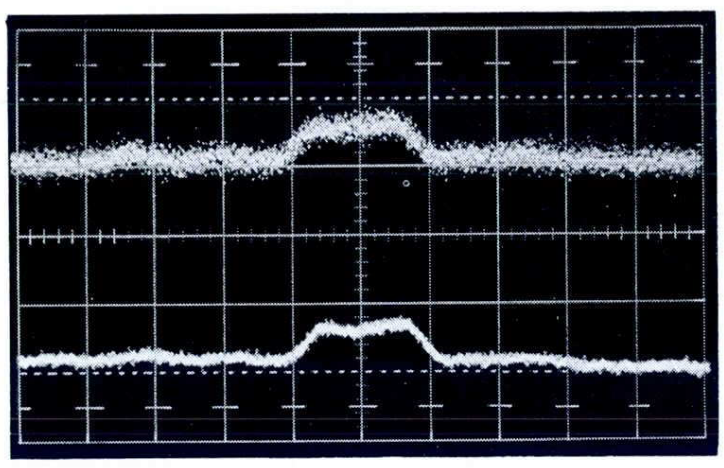
SHIPPING WEIGHT—11 lbs.

TYPE 1S1 SAMPLING UNIT $1100

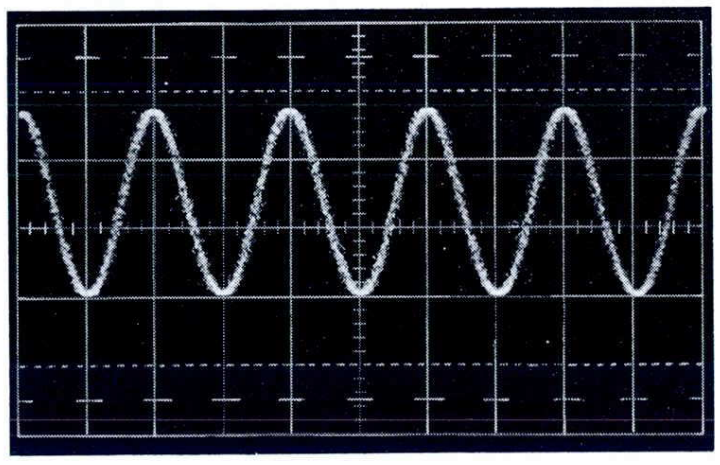
Each instrument includes: 1—cable, 50-Ω, 5 nsec, RG-8 with GR connectors (017-0502-00); 1—cable, 50-Ω 10 nsec, RG-58 with GR connectors (017-0501-00); 1—patch cord, 18'' with banana connectors (012-0039-00), 2—Attenuator, 10X, 50-Ω (017-0044-00) 1—adapter, GR-to-BNC female (017-0063-00); 1—adapter, GR-to-BNC male (017-0064-00); 2—instruction manual (070-0475-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

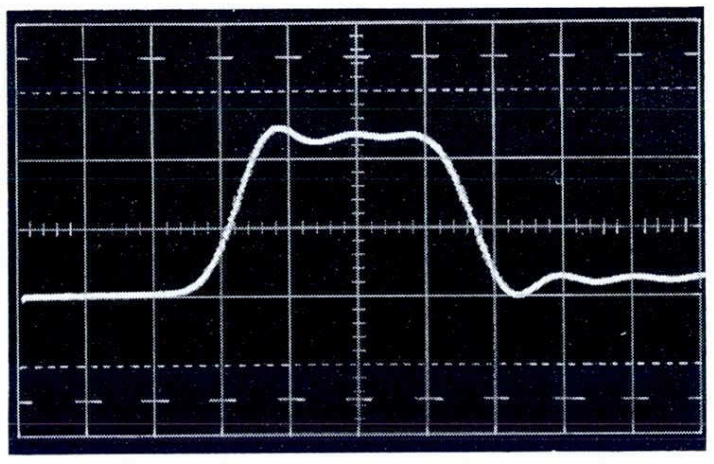
THE WAVEFORM PHOTOGRAPHS BELOW ILLUSTRATE THE PERFORMANCE CAPABILITIES OF THE TYPE 1S1 SAMPLING UNIT. THESE INCLUDE LOW INHERENT DISPLAY NOISE, STABLE TRIGGERING, REAL-TIME SAMPLING, PLUS TYPICAL TIME-DOMAIN REFLECTOMETRY MEASUREMENTS.



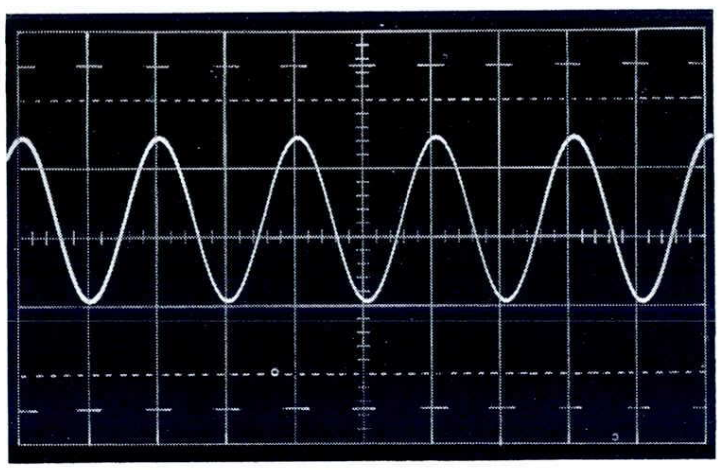
TANGENTIAL NOISE
A 1 millivolt, 2 nsec wide pulse externally triggered. Upper waveform is unsmoothed. the lower is smoothed.
Vert: 2 mv/cm
Horiz: 1 nsec/cm



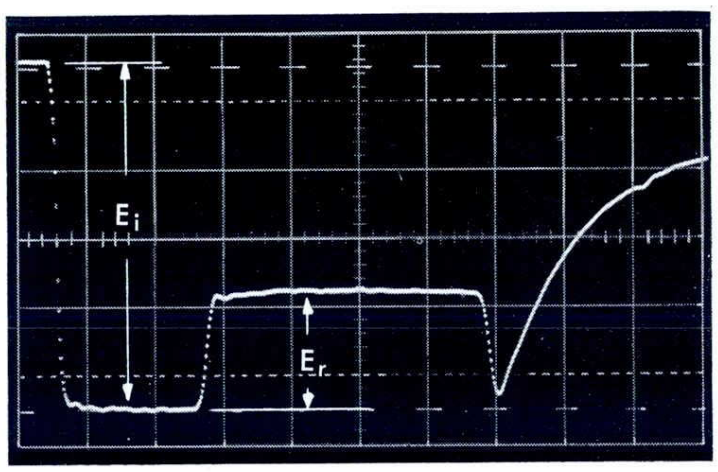
TRIGGERING AT 1 Gc
A 1 Gc sine wave; internally triggered.
Vert: 100 mv/cm
Horiz: 0.5 nsec/cm



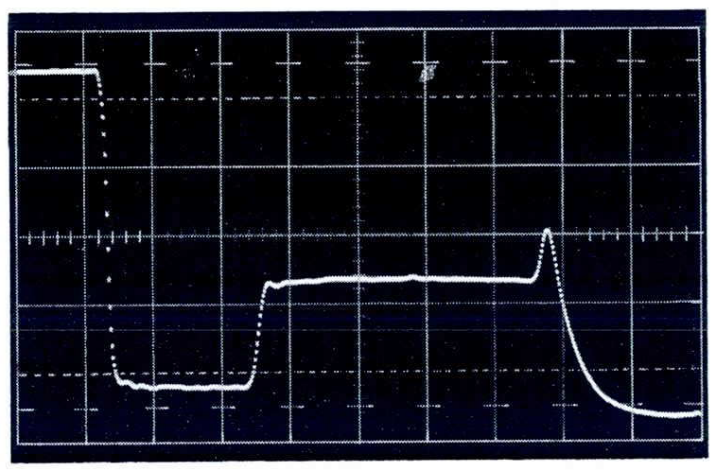
PULSE TRIGGERING
A 50 mv, 2 nsec wide pulse; internally triggered.
Vert: 20 mv/cm
Horiz: 0.5 nsec/cm



REAL-TIME SAMPLING DISPLAY
A 100 cps sine wave; Internal Main Frame triggering.
Vert: 100 mv/cm
(free running sampler)
Horiz: 0.5 millisecond/cm
(realtime—main frame)



TIME DOMAIN REFLECTOMETRY
The display shows a 50-ohm system with a transition to a 25-ohm system, terminated with an inductive load.
Vert: 100 mv/cm
Horiz: 5 nsec/cm



TIME DOMAIN REFLECTOMETRY
The display shows a 50-ohm system with a transition to a 25-ohm system, terminated with a capacitive load.
Vert: 100 mv/cm
Horiz: 5 nsec/cm

$$\rho = \frac{E_r}{E_i} \qquad Z_L = Z_O \frac{1 + \rho}{1 - \rho}$$

SPECTRUM ANALYSIS

Present users of Tektronix Type 530, 540, 550 and 580*-Series Oscilloscopes can now achieve high-quality spectrum analysis at a fraction of the cost of other analyzers. Purchasing the Spectrum Analyzer and Oscilloscope together, in the case of the new customer, gives the same analysis capability plus all the advantages and versatility inherent in the Oscilloscope and such other plug-in units as may be desired.

Typically, the Spectrum Analyzer Plug-In Unit selects a portion of the electromagnetic spectrum—as wide as 60 Mc, for example—and displays visually on the oscilloscope crt all the radio activity occuring there. With the DISPERSION control, you can "zoom in" on any portion of this activity for a closer look, resolving signals separated by as little as 1 kc in the case of the Type L-20, or 10 cps in the case of the Type 1L10. This wide range of resolution makes the Tektronix Spectrum Analyzer most applicable to a great variety of signal analysis.

Within the portion of the spectrum that concerns you, any waveform—amplitude or frequency modulated, pulsed carriers, etc.—is displayed as a series of "pips" on the crt. The analyzer changes the time-base of your oscilloscope to a frequency base.

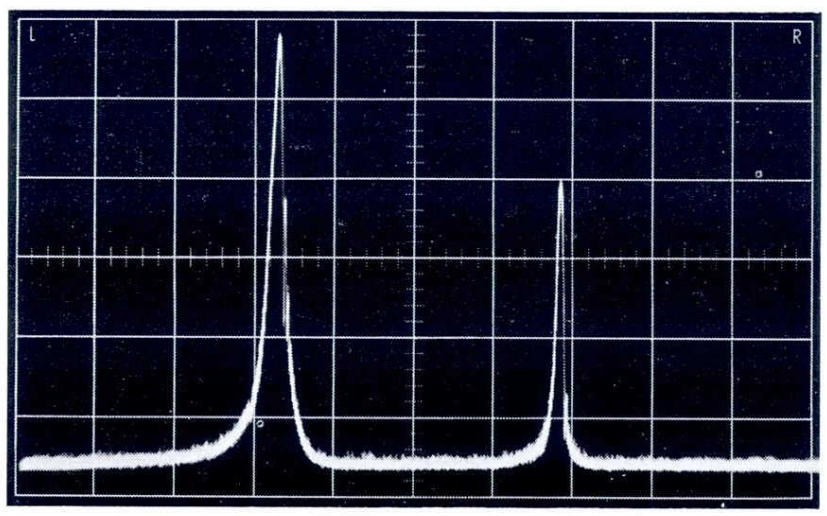
The dynamic range capability of the Tektronix Spectrum Analyzers is greatly increased by the inclusion of square-law and logarithmic detection modes as well as a linear mode. The ability to compress or expand signals greatly enhances the versatility of these instruments. Signals of very nearly the same amplitude can be displayed in the SQUARE-LAW MODE which expands the small difference to a proportion that facilitates measurements. Conversely, signals of greatly different amplitude (40 db, for example) can be displayed in the LOG MODE which compresses the difference between them. In addition, the Analyzer's VIDEO INPUT allows conventional time-based displays from 10 cps to the bandwidth of the oscilloscope.

The units manufactured by Tektronix are extremely sensitive and will give usable displays with inputs lower than —100 dbm. This represents a power level of 10^{-13} watts, using the conventional reference level of 0 dbm = one milliwatt.

The usefulness of Tektronix Spectrum Analyzers extends into many measurement areas. They are used by Government Agencies to check the sidebands of radio-transmitting devices. Telephone companies find transmission-line carrier measurements quick and accurate, often providing data not obtainable by other means. Spectrum Analyzers are finding increased use in missile projects and the exploration of outer space, especially in association with the maintenance and trouble-shooting of telemetry equipment. They are indispensable to recently developed techniques of servicing radar and microwave equipment.

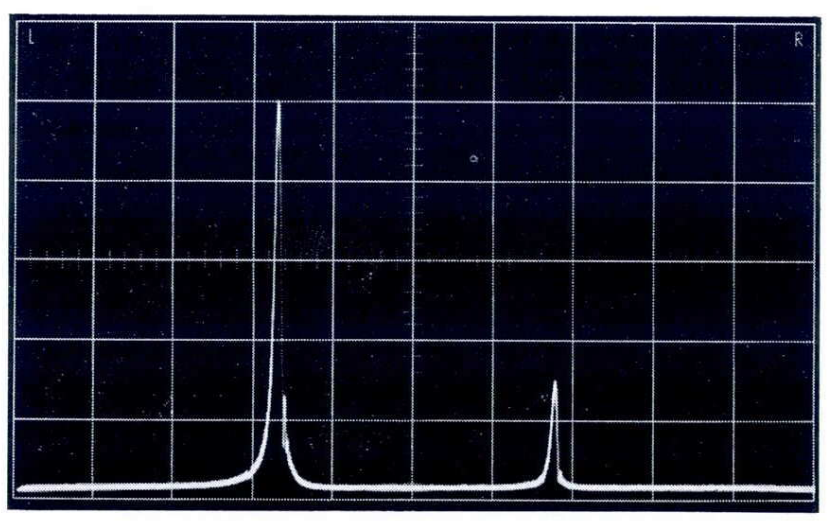
The constantly-increasing list of analyzer applications proves these instruments to be a solid addition to the Tektronix line. You are encouraged to consult with your Tektronix Field Engineer to discuss your measurement and test problems.

* A Type 81 Adapter is required.

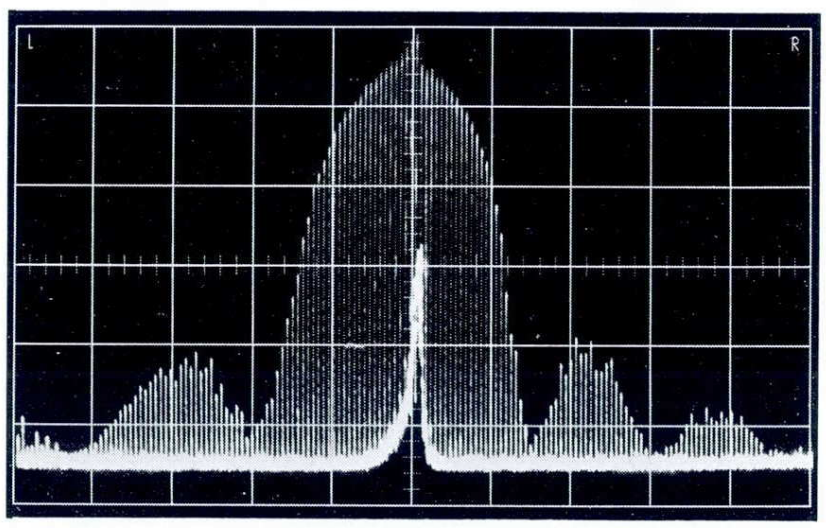


Log Detection Mode

500-cps Modulation of 450-Mc Signal

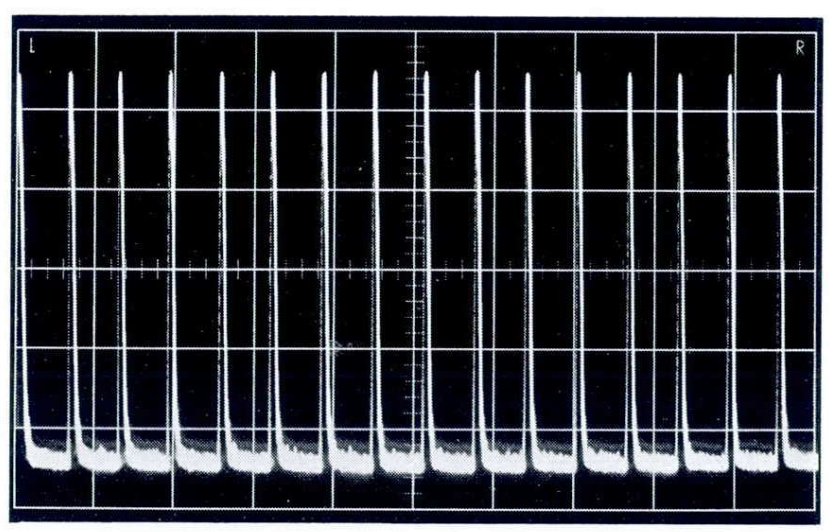


Linear Detection Mode



Repetition-Rate lines evident at 5 msec/cm
(Note: CW Feedthrough)

200-Mc Pulse



Repetition-Rate measurement at 0.5 msec/cm

Type 1L10 1-to-36 MC SPECTRUM ANALYZER

- ***CALIBRATED DISPERSION***
- ***CROSS-COUPLED RESOLUTION***
- ***I. F. STABILITY***
- ***IMAGE REJECTION***

1 to 36-Mc spectral displays can now be viewed on any Tektronix Type 530, 540, 550 or (with adapter), 580-Series Oscilloscope. The Type 1L10 Analyzer Plug-In Unit provides FREQUENCY-BASED DISPLAYS with 100 cps to 20 kc CALIBRATED DISPERSION plus a SEARCH MODE for rapid location of signals.

CROSS-COUPLED RESOLUTION from 10 cps to 1 kc greatly simplifies operation since, in most applications, a narrow resolution bandwidth is desired at narrow dispersion (e.g., 10-cps resolution at 0.01 kc/cm dispersion), and a wide resolution bandwidth at wide dispersion (e.g., 1-kc resolution at 2 kc/cm dispersion). By cross-coupling the dispersion and resolution controls, operation is optimized and simplified, yet they can be uncoupled and operated separately, if required.

I.F. stability is achieved through use of CRYSTAL-CONTROLLED OSCILLATORS. Even the swept local oscillator is controlled through a crystal discriminator. An external, front-end, crystal-operated oscillator can be connected through a front-panel patch arrangement to provide added stability to spectral displays within or outside the normal 1 to 36-Mc range of the Type 1L10.

IMAGE REJECTION is achieved through use of a 60-Mc first i.f. amplifier which places images at more than twice the upper tuning frequency of the Type 1L10.

FREQUENCY RANGE
1 to 36 Mc, fine and coarse tuning.
Dial Accuracy within ±(100 kc + 1% of reading).

MINIMUM SENSITIVITY
—100 dbm, measured at 10 cps resolution, .01 kc/cm dispersion.

FREQUENCY STABILITY
i. f. within 2 ppm/°F, 1 ppm/volt (line).
l. o. within 150 ppm/° F, 10 ppm/volt (line).

MAXIMUM FM
i. f. within 5 cps.
l. o. within 25 cps + 1 cps/Mc dial frequency.

CALIBRATED DISPERSION
0.01 kc/cm to 2 kc/cm, 8 steps, 1-2-5 sequence.
Accuracy within ±3% when adjusted for individual oscilloscope, within +13, —7% without adjustment. Search position—minimum 20 kc + 1 kc/Mc dial frequency full scale (10 cm).

RESOLUTION
10 cps to 1 kc, cross coupled with calibrated dispersion positions, and separately switchable. Search position—approximately 10 kc.

DISPLAY FLATNESS
±1 db.

SWEEP LINEARITY
5%

MAXIMUM INPUT POWER
+24 dbm at full rf attenuation, —20 dbm without rf attenuation.

RF ATTENUATOR
51 db ± 0.1 db/db in 1-db steps.
½ watt maximum power-handling capability.

SWEEP RATE
Oscilloscope rates extend from 0.02 cps (5 sec/cm) to beyond practical analyzer range.
Versatile oscilloscope triggering.

DISPLAY FUNCTIONS
Log — 50-db dynamic range over 6 cm.
Linear — 26-db dynamic range over 6 cm.
Linear X10 — 26-db dynamic range over 6 cm.
Video — 100 mv/cm (variable) 10 cps to oscilloscope vertical bandwidth, 50-Ω input resistance.

1L10

RECORDER OUTPUT
DC-coupled, 600-Ω impedance, 15 mv/cm display in Linear mode, output linear with voltage.

INPUT IMPEDANCE
50 Ω and 600 Ω nominal.

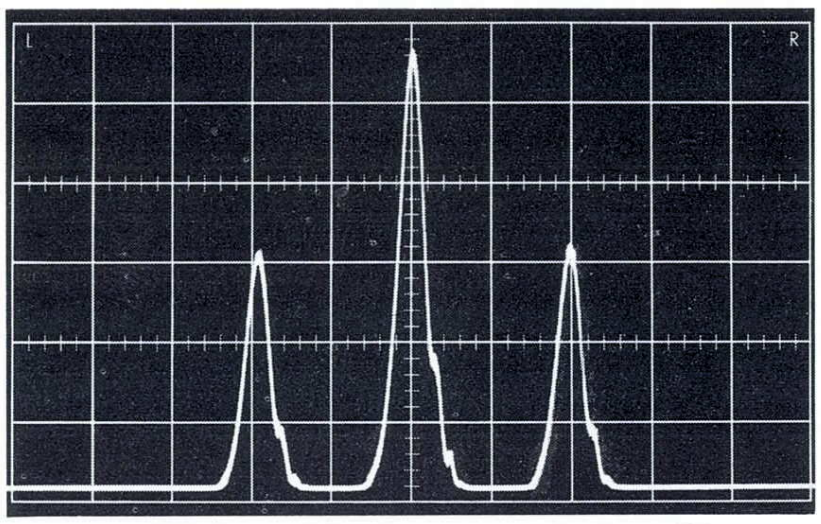
WEIGHT
Net — 6 pounds, shipping — 10 pounds, approx.

TYPE 1L10 SPECTRUM ANALYZER UNIT $1200
Each instrument includes: 1—cable assembly, BNC to BNC, 2½" (012-0097-00); 1—cable assembly, BNC to banana plug, 24" (012-0095-00); 2—instruction manual (070-0510-00).

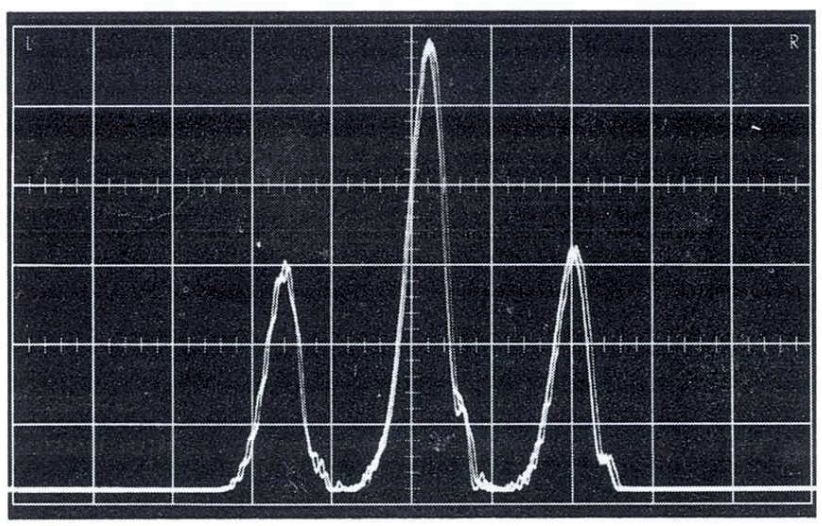
U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

TYPICAL DISPLAYS

60-MC IF SIGNALS

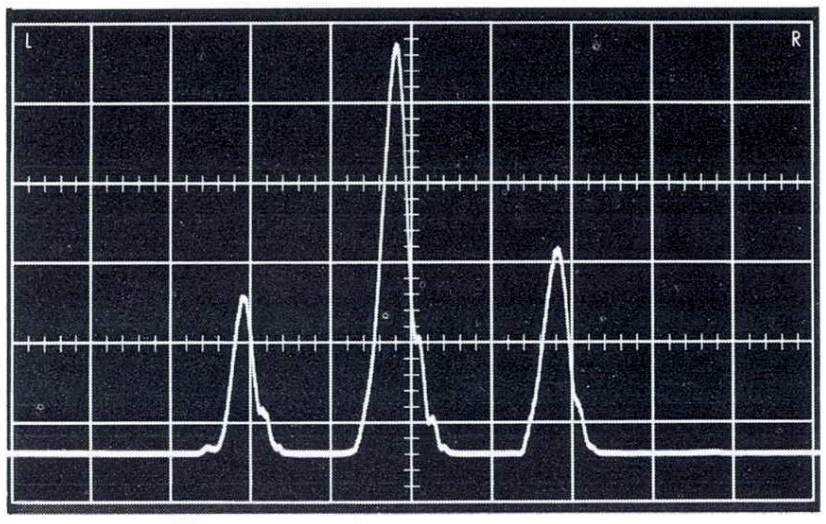


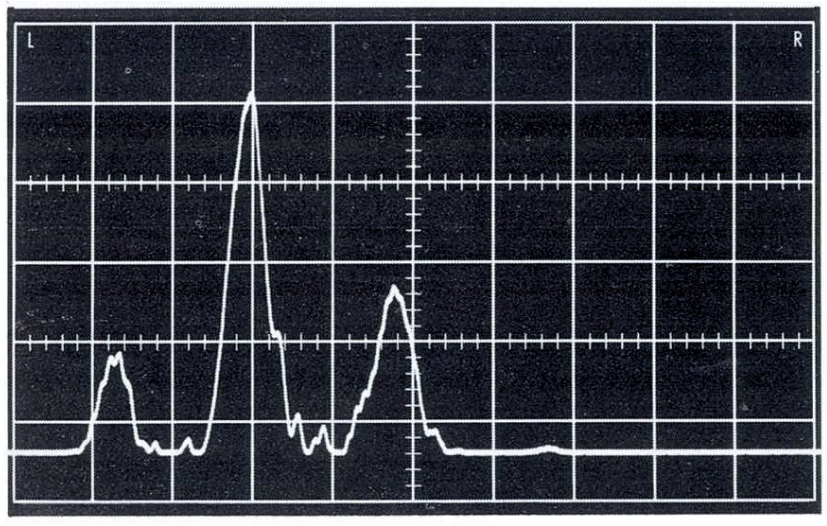
400-cps Sidebands
.2 kc/cm Dispersion



100-cps Sidebands
.05 kc/cm Dispersion

18-MC CONVERTED SIGNALS





Type L-20 / L-30 MULTI-BAND SPECTRUM ANALYZERS

- ***WIDE FREQUENCY COVERAGE***
- ***VIDEO FILTER***
- ***RELATIVE-FREQUENCY CALIBRATOR***

The Type L-20 and L-30 are similar Spectrum Analyzers, the primary difference being the frequency range over which they operate. Both units provide a wide frequency coverage at high sensitivity, and offer the convenience of a video filter and choice of four vertical display modes. They operate in any Tektronix Type 530, 540, 550 or (with adapter) 580-Series Oscilloscope.

CHARACTERISTICS	TYPE L-20	TYPE L-30
FREQUENCY RANGE (MC)	Band 1: 10 to 230 Band 2: 230 to 900 Band 3: 900 to 2000 Band 4: 2000 to 3100 Band 5: 3100 to 4000	1000 to 2040 2040 to 4200 4200 to 6400 6400 to 8600 8600 to 10400
MINIMUM SENSITIVITY (Measured at 1-kc Resolution, 20 kc Dispersion, 50 msec/cm, Peaking optimized)	Band 1: —105 dbm Band 2: —110 dbm Band 3: —100 dbm Band 4: —95 dbm Band 5: —90 dbm	—105 dbm —100 dbm —95 dbm —90 dbm —75 dbm
INCIDENTAL FM	800 cps on Band 1 and 2 (fundamental)	800 cps on Band 1 (fundamental)

DIAL ACCURACY
±(2 Mc + 1% of rf input frequency)

DISPERSION
Narrow — 15 kc to 5 Mc, continuously variable.
Wide — 100 kc to 60 Mc, continuously variable.
Oscilloscope 5X magnifier usable to 3 kc; up to 100X magnifier on some oscilloscopes.
Band 1 of Type L-20 normally limited to 5-Mc dispersion by narrow-band filter, isolating the local oscillator from the i.f. input. Filter automatically switched out in Bands 2-5, can be manually switched out from front panel in Band 1.

RESOLUTION
1 kc to 100 kc, continuously variable.

DISPLAY FLATNESS
±3 db (60 Mc).

MARKERS
Single or Picket Fence — continuously variable ±30 Mc.
Picket Fence — 100-kc or 1-Mc spacing.

MAXIMUM INPUT POWER
—30 dbm.

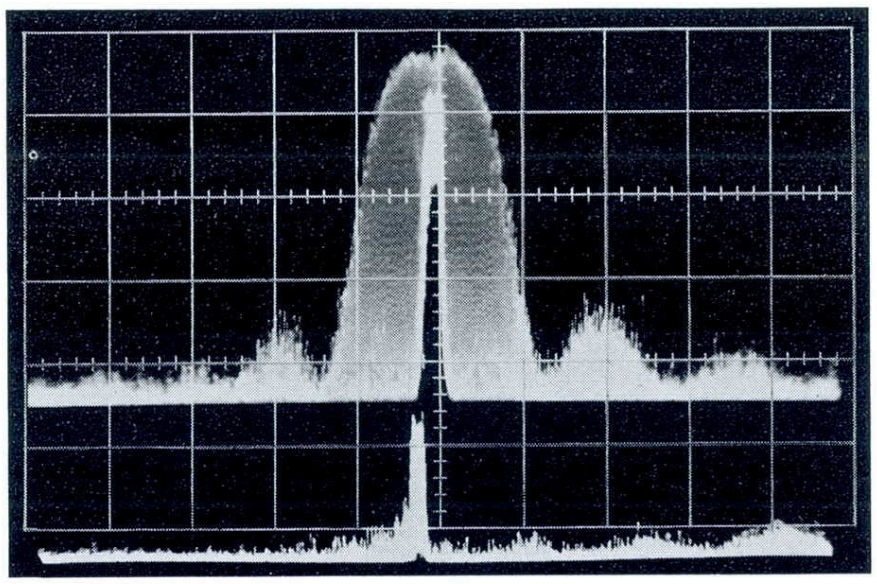
I.F. ATTENUATOR
51 db ±0.1 db/db in 1-db steps.

I.F. GAIN CONTROL
50 db (variable).

SWEEP RATE
Oscilloscope rates extend from 0.02 cps (5 sec/cm) to beyond practical analyzer range.
Versatile oscilloscope triggering.

PRINTED IN U.S.A.

L-20
L-30



DUAL-BEAM SPECTRUM ANALYSIS

Two Tektronix Spectrum Analyzers in a Type 551 or 555 Oscilloscope allow simultaneous monitoring of 2 portions of the electromagnetic spectrum. Simultaneous spectrum displays (frequency-based) and repetition rate (time-based) displays can be viewed using 2 identical Analyzers tuned to the same frequency. Any Letter-Series or '1' Series Plug-In Unit can also be used with an Analyzer to provide simultaneous displays of pulse shape and spectral content.

DISPLAY FUNCTIONS

Log — 40-db dynamic range over 6 cm.

Linear — 26-db dynamic range over 6 cm.

Square Law — 13-db dynamic range over 6 cm.

Video — 100 mv/cm (variable) 10 cps to oscilloscope vertical bandwidth, $\cong$ 100-Ω input resistance.

INPUT IMPEDANCE

Nominal 100 Ω

WEIGHT

Net — 8 pounds, shipping — 12 pounds, approx.

TYPE L-20 SPECTRUM ANALYZER UNIT $1995

Each instrument includes: 1—patch cord, banana plug to banana plug, 18" (012-0031-00); 2—instruction manual (070-0474-00).

TYPE L-30 SPECTRUM ANALYZER UNIT $1995

Each instrument includes: 1—patch cord, banana plug to banana plug, 18" (012-0031-00); 2—instruction manual (070-0474-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 2A60 DC-to-1MC AMPLIFIER UNIT

The Type 2A60 Amplifier is a general purpose plug-in unit. The unit may be used in any of the Type 560-Series Oscilloscopes. However in the Type 567 and RM567, the measurements will not be presented in digital form.

CALIBRATED SENSITIVITY is 0.05 v/div, 0.5 v/div, 5 v/div and 50 v/div; accuracy is within 3%. Uncalibrated continuous control from 0.05 v/div to 500 v/div.

PASSBAND is dc to 1 Mc.

RISETIME is 0.35 μsec.

MAXIMUM INPUT VOLTAGE is 600 volts.

INPUT IMPEDANCE is 1 megohm paralleled by approximately 47 pf.

NET WEIGHT is 3 pounds. Shipping weight is 4 pounds., approx.

TYPE 2A60 AMPLIFIER UNIT **$105**

Each instrument includes: 2—instruction manuals (070-0263-00).

Type 2A61 LOW-LEVEL DIFFERENTIAL AMPLIFIER

The Type 2A61 is a low-level ac differential amplifier useful for very low-level ac signals in addition to usual differential operation. It may be used in any Type 560-Series Oscilloscope. However in the Type 567 and RM567, measurements will not be presented in digital form.

OPERATING MODES include Input A only; negative Input B only; Input A minus Input B; and CM (common mode)—for checking differential rejection ratio.

CALIBRATED SENSITIVITY is from 0.01 mv/div to 20 mv/div in 11 steps, 1-2-5 sequence; accuracy 5%. Uncalibrated continuous control from 0.01 mv/div to 50 mv/div.

FREQUENCY RESPONSE is 0.06 cps to approximately 0.3 Mc decreasing to 0.1 Mc at 0.01 mv/div.

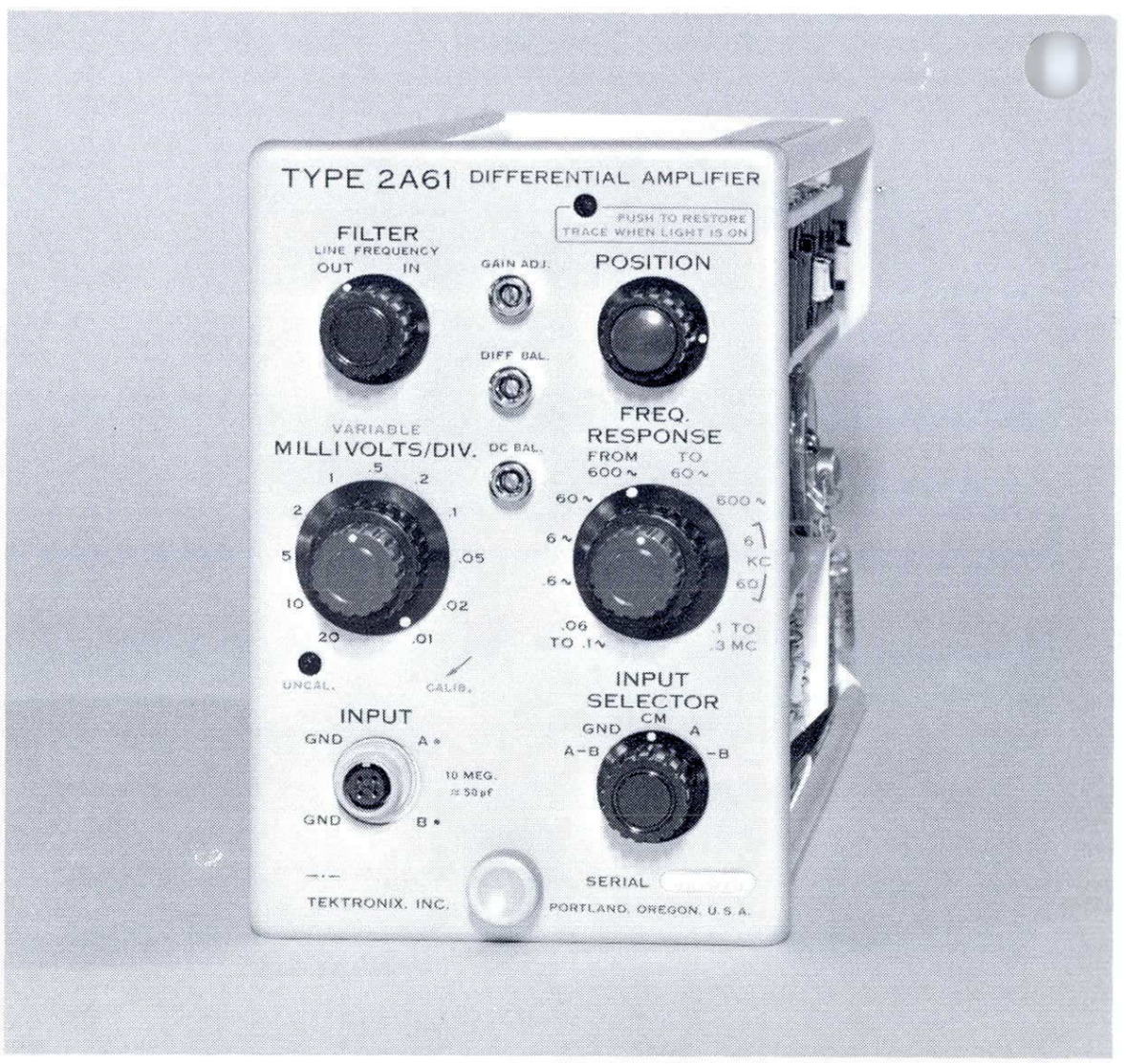
FREQUENCY RESPONSE CONTROL selects several high-frequency and low-frequency 3-db points thus restricting the passband to improve the signal-to-noise ratio.

COMMON MODE REJECTION RATIO is 50,000 to 1 below 10 kc with a 5-v common-mode input.

LINE-FREQUENCY NOISE FILTER is a notch filter that provides better than 50 to 1 rejection of 60 cps line-frequency noise. Filters for 50 cps and 400 cps are also available.

EQUIVALENT INPUT NOISE is less than 20 μv peak-to-peak (3.5 μv rms) at maximum bandwidth.

TRACE RESTORER button returns the trace to its normal vertical position after the trace has been driven off the screen.



INPUT IMPEDANCE is 10 megohms paralleled by ≈50 pf.

NET WEIGHT is 4¼ pounds. Shipping weight is ≈5 pounds.

TYPE 2A61 AMPLIFIER UNIT **$385**

Each instrument includes: 2—instruction manuals (070-0321-00), 1—input cable (012-0072-00).

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Please refer to Terms and Shipment, General Information page.

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DIFFERENTIAL AMPLIFIER UNIT Type 2A63

The Type 2A63 is a differential-input amplifier unit that is extremely useful for making voltage measurements between two above-ground points and for canceling in-phase signals such as hum pickup in connecting leads. This unit may be used in any of the Type 560-Series Oscilloscopes. However in the Type 567 and RM567, the measurements will not be presented in digital form.

CALIBRATED SENSITIVITY is from 1 mv/div to 20 v/div in 14 steps, 1-2-5 sequence; accuracy within 3%. Uncalibrated continuous control from 1 mv/div to 50 v/div.

PASSBAND is dc to 300 kc.

RISETIME is 1 μsec (approx).

DIFFERENTIAL INPUT has better than 50-to-1 CMR (Common Mode Rejection) at 0.2 v/div with 50-kc sine wave.

PHASE SHIFT for X-Y displays is nominally less than 1° at 50 kc.

INTER-STAGE AC COUPLING reduces drift at high gain.

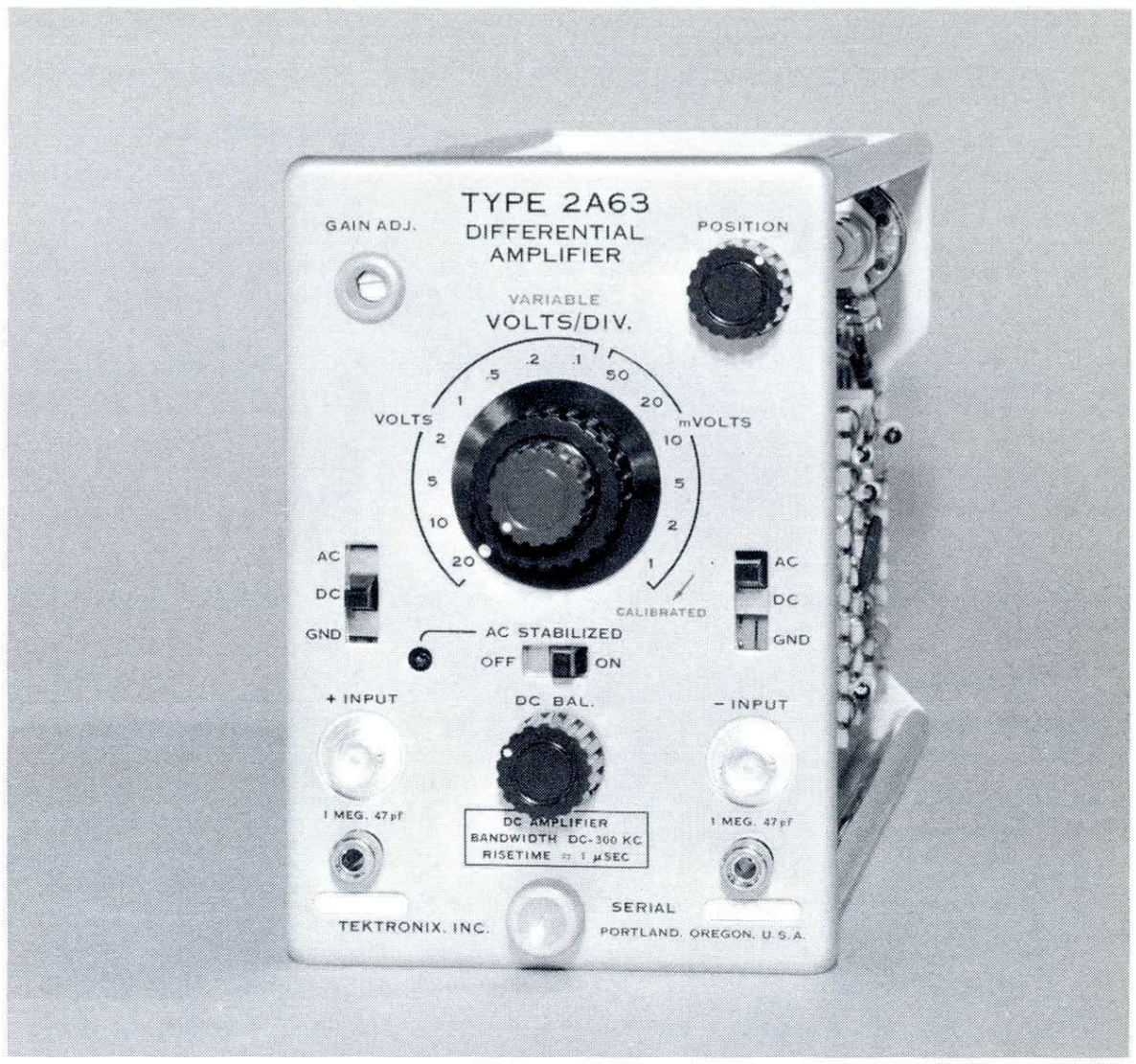
INPUT IMPEDANCE is 1 megohm paralleled by approximately 47 pf.

MAXIMUM INPUT VOLTAGE is 600 volts.

NET WEIGHT is 3¾ pounds. Shipping weight is 5 pounds, approx.

TYPE 2A63 AMPLIFIER UNIT **$150**

Each instrument includes: 2—instruction manuals (070-0266-00).



TIME-BASE UNIT Type 2B67

The Type 2B67 is a Time-Base Unit that may be used to generate a sweep for any of the 560-Series Oscilloscopes, except the Type 565 and RM565. However in the Type 567 and RM567, the measurements will not be presented in digital form. The Type 2B67 has facilities for an external input to the sweep amplifier.

CALIBRATED SWEEP RANGE is from 1 μsec/div to 5 sec/div in 21 steps,1-2-5 sequence; accuracy 3%—with magnifier 5%. Uncalibrated continuous control from 1 μsec/div to 12 sec/div.

5X MAGNIFIER extends sweep rate to 0.2 μsec/div.

SINGLE SWEEP for one-shot waveform photography.

TRIGGER FACILITIES include Internal, External, Line; Amplitude-Level Selection; AC or DC Coupling; Automatic or Free Run; ± Slope.

TRIGGER REQUIREMENT for internal is 2 minor graticule divisions of deflection; for external is from 0.5 v dc to 2.0 v at 2 Mc.

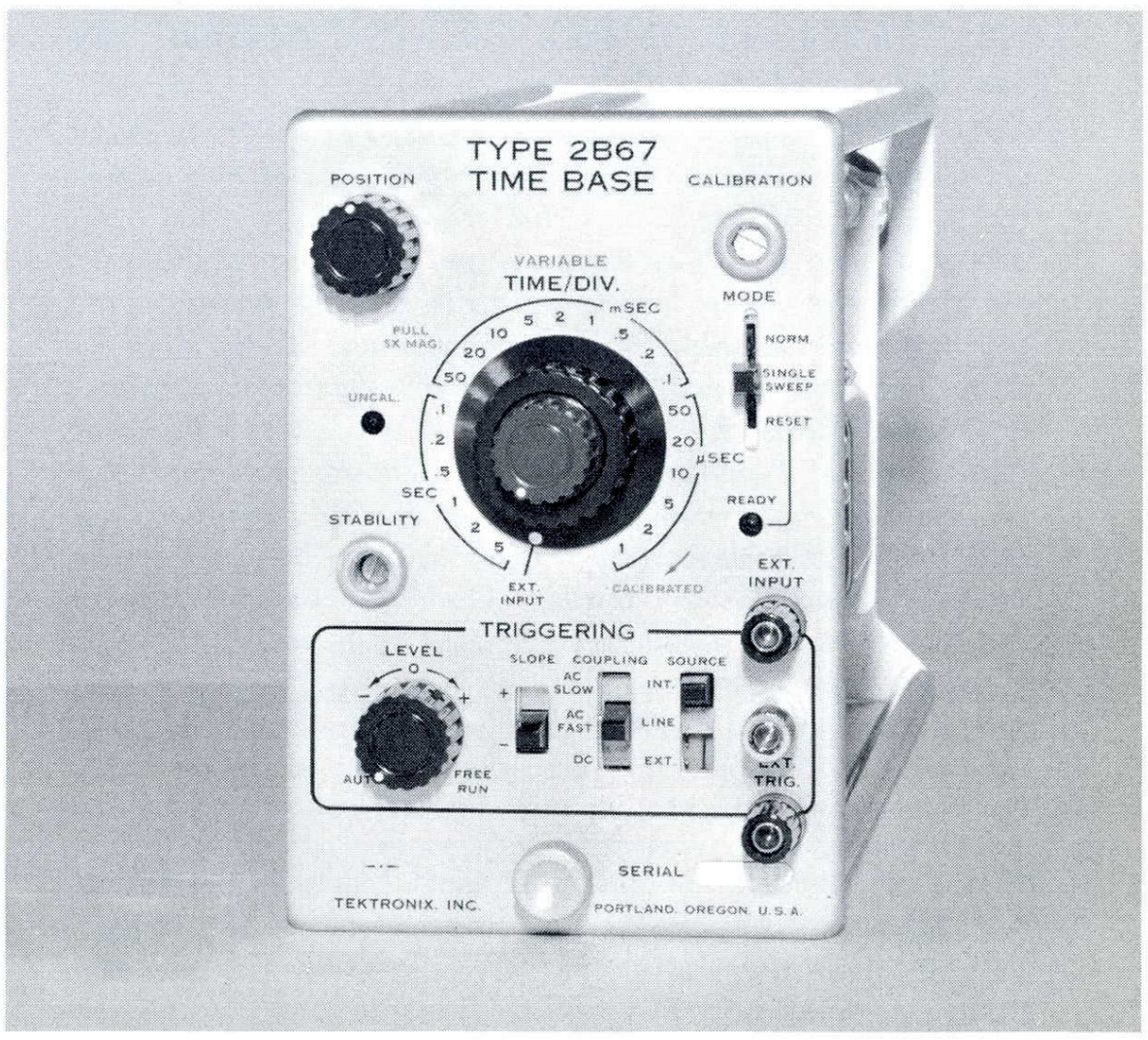
SWEEP AMPLIFIER has a passband of dc to 750 kc and a sensitivity of about 1 v/div.

NET WEIGHT is 4¼ pounds. Shipping weight is 5 pounds, approx.

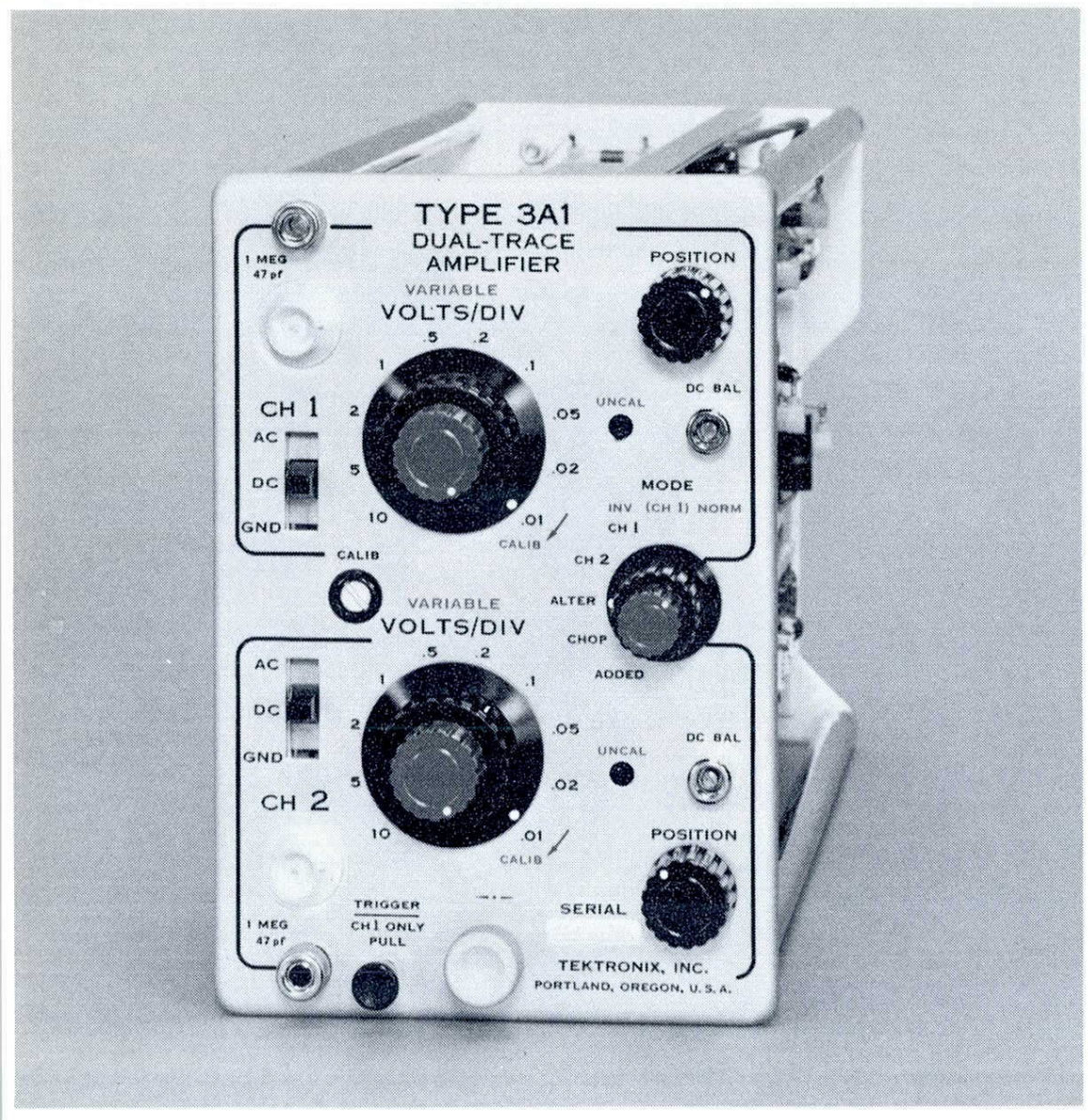
TYPE 2B67 TIME-BASE UNIT **$210**

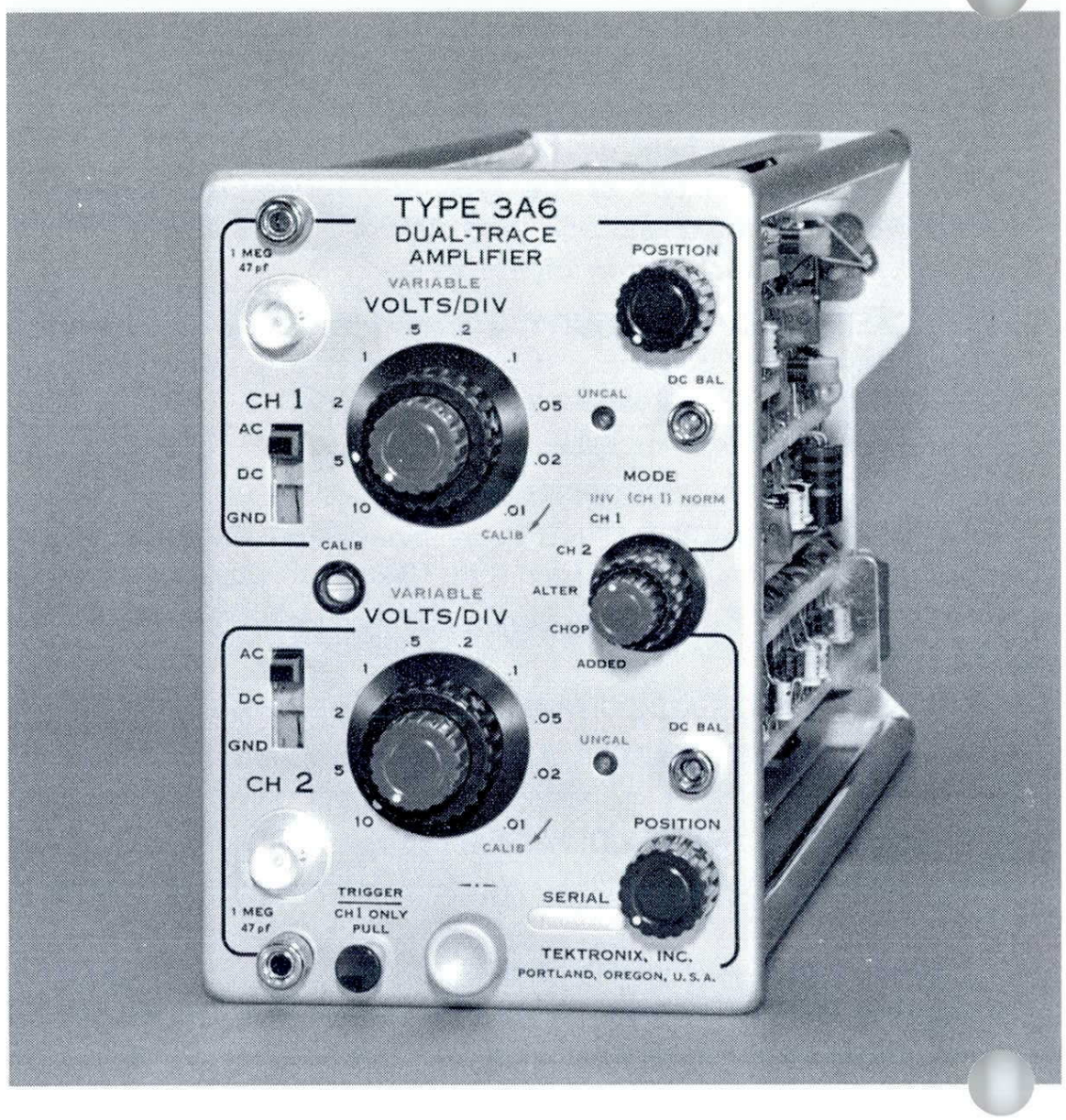
Each instrument includes: 2—instruction manuals (070-0366-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.



Type 3A1 / 3A6 DUAL-TRACE DC-to-10MC UNIT





The Type 3A1 and Type 3A6 Amplifiers are general-purpose dual-trace plug-in Units. They are identical in every respect except that the Type 3A1 does not have a signal-delay line. The Type 3A6 does contain an internal 260 nanosecond signal-delay line that allows viewing of the leading edge of the sweep-triggering waveform when using a high-speed time base such as the Type 3B1, 3B3 and 3B4 Time-Base Units.*

Both units have two separate channels, each with identical characteristics. The units can operate in one of five modes for a variety of single and dual-trace displays. Two Type 3A1's or two Type 3A6's may be used in the chopped mode for X-Y curve tracing, but there is no provision for synchronized switching or channel pairing. Because of its delay line, the Type 3A6 Amplifier will show marked phasing error above the audio range if used X-Y with other than another Type 3A6 Amplifier. Either instrument can be used in the Type 561A, RM561A, 564, RM564, 565 and RM565 Oscilloscopes. They may also be used in the Type 567 and RM567 Readout Oscilloscopes when digital readout is not required. Linear scan is 8 cm.

OPERATING MODES include Channel 1 only; Channel 2 only; Alternate—Channel 1 and 2 switched electronically on alternate sweeps; Chopped—In chopped operation, successive 4 μsec (approx.) segments of each channel are displayed at an approx. 125 kc rate per channel (chopped transient blanking is provided); and Added—outputs of Channel 1 and 2 added algebraically.

POLARITY of Channel 1 can be changed to provide 180° inversion. No polarity inversion on Channel 2.

CALIBRATED SENSITIVITY is 10 mv/div to 10 v/div in 10 steps, 1-2-5 sequence; accuracy within 3%. Uncalibrated continuous control from 10 mv/div to 25 v/div.

PASSBAND is dc to 10 Mc.

RISETIME is approximately 35 nsec.

INPUT COUPLING is either ac or dc. Ac-coupled low frequency 3-db point is 2 cps direct or 0.2 cps with 10X probe.

INPUT IMPEDANCE is 1 megohm paralleled by 47 pf.

MAXIMUM INPUT VOLTAGE is 600 volts (dc plus peak ac).

INTERNAL TRIGGER SIGNAL (for the time base) is selectable either from the output of Channel 1 only, or from the combined output of the unit.

NET WEIGHT: Type 3A1, 6 pounds; Type 3A6 6 pounds. Shipping weight: Type 3A1, 8 pounds (approx.); Type 3A6, 8 pounds (approx.).

TYPE 3A1 AMPLIFIER UNIT $450
Each instrument includes: 2—instruction manuals (070-0343-00).

TYPE 3A6 AMPLIFIER UNIT, with Signal Delay $540
Each instrument includes: 2—instruction manuals (070-0419-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

**The Type 3A1 and Type 3A6 can also be used with a Type 2B67 or Type 3B2 Time-Base Units, but it will not usually be possible to view the entire leading edge of the triggering waveform when used in conjunction with these time bases or the Type 565 and RM565 Oscilloscopes.*

PRINTED IN U.S.A.

DUAL-TRACE DIFFERENTIAL AMPLIFIER Type 3A3

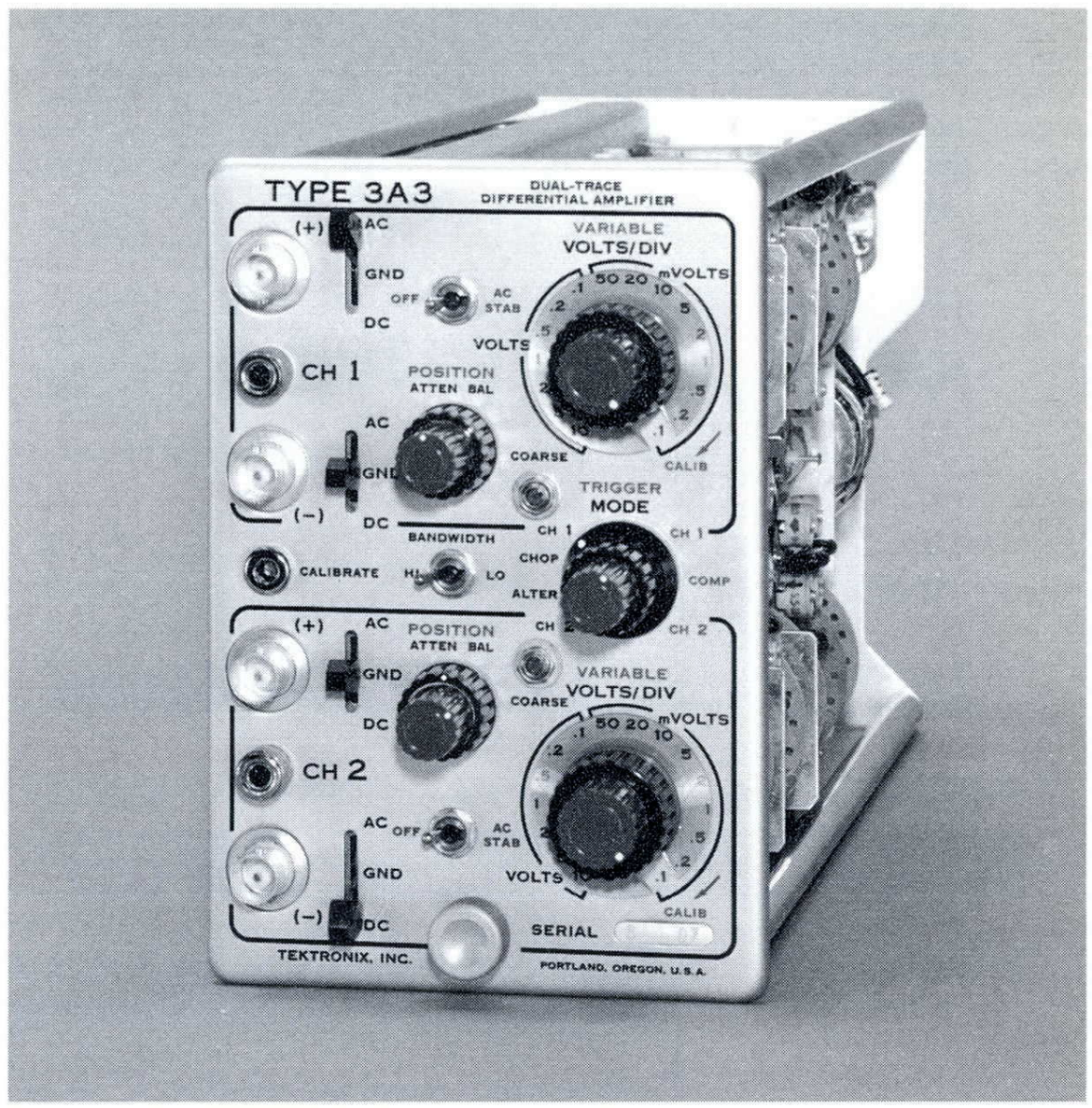
100 μV/CM SENSITIVITY DIRECT COUPLED

50,000:1 COMMON-MODE REJECTION

CONSTANT BANDWIDTH AT ALL SENSITIVITIES

HI or LO BANDWIDTH SELECTION

AC STABILIZATION



The Type 3A3 Dual-Trace Differential Amplifier is designed for use with all Tektronix 560-Series Oscilloscopes except the Type 560 itself. The Type 3A3 contains two independent high-gain amplifier channels. .Either channel may be used to produce a display, or the two channels electronically switched to produce dual-trace displays. The Type 3A3 has high sensitivity with direct-coupled inputs and a high degree of common-mode rejection.*

SENSITIVITY from 100 μv/cm to 10 v/cm is in 16 calibrated steps with 1-2-5 sequence, and is accurate within 3%. Sensitivity is continuously adjustable uncalibrated from 100 μv/cm to at least 25 v/cm.

BANDWIDTH for both channels is selected at the front panel. Either HI (dc to greater than 500 kc at —3 db) or LO (dc to 5 kc at —3 db) bandwidth is available. The selected bandwidth remains constant at all sensitivities.

AC STABILITY for each channel provides virtually drift-free operation in the 4 most sensitive ranges. With ac stability, and direct input coupling, the low-frequency 3-db points are ≈0.15 cps at 1 mv/cm, ≈0.3 cps at 0.5 mv/cm, ≈0.75 cps at 0.2 mv/cm, and ≈1.5 cps at 0.1 mv/cm.

**The Type 3A3 operates in cabinet and rack models of Type 561, 561A, 564, 565, and 567 Oscilloscopes. The 3A3 does not provide digital readout in the Type 567 Oscilloscope, and does not operate in the Type 560 Oscilloscope. It can be used separately from the oscilloscope with the use of the new Type 129 Power Supply.*

DISPLAY MODES include CH 1 only, or dual-trace with either chopped or alternate switching. In chopped operation, electronic switching occurs at approx. a 250-kc rate to show successive 2-μsec segments of each trace. Chopped transient blanking is provided.

NOISE with grounded input is less than 10 μv peak-to-peak with LO bandwidth, less than 40 μv peak-to-peak with HI bandwidth.

DRIFT is typically less than 500 μv/hour after 30-minute warm-up.

PHASE SHIFT is less than 2° from dc to 100 kc between any 2 Type 3A3 Amplifiers used in X-Y operation. Phase shift can be adjusted to 0° at any particular sensitivity.

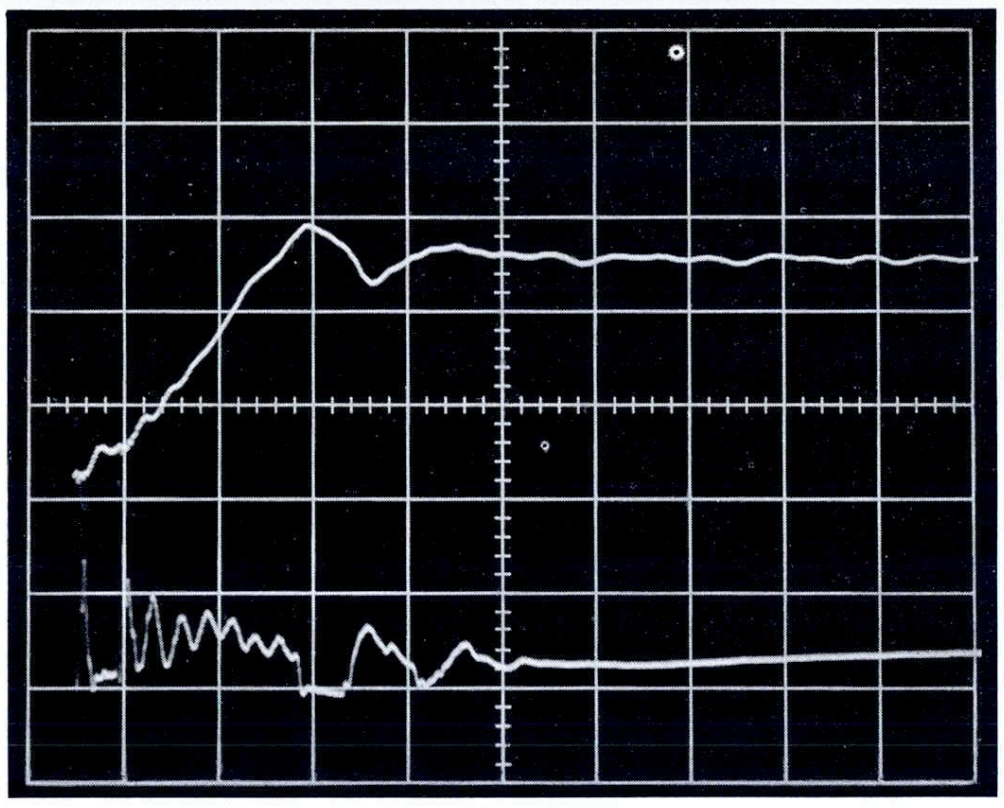
MULTIPLE X-Y DISPLAYS can be obtained with two Type 3A3 Plug-In Units. Dual-trace switching is synchronized, so that one Y-channel remains plotted against the same Y-channel once the display is set up. There is on provision for consistent pairing each time the system is operated.

INPUT COUPLING can be ac or dc, and is individually selected for each input (2 per channel). Amplifier input grids can be grounded with these same controls. With ac coupling, the low-frequency 3-db point is ≈2 cps direct, or 0.2 cps with 10X probe.

INPUT IMPEDANCE is 1 megohm paralleled by 47 pf. The input R can be disconnected with an internal wire link.

TRIGGER PICKOFF is internally coupled, and can be selected from Ch 1, Ch 2, or the composite signal after switching.

3A3



IMPACT STUDY

Chopped display of displacement and acceleration of a body at rest being struck by a solenoid plunger. Strain gage is differentially connected to upper channel at 100 μv/cm (dc coupled). Accelerometer is connected single-ended to the lower channel at 200 μv/cm (dc coupled).

DIFFERENTIAL CF OUTPUTS are available at the plug-in unit rear connecting pins. These ground-referenced outputs can be used to drive recorders with high input impedance, or other equipment. Output from Ch 1 or Ch 2 is a differential ≈2.5-volt signal for each centimeter of displayed signal. Output from the common output amplifier is a differential ≈5-volt signal for each centimeter of displayed signal. Bandwidth is dc to ≈500 kc with a non-capacitive load. Jacks can be easily installed at the rear of the oscilloscope to provide access to these outputs.

INTERCHANNEL ISOLATION

ELECTROSTATIC ISOLATION is 10^6:1 (120 db) or better referred to input signal levels.

SWITCHING ISOLATION in chopped operation is 100:1 or better referred to centimeters of display. The switching circuit introduces negligible interaction in all other operating modes.

TYPE 3A3 DUAL-TRACE DIFFERENTIAL AMPLIFIER . . $790

Each instrument includes 4 BNC to binding-post adapters (103-0033-00), 2 BNC-to-BNC 18″ red patch cords, and 2 instruction manuals (070-0408-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

COMMON-MODE REJECTION[1]				
0.1 MV/CM to 10 MV/CM[2]				
	Referred to Input Connectors		Referred to Input of Properly Adjusted P6023 Probes	
	DC-Coupled Input	AC-Coupled Input With Low-Z Source	DC-Coupled Input	AC-Coupled Input With Low-Z Source
DC to 100 kc	50,000:1			
500 kc	1,000:1	1,000:1		
DC to 10 cps			50,000:1	
15 cps		500:1		
60 cps		2,000:1		
100 cps			10,000:1	
1 kc to 10 kc			1,000:1	1,000:1
100 kc		50,000:1	500:1	500:1
20 MV/CM to 10 V/CM[3]				
(Equal to, or adjustable to, the following CMR ratios.)				
DC to 1 kc	10,000:1			
DC to 100 kc	1,000:1			
500 kc	500:1	500:1		
15 cps		500:1		
60 cps		2,000:1		

[1]For ground-referenced sine-wave common-mode signals.
[2]With 10 volts peak-to-peak or less in common mode at input connectors.
[3]With common-mode amplitude at input connectors of 100 volts peak-to-peak or less from 20 mv/cm to 0.1 v/cm, and with 600 volts peak-to-peak or less from 0.2 v/cm to 10 v/cm.

These common-mode signals will not overdrive the amplifier:
0.1 mv/cm to 10 mv/cm, ± 20 v from gnd (40 v pk-to-pk ac)
20 mv/cm to 0.1 v/cm, ± 200 v from gnd (400 v pk-to-pk ac)
0.2 v/cm to 10 v/cm, ± 600 v from gnd (1200 v pk-to-pk ac)

DUAL-TRACE DC-to-650KC UNIT Type 3A72

The Type 3A72 Amplifier is a general purpose dual-trace plug-in unit that has two separate channels, each with identical characteristics. The unit can operate in one of five operating modes for a variety of single and dual-trace displays. This unit may be used in any of the Type 560-Series Oscilloscopes except the Type 560. However in the Type 567 and RM567, the measurements will not be presented in digital form.

OPERATING MODES include Channel 1 only (normal or inverted); Channel 2 only; Alternate—Channel 1 and 2 switched electronically on alternate sweeps; Chopped—successive 16-μsec segments of each channel are displayed at an approx. 30-kc rate per channel. Chopped transient blanking is provided; Added—outputs of Channel 1 and 2 algebraically added.

MULTIPLE X-Y DISPLAYS can be obtained with two Type 3A72 Plug-In Units; both synchronization and automatic pairing are provided. With two Type 3A72's operated in the dual-trace mode, Channel 1 of the left-hand unit is always plotted against Channel 1 of the right-hand unit.

CALIBRATED SENSITIVITY is 10 mv/div to 20 v/div in 11 steps, 1-2-5 sequence; accuracy within 3%. Uncalibrated continuous control from 10 mv/div to 50 v/div.

PASSBAND is dc to 650 kc.

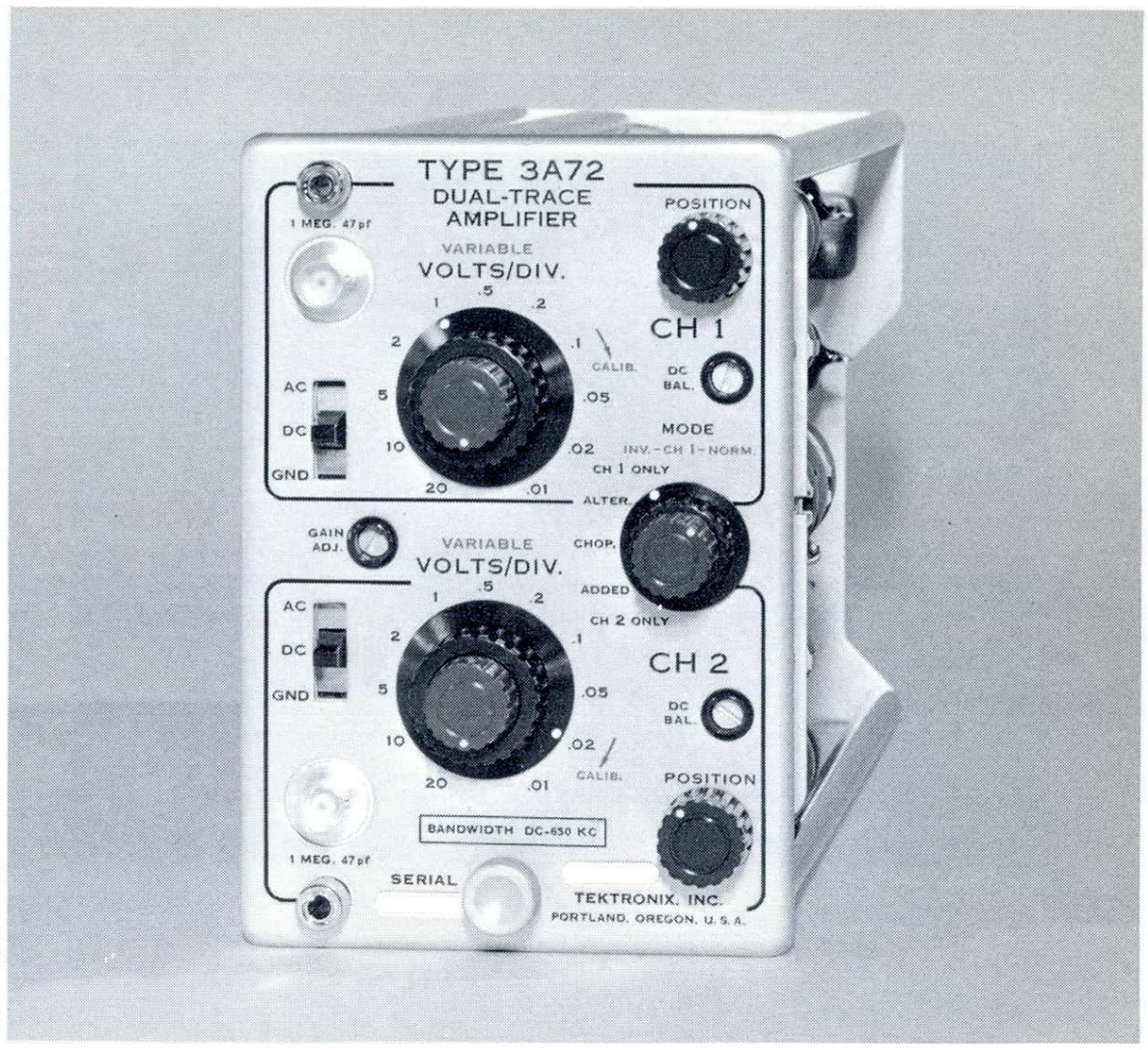
INPUT IMPEDANCE is 1 megohm paralleled by 47 pf.

MAXIMUM INPUT VOLTAGE is 600 volts.

NET WEIGHT is 5 pounds. Shipping weight is 6 pounds, approx.

TYPE 3A72 AMPLIFIER UNIT $275

Each instrument includes: 2—instruction manuals (070-0274-00).



AMPLIFIER UNIT Type 3A75

The Type 3A75 Amplifier is a general purpose wideband plug-in unit. The unit may be used in any of the Type 560-Series Oscilloscopes except the Type 560. However in the Type 567 and RM567, the measurements will not be presented in digital form.

CALIBRATED SENSITIVITY is 50 mv/div to 20 v/div in 9 steps, 1-2-5 sequence; accuracy within 3%. Uncalibrated continuous control from 50 mv/div to 50 v/div.

PASSBAND is dc to 4 Mc.

RISETIME is approximately 0.09 μsec.

MAXIMUM INPUT VOLTAGE is 600 volts.

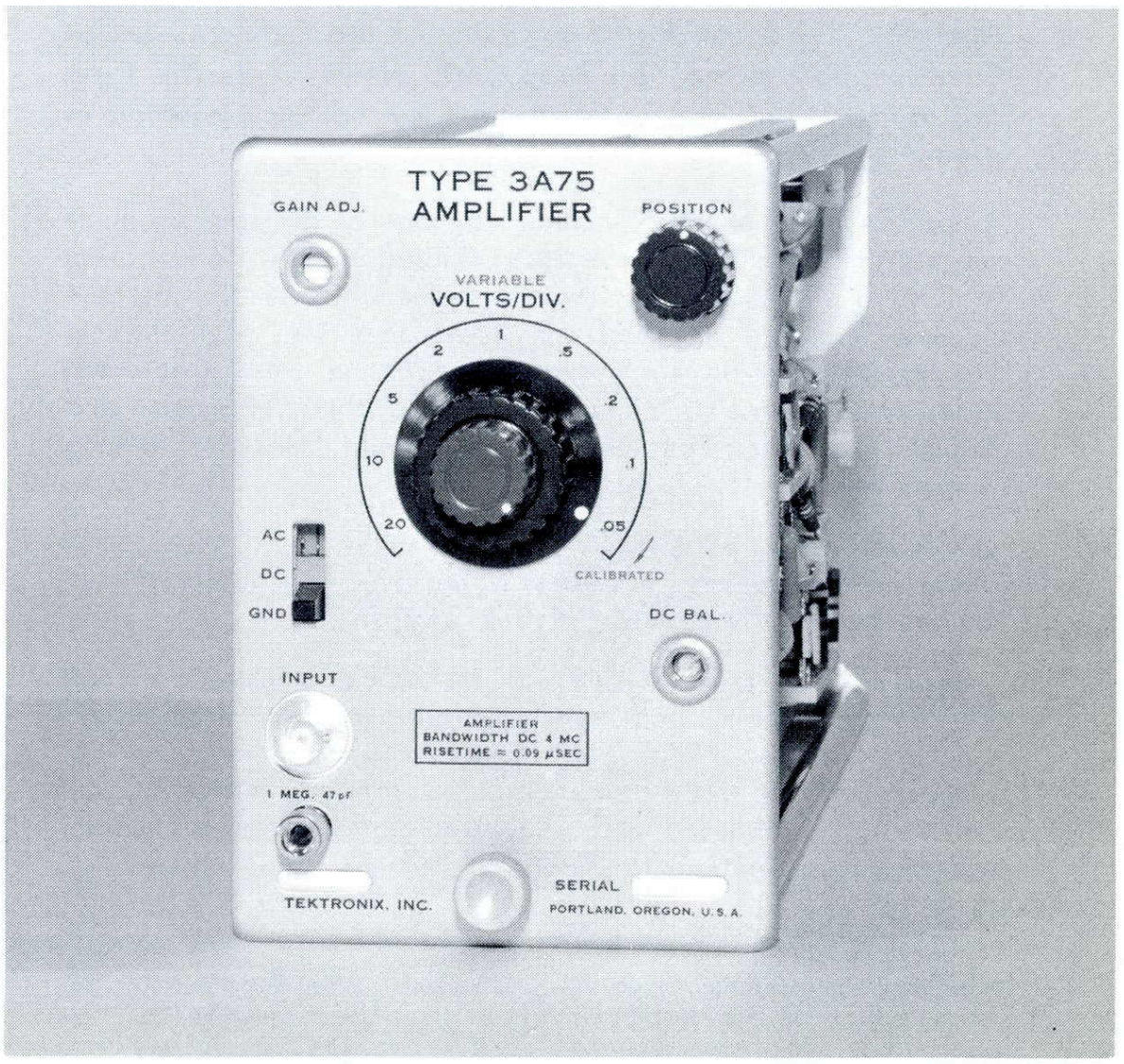
INPUT IMPEDANCE is 1 megohm paralleled by approximately 47 pf.

NET WEIGHT is 3½ pounds. Shipping weight is 8 pounds, approx.

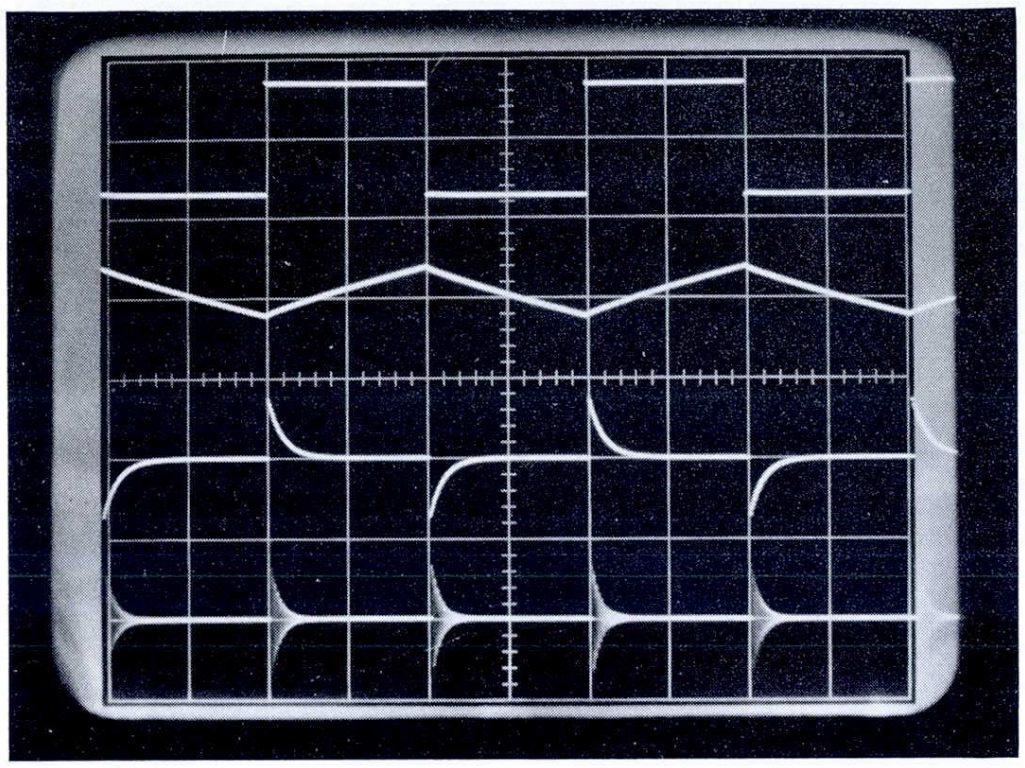
TYPE 3A75 AMPLIFIER UNIT $175

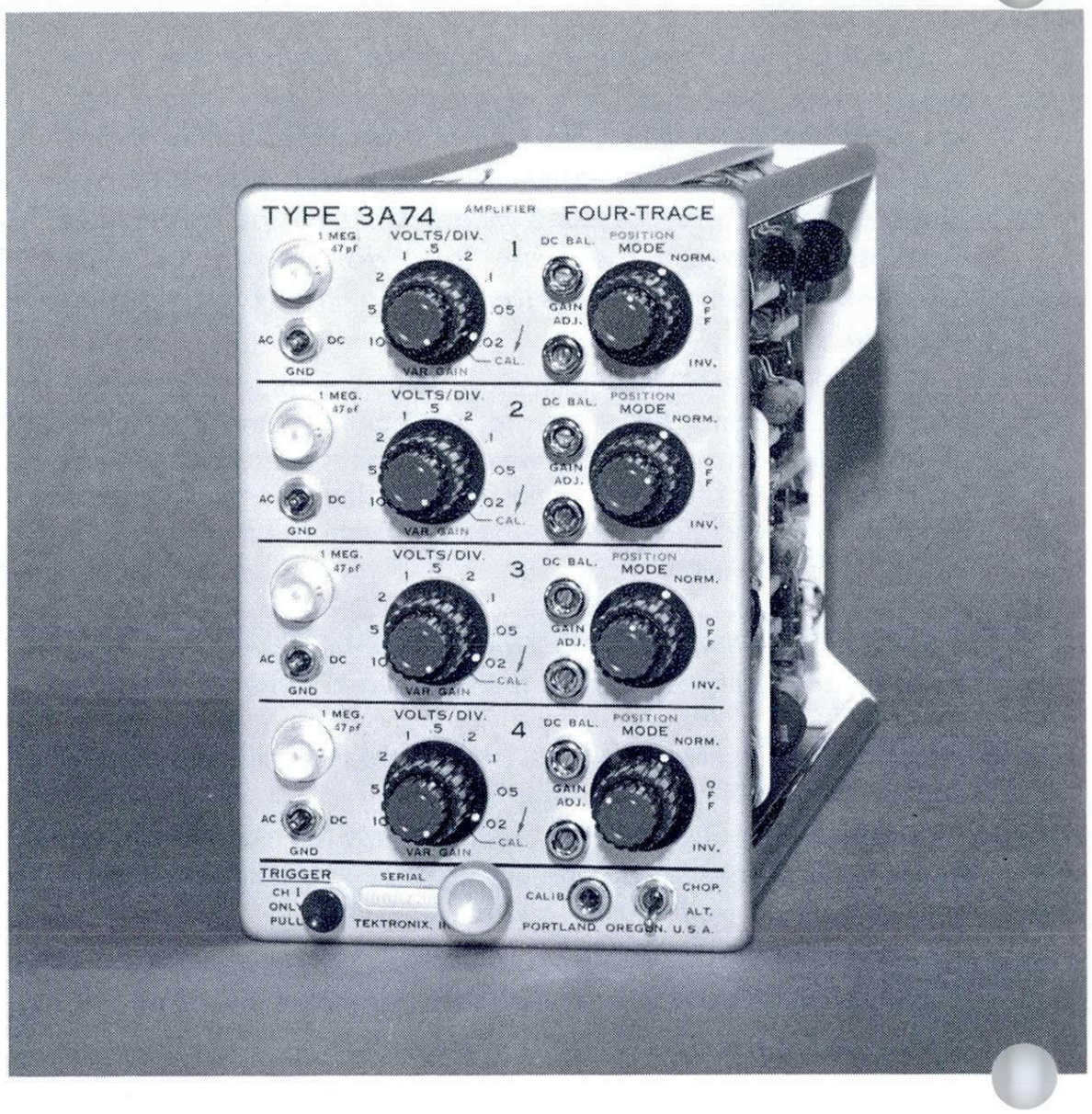
Each instrument includes: 2—instruction manuals (070-0275-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.



Type 3A74 FOUR-TRACE AMPLIFIER UNIT





The Type 3A74 Amplifier is a general purpose multi-trace plug-in unit that has four separate channels, each with identical characteristics. The unit can operate in a number of modes for a variety of single and multi-trace displays. The Type 3A74 can be used in any of the Type 560-Series Oscilloscope except the Type 560. However, in the Type 567 and RM567, the measurements will not be presented in digital form.*

OPERATING MODES include any one of the four channels separately (normal or inverted); Alternate—any combination of two or more channels switched electronically on alternate sweeps; Chopped—successive 2-μsec segments of each channel are displayed at an approx. rate per channel of: 250 kc when using two channels; 167 kc when using three channels; and 125 kc when using four channels. Chopped transient blanking is provided.

CALIBRATED SENSITIVITY is 0.02 v/div to 10 v/div in 9 steps, 1-2-5 sequence; accuracy within 3%. Uncalibrated continuous control from 0.02 v/div to 25 v/div.

MULTIPLE X-Y DISPLAYS can be obtained with two Type 3A74 Plug-In Units; both synchronization and automatic pairing are provided. With two Type 3A74's, two, three or four independent displays may be obtained, properly paired: Channel 4 of the left-hand unit is always plotted against Channel 4 of the right-hand unit, Channel 3 versus Channel 3, etc. . . .

PASSBAND is dc to 2 Mc.

* For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit Tektronix No. 040-0267-00.

INPUT IMPEDANCE is 1 megohm paralleled by 47 pf.

RISETIME is approximately 0.17 μsec.

INPUT COUPLING is either ac or dc. Ac-coupled low frequency 3-db point is 2 cps direct or 0.2 cps with 10X probe.

MAXIMUM INPUT VOLTAGE is 600 volts peak-to-peak.

INTERNAL TRIGGER SIGNAL (for the time-base) is from one of two sources as selected; either from the output of Channel 1 only or the combined output of the amplifier.

NET WEIGHT is 6¼ pounds. Shipping weight is 7 pounds, approx.

TYPE 3A74 AMPLIFIER UNIT $590

Each instrument includes: 2—instruction manuals (070-0347-00), 4—BNC to binding-post adapters (103-0033-00).

BNC ADAPTERS

Adapter, BNC to Binding Post
Order Part Number 103-0033-00 . . . . . $1.60

Adapter, BNC to UHF
Order Part Number 103-0032-00 . . . . . $1.70

For BNC probes, cables, and accessories, please refer to Catalog Accessory Section.

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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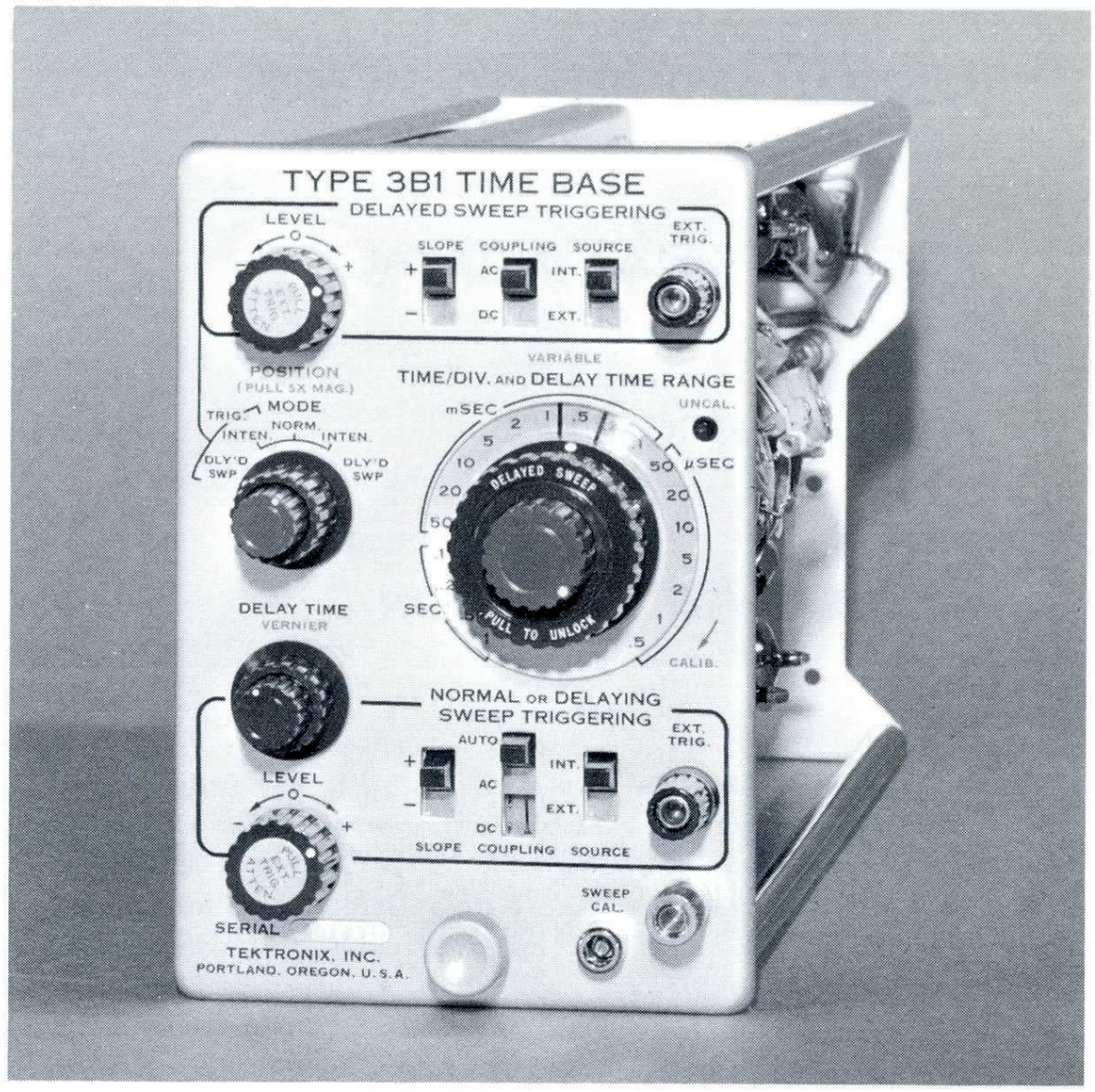
TIME-BASE UNIT Type 3B1

NORMAL AND DELAYED SWEEPS

FLEXIBLE TRIGGERING

5X MAGNIFICATION



The Type 3B1 Time-Base Unit is used to generate normal and delayed-sweeps. Flexible triggering facilities are similar for both the normal sweep and the delayed sweep. The unit can be used with the Type 561A, RM561A, 564, RM564, 567, and RM567 Oscilloscopes. However in the Type 567 and RM567, the measurements will not be presented in digital form.

CALIBRATED SWEEP RANGE for both normal and delayed sweeps is 0.5 μsec/div to 1 sec/div in 20 steps, 1-2-5 sequence; accuracy is within 3%. Sweep rates can also be varied continuously (uncalibrated) between steps and to 2.5 sec/div. The Variable control operates with the normal sweep in the normal display mode, and with delayed sweep in all other display modes.

5X MAGNIFIER increases the calibrated sweep rate to 0.1 μsec/cm.

SWEEP DELAY permits operation of the delayed sweep after a delay interval of 0.5 μsec to 10 sec, continuously variable in 20 ranges. After the delay range is selected, pulling the Time/Div knob disengages the ganged controls to allow independent setting of the delayed sweep time/div. Delay time is continuously variable (uncalibrated) from 1X to 10X the delay range setting by means of the Delay Time and Vernier controls.

The normal sweep generator operates as the display time base in (1) the NORMAL position, (2) the INTENSIFIED position—where the delayed-sweep generator intensifies a portion of the normal sweep trace, indicating the time during which the delayed sweep operates—and (3) the TRIGGERED INTENSIFIED position—where the delayed sweep is armed at the end of the delay time and starts by the delayed sweep trigger . . . intensifying a segment of the normal sweep trace as above.

The delayed-sweep generator operates as the display time base in (1) the DELAYED SWEEP position—displaying the portion of the trace which was intensified in the INTENSIFIED position . . . with time-jitter less than 1 part in 20,000 of the maximum available delay interval—and (2) the jitter-free TRIGGERED, DELAYED SWEEP position—displaying the portion of the trace which was intensified in the TRIGGERED, INTENSIFIED position.

TRIGGER FACILITIES include the following:

Normal Sweep Trigger Modes—Internal, External; AC or DC Coupling; Automatic; ±Slope.

Delayed Sweep Trigger Modes—Internal or External; AC or DC Coupling; ±Slope.

External Triggering—2 Ranges from 0.5 to 15 v and 5 to 150 v, plus or minus polarity.

TRIGGER REQUIREMENTS for both sweeps:

Internal Triggering—0.4 major graticule divisions from dc to 5 Mc, increasing to 1 major division at 10 Mc.

External Triggering—0.5 v from dc to 5 Mc, increasing to 1.25 v at 10 Mc.

NET WEIGHT is 5¼ pounds. Shipping weight is 8 pounds, approx.

TYPE 3B1 TIME-BASE UNIT $535

Each instrument includes: 2—instruction manuals (070-0344-00).

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

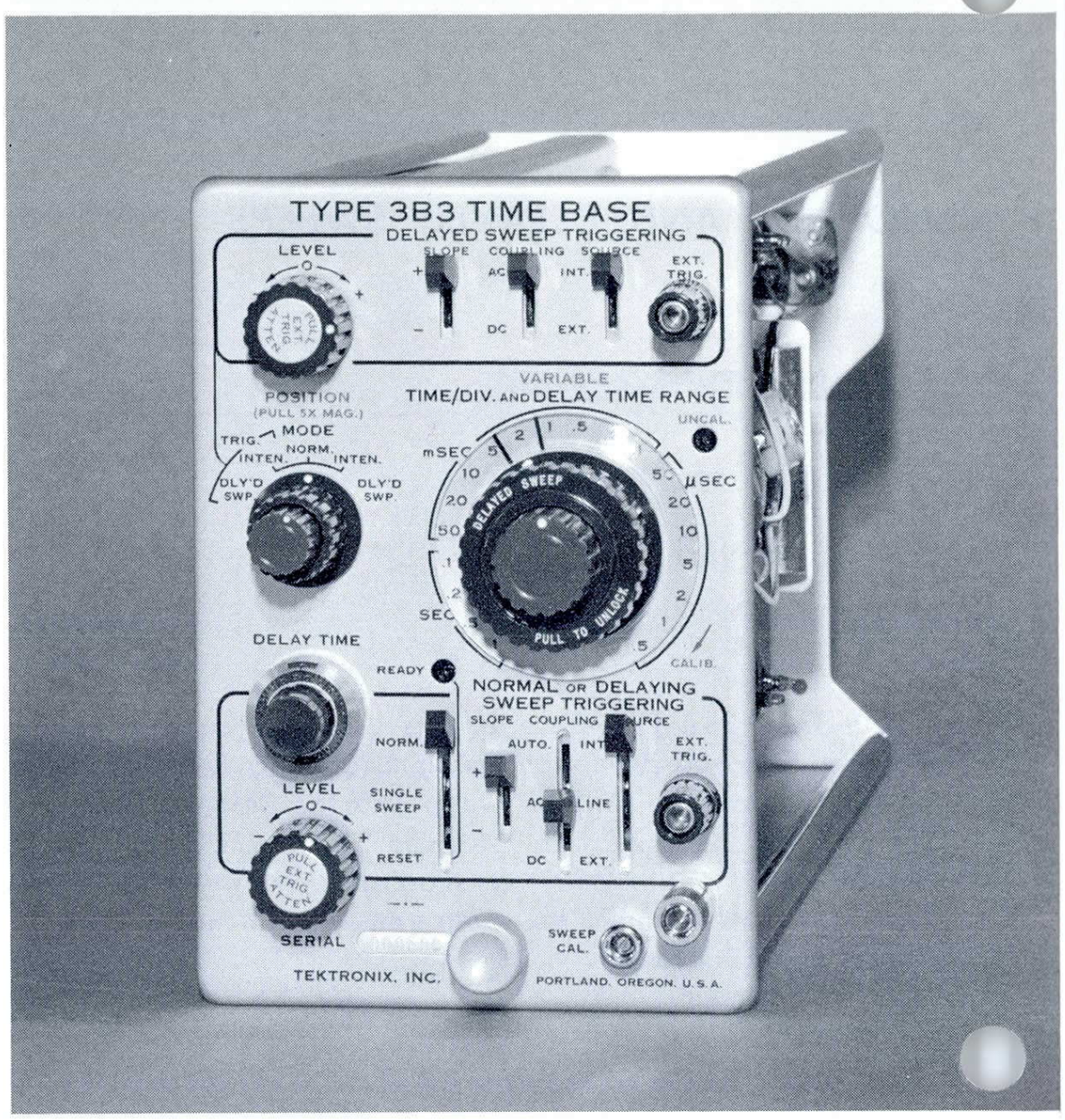
Type 3B3 TIME-BASE UNIT

NORMAL AND DELAYED SWEEPS

PRECISION DELAY INTERVAL

FLEXIBLE TRIGGERING

SINGLE SWEEP OPERATION



The Type 3B3 Time-Base Unit is used to generate normal and delayed-sweeps. Flexible triggering facilities are similar for both the normal sweep and delayed sweep. Calibrated sweep delay enables accurate delay intervals to be set and measured. The unit can be used with the Type 561A, RM561A, 564, RM564, 567, and RM567 Oscilloscopes. However, in the Type 567 and RM567, the measurements will not be presented in digital form.

CALIBRATED SWEEP RANGE for both normal and delayed sweeps is 0.5 μsec/div to 1 sec/div in 20 steps, 1-2-5 sequence; accuracy is within 3%. Sweep rates can also be varied continuously (uncalibrated) between steps and to 2.5 sec/div. The Variable control operates with the normal sweep in the normal display mode, and with delayed sweep in all other display modes.

5X MAGNIFIER increases the calibrated sweep rate to 0.1 μsec/cm.

SINGLE SWEEP operation facilitates photographic recordings of waveforms.

SWEEP DELAY operation permits accurate setting and measuring of delay intervals from 0.5 μsec to 10 sec. One control can select both the normal and delayed sweeps simultaneously or the delayed sweep rate can be selected independent of the normal sweep. Delay accuracy is ±1% of full scale reading and delay time linearity is within ±0.2% of full scale from 5 μsec to 2 seconds of delay.

The normal sweep generator operates as the display time base in (1) the NORMAL position, (2) the INTENSIFIED position—where the delayed-sweep generator intensifies a portion of the normal sweep trace, indicating the time during which the delayed sweep operates—and (3) the TRIGGERED, INTENSIFIED position—where the delayed sweep is armed at the end of the delay time and starts by the delayed sweep trigger . . . intensifying a segment of the normal sweep trace as above.

The delayed-sweep generator operates as the display time base in (1) the DELAYED SWEEP position—displaying the portion of the trace which was intensified in the INTENSIFIED position. . . with time-jitter less than 1 part in 20,000 of the maximum available delay interval—and (2) the jitter-free TRIGGERED, DELAYED SWEEP position—displaying the portion of the trace which was intensified in the TRIGGERED, INTENSIFIED position.

TRIGGER FACILITIES include the following:

Normal Sweep Trigger Modes—Internal, External, or Line; AC or DC Coupling; Automatic; ± Slope.

Delayed Sweep Trigger Modes—Internal or External; AC or DC Coupling; ± Slope.

External Triggering—2 ranges from 0.5 to 15 v and 5 to 150 v, plus or minus polarity.

TRIGGER REQUIREMENTS for both sweeps:
Internal Triggering—0.4 major graticule division from dc to 5 Mc, increasing to 1 major division at 10 Mc.
External Triggering—0.5 v from dc to 5 Mc, increasing to 1.25 v a 10 Mc.

NET WEIGHT is 6 pounds. Shipping weight is 7 pounds, approx.

TYPE 3B3 TIME-BASE UNIT $585

Each instrument includes: 2—instruction manuals (070-0365-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

PRINTED IN U.S.A.

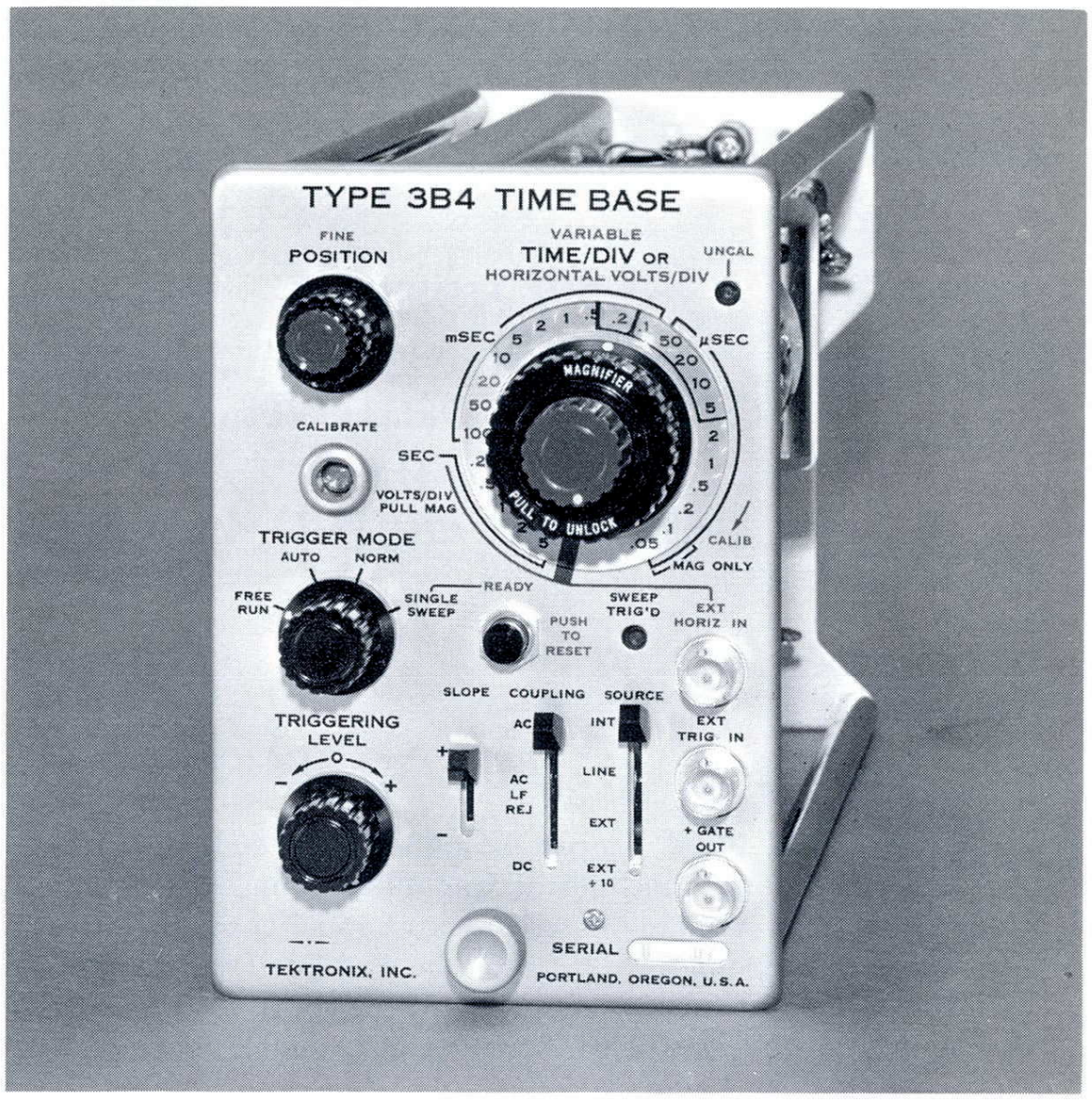
TIME-BASE UNIT Type 3B4

DIRECT READING MAGNIFIER

FLEXIBLE, HI-SPEED TRIGGERING

CALIBRATED EXTERNAL HORIZONTAL INPUT

SINGLE SWEEP OPERATION



The Type 3B4 plug-in unit is a wide-range time base with flexible, high-speed triggering facilities, and a wide-range, direct-reading magnifier, for use in all Tektronix 560-Series Oscilloscopes using 3B-Series time-base plug-in units. The Type 3B4 is recommended over the Type 2B67 for operation with Types 3A1, 3A6 and other wideband (> 5 Mc) vertical amplifier plug-in units.*

In addition to time base facilities, the 3B4 provides a dc-coupled external input amplifier with calibrated deflection sensitivity from 0.2 to 5 v/div.

CALIBRATED SWEEP RATE is 0.2 µsec/div to 5 sec/div in 23 calibrated steps in a 1-2-5 sequence. After a single adjustment to match the time base to the oscilloscope used, calibration accuracy is within 3% from 0.2 µsec/div to 2 sec/div; within 5% at 5 sec/div. Sweep rates are continuously variable (uncalibrated) between steps and to 12.5 sec/div.

DIRECT READING MAGNIFIER provides sweep expansion up to X50, and extends the fastest sweep rate to 50 nsec/div. The MAGNIFIER control is concentric with the TIME/DIV control, providing a direct indication of both the sweep rate being magnified and the magnified time/div rate. Up to 5 magnification steps are provided, to X40 or X50, depending on the TIME/DIV control setting before magnification. Magnified sweep rates are confined to the time/div steps on the panel, so there are no 'forbidden' (uncalibrated) combinations. Magnified sweep accuracy is within 5%.

The MAGNIFIER control also is used to set the external input sensitivity when the TIME/DIV control is in the "Ext Input" position.

SINGLE SWEEP operation facilitates waveform photography, and operation in the Types 564 and RM564 storage oscilloscopes.

**In the 567 or RM567, the 3B4 may be used as a display time-base, but does not activate the digital readout circuitry. In the Type 565 or RM565 (having integral time-bases) the Type 3B4 may be used to provide a vertical time base for raster applications, but does not provide retrace blanking.*

TRIGGER FACILITIES include:

TRIGGERING MODES—	Free-Run, Automatic (with bright base-line in the absence of a trigger), Normal, Single Sweep.
SOURCE—	Internal, Line, External, External ÷ 10.
COUPLING—	AC, AC LF Reject, DC.
TRIGGER POINT—	±Slope, ±Level: Two effective level ranges for external triggering — ±15 v (Ext) or ±150 v (Ext ÷ 10).
SENSITIVITY—	1 minor graticule division Int or 0.2 v Ext (2 v in Ext ÷ 10). DC to 20 Mc.
FREQUENCY RANGE—	Essentially dc to 20 Mc with reduced sensitivity above 20 Mc.
TRIGGER LIGHT—	A front panel light indicates when the sweep is receiving a triggering signal—especially convenient when using an external trigger.

EXTERNAL HORIZONTAL INPUT is calibrated in 5 steps from 0.2 v/div to 5 v/div (max input ±20 v); accuracy, when plug-in unit is matched to oscilloscope, is within 3%. The External Input Amplifier is dc coupled.

NET WEIGHT is 4½ pounds. Shipping weight is 6 pounds, approx.

TYPE 3B4 TIME BASE UNIT $400

Each instrument includes: 2 instruction manuals (070-0431-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

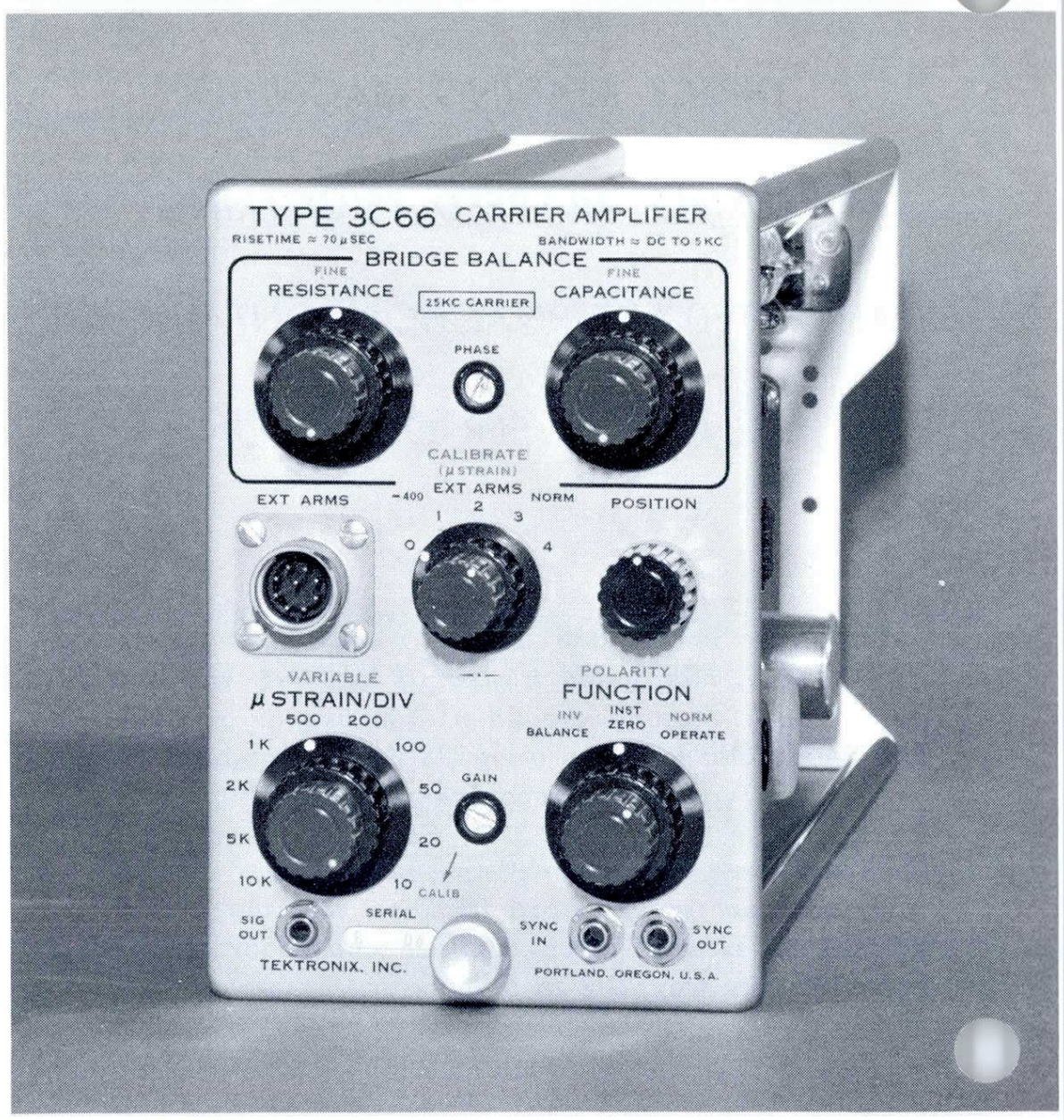
Type 3C66 CARRIER AMPLIFIER

HIGH GAIN

LOW NOISE

ESSENTIALLY DRIFT FREE

RECORDER OUTPUT



The Type 3C66 Carrier Amplifier with suitable transducer measures mechanical quantities that can be converted to a change in resistance, capacitance, or inductance. This unit may be used in any of the Type 560-Series Oscilloscopes except the Type 560. However in the Type 567 and RM567, the measurements will not be presented in digital form.

The gap between mechanical engineering and electronic instrumentation is bridged with the Type 3C66 and suitable transducers. The total range of applications is as broad as the mechanical field itself and includes stress analysis, vibration studies, and fatigue tests. Typical quantities measured are force, displacement, acceleration, and strain.

The Type 3C66 operates on an ac carrier principle. It uses an ac bridge at the input to convert transducer signals into an amplitude-modulated carrier signal. The carrier signal is amplified by a high-gain ac amplifier and then demodulated to obtain the crt deflection voltages.

Advantages of the 3C66 Carrier Amplifier include:

1. Desirable high gain with essentially no drift resulting from input signal conversion to carrier modulation followed by ac amplification.
2. Both static and dynamic strain are measured because of the dc to 5-kc passband.
3. Most of the undesired pickup from the input is eliminated because of selective filtering.
4. Reactive transducers (including some differential transformers) as well as capacitive and resistive transducers can be used with the unit.
5. Up to four simultaneous inputs to the input bridge is possible.

CALIBRATED SENSITIVITY is from 10 microstrain/div (microinches per inch/div) to 10,000 microstrain/div when the Type 3C66 is used with a single strain gage having a gage factor of approximately 2. Uncalibrated continuous control from 10 microstrain/div to 25,000 microstrain/div.

ATTENUATOR ACCURACY, when set accurately in any one step, is within 2% on all other steps.

GAGE FACTORS from 1 to 6 are usable without changing the steps of the sensitivity control. This range of factors is compensated for by adjusting the Gain Adjust Control.

EQUIVALENT DC SENSITIVITY in a comparable dc amplification system would require approximately 10 microvolts/div sensitivity for the same amount of power applied to the Type 3C66.

FREQUENCY RESPONSE is dc to 5 kc.

RISETIME is 70 microseconds, approx.

NOISE is typically equivalent to an input of 2.0 microstrain (pk-to-pk) at maximum calibrated sensitivity. This approximates an rms noise of 0.5 microstrain.

DRIFT of the over-all system is primarily a function of the transducer stability. The Type 3C66 Amplifier system is essentially drift free.

INPUT is to an ac bridge with 25-kc excitation voltage. One or more of the four bridge arms can have transducers attached to them. Total bridge voltage is approximately 5 v rms, regulated.

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3C66

CAPACITIVE TRANSDUCERS used in conjunction with a four-arm resistive bridge results in the following maximum useful sensitivities: 120-ohm bridge, 1 pf/div; 100-ohm bridge, 0.2 pf/div; useful sensitivities are slightly lower when using long cables.

INDUCTIVE TRANSDUCERS must have characteristics compatible with the 25-kc carrier frequency to function properly. Linear-variable-differential transformers designed for nominal carrier frequencies of 2 kc and higher usually operate satisfactorily without additional circuitry.

TRANSDUCER CABLE consisting of either 3-wire or 4-wire shielded microphone cable gives the best results in most applications.

CAPACITANCE BRIDGE BALANCE has a range of control that allows compensation for an unbalance of up to 250 pf across any external resistive arm of the input bridge.

RESISTIVE BRIDGE BALANCE has sufficient control to compensate for most standard transducers and strain gages.

GAGE RESISTANCE RANGE is useful with cable lengths to 100 feet and extends from approximately 50 ohms to 2000 ohms.

PHASE ADJUSTMENT permits either resistive or reactive transducer applications to be displayed (thus making the Type 3C66 very versatile).

CALIBRATION rotary switch connects a calibration resistor across the strain gage electrically to simulate an external mechanical strain. The calibration resistor supplied with the Type 3C66 Unit simulates a —400 microstrain unbalance of the bridge and is suitable for most strain gage applications. The calibration resistor is mounted on a handy plug-in receptacle. No special gage dial is necessary for the unit.

To aid in calibration, a nomograph is included in the instruction manual. This nomograph relates calibration of the supplied resistor to gage factors and strain gage resistances.

To include the gage factor in the calibration, merely increase or decrease the amplifier gain proportionally.

SYNC IN AND OUT CONNECTORS are used for synchronizing oscillators of two units thus eliminating low frequency beat notes which sometimes occur when two units are used in the same indicator at high sensitivities.

RECORDER SIGNAL OUTPUT is dc coupled and has an output of about 3 volts for each major division of crt display. Its dc level is adjustable to 0 v by an internal control.

NET WEIGHT is 5¼ pounds. Shipping weight is 7 pounds, approx.

TYPE 3C66 AMPLIFIER UNIT $400

Each instrument includes: 1—synchronizing cable, RG174/U (012-0063-00), 1—4-wire 15′ shielded connector cable (012-0040-00), 1—120 Ω internal bridge resistor assy. (013-0025-00), 1—150-k calibration resistor assy. (013-0078-00), 2—instruction manuals (070-0357-00).

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

TYPE 3C66 CARRIER AMPLIFIER BLOCK DIAGRAM

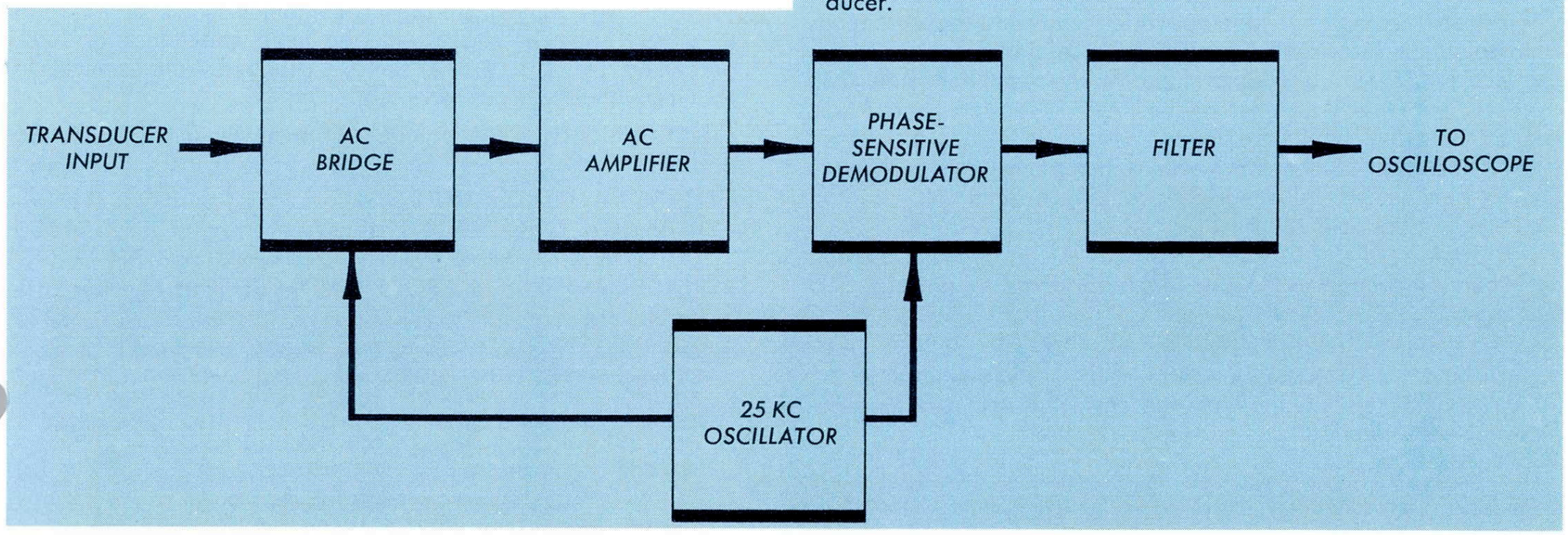
The input circuit for the unit is an ac bridge that has an external transducer connected into one or more of the bridge arms. Excitation voltage for the bridge is obtained from the 25-kc oscillator.

In operation, the transducer signals unbalance the bridge to modulate the 25-kc signal to produce an amplitude modulated suppressed-carrier output. The amplitude of the signal from the bridge is determined by amount of unbalance produced by the transducer signal. With no signal from the transducer, the carrier is suppressed. The phase of the bridge output is determined by the direction and type of unbalance.

The suppressed-carrier output of the bridge circuit is applied to the ac amplifier where the desired modulation sidebands are amplified while unwanted frequencies are rejected. An attenuator and gain control located in the amplifier determine the overall sensitivity of the unit.

The amplified modulation sidebands are applied to the phase-sensitive demodulator when a carrier is added in proper phase. The carrier permits only the desired phase to be demodulated.

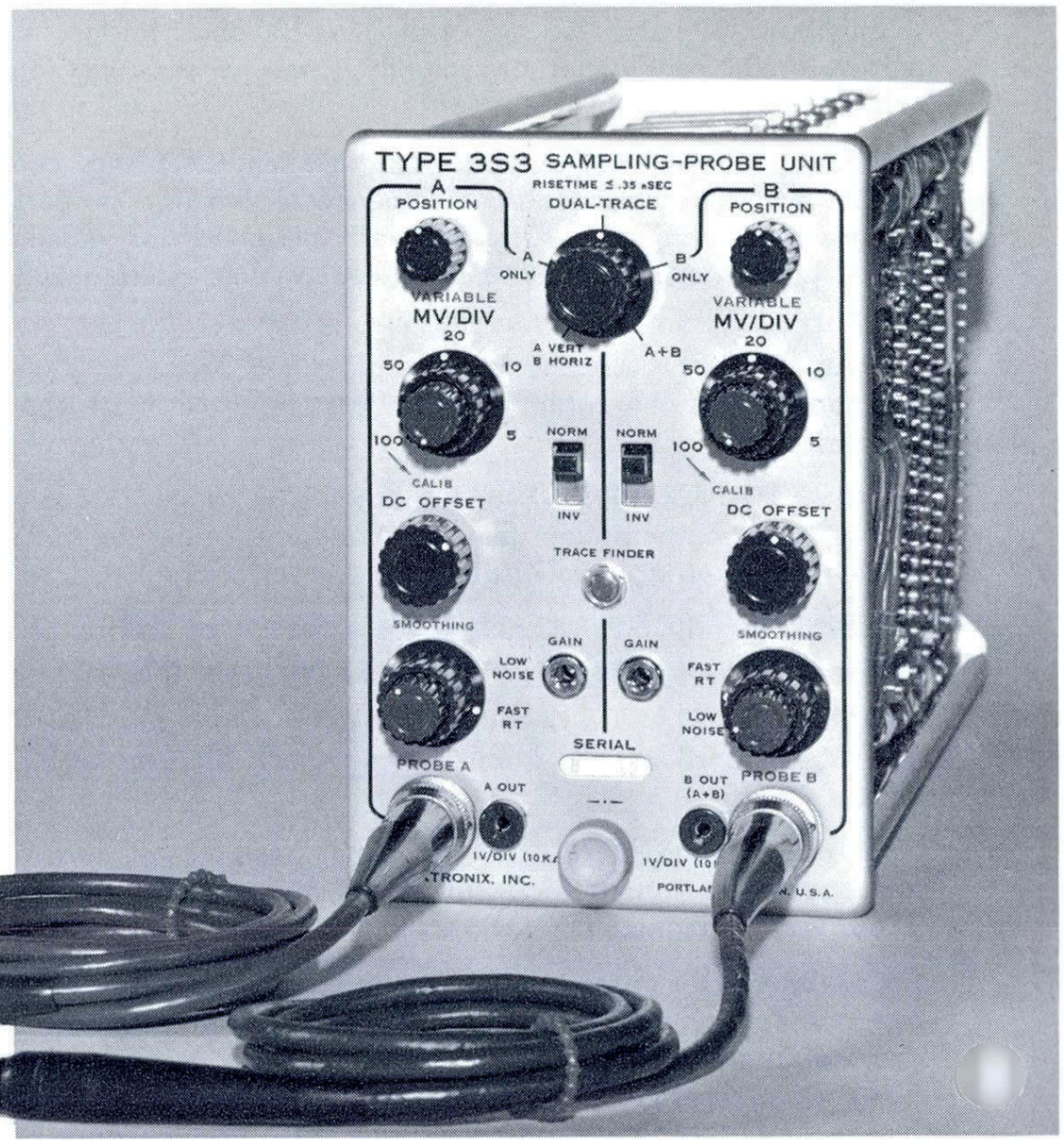
The output of the demodulator circuit is applied to a filter network where the undersirable modulation components are eliminated. The output from the filter is then applied to the associated oscilloscope through the interconnecting plug. The signal applied to the oscilloscope corresponds exactly to the signal applied to the input bridge circuit by the external transducer.



Type 3S3 SAMPLING-PROBE DUAL-TRACE UNIT

EXTREMELY COMPACT PROBES
DUAL-TRACE DISPLAYS
0.35 NSEC OR LESS RISETIME
100 K, 2 pf INPUT
LOW NOISE
RECORDER OUTPUTS

The Type 3S3 Sampling-Probe Unit is a low-noise dual-trace amplifier employing extremely compact sampling probes. It has two separate channels with identical characteristics and can operate in any one of five modes for a variety of single, dual-trace and X-Y displays. The Type 3S3 is designed to operate in conjunction with a Type 3T77 Sampling Sweep Unit in the Type 561A, 564, or 567 Oscilloscopes. In the Type 567, information can be presented in digital as well as analog form.*



OPERATING MODES include Channel A only; Channel B only; Alternate Dual Trace—Channels A and B switched electronically; A + B Outputs of Channel A and B added algebraically; A Vertical/B Horizontal—Channel A deflected vertically and B horizontally for X-Y displays. Independent controls for each channel provide for trace positioning and polarity inversion.

CALIBRATED SENSITIVITY is 5 mv/div, 10 mv/div, 20 mv/div, 50 mv/div, and 100 mv/div; accuracy within 3%. An uncalibrated continuous control extends the sensitivity to approximately 2 mv/div.

RISETIME AND SMOOTHING controls, while maintaining correct dot transient response, adjusts the instrument for: least noise, best risetime, or a compromise of the two, with signal source from below 25 ohms to beyond 300 ohms. A Fast-RT/Low-Noise switch in conjunction with the Smoothing control allows the operator to select optimum risetime at a sacrifice in noise level. Or, he may elect for a low noise level at some sacrifice in risetime.

At low signal repetition rates the trace may take up to several seconds to traverse the crt screen. A Type 3S3 in a Type 564 Storage Oscilloscope offers the most advantageous combination for visually displaying these signals.

RISETIME (with a 50-ohm input source impedance) is 0.35 nsec with the switch set at the FAST RT position and 1 nsec at the LOW NOISE position.

NOISE (with 50-ohm-input source impedance) can be adjuted to a minimum value equal to an input signal of less than 0.5 mv peak-to-peak.

CORRECT DOT TRANSIENT RESPONSE can be achieved with source impedances of less than 25 ohms to at least 300 ohms.

INPUT IMPEDANCE is 100 k paralleled by approx. 2 pf.

DYNAMIC RANGES is ±1.5 v with Risetime control set to LOW NOISE and ±3 v when the control is set to FAST RISETIME. Safe overload is ±10 v.

*For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-0267-00.

EXTERNAL TRIGGER is required, approximately 50 nsec prior to signal. Minimum repetition rate is 50 cps.

RECORDER SIGNAL OUTPUT of Channel A, Channel B, or Channel (A + B) is 1 v/div (through 10 kilohms), dc-coupled at +10 volt level.

DC OFFSET provides a means of displaying selected portions of signals having off-screen amplitudes. A control permits displaying of signals riding on a dc voltage as high as ±0.5 v.

TRACE FINDER button returns the trace to crt screen to aid in vertical positioning when the trace is driven off the screen by a large signal.

PROBE (Type P6038) used with the Type 3S3 is extremely compact. The sampling bridge is contained in the probe head to obtain optimum results with the input impedance of 100 k paralleled by 2 pf. Probe can be changed from channel to channel with only minor recalibration.

NET WEIGHT is 6¾ pounds. Shipping weight is 9 pounds, approx.

TYPE 3S3 AMPLIFIER UNIT
(with two Type P6038 Probes) $1500
Each instrument includes: 2—instruction manuals (070-0374-00)

REPLACEMENT P6038 PROBE PACKAGE (Part Number 010-0156-00) **$225**

Each package includes: 2—P6038 Probe Package (010-0156-00), which includes; 1—P6038 probe (010-0157-00); 1—Response normalizer (011-0070-00); 1—X10 attenuator (011-0071-00); 2—Test point jack (131-0258-00); 1—Coupling capacitor (011-0072-00); 1—Hook tip assembly (206-0114-00); 1—Ground clip (175-0249-00); 1—Probe holder (352-0024-00); 1—Instruction Manual (070-0400-00).

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DUAL-TRACE SAMPLING UNIT Type 3S76

Internal Triggering and Delay Lines

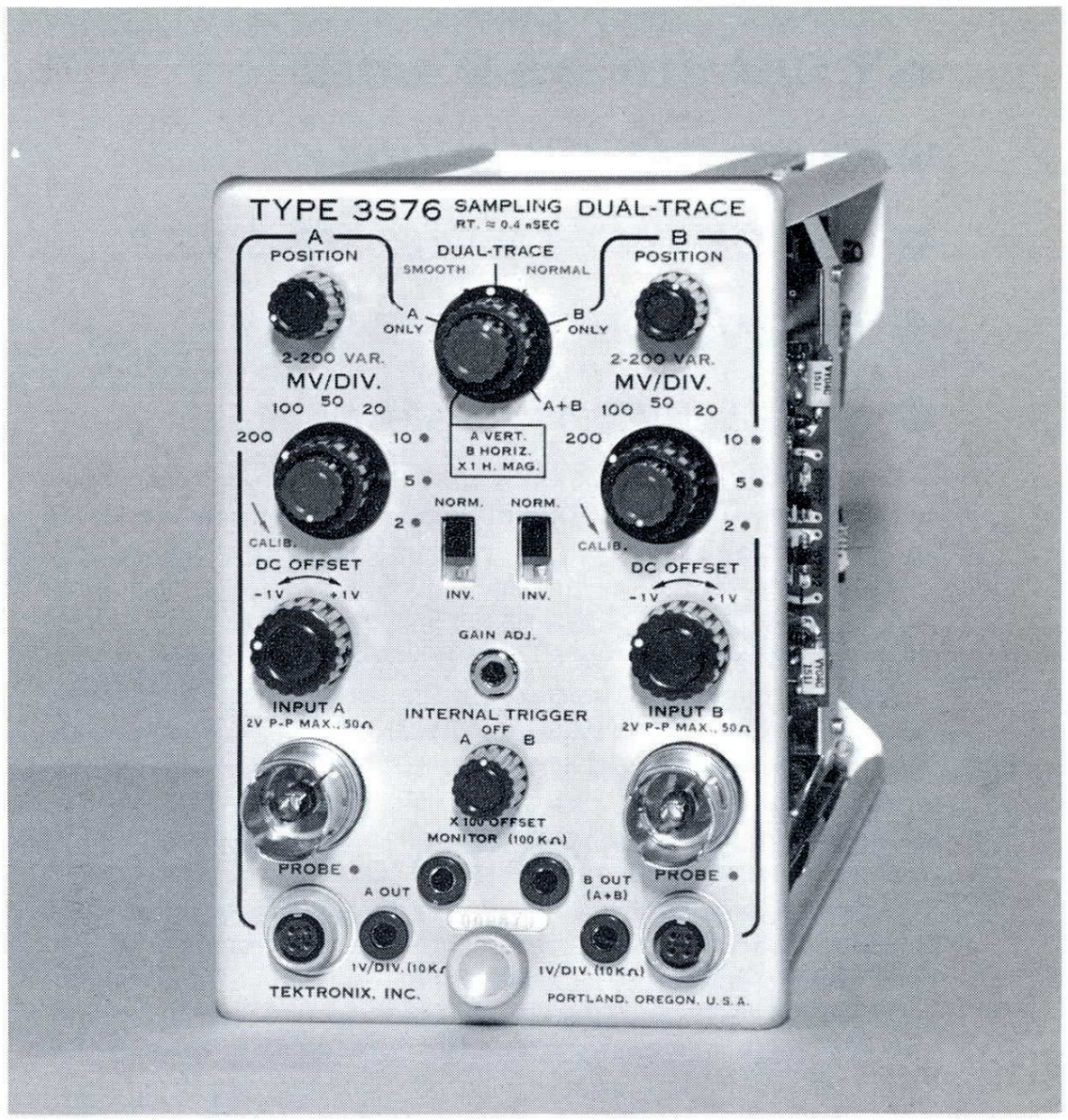
0.4-nsec or less Risetime

2 Identical Channels

5 Operating Modes

Recorder Outputs

The Type 3S76 Sampling Unit is a dual-trace amplifier containing two separate channels which possess identical characteristics. The unit can perform in any of five operating modes for a variety of single, dual-trace and X-Y displays. It is designed to operate in conjunction with a Type 3T77 Sampling Sweep Unit in Type 561A, 564 and 567 Oscilloscopes. In the Type 567, information will be presented in digital as well as analog form.*



OPERATING MODES include Channel A only; Channel B only; Dual-Trace—Channels A and B switched electronically on alternate samples; A+B—outputs of Channels A and B added algebraically; A Vertical/B Horizontal—Channel A deflected vertically and B horizontally for X-Y displays. Independent controls for each channel provide for trace positioning and polarity inversion.

CALIBRATED SENSITIVITY is from 2 mv/div to 200 mv/div in 7 calibrated steps, accuracy within 3%, except on the 2 mv/div. and 5 mv/div. steps, which have accuracy within 5%. A variable control permits continuous adjustment between steps.

FREQUENCY RESPONSE is equivalent to dc-to-3-db down at 875 Mc.

RISETIME is 0.4 nsec or less, with less than ±3% peak overshoot and undershoot.

NOISE is equivalent to an input signal of 2 mv pk-to-pk with Smooth-Normal Switch in NORMAL position and 1 mv pk-to-pk with Smooth-Normal Switch in SMOOTH position.

DC OFFSET is ±1 v, referred to input, and monitorable at the front panel at 100X magnitude.

INPUT IMPEDANCE is 50 ohms.

DYNAMIC RANGE is ±2 v. Full sensitivity can be used with signals up to ±2 v in amplitude. Safe overload is ±4 v (higher with reduced duty factor).

*For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit—Tektronix No. 040-0267-00.

SIGNAL DELAY through 55-nsec internal delay line for each channel allows viewing of leading edge of input waveform.

TRIGGER SOURCE selects built-in trigger takeoff signal from either channel.

RECORDER SIGNAL OUTPUT is 1 v/div (through 10 kilohms) dc-coupled at +10 volt level, both channels.

PROBE POWER is provided on both channels for cathode-follower probes.

NET WEIGHT is 7½ pounds. Shipping weight is 12 pounds, approx.

TYPE 3S76 DUAL-TRACE SAMPLING UNIT $1100

Each instrument includes: 2—10X attenuator, 50 Ω (017-0044-00); 2—5-nsec cable (017-0502-00); 2—Instruction Manual (070-0332-00).

PROBES

The following Tektronix probes are recommended for use with the Type 3S76. See Catalog Accessory pages for complete information on the probes.

Use	Input Impedance R	Input Impedance C	Rating	Prob. No.	Price
10:1 Attenuator	500 Ω	0.7 pf	16 vdc-500 vac	P6034	$ 35
100:1 Attenuator	5 k Ω	0.6 pf	50 vdc-500 vac	P6035	35
Selectable Attenuator	10 meg Ω	varies	varies	P6032	220
Current	—	—	500 ma	CTI/P6040	31

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Type 3T4 PROGRAMMABLE SAMPLING UNIT

- *CALIBRATED SWEEP RATES*
- *CALIBRATED SWEEP DELAY*
- *100 OR 1000 SAMPLES-PER SWEEP*
- *NORMAL OR SINGLE DISPLAY*
- *SINGLE DISPLAY START*

The 3T4 Sampling Unit adds great convenience to the operation of the Type 567 Digital Readout System by providing remote control of the horizontal time base. This unit is compatible with the following equipment: 3S76, 3S3, and other 3-series sampling units; 561, 561A, 564, and 567 Indicator Units; 6R1 and 6R1A Digital Units, and the 262 Programmer.

The multiple-pin connector on the front panel affords external control of equivalent-time sweep rates, delay time, samples per sweep, normal or single-display modes, and single-display start. These operations are obtained through the grounding of certain pins of the front-panel connector.

Front-panel outputs are TRIGGER OUT, which provides a 500-mv, negative pulse coinciding with the input trigger, and SWEEP OUTPUT which provides a staircase ramp. The unit also can be triggered internally and responds to input signals up to 1000 Mc. The SINGLE DISPLAY feature permits photographic trace recording. The 10X MAGNIFIER extends the on-screen calibrated sweep rate. A dual-purpose front-panel control permits manual or external scanning of the display, thus providing convenient operation of either X-Y or Y-T recorders.

SWEEP RATES

Equivalent-Time Sampling—1 nsec/div to 200 μsec/div, ±3%, in 2-5-10 sequence.
Real-Time Sampling—External clock, trigger, and single-display start inputs are required.

DELAY RANGE

1 nsec/div through 0.1 μsec/div—1000 nsec delay range.
0.2 μsec/div through 10 μsec/div—100 μsec delay range.
20 μsec/div through 100 μsec/div—1000 μsec delay range.
(No delay range for 200 μsec/div sweep rate, or in real-time sampling mode).

SWEEP MODES

+External Input—Scanning accomplished by external signal. Deflection factor adjustable from 5 to 20 volts/horizontal division.

Manual Scan—Display scanned by front-panel control.

Normal—Repetitive sweep.

Single Display—One sweep each time START button is depressed.

OTHER SWEEP CHARACTERISTICS

Samples per sweep—100 or 1000.
Magnification of crt display—X1 and X10.
Front-panel sweep output—Staircase ramp, 1 volt/horizontal division.

NEW

TRIGGERING

Trigger Inputs—Internal or External + and —. Trigger responds to inputs up to 1000 Mc.
Trigger Output—500 mv, negative polarity.

REMOTELY PROGRAMMABLE FUNCTIONS

Equivalent-Time Sweep Rates.
Delay Time.
Samples per Sweep (Digital read-out decimal information correct only on 1,000 samples/sweep).
Normal or Single-Display Modes.
Single-Display Start (When remotely programmed for SINGLE DISPLAY).

DIMENSIONS AND WEIGHT

Instrument is 16½" long by 4¼" wide by 6¼" high. Net weight is 5¾ lbs.; shipping weight is 11¾ lbs.

TYPE 3T4 SAMPLING SWEEP UNIT $1300
Each instrument includes: 2—Instruction Manual (070-0439-00).

OPTIONAL ACCESSORIES

Connector, 19-Pin, Male, Micro-Dot. Mates with front-panel connector of 3T4 Unit for external programming.
(131-0388-00) $32.30

Extender Card, 56-Pin (Modified 262). The card is a rigid extension which enables the printed-circuit cards to operate out of the Type 3T4 for servicing convenience.
(012-0078-00) $20.00

Remote Program Cable, 10 ft. long, 19-Pin Microdot, Male to 36-Pin Male Micro-Ribbon Connector.
(012-0101-00) $85.00

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Please refer to Terms and Shipment, General Information page.

SAMPLING SWEEP UNIT Type 3T77

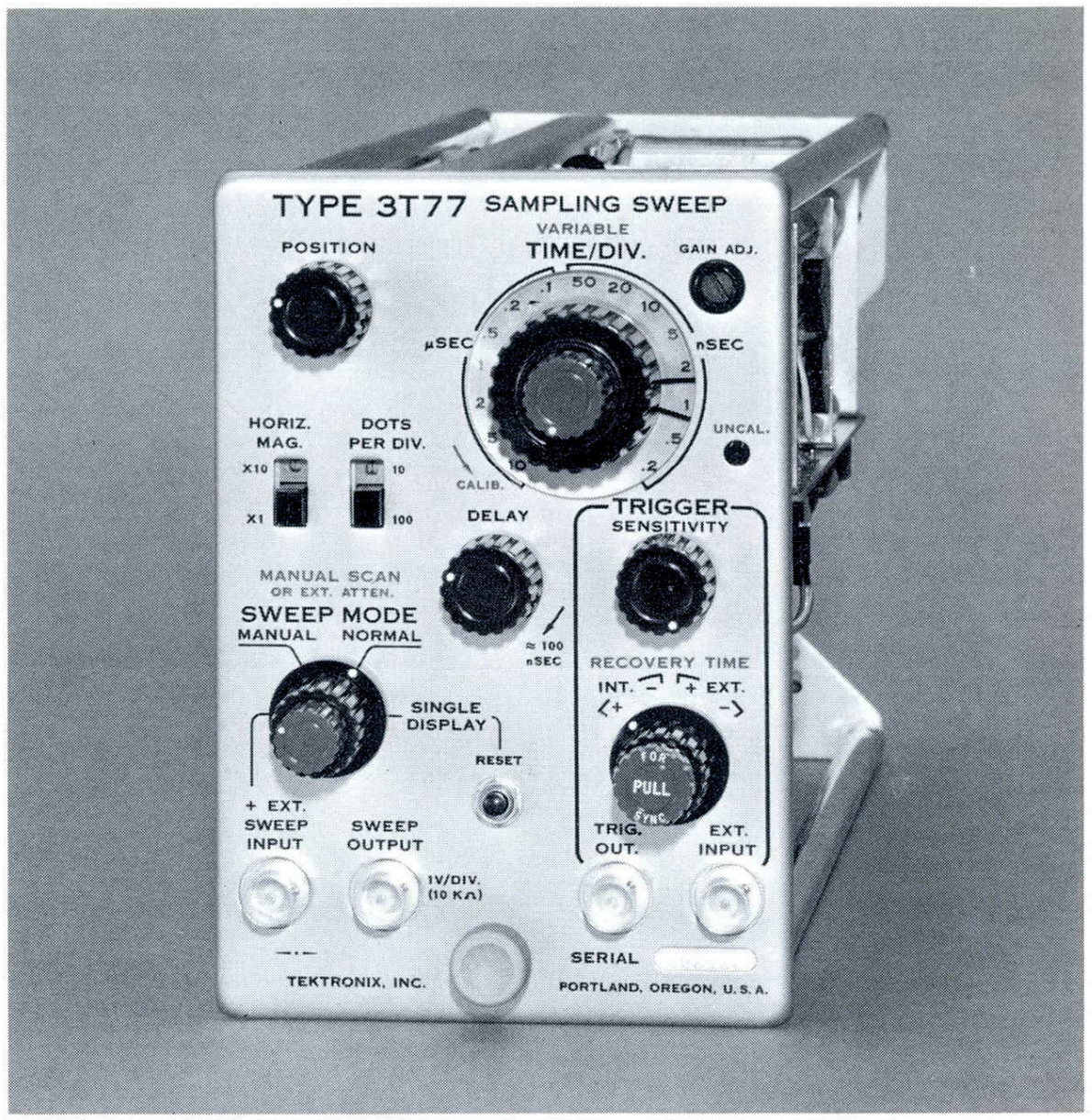
Triggering Through 1 Gigacycle

10 μsec/div to 0.02 nsec/div Sweep Rates

Variable Sweep Delay

Single-Display Provision

Recorder Output



The Type 3T77 is a Sampling Sweep Unit. It provides subnanosecond capabilities when used in conjunction with a Type 3S3 or 3S76 Sampling Unit in a Type 561A, 564 or 567 Oscilloscope. In the Type 567, information can be presented in digital as well as analog form.*

TRIGGERING CHARACTERISTICS

SINEWAVE TRIGGERING

FREQUENCY RANGE is from 100 kc through 1 Gc.

AMPLITUDE RANGE is from 10 mv to 800 mv pk-to-pk for external triggering. Five times more trigger amplitude is required for equivalent internal triggering. Optimum trigger amplitude for least jitter may depend on frequency. Damaging overload can occur at 5 v or greater.

JITTER varies with trigger amplitude, frequency and TIME/DIV setting. Typical figures are less than 50 psec jitter for 100 mv p-p of 30-Mc to 50-Mc sinewave. A special synchronizing mode may be used above 30 Mc for extra stability.

PULSE TRIGGERING

REPETITION RATE RANGE is from 10 pps (limited by memory drift in the vertical plug-in) through 10^9 pps (1 Gc).

AMPLITUDE RANGE is from 10 mv to 800 mv p-p for external triggering. Minimum trigger rise rate is approx. 150 mv/μsec. Optimum trigger amplitude for least jitter may depend on rise rate and rep rate. Damaging overload can occur at 5 v or greater.

JITTER is typically 50 psec or 0.1% of fast ramp duration, whichever is greater, for pulses of 50-mv amplitude, 2-nsec width (or 10 mv, 10-nsec width).

OTHER CHARACTERISTICS

DOT DENSITY can be either 10 or 100 dots/div.

* For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-0267-00.

CALIBRATED SWEEP RANGE is from 0.2 nsec/div to 10 μsec/div in 15 calibrated steps, 1-2-5 sequence. Accuracy is within 3%. A variable control permits continuous adjustment uncalibrated between calibrated rates.

10X MAGNIFIER permits a close-up view of any part of the display horizontally and extends the calibrated sweep rate to 0.02 nsec/div. Dot density remains constant when display is magnified.

MANUAL OR EXTERNAL SCANNING of the display provides convenient operation of remote recorders. At least 5 v/div (positive-going) is required for an external sweep.

SINGLE DISPLAYS useful for photography or storage can be initiated by a reset button.

RECORDER SWEEP OUTPUT is 1 v/div (through 10 kilohms), useful for driving recorders and other devices.

SWEEP DELAY of at least 100 nsec or one unmagnified screen diameter (whichever is greater) permits wide-range time positioning of the display.

NET WEIGHT is 5½ pounds. Shipping weight is 9 pounds, approx.

TYPE 3T77 SAMPLING SWEEP UNIT $650

Each instrument includes: 2—10X attenuator, 50 Ω (017-0044-00); 1—Adapater, BNC-to-GR (017-0064-00); 2—10-nsec GR cable (017-0501-00); 1—Adapter, BNC-to-UHF (103-0032-00); 2—Instruction Manual (070-0333-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 105 SQUARE-WAVE GENERATOR

RISETIME

Less than 20 nsec into a terminated 93 ohm cable.
As short as 13 nsec under suitable conditions.

FREQUENCY RANGE

25 cycles to 1 Mc, continuously variable.

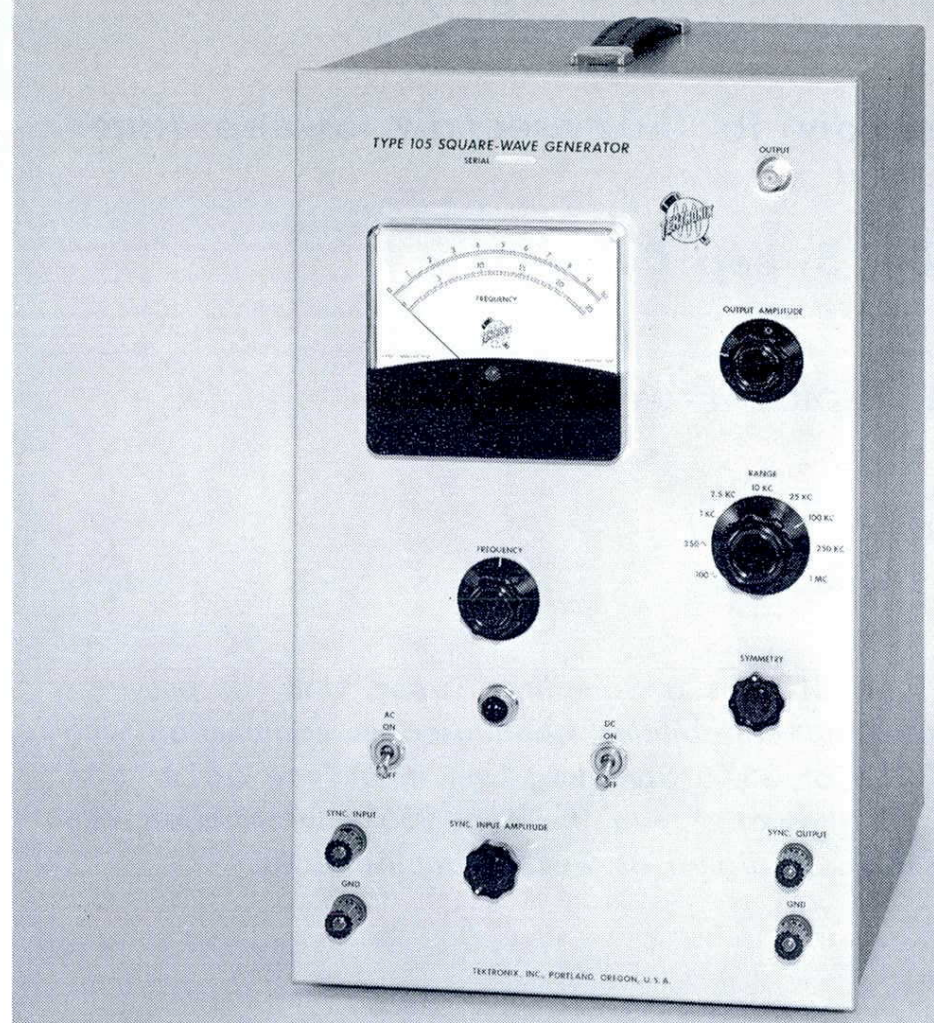
FREQUENCY METER

Direct reading, accurate within 3% of full scale.

MAXIMUM OUTPUT

15 v, approximately, into 93-ohm cable.
More than 160 ma, peak-to-peak.

The Type 105 produces precision square waves at any frequency from 25 cycles to 1 Mc. Wide range and flexibility of operation qualify the Type 105 for highly specialized laboratory and research applications as well as general purpose use. Short risetime, excellent waveform, variable amplitude control and accurate indication of frequency, along with other features, combine to make the Type 105 an ideal instrument for testing amplifiers and other electronic equipment designed for the 25 cycle-to-1 Mc range.



Frequency Range is 25 cps to 1 Mc, continuously variable, in nine ranges — 100, 250 cps, 1, 2.5, 10, 25, 100, 250 kc, and 1 Mc. Direct-reading frequency meter is accurate within 3% of full scale.

Output Amplitude is adjustable from 10 to 100 v across the internal 600-ohm load. Square-wave current available at the output is greater than 160 ma (peak-to-peak). With a 75-ohm terminated output coaxial cable, maximum voltage available is 12 v; with a 93-ohm cable, approximately 15 v.

Sync Output Terminal supplies a synchronzing signal with amplitude independent of the square-wave output-control setting. A Sync Input terminal permits synchronizing the square wave with a frequency standard.

Risetime is less than 20 nsec into a 93-ohm terminated cable; 18 nsec (approx.) when the 93-ohm cable is terminated at both ends; 13 nsec (approx.) into a 50-ohm cable terminated at both ends. For higher output voltages larger output impedances can be used, with a corresponding increase in risetime.

DC Power Supplies, electronically regulated, insure stable operation over line variations of 105-125 v, 210-250 v. Power consumption is 250 watts.

Mechanical Specifications include dimensions of 16⅞" high by 10⅜" wide by 15¼" deep. Weight, net 34 pounds; shipping, 47 pounds (approx.).

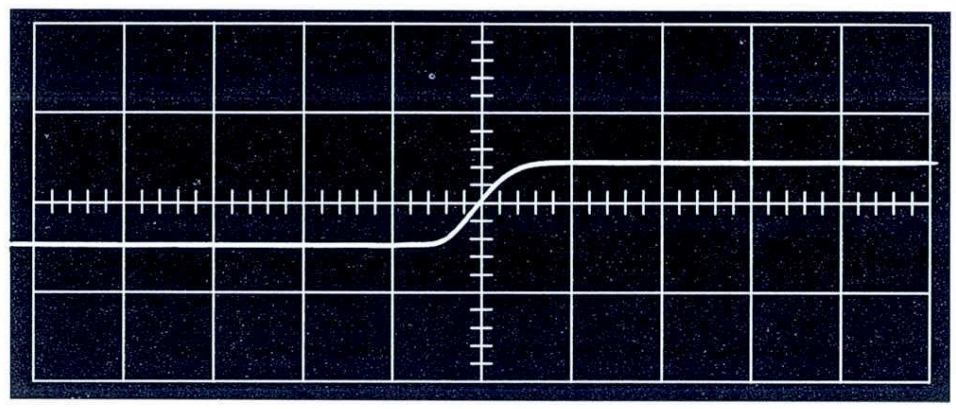


Fig. 1. 13-nsec risetime of the Type 105 displayed on 20 nsec/cm sweep. Generator connected to vertical deflection plates of crt, sensitivity 7 v/cm with 50-Ω cable terminated at both ends.

TYPE 105 GENERATOR $435

Each instrument includes: 1—93-Ω coaxial cable, BNC, (012-0075-00)*; 1—93-Ω termination, BNC, (011-0056-00), 1—clip lead adapter (013-0076-00); 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 1—post jack, BNC, (012-0092-00), 1—patch cord, BNC-to-BNC, 18" (012-0087-00), 2—instruction manual (070-0049-00).

ATTENUATOR, CABLES AND TERMINATIONS

A selection of terminating resistors, attenuators and coaxial cables for use with the Type 105 will be found in the Accessory pages of this catalog. Within certain technical limits, special terminating resistors and attenuators can be supplied on request.

*If specified on purchase order, a 50-Ω cable and resistor or a 75-Ω cable and resistor will be supplied instead . . . no extra charge.

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

PULSE GENERATOR Type 107

Risetime

Less than 3 nsec into a terminated 50-ohm cable.

Frequency Range

Approximately 400 kc to 1 Mc, uncalibrated.

Output Voltage

0.1 to 0.5 v, approximately, when cable is terminated in 50 ohms.

The Type 107 Square-Wave Generator is basically intended as a test accessory for Tektronix Instruments.

With less than 3-nsec risetime, the Type 107 provides a suitable square wave for checking and adjusting high-frequency response of most Tektronix Oscilloscopes and Wide-Band Preamplifiers. Source impedance is approximately 50 ohms. Output is ac coupled.

CHARACTERISTICS

Risetime—Less than 3 nanoseconds when the output 50-ohm cable is terminated.

Frequency Range—A front-panel control varies the frequency over an uncalibrated range of approximately 400 kc to greater than 1 Mc.

Output Voltage—When the output cable is terminated the output voltage range is approximately 0.1 v to 0.5 v pk-to-pk. If the cable is not terminated, the voltage range is 0.2 v to 1 v pk-to-pk.

Output Trigger—Output voltage is approximately 1.5 v pk-to-pk with a 93-ohm cable termination. The negative portion of the trigger slightly precedes the positive-going portion of the square-wave output. The trigger signal is available at a coaxial connector at the rear of the instrument.

Waveform—Special design consideration has been placed on the shape of the positive portion of the waveform. Therefore, only this portion should be used in transient response testing.

Power Supply—A conventional full-wave rectifier system employs a capacitor-input filter, a regulated +150 v is supplied for the output tube screen grid to insure constant output amplitude with a given APPROXIMATE AMPLITUDE setting.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 100 watts.

Mechanical Specifications—Dimensions are 10-9/16" high by 7" wide by 11⅛" deep. Net weight is 13 pounds. Shipping weight is 20 pounds, approx.

TYPE 107 GENERATOR $190

Each instrument includes: 1—50-Ω termination, BNC, (011-0049-00), 1—50-Ω X10 attenuator, BNC, (011-0059-00), 1—50-Ω cable, BNC, (012-0057-00), 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 2—instruction manual (070-0050-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 109 PULSE GENERATOR

0.25 nsec Risetime Pulses

Alternate Pulses of Equal or Different Time Duration

Calibrated Variable Amplitude Pulses of Either Positive or Negative Polarity

Pulse Durations to 40 nsec

The Type 109 is intended for use with fast-rise sampling systems or conventional oscilloscopes that generate their own internal sweep trigger. The Type 109 is transistorized and requires no warmup time before operating.

CHARACTERISTICS

PULSE RISETIME is less than 0.25 nsec.

PULSE WIDTH is near 0.5 nsec to a maximum of 40 nsec at full repetition rate; 300 nsec at half repetition rate. An external charge network with a 10X attenuation provides long duration pulses. Amplitude decay is only 10% in 300 nsec.

REPETITION RATE is preset between 550 pulses/sec to 720 pulses/sec.

PULSE AMPLITUDE can be selected from three calibrated ranges extending from zero through fifty-five volts, accuracy within 3%.

PULSE POLARITY can be either positive or negative.

OUTPUT IMPEDANCE is 50 ohms.

CHARGE LINES, either one or two, can be used to provide alternate equal or unequal pulses as desired. Equal charge lines produce a repetition rate of 550 pulses/sec to 720 pulses/sec.

EXTERNAL DC CHARGE VOLTAGE INPUTS permit alternate pulses of different amplitudes and/or polarity. Maximum external charge voltage is 600 volts. With up to 100 volts input, the output amplitude will be half the external input amplitude. At voltage inputs over 100 volts, the output amplitude will be less than half the input amplitude. At voltage inputs of over 50 volts, pulse irregularities may occur.

DC-POWER SUPPLIES are electronically regulated to compensate for widely varying load conditions.

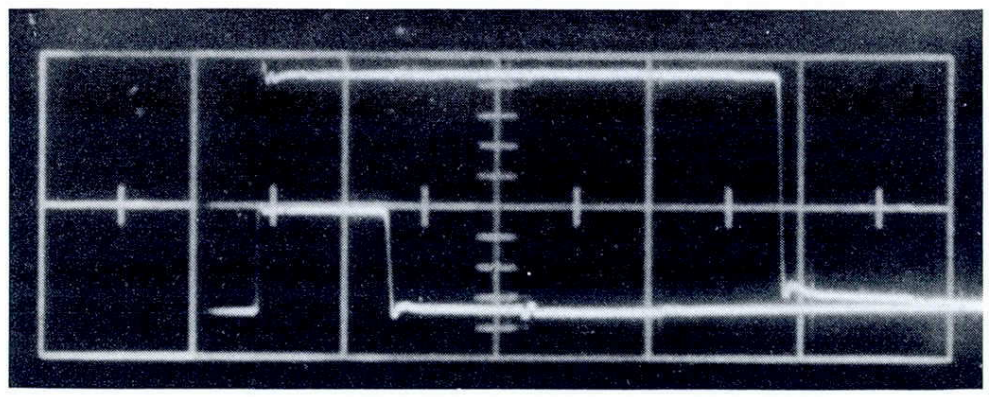
POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 800 cps, typically 60 watts.

MECHANICAL FEATURES include an aluminum-alloy chassis and anodized front panel. Dimensions are 7⅞" high by 5" wide by 11¾" deep. Net weight is 8½ pounds. Shipping weight is 18 pounds, approx.

TYPE 109 PULSE GENERATOR $360

Each instrument includes: 1—charge network (017-0067-00), 3—5-nsec cable (017-0502-00), 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 2—instruction manual (070-0299-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.



Alternate pulses of different widths and amplitudes produced by using 5-nsec and 20-nsec charge lines and external charge voltages. Vertical sensitivity 10 v/cm, sweep speed 10 nsec/cm.

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PULSE GENERATOR Type 111

The Type 111 is a high-repetition rate, fast-rise pulse generator. It is primarily intended for use with the Tektronix Sampling Plug-In Units; however, its characteristics make it ideally suited for use with conventional oscilloscopes and other equipment as well. The unit provides two pulse outputs: the fast-rising Output Pulses and the Pretrigger Pulses. The Pretrigger Pulses occur from 30 to 250 nanoseconds ahead of each Output Pulse. These Pretrigger Pulses can be used as a Regenerated Trigger Signal for the Sampling Systems without internal delay lines or as a triggering signal for a conventional oscilloscope. The amount of delay between the Pretrigger Pulse and the Output Pulse is variable by means of a front panel control. This eliminates the need in most applications for low-loss delay cables.

Output Pulse Risetime—Equal to or less than 0.5 nsec for both (+) and (—) polarity.

Output Pulse Duration—Minimum, approximately 2 nsec with no external charge line. Maximum, 1500 nsec at low repetition rates decreasing to 30 nsec at 100 kc repetition rate. Maximums are obtained with an external charge line.

Output Pulse Polarity—Either (+) or (—) as selected by a front panel control.

Output Pulse Repetition Rate—Four repetition rate ranges and a vernier control provide a continuous range of adjustment from approximately 10 pps to approximately 100 kc. Overlap between ranges is about 5%.

Output Pulse Aberrations—When the output is properly terminated, overshoot and other aberrations on the leading edge and top of the output pulse are less than 5% pk-to-pk of the pulse amplitude. Aberrations following the pulse are less than 10% pk-to-pk of the pulse amplitude. Pulse aberration figures are taken as viewed on a Tektronix Type 4S3 or equivalent. Figures may be greater when using other sampling systems.

Pulse Amplitude—More than 10 volts. The output voltage is fixed by the particular avalanche transistor used. External attenuators are necessary to vary the output amplitude. Refer to Accessories section for available 50 Ω attenuators.

Pretrigger Pulse Characteristics—Amplitude is about 10 volts, duration is about 300 nsec, and half-amplitude risetime is about 5 nsec.

Pulse Delay—The Output Pulse is delayed from 30 to 250 nsec after generation of the Pretrigger Pulse. The delay is continuously variable by means of a front panel control. Time jitter between the Pretrigger and the Output Pulse is less than 100 picoseconds.

Output Impedance—50 ohms.

External Trigger Signal—Positive 3 volts or greater at rise rate of 3 volts/μsec or faster. As long as rate of rise is maintained, repetition rates from 0 to 100 kc can be used.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 800 cps, typically 35 watts at 117 v.

Mechanical Specifications—Dimensions are 11⅛" high by 7" wide by 11⅛" deep. Net weight is 8¾ pounds. Shipping weight is 16 pounds, approx.

TYPE 111 GENERATOR $365

Each instrument includes: 1—5-nsec 50-Ω cable (017-0502-00), 1—9-nsec 50-Ω charge line (017-0506-00), 1—50-Ω 10X attenuator (017-0044-00), 1—3-wire power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 2—instruction manual (070-0252-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

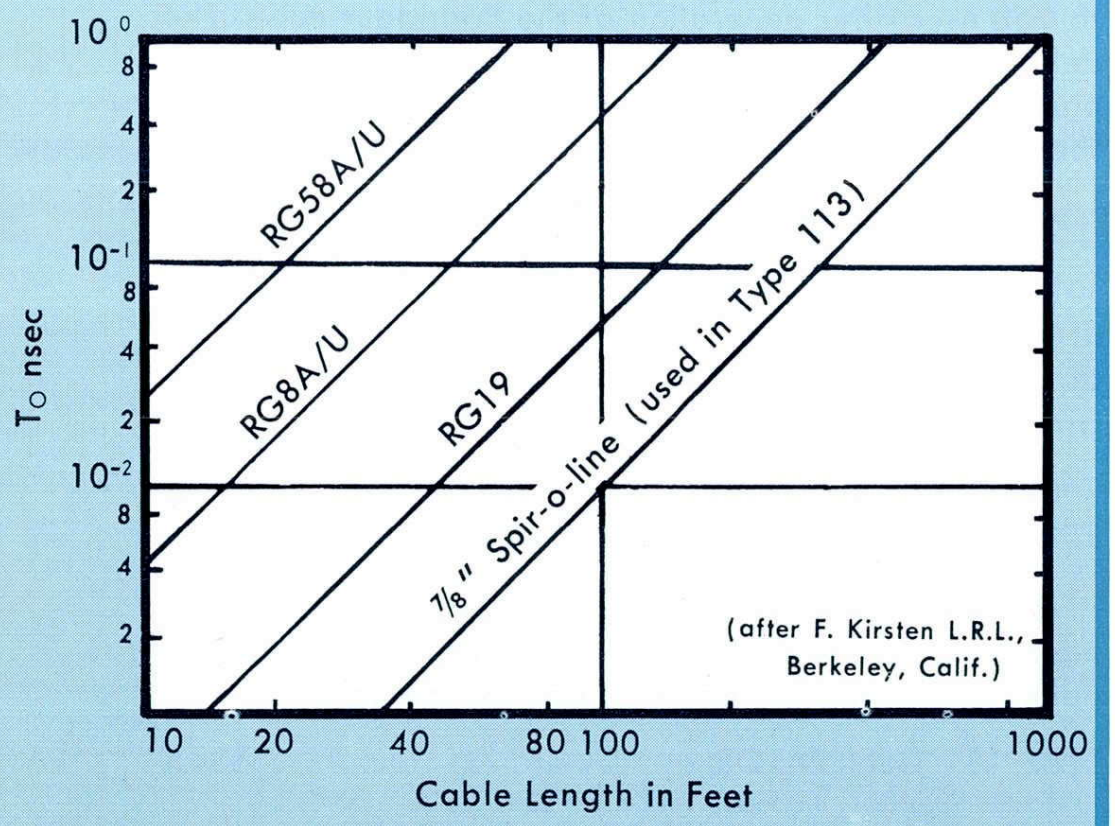
Type 113 DELAY CABLE

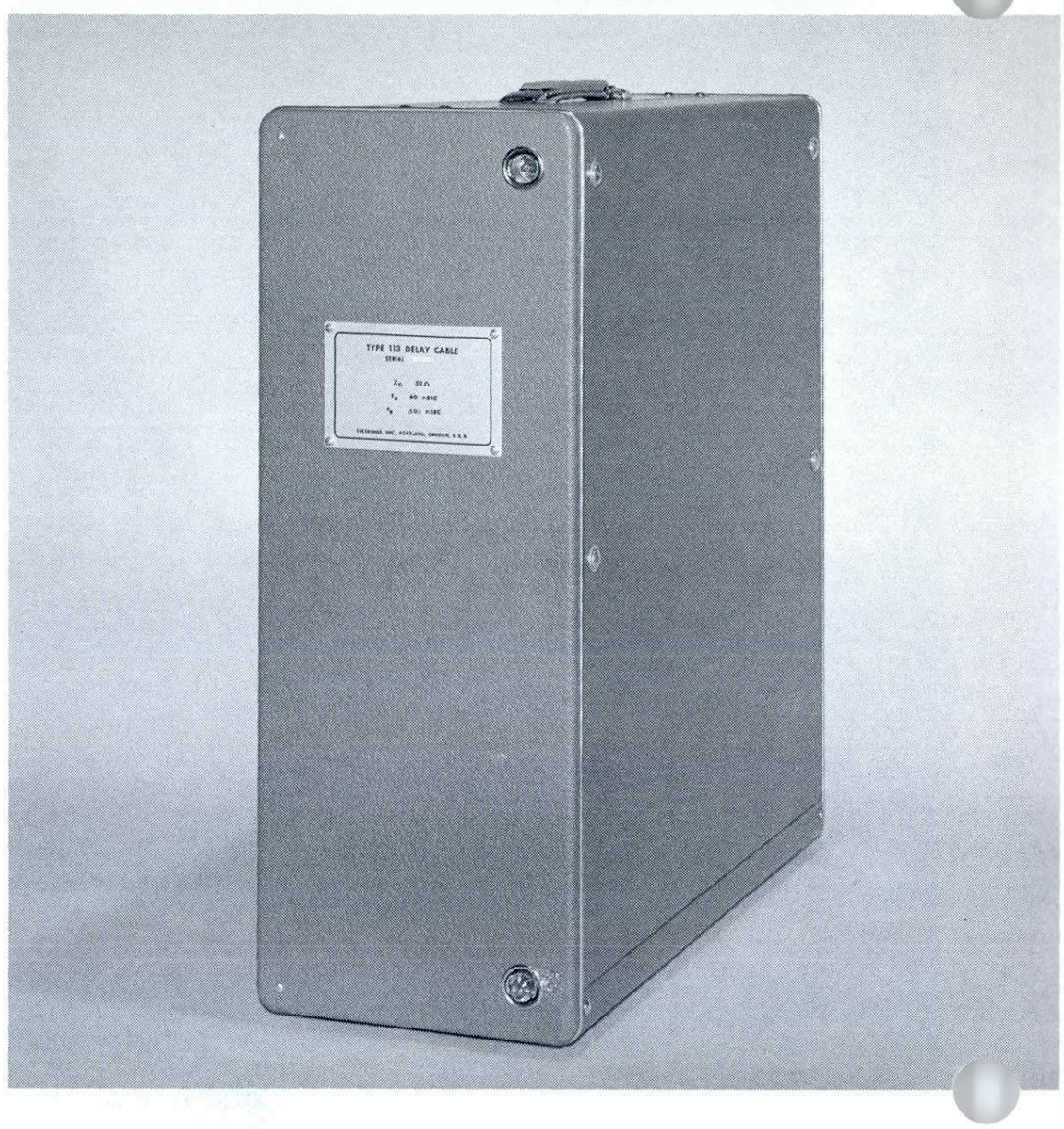
TRANSMISSION LINES

Transmission lines used for nanosecond pulses are commonly of the transverse electric and magnetic fields mode type. The Type 113 uses this mode, because response is desired to zero frequency with minimum dispersion. In the nanosecond region, skin effect losses cause most of the pulse distortion in well-constructed cables. This results in a nongaussian response. Risetimes of cascaded cables do not follow the usual rms addition method of combining risetimes, as in gaussian amplifiers.

Transmission line distortion of a step function shows up in a distinctive way. After a small transition period, the output rises fairly rapidly and then slows considerably, compared to an RC charge. An RC step requires 2.2 time constants to change from 10% to 90% of the input step. A transmission line requires 30 times the 0-to-50% risetime period to accomplish this (10% to 90%) transition.

The graph illustrates time of rise from 0-to-50% (T_0) of the input for various common coaxial cables. Note that the risetime deteriorates as the square of the length. Thus, it is very important to keep cable lengths (or delays) to a minimum. The Type 113 uses about 50 feet of 7/8" diameter cable, resulting in a 0-to-50% risetime of about 0.0025 nanosecond, and 10% to 90% of better than 0.1 nanosecond.





The Tektronix Type 113 Delay Cable has a delay of 60 nsec. In general it is used in those sampling applications where the vertical amplifier does not contain internal delay lines, where the triggering of the sweep is external and signal delay is required.

Adequate Time Delay—With 60 nsec inserted in the Type 110 and N system, about 10 nsec can be seen ahead of a fast leading edge.

High Quality Cable—Approximately 1.5 db loss per 100 feet at 1000 mc. Risetime approximately 0.1 nsec.

Mechanical Specifications—Three-piece cabinet houses the coaxial cable compactly coiled between two G.R. connectors. Side panels and bottom panel are easily removable. Rubber feet installed in one side, the bottom, and the back, facilitate use of the Tektronix Type 113 Delay Cable in any of three positions.

Dimensions are 22 3/8" high by 8 5/8" wide by 21 7/8" deep. Net weight is 44 3/4 pounds. Shipping weight is 59 pounds, approx.

TYPE 113 DELAY CABLE $250

U. S. Sales Price f.o.b. Beaverton, Oregon
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PULSE GENERATOR Type 114

- *LESS THAN 10-NANOSECOND RISE AND FALL TIME*
- *VARIABLE PULSE PERIOD, WIDTH, AND AMPLITUDE*
- *INSTANT SQUARE-WAVE SELECTION*
- *REGULATED POWER SUPPLY—STABLE, LOW-JITTER OPERATION*
- *ALL SOLID STATE—NO FAN*

NEW

The new Type 114 is a general-purpose generator designed for laboratory and production test facilities. The versatility of the Type 114 makes it well suited for numerous applications, such as medical stimulation, studying network response to changes in period and/or width, or determining the step response of systems. It can also serve as a repetition-rate generator or as a delay generator.

Compact in size, the Type 114 utilizes solid-state circuitry throughout, insuring trouble-free operation and long component life. Functional front-panel layout makes the instrument easy to operate. Three switches are used for selecting pulse period, width, and amplitude. Each switch has a variable control for use over the selected range. A front-panel lamp indicates when the pulse width exceeds the maximum allowed by the period. The width selector switch features a square-wave position providing symmetrical square-wave output at all pulse periods.

Front-panel connectors are provided for pulse output, trigger output, and external trigger input. Two Type 114's can be connected together so that the output pulse of the second unit is delayed by the pulse width of the first unit.

RISE AND FALL TIME
10 nsec or less.

PULSE ABERRATIONS
5% or less (at maximum amplitude).

POLARITY
Positive or negative.

PULSE PERIOD
5 switched positions from 1 μsec to 10 msec, plus external trigger position; continuously variable from 1 μsec to 100 msec. ACCURACY: $\pm$3% with variable control in calibrated position. JITTER: less than 0.05%.

PULSE WIDTH
5 switched positions from 100 nsec to 1 msec, plus square-wave mode; continuously variable from 100 nsec to 10 msec. ACCURACY: $\pm$3% with variable control in calibrated position. JITTER: less than 0.05%. Front-panel lamp indicates when pulse width exceeds pulse period. SQUARE-WAVE OUTPUT: symmetrical square-wave output at all Pulse Period settings.

PULSE AMPLITUDE
4 switched positions: —1 v to —3 v, —3 v to —10 v; +1 v to +3 v, +3 v to +10 v. Variable within each range. Maximum output into a 50-Ω load is 10 v; 16 v into 1,000-Ω load.

TRIGGER INPUT
Stable triggering on +2 v from dc to 2 Mc, with a trigger-pulse risetime less than 1 μsec.

TRIGGER OUTPUT
3 v, open circuit; 0.5 v into 50-Ω load. Front-panel switch sets trigger output pulse to occur at leading or trailing edge of output pulse.

POWER REQUIREMENTS
94.5 v to 137.5 v or 189 v to 275 v ac, 50 to 400 cps. Operating voltage selected by rear-panel switch.

CONNECTORS
BNC

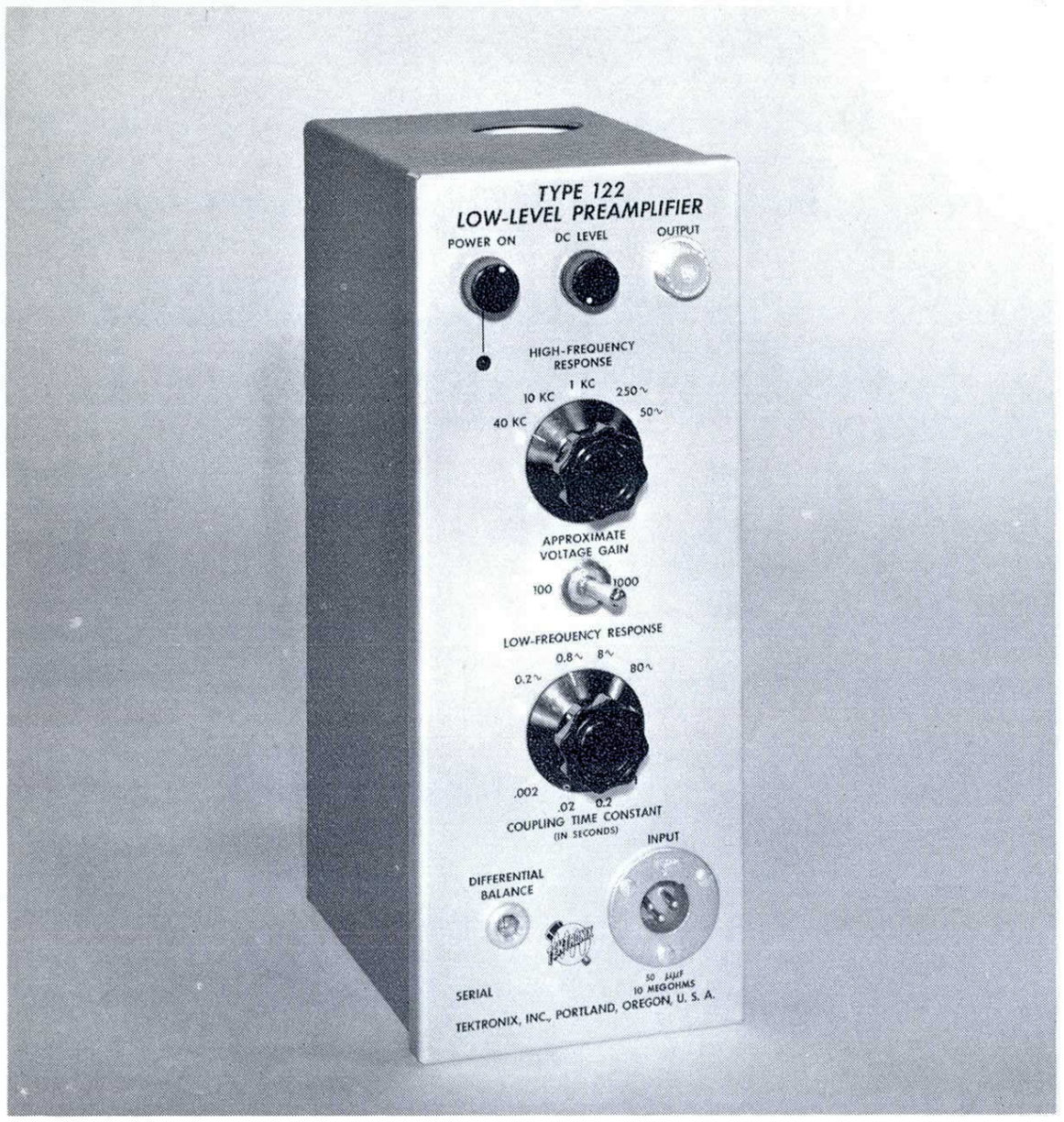
FINISH
Blue vinyl, anodized front-panel.

DIMENSIONS and WEIGHT
Dimensions—9" wide by 12½" deep by 6" high.
Net Weight—10 lbs.
Shipping Weight—14 lbs.

TYPE 114 PULSE GENERATOR $350
Each instrument includes: 1—power cord (161-0024-00), 1—3 to 2-wire adapter (103-0013-00), 2—instruction manual (070-0465-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 122 LOW-LEVEL PREAMPLIFIER



Voltage Gain
High position—approximately 1000.
Low position—approximately 100.

Frequency Response
0.2 cps to 40 kc maximum.

Input Selection
Single ended or differential.

The Tektronix Type 122 Low-Level Preamplifier is a compact 3-stage amplifier extending the usefulness of the oscilloscope into the microvolt region. The Type 122 is especially useful in biological research and other applications requiring the amplification of microvolt signals.

The Type 122 can be used with any dc-coupled oscilloscope, increasing its sensitivity by a factor of either 1000 or 100. If the Type 122 is used with an ac-coupled oscilloscope, the overall low-frequency response will be limited to that of the oscilloscope.

Shock mounting, careful bypassing, and use of the Tektronix Type 125 Power Supply or battery power reduce microphonics, noise, and hum to a low level.

Frequency Response—Maximum passband is 0.2 cycles to 40 kc, with 5 approximate high-frequency 3-db cutoff points. . . 50, 250 cps, 1, 10, and 40 kc; and 4 approximate low-frequency 3-db cutoff points. . . 0.2, 0.8, 8, and 80 cycles. Corresponding low frequency time constants are 1, 0.2, 0.02, and 0.002 seconds. High and low-frequency points are controlled by separate switches so a variety of frequency response characteristics can be obtained.

Voltage Gain—A toggle switch selects either a gain of 100 or 1000.

Rejection Ratio—80 to 100 db for in-phase signals from 5 cycles to 40 kc; maximum common-mode signal input is 4 v.

Signal Output—Maximum signal output is 20 v (peak-to-peak) for a maximum signal input of 0.02 v (peak-to-peak) in high gain position and 0.1 v (peak-to-peak) in low gain position. AC input signals up to these maximums or dc levels up to ±0.1 v (either gain setting) can be handled by the Type 122 before waveform distortion occurs. Output impedance is approximately 1000 ohms.

Input Impedance—With single-ended input, the impedance is 10 megohms paralleled by approximately 50 pf. Impedance for differential input is 20 megohms paralleled by approximately 50 pf.

Noise Level—Depending on the setting of the frequency response controls, the noise level, referred to the input, is 1 to 5 microvolts rms with the input terminals grounded.

Power Requirement—Powered through a standard octal plug: +135 v at 5 ma, −90 v at 4 ma, and 6.3 v at 0.9 amp. The Type 122 can be powered by the Type 125 Power Supply or by batteries. The battery cable furnished with the instrument is designed to be used with five 45-volt dry-cell batteries and one 6.3-volt storage battery. Batteries are not included with the Type 122.

Mechanical Specifications—Dimensions are 12¼" high by 4⅛" wide by 7⅛" deep. Net weight is 4¾ pounds. Shipping weigth is 9 pounds, approx.

TYPE 122 PREAMPLIFIER $135

Each instrument includes: 1—battery cable (012-0009-00), 1—output cable (012-0003-00), 1—input plug (131-0013-00), 2—instruction manual (070-0246-00).

Battery Cables

Extra long battery cables can be ordered to fit a particular arrangement.

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FRAME MOUNT Type FM122

The Type FM122 has a specially designed front panel and cabinet for use where mounting in a vertical position is required. It can be mounted in an existing support or adapted to mounting in a standard rack by a Tektronix Mounting Frame.

Electrical characteristics of the Type FM122 are the same as described for the Tektronix Type 122 Preamplifier.

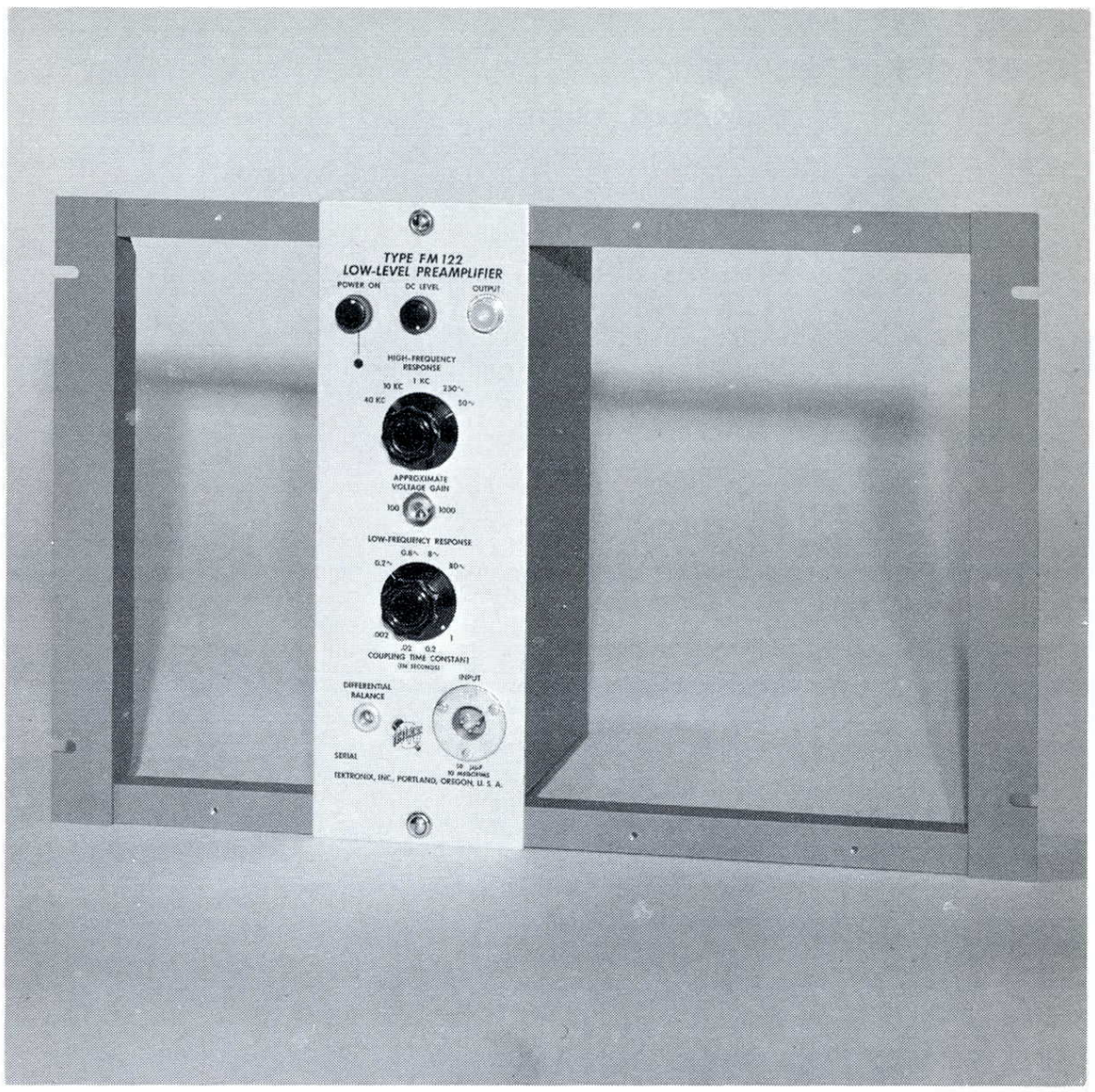
Mechanical Specifications—Dimensions are 12¼" high by 4⅛" wide by 7" deep. Net weight is 5½ pounds. Shipping weight is 9 pounds, approx.

TYPE FM122 (without Mounting Frame) $140

Each instrument includes: 1—battery cable (012-0009-00), 1—output cable (012-0003-00), 1—input plug (131-0013-00), 1—set mounting hardware, 2—instruction manual (070-0246-00).

Mounting Frame

Fits any standard 19-inch rack and is fastened to the front of the rack by four screws. Adapts Type FM122 Preamplifier to rack mounting. Capacity is four of any combination of Type FM122 Preamplifier, Type 360 Indicator, Type 160-Series Units, and Type FM125 Power Supply. (Note: Because the Type FM122 Preamplifier has high sensitivity, it is recommended that it be mounted at least 4 inches to the left of the Type FM125 Power Supply or other source of transformer hum field.) Part Number 014-0002-00 . . . . . $7



RACK MOUNT Type RM122

The Type RM122 is a mechanically rearranged Type 122 Preamplifier for horizontal mounting in a standard 19-inch rack. The instrument is fastened to the front of the rack by four screws. It requires only 5¼ inches of rack height.

Electrical characteristics of the Type RM122 are the same as described for the Tektronix Type 122 Preamplifier.

Mechanical Specifications—Dimensions are 5¼" high by 19" wide by 7" deep. Net weight is 6 pounds. Shipping weight is 14 pounds, approx.

TYPE RM122 . . . . . $140

Each instrument includes: 1—battery cable (012-0009-00), 1—output cable (012-0003-00), 1—input plug (131-0013-00), 1—set mounting hardware, 2—instruction manual (070-0246-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
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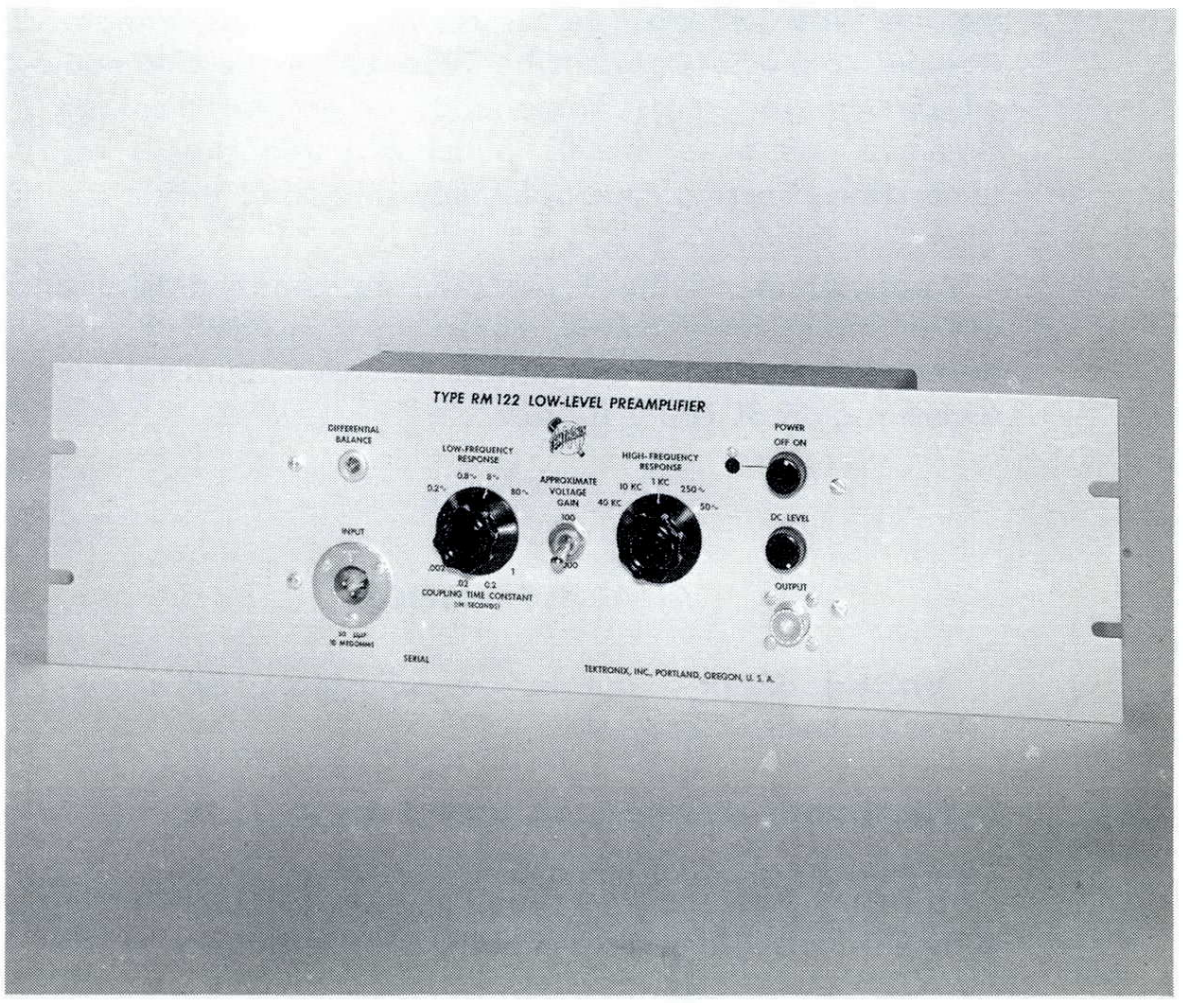


Type 123 PREAMPLIFIER

Compact

4 ¼ " high, 1 ½ " wide, 3 ⅞ " deep.

Weighs only 10 ounces.

Voltage Gain

Accurately set at 100.

Passband

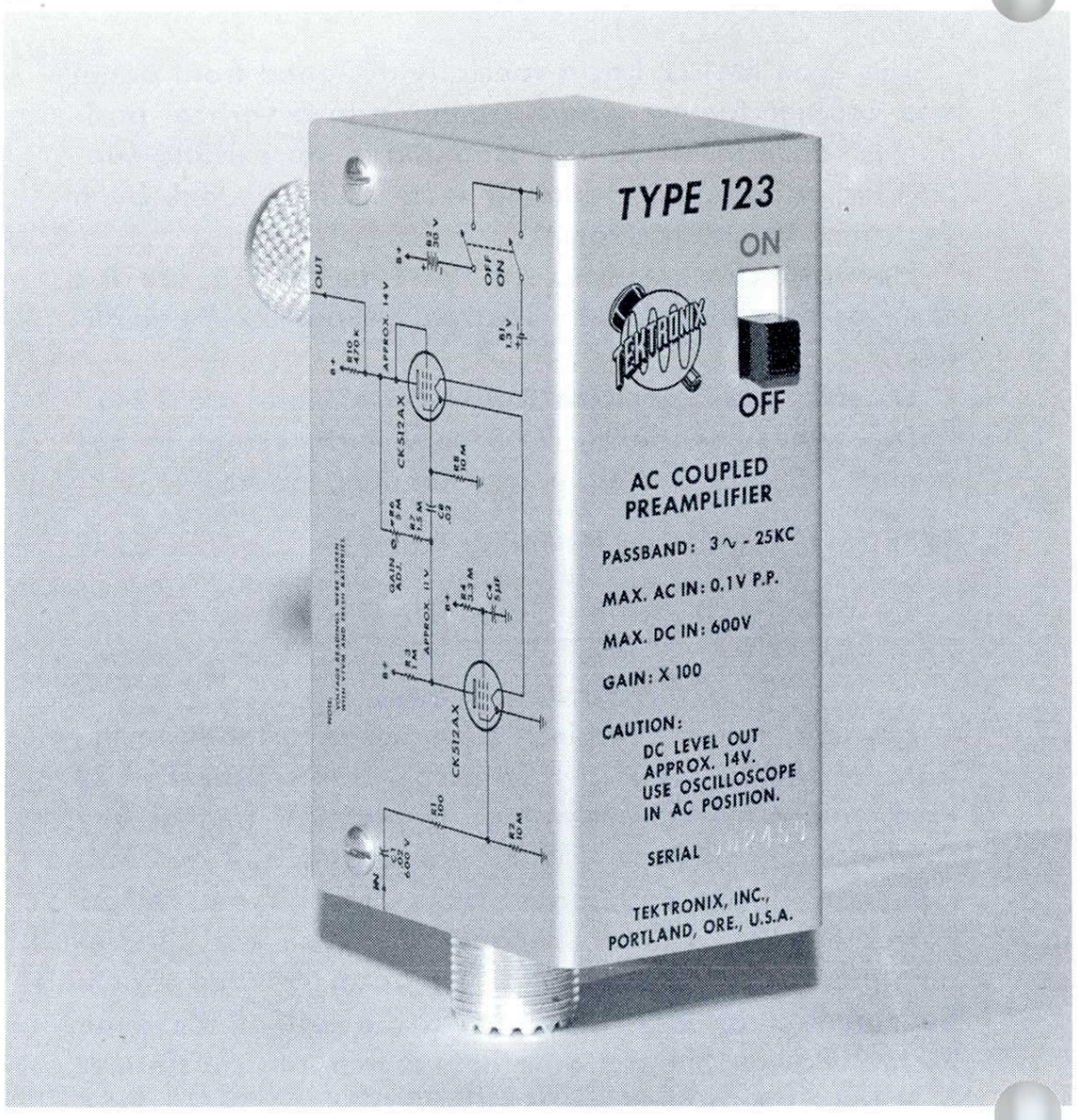
Within 3-db from 3 cps to 25 kc.

Maximum Input Signal

0.1 v peak-to-peak.

Hum-Free Low-Level Amplification

Powered by miniature batteries.



The Tektronix Type 123 Preamplifier is a compact, light-weight, battery-operated amplifier for use in applications where a gain of 100 without hum is desired. Passband is within 3-db from 3 cps to 25 kc. Where reduced high-frequency response is permissible, ground-loop hum pickup can be virtually eliminated by mounting the Type 123 close to the circuit under observation. Coaxial connectors permit the Type 123 to be connected directly to an oscilloscope or other instrument or even for use as a probe. Shock-mounted chassis reduces the effects of microphonics, shift, and drift.

Applications of the Type 123 are confined to the audio range; for example, observing hum levels, transducer preamplifier, and other low-level applications where a gain of 100 is desired.

CHARACTERISTICS

Voltage Gain—Gain is 100, adjustable with screwdriver calibration control.

Passband—Within 3-db from 3 cps to 25 kc.

Battery Powered—A small mercury cell supplies the filament voltage and a miniature 30 v battery is the source of plate voltage. Life of the mercury cell is approximately 100 hours. Plate-voltage battery life is about the same as shelf life, typically 1000 hours.

Noise Level—The maximum noise level, referred to the input, with the input grounded is less than 7.5 μv, rms; 50 μv, peak-to-peak.

Output Signal Level—DC level of output is approximately +15 v.

Maximum Input Signal—Maximum input signal for linear amplification is 0.1 v, peak-to-peak.

Input Impedance—10 megohms.

Effective Output Impedance—31 kilohms.

Power Requirement—One 1.345 v mercury cell and one 30 v miniature battery, included with the instrument.

Mechanical Specifications—Dimensions are 4 ¼ " high by 1 ½ " wide by 3 ⅞ " deep. Net weight is 10 ounces. Shipping weight is 2 pounds, approx.

TYPE 123 PREAMPLIFIER $75

Each instrument includes: 1—schematic

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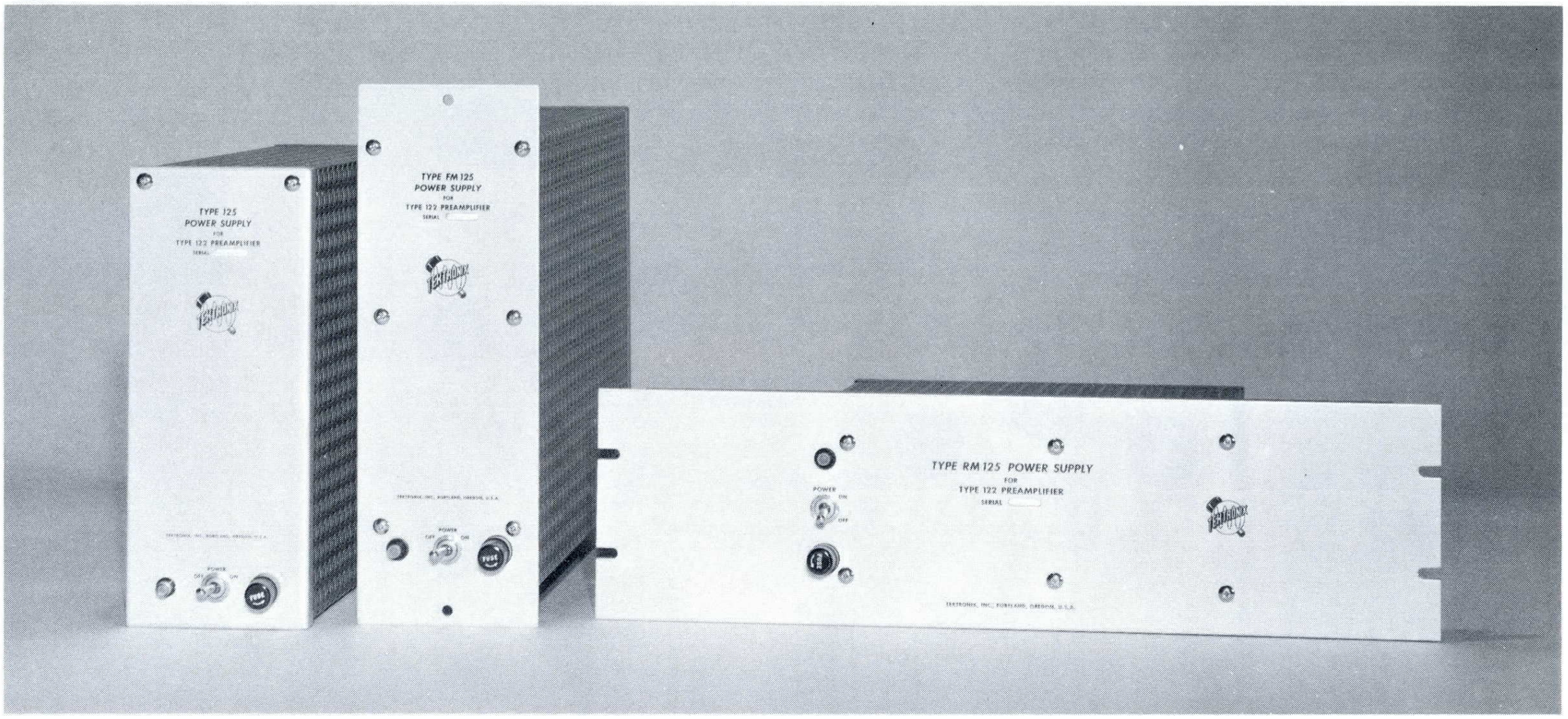
POWER SUPPLY Type 125 / FM125 / RM125



Electronic Voltage Regulation

Output Voltages

+135 v dc, 0 to 20 ma.

—90 v dc, 0 to 20 ma.

—6 v dc, 0.7 to 4 amp.

The Type 125 Power Supply provides power for one to four Type 122 Amplifiers.

Peak-to-peak ripple voltages are: +135 v supply, less than 3 mv; —90 v supply, less than 2 mv; —6 v supply, less than 5 mv. Voltage stability of the Type 125 is assured by use of regulated voltages applied to the tube heaters.

Power Requirement—105 v to 125 v, or 210 v to 250 v, 50 to 60 cps, 110 watts.

Mechanical Specifications—Dimensions are 14⅝" high by 4⅛" wide by 10⅜" deep. Net weight is 19 pounds. Shipping weight is 27 pounds, approx.

TYPE 125 POWER SUPPLY $285

Each instrument includes: 4—36" interconnecting cable (012-0065-00), 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 2—instruction manual (070-0246-00).

The Type FM125 has a specially designed front panel for use where vertical mounting in a standard rack is desired. It can be mounted in an existing support or adapted to mounting by a Tektronix mounting frame. Electrical characteristics are the same as the Type 125.

Mechanical Specifications—Dimensions are 12¼" high by 4⅛" wide by 13½" deep. Net weight is 19 pounds. Shipping weight is 27 pounds, approx.

TYPE FM125 . . . . . $290

Each instrument includes: 4—36" interconnecting cable (012-0065-00), 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 1—set mounting hardware, 2—instruction manual (070-0246-00).

Mounting Frame

Fits any standard 19-inch rack and is fastened to the front of the rack by four screws. Capacity is four of any combination of Type FM122 Preamplifier, Type FM125 Power Supply, Type 360 Indicator, and Type 160-Series Units. (Note: Because the Type FM122 Preamplifier has high sensitivity, it is recommended that it be mounted at least 4 inches to the left of the Type FM125 Power Supply.)

Order Part Number 014-0002-00 . . . . . $7

The Type RM125 is a mechanically rearranged Type 125 for horizontal mounting in a standard 19" rack. Electrical characteristics are the same as the Type 125.

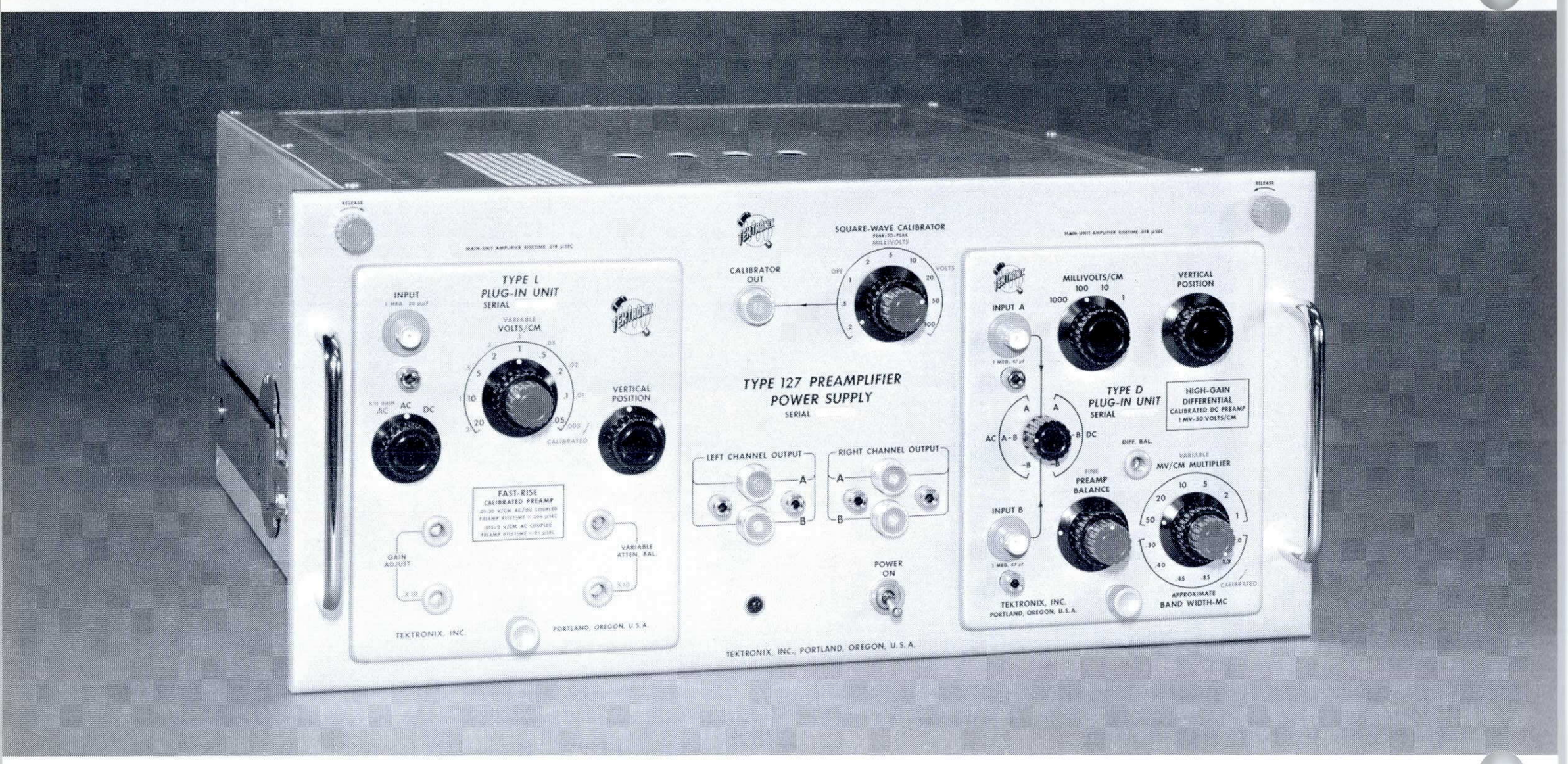
Mechanical Specifications—Dimensions are 5¼" high by 19" wide by 13½" deep. Net weight is 19 pounds. Shipping weight is 29 pounds, approx.

TYPE RM125 . . . . . $290

Each instrument includes: 4—36" interconnecting cable (012-0065-00), 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 1—set mounting hardware, 2—instruction manual (070-0246-00).

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 127 PREAMPLIFIER POWER SUPPLY



The Tektronix Type 127 Preamplifier Power Supply provides operating power to one or any combination of two Tektronix Letter Series or new '1' Series Plug-In Units. This permits the operation of Tektronix Plug-Ins separate from the oscilloscope in which they are normally used. For example, a double-differential dual-trace display can be obtained with a Type 127 and two Type D, E, or G Plug-In Units—when used in conjunction with an oscilloscope and Type C-A, 1A1, or 1A2 Plug-In Unit.

Also Triggering Signal Input Terminals are provided at the rear of the instrument to permit the introduction of triggering pulses into a Type C-A, 1A1, 1A2, or Type M Unit to utilize the alternate-sweep features of these multitrace units. The triggering pulses may be obtained from the + GATE OUT terminal of the associated oscilloscope.

The Type 127 also facilitates the use of Tektronix Plug-In Units in other applications.

CHARACTERISTICS

Balanced Output—The outputs of Plug-In Units powered by the Type 127 are fed through dc-coupled differential amplifier stages and cathode followers to provide a push-pull signal at the output terminals. Rise-time of the unit is 18 nsec, permitting maximum utilization of the response of Tektronix Type 530-Series Oscilloscopes. Push-pull output swing is linear ± 3% over a range of ± 0.3 volt into 170-ohm termination. Output dc operating levels are adjustable to ground potential.

Gain—The Type 127 has a gain of one, push-pull. With single-ended output, gain is one-half.

Output Terminals—Each channel has four output terminals, two on the front panel and two at the rear. Terminated 170-ohm output cables are furnished.

Electronic Regulation—All dc supply voltages to the Plug-In Units are electronically regulated to compensate for line voltage and load variations between 105 and 125 v or 210 and 250 v and for current-demand difference among the Plug-In Units. A current-sensitive relay switches in a compensating power load when only one preamplifier is plugged into the Type 127.

Amplitude Calibrator—A square-wave calibration voltage is available through a front-panel coaxial connector. Eighteen fixed voltages— 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100 millivolts, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 volts peak-to-peak are provided. Accuracy is within 3%. Square-wave frequency is approximately 1 kc.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, 450 watts maximum.

Mechanical Specifications—Dimensions are 8¾" high by 19" wide by 21⅝" deep. Net weight is 39½ pounds. Shipping weight is 69 pounds, approx.

TYPE 127 POWER SUPPLY (without plug-in units) $650

Each instrument includes: 4—170-Ω termination (011-0048-00), 4—170-Ω coaxial cable (012-0034-00), 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 1—pair mounting tracks (351-0085-00), 4—adapter, BNC to UHF (103-0032-00), 2—instruction manual (070-0284-00).

Supporting Cradles

For rear slide support when the instrument is to be mounted in a backless rack. Two cradles with necessary mounting hardware.

Order Part Number 040-0344-00 . . . . . $11.45

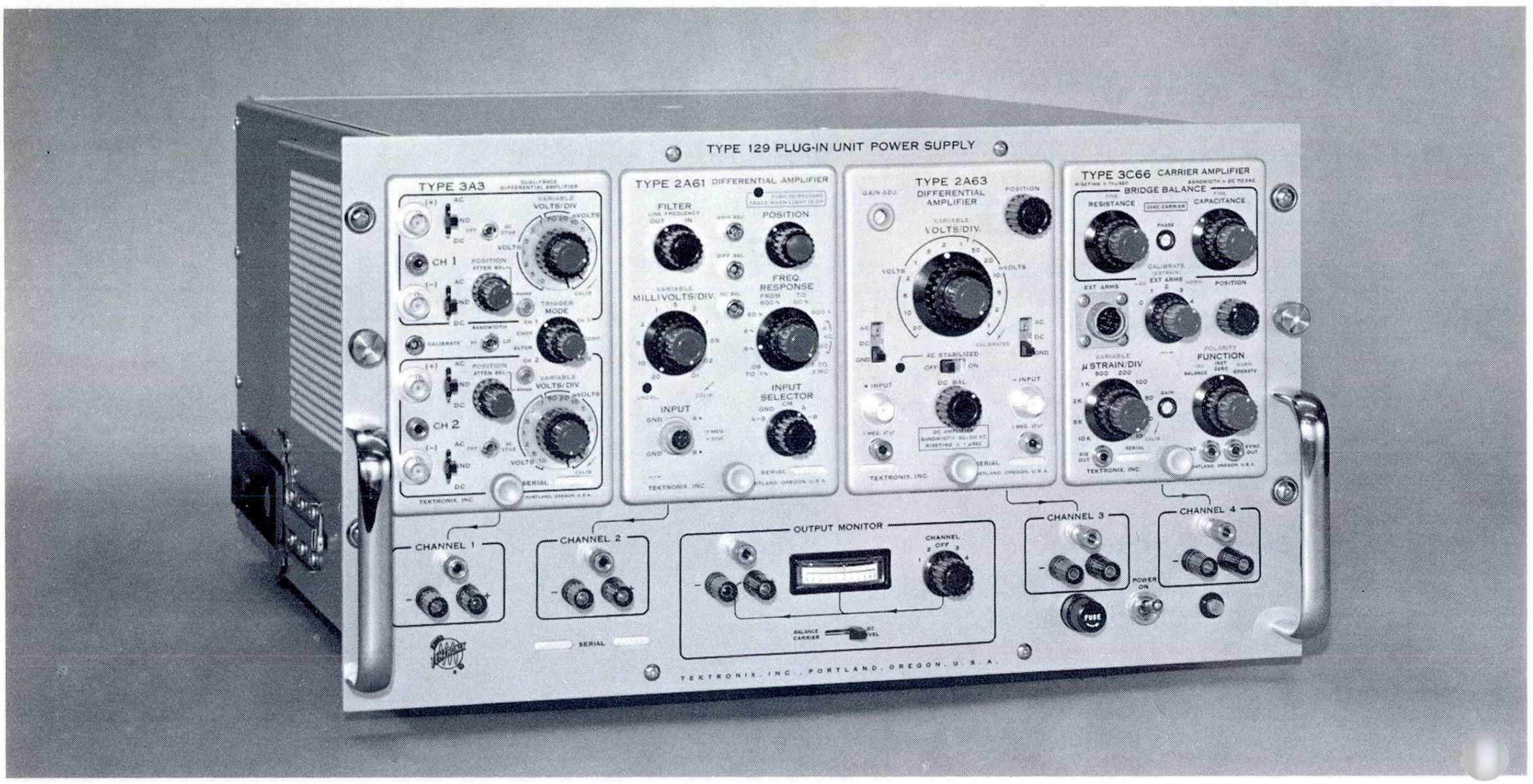
U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Output characteristics of the Type 127 in combination with Tektronix Plug-In Units, measured with the Type 127 output terminated in 170 ohms.

Plug-In Unit	Maximum Voltage Gain (push-pull output)	Frequency Response	Risetime
B	2 20	dc to 15 mc 2 cps to 11 mc	23 nsec 30 nsec
C-A	2	dc to 17 mc	20 nsec
D	100	dc to 300 kc at a gain of 100, increasing to 2 mc at a gain of 2	
E	2000	.06 cps to 20 kc at full gain, increasing to 60 kc at a gain of 200	
G	2	dc to 15 mc	23 nsec
H	20	dc to 12 mc	29 nsec
K	2	dc to 19 mc	18 nsec
L	2 20	dc to 19 mc 3 cps to 17 mc	18 nsec 20 nsec
M	5	dc to 15 mc	23 nsec
O	2	dc to 17 mc	20 nsec
Q	*	dc to 6 kc	60 μsec
W	2 100	dc to 16.5 mc dc to 7.5 mc	21 nsec 46 nsec
Z	2	dc to 11 mc	31 nsec
1A1	2 20 200	dc to 19 mc dc to 17 mc 2 cps to 11 mc	18 nsec 20 nsec 30 nsec
1A2	2	dc to 19 mc	18 nsec

* A 10 μstrain input produces a 100 mv output.

Type 129 PLUG-IN UNIT POWER SUPPLY



. . . a means for out-of-scope use of Tektronix 2 and 3-Series Plug-In Units

The Type 129 Plug-In Supply provides a new way to utilize the 2 and 3-Series Amplifier Plug-In Units in a wide variety of instrumentation systems. With this power supply the amplifiers are useful for driving recording equipment, X-Y plotters, oscilloscopes, or other external indicators having requirements within the plug-in unit specifications.

The Type 129 Plug-in Power Supply is recommended for use with the 2 and 3-Series single channel low-frequency amplifiers.

Multiple-trace plug-ins are usable in the Type 129, but operation should be limited to single-trace modes unless provision is made to operate the multiple-trace switching circuits at a relatively slow rate compatible with the output circuit bandpass.

The Type 129 powers up to four 2 and 3-Series plug-in units, singly or in combination. Each plug-in unit fits into a plug-in module having an output connector at the front and rear panels. A selectable cathode-follower or passive circuit card placed between the plug-in unit and the output connector controls the output characteristics. Each channel must use one of these cards in order to function properly with plug-in units except sampling and Type 3C66.*

With the cathode-follower plug-in circuit card installed, push-pull, low impedance signals (to approximatey 8 v peak-to-peak) are available via cathode followers at front and rear connectors. An automatic dc level-setting circuit keeps the average dc level of the two connectors close to 0 v. Passband of the cathode-follower output circuit is dc to approximately 1 Mc.

With the passive card installed, a high impedance push-pull signal is available at the front panel for balancing and a single-ended signal at low impedance (nominally 500 ohms) is available at the rear output connector. Passband of the passive divider output circuit is dc to approximately 100 kc and is dependent upon the plug-in used.

Each output can be switched to a meter for dc balance indication. This allows quick setting of the plug-in position control. In addition to the output monitor switch, a two-position switch has been included for balancing of the Type 3C66 Carrier Amplifier Plug-In Unit.

* Sampling plug-ins must be installed in pairs (one sampling sweep and one sampling vertical).

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TYPICAL APPLICATIONS FOR VOLTAGE AMPLIFICATION				
PLUG-IN TYPE	INDICATED SENSITIVITY	APPROXIMATE SYSTEM GAIN		
		With Passive Output Card*	With C.F. Output Card**	
			Single Ended	Push-Pull
2A60	50 mv/div	50	20	40
2A61	0.01 mv/div (AC)	2.5×10^5	10^5	2×10^5
2A63	1 mv/div (DC)	2.5×10^3	10^3	2×10^3
3A3	100 μv/div	2.5×10^4	10^4	2×10^4
3A75	50 mv/div	50	20	40
3C66	10 μstrain/div	0.25 v/μstrain	0.1 v/μstrain	0.2 v/μstrain

* Output single ended at rear connector
** Output at front or rear connector

In addition to supplying power for the plug-in compartments, the Type 129 provides regulated voltages at a rear-panel connector for powering accessories.

Two low-noise fans provide forced-air cooling for the power supply and plug-in compartments.

Electronically-regulated dc supplies insure stable operation with as much as —10% to +7% variation from design-center line voltage. The instrument is normally wired to operate at a design center of 117 volts, but a multi-tap transformer permits operation at design centers of 110, 117, 124, 220, 234, or 248 volts. Power consumption is typically 575 watts maximum under full load.

Dimensions are 10½" high by 19" wide by 23½" deep. Net weight is 46 pounds. Shipping weight is approximately 85 pounds.

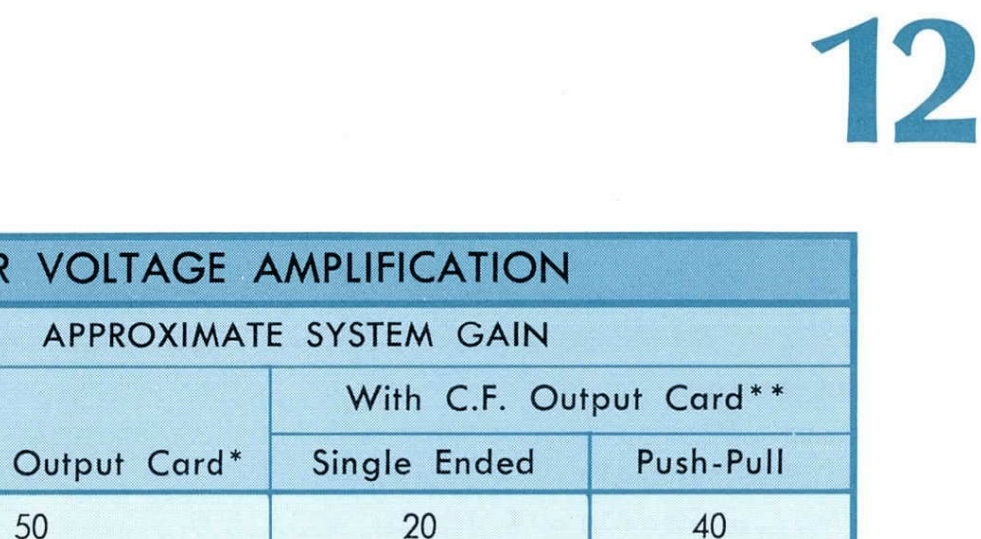
TYPE 129 RACK-MOUNT PLUG-IN UNIT POWER SUPPLY
(without circuit cards) $650

Each instrument includes: 1—right angle power cord (161-0022-00), 1—3 to 2-wire adapter (103-0013-00), 1—pair mounting tracks (351-0085-00), 2—instruction manual (070-0409-00).

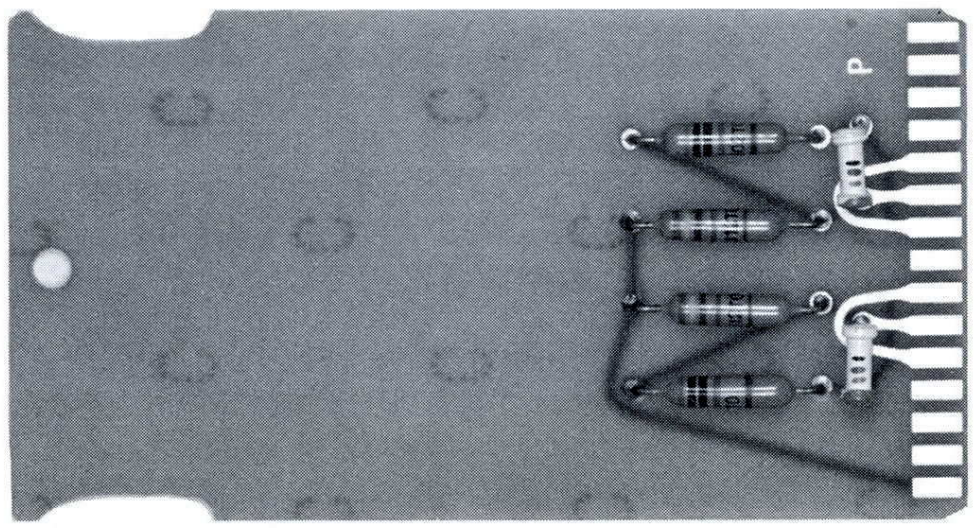
BLANK PLUG-IN CHASSIS

This chassis contains necessary unique mechanical parts for construction of a custom plug-in including frame, blank front panel, blank chassis, 24-pin connector, latch, and small hardware. Electrical components are not included.

BLANK PLUG-IN CHASSIS (Part No. 040-0245-00) $25



CATHODE-FOLLOWER CIRCUIT CARD
(Part No. 018-0001-00) $40



PASSIVE DIVIDER CIRCUIT CARD
(Part No. 018-0002-00) $10

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 130 DIRECT-READING L-C METER

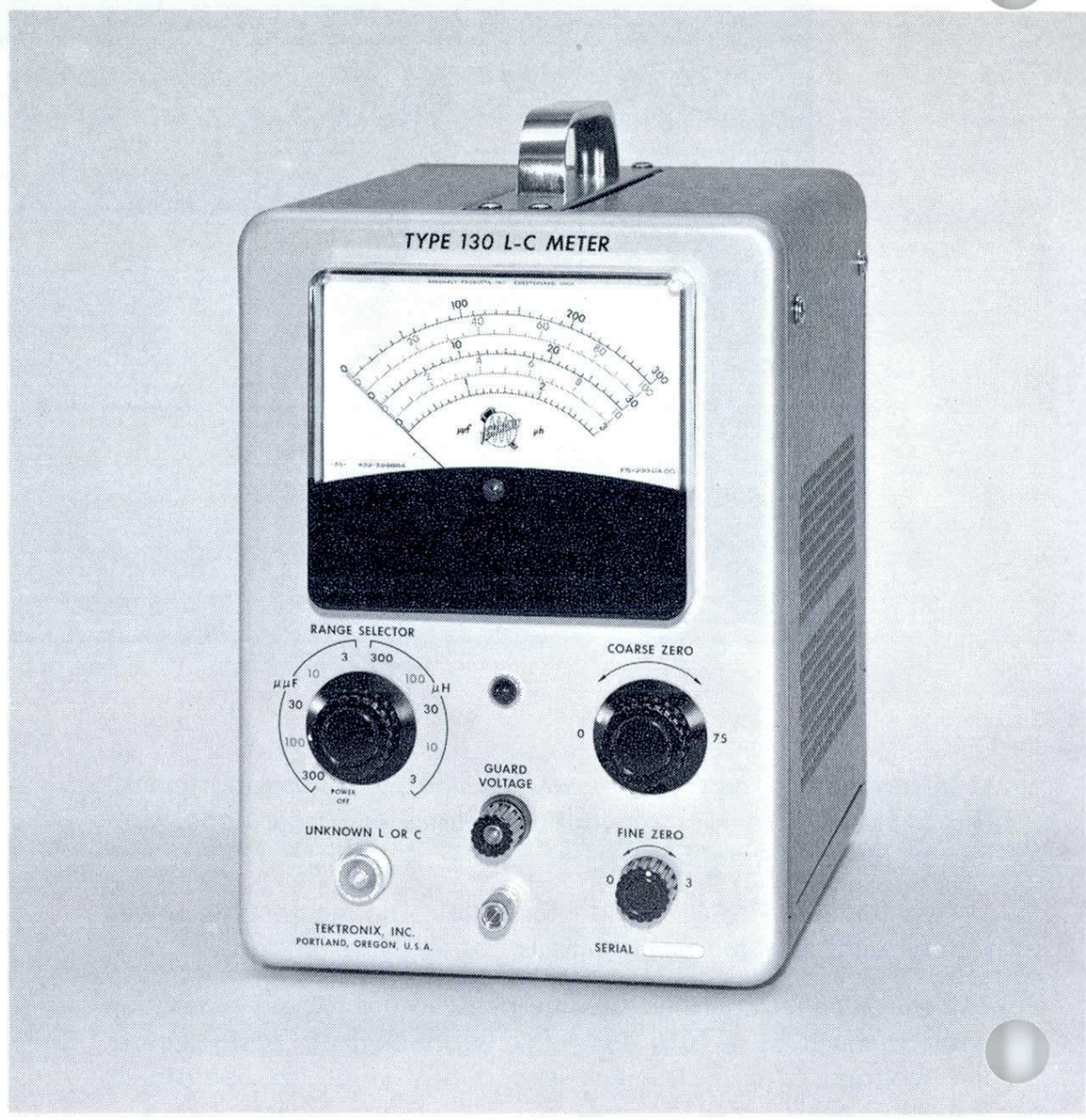
Five Ranges

Microhenries—0 to 3, 10, 30, 100, 300.
Picofarads—0 to 3, 10, 30, 100, 300.

Accuracy

Within 3% of full scale.

4 ½" Meter



Saves engineering time in circuit development work by providing quick inductance and capacitance readings even while circuit changes are being made. Aids in correct placement of critical components and leads.

Guard circuit produces a voltage of the same amplitude and phase as the voltage at the UNKNOWN terminals, but isolated from the frequency determining portions of the rest of the circuit. This permits separation of the capacitance to be measured from other capacitances and strays. Accurate measurements of direct inter-electrode capacitance in vacuum tubes can be made with ease.

The Type 130 can also be used for component testing, sorting, and color-code checking on a production basis.

The unknown value to be measured will determine the frequency of the variable oscillator in the Type 130. This frequency is beat against a 140-kc fixed oscillator. The difference frequency is shaped and counted, causing meter deflection proportional to the difference frequency. The direct-reading meter is calibrated in microhenries and picofarads.

Small actual and stray capacitances have very little effect on inductance measurements made with the Type 130. For instance, the meter reading will be affected less than 1% on inductance measurements where the actual and stray capacitances are as great as 50 pf.

Load Resistance Limits—The following loads will not appreciably alter the indication:

Capacitance, 0.1 megohm shunt.

Inductance, 20 k shunt, 10 ohms series.

A table included in the instruction manual provides corrections for greater loads.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, 40 watts.

Mechanical Specifications—Dimensions are 10⅝" high by 7" wide by 11⅛" deep. Net weight is 8¾ pounds. Shipping weight is 15 pounds, approx.

TYPE 130 DIRECT-READING L-C METER $225

Each instrument includes: 1—probe (010-0003-00), 1—black output lead (012-0014-00), 1—red output lead (012-0015-00), 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 2—instruction manual (070-0231-00).

Production Test Fixture

For use with the Type 130 L-C Meter. Speeds sorting and testing of capacitors and inductors.

Order Part Number 013-0001-00 . . . . . $5

Delta Standards

For calibration of the Type 130 L-C Meter. The unit provides accurately adjusted steps of capacitance and inductance, selected by a rotary selector switch. Values of the capacitance steps correspond to the full-scale adjustments required on the five scales of the Type 130. Two resistors of similar capacitance, values of 1 megohm and 0.1 megohm, are provided for the resistance compensation adjustment. A 300-μh standard permits proper adjustments of the inductance ranges.

Order Part Number 015-0001-00 . . . . . $40

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

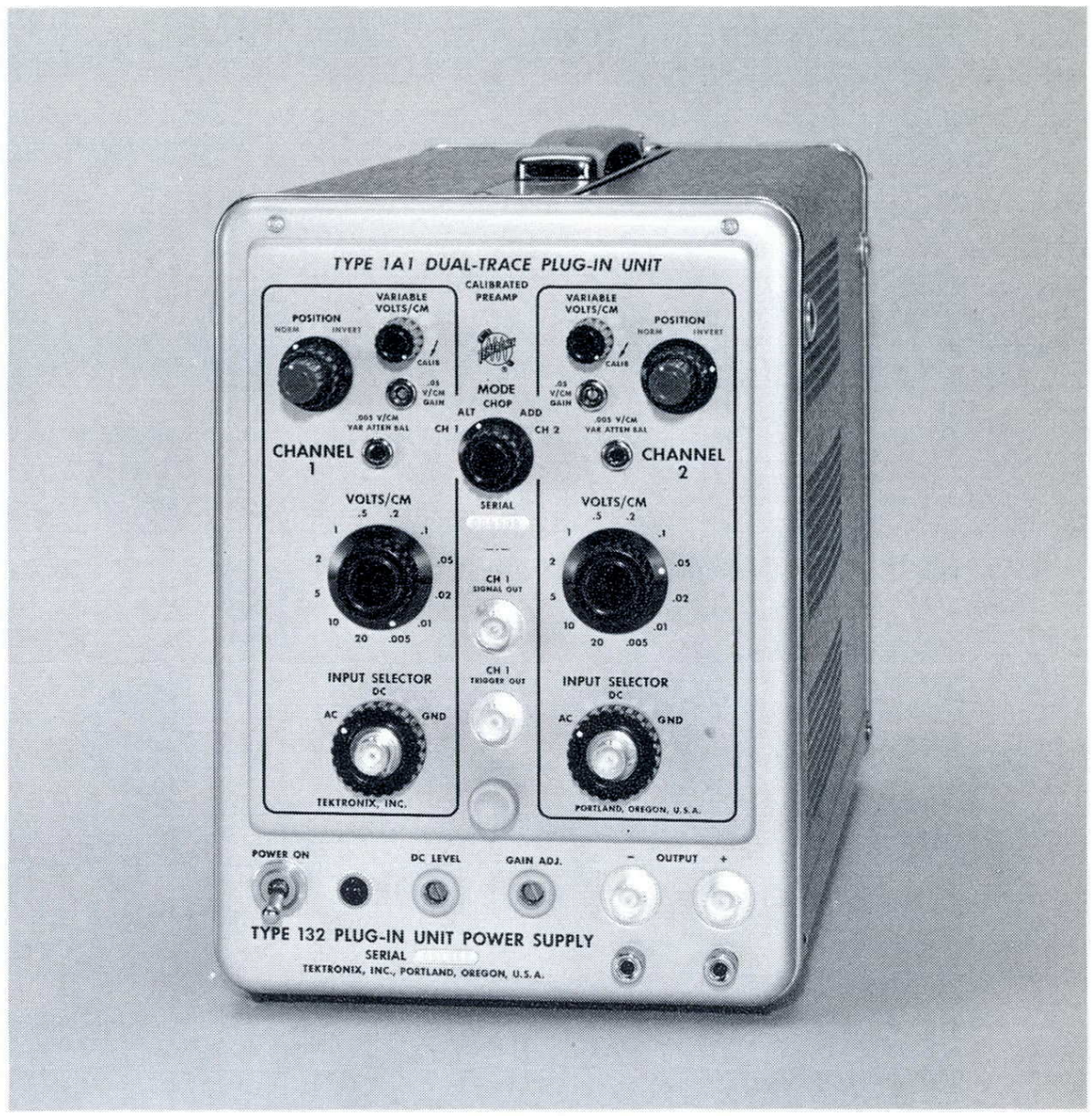
PLUG-IN UNIT POWER SUPPLY Type 132

The Type 132 provides an electronically regulated power supply and amplifier for any Tektronix Letter-Series or '1' Series Plug-In Unit.

Easily portable, it enables the many plug-ins to be used with or without an oscilloscope in a wide variety of applications.

The electronically regulated power supply provides correct operating voltages for both the internal amplifier and plug-in unit and assures stable operation.

Convenient front-panel terminals for either push-pull or single-ended output facilitate connections to associated equipment.



CHARACTERISTICS

Frequency Specifications are at 3-db down

Frequency Response and Risetime—DC to 15 mc, 23 nsec, when used with a Tektronix Type K or Type L Plug-In Unit and terminated with a 50-Ω load.

Gain—The push-pull gain is 10 when using a Tektronix Plug-In Unit at 50 mv/cm sensitivity, terminated with 93-Ω load. (approximately 5 into 50-Ω load).

Output Terminals—Push-Pull, or single-ended + or — outputs are available at front-panel terminals.

Output Voltage—High impedance load; ±50 volts at each connector and ±100 volts push-pull. Source impedance is approximately 5000 ohms with ±10 ma available (unterminated). With 93-ohm load, voltage swing is approximately ±1 volt.

Dual-Trace Operation—Convenient back-panel jacks and switching arrangements provide for use of the alternate and chopped modes of operation and blanking, with a Tektronix Type 1A1, 1A2, C-A or M Plug-In Unit.

Power Supply—Electronically regulated. Provides correct voltages for the amplifier and any Tektronix Letter-Series or '1' Series Plug-In Unit and assures stable operation.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, 320 watts.

Mechanical Specifications—Dimensions are 10¼" high by 7⅛" wide by 19⅛" deep. Net weight is 21½ pounds. Shipping weight is 36 pounds, approx.

TYPE 132 PLUG-IN UNIT POWER SUPPLY
(without plug-in units) $460

Each instrument includes: 2—93-Ω termination, BNC, (011-0056-00); 2—93-Ω cable, BNC, (012-0075-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 2—instruction manual (070-0288-00).

U.S. Sales Price f.o.b. Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

TYPE 132 TYPICAL PERFORMANCE WITH TEKTRONIX PLUG-IN UNITS

PLUG-IN TYPE	Equivalent noise referred to input (pk-pk)	Performance * With no termination		Performance * Terminated in 93 Ω		Performance * Double terminated 93 Ω	
		System ‡ Gain	Band Width	System ‡ Gain	Band Width	System ‡ Gain	Band Width
B	200 μvolt	5000 500	350 kc	100 10	10 mc 14 mc	50 5	10 mc 16 mc
C-A	200 μvolt	500	350 kc	10	14 mc	5	16 mc
D	100 μvolt	useful to 20,000	350 kc 200 kc	10 500	2 mc 300 kc	5 250	2 mc 300 kc
E	35 μvolt	useful to 10,000	†	10,000	†	5000	†
G	200 μvolt	500	350 kc	10	14 mc	5	16 mc
H	200 μvolt	5000	350 kc	100	11 mc	50	12 mc
K	200 μvolt	500	350 kc	10	14 mc	5	16 mc
L	200 μvolt	5000 500	350 kc	100 10	14 mc 14 mc	50 5	16 mc 16 mc
M	200 μvolt	500	350 kc	10	14 mc	5	16 mc
O	200 μvolt	500	350 kc	10	14 mc	5	16 mc
Q	**	Not Recommended		***	6 kc	****	6 kc
W	200 μvolt	Useful to 10,000 500	350 kc	500 10	7 mc 14.5 mc	250 5	7 mc 16 mc
Z	200 μvolt	500	350 kc	10	10 mc	5	10 mc
1A1	200 μvolt	useful to 10,000 5,000 500	2 cps to 350 kc 350 kc 350 kc	1000 100 10	2 cps to 10 mc 14 mc 14 mc	500 50 5	2 cps to 10 mc 16 mc 16 mc
1A2	200 μvolt	500	350 kc	10	14 mc	5	16 mc

* Performance measured with push-pull output of Type 132 connected into C-A unit in a Type 541A Oscilloscope.

** Typically 1.5 μstrain pk-to-pk at maximum sensitivity.

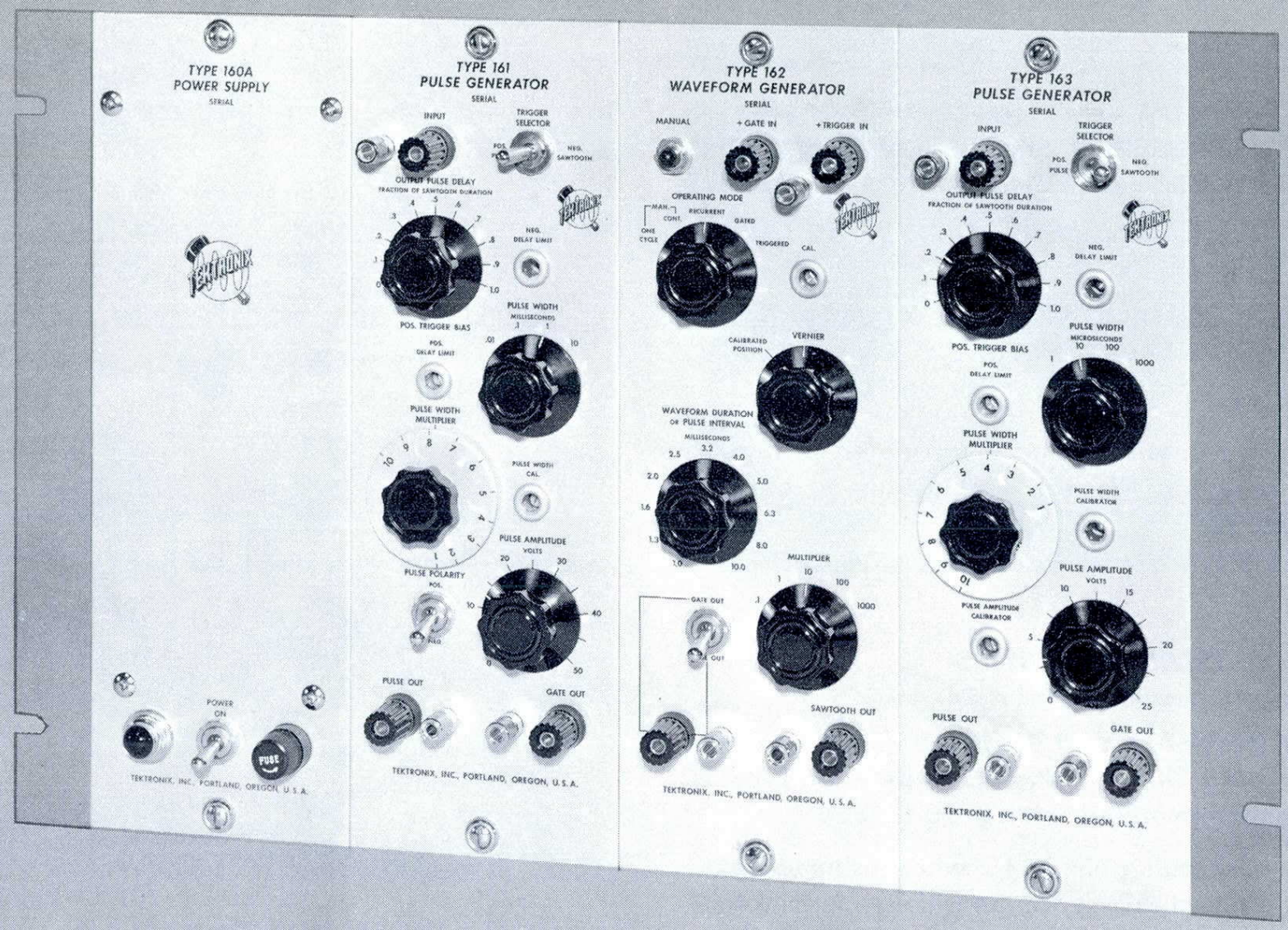
*** 10 μstrain produces 500 mv output.

**** 10 μstrain produces 250 mv output.

‡ System Gain = Overall gain from input of plug-in to the push-pull output cables. If only one output of Type 132 is used, this gain figure will be halved. When used with system gain of 500 or higher, dc drift in the input of the plug-in unit may become significant.

† See E Unit Specifications.

SEQUENCE CONTROL and MONITORING SYSTEM



Designed for complex measurement applications, the system consists of the Type 160-Series instruments and the Type 360 Indicator Unit. The Type 160-Series produces accurate timed pulses of adjustable amplitude, duration, and repetition rate. The series includes power-supply unit, pulse generator, waveform generator and fast-rise pulse generator. The Type 360 Indicator Unit provides bright displays of information generated by the Type 160-Series instruments.

Using several Type 160-Series instruments together produces many complex waveform patterns. The flexible system fits a wide variety of applications, including nerve stimulation in neurophysical experiments, timed gating devices for complex equipment, component testing for quality control, and data recording in the biophysical and geophysical fields, among others.

Rack-mounting the Sequence Control and Monitoring System offers compact convenience. The Type 360 Indicator Unit and the illustrated Type 160-Series instruments bolt quickly and easily to a Mounting Frame, which bolts to a standard nineteen-inch rack. As shown in the picture, the mounting frame securely holds four instruments.

TYPE 160A POWER SUPPLY	$190
TYPE 161 PULSE GENERATOR	$130
TYPE 162 WAVEFORM GENERATOR	$130
TYPE 163 FAST-RISE PULSE GENERATOR	$130
TYPE 360 INDICATOR UNIT	$270
MOUNTING FRAME	
Order Part Number 014-0002-00	$7

See appropriate pages for complete information on these instruments.

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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POWER SUPPLY Type 160A

Electronic Voltage Regulation

Output Connectors

Four sockets in parallel
Conveniently located at rear of chassis

Large Load Capacity

+300 v dc, unregulated.

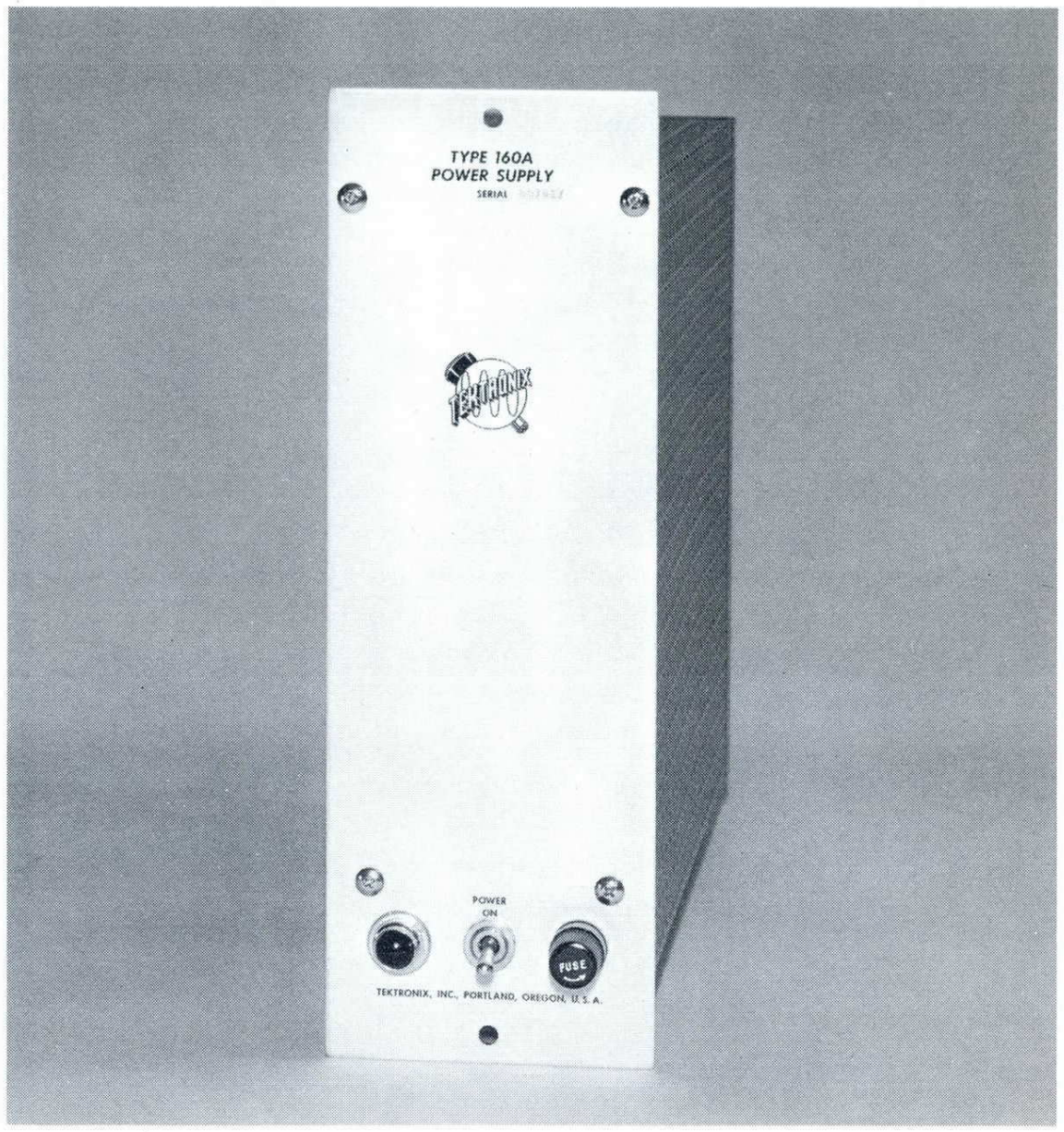
+225 v dc, regulated, at 225 ma.

+150 v dc, regulated, at 15 ma.

+80 v dc, unregulated.

—170 v dc, regulated, at 125 ma.

6.3 v ac, unregulated, at 20 amps.



The Type 160A Power Supply provides the required currents and voltages for one Type 360 Indicator Unit in combination with up to six Type 160-Series Generators. Power capability handles up to five Type 360 Indicator Units, up to five Type 163 Fast-Rise Pulse Generators, up to seven Type 162 Waveform Generators, or up to seven Type 161 Pulse Generators. Output terminals are four octal sockets on the back of the instrument.

Electronic regulation compensates for line-voltage variations between 105 and 125 v or 210 and 250 v, and for any current-demand differences between instruments.

MAXIMUM LOAD CONDITIONS

The maximum amount of current that can be drawn from the +300 v unregulated supply is limited by the amount of current drawn from the +225 v regulated supply and varies between 250 ma, in the absence of any current drawn from the +225 v supply, and zero when maximum current is drawn from the +225 v supply.

Output current of the +225 v supply is limited to 175 ma with no shunt across the series tube and increases to a maximum of 225 ma with a 1500-ohm shunt.

Power Requirement —105 v to 125 v or 210 v to 250 v, 50 to 60 cps, 350 watts maximum.

The Type 160A can be conveniently mounted with other Type 160-Series Instruments or the Type 360 Indicator Unit in a mounting frame that fits a standard 19" rack.

Dimensions are 12¼" high by 4⅛" wide by 14⅜" deep. Net weight is 20¼ pounds. Shipping weight is 28 pounds approx.

TYPE 160A POWER SUPPLY $190

Each instrument includes: 2—inter-unit power cable (012-0016-00), 1—3-conductor power cord (161-0010-00), 1—3 to 2-wire adapter (103-0013-00), 1—set mounting hardware, 1—instruction manual (070-0220-00).

Mounting Frame

A Mounting Frame conveniently adapts the Type 160A for rack mounting. The frame accepts up to 4 Type 160-Series Instruments or up to 3 Type 160-Series Instruments and a Type 360 Indicator Unit. The frame fits a standard 19" rack. Rack height required is 12¼".

Order Part Number 014-0002-00 . . . . . $7

Blank Panel for above, occupies same panel area as Type 160-Series Generator or Type 360 Indicator Unit.

Order Part Number 333-0157-00 . . . . . $2.50

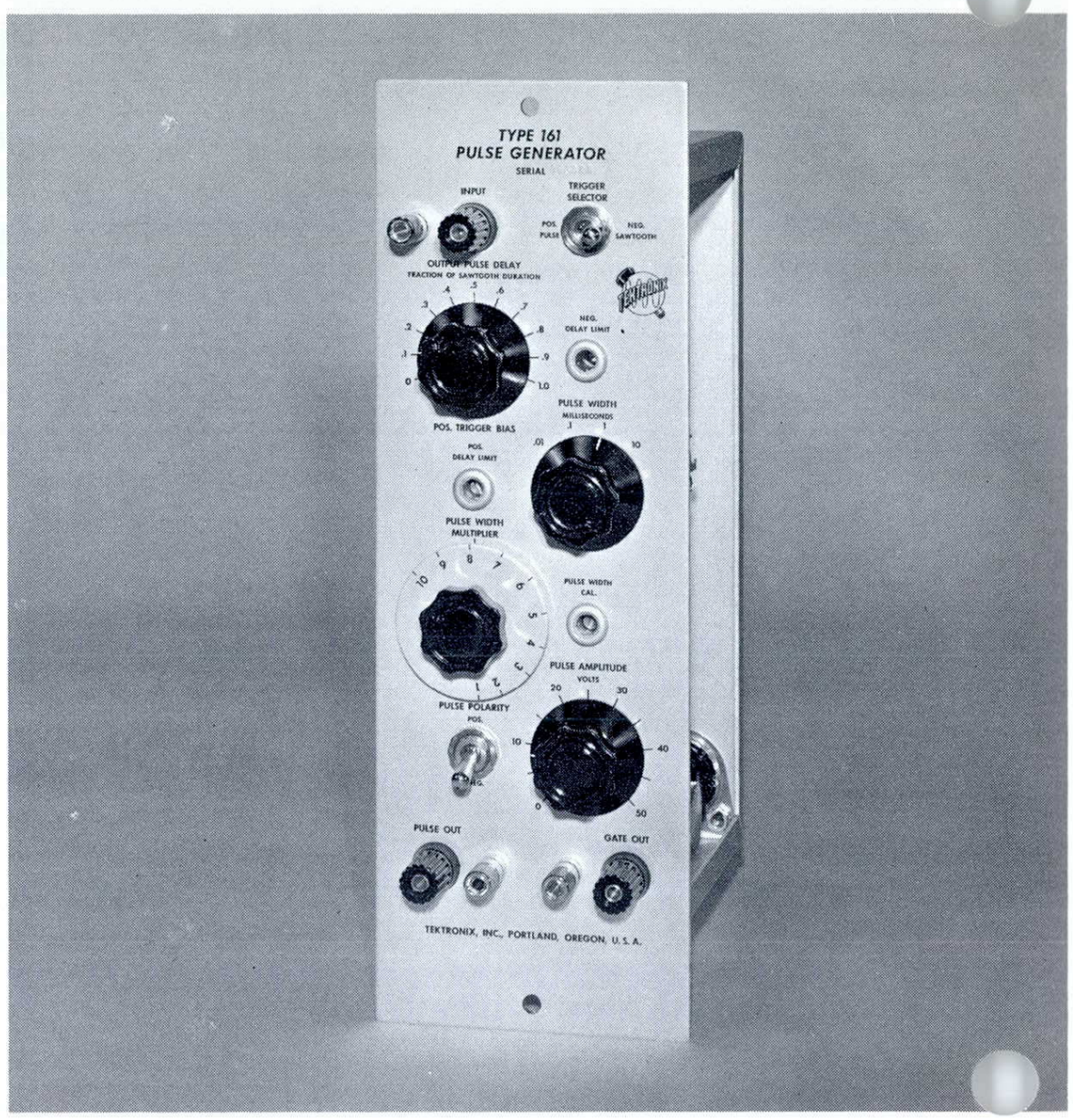
U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 161 PULSE GENERATOR

The Tektronix Type 161 Pulse Generator is designed to supply calibrated rectangular output pulses from zero to 50 v in amplitude and 10 μsec to 100 msec in duration when an external trigger of required voltage is received. An excellent trigger source is the Type 162 Waveform Generator. The 50-v Gate Output has the same duration and timing as the pulse, but is of fixed amplitude.

When triggered by a negative-going sawtooth, the output pulse and gate can be adjusted to occur at any designated point along the sawtooth. A calibrated control indicates output delay as a fraction of the triggering sawtooth duration. Other calibrated controls indicate pulse and gate width (in milliseconds) and pulse amplitude (in volts). When triggered by a positive pulse, the same output waveforms are available. In this instance the delay control functions as a triggering-level selector.

Voltages necessary to operate the Type 161 can be obtained from the Type 160A Power Supply, which can power up to seven Type 161 Generators.



Output Waveforms

Variable-amplitude positive or negative pulse.
Fixed-amplitude positive gate.

Output Characteristics

Risetime—Positive pulse; within 0.5 μsec when load capacitance is 10 pf or less, within 0.75 μsec for 100 pf or less load capacitance. Negative pulse; within 0.5 μsec when load capacitance is 10 pf or less, within 1.5 μsec for 100 pf or less load capacitance. Overshoot less than 5%.

Duration—calibrated, variable, 10 μsec to 0.1 sec.

Delay—continuously variable, 0 to 100% of triggering sawtooth waveform.

Amplitude Peak-to-Peak

Pulse—calibrated, continuously variable, 0 to 50 v.

Gate—fixed, 50 v positive, pk-to-pk minimum.

Output Impedance

Positive pulse—1.8 kilohms maximum.
Negative pulse—5 kilohms approximately.
Positive gate—1 kilohm maximum.

Trigger Requirements

Positive pulse, 3 v pk-to-pk minimum. Negative-going sawtooth; must include dc bias sufficient to keep voltage positive. Maximum repetition rate, 50 kc.

Power Requirements

—170 v dc at 17 ma, +225 v dc at 22 ma, 6.3 v ac at 1.65 amps.

The Type 161 can be conveniently mounted with other Type 160-Series Instruments or the Type 360 Indicator Unit in a Mounting Frame that fits a standard 19" rack.

Dimensions are 12¼" high by 4⅛" wide by 6⅜" deep.

Net weight is 3½ pounds. Shipping weight is 8 pounds, approx.

TYPE 161 PULSE GENERATOR $130
Each instrument includes: 1—inter-unit power cable (012-0017-00), 1—set mounting hardware, 1—instruction manual (070-0220-00).

Mounting Frame

A Mounting Frame conveniently adapts the Type 161 for rack mounting. The frame accepts up to 4 Type 160-Series Instruments or up to 3 Type 160-Series Instruments and a Type 360 Indicator Unit. The Frame fits a standard 19" rack. Rack height required is 12¼".

Order Part Number 014-0002-00 . . . . . $7

Blank Panel for above, occupies same panel area as Type 160-Series Generator or Type 360 Indicator Unit.

Order Part Number 333-0157-00 . . . . . $2.50

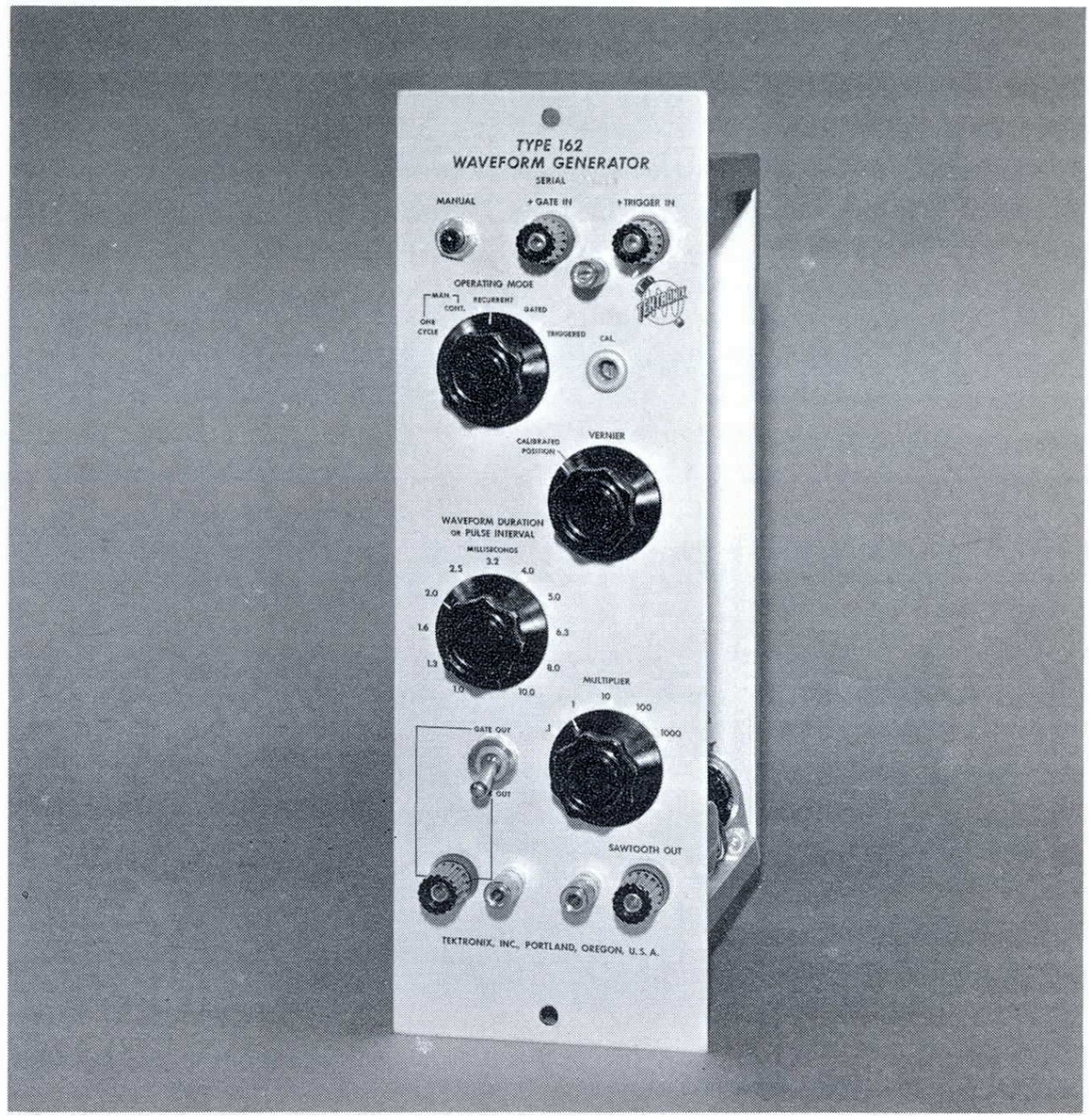
U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

WAVEFORM GENERATOR Type 162

The Type 162 Waveform Generator produces three types of calibrated output waveforms. Both the duration and repetition rate of the output waveforms—pulse, gate, and sawtooth— are adjustable. Triggering can occur from an external electrical impulse or by front-panel push button. The unit is designed to operate as a delay generator in conjunction with one of these instruments, and to supply a sweep voltage for the Type 360 Indicator Unit. It is useful for initiating chains of events electrically, for controlling their duration and repetition rate, and for generating waveforms recurrently. As such it is a stable repetition rate generator.

Amplitude of the pulse and gate waveforms is 50 volts, with minimum risetime of 1 μsec. Amplitude of the sawtooth waveform decreases linearly from +150 volts to +20 volts. A calibrated control indicates waveform duration. Shortest pulse duration is approximately 10 μsec.

Voltages necessary to operate the Type 162 can be obtained from the Type 160A Power Supply, which can power up to seven Type 162 Generators.



Output Waveforms

Positive pulse, positive gate, and negative-going positive sawtooth.

Output Characteristics

Risetime—1-μsec minimum.

Duration—pulse, 10 μsec to 0.05 sec, gate and sawtooth, 100 μsec to 10 sec.

Repetition Rate—0.1 cps to 10 kc, recurrent operation.

Amplitude

Pulse and gate—fixed, positive, 50 v pk-to-pk minimum.

Sawtooth—decreases linearly with time from +150 volts to +20 volts, ±4%.

Cathode-Follower Outputs

Output Impedance

1000 ohms approximately for all outputs.

Trigger Requirements

Positive pulse—15 volts.

Positive gate—8 volts.

Sine wave—6 volts rms, frequency from 5 cps to 50 kc. At frequencies below 5 cps, the product of rms voltage times frequency must exceed 10.

Power Requirements

—170 v dc at 7 ma. +150 v dc at 1 ma.

+225 v dc at 28 ma. 6.3 v ac at 1.7 amps.

The Type 162 can be mounted conveniently with other Type 160-Series Instruments or the Type 360 Indicator Unit in a Mounting Frame that fits a standard 19" rack.

Dimensions are 12¼" high by 4⅛" wide by 6⅜" deep. Net weight is 3½ pounds. Shipping weight is 8 pounds, approx.

TYPE 162 WAVEFORM GENERATOR $130

Each instrument includes: 1—inter-unit power cable (012-0017-00), 1—set mounting hardware, 1—instruction manual (070-0220-00).

Mounting Frame

A Mounting Frame conveniently adapts the Type 162 for rack mounting. The frame accepts up to 4 Type 160-Series Instruments or up to 3 Type 160-Series Instruments and a Type 360 Indicator Unit. The Frame fits a standard 19" rack. Rack height required is 12¼".

Order Part Number 014-0002-00 ..... $7

Blank Panel for above, occupies same panel area as Type 160-Series Generator or Type 360 Indicator Unit.

Order Part Number 333-0157-00 ..... $2.50

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

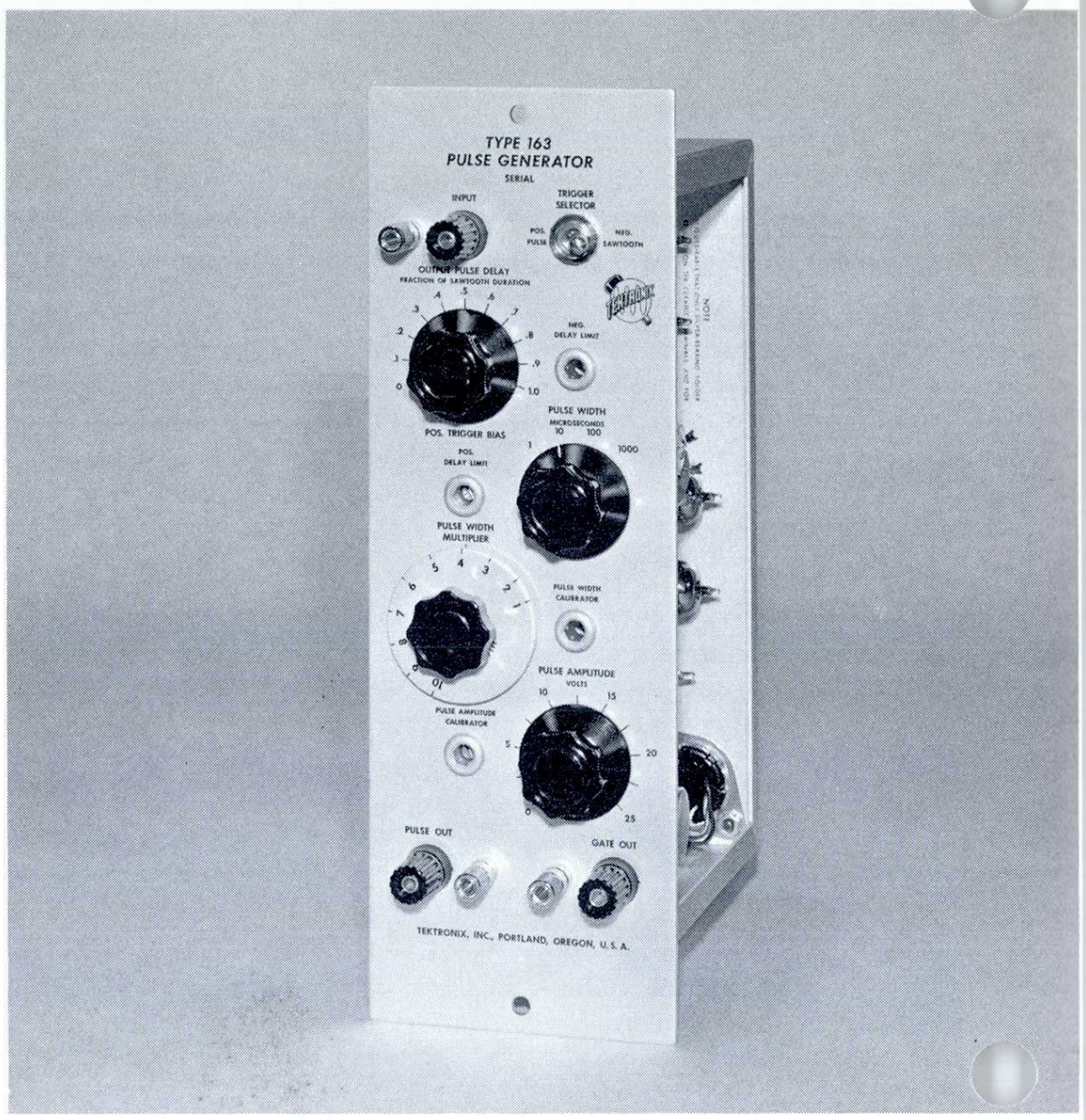
Type 163 PULSE GENERATOR

The Tektronix Type 163 Fast-Rise Pulse Generator is designed to supply rectangular output pulses from 0 to 25 v in amplitude and 1 μsec to 10 msec in duration when an external trigger of required voltage is received. An excellent trigger source is the Type 162 Waveform Generator. The 25 v Gate Output has the same characteristics as the pulse, but is of fixed amplitude.

When triggered by a negative-going sawtooth, the output pulse and gate can occur at any designated point along the sawtooth. A calibrated control indicates output delay as a fraction of the triggering sawtooth duration. Other calibrated controls indicate pulse and gate width (in microseconds) and pulse amplitude (in volts).

The Type 163 operates up to 50% duty cycle at the minimum time setting on any range. With higher multiplier-control settings, the duty cycle is correspondingly higher. Maximum repetition rate is 500 kc—with a generated pulse of 1 μsec duration.

Voltages necessary to operate the Type 163 can be obtained from the Type 160A Power Supply, which can power up to five Type 163 Generators.



Output Waveform

Variable-amplitude positive pulse.
Fixed-amplitude positive gate.

Output Characteristics

Risetime—Within 0.2 μsec when load capacitance is 10 pf or less, within 0.25 μsec for 100 pf or less load capacitance. Overshoot can be adjusted to zero.

Duration—calibrated, variable, 1 μsec to 10,000 μsec.

Delay—continuously variable, 0 to 100% of triggering sawtooth duration.

Decay Time—0.2 to 0.5 μsec.

Amplitude Peak-to-Peak

Pulse—calibrated, continuously variable, 0 to 25 v.
Gate—fixed, positive, 25 v pk-to-pk minimum.

Cathode-Follower Outputs

Output Impedance

Pulse—500 ohms (varies with pulse-amplitude control setting).
Gate—100 ohms.
Minimum load resistance—3.5 kilohms.

Trigger Requirements

Positive pulse, 2 v peak-to-peak minimum.
Negative-going sawtooth; must include dc bias sufficient to keep voltage positive. Maximum repetition rate, 500 KC.

Power Requirements

—170 v dc at 26 ma. +225 v dc at 45 ma.
6.3 v ac at 3.6 amp.

The Type 163 can be conveniently mounted with other Type 160-Series Instruments or the Type 360 Indicator Unit in a Mounting Frame that fits a standard 19" rack.

Dimensions are 12½" high by 4⅛" wide by 6⅜" deep.

Net weight is 3½ pounds. Shipping weight is 8 pounds, approx.

TYPE 163 PULSE GENERATOR $130

Each instrument includes: 1—inter-unit power cable (012-0017-00), 1—set mounting hardware, 1—instruction manual (070-0220-00).

Mounting Frame

A Mounting Frame conveniently adapts the Type 163 for rack mounting. The frame accepts up to 4 Type 160-Series Instruments or up to 3 Type 160-Series Instruments and a Type 360 Indicator Unit. The frame fits a standard 19" rack. Rack height required is 12¼".
Order Part Number 014-0002-00 . . . . . $7

Blank Panel for above, occupies same panel area as Type 160-Series Generator or Type 360 Indicator Unit.
Order Part Number 333-0157-00 . . . . . $2.50

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

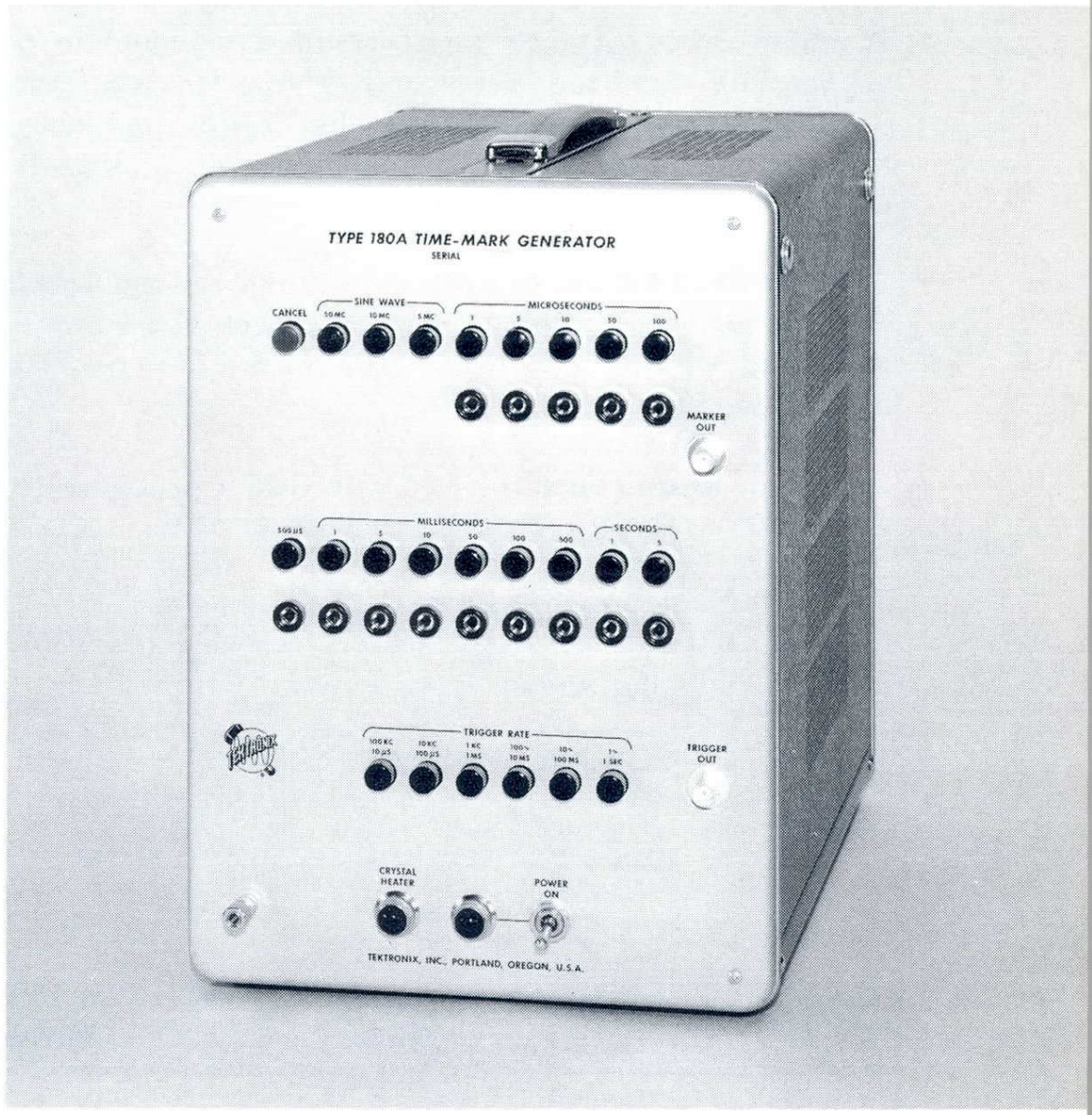
TIME-MARK GENERATOR Type 180A

14 Time-Mark Intervals
Two per decade from 1 μsec to 5 sec, available separately or in combinations as a timing comb.

Three Sine-Wave Frequencies
5 mc, 10 mc, and 50 mc.

Six Trigger-Rate Frequencies
1, 10, 100 cycles, 1, 10, 100 kc.

Accuracy Within 0.001%
Stability of 3 parts per million over a 24-hour period.



The Type 180A Time-Mark Generator is a high-quality source of time markers, sine waves and trigger impulses. Fourteen time markers, 3 sine-wave frequencies and 6 trigger-rate frequencies provide instrument versatility for a large number of applications in the laboratory or on the production line. With its frequency accuracy of .001% and stability of 3 ppm, the Type 180A is an ideal calibrating source for oscilloscope sweeps, oscillators, and counters. It can also be used as a time-measuring instrument and as a trigger-rate generator. Markers can be presented separately or mixed into a timing-comb combination.

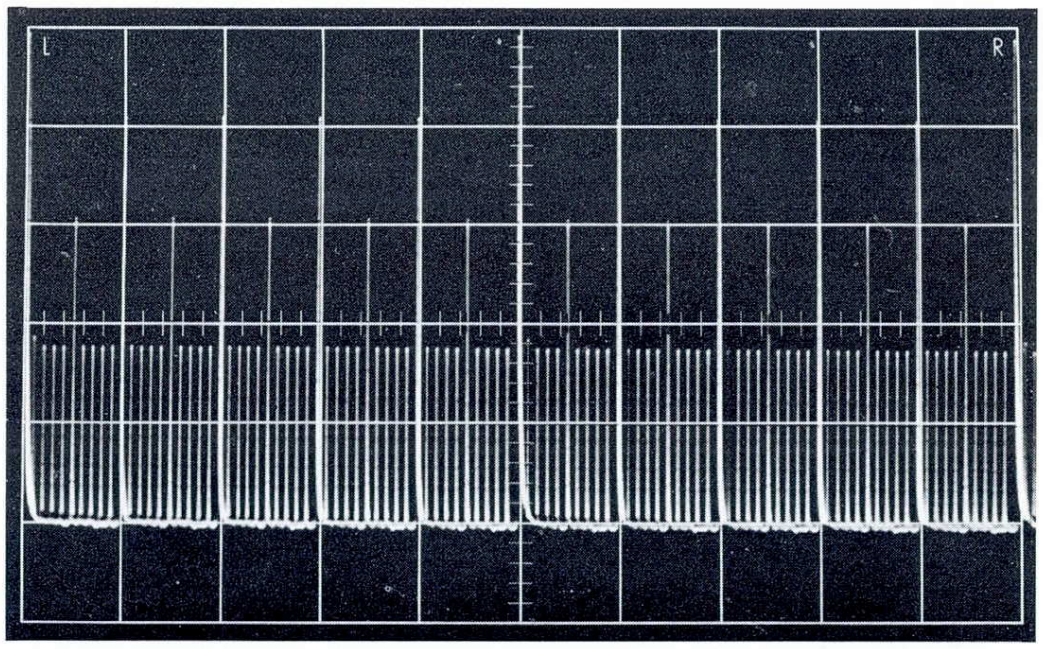
CHARACTERISTICS

Time Markers—Time markers occur at intervals of 1, 5, 10, 50, 100, 500 μsec, 1, 5, 10, 50, 100, 500 millisec, 1 sec and 5 sec. Markers are available separately and simultaneously through banana jacks, or mixed into a timing combination through a push-button arrangement and available at a coaxial connector.

Sine Waves—Push-button switches connect the sine-wave frequencies of 5 mc, 10 mc or 50 mc to the output connector. Output is 3 volts minimum across 50 ohms.

Trigger-Rate Generator—Trigger-rate frequencies of 1, 10, 100 cycles, 1, 10, and 100 kc are derived from the dividing multivibrators. Output is through a front-panel coaxial connector.

Timing comb formed by a combination of 100, 500 μsec, 1, and 5 msec markers. Sweep time/cm, 1 msec.



180A

Stability—All outputs are derived from a 1-mc crystal-controlled oscillator with a frequency tolerance of about 0.001%. The 1-mc crystal is mounted in a temperature-stabilized oven and a trimmer capacitor provides a means of adjusting the crystal frequency to zero beat with W.W.V. Stability is within 3 parts per million over a 24-hour period.

Regulated Power Supply—Electronically-regulated dc supplies insure stable operation over line-voltage and load variations between 105 and 125 v or 210 and 250 v, 50-60 cycles.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 240 watts at 117 v.

Mechanical Specifications—Dimensions are 13¾" high by 10" wide by 16⅝" deep. Net weight is 30¼ pounds. Shipping weight is 42 pounds, approx.

TYPE 180A TIME-MARK GENERATOR $625

Each instrument includes: 2—93-Ω output cable, BNC, (012-0075-00); 1—clip-lead adapter, BNC, (013-0076-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 2—instruction manual (070-0074-00).

FREQUENCY DOUBLER

This accessory is useful for timing the sweep on Type 580-Series Oscilloscopes. It doubles the 50-Mc output of the Type 180A to 100 Mc.

Order Part Number 015-0056-00 (BNC connector) . . $29.50

Order Part Number 015-0013-00 (UHF connector) . . $29.50

RACK MOUNT ADAPTER

A cradle mount to adapt the Type 180A Time-Mark Generator for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Tektronix blue vinyl finish. Rack height requirements 15¾".

Order Part Number 040-0277-00 . . . . . $45

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Nominal Voltage, Impedance and Risetime Values

	Marker Out Terminal			Jacks	
	Open Circuit Voltage	**Impedance for Half-Voltage**	**Risetime ***	**Open Circuit Voltage**	**Impedance for Half-Voltage**
Markers	3 volt minimum	390 Ω or less	0.07 μsec at 1 μsec to 1.7 μsec at 5 seconds	25 v minimum Using a P6006 probe	390 Ω at 1 μsec to 900 Ω at 5 seconds
Trigger Pulses	6 volt minimum	56 Ω or less	0.08 μsec at 100 kc to 0.30 μsec at 1 cps		
Sine Waves	3 volt minimum across 50-ohms				

* With MARKER OUT and TRIGGER OUT terminated in 93 Ω

SINE-WAVE GENERATOR Type 190B

Output Frequency

Continuously variable from 350 kc to 50 mc in 6 ranges. Additional setting at 50 kc, variable over a narrow band. Indication accurate within 2%.

Output Amplitude

Continuously variable from 40 millivolts to 10 volts peak-to-peak in 7 ranges. Amplitude indication accurate within 10% of full scale.

Harmonic Content

The harmonic content is typically less than 5%.

The Tektronix Type 190B supplies a constant-amplitude sine-wave signal over the frequency range of 350 kc to 50 mc. In addition, it supplies a 50-kc sine-wave output for reference purposes. Principal application of this instrument is the measurement of high-frequency response and other characteristics of wide-band amplifiers, attenuators, and delay networks.

Amplitude Variation

When the load-shunt capacitance does not exceed 10 pf, in the 10 v range, or 50 pf in the 5 v or lower ranges, the output amplitude varies less than ±2% from 50 kc to 30 mc; less than ±5% from 30 mc to 50 mc. The signal voltage at the attenuator-head input is automatically held constant at the value you select by means of the Output Amplitude control. Therefore, you don't have to readjust the Output Amplitude control when you change the generator frequency. Peak-to-peak level of the output signal at the input to the attenuator is indicated on the amplitude meter. The meter indicates actual output amplitude accurately within ±10% for load impedances $\geq$ 5 k. For lower values of load impedances, the attenuator output impedance must be considered. The output source impedance of the attenuator head varies with attenuator setting approximately as follows:

Output impedance

Nominal, 25 ohms. Actual values:

Attenuator setting volts, peak-to-peak	Output impedance in ohms, approx.
10	0
5 to 0.1	25

Regulated Power Supply

Electronic regulation compensates for line-voltage and load variations between 105 and 125 v or 210 and 250 v.

Power Requirement

105 v to 125 v or 210 v to 250 v, 50 to 800 cps, typically 100 watts.

Mechanical Specifications

Dimensions are 13¾" high by 9⅞" wide by 12" deep. Net weight is 23½ pounds. Shipping weight is 35 pounds, approx.

TYPE 190B SINE-WAVE GENERATOR $330

Each instrument includes: 1—attenuator unit with UHF connector (011-0054-00), 1—3 to 2-wire adapter (103-0013-00), 1—3-conductor power cord (161-0010-00), 1—instruction manual (070-0257-00).

TYPE 190B MOD 21

To order a Type 190B with a locking BNC-type connector mounted on the attenuator unit, please specify Mod 21.

TYPE 190B MOD 21 SINE-WAVE GENERATOR . . . $335

Each instrument includes: 1—attenuator unit with locking BNC-type connector (011-0075-00), 1—3 to 2-wire adapter (103-0013-00), 1—3-conductor power cord (161-0010-00), 1—instruction manual (070-0257-00).

Rack Mount Adapter

A cradle mount to adapt the Type 190B Signal Generator for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Tektronix blue vinyl finish. Rack height requirements 15¾".

Order Part Number 040-0277-00 . . . . . $45

U. S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 280 TRIGGER COUNTDOWN UNIT

INPUT SIGNAL FREQUENCIES—*30 megacycles to 5 gigacycles.*

OUTPUT SIGNAL FREQUENCIES—*Continuously variable from 15 to 45 megacycles.*

The Tektronix Type 280 Trigger Countdown Unit allows timing systems to be synchronized on frequencies up to 5 gigacycles. It can be used to lower the frequency of the triggering signals to within a range of 15 to 45 megacycles. This permits triggering circuits of timing systems to lock in solidly with high-frequency signals.

By using the Type 280 with a Tektronix sampling oscilloscope, microwave engineers can observe rf signals in the gigacycle range.

CHARACTERISTICS

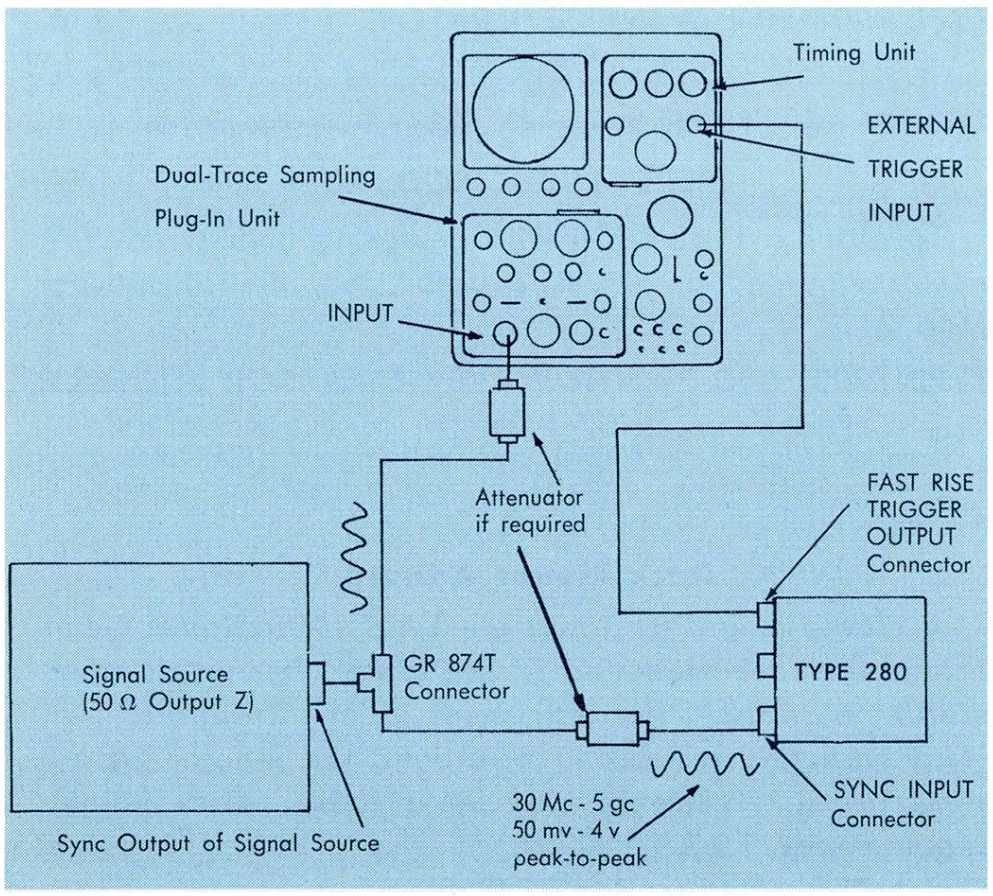
INPUT FREQUENCY is from 30 megacycles to 5 gigacycles.

INPUT SIGNAL VOLTAGE is 50 millivolts to 4 volts peak-to-peak.

INPUT IMPEDANCE is approximately 50 ohms.

OUTPUT REPETITION is continuously variable from 15 to 45 megacycles.

JITTER is 10 psec, or less than 1% of input signal period, whichever is larger.



Type 280 connected for use with Type 661 Oscilloscope.

TWO OUTPUTS—

LARGE AMPLITUDE TRIGGER OUTPUT is 1.5 volts, nominally 8-nsec long, with less than 4-nsec risetime, (for use with Type N Sampling Plug-In and high-speed conventional oscilloscopes).

FAST-RISE TRIGGER OUTPUT (terminated in 50 ohms) is 150 millivolts, with less than 0.4-nsec risetime, decaying with 2-nsec time constant, (for use with Type 1S1, 5T1, 5T1A, 3T4, or 3T77 and other high-speed sampling oscilloscopes).

AMPLITUDE OF TRIGGER OUTPUT as seen at input connector is approximately ±100 millivolts decaying with a 4-nsec time constant.

SHIELDING of the Type 280 is adequate to permit operation in areas that have significant rf radiation levels.

POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 800 cps, 10 watts.

MECHANICAL FEATURES include an aluminum-alloy chassis, die-cast aluminum-alloy top and bottom covers, and steel wrap-around housing. Overall dimensions are $7\frac{3}{8}$" high by $7\frac{5}{8}$" wide by $4\frac{5}{8}$" deep. Net weight is $4\frac{1}{2}$ pounds. Shipping weight is 9 pounds, approx.

TYPE 280 TRIGGER COUNTDOWN UNIT $265

Each instrument includes: 1—5-nsec cable (017-0512-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord, AC (161-0015-00); 2—Instruction Manual (070-0350-00).

U.S. Sales Price f.o.b. Beaverton, Oregon
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TRANSISTOR SWITCHING-TIME TESTER Type 290

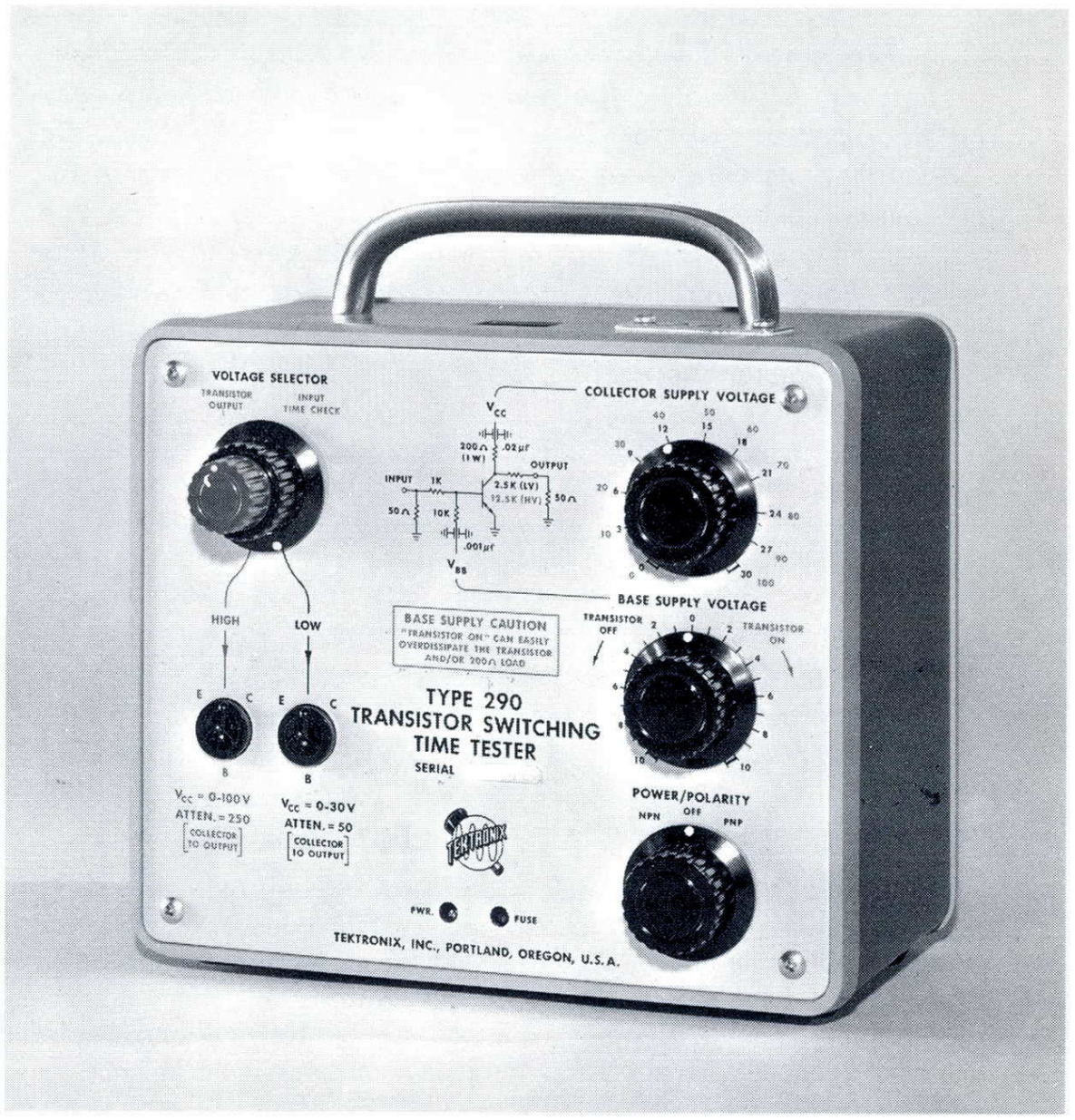
TESTS FAST-SWITCHING TRANSISTORS

RESPONSE TO LESS THAN 1 NSEC

WIDE RANGE OF TEST VOLTAGES

The Tektronix Type 290 Transistor Switching-Time Tester permits dc-coupled pulse-response characteristics of fast-switching transistors to be observed and measured on Tektronix oscilloscopes. Driven by a Tektronix fast-rise pulse generator and combined with a Tektronix fast-rise sampling oscilloscope, the Type 290 becomes an integral part of a transistor testing system with an over-all transient response of less than 1 nanosecond. (When a non-sampling oscilloscope is used, transient response is limited by the risetime of the oscilloscope.) This system can test fast NPN or PNP transistors on a short duty-cycle basis for delay, rise, storage, and fall times. Since these characteristics vary considerably with operating conditions, the Type 290 supplies a wide range of operating voltages.

The Type 290 does not use speedup capacitors or catching diodes. Use of these capacitors and diodes tends to test a circuit rather than a transistor.



TWO TRANSISTOR TEST SOCKETS (HIGH and LOW) are mounted on the Type 290 to provide for easy insertion of the transistor into grounded-emitter test circuit. The HIGH socket connects to a collector supply of 0-100 v and the LOW to a collector supply of 0-30 v.

INPUT SIGNALS from the pulse generator go to the base of the transistor under test. For each volt of the input pulse in excess of V_{be} there is 1 ma base current.

The input signal is attenuated 50-to-1 and appears at the Type 290 INPUT MONITOR connector. A similar input signal can be switched to the OUTPUT connector.

OUTPUT SIGNALS originate at the transistor collector and appear at the Type 290 OUTPUT connector. The collector circuit provides a resistive load of 200 ohms monitored by an internal dc-coupled passive probe. A transistor in the HIGH test socket has a passive probe output attenuation of 250-to-1 from the collector to the OUTPUT connector. A transistor in the LOW socket has an attenuation of 50-to-1 from the collector to the OUTPUT connector.

SIGNAL TRANSIT TIMES in the Type 290 are matched so the input pulse is compared to the transistor collector signal on a dual-trace oscilloscope using one trace attached to the INPUT MONITOR connector and the other attached to the OUTPUT connector. To compare the two signals on a single-trace oscilloscope, the trace is attached to the OUTPUT connector and the signals are switched with a front panel control.

LEAD LENGTH of the transistor test, up to approximately 2 inches, is unimportant at speeds slower than 2 nsec.

CONNECTORS are terminated in 50 ohms.

REGULATED SUPPLIES provide the collector and base voltage. Collector voltage is continuously variable from zero to 30 volts in the LOW position and from zero to 100 volts in the HIGH position. Base supply voltage is continuously variable from zero to ± 10 volts.

POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 800 cps, 15 watts.

MECHANICAL FEATURES include dimensions of 7 3/8" high by 7 5/8" wide by 5" deep. Net weight is 6 pounds. Shipping weight is 9 pounds, approx.

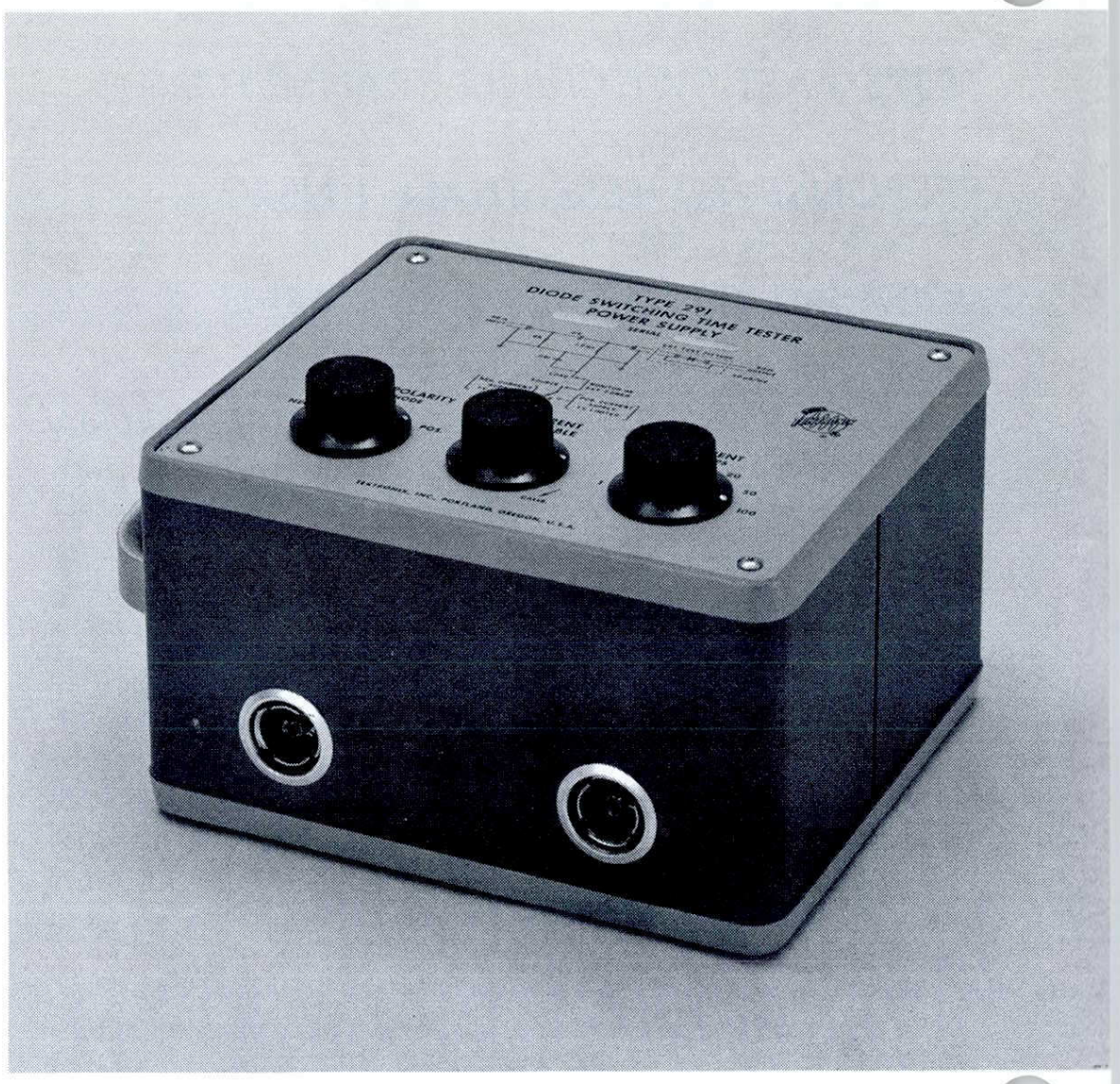
TYPE 290 TRANSISTOR SWITCHING-TIME TESTER . . $290

Each instrument includes: 1—10-nsec cable (017-0501-00); 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0015-00); 2—Instruction Manual (070-0285-00).

U. S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 291 DIODE SWITCHING-TIME TESTER

The Type 291 with associated Test Jig Adapter in conjunction with a suitable pulse generator and oscilloscope, permits measurement of fast-switching diode characteristics. Dc coupling permits direct reading of forward and reverse recovery current on the oscilloscope crt screen. Since the switching characteristics vary with diode current, the Type 291 Power Supply provides a range of dc test current to 100 milliamperes—with provision for external current supply to 500 milliamperes.



THE PULSE GENERATOR used should have a fast rise output; such as the Type 109. Pulse risetime should be short compared to the diode reverse-recovery time expected. Pulse width should be longer than the diode reverse-recovery time. Amplitude is called out in the diode test specifications but should not exceed half the diode-breakdown voltage.

THE OSCILLOSCOPE used should have a risetime faster than the expected reverse-recovery time, such as either the 560-Series, or Type 661 with sampling plug-in units, or 1S1 in 530-540-550 Series.

DIODE RECOVERY LOOP IMPEDANCE is 100 ohms.

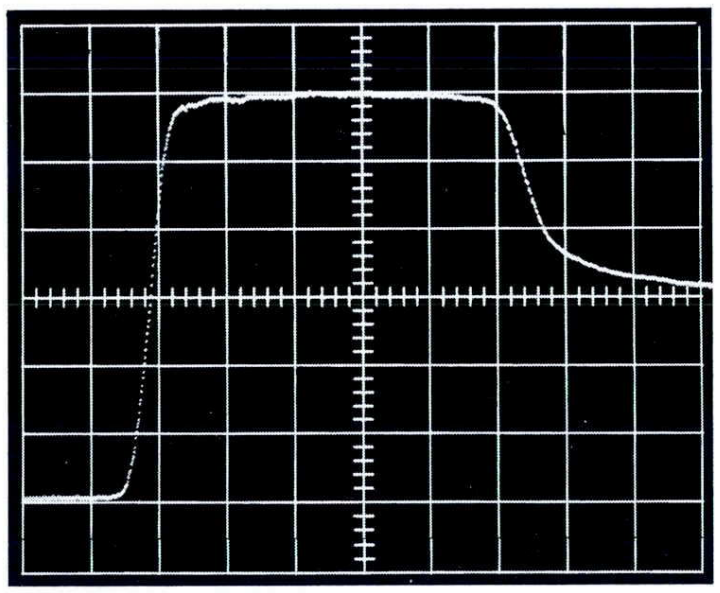
SUPPLY CURRENT is provided in seven calibrated steps from 1 milliampere to 100 milliamperes 1-2-5 sequence. Calibration accuracy is within ± 2% for all steps except the 100-milliamperes step, which is ± 3%. Uncalibrated, continuous adjustment from less than 1 milliampere to 100 milliamperes is also available. The current may be monitored externally.

POWER REQUIREMENT is 105 to 125 v or 210 v to 250 v, 50 to 400 cps, 6 watts.

MECHANICAL FEATURES include dimensions of 4 11/16" high by 6 9/16" wide by 8⅛" deep. Net weight is 6 pounds. Shipping weight is 9 pounds, approx.

TYPE 291 DIODE SWITCHING-TIME TESTER POWER SUPPLY (without test fixture) $185

Each instrument includes: 1—3 to 2-wire adapter (103-0013-00); 1—3-conductor power cord (161-0015-00); 2—Instruction Manual (070-0361-00).



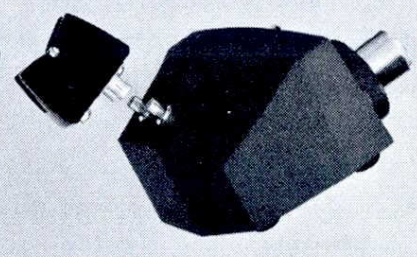
Horizontal — 1 nsec/div Vertical — 10 ma/div

Diode Reverse Recovery Waveform

In this diode-recovery waveform (displayed on a Tektronix Type 661 Sampling Oscilloscope), the diode shows a stored charge of approximately 6 picocoulombs per milliampere. Note the freedom from ringing and overshoot of the recovery waveform, owing to strip-line testing environment of the Diode Switching-Time Tester.

DIODE TEST JIG AND ADAPTER

013-0080-00



017-0075-00

The Diode Test Jig and Adapter provide for easy and rapid testing of diodes with the Type 291. The Jig-Adapter combination is matched to a 50-ohm line. Risetime response with the Type 291 is less than 0.35 nanosecond and less than 2% ringing is introduced in a 0.35 nanosecond system. Contact-to-contact capacitance is less than 0.004 pf.

V-shaped field-replaceable contacts with a life expectancy of 10 million insertions assure electrical continuity during a test.

Approximate weights are: Test Jig—2 ounces net, 4 ounces shipping; Adapter—10 ounces net, 1½ pounds shipping; Adapter and Jig—12 ounces net; 1 pound, 11 ounces shipping.

Approximate dimensions are: Test Jig—1½" high by 1¼" wide by 1¼" deep; Adapter—2" high by 5" wide and 3½" deep.

DIODE TEST JIG (Part Number 013-0080-00) $40

ADAPTER (Part Number 017-0075-00) $55

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

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SEMICONDUCTOR TESTER POWER SUPPLY Type 292

Type 292, with a test fixture, furnishes dc power and provides sub-nanosecond environment for reading out time and charge information about fast semiconductor diodes and transistors. A Type 292 is used between a sub-nanosecond pulse generator and the 50-Ω input of a sampling oscilloscope. Two variable electronically-regulated power supplies, TEST VOLTS and BIAS CURRENT, are electrically connected through a supporting platform to the test fixture in use. Polarity of either power supply can be inverted from the front panel; both supplies are short-circuit and open-circuit protected.

A general-purpose unwired plug-in transistor test fixture is shipped with each Type 292. The fixture consists of an etched-circuit board with a transistor socket mounted in the center. Signal connections to the fixture are made through coaxial connectors mounted on the circuit board. A number of isolated tie points are provided on the test fixture board to facilitate wiring of experimental circuits.

Banana-pin jacks at the rear of the Type 292 can be used for two purposes:

1. *Monitoring either the internal TEST VOLTS or BIAS CURRENT supply, or*
2. *Connecting external sources of current and voltage to the test fixture in use.*

Leads from the banana-pin jacks to the test fixture limit externally-supplied currents to 1 ampere or less.

TYPE 292 SEMICONDUCTOR TESTER POWER SUPPLY $325

Each instrument includes: 1—Adapter, 3-wire (103-0013-00); 3—P6040 probe (010-0133-00); 1—transistor test fixture, unwired (016-0057-00); 1—Power cord (161-0015-00); 2—Instruction Manual (070-0410-00).

TEST VOLTS POWER SUPPLY supplies fixed dc voltages of 1, 2, 5, 10 and 20 volts, accuracy within ±3% when the variable control is fully clockwise. An uncalibrated variable control allows the voltage of a fixed step to be divided by any factor between 1 and at least 10. Ripple voltage (either polarity) is equal to, or less than, 4 mv pk-to-pk at any voltage, over a current range of 0-200 ma, for line voltages from 105 to 125 v ac, or 230 to 250 v ac. Maximum short-circuit current is about 400 ma on all ranges.

BIAS CURRENT POWER SUPPLY supplies fixed dc currents in 11 calibrated steps from 0.1 ma to 200 ma, 1-2-5 sequence, accuracy within ±3% when the variable control is fully clockwise. An uncalibrated variable control allows the current of a fixed step to be divided by any factor between 1 and at least 10. Ripple current (either polarity), listed below, applies for any current from about 2 μa to 200 ma, for line voltages from 105 to 125 v ac or 230 to 250 v ac, providing the load on the current supply limits the output voltages to less than 20 volts.

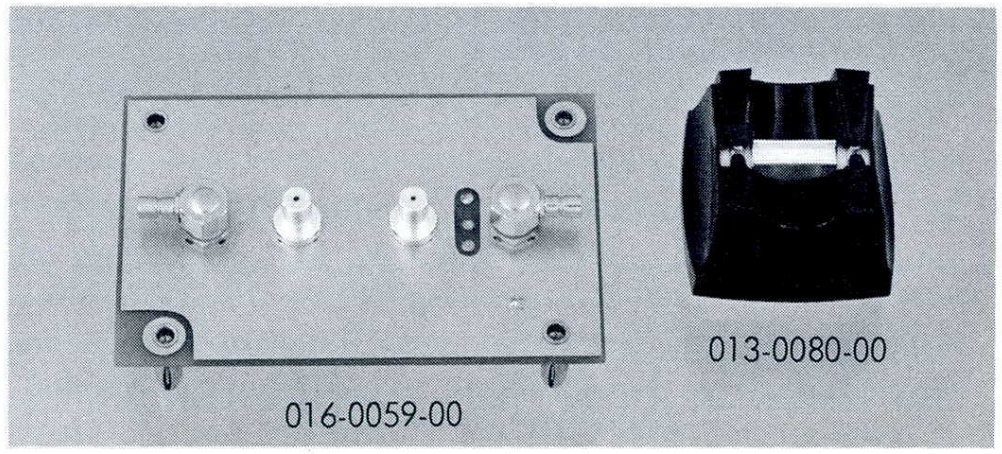
RANGE	RIPPLE
0.1 to 20 ma	less than 5 μa
50 ma	less than 10 μa
100 ma	less than 20 μa
200 ma	less than 100 μa

POWER REQUIREMENTS are from 105 v to 125 v or 210 v to 250 v, 50 to 60 cycles, 30 watts.

MECHANICAL SPECIFICATIONS include dimensions of 4⅝" high by 8" wide by 10" deep. Net weight is 6¼ pounds, approx. Shipping weight is 12 pounds, approx.

OPTIONAL TEST ACCESSORIES

TRANSISTOR TEST FIXTURE, UNWIRED, Part Number 016-0057-00 ..... $16



A special jig is available for testing axial-lead diodes. Contact-resistance problems are minimized by the use of V-shaped jig contacts.

An adapter will be required to mechanically support and electrically connect the diode test jig to the Type 292 platform.

Careful design of the jig and adapter provides high-quality 50-ohm coaxial connections to the diode leads.

TEST JIG ADAPTER, Part Number 016-0059-00 ..... $21
DIODE TEST JIG, Part Number 013-0080-00 ..... $40

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Type 1121 AMPLIFIER

Amplifier Gain

Accurately set at 100 x.

Input Attenuator

Attenuates input signal by a factor of 1X through 500X in 9 calibrated steps.

Gain Stability

Within ±1% over 24-hour period.

Frequency Response

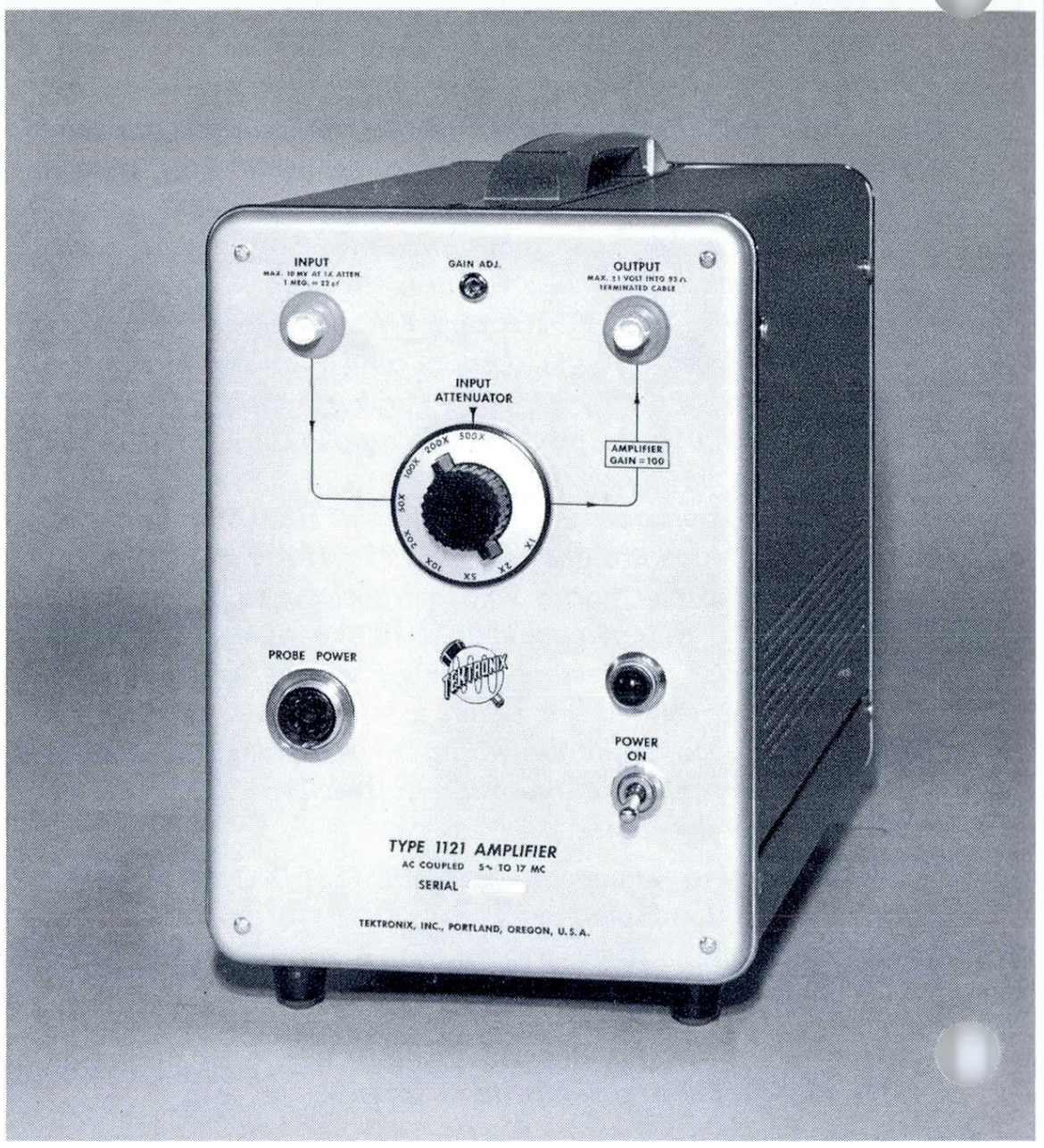
5 cycles to 17 megacycles (3 db down) at 1X, 2X, 5X, and 10X attenuator settings.

Transient Response

Risetime—21 nanoseconds.

Probe Power

Heater supply—6.3 v dc, 0.2 amp.
Plate supply—120 v dc, 10 ma regulated.



The Type 1121 Wide-Band Amplifier is a cascode-input, low-noise amplifier designed with Tektronix precision, quality, and style. It increases the amplitude of low-level wide-band signals; thus increases the sensitivity of the oscilloscope or other associated instrument with which it is operated.

The output, terminated in 93-ohm coaxial cable, allows separation of at least 100 feet between the Type 1121 and associated instrument without causing noticeable deterioration of the response. Output voltage of ±1 volt guarantees linear amplification of any input signal up to ±10 mv at full gain. Internal noise is no more than 50 μv peak-to-peak with the input grounded and the INPUT ATTENUATOR control in the 1-X position. As in all Tektronix instruments, optimum response is a prime consideration. Risetime is approximately 21 nsec, and passband extends from 5 cycles to over 17 mc with the INPUT ATTENUATOR control in the 1-X, 2-X, 5-X or 10-X positions.

Power is available at the front panel for a cathode-follower probe. For applications requiring both high impedance input and high gain or where the attenuation of an rc probe would be objectionable, a Tektronix P170CF cathode-follower probe can be used.

The Type 1121 has a turret-type step attenuator that permits attenuation of the input level to a factor of 500X in nine calibrated steps. Unique design of the attenuator allows the series and shunt compensations to be conveniently set without removing the instrument side panels. Hum pick-up at the input is minimized by the inherently short internal leads. These leads are of the same length in all positions of the attenuator, thus lower, more-stable values of circuit capacitance are realized. Input impedance is 1 megohm paralleled by approximately 22 pf at all step-attenuator positions. This feature enables the use of a probe with minimum circuit loading on the point measured.

Other features include a cascode-input circuit using a frame-grid triode, two voltage amplifier stages (that retains the polarity of the input at the output), and transistor-regulated heater supplies.

Its compactness, reliability, and low noise level adapt the versatile Type 1121 to almost any application involving wide-band amplification.

CHARACTERISTICS

Input Impedance—Direct, 1 megohm paralleled by approximately 22 pf.

Internal Noise—Internally generated noise is equivalent to an input signal of 50 μv, pk-to-pk, maximum, with the INPUT ATTENUATOR at 1X.

Gain Stability—After initial warmup, and under all conditions of line voltage between 105 and 125 volts or 210 and 250 volts, gain stability of the Type 1121 is well within $\pm$1% over a twenty-four hour period.

Input Attenuation—The turret-type step attenuator permits accurate attenuation of the input level from a net gain factor of 100 x to 0.2 x in nine calibrated steps: 1X, 2X, 5X, 10X, 20X, 50X, 100X, 200X, and 500X. Attenuator accuracy is 3%.

Frequency Response—With the INPUT ATTENUATOR control in the 1-X, 2-X, 5-X, or 10-X positions, transient response is clean over a band extending from 5 cps to 17 mc (at 3 db down). Passbands for the remaining attenuator positions are as follows: 20X—5 cps to 16.5 mc, 50X—5 cps to 16.0 mc, 100X—5 cps to 15.5 mc, 200X—5 cps to 14.0 mc, and 500X—5 cps to 12.0 mc.

Probe Power—The front-panel PROBE POWER socket provides 0.2 amp dc at 6.3 volts for the heater supply and 10 ma regulated dc at 120 volts for the plate supply of a cathode-follower probe. The Tektronix P170CF cathode-follower probe is ideally suited for use with Type 1121 Amplifier.

When a P170CF cathode-follower probe is used with a Type 1121 Amplifier ahead of a Type 540A or 540B-Series Oscilloscope and a Type L Plug-In Unit set at 0.05 v/cm, overall sensitivity of the combination is 1 mv/cm. Passband will be 5 cps to 16 mc. At this sensitivity, noise inherent in the Type 1121 will appear as 0.1 centimeter of deflection. With the L unit set at 0.005 v/cm, overall sensitivity is 0.1 mv/cm. Passband will be 5 cps to 15 mc and inherent noise will appear as 1 centimeter of deflection. Input impedance of the P170CF probe is 12 megohm paralleled by 5 pf.

Other passive probes are available. Please refer to the Catalog Accessory pages.

Output Voltage—Capable of a $\pm$1 volt swing in a terminated 93-ohm coaxial cable, the Type 1121 reproduces any input signal up to $\pm$10 mv at full gain. The ouput, via cathode followers, permits up to 100 foot separation between the amplifier and associated instrument without noticeable waveform distortion.

Output Connection—Output of the Type 1121 is connected to the associated instrument via a 93-ohm coaxial cable and 93-ohm termination. The terminated end of the cable must be connected to the associated instrument for minimum waveform distortion. If additional cable length is required, insert a section of RG62U (93 ohm) cable between the Type 1121 OUTPUT and the cable supplied with the amplifier.

Regulated Power Supplies—The Type 1121 embodies exceptionally stable power-supply voltage regulation. Transistor-regulated heater circuits limit the heater-supply ripple components to less than 4 mv. Electronically-regulated plate circuits insure stable operation over line fluctuations between 105 to 125 volts or 210 to 250 volts.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, 150 watts.

Mechanical Specifications—Dimensions are 10¾" high by 7" wide by 15⅞" deep. Net weight is 18½ pounds. Shipping weight is 28 pounds, approx.

TYPE 1121 AMPLIFIER $465

Each instrument includes: 1—93-Ω termination, BNC, (011-0056-00); 1—93-Ω cable, BNC, (012-0075-00); 1—3-conductor power cord (161-0010-00); 1—3 to 2-wire adapter (103-0013-00); 2—instruction manual (070-0204-00).

ACCESSORIES

P170CF Cathode-Follower Probe—The probe alone has an attenuation ratio of 2X. With the 3 included attenuator heads, attenuation is variable from 4X to 4000X. Probe power is obtained directly from the Type 1121 Amplifier. When used with the Type 1121, a 170-ohm termination is required (see below).

P170CF CATHODE-FOLLOWER PROBE (010-0101-00) $99.50

170-OHM UHF TERMINATION (011-0048-00) .. $15

Coaxial Output Cable—For applications requiring variable attenuation between steps, a 93-ohm, 42" coaxial output cable (with UHF connectors) that terminates in a variable attenuator can be used.

OUTPUT CABLE (012-0004-00) $13.50

BNC to UHF Adapter—This adapter makes the above accessories with UHF connectors compatible with the Type 1121 Amplifier.

BNC MALE ADAPTER (103-0032-00) $1.70

U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

LIMITED-DEMAND INSTRUMENTS

The instruments described on this page are in limited demand, but represent a desirable choice in a few specialized cases. As such, they remain available for you who still have a need for them. Consult your Tektronix Field Engineer for information on other instruments in the Tektronix product line that generally give greater value in application areas presently filled by these instruments.

TYPE 506 OSCILLOSCOPE

The Tektronix Type 506 offers high-level performance and portability for general-purpose laboratory and field applications. Dual-trace vertical amplifier plug-in units provide sensitivity to 10 mv/cm with passbands greater than 20 Mc. Recommended time-base units provide a choice of sweep delay or wide-range, direct-reading sweep magnification.

TYPE 506 OSCILLOSCOPE $525

The Type 9A2 Dual-Trace Amplifier Unit provides dc to 20 Mc passband, contains two identical channels for dual-trace displays, and includes a signal delay line for viewing the leading edge of the triggering signal on the crt.

TYPE 9A2 AMPLIFIER UNIT $550

The Type 9A1 Dual-Trace Amplifier Unit has dc to 23 Mc passband, no delay line, and has restricted internal triggering passband.

TYPE 9A1 AMPLIFIER UNIT $475

TYPE 517A OSCILLOSCOPE

The Tektronix Type 517A Oscilloscope is a wide-band high-voltage instrument for observation and photographic recording of very-fast-rising waveforms having low duty cycle. With its risetime of 7 nsec, 24-kv accelerating potential, and high-speed sweeps, the Type 517A is especially suited to single-sweep applications involving transients of very short duration.

TYPE 517A OSCILLOSCOPE $3400

TYPE 541A/RM41A OSCILLOSCOPE

The Tektronix Types 541A and RM41A are high-speed DC to 33 Mc laboratory oscilloscopes achieving a high degree of versatility through use of Tektronix Letter-Series and '1' Series Plug-In Units. This versatility combined with wide sweep range, high accelerating potential, and long, dependable life, makes the Types 541A and RM41A useful in many applications.

TYPE 541A (without plug-in units) $1225
TYPE RM41A (without plug-in units) $1325

TYPE 3A2/3B2 PLUG-IN UNITS

Tektronix Type 3A2 Dual-Trace Amplifier Unit and Type 3B2 Time-Base Unit enable low and medium frequency digital readout with the Type 567 Oscilloscope and Type 6R1A Digital Unit. They also provide analog displays when used with Type 561A or 564 Oscilloscopes.

TYPE 3A2 DUAL-TRACE AMPLIFIER UNIT $500
TYPE 3B2 TIME-BASE UNIT $650

TYPE 128 POWER SUPPLY

The Type 128 Probe Power Supply furnishes the necessary plate and filament voltages for cathode-follower probes such as the Tektronix P170CF and P500CF.

TYPE 128 PROBE POWER SUPPLY $110

TYPE 133 POWER SUPPLY

The Type 133 provides power to an internal, transistorized amplifier and any Tektronix Letter-Series, Spectrum Analyzers or '1' Series Plug-In Unit. The flexibility of this plug-in feature permits quick adaptation of the Type 133 to meet any particular requirement.

TYPE 133 POWER SUPPLY (without plug-in units) . . $440

TYPE 181 TIME-MARK GENERATOR

The Type 181 and RM181 provide accurate time-markers of 1, 10, 100, 1000, and 10,000 microseconds, plus a 10-Mc sine wave. These markers are used for oscilloscope sweep calibration and comparison time measurements.

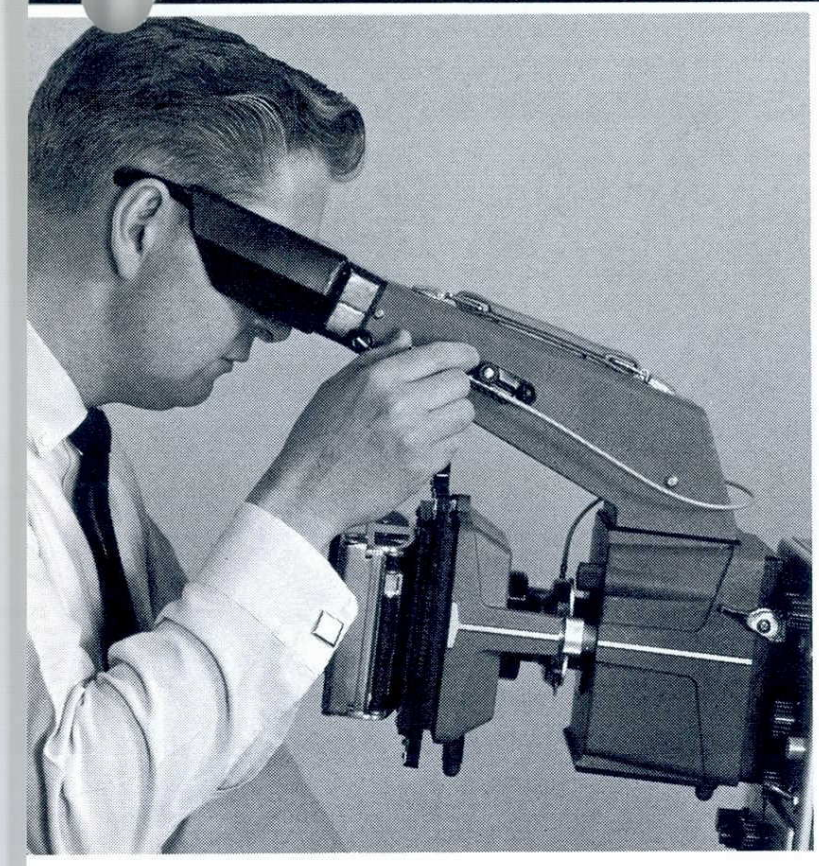
TYPE 181 TIME-MARK GENERATOR $265
TYPE RM181 TIME-MARK GENERATOR $290

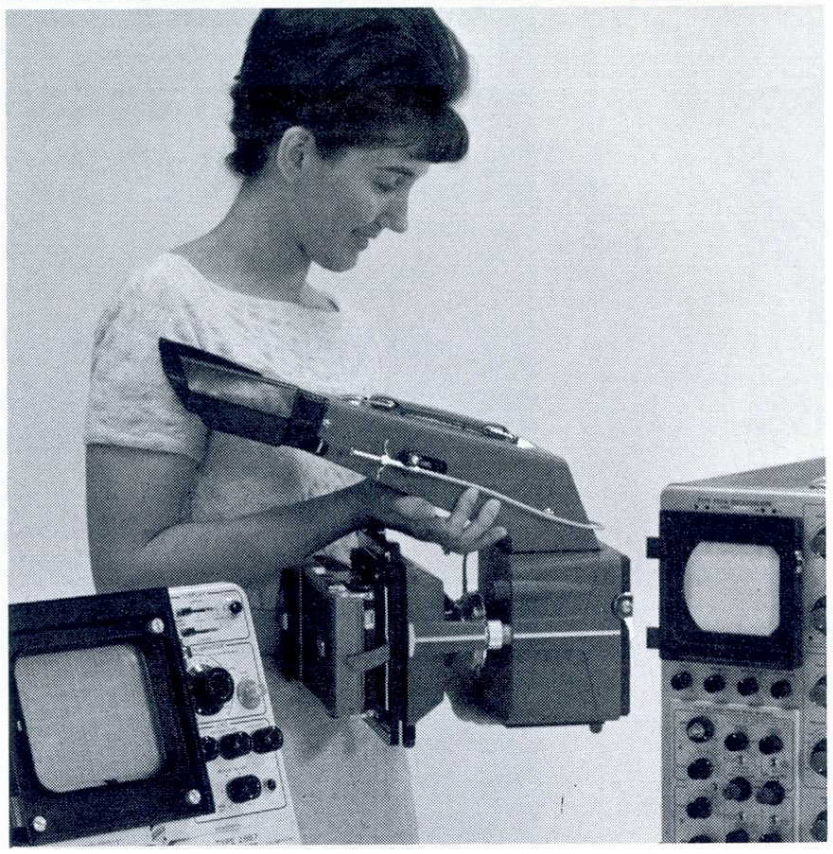
For more information—
or a demonstration—
call your Tektronix field engineer

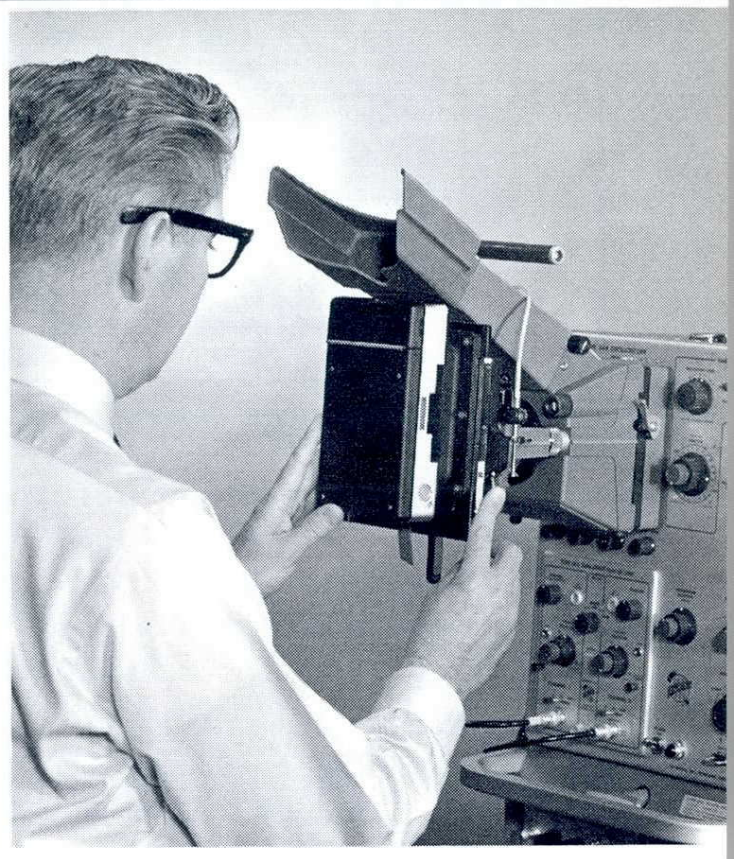
U.S. Sales Price f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

PRINTED IN U.S.A.

Type C-12 & C-27 Cameras

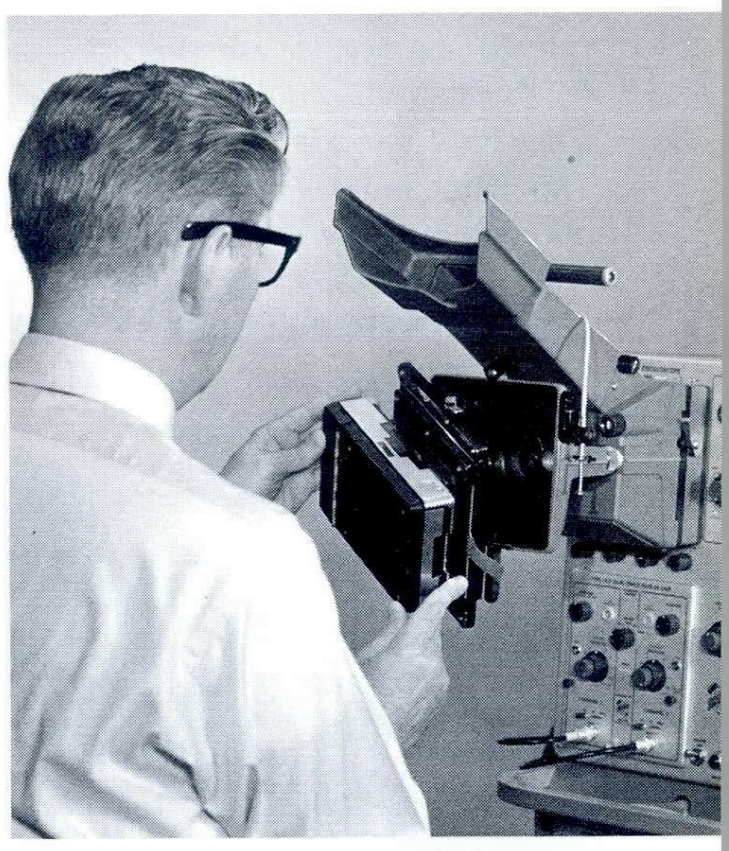


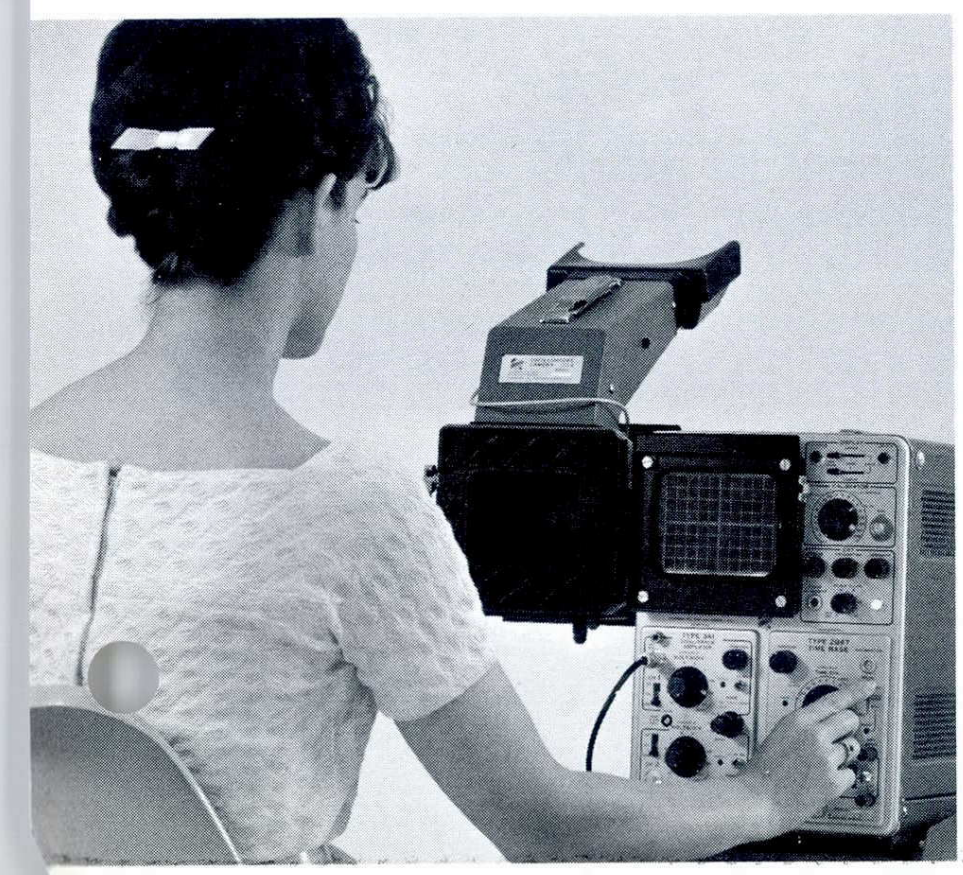


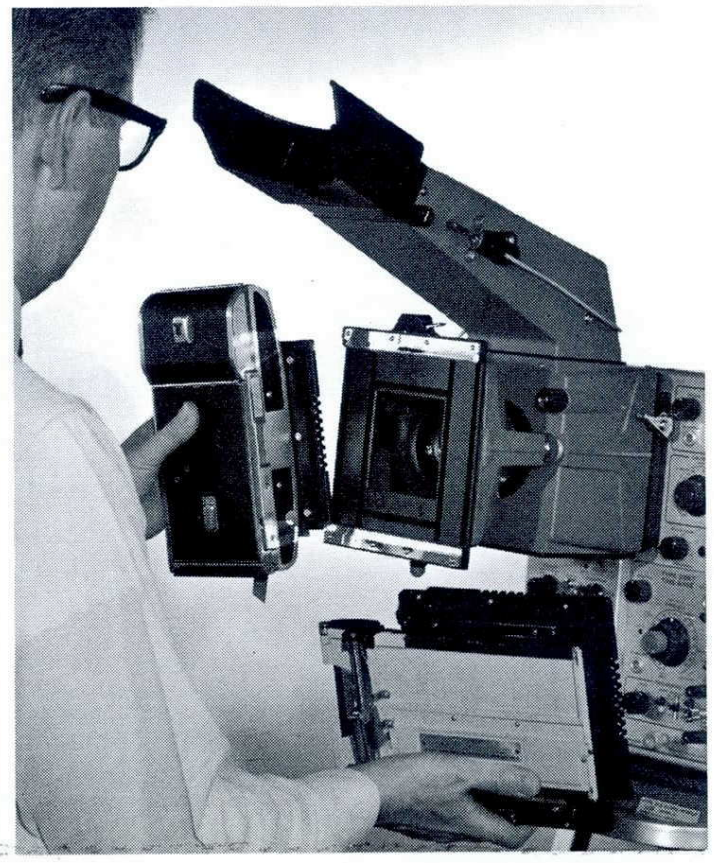


DESIGN FEATURES

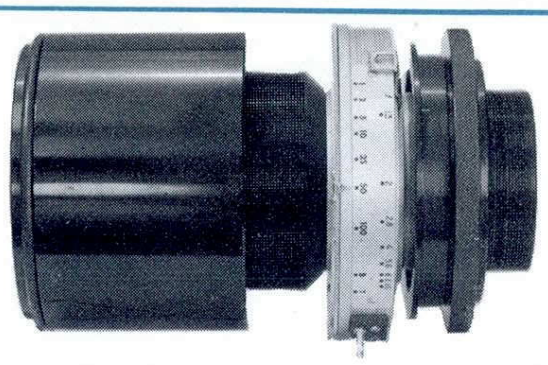
- Lift-On Mounting and Swing-Away Hinging—unrestricted crt viewing for normal oscilloscope operation
- Easily-Accessible Shutter Controls—no groping or camera removal necessary for adjustment
- Comfortable Binocular Viewing—with or without glasses
- Locking Focus Control—quick adjustment for use on more than one oscilloscope
- Sliding Back—nine positive detent positions for multiple exposures
- Rotating Back—horizontal or vertical mounting for most efficient use of film







Cameras



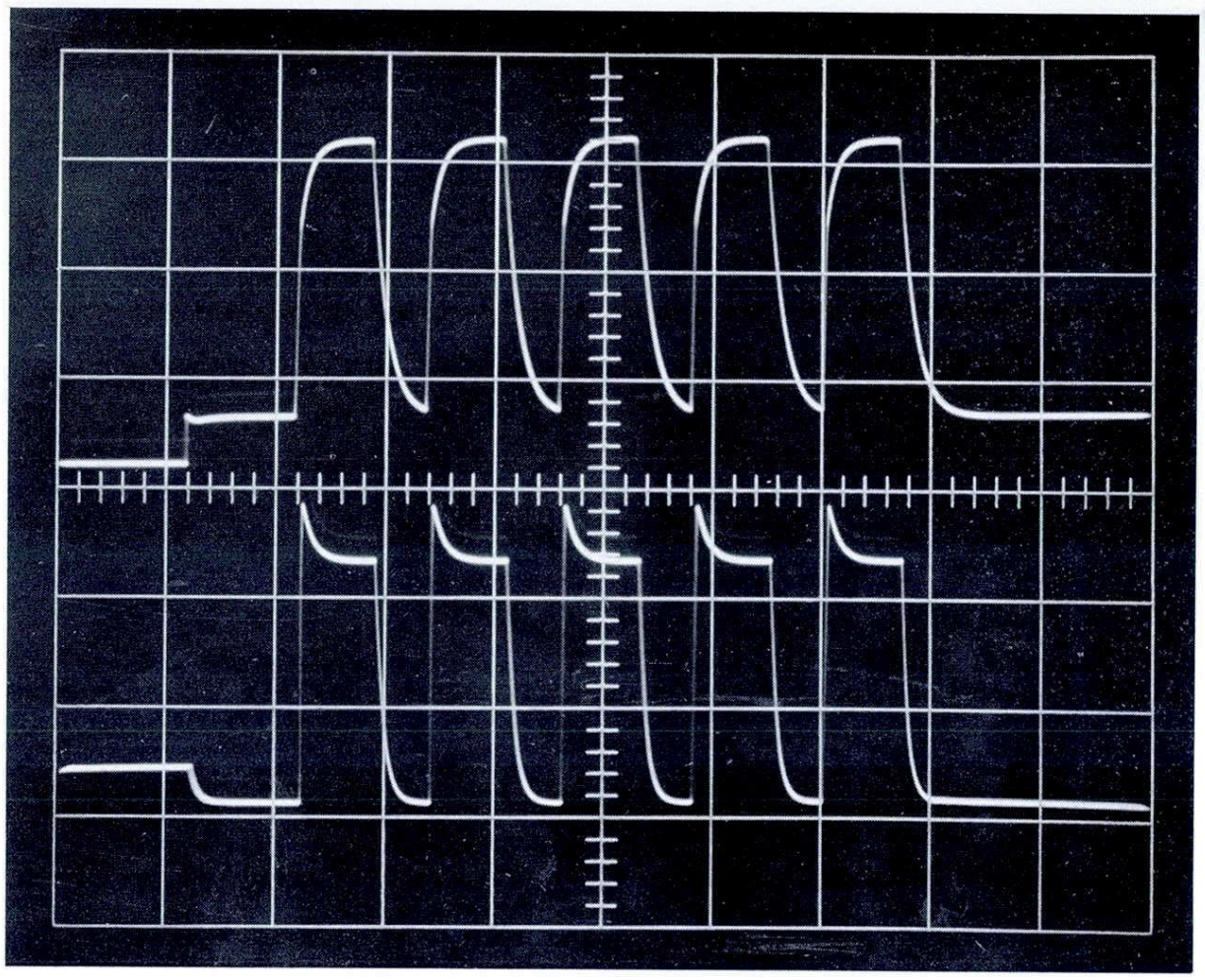
A WORD ABOUT LENSES

Seven interchangeable lenses are available for use with the Polaroid[1] Land or Graflok[2] Film Backs. The wide range of object-to-image ratios and maximum apertures permits selection of the lens which is most right for your application.

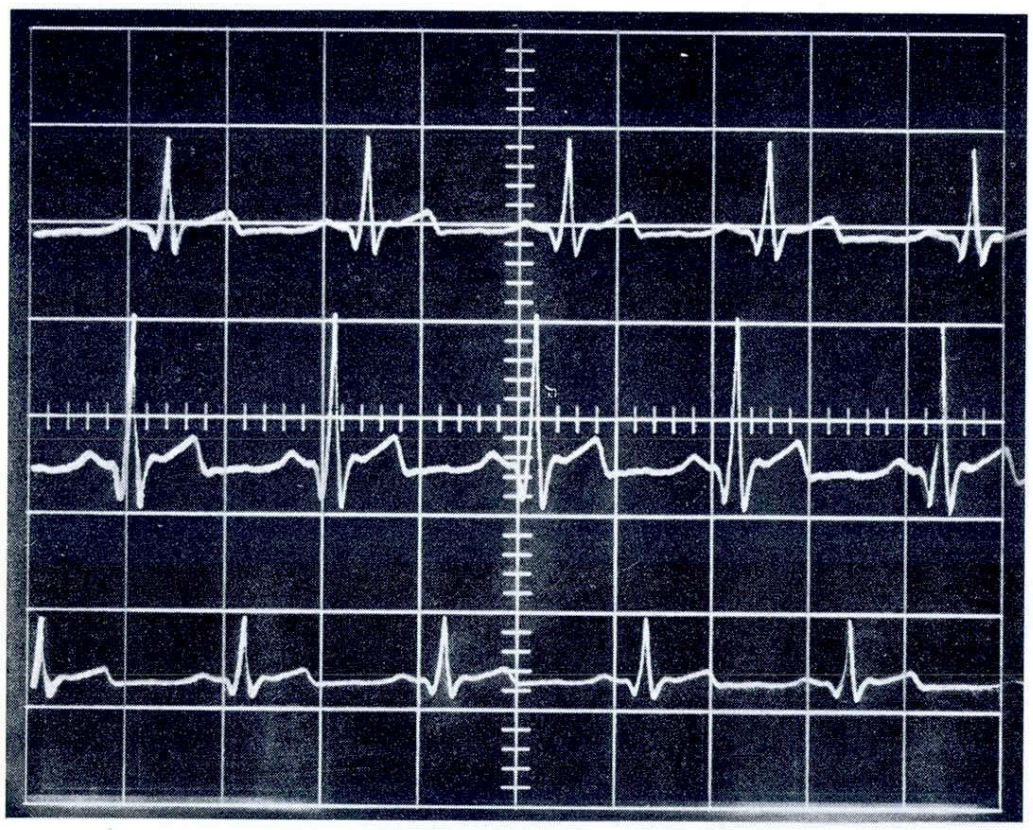
Lens optics are designed to meet the strict requirements of precision oscillography: flat field, low distortion, and high resolution even at maximum aperture openings.

Lenses are set for precise object-to-image ratios in prefocused mounts, for easy interchange in camera.

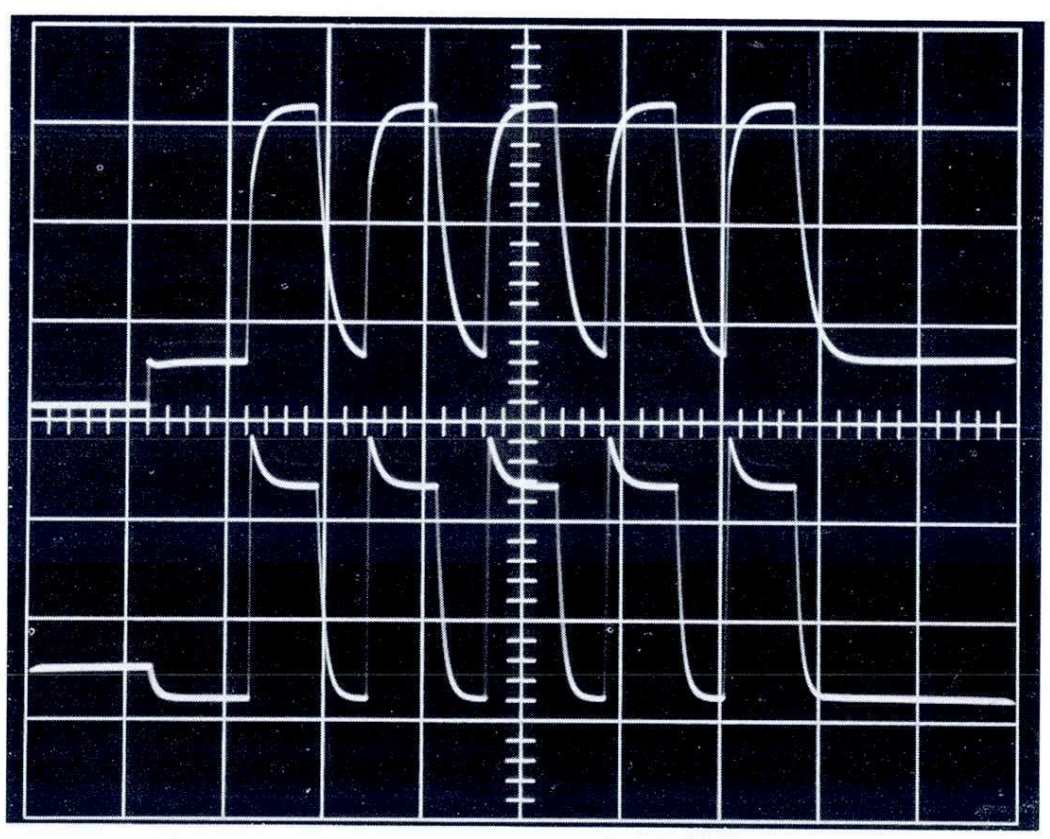
*Writing Rate Factor (WRF) is an arbitrary indication of the relative light-gathering capability of the various lenses. A WRF of 4 indicates four times as much light-gathering ability as a WRF of 1.



PRECISE FULL-SIZE IMAGE & HIGH WRITING RATE —f/1.4, 1:1 object-to-image ratio . . . for precise full-size records . . . measurements can be scaled directly off photograph with maximum resolution . . . WRF* of 7.



GENERAL PURPOSE—f/1.9, 1:0.85 object-to-image ratio . . . image brightness sufficient for most applications. When photographing 8 x 10 cm graticules or 10 x 10 division graticules, such as used on Tektronix Types 570, 575, and 536, we recommend use of the f/1.9, 1:0.85 lens to provide the largest size image that will still fall within the maximum recording area of 3¼ x 4¼ size Polaroid film . . . WRF* of 4.

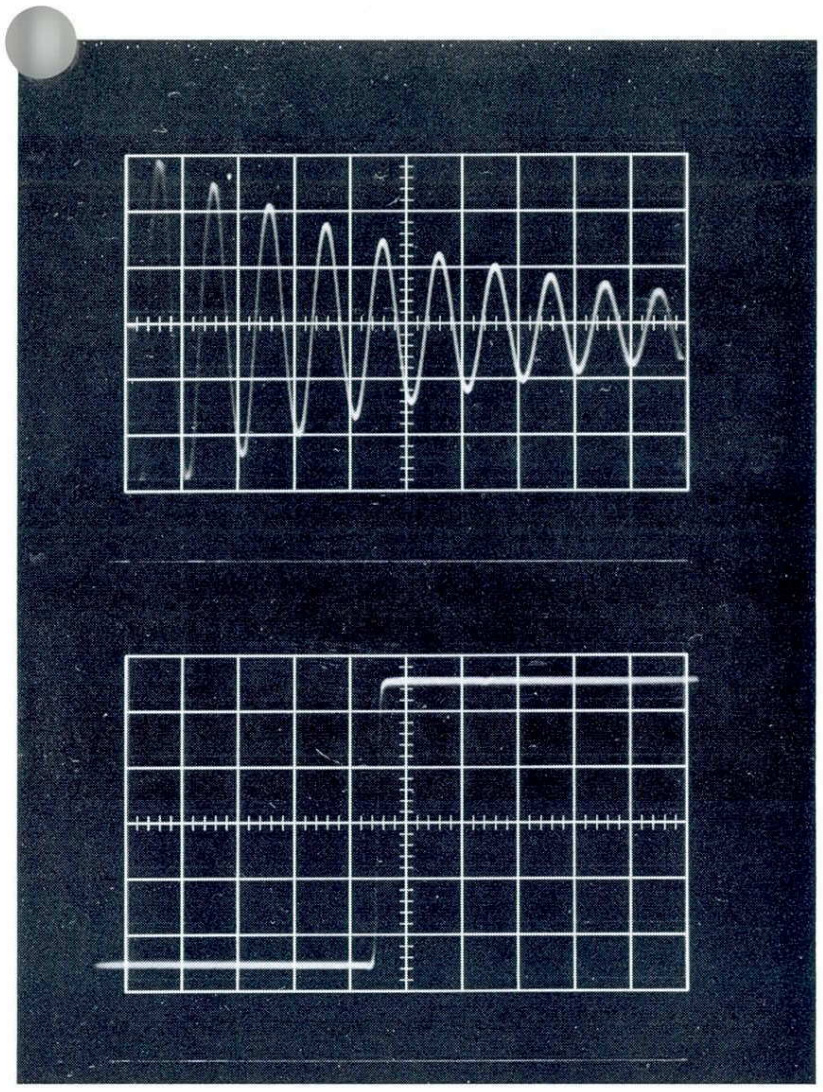


GENERAL PURPOSE—f/1.9, 1:0.9 object-to-image ratio . . . image brightness sufficient for most applications . . . records up to 8 x 10-cm graticule on 3¼ x 4¼ film with maximum resolution . . . WRF* of 4.

[1]Registered Trade-Mark Polaroid Corporation

[2]Registered Trade-Mark Graflex, Inc.

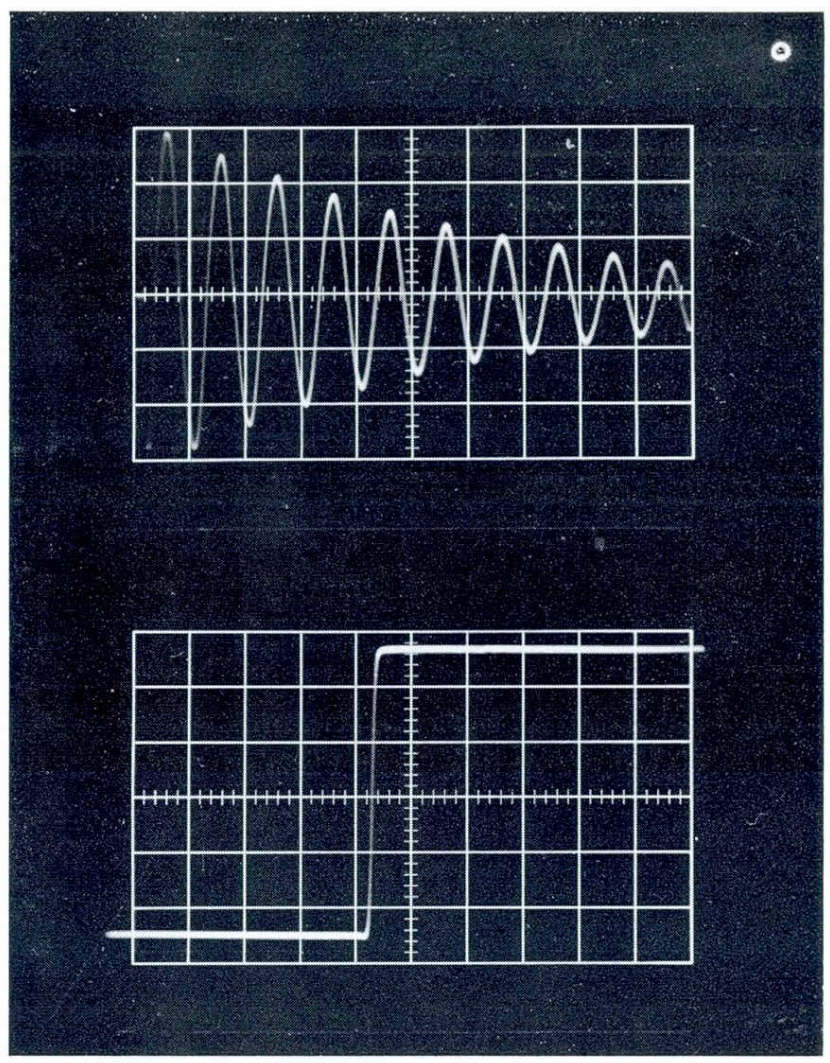
Cameras

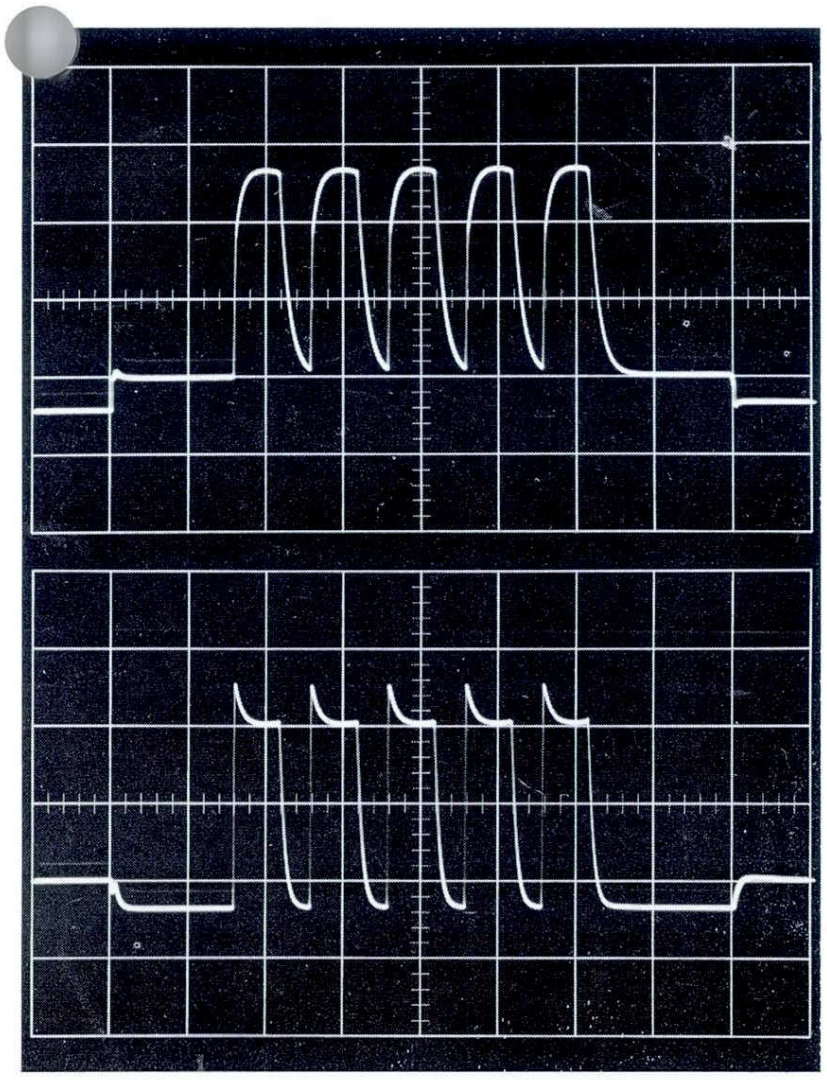


Photographs taken under identical conditions illustrate relative writing-rate capabilities of the two lenses.

HIGH WRITING RATE—f/1.9, 1:0.5 object-to-image ratio . . . for high writing rate applications such as single-shot photography of fast transients . . . recommended for use with Tektronix Type 519 and 580-Series Oscilloscopes . . . WRF* of 6.

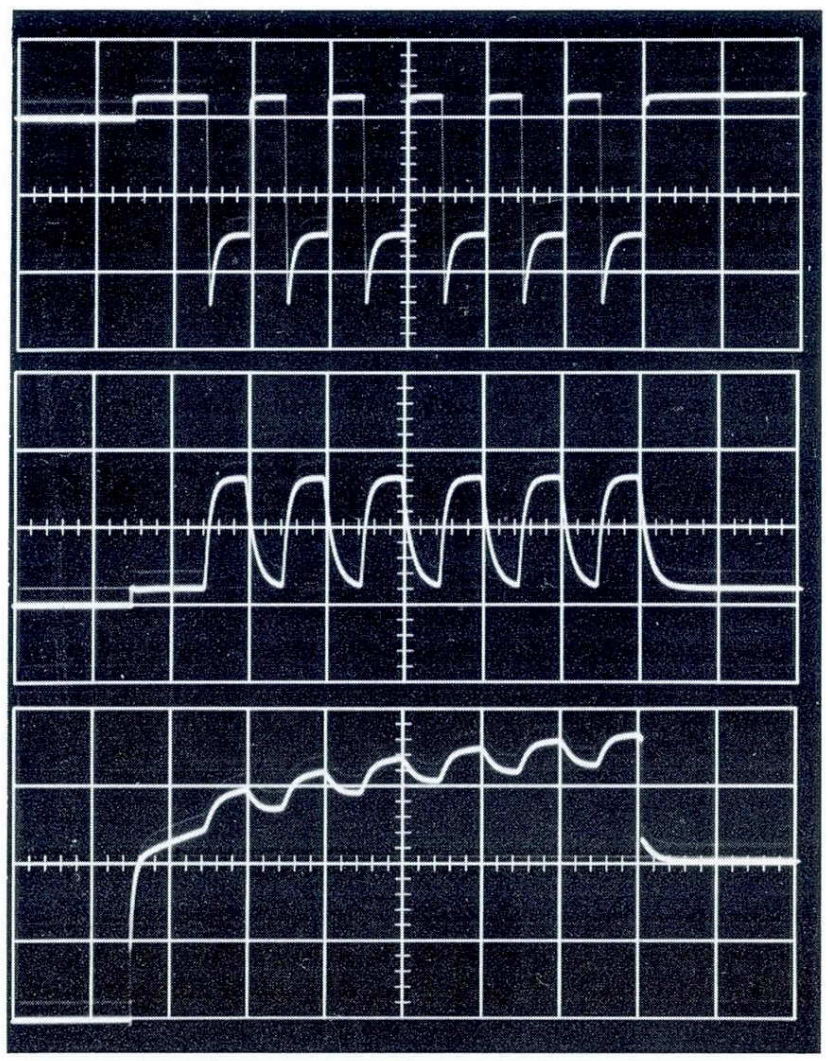
ULTRA-HIGH WRITING RATE—f/1.3, 1:0.5 object-to-image ratio . . . for applications where writing rate is the prime consideration . . . advances the state of the art and in combination with the C-27 Main Frame makes possible the recording of higher-speed phenomena than before . . . WRF* of 12.



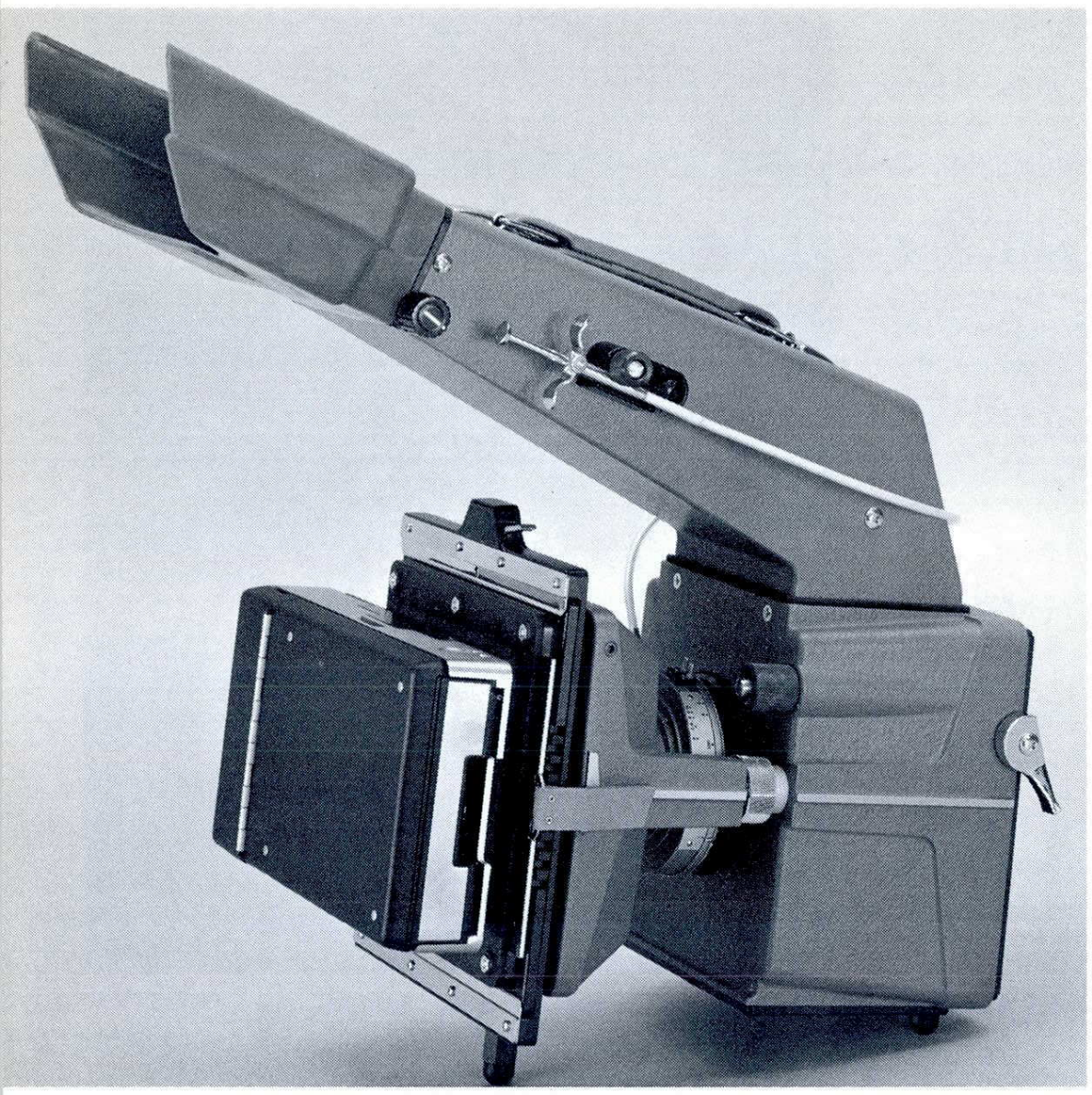


FILM & LENS ECONOMY—f/4.5, 1:0.7 object-to-image ratio . . . for economy of price and efficient use of film where high writing rate is not required . . . 3 records of 4 x 10-cm graticule, or 2 records of 6 x 10-cm graticule on 3¼ x 4¼ film . . .WRF* of 1.

FILM ECONOMY & MEDIUM WRITING RATE—f/1.9, 1:0.7 object-to-image ratio . . . efficient use of film . . .WRF* of 5.



Cameras



STANDARD C-12 CAMERA

The C-12 Camera is ideally suited for general-purpose trace recording. A beam-splitting mirror provides the operator with an on-axis binocular view of the crt display, and also allows use of the Projected Graticule accessory (see facing page). The f/1.9—1:0.9 lens supplied with the standard C-12 offers the ideal compromise of writing rate and image size (up to 8 x 10 cm coverage) in a moderately-priced camera. The Polaroid Land Pack-Film Back offers convenient loading and picture development outside the camera. Dimensions overall 15 3/8" high by 7½" wide by 17¼" long. Net weight is 12¾ pounds. Shipping weight is approximately 15 pounds.

C-12 CAMERA $450

Each camera includes: 1—cable release (122-0586-00), 1—focus plate 387-0893-00), 2—instruction manuals (070-0383-00).

ROLL-FILM CAMERA identical to the Standard C-12, except a Polaroid Roll-Film Back is substituted for the Pack-Film Back.

C-12-R CAMERA $450

ELECTRICALLY-ACTUATED* CAMERA identical to the Standard C-12, but with a shutter actuator and built-in power supply.

C-12-S CAMERA $605

ELECTRICALLY-ACTUATED* CAMERA with Roll-Film Back combines features of the C-12-R and C-12-S, above.

C-12-RS CAMERA $605

CUSTOM C-12 CAMERAS

LENS (Writing rate factor compared to Standard f/1.9, 1:0.9 lens)	SHUTTER ACTUATOR and BUILT-IN POWER SUPPLY*	POLAROID FILM BACK	ORDER NO.	PRICE
FILM ECONOMY & MEDIUM WRF—f/1.9, 1:0.7 Records two 6 x 10-cm or three 4 x 10-cm graticules on each film. Writing rate factor 1.25X Standard Lens.	No	Pack Film Roll Film	C-12-547 C-12-547 R	$470 470
	Yes	Pack Film Roll Film	C-12-547 S C-12-547 RS	625 625
HIGH WRITING RATE—f/1.9, 1:0.5 Records fast-writing displays such as single-shot transients. Writing rate factor 1.5X Standard Lens.	No	Pack Film Roll Film	C-12-549 C-12-549 R	490 490
	Yes	Pack Film Roll Film	C-12-549 S C-12-549 RS	645 645
FILM & LENS ECONOMY—f/4.5, 1:0.7 Records two 6 x 10-cm or three 4 x 10-cm graticules on each film. Writing rate factor .25X Standard Lens.	No	Pack Film Roll Film	C-12-550 C-12-550 R	395 395
PRECISE FULL-SIZE IMAGE & HIGH WRITING RATE—f/1.4, 1:1 Records full-size image of 8 x 10-cm graticule (on 4 x 5 film with Graflok Back). Writing rate factor 1.75X Standard Lens.	No	Pack Film Roll Film	C-12-608 C-12-608 R	565 565
	Yes	Pack Film Roll Film	C-12-608 S C-12-608 RS	720 720
ULTRA-HIGH WRITING RATE—f/1.3, 1:0.5 Where writing rate is prime consideration Records two 6 x 10-cm graticules on each film. Writing rate factor 3X Standard Lens.	No	Pack Film Roll Film	C-12-662 C-12-662 R	615 615
	Yes	Pack Film Roll Film	C-12-662 S C-12-662 RS	770 770
GENERAL-PURPOSE—f/1.9, 1:0.85 Complete 8 x 10-cm graticule is always positioned within exposable area of 3¼ x 4¼ film. Writing rate factor same as Standard C-12.	No	Pack Film Roll Film	C-12-692 C-12-692 R	450 450
	Yes	Pack Film Roll Film	C-12-692 S C-12-692 RS	605 605

Any Tektronix Standard or Custom Trace-Recording Camera can be ordered less back. Use suffix 'G' after the Order Number and deduct $80 from the price. 4 x 5 and 2¼ x 3¼ Graflok Backs and accessories are shown on page 245.

***Power supplies are normally wired for 115 v. For 230 v add suffix 'B' to the Order Number. Price for either is the same.**

All cameras are sold less mounting bezel; order from page 244.

PROJECTED GRATICULE for the C-12 Camera

The Projected Graticule eliminates parallax, one of the most common problems in viewing and photographing waveforms on an external graticule.

Parallax is the apparent displacement of the trace in relation to the graticule. Error is introduced since the graticule and crt phosphor are on different planes.

To eliminate parallax, a virtual image of the graticule is presented at the crt phosphor plane as viewed by the operator and as projected to the camera film plane.

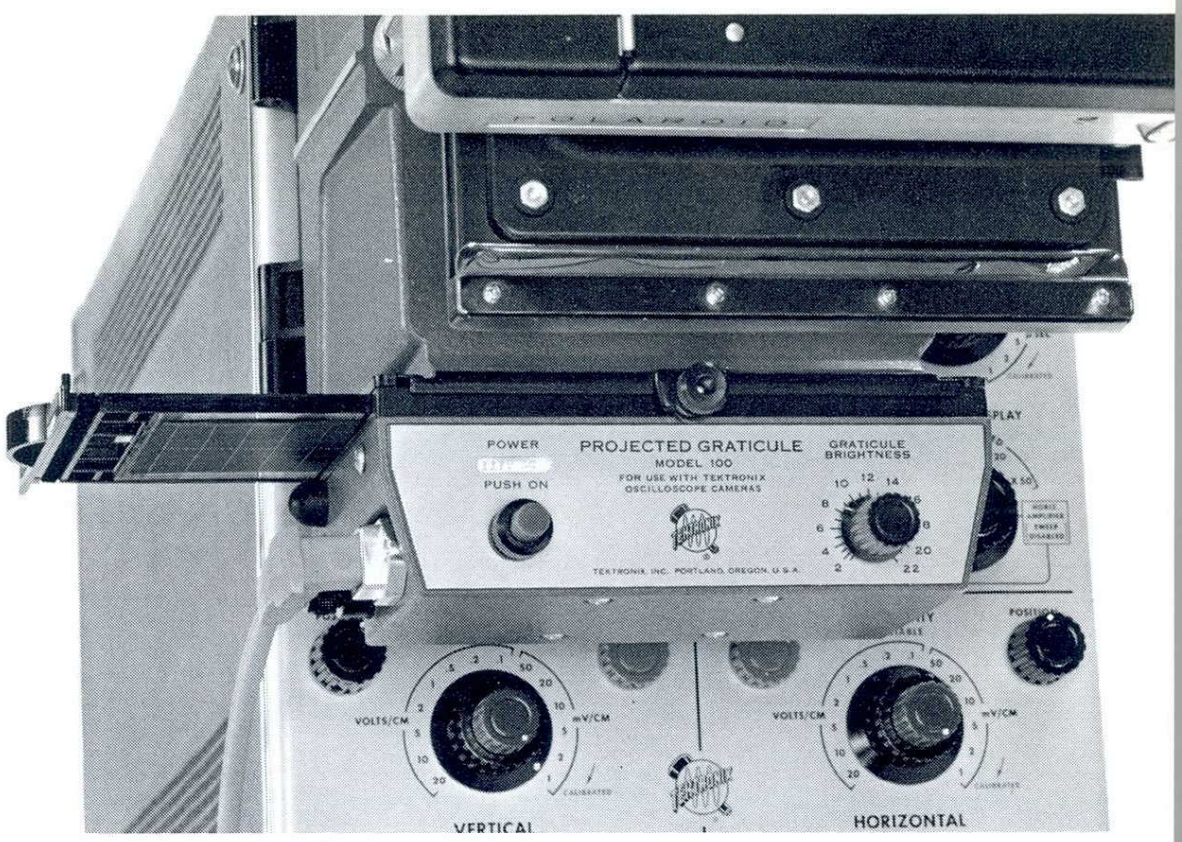
Special graticules, reference waveforms, or any image that can be recorded on a film transparency, can be superimposed on the crt display. The transparency is held in a slide holder and is easily slipped in and out of the Projected Graticule case, making possible rapid change of graticule slides.

The projected graticule provides up to an 8 x 10-cm projection, a portion of which can be used for write-in data. Colored filters can be inserted to match or contrast the projection with the crt phosphor.

The light source is indexed in $\approx$ ½ f stop increments for use as a film exposure guide. This source can also be used for precise prefogging of film for increased sensitivity in fast writing-rate applications.

Power requirements are 90 to 130 v, or 180 to 260 v, 50 to 440 cps.

Although the Projected Graticule case is small (it adds only 2¼" to camera height), clearance problems exist with the Type 81 Adapter and a few plug-in unit/probe combinations. If in doubt about compatibility, please consult your Tektronix Field Office or Representative.

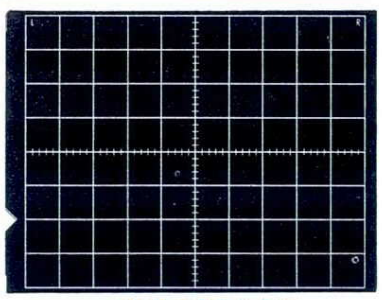


PROJECTED GRATICULE for 115 volts (016-0204-00) $160

PROJECTED GRATICULE for 230 volts (016-0234-00) $160

Includes: 1—power cord (161-0015-00), 1—3 to 2-wire adapter (103-0013-00), 1—graticule film, 4 x 10 cm with write-in area and short minor lines (331-0117-00), 1—graticule film, 6 x 10 cm with write-in area and short minor lines (331-0111-00), 1—graticule film, 8 x 10 cm without write-in area, but with full minor lines (331-0119-00), 1—graticule mask, 4 x 10 cm (331-0118-00), 1—graticule mask, 6 x 10 cm (331-0116-00), 1—instruction manual (070-0402-00).

OPTIONAL GRATICULE FILMS and MASKS .. $0.85 each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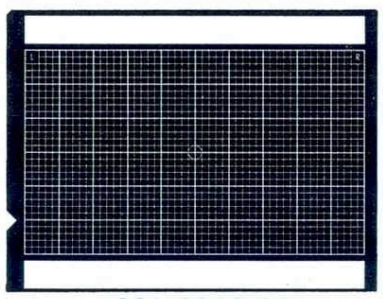
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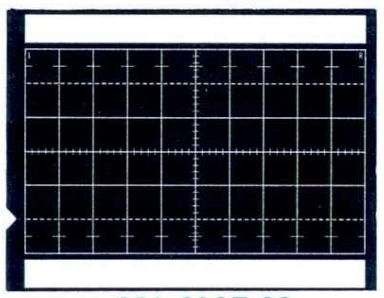
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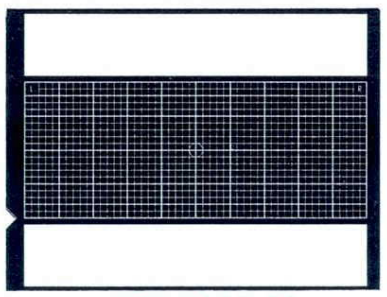
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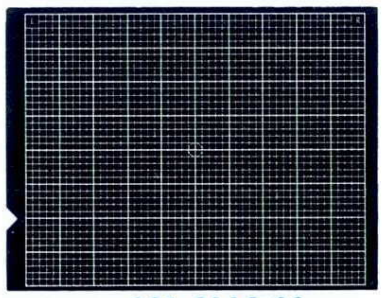
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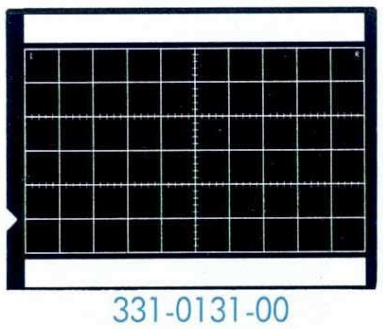
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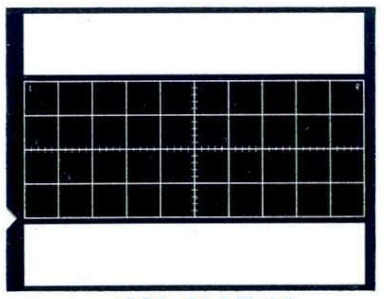
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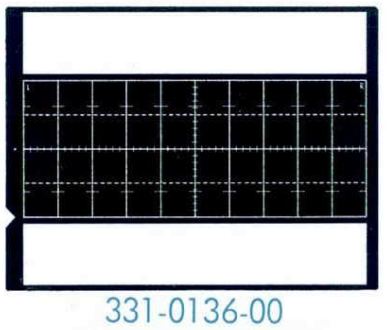
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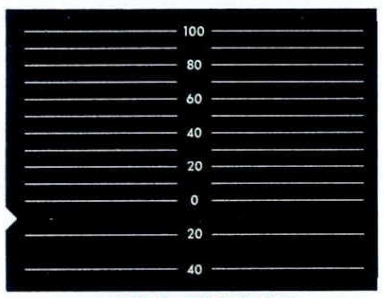

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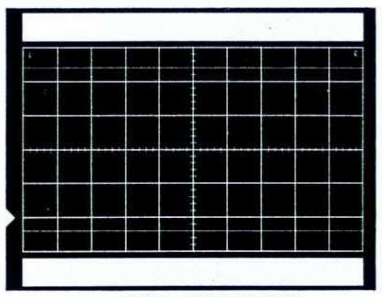
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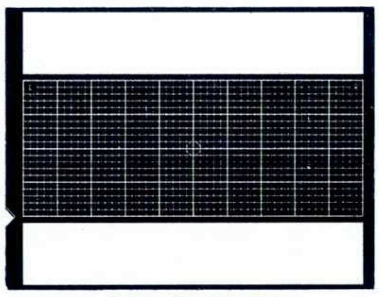
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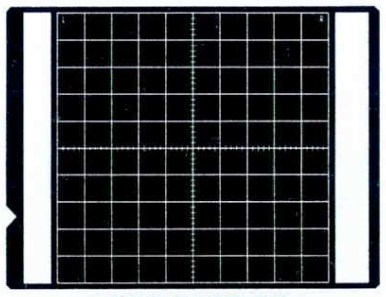
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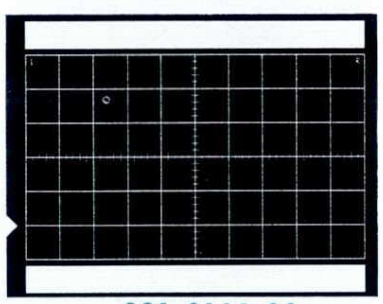
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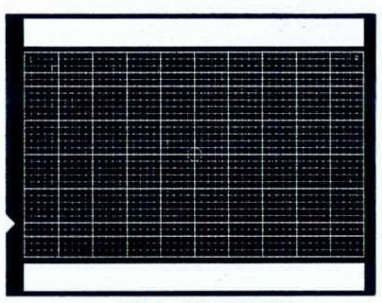
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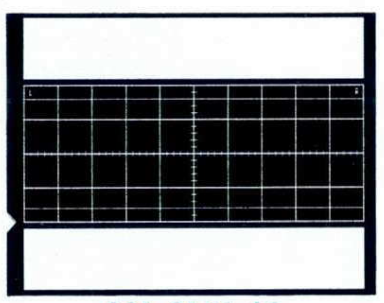
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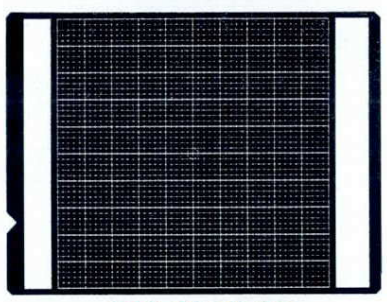

331-0128-00

GRATICULE SLIDES
$3 each

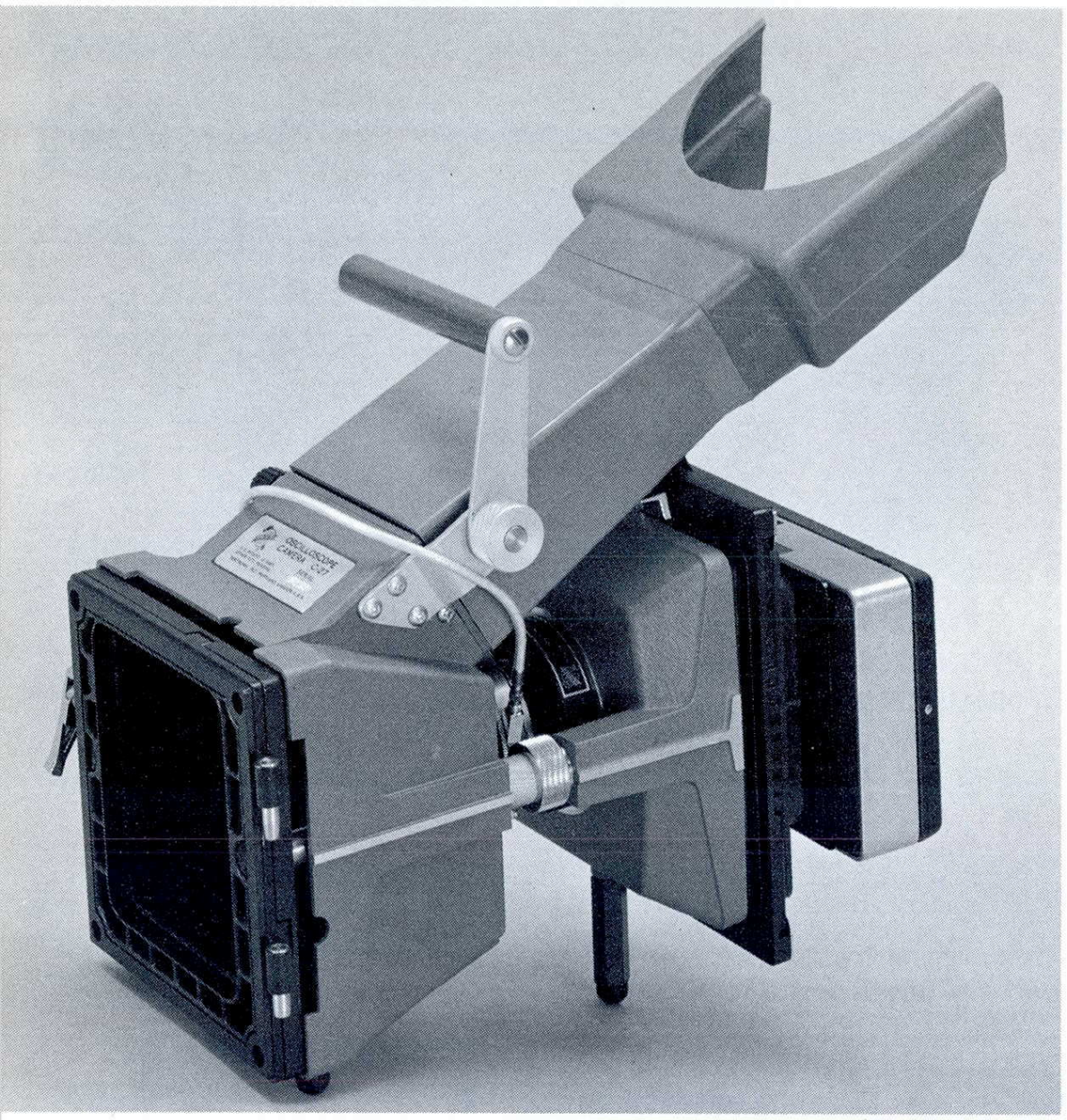
Amber Window
122-0669-00

Blue Window
122-0667-00

Green Window
122-0668-00

Cameras

STANDARD C-27 CAMERA



The C-27 Camera combines general-purpose utility and performance in a design compact enough for multiple stacking on 7" Rack-Mount Oscilloscopes.

Direct binocular viewing is featured. For stacking, the viewing tunnel is removed and the carrying handle folded out of the way. The camera frame can be rotated 90° or 180° to view from the top, bottom, or either side. The f/1.9—1:0.85 lens supplied with the Standard C-27 offers an ideal compromise of writing rate and image size (8 x 10-cm on 3¼ x 4¼ film or 10 x 10-cm coverage on 4 x 5 film) in a moderately-priced camera.

The Polaroid Land Pack-Film Back offers convenient loading and picture development outside the camera. Dimensions overall are 13 7/32" high (only 8" with viewing tunnel removed) by 7½" wide by 13 11/32" long (only 12" with viewing tunnel removed). Net weight is 10 pounds. Shipping weight is approximately 14 pounds.

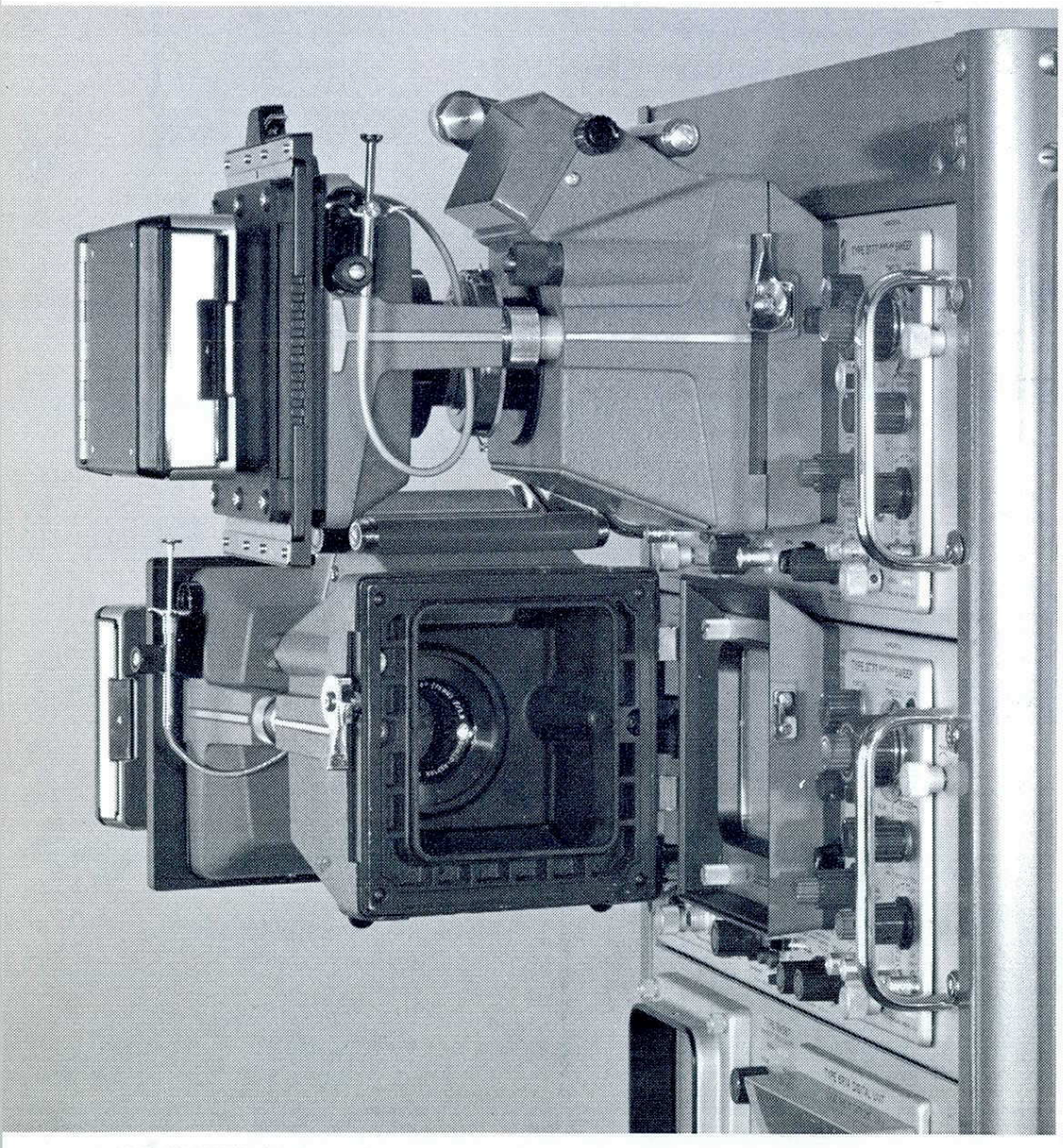
C-27 CAMERA $420

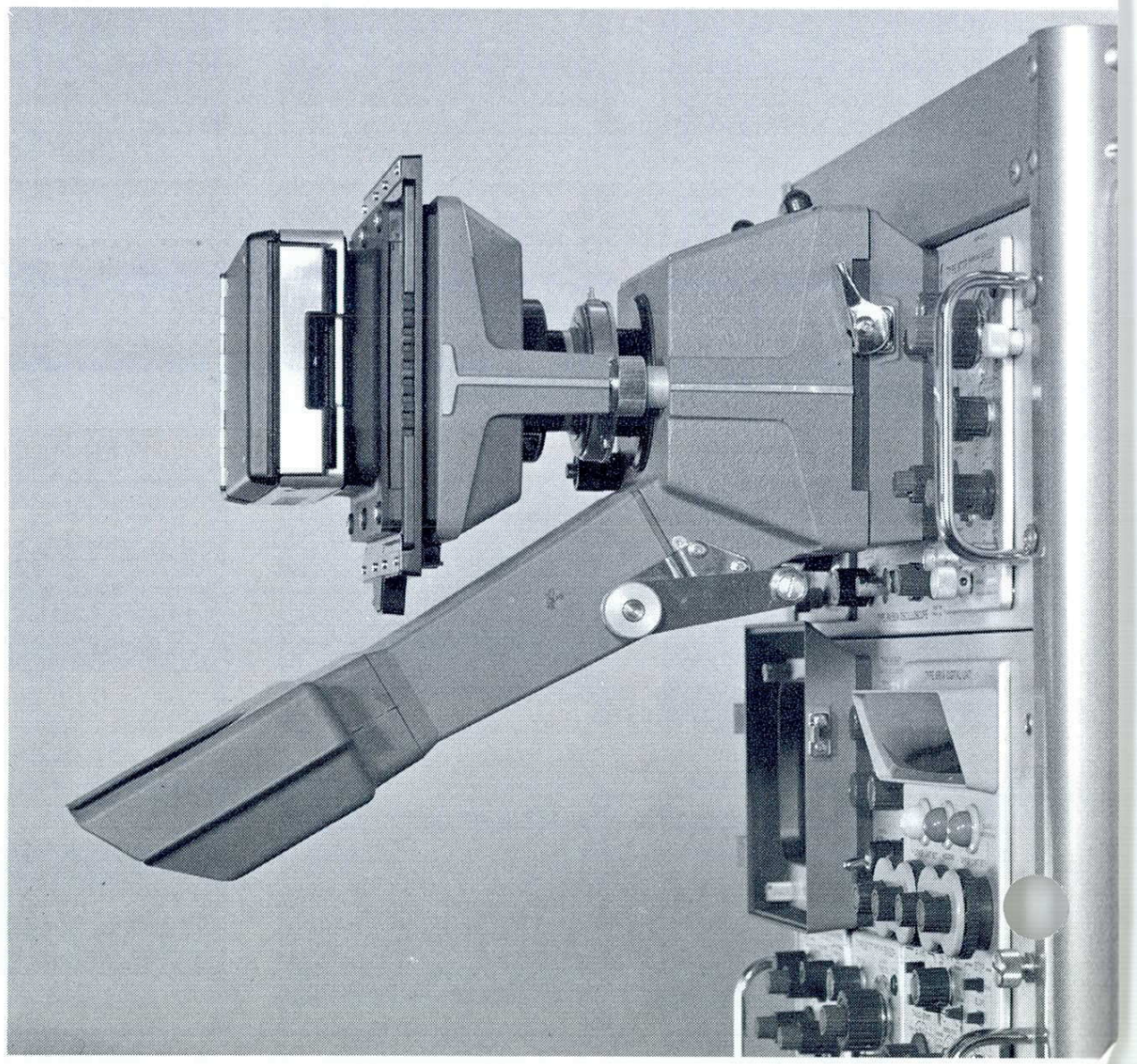
Each camera includes: 1—cable release (122-0586-00), 1—focus plate (387-0893-00), 2—instruction manuals (070-0383-00).

ROLL-FILM CAMERA identical to the Standard C-27, except a Polaroid Roll-Film Back is substituted for the Pack-Film Back.
C-27-R CAMERA $420

ELECTRICALLY-ACTUATED* CAMERA identical to the Standard C-27, but with a shutter actuator and built-in power supply. (See page 246.)
C-27-C CAMERA $575

ELECTRICALLY-ACTUATED* CAMERA with Roll-Film Back combines features of the C-27-R and C-27-S, above.
C-27-RS CAMERA $575





Cameras

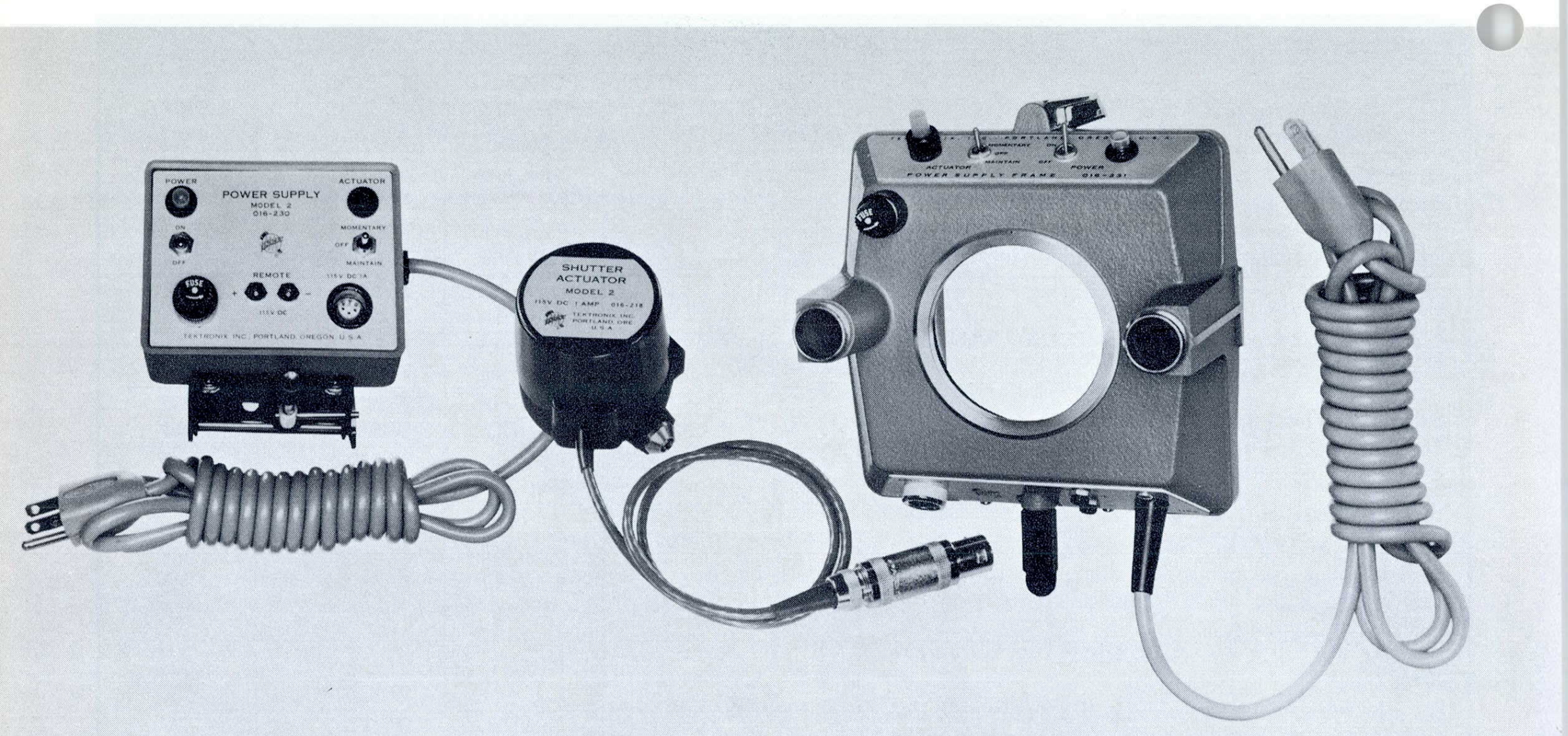
CUSTOM C-27 CAMERAS				
LENS (Writing rate factor compared to Standard f/1.9, 1:0.85 lens)	SHUTTER ACTUATOR and BUILT-IN POWER SUPPLY*	POLAROID FILM BACK	ORDER NO.	PRICE
FILM ECONOMY & MEDIUM WRF—f/1.9, 1:0.7 Records two 6 x 10-cm or three 4 x 10-cm graticules on 3¼ x 4¼ film, or one 10 x 10 cm with optional Graflok Back. Writing rate factor 1.25X Standard Lens.	No	Pack Film Roll Film	C-27-547 C-27-547 R	$440 440
	Yes	Pack Film Roll Film	C-27-547 S C-27-547 RS	595 595
GENERAL-PURPOSE—f/1.9, 1:0.9 Records an 8 x 10-cm graticule on 3¼ x 4¼ film. Writing rate factor same as Standard Lens.	No	Pack Film Roll Film	C-27-548 C-27-548 R	420 420
	Yes	Pack Film Roll Film	C-27-548 S C-27-548 RS	575 575
HIGH WRITING RATE—f/1.9, 1:0.5 Records fast-writing displays such as single-shot transients. Writing rate factor 1.5X Standard Lens.	No	Pack Film Roll Film	C-27-549 C-27-549 R	460 460
	Yes	Pack Film Roll Film	C-27-549 S C-27-549 RS	615 615
FILM & LENS ECONOMY—f/4.5, 1:0.7 Records two 6 x 10-cm or three 4 x 10-cm graticules on each film. Recommended when cost rather than writing rate is the prime consideration. Writing rate factor .25X Standard Lens.	No	Pack Film Roll Film	C-27-550 C-27-550 R	365 365
PRECISE FULL-SIZE IMAGE & HIGH WRITING RATE—f/1.4, 1:1 Records full-size image of 10 x 10-cm graticule (on 4 x 5 film with Graflok Back). Writing rate factor 1.75X Standard Lens.	No	Pack Film Roll Film	C-27-608 C-27-608 R	535 535
	Yes	Pack Film Roll Film	C-27-608 S C-27-608 RS	690 690
ULTRA-HIGH WRITING RATE—f/1.3, 1:0.5 Records two 6 x 10-cm graticules on each film. Writing rate factor 3X Standard Lens.	No	Pack Film Roll Film	C-27-662 C-27-662 R	585 585
	Yes	Pack Film Roll Film	C-27-662 S C-27-662 RS	740 740

Any Tektronix Standard or Custom Trace-Recording Camera can be ordered less back. Use suffix 'G' after the Order Number and deduct $80 from the price. 4 x 5 and 2¼ x 3¼ Graflok Backs and accessories are shown on page 245.

*Power supplies are normally wired for 115 v. For 230 v add suffix 'B' to the Order Number. Price for either is the same.

All cameras are sold less mounting bezel; order from page 244.

Cameras



SHUTTER ACTUATOR

The Shutter Actuator System (Model 2) is a rotary solenoid-operated release that closely simulates the action of a hand-operated cable release. It permits electrical actuation of most Tektronix Trace-Recording Cameras.

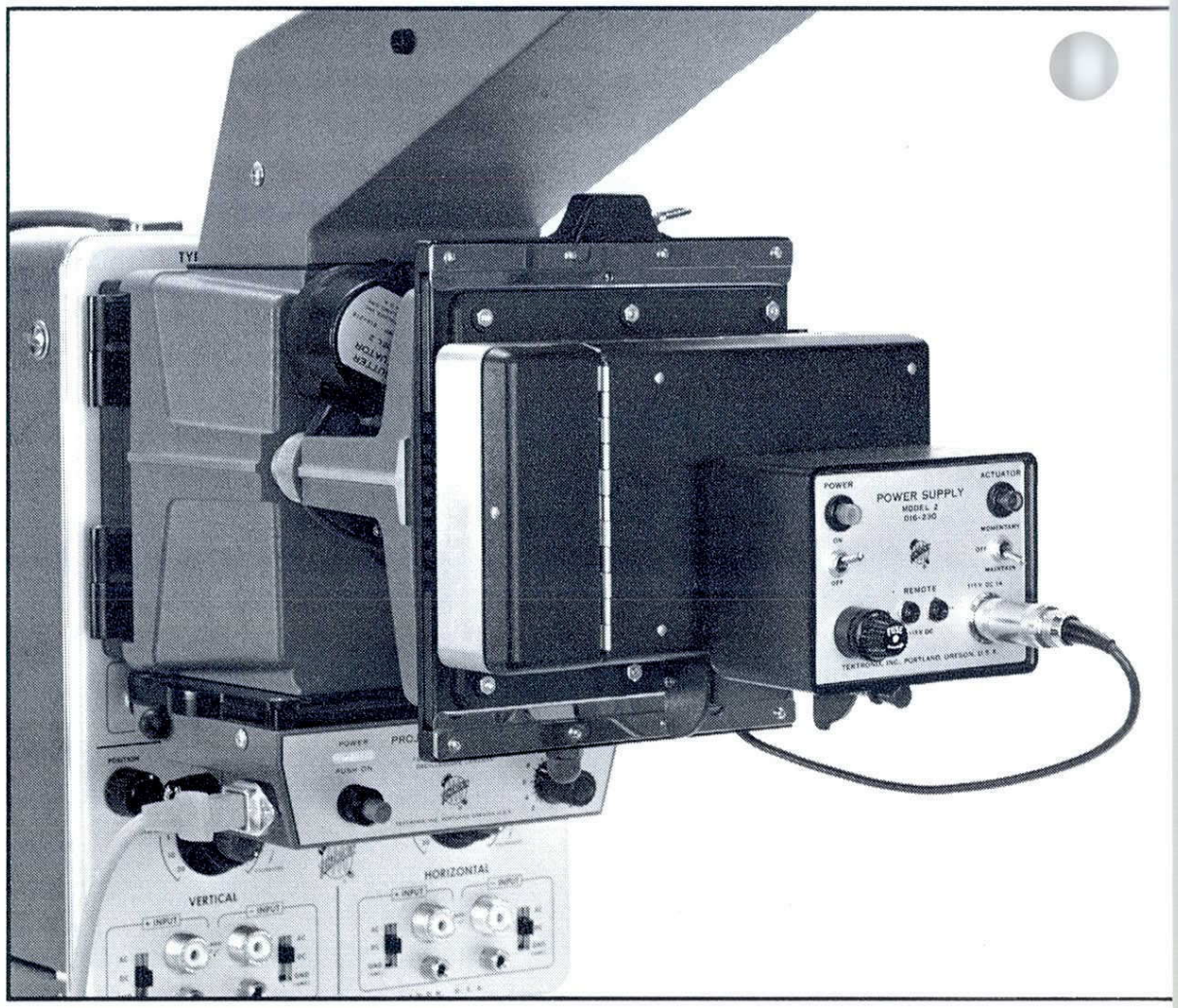
A holding circuit in the power supply allows the actuator to be energized indefinitely without overheating. This feature is especially useful in obtaining Time exposures. Several actuators can be operated simultaneously by paralleling the remote switches from the individual power supplies.

Two power supply packages are available. They are electrically identical, and differ only in mechanical configuration. One takes the place of the standard Rear Frame in the C-12, and C-27 Camera. The other is a separate small housing which can be mounted to either of the Polaroid Backs, or used remotely.

CHARACTERISTICS

The actuator mounts to the cable release bushing of the Alphax #3 and Ilex #3 shutters. It is not compatible with the Alphax #1 shutter used in the f/4.5—1:0.7 lens.

Operating time from switch contact to full open blades at 115 vac is 20 to 25 msec.



Power requirement is 115 vac, 50 to 400 cps, or 115 vdc.

Actuator for either supply (016-0218-00) ..... **$ 75**

Separate Power Supply (016-0230-00) ..... **$ 85**
Includes hinged mounting bracket (122-0713-00)

Built-in Power Supply (016-0231-00) **$125**

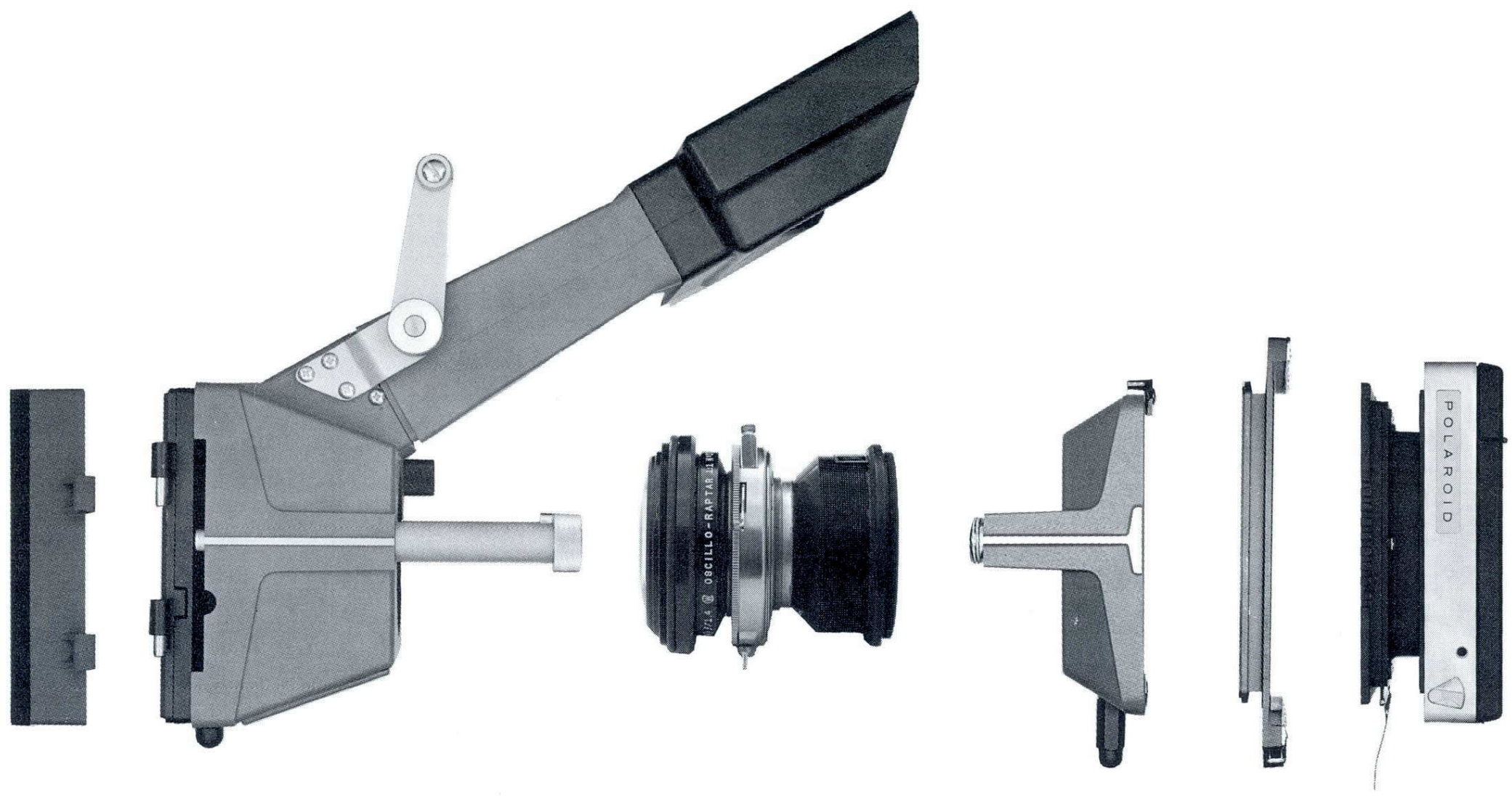
Power requirement is 230 vac, 50 to 400 cps, or 230 vdc.

Actuator for either supply (016-0235-00) ..... **$ 75**

Separate Power Supply (016-0236-00) ..... **$ 85**
Includes hinged mounting bracket (122-0713-00)

Built-in Power Supply (016-0237-00) **$125**

Cameras



Tektronix Trace-Recording Cameras are designed for maximum flexibility and easy interchange of components. A complete camera consists of an appropriate mounting bezel, main frame assembly, lens, rear frame, rotating slide adapter, and Graflok or Polaroid Land film back. Standard Camera Assemblies are described on the following pages. Variations of the standard cameras (using interchangeable lenses and backs and incorporating a shutter actuator with built-in power supply) are also available as custom cameras. Each component part can be ordered separately for further versatility or for addition to a present Tektronix Trace-Recording Camera. Your nearest Tektronix Field Office or Representative is ready to assist you in your trace-recording needs.

CAMERA BACKS AND FILM

Four different backs are available for Tektronix Trace-Recording Cameras: Polaroid 3¼ x 4¼ Pack Film and Roll Film Backs, and Graflok 4 x 5 and 2¼ x 3¼ Backs. The choice of a Camera Back will depend primarily on (1) the intended use for the photograph, (2) how quickly you want the finished photograph, (3) how large an area you wish to photograph, (4) the magnification factor of the particular lens used, and (5) the size of the positive or negative desired. If you want to obtain a negative from which a number of prints can be made, either Type 55 P/N film (which comes in Polaroid Land 4 x 5, only) or conventional film is quite satisfactory.

With either Polaroid Land or conventional films, the exposable area of the film used by the selected back must be at least as large as the image from the lens. Size will depend on the object-to-image ratio of the camera lens and on the size of the oscilloscope display. For example, the roll film back for 120 or 620 film would probably not be used with a 1:0.9 lens and a 10-cm wide oscilloscope display. This is because the image of the display is 9 centimeters wide and the exposable area (long dimension) of the film is only about 8.25 centimeters. Thus at least 7.5 mm would be cut off of the photograph. The film size should be at least 5 mm larger than the size of the image to allow for normal tolerances in the construction of the Camera Backs and for the position of the film in the back.

Available film types and film speed are other important considerations in choosing a back, especially where single-shot transients must be recorded. Polaroid Type 47 and Type 107 (roll film and pack film, respectively) each have an ASA equivalent exposure index of 3000. Polaroid Type 410 roll film is especially suited for high-speed photography. It has an ASA equivalent of 10,000. Each film type has 8 exposures, and develops in 10 seconds. Roll-film versions develop inside the film back; pack film develops outside.

Polaroid films can also be used in a Polaroid 4 x 5 film holder with the 4 x 5 Graflok Back. This combination, used with Type 57 film (3000 speed), a 1:1 lens, and a C-27 Main Frame will give full-size records of graticule areas as large as 8 x 10 cm. A Standard C-27 Camera (1:0.85 lens) equipped in the same way will make a complete record of a 10 x 10 cm graticule.

Conventional cut film and 120 roll film can be used with either the 4 x 5 or 2¼ x 3¼ Graflok Back and the proper holder or adapter. A number of film types, manufactured by Eastman Kodak, Agfa, Ansco, and others, are available in both forms, at ASA speeds of from 64 to 1250.

A detailed list of film types and characteristics of these and other films not mentioned here can be obtained from the respective manufacturer.

Cameras

MOUNTING BEZELS

Each Bezel can be used to mount the rectangular polarized viewer (016-0039-00).

FOR C-12 CAMERA

For Tektronix Oscilloscopes with round 5" crt.
Part No. 016-0226-00 . . . $15

For Tektronix 560-Series Oscilloscope with rectangular crt and Type 506.
Part No. 016-0217-00 . . . $15

For Tektronix Type 519.
Part No. 016-0239-00 . . . $25

For some Hewlett-Packard Oscilloscopes. Contact your local Tektronix Field Office or Representative.
Part No. 016-0229-00 . . . $16

FOR C-27 CAMERA

For all Tektronix Oscilloscopes with 5" round crt.
Part No. 016-0225-00 . . . $15

For all Tektronix 560-Series Oscilloscopes with rectangular crt, the Type RM529 and Type 506.
Part No. 016-0224-00 . . . $15

For Tektronix Type 647 and RM647 Oscilloscopes.
Part No. 016-0223-00 . . . $15

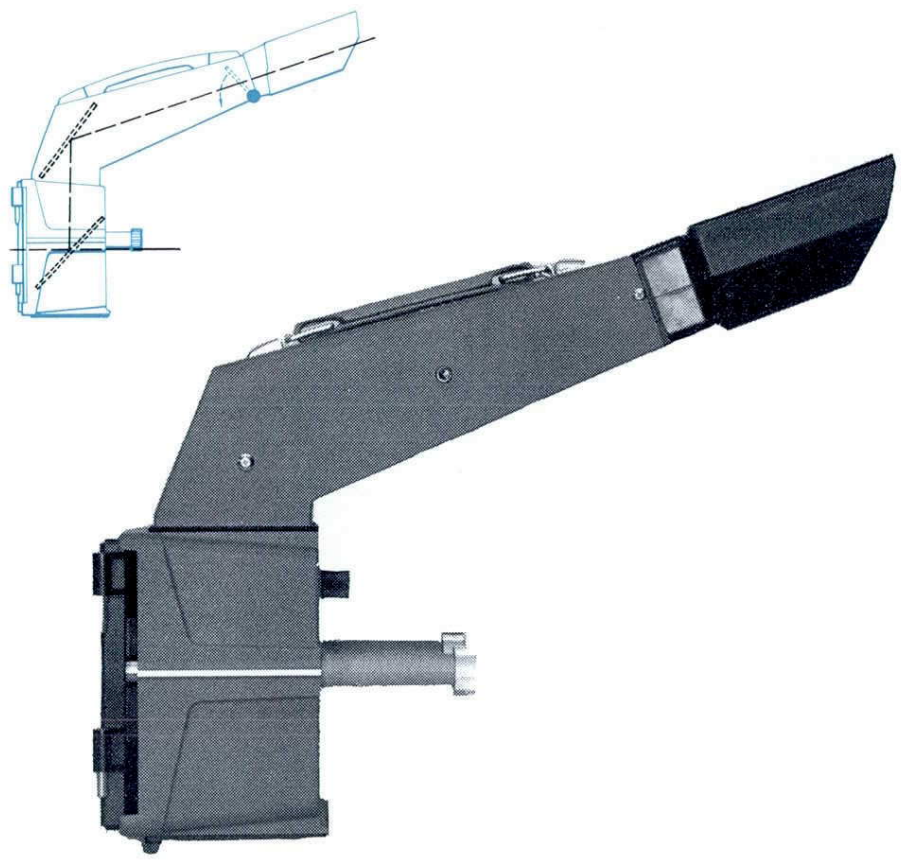
For Tektronix Type 519
Part No. 016-0240-00 . . . $25

For most models of Hewlett-Packard Oscilloscopes. Contact your local Tektronix Field Office or Representative.
Part No. 016-0228-00 . . . $15

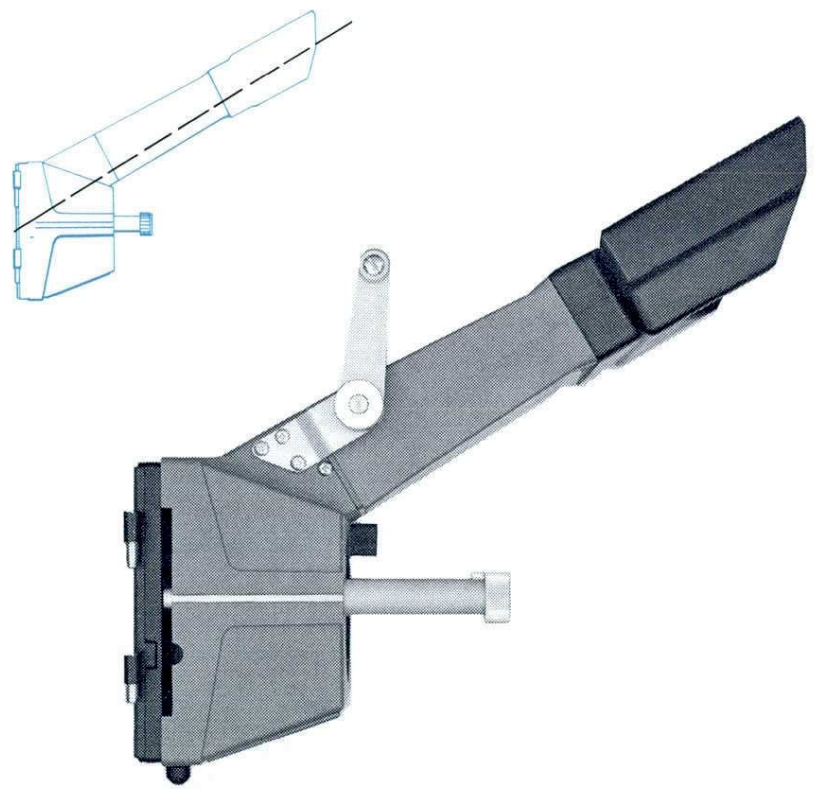
For some models of DuMont Oscilloscopes. Contact your local Tektronix Field Office or Representative.
Part No. 016-0227-00 . . . $15

MAIN FRAME ASSEMBLIES

Each Main Frame Assembly includes a cable release and standard camera instruction manual.

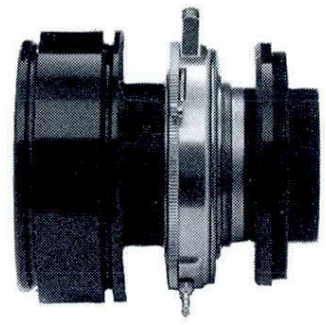


C-12 Main Frame with beam-splitting mirror and on-axis binocular viewing.
Part No. 122-0635-00 . . . . . $155

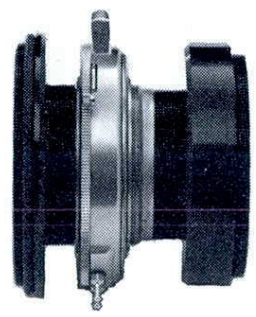


C-27 Main Frame with direct binocular viewing, removable viewing tunnel and maximum light transmission from crt to film.
Part No. 122-0676-00 . . . . . $125

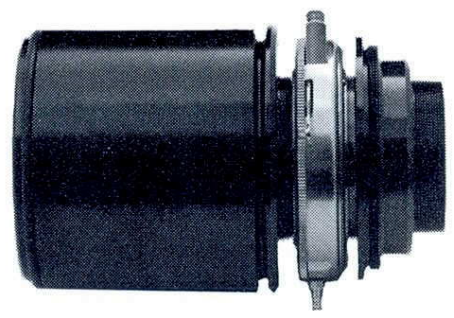
INTERCHANGEABLE LENSES



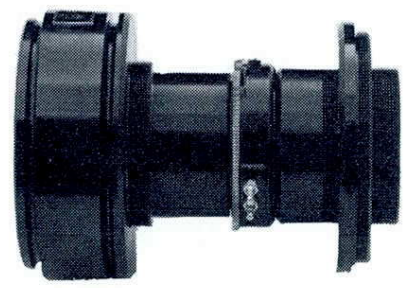
f/1.9—1:0.7
Film Economy
Medium Writing Rate
Alphax or Ilex
No. 3X Shutter
Part No. 122-0547-00 $180



f/1.9—1:0.9
General Purpose
Alphax or Ilex
No. 3X Shutter
Part No. 122-0548-00 $160



f/1.9—1:0.5
High Writing Rate
Alphax or Ilex
No. 3X Shutter
Part No. 122-0549-00 $200

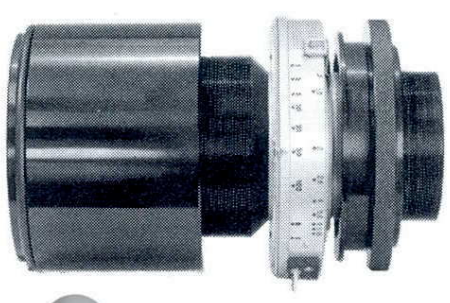


f/4.5—1:0.7
Economy of Film & Price
Alphax No. 1 Shutter
Part No. 122-0550-00 $105

Cameras

INTERCHANGEABLE LENSES

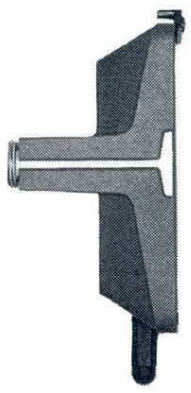
f/1.4—1:1
Precise full-size Image
High Writing Rate
Alphax No. 3 Shutter
Part No. 122-0608-00 $275



f/2—1:0.5
Ultra-High Writing Rate
Ilex No. 3X Shutter
Part No. 122-0662-00 $325

f/1.9—1:0.85
General Purpose
Alphax or Ilex
No. 3X Shutter
Part No. 122-0692-00 $160

REAR FRAMES



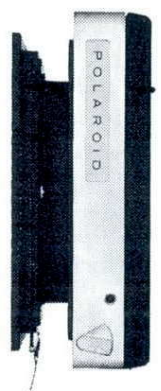
Standard Frame
Part No. 122-0591-00 $45

Power Supply Frame for Model 2 Shutter Actuator
Refer to page 242.

ROTATING SLIDE ADAPTER

Adapts Polaroid or Graflok Back to rear frame.
Part No. 122-0602-00 $25

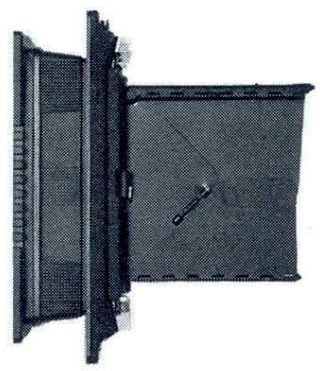
INTERCHANGEABLE FILM BACKS



Polaroid Land 3¼ x 4¼
Pack-Film Back, 8 exp.
Part No. 122-0671-00 $ 75
Focus Plate for above.
Part. No. 387-0893-00 $5.35

Polaroid Land 3¼ x 4¼
Roll-Film Back, 8 exp.
Part No. 122-0603-00 $ 75
Focus Plate for above.
Part No. 387-0460-00 $ 5

(Focus Plates not needed if Graflok Back is available.)

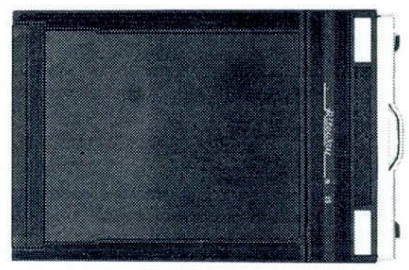


4 x 5 Graflok Back with Focusing Screen accepts standard cut-film holders film-pack adapters, roll-film (120) adapters, Polaroid 4 x 5 Film Holder.
Part No. 122-0604-00 $ 45

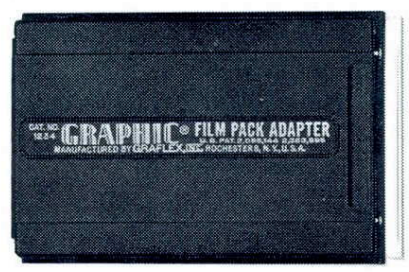
2¼ x 3¼ Graflok Back with Focusing Screen accepts standard cut-film holders, film-pack adapters, roll-film (120) adapters.
Part No. 016-0233-00 $ 45

ACCESSORIES FOR GRAFLOK BACKS

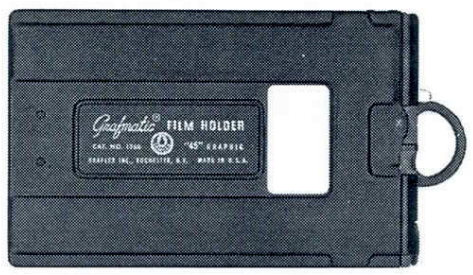
Readily available from local camera shops.



Cut-Film Holder
2 exposures



Film-Pack Adapter
12 exposures



Film Holder
6 exposures

Roll-Film Adapter "22"
12 exposures, 2¼ x 2¼, 120 film

Roll-Film Adapter "23"
8 exposures, 2¼ x 3¼, 120 film

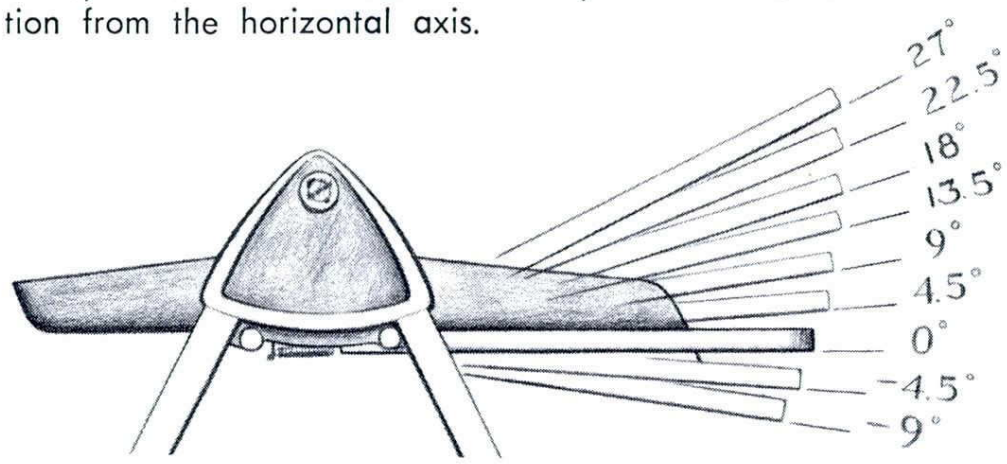
Polaroid Land 4 x 5 Film Holder.

Scope-Mobile® Carts

TYPE 200 SERIES

Five models comprise the Type 200-Series Scope-Mobile® Carts featuring tilt locking in one of nine tray positions. These tilt-lock models include the Types 201-1, 201-2, 202-1, 202-2, and 205-1. The three models ending with -1 have a storage drawer for holding accessory items. The two models ending with -2 have a storage drawer and a plug-in carrier for housing a pair of plug-in units. Three ac-receptacles are located at the rear of the storage drawer for supplying power to the oscilloscope and associated instruments. A flange around the receptacles provides convenient storage for the power cord when not in use. All tilt-lock models come equipped with front-wheel brakes.

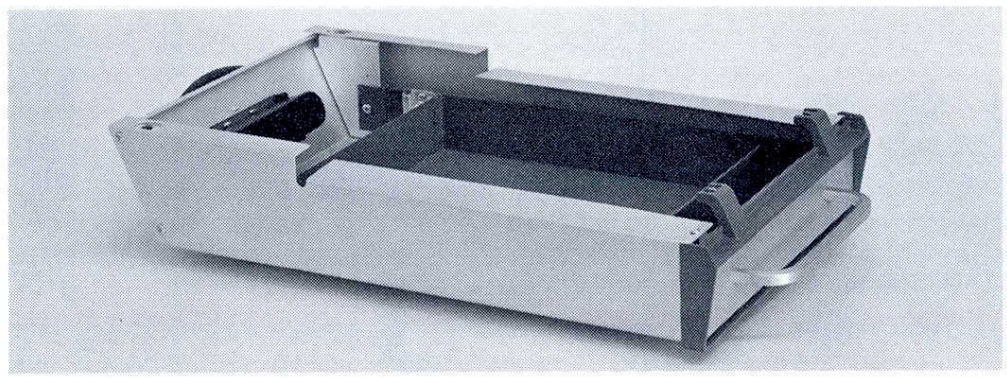
ADJUSTABLE TRAY tilt-locks in either of six 4.5° steps in the upward direction or two 4.5° steps in the downward direction from the horizontal axis.



MECHANICAL FEATURES include aluminum construction, 5-inch rubber wheels with front wheel brakes, and linoleum-topped steel shelf at the bottom.

OVERALL DIMENSIONS are approximately 36" high by 17½" wide by 28" deep for the 201-1, -2 and the 202-1, -2; 36" high by 22" wide by 28" deep for the 205-1.

Either the storage drawer or the storage drawer and plug-in carrier combination can be ordered separately to modernize older 200-Series Scope-Mobile® Carts.



014-0012-00 drawer for 201-1 ..... $40
014-0013-00 drawer/plug-in carrier combination for 201-2 .. 45
014-0014-00 drawer for 202-1 40
014-0015-00 drawer/plug-in carrier combination for 202-2 .. 45

MODEL	DRAWER	PLUG-IN CARRIER	TRAY WIDTH	TRAY DESIGNED FOR TEKTRONIX OSCILLOSCOPE TYPE	NET WEIGHT	PRICE
201-1	YES	NO	10½"	503, 504, 506, 515A 516, 561, 561A 564, 647	38 lbs.	$120.00
201-2		2, 3, 9, 10 and 11 Series	10½"			130.00
202-1 MOD 52		NO	14¾"	519		155.00
202-1		NO	14"	502A*, 507, 517, 517A, 530, 540, 550, 580 Series; 570, 575, 661.		120.00
202-2		1, 80 and Letter Series	14"			130.00
205-1		NO	17¾"	565, 567, AND ALL RACK-MOUNT INSTRUMENTS	43 lbs.	135.00

* Requires special adapter, part no 040-0365-00 ..... $ 2.15

PRINTED IN USA

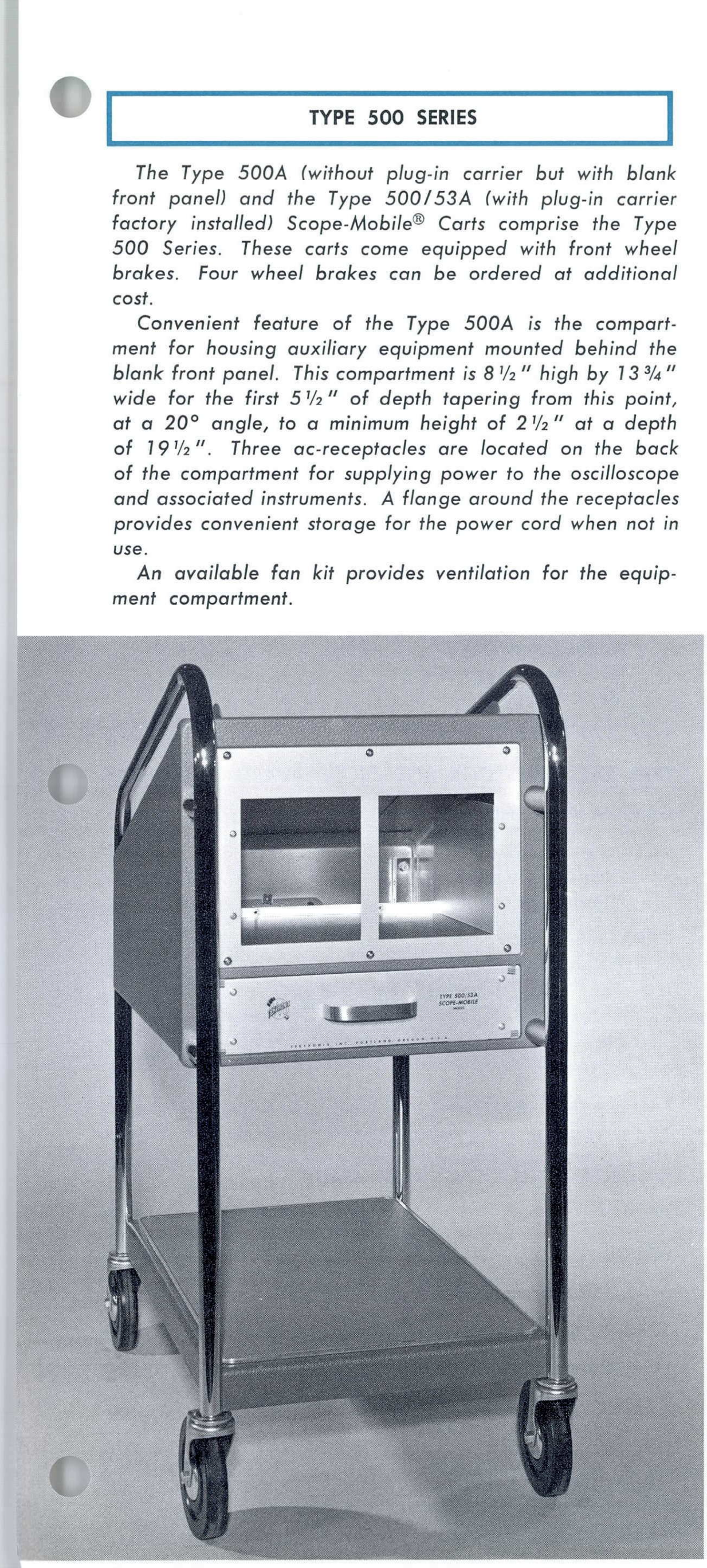
Scope-Mobile® Carts

TYPE 500 SERIES

The Type 500A (without plug-in carrier but with blank front panel) and the Type 500/53A (with plug-in carrier factory installed) Scope-Mobile® Carts comprise the Type 500 Series. These carts come equipped with front wheel brakes. Four wheel brakes can be ordered at additional cost.

Convenient feature of the Type 500A is the compartment for housing auxiliary equipment mounted behind the blank front panel. This compartment is 8½" high by 13¾" wide for the first 5½" of depth tapering from this point, at a 20° angle, to a minimum height of 2½" at a depth of 19½". Three ac-receptacles are located on the back of the compartment for supplying power to the oscilloscope and associated instruments. A flange around the receptacles provides convenient storage for the power cord when not in use.

An available fan kit provides ventilation for the equipment compartment.



STATIONARY TRAY slants upward at a 20° angle.

TRAY WIDTH is 13¾ inches.

STORAGE DRAWER is felt-lined and slides on nylon guides, provides handy storage for accessory items, such as probes, cables, and manuals.

NET WEIGHT is approximately 35 pounds.

Type		Price
500A	without plug-in carrier	$ 99.50
500A Export*	without plug-in carrier	99.50
500/53A	with plug-in carrier	110.00
500/53A Export*	with plug-in carrier	110.00

*Modified for export packaging

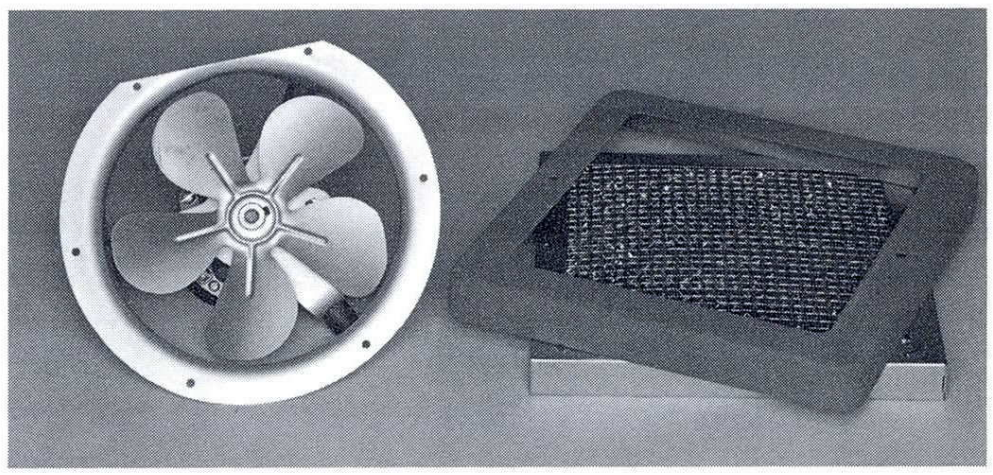
FOUR WHEEL BRAKES

TYPE 500A MOD 741B $114.50
TYPE 500/53A MOD 741B 125.00

PLUG-IN CARRIER
(can be ordered separately)

This carrier replaces the blank panel on the Type 500A and provides storage space for two letter or 80-series plug-in units. Order Part Number 014-0005-00 ..... $10.50

FAN KIT



This fan kit provides forced-air ventilation for the instruments housed in the equipment compartment. The kit contains a motor, 5-inch blade, filter, and necessary mounting hardware. Order Part Number 040-0161-00 ..... $20.40

SPECIAL TRAYS

Special trays furnish a secure positioning mount for Tektronix Oscilloscopes smaller in size than those for which the Scope-Mobile® Cart was intended.

Oscilloscopes	*Part Number*	*Price*
502A	436-0019-00	$4.55
503, 504, 515A, 516, 561A, 564	436-0058-00	9.75

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PRINTED IN U.S.A.

PROBE-INSTRUMENT COMPATIBILITY CHART

	CT-1, P6040	CT-2, P6041	CT-3	P6016	P6038	P6034 P6035	P6027 P6028	P6023	P6013 P6015	P6008 P6009	P6010	P6011	P6006 P6007	P6032	P500CF**	P500CF	P170CF*	P170CF
OSCILLOSCOPES																		
310A		X		X			X		X			X	X		0		0	
317		X		X			X		X			X	X		0		0	
RM17		X		X			X		X			X	X		0		0	
321		X		X			X		X			X	X		0		0	
321A		X		X			X		X			X	X		0		0	
360		X		X			X		X			X	X		0		0	
422		X		X			X		X			X	X		0		0	
502A		0		X			X	X	X			X	X		0		0	
503		0		X			X	X	X			X	X		0		0	
RM503		0		X			X	X	X			X	X		0		0	
504		0		X			X		X			X	X		0		0	
RM504		0		X			X		X			X	X		0		0	
515A		X		X			X		X			X	X		0		0	
RM15		X		X			X		X			X	X		0		0	
516		X		X			X		X			X	X		0		0	
517A	0	0	0															X
519	0	0	0			0												
524AD							X					X	X			X		
525							X					X	X					
526							X					X						
527							X					X						
RM527							X					X						
RM529							X					X						
PLUG-IN UNITS																		
B		X		X			X		X			X	X		0		0	
CA		X		X			X	0	X		0	X	X		0		0	
D		X		X			X	X	X			X	X		0		0	
G		X		X			X	X	X			X	X		0		0	
H		X		X			X		X			X	X		0		0	
K		X		X			X		X		0	X	X		0		0	
L		X		X			X		X		0	X	X		0		0	
M		X		X			X		X			X	X		0		0	
N	X	0	X			0												
O		X		X			X		X			X	X		0		0	
W		X		X				X	0				0		0		0	
Z		X		X				X	0				0		0		0	
1A1	0	X	0	X		0	X		X	X	X	X	0		0		0	
1A2	0	X	0	X		0	X		X	X	X	X	0		0		0	
1S1	X	0	X			X								X				
2A60		X		X			X		X			X	X		0		0	
2A63		X		X			X	X	X			X	X		0		0	
3A1		X		X			X	0	X			X	X		0		0	
3A2		X		X			X		X			X	X		0		0	
3A3		X		X				X	X				0		0		0	
3A6		X		X				0	X				X		0		0	
3A72		X		X			X	0	X			X	X		0		0	
3A74		X		X			X		X			X	X		0		0	
3A75		X		X			X		X			X	X		0		0	
10A1	0	X	0	X				X	0				0		0			
10A2	0	X	0	0		0	X		X	X	X	X	X		0		0	
82	0	X	0	0		0			X	X	X	0	0		0		0	
86	0	X	0	0		0		X	X	X	X	0	0		0		0	
3S76	X	0	X	X		X								X				
3S3	X	0	X		X													
4S1	X	0	X			X								X				
4S2	X	0	X		X	X								X				
4S3	X	0	X															
9A1		X		X			X	0	X			X	X		0		0	
9A2		X		X			X	0	X			X	X		0		0	
AMPLIFIERS																		
123							X								0		0	
1121							X						X		0			X

* *With 128 Power Supply and 170 Ω Termination*

** *With 128 Power Supply*

X *Recommended*

O *These combinations have limitations, but they may be very useful in certain applications.*

Accessories

PROBES

Tektronix manufactures both active and passive probes for broadening the applications of Tektronix preamplifiers and oscilloscopes.

A prime consideration in selecting a probe is the attenuation ratio. Probe attenuation allows the measurement of signals that would otherwise over-drive the preamplifier or oscilloscope. In addition, the higher input resistance and lower input capacitance associated with the attenuation reduces the loading effect of the oscilloscope on the circuit under test.

To help you select the right probe for your application, the probes have been grouped in three categories: general purpose, special purpose, and sampling. The following factors should be considered in making your selection:

1. Be sure the desired probe will match the input resistance and capacitance of the oscilloscope used, and is equipped with the proper connector.

2. For RF (CW) or high-voltage applications, select a probe with an adequate RF or HV rating. Most probes require derating for RF work, due to heating effects.

3. Select a probe with adequate risetime and bandwidth for the oscilloscope and application.

4. When considering high input impedance, select the shortest cable length, highest attenuation probe compatible with the application. The probe with the lowest input capacitance will generally provide the most accurate measurements.

When ordering any probe, please designate not only the type but also the nine-digit part number.

If you desire help in selecting the right probe for your application, please consult your Tektronix Field Engineer.

GENERAL PURPOSE PROBES

P6006 10X PASSIVE PROBE

The Type P6006 low input-capacitance probe has improved design and electrical characteristics over its predecessors, the Types P6000, P6003, P6017, and P6022 Probes.

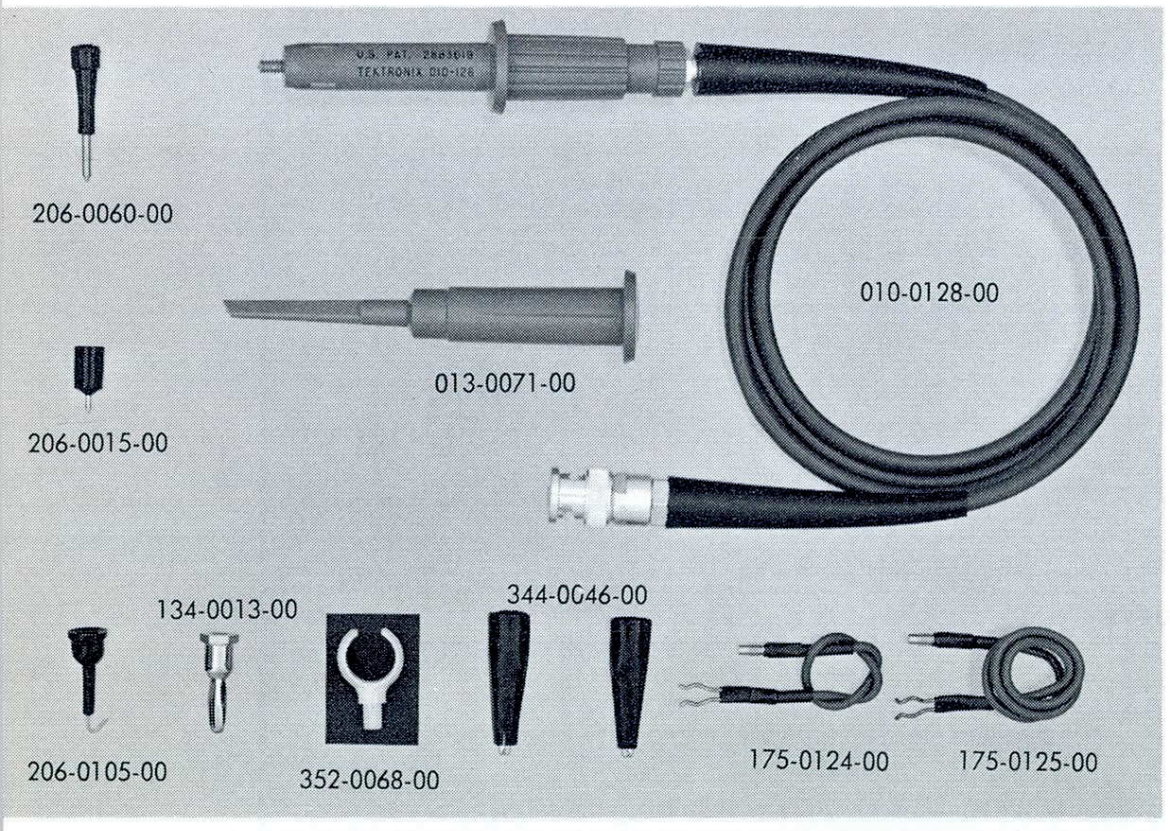
By rotating the probe body with respect to its base, the probe time-constant can be made equal to the input time-constant of the oscilloscope or plug-in unit.

At no additional cost, the probe is available with 6′, 9′ and 12′ cable lengths in addition to the standard 3.5′ cable length, with either BNC or UHF connectors. UHF to BNC adapters are available from your local supplier or Tektronix, Inc.

ATTENUATION RATIO is 10X.

INPUT RESISTANCE is 10 megohms.

INPUT CAPACITANCE for standard length probe is approximately 7 pf when used with an instrument having a 20 pf input capacitance and approximately 9.5 pf when used with an instrument having a 47 pf input capacitance.



PROBE RISETIME is approximately 5 nsec.

TYPICAL RISETIME of probe, Type K Plug-In Unit, and Type 540-Series Oscilloscope is 13 nsec.

VOLTAGE RATING is 600 v dc or ac pk-to-pk.*

STANDARD CABLE is 3.5′ long, terminated with BNC or UHF connector.

P6006 PROBE PACKAGE (010-0127-00 BNC or 010-0125-00 UHF) $22

Includes:

1—P6006 probe, 010-0128-00 BNC or 010-0126-00 UHF
1—straight tip, 206-0015-00
1—hook tip, 206-0105-00
1—pincher tip, 013-0071-00
1—spring tip, 206-0060-00
1—banana plug, 134-0013-00
2—minigator clips, 344-0046-00
1—probe holder, 352-0068-00
1—5″ ground lead, 175-0124-00
1—12″ ground lead, 175-0125-00
1—instruction manual, 070-0381-00

*Peak-to-peak voltage derating is necessary for CW frequencies higher than 5.7 Mc when working into a 20 pf input, or higher than 3.6 Mc when working into a 47 pf input.

ADDITIONAL CABLE LENGTH P6006 PROBE PACKAGE WITH CORRESPONDING INPUT C.

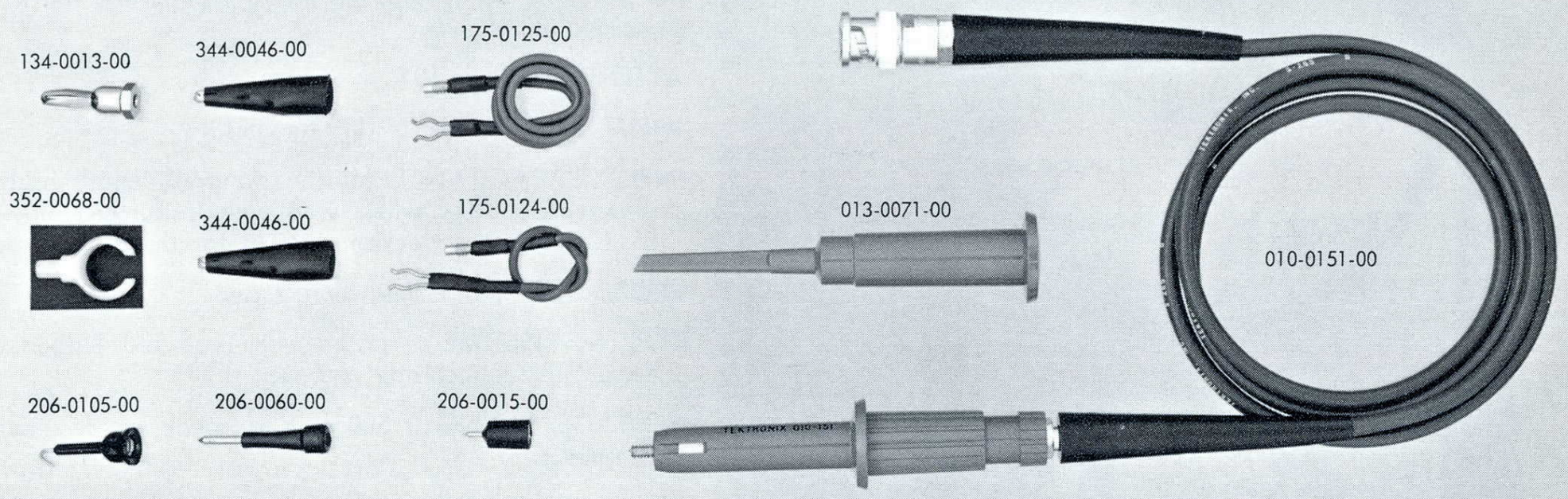
Cable Length	Input C		Part Number		Price
	20 pf	47 pf	BNC Connector	UHF Connector	
6′	8.5 pf	11.0 pf	010-0160-00	010-0158-00	$22
9′	11.0 pf	13.5 pf	010-0146-00	010-0142-00	22
12′	13.0 pf	15.5 pf	010-0148-00	010-0144-00	22

REPLACEMENT PROBES (without tips and ground leads)

Cable Length	Part Number		Price
	BNC Connector	UHF Connector	
3.5′	010-0128-00	010-0126-00	$19.50
6′	010-0161-00	010-0159-00	19.50
9′	010-0147-00	010-0143-00	19.50
12′	010-0149-00	010-0145-00	19.50

SEE PAGE 249 FOR PROBE COMPATIBILITY

P6007 100X PASSIVE PROBE



The Type P6007 low input-capacitance probe has improved overall design and electrical characteristics over its predecessors, the Types P6002 and P6005 Probes.

By rotating the probe body with respect to its base, the probe time constant can be made equal to the input time constant of the oscilloscope or plug-in unit.

At no additional cost, the probe is available with 6', 9', and 12' cable lengths in addition to the standard 3.5' cable length with either BNC or UHF connectors. UHF to BNC adapters are available from your local supplier or Tektronix Inc.

ATTENUATION RATIO is 100X.

INPUT RESISTANCE is 10 megohms.

INPUT CAPACITANCE for a standard length probe is approximately 2.0 pf when used with an instrument having a 20 pf input capacitance and approximately 2.3 pf when used with an instrument having a 47 pf input capacitance.

PROBE RISETIME is approximately 7 nsec.

TYPICAL RISETIME of probe, Type K Plug-In Unit, and Type 540-Series Oscilloscope is 13 nsec.

VOLTAGE RATING is 1.5 kv dc or ac rms, 4.2 kv ac pk-to-pk.*

STANDARD CABLE is 3.5′ long, terminated with BNC or UHF connector.

*Peak-to-peak voltage derating is necessary for CW frequencies higher than 200 kc. At 10 Mc, the maximum allowable pk-to-pk voltage is 2 kv. Above 10 Mc, additional derating is required depending on the input capacitance of the plug-in or instrument used.

P6007 PROBE PACKAGE
(010-0150-00 BNC or 010-0134-00 UHF) $22

Includes:
- 1—P6007 probe, 010-0151-00 BNC or 010-0135-00 UHF
- 1—straight tip, 206-0015-00
- 1—hook tip, 206-0105-00
- 1—pincher tip, 013-0071-00
- 1—spring tip, 206-0060-00
- 1—banana plug, 134-0013-00
- 2—minigator clips, 344-0046-00
- 1—probe holder, 352-0068-00
- 1—5″ ground lead, 175-0124-00
- 1—12″ ground lead, 175-0125-00
- 1—instruction manual, 070-0381-00

ADDITIONAL CABLE LENGTH P6007 PROBE PACKAGE WITH CORRESPONDING INPUT C.

Cable Length	Input C		Part Number		Price
	20 pf	47 pf	BNC Connector	UHF Connector	
6′	2.2	2.5	010-0165-00	010-0162-00	$22.00
9′	2.4	2.7	010-0152-00	010-0136-00	22.00
12′	2.6	2.8	010-0154-00	010-0138-00	22.00

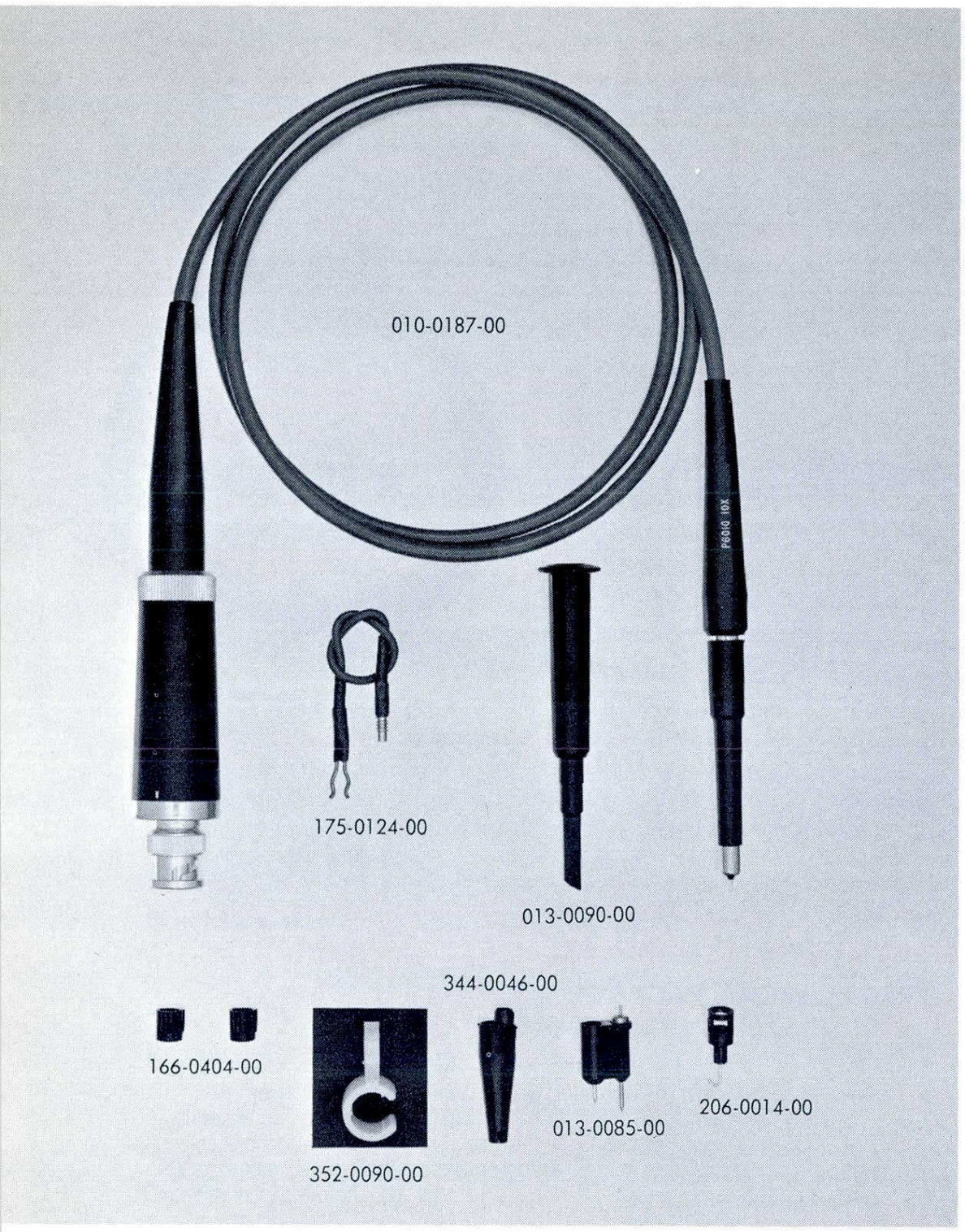
REPLACEMENT PROBES (without Tips and Ground Leads).

Cable Length	BNC Connector	UHF Connector	Price
3.5′	010-0151-00	010-0135-00	$19.50
6′	010-0166-00	010-0163-00	19.50
9′	010-0153-00	010-0137-00	19.50
12′	010-0155-00	010-0139-00	19.50

SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P6010 10X PASSIVE PROBE



The new P6010 is a miniature passive probe designed for use with Tektronix wide-band oscilloscopes. The probe is easily compensated for use with any instrument having an input capacitance of 14 to 21 pf.

Extra small in size, the P6010 is well suited for servicing subminiature circuits where easy access is required. In addition to the standard 3.5′ length, the probe is available with a 6′ cable at no additional cost.

ATTENUATION is 10X.

INPUT RESISTANCE is 10 megohms.

INPUT CAPACITANCE for the standard length probe is approximately 10 pf when used with instruments having a 14 to 21 pf input capacitance; 12 pf for the 6′ version.

PROBE RISETIME is less than 2 nsec.

TYPICAL RISETIME of probe with Type 1A1 Plug-In Unit and Type 547 Oscilloscope is 7 nsec.

VOLTAGE RATING is 500 v dc, ac peak, or dc and ac peak combined.*

STANDARD CABLE is 3.5′ long, terminated with a BNC connector.

P6010 3.5′ PROBE PACKAGE (010-0188-00) $30.00

P6010 6′ PROBE PACKAGE (010-0185-00) $30.00

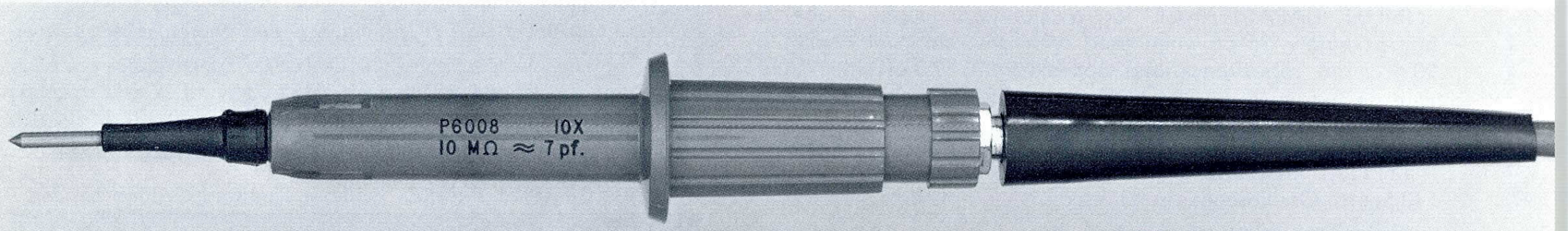
Includes:

- 1—P6010 probe, 010-0187-00 or 010-0184-00
- 1—hook tip, 206-0014-00
- 1—pincher, tip, 013-0090-00
- 1—bayonet ground adapter, 013-0085-00
- 1—minigator clip, 344-0046-00
- 1—probe holder, 352-0090-00
- 1—5″ ground lead, 175-0124-00
- 2—insulating tubes, 166-0404-00
- 1—instruction manual, 070-0495-00

P6010 3.5′ PROBE ONLY (010-0187-00) $25.00

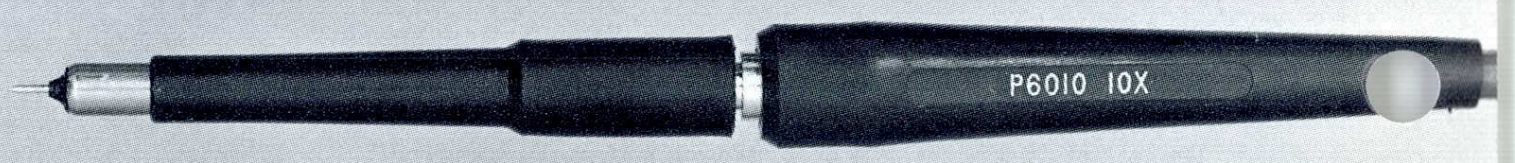
P6010 6′ PROBE ONLY (010-0184-00) $25.00

*Peak voltage derating is necessary for CW frequencies higher than 2.5 Mc. At 20 Mc, the maximum allowable peak voltage is 175 v; 60 v at 60 Mc.



(ACTUAL SIZE)

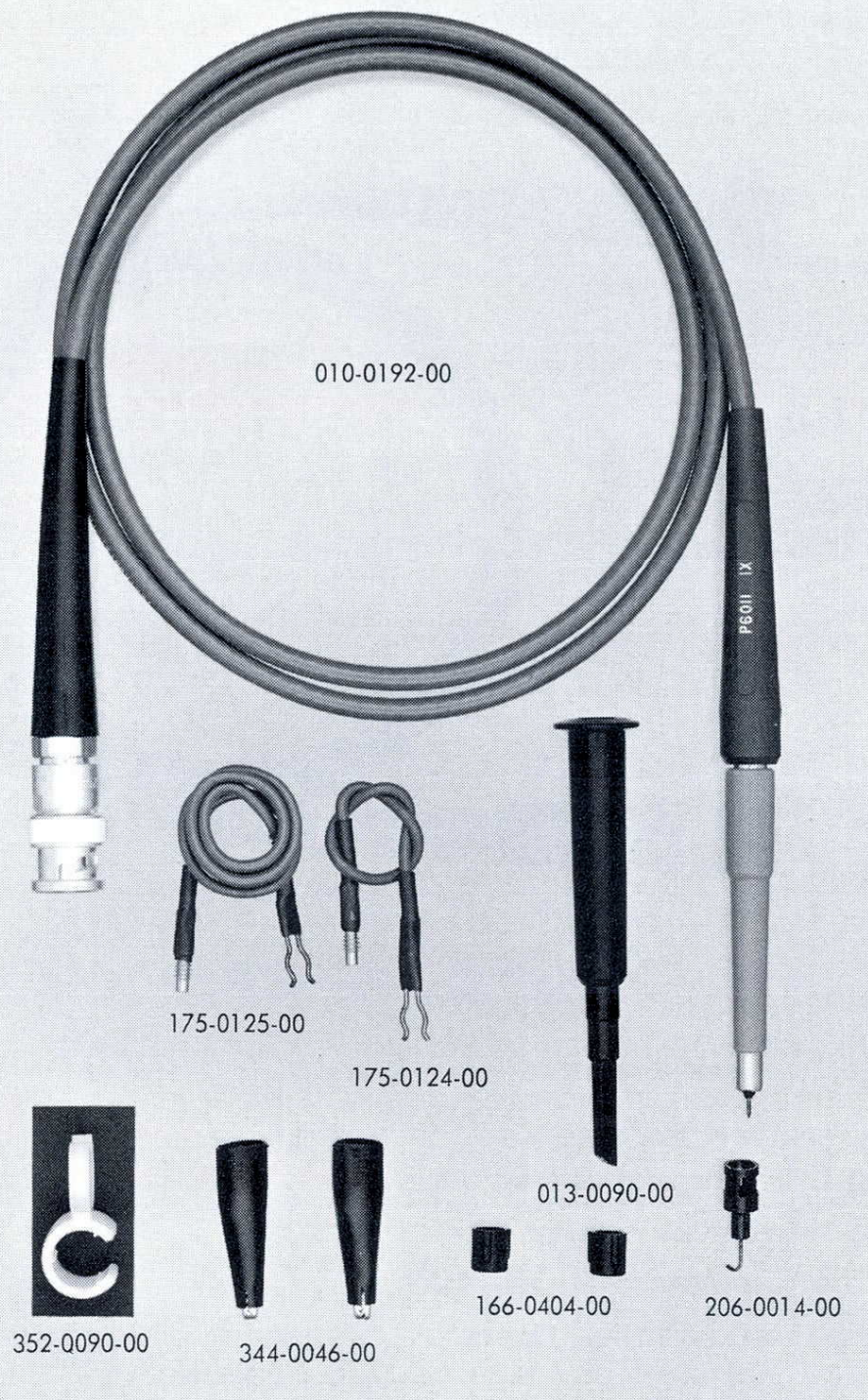
THIS PHOTO SHOWS THE SMALL SIZE OF THE P6010 OR P6011 IN COMPARISON WITH A CONVENTIONAL PROBE.



SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P6011 1X PASSIVE PROBE



Similar to the P6010 in design, the new P6011 1X Passive Probe can be used with all Tektronix general-purpose oscilloscopes. Like the P6010, the small size of the probe body makes it ideal for working on compact circuitry.

The probe cable utilizes a resistive center conductor for damping critical reflections, insuring maximum bandwidth. In addition to the standard 3.5′ length, the probe is available with a 6′ cable at no additional cost.

ATTENUATION is 1X.

INPUT RESISTANCE is 1 megohm.

INPUT CAPACITANCE for the standard length probe is approximately 28 pf; 48 pf for the 6′ version, instrument excluded.

PROBE RISETIME for the standard cable length is less than 12 nsec working into a plug-in with an input capacitance of 15 pf; less than 15 nsec working into a plug-in with an input capacitance of 20 pf. The probe risetime of the 6′ version is less than 15 nsec into 15 pf or less than 17 nsec into 20 pf.

VOLTAGE RATING is 600 v dc, ac peak, or dc and ac peak combined.*

STANDARD CABLE is 3.5′ long, terminated with a BNC connector.

P6011 3.5′ PROBE PACKAGE (010-0193-00) $15.00

P6011 6′ PROBE PACKAGE (010-0190-00) $15.00

Includes:

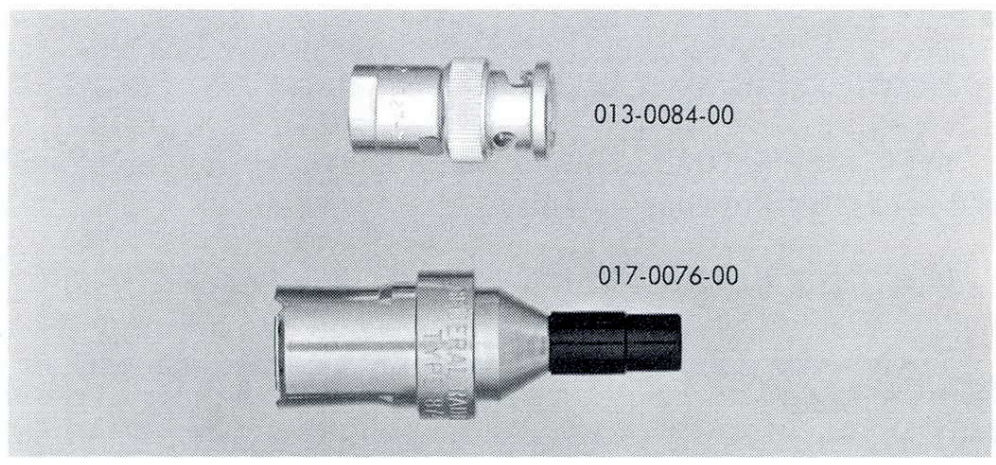
- 1—P6010 probe, 010-0189-00 or 010-0192-00
- 1—hook tip, 206-0014-00
- 1—pincher tip, 013-0090-00
- 1—minigator clip, 344-0046-00
- 1—probe holder, 352-0090-00
- 1—5″ ground lead, 175-0124-00
- 2—insulating tubes, 166-0404-00
- 1—12″ ground lead, 175-0125-00
- 1—instruction manual, 070-0512-00

P6011 3.5′ PROBE ONLY (010-0192-00) $12.00

P6011 6′ PROBE ONLY (010-0189-00) $12.00

*Peak voltage derating is necessary for CW frequencies higher than 0.5 Mc. When the probe is used with a plug-in having an input C of 20 pf, the maximum allowable peak voltage at 1 Mc is 510 v. At 5 Mc, the maximum is 100 v; 46 v at 10 Mc. When the probe is used with a plug-in having a 47 pf input, the allowable voltage will be lower by a ratio of 1.3.

OPTIONAL ACCESSORIES



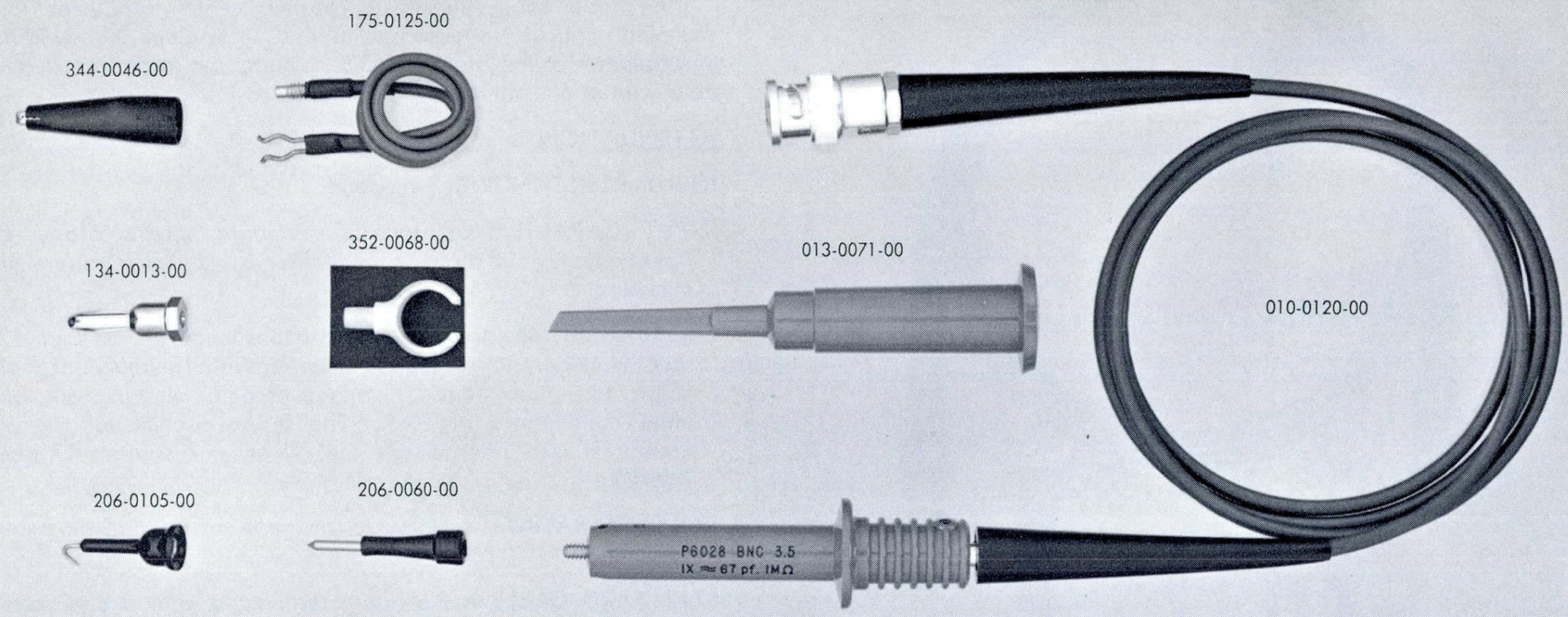
P6010 or P6011-to-BNC ADAPTER (013-0084-00) $3.00

P6010 or P6011-to- GR ADAPTER (017-0076-00) $4.50

SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P6027 and P6028 1X PROBES



The P6027 and P6028 passive probes are identical in all respects with the exception of the connectors. The P6027 uses a UHF connector. The P6028 uses a BNC connector.

In addition to the standard 3.5′ cable length, these probes are available in cable lengths of 6′, 9′, and 12′, at no additional cost. Insertion loss increases with probe cable length. For a 12′ cable length probe, insertion loss is an additional 3-db at 16 Mc.

ATTENUATION RATIO is 1X.

INPUT RESISTANCE is 1 meg.

INPUT CAPACITANCE for a standard length probe is 60 pf when used with an instrument having a 20 pf input capacitance and 87 pf when used with an instrument having a 47 pf input capacitance.

PROBE RISETIME is approximately 10 nsec.

TYPICAL RISETIME of probe, Type K Plug-In Unit, and Type 540-Series Oscilloscope is 16 nsec.

VOLTAGE RATING is 600 v dc or ac pk-to-pk.*

STANDARD CABLE is 3.5′ long, terminated with BNC or UHF connector.

*peak-to-peak voltage derating is necessary for CW frequencies higher than 1 Mc. At 10 Mc, the maximum allowable pk-to-pk voltage is 60 v.

P6027 PROBE PACKAGE
with UHF connector (010-0070-00) $12.50

P6028 PROBE PACKAGE
with BNC connector (010-0074-00) $12.50

Each probe package includes:

- 1—probe (010-0116-00) or (010-0120-00 BNC)
- 1—hook tip, 206-0105-00
- 1—pincher tip, 013-0071-00
- 1—spring tip, 206-0060-00
- 1—banana plug, 134-0013-00
- 1—minigator clip, 344-0046-00
- 1—probe holder, 352-0068-00
- 1—12″ ground lead, 175-0125-00
- 1—parts list

REPLACEMENT PROBES (without tips and ground leads)

Cable Length	Part Number		Price
	P6027	P6028	
3.5′	010-0116-00	010-0120-00	$9.45
6′	010-0117-00	010-0121-00	9.45
9′	010-0118-00	010-0122-00	9.45
12′	010-0119-00	010-0123-00	9.45

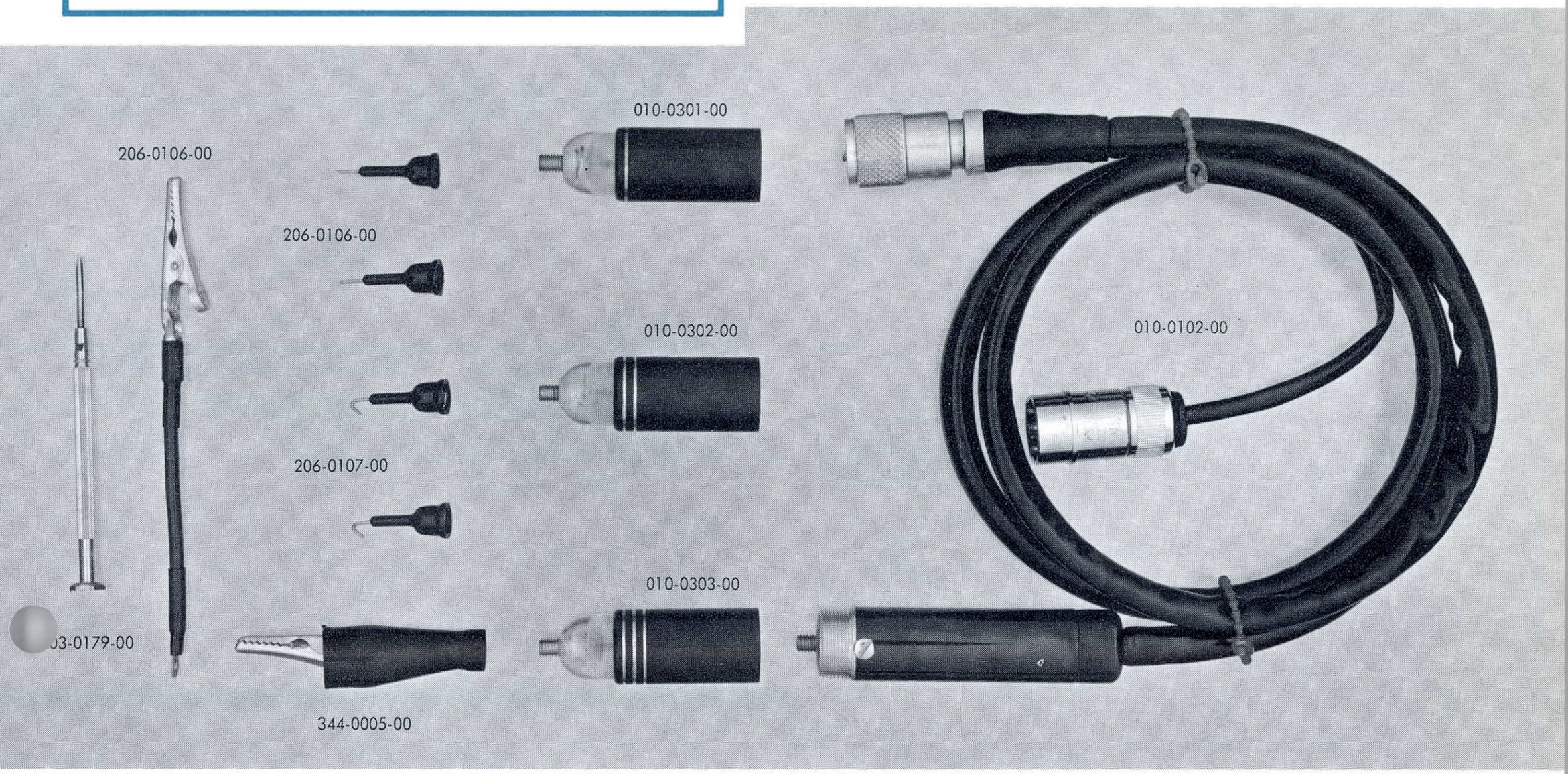
P6027 and P6028 PROBES *with over 3.5′ cable lengths*

Probe	Cable Length	Con-nector	Part No.	Input Capacitance		Price
				Min-pf	Max-pf	
P6027	6 ft.	UHF	010-0071-00	83.0	110.0	$12.50
P6028		BNC	010-0075-00			
P6027	9 ft.	UHF	010-0072-00	110.0	137.0	$12.50
P6028		BNC	010-0076-00			
P6027	12 ft.	UHF	010-0073-00	138.0	165.0	$12.50
P6028		BNC	010-0077-00			

SEE PAGE 249 FOR PROBE COMPATIBILITY

SPECIAL PURPOSE PROBES

P170CF CATHODE-FOLLOWER PROBE



The P170CF has been developed for use with the Tektronix Type 517A Oscilloscope. When used with oscilloscopes other than the Type 517A, the P170CF requires use of a power supply such as the Tektronix Type 128 Probe Power Supply.

The preamplifier grid line in the Type 517A acts as the 170-ohm termination for the P170CF probe. When the probe is used with oscilloscopes other than the Type 517A, the Tektronix 170-ohm terminating resistor is recommended for proper termination of the P170CF.

The probe uses three adjustable attenuator heads for attenuation ratios up to 4000X.

PROBE ALONE:

ATTENUATION is 2X.

RISETIME is less than 2 nsec.

INPUT SHUNT CAPACITANCE is 5 to 5.5 pf.

LOW FREQUENCY INPUT RESISTANCE is 12 megahoms, isolated by 0.001 μf coupling capacitor.

FREQUENCY RESPONSE is down less than 0.5 db at 65 Mc for high frequency and down 3 db at 15 cps for low frequency.

MAXIMUM VOLTAGE INPUT is $\pm$0.5 v peak.

POWER SUPPLY REQUIREMENTS are regulated + 120 v at 10 ma, regulated or unregulated 6.3 v at 150 ma.

CABLE is 3.5′ long, terminated with a UHF connector.

P170CF PROBE PACKAGE (010-0101-00 ..... $99.50

Includes:

1—P170CF probe, 010-0102-00
1—PAX-1 attenuator head, 010-0301-00
1—PAX-11 attenuator head, 010-0302-00
1—PAX-111 attenuator head, 010-0303-00
2—hook tips, 206-0107-00
2—straight tips, 206-0106-00
1—ground lead, 175-0014-00
1—clip, 344-0005-00
1—screwdriver, 003-0179-00
1—instruction manual, 070-0201-00

P170CF ONLY (010-0102-00) $53.00

170-Ω TERMINATION (011-0048-00) $15.00

P170CF ATTENUATOR HEADS

Type	*Attenuation (includes P170CF)*	*Input Capacity*	*Low-Freq. 3-db Point*	*Max. Voltage Input*	*Part No.*	*Price*
PAX-I	4X min. 40X max.	5 pf 1.2 pf	800 cps 1700 cps	$\pm$1 v pk.	010-0301-00	$14.00
PAX-II	40X min. 400X max.	5 pf 1.2 pf	150 cps 150 cps	$\pm$10 v pk.	010-0302-00	$14.00
PAX-III	400X min. 4000X max.	3 pf 1.1 pf	60 cps 60 cps	$\pm$100 v pk.	010-0303-00	$14.00

SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P500CF CATHODE-FOLLOWER PROBE

The P500CF Probe has been developed for use with the Tektronix Type 524AD Oscilloscope. When used with oscilloscopes other than the Type 524AD, the P500CF requires use of a power supply such as the Tektronix Type 128 Probe Power Supply.

PROBE GAIN is from 0.8 to 0.85.

ATTENUATION is 10X with attenuator head.

INPUT IMPEDANCE is 40 megohms paralleled by 4 pf when using the probe alone and 10 megohms paralleled by 2 pf when using 10X attenuator head.

HIGH FREQUENCY RESPONSE is 0.5-db down at 10 Mc.

LOW FREQUENCY RESPONSE is 3-db down at 5 cps.

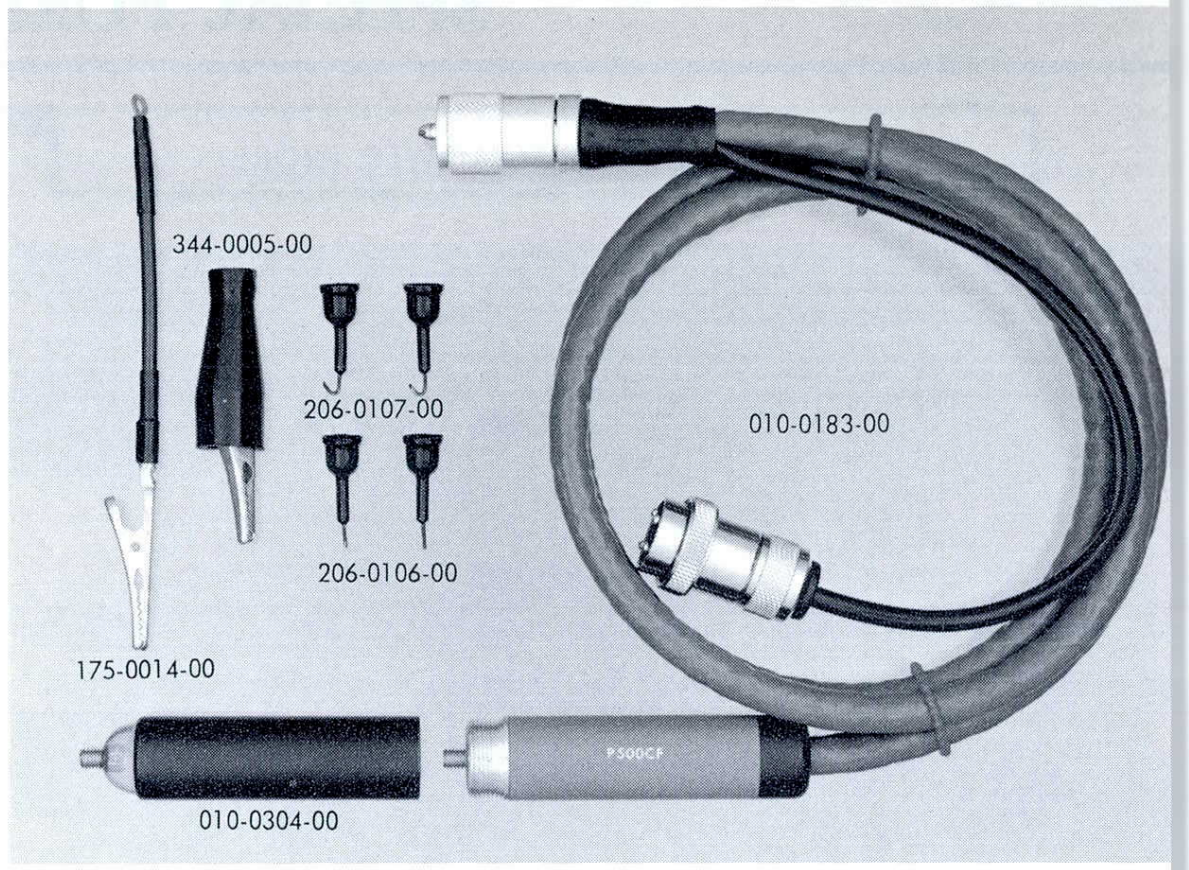
AMPLITUDE DISTORTION is less than 3% for peak amplitudes up to 5 v when using the probe alone, or up to 50 v when using the 10X attenuator head.

MAXIMUM INPUT VOLTAGE is approximately 5 v at 10 Mc or 2 v at 30 Mc for the probe alone and approximately 50 v at 10 Mc or 20 v at 30 Mc when using the 10X attenuator head.

HUM LEVEL is less than 1.5 mv at maximum sensitivity.

POWER SUPPLY REQUIREMENTS are regulated +120 v at 25 ma, regulated or unregulated +6.3 v at 150 ma, dc voltages.

CABLE is 3.5′ long, terminated with a UHF connector.



P500CF PROBE PACKAGE (010-0109-00) $85

Includes:

- 1—P500CF probe, 010-0183-00
- 1—10X probe head, 010-0304-00
- 2—hook tips, 206-0107-00
- 2—straight tips, 206-0106-00
- 1—ground lead, 175-0014-00
- 1—clip, 344-0005-00
- 1—instruction manual, 070-0212-00

P500CF PROBE ONLY (010-0183-00) $50

P6023 10X PROBE

Initially designed for the Tektronix Type Z Plug-In Unit, the P6023 low-capacitance probe is well suited for use with all Tektronix differential preamplifiers.

The probe can be adjusted to match plug-in input capacitance ranging from 20 pf to 50 pf. The X10 attenuation ratio is adjustable over a ±2.5% range to compensate for differences in the input resistance of the plug-in unit. When two P6023 probes are used to drive the two inputs of a differential amplifier, the ability to change the attenuation ratio of one probe versus the other helps to maintain the common-mode rejection ratio of the system.

ATTENUATION RATIO is 10X, adjustable ±2.5%.

INPUT RESISTANCE is 8 meg.

INPUT CAPACITANCE is approximately 12 pf when used with an instrument having a 20 pf or 47 pf input capacitance.

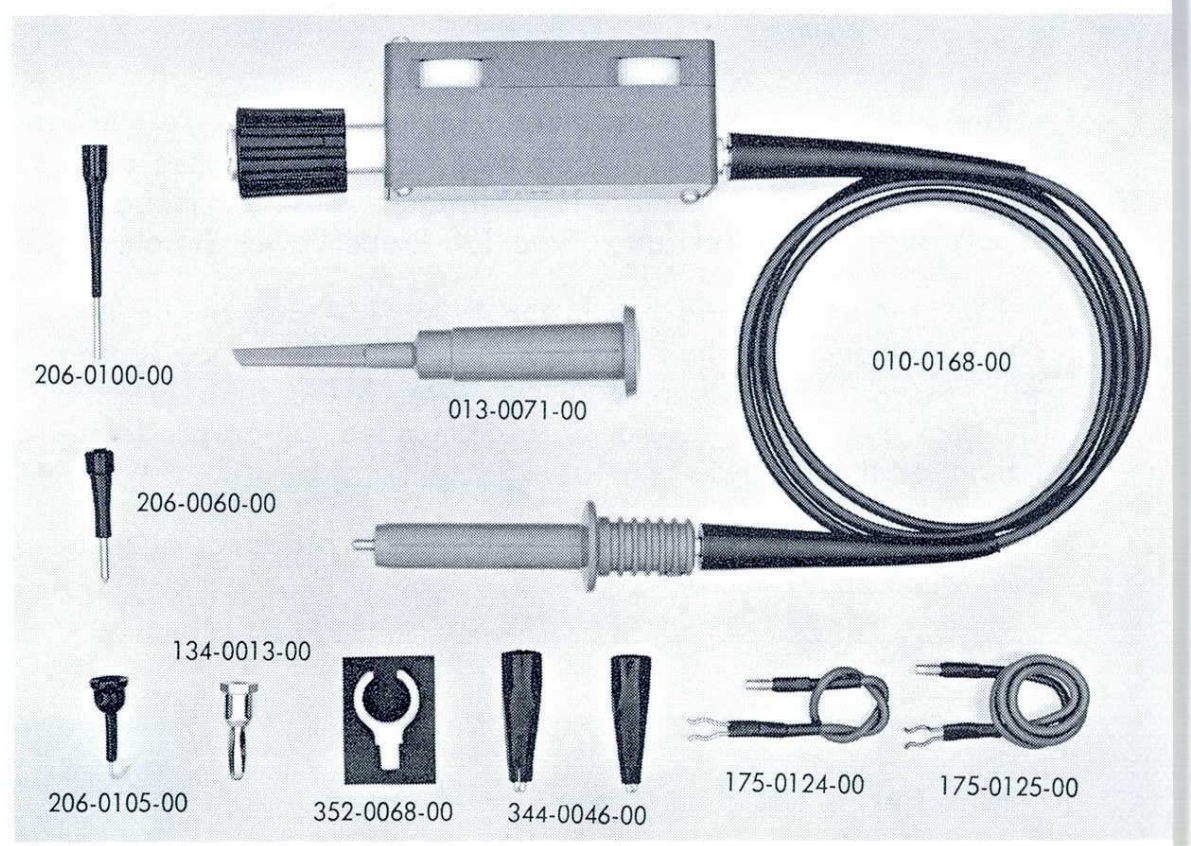
PROBE RISETIME is less than 7 nsec.

TYPICAL RISETIME of probe, Type Z Plug-In Unit, and Type 540-Series Oscilloscope is 16 nsec.

VOLTAGE RATING is 1000 v dc or ac pk-to-pk*.

CABLE is 3.5′ long, terminated with a locking BNC or UHF connector.

*Peak-to-peak voltage derating is necessary for CW frequencies higher than 5 Mc. At 20 Mc, the maximum allowable pk-to-pk voltage is 300 v.



P6023 PROBE PACKAGE
(010-0167-00 LOCKING BNC or 010-0065-00 UHF) $40

Includes:

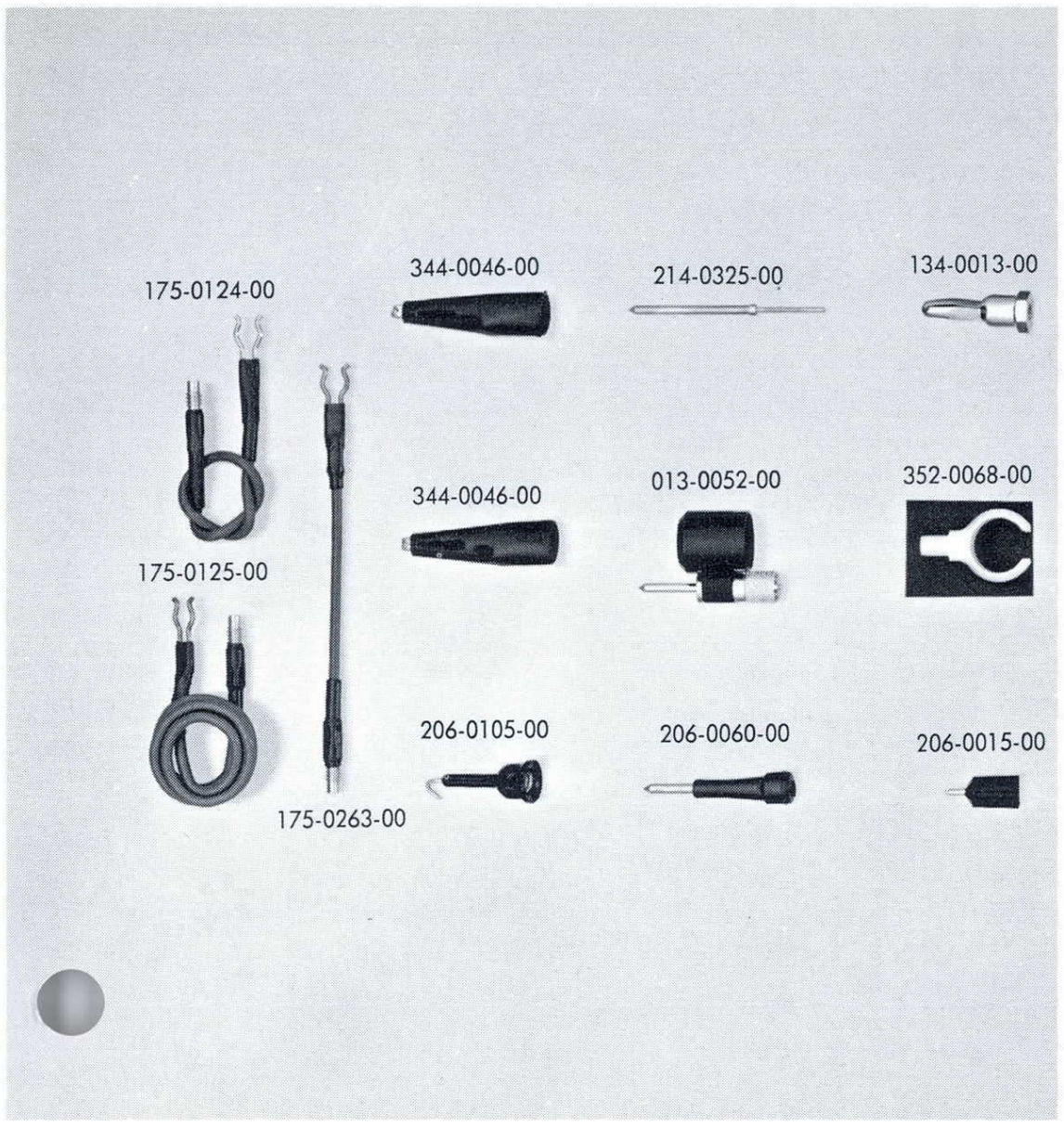
- 1—P6023 probe, 010-0168-00 BNC or 010-0097-00 UHF
- 1—spring tip, 206-0060-00
- 1—hook tip, 206-0105-00
- 1—pincher tip, 013-0071-00
- 1—calibration tip, 206-0100-00
- 1—banana plug, 134-0013-00
- 2—minigator clips, 344-0046-00
- 1—probe holder, 352-0068-00
- 1—5″ ground lead, 175-0124-00
- 1—12″ ground lead, 175-0125-00
- 1—instruction manual, 070-0294-00

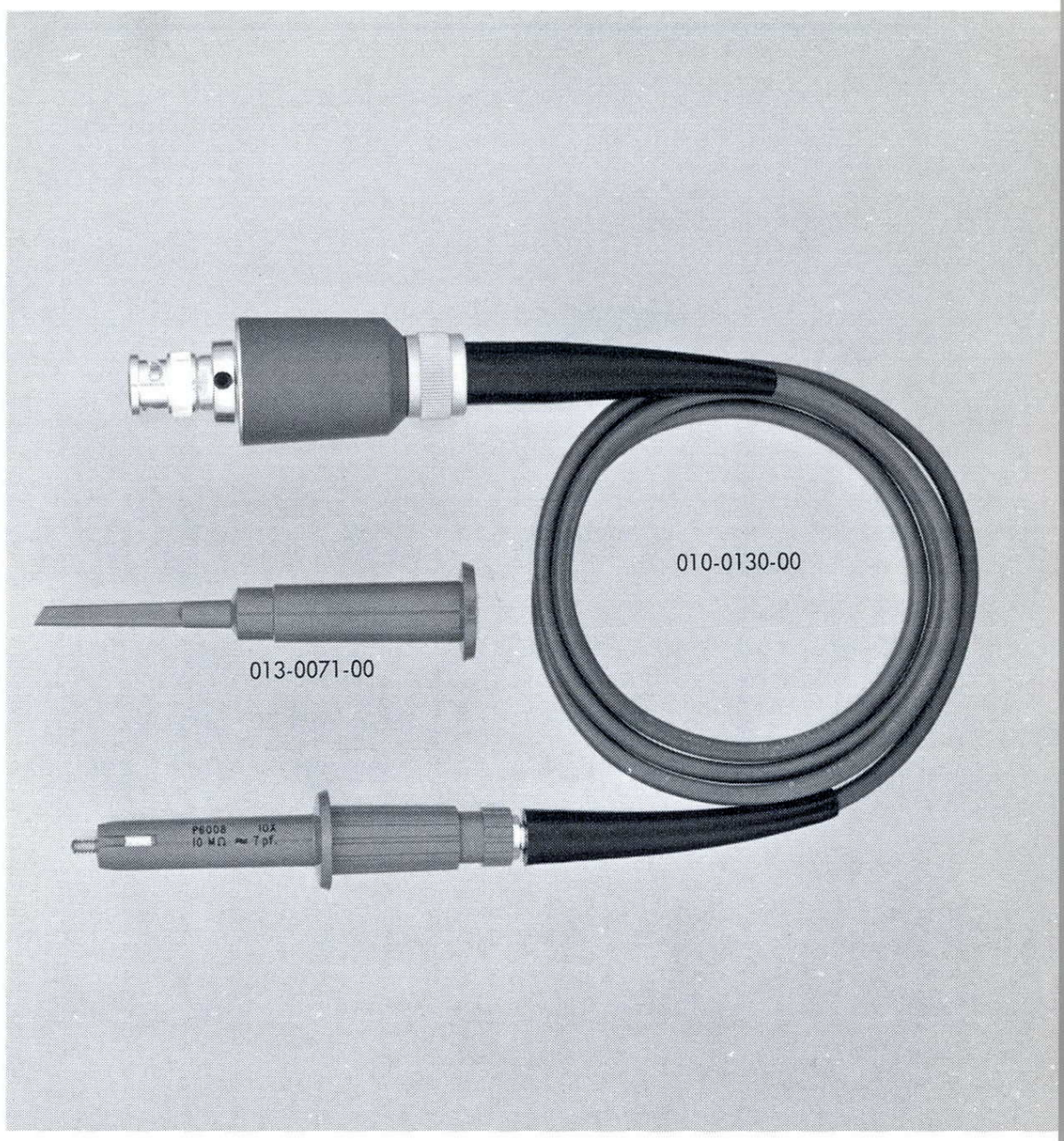
P6023 PROBE ONLY
(010-0168-00 LOCKING BNC or 010-0097-00 UHF) $33

SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P6008 10X PASSIVE PROBE





The P6008 low-capacitance probe was designed for use with the Tektronix Type 82 and 86 Plug-In Units. It is also recommended for use with Types 1A1, 1A2, and 10A2.

The time-constant of the probe is adjusted by rotating the probe body with respect to its base. The range of adjustment is sufficient to match the input time-constant of all Tektronix Plug-In Units ranging from 8 to 50 pf. Maximum frequency response (minimum risetime) is obtained when the P6008 is used with plug-in units having minimum input capacitance.

ATTENUATION RATIO is 10X.

INPUT RESISTANCE is 10 meg.

INPUT CAPACITANCE is approximately 7.5 pf.

PROBE RISETIME is less than 3 nsec.

TYPICAL RISETIME of probe, Type 82 Plug-In Unit, and Type 580-Series Oscilloscope is 5 nsec.

VOLTAGE RATING is 600 v dc or ac pk-to-pk*.

CABLE is 3.5′ long, terminated with a BNC connector.

P6008 PROBE PACKAGE (010-0129-00) $35

Includes:

- 1—P6008 probe, 010-0130-00
- 1—bayonet adapter, 013-0052-00
- 1—hook tip, 206-0105-00
- 1—pincher tip, 013-0071-00
- 1—spring tip, 206-0060-00
- 1—straight tip, 206-0015-00
- 1—banana plug, 134-0013-00
- 1—center pin, 214-0325-00
- 2—minigator clips, 344-0046-00
- 1—probe holder, 352-0068-00
- 1—3″ ground lead, 175-0263-00
- 1—5″ ground lead, 175-0124-00
- 1—12″ ground lead, 175-0125-00
- 1—instruction manual, 070-0362-00

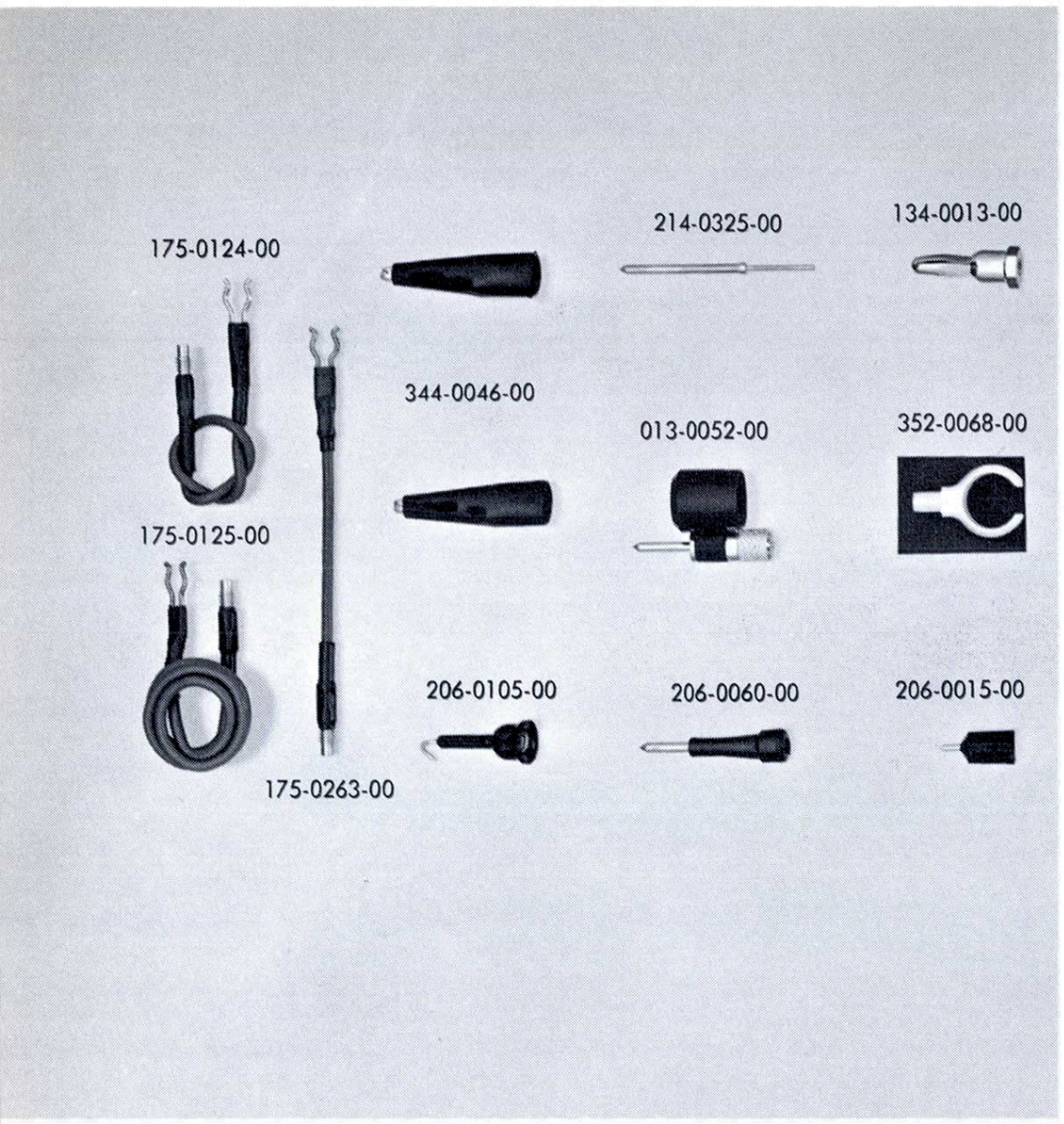
P6008 PROBE ONLY (010-0130-00) $30

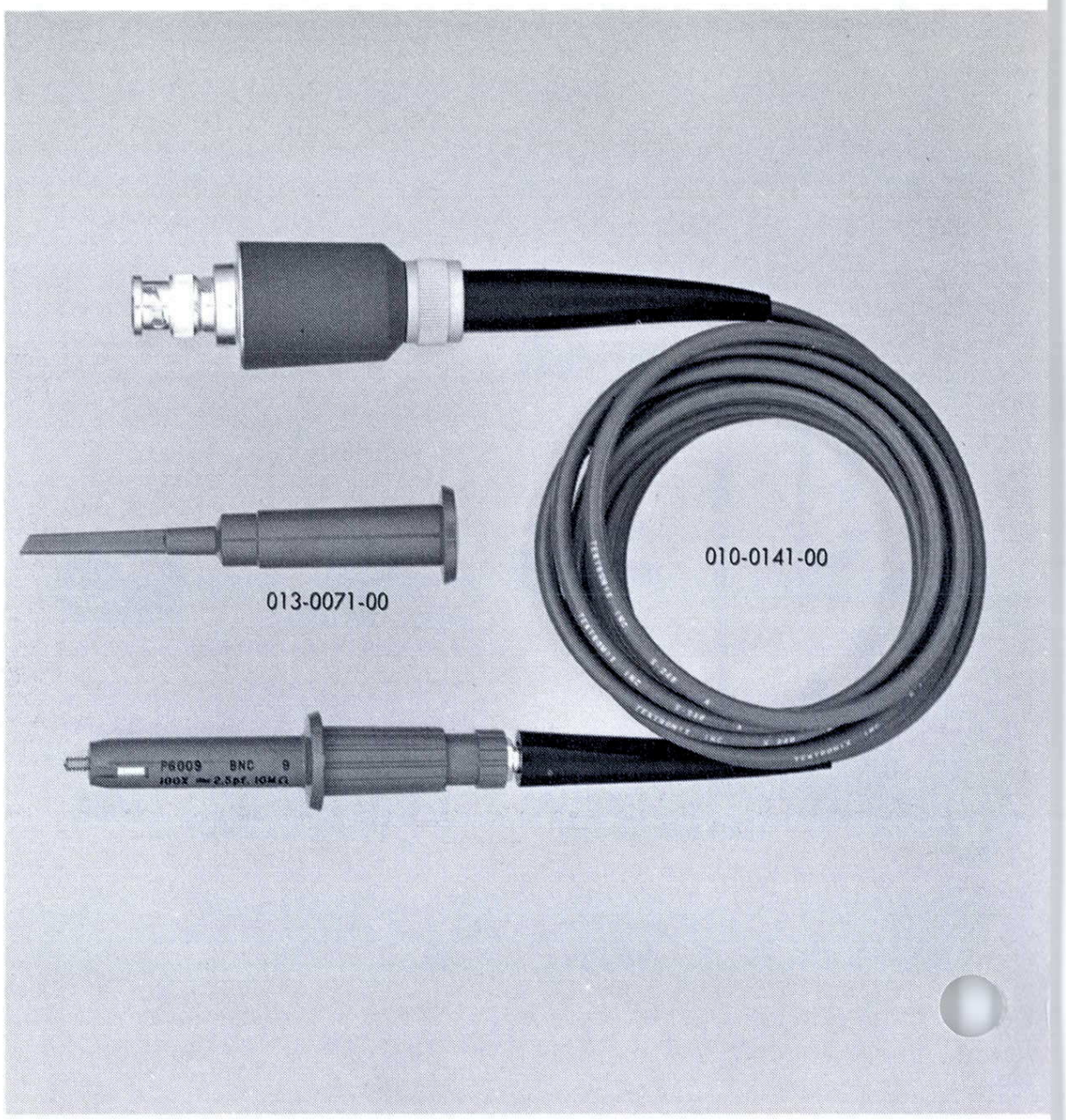
*peak-to-peak voltage derating is necessary for CW frequencies higher than 20 Mc. At 40 Mc, the maximum allowable pk-to-pk voltage is 300 v.

SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P6009 100X PASSIVE PROBE





Initially designed for use with the Types 82 and 86 Plug-In Units, the P6009 low-capacitance probe is also recommended for use with the Types 1A1 and 1A2. A separate version of the P6009 is available for use with the Type 10A2 Plug-In Unit.

The time-constant of the probe is adjusted by rotating the probe body with respect to its base. The range of adjustment is sufficient to match the input time-constant of all Tektronix Plug-In Units ranging from 8 to 50 pf. Maximum frequency response (minimum risetime) is obtained when the P6009 is used with plug-in units having minimum input capacitance.

ATTENUATION RATIO is 100X.

INPUT RESISTANCE is 10 meg.

INPUT CAPACITANCE is 2.5 pf.

PROBE RISETIME is approximately 2 nsec.

TYPICAL RISETIME of probe, Type 82 Plug-In Unit, and 580 Series Oscilloscope is 4.5 nsec.

VOLTAGE RATING is 1.5 kv dc or ac rms, 4 kv ac peak-to-peak.*

CABLE is 9′ long, terminated with a BNC connector.

P6009 PROBE PACKAGE (010-0140-00) $55

P6009 PROBE PACKAGE, for Type 10A2 (010-0170-00) .. 55

Includes:

- 1—P6009 probe, 010-0141-00 or 010-0171-00
- 1—bayonet adapter, 013-0052-00
- 1—hook tip, 206-0105-00
- 1—pincher tip, 013-0071-00
- 1—spring tip, 206-0060-00
- 1—straight tip, 206-0015-00
- 1—banana plug, 134-0013-00
- 1—center pin, 214-0325-00
- 2—minigator clips, 344-0046-00
- 1—probe holder, 352-0068-00
- 1—3″ ground lead, 175-0263-00
- 1—5″ ground lead, 175-0124-00
- 1—12″ ground lead, 175-0125-00
- 1—instruction manual, 070-0401-00

P6009 PROBE ONLY (010-0141-00) $50

P6009 PROBE ONLY for Type 10A2 (010-0171-00) 50

*peak-to-peak voltage derating is necessary for CW frequencies higher than 300 kc. At 40 Mc, the maximum allowable pk-to-pk voltage is 575 v.

SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P6013 HIGH-VOLTAGE PROBE

The Type P6013 provides 1000X attenuation for oscilloscope measurements of high amplitude waveforms or dc potentials up to 12 kv. Pulse frequency can be up to 100 kc at 12 kv.

The probe can be compensated for oscilloscope input capacities up to 60 pf.

ATTENUATION RATIO is 1000X.

INPUT RESISTANCE is 100 meg.

INPUT CAPACITANCE is 3 pf.

PROBE RISETIME is less than 7 nsec.

TYPICAL RISETIME of probe, Type K Plug-In Unit, and Type 540-Series Oscilloscope is 14 nsec.

VOLTAGE RATING is 12 kv dc, pk pulse, or pk ac.*

CABLE is 10′ long, terminated with a LOCKING BNC or UHF connector.

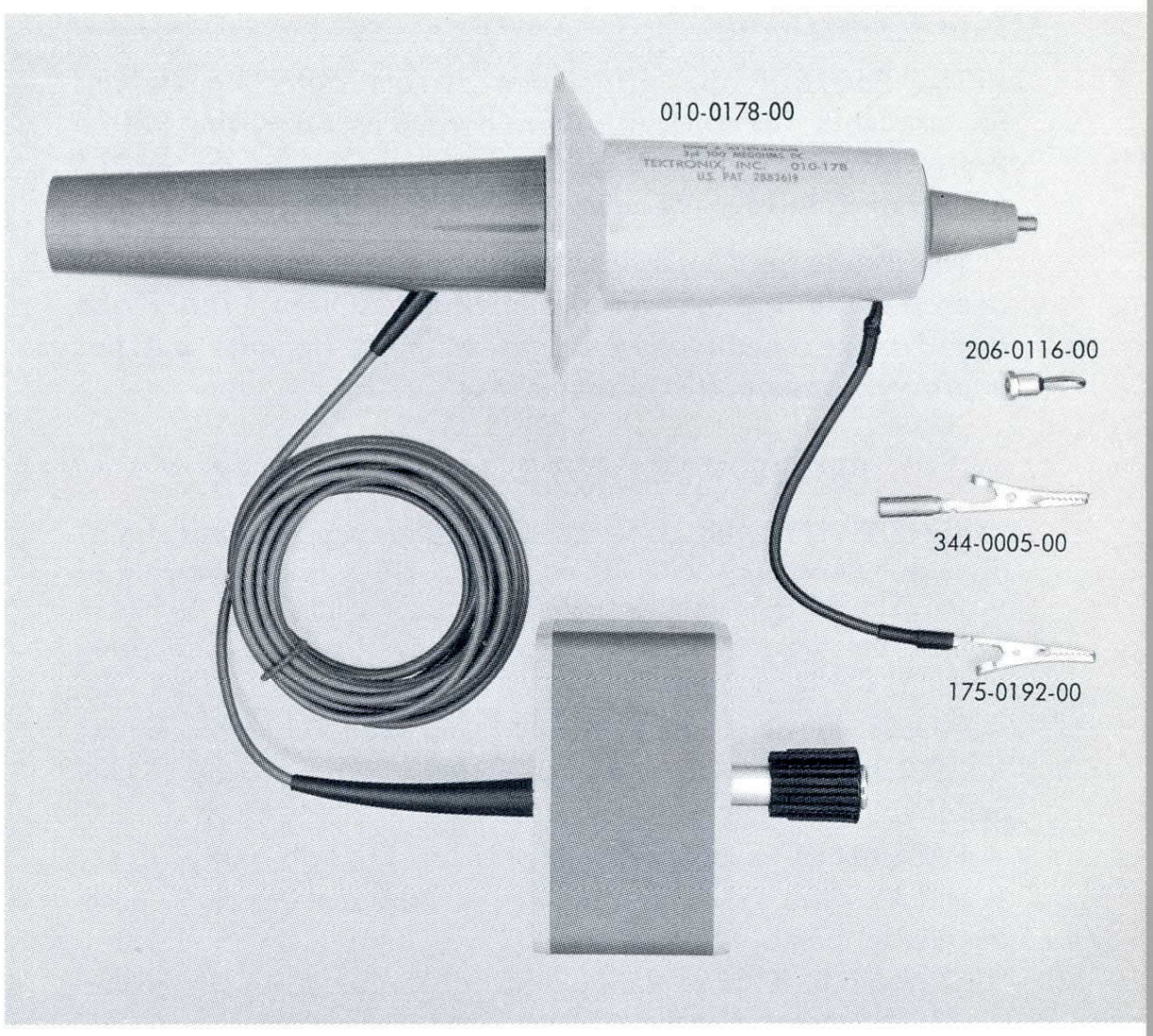
P6013 PROBE PACKAGE (010-0177-00 LOCKING BNC or 010-0181-00 UHF) $75

Includes:

- 1—P6013 Probe, 010-0182-00 or 010-0178-00
- 1—banana plug, 206-0116-00
- 1—alligator clip, 344-0005-00
- 1—7″ ground lead, 175-0192-00
- 1—instruction manual, 070-0321-00

*peak-to-peak voltage derating is necessary for CW frequencies higher than 100 kc. At 1 Mc, the maximum allowable pk-to-pk voltage is 5.5 kv.

P6013 PROBE ONLY (010-0178-00 BNC or 010-0182-00 UHF) $65



P6015 HIGH-VOLTAGE PROBE

The Type P6015 provides 1000X attenuation for oscilloscope measurements up to 40-kv peak. Voltage or duty cycle derating is necessary for RF voltages at frequencies over 100 kc, or in environmental temperatures above 25° C.

The probe time constant can be adjusted to equal the oscilloscope input time constant for instruments with 12 pf to 50 pf input capacitance.

ATTENUATION RATIO is 1000X, adjustable ±9%.

INPUT RESISTANCE is 100 meg.

INPUT CAPACITANCE is approximately 2.7 pf.

PROBE RISETIME is approximately 4 nsec.

TYPICAL RISETIME of probe, Type K Plug-In Unit, and Type 540-Series Oscilloscope is 13 nsec.

TEMPERATURE RANGE is 10° C to 55° C environmental temperature. Calibration adjustments are necessary when environmental or nose resistor temperature changes.

VOLTAGE RATING is 40 kv pk ac or pulse, 20 kv dc or rms continuous at 25°C environmental temperature.*

CABLE is 10′ long, terminated with a BNC or UHF connector.

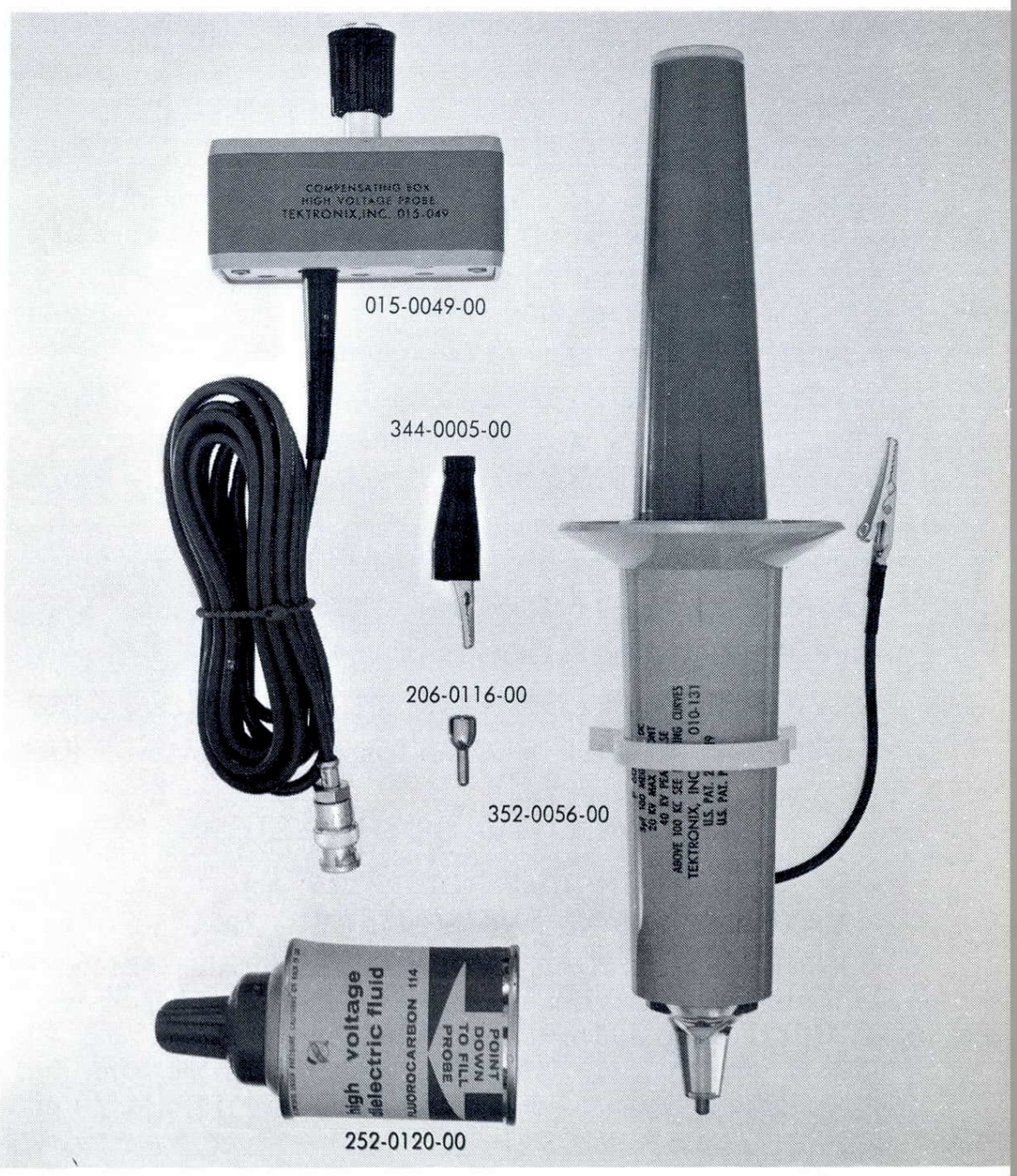
P6015 PROBE PACKAGE (010-0172-00 LOCKING BNC or 010-0132-00 UHF) $200

Includes:

- 1—P6015 probe, 010-0131-00
- 1—compensating box, 015-0049-00 BNC or 015-0039-00 UHF
- †1—storage case, 202-0103-00
- †1—storage case, 436-0035-00
- 1—anti-roll ring, 352-0056-00
- 1—alligator clip tip, 344-0005-00
- 1—7″ ground lead, 175-0192-00
- 1—tip, 206-0116-00
- 1—can, dielectric, 252-0120-00
- 1—instruction manual, 070-0373-00

*peak-to-peak voltage derating is necessary for CW frequencies higher than 100 kc. At 10 Mc, the maximum allowable pk-to-pk voltage is 13 kv.

†(not shown)



SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P6016 AC CURRENT PROBE

The P6016 Probe offers two current detecting systems for use with Tektronix wide-band oscilloscopes, the P6016 Probe and Type 131 Amplifier combination, or the P6016 Probe and Passive Termination combination.

The Probe and Amplifier combination measures currents over a wide range with risetimes to 20 nsec. The Probe and Passive combination is not quite as flexible, but has improved passband characteristics.

PROBE AND TYPE 131 AMPLIFIER

SENSITIVITY with a 50 mv/div oscilloscope input is 1 ma/div basic sensitivity with 10 calibrated steps from 1 ma/div to 1 amp/div in a 1-2-5 sequence, accuracy within 3%. Variable control on the oscilloscope provides continuous uncalibrated ranging between steps.

NOISE is equivalent to a 100-μamp, pk-to-pk, input signal.

RISETIME is 20 nsec with a Tektronix Type K Plug-In Unit and Type 540A-Series Oscilloscope.

PASSBAND is approximately 17 Mc at 3-db down.

DELAY TIME is 40 nsec or less measured at the 50% pulse amplitude points.

LOW-FREQUENCY RESPONSE at 3-db down is 50 cps.

AC CURRENT SATURATION RATING is 15 amps pk-to-pk, decreasing to 8 amps at 400 cps, 400 ma at 50 cps.

POWER REQUIREMENT is 105-125 v ac, approximately 0.5 watt at 117 v, or approximately 1 watt at 234 v ac, or 0.2 watt at 22.5* battery charge.

P6016 PROBE, TYPE 131 AMPLIFIER, 117 V POWER SUPPLY (015-0054-00 LOCKING BNC or 015-0030-00 UHF) $235.00

P6016 PROBE, TYPE 131 AMPLIFIER, 234 V POWER SUPPLY (015-0055-00 LOCKING BNC or 015-0045-00 UHF) 235.00

TYPE 131 AMPLIFIER AND 117 V POWER SUPPLY (015-0051-00 LOCKING BNC or 015-0011-00 UHF) 160.00

TYPE 131 AMPLIFIER AND 234 V POWER SUPPLY (015-0052-00 LOCKING BNC or 015-0024-00 UHF) 160.00

TYPE 131 AMPLIFIER AND 22.5 V BATTERY ADAPTER (015-0053-00 LOCKING BNC or 015-0026-00 UHF) 120.00

TYPE 131 AMPLIFIER, less power supply (015-0050-00 LOCKING BNC or 015-0029-00 UHF) 115.00

117 V POWER SUPPLY ONLY (015-0027-00) 60.00

234 V POWER SUPPLY ONLY (015-0028-00) 60.00

*22.5 V BATTERY ADAPTER ONLY (013-0050-00) 8.00

CALIBRATOR ADAPTER (017-0031-00) 3.50

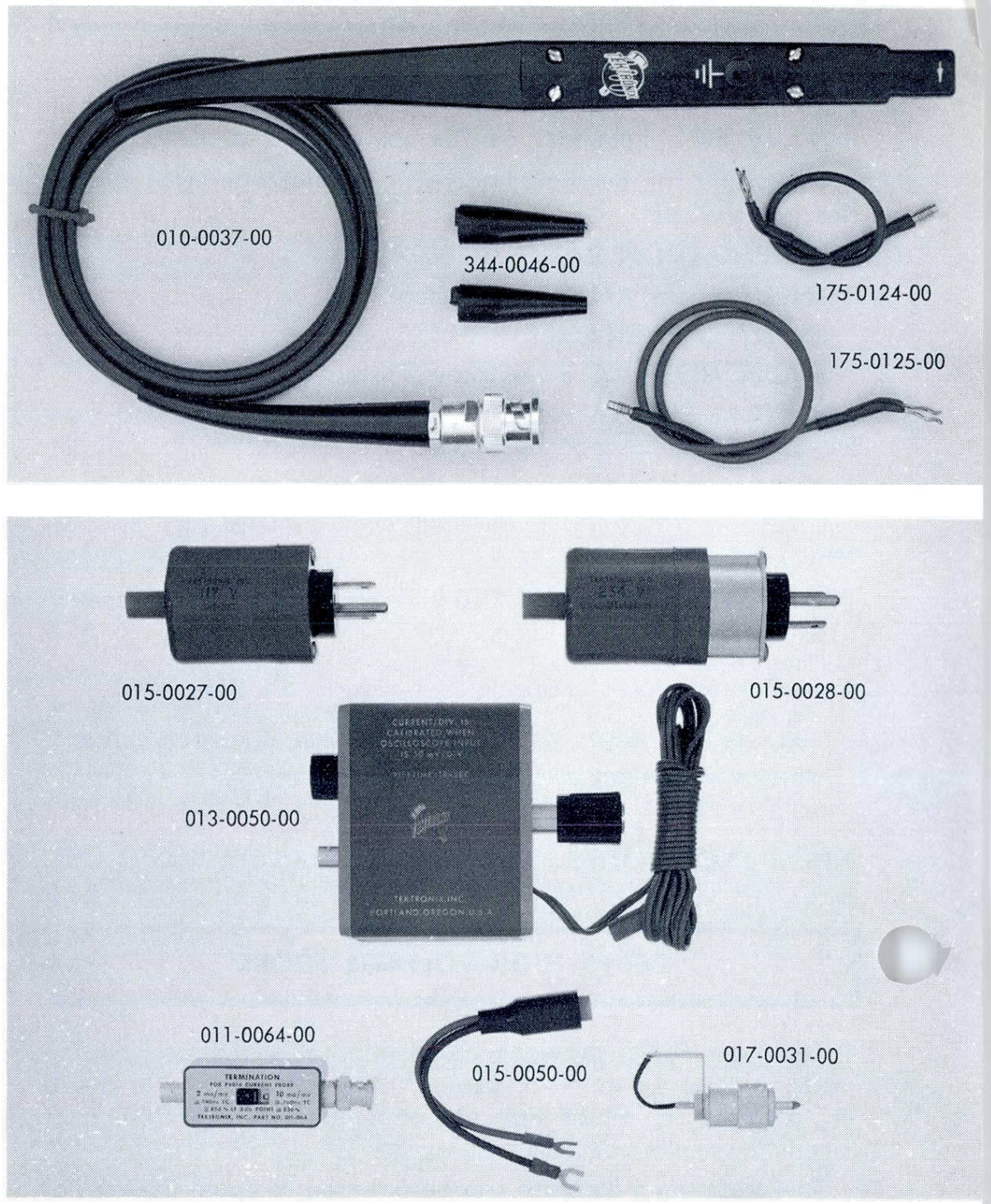
COMMON TO BOTH SYSTEMS

DC SATURATION THRESHOLD is 0.5 amp.

MAXIMUM BREAKDOWN VOLTAGE is 600 v.

INSERTION IMPEDANCE after a step function has been applied to the conductor under test is (1) 0.06 Ω after 50 nsec, (2) 0.04 Ω after 100 nsec, (3) 0.015 Ω after 1 μsec, and (4) 0.006 Ω after 10 μsec. Dependent upon size of the wire, the capacitance between conductor and probe case is typically 1 pf.

*Use Eveready #763 or equivalent.



PROBE AND PASSIVE TERMINATION

SENSITIVITY is either 2 ma/mv or 10 ma/mv of oscilloscope sensitivity, accuracy within 3%.

RISETIME is 17 nsec, ±4% maximum rolloff, overshoot, and ringing, with a Tektronix Type K Plug-In Unit and Type 540A-Series Oscilloscope.

PASSBAND is approximately 20 Mc at 3-db down.

DELAY TIME is 20 nsec or less measured at the 50% pulse amplitude points.

LOW-FREQUENCY RESPONSE at 3-db down is approximately 850 cps at 2 ma/mv (5% tilt of 10 μsec square-wave pulse) and approximately 230 cps at 10 ma/mv (5% tilt of 35 μsec square-wave pulse).

MAXIMUM CURRENT RATING is 15 amps pk-to-pk.

P6016 PROBE (010-0037-00) $75.00

PROBE AND PASSIVE TERMINATION BNC (011-0074-00) 90.00

PROBE AND PASSIVE TERMINATION UHF (011-0044-00) 90.00

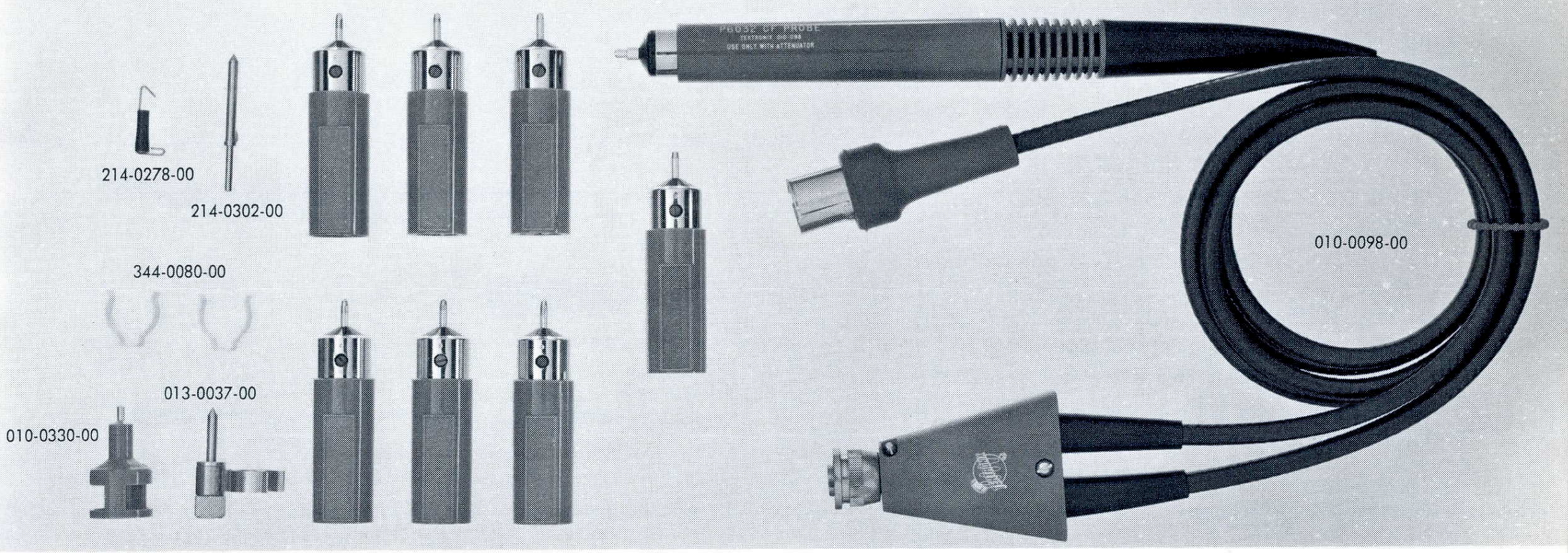
PASSIVE TERMINATION (011-0028-00 UHF or 011-0064-00 BNC) 20.00

Each probe includes:
1—5" ground lead, 175-0124-00
1—12" ground lead, 175-0125-00
2—minigator clips, 344-0046-00
1—instruction manual, 070-0237-00

SEE PAGE 249 FOR PROBE COMPATIBILITY

SAMPLING PROBES

P6032 CATHODE-FOLLOWER PROBE



The P6032 is a high-frequency cathode-follower probe designed for use with Tektronix vertical sampling plug-in units, such as the Type 3S76, 4S1, 4S2, or 1S1.

The attenuator heads can be compensated for ac attenuation ratios.

RISETIME is typically 0.4 nsec for probe and attenuator head.

MAXIMUM OUTPUT is ±150 mv into a 50-Ω load.

SIGNAL DELAY is approximately 10 nsec.

POWER REQUIREMENTS are 12.6 v at 180 ma for the filament and +100 v at 12 ma for the plate.

CABLE is 54" long with GR connector.

CAPACITOR-COUPLER HEAD is rated at 0.001 μfd, 600 v dc. Low frequency 3-db point is 16 cps.
Order Part Number 010-0330-00 ..... $4

P6032 PROBE PACKAGE (010-0108-00) $220

Includes:
- 1—P6032 probe, 010-0098-00
- 1—capacitor-coupler head
- 1—ground clip, 013-0037-00
- 1—spring contact, 214-0278-00
- 7—attenuator heads
- 1—center pin, 214-0302-00
- 2—solderable ground clips, 344-0080-00
- 1—instruction manual, 070-0327-00

P6032 PROBE ONLY (010-0098-00) $115

Part Number	*Attenuator Head*	*Max. Input Voltage**	*Input Capacitance (± 10%)*
010-0350-00	10X	± 1.5 v	3.6 pf
010-0351-00	20X	± 3.0 v	2.6 pf
010-0352-00	50X	± 7.5 v	1.8 pf
010-0353-00	100X	± 15 v	1.5 pf
010-0354-00	200X	± 30 v	1.4 pf
010-0355-00	500X	± 75 v**	1.3 pf
010-0356-00	1000X	± 150 v**	1.3 pf

*Limited by linearity of cathode follower. This value may be exceeded by 50% for pulses without damage to probe components.
**Must be derated for continuous wave use. Peak-to-peak voltage derating is necessary at CW frequencies higher than 500 Mc for the 1000X attenuator head and 1000 Mc for the 500X attenuator head.

Attenuator Head	*Max. Input Voltage (peak-to-peak) (at 100% duty factor)*			
	500 Mc	*750 Mc*	*1000 Mc*	*1250 Mc*
500X	150 v	150 v	150 v	125 v
1000X	300 v	200 v	150 v	125 v

INPUT RESISTANCE at DC of all attenuator heads is 10 megohms ± 2%.

All heads ..... $18.00 ea.

SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

P6034 10X PROBE

The P6034 low-capacitance, miniature passive probe is designed for use with Tektronix Type 4S1, 4S2 or Type 3S76 Pulse-Sampling Plug-In Units for making accurate measurements of high-speed repetitive pulses. Risetime of the probe conforms to the risetime of the plug-in units.

The probe is marked for attenuation ratio, wattage rating, and resistance of the probe.

ATTENUATION RATIO is 10X.

INPUT RESISTANCE is 500 ohms ±1.5%, approximately 300 ohms at 1 Gc.

INPUT CAPACITANCE is 0.7 pf, dc to 100 Mc.

PROBE RISETIME is less than 100 psec.

PASSBAND is dc to 3.5 Gc (3-db down).

LOW FREQUENCY RESPONSE is approximately 70 kc at 3-db down, ac coupled.

MAXIMUM RINGING AND OVERSHOOT is 2% using a 25-ohm source and coaxial probe ground.

VOLTAGE RATING is 16 v dc or 45 v pk-to-pk.*

CABLE is 18" long with GR connector.

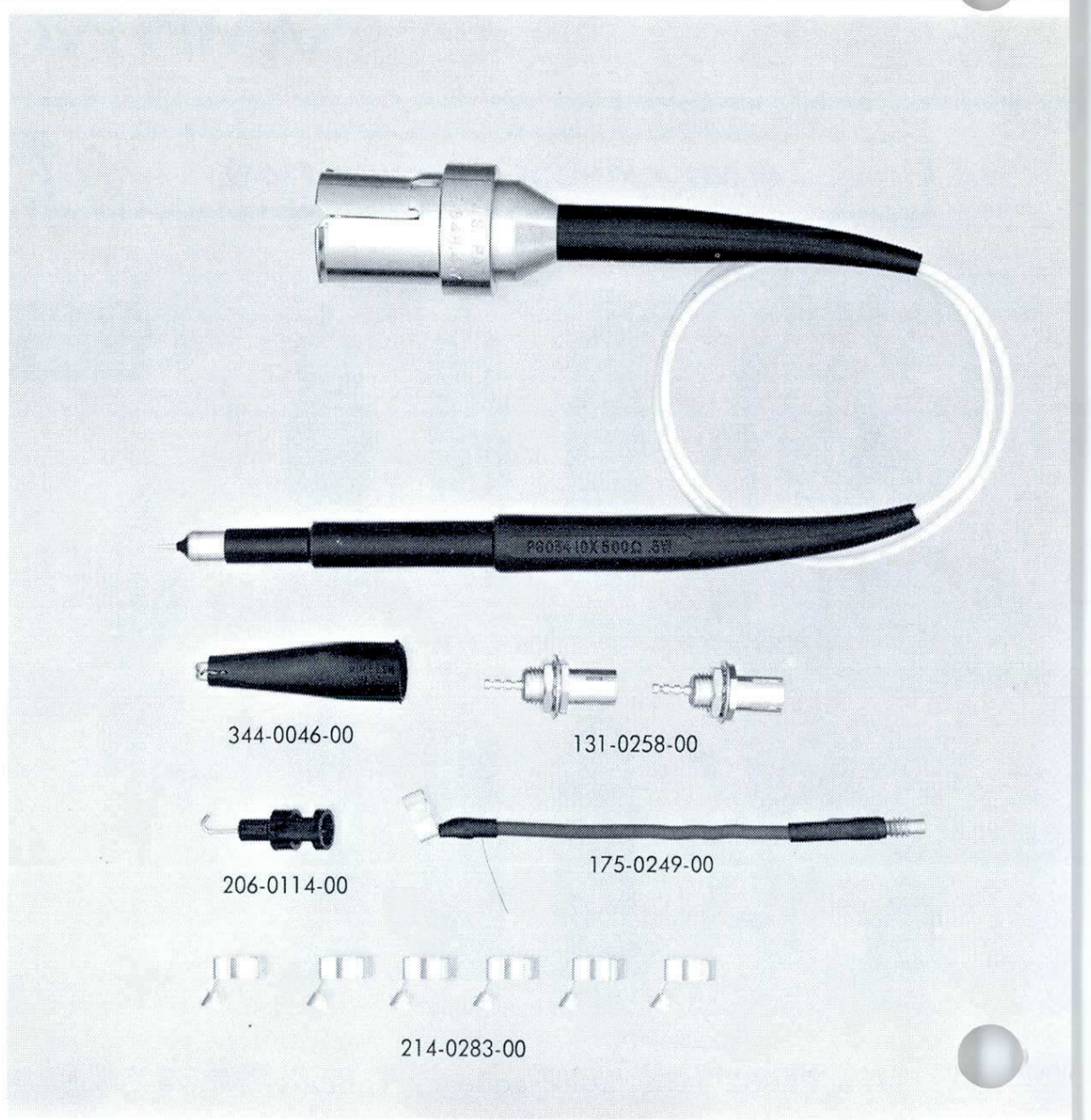
P6034 PROBE PACKAGE (010-0110-00) $35

Includes:

- 1—P6034 probe
- 1—hook tip, 206-0114-00
- 6—ground clip, 214-0283-00
- 1—minigator clip, 344-0046-00
- 2—test jacks, 131-0258-00
- 1—2½" ground lead, 175-0249-00
- 1—instruction manual, 070-0368-00

*peak-to-peak voltage derating is necessary for CW frequencies higher than 800 Mc. At 1 Gc, the maximum allowable pk-to-pk voltage is 25 v.

OPTIONAL ACCESSORIES—see probe adapters on facing page.



P6035 100X PROBE

The P6035 low-capacitance miniature passive probe physically resembles the P6034 probe. It is designed for use with the Types 4S1, 4S2 and 3S76 Sampling Plug-In Units for making high-speed repetitive-pulse measurements.

The probe is marked for attenuation ratio, wattage rating, and resistance of the probe.

ATTENUATION RATIO is 100X.

INPUT RESISTANCE is 5 k ±1.5%, approximately 1.5 k at 1 Gc.

INPUT CAPACITANCE is 0.6 pf, dc to 100 Mc.

PROBE RISETIME is less than 200 psec.

PASSBAND is dc to 1.7 Gc (3-db down).

LOW FREQUENCY RESPONSE is approximately 6 kc at 3-db down, ac coupled.

MAXIMUM RINGING AND OVERSHOOT is 2% using a 25-ohm source and coaxial probe ground.

VOLTAGE RATING is 50 v dc or 140 v pk-to-pk.*

CABLE is 18" long with GR connector.

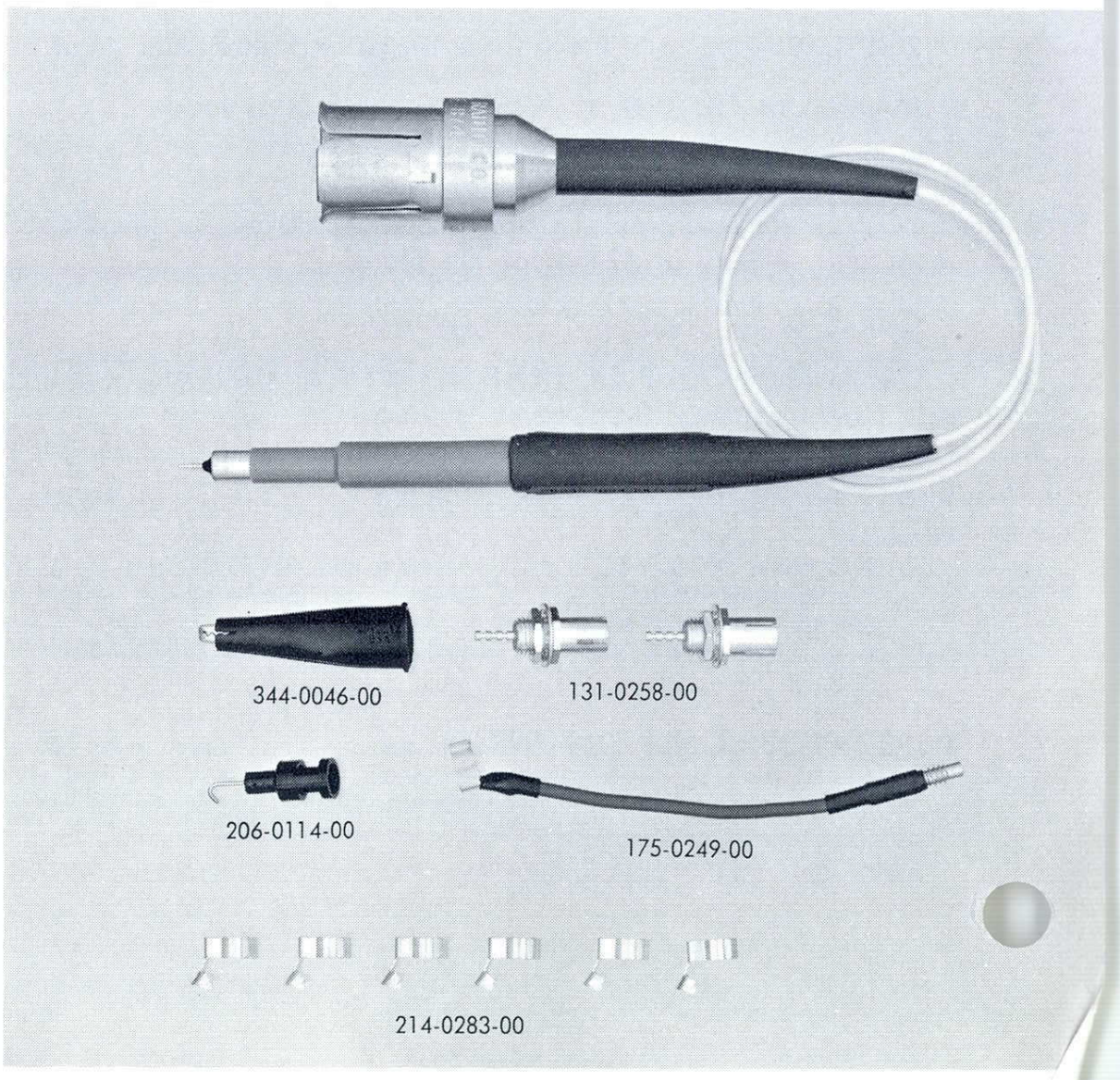
P6035 PROBE PACKAGE (010-0111-00) $35

Includes:

- 1—P6035 probe
- 1—hook tip, 206-0114-00
- 6—ground clips, 214-0283-00
- 1—minigator clip, 344-0046-00
- 2—test jacks, 131-0258-00
- 1—2½" ground lead, 175-0249-00
- 1—instruction manual, 070-0369-00

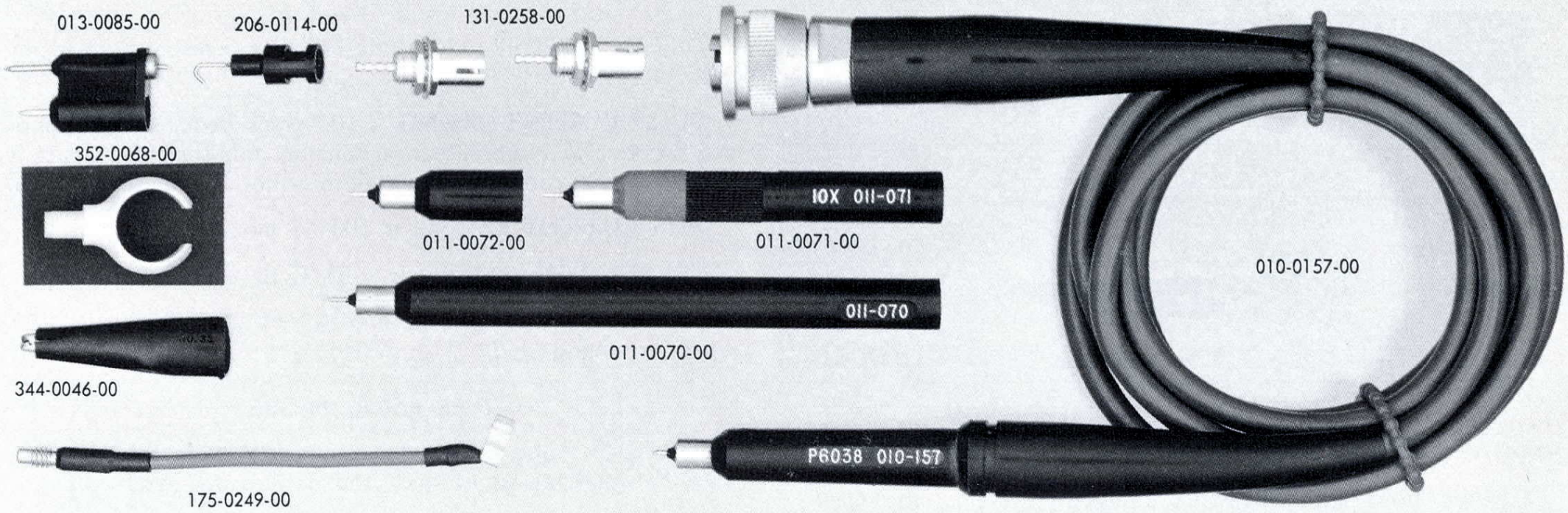
*peak-to-peak voltage derating is necessary for CW frequencies higher than 500 Mc. At 1 Gc, the maximum allowable pk-to-pk voltage is 60 v.

OPTIONAL ACCESSORIES—see probe adapters on facing page.



SEE PAGE 249 FOR PROBE COMPATIBILITY

P6038 DIRECT SAMPLING PROBE



Specifically designed for use with the Type 3S3 and 4S3 Sampling Plug-Ins, the P6038 Probe features wide-band performance in the dc-to-1000 Mc range.

Very small in size for ease of handling, the P6038 Probe contains sampling circuitry in the probe head, permitting low-noise, full-sensitivity measurements even when used with source impedances above 50 ohms.

Standard accessories supplied with the P6038 Probe include a 10X Attenuator, a Coupling Capacitor for blocking the dc component of the signal, and a non-attenuating Response Normalizer to assure the probe input is insensitive to source impedance variations.

PROBE ALONE:

ATTENUATION is 1X.

INPUT RESISTANCE is 100 k ± 1%.

INPUT CAPACITANCE is 2 pf ± 10%.

TYPICAL RISETIME with Type 3S3 or 4S3 Plug-In Unit and a 50-ohm source is 0.35 nsec or less.

CABLE is approximately 4.5′ with special 4-pin connector.

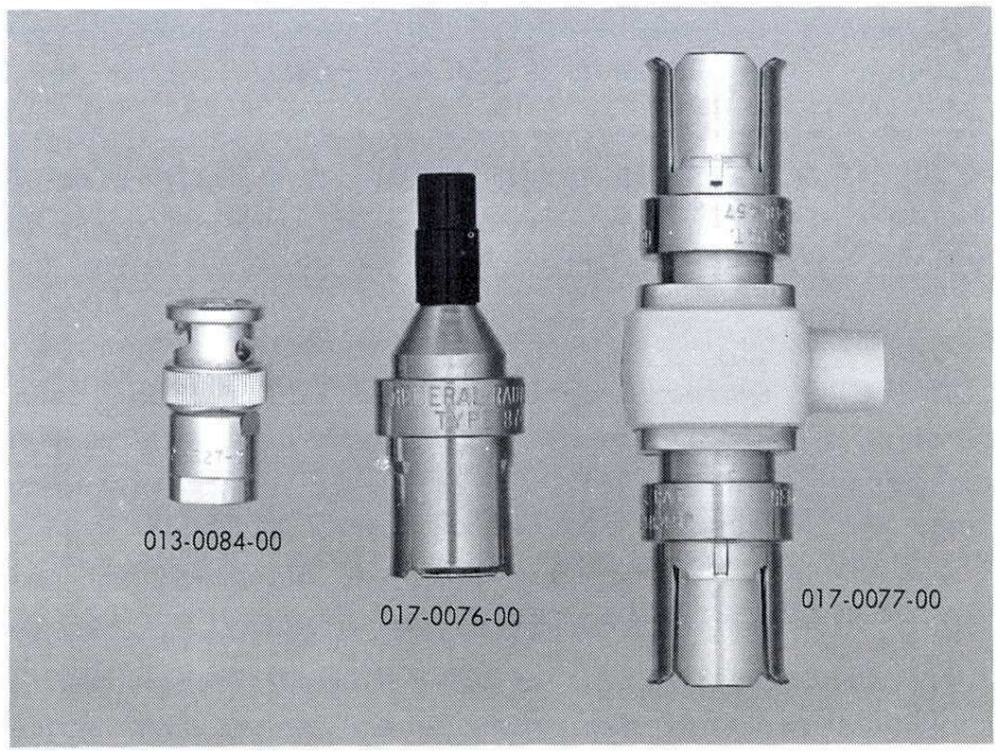
P6038 PROBE PACKAGE (010-0156-00) $225

Includes:

- 1—P6038 probe, 010-0157-00
- 1—coupling capacitor, 011-0072-00
- 1—10X attenuator, 011-0071-00
- 1—response nomalizer, 011-0070-00
- 2—test-point jacks, 131-0258-00
- 1—bayonet ground assembly, 013-0085-00
- 1—hook tip, 206-0114-00
- 1—ground clip, 175-0249-00
- 1—probe holder, 352-0068-00
- 1—carrying case, 202-0123-00
- 1—minigator clip, 344-0046-00
- 1—instruction manual, 070-0400-00

P6038 PROBE ONLY (010-0157-00) $155

PROBE/ADAPTER CHARACTERISTICS		
	INPUT R	INPUT C
PROBE AND COUPLING CAPACITOR		3.5 pf ± 10%
PROBE AND 10X ATTENUATOR	1 meg ± 1%	1.8 pf ± 10%
PROBE AND RESPONSE NORMALIZER	100.3 k ± 1%	3.5 pf ± 10%



OPTIONAL ACCESSORIES

PROBE TIP-TO-GR ADAPTER (017-0076-00) ..... $ 4.50

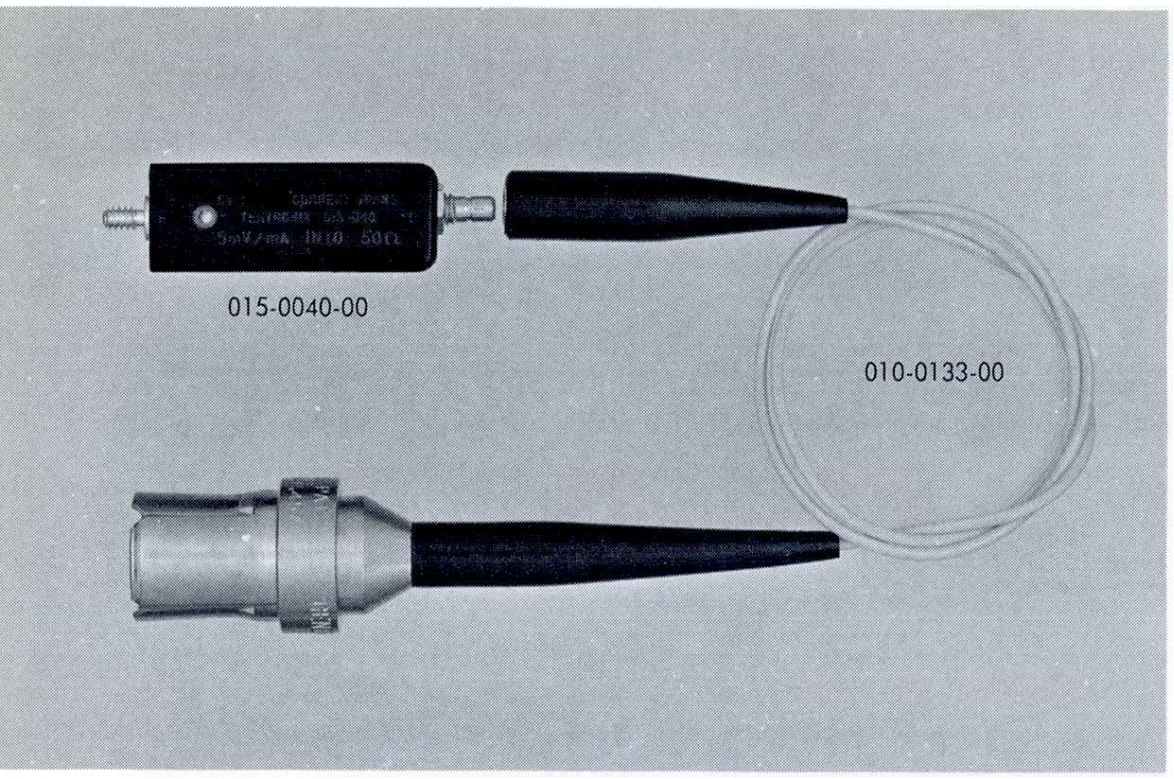
PROBE TIP-TO-BNC ADAPTER (013-0084-00) 3.00

VP-2 VOLTAGE PICKOFF "T" (017-0077-00) 30.00

SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

TYPE CT-1 CURRENT TRANSFORMER & P6040 PROBE



When used with Tektronix sampling systems, the CT-1 and P6040 combination will measure milliamp currents at frequencies from 35 kc to beyond 1 Gc.

Because of its compact size (approx. 2" long, 9/16" wide and 3/8" thick) the CT-1 is easy to use in crowded circuits. Its insulated case eliminates the possibilty of shorting-out adjacent components or wiring.

SENSITIVITY is 5 mv/ma into a 50-ohm load. Accuracy is better than ±3%.

DECAY TIME CONSTANT is 5 μsec, approximated by 1% per 50 nsec; limit, 1 μsec.

RISETIME is less than 0.35 nsec.

FREQUENCY RESPONSE is 35 kc to 1 Gc (30% down points).

INSERTION IMPEDANCE with a 50-ohm termination is 1 ohm shunted by approximately 5 μh; 2 ohms shunted by approximately 5 μh without a 50-ohm termination.

CAPACITIVE LOADING to a bare wire passing through the CT-1 transformer is typically 1.5 pf for no. 14 gauge, 0.6 pf for no. 20 gauge.

MAXIMUM VOLTAGE OF CIRCUIT UNDER TEST is 1000 v dc.

DIRECT CURRENT reduces the L/R time constant by a factor of 2 at 0.6 amp.

PULSE CURRENT RATING is 100 amps peak, with an amp-sec product of 1 amp-μsec. When the amp-second product is exceeded, the core saturates reducing the CT-1 output to zero.

RMS CURRENT RATING is 500 ma maximum.

TEMPERATURE RATING is −25°C to +65°C.

PHYSICAL DIMENSIONS are 3/8" x 9/16" x 1 13/16" plus 1/4" x 6-32 mounting stud.

TYPE P6040 PROBE

The P6040 Probe is an inter-connecting cable for the CT-1, used between the transformer and oscilloscope input.

If several CT-1 Transformers are in a circuit, the P6040 Probe can be used to monitor any one of them.

The P6040 can be used with other test-point connectors, such as Amphenol series 27 Sub-Minax or Sealectro Sub-Miniature rf.

IMPEDANCE is 50 Ω.

ATTENUATION is 1X.

OUTPUT CONNECTOR is a GR type.

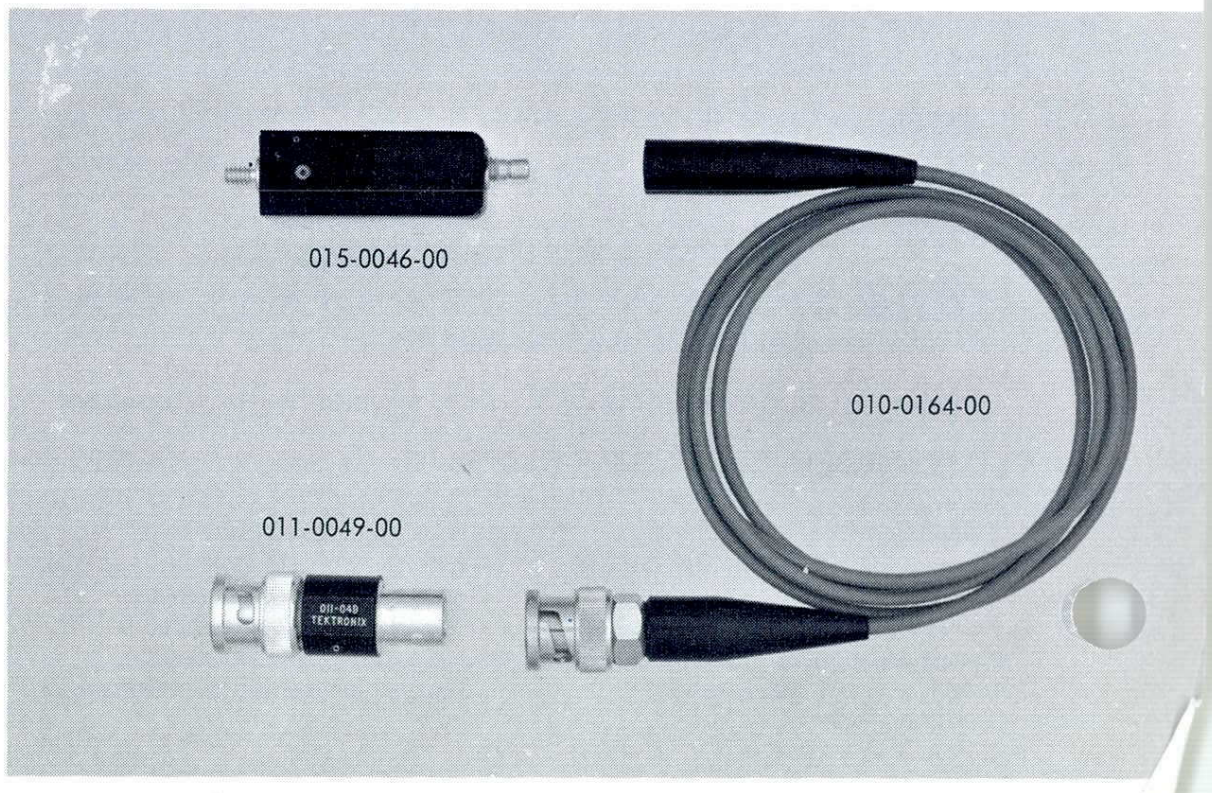
CABLE LENGTH is 18 inches. Additional 50-Ω cable can be used in series with the probe. RG8/U or RG58A/U is recommended for best preservation of the CT-1 Transformer high-frequency response.

CT-1 AND P6040 (015-0041-00) $31
CT-1 CURRENT TRANSFORMER (015-0040-00) 17
P6040 PROBE (010-0133-00) 14

TYPE CT-2 CURRENT TRANSFORMER & P6041 PROBE

The CT-2 Current Transformer and P6041 Probe combination is designed for use with conventional oscilloscopes such as the Tektronix Type 530, 540, 550 and 580 Series. Since the frequency response of the CT-2/P6041 is only 7% down at 200 Mc, the response of the system will be that of the oscilloscope used.

The insulated case of the CT-2 Current Transformer is convenient to use in applications where limited circuit space exists. Several CT-2 Transformers may be placed throughout the circuit and monitored by one or more P6041 Probes.



SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

SENSITIVITY is 1 mv/ma into a 50-ohm load. Accuracy is better than ±3%.

DECAY TIME CONSTANT is 125 μsec, approximated by 1% per 1.25 μsec; limit, 25 μsec.

RISETIME is approximately 0.5 nsec.

FREQUENCY RESPONSE is 30% down at 1.2 kc, 7% down at 200 Mc.

INSERTION IMPEDANCE with a 50-ohm termination is 0.04 ohms shunted by approximately 5 μh; 0.08 ohms shunted by approximately 5 μh without a 50-ohm termination.

CAPACITIVE LOADING to a bare wire passing through the CT-2 Transformer is typically 2.1 pf for no. 16 gauge, 0.7 pf for no. 22 gauge.

MAXIMUM VOLTAGE OF CIRCUIT UNDER TEST is 1000 v dc.

DIRECT CURRENT reduces the L/R time constant by a factor of 2 at 0.5 amp.

PULSE CURRENT RATING is 100 amps peak, with an amp-sec product of 50 amp-μsec. When the amp-second product is exceeded, the core saturates reducing the CT-2 output to zero.

RMS CURRENT RATING is 2.5 amps maximum.

TEMPERATURE RATING is −25°C to +65°C.

PHYSICAL DIMENSIONS are 3/8" x 9/16" x 1 13/16" plus 1/4" x 6-32 mounting stud.

TYPE CT-3 50-OHM SIGNAL PICKOFF

Designed for use with high-frequency Oscilloscopes, the CT-3 Pickoff provides a convenient means of picking off a signal in a 50-ohm system. Used with any of the Tektronix Sampling Instruments, the CT-3 provides the link for use as a trigger source.

The CT-3 inductively meters the current in a circuit, developing a proportional output voltage. Used in a 50-ohm system, the output voltage of the CT-3 is 10% of the voltage at the center conductor.

SENSITIVITY is 10% of the voltage under test, into a 50-ohm load.

DECAY TIME CONSTANT is 4.5 μsec at 0 dc current.

RISETIME is less than 0.4 nsec.

FREQUENCY RESPONSE is 50 kc to 875 Mc at 0 dc current.

INSERTION IMPEDANCE with a 50-ohm termination is 1 ohm shunted by 4.5 μh; 2 ohms shunted by 4.5 μh without a 50-ohm termination.

VSWR is less than 1.2 at 1.5 Gc.

VOLTAGE RATING at 0 v dc is 25 v RMS, 1 kv pulse pk. The volts-sec product is 100 v μsec. If exceeded, the L/R decay will decay rapidly toward zero.

ORDER PART NUMBER 017-0061-00 . . . . . $30.00

TYPE P6041 PROBE

The P6041 Probe serves as an interconnecting cable between the CT-2 Transformer and the oscilloscope input. A 50-ohm termination is used in conjunction with the P6041 for terminating the probe at the high impedance input of the oscilloscope used.

Although designed for use with the CT-2, the P6041 Probe can be used with other test-point connectors, such as Amphenol Series 27 Sub-Minax or Sealectro Sub-Miniature RF.

IMPEDANCE is 50 ohms.

ATTENUATION is 1X.

OUTPUT CONNECTOR is BNC type.

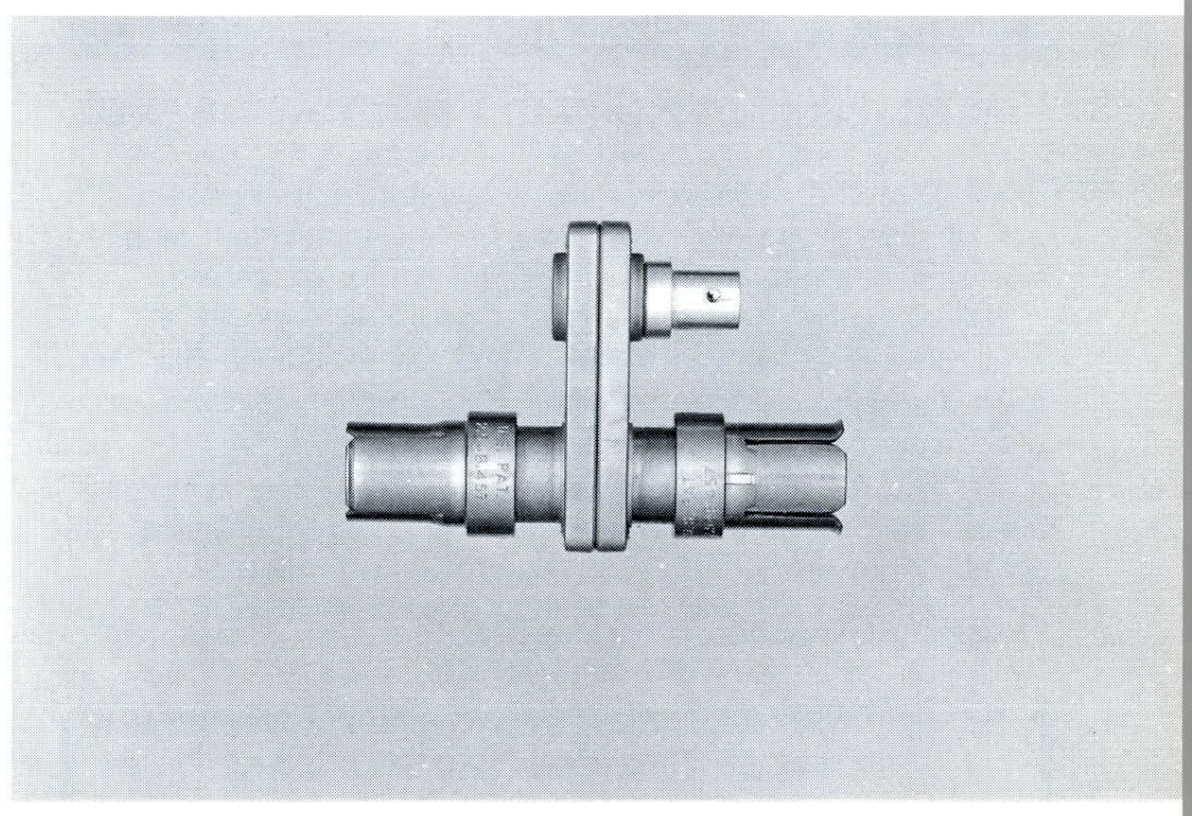
CABLE LENGTH is 42". Additional 50-ohm cable can be used in series with the probe. RG8/U or RG58A/U cable is recommended to preserve the high-frequency response.

CT-2 AND P6041/50-OHM TERMINATION (015-0047-00) . . $37.75

CT-2 CURRENT TRANSFORMER (015-0046-00) 17.00

P6041 PROBE (010-0164-00) 12.00

50-OHM TERMINATION (011-0049-00) 8.75

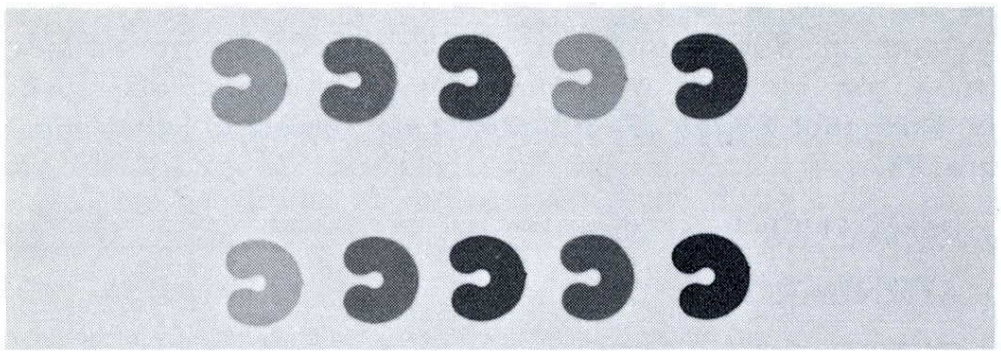


SEE PAGE 249 FOR PROBE COMPATIBILITY

Accessories

PROBE ACCESSORIES

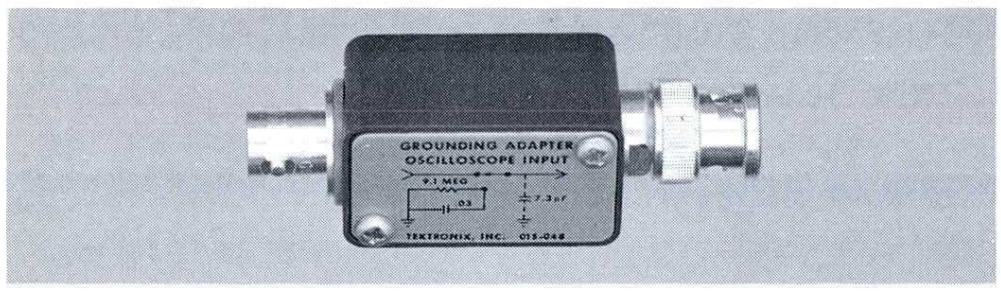
IDENTIFICATION TAGS



Probe identification tags for multi-probe applications help locate correlating probe ends quickly. One package contains 2 each of 10 colors.

Order Part Number 334-0798-00 ..... $1.00

PROBE GROUNDING ADAPTER



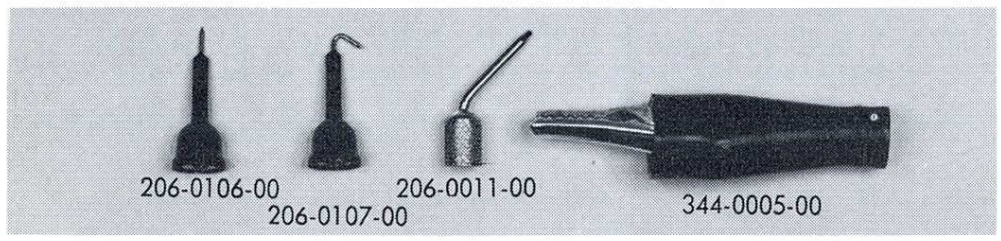
PROBE GROUNDING ADAPTER for Tektronix 10X probes provides a convenient method of establishing the vertical position of the oscilloscope trace in relation to zero volts input at the probe tip. The adapter eliminates the need for moving the probe tip from the signal source to ground.

Push-button operation of the Adapter disconnects the oscilloscope input from the probe and, at the same time, connects the input to ground through a parallel combination of a 9.1 megohm resistor and a 0.03 μf capacitor.

The Probe Grounding Adapter adds 7.5 pf to the input capacitance of the plug-in or oscilloscope. Readjustment of the probe is necessary for proper square-wave response.

Order Part Number (015-0048-00 BNC) $11
(015-0044-00 UHF) 11

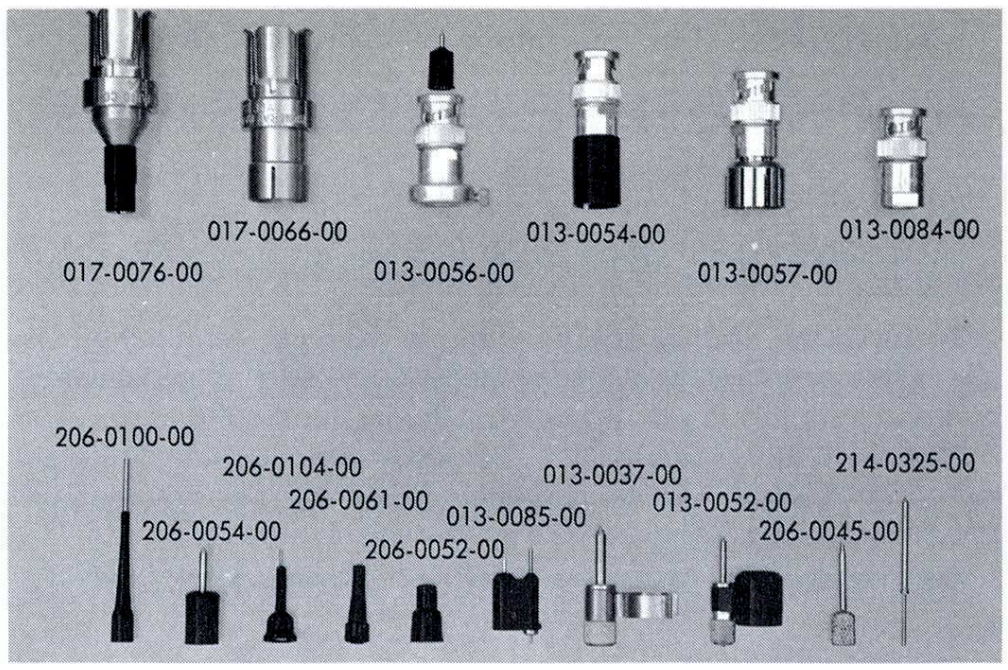
PROBE TIPS AND GROUND LEADS



SPECIAL-PURPOSE TIPS FOR P170CF, P500CF AND P410 PROBES

The following tips have a 10-32 thread size.

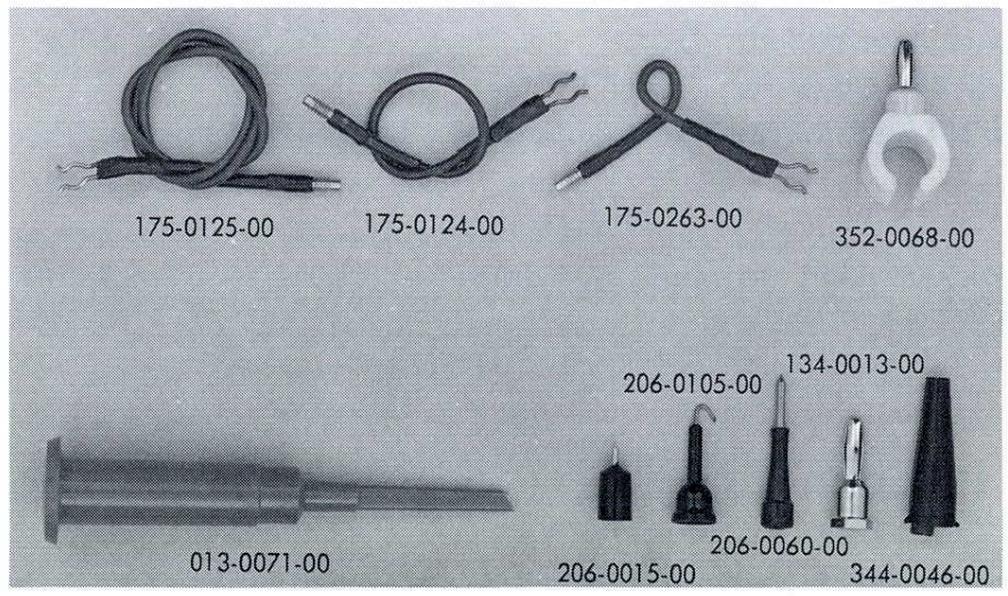
Description	Part Number	Price
Straight Shank	206-0106-00	$.25
Hook Shank	206-0107-00	.25
Bent Shank, fits 0.082" pin jacks	206-0011-00	.25
Alligator-Clip Assembly	344-0005-00	.40



SPECIAL-PURPOSE TIPS AND ADAPTERS

The following tips have a 6-32 thread size.

Description	Part Number	Price
Probe tip to BNC adapter (for P6025, P6026, P6032)	013-0057-00	$4.50
Probe tip to BNC adapter (for P6006, P6007, P6008 and P6009)	013-0054-00	3.00
Adapts probe to male BNC connector	013-0056-00	3.00
Probe tip to BNC adapter (for P6010, P6011, P6034, P6035, P6038)	013-0084-00	3.00
Probe tip to GR adapter (for P6025, P6026, P6032)	017-0066-00	6.25
Probe tip to GR adapter (for P6010, P6011, P6034, P6035, P6038)	017-0076-00	4.50
Bayonet ground assembly (for P6008, P6009)	013-0052-00	2.50
Bayonet ground assembly (for P6010, P6011, P6034, P6035, P6038)	013-0085-00	2.50
Center pin (for 013-0052-00)	214-0325-00	.80
Ground Clip Assembly (for P6025 and P6026)	013-0037-00	2.50
Insulated Straight Shank	206-0054-00	.25
Long Straight Shank	206-0104-00	.25
Spring Tip, without shank	206-0061-00	.40
Recessed, fits 0.065" recessed pin or plug	206-0052-00	.25
Straight Shank, fits 0.082" pin jacks	206-0045-00	.25
Calibration tip (for P6023)	206-0100-00	2.70

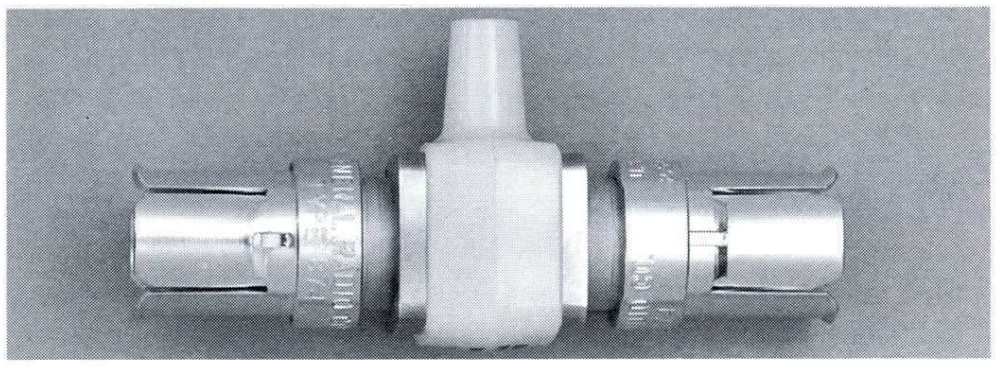


Accessories

The following tips have a 6-32 thread size.

Description	Part Number	Price
12-inch Ground Lead	175-0125-00	$ .55
5-inch Ground Lead	175-0124-00	.50
3-inch Ground Lead	175-0263-00	.55
Holder	352-0068-00	.20
Pincher	013-0071-00	2.00
Short Straight Shank	206-0015-00	.25
Hook Shank	206-0105-00	.25
Spring Tip	206-0060-00	.50
Banana Tip	134-0013-00	.15
Minigator Clip	344-0046-00	.15

50-OHM VOLTAGE PICKOFF "T"



The 50-ohm "T" type pickoff allows signal pickoff from a closed 50-ohm system with minimum disturbance of the system's characteristics. The coaxial "T" incorporates GR Type connectors at each end, with a plastic center collar for probe tip insertions.

TYPE VP-1 is designed for use with the P6034 or P6035 Miniature Passive Probes. The reflection coefficient of the VP-1 alone is approximately 3%. With the P6034 or P6035 inserted, it is typically 2%. The resistive reflection of the VP-1 is ½% when used with the P6035, 5% when used with the P6034.

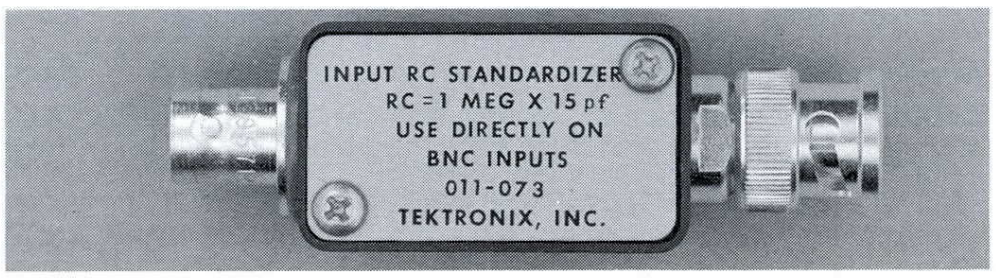
Order Part Number 017-0073-00 . . . . . $25

TYPE VP-2 is used in conjunction with the P6038 Direct Sampling Probe. The reflection coefficient without the P6038 Probe is approximately 4%. With the probe inserted it is typically 6%.

All accessory heads supplied with the P6038 Probe can be used with the VP-2.

Order Part Number 017-0077-00 . . . . . $30

INPUT TIME-CONSTANT STANDARDIZERS

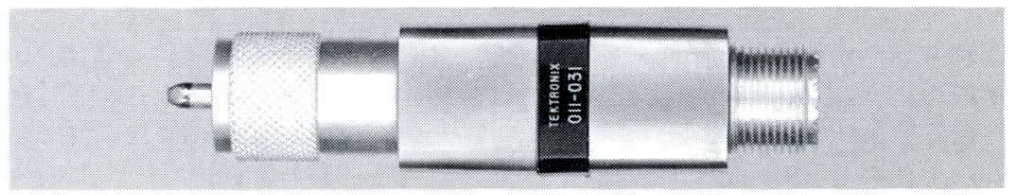


Five input time-constant standardizers are available for standardizing input capacitances of 12 pf, 15 pf, 20 pf, 24 pf, and 47 pf. Each standardizer has an approximate 1 megohm impedance and 2X voltage attenuation.

12 pf (011-0051-00 UHF) (011-0065-00 BNC)	$10.00
15 pf (011-0073-00 BNC)	10.00
20 pf (011-0022-00 UHF) (011-0066-00 BNC)	10.00
24 pf (011-0029-00 UHF) (011-0067-00 BNC)	10.00
47 pf (011-0030-00 UHF) (011-0068-00 BNC)	10.00

INPUT ADAPTERS—ATTENUATORS—TERMINATIONS

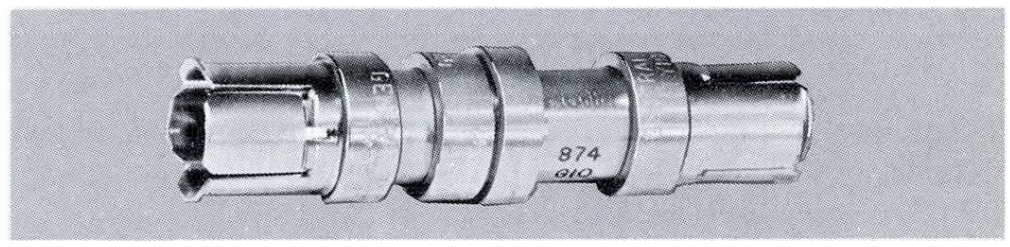
Each accessory is marked as to type, ratio, maximum power, and correct orientation. Attenuators with UHF, GR, and TEKTRONIX 125-ohm connectors have color-coded bands that designate the attenuation ratio. Gold-plated connectors designate all 125-ohm ends.



ACCESSORIES WITH UHF-TYPE CONNECTORS

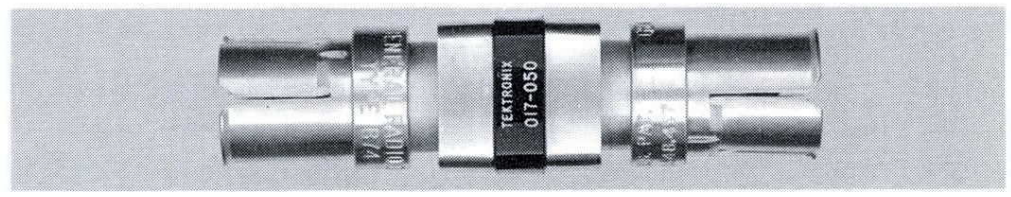
Description	Part Number	Price
50-Ω termination	011-0045-00	$15.00
50-Ω 5:1 attenuator	011-0032-00	16.00
50-Ω 10:1 attenuator	011-0031-00	16.00
50-Ω to 75-Ω min. loss attenuator	011-0041-00	16.00
50-Ω to 93-Ω min. loss attenuator	011-0042-00	16.00
50-Ω to 170-Ω min. loss attenuator	011-0043-00	16.00
75-Ω termination	011-0046-00	15.00
75-Ω 5:1 attenuator	011-0034-00	16.00
75-Ω 10:1 attenuator	011-0033-00	16.00
93-Ω termination	011-0047-00	15.00
93-Ω 5:1 attenuator	011-0036-00	16.00
93-Ω 10:1 attenuator	011-0035-00	16.00
170-Ω* termination	011-0048-00	15.00

*vswr less than 1.25 up to 30 mc.



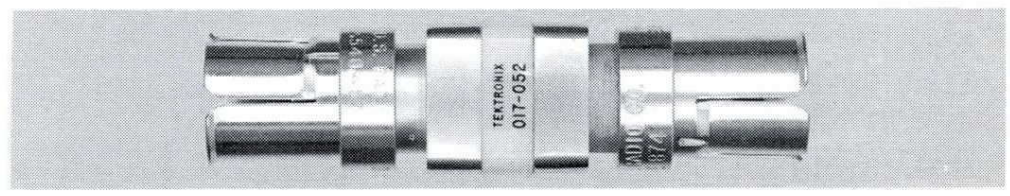
ACCESSORIES WITH GR-TYPE CONNECTORS

50-Ω termination	017-0081-00	$23.00
50-Ω 2:1 attenuator	017-0080-00	30.00
50-Ω 5:1 attenuator	017-0079-00	30.00
50-Ω 10:1 attenuator	017-0078-00	30.00
50-Ω power divider	017-0082-00	70.00



ACCESSORIES WITH TEKTRONIX 125-Ω TYPE CONNECTORS

125-Ω termination	017-0051-00	$20.00
125-Ω 2:1 attenuator	017-0071-00	25.00
125-Ω 5:1 attenuator	017-0049-00	30.00
125-Ω 10:1 attenuator	017-0050-00	30.00
125-Ω to 200-Ω Hewlett-Packard	017-0038-00	20.00



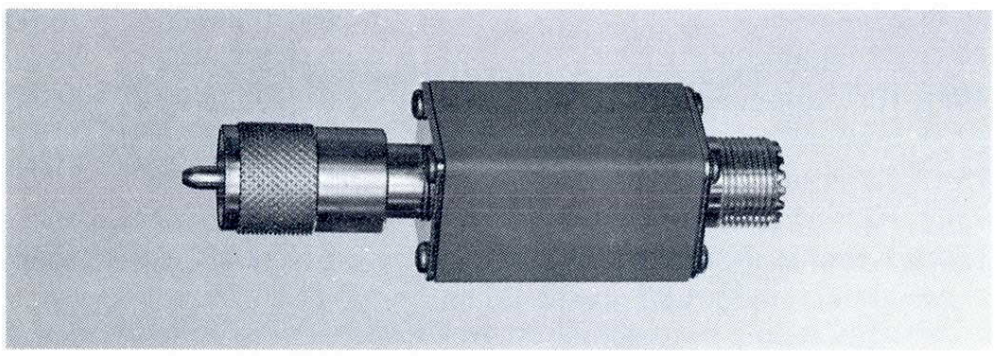
ACCESSORIES WITH GR-TEKTRONIX 125-Ω TYPE CONNECTORS

50-Ω to 125-Ω min. loss atten.	017-0052-00	$30.00
125-Ω adapter N50/N125	017-0053-00	17.50
125-Ω adapter N50/T125	017-0054-00	17.50
125-Ω adapter T50/N125	017-0055-00	23.00

Accessories

ACCESSORIES WITH BNC-TYPE CONNECTORS

50-Ω termination	011-0049-00	$ 8.75
50-Ω 2:1 attenuator	011-0069-00	10.00
50-Ω 2.5:1 attenuator	011-0076-00	10.00
50-Ω 5:1 attenuator	011-0060-00	10.00
50-Ω 10:1 attenuator	011-0059-00	10.00
50-Ω to 75-Ω min. loss attenuator	011-0057-00	10.00
50-Ω to 93-Ω min. loss attenuator	011-0058-00	10.00
75-Ω termination	011-0055-00	8.75
75-Ω 10:1 attenuator	011-0061-00	10.00
93-Ω termination	011-0056-00	8.75
93-Ω 10:1 attenuator	011-0062-00	10.00
170-Ω termination (UHF to BNC)	011-0063-00	10.00



TERMINATION BLOCKS W/O ELECTRICAL COMPONENTS

Component housings are useful for applications requiring special circuitry.

$1\frac{11}{16}$" block with UHF connector
Order Part Number 011-0019-00 ..... $5.00

$2\frac{7}{16}$" block with UHF connector
Order Part Number 011-0020-00 ..... $5.00

CONNECTOR CHARACTERISTICS

Accuracy of Indicated Attenuation Ratio:

UHF	±2% at dc; ±3% at 100 megacycles.
GR	±2% at dc; ±3% at 1 gigacycle.
TEKTRONIX 125 Ω	±2% at dc; ±3% at 1 gigacycle.
BNC	±2% at dc; ±3% at 100 megacycles.

Voltage Standing Wave Ratio:

UHF	less than 1.2 up to 100 megacycles.
GR	less than 1.1 up to 1 gigacycle.
TEKTRONIX 125 Ω	less than 1.1 up to 1 gigacycle.
BNC	less than 1.1 up to 100 megacycles.

Power Rating:

UHF	1.5 watts.
GR	1 watt.
TEKTRONIX 125 Ω	1 watt.
BNC	1 watt.

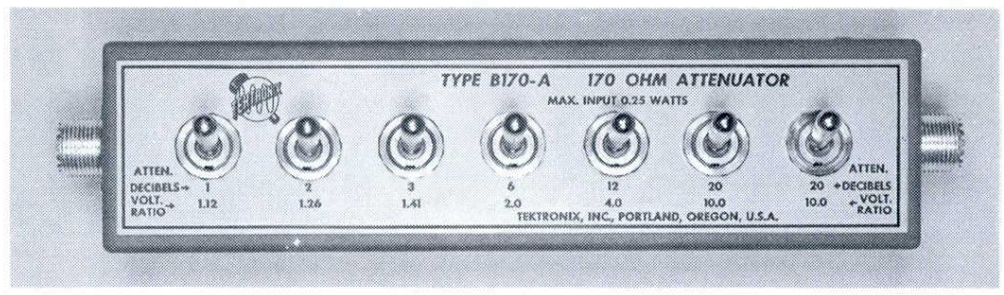
Output to Input Voltage Ratios for Minimum-Loss Attenuators:

When properly terminated the E_{out}/E_{in} ratios for the various minimum-loss attenuators are as follows:

Connection	E_{out}/E_{in}
50 Ω → 75 Ω	0.63
75 Ω → 50 Ω	0.42
50 Ω → 93 Ω	0.59
93 Ω → 50 Ω	0.32
50 Ω → 125 Ω	0.56
125 Ω → 50 Ω	0.23
50 Ω → 170 Ω	0.54
170 Ω → 50 Ω	0.16

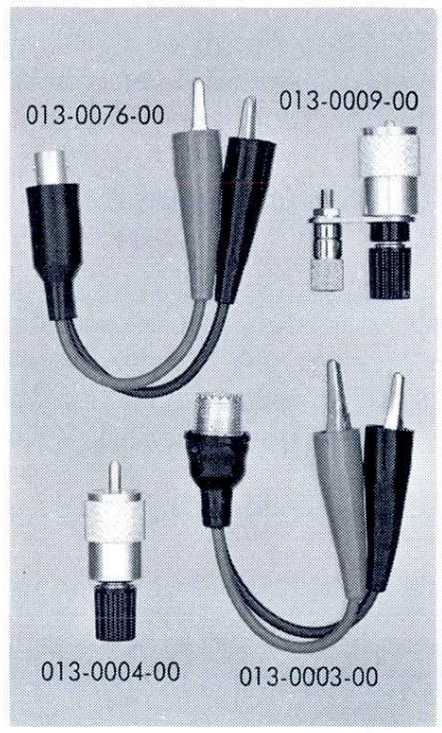
All attenuators, with the exception of minimum-loss types, are T-type attenuators.

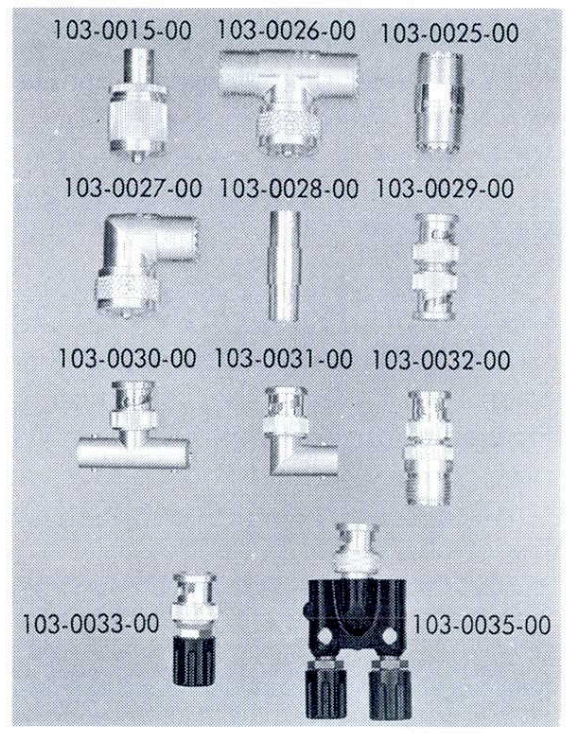
B170-A ATTENUATOR



170-Ω pi-attenuator, uses 2% precision resistors, 1 to 64 db in 1 db steps, 0.25 watt.
Order Part Number 011-0017-00 ..... $60.00

MISCELLANEOUS ADAPTERS

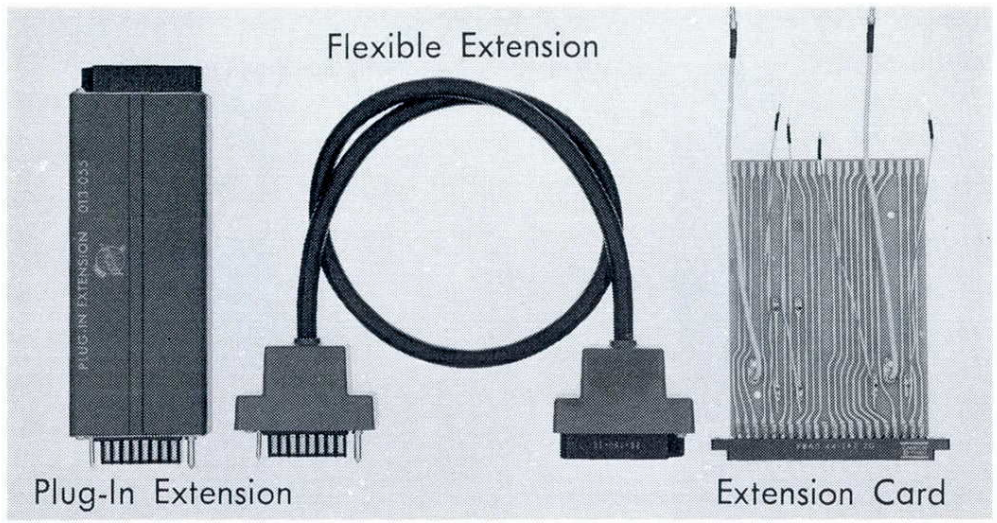




Description	Part Number	Price
Adapter, clip lead BNC	013-0076-00	$3.00
Adapter, clip lead UHF	013-0003-00	3.00
Adapter, binding post	013-0004-00	3.00
Binding Post Adapter, with ground terminal, ¾" spacing	013-0009-00	3.25
UHF Male to BNC Female	103-0015-00	1.65
UHF Female to Female	103-0025-00	1.45
UHF T Male to 2 Female	103-0026-00	2.60
UHF Elbow	103-0027-00	1.65
BNC Female to Female	103-0028-00	1.60
BNC Male to Male	103-0029-00	3.25
BNC T Male to 2 Female	103-0030-00	3.50
BNC Elbow	103-0031-00	1.50
Male BNC to Female UHF	103-0032-00	1.70
BNC to Binding Post	103-0033-00	1.60
BNC Dual Binding Post	103-0035-00	5.35

Accessories

PLUG-IN UNIT ACCESSORIES



PLUG-IN EXTENSIONS—allow unit to be operated partially out of the oscilloscope:

For units in Type 560-Series Oscilloscopes
Order Part Number 013-0034-00 . . . . . $14.00

For units in Type 530-, 540-, 550-, 580-Series Oscilloscopes
Order Part Number 013-0055-00 . . . . . $14.50

For units in Type 647 Oscilloscope
Order Part Number 013-0077-00 . . . . . $20.75

For Type R Unit only
Order Part Number 013-0015-00 . . . . . $11.00

For Type 21A and 22A Time-Base Units
Order Part Number 013-0013-00 . . . . . $20.75

EXTENSION CARDS—extend removable circuit cards for ease of calibration and maintenance.

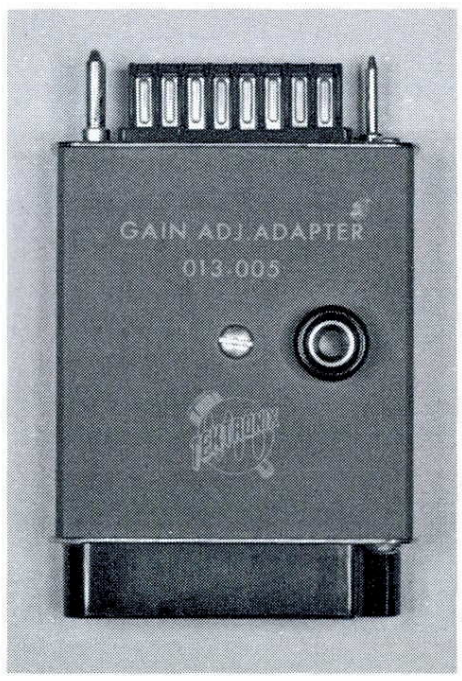
For Type 1A1 Plug-In Unit
Order Part Number 012-0079-00 . . . . . $25.00

For Type 262 Programmer
Order Part Number 012-0078-00 . . . . . $20.00

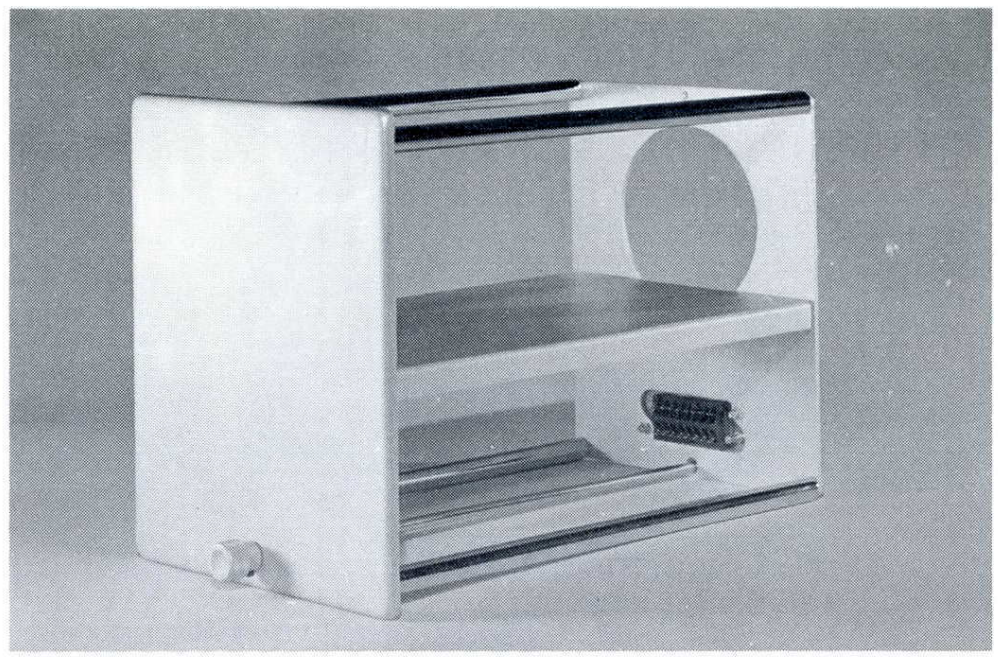
FLEXIBLE EXTENSIONS—permit plug-in unit operation away from the oscilloscope. Useful for trouble shooting—not used for calibration.

For 1-Series and Letter-Series Plug-In Units
Order Part Number 012-0038-00 . . . . . $20.00

For 10 and 11-Series Plug-In Units
Order Part Number 012-0080-00 . . . . . $24.00

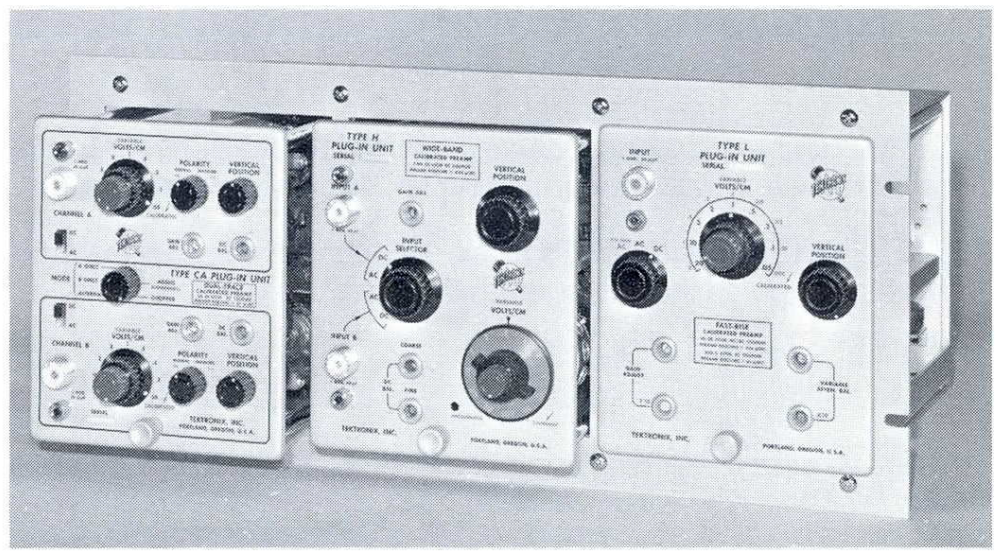


GAIN ADJUST ADAPTER
Pertmits an external calibrating signal to bypass the plug-in preamplifier, for calibrating the sensitivity of the main amplifier of Types 530, 540 and 550-Series Oscilloscopes.
Order Part Number 013-0005-00 . . . . . $15



BLANK 1-SERIES AND LETTER-SERIES PLUG-IN CHASSIS—Useful for constructing your own special circuits.
Order Part Number 040-0065-00 . . . . . $25.00

BLANK TYPE 560-SERIES PLUG-IN CHASSIS—For special circuit construction of sweep or vertical amplifier.
Order Part Number 040-0245-00 . . . . . $25.00



PLUG-IN PREAMPLIFIER STORAGE CABINET mounts in standard rack, available in two types:

FOR 1-SERIES AND LETTER-SERIES PLUG-IN UNITS—holds 3 plug-in units. Measures 19″ wide, 8¾″ high, 9⅜″ deep.
Order Part Number 437-0031-00 . . . . . $25

FOR 2 AND 3-SERIES PLUG-IN UNITS—holds 4 plug-in units. Measures 19″ wide, 7″ high, 13 5/16″ deep.
Order Part Number 437-0071-00 . . . . . $30

PULSERS

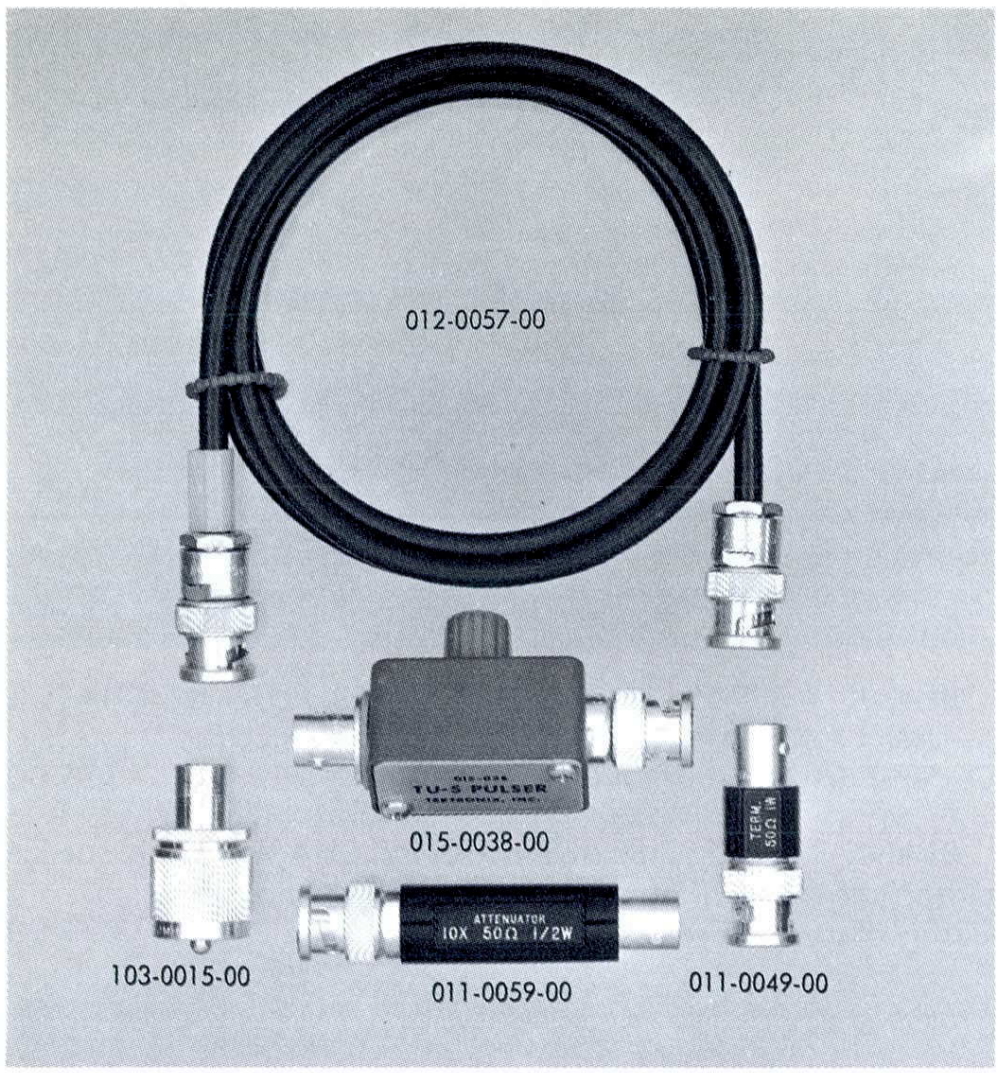
TYPE TU-5 PULSER—The TU-5 tunnel diode pulser generates a fast-rise, flat-top square wave designed to aid in adjustment of transient response of the Tektronix 80-Series Plug-In Units. It can also be used with letter series and sampling plug-in units. When used with letter-series and 80-Series plug-in units the pulser is sufficiently fast to show the risetime of the oscilloscope and plug-in unit.

The oscilloscope calibrator output provides the proper input to the pulser.

A bias adjustment on the pulser provides for changes in tunnel-diode characteristics due to temperature variations, tolerance, or other variables.

RISETIME—less than or equal to 1.0 nsec into 50 ohms.

Accessories



AMPLITUDE—at least 200 mv with 50-ohm termination, 20 mv with 10X attenuator and 50-ohm termination.

PULSE WIDTH—about 0.5 msec, dependent on oscilloscope calibrator output, (oscilloscope calibrator is 1 kc).

OUTPUT IMPEDANCE—50 ohms (25 ohms when used with 50 ohm termination).

SOURCE VOLTAGE—100 volt square wave (10 ma) from the oscilloscope calibrator output.

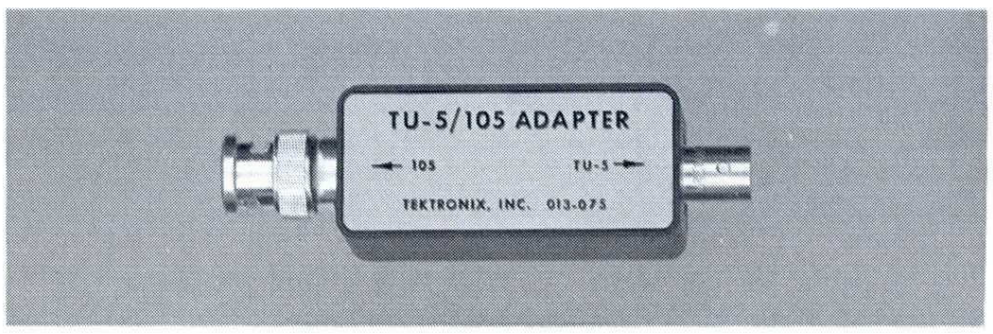
REPETITION RATE—same as source voltage (1 kc from oscilloscope calibrator output).

BNC CONNECTORS—for input and output.

TU-5 PULSER PACKAGE (015-0043-00) **$46.50**

Includes: 1—TU-5 Pulser, 015-0038-00; 1—10X attenuator, 011-0059-00; 1—50-ohm termination, 011-0049-00; 1—UHF to BNC adapter, 103-0015-00; 1—50-ohm cable, 012-0057-00.

TU-5 PULSER ONLY (015-0038-00) **$25.00**

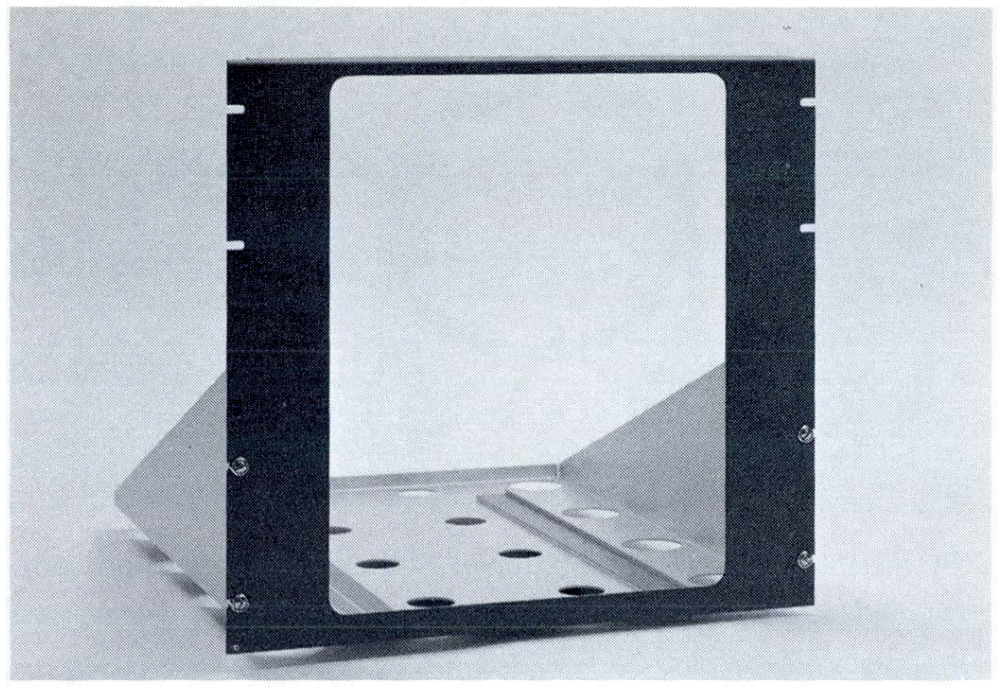


TU-5/105 ADAPTER—allows the TU-5 Pulser to be used with the Type 105 Square-Wave Generator.

The Adapter inverts the negative 100 v output of the Type 105 to a positive voltage source for driving the TU-5. A brighter trace display is possible because of the faster repetition rate of the Type 105 output.

TU-5/105 ADAPTER (013-0075-00) **$20.00**

MOUNTING ACCESSORIES



CRADLE-MOUNT—For rack mounting cabinet-type oscilloscopes. Each cradle-mount consists of a cradle (or "shelf") to support the instrument in any standard 19" relay rack, and a mask to fit over the regular instrument panel. Blue vinyl finish.

For Type 524AD, Type 530-Series, Type 540-Series, and Type 570 with serial numbers above 5000, Type 530A-Series, Type 540A-Series, Type 575, Type 580-Series, and Type 661 all serial numbers (1 mask, 1 cradle). Rack height requirements 17½".
Order Part Number 040-0281-00 ..... $45

For Type 507 and Type 551 instruments (2 masks, 2 cradles). Rack height requirements; Indicator mask 17½", Power Supply mask 12¼".
Order Part Number 040-0279-00 ..... $72.80

For Type 180A, Type 190A, Type 515A and Type 516 instruments (1 mask, 1 cradle). Rack height requirements 15¾".
Order Part Number 040-0277-00 ..... $45

For Type 502A instruments (1 mask, 1 cradle). Rack height requirements 17½".
Order Part Number 040-0278-00 ..... $45

For Type 555 (2 masks, 2 cradles). Rack height requirements: Indicator mask 21", Power Supply mask 12¼".
Order Part Number 040-0280-00 ..... $72.80

For Types 503, 504, 561, 561A, 564 instruments (1 mask, 1 cradle). Rack height requirements 15¾".
Order Part Number 040-0321-00 ..... $45

Cradle assembly for mounting 527 on left side of monitor.
Order Part Number 426-0133-00 ..... $57.50

Cradle assembly for mounting 527 on right side of monitor.
Order Part Number 426-0134-00 ..... $57.50

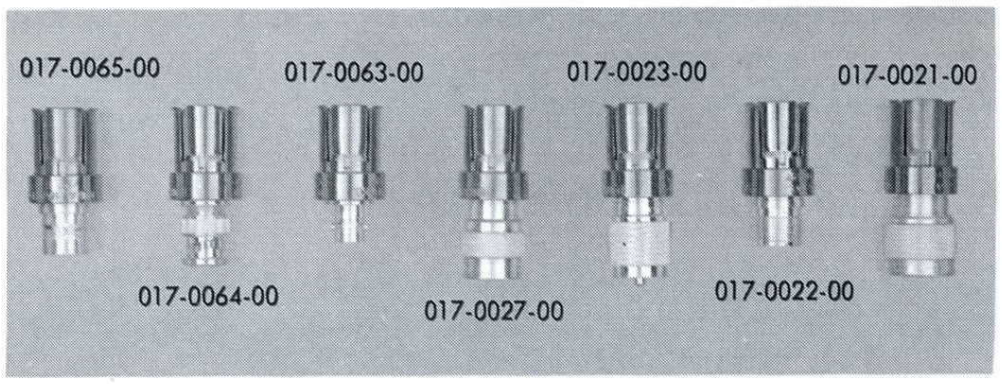
Cradle assembly for mounting two 527's side by side.
Order Part Number 426-0135-00 ..... $57.50

MOUNTING FRAME—Holds four of any combination of Type FM122, Type 360, or Type 160-Series units. Mounts to standard instrument rack.
Order Part Number 014-0002-00 ..... $7.00

BLANK PANEL—Provides coverage for mounting frame Type FM122 area not being used.
Order Part Number 333-0157-00 ..... $2.50

Accessories

SAMPLING ACCESSORIES



ADAPTERS

	Part No.	Price
GR to C male	017-0027-00	$7.00
GR to N male	017-0021-00	5.50
GR to UHF female	017-0022-00	5.50
GR to UHF male	017-0023-00	5.00
GR to BNC female	017-0063-00	4.75
GR to BNC male	017-0064-00	6.50
GR to C female	017-0065-00	7.50

50-OHM CONNECTING CABLES (GR-TYPE CONNECTORS)

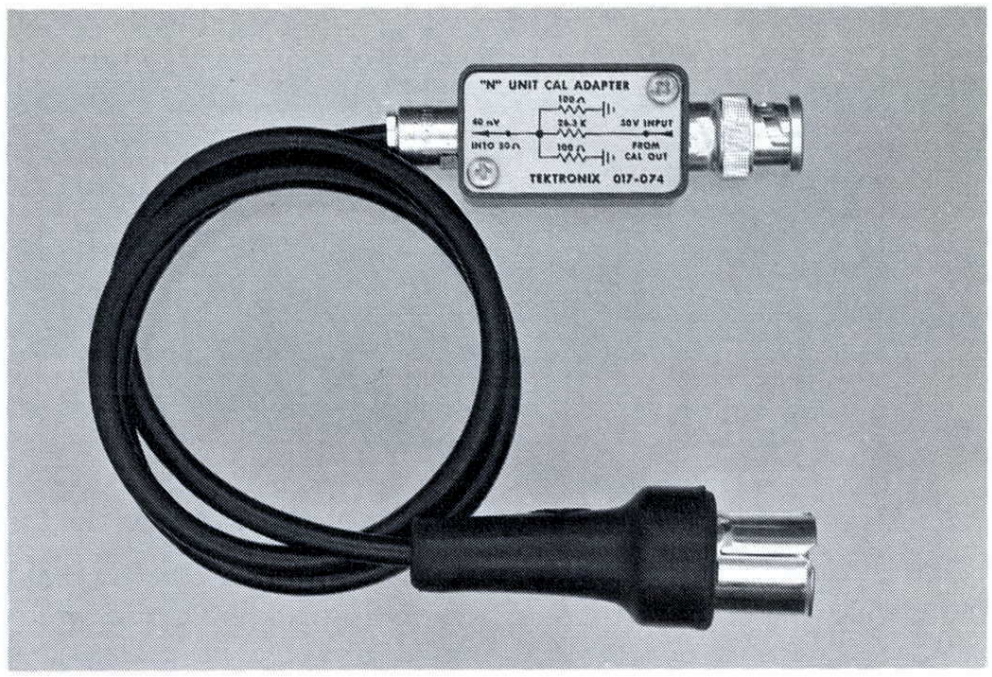
Delay	Cable Type	Part No.	Price
1 nsec	RG58/AU*	017-0503-00	$ 8.25
2 nsec	RG58/AU	017-0505-00	13.50
5 nsec	RG8/AU	017-0502-00	13.50
10 nsec	RG58/AU	017-0501-00	13.50
20 nsec	RG8/AU	017-0504-00	16.50

*Connector on one end only.

ACCESSORIES WITH GR-TYPE CONNECTORS

	Part No.	VSWR Rating	Price
50-Ω 10:1 Attenuator	017-0078-00	<1.1 to 1 GC	$30.00
50-Ω 5:1 Attenuator	017-0079-00	<1.1 to 1 GC	30.00
50-Ω 2:1 Attenuator	017-0080-00	<1.1 to 1 GC	30.00
50-Ω Termination	017-0081-00	<1.1 to 1 GC	23.00
50-Ω Type 874-K Coupling Cap	017-0028-00	<1.06 to 1 GC	10.00
50-Ω Type 874-X Insertion Unit	017-0030-00	—	13.00
50-ΩType 874-EL 90° Elbow	017-0070-00	<1.06 to 2 GC <1.5 to 4 GC	10.00
50-Ω Type 874-T Tee	017-0069-00	—	13.00
50-Ω to 125-Ω Min Loss Attenuator	017-0052-00	<1.2 to 1 GC	30.00
50-Ω Type 874-TPD Power Divider	017-0082-00	—	70.00

CALIBRATOR ADAPTER



The Adapter is basically intended for use with the Type N Plug-In Unit, but can be used with any Tektronix sampling system except those incorporating the Type RM561 and Type 567 Oscilloscopes. The Adapter converts a 50-volt output from the oscilloscope calibrator to 40 mv at an impedance of 50 ohms for use in calibrating the gain of the sampling system.

Order Part Number (017-0010-00 UHF) $20
(017-0074-00 BNC) 20

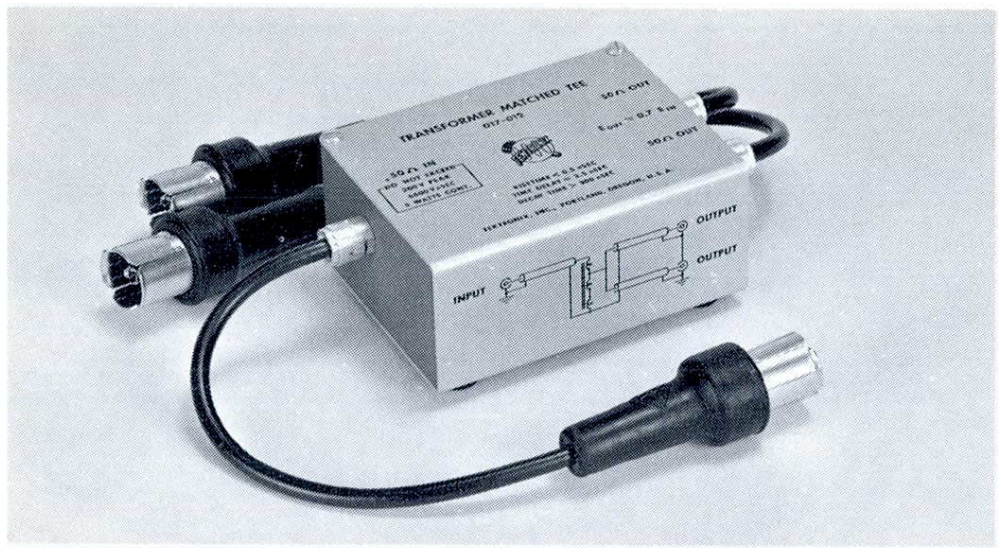
TIMING STANDARD

The Timing standard is a 3% device for calibrating equivalent sweep speeds of the Tektronix sampling systems. It is designed to ring at periods of 1, 2, 5, and 10 nsec when excited by a fast-rising pulse.

Order Part Number 013-0028-00 ..... $60

Accessories

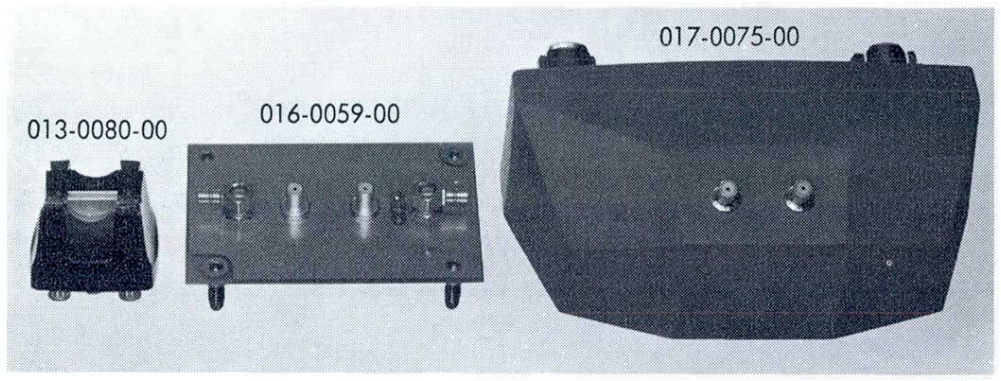
TRANSFORMER MATCHED "T"



This unit provides two 50-ohm outputs from one 50-ohm input and divides the regenerated trigger for simultaneous triggering of two sampling sweep systems. Not designed for signal purposes.

Order Part Number 017-0012-00 . . . . . $45

DIODE TEST JIG



DIODE TEST JIG for the TYPE 291 DIODE SWITCHING-TIME TESTER or the TYPE 292 SEMICONDUCTOR TESTER-POWER SUPPLY provides a quick and convenient facility for checking round or ribbon lead diodes. V-shaped contacts plus magnetic attraction assures good electrical continuity for the diode under test. The contacts are replaceable yet have a life of 10-million diode insertions. The risetime of the Type 291 or 292 when used with the Test Jig is less than 0.35 nsec. Conductor capacitance of the jig is less than 0.004 pf side to side.

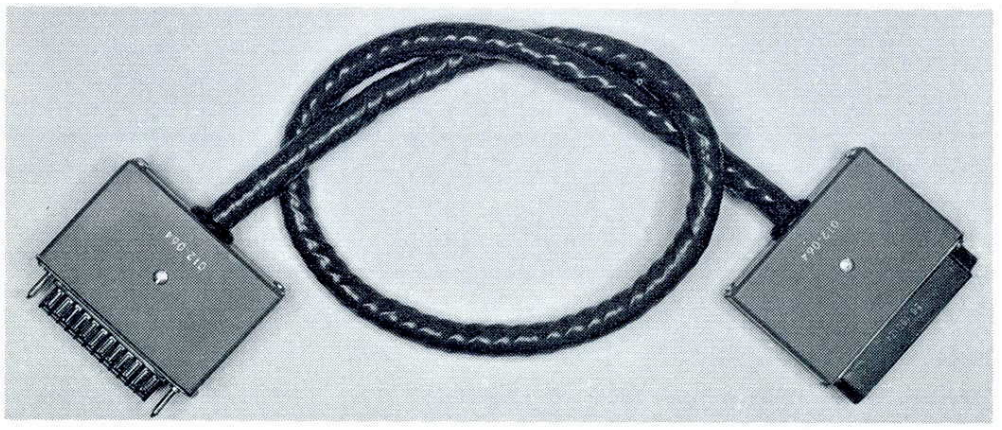
An adapter is required to provide electrical contact and mechanical support for the Test Jig when used with the Type 291 or 292.

DIODE TEST JIG (013-0080-00) $40

ADAPTER FOR TYPE 291 (017-0075-00) $55

ADAPTER FOR TYPE 292 (016-0059-00) $21

PLUG-IN UNIT ACCESSORIES

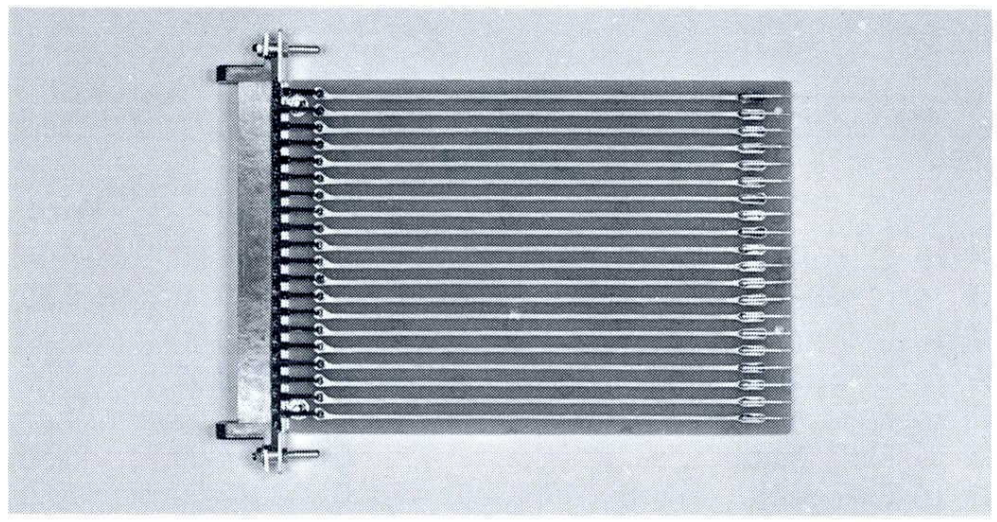


FLEXIBLE EXTENSION—30" long, permits Type 661 vertical or sweep plug-in units to be operated away from oscilloscope. See Gremar Cable.

Order Part Number 012-0064-00 . . . . . $23

FLEXIBLE EXTENSION — 30" long, permits Type 3S76 and Type 3T77 Sampling Plug-In Units to be operated away from oscilloscope.

Order Part Number 012-0066-00 . . . . . $23



15-PIN PLUG-IN EXTENSION CARD — Allows protrusion of Type 6R1A 15-pin etched-circuit boards.

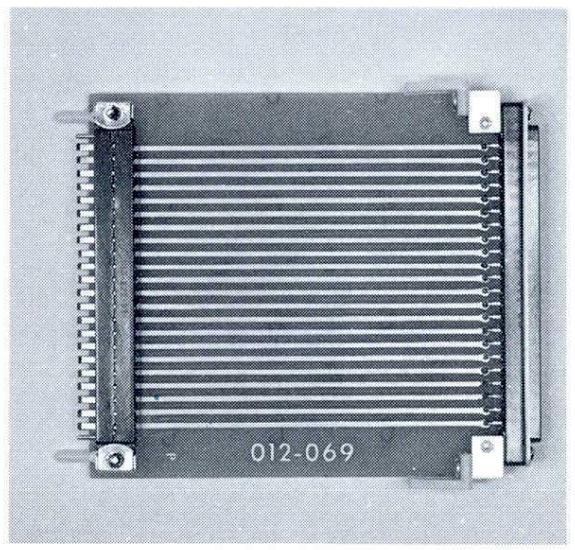
Order Part Number 012-0067-00 . . . . . $20

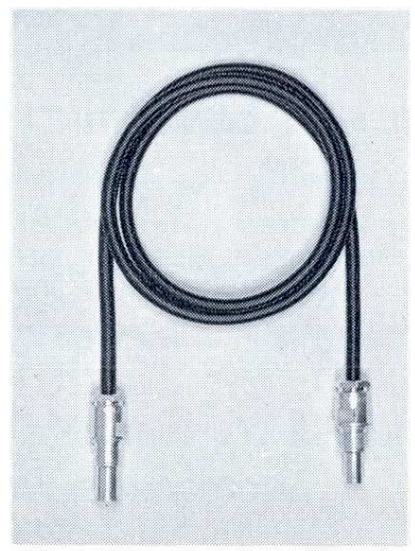
20-PIN PLUG-IN EXTENSION CARD — Allows protrusion of Type 6R1A 20-pin etched-circuit boards.

Order Part Number 012-0068-00 . . . . . $25

56-PIN PLUG-IN EXTENSION CARD—Allows protrusion of Type 3T4 56-pin etched-circuit boards. Also used for extending Type 262 Programmer cards.

Order Part Number 012-0078-00 . . . . . $20





TYPE 3S3 SUB-CHASSIS EXTENSION — Allows maintenance of Type 3S3 sub-chassis when 3S3 is extended out of oscilloscope.

Order Part Number 012-0077-00 . . . . . $25

TYPE 4S1 SUB-CHASSIS EXTENSION — Allows maintenance of Type 4S1 sub-chassis when 4S1 is extended out of oscilloscope.

Order Part Number 012-0069-00 . . . . . $25

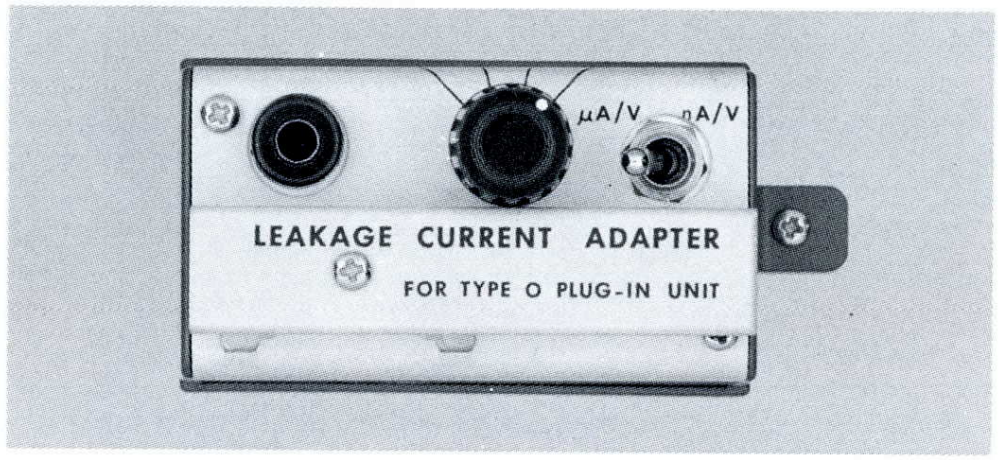
50-OHM GREMAR CABLE — For retaining internal trigger and snap-off driver connection between plug-in units of the Type 661 when one or both plug-in units are extended out of oscilloscope.

Order Part Number 012-0070-00 . . . . . $10.50

Accessories

TYPE "O" PLUG-IN UNIT ACCESSORIES

LEAKAGE CURRENT ADAPTER



The Leakage Current Adapter, used with the Type O Operational Amplifier Plug-In Unit, adapts the plug-in for measuring the reverse leakage current of semiconductor diodes and small-signal transistors. The adapter may also be used for measuring junction resistance or capacitance.

Banana plugs on the base of the adapter allow the unit to be plugged into the jacks on the front panel of the Type O Unit. Axial-lead diodes are checked by placing them in a notched retainer mounted on a swing-down cover. When closed, the cover places the leads against spring-contact clips, assuring good electrical contact. A four-pin socket is provided for checking small-signal transistors. The diode clips and the transistor socket are completely shielded to minimize leakage capacitance.

A positive-going sawtooth voltage is required for driving the adapter. Tektronix Oscilloscopes that accept the Type O Plug-In Unit have a Sawtooth or Sweep Out jack conveniently located on the front panel for supplying the required sawtooth voltage.

VERTICAL DEFLECTION FACTOR—1 microamp/volt or 1 nanoamp/volt, selected by a toggle switch.

VERTICAL DEFLECTION ACCURACY— ±8%.

HORIZONTAL DEFLECTION FACTOR—(with 100-v sawtooth, minimum). 1, 2, 5 and 10-v/cm selected by Horizontal V/CM switch.

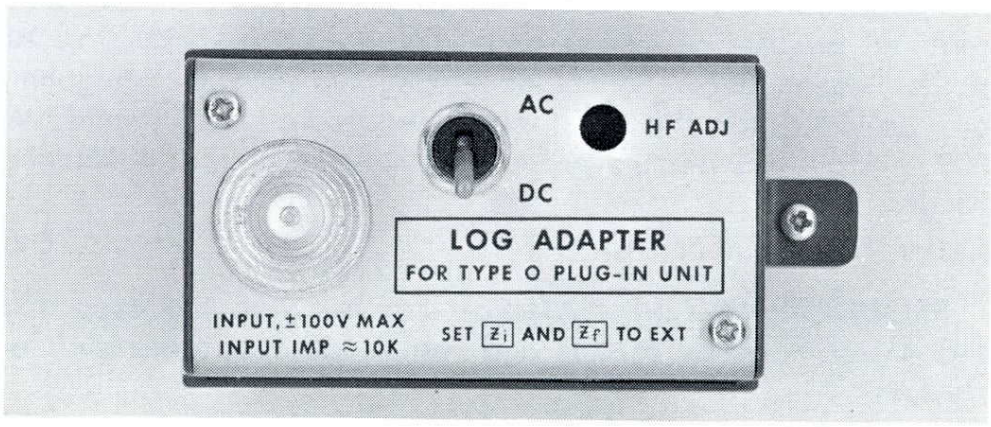
HORIZONTAL DEFLECTION ACCURACY— ±3%.

INPUT SAWTOOTH VOLTAGE—100 to 200 v (for 10-v/cm horizontal deflection).

MAXIMUM INTERNAL LEAKAGE—50 picoamps at 100 v.

LEAKAGE CURRENT ADAPTER (013-0086-00) $85

LOGARITHMIC AMPLIFIER ADAPTER



The Logarithmic Amplifier Adapter converts linear amplification characteristics of the A or B operational amplifiers in the Type O Operational Amplifier Plug-In Unit to approximate logarithmic characteristics.

ALLOWABLE INPUT SIGNAL—±100 v maximum, ac or dc coupled.

INPUT IMPEDANCE—Approximately 10 kilohms.

AMPLIFICATION CHARACTERISTICS—With the Logarithmic Amplifier Adapter, the operational amplifier approximates a logarithmic amplification response for input signals from ± 0.1 v to ± 100 v.

Signal-In	Deflection
± 0.1 v	1 cm ± 0.5 mm
± 1.0 v	2 cm ± 0.5 mm
± 10.0 v	3 cm ± 1.0 mm
± 100 v	4 cm ± 1.0 mm

Below an input level of ± 0.05 v, the amplifier is no longer logarithmic.

RISETIME—Typically 0.2 μsec—for a 10-v signal to rise from 0.1 v to 10 v.

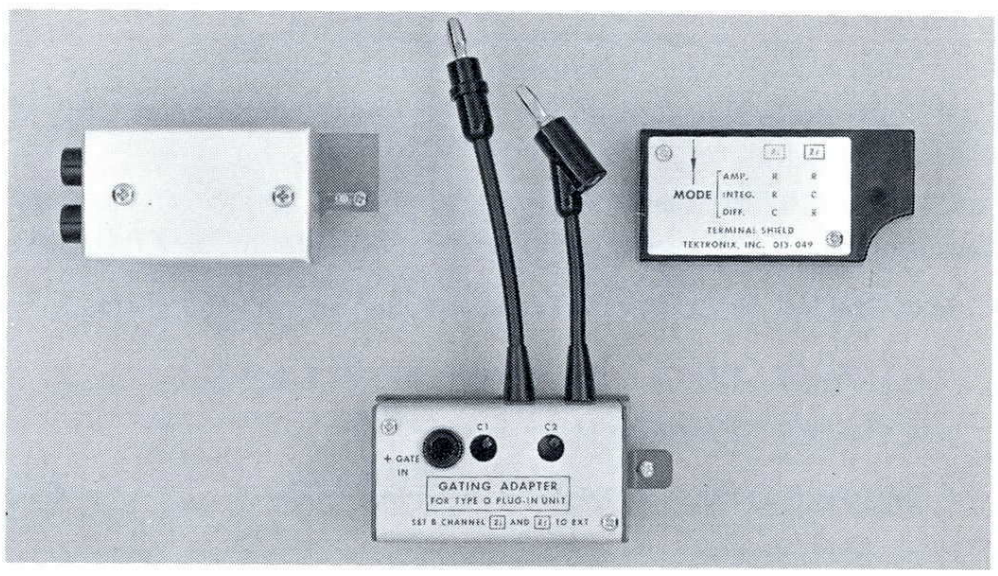
FALLTIME—Typically 0.3 μsec—for a 10-v signal to fall from 10 v to 0.1 v.

LOW FREQUENCY RESPONSE—65 cps. (In the AC-coupled mode, the —3-db point for signals of over 500 mv peak amplitude, and where the effective input resistance is 10 k).

PASSBAND—The —3-db apparent passband varies with both signal amplitude and signal dc level. It varies typically from 400 kc to 1 Mc, depending on the input signal.

LOGARITHMIC AMPLIFIER ADAPTER
Order Part Number 013-0067-00 . . . . . $75

TERMINAL ADAPTERS AND SHIELDS



TERMINAL ADAPTER ASSEMBLY has all the mechanical parts for creating a custom adapter for the "O" Unit.
Order Part Number 013-0048-00 . . . . . $10

TERMINAL SHIELD protects exposed terminals of the "O" Unit from spurious signals.
Order Part Number 013-0049-00 . . . . . $2.50

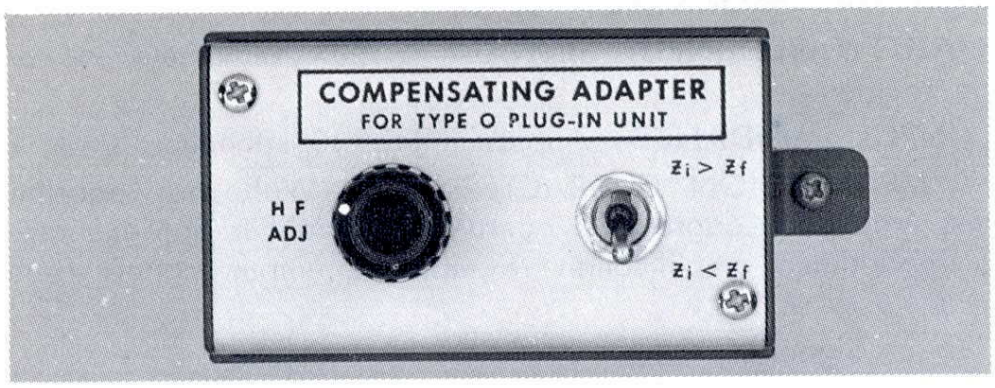
GATING ADAPTER permits on and off gating of the Type O Unit from the +20 v gate output of the oscilloscope used.

With the Adapter plugged into the "B" Operational Amplifier of the Type O Unit, the "A" Operational Amplifier is gated on or off. The signal applied is then amplified, integrated or differentiated only during the "on" time.

The Adapter is particularly useful for integration operations, where the accumulative voltage of repetitive signals would exceed the voltage rating of the Type O Unit input.
Order Part Number 013-0068-00 . . . . . $75

Accessories

COMPENSATING ADAPTER

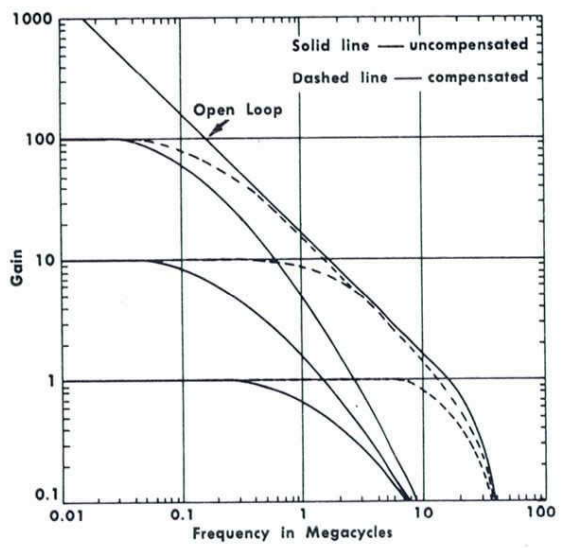


The Compensating Adapter extends the frequency performance of the Type O Unit operational amplifiers.

The adapter compensates for stray capacitance associated with the internal Z_i and Z_f resistors, providing an adjustment for optimum HF response.

CHARACTERISTICS
(Type O Unit and Adapter)

TYPICAL FREQUENCY RESPONSE of the Type O unit with and without the Compensating Adapter:



INPUT RESISTANCE—0.01 to 1 meg, determined by Z_i Selector position.

INPUT CAPACITANCE—approximately 40 to 450 pf, depending on the Z_f Selector position. (Maximum at X100 gain)

MAXIMUM INPUT VOLTAGE—400 v dc or 150 v rms.*

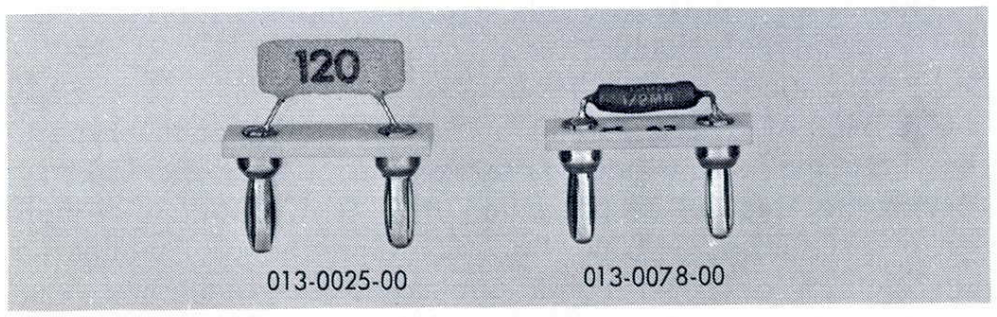
MAXIMUM OUTPUT VOLTAGE— ±50 v peak.

MAXIMUM TEMPERATURE— +55° C.

COMPENSATING ADAPTER (013-0081-00) $35

*Voltage derating is necessary for frequencies above 1 Mc.

TYPE Q PLUG-IN UNIT RESISTOR BOARDS



120-OHM PLUG-IN RESISTOR BOARD
Order Part Number 013-0025-00 ..... $2.25

150 K-OHM PLUG-IN RESISTOR BOARD
Order Part Number 013-0078-00 ..... $2.25

TYPE R PLUG-IN UNIT PLATE WIRED ASSEMBLIES

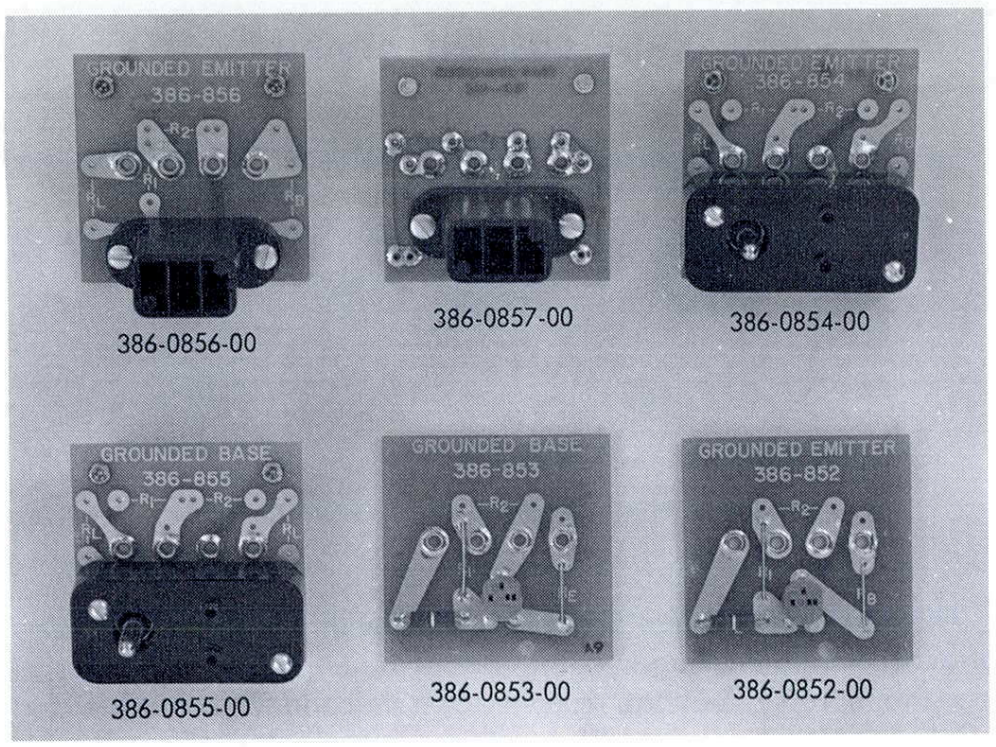
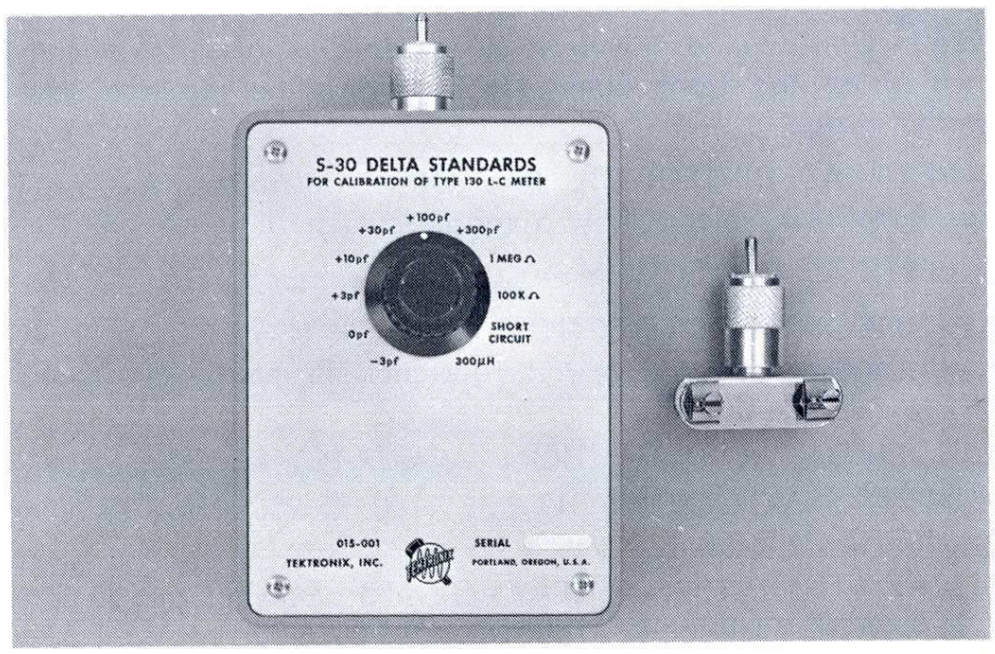


PLATE WIRED "R" ASSEMBLIES for various transistor checks

Description	Part No.	Price
Grounded emitter socket	386-0852-00	$5.00
Grounded base socket	386-0853-00	5.00
Grounded emitter power socket	386-0854-00	6.00
Grounded base power socket	386-0855-00	6.00
Grounded emitter adapter	386-0856-00	6.00
Grounded base adapter	386-0857-00	6.00

TYPE 130 L-C METER ACCESSORIES

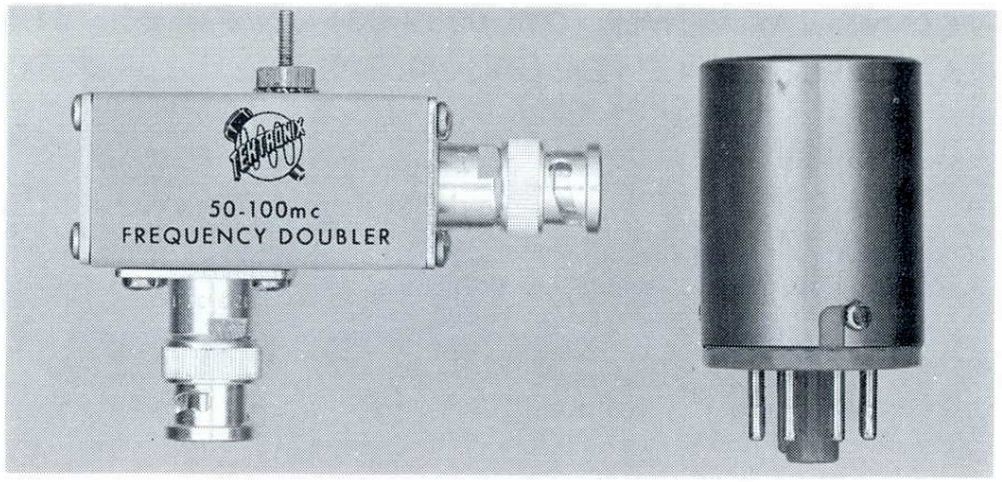


DELTA STANDARDS—For calibration of the Type 130 L-C Meter. The unit provides accurate steps of capacitance and inductance, selectable by a rotary selector switch. Values of the capacitance steps correspond to the full-scale adjustments required on the five scales of the Type 130. Two resistors of similar capacitance, values of 1 megohm and 0.1 megohm, are provided for the resistance compensation adjustment. A 300 μh standard permits proper adjustments of the inductance ranges.
Order Part Number 015-0001-00 ..... $40

PRODUCTION TEST FIXTURE—For use with the Type 130 L-C Meter. Speeds sorting and testing of capacitors and inductors.
Order Part Number 013-0001-00 ..... $5

Accessories

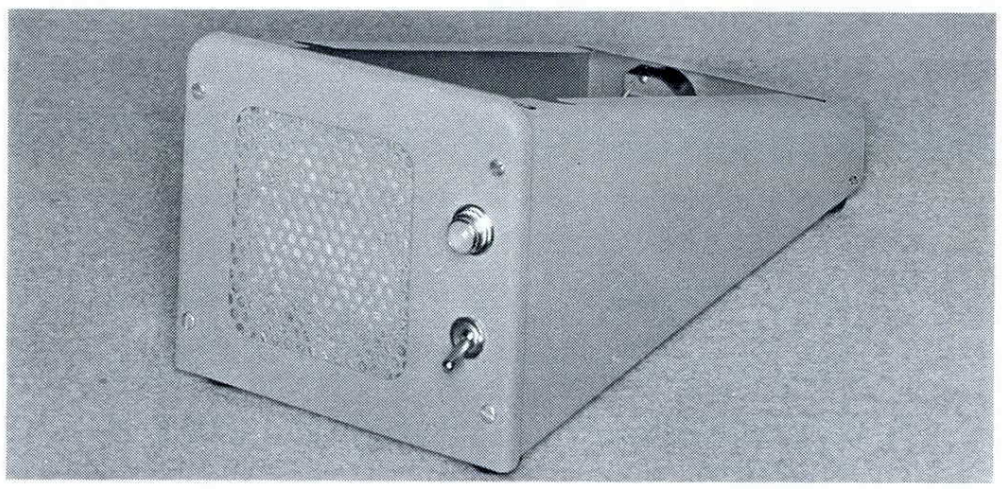
TYPE 180-181 ACCESSORIES



TYPE 181/RM181 CRYSTAL OVEN—A 1-Mc crystal mounted in a temperature-stabilized oven. Frequency adjustable to zero beat with W.W.V. Accuracy is 0.001% and frequency stability is 3 parts per million over a 24-hour period.
Order Part Number 158-0007-00 ..... $29

FREQUENCY DOUBLER for the Type 180 or 180A Time Mark Generator doubles the 50 Mc output to 100 Mc. Particularly useful for calibrating Type 580-Series Oscilloscopes.
Order Part Number (015-0056-00 BNC) $29.50
Order Part Number (015-0013-00 UHF) 29.50

TYPE 310/310A FAN BASE

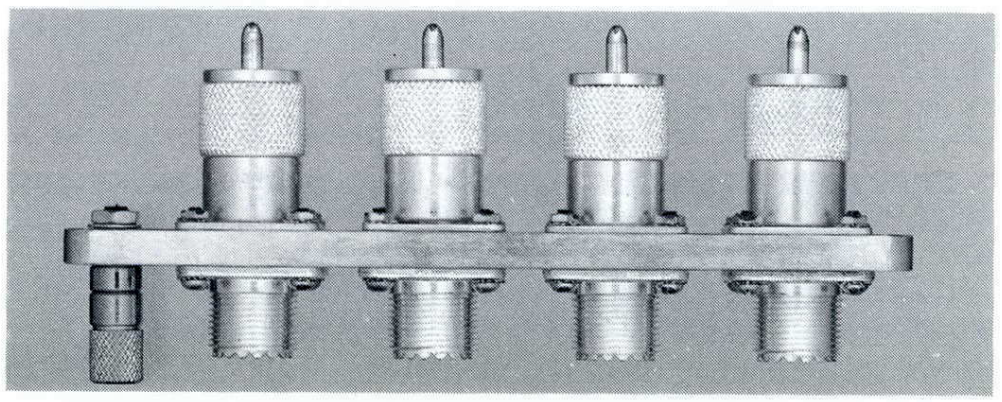


TYPE 310/310A FAN BASE provides filtered forced-air ventilation to reduce operating temperature when the instrument is used continuously for prolonged periods of time or in a hot or limited-ventilation area. The Fan Base tilts the oscilloscope to a convenient viewing angle.

For use on 105-125 v, 50 to 60 cps only:
Order Part Number 016-0012-00 ..... $50.00

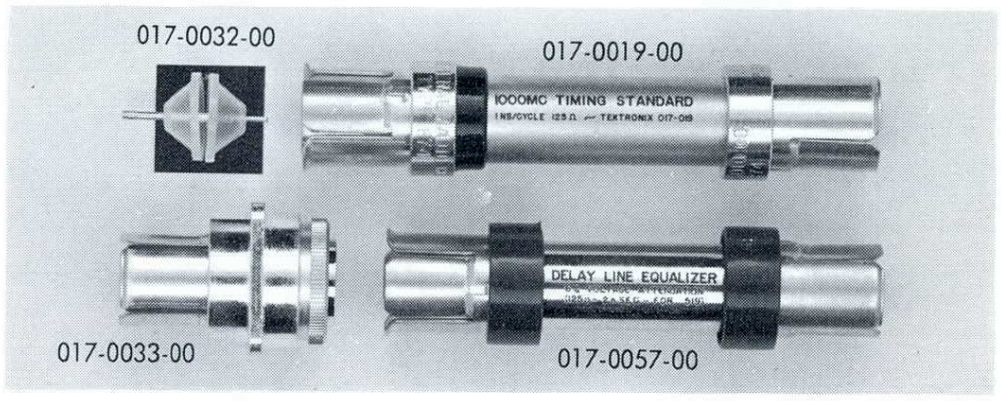
For use on 210-250 v, 50 to 60 cps only:
Order Part Number 016-0013-00 ..... $50.00

TYPE 507 GROUND CONNECTOR



For placing Type 507 Oscilloscope connectors on a common ground.
Order Part Number 013-0011-00 ..... $21.50

TYPE 519 ACCESSORIES



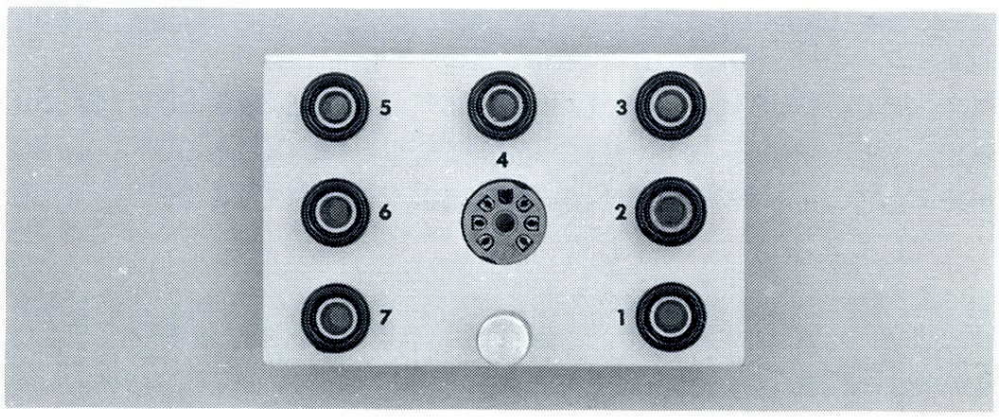
Description	Part No.	Price
1000 Mc Timing Standard	017-0019-00	$35.00
Double Button Contact Assembly	017-0032-00	2.25
Connector Panel Assembly	017-0033-00	7.00
Delay Line Equalizer	017-0057-00	10.00

125 Ω ACCESSORIES

Other than those listed under Oscilloscope Input Adapters, Attenuators and Terminations.

Description	Part No.	Price
Attenuator 1.4:1 for 125-Ω Connector	017-0009-00	$25.00
Component Insertion Unit	017-0013-00	10.00
Coupling Capacitor	017-0018-00	10.75
Cable Connector Spare Kit	017-0035-00	7.00
90° Elbow Assembly	017-0043-00	15.00
1 nsec delay cable, RG63/U	017-0507-00	16.50
2 nsec delay cable, RG63/U	017-0508-00	16.00
5 nsec delay cable, RG63/U	017-0509-00	16.50
10 nsec delay cable, RG63/U	017-0510-00	17.50
20 nsec delay cable, RG63/U	017-0511-00	24.00

TYPE 570 ADAPTER PLATES



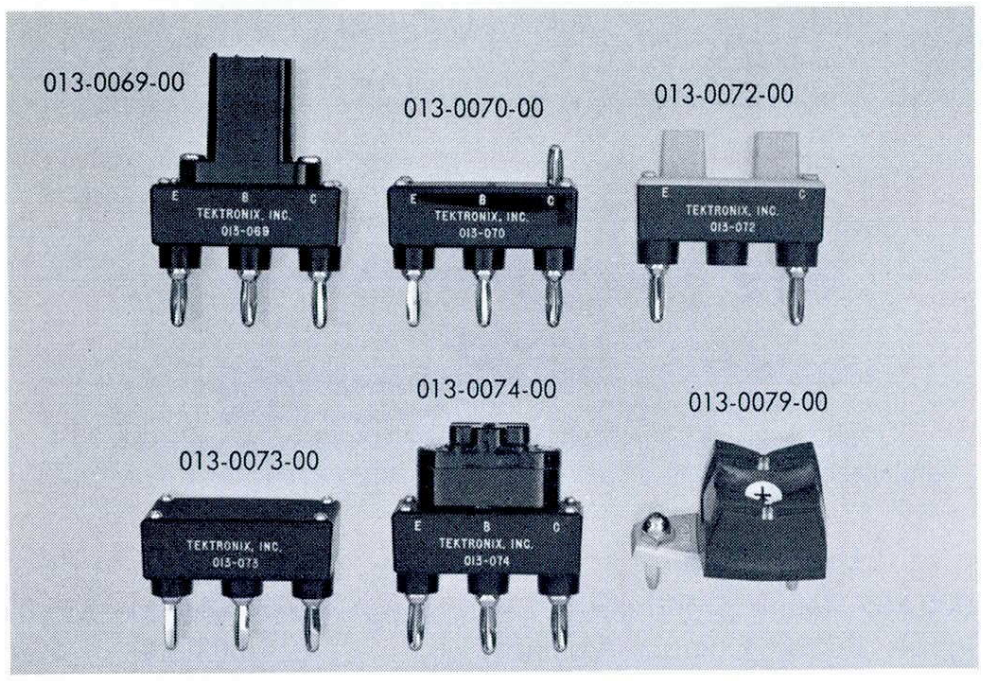
With Jacks Installed

Description	Part No.	Price
7-pin adapter plate	016-0004-00	$10.00
8-pin adapter plate	016-0005-00	10.00
9-pin adapter plate	016-0006-00	10.00
Blank adapter plate	016-0007-00	5.00
13-pin Nixie* Base	016-0040-00	12.50
5-pin Nuvistor Twelvar Base	016-0041-00	10.00
7-pin Nuvistor Twelvar Base	016-0042-00	10.00
12-pin Compactron duodecar Base	016-0043-00	12.50
9-pin Novar Base	016-0044-00	10.00

*Burroughs registered trademark.

Accessories

TYPE 575 TRANSISTOR AND DIODE ADAPTERS



Description	Part No.	Price
3-terminal (for wire lead transistors)	013-0069-00	$5.00
3-terminal (for 2-pin base power transistors	013-0070-00	5.00
Diode Test Jig (Tektronix)	013-0072-00	5.00
Diode Test Jig (Daymarc)	013-0079-00	25.00
Blank Adapter Box	013-0073-00	4.00
Power Transistor Adapter (for transistors with hook leads)	013-0074-00	5.00

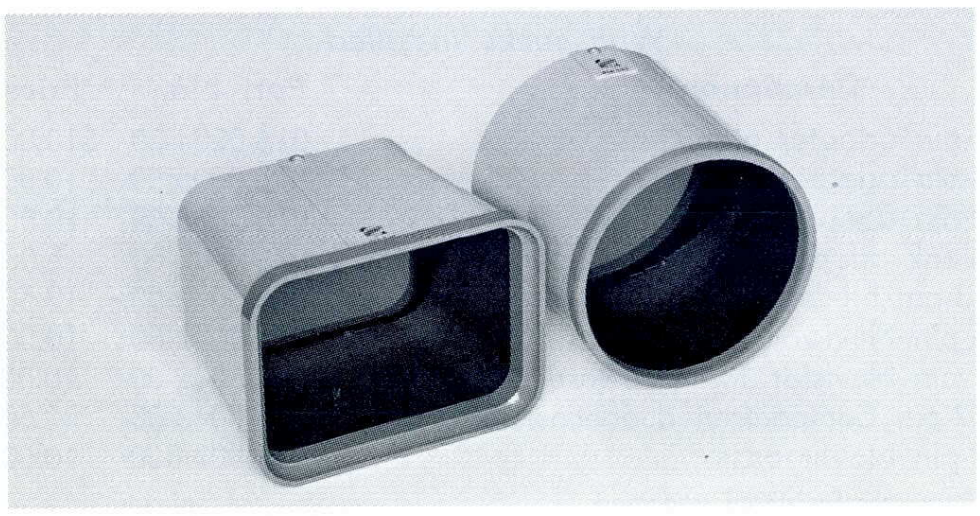
CAMERA MOUNTING ADAPTERS

BEZELS for mounting cameras other than Tektronix types on Tektronix Oscilloscopes. Mounting ring measures $5\frac{5}{8}$" outside diameter. Die-cast construction.

FOR 500-SERIES OSCILLOSCOPES* (014-0018-00) $4.50
FOR 560-SERIES OSCILLOSCOPES (014-0016-00) 4.50
FOR 600-SERIES OSCILLOSCOPES (014-0017-00) 4.50

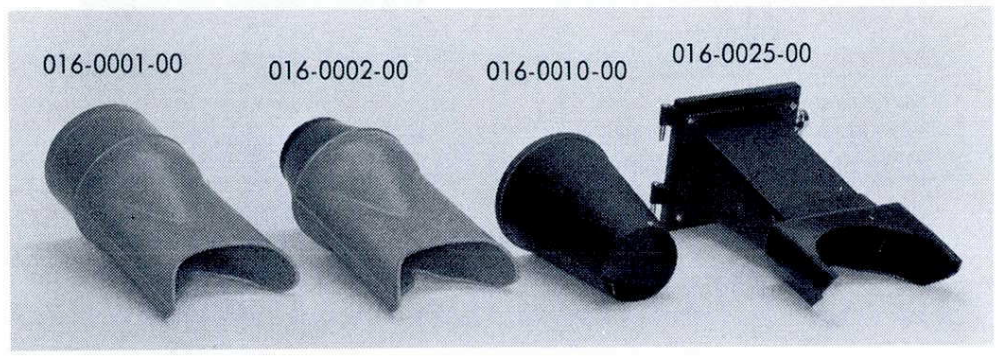
*Not recommended for use with the Type 519 Oscilloscope.

VIEWING ACCESSORIES



POLARIZED VIEWERS—For Tektronix 5" Oscilloscopes. The viewers reduce troublesome reflections and glare under high ambient-light conditions.

RECTANGULAR VIEWER (016-0039-00) $10
PLASTIC ROUND VIEWER (016-0053-00) 10



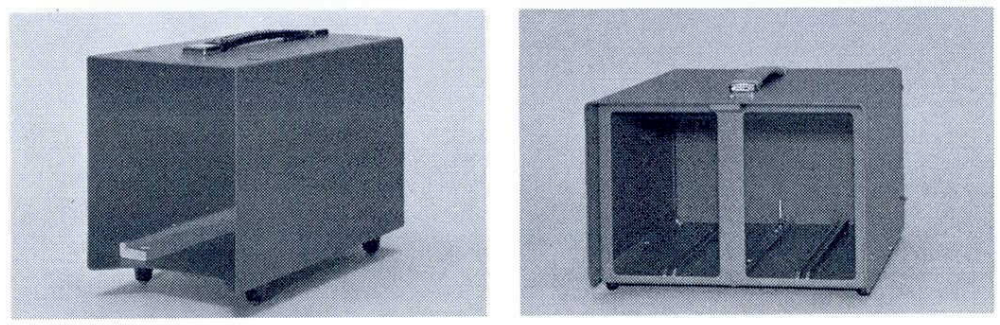
VIEWING HOOD—For Tektronix 5" Oscilloscopes. Includes molded rubber eyepiece and separate tubular light shield.
Order Part Number 016-0001-00 ..... $5.00

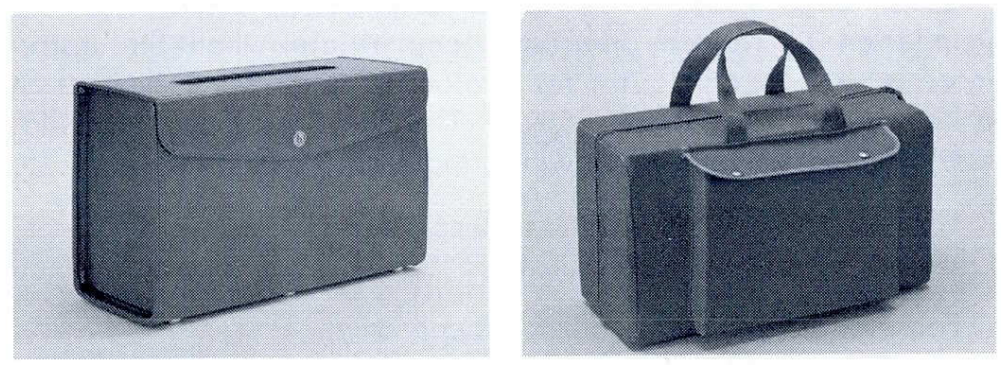
VIEWING HOOD—For Tektronix 3" Oscilloscopes except Type 321 below S/N 3210. Includes molded rubber eyepiece and separate tubular light shield.
Order Part Number 016-0002-00 ..... $5.00

COLLAPSIBLE VIEWING HOOD—For Tektronix 3" Oscilloscopes except Type 321 below S/N 3210. It is made of black acrylic plastic with handy fastening arrangement.
Order Part Number 016-0010-00 ..... $3.50

VIEWING HOOD—For Tektronix Type 519 Oscilloscope.
Order Part Number 016-0025-00 ..... $36.50

CARRYING CASES





CARRYING CASE FOR LETTER-SERIES OR 1-SERIES PLUG-IN UNITS—Provides protection for one oscilloscope plug-in unit.
Order Part Number 437-0065-00 ..... $20

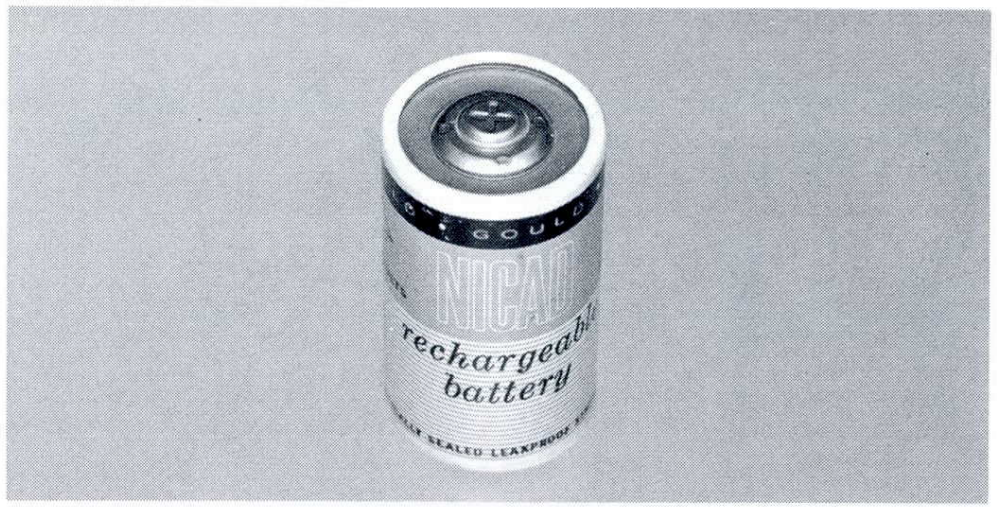
CARRYING CASE FOR 2, 3, 10 and 11 SERIES PLUG-IN UNITS—accommodates two plug-in units.
Order Part Number 437-0070-00 ..... $20

CARRYING CASE—For Type 321-321A Portable Oscilloscope.
Order Part Number 016-0026-00 ..... $30

CARRYING CASE—For Type 181 Generator or Type 310A Oscilloscope. Made of sturdy, turquoise-colored canvas.
Order Part Number 016-0028-00 ..... $17.65

Accessories

REPLACEMENT BATTERIES

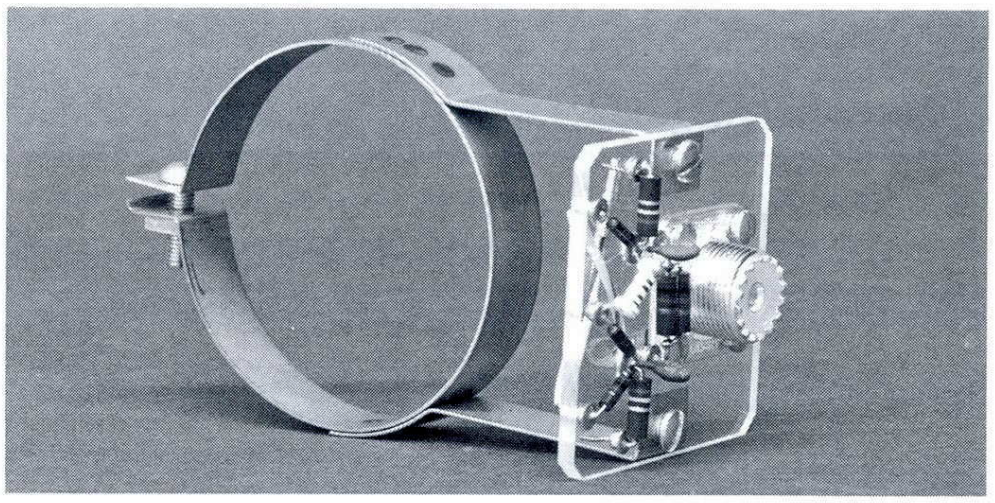


NiCd CELLS—3½ A.H. 'D' size, rechargeable, for Tektronix portable oscilloscopes.

FOR TYPE 321-321A: Order 10 (Part Number 146-0005-00), $9.15 each ..... Total $91.50

FOR TYPE 422: Order 20 (Part Number 146-0008-00), $7.00 each ..... Total $140.00

DEFLECTION PLATE CONNECTOR

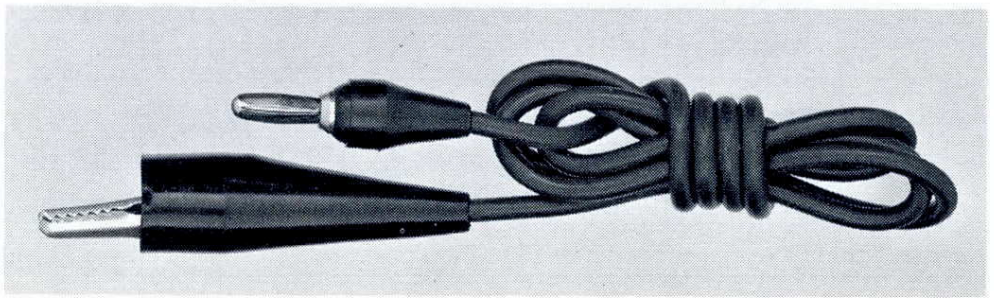


The connector can be used with Types 530, 540, 530A, and 540A-Series Oscilloscopes. It provides a convenient means of making a connection directly to the cathode-ray tube vertical deflection plates. It is designed for use with high-frequency, fast-rise pulses or transient signals. The function of the vertical position control of the oscilloscope is retained. The connector is designed for use with 52-ohm cables. The connector is not recommended for use with frequencies below 8 kc or pulses with correspondingly slow risetimes.

For instruments with serial numbers 5000 and below, Order Part Number 013-0006-00 ..... $10

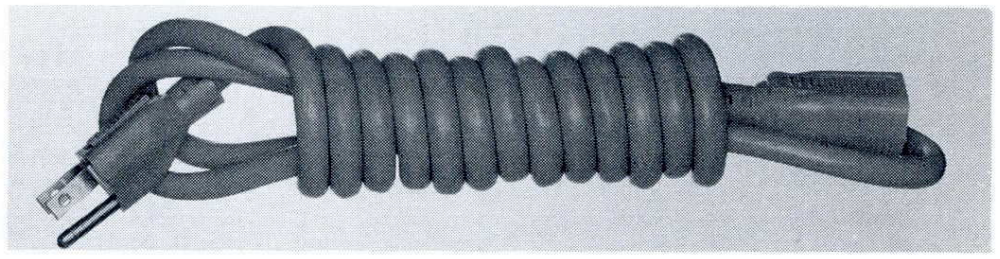
For instruments with serial numbers 5001 and above, Order Part Number 013-0007-00 ..... $10

MISCELLANEOUS CORDS AND LEADS



Description	Length (Inches)	Connectors	Part No.	Price
Output Lead, Black	30	Banana Plug to Alligator Clip	012-0014-00	$2.50
Output Lead, Red			012-0015-00	2.50
Patch Cord, Black	6	Banana Plug-Jack (Both Ends)	012-0023-00	1.15
Patch Cord, Red			012-0024-00	1.15
100-Ω Suppressor Cord			012-0025-00	3.00
300-Ω Suppressor Cord			012-0026-00	3.00
1000-Ω Suppressor Cord		Banana Plug (Both Ends)	012-0027-00	3.00
Patch Cord, Black			012-0028-00	2.00
Patch Cord, Red			012-0029-00	2.00
Patch Cord, Red	18		012-0031-00	1.20
Patch Cord, Black			012-0039-00	1.20
Master-Slave Cord-N Unit	12	Tini-Plug (Both Ends)	012-0055-00	3.75

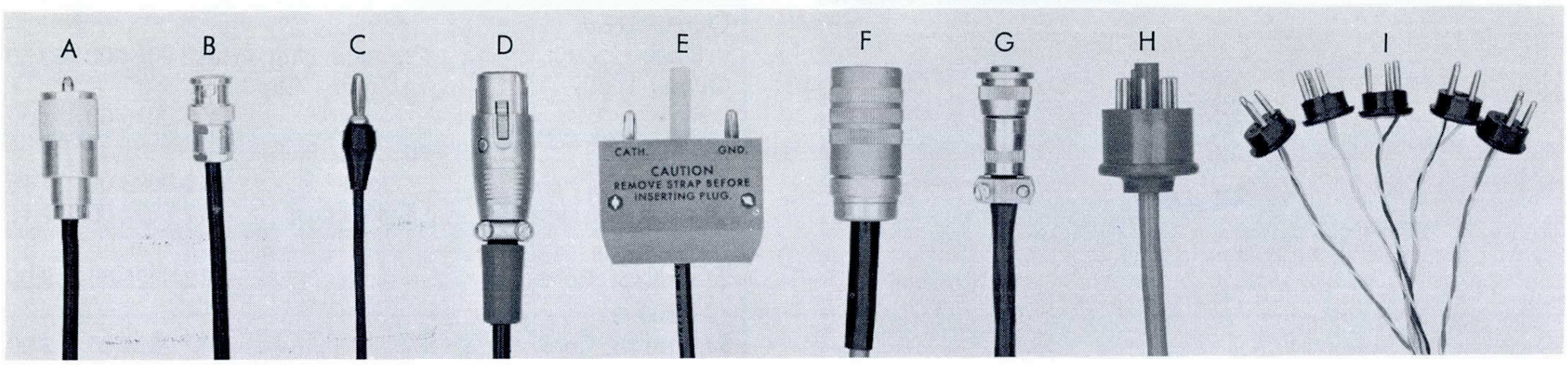
POWER CORDS

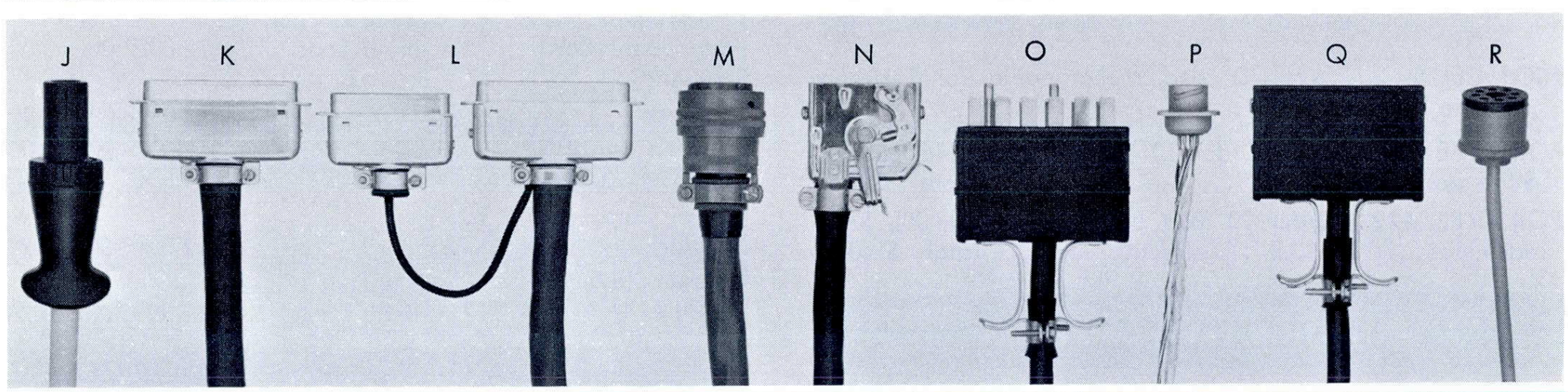


Connectors	Conductors		Length (Feet)	Part No.	Price
	Number	Gauge			
Male Plug to Female Plug	2	16	8	161-0004-00	$2.10
	3	16	8	161-0010-00	2.40
	3	16	28 in.	161-0025-00	1.45
Male Plug (one end only)	3	18	8	161-0017-00	1.95
	3	18	10	161-0006-00	6.10
	2	18	8	161-0002-00	1.60
Male Plug to Right Angle Female Plug	2	18	8	161-0007-00	3.70
	3	18	8	161-0022-00	3.60
Male Plug to Special Plug (ac cord for Types 321, 422)	3	20	8	161-0015-00	3.20
Male Plug to Special Plug (dc cord for Types 321, 422)	3	20	8	161-0016-00	2.70
Male Plug to Special Plug (ac only cord for Type 422)	3	18	8	161-0024-00	2.75
Male Plug to Special A Connector	3	16	8	161-0005-00	3.25

Accessories

MISCELLANEOUS CABLES





INSTRUMENT TYPE	FUNCTION	LENGTH (INCHES)	IMPEDANCE (OHMS)	CONNECTOR TYPE	CONNECTOR FIG.	PART NUMBER	PRICE
GENERAL	Output	42	50	UHF	A-A	012-0001-00	$ 6.50
GENERAL	Output	42	50	BNC	B-B	012-0057-00	4.00
GENERAL	Output	42	75	UHF	A-A	012-0002-00	7.50
GENERAL	Output	42	75	BNC	B-B	012-0074-00	6.50
GENERAL	Output	42	93	UHF	A-A	012-0003-00	6.50
GENERAL	Output	42	93	BNC	B-B	012-0075-00	4.00
GENERAL	Output-Terminated with 93 Ω Resistor	42	93	UHF	A-A	012-0005-00	6.50
GENERAL	Output-Terminated with Variable Attenuator	42	93	UHF	A-A	012-0004-00	13.50
GENERAL	Output	42	170	UHF	A-A	012-0006-00	7.50
GENERAL	Horizontal Input	18	—	Banana	C-C	012-0054-00	2.50
GENERAL	Adapter Cable	5	—	2-Banana to UHF	A-C	012-0059-00	3.50
E	Input	30	—	Special 3-pin	D	012-0022-00	6.00
N	CRT Cathode Unblanking	62	—	Special 2-Banana to BNC	B-E	012-0052-00	11.00
N	Horizontal Input	30	—	Banana to UHF	A-C	012-0053-00	7.50
Q	Input	15 ft.	—	Special 9-pin	F	012-0040-00	12.00
2A61	Input	60	—	Special 4-pin	G	012-0072-00	10.00
122	Battery Cable	7 ft.	—	Octal to (5) 3-pin	H-I	012-0009-00	15.00
127	Input	60	170	UHF	A-A	012-0034-00	7.50
160, 360	Inter-connecting	20	—	Octal	H-R	012-0016-00	7.00
161, 162, 163	Inter-connecting	10	—	Octal	H-H	012-0017-00	5.00
175	Test Cable	30	—	Banana	C-C	012-0056-00	1.75
175	Test Cable-Black Plug	42	—	Special Plug	J-J	012-0044-00	9.00
175	Test Cable-Red Plug	42	—	Special Plug	J-J	012-0043-00	9.00
175	Socket Adapter	—	—	Special 9-pin	P	012-0045-00	11.25
262	6R1 Inter-connecting	6 ft.	—	36-50 Pin Ribbon Special 41-pin	L-M	012-0081-00	60.00
262	262 Inter-connecting	48	—	50-pin Ribbon	K-K	012-0082-00	60.00
507, 517A**	Inter-connecting	30	—	16-pin Ribbon	N-N	012-0032-00	27.00
551, 555	Inter-connecting	72	—	16-pin Ribbon	N-N	012-0051-00	28.40
517/517A*	Inter-connecting	30	—	12-pin Ribbon	O-Q	012-0012-00	20.00

* Serial Number 101-1739 ** Serial Number 1740 and up.

Accessories

STANDARD GRATICULES

GRATICULE RULING					
INSTRUMENT TYPE*	DIVISION	VERTICAL	HORIZONTAL	PART NO.	PRICE
310, 310A, 360	¼"	8	10	331-0027-00	$2.25
316		8	10	331-0042-00	2.25
317		8	10	331-0095-00 (adjustable) 331-0042-00 (not adjustable)	2.25
321, 321A		6	10	331-0055-00	2.25
502, 502A, 565	1 cm	10	10	331-0047-00	3.50
503, 504, 560, 561, 661		8	10	331-0056-00	3.50
507, 515, 515A, 516, 531 531A, 533, 533A, 535, 535A		6	10	331-0037-00 (adjustable) 331-0016-00 (not adjustable)	3.50
517 (SN 101-925)		4	8	331-0008-00	9.50
517A (SN 926-957)		4	8	331-0030-00	9.50
517A (SN 958-up)		4	8	331-0033-00	9.50
519		2	6	331-0065-00	9.50
524, 524AD		6	10	331-0006-00	3.50
525	Marked in Percentage for Modulation Measurement			331-0035-00	3.50
526	Marked in Degrees for Color TV Vector Analysis			331-0104-00	9.50
527	Composite IEEE			331-0069-00	3.50
RM527	—40 to +100 Units			331-0068-00	3.50
532	1 cm	8	10	331-0026-00	3.50
536, 570, 575	5/16"	10	10	331-0028-00	3.50
541, 541A, 543, 543A, 545 545A, 581, 581A, 585, 585A	1 cm	4	10	331-0034-00 (adjustable)	3.50
551, 555		6	10	331-0045-00	3.50
RM561, 567		8	10	331-0076-00	3.50
564		8	10	331-0097-00	3.50

* For both cabinet and rack-mount instruments unless rack-mount version is listed.

SPECIAL PURPOSE GRATICULES

GRATICULE RULING					
INSTRUMENT TYPE*	DIVISION	VERTICAL	HORIZONTAL	PART NO.	PRICE
524, 524AD	1/8" x 1 cm	17	10	331-0009-00	$3.50
524, 524AD, 525	Color TV Bar Dimensions			331-0040-00	4.50
527	Non-composite IEEE			331-0079-00	3.50
527	Marked in Percentage for Video Modulation Measurements			331-0080-00	3.50
RM527, RM529	Non-composite IEEE 0-100 Units			331-0077-00	3.50
RM527	Marked in Percentage for Video Modulation Measurements			331-0078-00	3.50
RM529†	Composite IEEE —50 to +110 Units			331-0156-00	3.45
RM529†	—50 to +120 IEEE Units and 0-100% Modulation			331-0157-00	3.45
RM529†	7 cm H.A.D., Sine², and 2%, 4% 'K' Factor			331-0161-00	3.45
531, 531A, 533 533A, 535, 535A MOD108A	.85 cm	6	10	331-0051-00	3.50
536	For Phase Angle Measurements			331-0057-00	3.50
541, 541A, 543 543A, 545, 545A MOD 108A	.85 cm	4	10	331-0052-00	3.50
551 MOD 108A	.85 cm	6	10	331-0053-00	3.50
561A MOD 210C.	1 cm	6	10	331-0090-00	3.50

* For both cabinet and rack-mount instruments unless rack-mount version is listed.
† Also usable with the Type RM527.

Accessories

UNSCRIBED GRATICULES

Instrument Type*	Part No.	Price
310, 310A, 316, 317, 360	386-0395-00	$1.50
502, 502A, 517 (SN 926-957), 524, 524AD, 525, 526, 532, 536, 551, 555, 570, 575	331-0093-00	2.00
503, 504, 560, 561, 661	331-0105-00	2.00
507, 515, 515A, 516, 517A (SN 957-up), 581, 581A, 585, 585A	386-0451-00	2.00
527, RM561, 567	331-0084-00	2.00
531, 531A, 533, 533A, 535, 535A, 541, 541A, 543, 543A 545, 545A	386-0451-00 (adjustable)	2.00
	331-0093-00 (not adjustable)	2.00
561A, RM561A, 564 (Implosion shield for ceramic type crt only.)	337-0539-00	2.00

* For both cabinet and rack-mount instruments unless rack-mount version is listed.

CATHODE-RAY TUBE LIGHT FILTERS

Filters for Tektronix Oscilloscopes using 5" round crt's with external graticule.

Instrument*	Color	Part Number	Price
Types 502, 502A, 503, 504, 515, 515A, 516, 517, 517A, 524AD, 525, 526, 661, 530, 540 and 550-Series	Green	378-0514-00	$ .90
	Amber	378-0516-00	.90
	Blue	378-0515-00	.90
	Yellow	378-0502-00	1.70

Filters for Tektronix Oscilloscopes using 5" round crt's with internal graticule.

Instrument*	Color	Part Number	Price
Types 543B, 544, 545B, 546, 547, 555, 565, 581A, 585A	Smoke Grey	378-0546-00	$1.65

Filters for Tektronix Oscilloscopes using rectangular glass crt's.

Instrument*	Color	Part Number	Price
Type 422	Smoke Grey	378-0549-00	$ .40
Types 527, RM527 RM529, 561	Green	378-0525-00	1.50
	Amber	378-0528-00	1.50
	Blue	378-0527-00	1.50
Types 506, 561A, 567	Smoke Grey	378-0544-00	1.00
Type 647	Smoke Grey	378-0548-00	.45

Filters for Tektronix Oscilloscopes using rectangular ceramic crt's.

Instrument*	Color	Part Number	Price
Types 561A, 564	Green	378-0534-00	$ .90
	Amber	378-0536-00	.90
	Blue	378-0535-00	.90

* For both cabinet and rack-mount instruments unless rack-mount version is listed.

Filters for Tektronix Oscilloscopes using 3" crt's

Instrument*	Color	Part Number	Price
Type 315D	Green	378-0505-00	$ .50
	Amber	378-0506-00	.50
	Blue	378-0507-00	.50
	Yellow	378-0508-00	.50
Types 321, 321A	Green	378-0521-00	.50
	Amber	378-0524-00	1.10
	Blue	378-0523-00	1.15
Types 310, 310A, 316, 317, 360	Green	378-0509-00	.50
	Amber	378-0511-00	.50
	Blue	378-0510-00	.50
	Yellow	378-0512-00	.50

*For both cabinet and rack-mount instruments unless rack-mount version is listed.

CRT MESH FILTERS

The mesh filter improves display contrast for oscilloscope viewing under high-ambient light conditions. The filter is a direct replacement for the existing graticule cover on most Tektronix instruments, or, in the case of the new portable oscilloscopes, snaps in the CRT opening on the front panel.

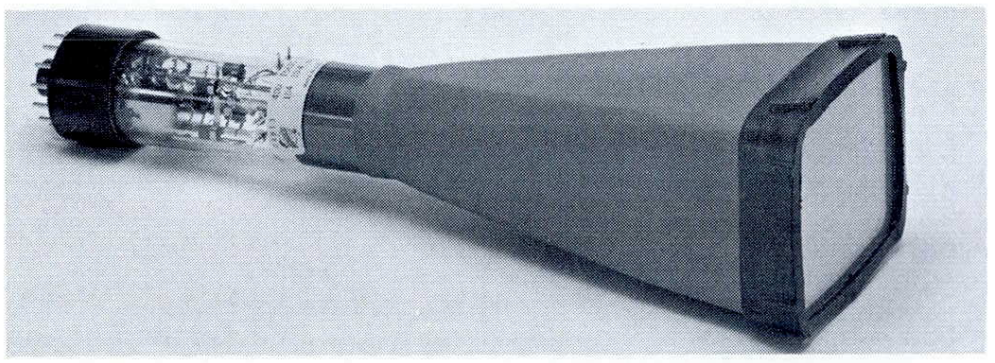
A fine metal screen with a matte black surface is utilized to reduce light reflections. Although light transmission from the CRT is reduced to approximately 28%, the high attenuation of external reflections allows viewing low-intensity displays in room light or other bright surroundings.

The mesh filter also serves as an RFI filter. Installed on the instrument, the metal frame of the filter is grounded, providing effective filtering of the RFI spectrum.

INSTRUMENT*	PART NUMBER	PRICE
Type 422	378-0571-00	$12.00
Types 502, 502A, 503, 504, 515, 515A, 516, 517A, 524AD, 661; 530, 540, 550, 580-Series	378-0572-00	15.00
Types 506, 560-Series, 527, RM529	378-0575-00	15.00
Type 647	378-0574-00	15.00

* For both cabinet and rack-mount instruments unless rack-mount version is listed.

REPLACEMENT CATHODE-RAY TUBES



Replacement CRT's listed are for current production instruments only. Phosphor types other than indicated are available on special order. (See page 14 for phosphor descriptions.) Direct-replacement CRT's for all earlier instruments not listed are also available. Consult your Tektronix Field Engineer for particulars.

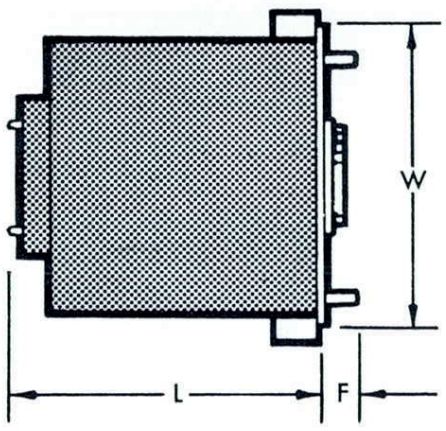
Accessories

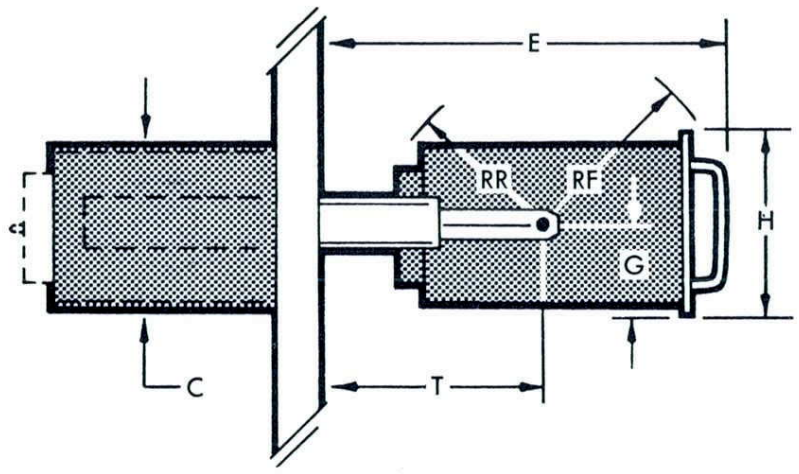
Instrument†	Phosphor	Graticule Used	Notes	Part Number	Price
310A, 360	P1	External	For all Serial Numbers P31 is Standard Phosphor for 310A; P2 for 360	154-0362-00	$ 45.00
	P2*			154-0363-00	45.00
	P7			154-0364-00	45.00
	P11			154-0365-00	45.00
	P31*			154-0366-00	45.00
317	P1	External	For all Serial Numbers	154-0216-00	90.00
	P2*			154-0196-00	90.00
	P7			154-0217-00	90.00
	P11			154-0218-00	90.00
	P31			154-0346-00	90.00
321A	P2	External	For all Serial Numbers	154-0442-00	85.00
	P7			154-0443-00	85.00
	P11			154-0444-00	85.00
	P31*			154-0433-00	85.00
422	P31*	Internal	For all Serial Numbers	154-0466-00	140.00
502A	P1	External	For all Serial Numbers	154-0245-00	125.00
	P2*			154-0246-00	125.00
	P7			154-0247-00	125.00
	P11			154-0248-00	125.00
	P31			154-0348-00	125.00
503, 504	P1	External	For all Serial Numbers	154-0264-00	60.00
	P2*			154-0265-00	60.00
	P7			154-0266-00	60.00
	P11			154-0267-00	60.00
	P31			154-0341-00	60.00
506	P31*	Internal	For all Serial Numbers	154-0462-00	80.00
507	P2	External	For all Serial Numbers	154-0299-00	125.00
	P11*			154-0137-00	125.00
	P31			154-0415-00	125.00
515A, 516	P1	External	For all Serial Numbers	154-0125-00	60.00
	P2			154-0120-00	60.00
	P7			154-0126-00	60.00
	P11			154-0127-00	60.00
	P31*			154-0344-00	60.00
517A	P2	External	For all Serial Numbers	154-0109-00	110.00
	P11*			154-0105-00	110.00
	P31			154-0416-00	110.00
519	P11*	External	For SN 244 and above only	154-0308-00	1000.00
524AD	P1*	External	For all Serial Numbers	154-0068-01	40.00
	P7			154-0069-01	40.00
	P11			154-0070-01	40.00
526	P1*	External	For all Serial Numbers	154-0289-00	99.00
RM529	P1	External	For all Serial Numbers	154-0469-00	60.00
	P2			154-0470-00	60.00
	P7			154-0471-00	60.00
	P11			154-0472-00	60.00
	P31*			154-0473-00	60.00
531A, 533A 535A	P1	External	For all Serial Numbers	154-0178-00	75.00
	P2*			154-0165-00	75.00
	P7			154-0179-00	75.00
	P11			154-0180-00	75.00
	P31			154-0350-00	75.00
536	P1	External	For all Serial Numbers	154-0140-00	75.00
	P2			154-0133-00	75.00
	P7			154-0135-00	75.00
	P11			154-0136-00	75.00
	P31*			154-0351-00	75.00
541A	P1	External	For all Serial Numbers	154-0181-00	75.00
	P2*			154-0175-00	75.00
	P7			154-0182-00	75.00
	P11			154-0183-00	75.00
	P31			154-0339-00	75.00
543B, 544, 545B, 546, 547	P2	Internal	For all Serial Numbers	154-0478-01	120.00
	P7			154-0478-02	120.00
	P11			154-0478-03	120.00
	P31*			154-0478-00	120.00
551	P1	External	For SN 2032 and above only	154-0251-00	180.00
	P2*			154-0252-00	180.00
	P7			154-0254-00	180.00
	P11			154-0255-00	180.00
	P31			154-0352-00	180.00
555	P2*	Internal	For SN 9000 and above only	154-0476-00	245.00
	P7			154-0476-01	245.00
	P11			154-0476-02	245.00
	P31			154-0476-03	245.00
561A, 567	P2	Internal	561A: All Serial Numbers 567: SN 1999 and above only RM567: SN 2000 and above only	154-0454-00	80.00
	P7			154-0455-00	80.00
	P11			154-0456-00	80.00
	P31*			154-0449-00	80.00
564	200	External	Optimum stored Brightness	154-0410-00	450.00
	201		Optimum Writing Rate	154-0418-00	450.00
565	P2*	Internal	For SN 1000 and above only	154-0477-00	195.00
	P7			154-0477-01	195.00
	P11			154-0477-02	195.00
	P31			154-0477-03	195.00
570, 575	P1*	External	For all Serial Numbers	154-0093-00	60.00
	P2			154-0097-00	60.00
	P7			154-0102-00	60.00
	P11			154-0103-00	60.00
	P31			154-0343-00	60.00
581A, 585A	P2	Internal	581A: SN 5000 and above only 585A: SN 9000 and above only RM585A: SN1000 and above only	154-0479-01	195.00
	P11			154-0479-02	195.00
	P31*			154-0479-00	195.00
647	P11	Internal	647: SN 220 and above only RM647: All Serial Numbers	154-0434-00	270.00
	P31*			154-0448-00	270.00
661	P1	External	For SN 310 and above only	154-0264-00	60.00
	P2*			154-0265-00	60.00
	P7			154-0266-00	60.00
	P11			154-0267-00	60.00
	P31			154-0341-00	60.00

† Both Cabinet and Rackmount versions unless Rackmount is listed.
* Standard Phosphor shipped with the instrument initially.

U.S. Sales Prices f.o.b. Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

Instrument Dimensions





RACK MOUNT INSTRUMENTS *EXCLUSIVE OF PLUG-IN UNITS AND PROBES*		
Symbol	**Description**	**Definition**
H	Height	Height of front panel.
W	Width	Width of front panel.
L	Length	Rack front to rearmost permanent fixture, excluding cables.
F	Forward Clearance	Back of front panel to foremost protrusion.
G	Vertical Axis	Bottom of front panel to horizontal plane of rotation.
E	Extended Inst.	Maximum forward clearance with instrument out and horizontal.
RF	Radius — front	Front radius of rotation.
RR	Radius — rear	Rear radius of rotation.
T	Track	Rack front to pivot point.
C	Cabinet	Cabinet height.

These instruments mount with sliding tracks in a cabinet that mounts to a standard 19" rack.

These instruments mount with sliding tracks to a standard 19" rack. Rear support for sliding tracks is required, such as an enclosed rack.

These instruments bolt directly to a standard 19" rack. They can be ordered at additional cost, with tilt-lock, sliding tracks. Rear support for tracks is required.

	MOUNTING DIMENSIONS									
TYPE	**H**	**W**	**L**	**F**	**G**	**E**	**RF**	**RR**	**T**	**C**
RM15	8 3/4	19	22 9/16	1 3/4	2 7/16	29 5/8	13 7/8	12 1/2	16 1/2	8 5/8
RM17	7	19	17 5/8	1 3/4	2 13/16	21 1/8	12 9/16	7 3/4	9 1/8	6 13/16
RM31A	14	19	22 3/4	2 1/8	7 1/16	29 1/2	14	12 3/8	16 3/8	13 7/8
RM33A	14	19	22 3/4	2 1/8	7 1/16	29 1/2	14	12 3/8	16 3/8	13 7/8
RM35A	14	19	22 3/4	2 1/8	7 1/16	29 1/2	14	12 3/8	16 3/8	13 7/8
RM41A	14	19	22 3/4	2 1/8	7 1/16	29 1/2	14	12 3/8	16 3/8	13 7/8
127	8 3/4	19	21 5/8	1 3/4	2 7/16	28 5/8	12 11/16	12 1/4	16 3/8	8 3/4
129	10 1/2	19	21 3/4	2 1/8	1 3/4	29 1/2	17 5/8	11 1/16	13 1/4	10 7/16
RM502A	12 1/4	19	21 1/2	1 7/8	2 7/16	26	15 5/8	10 3/8	13	11
RM503	7	19	17	1 3/4	3 1/2	22 3/4	11 7/8	7 9/16	11 1/8	7
RM504	7	19	17	1 3/4	3 1/2	22 3/4	11 7/8	7 9/16	11 1/8	7
526	8 3/4	19	17 15/16	1 3/4	2 7/16	21 1/2	11 3/4	10	10 5/8	8 5/8
RM529	5 1/4	19	18 1/4	1 3/4	2 3/8	21 1/4	12 1/8	8 1/2	9 3/8	—
RM543B	14	19	22 5/8	1 15/16	7 1/16	28 3/4	13 7/16	13	16 3/8	13 7/8
RM544	14	19	22 5/8	1 15/16	7 1/16	28 3/4	13 7/16	13	16 3/8	13 7/8
RM545B	14	19	22 5/8	1 15/16	7 1/16	28 3/4	13 7/16	13	16 3/8	13 7/8
RM546	14	19	22 5/8	1 15/16	7 1/16	28 3/4	13 7/16	13	16 3/8	13 7/8
RM547	14	19	22 5/8	1 15/16	7 1/16	28 3/4	13 7/16	13	16 3/8	13 7/8
RM561A	7	19	18 3/8	1 11/16	2 5/16	24 5/16	13 7/16	7 1/8	11 1/8	6 7/8
RM564	7	19	18 3/8	1 11/16	2 7/16	24 5/16	13 3/4	7 7/8	11	6 3/4
RM565	12 1/4	19	22	1 7/8	2 7/16	30 9/16	15 13/16	14	16 5/8	12 3/16
RM567	12 1/4	19	22	1 7/8	2 7/16	31 5/8	16 7/8	12	16 9/16	12 3/16
RM585A	14	19	22 3/4	2 1/8	7 1/16	29 1/2	14	12 3/8	16 3/8	13 7/8
RM647	7	19	19	1 11/16	2 7/16	27 7/8	13 5/8	8 11/16	14 5/8	6 3/4

Shipping Weights and Volumes

Type	Net Wt. in lbs.	Domestic Packed in lbs.	Export Packed Weight lbs.	Export Packed Weight Kgs.	Export Packed Volume Cu. Ft.
B	4	6	14	6	2
CA	4 3/4	9	15	7	2
C-12	14 1/4	16	32	15	4
C-27	10	14	29	13	3
D	4 1/2	8	14	6	2
E	4 1/4	8	14	6	2
FM122	5 1/2	9	15	7	1
FM125	19	27	42	19	4
G	4 1/4	6	14	6	2
H	4	9	14	6	2
K	3 3/4	8	13	6	2
L	4 1/2	8	14	6	2
L-20	7 1/4	11	15	7	2
L-30	7 3/4	13	17	8	2
M	5 1/4	8	16	7	2
O	5 1/2	9	17	7	2
Q	5 1/4	10	16	7	2
R	7 1/4	9	18	8	2
RM15	57	75	96	44	9
RM122	6	14	25	11	4
RM125	19	29	39	22	5
RM17	35	66	87	39	9
RM181	15 3/4	33	44	20	4
RM31A	75	101	122	55	9
RM33A	74 1/2	100	121	55	9
RM35A	78 1/4	105	126	57	9
RM41A	75 1/2	100	121	55	9
RM502A	90	97	117	51	9
RM503	27	51	72	33	9
RM504	25 1/2	48	69	31	9
RM543B	81	108	130	56	9
RM544	80 1/2	109	132	57	9
RM545B	85	113	135	59	9
RM546	87	114	136	59	9
RM547	87	116	139	60	9
RM561A	30 1/2	54	74	33	10
RM564	31	41	80	35	9
RM565	67	101	122	55	9
RM567	50 1/2	85	106	48	9
RM585A	81	110	131	59	9
RM647	50	61	84	37	9
S	4 1/4	9	14	6	2
T	4 3/4	9	15	7	2
W	5	7	11	5	2
Z	5 3/4	10	16	7	2
1A1	5 1/2	10	15	7	1
1A2	4 1/4	8	13	6	1
1S1	7 3/4	11	15	7	2
1L10	6	10	14	7	2
105	34	47	61	28	4
107	13	20	31	14	3
109	8 1/2	18	28	13	3
111	8 3/4	16	27	12	3
114	10	14	19	9	3
1121	18 1/2	28	40	18	4
113	44 3/4	59	75	34	6
122	4 3/4	9	14	6	1
123	1	2	8	4	1
125	15	19	42	19	4
127	39 1/2	69	90	41	9
129	46	85	103	45	8
130	8 3/4	15	26	12	3
132	21 1/2	36	67	30	4
133	22	36	67	30	4
160A	20 1/4	28	44	20	3
161	3 1/2	8	13	6	1
162	3 1/2	8	13	6	1
163	3 1/2	8	13	6	1
175	93	118	139	63	9
180A	30 1/4	47	60	27	4
181	15 1/2	25	36	16	4
190B	23 1/2	35	46	21	6
2A60	3	4	17	8	3
2A61	4 1/4	5	18	8	3
2A63	3 3/4	5	18	8	3
2B67	4 1/4	5	18	8	3

Type	Net Wt. in lbs.	Domestic Packed in lbs.	Export Packed Weight lbs.	Export Packed Weight Kgs.	Export Packed Volume Cu. Ft.
261	17 1/2	28	50	22	9
262	24	39	50	23	5
280	4 1/2	9	15	7	2
290	6	9	15	7	2
291	6	9	15	7	2
292	6 1/4	12	17	7	1
3A1	6	8	13	6	3
3A2	5 1/4	8	13	6	2
3A3	6	10	15	7	2
3A6	6	8	13	6	2
3A72	5	6	19	9	3
3A74	6 1/4	7	20	9	3
3A75	3 1/2	8	17	8	3
3B1	5 1/4	8	19	9	3
3B2	5	8	13	6	2
3B3	6	7	18	8	3
3B4	4 1/2	6	11	5	1
3C66	5 1/4	7	15	7	2
3S3	6 3/4	9	18	8	2
3S76	7 1/2	12	23	10	3
3T4	5 3/4	8	12	6	3
3T77	5 1/2	9	20	9	3
310A	23	34	45	20	4
317	33 1/4	47	57	26	4
321A	14	22	29	13	3
360	10	17	31	14	4
422	22 1/2	31	45	21	5
4S1	15 1/4	21	29	13	4
4S2	9	15	23	10	3
4S3	13	16	23	10	3
5T1A	6	12	20	9	3
5T3	6 3/4	13	17	8	3
502A	60	65	84	38	8
503	29 1/2	38	49	22	6
504	27 1/4	43	57	26	5
506	28	39	50	22	6
507	94 1/2	120	147	67	12
515A	42 1/4	52	63	29	6
516	44 1/4	54	65	29	6
517A	175	186	281	127	21
519	103 3/4	136	169	77	13
524AD	61	82	106	48	9
526	45 1/4	74	95	43	9
RM529	30	57	81	37	9
531A	57 3/4	78	95	43	8
533A	62 1/4	78	95	43	8
535A	61 1/2	83	100	45	8
536	55 3/4	76	93	42	8
541A	59	79	96	44	8
543B	64	81	99	43	8
544	59 3/4	80	98	43	8
545B	64	84	102	46	8
546	65 3/4	85	103	45	8
547	65 3/4	85	103	45	8
551	96 3/4	126	155	70	12
555	116 1/4	150	183	83	13
561A	28	39	50	23	6
564	33	41	52	24	6
565	62	92	113	49	9
567	49	76	97	44	9
570	74 3/4	94	111	50	8
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581A	71	80	97	44	8
585A	74	84	101	46	8
6R1A	13 3/4	21	32	14	4
647	40 1/2	51	62	27	6
661	49 1/2	67	84	38	8
81	4	6	17	8	3
82	4 3/4	10	16	7	2
86	3 1/4	7	13	6	2
9A1	5	6	11	5	2
9A2	6	8	13	6	2
10A1	4 3/4	9	13	6	2
10A2	5	7	19	8	4
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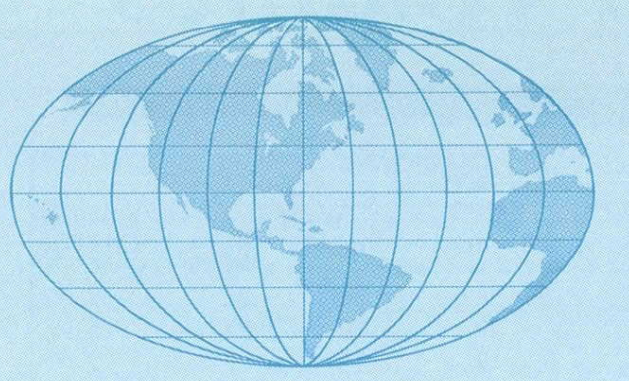
11B2	6 1/2	9	14	7	2



GENERAL AND ORDERING INFORMATION

THE UNITED STATES

INSTRUMENT ORDERS, TERMS, AND SHIPMENT

Orders should be placed with your Tektronix Field Engineering Office listed on page 286.

For domestic orders, placed in accordance with the normal Tektronix marketing practices, our terms are net thirty days. Shipping delay may be prevented by establishing credit at the time of placing your order. When desirable, COD shipments can be arranged. Normally all prices and quotations are FOB Beaverton, Oregon.

Unless otherwise specified on your order, shipment will be made via most economical method. If a specific surface carrier is specified, shipment will be made at full valuation unless your order instructs differently. In case air shipment and full valuation are desired, please specify whether Air Express or Air Freight. Lacking specification, Air Freight and full valuation will be used.

FIELD MAINTENANCE

To help assure adequate instrument-maintenance facilities for our customers, Tektronix has established Field Engineering Offices and Repair Centers at strategic points in the United States. Your own Tektronix Field Office will process all orders for repair parts promptly, and provide emergency parts service when needed to restore an instrument to operating condition. Your Field Office will also arrange for fast service with necessary recalibration or repair work on your instruments at nearby Repair Center.

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 in your area. This procedure will assure you the fastest possible service. Please include instrument Type number and Serial number with all requests for parts or service. PLEASE DO NOT RETURN INSTRUMENTS OR PARTS BEFORE RECEIVING DIRECTIONS.

WARRANTY

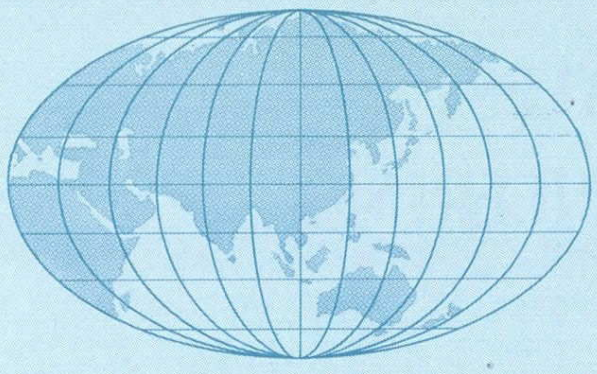
All Tektronix instruments are warranted against defective materials and workmanship for one year. Tektronix transformers, manufactured in our own plant, are warranted for the life of the instrument.

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

Tektronix, Inc. is an Oregon Corporation,

Home Office & Factory, P.O. Box 500, Beaverton, Oregon 97005

Telephone: 644-0161 TWX—503-291-6805 Telex: 036-636 Cable: TEKTRONIX



GENERAL AND ORDERING INFORMATION

CUSTOMERS OUTSIDE THE UNITED STATES

To provide you with personal assistance in ordering as well as servicing Tektronix instruments, we have established Field Engineering Offices and technically qualified Tektronix distributors in many countries throughout the world. The Tektronix office or distributor in your country will be pleased to help you select the instrument that best suits your requirements in performance, and provide you with prompt ordering service.

COUNTRIES WITH TEKTRONIX FIELD ENGINEERING OFFICES

AUSTRALIA
CANADA
SWITZERLAND
UNITED KINGDOM

Listed on page 287

The Tektronix Field Engineering office in your country will provide you with quotations and accept your orders. Normally, prices quoted are fob your plant.

COUNTRIES WITH TEKTRONIX DISTRIBUTORS

Listed on page 287

Your Tektronix distributor will provide you with quotations FOB your country and accept your orders.

COUNTRIES WITH NO TEKTRONIX DISTRIBUTOR

or Tektronix Field Engineering Office

Please address your inquiries and orders to:

Tektronix, Inc.
International Marketing Dept.
P. O. Box 500
Beaverton, Oregon, USA

Staff Field Engineers will be pleased to provide you with information on Tektronix instruments and answer your technical questions. A pro forma invoice will be issued, if requested, indicating price and sales conditions. When our pro forma invoice or purchase order acknowledgement is issued, we will indicate the documents needed to ship your order. We will be glad to prepare necessary export documentation for you and make all shipping arrangements.

METHOD OF PAYMENT

We would like to make our products available to customers on open account terms, whenever conditions permit. Upon request for open account terms consideration will be given to foreign exchange convertability, and the credit rating of the customer. Where time will not permit enough information to be presented to establish open account terms or where financial practices preclude open account terms, payment will be requested by cash in advance or irrevocable letter of credit.

SHIPMENTS

Unless otherwise requested, shipments will be made by the most economical method.

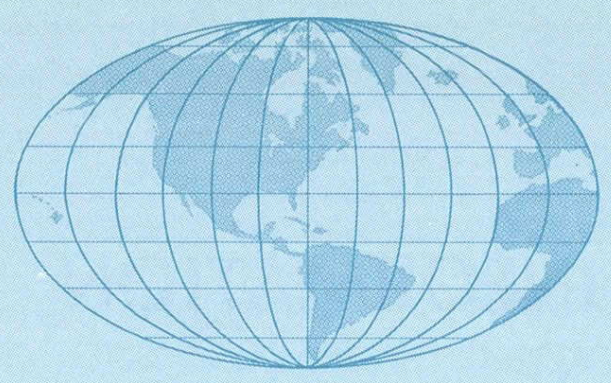
WARRANTY

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

SERVICE

If you require service, replacement parts, a warranty question resolved, or other help, please notify the Tektronix facility through which you ordered your instrument. They will process all orders for repair parts promptly, and provide emergency parts service when needed to restore an instrument to operating condition. They will also arrange for fast service with necessary recalibration or repair work on your instrument.

PLEASE DO NOT RETURN INSTRUMENTS OR PARTS BEFORE RECEIVING DIRECTIONS.



UNITED STATES FIELD ENGINEERING OFFICES

TEKTRONIX, INC.

Tektronix, Inc., an Oregon Corporation, Home Office & Factory, P. O. Box 500, Beaverton, Oregon 97005

Telephone: (503) 644-0161 TWX—503-291-6805 Telex: 036-691 Cable: TEKTRONIX

FIELD ENGINEERING OFFICES

ALABAMA
Huntsville... 3322 South Memorial Parkway, Suite 6, Huntsville 35801
Telex 05-9422 ... Telephone: (205) 881-2912

ARIZONA
Phoenix... 7045 E. Camelback Road, Scottsdale 85251... Telex 066-701 ..... Telephone: (602) 946-4273
Tucson Area: Enterprise 383

CALIFORNIA
San Diego... 3045 Rosecrans Street, San Diego 92110... Telex 069-525 ..... Telephone: (714) 222-0384

Los Angeles Area
• *Orange*... 1722 E. Rose Avenue, Orange 92667... Telex 06-78812 ..... Telephone: (714) 633-3450
Pasadena... 1194 East Walnut Street, Pasadena 91106... TWX: 213-449-1151... Telex 06-74397
Telephone (213) 449-2164
From Los Angeles telephones call: 681-0201
• *Van Nuys*... 16930 Sherman Way, Van Nuys 91406... Telex 74396 ..... Telephone: (213)-987-2600
From Los Angeles telephones: 873-6868
Island of Oahu, Hawaii Area: ENterprise 5-700

San Francisco Bay Area
Walnut Creek... 1709 Mt. Diablo Blvd., Walnut Creek 94596... Telex 033-644 .... Telephone: (415) 935-6101
From Oakland, Berkeley, Richmond, Albany and San Leandro: 254-5353
• *Palo Alto*... 3944 Fabian Way, Palo Alto 94303... Telex 033-911 ..... Telephone: (415) 326-8500

COLORADO
Denver... 2120 South Ash Street, Denver 80222... Telex 045-662 ..... Telephone: (303) 757-1249
Salt Lake Area: Zenith 381

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• Orlando... 205 East Colonial Drive, Orlando 32801... Telex 056-515 ..... Telephone: (305) GArden 5-3483
(also serves Puerto Rico) From The Cape Kennedy Area: 636-0343

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• Chicago... 400 Higgins Road, Park Ridge 60068... Telex 02-53374 ..... Telephone: (312) 825-6666
119 East Ogden Avenue, Suite 111, Hinsdale 60521 .. Telex 02-53694 .. Telephone: (312) 325-3050

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Telephone: (317) LIberty 6-2408

KANSAS
Kansas City... 5845 Horton, Suite 6, Mission 66202... Telex 04-2321 ..... Telephone: (913) HEdrick 2-1003
St. Louis Area: ENterprise 6510

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• Baltimore... 1045 Taylor Avenue, Towson 21204... Telex 087-804 ..... Telephone: (301) 825-9000
From Harrisburg, Lancaster and York Area call ENterprise 1-0631

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MICHIGAN
• Detroit... 27308 Southfield Road, P. O. Box 37, Lathrup Village 48037
Telex 023-400 ... Telephone: (313) ELgin 7-0040

MINNESOTA
Minneapolis... 3307 Vera Cruz Ave. North, Suite 102, Minneapolis 55422
Telex 029-699.. Telephone: (612) 533-2727

NEW MEXICO
• Albuquerque... 1258 Ortiz Drive, S.E., Albuquerque 87108... Telex 074-621 ..... Telephone: (505) 268-3373
Southern New Mexico Area: Enterprise 678

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Buffalo... 965 Maryvale Drive, Buffalo 14225... Telex 091-238 ..... Telephone: (716) 633-7861
• Endicott... 3214 Watson Blvd., Endwell 13763... Telex 093-796 ..... Telephone: (607) PIoneer 8-8291
• Poughkeepsie... 12 Raymond Ave., Poughkeepsie 12603... Telex 096-4724 ... Telephone: (914) GRover 1-3620
• Syracuse... East Molloy Road & Pickard Drive, P.O. Box 155, Syracuse 13211
Telex 093-739 .... Telephone: (315) 455-6666

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Telex: ROSN 01-26446 .... Telephone (516) HT 4-2300
• *Northern N.J.* ... 400 Chestnut Street, Union, New Jersey 07083... Telex 01-26344 .. Telephone: (201) 688-2222
Hudson River Valley, Westchester County, Connecticut... 144 Morgan Street, Stamford, Connecticut 06905
Telex 096-5917 ..... Telephone: (203) DAvis 5-3817

NORTH CAROLINA
• Greensboro... 1011 Homeland Avenue, Greensboro 27405... Telex 057-417 ..... Telephone: (919) 274-4647

OHIO
Cleveland... 5562 Pearl Road, Suite 101, Cleveland 44129... Telex 098-5217 ..... Telephone: (216) 884-6558
Columbus... 12 West Selby Blvd., Suite 5, Worthington 43085
Telex: WOGN 024-684 ... Telephone: (614) 888-4040
Dayton... 3601 South Dixie Drive, Dayton 45439... Telex 02-8825 ..... Telephone: (513) 293-4175

PENNSYLVANIA
• Philadelphia... 126 Presidential Blvd. North, Bala-Cynwyd 19004... Telex 083-4218
Telephone: (215) TEnnyson 9-3111
Pittsburgh... 3834 Northern Pike, Monroeville 15146... Telex 086-761 ..... Telephone: (412) 351-3345

TEXAS
• Dallas... 2600 Stemmons Freeway, Suite 162, Dallas 75207... Telex 073-2217
Telephone: (214) MElrose 1-4560
Houston... 3723 Westheimer, Suite H, Houston 77027... Telex 077-494 ... Telephone: (713) MOhawk 7-8301
Austin Area: ENterprise 3093
New Orleans, Louisiana Area: WX 3093

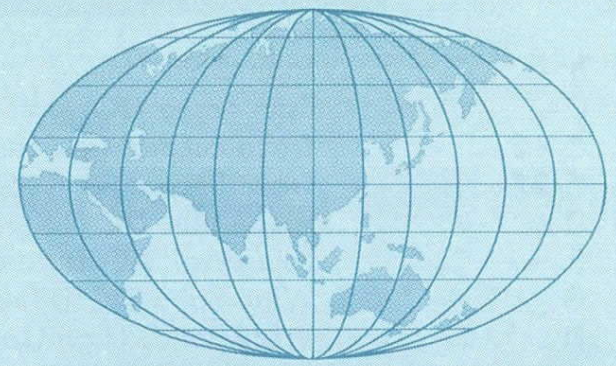
WASHINGTON
Seattle... 236 S.W. 153rd St., Seattle 98166... Telex 032-488 ..... Telephone: (206) CHerry 3-2494
From Portland, Corvallis, Eugene (Oregon): Commerce 9369
From Pullman, Richland, Spokane, Yakima: Zenith 9369

WASHINGTON, D.C.
• Washington, D.C.... 4205 Evergreen Lane, Annandale, Virginia 22003... TWX: 703-256-8902... Telex 089-515
Telephone: (703) 256-6700
Norfolk, Portsmouth, and Hampton, Virginia Area: Enterprise 741

• **Also Repair Center**

Area Code Numbers are in parenthesis preceding telephone number.

INTERNATIONAL FIELD OFFICES AND DISTRIBUTORS



TEKTRONIX INTERNATIONAL FIELD OFFICES

• AUSTRALIA	Tektronix Australia Pty. Limited, 4-14 Foster Street, Sydney, N.S.W.; (mail address P. O. Box 488, Darlinghurst, N.S.W.) ... Telephone: 211-2666 Cable: TEKTRONIX AUSTRALIA Tektronix Australia Pty. Limited, Suite 20, 67 Queen's Road, Melbourne, Victoria ..... Telephone: 51-1592
• CANADA	Tektronix Canada Ltd., 5050 de Sorel Street, Montreal 9, Quebec ..... Telephone: (514) 731-3761 Telex: 01-2867 Tektronix Canada Ltd., 4A Finch Ave. West, Willowdale, Ontario .... Telephone: Toronto (416) 225-1138 Toronto Telex: 02-2776 From Ottawa Telephone: (613) 828-6962
• SWITZERLAND	Tektronix International A.G., Alpenstrasse No. 9, 6300 Zug (P. O. Box 57, 6301 Zug) ..... Telex: 58408 ... Cable: TEKINTAG ... Telephone: 042 49192
• UNITED KINGDOM	Tektronix U.K. Ltd., Beaverton House, Station Approach, Harpenden, Herts ..... Telex No. 25559...Cable: TEKTRONIX HARPENDEN...Telephone: Harpenden 61251

• ALSO REPAIR CENTER

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*ANGOLA	Equipamentos Tecnicos, Lda., Caixa Postal 6319, Luanda ..... Telephone: Luanda 6917 Cable: EQUIPAL Luanda
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*BELGIUM	Régulation Mesure, SPRL, 22, Rue Saint-Hubert, Bruxelles 15..... Telephone: 71.20.20 Telex: 02-21520...Cable: MEREG Bruxelles
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*FINLAND	Into O/Y, P. O. Box 153, 11, Meritullinkatu, Helsinki ..... Telephone: 66.39.09 & 63.51.25 Cable: INTO, Helsinki
*FRANCE	Relations Techniques Intercontinentales, S.A., 134, Avenue de Malakoff, Paris XVI ..... Telex: 25.002 ... Cable: RELATEK, Paris ... Telephone: PASsy 08-36 & PASsy 43-09
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INDIA	Electronic Enterprises, 46, Karani Building, New Charni Road, Bombay 4 BR ..... Telephone: 75376 Cable: TRONIX Bombay
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MEXICO	Fredin S.A., Melchor Ocampo No. 212-505, Mexico 5, D.F., (P. O. Box 53-958, Mexico 17, D.F.) ..... Telephone: 46-44-21, 34-88-61
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PAKISTAN	Pak-Land Corporation, Central Commercial Area, Iqbal Road, P.E.C.H. Society, Karachi 29 Cable: PAKLAND Pakistan ..... Telephone: 47315
*PORTUGAL	Equipamentos de Laboratorio LDA, Rue Pedro Nunes 47, Lisboa 1 ..... Telephone: 73.34.36 & 73.34.37 Cable: EQUILAB, Lisboa
*REPUBLIC OF SOUTH AFRICA	Protea Physical & Nuclear Instrumentation (Pty) Ltd., 38, Faraday Street, Wemmer, Johannesburg ..... Telex: J7337 ... Cable: MANLU ..... Telephone: 838-8351
*SPAIN	Carols Rafael Marés, S.L., Valencia 333, Barcelona (9) ..... Telephone: 257.62.00 Cable: SERAM Barcelona
*SWEDEN	Erik Ferner, A.B., Snormakarvagen 35, Box 56, Bromma ..... Telephone: 08/252870 Telex: 10312 ... Cable: SCIENTRON, Stockholm
*The NETHERLANDS	C. N. Rood, N. V., 13, Cort van der Lindenstraat, P. O. Box 4542, Rijswijk ..... Telex: 31238 ... Cable: ROODHAAG, Rijswijk ... Telephone: The Hague 98.51.53
*TURKEY	M. Suheyl Erkman, Necatibey Cad No. 207, Galata, Istanbul ..... Telephone: 441546 Cable: INGMESUER Istanbul
URUGUAY	Compañia Uruguaya De Rayos X y Electromedicina S.A., Mercedes 1300, Yaguaron 1449, Montevideo ..... Cable: CURZRAY, Montevideo ..... Telephone: 8 58 29
VENEZUELA	Tecnica Nuclear de Venezuela, C.A., (Apartado Del Este 10.507) Plaza Morelos Edificio Eso, Caracas.... Cable: TECNUC Caracas ..... Telephone: 54-39-56
*WEST GERMANY	Rohde & Schwarz Vertriebs-GmbH, Hohe Strasse 160-168, Köln..... Telephone: 23-30-06 Telex: 08882917...Cable: ROHDESCHWARZ Köln Rohde & Schwarz Handels-GmbH, Ernst-Reuter-Platz, 10, Berlin 10 ..... Telephone: 34-05-36 Telex: 0181636...Cable: ROHDESCHWARZ Berlin Rohde & Schwarz Vertriebs-GmbH, Kornerstrasse 34, Hamburg .....Telephone: 27.41.41 Telex: 0213749...Cable: ROHDESCHWARZ Hamburg Rohde & Schwarz Vertriebs-GmbH, Kriegstrasse 39, Karlsruhe ..... Telephone: 23.97.7 Telex: 0782730 ... Cable: ROHDESCHWARZ Karlsruhe Rohde & Schwarz Vertriebs-GmbH, Dachauer Strasse 109, München ..... Telephone. 52.10.41 Telex: 0522953...Cable: ROHDESCHWARZVERTRIEB München

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