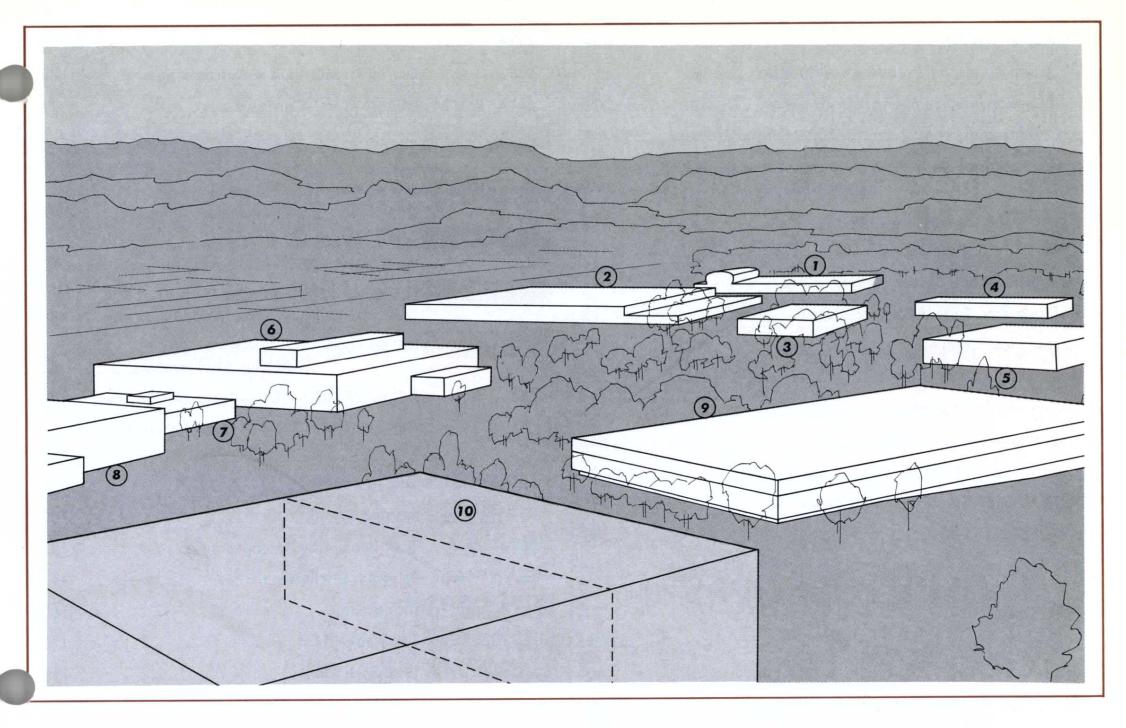


TYPE	PA	AGE
321A	Portable Oscilloscope	19
RM502A	Rack-Mount 100 µv/cm Dual Beam	
	Oscilloscope	24
506	DC to 23 MC Oscilloscope	31
543B, RM543B	DC to 33 MC—100X Magnifier	
	Oscilloscopes	74
544, RM544	DC to 50 MC—100X Magnifier	
	Oscilloscopes	77
545B, RM545B	DC to 33 MC—Sweep Delay Oscilloscopes	80
546, RM546	DC to 50 MC—Sweep Delay Oscilloscopes	84
547, RM547	DC to 50 MC—Automatic Display Switching	
	Oscilloscopes	84
RM564	Rack-Mount Storage Oscilloscope	102
647, RM647	DC to 50 MC Oscilloscopes	143
10A2	Dual Trace Unit	146
1181	Time-Base Unit	147
1182	Time-Base Unit	149
10/11M1	Test Unit	151
129	Plug-In Unit Power Supply	214
261	Coaxial Switch	122
292	Semi-Conductor Tester Power Supply	231
1A1	Wide-Band, High-Gain, Dual-Trace Unit	185
1A2	Wide-Band, Dual-Trace Unit	185
3A2	Dual-Trace Unit	190
3A3	100 μv/div Differential Unit	191
3A6	Dual-Trace DC to 10 MC Unit	189
3B2	Time-Base Unit	190
3B4	Time-Base Unit	197
6R1A	Digital Unit	115
9A1	Dual-Trace Unit	32
9A2 C-27	Dual-Trace Unit Trace-Recording Camera	33 243



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.



A portion of the 300-acre Tektronix Industrial Park—modern air-conditioned buildings where skilled technicians produce high-quality products: Tektronix Oscilloscopes and associated instruments.

- (1) Ceramics Building where production of ceramic terminal strips and other ceramic parts is carried out; additionally, the home of advanced research.
- (2) Metals Building where metal and plastic components are formed, molded and fabricated.
- (3) Utilities Building houses the central heating plant and departments concerned with upkeep and expansion of the industrial park.
- (4) Maintenance Building when completed in the Fall '64, 19,000 square feet will be occupied by maintenance shops and supplies.
- (5) Electrochemistry Building one of the largest specialized precision electrochemical units in the western U. S. Includes such processes as electroplating, photo etching, photo anodizing, photo lithography, and electrochemical etching.
- (6) Assembly East where the oscilloscope circuits are wired and assembled into the finished product. One of

two similar buildings, each containing over 125,000 square feet.

- (7) Cafeteria located between the two instrument manufacturing buildings, Assembly East and Assembly West.
- (8) Assembly West.
- (9) Cathode Ray Tube Building manufacturing facilities for the "heart of the oscilloscope", over 115,000 square feet for present cathode-ray-tube manufacturing, and for future expansion. Special moveable partitions allow maximum building utilization to meet changing needs.
- (10) Technical Center when completed in Winter '65, will represent a total investment of over \$4 million. With 227,000 square feet its 4 levels will consolidate management and engineering activities now conducted in 7 different areas.

Other buildings in the Tektronix Industrial Park not visible in this photograph include the Receiving Building, Shipping Building, Graphics Building, Chemical Storage Building and Administration Building.

Engineering activities now located at the Sunset Plant, 2½ miles northeast of this area, will move to the new Technical Center upon its completion.

Contents

Reference Sec	ction	4-11	TYPE	PAG	GE
Oscilloscop	es by Frequency Response	4-5	536	DC to 10 MC — X-Y Oscilloscope	68
Television of	and Sampling Oscilloscopes	6,10	541A, RM41A	DC to 33 MC Oscilloscopes	71
Oscilloscop	es with 2 and 3-Series Plug-In Units	6-7	543B, RM543B	DC to 33 MC — 100X Magnifier	
Oscilloscop	es with '1' Series and Letter Series Plug-In Units	8-9	544, RM544	Oscilloscopes DC to 50 MC — 100X Magnifier	74
Curve-Traci	ng Oscilloscopes	10		Oscilloscopes	77
	nstruments	10-11	545B, RM545B	DC to 33 MC — Sweep Delay	
	and Specifications	12	E44 PME44	Oscilloscopes	80
	Tube Phosphor Data	13	546, RM546	DC to 50 MC — Sweep Delay Oscilloscopes	84
	Contents	234	547, RM547	DC to 50 MC — Automatic Display	
Acessories		235		Switching Oscilloscopes	
Instrument Di	mensions	282	551	DC to 27 MC — Dual-Beam Oscilloscope .	90
Shipping Wei	ghts and Volumes	283	555	DC to 33 MC — Sweep Delay—Dual-Beam Oscilloscope	01
General and	Ordering Information 28	4-285	561 A PM561 A		
Field Offices	and Overseas Distributors 28	6-287	564, RM564	Storage Oscilloscopes	
Index		288	565, RM565	Storage Oscilloscopes	
	20011100000000		567, RM567	Readout Oscilloscopes	
	OSCILLOSCOPES		6R1A	Digital Unit	
TVDE	,	NA GE	3A2	Dual-Trace Unit	
TYPE		PAGE	3B2	Time-Base Unit	
310A	DC to 4 MC Portable Oscilloscope		3\$3	Sampling-Probe Dual-Trace Unit	
317, RM17	DC to 10 MC Oscilloscopes		3\$76		
321A	Portable Oscilloscope		3T77	Dual-Trace Sampling Unit	
360	Indicator Unit		261	Sampling Sweep Unit	
	100 μv/cm Dual-Beam Oscilloscope		262	Coaxial Switch	
503, RM503	DC to 450 KC — X-Y Oscilloscopes		202	Programmer	
504, RM504	DC to 450 KC Oscilloscopes		570	Sampling Accessories	
506	DC to 23 MC Oscilloscope		570 575	Electron Tube Characteristic Curve Tracer 1	
9A1	Dual-Trace Unit		575	Transistor Curve Tracer	
9A2	Dual-Trace Unit	33	175	High-Current Adapter for Type 575 13	
507	Surge-Test Oscilloscope	. 34	581 A	DC to 85 MC Oscilloscope	35
515A, RM15	DC to 15 MC Oscilloscopes		585A, RM585A	DC to 85 MC — Sweep Delay Oscilloscopes 13	25
516	DC to 15 MC — Dual-Trace Oscilloscope	40	81	•	
517A	High-Speed Oscilloscope		82	Plug-In Adapter	
519	DC to 1 Gigacycle Oscilloscope			Dual-Trace Unit	
524AD	Television Oscilloscope	48	84	Test Unit	
525	Television Waveform Monitor	51	86	Plug-In Unit	
526	Color Television Vectorscope	54	647, RM647	DC to 50 MC Oscilloscopes	
527, RM527	Television Waveform Monitors	57	10A2	Dual-Trace Unit	46
531A, RM31A	DC to 15 MC Oscilloscopes	61	1181	Time-Base Unit	47
535A, RM35A	DC to 15 MC — Sweep Delay Oscilloscopes	61	1182	Time-Base Unit	
533A, RM33A	DC to 15 MC — 100X Magnifier		10/11M1	Test Unit	
	Oscilloscopes	65	661	Sampling Oscilloscope	52

Contents

TYPE	PAGE	TYPE	PAGE
4\$1	Dual-Trace Sampling Unit	3C66	Carrier Amplifier Unit
4S2	Dual-Trace Sampling Unit	3S3	Sampling-Probe Dual-Trace Unit 200
4S3	Sampling-Probe Dual-Trace Unit 156	3S76	Dual-Trace Sampling Unit
5T1 A	Sampling Timing Unit	3T77	Sampling Sweep Unit
280	Trigger Countdown	AUXII	LIARY INSTRUMENTS
290	Transistor Switching-Time Tester 159	105	Square-Wave Generator
291	Diode Switching-Time Tester 160	107	Square-Wave Generator 204
292	Semiconductor Tester Power Supply 161	109	Pulse Generator
	Sampling Accessories	111	Pretrigger Pulse Generator 206
	PLUG-IN UNITS	113	Delay Cable
В	High-Gain Unit	122, FM122	
СA	Dual-Trace DC Unit	RM122	Low-Level Preamplifiers
D	High-Gain DC Differential Unit 167	123	AC-Coupled Preamplifiers
E	Low-Level AC Differential Unit 168	125, FM125 RM125	Power Supplies 211
G	Wide-Band DC Differential Unit 169	127	Plug-In Unit Power Supply
Н	Wide-Band, High-Gain DC	127	Plug-In Unit Power Supply
K	Fast-Rise DC Unit	130	L-C Meter
ı	Fast-Rise, High-Gain Unit	132	Power Supply
M	Four-Trace DC Unit	133	Power Supply
0	Operational Amplifier Unit	133	Monitoring
Q	Transducer and Strain Gage Unit 176	160A	Power Supply
R	Transistor-Risetime Unit	161	Pulse Generator
S	Diode Recovery Unit	162	Waveform Generator
T	Time-Base Generator	163	Fast-Rise Pulse Generator
Z	Differential-Comparator Unit 183	180A	Time-Mark Generator
1A1	Wide-Band, High Gain, Dual-Trace Unit 185	181, RM181	Time-Mark Generators
1A2	Wide-Band, Dual-Trace Unit 185	190B	Sine-Wave Generator
2A60	DC to 1 MC Unit	280	Trigger Countdown 228
2A61	Low-Level Differential Unit 187	290	Transistor Switching-Time Tester 229
2A63	DC to 300 KC Differential Unit 188	291	Diode Switching-Time Tester 230
2B67	Time-Base Unit	292	Semi-Conductor Tester Power Supply 231
3A1	Dual-Trace DC to 10 MC Unit 189	1121	5 cps to 17 MC Amplifier
3A6	Dual-Trace DC to 10 MC Unit 189		
3A2	Dual-Trace Unit		ACCESSORIES
3B2	Time-Base Unit		Contents
3A3	100 μv/div Differential Unit	C-12, C-13 C-19, C-27	Trace-Recording Cameras
3A72	Dual-Trace DC to 650 KC Unit 193		-mm Attachment
3A75	DC to 4 MC Unit		e [®] Carts
3A74	Four-Trace DC to 2 MC Unit		
3B1	Time-Base Unit		for Tektronix Instruments
3B3	Time-Base Unit		in this catalog supersedes all previously published
3B4	Time-Base Unit		pecification and price change privileges reserved.
	NEW		

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.

					SCILLOSCOPES	pilities)				
Oscilloscope	Vertical‡ Passband	Risetime	Calibrated Sensitivity	Vertical Signal Delay	-	Calibrated Sweep Range	Magnifier Max. Calib. Sweep Rate	POTANTICI	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†	152
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†	152
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	45
*Type 561A ©	_ 0.00	0.4 nsec	2 mv/cm to 200 mv/cm	Yes	through 100 nsec	$0.2~\rm nsec/cm$ to $10~\mu sec/cm$	10X 20 psec/cm	3.5 kv	\$ 500†	98
*Type 564 © Storage	Equivalent to DC to 875 MC	0.4 nsec	Same featur signal infor		pe 561A (abo	ove) plus SPLIT-S	CREEN STOR	AGE of	\$ 950†	102
*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).						
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†	135
*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†	135
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	42
*Type 544 ®		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†	77
*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†	84
*Type 547 [®] Display- Switching	DC to 50 MC	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†	84
*Type 647 ® Environ- mentalized		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	\$1225†	143
*Type 541A @		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†	71
*Type 543B	DC to 33 MC	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†	74
*Type 545B ®	20.000000	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†	80
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†	94

- ‡ Frequency Specifications are at 3-db down.
- † Price does not include Plug-In Units.
- * Rack-Mount models are available.
- (A) When used with Types 4S2 and 5T1A Sampling Plug-In Units.
- B When used with Types 4S1 and 5T1A Sampling Plug-In Units.
- © When used with Types 3S76 and 3T77 Sampling Plug-In Units.
- 1 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.
- (F) When used with Type 10A2 Amplifier and Type 11B2 Time Base Unit.
- (G) When used with Type 1A1 Plug-In Preamplifier. 5 mv/cm at dc to 23 Mc.
- (H) 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.

					CILLOSCOPES band Capab	ilities)				
Oscilloscope	Vertical ‡ Passband	Risetime	Calibrated Sensitivity	V ertical Signal Delay	Calibrated Sweep Delay	Calibrated Sweep Range	Magnifier Max. Calib. Sweep Rate	Accel. Potential	Price	Page
Type 551 ① 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†	90
Type 506 ①	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†	31
*Type 515A		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	37
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	40
*Type 531A ®	DC to 15 MC	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†	61
*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†	65
*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†	61
Type 536 ⁽¹⁾ 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†	68
*Type 317 Daylight)" Portable		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	16
*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†	98
*Type 564 ^M Storage	DC to 10 MC	Same f informat	eatures as Ty tion.	ype 561A	(above) plus	s SPLIT-SCREEN	STORAGE o	f signal	\$ 950†	102
*Type 565 ® Dual-Beam		35 nsec	10 mv/cm to 10 v/cm	No	1 μsec to 50 sec	1 μsec/cm to 5 sec/cm	10X 0.1 μsec/cm	4 kv	\$1400†	107
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	5Χ 0.1 μsec/div	4 kv	\$ 900	19
Type 310A 3" Portable	DC to 4MC	0.1 μsec 90 nsec	10 mv/div to 0.1 v/div 0.1 v/div to 50 v/div	140	None	0.5 μsec/div to 0.2 sec/div	5X 0.1 μsec/div	1.8 kv	\$ 675	14
*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	The same of the sa	\$ 640	27
*Type 504		0.75 μ s ec	5 mv/cm to 20 v/cm	No	None	1 μsec/cm to 0.5 sec/cm	None	3 kv	\$ 540	29
*Type 502A Dual-Beam and X-Y	DC to 50 KC increasing to DC to 1 MC		100 μv/cm to 20 v/cm	130	None	1 μsec/cm to 5 sec/cm	2, 5, 10, and 20X 1 μsec/cm	3 kv	\$1050	24

[‡] Frequency Specifications are at 3-db down.

Price does not include Plug-In Units.

^{*} Rack-Mount models are available.

⁽¹⁾ 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.

① When used with Type 9A2 Plug-In Amplifier and Type 3B3 Plug-In Time Base.

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

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

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

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

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	34			

				ELEVISION OSCILLO	SCOPES				
Instrument	Risetime	Calibrated Sensitivity	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	48
Type 525 Waveform Monitor	***	15 mv/cm with 1X, 2X, 5X step attenuator	No	Flat, Low-Pass, High-Pass, IRE	Field and Line Rates	5 and 25X	4 kv	\$1140	51
Type 526 Vectorscope									
*Type 527 Waveform Monitor		0.25 v to 1.6 v for 7 cm	No	Flat, IRE	Field and Line Rates	5 and 25X	4 kv	\$ 925	57

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.

	TIA	IE-BASE UNIT	S		
Plug-In Type	Sweep Rate *	Magnifier	Triggering	Price	Page
2B67 Single Sweep	1 μ sec/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	188
3B1 Sweep Delay	0.5 μsec/cm to 1 sec/cm, 1-2- 5 sequence (for both norma and delayed sweeps).		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.		Internal, External, Line; Amplitude-level selection; ac or dc coupled; ± slope.	\$ 650	190
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 delayer from 0.5 μsec to 10 sec.		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, 1-2-3 sequence. Magnifier reads sweep rate directly up to 50 nsec/cm.	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
Sampling Sweep (use with 3S3 or 3S76)	Equivalent sweep rates 0.2 nsec/cm to 10 μ sec/cm, 1-2-5 sequence.		Internal or External, ± slope.	\$ 650	202

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.

and provide the state of the st	Total Marie Control					-
			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	187
2A61 Low-Level Differential		0.06 cps—300 kc	$10 \mu \text{v/cm}$ — 20mv/cm , $1-2-5$ sequence.	10 meg—50 pf; ±5 v (ac—coupled only)	\$ 385	187
2A63 Differential 50:1 rejection ratio		dc — 300 kc.	1 mv/cm—20 v/cm, 1-2-5 sequence.		\$ 150	188
3A1 Dual-Trace (Identical Channels)		dc — 10 Mc.	10 mv/cm—20 v/cm, 1-2-5 sequence.		\$ 450	189
3A2 Dual-Trace (Identical Channels)		dc—500 kc	10 mv/cm—10 v/cm, 1-2-5 sequence.		\$ 500	190
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	189
3A72 Dual-Trace (Identical Channe's)		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)		dc to equivalent 1 Gc. (0.35 nsec rise-time)	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)	117	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 Types 567/6R1A and any of 3 combinations of vertical and horizontal Plug-In Units: Type 3S3/3T77, 3S76/3T77, or 3A2/3B2. Other 2-Series and 3-Series Plug-In Units can be used for normal crt display, but do not provide digital readout.

X & Y Plug-Ins	Risetime	Calibrated Sensitivity	Input Impedance	Calibrated Sweep Range	Sweep Delay	Digital Resolution	Trigger	System Price
353/3T77	0.35 nsec	5 mv/cm to 100 mv/cm	100 k, 2 pf	0 k, 2 pf equiv. 0.2 nsec/cm to Through 10 or 10 μsec/cm approx. 100 dots			External	\$5450 (includes 2 probes)
3\$76/3T77	0.4 nsec	2 mv/cm to 200 mv/cm	50 Ω	plus 10X magnifier	100 nsec	per cm		\$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

Reference

					CHARACTE	ERISTICS OF TEK	TRONIX OSCILL	OSCOPES
					* Type 531A General Purpose Oscilloscope	* Type 533A General Purpose Oscilloscope	* Type 535A Sweep Delay Oscilloscope	Type 536 X-Y Curve Tracer Oscilloscope
PLUG	-IN UNIT TYPE	PRICE	PAGE	CALIBRATED SENSITIVITY	RISETIME AND	PASSBAND OF O	SCILLOSCOPE AND	PLUG-IN UNIT
	Wide-Band			≈500 µv/cm		35 nsec 2 cps to 10 Mc		44 nsec 2 cps to 8 Mc
1A1	High-Gain	\$600	185	5 mv/cm		25 nsec dc to 14 Mc		33 nsec
	Dual-Trace Unit			50 mv/cm to 20 v/cm		23 nsec dc to 15 Mc		dc to 10.5 Mc 31 nsec dc to 11 Mc
1A2	Wide-Band Dual-Trace Unit	\$325	185	50 mv/cm to 20 v/cm		23 nsec dc to 15 Mc		31 nsec dc to 11 Mc
	High-Gain		11	5 mv/cm to 20 mv/cm		35 nsec 2 cps to 10 Mc	777 - 100 -	40 nsec 2 cps to 9 Mc
В	Unit	\$145	165	50 mv/cm to 20 v/cm		25 nsec dc to 14 Mc	480	35 nsec dc to 10 Mc
C-A	Dual-Trace	\$260	166	50 mv/cm		26 nsec		35 nsec
	DC Unit High-Gain DC			to 20 v/cm 1 mv/cm to		dc to 13.5 Mc 0.18 μsec		dc to 10 Mc
D	Differential	\$170	167	50 v/cm	S. Carlotte and P. P.	dc to 300 kc, increa	sing to 2 Mc	
E	Low-Level AC Differential	\$190	168	50 μv/cm to 10 mv/cm	0.00	6 μsec 6 cps to 20 kc, increa	sing to 60 kc	
G	Wide-Band DC Differential	\$190	169	50 mv/cm to 20 v/cm		25 nsec dc to 14 Mc		35 nsec dc to 10 Mc
н	Wide-Band High-Gain DC Unit	\$185	170	5 mv/cm to 20 v/cm		31 nsec dc to 11 Mc	47 3	37 nsec dc to 9.5 Mc
K	Fast-Rise DC Unit	\$145	171	50 mv/cm to 20 v/cm		23 nsec dc to 15 Mc		31 nsec dc to 11 Mc
	Fast-Rise High-Gain	t010	170	5 mv/cm to 2 v/cm		23 nsec 3 cps to 15 Mc		35 nsec 3 cps to 10 Mc
L	Unit	\$210	172	50 mv/cm to 20 v/cm		23 nsec dc to 15 Mc		31 nsec dc to 11 Mc
M	Four-Trace Unit	\$525	173	20 mv/cm to 10 v/cm		25 nsec dc to 14 Mc		35 nsec dc to 10 Mc
	Operational Amplifier	\$525	174	50 mv/cm to		25 nsec dc to 14 Mc		35 nsec dc to 10 Mc
0	Unit	\$525	1/4	20 v/cm		operations of integra dinear amplification.	tion, differentiation,	function generation,
Q	Strain Gage Unit	\$325	176	10 μstrain/div to 10,000 μstrain/div		dc to 6 kc. Meas nanical quantity that or inductance.		
R	Transistor Risetime Unit	\$325	178	0.5 ma/cm to 100 ma/cm		setime pulse, 400-mo band same as with h		00-ma bias supply,
S	Semiconductor Diode-Recovery Unit	\$260	180	50 mv/cm and 0.5 v/cm	1 to 20 ma forwar same as with K U	rd current, 0 to 2 mc Unit.	reverse current, rise	etime and passband
7	Time-Base Generator Unit	\$240	182			brated sweep rates ing facilities include coupled.		
Z	Differential- Comparator Unit	\$525	183	50 mv/cm to 25 v/cm		35 nsec dc to 10 Mc		40 nsec dc to 9 Mc
					(0 to \pm 100 v) do	ation" up to 500 to c comparison voltage resolution. 40,000 to	es. \pm 2000 cm eff	ective scale length.

Chart

WITH '1' SERIES AND L	ETTER SERIES PLUG	-IN PREAMPI	LIFIERS				
* Type 541A	Delay Fast-Rise	* 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 A	ND PLUG-IN U	NIT				e metali
25 nsec		23 nsec		26 nsec		25 nsec 2 cps to 14 Mc	
2 cps to 14 Mc 15 nsec		2 cps to 15 Mc 12.5 nsec		2 cps to 13 Mc 16.5 nsec		15 nsec	
dc to 23 Mc 10.5 nsec		dc to 28 Mc 7 nsec		dc to 21 Mc		dc to 23 Mc 10.5 nsec	
dc to 33 Mc		dc to 50 Mc		dc to 27 Mc		dc to 33 Mc	A SEE STATE
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	
CALLED AND DESCRIPTION OF THE PERSON OF THE	30 nsec			30 nsec 2 cps to 12 Mc		30 nsec 2 cps to 12 Mc	
	2 cps to 12 Mc 18 nsec			20 nsec		18 nsec	
	dc to 20 Mc			dc to 18 Mc		dc to 20 Mc	特别 主 L
	15 nsec dc to 24 Mc			16 nsec dc to 22 Mc		15 nsec dc to 24 Mc	
		18 μsec to 300 kc, increas	ing to 2 Mc				
		6 μsec cps to 20 kc, incr	easing to 60 kc				
	18 nsec dc to 20 Mc			20 nsec dc to 18 Mc	- P-1	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	
下便上"大人工艺"产	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	
	cise operations of integ or nonlinear amplification		tion, function g	eneration,			
60 μsec riset strainany	ime, dc to 6 kc. Me mechanical quantity the tance, or inductance.	asures force, di					
	sec risetime pulse, 400- passband same as with		ply, 100-ma bio	as supply,			
1 to 20 ma same as with	forward current, 0 to 2 in K Unit.	ma reverse curre	nt, risetime and	passband			
Generates 22 magnifier. To either ac or	2 calibrated sweep rate riggering facilities includ dc coupled.	es from 0.2 μsec/ le Manual, Autom	div to 2 sec/dinatic, H. F. Sync	v plus 5X and Line,		10年	
	27 nsec dc to 13 Mc			475			
$(0 \text{ to } \pm 100)$	ignification" up to 500 0 v) dc comparison volta imum resolution. 40,000	ages. \pm 2000 \circ	cm effective sca	le length.			
† Uses '1' Series and Letter-Series Plu	g-In Units with Type 81	Adapter.					
				计算工程 医工作的位置			

			SA	MPLING	SYSTEMS					
Instrument	Input Impedance	Risetime	Calibrated Sensitivity	Signal Delay	Sweep Delay	Equivalent Sweep Time	Samples Per Centimeter	Trigger	System Price	Page
Type 661 with Types 5T1A and 4S2 Units	50 Ω	0.1 nsec		No	through	1 nsec/cm	5, 10, 20,	External	\$3500	152
Type 661 with Types 5T1A and 4S1 Units	50 Ω	0.35 nsec		Yes		to 100 μsec/cm plus magnifier	50, 100 or 1000	Internal or External	\$3330	152
Type 661 with Types 5T1A and 4S3 Units	100 k, 2 pf	0.35 nsec	2-200 mv/cm 1-2-5 sequence	No				External	\$3500 (with probes)	152
*Type 561A with Types 3S76 and 3T77 Units	50 Ω	0.4 nsec		Yes	Through 100 nsec	The Control of the Co	10 or 100	Internal or External	\$2250	98
*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)	98
*Type 564 with Types 3S76 and 3T77 Units	50 Ω	0.4 nsec	Same features STORAGE of s			, 3S76, 3T77 (ak	pove) plus SPLI	T-SCREEN	\$2700	102
*Type 564 with Types 3S3 and 3T77 Units	100 k, 2 pf	0.35 nsec	Same features STORAGE of			, 3S3, 3T77 (ab n.	oove) plus SPLI	T-SCREEN	\$3100 (with probes)	102
*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.						111
*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.						
* Rack Mount mod	dels are avail	able								

	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	158
Type 290 Transistor Switching-Time Tester	Measures fast transistors, short duty cycle measurements of delay time, risetime, storage time, and fall time.	\$ 290	159
Type 291 Diode Switching-Time Tester	Measures fast-switching diodes, forward and reverse recovery. Response better than 0.35 nsec.	\$ 185	160

	CHARA	CTERISTIC-CURVE	TRACERS					
Instrument	Vertical Axis	Horizontal Axis			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 μα/div to 50 ma/div 1-2-5 sequence 1-2-5 sequence		Plate, screen, or grid current vs. plate or grid voltage. 4 kv		Yes	\$1100	127	
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	130
Instrument	Collector Supply	Base Su	Base Supply Calibr		rated Display	A-B Comparison	Price	Page
Type 175 adapts the Type 575 to measurement of high power (NPN and PNP) transistors and diodes. Specifications apply ONLY when used with Type 575 Curve Tracer.		tive or single family.		Vertical Axis— Collector Current Horizontal Axis— Collector Voltage		Yes	\$1475	150

0	INDUCTANCE AND CAPACITANCE METER								
Instrument	Ranges	Accuracy	Guard Voltage	Price	Page				
Type 130		within 3%	Permits mea- suring an un- known ca- pacitance while elimin- ating effects of other ca- pacitances.	\$ 225	216				

	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 in- ternal 600-Ω load	\$ 435	203				
Type 107	3 nsec	400 kc to 1 Mc	0.1 v to 0.5 v with 52-Ω ter- mination	\$ 190	204				

	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	208	
Type 123	100X	3 cps to 25 kc	7.5 μv, rms, or less grounded	No	10 megohms	31 kilohms	\$ 75	210	
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		Main Pulse	学生 主		0	utput	Trigger Req.	Price	Page
	Frequency	Width	Risetime	Delay	Amplitude	Impedance			
Type 109	275 to 700 cps	0.5 nsec to 300 nsec	< 0.25 nsec	None	0 to 50 v	50 Ω	None	\$360	205
Type 111	0 to 100 kc	2 nsec to 0.1 μsec	0.5 nsec	30 to 250 nsec	±5 v	50 Ω	+5 v	\$365	206
† Type 161	0 to 50 kc	10 μsec to 0.1 sec	0.5 μsec	Variable	0 to ±50 v	1—5 kΩ	+3 v	\$130	221
† Type 162	0 to 10 kc	100 μsec to 10 sec	1 μ sec	None	50 v	1 kΩ	+15 v	\$130	222
† 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	223

[†] 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	224		
*Type 181	1 per decade from 1 μsec to 10 msec.	10 Mc	about 0.03%	0.005% per hour	\$ 265	226		

^{*} Rack-Mount models are available.

th 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								
strument	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		

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 capabilit 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.

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.



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, wirewound 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 (A) Brightness	Persistence ®	Crystal © Size	Principal Use	Comments
Pl	Yellowish- Green	Yellowish- Green	128	Medium	Fine	Slow Repetition Rate Oscilloscope Displays	Used to keep down flicker
P2	Green	Green	238	Medium Short*	Coarse	General Purpose Displays	Good compromise for high and low speed applications.
P4	White	White	165	Medium Short	Coarse	Television Pictures (Image Displays)	
P7	Greenish-Blue	Yellow	128	Long *	Coarse	Slow Speed Displays	
P11	Blue	Blue	100	Medium Short	Medium	Oscilloscope Photography	High blue light content and small spot size conducive to sharp photographs.
P15	Blueish-Green	Blueish-Green	32	Short	Fine	Moving Film Photography Flying Spot Scanner Displays	Poor for high-speed photog- raphy.
P20	Green	Green	250	Medium	Medium	General Purpose Displays	
P31	Green	Green	284	Medium	Coarse	Oscilloscope Displays In High Ambient Light	

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

Type 310 A DC-to-4MC OSCILLOSCOPE



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, 0.01 v/div to 50 v/div.

PASSBAND—Dc-coupled, dc to 4 Mc.

Ac-coupled, 2 cps to 3.5 Mc.

RISETIME—90 nsec at 0.1 v/cm, 100 nsec at 0.01 v/cm. INPUT—1 megohm, 40 pf.

HORIZONTAL

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

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

TRIGGER REQUIREMENTS—Internal: 0.5-div deflection. External: 0.2 to ± 20 v.

EXTERNAL INPUT-1.5 v/div.

CRT

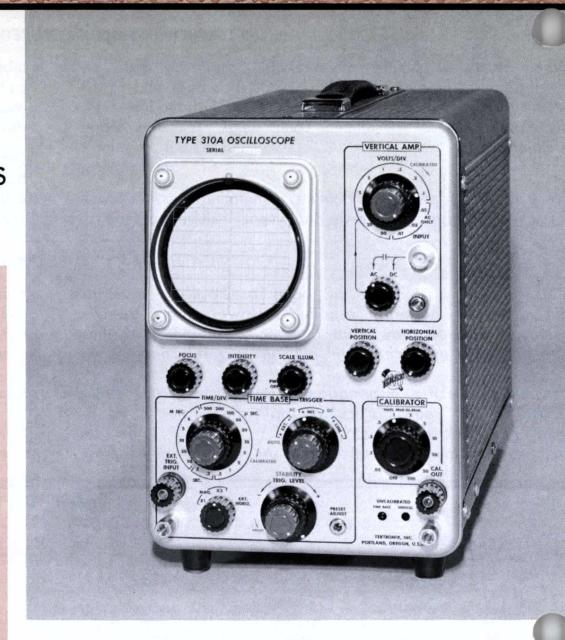
DISPLAY AREA—8 x 10 div. Each div equal to ¼ inch. ACCELERATING POTENTIAL—1.85 kv.

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. Risetime 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.



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 μ sec/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 μ sec/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- μ sec/div sweep extends the calibrated range to $0.1~\mu$ sec/div. Accuracy is within 3% of the displayed portion of the magnified sweep on all ranges except the $0.5~\mu$ sec/div range, where accuracy is within 5%.

DC-Coupled Unblanking—The unblanking waveform is dc-coupled to the control grid of the cathoderay tube. This assures uniform bias for all sweep speeds 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 mc, 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.

Trigger Requirements—Internal triggering—a signal large enough to produce a one-half division deflection. External—a signal of 0.2 v to $\pm 20 \text{ v}$.

Horizontal Input—A back-panel terminal permits use of an external signal to drive the horizontal amplifier. Deflection factor is 1.5 v/div.

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.

Accelerating Potential—1.85 kv accelerating potential, electronically regulated, is applied to the flat-faced cathode-ray tube. A P31 phosphor is normally supplied.

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 to 800 cycles.

Power Requirement—105 v to 125 v or 210 v to 250 v, typically 175 watts.

The Type 310A will operate over the range of 50 to 800 cps, but at 800 cps about 4% greater line voltage is required. This can be partially compensated for by using the multi-tap primary on the power transformer.

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.

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

Mechanical Specifications—Dimensions are 10%" high by 7" wide by 17%" deep. Net weight is 23 pounds. Shipping weight is 34 pounds, approx.

TYPE 3	310A OSCILLOSCOPE	\$675
Each	instrument includes: 1-P6006 probe (010-127), 1-3 to	2-
wire	adapter (103-013), 1—BNC to binding-post adapter (10)3-
033),	1-3-conductor power cord (161-013), 1-green filter (37	78-
509),	1-red test lead (012-031), 2-instruction manuals (070-24	4).

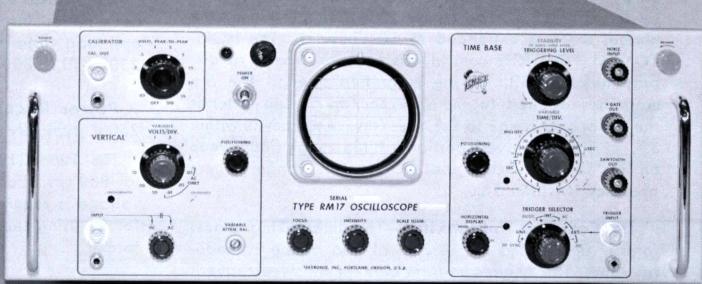
FAN BASE

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 016-012	\$50
For use on 210-250 v, 50 to 60 cps only:	
Order Part Number 016-013	\$50

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





BRIGHT TRACE ELECTRONICALLY-REGULATED DC SUPPLIES

COMPACT CABINET OR RACK-MOUNT MODELS

The Type 317 is an excellent oscilloscope for the day-light 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 1/4 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.

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 $0.25 \mu sec$ 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 μ sec/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 μ sec/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.



317 RM17

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.

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

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 a	t 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.

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

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.

Cabinet Model—Dimensions are 12%" high by 8%" wide by 19%" deep. Net weight is 33% pounds. Shipping weight is 47 pounds, approx.

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

Each instrument includes: 1—P6006 probe (010-127), 1—3 to 2wire adapter (103-013), 1—BNC to binding-post adapter (103-033),
1—3-conductor power cord (161-010), 1—green filter (378-509),
1—red test lead (012-031), 2—instruction manuals (070-297).

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 (010-127), 1—3 to 2wire adapter (103-013), 2—BNC to binding-post adapters (103033), 1—3-conductor power cord (161-010), 1—guide track (351017), 1—green filter (378-509), 1—red test lead (012-031), 2—
instruction manuals (070-325).

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

Each instrument includes: 1—P6006 probe (010-127), 1—3 to 2wire adapter (103-013), 2—BNC to binding-post adapters (103033), 1—3-conductor power cord (161-010), 1—guide track (351017), 1—green filter (378-509), 1—red test lead (012-031), 2—
instruction manuals (070-325).

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 040-345 \$12.00

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



PORTABLE OSCILLOSCOPE Type 3 1

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. Also, the lowest operating temperature is —15°C, while the highest operating temperature (without batteries is +55°C. 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.

Operating temperature range on the internal batteries is from 0° C to $+40^{\circ}$ C and -15° C to $+55^{\circ}$ C with external power at altitudes to 15,000 feet. Non-operating temperature range is -55° C to $+75^{\circ}$ C without batteries and -40° C to $+75^{\circ}$ C with batteries at altitudes to 50,000 feet.

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-topeak at 6 Mc.

EXTERNAL INPUT—Sensitivity: With 5X MAG on, 1 v/div ± 5%.

Bandwidth: DC to at least 1 Mc. Impedance: 100 k paralleled by approx. 30 pf.

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 peakto-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%.

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

DC COUPLED UNBLANKING provides uniform brightness on all sweep speeds.

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, accoupled 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 $\pm 5\%$ with the 5X MAG on. Input impedance is 100 kilohms $\pm 5\%$ 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% (within 4% from —15°C to +55°C). 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.

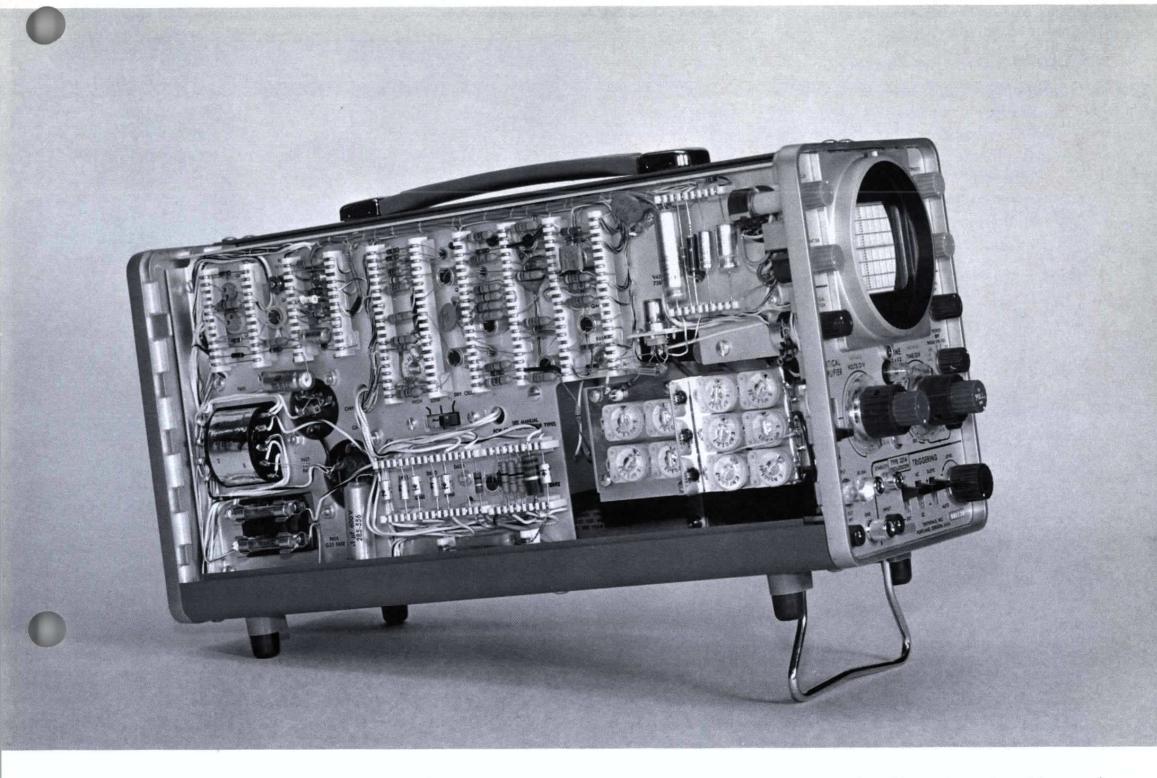
ILLUMINATED GRATICULE is edge lighted. Adjustment is provided by the SCALE ILLUM control when operating from an ac line only. Display area of the graticule is marked in six vertical and ten horizontal one-fourth inch major divisions. Centerlines are marked in five minor divisions per major division.

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

POWER REQUIREMENTS are satisfied either from ten size D flashlight cells (approximately $\frac{1}{2}$ 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 $2\frac{1}{2}$ 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.





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.

ENVIRONMENTAL CAPABILITIES for: vibration (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). Shock (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. Shock (non-operating)—60 G's, one-half sine, 11-millisecond duration. One shock each direction along each of the three major axies; total of 6 shocks. Humidity (non-operating)—Meets Mil-Std-202B, method 106A (except freezing and vibration) through 5 cycles (120 hours). Transit (non-operating)—Meets National Safe Transit test when factory-packaged. Vibration for one hour at slightly greater than one G. Eighteeninch drop in any orientation.

DIMENSIONS are $8\frac{1}{4}$ " high by $5\frac{3}{4}$ " 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, (010-127), 1—3 to 2-wire adapter (103-013), 1—3-conductor power cord, AC (161-015), 1—3-conductor power cord, DC (161-016), 1—gray filter (378-547), 1—BNC to binding-post adapter (103-033), 1—red test lead (012-031), 2—instruction manuals (070-425).

CARRYING CASE

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

Order Part Number 016-026 \$30

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

Type 360 INDICATOR UNIT



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

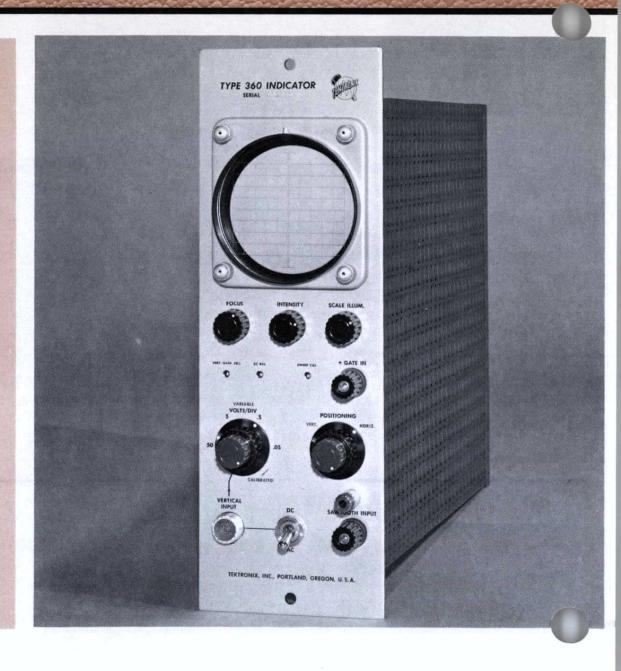
6.3 volts at 3.5 amps.

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.

Several indicators can be driven by a single Type 162 Waveform Generator. The Type 162, an indicator, and a Type 161 Pulse Generator provide a calibrated delayed sawtooth. The indicator used with a Type 122 Preamplifier permits low-level applications and increases the sensitivity of the unit to 50 microvolts per division.

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.



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.

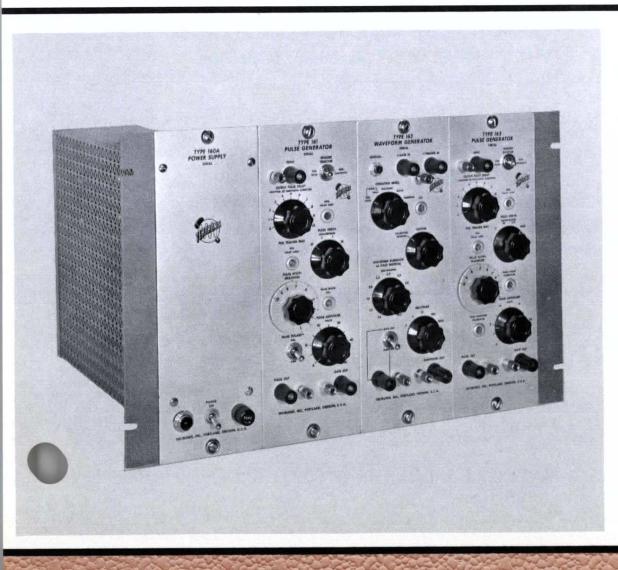
Positioning Controls—Separate knobs for vertical and horizontal positioning are provided on concentric controls.

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 $12\frac{1}{4}$ " high by $4\frac{1}{8}$ " wide by 14" deep. Net weight is 10 pounds. Shipping weight is 17 pounds, approx.

Each instrument includes: 1—P6006 probe (010-125), 1—inter-unit power cable (012-016), 1—green filter (378-509), 1 set—mounting hardware, 1—instruction manual (070-220).

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.

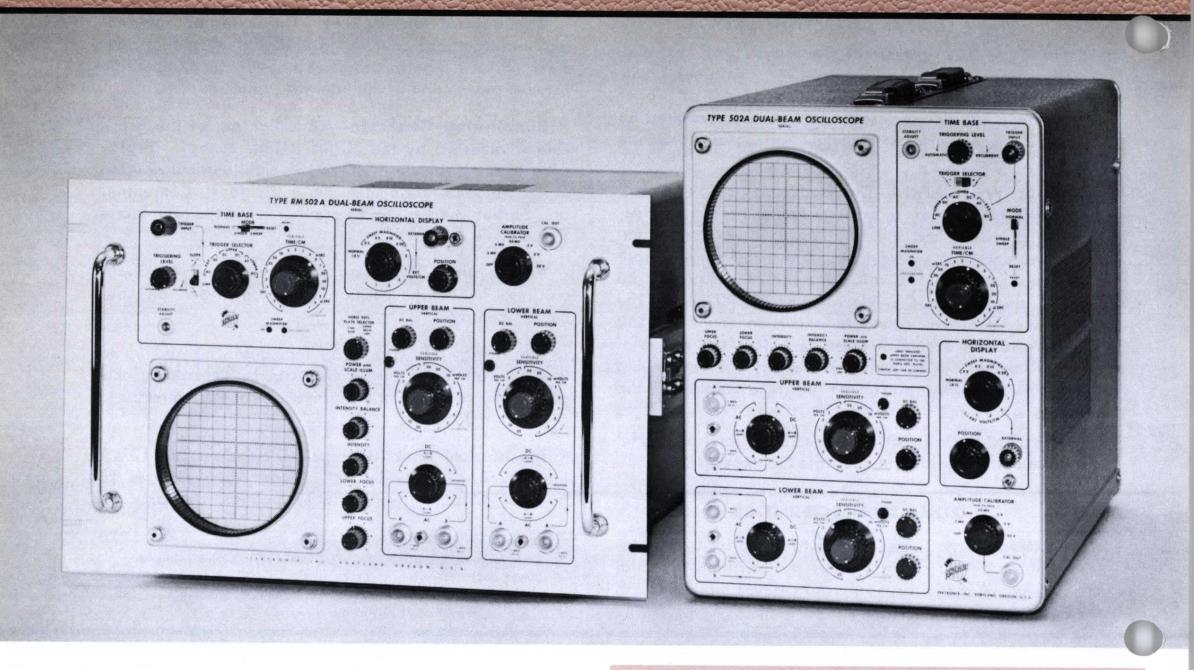
The Type 360 Indicator Unit and Type 160-Series Instruments can be secured quickly and easily to a Mounting Frame which bolts to a standard 19" rack.

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 014-002) \$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.

Type $\frac{502\text{A}}{\text{RM}502\text{A}}$ 100 μ v/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 add these extremely useful features: $100~\mu v/cm$ sensitivity, single-sweep operation, variable sensitivity and sweep-time controls, intensity balance, beam finders, and other refinements.

CHARACTERISTIC SUMMARY

VERTICAL

CALIBRATED SENSITIVITY—100 μ v/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. INPUT—1 megohm, 47 pf.

HORIZONTAL

CALIBRATED SWEEP RANGE—1 μ sec/cm to 5 sec/cm. SWEEP MAGNIFIER—X2, X5, X10, X20; 5% accuracy to 1 μ sec/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, 280 watts.

APPLICATIONS

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

- 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 $100 \, \mu \text{v/cm}$ sensitivity, or dual-beam X-Y curves at up to $0.1 \, \text{v/cm}$ sensitivity.

CALIBRATED SENSITIVITY from 100 $\mu v/cm$ 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 $\mu v/cm$ to approximately 50 v/cm.

PASSBANDS are dc to 50 kc at $100~\mu v/cm$, increasing to dc to 100~kc at $200~\mu v/cm$, 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.

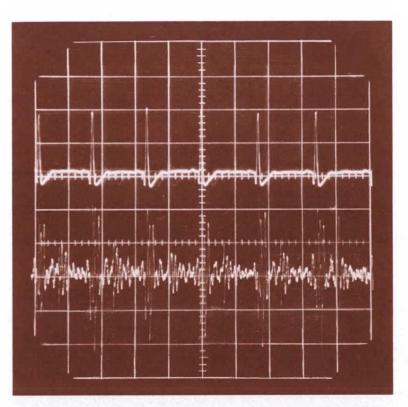
PASSIVE PROBES supplied with the Type 502A and RM502A reduce loading on the circuit under test and attenuate the signal by a factor of 10. Input impedance becomes 10 megohms paralleled by approximately 9.5 pf.

HORIZONTAL-DEFLECTION SYSTEM

SWEEP RANGE from 1 μ sec/cm to 5 sec/cm is in 21 calibrated steps with 1-2-5 sequence and is accurate within 3% of panel reading. Sweep speed is continuously variable uncalibrated from 1 μ sec/cm to over 12 sec/cm.

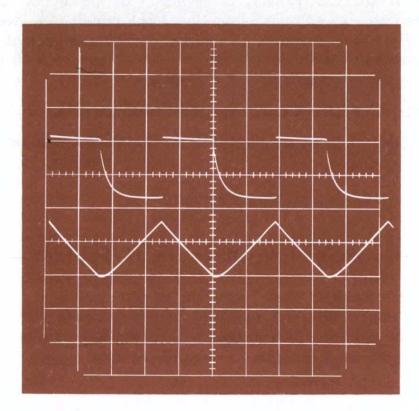
SWEEP MAGNIFIER expands the center portion of the normal sweep to fill 10 cm. X2, X5, X10, or X20 magnification is available. When the magnified sweep does not exceed the maximum calibrated rate of 1 μ sec/cm, accuracy is within 5% of the displayed portion of the magnified sweep. A panel light indicates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

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 $100~\mu v/cm$ 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 ν to 10 ν), or line, and can be ac or dc coupled.

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 from 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.

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.

OVERALL DIMENSIONS are $15^{3}/_{4}$ " high by $11^{1}/_{2}$ " wide by $23^{3}/_{4}$ " deep. Net weight is 60 pounds. Shipping weight is 65 pounds, approx.

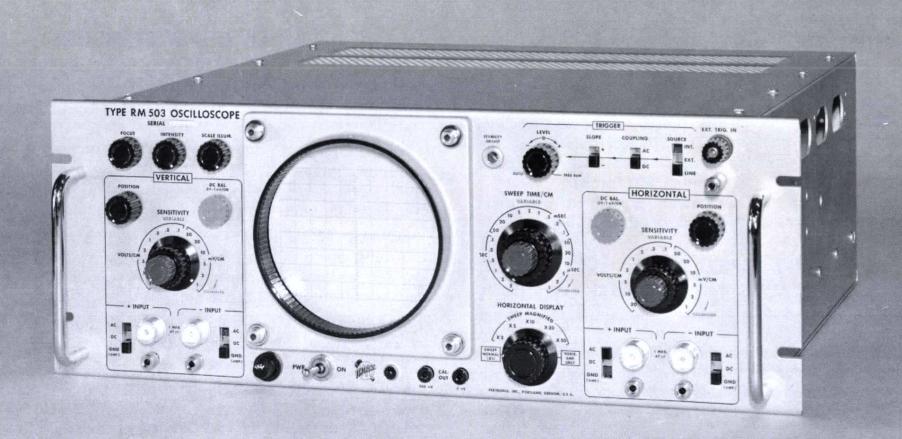
TYPE 502A OSCILLOSCOPE \$1050

Each instrument includes: 2—P6006 probes (010-125), 1—red test lead (012-031), 2—A510 binding-post adapters (013-004), 1—3 to 2-wire adapter (103-013), 1—3-conductor power cord (161-010), 1—polarized light filter (378-539), 2—instruction manuals (070-382).

TYPE RM502A OSCILLOSCOPE \$1150

Each instrument includes: 2—P6006 probes (010-125), 1—red test lead (012-031), 2—A510 binding-post adapters (013-004), 1—3 to 2-wire adapter (103-013, 1—3-conductor power cord (161-010), 1—polarized light filter (378-539), 1 set—mounting hardware,, 2—instruction manuals (070-382).

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





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 about 1 mv/cm. INPUT—1 megohm, 47 pf.

SWEEP GENERATOR

CALIBRATED SWEEP RANGE—1 μ sec/cm to 5 sec/cm. SWEEP MAGNIFIER—X2, X5, X10, X20, X50; 5% accuracy to 0.1 μ sec/cm.

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, 107 watts.

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.

DIFFERENTIAL INPUT provides an effective means of eliminating unwanted common-mode signals. Common-mode rejection ratio is 100:1 from 1 mv/cm to 0.2 v/cm, and 50:1 from 0.5 v/cm to 20 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.

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 DIFFERENCE between amplifiers, when both are in plus (+) input and at equal sensitivities from 1 mv/cm through 2 v/cm, does not exceed 1 degree up to 100 kc or 2 degrees up to 450 kc.

SWEEP GENERATOR

SWEEP RANGE from 1 μ sec/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 μ sec/cm to over 12 sec/cm.

SWEEP MAGNIFIER expands the center portion of the normal sweep to fill 10 cm. X2, X5, X10, X20, or X50 magnification is available. When the magnified sweep does not exceed the maximum calibrated rate of 0.1 μ sec/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.

SOURCE can be internal ($\frac{1}{2}$ -cm deflection), external ($\frac{1}{2}$ -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 $14^{3}/_{4}$ " high by 10" wide by $21^{5}/_{8}$ " deep. Net weight is $29^{1}/_{2}$ 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.

Each instrument includes: 2—A510 binding post adapters (013-004), 1—3 to 2-wire adapter (103-013), 1—green filter (378-514), 1—instruction manual (070-218).

TYPE RM503 OSCILLOSCOPE \$655

Each instrument includes: 2—A510 binding post adapters (013-004), 1—3 to 2-wire adapter (103-013), 1—3-conductor power cord (161-022), 1 set—mounting hardware, 1—green filter (378-514), 2—instruction manuals (070-314).

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 adapters (013-004), 1—3 to 2-wire adapter (103-013), 1—3 conductor power cord (161-022), 1 set—mounting hardware, 1—green filter (378-514), 2—instruction manuals (070-314).

SLIDE-OUT TRACK KIT (Part No. 351-050) \$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.

		Input Im	pedance		A FEET () 表现	
Probe	Atten. Ratio	Resist- ance	Capaci- tance	Voltage Rating	Part No.	Price
P6006	10:1	10 meg Ω	9.5 pf	600 v	010-125	\$22.00
P6023	10:1	8 meg Ω	12 pf	1000 v	010-065	\$40.00
P6027	1:1	1 meg Ω	94 pf	600 v	010-070	\$12.50

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



DC-to-450KC OSCILLOSCOPE Type



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 μ sec/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,

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 μ sec/cm to 0.5 sec/cm is in 18 calibrated steps with 1-2-5 sequence, and is accurate within 3%. Sewep rate is variable between steps uncalibrated from 1 μ sec/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 ($\frac{1}{2}$ -cm deflection), external ($\frac{1}{2}$ -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 8×10 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 $14^3/_4$ " high by 10" wide by $21^5/_8$ " deep. Net weight is $27^1/_4$ 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.

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.

SLIDE-OUT TRACK KIT (Part No. 351-050)\$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.

		Input Im	pedance			
Probe	Atten. Ratio	Resist- ance	Capaci- tance	Voltage Rating	Part No.	Price
P6006	10:1	10 meg Ω	*9.5 pf	600 v	010-125	\$22.00
P6027	1:1	$1~{ m meg}~\Omega$	94 pf .	600 v	010-070	\$12.50

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



DC-to-23MC OSCILLOSCOPE Type

PARALLAX-FREE ILLUMINATED INTERNAL GRATICULE

WIDEBAND VERTICAL PLUG-IN UNITS

DELAYED SWEEP OR
X50 MAGNIFIER HORIZONTAL PLUG-IN UNIT

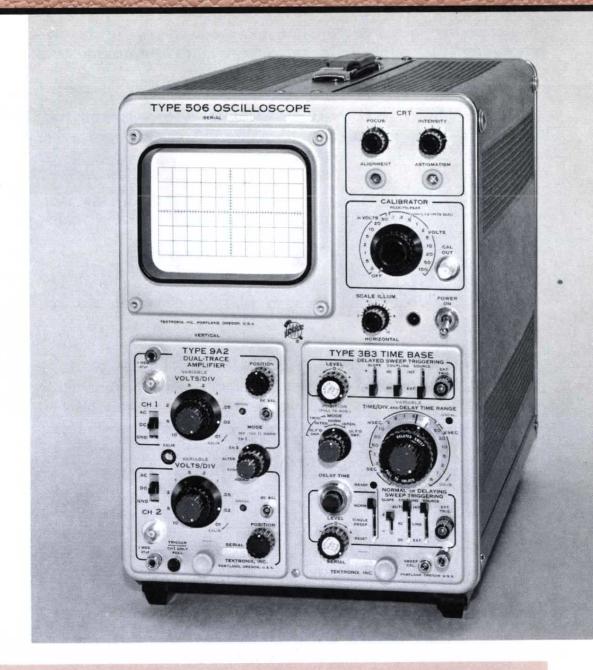
HIGH WRITING SPEED

COMPACT SIZE

The Type 506 Oscilloscope and 9A-Series Plug-In Units offer a new high level of 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.

A new Tektronix rectangular crt provides unusually high brightness and photographic writing speed combined with small spot size and the excellent edge-focus characteristics of a mono-accelerator crt.

The parallax-free internal graticule with controllable edge-lighting enables optimum scale illumination for viewing or waveform photography.



CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics depend upon plug-in unit. With Type 9A2 Dual-Trace Unit:

PASSBAND—dc-to-23 Mc at —3 db point.

RISETIME-15 nsec.

SIGNAL DELAY-260 nsec.

SENSITIVITY—10 mv/div to 10 v/div, 1-2-5 sequence. (1 div = 1 cm)

With TYPE 9A1 Dual-Trace Unit:

Similar to Type 9A2 except has no delay line.

HORIZONTAL

Horizontal characteristics depend upon the plug-in unit. With TYPE 3B3 Time Base Unit:

SWEEP RANGE—0.5 μ sec/div to 1 sec/div, 1-2-5 sequence.

5X MAGNIFIER—increases sweep speed to 0.1 μ sec/div. SWEEP DELAY—0.5 μ sec to 10 sec, calibrated and continuously variable.

SINGLE-SWEEP OPERATION—facilitates waveform photography.

With TYPE 3B4 Time Base Unit:

SWEEP RANGE—50 nsec/div to 1 sec/div, 1-2-5 sequence.

SWEEP MAGNIFIER—wide range (to X50), direct reading.

CRT

IMPROVED WRITING RATE—small spot size and good edge focus.

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—3.5 kv (mono-accelerator).

STANDARD PHOSPHOR—P31.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mv to 100 v, 1-2-5 sequence; Positive-going squarewave at line frequency. POWER REQUIREMENTS—105 to 125 v, or 210 to 250 v, 50 to 400 cps, 240 watts maximum.

CHARACTERISTICS

VERTICAL PLUG-IN COMPARTMENT accepts 9A-Series wideband amplifier plug-in units.

HORIZONTAL PLUG-IN COMPARTMENT accepts the Type 3B3 and Type 3B4 Time Base Units which are recommended for general-purpose use, although all the Tektronix 2- and 3-Series Time-Base Plug-In Units are electrically compatible with the Type 506.

TEKTRONIX CRT is a rectangular, flat-faced tube with an internal parallax-free graticule with controllable edge-lighting. New 3.5 kv mono-accelerator gun design provides high brightness and photographic writing speed. A P31 phosphor is normally supplied.

506

DISPLAY CONTROLS on the front-panel include Focus, Intensity, and Scale Illumination (of the 6-cm by 10-cm display area), in addition to adjustments for Astigmatism and Trace Alignment.

ILLUMINATED INTERNAL GRATICULE is edge-lighted and is marked in 6 vertical and 10 horizontal cm divisions. The centerlines are marked every 2 mm.

Z-AXIS INPUT through a 5-way binding post at the rear of the instrument permits external modulation of the crt cathode.

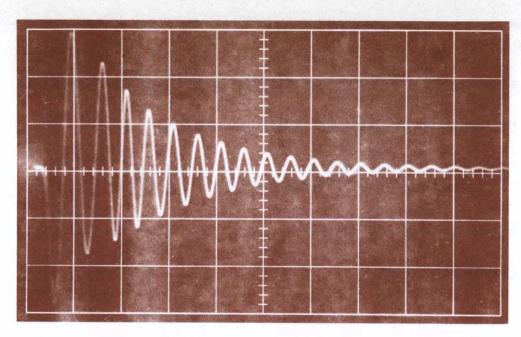
CALIBRATOR has 18 calibrated positive-going square-wave voltages available from 0.2 mv to 100 v, pk-to-pk, at line frequency.

ELECTRONICALLY-REGULATED SUPPLIES furnish all voltages required for proper operation of the indicator and plugin units. Regulated dc-supply operates with line voltage between 105 v to 125 v or 210 v to 250 v, 50 to 400 cps.

POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 400 cps, 240 watts maximum.

OVERALL DIMENSIONS are $14\frac{1}{2}$ " high, 10" wide, and $21\frac{1}{8}$ " deep. Net weight (less plug-ins) is 28 pounds; shipping weight is 39 pounds, approx.

TYPE 506 OSCILLOSCOPE, without plug-in units \$525 Each instrument includes: 1—3 wire power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—adapters, BNC-to-binding post (103-033), 1—red test lead (012-031), 1—light filter (378-534), 2—instruction manuals.



HIGH WRITING SPEED CONVENIENT PHOTOGRAPHY Single-sweep display, taken with a Tektronix Type C27 Camera. Indicated writing speed is $350 \text{ cm}/\mu\text{sec}$ (writing rate = amplitude in cm x displayed frequency x π). Note that the internal graticule and trace are both in good focus even though the photograph was taken at f/1.9. Adjustable illumination of the internal graticule provides waveform photographs with sharply delineated rulings.

POLARIZED VIEWER

Under high ambient-light conditions it is often difficult to view oscilloscope traces unless the trace intensity is greatly increased. Many times this is not feasible. The new Tektronix Polarized Viewer makes it easy to see oscilloscope traces of normal to low intensity even with high ambient light.

The Polarized Viewer slips on or off the rectangular graticule covers of the Type 506 in seconds.

RECTANGULAR POLARIZED VIEWER (Part No. 016-039) \$10

TYPE 9A1 DUAL-TRACE AMPLIFIER UNIT

The Type 9A1 is designed for use with the Tektronix Type 506 Oscilloscope. It contains two identical amplifier channels. Either channel can be used independently for a single-trace display, or the two channels can be electronically switched for a dual-trace display. Also, the two channels can be added algebraically and the resultant waveform displayed on the indicator unit crt.

PASSBAND is dc to 23 Mc.

RISETIME is typically 15 nsec.

OPERATING MODES include Channel 1 only (normal or inverted for signal rejection); Channel 2 only; Alternate—Channel 1 and 2 switched electronically at the end of each sweep; Chopped—in chopped operation, successive $3.3~\mu sec$ segments of each channel are displayed at an approximate 150-kc rate per channel. Chopped transient blanking is provided. Added Algebraically—outputs of Channel 1 and 2 algebraically. (Channel 1 may be inverted for signal rejection.)



CALIBRATED SENSITIVITY is 10 mv/div to 10 v/div in 10 steps, 1-2-5 sequence. Variable control for each channel permits continuous, uncalibrated adjustment between steps and to 25 v/div. Accuracy of calibrated positions is $\pm 3\%$ of indicated deflection (when unit is accurately adjusted at the 10 mv/div position).

INPUT COUPLING is either ac, dc, or grounded grid (input open), as selected by a front-panel switch. Ac-coupled low-frequency-3-db point is 2 cps direct or 0.2 cps with 10X passive probe.

INPUT IMPEDANCE is 1 megohm paralleled by 47 pf.

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

INTERNAL TRIGGER SIGNAL for the time base unit is a composite signal from both channels (depends on operating mode and includes switching transients), or from Channel 1 only, as determined by a front-panel switch.

NET WEIGHT is 5 pounds. Shipping weight is 6 pounds, approx.

TYPE 9A1 DUAL-TRACE AMPLIFIER UNIT \$475

Each instrument includes: 2—instruction manuals.

TYPE 9A2 DUAL-TRACE AMPLIFIER UNIT

The Type 9A2 Dual-Trace Amplifier Unit is designed for use with the Tektronix Type 506 Oscilloscope. It contains two identical amplifier channels which can be used independently for a single-trace display, or the two channels can be electronically switched for a dual-trace display. Also, the two channels can be added algebraically and the resultant waveform displayed on the indicator-unit crt.

A signal delay line in the Type 9A2 delays the signal approximately 260 nsec while the triggering signal passes to the time base undelayed. This allows the leading edge of the triggering signal to be viewed on the crt.

PASSBAND is dc-to-23 Mc.

RISETIME is typically 15 nsec.

SIGNAL DELAY is approximately 260 nsec.

OPERATING MODES include Channel 1 only (normal or inverted for signal rejection); Channel 2 only; Alternate—Channel 1 and 2 switched electronically at the end of each sweep; Chopped—in chopped operation, successive 3.3 μ sec segments of each channel are displayed at an approximate 150-kc rate per channel. Chopped transient blanking is provided. Added Algebraically—outputs of Channel 1 and 2 algebraically. (Channel 1 may be inverted for signal rejection,)

CALIBRATED SENSITIVITY is 10 mv/div to 10 v/div in 10 steps, 1-2-5 sequence. Variable control for each channel permits continuous, uncalibrated adjustment between steps and to 25 v/div. Accuracy of calibrated positions is $\pm 3\%$ of indicated deflection (when unit is accurately adjusted at the 10 mv/div position).

INPUT COUPLING is either ac, dc, or grounded grid (input open), as selected by a front-panel switch. Ac-coupled low-frequency-3-db point is 2 cps direct or 0.2 cps with 10X passive probe.

INPUT IMPEDANCE is 1 megohm paralleled by 47 pf.

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

INTERNAL TRIGGER SIGNAL for the time base unit is a composite signal from both channels (depends on operating mode and includes switching transients), or from Channel 1 only, as determined by a front-panel switch.

NET WEIGHT is 5 pounds. Shipping weight is 6 pounds, approx.



TYPE 9A2 DUAL-TRACE AMPLIFIER UNIT \$550 Each instrument includes: 2—instruction manuals.

PROBES

Attenuator probes are not included with the Type 506 Oscilloscope. Tektronix probes are recommended when minimum loading of the circuit is required.

The following probes are recommended for general-purpose use with the Type 506 Oscilloscope and 9A-Series Plug-In Units.

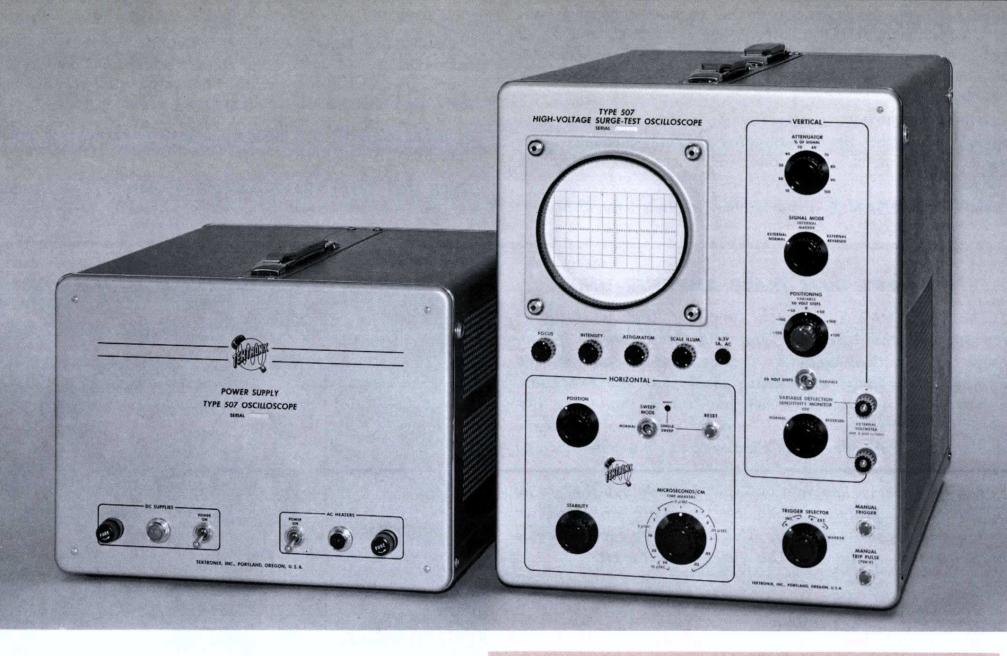
Use	Input Impedance	Rating	Probe	Price
1:1 Attenuator	1 meg Ω 97 pf	600 v max	P6028	\$12.50
10:1 Attenuator	10 meg Ω 9.5 pf	600 v max	P6006	22.00
100:1 Attenuator	100 meg Ω 2.3 pf	1.5 kv max	P6007	22.00

See Catalog Accessory pages for additional information.

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

Type 5 7 SURGE-TESTING OSCILLOSCOPE





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 μ sec/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 μ sec to 10 μ sec.

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.

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 μ sec surge-testing waveform. Voltage-breakdown and heat-dissipation limitations must be considered before impressing signals greater than 3 kv and/or longer than 40 μ sec.

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.

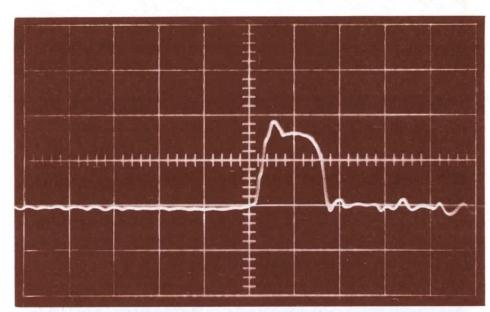
External Voltmeter Connectors—Terminals are provided for a high-impedance ($5000 \Omega/\text{volt}$) dc voltmeter, permitting vertical calibration when using the variable positioning.

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 μ sec/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 singlesweep 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- μ sec time mark is available at sweep speeds from $0.02~\mu$ sec/cm to $0.2~\mu$ sec/cm; $0.5~\mu$ sec, from $0.5~\mu$ sec/cm to $2~\mu$ sec/cm; $5~\mu$ sec, from $5~\mu$ sec/cm to $20~\mu$ sec/cm; and $10~\mu$ sec, at $50~\mu$ sec/cm. These are useful as references when photographing pulses.

507

Trip Pulse For Manual Triggering—This is intended for use in triggering a trip-pulse generator. A pulse of approximately 700 v amplitude and $5 \mu sec$ 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%" high by 13%" wide by 23¾" deep for the indicator unit and 10¾" high by 13½" wide by 17¾" deep for the power-supply unit. Net weight of the indicator unit is 54 pounds, and of the power-supply unit is 40½ 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 (012-032), 1—507 ground connector (013-011), 1—3 to 2-wire adapter (103-013), 1—3-conductor power cord (161-010), 1—blue filter (378-515), 2—instruction manuals (070-091).



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 17½", Power Supply mask 12¼".

Order Part Number 040-279 \$78.50

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.

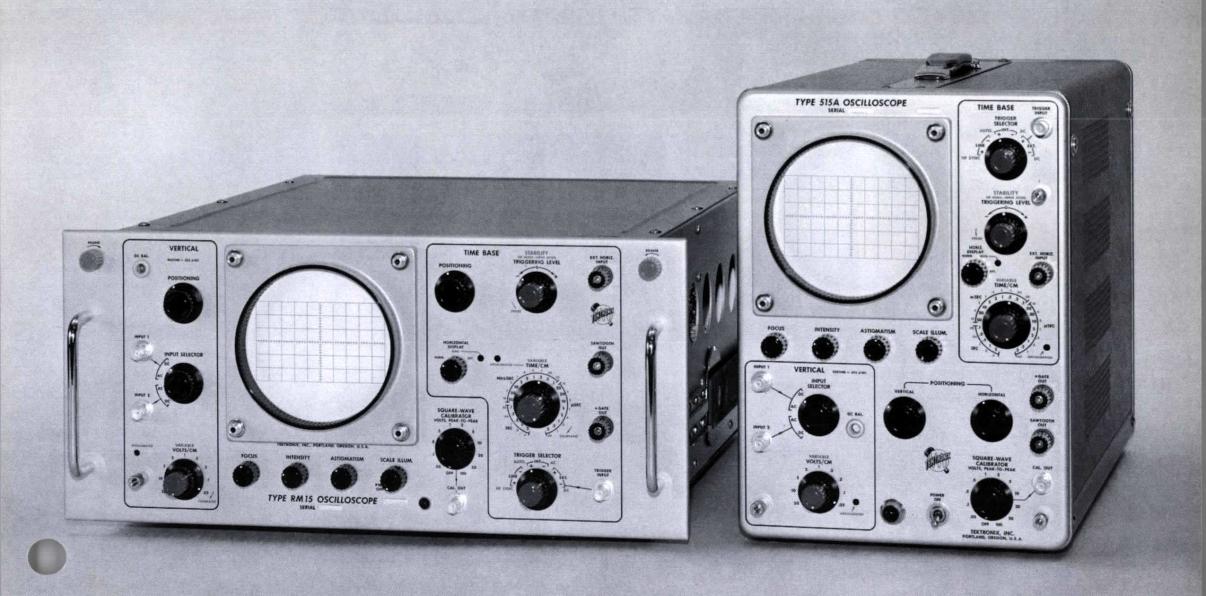
The Type 507 has been designed to ensure minimum sensitivity to extraneous disturbances and can withstand a limit of 2000 crest volts to ground for transformer break-down.

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.



DC-to-15MC OSCILLOSCOPE Type



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 $0.04~\mu sec/cm$ 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: 0.5 v to 20 v.

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

CRT

DISPLAY AREA-6 x 10 cm.

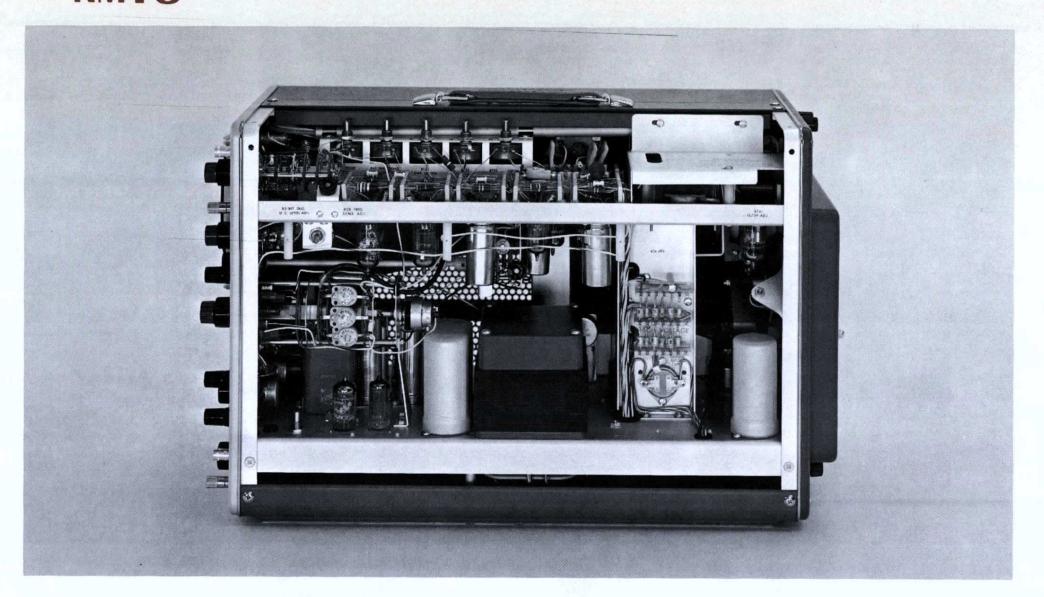
ACCELERATING VOLTAGE-4 kv.

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.

515A RM15



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 μ sec 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 μ sec/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 adjustable from 0.04 μ sec/cm to 6 sec/cm. 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 $0.04~\mu sec/cm$. 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.

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 0.5 v 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.

Regulated Power Supply—Electronic regulation compensates for load differences and line-voltage 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 300 watts. Type 515A-MOD101 operates on 50 to 400 cps, uses dc fan motor.

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 $9\frac{7}{8}''$ wide by $21\frac{3}{4}''$ deep. Net weight is $42\frac{1}{4}$ pounds. Shipping weight is 52 pounds, approx.

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

Each instrument includes: 1—P6006 probe (010-127), 1—3 to 2wire adapter (103-013), 2—BNC to binding-post adapters (103-033),
1—3-conductor power cord (161-010), 1—green filter (378-514),
1—red test lead (012-031), 2—instruction manuals (070-247).

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

Each instrument includes: 1—P6006 probe (010-127), 1—3 to 2wire adapter (103-013), 2—BNC to binding-post adapters (103-033),
1—3-conductor power cord (161-010), 1—green filter (378-514),
1—red test lead (012-031), 2—instruction manuals (070-247).

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 ¾ " high by 19" wide by 22 ¾ " dep. 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 MOD101 OSCILLOSCOPE \$1010

Each instrument includes: 1—P6006 Probe (010-127), 1—3 to 2wire adapter (103-013), 2—BNC to binding-post adapters (103033), 1—3-conductor power cord (161-010), 1—guide track (351006), 1—green filter (378-514), 1—red test lead (012-031), 2—instruction manuals (070-242).

SUPPORTING CRADLES

When the Type RM15 or Type RM15 MOD101 is used in a backless rack, these supporting cradles are necessary for rear-slide support.

Order Part Number 040-344\$12.00

FAN MOTOR KIT

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

Type 5 DC-to-15MC DUAL-TRACE OSCILLOSCOPE



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: 0.5 v to 25 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.

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

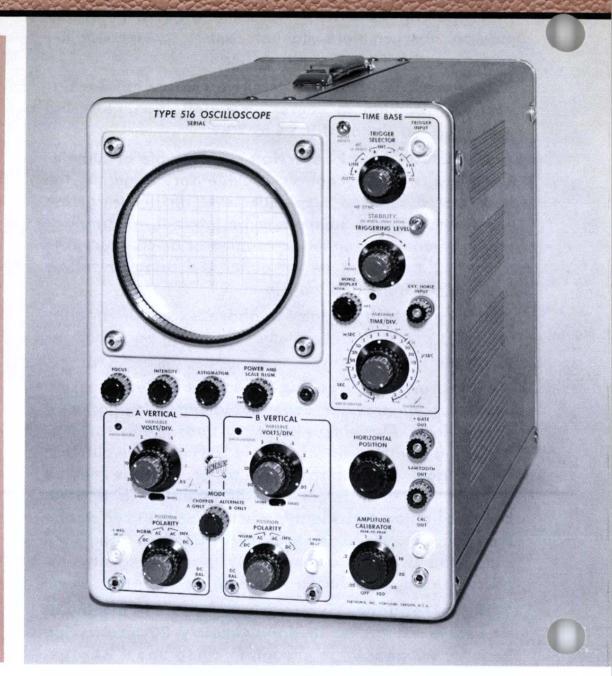
Frequency Specifications are at 3-db down

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- μ sec 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 μ sec/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

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 μ sec/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 unfirom 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 1.4 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 20 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 0.5 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 516MOD101 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	Voltag	je		Ope	rati	ing R	ange
	(igures	taken	at	60 c	ps)		
	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 9%" wide by 21%" deep. Net weight is 44% pounds. Shipping weight is 54 pounds, approx.

TYPE 516 (50 to 60 cps operation) \$1070 Each instrument includes: 2—P6006 probes (010-127), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapters (103-033), 1—3-conductor power cord (161-010), 1—green filter (378-

514), 1—red test lead (012-031), 2—instruction manuals (070-225).

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

Each instrument includes: 2—P6006 probes (010-127), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapters (103-033), 1—3-conductor power cord (161-010), 1—green filter (378-514), 1—red test lead (012-031), 2—instruction manuals (070-225).

RACK MOUNT ADAPTER

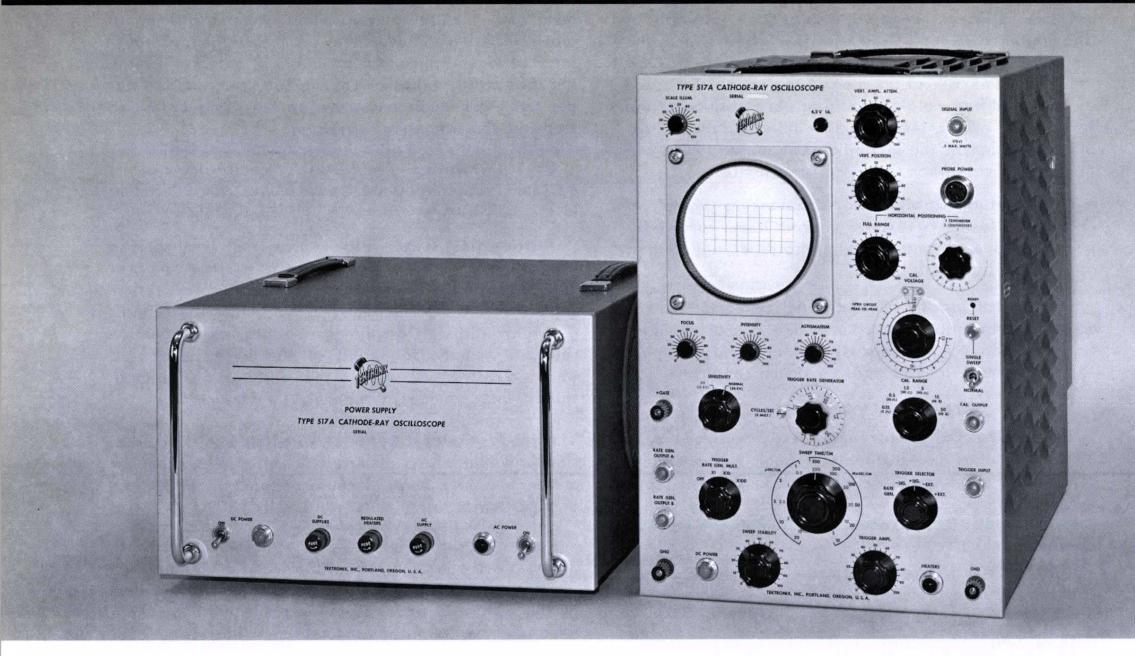
A cradle mount to adapt the Type 516 Oscilloscope for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Rack height requirement is $15\sqrt[3]{4}$ ".

Order Part Number 040-277 \$45

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

Type 517/A HIGH-SPEED OSCILLOSCOPE



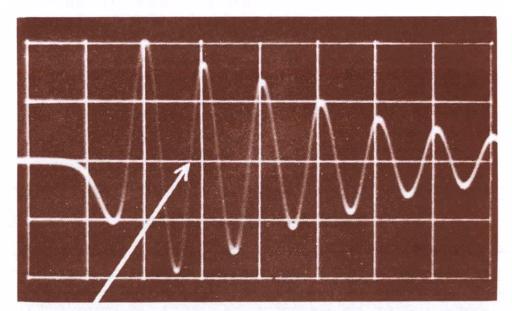


UP TO 1100 cm/µsec WRITING RATE

SELECTABLE ACCELERATING VOLTAGE

CALIBRATED HORIZONTAL POSITIONING

SINGLE-SWEEP OPERATION



Arrow indicates $1100 \text{ cm}/\mu\text{sec}$ writing-speed point on 100-mc damped oscillation, displayed on single 10 nsec/cm sweep of Type 517A Oscilloscope with T517P11 crt. Recorded on 35-mm TRI-X film at f1.9 with 4.2 to 1 reduction, developed 26 minutes in D-19 at 68°F .

CHARACTERISTIC SUMMARY

VERTICAL

SENSITIVITY—50 mv/cm or better to 400 v/cm at 24 kv. RISETIME—7 nsec. INPUT—170 Ω .

HORIZONTAL

CALIBRATED SWEEP RANGE—5 nsec/cm to $20\mu\text{sec/cm}$. TRIGGER REQUIREMENTS—Internal: 2-mm deflection. External: 0.3 to 15 v.

TRIGGER-RATE GENERATOR—15 to 15,000 cps, continuously variable.

CRT

DISPLAY AREA—4 x 8 cm.

ACCELERATING VOLTAGE—12 or 24 kv, selectable.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.15 to 50 v, approx. 25-kc square wave.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 1250 watts.



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.

VERTICAL DEFLECTION SYSTEM

Frequency Specifications are at 3-db down

Distributed Amplifier—A 5-stage distributed amplifier is used to derive a transient-response risetime of 7 nanoseconds.

Sensitivity—Basic sensitivity is 50 mv/cm or better at 24-kv accelerating potential, 25 mv/cm or better at 12 kv. A front-panel control selects either normal (24 kv) or X2 sensitivity (12 kv). Vertical amplifier attenuation is continuously adjustable over a 2 to 1 range.

Input—The input of the vertical amplifier is connected through a coaxial connector directly to the 170-ohm first-stage grid line.

Cathode-Follower Probe—To provide higher input impedances, a cathode-follower probe and three capacitive attenuator heads are supplied with the Type 517A. The input impedance of the probe alone consists of 12 megohms paralleled by approximately 5 pf. Each attenuator head will present a different input capacitance, decreasing with higher attenuation ratios. Each attenuator head is adjustable over a ten-to-one range by means of a screwdriver adjustment in the nose of the head, making the following deflection factors and attenuator ranges available—with minimum and maximum oscilloscope vertical amplifier attenuation.

	Sensitivity of Type 517A at 24-KV Accelerating Potential					Total Attenuation at CRT		
Scope Input	0.05	to	0.1 v/cm	1:1	to	2:1		
Probe Body Alone	0.1	to	0.2 v/cm	2:1	to	4:1		
Probe with Attenuator I	0.2	to	4 v/cm	4:1	to	80:1		
Probe with Attenuator II	2	to	40 v/cm	40:1	to	800:1		
Probe with Attenuator III	20	to	400 v/cm	400:1	to	8000:1		

Step Attenuator—A separate 170-ohm step attenuator is furnished with the Type 517A. The attenuator uses 2% precision resistors, and covers the range of 1 to 64 db in 1-db steps. It is rated at 0.25 w. Also furnished is a 170-ohm coaxial cable, 42" long.

Auxiliary Power—A front-panel socket is provided to supply power for a cathode-follower probe or an auxiliary amplifier stage connected close to the circuit under observation. 6.3 v dc at 150 ma and 110 v dc at 9.5 ma are available (in addition to 6.3 v ac at 1 amp at front-panel pin jack).

Signal Delay—Approximately 65 nsec of delay cable is incorporated in the vertical amplifier. This delay, along with an inherent 55 nsec delay in the amplifier, permits the sweep to start before the signal reaches the vertical deflection plates.

Direct Input CRT—An aperture in the side of the cabinet permits direct connection to the crt deflection plates for observation of extremely-fast transients.

HORIZONTAL DEFLECTION SYSTEM

Calibrated Sweep Rates—The basic sweep waveform is generated by a boot-strap circuit with an inverter stage for balanced deflection. Eleven fixed, calibrated sweep rates accurate within 2%...10, 20, 50, 100, 200, 500 nsec/cm, 1, 2, 5, 10, 20 μ sec/cm are available at 24 kv accelerating potential; and 5, 10, 25, 50, 100, 250 nsec/cm, 0.5, 1, 2.5, 5, 10 μ sec per cm at 12 kv.

Horizontal-Position Vernier—In addition to the normal horizontal-position control, a vernier control calibrated in millimeters provides accurate measurements over a range of 1 cm (24-kv accelerating potential) for use in measuring risetimes, etc.

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 presses the reset button.

Trigger Selection—A front-panel switch selects a trigger from an observed signal of either polarity, an external trigger source of either polarity, or the internal trigger generator.

Trigger Requirements—The Type 517A uses a distributed amplifier in the trigger circuitry to handle fastrise trigger signals. An internal pulse giving a 2-mm deflection will trigger the Type 517A. External pulse requirements are 0.3 to 15 v.

Trigger-Rate Generator — Internal trigger-rate generator is continuously variable from 15 to 15,000 cycles in three ranges with accuracy within 5% of full scale. Two cathode-follower outputs are available... 20 v at 50 ohms internal impedance and 60 v at 200 ohms internal impedance. Risetime is approximately $0.15~\mu sec.$

Automatic Duty-Cycle Limiter—The maximum duty cycle of the sweep system is automatically limited to about 30% to avoid exceeding the dissipation limits of some of the sweep circuit components.

POWER SUPPLY

Low Voltage—The low-voltage power supply is separate from the indicator unit, supplying power to it by an inter-connecting cable. All dc supplies are electronically regulated and heaters in the indicator unit are regulated by a saturable-reactor method to insure stable operation over line-voltage and load variations between 105 and 125 v or 210 and 215 v.

High Voltage—Accelerating potentials for the crt are obtained from an oil-filled oscillator-type supply, all voltages electronically regulated to insure stable operation for both load and line changes. A front-panel switch on the indicator unit changes the accelerating voltage from 24 kv to 12 kv by changing the sampling voltage in the regulator circuit.

517A

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 1250 watts.

OTHER CHARACTERISTICS

Amplitude Calibrator—A pulse-type calibrator is used in the Type 517A and is available at the front-panel through a coaxial connector. The output voltage is continuously variable from 0.15 v to 50 v peak full scale in 6 ranges with accuracy within 4% of full scale. Frequency is approximately 25 kc.

Metallized Cathode-Ray Tube—The Type 517A uses a 5" flat-faced metallized precision tube with helical post-accelerating anode. It provides a full 4-cm x 8-cm viewing area when operated at 24-kv accelerating potential. Position of the high-voltage connector permits bringing the tube face flush with the panel. A P11 phosphor is normally furnished.

Output Waveforms—In addition to the two triggerrate generator outputs and calibrator output, a + GATE waveform of approximately 30 volts amplitude is available. Its duration is approximately equal to the sweep being generated. Risetime is 30 nsec, from a cathodefollower source impedance of 200 ohms.



Illuminated Graticule—An edge-lighted graticule is marked in centimeter squares, 4 vertical and 8 horizontal, for convenience in making time and amplitude measurements. Illumination is controlled by a frontpanel knob.

Mechanical Specifications—Dimensions are $18 \frac{1}{2}$ " high by $13 \frac{1}{2}$ " wide by $27 \frac{1}{4}$ " deep for the indicator unit and 10" high by $16 \frac{1}{4}$ " wide by $20 \frac{1}{4}$ " deep for the power supply. Net weight is $74 \frac{1}{2}$ pounds for the indicator unit, $65 \frac{1}{2}$ pounds for the power supply. Total shipping weight is 186 pounds approx. (with indicator unit weighing 100 pounds approx., power supply weighing 79 pounds approx.)

TYPE 517A OSCILLOSCOPE \$3400

Each instrument includes: 1—P170CF probe (010-101), 1—170- Ω step attenuator (011-017), 1—170- Ω output cable (012-006), 1—interconnecting cable (012-032), 1—camera bezel (014-011), 1—viewing hood (016-001), 1—3-conductor power cord (161-010), 120" 3-conductor power cord (161-014), 1—3 to 2-wire adapter (103-013), 1—light filter (378-515), 2—straight probe tips (206-106), 2—hooked probe tips (206-107), 2—instruction manuals (070-229).

SCOPE-MOBILE® CART

Tektronix Scope-Mobile carts are available for the Type 517A 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

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





DC-to-1 GIGACYCLE OSCILLOSCOPE Type 5

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 $\pm 2\%$.

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.

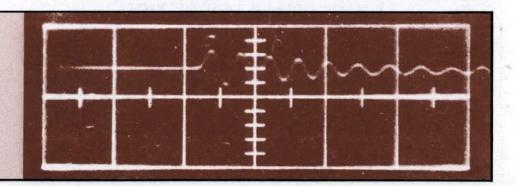


The Tektronix Type 519 Oscilloscope is a calibrated, high-speed, laboratory instrument designed for observation, measurement, and photographic recording of fractional nanosecond risetimes. A 2 x 6 cm viewing area, coupled with 24-kv accelerating potential, affords bright displays with excellent definition. 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. Picture taken with a Tektronix C19 Camera.



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 \pm 2%. Maximum signal input is \pm 15 volts dc or rms, or \pm 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 up to approximately 150 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

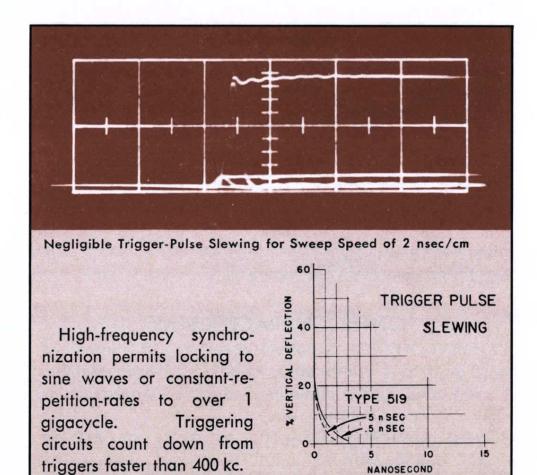
Calibrated Sweep—Nine calibrated rates: 2, 5, 10, 20, 50, 100, 200, 500, and 1000 nsec/cm are provided by a linear, push-pull, time-base generator. Accuracy is typically within 3% for the 2 nsec/cm position and within 2% for slower rates. For the fastest time-base range, only $2.5~\mu sec$ elapses between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

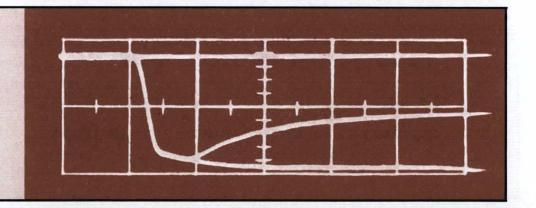
Synchroscope Operation—The output signal from either the +TRIGGER $50~\Omega$, the DELAYED +GATE, or the +RATE $50~\Omega$ connector can be used to initiate the input waveform.

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.



DIODE CHARACTERISTICS

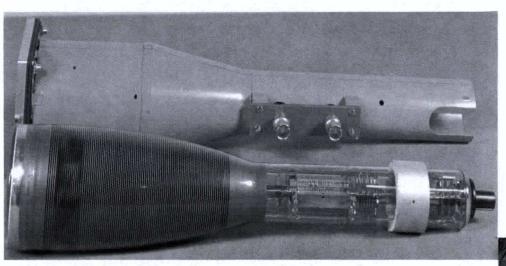
Switching and storage times in fast transistors and diodes can be measured using the outstanding characteristics of the Type 519. In the typical diode recovery-time waveform, the upper trace is a reference trace, the middle trace shows the diode turned on, and the lower trace shows the diode shorted. 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 Type C-12, C-13, or C-19 Trace-Recording Camera. The C-19 is designed for recording high-speed pulses, where maximum light transmission from crt to film is essential. Several lens, 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 $22 \frac{1}{4}$ "high by $14 \frac{5}{8}$ " wide by $25 \frac{1}{4}$ " deep. Net weight is $103 \frac{3}{4}$ pounds. Shipping weight is 136 pounds, approx.

TYPE 519 OSCILLOSCOPE \$3900

Each instrument includes: 2—125- Ω terminations (017-051), 2—125- Ω insertion units (017-013), 1—125 Ω coupling capacitor (017-013), 1—125- Ω 1-Gc timing standard (017-019), 1—double button assembly (017-032), 1—panel adapter assembly (017-033), 1—cable connector (017-035), 1—125- Ω T50/T125 attenuator (017-052), 1—125- Ω N50/N125 adapter (017-053), 1—125- Ω T50/N125 adapter (017-055), 1—delay line equalizer (017-057), 1—125- Ω 1-nsec delay cable (017-507), 1—125- Ω 2-nsec delay cable (017-508), 1—125- Ω 5-nsec delay cable (017-509), 1—125- Ω 10-nsec delay cable (017-510), 1—viewing hood (016-025), 1—phone jack plug (134-069), 2—reed switches (260-362), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—accessory box tray (436-030), 1—accessory box (202-083), 2—instruction manuals (070-243).

OPTIONAL ACCESSORIES

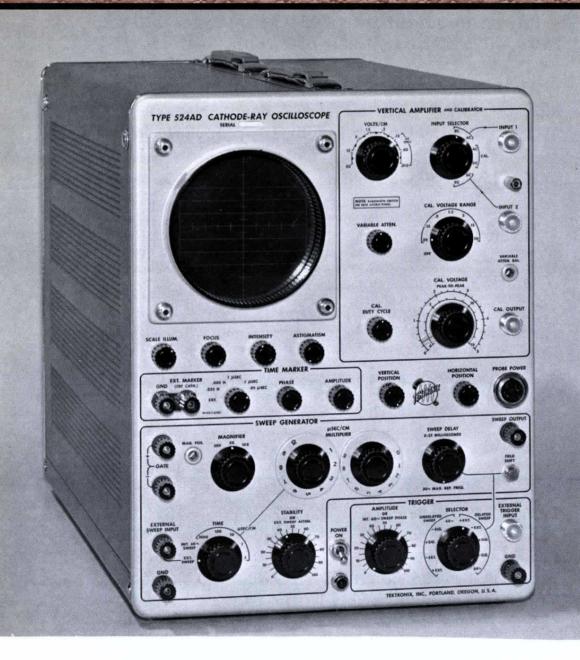
Accessory	Part No.	Price
125- Ω 2:1 attenuator	017-071	\$25.00
125- Ω 5:1 attenuator	017-049	30.00
125- Ω 10:1 attenuator	017-050	30.00
125- Ω N50/T125 adapter	017-054	17.50
125- Ω 90° elbow assembly	017-043	15.00
125- Ω 20-nsec cable	017-511	24.00

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



Type 524 A 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 μ sec, 0.1 μ sec, 1.0 μ sec, 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 syncpulse 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

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 9.5 pf.

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

HORIZONTAL DEFLECTION SYSTEM

Calibrated Sweeps—The Type 524AD has a continuously variable, linear, triggered time base covering the range of 0.1 μ sec/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 speeds 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 μ sec, 0.1 μ sec, and 0.05 μ sec. Since H is 63.5 μ sec, 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 16 3/4" 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 (010-125), 2—A510 binding-post adapters (013-004), 1—H510 viewing-hood assy. (016-001), 1—3 to 2-wire adapter (103-013), 1—3-conductor power cord (161-010), 1—TV graticule (331-009), 1—green filter, installed (378-514), 2—instruction manuals (070-236).

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 $17\frac{1}{2}$ ".

Order Part Number 040-281 \$45

SCOPE-MOBILE® CARTS

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.

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.



TELEVISION WAVEFORM MONITOR Type 5225



Frequency Response

FLAT—within 1% between 60 cycles and 5 mc. LOW PASS—passes stair steps, eliminating high frequencies.

HIGH PASS—passes high frequencies, eliminating stair steps.

IRE—meets 1958 Standard 23S-1.

Excellent Linearity

Insures accurate color signal linearity measurements.

Automatically-Synchronized Sweeps

Both field and line rates.

Keyed Clamp-Type DC Restorer

Gain Stability Within 1%

The Tektronix Type 525 Television Waveform Monitor displays the composite video waveform with the precision required for all television broadcasting. Exacting demands of the color-television broadcaster for an accurate display of signal linearity, level, and bandwidth are fulfilled with the Type 525.

Special features of the Type 525: Four vertical-amplifier response characteristics, automatically-synchronized sweeps at line or field rate, bridging, or terminating, or differential signal inputs, keyed dc restorer, stable gain characteristics. Simplicity of controls aids in easy monitor operation.

TYPICAL COLOR-TV WAVEFORMS AS VIEWED ON THE TYPE 525 TELEVISION WAVEFORM MONITOR

Photos taken through the courtesy of KPTV, Portland, Oregon.

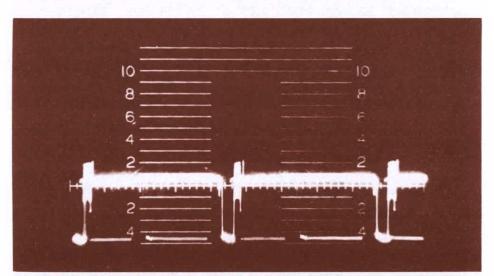


Fig. 1—Horizontal-sync pulse with color burst—Flat vertical response.

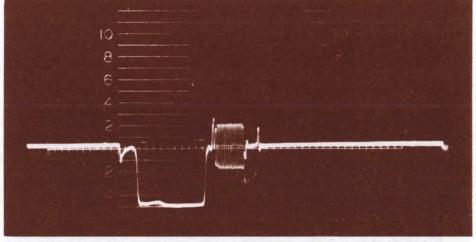


Fig. 2—Same as Fig. 1 with sweep magnified 5 times.

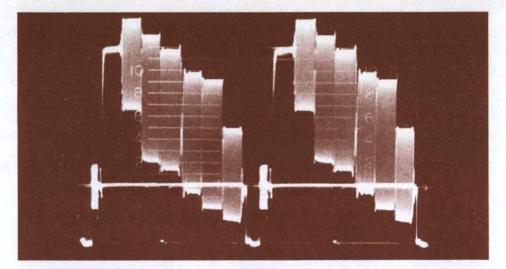


Fig. 3—Color-bar waveform with FLAT vertical response.

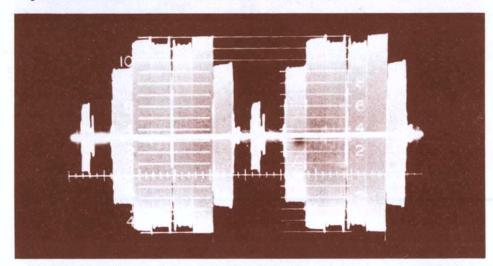


Fig. 5-Fig. 3 waveform with HIGH-PASS response.

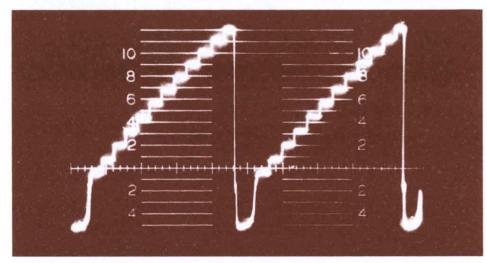


Fig. 7—Same waveform as Fig. 6 with LOW-PASS response.

VERTICAL DEFLECTION SYSTEM

Frequency Response—A response selector switch selects any one of four characteristics: IRE, meets new 1958 Standard 23S-1; FLAT, within 1%, between 60 cycles and 5 mc; LOW PASS, passes the stair steps but eliminates the high frequencies, HIGH PASS, with increase in gain adjustable to 5x, excludes the stair steps but passes the high frequencies for linearity tests.

Sensitivity—The basic deflection factor of the vertical amplifier is 0.015 v/cm. A three-step attenuator, 1x, 2x, 5x, and variable gain control can adjust the waveform to fill the graticule.

Stability—Electronic regulation of all dc power, and use of current stabilization in the amplifier, maintains stability and constant gain. Minimum adjustment of the monitor is required after it is once set. Gain stability is within 1% over a ten-hour period.

Linearity—The vertical amplifier linearity is well above the requirements for highly accurate color-tele-

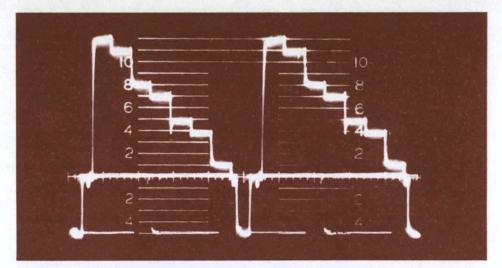


Fig. 4—Same waveform as Fig. 3 with LOW-PASS response.

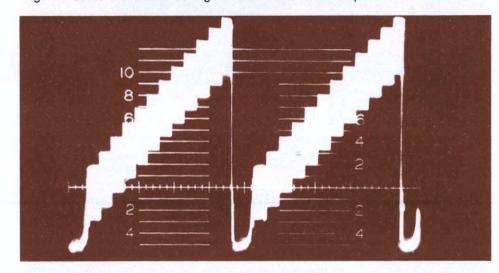


Fig. 6—Staircase with 3.58 mc added—FLAT vertical response.

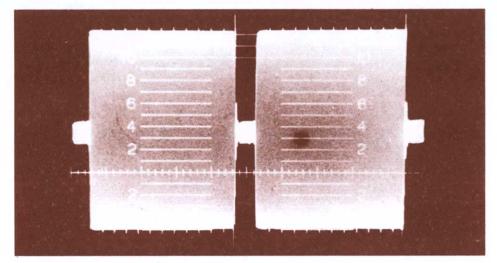


Fig. 8—Fig. 6 waveform with HIGH-PASS response.

vision video signal linearity measurements. Signals can be expanded to the equivalent of 35 cm, with any 7 cm accurately displayed on the screen.

DC Restorer—A clamp circuit, keyed by a pulse derived from the sync-separator circuit, restores the dc level of the display to the tip of the sync pulse at each line-frequency pulse. The restorer can be switched in or out as desired.

Vertical Input Connectors—All input connectors are located at the rear of the instrument. The vertical deflection system has push-pull input to permit two single-ended signals to be applied to the monitor at the same time. They can be independently selected, rapidly compared, or applied differentially to cancel out inphase unwanted signals, by a front-panel switch. Each input is paralleled with another coaxial connector to permit the monitor to bridge or terminate the video circuit. The 75-ohm terminating resistors are supplied with the instrument.

HORIZONTAL DEFLECTION SYSTEM

Sync Separator—A sync-separator circuit receives the composite video signal either internally from a point on the vertical amplifier, or through an external-trigger connector located at the rear of the instrument. External triggering requires a signal of at least 0.5 v amplitude.

Field and Line Speeds—The sweep will synchronize automatically with either line or field pulses. Sweep frequencies correspond to 7875 cycles for line and 30 cycles for field frequencies. A front-panel switch selects one or the other sweep frequency.

Horizontal Rate, Magnifier—The variable HORI-ZONTAL RATE control adjusts the sweep-time rate so 2, 3, or 4 lines or fields can be displayed at one time. A three-position switch selects accurate magnification of the sweep by 1X, 5X, or 25X. Magnification expands the portion of the sweep that is centered, equally to right and left of screen center.

OTHER CHARACTERISTICS

Amplitude Calibrator—The calibrator provides pulses with a duty cycle of about 75%, and with amplitudes between .015 volts and 1.5 volts, peak-to-peak, continuously adjustable in four ranges, 0.05, 0.15, 0.5, and 1.5 volts. Accuracy is within 2% of full scale on all ranges. The continuously-adjustable interpolating control is linear within 1%.

Cathode-Ray Tube—The Tektronix crt used in the Type 525 is a precision 5" flat-faced tube with a helical post-accelerating anode. It provides 8 cm of linear vertical deflection. A 4-kv accelerating potential provides a bright trace. A P1 phosphor is normally supplied.

Illuminated Graticule—An edge-illuminated graticule is marked in percentage, to +100 and -40. Each centimeter division equals 20%. Illumination is controlled by a front-panel knob.

External Time Markers—A binding post, located at the rear of the instrument, is available for applying external time markers to the crt cathode.

Accessibility—The Type 525 cabinet is designed for standard rack mounting. Chassis is attached to the cabinet with a slide-out mounting that permits it to be tilted vertically, providing easy access to all components.

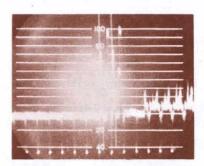


Fig. 9—Two-line test signal displayed at field sweep rate with 25-times sweep with intensifier turned on, Sweep duramagnification. Vertical amplifier is set tion 60 usec at line rate, vertical ampliat FLAT response. (flat from 60 cycles fier set at FLAT response. to 5 mc).

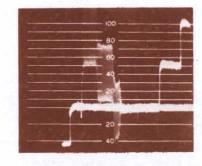


Fig. 10—Same test signal displayed

Internal Adjustments — Internal-adjustment controls, which may require readjustment occasionally, are mounted on the left of the chassis near the front, easily accessible to the operator by sliding the monitor partly out of the case.

Regulated Power Supply—DC power supplies are regulated to maintain constant dc voltages for changes in load, and for ac input voltages 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 380 watts.

Mechanical Specifications—Dimensions are 8 3/4" high by 19" wide by 21" deep. Net weight is 54 3/4 pounds. Shipping weight is 75 pounds, approx.

Each instrument includes: 2—terminating resistors (011-023), 1— 3 to 2-wire adapter (103-013), 1-3-conductor power cord (161-010), 1 set-mounting hardware, 1-green filter, installed (378-514), 2—instruction manuals (070--271).

Type 525 With Intensifier

model is equipped with intensifier for This vertical-blanking-interval test signal. Additional circuitry provides for displaying the two or three lines of the vertical blanking interval that are used to carry transmission test signals. The cathode-ray tube is unblanked only during the test-signal period. Sweep speed is automatically increased to a maximum sweep duration of approximately 60 μ sec so that a single line of the test signal can be displayed over the full screen width. Sweep repetition rate is consequently increased to 15.75 kc for maximum brightness. The start of the unblanking period is adjustable between 13 and 21 lines after the beginning of the vertical blanking interval; thus including all lines suitable for carrying test signals.

TYPE 525MOD111 OSCILLOSCOPE \$1215

Each instrument includes: 2—terminating resistors (011-023) 1— 3 to 2-wire adapter (103-013), 1-3-conductor power cord (161-010), 1 set-mounting hardware, 1-green filter, installed (378-514), 2—instruction manuals (070--271).

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

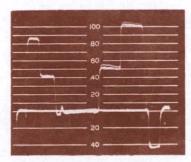


Fig. 11—Same test signal displayed with vertical amplifier switched to LOW PASS response. Sweep duration 70 µsec at half the line rate.

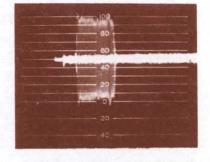


Fig. 12—Cross-modulation check—same test signal displayed with vertical amplifier switched to HIGH PASS response. Shows relative amplifications at three luminance levels.

Type 7 2 COLOR-TELEVISION VECTORSCOPE





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

Vertical Interval Testing—A keying circuit permits measurements on color 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.



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 $\pm 1.5^{\circ}$ can be made using the vector display. Accuracy of saturation measurements will be within $\pm 2\%$ 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 μ sec of the linear sweep. During the 3- μ sec 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.

INTERFIELD-SIGNAL KEY

When the INTERFIELD SIGNAL KEY Switch is in the ON position, the cathode-ray tube is gated on only during the 3 or 4 lines occupied by the interfield signal. Video clutter is thus eliminated from the display.

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 $3.5 \, \text{v}$ to $8 \, \text{v}$ 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 ($R = 1 \, \text{megohm}$, $C = 25 \, \text{pf}$).

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" flatfaced monoaccelerator tube with similar vertical and horizontal sensitivities, excellent linearity. Accelerating potential is 4 kv. A P1 phosphor is normally supplied.

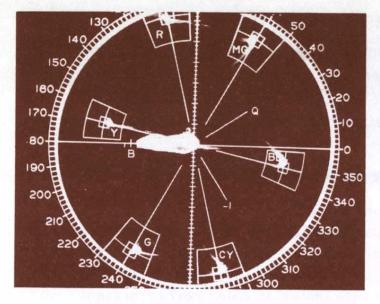


Fig. 1—Vector display of encoder output with 75% saturated color-bar test signal. Test-circle alignment with each other and with scribed graticule encoders for direct comparison measurements. circle verifies accuracy of Vectorscope.

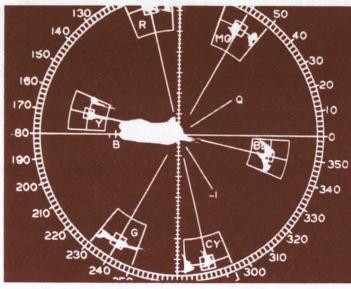


Fig. 2—Dual vector display. Electronic switching of Vectorscope inputs presents signals from two

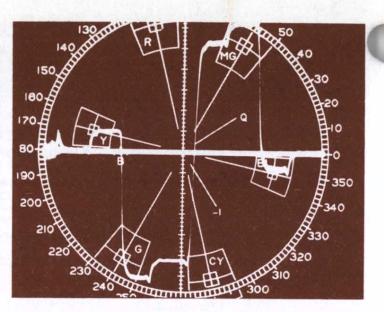


Fig. 3—Demodulated color-bar signal displayed on linear sweep. Burst packet at left end of trace is nulled out, indicating correct phasing of burst at 180°. The signal channel not in use provides a reference trace on the screen at zero signal level.

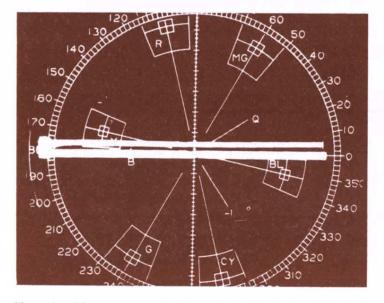


Fig. 4—Line-sweep display of Bell Kelly Set test signal fed directly into Vectorscope, with gain control at maximum and magnifier on. Lower line is reference, upper line is the phase-demodulated 3.58-mc information contained in signal. Lack of differential-phase distortion is evidenced by straight line.

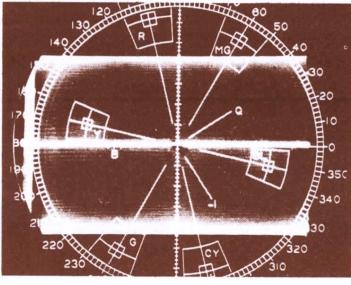


Fig. 5—Vectorscope line-sweep display of Bell Kelly Set signal with asynchronous demodulation has passed through an amplifier. Differential-(burst-controlled oscillator free running). Gain control is set at approximately half of maximum and magnifier is turned off. Lack of differentialamplitude distortion is evidenced by lack of variation in amplitude.

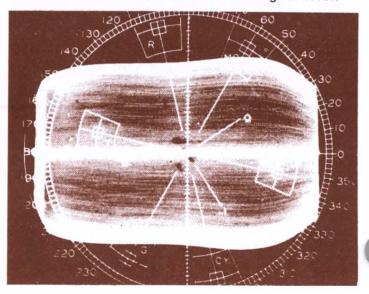


Fig. 6—Same conditions as Fig. 5 except signal amplitude distortion contributed by the amplifier is measured at 30% by using maximum amplitude as reference.

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 slideout mounting that permits it to be tilted vertically, providing easy access to all components.

Mechanical Specifications—Dimensions are 8 3/4" high by 19" wide by 18" rack depth. Net weight is 45¼ pounds. Shipping weight is 74 pounds, approx.

TYPE 526 OSCILLOSCOPE \$1665 Each instrument includes: 3—terminating resistors (011-023), 1— 3 to 2-wire adapter (103-013), 1-3-conductor power cord (161-

010), 1—guide track (351-017), 1—green filter (378-514), 2—instruction manuals (070-121).

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 040-344 \$12.00

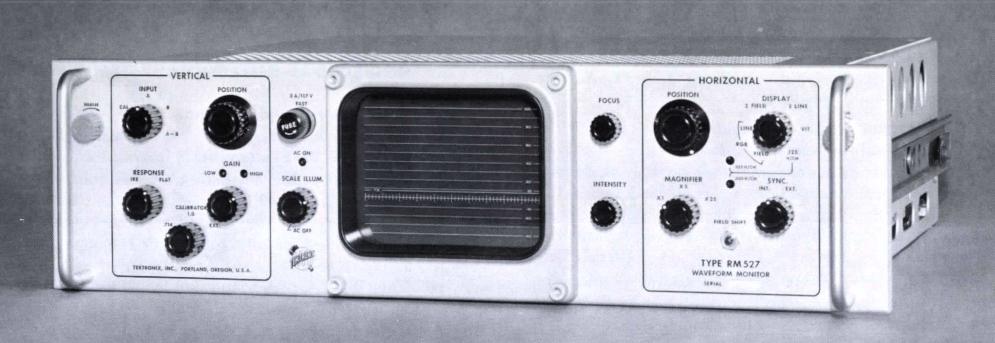
SPECIAL MODEL

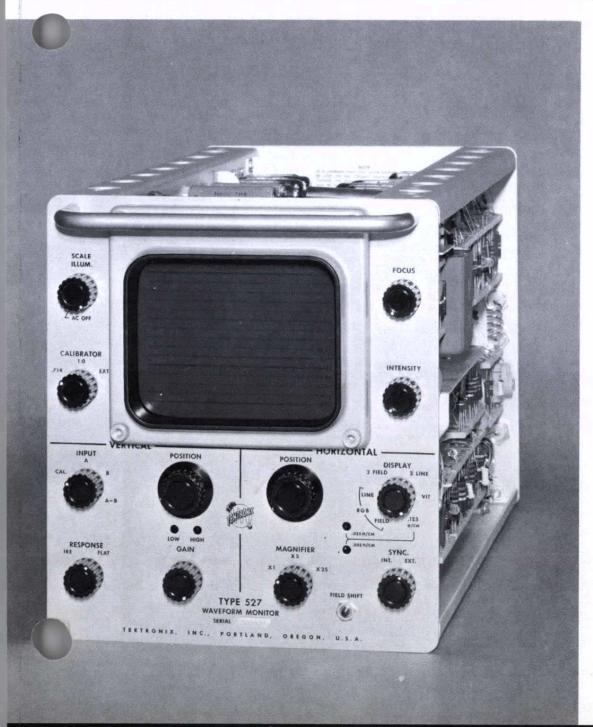
The Type 526 MOD 158B is engineered for the C.C.I.R. color subcarrier frequency of 4.4296875 mc/ sec. The Precision Phase Shift dial reads directly in degrees at the C.C.I.R. frequency. All other specifications are identical to those for the Type 526.

TYPE 526 MOD 158B OSCILLOSCOPE \$1750

Each instrument includes: 3—terminating resistors (011-023), 1— 3 to 2-wire adapter (103-013), 1—3-conductor power cord (161-010), 1—guide track (351-017), 1—green filter (378-514), 2—instruction manuals (070-121).

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





Frequency Response

Flat—within ± 1 % between 60 cycles and 5 mc. IRE—1958 Standard 23S-1

Calibrated Sweeps

Eliminates need for time-markers.

Backporch DC Restoration

Internal Voltage Calibrator

0.714 v or 1.00 v peak-to-peak.

Space-saving Size

The Type 527 is a compact, easy-to-operate, precision, video-waveform monitor, built to meet the exacting demands of the TV-Broadcaster.

It displays and measures linearity, signal level, and bandwidth of both black-and-white and color television-signal waveforms with a high degree of accuracy and dependability.

A unique space-saving feature of the Type 527 is that two Type 527's, or two RM527's, or one Type 527 and one 8" commercial monitor, mount in a rack-space only $10\frac{1}{2}$ " high.

$\frac{527}{\mathsf{RM}\,527}$

VERTICAL-DEFLECTION SYSTEM

Frequency Response—A response selector switch selects one of two characteristics: Flat, $\pm 1\%$, from 60 cycles to 5 megacycles; IRE, 1958 Standard 23S-1 (3.58 mc is at -20 db).

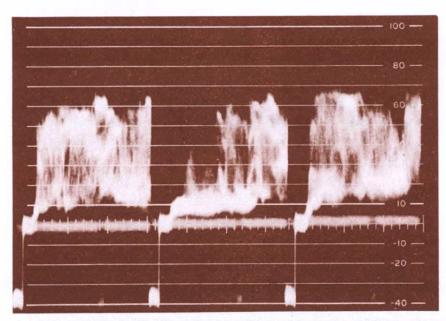
Sensitivity—Variable from 0.25 volt, minimum, to 1.6 volts, maximum, for 140 IRE units (7 centimeters of vertical deflection).

Stability—All dc power supplies are electronically regulated to maintain stability and constant gain.

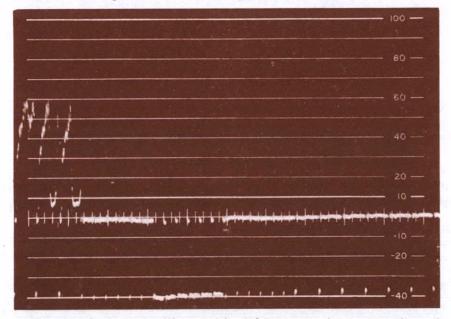
Linearity—Small-signal amplitude linearity of the vertical deflection system is within $\pm 1\%$.

D.C. Restorer—A unique feedback dc-restorer circuit, not a signal clamp, stabilizes the blanking pulse backporch at a constant level on the crt despite changes in signal amplitude or average luminance. The dc-restoration time constant is sufficiently long so hum and tilt in the video signal will be displayed. This circuit eliminates dc drift of the vertical amplifier, making it unusually stable. There is no distortion, clipping, or degradation of the color-burst signal. The presence of the color-burst does not cause the base-line to shift.

Video Input—A four-position switch permits selection of one of four input signals; Calibrator, A, B, or the balanced input A-B.



RGB Line position. One line each of the red, green, and blue camera signals from a color processing amplifier.



2 Field Display position with X25 mag shows details of vertical blanking pulse.

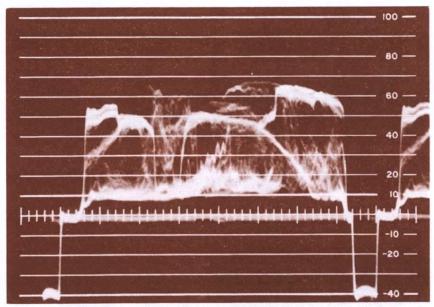
Two bridged $75-\Omega$ compensated signal inputs are provided. Input impedance is never less than 1 megohm. Differential (balanced) input can be used and floating-input operation is possible.

The inputs are designed for high-impedance loop-through operation on 75-ohm lines. In the loop-through mode, the 20-pf input capacitance is inductively compensated for 75-ohm systems. High-impedance bridging mode can be achieved, with an input capacitance of 50 pf.

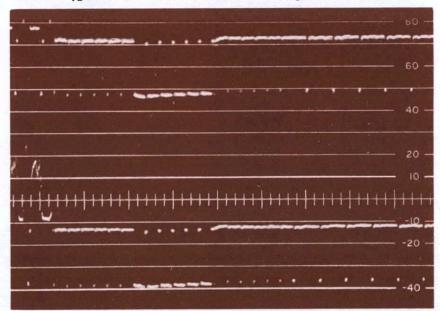
HORIZONTAL-DEFLECTION SYSTEM

Calibrated Sweep—Calibrated sweep speeds of $0.125 \, \text{H/cm}$, $0.025 \, \text{H/cm}$ (with 5-x magnifier), or $0.005 \, \text{H/cm}$ (with 25-x magnifier), provide a simple and accurate means for measuring the various pulse widths. The triggered "Miller run-down" time base is dc coupled to the crt. The magnifier circuit provides X5 or X25 expansion of any portion of the time base with an accuracy of $\pm 5\%$. Any portion of the TV line can be magnified for detailed study. This accurate sweep rate feature eliminates the need for Z-axis timemarks, with a consequent reduction in instrument complexity.

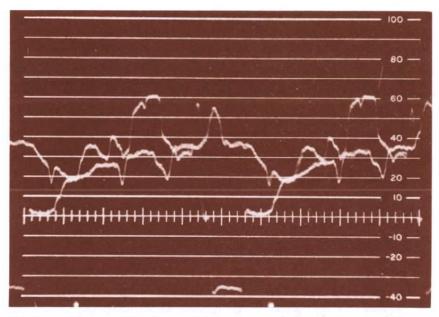
Neon lamps indicate the selected sweep rates when magnifier is used.



2 Line Display position. Display shows approximately 1-2/3 lines at $\frac{1}{2}$ the line rate. Taken at X1 mag.



Displays of the odd field and even field vertical blanking pulse at X25 magnification. Pushbutton Field Shift switches the display to alternate field (double exposure).



V.I.T position of Horizontal Display switch. It is possible to range into the top of the picture and examine any one TV line near the top. Note alternate field line displacement of $\frac{1}{2}$ line (X25 mag.)

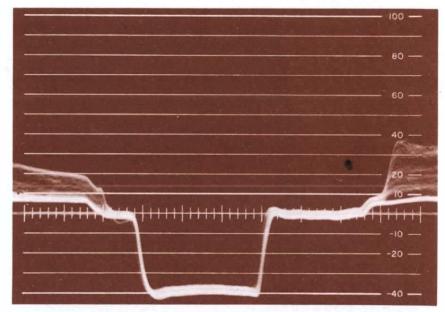
Horizontal Display—A six-position switch permits selection of any one of the following displays:

- 2 LINE—Displays approximately 1 ½ lines at ½ the line rate.
- 2 FIELD—Displays approximately 1 ½ fields at the frame rate. A Field Shift pushbutton allows display of odd or even fields.
- VIT—Displays, at the field rate, the portion of the vertical blanking pulse which may contain vertical-interfield test signals. The field-rate display will show the ½-line transposition of horizontal sync pulses due to interlace.
- .125 H/CM—When the Display Switch is set to .125 H/CM, one TV line occupies exactly 8.0 cm and is thus self-checking.
- RGB LINE and FIELD—The RGB Line or Field positions are used in conjunction with color processing amplifiers which can provide sequential red, green, and blue camera signals to the Type 527 as video input. These signals are switched at the field rate. A 20 cps, 3-step, staircase switching signal of up to 20 volts overall amplitude, from the processing amplifier, is applied to the horizontal amplifier in the Type 527 for displaying RGB signals side-by-side on the crt.

The RGB Field display provides a display at the TV field rate. The RGB Line, a display at the TV line rate. A small portion of the total signal will be missing due to retrace-time considerations.

Sync Separator—The sync separator supplies linerate or field-rate triggers for the sweep generator from composite video signals.

Internal-External Sync—A front-panel switch allows selection of either internal or external sync sources.



5X expansion of .125 H/CM sweep. Frontporch measures 1 cm or .025 H. Sync pulse is 3 cm or .075 H and backporch is 3 cm or .075 H. Simple 1 cm, 3 cm, 3 cm test shows proper sync and blanking pulses and frontporch widths.

OTHER FEATURES

Vertical Amplifier Calibrator—A three-position switch permits choice of a 25-kc square-wave calibration pulse of 0.714 v, or 1.00 v, peak-to-peak, or external calibration input. A temperature-compensated zener diode provides long-term accuracy of $\pm 1\%$ over the normal range of temperatures.

0.714 volt corresponds to 100 IRE units on a 1.00 volt composite video signal. The 1.00 volt level is useful with 1.4 volts composite video signals and 1.00 volt non-composite video signals.

Due to the operation of the dc-restorer circuit, the bottom portion of the internal calibration pulses remain at the same IRE level on the crt as the video blanking pulses.

The vertical position control requires no adjustment in checking calibration.

Cathode-Ray Tube—The Tektronix designed and manufactured rectangular 5" (diagonal measure) monoaccelerator crt provides an exceptionally bright display. Accelerating potential is 4 kv. A P1 phosphor is normally supplied. The useful display area is 7 x 10 cm, the same as round 5" crts, while the rectangular shape permits the space-savings realized in these compact instruments.

Illuminated Graticule—The edge-lighted graticule has 7 x 10 centimeters marked in IRE units between —40 and 100. Each scale division equals 10 IRE units. Illumination is controlled with a front-panel knob.

DC-Coupled Unblanking—The unblanking signal is dc-coupled to the crt, providing uniform trace brightness of even the slowest time base.

Power Supply—All dc power supplies are electronically regulated to provide stable operation throughout the range of 105 v to 125 volts or 210 v to 250 volts, 50 to 60 cycles.

527 RM**527**



Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 206 watts at 117 v.

Mechanical Specifications—Dimensions are $9\frac{\%}{8}$ high by $8\frac{1}{2}$ wide by $20\frac{3}{8}$ deep. Net weight is $31\frac{1}{2}$ pounds. Shipping weight is 41 pounds, approx.

TYPE 527 OSCILLOSCOPE \$925

Each instrument includes: 1—light filter (378-525), 1—3 to 2-wire adapter (103-013), 1—plate spacer (387-684), 2—instruction manuals (070-277).

TYPE RM527

The RM527 is a mechanically rearranged Type 527 for mounting in a standard 19" rack. Electrical characteristics are the same as described for the Type 527.

Mounting—The RM527 is furnished with slide-out tracks. It can be pulled forward and tilted 90° for servicing convenience.

Mechanical Specifications—Dimensions are $5\frac{1}{4}$ " high by $18\frac{1}{4}$ " deep and fits a standard 19" rack. Net weight is 34 pounds. Shipping weight is 62 pounds, approx.

TYPE RM527 OSCILLOSCOPE \$1000

Each instrument includes: 1—light filter (378-525), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-296).

SPECIAL MODEL TYPE 527/RM527

This special model of the waveform monitor has all capabilities of the Type 527 or RM527 plus two additional features—a Line Selector and a Video-Distribution Amplifier.

The Line Selector permits detailed analyses of single television lines (particularly useful with $4\frac{1}{2}$ inch cameras), and the Video-Distribution Amplifier permits slaving a picture monitor to the oscilloscope display.

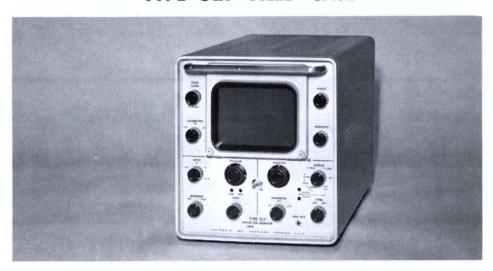
Consult your Field Engineer to learn about the advantages, limitations, and delivery time of this modified instrument.

MOUNTING CRADLES

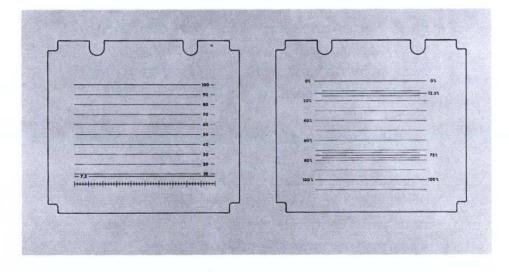
Two different cradle assemblies for the Type 527, available at extra cost, enable either right or left side mounting of the instrument with a commercial 8" picture monitor in a standard 19" rack. This combination requires only $10\frac{1}{2}$ " of rack height. Or two 527's can be mounted side-by-side in the same space. A front mask fits each combination.

Description	Part Number	Price
Cradle Assembly, left-side mounting oscilloscope	426-133	\$57.50
Cradle Assembly, right-side `mounting oscilloscope	426-134	\$57.50
Cradle Assembly, side-by-side mounting oscilloscope	426-135	\$57.50

TYPE 527 FIELD CASE



TYPE 527 ACCESSORIES



Description	Part Number	Price
Graticule, non-composite IRE	331-079	\$3.45
Graticule, % video modulation	331-080	\$3.45

TYPE RM527 ACCESSORIES

Description	Part Number	Price
Graticule, non-composite IRE	331-077	\$3.45
Graticule, % video modulation	331-078	\$3.45

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



DC-to-15MC OSCILLOSCOPES Type with SWEEP DELAY

$\frac{RM31A}{RM35A} \frac{531A}{535A}$



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

HIGH INTENSITY TRACE

16 VERTICAL PLUG-IN UNITS

DELAYED SWEEP

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of the new Type 1A1 and 1A2 and all of the Letter-Series Plug-In Units.

HORIZONTAL

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

SWEEP MAGNIFIER—5X, extends sweep range to 0.02 μ sec/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 μ sec 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 13.5Mc, 26-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.

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, 35nsec 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 μ v/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 rise-time at 50 mv/cm to 50 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 11 Mc, 31-nsec rise-time 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 μ sec risetime at 10 μ strain/div to 10,000 μ strain/div.

For Transistor-Risetime Checking—

TYPE R UNIT-23-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

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

The Tektronix Type 531A and Type 535A are DC-to-15 Mc Oscilloscopes with easy-to-operate functionally-grouped controls, selective triggering facilities, and a high degree of versatility through the use of the new Type 1A1 and 1A2 and Type A to Z Plug-In Units. Bright displays at low repetition rates, 6-cm linear vertical deflection, and wide sweep range make the Type 531A and Type 535A efficient all-purpose instruments. The Type 535A has all the features of the Type 531A plus a second time-base generator for many specialized applications.

APPLICATIONS

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

- Make accurate incremental measurements along a complex waveform.
- 2. Make accurate phase-angle measurements between two signals, up to frequencies of 1 mc.
- 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.
- 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.
- 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 μ sec/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 μ sec/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 μ sec/cm to 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%.

RM31A 531A RM35A 535A

TIME BASE B Calibrated Sweeps—Eighteen direct-reading calibrated steps are provided: 2, 5, 10, 20, 50 μ sec/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 cycles 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 $0.02~\mu sec/cm$. 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 μ sec 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 DE-LAY-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 μ sec 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).

RM31A 531A FM35A 535A

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-intime 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 readings 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-saw-tooth 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 cathoderay-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.

Regulated Power Supply—Electronic regulation compensates for line-voltage variations between 105 and 125 v or 210 and 250 v, and for current-demand differences among the plug-in units.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps; 455 watts maximum for Type 531A, 550 watts maximum for Type 535A.

Cabinet Models—Type 531A and 535A dimensions are 16%" high by 13%" wide by 23%" deep. Type 531A net weight is 57% 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 22 ¾" 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 78 ¼ pounds; shipping weight is 105 pounds, approx.

TYPE RM31A, without plug-in units \$1095

Each instrument inculdes: 2—P6006 probes (010-127), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapters (103-033), 1—test lead (012-031), 1—light filter (378-514), 1—set mounting hardware, 2—instruction manuals (070-301).

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.

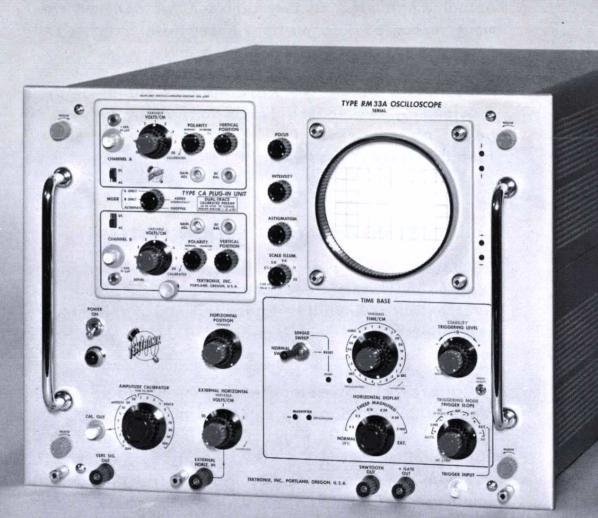
U.S. Sales Prices f.o.b. Beaverton, Oregon Please refer to Terms and Shipment, General Information page.



DC-to-15MC OSCILLOSCOPE Type

with 100X MAGNIFIER







HIGH-INTENSITY TRACE

WIDE RANGE SWEEP MAGNIFICATION

15 VERTICAL PLUG-IN UNITS

CHARACTERISTIC SUMMARY VERTICAL

Vertical deflection characteristics extremely flexible through use of the new Type 1A1 and 1A2 Units and all Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED SWEEP RANGE—0.1 μ sec/cm to 5 sec/cm. SWEEP MAGNIFIER—X2 to X100, extends sweep range, accurately, to 0.02 μ sec/cm.

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

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, 26-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, 35nsec 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 μ v/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 rise-time at 50 mv/cm to 50 v/cm.

For High DC Sensitivity-

TYPE H WIDE-BAND UNIT—DC to 11 Mc, 31-nsec rise-time 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 μ sec risetime at 10 μ strain/div to 10,000 μ strain/div.

For Transistor-Risetime Checking-

TYPE R UNIT—23-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

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

The Type 533A is a dc-to-15 mc oscilloscope with wide range of application coverage through Tektronix Type A to Z 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 functionallygrouped 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 $0.02~\mu sec/cm$ 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 μ sec/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 μ sec/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 $0.02~\mu sec/cm$, 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 decoupled 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 240 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.

Regulated Power Supply—Electronic regulation compensates for line-voltage variations between 105 and 125 v, or 210 and 250 v, and for current-demand differences among the plug-in preamplifiers.

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

Cabinet Model—Type 533A dimensions are 16%" high by 13%" wide by 23%" deep. Net weight is 62% 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 22 ¾" 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 RM33A, without plug-in units \$1225

Each instrument includes: 2—P6006 probes (012-127), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapters, (103-033), 1—test lead (012-031), 1—light filter (378-514), 1—set mounting hardware, 2—instruction manuals (070-303).

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

Type 5 3 DC-to-10MC X-Y OSCILLOSCOPE



ACCURATE PHASE BALANCE
WIDE BAND "X-Y" DISPLAY
14 AMPLIFIER PLUG-IN UNITS
TIME-BASE PLUG-IN AVAILABLE

CHARACTERISTIC SUMMARY VERTICAL AND HORIZONTAL

Both vertical and horizontal deflection characteristics extremely flexible through use of the new Type 1A1 and 1A2 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- \% x 3- \% 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.

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 μ sec at 5 mv/div to 0.05 v/div.

Type C-A-DC to 10 mc, 35 nsec.

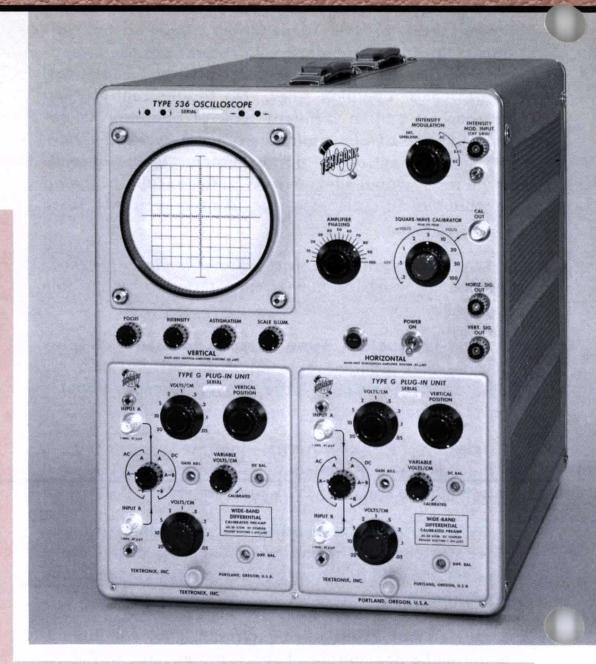
Type D—DC to 300 kc at 1 mv/div, increasing to 2 mc at 50 mv/div, 0.18 μ sec.

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/div3 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 high waveform resolution and precise amplitude measurements via the slide-back technique—Type Z

ADDITIONAL PLUG-IN UNITS

Type T—For conventional oscilloscope operation, the Type T Time-Base Generator must be plugged into the horizontal system. Specifications of the Type 536 horizontal-deflection sysem with the Type T Unit are:

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

5-x Sweep Magnifier—Increases calibrated sweep rate to $0.04 \mu sec/div$.

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.

Type R—for transistor-risetime checking in conventional oscilloscope operation—35-nsec risetime.

The Type 536 is an unusually practical instrument, combining a wide-band "X-Y" oscilloscope with an excellent general-purpose laboratory oscilloscope. Two carefully-designed main amplifiers and a Tektronix cathode-ray tube with equal X and Y deflection characteristics are the basic components.

With two of the same wide-band preamplifiers plugged in, the horizontal and vertical deflection systems are almost identical. Relative phase shift is less than one degree to 15 mc, and, by means of a front-panel control, phase balance can be obtained at any frequency to over 25 mc.

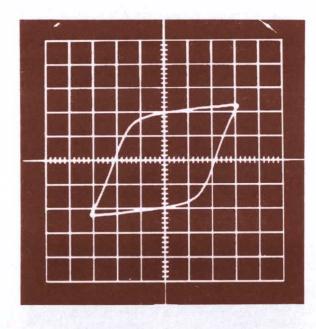
With the Time-Base Plug-In Unit, Type T, plugged into the horizontal amplifier, and one of the Type 1A1, 1A2, or Letter-Series wide-band units plugged into the vertical amplifier, the Type 536 functions as a general-purpose oscilloscope.

APPLICATIONS

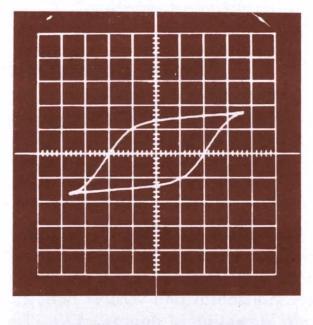
In curve-tracing applications the Type 536 extends the range of familiar techniques to today's higher-frequency problems. Differential input, a feature that eliminates the need for a common XY terminal, is available in the wideband Type G Plug-In Preamplifier. A pair of Type G Units provide accuracy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

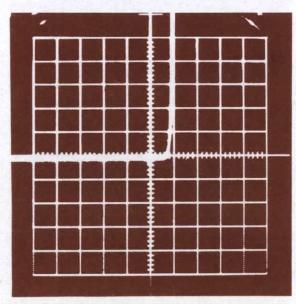
Some applications for a wide-band "X-Y" oscilloscope:

- 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.
- 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.
- Performance tests of demodulators for above modulation systems.
- 11. Determining gating circuit characteristics.
- 12. Function generator y = f(x).

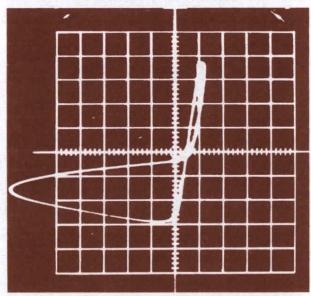


Ferrite bead characteristics at two different temperatures—left, at 25°C; right, at equilibrium temperature due to self heating. Type 536 with two Type G Units, driving frequency 1 mc.





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;



VERTICAL AND HORIZONTAL DEFLECTION SYSTEMS

All characteristics of the horizontal deflection system are the same as those of the vertical deflection system when the same type of Plug-In Unit is plugged into both systems. Both main amplifiers have excellent transient response with risetimes of 31 nsec with Type K Units plugged in. One of the Letter-Series Units can be plugged into the vertical or the horizontal deflection system. Provided the amplifiers are not overdriven by the input signals, relative phase shift with Type K Plug-In Preamplifiers is less than 1 degree from dc to 15 mc. Phase-shift balance can be obtained at any frequency to 30 mc with a front-panel amplifier phasing control.

Type 536 characteristics with Type G Units are:

Passbands—dc to 10 mc.

Risetimes—35 nsec.

Deflection factors—0.05 v/div maximum, 9 calibrated steps from 0.05 v/div to 20 v/div; continuously-variable adjustment between steps.

Relative phase shift—less than one degree to 15 mc, less than two degrees to 17 mc, less than five degrees to 23 mc—provided amplifiers are not overdriven by the input signals.

Amplifier phasing control—phase balance can be obtained at any frequency to over 25 mc provided amplifiers are not overdriven by the input signals.

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 (3 ½ " x 3 ½ ") 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 accoupling 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 (3 ½ by 3 ½ 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 7 pf, maximum deflection factor is 0.5 v/cm. Excellent transient response is retained, as the probes introduce no overshoot or ringing.

Regulated Power Supply—Electronic regulation compensates for line-voltage variations and for current-demand differences among the plug-in units.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 625 watts with two Type K Units.

Mechanical Specifications—Dimensions are 16% "high by 13% "wide by 23% "deep. Net weight is 55% pounds. Shipping weight is 76 pounds, approx. TYPE 536, without plug-in units \$1085

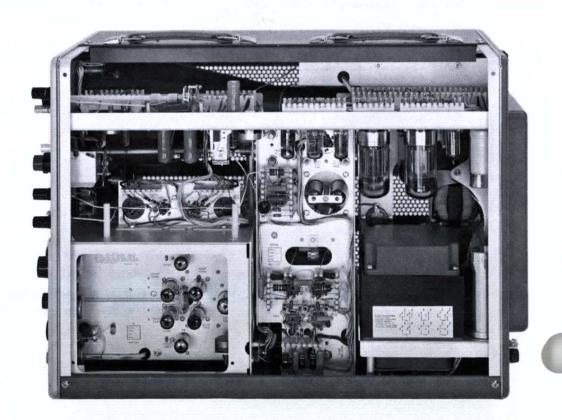
Each instrument includes: 2—P6006 probes (010-127), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapters (103-033), 1—phase-measuring graticule (331-057), 1—test lead (012-031), 1—light filter (378-514), 2—instruction manuals (070-270).

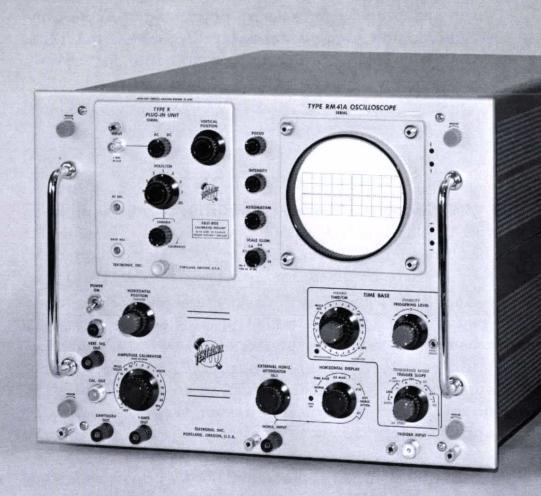
Rack Mount Adapter

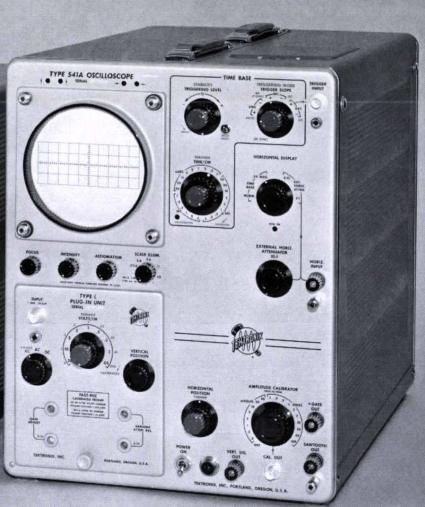
A cradle mount to adapt the Type 536 Oscilloscope for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Tektronix blue vinyl finish. Rack height requirements $17 \frac{1}{2}$ ".

Order Part Number 040-281 \$45

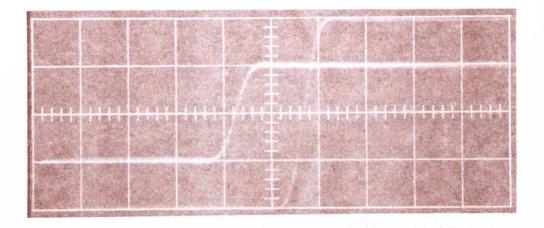
U.S. Sales Prices f.o.b. Beaverton, Oregon Please refer to Terms and Shipment, General Information page.







HIGH-INTENSITY TRACE 16 VERTICAL PLUG-IN UNITS 33-MC PASSBAND



Two single shot waveforms show 12-nsec risetime capability of Type 541A with a Type L Plug-In Preamplifier at $0.05\,\mathrm{v/cm}$ sensitivity. Sweep rate for both waveforms is 20 nsec. CRT is a standard T543P2. Recorded with a Tektronix C-27 Camera equipped with an f/1.9-1:0.7 lens set at f/1.9. Film is Polaroid Type 410, ASA 10,000 speed, prefogged and developed 10 seconds. Speed of CRT beam between 10% and 90% amplitude points of 4 cm high waveform is 267 cm/ μ sec. Speed of CRT beam between 10% and 90% amplitude points of 2 cm high waveform is 133 cm/ μ sec.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of all Letter-Series Plug-In Units and the new '1' Series Dual-Trace 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: 2-mm deflection.
External: 0.2 to 10 v.

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

CRT

DISPLAY AREA—4 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, 520 watts maximum.

541A RM41A

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 DC 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 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 μ v/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 rise-time 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, 30nsec 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 μ sec risetime at 10 μ strain/div to 10,000 μ strain/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 Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27-nsec risetime at 50 mv/cm to 25 v/cm.

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 efficient and valuable instruments.

VERTICAL DEFLECTION SYSTEM

DC-Coupled Output Amplifier—The wide-band fast-rise dc-coupled output amplifier has a risetime of 10.5 nsec with a Type 1A1 or 1A2 Unit plugged in. It is factory adjusted for optimum transient response.

The Type K Fast-Rise Plug-In Preamplifier, developed for Type 541A and Type RM41A Oscilloscopes, provides a maximum sensitivity of 0.05 v/cm, with 12-nanosecond risetime, dc-to-30 mc passband, and 20 pf input capacitance. (Frequency response is down 3 db $\pm \frac{1}{2}$ db at 30 mc, 6 db at approximately 41 mc, 12 db at approximately 55 mc.)

Balanced Delay Network — A signal delay of 0.2 μ sec 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

The sweep generator used in the Type 541A and Type RM41A is the Miller-runup type. Inverse feedback in the timing circuitry assures excellent linearity. Characteristics of this circuitry provide a sweep range of $0.02~\mu sec/cm$ 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 μ sec/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 μ sec/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—5-x magnifier increases the calibrated sweep time to 0.02 $\mu sec/cm$. 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 by rotating the HORIZONTAL POSITION control. Accurate 5-x magnification is obtained on all ranges.

Triggering Facilities—Versatile triggering circuitry provides for complete manual control, preset stability, H.F SYNC and AC LF REJECT (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 cps and 2 mc, 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—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 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.

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 over the wide sweep range of the Type 541A and Type RM41A, 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—An edge-lighted graticule is marked in centimeter squares with two-millimeter centerline divisions for convenience in making time and amplitude measurements. Viewing area is 4 by 10 cm.

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 through a rear-panel switch.

Output Waveforms—A 20-v positive gate of the same duration as the sweep and a 150-v sweep-saw-tooth 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.

Probes—Two low-capacitance probes (10-x atten.) are supplied with the instrument. Input capacitance of the Type 541A-Type K or Type RM41A-Type K combination with probes is 7 pf, maximum sensitivity is 0.5 v/cm. Excellent transient response is retained, as the probes introduce no overshoot or ringing, but frebination with probes 7 pf, maximum sensitivity is 0.5 v/cm. Excellent transient response is retained, as the probes introduce no overshoot or ringing, but fre-

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

Regulated Power Supply—Electronic regulation compensates for line-voltage variations between 105 and 125 v or 210 and 250 v, and for current-demand differences among the plug-in units.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps; 520 watts maximum for Type 541A.

Cabinet Model—Type 541A dimensions are 16%" high by 13%" wide by 23%" deep. Net weight is 59 pounds; shipping weight is 79 pounds, approx.

Rack-Mount Model—Type RM41A 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 22 3/4" deep. For further mounting information, refer to the Catalog instrument dimension page. Type RM41A net weight is 75 1/2 pounds; shipping weight is 100 pounds, approx.

3 to 2-wire adapter (103-013), 2—instruction manuals (070-154).

TYPE RM41A, without plug-in units \$1325

Each instrument includes: 2—P6006 probes (010-127), 1—red test lead (012-031), 2—BNC to binding-post adapters (103-033), 1—light filter (378-514), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 2—instruction manuals (070-308).

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

DC-to-33MC OSCILLOSCOPE with 100X MAGNIFIER





UNIFORM-FOCUS 6 x 10-CM DISPLAY

ILLUMINATED NO-PARALLAX GRATICULE

SIMPLIFIED VERTICAL AMPLIFIER

PUSH-PULL DELAY CABLE (NO ADJUSTMENTS)

FULL-PASSBAND TRIGGERING

PLUS:

FULL COMPATIBILITY WITH ALL A-TO-Z PLUG-IN UNITS

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 or Letter-Series Plug-In Units.

CHARACTERISTIC SUMMARY VERTICAL

Vertical deflection characteristics extremely flexible through use of all 1-Series or Letter-Series 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 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 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 μ v/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 Precise Amplitude Measurement via the Slide-Back Technique—

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27 nsec risetime at 50 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 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.

VERTICAL-DEFLECTION SYSTEM

FREQUENCY RESPONSE with A-to-Z Plug-in Units extends from dc to 30 Mc, depending on the unit used. Specialized A-to-Z Plug-In Units adapt the Type 543B 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 new 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 μ sec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence, accuracy within $\pm 3\%$. 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 $\pm 5\%$ 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 55 pf.

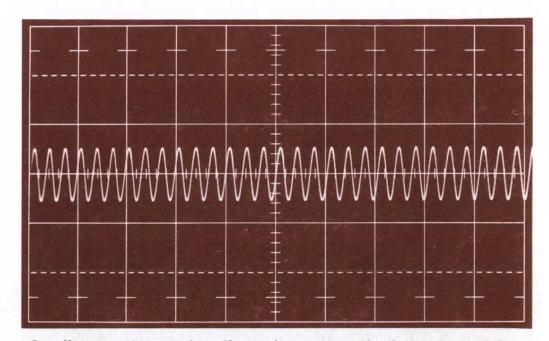
FRONT PANEL OUTPUTS include a +Gate (0 to at least +20 volts), and a sawtooth (typically 0 to at least +130 volts), from the time base.

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- μ a beam current (2- μ a 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.

INTERNAL 6 x 10-CM GRATICULE with variable edgelighting 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.

543B RM543B

FRONT-PANEL CONTROLS include trace rotation (a screw-driver 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 less than 20 volts, peak-to-peak for visible modulation.

TRIGGER

	TRIGGER MODE	TRIGGER REQUIREMENTS					
	AC	2-mm deflection from 150 cps to 10 Mc, increasing to 1 mc at 30 Mc. Will trigger below 150 cps with increased deflection.					
INTERNAL	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 to 10 Mc with increased deflection. Will trigger to 50 cps with increased deflection.					
	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.					
EXTERNAL	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 to 10 Mc with increased deflection. Will trigger to 50 cps with increased signal.					

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

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable, low-drift operation. The instrument is normally wired to operate from 103.5 to 126.5 volts (115 v \pm 10%). A multi-tap transformer permits operation at center line voltage of 108, 115, 122, 216, or 244 volts (\pm 10% on each range). Power consumption is typically 535 watts with maximum load at high line. The standard model operates from a 50 to 60-cycle line. An optional ac-to-ac solid-state converter for the fan motor is available for 50 to 50 and 400-cycle operation. It can be ordered installed in the instrument as MOD 101G.

ENVIRONMENTAL CAPABILITIES permit operation at up to 15,000 feet, and at temperatures from 0°C to +50°C.

AMPLITUDE CALIBRATOR provides 18 square-wave voltages from 0.2 mv to 100 volts in a 1-2-5 sequence, accuracy within $\pm 3\%$. Square-wave frequency is approximately 1 kc. A special output, useful in calibrating sampling plug-ins, provides 0.1 v $\pm 3\%$ into 50 Ω .

DIMENSIONS are $16\frac{7}{8}$ " high by $13\frac{1}{8}$ " wide by $23\frac{7}{8}$ " deep. Net weight is approximately 64 pounds, without plugin units.

TYPE 543B OSCILLOSCOPE, without plug-in units .. \$1300 Each instrument includes: 2—P6006 Probes (BNC) (010-127), 2—BNC to binding-post adapters (103-033), 1—test lead (012-031), 1—power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—crt protector plate (387-918), 1—BNC to BNC 18" 50 Ω cable (012-076), 1—BNC to UHF adapter (103-015), 2—instruction manuals (070-429).

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 Probes (BNC) (012-127), 2—BNC to binding-post adapters (103-033), 1—test lead (012-031), 1—crt protector plate (387-918), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 1—BNC to BNC 18'' 50- Ω cable (012-076), 1—BNC to UHF adapter (103-015), 2—instruction manuals (070-437).

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



DC-to-50MC OSCILLOSCOPE Type with 100X MAGNIFIER



UNIFORM-FOCUS 6 x 10-CM DISPLAY

ILLUMINATED NO-PARALLAX GRATICULE

SIMPLIFIED VERTICAL AMPLIFIER

WIDE-RANGE SWEEP MAGNIFIER

FULL-PASSBAND TRIGGERING

16 VERTICAL PLUG-IN UNITS

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 and '1' Series 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.

544 RM544

VERTICAL PLUG-IN UNITS

Frequency specifications are at 3-db down

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 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 μ v/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 rise-time at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μ sec risetime at 10 μ strain/div. to 10,000 μ strain/div.

For Transistor-Risetime Checking—

TYPE R UNIT-12-nsec risetime.

For Diode Recovery-Time Measurements-

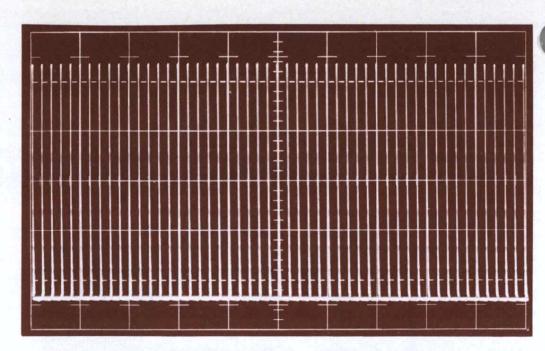
TYPE S UNIT—12-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27 nsec risetime at 50 mv/cm to 25 v/cm.

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 μ sec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence, accuracy within $\pm 2\%$. Sweep rates are also continuously variable uncalibrated between steps and to approximately 12 nsec/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 $\pm 5\%$ 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

Plug-In Unit. 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 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 $2 \,\mu a$ beam current ($2 \,\mu a$ 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 6×10 -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.

INTERNAL 6 x 10-CM GRATICULE with variable edgelighting 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 screw-driver 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 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, pk-to-pk for visable modulation.

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 μ sec from 0.2 mv to 5 v, and 1.0 μ sec 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.

ENVIRONMENTAL CAPABILITIES (OPERATING):

TEMPERATURE—0°C to +50°C ambient.

ALTITUDE-15,000 feet.

SHOCK—30 G's, one-half sine, 11-msec duration, 1 shock for each face, total of 6 shocks.

VIBRATION—0.015 inch pk-to-pk, 10 to 55 to 10 cps in 1-minute sweeps (2 G's) for 15 minutes on each axis.

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable, low-drift operation. The instrument is normally wired to operate from 103.5 to 126.5 volts (115 v \pm 10%). A multi-tap transformer permits operation at center line voltages of 108, 115, 122, 216, 230, or 244 volts (\pm 10% on each range). Power consumption is approximately 400 watts. The standard model operates from a 50 to 60-cycle line. An optional ac-to-ac solid-state converter for the fan motor is available for 50 to 60 and 400-cycle operation. It can be ordered installed in the instrument as MOD 101G.

CABINET MODEL DIMENSIONS are $16\frac{7}{8}$ " high by $13\frac{1}{8}$ " wide by $23\frac{7}{8}$ " deep. Net weight is $59\frac{3}{4}$ pounds. Shipping weight is approximately 80 pounds.

RACK-MOUNT MODEL DIMENSIONS are 14" high by 19" wide by 22³/₄" 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 probes (010-129), 1—crt protector plate (387-918), 1—gray light filter, installed (378-546), 2—BNC-to-binding post adapters (103-033), 2—test leads (012-031), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-418).

TYPE RM544 OSCILLOSCOPE, without plug-in units .. \$1650 Each instrument includes: 2—P6008 probes (010-129), 1—crt protector plate (387-918), 1—gray light filter, installed (378-546), 2—BNC-to-binding post adapters (103-033), 2—test leads (012-031), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 2—instruction manuals (070-422).

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

DC-to-33MC OSCILLOSCOPE





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

FULL COMPATIBILITY WITH ALL A-TO-Z PLUG-IN UNITS

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 or Letter-Series Plug-In Units. The instrument features two time base generators. The two time base generators 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 or Letter-Series 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,) 600 watts maximum.



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 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 μ v/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 Precise Amplitude Measurement via the Slide-Back Technique—

TYPE Z DIFFERENTIAL COMPARATOR UNIT— DC to 13 Mc, 27 nsec risetime at 50 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 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 μ sec risetime at 10 μ strain/div. to 10,000 μ strain/div.

For Transistor-Risetime Checking-

TYPE R UNIT-12-nsec risetime.

For Diode Recovery-Time Measurements— TYPE S UNIT—12-nsec risetime.

VERTICAL-DEFLECTION SYSTEM

FREQUENCY RESPONSE with A-to-Z Plug-in Units extends from dc to 30 Mc, depending on the unit used. Specialized A-to-Z Plug-In Units adapt the Type 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 new 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 μ sec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence, accuracy within $\pm 3\%$. 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 $2\,\mu \text{sec/cm}$ to $1\,\text{sec/cm}$ is in 18 calibrated steps with 1-2-5 sequence, accuracy within $\pm 3\%$. 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 μ sec/cm. Sweep accuracy is not decreased when using the magnifier; it remains within $\pm 3\%$.

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 55 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).

545B RM545B

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 μ sec 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 μ sec/cm and Time Base B is operating at 50 μ sec/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.

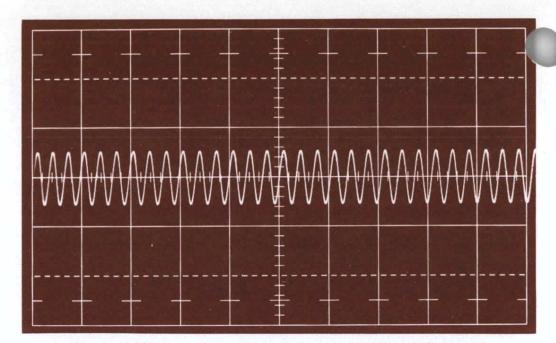
CRT AND DISPLAY FEATURES

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- μ a beam current (2- μ a 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.

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 screw-driver adjustment), intensity, focus, and astigmatism.



Small spot size and uniform focus provide fine trace definition across the entire 6 x 10-cm viewing area. The illuminated internal graticule eliminates parallax and increases read-out accuracy. Risetime and falltime measurements (10 to 90%) are easily made using the dashed graticule lines. A 30-Mc sine wave (internally triggered) is displayed.

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 less than 20 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 or 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.

	TRIGGER REQUIREMENTS									
	TRIGGER MODE	TIME BASE A	TIME BASE B							
	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.							
INTERNAL	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 to 10 Mc with increased deflection. Will trigger to 50 cps with increased deflection.	2-mm deflection from 300 cps to 5 Mc. Will trigger to 50 cps with increased deflection.							
	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.							
EXTERNAL	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 to 10 Mc with increased de- flection. Will trigger to 50 cps with in- creased signal.	0.5 v at 300 cps to 5 Mc. Will trigger to 50 cps with increased signal.							

OTHER CHARACTERISTICS

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable, low-drift operation. The instrument is normally wired to operate from 103.5 to 126.5 volts (115 v \pm 10%). A multi-tap transformer permits operation at center line voltages of 108, 115, 122, 216, 230, or 244 volts (\pm 10% on each range). Power consumption is typically 535 watts with maximum load at high line. The standard model operates from a 50 to 60-cycle line. An optional ac-to-ac solid-state converter for the fan motor is available for 50 to 60 and 400-cycle operation. It can be ordered installed in the instrument as MOD 101G.

ENVIRONMENTAL CAPABILITIES permit operation at up to 15,000 feet, and at temperatures from 0° C to $+50^{\circ}$ C.

AMPLITUDE CALIBRATOR provides 18 square-wave voltages from 0.2 mv to 100 volts in a 1-2-5 sequence, accuracy within $\pm 3\%$. Square-wave frequency is approximately 1 kc. A special output, useful in calibrating sampling plug-ins, provides 0.1 v $\pm 3\%$ into 50 Ω .

DIMENSIONS are $16\frac{7}{8}$ " high by $13\frac{1}{8}$ " wide by $23\frac{7}{8}$ " deep. Net weight is approximately 64 pounds, without plugin units.

TYPE 545B OSCILLOSCOPE, without plug-in units .. \$1550 Each instrument includes: 2—P6006 Probes (BNC) (010-127), 2—BNC to binding-post adapter (103-033), 1—test lead (012-031), 1—crt protector plate (387-918), 1—BNC to BNC 18" 50 Ω cable (012-076), 1—BNC to UHF adapter (103-015), 2—instruction manuals (070-428).

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 22 3/4" deep. Net weight is 85 pounds, without plug-in units.

TYPE RM545B OSCILLOSCOPE, less plug-in units \$1650 Each instrument includes: 2—P6006 Probes (BNC) (012-127), 2—BNC to binding-post adapters (103-033), 1—test lead (012-031), 1—crt protector plate (387-918), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 1—BNC to BNC 18" 50-Ω cable (012-076), 1—BNC to UHF adapter (103-015), 2—instruction manuals (070-438).

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

DC-to-50MC OSCILLOSCOPE with SWEEP DELAY





UNIFORM-FOCUS 6 x 10-CM DISPLAY

ILLUMINATED NO-PARALLAX GRATICULE

SIMPLIFIED VERTICAL AMPLIFIER

FULL-PASSBAND TRIGGERING

CALIBRATED SWEEP DELAY

16 VERTICAL PLUG-IN UNITS

AUTOMATIC DISPLAY SWITCHING (Type 547)

The Type 546 and 547 are essentially the same. Automatic Display Switching, featured in the Type 547, provides equivalent dual-beam performance without the additional cost and complexity of a dual-beam oscilloscope.

CHARACTERISTIC SUMMARY VERTICAL

Plug-In Preamplifiers adapt the Type 546 and 547 to a wide range of measurement capabilities. The oscilloscope vertical system accepts all Tektronix Letter-Series and '1' Series Plug-In Units.

HORIZONTAL

CALIBRATED SWEEP RANGE—Time Base A and B: 0.1 μ sec/cm to 5 sec/cm.

SWEEP MAGNIFIER—X2, X5, X10 (extends calibrated sweep rate to 10 nsec/cm).

CALIBRATED SWEEP DELAY—0.1 μ sec to 50 sec, continuously variable.

TRIGGER REQUIREMENTS—Internal: 2-mm deflection. External: 0.2 v, ac or dc.

EXTERNAL INPUT—0.1 v/cm to 1 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 510 watts.

VERTICAL PLUG-IN UNITS

Frequency specifications are at 3-db down

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 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 μ v/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 μ sec risetime at 10 μ strain/div. to 10,000 μ strain/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 Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27-nsec risetime at 50 mv/cm to 25 v/cm.

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 546 and 547 to strain-gage operational amplifier, multi-channel, and other applications.

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

Two separate and identical wide-range time bases are featured in the Type 546 and 547. Either time base can be used alone, or Time Base B can be used to accurately delay the start of Time Base A. In the type 547, Automatic Display Switching between the time bases allows an alternate presentation of the same signal at different sweep rates, or 2 different signals at the same or different sweep rates (with dual-trace plug-ins).

TIME BASE A and B SWEEP RANGE from 0.1 μ sec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence. Time Base A is accurate within $\pm 2\%$. Time Base B (the main time base) is accurate within $\pm 1\%$. Sweep rates are also continuously variable, uncalibrated from 0.1 μ sec/cm to approximately 12 sec/cm. Front-panel lamps indicate uncalibrated sweep rates.

2, 5 or 10X SWEEP MAGNIFICATION expands the center portion of the normal display to fill 10 cm. Accuracy is within $\pm 5\%$. The 10X magnifier can be used to extend the calibrated sweep rate to 10 nsec/cm.

SINGLE-SWEEP OPERATION facilitates photographic recording of waveforms displayed on either or both time bases. 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. Time Base A and B are both reset by the same switch. Front-panel lamps just above the Horizontal Display switch indicate which time base is ready to fire. The lamp 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 at least 0.1 v/cm or 1 v/cm with 10X 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 +20-v gates from both time bases, 100-v sawtooth from Time Base A, and a 10-v delayed trigger pulse (all voltages are approximate).

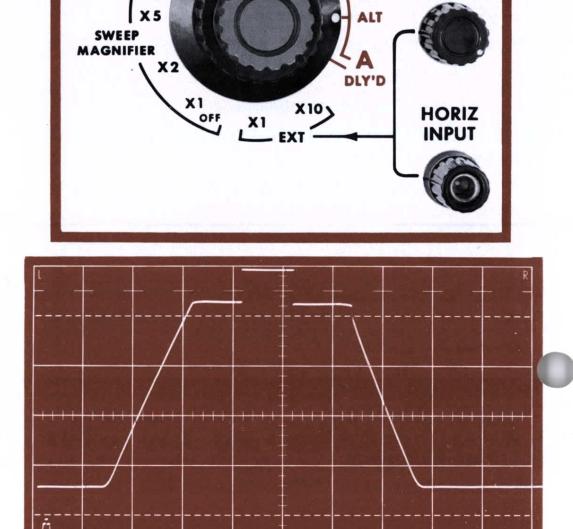
546 RM546 547 RM547

AUTOMATIC DISPLAY SWITCHING

Type **547**

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 viewed with the accuracy of the finest single-beam construction. 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 positioning to allow full control of dual displays.



HORIZONTAL DISPLAY

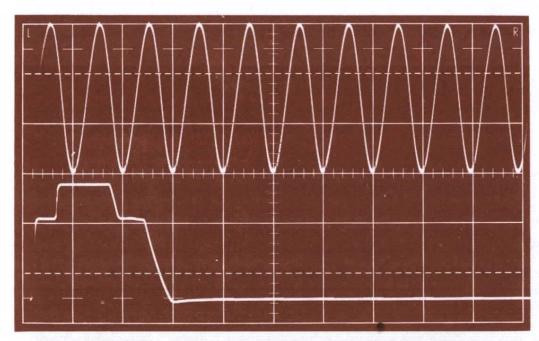
READY

B INTENS

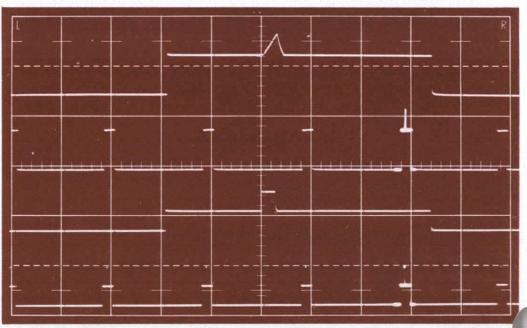
VAR 10-1

MAG ON

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.

TRIGGER

Triggering is separate and identical for both time bases. Wide-range trigger circuits allow triggering to beyond 50 Mc. The Trigger signal for each time base trigger circuit is selected and processed by a series of four lever switches. The control logic of these switches has been human-engineered for operator ease.

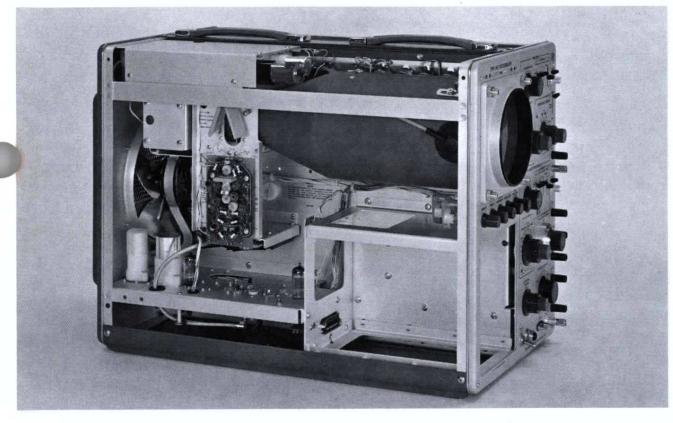
TRIGGER SOURCE can be internal, external, or line. The internal source can be selected from the oscilloscope vertical amplifier, or direct from Channel 1 of the Type 1A1 Dual-Trace Plug-In Unit. With a Type 1A1 operating in one of its channel-switching modes, the internal trigger signal can be selected 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 in "Alternate" switching mode, triggering internally from Channels 1 and 2 composite signal allows observation of 2 signals which are not harmonically related.

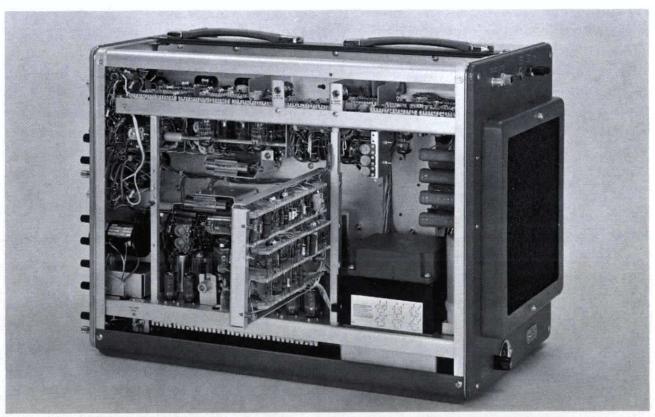
TRIGGER COUPLING can be direct or ac-coupled. AC Low-Frequency Reject (approximately 3-db down at 1.5 kc) prevents low-frequency components such as 60-cps hum from interfering with stable operation.

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.





546 RM546 547 RM547

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. Lockout-reset circuitry permits single-shot use of the calibrated delay features.

CALIBRATED DELAY RANGE is continuously variable from 0.1 μ sec to 50 sec. Accuracy from 50 μ sec to 50 sec is within $\pm 1\%$ of indicated delay ± 2 minor dial divisions on the Delay-Time Multiplier control. For delays less than 50 μ sec, accuracy is within $\pm 1\%$ ± 2 minor dial divisions plus 75 to 100 nsec (typical fixed-circuit delay). Incremental accuracy of the Delay-Time Multiplier is within ± 2 minor dial divisions for calibrated sweep rates up to 1 μ sec/cm. The variable control extends the delay range (uncalibrated) from 0.1 μ sec to approximately 120 sec.

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 is less than one part in 20,000.

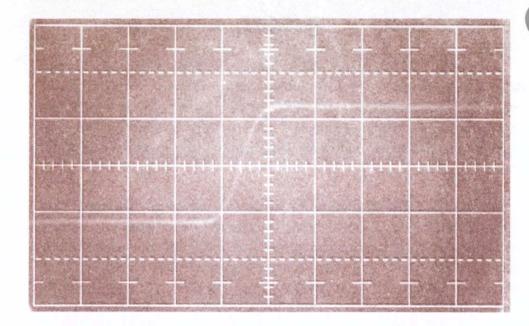
WIDE-RANGE MAGNIFICATION is readily accomplished when Time Base A is operated at a faster rate than Time Base B. For example, if Time Base A is operating at 1 μ sec/cm and Time Base B is operating at 50 μ sec/cm, the magnification is 50 times.

TRACE BRIGHTENING indicates that 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. The Time Base B unblanking level is adjustable at the front panel to normalize trace brightness when the 2 time bases are alternately displayed and running at widely different sweep rates.

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 546 and 547: 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- μ a beam current (2 μ a 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.



Single-shot waveform showing 7-nsec risetime capability of the Type 547 in combination with a Type 1A1 Preamplifier Plug-In Unit set at 0.050 v/cm. Sweep rate is 10 nsec/cm. CRT is a standard T5470P31. Photo recorded with a Tektronix C-27 Camera equipped with an f/1.3-1:0.5 lens set at f/1.3. Film is Polaroid Type 410, ASA 10,000 speed; prefogged; developed 10 seconds.

Speed of crt beam between 10% and 90% amplitude points of waveform is $285 \, \text{cm}/\mu \text{sec.}$

INTERNAL 6 X 10-CM GRATICULE with variable edgelighting 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 screw-driver 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 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, pk-topk for visable modulation.

ENVIRONMENTAL CAPABILITIES (OPERATING)

TEMPERATURE—0°C to +50°C ambient.

ALTITUDE-15,000 feet.

SHOCK—30 G's, one-half sine, 11-msec duration, 1 shock for each face, total of 6 shocks.

VIBRATION—0.015 inch pk-to-pk, 10 to 55 to 10 cps in 1-minute sweeps (2 G's) for 15-minutes on each axis.

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 μ sec from 0.2 mv to 5 v, and 1.0 μ sec 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.

ELECTRONICALLY-REGULATED DC SUPPLIES insure stable, low-drift operation. The instrument is normally wired to operate from 103.5 to 126.5 volts (115 v \pm 10%). A multi-tap transformer permits operation at center line voltages of 108, 115, 122, 216, 230, or 244 volts (\pm 10% on each range). Power consumption is approximately 510 watts. The standard model operates from a 50 to 60-cycle line. An optional ac-to-ac solid-state converter for the fan motor is available for 50 to 60 and 400-cycle operation. It can be ordered installed in the instrument as MOD 101G.

CABINET MODEL DIMENSIONS are $16\frac{7}{8}$ " high by $13\frac{1}{8}$ " wide by $23\frac{7}{8}$ " deep. Net weight is $65\frac{3}{4}$ pounds for each. Shipping weight is approximately 85 pounds.

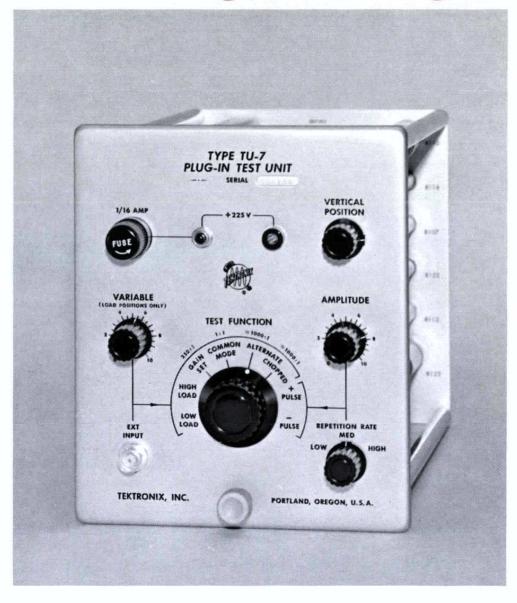
RACK-MOUNT MODEL DIMENSIONS are 14" high by 19" wide by 22³/₄" deep. The Type RM546 and RM547 are electrically identical to the Type 546 and 547, but mechanically rearranged to fit a standard 19-inch rack. They withdraw from their cabinet on slide-out tracks and can be tilted and locked in any of 7 positions. Net weight is 87 pounds for each. Shipping weight is approximately 114 and 116 pounds, respectively.

TYPE 546 OSCILLOSCOPE, without plug-in units . . . \$1750 Each instrument includes: 2—P6008 probes (010-129), 1—crt protector plate (387-918), 1—gray light filter, installed (378-546), 3—BNC-to-binding post adapters (103-033), 2—test leads (012-031), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-367).

TYPE 547 OSCILLOSCOPE, without plug-in units . . . \$1875 Each instrument includes: 2—P6008 probes (010-129), 1—crt protector plate (387-918), 1—gray llight filter, installed (378-546), 3—BNC-to-binding post adapters (103-033), 2—test leads (012-031), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-398).

TYPE RM546 OSCILLOSCOPE, without plug-in units . \$1850 Each instrument includes: 2—P6008 probes (010-129), 1—crt protector plate (387-918), 1—gray light filter, installed (378-546), 3—BNC-to-binding post adapters (103-033), 2—test leads (012-031), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 2—instruction manuals (070-421).

TYPE RM547 OSCILLOSCOPE, without plug-in units . \$1975 Each instrument includes: 2—P6008 probes (010-129), 1—crt protector plate (387-918), 1—gray light filter, installed (378-546), 3—BNC-to-binding post adapters (103-033), 2—test leads (012-031), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 2—instruction manuals (070-420).



TYPE TU-7 PLUG-IN TEST UNIT is a calibration aid for Tektronix Type 530, 540 or 550-Series Oscilloscopes using 1-Series or Letter-Series Plug-in Units. The only plug-in required for calibration, the Type TU-7 features a built-in pulse generator for checking risetime and adjusting transient response of the oscilloscope vertical amplifier.

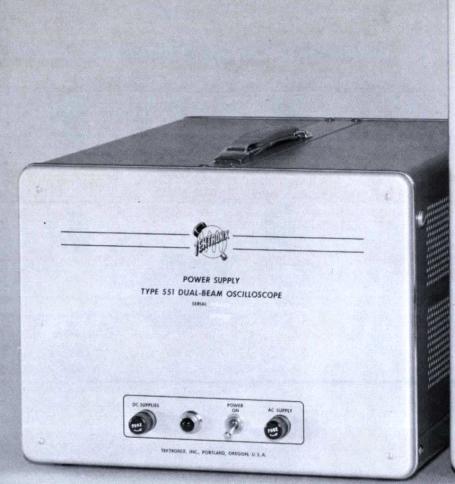
Other features include provisions for checking power supply regulation, chopped blanking operation, and alternate sync pulse circuitry. The TU-7 also checks dual-trace operation for instruments capable of displaying two time-base signals alternately.

TYPE TU-7 PLUG-IN TEST UNIT \$200

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

Type 5 5 DC-to-27MC DUAL-BEAM OSCILLOSCOPE







HIGH-INTENSITY TRACE DUAL-BEAM CRT PLUG-IN UNIT VERSATILITY

The Type 551 uses a Tektronix two-gun cathoderay 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 1-Series and Letter-Series Plug-In Preamplifiers, 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 decoupled sensitivity, differential input, and narrow-band microvolt sensitivity.

CHARACTERISTIC SUMMARY

VERTICALS

2 identical vertical-deflection systems

1-Series and Letter-Series 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.

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, 30nsec 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 rise-time at 20 mv/cm to 25 v/cm.

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 μ v/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 rise-time at 50 mv/cm to 50 v/cm.

For High DC Sensitivity—

TYPE H WIDE-BAND UNIT—DC to 14 Mc, 25-nsec rise-time 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, 16nsec risetime at 50 mv/cm to 50 v/cm.

For Transducer and Strain Gage Applications—

TYPE Q UNIT—DC to 6 kc, 60 μ sec risetime at 10 μ strain/div to 10,000 μ strain/div.

For Transistor-Risetime Checking—

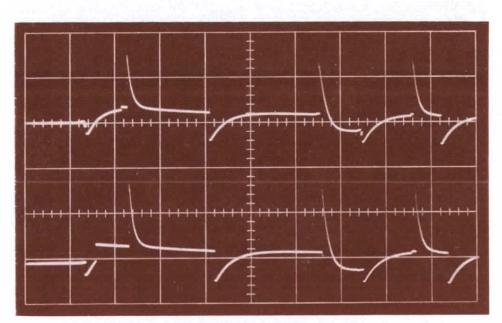
TYPE R UNIT—14-nsec risetime.

For Diode Recovery-Time Measurements—

TYPE S UNIT-14-nsec risetime.

For Precise Amplitude Measurement via the Slide-Back Technique—

TYPE Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27-nsec risetime at 50 mv/cm to 25 v/cm.



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.

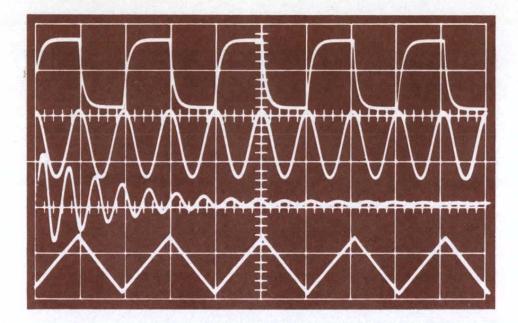
Balanced Delay Network — A signal delay of 0.2 μ sec is introduced into each channel by the balanced (push-pull) delay networks. Permits observation of the leading edge of the waveform that triggers the sweep.

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 $\mu sec/cm$ 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 $\mu sec/cm$, 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 $\mu sec/cm$ to $12 \, sec/cm$. Calibration accuracy of the fixed sweeps is within 3%.

Sweep Magnifier—5X magnifier increases the calibrated sweep time to $0.02~\mu sec/cm$. 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.

DC-Coupled Unblanking — The unblanking waveform is coupled to the grid of the cathode-ray tube, assuring 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 decoupled. 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 0.2 v/cm to approximately 50 v/cm. Passband is do 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.

Separate Power Supply — A separate unit supplies power to the Type 551 indicator unit through an interunit cable. Electronic regulation compensates for linevoltage variations between 105 and 125 v or 210 and 250 v, and for current-demand differences among the plug-in preamplifiers.

Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, 900 watts maximum.

Mechanical Specifications—Dimensions for Indicator Unit are 16% "high by 13%" wide by 23%" long. Dimensions for the Power Unit are 10%" high by 13%" wide by 17%" long.

Net Indicator Unit weight is $52 \frac{1}{2}$ pounds. Shipping weight is 74 pounds, approx. Net Power Unit weight is $44 \frac{1}{4}$ pounds. Shipping weight is 52 pounds, approx.

TYPE 551, without plug-in units \$1850

Each instrument includes: 4—P6006 probes (010-127), 1—red test lead (012-031), 1—inter-unit cable (012-032), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapter (103-033), 1—3-conductor power cord (161-010), 1—green filter (378-514), 2—instruction manuals (070-245).

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 probes (010-127), 1—red test lead (012-031), 1—inter-unit cable (012-032), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapter (103-033), 1—3-conductor power cord (161-010), 1—green filter (378-514), 2—instruction manuals (070-245).

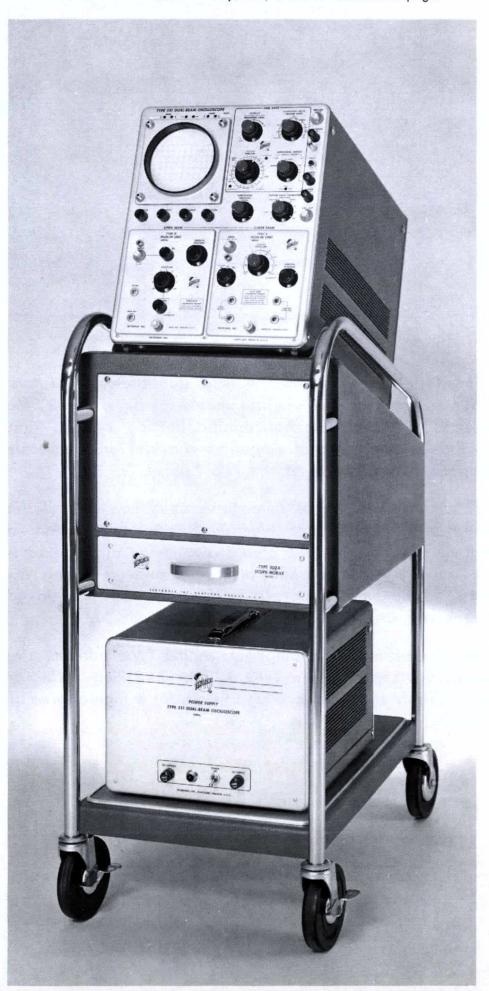
RACK MOUNT ADAPTER

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 $17\frac{1}{2}$ ", Power Supply mask $12\frac{1}{4}$ ". Tektronix blue vinyl finish.

Order Part Number 040-279 \$78.50

SCOPE-MOBILE® CARTS

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

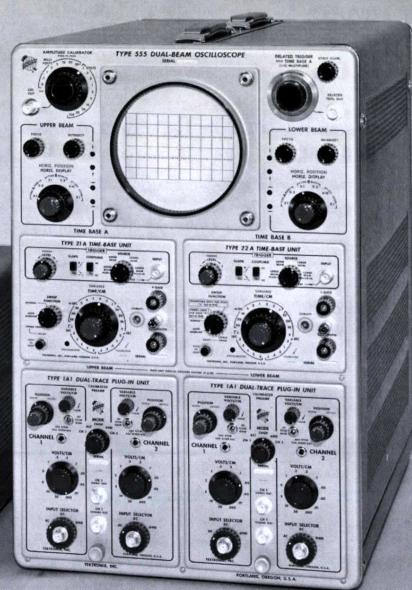


Type 7 7 DC-to-33MC DUAL-BEAM OSCILLOSCOPE with SWEEP DELAY



ILLUMINATED NO-PARALLAX GRATICULE
INDEPENDENT ELECTRON BEAMS
16 VERTICAL PLUG-IN UNITS
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 the new Type 1A1 or 1A2 Plug-In Unit or any Tektronix Letter-Series Plug-In Unit, for a high degree of signal-handling versatility.

CHARACTERISTIC SUMMARY VERTICALS

2 identical vertical-deflection systems

Two Type 1-Series and 14 Letter-Series 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 240 kc; 1 meg-ohm, 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.

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 rise-time 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 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 μ v/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 μ sec risetime at 10 μ strain/div. to 10,000 μ strain/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 Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27 nsec risetime at 50 mv/cm to 25 v/cm.

VERTICAL-DEFLECTION SYSTEMS

IDENTICAL MAIN AMPLIFIERS provide 10.5-nsec risetime and dc-to-33 Mc (3-db down) when used with the new Type 1A1 or 1A2 Plug-In Units. In addition, any Tektronix Letter-Series Plug-In Unit 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 μ sec 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 μ sec/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 μ sec/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 $0.02~\mu sec/cm$. 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 240 kc at maximum sensitivity. Input impedances are 1 megohm paralleled by approximately 47 pf.

555

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 $\pm 10 \, \text{v}$ range; fine control adjusts over $\pm 1 \, \text{v}$ range.

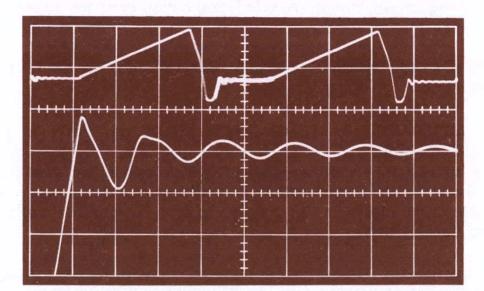
TRIGGER SOURCE can be internal, external, or line, and can be ac or dc coupled. Internally, either sweep can be triggered from the upper or lower beam, or directly from either vertical plug-in unit. The latter permits direct triggering from a single channel of future Tektronix multi-trace plug-in units.

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 μ sec 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 μ sec 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 μ sec/cm and TIME BASE B is operating at 1 μ sec/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.

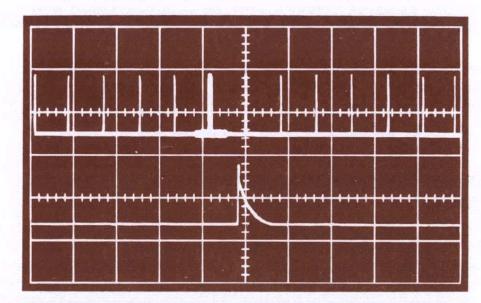
TRACE BRIGHTENING indicates the exact portion appearing on the magnified display, and shows the point-in-time relationship of the magnified display to the original display.

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 μ sec 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 sweep speeds 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.

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.

electronically-regulated DC supplies insure stable operation between 105 and 125 volts, or 210 and 250 volts. A separate unit supplies power to the Type 555 indicator unit through an interconnecting cable. All heaters in the indicator unit and amplifier heaters in the power supply are regulated for stable operation and long tube life.

POWER REQUIREMENT is 105 to 125 or 210 to 250 v, 50 to 60 cps, 1050 watts maximum.

INDICATOR UNIT is 201/8" high by 131/8" wide by 24" deep. Net weight is 66 pounds. Shipping weight is 89 pounds, approx.

POWER SUPPLY UNIT is $10^3/_8$ "high by $13^1/_2$ " wide by $17^1/_2$ " deep. Net weight is $50^1/_4$ pounds. Shipping weight is 61 pounds, approx.

TYPE 555, without preamplifier plug-in units \$2650

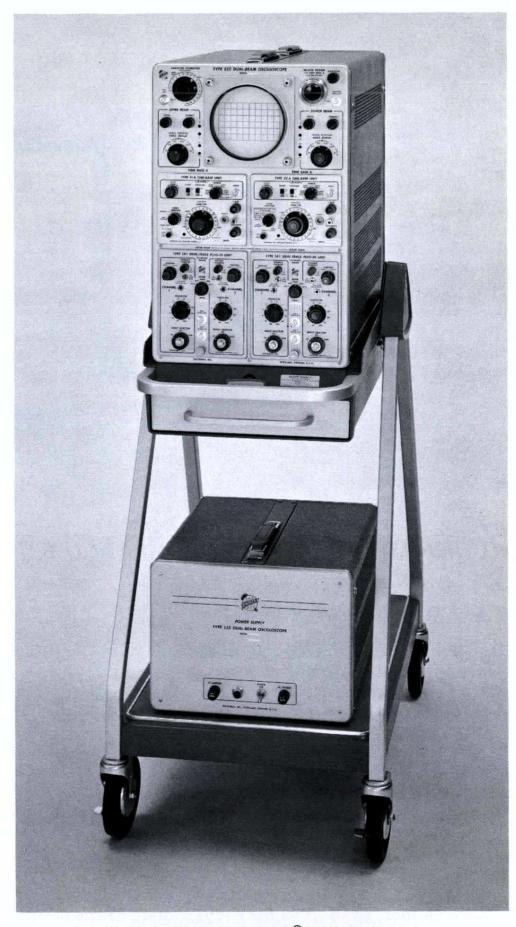
Each instrument includes: 1—Type 21A Time-Base Plug-In Unit, 1—Type 22A Time-Base Plug-In Unit, 4—P6006 probes (010-127), 1—test lead (012-031), 1—inter-unit cable (012-032), 1—time-base extension (013-013), 2—BNC to binding-post adapters (103-033), 1—gray light filter (378-546), 1—CRT Plate Protector (387-918), 1—3-conductor power cord (161-010), 13 to 2-wire adapter (103-013), 2—instruction manuals (070-165).

EXTRA TIME-BASE PLUG-IN UNITS

Net weight of each Type 21A and Type 22A Time Base Unit is $4\frac{1}{4}$ 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.

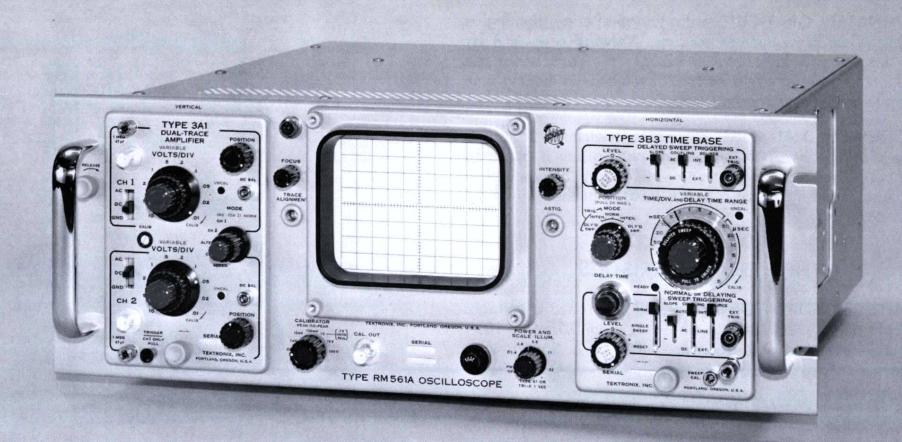


SCOPE-MOBILE® CARTS

TYPE 202-1 TILT-LOCK CART with storage drawer and locking front wheels
TYPE 202-2 TILT-LOCK CART with storage drawer, plug-in unit carrier, and locking front wheels
TYPE 500A CART with storage drawer and locking front wheels
TYPE 500/53A CART with storage drawer, plug-in unit carrier, and locking front wheels
See Catalog accessory pages for complete information.

561A OSCILLOSCOPE





ILLUMINATED NO-PARALLAX GRATICULE
X-Y DISPLAYS
13 AMPLIFIER PLUG-IN UNITS
6 TIME-BASE PLUG-IN UNITS
COMPACT SIZE

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of 13 amplifier of the 2-Series and 3-Series Plug-In Units.

HORIZONTAL

Horizontal deflection characteristics extremely flexible through use of 6 time-base units and 13 amplifiers of the 2-Series and 3-Series Plug-In Units.

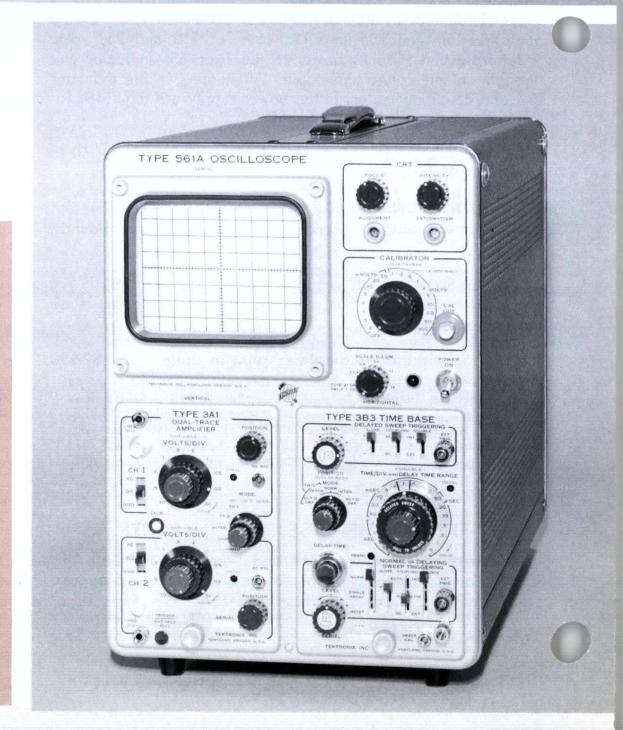
CRT

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.



2-SERIES AND 3-SERIES PLUG-IN UNITS

		AMPLIFIER U	UNITS		
TYPE	INPUT (ac or dc coupled)	PASSBAND (3-db down	THE REAL PROPERTY.	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	10 megohm—50 pf, ±5 v (ac-coupled only)	0.06 cps—300 l	kc	10 μv/div—20 mv/div, 1-2-5 sequence, with variable control.	\$385
2A63—Differential (50:1 rejection ratio)		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	1 megohm—47 pf,	dc—500 kc		$100 \mu \text{v/div}$ — 10v/div , 1-2-5 sequence, with variable control.	\$790
3A6—Dual Trace (identical channels)	600 volts max.	dc—10 Mc (has delay lin	e)	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)	K Surgar	dc—2 Mc.		20 mv/div—10 v/div, 1-2-5 sequence, with variable control.	\$590
3A75—Single trac	e	dc—4 Mc.	esta ye	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 μ strain/div—10,000 μ strain/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 probe
3S76—Dual Trace Sampling (for use with 3T77)	50 ohms dc-coupled	equivalent dc—875 Mc. (0.4-nsec riset	ime)	2 mv/div—200 mv/div, 1-2-5 sequence, with variable control.	\$1100
	er, manifestation and	TIME-BASE	UNIT		
TYPE	SWEEP FEATURE			TRIGGERING	PRICE
2B67	1 μsec/div to 5 sec/div, 1-2 variable between rates 5X Magnifier. Single Sweep	uncalibrated.	Sele	rnal, External, Line; Amplitude-Level ction; AC or DC-Coupling; Auto-c or Free-Run; ± Slope.	\$210
3B1	Normal and Delayed Sweep div to 1 sec/div, 1-2-5 seque brated delay settings, 0.5 μs variable between rates und	os—0.5 µsec/ ence. 18 cali- ec to 10 sec,	10.5 μsec/ Internal, External; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same features		\$535
3B2*	2 μsec/div to 1 sec/div, 1-2 variable between rates Variable sweep delay.	-5 sequence,	Sele	nal, External, Line; Amplitude-Level ction; AC or DC-Coupling; Free-Run; Slope.	\$650
3B3	Normal and Delayed Sweep div to 1 sec/div, 1-2-5 seq tinuously variable calibrated 0.5 μsec to 10 sec. Single Sw sweep.	d delay from	-0.5 μsec/ Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same fea-		\$585
3B4	0.2 μsec/div to 5 sec/div, 1-2 variable between rates 1X to 50X Magnifier, dir Single sweep.	2-5 sequence, uncalibrated. Internal, External, Line; Amplitude-level selection; AC or DC-Coupling; Automatic or		\$400	
3T77 Sampling Sweep (for use with 3S3) or 3S76)	Equivalent to 0.2 nsec/div div, 1-2-5 sequence, yaria rates uncalibrated. 10X M	ble between	Inte	rnal, External; ± Slope.	\$650

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.

Both the Type 561A and Type RM561A use a cathoderay 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 2A63 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 three 2-Series and 3-Series Time-Base Plug-Units.

SAMPLING DISPLAYS: The Type 3T77 Sampling Sweep Unit with either a Type 3S3 or Type 3S76 Amplifier Unit will 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: Two Type 3A72 or two Type 3A3 Units in the Type 561A or RM561A will provide two independent X-Y displays, properly paired; two Type 3A74 Units will provide up to four independent displays, Channel 1 plotted against Channel 1, Channel 2 against Channel 2, etc. (The Type 3A1 or 3A6 Unit does not provide for X-Y pairing, but may be used for X-Y displays if the 8-cm linear scan limit is observed. The Type 3A6 must be used with another 3A6 for accurate X-Y displays).

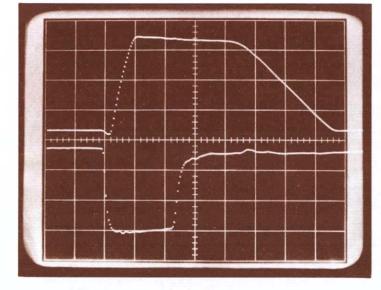
PARALLAX-FREE MEASUREMENTS—CONVENIENT PHOTOGRAPHY—

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.

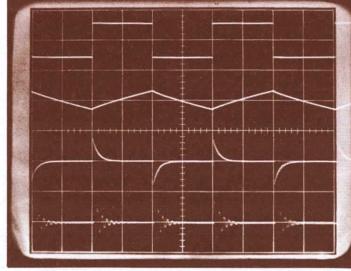
When the trace and graticule are on the same plane, as on the cathode-ray tube of the Type 561A and RM561A Oscilloscope, parallax is eliminated.

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.

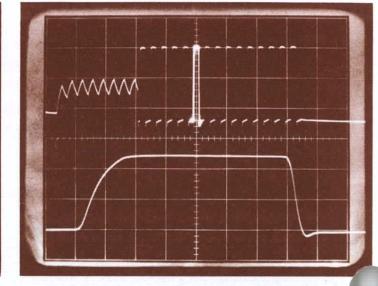
Adding to the convenience of operation are numbered settings of the illumination control that serve as an approximate exposure guide.



SAMPLING
Transistor turn-on and turn-off (upper trace). Driving pulse (lower trace).



MULTIPLE TRACES
Four traces photographed simultaneously.



DELAYING SWEEP (Double exposur, Intensified portion of waveform (upper trace) expanded (lower trace) by means of delayed sweep.

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 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 μ sec risetime, at line frequency. The 0.5 calibrator voltage provides 0.1 volts into 50 ohms, for convenient amplitude calibration of sampling units.

ages 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 $14\frac{1}{2}$ " high, 10" wide, and $21\frac{1}{8}$ " deep. Net weight is 28 pounds. Shipping weight is 39 pounds, approx.

TYPE 561A, without plug-in units \$500

Each instrument includes: 1—3-wire power cord (161-010), 1—3 to 2-wire adapter (103-013), 2 — BNC to binding-post adapters (103-033), 1 — test lead (012-031), 1 — light filter (378-534), 2 — instruction manuals (070-342).

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 $18^{3}/_{8}$ " deep. (Additional mounting information on the Catalog Instrument Dimensions page.) Net weight is $30^{1}/_{2}$ pounds. Shipping weight is 54 pounds, approx.

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-wire power cord (161-013), 1 — 3 to 2-wire adapter (103-013), 2 — BNC to binding-post adapters (103-033), 1—test lead (012-031), 1—light filter (378-534), 1—set mounting hardware, 1 — guide track (351-027), 2 — instruction manuals (070-352).

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 .	
®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. 040-245 \$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.

	STAN	DARD	PROBES		
	Input Indu	ctance			
Use	R	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			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
	SAMP	LING	PROBES		
	Input Indu	ctance			
Use	R	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		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

Under high ambient-light conditions it is often difficult to view oscilloscope traces unless the trace intensity is greatly increased. Many times this is not feasible. The new Tektronix Polarized Viewer makes it easy to see oscilloscope traces of normal to low intensity even with high ambient light.

The curved, circularly polarized filter in the viewer greatly reduces troublesome reflections and glare, with no distortion of the trace. And, the Polarized Viewer allows considerable freedom of movement for the operator—it is not necessary to peer through a narrow eyepiece of any sort.

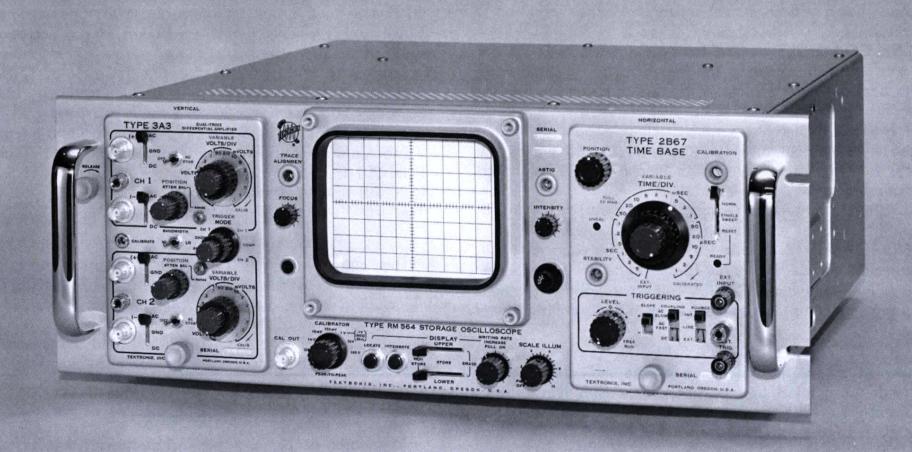
The Polarized Viewer slips on or off the rectangular graticule covers of the Type 561A or RM 561A in seconds.

Rectangular Polarized Viewer (Part No. 016-039) \$10

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

564 STORAGE OSCILLOSCOPE





13 AMPLIFIER PLUG-IN UNITS 6 TIME-BASE 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.

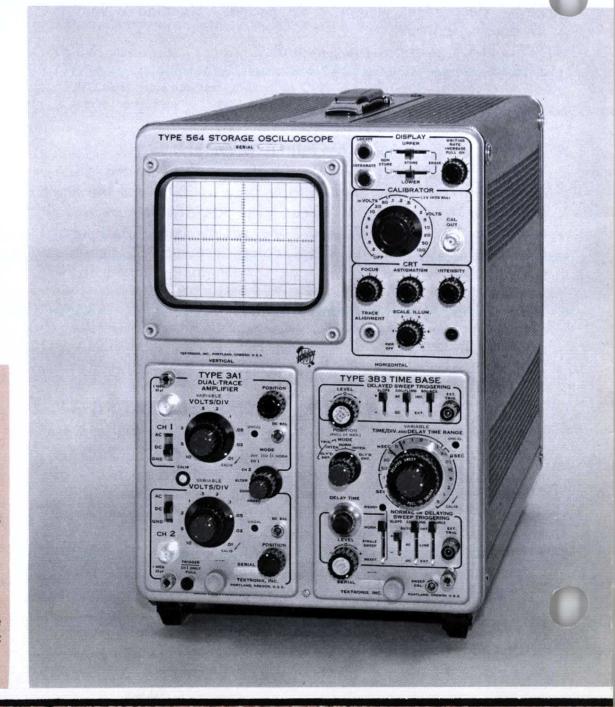
CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics extremely flexible through use of 13 Amplifier of the 2-Series and 3-Series Plug-In Units. Full passband capabilities of plug-in units available in conventional operation.

HORIZONTAL

Horizontal deflection characteristics extremely flexible through use of 6 Time-Base Units and 13 Amplifiers of the 2-Series and 3-Series Plug-In Units.



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), 0.1 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.
- 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.
- Change the stored standard while viewing other waveforms on the non-stored half.
- 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

Several types of displays are available for both storage and conventional operation of the Type 564. The Type 2-Series and 3-Series Plug-In Units provide a wide range of sensitivity and passband characteristics. (For stored displays however, the useful passband for single-shot storage is limited by the stored-mode writing characteristics of the crt used.)

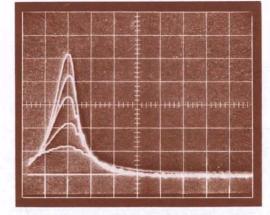
Single-trace and multi-trace displays are obtained by selecting either sampling or non-sampling amplifier plug-in units. Selection of the Type 2A63 gives differential amplifier operation, while strain gage and other transducer operations are available with the Type 3C66.

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.

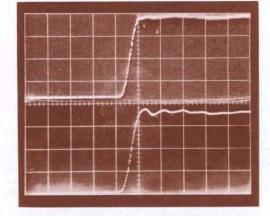
Multiple X-Y displays are available by using two multi-trace amplifiers. Two Type 3A72 or two Type 3A3 Units provide two independent X-Y displays, properly paired; two Type 3A74 Units provide up to four independent displays, Channel 1 plotted against Channel 1, Channel 2 against Channel 2, etc. (The Type 3A1 or 3A6 Unit does not provide for X-Y pairing, but may be used for X-Y displays if the 8-cm linear scan limit is observed. The Type 3A6 must be used with another 3A6 for accurate X-Y displays).

Sampling displays with risetimes in the sub-nanosecond region are obtained by using the Type 3T77 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.



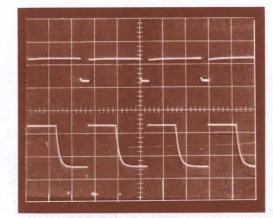
SHOCK TEST

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.

564 RM564

2-SERIES AND 3-SERIES PLUG-IN UNITS

		AMPLIFIER	UNITS		
TYPE	TYPE INPUT (ac or dc coupled)		vn)	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—30	0 kc	10 μ v/div—20 mv/div, 1-2-5 sequence, with variable control.	\$385
2A63—Differential (50:1 rejection ratio)		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	1 megohm—47 pf,	dc—500 kc		$100 \mu \text{v/div}$ — 10v/div , 1-2-5 sequence, with variable control.	\$790
3A6—Dual Trace (identical channels)	600 volts max.	dc—10 Mc (has delay I	ine)	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 trac	e	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 rise	time)	10 μ strain/div—10,000 μ strain/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 ris	setime)	5 mv/div—100 mv/div, 1-2-5 sequence, with variable control.	\$1500 (with probe
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 FEATURE			TRIGGERING	PRICE
2867	1 μsec/div to 5 sec/div, 1-2- variable between rates v 5X Magnifier. Single Sweep	uncalibrated.	Selec	nal, External, Line; Amplitude-Level ction; AC or DC-Coupling; Auto- c or Free-Run; ± Slope.	\$210
3B1	Normal and Delayed Sweep div to 1 sec/div, 1-2-5 seque brated delay settings, 0.5 μse variable between rates unc	nce. 18 cali- ec to 10 sec,	-0.5 μsec/ e. 18 cali- to 10 sec, Internal, External; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same features		\$535
3B2*	2 μsec/div to 1 sec/div, 1-2- variable between rates variable sweep delay.		Selec	nal, External, Line; Amplitude-Level tion; AC or DC-Coupling; Free-Run; lope.	\$650
3B3	Normal and Delayed Sweep div to 1 sec/div, 1-2-5 sequentinuously variable calibrated 0.5 μsec to 10 sec. Single Sweep sweep.	os—0.5 μsec/ uence. Con- d delay from Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same fea-		\$585	
3B4	0.2 μsec/div to 5 sec/div, 1-2 variable between rates to 1X to 50X Magnifier, directions in the surface of the	uncalibrated.	equence, Internal, External, Line; Amplitude-level selibrated. lection; AC or DC-Coupling; Automatic or		\$400
Sampling Sweep (for use with 3S3) or 3S76)	Equivalent to 0.2 nsec/div div, 1-2-5 sequence, yariab rates uncalibrated. 10X Ma	ole between	Inter	nal, External; ± Slope.	\$650

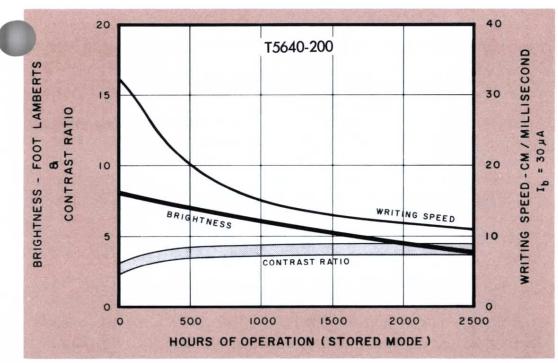
CRT PERFORMANCE

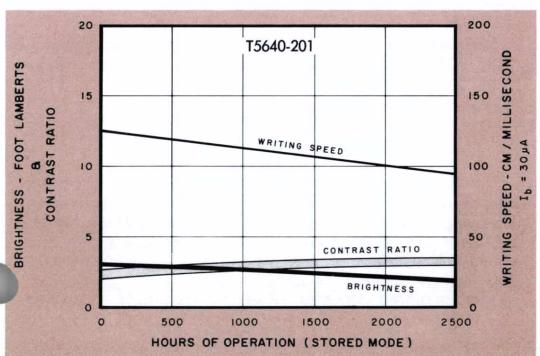
There are two storage tubes available for use in the Type 564 Oscilloscope. Both tubes exhibit characteristics of a conventional crt when used in the non-stored mode. One tube, the Type T5640-200, has the brightest stored display. The other tube, the Type T5640-201, has the fastest writing speed.

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.

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 over one hour.

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 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 μ sec 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 $13\frac{1}{2}$ " high by $9\frac{3}{4}$ " wide by $21\frac{1}{2}$ " deep. Net weight is 33 pounds. Shipping weight is 41 pounds, approx.

564 RM564

ORDERING INFORMATION

The Type 564 has the storage tube T5640-200 (stored display

of highest intensity).

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 (016-039), 1—3-wire power cord (161-010), 1—3-wire to 2-wire adapter (103-013), 2—BNC to binding-post adapters (103-033), 1—test lead (012-031), 2—instruction manuals (070-351).

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 0.1 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).

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 (016-039), 1—3-wire power cord (161-013), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapters (103-033), 1—test lead (012-031), 2—instruction manuals (070-351).

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 040-344 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 (016-039), 1—3-wire power cord (161-013), 1—3 to 2-wire adapter (103-013), 2—BNC to binding-post adapters (103-033), 1—test lead (012-031), 2—instruction manuals (070-351).

RM564 ACCESSORIES

Slide-out Track Kit (Part No. 351-050) \$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. 040-344) \$12.00

Remote-Erase Connector—Mates with connector on RM564—Cable not included (Part No. 134-049) \$3.40

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.

		STAND	ARD	PROBES		
	Use	Input Impe R	edance 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	e 100 meg Ω	3 pf	12 kv max	P6013	75.00
1000:1	High Voltage	e 100 meg Ω	2.7 pf	40 kv max	P6015	200.00
	Current			15 amps max	P6016	75.00

SAMPLING PROBES							
	Input Impe	edance			3 34		
Use	R	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.

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. 040-245) \$25

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



DUAL-BEAM OSCILLOSCOPE Type





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 Non-Sampling 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 μ sec 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 8 cm vertical, overlap of the two beams is 6 cm). Graticule division equals 1 cm, minor division equals 2 mm. Illuminated no-parallax graticule.

ACCELERATING VOLTAGE-4 kv.

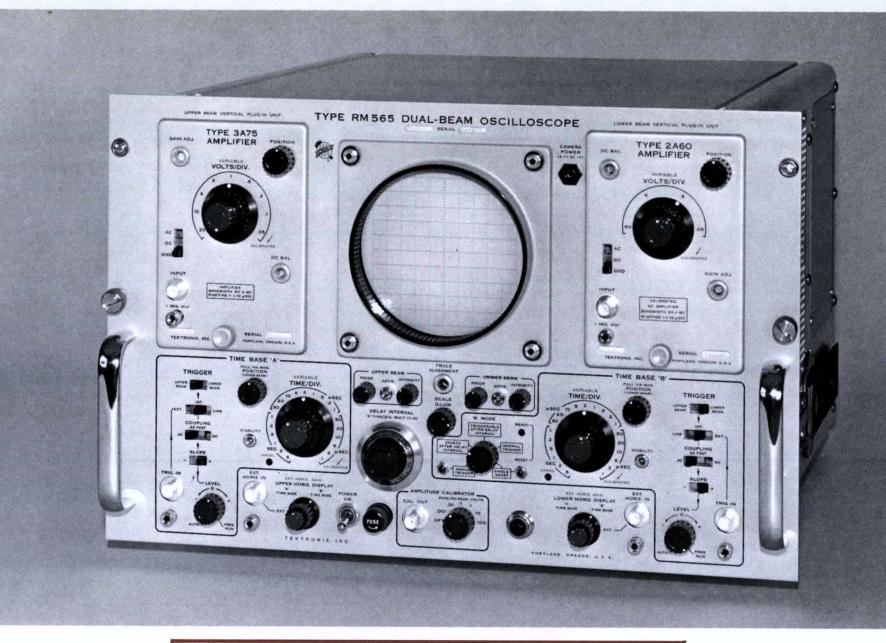
OTHER CHARACTERISTICS

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

REAR-PANEL OUTPUT CATHODE FOLLOWERS—Output impedance approx. 500 ohms; max. load 2 ma.

POWER REQUIREMENTS—105 to 125 v or 210 to 250 v, 600 watts max.

565 RM565



2-SERIES AND 3-SERIES PLUG-IN 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 μ v/div—20 mv/div, 1-2-5 sequence, with variable control.	\$385
2A63—Differential (50:1 rejection ratio)		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	1 megohm—47 pf,	dc—500 kc	100 μv/div—10 v/div, 1-2-5 sequence, with variable control.	\$790
3A6—Dual Trace (identical channels)	600 volts max.	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

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 non-sampling Plug-In 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 cathode-follower 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.

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 μ f and 1 meg).

"AC FAST" coupling time constant— 10^{-5} sec (100 pf and 100 k).

HORIZONTAL SWEEP GENERATORS

RANGE—1 μ sec/div to 5 sec/div in 21 calibrated steps, 1-2-5 sequence. Accuracy within 3%.

VARIABLE—Control permits continuous adjustment uncalibrated from 1 μ sec/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 μ sec/div.

HORIZONTAL AMPLIFIERS

SENSITIVITY—Approximately 100 mv/div to 300 v/div, continuously adjustable.

INPUT RESISTANCE—100 kilohms, $\pm 20\%$.

PASSBAND—dc-to-350 kc, at maximum sensitivity.

DELAY INTERVAL

RANGE—10 μ sec 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, positivegoing square wave.

ACCURACY—Within 3%.

FREQUENCY—Approximately 1 kc.

REAR-PANEL OUTPUT CATHODE FOLLOWERS

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

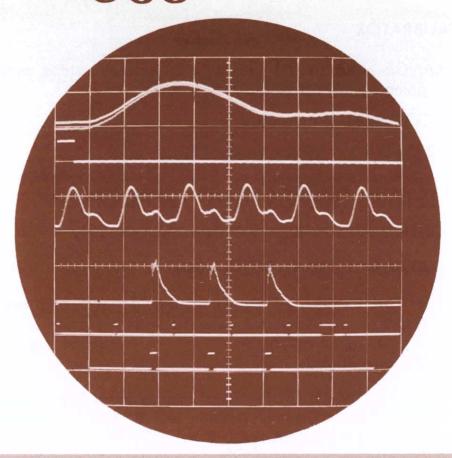
(pertain to both sweep systems except as indicated for "B" sweep)

TRIGGER FACILITIES

Trigger selection is accomplished by slide-switch logic. This arrangement allows quick selection and quick visual checks. Sequence is as follows:

- EXTERNAL, INTERNAL (upper or lower beam), or LINE frequency triggering.
- COUPLING can be AC, AC FAST, or DC.
- 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.

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 23½" 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 121/4" 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-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—test lead (012-031), 1—smoked gray filter (installed) (378-546), 1—plate, protector, crt (387-918), 2—BNC-to-binding-post adapters (103-033), 2—instruction manuals (070-269).

TYPE RM565, without plug-in units \$1500

Each instrument includes: 1—3-conductor power cord (161-022), 1—3 to 2-wire adapter (103-013), 1—test lead (012-031), 2—BNC-to-binding-post adapters (103-033), 1—guide (pair) cabinet (351-055), 1—smoked gray filter (installed) (378-546), 1—plate, protector, crt (387-918), 2—instruction manuals (070-353).

SUPPORTING CRADLES

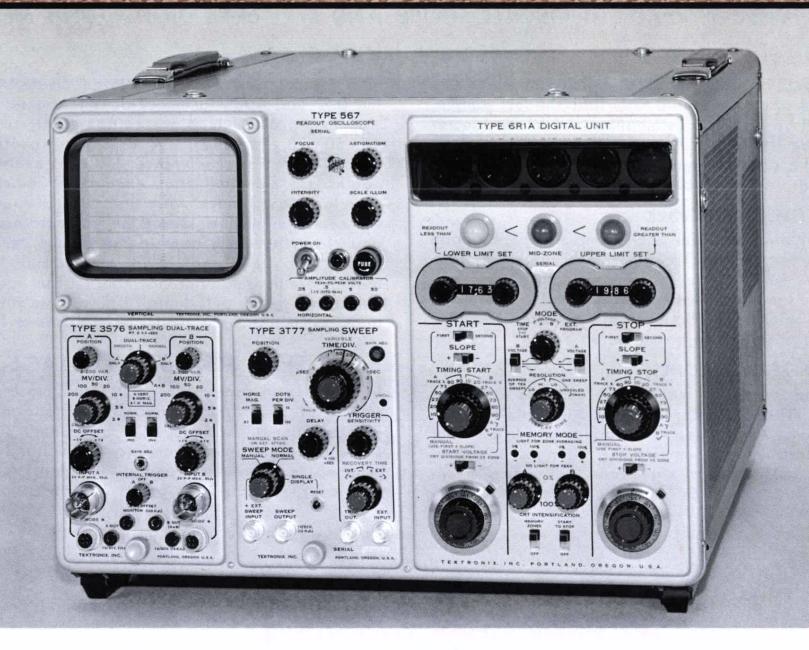
When the Type RM565 is used in a backless rack, these supporting cradles are necessary for rear-slide support.

Order Part Number 040-346 \$12.00

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



DIGITAL READOUT OSCILLOSCOPE Type 5



DIGITAL READOUT PLUS ANALOG DISPLAYS

DIGITAL READOUT OF RISETIME

DIGITAL READOUT OF AMPLITUDE

DIGITAL READOUT OF TIME DIFFERENCES

SELECTABLE HIGH AND LOW NO-GO LIMITS

EXTERNALLY PROGRAMMABLE

GITAL AND GO/NO-GO OUTPUTS

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, μ sec, msec, 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 6R1 A DIGITAL UNIT MEASURE TIM

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

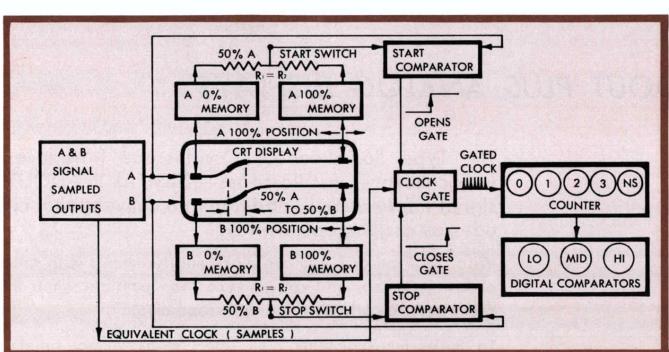
Two intensified zones on each trace indicate 0% and 100% zones. The zones can be positioned at any point on the display. Amplitudes corresponding to the four zones are stored in memory circuits. Changes in amplitude, vertical position, or waveform automatically reestablish new 0% and 100% memory amplitudes.

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, with decimal points included.

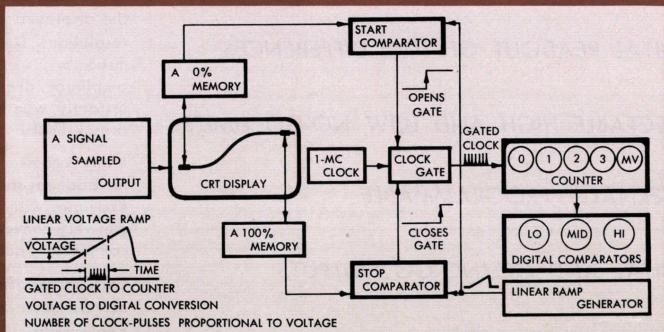
HOW THEY MEASURE VOLTAGE

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

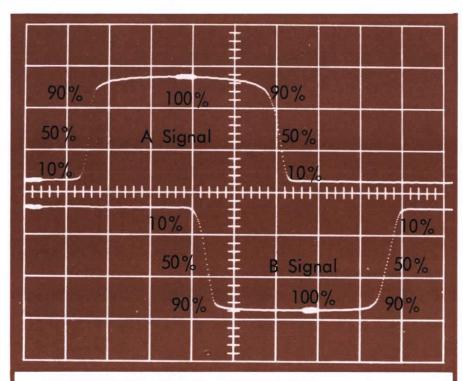
TYPES 567/6R1A
BLOCK DIAGRAM
MEASURING VOLTAGE



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 Types 567/6R1A and any of 3 combinations of vertical and horizontal Plug-In Units: Type 3S3/3T77, 3S76/3T77, or 3A2/3B2. Other 2-Series and 3-Series Plug-In Units can be used for normal crt display, but do not provide digital readout.

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	ec/cm to Through 1	10 or 100 dots	External	\$5450 (includes 2 probes)
3576/3T77	0.4 nsec	2 mv/cm to 200 mv/cm	50 Ω	plus 10X magnifier	100 nsec	per cm		\$5050
3A2/3B2	0.7 μ s ec	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



DUAL-TRACE DISPLAY SHOWING TYPICAL MEASUREMENTS

0.10 11.110 11		
MEASUREMENT	6R1A PRC	OGRAM
	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 $100~\mu sec$ 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).

READOUT OSCILLOSCOPE

AMPLITUDE CALIBRATOR is at line frequency and has 4 calibrated pk-to-pk square wave voltages of 0.05 v, 0.5 v, 5 v, and 50 v available at front panel. The 0.5 v position provides 100 mv into a $50-\Omega$ load, for convenient calibration of sampling plug-ins.

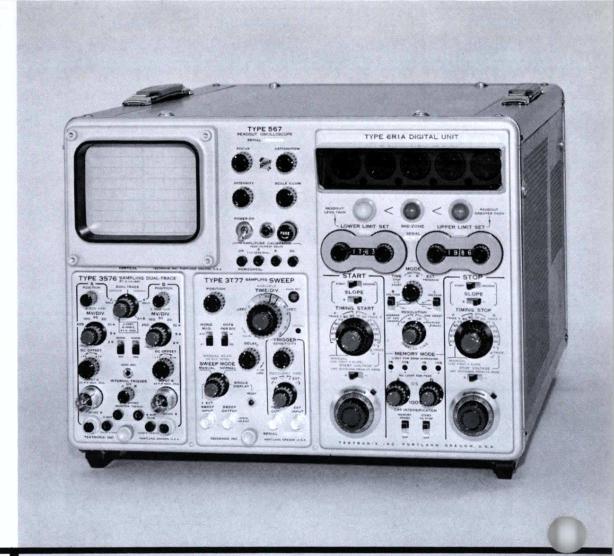
DC-VOLTAGE SUPPLIES are electronically regulated to compensate for widely varying line conditions. Separate regulated heater supply is provided.

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 GRATICULE has controlled edge-lighting and is marked in 8 vertical and 10 horizontal cm divisions.

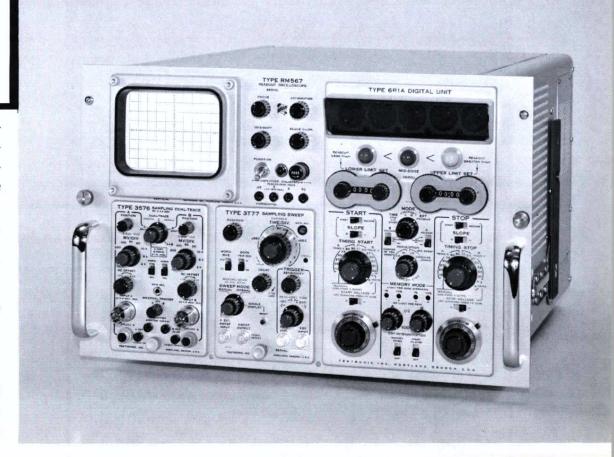
MECHANICAL SPECIFICATIONS: Dimensions are 13⁵/₈" high by 17" wide by 23" deep. Net weight is 49 pounds. Shipping weight is 76 pounds, approx.



Type RM567 RACK MOUNT

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

MECHANICAL SPECIFICATIONS: Dimensions are $12\frac{1}{4}$ " high by 19" wide by 22" deep. Net weight is $50\frac{1}{2}$ pounds. Shipping weight is 85 pounds, approx.



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 012-066 (24-pin extension) \$23.00

Circuit-Board Extensions for Digital Unit

Order Part Number 012-068 (20-pin extension) \$25.00 Order Part Number 012-067 (15-pin extension) \$20.00

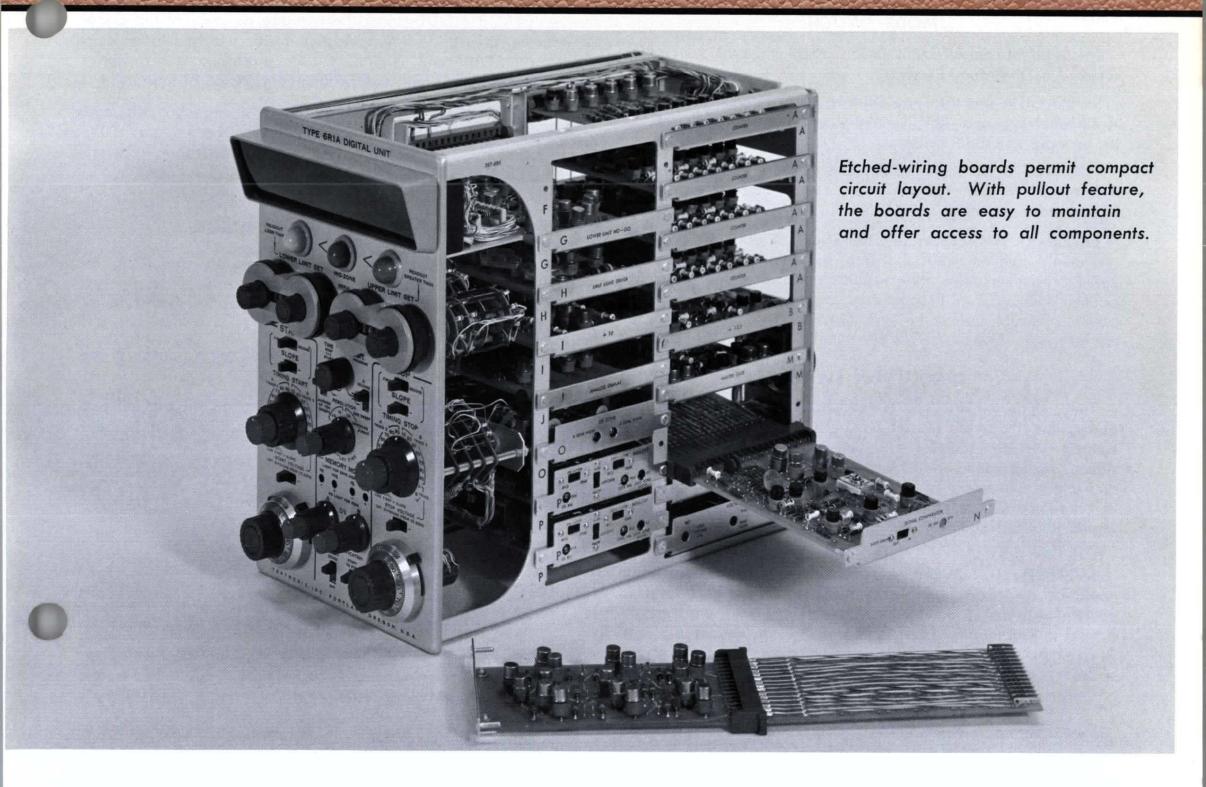
with in-plant facilities. If your company has this facility, or if you intend performing your own maintenance, please include 2 plug-in extensions and 2 circuit-board extensions (one each of 15-pin and 20-pin extensions). One set of 4 will usually be adequate for maintenance of several instruments.

These items are offered for the convenience of companies





DIGITAL UNIT Type 6 R1



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.

6R1A

MODE SWITCH

The type of measurement to be made (time or voltage) is selected by the Mode Switch.

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 to 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 $5\,\mu \rm sec$, 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 occurring 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.

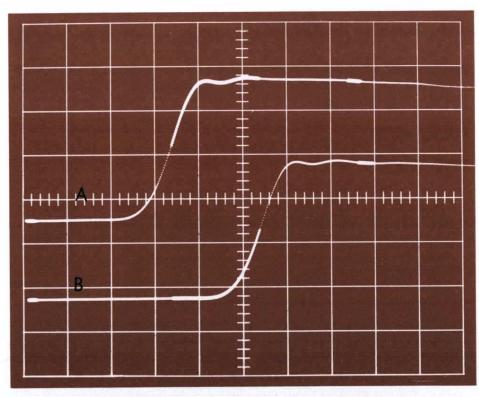
START-TO-STOP INTENSIFICATION turns on and off the start-to-stop zone on the displayed waveform which allows verifying start-to-stop interval.

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.



DELAY-TIME INTERVAL MEASUREMENT
Start: +50% A Trace Stop: +50% B Trace

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.

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

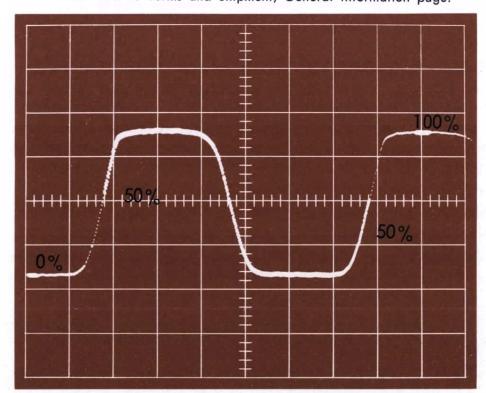
READOUT is in a numerical range from 0.0001 to 9999. Display time is variable between approximately 5 sec and 0.1 sec. Units of measure include: microvolts, millivolts, and volts; nanoseconds, microseconds, milliseconds, and seconds.

DIGITAL READOUT ACCURACY of the Type 6R1A is better than the accuracy obtainable by visual measurement of the same waveform on a conventional oscilloscope display. For assistance in determining system accuracy in specific applications, consult your Tektronix Field Office.

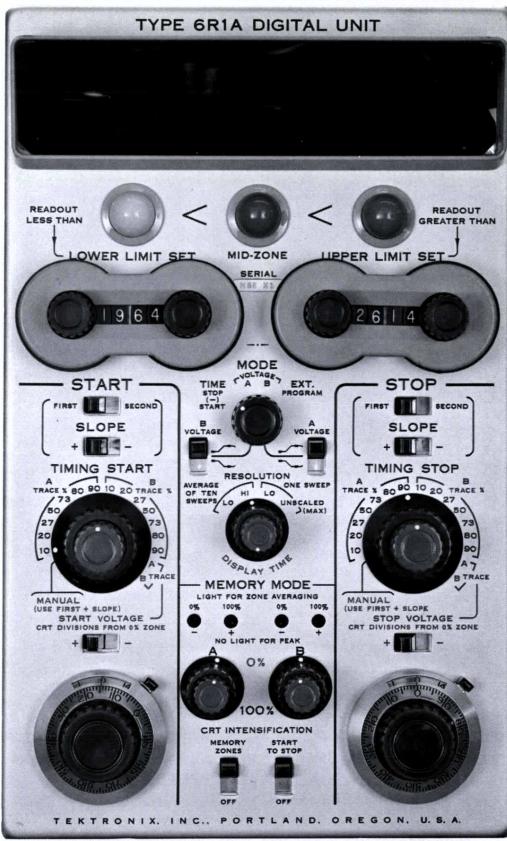
INPUT is internally connected from horizontal and vertical plug-in units.

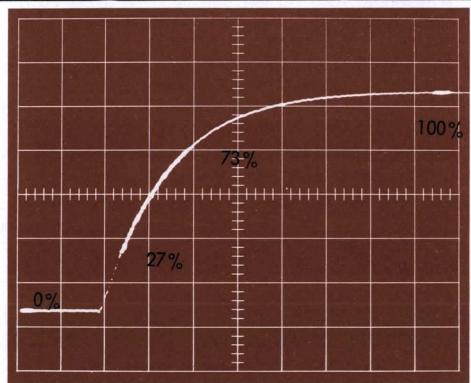
MECHANICAL FEATURES include an aluminum-alloy chassis and anodized front panel. Net weight is 13³/₄ pounds. Shipping weight is 21 pounds, approx.

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 2nd +slope



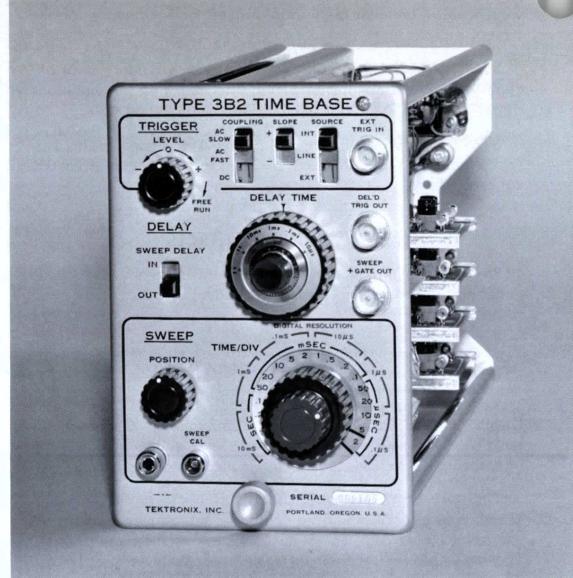


TIME-CONSTANT MEASUREMENT
Start (from) Stop (to)
27% A Trace +73% A Trace

$\frac{3A2}{3B2} \text{ dual-trace amplifier unit} \\ \frac{3B2}{3B2} \text{ time-base unit}$







Tektronix Type 3A2 Dual-Trace Amplifier Unit and Type 3B2 Time-Base Unit enable low and medium frequency digital read-out 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

OPERATING MODES are Channel 1, Channel 2, Added, Alternate, or Chopped. In chopped operation, successive 12 μ sec segments of each channel are displayed at an approx. 40 kc rate per channel. Chopped transient blanking is provided.

SENSITIVITY from 10 mv/div to 10 v/div is in 10 calibrated steps with 1-2-5 sequence, accuracy within 3%. An uncalibrated control permits continuous adjustment between steps and to approximately 25 v/div.

AMPLIFIER PASSBAND is dc to 500 kc for analog display. SEPARATE CONTROLS include those for attenuation, inversion, positioning, and ac or dc-coupling of each channel.

TRIGGERING can be from Channel 1, Channel 2, or from the signal displayed on the screen.

INPUT IMPEDANCE is 1 megohm, paralleled by approximately 47 pf.

MAXIMUM VOLTAGE INPUT is 600 v (dc plus peak ac).

NET WEIGHT is $5\frac{1}{4}$ pounds. Shipping weight is 8 pounds, approx.

TYPE 3A2 DUAL-TRACE AMPLIFIER UNIT \$500

Each instrument includes: 1—BNC to binding-post adapter (103-033), 2—instruction manuals (070-354).

TYPE 3B2 TIME-BASE UNIT

TRIGGERING LEVEL operates over a \pm 12 volt range.

TRIGGER-SOURCE can be internal with 2 mm signal display (from oscilloscope calibrator), external with 0.4 v signal, or line.

TRIGGER COUPLING can be AC Slow, AC Fast, or DC; ± Slope.

SWEEP RANGE from 2 $\mu sec/div$ to 1 sec/div is in 18 calibrated steps with 1-2-5 sequence, accuracy within 3%. Calibrated digital readout available from 1 sec/div through 20 $\mu sec/div$ ranges.

DIGITAL RESOLUTION selects crystal-controlled clock rates from $1.0~\mu sec$ to 10~msec in 5 decade steps. Resolution can be selected independently of sweep time, to increase readout accuracy when the first significant digit is known. The front panel indicates the maximum resolution (without possible counter overflow) that can be attained for each sweep rate.

CALIBRATED SWEEP DELAY can be switched in or out. Delay time is continuously variable from $5\,\mu \rm sec$ to 10.5 sec, accuracy within 1%.

OUTPUTS are available at front-panel BNC connectors. The Delayed Trigger output is nominally + 5 v; Sweep Gate is nominally + 15 v.

NET WEIGHT is 5 pounds. Shipping weight is 8 pounds, approx.

TYPE 3B2 TIME-BASE UNIT \$650

Each instrument includes: 2—instruction manuals (070-355).

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

Q IN CO



SAMPLING-PROBE DUAL-TRACE UNIT Type 353

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; Dual Trace—Channels A and B switched electronically on alternate sweeps; 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-input source impedance) can be adjusted 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. MAXIMUM INPUT SIGNAL is ± 1.5 v with Risetime control set to LOW NOISE and ±3 v when the control is set to FAST RISETIME.

*For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-267.



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 $\pm 0.5 \, \text{v}$.

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 $6^{3}/_{4}$ pounds. Shipping weight is 9 pounds, approx.

TYPE 3S3 AMPLIFIER UNIT

REPLACEMENT P6038 PROBE (Part Number 010-156) \$225 Each probe includes: Normalizer (011-070), 10X attenuator (011-071), capacitor coupler (011-072), 2—test point packs (131-258), 1—bayonet ground adapter (013-085), 1—hook tip (206-114), 1—ground clip (175-249), 1—probe holder (352-024), 1—carrying case (202-123), 1—instruction manual (070-400).

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

Type 3576 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 sweeps; 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/cm and 5 mv/cm 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 $\pm 3\%$ peak overshoot and undershoot.

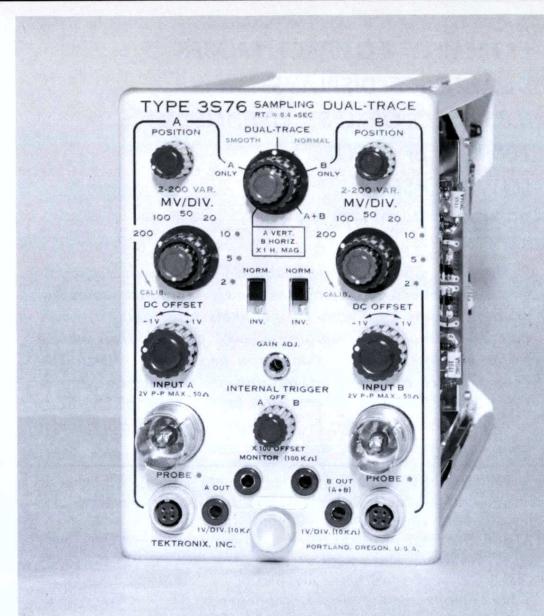
NOISE is equivalent to an input signal of 2 mv pk-to-pk with Smooth-Normal Switch in NORMAL position and 1 mv pk-to-pk with Smooth-Normal Switch in SMOOTH position.

DC OFFSET is -1 to +1 v, referred to input, and monitorable at the front panel at 100X magnitude.

INPUT IMPEDANCE is 50 ohms.

INPUT SIGNALS can be up to 2 v pk-to-pk.

*For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit—Tektronix No. 040-267.



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 $7\frac{1}{2}$ pounds. Shipping weight is 12 pounds, approx.

TYPE 3S76 DUAL-TRACE SAMPLING UNIT \$1100 Each instrument includes: 2—50-Ω 10X attenuators (017-044), 2—5-nsec RG8A/U cables (017-502), 2—instruction manuals (070-332).

PROBES

The following Tektronix probes are recommended for use with the Type 3S76 and other Type 2-Series and 3-Series Sampling Plug-In Units. See Catalog Accessory pages for complete information on the probes.

	Input Imp	edance			
Use	R	С	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.





SAMPLING SWEEP UNIT Type

Internal or External Triggering

10 μsec/div to 0.02 nsec/div Sweep Speeds

Variable Sweep Delay through 100 nsec

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.



EXTERNAL TRIGGERING

AMPLITUDE RANGE is 10 mv pk-to-pk minimum, 800 mv pk-to-pk maximum. Damaging overload occurs at 5 volts and greater.

PULSE REPETITION RATE is 10 cps to 300 Mc. Trigger circuitry counts down to maximum sampling rate of approximately 100 kc. (Rate with 3S76, 50 pps to 300 Mc.)

JITTER is 50 picoseconds 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) with repetition rate less than 10 Mc. Jitter increases with less amplitude and/or pulse width, and with repetition rates above 10 Mc.

INTERNAL TRIGGERING

Same specifications as EXTERNAL TRIGGERING, but modified by vertical plug-in being used. When used with 3S76, all specifications are the same except 5X amplitude is required at A or B vertical input.

OTHER CHARACTERISTICS

DISPLAY can be either 10 or 100 dots/div.

CALIBRATED SWEEP RANGE is from 0.2 nsec/div to 10 μ sec/div in 15 calibrated steps, 1-2-5 sequence. Accuracy is within 3%. A variable control permits continuous adjustment uncalibrated between calibrated rates.

* For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-267.



10X MAGNIFIER extends the calibrated sweep rate to 0.02 nsec/div.

MANUAL SCAN OR EXTERNAL ATTENUATOR, a dual-purpose control, permits manual scanning of signals or control of external sweep amplitudes.

EXTERNAL SWEEP INPUT is dc-coupled and accepts a minmum 50-v positive going sweep for 10-div display.

SINGLE DISPLAYS useful for photography 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 approximately 100-nsec permits observation of a selected portion of a waveform.

NET WEIGHT is $5\frac{1}{2}$ pounds. Shipping weight is 9 pounds, approx.

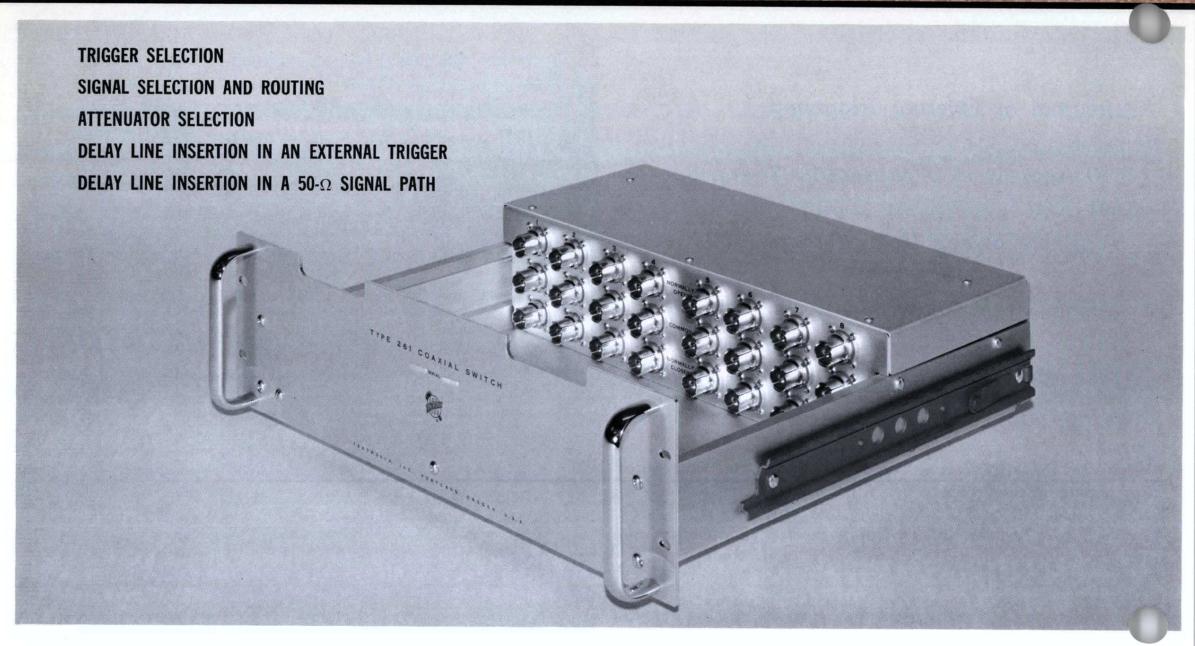
TYPE 3T77 SAMPLING SWEEP UNIT \$650

Each instrument includes: 1—BNC to UHF adapter (103-032), 1—BNC to GR adapter (017-064), 2—10 nsec RG58A/U cables (017-501), 2—10X attenuators (017-044), 2—instruction manuals (070-333).

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

Type 261 COAXIAL SWITCH





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 $18\frac{1}{2}$ inches out from mounting rack. The Coaxial Switch uses $5\frac{1}{4}$ 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 $5\frac{7}{32}$ inches high. Chassis is $18\frac{13}{32}$ inches deep plus $1\frac{1}{2}$ inch handles. Mounting depth, including cable, about $20\frac{1}{4}$ inches. Minimum rack opening is $17\frac{11}{16}$ inches.

WEIGHT is approximately $17\frac{1}{2}$ pounds, net and approximately 28 pounds, shipping.

TYPE 261 COAXIAL SWITCH \$700

Each instrument includes: 1—24-pin male connector (131-325), 1—chassis track, slide and guide (351-040), 2—instruction manuals (070-423).

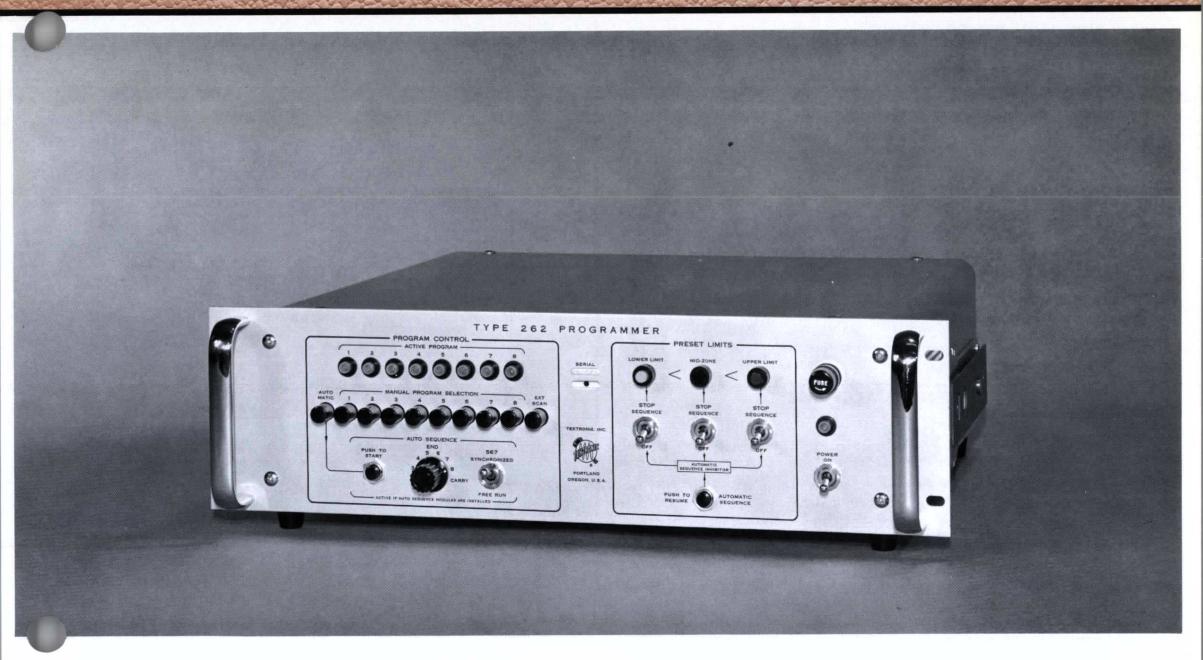
U.S. Sales Price f.o.b. Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.





PROGRAMMER Type 262



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 5671 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 rewired.

^{*} Cable capacitance and environmental noise limits the number of Programmers that can be used in series.

^{**} Automatic sequencers are required.

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 rearpanel 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

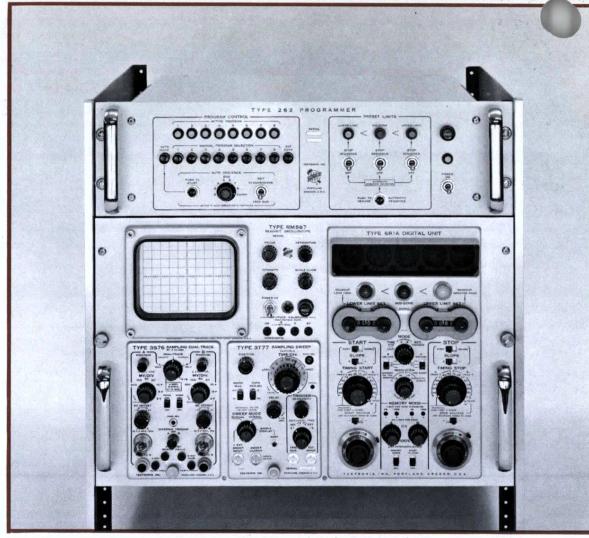
With the Automatic Sequencer installed, the measurement rate can be synchronized with auxiliary equipment or can be determined by the Type 567 and Type 262.

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.

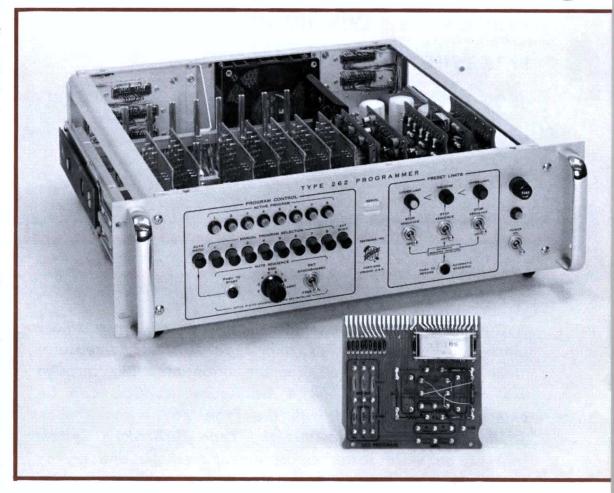
MECHANICAL FEATURES

The Type 262 mounts in a standard 19" rack and occupies only $5\frac{1}{4}$ " 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.

Risetime (10% to 90%) measurement shown.



TYPE 262 PROGRAMMER

\$1350

Includes: 1—cabinet feet kit (016-052), 1—power cord (161-013), 1—3 to 2-wire adapter (103-013), 1—262/6R1A cable (012-081),* 2—instruction manuals (070-399).

*If the Type 262 is to be connected to another Type 262, indicate on your order that you need a 262/262 cable (012-082) rather than a 262/6R1A cable (012-081).

NECESSARY ACCESSORIES FOR BASIC OPERATION

For basic operation of the Type 262, at least one program card is required.

PROGRAM CARD (Part No. 018-007) each \$25

PROGRAM CARD EXTENSION

OPTIONAL RESISTOR KIT

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. 040-331) \$215 SYNCHRONIZER BOARD Only (Part No. 018-005) . 95 COUNTER BOARD Only (Part No. 018-006) 120 AUXILIARY PROGRAMMING CARDS (not furnished with Type 262)

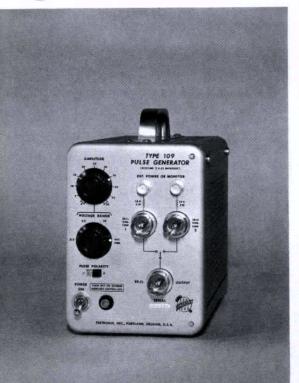
The Type 262 accommodates 8 auxiliary plug-in programming cards. Each card has gold, through-hole plating for best possible electrical contact.

CARD wit	h 11 reed r	elay assy. (Part	No.	018-003)	\$25
		018-004)			

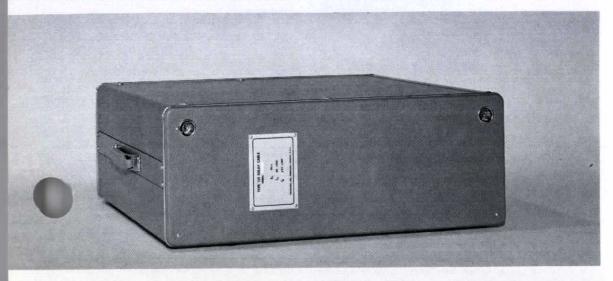
U.S. Sales Prices f.o.b. Beaverton, Oregon Please refer to Terms and Shipment, General Information page.

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 ± 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 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



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 \pm 10 v.

When using a single-trace oscilloscope, the input signal can be switched to the output for observation; when using a dualtrace 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.

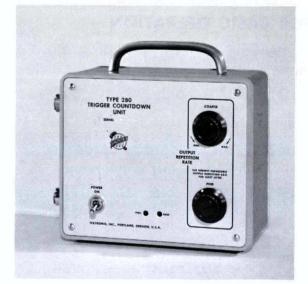
The Type 291 provides a range of dc test currents to 100 ma—with provision for external current supply to 500 ma and an external current monitor. The Type 291 and Test Fixture response is less than 0.35 nsec. The input pulse should be supplied from a fast-rise generator such as the Tektronix Type 109.

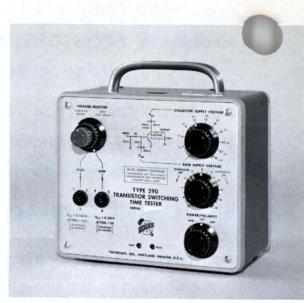
TYPE CT-1 CURRENT TRANSFORMER AND P6040 PROBE

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 \pm 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.	015-041)	 \$31
	only (Part			
	10 only (Po			





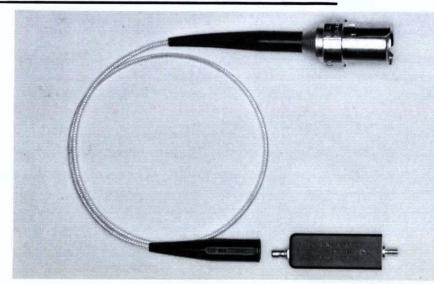




TYPE 292 SEMICONDUCTOR TESTER POWER SUPPLY

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.

OPTIONAL TEST FIXTURES AVAILABLE:



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



ELECTRON-TUBE-CURVE TRACER Type

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.

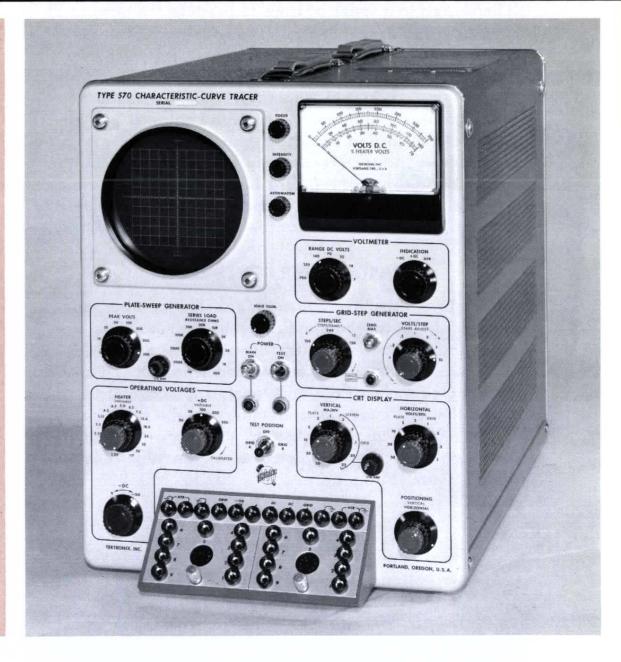
The Tektronix Type 570 Characteristic-Curve Tracer presents an accurate graphic analysis of electron-tube characteristics under almost any conceivable operating conditions. Circuit design can now be tailored to more closely fit the operating characteristics of available tubes. Tubes can be selected faster 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.

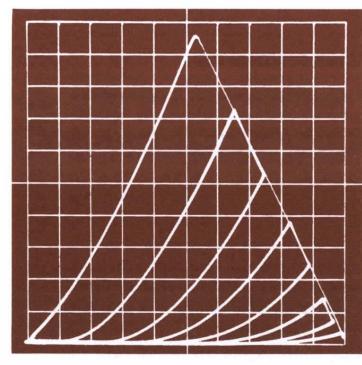


Fig. 1—Plate current plotted against plate voltage for one triode section of a 12AU7. Plate load is 5 k, peak plate-supply voltage is 500 v. Grid voltage is changed 5 v between curves, from —35 v to zero. Vertical sensitivity is 5 ma/div, horizontal sensitivity 50 v/div. Calibrated controls permit accurate current and voltage readings directly from the screen.

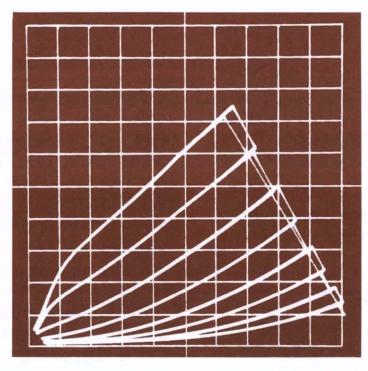


Fig. 2.—Same triode section of 12AU7 with only 20-v peak plate supply and sensitivities increased to 0.2 ma/div vertical and 2 v/div horizontal. Grid voltage is changed 2 v between curves, from —14 v to zero. This is essentially a 25-times magnification of the lower left portion of Fig. 1, showing the operating characteristics at low plate-supply voltage.

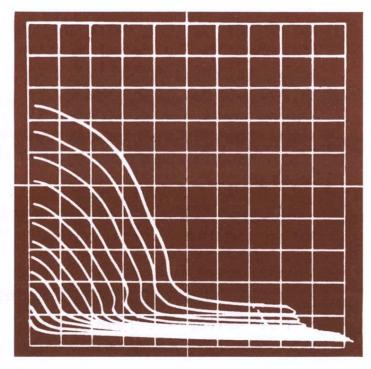


Fig. 3—Screen current plotted against plate voltage with positive grid bias on a 6AQ5. Plate load is 300 ohms, peak plate voltage is 100 v, screen-grid voltage is 100 v, with grid voltage changing 2 v/step from +16 v to below ze Vertical scale is 10 ma/div, horizontal scale is 10 v/div.

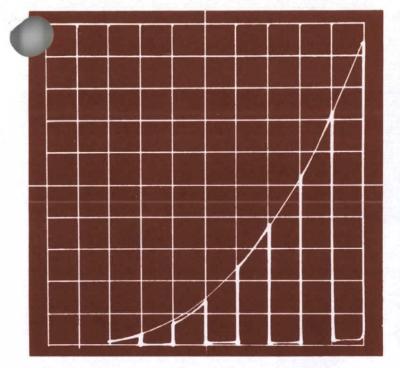


Fig. 4—Typical 12AU7 Eg-Ip curves. Plate load 5 k, peak plate-supply voltage 500 v, grid voltage changing 5 v/step from —35 v to zero, vertical sensitivity 5 ma/div, horizontal sensitivity 5 v/div.

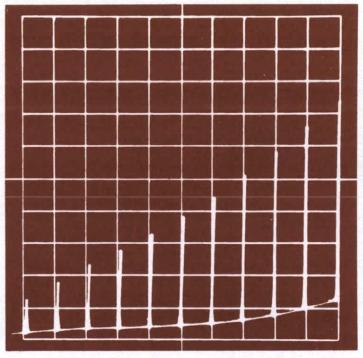


Fig. 5—Another family of curves with positive grid bias. Screen current is plotted against grid voltage. Operating conditions of the 6AQ5 are identical to Fig. 3, except horizontal sensitivity is 2 v/div.

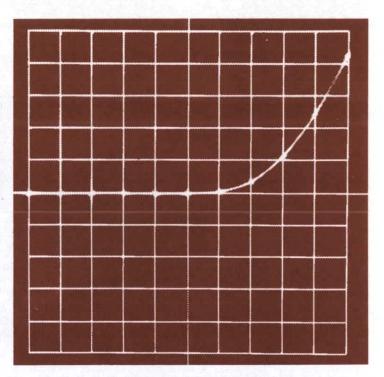


Fig. 6—Typical GERMANIUM DIODE curve. Inherent flexibility of the Type 570 permits accurate evaluation of diode characteristics and detailed examination of any part of the curve. Calibrated scales above are 0.2 v/div horizontal, 0.5 ma/div vertical, with zero points at center of screen.

Safety Switch—The extremely flexible operationalsetup 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.

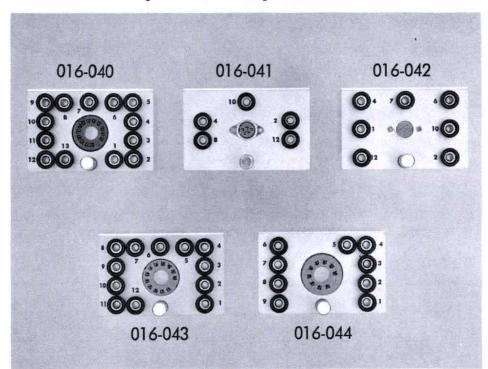
Illuminated Graticule—The 10 x 10-division graticule is edge-lighted. Illumination of the graticule is controlled by a front-panel knob.

Mechanical Specifications—Dimensions are 17'' high by $13 \frac{1}{8}''$ wide by $23 \frac{1}{4}''$ deep. Net weight is $74 \frac{3}{4}$ pounds. Shipping weight is 94 pounds, approx.

TYPE 570 CURVE TRACER \$1100

Each instrument includes: 5—double patch cords, black, 6" (012-023), 5—double patch cords, red, 6" (012-024), 2—suppressor cords, 100 Ω , 6" (012-025), 2—suppressor cords, 300 Ω , 6" (012-026), 2—suppressor cords, 1 k, 6" (012-027), 5—single patch cords, black, 6" (012-028), 5—single patch cords, red, 6" (012-029), 2—7-pin adapter plates (016-004), 2—8-pin adapter plates (016-005), 2—9-pin adapter plates (016-006), 2—black adapter plates (016-007), 1—3 to 2-wire adapter (103-013), 1—6U8 (154-033), 5—1/16 amp 3AG Fast-Blo fuses (159-024), 5— $\frac{1}{2}$ amp 3 AG Fast-Blo fuses (159-025), 1—3-conductor power cord (161-010), 1 green filter (378-514) 2—instruction manuals (070-167).

Optional Adapter Plates



Optional adapter plates with various sockets are available.

13 Pin Nixie* Base (016-040)	\$12.50
5 Pin Nuvister Twelvar Base (016-041)	\$10.00
7 Pin Nuvister Twelvar Base (016-042)	\$10.00
12 Pin Compactron Base (016-043)	\$12.50
9 Pin Novar Base (016-044)	

* Burroughs Registered Trademark

Rack Mount Adapter

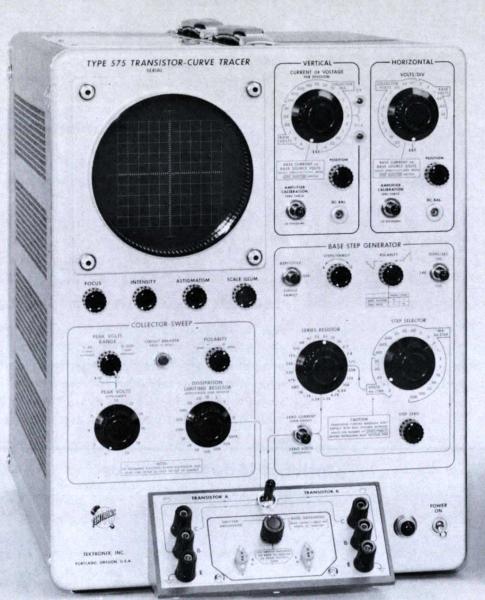
A cradle mount to adapt the Type 570 Characteristic-Curve Tracer for rack mounting is available. It consists of a cradle to support the instrument in any standard 19" relay rack and a mask to fit around the regular instrument panel. Rack height requirements 17 1/2".

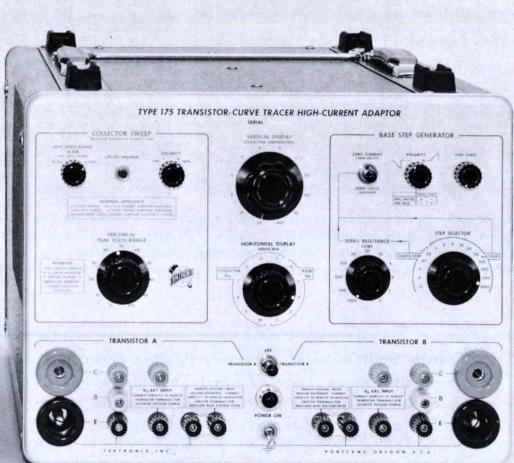
Order Part No. 040-281 \$45

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

e 575 TRANSISTOR-CURVE TRACER 175 HIGH-CURRENT ADAPTER







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-

Frequency—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, $\pm 3\%$.

—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, $\pm 3\%$.

-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, $\pm 3\%$.

Base or Emitter Source Voltage—0.01 v/div to 0.2 v/div, $\pm 3\%$.

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, $\pm 3\%$.

Transistor Base or Emitter Voltage—0.01 v/div to 0.5 v/div, $\pm 3\%$.

-0.1 v/div to 2 v/div.

Base or Emitter Source Voltage—0.01 v/div to 0.2 v/div, $\pm 3\%$.

CRT

DISPLAY AREA—10 x 10 div.

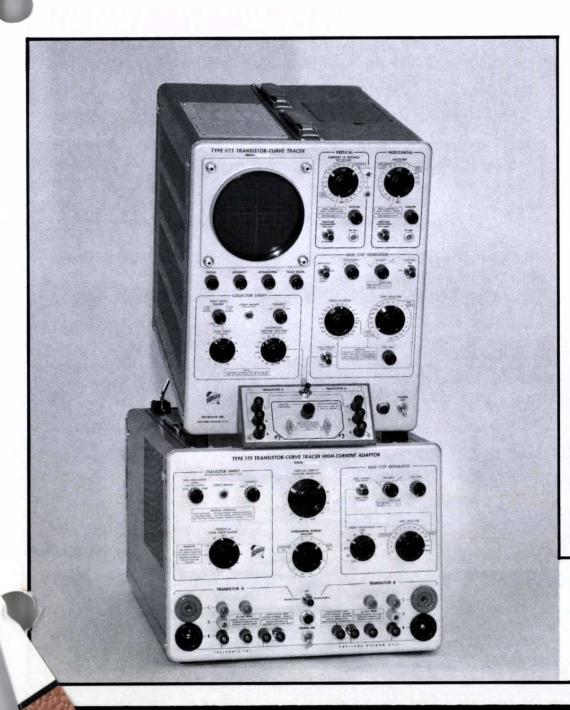
ACCELERATING VOLTAGE-4 kv.

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 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 families of steps to drive the base or emitter (whichever is ungrounded) of the transistor under test. These families of steps are used to generate either repetitive or single-family (as selected) characteristic curves for display. The steps in a family 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 families of steps.

Each step in a family of steps 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 $\pm 5\%$. 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 sweeps 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 values ranging from 1 ohm to 100 kilohms $\pm 5\%$. Any other desired value can be added externally.

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 and 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.

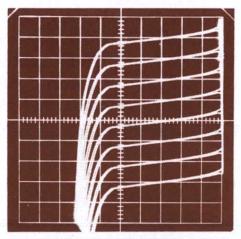
Transistor Base or Emitter Current—0.001 ma/div to 200 ma/div in 17 steps, 1-2-5 sequence.

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.

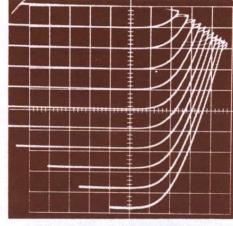
HORIZONTAL-DEFLECTION SYSTEM

Signals used for horizontal deflection are selected from various points in the transistor test circuit. Each point has several selectable deflection sensitivities available.



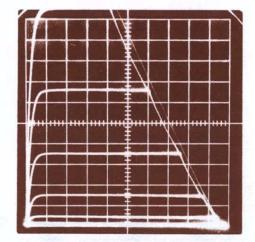
PNP TRANSISTOR

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.

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 semi-conductors. One switch will change the sockets from the common-emitter to the common-base test circuit configuration.

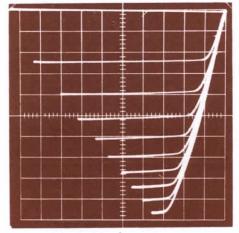
A second switch allows two transistors inserted into the test circuit to be rapidly compared by switching the test conditions from one to the other.

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.

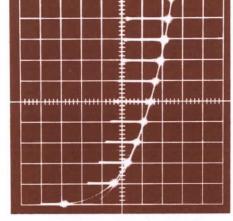
ILLUMINATED GRATICULE—The $3\frac{1}{8}$ " x $3\frac{1}{8}$ " edge-lighted graticule is marked in 10 by 10 $\frac{5}{16}$ inch divisions, with centerlines marked every one-fifth of a division. Illumination is controlled by a front-panel knob.

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.



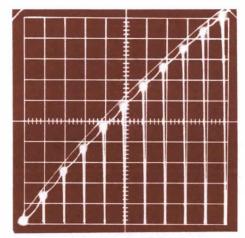
PNP TRANSISTOR

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.



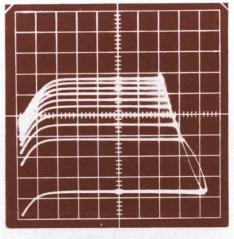
NPN TRANSISTOR

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.



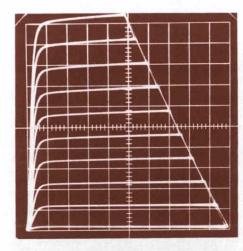
NPN TRANSISTOR

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.



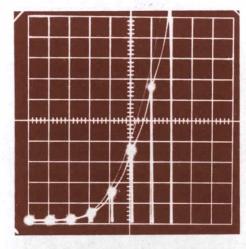
NPN TRANSISTOR

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.

575 175

POWER REQUIREMENT—105 to 125 v or 210 to 250 v, 50 to 60 cps, typically 410 watts maximum, 220 watts standby. Type 175—105 to 125 v, 50 to 60 cps, 1100 watts max.

MECHANICAL—Dimensions are 16%" high by 13%" wide by 23%" deep. Net weight is 66 pounds. Shipping weight is 85 pounds, approx. Type 175—Dimensions are 121% high by 151% wide by 23% deep. Net weight is 93 pounds. Shipping weight is 118 pounds, approx.

TYPE 575 TRANSISTOR CURVE-TRACER \$1075

Each instrumeent includes: 2—transistor adapters, long (013-069), 2—transistor adapters, short (013-070), 1—3 to 2-wire adapter (103-013), 2—2N1381 transistors (151-039), 1—3-condutcor power cord (161-010), 1—green filter (378-514), 2—instruction manuals (070-169).

TYPE 175 HIGH CURRENT ADAPTER \$1475

Each instrument includes: 2—black output leads (012-014), 2—red output leads (012-015), 1—interconnecting cable (012-042), 2—red test cables (012-043), 2—black test cables (012-044), 1—575 adapter cable (012-045), 2—blue test leads (012-056), 1—3 to 2-wire adapter (103-013), 1—3-conductor power cord (161-010), 1—3-conductor power cord 20" (161-014), 1—set mounting hardware, 2—instruction manuals (070-169).

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 instrumeent includes: 2—transistor adapters, long (013-069), 2—transistor adapters, short (013-070), 1—3 to 2-wire adapter (103-013), 2—2N1381 transistors (151-039), 1—3-conductor power cord (161-010), 1—green filter (378-514), 2—instruction manuals (070-169).

TYPE 175 MOD 167C

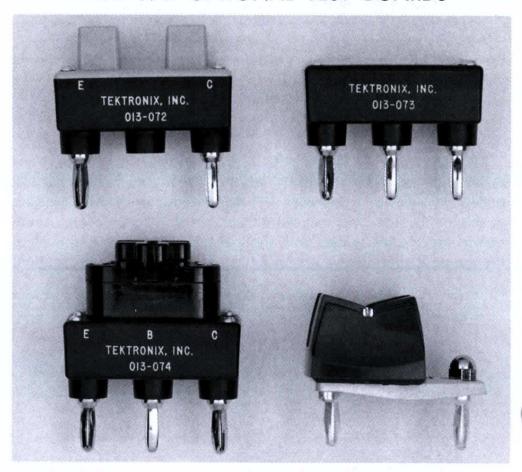
Modified Type 175 operates from 210 v to 250 v, 50 to 60 cps.

TYPE 175 MOD 167C HIGH CURRENT ADAPTER . . \$1475

Each instrument includes: 2—black output leads (012-014), 2—red output leads (012-015), 1—interconnecting cable (012-042), 2—red test cables (012-043), 2—black test cables (012-044), 1—575 adapter cable (012-045), 2—blue test leads (012-056), 1—3 to 2-wire adapter (103-013), 1—3-conductor power cord (161-010), 1—3-conductor power cord 20" (161-014), 1—set mounting hardware, 2—instruction manuals (070-169).

RACK MOUNT ADAPTER

TYPE 575 OPTIONAL TEST BOARDS

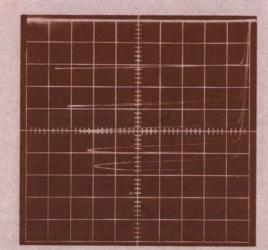


DIODE TEST JIG (013-072)—holds axial-lead diodes . \$5.00

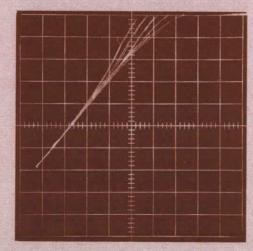
ADAPTER BOX (013-073)—allows you to mount your own semiconductor socket on the box 4.00

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

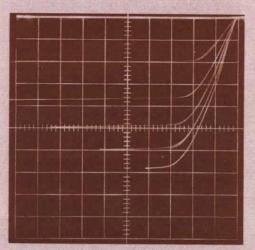
CHARACTERISTIC CURVE DISPLAYS WITH TYPE 175



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).



DC-to-85MC OSCILLOSCOPE Type

 $\frac{581A}{585A}$

RM585A





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

3 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: $0.05~\mu sec/cm$ to 2~sec/cm; Time Base B (Type 585A and RM585A only): $2~\mu sec/cm$ to 1~sec/cm.

SWEEP MAGNIFIER—5X, extends Time Base A sweep range to $0.01~\mu sec/cm$.

CALIBRATED SWEEP DELAY—2 μ sec to 10 sec, continuously variable.

TRIGGER REQUIREMENTS-

Internal: 2-mm deflection, ac coupled.

External: 0.2 v to $\pm 15 \text{ v}$, 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 GRATICULE DISPLAY AREA—4 x 10 cm. ACCELERATING VOLTAGE—10 kv.

581A 585A RM585A

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-95 Mc Type 581A Oscilloscope, the calibrated sweep delay of the Type 585A and RM585A Oscilloscopes enables the user to:

- Make accurate incremental measurements along a complex waveform.
- 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.
- Determine accurate time-difference measurements between amplifier input and output pulses.
- 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	Rise	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 $2 \,\mu \text{sec/cm}$ to $1 \,\text{sec/cm}$ 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 $0.4~\mu sec/cm$. 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 \pm 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.

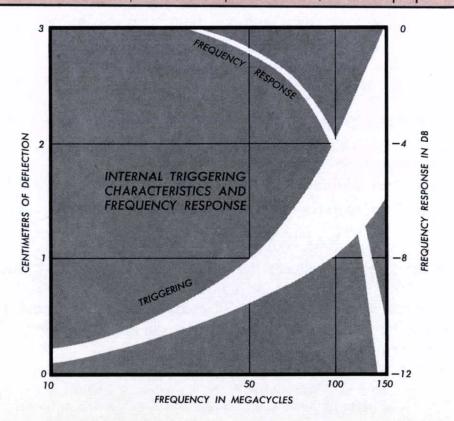
LOW-FREQUENCY REJECT operates above 15 kc to prevent low-frequency components, such as 60-cycle hum, from interfering with stable triggering. This mode also allows bright trace displays when a multiple-channel plug-in unit is operated in its alternate mode.

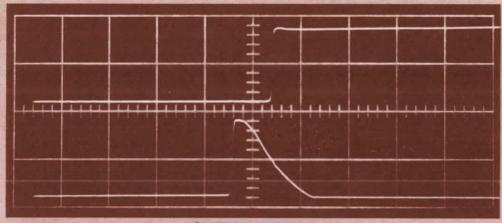
TRIGGER REQUIREMENTS for Type 581A and Time Base A and RM585A are as follows:

	INTERNAL			EXTERNAL		
FREQUENCY	AC	AC LF REJ	HF SYNC	AC/DC	HF SYNC	
15 cps to 15 kc	2 mm			0.2 v	1471-1-19	
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:

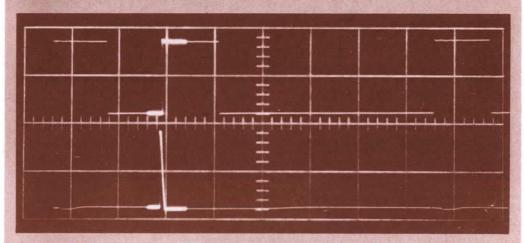
	INIT	ERNAL	EXTERNAL
FREQUENCY	AC	AC LF REJ	AC/DC
15 cps—15 kc	4 mm		0.2 v pk-pk
15 kc—1 Mc	4 mm	4 mm	0.5 v pk-pk
1 Mc—5 Mc	2 cm	2 cm	1.5 v pk-pk





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 μ sec 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 μ sec 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 μ sec 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.

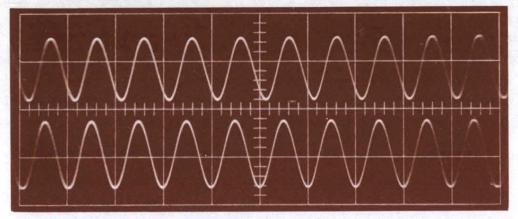
CONVENTIONAL OPERATION holds off the start of the delayed sweep for the precise amount of the selected delay time. Any time-modulation or jitter on the signal will be magnified in proportion to the amount of sweep expansion.

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 μ sec/cm and TIME BASE B is operating at 50 μ sec/cm, the magnification is 50 times.

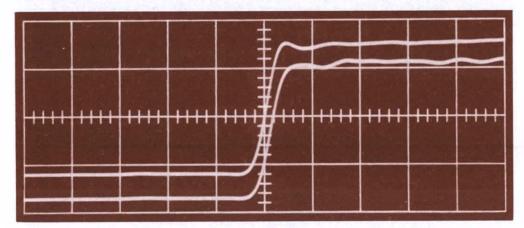
TRACE BRIGHTENING indicates the exact portion appearing on the magnified display, and shows the point-in-time relationship of the magnified display to the original display.

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 $0.05~\mu sec$ 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 16%" high by 131%" wide by 23%" 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 22³/₄" deep. Type RM585A net weight is 81 pounds. Shipping weight is 110 pounds, approx.

MAINTENANCE AIDS

Please refer to catalog accessory pages for more-complete information

TU-5 PULSER generates a 3-nsec 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.

Order Part Number 015-043 (includes accessories) \$46.50 Order Part Number 015-038 (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 013-055 \$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 015-013 (UHF connector) .. \$29.50 Order Part Number 015-056 (BNC connector) .. \$29.50

RACK-MOUNT ADAPTER

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

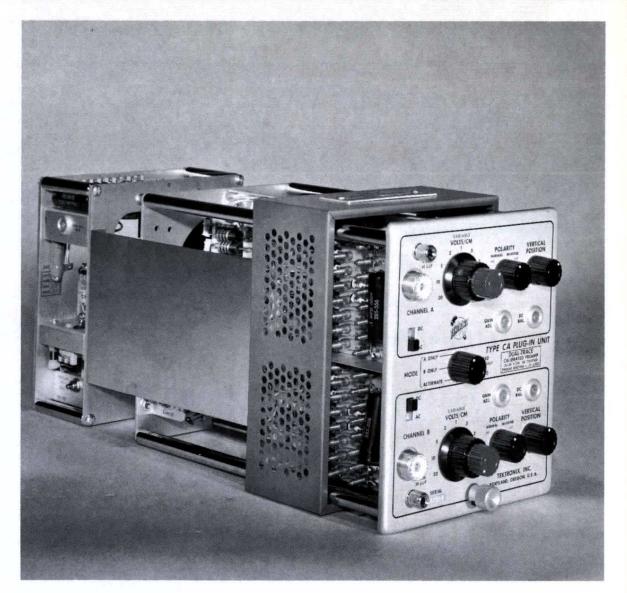
PLUG-IN ADAPTER Type

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 $6\frac{1}{2}$ " high by $5\frac{1}{2}$ " wide by $12\frac{1}{2}$ " deep. Net weight is 4 pounds. Shipping weight is 6 pounds, approx.

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 rise-time at 50 mv/cm to 50 v/cm.

TYPE C-A DUAL-TRACE UNIT—DC to 24 Mc, 15-nsec rise-time at 50 mv/cm to 50 v/cm.

TYPE M FOUR-TRACE UNIT—DC to 20 Mc, 17-nsec rise-time 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 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 μ v/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 μ sec risetime at 10 μ strain/div to 10,000 μ strain/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 Z DIFFERENTIAL COMPARATOR UNIT—DC to 13 Mc, 27 nsec risetime at 50 mv/cm to 25 v/cm.

Type 82 DUAL-TRACE UNIT



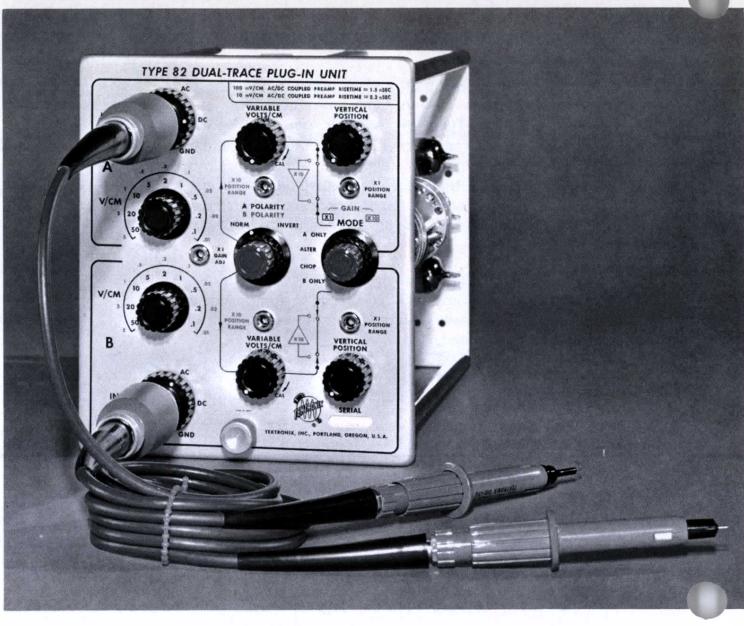
10 MV/CM SENSITIVITY

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- μ sec 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—4³/₄ pounds. Shipping—10 pounds, approx.

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 040-275 \$25

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

PLUG-IN TEST UNIT Type 84

For standardizing vertical sensitivity and transient response, and checking general Type 580-Series oscilloscope performance.

Variable 500-800 (approx.) PPS Mercury Pulser

0.2 nsec Pulse Risetime

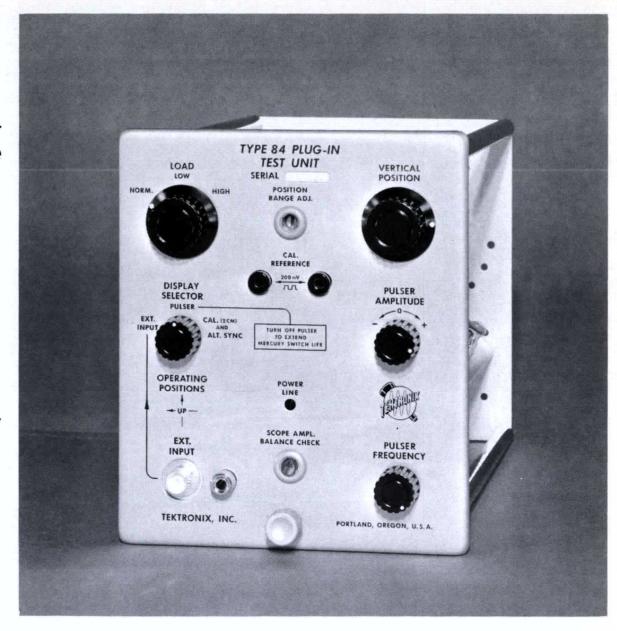
Continuously Adjustable Pulse Amplitude, 0 to 4 major divisions.

Positive or Negative Polarity

External Input for Time Markers

Selectable Loads for Checking Oscilloscope Power Supply Ripple at Low and High Load

200 mv $\pm 2\%$ Reference Voltage for Gain Standardization.



The Type 84 Plug-In Test Unit generates a fast-rise, stepfunction test signal of known waveshape for use in standardizing the transient response of the oscilloscope. In addition, the Type 84 Test Unit facilitates checking (1) the dualtrace alternate sync, (2) the main oscilloscope amplifier gain, (3) the power-supply regulation at minimum and maximum load capabilities, and (4) the oscilloscope dc vertical balance.

After standardizing a Type 580-Series Oscilloscope with the Type 84 Test Unit, the oscilloscope will accept a Type 80/P80, 82, or 86 Plug-In Unit without readjustment of the frequency-compensating circuits.

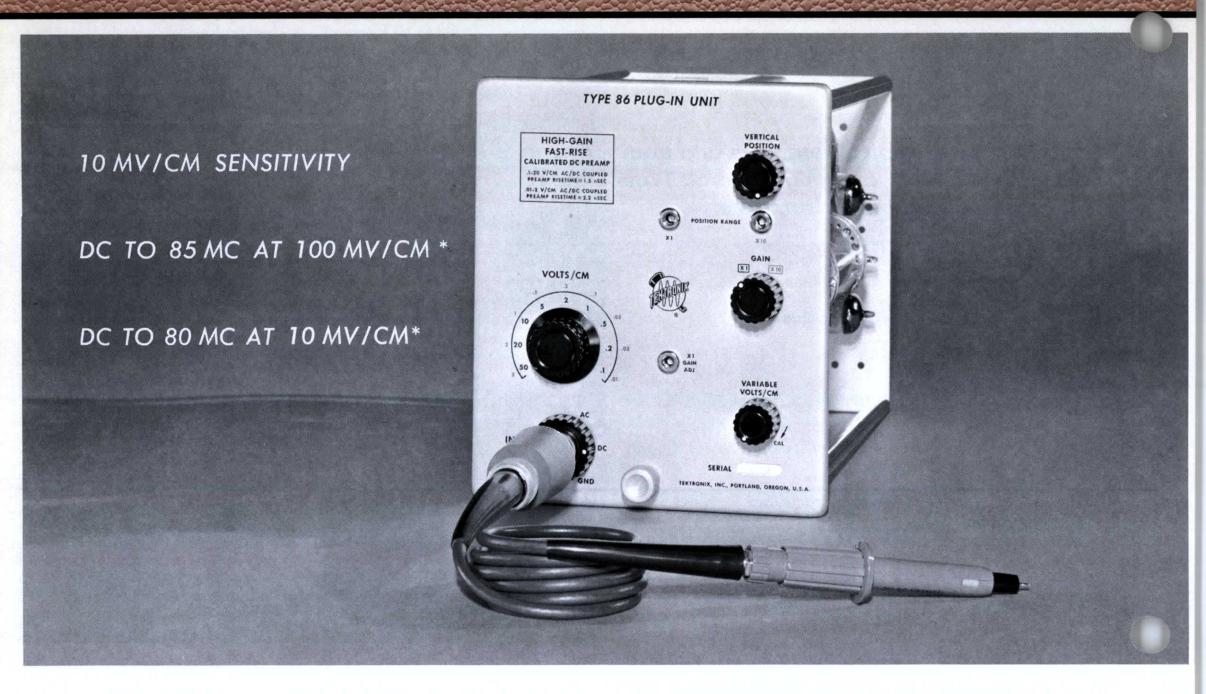
Note: As a result of component aging, particularly tubes, the transient response of an amplifier changes over a period of time. In contrast, the Type 84 Plug-In Test Unit will maintain stable waveform characteristics.

WEIGHT: Net—41/4 pounds Shipping—71/4 pounds, approx.

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

Type 8 6 PLUG-IN UNIT





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—31/4 pounds Shipping—7 pounds, approx.

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 distributedamplifier circuitry and modify Type 80 Plug-In Unit/Type P80 Probe combination.

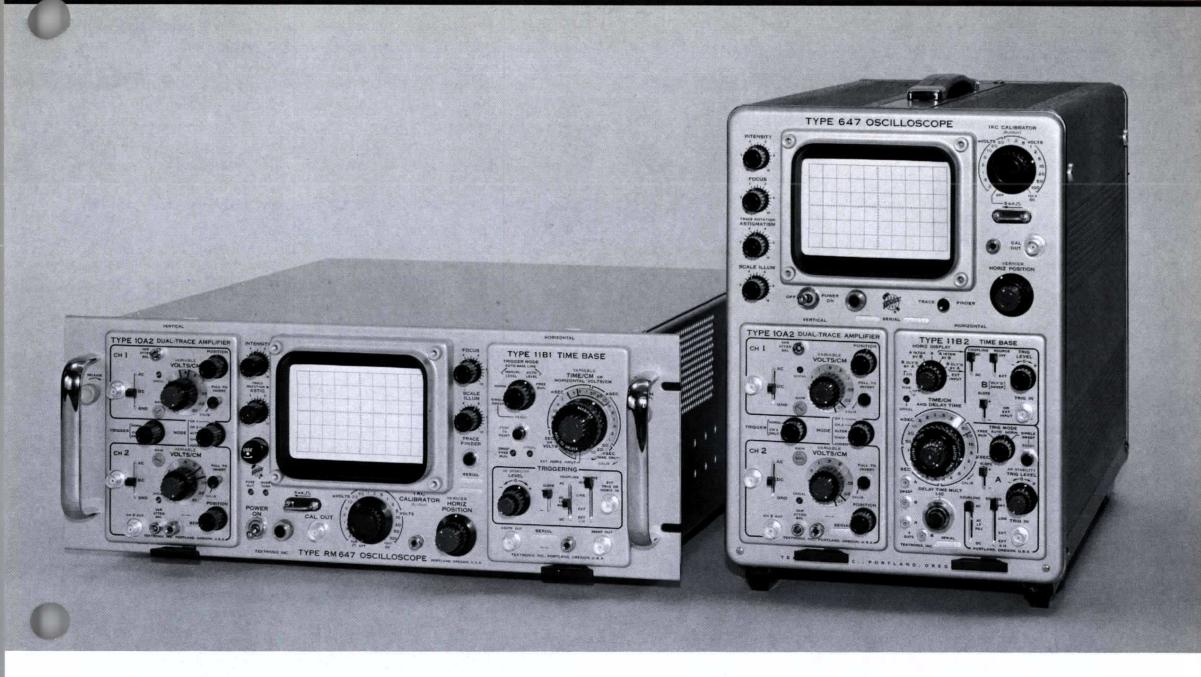
Order Part Number 040-275 \$25

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



DC-to-50MC OSCILLOSCOPES Type

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 (O°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 noparallax 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 ceramic tube with parallel-ground glass face-plate. Accelerating potential is 14 kv. A P31 phosphor is normally supplied.

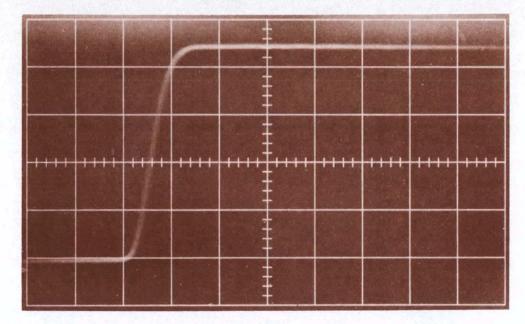
INTERNAL GRATICULE with variable edge lighting is accurately ruled in centimeter squares. Viewing area is 6 x 10 cm. Vertical and horizontal centerlines are marked in 2-mm divisions.

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 $22\text{-k}\Omega$ 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 μ fd and $22 \text{ k}\Omega$).

647 RM 647



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)

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 $\pm 0.1\%$ from -30° C to $+65^{\circ}$ C. Output resistance is 50 ohms from 0.2 mv to 0.2 v. Square-wave symmetry is accurate within $\pm 0.1\%$. Risetime and falltime are approximately 2 μ sec. 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 $14\frac{1}{4}$ " high by 10" wide by 23" deep. Net indicator weight is $40\frac{1}{2}$ pounds. Net weight with Type 10A2 and 11B2 Plug-In Units is 52 pounds.

TYPE 647 OSCILLOSCOPE, without plug-in units \$1225 Each instrument includes: 1—grey light filter, installed (378-548), 1—clear implosion shield (337-573), 1—20-inch 50-Ω cable, BNC male to BNC male (012-076), 1—3-conductor power cord (161-022), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-370).

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).

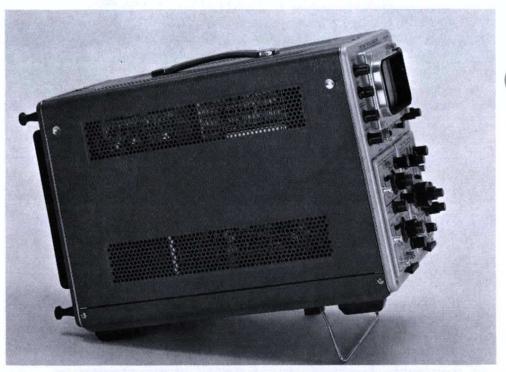
The standard model operates from a 50 to 60-cycle line (100 to 130 volts or 200 to 260 volts). A modified version operates from a 50 to 400-cycle line. Net indicator weight (with track assembly) is 50 pounds. Net weight with Type 10A2 and 11B2 Plug-In Units (and track assembly) is 61½ pounds.

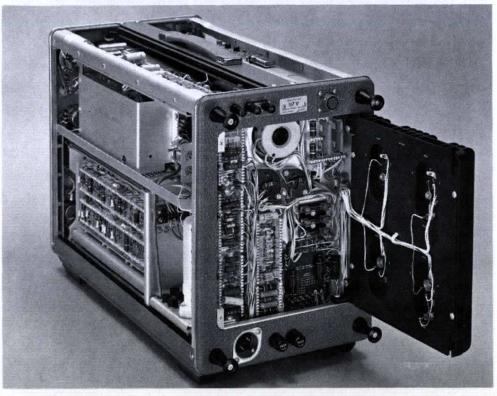
TYPE RM647 OSCILLOSCOPE, without plug-in units .. \$1425 Each instrument includes: 1—grey light filter, installed (378-548), 1—clear implosion shield (337-573), 1—20-inch $50-\Omega$ cable, BNC

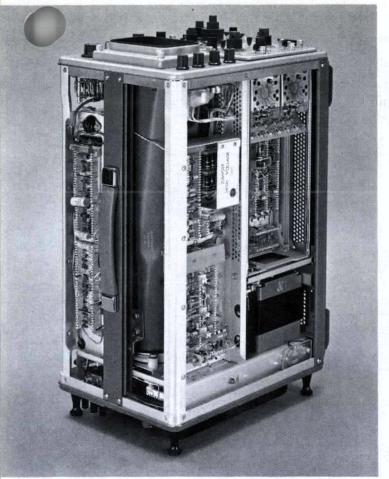
male to BNC male (012-076), 1—3-conductor power cord (161-022), 1—3 to 2-wire adapter (103-013), 1—set slide out tracks (351-006), 2—instructions manuals (070-435).

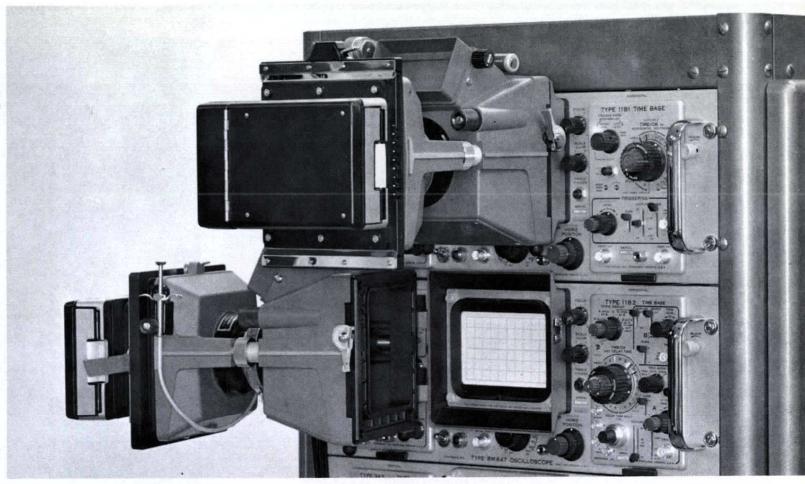
RACK MOUNT REAR SUPPORT KIT

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.







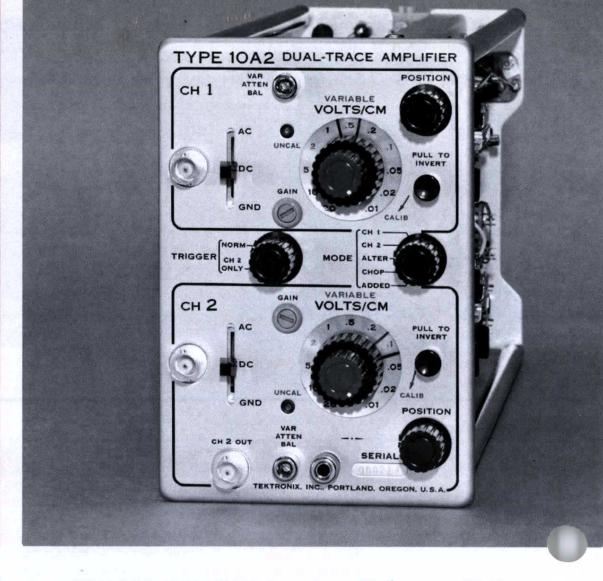


Et Et	NVIRONMENTAL CHARACTERISTICS
TEMPERATURE	OPERATING Type RM647: -30°C to +65°C. Type 647: -30°C to +65°C, continuous, when instrument is not tipped more than 20° in any direction from level position. When instrument is operated vertically (with front panel up), the maximum ambient temperature is +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 Mil-Std-202B, method 106A (except freezing and vibration) through 5 cycles (120 hours).
TRANSIT	NON-OPERATING Meets National Safe Transit test when factory-packaged: Vibration for one hour at slighty greater than one G. 18-inch drops on corners, edges, and flat surfaces, total of 10 drops.

Type 10 / 2 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 ($\pm 20\%$) 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 $+40^{\circ}$ 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 $\pm 2\%$ from -30°C to $+65^{\circ}\text{C}$. 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—7 pounds, approx.

E	NVIRONMENTA	L
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 Dis- placement	<1 cm/20°C	

TYPE 10A2 AMPLIFIER

\$675

Each instrument includes: 2-instruction manuals (070-376).

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



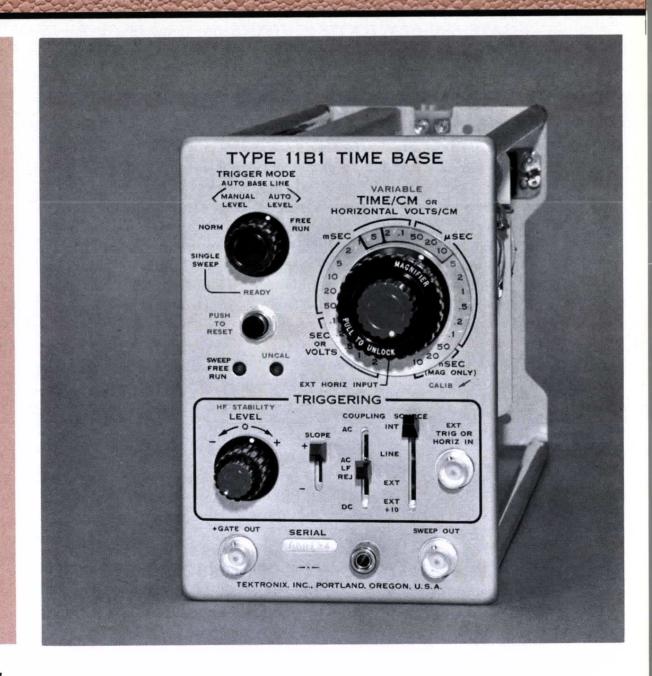
TIME-BASE UNIT Type

WIDE SWEEP RANGE

DIRECT-READING MAGNIFIER

FLEXIBLE TRIGGERING

SINGLE-SWEEP OPERATION



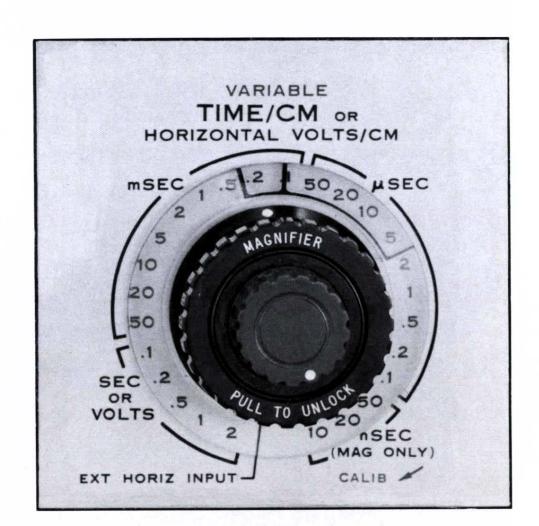
The Type 11B1 is a ruggedized time-base unit for the Type 647 Oscilloscope. It features a single wide-range time base and a direct-reading 1X to 50X sweep magnifier.

SWEEP RANGE from 0.1 $\mu sec/cm$ to 2 sec/cm is in 23 calibrated steps with 1-2-5 sequence. Sweep rates are continuously variable uncalibrated from 0.1 $\mu sec/cm$ 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 20 or 10 nsec/cm	±1% ±2%	±1.5% ±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 $\pm 2\%$, or 1 v/cm to 20 v/cm in 5 steps, accuracy within $\pm 5\%$ using the $\div 10$ 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 $\div 10$ " 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 $\div 10$ trigger attenuator.

TRIGGER SOURCE can be internal, external, external \div 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.

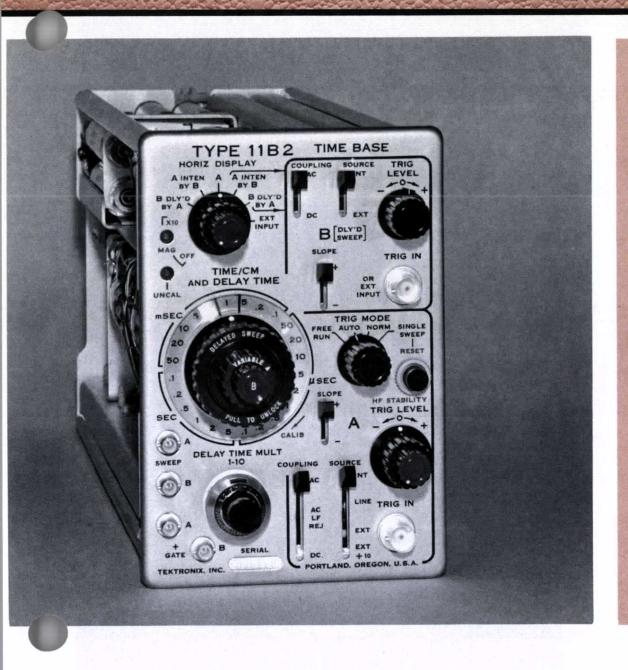
FREE-RUN LIGHT warns the operator when the sweep is free running. The indicator is particulary useful when setting up triggering in the automatic mode from a high repetition-rate external trigger source.

WEIGHT: Net-41/2 pounds. Shipping-7 pounds, approx.

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



TIME-BASE UNIT Type 1139



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 μ sec/cm to 5 sec/cm is in 24 calibrated steps with 1-2-5 sequence. Sweep rates are continuously variable uncalibrated from 0.1 μ sec/cm to approximately 12 sec/cm. A front-panel lamp indicates uncalibrated sweep rates.

10X SWEEP MAGNIFIER expands the center portion of the normal 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 $\pm 10\%$ without magnification or 0.1 v/cm $\pm 10\%$ 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 speed) when no input signal is applied, or when the input signal repetition rate is less than 20 cps. Above 20 cps, Time Base A is triggered at the repetition rate of the incoming trigger signal to achieve jitter-free displays to beyond 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 $\div 10$, 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) prevents low-frequency components, such as 60-cps hum, from interfering with stable operation.

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 at 50 Mc.

SWEEP DELAY

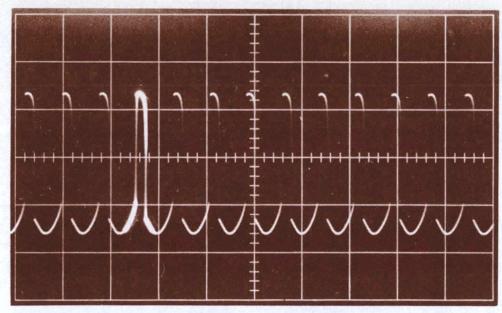
CALIBRATED DELAY RANGE from Time Base A is continuously variable, 1 μ sec to 50 sec. A ten-turn precision potentiometer permits accurate delay time multiplication of the Time Base A delay steps. The 3 fastest Time Base A rates are not normally used for delay generation.

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 10⁵ of Maxi- mum 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 completely jitter free. A steady display is thus provided for timemodulated pulses and signals with inherent jitter.

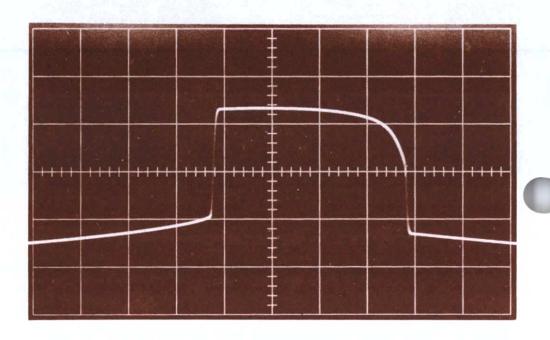
CONVENTIONAL OPERATION holds off the start of the delayed sweep for the precise amount of the selected delay time. Any time-modulation or jitter on the signal will be magnified in proportion to the amount of sweep expansion.

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 μ sec/cm and TIME BASE A is operating at 50 μ sec/cm, the magnification is 50 times.

TRACE BRIGHTENING indicates the exact 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 $-6\frac{1}{2}$ pounds, Shipping-9 pounds, approx.

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



TEST UNIT Type 10/11/11

For Standardizing:

Type 647 and RM647 Oscilloscopes to achieve interchangeability with a number of 10 and 11-Series Plug-In Units.

For Setting:

Power supply voltages
Horizontal amplifier gain
Vertical amplifier gain
Vertical amplifier transient response

For Checking:

Power supply ripple and regulation under different load conditions.

The Type 10/11M1 is designed to operate from +15°C to +35°C and will perform to the following specifications throughout this range.

Oscilloscope gain can be adjusted to within $\pm 0.3\%$ accuracy for the horizontal amplifier and within $\pm 0.7\%$ for the vertical amplifier.

An internal fast-rise electronic pulser is adjustable in amplitude, polarity, and repetition rate. Pulse risetime is nominally 3 nsec. Time markers can be inserted through an external input.

A front-panel output can be used in conjunction with a test oscilloscope to monitor dc error of the regulated power supplies. An output of 5 mv represents an error of 0.1%.

Non-operating environmental capabilities are identical to those of the Type 647.

Net weight is $4^{3}/_{4}$ lbs., shipping approx. 7 lbs.

TYPE 10/11M1 TEST UNIT \$500

Each instrument includes: 2-instruction manuals (070-441).



TYPE 647 ACCESSORIES

PROBE CHARACTERISTICS WITH TYPE 10A2 AMPLIFIER					
PROBE	P6006	P6007	P6008	P6009	
ATTENUATION RATIO	10X	100X	10X	100X	
INPUT RESIS- TANCE	10 megohms	10 megohms	10 megohms	10 megohms	
INPUT CAPACI- TANCE (typical)	6.7 pf	2.1 pf	7.7 pf	2.6 pf	
TOTAL RISETIME	<10 nsec	<10 nsec	<8.1 nsec	<7.1 nsec	
VOLTAGE RAT- ING	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**	
CABLE LENGTH	3.5′†	3.5'†	3.5'	9'	
PART NUMBER	010-127	010-150	010-129	010-170	
PRICE	\$22	\$22	\$35	\$55	

- *Peak-to-peak voltage derating is necessary for CW frequencies higher than 5.7 Mc.
- **Peak-to-peak voltage derating is necessary for CW frequencies higher than 200 kc.
- ***Peak-to-peak voltage derating is necessary for CW frequencies higher than 20 Mc.
- †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.

For applications where increased input resistance, reduced loading of the circuit under test, and retention of maximum passband are required, P6008 and P6009 Probes are recommended. In applications where passband is not a prime consideration, P6006 and P6007 Probes can be used. All probes include a variety of tips for easy access to components, even in crowded circuit conditions. Easy adjustment is a feature of all probes. They are compensated by merely turning the probe body with respect to the probe base.

PLUG-IN EXTENSIONS

12"	Rigid E	xtension	(Part	No.	013-077)	 \$20.75
30"	Flexible	Extension	n (Pai	rt No	. 012-080)	 24.00

REAR-PANEL CONNECTOR

10-Pin Connector for remote single sweep reset and external use of power supply voltages (Part No. 131-300) \$13.30

BNC to BSM ADAPTER

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

Type 661 SAMPLING OSCILLOSCOPE

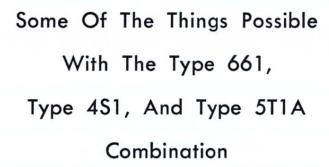


2 mv/cm to 200 mv/cm Calibrated Sensitivity Monitorable Dc Offset

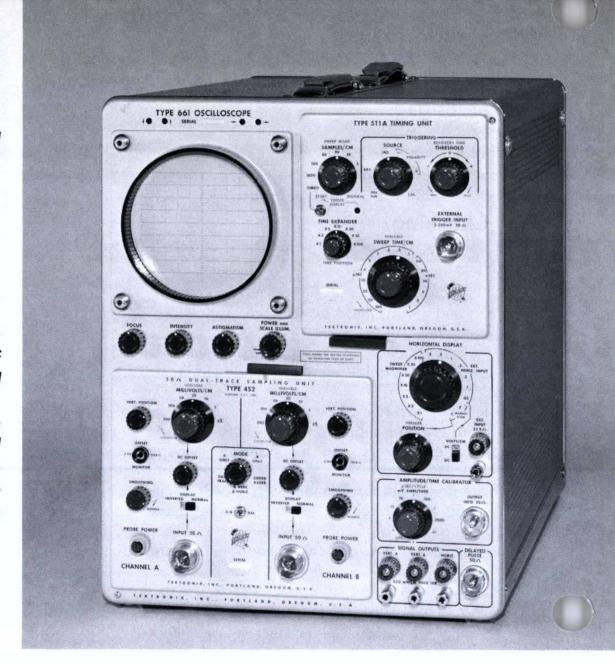
1 nsec/cm to 100 μsec/cm Calibrated Sweep Speed X2 to X100 Time Expander (constant dots/cm) Repetitive, single, or Timed Displays Delay through Full Time Base Duration

This compact and complete sampling system consists of a Type 5T1A 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. 100X 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.



- 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. Observe less than 10-psec time jitter on fastest sweep range (optimum triggering conditions).
- 3. Measure pulse risetime with 0.35 nanosecond response in both channels. Full scale time-measurement range extends to 1 millisecond.
- 4. Use time expansion of either 1, 2, 5, 10, 20, 50, or 100 times, while maintaining a constant number of samples/cm.
- Change time position over full unexpanded time-base duration for viewing expanded signals.



- 6. Display repetitive signals on 16 calibrated equivalent sweep rates from 1 nsec/cm to 100 μsec/cm, accurate within 3%. Magnifier provides sweep expansion from 1 to 100 times . . . time per dot remains the same for digital readout (rear panel connector provides signals for connection to counter).
- 7. Dot transient response and dc reference are independent of signal source impedance.
- 8. Reduce random system time jitter and amplitude noise by means of a smoothing control.
- Measure millivolt signals in the presence of a substantial dc component by means of a dc-offset voltage monitorable at the front panel.
- 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 dualtrace displays and signals added algebraically.
- Drive X-Y plotters or similar readout accessories, manually or automatically. Slow speed scan nominally set at 7.5 sec/cm.
- 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 1X, 2X 5X, 10X, 20X, 50X, or 100X, 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 μ sec/cycle to 10 μ sec/cycle in 4 decade steps. Accuracy with 50-ohm load is within 0.2%, except within 2% at 0.01 μ sec/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, Vertcial 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 ISO-LATED 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.

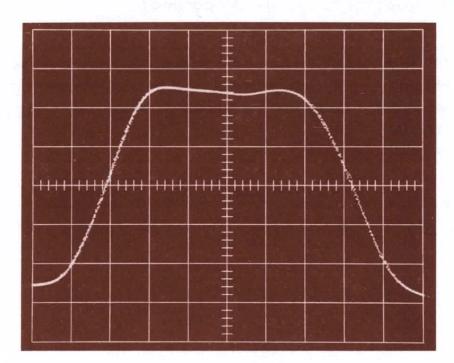
MECHANICAL FEATURES

Dimensions are $16\frac{7}{8}$ " high by $13\frac{1}{8}$ " wide by $23\frac{3}{4}$ " deep. Net weight is $49\frac{1}{2}$ pounds. Shipping weight is ≈ 67 pounds.

TYPE 661 OSCILLOSCOPE, without plug-in units \$1150

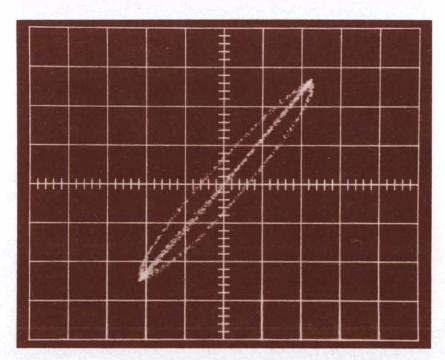
Each instrument includes: 1—light filter (378-514), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013) 2—instruction manuals (070-324).

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



TIME JITTER

A 1-volt 1.2 nsec pulse internally triggering the 4S1/5T1A system. Vertical sensitivity is 200 mv/cm, sweep speed is 0.2 nsec/cm (1 nsec/cm with 5X expander). Note very small amount of time jitter. Note clean 0.2-nsec risetime of the Type 109 Pulse Generator and 0.35-nsec risetime of the Type 4S1 combined for less than 0.4-nsec total risetime.



TYPICAL APPLICATION

2 gigacycle sine-wave driving inputs to 4S1 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 4 S 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 generalpurpose sampling plug-in unit with separate internal trigger takeoffs, delay lines, and terminations, which permit triggering on either A or B input signals.

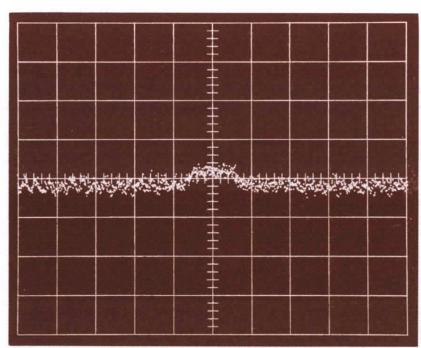
DISPLAY MODES include $\pm A$ only, $\pm B$ only, Dual-Trace, Algebraic Addition, and an X-Y display of A—vertically and B—horizontally (for observation of hysteresis loops, phase shift, similar displays). Independent controls for each channel permit positioning and inverting input signals as desired.

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.

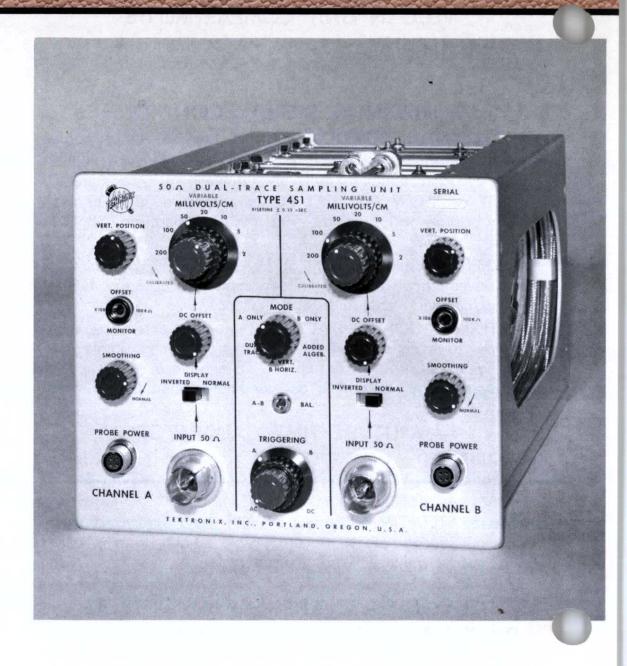
SENSITIVITY is in 7 calibrated steps from 2 mv/cm to 200 mv/cm, 1-2-5 sequence, accuracy within 3%. A variable control permits continuous adjustment uncalibrated from 200 mv/cm to 0.67 mv/cm.

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 4S1/5T1A 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 dots. Most observers agree that the tangential noise displayed is 0.8 millivolts (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-order signal discontinuities.

DYNAMIC RANGE is 2 volts. Full sensitivity can be used with overloads up to 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 1/8 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 cathodefollower probes. See Accessory pages.

WEIGHT: Net—151/4 pounds. Shipping—21 pounds, approx. TYPE 4S1 DUAL-TRACE SAMPLING UNIT \$1430

Each instrument includes: 2-10X 50- Ω attenuators (017-044), 2—5-nsec 50- Ω cables (017-502), 2—instruction manuals (070-329).

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





DUAL-TRACE SAMPLING UNIT Type 4 5 2

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, except for delay lines and internal triggering.

661/5T1A/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).

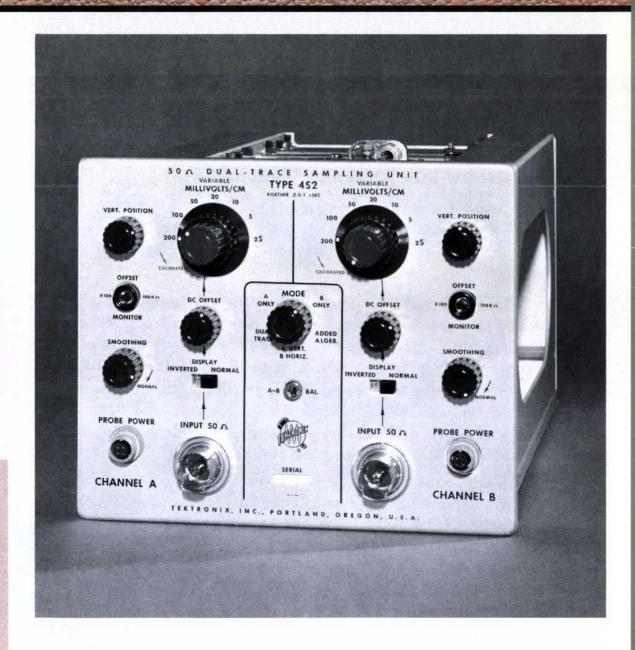
DISPLAY fractions of a degree of relative phase shift to over 3 gigacycle frequency with lissajous-mode operation (usually limited by harmonic content or residual reflections to a few degrees absolute). Over 500 Mc, use Type 280 Trigger Count-Down Unit.

DISPLAY MODES include $\pm A$ only, $\pm B$ 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 $\pm 5\%$.

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 $\pm 1\%$ resistor and approximately 3 pf.

PROBE POWER is available at the front panel for cathodefollower probes. See Accessory pages.

WEIGHT: Net—9 pounds. Shipping—15 pounds, approx.

TYPE 4S2 DUAL-TRACE SAMPLING UNIT \$1600

Each instrument includes: 2—10X 50- Ω attenuators (017-044), 2—2—5-nsec 50- Ω cables (017-502), 2—instruction manuals (070-356).

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

Type 4 S 3 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 μ v noise (smoothed)

±2-volt Dynamic Range

±1-volt DC Offset

The Type 4S3 Sampling Probe Unit 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.

S A M P LIN G - P R O B E DUAL - IRACE UNIT

WARRANTE MILLIVOLTS/CM

TYPE 453

MILLIVOLTS/CM

MONITOR

DISPLAY MODES include $\pm A$ only, $\pm B$ 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, 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 μ v 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 overloads up to ± 2 volts in amplitude. Safe overload is 10 volts momentary dc or peak ac (100 volts with 10X attenuator).

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 probeto-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.

P6038 DIRECT SAMPLING PROBE (010-156) \$225

2—instruction manuals (070-397).

Each Probe Package includes: 1—response normalizer (011-070), 1—10X attenuator 011-071), 1—coupling capacitor (011-072), 2—test point jacks, 1—hook tip assembly (206-114), 1—ground clip (175-249), 1—probe holder (352-024), 1—accessory box (202-123), 1—minigator clip (344-046), 1—instruction manual (070-400).

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





TIMING UNIT Type

1 nsec/cm to 100 µsec/cm Calibrated Sweep Speeds
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 provides flexible triggering and generates the time base. External trigger sensitivity is 5 mv, for pulses 1 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 2%), 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.

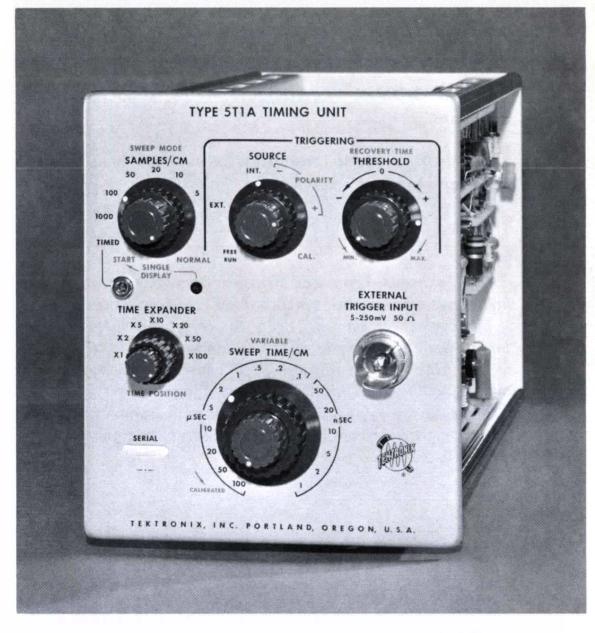
EQUIVALENT SWEEP RANGE from 1 nsec/cm to 100 μ sec/cm is in 16 calibrated rates with 1-2-5 sequence, accuracy within 3%. A variable control permits continuous adjustment uncalibrated from approximately 0.33 nsec/cm (3.3 psec/cm time expanded) to 100 μ sec/cm.

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 μ sec 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 1/2 nsec decay time constant.

TRIGGER THRESHOLD is continuously variable, $\pm 200 \text{ mv}$.

RECOVERY TIME may be varied from nominally 10 μ sec to 13 μ sec on sweep rates faster than 0.1 μ sec/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.

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.

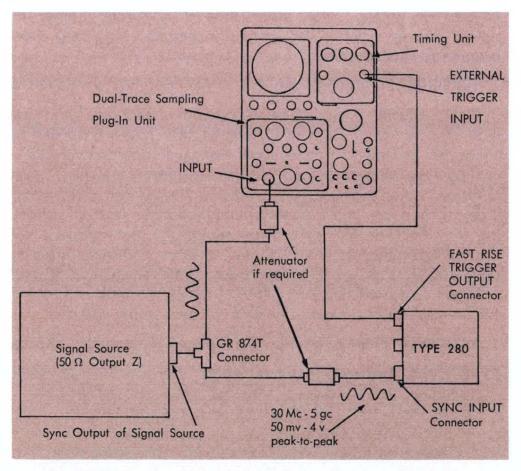
CHARACTERISTICS

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 5T1, 5T1A, or 3T77 and other high-speed sampling oscilloscopes).

AMPLITUDE OF TRIGGER OUTPUT as seen at oscilloscope input connector is approximately 50 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 $7^3/_8$ " high by $7^5/_8$ " wide by $4^5/_8$ " deep. Net weight is $4^1/_2$ pounds. Shipping weight is 9 pounds, approx.

TYPE 280 TRIGGER COUNTDOWN UNIT \$265

Includes: 2—instruction manuals (070-350), 1—5-nsec cable (017-512), 1—3-conductor power cord (161-015), 1—3 to 2-wire adapter (103-013).

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

TRANSISTOR SWITCHING-TIME TESTER Type

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.

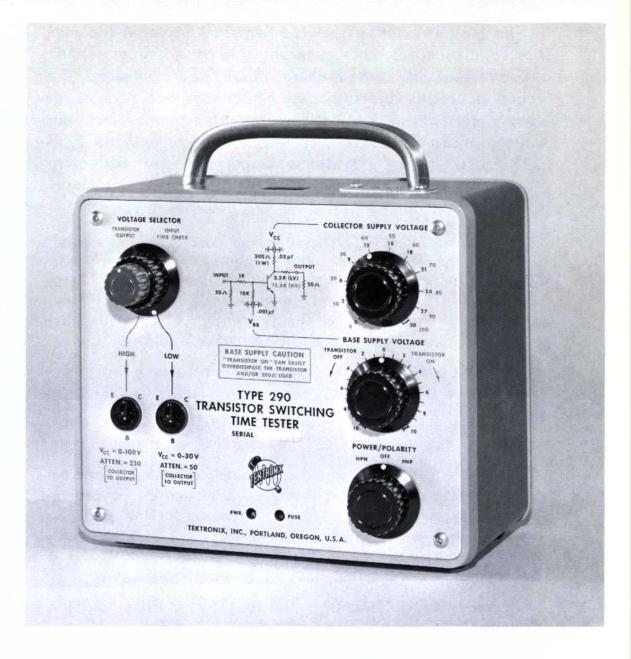
TWO TRANSISTOR TEST SOCKETS (HIGH and LOW) are mounted on the Type 290 to provide for easy insertion of the transistor into grounded-emitter test circuit. The HIGH socket connects to a collector supply of 0-100 v and the LOW to a collector supply of 0-30 v.

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 $V_{\rm be}$ 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 \pm 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: 2—instruction manuals (070-285), 1—10-nsec cable (017-501), 1—3-conductor power cord, (161-015), 1—3 to 2-wire adapter (103-013).

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.

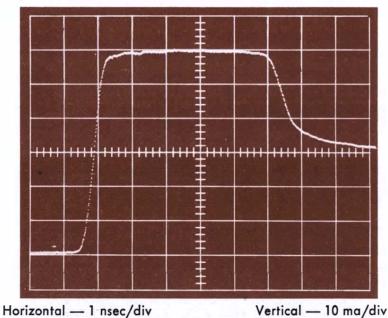
DIODE RECOVERY LOOP IMPEDANCE is 100 ohms.

SUPPLY CURRENT is provided in seven calibrated steps from 1 milliampere to 100 milliamperes 1-2-5 sequence. Calibration accuracy is within \pm 2% for all steps except the 100-milliamperes step, which is \pm 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 $8\frac{1}{8}$ " deep. Net weight is 6 pounds. Shipping weight is 9 pounds, approx.

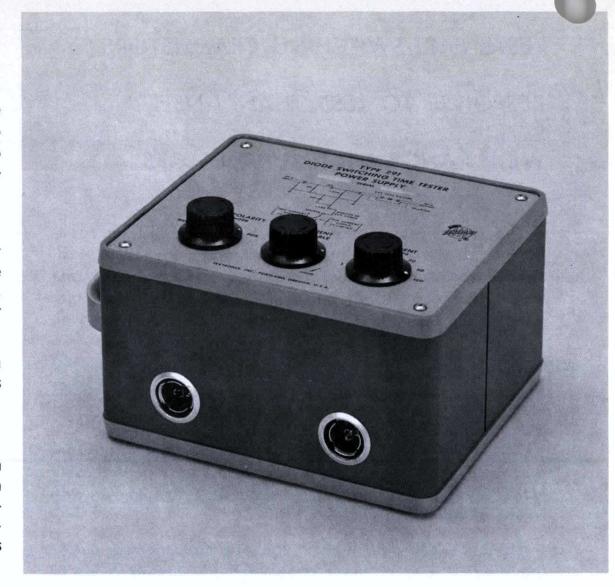
Includes: 2—instruction manuals (070-361), 1—3-conductor power cord (161-015), 1—3 to 2-wire adapter (103-013).



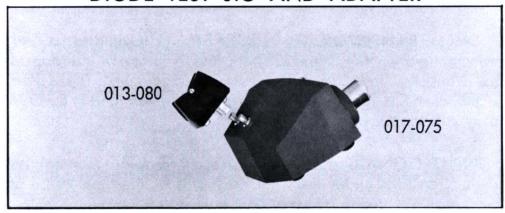
Diode Reverse Recovery Waveform

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.

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



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 nanoseconds and less than 2% ringing is introduced in a 0.35 nanosecond system. Conductive capacitance is less than 0.004 pf (side-to-side).

V-shaped field-replaceable contacts with a life expectancy of 10 million components utilize magnetic attraction to secure the diode and assure electrical continuity during a test. Diode ejection is either manual, by push button; or automatic, by solenoid (not included).

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— $1\frac{1}{2}$ " high by $1\frac{1}{4}$ " wide by $1\frac{1}{4}$ " deep; Adapter—2" high by 5" wide and $3\frac{1}{2}$ " deep.

DIODE TES	ST JIG (Part	Number 013-080)	 \$40
ADAPTER	(Part Number	r 017-075)	 \$55



SEMICONDUCTOR TESTER Type 2 **POWER SUPPLY**

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 subnanosecond 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 $\pm 3\%$ when the variable control is fully clockwise. An uncalibrated variable control allows the voltage of a fixed step to be attenuated 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 shortcircuit 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 $\pm 3\%$ when the variable control is fully clockwise. An uncalibrated variable control allows the current of a fixed step to be attenuated by any factor between 1 and at least 10. Ripple current (either polarity), listed below, applies for any current from about 2 μ a 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 $5~\mu a$		
50 ma	less than 10 μ a		
100 ma	less than 20 μ a		
200 ma	less than $100 \mu a$		

POWER REQUIREMENTS are from 105 v to 125 v or 210 v to 250 v, 50 to 60 cycles, 30 watts.

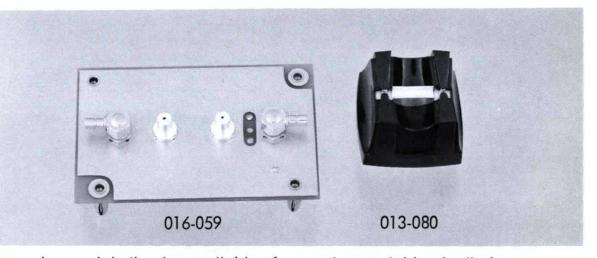
MECHANICAL SPECIFICATIONS include dimensions of 45/8" high by 8" wide by 10" deep. Net weight is 61/4pounds, approx. Shipping weight is 12 pounds, approx.



TYPE 292 SEMICONDUCTOR TESTER POWER SUPPLY \$325

Each instrument includes: 1—transistor test fixture, unwired (016-057), 3—P6040 cables (010-133), 1—3-conductor power cord (161-015), 1— 3 to 2-wire adapter (103-013), 2-instruction manuals (070-410).

OPTIONAL TEST ACCESSORIES



A special jig is available for testing axial-lead diodes. Contact-resistance problems are minimized by the use of Vshaped jig contacts.

An adapter will be required to mechanically support and electrically connect the diode test jig to the Type 292 plat-

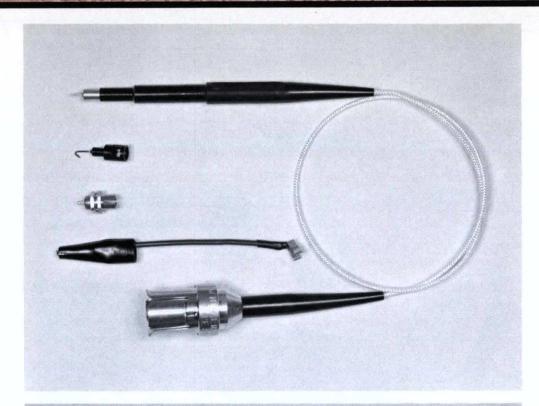
Careful design of the jig and adapter provides high-quality 50-ohm coaxial connections to the diode leads.

TEST JIG	ADAPTER, I	Part Number 016-059	,	\$21
DIODE TE	ST JIG, Par	t Number 013-080 .		\$40

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

SAMPLING ACCESSORIES

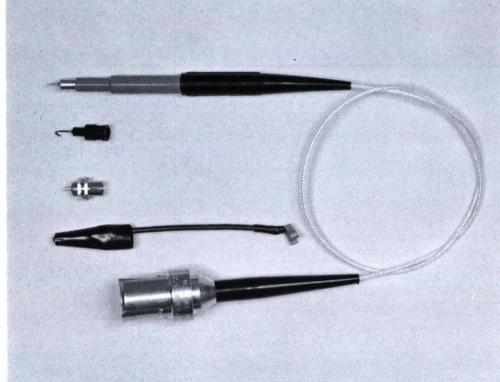




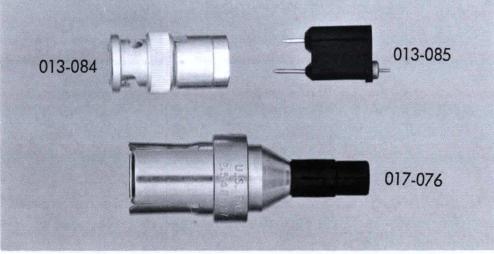
MINIATURE PASSIVE PROBES

for use with 50 ohm systems

TYPE P6034—10X Attenuation

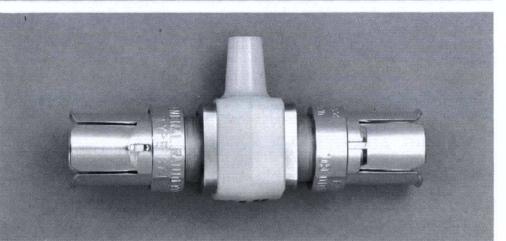


TYPE P6035—100X Attenuation



PROBE NOSE ADAPTERS

P6034, P6035, P6038 Probe Nose to BNC connector, Part Num-
ber 013-084 \$3.00
P6034, P6035, P6038 Probe Nose to GR connector, Part Number 017-076
P6034, P6035, P6038 Probe Nose bayonet ground assembly,
Part Number 013-085 \$2.50

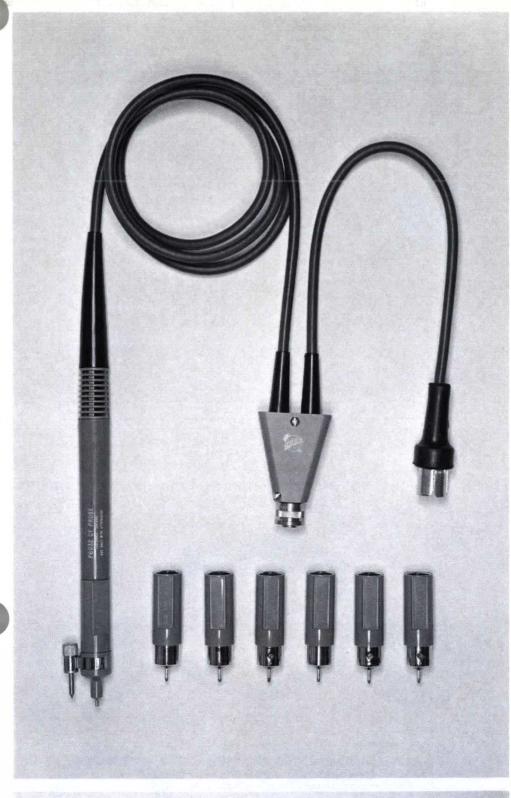


VOLTAGE PICKOFF

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	017-073	 \$25
VP-2—Order	Part	Number	017-077	 \$30

SAMPLING ACCESSORIES







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	$\pm 1.5 \mathrm{v}$	3.6 pf	10 meg
20X	±3.0 ∨	2.6 pf	10 meg
50X	±7.5 ∨	1.8 pf	10 meg
100X	±15 ∨	1.5 pf	10 meg
200X	±30 ∨	1.4 pf	10 meg
500X	\pm 75 v**	1.3 pf	10 meg
1000X	$\pm 150 \text{ v**}$	1.3 pf	10 meg
Attenuator Head		out Voltage (ped t 100% duty fa	
	500 Mc	750 Mc 1000 A	Ис 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.

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 \pm 150 mv into a 50-ohm load. Signal delay is approximately 10 nsec.

Order Part Number 010-108 \$220

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

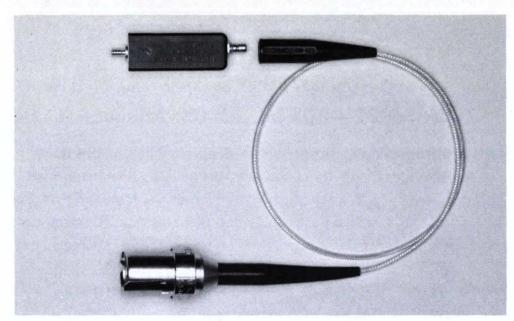
TRANSFORMER MATCHED "T"

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 017-012 \$45

^{**} 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.

SAMPLING ACCESSORIES



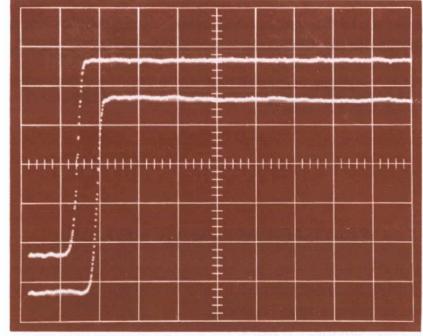
TYPE CT-1 CURRENT TRANSFORMER

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 $5 \mu \text{sec}$, approximated by 1% per 50 nsec, limit $1 \mu \text{sec}$. Maximum voltage is 1000 v, dc. Current ratings are 500 ma maximum RMS, 100 amp peak pulse (1 amp microsecond). Order Part Number $015\text{-}040 \dots \$17$

TYPE P6040 PROBE

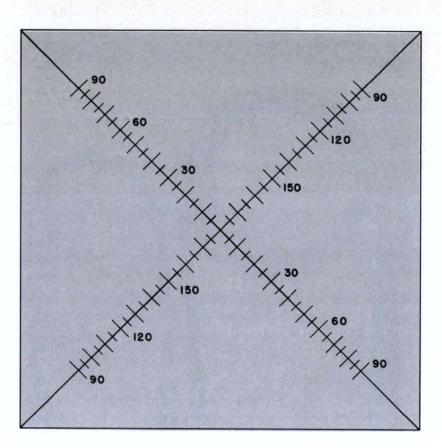
The Type P6040 is used as an inter-connecting cable for the Type CT-1 Transformer or other monitoring points using Amphenol series 27 Sub-Minax or Selectro Sub-Miniature RF connectors. The plug-on feature provides a quick means of connection to the CT-1. The 18"cable terminates in a GR type connector.



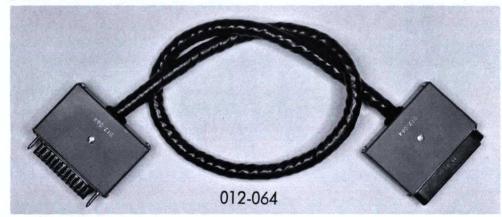
Dual-Trace Display of input and output of the Type CT-1.

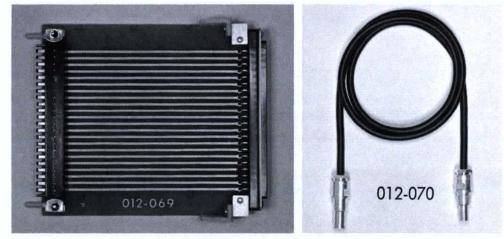
Vertical Sensitivity 10 mv/cm—Sweep Speed 5 nsec/cm. Upper waveform shows an input current step with 1-nsec risetime.

Lower waveform shows the output of the Type CT-1. Photo taken with Tektronix Type C-12 Camera and Type 661/4S1/5T1A Sampling System.



SPECIAL GRATICULE





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 U	Inite
Order Part Number 012-064 (24-pin extension	
Circuit-Board Extension for Dual-Trace Unit	
Order Part Number 012-069 (22-pin extension)	\$25.00
Coaxial Cable for Coupling Trigger Signals	Total Control of the
Order Part Number 012-070	\$10.50

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

WIDE-BAND HIGH-GAIN UNIT Type

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)

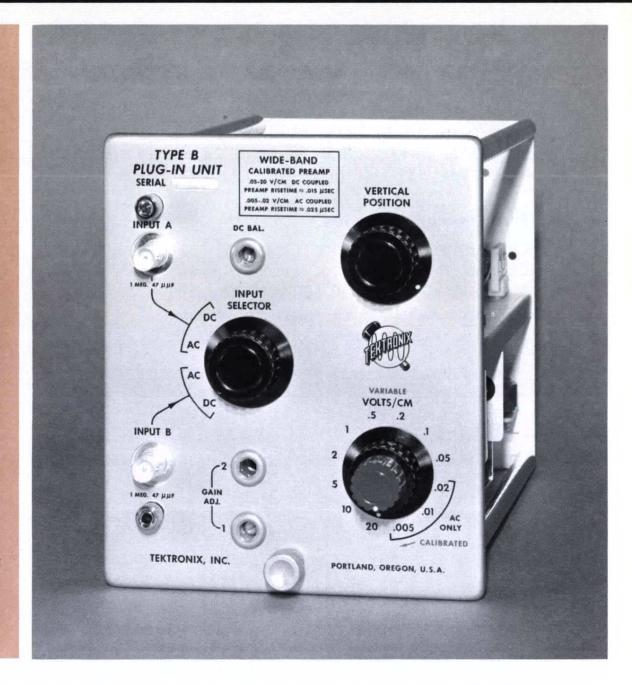
Frequency specifications are at 3-db down

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.

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 C-A DUAL-TRACE DC UNIT



Frequency Response and Risetime

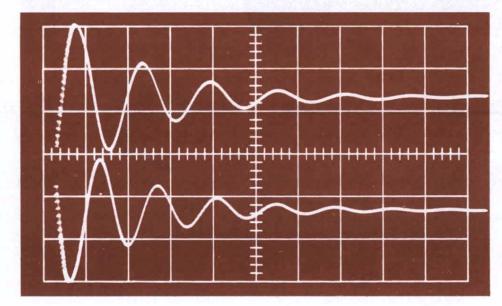
Frequency specifications are at 3-db down

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.

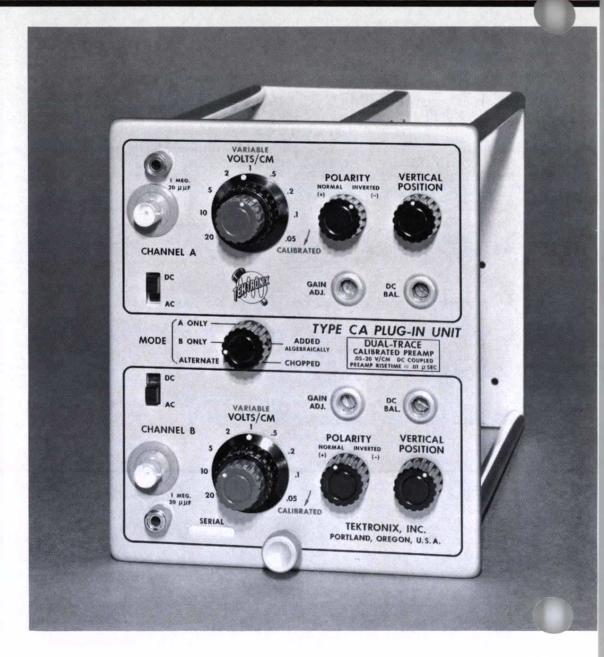
When operated A—B or B—A, common-mode rejection is at least 20 to 1 over the entire passband for signals up to 1-v amplitude. Rejection can be improved, especially at low frequencies, by adjusting the vernier attenuator controls and/or the GAIN ADJ. controls. Separate attenuator controls for each channel 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 $5-\mu sec$ 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 (070-318).

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



HIGH-GAIN DC DIFFERENTIAL UNIT Type



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 rejection ratio between in-phase and outof-phase signals.

Stability—Normal drift is from 2 to 5 mv/hr.

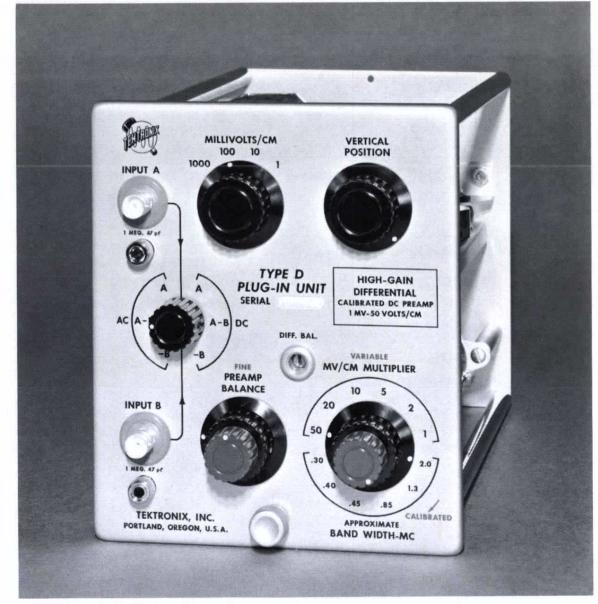
The Type D equips Tektronix Type 530, 540, 550 and 580* Series Oscilloscopes for work requiring dc-coupling at a sensitivity of 1 mv/cm. Differential input with high rejection ratio for in-phase signals permits cancellation of unwanted or interfering signals.

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 differentialbalance 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 my/cm and 100 my/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 my/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 my/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—4½ pounds Shipping—8 pounds, approx.

Each instrument includes: 2—instruction manuals (070-228).

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.

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 LOW-LEVEL AC DIFFERENTIAL UNIT



Sensitivity

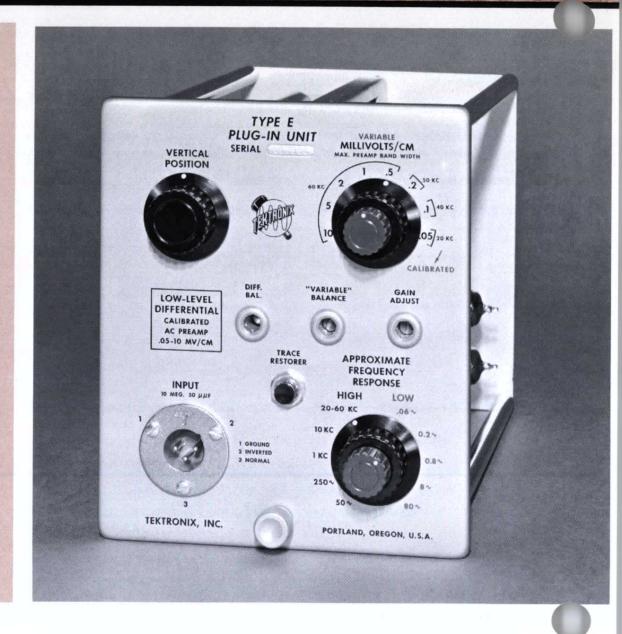
Calibrated—50 microvolts/cm to 10 millivolts/cm. Continuously Variable—50 microvolts/cm to 25 millivolts/cm.

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 μ v, 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 1/4 pounds Shipping—8 pounds, approx.

tion manuals (070-226).

TYPE E PLUG-IN UNIT \$190 Each instrument includes: 1—2-conductor cable (012-022), 2—instruc-

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



WIDE-BAND DC DIFFERENTIAL UNIT Type

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 gving 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 1/4 pounds.

Shipping—6 pounds approx.

TYPE G PLUG-IN UNIT \$190

Each instrument includes: 2—instruction manuals (070-241).

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.

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 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 dccoupling 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 fourposition switch. The INPUT SELECTOR provides for accoupling 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 (070-272).

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

Sensitivity

Calibrated-0.05 v/cm to 20 v/cm.

Frequency Response and Risetime

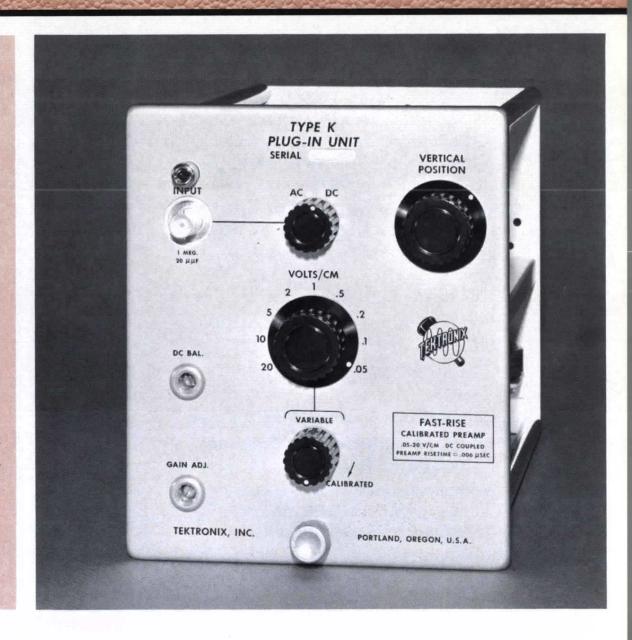
Frequency specifications are at 3-db down

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. Frequency response is down 3 db $\pm \frac{1}{2}$ db at 30 mc, 6 db at approximately 41 mc, 12 db at approximately 55 mc. The combined vertical-amplifier system is dc-coupled. When accoupled, 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. The 10X attenuator probe, furnished with Tektronix Fast-Rise Oscilloscopes, increases input impedance to 10 megohms paralleled by approximately 7 pf.

Weight: Net—3 ¾ pounds.
Shipping—8 pounds, approx.

TYPE K PLUG-IN \$145

Each instrument includes: 2—instruction manuals (070-230).

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

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. Frequency response is down 3-db $\pm \frac{1}{2}$ db at 30 Mc, 6-db at approximately 41 Mc and 12-db at approximately 55 Mc. An accoupled 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. The 10X attenuator probe, furnished with Tektronix Fast-Rise Oscilloscopes, increases the input impedance to 10 megohms paralleled by approximately 7 pf.

Weight: Net 4½ pounds
Shipping—8 pounds, approx.

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.

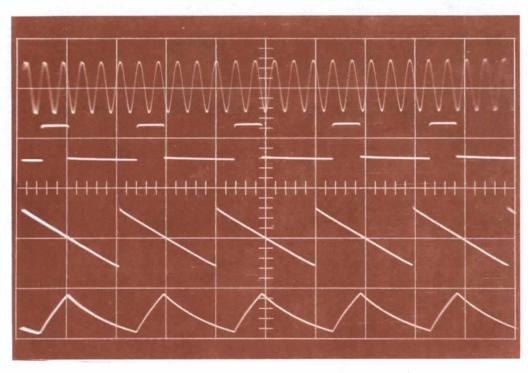


FOUR-TRACE UNIT Type

ELECTRONIC SWITCHING

DC-TO-20 MC PASSBAND

20 MV/CM MAXIMUM SENSITIVITY



In a Tektronix Oscilloscope that accepts letter-series plugins, 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 μ sec (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.

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

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

Type (

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 plugins, 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.

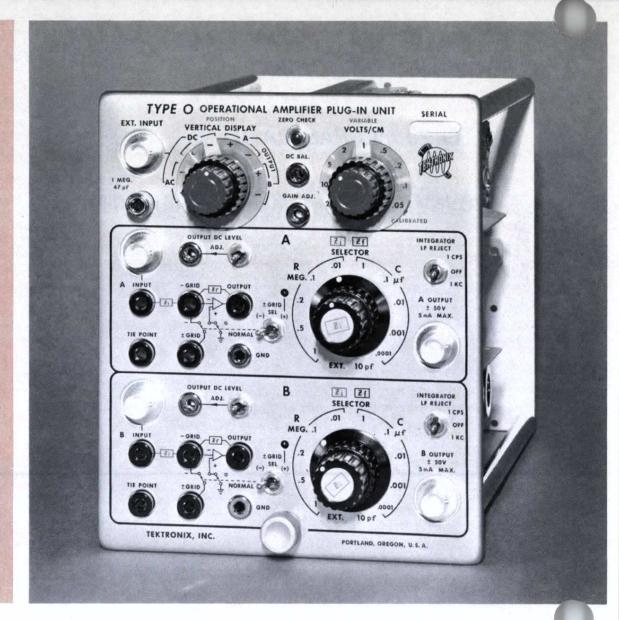
OPERATIONAL AMPLIFIERS

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 $\pm 50 \text{ v}$, $\pm 5 \text{ ma}$.

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 $R_{\rm f}=1$ 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 $\pm 1\%$, 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.

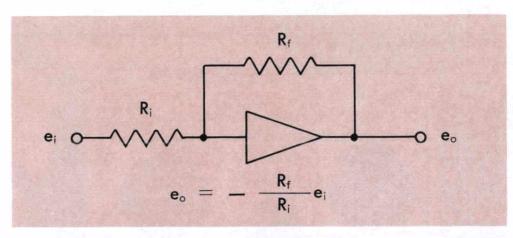
POSITIVE OR NEGATIVE FEEDBACK is possible.

VOLTAGE REJECTION (with 1 kc square wave) is at least 300 to 1 between operational amplifiers.

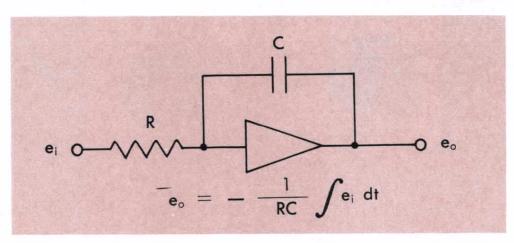
GRID CURRENT is less than 0.5 nanoampere for each input grid. Can be adjusted to less than 0.3 nanoampere for —grid and less than 0.15 nanoampere for + grid.

DRIFT is typically less than 10 mv/hr, referred to input, after warmup.

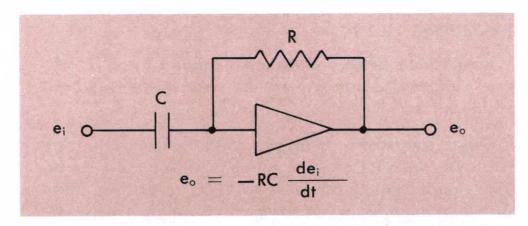
BASIC OPERATING MODES



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.



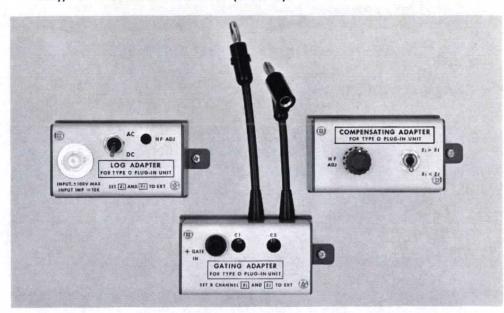
DIFFERENTIATION is accomplished by placing a capacitor in the input circuit. The unique characteristic of differentiation is its ability to extract higher frequency waveform components. It can advantageously detect minute information such as transients and slope changes. Differentiation of waveforms 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 (013-048), 2—terminal shields (013-049), 4—BNC to binding-post adapters (103-033), 2—instruction manuals (070-199).



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. Please refer to the catalog Accessory pages for complete information.

Order Part Number 013-067 \$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. Please refer to the catalog Accessory pages for complete information.

Order Part Number 013-068 \$75

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. Please refer to the catalog Accessory pages for complete information.

Order Part Number 013-081 \$35

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

Type (

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 \pm 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.

Dynamic plot of the depletionlayer capacitance of a backbiased diode.

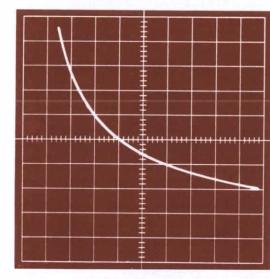
C Α

Α

Τ

Α

Ν C Ε



VOLTAGE

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 μ strain 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.

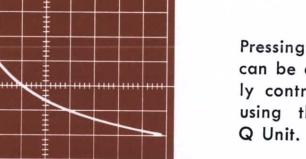
Capacitance Measurement—The Type Q Unit can be calibrated for direct reading in capacitance from 1 pf per division to a maximum value of 1000 pf without using a correction curve. Using a correction curve, the range can be extended to 10,000 pf per division. These specifications apply when using the internal 120ohm 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.

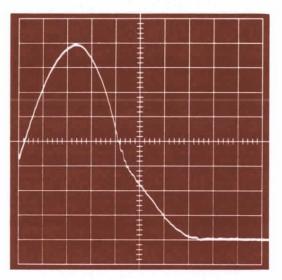
Capacitance Transducers—Using a capacitance transducer in conjunction with a four-arm resistive bridge results in the following maximum useful sensitivities:

120-ohm bridge (available internally) ... 1 pf/div 1000-ohm bridge 0.2 pf/div

Useful sensitivities are slightly lower when using long cables.



force can be accurate- O ly controlled by using the Type C Q Unit. Ε



TIME

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-51/4 pounds Shipping—10 pounds, approx.

TYPE Q PLUG-IN UNIT \$325

Each instrument includes: $1-120-\Omega$ internal bridge resistor assembly (013-025), 1 — 150-k calibration resistor assembly (013-026), 1 — 4-wire 15' shielded connecting cable (012-040), 2 — instruction manuals (070-199).

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

Type 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:

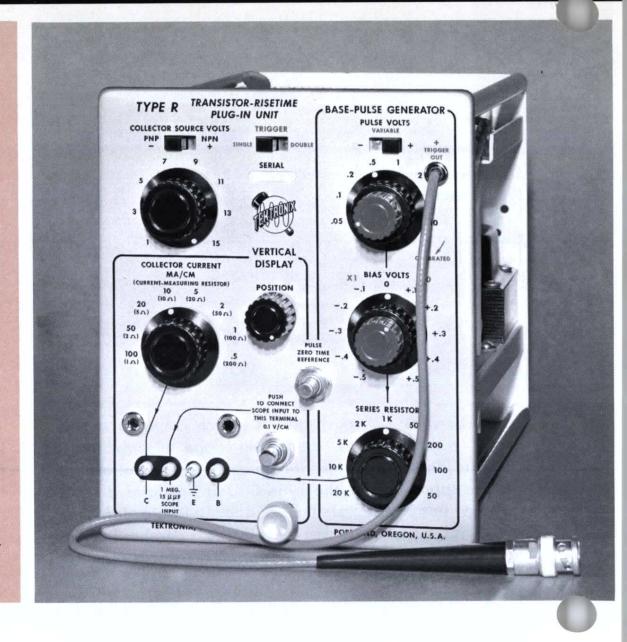
Type 551—14 nsec

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 μ sec. 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%.



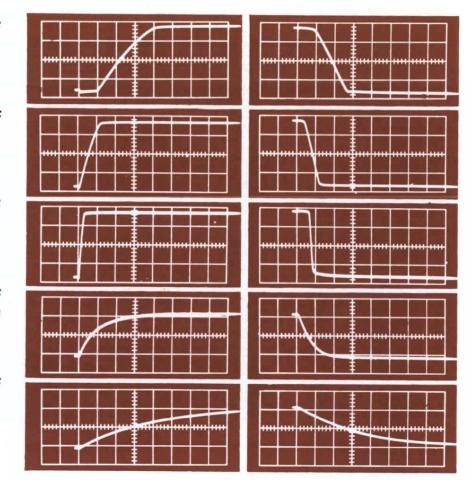
rive voltage: 10 v through 20 kilohms.

> 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- μ sec/div sweep rate. Driving conditions at left of each pair.

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.

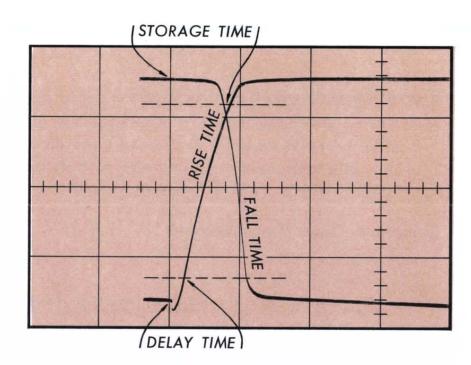
Triggering—A positive constant-amplitude trigger for the oscilloscope sweep is furnished through a short coaxial cable permanently attached to the Type R Unit.

Weight: Net—7 1/4 pounds Shipping—12 pounds, approx.

TYPE R PLUG-IN UNIT \$325

Each instrument includes: 1 — grounded emitter small transistor socket (386-852), 1 — grounded base small transistor socket (386-853), 10 — adapter springs (344-023), 2 — instruction manuals (070-286).

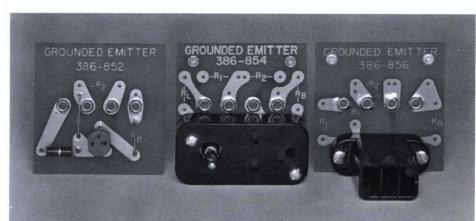
U. S. Sales Price f.o.b. Beaverton, Oregon Please refer to Terms and Shipment, General Information page.



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.

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.	Туре	Socket Type	Price
386-852	Gnd. Emitter	4-pin	\$5.00
386-853	Gnd. Base	4-pin	5.00
386-854	Gnd. Emitter	For power transistors such as 2N301 or 2N307	6.00
386-855	Gnd. Base	Same as above	6.00
386-856	Gnd. Emitter	Funnel type for long leads	6.00
386-857	Ġnd. 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

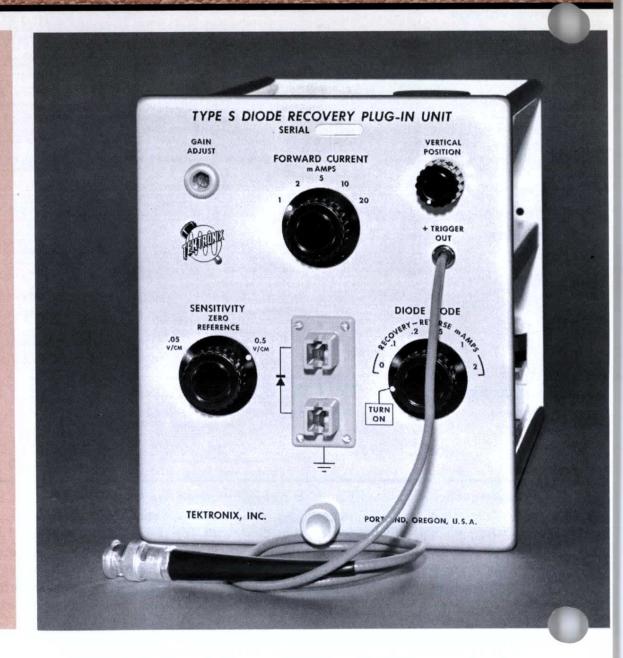
0, 0.1, 0.2, 0.5, 1, and 2 milliamps.

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 SEN-SITIVITY 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.

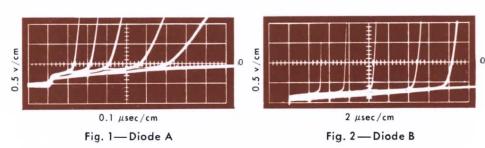
Eleven Calibrated Currents—Two switches, FOR-WARD CURRENT and DIODE MODE, provide eleven calibrated currents: the forward currents range from 1 to 20 milliamps, and the reverse currents range from zero to 2 milliamps, accuracy within 3%.

Weight: Net—41/4 pounds

Shipping—9 pounds approx.

Each instrument includes: 2-instruction manuals (070-223).

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



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.

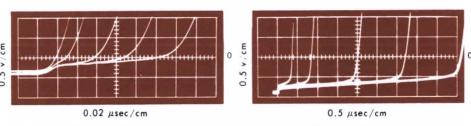
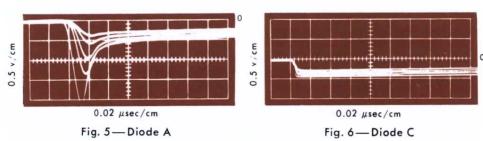


Fig. 3 - Diode A

Fig. 4 - Diode B

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.

I forward—1, 2, 5, 10, 20 ma. I reverse—2 ma.



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

TIME-BASE GENERATOR UNIT



Wide Sweep Range

Twenty-two calibrated sweep rates from 0.2 μ sec/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 μ sec/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 μ sec/div to 6 sec/div. Calibration accuracy of the fixed sweep rates will be within 3%.

Output Waveforms—Approximately +20 v Gate and +150 v sawtooth are available at front panel connectors. A 20-v positive-gate waveform of the same time duration as the sweep, and a 150-v 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 μ sec/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 3/4 pounds

Shipping—9 pounds, approx.

TYPE T PLUG-IN UNIT \$240

Each instrument includes: 2—instruction manuals (070-337).



DIFFERENTIAL COMPARATOR UNIT Type

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 hoe or hob.

High Amplitude Hum Rejection—

Reject up to 200 volts peak-to-peak common-mode hum.

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.



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—

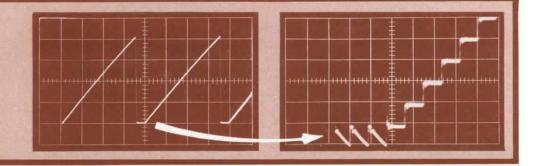
Measure residual amplitude modulation on a carrier, hum noise, etc., or incidental amplitude modulation on an FM or PM signal.

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.



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

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.

* A Type 81 Adapter is required.

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 $\pm 0.1\%$ in 100-hour drift test of comparison voltages.

Precision Potentiometer—

Zero-based linearity of $\pm 0.05\%$.

Resolution and Accuracy—

0.5 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 time.

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.

Variable Attenuation Probe

Initially designed for the Type Z Plug-In Unit for greatest accuracy at high sensitivity, the 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 capacities between 20 pf and 47 pf.

Order Part Number 010-167 \$40

Please refer to Catalog Accessory Section for additional information.



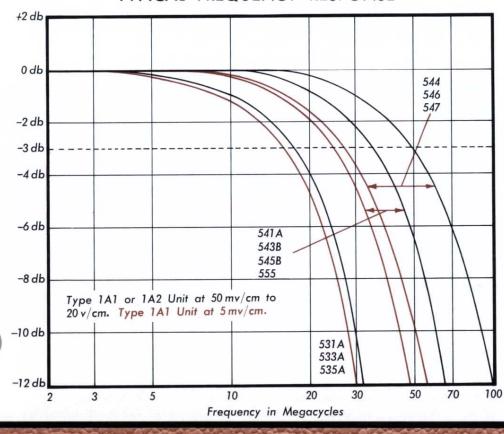
WIDE-BAND DUAL-TRACE DC UNITS Type





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, but 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), front-panel trigger output, front-panel signal output. In addition, Channel 1 Output, when cascaded into Channel 2 provides approximately 500 μv/cm sensitivity (ac coupled).

TYPICAL FREQUENCY RESPONSE



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 IMPEDANCE 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 580-Series Oscilloscopes require a Type 81 Adapter.

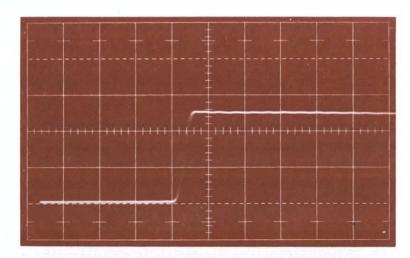
GAIN/PASSBAND CHARACTERISTICS				
OSCILLOSCOPE	Type 1A	Type 1A1 and 1A2		
TYPE	Single-Channel Passband and Risetime at 500 μ V/CM	Dual-Channel Passband and Risetime at 5 MV/CM	Dual-Channel Passband and Risetime at 50 MV/CM	
544, 546, 547	2 cps to 15 Mc	dc to 28 Mc	dc to 50 Mc**	
	23 nsec	12.5 nsec	7 nsec	
541, 541A, 543, 543A, 543B, 545, 545A, 545B, 555, 581*, 581A*, 585*, 585A*	2 cps to 14 Mc	dc to 23 Mc	dc to 33 Mc	
	25 nsec	15 nsec	10.5 nsec	
551	2 cps to 13 Mc	dc to 21 Mc	dc to 27 Mc	
	26 nsec	16.5 nsec	13 nsec	
531A, 533, 533A, 535A	2 cps to 10 Mc	dc to 14 Mc	dc to 15 Mc	
	35 nsec	25 nsec	23 nsec	
531, 535, 536	2 cps to 8 Mc	dc to 10.5 Mc	dc to 11 Mc	
	44 nsec	33 nsec	31 nsec	

^{*} Type 580-Series Oscilloscopes require a Type 81 Adapter.

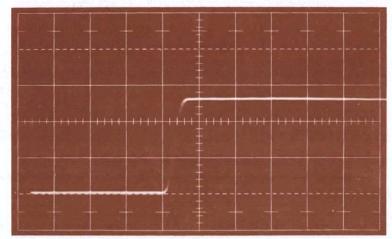
CLEAN HIGH-FREQUENCY RESPONSE

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.

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.

CHANNEL 1 SIGNAL OUTPUT is available at the front panel with up to 10X amplification. Output is at a source impedance of $\simeq 50~\Omega$. The Channel 1 output may be ac coupled into Channel 2, providing approximately 500 $\mu v/cm$ 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 $5\frac{1}{2}$ 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 (012-076), 1—female BNC to male UHF adapter (103-015), 2—instruction manuals (070-378).

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.

COMMON-MODE REJECTION is at least 20:1 throughout the full instrument passband for signals up to $\frac{1}{2}$ v pk-to-pk amplitude (measured at 50 mv/cm with variable attenuator in calibrated position).

NET WEIGHT is $4^{1}/_{4}$ pounds. Shipping weight is approximately 8 pounds.

TYPE 1A2 DUAL-TRACE PLUG-IN UNIT \$325 Each instrument includes: 2—instruction manuals (070-430).

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

*This output is utilized for internal triggering in Type 547, RM547, and Type 555 Oscilloscopes with Type 21A and 22A Time Base Units.

^{**} 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.



DC-to-1MC AMPLIFIER UNIT Type 2 A 6

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 $0.05\,\text{v/div}$, $0.5\,\text{v/div}$, $5\,\text{v/div}$ and $50\,\text{v/div}$; accuracy is within 3%. Uncalibrated continuous control from $0.05\,\text{v/div}$ to $500\,\text{v/div}$.

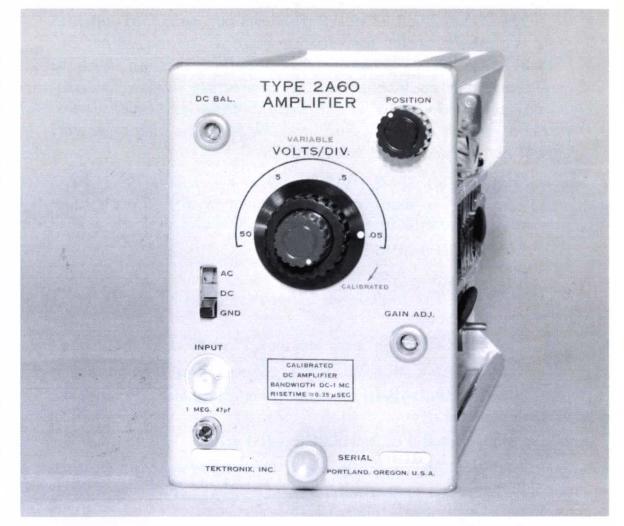
PASSBAND is dc to 1 Mc.

RISETIME is $0.35 \mu sec.$

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.



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 in put.

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 μ v peak-to-peak (3.5 μ v rms) at maximum bandwidth.

TRACE RESTORER button returns the trace to its normal vertical position after the trace has been driven off the screen.

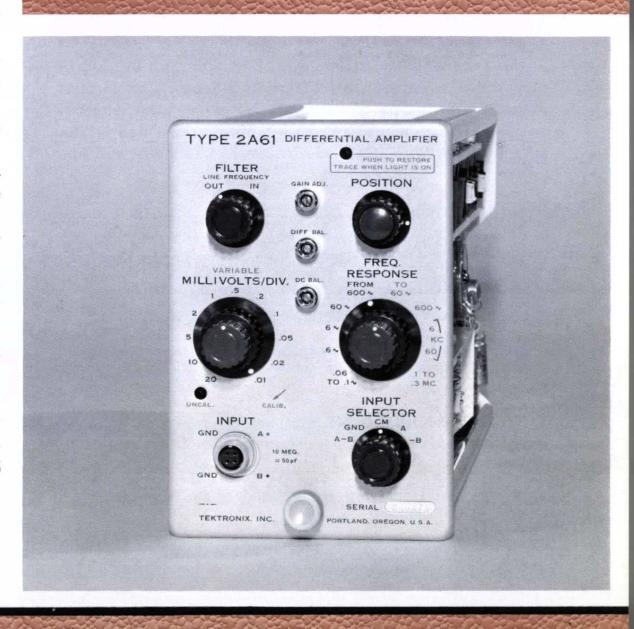
INPUT IMPEDANCE is 10 megohms paralleled by pprox50 pf.

NET WEIGHT is $4\frac{1}{4}$ pounds. Shipping weight is ≈ 5 pounds.

Each instrument includes: 2—instruction manuals (070-321), 1—input cable (012-072).

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

LOW-LEVEL DIFFERENTIAL Type 2/4/61 AMPLIFIER



Type 2463 DIFFERENTIAL AMPLIFIER UNIT



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 μ sec (approx).

DIFFERENTIAL INPUT has better than 50-to-1 CMR (Common Mode Rejection).

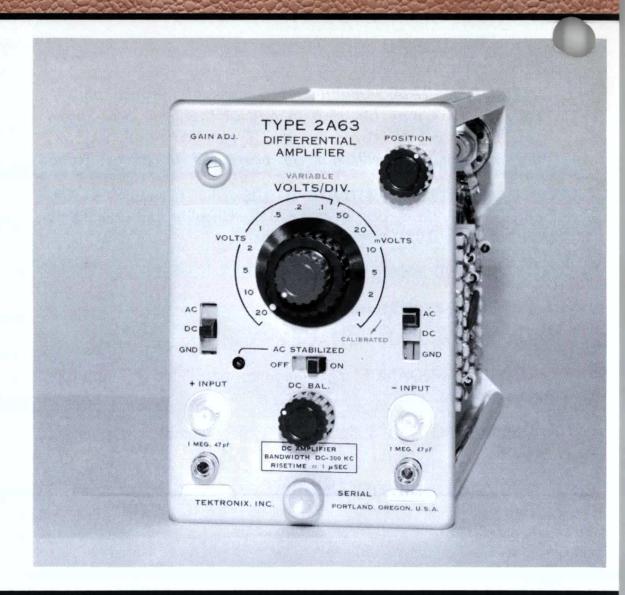
PHASE SHIFT is nominally less than 1° at 50 kc.

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 $3\frac{3}{4}$ pounds. Shipping weight is 5 pounds, approx.



Type 2B67 TIME-BASE UNIT

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 μ sec/div to 5 sec/div in 21 steps,1-2-5 sequence; accuracy 3%—with magnifier 5%. Uncalibrated continuous control from 1 μ sec/div to 12 sec/div.

5X MAGNIFIER extends sweep rate to $0.2 \,\mu sec/div$.

SINGLE SWEEP for one-shot waveform photography.

TRIGGER FACILITIES include Internal, External, Line; Amplitude-Level Selection; AC or DC Coupling; Automatic or Free Run; \pm 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 $4\frac{1}{4}$ pounds. Shipping weight is 5 pounds, approx.



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

188





DUAL-TRACE DC-to-10MC UNIT Type





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 3A1, 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. 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 μ sec (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.).

U.S. Sales Price 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.

Type $\frac{3A2}{3B2}$ DUAL-TRACE AMPLIFIER UNIT







Tektronix Type 3A2 Dual-Trace Amplifier Unit and Type 3B2 Time-Base Unit enable low and medium frequency digital read-out 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

OPERATING MODES are Channel 1, Channel 2, Added, Alternate, or Chopped. In chopped operation, successive 12 μ sec segments of each channel are displayed at an approx. 40 kc rate per channel. Chopped transient blanking is provided.

SENSITIVITY from 10 mv/div to 10 v/div is in 10 calibrated steps with 1-2-5 sequence, accuracy within 3%. An uncalibrated control permits continuous adjustment between steps and to approximately 25 v/div.

AMPLIFIER PASSBAND is dc to 500 kc for analog display. SEPARATE CONTROLS include those for attenuation, inversion, positioning, and ac or dc-coupling of each channel.

TRIGGERING can be from Channel 1, Channel 2, or from the signal displayed on the screen.

INPUT IMPEDANCE is 1 megohm, paralleled by approximately 47 pf.

MAXIMUM VOLTAGE INPUT is 600 v (dc plus peak ac).

NET WEIGHT is 51/4 pounds. Shipping weight is 8 pounds

NET WEIGHT is $51/_4$ pounds. Shipping weight is 8 pounds, approx.

TYPE 3A2 DUAL-TRACE AMPLIFIER UNIT \$500 Each instrument includes: 1—BNC to binding-post adapter (103-033), 2—instruction manuals (070-354).

TYPE 3B2 TIME-BASE UNIT

TRIGGERING LEVEL operates over a \pm 12 volt range.

TRIGGER-SOURCE can be internal with 2 mm signal display (from oscilloscope calibrator), external with 0.4 v signal, or line.

TRIGGER COUPLING can be AC Slow, AC Fast, or DC; \pm Slope.

SWEEP RANGE from 2 μ sec/div to 1 sec/div is in 18 calibrated steps with 1-2-5 sequence, accuracy within 3%. Calibrated digital readout available from 1 sec/div through 20 μ sec/div ranges.

DIGITAL RESOLUTION selects crystal-controlled clock rates from $1.0~\mu sec$ to 10~msec in 5 decade steps. Resolution can be selected independently of sweep time, to increase readout accuracy when the first significant digit is known. The front panel indicates the maximum resolution (without possible counter overflow) that can be attained for each sweep rate.

CALIBRATED SWEEP DELAY can be switched in or out. Delay time is continuously variable from $5\,\mu \rm sec$ to 10.5 sec, accuracy within 1%.

OUTPUTS are available at front-panel BNC connectors. The Delayed Trigger output is nominally + 5 v; Sweep Gate is nominally + 15 v.

NET WEIGHT is 5 pounds. Shipping weight is 8 pounds, approx.

TYPE 3B2 TIME-BASE UNIT \$650

Each instrument includes: 2—instruction manuals (070-355).



DUAL-TRACE DIFFERENTIAL AMPLIFIER Type

100 μV/CM SENSITIVITY DIRECT COUPLED

50,000:1 COMMON-MODE REJECTION

CONSTANT BANDWIDTH

AT ALL SENSITIVITIES

HI or LO BANDWIDTH SELECTION

AC STABILIZATION

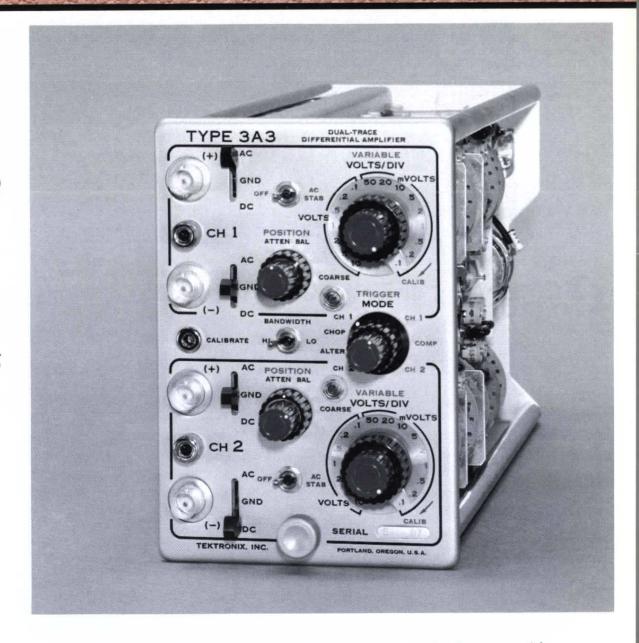
The Type 3A3 Dual-Trace Differential Amplifier is designed for use with all Tektronix 560-Series Oscilloscopes except the Type 560 itself.* The Type 3A3 contains two independent high-gain amplifier channels. Either channel may be used to produce a display, or the two channels electronically switched 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 $\mu v/cm$ 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 $\mu v/cm$ 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 $2-\mu sec$ 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.

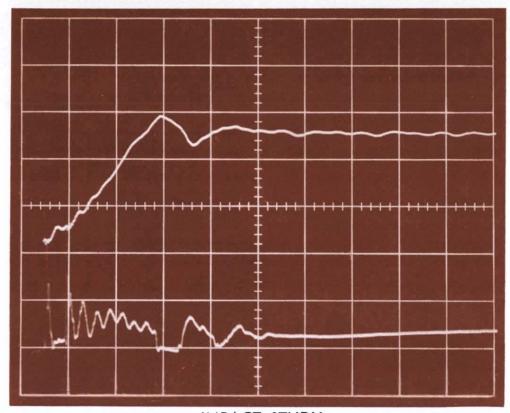
DRIFT is typically less than 500 $\mu v/hour$ after 30-minute warm-up.

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. Dual X-Y displays can be obtained with 2 Type 3A3 Units, or 1 Type 3A3 and a Type 3A74.

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 \approx 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.



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 $100~\mu v/cm$ (dc coupled). Accelerometer is connected single-ended to the lower channel at $200~\mu v/cm$ (dc coupled).

unit rear connecting pins. These ground-referenced outpoon can be used to drive recorders with high input impedance, or other equipment. Output from Ch 1 or Ch 2 is a differential \approx 2.5-volt signal for each centimeter of displayed signal. Output from the common output amplifier is a differential \approx 5-volt signal for each centimeter of displayed signal. Bandwidth is dc to \approx 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 10⁶:1 (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.

WEIGHT: Net— 6 pounds. Shipping—10 pounds, approx.

TYPE 3A3 DUAL-TRACE DIFFERENTIAL AMPLIFIER .. \$790

Each instrument includes 4 BNC to binding-post adapters (103-033) and 2 instruction manuals (070-408).

	Deferred to	Input Connectors	Deferred to	Innut of Dranauly	
	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	TO SERVICE		
DC to 10 cps			50,000:1		
15 cps		500:1			
60 cps		2,000:1	第二届新疆 发展的		
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		
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			
With 10 volts peo With common-mov/cm, and with 6	ak-to-peak or less ode amplitude at 500 volts peak-to-p	mmon-mode signals. in common mode at input conput connectors of 100 voleak or less from 0.2 v/cm to will not overdrive the	ts peak-to-peak or o 10 v/cm.	less from 20 mv/cm to 0.	



DUAL-TRACE DC-to-650KC UNIT Type

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- μ sec 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.

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 (070-274).



AMPLIFIER UNIT Type 3/75

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 μ sec.

MAXIMUM INPUT VOLTAGE is 600 volts.

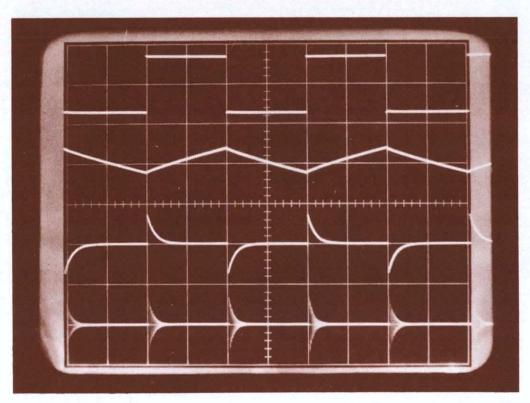
INPUT IMPEDANCE is 1 megohm paralleled by approximately 47 pf.

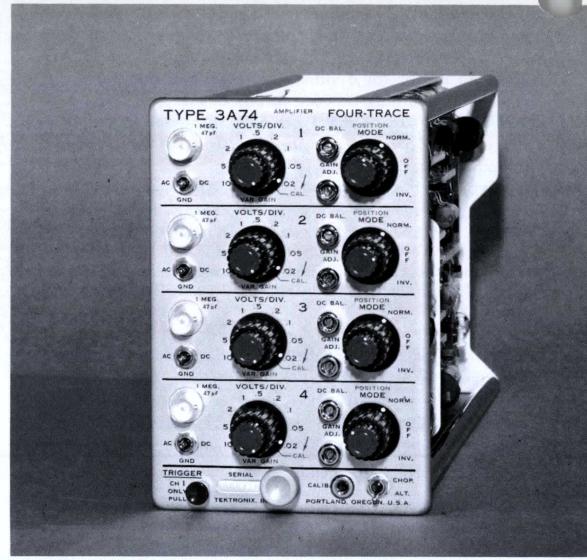
NET WEIGHT is $3\frac{1}{2}$ pounds. Shipping weight is 8 pounds, approx.



Type 3/7/4 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.

PASSBAND is dc to 2 Mc.

* For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-267.

RISETIME is approximately $0.17 \mu sec.$

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 $6\frac{1}{4}$ pounds. Shipping weight is 7 pounds, approx.

BNC ADAPTERS

Adapter, BNC to Binding Post Order Part Number 103-033	\$1.60
Adapter, BNC to UHF Order Part Number 103-032	\$3.55

For BNC probes, cables, and accessories, please refer to Catalog Accessory Section.



TIME-BASE UNIT Type 3

NORMAL AND DELAYED SWEEPS

FLEXIBLE TRIGGERING

5X MAGNIFICATION

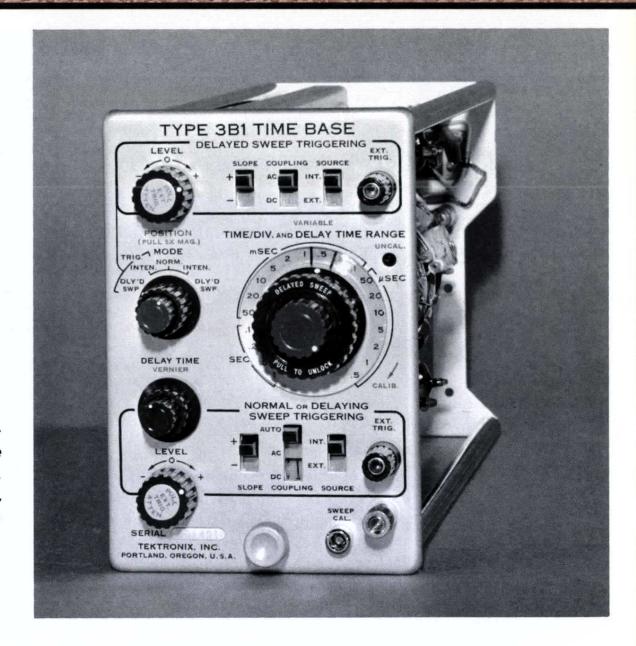
The Type 3B1 Time-Base Unit is used to generate normal and delayed-sweeps. Flexible triggering facilities are similar for both the normal sweep and the delayed sweep. The unit can be used with the Type 561A, RM561A, 564, RM564, 567, and RM567 Oscilloscopes. However in the Type 567 and RM567, the measurements will not be presented in digital form.

CALIBRATED SWEEP RANGE for both normal and delayed sweeps is $0.5 \,\mu \text{sec/div}$ 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 μ sec/cm.

SWEEP DELAY permits operation of the delayed sweep after a delay interval of $0.5~\mu sec$ 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 TRIG-GERED, 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; \pm Slope.

External Trggering—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 $5\frac{1}{4}$ pounds. Shipping weight is 8 pounds, approx.

Type 3 B 3 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.

callbrated sweep sweep 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 $\mu sec/cm$.

SINGLE SWEEP operation facilitates photographic recordings of waveforms.

SWEEP DELAY operation permits accurate setting and measuring of delay intervals from 0.5 μ sec 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 $\pm 1\%$ of full scale reading. Delay time linearity is within $\pm 0.2\%$ of full scale from 5 μ sec 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 at 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. (070-365).



TIME-BASE UNIT Type 3 34

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.

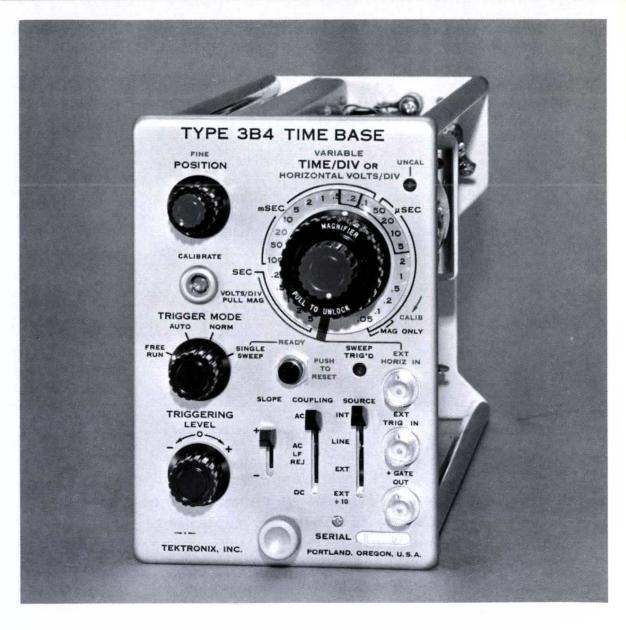
CALIBRATED SWEEP RATE is $0.2\,\mu sec/div$ to $5\,sec/div$ in 23 calibrated steps in a 1-2-5 sequence. After a single adjustment to match the time base to the oscilloscope used, calibration accuracy is within 3% from $0.2\,\mu sec/div$ to $2\,sec/div$; within 5% at $5\,sec/div$. Sweep rates are continuously 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 Free-Run, Automatic (with bright base-line MODES— in the absence of a trigger), Normal,

Single Sweep.

SOURCE— Internal, External ÷ 10, Line.

COUPLING— AC, AC LF Reject, DC.

TRIGGER POINT— ±Slope, ±Level: Two effective level

ranges for external triggering — $\pm 15 \,\mathrm{v}$

(Ext) or ± 150 v (Ext \div 10).

SENSITIVITY— 1 minor graticule division Int or 0.2 v Ext

(2 v in Ext \div 10). DC to 20 Mc.

FREQUENCY Essentially dc to 20 mc with reduced sensi-

RANGE— tivity above 20 Mc.

TRIGGER LIGHT— A front panel light indicates when the

sweep is receiving a triggering signal—especially convenient when using an ex-

ternal trigger.

EXTERNAL HORIZONTAL INPUT is calibrated in 5 steps from 0.2 v/div to 5 v/div (max input $\pm 20 \text{ v}$); accuracy, when plug-in unit is matched to oscilloscope, is within 3%. The External Input Amplifier is dc coupled.

NET WEIGHT is $4\frac{1}{2}$ pounds. Shipping weight is 6 pounds, approx.

Type 3066 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:

- Desirable high gain with essentially no drift resulting from input signal conversion to carrier modulation followed by ac amplification.
- 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.
- 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.

CAPACITIVE TRANSDUCERS used in conjunction with a fourarm 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 push-button 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 $5\frac{1}{4}$ pounds. Shipping weight is 7 pounds, approx.

TYPE 3C66 AMPLIFIER UNIT \$400

Each instrument includes: 1—synchronizing cable, RG174/U (012-063), 1—4-wire 15' shielded connector cable (012-040), 1—120 Ω internal bridge resistor assy. (013-025), 1—150 k calibration resistor assy. (013-078), 2—instruction manuals (070-357).

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

TYPE 3C66 CARRIER AMPLIFIER BLOCK DIAGRAM

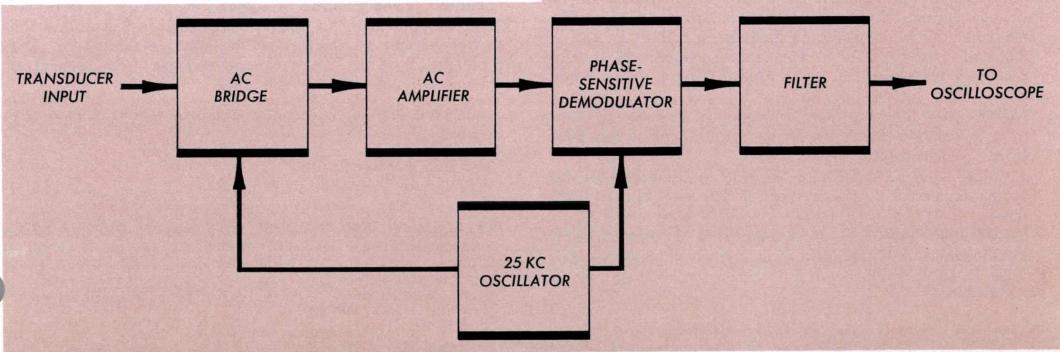
The input circuit for the unit is an ac bridge that has an external transducer connected into one or more of the bridge arms. Excitation voltage for the bridge is obtained from the 25-kc oscillator.

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 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 dualtrace 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: Dual Trace—Channels A and B switched electronically on alternate sweeps; 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.

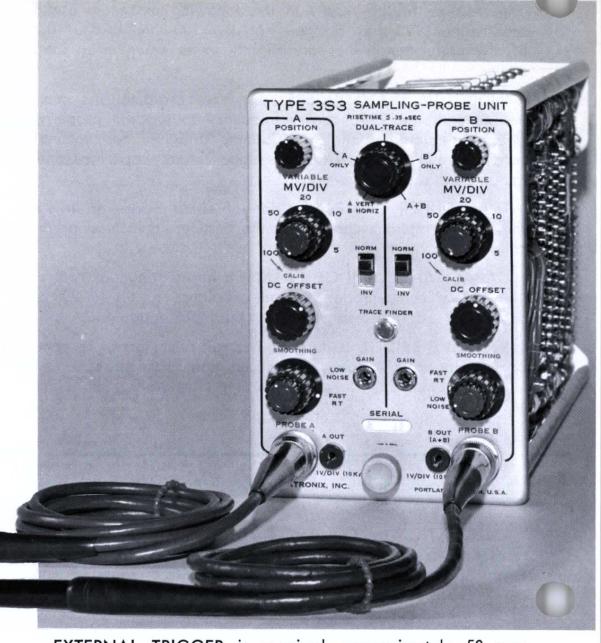
RISETIME (with a 50-ohm input source impedance) is 0.35 nsec with the switch set at the FAST RT position and 1 nsec at the LOW NOISE position.

NOISE (with 50-input source impedance) can be adjusted 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. MAXIMUM INPUT SIGNAL is ± 1.5 v with Risetime control set to LOW NOISE and $\pm 3 \, \mathrm{v}$ when the control is set to FAST RISETIME.

*For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-267.



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 $\pm 0.5 v$.

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 63/4 pounds. Shipping weight is 9 pounds, approx.

TYPE 3S3 AMPLIFIER UNIT

Each instrument includes: 2—instruction manuals (070-374).

REPLACEMENT P6038 PROBE (Part Number 010-156) \$225 Each probe includes: Normalizer (011-070), 10X attenuator (011-071), capacitor coupler (011-072), 2—test point packs (131-258), 1—bayonet ground adapter (013-085), 1-hook tip (206-114), 1-ground clip (175-249), 1—probe holder (352-024), 1—carrying case (202-123), 1—instruction manual (070-400).



DUAL-TRACE SAMPLING UNIT Type 3576

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 sweeps; 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/cm and 5 mv/cm 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 $\pm 3\%$ peak overshoot and undershoot.

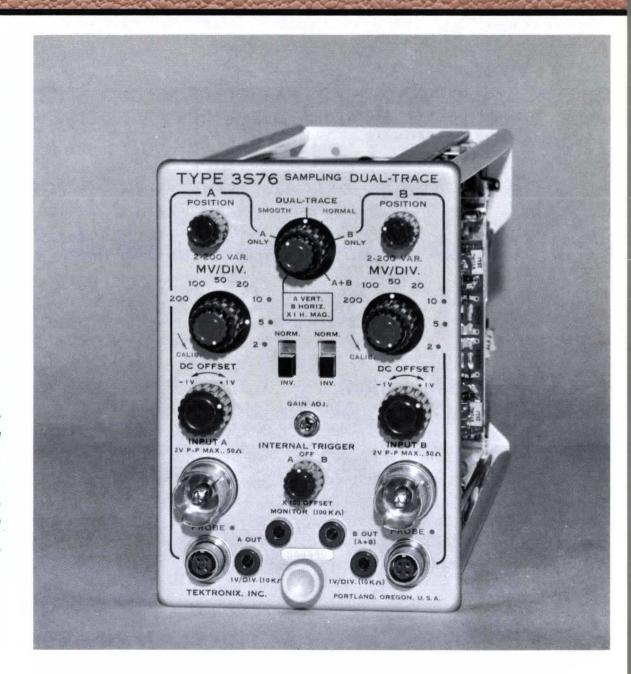
NOISE is equivalent to an input signal of 2 mv pk-to-pk with Smooth-Normal Switch in NORMAL position and 1 mv pk-to-pk with Smooth-Normal Switch in SMOOTH position.

DC OFFSET is -1 to +1 v, referred to input, and monitorable at the front panel at 100X magnitude.

INPUT IMPEDANCE is 50 ohms.

INPUT SIGNALS can be up to 2 v pk-to-pk.

*For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit—Tektronix No. 040-267.



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 $7\frac{1}{2}$ pounds. Shipping weight is 12 pounds, approx.

TYPE 3S76 DUAL-TRACE SAMPLING UNIT \$1100 Each instrument includes: $2-50-\Omega$ 10X attenuators (017-044), 2-5-nsec RG8A/U cables (017-502), 2-instruction manuals (070-332).

PROBES

The following Tektronix probes are recommended for use with the Type 3S76 and other Type 2-Series and 3-Series Sampling Plug-In Units. See Catalog Accessory pages for complete information on the probes.

Use	R	C	Rating	Prob. No.	Price
10:1 Attenuator	500 Ω	0.7 pf	16 vdc-500 vac	P6034	\$ 35
100:1 Attenuator	5kΩ	0.6 pf	50 vdc-500 vac	P6035	35
Selectable Attenuator	10 meg Ω	varies	varies	P6032	220
Current			500 ma	CTI/P6040	31

Type 3 77 SAMPLING SWEEP UNIT



Internal or External Triggering

10 μsec/div to 0.02 nsec/div Sweep Speeds

Variable Sweep Delay through 100 nsec

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

EXTERNAL TRIGGERING

AMPLITUDE RANGE is 10 mv pk-to-pk minimum, 800 mv pk-to-pk maximum. Damaging overload occurs at 5 volts and greater.

PULSE REPETITION RATE is 10 cps to 300 Mc. Trigger circuitry counts down to maximum sampling rate of approximately 100 kc. (Rate with 3S76, 50 pps to 300 Mc.)

JITTER is 50 picoseconds 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) with repetition rate less than 10 Mc. Jitter increases with less amplitude and/or pulse width, and with repetition rates above 10 Mc.

INTERNAL TRIGGERING

Same specifications as EXTERNAL TRIGGERING, but modified by vertical plug-in being used. When used with 3S76, all specifications are the same except 5X amplitude is required at A or B vertical input.

OTHER CHARACTERISTICS

DISPLAY can be either 10 or 100 dots/div.

CALIBRATED SWEEP RANGE is from 0.2 nsec/div to 10 μ sec/div in 15 calibrated steps, 1-2-5 sequence. Accuracy is within 3%. A variable control permits continuous adjustment uncalibrated between calibrated rates.

* For optimum operation, Type 561 Oscilloscopes below Serial Number 580 must be modified with Modification Kit-Tektronix No. 040-267.



10X MAGNIFIER extends the calibrated sweep rate to 0.02 nsec/div.

MANUAL SCAN OR EXTERNAL ATTENUATOR, a dual-purpose control, permits manual scanning of signals or control of external sweep amplitudes.

EXTERNAL SWEEP INPUT is dc-coupled and accepts .a minmum 50-v positive going sweep for 10-div display.

SINGLE DISPLAYS useful for photography 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 approximately 100-nsec permits observation of a selected portion of a waveform.

NET WEIGHT is $5\frac{1}{2}$ pounds. Shipping weight is 9 pounds, approx.

TYPE 3T77 SAMPLING SWEEP UNIT \$650

Each instrument includes: 1—BNC to UHF adapter (103-032), 1—BNC to GR adapter (017-064), 2—10 nsec RG58A/U cables (017-501), 2—10X attenuators (017-044), 2—instruction manuals (070-333).





SQUARE-WAVE GENERATOR Type

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.

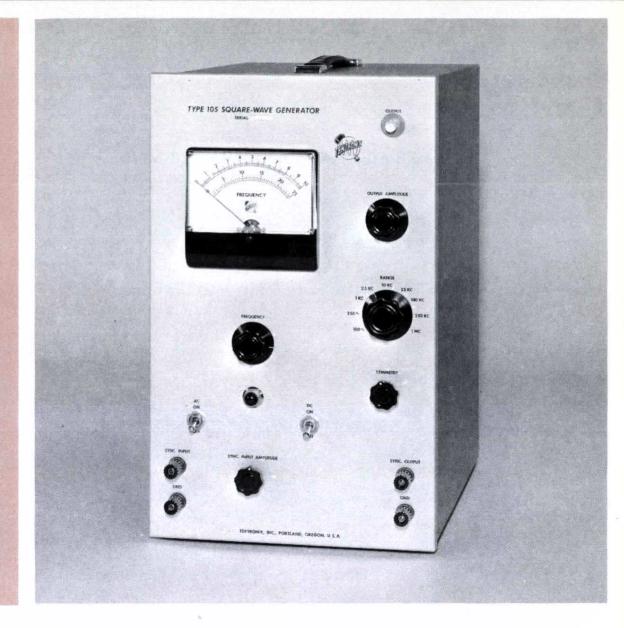
FREQUENCY METER

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 52-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 $16\frac{7}{8}$ " high by $10\frac{3}{8}$ " wide by $15\frac{1}{4}$ " deep. Weight, net 34 pounds; shipping, 47 pounds (approx.).

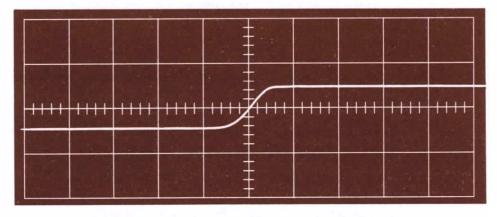


Fig. 1. 13-nsec risetime of the Type 105 displayed on 20 nsec/cm sweep. Generator connected to vertical deflection plates of crt, sensitivity 7 v/cm with 52 Ω cable terminated at both ends.

ATTENUATOR, CABLES AND TERMINATIONS

1-3 to 2-wire adapter (103-013), 2-instruction manuals (070-049).

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 52- Ω cable and resistor or a 75- Ω cable and resistor will be supplied instead . . . no extra charge.

Type 7 SQUARE-WAVE GENERATOR



Risetime

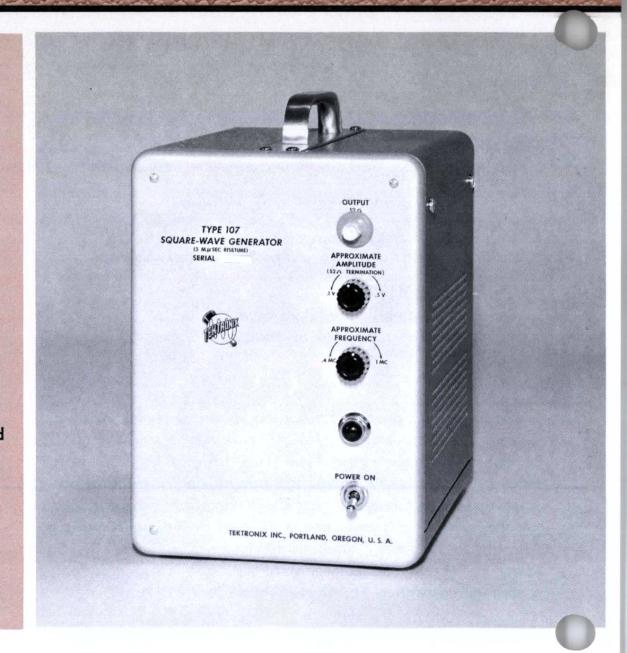
Less than 3 nsec into a terminated 50-ohm cable.

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 APPROXI-MATE 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 11 \%" deep. Net weight is 13 pounds. Shipping weight is 20 pounds, approx.

TYPE 107 GENERATOR \$190

Each instrument includes: 1—50- Ω termination (011-049), 1—50- Ω X10 attenuator (011-059), 1—50- Ω cable (012-057), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-050).



PULSE GENERATOR Type

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 volts through fifty volts, accuracy within 3%.

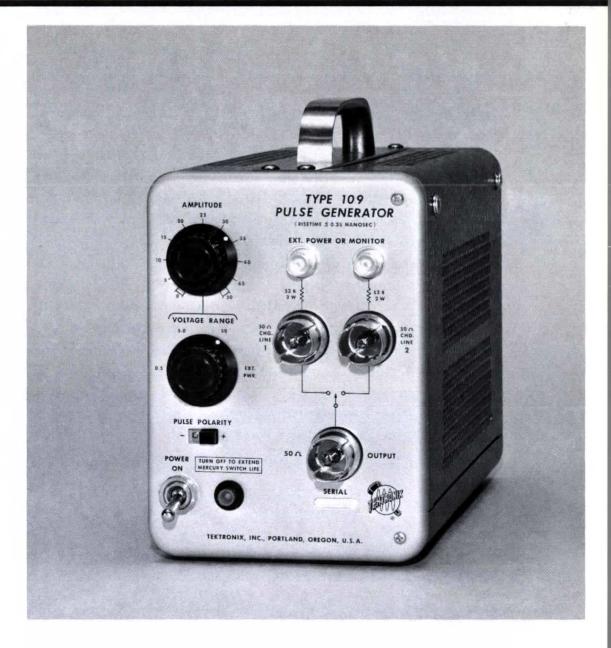
PULSE POLARITY can be either positive or negative.

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.



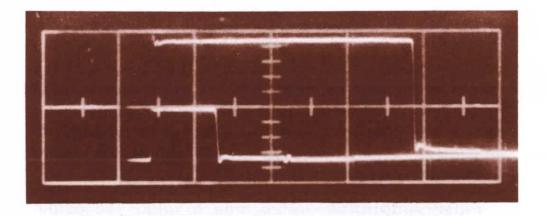
POWER REQUIREMENT is 105 v to 125 v or 210 v to 250 v, 50 to 800 cps, typically 60 watts.

MECHANICAL FEATURES include an aluminum-alloy chassis and anodized front panel. Dimensions are $7\frac{7}{8}$ " high by 5" wide by $11\frac{3}{4}$ " deep. Net weight is $8\frac{1}{2}$ pounds. Shipping weight is 18 pounds, approx.

TYPE 109 PULSE GENERATOR \$360

Each instrument includes: 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 3—5-nsec cables (017-502), 1—charging network, 2—instruction manuals (070-299).

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

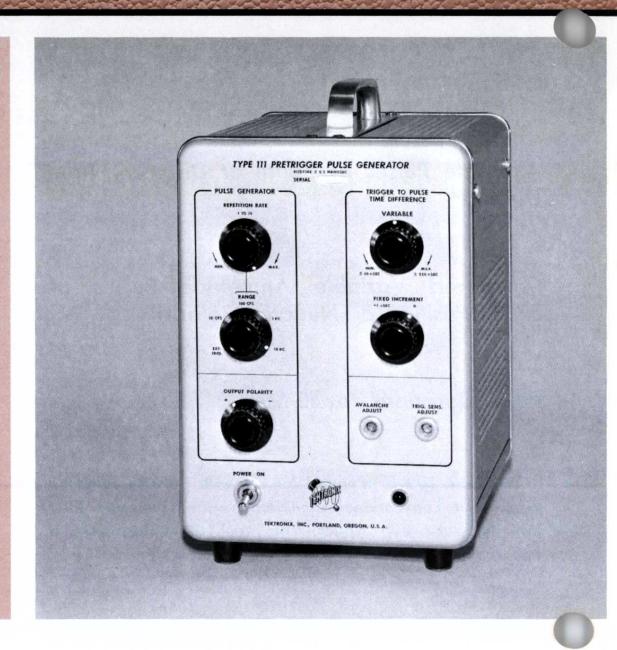


Alternate pulses of different widths and amplitudes produced by using 5-nsec and 20-nsec charge lines and external charge voltages. Vertical sensitivity 10 v/cm, sweep speed 10 nsec/cm.

Type PULSE GENERATOR



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, 100 nsec at low repetition rates decreasing to 20 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 the flat-topped portion of the output pulse are less than 5% pk-to-pk of the pulse amplitude. Aberrations following the 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 6 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 $50~\Omega$ attenuators.

Pretrigger Pulse Characteristics—Amplitude is about 10 volts, duration is about 250 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 5 volts or greater at rise rate of 3 volts/ μ sec 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 11% "high by 7" wide by 11%" deep. Net weight is 8% pounds. Shipping weight is 16 pounds, approx.

TYPE 111 GENERATOR \$365

Each instrument includes: 1—5 nsec 50- Ω coax cable with G.R. connectors (017-502) 1—9 nsec 50- Ω coax cable charge line with a G.R. connector (017-506), 1—50- Ω 10X attenuator (017-044), 1—3-wire power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-252).

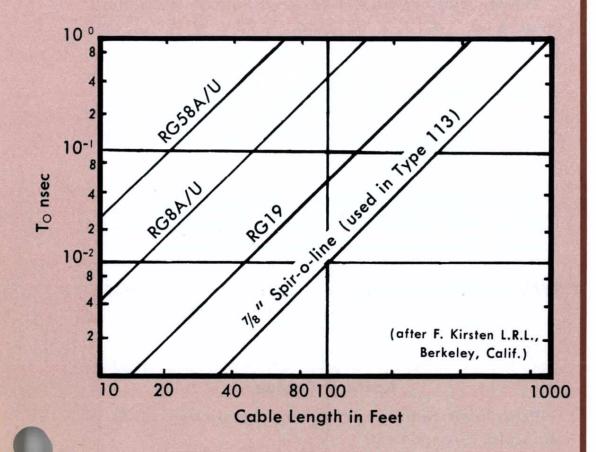


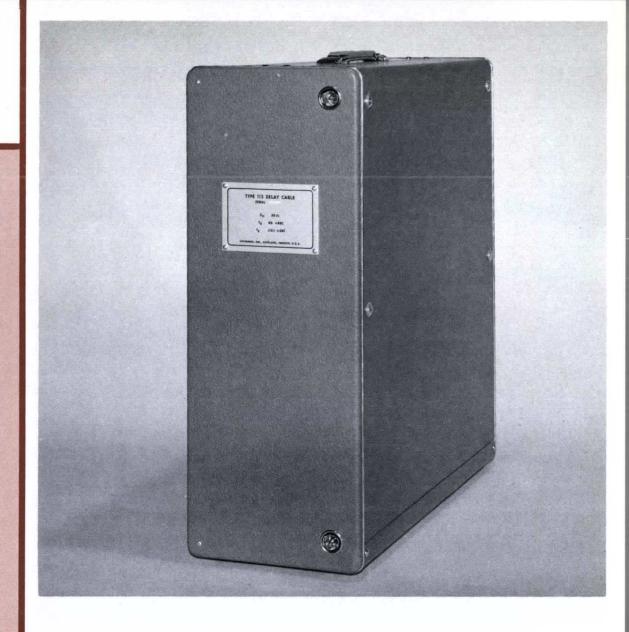
TRANSMISSION LINES

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% (T₀) 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 % " high by 8 % " wide by 21 % " deep. Net weight is 44 % pounds. Shipping weight is 59 pounds, approx.

TYPE 113 DELAY CABLE \$250

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 accoupled 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 $\pm 0.1 \text{ v}$ (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: $+135 \,\mathrm{v}$ at $5 \,\mathrm{ma}$, $-90 \,\mathrm{v}$ at $4 \,\mathrm{ma}$, and $6.3 \,\mathrm{v}$ at $0.9 \,\mathrm{amp}$. 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 $12\frac{1}{4}$ " high by $4\frac{1}{8}$ " wide by $7\frac{1}{8}$ " deep. Net weight is $4\frac{3}{4}$ pounds. Shipping weight is 9 pounds, approx.

TYPE 122 PREAMPLIFIER \$135

Each instrument includes: 1—battery cable (012-009), 1—output cable (012-003), 1—input plug (131-013), 2—instruction manuals (070-246).

Battery Cables

Extra long battery cables can be ordered to fit a particular arrangement.

FRAME MOUNT Type FM122

CHARACTERISTICS

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 $12\frac{1}{4}$ " high by $4\frac{1}{8}$ " wide by 7" deep. Net weight is $5\frac{1}{2}$ pounds. Shipping weight is 9 pounds, approx.

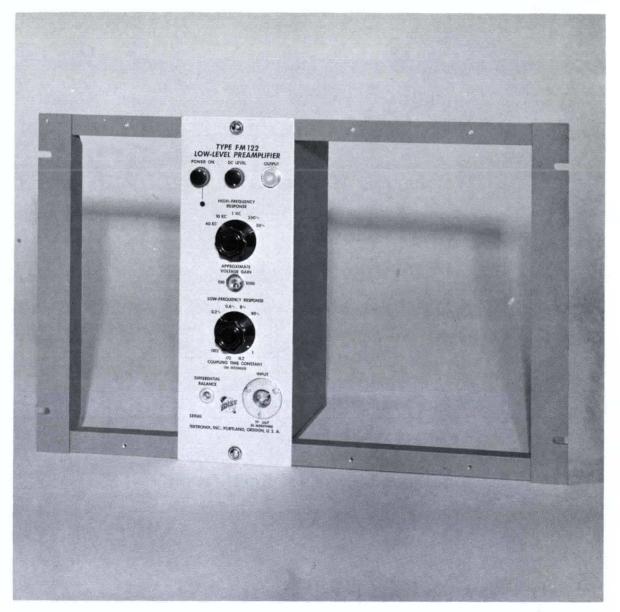
TYPE FM122 (without Mounting Frame) \$140

Each instrument includes: 1—battery cable (012-009), 1—input plug (131-013), 1—output cable (012-003), 2—instruction manuals

Mounting Frame

(070-246).

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



RACK MOUNT Type RM122

CHARACTERISTICS

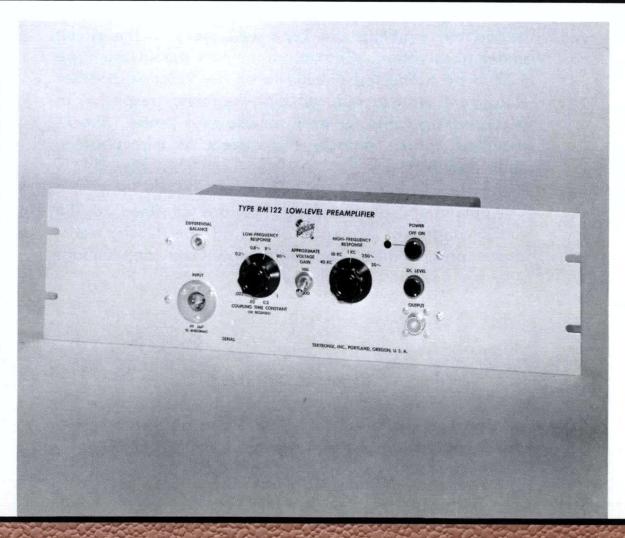
The Type RM122 is a mechanically rearranged Type 122 Preamplifier for horizontal mounting in a standard 19-inch rack. The instrument is fastened to the front of the rack by four screws. It requires only $5\frac{1}{4}$ inches of rack height.

Electrical characteristics of the Type RM122 are the same as described for the Tektronix Type 122 Preamplifier.

Mechanical Specifications—Dimensions are $5\frac{1}{4}$ " 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 (012-009), 1—input plug (131-013), 1—output cable (012-003), 2—instruction manuals (070-246).



Type 23 PREAMPLIFIER



Compact

4 1/4" high, 1 1/2" wide, 3 1/8" deep.

Weighs only 10 ounces.

Voltage Gain

Accurately set at 100 times.

Passband

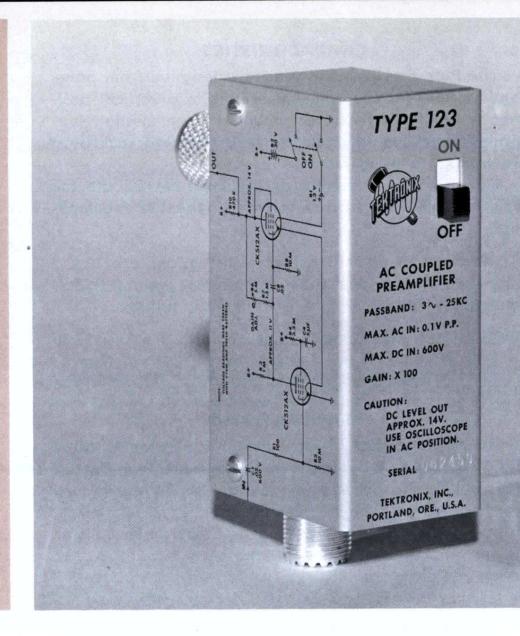
Within 3-db from 3 cps to 25 kc.

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 additional hum signal 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, and at reduced high-frequency response, in a connecting cable, or even for use as a probe. Shockmounted 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 μ v, rms; 50 μ v, 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.

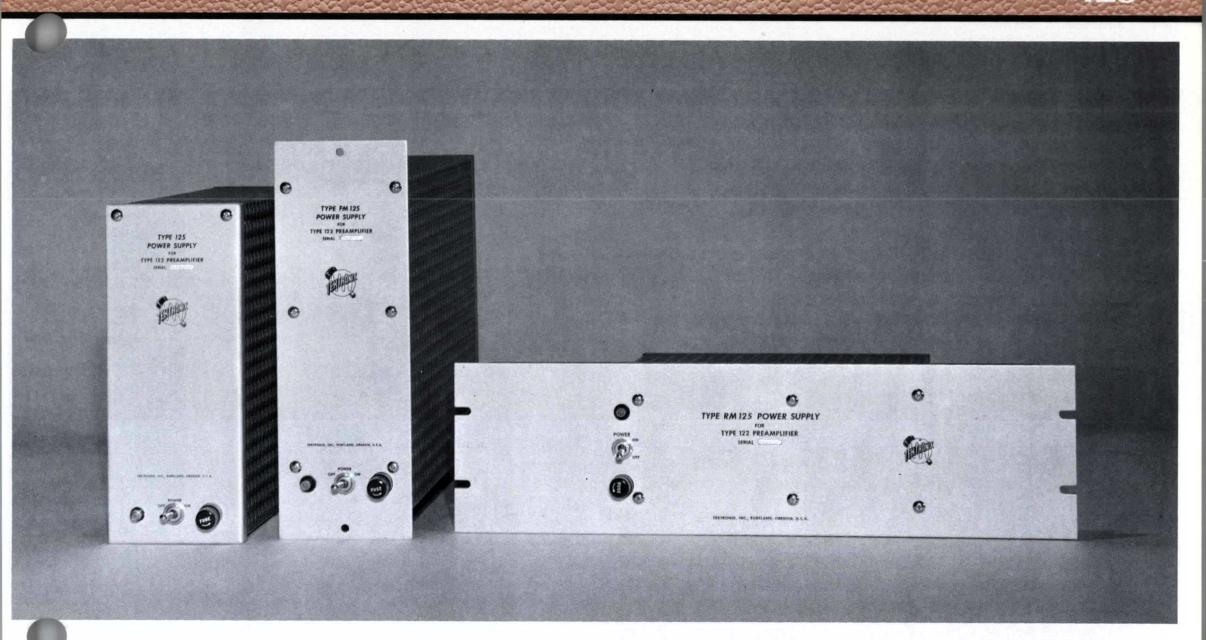
Effective Output Impedance—31 kilohms.

Power Requirement—One 1.345 v mercury cell and one 30 v miniature battery, included with the instrument.

Mechanical Specifications—Dimensions are $4\frac{1}{4}$ " high by $1\frac{1}{2}$ " wide by $3\frac{1}{8}$ " deep. Net weight is 10 ounces. Shipping weight is 2 pounds, approx.

Each instrument includes: 1—schematic





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: $+135 \, \text{v}$ supply, less than 3 mv; $-90 \, \text{v}$ supply, less than 2 mv; $-6 \, \text{v}$ 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 14%" high by 4%" wide by 10%" deep. Net weight is 19 pounds. Shipping weight is 27 pounds, approx.

TYPE 125 POWER SUPPLY \$285

Each instrument includes: 4—36" interconnecting cables (012-065), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-246).

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

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 12 1/4" high by 4 1/8" wide by 13 1/2" deep. Net weight is 19 pounds. Shipping weight is 27 pounds, approx.

Each instrument includes: 4—36" interconnecting cables (012-065), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 2—instruction manuals (070-246).

Mounting Frame

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.

Each instrument includes: 4—36" interconnecting cables (012-065), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 2—instruction manuals (070-246).

Type 27 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. Risetime 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 $8\frac{3}{4}$ " high by 19" wide by $21\frac{5}{8}$ " deep. Net weight is $39\frac{1}{2}$ pounds. Shipping weight is 69 pounds, approx.

TYPE 127 POWER SUPPLY (without plug-in units) \$650

Each instrument includes: 4—170 Ω terminations (011-048), 4—170 Ω coaxial cables (012-034), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set slide-out tracks (351-006), 2—instruction manuals (070-284).

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 040-344 \$12.00

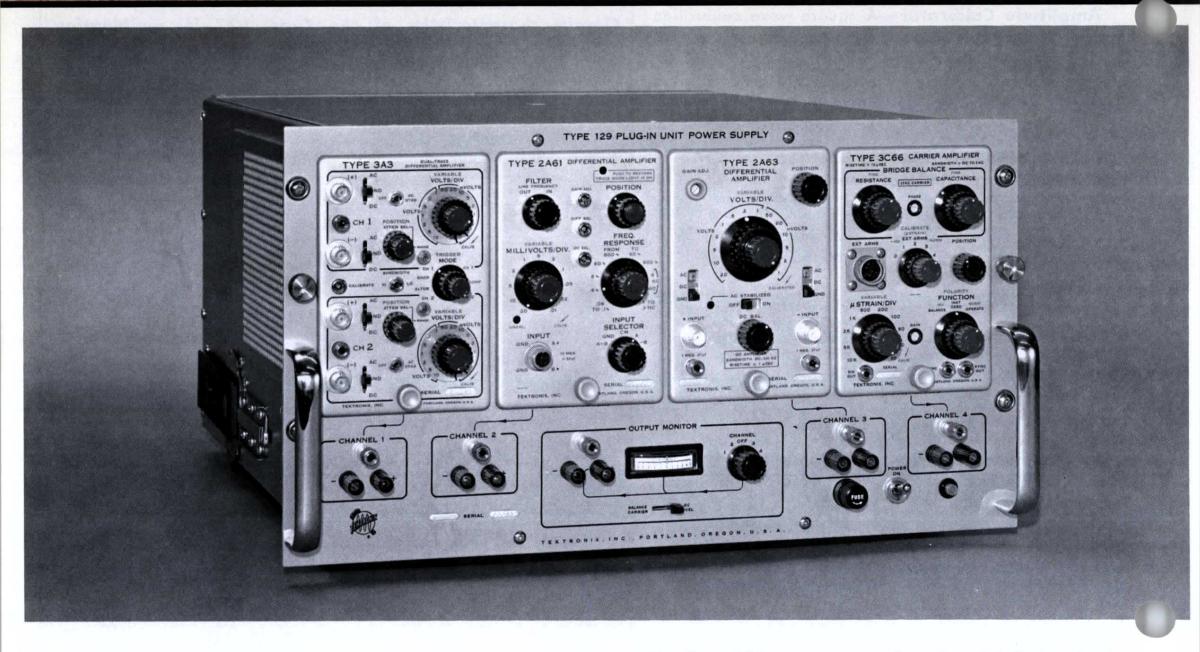
U. S. Sales Prices f.o.b. Beaverton, Oregon Please refer to Terms and Shipment, General Information page.

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		
A	2	dc to 15 mc	23 nsec		
В	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		
0	2	dc to 17 mc	20 nsec		
Q	*	dc to 6 kc	60 μsec		
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		

Type 199 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 pushpull 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 ouput 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).



PLUG-IN	INDICATED	APPROXIMATE	SYSTEM GAIN		
TYPE	TYPE SENSITIVITY		With C.F. Output Card**		
	With Passive Output Card*	Single Ended	Push-Pull		
2A60	50 mv/div	50	20	40	
2A61	0.01 mv/div (AC)	2.5 x 10⁵	10 ⁵	2 x 10 ⁵	
2A63	1 mv/div (DC)	2.5 x 10 ³	10³	2×10^3	
3A3	100 μv/div	2.5 × 10⁴	10⁴	2 x 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

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.

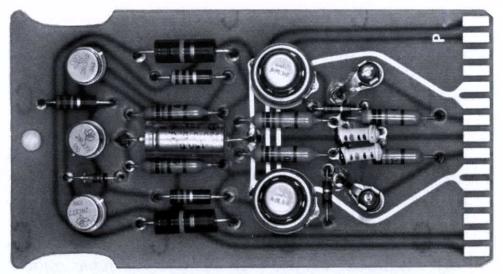
Electronically-regulated dc supplies insure stable operation with as much as -10% to +7% variation from design-center line voltage. The instrument is normally wired to operate at a design center of 117 volts, but a multi-tap transformer permits operation at design centers of 110, 117, 124, 220, 234, or 248 volts. Power consumption is typically 575 watts maximum under full load.

Dimensions are $10\frac{1}{2}$ " high by 19" wide by $23\frac{1}{2}$ " deep. Net weight is 46 pounds. Shipping weight is approximately 85 pounds.

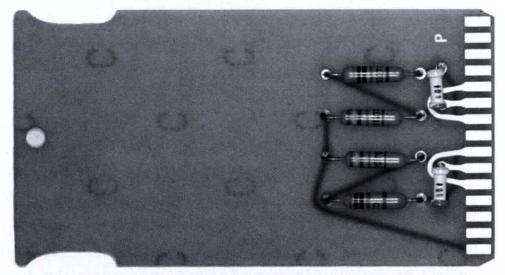
BLANK PLUG-IN CHASSIS

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. 040-245) \$25



CATHODE-FOLLOWER CIRCUIT CARD (Part No. 018-001) \$40



PASSIVE DIVIDER CIRCUIT CARD (Part No. 018-002) . . \$10

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

^{**} Output at front or rear connector

Type 2 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 1/2" 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.

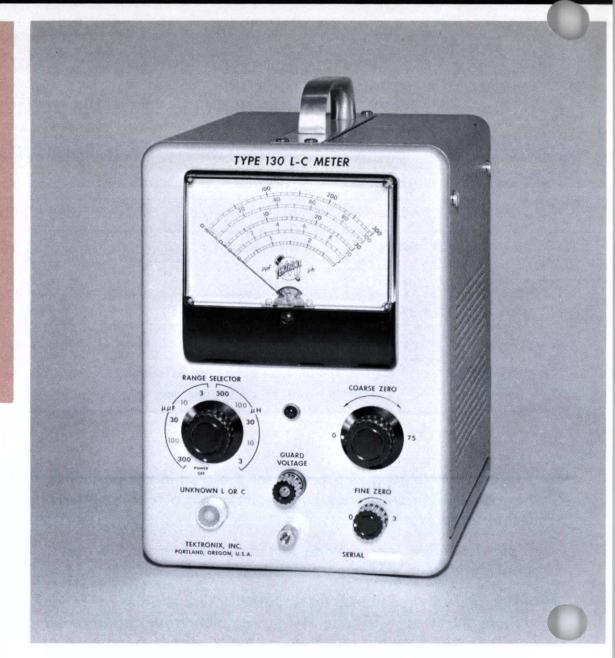
Small actual and stray capacitances have very little effect on inductance measurements made with the Type 130. For instance, the meter reading will be affected less than 1% on inductance measurements where the actual and stray capacitances are as great as 50 pf.

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 10% "high by 7" wide by 11% "deep. Net weight is 8% pounds. Shipping weight is 15 pounds, approx.

TYPE 130 DIRECT-READING L-C METER \$225

Each instrument includes: 1—P93C probe (010-003), 1—black out-

put lead (012-014), 1—red output lead (012-015), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-231).

Production Test Fixture

For use with the Type 130 L-C Meter. Speeds sorting and testing of capacitors and inductors.

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- μ h standard permits proper adjustments of the inductance ranges.

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





PLUG-IN UNIT POWER SUPPLY Type 1 3 2

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 52 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 52 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 $10\frac{1}{4}$ " high by $7\frac{1}{8}$ " wide by $19\frac{1}{8}$ " deep. Net weight is $21\frac{1}{2}$ pounds. Shipping weight is 36 pounds, approx.

TYPE 132 PLUG-IN UNIT POWER SUPPLY (without plug-in units) \$460

Each instrument includes: $2-93-\Omega$ BNC terminations (011-056), $2-93-\Omega$ BNC to BNC cables (012-075), 1-3-conductor power cord (161-010), 1-3 to 2-wire adapter (103-013), 2-instruction manuals (070-288).

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



	Equivalent noise	The second secon	Performance * With no termination		Performance * Terminated in 93 Ω		Performance * Double terminated 93 (
PLUG-IN TYPE	referred to input (pk-pk)	System ‡ Gain	Band Width	System ‡ Gain	Band Width	System ‡ Gain	Band Width	
Α	200 μvolt	500	350 kc	10	14 mc	5	16 mc	
В	200 μvolt	500 5000	350 kc	10 100	14 mc 10 mc	5 50	16 mc 10 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	t	
G	200 μvolt	500	350 kc	10	14 mc	5	16 mc	
н	200 μvolt	5000	350 kc	100	11 mc	50	12 mc	
K	200 μvolt	500	350 kc	10	14 mc	5	16 mc	
ı	200 μvolt	500 5000	350 kc	10 100	14 mc 14 mc	5 50	16 mc 16 mc	
M	200 μvolt	500	350 kc	10	14 mc	5	16 mc	
0	200 μvolt	500	350 kc	10	14 mc	5	16 mc	
Q		Not Reco	mmended	***	6 kc	****	6 kc	
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	
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.

Type 133 PLUG-IN UNIT POWER SUPPLY



The Type 133 provides power to an internal, transistorized amplifier and any Tektronix Letter-Series 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.

The frequency response of the transistorized amplifier is dc to 100 kc and the output is $\pm 5 \text{ volts}$. The source impedance is 2 ohms. Characteristics of this unit make it particularly useful for driving recorders, and in audio or other low-frequency work.

Connectors on the front-panel enable the output to be fed directly into an oscilloscope or used for other applications.

A typical application of the Type 133 is its use in conjunction with the Tektronix Type Q Transducer and Strain Gage Unit. This completely self-contained combination requires no external equipment other than the strain gages or transducers needed for the particular operation. The output can drive a recorder and be monitored visually, with an oscilloscope, at the same time. The indicating instrument should have some response at 25 kc to enable balancing the bridge in the Type Q Unit, otherwise an external monitor must be used.

Frequency Response—DC to 100 kc.

Gain—The gain is 10, single-ended.

Output—±5 v (high impedance load.)

1.5 a (short circuit).

The source impedance is 2 ohms.

DC Adjust—The output dc operating level adjusts to ground potential.

Phase Inversion—An internal switch permits phase inversion of the signal.

Monitor Jack—Allows constant observation of the output with an oscilloscope without switching cables.

Dual-Trace Operation—Convenient back-panel jacks and switching arrangements provide for use of the Alternate mode of operation when using a Tektronix Type 1A1, 1A2, C-A or M Plug-In Unit.

Power Supply—Electronic regulation of the power supply assures stable operation under changing loads or line voltages.

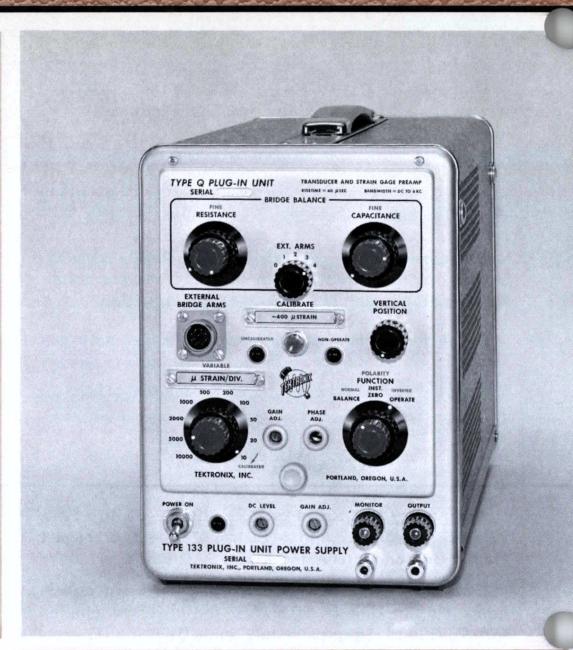
Power Requirement—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, 320 watts.

Mechanical Specifications—Dimensions are $10 \frac{1}{4}$ "high by $7 \frac{1}{8}$ " wide by $19 \frac{1}{4}$ " deep. Net weight is 22 pounds. Shipping weight is 36 pounds, approx.

TYPE 133 POWER SUPPLY (without plug-in units) . . \$440

Each instrument includes: 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-290).

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



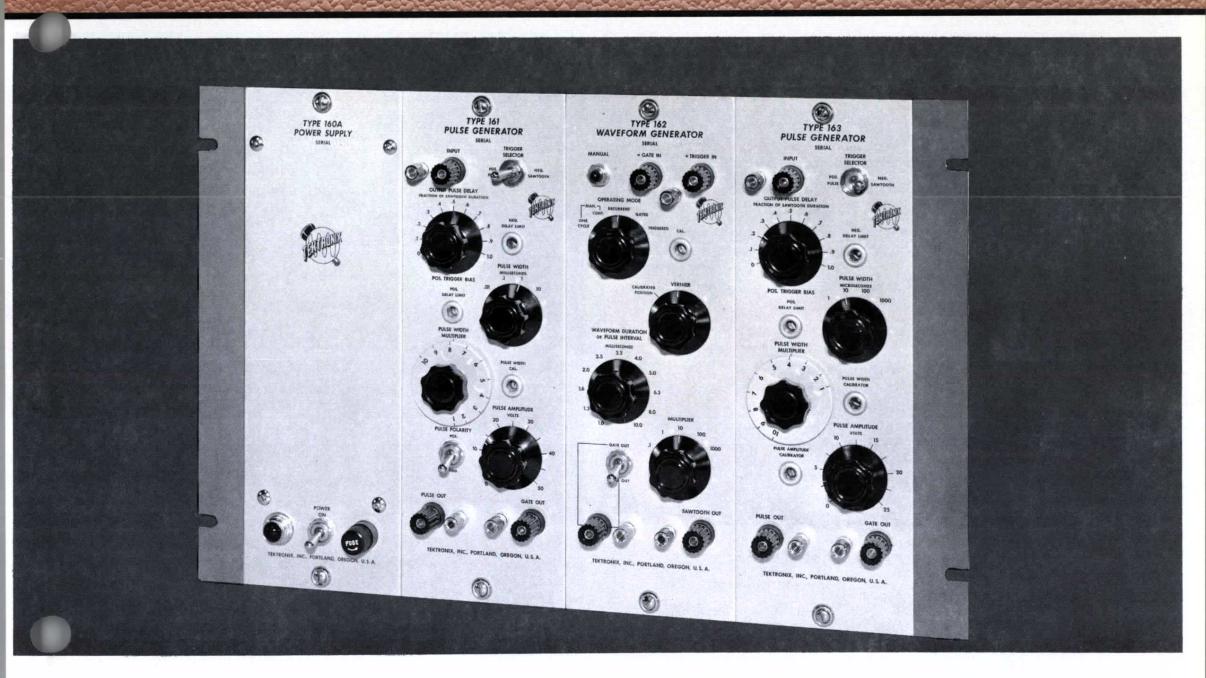
TYPE 133 TYPICAL PERFORMANCE

Frequency specifications are at 3-db down

Trequency specifications are at 5-ab down					
PLUG-IN TYPE	Equivalent noise referred to Input	Overall Gain (No Load)	Bandwidth		
Α	200 μvolt	10	DC to 100 kc		
B	200 μvolt	10 100 (AC only)	DC to 100 kc 2 cps to 100 kc		
C-A	200 μvolt	10	DC to 100 kc		
D	100 μvolt	500	DC to 100 kc		
E	35 μvolt	10,000	See E Unit		
G	200 μvolt	10	DC to 100 kc		
H	200 μvolt	100	DC to 100 kc		
K	200 μvolt	10	DC to 100 kc		
L	200 μvolt	10 100 (AC only)	DC to 100 kc 3 cps to 100 kc		
M	200 μvolt	10	DC to 100 kc		
0	200 μvolt	10	DC to 100 kc		
Q	Typically 1.5 μstrain pk-to-pk at max sensitivity	10 μstrain produces 500 mv output at max sensitivity	DC to 6 kc		
Z	200 μvolt	10	DC to 100 kc		
1A1	200 μvolt	10 100 1000	DC to 100 kc DC to 100 k 2 cps to 100 kc		
1A2	200 μvolt	10	DC to 100 kc		



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 014-002	. \$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.

Type 160 A POWER SUPPLY



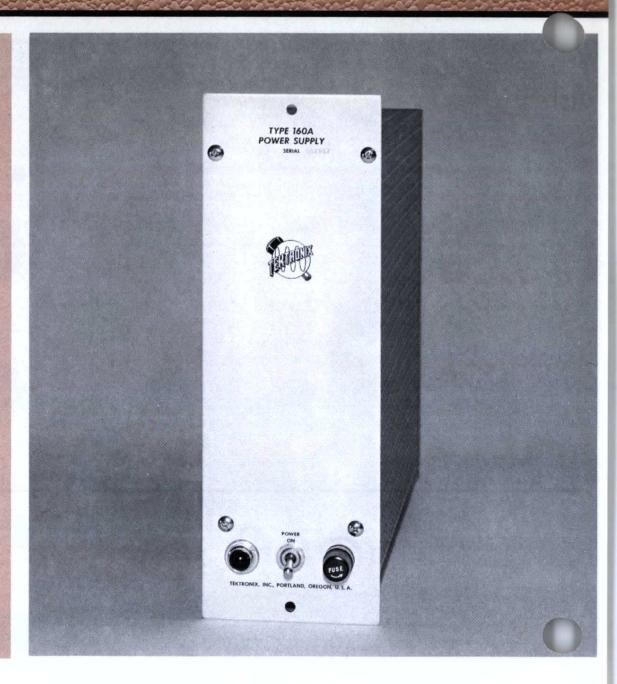
Electronic Voltage Regulation

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 $12\frac{1}{4}$ " high by $4\frac{1}{8}$ " wide by $14\frac{3}{8}$ " deep. Net weight is $20\frac{1}{4}$ pounds. Shipping weight is 28 pounds approx.

TYPE 160A POWER SUPPLY \$190

Each instrument includes: 2—inter-unit power cables (012-016), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 1—set mounting hardware, 1—instruction manual (070-220).

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 12 1/4".

Order Part Number 014-002 \$7

Blank Panel for above, occupies same panel area as Type 160-Series Generator or Type 360 Indicator Unit. Order Part Number 333-157 \$2.50

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

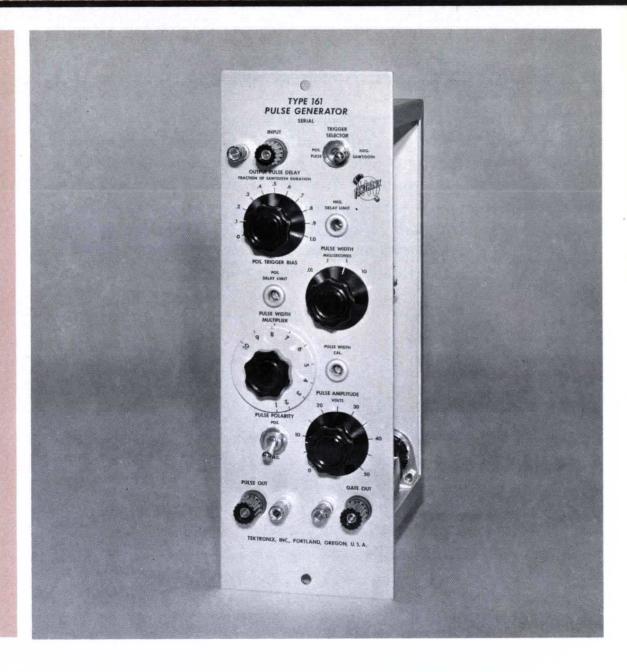


PULSE GENERATOR Type

The Tektronix Type 161 Pulse Generator is designed to supply calibrated rectangular output pulses from zero to 50 v in amplitude and 10 μ sec 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 $0.5~\mu sec$ when load capacitance is 10 pf or less, within $0.75~\mu sec$ for 100 pf or less load capacitance. Negative pulse; within $0.5~\mu sec$ when load capacitance is 10 pf or less, within $1.5~\mu sec$ for 100 pf or less load capacitance. Overshoot less than 5%.

Duration—calibrated, variable, 10 μ sec 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 $12\frac{1}{4}$ " high by $4\frac{1}{8}$ " wide by $6\frac{3}{8}$ " deep.

Net weight is $3\frac{1}{2}$ pounds. Shipping weight is 8 pounds, approx.

Mounting Frame

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

Type 162 WAVEFORM GENERATOR



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 μ sec. 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 μ sec.

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- μ sec minimum.

Duration—pulse, 10 μ sec to 0.05 sec, gate and sawtooth, 100 μ sec 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, $\pm 4\%$.

Cathode-Follower Outputs

Output Impedance

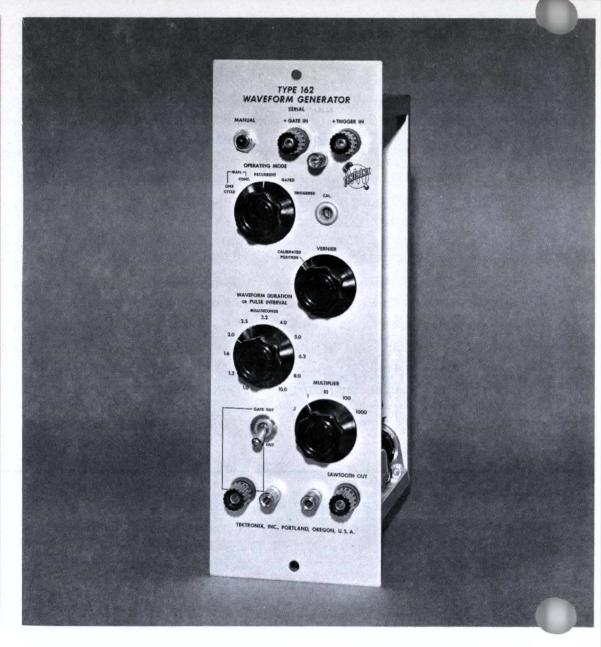
1000 ohms approximately for all outputs.

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 $12\frac{1}{4}$ " high by $4\frac{1}{8}$ " wide by $6\frac{3}{8}$ " deep. Net weight is $3\frac{1}{2}$ pounds. Shipping weight is 8 pounds, approx.

TYPE 162 WAVEFORM GENERATOR \$130

Each instrument includes: 1—inter-unit power cable (012-017), 1—set mounting hardware, 1—instruction manual (070-220).

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 121/4".

Order Part Number 014-002 \$7

Blank Panel for above, occupies same panel area as Type 160-Series Generator or Type 360 Indicator Unit.

Order Part Number 333-157 \$2.50

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



FAST-RISE PULSE GENERATOR Type

The Tektronix Type 163 Fast-Rise Pulse Generator is designed to supply rectangular output pulses from 0 to 25 v in amplitude and 1 μ sec 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 μ sec 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 μ sec when load capacitance is 10 pf or less, within 0.25 μ sec for 100 pf or less load capacitance. Overshoot can be adjusted to zero.

Duration—calibrated, variable, 1 μ sec to 10,000 μ sec.

Delay—continuously variable, 0 to 100% of triggering sawtooth duration.

Decay Time—0.2 to 0.5 μ sec.

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).

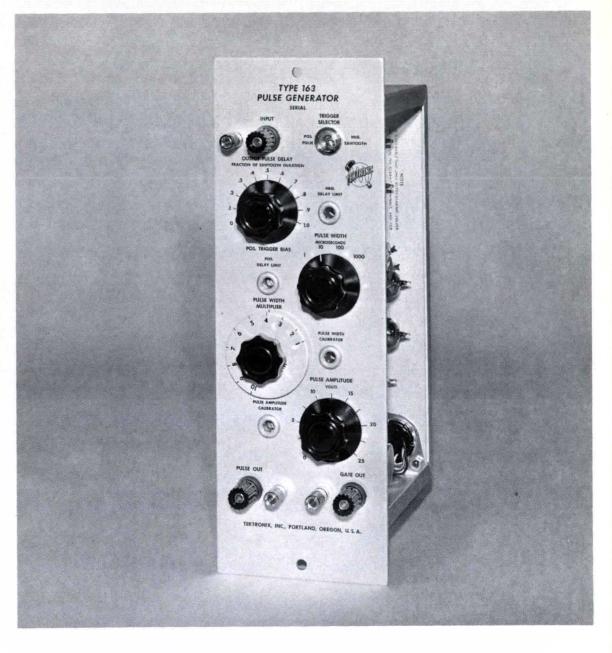
Gate-100 ohms.

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 $12\frac{1}{2}$ " high by $4\frac{1}{8}$ " wide by $6\frac{3}{8}$ " 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 (012-017), 1—set mounting hardware, 1—instruction manual (070-220).

Mounting Frame

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

Type 180 A TIME-MARK GENERATOR



14 Time-Mark Intervals

Two per decade from 1 μ sec to 5 sec, available separately or in combinations as a timing comb.

Three Sine-Wave Frequencies

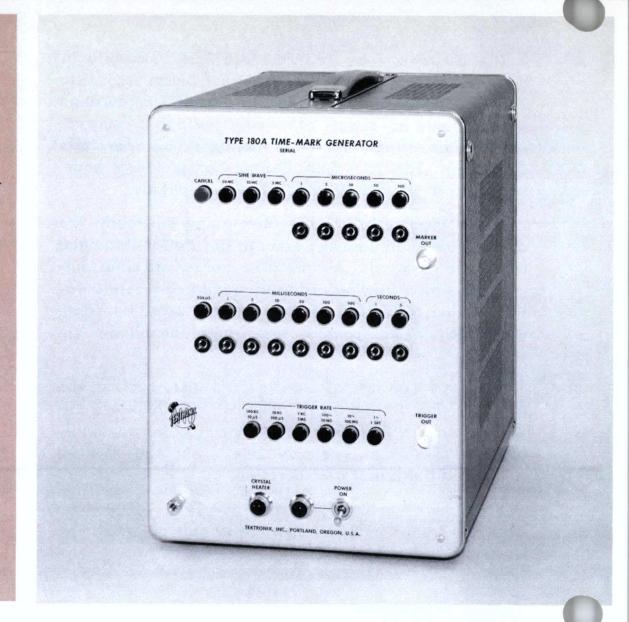
5 mc, 10 mc, and 50 mc.

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.

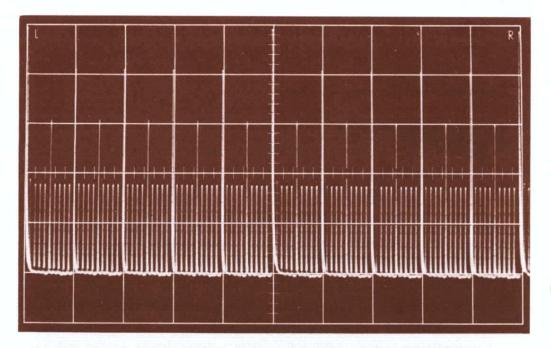
CHARACTERISTICS

Time Markers—Time markers occur at intervals of 1, 5, 10, 50, 100, 500 μ sec, 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 sinewave frequencies of 5 mc, 10 mc or 50 mc to the output connector. Output is 3 volts minimum across 52 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.



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 $13\frac{3}{4}$ " high by 10" wide by $16\frac{5}{8}$ " deep. Net weight is $30\frac{1}{4}$ pounds. Shipping weight is 42 pounds, approx.

TYPE 180A TIME-MARK GENERATOR \$625

Each instrument includes: 2—93- Ω output cables (012-075), 1—clip-lead adapter (013-076), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-074).

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 015-056 (BNC connector) \$29.50

Order Part Number 015-013 (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 15 \(^3\lambda''\).

Order Part Number 040-277 \$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

	Mark	er 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	$390~\Omega$ at $1~\mu{ m sec}$ to $900~\Omega$ at $5~{ m sec}$ onds
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 52-ohms		LES COMPANY OF THE PARTY OF THE		

* With MARKER OUT and TRIGGER OUT terminated in 93 Ω

<u>181</u> рм191

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. Any of the six signals can be switched to a front-panel output connector. Also the five time-markers are available separately at front-panel binding posts.

All outputs are derived from a 1-Mc crystal-controlled oscillator with a frequency tolerance of about 0.03% and after initial warmup, a short time stability of about 0.005% per hour. Greater stability is available with a directly interchangeable crystal mounted in a temperature-controlled oven. This plug-in crystal is available as an accessory, or as MOD 110 installed in the generator and provides a stability of 3 parts per million over a 24-hour period.

NOMINAL OUTPUT VALUES					
Marker	Amplitude	Risetime	Impedance		
0.1 μsec	2 v	sine wave	150 ohms		
1 μsec	2 v	0.01 μsec	80 ohms		
10 μsec	2 v	0.12 μsec	80 ohms		
100 μsec	2 v	0.3 μsec	80 ohms		
1000 μsec	2 v	0.5 μsec	80 ohms		
10,000 μsec	2 v	0.8 μsec	80 ohms		

POWER REQUIREMENT—105 v to 125 v or 210 v to 250 v, 50 to 60 cps, typically 100 watts at 117 v.

CABINET MODEL—Dimensions are 10" high by $7\frac{1}{8}$ " wide by $17\frac{3}{4}$ " deep. Net weight is $15\frac{1}{2}$ pounds. Shipping weight is 25 pounds, approx.

RACK MOUNT MODEL—For 19" rack it requires $5\frac{1}{4}$ " of rack height and $10\frac{1}{2}$ " depth. Net weight is $15\frac{3}{4}$ " pounds. Shipping weight is 32 pounds, approx.

TYPE 181 MOD 110 TIME-MARK GENERATOR \$285

Each instrument includes: 1—black output lead (012-014), 1—red output lead (012-015), 1—93 Ω cable, BNC both ends (012-075), 1—3 to 2-wire adapter (103-013), 1—BNC to binding-post adapter (103-013), 1—BNC to binding-post adapter (103-033), 1—3-conductor power cord (161-010), 2—instruction manuals (070-292).

TYPE RM181 MOD 110 TIME-MARK GENERATOR . . \$310 Each instrument includes: 1—black output lead (012-014), 1—red output lead (012-015), 1—93 Ω cable, BNC both ends (012-075), 1—3 to 2-wire adapter (103-013), 1—BNC to binding-post adapter (103-033), 1—3-conductor power cord (161-010), 1 set—mounting hardware, 2—instruction manuals (070-360).

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



SINE-WAVE GENERATOR Type 1908

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%.

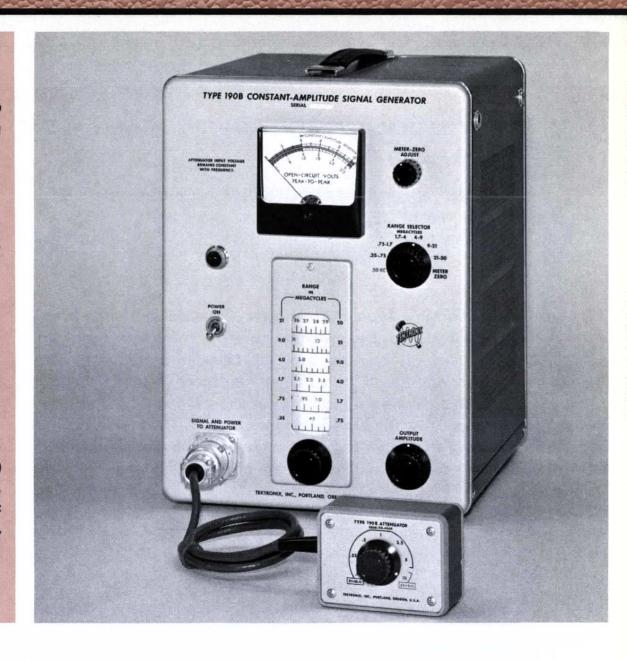
Output Amplitude

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 $\pm 2\%$ from 50 kc to 30 mc; less than $\pm 5\%$ from 30 mc to 50 mc. Peak-to-peak level of the output signal at the input to the attenuator is indicated on the amplitude meter. The Output Amplitude control sets the amount of signal voltage applied to the input of the external attenuator head. The signal voltage at the attenuatorhead 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. 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
10
5 to 0.1

Actual values:

Output impedance
in ohms, approx.

0
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 $13\frac{3}{4}$ " high by $9\frac{7}{8}$ " wide by 12" deep. Net weight is $23\frac{1}{2}$ pounds. Shipping weight is 35 pounds, approx.

TYPE 190B SINE-WAVE GENERATOR \$330

Each instrument includes: 1—attenuator unit (011-054), 1—3 to 2-wire adapter (103-013), 1—3-conductor power cord (161-010), 1—instruction manual (070-257).

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 15 3/4".

Order Part Number 040-277 \$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

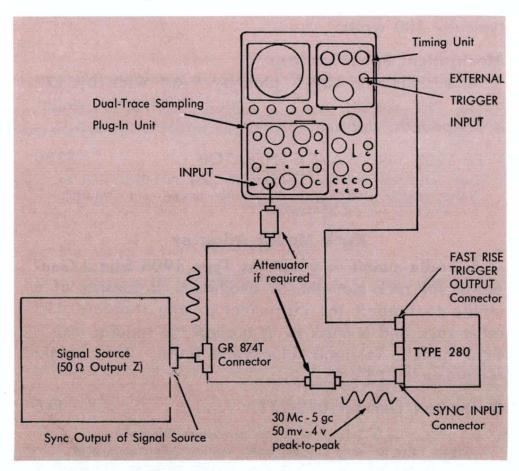
INPUT FREQUENCY is from 30 megacycles to 5 gigacycles.

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 5T1, 5T1A, or 3T77 and other high-speed sampling oscilloscopes).

AMPLITUDE OF TRIGGER OUTPUT as seen at oscilloscope input connector is approximately 50 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 $7^3/_8$ " high by $7^5/_8$ " wide by $4^5/_8$ " deep. Net weight is $4^1/_2$ pounds. Shipping weight is 9 pounds, approx.

TYPE 280 TRIGGER COUNTDOWN UNIT \$265

Includes: 2—instruction manuals (070-350), 1—5-nsec cable (017-512), 1—3-conductor power cord (161-015), 1—3 to 2-wire adapter (103-013).

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



TRANSISTOR SWITCHING-TIME TESTER Type 29

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.

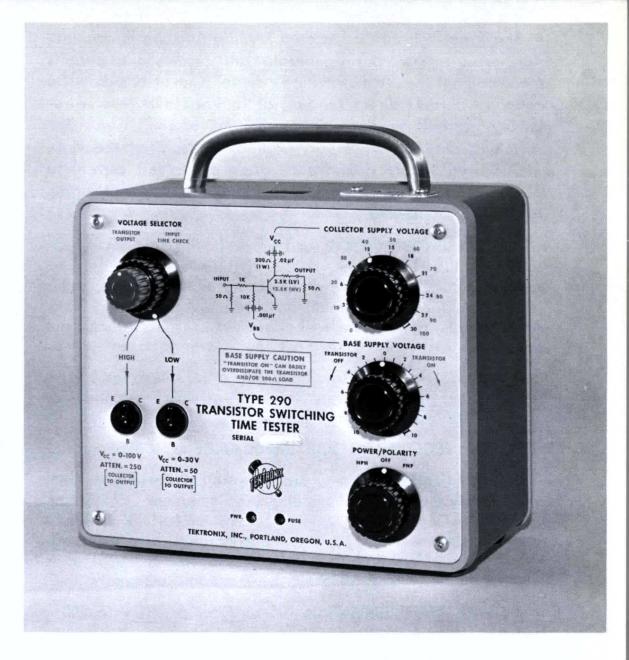
TWO TRANSISTOR TEST SOCKETS (HIGH and LOW) are mounted on the Type 290 to provide for easy insertion of the transistor into grounded-emitter test circuit. The HIGH socket connects to a collector supply of 0-100 v and the LOW to a collector supply of 0-30 v.

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 $V_{\rm be}$ 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 \pm 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 73/8" high by 75/8" 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: 2—instruction manuals (070-285), 1—10-nsec cable (017-501), 1—3-conductor power cord, (161-015), 1—3 to 2-wire adapter (103-013).

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. Do 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.

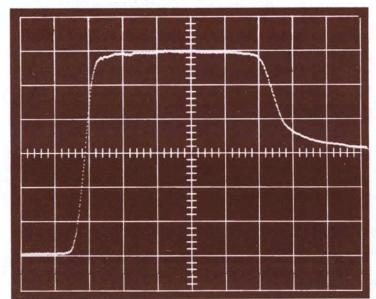
DIODE RECOVERY LOOP IMPEDANCE is 100 ohms.

SUPPLY CURRENT is provided in seven calibrated steps from 1 milliampere to 100 milliamperes 1-2-5 sequence. Calibration accuracy is within \pm 2% for all steps except the 100-milliamperes step, which is \pm 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^{18} " deep. Net weight is 6 pounds. Shipping weight is 9 pounds, approx.

Includes: 2—instruction manuals (070-361), 1—3-conductor power cord (161-015), 1—3 to 2-wire adapter (103-013).



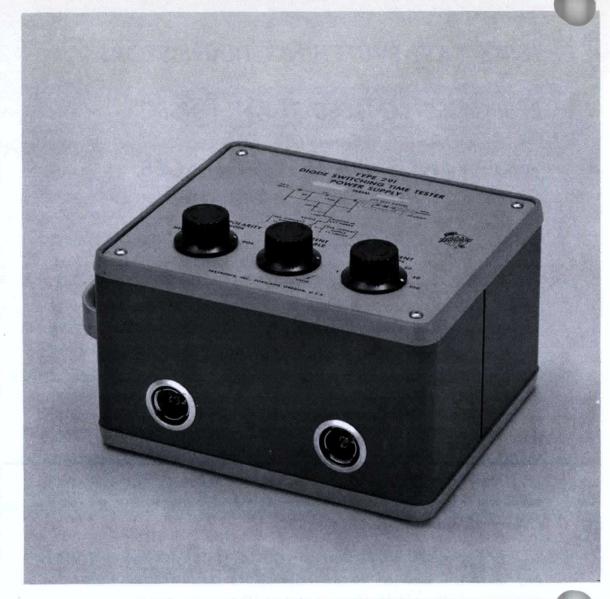
Horizontal — 1 nsec/div

Vertical — 10 ma/div

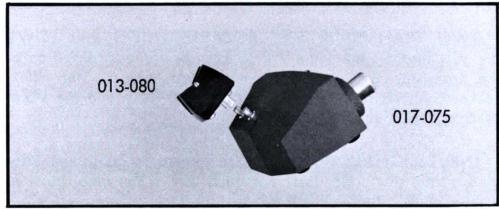
Diode Reverse Recovery Waveform

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.

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



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 nanoseconds and less than 2% ringing is introduced in a 0.35 nanosecond system. Conductive capacitance is less than 0.004 pf (side-to-side).

V-shaped field-replacetable contacts with a life expectancy of 10 million components utilize magnetic attraction to secure the diode and assure electrical continuity during a test. Diode ejection is either manual, by push button; or automatic, by solenoid (not included).

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— $1\frac{1}{2}$ " high by $1\frac{1}{4}$ " wide by $1\frac{1}{4}$ " deep; Adapter—2" high by 5" wide and $3\frac{1}{2}$ " deep.

DIODE TEST JIG (Part Number 013-080)	\$40
ADAPTER (Part Number 017-075)	\$55

230



SEMICONDUCTOR TESTER 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:

- Monitoring either the internal TEST VOLTS or BIAS CURRENT supply, or
- 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 $\pm 3\%$ when the variable control is fully clockwise. An uncalibrated variable control allows the voltage of a fixed step to be attenuated 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 $\pm 3\%$ when the variable control is fully clockwise. An uncalibrated variable control allows the current of a fixed step to be attenuated by any factor between 1 and at least 10. Ripple current (either polarity), listed below, applies for any current from about 2 μ a 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 $5~\mu a$
50 ma	less than 10 μ a
100 ma	less than 20 μ a
200 ma	less than 100 μ a

POWER REQUIREMENTS are from 105 v to 125 v or 210 v to 250 v, 50 to 60 cycles, 30 watts.

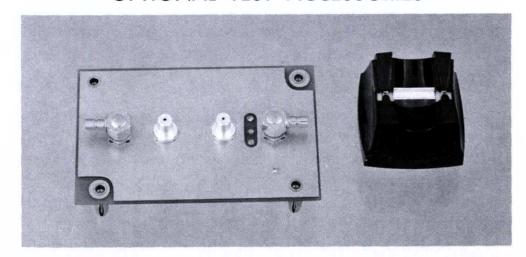
MECHANICAL SPECIFICATIONS include dimensions of $4^{5}/_{8}$ " high by 8" wide by 10" deep. Net weight is $6^{1}/_{4}$ pounds, approx. Shipping weight is 12 pounds, approx.



TYPE 292 SEMICONDUCTOR TESTER POWER SUPPLY \$325

Each instrument includes: 1—transistor test fixture, unwired (016-057), 3—P6040 cables (010-133), 1—3-conductor power cord (161-015), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-410).

OPTIONAL TEST ACCESSORIES



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.

DIODE TEST	JIG, Part	Number 013-080		\$40
TEST JIG AD	APTER, Po	art Number 016-05	9	\$21

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.

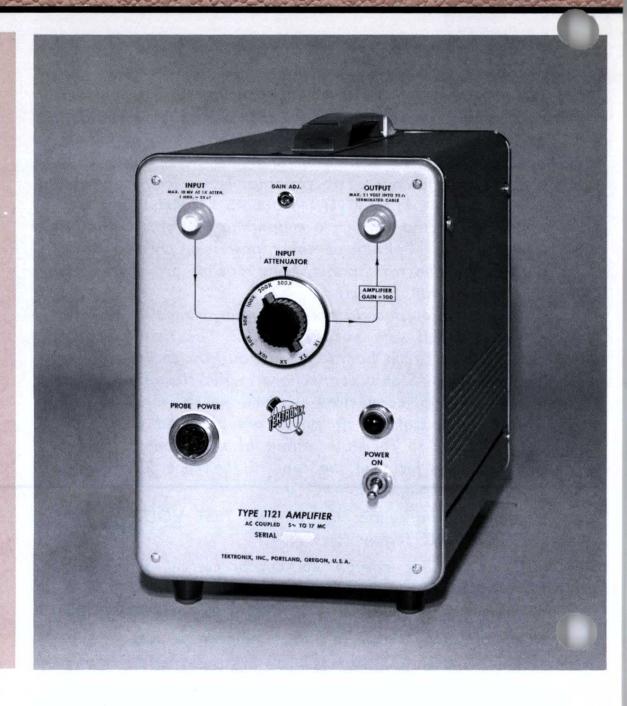
Probe Power

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 low-noise, cascode-input 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 μ v 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 cathodefollower probe. For applications requiring both high impedance input and high gain or where the attenu-



ation 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 μ v, 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 newly-designed 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 ± 1 volt swing in a terminated 93-ohm coaxial cable, the Type 1121 reproduces any input signal up to ± 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 in-

strument for minimum waveform distortion. If additional cable length is required, insert a section of RG62U (93 ohm) cable between the Type 1121 OUT-PUT 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 $10\frac{3}{4}$ " high by 7" wide by $15\frac{7}{8}$ " deep. Net weight is $18\frac{1}{2}$ pounds. Shipping weight is 28 pounds, approx.

TYPE 1121 AMPLIFIER \$465

Each instrument includes: 1—93 Ω cable (012-075), 1—93- Ω termination (011-056), 1—3-conductor power cord (161-010), 1—3 to 2-wire adapter (103-013), 2—instruction manuals (070-204).

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 (010-101) ... \$99.50

170-OHM UHF TERMINATION (011-048) \$15

P93A Coaxial Output Cable—For applications requiring variable attenuation between steps, a P93A coaxial output cable can be used. The 93-ohm, 42" cable terminates in a variable attenuator with UHF connector.

P93A OUTPUT CABLE (012-004) \$13.50

BNC to UHF Adapter—This adapter makes the above accessories with UHF connectors compatible with the Type 1121 Amplifier.

BNC MALE ADAPTER (103-032) \$3.55

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

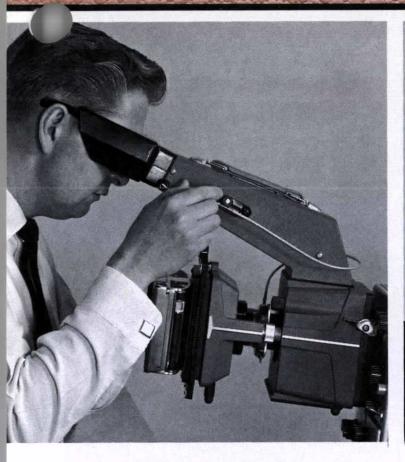
ACCESSORY SECTION CONTENTS



TRACE-RECORDING	TYPE 130 L-C METER ACCESSORIES
SCOPE-MOBILE® CARTS	TYPE 180-181 ACCESSORIES
PROBES	TYPE 310/310A FAN BASE 276
Introduction	TYPE 321-321A BATTERIES 276
Probe-Instrument Compatibility Chart General Purpose Probes	TYPE 507 GROUND CONNECTOR 276
Special Purpose Probes Sampling Probes CT-1 Current Transformer and P6040 Probe CT-2 Current Transformer and P6041 Probe CT-3 50-ohm Signal Pickoff	TYPE 519 ACCESSORIES
PROBE ACCESSORIES	125-Ω ACCESSORIES
INPUT TIME-CONSTANT STANDARDIZERS 267	Delay Cables
INPUT ADAPTERS-ATTENUATORS-TERMINATIONS 267 B170-A Attenuator Miscellaneous Adapters	TYPE 570 ADAPTER PLATES
PLUG-IN UNIT ACCESSORIES	VIEWING ACCESSORIES
Plug-In Storage Cabinets TEST UNITS	CARRYING CASES
MOUNTING ACCESSORIES	DUAL INPUT SWITCHING ASSEMBLY 278
SAMPLING ACCESSORIES	DEFLECTION PLATE CONNECTOR
Connecting Cables	MISCELLANEOUS CORDS AND LEADS 278
Calibration Adapter 50-Ω Voltage Pickoff T's	POWER CORDS
Timing Standard	MISCELLANEOUS CABLES
Transformer Matched "T"	STANDARD GRATICULES
Diode Test Jigs Plug-In Unit Accessories	SPECIAL GRATICULES
TYPE "O" PLUG-IN UNIT ACCESSORIES 274	UNSCRIBED GRATICULES
Logarithmic Amplifier Adapter	
Compensating Adapter	PLEXIGLASS LIGHT FILTERS 281
TYPE "Q" PLUG-IN UNIT RESISTOR BOARDS 275	REPLACEMENT CATHODE-RAY TUBES 281
TYPE "R" PLUG-IN UNIT PLATE WIRED ASSEMBLIES 275	



Type C-12, C-13, C-19 & C-27 Cameras



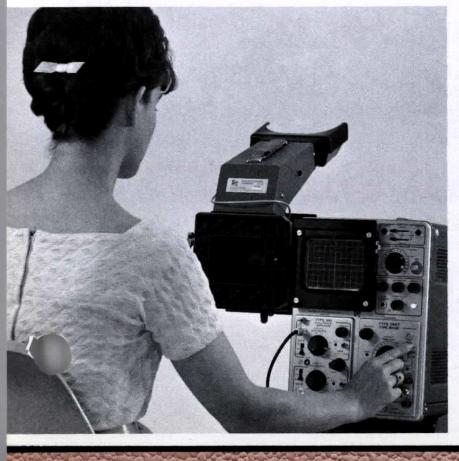


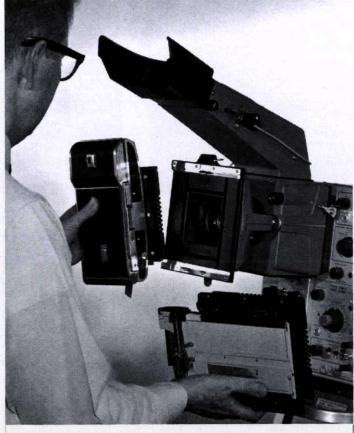


DESIGN FEATURES

- 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

*C-13 features hinged viewing aperture in place of viewing hood.











A WORD ABOUT LENSES

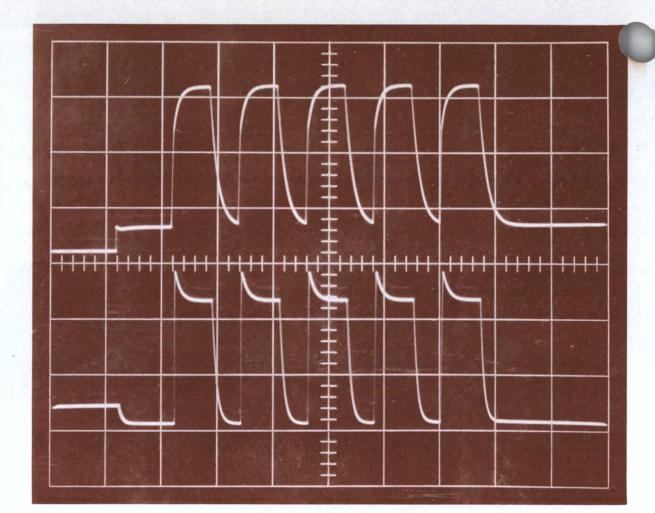
Seven interchangeable lenses are available for use with the Polaroid Land or Graflok Film Backs. The Type 350 Camera Attachment contains its own lens.

Lens optics are designed to meet the strict requirements of precision oscillography: flat field, low distortion, and high resolution even at maximum aperture openings.

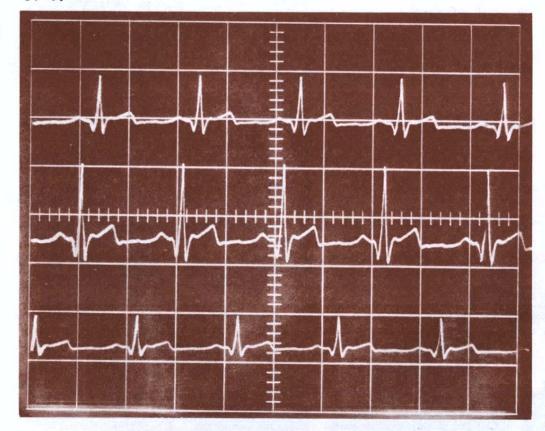
Lenses are set for precise object-to-image ratios in prefocused mounts, for easy interchange in camera.

The wide range of object-to-image ratios and maximum apertures permits selection of the lens which is most right for your application.

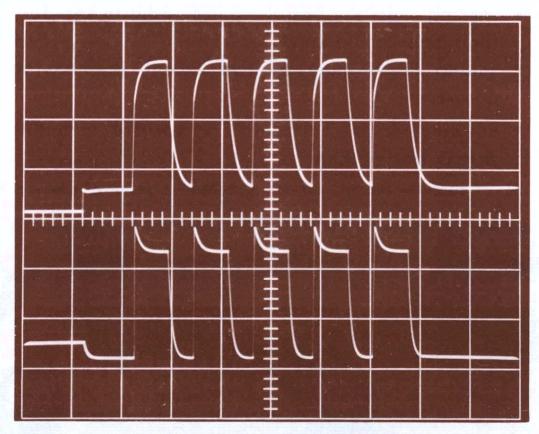
*Writing Rate Factor (WRF) is an arbitrary indication of the relative light-gathering capability of the various lenses. A WRF of 4 indicates four times as much light-gathering ability as a WRF of 1.



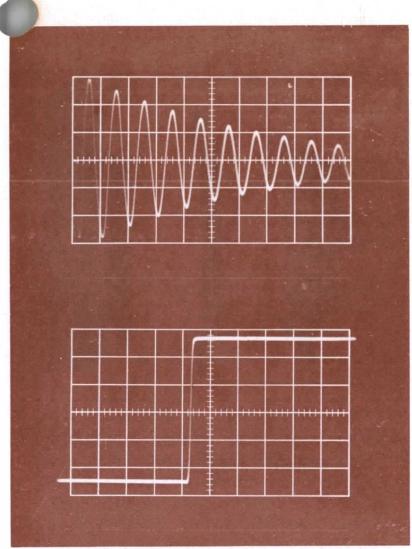
PRECISE FULL-SIZE IMAGE—f/1.4, 1:1 object-to-image ratio . . . for precise full-size records . . . measurements can be scaled directly off photograph with maximum resolution . . . WRF* of 7.



GENERAL PURPOSE—f/1.9, 1:0.85 object-to-image ratio . . . image brightness sufficient for most applications. When photographing 8×10 cm graticules or 10×10 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 73.4×97 mm maximum recording area of $3^{1}/_{4} \times 4^{1}/_{4}$ size Polaroid film . . . WRF* of 4.

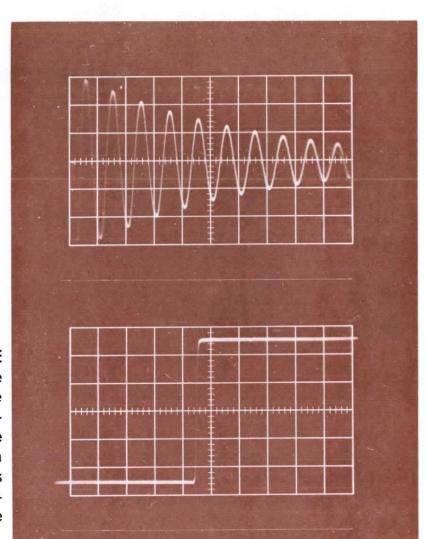


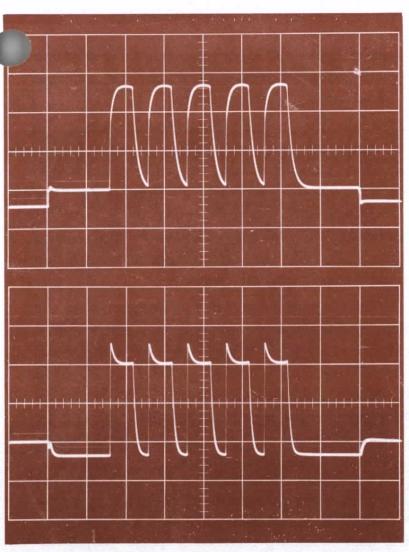
GENERAL PURPOSE—f/1.9, 1:0.9 object-to-image ratio . . . image brightness sufficient for most applications . . . records up to 8×10 -cm graticule on $3\frac{1}{4} \times 4\frac{1}{4}$ film with maximum resolution . . . WRF* of 4.



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.

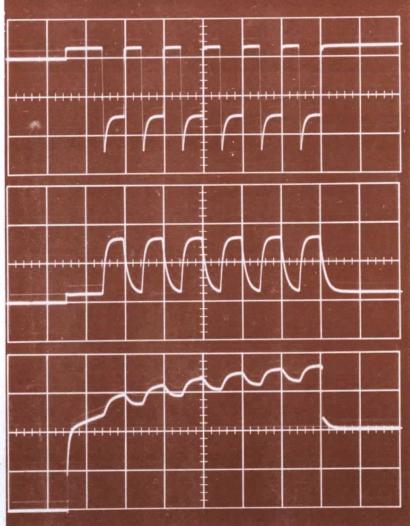
ULTRA-HIGH WRITING RATE—f/1.3, 1:0.5 object-to-image ratio . . . for applications where writing rate is the prime consideration . . . advances the state of the art and in combination with the C-19 Main Frame makes possible the recording of higher-speed phenomena than before . . . WRF* of 12.

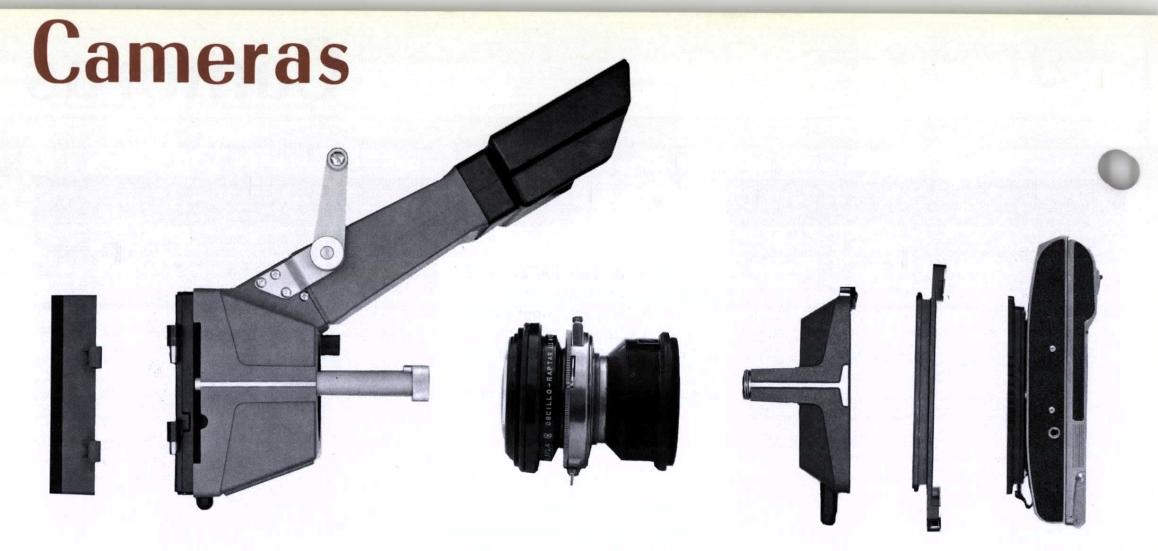




ECONOMY—f/4.5, 1:0.7 object-to-image ratio . . . for economy of price and efficient use of film where high writing rate is not required . . . 3 records of 4×10 -cm graticule, or 2 records of 6×10 -cm graticule on $3^{1}/_{4} \times 4^{1}/_{4}$ film . . . WRF* of 1.

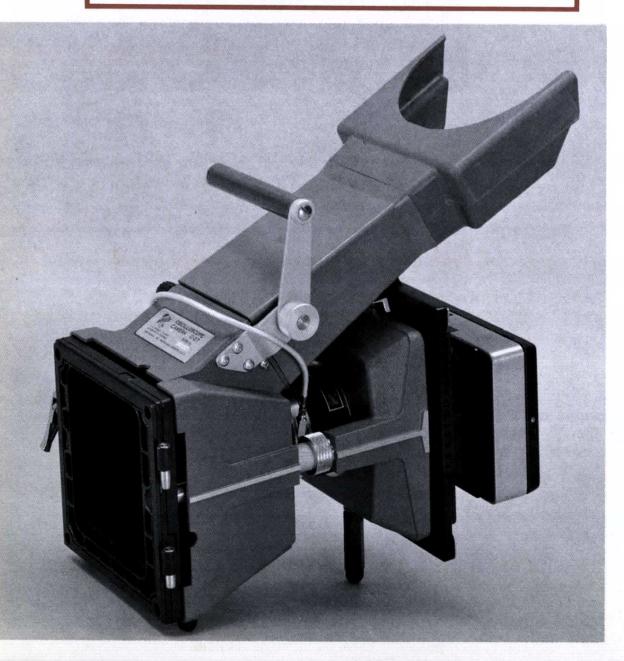
ECONOMY & SPEED—f/1.9, 1:0.7 object-to-image ratio . . . efficient use of film . . . WRF* of 5.





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 film back. For 35-mm photography, only a bezel, main frame assembly, and Type 350 Camera Attachment are required. Four Standard Camera Assemblies are described on the following pages. Variations of the standard cameras (using inter-changeable 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.

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 $(8 \times 10\text{-cm} \text{ on } 3^{1}/_{4} \times 4^{1}/_{4} \text{ film or } 10 \times 10\text{-cm} \text{ coverage on } 4 \times 5 \text{ film})$ 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 $7^{1/2}$ " wide by 13 11/32" long (only 12" with viewing tunnel removed). Net weight is 10 pounds. Shipping weight is approximately 14 pounds.

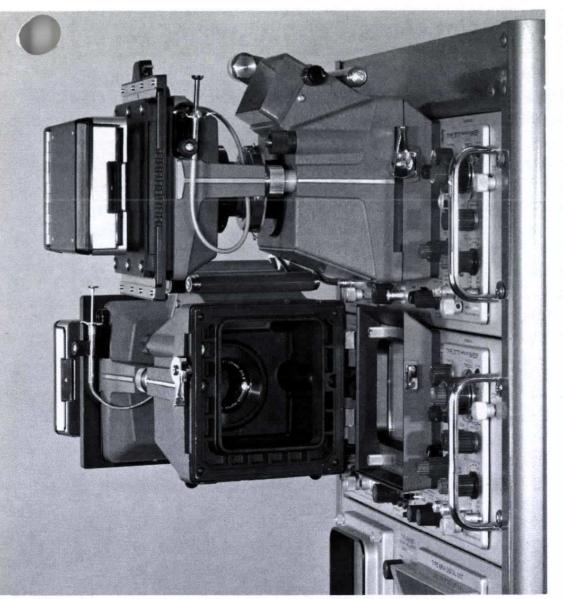
C-27 CAMERA, (less mounting bezel — see page 246) \$420 Each camera includes: 1—cable release (122-586), 1—focus plate (387-893), 2—instruction manuals (070-383).

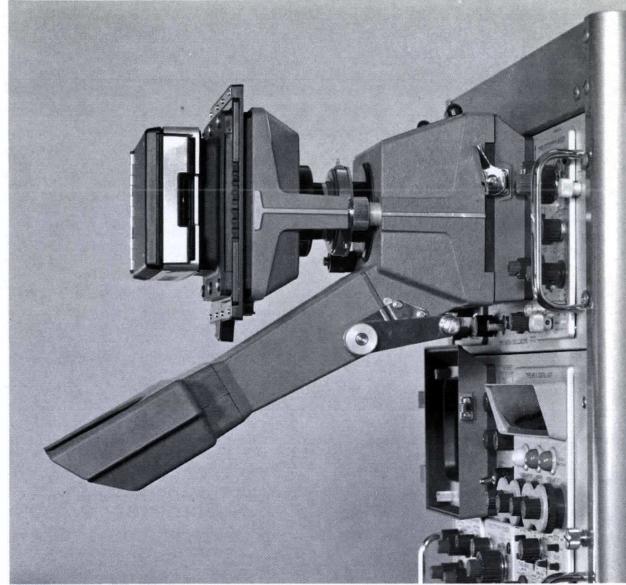
ROLL-FILM CAMERA identical to the Standard C-27, except a Polaroid Roll-Film Back is substituted for the Pack-Film Back. C-27-R CAMERA, (less mounting bezel—see page 246) \$420 ELECTRICALLY-TRIGGERED CAMERA identical to the Standard C-27, but with a shutter actuator and built-in power supply. (See page 245.)

C-27-S CAMERA, (less mounting bezel—see page 246) \$575 ELECTRICALLY-TRIGGERED CAMERA with Roll-Film Back combines features of the C-27-R and C-27-S, above.

C-27-RS CAMERA, (less mounting bezel-see page 246) \$575

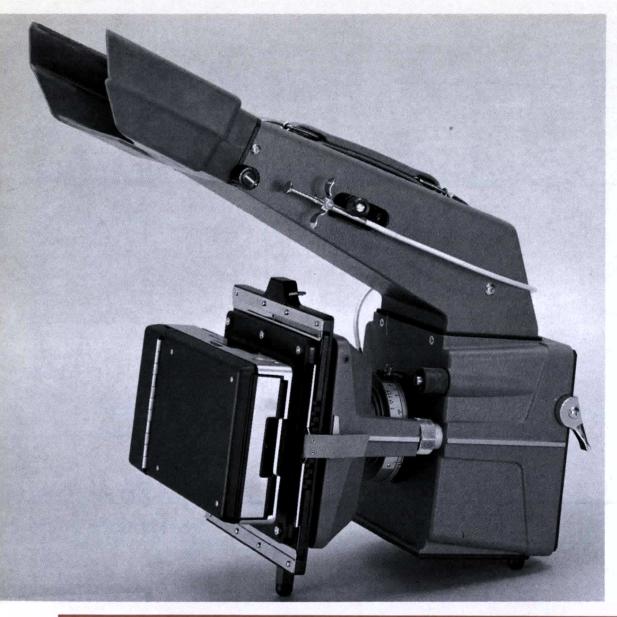
* Registered Trade-Mark Polaroid Corporation.





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 (less mounting bezel — see page 246)	
ECONOMY and SPEED—f/1.9, 1:0.7 Records two 6 x 10-cm or three 4 x 10-cm graticules on	No	Pack Film Roll Film	C-27-547 C-27-547 R	\$440 440	
$3\frac{1}{4} \times 4\frac{1}{4}$ film, or one 10×10 cm with optional Graflok Back. Writing rate factor 1.25X Standard Lens.	Yes	Pack Film Roll Film	C-27-547 S C-27-547 RS	595 595	
GENERAL-PURPOSE—f/1.9, 1:0.9	No	Pack Film Roll Film	C-27-548 C-27-548 R	420 420	
Records an 8×10 -cm graticule on $3\frac{1}{4} \times 4\frac{1}{4}$ film. Writing rate factor same as Standard Lens.	Yes	Pack Film Roll Film	C-27-548 S C-27-548 RS	575 575	
HIGH WRITING RATE—f/1.9, 1:0.5	No	Pack Film Roll Film	C-27-549 C-27-549 R	460 460	
Records fast-writing displays such as single-shot transients. Writing rate factor 1.5X Standard Lens.	Yes	Pack Film Roll Film	C-27-549 S C-27-549 RS	615 615	
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—f/1.4, 1:1 Records full-size image of 10 x 10-cm graticule (on	No	Pack Film Roll Film	C-27-608 C-27-608 R	535 535	
4 x 5 film with Graflok Back). Writing rate factor 1.75X Standard Lens.	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	No	Pack Film Roll Film	C-27-662 C-27-662 R	585 585	
Records two 6 x 10-cm graticules on each film. Writing rate factor 3X Standard Lens.	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 21/4 x 31/4 Graflok Backs and accessories are shown on page 247.



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, (less mounting bezel—see page 246) . . \$450 Each camera includes: 1—cable release (122-586), 1—focus plate (387-893), 2—instruction manuals (070-383).

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, (less mounting bezel—see page 246) \$450 ELECTRICALLY-TRIGGERED CAMERA identical to the Standard C-12, but with a shutter actuator and built-in power supply. (See page 245.)

C-12-S CAMERA, (less mounting bezel—see page 246) \$605 ELECTRICALLY-TRIGGERED CAMERA with Roll-Film Back combines features of the C-12-R and C-12-S, above.

C-12-RS CAMERA, (less mounting bezel—see page 246) \$605

CUSTOM C-12 CAMERAS						
(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 (less mounting bezel — see page 246)		
ECONOMY and SPEED—f/1.9, 1:0.7 Records two 6 x 10-cm or three 4 x 10-cm graticules	No	Pack Film Roll Film	C-12-547 C-12-547 R	\$470 470		
on each film. Writing rate factor 1.25X Standard Lens.	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		
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-12-550 C-12-550 R	395 395		
PRECISE FULL-SIZE IMAGE—f/1.4, 1:1 Records full-size image of 8 x 10-cm graticule (on	No	Pack Film Roll Film	C-12-608 C-12-608 R	565 565		
4 x 5 film with Graflok Back). Writing rate factor 1.75X Standard Lens.	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 Compensates for losses in beam-splitting mirror where writing rate is prime consideration. Records	No	Pack Film Roll Film	C-12-662 C-12-662 R	615 615		
two 6 x 10-cm graticules on each film. Writing rate factor 3X Standard Lens.	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	No	Pack Film Roll Film	C-12-692 C-12-692 R	450 450		
within exposable area of 31/4 x 41/4 film. Writing rate factor same as Standard C-12.	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 21/4 x 31/4 Graflok Backs and accessories are shown on page 247.

PROJECTED GRATICULE for the C-12 Camera

The Projected Graticule eliminates parallax, one of the most common problems in making accurate readings of oscillographs taken of external graticule crt's.

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.

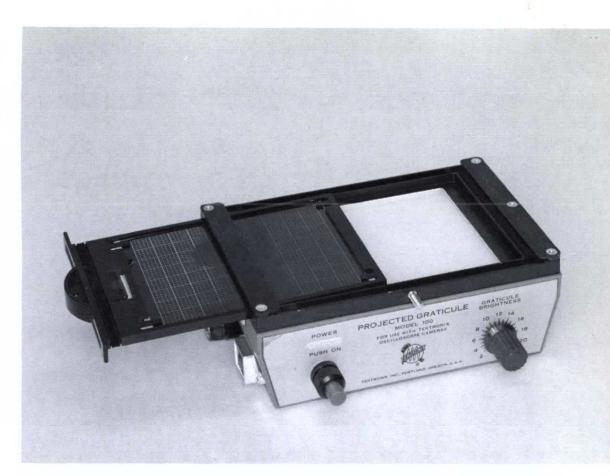
To eliminate parallax, a virtual image of the graticule is presented at the crt phosphor plane as viewed by the operator and as projected to the camera film plane.

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 8×10 -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.

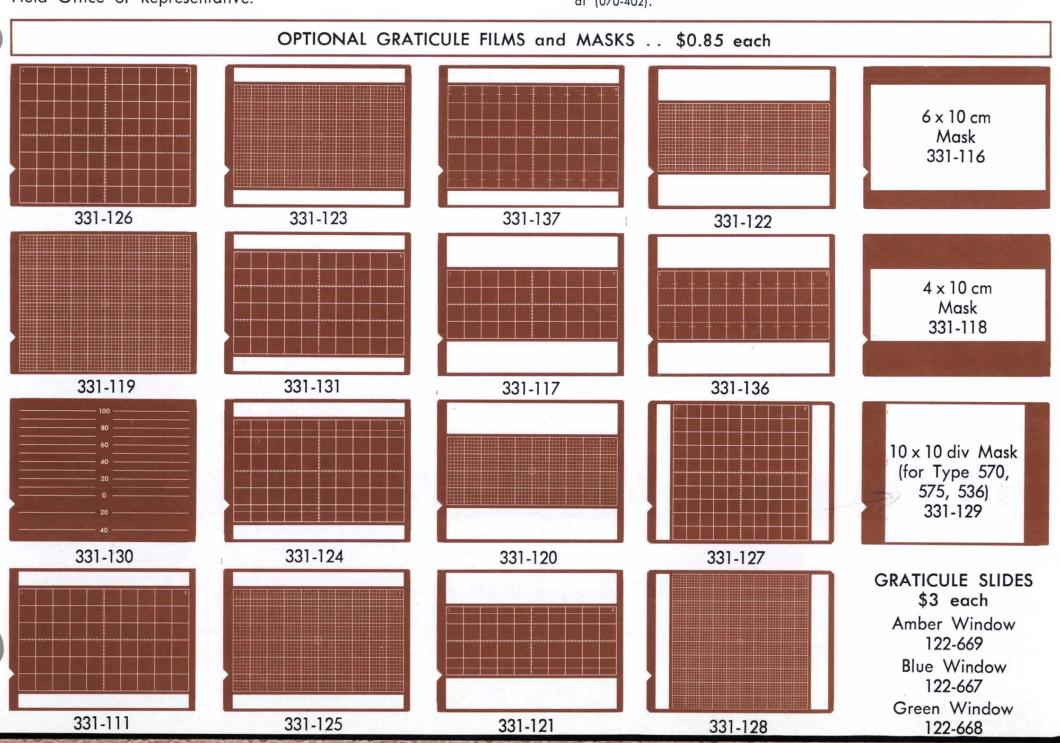
The light source is indexed in $\frac{1}{2}$ f stop increments for use as a film exposure guide. This source can also be used for precise prefogging of film for increased sensitivity in fast writing-rate applications.

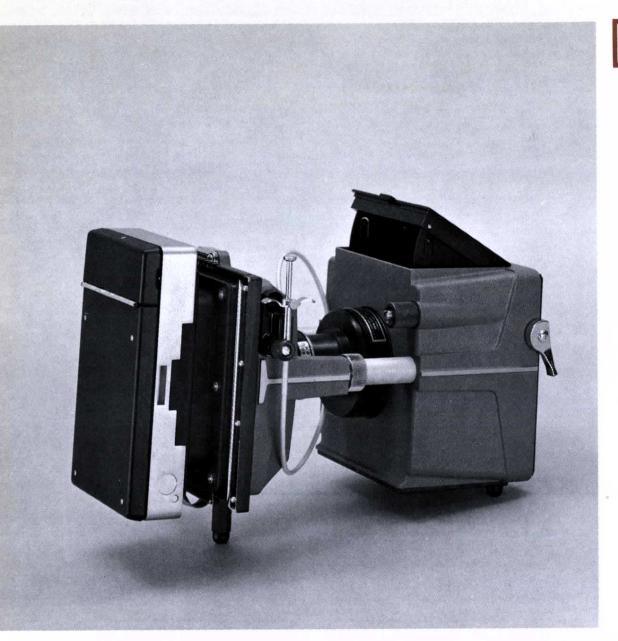
Power requirements are 90 to 130 v, or 180 to 260 v, 60 cps. Although the Projected Graticule case is small (it adds only 21/4" to camera height), clearance problems exist with the Type 81 Adapter and a few plug-in unit/probe combinations. If in doubt about compatibility, please consult your Tektronix Field Office or Representative.



PROJECTED GRATICULE (016-204)\$160

Includes: 1—power cord (161-015), 1—3 to 2-wire adapter (103-013), 1—graticule film, 4×10 cm with write-in area and short minor lines (331-117), 1—graticule film, 6×10 cm with write-in area and short minor lines (331-111), 1—graticule film, 8×10 cm without write-in area, but with full minor lines (331-119), 1—graticule mask, 4×10 cm (331-118), 1—graticule mask, 6×10 cm (331-116), 1—instruction manual (070-402).





STANDARD C-13 CAMERA

The C-13 Camera combines quality and economy where high writing rate is not required. Displays are viewed directly through a hinged aperture in the top of the camera frame. The f/4.5—1:0.7 lens supplied with the Standard C-13 offers economy of price and efficient use of film with up to 8 x 10 cm coverage. The Polaroid* Land Pack-Film Back offers convenient loading and picture development outside the camera. Dimensions overall are 8 3/4" high by 7 1/2" wide by 14" long. Net weight is 9 3/4 pounds. Shipping weight is approximately 14 pounds.

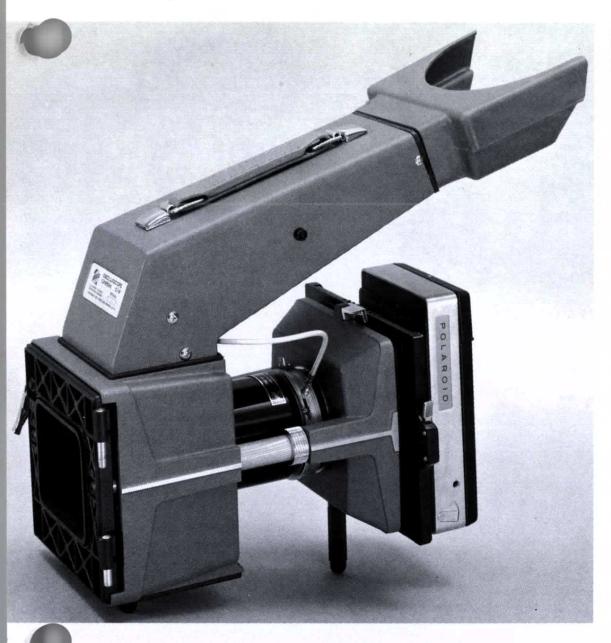
C-13 CAMERA, (less mounting bezel—see page 246) . . \$360 Each camera includes: 1—cable release (122-586), 1—focus plate (387-893), 2—instruction manuals (070-383).

ROLL-FILM CAMERA identical to the Standard C-13, except a Polaroid Land Roll-Film Back is substituted for the Pack-Film Back.

C-13-R CAMERA, (less mounting bezel—see page 246) \$360

	CUSTOM C-13	CAMERAS		
LENS (Writing rate factor compared to Standard f/4.5, 1:0.7 lens)	SHUTTER ACTUATOR and BUILT-IN POWER SUPPLY	POLAROID LAND FILM BACK	ORDER NO.	PRICE (less mounting bezel — see page 246)
GENERAL-PURPOSE—f/1.9, 1:0.9 Records an 8 x 10-cm graticule on 31/4 x	No	Pack Film Roll Film	C-13-548 C-13-548 R	\$415 415
41/4 film. Writing rate factor 4X Standard Lens.	Yes	Pack Film Roll Film	C-13-548 S C-13-548 RS	570 570
PRECISE FULL-SIZE IMAGE—f/1.4, 1:1 Records full-size image of 8 x 10-cm	No	Pack Film Roll Film	C-13-608 C-13-608 R	530 530
graticule (on 4 x 5 film with Graflok Back). Writing rate factor 7X Standard Lens.	Yes	Pack Film Roll Film	C-13-608 S C-13-608 RS	685 685
GENERAL-PURPOSE—f/1.9, 1:0.85 Insures complete coverage of 8 x 10-cm	No	Pack Film Roll Film	C-13-692 C-13-692 R	415 415
graticule on $3\frac{1}{4} \times 4\frac{1}{4}$ film. Writing rate factor 4X Standard Lens.	Yes	Pack Film Roll Film	C-13-692 S C-13-692 RS	570 570

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 21/4 x 31/4 Graflok Backs and accessories are shown on page 247.



STANDARD C-19 CAMERA

The C-19 Camera makes permanent records of single-shot phenomena where high writing rate is required. Mirror placement provides low-angle binocular viewing and maximum light transmission from crt to film. The f/1.9—1:0.5 lens supplied with the Standard C-19 records two 6 x 10-cm displays or an 8 x 10-cm display on 3½ x 4¼ film. The Polaroid* Land Pack-Film Back offers convenient loading and picture development outside the camera. Dimensions overall are 153/8" high by 7½" wide by 17¼" long. Net weight is 13¾ pounds. Shipping weight is approximately 18 pounds.

C-19 CAMERA, (less mounting bezel—see page 246) . . \$500 Each camera includes: 1—cable release (122-586), 1—focus plate (387-893), 2—instruction manuals (070-383).

ROLL-FILM CAMERA identical to the Standard C-19, except a Polaroid Roll-Film Back is substituted for the Pack-Film Back. C-19-R CAMERA, (less mounting bezel—see page 246) \$500 ELECTRICALLY-TRIGGERED CAMERA identical to the Standard C-19, but with a shutter actuator and built-in power supply. (See page 245).

C-19-S CAMERA, (less mounting bezel—see page 246) \$655
ELECTRICALLY-TRIGGERED CAMERA with Roll-Film Back combines features of the C-19-R and C-19-S, above.

C-19-RS CAMERA, (less mounting bezel—see page 246) \$655

	CUSTOM C-19	CAMERAS		
LENS (Writing rate factor compared to Standard f/1.9, 1:0.5 lens)	SHUTTER ACTUATOR and BUILT-IN POWER SUPPLY	POLAROID LAND FILM BACK	ORDER NO.	PRICE (less mounting bezel — see page 246)
GENERAL-PURPOSE—f/1.9, 1:0.9 Records on 8 x 10-cm graticule on 31/4 x	No	Pack Film Roll Film	C-19-548 C-19-548 R	\$460 460
41/4 film. Writing rate factor .67X Stand- ard Lens.	Yes	Pack Film Roll Film	C-19-548 S C-19-548 RS	615 615
PRECISE FULL-SIZE IMAGE—f/1.4, 1:1 Records full-size image of 8 x 10-cm graticule (on 4 x 5 film with Graflok	No	Pack Film Roll Film	C-19-608 C-19-608 R	575 575
Back). Writing rate factor 1.12X Standard Lens.	Yes	Pack Film Roll Film	C-19-608 S C-19-608 RS	730 730
GENERAL-PURPOSE—f/1.9, 1:0.85 Insures complete coverage of 8 x 10-cm	No	Pack Film Roll Film	C-19-692 C-19-692 R	460 460
graticule on 31/4 x 41/4 film. Writing rate factor .67X Standard Lens.	Yes	Pack Film Roll Film	C-19-692 S C-19-692 RS	615 615

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. 4×5 and $2\frac{1}{4} \times 3\frac{1}{4}$ Graflok Backs and accessories are shown on page 247.

35-MM ATTACHMENT FOR ALL TEKTRONIX CAMERAS

The Type 350 Camera Attachment consists of a 35-mm film-back and shutter, integral f/1.9 lens with 1:0.2 object-to-image ratio, and mounting hardware to fit a C-12, C-13, C-19 or C-27 Main Frame Assembly. Shown with a C-13 Camera frame.

The "automatic" advance feature of the Type 350 Camera Attachment allows a rapid sequence of exposures with no interruption to manually advance the film to each new frame. The spring motor automatically advances the film one frame each time the shutter trigger is depressed and released. Up to 4 exposures per second can be made using the Model 2 Shutter Actuator.

Shutter speeds are 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, and Bulb. Time exposures are obtained using the Model 2 Shutter Actuator in its 'holding' mode, or locking the cable release with shutter set at B.

Calibrated lens apertures are f/1.9, f/2.8, f/4, f/5.6, f/8, f/11, and f/16. The object-to-image ratio for this lens is 1:0.2, thus its writing rate factor is approximately 1.8X the f/1.9, 1:0.9 lens. With appropriate film processes, the Type 350 Camera Attachment is well suited for photographing fast single-sweep displays.

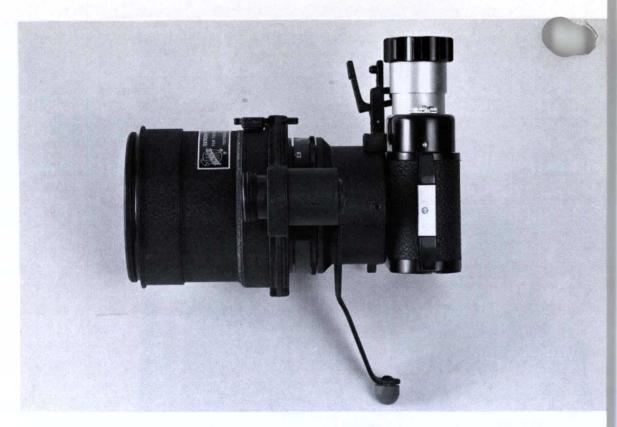
Standard 35-mm cassettes with either 20 or 36-exposures can be used. The Type 350 takes approximately 30 exposures on a 20-exposure roll, or 55 exposures on a 36-exposure roll. Each exposure is 23.2×23.6 mm. Viewing area when mounted in slides is 22×22 mm. 10×10 -cm graticules can be photographed in conjunction with the C-27 Main Frame Assembly $(8 \times 10 \text{ cm})$ with all others).

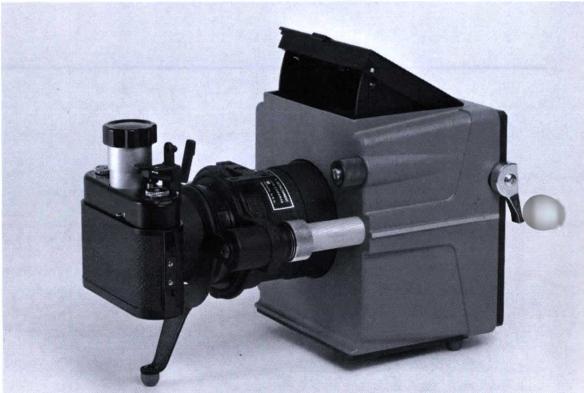
Net weight is $3\frac{1}{4}$ pounds. Shipping weight is approximately 7 pounds.

COMPLETE 35-MM CAMERAS

These cameras include the Type 350 Attachment and appropriate Main Frame Assembly. Mounting bezels must be ordered separately from page 246.

TYPE	350/C-12																		\$555
TYPE	350/C-13,	i	lı	JS	st	r	a	te	ec										520
TYPE	350/C-19																		565
TYPE	350/C-27							,											525





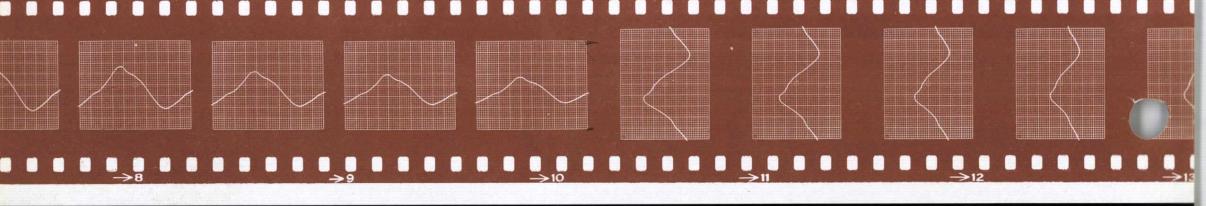
OPTIONAL 35-MM ACCESSORIES

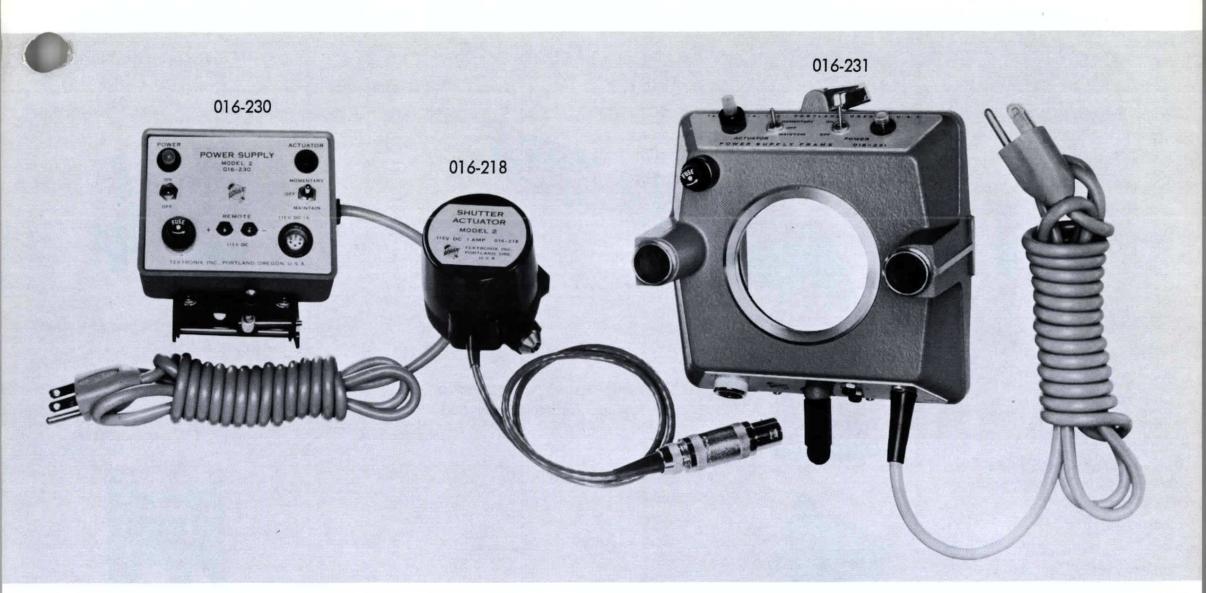
The NR cassette is a light-tight cassette which can be used in place of the standard take-up spool. With the NR cassette it is not necessary to rewind the film after the last exposure. This cassette is especially useful when it is desired to take a small number of pictures and remove them from the camera for immediate processing.

PART NUMBER 016-222 \$5.95

The TR cassette is used for bulk loading, when a great deal of 35-mm film is used, or for films that are only available in bulk.

PART NUMBER 016-221 \$5.95





NEW SHUTTER ACTUATOR for Electrically-triggered exposures

The Shutter Actuator System (Model 2) is a rotary solenoidoperated release that closely simulates the action of a handoperated cable release. It permits electrical triggering of most Tektronix Trace-Recording Cameras.

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, C-13, C-19, and C-27 Camera. The other is a separate small housing which can be mounted to the Type 350 35-mm Attachment, either of the Polaroid Backs, or used remotely.

A holding circuit in the separate power supply allows the actuator to be energized indefinitely without overheating. This feature is especially useful in obtaining Time exposures with the Type 350 35-mm Attachment. Several actuators can be operated simultaneously by paralleling the remote switches from the individual power supplies.

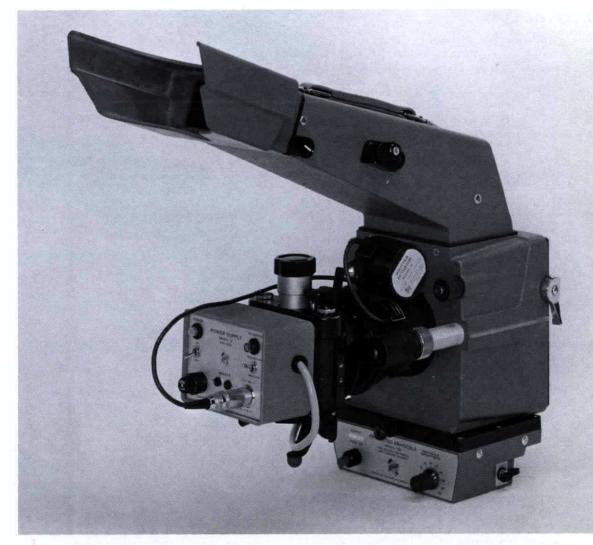
CHARACTERISTICS

The actuator mounts to the cable release bushing of the Alphax #3 and Ilex #3 shutters, and to the body of the Type 350 35-mm Attachment.

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 v dc.

Actuator for either supply (016-218)	\$ 75
Separate Power Supply (016-230)	85
Built-in Power Supply (016-231)	125



Model 2 Shutter Actuator shown with Type 350/C-12 Camera and optional Projected Graticule.

MOUNTING **BEZELS** Each Bezel can be used to mount the rectangular polarized viewer (016-039). FOR C-12, C-13 AND C-19

CAMERAS

For Tektronix Oscilloscopes with round 5" crt. (not needed with Type 519) Part No. 016-226 \$ 15 For Tektronix 560-Series Oscilloscopes with rectangular crt. and Type 506. Part No. 016-217 \$15 For some Hewlett-Packard Oscilloscopes. Contact your local Tektronix Field Office or Representative. Part No. 016-229 \$16



For all Tektronix Oscilloscopes with 5" round crt. Part No. 016-225 \$15

For all Tektronix 560-Series Oscilloscopes with rectangu-

Type 506. Part No. 016-224 \$15

lar crt, the Type RM527 and

For Tektronix Type 647 and RM647 Oscilloscopes.

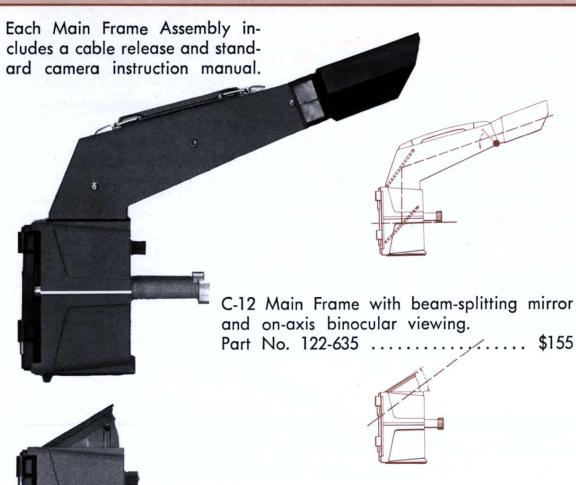
Part No. 016-223 \$15

For most models of Hewlett-Packard Oscilloscopes. Contact your local Tektronix Field Office or Representative. Part No. 016-228 \$15

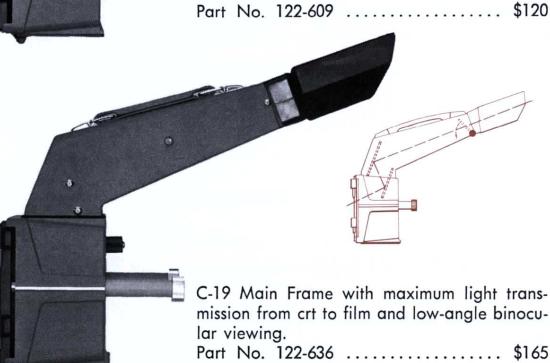
For some models of DuMont Oscilloscopes. Contact your local Tektronix Field Office or Representative.

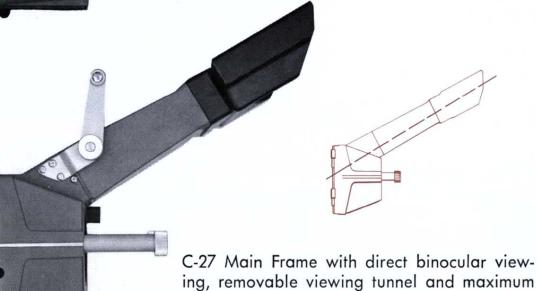
Part No. 016-227 \$15

MAIN FRAME **ASSEMBLIES**



C-13 Main Frame with hinged viewing aperture and maximum light transmission from crt to film.





light transmission from crt to film.

Part No. 122-676\$125

INTERCHANGEABLE LENSES



f/1.9—1:0.7 Economy plus Speed Alphax & Ilex No. 3X Shutter Part No. 122-547 ... \$180



f/1.9—1:0.9 General Purpose Alphax & Ilex No. 3X Shutter Part No. 122-548 ... \$160



f/1.9—1:0.5 High Writing Rate Alphax & Ilex No. 3X Shutter Part No. 122-549 ... \$200



f/4.5—1:0.7 Economy of Film & Price Alphax No. 1 Shutter Part No. 122-550 ... \$105

TERCHANGEABLE LENSES	REAR FRAMES	INTERCHANGEABLE FILM BACKS	ACCESSORIES FOR GRAFLOK BACKS
f/1.4—1:1 Precise full-size Image Alphax No. 3 Shutter Part No. 122-608 \$275			Readily available from local camera shops. Cut-Film Holder 2 exposures
	Standard Frame (not needed with Type 350) Part No. 122-591 \$45	Polaroid Land $3^{1}/_{4} \times 4^{1}/_{4}$ Roll-Film Back, 8 exp. Part No. 122-603 . \$ 75 Focus Plate for above. Part No. 387-460 . \$ 5 Polaroid Land $3^{1}/_{4} \times 4^{1}/_{4}$ Pack-Film Back, 8 exp. Part No. 122-671 . \$ 75 Focus Plate for above. Part No. 387-893 . \$5.35	Film-Pack Adapter 12 exposures
f/1.3—1:0.5 Ultra-High Writing Rate x No. 3X Shutter Part No. 122-662 \$325	Power Supply Frame for Model 2 Shutter Actua- tor (not used with Type 350) Part No. 016-231 . \$125	(Focus Plates not needed if Graflok Back is available.)	Film Magazine 6 exposures
f/1.9—1:0.85 General Purpose Alphax & Ilex No. 3X Shutter Part No. 122-692 \$160	ROTATING SLIDE ADAPTER	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. 122-604 \$45	Roll-Film Adapter "22" 12 exposures, 21/4 x 21/4, 120 film
	Adapts Polaroid or Graflok Back to rear frame. Part No. 122-602 \$25	2½ x 3½ Graflok Back with Focusing Screen ac- cepts standard cut-film holders, film-pack adapt- ers, roll-film (120) adapt- ers. Part No. 016-233 . \$ 45	Roll-Film Adapter "23" 8 exposures, 21/4 x 31/4, 120 film Polaroid Land 4 x 5 Film Holder.

Accessories



SCOPE-MOBILE® CARTS

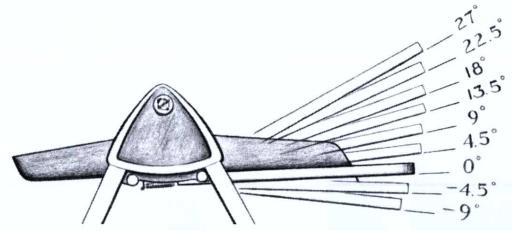
TYPE 200 SERIES



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. All tilt-lock models come equipped with front-wheel brakes.

CHARACTERISTICS

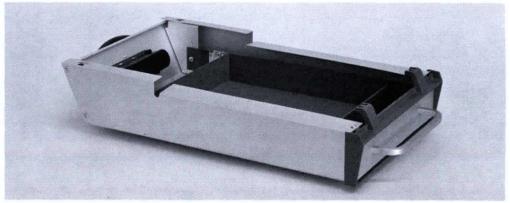
ADJUSTABLE TRAY tilt-locks in either of six 4.5° steps in the upward direction or two 4.5° steps in the downward direction from the horizontal axis.



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 $17\frac{1}{2}$ " 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.



014-012 drawer for 201-1	\$40
014-013 drawer/plug-in carrier combination for 201-2	45
014-014 drawer for 202-1	40
014-015 drawer/plug-in carrier combination for 202-2	45

MODEL	DRAWER	PLUG-IN CARRIER	TRAY WIDTH	TRAY DESIGNED FOR TEK- TRONIX OSCILLOSCOPE TYPE	NET WEIGHT	PRICE
201-1		NO	101/2"	503, 504, 506, 515A,		\$120.00
201-2		2, 3 and 9 Series	101/2"	516, 561, 561A, 564		130.00
202-1 MOD 52	YES	NO	143/4"	519	38 lbs.	155.00
202-1		NO	14"	502A*, 507, 517, 517A, 530, 540,		120.00
202-2		1 and Letter Series	14"	550, 580 Series; 570, 575, 661.		130.00
205-1		NO	173/4"	565, 567, AND ALL RACK- MOUNT INSTRUMENTS	43 lbs.	135.00
				* Requires special adapter, part no	. 436-033	. \$ 2.40

Accessories

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 8 ½" high by 13 ¾" 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".

An available fan kit provides ventilation for the equipment compartment.



CHARACTERISTICS

STATIONARY TRAY slants upward at a 20° angle.

TRAY WIDTH is 13³/₄ 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.

Туре		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 expe		

FOUR WHEEL BRAKES

TYPE 500A MOD 741B	\$114.50
TYPE 500/53A MOD 741B	125.00

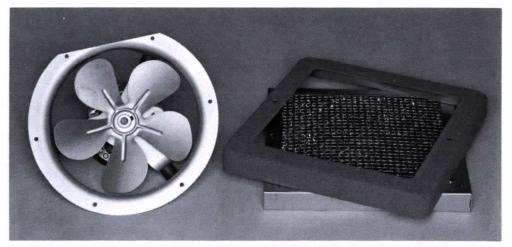
PLUG-IN CARRIER

(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 014-005\$10.50

FAN KIT



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	436-019	\$8.75
503, 504, 515A, 516, 561A, 564	436-058	9.75

Accessories

	CT-1, P6040	CT-2, P6041	СТ-3,	P6016	P6038	P6034 P6035	P6026	P6027 P6028	P6023	P6013 P6015	P6008 P6009	P6006 P6007	P6032	P6025	P500CF**	P500CF	P170CF*	P170CF
	F8040	F8041				10033			LOSCO		10007		11					
104		\ \ \		v				x		x		x			0		0.	TT.
10A		X		X	46.5			x		X		x			0		0	
M17		X	3 8 2 3	X				x		X		x			0		0	
21	47434	x	N. C.	х				x		х		X	BE TO		0		0	
21A		X		X				x		X		X			0		0	
60		X		X				X		X		X			0		0	
02A		0		X				X	X	X		X			0		0	
M503		0		x				x	x	x		X			0		0	
04		0		X				x		X	No. 10	X	BESS		0		0	LARS.
M504		0		х				x		X		X			0		0	
15A		X		X				X		X		X			0	200	0	
M15		X		X				X		X		X			0		0	
174	•	X	0	Х		2.4		X		X		X		450	0	P. D. L.		x
17A 19	0	0	0			0	0											
24AD	-,1							x				x				x		
525								x			12 %	x	119		14.72			
526					-	-		x	a i seriore								-	
527								X										
RM527				Z ISVY	Market St.	9.30	2	X										
								PLUG	-IN UN	IITS								
		X		X	and the same of			x	- 0 11	x		x		1	0		0	
A		x		x				x	0	x		X	10	1 1	0		0	
		x		x				X	x	x		X			0		0	
9		x		x		14.00		x	x	X		X			0		0	
	-	X		X				X		X		X			0		0	7
		X		X				X		X		X			0		0	
M		X		X				X		X		X			0		0	
N	x	0	x			0	x							x				
0		X	5.00	X				х		Х		x			0		0	
Z		X		x					X	0		0			0		0	
1A1	0	X	0	X		0		X		X	X	0			0		0	
1A2 2A60	0	X	0	X		0		X		X	^	0 X			0		0	
2A63		x		X				x	x	X		X	11		0		0	
3A1		X		X	6278.m			X	0	x		X	a second	4 500.0	0		0	
3A2		x		X				x		x		x			0		0	
3A3	BARTE.	x	1000	X					X	X		0			0		0	
3A6		X		X				x	0	x		X			0		0	
3A72 3A74	71 100	X		X		10.5		X		X		x			0		0	
3A75		X		X	7-7-4			X		X		X	E Service		0		0	
10A2	0	x	0	0		0		x		x	x	x			0		0	
82	0	X	0	0		0	100			x	x	0	19		0		0	
86	0	X	0	0		0			X	X	X	0			0		0	
3576	X	0	X	X		X	0						X					
353 451	X	0	X		X	x	0			1 8 2			x	10025				- Last
452	x	0	x		x	x							x					
453	x	0	x						7 6 卷 章			or with the second						
9A1	D. F. Fred	X		X	1239			x	0	x		X			0		0	
9A2		X		X				X	0	X		X			0		0	100
REALEST TO								AN	PLIFIE	RS			reside.	ALEE BO	SEL - SIGN			
122					E. G. (5)			X							0		0	
123								x				x			0			x
Mary Ville	Constitution of				T SEATTAIN													

PROBES

Tektronix manufactures both active and passive probes that broaden application areas for Tektronix oscilloscopes.

Most Tektronix probes are selectable for their attenuation ratios. They not only attenuate the signal to the oscilloscope but also reduce the loading effect of the oscilloscope on the circuit under test.

To assist in selection, the probes have been grouped as to general-purpose, special-purpose, and sampling. When making your selection, consider these guiding principles:

- 1. Be sure the desired probe will accommodate the input resistance and capacitance of the oscilloscope used, and is equipped with the proper type of 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.
- 3. Select for appropriate 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 compatible input capacitance will generally provide the most accurate measurements.

When ordering any probe, please designate not only the type but also the six-digit part number.

If you desire help in selecting the right probe for your applications, please consult your Tektronix Field Engineer.

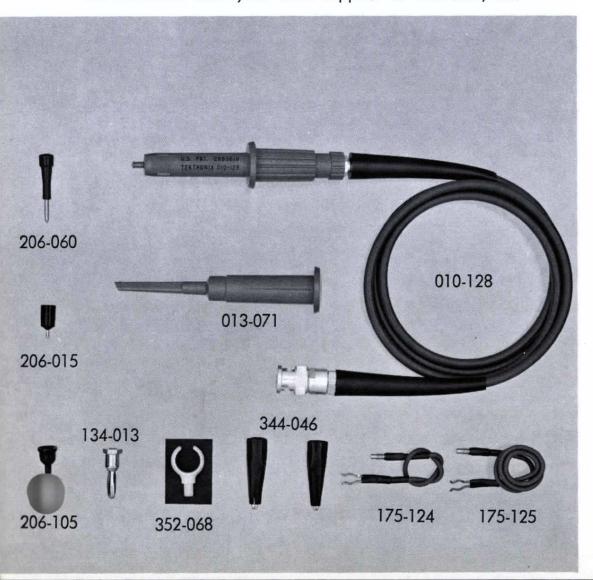
GENERAL PURPOSE PROBES

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 adjusted for the input time-constant of the oscilloscope or plug-in unit.

The probe is available with 6', 9', or 12' cable lengths in addition to the standard 3.5' cable length and either BNC or UHF connectors. BNC to UHF or 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 (010-127 BNC or 010-125 UHF) \$22

Includes: 1—P6006 probe, 010-128 BNC or 010-126 UHF

1—straight tip, 206-015

1—hook tip, 206-105

1—pincher tip, 013-071

1—spring tip, 206-060

1—banana plug, 134-013

I—probe holder, 352-068

1—5" ground lead, 175-124

1—12" ground lead, 175-125

1—instruction manual, 070-381

*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.

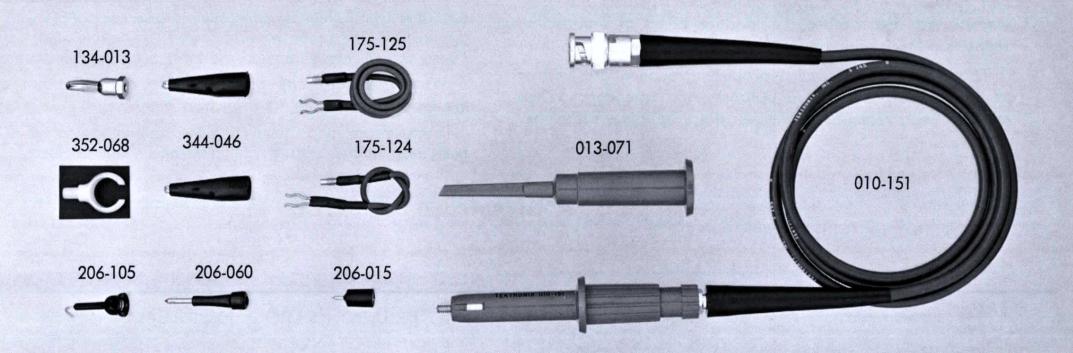
ADDITIONAL CABLE LENGTH P6006 PROBE PACKAGE WITH CORRESPONDING INPUT C CHANGE.

			Part N	lumber	
Cable	Inp	ut C	BNC	UHF	
Length	20 pf	47 pf	Connector	Connector	Price
6'	8.5 pf	11.0 pf	010-160	010-158	\$22
9'	11.0 pf	13.5 pf	010-146	010-142	22
12'	13.0 pf	15.5 pf	010-148	010-144	22

REPLACEMENT PROBES (without tips and ground leads)

	Part Nu		
Cable Length	BNC Connector	UHF Connector	Price
3.5'	010-128	010-126	\$19.50
6'	010-161	010-159	19.50
9'	010-147	010-143	19.50
12'	010-149	010-145	19.50

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 adjusted for 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 pkto-pk.*

STANDARD CABLE is 3.5' long, terminated with BNC or UHF connector.

P6007 PROBE PACKAGE (010-150 BNC or 010-134 UHF) \$22

Includes: 1-P6007 probe, 010-151 BNC or 010-135 UHF

1-straight tip, 206-015 1—hook tip, 206-105

1-pincher tip, 013-071

1-spring tip, 206-060 1—banana plug, 134-013

2-minigator clips, 344-046 1—probe holder, 352-068 1—5" ground lead, 175-124 1—12" ground lead, 175-125

1-instruction manual, 070-381

*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.

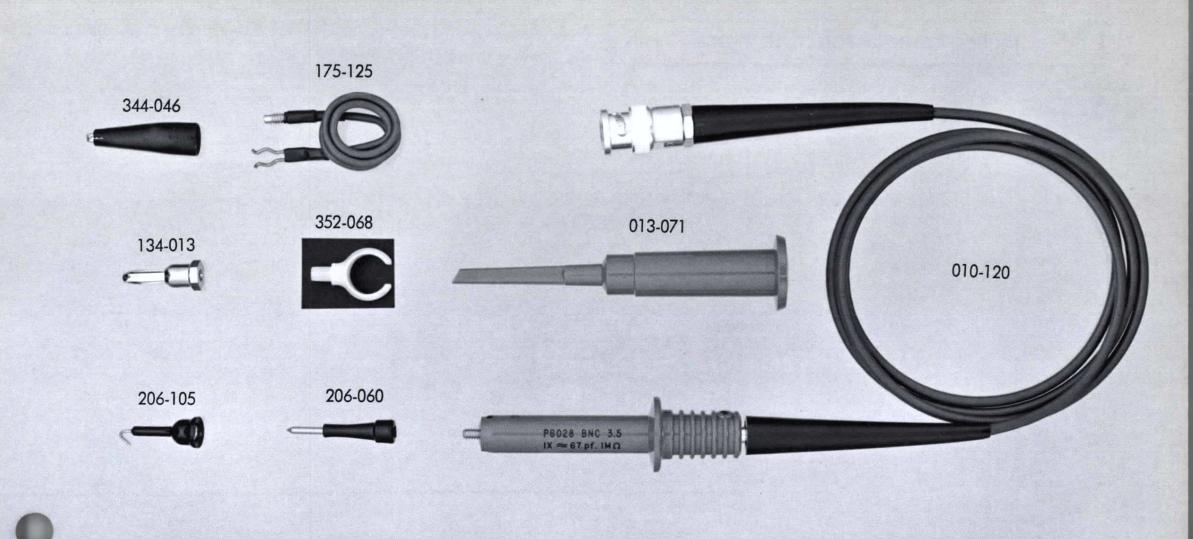
ADDITIONAL CABLE LENGTH P6007 PROBE PACKAGE WITH CORRESPONDING INPUT C CHANGE.

	45.11		Part N	lumber	
Cable Length	Inpu 20 pf		BNC Connector	UHF Connector	Price
6'	2.2	2.5	010-165	010-162	\$22.00
9'	2.4	2.7	010-152	010-136	22.00
12'	2.6	2.8	010-154	010-138	22.00

REPLACEMENT PROBES (without Tips and Ground Leads).

Cable Length	BNC Connector	UHF Connector	Price
3.5'	010-151	010-135	\$19.50
6'	010-166	010-163	19.50
9'	010-153	010-137	19.50
12'	010-155	010-139	19.50

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'. 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.

P6027 PROBE PACKAGE with UHF connector (010-070) \$12.50 P6028 PROBE PACKAGE with BNC connector (010-074) 12.50

Each probe package includes:

1-probe (UHF, 010-116) or (BNC, 010-120)

1—hook tip, 206-105 1-pincher tip, 013-071 1-minigator clip, 344-046 1—probe holder, 352-068

1-spring tip, 206-060

1—12" ground lead, 175-125

1-parts list 1—banana plug, 134-013

*peak-to-peak voltage derating is necessary for CW frequencies higher than 1 Mc. At 10 Mc, the maximum allowable pk-to-pk voltage

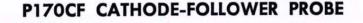
REPLACEMENT PROBES (without tips and ground leads)

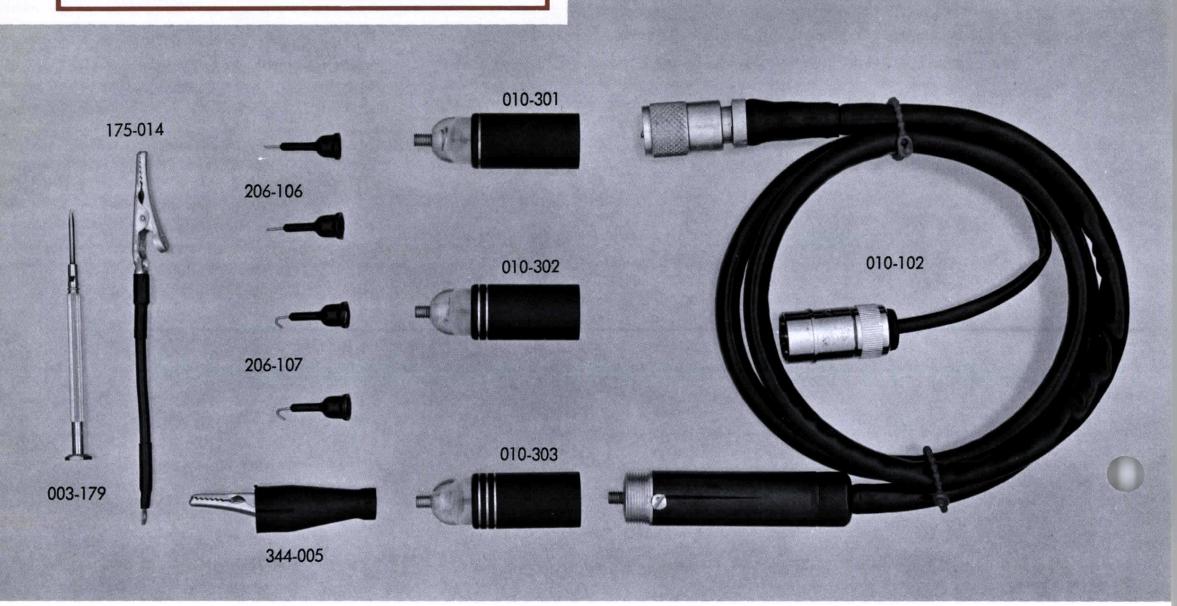
Cable	Part Number			
Length	P6027	P6028	Price	
3.5'	010-116	010-120	\$9.45	
6'	010-117	010-121	9.45	
9'	010-118	010-122	9.45	
12'	010-119	010-123	9.45	

P6027 and P6028 PROBES with over 3.5' cable lengths

10027	una 100	720 INC	JDL3 WIII	I OVEL 3	.5 Cubie	rengins
Probe	Cable Length	Con- nector	Part No.	Capac	out citance Max-pf	Price
P6027 P6028	6 ft.	UHF	010-071 010-075	83.0	110.0	\$12.50
P6027 P6028	9 ft.	UHF BNC	010-072 010-076	110.0	137.0	\$12.50
P6027 P6028	12 ft.	UHF BNC	010-073 010-077	138.0	165.0	\$12.50

SPECIAL PURPOSE PROBES





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 variable attenuator heads for attenuations 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 $\pm 0.5 \,\mathrm{v}$ 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 (010-101) \$99.50

Includes: 1—P170CF probe, 010-102 1—PAX-1 attenuator head,010-301 1—PAX-11 attenuator head, 010-302

1—PAX-1 attenuator head, 010-301 1—PAX-11 attenuator head, 010-302 1—PAX-111 attenuator head, 010-303 2—hook tips, 206-107 2—straight tips, 206-106 1—ground lead, 175-014 1—clip, 344-005 1—screwdriver, 003-179 1—instruction manual,

070-201

P170CF ONLY (010-102) \$53.00

		P170CF A	TTENUATOR	HEADS		
Туре	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	±1 v pk.	010-301	\$14.00
PAX-II	40X min. 400X max.	5 pf 1.2 pf	150 cps 150 cps	±10 v pk.	010-302	\$14.00
PAX-III	400X min. 4000X max.	3 pf 1.1 pf	60 cps 60 cps	±100 v pk.	010-303	\$14.00

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 (010-109) \$85

Includes: 1-P500CF probe

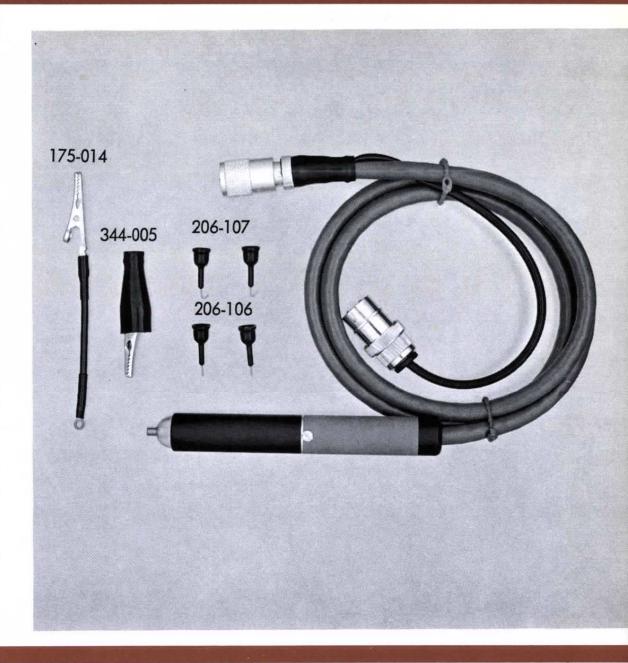
1—10X probe head, 010-304

2-hook tips, 206-107

2-straight tips, 206-106 1-ground lead, 175-014

1-clip, 344-005

1—instruction manual, 070-212



P6023 10X PROBE

Initially designed for the Tektronix Type Z Plug-In Unit, the Type P6023 applies its specifications as well to other Tektronix differential preamplifiers.

The probe can be compensated for input capacities between 20 pf and 50 pf. The attenuation can be compensated for normal plug-in attenuator differences between two plug-in units or two channels of the same plug-in unit.

ATTENUATION RATIO is 10X, adjustable $\pm 2.5\%$.

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.

P6023 PROBE PACKAGE (010-167 LOCKING BNC or 010-065 UHF)

Includes: 1-P6023 probe, 010-168 BNC or 010-097 UHF

1-long tip, 206-105

1-hook tip, 206-023

1-pincher tip, 013-027

1—calibration tip, 206-100

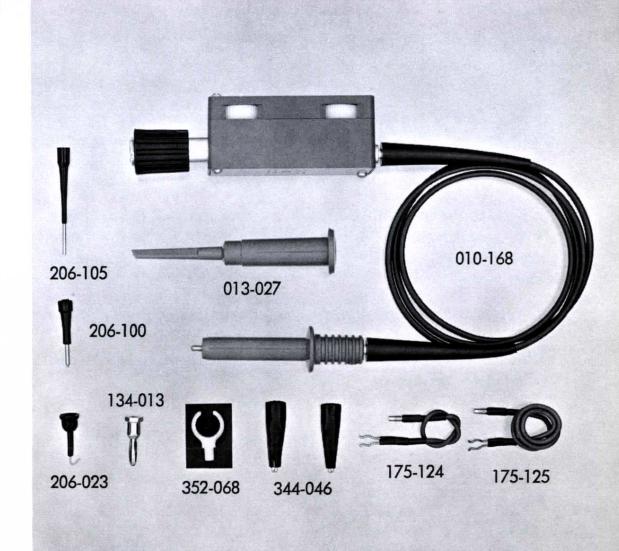
1-banana plug, 134-013

2-minigator clips, 344-046 1-probe holder, 352-068

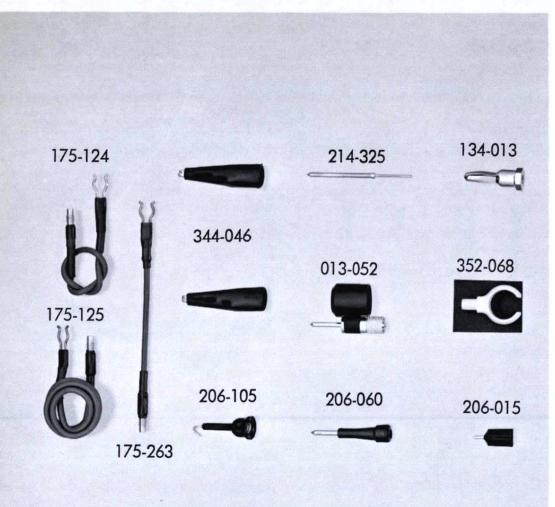
1—5" ground lead, 175-124 1—12" ground lead, 175-125 1-instruction manual, 070-294

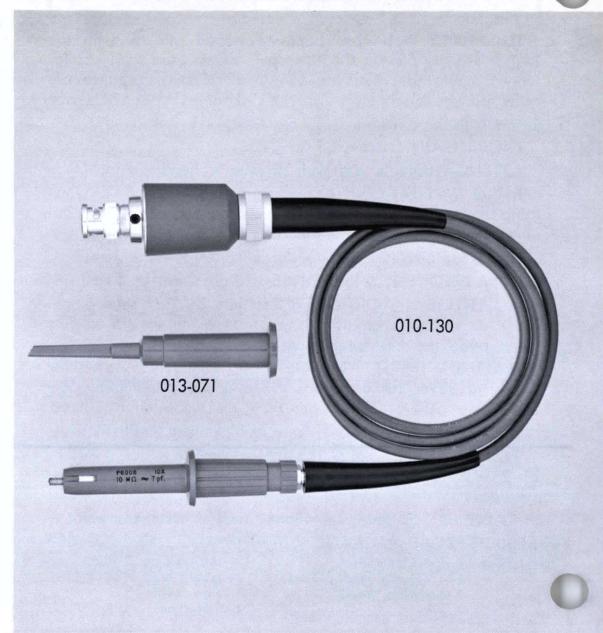
P6023 PROBE ONLY (010-168 LOCKING BNC or 010-097

*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.



P6008 10X PASSIVE PROBE





The P6008 low-capacitance probe was designed for use with the Tektronix Type 82 and Type 86 Plug-In Units. It can also be used with Type 1A1, 1A2 and 10A2 Plug-In Units.

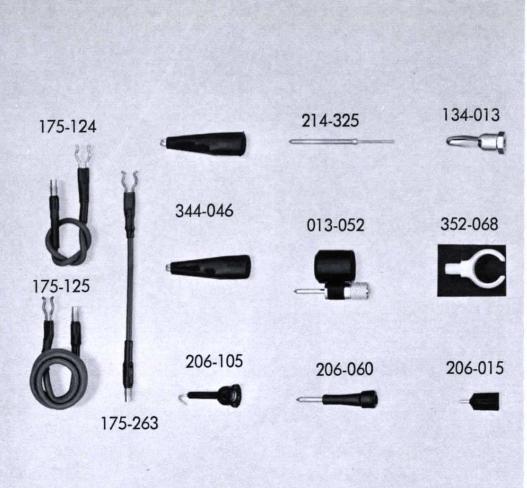
The probe can be adjusted by rotating the probe body with respect to the probe base so that the probe input time constant equals the input time constant of the plug-in unit.

When observing high-frequency signals with the Type P6008, it is necessary to use the shortest ground lead possible in order to avoid excessive inductance between test point and probe.

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 pk-to-pk.* CABLE is 3.5' long, terminated with a BNC connector. P6008 PROBE PACKAGE (010-129) \$35 Includes: 1—P6008 probe, 010-130 1—center pin, 214-325 1—bayonet adapter, 013-2-minigator clips, 344-046 1-probe holder, 352-068 1—hook tip, 206-105 1—3" ground lead, 175-263 1—5" ground lead, 175-124 1-pincher tip, 013-071 ground lead, 175-124 1—12" ground lead, 175-125 1—spring tip, 206-060 1—straight tip, 206-015 1—instruction manual, 070-362 1—banana plug, 134-013

voltage is 300 v.

P6009 100X PASSIVE PROBE





Initially designed for use with the Type 82 and Type 86 Plug-In Units, the P6009 low-capacitance probe can also be used with the 1A1, 1A2 Plug-In Unit. A separate version of the P6009 is available for use with the Type 10A2 Plug-In Unit.

The probe can be adjusted by rotating the probe body with respect to the probe base so that the probe input time constant equals the input time constant of the plug-in unit.

When observing high-frequency signals with the Type P6009, it is necessary to use the shortest ground lead possible in order to avoid excessive inductance between test point and probe.

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-topeak.* CABLE is 9' long, terminated with a BNC connector. P6009 PROBE PACKAGE (010-140) \$55 P6009 PROBE PACKAGE, for Type 10A2 (010-170) 55 Includes: 1—P6009 probe, 010-141 1—banana plug, 134-013 or 010-171 1-center pin, 214-325 1-bayonet adapter, 013- 2-minigator clips, 344-046 1-probe holder, 352-068 1—3" ground lead, 175-263 1—5" ground lead, 175-124 1—12" ground lead, 175-125 1—hook tip, 206-105 1-pincher tip, 013-071 1—spring tip, 206-060 1—instruction manual, 070-401 1—straight tip, 206-015 P6009 PROBE ONLY (010-141) \$50 P6009 PROBE ONLY, for Type 10A2 (010-171) *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.

P6013 HIGH-VOLTAGE PROBE

The Type P6013 provides 1000X attenuation as a means 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.

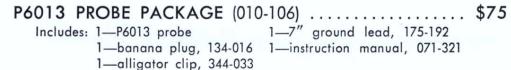
INPUT CAPACITANCE is 3 pf.

PROBE RISETIME is less than 7 nsec.

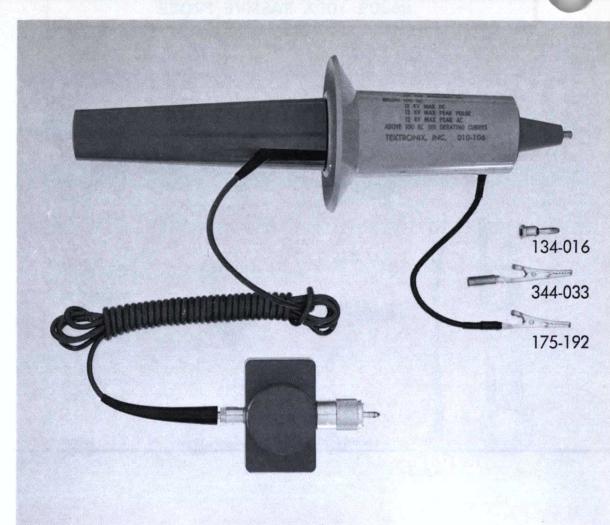
TYPICAL RISETIME of probe, Type K Plug-In Unit, and Type 540-Series Oscilloscope is 14 nsec.

VOLTAGE RATING is 12 kv dc, pk pulse, or pk ac.*

CABLE is 10' long, terminated with a UHF connector.



*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.



P6015 HIGH-VOLTAGE PROBE

The Type P6015 provides 1000X attenuation for oscilloscope measurements of waveforms reaching 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 that of the oscilloscope input time constant for those instruments having between 12 pf and 50 pf input capacitance.

ATTENUATION RATIO is 1000X, adjustable $\pm 9\%$.

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 Oescilloscope is 13 nsec.

TEMPERATURE RANGE is 10°C to 55°C environmental temperature. Calibration adjustments are necessary when environmental temperature changes.

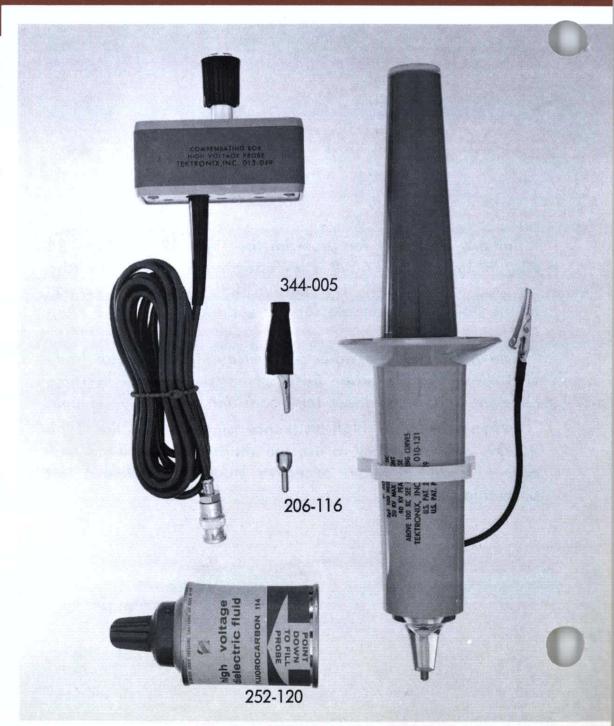
VOLTAGE RATING is 40 kv pk ac or pulse, 20 kv dc or rms continuous at 25°C environmental temperature.*

CABLE is 10' long, terminated with a BNC or UHF connector.

P6015 PROBE PACKAGE (010-172 LOCKING BNC

†1—probe holder, 352-056 †(not shown)

*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.



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 $100-\mu$ amp, 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 $105-125 \, \text{v}$ ac, approximately $0.5 \, \text{watt}$ at $117 \, \text{v}$, or approximately 1 watt at $234 \, \text{v}$ ac, or $0.2 \, \text{watt}$ at $22.5 \, \text{*}$ battery charge.

P6016 PROBE, TYPE 131 AMPLIFIER, 117 V POWER SUP	
(015-054 LOCKING BNC or 015-030 UHF)	235.00
P6016 PROBE, TYPE 131 AMPLIFIER, 234 V POWER SUPP	
(015-055 LOCKING BNC or 015-045 UHF)	235.00
TYPE 131 AMPLIFIER AND 117 V POWER SUPPLY	
(015-051 LOCKING BNC or 015-011 UHF)	160.00
TYPE 131 AMPLIFIER AND 234 V POWER SUPPLY	
(015-052 LOCKING BNC or 015-024 UHF)	160.00
TYPE 131 AMPLIFIER AND 22.5 V BATTERY ADAPTER	
(015-053 LOCKING BNC or 015-026 UHF)	120.00
TYPE 131 AMPLIFIER, less power supply	
(015-050 LOCKING BNC or 015-029 UHF)	115.00
117 V POWER SUPPLY ONLY (015-027)	60.00
234 V POWER SUPPLY ONLY (015-028)	60.00
*22.5 V BATTERY ADAPTER ONLY (013-050)	8.00
CALIBRATOR ADAPTER (017-031)	3.50

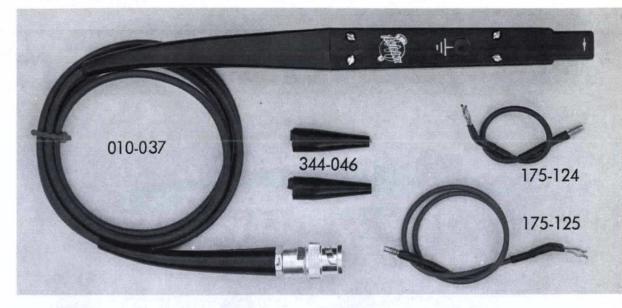
COMMON TO BOTH SYSTEMS

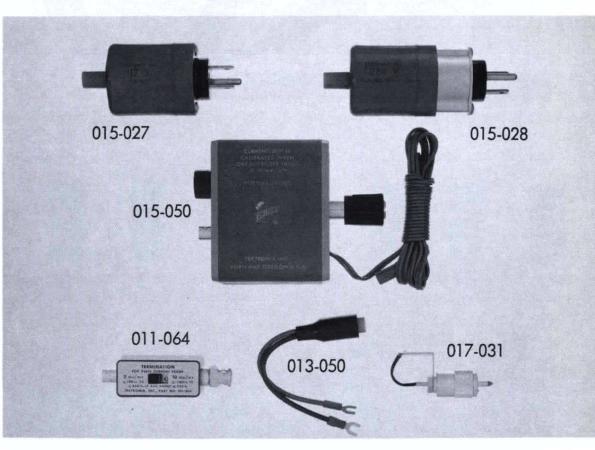
DC SATURATION THRESHOLD is 0.5 amp.

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 μ sec, and (4) 0.006 Ω after 10 μ sec. 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, $\pm 4\%$ 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.

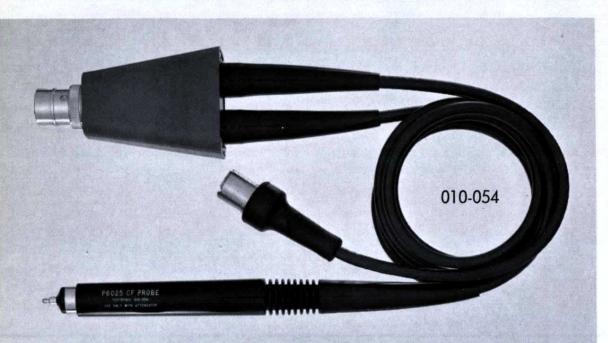
LOW-FREQUENCY RESPONSE at 3-db down is approximately 850 cps at 2 ma/mv (5% tilt of 10 μ sec square-wave pulse) and approximately 230 cps at 10 ma/mv (5% tilt of 35 μ sec square-wave pulse).

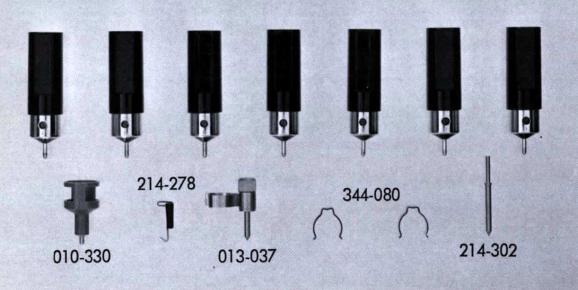
MAXIMUM CURRENT RATING is 15 amps pk-to-pk	c.
P6016 PROBE (010-037)	\$75.00
PROBE AND PASSIVE TERMINATION BNC (011-074)	90.00
PROBE AND PASSIVE TERMINATION UHF (011-044)	90.00
TASSIVE TERMINATION (011-020 OTH OF 011-004 BIVE)	20.00

Each probe includes: 1—5" ground lead, 175-124 2—minigator leads, 344-046 1—12" ground lead, 175-125 1—instruction manual, 070-237

SAMPLING PROBES

P6025 CATHODE-FOLLOWER PROBE





The P6025 Cathode-Follower Probe, a high-frequency probe designed for use with the Tektronix Type N Sampling Plug-In Unit, offers flexibility through 7 attenuator heads. All attenuator heads can be compensated for proper ac attenuation ratios.

Normally dc coupled, the probe can also be ac-coupled with a capacitor-coupler head that is supplied with the probe.

OUTPUT is $\pm 100 \, \text{mv}$ into a 50-ohm load.

OUTPUT DC LEVEL is approximately +350 mv.

INPUT RESISTANCE is 10 megohms with an attenuator head. POWER REQUIREMENTS are 6.3 v ac at 200 ma for the heater and + 100 v dc at approximately 12 ma for the plate.

CABLE is 54 inches long with GR connector.

RISETIME of the probe, attenuator head, Type N Unit, is 0.85 nsec for attenuations of 200X and less, and 1 nsec for attenuations above 200X, when using a 25-ohm source impedance. A higher source impedance imposes an RC charge time as a restriction on the probe risetime.

CAPACITOR-COUPLER HEAD is rated at 0.001 μ fd, 500 v dc, and has a low-frequency 3-db point of 16 cps. Part Number 010-330 \$4

Part Number	Attenuator	Input C ±10%	Max. Linear Voltage Input in ± Volts
010-323	10X	5.0 pf	1
010-324	20X	3.5 pf	2
010-325	50X	2.5 pf	5
010-326	100X	1.8 pf	10
010-327	200X	1.5 pf	20
010-328	500X	1.3 pf	50
010-329	1Q00X	1.2 pf	100

P6025 PROBE PACKAGE (010-053)\$260

Includes: 1—P6025 probe, 010-054 7—attenuator heads 1—capacitor-coupler head

2-ground clips, 344-080 1—bayonet ground clip, 013-037 1—extended bayonet pin, 214-302 1-instruction manual, 070-326

P6025 PROBE Only (010-054) \$165

1—hook tip, 214-278

P6026 PASSIVE PROBE

The Type P6026 Probe, usable with any of the Tektronix 50-ohm input sampling systems, has extremely low input capacitance with passband characteristics to 600 Mc.

The seven attenuator heads are easily interchangeable and do not require compensation.

The probe includes two 50-ohm terminations, one for ac coupling and one for dc coupling.

Attenu- ator-DC Accuracy within 2%	Input C	Input R at 600 Mc	Input R at DC	coupled approx. AC 3 db point
5X	0.5 pf	125 Ω	125 Ω	1.4 Mc
10X	0.5 pf	250 Ω	250 Ω	720 kc
20X	0.6 pf	500 Ω	500 Ω	360 kc
50X	0.8 pf	1 kΩ	1.25 kΩ	140 kc
100X	0.8 pf	2 kΩ	2.5 kΩ	65 kc
200X	0.8 pf	3.25 kΩ	5 kΩ	32 kc
500X	0.8 pf	4 kΩ	12.5 kΩ	13 kc.
50 Ω DC	termination	n, 010-340	50 Ω AC	termination
	Accuracy within 2% 5X 10X 20X 50X 100X 200X 500X	Accuracy within 2% Input C 5X 0.5 pf 10X 0.5 pf 20X 0.6 pf 50X 0.8 pf 100X 0.8 pf 200X 0.8 pf 500X 0.8 pf 500X 0.8 pf	Accuracy within Input R at 2% Input C 600 Mc 5X 0.5 pf 125 Ω 10X 0.5 pf 250 Ω 20X 0.6 pf 500 Ω 50X 0.8 pf 1 k Ω 100X 0.8 pf 2 k Ω 200X 0.8 pf 3.25 k Ω 500X 0.8 pf 4 k Ω 50 Ω DC termination, 010-340	Accuracy within Input R at lnput R 2% Input C 600 Mc at DC 5X 0.5 pf 125 Ω 125 Ω 10X 0.5 pf 250 Ω 250 Ω 20X 0.6 pf 500 Ω 500 Ω 50X 0.8 pf 1 kΩ 1.25 kΩ 100X 0.8 pf 2 kΩ 2.5 kΩ 200X 0.8 pf 3.25 kΩ 5 kΩ 500X 0.8 pf 4 kΩ 12.5 kΩ 50 Ω DC termination, 010-340 50 Ω AC

STANDARD CABLE is a 10-nsec RG58A/U cable, approximately 61/2 feet long; 5-nsec and 10-nsec RG8/U cables are available for extending the cable length. A frequency response loss becomes apparent when the cable is extended beyond 20 feet.

10 nsec, approx. 6.5' long (017-501)	\$13.50
5 nsec, approx. 3.5' long (017-502)	13.50
P6026 PROBE PACKAGE (010-055)	\$140

Includes: 1—hook tip, 214-278

1—50 Ω ac termination, 010-340

1—50 Ω dc termination, 010-331 1-ground clip, 013-037

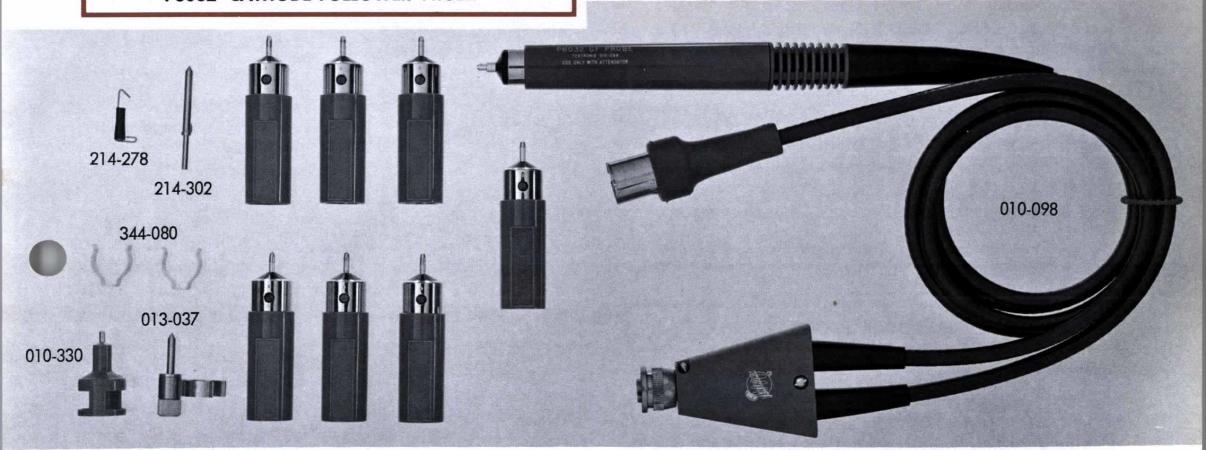
1-adapter, 017-036

7—attenuator heads 1—10 nsec cable, 017-501 1-carrying case, 202-081

1—instruction manual 070-291



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, Type 4S1, and Type 4S2.

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 $50-\Omega$ load.

SIGNAL DELAY is approximately 10 nsec.

POWER REQUIREMENTS are $12.6 \, \text{v}$ at $180 \, \text{ma}$ for the filament and $+100 \, \text{v}$ at $12 \, \text{ma}$ for the plate.

CABLE is 54" long with GR connector.

P6032 PROBE PACKAGE (010-108) \$220

Includes: 1—P6032 probe, 010-098 7—attenuator heads 1—capacitor-coupler head 1—center pin, 214-302

1—ground clip, 013-037 2—solderable ground clips, 344-080 1—spring contact, 214-278 1—instruction manual, 070-327

P6032 PROBE ONLY (010-098)\$115

Part Number	Attenuator Head	Max. Input Voltage*	Input Capacitance (± 10%)
010-350	10X	± 1.5 v	3.6 pf
010-351	20X	± 3.0 v	2.6 pf
010-352	50X	± 7.5 v	1.8 pf
010-353	100X	± 15 v	1.5 pf
010-354	200X	± 30 v	1.4 pf
010-355	500X	± 75 v**	1.3 pf
010-356	1000X	± 150 v**	1.3 pf
010-352 010-353 010-354 010-355	50X 100X 200X 500X	± 7.5 v ± 15 v ± 30 v ± 75 v** ± 150 v**	1.8 pf 1.5 pf 1.4 pf 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			ge (peak-to duty factor	
Head	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 $\pm \,$ 2% .

P6034 10X PROBE

The P6034 low-capacitance, miniature passive probe assists Tektronix Type 4S1, 4S2 and Type 3S76 Pulse-Sampling Plug-In Units in realizing accurate measurements of high-speed repetitive pulse. 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 $\pm 1.5\%$, 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.

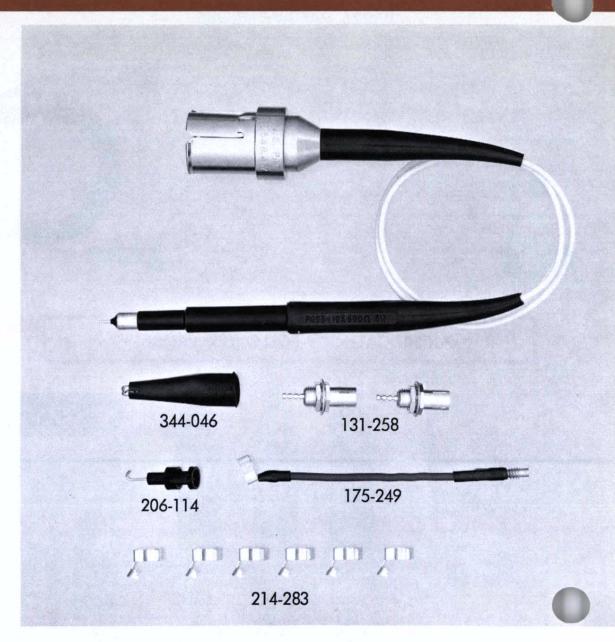
P6034 PROBE PACKAGE (010-110) \$35

Includes: 1—P6034 probe 1—hook tip, 206-114 2—test jacks, 131-258 1—2½" ground lead, 175-249 1—instruction manual, 070-368

6—ground clips, 214-283 1—minigator clip, 344-046

*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.



P6035 100X PROBE

The P6035 low-capacitance miniature passive probe physically resembles the P6034 probe and adheres closely to the risetime of the Type 4S1, 4S2 and Type 3S76 Sampling Plug-In Units when 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 $5 \text{ k} \pm 1.5\%$, 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.*

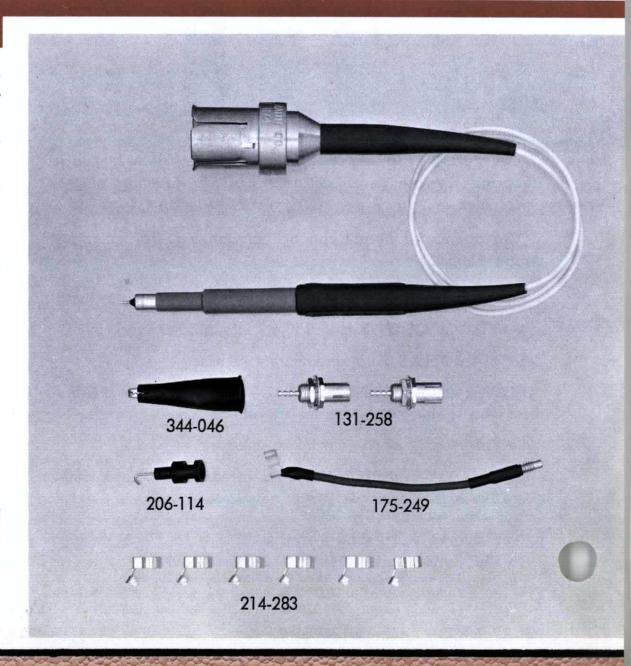
CABLE is 18" long with GR connector.

Includes: 1—P6035 probe 1—hook tip. 206-114 2—test jacks, 131-258

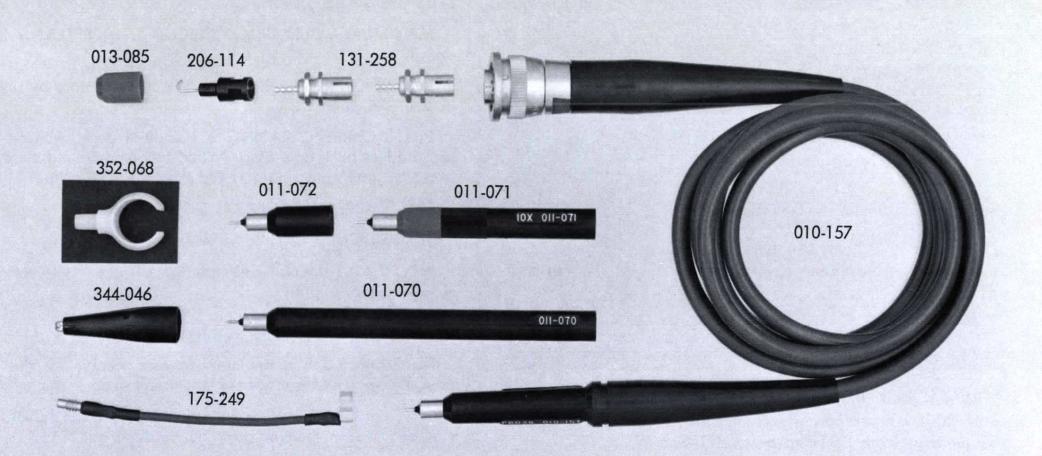
1-minigator clip, 344-046

16 necessary for CW frequencies highe

*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.



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 $100 \text{ k} \pm 1\%$.

INPUT CAPACITANCE is $2 \text{ pf} \pm 10\%$.

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 ONLY (010-157) \$155

P6038 PROBE PACKAGE (010-156) \$225

Includes: 1—P6038 probe, 010-157

1-coupling capacitor, 011-072

1—10X attenuator, 011-071

1—response normalizer, 011-070 2—test-point jacks, 131-258

1—bayonet ground adapter, 013-

1-hook tip, 206-114

1-ground clip, 175-249

1-probe holder, 352-068 1-carrying case, 202-123

1-minigator clip, 344-046 1—instruction manual, 070-400

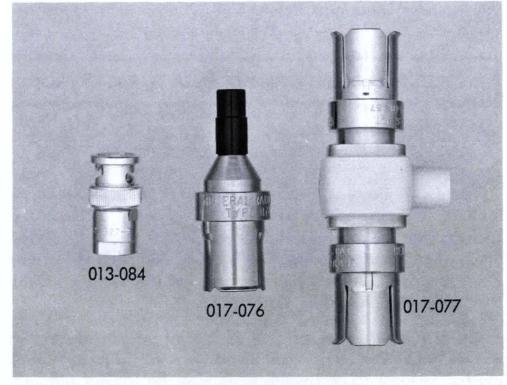
P6038 PROBE/ADAPTER CHARACTERISTICS INPUT R INPUT C

PROBE AND COUPLING

CAPACITOR PROBE AND 10X $1.8 \, \mathrm{pf} \, \pm \, 10\%$ 1 meg ± 1% ATTENUATOR

 $3.5 \, \mathrm{pf} \, \pm \, 10\%$

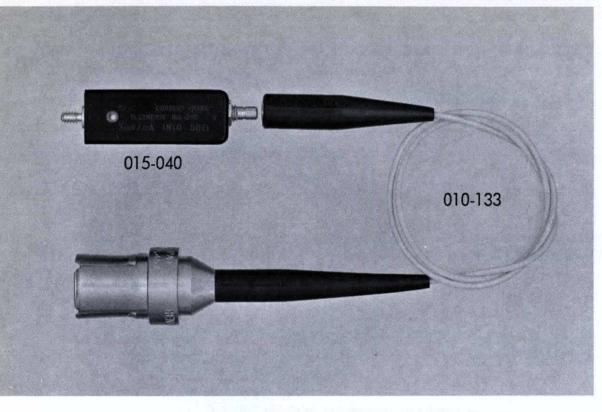
 $3.5 \, \mathrm{pf} \, \pm \, 10\%$ PROBE AND RESPONSE $100.3 \, k \pm 1\%$ NORMALIZER



OPTIONAL ACCESSORIES

P6038-TO-GR ADAPTER (017-076) \$	4.50
P6038-TO-BNC ADAPTER (013-084)	3.00
VP-2 VOLTAGE PICKOFF "T" (017-077)	30.00

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, $\%_{16}$ " 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 $\pm 3\%$.

DECAY TIME CONSTANT is 5 μ sec, approximated by 1% per 50 nsec; limit, 1 μ sec.

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 $5 \mu h$; 2 ohms shunted by approximately $5 \mu h$ 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

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 ampsec product of 1 amp- μ sec. 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 $\frac{3}{8}$ " x $\frac{9}{16}$ " x $1^{13}/_{16}$ " plus $\frac{1}{4}$ " 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 50Ω .

ATTENUATION is 1X.

OUTPUT CONNECTOR is a GR type.

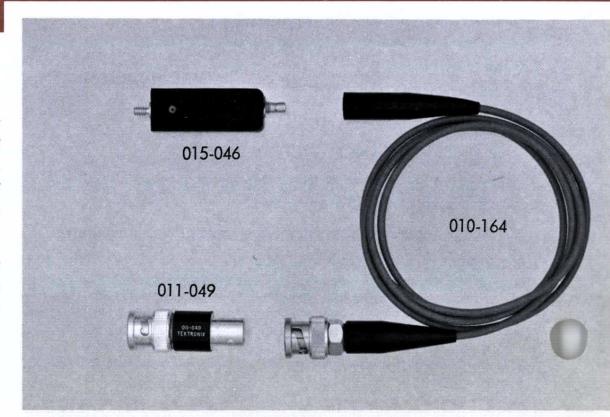
CABLE LENGTH is 18 inches. Additional $50-\Omega$ cable can be used in series with the probe. RG8/U or RG58A/U is recommended for best preservation of the CT-1 Transformer high-frequency response.

CT-1	AND P60	040 (015-041)		 	. \$31
CT-1	CURRENT	TRANSFOR	RMER (015-040)	 	. 17
P604	0 PROBE	(010-133)			 	. 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.



SENSITIVITY is 1 mv/ma into a 50-ohm load. Accuracy is better than $\pm 3\%$.

DECAY TIME CONSTANT is 125 μ sec, approximated by 1% per 1.25 μ sec; limit, 25 μ sec.

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 μ h; 0.08 ohms shunted by approximately 5 μ h 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 ampsec product of 50 amp- μ sec. 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 $\frac{3}{8}$ " x $\frac{9}{16}$ " x $1^{13}/_{16}$ " plus $\frac{1}{4}$ " x 6-32 mounting stud.

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 (015-0	047) \$37.75
CT-2 CURRENT TRANSFORMER (015-046)	17.00
P6041 PROBE (010-164)	12.00
50-OHM TERMINATION (011-049)	8.75

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.

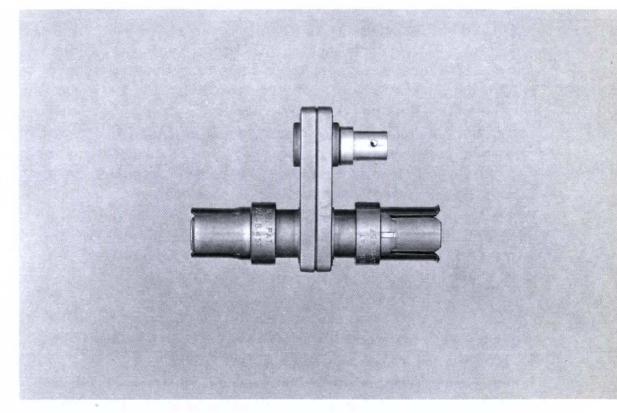
DECAY TIME CONSTANT is 4.5 μ sec at 0 dc current. RISETIME is approximately 0.4 nsec.

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 μ h; 2 ohms shunted by 4.5 μ h without a 50-ohm termination.

VSWR is approximately 1.2 at 1.5 Gc.

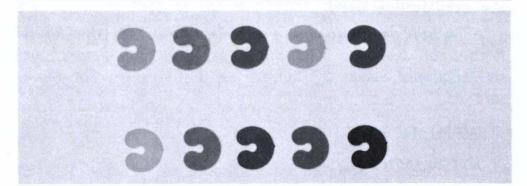
VOLTAGE RATING at 0 v dc is 25 v RMS, 1 kv pulse pk. The volts-sec product is 100 v $\mu \text{sec.}$ If exceeded, the L/R decay will decay rapidly toward zero.

ORDER PART NUMBER 017-061 \$30.00



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 334-798 \$1.00

PROBE GROUNDING ADAPTER

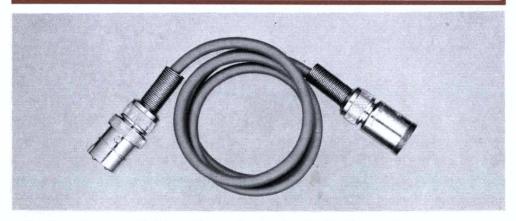


PROBE GROUNDING ADAPTER for Tektronix 10X probes provides a convenient method of establishing the vertical position of the oscilloscope trace in relation to the zero volts input at the probe tip. The adapter eliminates the need moving the probe tip from the signal source to ground.

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.

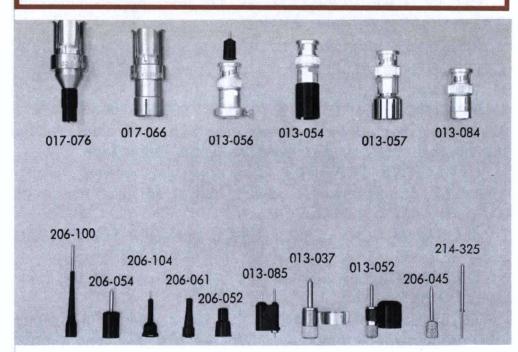
POWER CABLE EXTENSION



Probe Power-Cable Extension—A 30." 3-conductor power-cable extension for Tektronix P170CF and P500CF cathode-follower probes, permits wider separation of the probe power source from the instrument signal input.

Order Part Number 012-030 \$7.50

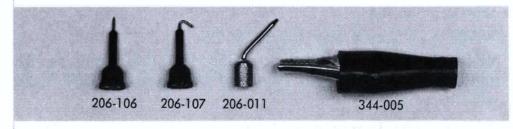
PROBE TIPS AND GROUND LEADS



SPECIAL-PURPOSE TIPS AND ADAPTERS

The following tips have a 6-32 thread size.

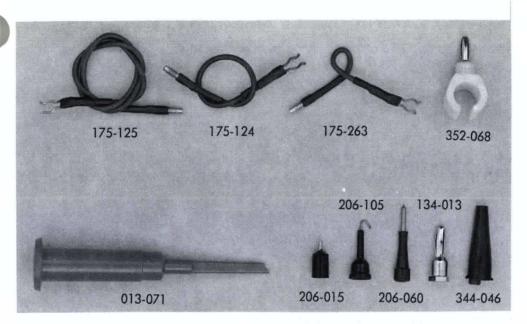
Description Po	art Number	Price
Probe tip to BNC adapter (for P6025, P6026, P6032) Probe tip to BNC adapter	013-057	\$4.50
(for P6006, P6007, P6008 and P6009)	013-054	3.00
Adapts probe to male BNC connector	013-056 013-084	3.00 3.00
Probe tip to BNC adapter (for P6034, P6035, P6038)	013-004	3.00
Probe tip to GR adapter	017-066	6.25
(for P6025, P6026, P6032)		
Probe tip to GR adapter	017-076	4.50
(for P6034, P6035, P6038) Bayonet ground assembly	013-052	2.50
(for P6008, P6009)	013-032	2.50
Bayonet ground assembly	013-085	2.50
(for P6034, P6035, P6038)	01 / 005	1.05
Center pin (for 013-052)	214-325	1.95
Ground Clip Assembly (for P6025 and P6026)	013-037	2.50
Insulated Straight Shank	206-054	.25
Long Straight Shank	206-104	.25
Spring Tip, without shank	206-061	.40
Recessed, fits 0.065" recessed pin or	206-052	.25
plug Straight Shank, fits 0.082" pin jacks	206-052	.25
Calibration tip (for P6023)	206-100	2.70



SPECIAL-PURPOSE TIPS FOR P170CF, P500CF AND P410 PROBES

The following tips have a 10-32 thread size.

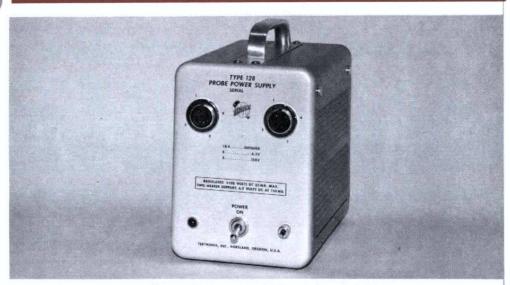
The following hips have a follow	ilicua sizo.	
Description	Part Number	Price
Straight Shank	206-106	\$.25
Hook Shank	206-107	.25
Bent Shank, fits 0.082" pin jacks	206-011	.25
Alligator-Clip Assembly	344-005	.40



The following tips have a 6-32 thread size.

Description	Part Number	Price
12-inch Ground Lead	175-125	\$.55
5-inch Ground Lead	175-124	.50
3-inch Ground Lead	175-263	.55
Holder	352-068	.20
Pincher	013-071	2.00
Short Straight Shank	206-015	.25
Hook Shank	206-105	.25
Spring Tip	206-060	.50
Banana Tip	134-013	.10
Minigator Clip	344-046	.15

PROBE 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.

The two probe connections use separate $+6.3 \,\mathrm{v}$ dc voltage supplies.

PLATE SUPPLY is +120 v dc, regulated, at 25 ma.

HEATER SUPPLIES consist of two unregulated $+6.3 \,\mathrm{v}$ dc at 150 ma.

PLATE SUPPLY RIPPLE is 5 mv pk-to-pk, maximum.

HEATER SUPPLY RIPPLE is 75 mv pk-to-pk, maximum.

POWER REQUIREMENTS are 105 to 125 v or 210 to 250 v, 50 to 800 cps, 25 watts (with P500CF probes).

MECHANICAL FEATURES include an aluminum-alloy chassis, three piece blue vinyl-finish cabinet, anodized front panel.

TYPE 128 PROBE POWER SUPPLY \$110

Includes: 1—3-conductor power cord, 161-010 1—3 to 2-wire adapter, 103-013 2—instruction manuals, 070-389

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 (011-051	UHF) (011-065	BNC)	\$10.00
15 pf (011-073	BNC)		10.00
20 pf (011-022	UHF) (011-066	5 BNC)	10.00
24 pf (011-029	UHF) (011-067	BNC)	10.00
47 pf (011-030	UHF) (011-068	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.



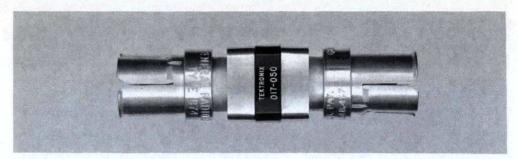
ACCESSORIES WITH UHF-TYPE CONNECTORS

Description	Part Number	Price
50- Ω termination	011-045	\$15.00
50- $Ω$ 5:1 attenuator	011-032	16.00
$50-\Omega$ 10:1 attenuator	011-031	16.00
$50-\Omega$ to $75-\Omega$ min. loss attenuator	011-041	16.00
$50-\Omega$ to $93-\Omega$ min. loss attenuator	011-042	16.00
50 - Ω to 170 - Ω min. loss attenuator	011-043	16.00
75-Ω termination	011-046	15.00
75-Ω 5:1 attenuator	011-034	16.00
75- Ω 10:1 attenuator	011-033	16.00
93- Ω termination	011-047	15.00
93- Ω 5:1 attenuator	011-036	16.00
93- Ω 10:1 attenuator	011-035	16.00
170-Ω* termination	011-048	15.00
*vever lose than 1 25 up to 30 mc		



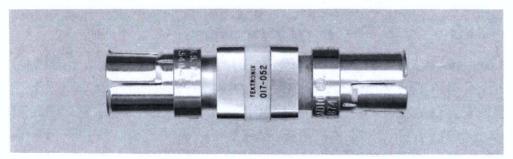
ACCESSORIES WITH GR-TYPE CONNECTORS

017-047	\$20.00
017-046	20.00
017-045	20.00
017-044	20.00
	017-046 017-045



ACCESSORIES WITH TEKTRONIX 125-Ω TYPE CONNECTORS

125-Ω termination	017-051	\$20.00
125- Ω 2:1 attenuator	017-071	25.00
125- Ω 5:1 attenuator	017-049	30.00
125- Ω 10:1 attenuator	017-050	30.00
125- Ω to 200- Ω Hewlett-Packard	017-038	20.00



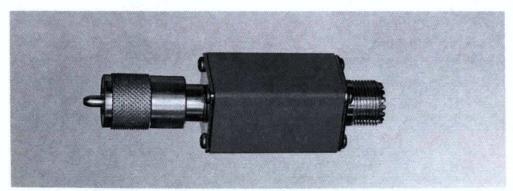
ACCESSORIES WITH GR-TEKTRONIX $125-\Omega$ TYPE CONNECTORS

50- Ω to 125- Ω min. loss atten.	017-052	\$30.00
125-Ω adapter N50/N125	017-053	17.50
125-Ω adapter N50/T125	017-054	17.50
125-Ω adapter T50/N125	017-055	23.00



ACCESSORIES WITH BNC-TYPE CONNECTORS

50- $Ω$ termination	011-049	\$ 8.75
50- Ω 5:1 attenuator	011-060	10.00
$50-\Omega$ 10:1 attenuator	011-059	10.00
$50-\Omega$ to $75-\Omega$ min. loss attenuator	011-057	10.00
50 - Ω to 93 - Ω min. loss attenuator	011-058	10.00
75-Ω termination	011-055	8.75
75-№ 10:1 attenuator	011-061	10.00
93-Ω termination	011-056	8.75
93- Ω 10:1 attenuator	011-062	10.00
170- Ω termination (UHF to BNC)	011-063	10.00



TERMINATION BLOCKS W/O ELECTRICAL COMPONENTS

Component housings are useful for applications requiring special circuitry.

111/16" block with UHF connector	
Order Part Number 011-019	\$5.00
2 ⁷ / ₁₆ " block with UHF connector	ψ5.00
Order Part Number 011-020	\$5.00

CONNECTOR CHARACTERISTICS

Accuracy of Indicated Attenuation Ratio:

UHF	±2%	at dc;	$\pm 3\%$ a	t 100 megacycles.
GR	±2%	at dc;	$\pm 3\%$ a	t 1 gigacycle.
TEKTRONIX	$125 \Omega \pm 2\%$	at dc;	$\pm 3\%$ a	t 1 gigacycle.
BNC	±2%	at dc;	$\pm 3\%$ a	t 100 megacycles.

Voltage Standing Wave Ratio:

UHF	less	than	1.2	up i	to	100 megacycles.
GR	less	than	1.1	up 1	to	1 gigacycle.
TEKTRONIX	125 Ω less	than	1.1	up 1	to	1 gigacycle.
BNC	less	than	1.1	up 1	to	100 megacycles.

Power Rating:

UHF		1.	5 watts.
GR		1	watt.
TEKTRONIX	125Ω	1	watt.
BNC		1	watt.

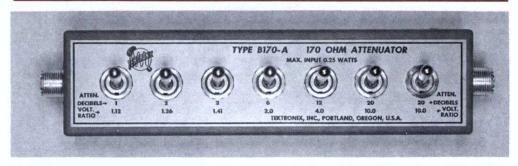
Output to Input Voltage Ratios for Minimum-Loss Attenuators:

When properly terminated the E_{out}/E_{in} ratios for the various minimum-loss attenuators are as follows:

Connec	ction	E _{out} /E _{in}	Connection	E _{out} /E _{in}
50 $\Omega \rightarrow$	75Ω	0.63	$50 \Omega \rightarrow 125 \Omega$	0.56
$75 \Omega \rightarrow$	50Ω	0.42	$125 \Omega \rightarrow 50 \Omega$	0.23
$50 \Omega \rightarrow$	93 Ω	0.59	$50 \Omega \rightarrow 170 \Omega$	0.54
93 $\Omega \rightarrow$	50Ω	0.32	$170 \Omega \rightarrow 50 \Omega$	0.16

All attenuators, with the exception of minimum-loss types, are T-type attenuators.

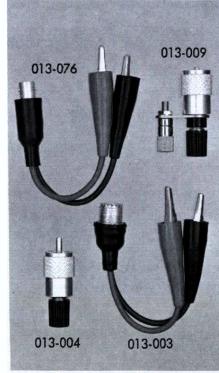
B170-A ATTENUATOR

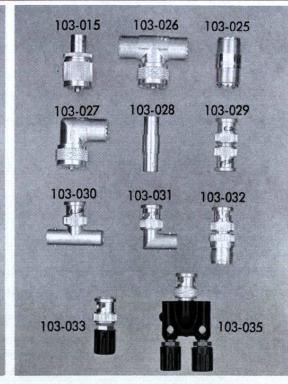


 $170\text{-}\Omega$ pi-attenuator, uses 2% precision resistors, 1 to 64 db in 1 db steps, 0.25 watt.

Order Part Number 011-017 \$60.00

MISCELLANEOUS ADAPTERS



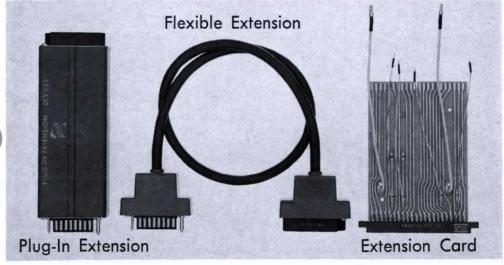


h	Description	Part Number	Price
"	Adapter, clip lead BNC	013-076	\$3.00
	Adapter, clip lead UHF	013-003	3.00
	Adapter, binding post UHF	013-004	3.00
	Binding Post Adapter, with ground	d .	
	terminal, 3/4" spacing	013-009	3.25
	UHF Male to BNC Female	103-015	2.75
	UHF Female to Female	103-025	1.45
	UHF T Male to 2 Female	103-026	3.40
	UHF Elbow	103-027	2.15
	BNC Female to Female	103-028	2.40
	BNC Male to Male	103-029	5.45
	BNC T Male to 2 Female	103-030	4.60
	BNC Elbow	103-031	3.70
	Male BNC to Female UHF	103-032	3.55
	BNC to Binding Post	103-033	1.60
	BNC Dual Binding Post	103-035	5.35

GAIN ADJUST ADAPTER-Permits 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 013-005 \$15

PLUG-IN UNIT ACCESSORIES



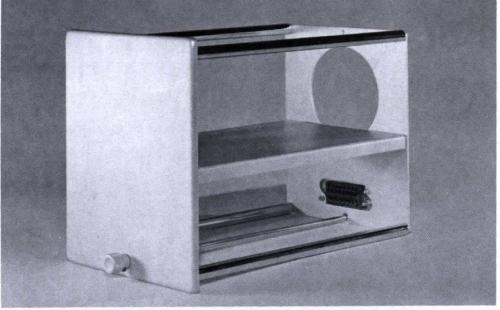
PLUG-IN EXTENSIONS—allow unit to be operated par-

tially out of the oscilloscope:
For units in Type 560-Series Oscilloscopes Order Part Number 013-034 \$14.00
For units in Type 530-, 540-, 550-, 580-Series Oscilloscopes Order Part Number 013-055
For units in Type 647 Oscilloscope Order Part Number 013-077 \$20.75
For Type R Unit only Order Part Number 013-015 \$11.00
For Type 21A and 22A Time-Base Units Order Part Number 013-013 \$20.75
EXTENSION CARDS —extend removable circuit cards for ease of calibration and maintenance.
For Type 1A1 Plug-In Unit Order Part Number 012-079 \$25.00
For Type 262 Programmer Order Part Number 012-078 \$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 012-080 \$24.00

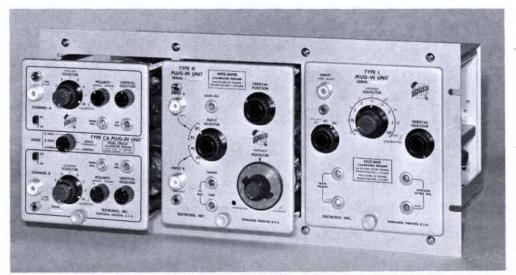
For 10 and 11-Series Plug-In Units

\$20.00



BLANK 1-SERIES AND LETTER-SERIES PLUG-IN CHASSIS —Useful for constructing your own special circuits. Order Part Number 040-065 \$25.00

BLANK TYPE 560-SERIES PLUG-IN CHASSIS—For special circuit construction of sweep or vertical amplifier. Order Part Number 040-245 \$25.00

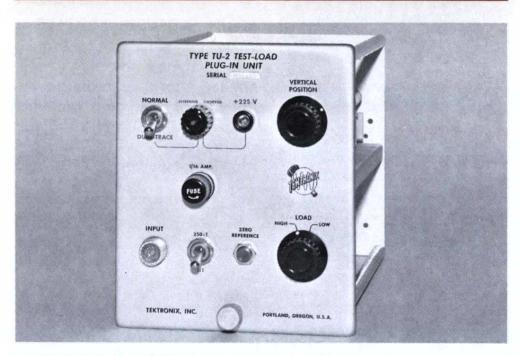


PLUG-IN PREAMPLIFIER STORAGE CABINET mounts in standard rack, available in two types:

FOR 1-SERIES AND LETTER-SERIES PLUG-IN UNITS-holds 3 plug-in units. Measures 19" wide, 83/4" high, 93/8" deep. Order Part Number 437-031 \$25

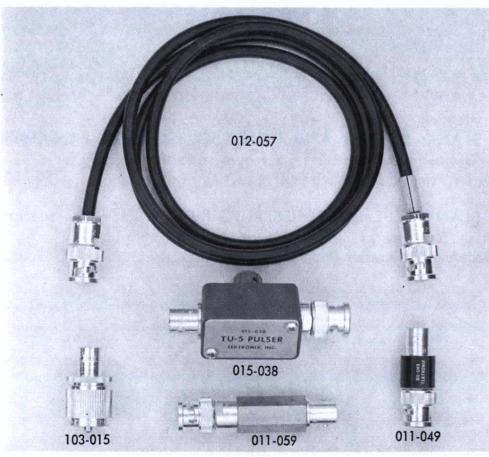
FOR 2 AND 3-SERIES PLUG-IN UNITS—holds 4 plug-in units. Measures 19" wide, 7" high, 135/16" deep. Order Part Number 437-071 \$30

TEST UNITS



TYPE TU-2 TEST-LOAD PLUG-IN UNIT—The unit is used to check Tektronix Type 530, 540, 550-Series Oscilloscope power-supply regulation under high load and low load demands of A to Z plug-in units. It can also be used to check vertical amplifier balance, vertical amplifier gain, and dual-trace function of the oscilloscope.

TYPE TU-2 TEST UNIT \$75



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 0.3 nsec into 50 ohms.

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.

011-049

Includes: 1—TU-5 Pulser, 015-038 1—UHF to BNC adapter, 103-015 1—10X attenuator, 011-059 1—50-ohm cable, 012-057 1—50-ohm termination,

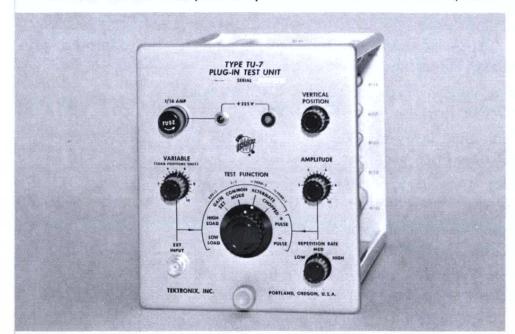
TU-5 PULSER ONLY (015-038) \$25.00



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 (013-075) \$20.00

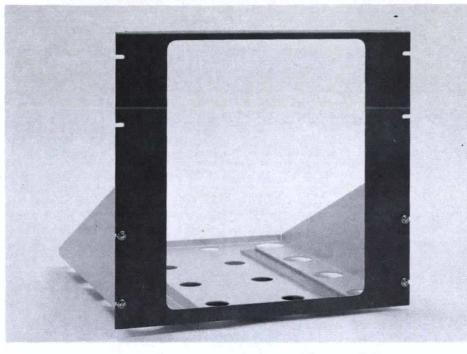


TYPE TU-7 PLUG-IN TEST UNIT is a calibration aid for Tektronix Type 530, 540 or 550-Series Oscilloscopes using 1-Series or Letter-Series Plug-in Units. The only plug-in required for calibration, the Type TU-7 features a built-in pulse generator for checking risetime and adjusting transient response of the oscilloscope vertical amplifier.

Other features include provisions for checking power supply regulation, chopped blanking operation, and alternate sync pulse circuitry. The TU-7 also checks dual-trace operation for instruments capable of displaying two time-base signals alternately.

TYPE TU-7 PLUG-IN TEST UNIT \$200

MOUNTING ACCESSORIES



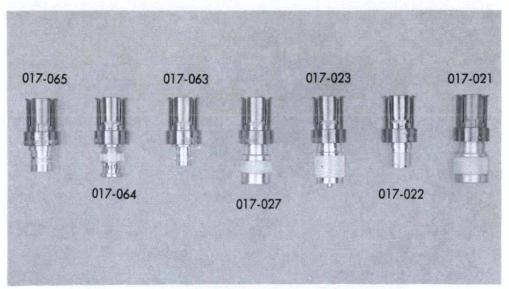
CRADLE-MOUNT—For rack mounting cabinet-type oscilloscopes. Each cradle-mount consists of a cradle (or "shelf") to support the instrument in any standard 19" relay rack, and a mask to fit over the regular instrument panel. Blue vinyl finish.

For Type 507 and Type 551 instruments (2 masks, 2 cradles). Rack height requirements; Indicator mask $17\frac{1}{2}$ ", Power Supply mask $12\frac{1}{4}$ ".

Order Part Number 040-279\$78.50

For Type 555 (2 masks, 2 cradles). Rack height requirements: Indicator mask 21", Power Supply mask 121/4".

SAMPLING ACCESSORIES



ADAPTERS

Part No.	Price
017-027	\$6.25
017-021	6.25
017-022	6.25
017-023	6.25
017-063	6.25
017-064	6.25
017-065	6.25
	017-027 017-021 017-022 017-023 017-063 017-064



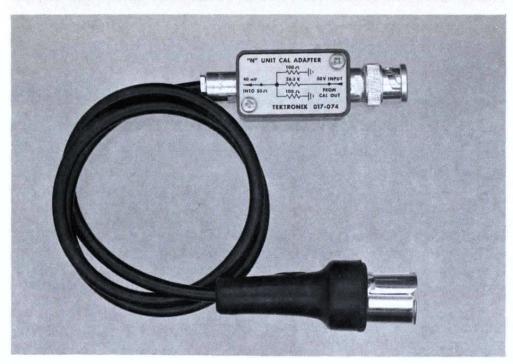
50-OHM CONNECTING CABLES (GR-TYPE CONNECTORS)

Delay	Cable Type	Part No.	Price
1 nsec	RG58/AU	017-503	\$ 8.25
2 nsec	RG58/AU	017-505	13.50
5 nsec	RG8/AU	017-502	13.50
10 nsec	RG58/AU	017-501	13.50
20 nsec	RG8/AU	017-504	16.50

ACCESSORIES WITH GR-TYPE CONNECTORS

ACCESSORIES WI	In GK-III	PE COMMECTORS	
	Part No.	VSWR Rating	Price
50 Ω 10:1 Attenuator	017-044	<1.1 to 1 GC	\$20.00
50 Ω 5:1 Attenuator	017-045	<1.1 to 1 GC	20.00
50 Ω 2:1 Attenuator	017-046	<1.1 to 1 GC	20.00
50 Ω Termination	017-047	<1.1 to 1 GC	20.00
50 Ω Type 874-K Coupling			
Сар	017-028	<1.06 to 1 GC	\$10.00
50 Ω Type 874-X Insertion			
Unit	017-030		\$13.00
50 Ω Type 874-EL 90°			
Elbow	017-070	< 1.06 to 2 GC	\$10.00
		<1.5 to 4 GC	
50 Ω Type 874-T Tee	017-069	-	\$13.00
$50~\Omega$ to $125~\Omega$ Min Loss	017-052	<1.2 to 1 GC	\$30.00
Attenuator			

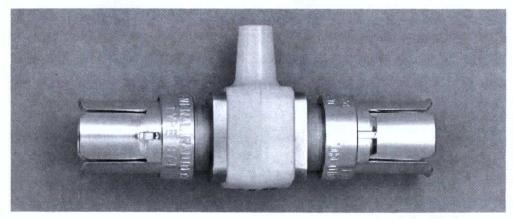
CALIBRATOR ADAPTER



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 (017-010 UHF) \$20 (017-074 BNC) 20

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 $\frac{1}{2}$ % when used with the P6035, 5% when used with the P6034.

Order Part Number 017-073 \$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 017-077 \$30

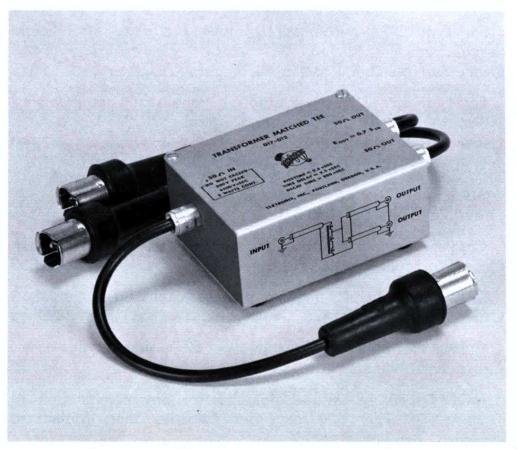
TIMING STANDARD



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 013-028 \$60

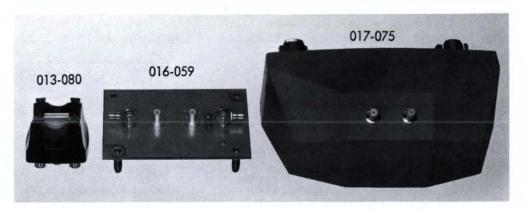
TRANSFORMER MATCHED "T"



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 017-012 \$45

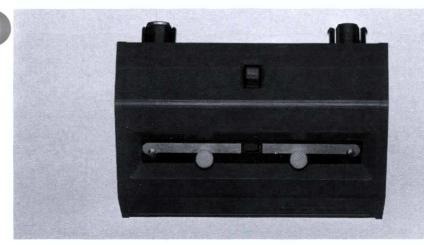
DIODE TEST JIGS



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 (013-080)	\$40
ADAPTER FOR TYPE 292 (016-059)	\$21
ADAPTER FOR TYPE 291 (017-075)	\$55

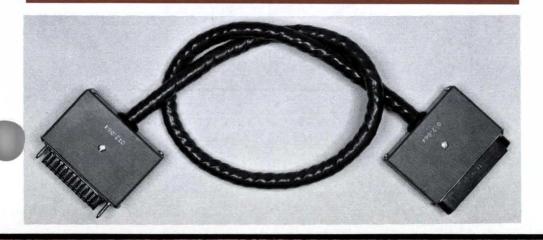


TYPE TF-1 DIODE TEST FIXTURE used with the TYPE 291 DIODE SWITCHING-TIME TESTER features pushbutton diode ejection for rapid testing of diodes with round or ribbon type leads. A solenoid may be added to the fixture for automatic rejection. Diodes under test are held in place magnetically insuring good electrical contact.

The risetime of the Type 291 with the Type TF-1 fixture is less than 0.35 nsec.

Order Part Number 017-072 \$65

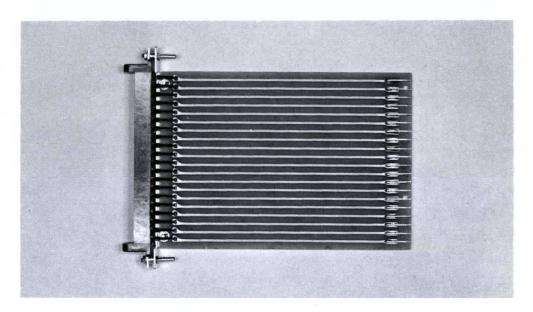
PLUG-IN UNIT ACCESSORIES



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 012-064 \$23

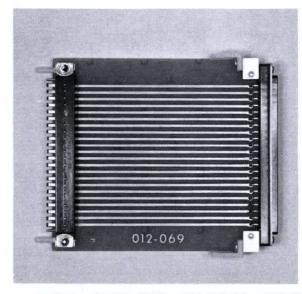
FLEXIBLE EXTENSION — 30" long, permits Type 3S76 and Type 3T77 Sampling Plug-In Units to be operated away from oscilloscope.



15-PIN PLUG-IN EXTENSION CARD — Allows protrusion of Type 6R1 15-pin etched-circuit boards.

Order Part Number 012-067 \$20

20-PIN PLUG-IN EXTENSION CARD — Allows protrusion of Type 6R1 20-pin etched-circuit boards.





TYPE 3S3 SUB-CHASSIS EXTENSION — Allows maintenance of Type 3S3 sub-chassis when 3S3 is extended out of Oscilloscope.

Order Part Number 012-077 \$25

TYPE 4S1 SUB-CHASSIS EXTENSION — Allows maintenance of Type 4S1 sub-chassis when 4S1 is extended out of oscilloscope.

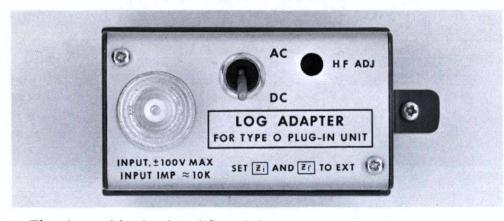
Order Part Number 012-069 \$25

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 012-070 \$10.50

TYPE "O" PLUG-IN UNIT ACCESSORIES

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— $\pm 100 \, v$ 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 \pm 0.1 v to \pm 100 v.

Signal-In	Deflection					
\pm 0.1 v	$1~{\rm cm}~\pm~0.5~{\rm mm}$					
\pm 1.0 v	$2~\text{cm}~\pm~0.5~\text{mm}$					
\pm 10.0 v	$3~\mathrm{cm}~\pm~1.0~\mathrm{mm}$					
\pm 100 v	$4~\mathrm{cm}~\pm~1.0~\mathrm{mm}$					

Below an input level of \pm 0.05 v, the amplifier is no longer logarithmic.

RISETIME—Typically 0.2 μ sec—for a 10-v signal to rise from 0.1 v to 10 v.

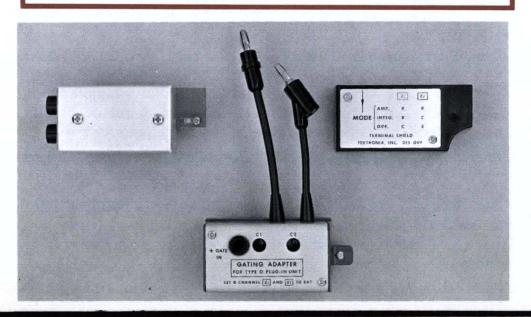
FALLTIME—Typically 0.3 μ sec—for a 10-v signal to fall from 10 v to 0.1 v.

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 (Part No. 013-067) \$75

TERMINAL ADAPTERS AND SHIELDS

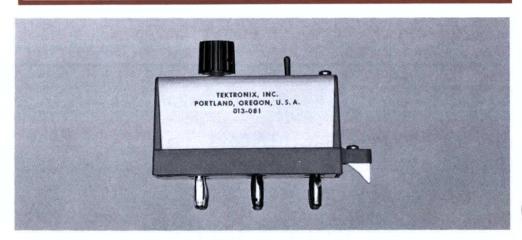


TERMINAL ADAPTER ASSEMBLY has all the mechanical
parts for creating a custom adapter for the "O" Unit.
Order Part Number 013-048
TERMINAL SHIELD protects exposed terminals of the "O"
Unit from spurious signals.
Order Part Number 013-049 \$2.50

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.

COMPENSATING ADAPTER



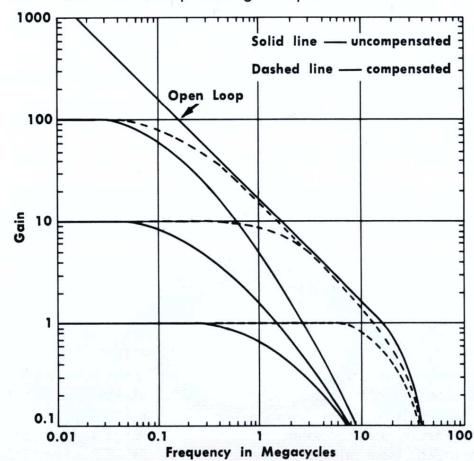
The Compensating Adapter extends the frequency performance of the Type O Unit operational amplifiers.

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 is 0.01 to 1 meg, determined by $Z_{\rm i}$ Selector position.

INPUT CAPACITANCE is approximately 40 to 450 pf, depending on the Z_f Selector position. (Maximum at X100 gain)

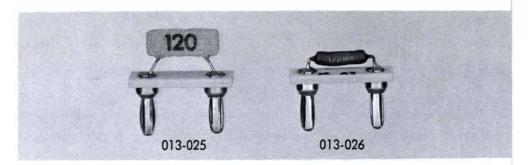
MAXIMUM INPUT VOLTAGE is 400 v dc or 150 v rms.*

MAXIMUM OUTPUT VOLTAGE is $\pm 50 \,\mathrm{v}$ peak.

MAXIMUM TEMPERATURE is +55° C.

*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 013-025	\$2.25
150 K-OHM PLUG-IN RESISTOR BOARD	
Order Part Number 013-026	\$2.25

TYPE R PLUG-IN UNIT PLATE WIRED ASSEMBLIES

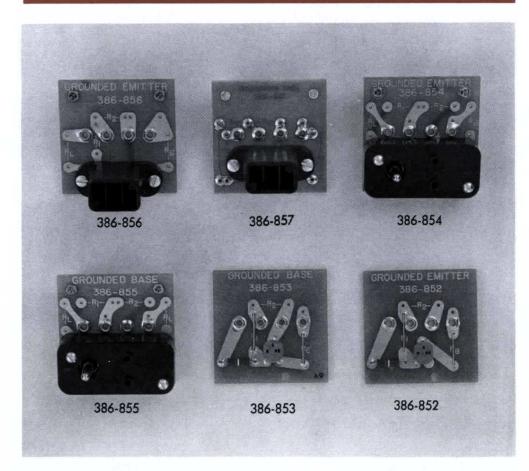
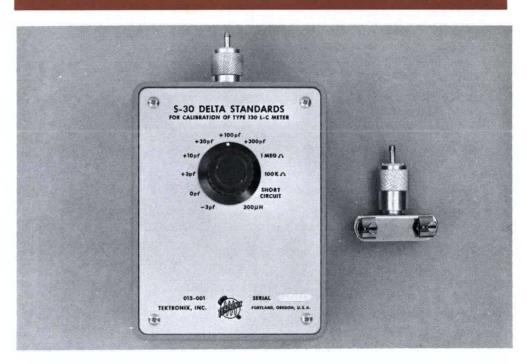


PLATE WIRED "R" ASSEMBLIES for various transistor checks

Description	Part No.	Price
Grounded emitter socket	386-852	\$5.00
Grounded base socket	386-853	5.00
Grounded emitter power socket	386-854	6.00
Grounded base power socket	386-855	6.00
Grounded emitter adapter	386-856	6.00
Grounded base adapter	386-857	6.00

TYPE 130 L-C METER ACCESSORIES



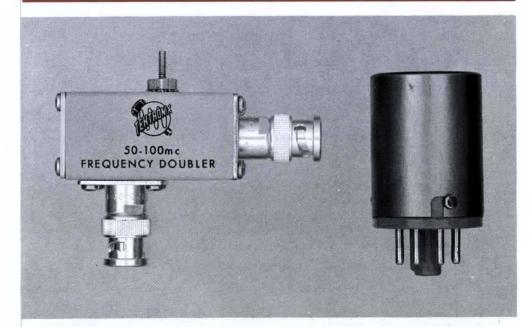
DELTA STANDARDS—For calibration of the Type 130 L-C Meter. The unit provides accurate steps of capacitance and inductance, selectable by a rotary selector switch. Values of the capacitance steps correspond to the full-scale adjustments required on the five scales of the Type 130. Two resistors of similar capacitance, values of 1 megohm and 0.1 megohm, are provided for the resistance compensation adjustment. A 300 μ h standard permits proper adjustments of the inductance ranges.

Order Part Number 015-001 \$40

PRODUCTION TEST FIXTURE—For use with the Type 130 L-C Meter. Speeds sorting and testing of capacitors and inductors.

Order Part Number 013-001\$5

TYPE 180-181 ACCESSORIES



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.

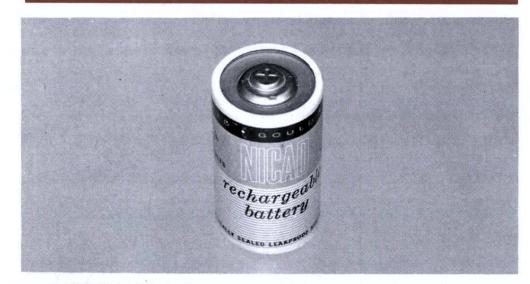
TYPE 310/310A FAN BASE



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 016-012	\$50
For use on 210-250 v, 50 to 60 cps only: Order Part Number 016-013	\$50

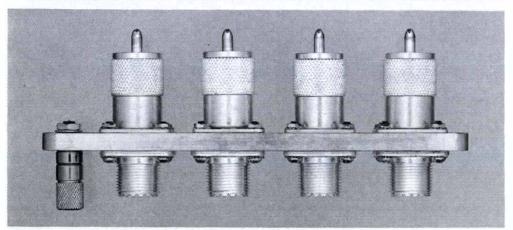
TYPE 321-321A BATTERIES



NiCd CELLS— $3\frac{1}{2}$ A.H. 'D' size, rechargeable, for Type 321 Portable Oscilloscope.

Order 10—(Part Number 146-005), \$7.00 each ... Total \$70.00

TYPE 507 GROUND CONNECTOR



TYPE 519 ACCESSORIES



Description	Part No.	Price
1000 Mc Timing Standard	017-019	\$35.00
Double Button Contact Assembly	017-032	2.25
Connector Panel Assembly	017-033	7.00
Delay Line Equalizer	01 <i>7-</i> 057	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	017-009	\$25.00
Component Insertion Unit	017-013	10.00
Coupling Capacitor	017-018	10.75
Cable Connector Spare Kit	017-035	7.00
90° Elbow Assembly	017-043	15.00
1 nsec delay cable, RG63/U	017-507	16.50
2 nsec delay cable, RG63/U	017-508	16.00
5 nsec delay cable, RG63/U	017-509	16.50
10 nsec delay cable, RG63/U	017-510	17.50
20 nsec delay cable, RG63/U	017-511	24.00

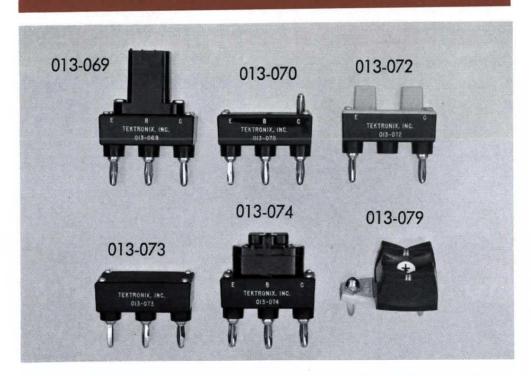
TYPE 570 ADAPTER PLATES



With Jacks Installed

.,		
Description	Part No.	Price
7-pin adapter plate	016-004	\$10.00
8-pin adapter plate	016-005	10.00
9-pin adapter plate	016-006	10.00
Blank adapter plate	016-007	5.00
13-pin Nixie* Base	016-040	12.50
5-pin Nuvistor Twelvar Base	016-041	10.00
7-pin Nuvistor Twelvar Base	016-042	10.00
12-pin Compactron duodecar Base	016-043	12.50
9-pin Novar Base	016-044	10.00
*Burroughs registered trademark.		

TYPE 575 TRANSISTOR AND DIODE ADAPTERS



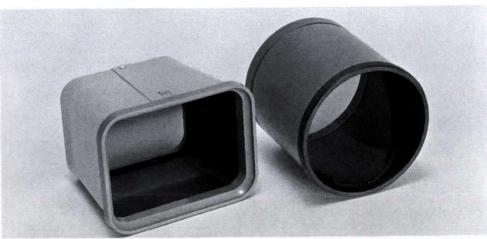
Description	Part No.	Price
3-terminal (for wire lead transistors)	013-069	\$5.00
3-terminal (for 2-pin base power transistors	013-070	5.00
Diode Test Jig (Tektronix)	013-072	5.00
Diode Test Jig (Daymarc)	013-079	25.00
Blank Adapter Box	013-073	4.00
Power Transistor Adapter	013-074	5.00
(for transistors with hook leads)		

VIEWING ACCESSORIES



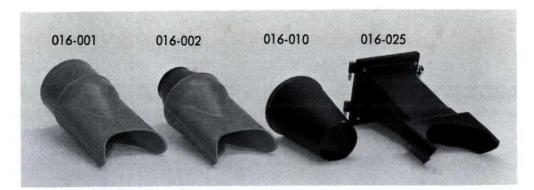
BEZEL—For mounting cameras, other than Tektronix types, on Tektronix 5" Oscilloscopes. Dimensions— $5\frac{7}{8}$ " square; ring $\frac{7}{8}$ " deep, diameter $\frac{55}{8}$ " outside, $\frac{51}{8}$ " inside. Die-cast construction.

Order Part Number 014-011 \$4.50



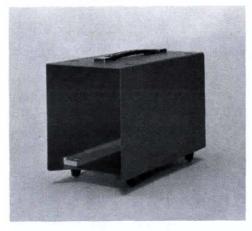
POLARIZED VIEWERS—For Tektronix 5" Oscilloscopes. The viewers reduce troublesome reflections and glare under high ambient-light conditions.

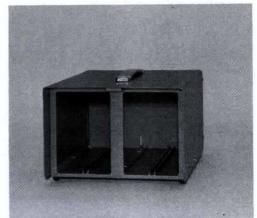
RECTANGULAR VIEWER (016-039)						 	\$10	
PLASTIC ROUND VIEWER (016-053)							10	



VIEWING HOOD—For Tektronix Type 519 Oscilloscope. Order Part Number 016-025\$ 36.50

CARRYING CASES



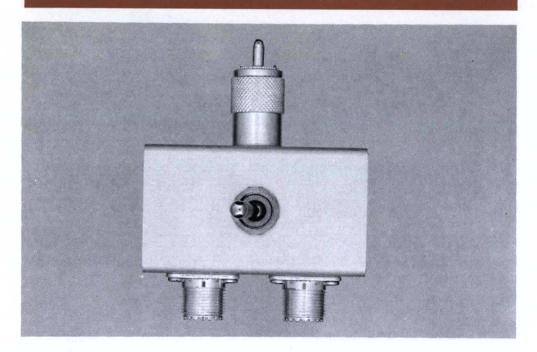




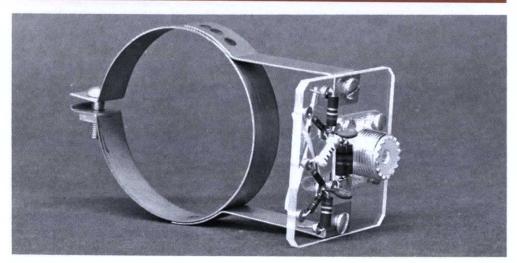


CARRYING CASE—For Type 321 Portable Oscilloscope.
Order Part Number 016-026\$30

DUAL-INPUT SWITCHING ASSEMBLY



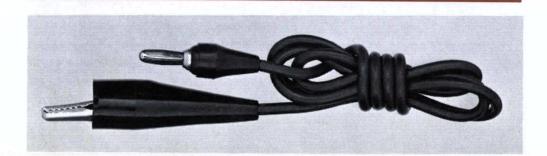
DEFLECTION PLATE CONNECTOR



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.

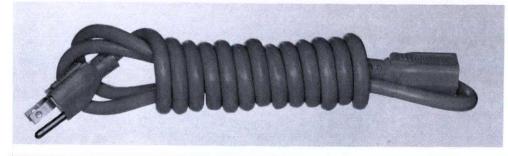
For instruments with serial numbers 5001 and above, Order Part Number 013-007\$10

MISCELLANEOUS CORDS AND LEADS



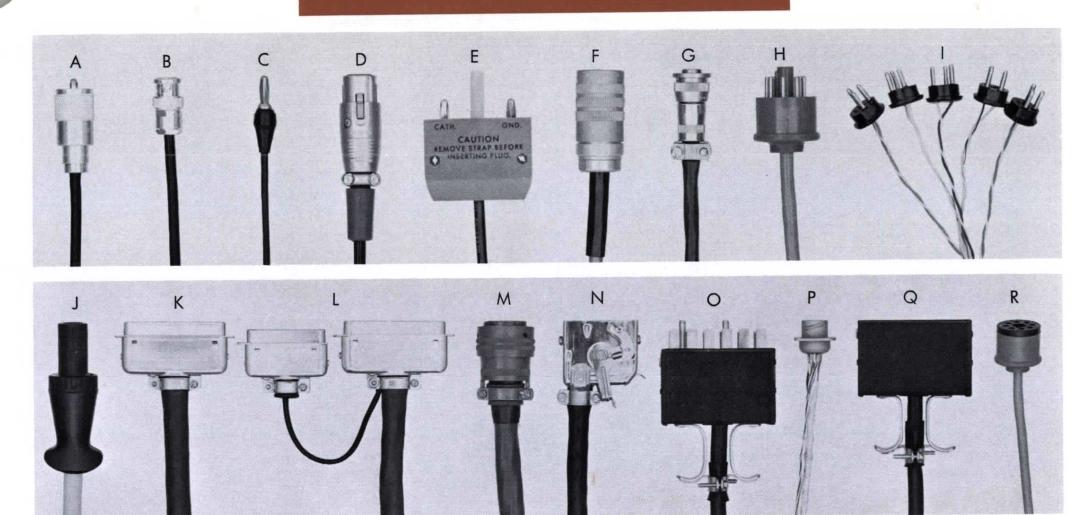
Description	Length (Inches)	Connectors	Part No.	Price
Output Lead, Black Output Lead,	36	Banana Plug to Alligator Clip	012-014	\$2.50
Red			012-015	2.50
Patch Cord, Black		Banana Plug- Jack (Both Ends)	012-023	1.15
Patch Cord, Red		(Bom Ends)	012-024	1.15
100-Ω Suppressor Cord 300-Ω			012-025	3.00
Suppressor Cord	6		012-026	3.00
1000-Ω Suppressor Cord Patch Cord,		Banana Plug (Both Ends)	012-027	3.00
Black			012-028	2.00
Patch Cord, Red			012-029	2.00
Patch Cord, Red	18		012-031	1.20
Patch Cord, Black		enalti (menalti menalti e	012-039	1.20
Master-Slave Cord-Type N Unit	12	Tini-Plug (Both Ends)	012-055	3.75

POWER CORDS



Connectors		uctors	Length	Part	Price
	Number	Gauge	(Feet)	No.	
	2	16	8	161-004	\$2.10
Male Plug to	3	16	8	161-010	2.40
Female Plug	3	16	20 in.	161-014	1.40
		18	8	161-019	5.00
Male Plug	3 3 2	18	8	161-017	1.95
(one end only)	3	18	10	161-006	6.10
	2	18	8	161-002	1.60
Male Plug to Right Angle	2	18	8	161-007	3.70
Female Plug	3	18	8	161-022	3.60
Male Plug to Special Plug (ac cord for Type 321)	3	20	8	161-015	3.20
Male Plug to Special Plug (dc cord for Type 321)	3	20	8	161-016	2.70
Male Plug to Special A Connector	3	16	8	161-005	3.25

MISCELLANEOUS CABLES



INSTRUMENT		LENGTH	IMPEDANCE	CONNECTO)R	PART	
TYPE	FUNCTION	(INCHES)	(OHMS)	TYPE	FIG.	NUMBER	PRICE
GENERAL	Output	42	50	UHF	Α	012-001	\$ 6.50
GENERAL	Output	42	50	BNC	В	012-057	4.00
GENERAL	Output	42	75	UHF	A	012-002	7.50
GENERAL	Output	42	75	BNC	В	012-074	6.50
GENERAL	Output	42	93	UHF	Α	012-003	6.50
GENERAL	Output	42	93	BNC	В	012-075	4.00
GENERAL	Output-Terminated	42	93	UHF	Α	012-005	6.50
	with 93 Ω Resistor						
	Output-Terminated	42	93	UHF	Α	012-004	13.50
GENERAL	with Variable Attenuator						
GENERAL	Output	42	170	UHF	A C	012-006	7.50
GENERAL	Horizontal Input	18		Banana		012-054	2.50
GENERAL	Adapter Cable	5		2-Banana to UHF	A-C	012-059	3.50
E	Input	30		Special 3-pin	D	012-022	6.00
N	CRT Cathode	62		Special 2-Banana	B-E	012-052	11.00
	Unblanking			to BNC			
N	Horizontal Input	30	_	Banana to UHF	A-C	012-053	7.50
Q	Input	15 ft.		Special 9-pin	F	012-040	12.00
2A61	Input	60		Special 4-pin	G	012-072	10.00
122	Battery Cable	7 ft.		Octal to (5) 3-pin	H-I	012-009	15.00
127	Input	60	170	UHF	A	012-034	7.50
160, 360	Inter-connecting	20		Octal	H-R	012-016	7.00
161, 162, 163	Inter-connecting	10	_	Octal	Н	012-017	5.00
175	Test Cable	30	_	Banana	С	012-056	1.75
175	Test Cable-Black Plug	42		Special Plug	J	012-044	9.00
175	Test Cable-Red Plug	42		Special Plug	J	012-043	9.00
175	Socket Adapter	-3		Special 9-pin	P	012-045	11.25
262	6R1 Inter-connecting	6 ft.	-	36-50 Pin Ribbon	L-M	012-081	60.00
				Special 41-pin			
262	262 Inter-connecting	48	-	50-pin Ribbon	K	012-082	60.00
507, 517A**	Inter-connecting	30		16-pin Ribbon	N	012-032	27.00
551, 555	Inter-connecting	72	-	16-pin Ribbon	N	012-051	28.40
517/517A*	Inter-connecting	30		12-pin Ribbon	0-Q	012-012	20.00
* Serial Num		** C: - N	umber 1740 and				

STANDARD GRATICULES

		RATICULE RULI				
INSTRUMENT TYPE*	DIVISION	VERTICAL	HORIZONTAL	PART NO.	PRICI	
310, 310A, 360		8	10	331-027	\$1.7	
316		8	10	331-042	1.7	
317	1/4"	8	10	331-095 (adjustable) 331-042 (not adjustable)	1.7	
321, 321A		6	10	331-055	1.7	
502, 502A, 565		10	10	331-047	2.9	
503, 504, 560, 561, 661		8	10	331-056	2.9	
507, 515, 515A, 516, 531 531A, 533, 533A, 535, 535A	, 1 cm	6	10	331-037 (adjustable) 331-016 (not adjustable)	2.9	
517 (SN 101-925)		4	8	331-008	8.0	
517A (SN 926-957)		4	8	331-030	8.0	
517A (SN 958-up)		4	8	331-033	2.9	
519		2	6	331-065	8.0	
524, 524AD		6	10	331-006	2.9	
525		ked in Percentag dulation Measure		331-035	3.4	
526	Mo Col	arked in Degrees or TV Vector An	for alysis	331-104	8.0	
527	Special	7	10	331-069	3.4	
RM527	Special	7	10	331-068	3.4	
532	1 cm	8	10	331-026	2.9	
536, 570, 575	5/16''	10	10	331-028	2.9	
541, 541A, 543, 543A, 545 545A, 581, 581A, 585, 585A		4	10	331-034 (adjustable)	2.9	
551, 555	1 cm	6	10	331-045	2.9	
RM561, 567		8	10	331-076	2.9	
564		8	10	331-097	2.3	

SPECIAL PURPOSE GRATICULES

		GRATICULE RUL			
INSTRUMENT TYPE*	DIVISION VERTICAL HORIZONTAL		HORIZONTAL	PART NO.	PRICE
524, 524AD	1/8" x 1 cm	17	10	331-009	\$3.45
524, 524AD, 525	Co	lor TV Bar Dime	nsions	331-040	4.05
527		Non-composite I	RE	331-079	3.45
527		d in Percentage dulation Measure	331-080	3.45	
RM527		Non-Composite	RE	331-077	3.45
RM527		d in Percentage dulation Measure		331-078	3.45
531, 531A, 533 533A, 535, 535A MOD108A	.85 cm	6	10	331-051	2.90
536	For Pl	nase Angle Meas	urements	331-057	3.45
541, 541A, 543 543A, 545, 545A MOD 108A	.85 cm	4	10	331-052	2.90
551 MOD •108A	.85 cm	6	10	331-053	2.90
561A MOD 210C	1 cm	6	10	331-090	2.30

PLEXIGLASS LIGHT FILTERS

Filters for Tektronix oscilloscopes using 3" crt's							
Instrument	Color	Part No.	Price				
	Green	378-505	\$.50				
Type 315D	Amber	378-506	.50				
Type 313D	Blue	378-507	.50				
	Yellow	378-508	.50				
	Green	378-521	.50				
Type 321	Amber	378-524	1.10				
	Blue	378-523	1.15				
	Green	378-509	.50				
	Amber	378-511	.50				
General*	Blue	378-510	.50				
	Yellow	378-512	.50				

Filters	for	Tektronix	oscilloscopes	using	5"	crt's	
---------	-----	-----------	---------------	-------	----	-------	--

* For all 3" oscilloscopes not listed.

Instrument	Color	Part No.	Price
	Green	378-525	\$1.50
Types 527, RM527, 561	Amber	378-528	1.50
K/VI327, 301	Blue	378-527	1.50
	Green	378-514	.90
General*	Amber	378-516	.90
	Blue	378-515	.90
* For all 5"	oscilloscopes no	t listed.	

Filters for Tektronix oscilloscopes using rectangular crt's

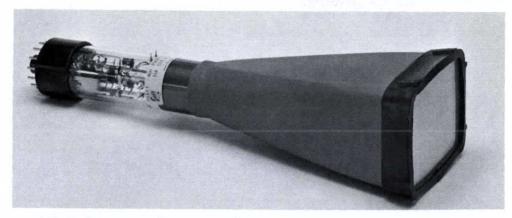
Instrument	Color	Part No.	Price
	Green	378-534	\$.90
Type 561A	Amber	378-536	.90
	Blue	378-535	.90

UNSCRIBED GRATICULES

Instrument Type*	Part No.	Price
310, 310A, 316, 317, 360	386-395	\$1.25
502, 502A, 517 (SN 926- 957), 524, 524AD, 525, 526, 532, 536, 551, 555, 570, 575	331-093	1.45
503, 504, 560, 561, 661	331-105	1.45
507, 515, 515A, 516, 517A (SN 957-up), 581, 581A, 585, 585A	386-451	1.45
527, RM561, 567	331-084	2.30
531, 531A, 533, 533A, 535, 535A, 541, 541A, 543,	386-451 (adjustable)	1.45
543A 545, 545A	331-093 (not adjustable)	1.45
561A, RM561A, 564 (Implosion shield for ceramic type crt only.)	337-539	1.45

* For both cabinet and rack-mount instruments unless rack-mount version is listed.

DIRECT REPLACEMENT CATHODE-RAY TUBES



All Tektronix direct replacement crt's are under a new numbering system that provides more flexibility for future designations of the crt's.

Example T5610-31-1 tube type-phosphor-internal graticule design variation

In the following list, phosphor designation is eliminated in order to avoid much repetition. Replacement crt's are normally available with phosphors P1, 2, 7, 11, or 31. It will be necessary to specify the phosphor desired when ordering. Other phosphors are available on special order. Consult your Tektronix Field Engineer for particulars.

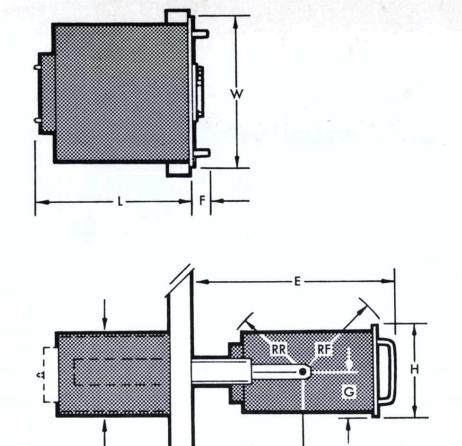
INSTRUMENT*	CRT TYPE	PRICE**
310, 310A, 360 316 317	T3100 T3160 T3170	\$ 45.00 80.00 90.00
321	T3210	85.00
321 A	T3211	85.00
502	T5020	125.00
502A	T5021	125.00
503, 504, 560, 561, 661	T5030	60.00
506	T5033	80.00
507	T5070	125.00
515, 515A, 516	T0550	60.00
517, 517A	T0541	110.00
519	T5191	1000.00
524, 524AD	5ABP1	32.65
525	T0520	60.00
526	T5260	99.50
527	T5270	80.00
531, 535	T0510	75.00
531A, 533, 533A, 535A	T5330	<i>7</i> 5.00
532, 570, 575	T0520	60.00
536	T5360	75.00
541, 545	T0540	75.00
541A, 543, 543A, 545A	T5430	75.00
543B, 544, 545B, 546, 547	T5470	120.00
551	T5511	180.00
555	T5550	225.00
RM561	T5032	60.00
561A, 567	T5610	60.00
564	T5640	450.00
565	T5650	175.00
581, 581A, 585, 585A	T5810	175.00
647	T6470	250.00
* Both conventional and rackmoun	t instruments unless nates	J

^{*} Both conventional and rackmount instruments unless noted.

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

^{**} Prices slightly higher for internal graticule option where available.

Instrument Dimensions



BALL HER BASISTAN	RACK MOUNT INSTRUMENTS EXCLUSIVE OF PLUG-IN UNITS AND PROBES								
Symbol	Description	Definition							
Н	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 fore- most 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.							
A LITTER	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.

			MOUNT	ING DIA	MENSIO	NS				
TYPE	H	W		F	G	E	RF	RR	T	С
RM15	83/4	19	22%/16	13/4	27/16	295/8	137/8	121/2	161/2	8.5/8
RM17	7	19	175/8	13/4	213/16	211/8	12%/16	73/4	91/8	613/1
RM31A	14	19	223/4	21/8	71/16	291/2	14	123/8	$16^{3}/_{8}$	137/8
RM33A	14	19	223/4	21/8	71/16	291/2	14	123/8	163/8	137/8
RM35A	14	19	223/4	21/8	71/16	291/2	14	123/8	$16^{3}/_{8}$	137/8
RM41A	14	19	223/4	21/8	71/16	291/2	14	123/8	$16^{3}/_{8}$	137/8
127	83/4	19	215/8	13/4	27/16	285/8	1211/16	121/4	163/8	83/4
RM502A	121/4	19	21 1/2	17/8	27/16	26	155/8	103/8	13	11
RM503	7	19	17	13/4	31/2	223/4	117/8	7%/16	111//8	7
RM504	7	19	17	13/4	31/2	223/4	117/8	7%/16	111//8	7
525	83/4	19	2015/16	111/16	23/8	241/8	145/8	91/8	103/8	81/2
526	83/4	19	1715/16	13/4	27/16	211/2	113/4	10	105/8	85/8
RM527	51/4	19	181/4	17/8	21/4	211/4	12	81/2	93/8	51/10
RM543B	14	19	225/8	115/16	71/16	283/4	137/16	13	$16^{3}/_{8}$	137/8
RM544	14	19	225/8	115/16	71/16	283/4	137/16	13	$16^{3}/_{8}$	137/8
RM545B	14	19	225/8	115/16	71/16	283/4	137/16	13	$16^{3}/_{8}$	137/8
RM546	14	19	225/8	115/16	71/16	283/4	137/16	13	$16^{3}/_{8}$	137/8
RM547	14	19	225/8	115/16	71/16	283/4	137/16	13	163/8	137/8
RM561A	7	19	183/8	111/16	25/16	245/16	137/16	71/8	111/8	67/8
RM564	7	19	183/8	111/16	27/16	245/16	133/4	77/8	11	63/4
RM565	121/4	19	22	17/8	27/16	30%16	1513/16	14	165/8	123/10
RM567	121/4	19	22	17/8	27/16	31.5/8	167/8	12	16%16	123/10
RM585A	14	19	223/4	21/8	71/16	291/2	14	123/8	163/8	137/8
RM647	7	19	19	111/16	27/16	277/8	135/8	811/16	145/8	63/4

Shipping Weights and Volumes

Туре	Domestic Net Wt. Packed in Ibs. in Ibs.	Export Pac Weight Ibs. Kgs.	ked Volume Cu. Ft.	Туре	Net Wt.	Domestic Packed in lbs.	Export Pac Weight Ibs. Kgs.	cked Volume Cu Ft.
B CA C-12 C-13 C-19 C-27 C-350 D E FM122 FM125 G H K L M O Q R RM15 RM122 RM125 RM17 RM181 RM31A RM33A RM35A RM41A RM502A RM503 RM504 RM503 RM504 RM503 RM504 RM507 RM543B RM545 RM547 RM565 RM567 RM585A RM647 S T Z 1A1 1A2 105 107 109 111 113 122 123 125 127 129 130 132 133 160A 161 162 163 175 180A 181 190B 2A60 2A61 2A63 2B67 261	4 6 43/4 9 141/4 16 111/2 15 151/2 18 10 14 31/4 8 51/2 9 19 27 41/4 6 4 9 33/4 8 41/2 8 51/4 8 51/2 9 51/4 10 71/4 9 57 75 6 14 19 29 35 66 153/4 33 75 101 741/2 100 781/4 105 751/2 100 90 97 27 51 251/2 48 34 62 81 108 801/2 109 85 113 87 114 87 116 301/2 54 31 41 67 101 501/2 85 81 110 50 61 41/4 9 43/4 9 53/4 10 51/2 10 41/4 8 34 47 13 20 81/2 10 81/2 10 81/2 10 81/2 10 81/2 10 81/2 10 81/2 10 81/2 10 81/2 10 81/2 10 81/2 10 85 81 110 50 61 41/4 9 43/4 9 53/4 10 51/2 10 41/4 8 34 47 13 20 81/2 10 81/2	14 6 15 7 32 15 31 14 35 16 29 13 19 8 14 6 14 6 15 7 42 19 14 6 13 6 14 6 13 6 14 6 13 6 14 6 14 6 15 7 16 7 17 7 18 8 96 44 25 11 39 22 87 39 44 20 121 55 135 59 136 59 139 60 35 122 136 59 139 60 13 6 14 13	2244434221422222229459499999999999999999999999	262 280 290 291 292 3A1 3A2 3A3 3A6 3A72 3A74 3A75 3B1 3B2 3B3 3B4 3C66 3S3 3S76 3T77 310A 317 321A 360 4S1 4S2 4S3 5T1A 502A 503 504 506 507 515A 516 517A 519 524AD 525 526 527 531A 535A 544 545B 544 545B 546 547 551 555 561 575 570 570	24 4 ¹ / ₂ 6 6 ¹ / ₄ 6 6 ¹ / ₄ 6 6 5 ¹ / ₄ 6 6 5 ¹ / ₄ 5 ¹ / ₄ 5 ¹ / ₂ 5 ¹ / ₄ 6 ³ / ₄ 7 ¹ / ₂ 5 ¹ / ₂ 23 33 ¹ / ₄ 14 10 15 ¹ / ₄ 9 13 6 60 29 ¹ / ₂ 27 ¹ / ₄ 28 94 ¹ / ₂ 42 ¹ / ₄ 44 ¹ / ₄ 175 103 ³ / ₄ 61 ¹ / ₂ 57 ³ / ₄ 62 ¹ / ₄ 61 ¹ / ₂ 55 ³ / ₄ 65 ³ / ₄ 116 ¹ / ₄ 28 33 62 49 74 ³ / ₄ 40 ¹ / ₂ 49 ¹ / ₂ 61 ¹ / ₂	39 9 9 9 9 12 8 8 10 8 6 7 8 8 8 7 6 7 9 12 9 34 47 22 17 15 16 12 65 84 39 120 52 54 186 136 82 75 74 18 80 84 85 85 126 150 39 41 92 76 8 8 8 8 7 6 7 7 7 9	50 23 15 7 15 7 17 7 13 6 13 6 15 7 13 6 19 9 20 9 17 8 19 9 20 9 17 8 19 9 13 6 18 8 21 10 20 9 45 20 57 26 29 13 31 14 29 23 10 20 9 84 38 49 22 57 26 50 22 147 67 63 29 281 127 169 77 106 48 95 43 100 95 43 101 97 106 48 97 106 48 98 43 102 46 103 45 103 45 103 45 104 49 97 44 101 24 101 25 102 27 103 49 104 49 105 40 107 40 108 40 109 41 100 45 100 45 101 46 103 45 103 45 104 47 105 46 107 47 108 48 109 49 111 50 108 48 109 49 111 50 108 48 109 49 111 50 108 48 109 49 111 50 101 30 102 46 103 45 103 45 103 45 104 40 105 40 107 40 108 40 109 40 101 32 101 32 102 46 103 45 103 45 104 40 105 40 107 40 108 40 109 40 101 40 101 40 101 40 102 40 103 45 104 40 105 40 107 40 108 40 109 40 101 40 101 40 102 40 103 45 104 40 105 40 107 40 108 40 109 40 101 40 101 40 102 40 103 45 104 40 105 40 107 40 108 40 109 40 101 40 101 40 102 40 103 45 104 40 105 40 107 40 108 50 108 50	52221322233332312233443443433386562621399948888888888888888888888888888888888

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: Mitchell 4-0161 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 pages 285

The Tektronix Field Engineering office in your country will provide you with quotations and accept your orders. Normally, prices quoted for Canada are FOB Toronto, Montreal

and 286. da are FOB Toronto, Montreal or Vancouver; and for Australia, Switzerland and United Kingdom they are FOB your plant.

COUNTRIES WITH TEKTRONIX DISTRIBUTORS

Listed on pages 285 and 286.

Your Tektronix distributor will provide you with quotations FOB your country and accept your orders.

COUNTRIES WITH NO TEKTRONIX DISTRIBUTOR

nor 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 BE-FORE RECEIVING DIRECTIONS.

TEKTRONIX, INC.

Tektronix, Inc., an Oregon Corporation, Home Office & Factory, P. O. Box 500, Beaverton, Oregon 97005 Telephone: (503) MItchell 4-0161 TWX—503-291-6805 Telex: 036-691 Cable: TEKTRONIX

FIELD ENGINEERING OFFICES

	FIELD ENGINEERING OFFICES
ALABAMA	Huntsville 3322 South Memorial Parkway, Suite 6, HuntsvilleTelex 05-9422 Telephone: (205) 881-2912
ARIZONA	Phoenix 7045 E. Camelback Road, ScottsdaleTelex 061-701
CALIFORNIA	San Diego 3045 Rosecrans Street, San Diego 10Telex 069-525 Telephone: (714)222-0384
Los Angeles Area	• Orange 1722 E. Rose Avenue, OrangeTelex 06-78812
	Pasadena 1194 East Walnut Street, PasadenaTWX: 213-449-1151Telex 06-74397
	Telephone (213) 449-2164
	From Los Angeles telephones call: 681-0201
	• Van Nuys 16930 Sherman Way, Van NuysTelex 06-74396
San Francisco Bay Area	Walnut Creek 1709 Mt. Diablo Blvd., Walnut Creek Telex 033-644 Telephone: (415) 935-6101 From Oakland, Berkeley, Richmond, Albany and San Leandro: 254-5353
- 13	• Palo Alto 3944 Fabian Way, Palo AltoTelex 033-911
COLORADO	Denver 2120 South Ash Street, Denver 22Telex 045-662
FLORIDA	• Orlando 205 East Colonial Drive, OrlandoTelex 056-515 Telephone: (305) GArden 5-3483 (also serves Puerto Rico)
GEORGIA	• Atlanta 467 Armour Circle, N.E., Atlanta 24Telex 05-42233
ILLINOIS	• Chicago 400 Higgins Road, Park RidgeTelex 02-53374
INDIANA	Indianapolis 3937 North Keystone Avenue, Indianapolis 5 Telex 027-348 Telephone: (317) LIberty 6-2408
KANSAS	Kansas City 5845 Horton, Suite 6, MissionTelex 04-2321
MARYLAND	• Baltimore 1045 Taylor Avenue, Towson 4Telex 087-804 Telephone: (301)825-9000
MASSACHUSETTS	• Boston 244 Second Avenue, Waltham, Massachusetts 02154Telex 094-6301 Telephone: (617) 894-4550
MICHIGAN	• Detroit 27310 Southfield Road, Lathrup VillageTelex 023-400Telephone: (313) ELgin 7-0040
MINNESOTA	Minneapolis 3307 Vera Cruz Ave. North, Suite 102, MinneapolisTelex 029-699 Telephone: (612) 533-2727
NEW MEXICO	• Albuquerque 1258 Ortiz Drive, S.E., AlbuquerqueTelex 074-621 Telephone: (505) 268-3373 Southern New Mexico Area: Enterprise 678
NEW YORK	Buffalo 965 Maryvale Drive, Buffalo 25Telex 091-238
	• Endicott 3214 Watson Blvd., EndwellTelex 093-796 Telephone: (607) PIoneer 8-8291
	• Poughkeepsie 12 Raymond Ave., PoughkeepsieTelex 096-4724 Telephone: (914) GRover 1-3620
	• Syracuse East Molloy Road & Pickard Drive, P.O. Box 155, Syracuse 11 Telex 093-739 Telephone: (315)455-6666
New York City Area	 New York City and Long Island 125 Mineola Avenue, Roslyn Heights, L. I., N. Y. 11577 Telex: ROSN 01-26446 Telephone (516) HT 4-2300
	• Northern N. J 400 Chestnut Street, Union, New Jersey Telex 01-26344 Telephone: (201) 688-2222
	Hudson River Valley, Westchester County, Connecticut 144 Morgan Street, Stamford, Connecticut Telex 096-5917 Telephone: (203) DAvis 5-3817
NORTH CAROLINA	• Greensboro 1838 Banking Street, Greensboro Telex 057-417 Telephone: (919)274-4647
OHIO	Cleveland 1503 Brookpark Road, Cleveland 9Telex 098-5217 Telephone: (216) 351-8414
	Dayton 3601 South Dixie Drive, Dayton 39Telex 02-8825
PENNSYLVANIA	• Philadelphia 126 Presidential Blvd. North, Bala-CynwydTelex 083-4218. Telephone: (215) TEnnyson 9-3111
	Pittsburgh 3834 Northern Pike, MonroevilleTelex 086-761
TEXAS	• Dallas 2600 Stemmons Freeway, Suite 162, DallasTelex 073-2217 Telephone: (214) MEIrose 1-4560
	Houston 3723 Westheimer, Suite H, Houston 27 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 66Telex 032-488
WASIIINGION	From Portland, Corvallis, Eugene (Oregon): Commerce 9369
	From Pullman, Richland, Spokane, Yakima: Zenith 9369
WASHINGTON, D.C.	• Washington, D.C 4205 Evergreen Lane, Annandale, VirginiaTWX: 703-256-8902Telex 089-515 Telephone: (703) 256-67
	• ALSO REPAIR CENTER Norfolk, Portsmouth, and Hampton, Virginia Area: Enterprise 741

Area Code Numbers are in parenthesis preceding telephone number.

TEKTRONIX CANADA LTD.

QUEBEC	 Montreal 3285 Cavendish Blvd., Suite 160, Montreal 28Telex: 01-2867 Telephone: (514) 489-9707 						
ONTARIO	 Toronto 4A Finch Ave. West, WillowdaleTelex: 02-2776 Telephone: Toronto (416) 225-1138 						
ALSO REPAIR CENTER							

TEKTRONIX FIELD ENGINEERING OFFICES

	TERROTAL TIELD ENGINEERING OFFICES				
• AUSTRALIA	Tektronix Australia Pty. Limited, 4-14 Foster Street, Sydney, N.S.W.; (mail address P. O. Box 488, Crown Cable: TEKTRONIX AUSTRALIA Street, N.S.W.) Telephone 211-2666 Tektronix Australia Pty. Limited, Suite 20, 67 Queen's Road, Melbourne, Victoria Telephone: 26-1135				
• UNITED KINGDOM	Tektronix U.K. Ltd., Beaverton House, Station Approach, Harpenden, Herts				
• SWITZERLAND	Tektronix International A.G., Zeughaus-gasse No. 9, 6300 Zug (P. O. Box 57, 6301 Zug)				
	• ALSO REPAIR CENTER Telex: 58408 Cable: TEKINTAG Telephone: 042 49192				
	TEKTRONIX OVERSEAS DISTRIBUTORS				
*ANGOLA	Equipamentos Tecnicos, Lda., Caixa Postal 6319, Luanda				
ARGENTINA *AUSTRIA	Coasin S.A., Viel 969, Buenos Aires				
*BELGIUM	Régulation Mesure, SPRL, 22, Rue Saint-Hubert, Bruxelles 15				
BRASIL	Telex: 02-21520Cable: MEREG Bruxelles Importação Industria E Comércio Ambriex, S.A., Av. Graça Aranha 226-6°, Rio de Janeiro, ZC-00 Cable: RAIOCARDIO Rio de Janeiro Telephone: 42-7990 & 42-7291				
	Importação Industria E Comércio Ambriex, S.A., Rua da Consolação, 37, Grupo 1102, São Paulo				
CHILE	Telephone: 37-7611 Carlos Pentz Rettig, Casilla 2839, Santiago				
COLOMBIA	Manuel Trujillo Venegas & Cia., Ltda., Calle 12 No. 5-82 4° Piso (Apartado Aereo #3956) Bogota D.E., Cable: MATRUVE Bogota Telephone: 42 31 99 & 42 92 17				
*DENMARK	Tage Olsen A.S., 1, Ronnegade, Copenhagen O				
FEDERATION	Telex: 5788Cable: TOCOPEN, Copenhagen Mechanical & Combustion Engineering Co., Ltd., 9, Jalan Kilang, Red Hill Industrial Estate,				
OF MALAYSIA *FINLAND	(P. O. Box 46, Alexandra Post Office), Singapore 3 Cable: MECOMBTelephone: 62361-3 Into O/Y, P. O. Box 153, 11, Meritullinkatu, Helsinki				
*FRANCE	Relations Techniques Intercontinentales, S.A., 134, Avenue de Malakoff, Paris XVI				
*GREECE	Marios Dalleggio Representations, 2, Alopekis Street, Athens 139				
HONG KONG and MACAU	International Service Corporation Ltd., 64, Castle Peak Road, Kowloon, Hong Kong Telephone: 868214				
INDIA	Cable: INSCOL, Hong Kong Electronic Enterprises, 46, Karani Building, New Charni Road, Bombay 4 BR				
*ISRAEL	Cable: TRONIX Bombay Eastronics Limited, 22, Maze St., (P.O. Box 2554) Tel Aviv				
*ITALY	Telex: 033-638Cable: EASTLAND Tel Aviv Silverstar Ltd., Via Dei Gracchi N20, Milano				
	Silverstar Ltd., Via Paisiello N.30, Roma Cable: SILVERSTAR, Roma Telephone: 855.366 & 869.009 Silverstar Ltd., Via Castelfidardo N.21, Torino				
JAPAN	Midoriya Electric Co., Ltd., 3, 2-Chome, Kyobashi, Chuo-Ku, Tokyo Telephone: 561-9256 & 561-5848 Cable: MIDRIYAELC Tokyo				
*LEBANON MEXICO	Projects Consulting Engineers, P. O. Box 2293, Beirut Cable: PROJECTS Beirut Telephone: 241200 Fredin S.A., Melchor Ocampo No. 212-505, Mexico 5, D.F., (P. O. Box 53-958, Mexico 17, D.F.)				
NEW ZEALAND	Telephone: 46-44-21, 34-88-61 W & K McLean, Ltd., 7 Anzac Avenue, (P.O. Box 3097) Auckland				
*NORWAY	Cable: KOSFY Auckland Morgenstierne & Company, Wesselsgt 6, Oslo 1				
PAKISTAN	Telex: 1719 Cable: MOROF Oslo Pak-Land Corporation, Central Commercial Area, Iqbal Road, P.E.C.H. Society, Karachi 29				
*PORTUGAL	Cable: PAKLAND Pakistan				
*REPUBLIC OF SOUTH AFRICA	Cable: EQUILAB, Lisboa Protea Physical & Nuclear Instrumentation (Pty) Ltd., 38, Faraday Street, Wemmer, Johannesburg				
*SPAIN	Telex: J7337 Cable: MANLU Telephone: 33-1015 Carlos Rafael Marés, S.L., Valencia 333, Barcelona (9)				
*SWEDEN	Erik Ferner, A.B., Snormakarvagen 35, Box 56, Bromma				
*The NETHERLANDS	C. N. Rood, N. V., 13, Cort van der Lindenstraat, P. O. Box 4542, Rijswijk				
*TURKEY	M. Suhyl Erkman, Necatibey Cad No. 207, Galata, 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				
*WEST GERMANY	Rohde & Schwarz Vertriebs-GmbH, Hohe Strasse 160-168, Köln				
	Rohde & Schwarz Handels-GmbH, Ernst-Reuter-Platz, 10, Berlin 10				
	Rohde & Schwarz Vertriebs-GmbH, Kornerstrasse 34, Hamburg				
	Rohde & Schwarz Vertriebs-GmbH, Kriegstrasse 39, Karlsruhe				
	Rohde & Schwarz Vertriebs-GmbH, Dachauer Strasse 109, München				
*Served by Tektronix Limited, P. O. Box 36, St. Peter Port, Guernsey, Channel Islands. Other Overseas Areas and Distributors served by International Marketing, P. O. Box 500, Beaverton, Oregon 97005, U.S.A., Cable: TEKTRONIX.					

Index

	是我们在自己的第三人称单位的企业的是对于自己的企业		JE MOR	MACHANIA PER VINCE		
В	High-Gain Unit		165	2B67	Time-Base Unit	188
CA	Dual-Trace DC Unit		166	310A	DC to 4 MC Portable Oscilloscope	14
C-12	Trace-Recording Camera		240	317, RM17	DC to 10 MC Oscilloscope	16
C-13	Trace-Recording Camera		242	321A	Portable Oscilloscope	19
C-19	Trace-Recording Camera		243	360	Indicator Unit	22
C-27	Trace-Recording Camera		238	3A1	Dual-Trace DC to 10 MC Unit	189
D	High-Gain DC Differential Unit		167	3A2		190
E	Low-Level AC Differential Unit		168	3A3	100 μv/div Differential Unit	191
G	Wide-Band DC Differential Unit		169	3A6	Dual-Trace DC to 10 MC Unit	189
H	Wide-Band, High-Gain DC Unit		170	3A72	Dual-Trace DC to 650 KC Unit	193
K	Fast-Rise DC Unit		171	3A74	Four-Trace DC to 2 MC Unit	194
L	Fast-Rise, High-Gain Unit		172	3A75	DC to 4 MC Unit	193 195
M	Four-Trace DC Unit		173 174	3B1 3B2	Time-Base Unit Time-Base Unit 118,	190
0	Operational Amplifier Unit Transducer & Strain Gage Unit		176	3B3	Time-Base Unit	196
Q R	Transistor-Risetime Unit		178	3B4	Time-Base Unit	197
S	Diode Recovery Unit		180	3C66	Carrier Amplifier Unit	198
T	Time-Base Generator		182	383	The state of the s	200
Ž	Differential-Comparator Unit		183	3\$76		201
21A	Time-Base Unit		97	3T77		202
22A	Time-Base Unit		97	4\$1	Dual-Trace Sampling Unit	154
81	Plug-In Unit Adapter		139	4\$2	Dual-Trace Sampling Unit	155
82	Dual-Trace Unit		140	4S3	Sampling-Probe Dual-Trace Unit	156
84	Test Unit		141		Scope-Mobile Cart	249
86	Plug-In Unit		142		100 μv/cm Dual-Beam Oscilloscope	24
105	Square-Wave Generator		203	503, RM503	DC to 450 KC—X-Y Oscilloscope	27
107	Square-Wave Generator		204	504, RM504	DC to 450 KC Oscilloscope	29
109	Pulse Generator		205	506	DC to 23 MC Oscilloscope	31
111	Pretrigger Pulse Generator		206	507	Surge-Test Oscilloscope	34 37
113	Delay Cable		207 208	515, RM15 516	DC to 15 MC Oscilloscope DC to 15 MC — Dual-Trace Oscilloscope	40
122, FM122, RM122	Low-Level Preamplifier		200	517A	High-Speed Oscilloscope	4
123	AC-Coupled Preamplifier		210	517	DC to 1 Gigacycle Oscilloscope	45
125, FM125,	Power Supply		211	524AD	Television Oscilloscope	48
RM125	Tower dopping		2	525	Television Waveform Monitor	51
127	Plug-In Unit Power Supply		212	526	Color Television Vectorscope	54
129	Plug-In Unit Power Supply		214	527, RM527	Television Waveform Monitor	57
130	L-C Meter		216	531A, RM31A	DC to 15 MC Oscilloscope	61
132	Plug-In Unit Power Supply		217	533A, RM33A	DC to 15 MC — 100X Magnifier	
133	Plug-In Unit Power Supply		218		Oscilloscope	65
160A	Power Supply		220	535A, RM35A	DC to 15 MC — Sweep Delay Oscilloscope	
161	Pulse Generator		221	536	DC to 10 MC — X-Y Oscilloscope	68
162	Waveform Generator		222	541A, RM41A	DC to 33 MC Oscilloscope	71
163	Fast-Rise Pulse Generator		223	543B, RM543B	DC to 33 MC — 100X Magnifier	7.4
175	High-Current Adapter for Type 575		130	544 DM544	Oscilloscope	74
180A 181, RM181	Time-Mark Generator Time-Mark Generator		224 226	544, RM544	DC to 50 MC — 100X Magnifier Oscilloscope	77
190B	Sine-Wave Generator		227	545B, RM545B	DC to 33 MC — Sweep Delay Oscilloscope	05
1A1	Wide-Band, High-Gain, Dual-Trace Unit		185	546, RM546	DC to 50 MC — Sweep Delay Oscilloscope	
1A2	Wide-Band, Dual-Trace Unit		185	547, RM547	DC to 50 MC — Automatic Display	
10A2	Dual-Trace Unit		146	· /	Switching Oscilloscope	84
10/11M1	Test Unit		151	551	DC to 27 MC — Dual-Beam Oscilloscope	90
11B1	Time-Base Unit		147	555	DC to 33 MC — Sweep Delay - Dual-Bean	n 94
11B2	Time-Base Unit		149	561A, RM561A	Oscilloscope	98
201-1	Tilt-Lock Scope-Mobile Cart		248	564, RM564	Storage Oscilloscope	102
201-2	Tilt-Lock Scope-Mobile Cart		248	565, RM565	Dual-Beam Oscilloscope	107
202-1	Tilt-Lock Scope-Mobile Cart		248	567, RM567	Readout Oscilloscope	111
202-2	Tilt-Lock Scope-Mobile Cart		248	570	Electron Tube Characteristic Curve Tracer	127
205-1	Tilt-Lock Scope-Mobile Cart		248	575	Transistor Curve Tracer	130
261	Coaxial Switch		122	581A	DC to 85 MC Oscilloscope	135
262	Programmer	1.50	123		DC to 85 MC — Sweep Delay Oscilloscope	
280			228	5T1A	Sampling Timing Unit	157
290 291			229	647, RM647	DC to 50 MC Oscilloscope	14
292			230	661 6R1A	Sampling Oscilloscope Digital Unit	152 115
2A60	DC to 1 MC Unit	101,	187	9A1	Dual-Trace Unit	32
2A61	Low-Level Differential Unit		187	9A2	Dual-Trace Unit	33
2A63	DC to 300 KC Differential Unit		188	1121	5 cps to 17 MC Amplifier	232
			e, at all	and the state of t		

