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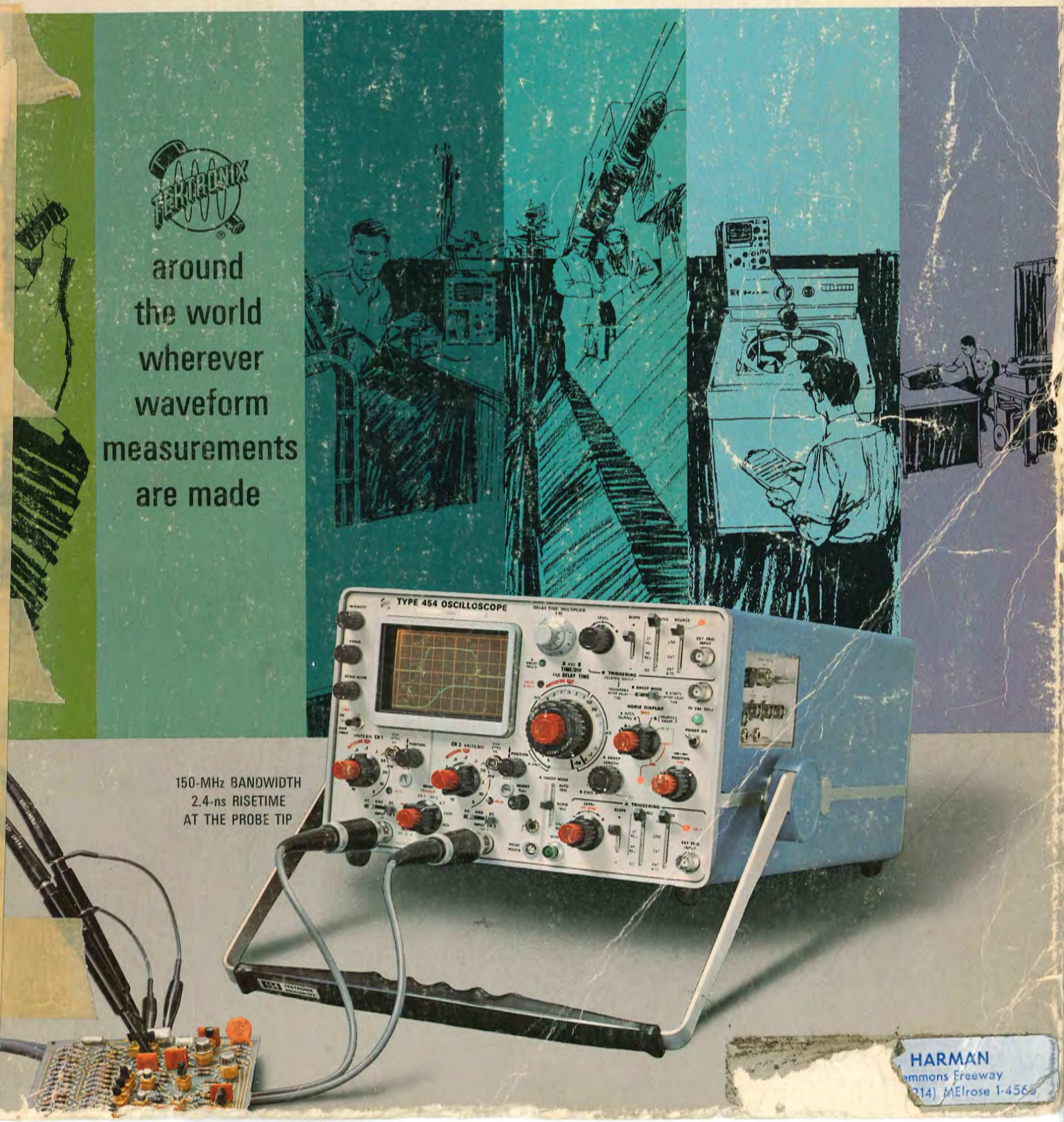
TEKTRONIX OSCILLOSCOPES & ASSOCIATED INSTRUMENTS

around
the world
wherever
waveform
measurements
are made



150-MHz BANDWIDTH
2.4-ns RISETIME
AT THE PROBE TIP

NEW INSTRUMENTS

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.

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

How To Use This Catalog

Readers who know our product line can consult the contents page and go directly to the instrument of interest. Others, who are not so well acquainted must approach the solution to their measurement problem in a different way. This page points out features of this catalog that are included to help the reader find the instrument he requires.

CONTENTS

The content pages will give you a brief look at all of the oscilloscopes and associated instruments available and, at the same time, allow you to match your basic requirements with a group of instruments that share similar characteristics.

Instruments are grouped together according to common characteristics; for example, those oscilloscopes that feature portability; those oscilloscopes that use the same group of plug-in units; those oscilloscopes that use the sampling technique for their display, etc. The sequence of instruments within these groups is arranged by instrument type number in an ascending order. For quick association, you'll find the applicable plug-in units grouped immediately after the group or groups of oscilloscopes in which they are used.

REFERENCE CHARTS

Since bandwidth, risetime, and deflection factor as well as other parameters are of vital interest to you in selecting an instrument, this catalog contains a group of reference charts that provide these essentials. These charts will allow you to make a quick comparison among instruments.

The chart on pages 4 to 6 covers all Tektronix oscilloscopes, and is indexed by bandwidth. This chart will show you the different oscilloscopes (with plug-in units if used) available within a particular bandwidth range. The chart also lists the important features and characteristics of the oscilloscope, the price, and the catalog page number where you will find the instrument described in complete detail.

The charts on pages 6 through 13 cover all oscilloscopes, plug-in units, and associated instruments contained in this catalog. Like the content pages, the instruments are grouped according to similar characteristics. On pages 8, 9, 10 and 11 you'll find the oscilloscopes that use plug-in units listed along with the plug-in units and their respective characteristics. These charts quickly point out the versatility offered by the plug-in type oscilloscope.

The reference charts are included in this catalog to help you make a quick comparison of features, major characteristics and prices of the various instruments. After you've narrowed your selection, turn to the page indicated by the chart for a complete description. You will notice that each major instrument description includes a characteristic summary that contains details of the vertical, horizontal, and CRT systems. Comparing the summaries of any two instruments will point out their major differences.

REFERENCE INFORMATION

Page 14 explains the significance of characteristics in terms of measurement capability. Much of the information on bandwidth and risetime will be helpful in judging the applicability of various instruments to a measurement problem. Page 15 discusses Tektronix-manufactured components and also contains a chart of available CRT phosphors with technical data as well as suggested areas of usage.

DEFINITIONS AND ABBREVIATIONS

Page 16 lists some of the abbreviations used at Tektronix, primarily derived from IEEE standards. The definitions on pages 17 and 18 represent our concept of the terms used in this catalog.

ACCESSORIES

Accessory items for use with Tektronix instruments are described on pages 280 through 311.

FIELD OFFICE ASSISTANCE

Tektronix maintains 50 domestic and international field offices as well as 31 distributors with 43 offices spread throughout the world. These offices are staffed with qualified field engineers who specialize in solving measurement problems. They provide a direct communication link between you and the factory and are the people to contact for assistance. Please call or visit your nearest field office for details on applications, maintenance, or instrument orders. You'll find these offices listed on pages 317 through 319.

Ordering information such as terms, shipment, and warranty details are contained on pages 315 and 316.

INDEX

The last two pages contain a comprehensive index of (1) instruments in numerical order according to type numbers, and (2) accessories by subject.

Contents

Contents

Reference Charts

This table provides a reference for bandwidth (at 3-dB down) and risetime capabilities of Tektronix Oscilloscopes.

Prices listed in this table are for cabinet model oscilloscopes and include the plug-in units (when applicable) required to obtain the stated bandwidth.

A more complete description can be found in the individual instrument section.

Call your Tektronix Field Office for assistance in selecting the instrument for your particular application. See page 317 for Field Office listings.

TEKTRONIX OSCILLOSCOPES

(according to bandwidth capabilities)

MAXIMUM BAND-WIDTH	RISE-TIME	OSCILLOSCOPE	PLUG-IN UNIT	MINIMUM DEFL FACTOR / DEFL FACTOR AT MAX BW	DUAL TRACE	CALI-BRATED SWEEP DELAY	RACK-MOUNT AVAIL-ABLE	PRICE	OSCILLOSCOPE	PAGE
Equiv to 3.9 GHz	90 ps	Type 530, 540, 550, 580 Series	1S2	5 mV/cm / 5 mV/cm	No	Time Positions Through Full Time Base (uncal)	—	$1300 (1S2 only)	Type 530, 540, 550, 580 Series	67 to 106, 290
		Type 661	4S2A, 5T3	2 mV/cm / 2 mV/cm	Yes		No	$3400	Type 661	229
Equiv to 1 GHz	350 ps	Type 530, 540, 550, 580 Series	1S1	2 mV/cm / 2 mV/cm	No		—	$1100 (1S1 only)	Type 530, 540, 550, 580 Series	67 to 106, 290
		Type 661	4S1, 5T3	2 mV/cm / 2 mV/cm	Yes		No	$3380	Type 661	229
1 GHz	350 ps	Type 519	—	≤10 V/cm / ≤10 V/cm	No	(uncal)	No	$3900	Type 519	57
Equiv to 875 MHz	0.4 ns	Type 561A	3S76 & 3T77A	2 mV/div / 2 mV/div	Yes	Time Positions Through Full Time Base (uncal)	Yes	$2250	Type 561A	142
		Type 564 Storage						$2625	Type 564 Storage	146
		Type 567 Digital Readout						$5050	Type 567 Digital Readout	156
		Type 568 Digital Readout						$5500	Type 568 Digital Readout	162
150 MHz	2.4 ns	Type 454 Ruggedized Portable	—	5 mV/div / 20 mV/div	Yes	Yes	Yes	$2550	Type 454 Ruggedized Portable	35
100 MHz	3.5 ns	Type 647A Ruggedized	10A2A & 11B2A	10 mV/cm / 10 mV/cm	Yes	Yes	Yes	$3125	Type 647A Ruggedized	218
85 MHz	4.2 ns	Type 581A	82	10 mV/cm / 100 mV/cm	Yes	No	No	$2075	Type 581A	209
		Type 585A	82		Yes	Yes	Yes	$2375	Type 585A	212

MAXIMUM BAND-WIDTH	RISE-TIME	OSCILLOSCOPE	PLUG-IN UNIT	MINIMUM DEFL FACTOR / DEFL FACTOR AT MAX BW	DUAL TRACE	CALI-BRATED SWEEP DELAY	RACK-MOUNT AVAIL-ABLE	PRICE	OSCILLOSCOPE	PAGE
50 MHz	7 ns	Type 453 Ruggedized Portable	—	5 mV/div / 20 mV/div	Yes	Yes	Yes	$1950	Type 453 Ruggedized Portable	31
		Type 544 with 100X Mag	1A1	5 mV/cm / 50 mV/cm	Yes	No	Yes	$2150	Type 544 with 100X Mag	82
		Type 546	1A1	5 mV/cm / 50 mV/cm	Yes	Yes	Yes	$2350	Type 546	88
		Type 547 Sweep Switching	1A1					$2475	Type 547 Sweep Switching	91
		Type 556 Dual Beam	1A1 (2)					$4350	Type 556 Dual Beam	106
33 MHz	11 ns	Type 543B with 100X Mag	1A1	5 mV/cm / 50 mV/cm	Yes	No	Yes	$1900	Type 543B with 100X Mag	79
		Type 545B	1A1		Yes	Yes	Yes	$2150	Type 545B	85
		Type 555 Dual Beam	1A1 (2)		Yes	Yes	No	$3850	Type 555 Dual Beam	103
30 MHz	12 ns	Type 549 Storage	1A1	5 mV/cm / 50 mV/cm	Yes	Yes	No	$2975	Type 549 Storage	95
27 MHz	13 ns	Type 551 Dual Beam	1A1 (2)	5 mV/cm / 50 mV/cm	Yes	No	No	$3050	Type 551 Dual Beam	100
15 MHz	24 ns	Type 422 AC, DC, or Battery Portable	—	10 mV/div / 10 mV/div	Yes	No	Yes	$1400 (AC)	Type 422 AC, DC, or Battery Portable	27
		Type 515A	—	50 mV/div / 50 mV/div	No	No	Yes	$875	Type 515	52
		Type 516	—	50 mV/div / 50 mV/div	Yes	No	No	$1070	Type 516	55
		Type 531A	1A1	5 mV/cm / 50 mV/cm	Yes	No	Yes	$1595	Type 531A	67
		Type 533A with 100X Mag	1A1	5 mV/cm / 50 mV/cm	Yes	No	No	$1725	Type 533A with 100X Mag	70
		Type 535A	1A1	5 mV/cm / 50 mV/cm	Yes	Yes	Yes	$2000	Type 535A	73
		Type 561A Automatic/ Programmable	3A5 & 3B5	1 mV/div / 10 mV/div	No	Delayed Sweep Magnifier	Yes	$2150	Type 561A Automatic/ Programmable	142
		Type 564 Automatic/ Programmable Storage						$2525	Type 564 Automatic/ Programmable Storage	146
11 MHz	32 ns	Type 536 X-Y	1A1 (2)	5 mV/div / 50 mV/div	Yes	No	No	$2285	Type 536 X-Y	76

continued

Reference Charts

MAXIMUM BAND-WIDTH	RISE-TIME	OSCILLOSCOPE	PLUG-IN UNIT	MINIMUM DEFL FACTOR / DEFL FACTOR AT MAX BW	DUAL TRACE	CALI-BRATED SWEEP DELAY	RACK-MOUNT AVAIL-ABLE	PRICE	OSCILLOSCOPE	PAGE
10 MHz	35 ns	Type 317	—	10 mV/div / 10 mV/div	No	No	Yes	$875	Type 317	21
		Type 561A	3A6 & 3B3	10 mV/div / 10 mV/div	Yes	Yes	Yes	$1610	Type 561A	142
		Type 564 Storage	3A6 & 3B3					$1985	Type 564 Storage	146
		Type 565 Dual Beam	3A6 (2)					$2450	Type 565 Dual Beam	151
6 MHz	60 ns	Type 321A AC DC, or Battery Portable	—	10 mV/div / 10 mV/div	No	No	No	$900	Type 321A AC, DC, or Battery Portable	24
4 MHz	90 ns	Type 310A	—	10 mV/div / 10 mV/div	No	No	No	$675	Type 310A	19
1 MHz	0.35 μs	Type 502A Dual Beam & X-Y	—	100 μV/cm / 200 mV/cm	No	No	Yes	$1050	Type 502A Dual Beam & X-Y	43
450 kHz		Type 503 Differential & X-Y	—	1 mV/cm / 1 mV/cm	No	No	Yes	$640	Type 503 Differential & X-Y	46
		Type 504	—	5 mV/cm / 5 mV/cm	No	No	Yes	$540	Type 504	49

HIGH-VOLTAGE SURGE-TEST OSCILLOSCOPES

Oscilloscope	*Risetime*	*Deflection Factor*	*Signal Delay*	*Sweep Delay*	*Calibrated Sweep Range*	*Sweep Magnifier*	*Accel Potential*	*Price*	*Page*
Type 507	10 ns	Approximately 50 V/cm to 500 V/cm	Ext Cable†	None	20 ns/cm to 50 μs/cm	None	24 kV	$2900	265

†Cable not supplied with instrument.

TELEVISION OSCILLOSCOPES

Instrument	*Risetime*	*Calibrated Deflection Factor*	*Signal Delay*	*Vertical Response*	*Calibrated Sweep Range*	*Sweep Magnifier*	*Accel Potential*	*Price*	*Page*
Type 524AD Oscilloscope	35 ns	15 mV/cm to 20 V/cm	Yes	Normal, Flat, IEEE	0.1 μs/cm to 0.01 s/cm	3 and 10X	4 kV	$1300	265
Type 526 Vectorscope	Dual Channel displays, with either vector or linear-sweep presentation of demodulated chroma signal.						4 kV	$1665	60
Type 529* Waveform Monitor		For 6 cm deflection: 1 V, 0.5 V, and 0.2 V steps; 120 mV to 1.5 V (uncalibrated variable range)	No	Flat, IEEE, Low-Pass, High-Pass	0.125 H/cm, Field and Line Rates	5 and 25X	5.5 kV	$1050	63

*Rack-Mount models are available.

DIGITAL READOUT COMBINATIONS

X & Y PLUG-INS	RISETIME	CALIBRATED DEFLECTION FACTOR	INPUT RC OR IMPEDANCE	CALIBRATED SWEEP RANGE	TIME POSITION	DIGITAL RESOLUTION	TRIGGER	UNIT PRICE
3S3 and 3T77A*†	0.35 ns	5 mV/div to 100 mV/div	100 kΩ, 2 pF	equiv 0.2 ns/div to 10 μs/div plus X10 magnifier	Through full time base	10 or 100 dots per div	External	$1500 $ 650
3S76 and 3T77A*†	0.4 ns	2 mV/div to 200 mV/div	50 Ω				Internal or External	$1100 $ 650
3A2 and 3B2	0.7 μs	10 mV/div to 10 V/div	1 mΩ, 47 pF	2 μs/div to 1 s/div	5 μs to 10.5 s	1 μs to 10 ms with 6R1A. Extends to 0.1 μs with 230.	Internal or External	$ 500 $ 650

Type 567 Readout Oscilloscope and Type 6R1A Digital Unit $3300
Type 568 Readout Oscilloscope and Type 230 Digital Unit $3700

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

†The Type 3T2 Random Sampling Sweep can be switched (internally) for use with digital readout. Sweep range is 100 μs/div to 20 ps/div, Time Position range is 0 to 1 ms in 5 decade steps, and digital resolution is 100 samples/div. Type 3T2 .... $ 950

SPECTRUM ANALYZERS

CHARACTERISTICS	TYPE 1L5 PLUG-IN	TYPE 3L5 PLUG-IN	TYPE 1L10 PLUG-IN	TYPE 3L10 PLUG-IN	TYPE 1L20 PLUG-IN	TYPE 1L30 PLUG-IN	TYPE 491 PORTABLE	TYPE R491 RACK MODEL
CENTER FREQUENCY	50 Hz to 1 MHz		1 MHz to 36 MHz		10 MHz to 4.2 GHz	925 MHz to 10.5 GHz	10 MHz to 40 GHz	
SENSITIVITY	10 μV/div RMS for spectral displays. 1 mV/div P to P for time-based displays.		—100 dBm		—110 dBm to —90 dBm	—105 dBm to —75 dBm	—110 dBm to —70 dBm	
CALIBRATED DISPERSION	10 Hz/div to 100 kHz/div 100 Hz to 1 MHz full scale		10 Hz/div to 2 kHz/div 100 Hz to 20 kHz full scale		1 kHz/div to 10 MHz/div 10 kHz to 100 MHz full scale			
COUPLED RESOLUTION	≤10 Hz to ≥500 Hz		10 Hz to 1 kHz		1 kHz to 100 kHz			
	coupled with calibrated dispersion positions and separately switchable							
INCIDENTAL FM	≤3 Hz from 50 to 9900 Hz ≤10 Hz from 9.9 to 990 kHz		IF—5 Hz LO—26 Hz to 61 Hz		<300 Hz at fundamental, with Phase Lock			
VERTICAL DISPLAY	log, linear, video		log, linear, linear X10 (1L10 only), video		log, linear, square law, video		log, linear, square law	
OSCILLOSCOPES USED WITH	530, 540, 550, and (with adapter) 580 Series	Type 561A and 564	530, 540, 550, and (with adapter) 580 Series	Type 561A and 564	530, 540, 550, and (with adapter) 580 Series		self contained	
PAGE	133	193	135	195	136		39	
PRICE	$950	$1050	$1100	$1200	$1825	$1825	$4200	$4300

Reference Charts

CHARACTERISTICS OF TEKTRONIX OSCILLOSCOPES WITH

PLUG-IN UNIT TYPE		PAGE	PRICE	MINIMUM DEFLECTION FACTOR	Type 531A*, 533A, 535A*	Type 536
1A1	Dual-Trace Unit	123	$ 600	≈500 μV/cm 5 mV/cm 50 mV/cm	35 ns; 2 Hz to 10 MHz 25 ns; DC to 14 MHz 24 ns; DC to 15 MHz	44 ns; 2 Hz to 8 MHz 35 ns; DC to 10 MHz 32 ns; DC to 11 MHz
1A2	Dual-Trace Unit	123	325	50 mV/cm	24 ns; DC to 15 MHz	32 ns; DC to 11 MHz
1A4	Four-Trace Unit	125	750	10 mV/cm	24 ns; DC to 15 MHz	32 ns; DC to 11 MHz
1A5	Differential Comparator Unit	127	550	5 mV/cm 2 mV/cm 1 mV/cm	24 ns; DC to 15 MHz 25 ns; DC to 14 MHz 25 ns; DC to 14 MHz	32 ns; DC to 11 MHz 32 ns; DC to 11 MHz 32 ns; DC to 11 MHz
1A6	Differential Unit	129	230	1 mV/cm		
1A7	Differential Unit	130	425	10 μV/cm		
1L5	Spectrum Analyzer Unit	133	950			
1L10	Spectrum Analyzer Unit	135	1100	Sensitivity: to —100 dBm at 1-kHz resolution		
1L20	Spectrum Analyzer Unit	136	1825	Sensitivity: to —110 dBm at 1-kHz resolution		
1L30	Spectrum Analyzer Unit	136	1825	Sensitivity: to —105 dBm at 1-kHz resolution		
1S1	Sampling Unit	138	1100	2 mV/cm		
1S2	Time Domain Reflectometer and Wide-Band Sampling Unit	140	1300	ρ = 0.005/div 5 mV/div		
B	Single-Trace Unit	110	145	5 mV/cm 50 mV/cm	35 ns; 2 Hz to 10 MHz 25 ns; DC to 14 MHz	40 ns; 2 Hz to 9 MHz 35 ns; DC to 10 MHz
CA	Dual-Trace Unit	265	260	50 mV/cm	27 ns; DC to 13 MHz	35 ns; DC to 10 MHz
D	Differential Unit	265	170	1 mV/cm		
E	Differential Unit	111	190	50 μV/cm		
G	Differential Unit	112	190	50 mV/cm	25 ns; DC to 14 MHz	35 ns; DC to 10 MHz
H	Single-Trace Unit	113	185	5 mV/cm	32 ns; DC to 11 MHz	37 ns; DC to 9.5 MHz
K	Single-Trace Unit	114	145	50 mV/cm	24 ns; DC to 15 MHz	32 ns; DC to 11 MHz
L	Single-Trace Unit	115	210	5 mV/cm 50 mV/cm	25 ns; 3 Hz to 14 MHz 24 ns; DC to 15 MHz	35 ns; 3 Hz to 10 MHz 32 ns; DC to 11 MHz
M	Four-Trace Unit	116	525	20 mV/cm	25 ns; DC to 14 MHz	35 ns; DC to 10 MHz
O	Operational Amplifier Unit	117	525	50 mV/cm	25 ns; DC to 14 MHz	35 ns; DC to 10 MHz
Q	Strain Gage Unit	119	325	10 μstrain/div		
T	Time-Base Generator Unit	76	240			
W	Differential Comparator Unit	121	550	1 mV/cm 50 mV/cm	50 ns; DC to 7 MHz 27 ns; DC to 13 MHz	54 ns; DC to 6.5 MHz 35 ns; DC to 10 MHz
Z	Differential Comparator Unit	265	525	50 mV/cm	35 ns; DC to 10 MHz	40 ns; DC to 9 MHz

*Rack-Mount Models are available.

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

"1" SERIES AND LETTER SERIES PLUG-IN PREAMPLIFIERS

RISETIME AND BANDWIDTH OF OSCILLOSCOPE AND PLUG-IN UNIT				PLUG-IN UNIT TYPE	
Type 543B 545B*, 555, 581A†, 585A†**	*Type 544*, 546*, 547*, 556**	*Type 549*	*Type 551*		
25 ns; 2 Hz to 14 MHz 16 ns; DC to 23 MHz 11 ns; DC to 33 MHz	24 ns; 2 Hz to 15 MHz 13 ns; DC to 28 MHz 7 ns; DC to 50 MHz	25 ns; 2 Hz to 14 MHz 16 ns; DC to 23 MHz 12 ns; DC to 30 MHz	27 ns; 2 Hz to 13 MHz 17 ns; DC to 21 MHz 13 ns; DC to 27 MHz	1A1	*Dual-Trace Unit*
11 ns; DC to 33 MHz	7 ns; DC to 50 MHz	12 ns; DC to 30 MHz	13 ns; DC to 27 MHz	1A2	*Dual-Trace Unit*
11 ns; DC to 33 MHz	7 ns; DC to 50 MHz	12 ns; DC to 30 MHz	13 ns; DC to 27 MHz	1A4	*Four-Trace Unit*
11 ns; DC to 33 MHz 12 ns; DC to 31 MHz 12 ns; DC to 30 MHz	7 ns; DC to 50 MHz 8 ns; DC to 45 MHz 9 ns; DC to 40 MHz	12 ns; DC to 30 MHz 13 ns; DC to 29 MHz 13 ns; DC to 28 MHz	13 ns; DC to 27 MHz 14 ns; DC to 26 MHz 14 ns; DC to 25 MHz	1A5	*Differential Comparator Unit*
0.18 μs; DC to 2 MHz				1A6	*Differential Unit*
0.7 μs; DC to 500 kHz; Selectable high and low-frequency 3-dB points				1A7	*Differential Unit*
10 μV/cm RMS for spectral displays from 10 Hz to 1 MHz 1 mV/cm P to P for time-based displays from 10 Hz to 1 MHz				1L5	*Spectrum Analyzer Unit*
Frequency range is 1 to 36 MHz.				1L10	*Spectrum Analyzer Unit*
Frequency range is 10 MHz to 4.2 GHz.				1L20	*Spectrum Analyzer Unit*
Frequency range is 925 MHz to 10.5 GHz.				1L30	*Spectrum Analyzer Unit*
350 ps risetime (corresponding to an equivalent bandwidth of 1 GHz), equivalent sweep range of 100 ps/cm to 50 μs/cm, 50 Ω input.				1S1	*Sampling Unit*
90 ps risetime (corresponding to an equivalent bandwidth of 3.9 GHz), full scale time measurements to 10 μs; distance measurements to 1 km.				1S2	*Time Domain Reflectometer and Wide-Band Sampling Unit*
30 ns; 2 Hz to 12 MHz 18 ns; DC to 20 MHz		30 ns; 2 Hz to 12 MHz 20 ns; DC to 18 MHz	30 ns; 2 Hz to 12 MHz 20 ns; DC to 18 MHz	B	*Single-Trace Unit*
15 ns; DC to 24 MHz		16 ns; DC to 23 MHz	16 ns; DC to 22 MHz	CA	*Dual-Trace Unit*
0.18 μs; DC to 300 kHz, increasing to 2 MHz.				D	*Differential Unit*
6 μs; 0.06 Hz to 20 kHz, increasing to 60 kHz; selectable high and low-frequency 3-dB points				E	*Differential Unit*
18 ns; DC to 20 MHz		20 ns; DC to 18 MHz	20 ns; DC to 18 MHz	G	*Differential Unit*
23 ns; DC to 15 MHz		25 ns; DC to 14 MHz	25 ns; DC to 14 MHz	H	*Single-Trace Unit*
12 ns; DC to 30 MHz		13 ns; DC to 27 MHz	14 ns; DC to 25 MHz	K	*Single-Trace Unit*
15 ns; 3 Hz to 24 MHz 12 ns; DC to 30 MHz		16 ns; 3 Hz to 23 MHz 13 ns; DC to 27 MHz	16 ns; 3 Hz to 22 MHz 14 ns; DC to 25 MHz	L	*Single-Trace Unit*
17 ns; DC to 20 MHz		19 ns; DC to 19 MHz	19 ns; DC to 19 MHz	M	*Four-Trace Unit*
14 ns; DC to 25 MHz		16 ns; DC to 23 MHz	16 ns; DC to 23 MHz	O	*Operational Amplifier Unit*
Performs precise operations of integration, differentiation, function generation and linear or non-linear amplification.					
60 μs risetime, DC to 6 kHz, measures force, displacement, acceleration, strain . . . any mechanical quantity that can be converted to a change in resistance, capacitance, or induction.				Q	*Strain Gage Unit*
Generates a sawtooth sweep in 22 calibrated steps from 0.2 μs/div to 2 s/div plus X5 magnifier. Triggering facilities include Manual, Automatic, HF Sync and Line, either AC or DC-coupled.				T	*Time-Base Generator Unit*
44 ns; DC to 8 MHz 16 ns; DC to 23 MHz		50 ns; DC to 7 MHz 16 ns; DC to 22 MHz	47 ns; DC to 7.5 MHz 18 ns; DC to 20 MHz	W	*Differential Comparator Unit*
27 ns; DC to 13 MHz		27 ns; DC to 13 MHz	27 ns; DC to 13 MHz	Z	*Differential Comparator Unit*

AMPLIFIER UNITS FOR TYPE 560-SERIES OSCILLOSCOPES

Plug-In Type	Bandwidth (3-dB down)	Calibrated Deflection Factor*	Input (AC or DC-coupled)	Price	Page
2A60	DC—1 MHz	50 mV/div—50 V/div in 4 steps.	1 megohm shunted by 47 pF, 600 volts max	$ 105	173
2A61 Low-Level Differential	0.06 Hz—300 kHz	10 μV/div—20 mV/div, 1-2-5 sequence.	10 megohm—50 pF; ±5 V (AC-coupled only)	$ 385	174
2A63 Differential 50:1 rejection ratio	DC—300 kHz	1 mV/div—20 V/div, 1-2-5 sequence.	1 megohm shunted by 20 pF, 600 volts max	$ 150	175
3A1 Dual-Trace (Identical Channels)	DC—10 MHz	10 mV/div—20 V/div, 1-2-5 sequence.		$ 490	265
3A2 Dual-Trace (Identical Channels)	DC—500 kHz	10 mV/div—10 V/div, 1-2-5 sequence.		$ 500	167
3A3 Dual-Trace Differential	Selectable DC—5 kHz or DC—500 kHz	100 μV/div—10 V/div, 1-2-5 sequence.		$ 790	177
3A5 Automatic/ Programmable	DC—15 MHz DC—5 MHz	10 mV/div—50 V/div, 1-2-5 sequence. 1 mV/div—5 mV/div, 1-2-5 sequence.	1 megohm shunted by 24 pF, 600 volts max	$ 760	179
3A6 Dual-Trace (Identical Channels)	DC—10 MHz	Identical to Type 3A1 above but with internal delay line.	1 megohm shunted by 47 pF, 600 volts max	$ 525	182
3A7 High Gain Differential Comparator	DC—10 MHz, decreasing to DC—4 MHz	1 mV/div—50 V/div, 1-2-5 sequence, plus 4-step decade attenuator.	1 megohm shunted by 20 pF, 500 volts max	$ 635	183
3A8 Operational Amplifier	DC—3.5 MHz	20 mV/div—10 V/div.		$ 600	184
3A72 Dual-Trace (Identical Channels)	DC—650 kHz	10 mV/div—20 V/div, 1-2-5 sequence.	1 megohm shunted by 47 pF, 600 volts max	$ 275	186
3A74 Four-Trace (Identical Channels)	DC—2 MHz	20 mV/div—10 V/div, 1-2-5 sequence.		$ 590	187
3A75	DC—4 MHz	50 mV/div—20 V/div, 1-2-5 sequence.		$ 175	188
3C66 Strain Gage	DC—5 kHz	10 μstrain/div—10,000 μstrain/div, 1-2-5 sequence.	120 Ω strain gage bridge	$ 400	191
3L5 Spectrum Analyzer	10 Hz—1 MHz	10 μV/div—2 V/div for spectral displays, 1 mV/div—100 V/div for time-based displays.	1 megohm shunted by 30 pF.	$1050	193
3L10 Spectrum Analyzer	1—36 MHz	—100 dBm at 2 kHz/div dispersion and 1 kHz (coupled) resolution	50 Ω and 600 Ω	$1200	195
3S3 Dual-Trace Sampling (Use with 3T2, 3T77A or 3T4)	DC to equivalent 1 GHz (0.35 ns risetime)	5 mV/div—100 mV/div, 1-2-5 sequence.	100 kΩ, 2 pF, ±3 V max	$1500 (with probes)	197
3S76 Dual-Trace Sampling (Use with 3T77A or 3T4)	DC to equivalent 875 MHz (0.4 ns risetime)	2 mV/div—200 mV/div, 1-2-5 sequence.	50 Ω, 2 volts P to P max DC-coupled	$1100	198

*Variable between steps, uncalibrated.

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, RM567, 568, R568 Readout Oscilloscopes (with a Digital Unit) use these units for digital readout. Other Amplifier and Time Base Units can be used without digital readout.

TIME-BASE UNITS FOR TYPE 560-SERIES OSCILLOSCOPES

Plug-In Type	Sweep Range*	Magnifier	Triggering	Price	Page
2B67 Single Sweep	1 μs/div to 5 s/div, 1-2-5 sequence.	5X	Internal, External, Line; amplitude-level selection; AC or DC-coupled; automatic or free run; ±slope.	$ 210	176
3B1 Sweep Delay	0.5 μs/div to 1 s/div, 1-2-5 sequence (for both normal and delayed sweeps).	5X	Internal, External; amplitude-level selection; AC or DC-coupled; automatic (normal sweep only) or free-run; ± slope.	$ 535	265
3B2 Calibrated Sweep Delay	2 μs/div to 1 s/div, 1-2-5 sequence. Continuously variable calibrated delay from 5 μs to 10.5 s.	No	Internal, External, Line; amplitude-level selection; AC or DC-coupled; ± slope.	$ 650	167
3B3 Calibrated Sweep Delay Single Sweep	0.5 μs/div to 1 s/div, 1-2-5 sequence (for both normal and delayed sweeps). Continuously variable calibrated delay from 0.5 μs to 10 s.	5X	Internal, External; amplitude-level selection, AC or DC-coupled, ± slope. Normal sweep has in addition: automatic and line plus single sweep.	$ 585	189
3B4 Direct-Reading Magnifier Single Sweep	0.2 μs/div to 5 s/div, 1-2-5 sequence. Magnifier reads sweep range directly up to 50 ns/div.	up to 50X	Internal, External, External ÷10, Line; amplitude-level selection, AC, AC low-frequency reject or DC-coupling; free-run, automatic, or normal modes; ± slope.	$ 400	190
3B5 Automatic/ Programmable	5 s/div to 0.1 μs/div, 1-2-5 sequence.	10X and 100X	Internal, External; amplitude-level selection; AC or DC-coupled; automatic; ± slope.	$ 890	180
3T2 Random Sampling Sweep (use with 3S3)	Equivalent sweep range 200 ps/div to 100 μs/div, 1-2-5 sequence. X10 Magnifier extends rate to 20 ps/div.	10X	From Vert. Signal Out (3S3); External; ±Slope.	$ 950	199
3T4 Programmable Sampling Sweep (use with 3S3 or 3S76)	Equivalent sweep range 1 ns/div to 200 μs/div, 1-2-5 sequence. Programmable through front-panel connector.	10X	Internal (3S76 only) or External, ±slope.	$1300	201
3T4 with Type 283 Real Time Adapter (use with 3S3 or 3S76)	Real Time Sampling 1 ms/div to 1 s/div, 1-2-5 sequence.	No	Internal. From Vert. Signal Out; External; Free Run; ±Slope.	$1650	201
3T77A Sampling Sweep (use with 3S3 or 3S76)	Equivalent sweep range 0.2 ns /div to 10 μs/div, 1-2-5 sequence.	10X	Internal (3S76 only), or External, ± slope.	$ 650	203
	*Variable between steps, uncalibrated.				

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

Type 567, RM567, 568, R568 (with a Digital Unit) use these units for digital readout. Other Amplifier and Time Base Units can be used without digital readout.

SAMPLING PLUG-IN UNITS FOR TYPE 530, 540, 550, AND 580* SERIES OSCILLOSCOPES

Plug-In	Input Impedance	Risetime	Calibrated Deflection Factor	Signal Delay	Trigger	Time Position	Equivalent Sweep Range	Samples Per Centimeter	Price	Page
1S1	50 Ω	0.35 ns	2—200 mV/cm, 1-2-5 sequence	Yes	Internal or External	0 to 500 μs	100 ps/cm to 50 μs/cm	Variable from approx 5 samples/cm to over 700 samples/cm	$1100	138
1S2	50 Ω	90 ps	5—500 mV/cm, 1-2-5 sequence	No	External	Through full time base	0.1 ns/cm to 1 μs/cm	Selected by resolution switch	$1300	140

*A Type 81 Adapter is required.

SAMPLING PLUG-IN UNITS FOR TYPE 560-SERIES OSCILLOSCOPES

Instrument *	Input RC or Impedance	Risetime	Calibrated Deflection Factor	Signal Delay	Time Position	Equivalent Sweep Range	Samples Per Division	Trigger	Plug-In Price	Page
Types 3S76 and 3T77A Units	50 Ω	0.4 ns	2-200 mV/div 1-2-5 sequence	Yes	Through full time base	0.2 ns/div to 10 μs/div plus X10 mag	10 or 100	Internal or External	$1750	198 203
Types 3S3 and 3T77A Units	100 kΩ, 2 pF	0.35 ns	5-100 mV/div 1-2-5 sequence	No				External	$2150	197 203
Types 3S3 and 3T2 Units				No (Not needed)	0 to 1 ms 5 decade steps	20 ps/div to 100 μs/div	5 to ∞	External or External from Type 3S3	$2450	197 199
Types 3S76 and 3T4 Units	50 Ω	0.4 ns	2-200 mV/div 1-2-5 sequence	Yes	0 to 1000 μs depends on TIME/DIV None with Type 283	1 ns/div to 200 μs/div	10 or 100	Internal or External	$2400	198 201
Types 3S76, 3T4 and 283 Adapter						1 ns/div to 200 μs/div and 1 ms/div to 1 s/div			$2750	198 201
Types 3S3, 3T4 and 283 Adapter	100 kΩ, 2 pF	0.35 ns	5-100 mV/div 1-2-5 sequence	No				External	$3150	197 201

*These plug-in units may be used in Type 561A, Type 564, Type 567, and Type 568 Oscilloscopes. Rack Mount models are available.

SAMPLING SYSTEMS FOR TYPE 661 OSCILLOSCOPE

Instruments	Input Impedance or RC	Risetime	Calibrated Deflection Factor	Signal Delay	Time Position	Equivalent Sweep Range	Samples Per Division	Trigger	System Price	Page
Type 661 with Types 5T3 and 4S2A	50 Ω	90 ps	2—200 mV/cm, 1-2-5 sequence	No	Through full time base	10 ps/cm to 100 μs/cm	5, 10, 20, 50, 100, or 1000	Ext only	$3400	229
Type 661 with Types 5T3 and 4S1	50 Ω	0.35 ns		Yes				Int or Ext	$3380	229
Type 661 with Types 5T3 and 4S3	100 kΩ 2 pF	0.35 ns		No				Ext only	$3400 with probes	229

SAMPLING SYSTEM ACCESSORIES

Instrument	Description	Price	Page
281 Time Domain Reflectometry Pulser	Provides 0.5 V pulse with ≤0.75 ns risetime and ≥5 μs width for TDR applications. Uses probe power.	$ 95	260
282 Probe Adapter	Allows many conventional probes to work into 50 Ω. Uses probe power.	$ 95	260
Type 292 Semiconductor Tester and Power Supply	Furnishes DC power and provides sub-nanosecond environments for reading out time and charge information about fast semiconductor diodes and transistors.	$325	261

AMPLIFIERS

Instrument	Gain	Bandwidth‡	Noise Level	Differential Input	Input RC	Output Impedance	Price	Page
***Type 122**	100X or 1000X	0.2 Hz to 40 kHz	1-5 μV, RMS, grounded	Yes	10 megohms, 50 pF	1000 ohms	$ 135	245
Type 1121	100X	5 Hz to 17 MHz 21-ns risetime	50 μV or less P to P, grounded	No	1 megohm, 22 pF	93 ohms	$ 465	265

‡ Bandwidth Specifications are at 3-dB down. * Rack-Mount models are available.

PULSE GENERATORS

Instrument	Frequency or Period	Main Pulse Width	Risetime	Delay	Output Amplitude	Output Impedance	Trigger Req	Price	Page
Type 109	550 to 720 Hz	0.5 ns to 300 ns	<0.25 ns	None	0 to 55 V	50 Ω	None	$ 360	239
Type 111	10 to 100 kHz	2 ns to 1.5 μs	0.5 ns	30 to 250 ns	±10 V	50 Ω	+3 V	$ 365	240
Type 114	1 μs to 10 ms	Squarewave and 100 ns to 10 ms	≤10 ns	None	±1 V to ±10 V	16—84 Ω	+2 V to +20 V	$ 295	242
Type R116 (Programmable)	100 ns to 11 ms	50 ns to 550 μs	10 ns to 110 μs (Selectable)	50 ns to 550 μs	0.4 V to 10 V	50 Ω	+2 V to +20 V	$1550	243
†Type 161	0 to 50 kHz	10 μs to 0.1 s	0.5 μs	Variable	0 to ±50 V	1—5 kΩ	+3 V	$ 130	255
†Type 162	0 to 10 kHz	100 μs to 10 s	1 μs	None	50 V	1 kΩ	+15 V	$ 130	256
†Type 163	0 to 500 kHz	1 μs to 10 ms	0.2 μs	Variable	0 to +25 V	100 Ω—3.5 kΩ	2 V	$ 130	257
Type R293 (Programmable)	10 kHz to 100 kHz	2 ns to 250 ns	1 ns	200 ns	6 V to 12 V	50 Ω	+2 V	$1000	262

† 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

SIGNAL GENERATORS

Instrument	Description	Price	Page
Type 106	Square-Wave Generator; frequency range is 10 Hz to 1 MHz, risetime ≤2 ns; pos and neg outputs of 50 mV to 500 mV into 50 Ω plus high ampl output with ≤12 ns risetime.	$590	238
Type 184	Time-Mark Generator; marker interval range of 1 μs to 5 s in 1-5-10 sequence, crystal-controlled oscillator.	$675	258
Type 191	Constant Amplitude Signal Generator; frequency range is 350 kHz to 100 MHz, 5 mV to 5 V amplitude.	$400	259

Reference Information

DESCRIPTIONS AND SPECIFICATIONS

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

THE OSCILLOSCOPE

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.

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.

ENVIRONMENTAL CHARACTERISTICS

The following instruments are specifically designed for the more severe environments often encountered when they are used in portable or mobile applications:

321A, 422 and R422, 453 and R453, 454 and R454, 491 and R491, 647A and R647A.

The environmental characteristics listed include some or all of the following:

Temperature, Altitude, Humidity, Vibration, Shock, Electromagnetic interference (EMI, previously RFI), and Transportation.

Sample production instruments are tested periodically as part of a continual quality control process. Complete tests on every production instrument are undersirable as well as uneconomical.

The specifications for humidity, vibration, shock and transportation are intended to be beyond what can be expected in use, and operation at these extremes may cause minor physical deterioration. Such operation, however, should not cause electrical performance deterioration outside specifications. The specifications for temperature and altitude are such that continual use at the limits will not cause significant short term deterioration. Naturally, higher temperature operation can be expected to reduce long term reliability and should be avoided if possible. The EMI test is completely non-destructive.

For more specific information on the environmental characteristics and how they apply to the above instruments, please refer to the page covering that instrument.

BANDWIDTH AND RISETIME MEASUREMENTS

BANDWIDTH

Frequency-response characteristics are at the 3-dB down points unless otherwise stated.

Equipment for measuring frequency response (bandwidth) 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 sinewave generators must usually be terminated to match their output impedance. For oscilloscopes having an upper frequency response in the area from 350 kilohertz through 100 megahertz, Tektronix uses Type 191 Constant Amplitude Signal Generator to check for high frequency roll-off characteristics.

RISETIME

A characteristic of importance to the pulse-measurement field is risetime. This parameter is generally a good indication of relative bandwidth. In short, faster risetime means greater bandwidth (in the direction of higher frequencies). Several factors must be considered in making risetime measurements. For reasonably accurate readings of risetime, the oscilloscope should be approximately 5 times faster than the signal to be measured. When risetime of the signal approaches risetime of the oscilloscope, the true signal risetime can be computed. Risetime of cascaded signals is calculated by taking the square root of the sum of the squares (of signal and oscilloscope risetimes). For example, a signal with a risetime of one nanosecond viewed on an oscilloscope with a risetime capability of one nanosecond will appear as approximately 1.4 nanoseconds.

RISETIME MEASUREMENT EQUIPMENT

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 106 Square-wave Generator (approximately 1-ns risetime), or Type 109 Pulse Generator (less than 0.25-ns risetime) for checking risetime of general purpose osciloscopes.

VOLTAGE RATINGS

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

MECHANICAL AND ELECTRICAL 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. When rack-mounting an instrument, add approx 3 inches to the depth of the instrument for adequate clearance of rear connections (power cords, etc.). Should the chassis temperature become excessive, 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.

POWER REQUIREMENTS

In general, instruments are factory wired for operation at 115 volts AC. Most instruments can be wired for operation at other line voltages, if specified on the purchase order. Tektronix instruments are designed with electronically-regulated power supplies to compensate for changing line voltages.

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, and ceramic terminal strips—in addition to precision potentiometers, capacitors, wire-wound resistors, inductors, semiconductor and solid-state devices.

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

CATHODE-RAY-TUBE PHOSPHOR DATA

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

For more specific information regarding the best-suited phosphor for your particular application, please confer with your Tektronix Field Engineer, Representative or Distributor. 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, decay, etc. The following table describes the more commonly used phosphors.

PHOSPHOR DATA CHART

Phosphor	*Fluorescence*	*Phosphorescence*Ⓐ	*Relative Luminance*Ⓑ	*Relative Writing Speed*Ⓒ *(in % based on P-11 as 100%)*	*Decay to 0.1% (time in ms)*	*Comments*
P-1	Yellowish-green	—	45%	35%	95	General purpose.
P-2	Bluish-green	Green	60%	70%	51*	Good compromise for high and low speed applications.
P-4	White	—	50%	75%	20	Television displays.
P-7	Blue-white	Yellow-green	45%	95%	66*	Long decay.
P-11	Purplish-blue	—	25%	100%	17	High photographic writing speed.
P-15	Bluish-green	—	15%	25%	0.05	Very short decay.
P-31	Green	—	100%	75%	32	High luminance; general purpose.

Ⓐ Where different than fluorescence.

Ⓑ Taken with a Spectra Brightness Spot Meter which incorporates a CIE standard eye filter. Representative of 10 kV aluminized screens. P-31 as reference.

Ⓒ P-11 as reference with Polaroid 410 film. Representative of 10 kV aluminized screens.

* Low level decay lasts over one minute under conditions of low ambient illumination.

Symbols and Abbreviations

The user of this catalog may find some unfamiliar symbols and abbreviations. In general, Tektronix has adopted the Symbols For Units, IEEE Standard Number 260, dated January 15, 1965. The abbreviations have been adopted by Tektronix following a thorough study of available abbreviations and guidelines published by the National Bureau of Standards, United States Government, American Standards Association, and others.

Many of these symbols and abbreviations are new, and inconsistencies between this list and other sources such as instrument panels and existing instrument manuals will be found. Future instruments and manuals will reflect adherence to these new symbols and abbreviations.

Below are some of the symbols and abbreviations used in this catalog. Those symbols found in IEEE Standard Number 260 are marked with an asterisk.

alternating current	AC
*ampere	A
amplitude modulation	AM
approximate	approx
approximately equal to	$\approx$ or $\simeq$
attenuation	atten
audio frequency	AF
automatic	auto
bandwidth	bw
base	b
*bel	B
calibrate	cal
cathode-ray oscilloscope	CRO or scope
cathode-ray tube	CRT
*centimeter	cm
clockwise	cw
common-mode rejection	CMR
common-mode rejection ratio	CMRR
counterclockwise	ccw
continuous wave	CW
current	I
*decibel	dB
*decibel referred to one milliwatt	dBm
deflection factor	DF
*degree	°
*degree celsius (centigrade)	°C
*degree fahrenheit	°F
*degree kelvin	°K
delay	dly
delay line	DL
differential	diff
direct current	DC
division	div
electromagnetic interference	EMI
*farad	F
*foot	ft
*foot lambert	fL
frequency modulation	FM
giga	G
*gigahertz	GHz
graticule	grat
gravity unit	g
greater than	$>$
greater than or equal to	$\geq$
ground	gnd
*henry	H
*hertz	Hz
*hour	h
impedance	Z
*inch	in
inductance	L
intermediate frequency	IF
kilo	k
*kilogram	kg
*kilohertz	kHz
kilohm	kΩ
kilometer	km
*kilovolt	kV
less than	$<$
less than or equal to	$\leq$
local oscillator	LO
low frequency	LF
maximum	max
mega	M
*megahertz	MHz
*megohm	MΩ
*meter	m
micro	μ
*microsecond	μs
milli	m
*millimeter	mm
*millisecond	ms
*millivolt	mV
minus	—
nano	n
*nanosecond	ns
negative	neg
ohm	Ω
operational amplifier	op amp
oscilloscope	scope or CRO
pair	pr
parts per million	P/M
peak to peak	P-P
per	/
*pico	p
*picoampere	pA
*picofarad	pF
*picosecond	ps
plus	+
plus and minus	+ and —
plus or minus	$\pm$
positive	pos
pulse per second	p/s
pulse-repetition rate	PRR
pulse width	PW or t_p
radio-frequency interference	RFI
resistance	R
resistance-capacitance	RC
resistance-inductance	RL
root mean square	RMS
*revolution per minute	r/min
risetime	t_r
*second (time)	s
serial number	SN
signal	sig
signal-to-noise ratio	S/N
standing-wave ratio	SWR
storage time	t_s
sweep	swp
synchronize	sync
temperature	T
time domain reflectometry	TDR
tolerance	tol
*volt	V
*watt	W

*IEEE Standard Number 260

Glossary of Oscilloscope Terms

This glossary of oscilloscope terms is published to promote better communication through use of a common concept of terms.

These terms are, in part, the result of work performed by the Subcommittee on Oscilloscopes, IEEE G-IM Committee on High Frequency Instruments.

At this time, the proposed list has been submitted, but not yet accepted by the IEEE.

Accelerating Voltage—The cathode-to-phosphor screen voltage applied to a cathode-ray tube for the purpose of accelerating the electron beam.

Alternate Mode—A means of displaying output signals of two or more channels by switching the channels, in sequence, after each sweep.

Astigmatism—In the viewing plane of the cathode-ray tube, any deviation of the indicating spot from a circular shape.

Bandwidth—A statement of the frequencies defining the upper and lower limits of a frequency spectrum where the amplitude response of an amplifier to a sinusoidal waveform becomes 0.707 (—3 dB) the amplitude at a reference frequency. When only one number appears, it is taken as the upper limit.

Bezel—The flange or cover used for holding an external graticule or CRT cover in front of the CRT in an oscilloscope. May also be used for mounting a trace recording camera or other accessory item.

Blanking—Extinguishing of the spot. Retrace Blanking is the extinction of the spot during the retrace portion of the sweep waveform. The term does not necessarily imply blanking during the holdoff interval or while waiting for a trigger in a triggered sweep system.

Brightness—The attribute of visual perception in accordance with which an area appears to emit more or less light. (See Luminance.)

Channel—A single path for transmitting electric signals, usually in distinction from other parallel paths.

Chopped Mode—A time-sharing method of displaying output signals of two or more channels with a single CRT gun, in sequence, at a rate not referenced to the sweep.

Chopping Rate—The rate at which channel switching occurs in Chopped Mode.

Chopping Transient Blanking—The process of blanking the indicating spot during the switching periods in Chopped Mode.

Common-Mode Rejection Ratio (CMRR)—The ratio of the deflection factor for a Common-Mode Signal to the deflection factor for a Differential Signal.

Common-Mode Signal—The instantaneous algebraic average of two signals applied to a balanced circuit, all signals referred to a common reference.

DC Balance—An adjustment of circuitry to avoid a change in DC level when changing gain.

DC Offset—A DC level which may be added to the input signal, referred to the input terminals.

DC Shift—An error in transient response with a time constant approaching several seconds.

Deflection Blanking—Blanking by means of a deflection structure in the CRT electron gun which traps the electron beam inside the gun to extinguish the spot, permitting blanking during retrace and between sweeps regardless of intensity setting.

Deflection Factor—The ratio of the input signal amplitude to the resultant displacement of the indicating spot. (e.g., volts/division.)

Delayed Sweep—1. A sweep that has been delayed either by a predetermined period or by a period determined by an additional independent variable. 2. Mode of operation of a sweep, as defined above.

Dual-Beam Oscilloscopes—An oscilloscope in which the cathode-ray tube produces two separate electron beams that may be individually or jointly controlled.

Dual-Trace—A mode of operation in which a single beam in a cathode-ray tube is shared by two signal channels. See Alternate Mode and Chopped Mode.

External Triggering—Introducing the Triggering Signal directly into the trigger circuit from an external source.

Fluorescence—Emission of light from a substance (a phosphor) during excitation by radiant energy.

Focus—The maximum convergence of the electron beam manifested by minimum spot size on the phosphor screen. (Note definition for Astigmatism.)

Graticule—A scale for measurement of quantities displayed on the cathode-ray tube of an oscilloscope.

Information Writing Speed—The cathode-ray tube characteristic which is an indication of the maximum number of bits of information per second that can be photographically recorded and identified. Test conditions must be specified.

Input RC Characteristics—The DC resistance and capacitance to ground present at the input of an oscilloscope.

Intensity Modulation—The process and/or effect of varying the electron beam current in a cathode-ray tube resulting in varying brightness or luminance of the trace.

Internal Graticule—A graticule whose rulings are a permanent part of the inner surface of the cathode-ray tube faceplate.

Internal Triggering—Using a sample of a deflection signal (usually the vertical deflection signal) as a triggering signal source.

Jitter—An aberration of a repetitive display indicating instability of the signal or of the oscilloscope. May be random or periodic, and is usually associated with the time axis.

Line Triggering—Triggering from the power-line frequency.

Luminance—The photometric equivalent of brightness.

Note: Luminance is recommended for the photometric quantity which has been called brightness. Use of this term permits brightness to be used entirely with reference to the sensory response. The photometric quantity has been confused often with the sensation merely because of the use of one name for two distinct ideas. Brightness will continue to be used properly in non-quantitative statements especially with reference to sensations and perceptions of light.

Magnified Sweep—A sweep whose time per division has been decreased by amplification of the sweep waveform rather than by changing the time constants used to generate it.

Glossary of Oscilloscope Terms

Oscillography—The art and practice of utilizing the oscillograph.

Oscilloscope—An oscillograph primarily intended for the immediate viewing of the graphical plot . . . most commonly used to denote a cathode-ray oscilloscope.

Overshoot—The initial transient response to a unidirectional change in input which occurs simultaneously with the main transmission but exceeds its limiting final value.

Persistence—See Phosphor Decay.

Phosphor Decay—A phosphorescence curve, energy emitted versus time.

Phosphorescence—Emission of light from a substance after excitation has been removed.

Preshoot—The initial transient response to a unidirectional change in input which precedes the main transmission and may be of the same or opposite polarity.

Raster—A predetermined pattern of scanning lines used in a CRT display.

Ringing—An oscillatory transient occurring in the output of a system as a result of a suddenly applied change in input. Usually damped in time.

Risetime—The interval between the instants at which the pulse amplitude first reaches specified lower and upper limits. Unless otherwise stated, these limits shall be 10% and 90% of the pulse's amplitude.

Rolloff—The particular manner in which the amplitude-frequency characteristic behaves as it approaches its frequency limits.

Rounding—The loss of a sharp corner of a waveform; hence, a loss of high frequency components in the waveform. Commonly, the loss of the corner following the leading edge of a squarewave.

Signal Delay—The transmission time of a signal through a network. The time is always finite, may be undesired, or may be purposely introduced.

Single Sweep—Operating mode for a triggered-sweep oscilloscope in which the sweep must be reset for each operation, thus preventing unwanted multiple display; particularly useful for trace photography. In the interval after the sweep is reset and before it is triggered it is said to be armed.

Spot—The illuminated spot that appears where the electron beam strikes the fluorescent screen of a CRT.

Stability—Property of retaining defined electrical characteristics for a prescribed period. Deviations from a stable state may be called **drift** or **jitter**. In triggered sweep systems, **triggering stability** may refer to the ability of the trigger and sweep system to maintain jitter-free display of high-frequency waveforms for relatively long (seconds to hours) periods of time. Also the name of the control used on some oscilloscopes to adjust the sweep for triggered, free running, or synchronized operation.

Sweep Accuracy—Accuracy of the trace horizontal displacement compared with the reference independent variable, usually expressed in terms of average rate error as a percent of full scale. (See Sweep Linearity.)

Sweep Delay Accuracy—Accuracy of indicated sweep delay, usually specified in error terms.

Sweep Linearity—Maximum displacement error of the independent variable between specified points on the display area.

Sweep Lockout—Means for preventing multiple sweeps when operating in a single-sweep mode.

Sweep Magnifier—Circuit or control for expanding part of the sweep display. Sometimes known as sweep expander.

Sweep Range—The set of sweep time/division settings provided.

Sweep Reset—In oscilloscopes the single-sweep operation, the arming of the sweep generator to allow it to cycle once.

Sweep Switching—Alternate display of two or more time bases or other sweeps using a single-beam CRT; comparable to dual- or multiple-trace operation of a deflection amplifier.

Sweep Time/Div—The nominal time required for the spot in the reference coordinate to move from one graticule division to the next.

Synchronized Sweep—A sweep which would free-run in the absence of an applied signal but in the presence of the signal, is synchronized by it.

Tilt—The slope associated with the flat portion of a nominally rectangular pulse of given time duration.

Trace Width—The distance between two points on opposite sides of a trace at which luminance is 50% of maximum. If the trace departs from a well-behaved (approximately Gaussian) form, it should be smoothed for the purpose of measurement.

Transient Response—Commonly, the characteristic response of a system to a unit step or unit impulse. Elements of transient response most commonly specified are: risetime, falltime, overshoot, undershoot, preshoot, and ringing.

Trigger—A pulse used to initiate some function (e.g., a Triggered Sweep or delay ramp). Where the terms Trigger and Triggering Signal are used together, Triggering Signal conventionally refers to a waveform applied to the triggering circuits and from which a trigger or trigger pulse is derived. Otherwise, Trigger may loosely refer to a waveform of any shape used as a signal from which to derive a trigger pulse, as in "trigger source", "trigger input", etc.

Trigger Countdown—A process that reduces the repetition rate of a triggering signal.

Triggering Level—The instantaneous level of a triggering signal at which a trigger is to be generated. Also the name of the control which selects the level.

Triggering Signal—The signal from which a trigger is derived.

Triggering Slope—The positive-going (+ slope) or negative-going (— slope) portion of a triggering signal from which a Trigger is to be derived. Also, the control which selects the slope to be employed.

Unblanking—Turning on of the CRT beam.

Undershoot—The initial transient response to a unidirectional change in input which occurs simultaneously with the main transmission and is opposite in polarity (See Rounding).

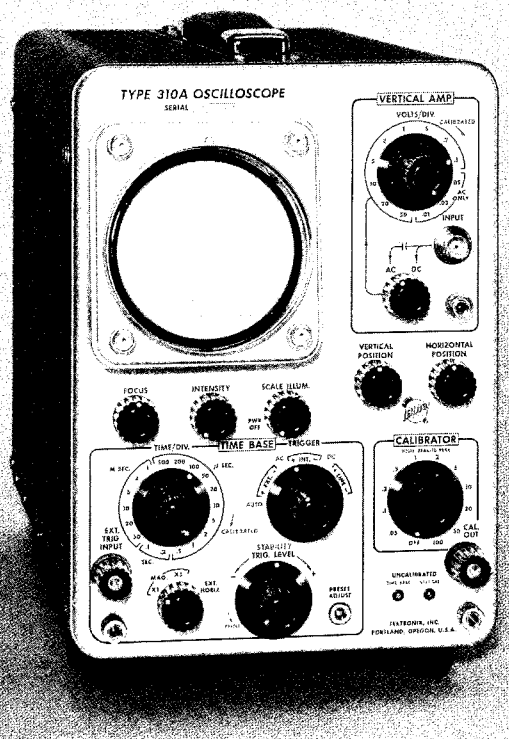
Writing Speed—See Information Writing Speed.

Writing Time/Div—The minimum time per unit distance required to record a trace. The method of recording must be specified.

X-Y Display—A rectilinear coordinate plot of two variables.

Z-Axis Amplifier—An amplifier for signals controlling a display perpendicular to the X-Y Axis (commonly intensity of the spot).

DC-to-4 MHz PORTABLE OSCILLOSCOPE



- ***SMALL SIZE—LIGHT WEIGHT***
- ***4-MHz BANDWIDTH***
- ***10 mV/div DEFLECTION FACTOR***

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-hertz 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 precise time and amplitude measurements either in the laboratory or in the field. Panel design and controls contribute to operator convenience.

CHARACTERISTIC SUMMARY

VERTICAL

BANDWIDTH—0.1 V/div to 50 V/div, DC to 4 MHz. 0.01 V/div to 0.05 V/div, 2 Hz to 3.5 MHz.

RISETIME—90 ns to 0.1 V/div, 100 ns to 10 mV/div.

CALIBRATED DEFLECTION FACTOR
DC-coupled, 0.1 V/div to 50 V/div.
AC-coupled only, 0.01 V/div to 0.05 V/div.

INPUT RC—1 megohm paralleled by approx 40 pF.

HORIZONTAL

CALIBRATED TIME BASE—0.5 μs/div to 0.2 s/div.

X5 MAGNIFIER—Extends time base to 0.1 μs/div.

EXTERNAL INPUT—1.5 V/div, DC to 500 kHz.

CRT

DISPLAY AREA—8 x 10 div. Each div equal to 1/4 inch.

ACCELERATING POTENTIAL—1.85 kV.

OTHER

AMPLITUDE CALIBRATOR—50 mV to 100 V, 1-kHz square-wave (approx).

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

TYPE 310A

VERTICAL DEFLECTION

BANDWIDTH
DC to 4 MHz at 3-dB down to 0.1 V/div, 2 Hz to 3.5 MHz at 3 dB down to 10 mV/div. Low-frequency 3 dB down point, AC coupled: 2 Hz direct, 0.2 Hz with included 10X probe.

RISETIME
≈90 ns to 0.1 V/div; ≈100 ns to 10 mV/div.

DEFLECTION FACTOR
10 mV/div to 50 V/div in 12 calibrated steps (1-2-5 sequence), accurate within 3%. AC coupled at 10 mV/div to 50 mV/div. Uncalibrated, continuously variable between steps and to approx 125 V/div. Warning light indicates uncalibrated setting.

INPUT RC
1 megohm paralleled by approx 40 pF.

HORIZONTAL DEFLECTION

TIME BASE
0.5 μs/div to 0.2 s/div in 18 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 0.6 s/div. Warning light indicates uncalibrated setting.

X5 MAGNIFIER
Operates over full time base, increases fastest rate to 0.1 μs/div. Magnified time base accurate within 4% (5% at 0.1 μs/div).

EXTERNAL INPUT
1.5 V/div, adjustable. DC to 500 kHz at —3 dB. Input R approx 100 kΩ.

TRIGGERING

MODES
Manual or automatic. Automatic operation is useful between approx 60 Hz and 2 MHz, minimizes trigger adjustment for signals of different amplitudes, shapes and repetition rates. With no input, automatic triggering occurs at an approx 50 Hz rate, providing a convenient reference trace.

COUPLING
AC or DC.

SOURCES
Internal, external, or line.

REQUIREMENTS
0.25-div deflection or 0.2 V external from DC to 1 kHz, increasing to 2-div deflection or 2 V external at 5 MHz. AC coupling response —3 dB at 16 Hz. Automatic operation requires 0.25 div deflection or 0.2 V external from 60 Hz to 1 kHz, increasing to 2-div deflection or 2.0 V external at 2 MHz.

CRT

TEKTRONIX CRT
8 x 10-div display area; each div is 1/4 inch. 3-inch tube operates at 1.85-kV accelerating potential. P31 phosphor normally supplied. Z-axis input for external modulation of CRT; approx 20 V will modulate CRT at normal intensity.

GRATICULE
External; variable edge lighting. Vertical and horizontal centerlines marked in 5 minor divisions per major 1/4-inch division.

OTHER

AMPLITUDE CALIBRATOR
50 mV to 100-V squarewave, 11 calibrated steps (1-2-5 sequence), accurate within 3%. Approx 1-kHz repetition rate.

POWER REQUIREMENTS
Wired for 105 to 125 VAC (117-V nominal). Transformer taps permit operation at nominal voltages of 110, 117, 124, 220, 234 and 248 VAC, 50 to 800 Hz (requires approx 4% higher line voltage at 800 Hz). Power consumption approx 175 W. Can be factory wired for any of the above nominal voltages, if so indicated on order.

DIMENSIONS AND WEIGHTS

Height	10 7/8 in	27.6 cm
Width	6 15/16 in	17.6 cm
Depth	17 11/16 in	44.9 cm
Net Weight	23 1/2 lb	10.7 kg
Domestic shipping weight	~30 lb	~13.6 kg
Export-packed weight	~38 lb	~17.3 kg

STANDARD ACCESSORIES
P6012 probe (010-0203-00); 18-in BNC-to-BNC patch cord (012-0087-00); 18-in BNC-to-banana plug patch cord (012-0091-00); BNC post jack (012-0092-00); 3-conductor power cord (161-0024-00); 3 to 2-wire adapter (103-0013-00); smoke gray filter (378-0550-00); two instruction manuals (070-0244-00).

TYPE 310A OSCILLOSCOPE $675

OPTIONAL ACCESSORIES

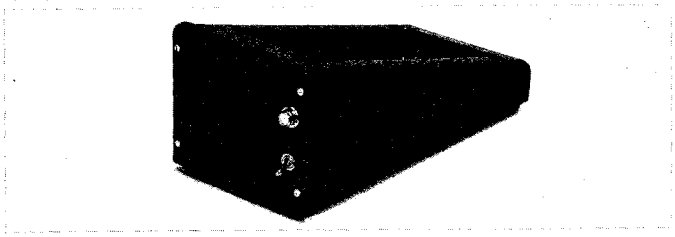
Optional accessories increase measurement capability and provide added convenience. The standard probe supplied with the instrument satisfies most measurement requirements; optional probes may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

CARRYING CASE
Protects Type 310A, provides convenient accessory storage compartment, order 016-0028-01 ..... $19.50

C-30 CAMERA
f/1.9 lens; magnification variable from 1.5:1 to 0.7:1; Polaroid Land* Pack-film back, order C-30 ..... $390
Type 310A to C-30 Camera adapter, order 016-0241-00 $15

PROBES
P6007 100X Probe Package, order 010-0150-00 ..... $22
P6011 1X Miniature Probe Package, order 010-0193-00 .. $15

FAN BASE

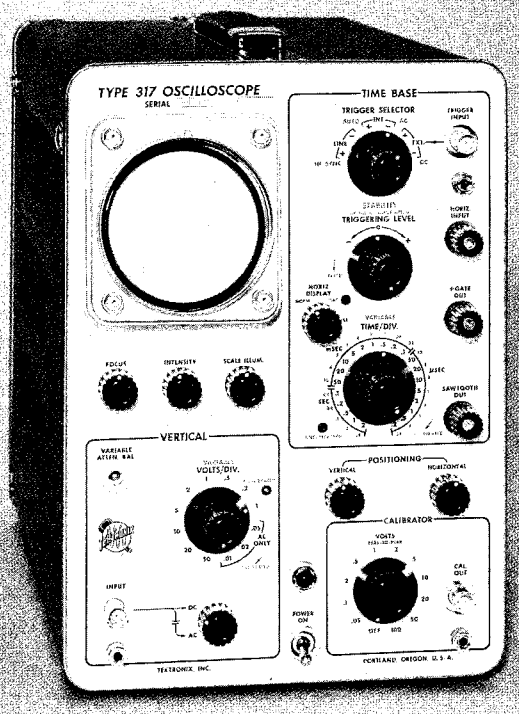


Provides filtered forced-air ventilation recommended for continuous operation at 25°C or higher. Tilts Type 310A for convenient viewing.
Order 016-0012-00 for 105 to 125 V, 50 to 60 Hz $50
Order 016-0013-00 for 210 to 250 V, 50 to 60 Hz $50

*Registered Trade-Mark Polaroid Corporation

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

DC-to-10 MHz 9-kV OSCILLOSCOPES



BRIGHT TRACE

10-MHz BANDWIDTH AT 10 mV/div

INTERNAL DELAY LINE

COMPACT CABINET OR RACK MODELS

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

CHARACTERISTIC SUMMARY

VERTICAL

BANDWIDTH—DC-coupled, DC to 10 MHz. AC-coupled, 2 Hz to 10 MHz.

RISETIME—35 ns.

CALIBRATED DEFLECTION FACTOR—
DC-coupled, 0.1 V/div to 50 V/div.
AC-coupled, 0.01 V/div to 50 V/div.

INPUT RC—1 megohm paralleled by approx 40 pF.

HORIZONTAL

CALIBRATED TIME BASE—0.2 μs/div to 2 s/div.

X5 MAGNIFIER—Extends calibrated time base to 0.04 μs/div.

EXTERNAL INPUT—1.4 V/div, DC to 500 kHz.

CRT

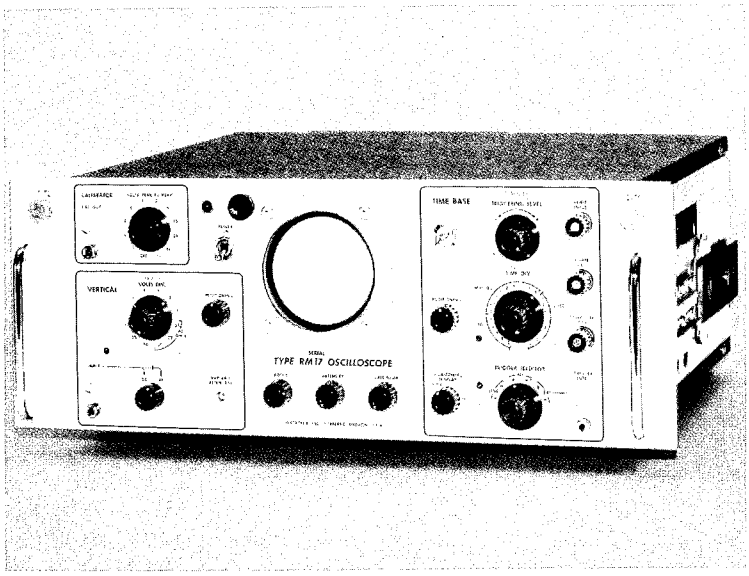
DISPLAY AREA—8 x 10 div. Each div equal to 1/4 inch.

ACCELERATING VOLTAGE—9 kV.

OTHER

AMPLITUDE CALIBRATOR—50 mV to 100 V, 1-kHz square-wave (approx).

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



VERTICAL DEFLECTION

BANDWIDTH
DC to 10 MHz at 3-dB down to 0.1 V/div, 2 Hz to 10 MHz at 3-dB down to 10 mV/div. Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with included 10X probe.

RISETIME
≈35 ns.

DEFLECTION FACTOR
10 mV/div to 50 V/div in 12 calibrated steps (1-2-5 sequence), accurate within 3%. AC coupled at 10 mV/div to 50 mV/div. Uncalibrated, continuously variable between steps and to approx 125 V/div. Warning light indicates uncalibrated setting.

INPUT RC
1 megohm paralleled by approx 40 pF.

DELAY LINE
Permits viewing leading edge of displayed waveform.

HORIZONTAL DEFLECTION

TIME BASE
0.2 μs/div to 2 s/div in 22 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to at least 5 s/div. Warning light indicates uncalibrated setting.

X5 MAGNIFIER
Operates over full time base, increases fastest rate to 0.04 μs/div. Magnified time base accurate within 5%.

EXTERNAL INPUT
1.4 V/div, adjustable. DC to 500 kHz at —3 dB. Input R approx 100 kΩ.

FRONT-PANEL OUTPUTS
≈20-V positive gate, ≈150-V positive-going sawtooth.

TRIGGERING

MODES
Manual or automatic triggering, high-frequency sync. Automatic operation is useful between approx 60 Hz and 2 MHz, minimizes trigger adjustment for signals of different amplitudes, shapes, and repetition rates. With no input, automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace. High-frequency sync assures a steady display of sinewaves to 15 MHz.

COUPLING
AC to DC.

SOURCES
Internal, external, or line.

REQUIREMENTS
0.2-div deflection or 0.5 V external from DC to 1 kHz, increasing to 2-div deflection or 4 V external at 5 MHz. AC coupling response —3 dB at approx 16 Hz. Automatic operation requires 0.5-div deflection or 1 V external from 60 Hz to 1 kHz, increasing to 2-div deflection or 4 V external at 2 MHz. High-frequency sync requires 0.2-div deflection or 0.5 V external at 5 MHz, increasing to 2-div deflection or 4 V external at 15 MHz.

CRT

TEKTRONIX CRT
8 x 10-div display area; each div is 1/4 inch. 3-inch tube provides brilliant trace with 9-kV accelerating potential. P31 phosphor is normally supplied. Z-axis input for external modulation of CRT; approx 10 V will modulate CRT at normal intensity.

GRATICULE
External; variable edge lighting. Vertical and horizontal centerlines marked in 5 minor divisions per major 1/4-inch division.

OTHER

AMPLITUDE CALIBRATOR
50 mV to 100-V squarewave, 11 calibrated steps (1-2-5 sequence), accurate within 3%. Approx 1-kHz repetition rate.

POWER REQUIREMENTS
Wired for 105 to 125 VAC (117-V nominal). Transformer taps permit operation at nominal voltages of 110, 117, 124, 220, 234 and 248 VAC, 50 to 60 Hz. Power consumption 300 W maximum. Can be factory wired for any of the above nominal voltages, if so indicated on order.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	12 3/8 in	31.4 cm
Width	8 1/2 in	21.6 cm
Depth	18 11/16 in	47.5 cm
Net weight	33 lb	15.0 kg
Domestic shipping weight	~46 lb	~21.0 kg
Export-packed weight	~57 lb	~25.9 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	18 1/8 in	46.0 cm
Net weight	36 1/2 lb	16.6 kg
Domestic shipping weight	~65 lb	~29.5 kg
Export-packed weight	~89 lb	~40.5 kg

RACK-MOUNTING

Type RM17 withdraws from rack on slide-out tracks, tilts and locks in 7 positions. Further mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES

P6012 probe (010-0203-00); 18-in BNC-to-BNC patch cord (012-0087-00); 18-in BNC-to-banana-plug patch cord (012-0091-00); BNC post jack (012-0092-00); 3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); smoke gray filter (378-0550-00); two instruction manuals (070-0297-00). Type RM17 includes same accessories except manual (070-0325-00), also includes mounting tracks (351-0017-00) and hardware.

TYPE 317 OSCILLOSCOPE $875
TYPE RM17 OSCILLOSCOPE $950

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The standard 10X probe supplied with the instrument satisfies most measurement requirements; optional probes may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

PROBES

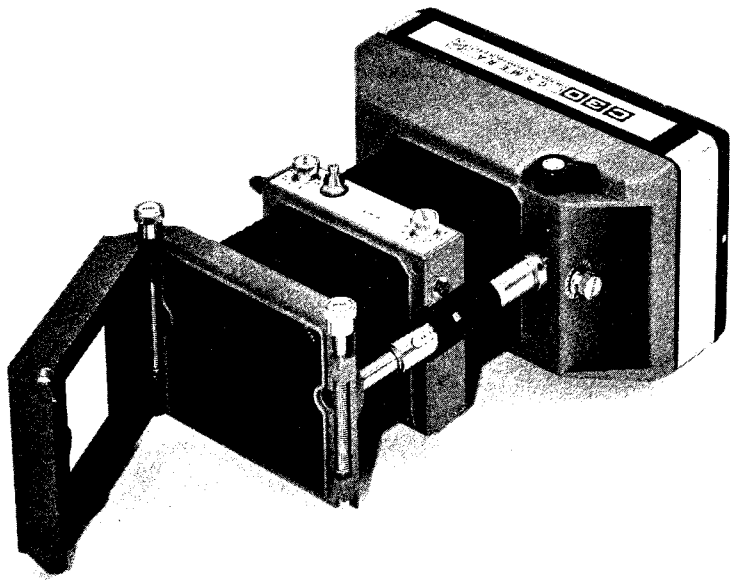
P6007 100X Probe Package, order 010-0150-00 ..... $ 22
P6011 1X Miniature-Probe Package, order 010-0193-00 $ 15

SUPPORTING CRADLE

Required to mount Type RM17 in backless rack, order 040-0345-00 ..... $ 12

C-30 CAMERA

f/1.9 lens; magnification variable from 1.5:1 to 0.7:1; Polaroid Land* Pack-film, order C-30 ..... $390
Type 317 to C-30 Camera adapter, order 016-0241-00 . $ 15



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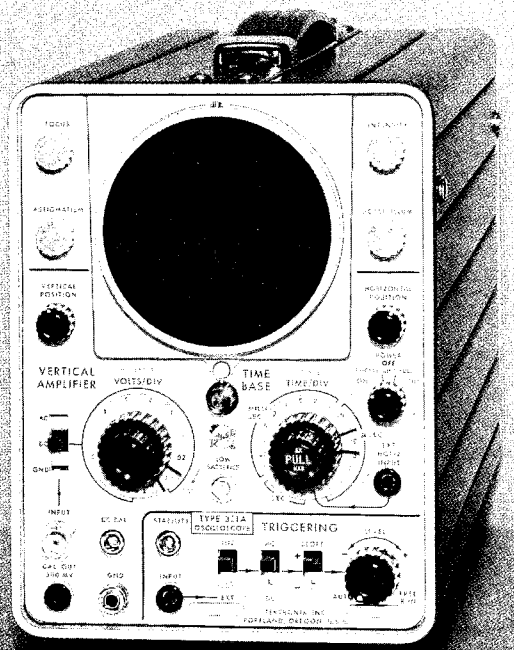
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

TYPE 321A

DC-to-6 MHz PORTABLE OSCILLOSCOPE



- ***6 MHz BANDWIDTH AT 10 mV/DIV***
- ***SMALL SIZE—LIGHT WEIGHT***
- ***SOLID-STATE DESIGN***
- ***LOW POWER CONSUMPTION***
- ***AC, DC, OR BATTERY OPERATED***
- ***DESIGNED FOR SEVERE ENVIRONMENTS***

The Type 321A is a high-performance DC-to-6 MHz Oscilloscope. Its portable and rugged design plus a choice of power options make it ideal for field operations requiring accurate waveform measurements. With internal batteries, it weighs only 17 pounds; without batteries, it weighs only 14 pounds.

CHARACTERISTIC SUMMARY

VERTICAL

BANDWIDTH—DC to 6 MHz.

RISETIME—59 ns.

CALIBRATED DEFLECTION FACTOR—10 mV/div to 20 V/div, DC coupled.

INPUT RC—1 megohm paralleled by approx 35 pF.

HORIZONTAL

CALIBRATED TIME BASE—0.5 μs/div to 0.5 s/div.

X5 MAGNIFIER—Extends time base to 0.1 μs/div.

EXTERNAL INPUT—1 V/div, DC to 1 MHz.

CRT

DISPLAY AREA—6 x 10 div. Each div equal to 1/4 inch.

ACCELERATING VOLTAGE—4 kV.

OTHER

AMPLITUDE CALIBRATOR—500-mV squarewave peak to peak and internal 40-mV squarewave peak to peak at approx 2 kHz.

POWER OPTIONS—10 size D batteries; external DC supply of 11.5 to 35 V, $\leq$700 mA; 115 VAC $\pm$10% or 230 VAC $\pm$10%, 45 to 800 Hz, 20 W.

VERTICAL DEFLECTION

BANDWIDTH

DC to 6 MHz at 3-dB down. Low-frequency 3-dB-down point with AC coupling is ≤2 Hz direct, ≤0.2 Hz with included 10X probe.

RISETIME

≤59 ns.

DEFLECTION FACTOR

10 mV/div to 20 V/div in 11 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/div.

INPUT RC

1 megohm paralleled by approx 35 pF.

MAXIMUM INPUT VOLTAGE

600 V combined DC + peak AC.

HORIZONTAL DEFLECTION

TIME BASE

0.5 μs/div to 0.5 s/div in 19 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 1.5 s/div.

X5 MAGNIFIER

Extends all time base steps, the fastest to 0.1 μs/div. Magnified display accurate within 3%.

EXTERNAL INPUT

1 V/div ±10% with X5 magnifier. DC to ≥1 MHz at −3 dB. Input RC approx 100 kΩ paralleled by approx 30 pF.

TRIGGER

MODES

Automatic or manual level selection, or free run. Automatic operation is useful above 50 Hz, minimizes trigger adjustment for signals of different amplitudes, shapes, and repetition rates. With no input, automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace.

COUPLING

AC or DC

SOURCES

Internal or external. External trigger input RC approx 100 kΩ paralleled by approx 5 pF.

REQUIREMENTS

0.2-div deflection or 1 V external from DC to 1 kHz, increasing to 1-div deflection or 3 V external at 6 MHz. Requirements increase below 600 Hz for internal AC-coupled triggering, and below approx 16 Hz with external AC-coupled triggering.

CRT

TEKTRONIX CRT

6 x 10-div display area; each div is 1/4 inch. 3-inch tube provides bright trace, utilizes low heater power. 4-kV accelerating potential. P31 phosphor normally supplied. Z-axis input for external modulation of CRT; negative signal of approx 30 V peak will cut off beam from maximum brightness, less voltage required with low intensity settings.

GRATICULE

External; variable edge lighting when instrument is operated from AC line. Vertical and horizontal centerlines marked in 5 minor divisions per major 1/4-inch division.

ENVIRONMENTAL CAPABILITIES

TEMPERATURE

Operating (without batteries) −15°C to +55°C.
(with batteries installed) 0°C to +40°C.
Non-operating (without batteries) −55°C to +75°C.
(with batteries installed) −40°C to +60°C.

ALTITUDE

Operating: 15,000 ft max.
Non-operating: 50,000 ft max.

VIBRATION

Operating: 15 minutes along each of 3 axes at 0.025 in peak to peak displacement (4 g's at 55 Hz), 10 to 55 to 10 Hz in 1-minute cycles.

SHOCK

Operating: 20 g's, 1/2 sine, 11-ms duration, 12 shocks total.
Non-operating: 60 g's, 1/2 sine, 11-ms duration, 6 shocks total.

TRANSPORTATION

In shipping carton: meets National Safe Transit test-vibration for one hour at slightly greater than 1 g; 18 in drop on any corner, edge, or flat surface of the shipping container.

OTHER

AMPLITUDE CALIBRATOR

500 mV at external jack; accurate within 2% at 25° C, within 3% throughout operating range. 40 mV applied internally to vertical amplifier; accurate within 3% at 25° C, within 4% throughout operating range. ≤2-μs risetime; 2 kHz ±20% repetition rate; 45% to 55% duty cycle.

POWER OPTIONS

Wired for 115 V RMS ±10%, 45 to 800 Hz; tapped transformer also allows operation at 230 V ±10%; 20-W maximum power consumption for oscilloscope only, 30-W maximum with internal batteries under full charge. Operates on external DC supply from 11.5 to 35 V DC; draws ≤700 mA. Operates on 10 internal size D batteries. Flashlight cells provide approx 1/2 hour continuous operation (longer on intermittent operation). Alkaline cells such as Eveready E95, Burgess AL-2 or Mallory MN-1300 provide approx 2 1/2 hours continuous operation; NiCd rechargeable cells provide approx 6 hours continuous operation. Front-panel light indicates when internal batteries are low or, (using external power) when the voltage source drops too low for proper power supply regulation.

BATTERY CHARGER

Internal charger provides two different charging currents to the internal batteries (except dry cells). A trickle charge or a full charge is applied to the internal batteries when the instrument is turned off, but connected to the AC line.

DIMENSIONS AND WEIGHTS

Height	8¾ in	22.2 cm
Width	5¾ in	14.6 cm
Depth	16½ in	41.9 cm
Net weight	14¼ lbs	6.5 kg
Domestic shipping weight	~22 lbs	~10.0 kg
Export packed weight	~33 lbs	~15.0 kg

STANDARD ACCESSORIES

P6012 10X probe (010-0203-00); two 18 in BNC-to-banana plug patch cords (012-0091-00); DC power cord (161-0016-01); AC power cord (161-0015-01); 3 to 2-wire adapter (103-0013-00); smoke-gray light filter (378-0547-00); mesh filter, installed (378-0577-00); two instruction manuals (070-0425-00).

TYPE 321A OSCILLOSCOPE (without batteries) .. $900

OPTIONAL ACCESSORIES

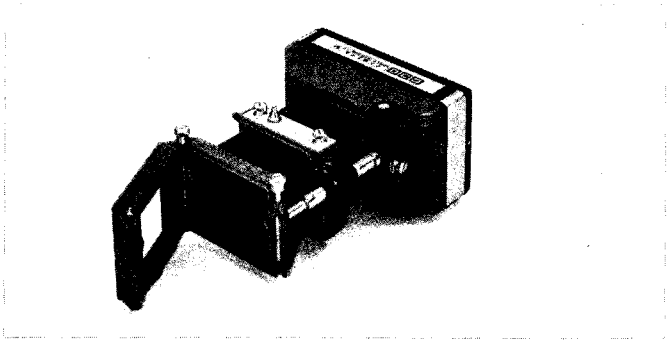
Optional accessories increase measurement capability and provide added convenience. The standard 10X probe supplied with the instrument satisfies most measurement requirements; optional probes may be better suited for particular applications. In addition to the listed optional probes, other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

RECHARGEABLE BATTERIES

Each NiCd cell, order 146-0010-00 ..... $ 7
Set of 10 NiCd cells, order 016-0077-01 ..... $ 70

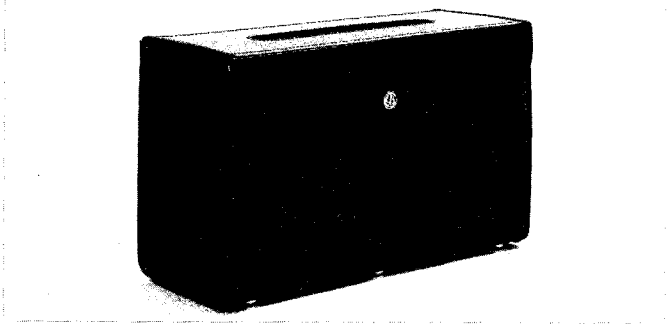
PROBES

P6007 100X Probe Package, order 010-0150-00 ..... $ 22
P6011 1X Miniature-Probe Package, order 010-0193-00 $ 15



C-30 CAMERA

f/1.9 lens; magnification variable from 1.5:1 to 0.7:1; Polaroid Land* Pack-Film back, order C-30 ..... $390
321A to C-30 Camera adapter, order 016-0242-00 ..... $ 15



CARRYING CASE

Protects Type 321A, provides convenient accessory storage compartment, order 016-0026-00 ..... $ 35

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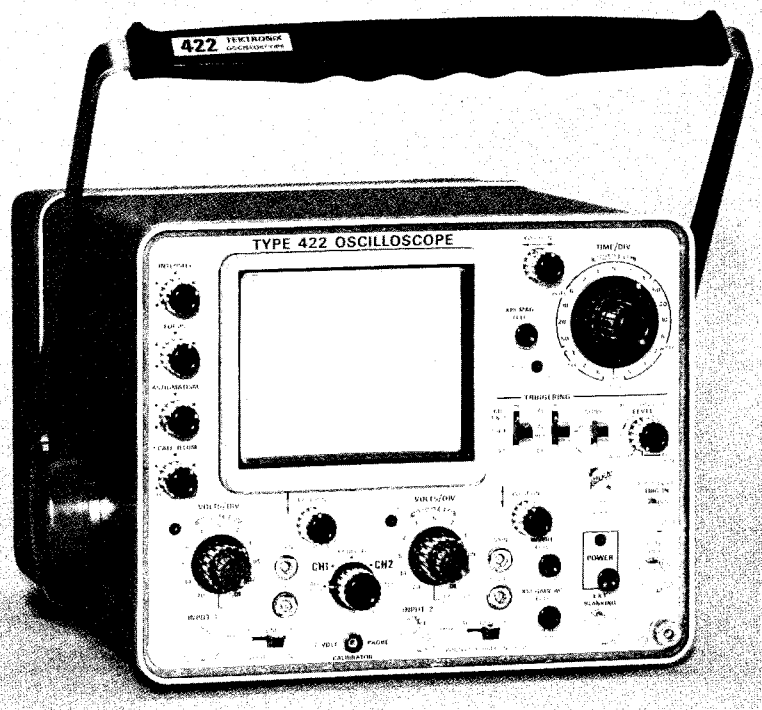
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-15 MHz PORTABLE OSCILLOSCOPES



- ***SMALL SIZE—LIGHT WEIGHT***
- ***DUAL TRACE***
- ***SHARP, BRIGHT DISPLAYS***
- ***DESIGNED FOR SEVERE ENVIRONMENTS***
- ***AC AND AC/DC VERSIONS***
- ***VERSATILE PERFORMANCE***

The Type 422 is a portable dual-trace oscilloscope that combines small size and light weight with the ability to make precise waveform measurements. It weighs under 22 pounds and occupies less than 0.6 cubic foot. To make it truly portable, the Type 422 is ruggedly constructed to withstand shock, vibration, and other extremes of environment. Because of this, it is finding its way on shipboard, flight lines, and even remote communication sites. No longer need measurements be compromised due to adverse field conditions; the Type 422 brings the precision of the laboratory to the field.

The Type R422 is the same instrument arranged in a rackmount panel assembly with a hinged-door compartment for storing accessories. The hinged door can be removed to allow the installation of a second Type 422 for applications that require two instruments. The entire assembly is mounted to the rack with slide-out tracks.

CHARACTERISTIC SUMMARY

VERTICAL

(2 Identical Channels)

BANDWIDTH—DC to 15 MHz.

RISETIME—23 ns.

CALIBRATED DEFLECTION FACTOR—10 mV/div to 20 V/div.

INPUT RC—1 megohm paralleled by approx 30 pF.

HORIZONTAL

CALIBRATED TIME BASE—0.5 μs/div to 0.5 s/div.

X10 MAGNIFIER—Extends fastest time-base to 0.05 μs/div.

EXTERNAL INPUT—1 V/div to 100 V/div, DC to 500 kHz.

CRT

DISPLAY AREA—8 x 10 divisions (0.8 cm/div).

ACCELERATING VOLTAGE—6 kV.

OTHER

AMPLITUDE CALIBRATOR—0.2 V peak to peak, internally; 2 V peak to peak, front-panel jack; 1-kHz squarewave (approx).

POWER OPTIONS—AC Model: 115 V or 230 V ±10%, 45 to 440 Hz, approx 40 W.

AC/DC Model: AC mode—115 V or 230 V ±20%, 45 to 440 Hz except derate linearly to +10% from 50 Hz to 45 Hz.

DC mode—11.5 V to 35 V, approx 23 W. Also accepts 24 V battery pack.

VERTICAL DEFLECTION
(2 Identical Channels)

BANDWIDTH
DC to 15 MHz at 3-dB down (each channel); 5 Hz to 5 MHz at 3-dB down, on X10 gain (channel 2). Low-frequency 3-dB-down point is ≈2 Hz with AC coupling (each channel), ≈0.2 Hz with included 10X probe.

RISETIME
23 ns each channel; 70 ns at X10 gain (channel 2).

DEFLECTION FACTOR
10 mV/div to 20 V/div in 11 calibrated steps, 1-2-5 sequence (each channel). Deflection factor extended to 1 mV/div in X10 position (channel 2). All steps accurate within 3%; 7.5% on X10 GAIN (channel 2). Uncalibrated, continuously variable between steps and to approx 50 V/div. Warning light indicates uncalibrated setting.

INPUT RC
1 megohm paralleled by approx 30 pF. Channel 1 and 2 time constants matched to ±1%.

MAXIMUM INPUT VOLTAGE
300 V combined DC and peak AC.

OPERATING MODES
Channel 1 only; Channel 2 only; Channels 1 and 2 added algebraically; dual-trace chopped; dual-trace alternate. In chopped operation, successive 5-μs segments of each channel are displayed at an approx 100-kHz rate. Channel 2 has polarity inversion. Common-mode rejection ratio is ≥100:1 at 50 kHz with optimized gain setting.

DELAY LINE
Permits viewing of leading edge of triggering waveform.

HORIZONTAL DEFLECTION

TIME BASE
0.5 μs/div to 0.5 s/div in 19 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 1.25 s/div. Warning light indicates uncalibrated vernier settings.

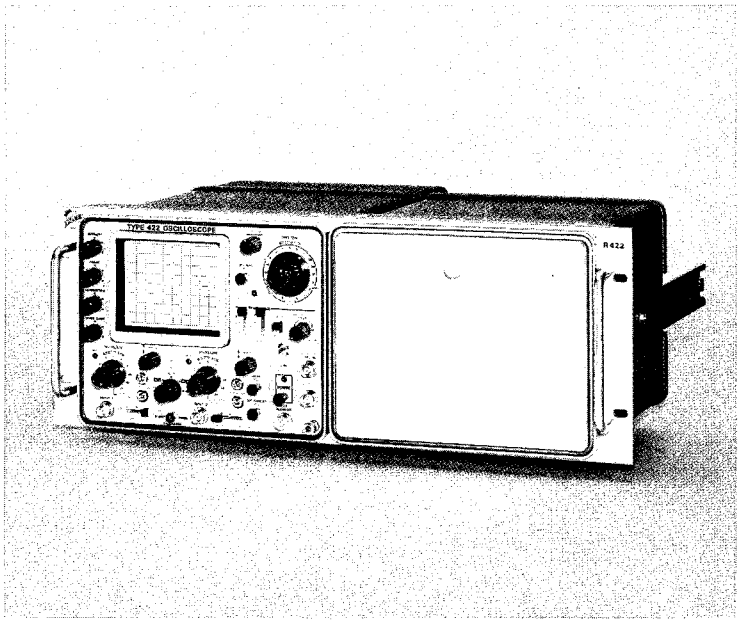
X10 MAGNIFIER
Operates over full time base, increases fastest rate to 0.05 μs/div. Accuracy of magnified time base is within 5%.

EXTERNAL INPUT
Variable between approx 10 V/div to 100 V/div and approx 1 V/div to 10 V/div with X10 magnifier. DC to ≥500 kHz at 3-dB down. Input RC approx 300 kΩ paralleled by approx 35 pF.

OTHER
Gate output (on front panel) is a negative-going rectangular pulse with same duration as time base; 0.5 V minimum; approx 600-ohm source impedance.

TRIGGER

MODES
Manual level selection; Automatic; Free Run. Automatic triggering may be used for signal repetition rates above 50 Hz, eliminating the need for re-adjusting trigger LEVEL while sequentially viewing signals of different amplitudes, shapes, and repetition rates. With no input, automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace.



COUPLING
DC; AC; AC LOW FREQ REJECT.

SOURCES
Internal: Channels 1 and 2, Channel 1 only;
External: Input RC is approx 300 kΩ paralleled by approx 35 pF. Positive or Negative slope.

REQUIREMENTS
DC: 0.2-div deflection or 125 mV ext up to 5 MHz, increasing to 1 div or 0.6 V at 15 MHz.
AC: Same as DC except low-frequency response is 3-dB down at approx 25 Hz.
AC LOW FREQ REJECT: Same as DC except low-frequency response is 3-dB down at approx 25 kHz.
AUTOMATIC: Int: 0.8 div from 50 Hz to 4 MHz, increasing to 2.5 div at 15 MHz.
EXT: 0.6 V from 50 Hz to 7 MHz, increasing to 1.2 V at 15 MHz.

OTHER

AMPLITUDE CALIBRATOR
Approx 1-kHz squarewave, negative-going. Provides 0.2 V, internally, ±0.7%, and 2 V, ±2.7%, at Probe Cal jack on front panel.

TEKTRONIX CRT
Rectangular, 4-inch, with 0.8-cm divisions; 8 x 10-div display area. Illuminated internal graticule. 6-kV accelerating potential. External blanking, DC-coupled +2 V and greater will completely blank trace with normal INTENSITY settings. Phosphor is P31.

ENVIRONMENTAL FEATURES—AC MODEL

Temperature:	Operating: −15°C to +55°C. Non-operating: −55°C to +75°C.
Altitude:	Operating: 15,000 ft, maximum. Non-operating: 50,000 ft, maximum.
Humidity:	Non-operating: Meets electrical performance specification after exposure to five cycles (120 hrs) of MIL-STD-202B, Method 106A (omit freezing and vibration, and allow a 24-hour post-test drying period at room ambient conditions of 25, ±5° C and 20 to 80% relative humidity).

Vibration:	Operating: 15 minutes along each of 3 axes at 0.025 inch peak to peak displacement (4 g's at 55 Hz), 10-55-10 Hz in 1-minute cycles.
Shock:	Operating: 30 g's, ½ sine, 11-ms duration, 12 shocks total. Non-operating: 60 g's, ½ sine, 11-ms duration, 6 shocks total.
RFI:	Meets interference requirements of MIL-I-6181D and MIL-I-16910A, Power line conducted: 150 kHz—25 MHz. Radiated (with mesh filter installed): 14 kHz—1000 MHz.
Transportation: (In shipping carton.)	National Safe Transit. 1 hour at approx 1 g vibration. 30 inch (18 inch for R422) drop on any corner, edge, or flat surface of the shipping container.

ENVIRONMENTAL FEATURES—AC/DC MODEL, with batteries

Same as AC MODEL, except,

Temperature:	Operating: —15°C to +40°C Non-operating: —40° C to +60° C
Humidity:	With batteries, derate temperature from +65°C to +60°C.

POWER OPTIONS

AC Model: 115 V or 230 V ±10%, 45 to 440 Hz. Requires approx 40 watts.

AC/DC Model: AC mode: 115 V or 230 V ±20% 45-440 Hz except derate linearly to +10% from 50 Hz to 45 Hz. DC mode: 11.5 V—35 V, approx 23 watts (CONSTANT POWER—2 A max, 650 mA min). Accepts 24 V battery pack.

DIMENSIONS AND WEIGHTS (Type 422)

Height	$6\frac{15}{16}$ in	17.7 cm
Width	$9\frac{3}{8}$ in	23.8 cm
Depth (including panel cover) AC Model	$15\frac{3}{4}$ in	40.0 cm
AC/DC Model	$18\frac{9}{16}$ in	47.2 cm
Depth (with extended handle) AC Model	$17\frac{13}{16}$ in	45.4 cm
AC/DC Model	$20\frac{5}{8}$ in	52.4 cm
Net weight (without front cover) AC Model	$18\frac{3}{4}$ lbs	8.5 kg
AC/DC Model (less batt.)	$20\frac{1}{2}$ lbs	9.3 kg
AC/DC Model (with batt.)	$27\frac{1}{2}$ lbs	12.5 kg
Weight (with front cover and accessories) AC Model	$21\frac{1}{4}$ lbs	9.7 kg
AC/DC Model (less batt.)	23 lbs	10.5 kg
AC/DC Model (with batt.)	30 lbs	13.7 kg
Domestic shipping weight AC Model	~30 lbs	~13.6 kg
AC/DC Model, less batteries	~32 lbs	~14.6 kg
Export-packed weight AC Model	~44 lbs	~20.0 kg
AC/DC Model, less batteries	~46 lbs	~20.9 kg

DIMENSIONS AND WEIGHTS (Type R422)

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Depth (behind front-panel)	$12\frac{1}{2}$ in	31.8 cm
Net weight	$23\frac{1}{4}$ lbs	10.6 kg
Domestic shipping weight	~50 lbs	~22.7 kg
Export-packed weight	~73 lbs	~33.2 kg

AC POWERED INSTRUMENTS

STANDARD ACCESSORIES

Two P6012 10X probe (010-0203-00); adapter, BNC to binding post (103-0033-00); ornamental ring (354-0248-00); light graticule, smoke gray filter (378-0549-00); clear, CRT protector plate (386-0118-00); mesh filter, installed, (378-0571-00); AC power supply (016-0072-00); 3 to 2-wire adapter (103-0013-00); power cord, 117 V, 3-conductor, right-angle, female with straight male plug (161-0024-00); two instruction manuals (070-0434-00).

TYPE 422 OSCILLOSCOPE WITH AC POWER SUPPLY $1400

Type R422 Oscilloscope (mounted on left side) includes accessories listed for Type 422 above plus BNC to post jack adapter (012-0092-00); slide-out tracks (351-0100-00); and mounting hardware.

TYPE R422 OSCILLOSCOPE (mounted on left side) $1475

Type R422 Oscilloscope (mounted on right side) includes accessories listed for Type 422 above plus BNC to post jack adapter (012-0092-00); slide-out tracks (351-0100-00); and mounting hardware.

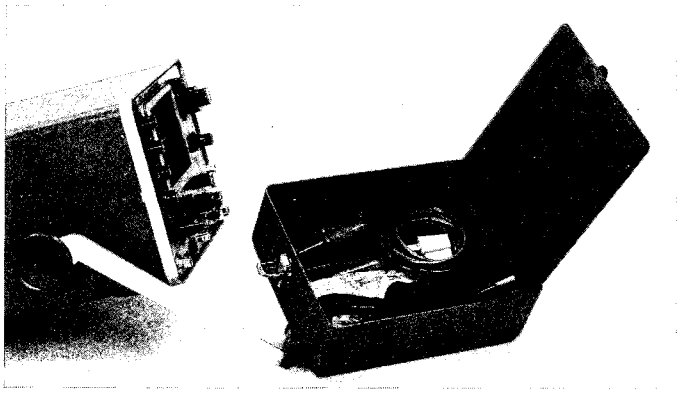
TYPE R422 MOD 150E $1475

Type 422 Oscilloscope without cabinet for rackmount conversion includes accessories listed for Type 422.

TYPE 422 MOD 146B $1375

Two Type 422's mounted in a rack-mount panel include two sets of accessories listed for Type 422 above plus two BNC to post jack adapters (012-0092-00); slide-out tracks (351-0100-00); and mounting hardware.

TYPE R422 MOD 150B $2850



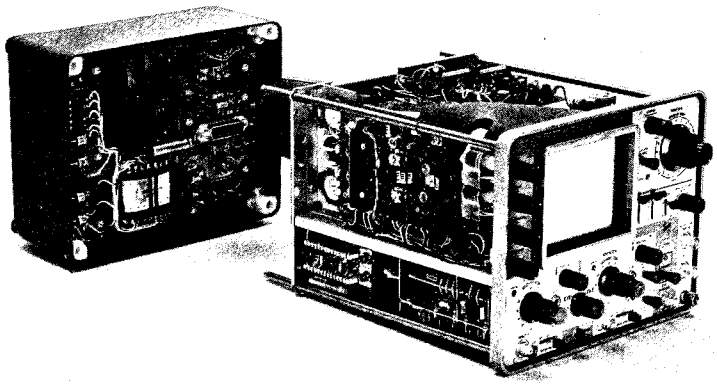
Front cover also serves as storage for standard accessory items.

AC/DC POWERED INSTRUMENTS

STANDARD ACCESSORIES

Type 422 with AC/DC battery power supply, less batteries. Two P6012 10X probe (010-0203-00); ornamental ring (354-0248-00); light graticule, smoke gray filter (378-0549-00); clear, CRT, protector plate (386-0118-00); mesh filter, installed (378-0571-00); AC/DC power supply (016-0073-00); 3 to 2-wire adapter (103-0013-00); 3-wire AC with female connector and male plug power cord (161-0015-01); 3-wire DC with female connector power cord (161-0016-01); BNC to binding post adapter (103-0033-00); two instruction manuals for AC/DC power supply (070-0471-00); two instruction manuals for Type 422 (070-0434-00).

TYPE 422 MOD 125B, less batteries $1750



Type 422 with cabinet removed. AC power supply is shown behind Type 422, and becomes rear cover when mounted in place.

POWER SUPPLY AC/DC BATTERY, LESS BATTERIES.
Domestic shipping weight 10¼ lbs.
Includes: 3 to 2-wire adapter (103-0013-00); power cord, 3-wire AC w/female connector and male plug (161-0015-01); power cord, 3-wire DC w/female connector (161-0016-01); two instruction manuals (070-0471-00).
Order Part Number 016-0073-00 ..... $600

Battery pack provides 24 volts; rechargeable internally from AC line. Powers the Type 422 Oscilloscope for approx 4 hours. Shipping weight 9 lbs, 15 oz.

BATTERY PACK FOR TYPE 422 MOD 125B, 016-0066-02
..... $ 125

CONVERSION KITS

PORTABLE TO RACK-MOUNT CONVERSION KIT.
This mounting kit includes hardware and instructions to convert existing Type 422 Oscilloscopes for rack-mount installation.
Order Part Number 040-0419-00 ..... $85

RACK-MOUNT TO PORTABLE CONVERSION KIT.
This kit includes the cabinet and necessary hardware to convert existing Type R422 Oscilloscopes for portable operation.
Order Part Number 040-0421-00 ..... $40

OPTIONAL ACCESSORIES

Optional accessories serve to extend the usefulness of the Type 422 in certain applications. This listing covers only the more commonly used items. The standard probes (10X) supplied with the instrument satisfy most measurement requirements. In addition to the listed optional probes, other probes are available for current and high-voltage measurements. A complete list of accessory items can be found in the Accessory Section of this catalog.

DUST COVER
Provides protection for Type 422 during transport or storage.
Type 422 (with battery pack) COVER, 016-0075-00 .... $7.50
Type 422 (without battery pack) COVER, 016-0076-00 .. $7.50

COLLAPSIBLE VIEWING HOOD
Permits viewing of trace under high ambient-light conditions, 016-0082-00 ..... $7.50

C-30 CAMERA
f/1.9 lens, magnification variable from 1.5:1 to 0.7:1; Polaroid Land* Pack-film back, order C-30 ..... $390.00

PROBES
P6007 100X Probe Package, order 010-0150-00 ..... $22.00
P6011 1X Miniature Probe Package, order 010-0193-00 . $15.00

SCOPE-MOBILE® CART
Type 200-2 occupies less than 18 inches aisle space, has storage space in base $60

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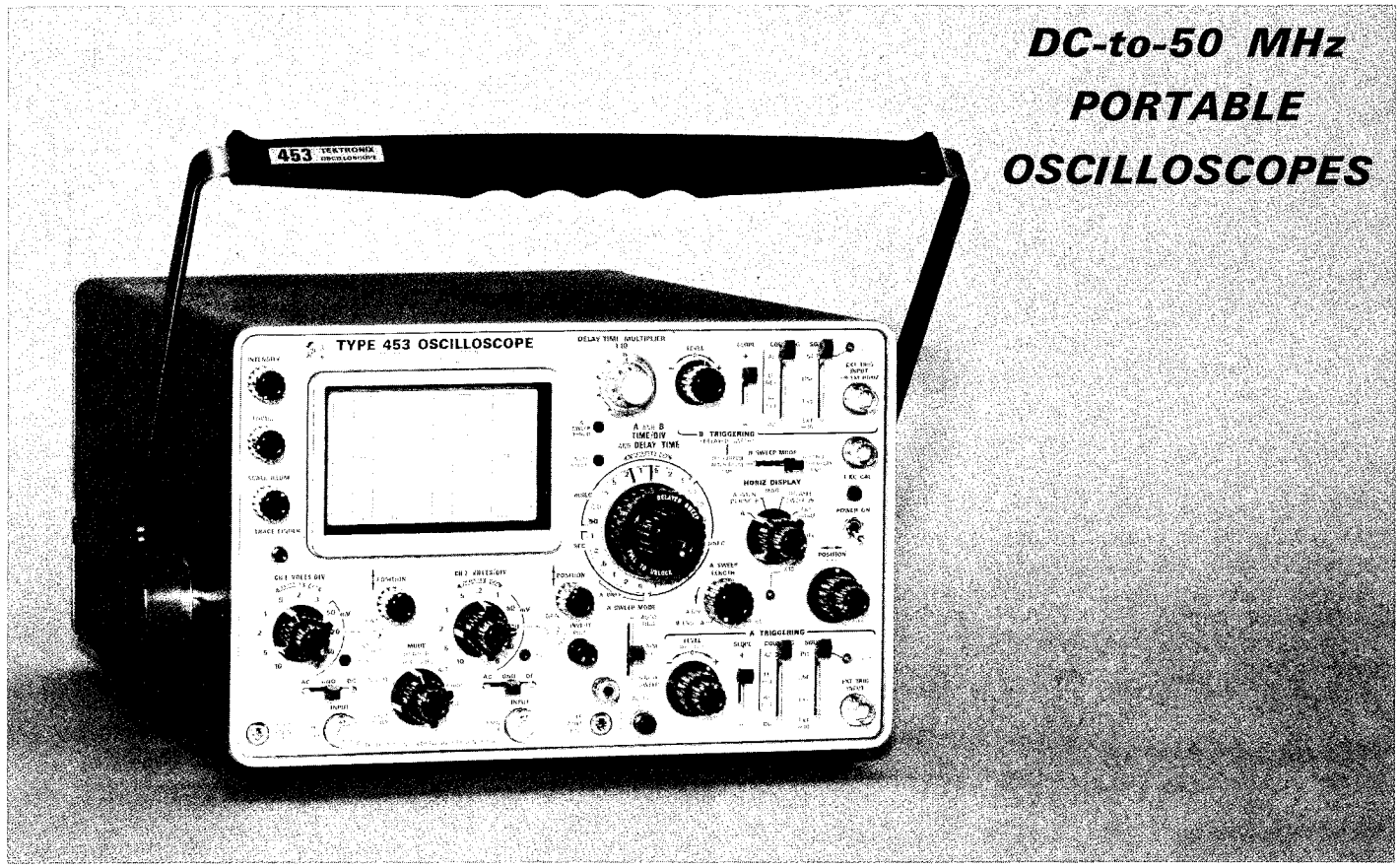
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-50 MHz PORTABLE OSCILLOSCOPES



- ***COMPACT, LIGHT WEIGHT***
- ***DUAL-TRACE, 5-mV DEFLECTION FACTOR***
- ***50-MHz BANDWIDTH WITH PROBE***
- ***CALIBRATED SWEEP DELAY***
- ***FULL-BANDWIDTH TRIGGERING***
- ***FULL-SENSITIVITY X-Y DISPLAY***
- ***FOR SEVERE ENVIRONMENTS***

The Type 453 is a highly portable, wide-band, dual-trace oscilloscope designed to withstand rough transport and other environmental extremes. Bandwidth of the Type 453 is DC to 50 MHz (at the tip of supplied probes), and is up to 52.5 MHz when not using probes. Probes are miniaturized to permit servicing of sub-miniature circuits.

The sharply-focused, bright trace provides a high-definition display compatible with the wide-band capabilities of the Type 453.

Mechanical design features include plug-in transistors (for ease of maintenance), a front-panel cover (for use in transit or storage) with storage space for accessory items, and a carrying handle which can be rotated to several positions as a tilt-stand or for convenient carrying.

Channel 1 can be switched to give horizontal deflection with Channel 2 providing the vertical deflection, enabling full-sensitivity X-Y displays (to 5 mV/div).

Type R453 is electrically identical to Type 453. It mounts on tilting, slide-out tracks to a standard 19-inch rack, requiring only 7 inches of vertical rack-space.

CHARACTERISTIC SUMMARY

VERTICAL

(2 Identical Channels)

BANDWIDTH (with P6010 Probe) — DC to 50 MHz from 20 mV/div to 10 V/div, DC to 45 MHz at 10 mV/div, DC to 40 MHz at 5 mV/div. Deflection Factor with probe is 10X panel reading.

RISETIME (with P6010 Probe) — $\leq$7 ns to 20 mV/div, $\leq$7.8 ns to 10 mV/div, $\leq$8.75 ns to 5 mV/div.

CALIBRATED DEFLECTION FACTOR — 5 mV/div to 10 V/div.

INPUT RC — 1 megohm paralleled by approx 20 pF.

HORIZONTAL

CALIBRATED TIME BASE — 0.1 μs/div to 5 s/div.

X10 MAGNIFIER — Operates over full time base, increases fastest rate to 10 ns/div.

CALIBRATED DELAY — 1 μs to 50 s.

EXTERNAL INPUT — 270 mV/div to 2.7 V/div, or Channel 1 can drive HORIZONTAL.

CRT

DISPLAY AREA — 6 x 10 div (0.8 cm/div).

ACCELERATING VOLTAGE — 10 kV.

OTHER

TIME AND AMPLITUDE CALIBRATOR — 1 V or 0.1 V output; 5 mA output; 1-kHz squarewave.

POWER REQUIREMENTS — 96 to 137 V or 192 to 274 V, 45 to 440 Hz, approx 100 watts.

VERTICAL DEFLECTION (2 Identical Channels)				
DEFLECTION FACTOR*	BANDWIDTH**		RISETIME	
	Type 453 Only	With P6010 Probe	Type 453 Only	With P6010 Probe
5 mV/div	DC to ≥41 MHz	DC to ≥40 MHz	≤8.5 ns	≤8.75 ns
10 mV/div	DC to ≥46.5 MHz	DC to ≥45 MHz	≤7.5 ns	≤7.8 ns
20 mV/div through 10 V/div	DC to ≥52.5 MHz	DC to ≥50 MHz	≤6.7 ns	≤7 ns
1 mV/div Ch 1 & 2 Cascaded	DC to ≥25 MHz		≤14 ns	

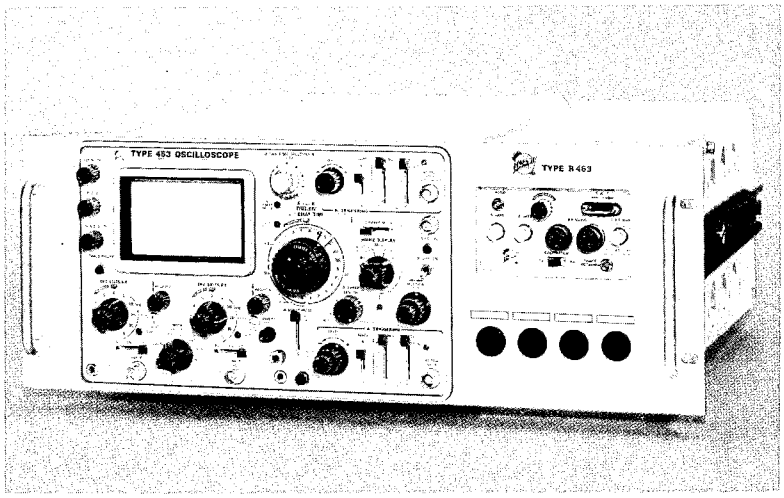
*Without P6010 Probe. Deflection Factor with probe is 10X panel reading.
**Measured at —3-dB. AC response is 3-dB down at ≈1.6 Hz (≈0.16 Hz with P6010 10X probe).

DEFLECTION FACTOR (EACH CHANNEL)
5 mV/div to 10 V/div in 11 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated continuously variable between steps and to ≈25 V/div. Warning lights indicate uncalibrated settings.

INPUT RC
1 megohm ±2% paralleled by 20 pF ±3%.

MAXIMUM INPUT VOLTAGE
600 V combined DC + peak AC.

OPERATING MODES
Channel 1 only; Channel 2 only (normal or inverted); Added algebraically (≥20:1 Common-Mode Rejection Ratio at up to 20 MHz, linear dynamic range ≥20X indicated deflection factor); Alternate; Chopped: Successive ≈1-μs segments of each Channel are displayed at a 500 kHz (±20%) rate.



TRACE DRIFT		
DEFLECTION FACTOR	TIME	TEMPERATURE
5 mV/div	≤1 div/h	≤0.1 div/°C
10 mV/div	≤0.5 div/h	≤0.05 div/°C
20 mV/div through 10 V/div	≤0.25 div/h	≤0.025 div/°C

DELAY LINE
Permits viewing of leading edge of triggering waveform.

TRIGGER SOURCE
Normal (displayed signal); Channel 1 (pickoff ahead of channel switching).

SIGNAL OUTPUT
Channel 1 Vertical Signal: ≥25 mV/div into 1 megohm; approx 50-Ω output resistance; DC to ≥25 MHz (—3 dB).

HORIZONTAL DEFLECTION

TIME BASE A
0.1 μs/div to 5 s/div in 24 calibrated steps (1-2-5 sequence). Uncalibrated continuously variable between steps and to ≥12.5 s/div. Warning light indicates uncalibrated setting. Sweep length continuously variable from ≤4 div to 11.0 ±0.5 div.

TIME BASE B
0.1 μs/div to 0.5 s/div in 21 calibrated steps (1-2-5 sequence). Uncalibrated continuously variable between steps and to ≥1.25 s/div. Warning light indicates uncalibrated setting.

TIME BASE A & B SWEEP ACCURACY		
SWEEP RANGE	0°C to 40°C	—15°C to *+55°C
0.1 μs/div to 50 ms/div	±3%	±4%
0.1 s/div to 5 s/div	±3%	±5%

TIME BASE A SWEEP MODES
Auto Trigger—sweep free runs in absence of triggering signal; Normal Trigger; Single Sweep. Light indicates when sweep is triggered.

TIME BASE B SWEEP MODES
Time Base B Triggerable after delay time; Time Base B starts after delay time.

X10 MAGNIFIER
Operates over full time base, increases fastest rate to 10 ns/div. Magnified display accurate within 1% in addition to specified basic sweep accuracy.

TIME BASE A & B TRIGGER SENSITIVITY		
TRIGGER MODE	TO 10 MHz	AT 50 MHz
DC INTERNAL	≤0.2 div deflection	≤1 div deflection
DC EXTERNAL	≤50 mV	≤200 mV
AC	As above, except —3 dB at 16 Hz	
AC LF REJECT	As above, except —3 dB at 16 kHz	
AC HF REJECT	As above, except —3 dB at 16 Hz and 100 kHz	

TRIGGER SOURCES

Internal, Line, External, External ÷ 10.

Input RC approx 1 megohm paralleled by approx 20 pF (except in AC LF Reject mode). 600 volts maximum input (DC + peak AC). Level adjustment through ≥ ±2 volts in External, through ≥ ±20 volts in External ÷ 10.

FULL-SENSITIVITY X-Y (CH 1 HORIZ, CH 2 VERT)

5 mV/div to 10 V/div in 11 calibrated steps (1-2-5 sequence), accurate within 5% from 0° C to +40° C within 8% from —15° C to *+55° C. Bandwidth is DC to ≥5 MHz (—3 dB). Phase difference from Channel 2 is ≤3° at 50 kHz.

HORIZONTAL AMPLIFIER (EXTERNAL INPUT)

270 mV/div ±15% in External, 2.7 V/div ±20% in External ÷10. Same bandwidth and phase difference as above.

SIGNAL OUTPUTS

A and B Gates: 12 volts ±10%, approx 1.5-kΩ output resistance.

CALIBRATED SWEEP DELAY

DELAY TIME RANGE

1 μs to 50 s, continuously variable with 10-turn multiplier.

DELAY ACCURACY		
DELAY	0°C to +40°C	—15° C to *+55° C
1 μs/div to 50 ms/div	±1.5%	±2.0%
0.1 s/div to 5 s/div	±2.5%	±3.5%

MULTIPLIER INCREMENTAL LINEARITY

Included in delay accuracy: ±0.2% from 0°C to +40°C, ±0.3% from —15° C to*+55° C.

JITTER

≤1 part in 20,000 of maximum delay.

ENVIRONMENTAL CAPABILITIES

TEMPERATURE

Operating: (Type 453) —15° C to +55° C.
Operating: (Type R453) —15° C to +45° C.
Non-operating: (both models) —55° C to +75° C.

ALTITUDE

Operating: 15,000 feet; maximum allowable ambient temperature decreased 1°C/1000 feet from 5,000 to 15,000 feet.
Non-operating: 50,000 feet.

* +45°C for R453.

VIBRATION

Operating: 15 minutes along each of the three axes, 0.025 inch peak to peak displacement (4 g's at 55 Hz) 10 to 55 to 10 Hz in 1-minute cycles.

SHOCK

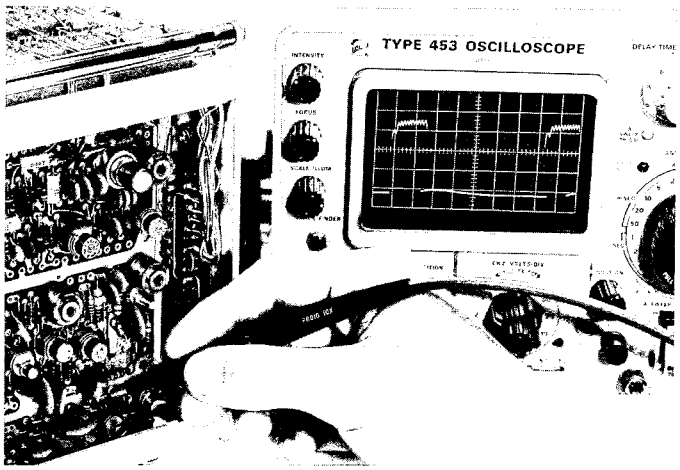
Operating and non-operating: 30 g's, ½ sine, 11-ms duration, 12 shocks total.

TRANSPORTATION

In shipping carton: Meets National Safe Transit test of vibration for 1 hour at slightly greater than 1 g, 30-inch (18-inch for R453) drop on any corner, edge, or flat surface of the shipping container.

HUMIDITY

Non-operating: Meets electrical performance specifications after exposure to five cycles (120 hours) of Mil-Std-202B, Method 106A (omit freezing and vibration, and allow a 24-hour post-test drying period at +25°C and 20% to 80% relative humidity).



Small probe for easy access to dense circuitry.

OTHER

TIME AND AMPLITUDE CALIBRATOR

1 volt or 0.1 volt output; 5-mA output. Amplitude accurate within 1% from 0° C to +40° C, within 1.5% from —15° C to *+55° C. 1-kHz squarewave, repetition rate accurate within 0.5% from 0° C to +40° C, within 1% from —15° C to *+55° C. ≤1-μs risetime; 49% to 51% duty cycle.

TRACE FINDER

Compresses display to within graticule area, for ease in determining the location or relative magnitude of an off-screen signal.

TEKTRONIX CRT

4-inch rectangular tube; 6 x 10 div (each div = 0.8 cm) display area; P31 phosphor standard. 10-kV accelerating potential. Noticeable modulation at normal intensity with 5 volts or less peak to peak at Z-axis input; DC to ≥50 MHz usable frequency range; 200 volts (DC and peak AC) maximum input voltage.

POWER REQUIREMENTS

Operates from 115-volt or 230-volt nominal line, 45 to 440 Hz. Oscilloscope power supply automatically regulates at either nominal voltage, when appropriate power cord is inserted. Rear-panel switch permits operation on line voltage above or below nominal: high range—103 to 137 volts or 206 to 274 volts, low range—96 to 127 volts or 192 to 254 volts (when line contains ≤2% total harmonic distortion). Power consumption approx 100 watts.

COOLING

Filtered forced-air cooling.

DIMENSIONS AND WEIGHTS (Type 453)

Height	7¼ in	18.4 cm
Width	11⅝ in	29.5 cm
Depth (including panel cover)	20½ in	52.1 cm
Depth (with extended handle)	22⅜ in	56.8 cm
Net weight (without panel cover)	27¾ lb	12.6 kg
Weight (with panel cover and accessories)	30 lb	13.6 kg
Weight (with dust and rain cover, power cord, and one instruction manual)	32 lb	14.6 kg
Domestic shipping weight	~42 lb	~19.1 kg
Export-packed weight	~54 lb	~24.6 kg

DIMENSIONS AND WEIGHTS (Type R453)

Height	7 in	17.8 cm
Width	19 in	48.2 cm
Depth (behind front panel)	17¾ in	45.0 cm
Net weight	32¼ lb	14.7 kg
Domestic shipping weight	~63½ lb	~28.8 kg
Export-packed weight	~87 lb	~39.6 kg

* +45° C for R453.

STANDARD ACCESSORIES

Two P6010 3.5 ft 10X probe package (010-0188-00); 18-inch 50-Ω BNC cable (012-0076-00); BNC jack post (012-0092-00); 115-volt power cord (161-0024-01); 230-volt power cord (161-0027-01); 3 to 2-wire adapter (103-0013-00); CRT ornamental ring (354-0269-00); smoke gray light filter (378-0576-00); mesh filter (installed) (378-0573-00); CRT face-plate protector (386-0218-00); oscilloscope dust and rain cover (016-0074-01); two BNC to binding post adapters (103-0033-00); five fuses, assorted spares; two instruction manuals (070-0478-00);. Accessories for R453 are the same as for Type 453 less dust and rain cover, but also includes: mounting hardware; slide-out tracks (351-0101-00).

TYPE 453 OSCILLOSCOPE $1950

TYPE R453 OSCILLOSCOPE $2035

RACK-MOUNT CONVERSION KIT (040-0420-00) $100

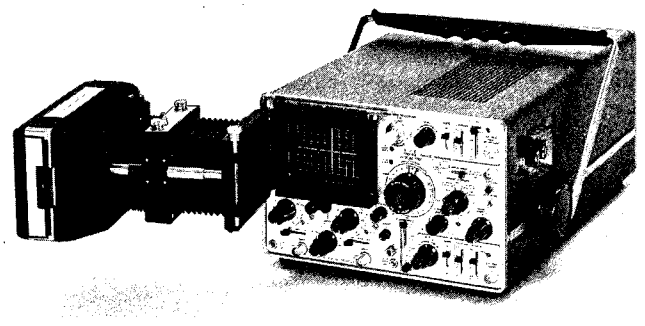
Includes hardware and instructions to convert existing Type 453 Portable Oscilloscopes for rack-mount installation.

OPTIONAL ACCESSORIES

Optional accessories serve to extend the usefulness of the Type 453 in certain applications. This list covers only the more commonly used items. The standard probes (10X) supplied with the instrument satisfy most measurement requirements. In addition to the listed optional probes, other probes are available for current and high-voltage measurements. A complete list of accessory items can be found in the Accessory Section of this catalog.

COLLAPSIBLE VIEWING HOOD

Permits viewing of trace under high ambient-light conditions.
016-0083-00 ..... $7.50



The Type 453 with the Tektronix C-30.

C-30 CAMERA

f/1.9 lens, magnification variable from 1.5:1 to 0.7:1; Polaroid Land** Pack-Film back, order C-30 ..... $390.00

PROBES

P6010 6 ft 10X Probe Package (010-0185-00) $30.00
P6011 3.5 ft 1X Probe Package (010-0193-00) $15.00

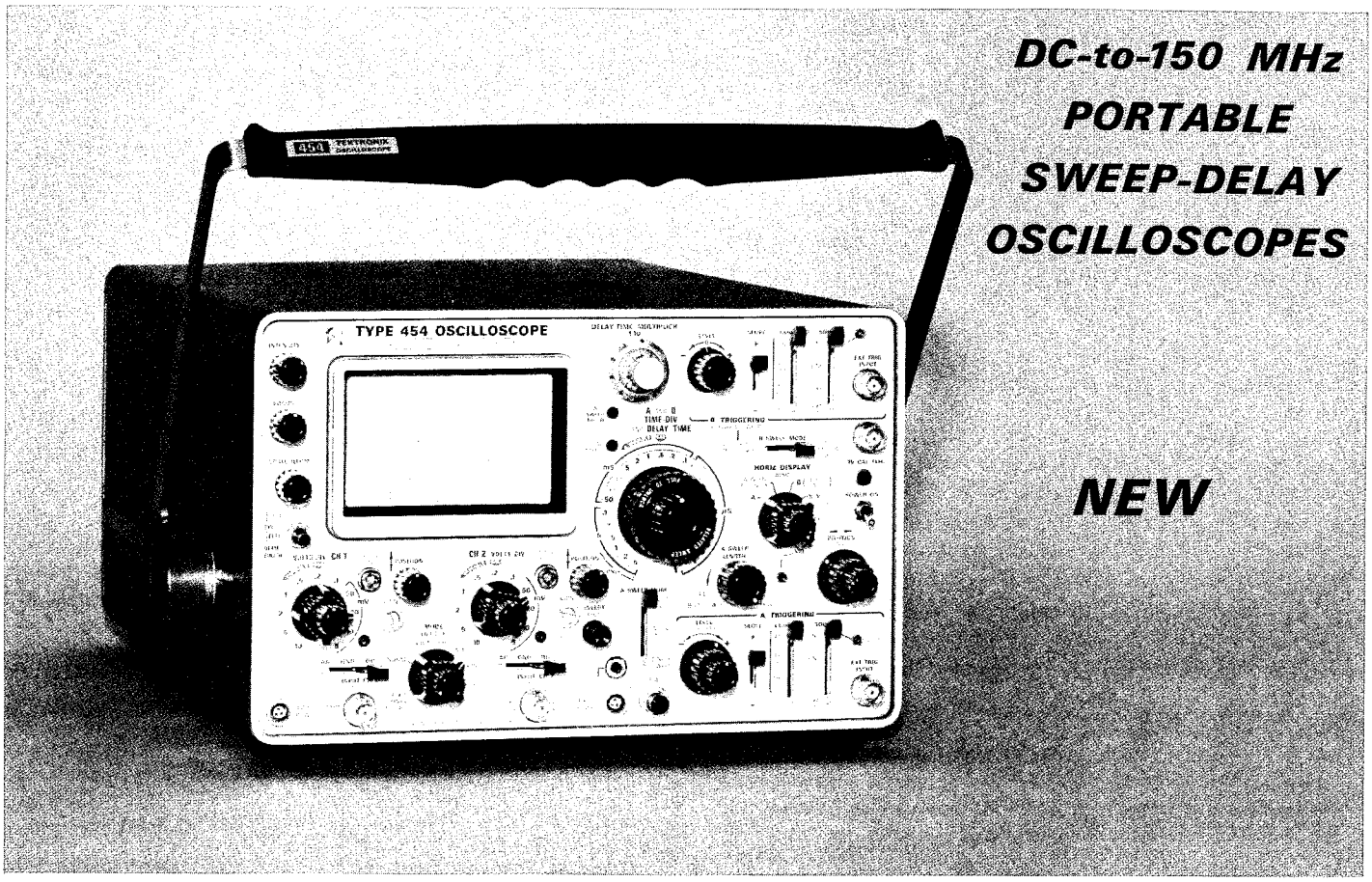
SCOPE-MOBILE® CART

Type 200-1 occupies less than 18 inches aisle space, has storage space in base $60

**Registered Trade-Mark Polaroid Corporation

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

DC-to-150 MHz PORTABLE SWEEP-DELAY OSCILLOSCOPES



NEW

- ***HIGH-WRITING-SPEED CRT***
- ***DUAL-TRACE, 5-mV/div DEFLECTION FACTOR***
- ***FULL-BANDWIDTH TRIGGERING***
- ***CALIBRATED SWEEP DELAY***
- ***FULL-SENSITIVITY X-Y DISPLAYS***
- ***COMPACT, RUGGED CONSTRUCTION***
- ***SOLID STATE DESIGN***

The Type 454 offers convenient measurement of fast-rise pulses and high-frequency signals previously beyond the capability of most conventional real-time oscilloscopes. Using the miniature P6047 Probe, risetime of the Type 454 is 2.4 ns, with a corresponding bandwidth of 150 MHz.

The two channels of the Type 454 provide cascaded single-trace displays at 1 mV/div, and also provide X-Y displays to 5 mV/div. The dual-trace vertical system displays either channel separately, adds channels algebraically, alternates displays between channels, or chops the display at a rate of 1 MHz.

A time-base system with calibrated sweep delay permits highly-magnified displays of small portions of undelayed sweeps, accurate measurement of waveform time jitter, precise time measurements, and many other measurement uses.

The Type 454 is mechanically designed to withstand environmental extremes and rough handling in transit. Plug-in transistors provide ease of maintenance.

Type R454 (the rackmount model) is electrically identical to Type 454, but is mechanically designed to mount on tilting slide-out tracks in a standard 19-in rack.

CHARACTERISTIC SUMMARY

VERTICAL

(2 identical channels)

BANDWIDTH (with P6047 10X Probe)—DC to 150 MHz from 10 V/div to 20 mV/div, DC to 100 MHz at 10 mV/div, DC to 60 MHz at 5 mV/div. Deflection factor with P6047 Probe is 10X panel reading.

RISETIME (with P6047 10X Probe)—2.4 ns from 10 V/div to 20 mV/div, 3.5 ns at 10 mV/div, 5.9 ns at 5 mV/div.

CALIBRATED DEFLECTION FACTORS—5 mV/div to 10 V/div, 11 steps.

INPUT RC—1 megohm paralleled by 20 pF.

HORIZONTAL

CALIBRATED TIME BASE—0.05 μs/div to 5 s/div, 24 steps.

TRIGGERING—DC to 150 MHz.

X10 MAGNIFIER—Operates over full time base, increases fastest rate to 5 ns/div.

CALIBRATED SWEEP DELAY—1 μs to 50 s.

X-Y OPERATION—5 mV/div to 10 V/div, DC to 2 MHz.

CRT

DISPLAY AREA—6 x 10 div (0.8 cm/div), internal graticule.

ACCELERATING POTENTIAL—14 kV.

OTHER

AMPLITUDE AND TIME CALIBRATOR—1 V, 5 mA; 1 kHz.

PROBE POWER—2 connectors for P6045 FET Probe power.

POWER REQUIREMENTS—90 to 136 V and 180 to 272 V in six ranges; range selection via quick-change switching device. 48 to 440 Hz, approx 125 watts maximum.

VERTICAL DEFLECTION SYSTEM
(2 identical channels)

BANDWIDTH* AND RISETIME
(0°C to +40°C)

DEFLECTION FACTOR**	DRIVEN FROM 25 Ω or P6047 PROBE	WITH P6045 FET PROBE
10 V/div to 20 mV/div	150 MHz and 2.4 ns	130 MHz and 2.7 ns
10 mV/div	100 MHz and 3.5 ns	95 MHz and 3.7 ns
5 mV/div	60 MHz and 5.9 ns	58 MHz and 6 ns

*Measured at 3-dB down. AC response is 3-dB down at approx 8 Hz (approx 0.8 Hz with P6047 10X Probe).

**Without P6047 10X Probe. Deflection factor with P6047 is 10X panel reading.

PROBE DATA—P6047 10X Passive Probe (supplied with Type 454): 10X attenuation, 10 megohms input resistance, and 10 pF input capacitance. P6045 1X FET Active Probe (extra-cost option): 1X attenuation, 10 megohms input resistance, and less than 4 pF input capacitance. See catalog accessory page for additional data.

TRACE FINDER—5-MHz BANDWIDTH SWITCH
Down position compresses display to within graticule area for convenient trace location. Up position limits bandwidth of main vertical amplifier to approx 5 MHz for noise and interference reduction at higher sensitivities. Center position provides normal operation.

DEFLECTION FACTOR (2 identical channels)
5 mV/div to 10 V/div in 11 calibrated steps (1-2-5 sequence), accurate within ± 3%. Continuously variable (uncalibrated) between steps and to approx 25 V/div. Warning lights indicate uncalibrated settings.

INPUT RC
1 megohm ± 2%, paralleled by 20 pF ± 1 pF.

MAXIMUM INPUT VOLTAGE
600 V combined DC + peak AC.

PROBE POWER
Two connectors provide correct operating voltages for two P6045 FET Probes.

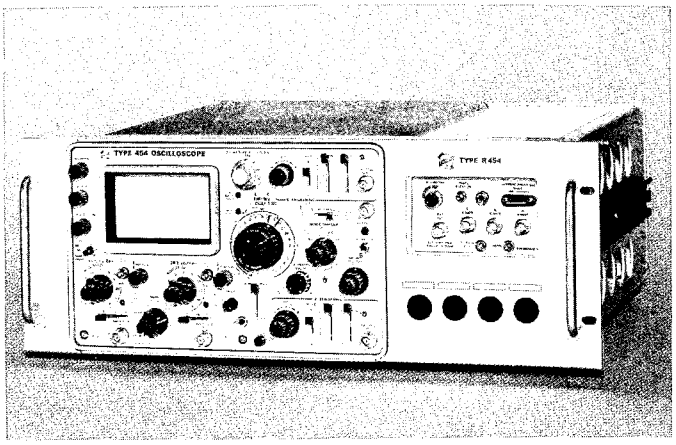
OPERATING MODES
Channel 1 only; Channel 2 only (normal or inverted; Added algebraically, Alternate, Chopped at 1 MHz (± 20%).

SIGNAL DELAY
Fixed delay line, approx 140 ns.

SIGNAL OUTPUT
Channel 1 vertical output: ≥ 25 mV per division of Channel 1 display (into 1 megohm); approx 50-Ω output resistance; DC to ≥ 33 MHz (3-dB down).

X-Y OPERATION (Ch 1 X, Ch 2 Y)
5 mV/div to 10 V/div in 11 calibrated steps (1-2-5 sequence), accurate within ±3%. X bandwidth is DC to ≥ 2 MHz (3-dB down). Phase difference is ≤ 3° to 2 MHz.

TRIGGER SOURCE
Normal (displayed signal); pickoff ahead of channel switching.



HORIZONTAL DEFLECTION SYSTEM

TIME BASE A
0.05 μs/div to 5 s/div in 25 calibrated steps (1-2-5 sequence). Continuously variable (uncalibrated) between steps and to approx 12.5 s/div. Warning light indicates uncalibrated setting. Sweep length continuously variable from ≤ 4 div to 11.0 div ± 0.5 div.

TIME BASE B
0.05 μs/div to 0.5 s/div in 22 calibrated steps (1-2-5 sequence). Continuously variable (uncalibrated) between steps and to approx 1.25 s/div. Warning light indicates uncalibrated setting.

TIME BASE A & B SWEEP ACCURACY

SWEEP RANGE	0°C to +40°C	−15°C to +55°C
0.05 μs/div to 50 ms/div	± 3% Normal ± 4% Magnified	± 4% Normal ± 5% Magnified
0.1 s/div to 5 s/div*	± 3% Normal ± 4% Magnified	± 5% Normal ± 6% Magnified

*Time Base B slowest sweep is 0.5 s/div.

HORIZONTAL-DISPLAY MODES
Time Base A only, A Intensified During B, B (delayed sweep), and X-Y (switches Channel 1 to drive X axis).

TIME BASE A SWEEP MODES
Repetitive sweep with automatic triggering, repetitive sweep with normal triggering, or single sweep for photographic recording.

TIME BASE B SWEEP MODES
Time Base B triggerable after delay time, or Time Base B runs automatically at end of delay time.

X10 MAGNIFIER
Operates over full time base, increases fastest rate to 5 ns/div.

SIGNAL OUTPUTS
Positive gates from both time bases (12 V ± 10%), and a positive-going sawtooth from Time Base A (10 V ± 10%).

CALIBRATED SWEEP DELAY

DELAY TIME RANGE
1 μs to 50 s, continuously variable with 10-turn, calibrated multiplier.

DELAY ACCURACY		
DELAY TIME	0°C to +40°C	−15°C to +55°C
1 μs/div to 50 ms/div	± 1.5%	± 2%
0.1 s/div to 5 s/div	± 2.5%	± 3.5%

MULTIPLIER INCREMENTAL LINEARITY

Included in delay accuracy: ±0.2% from 0°C to +40°C, ± 0.3% from −15°C to +55°C.

JITTER

≤ 1 part in 20,000 of 10X Time Base A time/div setting.

TRIGGERING

MODES

Automatic or Normal on Time Base A. Automatic operation useful between 20 Hz and 150 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes and repetition rates. With no input (or input less than 20 Hz), the automatic triggering free runs the sweep and provides a convenient reference trace at all sweep rates. Normal triggering only on Time Base B. With sweep delay, Time Base B can be set to run at end of delay period, or to be triggerable at end of delay period.

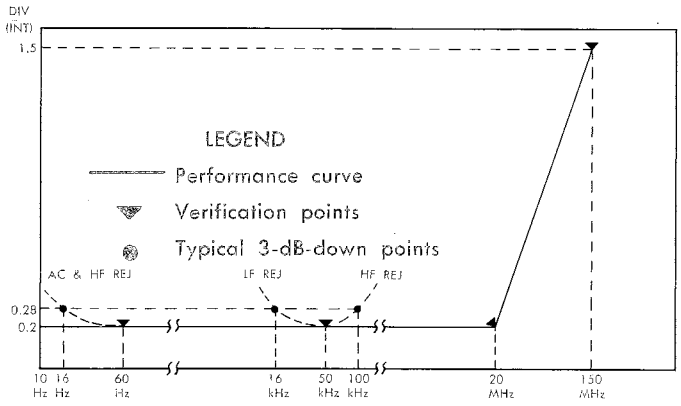
COUPLING, TIME BASE A & B

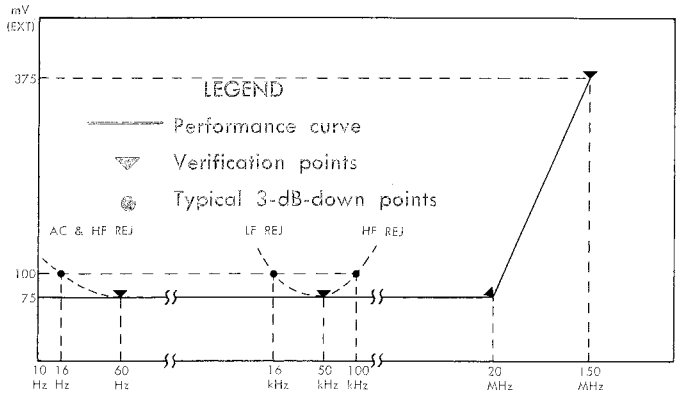
AC, DC, AC Low-Frequency Reject, or AC High-Frequency Reject.

SOURCES, TIME BASE A & B

Internal, External, External ÷ 10, or Line. External input RC approx 1 megohm paralleled by approx 20 pF (except AC LF Reject). 500-V maximum input (DC + peak AC).

REQUIREMENTS, TIME BASE A & B





CONVENIENT SWITCH LOGIC

Trigger switches are arranged with the up position providing the most commonly used set of trigger functions: Automatic mode, + slope, AC coupling and Internal source.

ENVIRONMENTAL CAPABILITIES

TEMPERATURE

Operating: −15°C to +55°C. Nonoperating: −35°C to +75°C.

ALTITUDE

Operating: To 15,000 feet; maximum allowable ambient temperature decreased by 1°/1000 feet from 5,000 to 15,000 feet. Nonoperating: to 50,000 feet.

VIBRATION

Operating: 15 minutes along each of the three axes, 0.025 inch peak-to-peak displacement (4 g's at 55 Hz) 10 to 55 to 10 Hz in 1-minute cycles.

ELECTROMAGNETIC INTERFERENCE (Type 454 MOD 163D and R454 MOD 163D only)

Meets interference requirements of MIL-I-6181D and MIL-I-16910A, power line conducted: 150 kHz to 25 MHz, radiated (with mesh filter installed): 150 kHz to 1 GHz.

SHOCK

Operating and nonoperating: 30 g's, ½ sine, 11-ms duration, 2 shocks per axis (guillotine-type shocks).

TRANSPORTATION

Meets National Safe Transit test when factory-packaged: Vibration for one hour at slightly greater than one g. Drop on any corner, edge or flat surface; 18-in drop for Type R454, 30-in drop for Type 454.

CRT

TEKTRONIX CRT

4-in rectangular tube; 6 x 10 div display area, each div is 0.8 cm, horizontal and vertical centerlines further marked in 0.2-div increments. P31 phosphor normally supplied. 14-kV accelerating potential. Z-axis input DC coupled to CRT cathode; noticeable modulation at normal intensity with 5-V peak-to-peak signal; DC to 50 MHz usable frequency range.

OTHER

AMPLITUDE AND TIME CALIBRATOR

1 V, 5 mA at external jack; accurate within 1% from 0°C to +40°C, and within 1.5% from −15°C to +55°C. 1-kHz repetition rate accurate within 0.5% from 0°C to +40°C, and within 1% from −15°C to +55°C. Risetime ≤ 1 μs, duty cycle 49% to 51%, output resistance 250 Ω ± 1%.

POWER REQUIREMENTS

Quick-change line-voltage selector provides six ranges: 90 to 110 V, 104 to 126 V, 112 to 136 V, 180 to 220 V, 208 to 252 V, and 224 to 272 V. 48 to 440 Hz, 125 watts maximum at 115 V and 60 Hz.

COOLING

Filtered, forced-air ventilation.

TYPE 454 / R454

TYPE 454 DIMENSIONS AND WEIGHTS

Height	7¼ in	18.4 cm
Width	12½ in	30.8 cm
Depth (incl. panel cover)	20½ in	52 cm
Depth (handle extended)	22⅜ in	56 cm
Net weight (w/o panel cover)	29¼ lb	12.7 kg
Net weight (with panel cover and accessories	31¼ lb	13.6 kg
Domestic shipping weight	~43 lb	~18.7 kg
Export-packed weight	~57 lb	~24.8 kg

TYPE R454 DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Depth (behind front panel)	17¾ in	45 cm
Net weight	33½ lb	14.5 kg
Domestic shipping weight	~65 lb	~28.2 kg
Export-packed weight	~86 lb	~37.4 kg

STANDARD ACCESSORIES

Two P6047 Probes with accessories (010-0211-00); 50-Ω 18-in BNC cable (012-0076-00); BNC jack post (012-0092-00); 3 to 2-wire power-cord adapter (103-0013-00); CRT ornamental ring (354-0269-00); light filter, smoke gray (378-0576-00); two BNC binding-post adapters (103-0033-00); dust and rain cover (016-0074-01); two instruction manuals (070-0617-00); four fuses, assorted spares.

TYPE 454 OSCILLOSCOPE $2550

TYPE R454 OSCILLOSCOPE $2635

As above but meets electromagnetic interference requirements of MIL-I-6181D and MIL-I-16910A; Power line conducted: 150 kHz to 25 MHz; Radiated (with mesh filter installed): 150 kHz to 1 GHz.

TYPE 454 MOD 163D $2650

TYPE R454 MOD 163D $2735

RACK MOUNT CONVERSION KIT (040-0446-00) .. $100

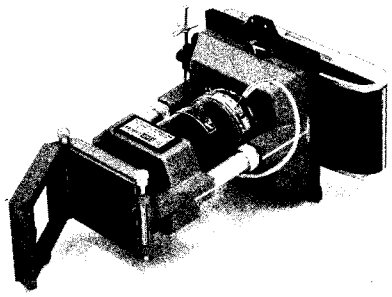
Includes hardware and instructions to convert existing Type 454 Portable Oscilloscopes for rack-mount installation.

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The standard probes supplied with the instrument satisfy most measurement requirements; optional probes, including high-voltage and current-measuring probes, may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

PROBE

P6045 1X FET Active Probe Package (010-0204-00) $275

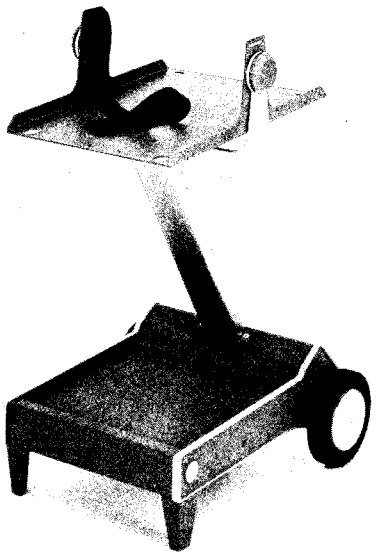


C-40 HIGH-SPEED CAMERA

f/1.3, 1:0.5 lens with Roll-Film back for 10,000 speed film. Order C-40 ..... $540

C-30 COMPACT CAMERA

f/1.9 lens, magnification variable from 1.5:1 to 0.7:1, Polaroid Land* Pack-Film back, order C-30 ..... $390



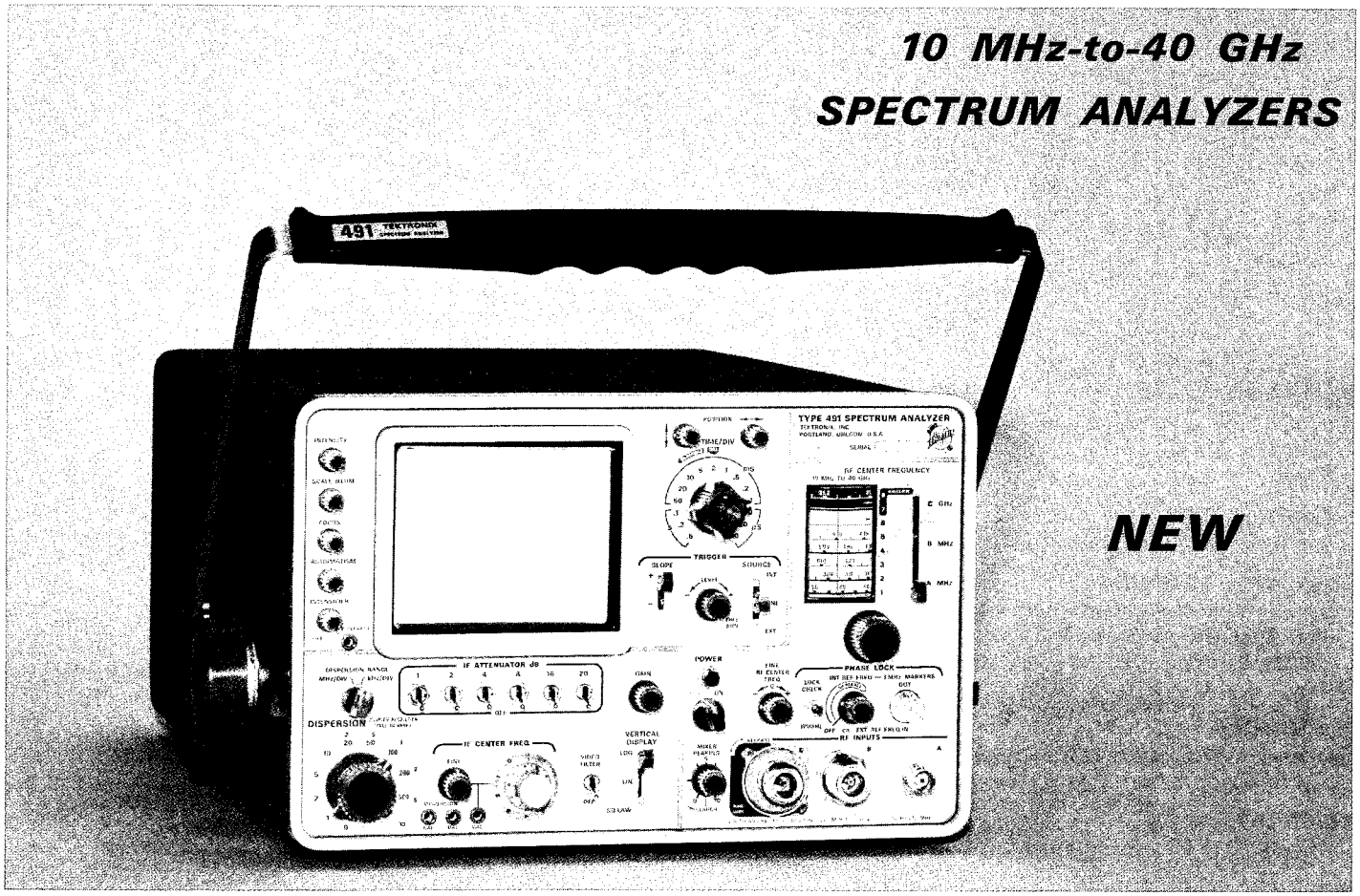
SCOPE-MOBILE® CART

200-1 Scope-Mobile is small and compact for easy maneuvering ..... $ 60

*Registered Trade-Mark, Polaroid Corporation.

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

10 MHz-to-40 GHz SPECTRUM ANALYZERS



NEW

- ***COMPACT, LIGHT WEIGHT***
- ***INTERNAL PHASE LOCK***
- ***CALIBRATED DISPERSION TO 100 MHz***
- ***COUPLED RESOLUTION***
- ***±1.5-dB DISPLAY FLATNESS TO 12.4 GHz***
- ***WIDE-RANGE TIME BASE***
- ***LOW POWER CONSUMPTION***
- ***ENVIRONMENTALIZED***
- ***SOLID-STATE DESIGN***

The Type 491 is a precision, wide-band spectrum analyzer designed for rugged environmental conditions and easy mobility. It is an easy-to-carry package weighing less than 40 pounds complete with accessories. The Type R491 is electrically identical, requires only 7 inches of rack height.

Operation is simple. Resolution and calibrated dispersion controls are coupled, providing narrow resolution bandwidth at narrow dispersion and wide resolution bandwidth at wide dispersion. Since dispersion is calibrated, frequency differences can be read directly from the CRT. Internal phase lock provides stable displays even at 1 kHz/div dispersion.

Both Type 491 and R491 are completely self contained, have oscilloscope-type time base and trigger circuits, 8 x 10-div CRT with P7 phosphor and internal graticule. They operate over a wide range of AC voltages, require only 50 W, maximum.

With these state-of-the-art analyzers, Tektronix offers an ideal combination of performance, weight, size, and cost: Type 491 and R491.

BAND	FREQUENCY RANGE	MINIMUM CW SENSITIVITY*	
		1-kHz RESOLUTION	100-kHz RESOLUTION
1	10 MHz to 275 MHz	≥ —100 dBm	≥ —80 dBm
2	275 MHz to 900 MHz	≥ —110 dBm	≥ —90 dBm
3	800 MHz to 2000 MHz	≥ —105 dBm	≥ —85 dBm
4	1.5 GHz to 4.0 GHz	≥ —110 dBm	≥ —90 dBm
5	3.8 GHz to 8.2 GHz	≥ —100 dBm	≥ —80 dBm
6	8.2 GHz to 12.4 GHz	≥ —95 dBm	≥ —75 dBm
7	12.4 GHz to 18.0 GHz	≥ —90 dBm	≥ —70 dBm
8	18.0 GHz to 40 GHz	≥ —80 dBm to 26.5 GHz ≥ —70 dBm to 40 GHz	≥ —60 dBm ≥ —50 dBm

*Signal + noise = 2 X noise

DIAL ACCURACY
± (2 MHz + 1% of dial reading).

CALIBRATED DISPERSION
1 kHz/div to 10 MHz/div in 1-2-5 sequence, 2 ranges (kHz/div —MHz/div). Accuracy throughout full range of IF-center frequency control, within ±3% except at 2 MHz/div (±5%) and 1 MHz/div (±7%). Accuracy can be increased using internal 1-MHz crystal markers for calibration. Dispersion linearity within ±3%. Zero dispersion useful for PRF measurements.

COUPLED RESOLUTION
1 kHz to 100 kHz, coupled with calibrated dispersion positions but separately switchable.

DISPLAY FLATNESS
±1.5 dB over 100-MHz dispersion, except over ±25 MHz for Band 1; ±3 dB over 100-MHz dispersion in waveguide Bands.

INCIDENTAL FM
Less than 300 Hz at fundamental, with Phase Lock.

FREQUENCY STABILITY
kHz/div dispersion range—±10 kHz from 103.5 to 126.5 VAC after 1 minute; ±5 kHz/° C. MHz/div dispersion range—±200 kHz from 103.5 to 126.5 VAC after 1 minute; ±20 kHz/° C.

PHASE LOCK
Internal 1-MHz reference. External input accepts 1-MHz to 5-MHz signals from 1 V to 5 V peak to peak.

INPUT IMPEDANCE
Approx 50 Ω for coaxial inputs.

MAXIMUM INPUT POWER
—30 dBm for linear operation, +15 dBm (25 mW) safe diode power limit.

IF ATTENUATOR
51 dB in 1-dB steps, ±0.1 dB/dB.

IF GAIN CONTROL
>50-dB range.

IF CENTER FREQUENCY
±25-MHz adjustment of center frequency from 5 MHz/div to 0.2 MHz/div dispersion positions, ±10-MHz adjustment at 10 MHz/div, ±2.5-MHz adjustment from 500 kHz/div to 1 kHz/div dispersion positions.

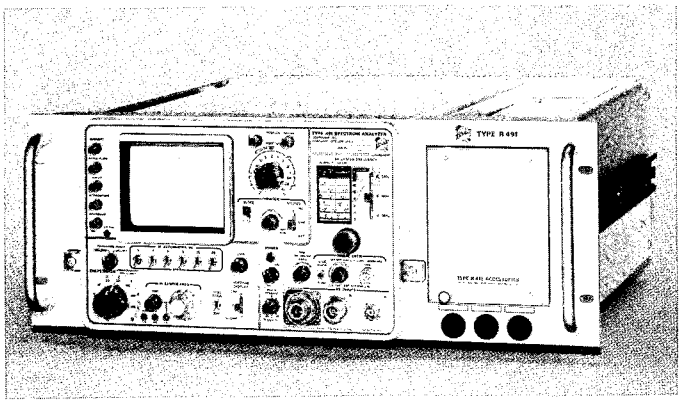
VERTICAL DISPLAY (8 DIVISIONS)
Log — ≥40-dB dynamic range.
Linear — ≥26-dB dynamic range.
Square Law — ≥13-dB dynamic range.

HORIZONTAL DEFLECTION

INTERNAL SAWTOOTH GENERATOR
10 μs/div to 0.5 s/div in 15 calibrated steps (1-2-5 sequence). Uncalibrated continuously variable between steps and to approx 1.25 s/div.

TRIGGER SOURCE
Internal, external, or line. 600-V maximum external input (DC + peak AC).

TRIGGER REQUIREMENTS
0.2-div deflection or 0.2-V external from 20 Hz to 100 kHz.

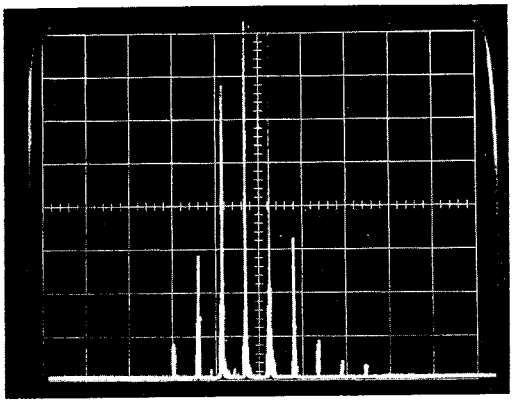


CRT AND DISPLAY FEATURES

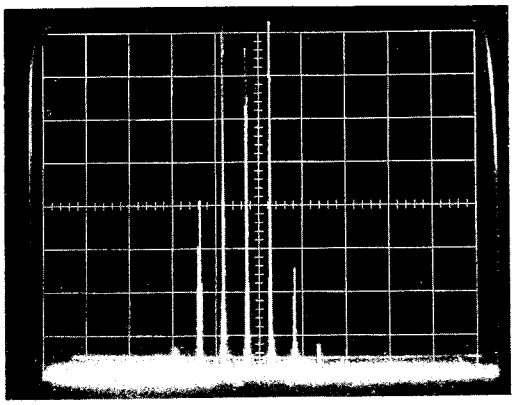
TEKTRONIX CRT
8 x 10-div display area (each div = 0.8 cm); P7 phosphor normally furnished.

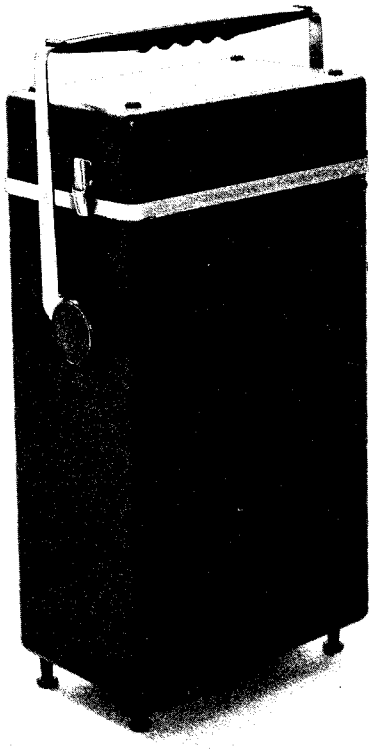
GRATICULE
Internal, no parallax, variable edge lighting.

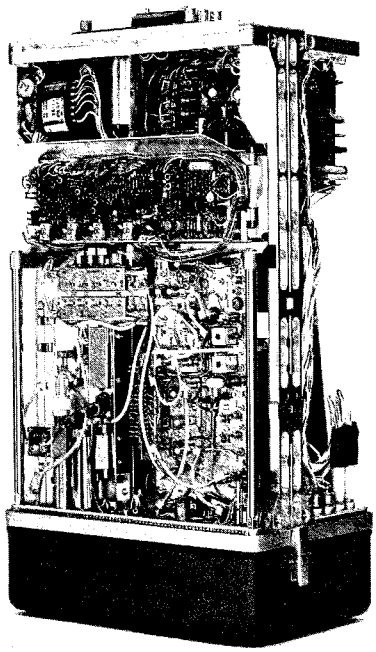
DISPLAY FEATURES
Intensity, focus and astigmatism controls. Intensifier adjusts relative brightness of signal and baseline for convenient viewing and photography.



Quality of photographs is greatly enhanced when relative brightness of signal and baseline can be controlled, as in upper waveform. Lower waveform taken under same conditions shows normal results of slow sweep time/div settings. Improvement is even more pronounced in some applications. Waveforms photographed with C-30 Camera.







ENVIRONMENTAL CAPABILITIES

ELECTROMAGNETIC INTERFERENCE

Meets specifications of MIL-I-6181D over the following frequency ranges: Radiated (with CRT mesh filter installed) —150 kHz to 1 GHz; conducted (power line) —150 kHz to 25 MHz.

TEMPERATURE

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

ALTITUDE

Operating: 15,000 feet.
Non-operating: 50,000 feet.

HUMIDITY

Non-operating: Meets electrical performance specifications after exposure to five cycles (120 hours) of Mil-Std-202C, Method 106B (omit freezing and vibration, and allow a 24-hour post-test drying period at +25° C and 20% to 80% relative humidity).

VIBRATION

Operating: 15 minutes along each of the three axes, 0.025 inch peak to peak displacement (4 g's at 55 Hz) 10 to 55 to 10 Hz in 1-minute cycles.

SHOCK

Operating and non-operating: 30 g's, ½ sine, 11-ms duration, 1 shock per axis.

TRANSPORTATION

In shipping carton: Meets National Safe Transit test of vibration for 1 hour at slightly greater than 1 g, 30-inch drop (18-inch for R491) on any corner, edge, or flat surface of the shipping container.

OTHER CHARACTERISTICS

POWER REQUIREMENTS

50 W maximum, 90 to 272 VAC, 48 to 440 Hz. Quick-change transformer taps permit operation at 90 to 110, 104 to 126, 112 to 136, 180 to 220, 208 to 252, or 224 to 272 VAC.

REAR PANEL CONNECTORS

BNC connectors for external trigger input, sawtooth output (75 mV/div) and recorder output ($\geq$4 mV/div of displayed signal in LIN mode, DC-coupled, approx 600-Ω source resistance).

CABINET MODEL DIMENSIONS AND WEIGHTS

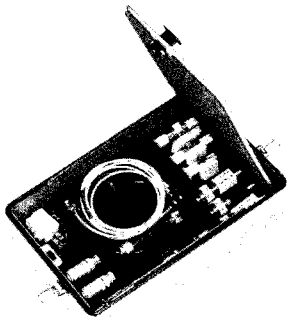
Height	7 3/16 in	18.2 cm
Width	12 7/16 in	31.6 cm
Depth (incl. panel cover)	19 11/16 in	50.0 cm
Depth (with handle extended)	21 9/16 in	54.7 cm
Net weight (w/o panel cover)	30 lb	13.6 kg
Weight (with panel cover and accessories)	38 lb	17.3 kg
Domestic shipping weight	~50 lb	~22.7 kg
Export-packed weight	~62 lb	~28.2 kg

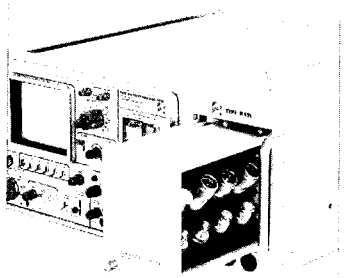
RACK MODEL DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	17½ in	44.4 cm
Net weight	41 lb	18.6 kg
Domestic shipping weight	~72 lb	~32.7 kg

RACK MOUNTING

Type R491 withdraws from rack on slide-out tracks, tilts for convenience. Further mounting information on catalog instrument dimension page.





ACCESSORY STORAGE

Included panel dust cover for Type 491 and drawer for Type R491 hold all standard accessories except manuals and dust and rain cover.

STANDARD ACCESSORIES

6' BNC cable, 50 Ω miniature coax (012-0113-00); 6' N cable, RG 55/U coax (012-0114-00); 2' TNC cable, RG 55/U coax (012-0115-00); wave guide mixer, 12.4 to 18 GHz (119-0097-00); wave guide mixer, 18 to 26.5 GHz (119-0098-00); wave guide mixer, 26.5 to 40 GHz (119-0099-00); 10-dB attenuator, Type N fittings (011-0085-00); 20-dB attenuator, Type N fittings (011-0086-00); 40-dB attenuator, Type N fittings (011-0087-00); two BNC male to N female adapters (103-0058-00); two BNC female to N male adapters (103-0045-00); wave guide mixer adapter (119-0104-00); power cord (161-0024-00); dust and rain cover (016-0074-01); 3 to 2-wire adapter (103-0013-00); blue light filter (378-0558-00); amber light filter (378-0559-00); clear CRT protector plate (386-0118-00); ornamental ring (354-0248-00); mesh filter, installed (387-0571-00); two one-ampere fuses (159-0022-00); ½-ampere fuse (159-0025-00); two instruction manuals (070-0598-00). Type R491 includes all above accessories except the dust and rain cover, also includes mounting tracks and hardware.

TYPE 491 SPECTRUM ANALYZER $4200

TYPE R491 SPECTRUM ANALYZER..... $4300

CONVERSION KITS

PORTABLE TO RACK-MODEL

Kit includes hardware and instructions to convert existing Type 491 Analyzers for rack installations.

Order 040-0444-00 ..... $125

RACK MODEL TO PORTABLE

Kit includes cabinet and instructions to convert Type R491 Analyzers for portable operation.

Order 040-0445-00 ..... $75

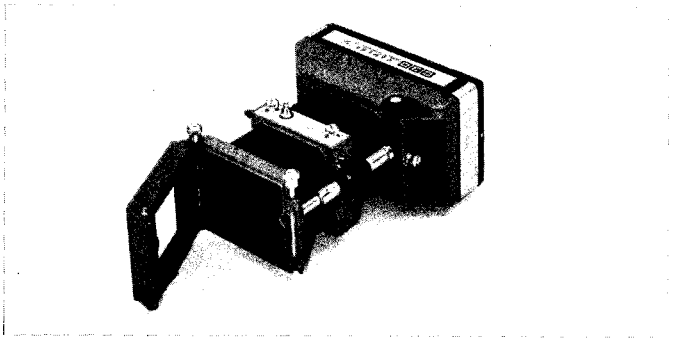
OPTIONAL ACCESSORIES

Optional accessories provide added convenience to the Type 491 and R491. Cameras, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

COLLAPSIBLE VIEWING HOOD

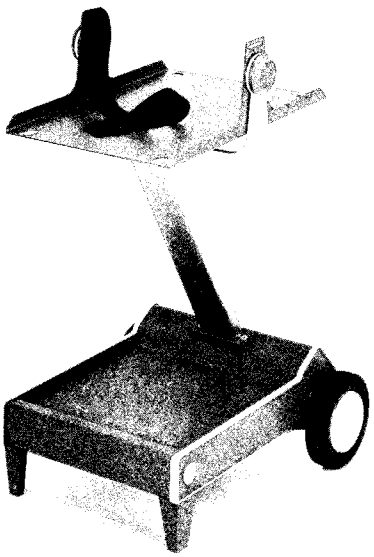
Permits viewing of trace under high ambient-light conditions, order 016-0082-00 ..... $7.50

C-30 CAMERA



f/1.9 lens; magnification variable from 1.5:1 to 0.7:1; Polaroid Land* Pack-Film back, order C-30 ..... $390

SCOPE-MOBILE CART



Model 200-1: friction locks hold Type 491 at 0° to 60° angle. Cart occupies <18 in of aisle space, goes up and down stairs easily, has storage space in base, order 200-1 . $60.00

PANEL DUST COVER

Included as a part of Type 491, protects front panel and holds standard accessories. Available separately for use with Type R491, order 200-0633-03 ..... $20.00

BNC THRU-PANEL ADAPTER

Mounts in pre-punched holes in Type R491 panel, BNC connector on both sides, order 103-0070-00 ..... $2.25

BNC CABLE

Used in conjunction with above adapter, provides access to rear-panel connectors on Type R491. BNC-to-BNC 3-foot cable, order 012-0117-00 ..... $4.00

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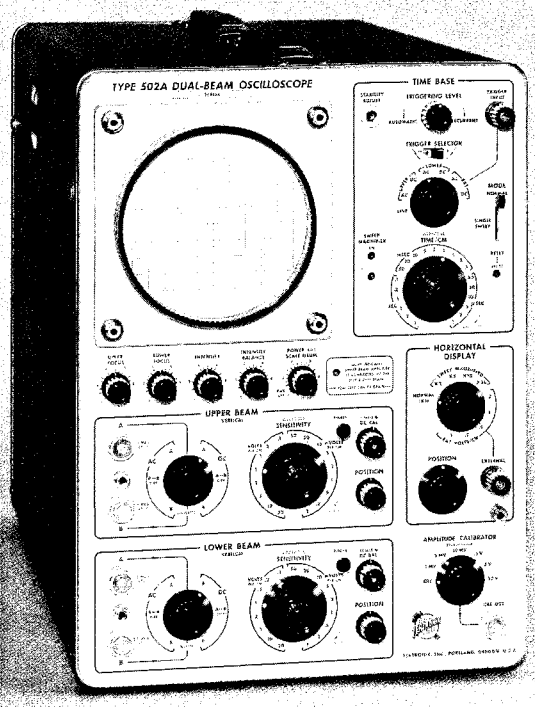
100 μV/cm DUAL-BEAM OSCILLOSCOPES



- ***2 IDENTICAL VERTICAL AMPLIFIERS***
- ***DIFFERENTIAL INPUT AT ALL DEFLECTION FACTORS***
- ***X-Y CURVE TRACING WITH 1 OR 2 BEAMS***
- ***SINGLE SWEEP OPERATION***
- ***BEAM FINDERS***

A wide range of measurement capabilities make the Type 502A and RM502A useful in a variety of applications including education, medicine, defense, and production control. Differential or single-ended inputs can be used for dual-beam or single-beam X-Y displays as well as dual-beam or single-beam time-based displays. With one of the vertical amplifiers switched to provide horizontal deflection, full sensitivity is available for both axes. Phase shift is less than 1 degree from DC to 100 kHz. With the external horizontal amplifier switched to provide horizontal deflection, dual-beam X-Y plots can be displayed at full vertical sensitivity, and at 0.1 V/cm to 2 V/cm horizontally.

CHARACTERISTIC SUMMARY

VERTICAL

BANDWIDTH—DC to 100 kHz at 100 μV/cm, increasing to DC to 1 MHz from 5 mV/cm to 20 V/cm.

CALIBRATED DEFLECTION FACTOR—100 μV/cm to 20 V/cm.

INPUT RC—1 megohm paralleled by approx 47 pF.

COMMON-MODE REJECTION—At least 50,000:1 (DC to 50 kHz).

HORIZONTAL

CALIBRATED TIME BASE—1 μs/cm to 5 s/cm.

SWEEP MAGNIFIER—X2, X5, X10, X20.

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-kHz square-wave.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V, 50 to 60 Hz; 290 watts, 315 VA (maximum).

TYPE 502A / RM502A

APPLICATIONS

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

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

VERTICAL DEFLECTION

Two identical systems

BANDWIDTH
DC to ≥100 kHz (3-db down) at 100 μV/cm, increasing to DC to ≥1 MHz (3-db down) from 5 mV/cm to 20 V/cm. Low-frequency 3-dB-down point is ≤2 Hz with AC coupling, ≤0.2 Hz with included 10X probe.

DEFLECTION FACTOR
100 μV/cm to 20 V/cm in 17 calibrated steps (1-2-5 sequence), accurate within 2% (3% at 100 μV/cm). Uncalibrated, continuously variable between steps and to approx 50 V/cm.

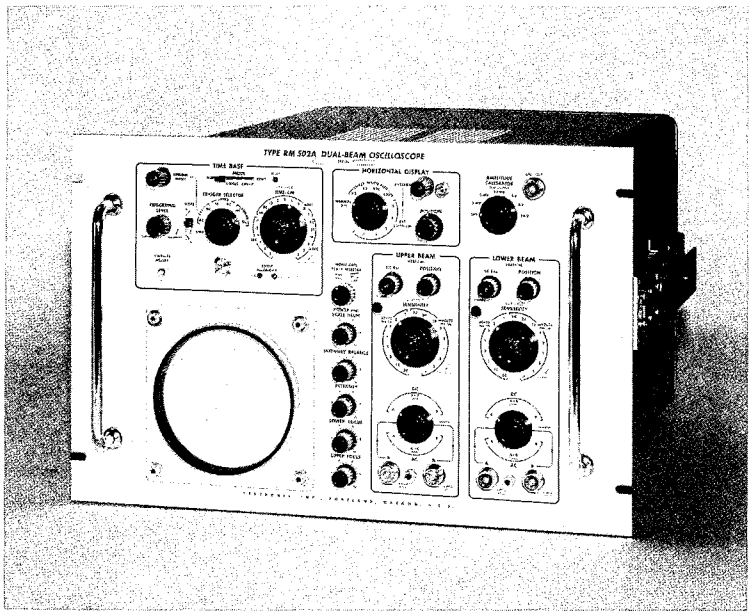
INPUT RC
1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE (DC to 1 MHz)
50 V (combined DC + peak AC) from 100 μV/cm to 0.2 V/cm. 350 V (combined DC + peak AC) from 0.5 V/cm to 20 V/cm.

COMMON-MODE REJECTION
≥50,000:1 from 100 μV/cm to 2 mV/cm (DC to 50 kHz), ≥1000:1 at 200 mV/cm (DC to 50 kHz) with ±5 V input; adjustable to ≥5000:1 (DC to 1 kHz) and to ≥500:1 (to 50 kHz) from 0.5 V/cm to 20 V/cm with ±50 V input. ≥2000:1 at 60 Hz with AC coupling.

DC DRIFT
Typically ≤400 μV/hour averaged over 10 hours, temperature and line voltage constant. ≤300 μV with line variation from 105 to 125 V AC.

DIRECT-COUPLED SIGNAL OUTPUTS
CF outputs for each amplifier at rear panel. Approx 2 V for each centimeter of displayed signal.



HORIZONTAL DEFLECTION

Common to both beams

TIME BASE
1 μs/cm to 5 s/cm in 21 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12.5 s/cm. Warning light indicates uncalibrated setting.

SWEEP MAGNIFIER
X2, X5, X10, or X20 magnification; magnified time base accurate within 5% up to 1 μs/cm.

DISPLAY MODES
Normal or single sweep.

EXTERNAL INPUT
0.1 V/cm to 2 V/cm in 5 calibrated steps (1-2-5 sequence), accuracy within ±5%, DC to 100 kHz. 20 V maximum (DC + peak AC). Input RC approx 1 megohm paralleled by approx 70 pF.

X-Y OPERATION

SINGLE-BEAM CURVE TRACING
100 μV/cm to 20 V/cm calibrated deflection factor in each axis, differential or single-ended input. Panel light indicates upper beam amplifier switched to provide horizontal deflection. X-Y phase difference between amplifiers is ≤1° from DC to 100 kHz, measured at 100 μV/cm.

DUAL-BEAM CURVE TRACING
100 μV/cm to 20 V/cm calibrated vertical deflection factor, separately selectable for upper and lower beams, differential or single-ended input; 0.1 V/cm to 2 V/cm calibrated horizontal deflection factor using external horizontal input common to both beams.

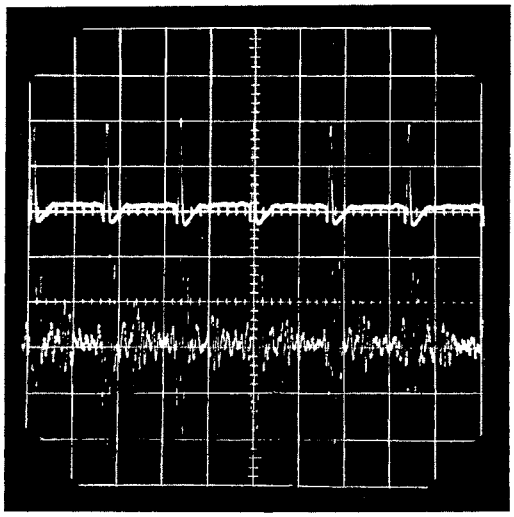
TRIGGER

MODES
Automatic or manual level selection, free run (recurrent). Automatic operation minimizes trigger adjustment for signals of different amplitudes, shapes, and repetition rates. With no input, automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace.

COUPLING
AC or DC.

SOURCES
Internal from either amplifier, external, or line. Input R approx 1 megohm.

REQUIREMENTS
2-mm deflection throughout instrument bandwidth, 0.5 to 10 V external from DC to 1 MHz. Requirements increase below 50 Hz with AC coupling.



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.

CRT AND DISPLAY FEATURES

TEKTRONIX DUAL-BEAM CRT
8 x 10-cm display per beam with 6-cm overlap. Separate vertical-deflection plates; common horizontal deflection plates. 3-kV accelerating potential. P2 phosphor normally supplied. Z-axis input requires 25 V peak to peak for CRT modulation at normal intensity.

GRATICULE
External; variable edge lighting. 10 x 10-cm display area. Vertical and horizontal centerlines marked in 2-mm divisions.

DISPLAY FEATURES
Pushbutton beam finder for each beam, separate focus for each beam, common intensity, intensity balance.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR
0.5 mV to 50 V in 6 calibrated decade steps, accurate within 3%. 1-kHz ±30% repetition rate.

POWER REQUIREMENT
Wired for 105 to 125 VAC (117-V nominal). Transformer taps permit operation at nominal voltages of 110, 117, 124, 220, 234 and 248 VAC, 50 to 60 Hz. Power consumption 290-W maximum and 315-VA maximum.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	15⅞ in	40.3 cm
Width	11⅜ in	28.9 cm
Depth	23⅞ in	60.7 cm
Net weight	50¼ lbs	22.8 kg
Domestic shipping weight	~62 lbs	~28.2 kg
Export-packed weight	~84 lbs	~38.2 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	12¼ in	31.1 cm
Width	19 in	48.3 cm
Rack depth	22¾ in	57.8 cm
Net weight	58 lbs	26.4 kg
Domestic shipping weight	~97 lbs	~44.1 kg
Export-packed weight	~117 lbs	~53.2 kg

Type RM502A can be withdrawn from rack on slide-out tracks, tilted and locked in 4 positions.

STANDARD ACCESSORIES
Two P6006 10X probes (010-0125-00), test lead (012-0031-00), two binding-post adapters (013-0004-00), 3 to 2-wire adapter (103-0013-00), 3-conductor power cord (161-0010-00), smoke-gray light filter (378-0567-00), two instruction manuals (070-0382-01). Type RM502A includes in addition one pair mounting tracks (351-0085-00), and mounting hardware.

TYPE 502A OSCILLOSCOPE $1050

TYPE RM502A OSCILLOSCOPE $1150

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The standard 10X probes supplied with the oscilloscope, and the listed optional probes satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

SCOPE-MOBILE® CART
Model 202-1: storage drawer and 9-position tilt-lock oscilloscope tray, order 202-1 ..... $120

Order tray adapter 040-0365-00 ..... $2.75

CAMERAS
C-27-547: f/1.9—1:0.7 lens, Polaroid Land[1] Pack Film back provides 10 x 10-cm coverage on 3¼ x 4½ film, order C-27-547 ..... $440

C-27G: f/1.9—1:0.85 lens, no back, provides 10 x 10-cm coverage on 4 x 5 film with optional Graflok[2] back and Polaroid Land film holder $340

Graflok back for 4 x 5 film holder (not included), order 122-0604-00 ..... $45

Type 502A to C-27-547 or C-27G Camera adapter, order 016-0225-00 ..... $15

PROBES
P6023 10X Probe: for more-accurate differential measurements, order 010-0065-00 ..... $40

P6027 1X Probe: 1-MΩ, 87-pF input RC, order 010-0070-00 ..... $12.50

[1] Registered Trade-Mark Polaroid Corporation

[2] Registered Trade-Mark Graflex, Inc.

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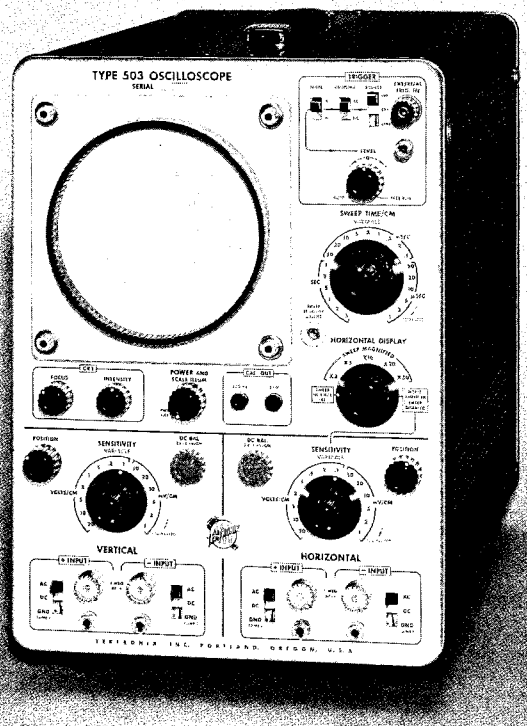
DC-to-450 kHz X-Y OSCILLOSCOPES



- ***IDENTICAL VERTICAL & HORIZONTAL AMPLIFIERS***
- ***DIFFERENTIAL INPUT AT ALL DEFLECTION FACTORS***
- ***ELECTRONICALLY-REGULATED DC SUPPLIES***
- ***COMPACT CABINET OR RACK MODELS***

The Type 503 and RM503 provide accurate measurements and signal-handling versatility in DC-to-450 kHz applications. Differential or single-ended inputs can be used for X-Y displays or conventional time-based displays. Large display area, simple operation, and low cost make the Type 503 ideal for classroom and production-line uses.

The Type RM503, for the same reasons, is ideal for inclusion in a variety of systems, or other monitor applications.

CHARACTERISTIC SUMMARY

VERTICAL & HORIZONTAL

BANDWIDTH—DC to 450 kHz.

CALIBRATED DEFLECTION FACTOR—1 mV/cm to 20 V/cm.

INPUT RC—1 megohm paralleled by approx 47 pF.

COMMON-MODE REJECTION—100:1 at 1 mV/cm deflection factor. DC to 50 kHz, 4 V P to P, max.

SWEEP GENERATOR

CALIBRATED TIME BASE—1 μs/cm to 5 s/cm.

SWEEP MAGNIFIER—X2, X5, X10, X20, X50.

CRT

DISPLAY AREA—8 x 10 cm.

ACCELERATING VOLTAGE—3 kV.

OTHER

AMPLITUDE CALIBRATOR—5 mV and 0.5 V, approx 350 Hz squarewave.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V, 120 watts, max.

VERTICAL AND HORIZONTAL DEFLECTION

Two identical systems

BANDWIDTH

DC to 450 kHz at 3-dB down. Low-frequency 3-dB point is ≤10 Hz with AC coupling. Bandwidth constant at all deflection factors.

DEFLECTION FACTOR

1 mV/cm to 20 V/cm in 14 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to at least 50 V/cm.

INPUT RC

1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE

350 V combined DC + peak AC.

COMMON-MODE REJECTION

From DC to 50 kHz: ≥100:1 at calibrated deflection factors from 1 mV/cm to 0.2 V/cm with 4-V peak to peak input, ≤30:1 at calibrated deflection factors from 0.5 V/cm to 20 V/cm with 40-V peak to peak input (400-V peak to peak from 5 V/cm to 20 V/cm).

PHASE DIFFERENCE IN X-Y MODE

≤1° to 450 kHz at equal calibrated deflection factors from 1 mV/cm to 0.2 V/cm, ≤2° to 50 kHz at equal calibrated deflection factors from 0.5 V/cm to 20 V/cm. Same polarity inputs in both cases.

HORIZONTAL DEFLECTION

TIME BASE

1 μs/cm to 5 s/cm in 21 calibrated steps (1-2-5 sequence) accurate within 3%. Uncalibrated, continuously variable between steps and to at least 12 s/cm.

MAGNIFIER

X2, X5, X10, X20 or X50 magnification; magnified time base accurate within 5% up to 0.1 μs/cm.

TRIGGER

MODES

Automatic or manual level selection, free run. Automatic operation is useful from 50 Hz to 450 kHz, minimizes trigger adjustment for signals of different amplitudes, shapes, and repetition rates. With no input, automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace.

COUPLING

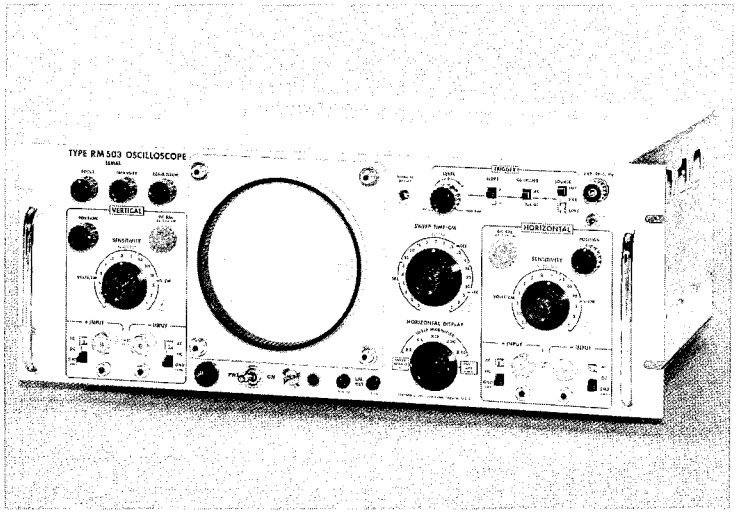
AC or DC.

SOURCES

Internal, external or line.

REQUIREMENTS

½-cm deflection from DC to 50 kHz, increasing to 2-cm deflection at 450 kHz; ½ V external from DC to 450 kHz. Requirements increase below 50 Hz with AC coupling. Automatic operation requires 4/5-cm deflection from 50 Hz to 50 kHz, increasing to 2.5 cm at 450 kHz; ½ V external from 50 Hz to 450 kHz.



CRT

TEKTRONIX CRT

3-kV accelerating potential. P2 phosphor normally supplied. Z-axis input requires 10 V for CRT modulation at normal intensity.

GRATICULE

External; variable edge lighting. 8 x 10-cm display area. Vertical and horizontal centerlines marked in 2-mm divisions.

OTHER

AMPLITUDE CALIBRATOR

5-mV and 500-mV squarewaves, accurate within 3%. 350-Hz ±50% repetition rate.

POWER REQUIREMENTS

Wired for 105 to 125 VAC (117-V nominal); transformer taps permit operation from 210 to 250 VAC (234-V nominal); 50 to 60 Hz. Operates from 112 to 132 or 224 to 264 VAC at 400 Hz, 120 to 140 or 240 to 280 VAC at 800 Hz. 120-W maximum power consumption (125 V at 50 Hz).

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	14 11/16 in	37.3 cm
Width	9 3/4 in	24.8 cm
Depth	21 5/8 in	55.0 cm
Domestic shipping weight	~38 lbs	~17.3 kg
Net weight	29 1/2 lbs	13.4 kg
Export-packed weight	~51 lbs	~23.2 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	17 in	43.2 cm
Net weight	28 lbs	12.7 kg
Domestic shipping weight	~51 lbs	~23.2 kg
Export-packed weight	~72 lbs	~32.7 kg

RACK MOUNTING

Type RM503 mounts directly to standard 19 inch rack. MOD 171A can be withdrawn from rack on slide-out tracks, tilted and locked in 7 positions.

STANDARD ACCESSORIES

Two A510 binding-post adapters (013-0004-00); 3 to 2-wire adapter (103-0013-00); smoke-gray filter (378-0567-00); two instruction manuals (070-0218-01). Type RM503 also includes mounting hardware.

TYPE 503 OSCILLOSCOPE $640

TYPE RM503 OSCILLOSCOPE $655

TYPE RM503 OSCILLOSCOPE, MOD 171A $705

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The probes recommended for use with these oscilloscopes satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

PROBES

P6006 10X Probe Package, order 010-0125-00 ..... $ 22

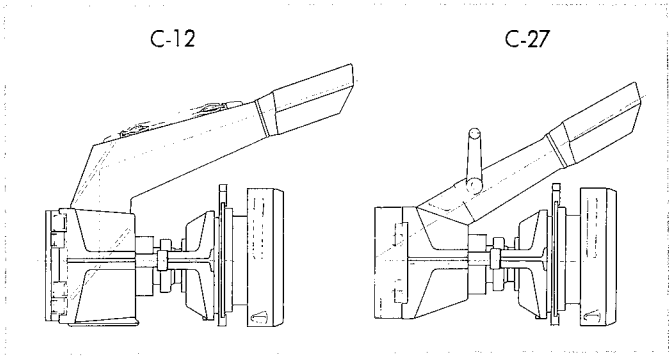
P6007 100X Probe Package, order 010-0134-00 ..... $ 22

P6023 10X Probe Package, for more-accurate differential measurements, order 010-0065-00 ..... $40

P6027 1X Probe Package, order 010-0070-00 ..... $12.50

SCOPE-MOBILE® CART

Model 201-1: storage drawer and 9-position tilt-lock oscilloscope tray, order 201-1 ..... $120



CAMERAS

Standard C-12 provides no-parallax viewing, f/1.9-1:0.85 lens, Polaroid Land* Pack Film back, order C-12 ..... $450
Type 503 or RM503 to C-12 Camera adapter, order 016-0226-00 ..... $ 15

Standard C-27 has rotating and removable viewing hood allowing mounting on adjacent Type RM503's, f/1.9-1:0.85 lens. Polaroid Land Pack Film back, order C-27 ..... $420
Type 503 or RM503 to C-27 Camera adapter, order 016-0225-00 ..... $ 15

SLIDE-OUT TRACKS

Convert standard Type RM503 to MOD 171A, provide easy withdrawal and tilt of instrument, order 351-0050-00. . . .$45

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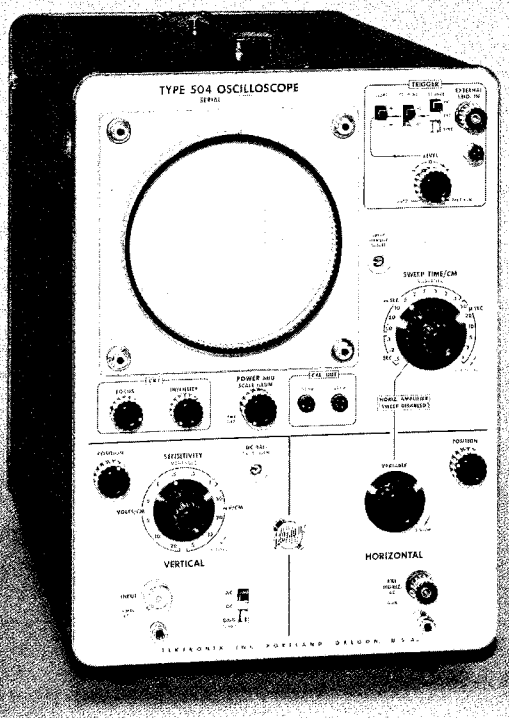
DC-to-450 kHz OSCILLOSCOPES



- ***ELECTRONICALLY-REGULATED DC SUPPLIES***
- ***COMPACT CABINET OR RACK MODELS***

The Type 504 and RM504 provide accurate measurements in DC-to-450 kHz applications. Large display area, simple operation, and low cost make the Type 504 ideal for classroom and production-line uses.

The Type RM504, for the same reasons, is ideal for inclusion in a variety of systems, or other monitor applications.

CHARACTERISTIC SUMMARY

VERTICAL

BANDWIDTH—DC to 450 kHz.

CALIBRATED DEFLECTION FACTOR—5 mV/cm to 20 V/cm.

INPUT RC—1 megohm paralleled by approx 47 pF.

HORIZONTAL

CALIBRATED TIME BASE—1 μs/cm to 0.5 s/cm.

EXTERNAL INPUT—0.5 V/cm, variable.

CRT

DISPLAY AREA—8 x 10 cm.

ACCELERATING VOLTAGE—3 kV.

OTHER

AMPLITUDE CALIBRATOR—25 mV and 0.5 V, approx 350 Hz squarewave.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V, 115 watts, max.

VERTICAL DEFLECTION

BANDWIDTH
DC to 450 kHz at 3-dB down. Low-frequency 3-dB point is ≤10 Hz with AC coupling. Bandwidth constant at all deflection factors.

DEFLECTION FACTOR
5 mV/cm to 20 V/cm in 12 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to at least 50 V/cm.

INPUT RC
1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE
350 V combined DC + peak AC.

HORIZONTAL DEFLECTION

TIME BASE
1 μs/cm to 0.5 s/cm in 18 calibrated steps (1-2-5 sequence) accurate within 3%. Uncalibrated, continuously variable between steps and to at least 1.2 s/cm.

EXTERNAL INPUT
0.5 V/cm, variable.

TRIGGER

MODES
Automatic or manual level selection, free run. Automatic operation is useful from 50 Hz to 450 kHz, minimizes trigger adjustment for signals of different amplitudes, shapes, and repetition rates. With no input, automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace.

COUPLING
AC or DC.

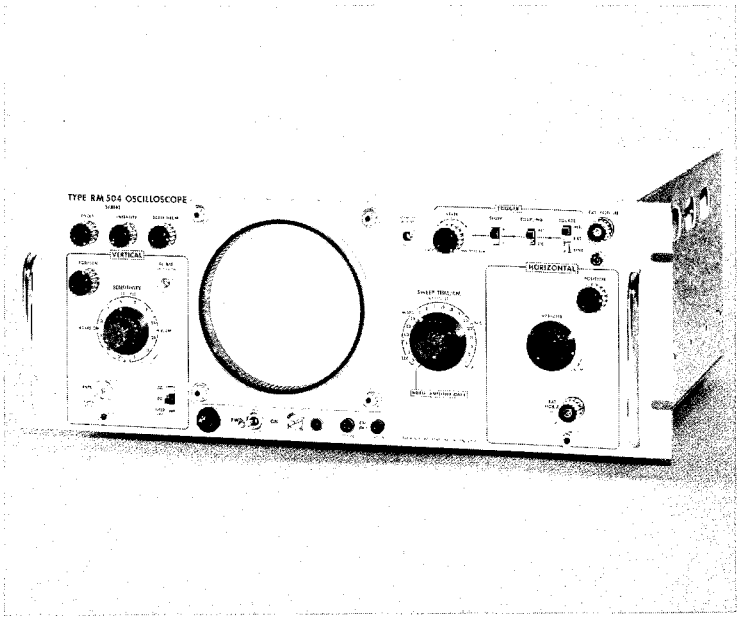
SOURCES
Internal, external or line.

REQUIREMENTS
½-cm deflection from DC to 50 kHz, increasing to 2-cm deflection at 450 kHz; ½ V external from DC to 450 kHz. Requirements increase below 50 Hz with AC-coupling. Automatic operation requires 4/5-cm deflection from 50 Hz to 50 kHz, increasing to 2.5 cm at 450 kHz; ½ V external from 50 Hz to 450 kHz.

CRT

TEKTRONIX CRT
3-kV accelerating potential. P2 phosphor normally supplied. Z-axis input requires 10 V for CRT modulation at normal intensity.

GRATICULE
External; variable edge lighting. 8 x 10-cm display area. Vertical and horizontal centerlines marked in 2-mm divisions.



OTHER

AMPLITUDE CALIBRATOR
25-mV and 500-mV squarewaves, accurate within 3%. 350 Hz ±50% repetition rate.

POWER REQUIREMENTS
Wired for 105 to 125 VAC (117-V nominal); transformer taps permit operation from 210 to 250 VAC (234-V nominal); 50 to 60 Hz. Operates from 112 to 132 or 224 to 264 VAC at 400 Hz, 120 to 140 or 240 to 280 VAC at 800 Hz. 115-W maximum power consumption (125 V at 50 Hz).

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	14 11/16 in	37.3 cm
Width	9 3/4 in	24.8 cm
Depth	21 5/8 in	55.0 cm
Net weight	27 1/2 lbs	12.5 kg
Domestic shipping weight	~36 lbs	~16.4 kg
Export-packed weight	~50 lbs	~22.7 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	17 in	43.2 cm
Net weight	25 1/2 lbs	11.6 kg
Domestic shipping weight	~49 lbs	~22.3 kg
Export-packed weight	~69 lbs	~31.4 kg

RACK MOUNTING
Type RM504 mounts directly to standard 19 inch rack. MOD 171A can be withdrawn from rack on slide-out tracks, tilted and locked in 7 positions.

STANDARD ACCESSORIES
A510 binding-post adapter (013-0004-00); 3 to 2-wire adapter (103-0013-00); smoke-gray filter (378-0567-00); two instruction manuals (070-0224-00). Type RM504 also includes mounting hardware.

TYPE 504 OSCILLOSCOPE $540

TYPE RM504 OSCILLOSCOPE $550

TYPE RM504 OSCILLOSCOPE, MOD 171A $600

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The probes recommended for use with these oscilloscopes satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

PROBES

P6006 10X Probe Package, order 010-0125-00 ..... $ 22

P6007 100X Probe Package, order 010-0134-00 ..... $ 22

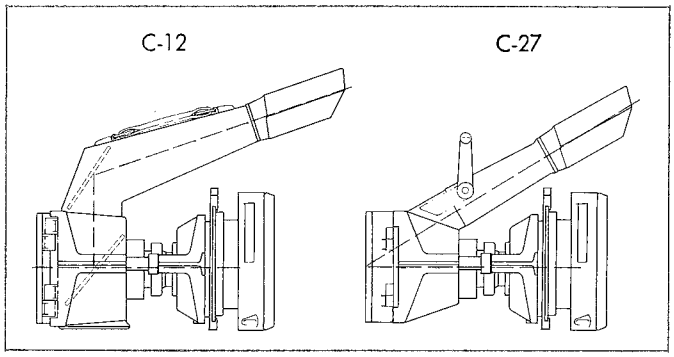
P6027 1X Probe Package, order 010-0070-00 ..... $12.50

SCOPE-MOBILE® CART

Model 201-1: storage drawer and 9-position tilt-lock oscilloscope tray, order 201-1 ..... $120

SLIDE-OUT TRACKS

Convert standard Type RM504 to MOD 171A, provide easy withdrawal and tilt of instrument, order 351-0050-00. . . .$45



CAMERAS

Standard C-12 provides no-parallax viewing, f/1.9-1:0.85 lens, Polaroid Land* Pack Film back, order C-12 ..... $450
Type 504 or RM504 to C-12 Camera adapter, order 016-0226-00 ..... $ 15

Standard C-27 has rotating and removable viewing hood allowing mounting on adjacent Type RM504's, f/1.9-1:0.85 lens. Polaroid Land Pack Film back, order C-27 ..... $420
Type 504 or RM504 to C-27 Camera adapter, order 016-0225-00 ..... $ 15

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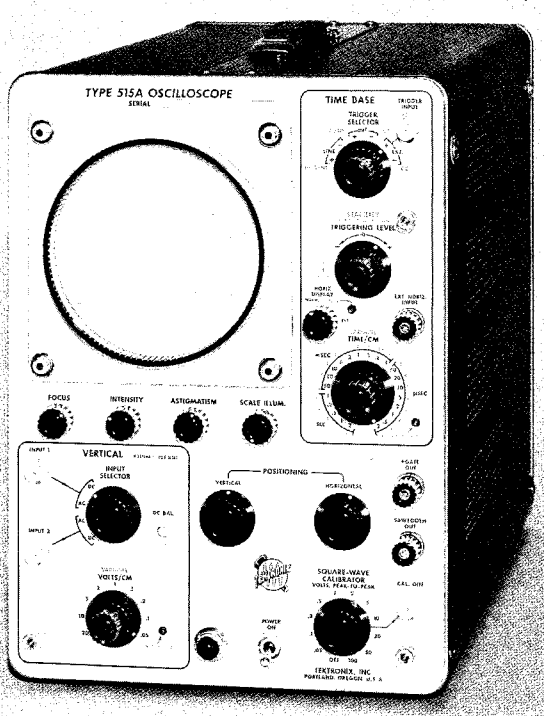
Please refer to Terms and Shipment, General Information page.

DC-to-15 MHz OSCILLOSCOPES



The Tektronix Type 515A is a DC-coupled general purpose cathode-ray oscilloscope combining reliable circuitry in an easy-to-use, compact instrument. Wide time-base range, broad bandwidth characteristics, and calibrated deflection factor make the Type 515A well suited for general-purpose laboratory work and production-line testing applications.

CHARACTERISTIC SUMMARY

VERTICAL

BANDWIDTH—DC to 15 MHz.

RISETIME—24 ns.

CALIBRATED DEFLECTION FACTOR—50 mV/cm to 20 V/cm.

INPUT RC—1 megohm paralleled by approx 36 pF.

HORIZONTAL

CALIBRATED TIME BASE—0.2 μs/cm to 2 s/cm.

X5 MAGNIFIER—Operates over full time base, increases fastest rate to 40 ns/cm.

EXTERNAL INPUT—1.4 V/cm to approx 25 V/cm. DC to 500 kHz at 1.4 V/cm.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—4 kV.

OTHER

AMPLITUDE CALIBRATOR—50 mV to 100 V, approx 1-kHz squarewave.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V, 50 to 60 Hz, approx 300 W.

VERTICAL DEFLECTION

BANDWIDTH
DC to 15 MHz at 3-dB down. Low-frequency 3-dB-down point is approx 2 Hz with AC coupling, approx 0.2 Hz with included 10X probe.

RISETIME
24 ns.

DEFLECTION FACTOR
50 mV/cm to 20 V/cm in 9 calibrated steps, 1-2-5 sequence. All steps accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm. Warning light indicates uncalibrated setting.

INPUT RC
1 megohm paralleled by approx 36 pF.

MAXIMUM INPUT VOLTAGE
600 V combined DC and peak AC.

SIGNAL INPUTS
Two manually-selected signal inputs with approx 60-dB isolation.

DELAY LINE
Permits viewing of leading edge of triggering waveform.

HORIZONTAL DEFLECTION

TIME BASE
0.2 μs/cm to 2 s/cm in 22 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 5 s/cm. Warning light indicates uncalibrated setting.

X5 MAGNIFIER
Operates over full time base, increases fastest rate to 40 ns/cm. Accuracy of magnified time base is within 5%. A neon light indicates when the magnifier is in use.

EXTERNAL INPUT
Variable between approx 1.4 V/cm to 25 V/cm. DC to 500 kHz at 1.4 V/cm (3-dB-down).

OTHER
Gate output: positive-going rectangular pulse with same duration as time base; approx 20-V amplitude.

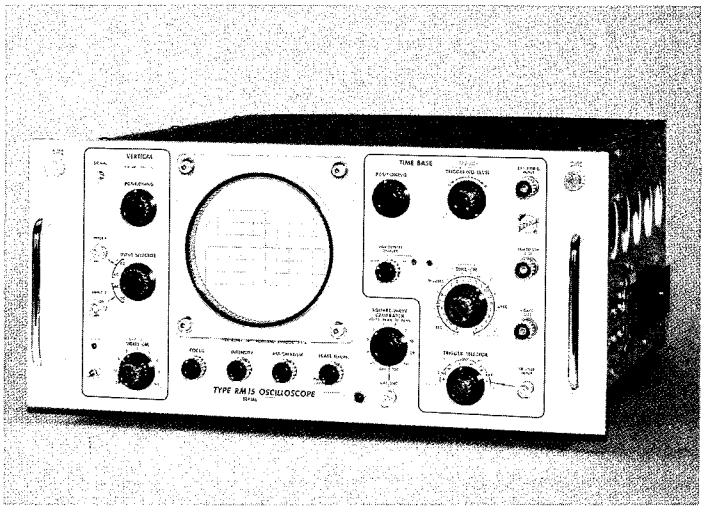
Sawtooth output: positive-going ramp with same duration as time base; approx 150-V amplitude.

TRIGGER

MODES
Manual level selection; Automatic; Preset Stability; HF SYNC. Automatic triggering may be used for signal repetition rates between approx 50 Hz to 2 MHz, eliminating the need for re-adjusting TRIGGERING LEVEL while sequentially viewing signals of different amplitudes, shapes, and repetition rates. With no input, automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace. HF SYNC assures a steady display of sinewave signals up to approx 20 MHz.

COUPLING
DC or AC.

SOURCES
Internal; External; or Line (60 Hz).



REQUIREMENTS
DC: 2 mm deflection (Int) or 0.2 V to 20 V (Ext) from DC to approx 5 MHz.

AC: Same as DC except low-frequency response is 3-dB-down at approx 16 Hz.

AUTOMATIC: 5 mm deflection (Int) or 1 V to 20 V (Ext) from 60 Hz to 2 MHz.

HF SYNC: 2 cm deflection (Int) or 2 V (Ext) from 5 MHz to 20 MHz.

OTHER

AMPLITUDE CALIBRATOR
Approx 1-kHz squarewave; 50 mV to 100 V peak to peak in 11 steps (1-2-5 sequence); accurate within 3%.

TEKTRONIX CRT
Round, 5-inch, flat-faced tube with helical post-accelerating anode. 4-kV accelerating potential. Edge-lighted graticule is scaled with 6 vertical and 10 horizontal centimeter divisions. P31 phosphor normally supplied. Z-axis input (515A only): AC-coupled to CRT cathode: 0.015 μF, 27 kΩ. Positive signal of 5 V will provide adequate blanking of trace at moderate intensity setting. Maximum recommended drive is ±20 V.

DIMENSIONS AND WEIGHTS

Height	14 1/16 in	35.7 cm
Width	9 3/4 in	24.8 cm
Depth	21 13/16 in	55.4 cm
Net weight	42 lbs	19.1 kg
Domestic shipping weight	~51 lbs	~23.2 kg
Export-packed weight	~64 lbs	~29 kg

POWER REQUIREMENTS
105 V to 125 V or 210 V to 250 V, 50 to 60 Hz, wired for 117 V center. Instrument can be ordered wired for operation on any line voltage listed below. Power consumption is approx 300 watts.
Changing taps insures regulation as follows:

110	99 to 117 volts	220	198 to 235 volts
117	105 to 125 volts	234	210 to 250 volts
124	111 to 132 volts	248	223 to 265 volts

STANDARD ACCESSORIES

P6006 10X probe package (010-0127-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke gray filter (378-0567-00); patch cord, BNC-to-BNC, 18 inch (012-0087-00); patch cord, BNC-to-banana plug, 18 inch (012-0091-00); post jack, BNC (012-0092-00); two instruction manuals (070-0247-00).

TYPE 515A OSCILLOSCOPE $875

RACK-MOUNT OSCILLOSCOPE

The Type RM15 is a mechanically rearranged Type 515A Oscilloscope. It mounts in a standard 19-inch rack on slide-out 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 Type RM15 are the same as described for Type 515A Oscilloscope.

DIMENSIONS AND WEIGHTS

Height	$8\frac{3}{4}$ in	22.2 cm
Width	19 in	48.2 cm
Depth	$22\frac{11}{16}$ in	57.8 cm
Net weight	42 lbs	19.1 kg
Domestic shipping weight	~76 lbs	~34.6 kg
Export-packed weight	~96 lbs	~43.6 kg

STANDARD ACCESSORIES

Type RM15 includes accessories listed for Type 515A plus one pair mounting tracks (351-0085-00). Part number for included instruction manuals (2) is (070-0242-00).

TYPE RM15 OSCILLOSCOPE $950

OPTIONAL ACCESSORIES

Optional accessories serve to extend the usefulness of the Type 515A and Type RM15 in certain applications. This listing covers only the more commonly used items. The standard probe (10X) supplied with the instrument satisfies most measurement requirements; optional probes may be better suited for particular applications. In addition to the listed optional probes, other probes are available for current and high-voltage measurements. A complete list of accessory items can be found in the Accessory Section of this catalog.

SUPPORTING CRADLES

When the Type RM15 is used in a backless rack, these supporting cradles are necessary for rear slide support.
Order 040-0344-00 ..... $ 12.00

SCOPE-MOBILE® CART

Type 201-1 Scope-Mobile® Cart features tilt locking in any of nine positions for convenience in viewing Type 515A. 5-inch rubber wheels permit easy transport between locations. Order Type 201-1 ..... $120.00

DUST COVER

Provides protection for Type 515A during transport or storage. Made of waterproof blue vinyl with a clear frontal area for easy identification of the instrument. Order 016-0067-00 ..... $ 7.50

POLARIZED VIEWER

The polarized viewer reduces troublesome reflections and glare under high ambient-light conditions. Order 016-0053-00 ..... $ 10.00

VIEWING HOOD

Includes molded rubber eyepiece and separate tubular light shield. Order 016-0001-01 ..... $ 5.00

CAMERAS

Standard C-12 provides no-parallax viewing, f/1.9-1:0.85 lens, Polaroid Land® Pack Film back, order C-12 ..... $450
Type 515 or RM15 to C-12 Camera adapter, order 016-0226-00 ..... $ 15

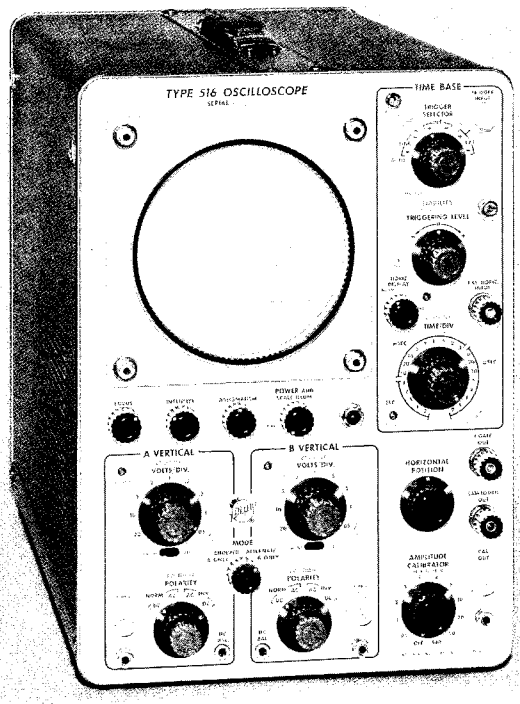
Standard C-27 has rotating and removable viewing hood allowing mounting on adjacent Type RM15's, f/1.9-1:0.85 lens, Polaroid Land Pack Film back, order C-27 ..... $420
Type 515 or RM15 to C-27 Camera adapter, order 016-0225-00 ..... $ 15

PROBES

P6007 100X Probe Package, order 010-0150-00 ..... $ 22.00
P6028 1X Probe Package, order 010-0074-00 ..... $ 12.50

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

DC-to-15 MHz DUAL-TRACE OSCILLOSCOPE



- ***2 IDENTICAL INPUT CHANNELS***
- ***CHOPPED OR ALTERNATE SWITCHING***

The Type 516 is a dual-trace, semi-portable instrument ideally suited to bench work applications. Vertical calibrated deflection factor 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.

CHARACTERISTIC SUMMARY

VERTICAL

(2 Identical Channels)

BANDWIDTH—DC to 15 MHz.

RISETIME—24 ns..

CALIBRATED DEFLECTION FACTOR—50 mV/cm to 20 V/cm.

INPUT RC—1 megohm paralleled by approx 20 pF.

HORIZONTAL

CALIBRATED TIME BASE—0.2 μs/cm to 2 s/cm.

X5 MAGNIFIER—Operates over full time base, increases fastest rate to 40 ns/cm.

EXTERNAL INPUT—1.5 V/cm to approx 25 V/cm. DC to 500 kHz at 1.5 V/cm.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—4 kV.

OTHER

AMPLITUDE CALIBRATOR—50 mV to 100 V, approx 1-kHz squarewave.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V, 50 to 60 Hz, approx 300 W.

TYPE 516

VERTICAL DEFLECTION

(2 Identical Channels)

BANDWIDTH

DC to 15 MHz at 3-dB down. Low-frequency 3-dB-down point is approx 2 Hz with AC coupling, approx 0.2 Hz with included 10X probe.

RISETIME

24 ns.

DEFLECTION FACTOR

50 mV/cm to 20 V/cm in 9 calibrated steps, 1-2-5 sequence. All steps accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm. Warning light indicates uncalibrated setting.

INPUT RC

1 megohm paralleled by approx 20 pF.

MAXIMUM INPUT VOLTAGE

600 V combined DC and peak AC.

OPERATING MODES

Channel A only; Channel B only; Alternate; Chopped; 3.3 μs segments of each channel are displayed (chopping rate 150 kHz). Chopped transient blanking is provided. Polarity; either channel may be operated as normal or inverted.

SIGNAL DELAY

Permits viewing the leading edge of waveform.

HORIZONTAL DEFLECTION

TIME BASE

0.2 μs/cm to 2 s/cm in 22 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 6 s/cm. Warning light indicates uncalibrated setting.

X5 MAGNIFIER

Operates over full time base, increases fastest rate to 40 ns/cm. Accuracy of magnified time base is within 5%. A neon light indicates when the magnifier is in use.

EXTERNAL INPUT

Variable between approx 1.5 V/cm to 25 V/cm. DC to 500 kHz at 1.5 V/cm (3-dB-down).

OTHER

Gate output: positive-going rectangular pulse with same duration as time base; approx 25 V amplitude.

Sawtooth output: positive-going ramp with same duration as time base; approx 150 V amplitude.

TRIGGER

MODES

Manual level selection; Automatic; Preset Stability; HF SYNC. Automatic triggering may be used for signal repetition rates between approx 60 Hz to 2 MHz, eliminating the need for re-adjusting TRIGGERING LEVEL while sequentially viewing signals of different amplitudes, shapes, and repetition rates. With no input, automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace. HF SYNC assures a steady display of sinewaves to approx 20 MHz.

COUPLING

DC or AC.

SOURCES

Internal; External; or Line (60 Hz).

REQUIREMENTS

DC: 2 mm deflection (Int) or 0.5 V to 25 V (Ext) from DC to approx 5 MHz.

AC: Same as DC except low-frequency response is 3-dB-down at approx 16 Hz.

AUTOMATIC: 5 mm deflection (Int) or 1 V to 20 V (Ext) from 60 Hz to 2 MHz.

HF SYNC: 2 cm deflection (Int) or 2 V (Ext) from 5 MHz to 20 MHz.

OTHER

AMPLITUDE CALIBRATOR

Approx 1-kHz squarewave; 50 mV to 100 V peak to peak in 11 steps (1-2-5 sequence); accurate within 3%.

TEKTRONIX CRT

Round, 5-inch, flat-faced tube with helical post-accelerating anode. 4-kV accelerating potential. Edge-lighted graticule is scaled with 6 vertical and 10 horizontal centimeter divisions. P31 phosphor normally supplied.

DUAL-TRACE BLANKING

A rear panel switch provides blanking voltage to eliminate switching transients when operating in the chopped mode.

DIMENSIONS AND WEIGHTS

Height	14 1/16 in	35.7 cm
Width	9 3/4 in	24.8 cm
Depth	21 13/16 in	55.4 cm
Net weight	43 1/2 lbs	19.8 kg
Domestic shipping weight	~53 lbs	~24.1 kg
Export-packed weight	~66 lbs	~30 kg

POWER REQUIREMENTS

105 V to 125 V or 210 V to 250 V, 50 to 60 Hz, wired for 117 V center. Power consumption is approx 300 watts.

Changing taps insures regulation as follows:

110	99 to 117 volts	220	198 to 235 volts
117	105 to 125 volts	234	210 to 250 volts
124	111 to 132 volts	248	223 to 265 volts

STANDARD ACCESSORIES

Two P6006 probe packages (010-0127-00); 3 to 2 wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); Smoke gray filter (378-0567-00); Patch cord, BNC-to-BNC, 18 in (012-0087-00); Patch cord, BNC-to-banana plug, 18 in (012-0091-00); Post jack, BNC (012-0092-00); two instruction manuals (070-0225-00).

TYPE 516 OSCILLOSCOPE $1070

OPTIONAL ACCESSORIES

Optional accessories serve to extend the usefulness of the Type 516 in certain applications. This listing covers only the more commonly used items. The standard probes (10X) supplied with the instrument satisfy most measurement requirements; optional probes may be better suited for particular applications. In addition to the listed optional probes, other probes are available for current and high-voltage measurements. A complete list of accessory items can be found in the Accessory Section of this catalog.

RACKMOUNT 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 inch relay rack and a mask to fit around the regular instrument panel. Rack height requirement is 15 3/4 inches.

Order 040-0277-00 ..... $ 45.00

SCOPE-MOBILE® CART

Type 201-1 Scope-Mobile® Cart features tilt locking in any of nine positions for convenience in viewing Type 516. 5-inch rubber wheels permit easy transport between locations.

Order Type 201-1 ..... $120.00

C-12 CAMERA

f/1.9, 1:0.85 lens; Polaroid Land* Pack-Film Back. Beam-splitting mirror provides on-axis binocular view of the CRT display, eliminating parallax, order C-12 ..... $450.00

C-12 Camera adapter, order 016-0226-00 ..... $ 15.00

PROBES

P6007 100X Probe Package, order 010-0150-00 .... $ 22.00

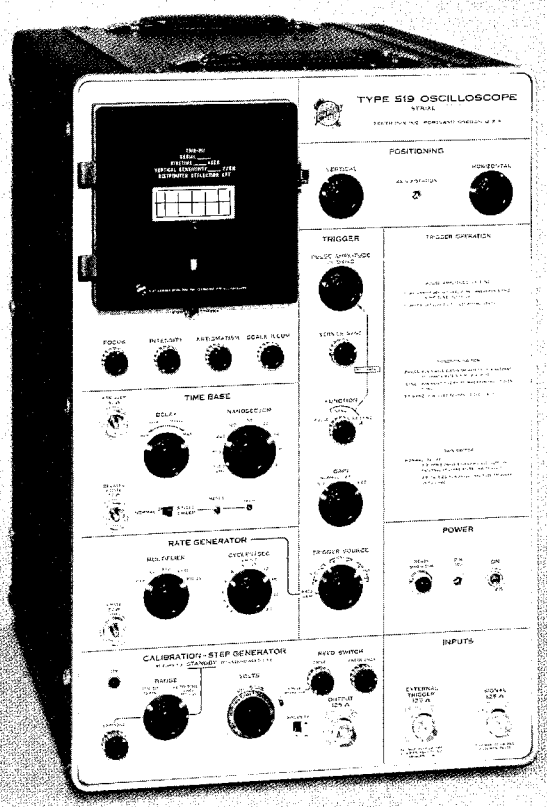
P6028 1X Probe Package, order 010-0074-00 ..... $ 12.50

* Registered Trade-Mark Polaroid Corporation

U.S. Sales Prices FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

DC-to-1 GHz OSCILLOSCOPE



- ***SINGLE-SHOT PHOTOGRAPHS AT 2 NS/CM***
- ***0.004-INCH SPOT SIZE***
- ***SENSITIVE WIDEBAND TRIGGER SYSTEM***
- ***SYNCHRONIZATION TO OVER 1 GIGAHERTZ***
- ***VSWR, 1.25, OR LESS, TO 1 GIGAHERTZ***
- ***DISTRIBUTED-DEFLECTION CRT***
- ***BUILT-IN DELAY LINE***

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 resolution. Performance features include: bandwidth from DC to beyond 1 gigahertz, risetime less than 0.35 ns, deflection factor $\leq$10 V/cm, linear sweeps to 2 ns/cm, sweep delay through 35 ns, 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—a connection of the signal from the device under test.

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

CHARACTERISTIC SUMMARY

VERTICAL

BANDWIDTH—DC to 1000 MHz.

RISETIME—less than 0.35 ns.

DEFLECTION FACTOR—$\leq$10 V/cm.

INPUT IMPEDANCE—125 Ω ±2%.

HORIZONTAL

CALIBRATED TIME BASE—2 to 1000 ns/cm.

SWEEP DELAY—0 to 35 ns.

CRT

DISPLAY AREA—2 x 6 cm.

ACCELERATING VOLTAGE—24 kV.

OTHER

CALIBRATION-STEP GENERATOR—0 to 10 V into 125 Ω or 0 to 1 V into 50 Ω, calibrated and continuously variable. (0.1 ns risetime, approx.) Approximately 750 Hz repetition rate.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V, approx 650 watts.

VERTICAL DEFLECTION

BANDWIDTH
DC to 1 GHz at 3-dB down.

RISETIME
Less than 0.35 ns.

DEFLECTION FACTOR
≤10 V/cm.

INPUT IMPEDANCE
125 Ω ±2%.

MAXIMUM INPUT SIGNAL
±15 VDC or 15 V RMS, or ±100-V pulse. Maximum power input is 1.8 watts.

SIGNAL DELAY
45 ns approx. Permits viewing of leading edge of triggering waveform.

HORIZONTAL DEFLECTION

TIME BASE
2 ns/cm to 1000 ns/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%.

SWEEP DELAY
Sweep start delayed 0—35 ns.

SINGLE SWEEP
After a single sweep is generated, the sweep circuit is locked out until the RESET button is pressed—sweep fires on next trigger. An external jack is provided for remote control of single sweep operation.

SYNCHROSCOPE OPERATION
The output signal from either the +TRIGGER 50 Ω, the DELAYED +GATE 50 Ω, or the +RATE 50 Ω connector can be used to control an external device.

RATE GENERATOR
Output pulse approx 15 V, risetime ≤ 0.8 ns, duration approx 10 ns. Repetition rate variable between 3 Hz and 30 kHz.

TRIGGER

MODES
Pulse—Permits choice of a free-running sweep or a stable sweep which can be triggered on random or uniform repetition rates up to approx 50 MHz.
Sync—Permits stable displays of signals occurring at a constant repetition rate to over 100 MHz.
HF Sync—Permits the sweep to be synchronized with signals from approx 100 MHz to over 1 GHz.

SOURCES
Internal, external, calibration-step generator, or rate generator.

REQUIREMENTS
Two trace widths vertical deflection and 1 ns or greater duration (Internal) or 20 mV or greater amplitude and 1 ns or greater duration (External). Sweep triggers on either the positive or negative slope of the triggering signal.

TRIGGER GAIN
Four gain settings of X0.2, NORMAL, X5, and X20 provide for attenuation or amplification of trigger signals.

MISCELLANEOUS

CALIBRATION STEP GENERATOR
A step-waveform of approximately 750 Hz repetition rate, with amplitude continuously variable and calibrated from 0 to 10 V into 125 Ω, or 0 to 1 V into 50 Ω (through a T50/T125 adapter) is available at a front-panel 125-Ω connector. Risetime is approximately 0.1 ns and either polarity can be selected. Continously variable uncalibrated amplitudes of 0 to 50 V into 125 Ω are also available.

CATHODE-RAY TUBE
5" round, flat-faced tube. 24 kV accelerating potential. Spot diameter at normal intensity 0.004 inch. Maximum x-ray radiation at a distance of two inches from the faceplate does not exceed 0.7 millirems per hour (human limit is 2.5 millirems per hour). At normal viewing distances, x-ray radiation is essentially zero. Normally supplied with P11 phosphor.

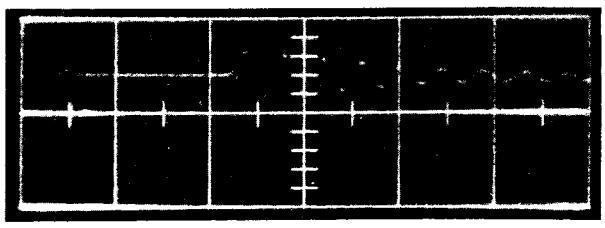
GRATICULE
Edge-lighted with 2 vertical - 6 horizontal centimeter divisions. The horizontal center line markings are 5 mm apart and the vertical center line markings are 2 mm apart. Illumination is controlled by a front-panel knob. The graticule can be dropped out of view if desired.

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

POWER REQUIREMENTS
105 V to 125 V or 210 V to 250 V, 50 to 60 Hz, typically 650 watts. Factory wired for 105 V to 125 V. May be ordered wired for 210 V to 250 V operation.

SINGLE-SHOT PHOTOGRAPHY

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



DIMENSIONS AND WEIGHTS

Height	22¼ in	56.5 cm
Width	14⅝ in	37.2 cm
Depth	25¼ in	64.1 cm
Net weight	97 lb	44.1 kg
Domestic shipping weight	~130 lb	59 kg
Export-packed weight	~169 lb	77 kg

STANDARD ACCESSORIES

Viewing hood (016-0001-01); two 125 Ω terminations (017-0051-00); two 125 Ω insertion units (017-0013-00); 125 Ω coupling capacitor (017-0018-00); 125 Ω 1-GHz timing standard (017-0019-00); Double-button contact assembly (017-0032-00); Panel adapter assembly (017-0033-00); Cable connector (017-0035-00); 125 Ω min loss attenuator, T50/T125 (017-0052-00); 125 Ω adapter N50/N125 (017-0053-00); 125 Ω adapter, T50/N125 (017-0055-00); Delay-line equalizer (017-0057-00); 1-ns cable (017-0507-00); 2-ns cable (017-0508-00); 5-ns cable (017-0509-00); 10-ns cable (017-0510-00); 3 to 2-wire adapter (103-0013-00); Phone jack plug (134-0069-00); 3-conductor power cord (161-0010-00); Walnut box (202-0083-00); Two reed switches (260-0693-00); Accessory box tray (436-0030-00); Two instruction manuals (070-0243-00).

TYPE 519 OSCILLOSCOPE $3900

OPTIONAL ACCESSORIES

Optional accessories serve to extend the usefulness of the Type 519 in certain applications. This listing covers only the more commonly used items. The termination, cables, and adapters supplied with the instrument satisfy most measurement requirements. A complete list of accessory items can be found in the Accessory Section of this catalog.

ATTENUATORS, ADAPTERS, AND CABLES

125-Ω 2:1 attenuator, order 017-0071-00	$30.00
125-Ω 5:1 attenuator, order 017-0049-00	30.00
125-Ω 10:1 attenuator, order 017-0050-00	30.00
125-Ω adapter N50/T125, order 017-0054-00	17.50
125-Ω 90° elbow assembly, order 017-0043-00	15.00
125-Ω 20-ns cable, order 017-0511-00	24.00

SCOPE-MOBILE® CART

Provides portability between various operating areas and serves as a convenient working surface for Type 519, order Model 202-1, Mod 52 ..... $155.00

CAMERA

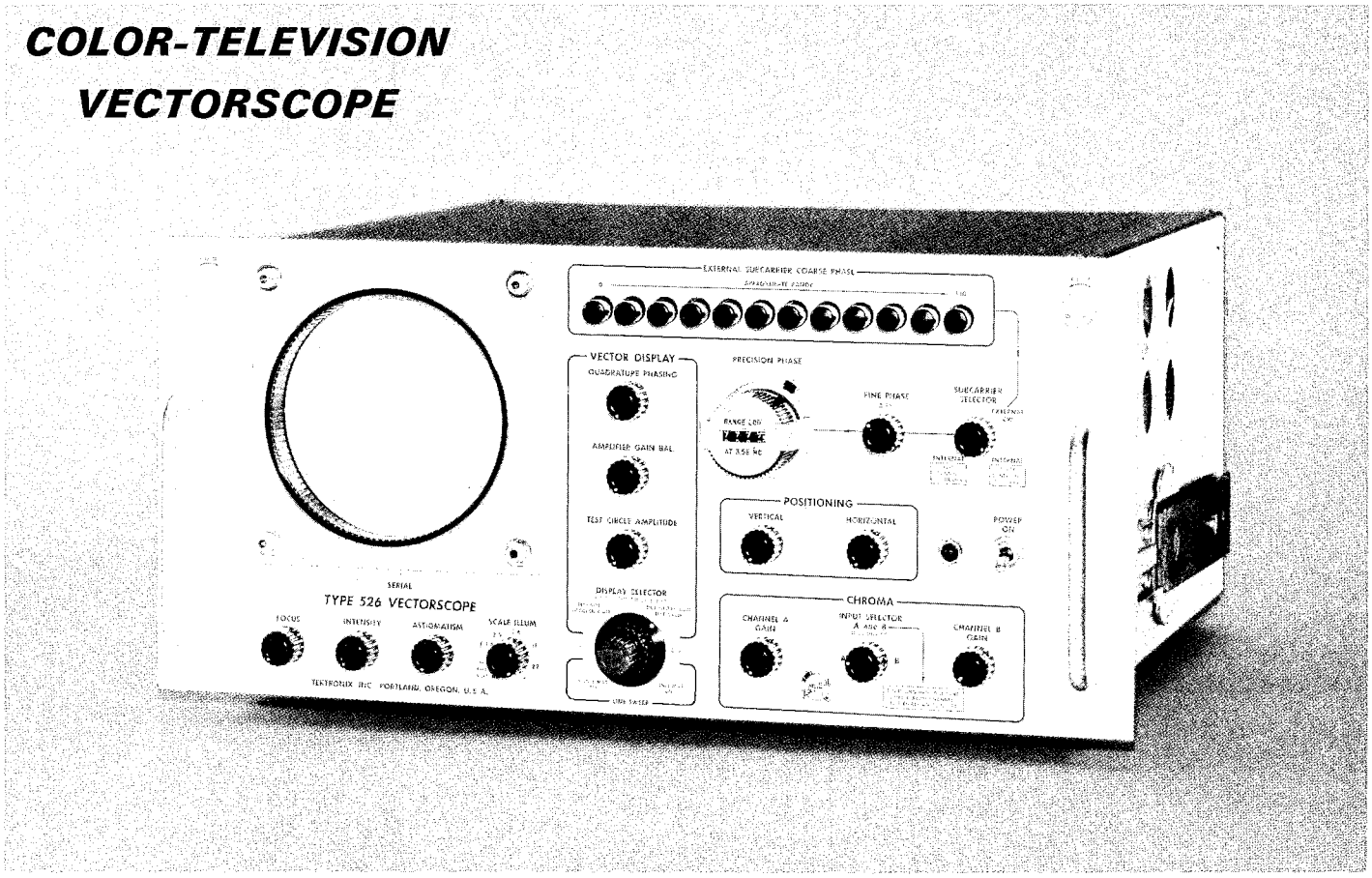
Ultra-high writing rate—f1.3, 1:0.5—Polaroid* Roll-Film back, order C-27-662R $585.00

*Registered Trade-Mark Polaroid Corporation

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

TYPE 526

COLOR-TELEVISION VECTORSCOPE



- ***DIFFERENTIAL PHASE MEASUREMENTS***
- ***DIFFERENTIAL GAIN MEASUREMENTS***
- ***LINEAR TIME BASE***
- ***POSITIVE IDENTIFICATION OF BURST PULSE***
- ***PUSH-PULL 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 NTSC 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 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 ±1.5° can be made using the vector display. Accuracy of saturation measurements will be within ±2% on graticule, closer when comparing two signals.

LINEAR-SWEEP PRESENTATION

Phase measurements are simplified by displaying the demodulated chroma signals vertically on a linear horizontal sweep, which is terminated by the horizontal sync pulse and restarts just prior to the burst packet. Using the null technique, differential phase can be measured to 0.1° and differential gain to an accuracy of 1%. A signal magnifier can be used to expand the vertical deflection approximately 7 times.

DUAL DISPLAYS

In dual-channel operation, successive 2-ms segments of each channel are displayed at an approx 500-hertz rate per channel. For example, the input signal to a portion of the broadcast facility 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 facility 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 μs of the linear sweep. During the 3-μs interval the CRT trace is brightened for positive identification of the burst packet. Trace brightening during the burst-sampling interval also facilitates adjustment of burst-amplifier gating.

VERTICAL INTERVAL TEST SIGNAL OBSERVATION

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

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

OTHER CHARACTERISTICS

DC-COUPLED SIGNAL CIRCUITS

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

VIDEO INPUTS

Channel A and Channel B inputs are compensated for 75-ohm loop-through operation. Input stages are cathode followers. Sufficient gain is provided to allow use of a compensated probe rather than loop-through input. The gain controls of each channel have a range of 40 dB and produce virtually no phase-shift effects.

SYNC INPUT

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

EXTERNAL SUBCARRIER INPUT

High-impedance compensated loop-through connector for 75-ohm coaxial cable (R = 1 megohm, C = 20 pF). Input has buffer-amplifier stage and requires a signal level of 2 V 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

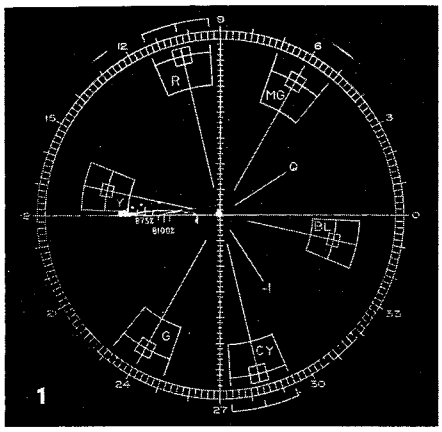
A jack (PL-55) is provided for external trace-brightening pulses. Internal blanking circuitry is disconnected when an external signal is being applied. Signal required for trace brightening is an AC-coupled positive-going 20-volt pulse, which can be obtained from the + GATE terminal of a Tektronix oscilloscope 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.

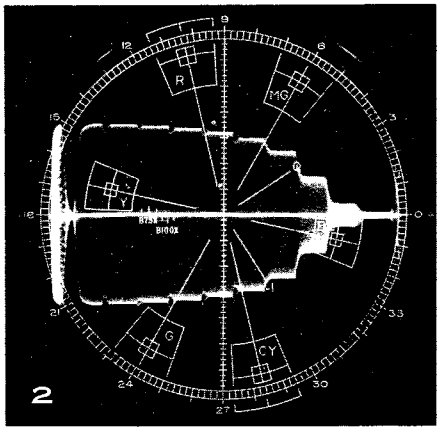
TEKTRONIX CRT

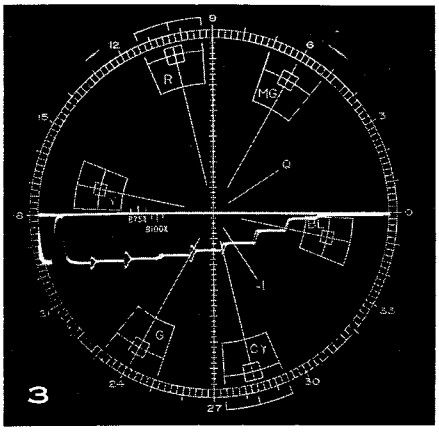
The Type 526 uses a 5-inch flat-faced monoaccelerator tube with similar vertical and horizontal deflection factors and excellent linearity. Accelerating potential is 4 kV. A P31 phosphor is normally supplied.

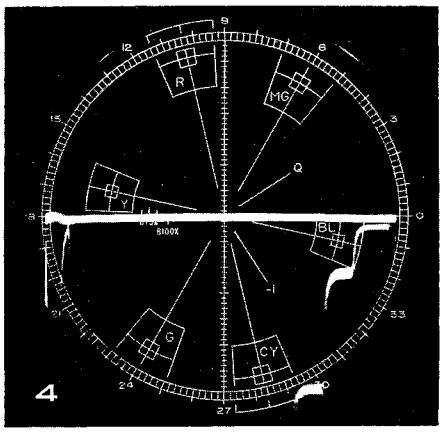
GRATICULE

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. The large boxes









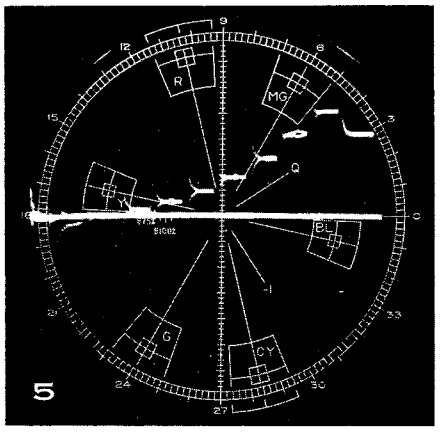


Figure 1. VECTOR DISPLAY
Modulated Stairstep Signal showing differentiol gain (differing radial distance from center), and differential phase (rotation of dots around center).

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

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

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

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

represent ±20% in amplitude and ±10° in phase. This is in accord with current FCC rules and regulations. The small boxes represent ±5% in amplitude and ±3° in phase. These numbers are thought to represent good studio practice. The limits around the burst signal are ±10%. Graticule illumination is controlled by a front-panel knob.

POWER REQUIREMENT

Electronically-regulated DC supplies insure stable operation between 105 and 125 V or between 210 and 250 V, 50 to 60 Hz. Transformer taps allow operation on either range. Instrument factory wired for 117 V. Power consumption approximately 240 watts.

ACCESSIBILITY

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

DIMENSIONS AND WEIGHTS

Height	8¾ in	22.2 cm
Width	19 in	48.2 cm
Rack depth	18 in	45.7 cm
Net weight	44½ in	20.2 kg
Domestic shipping weight	~74 lbs	~33.6 kg
Export-packed weight	~95 lbs	~43.2 kg

STANDARD ACCESSORIES

Three terminating resistors (011-0023-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0024-00); smoke gray filter (378-0567-00); one pair mounting tracks (351-0084-00); two instruction manuals (070-0121-00).

TYPE 526 VECTORSCOPE $1665
TYPE 526 MOD 158M VECTORSCOPE $1750

The Type 526 MOD 158M is modified and factory calibrated for use at the PAL color subcarrier frequency of 4.43361875 MHz. The Precision Phase Shift dial reads directly in degrees at the PAL frequency. An appropriate graticule will be furnished. All other specifications are identical to those listed for the standard Type 526.

OPTIONAL ACCESSORIES

SUPPORTING CRADLES

For rear slide support when instrument is mounted in backless rack. Includes two cradles with necessary mounting hardware. Order 040-0344-00 ..... $12.00

C-27 CAMERA

f/1.9, 1:0.5 lens; Polaroid Land* Pack-Film back, order C-27-549 ..... $460
Type 526 to C-27 Camera Adapter, order 016-0225-00....$ 15

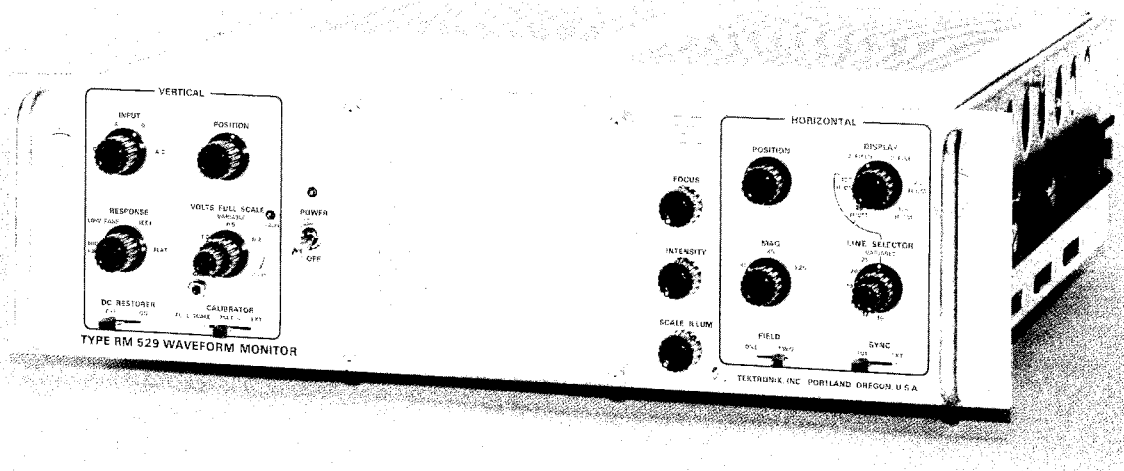
TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES

In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.

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

*Registered Trade-Mark Polaroid Corporation

TELEVISION WAVEFORM MONITORS



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

Newest of the Tektronix line of Television Instruments, the Type 529 and RM529 bring to the Industry a new flexibility in waveform monitoring: signal-level monitoring, bandwidth and differential gain measurements, sine^2-pulse and bar testing, monitoring Vertical Interval Test signals, transmitter percent-of-modulation measurements, YRGB displays (in conjunction with color-processing amplifiers) and others. Included are four video response characteristics, HIGH-PASS, LOW-PASS, IEEE, and FLAT. Both instruments feature FLAT RESPONSE to 8 MHz, assuring excellent waveform fidelity for sine squared testing with 2T, T and $\frac{1}{2}$T pulses.

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

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

BRIGHT WAVEFORM DISPLAYS in line selector operation are obtained with a new, highly efficient 5" aluminized CRT. The instrument uses the best of both solid-state and vacuum-tube circuitry resulting in improved stability and reliability. These instruments do not require a fan, resulting in cleaner operation and complete freedom from noise.

HORIZONTAL SELECTION provides 2-field or 2-line displays, plus calibrated sweep rates of 0.125 H/cm or 0.25 H/cm. Either calibrated rate may be delayed for line selection. SWEEP MAGNIFICATION extends the sweep rate by X5 or X25, offering calibrated sweep rates from 0.250 H/cm to 0.005 H/cm. POSITIVE FIELD SELECTION assures stable displays in the presence of random noise bursts and video switching. The LINE SELECTOR permits detailed study of any portion of any desired line(s), and a front panel switch selects lines 16 through 21 for viewing VIT signals. A VIDEO-OUTPUT AMPLIFIER supplies video and a brightening pulse to the associated picture monitor, intensifying the same line, or lines, displayed on the instrument when using the LINE SELECTOR. The amplifier has excellent frequency response and linearity.

VIDEO FEATURES

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

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

FREQUENCY RESPONSE
4 response characteristics provide: FLAT: +0.0 — 0.1 dB to 6 MHz; +0.0 — 0.3 dB to 8 MHz. IEEE-Spec 23S-1 of 1958 (amended): 3.58 MHz —20 dB. HIGHPASS: 3.58 MHz plus and minus 400 kHz at —3 dB. LOW PASS: —18 dB at 500 kHz.

LOW FREQUENCY TILT
Less than 1% tilt on 50-Hz square wave.

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

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

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

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

TIME-BASE FEATURES

CALIBRATED TIME BASE
0.125 H/cm. Magnifier extends calibrated time base to 0.025 H/cm and 0.005 H/cm. Accuracy is ±3%. Rep rate is ½ of the TV line rate. The time base can be calibrated using TV signals. Color burst is displayed without phase interlace. (see Fig. 6)

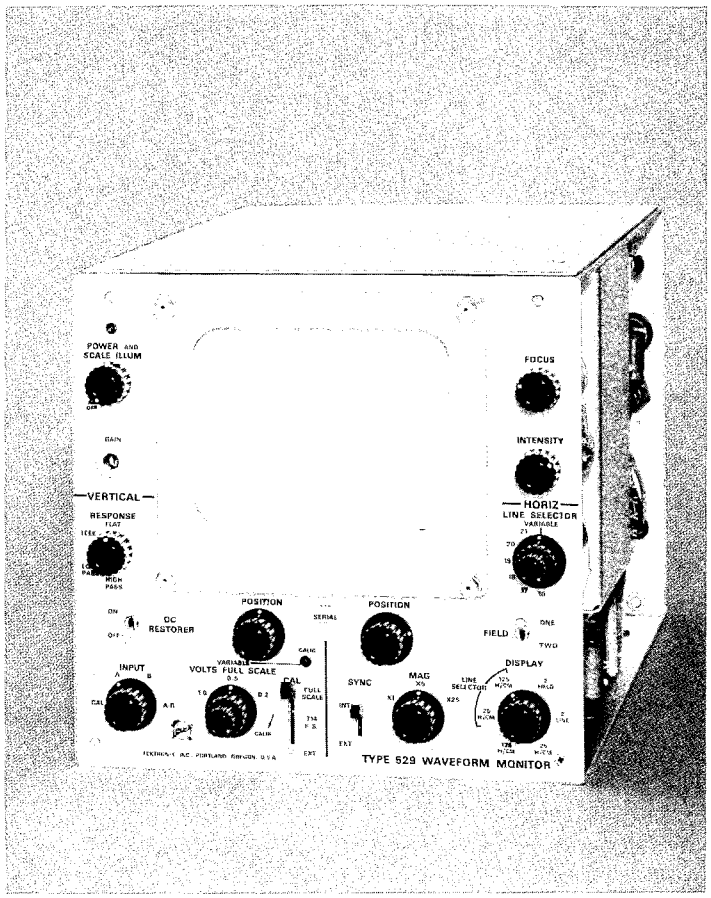
UNCALIBRATED TIME BASE
2 LINE: Triggered time base with rep rate of ⅓ TV line frequency. Provides complete 2-line display with horizontal blanking centered on the screen. (see Fig. 5.)

2 FIELD: Synchronized time base with rep rate the same as the TV frame rate. Entire frame of video is displayed with the vertical blanking centered on the screen. Time base will free-run in the absence of signal, indicating loss of incoming signal.

TIME-BASE MAGNIFIER
X5 and X25. Accuracy ±3%. Magnifier expands the center of the display, convenient for monitoring equalizing or serrated pulses.

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

*Sync tip restoration available by simple modification.



VIT SELECTOR
Front-panel switch selects lines 16 through 21. Knob position indicates line selected for viewing.

LINE SELECTOR
Variable delay allows any line of either field to be viewed.

FIELD SELECTOR
Positive-acting field selection.

TRIGGER SELECTION
Stable triggering on composite video signals. INTERNAL: 200 mV to 1 V or more, peak to peak. EXTERNAL: 250 mV to 1 V or more, peak to peak.

OTHER FEATURES

REGULATED POWER SUPPLY
Operates on 115 V or 230 V line ± 10% RMS. LINE FREQUENCY: 50-60 Hz. POWER CONSUMPTION: Approx 80 W at 115 V, 60 Hz.

TEKTRONIX CATHODE-RAY TUBE
Flat-faced, 5" rectangular CRT, operating at 5.5 kV accelerating potential. Calibrated viewing area, 7 x 10 cm. Electrical beam rotator provides trace alignment. Standard phosphor furnished (P-31). Scale illumination: Variable edge-lighting.

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

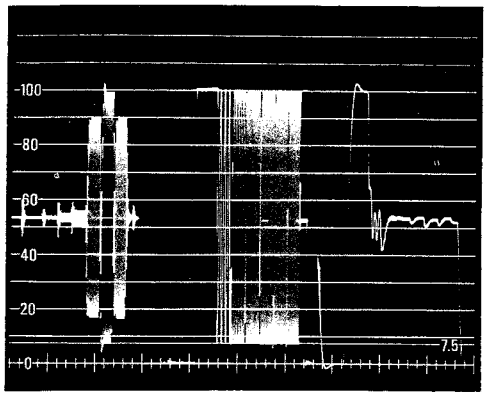


Fig. 1.—Multiburst Signal. Multiple exposure photograph. Left: High-pass response position. Center: Flat-frequency response position. Right: Low-pass response position.

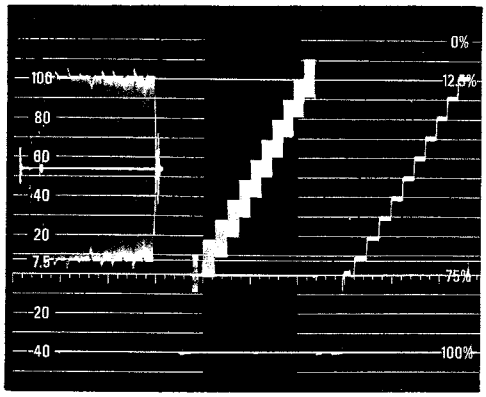


Fig. 2.—Modulated Stair-Step Signal. Multiple exposure. Left: High-pass position, showing gain increased to X5 for measuring differential gain. Center: Flat-response position. Stair-step signal shows 20 IEEE units of color sub-carrier. Right: IEEE response position showing sub-carrier substantially eliminated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

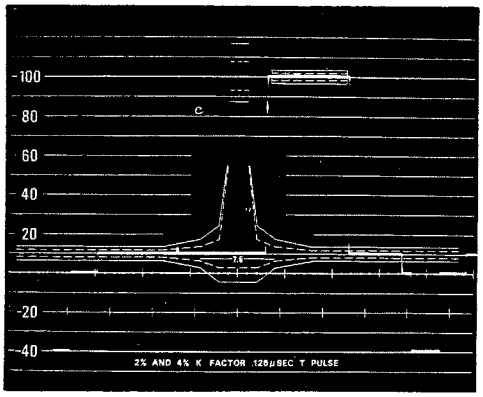


Fig. 3.—Sine² Pulse and Bar Signal. 0.125 μs HAD T-Pulse and Bar.

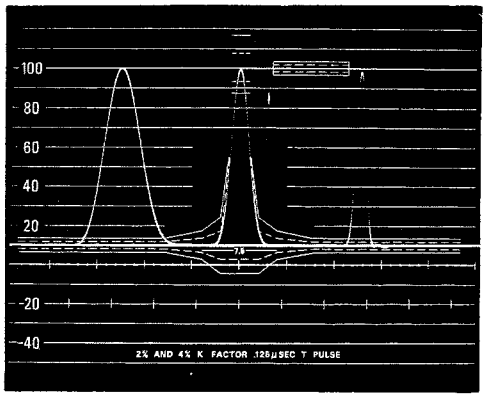


Fig. 4—2T Signal. Multiple exposure. Left: 2T. Center: T. Right: ½ T Sine² , 0.25, 0.125, 0.0625 μs HAD.

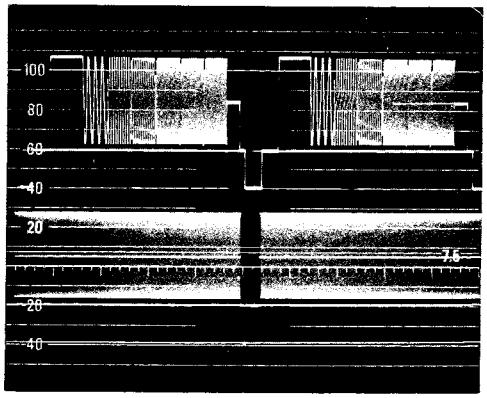


Fig. 5.—Double exposure showing complete two-field displays and two-line displays.

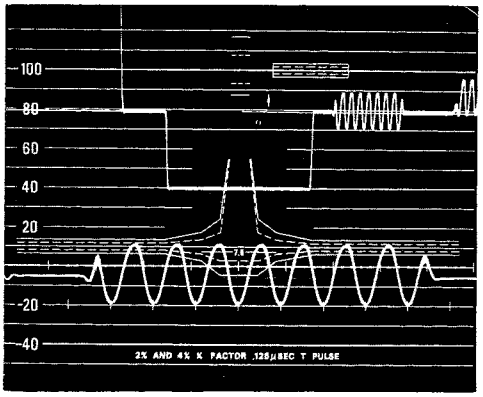


Fig. 6.—Color-Burst Signal. Double exposure. Top: X5 magnification. Horizontal display. 0.125 H/cm. Sweep: 0.025 H/cm. Bottom: X25 magnification. Horizontal display: 0.125 H/cm. Sweep: 0.005 H/cm.

VENTILATION

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

CONSTRUCTION

Aluminum-alloy chassis.

FINISH

Anodized front panel.

DIMENSIONS AND WEIGHTS

TYPE 529:	Height	8¼ in	21 cm
	Width	8½ in	21.6 cm
	Depth	19 9/16 in	49.7 cm
	Net weight	25½ lbs	11.6 kg
	Domestic shipping weight	~34 lbs	~15.5 kg
	Export-packed weight	~47 lbs	~21.4 kg

Two Type 529 Waveform Monitors can be mounted side-by-side, or one mounted alongside an associated picture monitor in a standard 19 inch rack or console.

TYPE RM529:	Height	5¼ in	13.3 cm
	Width	19 in	48.2 cm
	Rack depth	18¼ in	46.4 cm
	Net weight	30½ lbs	13.9 kg
	Domestic shipping weight	~59 lbs	~26.8 kg
	Export-packed weight	~81 lbs	~36.8 kg

Instrument fits standard 19 inch rack, can be pulled forward and tilted 90°.

STANDARD ACCESSORIES

TYPE 529: Smoke-gray light filter (378-0560-00); composite graticule as shown in fig. 5 (331-0156-01); noncomposite graticule as shown in fig. 1 (331-0077-01); dual scale graticule as shown in fig. 2 (331-0157-00); sine², K factor, and IEEE graticule, as shown in figs. 3, 4, 6 (331-0161-00); 75-ohm termination resistor (011-0023-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0509-00).

TYPE RM529: same as Type 529 but includes four retainer bars (381-0187-00); one pr tracks (351-0040-02); two instruction manuals (070-0466-00).

ORDERING INFORMATION

ORDER TYPE 529 OR RM529 FOR 525 LINE, 30 FRAME TELEVISION STANDARDS

TYPE 529 WAVEFORM MONITOR $1050
TYPE RM529 WAVEFORM MONITOR $1100

ORDER TYPE 529 OR RM529, MOD 188A FOR 625 LINE, 25 FRAME TELEVISION STANDARDS, CALIBRATED WITH CCIR AND PAL SIGNALS

Features line selector and VIT selector (discrete line selection for lines 16 through 21) calibrated for 625-line 25-frame systems. HORIZONTAL DISPLAYS are 2 FIELD, 2 LINE, 0.1 H/cm and 10 μs/cm; LINE SELECTOR SWEEP RATES, 0.2 H/cm and 0.1 H/cm. HIGH PASS RESPONSE: 4.43 MHz at 60 mV full scale; —3 dB bandwidth 800 kHz. BANDPASS: Center, 1.1 MHz; bandwidth —1 dB at 0.9 and 1.3 MHz, —18 dB at 0.2 MHz. FLAT: Response +0, —0.1 dB from midband response, 50 Hz to 6 MHz. CALIBRATION VOLTAGES: 0.70 and 1.00 V. LINE VOLTAGE: wired and fused for 230 V unless otherwise specified. Each instrument includes accessories listed for standard 529/RM529, except graticules furnished are calibrated for CCIR rather than IEEE signals: Graticule, composite CCIR video, Sin^2 and K factor—ruled 0-100 units with 30-unit blanking level, 2 and 4% K factor for 0.1 μs T pulse and 0.2 μs 2T pulse (331-0185-00); Graticule, composite CCIR video—ruled 0-100 units with 30-unit blanking level (331-0184-00).

TYPE 529 MOD 188A $1050
TYPE RM529 MOD 188A $1100

The Type 529 and RM529 can be adapted for use with other television system standards. Please consult your Tektronix Field Engineer or Representative.

OPTIONAL ACCESSORIES

TYPE 529 FIELD CASE

Provides cabinet protection for the Type 529 when used for applications outside of the rack. Aluminum construction, blue vinyl finish; order 016-0084-00 ..... $50

C-27 CAMERA

f/1.9-1:0.85 lens; Polaroid Land+ Pack-Film back, order C-27 ..... $420

Type 529 or RM529 to C-27 Camera Adapter, order 016-0224-00 ..... $ 15

MESH FILTER

For improving display contrast when viewing under high-ambient light conditions; includes special graticule cover. Order 378-0575-00 ..... $ 15

CONNECTOR

Used with color processing amplifiers for RBG, etc. displays. Order 134-0049-00 ..... $ 4

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TYPE 529 MOUNTING CRADLES

Two different cradle assemblies, with associated bezels, allow the Type 529 Waveform Monitor to be mounted alongside an 8 inch or 9 inch Conrac* Picture Monitor, in a standard 19 inch rack. A cradle and bezel are also available for mounting two Type 529's side-by-side.

FOR MOUNTING 8 INCH CNB-8 PICTURE MONITOR (REQUIRES 10½ INCHES RACK SPACE)

Description	Part Number	Price
Cradle Assembly	014-0021-00	$25.00
Bezel, for mounting Type 529 on operator's left	014-0027-00	45.00
Bezel, for mounting Type 529 on operator's right	014-0028-00	45.00

FOR MOUNTING 8 INCH CZB-8 PICTURE MONITOR (REQUIRES 10½ INCHES RACK SPACE)

Cradle Assembly	014-0021-00	25.00
Bezel, for mounting Type 529 on operator's left	014-0025-00	45.00
Bezel, for mounting Type 529 on operator's right	014-0026-00	45.00

FOR MOUNTING 9 INCH RNB-9 PICTURE MONITOR (REQUIRES 8¾ INCHES RACK SPACE)

Cradle Assembly	014-0020-00	25.00
Bezel, for mounting Type 529 on operator's left	014-0023-00	35.00
Bezel, for mounting Type 529 on operator's right	014-0024-00	35.00

FOR MOUNTING TWO TYPE 529 WAVEFORM MONITORS SIDE-BY-SIDE (REQUIRES 8¾ INCHES RACK SPACE)

Cradle Assembly	014-0020-00	25.00
Bezel	014-0022-00	35.00

RM529 CRADLE ASSEMBLY

For mounting the Type RM529 in a WECO backless rack, order 426-0309-00 ..... $8.90

See the accessory pages at the rear of the catalog for additional information on cameras and other accessory items not listed.

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES

In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.

*Registered Trademark, Conrac Division, Giannini Controls Corporation

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

DC-to-15 MHz OSCILLOSCOPE

6 X 10 CM DISPLAY

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

The Type 531A is the lowest-cost oscilloscope that accepts Letter-Series and 1-Series Plug-In Units. In common with other Type 530-Series Oscilloscopes, the Type 531A has 10-kV accelerating voltage for bright displays, 6 x 10-cm display area, and a DC-to-15 MHz vertical-deflection system. With spectrum analyzer and sampling plug-in units, measurement capabilities extend into the gigahertz region.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of the 1-Series and Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

X5 MAGNIFIER—Extends time base to 20 ns/cm.

EXTERNAL INPUT—0.2 V/cm to 2 V/cm, DC to 350 kHz.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—10 kV.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mV to 100 V (1-kHz square wave).

POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 V (±9% on each range). 455 watts maximum.

VERTICAL PLUG-IN UNITS				
PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 15 MHz DC to 14 MHz 2 Hz to 10 MHz	24 ns 25 ns 35 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 15 MHz	24 ns	325
CA Dual-Trace	50 mV/cm	DC to 13 MHz	27 ns	260
1A4 Four-Trace	10 mV/cm	DC to 15 MHz	24 ns	750
M Four-Trace	20 mV/cm	DC to 14 MHz	25 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 14 MHz 2 Hz to 10 MHz	25 ns 35 ns	145
H	50 mV/cm	DC to 11 MHz	32 ns	185
K	50 mV/cm	DC to 15 MHz	24 ns	145
L	50 mV/cm 5 mV/cm	DC to 15 MHz 3 Hz to 14 MHz	24 ns 25 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 14 MHz	25 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 1 mV/cm	DC to 15 MHz DC to 14 MHz	24 ns 25 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 14 MHz	25 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 7 MHz DC to 13 MHz	50 ns 27 ns	550
Z Comparator	50 mV/cm	DC to 10 MHz	35 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	

VERTICAL DEFLECTION

BANDWIDTH
DC to 15 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
24 ns, depending on plug-in unit. See chart.

DELAY LINE
Permits viewing leading edge of displayed waveform.

SIGNAL OUTPUT
<10 Hz to >5 MHz at 3-dB down, no load (cathode-follower output). At least 1.5 V for each centimeter of displayed signal.

HORIZONTAL DEFLECTION

TIME BASE
0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning light indicates uncalibrated setting.

X5 MAGNIFIER
Operates over full time base, increases fastest rate to 20 ns/cm. Magnified time base accurate within 5%.

EXTERNAL INPUT
Fixed steps of approx 0.2 V/cm and 2 V/cm, continuously variable between steps and to approx 20 V/cm,DC to ≥350 kHz at —3 dB. 50-V maximum input (DC + peak AC) in most sensitive position. Input RC approx 1 MΩ paralleled by approx 40 pF.

SIGNAL OUTPUTS
Gate (positive going from 0 to at least +20 V), sawtooth (positive going from 0 to at least +130 V). Cathode follower outputs.

TRIGGER

MODES
Automatic mode or manual level selection; high-frequency sync. Automatic operation is useful between approx 50 Hz and 2 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes, and repetition rates. With no input (or input less than 50 Hz), automatic triggering occurs at an approx 40-Hz rate, providing a convenient reference trace. High-frequency sync assures a steady display of sine-waves from less than 5 to 30 MHz.

COUPLING
AC, DC or AC LF reject.

SOURCES
Internal (from oscilloscope vertical amplifier), external, or line. External trigger input RC approx 1 MΩ (except 91 kΩ in AC LF reject) paralleled by approx 40 pF. 50-V maximum input (DC + peak AC).

REQUIREMENTS
0.2-cm deflection or 0.2-V external from 150 Hz to 2 MHz, increasing to 1-cm deflection or 1-V external at 5 MHz. Requirements increase below 150 Hz with AC coupling, below 10 kHz with AC low-frequency reject. DC coupling requires 0.4-cm deflection or 0.2-V external from DC to 2 MHz, increasing to 2-cm deflection or 1-V external at 5 MHz. Automatic operation requires 0.2-cm deflection or 0.2 V external from 50 Hz to 1 MHz, increasing to 1-cm deflection or 1-V external at 2 MHz. High-frequency sync requires 2-cm deflection or 2-V external between approx 5 and 30 MHz. ±10-V trigger level selection.

CRT

TEKTRONIX CRT

5-in metallized screen, helical post accelerating anode, 10-kV accelerating potential for bright displays. P2 phosphor normally supplied. Z-axis input requires 20-V peak to peak for CRT modulation at normal intensity.

GRATICULE

External; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions.

DISPLAY FEATURES

Beam-position indicators show direction of CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

0.2-mV to 100-V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate.

POWER REQUIREMENTS

Wired for 115-V RMS ±9%; transformer taps permit operation at 108, 115, 122, 216, 230, or 244 V (±9% on each range); 50 to 60 Hz. 455-W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	$12\frac{15}{16}$ in	32.9 cm
Depth	$23\frac{7}{8}$ in	60.7 cm
Net weight	$56\frac{1}{2}$ lbs	25.7 kg
Domestic shipping weight	~75 lbs	~34.1 kg
Export-packed weight	~95 lbs	~43.2 kg

STANDARD ACCESSORIES

Two P6006 10X probes (010-0127-00); BNC-to-BNC 18-in patch cord (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00); BNC-post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter (378-0567-00); two instruction manuals (070-0130-00).

TYPE 531A, without plug-in units $995

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERA

The standard C-12 camera satisfies most trace-recording requirements. For applications that might require a different viewing system, lens, or back, refer to camera descriptions or consult your field engineer, representative, or distributor.

Standard C-12: f/1.9—1:0.85 lens, no-parallax viewing, Polaroid Land* Pack-Film back, order C-12 ..... $450

Type 531A to C-12 Camera adapter, order 016-0226-00 .. $15

PROBES

The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

RACK-MOUNT ADAPTER

Consists of cradle to support the Type 531A in any standard 19-in relay rack, and mask to fit around the front panel. Requires $17\frac{1}{2}$-in panel height, order 040-0281-00 .... $31.25

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES

In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.

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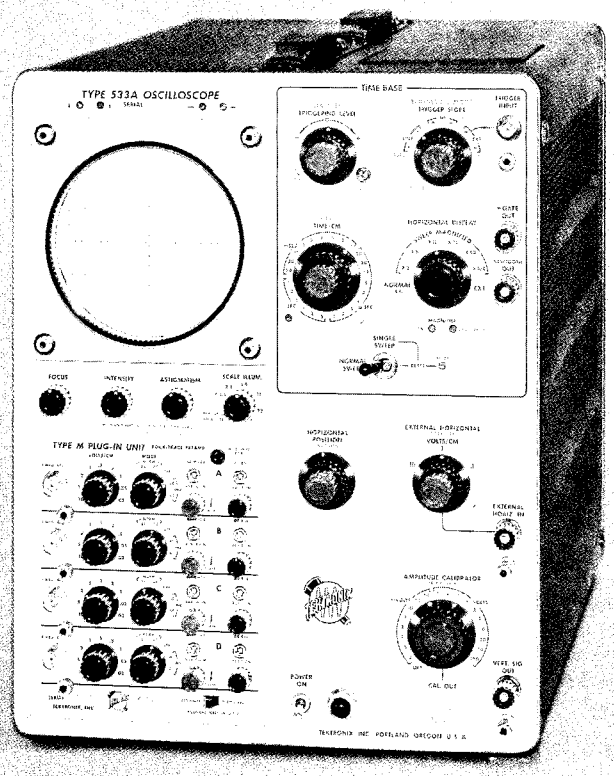
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

TYPE 533A

DC-to-15 MHz OSCILLOSCOPE



- ***X100 SWEEP MAGNIFIER***
- ***6 x 10-cm DISPLAY***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL PURPOSE PLUG-INS***

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

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

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of the 1-Series and Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

SWEEP MAGNIFIER—X2, X5, X10, X20, X50, X100. Extends calibrated time base to 20 ns/cm.

EXTERNAL INPUT—0.1 V/cm to 10 V/cm (calibrated) DC to 500 kHz.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—10 kV.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mV to 100 V; 1-kHz square wave.

POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 V (±9% on each range). 500 watts maximum.

VERTICAL PLUG-IN UNITS				
PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 15 MHz DC to 14 MHz 2 Hz to 10 MHz	24 ns 25 ns 35 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 15 MHz	24 ns	325
CA Dual-Trace	50 mV/cm	DC to 13 MHz	27 ns	260
1A4 Four-Trace	10 mV/cm	DC to 15 MHz	24 ns	750
M Four-Trace	20 mV/cm	DC to 14 MHz	25 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 14 MHz 2 Hz to 10 MHz	25 ns 35 ns	145
H	50 mV/cm	DC to 11 MHz	32 ns	185
K	50 mV/cm	DC to 15 MHz	24 ns	145
L	50 mV/cm 5 mV/cm	DC to 15 MHz 3 Hz to 14 MHz	24 ns 25 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 14 MHz	25 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 1 mV/cm	DC to 15 MHz DC to 14 MHz	24 ns 25 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 14 MHz	25 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 7 MHz DC to 13 MHz	50 ns 27 ns	550
Z Comparator	50 mV/cm	DC to 10 MHz	35 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	

VERTICAL DEFLECTION

BANDWIDTH

DC to 15 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME

24 ns, depending on plug-in unit. See chart.

DELAY LINE

Permits viewing leading edge of displayed waveform.

SIGNAL OUTPUT

<10 Hz to >5 MHz at 3-dB down, no load (cathode follower output). At least 1.5 V for each centimeter of displayed signal.

HORIZONTAL DEFLECTION

TIME BASE

0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning light indicates uncalibrated setting.

MAGNIFIER

X2, X5, X10, X20, X50, or X100 magnification. Magnified time base accurate within 5% up to 20 ns/cm. Warning light indicates when magnified time base exceeds 20 ns/cm (uncalibrated).

OPERATING MODES

Normal, single sweep.

EXTERNAL INPUT

0.1, 1, and 10 V/cm, accurate within 5%. Uncalibrated, continuously variable between steps and to approx 100 V/cm. DC to ≥500 kHz at —3 dB. 50-V maximum input (DC + peak AC) in most sensitive position. Input RC approx 1 MΩ paralleled by approx 40 pF.

SIGNAL OUTPUTS

Gate (positive going from 0 to at least +20 V), sawtooth (positive going from 0 to at least +130 V). Cathode follower outputs.

TRIGGER

MODES

Automatic mode or manual level selection; high-frequency sync. Automatic operation is useful between approx 50 Hz and 2 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes, and repetition rates. With no input (or input less than 40 Hz), automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace. High-frequency sync assures a steady display of sinewaves from less than 5 to 30 MHz.

COUPLING

AC, DC or AC LF reject.

SOURCES

Internal (from oscilloscope vertical amplifier), external, or line. External trigger input RC approx 1 MΩ (except 91 kΩ in AC LF reject) paralleled by approx 40 pF. 50-V maximum input (DC + peak AC).

REQUIREMENTS

0.2-cm deflection or 0.2-V external from 150 Hz to 2 MHz, increasing to 1-cm deflection or 1-V external at 5 MHz. Requirements increase below 150 Hz with AC coupling, below 10 kHz with AC low-frequency reject. DC coupling requires 0.4-cm deflection or 0.2-V external from DC to 2 MHz, increasing to 2-cm deflection or 1-V external at 5 MHz. Automatic operation requires 0.2-cm deflection or 0.2-V external from 50 Hz to 1 MHz, increasing to 1-cm deflection or 1-V external at 2 MHz. High-frequency sync requires 2-cm deflection or 2-V external between approx 5 and 30 MHz. ±10-V trigger level selection.

CRT

TEKTRONIX CRT

5-in metallized screen, helical post accelerating anode, 10-kV accelerating potential for bright displays. P2 phosphor normally supplied. Z-axis input requires 20-V peak to peak for CRT modulation at normal intensity.

GRATICULE

External; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions.

DISPLAY FEATURES

Beam-position indicators show direction of CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

0.2-mV to 100-V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate.

POWER REQUIREMENTS

Wired for 115-V RMS ±9%; transformer taps permit operation 108, 115, 122, 216, 230, or 244 V (±9% on each range); 50 to 60 Hz. 500 W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	$12\frac{15}{16}$ in	32.9 cm
Depth	$23\frac{7}{8}$ in	60.7 cm
Net weight	$57\frac{1}{2}$ lbs	26.2 kg
Domestic shipping weight	~76 lbs	~34.6 kg
Export-packed weight	~95 lbs	~43.2 kg

STANDARD ACCESSORIES

Two P6006 10X Probes (010-0127-00); BNC-to-BNC 18-in patch cord (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00); BNC-post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter (378-0567-00); two instruction manuals (070-0258-00).

TYPE 533A, without plug-in units $1125

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERA

The standard C-12 camera satisfies most trace-recording requirements. For applications that might require a different viewing system, lens, or back, refer to camera descriptions or consult your field engineer, representative, or distributor. Standard C-12: f/1.9—1:0.85 lens, no-parallax viewing, Polaroid Land* Pack-Film back, order C-12 ..... $450
Type 533A to C-12 Camera adapter, order 016-0226-00 .. $15

PROBES

The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

RACK-MOUNT ADAPTER

Consists of cradle to support the Type 533A in any standard 19-in relay rack, and mask to fit around the front panel. Requires $17\frac{1}{2}$-in panel height, order 040-0281-00 .... $31.25

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES

In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.

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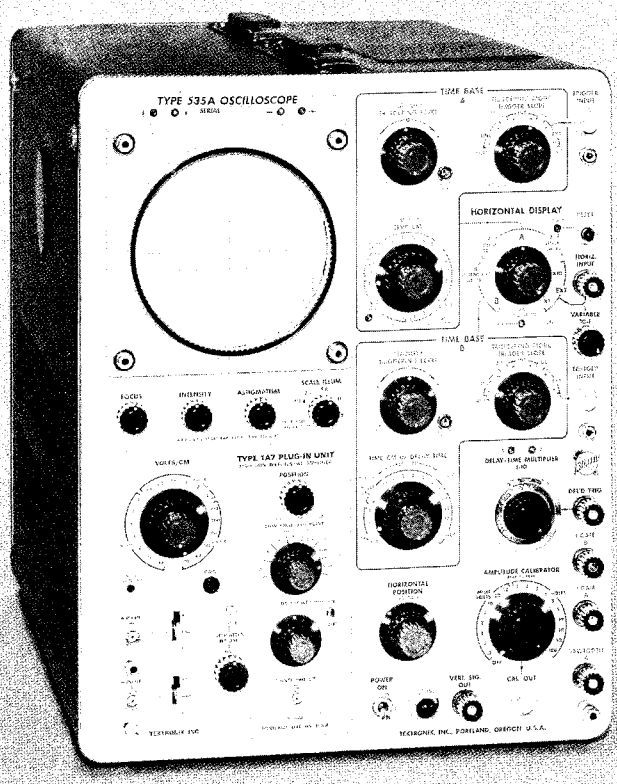
Please refer to Terms and Shipment, General Information page.

DC-to-15 MHz OSCILLOSCOPES



CALIBRATED SWEEP DELAY

6 x 10-CM DISPLAY

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

The Type 535A and RM35A Oscilloscopes are versatile laboratory instruments designed for use with all Tektronix Letter-Series or 1-Series Plug-In Units.

The two time-base generators can be used in delayed sweep operation for highly accurate time measurements.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of all 1-Series and Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

X5 MAGNIFIER—Extends time base to 20 ns/cm.

CALIBRATED SWEEP DELAY—2 μs to 10 s.

EXTERNAL INPUT—0.2 V/cm to 2 V/cm, DC to 350 kHz.

CRT

DISPLAY AREA—6 x 10 cm.

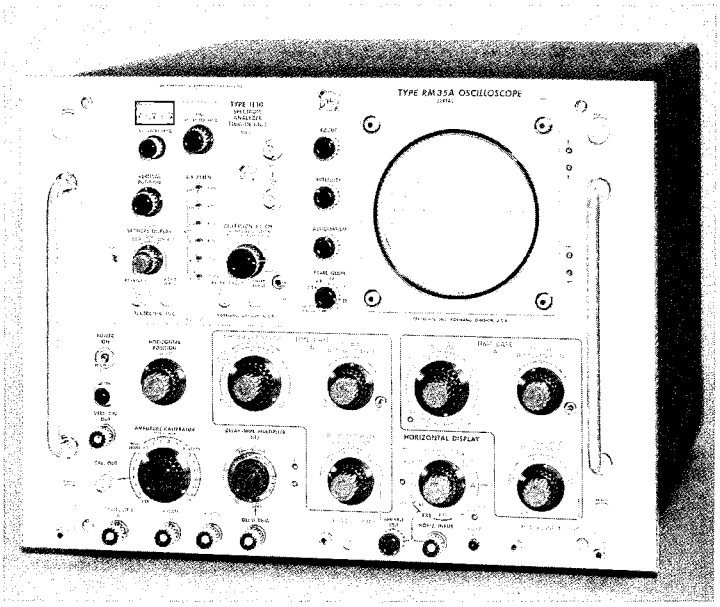
ACCELERATING VOLTAGE—10 kV.

OTHER

AMPLITUDE CALIBRATOR—0.2 mV to 100 V (1-kHz square-wave).

POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 V (±9% on each range), 550 watts maximum.

VERTICAL PLUG-IN UNITS				
PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 15 MHz DC to 14 MHz 2 Hz to 10 MHz	24 ns 25 ns 35 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 15 MHz	24 ns	325
CA Dual-Trace	50 mV/cm	DC to 13 MHz	27 ns	260
1A4 Four-Trace	10 mV/cm	DC to 15 MHz	24 ns	750
M Four-Trace	20 mV/cm	DC to 14 MHz	25 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 14 MHz 2 Hz to 10 MHz	25 ns 35 ns	145
H	50 mV/cm	DC to 11 MHz	32 ns	185
K	50 mV/cm	DC to 15 MHz	24 ns	145
L	50 mV/cm 5 mV/cm	DC to 15 MHz 3 Hz to 14 MHz	24 ns 25 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 14 MHz	25 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 1 mV/cm	DC to 15 MHz DC to 14 MHz	24 ns 25 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 14 MHz	25 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 7 MHz DC to 13 MHz	50 ns 27 ns	550
Z Comparator	50 mV/cm	DC to 10 MHz	35 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	



VERTICAL DEFLECTION

BANDWIDTH

DC to 15 MHz at 3 dB down, depending on plug-in unit. See chart.

RISETIME

24 ns, depending on plug-in unit. See chart.

DELAY LINE

Permits viewing leading edge of displayed waveform.

SIGNAL OUTPUT

<10 Hz to >5 MHz at 3-dB down, no load (cathode follower output). At least 1.5 V for each centimeter of displayed signal.

HORIZONTAL DEFLECTION

TIME BASE A

0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning light indicates uncalibrated setting.

TIME BASE B

2 μs/cm to 1 s/cm in 18 calibrated steps (1-2-5 sequence), accurate within 3%. Sweep length continuously variable from 4 to 10 cm, allowing use of Time Base B as a repetition-rate generator from 0.1 Hz to 40 kHz.

X5 MAGNIFIER

Operates over full time base, increases fastest Time Base A rate to 20 ns/cm, and the fastest Time Base B rate to 0.4 μs/cm. Magnified time base accurate within 5%.

DELAY TIME

2 μs to 10 s, continuously variable and calibrated, accurate within 1% (3% at 3 slowest sweep rates) of indicated delay ±2 minor dial divisions (add processing time of approx 300 ns at fast sweep rates). Incremental delay-time accurate within 1% ±4 minor divisions. Short-term jitter ≤1/20,000 of total Time Base B delay time.

DELAY MODES

Depending on the setting of the Delayed Sweep stability control, the Delayed Sweep can start immediately at end of delay time, or be triggerable at end of delay time (for jitter-free displays).

OPERATING MODES

Time Base A—Normal, single sweep, delayed by B.
Time Base B—Normal, intensified by A.

EXTERNAL INPUT

Fixed steps of approx 0.2 V/cm and 2 V/cm, continuously variable between steps and to approx 20 V/cm, DC to ≥350 kHz at −3 dB. 50 V maximum input (DC + peak AC). Input RC approx 1 MΩ paralleled by approx 47 pF.

SIGNAL OUTPUTS

Gates from both time bases (positive going from 0 to at least +20 V), sawtooth from Time Base A (positive going from 0 to at least +130 V), and a delayed trigger pulse (positive going from 0 to at least +5 V). Cathode-follower outputs.

TRIGGER

MODES

Automatic mode or manual level selection; high-frequency sync on Time Base A. Automatic operation is useful between approx 50 Hz and 2 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes, and repetition rates. With no input (or input less than 50 Hz), automatic triggering occurs at an approx 40 Hz rate, providing a convenient reference trace. High-frequency sync assures a steady display of sinewaves from less than 5 MHz to 30 MHz.

COUPLING

AC or DC; AC LF reject on Time Base A.

SOURCES

Internal (from oscilloscope vertical amplifier), external, or line. External trigger input RC approx 1 MΩ (91 kΩ at AC LF reject) paralleled by approx 40 pF for Time Base A, approx 1 MΩ paralleled by approx 50 pF for Time Base B.

TIME BASE A REQUIREMENTS

0.2-cm deflection or 0.2-V external from 150 Hz to 2 MHz, increasing to 1-cm deflection or 1 V external at 5 MHz. Requirements increase below 150 Hz with AC coupling, below 10 kHz with AC low-frequency reject. DC coupling requires 0.4-cm deflection or 0.2-V external to 2 MHz, increasing to 2-cm deflection or 1-V external at 5 MHz. Automatic operation requires 0.2-cm deflection or 0.2 V external from 50 Hz to 1 MHz, increasing to 1-cm deflection or 1-V external at 2 MHz. High-frequency sync requires 2-cm deflection or 2-V external between approx 5 and 30 MHz. ±10-V trigger level range.

TIME BASE B REQUIREMENTS

0.2-cm deflection or 0.2-V external from 150 Hz to 1 MHz, increasing to 1-cm deflection or 1-V external at 3 MHz. Requirements increase below 150 Hz with AC coupling. DC coupling requires 0.4-cm deflection or 0.2-V external to 1 MHz, increasing to 2-cm deflection or 1 V external at 3 MHz. Automatic operation requires 0.2-cm deflection or 0.2-V external from 50 Hz to 1 MHz, increasing to 1-cm deflection or 1-V external at 2 MHz.

CRT

TEKTRONIX CRT

5-in metallized screen, helical post accelerating anode, 10-kV accelerating potential for bright displays. P2 phosphor normally supplied. Z-axis input requires 20-V peak to peak for CRT modulation at normal intensity.

GRATICULE

External; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions.

DISPLAY FEATURES

Beam-position indicators show direction of CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate.

POWER REQUIREMENTS

Wired for 115 V RMS ±9%; transformer taps permit operation at 108, 115, 122, 216, 230, or 244 V (±9% on each range); 50 to 60 Hz. 550 W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	$12^{15}/_{16}$ in	32.9 cm
Depth	$23^{7}/_{8}$ in	60.7 cm
Net weight	$61^{1}/_{4}$ lbs	27.9 kg
Domestic shipping weight	~ 80 lbs	~36.4 kg
Export-packed weight	~100 lbs	~45.5 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	14 in	35.6 cm
Width	19 in	48.3 cm
Rack depth	$22^{11}/_{16}$ in	57.6 cm
Net weight	$78^{1}/_{4}$ lbs	35.6 kg
Domestic shipping weight	~104 lbs	~47.3 kg
Export-packed weight	~125 lbs	~56.8 kg

RACK MOUNTING

Type RM35A withdraws from its cabinet on slide-out tracks, tilts and locks in 7 positions. Further mounting information on catalog instrument dimensions page.

STANDARD ACCESSORIES

Two P6006 10X probes (010-0127-00); BNC-to-BNC 18-in patch cord (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00); BNC post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter (378-0567-00); two instruction manuals (070-0145-00). Type RM35A also includes mounting hardware.

TYPE 535A, without plug-in units $1400

TYPE RM35A, without plug-in units $1500

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERA

The standard C-12 camera satisfies most trace-recording requirements. For applications that might require a different viewing system, lens, or back, refer to camera descriptions or consult your field engineer, representative, or distributor.

Standard C-12: f/1.9—1:0.85 lens, no-parallax viewing, Polaroid Land* Pack-Film back, order C-12 ..... $450

Type 535A to C-12 Camera adapter, order 016-0226-00 $ 15

PROBES

The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES

In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured.

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U. S. Sales Prices FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

DC-to-11 MHz X-Y OSCILLOSCOPE

- ***ACCURATE PHASE BALANCE***
- ***X-Y or Y-T DISPLAYS***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL PURPOSE PLUG-INS***

The Type 536 represents a combination of wide-band "X-Y" and general-purpose laboratory oscilloscopes. Identical main amplifiers and a Tektronix CRT with equal X and Y deflection characteristics are the basic components. Using identical wide-band Plug-In Units, horizontal and vertical deflection systems are almost identical. Relative phase shift is less than 1° to 15 MHz, and phase balance can be obtained at any frequency to 30 MHz.

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

CHARACTERISTIC SUMMARY

VERTICAL AND HORIZONTAL

Vertical and horizontal deflection characteristics are extremely flexible through use of the 1-Series and Letter-Series Plug-In Units.

TIME-BASE DEFLECTION
(with Type T Time-Base Generator)

CALIBRATED TIME BASE—0.2 μs/div to 2 s/div.

5X MAGNIFIER—Extends time base to 40 ns/div.

CRT

DISPLAY AREA—10 x 10 divisions (3⅛ x 3⅛ inches).

ACCELERATING VOLTAGE—4 kV.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mV to 100 V; 1 kHz square wave.

POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 V (±9% on each range). Approx 625 watts maximum.

VERTICAL PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm	DC to 11 MHz	32 ns	$ 600
	5 mV/cm	DC to 10 MHz	35 ns	
	≈500 μV/cm	2 Hz to 8 MHz	44 ns	
1A2 Dual-Trace	50 mV/cm	DC to 11 MHz	32 ns	325
CA Dual-Trace	50 mV/cm	DC to 10 MHz	35 ns	260
1A4 Four-Trace	10 mV/cm	DC to 11 MHz	32 ns	750
M Four-Trace	20 mV/cm	DC to 10 MHz	35 ns	525
SINGLE TRACE				
B	50 mV/cm	DC to 10 MHz	35 ns	145
	5 mV/cm	2 Hz to 9 MHz	40 ns	
H	50 mV/cm	DC to 9.5 MHz	37 ns	185
K	50 mV/cm	DC to 11 MHz	32 ns	145
L	50 mV/cm	DC to 11 MHz	32 ns	210
	5 mV/cm	3 Hz to 10 MHz	35 ns	
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 10 MHz	35 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	1 mV/cm	DC to 11 MHz	32 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 10 MHz	35 ns	190
W Comparator	1 mV/cm	DC to 6.5 MHz	54 ns	550
	50 mV/cm	DC to 10 MHz	35 ns	
Z Comparator	50 mV/cm	DC to 9 MHz	40 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	

APPLICATIONS

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

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

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

VERTICAL AND HORIZONTAL DEFLECTION

Two identical systems

BANDWIDTH
DC to 11 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
32 ns, depending on plug-in unit. See chart.

SIGNAL OUTPUT
At least 1 V for each division of displayed signal. Cathode follower outputs.

PHASE DIFFERENCE IN X-Y MODE
<1° from DC to 15 MHz with two Type K Units at 50 mV/div. Front-panel control for amplifier phasing to 30 MHz, with signals not overdriving the Type K Units.

HORIZONTAL DEFLECTION

With Type T Plug-In Unit

TIME BASE
0.2 μs/div to 2 s/div in 22 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 5 s/div. Warning light indicates uncalibrated setting.

X5 MAGNIFIER
Operates over full time base, increases fastest rate to 40 ns/div. Magnified display accurate within 5%.

SIGNAL OUTPUTS
Gate (positive going from 0 to at least +20 V), sawtooth (positive going from 0 to at least +150 V). Cathode follower outputs.

TRIGGER

With Type T Plug-In Unit

MODES

Automatic or manual level selection; high-frequency sync. Automatic operation is useful between approx 50 Hz and 2 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes, and repetition rates. With no input (or input less than 40 Hz), automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace. High-frequency sync assures a steady display of sinewaves from approx 5 to 15 MHz.

COUPLING

AC, DC, or AC LF reject.

SOURCES

External or line. External trigger input RC approx 100 kΩ paralleled by approx 25 pF.

REQUIREMENTS

0.2 V from DC to 1 MHz, increasing to 10 V at 5 MHz. Requirements increase below 100 Hz with AC coupling, below 10 kHz with AC low-frequency reject. High-frequency sync requires 2 V from approx 5 to 15 MHz.

CRT

TEKTRONIX CRT

Identical characteristics for vertical and horizontal deflection plates. 4-kV accelerating potential. P31 phosphor normally supplied. Z-axis input requires 1 V peak to peak for perceptable CRT modulation, +20 V for complete "black-to-white" unblanking.

GRATICULE

External; variable edge lighting. 10 x 10-division display area (3⅛ x 3⅛ inches). Vertical and horizontal center lines marked in 1/5 divisions.

DISPLAY FEATURES

Beam-position indicators show direction of CRT beam when off screen.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate.

POWER REQUIREMENTS

Wired for 115 V RMS ±9%; transformer taps permit operation at 108, 115, 122, 216, 230, or 244 V (±9% on each range); 50 to 60 Hz. 625 W maximum power consumption with 2 Type K Units. Can be factory wired for any of the above nominal voltages, if so indicated on order.

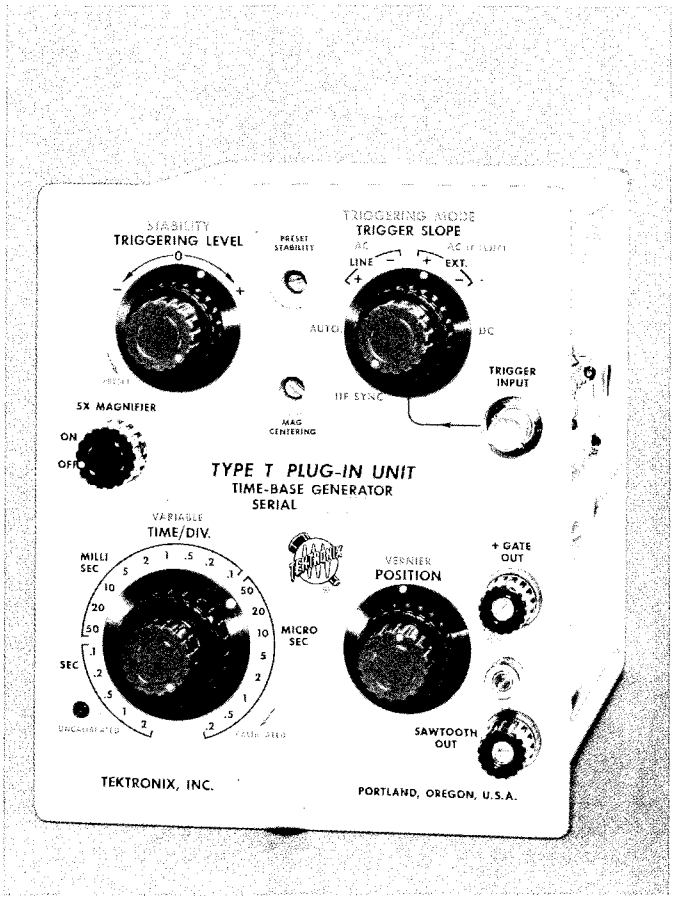
DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	12 15/16 in	32.9 cm
Depth	23⅞ in	60.7 cm
Net weight	56¾ lbs	25.8 kg
Domestic shipping weight	~73 lbs	~33.2 kg
Export-packed weight	~93 lbs	~42.3 kg

STANDARD ACCESSORIES

Two P6006 10X probes (010-0127-00); BNC-to-BNC 18-in patch cord (012-0087-00); BNC to-banana plug 18-in patch cord (012-0091-00); BNC-post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter (378-0567-00); phase-measurement graticule (331-0057-00); two instruction manuals (070-0270-00).

TYPE 536, without plug-in units $1085



TYPE T TIME-BASE GENERATOR $240

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERA

The standard C-12 camera satisfies most trace-recording requirements. For applications that might require a different viewing system, lens, or back, refer to camera descriptions or consult your field engineer, representative, or distributor.

Standard C-12: f/1.9—1:0.85 lens, no-parallax viewing, Polaroid Land* Pack-Film back, order C-12 ..... $450

Type 536 to C-12 Camera adapter, order 016-0226-00 .. $15

PROBES

The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

RACK-MOUNT ADAPTER

Consists of cradle to support the Type 536 in any standard 19-in relay rack, and mask to fit around the front panel. Requires 17½-in panel height, order 040-0281-00 .... $31.25

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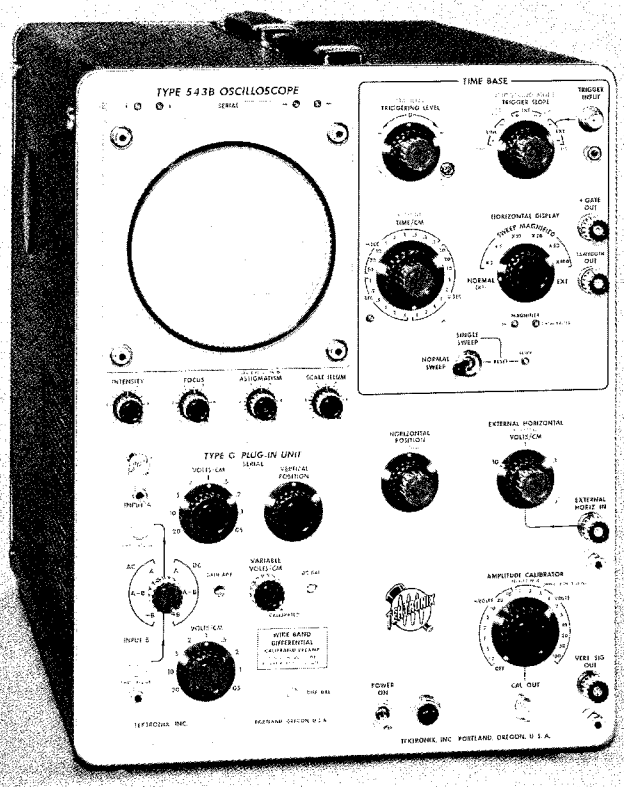
DC-to-33 MHz OSCILLOSCOPES



- ***X100 SWEEP MAGNIFIER***
- ***UNIFORM-FOCUS 6 x 10-CM DISPLAY***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***FULL-BANDWIDTH TRIGGERING***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***

The Type 543B and RM543B are versatile laboratory oscilloscopes designed for use with all Tektronix Letter-Series and 1-Series Plug-In Units.

A wide-range magnifier provides six steps of sweep magnification from X2 to X100.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of all 1-Series and Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

SWEEP MAGNIFIER—X2, X5, X10, X20, X50, X100. Extends time base accurately to 20 ns/cm.

EXTERNAL INPUT—0.1 V/cm to 10 V/cm (calibrated), DC to 500 kHz.

CRT

DISPLAY AREA—6 x 10 cm.

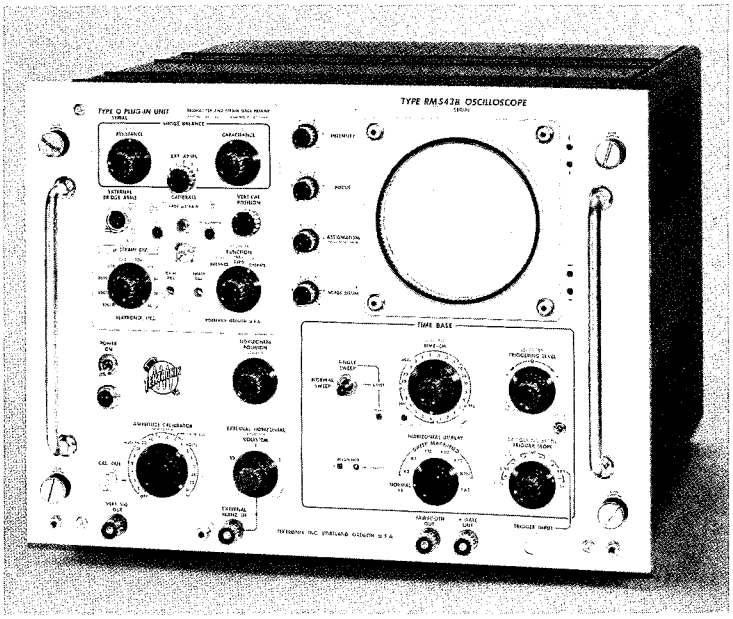
ACCELERATING VOLTAGE—10 kV.

OTHER

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz square-wave.

POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 V (±10% on each range), 535 watts maximum.

VERTICAL PLUG-IN UNITS				
PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 33 MHz DC to 23 MHz 2 Hz to 14 MHz	11 ns 16 ns 25 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 33 MHz	11 ns	325
CA Dual-Trace	50 mV/cm	DC to 24 MHz	15 ns	260
1A4 Four-Trace	10 mV/cm	DC to 33 MHz	11 ns	750
M Four-Trace	20 mV/cm	DC to 20 MHz	18 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 20 MHz 2 Hz to 12 MHz	18 ns 30 ns	145
H	50 mV/cm	DC to 15 MHz	24 ns	185
K	50 mV/cm	DC to 30 MHz	12 ns	145
L	50 mV/cm 5 mV/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 25 MHz	14 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 2 mV/cm 1 mV/cm	DC to 33 MHz DC to 31 MHz DC to 30 MHz	11 ns 12 ns 12 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 20 MHz	18 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 8 MHz DC to 23 MHz	44 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	



VERTICAL DEFLECTION

BANDWIDTH
DC to 33 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
11 ns, depending on plug-in unit. See chart.

DELAY LINE
Permits viewing leading edge of displayed waveform, requires no tuning.

SIGNAL OUTPUT
Approx 1.2 V for each centimeter of displayed signal.

HORIZONTAL DEFLECTION

TIME BASE
0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning light indicates uncalibrated setting.

MAGNIFIER
X2, X5, X10, X20, X50 or X100 magnification. Magnified time base accurate within 5% up to 20 ns/cm. Warning light indicates if time base exceeds 20 ns/cm (uncalibrated).

OPERATING MODES
Normal, single sweep.

EXTERNAL INPUT
0.1, 1, and 10 V/cm, accurate within 5%. Uncalibrated, continuously variable between steps and to approx 100 V/cm. DC to ≥500 kHz at —3 dB. 50-V maximum input (DC + peak AC) in most-sensitive position. Input RC approx 1 MΩ paralleled by approx 55 pF.

SIGNAL OUTPUTS
Gate (positive going from 0 to at least +20 V), sawtooth (positive going from 0 to at least +130 V).

TRIGGER

MODES
Automatic mode or manual level selection. Automatic operation is useful between approx 50 Hz and 10 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes, and repetition rates. With no input (or input less than 50 Hz), automatic triggering occurs at an approx 40 Hz rate, providing a convenient reference trace.

COUPLING
AC, DC or AC LF reject.

SOURCES
Internal (from oscilloscope vertical amplifier), external, or line. External trigger input RC approx 1 MΩ (91 kΩ at AC LF reject) paralleled by approx 25 pF. 50-V maximum input (DC + peak AC).

REQUIREMENTS
0.2-cm deflection or 0.2-V external from 150 Hz to 10 MHz, increasing to 1-cm deflection or 1-V external at 30 MHz. Requirements increase below 30 kHz with AC low-frequency reject. DC coupling requires 0.6-cm deflection or 0.2-V external to 10 MHz. Automatic operation requires 0.5-cm deflection or 0.5-V external at 150 Hz, increased deflection to 10 MHz.

CRT

TEKTRONIX CRT
5-in metallized screen, helical post accelerating anode, 10-kV accelerating potential for bright displays. Spot diameter with intensity adjusted for typical ambient-light conditions (2 μA beam current) is nominally 9 mils at center screen, no more than 12 mils at either end of the horizontal axis. P31 phophor normally supplied. Z-axis input requires 15 V peak to peak for CRT modulation at normal intensity.

GRATICULE
Internal, no parallax; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions. Two additional horizontal lines for convenient risetime measurements.

DISPLAY FEATURES
Beam-position indicators show direction of CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR
0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate. Special output, useful in calibrating sampling plug-ins, provides 0.1 V ±3% into 50 Ω.

POWER REQUIREMENTS
Wired for 115 V RMS ±10%; transformer taps permit operation at 108, 115, 122, 216, 230, or 244 V (±10% on each range); 50 to 60 Hz. 535 W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	12 15/16 in	32.9 cm
Depth	23 7/8 in	60.7 cm
Net weight	60 1/4 lbs	27.4 kg
Domestic shipping weight	~78 lbs	~35.5 kg
Export-packed weight	~97 lbs	~44.1 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	14 in	35.6 cm
Width	19 in	48.3 cm
Rack Depth	22 11/16 in	57.6 cm
Net weight	81 lbs	36.8 kg
Domestic shipping weight	~106 lbs	~48.2 kg
Export-packed weight	~130 lbs	~59.1 kg

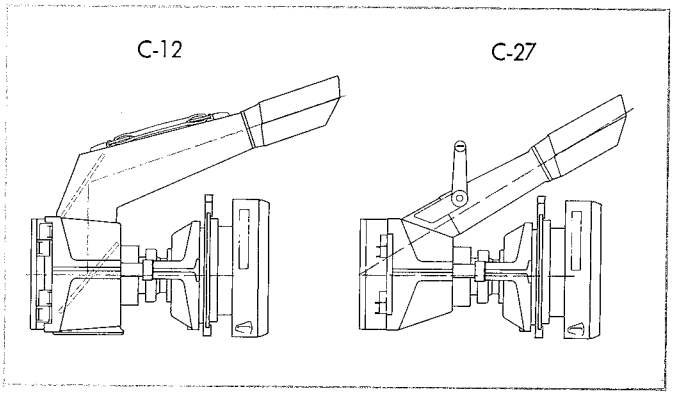
RACK MOUNTING
Type RM543B withdraws from its cabinet on slide-out tracks, tilts and locks in 7 positions. Further mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES
Two P6006 10X probes (010-0127-00); BNC-to-BNC 18-in 50-Ω cable (012-0076-00); BNC-to-BNC 18-in patch cord (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-01); BNC post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter, installed (378-0567-00); clear CRT protection plate (387-0918-00); two instruction manuals (070-0429-00). Type RM543B also includes mounting hardware.

TYPE 543B, without plug-in units $1300
TYPE RM543B, without plug-in units $1400

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.



CAMERAS
C-12 has dichroic mirror for straight-on viewing and use of optional projected graticule, f/1.9—1:0.85 lens, Polaroid* Land Pack Film back accepts 3000-speed film, order Standard C-12 ..... $450
Type 543B to C-12 Camera adapter, order 016-0226-00 $ 15
C-27 provides direct viewing and maximum transmission of light to film, f/1.9—1:0.85 lens, Polaroid Land Pack Film back accepts 3000-speed film, order Standard C-27 ..... $420
Type 543B to C-27 Camera adapter, order 016-0225-00 $ 15
Polaroid Roll Film back accepts 10,000-speed film for increased writing speed, can be substituted at no additional cost in either camera. Order C-12R or C-27R. Optional lenses are also available.

PROBES
The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART
Model 202-2: storage drawer, carrier for 2 plug-in units. 9-position tilt-lock oscilloscope tray, order 202-2 .... $130

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES
In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.

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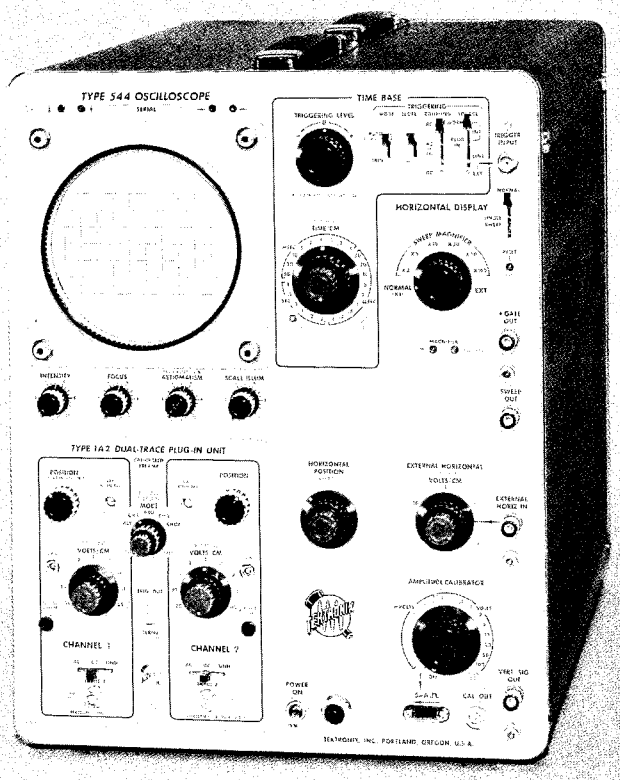
TYPE 544
RM544

DC-to-50 MHz OSCILLOSCOPES



- ***X100 SWEEP MAGNIFIER***
- ***UNIFORM-FOCUS 6 x 10-CM DISPLAY***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***FULL-BANDWIDTH TRIGGERING***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***

Type 544 and RM544 Oscilloscopes are versatile laboratory instruments designed for maximum performance with all Letter-Series and 1-Series Plug-In Units. Bandwidth extends from DC to 50 MHz.

A wide-range magnifier provides six steps of sweep magnification from X2 to X100.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of all 1-Series and Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

SWEEP MAGNIFIER—X2, X5, X10, X20, X50, X100. Extends calibrated time base accurately to 10 ns/cm.

EXTERNAL INPUT—0.1 V/cm to 10 V/cm (calibrated). DC to 400 kHz.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—10 kV.

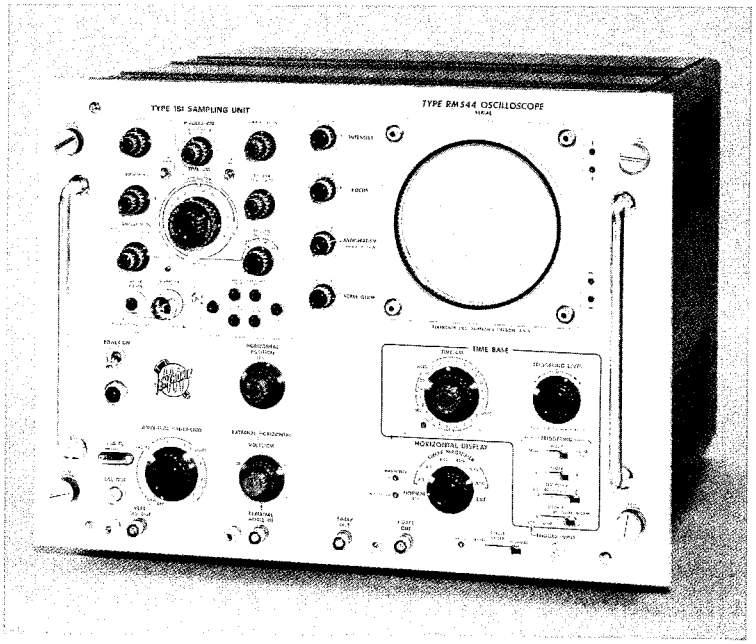
OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mV to 100 V (1 kHz squarewave), 100 V DC, 5 mA DC, 5 mA 1-kHz squarewave.

POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 V (±10% on each range), typically 400 watts.

VERTICAL PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 50 MHz DC to 28 MHz 2 Hz to 15 MHz	7 ns 13 ns 24 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 50 MHz	7 ns	325
CA Dual-Trace	50 mV/cm	DC ta 24 MHz	15 ns	260
1A4 Four-Trace	10 mV/cm	DC to 50 MHz	7 ns	750
M Four-Trace	20 mV/cm	DC to 20 MHz	18 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 20 MHz 2 Hz to 12 MHz	18 ns 30 ns	145
H	50 mV/cm	DC to 15 MHz	24 ns	185
K	50 mV/cm	DC to 30 MHz	12 ns	145
L	50 mV/cm 5 mV/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 25 MHz	14 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 2 mV/cm 1 mV/cm	DC to 50 MHz DC to 45 MHz DC to 40 MHz	7 ns 8 ns 9 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 20 MHz	18 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 8 MHz DC to 23 MHz	44 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	



VERTICAL DEFLECTION

BANDWIDTH
DC to 50 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
7 ns, depending on plug-in unit. See chart.

DELAY LINE
Permits viewing leading edge of displayed waveform, requires no tuning.

SIGNAL OUTPUT
20 ns risetime, at least 0.3 V for each centimeter of displayed signal.

HORIZONTAL DEFLECTION

TIME BASE
0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 2%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning light indicates uncalibrated setting.

MAGNIFIER
X2, X5, X10, X20, X50 or X100 magnification. Magnified time base accurate within 5% up to 10 ns/cm. Warning light indicates if time base exceeds 10 ns/cm (uncalibrated).

OPERATING MODES
Normal, single sweep. Single sweep reset at front panel, or with ≥+20-V pulse with <0.5-μs risetime, through rear-panel connector.

EXTERNAL INPUT
0.1, 1, and 10 V/cm, accurate within 5%. Uncalibrated, continuously variable between steps and to approx 100 V/cm. DC to ≥400 kHz at —3 dB. 50-V maximum input (DC + peak AC) in most sensitive position. Input RC approx 1 MΩ paralleled by approx 55 pF.

SIGNAL OUTPUTS
Gate (positive-going from 0 to at least +20 V) sawtooth (positive-going from 0 to at least +90 V).

TRIGGER

MODES
Manual level selection with triggered or automatic operation. Automatic operation provides a convenient reference trace with no trigger-signal input, or repetition rates less than 20 Hz. Reference trace is bright throughout the full time-base range.

COUPLING
AC, DC, or AC LF reject.

SOURCES
Internal (from oscilloscope vertical amplifier or direct from a single channel of Type 1A1, 1A2, or 1A4 Plug-In Units), external, or line. 30 V maximum external input (DC + peak AC). External trigger input RC approx 1.1 MΩ paralleled by approx 30 pF.

REQUIREMENTS
0.2-cm deflection or 0.2-V external at 1 kHz, increasing to 1-cm deflection or 0.2-V external at 50 MHz. Requirements increase below 2 kHz with AC low-frequency reject. DC coupling requires 0.5-cm deflection or 0.2-V external at DC to 50 MHz. ±2-V or ±20-V trigger level selection.

CRT

TEKTRONIX CRT
5-in metalized screen, helical post accelerating anode, 10-kV accelerating potential for bright displays. Spot diameter with intensity adjusted for typical ambient-light conditions (2-μA beam current) is nominally 9 mils at center screen, no more than 12 mils at either end of the horizontal axis. P31 phosphor normally supplied. Z-axis input requires 15-V peak to peak for CRT modulation at normal intensity.

GRATICULE
Internal, no parallax; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions. Two additional horizontal lines for convenient risetime measurements.

DISPLAY FEATURES
Beam-position indicators show direction of CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR
0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate. 50-Ω source resistance from 0.2 mV to 0.2 V. 0.6-μs risetime from 0.2 mV to 5 V; 1-μs from 10 V to 100 V. 100-V DC reference output also provided. Front-panel current loop for 5 mA, ±3%, squarewave or DC.

POWER REQUIREMENTS
Wired for 115 V RMS ±10%; transformer taps permit operation at 108, 115, 122, 216, 230, or 244 V (±10% on each range); 50 to 60 Hz. 400 W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	12 15/16 in	32.9 cm
Depth	23 7/8 in	60.7 cm
Net weight	61 lbs	27.8 kg
Domestic shipping weight	~80 lbs	~36.4 kg
Export-packed weight	~97 lbs	~44.1 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	14 in	35.6 cm
Width	19 in	48.3 cm
Rack depth	22 1/16 in	57.6 cm
Net weight	82 1/4 lbs	37.4 kg
Domestic shipping weight	~106 lbs	~48.2 kg
Export-packed weight	~130 lbs	~59.1 kg

RACK MOUNTING
Type RM544 withdraws from its cabinet on slide-out tracks, tilts and locks in 7 positions. Further mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES
Two P6008 10X probes (010-0129-00), two BNC-to-BNC 18-in patch cords (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00), BNC post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter, installed (378-0567-00); clear CRT protector plate (387-0918-00); two instruction manuals (070-0418-00). Type RM544 also includes mounting hardware.

TYPE 544, without plug-in units $1550
TYPE RM544, without plug-in units $1650

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERAS
C-12 has dichroic mirror for straight-on viewing and use of optional projected graticule, f/1.9—1:0.85 lens, Polaroid* Land Pack Film back accepts 3000-speed film, order Standard C-12 ..... $450
Type 544 to C-12 Camera adapter, order 016-0226-00 .. $ 15

C-27 provides direct viewing and maximum transmission of light to film, f/1.9—1:0.85 lens, Polaroid Land Pack Film back accepts 3000-speed film, order Standard C-27 ..... $420
Type 544 to C-27 Camera adapter, order 016-0225-00 .. $ 15

Polaroid Roll Film back accepts 10,000-speed film for increased writing speed, can be substituted at no additional cost in either camera. Order C-12R or C-27R. Optional lenses are also available.

PROBES
The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART
Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES
In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.

*Registered Trade-Mark Polaroid Corporation

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

DC-to-33 MHz OSCILLOSCOPES

- ***CALIBRATED SWEEP DELAY***
- ***UNIFORM-FOCUS 6 x 10-CM DISPLAY***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***FULL-BANDWIDTH TRIGGERING***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***

The Type 545B and RM545B are versatile laboratory oscilloscopes designed for use with all Tektronix Letter-Series and 1-Series Plug-In Units.

Two separate time-base generators can be used in delayed-sweep operation for highly-accurate time measurements.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of all 1-Series and Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm. Time Base B 2 μs/cm to 1 s/cm.

X5 MAGNIFIER—Extends time base to 20 ns/cm.

CALIBRATED SWEEP DELAY—2 μs to 10 s.

EXTERNAL INPUT—0.2 V/cm, DC to 350 kHz.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—10 kV.

OTHER

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz square-wave.

POWER REQUIREMENTS—108, 115, 122, 216, 230, or 244 V (±10% on each range), 585 watts maximum.

VERTICAL DEFLECTION

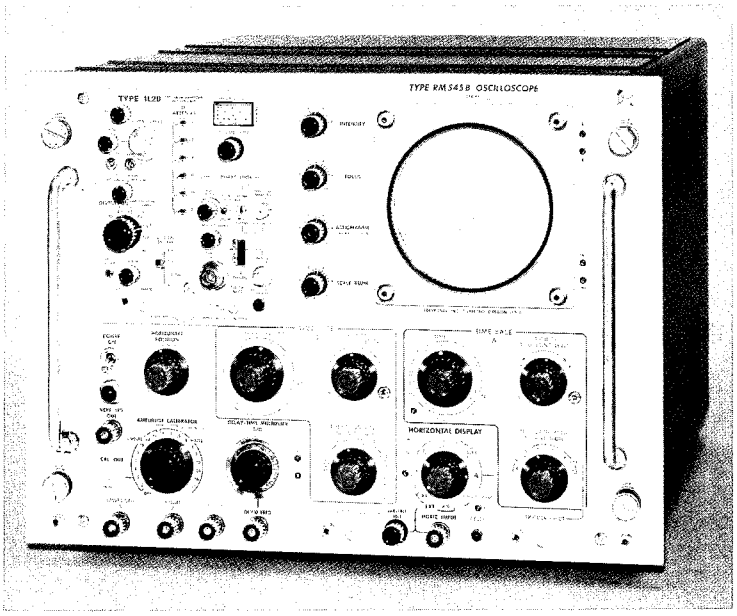
BANDWIDTH
DC to 33 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
11 ns, depending on plug-in unit. See chart.

DELAY LINE
Permits viewing leading edge of displayed waveform, requires no tuning.

SIGNAL OUTPUT
Approx 1.2 V for each centimeter of displayed signal.

VERTICAL PLUG-IN UNITS	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 33 MHz DC to 23 MHz 2 Hz to 14 MHz	11 ns 16 ns 25 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 33 MHz	11 ns	325
CA Dual-Trace	50 mV/cm	DC to 24 MHz	15 ns	260
1A4 Four-Trace	10 mV/cm	DC to 33 MHz	11 ns	750
M Four-Trace	20 mV/cm	DC to 20 MHz	18 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 20 MHz 2 Hz to 12 MHz	18 ns 30 ns	145
H	50 mV/cm	DC to 15 MHz	24 ns	185
K	50 mV/cm	DC to 30 MHz	12 ns	145
L	50 mV/cm 5 mV/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 25 MHz	14 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 2 mV/cm 1 mV/cm	DC to 33 MHz DC to 31 MHz DC to 30 MHz	11 ns 12 ns 12 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 20 MHz	18 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 8 MHz DC to 23 MHz	44 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	



HORIZONTAL DEFLECTION

TIME BASE A
0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12.5 s/cm. Warning light indicates uncalibrated setting.

TIME BASE B
2 μs/cm to 1 s/cm in 18 calibrated steps (1-2-5 sequence), accurate within 3%. Sweep length continuously variable from 4 to 10 cm, allowing use of Time Base B as a repetition-rate generator from 0.1 Hz to 40 kHz.

X5 MAGNIFIER
Operates over full time base, increases fastest Time Base A rate to 20 ns/cm, and the fastest Time Base B rate to 0.4 μs/cm. Magnified time base accurate within 5%.

DELAY TIME
2 μs to 10 s, continuously variable and calibrated, accurate within 1% of indicated delay ±2 minor dial divisions (add processing time of approx 200 ns at fast sweep rates). Incremental delay-time accurate within 1% ±4 minor dial divisions. Short-term jitter ≤1/20,000 of total Time Base B delay time.

DELAY MODES
Depending on the setting of the Delayed Sweep stability control, the Delayed Sweep can start immediately at end of delay time, or be triggerable at end of delay time (for jitter-free displays).

OPERATING MODES
Time Base A—Normal, single sweep, delayed by B.
Time Base B—Normal, intensified by A.

EXTERNAL INPUT
Fixed steps of approx 0.2 V/cm and 2 V/cm, continuously variable between steps and to approx 20 V/cm, DC to ≥350 kHz at —3 dB. 50-V maximum input (DC + peak AC). Input RC approx 1 MΩ paralleled by approx 45 pF.

SIGNAL OUTPUTS
Gates from both time bases (positive going from 0 to at least +20 V), sawtooth from Time Base A (positive going from 0 to at least +130 V), and a delayed trigger pulse (positive going from 0 to at least +5 V).

TRIGGER

MODES
Automatic mode or manual level selection. Automatic operation is useful between approx 50 Hz and 10 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes, and repetition rates. With no input (or input less than 50 Hz), automatic triggering occurs at an approx 40-Hz rate, providing a convenient reference trace.

COUPLING
AC or DC; AC LF reject on Time Base A.

SOURCES
Internal (from oscilloscope vertical amplifier), external, or line. 50-V maximum external input (DC + peak AC). External trigger input RC approx 1 MΩ (91 kΩ at AC LF reject) paralleled by approx 25 pF for Time Base A, approx 1 MΩ paralleled by approx 47 pF for Time Base B.

TIME BASE A REQUIREMENTS
0.2-cm deflection or 0.2-V external from 150 Hz to 10 MHz, increasing to 1-cm deflection or 1-V external at 30 MHz. Requirements increase below 30 kHz with AC low-frequency reject. DC coupling requires 0.6-cm deflection or 0.2-V external to 10 MHz. Automatic operation requires 0.5-cm deflection or 0.5-V external at 150 Hz, increased deflection to 10 MHz.

TIME BASE B REQUIREMENTS
0.2-cm deflection or 0.2-V external at 300 Hz to 5 MHz, increasing to 1-cm deflection or 1-V external at 10 MHz. Requirements increase below 300 Hz with AC coupling. DC coupling requires 0.6-cm deflection or 0.2-V external to 5 MHz. Automatic operation requires 0.5-cm deflection or 0.5-V external at 300 Hz, will trigger from 50 Hz to 5 MHz with increased signal.

CRT

TEKTRONIX CRT
5-in metallized screen, helical post acceleraing anode. 10-kV accelerating potential for bright displays. Spot diameter with intensity adjusted for typical ambient-light conditions (2-μA beam current) is nominally 9 mils at center screen, no more than 12 mils at either end of the horizontal axis. P31 phosphor normally supplied. Z-axis input requires 15-V peak to peak for CRT modulation at normal intensity.

GRATICULE
Internal, no-parallax; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions. Two additional horizontal lines for convenient risetime measurements.

DISPLAY FEATURES
Beam-position indicators show direction of CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR
0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate. Special output, useful in calibrating sampling plug-ins, provides 0.1 V ±3% into 50 Ω.

POWER REQUIREMENTS
Wired for 115 V RMS ±10%; transformer taps permit operation at 108, 115, 122, 216, 230, or 244 V (±10% on each range); 50 to 60 Hz. 585-W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so specified on order.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	$12\frac{15}{16}$ in	32.9 cm
Depth	$23\frac{7}{8}$ in	60.7 cm
Net weight	64 lbs	29.1 kg
Domestic shipping weight	~82 lbs	~37.3 kg
Export-packed weight	~101 lbs	~45.9 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	14 in	35.6 cm
Width	19 in	48.3 cm
Rack depth	$22\frac{11}{16}$ in	57.6 cm
Net weight	85 lbs	38.6 kg
Domestic shipping weight	~111 lbs	~50.5 kg
Export-packed weight	~130 lbs	~59.1 kg

RACK MOUNTING
Type RM545B withdraws from its cabinet on slide-out tracks, tilts and locks in 7 positions. Further mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES
Two P6006 10X probes (010-0127-00); BNC-to-BNC 18-in 50-Ω cable (012-0076-00); two BNC-to-BNC 18-in patch cords (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00); BNC post jack (012-0092-00), 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter, installed (378-0567-00); clear CRT protector plate (387-0918-00); two instruction manuals (070-0428-00). Type RM545B also includes mounting hardware.

TYPE 545B, without plug-in units $1550
TYPE RM545B, without plug-in units $1650

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERAS
C-12 has dichroic mirror for straight-on viewing and use of optional projected graticule, f/1.9—1:0.85 lens, Polaroid* Land Pack Film back accepts 3000-speed film, order Standard C-12 ..... $450
Type 545B to C-12 Camera adapter, order 016-0226-00 . $ 15
C-27 provides direct viewing and maximum transmission of light to film, f/1.9—1:0.85 lens, Polaroid Land Pack Film back accepts 3000-speed film, order Standard C-27 .. $420
Type 545B to C-27 Camera adapter, order 016-0225-00 . $ 15
Polaroid Roll Film back accepts 10,000-speed film for increased writing speed, can be substituted at no additional cost in either camera. Order C-12R or C-27R. Optional lenses are also available.

PROBES
The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART
Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES
In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured.

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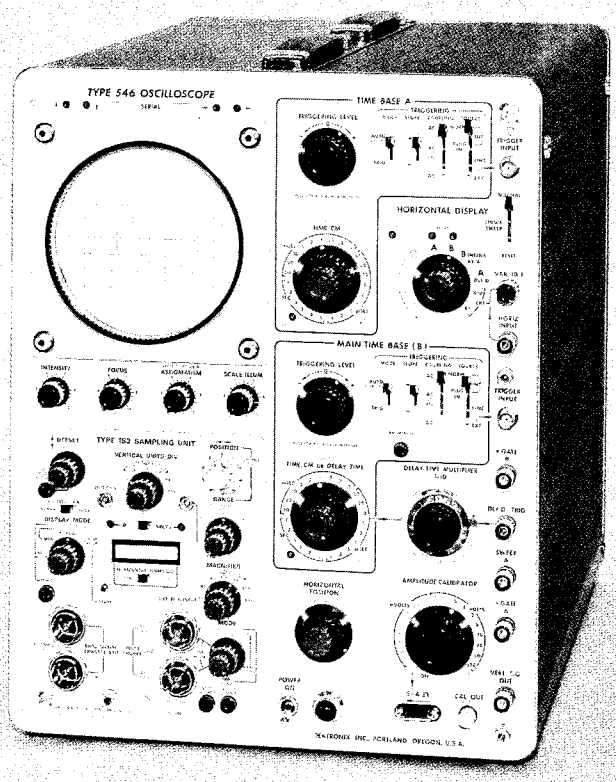
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-50 MHz OSCILLOSCOPES



- ***CALIBRATED SWEEP DELAY***
- ***UNIFORM-FOCUS 6 x 10-CM DISPLAY***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***FULL-BANDWIDTH TRIGGERING***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***

Type 546 and RM546 Oscilloscopes are versatile laboratory instruments designed for maximum performance with all Letter-Series and 1-Series Plug-In Units. Bandwidth extends from DC to 50 MHz.

The two time-base generators can be used in delayed sweep operations for highly accurate time measurements.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of all 1-Series and Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

SWEEP MAGNIFIER—X2, X5, or X10 extends calibrated time base to 10 ns/cm.

CALIBRATED SWEEP DELAY—0.1 μs to 50 s.

EXTERNAL INPUT—0.1 V/cm to 1 V/cm deflection factor, DC to 400 kHz.

CRT

DISPLAY AREA—6 x 10 cm.

ACCELERATING VOLTAGE—10 kV.

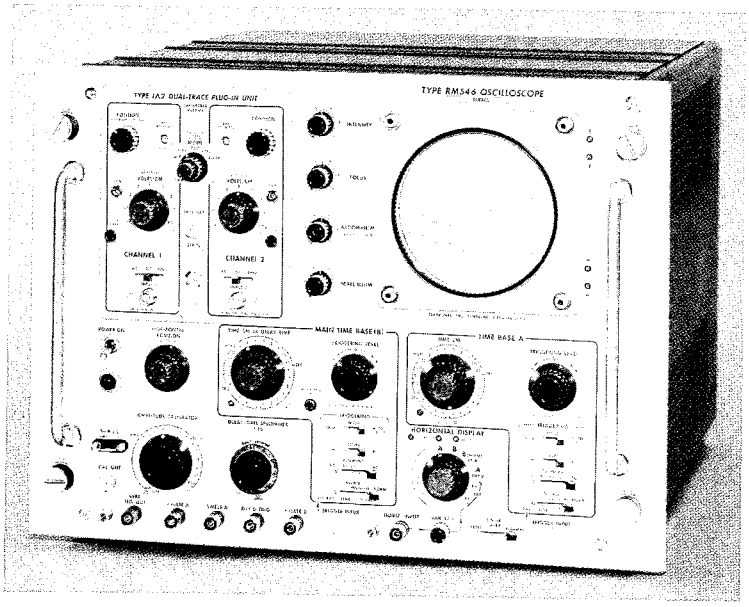
OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz squarewave, 100 V DC, 5 mA DC, 5 mA 1-kHz squarewave.

POWER REQUIREMENT—108, 115, 122, 216, 230, or 244 V (±10% on each range), typically 510 watts.

VERTICAL PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 50 MHz DC to 28 MHz 2 Hz to 15 MHz	7 ns 13 ns 24 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 50 MHz	7 ns	325
CA Dual-Trace	50 mV/cm	DC to 24 MHz	15 ns	260
1A4 Four-Trace	10 mV/cm	DC to 50 MHz	7 ns	750
M Four-Trace	20 mV/cm	DC to 20 MHz	18 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 20 MHz 2 Hz to 12 MHz	18 ns 30 ns	145
H	50 mV/cm	DC to 15 MHz	24 ns	185
K	50 mV/cm	DC to 30 MHz	12 ns	145
L	50 mV/cm 5 mV/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 25 MHz	14 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 2 mV/cm 1 mV/cm	DC to 50 MHz DC to 45 MHz DC to 40 MHz	7 ns 8 ns 9 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 20 MHz	18 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 8 MHz DC to 23 MHz	44 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm 5 mV/cm	140 ps system risetime DC to 3.9 GHz	90 ps	1300



VERTICAL DEFLECTION

BANDWIDTH

DC to 50 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME

7 ns, depending on plug-in unit. See chart.

DELAY LINE

Permits viewing leading edge of displayed waveform, requires no tuning.

SIGNAL OUTPUT

20-ns risetime, at least 0.3 V for each centimeter of displayed signal.

HORIZONTAL DEFLECTION

TIME BASE A AND B

0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 2%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning light indicates uncalibrated setting.

MAGNIFIER

X2, X5, or X10 magnification over full time base, increases fastest rate to 10 ns/cm. Magnified time base accurate within 5%.

DELAY TIME

0.1 μs to 50 s, continuously variable and calibrated, accurate within 1% of indicated delay ±2 minor dial divisions from 50 μs to 50 s. At delay times less than 50 μs add ≤100 ns for fixed delay. Incremental delay-time accurate within 1% ±4 minor dial divisions, from 1 μs to 50 s, ±10 minor divisions at 0.1, 0.2 and 0.5 μs. Uncalibrated delay to approx 120 s. Short-term jitter ≤1/20,000 of total Time Base B delay time.

DELAY MODES

Delayed sweep starts immediately at end of delay time, or is triggerable at end of delay time (for jitter-free displays).

DISPLAY MODES

Time Base A—Normal, delayed by B, single sweep of both modes. Time Base B—Normal, intensified by A, single sweep of both modes. Single sweep reset at front panel or with ≥+20-V pulse with <0.5-μs risetime, through rear-panel connector.

EXTERNAL INPUT

Fixed steps of approx 0.1 V/cm and 1 V/cm, continuously variable between steps and to approx 10 V/cm, DC to ≥400 kHz at −3 dB. 50-V maximum input (DC + peak AC) in most sensitive position. Input RC approx 1 MΩ paralleled by approx 55 pF.

SIGNAL OUTPUTS

Gates from both time bases (positive going from 0 to at least +20 V), sawtooth from Time Base A (positive going from approx 0 to at least +90 V), and a delayed trigger pulse (positive going from 0 to at least +10 V).

TRIGGER

2 identical systems

MODES

Manual level selection with triggered or automatic operation. Automatic operation provides a convenient reference trace with no trigger-signal input, or repetition rates less than 20 Hz. Reference trace is bright throughout the full time-base range.

COUPLING

AC, DC, or AC LF reject.

SOURCES

Internal (from oscilloscope vertical amplifier or direct from a single channel of Type 1A1, 1A2 or 1A4 Plug-In Units), external, or line. 30-V maximum external input (DC + peak AC). External trigger input RC approx 1.1 MΩ paralleled by approx 30 pF.

REQUIREMENTS

0.2-cm deflection or 0.2-V external at 1 kHz, increasing to 1-cm deflection or 0.2-V external at 50 MHz. Requirements increase below 2 kHz with AC low-frequency reject. DC coupling requires 0.5-cm deflection or 0.2-V external at DC to 50 MHz. ±2-V or ±20-V trigger level selection.

CRT

TEKTRONIX CRT

5-in metallized screen, helical post accelerating anode, 10-kV accelerating potential for bright displays. Spot diameter with intensity adjusted for typical ambient-light conditions (2-μA beam current) is nominally 9 mils at center screen, no more than 12 mils at either end of the horizontal axis. P31 phosphor normally supplied. Z-axis input requires 15 V peak to peak for CRT modulation at normal intensity.

GRATICULE

Internal, no parallax; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions. Two additional horizontal lines for convenient risetime measurements.

DISPLAY FEATURES

Beam-position indicators show direction of CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate. 50-Ω source resistance from 0.2 mV to 0.2 V. 0.6-μs risetime from 0.2 mV to 5 V; 1-μs from 10 V to 100 V. 100-V DC reference output also provided. Front-panel current loop for 5 mA ±3%, squarewave or DC.

POWER REQUIREMENTS

Wired for 115 V RMS ±10%; transformer taps permit operation at 108, 115, 122, 216, 230, or 244 V (±10% on each range); 50 to 60 Hz. 510 W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	12 15/16 in	32.9 cm
Depth	23 7/8 in	60.7 cm
Net weight	65 1/4 lbs	29.7 kg
Domestic shipping weight	~ 84 lbs	~38.2 kg
Export-packed weight	~102 lbs	~46.4 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	14 in	35.6 cm
Width	19 in	48.3 cm
Rack depth	22 11/16 in	57.6 cm
Net weight	85 1/2 lbs	38.9 kg
Domestic shipping weight	~112 lbs	~51.0 kg
Export-packed weight	~136 lbs	~61.8 kg

RACK MOUNTING

Type RM546 withdraws from its cabinet on slide-out tracks, tilts and locks in 7 positions. Further mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES

Two P6008 10X probes (010-0129-00); three BNC-to-BNC 18-in patch cords (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00), BNC post jack (012-0092-00). 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter, installed (378-0567-00); clear CRT protector plate (387-0918-00); two instruction manuals (070-0367-00). Type RM546 also includes mounting hardware.

TYPE 546, without plug-in units $1750

TYPE RM546, without plug-in units $1850

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERAS

C-12 has dichroic mirror for straight-on viewing and use of optional projected graticule, f/1.9—1:0.85 lens, Polaroid* Land Pack Film back accepts 3000-speed film, order Standard C-12 ..... $450

Type 546 to C-12 Camera adapter, order 016-0226-00 .. $ 15

C-27 provides direct viewing and maximum transmission of light to film, f/1.9—1:0.85 lens, Polaroid Land Pack Film back accepts 3000-speed film, order Standard C-27 ..... $420

Type 546 to C-27 Camera adapter, order 016-0225-00 .. $ 15

Polaroid Roll Film back accepts 10,000-speed film for increased writing speed, can be substituted at no additional cost in either camera. Order C-12R or C-27R. Optional lenses are also available.

PROBES

The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES

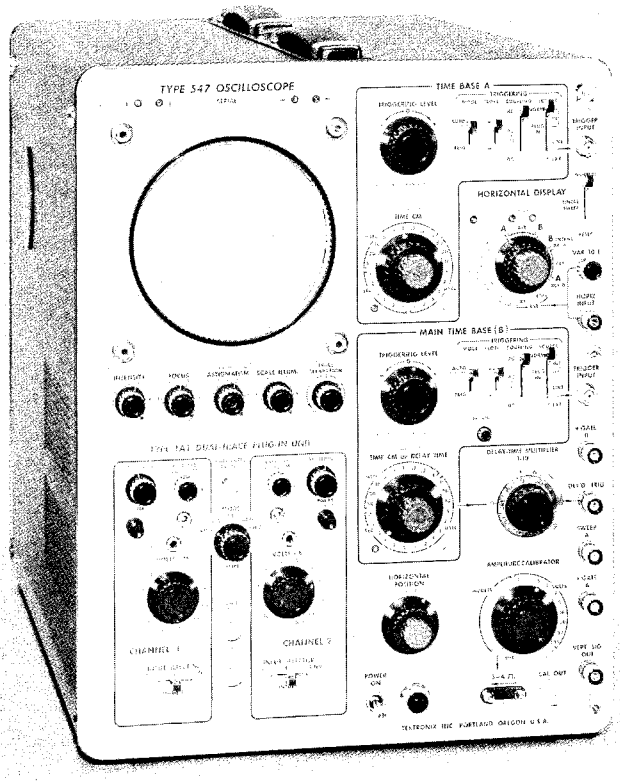
In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.

*Registered Trade-Mark Polaroid Corporation

U.S. Sales Prices FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

DC-to-50 MHz OSCILLOSCOPES



- ***AUTOMATIC DISPLAY SWITCHING***
- ***CALIBRATED SWEEP DELAY***
- ***UNIFORM-FOCUS 6 x 10-CM DISPLAY***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***FULL-BANDWIDTH TRIGGERING***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***

Type 547 and RM547 feature AUTOMATIC DISPLAY SWITCHING which provides general dual-beam performance without the additional cost of a dual-beam oscilloscope. With appropriate Plug-In units, both instruments are adaptable to a wide variety of applications such as WIDE-BAND RESPONSE (up to 50 MHz with Type 1A1 Plug-In Unit), DIFFERENTIAL INPUT, OPERATIONAL, TRANSDUCER AND STRAIN-GAGE, and others.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of all 1-Series and Letter-Series Plug-In Units.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

SWEEP MAGNIFIER—X2, X5, or X10, extends calibrated time base to 10 ns/cm.

CALIBRATED SWEEP DELAY—0.1 μs to 50 s.

EXTERNAL INPUT—0.1 V/cm to 1 V/cm deflection factor, DC to 400 kHz.

CRT

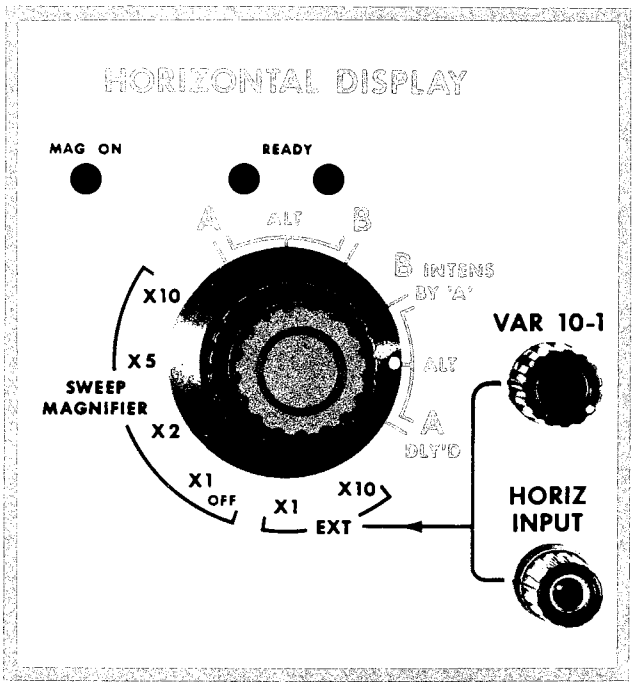
DISPLAY AREA—6 x 10 cm.

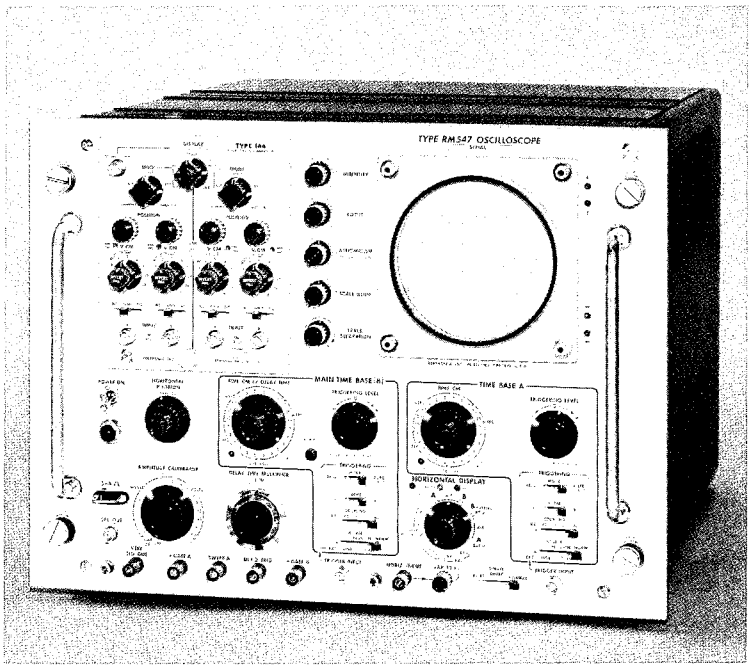
ACCELERATING VOLTAGE—10 kV.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz squarewave, 100 V DC, 5 mA DC, 5 mA 1-kHz squarewave.

POWER REQUIREMENT—108, 115, 122, 216, 230, or 244 V (±10% on each range), typically 510 watts.

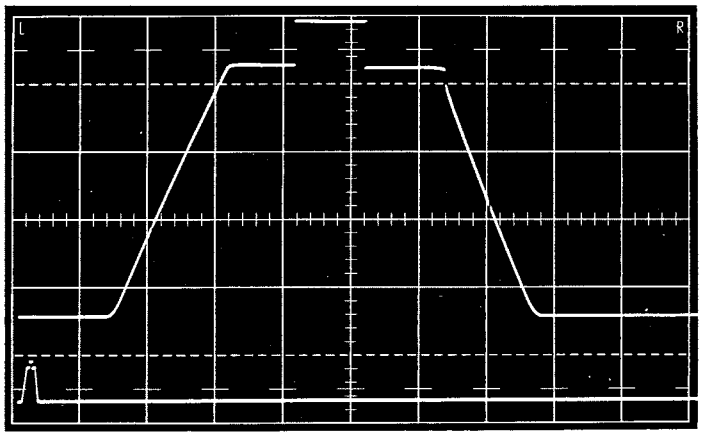




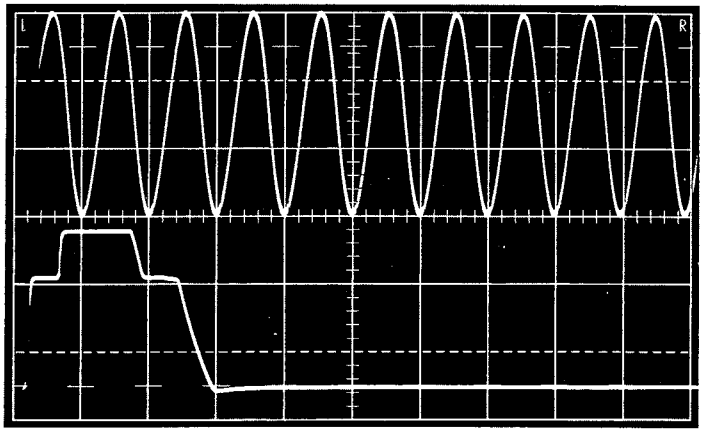
AUTOMATIC DISPLAY SWITCHING

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.

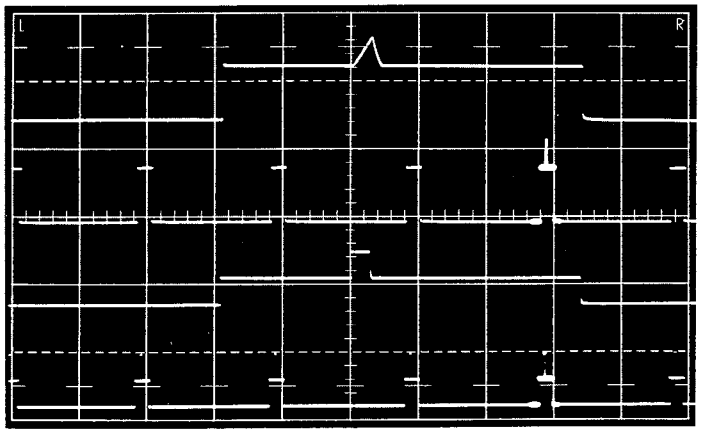
Two different signals can be alternately displayed at the same or different sweep rates with a Type 1A1 or 1A2 Dual-Trace Unit. With the new Type 1A4 Four-Trace Unit, channels 1 and 2 can be locked to time base A, and channels 3 and 4 can be locked to time base B. In many applications, this provides equivalent dual-beam operation without the additional cost and complexity of a dual-beam oscilloscope. Dual displays are equal in quality to the finest single presentations. Also, the full 6 x 10-cm screen area can be used to display signals on either time base. A trace separation control operates in conjunction with the normal vertical position to allow full control of dual displays.



Vertical and Horizontal Expansion—same signal applied to both channels of the Type 1A1 Dual-Trace Unit with independent control of sensitivity and sweep rate to expand display.



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 B sweep brightened over a selected portion, and the selected portion expanded to fill 10 cm.

VERTICAL PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 50 MHz DC to 28 MHz 2 Hz to 15 MHz	7 ns 13 ns 24 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 50 MHz	7 ns	325
CA Dual-Trace	50 mV/cm	DC to 24 MHz	15 ns	260
1A4 Four-Trace	10 mV/cm	DC to 50 MHz	7 ns	750
M Four-Trace	20 mV/cm	DC to 20 MHz	18 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 20 MHz 2 Hz to 12 MHz	18 ns 30 ns	145
H	50 mV/cm	DC to 15 MHz	24 ns	185
K	50 mV/cm	DC to 30 MHz	12 ns	145
L	50 mV/cm 5 mV/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 25 MHz	14 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 2 mV/cm 1 mV/cm	DC to 50 MHz DC to 45 MHz DC to 40 MHz	7 ns 8 ns 9 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 20 MHz	18 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 8 MHz DC to 23 MHz	44 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	

VERTICAL DEFLECTION

BANDWIDTH
DC to 50 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
7 ns, depending on plug-in unit. See chart.

DELAY LINE
Permits viewing leading edge of displayed waveform, requires no tuning.

SIGNAL OUTPUT
20-ns risetime, at least 0.3 V for each centimeter of displayed signal.

HORIZONTAL DEFLECTION

TIME BASE A AND B
0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 2%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning light indicates uncalibrated setting.

MAGNIFIER
X2, X5, or X10 magnification over full time-base, increases fastest rate to 10 ns/cm. Magnified time base accurate within 5%.

DELAY TIME
0.1 μs to 50 s, continuously variable and calibrated, accurate within 1% of indicated delay ±2 minor dial divisions from 50 μs to 50 s. At delay times less than 50 μs add ≤100 ns for fixed delay. Incremental delay-time accurate within 1% ±4 minor dial divisions, from 1 μs to 50 s, ±10 minor divisions at 0.1, 0.2 and 0.5 μs. Uncalibrated delay to approx 120 s. Short-term jitter ≤1/20,000 of total Time Base B delay time.

DELAY MODES
Delayed sweep starts immediately at end of delay time, or is triggerable at end of delay time (for jitter-free displays).

DISPLAY MODES
Time Base A only, Time Base B only, A alternated with B, B intensified by A, A delayed by B, B intensified by A alternated with A delayed by B. Single sweep on all the A and the B sweep modes, can be reset at front panel or with ≥+20-V pulse with <0.5-μs risetime, through rear-panel connector.

EXTERNAL INPUT
Fixed steps of approx 0.1 V/cm and 1 V/cm, continuously variable between steps and to approx 10 V/cm, DC to ≥400 kHz at —3 dB. 50 V maximum input (DC + peak AC) in most sensitive position. Input RC approx 1 MΩ paralleled by approx 55 pF.

SIGNAL OUTPUTS
Gates from both time bases (positive going from 0 to at least +20 V), sawtooth from Time Base A (positive going from approx 0 to at least +90 V), and a delayed trigger pulse (positive going from 0 to at least +10 V).

TRIGGER

2 identical systems

MODES
Manual level selection with triggered or automatic operation. Automatic operation provides a convenient reference trace with no trigger-signal input, or repetition rates less than 20 Hz. Reference trace is bright throughout the full time-base range.

COUPLING
AC, DC, or AF LF reject.

SOURCES

Internal (from oscilloscope vertical amplifier or direct from a single channel of Type 1A1, 1A2 or 1A4 Plug-In Unit), external, or line. 30 V maximum external input (DC + peak AC). External trigger input RC approx 1.1 MΩ paralleled by approx 30 pF.

REQUIREMENTS

0.2-cm deflection or 0.2 V external at 1 kHz, increasing to 1-cm deflection or 0.2 V external at 50 MHz. Requirements increase below 2 kHz with AC low-frequency reject. DC coupling requires 0.5-cm deflection or 0.2 V external at DC to 50 MHz. ±2-V or ±20-V trigger level selection.

CRT

TEKTRONIX CRT

5-in metallized screen, helical post accelerating anode, 10-kV accelerating potential for bright displays. Spot diameter with intensity adjusted for typical ambient-light conditions (2-μA beam current) is nominally 9 mils at center screen, no more than 12 mils at either end of the horizontal axis. P31 phosphor normally supplied. Z-axis input requires 15 V peak to peak for CRT modulation at normal intensity.

GRATICULE

Internal, no parallax; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions. Two additional horizontal lines for convenient risetime measurements.

DISPLAY FEATURES

Beam-position indicators show direction of CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate. 50-Ω source resistance from 0.2 mV to 0.2 V. 0.6-μs risetime from 0.2 mV to 5 V; 1-μs from 10 V to 100 V. 100-V DC reference output also provided. Front-panel current loop for 5 mA ±3%, squarewave or DC.

POWER REQUIREMENTS

Wired for 115 V RMS ±10%; transformer taps permit operation at 108, 115, 122, 216, 230, or 244 V (±10% on each range); 50 to 60 Hz. 510 W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	12 15/16 in	32.9 cm
Depth	23 7/8 in	60.7 cm
Net weight	65 3/4 lbs	29.9 kg
Domestic shipping weight	~ 85 lbs	~38.6 kg
Export-packed weight	~103 lbs	~46.8 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	14 in	35.6 cm
Width	19 in	48.3 cm
Rack depth	22 1/16 in	57.6 cm
Net weight	86 1/4 lbs	39.2 kg
Domestic shipping weight	~114 lbs	~51.8 kg
Export-packed weight	~137 lbs	~62.3 kg

RACK MOUNTING

Type RM547 withdraws from its cabinet on slide-out tracks, tilts and locks in 7 positions. Further mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES

Two P6008 10X probes (010-0129-00); three BNC-to-BNC 18-in patch cords (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00); BNC post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter, installed (378-0567-00); clear CRT protector plate (387-0918-00); two instruction manuals (070-0398-00). Type RM547 also includes mounting hardware.

TYPE 547, without plug-in units $1875

TYPE RM547, without plug-in units $1975

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERAS

C-12 has dichroic mirror for straight-on viewing and use of optional projected graticule, f/1.9—1:0.85 lens, Polaroid* Land Pack Film back accepts 3000-speed film, order Standard C-12 ..... $450
Type 547 to C-12 Camera adapter, order 016-0226-00 . $ 15

C-27 provides direct viewing and maximum transmission of light to film, f/1.9—1:0.85 lens, Polaroid Land Pack Film back accepts 3000-speed film, order Standard C-27 ..... $420
Type 547 to C-27 Camera adapter, order 016-0225-00 . $ 15

Polaroid Roll Film back accepts 10,000-speed film for increased writing speed, can be substituted at no additional cost in either camera. Order C-12R or C-27R. Optional lenses are also available.

PROBES

The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES

In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.

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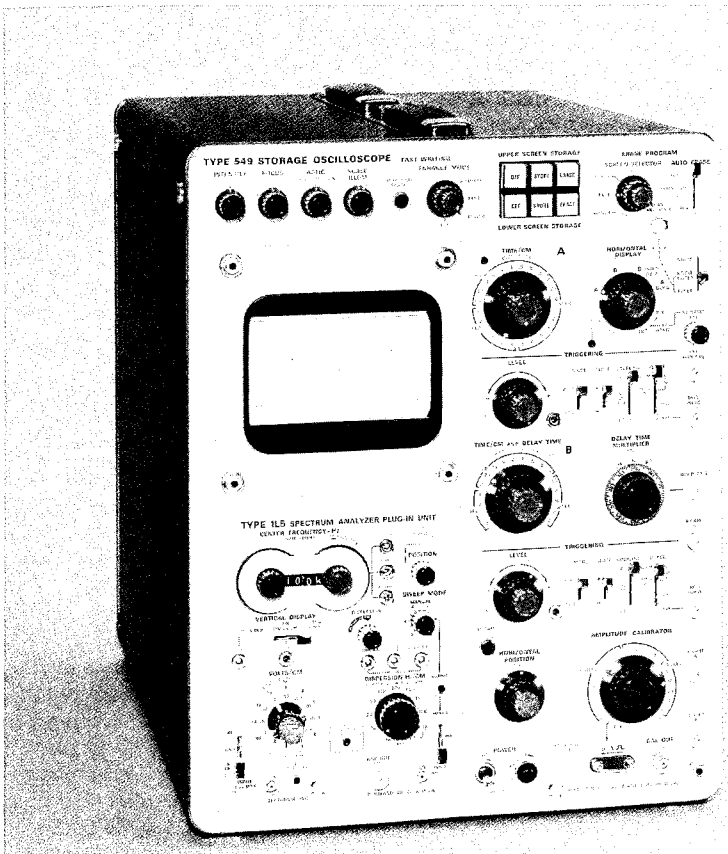
Please refer to Terms and Shipment, Generol Information page.

STORAGE OSCILLOSCOPE



- ***BISTABLE SPLIT-SCREEN STORAGE AND CONVENTIONAL DISPLAYS***
- ***AUTOMATIC ERASE SYSTEM***
- ***5 cm/μs WRITING SPEED***
- ***CALIBRATED SWEEP DELAY***
- ***FULL-BANDWIDTH TRIGGERING***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL PURPOSE PLUG-IN UNITS***

The Type 549 extends the exclusive Tektronix split-screen and bistable storage features into research and development applications. Offering a high degree of versatility, it accepts all letter-series and 1-series plug-in units covering a multitude of applications including sampling and spectrum analysis.

The split-screen, bistable CRT provides high contrast displays and unparalleled writing speeds. Each half of the 6 x 10-cm display area can be independently controlled, thus allowing stored or conventional displays on either the upper or lower half. A stored display can then be compared simultaneously with a conventional display.

An automatic erase system offers a new convenience to storage oscilloscope users. Through front panel controls, this system can be directed to automatically erase either or both halves of the display area after a predetermined viewing time. Viewing time can be varied from $\leq$0.5 seconds to $\geq$5 seconds with AUTO ERASE selected for either PERIODIC or AFTER-SWEEP operation. Used in conjunction with the SINGLE SWEEP, the "After-Sweep" erase circuit automatically resets the Single-Sweep circuit at the end of the viewing-time interval.

CHARACTERISTIC SUMMARY

VERTICAL

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

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.
X5 MAGNIFIER—Extends time base to 20 ns/cm.
CALIBRATED SWEEP DELAY—2 μs to 10 s.
EXTERNAL INPUT—0.2 V/cm, DC to 350 kHz.

STORAGE CRT

DISPLAY AREA—6 x 10 cm.
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.
LOCATE ZONE—Locate button permits vertical position finding.
VIEWING TIME—Up to one hour.
ERASE TIME—150 ms maximum.
WRITING SPEED—0.5 cm/μs. 5 cm/μs with enhancement.

OTHER

AMPLITUDE CALIBRATOR—0.2 mV to 100 V; current loop.
POWER REQUIREMENTS—104, 115, 127, or 208, 230, and 254 volts, center value (regulation range ±10%), 650 W (approx) maximum.

AVAILABLE DISPLAYS

With the wide range of vertical plug-in units, several types of stored and conventional displays are obtainable. The Type 549, by virtue of a **new** bistable split-screen storage CRT capable of unparalleled writing speeds, extends storage-measuring capability into previously unattainable areas.

SINGLE-TRACE AND MULTI-TRACE

Multi-trace displays are obtained by selecting a Type 1A1, 1A2, 1A4, CA, or M Amplifier Plug-In Unit. All other 1-Series and Letter-Series Plug-In Units will give single-trace displays. Selection of the Type 1A5, 1A6, 1A7, D, E, or G gives differential amplifier operation, while strain gage and other transducer operations are available with the Type Q Unit.

SAMPLING

Sampling displays with risetimes in the sub-nanosecond region are obtained using a Type 1S1 or 1S2 Sampling Unit. The Type 1S1 is a general-purpose sampler with 1 GHz bandwidth, delay line and internal triggering. The Type 1S2 is designed specifically for TDR (time-domain reflectometry) applications, but offers general-purpose sampling with 3.9 GHz bandwidth and built-in triggering.

SPECTRUM ANALYSIS

Spectral displays are obtained using a Type 1L5, 1L10, 1L20, or 1L30 Spectrum Analyzer Plug-In Unit to cover a frequency range from 10 Hz to 10.5 GHz.

There are decided advantages in using the storage oscilloscope for spectrum analysis. When slow sweep times are used, it is often difficult to view a complete display; however, by storing the display it can be completely and easily observed.

Signal drift is easily measured using the storage technique. The signal is stored and then as subsequent displays are stored, drift of the signal can be observed. Or, the spectral display can be stored on one half of the screen and simply compared with a similar non-stored display on the other.

STORAGE CRT AND DISPLAY FEATURES

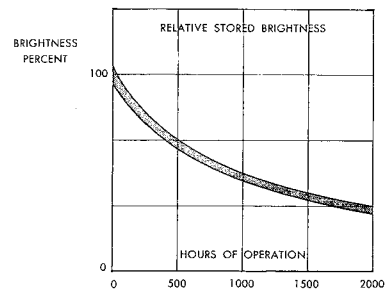
STORAGE CRT

Direct viewing, bistable, split-screen, mono-accelerating with 4-kV accelerating potential and separate non-store "locate zone". External edge-lighted graticule. Tektronix bistable storage offers: 1) Brightness of a stored trace independent of viewing time; 2) Contrast of a stored trace independent of viewing time; and 3) Brightness of a stored trace independent of writing speed.

DISPLAY AREA

6 x 10-cm split-screen storage area with independent or common control, plus locate zone.

LIFE CHARACTERISTICS



The aging rate of the storage target depends upon the mode of use. The above chart shows typical brightness aging characteristics when the target is used continuously in STORE mode.

SPLIT-SCREEN STORAGE

Store on either upper or lower half of screen with conventional display on other half; store on entire screen; or, non-store on entire screen. Independent operation of both halves.

VIEWING TIME

Up to one hour. If ENHANCE MODE is to be used, it is recommended that displays be stored for 20 minutes or less.

ENHANCE MODE

Controls the single sweep storage capabilities of the storage CRT. Through adjustment of ENHANCE LEVEL control, single-trace spot velocities up to 5 cm/μs or better can be stored with minimal loss of resolution and contrast.

LOCATE BUTTON (Serves two functions)

STORAGE—When depressed, the beam appears at the left of the CRT screen marking the vertical position of the next sweep. CONVENTIONAL DISPLAYS—Permits beam finding of off screen signals.

ERASE TIME

150 ms maximum.

AUTO ERASE SYSTEM

Viewing time before erase continuously variable from $\leq$0.5 s to $\geq$5 s.

In the PERIODIC Mode, there is a continuous sequence of storing, viewing time and erasure. This sequence occurs regardless of whether or not a signal is present and is independent of the sweep. In the AFTER SWEEP mode—which is used in conjunction with the SINGLE SWEEP—the sequence begins with the arrival of the signal. The signal initiates a sweep by triggering the Single Sweep circuitry. Viewing time begins as the sweep ends. At the end of the viewing time, erasure automatically resets the SINGLE SWEEP, readying it for the next signal. This cycle will automatically repeat itself as long as a signal is available.

Manual control available through Erase and Reset button or by Reset position of Single Sweep switch.

REMOTE CONTROL OPERATION

The Type 549 has remote control-operation capabilities using contact closure. A 9-pin connector, located on the rear panel, supplies one ground and 7 inputs (plus one spare) that allows the following functions:

1. Remote erase of upper screen.
2. Remote erase of lower screen.
3. Remote resetting of sweep for single-sweep operation.
4. Remote erase of both halves of the screen and resetting of the sweep.
5. Remote switching from conventional operation to storage operation (independently or commonly) of upper or lower screen halves.
6. Remote interruption of the Auto Erase sequence in order to hold a stored waveform.

Operation of these circuits is achieved by grounding the appropriate pin in the connector.

REMOTE CONTROL UNIT

(Optional accessory, part number 012-0102-00). Performs Remote Erase and Reset functions numbers 1, 2, and 3 above.

Z-AXIS INPUT

A CRT grid selector switch on the rear panel allows the CRT grid to be driven from the internal unblanking signal, or from an external source, DC coupled. A CRT CATHODE-SELECTOR switch allows the cathode to be driven from the internal chopped-blanking signal, or from an external source, AC coupled.

VERTICAL PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 30 MHz DC to 23 MHz 2 Hz to 14 MHz	12 ns 16 ns 25 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 30 MHz	12 ns	325
CA Dual-Trace	50 mV/cm	DC to 23 MHz	16 ns	260
1A4 Four-Trace	10 mV/cm	DC to 30 MHz	12 ns	750
M Four-Trace	20 mV/cm	DC to 19 MHz	19 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 18 MHz 2 Hz to 12 MHz	20 ns 30 ns	145
H	50 mV/cm	DC to 14 MHz	25 ns	185
K	50 mV/cm	DC to 27 MHz	13 ns	145
L	50 mV/cm 5 mV/cm	DC to 27 MHz 3 Hz to 23 MHz	13 ns 16 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 23 MHz	16 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 2 mV/cm 1 mV/cm	DC to 30 MHz DC to 29 MHz DC to 28 MHz	12 ns 13 ns 13 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 18 MHz	20 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 7 MHz DC to 22 MHz	50 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm 5 mV/cm	140 ps system risetime DC to 3.9 GHz	90 ps	1300

VERTICAL DEFLECTION

BANDWIDTH
DC to ≥30 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
≤12 ns, depending on plug-in unit. See chart.

DELAY LINE
Permits viewing leading edge of displayed waveform, requires no tuning.

SIGNAL OUTPUT
DC to ≥5 MHz at 3-dB down, ≤70 ns risetime, 1.5 V ±20% for each centimeter of displayed signal.

HORIZONTAL DEFLECTION

TIME BASE A
0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12.5 s/cm. Warning light indicates uncalibrated setting.

TIME BASE B
2 μs/cm to 1 s/cm in 18 calibrated steps (1-2-5 sequence), accurate within 3%. Sweep length variable from 4 to 10 cm, allowing use of Time Base B as a repetition-rate generator from 0.1 Hz to 40 kHz.

X5 MAGNIFIER
Operates over full time base, increases fastest Time Base A rate to 20 ns/cm, and the fastest Time Base B rate to 0.4 μs/cm. Magnified time base accurate within 5%.

DELAY TIME
2 μs to 10 s, continuously variable and calibrated, accurate within 1% of indicated delay ±2 minor divisions. Add processing time of 200 ns at fast sweep rates. Incremental delay-time accurate within 1% ±4 minor divisions. Short-term jitter ≤1 part in 20,000 of the available delay time.

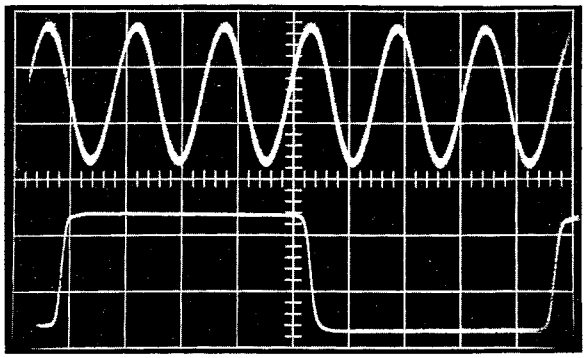
DELAY MODES
Depending on the setting of the Delayed Sweep stability control, the Delayed Sweep can start immediately at end of delay time, or be triggerable at end of delay time (for jitter-free displays).

OPERATING MODES
Time Base A, Time Base B, B intensified by A, and A delayed by B. Single sweep in any mode; reset accomplished with ERASE and RESET button on front panel, NORMAL-SINGLE SWEEP-RESET switch on front panel, automatically with AUTO ERASE switch in AFTER SWEEP and NORMAL-SINGLE SWEEP-RESET switch in SINGLE SWEEP, or by remote control through rear-panel connector.

EXTERNAL INPUT
Fixed steps of approx 0.2 V/cm and 2 V/cm, continuously variable between steps and to approx 20 V/cm, DC to ≥350 kHz at —3 dB with maximum gain. 600 V maximum input (DC + peak AC). Input RC approx 1 MΩ paralleled by <60 pF.

SIGNAL OUTPUTS
Gates from both time bases (0 to at least +20 V), sawtooth from Time Base A (0 to at least +130 V), and a delayed trigger pulse (at least +5 V).

STORED DISPLAYS

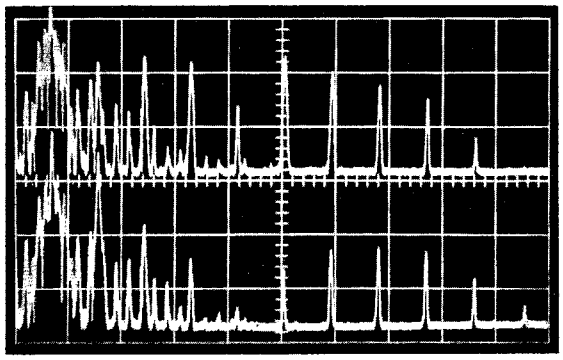


5 cm/μs SINGLE-SWEEP WRITING SPEED

Upper display shows a single shot 625-kHz sinewave stored in enhanced mode of operation. Sweep time is 1 μs/cm.

FAST REPETITIVE DISPLAY

Lower display is a recurrent, 1-MHz squarewave with a risetime of 20 ns stored without enhancement. Sweep time is 0.1 μs/cm.



FREQUENCY-BASED DISPLAY

Harmonic analysis of simulated 440-Hz oboe tone (upper) and violin (lower screen). Dispersion is 500 Hz/cm; minimum resolution bandwidth. Zero-frequency feedthrough is displayed in the first centimeter.

TRIGGER

MODES

Automatic or manual level selection. Automatic operation is useful between approx 50 Hz and 1 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes, and repetition rates. With no input (or input less than 50 Hz), automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace.

COUPLING

AC, DC, or AC LF reject.

SOURCES

Internal from oscilloscope vertical amplifier (or direct from a single channel of Type 1A1, 1A2 or 1A4 Plug-In Units), external, or line. 50-V maximum external input (DC + peak AC).

TIME BASE A REQUIREMENTS

0.2-cm deflection or 0.3-V external from DC to 10 MHz, increasing to 2-cm deflection or 3-V external at 30 MHz. Requirements increase below 300 Hz with AC coupling, below 200 kHz with AC low-frequency reject. Automatic operation requires 0.2-cm deflection or 0.3-V external from 300 Hz to 10 kHz, increasing to 2-cm deflection or 3-V external at 1 MHz.

TIME BASE B REQUIREMENTS

0.2-cm deflection or 0.3-V external from DC to 1 MHz, increasing to 1-cm deflection or 1.5-V external at 10 MHz. Requirements increase below 300 Hz with AC coupling, below 200 kHz with AC low-frequency reject. Automatic operation requires 0.2-cm deflection or 0.3-V external from 300 Hz to 10 kHz, increasing to 2-cm deflection or 3-V external at 1 MHz.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 2%. 50-Ω ±2% source resistance from 0.2 mV to 0.2 V. ~1-μs risetime; 1-kHz ±25% repetition rate; 40% to 60% duty cycle. 100-V DC reference output also provided. Front-panel current loop for 5 mA ±2%, squarewave or DC.

POWER REQUIREMENTS

Wired for 115 V RMS ±10%; rear-panel and internal switches permit operation at 104, 115, 127, 208, 230, or 254 V (±10% on each range); 50 to 60 Hz source having less than 2% harmonic distortion. Approx 650 W maximum power consumption, approx 750 VA maximum.

DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	$12^{15}/_{16}$ in	32.9 cm
Depth	$23^{7}/_{8}$ in	60.7 cm
Net weight	$67^{3}/_{4}$ lbs	30.8 kg
Domestic shipping weight	~ 89 lbs	~40.5 kg
Export-packed weight	~114 lbs	~51.8 kg

STANDARD ACCESSORIES

Two P6006 10X probes (010-0127-00); two BNC-to-BNC 18-in patch cords (012-0087-00); BNC-to-binding post adapter (103-0033-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray light filter (378-0567-00); two instruction manuals (070-0508-00).

TYPE 549, without plug-in units **$2375**

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERA

The standard C-12 camera satisfies most trace-recording requirements. For applications that might require a different viewing system, lens, or back, refer to camera descriptions or consult your field engineer, representative, or distributor.

Standard C-12: f/1.9—1:0.85 lens, no-parallax viewing, Polaroid Land* Pack-Film back, order C-12 ..... $450
Type 549 to C-12 Camera adapter, order 016-0226-00 . $ 15

PROBES

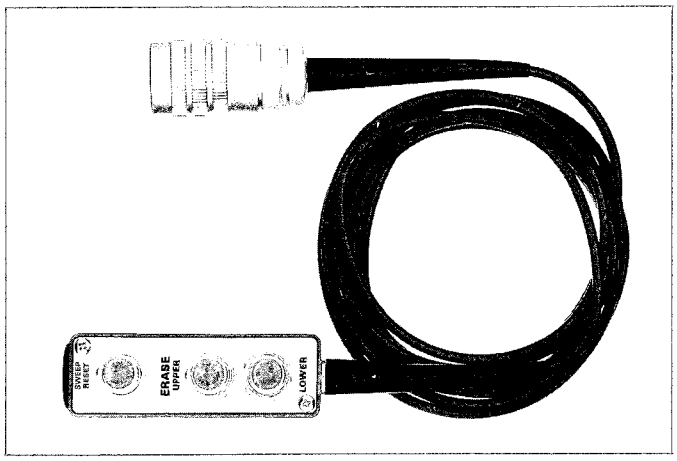
The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

TV ACCESSORIES FOR GENERAL-PURPOSE OSCILLOSCOPES

In addition to the Tektronix line of television instruments, accessories are available for use with many Tektronix general-purpose oscilloscopes. A TV Sync Separator provides stable triggering for the display of composite video signals. A Video Staircase Differentiator allows the amplitude linearity of television systems and their components to be measured. See the accessory pages at the rear of the catalog for additional information.



REMOTE-CONTROL UNIT

Separate controls for erase of upper screen, erase of lower screen, and single-sweep reset. Mates to oscilloscope rear-panel connector, 9-foot cable, order 012-0102-00 .. $25

REMOTE-CONTROL CONNECTOR

9-pin cable connector for 5 erase and reset functions plus selection of storage or non-storage operation. Mates to oscilloscope rear-panel connector. Cable and control unit not included, order 134-0049-00 .....$ 4

RACK-MOUNT ADAPTER

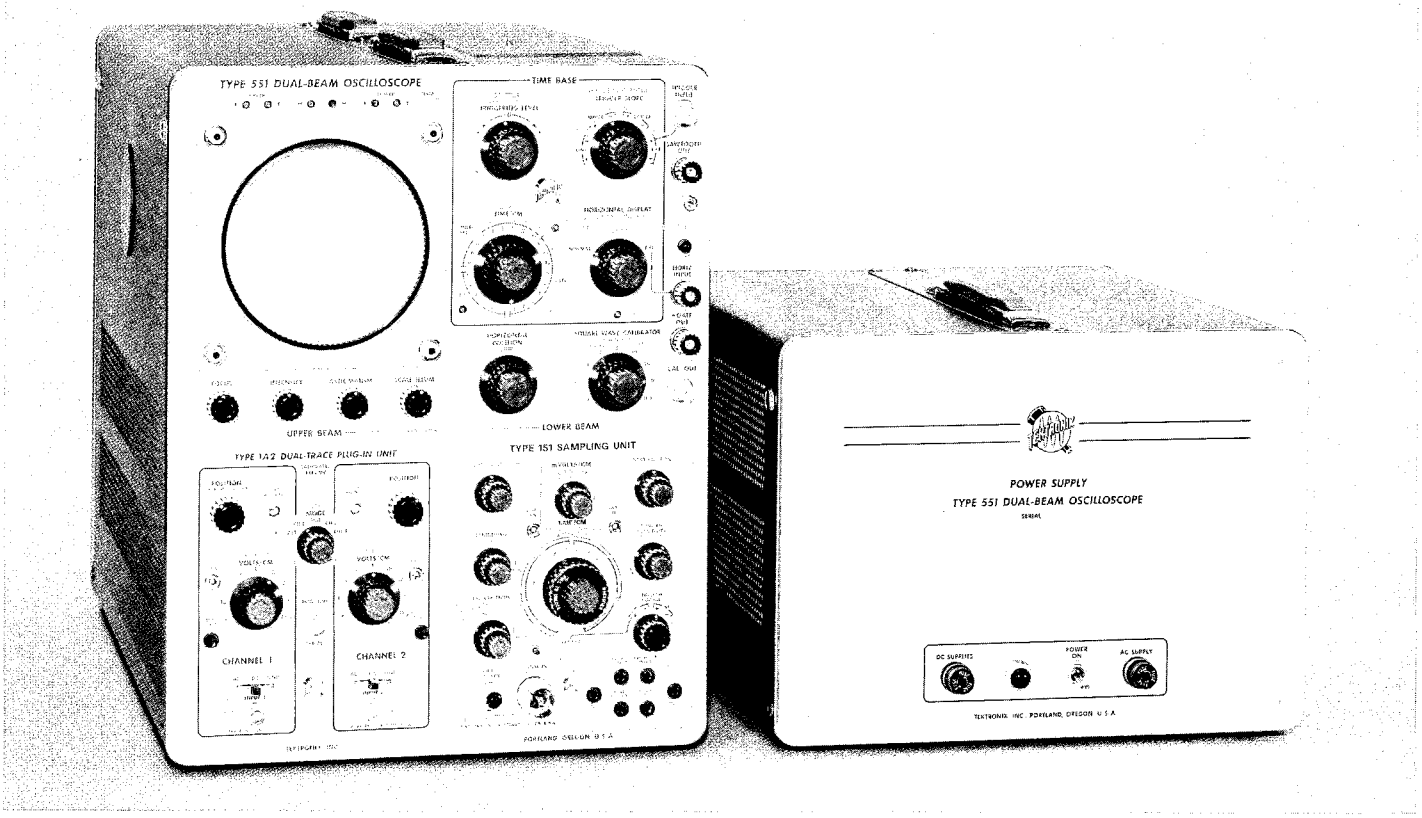
Consists of cradle to support the Type 549 in any standard 19-in relay rack, and mask to fit around the front panel. Requires 17½-in panel height, order 040-0281-00 .... $31.25

*Registered Trade-Mark Polaroid Corporation

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

TYPE 551

DC-to-27 MHz DUAL-BEAM OSCILLOSCOPE



- ***TWO VERTICAL-DEFLECTION SYSTEMS***
- ***COMMON HORIZONTAL DEFLECTION***
- ***4 x 10-CM DISPLAY PER BEAM***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***

The Type 551 uses a Tektronix two-gun cathode-ray tube with two pairs of vertical-deflection plates. A single pair of horizontal-deflection plates is common to both electron beams. The two wide-band main amplifiers in the Type 551 are designed for Tektronix Letter-Series and 1-Series Plug-In Units, providing a high degree of signal-handling versatility in both channels. Both electron beams are simultaneously deflected horizontally at any one of many sweep rates provided by an accurately-calibrated time base generator.

CHARACTERISTIC SUMMARY

VERTICAL

2 identical vertical-deflection systems.

Letter-Series and 1-Series Plug-in Units offer a wide selection of vertical-deflection characteristics for both beams.

HORIZONTAL

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

5X MAGNIFIER—Extends time base to 20 ns/cm.

EXTERNAL INPUT—0.2 V to 50 V/cm; DC to 400 kHz.

CRT

DISPLAY AREA—4 x 10 cm (each beam), 2-cm overlap.

ACCELERATING VOLTAGE—10 kV.

OTHER

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz square-wave.

POWER REQUIREMENTS—105 V to 125 V or 210 V to 250 V, 900 watts maximum.

VERTICAL PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm	DC to 27 MHz	13 ns	$ 600
	5 mV/cm	DC to 21 MHz	17 ns	
	≈500 μV/cm	2 Hz to 13 MHz	27 ns	
1A2 Dual-Trace	50 mV/cm	DC to 27 MHz	13 ns	325
CA Dual-Trace	50 mV/cm	DC to 22 MHz	16 ns	260
1A4 Four-Trace	10 mV/cm	DC to 27 MHz	13 ns	750
M Four-Trace	20 mV/cm	DC to 19 MHz	19 ns	525
SINGLE TRACE				
B	50 mV/cm	DC to 18 MHz	20 ns	145
	5 mV/cm	2 Hz to 12 MHz	30 ns	
H	50 mV/cm	DC to 14 MHz	25 ns	185
K	50 mV/cm	DC to 25 MHz	14 ns	145
L	50 mV/cm	DC to 25 MHz	14 ns	210
	5 mV/cm	3 Hz to 22 MHz	16 ns	
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 23 MHz	16 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm	DC to 27 MHz	13 ns	550
	2 mV/cm	DC to 26 MHz	14 ns	
	1 mV/cm	DC to 25 MHz	14 ns	
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 18 MHz	20 ns	190
W	1 mV/cm	DC to 7.5 MHz	47 ns	550
Comparator	50 mV/cm	DC to 20 MHz	18 ns	
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	

VERTICAL DEFLECTION

2 identical systems

BANDWIDTH
DC to 27 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
13 ns, depending on plug-in unit. See chart.

DELAY LINE
Permits viewing leading edge of displayed waveform.

HORIZONTAL DEFLECTION

Common to both beams

TIME BASE
0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning light indicates uncalibrated setting.

X5 MAGNIFIER
Operates over full time base, increases fastest rate to 20 ns/cm. Magnified time base accurate within 5%.

OPERATING MODES
Normal, single sweep.

EXTERNAL INPUT
Continuously variable from 0.2 V/cm to 50 V/cm, DC to ≥400 kHz at —3 dB. 50-V maximum input (DC + peak AC) in most sensitive position. Input RC approx 100 kΩ paralleled by approx 30 pF.

SIGNAL OUTPUTS
Gate (positive going from 0 to at least +20 V), sawtooth (positive going from 0 to at least +150 V). Cathode follower outputs.

TRIGGER

MODES
Automatic or manual level selection; high-frequency sync. Automatic operation is useful between approx 50 Hz and 2 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes, and repetition rates. With no input (or input less than 40 Hz), automatic triggering occurs at an approx 50-Hz rate, providing a convenient reference trace. High-frequency sync assures a steady display of sinewaves from approx 5 MHz to 30 MHz.

COUPLING
AC, DC, or AC LF reject.

SOURCES
Internal (from either oscilloscope vertical amplifier), external, or line. External trigger input RC approx 1 MΩ paralleled by approx 55 pF.

REQUIREMENTS
0.2-cm deflection or 0.2-V external from DC to below 5 MHz, increasing to 1-cm deflection or 1-V external at 5 MHz. Requirements increase below 16 Hz with AC coupling, below 16 kHz with AC low-frequency reject. Automatic operation requires 0.4-cm deflection or 0.4-V external from 60 Hz to 250 kHz, increasing to 1-cm deflection or 1-V external at 2 MHz. High-frequency sync requires 2-cm deflection or 2-V external from approx 5 Hz to 30 MHz.

CRT

TEKTRONIX DUAL-BEAM CRT

4 x 10-cm display per beam with at least 2-cm overlap. Separate vertical-deflection plates; common horizontal deflection plates. Metallized screen, helical post accelerating anode. 10-kV accelerating potential for bright displays. P2 phosphor normally supplied. Z-axis input requires 20 V peak to peak for CRT modulation at normal intensity.

GRATICULE

External; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions.

DISPLAY FEATURES

Beam-position indicators show direction of each CRT beam when off screen.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate.

POWER REQUIREMENTS

Wired for 105 to 125 VAC (117 V nominal); transformer taps permit operation at 107, 117, 127, 214, 234 or 254 VAC: 50 to 60 Hz. 850 W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

OSCILLOSCOPE DIMENSIONS AND WEIGHTS

Height	17 in	43.2 cm
Width	$12\frac{15}{16}$ in	32.9 cm
Depth	$23\frac{7}{8}$ in	60.7 cm
Net weight	$51\frac{3}{4}$ lbs	23.5 kg
Domestic shipping weight	71 lbs	32.3 kg
Export-packed weight	92 lbs	41.8 kg

POWER SUPPLY DIMENSIONS AND WEIGHTS

Height	$10\frac{9}{16}$ in	26.8 cm
Width	$13\frac{5}{16}$ in	33.8 cm
Depth	$17\frac{7}{16}$ in	44.3 cm
Net weight	$43\frac{1}{2}$ lbs	19.8 kg
Domestic shipping weight	52 lbs	23.6 kg
Export-packed weight	71 lbs	32.3 kg

STANDARD ACCESSORIES

Four P6006 10X probes (010-0127-00); two BNC-to-BNC 18-in patch cords (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00); BNC post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); inter-unit cable (012-0032-01); smoke-gray light filter (378-0567-00); two instruction manuals (070-0245-00).

TYPE 551, without plug-in units $1850

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERA

The standard C-12 camera satisfies most trace-recording requirements. For applications that might require a different viewing system, lens, or back, refer to camera descriptions or consult your field engineer, representative, or distributor.

Standard C-12: f/1.9—1:0.85 lens, no parallax viewing, Polaroid Land* Pack-Film back, order C-12 ..... $450

Type 551 to C-12 Camera adapter, order 016-0226-00 .. $ 15

PROBES

The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

INTER-UNIT CABLE

Six-foot cable allows increased separation of Type 551 and Power Supply, order 012-0051-00 ..... $28.50

RACK-MOUNT ADAPTER

Consists of two cradles to support the Type 551 and Power Supply in any standard 19-in relay rack, and two masks to fit around the front panels. Requires $17\frac{1}{2}$-in panel height for Type 551, $12\frac{1}{4}$-in panel height for Power Supply. Order 040-0279-00 ..... $75

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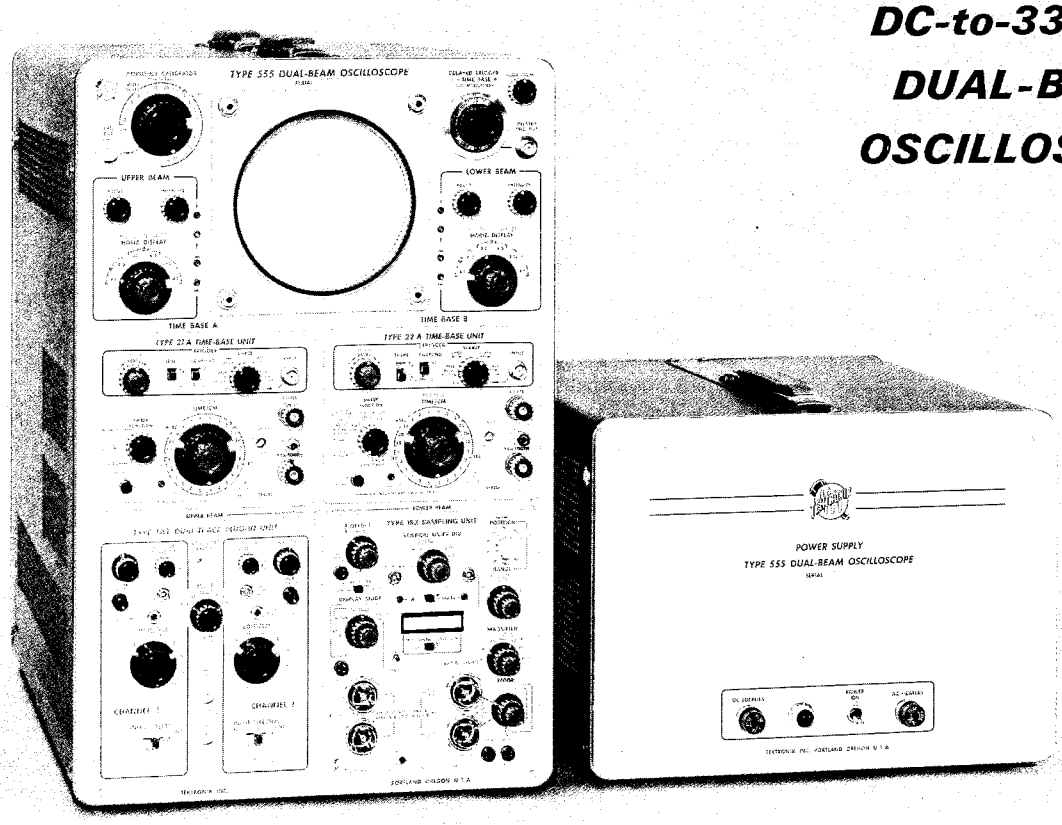
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

DC-to-33 MHz DUAL-BEAM OSCILLOSCOPE



TWO VERTICAL AND HORIZONTAL SYSTEMS

CALIBRATED SWEEP DELAY

4 x 10-CM DISPLAY PER BEAM

ILLUMINATED NO-PARALLAX GRATICULE

FULL-BANDWIDTH TRIGGERING

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

The Type 555 Oscilloscope is a dual-beam laboratory instrument for accurate measurements in the DC to 33 MHz range. Two complete horizontal-deflection systems and two independent vertical amplifiers provide for completely independent deflection of the two beams.

Either of two plug-in time base units can control the sweep of either or both electron beams. In addition, a continuously-variable calibrated sweep delay allows expansion of a selected portion of the undelayed sweep for precise time measurements. Delayed and undelayed sweeps can be presented simultaneously.

The wide-band main amplifiers in the Type 555 are designed to accept Letter-Series and 1-Series Plug-In Units for a high degree of signal-handling versatility.

CHARACTERISTIC SUMMARY

VERTICAL

2 identical vertical-deflection systems

Letter-Series and 1-Series Plug-In Units offer wide selection of vertical-deflection characteristics for both beams.

HORIZONTAL

2 independent horizontal-deflection systems

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

5X MAGNIFIER— Extends time base to 20 ns/cm.

CALIBRATED SWEEP DELAY—0.1 μs to 50 s.

EXTERNAL INPUT—0.2 to 20 V/cm; DC to 350 kHz.

CRT

DISPLAY AREA—4 x 10 cm (each beam), 2-cm overlap.

ACCELERATING VOLTAGE—10 kV.

OTHER

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz square-wave.

POWER REQUIREMENTS—105 to 125 V, or 210 to 250 V, 50 to 60 Hz, 1050 watts maximum.

VERTICAL PLUG-IN UNITS				
PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 33 MHz DC to 23 MHz 2 Hz to 14 MHz	11 ns 16 ns 25 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 33 MHz	11 ns	325
CA Dual-Trace	50 mV/cm	DC to 24 MHz	15 ns	260
1A4 Four-Trace	10 mV/cm	DC to 33 MHz	11 ns	750
M Four-Trace	20 mV/cm	DC to 20 MHz	18 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 20 MHz 2 Hz to 12 MHz	18 ns 30 ns	145
H	50 mV/cm	DC to 15 MHz	24 ns	185
K	50 mV/cm	DC to 30 MHz	12 ns	145
L	50 mV/cm 5 mV/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 25 MHz	14 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 2 mV/cm 1 mV/cm	DC to 33 MHz DC to 31 MHz DC to 30 MHz	11 ns 12 ns 12 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 20 MHz	18 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 8 MHz DC to 23 MHz	44 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	

VERTICAL DEFLECTION

2 identical systems

BANDWIDTH
DC to 33 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME
11 ns, depending on plug-in unit. See chart.

DELAY LINE
Permits viewing leading edge of displayed waveform.

HORIZONTAL DEFLECTION

2 nearly-identical systems with Type 21A and 22A Time Base Units

TIME BASE A AND B
0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12 s/cm. Warning lights indicate uncalibrated settings.

X5 MAGNIFIER
Operates over full time base, increases fastest rate to 20 ns/cm. Magnified time bases accurate within 5%.

DELAY TIME
0.1 μs to 50 s, continuously variable and calibrated, accurate within 3% of indicated delay + approx 500 ns fixed trigger delay. Incremental accuracy within 0.2% of available delay. Short-term jitter ≤1/20,000 of the total Time Base A delay time.

DELAY MODES
Delayed sweep starts immediately at end of delay time, or is triggerable at end of delay time (for jitter-free displays).

DISPLAY MODES
Display logic identical for upper and lower beam. Either time-base plug-in unit can deflect either or both beams. Single-sweep operation with separate reset for each time base.

EXTERNAL INPUT
Fixed steps of approx 0.2 V/cm and 2 V/cm, continuously variable between steps and to approx 20 V/cm, DC to ≥350 kHz at —3 dB. 50 V maximum input (DC + peak AC) in most sensitive position. Input RC approx 1 MΩ paralleled by approx 47 pF.

SIGNAL OUTPUTS
Gates from both time bases (approx +20 V), sawtooths from both time bases (approx +150 V), and a delayed trigger pulse (approx +5 V).

TRIGGER

2 identical systems

MODES
Manual level selection with triggered or automatic baseline operation. Automatic operation provides a convenient reference trace with no trigger-signal input, or repetition rates less than 20 Hz. Reference trace is bright throughout the full time-base range. Triggering is jitter free to beyond 33 MHz.

COUPLING
AC or DC.

SOURCES
Internal (from either oscilloscope vertical amplifier or single channels of Type 1A1, 1A2 or 1A4 Plug-In Units), external, or line. 50 V maximum external input (DC + peak AC). External trigger input RC approx 1 MΩ paralleled by approx 30 pF.

REQUIREMENTS
0.5-cm deflection or 0.5-V external from DC to 5 MHz, increasing to 2-cm deflection or 1.5-V external at 33 MHz. Requirements increase below 160 Hz with AC coupling. Automatic operation requires 0.5-cm deflection or 0.5-V external from 20 Hz to 5 MHz, increasing to 2-cm deflection or 1.5-V external at 33 MHz.

CRT

TEKTRONIX CRT
4 x 10-cm display per beam with at least 2-cm overlap. Separate vertical and horizontal deflection plates. Metalized screen, helical post accelerating anode. 10-kV accelerating potential for bright displays. P31 phosphor normally supplied. Z-axis input requires 20 V peak to peak for CRT modulation at normal intensity.

GRATICULE
Internal no parallax; variable edge lighting. 6 x 10-cm display area. Vertical and horizontal center lines marked in 2-mm divisions.

DISPLAY FEATURES
Beam-position indicators show direction of each CRT beam when off screen. Multi-trace blanking eliminates switching transients from display when multi-trace plug-in unit is operated in chopped mode.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR
0.2 mV to 100 V squarewave, 18 calibrated steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate.

POWER REQUIREMENTS
Wired for 105 to 125 VAC (117 V nominal); transformer taps permit operation at 107, 117, 127, 214, 234, or 254 VAC; 50 to 60 Hz. 1050 W maximum power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

OSCILLOSCOPE DIMENSIONS AND WEIGHTS

Height	20 1/4 in	51.4 cm
Width	12 15/16 in	32.9 cm
Depth	23 7/8 in	60.7 cm
Net weight	66 lbs	30.0 kg
Domestic shipping weight	~87 lbs	~39.6 kg
Export-packed weight	~111 lbs	~50.5 kg

POWER SUPPLY DIMENSIONS AND WEIGHTS

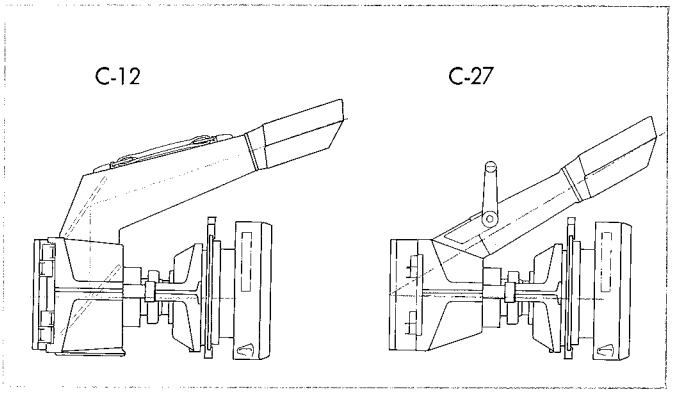
Height	10 9/16 in	26.8 cm
Width	13 5/16 in	33.8 cm
Depth	17 7/16 in	44.3 cm
Net weight	52 lbs	23.6 kg
Domestic shipping weight	~61 lbs	~27.8 kg
Export-packed weight	~71 lbs	~32.3 kg

STANDARD ACCESSORIES
Four P6006 10X probes (010-0127-00); two BNC-to-BNC 18-in patch cords (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00); BNC post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); inter-unit cable (012-0032-01); time-base extension (013-0013-00); smoke-gray light filter, installed (378-0567-00); clear CRT protector plate (387-0918-00); two instruction manuals (070-0403-00).

TYPE 555 with time-base plug-in units, without vertical plug-in units $2650

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.



CAMERAS
C-12 has dichroic mirror for straight-on viewing and use of optional projected graticule, f/1.9—1:0.85 lens, Polaroid* Land Pack Film back accepts 3000-speed film, order Standard C-12 ..... $450
Type 555 to C-12 Camera adapter, order 016-0226-00 . $ 15

C-27 provides direct viewing and maximum transmission of light to film, f/1.9—1:0.85 lens, Polaroid Land Pack Film back accepts 3000-speed film, order Standard C-27 ..... $420

Type 555 to C-27 Camera adapter, order 016-0225-00 .$ 15
Polaroid Roll Film back accepts 10,000-speed film for increased writing speed, can be substituted at no additional cost in either camera. Order C-12R or C-27R. Optional lenses are also available.

*Registered Trade-Mark Polaroid Corporation

PROBES
The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART
Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray, order 202-2 ..... $130

RACK-MOUNT ADAPTER
Consists of two cradles to support the Type 555 and Power Supply in any standard 19-in relay rack, and two masks to fit around the front panels. Requires 21-in panel height for Type 555, 12 1/4-in panel height for Power Supply, order 040-0280-00 ..... $ 75

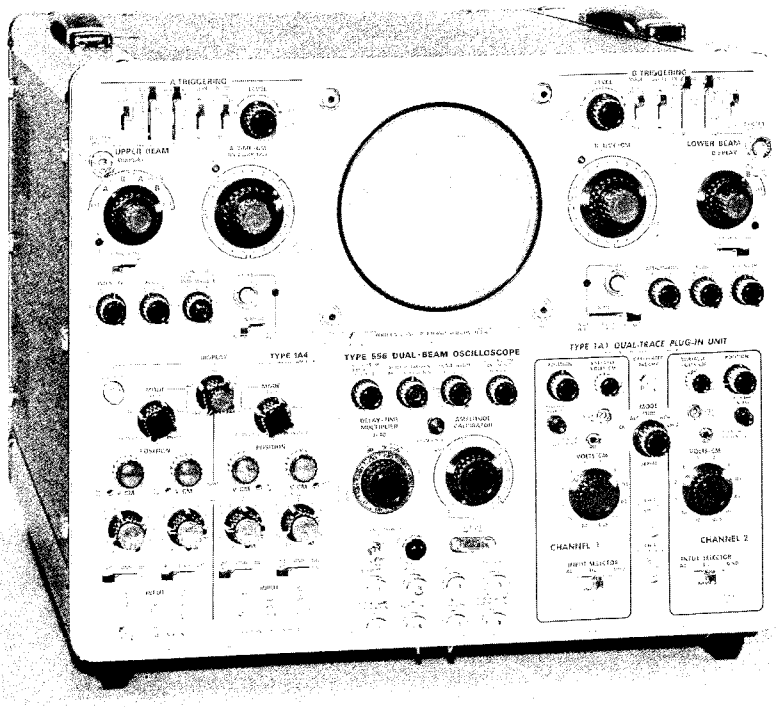
INTER-UNIT CABLE
Six-foot cable permits increased separation of Type 555 and Power Supply, order 012-0051-00 ..... $28.50

EXTRA TIME-BASE UNITS

TYPE 21A $275
TYPE 22A with Sweep Delay $285

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

DC-to-50 MHz DUAL-BEAM OSCILLOSCOPES



- ***TWO VERTICAL AND HORIZONTAL SYSTEMS***
- ***OVER 50 DISPLAY MODES INCLUDING DUAL-BEAM DISPLAY WITH ONE INPUT***
- ***CALIBRATED SWEEP DELAY***
- ***EMI SUPPRESSION***
- ***6 x 10-CM DISPLAY PER BEAM***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***FULL-BANDWIDTH TRIGGERING***
- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***

The Type 556 and R556 are dual-beam laboratory instruments for accurate measurement in the DC to 50 MHz range. Features include independent vertical and horizontal deflection systems, trigger selectability for cross triggering, and uniform-focus CRT with 6 x 10-cm scan per beam.

Unique display capability allows simultaneous display of one signal at two different sweep times, using only one probe for minimum circuit loading.

CHARACTERISTIC SUMMARY

VERTICAL

2 identical vertical-deflection systems

Letter-Series and 1-Series Plug-In Units offer wide selection of vertical-deflection characteristics for both beams.

HORIZONTAL

2 independent horizontal-deflection systems

CALIBRATED TIME BASE—0.1 μs/cm to 5 s/cm.

X10 MAGNIFIER—Extends time base to 10 ns/cm.

CALIBRATED SWEEP DELAY—0.1 μs to 50 s.

EXTERNAL INPUT—$\leq$0.1 V/cm to approx 10 V/cm; DC to $\geq$400 kHz.

CRT

DISPLAY AREA—6 x 10 cm per beam, 4-cm overlap.

ACCELERATING VOLTAGE—10 kV.

OTHER

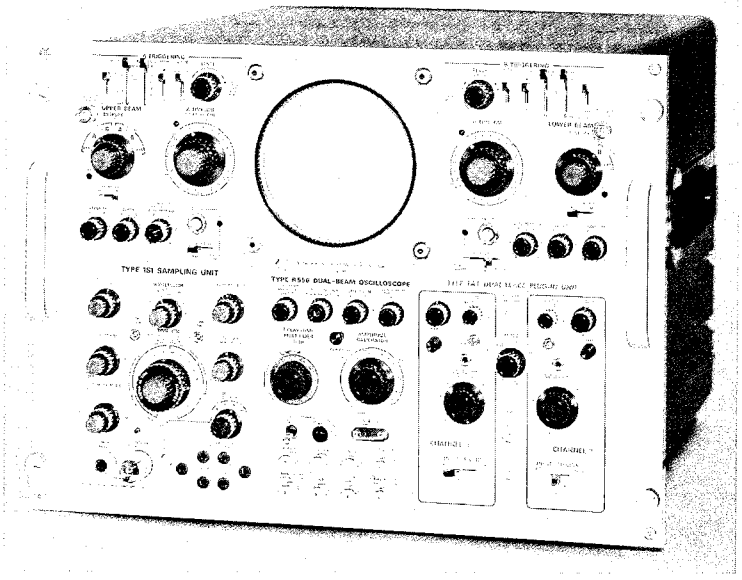
ELECTROMAGNETIC INTERFERENCE—Meets MIL-I-6181D, Radiated: 150 kHz to 1 GHz; Conducted: 150 kHz to 25 MHz.

AMPLITUDE CALIBRATOR—1-kHz squarewave; 0.2 mV to 100 V; 100 VDC; 5 mA, 1-kHz squarewave; 5 mA DC.

POWER REQUIREMENTS—90 to 117 V, 100 to 130 V, 180 to 234 V, or 200 to 260 V; 50 to 60 Hz; approx 840 watts, 1 kVA (maximums).

VERTICAL PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 50 MHz DC to 28 MHz 2 Hz to 15 MHz	7 ns 13 ns 24 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 50 MHz	7 ns	325
CA Dual-Trace	50 mV/cm	DC to 24 MHz	15 ns	260
1A4 Four-Trace	10 mV/cm	DC to 50 MHz	7 ns	750
M Four-Trace	20 mV/cm	DC to 20 MHz	18 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 20 MHz 2 Hz to 12 MHz	18 ns 30 ns	145
H	50 mV/cm	DC to 15 MHz	24 ns	185
K	50 mV/cm	DC to 30 MHz	12 ns	145
L	50 mV/cm 5 mV/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 25 MHz	14 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325
DIFFERENTIAL				
1A5 Comparator	5 mV/cm 2 mV/cm 1 mV/cm	DC to 50 MHz DC to 45 MHz DC to 40 MHz	7 ns 8 ns 9 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 20 MHz	18 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 8 MHz DC to 23 MHz	44 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	



VERTICAL DEFLECTION

2 identical systems

BANDWIDTH

DC to ≥50 MHz at 3-dB down, depending on plug-in unit. See chart.

RISETIME

≤7 ns, depending on plug-in unit. See chart.

DELAY LINE

Permits viewing leading edge of displayed waveform, requires no tuning.

HORIZONTAL DEFLECTION

2 identical systems

TIME BASE A AND B

0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12.5 s/cm. Warning light indicates uncalibrated setting.

X10 MAGNIFIER

Operates over full time base, increases fastest rate to 10 ns/cm. Magnified time base accurate within 5%.

DELAY TIME

0.1 μs to 50 s, continuously variable and calibrated, accurate within 1% of indicated delay ±2% of A TIME/CM setting (±5% from 0.5 μs/cm to 0.1 μs/cm) + fixed delay in system of ≤150 ns. Incremental delay-time accurate within 1% of indicated incremental delay ±4% of A TIME/CM setting (±7% from 0.5 μs/cm to 0.1 μs/cm). Uncalibrated delay to approx 120 s. Short-term jitter ≤1 part in 20,000 of the available delay time.

DELAY MODES

Delayed sweep starts immediately at end of delay time, or is triggerable at end of delay time (for jitter-free displays).

OPERATING MODES

Time Base A—Normal and Single Sweep.
Time Base B—Normal, B delayed by A, and Single Sweep.

EXTERNAL INPUT

≤0.1 V/cm with X10 Display Mag, ≤1 V/cm with X1 Display Mag, continuously variable from ≤0.1 V/cm to approx 10 V/cm. DC to ≥400 kHz at 3-dB down. 50-V maximum (DC + peak AC). Input RC approx 1 megohm paralleled by approx 65 pF.

SIGNAL OUTPUTS

Gates from both time bases ($\geq$+10 V), sawtooths from both time bases ($\geq$9 V/cm), delayed trigger pulse ($\geq$7 V).

TRIGGER

2 identical systems

MODES

Triggered and Auto Stability. Latter mode free runs sweep in absence of triggering signal, triggers on signals $\geq$30 Hz.

COUPLING

AC, DC, AC LF reject, AC HF reject.

SOURCES

Internal from left or right vertical amplifier, left or right plug-in, external, or line. External trigger input RC approx 1 megohm paralleled by approx 35 pF. 50-V maximum external input (DC + peak AC). External trigger signals that have an amplitude greater than 2 V and a rate of rise exceeding 1/3 V/ns may cause erratic triggering. Internal source selectable from the oscilloscope vertical amplifier, or direct from a single channel of Type 1A1, 1A2, and 1A4 Plug-In Units. The latter mode displays the true time relationship between signals when plug-in units are in chopped or alternate operation.

REQUIREMENTS

0.2-cm deflection or 0.2-V external from 60 Hz to 10 MHz, increasing to 1-cm deflection or 0.4-V external at 50 MHz. Requirements increase below 2.5 kHz with AC LF REJECT ($\geq$ 3-cm deflection or $\geq$3-V external at 30 Hz), and above 60 kHz with AC HF REJECT ($\geq$1-cm deflection or $\geq$1-V external at 6 MHz). DC coupling requires 0.35-cm deflection or 0.2 V external from DC to 10 MHz, increasing to 2-cm deflection or 0.4-V external at 50 MHz.

DISPLAY LOGIC

UPPER BEAM

Signals from left or right plug-in unit may be deflected with either A or B Time Base, or an external signal (Ext Horiz In); triggered from either plug-in unit (single channel or composite signal), externally or from line.

LOWER BEAM

Signals from right plug-in unit may be deflected with either Time Base B or an external signal; triggered from either plug-in unit (single channel or composite signal), externally or from line.

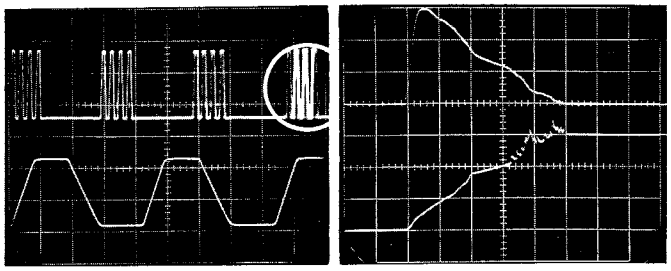
SIMULTANEOUS DISPLAY CAPABILITIES

UPPER BEAM		LOWER BEAM		TYPE OF DISPLAY
Plug-in Unit	Horizontal Deflection	Plug-in Unit	Horizontal Deflection	
left	A sweep	right	B sweep	Independent deflection systems.
right	A sweep	right	B sweep	Same signal at 2 different sweep time/cm settings, minimizes circuit loading.
left	B sweep	right	B sweep	2 signals, common sweep time/cm setting.
right	external	right	B sweep	X-Y and Y-T displays.
left	external	right	B sweep	
left	A sweep	right	external	
right	A sweep	right	external	
left	B sweep	right	external	
right	B sweep	right	external	
left	external	right	external	Dual-beam X-Y displays.
15 additional single-sweep combinations. 4 additional delay-sweep combinations.				

CRT AND DISPLAY FEATURES

TEKTRONIX DUAL-BEAM CRT

5-inch round tube, 8 x 10 cm display area; $\geq$6 x 10 cm per beam with 4-cm overlap. Spot size, focus uniformity and geometry equivalent to our finest single-beam tubes. Aluminized construction, helical post acceleration. P31 phosphor. Z-axis input requires 10 V peak to peak for CRT modulation at normal intensity.

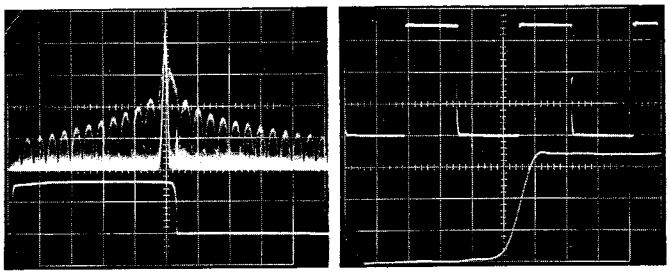


SINGLE-INPUT DUAL-BEAM DISPLAYS (Above left)

Upper beam shows bursts of 2.5 MHz pulses on Time Base A with time variation between bursts. This shows up as increasing time-jitter between the first and successive bursts. The lower beam shows Time Base B (0.1 µs/cm) delayed by Time Base A and triggered on the second pulse of the last burst to provide a jitter-free expanded display of the A Sweep intensified zone. The use of only one probe and one plug-in input simplifies signal connection and provides minimum loading on the signal source.

SIMULTANEOUS SINGLE-SHOT DISPLAYS (Above right)

Current versus voltage display of a 0.75 ampere, fast-blow fuse during destructive overload. Both beams are driven by B Time Base (50 µs/cm) which is delayed by pre-triggered A Time Base to provide base reference lines before and after the event. The upper beam shows the current through the fuse at 30 A/cm while the lower beam shows the corresponding voltage across the fuse at 100 V/cm.



TIME AND FREQUENCY DISPLAYS (Above left)

Upper beam shows the spectral output of a 200-MHz gated oscillator applied as IF feedthrough to a Type 1L20 Spectrum Analyzer; the calibrated dispersion is 1 MHz/cm. The lower beam shows a real-time display of the 10-kHz gating pulse (0.5 µs/cm).

SAMPLING AND REAL-TIME DISPLAYS (Above right)

Upper beam shows a squarewave at 1 µs/cm, as applied to a Type 1A2 Plug-In. The lower beam shows the leading-edge of the same waveform at 1 ns/cm, as applied to a Type 1S1 Wide-Band Sampling Plug-In.

INTERNAL GRATICULE

Variable edge lighting. Vertical and horizontal centerlines marked in 2-mm divisions.

DISPLAY CONTROLS

Separate intensity, focus and astigmatism controls for each beam, intensity contrast between A sweep and non-intensified-B-zone of A sweep, trace rotation (screwdriver adjustment), and trace separation. BEAM FINDER button functions in both X-Y systems, indicates direction of off-screen signals.

OTHER CHARACTERISTICS

ELECTROMAGNETIC INTERFERENCE

Oscilloscopes meet interference specifications of MIL-I-6181 D over the following frequency ranges: Radiated (with CRT mesh filter and BNC connector covers installed) —150 kHz to 1 GHz; conducted (power line) —150 kHz to 25 MHz.

AMPLITUDE CALIBRATOR

0.2 mV to 100 V in 18 calibrated steps (1-2-5 sequence), accuracy within ±2%. 50-Ω source resistance from 0.2 mV to 0.2 V. ≤1.5-μs risetime; 1-kHz ±25% repetition rate; 45% to 55% duty cycle. 100-V DC reference output also provided. Front-panel current loop for 5 mA ±2%, squarewave or DC.

POWER REQUIREMENTS

Wired for 100 to 130 V RMS, 50 to 60 Hz source having less than 2% harmonic distortion. Quick-change transformer taps allow 4 regulation ranges and do not require soldering. The following table describes the power source requirements for the Type 556 and R556. Power consumption: approx 840 W max and approx 1 kVA max.

≤2% HARMONIC DISTORTION	>2% HARMONIC DISTORTION*
90 to 117 V RMS	127 to 165 V Peak
100 to 130 V RMS	142 to 183 V Peak
180 to 234 V RMS	254 to 330 V Peak
200 to 260 V RMS	284 to 366 V Peak

$$\frac{\text{*Peak V}}{\text{RMS V}}$$ between 1.3 and 1.414

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	15 3/16 in	38.6 cm
Width	16 15/16 in	43.0 cm
Depth	24 in	61.0 cm
Net Weight	83 lb	37.7 kg
Domestic shipping weight	~135 lb	~61.5 kg
Export-packed weight	~148 lb	~67.3 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	14 in	35.6 cm
Width	19 in	48.3 cm
Rack depth	22 13/16 in	57.9 cm
Net weight	87 3/4 lb	39.9 kg
Domestic shipping weight	~151 lb	~68.6 kg

RACK MOUNTING

Type R556 mounts on tilting slide-out tracks to standard 19-inch rack. Further mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES

Four P6008 10X probes (010-0129-00); eighteen BNC caps, ten installed (016-0088-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0030-00); smoke gray light filter (378-0567-00); clear CRT protector plate (387-0918-00); graticule cover (200-0382-00); CRT mesh filter, installed (378-0572-00); two instruction manuals (070-0511-00). Type R556 also includes mounting tracks (351-0086-00) and mounting hardware.

TYPE 556, without plug-in units **$3150**
TYPE R556, without plug-in units **$3250**

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. Cameras, probes, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

CAMERAS

C-12 has dichroic mirror for straight-on viewing and use of optional projected graticule, f/1.9—1:0.85 lens, Polaroid* Land Pack Film back accepts 3000-speed film, order Standard C-12 ..... $450
Type 556 to C-12 Camera adapter, order 016-0226-00 .. $ 15

C-27 provides direct viewing and maximum transmission of light to film, f/1.9—1:0.85 lens, Polaroid Land Pack Film back accepts 3000-speed film, order Standard C-27 ..... $420
Type 556 to C-27 Camera adapter, order 016-0225-00 .. $ 15

Polaroid Roll Film back accepts 10,000-speed film for increased writing speed, can be substituted at no additional cost in either camera. Order C-12R or C-27R. Optional lenses are also available.

PROBES

The standard 10X probes supplied with the instrument satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 205-2: storage drawer, carrier for 3 plug-in units, 9-position tilt-lock oscilloscope tray, order 205-2 .... $130

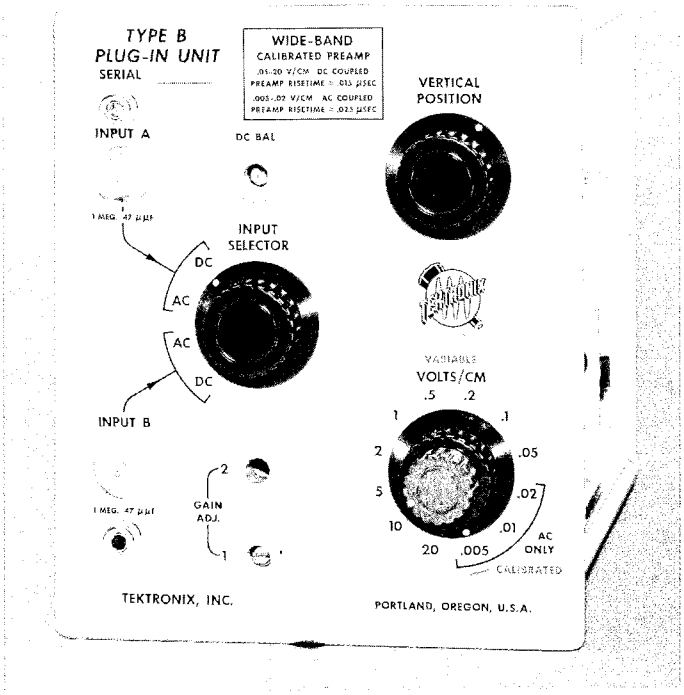
*Registered Trade-Mark, Polaroid Corporation

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

TYPE B

DC-to-20 MHz UNIT

- **5 mV/cm to 20 V/cm CALIBRATED DEFLECTION FACTOR**
- **LOW COST**



The Type B Plug-In Preamplifier meets the requirements of many wide-band applications. Wide bandwidth, excellent transient response, DC-coupling, and calibrated deflection factors 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.

Type 127, 132, and 133 Power Supplies are available to operate this plug-in unit outside an oscilloscope. See description of these instruments for details.

CHARACTERISTICS

TYPE B AND OSCILLOSCOPE	DEFLECTION FACTOR	BANDWIDTH† (—3 dB)	RISETIME
531A, 533A, 535A	50 mV/cm to 20 V/cm	DC to 14 MHz	25 ns
	5 mV/cm to 50 mV/cm	2 Hz to 10 MHz	35 ns
536	50 mV/cm to 20 V/cm	DC to 10 MHz	35 ns
	5 mV/cm to 50 mV/cm	2 Hz to 9 MHz	40 ns
543B, 544, 545B, 546, 547, 555, 556, 581A*, 585A*	50 mV/cm to 20 V/cm	DC to 20 MHz	18 ns
	5 mV/cm to 50 mV/cm	2 Hz to 12 MHz	30 ns
549, 551	50 mV/cm to 20 V/cm	DC to 18 MHz	20 ns
	5 mV/cm to 50 mV/cm	2 Hz to 12 MHz	30 ns

*A Type 81 Adapter is required.

†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR

5 mV/cm to 20 V/cm in 12 calibrated steps (1-2-5 sequence), accurate within 3%. AC coupled at 5 mV/cm to 20 mV/cm. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC

1 megohm paralleled by approx 47 pF.

INPUT SELECTION

Two inputs, front-panel selection of either.

WEIGHTS

Net weight	4 lbs	1.8 kg
Domestic shipping weight	~ 7 lbs	~3.2 kg
Export-packed weight	~11 lbs	~5.0 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0219-00).

TYPE B PLUG-IN UNIT **$145**

OPTIONAL ACCESSORIES

The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

P6006* 10X Probe Package, order 010-0127-00 ..... $ 22.00
P6007 100X Probe Package, order 010-0150-00 ..... $ 22.00
P6028 1X Probe Package. order 010-0074-00 ..... $ 12.50

*Included with Type 531A, 533A, 536, 535A, 543B, 545B, 549, 551 and 555 Oscilloscopes.

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

0.06 Hz to 60 kHz BANDWIDTH

SELECTABLE 3-dB POINTS

50 μV/CM to 10 mV/CM CALIBRATED DEFLECTION FACTOR

LOW NOISE

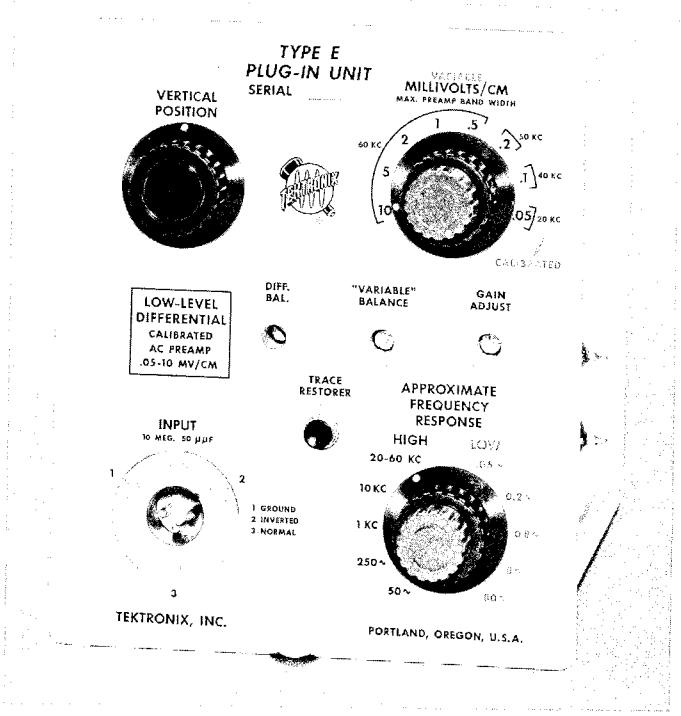
50,000:1 COMMON-MODE REJECTION

AC DIFFERENTIAL UNIT

The Type E Plug-In Unit provides Tektronix Type 530, 540, 550 and 580* Series Oscilloscopes with a calibrated deflection factor of 50 μV/cm for low-level applications. Separate high-frequency and low-frequency response controls permit restricting the bandwidth to increase the signal-to-noise ratio.

The Type 127, 132, and 133 Power Supplies are available to operate this plug-in unit outside an oscilloscope. See the description of these instruments for details.

Differential input permits measurements in which the output is proportional to the difference between signals applied through the included 2-conductor cable. Differential operation is useful for measurements between 2 above-ground points, and for cancellation of in-phase signals such as hum pickup at the signal source.



CHARACTERISTICS

BANDWIDTH
0.06 Hz to 20 kHz at 50 μV/cm, 0.06 Hz to 60 kHz at 0.5 mV/cm to 10 mV/cm. Maximum bandwidth for each position of MILLIVOLTS/CM switch indicated on front panel. Selectable high and low-frequency 3-dB points.

HIGH-FREQUENCY 3-dB POINTS
20 to 60 kHz (depending on deflection factor), 10 kHz, 1 kHz, 250 Hz and 50 Hz.

LOW-FREQUENCY 3-dB POINTS
0.06 Hz, 0.2 Hz, 0.8 Hz, 8 Hz and 80 Hz.

DEFLECTION FACTOR
50 μV/cm to 10 mV/cm in 8 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 25 mV/cm.

INPUT RC
10 megohms paralleled by approx 50 pF for single-ended applications; 20 megohms paralleled by approx 50 pF for differential applications.

*A Type 81 Adapter is required.

COMMON-MODE REJECTION
50,000:1 for in-phase signals up to 1 kHz with amplitudes up to ±2 V peak-to-peak; constant at all deflection factors.

COMBINED NOISE AND HUM
5-μV RMS maximum with grounded inputs.

TRACE RESTORER
Pushbutton returns trace to its normal position, if driven from the CRT by a large transient.

WEIGHTS

Net weight	4¼ lbs	1.9 kg
Domestic shipping weight	~7 lbs	~3.2 kg
Export-packed weight	~11 lbs	~5.0 kg

STANDARD ACCESSORIES
2-conductor 30-in cable (012-0022-00), two instruction manuals (070-0226-00).

TYPE E PLUG-IN UNIT $190

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

TYPE G

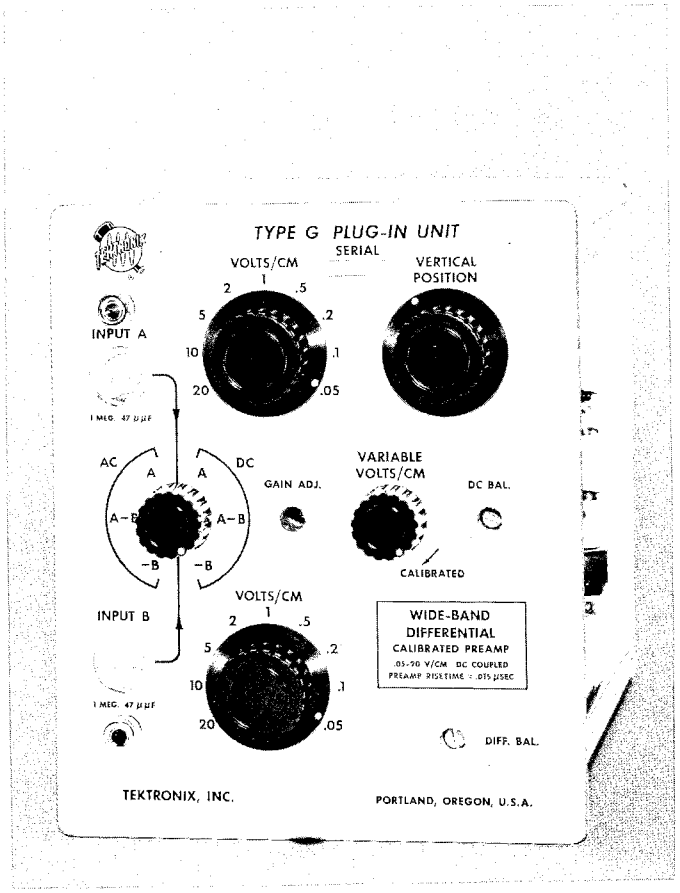
DC-to-20 MHz DIFFERENTIAL UNIT

- **50 mV/CM to 20 V/CM CALIBRATED DEFLECTION FACTOR**
- **100:1 COMMON-MODE REJECTION**

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 bandwidth at full gain. Independent step attenuators in each input with 80-dB isolation permit mixing signals of wide amplitude difference. Either input can be used separately, INPUT B giving a polarity-inverted display.

Type 127, 132, and 133 Power Supplies are available to operate this plug-in outside an oscilloscope. See the description of these instruments for details.

Differential input permits measurements in which the output is proportional to the difference between signals applied to inputs A and B. Differential operation is useful for measurements between 2 above-ground points, and for cancellation of in-phase signals such as hum pickup at the signal source.



CHARACTERISTICS

TYPE G UNIT AND OSCILLOSCOPE	BANDWIDTH† (—3 dB)	RISETIME
531A, 533A, 535A	DC to 14 MHz	25 ns
536	DC to 10 MHz	35 ns
543B, 544, 545B, 546, 547, 555, 556, 581A*, 585A*	DC to 20 MHz	18 ns
549, 551	DC to 18 MHz	20 ns

*A Type 81 Adapter is required.

†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR
50 mV/cm to 20 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC
1 megohm paralleled by approx 47 pF.

OPERATING MODES
Input A only, input B only (inverted), A-B (differential).

COMMON-MODE REJECTION
Better than 100:1 at 20 MHz and 50 mV/cm, better than 300:1 at 60 Hz. Common-mode signal should not exceed 2 V peak-to-peak between input grids. At 0.5 V/cm and 5 V/cm, signals should not exceed 20 V and 200 V respectively.

WEIGHTS

Net weight	4½ lbs	1.9 kg
Domestic shipping weight	~7 lbs	~3.2 kg
Export-packed weight	~12 lbs	~5.5 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0241-00).

TYPE G PLUG-IN UNIT $190

OPTIONAL ACCESSORIES

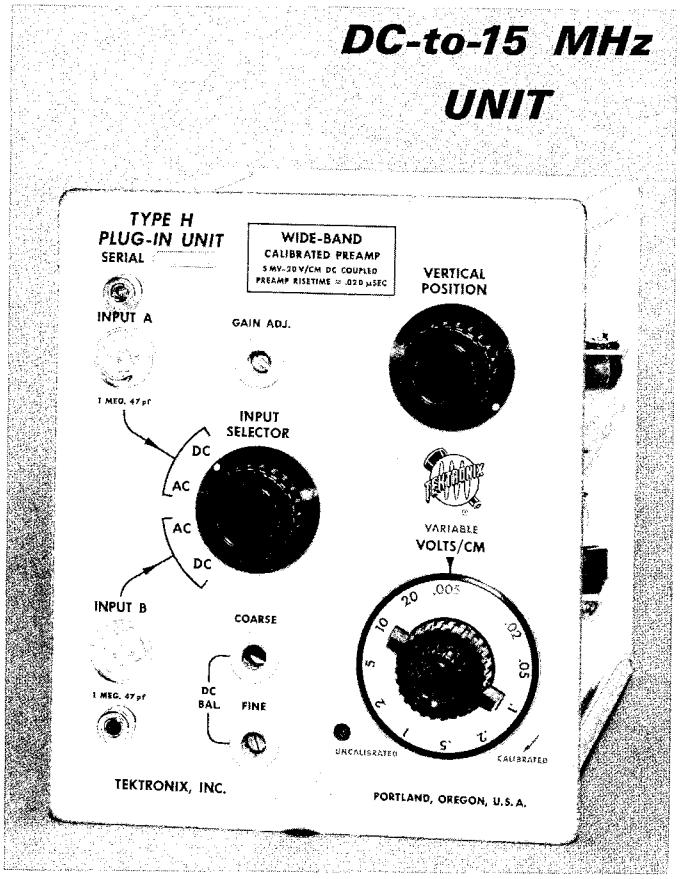
The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

P6007 100X Probe Package, order 010-0150-00 ..... $22.00
P6023 10X Probe Package, adjustable attenuation ratio helps maintain common-mode rejection, order 010-0167-00 $40.00

P6028 1X Probe Package, order 010-0074-00 ..... $12.50

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

DC-to-15 MHz UNIT



5 mV/CM to 20 V/CM CALIBRATED DEFLECTION FACTOR

The Type H is a wide-band preamplifier with DC coupling over its full deflection-factor range. It provides a maximum deflection factor of 5 mV/cm in Type 530, 540, 550, and 580* Series Oscilloscopes, with excellent transient-response characteristics.

Type 127, 132, and 133 Power Supplies are available to operate this plug-in outside an oscilloscope. See the description of these instruments for details.

CHARACTERISTICS

TYPE H UNIT AND OSCILLOSCOPE	BANDWIDTH† (—3 dB)	RISETIME
531A, 533A, 535A	DC to 11 MHz	32 ns
536	DC to 9.5 MHz	37 ns
543B, 544, 545B, 546, 547, 555, 556, 581A*, 585A*	DC to 15 MHz	24 ns
549, 551	DC to 14 MHz	25 ns

*A Type 81 Adapter is required.

†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR

5 mV/cm to 20 V/cm in 12 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC

1 megohm paralleled by approx 47 pF.

INPUT SELECTION

Two inputs, front-panel selection of either.

WEIGHTS

Net weight	3¾ lbs	1.7 kg
Domestic shipping weight	~7 lbs	~3.2 kg
Export-packed weight	~11 lbs	~5.0 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0272-00).

TYPE H PLUG-IN UNIT $185

OPTIONAL ACCESSORIES

The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

P6006* 10X Probe Package, order 010-0127-00 ..... $22.00
P6007 100X Probe Package, order 010-0150-00 ..... $22.00
P6028 1X Probe Package, order 010-0074-00 ..... $12.50

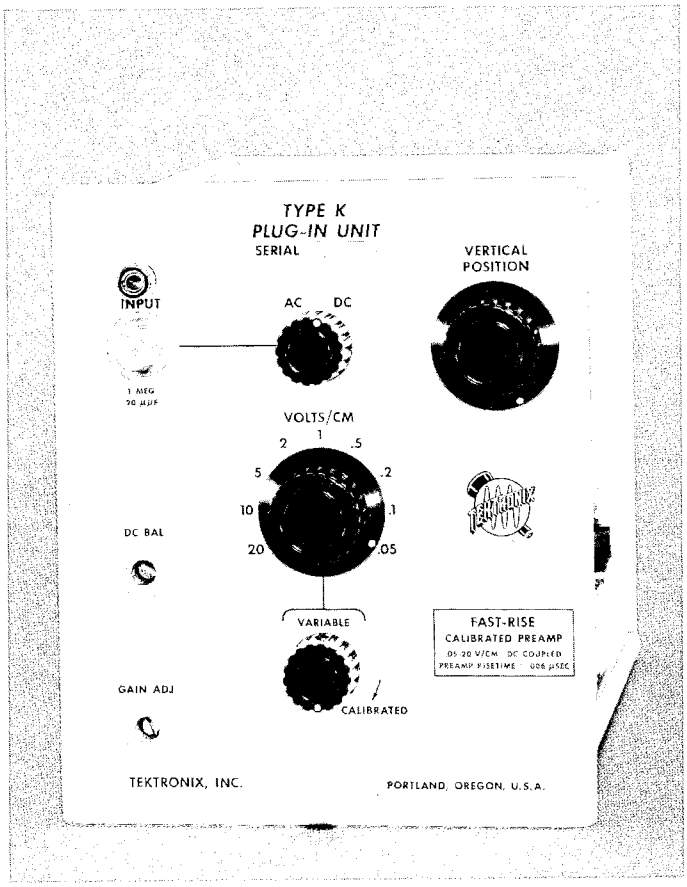
*Included with Type 531A, 533A, 535A, 536, 543B, 545B, 549, 551 and 555 Oscilloscopes.

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

TYPE K

DC-to-30 MHz UNIT

- **50 mV/CM to 20 V/CM CALIBRATED DEFLECTION FACTOR**
- **LOW COST**



The Type K Fast-Rise Unit provides Type 540, 550, and 580* Series Oscilloscopes with calibrated deflection factors 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.

Type 127, 132, and 133 Power Supplies are available to operate this plug-in outside an oscilloscope. See the description of these instruments for details.

CHARACTERISTICS

TYPE K UNIT AND OSCILLOSCOPE	BANDWIDTH† (—3 dB)	RISETIME
531A, 533A, 535A	DC to 15 MHz	24 ns
536	DC to 11 MHz	32 ns
543B, 544, 545B, 546, 547, 555, 556, 581A*, 585A*	DC to 30 MHz	12 ns
549	DC to 27 MHz	13 ns
551	DC to 25 MHz	14 ns

*A Type 81 Adapter is required.

†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR

50 mV/cm to 20 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC

1 megohm paralleled by approx 20 pF.

WEIGHTS

Net weight	3½ lbs	1.6 kg
Domestic shipping weight	~6 lbs	~2.7 kg
Export-packed weight	~11 lbs	~5.0 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0230-00).

TYPE K PLUG-IN UNIT $145

OPTIONAL ACCESSORIES

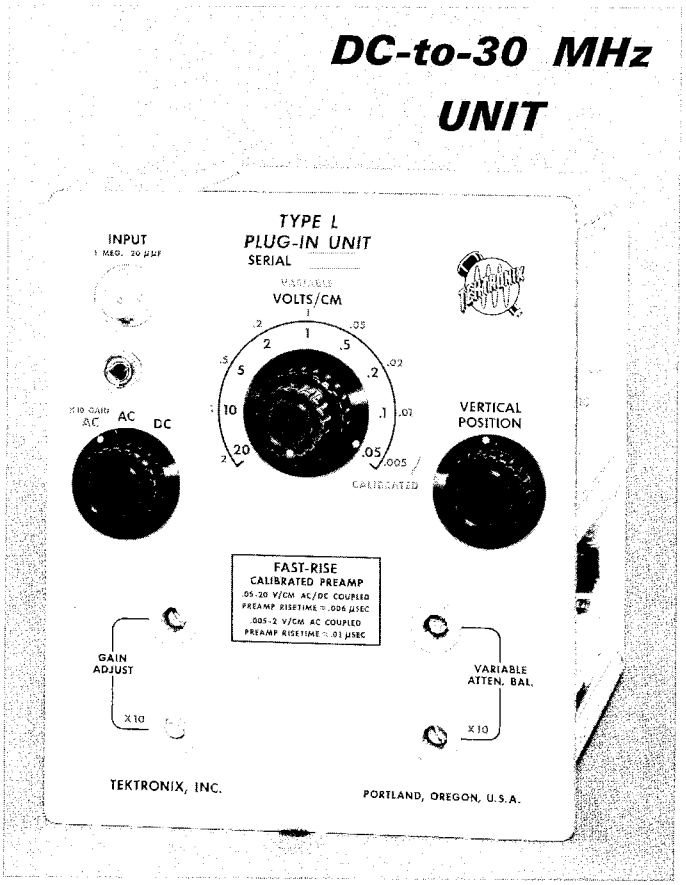
The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

P6006* 10X Probe Package, order 010-0127-00 ..... $22.00
P6007 100X Probe Package, order 010-0150-00 ..... $22.00
P6028 1X Probe Package, order 010-0074-00 ..... $12.50

*Included with Type 531A, 533A, 535A, 536, 543B, 545B, 549, 551 and 555 Oscilloscopes.

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

DC-to-30 MHz UNIT



5 mV/CM to 20 V/CM
CALIBRATED DEFLECTION FACTOR

The Type L Fast-Rise High-Gain Unit duplicates the performance of the Type K and offers an extended deflection factor to 5 mV/cm, AC-coupled. An AC-coupled amplifier provides a gain of 10X with slightly reduced bandwidth and slower risetime. When used with Type 530-Series Oscilloscopes, the unit has somewhat reduced bandwidth and slower risetime.

Type 127, 132, and 133 power supplies are available to operate this plug-in outside an oscilloscope. See the description of these instruments for details.

CHARACTERISTICS

TYPE L AND OSCILLOSCOPE	DEFLECTION FACTOR	BANDWIDTH† (—3 dB)	RISE-TIME
531A, 533A, 535A	50 mV/cm to 20 V/cm 5 mV/cm to 2 V/cm	DC to 15 MHz 3 Hz to 14 MHz	24 ns 25 ns
536	50 mV/cm to 20 V/cm 5 mV/cm to 2 V/cm	DC to 11 MHz 3 Hz to 10 MHz	32 ns 35 ns
543B, 544, 545B, 546, 547, 555, 556, 581A*, 585A*	50 mV/cm to 20 V/cm 5 mV/cm to 2 V/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns
549	50 mV/cm to 20 V/cm 5 mV/cm to 2 V/cm	DC to 27 MHz 3 Hz to 23 MHz	13 ns 16 ns
551	50 mV/cm to 20 V/cm 5 mV/cm to 2 V/cm	DC to 25 MHz 3 Hz to 22 MHz	14 ns 16 ns

*Requires a Type 81 Adapter.

†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR

50 mV/cm to 20 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%. 5 mV/cm to 2 V/cm in 9 calibrated steps, AC coupled, using X10 gain. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC

1 megohm paralleled by approx 20 pF.

WEIGHTS

Net weight	4¼ lbs	1.9 kg
Domestic shipping weight	~7 lbs	~3.2 kg
Export-packed weight	~12 lbs	~5.5 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0336-00).

TYPE L PLUG-IN UNIT $210

OPTIONAL ACCESSORIES

The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

P6006* 10X Probe Package, order 010-0127-00 ..... $22.00
P6007 100X Probe Package, order 010-0150-00 ..... $22.00
P6028 1X Probe Package, order 010-0074-00 ..... $12.50

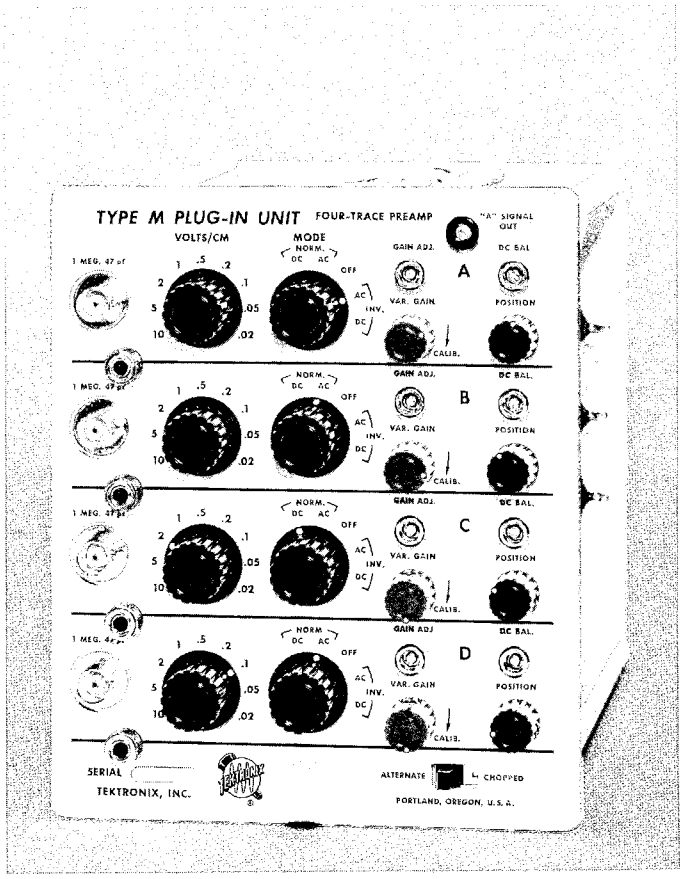
*Included with Type 531A, 533A, 535A, 536, 543B, 545B, 549, 551 and 555 Oscilloscopes.

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

TYPE M

DC-to-20 MHz FOUR-TRACE UNIT

- **20 mV/CM to 10 V/CM CALIBRATED DEFLECTION FACTOR**
- **CHANNEL A SIGNAL OUTPUT**



The Type M Unit provides four-trace displays in Type 530, 540, 550, and 580* Series Oscilloscopes. The four input channels are identical. Each has separate controls for coupling, attenuating, inverting and positioning the signal. Chopped or alternate electronic switching can be used for multi-channel displays.

Type 127, 132, and 133 Power Supplies are available to operate this plug-in unit outside an oscilloscope. See the description of these instruments for details.

CHARACTERISTICS

TYPE M UNIT AND OSCILLOSCOPE	BANDWIDTH† (—3 dB)	RISETIME
531A, 533A, 535A,	DC — 14 MHz	25 ns
536	DC — 10 MHz	35 ns
543B, 544, 545B, 546, 547, 581A*, 585A*, 555, 556	DC — 20 MHz	18 ns
549, 551	DC — 19 MHz	19 ns

*Requires a Type 81 Adapter

†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR

20 mV/cm to 10 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 25 V/cm.

INPUT RC

1 megohm paralleled by approx 47 pF.

OPERATING MODES

Any single channel, normal or inverted; chopped or alternate electronic switching between channels. Alternate: 2 or more channels switched at the end of each sweep. Chopped: successive 1-μs (approx) segments of 2 or more channels displayed at an approx rate per channel of 500 kHz using 2 channels, 333 kHz using 3 channels, and 250 kHz using 4 channels. Chopped transient blanking except in Type 536, 551, 581A, and 585A Oscilloscopes.

SIGNAL OUTPUT

Channel A Output for external triggering provides stable displays in chopped or alternate modes, allows display of signals in their true time or phase relationship.

WEIGHTS

Net weight	5¼ lbs	2.4 kg
Domestic shipping weight	~9 lbs	~4.1 kg
Export-packed weight	~13 lbs	~5.9 kg

STANDARD ACCESSORIES

Four BNC-to-binding post adapters (103-0033-00); BNC-to-BNC 18-in patch cord (012-0087-00); BNC-to-banana plug 18-in patch cord (012-0091-00); two instruction manuals (070-0295-00).

TYPE M PLUG-IN UNIT $525

OPTIONAL ACCESSORIES

The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

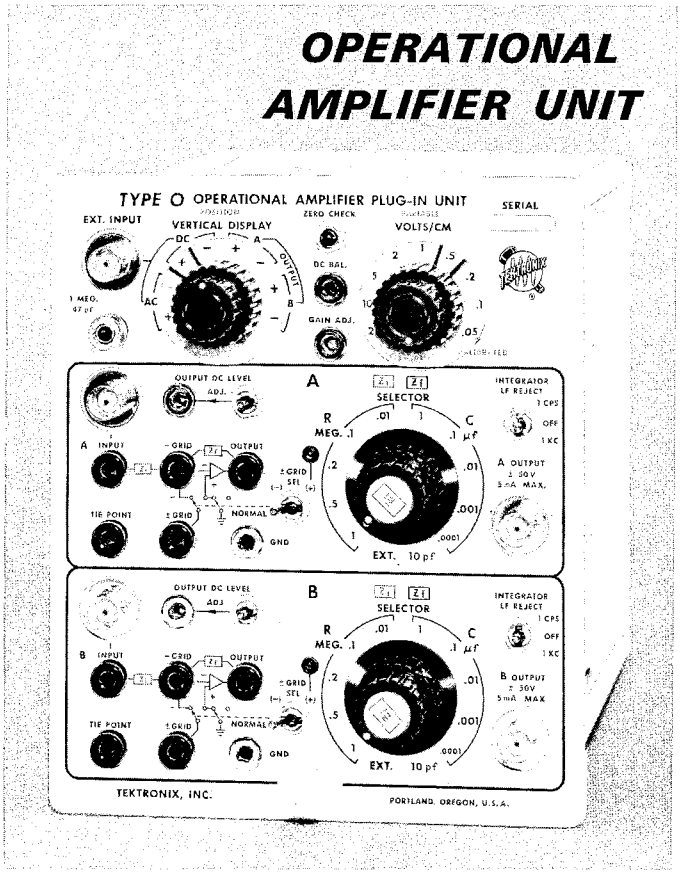
P6006* 10X Probe Package, order 010-0127-00 ..... $22.00
P6007 100X Probe Package, order 010-0150-00 ..... $22.00
P6028 1X Probe Package, order 010-0074-00 ..... $12.50

*Included with Type 531A, 533A, 535A, 536, 543B, 545B, 549, 551 and 555 Oscilloscopes.

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

OPERATIONAL AMPLIFIER UNIT

- ***TWO OPERATIONAL AMPLIFIERS***
- ***15 MHz OR GREATER GAIN-BANDWIDTH PRODUCT***
- ***2500 OR GREATER OPEN-LOOP GAIN***
- ***SELECTABLE INTERNAL Z_i AND Z_f COMPONENTS***
- ***PROVISION FOR EXTERNAL Z_i AND Z_f COMPONENTS***



The Type O Operational Amplifier Unit performs precise integration, differentiation, function generation, linear and non-linear amplification. It contains two operational amplifiers and a display amplifier. Each operational amplifier has identical features, including front-panel selection of internal Z_i and Z_f components. External components can be used independently or in combination with the internal resistor-capacitor combinations. The output of either operational amplifier can be applied to the other operational amplifier; either output can be applied to the display amplifier. The results can be viewed on Tektronix Type 530, 540, 550, and 580* Series Oscilloscopes and/or fed to other devices.

Type 127, 132, and 133 Power Supplies are available to operate this plug-in unit outside an oscilloscope. See description of these instruments for details.

DISPLAY AMPLIFIER

TYPE O UNIT AND OSCILLOSCOPE	BANDWIDTH† (—3 dB)	RISETIME
531A, 533A, 535A	DC to 14 MHz	25 ns
536	DC to 10 MHz	35 ns
543B, 544, 545B, 546, 547, 555, 556, 581A*, 585A*	DC to 25 MHz	14 ns
549, 551	DC to 23 MHz	16 ns

*A Type 81 Adapter is required
†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR
50 mV/cm to 20 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC
1 megohm paralleled by approx 47 pF.

OPERATING MODES
Signal source selection from either operational amplifier or an external signal. AC or DC coupling. The display can be inverted to provide the desired deflection polarity.

OPERATIONAL AMPLIFIERS

OPEN-LOOP GAIN
2500 minimum.

OPEN-LOOP GAIN-BANDWIDTH PRODUCT
15 MHz or greater; checked at 10 MHz for open-loop gain greater than 1.5.

CLOSED-LOOP BANDWIDTH
750 kHz or greater at unity gain with internal input and feedback resistors, up to 10 MHz with external compensation (such as provided by the optional Compensating Adapter).

OUTPUT RANGE
± 50 V, ± 5 mA.

OUTPUT DC LEVEL
Adjustable to ground at front panel.

OUTPUT IMPEDANCE
Approx 30 Ω at 1 MHz for compensated unity-gain amplifier.

DRIFT
Typically <10 mV/hour referred to input (after warmup).

NOISE
Typically <0.5 mV peak-to-peak (equivalent input noise), approx 3 mV peak-to-peak additional output noise when $R_f =$ 1 megohm.

GRID CURRENT
<0.5 nA for each input grid; adjustable to <0.3 nA for —grid and <0.15 nA for +grid.

CROSSTALK BETWEEN AMPLIFIERS
$\geq 300{:}1$ with 1-kHz squarewave.

FEEDBACK
Provision for negative and/or positive feedback. Negative feedback utilizes internal and/or external impedances; positive feedback utilizes external impedances only.

SELECTABLE INPUT AND FEEDBACK COMPONENTS
Front-panel switches allow independent selection of the following resistors and capacitors in any combination as Z_i and Z_f: 10, 100, 200 and 500 kΩ, 1 MΩ; 10 and 100 pF, 0.001, 0.01, 0.1, and 1 μF. All values are $\pm 1\%$ except 10 and 100 pF which are adjustable.

INTEGRATION LOW-FREQUENCY REJECT
For high-frequency integration applications, reduces integration of drift and signals below approx 1 Hz or 1 kHz; can be switched out when desired.

TERMINAL ADAPTERS

Two shielded adapters included for construction of external circuitry for custom applications. Suggested circuits for special applications are shown in the instruction manual.

WEIGHTS

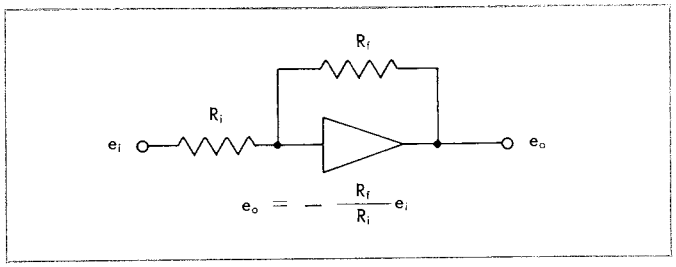
Net weight	5½ lbs	2.5 kg
Domestic shipping weight	~10 lbs	~4.5 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES

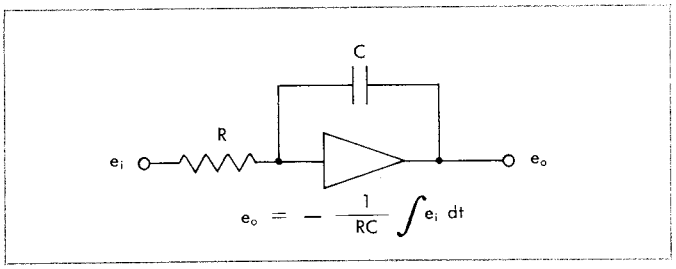
Two terminal adapters (013-0048-00); two terminal shields (013-0049-00); two BNC-to-binding post adapters (103-0033-00); two BNC-to-BNC 18-in patch cords (012-0087-00); two instruction manuals (070-0323-00).

TYPE O PLUG-IN UNIT $525

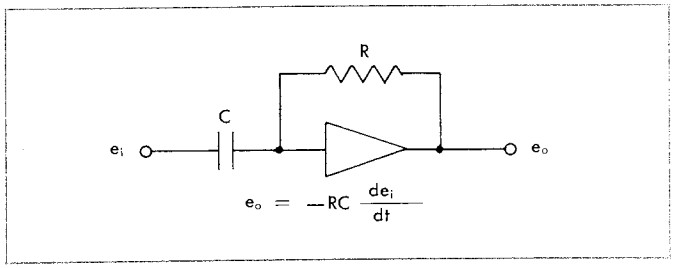
BASIC OPERATING MODES



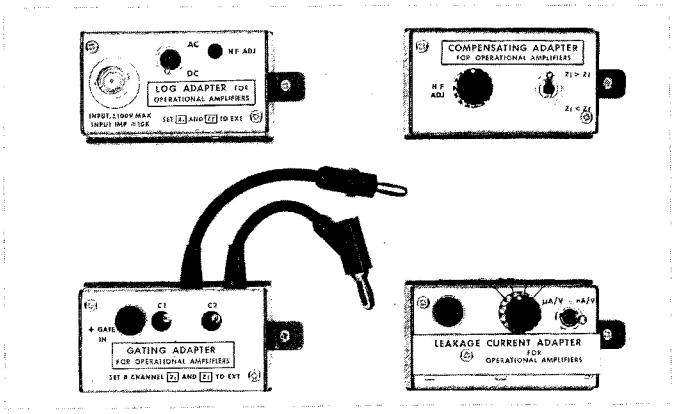
AMPLIFICATION is determined by the ratio of input to feedback resistors. This provides convenient signal step-up or step-down, with low output impedances, to over 750 kHz. Use of external compensation extends the closed-loop gain-bandwidth product to 10 MHz or more.



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 MHz 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 MHz is possible.



OPTIONAL ACCESSORIES

LOG ADAPTER

The Log Adapter with the Type O Plug-In Unit allows the display and measurement of high-amplitude signals mixed with low-amplitude signals. Pulses and transient waveforms differing in amplitude by up to 1000 to 1 can be displayed and measured on the same trace.

The Log Adapter is a logarithmic feedback network that converts the A or B operation amplifier in a Type O Plug-In Unit from a linear amplifier to essentially a logarithmic amplifier. The adapter can be plugged directly into the jacks on the front panel of the Type O Plug-In Unit.

Order Part Number 013-0067-00 ..... $75

COMPENSATING ADAPTER

The Compensating Adapter extends the high-frequency performance of either operational amplifier of the Type O Plug-In Unit when the internal Z_i and Z_f resistors are used in any combination for either gain or attenuation.

Without the Compensating Adapter, stray capacitance associated with the internal Z_i and Z_f resistors limits the operational amplifiers high-frequency performance. The adapter can be plugged into the front panel of the Type O Plug-In Unit.

Order Part Number 013-0081-00 ..... $35

GATING ADAPTER

The Gating Adapter allows integration and display of repetitive signals, by resetting the integrator to zero during the oscilloscope's retrace time. The adapter uses Operational Amplifier "B" of the Type O to gate Amplifier "A" on and off in response to an external gating signal, such as the +Gate from the oscilloscope. The signal applied to Amplifier "A" is then amplified, integrated, or differentiated only during the "on" time.

Order Part Number 013-0068-00 ..... $75

LEAKAGE CURRENT ADAPTER

Used with the Type O Plug-In Unit, the Leakage Current Adapter provides the facility for measuring leakage current of semiconductor diodes and small signal transistors.

The adapter plugs into the operational jacks located on the front panel of the Type O Unit. A positive-going sawtooth voltage is required for driving the adapter. Tektronix Oscilloscopes that accept the Type O Plug-In Unit have a Sawtooth or Sweep-Out jack conveniently located on the front panel for supplying the required sawtooth voltage.

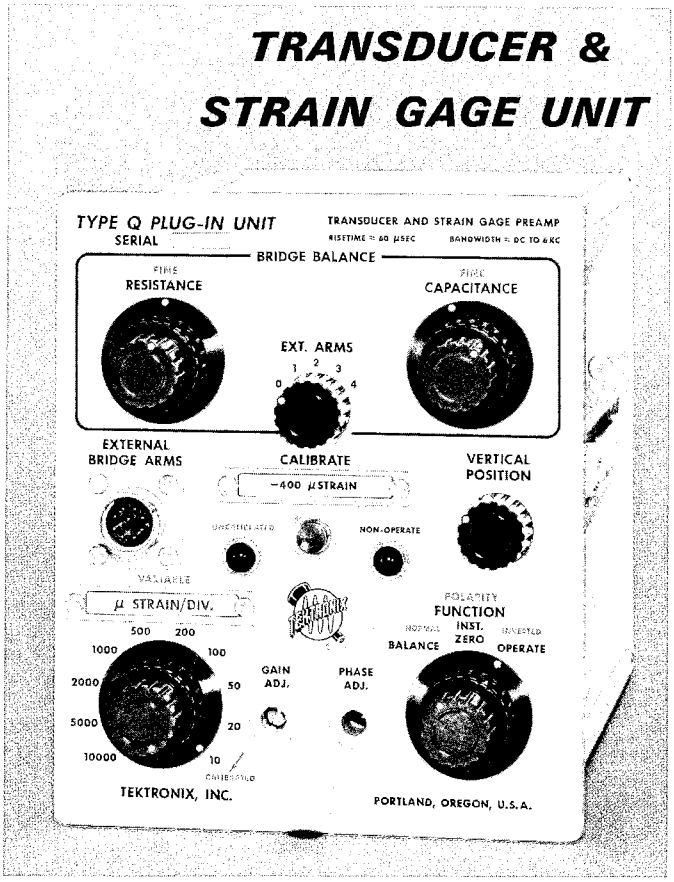
Order Part Number 013-0086-00 ..... $85

Please refer to the catalog accessory pages for complete information on the above adapters.

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

TRANSDUCER & STRAIN GAGE UNIT

- ***HIGH GAIN***
- ***LOW NOISE***
- ***ESSENTIALLY DRIFT FREE***



The Type Q Plug-In Unit permits any Tektronix Type 530, 540, 550, or 580* Series Oscilloscope 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.

Requiring no external equipment other than the strain gages or transducers operated with it and the associated oscilloscope, 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.

Type 127, 132, and 133 Power Supplies are available to operate this plug-in outside an oscilloscope. See the description of these instruments for details.

BANDWIDTH
DC to 6 kHz at 3-dB down.

RISETIME
Approximately 60 μs.

CALIBRATED DEFLECTION FACTOR
10 μstrain (microinches per inch) /div to 10,000 μstrain/div in 10 calibrated steps (1-2-5 sequence), when used with a single strain gage having a gage factor of approx 2. With four active arms and a gage factor of 2, deflection factor extends to 2.5 μstrain/div. Attenuator accurate within 2%. Uncalibrated, continuously variable between steps and to approx 25,000 μstrain/div. Warning light indicates uncalibrated setting.

AMPLIFIER INPUT
Input is to an AC bridge with 25-kHz 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.

*A Type 81 Adapter is required.

NOISE
Typically equivalent to an input of 1.5 microstrain (peak to peak) at maximum calibrated sensitivity. This approximates an RMS noise of 0.5 microstrain.

DRIFT
Drift of the over-all system is primarily a function of the transducer stability. The Type Q Amplifier system is essentially drift free.

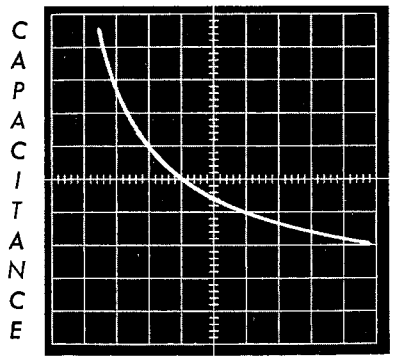
GAGE FACTORS
Factors from 1 to 6 are usable without changing the steps of the μstrain/div control. The range of factors is compensated for by adjusting the Gain Adjust Control.

EQUIVALENT DC SENSITIVITY
A comparable DC amplification system would require a deflection factor of approx 10 μV/div for the same amount of power applied to the input bridge.

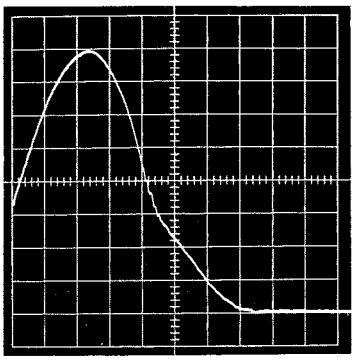
CAPACITIVE TRANSDUCERS
Use in conjunction with a four-arm resistive bridge results in the following maximum useful deflection capabilities: 120-ohm bridge (available internally), 1 pF/div; 1000-ohm bridge, 0.2 pF/div; useful deflection capabilities are slightly lower when using long cables.

INDUCTIVE TRANSDUCERS
Must have characteristics compatible with the 25-kHz carrier frequency to function properly. Linear-variable-differential transformers designed for nominal carrier frequencies of 2 kHz and higher usually operate satisfactorily without additional circuitry.

Dynamic plot of the depletion-layer capacitance of a back-biased diode.



Pressing force can be accurately controlled by using the Type Q Unit.



TRANSDUCER CABLE

Either 3-wire or 4-wire shielded microphone cable gives the best results in most applications.

CAPACITANCE BRIDGE BALANCE

A vernier control allows compensation for an unbalance of up to 250 pF across any external resistive arm of the input bridge.

RESISTANCE BRIDGE BALANCE

A vernier control provides sufficient range to compensate for most standard transducers and strain gages.

GAGE RESISTANCE RANGE

Useful with cable lengths to 100 feet; extends from approximately 50 ohms to 2000 ohms. For optimum performance, the recommended range is between 120 and 500 Ω.

PHASE ADJUSTMENT

Permits either resistive or reactive transducer applications to be displayed.

CALIBRATION SWITCH

A rotary switch connects a calibration resistor across the strain gage to electrically simulate an external mechanical strain. The calibration resistor supplied with the Type Q 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 nesessary 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.

WEIGHTS

Net weight	5¼ lbs.	2.4 kg
Domestic shipping weight	~ 9 lbs.	~4.1 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES

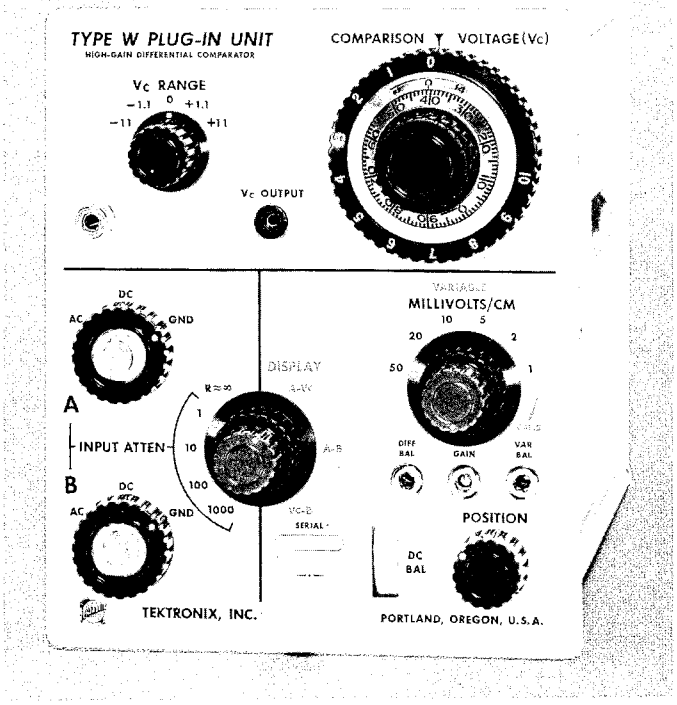
4-wire 15-ft shielded connector cable (012-0040-00); two instruction manuals (070-0199-00).

TYPE Q PLUG-IN UNIT $325

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

DIFFERENTIAL COMPARATOR UNIT

- **1 mV/CM TO 50 V/CM CALIBRATED DEFLECTION FACTOR**
- **UP TO 23-MHz BANDWIDTH**
- **20,000:1 COMMON-MODE REJECTION**
- **11,000 cm EFFECTIVE SCREEN HEIGHT**



The Type W High-Gain Differential Comparator adds to the measurement capabilities of Tektronix Type 530, 540, 550 and 580* Series Oscilloscopes. Used with Type 127, 132 or 133 Power Supply, the Type W can drive recording equipment, X-Y plotters, oscilloscopes, or other indicators.

As a differential input preamplifier, the dynamic range of the W Unit permits common-mode signals up to ±15 volts in amplitude to be applied to the amplifier without attenuation. With a rejection ratio of 20,000 to 1 for DC or low-frequency signals, signals of 1 mV or less on large common-mode signals can be measured. A front-panel attenuator permits the acceptance of common-mode voltages up to 500 V.

As a differential comparator, voltage measurements using the slide-back technique can be made with this unit. The high accuracy and stability of the DC comparison voltage added differentially to the input signal makes precise voltage measurements possible. Using this mode of operation, the W Unit has an effective screen height of ±11,000 cm. This is equivalent to a ±11-volt dynamic signal range at a deflection factor of 1 mV/cm. Within this range, calibrated ±DC comparison voltages can be added differentially to the input signal to permit a maximum of about 0.001% or 100 μV per mm to be resolved.

CONVENTIONAL PREAMPLIFIER

TYPE W UNIT AND OSCILLOSCOPE	MILLIVOLTS/CM SETTING	BANDWIDTH† (−3 dB)	RISETIME
531A, 533A, 535A	50	DC to 13 MHz	27 ns
	1	DC to 7 MHz	50 ns
536	50	DC to 10 MHz	35 ns
	1	DC to 6.5 MHz	54 ns
543B, 544, 545B, 546, 547, 555, 556, 581A*, 585A*	50	DC to 23 MHz	16 ns
	1	DC to 8 MHz	44 ns
549	50	DC to 22 MHz	16 ns
	1	DC to 7 MHz	50 ns
551	50	DC to 20 MHz	18 ns
	1	DC to 7.5 MHz	47 ns

*A Type 81 Adapter is required.

†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR

1 mV/cm to 50 V/cm, depending on millivolts/cm and attenuator settings. Millivolts/cm positions accurate within 3%. Uncalibrated, continuously variable between steps and to approx 125 V/cm.

ATTENUATORS

4 decade steps covering range of 1 to 1,000. 10X position accurate within ±0.05%; 100X within ±0.15%, 1000X within ±3%.

INPUT RC

1 megohm paralleled by 20 pF (except in additional 1X attenuation position ($R \approx \infty$) where $R > 10{,}000$ megohm). Input resistance of 10X and 1X attenuators is matched within ±0.1%.

DIFFERENTIAL-INPUT PREAMPLIFIER

COMMON-MODE REJECTION

At least 20,000:1 at DC to 20 kHz with 30-V peak to peak, DC-coupled. AC COMMON-MODE REJECTION: at least 1000:1 at 60 Hz, with 30-V peak to peak, AC-coupled.

MAXIMUM PEAK INPUT

±15 volts, increasing to ±150 volts with 10X attenuation and ±500 volts with 100X or 1000X attenuation.

HIGH-RESOLUTION VOLTAGE MEASUREMENT using the slide-back technique

A 150-volt sawtooth waveform is applied and clipped with a zener diode, shown in Figure 1. The knee of the curve is shown expanded vertically and horizontally in Figures 2 and 3. This resolution is made possible in the Type W Unit by using the slide-back technique. Figure 3 clearly shows zener noise. 10X more "vertical magnification", to 1 mV/cm, could be used, if desired.

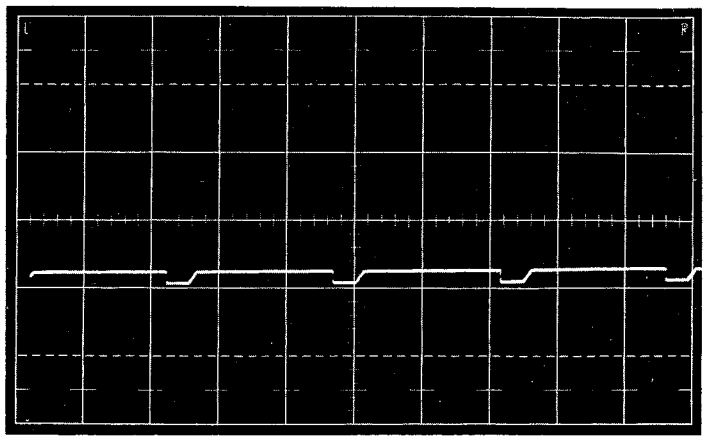


Figure 1—50 V/cm, 5 ms/cm.

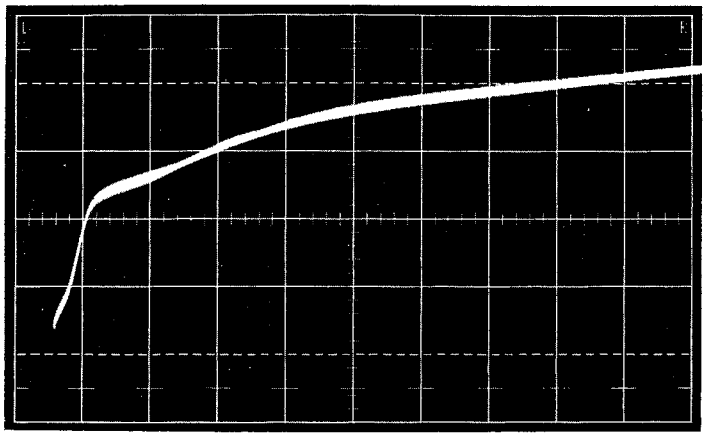


Figure 2—50 mV/cm, 0.2 ms/cm.

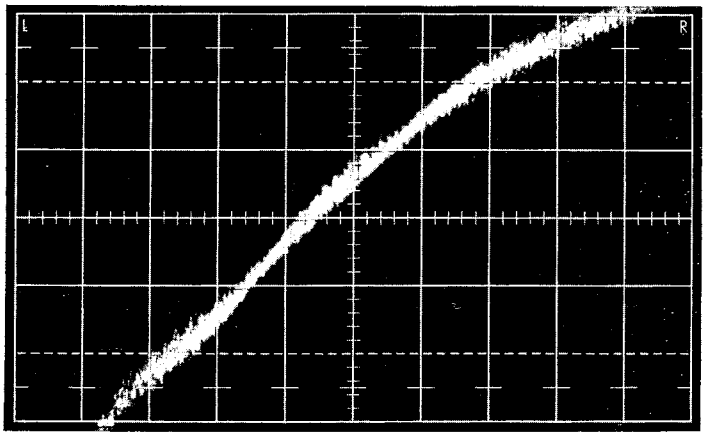


Figure 3—(Single sweep), 10 mV/cm, 100 μs/cm.

CALIBRATED DIFFERENTIAL COMPARATOR

COMPARISON VOLTAGE
0 to ±1.1 V, or 0 to ±11 V. Accuracy: ±(0.15% of indicated value plus 0.05% of Vc range).

Vc SUPPLY RESOLUTION
0 to ±1.1 V range: 100 μV per minor dial div; 0 to ±11 V range: 1 mV per minor dial div.

MAXIMUM PEAK INPUT
Same as for Differential-Input.

OVERDRIVE RECOVERY
Recovers to within 10 mV of reference signal within 300 ns after the signal returns to the screen. Certain overdrive signals can cause an additional slow (thermal) shift of up to 5 mV in the reference level.

WEIGHTS

Net weight	5 lbs	2.3 kg
Domestic shipping weight	~ 8 lbs	~3.6 kg
Export-packed weight	~12 lbs	~5.5 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0432-00).

TYPE W PLUG-IN UNIT $550

OPTIONAL ACCESSORIES

The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

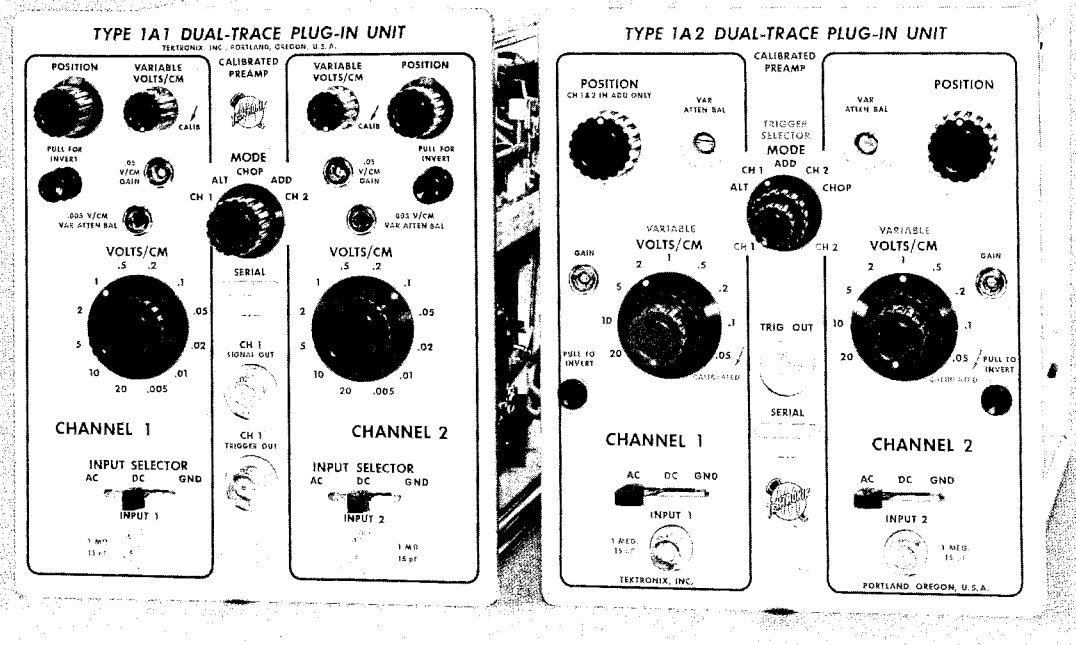
P6007 100X Probe Package, order 010-0150-00 ..... $22.00

P6023 10X Probe Package, adjustable attenuation ratio helps maintain common-mode rejection, order 010-0167-00 40.00

P6028 1X Probe Package, order 010-0074-00 ..... 12.50

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

DC-to-50 MHz DUAL-TRACE UNITS



TYPE 1A1

- ***5 mV/CM to 20 V/CM CALIBRATED DEFLECTION FACTOR***
- ***≈500 μV/CM SINGLE CHANNEL***
- ***CHANNEL 1 SIGNAL & TRIGGER OUTPUTS***
- ***SOLID-STATE DESIGN***

TYPE 1A2

- ***50 mV/CM to 20 V/cm CALIBRATED DEFLECTION FACTOR***
- ***CHANNEL 1 OR 2 TRIGGER OUTPUT***

COMMON CHARACTERISTICS

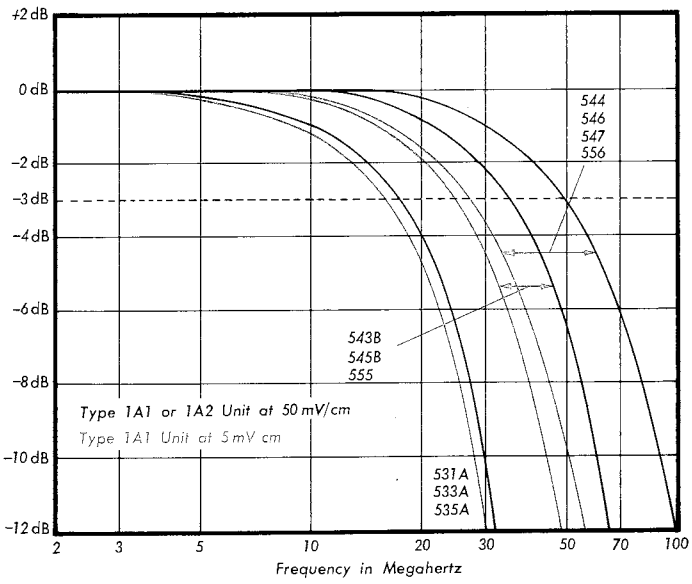
Type 1A1 and 1A2 Units provide dual-trace displays in Type 530, 540, 550, and 580* Series Oscilloscopes. Maximum bandwidth is achieved in Type 544, 546, 547, and 556 Oscilloscopes. Input channels of each plug-in unit are identical. Each has separate controls for coupling, attenuating, inverting and positioning the signal. Chopped or alternate electronic switching can be used for dual-trace displays.

When either plug-in unit is used with Type 547 or RM547 Oscilloscopes, the alternate switching circuit in the plug-in unit 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 the equivalent of a dual-beam oscilloscope without the additional complexity and cost.

Solid-state components are used throughout, except for inputs and outputs in the Type 1A1, inputs and output driver in the Type 1A2.

Type 127, 132, and 133 Power Supplies are available to operate the Type 1A1 and 1A2 outside an oscilloscope. See the description of these instruments for details.

TYPICAL BANDWIDTH



TYPE 1A1 / 1A2

TYPE 1A1

TYPE 1A1 UNIT AND OSCILLOSCOPE	DEFLECTION FACTOR	BANDWIDTH† (—3 dB)	RISETIME
531A, 533A, 535A	50 mV/cm	DC to 15 MHz	24 ns
	5 mV/cm	DC to 14 MHz	25 ns
	~500 μV/cm	2 Hz to 10 MHz	35 ns
536	50 mV/cm	DC to 11 MHz	32 ns
	5 mV/cm	DC to 10 MHz	35 ns
	~500 μV/cm	2 Hz to 8 MHz	44 ns
543B, 545B, 555, 581A*, 585A*	50 mV/cm	DC to 33 MHz	11 ns
	5 mV/cm	DC to 23 MHz	16 ns
	~500 μV/cm	2 Hz to 14 MHz	25 ns
544, 546, 547, 556	50 mV/cm	DC to 50 MHz	7 ns
	5 mV/cm	DC to 28 MHz	13 ns
	~500 μV/cm	2 Hz to 15 MHz	24 ns
549	50 mV/cm	DC to 30 MHz	12 ns
	5 mV/cm	DC to 23 MHz	16 ns
	~500 μV/cm	2 Hz to 14 MHz	25 ns
551	50 mV/cm	DC to 27 MHz	13 ns
	5 mV/cm	DC to 21 MHz	17 ns
	~500 μV/cm	2 Hz to 13 MHz	27 ns

*A Type 81 Adapter is required.
†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR
5 mV/cm to 20 V/cm in 12 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC
1 megohm paralleled by approx 15 pF.

MAXIMUM INPUT VOLTAGE
600 V combined DC + peak AC.

OPERATING MODES
Either single channel, normal or inverted; algebraic addition; chopped or alternate electronic switching between channels. Alternate: channels switched at the end of each sweep. Chopped: successive 500-ns segments of each channel displayed at an approx 1-MHz rate per channel. Chopped transient blanking except in Type 536, 551, 581A, and 585A Oscilloscopes.

SIGNAL OUTPUT
Channel 1 Output provides up to X10 gain, can be AC coupled into Channel 2 for approx 500 μV/cm deflection factor. Noise or frequency filters can be inserted between channels if desired. Output impedance is approx 50 Ω. Maximum bandwidth of output alone is DC to 35 MHz; see chart for bandwidths at 500 μV/cm.

TRIGGER OUTPUT
Channel 1 output for external triggering permits viewing true time relationship between signals in alternate or chopped operation. Output also applied internally to Type 544, 546, 547, 549, 555 (with Types 21A and 22A), and 556 Oscilloscopes. Approx 0.5 V for each centimeter of displayed signal at 1 kHz with calibrated deflection factors.

WEIGHTS

Net weight	5¾ lbs	2.6 kg
Domestic shipping weight	~11 lbs	~5.0 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES
BNC-to-BNC 50 Ω cable (012-0076-00), two instruction manuals (070-0378-01).

TYPE 1A1 PLUG-IN UNIT $600

TYPE 1A2

TYPE 1A2 UNIT AND OSCILLOSCOPE	BANDWIDTH† (—3 dB)	RISETIME
531A, 533A, 535A	DC to 15 MHz	24 ns
536	DC to 11 MHz	32 ns
543B, 545B, 555, 581A*, 585A*	DC to 33 MHz	11 ns
544, 546, 547, 556	DC to 50 MHz	7 ns
549	DC to 30 MHz	12 ns
551	DC to 27 MHz	13 ns

*A Type 81 Adapter is required.
†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR
50 mV/cm to 20 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC
1 megohm paralleled by approx 15 pF.

MAXIMUM INPUT VOLTAGE
600 V combined DC + peak AC.

OPERATING MODES
Either single channel, normal or inverted; algebraic addition; chopped or alternate electronic switching between channels. Alternate: channels switched at the end of each sweep. Chopped: successive 2-μs segments of each channel displayed at an approx 220-kHz rate per channel. Chopped transient blanking except in Type 536, 551, 581A, and 585A Oscilloscopes.

COMMON-MODE REJECTION
≥20:1 throughout full bandwidth for signals up to 0.5 V peak-to-peak (measured at maximum gain).

TRIGGER OUTPUT
Channel 1 or 2 output for external triggering permits viewing true time relationship between signals in alternate or chopped operation. Output also applied internally to Type 544, 546, 547, 549, 555 (with Type 21A and 22A), and 556 Oscilloscopes. At least 0.5 V for each centimeter of displayed signal at 1 kHz with calibrated deflection factors.

WEIGHTS

Net weight	4½ lbs	2.0 kg
Domestic shipping weight	~ 8 lbs	~3.6 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0430-01).

TYPE 1A2 PLUG-IN UNIT $325

OPTIONAL ACCESSORIES

The probes recommended for use with these plug-in units satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

P6008** 10X Probe Package, order 010-0129-00 ... $35.00
P6009 100X Probe Package, order 010-0140-00 .... $55.00
P6028 1X Probe Package, order 010-0074-00 ..... $12.50

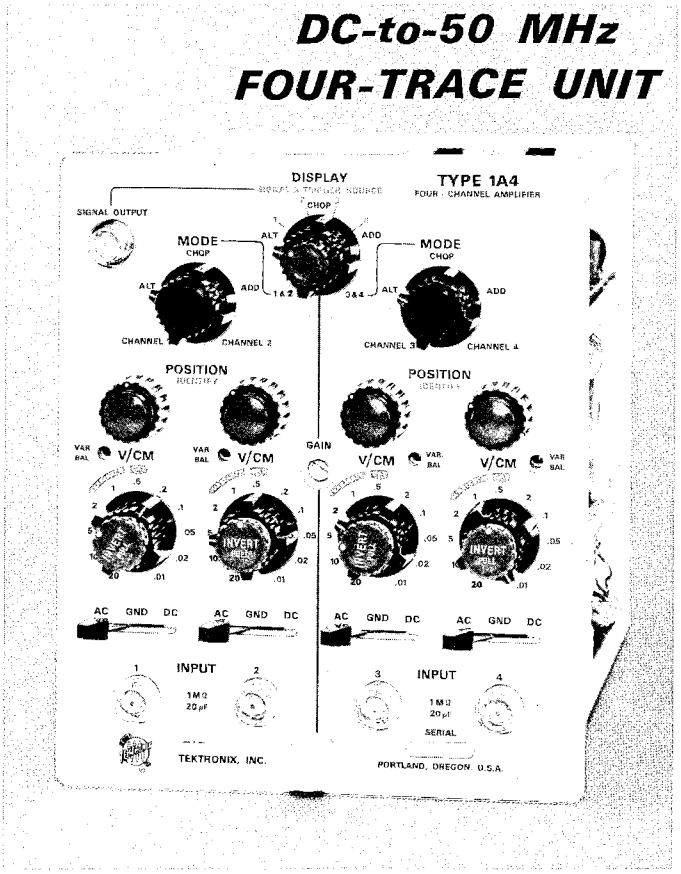
**P6008 10X Probes included with Type 544, 546, 547 and 556 Oscilloscopes increase input resistance to 10 MΩ and decrease input capacitance to approx 7.5 pF. Bandwidth of probe and oscilloscope is 45 MHz or greater; risetime is approx 7 ns.

U. S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page.

NEW

DC-to-50 MHz FOUR-TRACE UNIT

- ***10 mV/cm to 20 V/cm DEFLECTION FACTOR***
- ***FOUR-CHANNEL ADDING (±1±2) + (±3±4)***
- ***GREATER VERSATILITY THAN TWO DUAL-TRACE UNITS***
- ***SIGNAL OUTPUT***
- ***SOLID-STATE DESIGN, FET INPUTS***



This plug-in unit for Type 530, 540, 550, and (with adapter) 580-Series Oscilloscopes through versatile switching logic provides the equivalent of two wide-band, dual-trace units connected to a third wide-band, dual-trace unit. Maximum bandwidth of DC to 50 MHz is achieved with Type 544, 546, 547 and 556 Oscilloscopes. The Type 1A4 provides a new standard of multi-channel versatility in all Tektronix Oscilloscopes that accept Letter-Series or 1-Series Plug-In Units.

Unique display logic provides unprecedented display flexibility: any channel can be viewed separately, alternately with any other channel(s), chopped with any other channel(s), added to or subtracted from any other channel(s). Alternate, chopped and added modes can also be used together: for example, Channel 1 added to Channel 2, and the resultant alternated with a chopped display of Channel 3 and 4. Used with Type 547 or RM547 Oscilloscopes, the alternate switching circuit in the plug-in unit can be slaved to the display switching circuit in the oscilloscope. For many applications, this provides the equivalent of a dual-beam oscilloscope, without the added complexity and cost.

The four input channels are identical. Each has separate controls for coupling, attenuating, inverting, positioning, and identifying the signal. Solid-state design, with FET inputs, provides low drift and fast stabilization time.

Type 127, 132, and 133 Power Supplies are available to operate the Type 1A4 outside an oscilloscope. See the description of these instruments for details.

CHARACTERISTICS

TYPE 1A4 UNIT AND OSCILLOSCOPE	BANDWIDTH† (—3 dB)	RISETIME
544, 546, 547, 556	DC to 50 MHz	7 ns
543B, 545B, 555, 581A*, 585A*	DC to 33 MHz	11 ns
549	DC to 30 MHz	12 ns
551	DC to 27 MHz	13 ns
531A, 533A, 535A	DC to 15 MHz	24 ns
536	DC to 11 MHz	32 ns

*A Type 81 Adapter is required.
†Low-frequency 3-dB point, AC coupled: ≤2 Hz, ≤0.2 Hz with 10X probe.

DEFLECTION FACTOR

10 mV/cm to 20 V/cm in 11 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/cm.

INPUT RC

1 megohm paralleled by approx 20 pF.

MAXIMUM INPUT VOLTAGE

600 V DC + peak AC.

DISPLAY MODES

Any single-channel; any two channels (alternated, chopped, or added); three channels (alternated, chopped, or added in any combination); and four channels (Channels 1 and 2 alternated, chopped, or added with Channels 3 and 4). Four channel addition is useful in single-shot displays of four different signals, as in delay and coincidence studies.

Channels are always displayed in numerical sequence in chopped and alternate modes. One channel will run twice when only three are turned on. In chopped operation, successive 2.5-μs (approx) segments of each channel are displayed. Chopping rate is approx 400 kHz. Chopped transient blanking with all oscilloscopes except Type 536, 551, 581A, and 585A.

DISPLAY SWITCHING (Type 547 and RM547 Oscilloscopes)

Alternate switching circuit in the Type 1A4 can be slaved to the Automatic Display Switching in Type 547 and RM547 Oscilloscopes to lock Channels 1 and 2 to Time Base A, and Channels 3 and 4 to Time Base B. For dual-trace slaving, Channel 1 or 2 is alternated with Channel 3 or 4. Alternation of up to 8 traces with each signal displayed on 2 different time bases is also possible when the 1A4 is not slaved to the oscilloscope.

COMMON-MODE REJECTION

At least 20:1 for 10 MHz common-mode signals up to 10 cm in amplitude.

CHANNEL ISOLATION

At least 50:1 for signals from DC to 20 MHz.

TYPE 1A4

SIGNAL OUTPUT AND TRIGGER SOURCE

Signal from any channel can be used to externally trigger the oscilloscope, thus indicating the true time relationship between signals displayed in alternate and chopped mode. Selected output also applied internally to Type 544, 546, 547, 549, 555 (with Type 21A and 22A), and 556 Oscilloscopes. The front-panel output can also be cascaded with another channel, providing additional gain useful in many applications. Signal output amplitude is >0.5 V/cm of displayed signal, unterminated at 1 kHz. Bandwith is ≤ 20 Hz to ≥ 10 MHz (to approx 500 kHz with any channel operated in chopped mode). Approx 50-Ω output impedance.

WEIGHTS

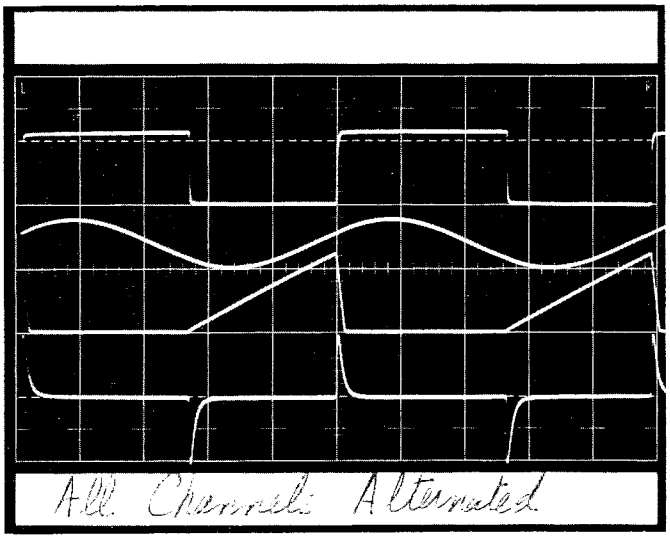
Net weight	6½ lb	3.1 kg
Domestic shipping weight	~10 lb	~4.5 kg
Export-packed weight	~16 lb	~7.3 kg

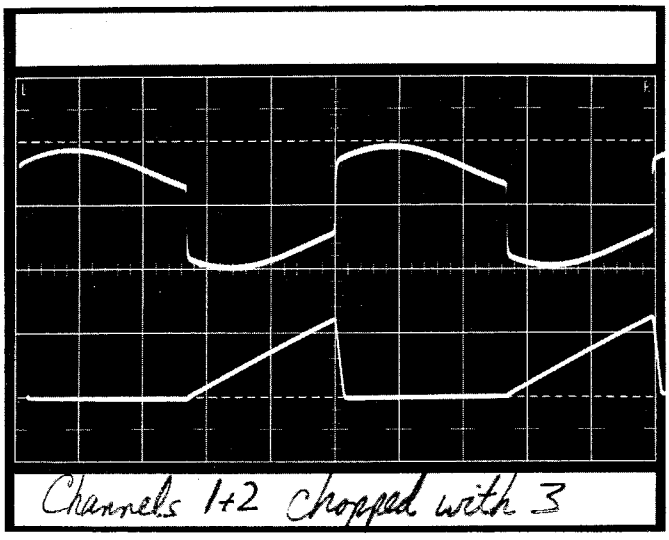
STANDARD ACCESSORIES

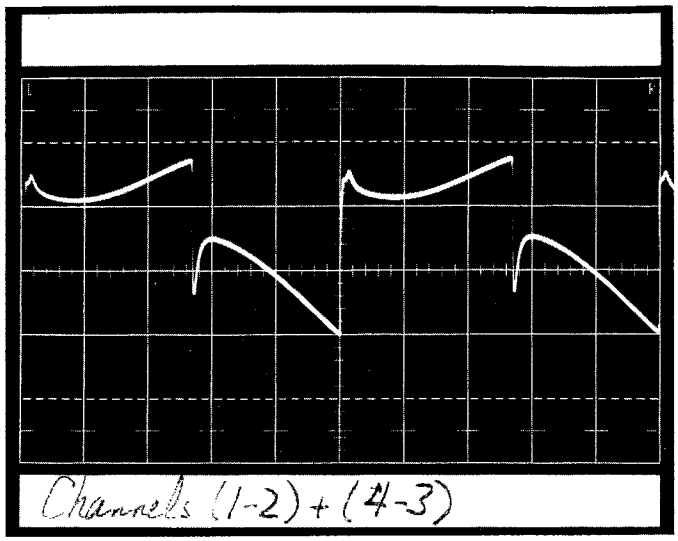
BNC-to-BNC 18-inch cable (012-0076-00); two instruction manuals (070-0545-00).

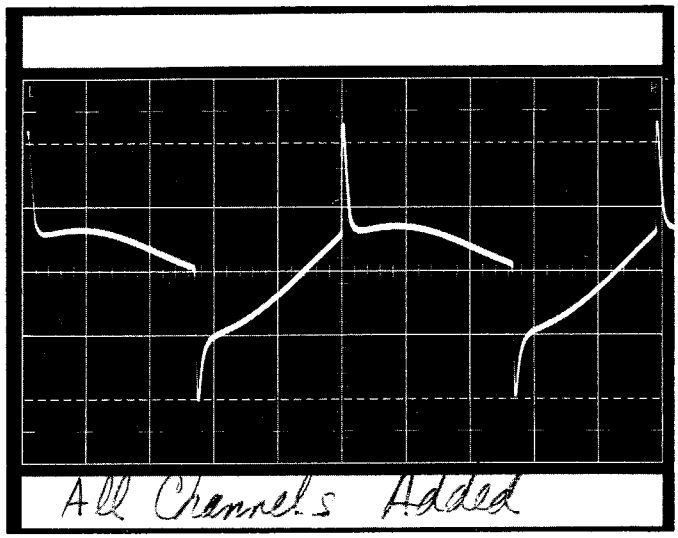
TYPE 1A4 PLUG-IN UNIT $750

SOME OF MANY POSSIBLE DISPLAY MODES









Waveforms photographed with C-12 Camera, Projected Graticule, Type 547 Oscilloscope.

OPTIONAL ACCESSORIES

The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

P6008** 10X Probe Package, order 010-0129-00 .... $35.00

P6009 100X Probe Package, order 010-0140-00 ..... $55.00

P6028 1X Probe Package, order 010-0074-00 ..... $12.50

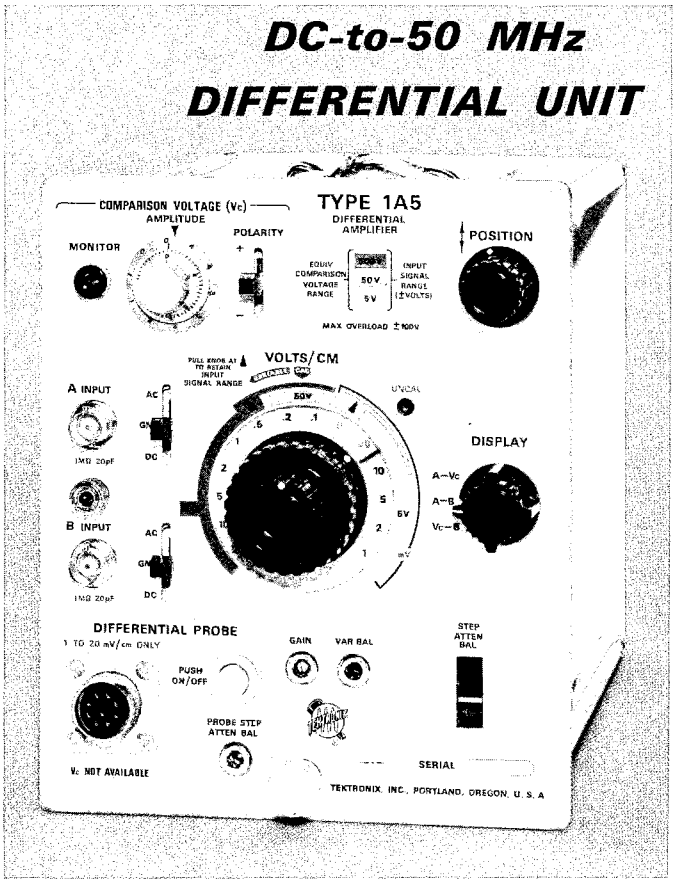
**P6008 10X probe included with Type 544, 547 and 556 Oscilloscopes increase input resistance to 10 MΩ and decrease input capacitance to approx 9 pF. Bandwidth of probe with Type 1A4 in above oscilloscopes is 45 MHz or greater; risetime is 8 ns or less.

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

NEW

DC-to-50 MHz DIFFERENTIAL UNIT

- *1 mV/cm to 20 V/cm CALIBRATED DEFLECTION FACTOR*
- *≥10,000:1 COMMON-MODE REJECTION FROM DC TO 1 MHz*
- *LOW DC DRIFT, NON MICROPHONIC*
- *±5-V COMPARISON VOLTAGE*
- *SOLID-STATE DESIGN, FET INPUTS*



This wide-band differential unit for Type 530, 540, 550, and (with adapter) 580-Series Oscilloscopes achieves a new high in common-mode rejection. Gain-bandwidth products exceed those previously available in a differential amplifier. Maximum bandwidth is obtained with Type 544, 546, 547, and 556 Oscilloscopes. Type 127, 132, and 133 Power Supplies are available to operate the Type 1A5 outside an oscilloscope. See the description of these instruments for details.

Solid state design, with FET inputs, provides low drift and eliminates microphonics.

CHARACTERISTICS

TYPE 1A5 UNIT AND OSCILLOSCOPE	DEFLECTION FACTOR	BANDWIDTH† (—3 dB)	RISE-TIME
544, 546, 547, 556	5 mV/cm to 20 V/cm 2 mV/cm 1 mV/cm	DC to 50 MHz DC to 45 MHz DC to 40 MHz	7 ns 8 ns 9 ns
543B, 545B, 555, 581A*, 585A*	5 mV/cm to 20 V/cm 2 mV/cm 1 mV/cm	DC to 33 MHz DC to 31 MHz DC to 30 MHz	11 ns 12 ns 12 ns
549	5 mV/cm to 20 V/cm 2 mV/cm 1 mV/cm	DC to 30 MHz DC to 29 MHz DC to 28 MHz	12 ns 13 ns 13 ns
551	5 mV/cm to 20 V/cm 2 mV/cm 1 mV/cm	DC to 27 MHz DC to 26 MHz DC to 25 MHz	13 ns 14 ns 14 ns
531A, 533A, 535A	5 mV/cm to 20 V/cm 2 and 1 mV/cm	DC to 15 MHz DC to 14 MHz	24 ns 25 ns
536	1 mV/cm to 20 V/cm	DC to 11 MHz	32 ns

†Low-frequency 3-dB point, AC coupled: ≤2 Hz.

*A Type 81 Adapter is required.

DEFLECTION FACTOR

1 mV/cm to 20 V/cm in 14 calibrated steps (1-2-5 sequence), accurate within 2.5% (within 2% from 1 mV/cm to 20 mV/cm). Uncalibrated, continuously variable between steps and to ≥ 50 V/cm.

INPUT RC

1 megohm paralleled by approx 20 pF.

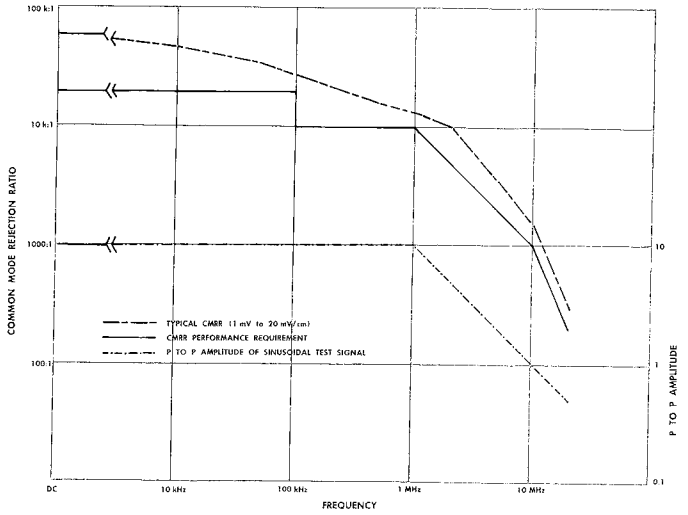
INPUT COUPLING

May be switched to AC, GND, or DC. Input coupling capacitor is automatically charged to proper voltage through a 1-megohm resistor when switch is in GND position.

MAXIMUM INPUT VOLTAGE

±100 V (DC + peak AC) from 1 mV/cm to 20 mV/cm, ±500 V (DC + peak AC) from 10 mV/cm to 20 V/cm.

COMMON-MODE REJECTION RATIOS*			
FREQUENCY	REJECTION RATIO	SINEWAVE AMPLITUDE	DEFLECTION FACTOR
DC to 100 kHz	≥20,000:1	10 V P to P	1 mV/cm to 20 mV/cm
100 kHz to 1 MHz	≥10,000:1	10 V P to P	1 mV/cm to 20 mV/cm
1 MHz to 10 MHz	≥10,000:1 ÷ frequency in MHz	10 V P to P ÷ frequency in MHz	1 mV/cm to 20 mV/cm
DC to 10 kHz	≥2,000:1	20 V P to P	10 mV/cm to 200 mV/cm
DC to 10 kHz	≥2,000:1	100 V P to P	100 mV/cm to 2 V/cm
DC to 10 kHz	≥100:1	100 V P to P	1 V/cm to 20 V/cm
60 Hz (AC coupled)	≥1,000:1	10 V P to P	1 mV/cm to 2 V/cm
*At 0°C to 50°C			



COMMON-MODE LINEAR DYNAMIC RANGE

≥±5 V (DC + peak AC) from 1 mV/cm to 20 mV/cm, ≥±50 V from 50 mV/cm to 0.2 V/cm, ≥±500 V from 0.5 V/cm to 20 V/cm. The ±50-V range can be extended from 50 mV/cm to 10 mV/cm, and the ±500-V range can be extended from 0.5 V/cm to 0.1 V/cm by pulling and turning the V/cm control.

DC DRIFT

With time: ≤200 μV/h at 25°C. With temperature: ≤200 μV/°C. With line voltage change: ≤300 μV from 105 to 125 VAC.

NOISE

≤50 μV RMS.

DC SHIFT DUE TO OVERDRIVE

≤1% of overdrive signal or ≤10 mV, whichever is smaller.

OVERDRIVE RECOVERY

Recovers to within 10 mV of DC-shifted level in less than 1 μs.

COMPARISON VOLTAGE

0 to ±5 V, internally applied to + input or — input, monitorable at front panel. Accuracy within 5 mV or 0.5% of comparison voltage, whichever is greater.

WEIGHTS

Net weight	5 lb	2.3 kg
Domestic shipping weight	~7 lb	~3.2 kg
Export-packed weight	~13 lb	~5.9 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0638-00).

TYPE 1A5 PLUG-IN UNIT $550

OPTIONAL DIFFERENTIAL PROBE

Availability is expected to be Fall 1967.

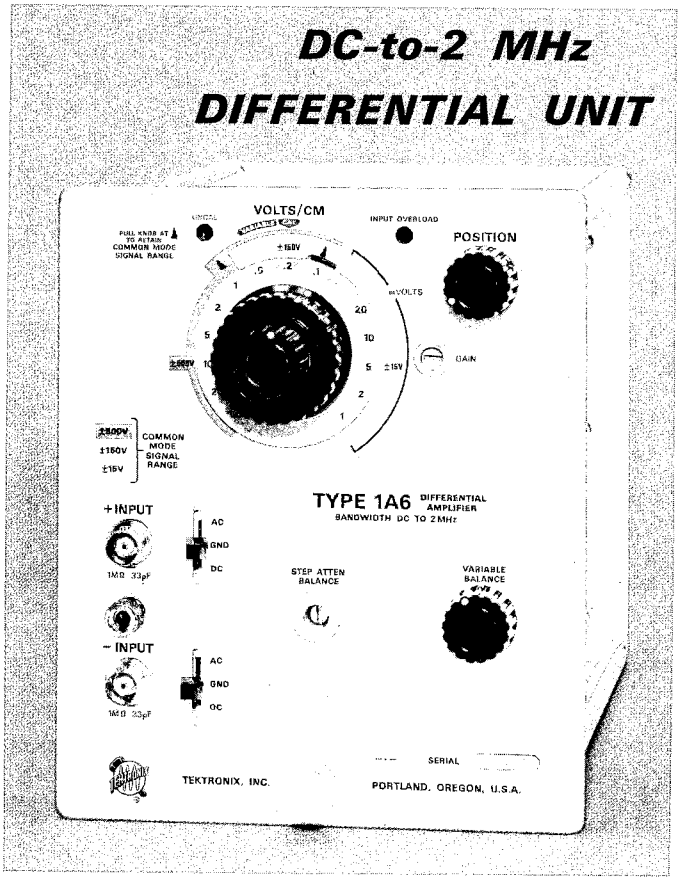
An active differential probe for the Type 1A5 increases common-mode rejection at high frequencies. This is achieved by measuring the signal directly at the source, thus bypassing the attenuators in the Type 1A5. The probe can be switched to provide 1X or 10X attenuation (10X or 100X with plug-on attenuator heads), and AC or DC coupling.

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

DC-to-2 MHz DIFFERENTIAL UNIT

NEW

- ***1 mV/CM to 50 V/CM CALIBRATED DEFLECTION FACTOR***
- ***CONSTANT BANDWIDTH***
- ***10,000:1 COMMON-MODE REJECTION***
- ***±15 V COMMON-MODE SIGNAL RANGE***
- ***SOLID-STATE DESIGN***



The Type 1A6 Plug-In Unit is a DC differential amplifier designed for Tektronix 530, 540, 550 and 580* Series Oscilloscopes. It features a differential input with a high rejection ratio for in-phase signals, allowing the cancellation of unwanted or interfering signals. The differential measuring capability is particularly useful in the display of instantaneous voltage difference between signals.

The plug-in unit is simple to operate. Only one control is used to select the deflection factor and the common-mode signal range.

Type 127, 132, and 133 Power Supplies are available to operate the Type 1A6 outside an oscilloscope. See the description of these instruments for details.

CHARACTERISTICS

BANDWIDTH
DC to ≥2 MHz (≤2 Hz to ≥2 MHz AC-coupled) at 3-dB down. Bandwidth independent of deflection factor.

RISETIME
≤0.18 μs.

DEFLECTION FACTOR
1 mV/cm to 50 V/cm in 15 calibrated steps, 1-2-5 sequence; ±1.5% accuracy from 1 mV/cm to 50 mV/cm, ±2.5% accuracy from 0.1 V/cm to 50 V/cm. Uncalibrated continuous variation between steps and to approx 125 V/cm.

INPUT RC
1 megohm paralleled by 33 pF.

INPUT COUPLING
AC, GND, or DC. Input coupling capacitor is automatically charged to proper voltage through a 1-megohm resistor when switch is in GND position.

COMMON-MODE REJECTION

1 mV/cm to 50 mV/cm	0.1 V/cm to 50 V/cm
≥10,000:1 from DC to 100 kHz	≥1000:1 from DC to 100 kHz
≥2000:1 at 60 Hz (AC-coupled)	≥1000:1 at 60 Hz (AC-coupled)

COMMON-MODE SIGNAL RANGE
±15 V (combined DC and peak AC) from 1 mV/cm to 50 mV/cm, ±150 V from 0.1 V/cm to 0.5 V/cm, ±500 V from 1 V/cm to 50 V/cm. The ±150-V range can be extended from 0.1 V/cm to 10 mV/cm, and the ±500-V range can be extended from 1 V/cm to 0.1 V/cm by pulling and turning the V/cm control.

*A Type 81 Adapter is required.

WEIGHTS

Net weight	4¼ lbs	1.9 kg
Domestic shipping weight	~ 8 lbs	~3.6 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0537-00).

TYPE 1A6 PLUG-IN UNIT $230

OPTIONAL ACCESSORIES

The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

P6007 100X Probe Package order 010-0150-00 ..... $22.00

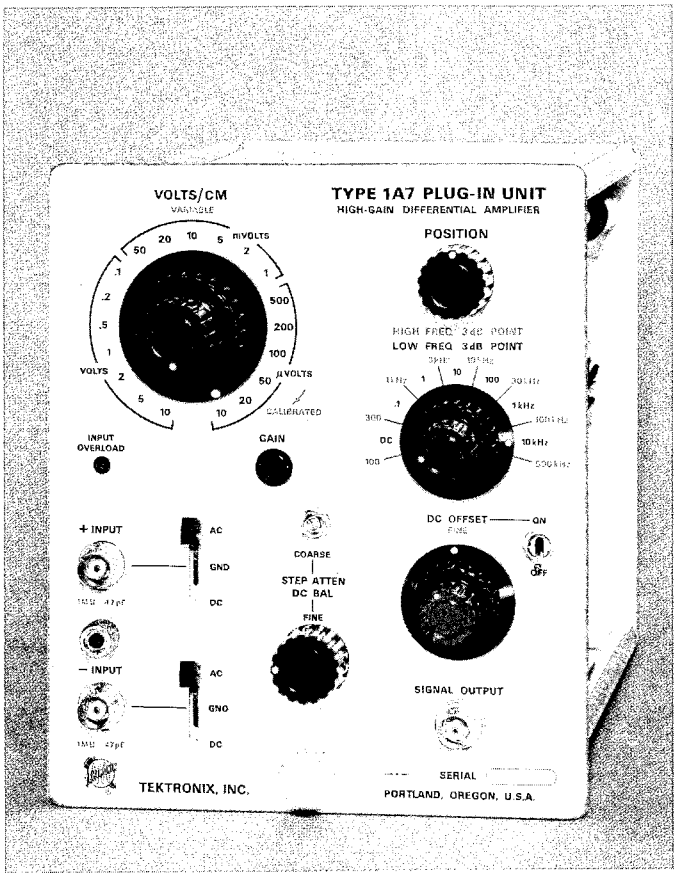
P6023 10X Probe Package, adjustable attenuation ratio helps maintain common-mode rejection, order 010-0167-00 40.00

P6028 1X Probe Package, order 010-0074-00 ..... 12.50

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

HIGH-GAIN DIFFERENTIAL UNIT

- **10 μV/CM to 10 V/CM CALIBRATED DEFLECTION FACTOR**
- **DC to 500 kHz BANDWIDTH**
- **SELECTABLE 3-dB POINTS**
- **LOW DC DRIFT, LOW NOISE**
- **50,000:1 COMMON-MODE REJECTION**
- **300 mV DC DIFFERENTIAL OFFSET**
- **DC-COUPLED FRONT-PANEL SIGNAL OUTPUT**
- **SOLID-STATE DESIGN**



CHARACTERISTICS

This general-purpose plug-in unit can be used with any Tektronix 530, 540, 550, or (with adapter) 580-Series Oscilloscope. Used with Type 127, 132 or 133 Power Supply, the Type 1A7 can drive recording equipment, X-Y plotters, oscilloscopes or other indicators. Featuring simplified DC balancing, high sensitivity, and selectable upper and lower 3-dB points, the Type 1A7 offers previously unavailable measurement capabilities. Capable of differential measurements with simultaneous DC offset, the Type 1A7 allows observation of very small differential signals which may have a considerable difference in DC potential. Common-mode rejection is 50,000:1 for signals up to 20 volts peak to peak, and up to 100 kHz. It can be adjusted to ≥310,000:1 for signals from DC to 20 kHz.

The DC to 500 kHz bandwidth is constant from 10 μV/cm to 10 V/cm. Drift ≤200 μV/h with ambient temperature and line voltage constant; ≤150 μV/°C. Input noise is 3.3-μV RMS, maximum (not including drift). Equivalent to 800-Ω short-circuit noise resistance (wide-band).

Solid-state components are used throughout, except for nuvistor inputs and cathode-follower front-panel output.

BANDWIDTH

DC to 500 kHz; bandwidth independent of deflection factor. Selectable high and low-frequency 3-dB points.

HIGH-FREQUENCY 3-dB POINTS

500 kHz, 100 kHz, 30 kHz, 10 kHz, 3 kHz, 1 kHz, 300 Hz and 100 Hz.

LOW-FREQUENCY 3-dB POINTS

DC, 0.1 Hz, 1 Hz, 10 Hz, 100 Hz, 1 kHz and 10 kHz.

DEFLECTION FACTOR

10 μV/cm to 10 V/cm in 19 calibrated steps, 1-2-5 sequence. Uncalibrated continuous variation between steps and to approx 25 V/cm.

DEFLECTION FACTOR AND DC OFFSET		
CALIBRATED DEFLECTION FACTOR	V/CM ACCURACY	MAX DC OFFSET (approx)
10 μV/cm, 20 μV/cm, and 50 μV/cm	2%	±300 mV
100 μV/cm to 10 mV/cm, in 1-2-5 sequence	1.5%	±300 mV
20 mV/cm, 50 mV/cm, and 0.1 V/cm.	2%	±3 V
0.2 V/cm, 0.5 V/cm, and 1 V/cm	2%	±30 V
2 V/cm, 5 V/cm and 10 V/cm	2%	±300 V

INPUT RC

1 megohm, paralleled by 47 pF.

INPUT COUPLING

May be switched to AC, GND, or DC. Input coupling capacitor is automatically charged to proper voltage through a 1-megohm resistor when switch is in GND position.

MAXIMUM INPUT VOLTAGE

200 V, combined DC and peak AC (60 Hz) from 10 μV/cm to 10 mV/cm. 600 V, combined DC and peak AC (60 Hz) from 20 mV/cm to 10 V/cm.

COMMON-MODE REJECTION RATIOS*			
FREQUENCY	REJECTION RATIO	SINEWAVE AMPLITUDE	DEFLECTION FACTOR
DC to 20 kHz	≥310,000:1 (110 dB)†	≤20 V P to P	10 μV/cm to 10 mV/cm
DC to 100 kHz	≥50,000:1	≤20 V P to P	10 μV/cm to 10 mV/cm
DC to 1 kHz	≥5,000:1†	≤200 V P to P	20 mV/cm to 10 V/cm
1 kHz to 100 kHz	≥500:1†	≤200 V P to P	20 mV/cm to 10 V/cm
60 Hz, AC-coupled at input	≥2000:1	20 V P to P	10 μV/cm to 10 mV/cm
		200 V P to P	20 mV/cm to 10 V/cm

*At 25° C ambient, with no DC offset.

†With internal adjustment.

DIFFERENTIAL OVERLOAD LIGHT
When lit, indicates excessive differential drive to input of amplifier.

DC DRIFT
With time: $\leq$200 μV/h, averaged over 10 h, with ambient temperature and line voltage constant. With temperature: $\leq$150 μV/°C.

INPUT NOISE
3.3 μV, RMS, maximum (not including drift). Equivalent to 800-Ω short-circuit noise resistance (wideband).

BALANCE CONTROLS
One front-panel control balances entire instrument. A non-interacting coarse control provides the proper operating range of the STEP ATTEN DC BAL control. When instrument amplifier frequency response is limited by the LOW FREQ 3 dB POINT control, DC drift is eliminated, and DC balance controls are inoperative.

FRONT-PANEL SIGNAL OUTPUT
34 mV ±10%, per displayed cm. DC-coupled, internally adjustable to ground reference.

WEIGHTS

Net weight	~4¾ lbs	2.1 kg
Domestic shipping weight	~ 9 lbs	~4.1 kg
Export-packed weight	~13 lbs	~5.9 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0379-00).

TYPE 1A7 PLUG-IN UNIT **$425**

OPTIONAL ACCESSORIES

The probes recommended for use with this plug-in unit satisfy most measurement requirements. Other probes are available for current and high-voltage measurements. See accessory pages at the rear of the catalog for additional information on these and other items.

The P6023 low-capacitance probe is well suited for use with most Tektronix differential units.

The probe can be adjusted to match plug-in unit input capacitance ranging from 20 pF to 50 pF. The X10 attenuation ratio is adjustable over a ±2.5% range to compensate for differences in the input resistance of the plug-in unit. When two P6023 probes are used to drive the two inputs of a differential amplifier, the ability to change the attenuation ratio of one probe versus the other helps to maintain the common-mode rejection ratio of the system.

P6023 10X Probe Package, adjustable attenuation ratio helps maintain common-mode rejection, order 010-0167-00 40.00

P6007 100X Probe Package, order 010-0150-00 ..... $22.00

P6028 1X Probe Package, order 010-0074-00 ..... 12.50

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

Spectrum Analysis

Present users of Tektronix Type 530, 540, 550 and (with adapter) 580-Series Oscilloscopes* can now achieve high-quality spectrum analysis at a fraction of the cost of other analyzers. A plug-in analyzer and oscilloscope offer several advantages over ordinary spectrum analyzers. The oscilloscope's calibrated time base and versatile triggering allow direct measurement of pulse repetition rate and provide stable displays even in the presence of interference. The oscilloscope also powers the analyzer, and displays the spectrum on its CRT. One oscilloscope then serves two functions: operates in the conventional time-based mode using Letter-Series or 1-Series Plug-In Units (or the analyzer's video input), operates in a frequency-based mode with the Type 1L5 50 Hz-to-1 MHz center frequency Analyzer, Type 1L10 1-to-36 MHz Analyzer, Type 1L20 10-to-4200 MHz Analyzer or Type 1L30 925-to-10,500 MHz Analyzer.

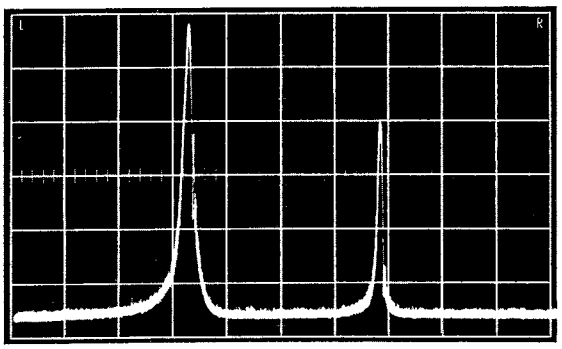
Typically, the Spectrum Analyzer Plug-In Unit selects a portion of the electromagnetic spectrum—as wide as 100 MHz, for example—and displays visually on the oscilloscope CRT all the radio activity occurring there. Within the portion of the spectrum that concerns you, any signal, amplitude or frequency modulated, pulsed carriers, etc.—is displayed as a series of "pips" on the CRT. CALIBRATED DISPERSION permits detailed study of the signal, with frequency difference read directly from the CRT. Signals separated by 10 Hz can be resolved with the Type 1L5 or 1L10; signals separated by 1 kHz can be resolved with the Type 1L20 or 1L30.

*Type 3L5 50-Hz-to-1 MHz center frequency Analyzer and Type 3L10 1-to-36 MHz Analyzer fit Type 561A and Type 564 Oscilloscopes.

The dynamic range capability of the Tektronix Spectrum Analyzers is greatly increased by the inclusion of square-law and logarithmic detection modes as well as a linear mode. The ability to compress or expand signals greatly enhances the versatility of these instruments. Signals of very nearly the same amplitude can be displayed in the SQUARE-LAW MODE which expands the small difference to a proportion that facilitates measurements. Conversely, signals of greatly different amplitude (40 dB, for example) can be displayed in the LOG MODE which compresses the difference between them.

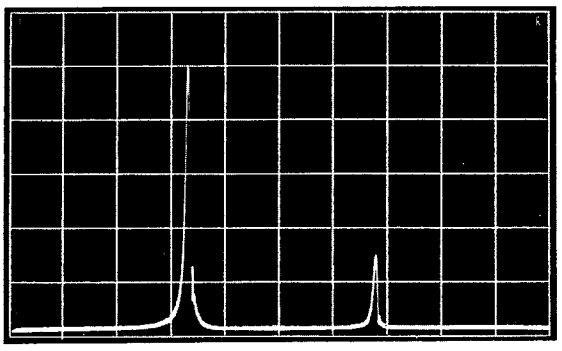
The units manufactured by Tektronix are extremely sensitive and will give usable displays with inputs lower than —100 dBm. This represents a power level of 10^{-13} watts, using the conventional reference level of 0 dBm = one milliwatt.

The usefulness of Tektronix Spectrum Analyzers extends into many measurement areas. They are used by government agencies to check the sidebands of radio-transmitting devices. Telephone companies find transmission-line carrier measurements quick and accurate, often providing data not obtainable by other means. Spectrum Analyzers are finding increased use in missile projects and the exploration of outer space, especially in association with the maintenance and trouble-shooting of telemetry equipment. They are indispensable to recently developed techniques of servicing radar and microwave equipment. The Type 1L5 extends spectrum analysis into lower-frequency applications including vibration studies, design of audio equipment, speech therapy, and others. You are encouraged to discuss your measurement and test problems with your Tektronix Field Engineer or Distributor.

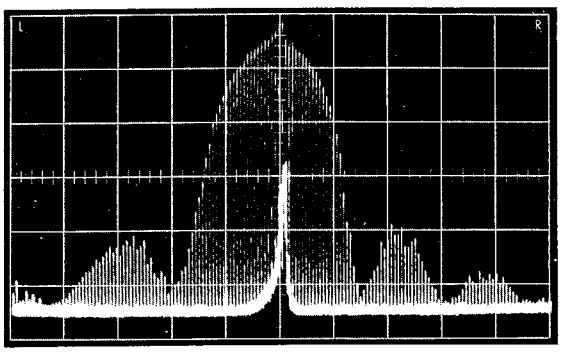


Log Detection Mode

500-Hz Modulation of 450-MHz Signal

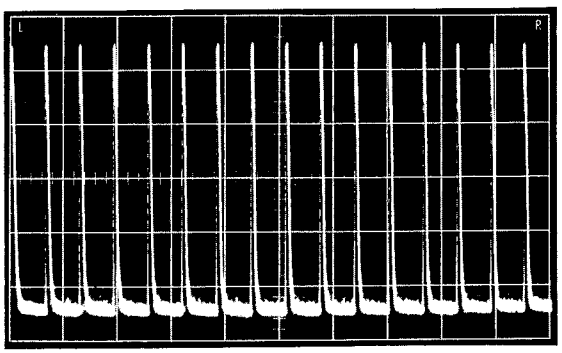


Linear Detection Mode



Repetition-Rate lines evident at 5 ms/cm
(Note: CW Feedthrough)

200-MHz Pulsed RF

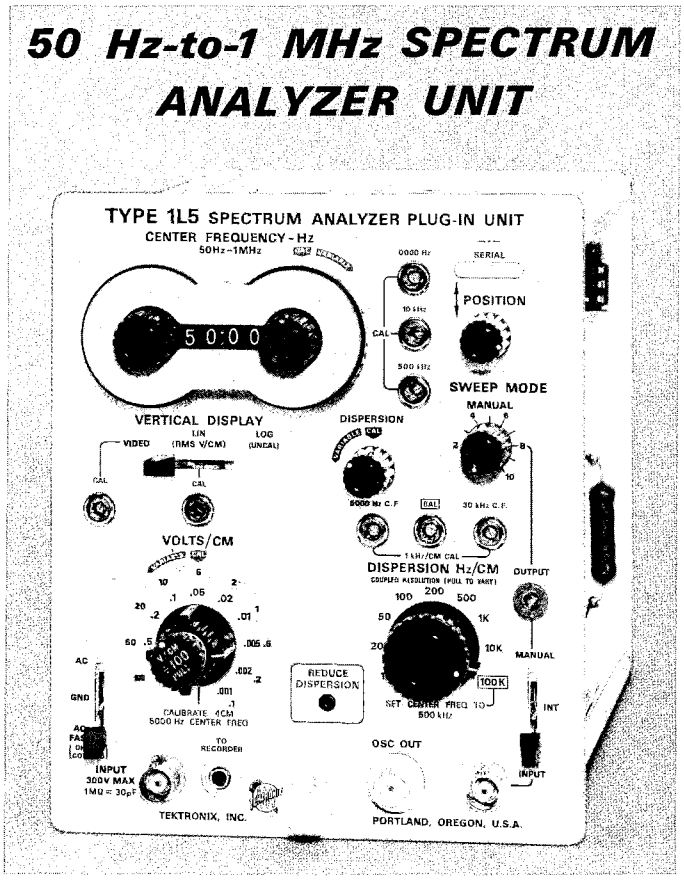


Repetition-Rate measurement at 0.5 ms/cm
Zero Dispersion

NEW

- **CALIBRATED VERTICAL DEFLECTION**
- **CALIBRATED DISPERSION**
- **10 Hz TO 1 MHz IN ONE DISPLAY**
- **TIME-BASED OR FREQUENCY-BASED DISPLAYS**
- **REPETITIVE OR MANUAL SCAN**
- **RECORDER OUTPUT**
- **SOLID-STATE DESIGN**

50 Hz-to-1 MHz SPECTRUM ANALYZER UNIT



The Type 1L5 operates over a center-frequency range of 50 Hz to 1 MHz, and provides accurate spectral and time-based displays from 10 Hz to 1 MHz. Calibrated volts/cm and Hz/cm controls make the Type 1L5 as easy to use as the Type 530, 540, 550 or (with adapter) 580-Series Oscilloscopes in which it operates. Used with Type 127, 132, or 133 Power Supply, the Type 1L5 can drive recording equipment, X-Y plotters, oscilloscopes, or other indicators.

Resolution bandwidth extends from 10 Hz to 500 Hz. High-resolution spectral displays can be viewed in their entirety (even at the very slow sweep rates required for maximum resolution) with the Type 549 Storage Oscilloscope. Stored displays can also be compared with subsequent displays, and can be easily photographed for permanent record.

Applications include vibration studies, waveform analysis, and noise measurements.

SPECTRAL DISPLAYS

CENTER FREQUENCY RANGE

50-Hz to 990-kHz, calibrated in 10-Hz, 100-Hz, 1-kHz and 10-kHz steps. Continuously variable uncalibrated between steps and to 1 MHz.

CENTER FREQUENCY	ACCURACY
50 Hz to 990 Hz	±(5% + 50 Hz + 20 Hz/°C change)
1000 Hz to 9900 Hz	±(5% + 100 Hz + 20 Hz/°C change)
10 kHz to 99 kHz	±(5% + 3 kHz + 200 Hz/°C change)
100 kHz to 990 kHz	±(5% + 10 kHz + 200 Hz/°C change)

DEFLECTION FACTOR

10 μV/cm to 2 V/cm in calibrated RMS steps (1-2-5 sequence), accurate within 5% (within 8% at 10 μV/cm to 500 μV/cm) for linear displays. Uncalibrated control provides continuous variation between steps, reduces gain by a factor of approx 3.

CALIBRATED DISPERSION

10 Hz/cm to 100 kHz/cm in 9 steps, accuracy within 5%, from 50 Hz to 9900 Hz, within 15% from 10 kHz to 990 kHz. Linearity within 3%.

COUPLED RESOLUTION

≤10 Hz to ≥500 Hz, coupled with calibrated dispersion positions and separately switchable.

DISPLAY FLATNESS

±0.5 dB from 10 Hz to 1 MHz, at switch positions from 10 mV/cm to 2 V/cm; +0.5 dB, —3 dB from 10 Hz to 1 MHz at switch positions from 1 mV/cm to 5 mV/cm.

NOISE

≤5 μV RMS.

INCIDENTAL FM

≤3 Hz from 50 Hz to 9900 Hz; ≤10 Hz from 9900 Hz to 990 kHz.

DYNAMIC RANGE

≥60 dB in LOG (uncalibrated) mode.

INTERMODULATION DISTORTION

>50-dB down from 6 cm in LOG mode.

RECORDER OUTPUT

5 to 15 mV for 6-cm display, 600-Ω source resistance, DC coupled.

LOCAL OSCILLATOR OUTPUT

From 2 MHz to 3 MHz; ≥1 V peak to peak.

SWEEP MODES

Manual, internal and external. Accuracy of frequency measurements can be increased using manual scan and monitoring the local oscillator output with a frequency counter. Type 549 Storage Oscilloscope and Type 556 Dual-Beam Oscilloscope provides an internally-coupled sweep to the Analyzer; external input is used with other oscilloscopes.

TYPE 1L5

TIME-BASED DISPLAYS

BANDWIDTH
10 Hz to 1 MHz.

DEFLECTION FACTOR
1 mV/cm to 100 V/cm in calibrated P to P steps (1-2-5 sequence), accurate within 3% (within 6% from 1 mV/cm to 50 mV/cm). Uncalibrated control provides continuous variation between steps, reduces gain by a factor of approx 3.

INPUT RC
1 megohm paralleled by approx 30 pF.

OTHER CHARACTERISTICS

WEIGHTS

Net weight	6 lb	2.7 kg
Domestic shipping weight	~10 lb	~4.5 kg
Export-packed weight	~18 lb	~8.2 kg

STANDARD ACCESSORIES
1X probe (010-0193-00), banana-to-banana cable (012-0031-00), BNC-to-banana cable (012-0091-00), plug (134-0052-00), plug protector (134-0076-00), two instruction manuals (070-0600-00).

TYPE 1L5 SPECTRUM ANALYZER UNIT $950

OPTIONAL ACCESSORIES

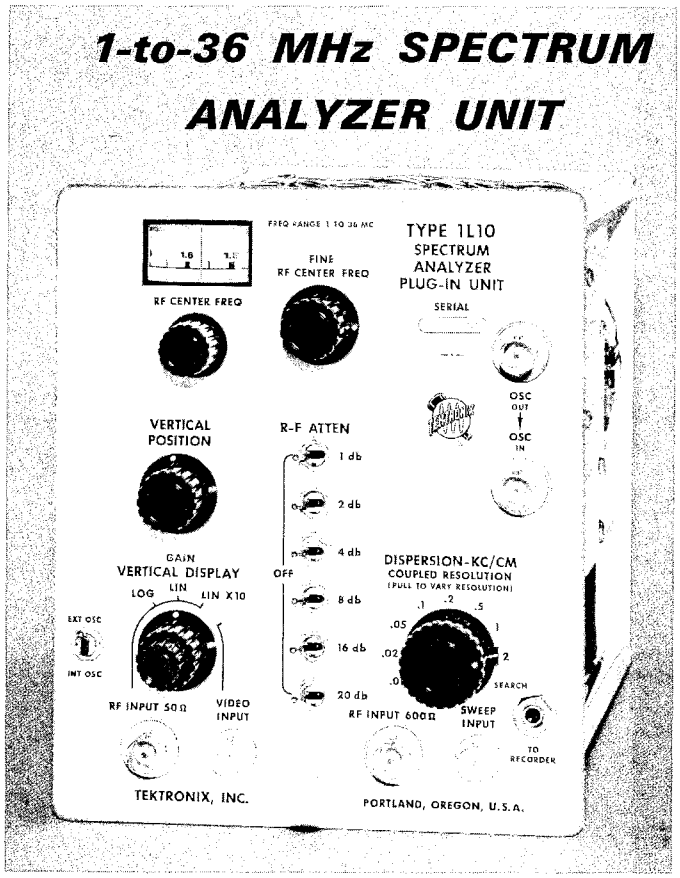
The standard 1X probe supplied with the analyzer satisfies most measurement requirements. Optional probes may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

P6007 100X Probe Package, order 010-0150-00 ..... $22
P6012 10X Probe Package, order 010-0203-00 ..... $27

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

1-to-36 MHz SPECTRUM ANALYZER UNIT

- ***CALIBRATED DISPERSION***
- ***COUPLED RESOLUTION***
- ***CRYSTAL-CONTROLLED SWEPT OSCILLATOR***
- ***IMAGE REJECTION***
- ***RECORDER OUTPUT***



1 to 36-Mc spectral displays can now be viewed on any Tektronix Type 530, 540, 550 or (with adapter) 580-Series Oscilloscope. The new Type 549 Oscilloscope adds further convenience to spectrum analysis—allowing storage and simultaneous comparison of spectral displays.

CALIBRATED DISPERSION from 10 cps/cm to 2 kc/cm makes frequency measurement as easy and accurate as time measurement. Frequency differences can be read directly from the CRT. The SEARCH MODE permits rapid location of signals for analysis.

COUPLED RESOLUTION from 10 cps to 1 kc greatly simplifies operation, providing narrow resolution bandwidth at narrow dispersion and wide resolution bandwidth at wide dispersion. Dispersion and resolution controls can be uncoupled and operated separately if desired, for optimized viewing of a particular signal.

IF stability is achieved through use of CRYSTAL-CONTROLLED OSCILLATORS. Even the swept local oscillator is controlled through a crystal discriminator. An external, front-end crystal-operated oscillator can be connected through a front-panel patch arrangement to provide added stability to spectral displays within or outside the normal 1 to 36-Mc range of the Type 1L10.

IMAGE REJECTION is achieved through use of a 60-Mc first IF amplifier which places images at more than twice the upper tuning frequency of the Type 1L10.

FREQUENCY RANGE
1 to 36 Mc, fine and coarse tuning.

MINIMUM CW SENSITIVITY (50 Ω INPUT)
—100 dbm, measured at 2 kc/cm dispersion and 1 kc (coupled) resolution.

DIAL ACCURACY
±(100 kc + 1% of dial reading).

CALIBRATED DISPERSION
0.01 kc/cm to 2 kc/cm, 8 steps, 1-2-5 sequence.
Accuracy within ±3% when adjusted for individual oscilloscope, within ±7% without adjustment. Dispersion linearity within ±5%. Search position (uncalibrated)—minimum 20 kc + 1 kc/Mc dial frequency full scale (10 cm).

COUPLED RESOLUTION
10 cps to 1 kc, coupled with calibrated dispersion positions, and separately switchable. Search position—approximately 10 kc.

DISPLAY FLATNESS
±1 db.

MAXIMUM INCIDENTAL FM
IF within 5 cps.
LO within 25 cps + 1 cps/Mc dial frequency.

FREQUENCY STABILITY
IF within 2 p/m per °F change, 1 p/m per 1 V line change.
LO within 150 p/m per °F change, 10 p/m per 1 V line change.

INPUT IMPEDANCE
Approx 50 Ω and approx 600 Ω.

MAXIMUM INPUT POWER
+24 dbm at full RF attenuation, —20 dbm without RF attenuation.

RF ATTENUATOR
51 db ±0.1 db/db in 1-db steps.
½ watt maximum power-handling capability.

IF GAIN CONTROL
>60 db range.

VERTICAL DISPLAY (6 cm)
Log—50-db dynamic range.
Linear—26-db dynamic range.
Linear X10—26-db dynamic range.
Video—100 mV/cm (variable), ≤16 cps to ≥10 Mc, approx 50-Ω input resistance.

RECORDER OUTPUT
DC-coupled, approx 600-Ω source resistance, 15 mV/cm display in Linear mode, output linear with voltage.

WEIGHTS

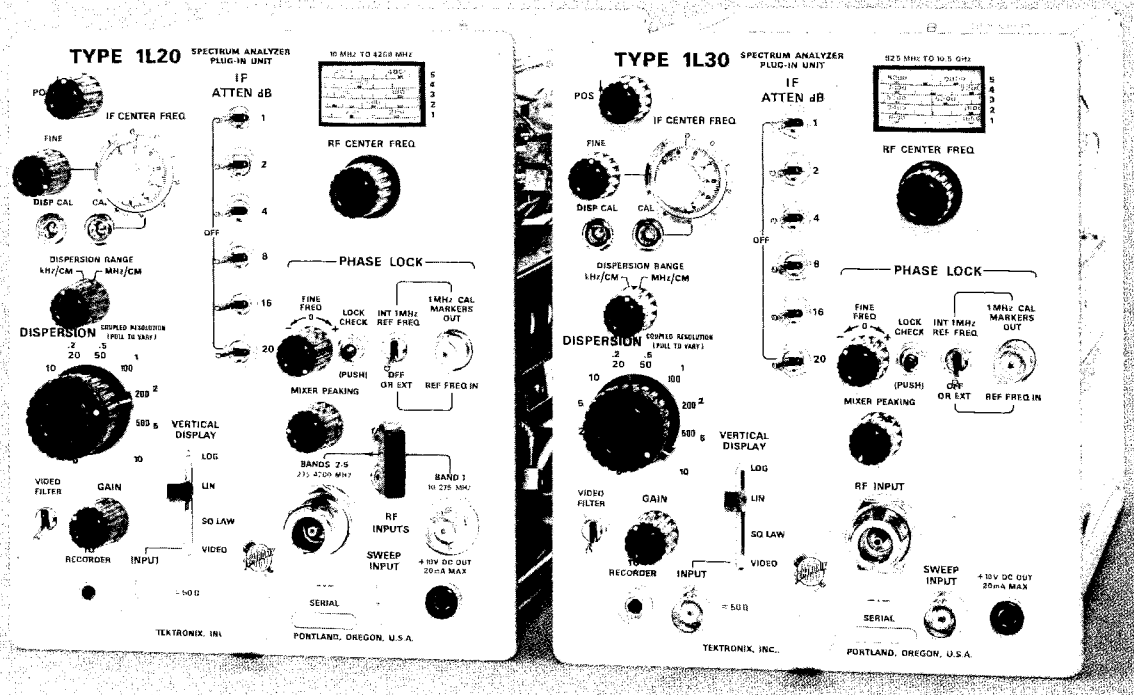
Net weight	6 lb	2.7 kg
Domestic shipping weight	~11 lb	~5.0 kg
Export-packed weight	~18 lb	~8.2 kg

STANDARD ACCESSORIES
Cable assembly, BNC to BNC, 2½ inches (012-0097-00); cable assembly, BNC to banana plug, 24 inches (012-0096-00); tini-plug (134-0052-00); two instruction manuals (070-0510-00).

TYPE 1L10 SPECTRUM ANALYZER UNIT $1100

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

MULTI-BAND SPECTRUM ANALYZER UNITS



Type 1L20 covers 10 MHz to 4.2 GHz

- ***INTERNAL PHASE LOCK***
- ***CALIBRATED DISPERSION TO 100 MHz***
- ***COUPLED RESOLUTION***
- ***±1.5 dB DISPLAY FLATNESS***
- ***RECORDER OUTPUT***

Type 1L30 covers 925 MHz to 10.5 GHz

New operating convenience and state-of-the-art performance is now offered in multi-band plug-in units for all present Tektronix Type 530, 540, 550, or (with adapter) 580-Series Oscilloscopes. The Type 549 Oscilloscope adds further convenience to spectrum analysis—allowing storage and simultaneous comparison of spectral displays.

BUILT-IN PHASE LOCK circuit synchronizes the analyzer local oscillator with a stable reference frequency (internal 1 MHz or external 1 to 5 MHz). When the local oscillator is locked in phase to the reference frequency, the local oscillator stability approaches that of the reference frequency. This allows very narrow dispersion at high frequencies where the analyzer would normally be limited by oscillator drift, microphonics, and other perturbations. Phase lock can be used to view any signal within the tuning range of the analyzer.

CALIBRATED DISPERSION from 1 kHz/cm to 10 MHz/cm makes frequency measurement as easy and accurate as time measurement. Frequency differences can be read directly from the CRT.

COUPLED RESOLUTION from 1 kHz to 100 kHz greatly simplifies operation, providing narrow resolution bandwidth at narrow dispersion and wide resolution bandwidth at wide dispersion. Dispersion and resolution controls can be uncoupled and operated separately if desired, for optimized viewing of a particular signal.

TYPE	BAND	FREQUENCY RANGE	MINIMUM CW SENSITIVITY* 1-kHz RESOLUTION	MINIMUM CW SENSITIVITY* 100-kHz RESOLUTION
1L20	1	10 MHz to 275 MHz	≥ −100 dBm	≥ −80 dBm
	2	275 MHz to 900 MHz	≥ −110 dBm	≥ −90 dBm
	3	850 MHz to 2 GHz	≥ −100 dBm	≥ −80 dBm
	4	1.95 GHz to 3.1 GHz	≥ −95 dBm	≥ −75 dBm
	5	3 GHz to 4.2 GHz	≥ −90 dBm	≥ −70 dBm
1L30	1	925 MHz to ≈2 GHz	≥ −105 dBm	≥ −85 dBm
	2	≈2 GHz to 4.1 GHz	≥ −100 dBm	≥ −80 dBm
	3	4.1 GHz to 6.25 GHz	≥ −95 dBm	≥ −75 dBm
	4	6.2 GHz to 8.4 GHz	≥ −90 dBm	≥ −70 dBm
	5	8.3 GHz to 10.5 GHz	≥ −75 dBm	≥ −55 dBm

*Signal + noise = 2X noise

DIAL ACCURACY
± (2 MHz + 1% of dial reading).

CALIBRATED DISPERSION
1 kHz/cm to 10 MHz/cm in 1-2-5 sequence, 2 ranges (kHz/cm—MHz/cm). Accuracy of 10-cm display, throughout full range of IF center frequency control, within ±3% except at 2 MHz/cm (±5%) and 1 MHz/cm (±7%). Accuracy can be increased using internal 1-MHz crystal markers for calibration. Dispersion linearity within ±3%. Zero dispersion useful for PRF measurements.

COUPLED RESOLUTION
1 kHz to 100 kHz, coupled with calibrated dispersion positions but separately switchable.

DISPLAY FLATNESS
±1.5 dB over 100-MHz dispersion, except over ±25 MHz for Band 1 of Type 1L20.

INCIDENTAL FM
Less than 300 Hz at fundamental, with Phase Lock.

FREQUENCY STABILITY
kHz/cm dispersion range—±10 kHz from 103.5 to 126.5 VAC after 1 minute; ±5 kHz/°C. MHz/cm dispersion range—±200 kHz from 103.5 to 126.5 VAC after 1 minute; ±20 kHz/°C. 1 MHz internal markers—0.01% (100 Hz).

PHASE LOCK
Internal 1-MHz reference accurate within 0.01%. External input accepts 1-MHz to 5-MHz signals from 1 V to 5 V peak to peak.

INPUT IMPEDANCE
Approx 50 Ω.

MAXIMUM INPUT POWER
−30 dBm for linear operation, +15 dBm (25 mW) safe diode power limit.

IF ATTENUATOR
51 dB in 1-dB steps, ±0.1 dB/dB.

IF GAIN CONTROL
>50 dB range.

IF CENTER FREQUENCY
±25 MHz adjustment of center frequency from 5 MHz/cm to 0.2 MHz/cm dispersion positions, ±2.5 MHz adjustment from 500 kHz/cm to 1 kHz/cm dispersion positions.

VERTICAL DISPLAY (6 cm)
Log—≥40-dB dynamic range.
Linear—≥26-dB dynamic range.
Square Law—≥13-dB total dynamic range.
Video— ≤16 Hz to ≥10 MHz, approx 50-Ω input resistance.

RECORDER OUTPUT
12 mV to 20 mV with linear display, DC-coupled, approx 600-Ω source resistance.

+10 V DC OUTPUT
Provides external accessory power, +10 V ±5%, 20 mA maximum.

WEIGHTS

Net weight	7½ lb	3.4 kg
Domestic shipping weight	~14 lb	~6.4 kg
Export-packed weight	~20 lb	~9.1 kg

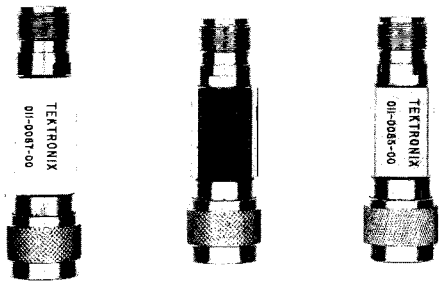
STANDARD ACCESSORIES
Patch cord, BNC to banana (012-0091-00); plug protector (134-0076-00); tini-plug (134-0052-00); two instruction manuals (070-0519-00 for Type 1L20, 070-0520-00 for Type 1L30).

TYPE 1L20 SPECTRUM ANALYZER UNIT $1825

TYPE 1L30 SPECTRUM ANALYZER UNIT $1825

OPTIONAL ACCESSORIES

Attenuators are all supplied with Type N fittings. See accessory section for adapters for other series. Frequency range is DC to 12.4 GHz. Power rating is 2 W average, 2 kW peak. Impedance is 50 Ω.



10-dB attenuator, order 011-0085-00 ..... $ 40
20-dB attenuator, order 011-0086-00 ..... $ 40
40-dB attenuator, order 011-0087-00 ..... $ 60

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Please refer to Terms and Shipment, General Information page.

TYPE 1S1

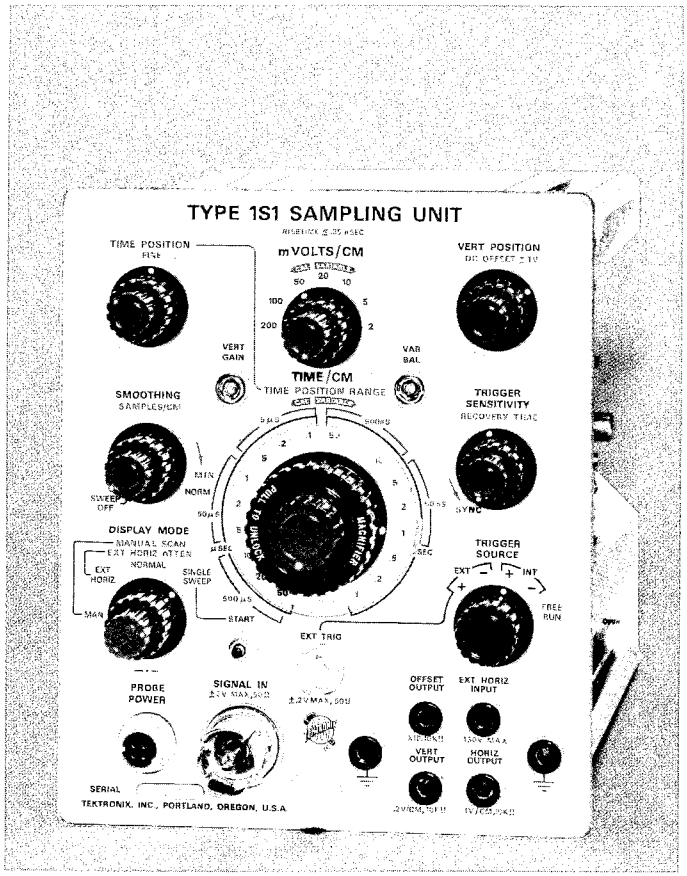
SAMPLING UNIT

- ***INTERNAL TRIGGERING***
- ***INTERNAL DELAY LINE***
- ***DIRECT-READING MAGNIFIER***
- ***LOW DISPLAY NOISE***

Used with any of the Type 530, 540, 550 or 580*-Series Oscilloscopes, the Type 1S1 Sampling Unit extends the measuring capabilities to 1 gigahertz. Operation is like a conventional oscilloscope—but with a combination of bandwidth and sensitivity possible only through sampling.

The Type 1S1 features internal triggering with a built-in delay line—no need for pretriggers or external delay lines. The tunnel-diode trigger circuit assures stable triggering through 1 gigahertz. Calibrated sweep range is from 100 ps/cm to 50 μs/cm. A single control is used to select the sweep range and magnify the display up to X100 when desired. This single-control feature allows direct read-out of the sweep time/cm even when magnified.

Calibrated vertical deflection factors range from 2 mV/cm to 200 mV/cm. Noise in the display is less than 1 mV, and can be reduced by a smoothing control. A DC-offset control permits observation of millivolt signals in the presence of up to $\pm$1 volt input levels. Output signals are available at the front panel for driving chart recorders.



VERTICAL SYSTEM

RISETIME
Less than or equal to 0.35 ns.

BANDWIDTH
Equivalent to DC-to-1000 MHz at 3-dB down.

DEFLECTION FACTOR
7 calibrated steps from 2 mV/cm to 200 mV/cm. All steps accurate within 3%. Variable between steps, extending to 500 μV/cm (uncalibrated).

RANDOM NOISE LEVEL
Less than 1 mV. Can be reduced to less than 500 μV with smoothing control.

INPUT IMPEDANCE
50 Ω nominal.

DC OFFSET
Range is $\pm$1 V. OUTPUT: (for monitoring the DC-offset level) ten times actual offset through 10 kΩ.

DYNAMIC RANGE
$\pm$2 V. Deflection factors to 2 mV/cm can be used with signals up to $\pm$2 volts in amplitude. Safe overload is $\pm$5 V.

VERTICAL OUTPUT
200 mV per displayed centimeter through 10 kΩ.

PROBE POWER
Available at front-panel connector for cathode-follower probe, Type 281 TDR Pulser, and Type 282 Adapter for high-impedance probes.

*Type 81 Plug-In Adapter required.

HORIZONTAL SYSTEM

TIME BASE
18 calibrated steps from 100 ps/cm to 50 μs/cm. ACCURACY: $\pm$3% normal or magnified. Variable between steps, extending sweep range to 33 ps/cm (uncalibrated).

MAGNIFIER
Allows display to be magnified around a fixed time-reference point while maintaining a constant number of samples/cm. Provides magnification up to X100 (depending on the sweep rate). Sweep TIME/CM has direct read-out even when magnified.

TIME POSITION
Moves the displayed time window and positions the time-reference point for magnification. Range is 500 μs to 50 ns in 5 decade steps. Time position variables provide adjustment of delay from zero to the range step selected.

EXT HORIZ INPUT
1 V/cm to 16 V/cm (approx). Permits externally scanning the sampled display. Time per centimeter remains calibrated.

SAMPLES/CM
Continuously variable, allowing optimum adjustment of display rate and dot density.

DISPLAY MODES
Repetitive, single display, manual scan, or external scan. Front-panel START button for single-display operation.

INTERNAL DELAY LINE
Permits viewing the leading edge of the input waveform.

TRIGGERING

3 trigger modes, AC-coupled: ±internal, ±external, and free run. EXTERNAL SENSITIVITY: 5 mV to 200 mV. RESPONSE: Sinewave triggering or synchronizing from 100 kHz through 1 GHz. Pulse triggering down to 10 p/s.

HORIZONTAL OUTPUT

1 V per displayed centimeter; 10 kΩ source impedance.

WEIGHTS

Net weight	7¾ lb	3.5 kg
Domestic shipping weight	~17 lb	~ 7.7 kg
Export-packed weight	~25 lb	~11.4 kg

STANDARD ACCESSORIES

Cable, 5 ns, RG8/213 with GR connectors (017-0502-00); cable, 50-Ω 10 ns, RG58/CU with GR connectors (017-0501-00); patch cord, 18 inches with banana connectors (012-0039-00); patch cord, 18 inches, BNC-banana plugs (012-0090-00) ; two attenuators, 10X, 50-Ω (017-0078-00); adapter, GR-to-BNC female (017-0063-00); adapter, GR-to-BNC male (017-0064-00); two instruction manuals (070-0475-00).

TYPE 1S1 SAMPLING UNIT $1100

OPTIONAL ACCESSORIES

TYPE 281 TDR PULSER

This compact current source is designed for use with Type 1S1 and other 50-Ω Sampling Units equipped with signal delay lines. Pulse Amplitude is approx 18.5 mA; Risetime ≤0.75 ns at leading negative transition; Width ≥5 μs.

TYPE 281 TDR PULSER (Order 015-0060-00) ..... $ 95

TYPE 282 PROBE ADAPTER

This accessory permits the use of conventional high-impedance probes with 50-Ω Sampling Units. Type 282 is recommended for use with P6008, P6009, or P6047 Probes. It can also be used with P6010 or P6011.

TYPE 282 PROBE ADAPTER (Order 015-0074-00) ..... $ 95

TYPES P6034 and P6035 MINIATURE PASSIVE PROBES

These probes permit accurate measurement of high-speed pulses and are very compact to permit easy access to modern, high-density circuitry. P6034 has 10X attenuation; input resitance is 500 Ω at DC and approx 300 Ω at 1.0 GHz. Risetime is less than 100 ps. P6035 has 100X attenuation; input resitance is 5000 Ω at DC and approx 1500 Ω at 1.0 GHz. Risetime is less than 200 ps.

TYPE P6034 (Order 010-0110-00) ..... $ 35
TYPE P6035 (Order 010-0111-00) ..... $ 35

TYPE CT-1 AND P6040 CURRENT TRANSFORMER AND PROBE

Type CT-1 provides a means for accurate measurement of current flow in a circuit, keeping loading effects to a minimum. Type P6040 serves as an inter-connecting cable between the CT-1 and an oscilloscope. Sensitivity is 5 mV/mA into a 50-Ω load; Bandwidth is 35 kHz to 1.0 GHz; Risetime is less than 0.35 ns.

TYPE CT-1 and P6040 (Order 015-0041-00) ..... $ 31

TYPE VP-1 VOLTAGE PICKOFF

Type VP-1 is a 50-Ω "T" type voltage pickoff for use with P6034 or P6035 probes, introducing minimum disturbance of the equipment under test.

TYPE VP-1 (Order 017-0073-00) ..... $ 25

This represents only a partial listing of the many useful items available for sampling systems. Please refer to the catalog accessory section for a more complete listing.

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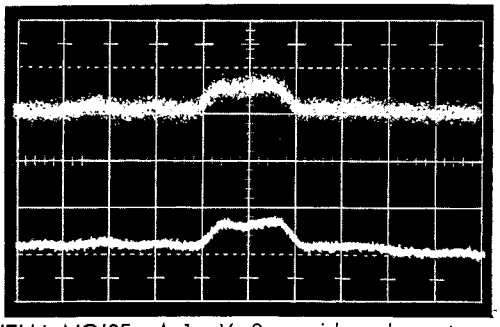
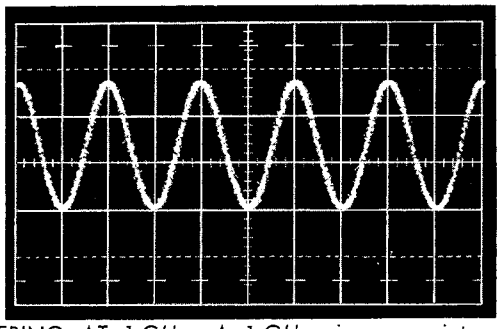
Please refer to Terms and Shipment, General Information page.

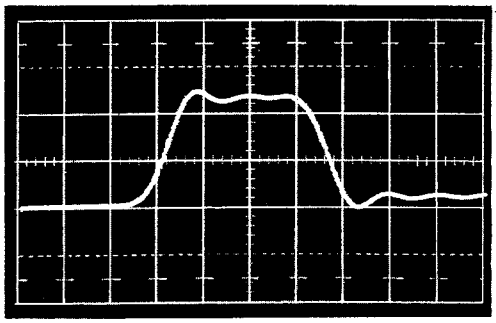
THE WAVEFORM PHOTOGRAPHS BELOW ILLUSTRATE THE PERFORMANCE CAPABILITIES OF THE TYPE 1S1 SAMPLING UNIT. THESE INCLUDE LOW INHERENT DISPLAY NOISE, STABLE TRIGGERING AND REAL-TIME SAMPLING.



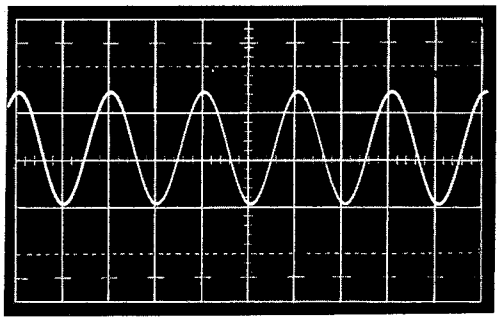
TANGENTIAL NOISE—A 1-mV, 2-ns wide pulse externally triggered. Upper waveform is unsmoothed. The lower is smoothed. Vert: 2 mV/cm. Horiz: 1 ns/cm.



TRIGGERING AT 1 GHz—A 1-GHz sinewave; internally triggered. Vert: 100 mV/cm. Horiz: 0.5 ns/cm.



PULSE TRIGGERING—A 50-mV, 2-ns wide pulse; internally triggered. Vert: 20 mV/cm. Horiz: 0.5 ns/cm.



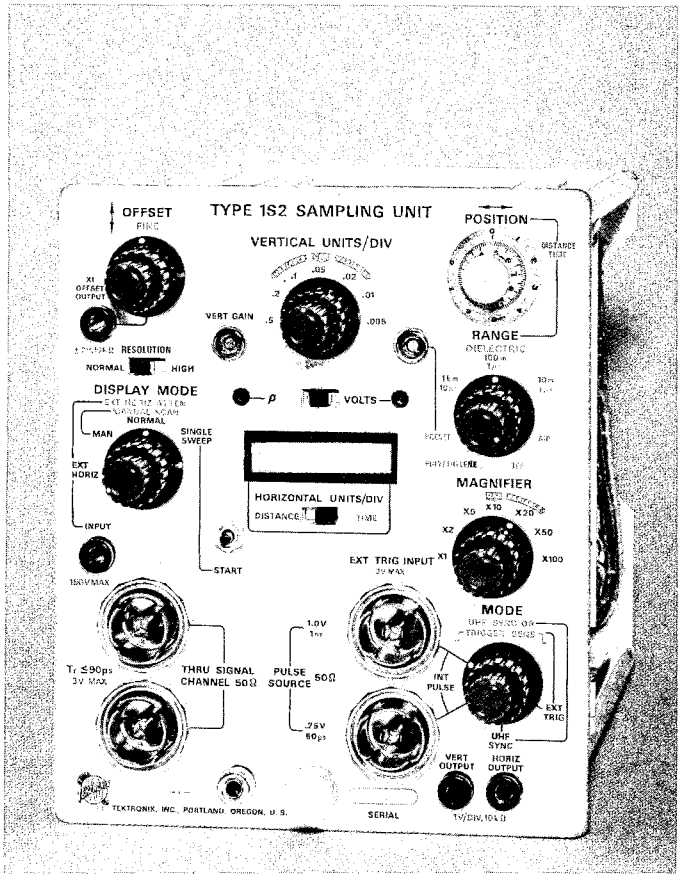
REAL-TIME SAMPLING DISPLAY—A 1-kHz sinewave; Internal Main Frame triggering. Vert: 100 mV/cm (free running sampler). Horiz: 0.5 ms/cm (realtime—main frame).

REFLECTOMETER & SAMPLING UNIT

- ***VERTICAL CALIBRATION IN RHO (ρ) OR VOLTAGE***
- ***HORIZONTAL CALIBRATION IN TIME OR DISTANCE***
- ***TWO INTERNAL PULSE SOURCES***
- ***LIGHTED READOUT OF HORIZONTAL SCALE FACTOR***
- ***90-ps GENERAL-PURPOSE SAMPLER***

Time-domain reflectometry measurements are easier than ever to make! The Type 1S2 in any Tektronix Oscilloscope that accepts Letter and 1-Series Plug-Ins is a complete TDR measurement system.

The ≤90-ps risetime, 5-mV/div deflection factor and built-in triggering capability make the Type 1S2 useful in many other sampling measurements.



SYSTEM PERFORMANCE AS REFLECTOMETER

VERTICAL

SYSTEM RISETIME
≤140 ps, for the displayed reflection from a short-circuited 20-cm air line.

VERTICAL SCALE
Calibrated in ρ (rho) and volts: 0.005 ρ/div to 0.5 ρ/div or 5 mV/div to 500 mV/div in 7 calibrated steps (1-2-5 sequence), accurate within 3%. Continuous variation between steps, uncalibrated.

INPUT IMPEDANCE
50 ohms (with supplied termination).

RESOLUTION
Reflection coefficients as small as 0.001 can be observed.

OFFSET RANGE
±2-V offset, monitorable at front panel, permits ±1% accuracy for slide-back measurements of either ρ or voltage.

VERTICAL OUTPUT
1 V for each major division of displayed signal, 10 kΩ ±1% source impedance.

HORIZONTAL

HORIZONTAL SCALE
Calibrated in distance and time: full-scale, 10-div display (without magnification) of 10 m, 100 m, or 1 km; 100 ns, 1 μs, or 10 μs. Accuracy is ±3% with or without magnification.

MAGNIFIER
X1 to X100 in 7 calibrated steps (1-2-5 sequence). Continuously variable between steps. Allows display to be magnified from a fixed on-screen reference point: 1 major division from the left edge of the graticule.

UNITS/DIV CALCULATOR
Horizontal scale factor (combination of horizontal range and magnification settings) readout, directly at front panel, indicates either distance or time/div.

DISTANCE OR TIME POSITION
Ten-turn dial directly reads one-way distance or round-trip time to test-line discontinuity. Round-trip time readings are accurate to within ±1%. Range of 10-turn dial is the same as the full-scale, 10-div display without magnification.

JITTER
≤20 ps with internal pulse sources.

DIELECTRIC
Calibrated for air, tfe and polyethylene lines. Preset mode adjustable for lines with velocity of propagation from 0.6 to 1.0X velocity of light.

DISPLAY MODES
Repetitive or single sweep, manual or external scan.

HORIZONTAL OUTPUT
1 V for each major division of displayed signal, 10 kΩ ±1% source impedance.

PULSE SOURCES

FAST-RISE OUTPUT
Approximately 50-ps risetime at approximately 250 mV, 50 Ω ±1% (reverse terminated).

LARGE-AMPLITUDE OUTPUT
Approximately 1-ns risetime at approximately 1.0 V, 50 Ω ±1% (reverse terminated).

PERFORMANCE AS GENERAL-PURPOSE SAMPLER

RISETIME
≤90 ps.

DEFLECTION FACTOR
5 mV/div to 500 mV/div in 7 calibrated steps, 1-2-5 sequence, accurate within 3%. Continuous variation between steps, uncalibrated.

INPUT IMPEDANCE
50 ohms (with supplied termination).

DYNAMIC RANGE
±2 V, ±5 V safe overload.

TANGENTIAL NOISE
Less than 2 mV.

TRIGGERING
±Pulses: 10 Hz to 5 GHz, 50 mV to 1 V. Sinewaves: 100 kHz to 5 GHz, 50 mV to 1 V.

STANDARD ACCESSORIES
Two GR elbows (017-0070-00); 5X attenuator (017-0079-00); 2X attenuator (017-0080-00); 50-Ω termination (017-0081-00); 20-cm air line (017-0084-00); 50-Ω termination, short circuit (017-0087-00); 5-ns cable, RG 8/213 (017-0502-00); 18-inch patch cord (012-0031-00); two instruction manuals (070-0543-00).

TYPE 1S2 SAMPLING UNIT $1300

OPTIONAL ACCESSORIES

Type 113 Delay Cable $250
Type P6034 10X Probe Package, order 010-0110-00 ... $ 35
Type P6035 100X Probe Package, order 010-0111-00 .. $ 35
This listing covers only a few of the more commonly useful items for sampling instruments. A more complete listing can be found in the accessory section of this catalog.

U.S. Sales Price FOB Beaverton, Oregon
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HOW THE MEASUREMENT IS MADE

Two methods may be used to determine the time or distance between the incident pulse and a discontinuity in the line. First, the dielectric selector and range selector are set for the particular line to be tested (in this case air and 10 m respectively). With the calibrated 10-turn position control set at zero, the incident pulse (the Type 1S2 has 2 internal pulse sources) is automatically aligned with the graticule reference line 1 major division from the left edge of the display. This is still true if another range is selected. A discontinuity is observed approximately 3.5 div to the right of the incident pulse (Fig 1). Since this discontinuity is quite short, X2 magnification is used for more detailed examination (Fig 2).

The first method utilizes the horizontal units/div calculator on the front panel. The 50 cm/div indication takes into consideration the 10-m full scale range (1 m/div) and X2 magnification. The CRT now indicates the discontinuity approximately 7 div to the right of the incident pulse. At 50 cm/div, the discontinuity is located about 350 cm down the line.

The second method allows measurement accuracy to within ±1%, utilizing the calibrated 10-turn control. As this control is turned from its zero setting, the entire display (incident pulse and discontinuity) moves to the left (Fig 3). When the discontinuity is aligned with the graticule reference line, the position control directly reads position as a percentage of position range (amount of delay). The position control in our example now reads 3.6, indicating the discontinuity at 360 cm.

There are also two methods of determining the reflection coefficient or voltage amplitude of the discontinuity. The measurement can be made directly from the CRT (divisions of deflection times vertical units/div control setting). A more accurate method utilizes the ±2-V offset and offset output. With a null volt-meter connected to the front-panel offset output, the baseline just preceding the reflection is aligned with a graticule line; the meter reading is then noted (Fig 4). The reflection is then repositioned (using the offset control) to align the peak of the reflection with the same graticule line (Fig 5). The difference between the present meter reading and the preceding one is the actual amplitude of the reflection. The meter reading in volts is equivalent to the numerical value of ρ when the ρ — volts switch on the Type 1S2 is in the ρ position; the meter reading is in volts with the switch in the volts position.

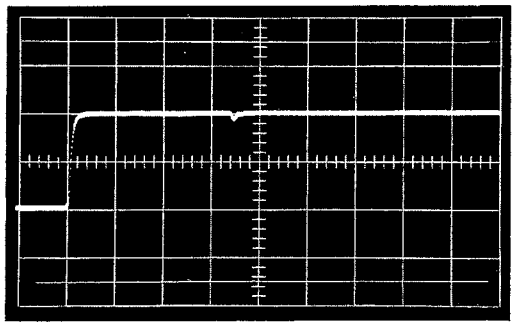


Fig 1 Vertical: ρ = 0.5/div Horizontal: 100 cm/div

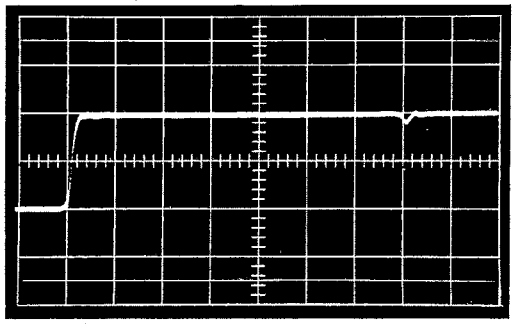


Fig 2 Vertical: ρ = 0.5/div Horizontal: 50 cm/div

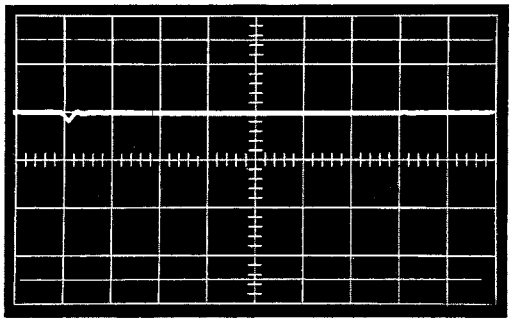


Fig 3 Vertical: ρ = 0.5/div Horizontal: 50 cm/div

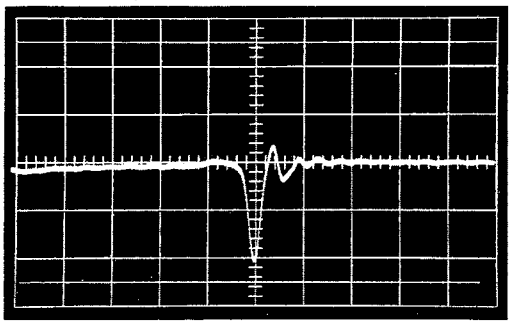


Fig 4 Vertical: ρ = 0.05/div Horizontal: 20 cm/div

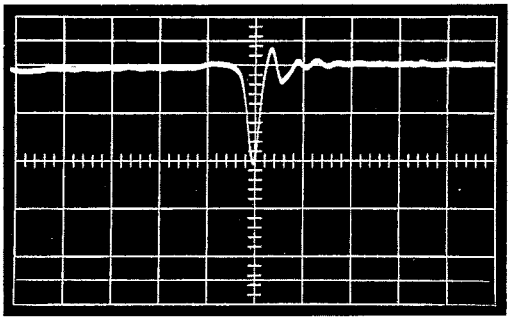
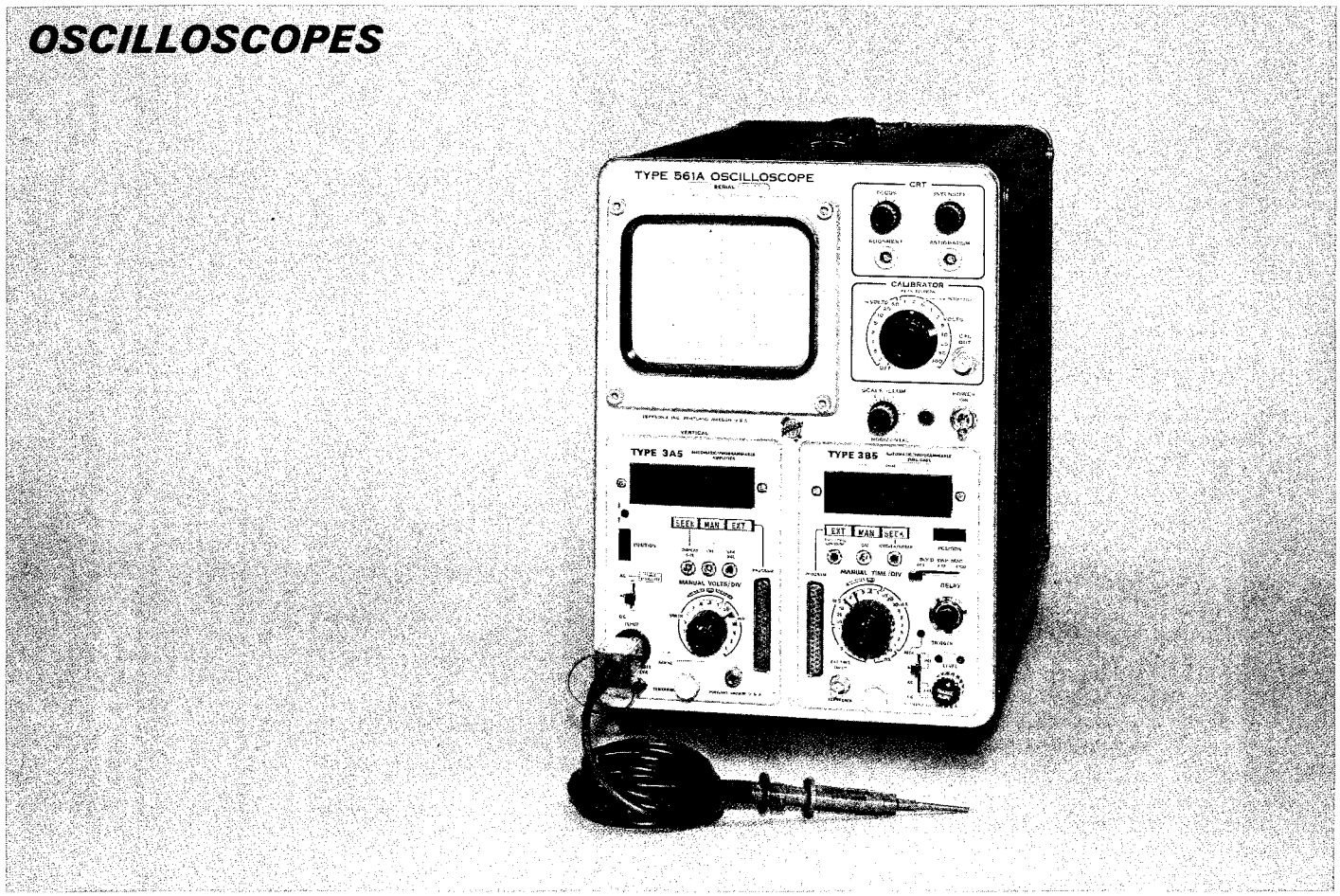


Fig 5 Vertical: ρ = 0.05/div Horizontal: 20 cm/div

OSCILLOSCOPES



- ***R & D TO PRODUCTION APPLICATIONS***
- ***SPECTRUM ANALYSIS OR AUTOMATIC DC-15 MHz SYSTEMS BY PLUG-IN VERSATILITY***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***X-Y DISPLAYS***

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 15-MHz 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. New plug-in units have extended the capability of these instruments to spectrum analysis, operational amplifiers, and automatic seeking amplifier-time base combinations.

Both the Type 561A and the Type RM561A use a cathode-ray tube that features an internal graticule with controllable illumination. Thus, you can take photographs with the same ease, but without the parallax of the external graticule.

Occupying only 7 inches of rack height, the Type RM561A bolts directly to the rack but may be ordered with optional slide-out tracks at additional cost.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of 2-Series and 3-Series Amplifier Plug-In Units.

HORIZONTAL

Horizontal deflection characteristics are extremely flexible through use of 2-Series and 3-Series Amplifier and Time-Base 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 Hz (561A), 50 to 60 Hz (RM561A), 240 watts maximum.

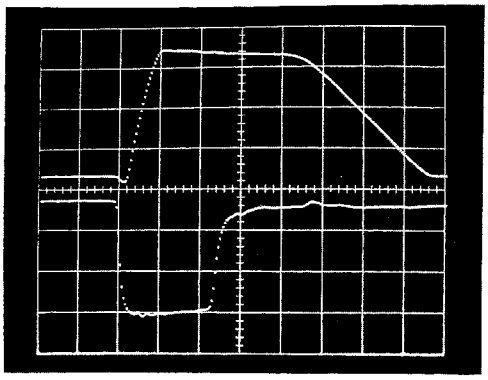
PARALLAX-FREE MEASUREMENTS—CONVENIENT PHOTOGRAPHY

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 parts of the display.

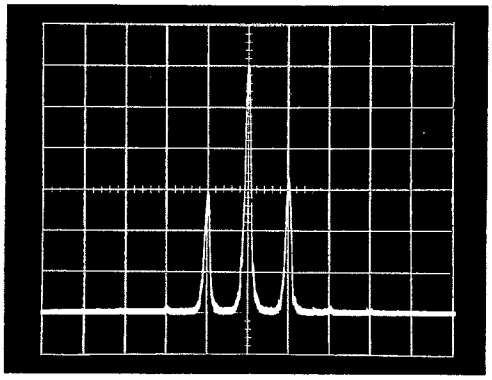
When the trace and graticule are on the same plane, as on the cathode-ray tube of the Type 561A and RM561A Oscilloscope, parallax is eliminated.

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.

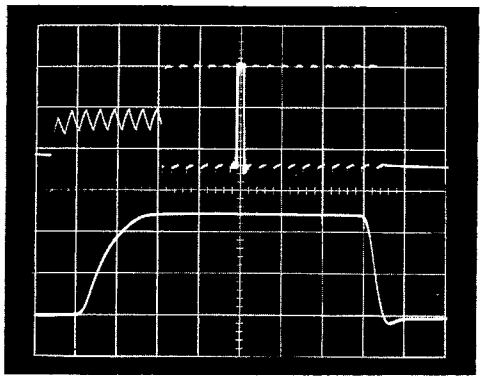
Adding to the convenience of operation the Type RM561A has numbered settings of the illumination control that serve as an approximate exposure guide.



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



SPECTRUM ANALYZER
Waveform showing center frequency and two sidebands.



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

PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (−3 dB)	T_R	PRICE
MULTIPLE TRACE				
3A1 Dual-Trace	10 mV/div	DC to 10 MHz	35 ns	$ 490
3A3 Dual-Trace	100 μV/div	DC to 500 kHz	0.7 μs	790
3A6 Dual-Trace	10 mV/div	DC to 10 MHz (has delay line)	35 ns	525
3A72 Dual-Trace	10 mV/div	DC to 650 kHz	0.54 μs	275
3A74 Four-Trace	20 mV/div	DC to 2 MHz	0.18 μs	590
SINGLE TRACE				
2A60	50 mV/div	DC to 1 MHz	0.35 μs	105
3A5 Automatic/Prog.	1 mV/div	DC to 15 MHz (has delay line)	23 ns	760
3A75	50 mV/div	DC to 4 MHz	90 ns	175
SPECIAL PURPOSE				
3A8 Operational	0.2 V/div	DC to 3.5 MHz	100 ns	600
3C66 Carrier Amp.	10 μstrain /div	DC to 5 kHz	70 μs	400
DIFFERENTIAL				
2A61 High-Gain	10 μV/div	0.06 Hz to 300 kHz	1.2 μs	385
2A63	1 mV/div	DC to 300 kHz	1.2 μs	150
3A3	100 μV/div	DC to 500 kHz	0.7 μs	790
3A7 Comparator	1 mV/div	DC to 10 MHz	35 ns	635

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (−3 dB)	T_R	PRICE
SPECTRUM ANALYZERS				
3L5	10 μV/div	10 Hz to 1 MHz		1050
3L10	−100 dBm	1 MHz to 36 MHz		1200
WIDE-BAND SAMPLING				
3S3 Dual-Trace	5 mV/div	DC to 1 GHz	0.35 ns	1500
3S76 Dual-Trace	2 mV/div	DC to 875 MHz (has delay line)	0.4 ns	1100

TIME-BASE UNITS

TYPE	FASTEST TIME-BASE RATE	MAGNIFIER	FEATURES	PRICE
2B67	1 μs/div	X5	single sweep	$ 210
3B1	0.5 μs/div	X5	sweep delay	535
3B3	0.5 μs/div	X5	calib. sweep delay; single sweep	585
3B4	0.2 μs/div	X1 to X50	single sweep	400
3B5 Automatic/ Programmable	0.1 μs/div	X10 X100	calib. delay mag; auto-seek programmable	890
3T2	20 ps/div	X10	random sampling	950
3T4 Programmable Sampling	1 ns/div	X10	single sweep; manual scan; calib. sweep delay	1300
3T77A Sampling	0.2 ns/div	X10	single sweep; manual scan sweep delay	650

CONVENTIONAL DISPLAYS

A wide range of non-sampling bandwidths and deflection factors are available in the selection of 2-Series and 3-Series Amplifier Plug-In Units. These include both single-trace and multi-trace units. The Types 2A61, 2A63, 3A3, and 3A7 are differential amplifier units while the Type 3C66 is useful for strain-gage and similar transducer operations.

Normal sweep, single sweep, magnified or delayed sweep is available with the group of 2-Series and 3-Series time-base plug-in units.

AUTOMATIC SEEKING

The Types 3A5 Amplifier (DC to 15 MHz) and 3B5 Time-Base are automatic-seeking plug-in units. These units, when commanded, have the ability to sense voltage levels and time changes and adjust their deflection factors to present calibrated on-screen displays. The control settings are read out on the front panels in large, lighted digits.

SAMPLING DISPLAYS

The Type 3T77A, 3T2 and 3T4 Sampling Sweep Units with either a Type 3S3 or Type 3S76 Amplifier Unit 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.

SPECTRUM ANALYSIS

The Type 3L10 Spectrum Analyzer Plug-In Unit covers the 1-36 MHz range. This plug-in unit with a sensitivity of —100 dBm and calibrated dispersion allows the display of RF signals with a resolution of 10 Hz to 1 kHz.

The Type 3L5 Spectrum Analyzer Plug-In Unit provides both spectral and time-based displays from 10 Hz to 1 MHz. Calibrated dispersion is 10 Hz/div to 100 kHz/div. Sensitivity is 10 μV/div RMS for spectral displays, 1 mV/div peak to peak for time-based displays

X-Y DISPLAYS

The Types 2A60, 2A61, 2A63, 3A3, 3A72, 3A74, and 3A75 Amplifier Plug-In 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. Plug-In units other than these listed above are not recommended for X-Y displays.

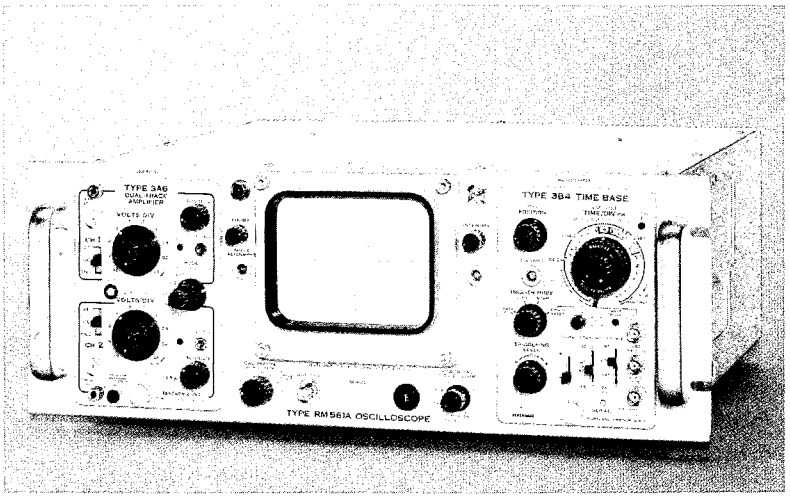
For medium and high-frequency X-Y operation, use of two units of the same type is recommended. Deflection-circuit capacitances of the Type 561A and RM561A are carefully standardized to minimize high frequency phase-shift between two plug-ins of the same type when operated X-Y.

MULTIPLE X-Y DISPLAYS

Using two Type 3A72 or two Type 3A74 Plug-In Units, both synchronization and automatic pairing are provided. With two 3A72's operated X-Y in the dual-trace mode, Channel 1 of the left-hand plug-in is always plotted against Channel 1 of the right-hand plug-in. With two Type 3A74's, two, three, or four independent displays may be obtained, properly paired: Channel 4 versus Channel 4, Channel 3 versus Channel 3, etc. . . .

Using two Type 3A1 or two Type 3A6 Plug-In Units, dual-trace switching is not synchronized. Dual X-Y displays within the center 8 cm x 8 cm area of the graticule may be obtained, but one plug-in or the other must usually be limited to single-trace operation unless four displays are wanted.

Using two Type 3A3 Plug-In Units, dual-trace switching is synchronized, so one Y Channel remains plotted against the same X Channel once the display is set up. There is no provision for consistent pairing each time the system is operated.



As with single X-Y displays, two plug-ins of the same type should always be used where X-Y phase relationships are to be preserved.

RASTER GENERATION

A raster display can be presented by using two time-base plug-in units, one in each compartment. Signal modulation can be achieved through the Z-axis of the CRT.

TYPE 561A CHARACTERISTICS

PLUG-IN COMPARTMENTS

Accepts all 2-Series and 3-Series Amplifier and Time-Base Units.

TEKTRONIX CRT

Flat-faced rectangular 5 in tube with internal "no parallax" graticule, controllable edge-lighting, 3.5-kV monoaccelerator, beam-deflection unblanking. A P31 Phosphor is normally supplied.

DISPLAY CONTROLS

Front-panel controls include Focus, Intensity, and Scale Illumination (of the 8-cm by 10-cm display area), in addition to screwdriver adjustments for Astigmatism and Trace Alignment.

ILLUMINATED INTERNAL GRATICULE

Edge lighted graticule 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

Accessible through a terminal at the rear of the instrument permits external modulation of the CRT cathode.

CALIBRATOR

18 calibrated squarewave voltages available, from 0.2 mV to 100 V, peak to peak—approximately 5-μs risetime, at line frequency. For 50 Ω systems the 0.5 V position provides 0.1 V into 50 ohms for convenient amplitude calibration of sampling units.

ELECTRONICALLY-REGULATED SUPPLIES

All voltages required for proper operation of the indicator and the plug-in units are regulated. DC-supply provides 85 watts for powering the 2-Series and 3-Series Plug-In Units. Supplies operate normally with or without plug-ins.

POWER REQUIREMENTS

240 watts maximum, 50 to 400 Hz. Instrument factory wired for 105 V to 125 V (117 V nominal) operation. Transformer taps permit operation at 210 V to 250 V (234 V nominal). Instrument can be ordered factory wired for 210 V to 250 V operation.

DIMENSIONS AND WEIGHTS

Height	14½ in	36.8 cm
Width	10 in	25.4 cm
Depth	21⅛ in	53.7 cm
Net weight	32 lb	14.6 kg
Domestic shipping weight	~40 lb	~18.2 kg
Export-packed weight	~50 lb	~22.7 kg

STANDARD ACCESSORIES

3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); CRT protector plate (387-0935-00); smoke gray filter (installed) (378-0560-00); 18-inch red patch cord, BNC-to-BNC (012-0087-00); 18-inch red patch cord, BNC-to-banana plug (012-0091-00); red post jack, BNC (012-0092-00); two instruction manuals (070-0342-00).

TYPE 561A, without plug-in units $500

TYPE RM561A RACKMOUNT

Electrically identical to the Type 561A except the calibrator range is 1 mV to 100 V and the line-frequency range is 50 to 60 Hz. Instrument mounts to a standard 19-inch rack. (Additional mounting information on Catalog Instrument Dimensions page).

DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	18⅜ in	46.7 cm
Net weight	32¼ lb	14.7 kg
Domestic shipping weight	~55 lb	~25.0 kg
Export-packed weight	~74 lb	~33.6 kg

STANDARD ACCESSORIES

Same as Type 561A, but includes mounting hardware and two instruction manuals (070-0352-01).

TYPE RM561A, without plug-in units $550

TYPE RM561A WITH SLIDE-OUT TRACKS

Type RM561A MOD 171A mounts to a standard 19-inch rack on slide-out tracks. It can be pulled out, tilted, and locked in any one of seven positions for convenient servicing. Instrument has same standard accessories as the Type RM561A, but also includes one pair of mounting tracks (351-0084-00).

TYPE RM561A MOD 171A, without plug-in units ... $600

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The probes recommended for use with these instruments are covered on the 2- and 3-series plug-in unit pages. Additional probes are available that may be better suited for a particular application, including current and high-voltage measurements. See the accessory pages at the rear of the catalog for information on these and other items.

CAMERAS

Standard C-12 with dichroic mirror for straight-on viewing and use of optional projected graticule; f/1.9—1:0.85 lens, Polaroid Land* Pack Film back, order C-12 ..... $450
Type 561A or RM561A to C-12 Camera adapter, order 016-0217-00 ..... $ 15
Standard C-27 has rotating and removable viewing hood allowing mounting on adjacent Type RM561A's, f/1.9—1:0.85 lens. Polaroid Land* Pack Film back, order C-27 .... $420
Type 561A or RM561A to C-27 Camera adapter, order 016-0224-00 ..... $ 15

SCOPE-MOBILE® CART

Model 201-2 for Type 561A: two plug-in carrier, 9-position tilt-lock oscilloscope tray, order 201-2 ..... $130

SLIDE-OUT TRACKS

Converts standard Type RM561A to MOD 171A; provides easy withdrawal and tilt of instrument, order 351-0050-00 ..... $ 45

CRADLE ASSEMBLY

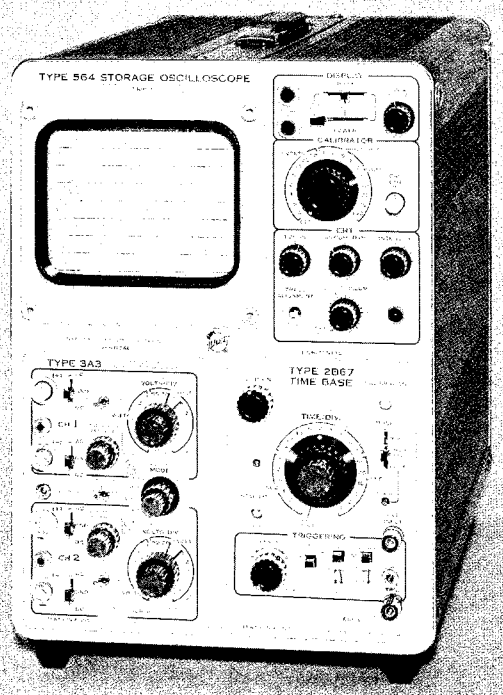
Provides rear slide support when RM561A MOD 171A is mounted in a backless rack, order 040-0344-00 ..... $ 12

*Registered Trade-Mark Polaroid Corporation

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

TYPE 564 / RM564

STORAGE OSCILLOSCOPES



- ***BISTABLE SPLIT-SCREEN STORAGE AND CONVENTIONAL DISPLAYS***
- ***UP TO 500 cm/ms WRITING SPEED***
- ***ACCEPTS A WIDE VARIETY OF VERTICAL AND TIME-BASE PLUG-IN UNITS***
- ***X-Y DISPLAYS***

The Types 564 and RM564 are general-purpose oscilloscopes offering plug-in versatility plus split-screen storage. These instruments accept a wide variety of 2-and 3-series plug-ins covering a multitude of applications including sampling and spectrum analysis. Used with the Types 3A5 and 3B5 Automatic/Programmable Plug-In Units, the Type 564 or Type RM564 speeds up production and laboratory measurements, and adds a new level of operator's convenience.

With the split-screen storage feature, either half of the 8 x 10-cm display can be independently controlled, thus allowing stored or conventional displays on either the upper or lower half. A stored display can be compared simultaneously with a conventional display. Or, a test or standard signal can be stored on one half of the screen, and compared in detail with successive signals displayed on the other half.

CHARACTERISTIC SUMMARY

VERTICAL

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

HORIZONTAL

Horizontal deflection characteristics are extremely flexible through use of versatile 2-Series and 3-Series Amplifier and Time-Base Units.

STORAGE 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.

VIEWING TIME—Up to one hour.

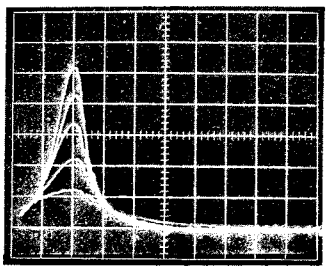
ERASE TIME—Approximately 0.25 second.

WRITING SPEED—Up to 500 cm/ms.

OTHER CHARACTERISTICS

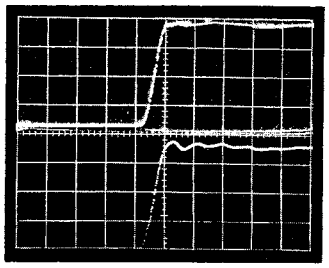
AMPLITUDE CALIBRATOR—0.2 mV to 100 V (564), 1 mV to 100 V (RM564), and 0.1 V into 50 Ω, power line-frequency.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V.



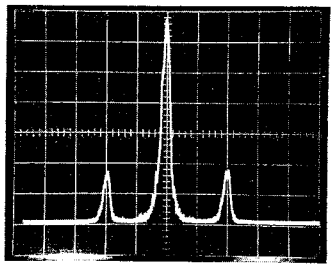
SHOCK TEST

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 ms/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.



STORED SPECTRAL DISPLAY

Stored waveform showing center frequency with two sidebands. Using single-sweep and storage allows measurement of frequency drift with spectrum analyzer unit.

PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
3A1 Dual-Trace	10 mV/div	DC to 10 MHz	35 ns	$ 490
3A3 Dual-Trace	100 μV/div	DC to 500 kHz	0.7 μs	790
3A6 Dual-Trace	10 mV/div	DC to 10 MHz (has delay line)	35 ns	525
3A72 Dual-Trace	10 mV/div	DC to 650 kHz	0.54 μs	275
3A74 Four-Trace	20 mV/div	DC to 2 MHz	0.18 μs	590
SINGLE TRACE				
2A60	50 mV/div	DC to 1 MHz	0.35 μs	105
3A5 Automatic/Prog.	1 mV/div	DC to 15 MHz (has delay line)	23 ns	760
3A75	50 mV/div	DC to 4 MHz	90 ns	175
SPECIAL PURPOSE				
3A8 Operational	0.2 V/div	DC to 3.5 MHz	100 ns	600
3C66 Carrier Amp.	10 μstrain /div	DC to 5 kHz	70 μs	400
DIFFERENTIAL				
2A61 High-Gain	10 μV/div	0.06 Hz to 300 kHz	1.2 μs	385
2A63	1 mV/div	DC to 300 kHz	1.2 μs	150
3A3	100 μV/div	DC to 500 kHz	0.7 μs	790
3A7 Comparator	1 mV/div	DC to 10 MHz	35 ns	635

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
SPECTRUM ANALYZERS				
3L5	T0 μV/div	10 Hz to 1 MHz		1050
3L10	—100 dBm	1 MHz to 36 MHz		1200
WIDE-BAND SAMPLING				
3S3 Dual-Trace	5 mV/div	DC to 1 GHz	0.35 ns	1500
3S76 Dual-Trace	2 mV/div	DC to 875 MHz (has delay line)	0.4 ns	1100

TIME-BASE UNITS

TYPE	FASTEST TIME-BASE RATE	MAGNIFIER	FEATURES	PRICE
2B67	1 μs/div	X5	single sweep	$ 210
3B1	0.5 μs/div	X5	sweep delay	535
3B3	0.5 μs/div	X5	calib. sweep delay; single sweep	585
3B4	0.2 μs/div	X1 to X50	single sweep	400
3B5 Automatic/ Programmable	0.1 μs/div	X10 X100	calib. delay mag; auto-seek programmable	890
3T2	20 ps/div	X10	random sampling	950
3T4 Programmable Sampling	1 ns/div	X10	single sweep; manual scan; calib sweep delay	1300
3T77A Sampling	0.2 ns/div	X10	single sweep; manual scan sweep delay	650

STORAGE OPERATION

Features of the Type 564 as a storage oscilloscope include—

Long-term storage with short-time erasure.
Storage of single shot signals.
Split-screen with individual controls for each half.

SOME THINGS YOU CAN DO WITH TYPE 564 STORED DISPLAYS

1. *Observe single-shot phenomena.*
2. *Study, for long periods of time, a waveform without having to photograph it. (Stored brightness and contrast remain essentially constant for up to an hour.)*
3. *Photograph only those stored waveforms you want.*
4. *Compare changing waveforms to a stored waveform, each displayed on half of the CRT face.*
5. *Change the stored standard while viewing other waveforms on the non-stored half.*
6. *Photograph a multi-event stored display with only one exposure.*
7. *Store fast recurrent phenomena by using the integrate feature.*
8. *Store X-Y displays.*

AVAILABLE DISPLAYS

With the wide-range sensitivity and bandwidth of the Type 564, several storage and conventional operation displays are obtainable. The range of signals which may be stored is limited by stored-mode writing characteristics of the CRT.

SINGLE-TRACE AND MULTI-TRACE

These displays are obtained by selecting either sampling or non-sampling amplifier plug-in units. Selection of the Type 2A61, 2A63, or 3A3, gives differential amplifier operation, while strain gage and other transducer operations are available with the Type 3C66.

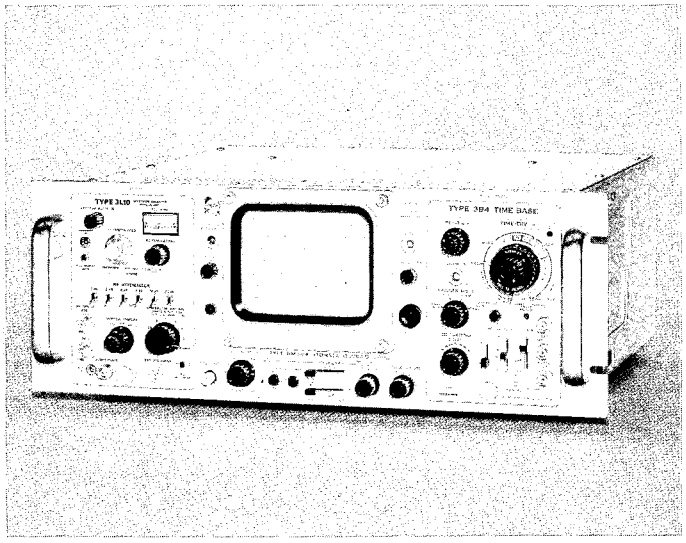
SAMPLING

Risetimes in the sub-nanosecond region are obtained by using Type 3T77A, 3T2, or 3T4 Sampling Sweep Unit with either a Type 3S3 or Type 3S76 Amplifier Unit. Either combination will provide a dual-trace display or a single display. The Type 3S3 provides a system with a high-impedance low-capacitance input while the Type 3S76 provides a 50-Ω input system.

SPECTRUM ANALYSIS

The Type 3L10 Spectrum Analyzer Plug-In Unit covers the 1 —36 MHz range. This plug-in unit, with a sensitivity of —100 dBm and calibrated dispersion, allows the display of RF signals with a resolution of 10 Hz to 1 kHz.

The Type 3L5 Spectrum Analyzer Plug-In Unit provides both spectral and time-based displays from 10 Hz to 1 MHz. Calibrated dispersion is 10 Hz/div to 100 kHz/div. Sensitivity is 10 μV/div RMS for spectral displays, 1 mV/div peak to peak for time-based displays.



SINGLE X-Y

X-Y display can be obtained by 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

Using two Type 3A72 or two Type 3A74 Plug-In Units, both synchronization and automatic pairings are provided. With two 3A72's operated X-Y in the dual trace mode, Channel 1 of the left-hand plug-in is always plotted against Channel 1 of the right-hand plug-in. With two Type 3A74's, two, three, or four independent displays may be obtained, properly paired: Channel 4 versus Channel 4, Channel 3 versus Channel 3, etc. . . .

Using two Type 3A1 or two Type 3A6 Plug-In Units, dual-trace switching is not synchronized. Dual X-Y displays within the center 8 cm x 8 cm area of the graticule may be obtained, but one plug-in or the other must usually be limited to single-trace operation unless four displays are wanted.

Using two Type 3A3 Plug-In Units, dual-trace switching is synchronized, so one Y Channel remains plotted against the same X Channel once the display is set up. There is no provision for consistent pairing each time the system is operated.

As with single X-Y displays, two plug-ins of the same type should always be used where X-Y phase relationships are to be preserved.

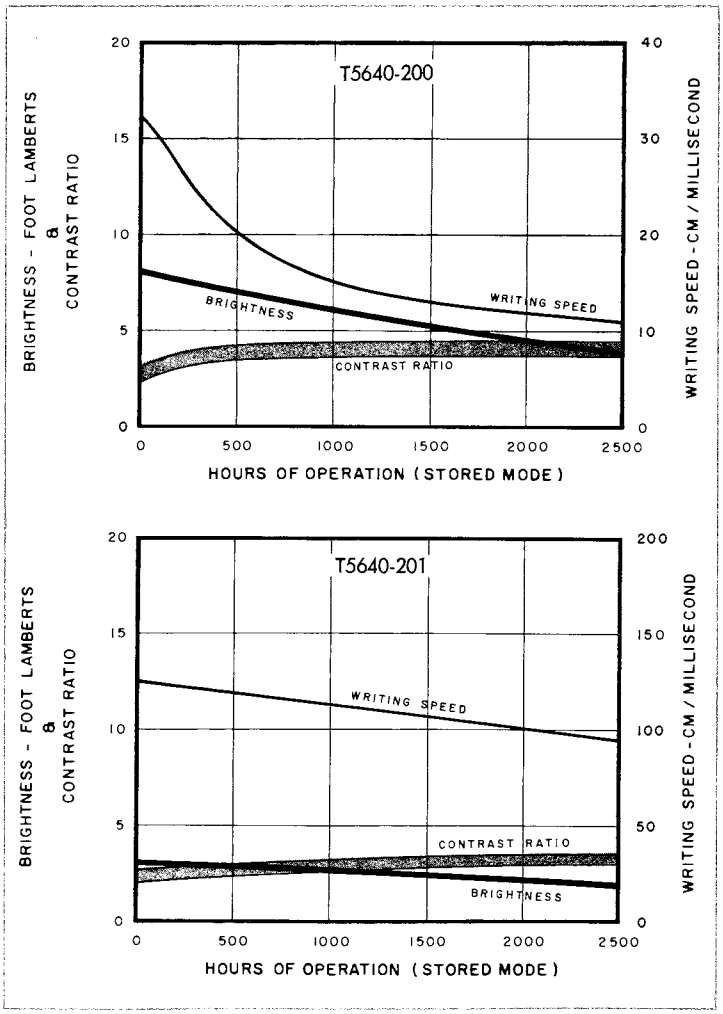
CRT PERFORMANCE

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 brighter stored display. The other tube, the Type T5640-201, has the faster writing speed.

By selecting the proper tube, you can obtain optimum oscilloscope performance for your particular application. Such selection is important because each tube has its own maximum writing speed and brightness for stored-mode operation. The brightness of a stored display for an individual tube is one value regardless of the intensity of the beam that generated it.

The hours shown are the actual hours the CRT is used in the stored mode with repetitive writing, storing, and erasing. It should be noted that non-storage operation of the CRT has little effect on the age characteristics 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



CRT

The CRT is a Tektronix Type T5640, flat-faced bistable storage tube with beam-deflection blanking and an accelerating voltage of 3.5 kV. It has an 8 x 10 cm storage target divided into two 4 x 10 cm areas, individually controllable for storage and erasure.

WARRANTED MINIMUM CHARACTERISTICS		
Characteristics Minimum Initial Brightness	T5640-200* 6 foot-lamberts	T5640-201† 2 foot-lamberts
Typical Brightness at 1000 hours (% of initial)	70%	80%
Writing Speed, Initial Minimum	25 cm/ms††‡	100 cm/ms††
Writing Speed at 1000 hours, (% of initial)	25%	90%

*Supplied with Type 564
†Supplied with Type 564 MOD 08
††Specification holds true for middle 7 x 9 cm area.

STORAGE CHARACTERISTICS

VIEWING TIME

Displays can be stored for viewing up to 1 hour. Longer times may be obtained but tend to reduce target sensitivity in the stored areas.

ERASURE TIME

Approximately 0.25 second.

STORED WRITING-SPEED ENHANCEMENT

This feature 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/ms using the T5640-200 CRT or up to 500 cm/ms using the T5640-201 CRT can be stored with minimal loss of resolution and contrast in the center 7 x 9 cm.

SINGLE SHOT SIGNALS

At slow or medium speeds, single-shot signals are easily stored for extended viewing time (within writing-speed capabilities of CRT selected).

INTEGRATE MODE

Increases the effective writing speed for repetitive fast signals with repetition rates that are too low for effective storage, but which may be too fast for satisfactory single-shot storage with enhancement.

TYPE 564 CHARACTERISTICS

PLUG-IN COMPARTMENTS

The instrument accepts 2-Series and 3-Series Amplifier and Time-Base Units.

LOCATE BUTTON

This 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

The 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

Accessible through a terminal at the rear of the instrument permits external modulation of the CRT cathode.

CALIBRATOR

There are 18 amplitude-calibrated squarewave voltages available, from 0.2 mV to 100 V, peak to peak; approximately 5-μs risetime, at line frequency. For 50-Ω systems, the 0.5-V switch position provides 0.1 V (peak to peak) into 50 ohms, for convenient calibration of sampling units.

ELECTRONICALLY REGULATED SUPPLIES

Regulated power supplies furnish all voltages required for proper operation of the Indicator and the plug-in units.

POWER REQUIREMENTS

240 watts maximum, 50 to 400 Hz. Instrument factory wired for 105 V to 125 V (117 V nominal) operation. Transformer taps permit operation at 210 V to 250 V (234 V nominal). Instrument can be ordered factory wired for 210 V to 250 V operation.

DIMENSIONS AND WEIGHTS

Height	14 11/16 in	37.3 cm
Width	9 3/4 in	24.8 cm
Depth	21 1/8 in	53.7 cm
Net weight	33 1/4 lb	15.2 kg
Domestic shipping weight	~43 lb	~19.5 kg
Export-packed weight	~54 lb	~24.6 kg

STANDARD ACCESSORIES

Polarized viewer (016-0039-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); patch cord, BNC-to-BNC, 18 inch (012-0087-00); patch cord, BNC-to-banana plug, 18 inch (012-0091-00); post jack, BNC (012-0092-00); two instruction manuals (070-0351-00).

TYPE 564, without plug-in units $875
(with CRT for stored display of highest intensity).

TYPE 564 MOD 08, without plug-in units 875
(with CRT for fastest stored writing speed).

TYPE RM564 RACKMOUNT

Similar to the Type 564 except the calibrator range is 1 mV to 100 V and the line-frequency range is 50 to 60 Hz. In addition, the RM564 has a connector on the rear panel for remote erase of the stored waveform on either or both halves of the split-screen storage tube. Instrument mounts to a standard 19-inch rack. (Additional mounting information on Catalog Instrument Dimensions page).

DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	18 7/16 in	46.9 cm
Net weight	33 3/4 lb	15.3 kg
Domestic shipping weight	~57 lb	~26.0 kg
Export-packed weight	~79 lb	~35.9 kg

STANDARD ACCESSORIES

Same as Type 564, but includes mounting hardware; power cord (161-0024-00); and two instruction manuals (070-0415-00).

TYPE RM564, without plug-in units $960
(with CRT for stored display of highest intensity).

TYPE RM564 MOD 08, without plug-in units 960
(With CRT for fastest stored writing speed).

TYPE RM564 WITH SLIDE-OUT TRACKS

Type RM564 MOD 171A or Type RM564 MOD 08, MOD 171A mounts to a standard 19-inch rack on slide-out tracks. It can be pulled out, tilted, and locked in any one of seven positions for convenient servicing. Instrument has same standard accessories as the Type RM564, but also includes one pair of mounting tracks (351-0084-00).

TYPE RM564 MOD 171A, without plug-in units ... $1010
(with CRT for stored display of highest intensity).

TYPE RM564 MOD 08, MOD 171A, without plug-in units
(with CRT for fastest stored writing speed) $1010

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The probes recommended for use with these instruments are covered on the 2- and 3-series plug-in unit pages. Additional probes are available that may be better suited for a particular application, including current and high-voltage measurements. See the accessory pages at the rear of the catalog for information on these and other items.

CAMERAS

Standard C-12 with dichroic mirror for straight-on viewing and use of optional projected graticule; f/1.9—1:0.85 lens, Polaroid Land* Pack Film back, order C-12 ..... $450

Type 564 or RM564 to C-12 Camera adapter, order 016-0217-00 ..... $ 15

Standard C-27 has rotating and removable viewing hood allowing mounting on adjacent Type RM564's f/1.9—1:0.85 lens, Polaroid Land* Pack Film back, order C-27 ..... $420

Type 564 or RM564 to C-27 Camera adapter, order 016-0224-00 ..... $ 15

SCOPE-MOBILE® CART

Model 201-2 for Type 564: two plug-in carrier, 9-position tilt-lock oscilloscope tray, order 201-2 ..... $130

SLIDE-OUT TRACKS

Converts standard Type RM564 or RM564 MOD 08 to MOD 171A; provides easy withdrawal and tilt of instrument, order 351-0050-00 ..... $ 45

CRADLE ASSEMBLY

Provides rear slide support when RM564 MOD 171A or RM564 MOD 08, MOD 171A is mounted in a backless rack, order 040-0344-00 ..... $ 12

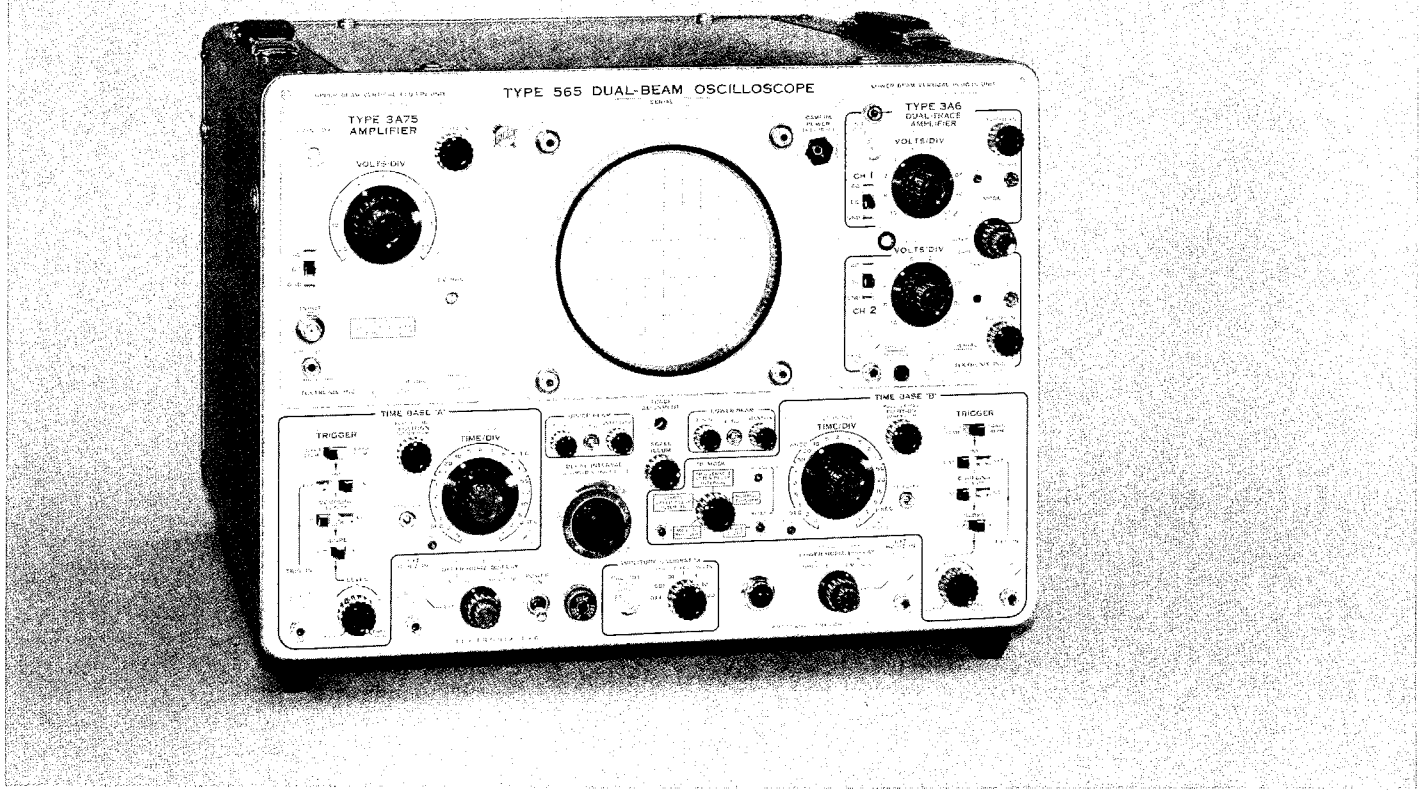
REMOTE-ERASE CONNECTOR

Mates with 9-pin connector on the rear panel of RM564, supplied without cable, order 134-0049-00 ..... $ 4

*Registered Trade-Mark Polaroid Corporation

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

DC-to-15 MHz DUAL-BEAM OSCILLOSCOPES



- ***TWO VERTICAL AND HORIZONTAL SYSTEMS***
- ***8 x 10-CM DISPLAY PER BEAM***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***CALIBRATED SWEEP DELAY***
- ***REAR-PANEL OUTPUT CONNECTORS***
- ***ACCEPTS WIDE VARIETY OF VERTICAL PLUG-INS***

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 2-Series or 3-Series Plug-In Units, except Spectrum Analyzer and Sampling Units. The horizontal amplifiers are built-in and can be driven by either of two sweep systems, simultaneously or independently, or from their external inputs. Front-panel controls permit using "A" sweep as a delaying sweep and "B" as the delayed sweep. In this mode of operation the upper beam is intensified for the duration of the "B" sweep. "B" sweep may also be used for single-sweep operation.

There are rear-panel outputs of: Vertical Signals, Horizontal Signals, + Gate, Delayed Trigger, and Auxiliary Power.

CHARACTERISTIC SUMMARY

VERTICAL

2 identical vertical-deflection systems

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

HORIZONTAL

2 independent horizontal-deflection systems

CALIBRATED TIME BASE—1 μs/div to 5 s/div.

10X MAGNIFIER—Extends time base to 0.1 μs/div.

CALIBRATED SWEEP DELAY—10 μs to 50 s.

EXTERNAL INPUT—Approx 100 mV/div to 30 V/div.

CRT

DISPLAY AREA—10 x 10 cm (each beam scans 8 cm vertical, overlap of the two beams is 6 cm). Major graticule division equals 1 cm, minor division equals 2 mm. Illuminated no-parallax graticule.

ACCELERATING VOLTAGE—4 kV.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—1 mV to 100 V, 1-kHz square wave.

REAR-PANEL SIGNAL OUTPUTS—Output impedance approx 500 ohms; max load 2 mA.

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

VERTICAL DEFLECTION

2 identical systems

Characteristics of the two vertical systems depend upon the 2-Series or 3-Series Amplifier Units used. Please refer to the plug-in chart for more information on these vertical amplifier units. (The 565 does not use Sampling or Spectrum Analyzer Plug-In Units.)

VERTICAL PLUG-IN UNITS*				
PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (−3 dB)	T_R	PRICE
MULTIPLE TRACE				
3A1 Dual-Trace	10 mV/div	DC to 10 MHz	35 ns	$490
3A3 Dual Trace	100 μV/div	DC to 500 kHz	0.7 μs	790
3A6 Dual-Trace	10 mV/div	DC to 10 MHz (has delay line)	35 ns	525
3A72 Dual-Trace	10 mV/div	DC to 650 kHz	0.54 μs	275
3A74 Four-Trace	20 mV/div	DC to 2 MHz	0.18 μs	590
SINGLE TRACE				
2A60	50 mV/div	DC to 1 MHz	0.35 μs	105
3A5 Automatic/Prog.	1 mV/div	DC to 15 MHz (has delay line)	23 ns	760
3A75	50 mV/div	DC to 4 MHz	90 ns	175
SPECIAL PURPOSE				
3A8 Operational	0.2 V/div	DC to 3.5 MHz	100 ns	600
3C66 Carrier Amp.	10 μstrain /div	DC to 5 kHz	70 μs	400
DIFFERENTIAL				
2A61 High-Gain	10 μV/div	0.06 Hz to 300 kHz	1.2 μs	385
2A63	1 mV/div	DC to 300 kHz	1.2 μs	150
3A3	100 μV/div	DC to 500 kHz	0.7 μs	790
3A7 Comparator	1 mV/div	DC to 10 MHz	35 ns	635

*2- and 3-Series Time Base Plug-Ins can be used for raster generation.

HORIZONTAL DEFLECTION

2 identical systems

TIME BASE A AND B

1 μs/div to 5 s/div in 21 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable and to approx 12 s/div. A warning light indicates when the variable control is in the uncalibrated position. Either time-base can be operated independently, or Time Base B can be delayed by Time Base A. In delayed-sweep operation, Time Base A display is intensified for the duration of the "B" sweep.

X10 MAGNIFIER

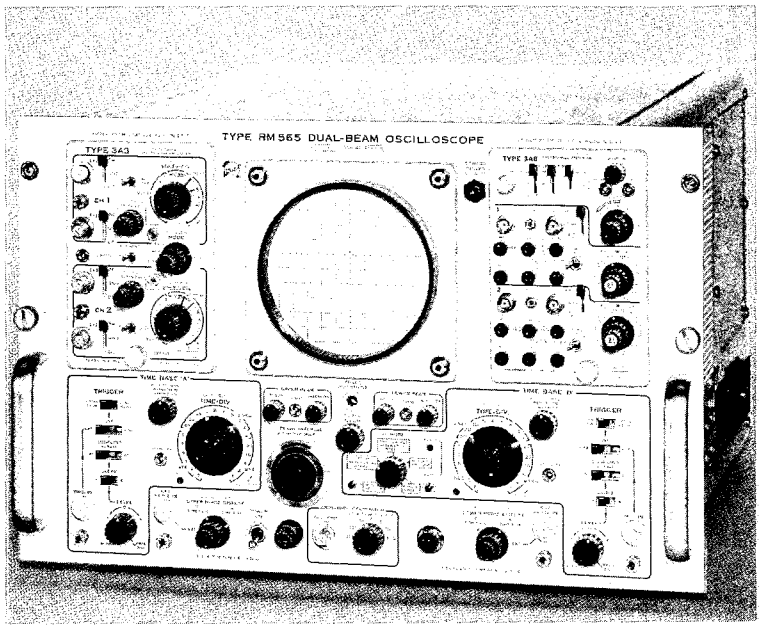
Operates over full time base, increases fastest rate to 0.1 μs/div. Magnified time base accurate within 5%.

DELAY INTERVAL

10 μs to 50 s, continuously variable and calibrated, accurate within 3% of indicated delay. Incremental delay-time accurate within 0.5%. Delay-time jitter is 1 part in 20,000 or less.

DELAY MODES

Delayed sweep starts immediately at end of delay time, or is triggerable at end of delay time (for jitter-free displays).



OPERATING MODES

Time Base A—Normal Sweep.
Time Base B—Normal, B delayed by A, and Single Sweep.

EXTERNAL INPUT

Upper and Lower Horizontal Display Switches select Time Base A, Time Base B, or Ext. In the External position, the gain is continuously variable from approx 100 mV/div to 30 V/div, DC to 350 kHz. Maximum input voltage is 300 V RMS. Input RC is approx 100 kilohms paralleled by 30-55 pF depending on gain setting.

TRIGGER

2 identical systems

MODES

Manual, Automatic, Free-run. In Automatic mode, sweep free-runs at approx 50 Hz in the absence of a triggering signal.

COUPLING

AC, AC Fast, DC.

SOURCES

Internal from Upper Beam or Lower Beam, External, or Line.

REQUIREMENTS

0.2 divisions of deflection internal or 0.5 V external up to 50 kHz, increasing to 1 div or 1 V at 2 MHz.

CRT AND DISPLAY FEATURES

TEKTRONIX DUAL-BEAM CRT

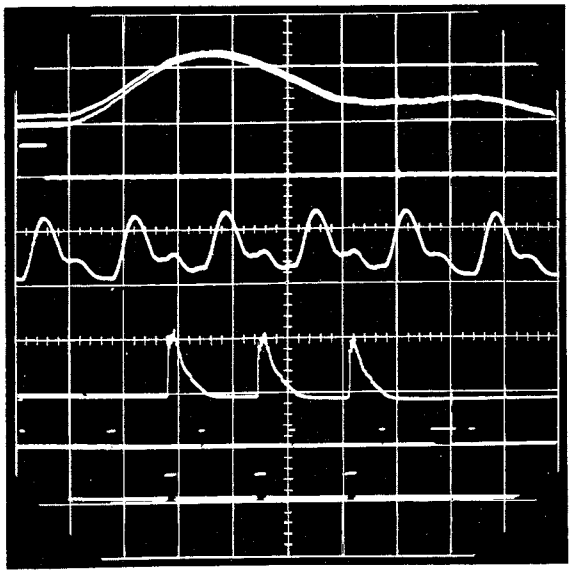
5-in round tube, 10 x 10 cm display area; 8 x 10 cm per beam with 6-cm overlap. Tube is aluminized with illuminated, internal, no-parallax graticule. Accelerating potential is 4 kV. P2 phosphor is normally supplied.

DISPLAY CONTROLS

Separate intensity, focus and astigmatism controls for each beam, intensity contrast between A sweep and non-intensified B-zone of A sweep (internal screwdriver adjustment), trace rotation.

Z-AXIS MODULATION

AC-coupled to both CRT grids via rear panel input connectors. Time constant is 3.5 ms nominally, CRT modulation requires approx 10 V at normal intensity.



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 s/div. Lower Beam sweep rate is 0.5 s/div. The configurations show:

1. *Arterial Pressure at 50 mm Hg/div*
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*

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR

1-kHz squarewave output, calibrated in 6 steps from 1 mV to 100 V. Accurate within 3%.

REAR-PANEL OUTPUTS

VERTICAL SIGNAL OUT (both upper and lower)—Signal amplitude, DC level, and transient response depend on the vertical plug-in unit used. Typical signal amplitude: 2 V/div to 4 V/div of display; DC level ±20 V. Output impedance: approx 500 ohms; maximum load current 2 mA.

HORIZONTAL OUTPUTS (both upper and lower)—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. Output impedance: approx 500 ohms; maximum load current 2 mA.

A AND B +GATES—Pulse height 20 V minimum; DC level zero volts. Output impedance: approx 500 ohms; maximum load current 2 mA.

DELAYED TRIGGER—Fast-rise pulse amplitude +8 V minimum; DC level zero volts. Output impedance: approx 50 ohms; maximum load current 2 mA.

POWER REQUIREMENTS

600 watts maximum, 50 to 60 Hz. Instrument factory wired for 105 V to 125 V (117-V nominal) operation, or 210 V to 250 V (234-V nominal) upon request. Transformer taps permit operation at nominal voltages ranging from 99 V to 132 V or 198 V to 265 V.

CABINET MODEL DIMENSIONS AND WEIGHTS

Height	13¾ in	34.9 cm
Width	16⅞ in	42.8 cm
Depth	23 9/16 in	59.8 cm
Net weight	67 lb	30.5 kg
Domestic shipping weight	~95 lb	~43.2 kg
Export-packed weight	~117 lb	~53.2 kg

RACK MODEL DIMENSIONS AND WEIGHTS

Height	12¼ in	31.1 cm
Width	19 in	48.3 cm
Rack depth	22 3/16 in	56.4 cm
Net weight	68 lb	30.9 kg
Domestic shipping weight	~104 lb	~47.3 kg
Export-packed weight	~124 lb	~56.4 kg

RACK-MOUNTING

Type RM565 mounts on tilting slide-out tracks to standard 19-inch rack. Additional mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES

3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke gray filter (installed) (378-0567-00); clear CRT protector plate (387-0918-00); two patch cords, BNC-to-BNC 18-inch (012-0087-00); post jack, BNC (012-0092-00); two instruction manuals (070-0269-00). Type RM565 also includes 1 pair mounting tracks (351-0086-00); power cord (161-0024-00); two instruction manuals (070-0353-00).

TYPE 565 without plug-in units $1400
TYPE RM565 without plug-in units 1500

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The probes recommended for use with these instruments are covered on the 2- and 3-series plug-in unit pages. Additional probes are available that may be better suited for a particular application, including current and high-voltage measurements. See the accessory pages at the rear of the catalog for information on these and other items.

CAMERAS

C-27-547: f/1.9—1:0.7 lens, Polaroid Land[1] Pack Film back provides 10 x 10-cm coverage on 3¼ x 4½ film, order C-27-547 ..... $440

C-27G: f/1.9—1:0.85 lens, no back, provides 10 x 10-cm coverage on 4 x 5 film with optional Graflok[2] back and Polaroid Land film holder, order C-27G $340

Graflok back for 4 x 5 film holder (not included), order 122-0604-00 ..... $ 45

Type 565, RM565 to C-27-547 or C-27G Camera adapter, order 016-0225-00 ..... $ 15

SCOPE-MOBILE® CART

Model 205-3: holds 4 plug-in units, has 9-position tilt-lock oscilloscope tray, order 205-3 ..... $130

CRADLE ASSEMBLY

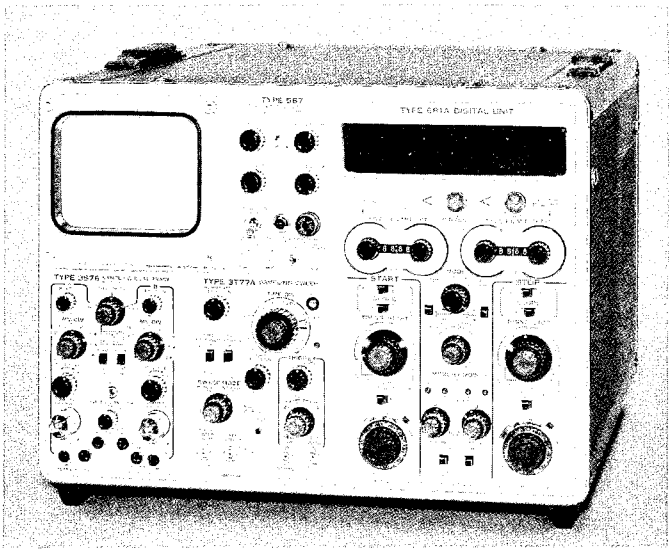
Provides rear slide support when RM565 is mounted in backless rack, order 040-0346-00 ..... $ 12

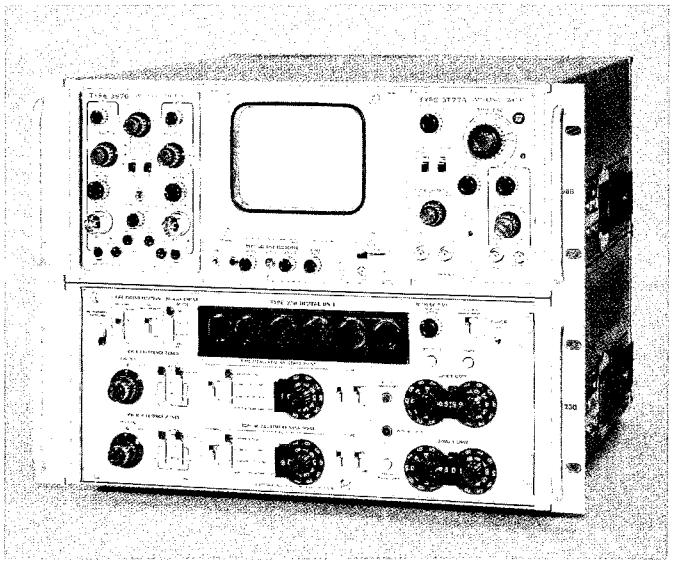
[1]Registered Trade-Mark Polaroid Corporation.

[2]Registered Trade-Mork Graflex Inc.

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

- ANALOG DISPLAYS
- OSCILLOSCOPE MEASUREMENTS IN DIGITAL FORM
- DIGITAL READOUT
  - PULSE AMPLITUDE
  - PULSE RISE AND FALL TIME
  - PULSE WIDTH
  - TIME INTERVAL
- INCREASED MEASUREMENT SPEEDS
- MEASUREMENT LIMIT SETTINGS
- DIGITAL RECORDING OUTPUTS
- GO/NO-GO OUTPUTS
- EXTERNALLY PROGRAMMABLE
- PLUG-IN VERSATILITY





DIGITAL READOUT PLUS ANALOG DISPLAYS

The NEW Type 568/230 and Type 567/6R1A Digital Readout Oscilloscope systems provide digital readout of measurements that are displayed in analog form on the CRT. They enable the engineer, technician, or production worker to make dynamic switching-time measurements with greater speed, repeatability, and convenience than has been possible by making measurements directly from a cathode-ray oscilloscope display.

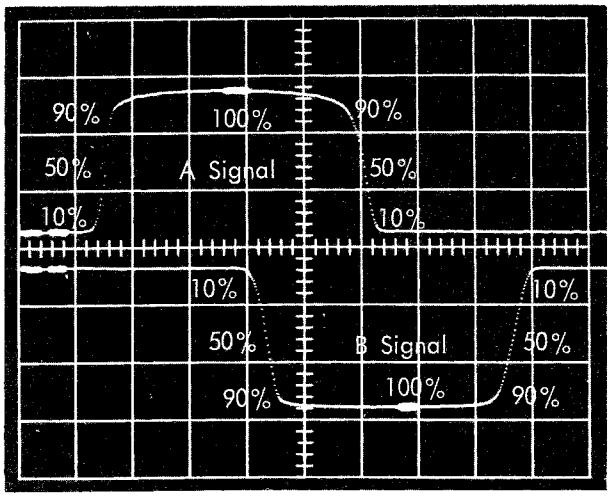
The Type 230 and Type 6R1A Digital Units have the ability to make a wide variety of repetitive-pulse measurements digitally without operator interpretation or error. These test measurements include pulse voltages, risetime, delay time, storage time, pulse width and many other specific measurements. The measurements are read out directly in four-digit resolution. The decimal point and unit of measure (ns, μs, ms, s, mV, V) are automatically presented when time/div, amplitude/div or measurement program is changed. Measurement limits may be selected to provide Go/No-Go indications.

Front panel controls can be set up manually or they can be set, or changed, by external programming when rapid automatic test measurements are desired. Output connectors are provided on the rear panel to permit recording of the displayed measurement digital information. This allows permanent collection of data on a printer, card punch or similar device.

The Type 567 Readout Oscilloscope and Type 6R1A Digital Unit can make up to 8 measurements per second with increased convenience and repeatability over conventional oscilloscopes. With Type 262 Programmers, the Type 6R1A Digital Unit can be externally programmed to provide up to 24 different measurement functions and measurement limits. Programs are selected by a front-panel switch on the Type 262 or automatically with the addition of automatic sequence cards. Output connectors provide the digital readout information in parallel form. The Type 567/6R1A Digital Readout Oscilloscope offers digital measurement capabilities and it can provide automatic measurement capabilities with the Type 262 Programmer. See pages 156 through 161 for more complete information.

The Type 568 Oscilloscope and Type 230 Digital Unit comprise a new high-speed solid-state digital oscilloscope system that provides maximum measurement flexibility. It is a step ahead in measurement capabilities with increased measurement speed, increased programming ease, BCD data outputs and solid-state reliability with extensive use of integrated circuits. The Type 568/230 can make up to 50 measurements per second and all of its measurement functions are easily programmed by grounding or opening its program lines. With proper programming techniques, the measurement speed can be increased to more than 100 measurements per second. The Type 568/230 has automatic polarity indication and increased measurement resolution. The data output is in BCD code and includes polarity, numbers, units, multiplier and limits. The Type 568/230 Digital Oscilloscope system offers maximum measurement flexibility and programming ease. See pages 162 through 166 for more complete information.

TYPICAL MEASUREMENT CAPABILITIES

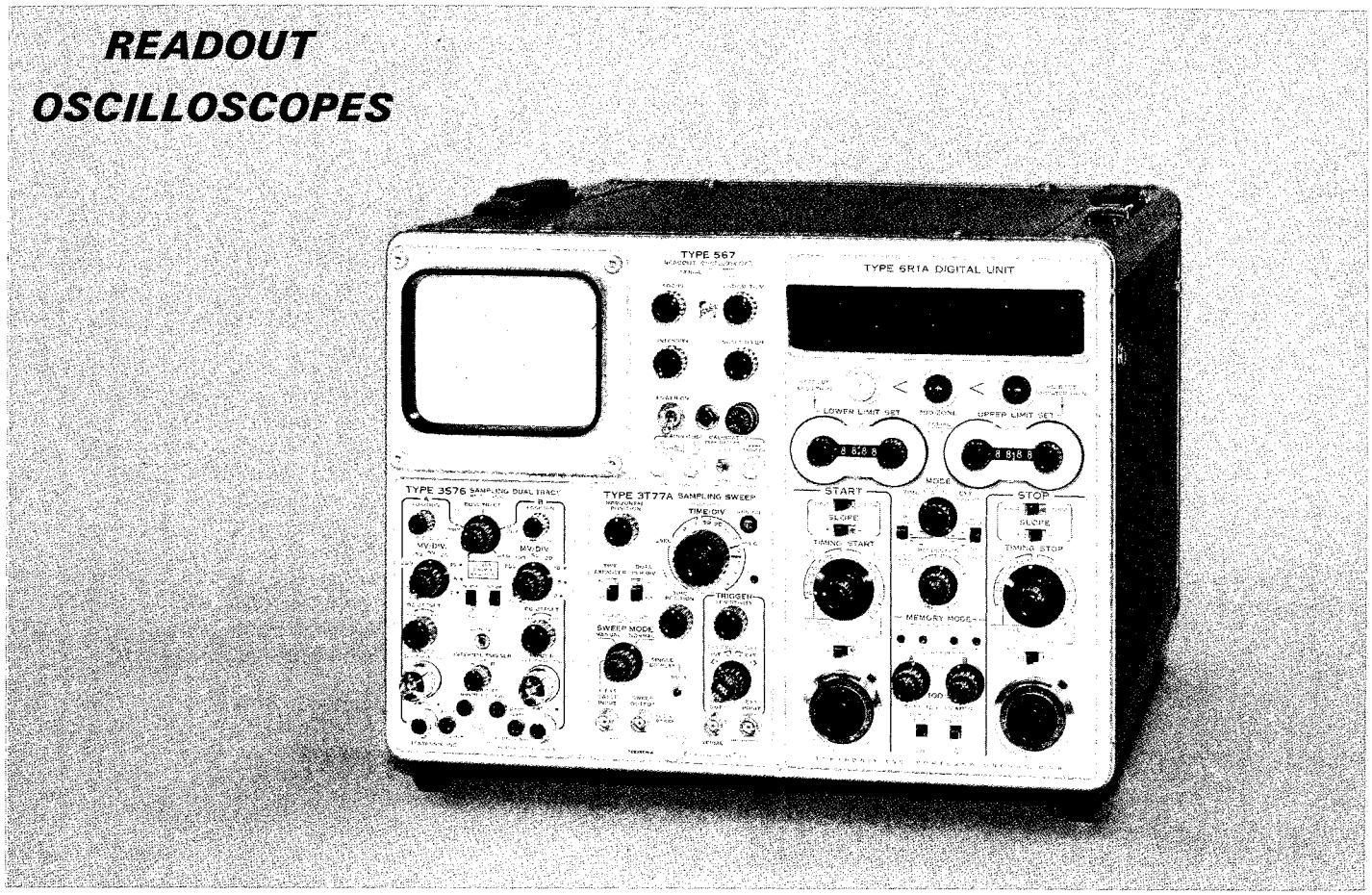


DUAL-TRACE DISPLAY SHOWING TYPICAL MEASUREMENTS

MEASUREMENT	6R1A PROGRAM	
	Start	Stop
Risetime A	+10%A	+90%A
Falltime A	−90%A	−10%A
Risetime B	−10%B	−90%B
Falltime B	+90%B	+10%B
Delay A to B	+10%A	−10%B
Storage A to B	−90%A	+90%B
Turn on A to B	+10%A	−90%B
Turn off A to B	−90%A	+10%B
Width A	+50%A	−50%A
Width B	−50%B	+50%B

1. **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 horizontal plug-ins presently available, time differences from 20 ps and up to 10 s can be displayed and read out digitally.
2. **VOLTAGE MEASUREMENTS** can be made between any 2 points on the waveform or to either the positive or negative peak signal within the positionable reference zones.
3. **PERMANENT RECORDS** of each test can be made with external equipment. The Digital Units provide digital and go/no-go outputs for use with a card punch, tape perforator, and numerical printers. The Type 6R1A provides parallel 10-line data output and the Type 230 provides parallel BCD (1 2 4 8) data output.
4. **EXTERNAL PROGRAMMING** permits rapid sequencing of measurements and test limits without changes of the front-panel controls.
5. **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.

READOUT OSCILLOSCOPES



- ***DIGITAL READOUT OF RISETIME, AMPLITUDE, AND TIME DIFFERENCES***
- ***SELECTABLE HIGH AND LOW NO-GO LIMITS***
- ***ILLUMINATED NO-PARALLAX GRATICULE***

The Type 567 and R567 Readout Oscilloscopes are designed to provide digital readout of the waveform displayed on the cathode-ray tube. Digital readout provides greater accuracy, speed, and convenience of measurement over conventional CRT displays.

Using an amplifier and a time-base unit that provides digital readout information, and the Type 6R1A Digital Readout Unit, the Type 567 system is well suited for repetitive-pulse measurements. The system can be further extended through use of the Type 262 Programmer when faster measurements are desired.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are determined by choice of 2-Series and 3-Series Amplifier Plug-In Units. See chart of Digital Readout Combinations for units which will provide both analog and digital displays.

HORIZONTAL

Horizontal deflection characteristics are determined by choice of 2-Series and 3-Series Amplifier and Time-Base Units. See chart of Digital Readout Combinations for units which will provide both analog and digital displays.

CRT

DISPLAY AREA—8 x 10 div. (Each major div = 1 cm).

ACCELERATING VOLTAGE—3.5 kV.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—5 V and 0.5 V into $\geq$1 MΩ or 500 mV and 50 mV into 50 Ω. Repetition rate is 20 kHz or 1 kHz.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V. Line frequency is 50 to 60 Hz. Power consumption is approx 405 watts.

DIGITAL READOUT COMBINATIONS

Digital and analog displays are simultaneously presented on the Type 567 Readout Oscilloscope and Type 6R1A Digital Unit. A Digital Readout Combination consists of a Type 567/6R1A and any of the following combinations of amplifier and time-base Plug-In Units. Other 2-Series and 3-Series Plug-In Units can be used for normal analog CRT display, but do not provide digital readout.

X & Y PLUG-INS	RISETIME	CALIBRATED DEFLECTION FACTOR	INPUT RC OR IMPEDANCE	CALIBRATED SWEEP RANGE	TIME POSITION	DIGITAL RESOLUTION	TRIGGER
3S3/3T2	0.35 ns	5 mV/div to 100 mV/div	100 kΩ, 2 pF	200 ps/div to 100 μs/div plus X10 magnifier	100 ns to 1 ms 5 decades	100 dots/div	External
3S3/3T4*				1 ns/div to 200 μs/div	1 μs to 1 ms 3 ranges	10 or 100 dots/div	
3S3/3T77A				0.2 ns/div to 10 μs/div plus X10 magnifier	Through full time base		
3S76/3T2	0.4 ns	2 mV/div to 200 mV/div	50 Ω	200 ps/div to 100 μs/div plus X10 magnifier	100 ns to 1 ms 5 decades	100 dots/div	Internal or External
3S76/3T4*				1 ns/div to 200 μs/div	1 ns to 1 ms 3 ranges	10 or 100 dots/div	
3S76/3T77A				0.2 ns/div to 10 μs/div plus X10 magnifier	Through full time base		
3A2/3B2	0.7 μs	10 mV/div to 10 V/div	1 MΩ, 47 pF	2 μs/div to 1 s/div	5 μs to 10.5 s	1 μs to 10 ms decade sequence	

*Type 3T4, when used with Type 283 Real Time Adapter has an additional range of CALIBRATED SWEEP from 1 ms/div to 1 s/div, but no TIME POSITION in "REAL TIME" operation. Type 3T4 can also be programmed through a front panel connector. (See Type 3T4 catalog page.)

CHARACTERISTICS

AMPLITUDE CALIBRATOR

Front-panel selection of squarewave outputs of 20 kHz, crystal-controlled, accuracy ±0.1%, or approx 1 kHz, RC time-constant controlled. Output voltages are 5 V and 0.5 V into 1 MΩ or greater, or 500 mV and 50 mV into 50 Ω. Connectors are BNC.

TEKTRONIX CATHODE-RAY TUBE

5-inch rectangular CRT with 3.5-kV accelerating potential. A P2 phosphor is normally supplied.

ILLUMINATED INTERNAL GRATICULE

Edge lighted graticule is marked in 8 vertical and 10 horizontal divisions (centimeters). Centerlines are also marked in 2-mm increments. Scale illumination is adjustable with a front-panel control.

DC-VOLTAGE SUPPLIES

Electronically regulated to compensate for widely varying line conditions. Separate regulated heater supply is included. Type 6R1A is also powered from these supplies.

POWER REQUIREMENTS

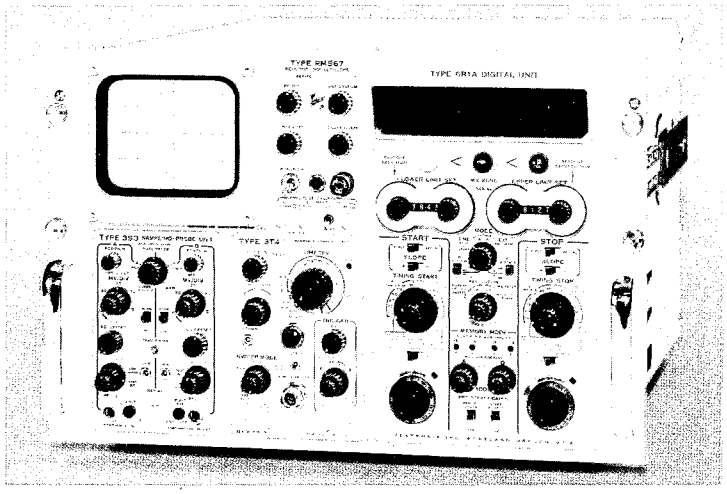
105 V to 125 V or 210 V to 250 V, 50 to 60 Hz, typically 405 watts. A thermal cutout switch prevents overheating of the instrument. Instrument is normally factory wired for 105 V to 125 V, but may be ordered wired for 210 V to 250 V.

TYPE 567 DIMENSIONS AND WEIGHTS

Height	13¾ in	34.9 cm
Width	16⅞ in	42.8 cm
Depth	23³/₁₆ in	58.8 cm
Net Weight	48¾ lb	22.2 kg
Domestic shipping weight	~76 lb	~34.6 kg
Export-packed weight	~97 lb	~44.1 kg

TYPE RM567 DIMENSIONS AND WEIGHTS

Height	12¼ in	31.1 cm
Width	19 in	48.3 cm
Rack Depth	22³/₁₆ in	56.4 cm
Net weight	50 lb	22.7 kg



Domestic shipping weight	~ 85 lb	~38.6 kg
Export-packed weight	~106 lb	~48.2 kg

STANDARD ACCESSORIES

3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); clear CRT protector plate (387-0935-00); smoke gray filter (installed) (378-0567-00); two instruction manuals (Type 567, 070-0322-01); (Type RM567, 070-0348-01). Also included with Type RM567: pair mounting slides (351-0086-00); set mounting hardware.

TYPE 567, without plug-in units $700

TYPE RM567, without plug-in units $800

OPTIONAL ACCESSORIES

SUPPORTING CRADLES

When Type RM567 is used in a backless rack, these cradles are necessary for rear slide support. Order Part Number 040-0346-00 ..... $12.00

U.S. Sales Prices FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

TYPE 6R1A

DIGITAL UNIT

- ***PRESENTS OSCILLOSCOPE MEASUREMENTS IN DIGITAL FORM***
- ***DIGITAL READOUT PARAMETERS***
  - ***PULSE AMPLITUDE***
  - ***PULSE RISE AND FALL***
  - ***PULSE WIDTH***
  - ***TIME INTERVAL***
- ***PROVISIONS FOR EXTERNAL PROGRAMMING AND SERIAL 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.*

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.

Output connectors are provided on the rear panel to permit recording of the displayed digits on a printer, card punch, tape recorder, electric typewriter, etc.

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

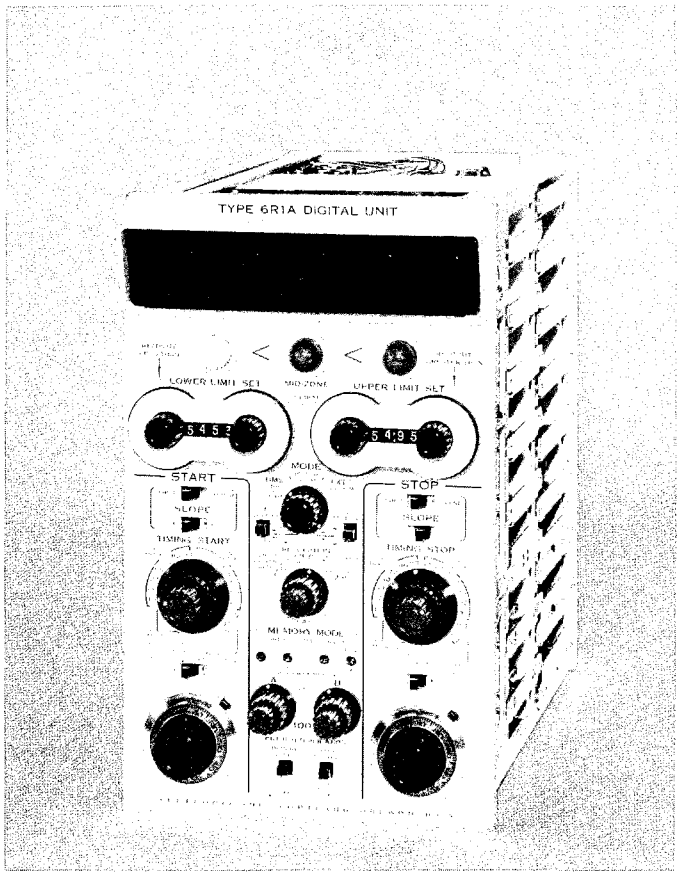
LOWER LIMIT SET presets the lower limit. Any digital reading less than the lower limit causes the LOWER LIMIT indicator to light.

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.

MODE SWITCH

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

TIME STOP (—) START sets the 6R1A to measure time durations set between the start and stop of timing circuits.



VOLTAGE A sets the Type 6R1A to measure voltage between A Channel 0% and 100% memory zones. Polarity is selected by an adjacent slide switch.

VOLTAGE B sets the Type 6R1A to measure voltage between B Channel 0% and 100% memory zones. Polarity is selected by an adjacent slide switch.

EXTERNAL PROGRAM sets the Types 6R1A to accept programming from an external source, such as the Tektronix Type 262 Programmer. The variety and flexibility of measurements possible with external programming are even greater than those possible through use of the Type 6R1A front-panel controls and measurements and limits can be changed more rapidly.

RESOLUTION SWITCH

Time measurements are performed by gating clock-pulses during the measurement interval. The clock in the case of sampling is the samples per unit equivalent time. For instance, sweep speed = 10 ns/div, samples/div = 100, then equivalent time/sample = 0.1 ns. If a measurement interval occupied 2.5 div, 250 samples would be registered in the digital readout counter. Reading would be 25.0 ns 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 unit's 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 5 or 2, 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 unit's 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 be only 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 s and 0.1 s, holds the display for the time needed to observe readings or operate peripheral equipment. (Can be modified for variable control between 1 s and 10 ms 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 μs, in order to establish a 100% reference level.

AVERAGE MODE stores the average DC level of the signal occurring during the 0% and 100% memory zones, to develop TIMING START and TIMING STOP percentage levels. Zones are adjustable in width and positionable on the sweep.

PEAK TO PEAK MODE stores the most negative and most positive levels of the signal occuring during the 0% and 100% memory zones, respectively. Zones are adjustable in width from 1 div to 10 div 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 div 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 (allows verifying start-to-stop interval).

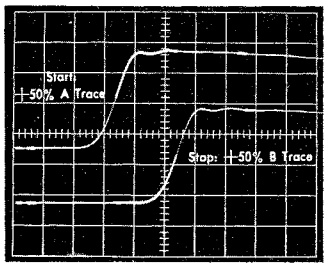
START-TIMING CONTROLS

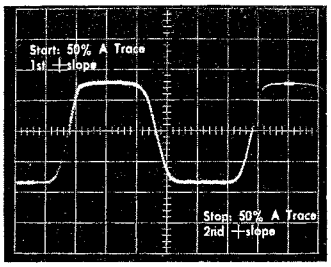
These controls program the initiation of timing.

+ 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 references to 0% and 100% zone amplitude). Automatically starts timing at the selected percentage. The 27% and 73% positions are useful for time constant measurements.





MANUAL START enables start-timing at any point on the waveform. Continuously variable over 9 div 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 s and 0.1 s. Units of measure include: microvolts, millivolts, and volts; nanoseconds, microseconds, milliseconds, and seconds.

DIGITAL READOUT ACCURACY of the 6R1A, in addition to providing measurement results in fast, convenient digital form, reduces the magnitude of measurement errors that are attributable to the visual resolution difficulties of a cathode-ray tube display. For assistance in determining system accuracy in specific applications, consult your Field Engineer.

INPUT is internally connected from horizontal and vertical plug-in units. Power requirements, AC and DC voltages for circuitry operation are supplied by Type 567 or RM567.

WEIGHTS

Net weight	14¾ lb	6.7 kg
Domestic shipping weight	~25 lb	~11.4 kg
Export-packed weight	~31 lb	~14.1 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0411-00).

TYPE 6R1A DIGITAL UNIT $2600

OPTIONAL ACCESSORIES

See information on Type 261 Coaxial Switch, Type 262 Programmer, and associated accessories. For custom arrangements, one or both of the following connectors will be necessary.

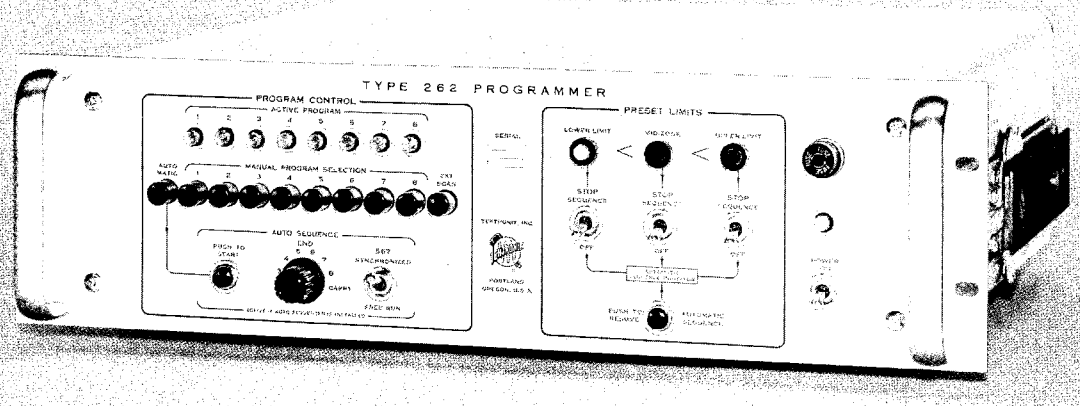
41-pin Connector, for external programming and control, order 131-0239-00 ..... $15

55-pin Connector, for external read-out (limit lamps, etc.), order 131-0240-00 ..... $18

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

TYPE 262

PROGRAMMER



- ***FOR 567/6R1A DIGITAL READOUT COMBINATION***
- ***UP TO 8 DIFFERENT MEASUREMENTS FOR EACH TYPE 262***
- ***UP TO 3 TYPE 262's OPERATE TOGETHER FOR 24 MEASUREMENTS***
- ***UP TO 8 MEASUREMENTS PER SECOND***
- ***PUSH BUTTON MEASUREMENT SELECTION OR***
- ***OPTIONAL AUTOMATIC SEQUENCE OF MEASUREMENTS****
- ***OPTIONAL SYNCHRONOUS CONTROL OF OTHER EQUIPMENT***

The Type 262 Programmer makes it possible to remotely control the measurement and readout capabilities of the 6R1A Digital Unit. Any set of up to eight different pre-selected time or voltage measurements can be made with each Type 262 used. The measurements are made from the same signal as is displayed on the Type 567 cathode-ray-tube screen, using plug-in units that furnish digital data to the 6R1A Digital Unit.

The kind of measurement selected is determined by the circuits on each of eight plug-in circuit cards that are plugged into the Type 262 during operation. Other plug-in program cards may be interchanged for a different set of measurements when different measurements are required.

* Automatic sequencers are required.

Up to three Type 262's may be used together at any one time to make up to 24 different tests or measurements without interchanging program cards.**

When a Type 6R1A is under the control of a Type 262 the circuits on the program cards take the place of circuits otherwise selected from the front panel of the 6R1A. Each wired program card represents a particular combination of some front panel control settings on the 6R1A.

PROGRAM CARDS

Plug-in program cards come ready for wiring. Cards are wired by soldering in appropriate jumpers and resistors according to instructions in the manual for the 262.

Each card is wired for a particular time or amplitude measurement. Examples are: risetime, delay time, pulse duration, pulse amplitude, time interval between two pulses. Upper and lower test limits can also be selected by wiring the cards as instructed.

If a change of measurement is desired, the plug-in program cards can be removed and other pre-wired cards easily inserted. Or the cards can be easily rewired.

AUXILIARY EQUIPMENT CONTROL

The Type 262 also accommodates 8 auxiliary equipment plug-in programming cards. The connectors from the auxiliary cards have parallel connections to 54 control lines available at the rear-panel of the Type 262 for controlling signal attenuators, signal generators, trigger source switches, signal switches, power supplies, etc., in step with the 6R1A measurement sequence.

** Cable capacitance and environmental noise limit the number of programmers that can be used in series.

MANUAL CONTROL

Front-panel push-buttons allow manual selection of measurements. The sequence is determined by the operator and any step in a program can be held for as long a period as needed. The measurement rate is determined by the Type 6R1A.

EXTERNAL CONTROL

Measurements can be selected externally through control lines available at the rear-panel connector. Selection is by contact closure to ground.

AUTOMATIC SEQUENCE CONTROL

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 control sequence of up to 8 measurements per Type 262.

Front-panel switches allow an automatic sequence to be interrupted 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.

POWER REQUIREMENTS

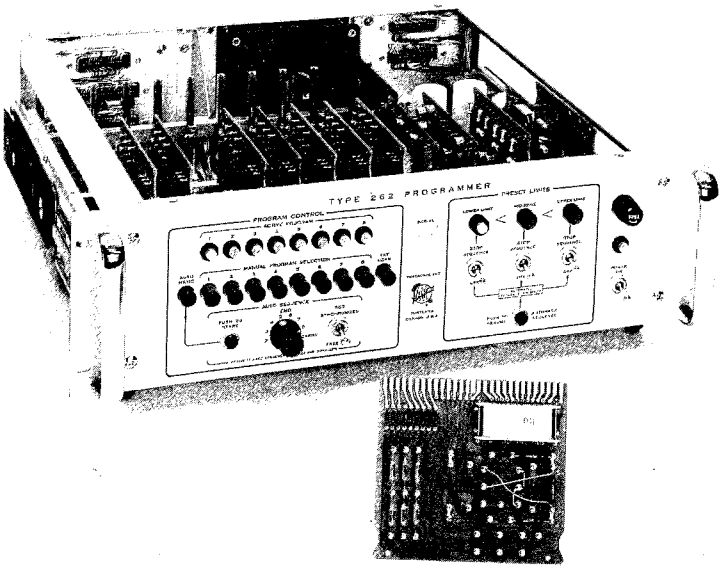
105 V to 125 V or 210 V to 250 V, 50 to 60 Hz, typically 35 watts. Instrument is normally factory wired for 105 V to 125 V, but may be ordered wired for 210 V to 250 V.

MECHANICAL FEATURES

The Type 262 mounts in a standard 19 inch rack with 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.

DIMENSIONS AND WEIGHTS

Height	5¼ in	13.3 cm
Width	19 in	48.3 cm
Depth	17⁹⁄₁₆ in	44.6 cm
Net weight	21¾ lb	9.9 kg
Domestic shipping weight	~57 lb	~26.0 kg
Export-packed weight	~80 lb	~36.4 kg



STANDARD ACCESSORIES

Cabinet feet kit (016-0052-00); pair mounting tracks (351-0085-00); set, mounting hardware; 3-conductor power cord (161-0024-00); 3 to 2-wire adapter (103-0013-00); 6R1A to 262 cable (012-0081-00)*; eight program cards (018-0007-00); resistor kit 016-0056-00); two instruction manuals (070-0399-00).

TYPE 262 PROGRAMMER $1500

*If the Type 262 is to be used with another Type 262, indicate on your order that you need a 262/262 cable (012-0082-00) rather than a 262/6R1A cable (012-0081-00).

OPTIONAL ACCESSORIES

PROGRAM CARDS

Each card can be wired for a particular time or amplitude measurement, permitting easy plug-in change of program. Eight cards are supplied with Type 262 as standard accessories.

PROGRAM CARD, order 018-0007-00 . . . . . $25

RESISTOR KIT

Contains 176, ¼ watt, 1% resistors for use in wiring program cards. One kit is supplied with Type 262 as standard accessories.

RESISTOR KIT, order 016-0056-00 . . . . . $50

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 Number 040-0331-00) . $215

SYNCHRONIZER BOARD Only
(Part Number (018-0005-00) $95

COUNTER BOARD Only (Part Number 018-0006-00) . . $120

AUXILIARY PROGRAMMING CARDS (not furnished with Type 262)

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

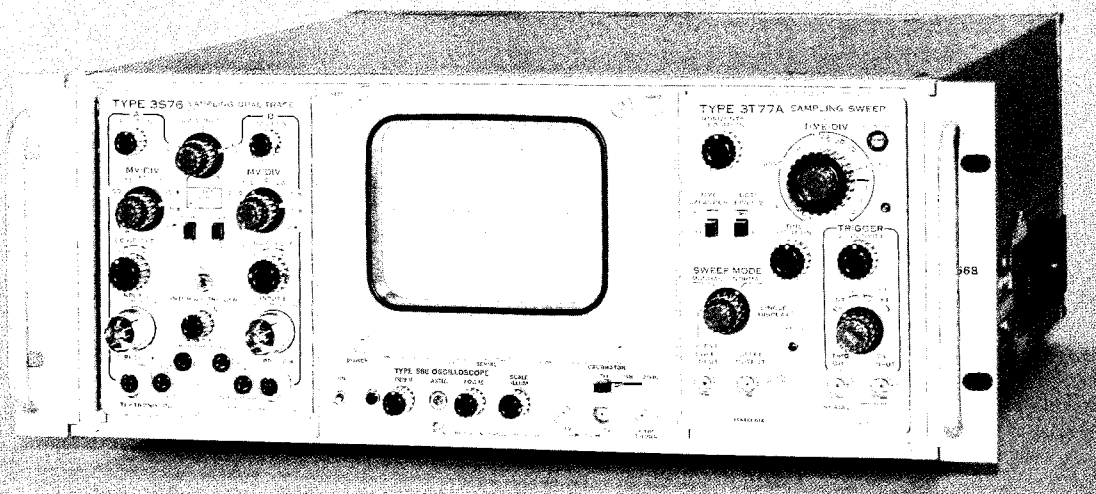
CARD with 11 reed relay assembly
(Part Number 018-0003-00) $25

CARD only (Part Number 018-0004-00) $18

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

OSCILLOSCOPES

NEW



- ***ANALOG DISPLAYS OF ANALOG/DIGITAL MEASUREMENT SYSTEM***
- ***PROVIDES MEASUREMENT INFORMATION FOR TYPE 230 DIGITAL UNIT***
- ***ACCEPTS ALL 2- AND 3-SERIES PLUG-IN UNITS***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***SOLID STATE DESIGN***

Type 568 and Type R568 Readout Oscilloscopes are designed for use with 2- and 3-series plug-in units in both the vertical and horizontal deflection systems. When used together with the Type 230 Digital Unit, digital readout of measurements (in addition to the analog display on the CRT) makes the measurements faster, more convenient, and more accurate.

Connectors on the rear provide measurement information for the Type 230 Digital Unit and couple trace-brightening information from the Type 230 to the Type 568.

The Types 568/R568 are designed mainly for use in digital measurement systems, but they are also quite useful in laboratory applications through use of amplifier, spectrum analysis, and time-base plug-in units.

Through use of solid state components, the Types 568/R568 offer reliable operation with low heat dissipation.

Both cabinet-style Type 568 and rack-mount Type R568 use the same mechanical construction. A quick conversion from one style to the other is possible by means of a few mechanical changes. Both instruments require only 7 inches of rack height and are constructed for convenient stacking with the Type 230 Digital Unit.

CHARACTERISTIC SUMMARY

VERTICAL

Vertical deflection characteristics are extremely flexible through use of 2-series and 3-series Amplifier Plug-In Units. See chart for plug-in units that provide digital readout when used with a Type 230 Digital Unit.

HORIZONTAL

Horizontal deflection characteristics are extremely flexible through use of 2-Series and 3-Series Amplifier and Time-Base Units. See chart for plug-in units that provide digital readout when used with a Type 230 Digital Unit.

CRT

DISPLAY AREA—8 x 10 div. (Each major div = 1 cm.)

ACCELERATING VOLTAGE—3.5 kV.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—5 V and 0.5 V into $\geq$100 kΩ or 500 mV and 50 mV into 50 Ω. Repetition rate is 20 kHz or 1 kHz.

POWER REQUIREMENTS—Transformer taps permit operation from 90 to 110 V, 104 to 126 V, 112 to 136 V; or 180 to 220 V, 208 to 252 V, 224 to 272 V. Line frequency is 48 to 66 Hz. Power consumption is 210 watts maximum.

DIGITAL READOUT COMBINATIONS

Digital and analog displays are simultaneously presented on the Type 568 Readout Oscilloscope and Type 230 Digital Unit. A Digital Readout Combination consists of a Type 568, Type 230, and any of the following combinations of amplifier and time-base Plug-In Units. Other 2-Series and 3-Series Plug-In Units can be used for normal analog CRT display, but do not provide digital readout.

X & Y PLUG-INS	RISETIME	CALIBRATED DEFLECTION FACTOR	INPUT RC OR IMPEDANCE	CALIBRATED SWEEP RANGE	TIME POSITION	DIGITAL RESOLUTION	TRIGGER
3S3/3T2	0.35 ns	5 mV/div to 100 mV/div	100 kΩ, 2 pF	200 ps/div to 100 μs/div plus X10 magnifier	100 ns to 1 ms 5 decades	100 dots/div	External
3S3/3T4*				1 ns/div to 200 μs/div	1 μs to 1 ms 3 ranges	10 or 100 dots/div	
3S3/3T77A				0.2 ns/div to 10 μs/div plus X10 magnifier	Through full time base 100 ns to 1 ms 5 decades		
3S76/3T2	0.4 ns	2 mV/div to 200 mV/div	50 Ω	200 ps/div to 100 μs/div plus X10 magnifier		100 dots/div	Internal or External
3S76/3T4*				1 ns/div to 200 μs/div	1 ns to 1 ms 3 ranges	10 or 100 dots/div	
3S76/3T77A				0.2 ns/div to 10 μs/div plus X10 magnifier	Through full time base		
3A2/3B2	0.7 μs	10 mV/div to 10 V/div	1 MΩ, 47 pF	2 μs/div to 1 s/div	5 μs to 10.5 s	0.1 μs to 10 ms decade sequence	

*Type 3T4, when used with Type 283 Real Time Adapter has an additional range of CALIBRATED SWEEP from 1 ms/div to 1 s/div, but no TIME POSITION in "REAL TIME" operation. Type 3T4 can also be programmed through a front panel connector. (See Type 3T4 catalog page.)

AMPLITUDE CALIBRATOR

Front-panel selection of squarewave outputs of 20 kHz, crystal-controlled, with an accuracy of ±0.05% or approx 1 kHz, RC time-constant controlled. Output voltages are 5 V and 0.5 V into 1 MΩ or greater or 500 mV and 50 mV into 50 Ω. + PRETRIGGER output provides a positive-going pulse that occurs ≈1/4 cycle ahead of the rising portion of the calibrator signal. Connectors are BNC.

TEKTRONIX CATHODE-RAY TUBE

5-inch rectangular CRT with 3.5-kV accelerating potential. A P2 phosphor is normally supplied.

ILLUMINATED INTERNAL GRATICULE

Edge lighted graticule is marked in 8 vertical and 10 horizontal divisions (centimeters). Centerlines are also marked in 2-mm increments. Scale illumination is adjustable with a front-panel control.

DC-VOLTAGE SUPPLIES

Electronically regulated to compensate for widely varying line conditions. Separate regulated heater supply is included. The Type 568 has an additional 25 watts of regulated power available at the rear connector for system use.

POWER REQUIREMENTS

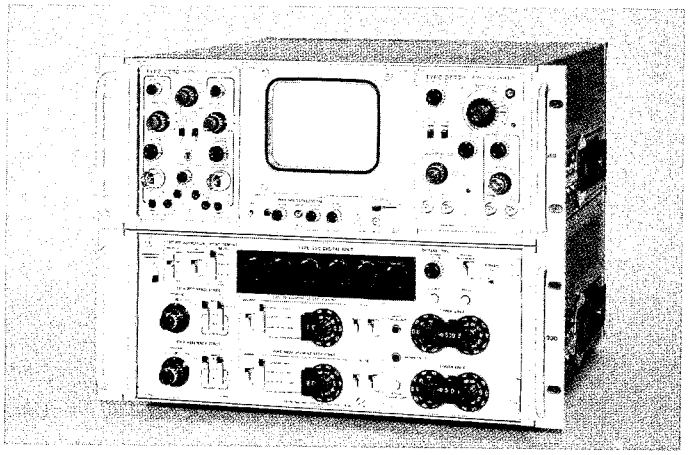
Quick-change line-voltage selection permits operation from any of the following line voltages:

90 V to 110 V	180 V to 220 V
104 V to 126 V	208 V to 252 V
112 V to 136 V	224 V to 272 V

The Type 568 will operate over a line frequency from 48 to 66 Hz, and its power consumption is 210 watts maximum.

TYPE 568 DIMENSIONS AND WEIGHTS

Height	8 in	20.3 cm
Width	16 13/16 in	42.7 cm
Depth	21 7/8 in	55.5 cm
Net weight	40 lb	18.2 kg
Domestic shipping weight	~52 lb	~23.6 kg
Export-packed weight	~72 lb	~32.7 kg



TYPE R568 DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	22 3/4 in	57.8 cm
Net weight	41 lb	18.6 kg
Domestic shipping weight	~56 lb	~25.5 kg
Export-packed weight	~76 lb	~34.5 kg

STANDARD ACCESSORIES

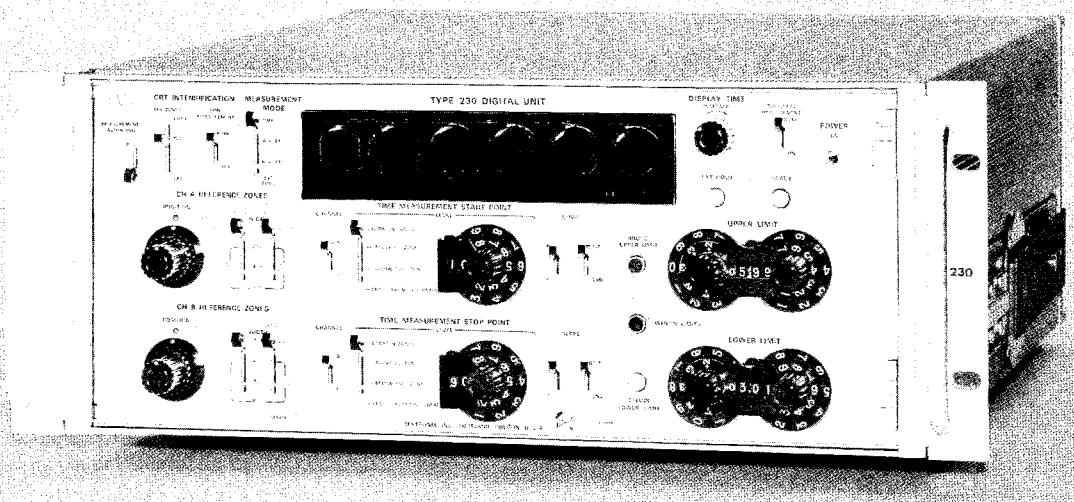
3 to 2-wire adapter (103-0013-00); CRT protector plate (387-0935-00); 18-inch patch cord, BNC-to-BNC (012-0087-00); 18-inch patch cord, BNC-to-banana plug (012-0091-00); patch cord, post jack-to-BNC (012-0092-00); two instruction manuals (070-0596-00).

TYPE 568, without plug-in units $850
TYPE R568, without plug-in units $900

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

DIGITAL UNIT

NEW



- **PRESENTS OSCILLOSCOPE MEASUREMENTS IN DIGITAL FORM**
- **DIGITAL READOUT PARAMETERS**
  - **PULSE AMPLITUDE**
  - **PULSE RISE AND FALL TIME**
  - **PULSE WIDTH**
  - **TIME INTERVAL**
- **UP TO 50 MEASUREMENTS PER SECOND**
- **PARALLEL GROUND-CLOSURE BCD PROGRAMMING**
- **BCD DATA OUTPUT (1 2 4 8)**
- **ALL SOLID STATE**
  EXTENSIVE USE OF INTEGRATED CIRCUITS

The Type 230 and Type R230 Digital Units are new high-speed solid-state units that provide digital measurements of signals displayed on the Type 568 Oscilloscope. The Type 230 has flexible measurement capabilities with up to 50 measurements per second, easy programming, BCD data outputs, and solid-state circuitry with extensive use of integrated circuits. The Type 230 Digital Unit can make a wide variety of repetitive pulse measurements on the signals displayed on the Type 568. The digital presentations can designate voltage measurements, time-difference measurements between similar pulses, and time-difference measurements between percentages or voltages of pulse amplitudes. The Type 230 can be externally programmed for use in high-speed automatic measurement systems and data output connectors provide measurement results in convenient BCD code.

MEASUREMENT MODES

The Type 230 Digital Unit's four basic measurement functions (Channel A volts, Channel B volts, Time, and External Program) are selected by the Measurement Mode switch.

VOLTAGE measurements are made on either Channel A or Channel B between the 0% and the 100% reference zones. The signal polarity is determined and read out automatically on the digital readout.

TIME measurements are made on either Channel A, Channel B or between the two channels. The time measurements are made from a pre-determined start point to a pre-determined stop point that can be referenced to the 0% and 100% reference zones or to the start of the sweep.

EXTERNAL PROGRAM: All of the front-panel functions required to make voltage and time measurements can be easily programmed externally. The variety and flexibility of measurements possible with external programming are even greater than those possible through use of the Type 230 front-panel controls, and measurements and limits can be changed more rapidly.

DIGITAL READOUT

The measurements made by the Type 230 are read out directly on four Nixie* tubes. Decimal point and unit of measure (ns, μs, ms, s, mV, V) are automatically presented. The polarity of the measurement (+ or —) is also read out automatically.

DISPLAY TIME

The digital readout display time may be varied from $\approx$10 ms to 10 s. EXTERNAL HOLD light indicates when the measured data is being held until the recording device has had sufficient time to record the measurement. External hold does not prevent the next measurement from being made. In TRIGGERED MEASUREMENT operation, a measurement is started after a receipt of a trigger (+ or —) and after DISPLAY TIME has been completed. The READY light indicates a ready condition for a trigger.

REFERENCE ZONES

To make any digital voltage or time measurement of the waveforms displayed on the Type 568 Oscilloscope, the Reference Zones must be properly set. The 0% and the 100% zones establish the reference points from which all measurements are made. The reference zones can be brightened on the oscilloscope by means of the CRT Intensification Reference Zone switch. The switch brightens both zones, 100% zone only, 0% zone only or disables the zone intensification.

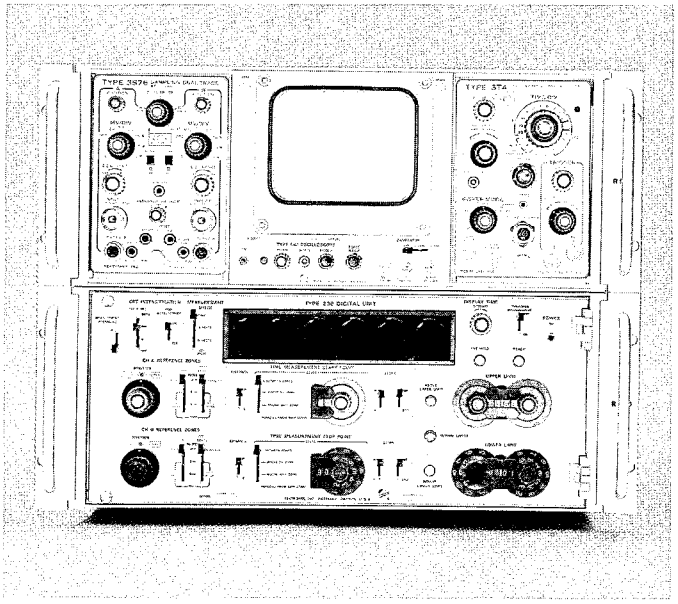
CHANNEL A REFERENCE ZONE

The 0% POSITION and 100% POSITION controls determine the start position of the 0% and 100% zones to any $\frac{1}{2}$-cm point from the start of the sweep by means of a 20-position switch. Five external program lines are required for each position control.

LEVEL WIDTH controls select the width of the reference zone and select the type of voltage reading, average or peak.

The AVERAGE 0.3-cm WIDTH position of the control is normally used for average voltage and most time measurements.

*Trade-Mark Burroughs Corporation



The three PEAK positions (2-cm, 4-cm, 10-cm WIDTH) are used for average to peak, or peak to peak voltage measurements. Two program lines are required for each 0% LEVEL or 100% LEVEL width controls.

CH B REFERENCE ZONES are identical in function and operation as Ch A Reference Zones except they are set on Ch B display.

TIME MEASUREMENT START POINT

The start of the time measurement is selected to start on either Channel A or Channel B and on the first or second positive-going or negative-going slope. The time measurement starts when the signal reaches one of the 99 pre-determined levels. Four different modes of start point level selection are available: (1) % between 0% and 100% zones, (2) mm above 0% zone, (3) mm below 100% zone, and (4) Horizontal mm from sweep start. Eleven BCD program lines are required for externally programming the time measurement start point. There are 159 pre-determined levels available in the external programming mode.

CRT intensification during the time measurement portion of the sweep is selected by means of the CRT Intensification Time Measurement On-Off switch.

TIME MEASUREMENT STOP POINT

All functions of the Time Measurement Stop Point are identical to the previously explained Time Measurement Start Point. It stops the count on the selected point on Ch A or Ch B. If the Stop Point occurs before the Start Point, a negative reading is indicated.

LIMIT CONTROLS

The Limit Controls select the UPPER and LOWER measurement Limits. Measurement limit results can be quickly determined on the front-panel by means of three lights (ABOVE UPPER LIMIT, WITHIN LIMITS, BELOW LOWER LIMIT) and the information is available on the rear panel for stopping automatic measurement sequences or for automatic sorting. Fifteen BCD lines are required for programming each limit control.

RESOLUTION

DOTS/MEASUREMENT Time measurements are performed by gating and counting clock-pulses during the measurement interval. If a measurement interval occupied 2.5 div and the sweep speed was 10 ns/div with 100 samples/div, then 250 samples would be registered in the digital readout counter and reading would be 25.0-ns. For sweep speeds with multipliers of 2, the count is doubled and the decimal is shifted to maintain maximum resolution. For multiples of 5 the count is divided by 2 providing 50 samples/div.

The TIME MEASUREMENT START and STOP comparators have ±0.1 mm pick-off resolution capabilities. This gives the Type 230 the ability to scale a 1-cm display in 1% steps.

MEASUREMENT AVERAGING permits selection of measurements to be a statistical average of eight sweeps or to be a measurement of only one sweep. One program line is required for Measurement Averaging selection.

EXTERNAL READOUT

Data outputs are available on the rear-panel of the Type 230 that permit the recording of measurement polarity, displayed digits, units of measure, decimal point, and measurement limit results. The information is in BCD code (1 2 4 8; true . . . ground, false . . . +12 Volts) and the Type 230 can be synchronized to the data recorder.

Regulated power is available for use in systems applications.

EXTERNAL PROGRAMMING

The Type 230 Digital Unit is designed to be externally programmed for use in high-speed measurement systems, up to 100 measurements per second with proper programming techniques. All of its measurement functions can be programmed by means of ground closures or logic levels. The programming is achieved with 104 program lines using negative logic with true being ground or <2 V and false being open or >6 V. Suitable programming devices include card readers, block readers, computers, etc.

HIGH SPEED PROGRAMMED MEASUREMENTS

When using the Type 3T4 Programmable Sampling Sweep for the oscilloscope time base, the Type 230 Digital Unit can program the Type 3T4 to provide increased measurement speeds. The time-base can be made to run fast (10 dots/div) during the non-measurement part of the sweep and then run at normal speeds (100 dots/div) for maximum resolution during the measurement. The Type 3T4 is also set for Single-Sweep operation and the sweep is started by the Type 230 so that no time is lost waiting for an unwanted sweep to finish. This function is obtained by externally programming the high speed program line.

Measurement speed can be increased by externally programming the position of the 0% and/or 100% Reference Zones start point to 12 cm. This puts the reference zones into a memory hold position of up to 10 seconds and permits several different measurements to be made without a zone charging sweep. This gives an additional feature of permitting measurements referenced to reference zones that are not on the CRT display.

TYPE 230 DIMENSIONS AND WEIGHTS

Height	8 in	20.3 cm
Width	16 13/16 in	42.7 cm
Depth	21 7/8 in	55.5 cm
Net weight	38 lb	17.3 kg
Domestic shipping weight	~50 lb	~22.7 kg
Export-packed weight	~73 lb	~33.2 kg

TYPE R230 DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Depth	22 3/4 in	57.8 cm
Net weight	40 lb	18.2 kg
Domestic shipping weight	~52 lb	~23.6 kg
Export-packed weight	~75 lb	~34.1 kg

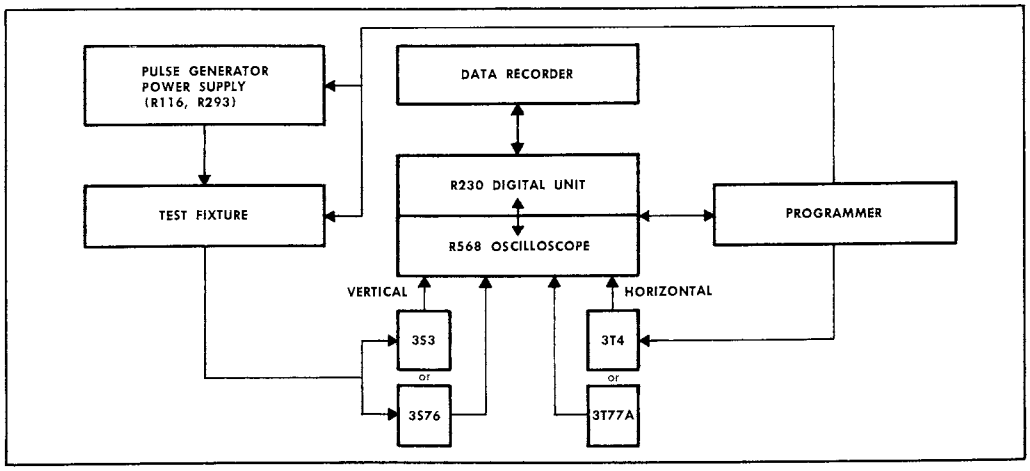
STANDARD ACCESSORIES

Type 230 to Type 568 48-inch interconnecting cable (012-0119-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0635-00).

TYPE 230 DIGITAL UNIT $2850
TYPE R230 DIGITAL UNIT $2900

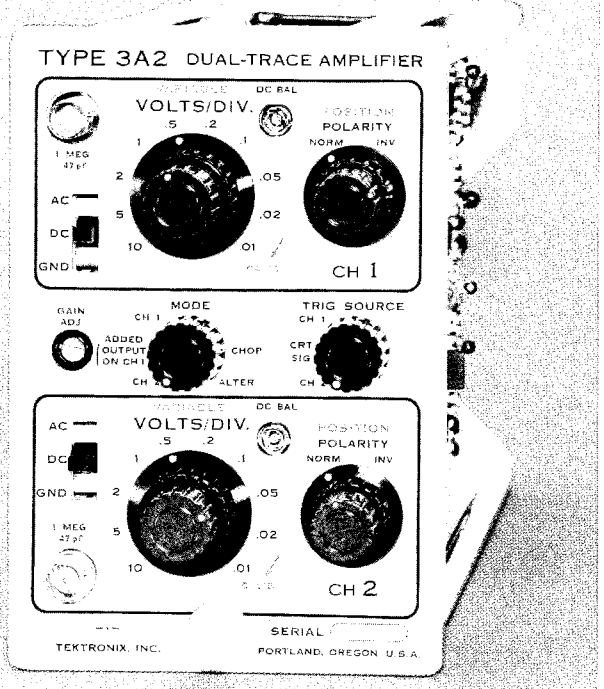
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

TYPICAL AUTOMATIC MEASUREMENT SYSTEM
(For further information, consult your Field Engineer, Representative, or Distributor)



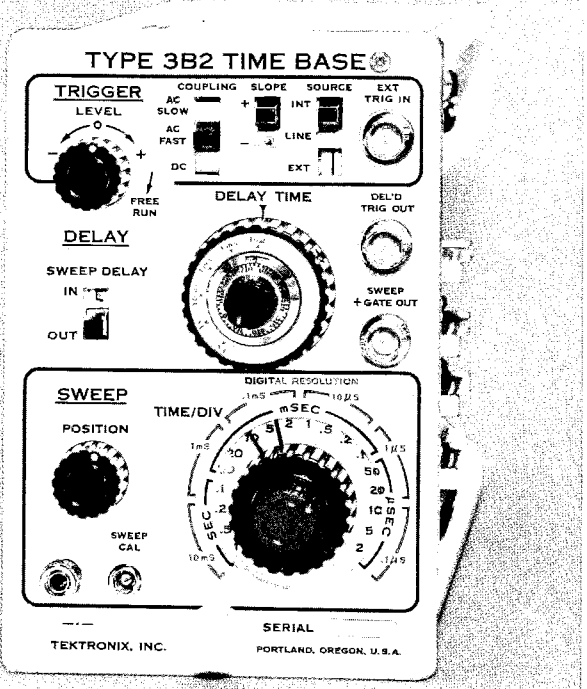
TYPE 3A2

DUAL-TRACE ANALOG/ DIGITAL AMPLIFIER UNIT



TYPE 3B2

ANALOG/DIGITAL TIME BASE UNIT



The Type 3A2 Dual-Trace Amplifier and Type 3B2 Time-Base Units enable digital readout and analog displays of low and medium-frequency information. Both types of displays are provided using the Type 567 Oscilloscope (with Type 6R1A) or Type 568 Oscilloscope (with Type 230). Analog displays (but not digital readout) are provided using Type 561A or 564 Oscilloscopes. The Type 3A2 also provides analog displays in the Type 565 Oscilloscope.

TYPE 3A2 DUAL-TRACE AMPLIFIER UNIT

BANDWIDTH
DC to 500 kHz at 3-dB down. Low-frequency 3-dB point AC-coupled: 2 Hz.

DEFLECTION FACTOR
10 mV/div to 10 V/div in 10 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuously variable between steps and to approx 25 V/div.

INPUT RC
1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE
600 V (DC + peak AC).

OPERATING MODES
Either single channel, normal or inverted; algebraic addition; chopped or alternate electronic switching between channels. Alternate: channels switched at the end of each sweep. Chopped: successive 12-μs segments of each channel displayed at an approx 40-kHz rate per channel. Chopped transient blanking is provided.

TRIGGER SOURCE
Channel 1, Channel 2, or displayed signal.

TYPE 3A2 DUAL-TRACE AMPLIFIER UNIT $500

TYPE 3B2 TIME-BASE UNIT

TIME BASE
2 μs/div to 1 s/div in 18 calibrated steps (1-2-5 sequence), accurate within 3%. Calibrated digital readout available throughout full time base with Types 568 and 230, from 20 μs/div to 1 s/div with Types 567 and 6R1A.

DIGITAL RESOLUTION
0.1 μs to 10 ms in 6 decade steps with Types 568 and 230; 1 μs to 10 ms in 5 decade steps with Types 567 and 6R1A. Resolution can be selected independently of time/div, to increase digital readout accuracy when the first significant digit is known. Front panel indicates maximum resolution (without possible counter overflow) that can be attained for each time/div setting. Clock accuracy is 0.1%.

DELAY TIME
5 μs to 10.5 s, continuously variable and calibrated, accurate within 1%. Delay can be switched in or out.

SIGNAL OUTPUTS
Delayed trigger nominally +5 V, sweep gate nominally +15 V.

TRIGGER COUPLING
AC Slow, AC Fast, or DC.

TRIGGER SOURCES
Internal, external, or line.

TRIGGER REQUIREMENTS
0.2-cm deflection or 0.4 V external. ±12-V trigger level selection.

TYPE 3B2 TIME-BASE UNIT $650

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

NEW

The Type 3T2 Random Sampling Sweep Unit provides a unique, state-of-the-art advancement in measurement capabilities. This unit may be used in a Type 561A, 564, 567, or 568 Oscilloscope, with a Vertical Dual-Trace Sampling Unit. In the Type 567 (with 6R1A) or 568 (with Type 230), information can be presented in digital as well as analog form. A front-panel switch selects either conventional sequentially-stepped sampling (for digital readout) or random sampling modes of operation.

Random sampling permits observation of the leading edge (or other portions) of signals even when used with vertical units that have no delay lines and without a pretrigger, thus avoiding the distortions or bandwidth-limiting effects of vertical signal delay lines. Random sampling is especially useful with sampling units such as Type 3S3 (no delay lines) featuring high-impedance probes and fast risetime/low noise operation.

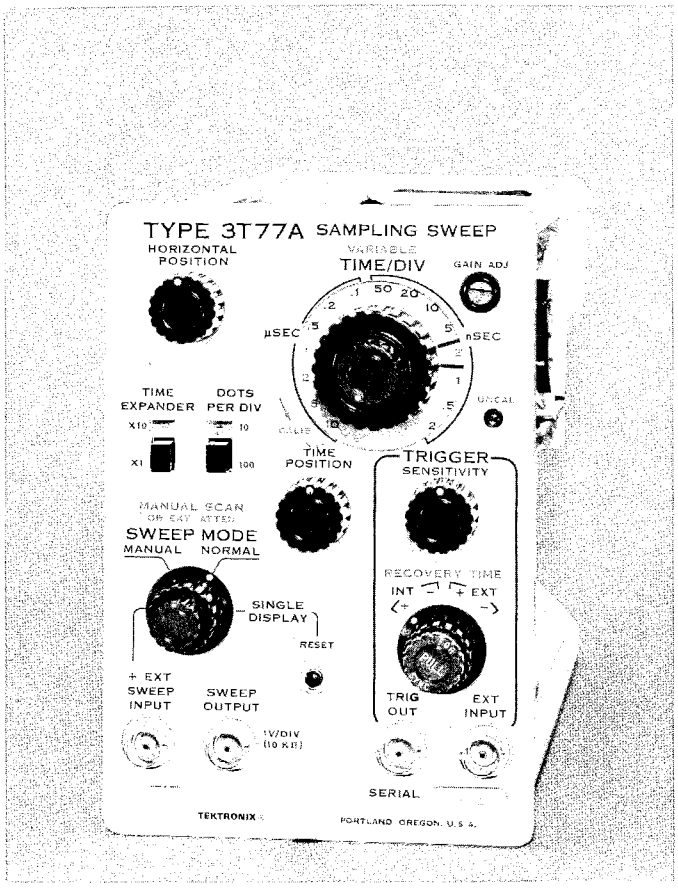
SWEEP TIME/DIV
100 μs/div to 200 ps/div, 1-2-5 sequence, extending to 20 ps/div with X10 DISPLAY MAGNIFIER. TIME/DIV is a resultant of the combined settings of TIME POSITION RANGE (100 ns to 1 ms), TIME MAGNIFIER (X1 to X50) and DISPLAY MAG (X1 or X10). TIME/DIV "window" provides digital readout for all combinations of these controls.

SAMPLES/DIV
Variable from approx 5 to an immeasurable number.

TRIGGER REPETITION RATE RANGE
10 Hz to 3 GHz (pulses); 10 kHz to 3 GHz (sinewaves). Separate 1 MΩ and 50 Ω external inputs.

TYPE 3T2 RANDOM SAMPLING SWEEP UNIT $950

SEE PAGE 199 FOR FURTHER INFORMATION



The Type 3T77A is a Sampling Sweep Unit. It provides subnanosecond capabilities when used with a Type 3S3 or 3S76 Sampling Unit in a Type 561A, 564, 567, or 568 Oscilloscope. In the Type 567 (with Type 6R1A) or 568 (with Type 230), information can be presented in digital as well as analog form.

SWEEP TIME/DIV
10 μs/div to 0.2 ns/div in 15 calibrated steps, 1-2-5 sequence, to 20 ps/div with TIME EXPANDER (samples/cm constant).

TIME POSITION
Provides a sweep delay range corresponding to at least one screen diameter, unexpanded, and at least ten screen diameters (100 div) when expanded.

TRIGGER REPETITION RATE RANGE
30 p/s (limited by memory drift in the vertical plug-in) through 10^9 p/s (1 GHz); 100 kHz through 1 GHz sinewaves.

AMPLITUDE RANGE
±10 mV to ±200 mV for external pulse triggering, 10 mV to 400 mV P to P for external sinewave triggering. Five times more trigger amplitude is required for equivalent internal triggering. Optimum trigger amplitude for least jitter depends on rise rate and rep rate (or frequency).

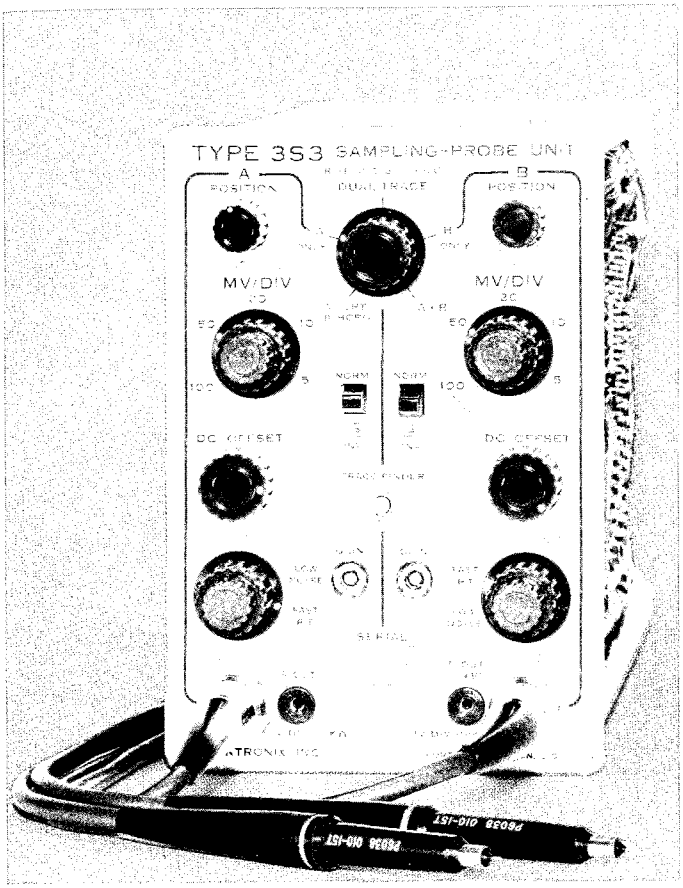
JITTER
Typically 50 ps or 0.1% of fast ramp duration whichever is greater for pulses of 50 mV amplitude, 2 ns width (or 10 mV, 10 ns width). <50 ps for 100 mV P to P, 30 to 50 MHz sinewaves.

TYPE 3T77A SAMPLING SWEEP UNIT $650

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

SEE PAGE 203 FOR FURTHER INFORMATION

DUAL-TRACE SAMPLING UNITS



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; operates in any of five modes for a variety of single, dual-trace and X-Y displays. The Type 3S3 is designed to operate with a Type 3T2, 3T77A or Type 3T4 Sampling Sweep Unit in the Type 561A, 564, 567, or 568 Oscilloscopes. In the Type 567 (with Type 6R1A) or Type 568 (with Type 230), information can be presented in digital as well as analog form.

BANDWIDTH
Equivalent to DC-to-1000 MHz.

RISETIME
0.35 ns or less (FAST RT) or approx 1 ns (LOW NOISE).

DEFLECTION FACTOR
5 mV/div to 100 mV/div in 5 calibrated steps, 1-2-5 sequence.

INPUT RC
100 kΩ paralleled by 2 pF.

DYNAMIC RANGE
±1.5 V (LOW NOISE) and ±3 V (FAST RT). Safe overload is ±10 V.

DC OFFSET
Through ±0.5 volts, for signal levels exceeding "on screen" sensitivity settings.

RANDOM NOISE
<0.5 mV (tangential) unsmoothed (LOW NOISE), 2 mV (FAST RT).

TRIGGER SOURCE
External only. Minimum repetition rate is 50 Hz.

TYPE 3S3 SAMPLING-PROBE UNIT $1500

SEE PAGE 197 FOR FURTHER INFORMATION

The Type 3S76 Sampling Unit is a dual-trace amplifier with internal delay lines and trigger takeoffs. It has two separate channels with identical characteristics; operates in any of five modes for a variety of single, dual-trace and X-Y displays. It is designed to operate with a Type 3T4 or Type 3T77A Sampling Sweep Unit in Type 561A, 564, 567 and 568 Oscilloscopes. In the Type 567 (with Type 6R1A) or 568 (with Type 230), information will be presented in digital as well as analog form.

BANDWIDTH
Equivalent to DC-to-875 MHz at 3-dB down.

RISETIME
0.4 ns or less.

DEFLECTION FACTOR
2 mV/div to 200 mV/div in 7 calibrated steps, 1-2-5 sequence.

INPUT IMPEDANCE
50 ohms. GR 874 input connectors.

DYNAMIC RANGE
±2 V. Full sensitivity can be used with signals up to ±2 V in amplitude. Safe overload is ±5 V.

DC OFFSET
Through ±1 V, referred to input, and monitorable at the front panel at 100 X magnitude.

TRIGGER SOURCE
Selects built-in trigger takeoff signal from either channel.

SIGNAL DELAY
55-ns internal delay line for each channel.

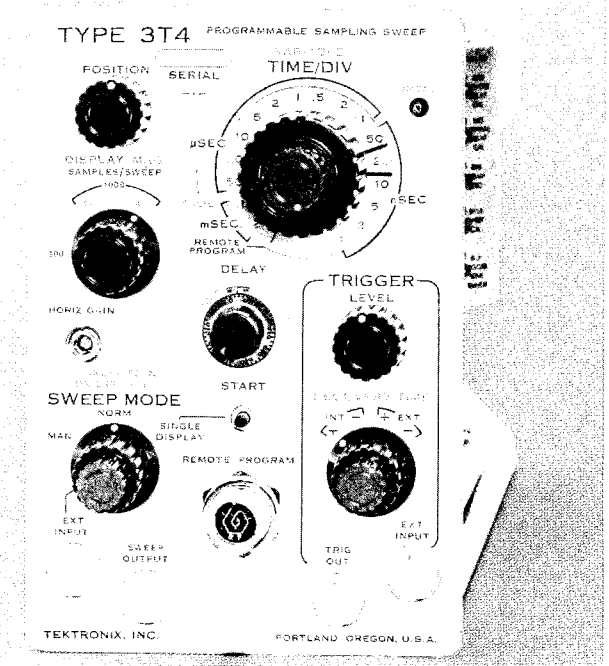
TYPE 3S76 DUAL-TRACE SAMPLING UNIT $1100

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

SEE PAGE 198 FOR FURTHER INFORMATION

TYPE 3T4

PROGRAMMABLE SAMPLING SWEEP UNIT



The Type 3T4 Sampling Sweep Unit extends the convenience of operation of the Type 567 or 568 Digital Readout Systems by providing remote control of the horizontal time base. This unit is compatible with the following equipment: 3S76, 3S3, and other 3-series Sampling Units; 561A, 564, 567, and 568 Indicator Units; 6R1, 6R1A, and 230 Digital Units; the 262 Programmer; and the 283 Real Time Adapter.

When used with the Type 283 Real Time Adapter, TIME/DIV extends from 1 ns/div to 1 s/div, covering the complete range of signals from sub-audio, to high-speed switching diodes.

The multiple-pin connector on the front panel affords external control of equivalent-time sweep steps, delay time, samples per sweep, normal or single-display modes, and single-display start. These operations are obtained through the grounding of certain pins of the front-panel connector. Delay time is determined by the value of resistors added externally. For real-time measurements, using the Type 283 Adapter, only TIME/DIV can be remotely controlled. Other functions, such as source or mode of triggering, normal or single display, etc. are manually set by front-panel controls on the adapter. No sweep delay is provided on the Type 283.

Front-panel outputs are TRIGGER OUT, which provides a 500-mV, negative pulse coinciding with the input trigger, and SWEEP OUTPUT which provides a staircase ramp. The unit also can be triggered internally and responds to input signals up to 1000 MHz. The SINGLE DISPLAY feature permits photographic trace recording. The 10X MAGNIFIER extends the on-screen calibrated sweep range. A dual-purpose front-panel control permits manual or external scanning of the display, thus providing convenient operation of either X-Y or Y-T recorders.

TYPE 3T4 SAMPLING SWEEP UNIT $1300

TYPE 283 / R283

REAL TIME ADAPTER NEW

The Type 283 or R283 Real Time Adapter is an accessory to provide real-time sampling capability for Type 3T4 Programmable Sampling Sweep. Real-time sampling permits the bandwidth, offset, and overload-recovery characteristics of equivalent-time sampling to be realized at slower sweep rates.

The adapter provides accurate sweep rates from 1 s/div through 1 ms/div. Triggering can be either from the Channel A or B vertical output signal (from vertical sampling unit) or an external source.

Manual control of REAL TIME/DIV, DISPLAY FUNCTIONS, and TRIGGERING SOURCE, MODE, and LEVEL can be from front-panel controls, or REAL TIME/DIV can be remotely controlled by a Type 262 or other closure-type programmer. A single Type 262 can be used to control all of the programmable functions of both a Type 3T4 and a 283 Real Time Adapter, including switching between equivalent-time sampling and real-time sampling. Functions other than REAL TIME/DIV on Type 283 manually selected from front-panel controls.

REAL TIME/DIV
1 ms/div to 1 s/div in 10 calibrated steps, 1-2-5 sequence.

TRIGGER MODES
Free Run; Int AC; Int DC; and Ext.

INTERNAL SOURCE
Channel A or Channel B from vertical sampling unit signal outputs.

TYPE 283 REAL TIME ADAPTER $350
TYPE R283 REAL TIME ADAPTER $350

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

SEE PAGE 201 FOR FURTHER INFORMATION

The usefulness of the Type 567 and 568 Oscilloscopes 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

Produces 0.25-ns risetime pulses of either equal or alternately different time duration. Pulse width is 0.5 to 100 ns at full repetition rate of 550 to 720 p/s; and to 300 ns at half repetition rate.

Pulse amplitude is variable 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 $\leq$0.5 ns for positive and negative polarity. Repetition rate is variable from 10 p/s to 100 kHz. Pulse duration is 2 ns to 1500 ns with an external charge line. Pulse amplitude is $\pm$10 V.

PRETRIGGER PULSE amplitude is $\approx$10 V, duration is 250 ns, and half-amplitude risetime is 5 ns (approx).

Time delay between pretrigger and output pulse is variable from 30 ns to 250 ns.

TYPE 111 PULSE GENERATOR $365

TYPE 113 DELAY CABLE

The Type 113 Delay Cable provides 60-ns 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 ns, and 10 to 90% risetime of better than 0.1 ns. Impedance is 50 Ω $\pm$1%.

TYPE 113 DELAY CABLE $250

TYPE R116 PROGRAMMABLE PULSE GENERATOR

The Type R116 Programmable Pulse Generator is a multi-purpose generator with variable output pulse characteristics. Repetition rates up to 10 MHz are available with amplitudes up to 10 volts and risetimes and falltimes as short as 10 ns. All functions of the Type R116 are programmable, making the instrument appropriate for applications requiring a variety of pulse characteristics that can be changed in rapid sequence. The Type R116 can also be operated entirely from the front panel (using the calibrated front-panel controls) or with a combination of remote programming and front-panel operation.

TYPE R116 PROGRAMMABLE PULSE GENERATOR $1550

TYPE R293 PROGRAMMABLE PULSE GENERATOR AND POWER SUPPLY

The Type R293 is a combination pulse generator and power supply which may be used for testing time and charge parameters of semiconductor devices. It can also be used to measure switching and propagation times of micro-logic circuits. The unit is useful in a wide variety of applications which require fast-rise and fast-fall pulses. The remote program capabilities make the instrument useful in production line and systems applications.

Risetime is $\leq$1 ns, repetition rate is $\leq$10 kHz to 100 kHz, amplitude is 6 to 12 V. The regulated current supply provides 300 μA to 300 mA at up to 20 V; the regulated voltage supply provides 0 to $\pm$50 V at up to 200 mA.

TYPE 293 PROGRAMMABLE PULSE GENERATOR AND POWER SUPPLY $1000

TYPE 281 TIME DOMAIN REFLECTOMETRY PULSER

Type 281 is a compact current source designed for use with Type 3S76, 4S1, and 1S1 50-Ω Sampling Units; power is obtained from their probe power connectors.

PULSE AMPLITUDE is approx 18.5 mA; RISETIME $\leq$0.75 ns at leading negative transition; WIDTH $\geq$5 μs from negative-going edge to positive-going edge, at 50% amplitude points; FLATNESS $\pm$2% overshoot and ringing following negative-going edge for first 10 ns, 0.5% thereafter; LOADING EFFECT on 50-Ω SYSTEM $\leq$10% reflection (capacitive).

TYPE 281 TDR PULSER (Order 015-0060-00) $95

TYPE 282 ADAPTER FOR HIGH-IMPEDANCE PROBES

This accessory permits the use of conventional high-impedance probes with 50-Ω sampling plug-in units, such as Types 1S1, 4S1, 4S2A, and 3S76. Now, with a wide-range sampling timing unit (Type 1S1, 3T4 and Type 283 Adapter, or Type 5T3), one oscilloscope can cover nearly the entire range of signal measurement (from power-supply ripple to sub-nanosecond events).

Other advantages include: voltage offset, smoothing, and overload-recovery features of sampling not normally available with a conventional oscilloscope; no loss of DC stability with sampling units; and excellent linearity over entire dynamic range.

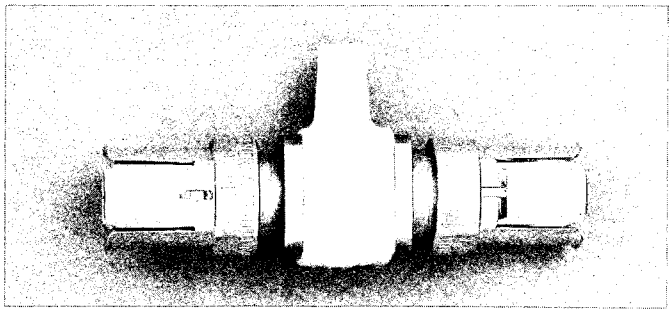
The adapter is recommended for use with the following probes: P6008, P6009, P6010, P6011, P6012, and P6047.

TYPE 282 PROBE ADAPTER (Order 015-0074-00) $95

50-Ω POWER DIVIDER, GR TYPE 874-TPD

This divider is designed for use in broad-band 50-Ω systems where the mismatch introduced by ordinary "Tee" connectors is undesirable. It is especially useful in a time-domain reflectometer set-up where test line, pulser, and oscilloscope must be coupled with a minimum of reflection-producing discontinuities.

TYPE 874-TPD POWER DIVIDER (Order 017-0082-00) $70



TYPE VP-1 50-OHM VOLTAGE PICKOFF

This 50-ohm "T" type pickoff allows signal pickoff from a closed 50-ohm system with minimum disturbance of the system's characteristics. Designed for use with Type P6034 or P6035 Probes, the reflection coefficient of Type VP-1 alone is approx 3%.

TYPE VP-1, order 017-0073-00 ..... $ 25

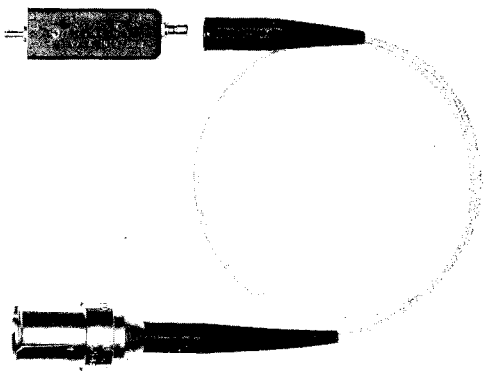
TYPE VP-2 50-OHM VOLTAGE PICKOFF

Similar to Type VP-1, this pickoff is designed for use with the P6038 Direct Sampling Probe. Reflection coefficient of Type VP-2 alone is approx 4%; with P6038 probe inserted, approx 6%.

TYPE VP-2, order 017-0077-00 ..... $ 30

U.S. Sales Price FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.



TYPE CT-1 CURRENT TRANSFORMER

Type CT-1 provides a means for accurate measurement of current flow in a circuit, while keeping loading effects to a minimum. TYPE P6040 serves as an inter-connecting cable between the CT-1 and an oscilloscope. SENSITIVITY is 5 mV/mA into a 50-Ω load. BANDWIDTH is 35 kHz to 1 GHz. RISETIME for pulse response is less than 0.35 ns. DECAY TIME CONSTANT is 5 μs, approximated by 1% per 50 ns; limit, 1 μs. MAXIMUM VOLTAGE is 1000 V, DC. CURRENT RATINGS are 500 mA maximum RMS, 100 A peak pulse.

CT-1 (ORDER PART NUMBER 015-0040-00) $17

P6040 PROBE (ORDER PART NUMBER 010-0133-00) $14

TYPE CT-1 AND P6040 (ORDER PART NUMBER 015-0041-00) $31

TYPE CT-2 CURRENT TRANSFORMER AND P6041 PROBE

Type CT-2 and probe are similar to CT-1 with probe, except for lower bandwidth limits, higher RMS current rating, and reduced sensitivity. SENSITIVITY is 1 mV/mA into a 50-Ω load. BANDWIDTH is 30% down at 1.2 kHz to 7% down at 200 MHz. RISETIME is approximately 0.5 ns. DECAY TIME CONSTANT is 125 μs, approximated by 1% per 1.25 μs; limit, 25 μs. CURRENT RATINGS are 2.5 A maximum RMS, 100 A peak pulse. Though designed primarily for conventional oscilloscopes, the longer decay time constant and higher RMS current rating make Type CT-2 useful for some sampling oscilloscope applications. (Requires BNC to GR adapter.)

CT-2 (ORDER PART NUMBER 015-0046-00) $17

P6041 PROBE (ORDER PART NUMBER 010-0164-00) $12

BNC to GR ADAPTER (Part Number 017-0063-00) $5.25

TYPE CT-3 50-OHM SIGNAL PICKOFF

The Type CT-3 provides a convenient means of picking off a signal in a 50-Ω system. Used with a Tektronix Sampling Instrument, the CT-3 provides the link for uses as a trigger source.

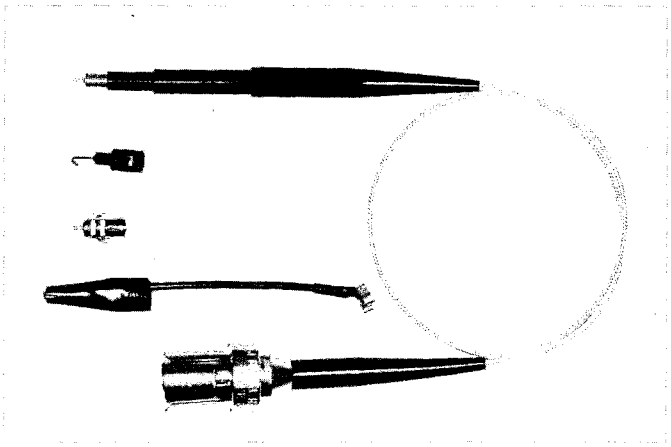
Sensitivity is 10% of the voltage under test, into a 50-Ω load. Risetime is less than 0.4 ns. Insertion impedance with a 50-Ω termination is 1 Ω shunted by 4.5 μH; or 2 Ω shunted by 4.5 μH without 50 Ω termination. VSWR approx 1.2 at 1.5 GHz.

ORDER PART NUMBER 017-0061-00 ..... $30.00

TYPE P6032 CATHODE-FOLLOWER PROBE

Type P6032 with a bandwidth of greater than 800 MHz, permits accurate measurements of high-speed repetitive pulses. The DC-coupled probe uses 7 plug-in attenuator heads (10X to 1000X). Risetime is typically 0.4 ns for probe and attenuator head. Maximum output is ±150 mV into a 50-Ω load. Signal delay is approximately 10 ns.

ORDER PART NUMBER 010-0108-00 ..... $220



TYPE P6034 10X PROBE

This low-capacitance, miniature passive probe is designed for use with Type 3S76 and other 50-ohm sampling plug-in units to permit convenient connection to high-speed circuitry with minimum loss of bandwidth. Probe risetime is less than 100 ps; bandwidth is DC to 3.5 GHz (3-dB down); input resistance is 500 ohms, or approx 300 ohms at 1 GHz; input capacitance is 0.7 pF, DC to 100 MHz; voltage rating is 16 V DC or 45 V peak to peak (derating necessary for CW frequencies above 800 MHz); attenuation ratio is 10X.

P6034 Probe Package, order 010-0110-00 ..... $35

TYPE P6035 100X PROBE

Similar to Type P6034, this probe provides higher input impedance, but greater signal attenuation. Probe risetime is less than 200 ps; bandwidth is DC to 1.7 GHz (3-dB down); input resistance is 5 kilohms, or approx 1.5 kilohms at 1 GHz; input capacitance is 0.6 pF, DC to 100 MHz; voltage rating is 50 V DC or 140 V peak to peak (derating necessary for CW frequencies above 500 MHz); attenuation ratio is 100X. P6035 Probe Package, order 010-0111-00 ..... $ 35

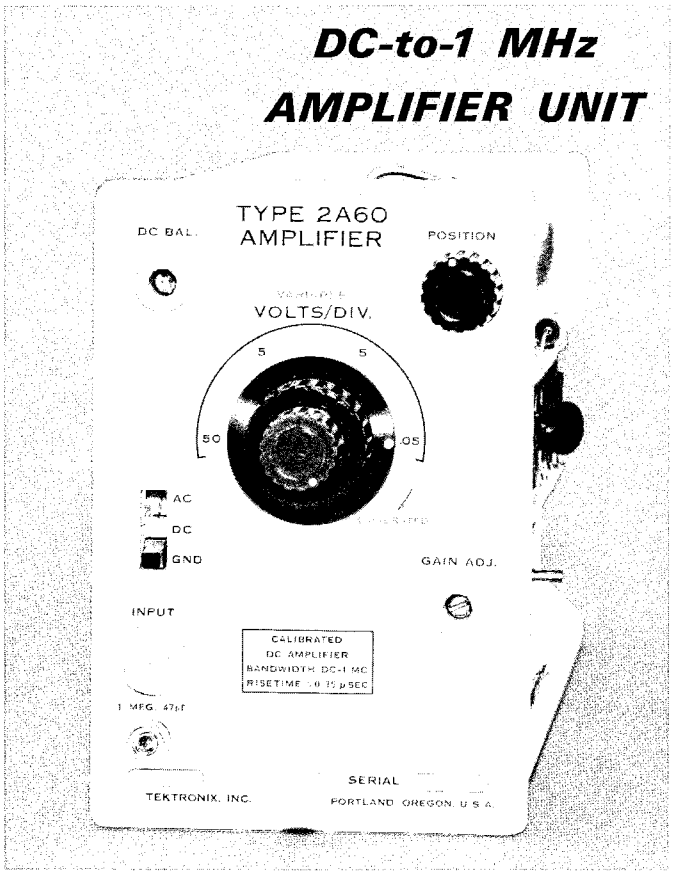
TYPE P6038 DIRECT SAMPLING PROBE

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 MHz range. Type P6038 is very small in size, containing sampling circuitry in the probe head. Low noise, full sensitivity measurements can be made even with signal source impedances above 50 ohms. Probe attenuation (direct) is 1X, with an input RC of 100 kΩ and 2 pF. With 10X attenuator, input RC becomes 1 MΩ and 1.8 pF.

P6038 PROBE PACKAGE, order 010-0156-00 ..... $225

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

DC-to-1 MHz AMPLIFIER UNIT



- ***DC TO 1 MHz BANDWIDTH***
- ***0.05 V/DIV TO 50 V/DIV CALIBRATED DEFLECTION FACTOR***
- ***LOW COST***

The Type 2A60 is a general-purpose plug-in unit. It may be used in the Type 561A, Type 564, Type 565, Type 567/6R1A or Type 568/230 Oscilloscope. However, in the Type 567/6R1A or 568/230, the measurements will not be presented in digital form. Used with the Type 129 Power Supply, the Type 2A60 can drive recorders, X-Y plotters, oscilloscopes, and other indicators.

BANDWIDTH
DC to 1 MHz at 3-dB down. AC-coupled low-frequency response is 2 Hz direct, 0.2 Hz with 10X probe.

RISETIME
0.35 μs.

DEFLECTION FACTOR
0.05 V/div, 0.5 V/div, 5 V/div and 50 V/div. Calibrated accuracy within 3%. Uncalibrated, continuously variable between steps and to approx 500 V/div.

INPUT RC
1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE
600 V combined DC + peak AC.

WEIGHTS

Net weight	3 lbs	1.4 kg
Domestic shipping weight	~ 6 lbs	~2.7 kg
Export-packed weight	~10 lbs	~4.5 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0263-00).

TYPE 2A60 AMPLIFIER UNIT $105

OPTIONAL ACCESSORIES

The probes recommended for use with this instrument satisfy most measurement requirements. Additional probes are available that may be better suited for a particular application, including high-voltage and current measurements. See accessory pages at the rear of the catalog for information on these and other items.

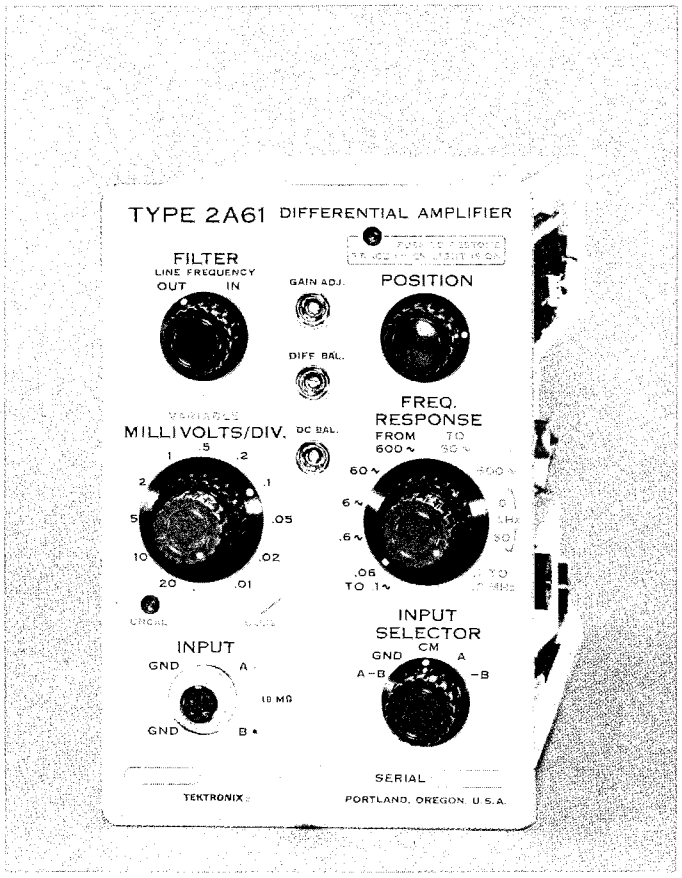
P6028 1X Probe Package, order 010-0074-00 ..... $12.50
P6006 10X Probe Package, order 010-0127-00 ..... 22.00
P6007 100X Probe Package, order 010-0150-00 ..... 22.00

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

TYPE 2A61

HIGH-GAIN AC DIFFERENTIAL UNIT

- ***0.06 Hz to 0.3 MHz BANDWIDTH SELECTABLE HIGH AND LOW 3-dB POINTS***
- ***0.01 mV/DIV to 20 mV/DIV CALIBRATED DEFLECTION FACTOR***
- ***LOW NOISE***
- ***50,000:1 COMMON-MODE REJECTION***



The Type 2A61 is an AC Differential Amplifier with excellent common-mode rejection and high-gain characteristics for low-level applications.

Differential input permits measurements where the output is proportional to the difference between signals applied through the included cable. Differential operation is useful for measurements between two above-ground points, and for cancellation of in-phase signals such as hum pickup at the signal source. Separate high-frequency and low-frequency response controls on the front panel of the unit restrict the bandwidth, thus increasing the signal-to-noise ratio.

The Type 2A61 may be used in the Type 561A, Type 564, Type 565, and in the Type 567/6R1A or Type 568/230 Oscilloscope. However, in the Type 567/6R1A or Type 568/230, the measurements will not be presented in digital form. Used with the Type 129 Power Supply, the Type 2A61 can drive recorders, X-Y plotters, oscilloscopes, and other indicators.

BANDWIDTH
0.06 Hz to 0.3 MHz at all deflection-factor settings except 0.01 mV/div (0.1 Hz to 0.1 MHz). Bandwidth is specified at 3-dB down. A FREQUENCY RESPONSE switch selects high and low-frequency 3-dB points.

HIGH-FREQUENCY 3-dB POINTS
60 Hz, 600 Hz, 6 kHz, 60 kHz and 0.1 to 0.3 MHz.

LOW-FREQUENCY 3-dB POINTS
0.06 to 0.1 Hz, 0.6 Hz, 6 Hz and 600 Hz.

DEFLECTION FACTOR
0.01 mV/div to 20 mV/div in 11 calibrated steps, 1-2-5 sequence; accurate within 5%. Uncalibrated, continuously variable between steps and to approx 50 mV/div.

INPUT RESISTANCE
10 megohms.

OPERATING MODES
Input A only, negative Input B only; Input A minus Input B, CM (common mode for checking differential rejection ratio).

COMMON-MODE REJECTION
50,000:1 below 10 kHz with a 5-V peak-to-peak sinewave input.

DIFFERENTIAL INPUT DC BIAS
±0.1 V maximum, at all deflection factors.

LINE-FREQUENCY NOISE FILTER
Notch filter provides better than 50-to-1 rejection of 60 Hz line-frequency noise. The instrument can also be ordered with a 50 Hz line-frequency filter. Order MOD 156M.

EQUIVALENT INPUT SHORT-CIRCUIT NOISE
Less than 3.5 μV RMS (approx 20 μV peak-to-peak) at maximum bandwidth and 0.01 mV/div deflection factor.

TRACE RESTORER
Pushbutton returns trace to its normal vertical position if driven off the screen.

WEIGHTS

Net weight	5 lbs	2.3 kg
Domestic shipping weight	~ 9 lbs	~4.1 kg
Export-packed weight	~12 lbs	~5.5 kg

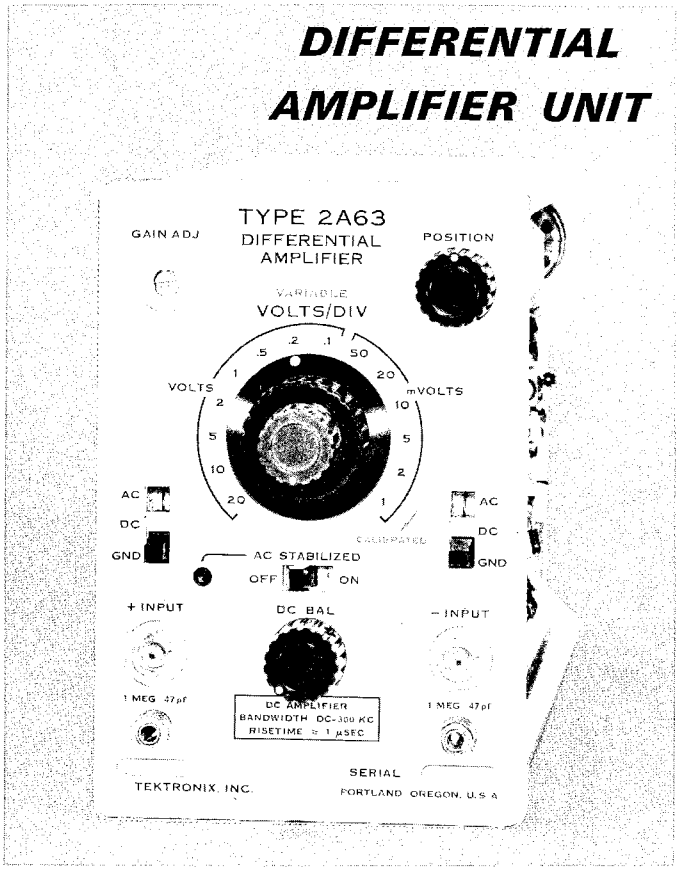
STANDARD ACCESSORIES
Two instruction manuals (070-0328-00); input cable (012-0072-00).

TYPE 2A61 AMPLIFIER UNIT $385
TYPE 2A61 MOD 156M (with 50 Hz line filter) 385

U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page

DIFFERENTIAL AMPLIFIER UNIT

- ***BETTER THAN 50-TO-1 CMR***
- ***1 mV/DIV TO 20 V/DIV CALIBRATED DEFLECTION FACTOR***



The Type 2A63 is a differential amplifier plug-in unit. It can be used to make voltage measurements between two above-ground points while at the same time cancelling in-phase signals such as hum pickup in the connecting leads.

The Type 2A63 may be used in the Type 561A, Type 564, Type 565, Type 567/6R1A or Type 568/230 Oscilloscope. However, in the Type 567/6R1A or Type 568/230, the measurements will not be presented in digital form. Used with the Type 129 Power Supply, the Type 2A63 can drive recorders, X-Y plotters, oscilloscopes, and other indicators.

BANDWIDTH
DC to 300 kHz at 3-dB down. AC-coupled low-frequency response is 2 Hz direct, 0.2 Hz with 10X probe.

RISETIME
$\leq$1.2 μs.

DEFLECTION FACTOR
1 mV/div to 20 V/div in 14 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/div.

INPUT RC
1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE
600 V combined DC + peak AC.

DIFFERENTIAL INPUT
Better than 50-to-1 CMRR (Common Mode Rejection Ratio) at 0.2 V/div with 50-kHz, 5 V peak to peak sinewave.

PHASE SHIFT
Phase shift between two Type 2A63 Units used for X-Y displays is nominally less than 1° at 50 kHz.

INTER-STAGE AC COUPLING
Reduces drift at high gain.

WEIGHTS

Net weight	3¾ lbs	1.7 kg
Domestic shipping weight	~ 7 lbs	~3.2 kg
Export-packed weight	~11 lbs	~5.0 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0266-00).

TYPE 2A63 AMPLIFIER UNIT $150

OPTIONAL ACCESSORIES

The probes recommended for use with this instrument satisfy most measurement requirements. Additional probes are available that may be better suited for a particular application, including high-voltage and current measurements. See accessory pages at the rear of the catalog for information on these and other items.

P6028 1X Probe Package, order 010-0074-00 ..... $12.50
P6023 10X Probe Package, adjustable attenuation helps maintain common-mode rejection, order 010-0167-00 40.00
P6007 100X Probe Package, order 010-0150-00 ..... 22.00

U. S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page.

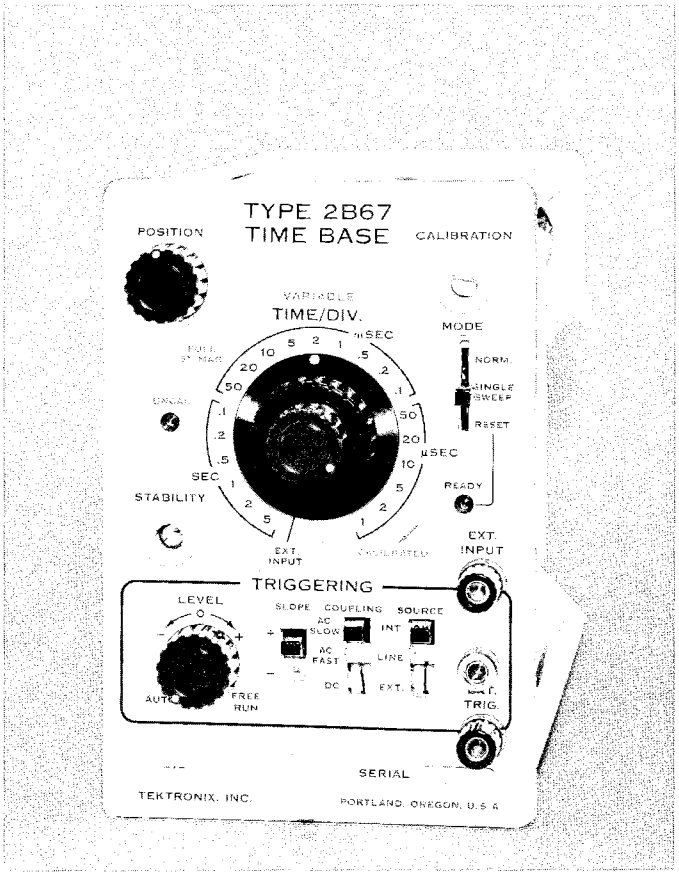
TYPE 2B67

TIME-BASE UNIT

- ***1 μs/DIV TO 5 s/DIV CALIBRATED TIME BASE***
- ***5X MAGNIFIER***
- ***SINGLE SWEEP OPERATION***
- ***LOW COST***

The Type 2B67 Time-Base Unit is designed to generate a sweep in the Type 561A, Type 564, Type 565 (raster generation), Type 567/6R1A or Type 568/230 Oscilloscope. However, in the Types 567/6R1A and 568/230, the measurements will not be presented in digital form.

The unit is recommended for use with 2- and 3-series vertical plug-in units with bandwidths up to 4 MHz.



TIME BASE

1 μs/div to 5 s/div in 21 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 12 s/div.

5X MAGNIFIER

Operates over full time base, increases the fastest rate to 0.2 μs/div. Magnified display accurate within 5%.

SINGLE SWEEP

For one-shot waveform photography and storage applications.

EXTERNAL HORIZONTAL INPUT

Approx 1 V/div, DC to 750 kHz at —3 dB.

TRIGGER

MODES

Manual, automatic, or free-run.

COUPLING

AC slow, AC fast, or DC.

SOURCES

Internal, external, or line.

REQUIREMENTS

Internal Triggering—0.4 divisions of display.

External Triggering—0.5 V at DC increasing to 2 V at 2 MHz.

WEIGHTS

Net weight	4¼ lbs	1.9 kg
Domestic shipping weight	~ 7 lbs	~3.2 kg
Export-packed weight	~11 lbs	~5.0 kg

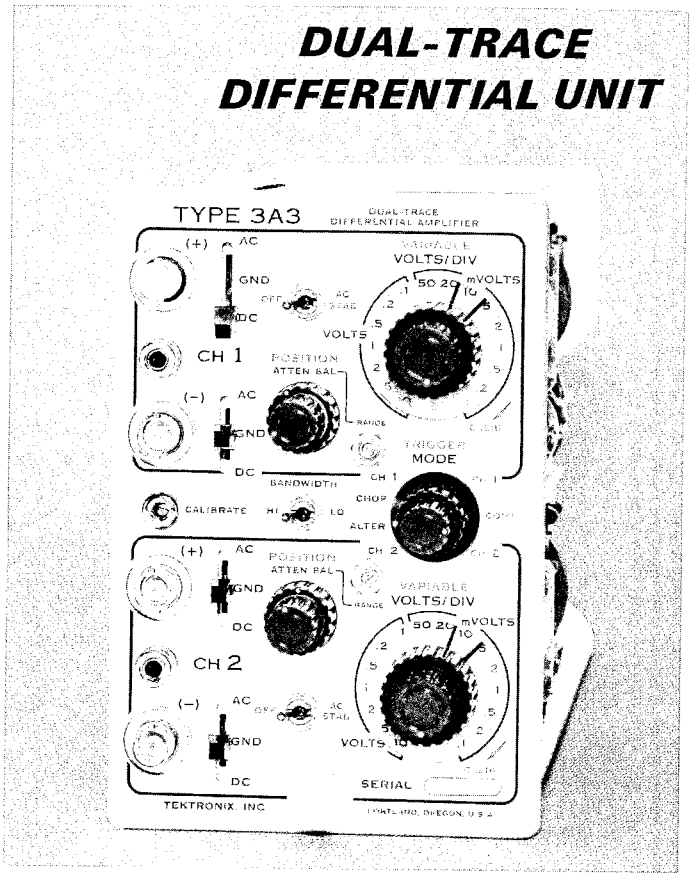
STANDARD ACCESSORIES

Two instruction manuals (070-0366-00).

TYPE 2B67 TIME-BASE UNIT $210

U. S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page.

DUAL-TRACE DIFFERENTIAL UNIT



- ***100 μV/DIV TO 10 V/DIV CALIBRATED DEFLECTION FACTOR***
- ***50,000:1 COMMON-MODE REJECTION***
- ***DC to 500 kHz BANDWIDTH CONSTANT AT ALL DEFLECTION FACTORS***
- ***AC STABILIZATION***

The Type 3A3 Dual-Trace Differential Amplifier is designed for use in the Type 561A, 564, 565, or in the Types 567/6R1A and 568/230 Oscilloscopes. However, in the Types 567/6R1A or 568/230, the measurements will not be presented in digital form. Used in the Type 129 Power Supply, the unit can be used to drive X-Y plotters, oscilloscopes, and other indicators.

The Type 3A3 contains two independent, high-gain amplifier channels with identical characteristics. Either channel may be used to produce a display, or the two channels may be electronically switched to produce dual-trace displays. The unit features high sensitivity with direct-coupled inputs and has a high degree of common-mode rejection. A switch on the front panel selects the upper bandwidth limit of the unit, thus increasing the signal-to-noise-ratio.

BANDWIDTH

DC to >500 kHz at 3-dB down. Low-frequency 3-dB point is 2 Hz with AC coupling, 0.2 Hz with 10X probe. A BANDWIDTH switch selects HI or LO upper 3-dB points: DC to >500 kHz or DC to 5 kHz. Selected bandwidth is constant at all deflection-factor settings.

DEFLECTION FACTOR

100 μV/div to 10 V/div in 16 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 25 V/div.

AC STABILITY

Provides virtually drift-free operation in the 4 most sensitive deflection-factor settings. With AC stability and direct input coupling, the low-frequency —3-dB points are approx 0.3 Hz at 1 mV/div, 0.6 Hz at 0.5 mV/div, 1.5 Hz at 0.2 mV/div, and 3 Hz at 0.1 mV/div.

INPUT RC

1 megohm paralleled by approx 47 pF. Input R can be disconnected by removing internal wire link.

OPERATING MODES

Channel 1, Channel 2, or dual-trace with Alternate or Chopped switching. In chopped operation, successive 2-μs segments of each channel are displayed at an approx 250-kHz rate. Chopped transient blanking is provided.

DUAL X-Y DISPLAYS

Obtained with two Type 3A3 Plug-In Units. Dual-trace switching is synchronized, so that one Y-channel remains plotted against the same X-channel, once the display is set up. There is no provision for consistent pairing each time the system is operated.

PHASE SHIFT

Less than 2° from DC to 100 kHz between two Type 3A3 Amplifiers used in X-Y operation. Phase shift can be adjusted to 0° at any particular deflection factor setting.

NOISE

Less than 10 μV peak-to-peak in the LO bandwidth position, less than 40 μV in the HI bandwidth position (with inputs grounded).

DRIFT

Typically less than 500 μV/hour. Averaged over 10 hours and after 30-minute warm-up.

INTERCHANNEL ISOLATION

Electrostatic Isolation is 10^6:1 or better referred to input signal levels. Dual-Trace Isolation in alternate or chopped operation is 100:1 or better referred to divisions of display. Example: 5 divisions displayed on channel 1 will cause no more than 0.05 divisions of deflection on channel 2.

TRIGGER PICKOFF

Internally coupled. Can be selected from Channel 1, Channel 2 or the composite signal after switching.

TYPE 3A3

DIFFERENTIAL CF OUTPUTS

Output is available from two of the connector pins at the rear of the plug-in for use in driving recorders or other equipment. Output amplitude is a ground-reference, differential, ≈5-volt signal for each division of displayed signal. Front-panel TRIGGER SWITCH allows signal out selection of CH 1, CH 2 or composite. Bandwidth is DC to ≈500 kHz with a non-capacitive load. Jacks can be easily installed at the rear of the oscilloscope to provide access to the CF outputs.

WEIGHTS

Net weight	5¾ lbs	2.6 kg
Domestic shipping weight	~10 lbs	~4.5 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES

Four BNC-to-binding post adapters (103-0033-00); two BNC-to-BNC 18-in patch cords (012-0087-00); two instruction manuals (070-0408-00).

TYPE 3A3 DUAL-TRACE DIFFERENTIAL AMPLIFIER . . . $790

OPTIONAL ACCESSORIES

The probes recommended for use with this instrument satisfy most measurement requirements. Additional probes are available that may be better suited for a particular application, including high-voltage and current measurements. See accessory pages at the rear of the catalog for information on these and other items.

P6028 1X Probe Package, order 010-0074-00 ..... $12.50
P6023 10X Probe Package, adjustable attenuation ratio helps maintain common-mode rejection, order 010-0167-00 40.00
P6007 100X Probe Package, order 010-0150-00 ..... 22.00

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

COMMON-MODE REJECTION[A]

0.1 mV/div to 10 mV/div[B]
(Equal to, or adjustable to, the following minimum CMR ratios.)

	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 kHz	50,000:1			
500 kHz	1,000:1	1,000:1		
DC to 10 Hz			50,000:1	
15 Hz		500:1		
60 Hz		2,000:1		
100 Hz			10,000:1	
1 kHz to 10 kHz			1,000:1	1,000:1
100 kHz		50,000:1	500:1	500:1

20 mV/div to 10 V/div[C]
(Equal to, or adjustable to, the following minimum CMR ratios.)

DC to 1 kHz	10,000:1	
1 kHz to 100 kHz	1,000:1	
500 kHz	500:1	500:1
15 Hz		500:1
60 Hz		2,000:1

[A] For ground-reference sine-wave common-mode signals.
[B] With ±5 V or less from ground, in common mode at input connectors.
[C] With common-mode amplitude at input connectors of ±50 V or less from ground, from 20 mV/div to 0.1 V/div, and with ±350 V or less from ground, from 0.2 V/div to 10 V/div.

These common-mode signals will not overdrive the amplifier:
0.1 mV/div to 10 mV/div, ±20 V from ground (40 V peak to peak AC)
20 mV/div to 0.1 V/div, ±200 V from ground (400 V peak to peak AC)
0.2 V/div to 10 V/div, ±350 V from ground (700 V peak to peak AC)

AUTO/PROGRAMMABLE AMPLIFIER UNIT

- **AUTOMATIC SENSITIVITY "SEEKING"**
- **PROGRAMMABLE FRONT-PANEL FUNCTIONS**
- **DIGITAL INDICATION OF CONTROL SETTINGS**

You can make measurements faster and easier with this high-performance plug-in unit*. Press the "seek" button on the special 10X probe and the instrument automatically selects the volts/division setting for a convenient display size. This "seek" feature is ideal for applications where the instrument is located out of reach, or for production-line testing that would normally require continuous readjustment of the volts/division control.

Upon receipt of the "seek" command, the deflection factor is automatically readjusted so that neither peak of the displayed waveform extends more than 3 divisions from the graticule center, thus establishing the display within the CRT viewing area. Large, lighted indicators in the front-panel window tell you at a glance the volts/division setting, input coupling, and when the manual variable volts/division control is in the uncalibrated position.

The Type 3A5 can be operated manually for applications that do not require the automatic features. In addition, the automatic functions are overridden whenever the manual V/div setting is changed. The plug-in can also be operated remotely using the Type 263 External Programmer. Both the "seek" feature and manual operation of the control settings are overridden when the instrument is programmed externally.

Other features of the Type 3A5 include a special "AC Trace Stabilized" circuit that minimizes trace drift. This feature is particularly useful when the instrument is operated at high sensitivity or when long term trace-stability is required. An internal signal delay line insures the display of the leading edge of fast rising waveforms.

OPERATING MODES

SEEK, MANUAL AND EXTERNAL

Seek operation selected by front-panel pushbutton or pushbutton on the P6030 Probe. Manual or external operation selected by front-panel pushbuttons.

SEEKING CHARACTERISTICS

DEFLECTION FACTOR

10 mV/div to 50 V/div without probe; 0.1 V/div to 500 V/div with probe.

SEEKING TIME

$\leq$200 ms. (Time required to complete one "seek" operation).

CYCLING TIME

2 to 4 s (interval between seek operations with "seek" command button held down continuously).

LOGIC CIRCUIT RESPONSE

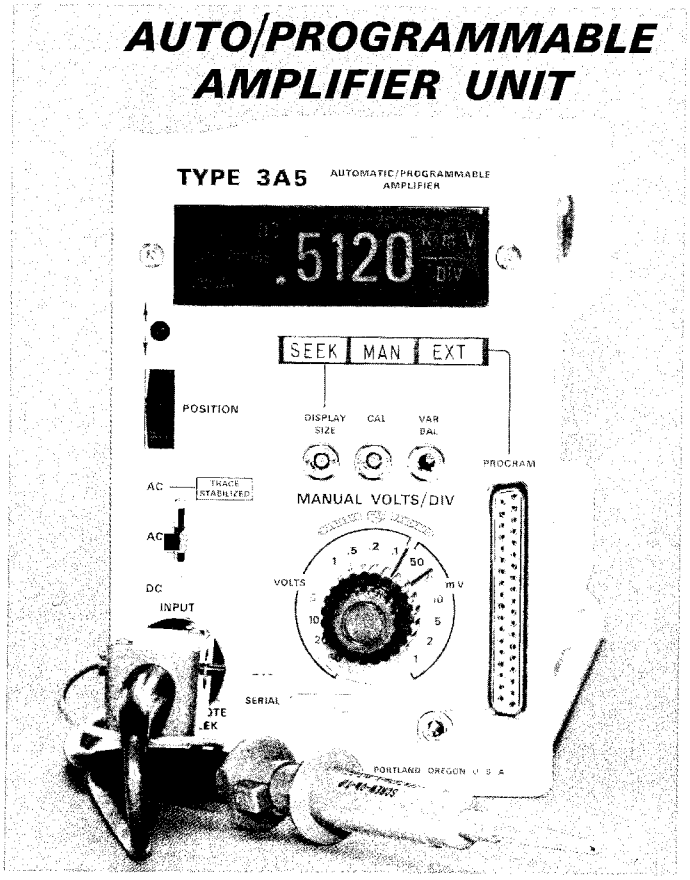
Seeking circuitry functions for signal rep-rates up to 20 MHz.

GENERAL CHARACTERISTICS

READOUT FACILITY

Bulb-and-film digits ½-inch high. Readout information includes 1 mV/div to 50 V/div (10 mV/div to 0.5 kV/div when special 10X probe activates the 10X circuit); "AC" or "DC" input coupling, "with probe" indication, and "uncal" indication when using the variable manual V/div control.

**Recommended for use with the Type 561A Oscilloscope or Type 564 Storage Oscilloscope.*



DEFLECTION FACTOR

10 mV/div to 50 V/div in 12 calibrated steps, 1-2-5 sequence; accurate within 3%. Additional steps of 1, 2 and 5 mV/div in manual mode only; accurate within 5%. A manual control provides uncalibrated variable V/div settings between all steps and to approx 500 V/div.

BANDWIDTH

DC to $\geq$15 MHz at 3-dB down, from 10 mV/div to 50 V/div (all modes). DC to $\geq$5 MHz at 1, 2 or 5 mV/div (manual mode only). AC-coupled low-frequency response is 2 Hz direct, 0.2 Hz with included 10X probe.

RISETIME

$\leq$23 ns at deflection factors of 10 mV to 50 V/div.

INPUT RC

1 megohm paralleled by approx 24 pF.

PROGRAMMABLE FUNCTIONS

V/div settings, with or without 10X probe, AC or DC input coupling, AC Trace Stabilization, all by contact closure to ground. Vertical positioning by analog current.

P6030 PROBE

10X probe with "seek" command button and 6 ft cable. Supplied with the instrument.

WEIGHTS

Net weight	5¼ lbs	2.4 kg
Domestic shipping weight	~11 lbs	~5.0 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES

P6030 10X Probe Package (010-0195-00); 37-pin connector (131-0422-00); connector cover (200-0660-02); telephone plug (134-0079-00); two instruction manuals (070-0500-00).

TYPE 3A5 AUTOMATIC/PROGRAMMABLE UNIT . . . $760

U.S. Sales Price FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

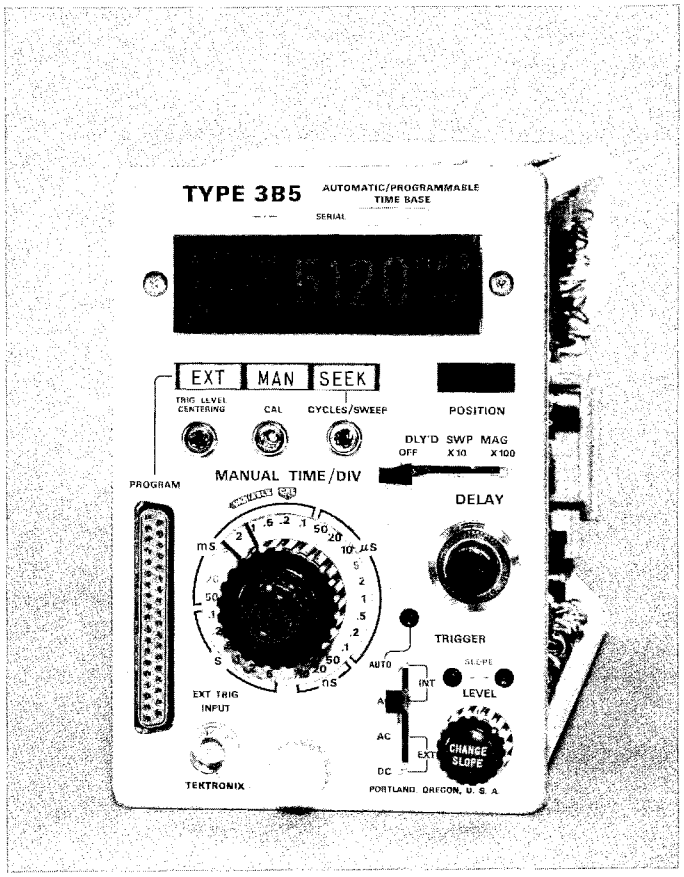
AUTOMATIC/PROGRAMMABLE TIME-BASE UNIT

- **AUTOMATIC TIME-BASE "SEEKING"**
- **PROGRAMMABLE FRONT-PANEL FUNCTIONS**
- **DIGITAL INDICATION OF CONTROL SETTINGS**
- **DELAYED SWEEP MAGNIFIER**

Used in association with the Type 3A5 Amplifier and P6030 Probe, the Type 3B5 automatically establishes a triggered time-base display upon receipt of the "seek" command from the probe. The time/division setting is automatically selected to provide a convenient display of 2 to 6 cycles. Lighted indicators in the front-panel window show the selected time/division setting. They also indicate when the time base is not triggered and when the manual variable time/division control is in the uncalibrated position.

The Type 3B5 features a delayed sweep magnifier for expanding the display by X10 or X100. A calibrated delay control selects the point in the display where magnification begins. When the sweep magnifier is in operation, the time/division readout is automatically corrected to indicate the magnified setting, and a "magnified sweep" indication lights up in the readout window.

The automatic "seek" feature of the Type 3B5 is overridden when the manual time/division control is used. Both the "seek" feature and manual operation of the control setting are overridden when the instrument is programmed remotely using the Type 263 External Programmer.



OPERATING MODES

SEEK, MANUAL AND EXTERNAL

Manual or external operation selected by front-panel pushbuttons. Seek operation selected by front-panel pushbutton or pushbutton on the P6030 Probe supplied with the Type 3A5 Amplifier.

SEEKING CHARACTERISTICS

TIME BASE

5 s/div to 0.1 μs/div.

SEEKING TIME

≤500 ms (time required to complete one "seek" operation).

CYCLING TIME

2 to 4 s ("seek" command button held down continuously).

LOGIC CIRCUIT RESPONSE

Seeking circuitry functions for signal rep-rates from 30 Hz to 20 MHz.

GENERAL CHARACTERISTICS

READOUT FACILITY

Bulb-and-film digits ½ inch high. Readout information includes 5 s/div to 10 ns/div sweep times, plus "Magnified Sweep," "Not Triggered," and "Uncalibrated" indications.

TIME BASE

10 ns/div to 5 s/div in 27 calibrated steps, 1-2-5 sequence. Accurate within 3% from 0.1 μs/div to 1 s/div; within 5% at 10, 20, or 50 ns/div and at 2 or 5 s/div. A manual control provides uncalibrated variable time/div settings between all steps and to approx 12.5 s/div.

DELAYED SWEEP MAGNIFIER

Expands the display by a factor of X10 or X100. X10 range magnifies time/division settings from 5 s/div to 1 μs/div. X100 range magnifies time/division settings from 5 s/div to 10 μs/div. Accuracy is within 3% for all magnified sweep times except the 5 and 2 s/div (within 5%). VARIABLE DELAY: 10-turn control determines portion of sweep to be magnified.

TRIGGER MODES

Internal: AC-coupled or Auto. External: AC-coupled or DC-coupled.

TRIGGER REQUIREMENTS

Internal AC, Auto (with Type 3A5): 0.5 div of signal displayed, 50 Hz to 8 MHz, increasing to 2 div at 20 MHz.

External AC: 1 V to 40 V peak to peak, 50 Hz to 20 MHz.

External DC: 2.5 V to 40 V peak to peak, DC to 10 Hz; 1 V to 40 V peak to peak, 10 Hz to 20 MHz.

PROGRAMMABLE FUNCTIONS

Time/div, magnifier range, trigger-mode, slope, and coupling, by contact closure to ground. Horizontal positioning, trigger level, and magnifier delay by analog current.

WEIGHTS

Net weight	5 lbs	2.3 kg
Domestic shipping weight	~11 lbs	~5.0 kg
Export-packed weight	~14 lbs	~6.4 kg

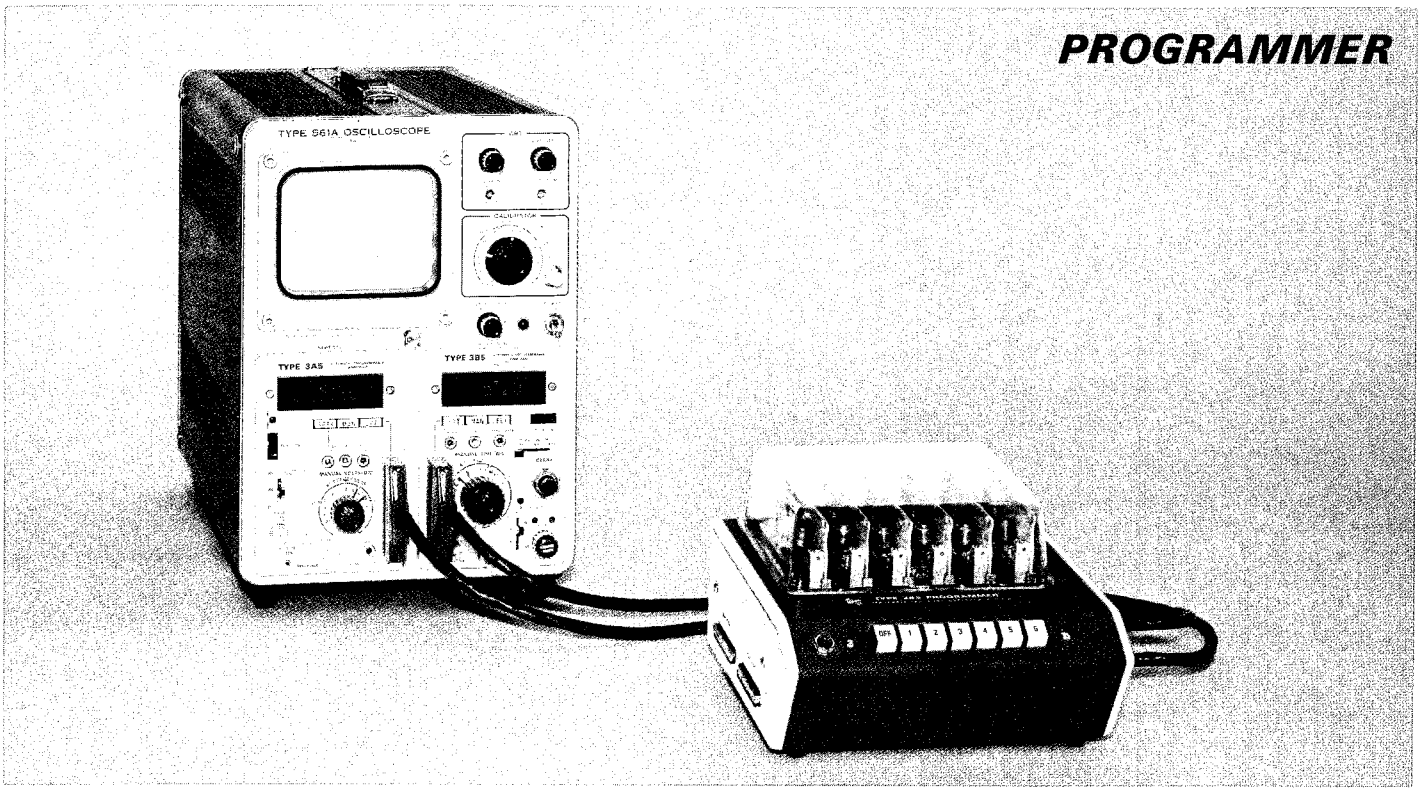
STANDARD ACCESSORIES

37 pin connector (131-0422-00); connector cover (200-0660-01); two instruction manuals (070-0538-00).

TYPE 3B5 AUTOMATIC/PROGRAMMABLE TIME BASE UNIT $890

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

PROGRAMMER



COMPLETE SYSTEM FOR FAST PRODUCTION-LINE TESTING

FAST FREQUENCY AND TIME MEASUREMENTS

REDUCED OPERATOR ERROR

SIMPLE, CONVENIENT OPERATION

The Type 561A Oscilloscope* combined with the Type 3A5, 3B5 Plug-In Units and the Type 263 Programmer, offers the ideal system for making production-line measurements quickly and conveniently . . . and with less chance for operator error. The system allows measurements to be made at the push of a button without changing the manual controls of either plug-in unit. The oscilloscope settings are programmed for a particular measurement and read out in large, lighted indicators on the face of the plug-in units. After the initial program is established, this new system can be operated by personnel with little or no technical training.

The Type 263 Programmer provides the facility for controlling the Type 3A5 and 3B5 Automatic/Programmable Plug-In Units remotely. Pushbuttons on the front panel of the Programmer select any one of six internal program cards. Each card, after initial set-up, establishes the plug-in functions required for a particular test or measurement. More than one programmer can be cascaded for applications requiring more than the six initial measurement set-ups. The plug-in type program cards are identical, allowing them to be interchanged or arranged in any sequence. New programs are easily established by relocating small jumpers and changing the potentiometer settings on the cards.

*Also Type 564 Oscilloscope for storage applications.

TYPE 263 CHARACTERISTICS

PROGRAM CAPABILITIES
All operational controls of the Type 3A5 and Type 3B5 are programmable except the variable volts/division and time/division functions. Program established by jumper placement and potentiometer setting on the program cards.

OUTPUT CABLES
Two 3 ft cables with multipin connectors.

CONSTRUCTION
Cast aluminum with wrap-around steel cabinet. Blue vinyl finish.

DIMENSIONS AND WEIGHTS

Height	5¾ in	14.6 cm
Width	8¾ in	22.2 cm
Depth	9 in	22.9 cm
Net weight	5½ lbs	2.5 kg
Domestic shipping weight	~12 lbs	~ 5.5 kg
Export-packed weight	~18 lbs	~ 8.2 kg

STANDARD ACCESSORIES
Eleven electrical leads (175-0674-00); two instruction manuals (070-0535-00).

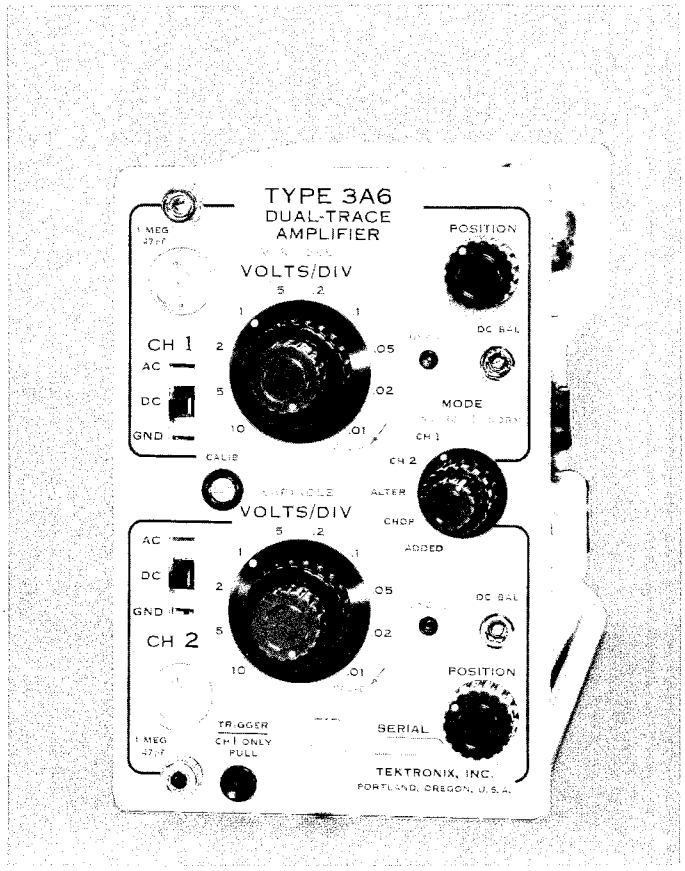
TYPE 263 PROGRAMMER, with 6 program cards	$325
extra program cards, order 670-0226-00 ea	30
TYPE 561A OSCILLOSCOPE, less plug-in units	500
TYPE 3A5 AMPLIFIER UNIT	760
TYPE 3B5 TIME-BASE UNIT	890

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

TYPE 3A6

DC-to-10 MHz DUAL-TRACE UNIT

- **TWO IDENTICAL CHANNELS**
- **FIVE OPERATING MODES**
- **DC TO 10 MHz BANDWIDTH**
- **10 mV/DIV TO 10 V/DIV CALIBRATED DEFLECTION FACTOR**



The Type 3A6 Amplifier is a general-purpose, dual-trace plug-in unit designed for use in the Types 561A, 564 and 565 Oscilloscopes. It can also be used in the Type 567/6R1A or Type 568/230 when digital readout is not required.

The Type 3A6 features two separate channels with identical characteristics. It can be operated in any one of five modes for a variety of single and dual-trace displays. Two Type 3A6's can be used for X-Y curve tracing, but without synchronized switching or channel pairing. An internal 260-nanosecond signal-delay allows viewing the leading edge of the waveform when using a high-speed time base such as the Type 3B1, 3B3, 3B4 or 3B5 Time-Base Unit*.

BANDWIDTH
DC to 10 MHz at 3-dB down. AC-coupled low-frequency response is 2 Hz direct, 0.2 Hz with 10X probe.

RISETIME
Approximately 35 ns.

DEFLECTION FACTOR
10 mV/div to 10 V/div in 10 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 25 V/div.

INPUT RC
1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE
600 V combined DC + peak AC.

OPERATING MODES
Includes Channel 1 only (polarity of Channel 1 can be changed to provide 180° inversion); Channel 2 only; alternate—Channel 1 and 2 switched electronically on alternate sweeps; Chopped—successive 4 μs (approx) segments of each channel are displayed at an approx 125 kHz rate per channel (chopped transient blanking is provided); Added—outputs of Channel 1 and 2 added algebraically.

**The Type 3A6 can be used with a Type 2B67 or Type 3B2 Time-Base Unit, but it will not usually be possible to view the entire leading edge of the triggering waveform. Same applies when the unit is used with Types 565 and RM565 Oscilloscopes.*

INTERNAL TRIGGER SIGNAL
(for the time base) Selectable from the output of Channel 1 only or from the combined output of the unit. Triggering from Channel 1 only permits viewing the true relationship between two signals when operating the unit in either alternate or chopped mode.

WEIGHTS

Net weight	5¾ lbs	2.6 kg
Domestic shipping weight	~ 9 lbs	~4.1 kg
Export-packed weight	~13 lbs	~5.9 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0419-00).

TYPE 3A6 AMPLIFIER UNIT $525

OPTIONAL ACCESSORIES

The probes recommended for use with this instrument satisfy most measurement requirements. Additional probes are available that may be better suited for a particular application, including high-voltage and current measurements. See accessory pages at the rear of the catalog for information on these and other items.

P6028 1X Probe Package, order 010-0074-00 ..... $12.50
P6006 10X Probe Package, order 010-0127-00 ..... 22.00
P6007 100X Probe Package, order 010-0150-00 ..... 22.00

U. S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page.

DIFFERENTIAL COMPARATOR UNIT

UP TO 10 MHz BANDWIDTH

20,000:1 COMMON-MODE REJECTION

11,000 cm EFFECTIVE SCREEN HEIGHT

The Type 3A7 High-Gain Differential Comparator adds to the measurement capabilities of Type 561A, 564, and 565 Oscilloscopes. It can also be used in the Types 567/6R1A and 568/230, but does not provide digital readout. Used with Type 129 Power Supply, the Type 3A7 can drive recording equipment, X-Y plotters, oscilloscopes, or other indicators.

As a differential input amplifier, the dynamic range of the 3A7 Unit permits common-mode signals up to ±15 volts in amplitude to be applied to the amplifier without attenuation. With a rejection ratio of about 20,000 to 1 for DC or low-frequency signals, differential signals of 1 mV or less on large common-mode signals can be measured. A front-panel attenuator permits the acceptance of common-mode voltages up to 500 V.

As a differential comparator, voltage measurements using the slide-back technique can be made with this unit. The high accuracy and stability of the DC comparison voltage, added differentially to the input signal, makes precise voltage measurements possible. Using this mode of operation, the 3A7 Unit has an effective screen height of ±11,000 cm. This is equivalent to a ±11-volt dynamic signal range at a deflection factor of 1 mV/cm. Within this range, calibrated ±DC comparison voltages can be added differentially to the input signal to permit a maximum of about 0.001% or 100 μV per mm to be resolved.

CALIBRATED DEFLECTION FACTOR

1 mV/div to 50 V/div, depending on millivolts/div and attenuator settings. Accuracy of millivolts/div positions is within 3%. Uncalibrated, continuous variation between steps and to approx 125 V/div.

mV/DIV	BANDWIDTH (—3 dB)† FREQUENCY	RISETIME
50 mV to 10 mV/div	DC to ≥10 MHz	≤35 ns
5 mV/div	DC to ≥ 8 MHz	≤44 ns
2 mV/div	DC to ≥ 6 MHz	≤58 ns
1 mV/div	DC to ≥ 4 MHz	≤88 ns

†Low-frequency 3-dB point, AC coupled: 2 Hz direct, 0.2 Hz with 10X probe.

INPUT CHARACTERISTICS

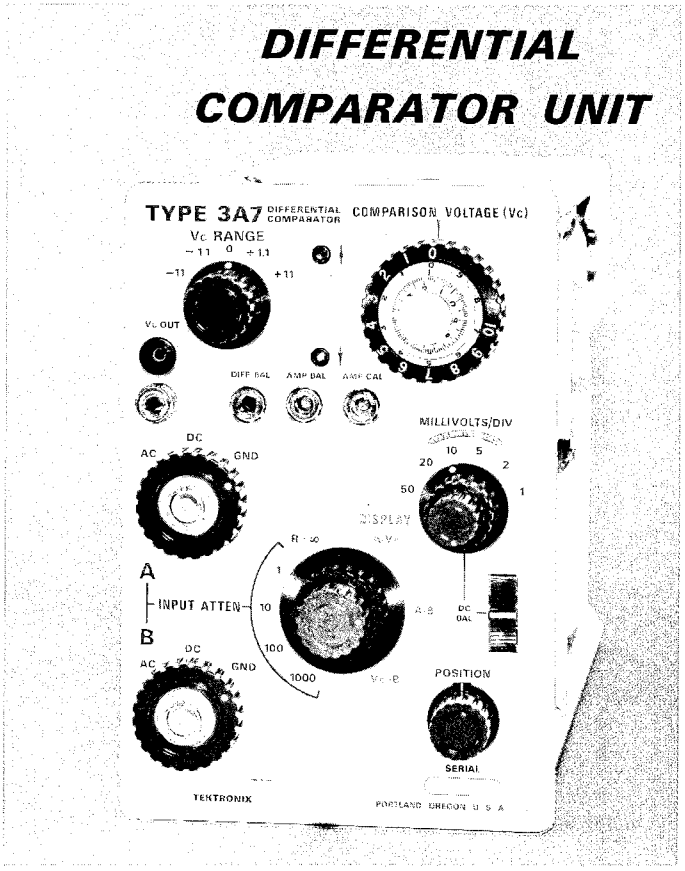
INPUT ATTEN	MAX PEAK INPUT VOLTS Common or Differential Mode	MAX INPUT ATTEN ERROR
R ≈ ∞	±15 V	*
1X	±15 V	**
10X	±150 V	±0.05%
100X	±500 V	±0.15%
1000X	±500 V	±3%

*Input R ≈ 10,000 to 50,000 MΩ.

**1X input R within ±0.1% of 10X input R.

INPUT RC

1 megohm paralleled by approx 20 pF.



COMMON-MODE REJECTION RATIO AT 1 mV/div	
DC COUPLED	≥20,000:1 with ±15 VDC or 30 V P to P AC, DC to 20 kHz
AC COUPLED	≥1000:1 with 30 V P to P at 60 Hz, to ≥20,000:1 at 20 kHz
HF (AC OR DC COUPLED)	≥500:1 with 30 V P to P at 500 kHz

COMPARISON VOLTAGE

0 to ±1.1 V, or 0 to ±11 V. Accuracy: ± (0.15% of indicated value plus 0.05% of V_c Range).

OVERDRIVE RECOVERY

Recovers to within 10 mV of reference signal within 300 ns after the signal returns to the screen. Certain overdrive signals can cause an additional slow (thermal) shift of up to 5 mV in the reference level.

WEIGHTS

Net weight	5¼ lbs	2.4 kg
Domestic shipping weight	~ 9 lbs	~4.1 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0477-00).

TYPE 3A7 DIFFERENTIAL COMPARATOR $635

OPTIONAL ACCESSORIES

P6028 1X Probe Package, order 010-0074-00 ..... $12.50

P6023 10X Probe Package, adjustable attenuation ratio helps maintain common-mode rejection, order 010-0167-00 40.00

P6007 100X Probe Package, order 010-0150-00 ..... 22.00

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

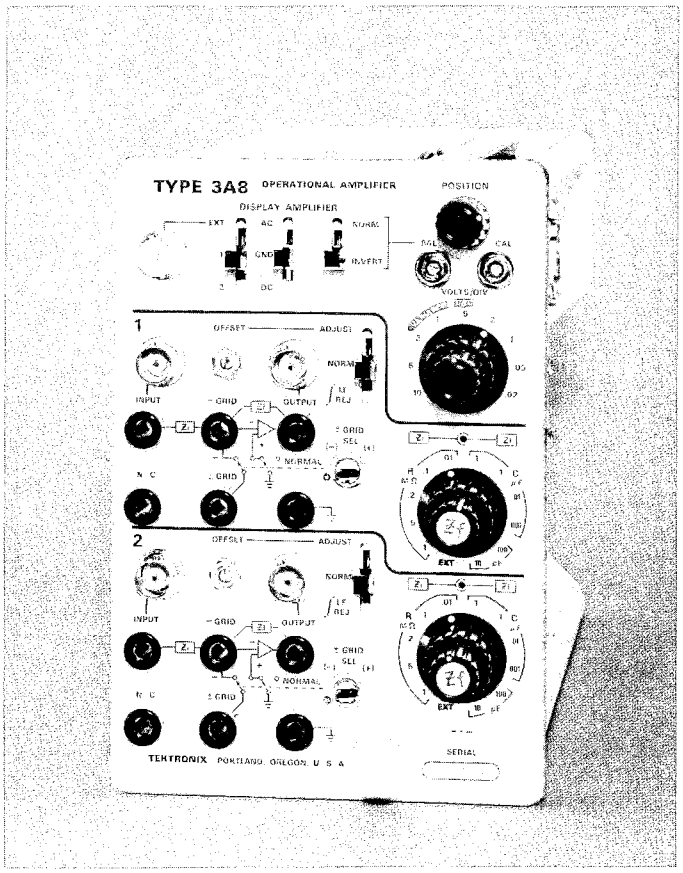
TYPE 3A8

OPERATIONAL AMPLIFIER UNIT

- ***TWO OPERATIONAL AMPLIFIERS***
- ***10 MHz OR GREATER GAIN-BANDWIDTH PRODUCT***
- ***15,000 OR GREATER OPEN-LOOP GAIN***
- ***SELECTABLE INTERNAL Z_i AND Z_f COMPONENTS***
- ***PROVISION FOR EXTERNAL Z_i AND Z_f COMPONENTS***

The Type 3A8 Operational Amplifier performs precise integration, differentiation, function generation, linear and nonlinear amplification. The unit can be used in any Tektronix 560-Series Oscilloscope including the Type 561A, 564, or Type 565. It can also be used in the Type 567/6R1A and Type 568/230, but without digital presentation of the measurement. Not for use with the Type 560. Signals from the operational amplifiers can be displayed on the oscilloscope and/or fed to other devices.

Used with the Type 129 Power Supply, the Type 3A8 can drive recorders, X-Y plotters, oscilloscopes, and other indicators.



DISPLAY AMPLIFIER

BANDWIDTH
DC to ≥3.5 MHz at 3-dB down.

RISETIME
≤100 ns.

DEFLECTION FACTOR
20 mV/div to 10 V/div in 9 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 25 V/div.

INPUT RC
1 megohm paralleled by 47 pF.

OPERATING MODES
Signal source selection from either operational amplifier or an external signal. AC or DC coupling. The display can be inverted to provide the desired deflection polarity.

OPERATIONAL AMPLIFIERS

OPEN-LOOP GAIN
≥15,000 at DC.

OPEN-LOOP GAIN-BANDWIDTH PRODUCT
≥10 MHz.

OUTPUT RANGE
±25 V, ±7.5 mA. Protected against shorts to ground.

OUTPUT IMPEDANCE
≤30 Ω at 1 MHz for compensated unity-gain amplifier.

INPUT OFFSET
Voltage: adjustable to zero ±500 μV (front-panel control).
Current: adjustable to zero ±50 pA (calibration control).

DRIFT
Typically <0.5 mV/hour referred to input after 30 minute warmup), averaged over 10 hours.

FEEDBACK
Provisions for negative and/or positive feedback. Negative feedback utilizes internal and/or external impedances; positive feedback utilizes external impedances only.

SELECTABLE INPUT AND FEEDBACK COMPONENTS
Front-panel switches allow independent selection of the following resistors and capacitors in any combination as Z_i and Z_f: 0.01, 0.1, 0.2, 0.5 and 1 megohm; 10 pF, 100 pF, 0.001, 0.01, 0.1 and 1 μF. All values are ±1% except 10 pF and 100 pF which are adjustable.

INTEGRATION LOW-FREQUENCY REJECT
An RC network which prevents integration below approx 1 Hz (voltage or current offset drift) can be switched in or out as needed. Other networks can be connected externally.

TERMINAL ADAPTERS

Two shielded terminal adapters are included for construction of external circuitry for custom applications. Over one hundred suggested circuits for special applications are shown in the instruction manual.

WEIGHTS

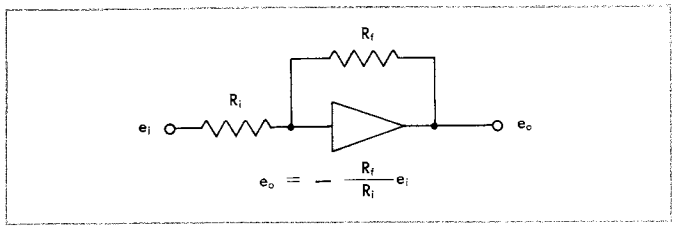
Net weight	4½ lbs	2.0 kg
Domestic shipping weight	~9 lbs	~4.1 kg
Export-packed weight	~13 lbs	~5.9 kg

STANDARD ACCESSORIES

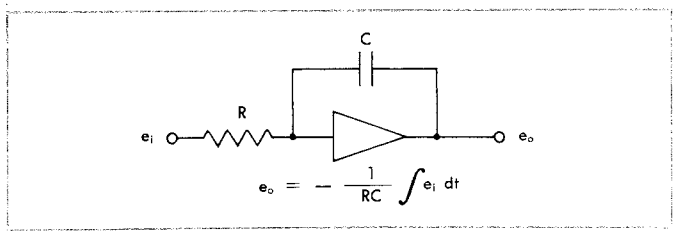
Two terminal adapters (013-0048-01); two terminal shields (013-0049-01); two BNC to binding post adapters (103-0033-00); two instruction manuals (070-0507-00).

TYPE 3A8 OPERATIONAL AMPLIFIER UNIT $600

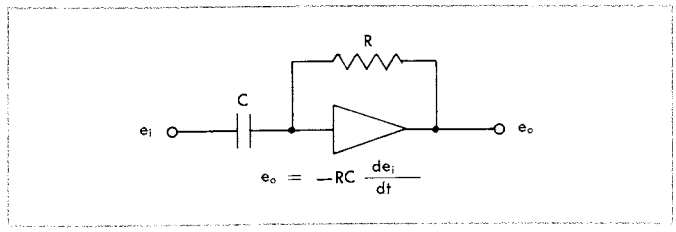
BASIC OPERATING MODES



AMPLIFICATION is determined by the ratio of R_f to R_i due to the high open-loop gain. This provides convenient signal step-up or step-down with low output impedance. External compensation extends the closed-loop gain-bandwidth (see Compensating Adapter).

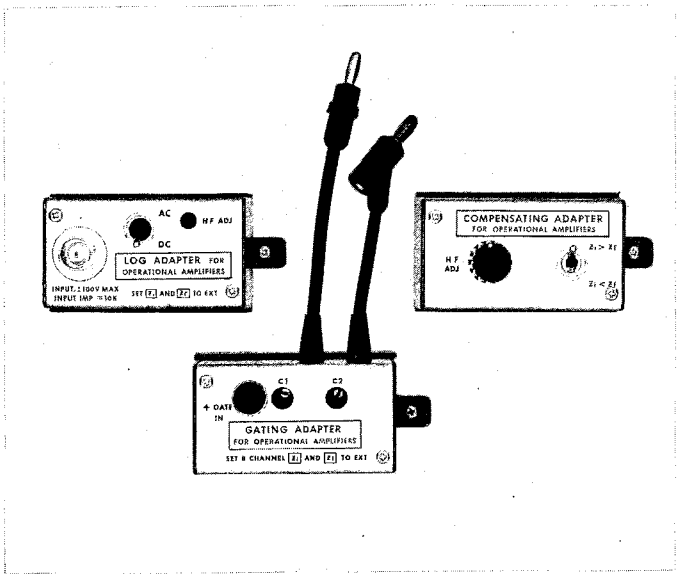


INTEGRATION is obtained by placing a capacitor in the feedback loop. Unlike the passive RC integrator, this circuit permits output loading. Typical applications include magnetic core B-H loop studies.



DIFFERENTIATION is accomplished by placing a capacitor in the input circuit. The unique characteristic of this circuit is the extraction of higher frequency signal components without loss of signal level. It can detect minute information such as transients and slope changes.

OPTIONAL ACCESSORIES



COMPENSATING ADAPTER

For extending the high-frequency performance of either operational amplifier when the internal Z_i and Z_f resistors are used in any combination for gain or attenuation. The adapter compensates for stray capacitance associated with the internal resistors, providing an adjustment for optimum HF response. Order Part Number 013-0081-00 ..... $35

LOG ADAPTER

Mixed low- and high-amplitude signals can be measured using the Log Adapter. Pulses and transient waveforms spanning three voltage decades to plus 100 volts or minus 100 volts can be displayed and measured on the same trace. Order Part Number 013-0067-00 ..... $75

GATING ADAPTER

The Gating Adapter allows integration and display of repetitive signals by resetting the integrator to zero during sweep retrace time. The adapter uses Operational Amplifier "2" of the Type 3A8 to gate amplifier "1" on and off in response to an external gating signal, such as the +Gate signal from a Type 3B4 Time Base Plug-In Unit. The signal applied to amplifier "1" is then amplified, integrated, or differentiated only during the "on" time. Order Part Number 013-0068-00 ..... $75

Please refer to the catalog accessory pages for complete information on the above adapters.

PROBES

The probes recommended for use with the display amplifier of the Type 3A8 satisfy most measurement requirements. Additional probes are available that may be better suited for a particular application including high-voltage and current measurements. See accessory pages at the rear of the catalog for information on these and other items.

P6028 1X Probe Package, order 010-0074-00 ..... $12.50
P6006 10X Probe Package, order 010-0127-00 ..... 22.00
P6007 100X Probe Package, order 010-0150-00 ..... 22.00

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

TYPE 3A72

DC-to-650 kHz DUAL-TRACE AMPLIFIER UNIT

- **TWO IDENTICAL CHANNELS**
- **FIVE OPERATING MODES**
- **10 mV/DIV TO 20 V/DIV CALIBRATED DEFLECTION FACTOR**

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 any of five operating modes for a variety of single and dual-trace displays. This unit can be used in the Type 561A, Type 564, or Type 565 Oscilloscope. It can also be used in the Types 567/6R1A and 568/230, but without digital presentation of the measurement.

BANDWIDTH

DC to 650 kHz at 3-dB down. AC-coupled low-frequency response is 2 Hz direct, 0.2 Hz with 10X probe.

DEFLECTION FACTOR

10 mV/div to 20 V/div in 11 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/div.

INPUT RC

1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE

600 V combined DC + peak AC.

OPERATING MODES

Includes Channel 1 only (normal or inverted); Channel 2 only; Alternate—Channel 1 and 2 switched electronically on alternate sweeps; Chopped—successive 16-μs segments of each channel are displayed at an approx 30-kHz rate per channel. Chopped transient blanking is provided; Added—outputs of Channel 1 and 2 algebraically added.

MULTIPLE X-Y DISPLAYS

Obtained with two Type 3A72 Plug-In Units; both synchronization and automatic pairing are provided. With two Type 3A72's operated in the dual-trace mode, Channel 1 of the left-hand unit is always plotted against Channel 1 of the right-hand unit.

WEIGHTS

Net weight	5 lbs	2.3 kg
Domestic shipping weight	~ 8 lbs	~3.6 kg
Export-packed weight	~13 lbs	~5.9 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0274-00).

TYPE 3A72 AMPLIFIER UNIT $275

OPTIONAL ACCESSORIES

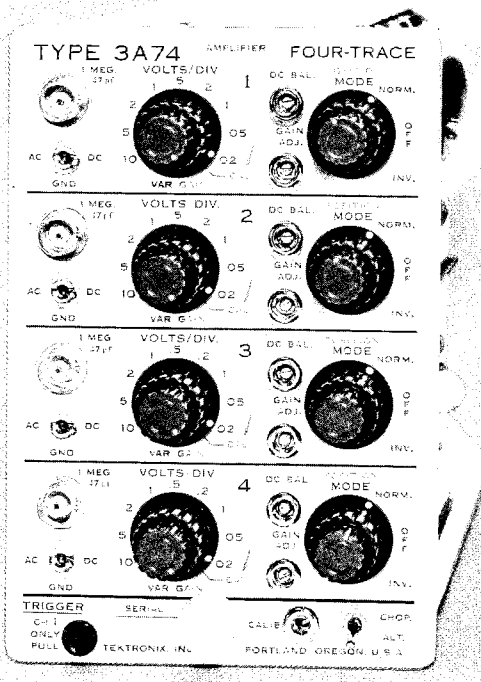
The probes recommended for use with this instrument satisfy most measurement requirements. Additional probes are available that may be better suited for a particular application, including high-voltage and current measurements. See accessory pages at the rear of the catalog for information on these and other items.

P6028 1X Probe Package, order 010-0074-00 ..... $ 12.50
P6006 10X Probe Package, order 010-0127-00 ..... 22.00
P6007 100X Probe Package, order 010-0150-00 ..... 22.00

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

DC-to-2 MHz FOUR-TRACE AMPLIFIER UNIT

- ***FOUR SEPARATE CHANNELS***
- ***ELECTRONIC CHANNEL SWITCHING***
- ***20 MV/CM TO 10 V/CM CALIBRATED DEFLECTION FACTOR***



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 the Type 561A, Type 564, Type 565, and in the Type 567/6R1A or Type 568/230 Oscilloscope. However, in the Type 567/6R1A or Type 568/230, the measurements will not be presented in digital form.

BANDWIDTH
DC to 2 MHz at 3-dB down. AC-coupled low-frequency response is 2 Hz direct, 0.2 Hz with 10X probe.

RISETIME
Approximately 0.17 μs.

DEFLECTION FACTOR
0.02 V/div to 10 V/div in 9 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 25 V/div.

INPUT RC
1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE
600 V combined DC + peak AC.

OPERATING MODES
Includes 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-μs segments of each channel are displayed at an approx rate per channel of: 250 kHz when using two channels; 167 kHz when using three channels; and 125 kHz when using four channels. Chopped transient blanking is provided.

MULTIPLE X-Y DISPLAYS
Obtained by using two Type 3A74 Plug-In Units; both synchronization and automatic pairing are provided. With two Type 3A74's, two, three or four independent displays may be obtained, properly paired: Channel 4 of the left-hand unit is always plotted against Channel 4 of the right-hand unit, Channel 3 versus Channel 3, etc.

INTERNAL TRIGGER SIGNAL (for the time-base)
From one of two sources as selected; either from the output of Channel 1 only or the combined output of the amplifier.

WEIGHTS

Net weight	6¼ lbs	2.8 kg
Domestic shipping weight	~10 lbs	~4.5 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES
Four BNC to binding-post adapters (103-0033-00); two instruction manuals (070-0347-00).

TYPE 3A74 AMPLIFIER UNIT $590

OPTIONAL ACCESSORIES

The probes recommended for use with this instrument satisfy most measurement requirements. Additional probes are available that may be better suited for a particular application, including high-voltage and current measurements. See accessory pages at the rear of the catalog for information on these and other items.

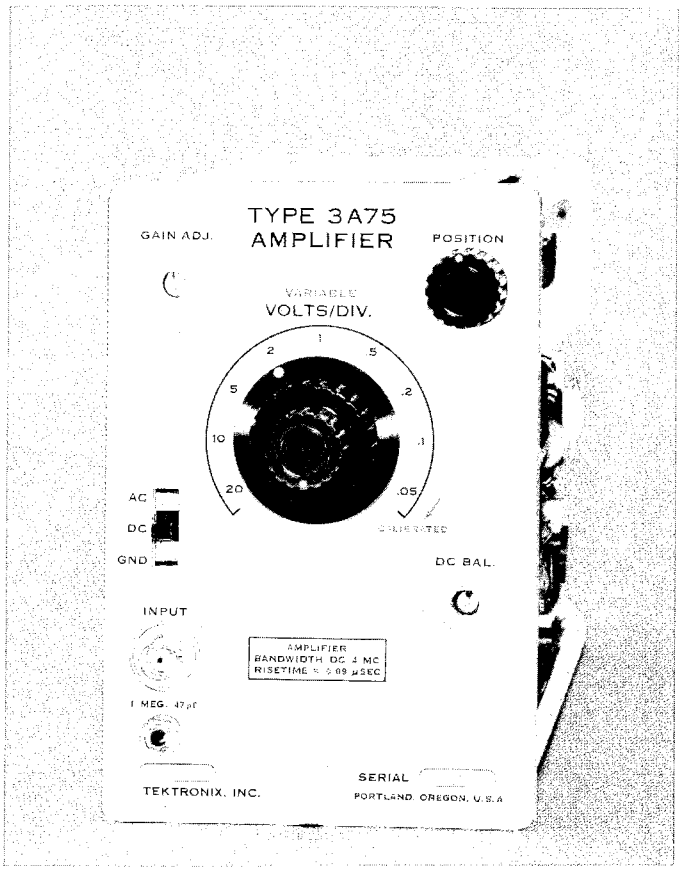
P6028 1X Probe Package, order 010-0074-00 ..... $12.50
P6006 10X Probe Package, order 010-0127-00 ..... 22.00
P6007 100X Probe Package, order 010-0150-00 ..... 22.00

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

TYPE 3A75

DC-to-4 MHz AMPLIFIER UNIT

- **DC TO 4 MHz BANDWIDTH**
- **50 mV/DIV TO 20 V/DIV CALIBRATED DEFLECTION FACTOR**



The Type 3A75 Amplifier is a general-purpose wide-band plug-in unit. It may be used in the Type 561A, Type 564, Type 565, or in the Type 567/6R1A and Type 568/230 Oscilloscope. Howver, in the Type 567/6R1A or Type 568/230, the measurement will not be presented in digital form. Used with the Type 129 Power Supply, the Type 3A75 can drive recorders, X-Y plotters, oscilloscopes and other indicators.

BANDWIDTH

DC to 4 MHz at 3-dB down. AC-coupled low-frequency response is 2 Hz direct, 0.2 Hz with 10X probe.

RISETIME

Approximately 0.09 μs.

DEFLECTION FACTOR

50 mV/div to 20 V/div in 9 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 50 V/div.

INPUT RC

1 megohm paralleled by approx 47 pF.

MAXIMUM INPUT VOLTAGE

600 V combined DC + peak AC.

WEIGHTS

Net weight	3½ lbs	1.6 kg
Domestic shipping weight	~ 6 lbs	~2.7 kg
Export-packed weight	~11 lbs	~5.0 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0275-00).

TYPE 3A75 AMPLIFIER UNIT $175

OPTIONAL ACCESSORIES

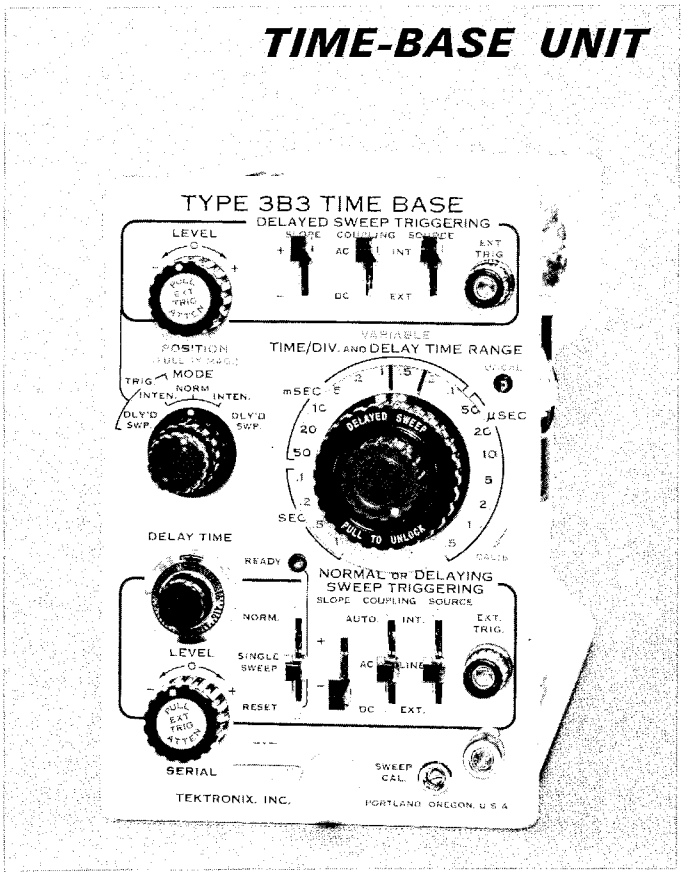
The probes recommended for use with this instrument satisfy most measurement requirements. Additional probes are available that may be better suited for a particular application, including high-voltage and current measurements. See accessory pages at the rear of the catalog for information on these and other items.

P6028 1X Probe Package, order 010-0074-00 ..... $ 12.50
P6006 10X Probe Package, order 010-0127-00 ..... 22.00
P6007 100X Probe Package, order 010-0150-00 ..... 22.00

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

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, Type 564, Type 565 (raster generation), and with the Type 567/6R1A or Type 568/230 Oscilloscope. However, with the Types 567/6R1A and 568/230, the measurements will not be presented in digital form.

TIME BASE

(Both normal and delayed sweeps.) 0.5 μs/div to 1 s/div in 20 calibrated steps, 1-2-5 sequence; accurate within 3%. Uncalibrated, continuously variable between steps and to approx 2.5 s/div. The Variable control operates with the normal sweep in the normal display mode, and with delayed sweep in all other display modes.

CALIBRATED SWEEP DELAY

Permits accurate setting and measuring of delay intervals from 0.5 μs to 10 s, continuously variable in 20 ranges. 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 accurate within 1% of full scale reading and delay time linearity is within 0.2% of full scale from 5 μs to 2 s 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.

5X MAGNIFIER

Increases the calibrated sweep rate to 0.1 μs/div. Magnified sweep accurate within 5%.

SINGLE SWEEP

Facilitates photographic recordings of waveforms.

TRIGGER

MODES

Normal-Sweep Trigger—manual or automatic.
Delayed-Sweep Trigger—manual only.

COUPLING

AC or DC.

SOURCES

Internal or External. Line triggering in normal sweep operation only. External trigger facility has two ranges: 0.5 to 15 V and 5 to 150 V, plus or minus polarity.

REQUIREMENTS

Internal Triggering—0.4 major graticule divisions from DC to 5 MHz, increasing to 1 major division at 10 MHz.
External Triggering—0.5 V from DC to 5 MHz, increasing to 1.25 V at 10 MHz. Requirements increase below 6 Hz with AC-coupling.

WEIGHTS

Net weight	5¼ lbs	2.3 kg
Domestic shipping weight	~ 9 lbs	~4.1 kg
Export-packed weight	~13 lbs	~5.9 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0365-00).

TYPE 3B3 TIME-BASE UNIT $585

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

TIME-BASE UNIT

- ***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. It can be used in the Type 561A, Type 564, Type 565 (raster generation), and in the Type 567/6R1A or Type 568/230 Oscilloscope.* The Type 3B4 is recommended for operation with Types 3A1, 3A6 and other wideband ($\geq$5 MHz) vertical amplifier plug-in units.

In addition to time base facilities, the 3B4 provides a DC-coupled external input amplifier with calibrated deflection factors from 0.2 to 5 V/div.

TIME BASE

0.2 μs/div to 5 s/div in 23 calibrated steps, 1-2-5 sequence; accuracy within 3% from 0.2 μs/div to 2 s/div, within 5% at 5 s/div. Uncalibrated, continuously variable between steps and to 12.5 s/div.

DIRECT READING MAGNIFIER

Provides sweep expansion up to X50 and extends the fastest sweep rate to 50 ns/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 accurate within 5%.

The MAGNIFIER control is also used to set the external input deflection factor when the TIME/DIV control is in the "Ext Input" position.

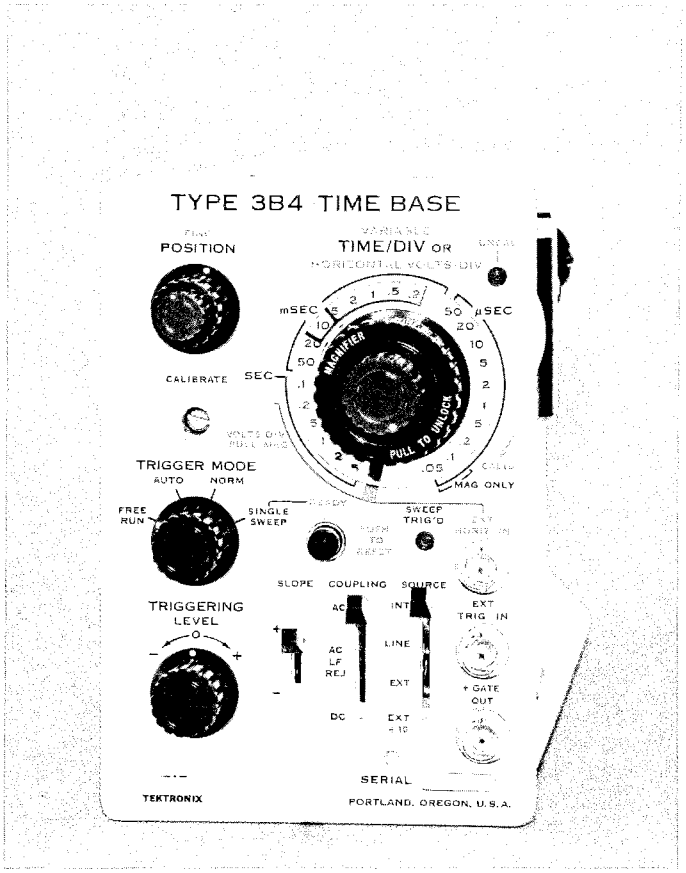
EXTERNAL HORIZONTAL INPUT

0.2 V/div to 5 V/div in 5 calibrated steps (max input $\pm$20 V); accuracy, when plug-in unit is matched to oscilloscope, is within 3%. The External Input Amplifier is DC-coupled.

SINGLE SWEEP

Facilitates waveform photography and operation in the Type 564 and RM564 storage oscilloscopes.

**In the Type 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

MODES

Manual, free-run, automatic (with bright base-line in the absence of a trigger).

COUPLING

AC, AC LF-Reject, DC.

SOURCES

Internal, Line, External, External ÷ 10. A front panel light indicates when the sweep is receiving a triggering signal—especially convenient when using an external trigger.

REQUIREMENTS

Internal Triggering—1 minor graticule division from DC to 20 MHz, with additional deflection required above 20 MHz. External Triggering—0.5 V to 15 V (EXT) or 5 V to 150 V (EXT ÷ 10) from DC to 20 MHz, with additional signal required above 20 MHz. Requirements increase below 30 Hz with AC-coupling.

WEIGHTS

Net weight	4½ lbs	2 kg
Domestic shipping weight	~ 7 lbs	~3.2 kg
Export-packed weight	~13 lbs	~5.9 kg

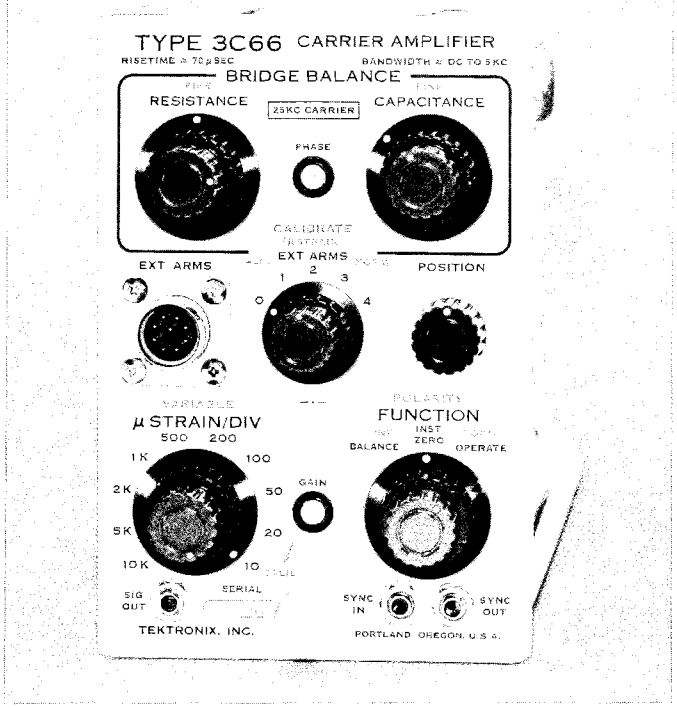
STANDARD ACCESSORIES

Two instruction manuals (070-0431-00).

TYPE 3B4 TIME BASE UNIT $400

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

CARRIER AMPLIFIER UNIT



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 the Type 561A, Type 564, Type 565, or in the Types 567/6R1A and 568/230 Oscilloscopes. However, in the Type 567/6R1A or Type 568/230 the measurements will not be presented in digital form. Used with the Type 129 Power Supply, the Type 3C66 can drive recorders, X-Y plotters, oscilloscopes, and other indicators.

The gap between mechanical engineering and electronic instrumentation is bridged with the Type 3C66 and suitable transducers. The total range of applications is as broad as the mechanical field itself and includes stress analysis, vibration studies, and fatigue tests. Typical quantities measured are force, displacement, acceleration, and strain.

The Type 3C66 operates on an AC carrier principle. It uses an AC bridge at the input to convert transducer signals into an amplitude-modulated carrier signal. The carrier signal is amplified by a high-gain AC amplifier and then demodulated to obtain the CRT deflection voltages.

Advantages of the 3C66 Carrier Amplifier include:

1. Desirable high gain with essentially no drift resulting from input signal conversion to carrier modulation followed by AC amplification.

2. Both static and dynamic strain are measured because of the DC to 5-kHz bandwidth.

3. Most of the undesired pickup from the input is eliminated because of selective filtering.

4. Reactive transducers (including some differential transformers) as well as capacitive and resistive transducers can be used with the unit.

5. Up to four simultaneous signals to the input bridge are possible.

BANDWIDTH
DC to 5 kHz at 3-dB down.

RISETIME
Approximately 70 μs.

CALIBRATED DEFLECTION FACTOR
10 microstrain/div (micro-inches 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.

AMPLIFIER INPUT
Input is to an AC bridge with 25-kHz 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.

NOISE
Typically equivalent to an input of 2.0 microstrain (peak to peak) at maximum calibrated sensitivity. This approximates an RMS noise of 0.5 microstrain.

DRIFT
Drift of the over-all system is primarily a function of the transducer stability. The Type 3C66 Amplifier system is essentially drift free.

GAGE FACTORS
Factors from 1 to 6 are usable without changing the steps of the sensitivity control. The range of factors is compensated for by adjusting the Gain Adjust Control.

EQUIVALENT DC SENSITIVITY
A comparable DC amplification system would require approximately 10 microvolts/div sensitivity for the same amount of power applied to the Type 3C66.

TYPE 3C66

CAPACITIVE TRANSDUCERS
Used in conjunction with a four-arm resistive bridge results in the following maximum useful sensitivities: 120-ohm bridge, 1 pF/div; 1000-ohm bridge, 0.2 pF/div; useful sensitivities are slightly lower when using long cables.

INDUCTIVE TRANSDUCERS
Must have characteristics compatible with the 25-kHz carrier frequency to function properly. Linear-variable-differential transformers designed for nominal carrier frequencies of 2 kHz and higher usually operate satisfactorily without additional circuitry.

TRANSDUCER CABLE
Either 3-wire or 4-wire shielded microphone cable gives the best results in most applications.

CAPACITANCE BRIDGE BALANCE
A vernier control allows compensation for an unbalance of up to 250 pF across any external resistive arm of the input bridge.

RESISTIVE BRIDGE BALANCE
A vernier control provides sufficient range to compensate for most standard transducers and strain gages.

GAGE RESISTANCE RANGE
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 SWITCH
A rotary switch connects a calibration resistor across the strain gage electrically to simulate an external mechanical strain. The calibration resistor supplied with the Type 3C66 unit simulates a —400 microstrain unbalance of the bridge and is suitable for most strain gage applications. The calibration resistor is mounted on a handy plug-in receptacle. No special gage dial is necessary for the unit.

To aid in calibration, a nomograph is included in the instruction manual. This nomograph relates calibration of the supplied resistor to gage factors and strain gage resistances.

To include the gage factor in the calibration, merely increase or decrease the amplifier gain proportionally.

SYNC IN AND OUT CONNECTORS
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
DC coupled with an output of about 3 V for each major division of CRT display. DC level is adjustable to 0 V by an internal control.

WEIGHTS

Net weight	5 lbs	2.3 kg
Domestic shipping weight	~ 9 lbs	~4.1 kg
Export-packed weight	~14 lbs	~6.4 kg

STANDARD ACCESSORIES
Synchronizing cable, RG174/U (012-0063-00); 4-wire 15 ft shielded connector cable (012-0040-00); two instruction manuals (070-0357-00).

TYPE 3C66 AMPLIFIER UNIT $400

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

TYPE 3C66 CARRIER AMPLIFIER BLOCK DIAGRAM

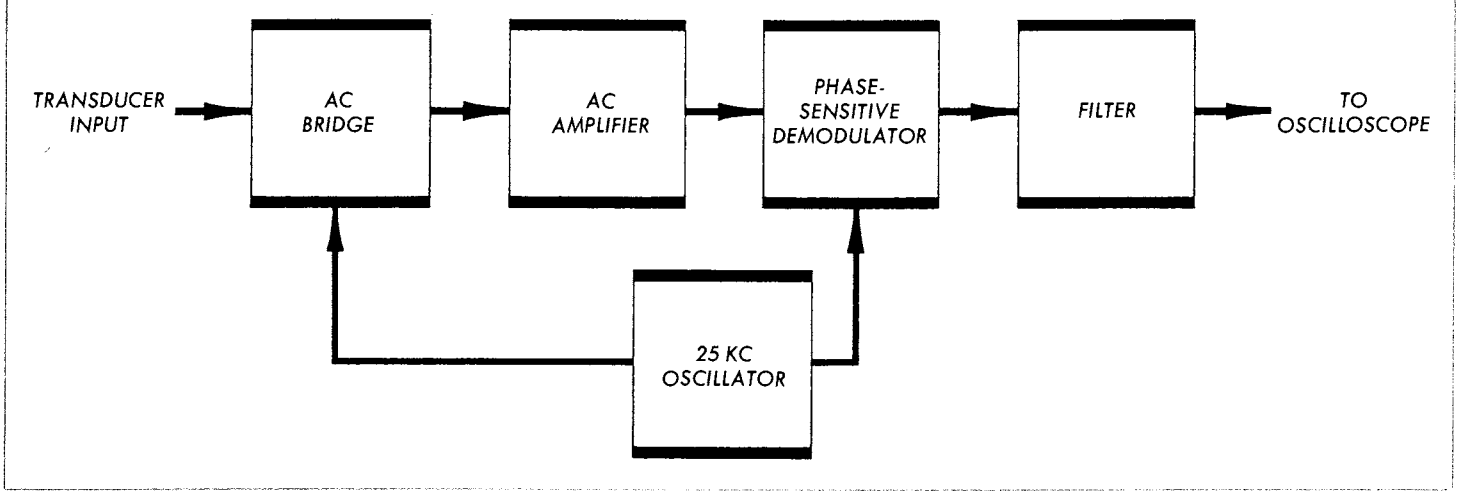
The input circuit for the unit is an AC bridge that has an external transducer connected into one or more of the bridge arms. Excitation voltage for the bridge is obtained from the 25-kHz oscillator.

In operation, the transducer signals unbalance the bridge to modulate the 25-kHz 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 over-all sensitivity of the unit.

The amplified modulation sidebands are applied to the phase-sensitive demodulator where a carrier is added in proper phase. The carrier permits only the desired phase to be demodulated.

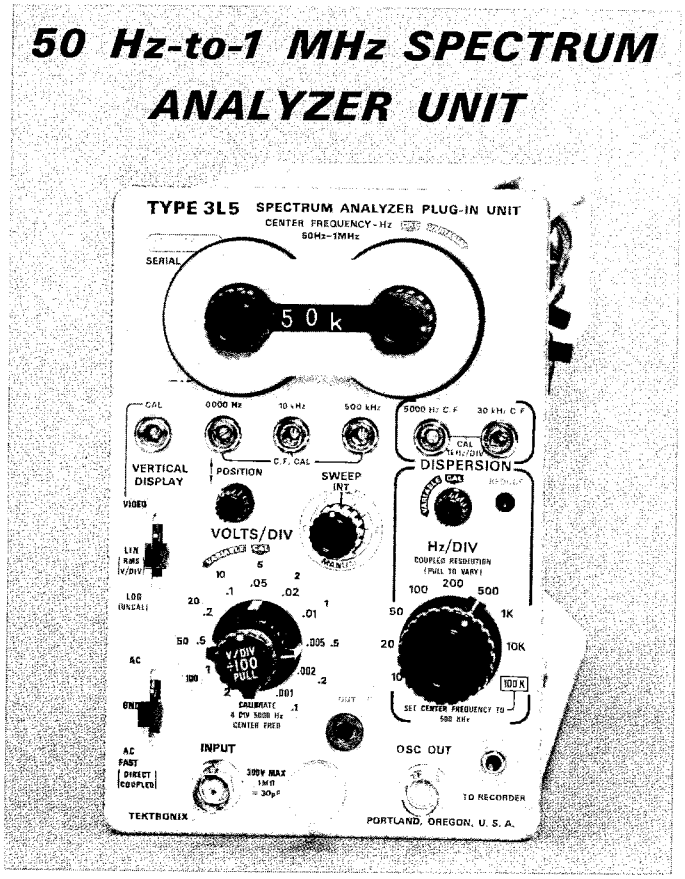
The output of the demodulator circuit is applied to a filter network where the undesirable modulation components are eliminated. The output from the filter is then applied to the associated oscilloscope through the interconnecting plug. The signal applied to the oscilloscope corresponds exactly to the signal applied to the input bridge circuit by the external transducer.



50 Hz-to-1 MHz SPECTRUM ANALYZER UNIT

NEW

- CALIBRATED VERTICAL DEFLECTION
- CALIBRATED DISPERSION
- 10 Hz TO 1 MHz IN ONE DISPLAY
- TIME-BASED OR FREQUENCY-BASED DISPLAYS
- REPETITIVE OR MANUAL SCAN
- RECORDER OUTPUT
- SOLID-STATE DESIGN



The Type 3L5 operates over a center-frequency range of 50 Hz to 1 MHz, and provides accurate spectral and time-based displays from 10 Hz to 1 MHz. Calibrated volts/div and Hz/div controls make the Type 3L5 as easy to use as the Type 561A or 564 Oscilloscope in which it operates. The Type 3L5 can be used with a Type 2B67, 3B1, 3B3, 3B4, or 3B5 Time Base Unit.* Used with Type 129 Power Supply, the Type 3L5 can drive recording equipment, X-Y plotters, oscilloscopes or other indicators.

Resolution bandwidth extends from 10 Hz to 500 Hz. High-resolution spectral displays can be viewed in their entirety (even at the very slow sweep rates required for maximum resolution) with the Type 564 Storage Oscilloscope. Stored displays can also be compared with subsequent displays, and can be easily photographed for permanent record.

Applications include vibration studies, waveform analysis, and noise measurements.

*Time Base Units with serial numbers under those listed require a simple modification to provide a sweep signal to the Analyzer. Type 2B67: 15180, Type 3B1: 4040, Type 3B3: 4270, Type 3B4: 740.

SPECTRAL DISPLAYS

CENTER FREQUENCY RANGE

50-Hz to 990-kHz, calibrated in 10-Hz, 100-Hz, 1-kHz and 10-kHz steps. Continuously variable uncalibrated between steps and to 1 MHz.

CENTER FREQUENCY	ACCURACY
50 Hz to 990 Hz	±(5% + 50 Hz + 20 Hz/°C change)
1000 Hz to 9900 Hz	±(5% + 100 Hz + 20 Hz/°C change)
10 kHz to 99 kHz	±(5% + 3 kHz + 200 Hz/°C change)
100 kHz to 990 kHz	±(5% + 10 kHz + 200 Hz/°C change)

DEFLECTION FACTOR

10 μV/div to 2 V/div in calibrated RMS steps (1-2-5 sequence), accurate within 5% (within 8% at 10 μV/div to 500 μV/div) for linear displays. Uncalibrated control provides continuous variation between steps, reduces gain by a factor of approx 3.

CALIBRATED DISPERSION

10 Hz/div to 100 kHz/div in 9 steps, accuracy within 5%, from 50 Hz to 9900 Hz, within 10% from 10 kHz to 990 kHz. Linearity within 3%.

COUPLED RESOLUTION

≤10 Hz to ≥500 Hz, coupled with calibrated dispersion positions and separately switchable.

DISPLAY FLATNESS

±0.5 dB from 10 Hz to 1 MHz, at switch positions from 10 mV/div to 2 V/div; +0.5 dB, −3 dB from 10 Hz to 1 MHz at switch positions from 1 mV/div to 5 mV/div.

NOISE

≤5 μV RMS.

INCIDENTAL FM

≤3 Hz from 50 Hz to 9900 Hz; ≤10 Hz from 9900 Hz to 990 kHz.

DYNAMIC RANGE

≥60 dB in LOG (uncalibrated) mode.

INTERMODULATION DISTORTION
>50-dB down from 6 cm in LOG mode.

RECORDER OUTPUT
5 to 15 mV for 6-cm display, 600-Ω source resistance, DC coupled.

LOCAL OSCILLATOR OUTPUT
From 2 MHz to 3 MHz; ≥1 V peak to peak.

SWEEP MODES
Manual and internal. Accuracy of frequency measurements can be increased using manual scan and monitoring the local oscillator output with a frequency counter. Type 561A and 564 Oscilloscopes with time base units provide an internally-coupled sweep to the Analyzer.

TIME-BASED DISPLAYS

BANDWIDTH
10 Hz to 1 MHz above 5 mV/div.

DEFLECTION FACTOR
1 mV/div to 100 V/div in calibrated P to P steps (1-2-5 sequence), accurate within 3% (within 6% from 50 mV/div to 1 mV/div). Uncalibrated control provides continuous variation between steps, reduces gain by a factor of approx 3.

INPUT RC
1 megohm paralleled by approx 30 pF.

OTHER CHARACTERISTICS

WEIGHTS

Net weight	5¾ lb	2.6 kg
Domestic shipping weight	~ 8 lb	~3.6 kg
Export-packed weight	~12 lb	~5.5 kg

STANDARD ACCESSORIES
1X probe (010-0193-00); banana-to-banana cable (012-0031-00); BNC-to-banana cable (012-0091-00); plug (134-0052-00); plug protector (134-0076-00); two instruction manuals (070-0630-00).

TYPE 3L5 SPECTRUM ANALYZER UNIT $1050

OPTIONAL ACCESSORIES

The standard 1X probe supplied with the analyzer satisfies most measurement requirements. Optional probes may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

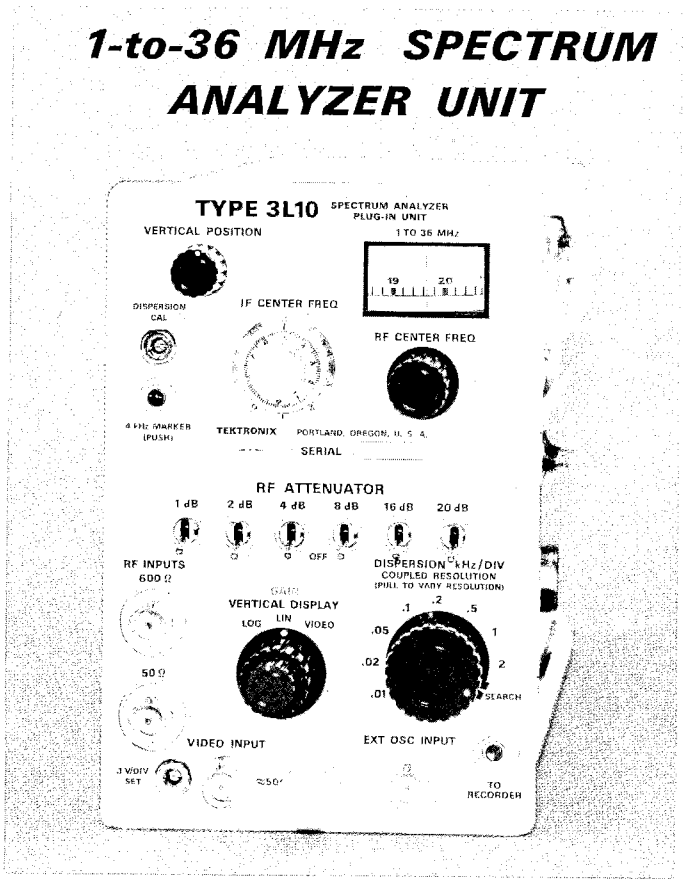
P6007 100X Probe Package, order 010-0150-00 ..... $22

P6012 10X Probe Package, order 010-0203-00 ..... $27

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

1-to-36 MHz SPECTRUM ANALYZER UNIT

- ***CALIBRATED DISPERSION***
- ***COUPLED RESOLUTION***
- ***CRYSTAL-CONTROLLED SWEPT OSCILLATOR***
- ***IMAGE REJECTION***
- ***RECORDER OUTPUT***
- ***STORED SPECTRAL DISPLAYS***



This 1-to-36 MHz Analyzer permits low-cost spectrum analysis with the compact Type 561A Oscilloscope, and stored or non-stored displays with the equally-compact Type 564 Oscilloscope. The Type 3L10 can be used with a Type 2B67, 3B1, 3B3, 3B4 or 3B5 Time Base Unit.*

CALIBRATED DISPERSION from 10 Hz/div to 2 kHz/div makes frequency measurement as easy and accurate as time measurement. Frequency differences can be read directly from the CRT. The SEARCH MODE permits rapid location of signals for analysis.

COUPLED RESOLUTION from 10 Hz to 1 kHz greatly simplifies operation, providing narrow resolution bandwidth at narrow dispersion and wide resolution bandwidth at wide dispersion. Dispersion and resolution controls can be uncoupled and operated separately if desired, for optimized viewing of a particular signal.

IF stability is achieved through use of CRYSTAL-CONTROLLED OSCILLATORS. Even the swept local oscillator is controlled through a crystal discriminator. An external front-end oscillator can be connected through a front-panel input to provide still greater stability to spectral displays within or outside the normal 1-to-36 MHz range of the Type 3L10.

IMAGE REJECTION is achieved through use of a 60-MHz first IF amplifier, which places images at more than twice the upper tuning frequency of the Type 3L10.

Analyzer familiarity is soon achieved, since operation is similar to that of the oscilloscope—with dispersion calibrated in kHz/div. Dispersion accuracy is quickly verified with crystal-controlled frequency markers available at the push of a button. This feature is especially convenient where the Analyzer is used with more than one oscilloscope.

*Time Base Units with serial numbers under those listed require a simple modification to provide a sweep signal to the Analyzer. Type 2B67: 15180, Type 3B1: 4040, Type 3B3: 4270, Type 3B4: 740.

FREQUENCY RANGE
1 to 36 MHz.

MINIMUM CW SENSITIVITY (50-Ω INPUT)
—100 dBm, measured at 2 kHz/div dispersion and 1 kHz (coupled) resolution.

DIAL ACCURACY
±(100 kHz + 1% of dial reading).

CALIBRATED DISPERSION
10 Hz/div to 2 kHz/div, 8 steps, 1-2-5 sequence. Accuracy within ±3% when calibrated with internal calibrator. Dispersion linearity within ±5%. Search position (uncalibrated) — minimum 20 kHz + 1 kHz/MHz of indicated frequency full scale (10 div).

DISPERSION CALIBRATOR
10.7-MHz carrier, 4-kHz crystal-controlled side-bands with ±0.1% accuracy.

COUPLED RESOLUTION
10 Hz to 1 kHz, coupled with calibrated dispersion positions, and separately switchable. Search position—approximately 10 kHz.

DISPLAY FLATNESS
±1 dB.

MAXIMUM INCIDENTAL FM
IF within 5 Hz.
LO within 25 Hz + 1 Hz/MHz dial frequency.

FREQUENCY STABILITY
IF within 2 p/m per °F change, 1 p/m per 1-V line change.
LO within 150 p/m per °F change, 10 p/m per 1-V line change.

INPUT IMPEDANCE
Approx 50 Ω and approx 600 Ω.

MAXIMUM INPUT POWER
+24 dBm at full RF attenuation, —20 dBm without RF attenuation.

RF ATTENUATOR
51 dB ±0.1 dB/dB in 1-dB steps.
½ watt maximum power-handling capability.

IF GAIN CONTROL
>60-dB range.

VERTICAL DISPLAY (8 DIVISIONS)
Log—50-dB dynamic range.
Linear—20-dB dynamic range.
Video—100 mV/div (variable) DC to 50 kHz, approx 50-Ω input resistance.

RECORDER OUTPUT
DC-coupled, approx 600-Ω source resistance, 15 mV/div display in Linear mode, output linear with voltage.

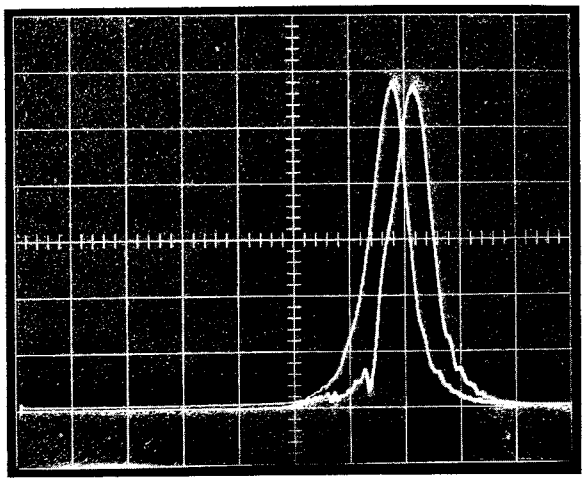
WEIGHTS

Net weight	6¼ lbs	2.8 kg
Domestic shipping weight	10 lbs	4.5 kg
Export-packed weight	17 lbs	7.7 kg

STANDARD ACCESSORIES
Tini-plug (134-0052-00); two instruction manuals (070-0521-00).

TYPE 3L10 SPECTRUM ANALYZER UNIT $1200

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

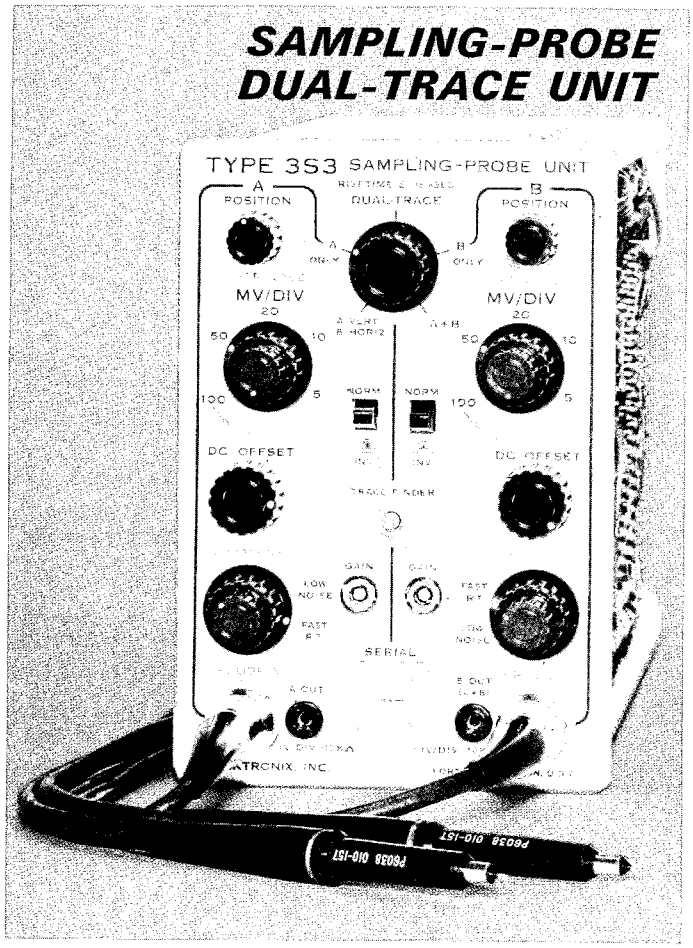


STORED SPECTRAL DISPLAY
with Type 564 Oscilloscope

Using the single-shot capabilities of the Type 2B67, and the storage capabilities of the Type 564, we are able to measure the drift of a 60-MHz crystal oscillator, as supplied to the IF of the Type 3L10.

Temperature variation shows as a drift of approx 4 Hz between sweeps. Dispersion is 10 Hz/div.

SAMPLING-PROBE DUAL-TRACE UNIT



- ***COMPACT PROBES***
- ***DUAL-TRACE DISPLAYS***
- ***0.35-ns OR LESS RISETIME***
- ***100 kΩ, 2 pF INPUT***
- ***LOW NOISE***

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 conjuction with a Type 3T2, 3T77A or Type 3T4 Sampling Sweep Unit in the Type 561A, 564, 567, or 568 Oscilloscopes. In the Type 567 (with Type 6R1A) or Type 568 (with Type 230), information can be presented in digital as well as analog form.

CHARACTERISTICS

(2 Identical Channels)

BANDWIDTH
Equivalent to DC-to-1000 MHz.

RISETIME
0.35 ns or less (FAST RT) or approx 1 ns (LOW NOISE) with a 50-Ω source.

DEFLECTION FACTOR
5 mV/div to 100 mV/div in 5 calibrated steps, 1-2-5 sequence (each channel). All steps accurate within 3%. Uncalibrated, continuous variation between steps and to approx 2 mV/div.

INPUT RC
100 kΩ paralleled by 2 pF.

DYNAMIC RANGE
±1.5 V with RISETIME control set to LOW NOISE, and ±3 V with the control set to FAST RT. Safe overload is ±10 V.

DISPLAY MODES
±A only; ±B only; Dual-Trace; Algebraic Addition of A and B inputs; and 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.

DC OFFSET
Through ±0.5 volts, for signal levels exceeding "on screen" sensitivity settings; allows utilization of full sensitivity to display and measure small signals or portions of signals riding on a DC level or as part of a larger signal.

RISETIME AND SMOOTHING CONTROLS
For least noise or best risetime, or a compromise of the two, while maintaining correct dot transient response 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.

RANDOM NOISE
Less than 0.5 mV (tangential) unsmoothed (LOW NOISE), 2 mV (FAST RISETIME), when using a 50-ohm source.

TRIGGERING
External only. Minimum repetition rate is 50 Hz.

SAMPLING PROBES
Included with the Type 3S3, and extremely compact to permit access to miniaturized circuitry. The sampling bridge is contained in the probe head to obtain optimum results with the input RC of 100 kΩ paralleled by 2 pF. Low-Frequency response is approx 3-dB down at 1.5 kHz with the included coupling capacitor; approx 3-dB down at 150 Hz with the coupling capacitor and 10X attenuator. Probes can be interchanged between channels with only minor readjustment.

WEIGHTS

Net weight	6¾ lb	3.1 kg
Domestic shipping weight	~13 lb	~5.9 kg
Export-packed weight	~17 lb	~7.7 kg

STANDARD ACCESSORIES
Two P6038 probe packages (010-0156-00); two instruction manuals (070-0374-00).
For probes and other convenient sampling accessories, see accessory section of this catalog.

TYPE 3S3/P6038 SAMPLING PROBE DUAL-TRACE UNIT $1500

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

TYPE 3S76

DUAL-TRACE SAMPLING UNIT

- ***INTERNAL TRIGGERING AND DELAY LINES***
- ***0.4-ns 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 display. It is designed to operate in conjunction with a Type 3T4 or Type 3T77A Sampling Sweep Unit in Type 561A, 564, 567 and 568 Oscilloscopes. In the Type 567 (with Type 6R1A) or 568 (with Type 230), information will be presented in digital as well as analog form.

CHARACTERISTICS

(2 Identical Channels)

BANDWIDTH
Equivalent to DC-to-875 MHz at 3-dB down.

RISETIME
0.4 ns or less.

DEFLECTION FACTOR
2 mV/div to 200 mV/div in 7 calibrated steps, 1-2-5 sequence. All steps accurate within 3%, except on the 2 mV/div and 5 mV/div steps, which are accurate within 5%. A variable control permits continuous adjustment between steps.

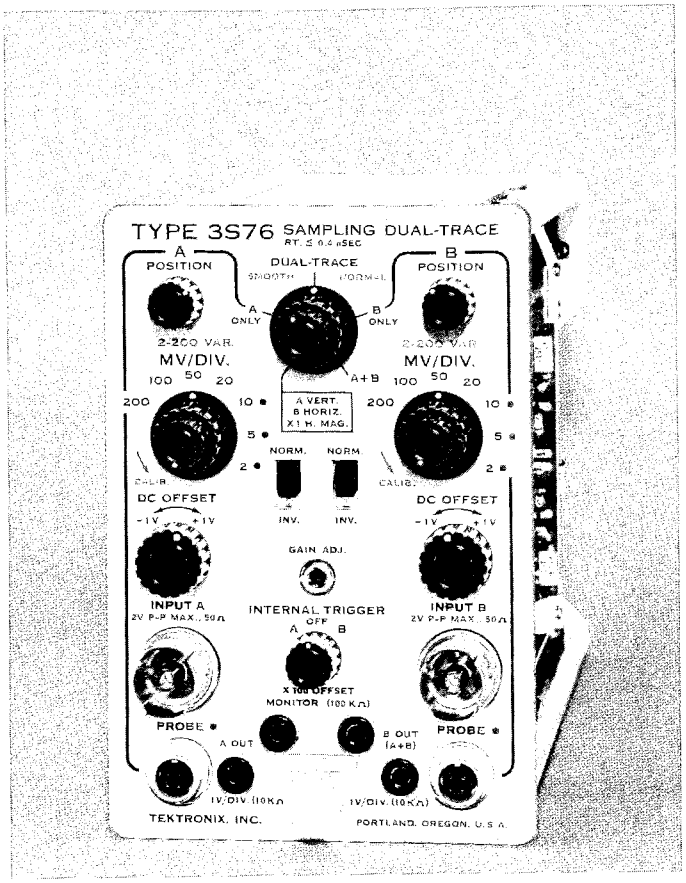
INPUT IMPEDANCE
50 ohms. GR 874 input connectors.

DYNAMIC RANGE
±2 V. Full sensitivity can be used with signals up to ±2 V in amplitude. Safe overload is ±5 V.

DISPLAY MODES
Channel A only; Channel B only; Dual-Trace—Channels A and B switched electronically on alternate samples; 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.

DC OFFSET
Through ±1 V, referred to input, and monitorable at the front panel at 100 X magnitude. Can be used to permit viewing of signals with off-screen amplitudes or signals riding on a DC voltage up to ±1 V.

RANDOM NOISE (TANGENTIAL)
Equivalent to an input signal of less than 2 mV peak to peak with Smooth-Normal Switch in NORMAL position and 1 mV peak to peak with Smooth-Normal Switch in SMOOTH position.



SIGNAL DELAY
55-ns 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
1 V/div (through 10 kilohms) DC-coupled at +10-volt level, both channels.

PROBE POWER
Available at front-panel connectors for cathode-follower probes, Type 281 TDR Pulser, and Type 282 Adapter for high-impedance probes.

WEIGHTS

Net weight	7¾ lb	3.5 kg
Domestic shipping weight	~13 lb	~5.9 kg
Export-packed weight	~17 lb	~7.7 kg

STANDARD ACCESSORIES
Two 10X 50-Ω attenuators (017-0078-00); two 5-ns 50-Ω cables (017-0502-00); two instruction manuals (070-0332-00).
For probes and other convenient sampling accessories, see accessory section of this catalog.

TYPE 3S76 DUAL-TRACE SAMPLING UNIT $1100

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

NEW

- **RANDOM OR SEQUENTIAL SAMPLING**
- **NO PRETRIGGER REQUIRED**
- **CALIBRATED SWEEP RANGES**
- **WIDE TIME POSITION RANGE**

SAMPLING SWEEP UNIT

The Type 3T2 Random Sampling Sweep Unit provides a unique, state-of-the-art advancement in measurement capabilities. This unit may be used in a Type 561A, 564, 567, or 568 Oscilloscope, in conjunction with a Vertical Dual-Trace Sampling Unit.

Random sampling permits observation of the leading edge (or other portions) of signals even when used with vertical units that have no delay lines and without a pretrigger, thus avoiding the distortions or bandwidth-limiting effects of vertical signal delay lines. Random sampling is especially useful with sampling units such as Type 3S3 (no delay lines) featuring high-impedance probes and fast risetime/low noise operation.

A front-panel switch (START POINT) selects either conventional, sequentially-stepped sampling or random sampling modes of operation.

SWEEP TIME/DIV
100 μs/div to 200 ps/div, 1-2-5 sequence, extending to 20 ps/div with X10 DISPLAY MAGNIFIER. Basic accuracy without X10 magnifier, $\pm$3%; with magnifier, $\pm$5%. TIME/DIV is a resultant of the combined settings of TIME POSITION RANGE, TIME MAGNIFIER, and DISPLAY MAG. The sweep rate is displayed (digitally) in the TIME/DIV "window" for all combinations of these controls.

TIME POSITION RANGE
100 ns, 1 μs, 10 μs, 100 μs, and 1 ms. TIME POSITION and FINE variable controls position start of the display through a time scale equal to TIME POSITION RANGE setting.

TIME MAGNIFIER
X1 to X50, 1-2-5 sequence. Used in conjunction with TIME POSITION RANGE control to select Time/Div. Uncalibrated, continuous variation between steps provided by VARIABLE control.

DISPLAY MAG
X1 or X10 magnification of the display.

DISPLAY MODES
Normal (repetitive), Single Sweep, Manual, or Ext Horiz. For external input, deflection factor is 1.5 V/div. A variable control provides attenuation (for signals exceeding graticule width).

SAMPLES/DIV
Continuously variable adjustment of samples displayed per horizontal division from approx 5 samples/div to an immeasurable number of samples/div.

An internal switch, CALIBRATED SAMPLES/DIV, disables the front-panel SAMPLES/DIV control and converts to 100 samples/div, calibrated, for use in Digital Oscilloscopes.

START POINT
Two-position switch (concentric with TIME POSITION RANGE switch) selects either random sampling (BEFORE TRIGGER) or conventional, sequentially-stepped sampling (WITH TRIGGER).

In BEFORE TRIGGER mode, the displayed "time window" may be positioned in time up to one-half times the TIME POSITION RANGE setting ahead of the trigger. This provides a base line up to 5 divisions long before the leading edge of the pulse to be viewed.

SWEEP OUTPUT (SWP OUT)
1 V/div (through 10 kilohms), useful for driving recorders.

PULSE TRIGGERING		
SOURCE	REPETITION RATE	AMPLITUDE*
EXTERNAL 1-megohm input (or UHF SYNC)	10 Hz to 100 MHz 600 MHz to 3 GHz	10 mV to 500 mV
EXTERNAL 50-ohm input	10 Hz to 600 MHz	5 mV to 250 mV
INTERNAL from SAMPLING UNIT	10 Hz to 600 MHz	(at vert input) 50 mV to 1.25 V

*Minimum trigger rise rate is 150 mV/μs.

SINEWAVE TRIGGERING		
SOURCE	REPETITION RATE	AMPLITUDE
EXTERNAL 1-megohm input (or UHF SYNC)	10 kHz to 100 MHz (+ trigger)	10 mV to 500 mV
	100 kHz to 100 MHz, 500 MHz to 3 GHz (— trigger)	
EXTERNAL 50-ohm input	100 kHz to 500 MHz	10 mV to 250 mV
INTERNAL from SAMPLING UNIT	100 kHz to 500 MHz	(at vert input) 50 mV to 1.25 V

TRIGGER JITTER

Depends on signal shape, repetition rate, triggering mode. May be as low as 30 ps under optimum conditions.

PULSE OUT

Approx 150 mV into 50 Ω, coincides with firing of the trigger circuit.

WEIGHTS

Net weight	6½ lb	3 kg
Domestic shipping weight	~11 lb	~5 kg
Export-packed weight	~17 lb	~7.7 kg

STANDARD ACCESSORIES

50-Ω 2X attenuator (011-0069-00); 50-Ω 5X attenuator (011-0060-00); 50-Ω 10X attenuator (011-0059-00); two 50-Ω 42-in BNC-to-BNC cable (012-0057-01); GR-to-BNC female adapter (017-0063-00); GR-to-BNC male adapter (017-0064-00); two instruction manuals (070-0631-00).

TYPE 3T2 RANDOM SAMPLING SWEEP UNIT $950

MODIFICATION KIT

When ordering a Type 3T2 for use with a Type 3S3 Dual-Trace Sampling Unit before Serial Number 1000, Memory Improvement Mod Kit No. 040-0442-00 is recommended to improve dot-transient response for random-sampling operation. The kit consists of 2 plug-in memory cards (one for each vertical channel). (All Type 3S3's ordered now will have the new memory cards installed.)

Order Part Number 040-0442-00 ..... $200

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

PROGRAMMABLE SAMPLING SWEEP UNIT

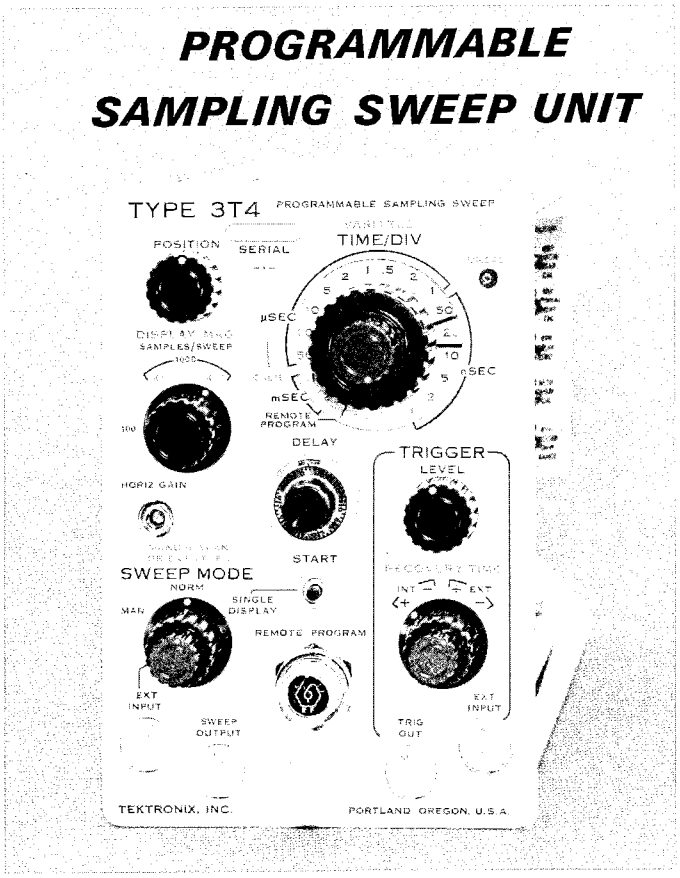
CALIBRATED SWEEP RANGES

CALIBRATED SWEEP DELAY

100 OR 1000 SAMPLES PER SWEEP

NORMAL OR SINGLE DISPLAY

SINGLE DISPLAY START



The Type 3T4 Sampling Sweep Unit extends the convenience of operation of the Type 567 or 568 Digital Readout Systems by providing remote control of the horizontal time base. This unit is compatible with the following equipment: 3S76, 3S3, and other 3-series Sampling Units; 561A, 564, 567, and 568 Indicator Units; 6R1, 6R1A, and 230 Digital Units; the 262 Programmer; and the 283 Real Time Adapter.

When used with the Type 283 Real Time Adapter, TIME/DIV extends from 1 ns/div to 1 s/div, covering the complete range of signals from sub-audio, to high-speed switching diodes.

The multiple-pin connector on the front panel affords external control of equivalent-time sweep steps, delay time, samples per sweep, normal or single-display modes, and single-display start. These operations are obtained through the grounding of certain pins of the front-panel connector. Delay time is determined by the value of resistors added externally. For real-time measurements, using the Type 283 Adapter, only TIME/DIV can be remotely controlled. Other functions, such as source or mode of triggering, normal or single display, etc. are manually set by front-panel controls on the adapter. No sweep delay is provided on the Type 283.

Front-panel outputs are TRIGGER OUT, which provides a 500-mV, negative pulse coinciding with the input trigger, and SWEEP OUTPUT which provides a staircase ramp. The unit also can be triggered internally and responds to input signals up to 1000 MHz. The SINGLE DISPLAY feature permits photographic trace recording. The 10X MAGNIFIER extends the on-screen calibrated sweep range. A dual-purpose front-panel control permits manual or external scanning of the display, thus providing convenient operation of either X-Y or Y-T recorders.

SWEEP TIME/DIV

Equivalent-Time Sampling—1 ns/div to 200 μs/div, ±3%, (1-2-5) sequence.

Real-Time Sampling—External clock, trigger, and single-display start inputs are required. See Type 283.

DELAY RANGE

1 ns/div through 0.1 μs/div—1000 ns delay range.

0.2 μs/div through 10 μs/div—100 μs delay range.

20 μs/div through 100 μs/div—1000 μs delay range.

(No delay range for 200 μs/div sweep range, or in real-time sampling mode.)

SWEEP MODES

+External Input—Scanning accomplished by external signal. Deflection factor adjustable from 5 to 20 volts/horizontal division.

Manual Scan—Display scanned by front-panel control.

Normal—Repetitive sweep.

Single Display—One sweep each time START button is depressed.

OTHER SWEEP CHARACTERISTICS

Samples per sweep—100 or 1000.

Magnification of CRT display—X1 or X10.

Front-panel sweep output—Staircase ramp, 1 volt/horizontal division.

TRIGGERING

Trigger Inputs—Internal or External + and —. Trigger responds to inputs up to 1000 MHz.

Trigger Output—500 mV, negative polarity.

REMOTELY PROGRAMMABLE FUNCTIONS

Equivalent-Time Sweep Ranges.

Delay Time.

Samples per Sweep (digital read-out decimal information correct only on 1000 samples/sweep).

Normal or Single-Display Modes.

Single-Display Start (when remotely programmed for SINGLE DISPLAY).

WEIGHTS

Net weight	5¾ lb	2.6 kg
Domestic shipping weight	~11 lb	~5.0 kg
Export-packed weight	~16 lb	~7.3 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0439-00).

TYPE 3T4 SAMPLING SWEEP UNIT $1300

OPTIONAL ACCESSORIES

Connector, 19-pin, Male, Miniature. Mates with front-panel connector of 3T4 Unit for external programming. (131-0388-00) $32.50

Remote Program Cable, 10-ft long, 19-Pin Miniature Connector, Male to 36-Pin Male Miniature Connector. (012-0101-00) $85.00

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

REAL TIME ADAPTER

NEW

The Type 283 or R283 Real Time Adapter is an accessory to provide real-time sampling capability for Type 3T4 Programmable Sampling Sweep.

The adapter provides accurate sweep rates from 1 s/div through 1 ms/div. Triggering can be from either the Channel A or B vertical output signal (from vertical sampling unit) or an external source.

Manual control of REAL TIME/DIV, DISPLAY FUNCTIONS, and TRIGGERING SOURCE, MODE, and LEVEL can be from front-panel controls, or REAL TIME/DIV can be remotely controlled by a Type 262 or other closure-type programmer. A single Type 262 can be used to control all of the programmable functions of both a Type 3T4 and a 283 Real Time Adapter, including switching between equivalent-time sampling and real-time sampling. Functions other than REAL TIME/DIV on Type 283 manually selected from front-panel controls.

REAL TIME/DIV

1 ms/div to 1 s/div in 10 calibrated steps, 1-2-5 sequence. Accuracy when used with Digital Readout Unit (Type 6R1A or 230) is ±0.1% plus time measurement tolerances of associated Digital Unit. For analog display measurement, accuracy is limited by Type 3T4 samples/div accuracy and accuracy of Horiz Gain adjustment.

DISPLAY MODES

Normal (repetitive) or Single Sweep. START button starts single sweep operation when DISPLAY switch is in the SINGLE position.

REAL TIME TRIGGERING

TRIGGER MODES

Free Run; Int AC; Int DC; and Ext.

INTERNAL SOURCE

Channel A or Channel B from vertical sampling unit signal outputs.

REQUIREMENTS

INT DC COUPLED: ≤0.5 div, displayed on CRT; DC to 1 kHz.
INT AC COUPLED: ≤0.5 div, displayed on CRT; ≃15 Hz to 1 kHz.
EXT AC COUPLED: ≤0.5 V peak to peak; ≃150 Hz to 1 kHz. Maximum input, ±20 V.

TRIGGER LEVEL RANGE

+ and −8 major div (Int) or + and −0.7 V (Ext).

EXTERNAL TRIGGER INPUT IMPEDANCE

50 Ω, changing to 1 kΩ with 50-ns time constant, then to several megohms with 10-ms time constant.

DIMENSIONS	TYPE 283		TYPE R283	
Height	5⅜ in	13.7 cm	3½ in	9 cm
Width	7¼ in	18.6 cm	19 in	48.3 cm
Depth	5½ in	14.1 cm	9 in	23 cm

WEIGHTS	TYPE 283		TYPE R283	
Net weight	3¾ lb	1.7 kg	4¾ lb	2.2 kg
Domestic shipping weight	~9 lb	~4.1 kg	~12 lb	~5.5 kg
Export-packed weight	~13 lb	~5.9 kg	~18 lb	~8.2 kg

STANDARD ACCESSORIES

Cable, remote programming (012-0101-00); cable assembly, 10-in special purpose (012-0103-00); cable assembly, 50-Ω coax (RG 58 C/U) with BNC connectors (012-0057-01); two instruction manuals, for 283 (070-0618-00) or for R283 (070-0619-00).

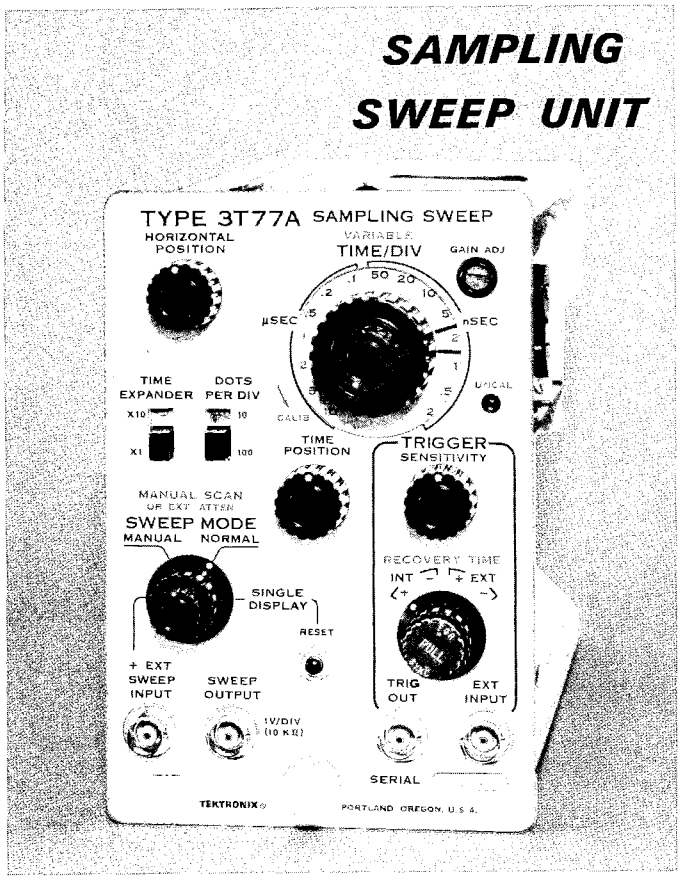
TYPE 283 REAL TIME ADAPTER $350
TYPE R283 REAL TIME ADAPTER $350

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

SAMPLING SWEEP UNIT

- ***TRIGGERING THROUGH 1 GIGAHERTZ***
- ***10 μs/div to 20 ps/div SWEEP RANGE***
- ***VARIABLE SWEEP DELAY***
- ***SINGLE-DISPLAY PROVISION***
- ***RECORDER OUTPUT***

The Type 3T77A is a Sampling Sweep Unit. It provides sub-nanosecond capabilities when used in conjunction with a Type 3S3 or 3S76 Sampling Unit in a Type 561A, 564, 567, or 568 Oscilloscope. In the Type 567 (with Type 6R1A) or 568 (with Type 230), information can be presented in digital as well as analog form.



TIMING SECTION

SWEEP TIME/DIV
10 μs/div to 0.2 ns/div in 15 calibrated steps, 1-2-5 sequence, extending to 20 ps/div with TIME/EXPANDER, accurate within 3%. A variable control permits continuous adjustment, uncalibrated, between steps.

SWEEP MODES
Normal (repetitive), Single Display, Manual, or + Ext. At least 5 V/div (positive-going) is required for an external sweep.

TIME EXPANDER
X10 expansion that maintains a constant number of samples per centimeter. Extends calibrated sweep range to 20 ps/div.

DOT DENSITY
Either 10 or 100 dots/div.

TIME POSITION
Provides a sweep delay range corresponding to at least one screen diameter, unexpanded and at least ten screen diameters (100 div) when expanded.

SWEEP OUTPUT
≃1 V/div (through 10 kilohms), useful for driving recorders.

TRIGGERING SECTION

PULSE TRIGGERING

REPETITION RATE RANGE
30 pulses per second (limited by memory drift in the vertical plug-in) through 10^9 pulses per second (1 GHz).

AMPLITUDE RANGE
±10 mV to ±200 mV for external triggering, Minimum trigger rise rate is approx 150 mV/μs. Optimum trigger amplitude for least jitter depends on rise rate and rep rate. Damaging overload can occur at 5 V or greater.

JITTER
Typically 50 ps or 0.1% of fast ramp duration whichever is greater for pulses of 50 mV amplitude, 2 ns width (or 10 mV, 10 ns width).

SINEWAVE TRIGGERING

FREQUENCY RANGE
100 kHz through 1 GHz.

AMPLITUDE RANGE
10 mV to 400 mV peak to peak for external triggering. Five times more trigger amplitude is required for equivalent internal triggering. Optimum trigger amplitude for least jitter depends on frequency. Damaging overload can occur at 5 V or greater.

JITTER
Varies with trigger amplitude, frequency and TIME/DIV setting. Typical figures are less than 50 ps jitter for 100 mV peak to peak 30 MHz to 50 MHz sinewave. A special synchronizing mode may be used above 30 MHz for extra stability.

WEIGHTS

Net weight	5¾ lb.	2.6 kg
Domestic shipping weight	~10¾ lb.	~4.9 kg
Export-packed weight	~20 lb.	~9 kg

STANDARD ACCESSORIES
Two 10X 50-Ω attenuators (017-0078-00); adapter, BNC-to-GR (017-0064-00); two 10-ns 50-Ω cables (017-0501-00); adapter, BNC-to-UHF (103-0032-00); two instruction manuals (070-0546-00).
See catalog accessory pages for other available optional sampling accessories.

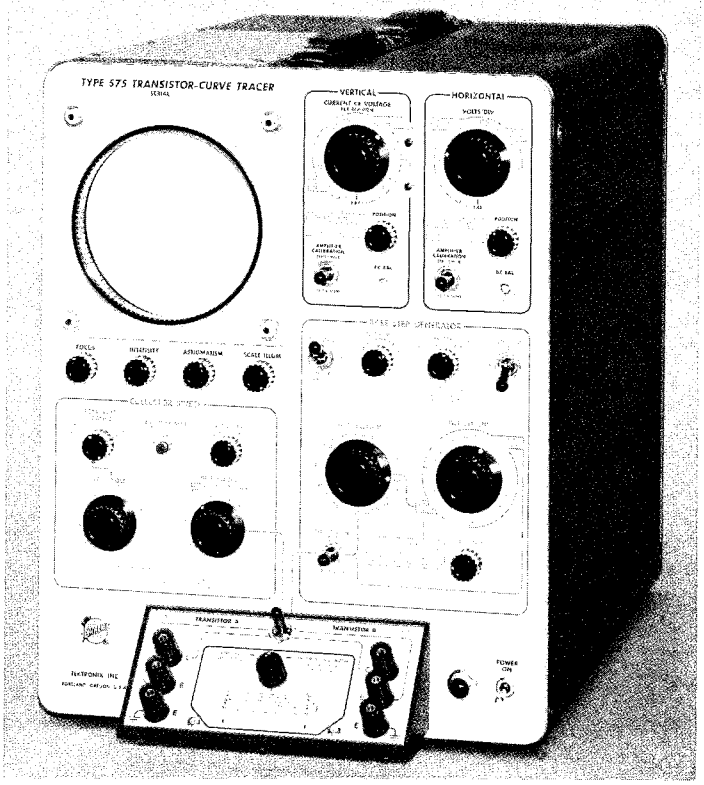
TYPE 3T77A SAMPLING SWEEP UNIT $650

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

TYPE 575

TYPE 175

TRANSISTOR-CURVE TRACER



HIGH-CURRENT ADAPTER

- ***SINGLE OR REPETITIVE DISPLAYS***
- ***DIRECT COMPARISON OF TRANSISTOR CHARACTERISTICS***
- ***SELECT CIRCUIT PARAMETERS WITH FRONT PANEL CONTROLS***
- ***MAKE TOTAL DIODE MEASUREMENTS***

Characteristics which are extended or changed by the Type 175 High-Current Adapter are shown in color.

CHARACTERISTIC SUMMARY

BASE OR EMITTER STEP GENERATOR—

Stepping Rate—2 or 4 times line frequency.

Number of Steps—Continuously variable from 4 to 12 steps per family of characteristic curves.

Single or Repetitive—Stops after a single family of curves is generated, or repeatedly generates the family of curves.

Type of Steps—Steps are increments of voltage or current and are either positive or negative.

Voltage Increments—Selectable from 0.01 V/step to 0.2 V/step ±3% with 2.4-A current capability. —Selectable from 0.02 V/step to 0.5 V/step with 12-A current capability.

Current Increments—Selectable from 0.001 mA/step to 200 mA/step, ±3%. —Selectable 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-A capability and from 0 V to 200 V minimum with 1-A capability. —Continuously variable from 0 V to 20 V with 200-A capability and 0 V to 100 V with 40-A capability.

Type 575 MOD 122C: Continuously variable from 0-20 V minimum with 10-A capability, 0-200 V minimum with 1-A capability or 0-400 V minimum with 0.5-A capability.

POLARITY—positive or negative. A third switch position is added on Type 575 MOD 122C providing 0-1.5 kV for diode breakdown test.

VERTICAL DISPLAY

CALIBRATED DEFLECTION FACTOR—

Transistor Collector Current—0.001 mA/div to 2000 mA/div, ±3%. —0.005 A/div to 20 A/div.

Transistor Base or Emitter Current—0.001 mA/div to 200 mA/div, ±3%.

Transistor Base or Emitter Voltage—0.01 V/div to 0.5 V/div, ±3%.

Base or Emitter Source Voltage—0.01 V/div to 0.2 V/div, ±3%.

HORIZONTAL DISPLAY

CALIBRATED DEFLECTION FACTOR—

Transistor Collector Voltage—0.01 V/div to 20 V/div, ±3%. —0.1 V/div to 10 V/div.

Transistor Base or Emitter Current—0.001 mA/div to 200 mA/div, ±3%.

Transistor Base or Emitter Voltage—0.01 V/div to 0.5 V/div, ±3%. —0.1 V/div to 2 V/div.

Base or Emitter Source Voltage—0.01 V/div to 0.2 V/div, ±3%.

CRT

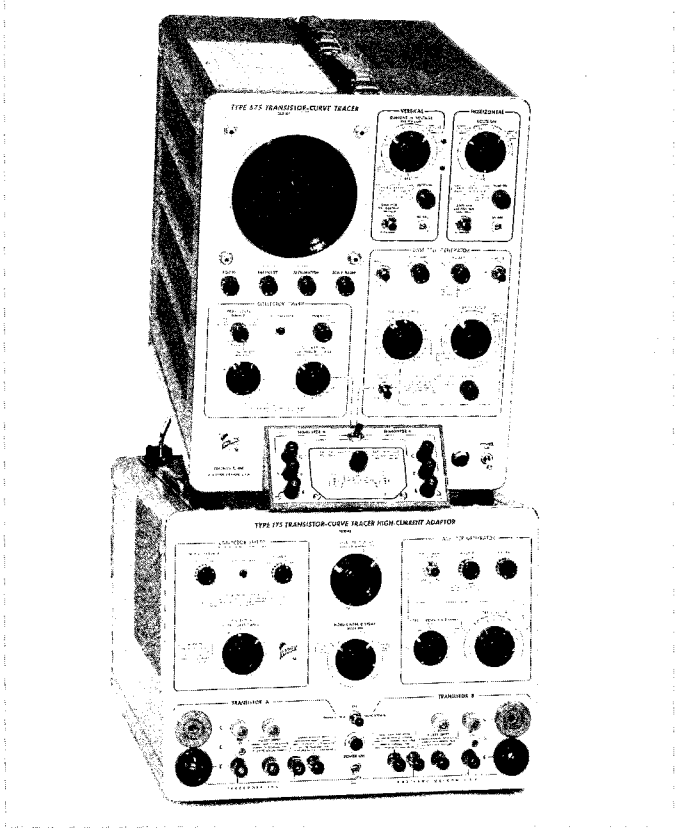
DISPLAY AREA—10 x 10 div ($5/16$ in per div).

ACCELERATING VOLTAGE—4 kV.

OTHER CHARACTERISTICS

COMPARISON SWITCH—Switch allows switching between two semiconductors for comparison.

POWER REQUIREMENTS—105 to 125 V or 210 to 250 V, 50 to 60 Hz, 410 watts max. —105 to 125 V, 50 to 60 Hz, 1100 watts max.



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.

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 semiconductor devices.

A special model (Type 575 MOD 122C), although similar to the Type 575, provides much higher voltages for diode breakdown test and collector supply. Horizontal deflection factor selections are extended to 200 V/div to accommodate the higher voltages.

Transistors under test are inserted into either a common-base or common-emitter test circuit. The transistor collector has a sweep voltage applied to it while a step voltage or current is applied to either the base or emitter (whichever is ungrounded). Voltage, for the collector, sweeps between zero and a selectable value and is generated by the Collector Sweep Generator. The Base or Emitter Step Generator applies steps to the base or emitter that start at zero and build up to a value determined by the number of steps and value of each step as selected with front-panel controls. Each sequence of steps, from zero to the maximum attained value, in conjunction with the sweep voltage on the collector produces one family of characteristic curves.

Signals used for vertical and horizontal deflection on the CRT are either current or voltage values selected from various points in the transistor test circuit. Thus, a selected vertical signal can be plotted against a selected horizontal signal to trace the desired semiconductor 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 semiconductors. 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.

BASE OR EMITTER STEP GENERATOR

The Step Generator develops current or voltage steps to drive the base or emitter (whichever is ungrounded) of the transistor under test. These steps are used to generate either repetitive or single-family (as selected) characteristic curves for display. The steps are adjustable in number from 4 to 12 and move in a positive or negative direction depending on the polarity switch setting. Step repetition rate is selectable as either 120 steps/s or 240 steps/s (values equal to 2X or 4X the line frequency). A control is available to set the starting point of a series of steps to zero.

Each step has a rise that is selected as either a value of current or a value of voltage. The value of each step rise in current ranges from 0.001 mA/step to 200 mA/step and is selected from 17 values that are in a 1-2-5 sequence. The value of each step rise in voltage is from 0.01 V/step to 0.2 V/step and is selected from 5 values that are in a 1-2-5 sequence. Also a switch is provided for grounding the transistor input to give a zero drive-voltage reference check, and opening the transistor input to give a zero drive-current reference check.

The driving resistance of the step generator, when developing voltage steps, is selected from 24 values that range from 1 ohm to 22 kilohms ±10%. Any other value can be added externally.

The Type 175 Step Generator output is basically the same as that of the Type 575. However, the current steps are selected from 10 values ranging from 1 mA/step to 1000 mA/step and the voltage steps are selected from 5 values ranging from 0.5 V/step to 10 V/step. In addition, the driving resistance is selected from 11 values ranging from 0.5 ohm to 1 kilohm. Any other resistance value can be added externally.

COLLECTOR SWEEP GENERATOR

The Collector Sweep Generator provides the sweep voltages that drive the collector of the transistor under test. These voltages sweep between zero and a peak value selected with a front-panel control. The peak voltage is either positive or negative depending on the setting of the polarity switch to allow the collector voltages to sweep between zero and positive peak values or zero and negative peak values. The repetition rate of the sweep is 2 times the line frequency; thus the collector voltage sweeps between zero and the peak value at least once for each step applied to the transistor base or emitter.

The peak sweep voltage is continuously adjustable from zero to 20 V with 10-A capability or from zero to 200 V with 1-A current capability. (Additional 0 to 400-V with 0.5-A current capability is provided on Type 575 MOD 122C.)

The collector current limiting resistance is selected from 16 values ranging from 1 ohm to 100 kilohms ±5%.

The Type 175 Collector Sweep Generator output is basically the same as that of the Type 575. However, the peak sweep voltage is continuously adjustable from zero to 20 V with 200-A capability of from zero to 100 V with 40-A 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.

On Type 575 MOD 122C, a third position has been added to the POLARITY switch, providing zero to 1.5 kV for checking diode breakdown voltage.

VERTICAL-DEFLECTION SYSTEM

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

CALIBRATED DEFLECTION FACTOR

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 deflection factor from 0.001 mA/div to 2000 mA/div. —0.005 A/div to 20 A/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.

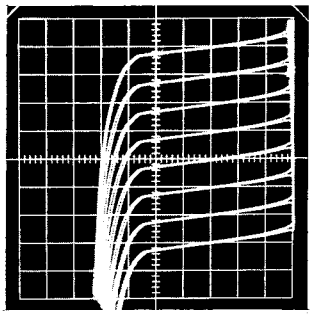
HORIZONTAL-DEFLECTION SYSTEM

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

CALIBRATED DEFLECTION FACTOR

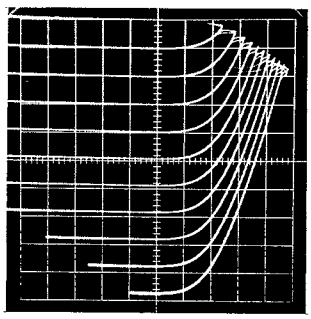
Transistor Collector Voltage—0.01 V/div to 20 V/div in 11 steps, 1-2-5 sequence. (0.1 V/div to 200 V/div on Type 575 MOD 122C).
—0.1 V/div to 10 V/div in 7 steps, 1-2-5 sequence.

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



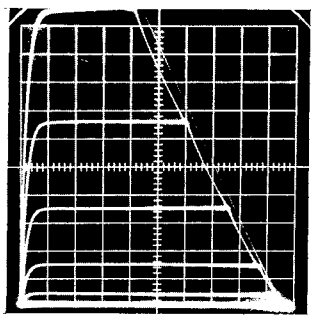
PNP TRANSISTOR

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.

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.

CRT

TEKTRONIX CRT

4-kV accelerating voltage, P31 phosphor normally supplied. Other phosphors available on request.

GRATICULE

External, $3\frac{1}{8}$ in x $3\frac{1}{8}$ in viewing area, 10 divisions each axis with each division measuring $\frac{5}{16}$ in. Horizontal and vertical centerlines further marked in $\frac{1}{16}$ in increments (5 per division).

OTHER

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 alongside the sockets accept other transistor and semiconductors. One switch will change the sockets from the common-emitter to the common-base test circuit configuration. A second switch allows two transistors inserted into the test circuit to be rapidly compared by switching the test conditions from one to the other.

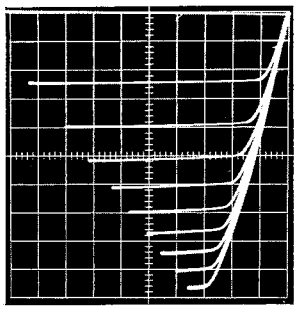
The Type 175 Transistor Test Panel is basically the same as that of the Type 575. Special connectors and cables are provided for high-current applications and for eliminating measurement errors due to voltage drops in high-current carrying leads.

POWER REQUIREMENT

Wired for 105 to 125 VAC (117-V nominal); may be ordered with transformer taps connected for nominal values of 107, 127, 214, 234, or 254 V; 50 to 60 Hz. 410 watts maximum. Type 175 wired for 105 to 125 V, 50 to 60 Hz, 1100 watts maximum. Type 175 MOD 167C wired for 210 to 250 V, 50 to 60 Hz, 1100 watts maximum.

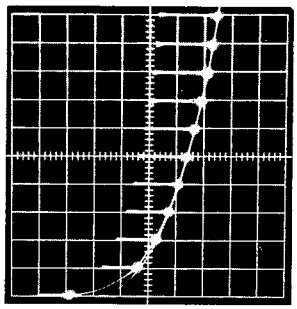
TYPE 575 AND TYPE 575 MOD 122C DIMENSIONS AND WEIGHTS

Height	$16\frac{3}{8}$ in	41.6 cm
Width	13 in	33 cm
Depth	$23\frac{5}{8}$ in	60 cm
Net weight	$66\frac{1}{4}$ lb	30.1 kg
Domestic shipping weight	~ 84 lb	~38.2 kg
Export-packed weight	~102 lb	~46.4 kg



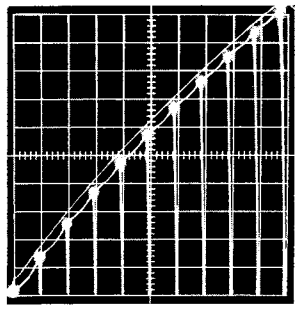
PNP TRANSISTOR

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.



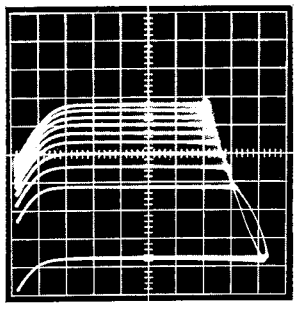
NPN TRANSISTOR

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.



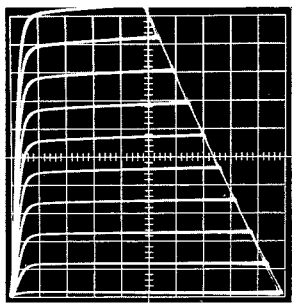
NPN TRANSISTOR

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, harizontal deflection 0.1 mA/div base current. Incremental and DC current gain can be determined from this display.



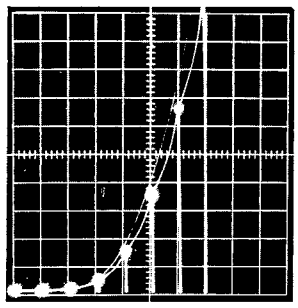
NPN TRANSISTOR

Base voltage vs collectar 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 //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 deflectian 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.

TYPE 175 AND TYPE 175 MOD 167C DIMENSIONS AND WEIGHTS

Height	12 1/16 in	30.7 cm
Width	13 1/16 in	33.2 cm
Depth	23 5/8 in	60 cm
Net weight	83 1/2 lb	38 kg
Domestic shipping weight	~117 lb	~53.2 kg
Export-packed weight	~139 lb	~63.2 kg

TYPE 575 AND TYPE 575 MOD 122C STANDARD ACCESSORIES

Two transistor adapters, long (013-0069-00); two transistor adapters, TO-3 (013-0070-00); 3 to 2-wire adapter (103-0013-00); two 2N1381 transistors (151-0039-00); 3-conductor power cord (161-0010-00); smoke gray filter (378-0567-00); two instruction manuals (070-0255-00).

TYPE 175 MOD 167C

Wired for 210 to 250 VAC (234-V nominal), 50 to 60 Hz, 1100 watts maximum.

TYPE 175 AND TYPE 175 MOD 167C STANDARD ACCESSORIES

Two black output lead (012-0014-00); two red output lead (012-0015-00); interconnecting cable (012-0042-00); two red test cables (012-0043-00); two black test cables (012-0044-00); 575 adapter cable (012-0045-00); two blue test lead (012-0056-00); 3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); 3-conductor power cord, 20-in (161-0014-00); two lock washers (210-0010-00); two nuts (210-0410-00); two screws (212-0520-00); two bolt hinges (214-0152-00); two instruction manuals (070-0255-00).

TYPE 575 TRANSISTOR CURVE TRACER $1075

TYPE 175 or TYPE 175 MOD 167C HIGH-CURRENT ADAPTER $1475

INCREASED COLLECTOR VOLTAGE

Type 575 MOD 122C, although similar to the Type 575, provides much higher diode breakdown test voltage (variable from zero to 1.5 kV, maximum short circuit current of 1 mA); also provides much higher collector supply (up to 400 V at 0.5 A).

TYPE 575 MOD 122C TRANSISTOR CURVE TRACER $1325

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. See accessory pages at the rear of the catalog for additional information on these and other items.

RACK MOUNT ADAPTER

Cradle mount to adapt the Type 575 Transistor-Curve Tracer for rack mounting. Consists of a cradle to support instrument in any standard 19-in relay rack and mask to fit around regular instrument panel. Tektronix blue vinyl finish. Rack height requirements 17 1/2 in. Order Part Number 040-0281-00 ..... $31.25

TYPE 575 OPTIONAL TEST FIXTURES

013-0072-00

013-0073-00

013-0074-00

013-0079-00

DIODE TEST FIXTURE

Holds axial-lead diodes. Order 013-0072-00 ..... $5.00

ADAPTER BOX

Allows mounting of additional semiconductor sockets. Order 013-0073-00 ..... $4.00

POWER TRANSISTOR SOCKET

For power transistors with hook leads. Order 013-0074-00 ..... $5.00

DIODE TEST ADAPTER

Production test fixture for rapid handling. Order 013-0079-00 ..... $25.00

CAMERA

The standard C-12 camera satisfies most trace-recording requirements. For applications that might require a different viewing system, lens, or back, refer to camera descriptions or consult your field engineer, representative, or distributor.

Standard C-12: f/1.9 — 1:0.85 lens, on-axis, no-parallax viewing, Polaroid Land* Pack-Film back, order C-12 ..... $450

Mounting Adapter for C-12, order 016-0226-00 ..... $ 15

SCOPE-MOBILE CART

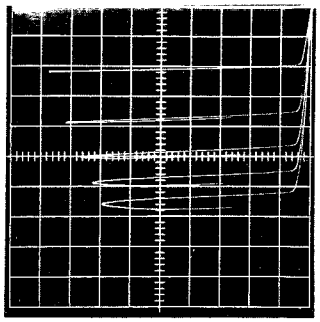
Model 202-2: storage drawer, 9-position tilt-lock oscilloscope tray, order Type 202-2 ..... $130

*Registered Trade-Mark, Polaroid Corporation.

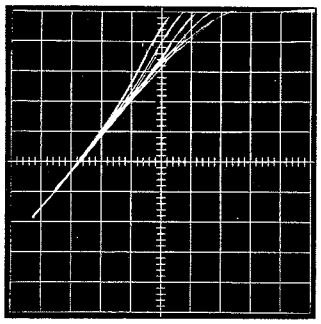
U.S. Sales Prices FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

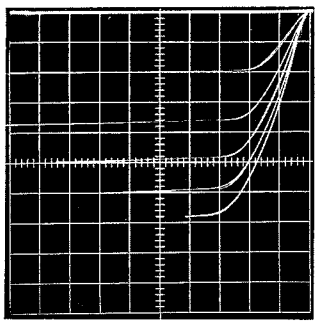
CHARACTERISTIC CURVE DISPLAYS WITH TYPE 175



Collector current vs collector voltage (emphasis on saturation resistance). Vertical deflection is 10 A/div, horizontal deflection is 0.2 V/div. Bose drive is 500 mA/step (top curve is 2.5 A).

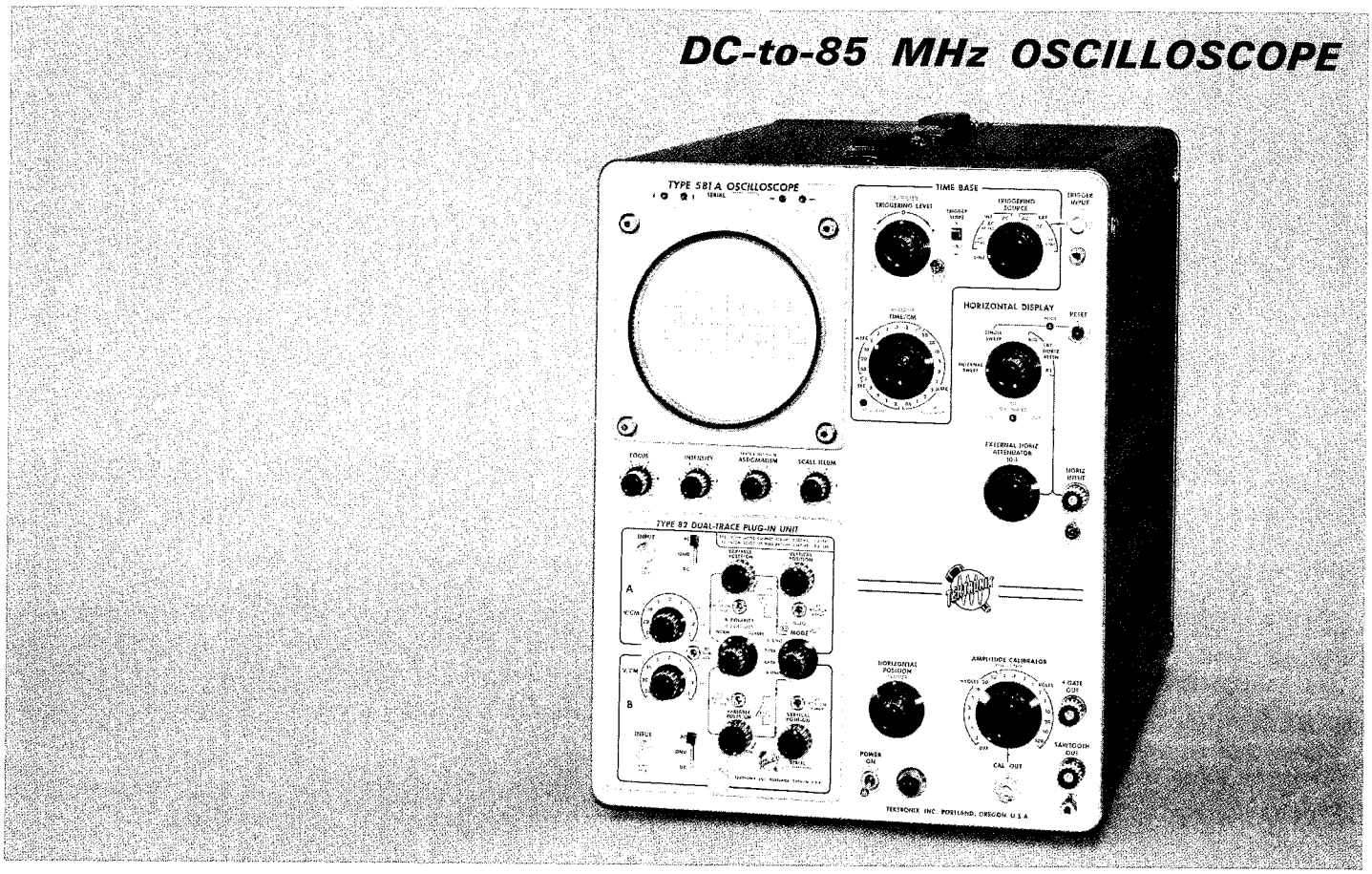


Collector current vs base voltage (collector sweep voltage is 4.2 V). Vertical deflection is 10 A/div, horizontal deflection is 0.1 V/div. Base drive is 500 mA/step.



Collector current vs collector voltage. Vertical deflection is 10 A/div, horizontal deflection is 1.0 V/div. Base drive is 500 mA/step (top curve is 2.5 A).

DC-to-85 MHz OSCILLOSCOPE



- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***TUNNEL-DIODE TRIGGERING TO BEYOND 150 MHz***
- ***SYNCHRONIZATION TO 250 MHz***
- ***SINGLE SWEEP FOR PHOTOGRAPHIC RECORDING***
- ***SINGLE-TRACE AND DUAL-TRACE PLUG-IN UNITS***
- ***MORE THAN 20 OTHER VERTICAL PLUG-IN UNITS (with adapter)***
- ***SMALL BRIGHT CRT SPOT***

The Type 581A Oscilloscope is a general-purpose, laboratory instrument featuring bandwidth to 85 MHz (at 3-dB down) when used with the Type 82 or Type 86 Plug-In Units. Tunnel-diode triggering to 150 MHz and HF Sync to 250 MHz makes the instrument useful beyond the specified bandwidth. The Type 81 Plug-In Adapter provides additional versatility by permitting the use of more than 20 Tektronix 1-series and letter-series plug-in units. Calibrated sweep rates to 10 ns/cm enhance the rise-time capabilities of the instrument.

CHARACTERISTIC SUMMARY

VERTICAL

Dual-trace displays from DC to 85 MHz (3-dB down) at 100 mV/cm or from DC to 80 MHz (3-dB down) at 10 mV/cm are available with the Type 82 Dual-Trace Plug-In Unit. Other vertical-deflection characteristics are extremely flexible through use of a wide variety of plug-in units.

HORIZONTAL

CALIBRATED TIME BASE—0.05 μs/cm to 2 s/cm.

SWEEP MAGNIFIER—X5, increases sweep rate to 0.01 μs/cm.

EXTERNAL INPUT—0.2 V/cm to 15 V/cm; DC to 350 kHz.

CRT

DISPLAY AREA—4 x 10 cm.

ACCELERATING VOLTAGE—10 kV.

OTHER

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz square-wave.

POWER REQUIREMENT—Wired for 105 to 125 V, may be ordered with taps connected for 210 to 250 V. 50 to 60 Hz, 560 watts maximum.

VERTICAL DEFLECTION

BANDWIDTH AND RISETIME

Bandwidth figures are at 3-dB down.

TYPE 82 or 86 PLUG-IN UNIT	MINIMUM BANDWIDTH	MAXIMUM RISETIME
at 100 mV/cm	85 MHz	4.2 ns
at 10 mV/cm	80 MHz	4.5 ns

DC COUPLED MAIN AMPLIFIER

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.

HORIZONTAL DEFLECTION

TIME BASE

50 ns/cm to 2 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Continuously variable (uncalibrated) between steps and to approx 5 s/cm. Warning light indicates uncalibrated setting.

DISPLAY MODES

Normal (repetitive) and single-sweep.

X5 MAGNIFIER

Operates over full time base, increases the fastest rate to 10 ns/cm. Magnified time base accurate within 5%.

EXTERNAL INPUT

Continuously variable deflection factor from 0.2 V/cm to 15 V/cm. DC to 350 kHz at maximum gain. Input RC approx 1 megohm paralleled by approx 47 pF.

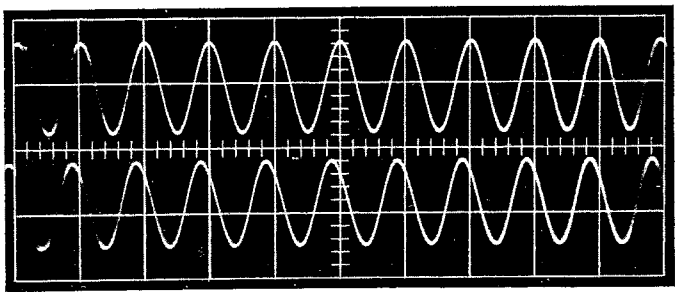
SIGNAL OUTPUTS

A positive gate of approx 20 V and a positive-going sawtooth of approx 150 V.

TRIGGER

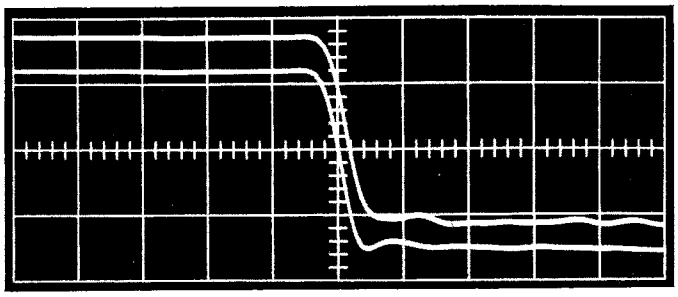
SOURCES

Internal, external, or line. Internal sources are AC coupled. External sources are AC or DC coupled. External trigger input RC approx 1 megohm paralleled by approx 30 pF.



PHASE COMPARISON

Dual-trace display of 100 MHz sinewaves at 10 ns/cm. Phase difference is approximately 55 degrees. Phase comparison and similar measurements are possible with the stable high-frequency triggreing system of the Type 581A Oscilloscope.

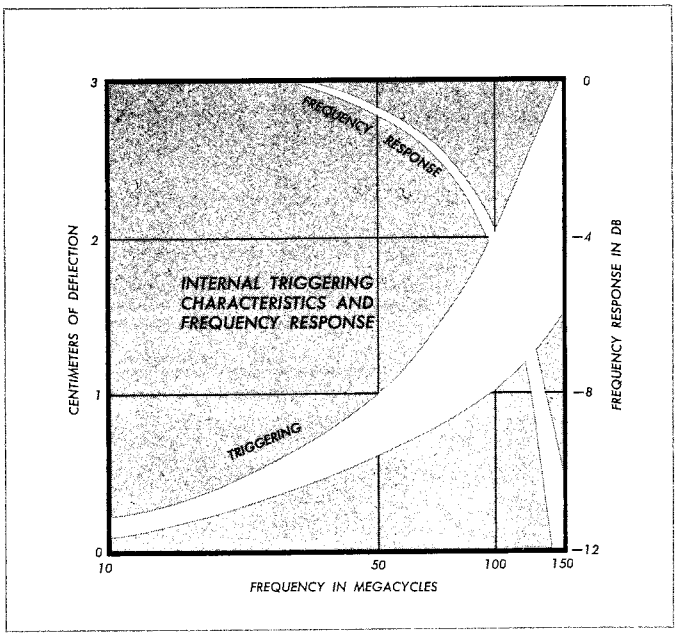


TIME COINCIDENCE

Dual-trace display of input and output pulses of a transistor amplifier at 10 ns/cm. Lower trace delayed 1 ns by the amplifier under observation. Note time resolution. The Type 581A Oscilloscope with Type 82 Dual-Trace Plug-In Unit can display time coincidence between input channels with no measurable difference at 10 ns/cm.

REQUIREMENTS

2-mm deflection or 0.3 V external from 15 Hz to 5 MHz. Requirements increase below 15 Hz with AC coupling, below 15 kHz with AC LF Reject. HF Sync requires 4-mm deflection or 0.2 V external from 5 MHz to 250 MHz.



CRT

TEKTRONIX CRT

5-in CRT metalized, lumped-constant, traveling-wave tube incorporating a helical post-accelerating anode and achieving a small, bright spot. Accelerating potential 10 kV. P31 phosphor normally supplied. Z-axis input for external modulation of CRT cathode; 20-V peak-to-peak signal will cause noticeable modulation.

GRATICULE

No-parallax, 4 x 10 cm, internal graticule with variable edge illumination, ruled in 1-cm divisions. Vertical and horizontal centerlines further marked in 2-mm increments.

DISPLAY FEATURES

Beam-position indicators light to show direction of CRT beam when off the screen.

OTHER

AMPLITUDE CALIBRATOR

Squarewaves from 0.2 mV to 100-V in 18 steps (1-2-5 sequence), accurate within 3%, approx 1-kHz repetition rate.

POWER OPTIONS

Wired for 105 to 125-V operation, 50 to 60 Hz. Tapped transformer allows operation also at 210 to 250 V. Power consumption 560 watts maximum.

DIMENSIONS AND WEIGHTS

Height	16⅞ in	42.9 cm
Width	13⅛ in	33.4 cm
Depth	23⅞ in	58.2 cm
Net weight	63 lbs	28.6 kg
Domestic shipping weight	~81 lbs	~36.8 kg
Export-packed weight	~99 lbs	~45.0 kg

STANDARD ACCESSORIES

3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray filter, installed (378-0567-00); clear, CRT-protector plate (387-0918-00); 18-in BNC-to-BNC patch cord (012-0087-00); 18-in BNC-to-banana plug patch cord (012-0091-00); post jack, BNC (012-0092-00); two instruction manuals (070-0390-01).

TYPE 581A OSCILLOSCOPE, without plug-in units . $1425

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. See accessory pages at rear of catalog for additional information on these and other items.

C27-662 R CAMERA

Equipped with a special lens to permit single-sweep photography of Type 581A Oscilloscope displays at fast writing rates. 1:0.5, f 1/3 lens; Polaroid Land* roll-film back.

Order C-27-662 R $585

Mounting Adapter, order 016-0225-00 ..... $ 15

PROBES

The standard 10X probes supplied with plug-in units satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

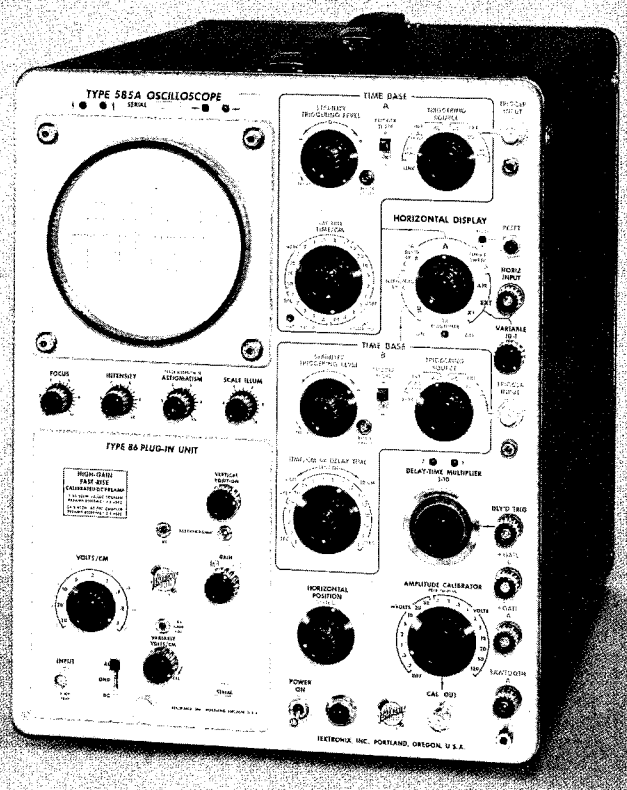
Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray.

Order Type 202-2 ..... $130

*Registered Trade-Mark, Polaroid Corporation

U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page

DC-to-85 MHz SWEEP DELAY OSCILLOSCOPES



- ***DUAL TIME BASES***
- ***CALIBRATED SWEEP DELAY***
- ***TUNNEL DIODE TRIGGERING TO BEYOND 150 MHz***
- ***SYNCHRONIZATION TO 250 MHz***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***SINGLE-SWEEP FOR PHOTOGRAPHIC RECORDING***
- ***SINGLE-TRACE AND DUAL-TRACE VERTICAL PLUG-IN UNITS***
- ***MORE THAN 20 OTHER VERTICAL PLUG-IN UNITS (with adapter)***

The Type 585A and Type RM585A are general-purpose laboratory instruments. Dual time base with delayed sweep permits highly magnified displays of a small portion of an undelayed sweep, accurate measurements of waveform time jitter, precise time measurements and many other uses. Sweep delay is calibrated and continuously variable from 1 μs to 10 s. Calibrated sweep rates to 10 ns/cm combine with the 85-MHz bandwidth (at 3-dB down) of the available Type 82 and Type 86 Plug-In Units to permit accurate rise time measurements of fast-rise steps and pulses. A Type 81 Plug-In Adapter is also available, and permits the use of more than 20 Tektronix 1-series and letter-series plug-in units.

CHARACTERISTIC SUMMARY

VERTICAL

Dual-Trace DC to 85 MHz (approx 3-dB down) displays at 100 mV/cm or DC to 80 MHz (approx 3-dB down) displays at 10 mV/cm are available with the Type 82 Dual-Trace Plug-In Unit. Extreme flexibility of vertical deflection characteristics through the use of a wide variety of plug-in units.

HORIZONTAL

CALIBRATED TIME BASE—Time Base A: 0.05 μs/cm to 2 s/cm; Time Base B: 2 μs/cm to 1 s/cm.

SWEEP MAGNIFIER—X5, extends Time Base A to 0.01 μs/cm.

CALIBRATED SWEEP DELAY—2 μs to 10 s, continuously variable.

EXTERNAL INPUT—0.02 V/cm to 15 V/cm; DC to 350 kHz at maximum gain.

CRT

DISPLAY AREA—4 x 10 cm.

ACCELERATING VOLTAGE—10 kV.

OTHER CHARACTERISTICS

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz square-wave.

POWER REQUIREMENT—105 to 125 V or 210 to 250 V, 50 to 60 Hz, 630 watts maximum.

VERTICAL DEFLECTION

BANDWIDTH AND RISETIME

Bandwidth figures are at 3-dB down.

TYPE 82 OR 86 PLUG-IN UNIT	MINIMUM BANDWIDTH	MAXIMUM RISETIME
at 100 mV/cm	85 MHz	4.2 ns
at 10 mV/cm	80 MHz	4.5 ns

DC-COUPLED MAIN AMPLIFIER

A two-stage distributed amplifier, a balanced fixed delay line and a twin-pentode output stage.

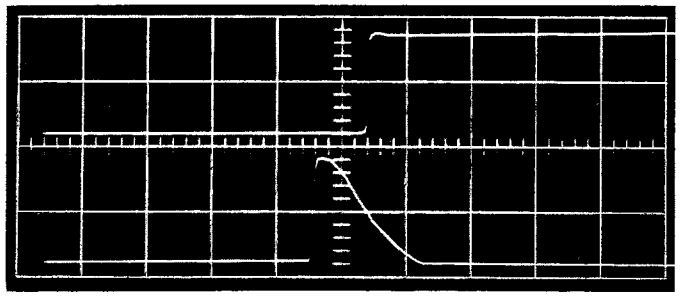
BALANCED DELAY NETWORK

Permits observation of the leading edge of the waveform that triggers the sweep.

HORIZONTAL DEFLECTION

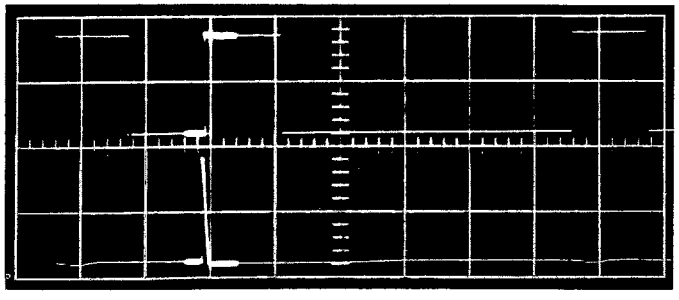
In addition to the usual oscilloscope applications, the calibrated sweep delay enables the user to:

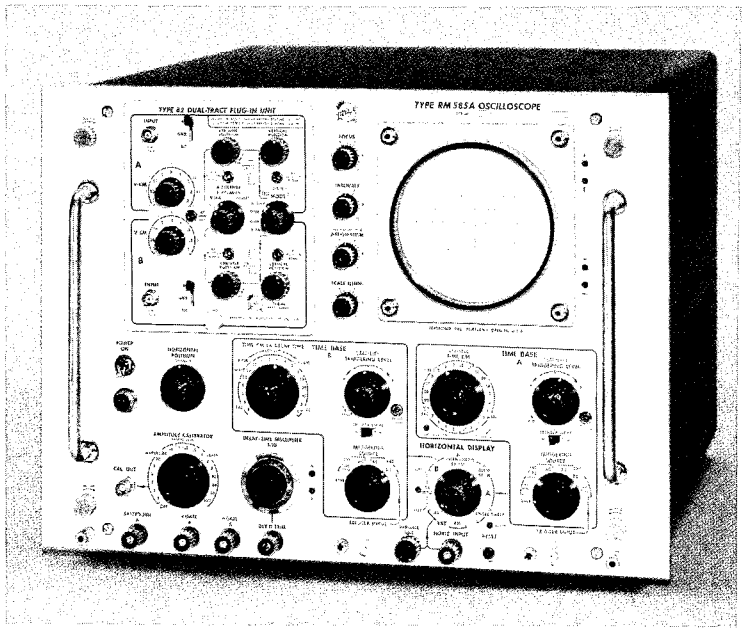
1. Make accurate incremental measurements along a complex waveform.
2. Display separate channels of a PTM system, with effects of time jitter removed, determining pulse amplitude and shape under modulation conditions.
3. Measure pulse-to-pulse intervals and amount of jitter on computer signals or any train of pulses.
4. Determine accurate time-difference measurements between amplifier input and output pulses.
5. Show time displacement, wave shape, and amplitude of individual channels in a telemetering system.
6. Utilize effective calibrated sweep magnification up to the highest practical limit. Actual magnification is the ratio of Time Base B TIME/CM to Time Base A TIME/CM.



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.





TIME BASE A

50 ns/cm to 2 s/cm in 24 calibrated steps (1-2-5 sequence), accurate within 3%. Continuously variable (uncalibrated) between steps and to approximately 5 s/cm. Warning light indicates uncalibrated setting.

TIME BASE B

2 μs/cm to 1 s/cm in 18 calibrated steps (1-2-5 sequence), accurate within 3%. Control for varying sweep length from 4 to 10 cm permits Time Base B to be used as a repetition-rate generator from 0.1 Hz to 40 kHz.

DELAY TIME

2 μs to 10 s, continuously variable and calibrated. Accuracy from 2 μs to 0.1 s within 1% of indicated delay. Accuracy from 0.2 s to 1 s within 3% of indicated delay. Incremental delay time accurate within 0.2% of the available delay time Short-term jitter less than 1 part in 20,000 of the available delay time.

X5 MAGNIFIER

Operates over full time base, increases the fastest Time Base A rate to 10 ns/cm and fastest Time Base B rate to 0.4 μs/cm. Magnified time base accurate within 5%.

OPERATING MODES

Time Base A: Normal, single sweep, delayed by B.
Time Base B: Normal, intensified by A.

EXTERNAL INPUT

Continuously variable deflection factor from 0.2 V/cm to 15 V/cm. DC to 350 kHz at maximum gain. Input RC approx 1 megohm paralleled by approx 47 pF.

SIGNAL OUTPUTS

Positive gates from both time bases of approx 20 V, a positive-going sawtooth of approx 150 V and a delayed trigger pulse of approx +5 V.

CRT

TEKTRONIX CRT

5-in CRT metalized, lumped-time-constant, traveling-wave tube incorporating a helical, post-accelerating anode and achieving a small, bright spot. Accelerating potential 10 kV. P31 phosphor normally supplied. Z-axis input for external modulation of CRT cathode; 20-V peak-to-peak signal will cause noticeable modulation.

GRATICULE

No-parallax, 4 x 10 cm, internal graticule with variable edge illumination is ruled in 1-cm divisions with vertical and horizontal centerlines further marked in 2-mm increments.

DISPLAY FEATURES

Beam-position indicators light to show direction of CRT beam when it is off the screen.

TRIGGER

SOURCES

Internal, external, or line. Internal sources are AC coupled. External sources are AC or DC coupled. External trigger input RC approx 1 megohm paralleled by approx 30 pF.

TIME BASE A REQUIREMENTS

2-mm deflection or 0.3 V external from 15 Hz to 5 MHz. Requirements increase below 15 Hz with AC coupling, below 15 kHz with AC LF Reject. HF Sync requires 4-mm deflection or 0.2 V external from 5 MHz to 250 MHz.

TIME BASE B REQUIREMENTS

4-mm deflection or 0.5-V external from 15 Hz to 1 MHz, increasing to 2-cm deflection or 1.5-V external at 5 MHz. Requirements increase below 15 Hz with AC coupling, below 15 kHz with AC LF Reject.

OTHER

AMPLITUDE CALIBRATOR

0.2 mV to 100-V squarewave in 18 steps (1-2-5 sequence). Accurate within 3%. Approx 1-kHz repetition rate.

POWER OPTIONS

Wired for 105 to 125-V operation, 50 to 60 Hz. Tapped transformer allows operation at 210 to 250 V. Power consumption 630 watts maximum.

TYPE 585A DIMENSIONS AND WEIGHTS

Height	16⅞ in	42.9 cm
Width	13⅜ in	33.4 cm
Depth	23⅜ in	58.2 cm
Net weight	67¼ lbs	30.6 kg
Domestic shipping weight	~85 lbs	~38.6 kg
Export-packed weight	~104 lbs	~47.3 kg

TYPE RM585A DIMENSIONS AND WEIGHTS

Height	14 in	35.6 cm
Width	19 in	48.3 cm
Depth	22¾ in	57.8 cm
Net weight	83½ lbs	38.0 kg
Domestic shipping weight	~108 lbs	~49.1 kg
Export-packed weight	~131 lbs	~59.5 kg

STANDARD ACCESSORIES

3 to 2-wire adapter (103-0013-00); 3-conductor power cord (161-0010-00); smoke-gray filter, installed (378-0567-00); clear CRT-protector plate (387-0918-00); 18-in BNC-to-BNC patch cord (012-0087-00); 18-in BNC-to-banana-plug patch cord (012-0091-00); BNC post jack (012-0092-00); Type 585A—two instruction manuals (070-0391-00). Type RM585A—two instruction manuals (070-0392-00); set mounting hardware included with Type RM585A.

TYPE 585A, without plug-in units $1725

TYPE RM585A, without plug-in units $1825

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. See accessory pages at rear of catalog for additional information on these and other items.

C27-662 R CAMERA

Equipped with a special lens to permit single-sweep photography of Type 581A Oscilloscope displays at fast writing rates. 1:0.5, f1/3 lens; Polaroid Land* roll-film back.

Order C-27-662 R $585

Mounting Adapter, order 016-0225-00 15

PROBES

The standard 10X probes supplied with plug-in units satisfy most measurement requirements; however, optional probes (recommended on plug-in unit pages) may be better suited for particular applications.

SCOPE-MOBILE CART

Model 202-2: storage drawer, carrier for 2 plug-in units, 9-position tilt-lock oscilloscope tray.

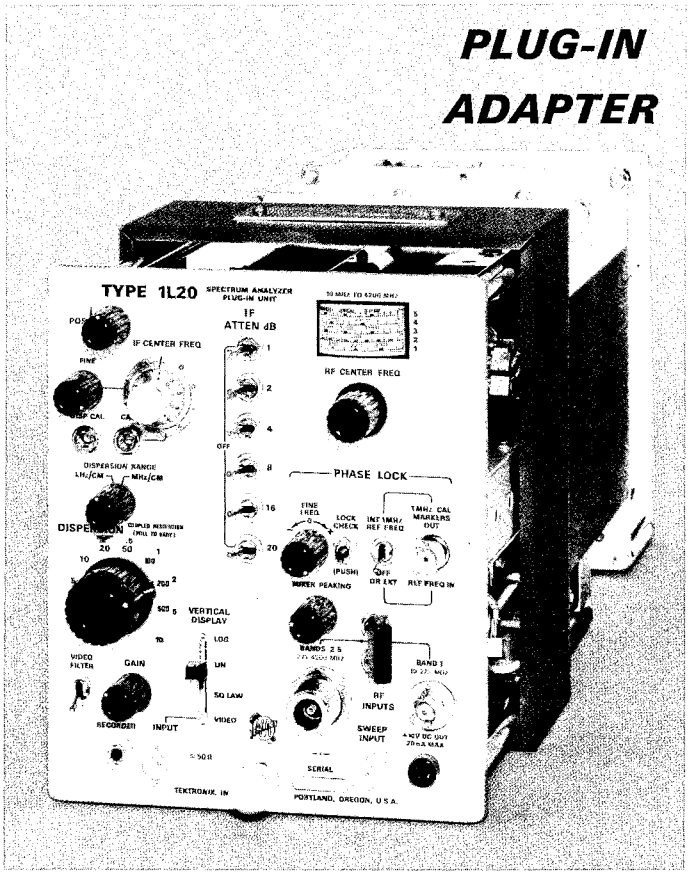
Order Type 202-2 ..... $130

*Registered Trade-Mark, Polaroid Corporation

U.S. Sales Prices FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information Page

PLUG-IN ADAPTER



With the Type 81 Plug-In Adapter, Tektronix 1-series and letter-series plug-in units can be used with Tektronix 580-series oscilloscopes; extending capability to include differential-comparator displays, sampling, stress analysis, operational amplifiers, spectrum analysis and others.

No cabling or switching is required; the Type 81 is simply inserted into the oscilloscope, then the plug-in unit is inserted into the adapter.

WEIGHTS

Net weight	4 lbs	1.8 kg
Domestic shipping weight	~ 6 lbs	~3 kg
Export-packed weight	~11 lbs	~5 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0232-01).

TYPE 81 PLUG-IN ADAPTER **$135**

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

EXTEND CAPABILITIES OF TYPE 580-SERIES OSCILLOSCOPES TO THESE AREAS

VERTICAL PLUG-IN UNITS

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
MULTIPLE TRACE				
1A1 Dual-Trace	50 mV/cm 5 mV/cm ≈500 μV/cm	DC to 33 MHz DC to 23 MHz 2 Hz to 14 MHz	11 ns 16 ns 25 ns	$ 600
1A2 Dual-Trace	50 mV/cm	DC to 33 MHz	11 ns	325
CA Dual-Trace	50 mV/cm	DC to 24 MHz	15 ns	260
1A4 Four-Trace	10 mV/cm	DC to 33 MHz	11 ns	750
M Four-Trace	20 mV/cm	DC to 20 MHz	18 ns	525
SINGLE TRACE				
B	50 mV/cm 5 mV/cm	DC to 20 MHz 2 Hz to 12 MHz	18 ns 30 ns	145
H	50 mV/cm	DC to 15 MHz	24 ns	185
K	50 mV/cm	DC to 30 MHz	12 ns	145
L	50 mV/cm 5 mV/cm	DC to 30 MHz 3 Hz to 24 MHz	12 ns 15 ns	210
SPECIAL PURPOSE				
O Operational	50 mV/cm	DC to 25 MHz	14 ns	525
Q Strain Gage	10 μstrain/div	DC to 6 kHz	60 μs	325

PLUG-IN UNIT	MINIMUM DEFLECTION FACTOR	BANDWIDTH (—3 dB)	T_R	PRICE
DIFFERENTIAL				
1A5 Comparator	1 mV/cm	DC to 33 MHz	11 ns	550
1A6	1 mV/cm	DC to 2 MHz	0.18 μs	230
1A7 High-Gain	10 μV/cm	DC to 500 kHz Selectable	0.7 μs	425
D	1 mV/cm (to 50 mV/cm)	DC to 300 kHz (DC to 2 MHz)	0.18 μs	170
E	50 μV/cm (to 10 mV/cm)	0.06 Hz to 20 kHz (to 60 kHz) Selectable	6 μs	190
G	50 mV/cm	DC to 20 MHz	18 ns	190
W Comparator	1 mV/cm 50 mV/cm	DC to 8 MHz DC to 23 MHz	44 ns 16 ns	550
Z Comparator	50 mV/cm	DC to 13 MHz	27 ns	525
SPECTRUM ANALYZERS				
1L5	10 μV/cm	10 Hz to 1 MHz		950
1L10	—100 dBm	1 MHz to 36 MHz		1100
1L20	—110 to —90 dBm	10 MHz to 4.2 GHz		1825
1L30	—105 to —75 dBm	925 MHz to 10.5 GHz		1825
WIDE-BAND SAMPLING				
1S1	2 mV/cm	DC to 1 GHz	350 ps	1100
1S2 TDR	5 mρ/cm	140 ps system risetime		1300
	5 mV/cm	DC to 3.9 GHz	90 ps	

TYPE 82

DUAL-TRACE UNIT

- ***DC TO 85 MHz AT 100 mV/cm****
- ***DC TO 80 MHz AT 10 mV/cm****
- ***CHOPPED OR ALTERNATE SWITCHING***

Two identical input channels add dual-trace capability to Tektronix Type 580-Series Oscilloscopes permitting the display of the time difference between two input signals, the response of two circuits to the same pulse, the input and output waveforms of a circuit, and many other dual-trace functions.

BANDWIDTH AND RISETIME

Bandwidth figures are at 3-dB down and apply to calibrated and uncalibrated deflection factors.

WITHOUT PROBE (Source impedance approx 25 ohms)			
DEFLECTION FACTOR	DC-COUPLED BANDWIDTH	AC-COUPLED LOW-FREQUENCY 3-dB POINT	RISETIME
X1 GAIN 100 mV to 100 V/cm	DC to 85 MHz	2 Hz	4.2 ns
X10 GAIN 10 mV to 10 V/cm	DC to 80 MHz	2 Hz	4.5 ns
WITH P6008 10X PROBE			
X1 GAIN 1 V to 500 V/cm	DC to 70 MHz	0.2 Hz	5 ns
X10 GAIN 100 mV to 50 V/cm	DC to 66 MHz	0.2 Hz	5.3 ns

DEFLECTION FACTOR

100 mV/cm to 50 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%. 2:1 variation, uncalibrated, between steps and to approx 100 V/cm.

X10 AMPLIFIER

DC coupled, extends deflection factor to 10 mV/cm. Operates at all deflection-factor settings, accurate within 3%.

P6008 10X PASSIVE PROBES

Increase input resistance to 10 megohms and decrease input capacitance to approx 7 pF. Risetime of Type 580-Series Oscilloscope with Type 82 Plug-In Unit and P6008 Probe, at an overall deflection factor of 1 V/cm is 5 ns.

INPUT RC

1 megohm paralleled by approx 15 pF.

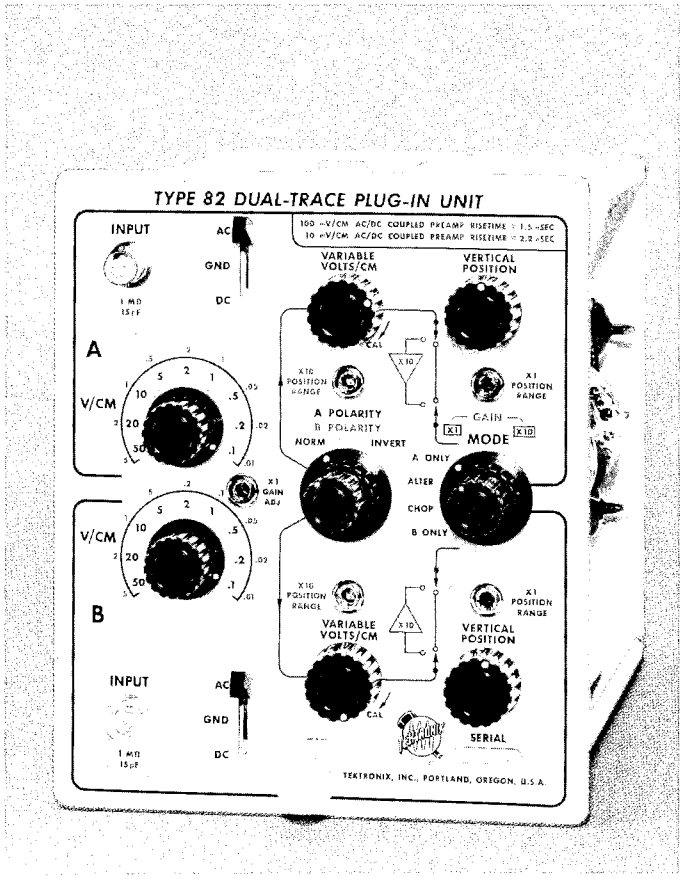
MAXIMUM INPUT VOLTAGE

600 V combined DC + peak AC.

WEIGHTS

Net weight	5 lbs	2.3 kg
Domestic shipping weight	~10 lbs	~4.5 kg
Export-packed weight	~14 lbs	~6.4 kg

*Approx 3-dB down



STANDARD ACCESSORIES

Two P6008 probes (010-0129-00); two instruction manuals (070-0439-01).

TYPE 82 DUAL-TRACE PLUG-IN UNIT $650

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The standard probe supplied with the instrument satisfies most measurement requirements; optional probes, including high-voltage and current-measuring probes, may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

PROBES

P6009 100X Passive Probe Package, order 010-0140-00 .. $55
P6011 1X Passive Probe Package, order 010-0193-00 .... $15

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. Order Part Number 040-0275-00 ..... $25

Each kit includes components to change delay-line impedance, standardize CRT termination, modify CRT and distributed amplifier circuitry, and modify Type 80/P80 combination.

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

SINGLE-TRACE UNIT

- ***10 mV/cm DEFLECTION FACTOR***
- ***DC TO 85 MHz AT 100 mV/cm****
- ***DC TO 80 MHz AT 10 mV/cm****

The Type 86 Plug-In Unit provides fast-rise capability, a calibrated deflection-factor range of 100 mV/cm to 50 V/cm and a built-in X10 amplifier which extends the deflection-factor range to 10 mV/cm. A P6008 Probe is supplied with the Type 86; other probes are available as optional accessories.

BANDWIDTH AND RISETIME

Bandwidth figures are at 3-dB down and apply to calibrated and uncalibrated deflection factors.

WITHOUT PROBE (Source impedance approx 25 ohms)			
DEFLECTION FACTOR	DC-COUPLED BANDWIDTH	AC-COUPLED LOW-FREQUENCY 3-dB POINT	RISETIME
X1 GAIN 100 mV to 100 V/cm	DC to 85 MHz	2 Hz	4.2 ns
X10 GAIN 10 mV to 10 V/cm	DC to 80 MHz	2 Hz	4.5 ns
WITH P6008 10X PROBE			
X1 GAIN 1 V to 500 V/cm	DC to 70 MHz	0.2 Hz	5 ns
X10 GAIN 100 mV to 50 V/cm	DC to 66 MHz	0.2 Hz	5.3 ns

DEFLECTION FACTOR

100 mV/cm to 50 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 3%. 2:1 variation, uncalibrated between steps and to approx 100 V/cm.

X10 AMPLIFIER

DC coupled, extends deflection factor to 10 mV/cm. Operates at all deflection-factor settings, accurate within 3%.

P6008 10X PASSIVE PROBE

Increases input resistance to 10 megohms and decreases input capacitance to approx 7 pF. Risetime of Type 580-Series Oscilloscope with Type 86 Plug-In Unit and P6008 Probe, at an overall deflection factor of 1 V/cm, is 5 ns.

INPUT RC

1 megohm paralleled by approx 15 pF.

MAXIMUM INPUT VOLTAGE

600 V combined DC + peak AC.

WEIGHTS

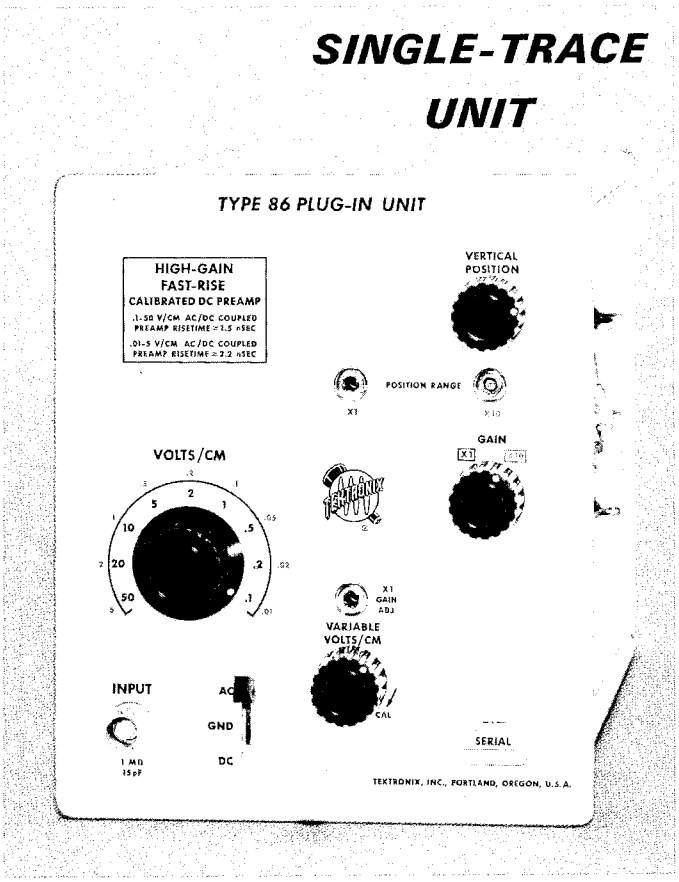
Net weight	3½ lbs	1.6 kg
Domestic shipping weight	~ 8 lbs	~3.6 kg
Export-packed weight	~12 lbs	~5.5 kg

STANDARD ACCESSORIES

P6008 Probe (010-0129-00); two instruction manuals (070-0364-01).

TYPE 86 PLUG-IN UNIT $350

*Approx 3-dB down



OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The standard probe supplied with the instrument satisfies most measurement requirements; optional probes, including high-voltage and current-measuring probes, may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

PROBES

P6009 100X Passive Probe Package, order 010-0140-00 .. $55
P6011 1X Passive Probe Package, order 010-0193-00 .... $15

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 Oscilloscopes with serial numbers prior to #950 for Type 581 and #2585 for Type 585 may require this modification. If in doubt about instrument modification, please consult your Field Engineer.

Each kit includes components to change delay-line impedance, standardize CRT termination, modify CRT and distributed-amplifier circuitry and modify Type 80 Plug-In Unit/Type P80 Probe combination.

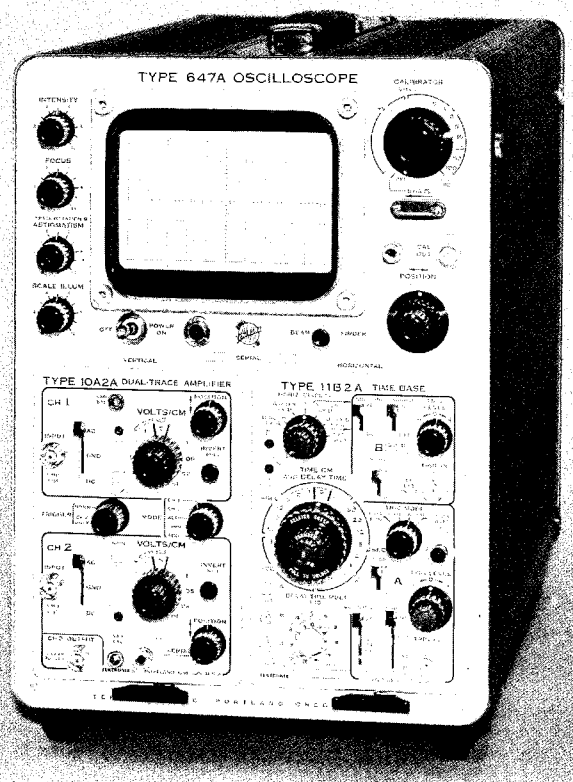
Order Part Number 040-0275-00 ..... $25

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

TYPE 647A / R647A

DC-to-100 MHz OSCILLOSCOPES

NEW



- ***DC-to-100 MHz BANDWIDTH***
- ***BUILT FOR SEVERE ENVIRONMENTS***
- ***HIGH WRITING SPEED***
- ***ILLUMINATED NO-PARALLAX GRATICULE***
- ***6 x 10-cm DISPLAY***

The Type 647A and R647A are compact, high-performance instruments capable of accurate measurements over an ambient temperature range from −30° C to +65° C. Accuracy is even better in normal ambient temperatures ranging from 0° C to +40° C.

The Type 647A and R647A Oscilloscopes offer bandwidths from DC to 100 MHz when used with the Type 10A2A Dual-Trace Plug-In Unit. Triggering over the entire 100-MHz bandwidth is possible with a Type 11B2A Sweep-Delay Time-Base Unit.

An accelerating potential of 14 kV provides a small, bright CRT spot with corresponding high writing speed. An internal, 6 x 10-cm graticule with variable illumination offers parallax-free measurements.

A new quick-change line-voltage selector permits simple and convenient adaptation to 6 different line-voltage ranges.

CHARACTERISTIC SUMMARY

VERTICAL

Two vertical plug-in units are available: Type 10A1 Differential Amplifier featuring voltage-comparator capability, and Type 10A2A Dual-Trace Amplifier with 100-MHz bandwidth. Operating modes of Type 10A2A include CH 1, CH 2, ALTERNATE, CHOP (~1-MHz rate), and ADD.

HORIZONTAL

Two time-base plug-in units are available: Type 11B1 with single time base and direct reading magnifier, and Type 11B2A with dual time bases and sweep delay; both units equipped with single sweep for photographic recording.

CRT

DISPLAY AREA—6 x 10 cm

ACCELERATING VOLTAGE—14 kV

OTHER

AMPLITUDE CALIBRATOR—0.2 mV to 100 V, 1-kHz square-wave.

POWER REQUIREMENT—90 V to 136 V and from 180 V to 272 V in six ranges; range selection accomplished by quick-change, switching device. Maximum power approx 200 watts at 115 V and 60 Hz. Type 647A: 45 to 440 Hz, Type R647A: 45 to 66 Hz.

VERTICAL DEFLECTION

BANDWIDTH AND RISETIME
Bandwidth figures are at 3-dB down.

PLUG-IN	DEFLECTION FACTOR	BANDWIDTH*		RISETIME	
		0°C to +40°C	−30°C to +65°C	0°C to +40°C	−30°C to +65°C
10A1	5 mV/cm to 20 V/cm	55 MHz	50 MHz	6 ns	7 ns
	1 mV/cm and 2 mV/cm	40 MHz	35 MHz	8.5 ns	10 ns
10A2A	10 mV/cm to 20 V/cm	100 MHz	90 MHz	3.5 ns	4.1 ns

SIGNAL DELAY
Permits observation of the leading edge of the waveform that triggers the sweep. Delay line requires no tuning.

HORIZONTAL DEFLECTION

Two Time-Base Plug-In Units are available for use with the Type 647A and R647A Oscilloscopes.

PLUG-IN UNIT	CALIBRATED RANGE	SWEEP MAGNIFIER	SWEEP SYSTEM
Type 11B1	0.1 μs/cm to 2 s/cm	Direct reading up to X50, 10 ns/cm max	Single Time Base Generator
Type 11B2A	0.1 μs/cm to 5 s/cm	X10, Extends Range to 10 ns/cm	Dual Time Base Generator with Sweep Delay

Both plug-in units have single-sweep and external-horizontal-amplifier capability.

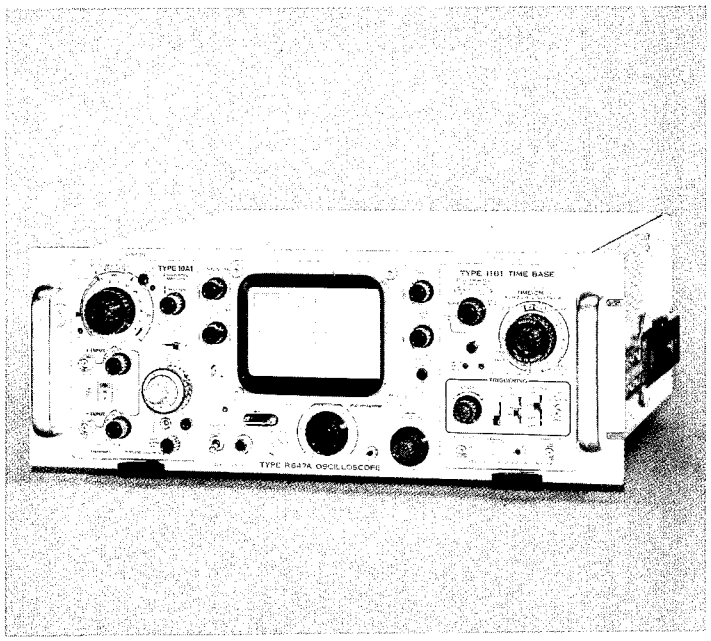
CRT

TEKTRONIX CRT
Rectangular, flat-faced CRT. 4-kV accelerating potential for bright displays. P31 phosphor normally supplied.

GRATICULE
No-parallax, 6 x 10-cm, internal graticule with variable edge illumination. Ruled in 1-cm divisions, vertical and horizontal centerlines further marked in 2-mm increments.

EXTERNAL CRT INPUTS
Input through unblanking amplifier to CRT grid with bandwidth from DC to 10 MHz; visible modulation with 4-V peak-to-peak signal. An additional input to CRT cathode is AC coupled (0.015 μF and 22 kΩ); visible modulation with 5-V peak-to-peak signal.

*Stated frequencies are upper bandwidth limits. Lower limit is DC (when DC coupled). With AC coupling, low-frequency 3-dB-down point is ~ 1.6 Hz without probe, or ~ 0.16 Hz with P6047 10X Probe.



OTHER

AMPLITUDE CALIBRATOR
0.2 mV to 100 V in 18 calibrated steps (1-2-5 sequence), 1-kHz squarewave. Crystal-controlled frequency accurate within 0.1% from −30° C to +65° C.
Output resistance 50 Ω from 0.2 mV to 0.2 V. Squarewave duty cycle 49.9% to 50.1%. Risetime ≤1 μs. For current-probe calibration, a 5-mA squarewave is available through a front-panel current loop. The calibrator also provides a 100-V DC output.

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%

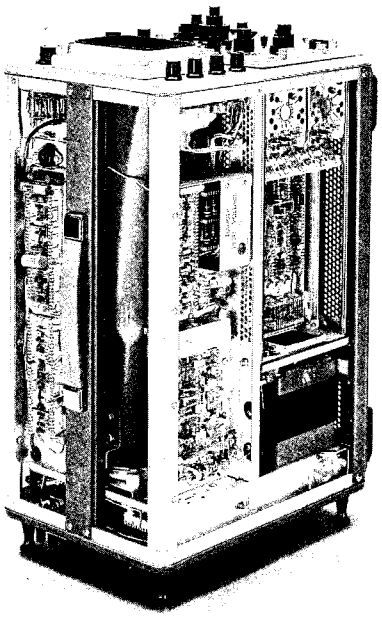
POWER REQUIREMENTS
Quick-change line-voltage selector permits selection of the following ranges: 90 V to 110 V, 104 V to 126 V, 112 V to 136 V, 180 V to 220 V, 208 V to 252 V, or 224 V to 272 V. Approx 200 watts maximum at 115 V and 60 Hz. Type 647A: 45 to 440 Hz. Type R647A: 45 to 66 Hz.

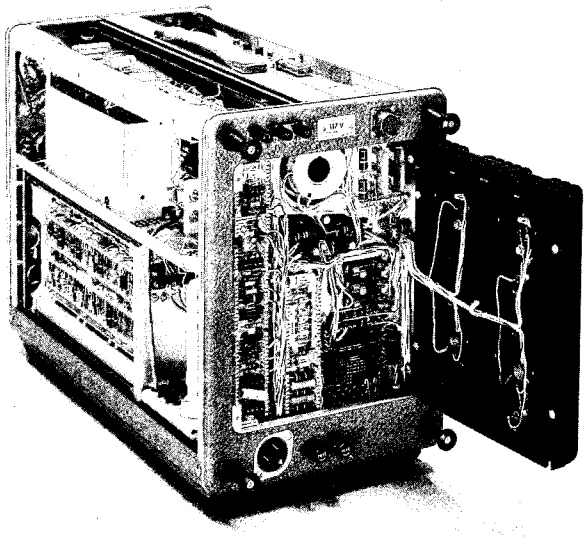
TYPE 647A DIMENSIONS AND WEIGHTS

Height	14⅝ in	37.1 cm
Width	9⅞ in	25.2 cm
Depth	22 in	56.0 cm
Net weight	40 lb	17.8 kg
Domestic shipping weight	~49 lb	~21.9 kg
Export-packed weight	~62 lb	~27.6 kg

TYPE R647A DIMENSIONS AND WEIGHTS

Height	7 in	17.8 cm
Width	19 in	48.3 cm
Rack depth	19 in	48.3 cm
Net weight	50 lb	22.2 kg
Domestic shipping weight	~73 lb	~32.4 kg
Export-packed weight	~96 lb	~42.6 kg





ENVIRONMENTAL CHARACTERISTICS	
TEMPERATURE	OPERATING Type R647A: —30° C to +65° C. Type 647A: —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 Hz in 1 minute sweeps (4 g at 55 Hz) for 15 minutes on each axis. 3 minute vibration at 55 Hz (each axis).
ALTITUDE	OPERATING 15,000 feet maximum. Maximum operating temperature of the Type 647A at 130 V line reduced to +55°C at 15,000 feet. NON-OPERATING 50,000 feet, maximum.
SHOCK	NON-OPERATING 20 G's, one-half sine, 11-millisecond duration. Two shocks each direction along each of the three major axes; total of 12 shocks.
HUMIDITY	NON-OPERATING Meets electrical performance specifications after exposure to five cycles (120 hours) of Mil-Std-202B, method 106A (omit freezing and vibration, and allow 24-hour post-test drying period before operating).
TRANSPORTATION	NON-OPERATING Meets National Safe Transit test when factory-packaged: Vibration for one hour at slightly greater than one G. Drop on any corner, edge or flat surface; 18-in drop for Type R647A, 30-in drop for Type 647A.
	*Applicable to R647A when mounted in a rack with rear support kit 016-0065-00.

STANDARD ACCESSORIES

Two P6047 Probes (010-0211-00); smoke-gray filter, installed (378-0548-00); 8-in, 50-Ω cable, BNC to BNC (012-0118-00); clear implosion shield (337-0573-00); 18-in patch cord, BNC to BNC (012-0087-00); 18-in patch cord, BNC to banana plug 012-0091-00); BNC post jack (012-0092-00); 3 to 2-wire adapter (103-0013-00); 6-in patch cord, BNC to BNC (012-0085-00); red butyrate graticule-light insert (337-0105-00); Type 647A: two instruction manuals (070-0614-00); Type R647A: two instruction manuals (070-0627-00); set mounting tracks and hardware (351-0085-00); rackmount rear support kit (016-0065-00).

TYPE 647A OSCILLOSCOPE, without Plug-In Units . **$1500**

TYPE R647A OSCILLOSCOPE, without Plug-In Units (45-to-66 Hz power source) **$1625**

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. The standard probe supplied with the instrument satisfies most measurement requirements; optional probes, including high-voltage and current-measuring probes, may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

REAR-PANEL CONNECTOR

10-pin connector for remote single-sweep reset and external use of power-supply voltages. Order (131-0300-00) $13

C27-662 R CAMERA

Equipped with a special lens to permit single-sweep photography of oscilloscope displays at fast writing speeds. 1:05, f/1.3 lens, Polaroid Land* roll-film back.

Order C-27-662 R $585

Mounting Adapter, order 016-0223-00 ..... $ 15

PROBES

P6023 10X Low-Capacitance Probe for use with Tektronix differential amplifiers.

Order P6023 PROBE PACKAGE (010-0167-00 LOCKING BNC) ..... $ 40

SCOPE-MOBILE® CART

Model 201-2: Storage drawer, carrier for two plug-in units, 9-position tilt-lock oscilloscope tray.

Order Type 201-2 ..... $130

*Registered Trade-Mark Polaroid Corporation

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

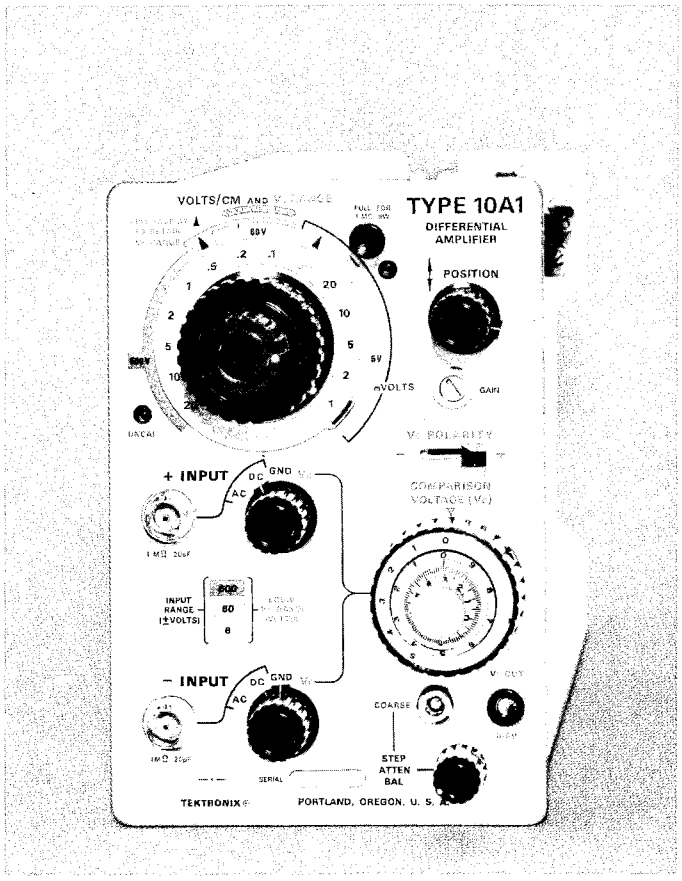
TYPE 10A1

DIFFERENTIAL UNIT

A CONVENTIONAL AMPLIFIER
DC to 55 MHz from 5 mV/cm to 20 V/cm
DC to 40 MHz at 1 mV/cm and 2 mV/cm

A DIFFERENTIAL AMPLIFIER
20,000:1 CMRR to 100 kHz
10,000:1 CMRR to 1 MHz
1,000:1 CMRR to 10 MHz

A CALIBRATED COMPARATOR
6, 60 and 600-V equivalent Vc range
6,000-cm slide-back scale
±(0.1% + 5 mV) Vc accuracy



The Type 10A1 combines the features of a conventional amplifier, a differential amplifier, and a calibrated differential comparator in a single plug-in unit for Type 647A and R647A Oscilloscopes. Rapid recovery from large differential overload allows detailed study of pulse-top flatness as well as comparator measurement of transient amplitudes. The effective 6,000-cm slide-back scale and 20,000:1 common-mode rejection ratio permit accurate measurements and comparisons. Rugged design insures accuracy over the same range of environmental conditions as stated for Type 647A and R647A Oscilloscopes.

CONVENTIONAL AMPLIFIER

BANDWIDTH AND RISETIME

Bandwidth is specified at 3-dB down. Bandwidth may be limited to 1 MHz ±10%, when desired, for noise reduction at higher sensitivities. Low-frequency 3-dB point is ~1.6 Hz with AC coupling, 0.16 Hz with P6047 10X Probe.

BANDWIDTH AND RISETIME WITH OR WITHOUT P6047 10X PROBE		
DEFLECTION FACTOR	0° C to +40° C	−30° C to +65° C
5 mV/cm to 20 V/cm	55 MHz and 6 ns	50 MHz and 7 ns
1 mV/cm and 2 mV/cm	35 MHz and 10 ns	35 MHz and 10 ns

DEFLECTION FACTOR

1 mV/cm to 20 V/cm in 14 calibrated steps (1-2-5 sequence). Continuously variable (uncalibrated) between steps and to approx 50 V/cm. Deflection factor can be calibrated at any step with front-panel GAIN adjustment. When GAIN has been accurately adjusted at 5 mV/cm, accuracies are as follows:

VOLTS/CM ACCURACY		
DEFLECTION FACTOR	0°C to +40°C	−30°C to +65°C
1 mV/cm (also 10 mV/cm and 0.1 V/cm with Vc range extended)	±2.5%	±4%
2 mV/cm through 2 V/cm (except 10 mV/cm and 0.1 V/cm with Vc range extended)	±1.5%	±2.5%
5 V/cm through 20 V/cm	±3%	±4%

INPUT RC

1 megohm paralleled by 20 pF.

DIFFERENTIAL AMPLIFIER

COMMON-MODE REJECTION RATIOS

Values stated apply at a deflection factor of 1 mV/cm and from 0° C to +40° C.

COMMON-MODE REJECTION DC COUPLED		
FREQUENCY RANGE	REJECTION RATIO	RANGE OF PEAK-TO-PEAK INPUT SINEWAVE
DC to 100 kHz	20,000:1	0 V to 10 V
100 kHz to 1 MHz	10,000:1	0 V to 10 V
1 MHz to 10 MHz	10,000:1*	0 V to 10 V*
20 MHz	freq in MHz 100:1	freq in MHz 0 V to 1 V
60 Hz	AC COUPLED 2,000:1	0 V to 10 V

*Divide CMRR and voltage by the frequency in MHz; e.g., CMRR is 5,000:1 with 5 V at 2 MHz.

At 10 mV/cm, using the internal 10X attenuator, CMRR is 2,000:1 for 20-V peak-to-peak 10 kHz sinewave.

RECOVERY TIME

$\leq$0.5 μs for a return to within $\pm$2mV after differential offset. Recovery DC error $\leq$0.5 mV after 1-ms recovery time. Characteristics apply from 0° C to +40° C.

CALIBRATED DIFFERENTIAL COMPARATOR

Comparison Voltage (Vc) can be used to offset the input waveform via the slide-back technique. The internal Vc source allows measurement, with 4-digit resolution, of signal amplitudes up to $\pm$600-V. Equivalent Vc range is normally selected simultaneously with deflection factor, but may be extended for a limited number of steps. Bandwidth and risetime in the extended Vc positions are the same as at 1 and 2 mV/cm.

INPUT VOLTAGE		
DEFLECTION FACTOR	LINEAR DYNAMIC RANGE and EQUIVALENT Vc RANGE	MAXIMUM COMBINED DC AND PEAK AC
1 mV/cm through 20 mV/cm	$\pm$6 V	$\pm$20 V
10 mV/cm through 0.2 V/cm	$\pm$60 V	$\pm$600 V
0.1 V/cm through 20 V/cm	$\pm$600 V	$\pm$600 V

Vc CHARACTERISTICS			
EQUIVALENT Vc RANGE	SLIDEBACK MEASUREMENT ACCURACY		DEFLECTION FACTOR
	0°C to +40°C	−30°C to +65°C	
6 volts	$\pm$(0.1% + 5 mV)	$\pm$(0.15% + 8 mV)	1 mV/cm through 20 mV/cm
60 volts	$\pm$(0.225% + 50 mV)	$\pm$(0.4% + 80 mV)	10 mV/cm through 0.2 V/cm*
600 volts	$\pm$(0.35% + 0.5 V)	$\pm$(0.65% + 0.8 V)	0.1 V through 20 V/cm*

*Pull knob to retain Vc range at two lowest deflection factors.

Vc OUTPUT

Available at front panel as well as internally. Output continuously variable from 0 to $\pm$6 V (0 to $\pm$0.6 V when deflection factor is set at 5, 10, or 20 V/cm). Accuracy is within $\pm$(0.1% + 5 mV) from 0° C to +40° C and within $\pm$ (0.15% + 8 mV) from −30° C to +65° C. (Open circuit values).

Vc CHARACTERISTICS WITH P6023 PROBE			
EQUIVALENT Vc RANGE	SLIDEBACK MEASUREMENT ACCURACY		DEFLECTION FACTOR
	0°C to +40°C	−30°C to +65°C	
60 volts	$\pm$(0.225% + 50 mV)	$\pm$(0.4% + 80 mV)	10 mV/cm through 0.2 V/cm
600 volts	$\pm$(0.5% + 0.5V)	$\pm$(0.95% + 0.8 V)	0.1 V/cm through 0.2 V/cm*
6000 volts**	+(1% + 5 V)	$\pm$(2% + 8 V)	1 V/cm through 200 V/cm*

*Pull knob to retain Vc range at two lowest deflection factors.

**Probe rating is 1000 volts maximum.

WEIGHTS

Net weight	4¾ lb	2.2 kg
Domestic shipping weight	~9 lb	~4.1 kg
Export-packed weight	~13 lb	~5.9 kg

STANDARD ACCESSORIES

Two instruction manuals (070-0464-00).

TYPE 10A1 DIFFERENTIAL AMPLIFIER $900

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. See accessory pages at rear of catalog for additional information.

PROBES

P6023 10X Low-Capacitance Probe for use with Tektronix differential amplifiers is provided with $\pm$2.5% adjustability of attenuation ratio; helpful in maintaining common-mode rejection ratio of the system. Order P6023 PROBE PACKAGE (010-0167-00 LOCKING BNC) $40

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

TYPE 10A2A

DC-to-100 MHz DUAL-TRACE UNIT

- **100-MHz BANDWIDTH WITH P6047 PROBE**
- **DUAL TRACE, 5 MODES**
- **FRONT-PANEL CHANNEL-2 OUTPUT**
- **TRIGGER SELECTION**

Bandwidth from DC to 100 MHz, at the probe tip, makes the Type 10A2A an especially versatile plug-in unit for the Type 647A and Type R647A Oscilloscopes. Two identical channels can be added algebraically, operated singly with either polarity, or operated dual trace with alternate or chopped switching. The Type 10A2A is built to meet the same environmental requirements as Type 647A and R647A Oscilloscopes.

BANDWIDTH
Without probe or with P6047 10X Probe: DC to 100 MHz (3-dB down) from 0° C to +40° C or DC to 85 MHz (3-dB down) from −30° C to +65° C. Low-frequency 3-dB point with AC coupling is ~1.6 Hz, ~0.16 Hz with 10X probe.

RISETIME
Without probe or with P6047 10X Probe: 3.5 ns from 0° C to +40° C or 4.1 ns from −30° C to +65° C.

DEFLECTION FACTOR
Without Probe: 10 mV/cm through 20 V/cm in 11 calibrated steps (1-2-5 sequence). After calibration at 0.01 V/cm, and at the operating temperature, deflection-factor accuracy is within 2% for the other 10 steps. Deflection factor can be calibrated at any step with front-panel GAIN adjustment. Deflection factor continuously variable (uncalibrated) between steps and to approx 50 V/cm. With P6047 10X Probe: All deflection factors multiplied by 10. Probe attenuation accurate within 2% from −30°C to +65°C.

INPUT RC
1 megohm paralleled by 20 pF.

CHOPPED MODE
Switches channels at 1 MHz (±20%) rate, displaying approx 500-ns segments of each channel. Chopped-transient blanking is provided.

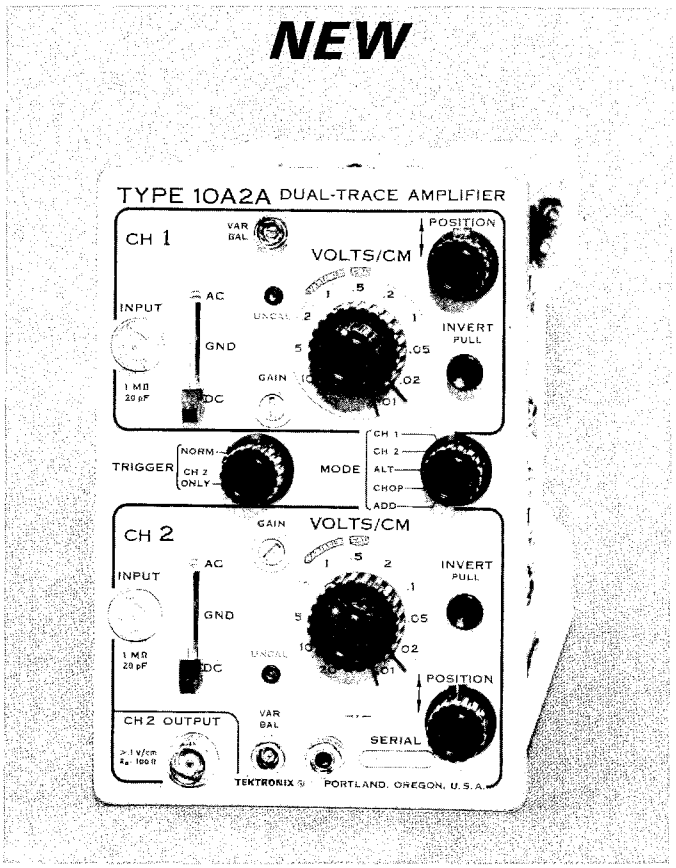
CHANNEL INVERSION
The display of either channel can be inverted for comparing signals 180° out of phase.

ADDED MODE
Common-mode rejection ratio 20:1 in added-algebraically mode for frequencies to 50 MHz and amplitudes to 10 cm.

CHANNEL ISOLATION (ATTENUATOR)
10,000:1 or greater for frequencies to 25 MHz.

CHANNEL-2 OUTPUT
Front-panel output with amplitude ≥100 mV per centimeter of Channel-2 display. Can be connected to Channel 1 in cascade for overall deflection factor of 1 mV/cm and bandwidth from DC to 30 MHz (3-dB down).

NEW



INTERNAL TRIGGER
Selectable triggering from common output amplifier or from Channel 2 only. Triggering from Channel 2 provides common time relationship between channels in Alternate or Chopped operation.

MAXIMUM INPUT VOLTAGE
600 V, DC + peak AC (≤1 kHz). Peak-to-peak AC not to exceed 600 V.

WEIGHTS

Net weight	5¼ lb	2.4 kg
Domestic shipping weight	~9 lb	~4.1 kg
Export-packed weight	~13 lb	~5.9 kg

STANDARD ACCESSORIES
Two instruction manuals (070-0615-00).

TYPE 10A2A DUAL-TRACE AMPLIFIER $775

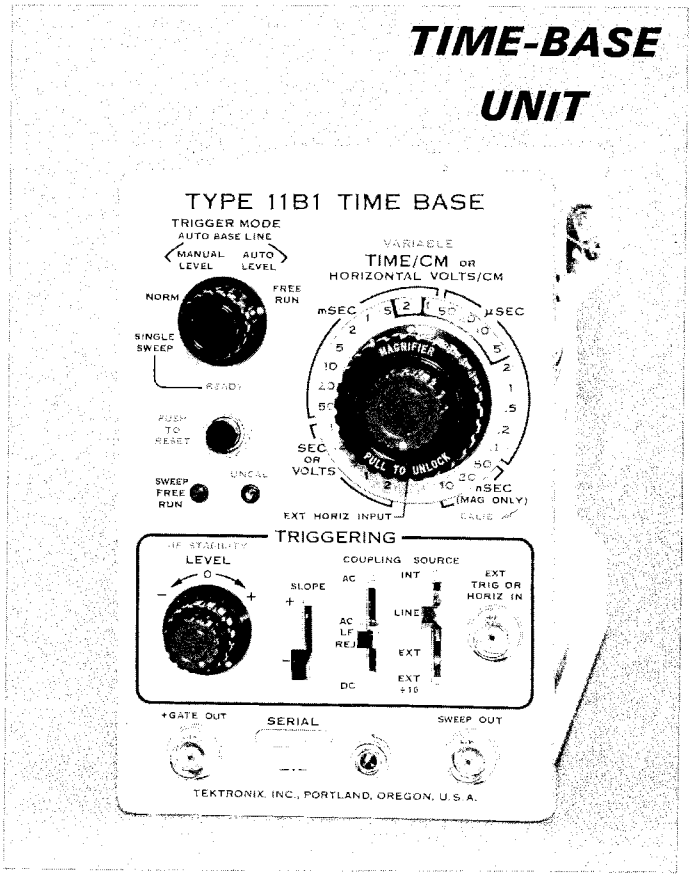
OPTIONAL ACCESSORIES

The standard probe supplied with the Type 647A satisfies most measurement requirements. Optional probes, including high-voltage and current-measuring probes, may be better suited for particular applications. See accessory pages at the rear of the catalog for additional information on these and other items.

PROBES
P6011 1X Passive Probe Package, order 010-0193-00 .. $15
P6009 100X Passive Probe Package, order 010-0170-00 . $55

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

TIME-BASE UNIT



- ***WIDE SWEEP RANGE***
- ***DIRECT-READING MAGNIFIER***
- ***VERSATILE TRIGGERING***
- ***SINGLE-SWEEP OPERATION***

The Type 11B1 is a Time-Base Plug-In Unit for Type 647A and R647A Oscilloscopes, and is built to meet the same environmental requirements. It features a single, wide-range sweep generator with a direct reading X1 to X50 magnifier. It provides normal sweeps to 0.1 μs/cm and direct-reading magnified sweeps to 10 ns/cm.

TIME BASE

0.1 μs/cm to 2 s/cm in 23 calibrated steps (1-2-5 sequence). Continuously variable (uncalibrated) between steps and to approx 5 s/cm. Free-run light warns the operator when sweep is not triggered.

DIRECT-READING MAGNIFIER

Up to X50 sweep expansion selected by TIME/CM switch.

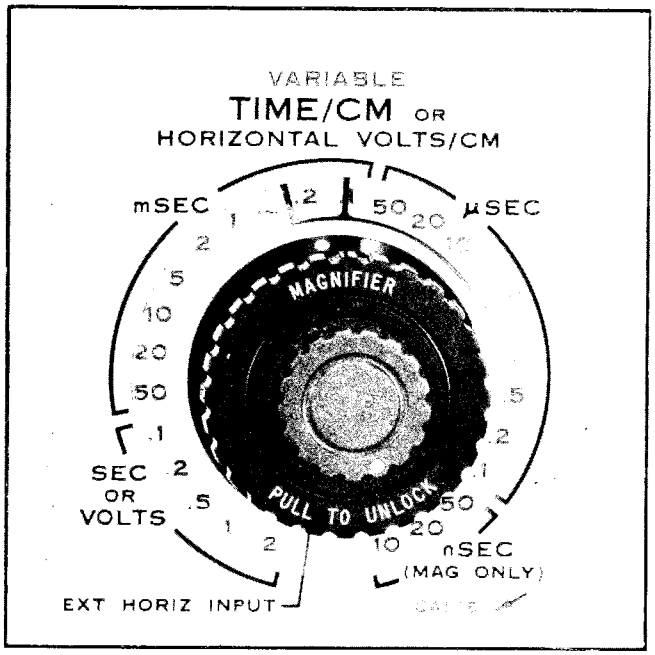
ACCURACIES		
SWEEP RATES	0° C to +40° C	−30° C to +65° C
0.1 μs/cm to 50 ms/cm	±1.5%	±2.5%
0.1 s/cm to 2 s/cm	±3%	+4%, −6%
Added by magnifier: 10 ns/cm and 20 ns/cm	±2%	±2.5%
50 ns/cm to 1 s/cm	±1%	±1.5%

EXTERNAL INPUT

0.1 V/cm to 2 V/cm in 5 steps, accurate within 2%; or, using ÷10 input attenuator, 1 mV/cm to 20 V/cm in 5 steps, accurate within 5%. Continuously variable (uncalibrated) between steps. DC to 3 MHz (3-dB down). Low-frequency 3-dB point 16 Hz with AC coupling, 17 kHz with AC low-frequency reject. Input RC approx 1 megohm paralleled by approx 35 pF (EXT) or approx 10 megohm and 6 pF (EXT ÷ 10).

SIGNAL OUTPUTS

+ Gate (approx 15 V) and positive-going sawtooth (approx 10 V) outputs via front-panel BNC connectors.



TYPE 11B1

TRIGGER

MODES

Free-run, single-sweep, normal and 2 types of automatic baseline operation (manual or auto trigger level). Automatic baseline triggering is useful above 20 Hz and minimizes trigger adjustment for signals of different amplitudes, shapes and repetition rates. With no triggering signal, a recurring sweep provides a convenient reference trace.

AUTO-LEVEL AUTOMATIC OPERATION

Establishes triggering level near waveform average. Offers triggering convenience for most waveforms.

MANUAL-LEVEL AUTOMATIC OPERATION

Full operator control of triggering level for triggering on either + or — slope. Provides for effective triggering with small amplitude or low duty cycle signals.

COUPLING

DC, AC (3-dB down at approx 16 Hz) or AC LF Reject (3-dB down at approx 17 kHz).

SOURCES

Internal, external, external ÷ 10, or line. External trigger input RC approx 1 megohm paralleled by 35 pF (EXT) or 10 megohm and 6 pF (EXT ÷ 10).

REQUIREMENTS

2-mm deflection or 125-mV external from DC to 50 kHz, increasing to 1-cm deflection or 250-mV external at 50 MHz. Requirements applicable to normal triggering or automatic baseline, manual level.

HIGH-FREQUENCY STABILITY

Changes time-base recovery time to reduce high-frequency jitter.

OTHER

WEIGHTS

Net weight	4¾ lb	2.2 kg
Domestic shipping weight	~ 8 lb	~3.6 kg
Export-packed weight	~13 lb	~5.9 kg

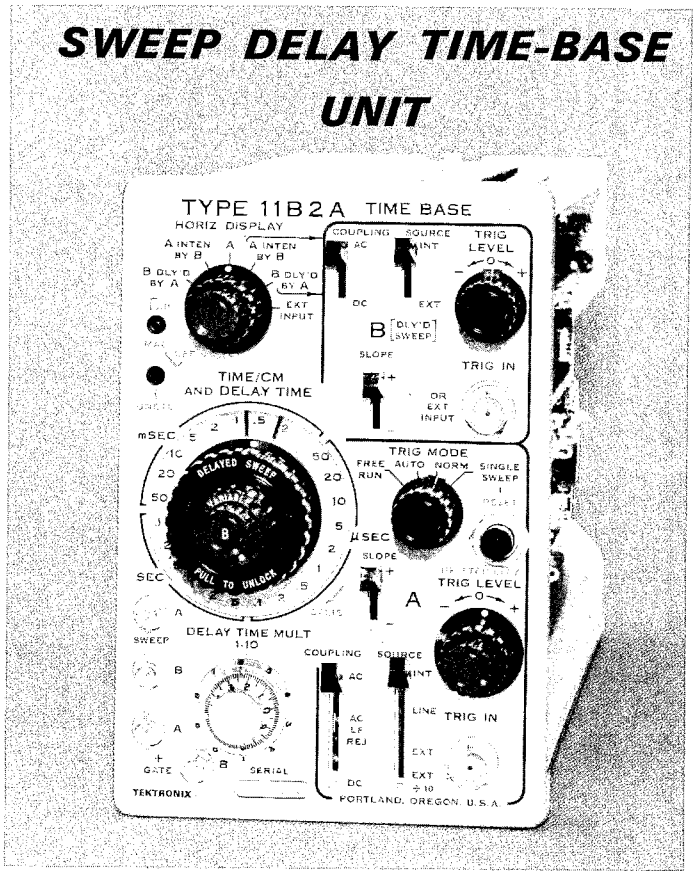
STANDARD ACCESSORIES

Two instruction manuals (070-0424-00).

TYPE 11B1 TIME BASE $650

U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Informotion page.

SWEEP DELAY TIME-BASE UNIT



NEW

- **NORMAL AND DELAYED SWEEPS**
- **VERSATILE TRIGGERING TO 100 MHz**
- **X10 SWEEP MAGNIFIER**
- **SINGLE SWEEP FOR PHOTOGRAPHIC RECORDING**

The Type 11B2A is a Time-Base Plug-In Unit for Type 647A and R647A Oscilloscopes, and is built to meet the same environmental requirements. Two separate time-base generators and a calibrated sweep delay are provided. Time Base A is the normal sweep and is also used to delay the start of Time Base B.

TIME BASE A AND B

0.1 μs/cm to 5 s/cm in 24 calibrated steps (1-2-5 sequence). Continuously variable (uncalibrated) between steps and to approx 12.5 s/cm.

X10 SWEEP MAGNIFIER

Operates over the full range of both time bases. Increases the fastest rate to 10 ns/cm.

ACCURACIES		
SWEEP RATES	0° C to +40° C	−30° C to +65° C
0.1 μs/cm to 50 ms/cm	±1.5%	±2.5%
0.1 s/cm to 5 s/cm	±3%	+4%, −6%
Added by X10 magnifier: 10 ns/cm and 20 ns/cm	±2%	±2.5%
50 ns/cm to 0.5 s/cm	±1%	±1.5%

DELAY TIME

1 μs to 50 s, continuously variable and calibrated.

DELAY ACCURACIES		
RANGE OR CHARACTERISTIC	0° C to +40° C	−30° C to +65° C
1 μs/cm to 50 ms/cm	±1.0% ID	+2% ID
0.1 s/cm to 5 s/cm	±2.5% ID	+3%, −6% ID
Multiplier Incremental Linearity	±0.15% FS	±0.2% FS
Jitter	Less than 1 part in 20,000 of maximum available delay	

ID—% of indicated delay.

FS—% of full scale (10X TIME/cm or DELAY TIME setting). For absolute delay from trigger point to delay start, trigger processing time (typically 100 ns) must be added.

OPERATING MODES

A only, A intensified by B, B delayed by A. In the two latter modes, B can be started automatically at the end of A, or is triggerable following the end of the delay period (providing a steady display of time-modulated pulses and signals with inherent jitter).

EXTERNAL INPUT

1 V/cm ±10% without magnification or 0.1 V/cm ±10% with X10 magnifier. Bandwidth is DC to 3 MHz (3-dB down). Low-frequency 3-dB point is 16 Hz with AC coupling. Input RC is 1 megohm paralleled by approx 30 pF.

SIGNAL OUTPUTS

Positive gates (approx 15 V) and positive-going sawtooths (approx 10 V) from both time bases.

TRIGGER

MODES

Normal, automatic, single-sweep, or free-run on Time Base A. Automatic operation is useful between approx 20 Hz and 100 MHz, minimizes trigger adjustments for signals of different amplitudes, shapes and repetition rates. With no input (or input less than 20 Hz), a recurring sweep provides a convenient reference trace.

COUPLING

AC, AC Low-frequency reject, or DC on Time Base A.

TYPE 11B2A

SOURCES

Internal source selected from oscilloscope vertical amplifier, external, external ÷ 10, or line. External trigger input RC approx 1 megohm paralleled by approx 25 pF (EXT) or 10 megohm and 5 pF (EXT ÷ 10).

TIME-BASE A REQUIREMENTS

3-mm deflection or 125-mV external from DC to 20 MHz increasing to 2-cm deflection or 250-mV external at 100 MHz. Requirements increase below 20 Hz with AC coupling; below 20 kHz with AC low-frequency reject.

TIME BASE B REQUIREMENTS

5-mm deflection or 125 mV external from DC to 20 MHz increasing to 3-cm deflection or 300-mV external at 100 MHz. Requirements decrease below 20 Hz with AC coupling.

OTHER

WEIGHTS

Net weight	6½ lb	3.0 kg
Domestic shipping weight	~10 lb	~4.5 kg
Export-packed weight	~14 lb	~6.4 kg

STANDARD ACCESSORIES

BNC female to BSM female adapter (103-0036-00); two instruction manuals (070-0640-00).

TYPE 11B2A TIME BASE $850

OPTIONAL ACCESSORIES

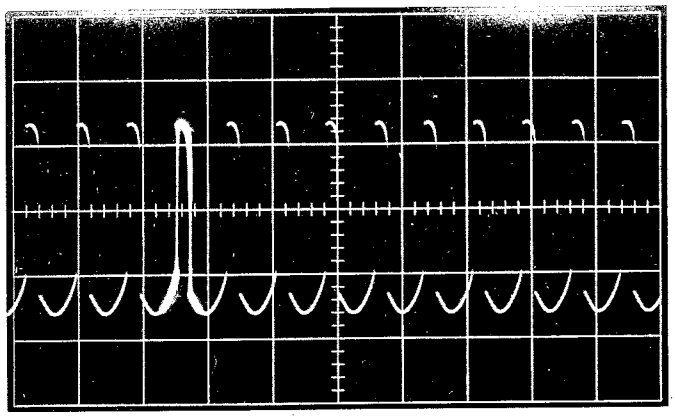
Optional accessories increase measurement capability and provide added convenience. These and other accessory items described in detail at the rear of the catalog.

BNC TO BSM ADAPTER

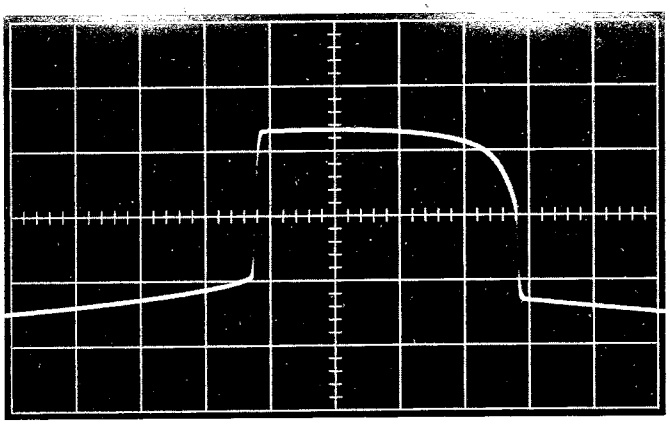
Converts Type 11B2A front-panel outputs to accept BNC cables.

Order 103-0036-00 ..... $5.00

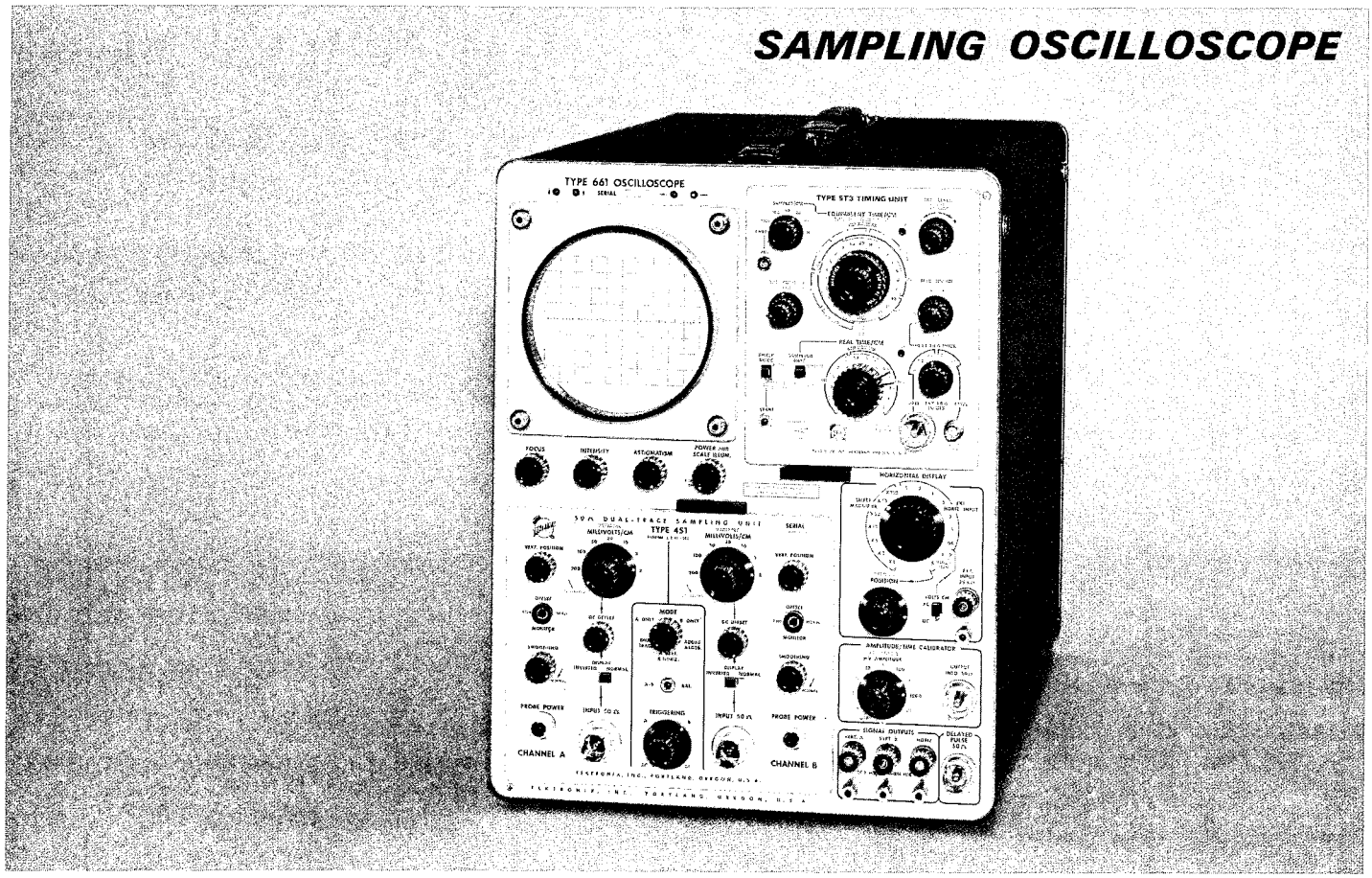
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.



The waveform below (B delayed by A) is a X20 expansion of the intensified portion of the waveform above (A intensified by B). Time Base A at 2 μs/cm, Time Base B at 0.1 μs/cm.



SAMPLING OSCILLOSCOPE



- ***PLUG-IN UNIT VERSATILITY***
- ***REPETITIVE, SINGLE, OR TIMED DISPLAYS***
- ***X-Y RECORDER OUTPUTS***
- ***VERTICAL AND HORIZONTAL RESOLUTION TO 0.1%***

With a Type 5T3 Timing Plug-In Unit and any of three Vertical Plug-In Units, Type 661 comprises an easy-to-operate complete sampling system. Type 5T3 Timing Unit provides a time-base range broad enough to cover most applications, from sub-audio to the picosecond region. In combination with Type 4S1 Sampling Unit, the system is similar (to operate) to a conventional (non-sampling) oscilloscope. Internal triggering eliminates the need for external trigger cabling. With Type 4S2A, the system is capable of displaying signals with extremely fast risetimes. Type 4S3 permits measurement of signals with high source impedances by use of miniature direct sampling probes. All three vertical units feature dual-trace capability, deflection factors to 2 mV/cm, and DC offset control with voltage monitor jack. This combination of deflection factor and DC offset provides 1000-to-1 vertical resolution. X100 time expansion and wide-range time position of Type 5T3 provide 1000-to-1 time resolution.

CHARACTERISTIC SUMMARY

VERTICAL (each channel)

(with Type 4S2A)

BANDWIDTH—Equivalent to DC to 3900 MHz.

RISETIME—90 ps.

CALIBRATED DEFLECTION FACTOR—2 mV/cm to 200 mV/cm.

INPUT IMPEDANCE—50 ohms.

HORIZONTAL

(with Type 5T3)

CALIBRATED TIME BASE—10 ps/cm to 5 s/cm.

MAGNIFIER—To X100 for Time Base range of 1 ns/cm to 100 μs/cm.

EXTERNAL INPUT—50 mV/cm to 5 V/cm (permits externally scanning the sampled display. Time per centimeter remains calibrated).

CRT

DISPLAY AREA—8 x 10 cm.

ACCELERATING VOLTAGE— $\approx$3 kV.

OTHER

AMPLITUDE/TIME CALIBRATOR—1 mV to 1000 mV, decade steps. 0.01 μs/cycle to 10 μs/cycle, decade steps.

POWER REQUIREMENTS—105 V to 125 V or 210 V to 250 V, 50 to 60 Hz, typically 450 W.

PLUG-IN UNIT COMPARTMENTS

Vertical system accepts any 4-series plug-in unit. Horizontal system accepts any 5-series plug-in unit.

TYPE 661

HORIZONTAL DISPLAY CONTROLS

HORIZONTAL POSITION
Coarse and fine adjustment-shift of display over 10 cm unmagnified or 1000 cm at full magnification.

FAST OR SLOW MANUAL SCAN
Permits detailed analysis of any portion of the display. This mode of operation facilitates driving external recorders.

SWEEP MAGNIFIER
X1, X2, X5, X10, X20, X50, or X100, symmetrical about the screen center, reduces the number of dots/cm and keeps time/dot uniform.

EXTERNAL HORIZONTAL INPUT
Permits externally scanning the sampled display. 50 mV/cm to 5 V/cm deflection factor (into 25-kΩ impedance) is in 7 steps, 1-2-5 sequence, either AC or DC-coupled. Equivalent time per centimeter remains calibrated.

AMPLITUDE/TIME CALIBRATOR
Calibrated amplitude from 1 mV to 1000 mV in 4 decade steps, accurate within 2% at 1000 mV with 50-ohm load. Calibrated time from 0.01 μs/cycle to 10 μs/cycle in 4 decade steps, accurate within 0.2%, except within 2% at 0.01 μs/cycle with 50-ohm load.

DELAYED-PULSE AND SIGNAL OUTPUTS
Delayed Pulse output permits the Type 661 (with 4 and 5-series plug-in units) to serve as a rate generator to trigger external circuitry. Pulses occur approx 50 ns after the equivalent sweep start with a Type 4S1 Unit, or approx 10 ns after sweep start with a Type 4S2A Unit. Amplitude is at least —350 mV and risetime is less than 150 ps. Output impedance is 50 ohms. Signal outputs include those for Vertical A, Vertical B, and Horizontal. Output impedances are approx 10 kilohms and amplitudes are approx 200 mV/cm referred to the CRT display.

TEKTRONIX CRT
Flat-faced round tube with an 8-cm by 10-cm viewing area and approx 3-kV accelerating potential. A P2 phosphor is normally supplied.

BEAM-POSITION INDICATORS
Show the direction of the CRT beam when it is deflected away from the center-screen area.

ILLUMINATED GRATICULE
Ruled in centimeter squares over an area of 8 by 10 cm, edge lighting is variable with front-panel control. Vertical and horizontal centerlines are further marked in 2-mm divisions for convenience in making time and amplitude measurements.

POWER REQUIREMENTS
105 V to 125 V or 210 V to 250 V, 50 to 60 Hz, typically 450 W. Instrument is normally factory wired for 105 V to 125 V, but can be ordered wired for 210 V to 250 V operation.

DIMENSIONS AND WEIGHTS

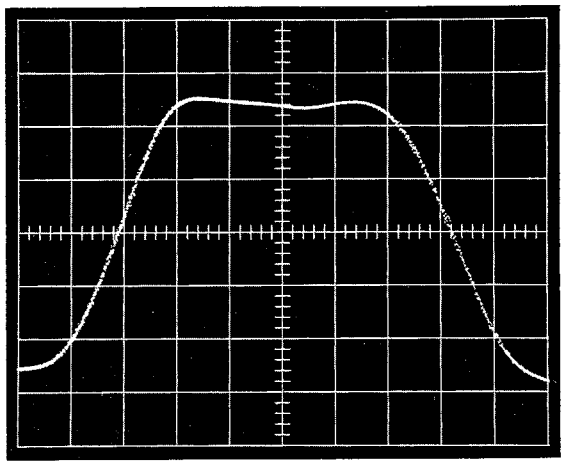
Height	16⅞ in	42.9 cm
Width	13⅛ in	33.4 cm
Depth	23¾ in	60.4 cm
*Net weight	48¼ lb	21.9 kg
*Domestic shipping weight	~65 lb	~29.5 kg
*Export-packed weight	~84 lb	~38.0 kg

*All weights shown are not including plug-in units.

STANDARD ACCESSORIES
3-conductor power cord (161-0010-00); 3- to 2-wire adapter (103-0013-00); smoke gray filter (378-0567-00); two instruction manuals (070-0324-00).

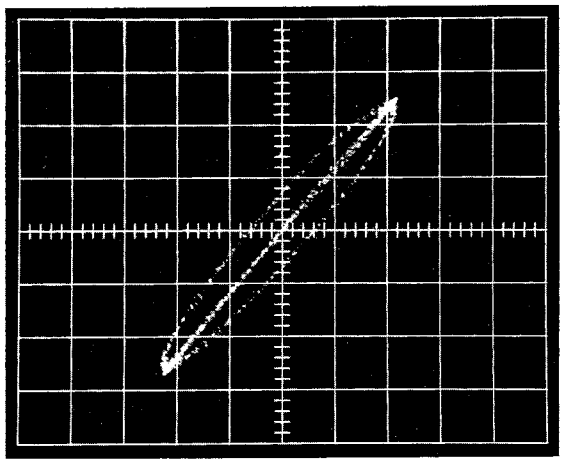
TYPE 661 OSCILLOSCOPE, without plug-in units . $1150

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



TIME JITTER

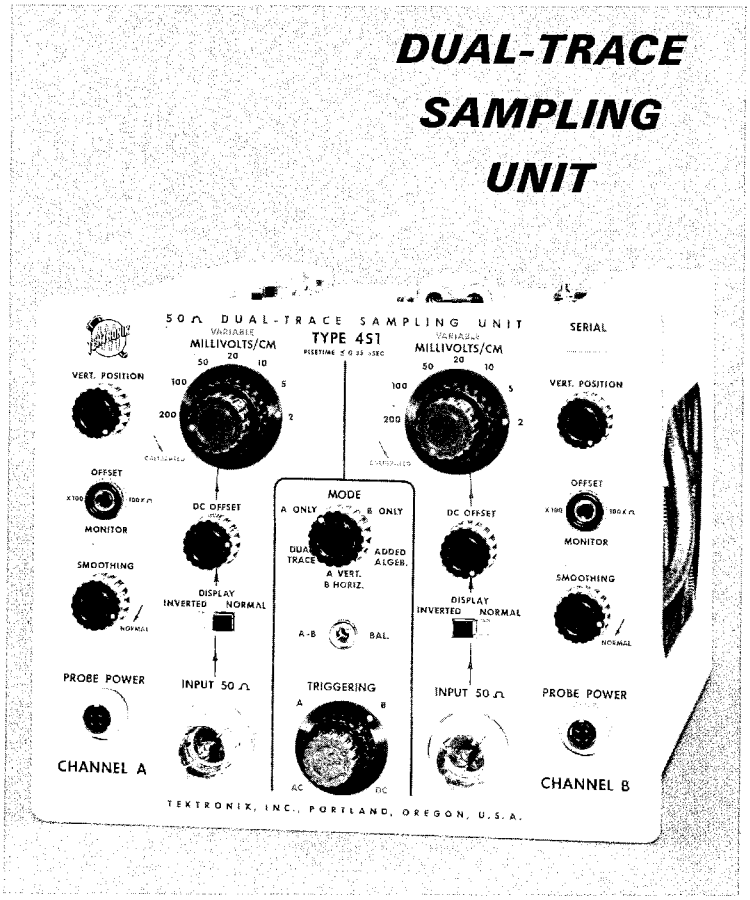
A 250 mV, 1.0 ns-wide pulse internally triggering the 4S1/5T3 system. Vertical deflection factor is 50 mV/cm; sweep rate is 0.2 ns/cm. Note that jitter is practically negligible.



TYPICAL APPLICATION

2 gigahertz sine-wave driving inputs to Type 4S2A for X-Y operation. Diagonal line shows in-phase characteristics. Ellipse is caused by insertion of 8 millimeters of airline to one input, resulting in approximately 20 degrees of phase shift. Resolution below one degree is possible.

DUAL-TRACE SAMPLING UNIT



- ***0.35-ns RISETIME***
- ***INTERNAL DELAY LINES***
- ***±2-VOLT DYNAMIC RANGE***
- ***±1-VOLT DC OFFSET***
- ***LESS THAN 1-mV RANDOM NOISE (UNSMOOTHED, ½-mV SMOOTHED)***

The Type 4S1 Dual-Trace Sampling Unit is a general-purpose sampling plug-in unit for the Type 661 Sampling Oscilloscope. Separate internal trigger takeoffs, delay lines, and terminations are provided, which permit triggering on either A or B input signals.

CHARACTERISTICS

(2 identical channels)

BANDWIDTH

Equivalent to DC-to-1000 MHz at 3-dB down.

RISETIME

Less than 0.35 ns.

DEFLECTION FACTOR

2 mV/cm to 200 mV/cm in 7 calibrated steps, 1-2-5 sequence (each channel). All steps accurate within 3%. Uncalibrated, continous variation between steps and to approx 0.67 mV/cm.

INPUT IMPEDANCE

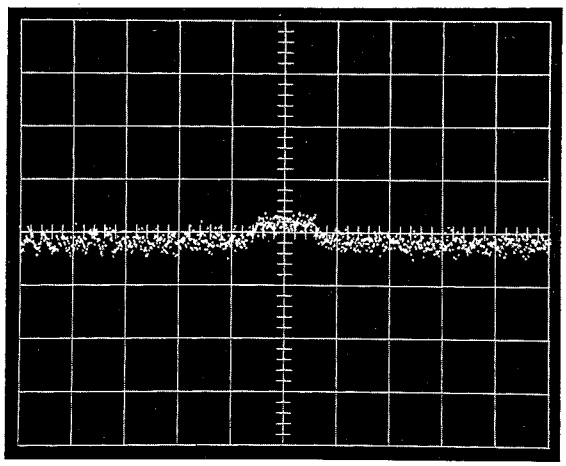
50 ohms. GR 874 input connectors. Tektronix 45-ns delay lines terminate in 2 pF and 50-ohm 1% resistors.

DYNAMIC RANGE

±2 volts. Full sensitivity can be used with signals up to ±2 volts in amplitude. Safe overload is ±10 V DC.

DISPLAY MODES

±A only, ±B only, Dual-Trace, Algebraic Addition of A and B inputs, and X-Y display of A-vertically and B-horizontally (for observation of hysteresis loops, phase shift).



TANGENTIAL NOISE

A 0.8-millivolt 2.5-ns pulse with Type 5T3 externally triggered. Vertical deflection factor is 2 mV/cm. This displays the random noise typical of the Type 4S1 (specification: tangential noise 1 mV, unsmoothed).

When making a visual noise reading from a sampling display, the eye interprets a noise value which is neither the RMS value nor the peak to peak value. Since most observers agree that a displayed noise value is approximately 3 times its RMS value, it is convenient to define the "tangential noise" value as exactly 3 times the RMS value. The tangential noise value thus defined contains approximately 90% of the trace dots and represents what most people see in the display.

DC OFFSET

Through ±1 volt, for signal levels exceeding "on screen" sensitivity settings, allows utilization of full sensitivity to display and measure small signals. Monitor jack permits voltmeter measurement of offset voltage.

RANDOM NOISE LEVEL

Equivalent to an input signal of 1 mV or less (tangential) unsmoothed, or 0.5-mV smoothed. Only approx 10% of the random noise dots are outside this level.

SMOOTHING CONTROL

Reduces system time jitter and amplitude noises, if needed.

TRIGGERING

Can be either internal or external with Type 5T3 Timing Unit. Separate internal delay lines and trigger takeoffs permit triggering on either A or B input signals. Trigger takeoffs deliver to the timing unit approx ⅛ the input signal amplitude. Risetime of the trigger amplifier system is nominally 0.6 ns (approx 600-MHz bandwidth).

PROBE POWER

Available at front-panel connectors for cathode-follower probes, Type 281 TDR Pulser and Type 282 Adapter for high-impedance probes. See Accessory pages.

WEIGHTS

Net weight	12 lb	5.4 kg
Domestic shipping weight	~23 lb	~10.4 kg
Export-packed weight	~30 lb	~13.6 kg

STANDARD ACCESSORIES

Two 10X 50-Ω attenuators (017-0078-00); two 5-ns 50-Ω cables (017-0502-00); two instruction manuals (070-0329-00).

TYPE 4S1 DUAL-TRACE SAMPLING UNIT $1430

U.S. Sales Price FOB Beaverton, Oregon

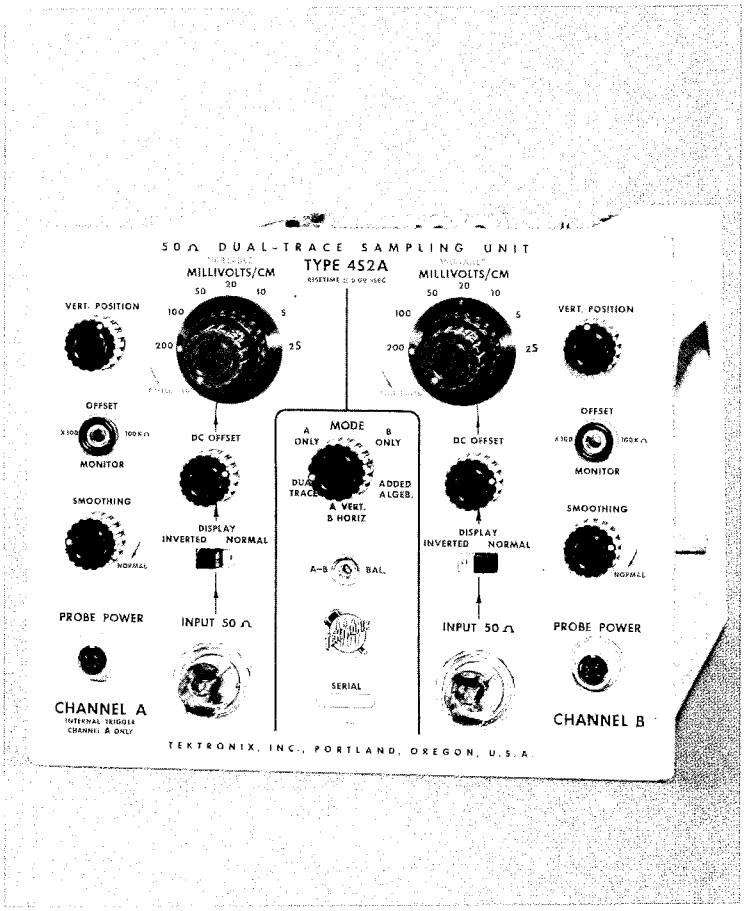
Please refer to Terms and Shipment, General Information page.

TYPE 4S2A

FAST-RISE DUAL-TRACE SAMPLING UNIT

- ***90-ps RISETIME***
- ***±1-VOLT DYNAMIC RANGE***
- ***±1-VOLT DC OFFSET***
- ***LESS THAN 4-mV RANDOM NOISE (UNSMOOTHED, <2 mV SMOOTHED)***

The Type 4S2A Dual-Trace Sampling Unit is a high resolution sampling plug-in unit which, with Types 661 and 5T3, is capable of displaying: 0.1% system discontinuities with centimeter separation (as a reflectometer); the fastest present switching transistor risetimes, including commercially available avalanche types; most tunnel-diode switching times (to 3 mA/pf); and stored charge in switching diodes to the 0.01 picocoulomb/milliampere region. Type 4S2A is also useful for very broad-band lissajous plots, permitting display of fractions of a degree of relative phase shift to over 3 GHz.



CHARACTERISTICS

(2 identical channels)

BANDWIDTH
Equivalent to DC-to-3900 MHz.

RISETIME
90 ps or less.

DEFLECTION FACTOR
2 mV/cm to 200 mV/cm in 7 calibrated steps, 1-2-5 sequence (each channel). All steps accurate within 3%. Uncalibrated, continuous variation between steps and to approx 0.67 mV/cm.

INPUT IMPEDANCE
50 ohms. GR 874 input connectors.

DYNAMIC RANGE
±1 volt. Full sensitivity can be used with signals up to ±1 volt in amplitude. Safe overload is ±5 V.

DISPLAY MODES
±A only, ±B only, Dual-Trace, Algebraic Addition of A and B inputs, and X-Y display of A-vertically and B-horizontally (for observation of hysteresis loops, phase shift, similar displays).

DC OFFSET
Through ±1 volt, for signal levels exceeding "on screen" sensitivity settings; allows utilization of full sensitivity to display and measure small signals or portions of signals riding on a DC level or as part of a larger signal. Monitor jack permits voltmeter measurement of offset voltage (at 100X the internal offset voltage level, ranging through ±100 volts).

RANDOM NOISE LEVEL
Less than 4 mV (tangential) unsmoothed or 2 mV smoothed. Only approx 10% of the random noise dots are outside this level.

SMOOTHING CONTROL
Reduces system time jitter and amplitude noises, if needed, when there is sufficient dot density.

TRIGGERING
Internally picked off Channel A only. No internal delay line is provided with either channel. Trigger takeoff delivers to the timing unit approx 1/10 the input signal amplitude. Risetime of the trigger takeoff circuit is approx 1 ns (from 10% to 50% points).

PROBE POWER
Available at front-panel connectors for cathode-follower probes and Type 282 Adapter for high-impedance probes. See Accessory pages.

WEIGHTS

Net weight	9¼ lb	4.2 kg
Domestic shipping weight	~17 lb	~ 7.7 kg
Export-packed weight	~24 lb	~10.9 kg

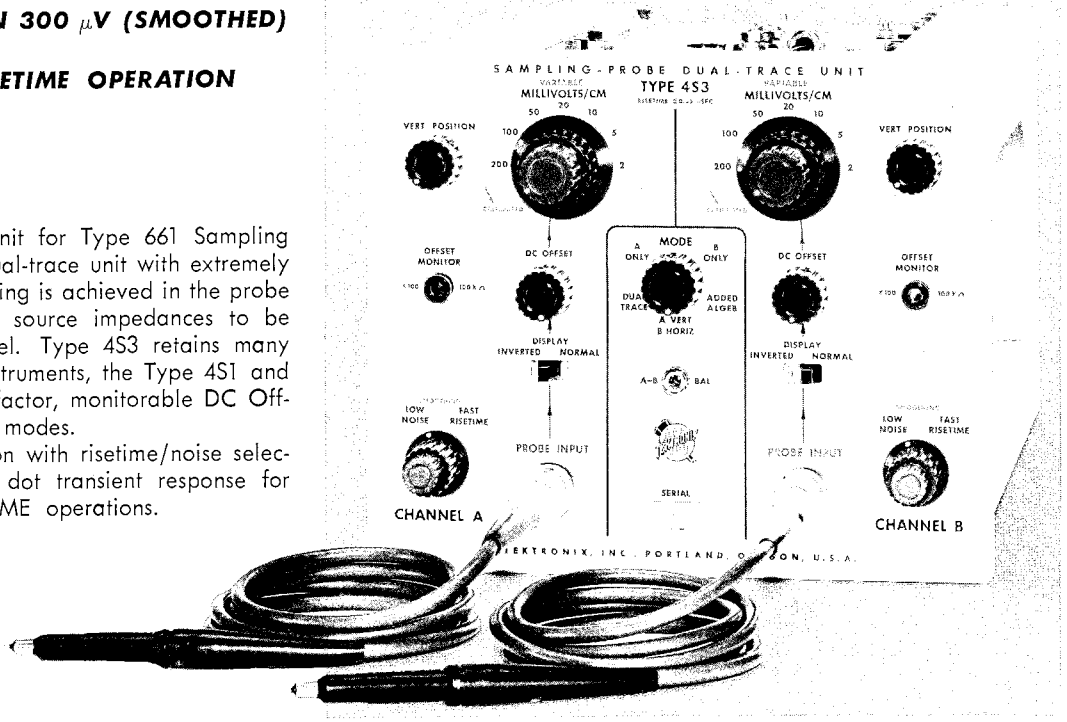
STANDARD ACCESSORIES
Two 10X 50-Ω attenuators (017-0078-00); two 5-ns 50-Ω cables (017-0502-00); two instruction manuals (070-0536-00).

TYPE 4S2A DUAL-TRACE SAMPLING UNIT $1450

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

SAMPLING-PROBE DUAL-TRACE UNIT

- ***0.35-ns RISETIME***
- ***MINIATURE DIRECT-SAMPLING PROBES***
- ***100 kΩ, 2 pF INPUT RC***
- ***RANDOM NOISE LESS THAN 300 μV (SMOOTHED)***
- ***LOW NOISE OR FAST RISETIME OPERATION***



The Type 4S3 Sampling-Probe Unit for Type 661 Sampling Oscilloscope is a special-purpose dual-trace unit with extremely small direct-sampling probes. Sampling is achieved in the probe head, permitting signals with high source impedances to be measured at a very low noise level. Type 4S3 retains many of the features of its companion instruments, the Type 4S1 and 4S2A, such as 2 mV/cm deflection factor, 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 operations.

CHARACTERISTICS

(2 identical channels)

BANDWIDTH

Equivalent to DC-to-1000 MHz.

RISETIME

0.35 ns or less (FAST RISETIME) or approx 0.5 ns (LOW NOISE) with a 50-Ω source.

DEFLECTION FACTOR

2 mV/cm to 200 mV/cm in 7 calibrated steps, 1-2-5 sequence (each channel). All steps accurate within 3%. Uncalibrated, continuous variation between steps and to approx 0.67 mV/cm.

INPUT RC

100 kΩ paralleled by 2 pF.

DYNAMIC RANGE

±2 volts. Full sensitivity can be used with signals up to ±2 volts in amplitude. Safe overload is ±10 V.

DISPLAY MODES

±A only, ±B only, Dual-Trace, Algebraic Addition of A and B inputs, and 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.

DC OFFSET

Through ±1 volt, for signal levels exceeding "on screen" sensitivity settings; allows utilization of full sensitivity to display and measure small signals or portions of signals riding on a DC level or as part of a larger signal. Monitor jack permits voltmeter measurement of offset voltage (at 100X the internal offset voltage level, ranging through ±100 volts).

RISETIME AND SMOOTHING CONTROLS

For least noise or best risetime, or a compromise of the two, while maintaining correct dot transient response 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.

RANDOM NOISE

Less than 0.5 mV (tangential) unsmoothed (LOW NOISE), 1 mV (FAST RISETIME), or approx 300 μV smoothed, when using a 50-ohm source.

TRIGGERING

External only, required approx 50 ns prior to signal. Please refer to TIMING UNIT characteristics.

SAMPLING PROBES

Included with the Type 4S3, and extremely compact to permit access to miniaturized circuitry. The sampling bridge is contained in the probe head to obtain optimum results with the input RC of 100 kΩ paralleled by 2 pF. Low-frequency response is approx 3-dB down at 1.5 kHz with the included coupling capacitor; approx 3-dB down at 150 Hz with the coupling capacitor and 10X attenuator. Probes can be interchanged between channels with only minor readjustment.

WEIGHTS

Net weight	9¾ lb	4.4 kg
Domestic shipping weight	~17 lb	~7.7 kg
Export-packed weight	~24 lb	~10.9 kg

STANDARD ACCESSORIES

Two P6038 probe packages (010-0156-00); two instruction manuals (070-0397-00).

TYPE 4S3/P6038 SAMPLING PROBE DUAL-TRACE UNIT $1450

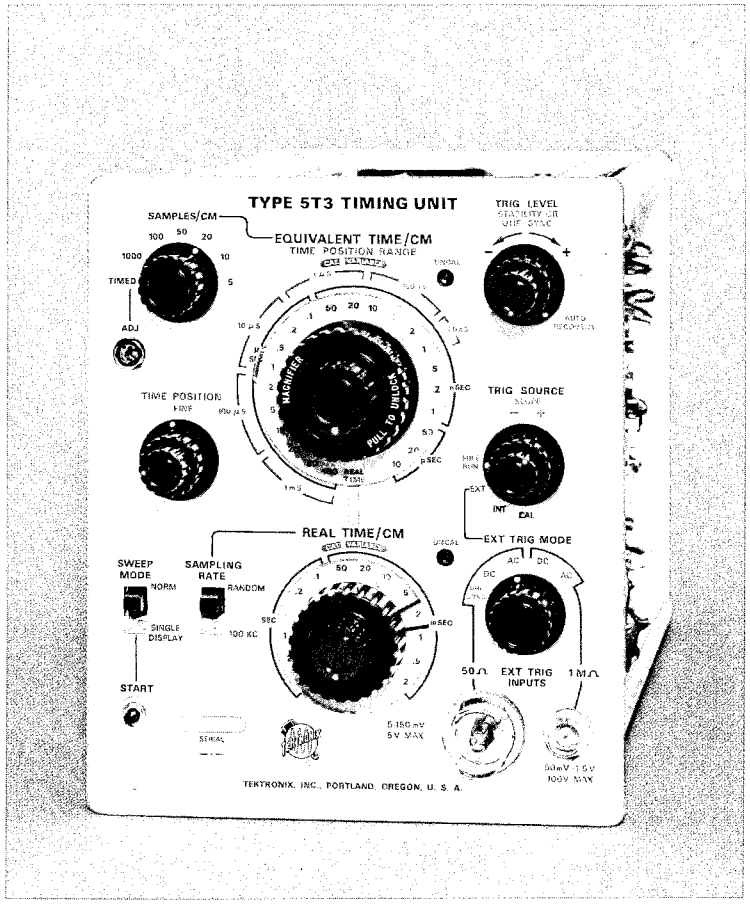
U.S. Sales Prices FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

TYPE 5T3

SAMPLING TIMING UNIT

- ***CALIBRATED SWEEP to 10 ps/cm***
- ***TRIGGERING to 500 MHz, SYNC to 5 GHz***
- ***REAL-TIME or EQUIVALENT-TIME SAMPLING***
- ***WIDE-RANGE MAGNIFIER AND TIME POSITION***



The Type 5T3 Timing Unit for Type 661 Oscilloscope incorporates both Equivalent-Time and Real-Time Sampling to provide a very broad range of sweep times. Versatile triggering operation, including 50-ohm and 1-megohm inputs, makes the Type 5T3 readily adaptable to a wide variety of applications. Trigger kickout (using external modes) is reduced to less than 10 mV by isolation amplifiers.

TIMING SECTION

REAL-TIME SAMPLING

0.2 ms/cm to 5 s/cm in 14 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuous variation between steps and to approx 80 μs/cm. The Sweep Magnifier in the Type 661 Oscilloscope provides up to X100 magnification of the CRT display. The 100-kHz sampling rate can be frequency modulated (60-Hz rate) to easily detect and correct false displays.

EQUIVALENT-TIME SAMPLING

10 ps/cm to 100 μs/cm in 22 calibrated steps (1-2-5 sequence), accurate within 3%. Uncalibrated, continuous variation between steps and to approx 4 ps/cm. Sweep steps from 1 ns/cm to 100 μs/cm can be magnified up to X100 while maintaining a constant number of samples/cm. Magnification occurs from a fixed time-reference point at the left edge of the screen. Equivalent-time sweep ranges, whether magnified or not, are read out directly on the Equivalent TIME/CM dial. Coarse and fine controls position the displayed time "window" and set the time-reference point for magnification.

SAMPLING DISPLAY

Real-time displays are in the form of dots (samples); the number of samples/cm depends on the TIME/CM setting. Equivalent-time displays can be viewed at 5, 10, 20, 50, 100, or 1000 samples/cm, or a timed slow scan (approx 0.5 s/cm to approx 5 s/cm) for chart recorder use.

SWEEP MODES

Normal (repetitive) or Single Display.

TRIGGER SECTION

NORMAL MODE

Triggering from DC to several hundred megahertz at 5-mV sensitivity. Schmitt-type tunnel-diode logic, operation similar to conventional (real-time) oscilloscope. Stability and Trigger Level controls; free-running displays possible.

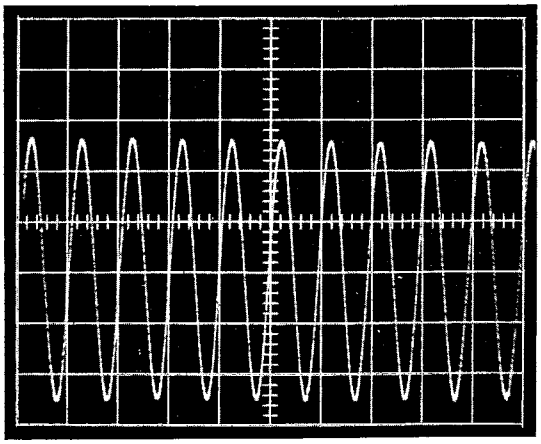
AUTOMATIC RECOVERY MODE

Triggering on fast, short pulses or synchronizing on high-frequency signals up to 500-MHz repetition at 5-mV sensitivity. One-knob adjustment for a wide variety of trigger signals.

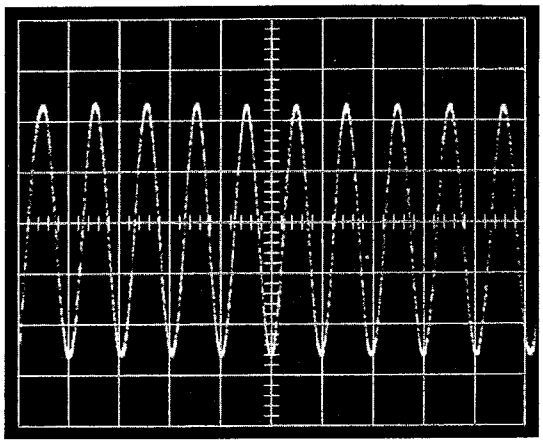
UHF SYNC MODE

Stable synchronization on low-amplitude signals from 500 MHz to 5 GHz. 50-ohm input connected directly (by-passing transistor amplifiers) through high-pass filter to very fast tunnel-diode multivibrator.

VIEW THESE 2 SIGNALS WITH THE TYPE 661/5T3/4S2A



50-Hz REAL-TIME DISPLAY
Horiz: 20 ms/cm; Vert: 100 mV/cm
External trigger, 1-megohm input



5-GHz EQUIVALENT-TIME DISPLAY
Horiz: 0.2 ns/cm; Vert: 100 mV/cm
External trigger, UHF Sync Mode

TRIGGER CAPABILITIES				
TRIGGER SOURCE	FREQUENCY COVERAGE†	COUPLING	DYNAMIC RANGE	MAXIMUM OVERLOAD
External 1-megohm input	DC to 20 MHz	DC	±50 mV to 1.5 V	±100 V
	160 Hz to 20 MHz	AC		
External 50-ohm input	DC to 500 MHz	DC	±5 mV to 150 mV	±5 V
	500 kHz to 500 MHz	AC		
	500 MHz to 5 GHz	UHF Sync		
Internal from Sampling Plug-In Unit	DC to ≈ 1 GHz	DC coupled in Type 5T3	Trigger takeoffs in the Type 4S1 Sampling Unit deliver ≈ 1/8 of input signal amplitude	
Internal from Oscilloscope Calibrator		AC	100-mV signal from Amplitude/Time Calibrator	

† AC lower-frequency limits refer to sinewaves only.

TRIGGER JITTER			
MODE	JITTER	FREQUENCY	PEAK TO PEAK VOLTAGE INPUT
NORMAL	≤ 30 ps	2-ns pulse width (50% points)	50 mV at 50-Ω input or 400 mV internal
AUTO RECOVERY	≤ 70 ps	500 MHz	50 mV at 50-Ω input or 400 mV internal
	≤ 30 ps	2-ns pulse width (50% points)	
UHF SYNC	≤ 30 ps	2 GHz	10 mV at 50-Ω input
		5 GHz	50 mV at 50-Ω input

WEIGHTS

Net weight	6¾ lb	3.1 kg
Domestic shipping weight	~10 lb	~4.5 kg
Export-packed weight	~16 lb	~7.3 kg

STANDARD ACCESSORIES

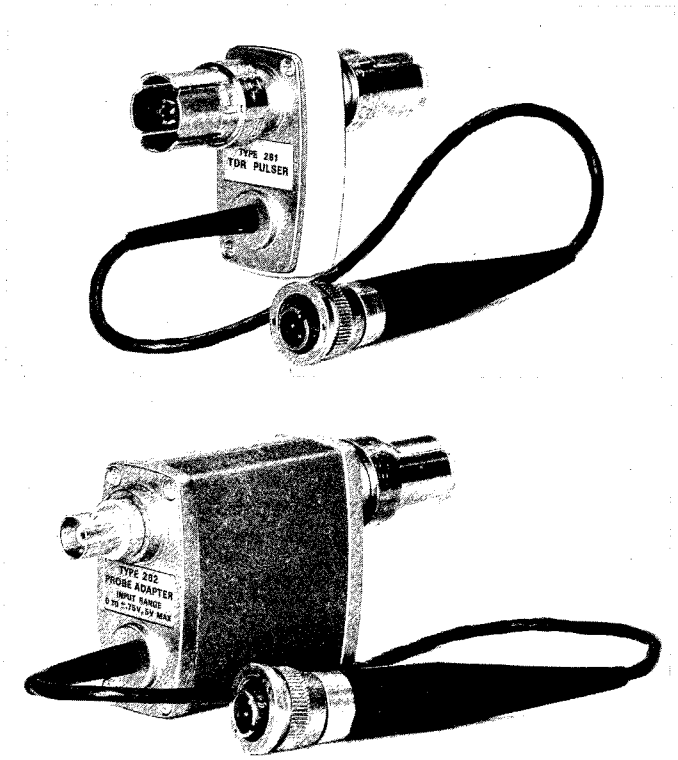
Two 10X 50-Ω attenuators (017-0078-00); 10-ns 50-Ω cable (017-0501-00); patch cord, BNC-to-banana plug (012-0090-00); two instruction manuals (070-0470-00).

TYPE 5T3 TIMING UNIT $800

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

SAMPLING ACCESSORIES

The usefulness of the Type 661 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 281 TIME DOMAIN REFLECTOMETRY PULSER

Type 281 is a compact current source designed for use with Type 3S76, 4S1, and 1S1 50-Ω Sampling Units; power is obtained from their probe power connectors.

PULSE AMPLITUDE is approx 18.5 mA; RISETIME $\leq$0.75 ns at leading negative transition; WIDTH $\geq$5 μs from negative-going edge to positive-going edge, at 50% amplitude points; FLATNESS $\pm$2% overshoot and ringing following negative-going edge for first 10 ns, 0.5% thereafter; LOADING EFFECT on 50-Ω SYSTEM $\leq$10% reflection (capacitive).

TYPE 281 TDR PULSER (Order 015-0060-00) $95

TYPE 282 ADAPTER FOR HIGH-IMPEDANCE PROBES

This accessory permits the use of conventional high-impedance probes with 50-Ω sampling plug-ins units, such as Types 1S1, 4S1, 4S2A, and 3S76. Now, with a wide-range sampling timing unit (Types 1S1 or 5T3), one oscilloscope can cover nearly the entire range of signal measurement (from power-supply ripple to sub-nanosecond events).

Other advantages include: voltage offset, smoothing, and overload-recovery features of sampling not normally available with a conventional oscilloscope; no loss of DC stability with sampling units; and excellent linearity over entire dynamic range.

The adapter is recommended for use with the following probes: P6008, P6009, P6010, P6011, P6012, and P6047.

TYPE 282 PROBE ADAPTER (Order 015-0074-00) $95

TYPE 109 PULSE GENERATOR

Produces 0.25-ns risetime pulses of either equal or alternately different time duration. Pulse width is 0.5 to 100 ns at full repetition rate of 550 to 720 p/s; and to 300 ns at half repetition rate.

Pulse amplitude is variable 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 $\leq$0.5 ns for positive and negative polarity. Repetition rate is variable from 10 p/s to 100 kHz. Pulse duration is 2 ns to 1500 ns with an external charge line. Pulse amplitude is $\pm$10 V.

PRETRIGGER PULSE amplitude is $\approx$10 V, duration is 250 ns, and half-amplitude risetime is 5 ns (approx).

Time delay between pretrigger and output pulse is variable from 30 ns to 250 ns.

TYPE 111 PULSE GENERATOR $365

TYPE 113 DELAY CABLE

The Type 113 Delay Cable provides 60-ns 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 ns, and 10 to 90% risetime of better than 0.1 ns. Impedance is 50 Ω $\pm$1%.

TYPE 113 DELAY CABLE $250

50-Ω POWER DIVIDER, GR TYPE 874-TPD

This divider is designed for use in broad-band 50-Ω systems where the mismatch introduced by ordinary "Tee" connectors is undesirable. It is especially useful in a time-domain reflectometer set-up where test line, pulser, and oscilloscope must be coupled with a minimum of reflection-producing discontinuities.

TYPE 874-TPD POWER DIVIDER (Order 017-0082-00) $70

TYPE P6038 DIRECT SAMPLING PROBE

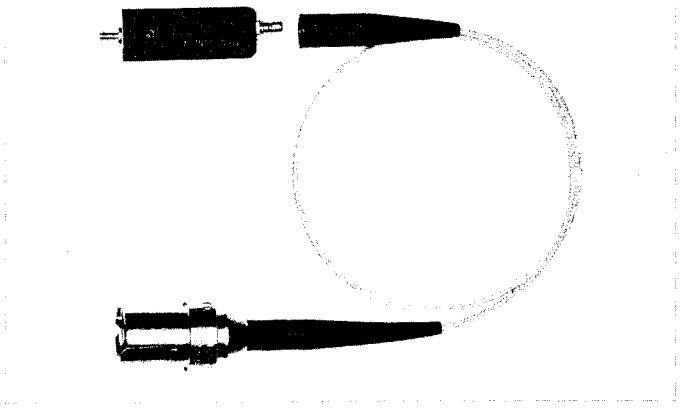
Specifically designed for use with the Type 3S3 and 4S3 Sampling Plug-Ins, the P6038 Probe features wide-band performance in the DC-to-1000 MHz range. Type P6038 is very small in size, containing sampling circuitry in the probe head. Low noise, full sensitivity measurements can be made even with signal source impedances above 50 ohms. Probe attenuation (direct) is 1X, with an input RC of 100 kΩ and 2 pF. With 10X attenuator, input RC becomes 1 MΩ and 1.8 pF.

P6038 PROBE PACKAGE, order 010-0156-00 ..... $225

TYPE P6032 CATHODE-FOLLOWER PROBE

Type P6032 with a bandwidth of greater than 800 MHz, permits accurate measurements of high-speed repetitive pulses. The DC-coupled probe uses 7 plug-in attenuator heads (10X to 1000X). Risetime is typically 0.4 ns for probe and attenuator head. Maximum output is $\pm$150 mV into a 50-Ω load. Signal delay is approximately 10 ns.

ORDER PART NUMBER 010-0108-00 ..... $220



TYPE CT-1 CURRENT TRANSFORMER

Type CT-1 provides a means for accurate measurement of current flow in a circuit, while keeping loading effects to a minimum. TYPE P6040 serves as an inter-connecting cable between the CT-1 and an oscilloscope. SENSITIVITY is 5 mV/mA into a 50-Ω load. BANDWIDTH is 35 kHz to 1 GHz. RISETIME for pulse response is less than 0.35 ns. DECAY TIME CONSTANT is 5 μs, approximated by 1% per 50 ns; limit, 1 μs. MAXIMUM VOLTAGE is 1000 V, DC. CURRENT RATINGS are 500 mA maximum RMS, 100 A peak pulse.

CT-1 (ORDER PART NUMBER 015-0040-00) $17

P6040 PROBE (ORDER PART NUMBER 010-0133-00) $14

TYPE CT-1 AND P6040 (ORDER PART NUMBER 015-0041-00) $31

TYPE CT-2 CURRENT TRANSFORMER AND P6041 PROBE

Type CT-2 and probe are similar to CT-1 with probe, except for lower bandwidth limits, higher RMS current rating, and reduced sensitivity. SENSITIVITY is 1 mV/mA into a 50-Ω load. BANDWIDTH is 30% down at 1.2 kHz to 7% down at 200 MHz. RISETIME is approximately 0.5 ns. DECAY TIME CONSTANT is 125 μs, approximated by 1% per 1.25 μs; limit, 25 μs. CURRENT RATINGS are 2.5 A maximum RMS, 100 A peak pulse. Though designed primarily for conventional oscilloscopes, the longer decay time constant and higher RMS current rating make Type CT-2 useful for some sampling oscilloscope applications. (Requires BNC to GR adapter.)

CT-2 (ORDER PART NUMBER 015-0046-00) $17

P6041 PROBE (ORDER PART NUMBER 010-0164-00) $12

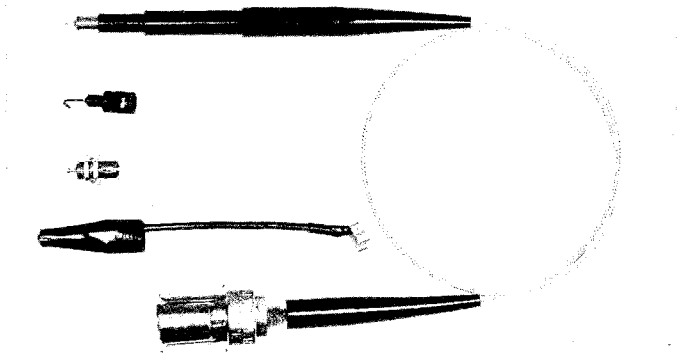
BNC to GR ADAPTER (Part Number 017-0063-00) $5.25

TYPE CT-3 50-OHM SIGNAL PICKOFF

The Type CT-3 provides a convenient means of picking off a signal in a 50-Ω system. Used with a Tektronix Sampling Instrument, the CT-3 provides the link for uses as a trigger source.

Sensitivity is 10% of the voltage under test, into a 50-Ω load. Risetime is less than 0.4 ns. Insertion impedance with a 50-Ω termination is 1 Ω shunted by 4.5 μH; or 2 Ω shunted by 4.5 μH without 50 Ω termination. VSWR approx 1.2 at 1.5 GHz.

ORDER PART NUMBER 017-0061-00 ..... $30.00



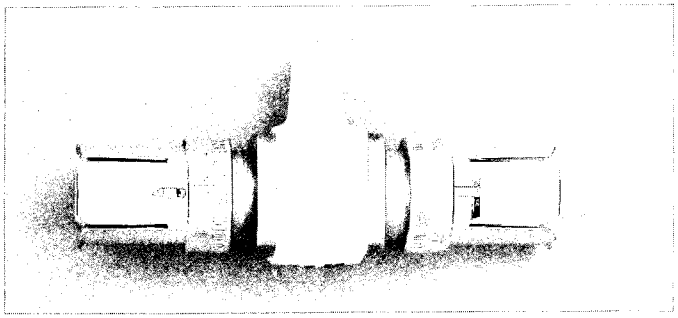
TYPE P6034 10X PROBE

This low-capacitance, miniature passive probe is designed for use with Type 4S1, 4S2A, and other 50-ohm sampling plug-in units to permit convenient connection to high-speed circuitry with minimum loss of bandwidth. Probe risetime is less than 100 ps; bandwidth is DC to 3.5 GHz (3-dB down); input resistance is 500 ohms, or approx 300 ohms at 1 GHz; input capacitance is 0.7 pF, DC to 100 MHz; voltage rating is 16 V DC or 45 V peak to peak (derating necessary for CW frequencies above 800 MHz); attenuation ratio is 10X.

P6034 Probe Package, order 010-0110-00 ..... $ 35

TYPE P6035 100X PROBE

Similar to Type P6034, this probe provides higher input impedance, but greater signal attenuation. Probe risetime is less than 200 ps; bandwidth is DC to 1.7 GHz (3-dB down); input resistance is 5 kilohms, or approx 1.5 kilohms at 1 GHz; input capacitance is 0.6 pF, DC to 100 MHz; voltage rating is 50 V DC or 140 V peak to peak (derating necessary for CW frequencies above 500 MHz); attenuation ratio is 100X. P6035 Probe Package, order 010-0111-00 ..... $ 35



TYPE VP-1 50-OHM VOLTAGE PICKOFF

This 50-ohm "T" type pickoff allows signal pickoff from a closed 50-ohm system with minimum disturbance of the system's characteristics. Designed for use with Type P6034 or P6035 Probes, the reflection coefficient of Type VP-1 alone is approx 3%.

TYPE VP-1, order 017-0073-00 ..... $ 25

TYPE VP-2 50-OHM VOLTAGE PICKOFF

Similar to Type VP-1, this pickoff is designed for use with the P6038 Direct Sampling Probe. Reflection coefficient of Type VP-2 alone is approx 4%; with P6038 probe inserted, approx 6%.

TYPE VP-2, order 017-0077-00 ..... $ 30

U.S. Sales Price FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

TYPE 106

SQUAREWAVE GENERATOR

- **10 Hz to 1 MHz REPETITION RATE**
- **HI-AMPLITUDE OR FAST-RISE OUTPUTS**
- **SYNC INPUT, TRIGGER OUTPUT**
- **SIMULTANEOUS + & — FAST-RISE OUTPUTS**

This general-purpose generator provides simultaneous positive and negative-going outputs with ≤1-ns risetime into 50 Ω, and a positive-going hi-amplitude output with ≤12-ns risetime into 50 Ω. A clean transition and flat top make the Type 106 ideal for checking oscilloscope transient response. It can be used in such applications as diode recovery, core testing, digital and analog design.

OUTPUT CHARACTERISTICS		
CHARACTERISTIC	+ and — FAST-RISE OUTPUTS	HI-AMPLITUDE OUTPUT
RISETIME (into 50 Ω)	≤2 ns at 500 mV	≤12 ns at 12 V, ≤20 ns at 0.5 V
REPETITION RATE	10 Hz to 1 MHz; decade steps, accuracy ±10%, variable between steps uncalibrated	
SYMMETRY	Duty cycle variable from 45% to 55%	
AMPLITUDE	50 mV to 500 mV into 50 Ω	0.5 V to 12 V into 50 Ω, 7 V to 120 V with no external load
ABERRATIONS	≤ + and — 2% in first 5 ns*, typically ≤0.5% for remainder of pulse top	≤ + and — 2% in first 100 ns*, typically ≤ 0.5% for remainder of pulse top

*Time period beings at 98%-amplitude point on rising edge.

OTHER CHARACTERISTICS

SYNC INPUT

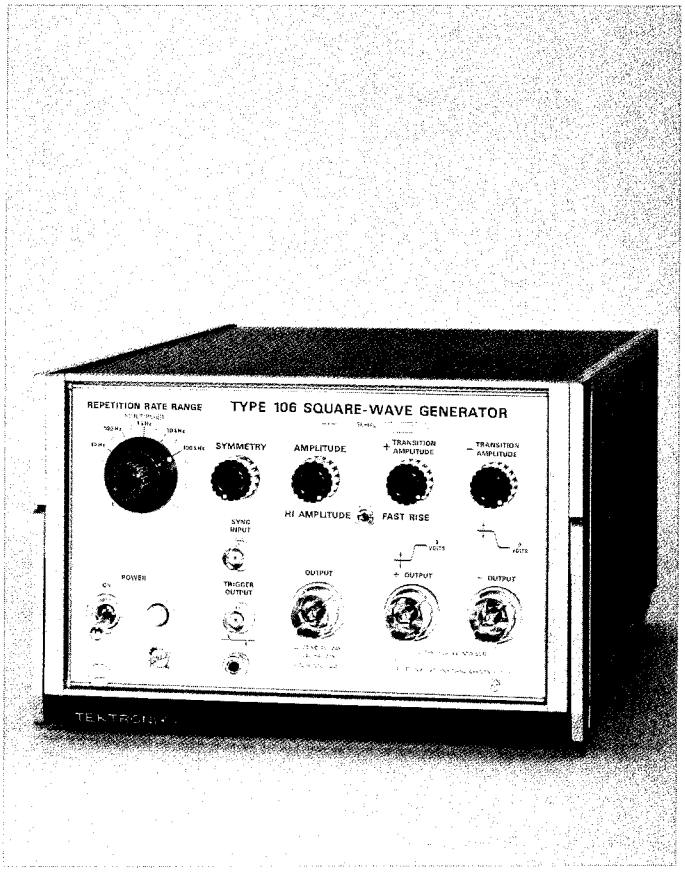
Accepts sinewaves, squarewaves, or pulses. Accepts 5 V to 100 V peak to peak sinewave, 2.5 V to 50 V pulse or squarewave, 100 Hz to 1 MHz.

TRIGGER OUTPUT

Differentiated squarewave, + and — triggers coincide (within 50 ns) with the rise and fall of the HI-AMPLITUDE output. ≤50 ns risetime into 50 Ω. 0 V to 0.1 V into 50 Ω, 0.4 V with no external load. ≤300 ps time jitter.

POWER REQUIREMENTS

103.5 V to 126.5 V or 207 V to 253 V, 50 to 60 Hz. Low or high range selected by rear-panel switch. Approx 85 watts maximum power consumption at 115 VAC.



DIMENSIONS AND WEIGHTS

Height	6¾ in	17.1 cm
Width	9 in	22.8 cm
Depth	15¾ in	40 cm
Net weight	15 lb	6.8 kg
Domestic shipping weight	~21 lb	~ 9.6 kg
Export-packed weight	~29 lb	~13.2 kg

STANDARD ACCESSORIES

5-ns cable (017-0502-00); 50-Ω GR-to-BNC in-line termination (017-0083-00); right-angle 3-conductor power cord (161-0024-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0523-00). (Power cord for MOD 146B is 161-0031-00).

TYPE 106 SQUARE-WAVE GENERATOR $590

TYPE 106 SQUARE-WAVE GENERATOR MOD 146B . $565
As above, but less cabinet, for mounting in Rack Adapter.

RACK ADAPTER FOR TYPE 106, 114, 184 and 191

Converts these generators for rack mounting. Any combination of two of these instruments can be mounted side by side in a 19-in rack, in only 5¼ in of panel height. Adapter provides forced-air ventilation and shielding between compartments. Blank panel included to cover unused rack opening when only one generator installed. Special power cord (161-0031-00) is required for each instrument installed. These cords are not supplied with the rack adapter.

RACK ADAPTER (016-0086-00) $125

POWER CORD FOR RACK ADAPTER (161-0031-00) . $2.55

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

PULSE GENERATOR

- ***0.25-ns RISETIME PULSES***
- ***ALTERNATE PULSES OF EQUAL OR DIFFERENT TIME DURATION***
- ***0-55 V CALIBRATED VARIABLE AMPLITUDE***
- ***SELECTABLE POLARITY***

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.

PULSE CHARACTERISTICS	
CHARACTERISTICS	PERFORMANCE
RISETIME	Less than 0.25 ns
REPETITION RATE	Preset between 550 p/s and 720 p/s (using two charge lines)
PULSE DURATION	0.5 ns to max of 100 ns at full rep rate; 300 ns at half rep rate
DECAY AMPLITUDE	approx 10% in 300 ns Adjustable from 0 through 55 V, accuracy ±3%
POLARITY	Positive or negative
OUTPUT IMPEDANCE	50 Ω

CHARGE LINES

Either one or two charge lines can be used to provide alternate equal or unequal pulses as desired. Equal charge lines produce a repetition rate of 500 pulses per second to 720 pulses per second.

EXTERNAL DC CHARGE VOLTAGE INPUTS

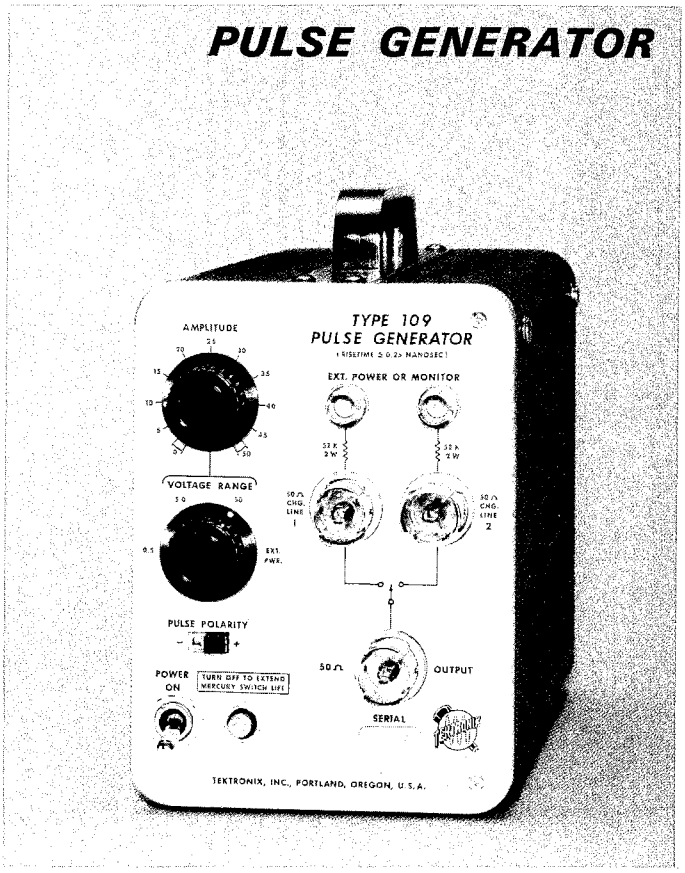
Use of external charge voltages allows attenuated pulses to be of different amplitude and polarity. Maximum external charge voltage is 600 volts. With up to 100 volts input, the output amplitude will be half the external input amplitude. At voltage inputs over 100 volts, the output amplitude will be less than half the input amplitude. At pulse outputs over 50 volts, irregularities may occur.

DC POWER SUPPLY

Electronically regulated to compensate for varying load conditions.

POWER REQUIREMENT

Wired for 105 to 125 V, may be ordered with the taps connected for 210 to 250 V. 50 to 800 Hz, 60 watts maximum.



DIMENSIONS AND WEIGHTS

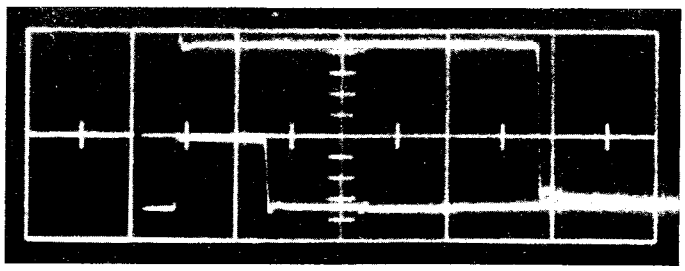
Height	7¾ in	19.7 cm
Width	4⅞ in	12.2 cm
Length	11⅞ in	30.2 cm
Net weight	8¼ lbs	3.8 kg
Domestic shipping weight	~17 lbs	~ 7.7 kg
Export-packed weight	~28 lbs	~12.7 kg

STANDARD ACCESSORIES

Charge network (017-0067-00); three 5-ns cables (017-0502-00); 3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0299-00).

TYPE 109 PULSE GENERATOR $360

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

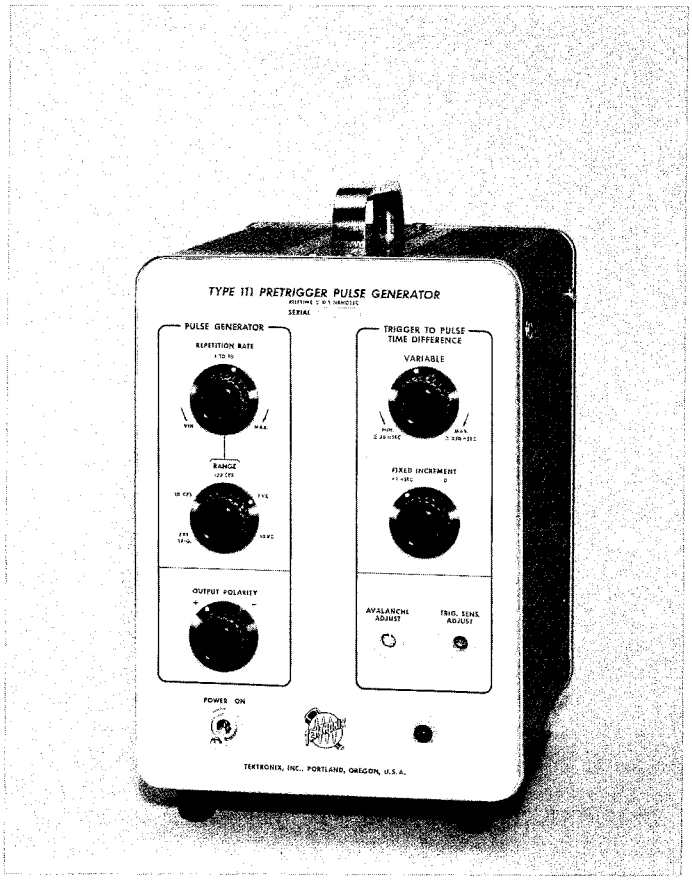


Alternate pulses of different widths and amplitudes produced by using 5-ns and 20-ns charge lines and external charge voltages. Vertical deflection factor 10 V/cm, sweep speed 10 ns/cm.

TYPE 111

PRETRIGGER PULSE GENERATOR

- ***0.5-ns RISETIME PULSES***
- ***PULSE DURATIONS TO 1500 ns***
- ***10 Hz to 100 kHz REPETITION RATE***
- ***SELECTABLE POLARITY***
- ***30 to 250-ns PRETRIGGERING***



The Type 111 is a low cost, fast-rise pulse generator. The unit provides two pulse outputs: fast-rising output pulses and pretrigger pulses. The pretrigger pulses occur from 30 to 250 nanoseconds ahead of each output pulse. Pretrigger pulses can be used as a regenerated trigger signal for 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 can be varied by means of a front-panel control. This eliminates the need for delay cables.

OUTPUT PULSE CHARACTERISTICS

CHARACTERISTIC	PERFORMANCE
RISETIME	$\leq$0.5 ns (either polarity)
REPETITION RATE	Continuously variable, 10 Hz to 100 kHz
PULSE DURATION	Continuously variable, 2 ns to 1500 ns
AMPLITUDE	$\geq$10 V
POLARITY	Positive or negative
OUTPUT IMPEDANCE	50 Ω
ABERRATIONS	$\leq$5% P to P on leading edge and top of output pulse; $\leq$10% P to P on region following the pulse

PRETRIGGER PULSE CHARACTERISTICS

Amplitude: $\approx$10 V, duration: $\approx$300 ns, risetime: $\approx$5 ns.

PULSE DELAY

30 to 250 ns, continuously variable. Time jitter less than 100 ps.

OUTPUT IMPEDANCE

50 ohms.

EXTERNAL TRIGGER SIGNAL

+3 V or greater at a rate of rise of 3 V/μs or faster. As long as rate of rise is maintained, repetition rates from 0 to 100 kHz can be used.

POWER REQUIREMENTS

Wired for 105 to 125 V, may be ordered with taps connected for 210 to 250 V. 50 to 800 Hz, approx 35 watts.

DIMENSIONS AND WEIGHTS

Height	$11\frac{7}{16}$ in	29 cm
Width	$6\frac{15}{16}$ in	17.7 cm
Depth	$11\frac{5}{16}$ in	28.7 cm
Net weight	9 lbs	4.1 kg
Domestic shipping weight	~14 lbs	~ 6.4 kg
Export-packed weight	~20 lbs	~ 9.1 kg

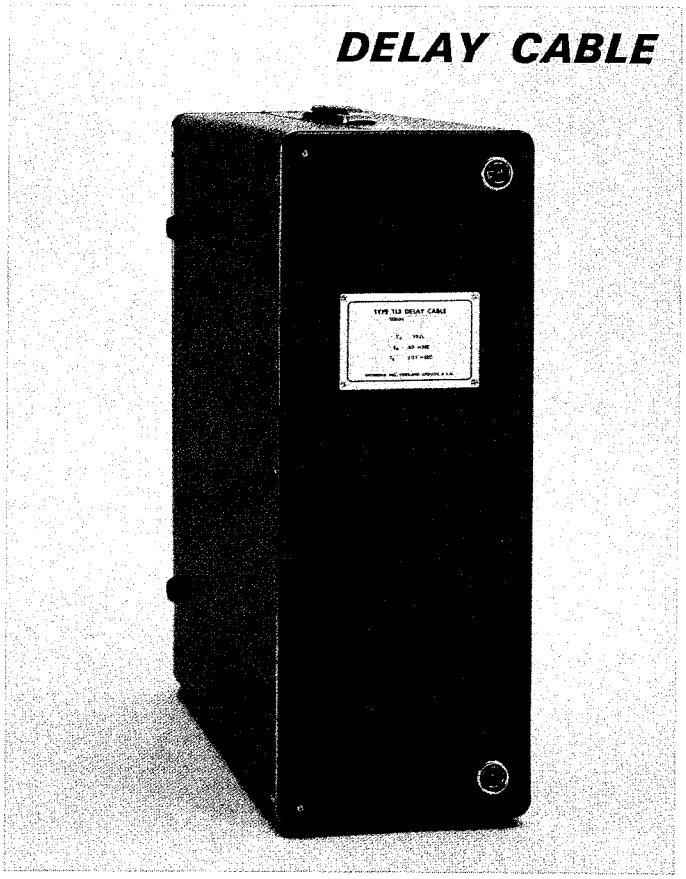
STANDARD ACCESSORIES

5-ns 50-Ω cable (017-0502-00); 9-ns 50-Ω charge line (017-0506-00); 50-Ω 10X attenuator (017-0078-00); 3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0252-00).

TYPE 111 PULSE GENERATOR $365

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

DELAY CABLE

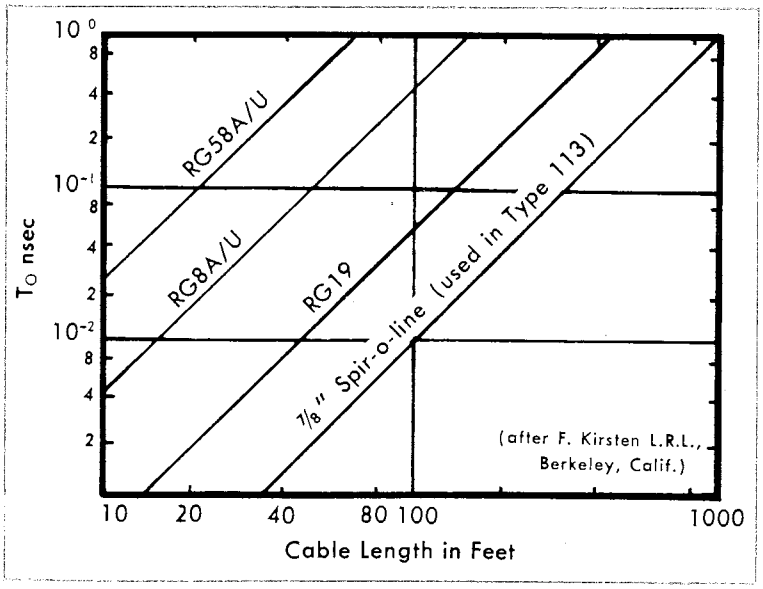


Transmission Lines

Transmission lines used for nanosecond pulses are commonly of the transverse electric and magnetic fields mode type. The Type 113 uses this mode, because response is desired to zero frequency with minimum dispersion. In the nanosecond region, skin effect losses cause most of the pulse distortion in well-constructed cables. This results in a nongaussian response. Risetimes of cascaded cables do not follow the usual RMS addition method of combining risetimes, as in gaussian amplifiers.

Transmission line distortion of a step function shows up in a distinctive way. After a small transition period, the output rises fairly rapidly and then slows considerably, compared to an RC charge. An RC step requires 2.2 time constants to change from 10% to 90% of the input step. A transmission line requires 30 times the 0-to-50% risetime period to accomplish this (10% to 90%) transition.

The graph illustrates time of rise from 0-to-50% (T_o) 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 in 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 ns and a characteristic impedance of 50 Ω. In general it is used in those sampling applications where the vertical amplifier does not contain internal delay lines and the triggering of the sweep is external and signal delay is required.

CHARACTERISTIC IMPEDANCE

50 Ω ±1%.

HIGH QUALITY CABLE

Approximately 1.5-dB loss per 100 feet at 1000 MHz. Risetime approximately 0.1 ns.

DIMENSIONS AND WEIGHTS

Height	22 3/8 in	57.1 cm
Width	8 5/8 in	21.9 cm
Depth	21 7/8 in	55.5 cm
Net weight	44 3/4 lbs	20.3 kg
Domestic shipping weight	~60 lbs	~27.3 kg
Export-packed weight	~75 lbs	~34.1 kg

TYPE 113 DELAY CABLE $250

U.S. Sales Price FOB Beaverton, Oregan
Please refer to Terms and Shipment, General Information page.

TYPE 114

PULSE GENERATOR

- ***10-ns RISETIME AND FALLTIME***
- ***VARIABLE PULSE PERIOD AND AMPLITUDE***
- ***SELECTABLE POLARITY***

The Type 114 is a general-purpose pulse and squarewave generator designed for laboratory and production test facilities. The broad operating range of the Type 114 makes it well suited for applications such as medical stimulations, studying network response to changes in pulse period and/or width, or determining the step response of systems.

OUTPUT CHARACTERISTICS		
CHARACTERISTIC	PERFORMANCE	ACCURACY
RISE AND FALL TIME	≤10 ns	—
PULSE OR SQUAREWAVE PERIODS	5 ranges from 1 μs to 10 ms continuously variable from 1 μs to 100 ms	Pulse: ±3% with variable in calibrated position. Squarewave: ±5% from 100 ms to 10 μs, ± 10% at 1 μs with variable in calibrated position
PULSE WIDTH (DURATION)	5 ranges from 100 ns to 1 ms continuously variable from 100 ns to 10 ms	±3% with variable control in calibrated position
AMPLITUDE	4 ranges: —1 V to —3 V, —3 V to —10 V, +1 V to +3 V, +3 V to +10 V. Variable within each range. Maximum: 10 V into 50 Ω, 16 V into 1 kΩ	—
POLARITY	Positive or negative	—
ABERRATIONS	≤5% (at maximum amplitude)	—

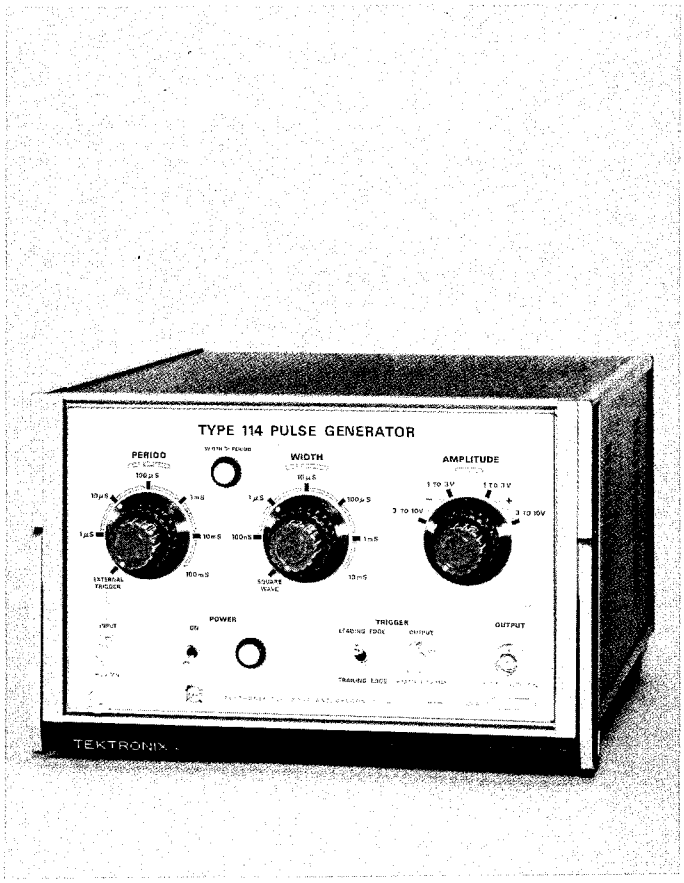
OTHER

EXTERNAL TRIGGER INPUT REQUIREMENT

Trigger signals from +2 V to +20 V having a risetime of 1 μs or less. Signals up to 2 MHz may be used.

TRIGGER OUTPUT

≥2 V, open circuit; approx 0.5 V into 50-Ω load. Front-panel switch sets trigger output pulse to occur at leading or trailing edge of output pulse.



POWER REQUIREMENTS

94.5 V to 137.5 V or 189 V to 275 V, 50 to 400 Hz. Low or high range selected by rear-panel switch. Approx 15 watts maximum power consumption.

DIMENSIONS AND WEIGHTS

Height	6¾ in	17.1 cm
Width	9 in	22.8 cm
Depth	12⅞ in	33.6 cm
Net Weight	9¼ lbs	4.2 kg
Domestic shipping weight	~13 lbs	~5.9 kg
Export-packed weight	~23 lbs	~10.5 kg

STANDARD ACCESSORIES

Right-angle 3-conductor power cord (161-0024-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0465-00). (Power Cord for MOD 146B is 161-0031-00).

TYPE 114 PULSE GENERATOR $295

TYPE 114 PULSE GENERATOR MOD 146B $270

As above, but less cabinet, for mounting in rack adapter.

RACK ADAPTER FOR TYPE 106, 114, 184 and 191

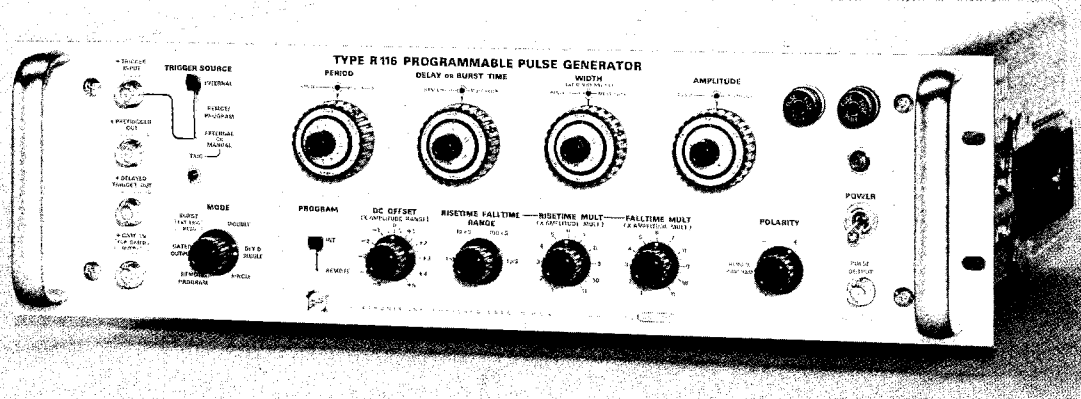
Converts these generators for rack mounting. Any combination of two of these instruments can be mounted side by side in a 10-in rack, in only 5¼ in of panel height. Adapter provides forced-air ventilation and shielding between compartments. Blank panel included to cover unused rack opening when only one generator installed. Special power cord (161-0031-00) is required for each instrument installed. These cords are not supplied with the rack adapter.

RACK ADAPTER (016-0086-00) $125

POWER CORD FOR RACK ADAPTER (161-0031-00) . $2.55

U. S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page.

PROGRAMMABLE PULSE GENERATOR



CALIBRATED AND PROGRAMMABLE PARAMETERS

- ***MODE***
- ***TRIGGER SOURCE***
- ***PERIOD***
- ***DELAY OR BURST TIME***
- ***WIDTH***
- ***POLARITY***
- ***AMPLITUDE***
- ***DC OFFSET***
- ***RISETIME AND FALLTIME***

The Type R116 is a broad-range, programmable pulse generator intended primarily for applications where various combinations of pulse amplitude, width, polarity, and other features are required in rapid sequence.

All functions and parameters are easily programmable with no need for extra-cost modifications. The Type R116 can also be operated manually from calibrated front-panel controls for initial test setup and for applications not requiring external programming. Full programming capability requires 21 bits and 7 analog lines.

PULSE CHARACTERISTICS (at 10-volts amplitude)

CHARACTERISTICS	RANGE	BASIC ACCURACY (% of dial)	REQUIRED PER PROGRAM
*RISETIME AND FALLTIME	10 ns to 110 μs	$\pm$5% (except $\pm$10% on 1 and 10 ns range. $<$10 ns uncalibrated.)	3 bits + 2 resistors
*PERIOD	100 ns to 11 ms	$\pm$3%, except shortest period range is $\pm$5%	4 bits + 1 resistor
*WIDTH	50 ns to 550 μs	$\pm$3%, except shortest width is $\pm$5%.	3 bits + 1 resistor
*DELAY OR BURST TIME	50 ns to 550 μs	$\pm$3%, except shortest delay is $\pm$5%.	3 bits + 1 resistor
*AMPLITUDE (into 50 Ω)	0.4 V to 10 V	$\pm$3% all ranges	2 bits + 1 resistor
*DC OFFSET (continuous)	$-$5 V to +5 V	$\pm$5% ($\pm$100 mV at zero offset)	1 resistor
POLARITY	positive or negative		

*These parameters are calibrated and continuously variable.

PROGRAM ACCURACY

Accuracy of the remote program when using recommended program resistor values is the same as the corresponding front-panel control plus 2%, plus any error in the value of the program resistor. For example, the period which has a basic accuracy of ±3% from the front panel would have a maximum error of ±5%, plus the error in the programming resistor when it is remotely programmed. Accuracy of remote programming may be improved by calibrating the instrument for remote programming rather than for front-panel operation.

OPERATING MODES

SINGLE
Undelayed pulses.

DELAYED SINGLE
Pulses occurring at the end of the delay time.

DOUBLE
Pairs of pulses: one occurring at the time of the normal undelayed pulse, one occurring at the end of the delay time.

BURST
Output pulses obtained for the duration of Burst Time when initiated by external triggering pulse. Pulses occur at internal repetition rate.

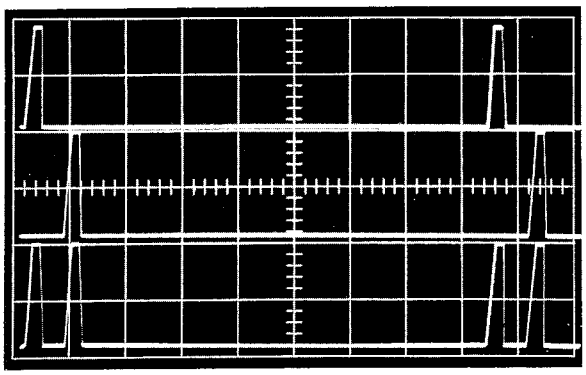
GATED OUTPUT
Output pulses obtained for the duration of input gate. Pulses are synchronous with input gate and occur at internal repetition rate.

REMOTE PROGRAM
Permits remote programming of the operating mode. Programming requires 4 bits.

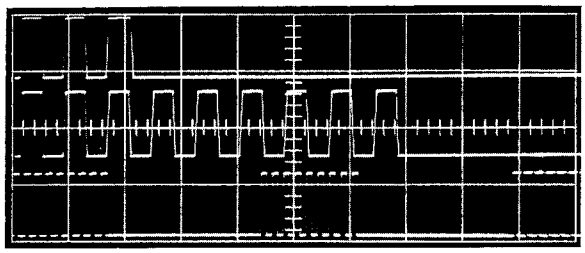
INPUTS

+TRIGGER
Accepts trigger from +2 V to +20 V, for triggering signals having at least 100 ns separation; +2 V to +4 V for signals having at least 50 ns separation. DC-coupled input.

+GATE
Accepts gate from +2 V to +10 V. Output pulses start approximately 100 ns after gate reaches +2-V level and continue until gate drops below +2 V. Output pulses synchronous with gate. DC-coupled input.



Multiple exposure showing timing relationships between Single, Delayed Single, and Double operating modes. Oscilloscope triggered from Type R116 Pretrigger. 50 μs/cm sweep time, 5 V/cm deflection factor.



Multiple exposure showing burst capabilities of the Type R116. Upper trace shows burst of 3 pulses. Center trace shows burst of 9; lower trace shows bursts of 9 on a slower time scale. 5 μs/cm sweep time on upper 2 traces; 20 μs/cm on lower trace 5 V/cm deflection factor.

AUXILIARY OUTPUTS

+PRETRIGGER
2 V minimum into 1 kΩ, risetime less than 20 ns. Occurs approx 30 ns prior to start of the undelayed output pulse.

+DELAYED TRIGGER
2 V minimum into 1 kΩ, risetime less than 20 ns. Occurs approx 30 ns prior to the start of the delayed output pulse.

OTHER

POWER REQUIREMENTS
94.5 to 137.5 V or 189 to 275 V, selectable by rear-panel switch. 50 to 60 Hz, 100 watts maximum.

DIMENSIONS AND WEIGHTS

Height	5¼ in	13.3 cm
Width	19 in	48.3 cm
Depth	17½ in	44.5 cm
Net weight	25¾ lbs	11.7 kg
Domestic shipping weight	~61 lbs	~27.7 kg
Export-packed weight	~86 lbs	~39.1 kg

STANDARD ACCESSORIES
30-in 50-Ω BNC cable (012-0057-01); 50-Ω BNC termination (011-0049-00); 36-pin remote program connector (131-0293-00); set mounting tracks (351-0084-00); set mounting hardware, cabinet feet kit (016-0052-00); 3-conductor power cord (161-0024-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0498-00).

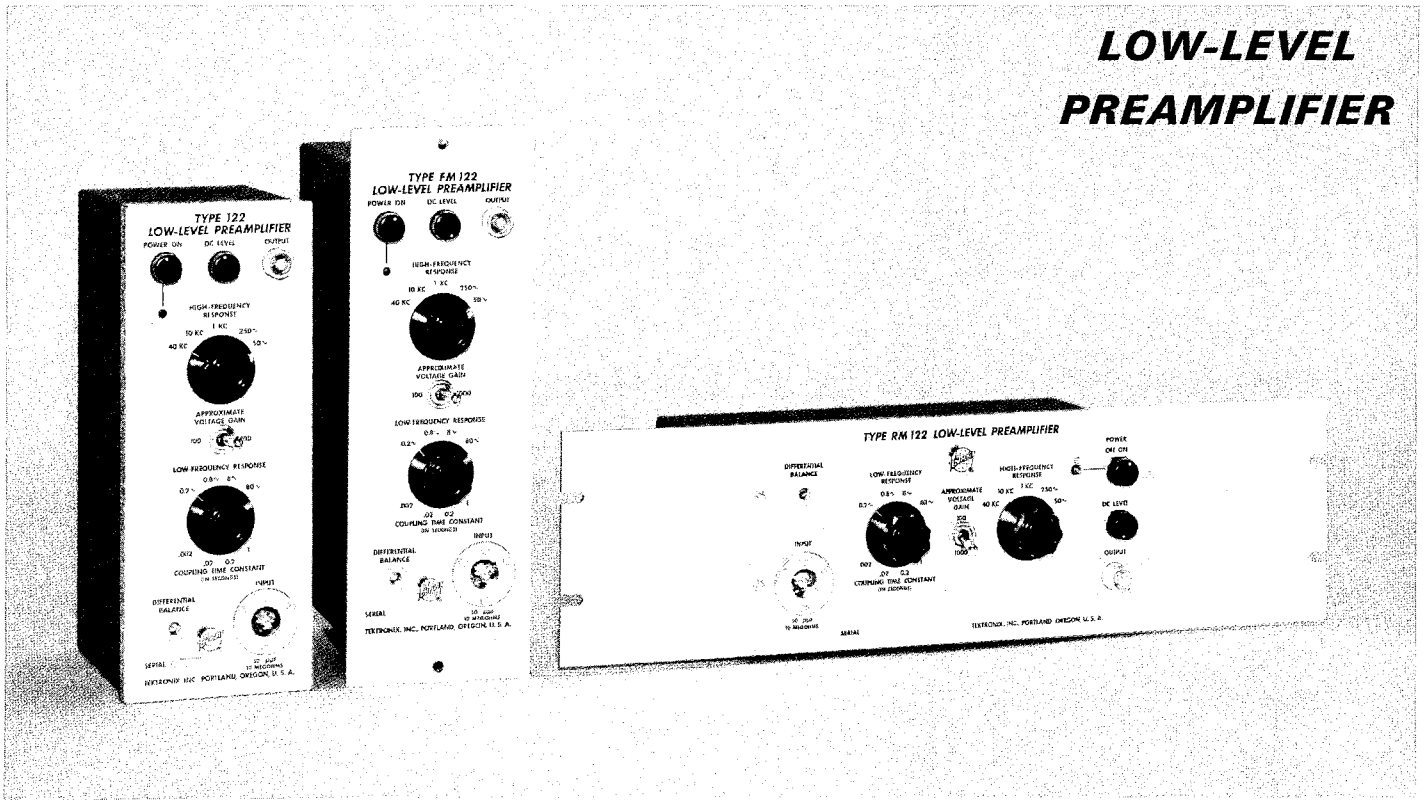
TYPE R116 PULSE GENERATOR $1550

OPTIONAL ACCESSORIES

Optional accessories increase measurement capability and provide added convenience. See accessory pages at the rear of the catalog for additional information.

U. S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page.

LOW-LEVEL PREAMPLIFIER



- ***100 OR 1000 VOLTAGE GAIN***
- ***SINGLE ENDED OR DIFFERENTIAL INPUT***

The Tektronix Type 122, FM122, or RM122 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 that require the amplification of microvolt signals.

BANDWIDTH

0.2 Hz to 40 kHz. High and low-frequency —3 dB points can be set by front panel switches.

VOLTAGE GAIN

100 or 1000, selected by a toggle switch.

INPUT RC

10 megohms paralleled by approximately 50 pF.

COMMON-MODE REJECTION RATIO (CMRR)

Better than 10,000:1 between 5 Hz and 40 kHz. Maximum common-mode input signal: 4 V.

SIGNAL OUTPUT

20 V (peak to peak) maximum in high gain position, 10 V (peak to peak) maximum in low gain position; AC signals up to 0.02 V (gain 1000) or 0.1 V (gain 100) and DC levels up to ±0.1 V (either gain setting) can be applied before waveform distortion occurs. Output impedance is approximately 1000 ohms.

NOISE LEVEL

1 to 5-μV RMS referred to input with input grounded.

POWER REQUIREMENTS

+135 V at 5 mA, —90 V at 4 mA, and 6.3 V at 0.9 A, applied through a standard octal plug. 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 V dry-cell batteries and one 6.3 V storage battery. Batteries are not included with the Type 122.

STANDARD ACCESSORIES

7 ft battery cable (012-0009-00); output cable (012-0003-00); input plug (131-0013-00); two instruction manuals (070-0246-00). Type FM122 and RM122 include mounting hardware.

DIMENSIONS AND WEIGHTS—TYPE 122

Height	12¼ in	31.2 cm
Width	4⅛ in	10.5 cm
Depth	7⅛ in	18.1 cm
Net weight	4¼ lb	1.9 kg
Domestic shipping weight	~ 9 lb	~ 4.1 kg
Export-packed weight	~13 lb	~ 5.9 kg

DIMENSIONS AND WEIGHTS—TYPE FM122

Electrically identical to Type 122, but designed to mount vertically in a standard rack with associated instruments. Can be mounted directly or mounted by Tektronix mounting frame. (see Type 125 catalog page for mounting frame information).

Height	12¼ in	31.2 cm
Width	4⅛ in	10.5 cm
Depth	7 in	17.8 cm
Net weight	4¾ lb	2.2 kg
Domestic shipping weight	~ 9 lb	~ 4.1 kg
Export-packed weight	~13 lb	~ 5.9 kg

DIMENSIONS AND WEIGHTS—TYPE RM122

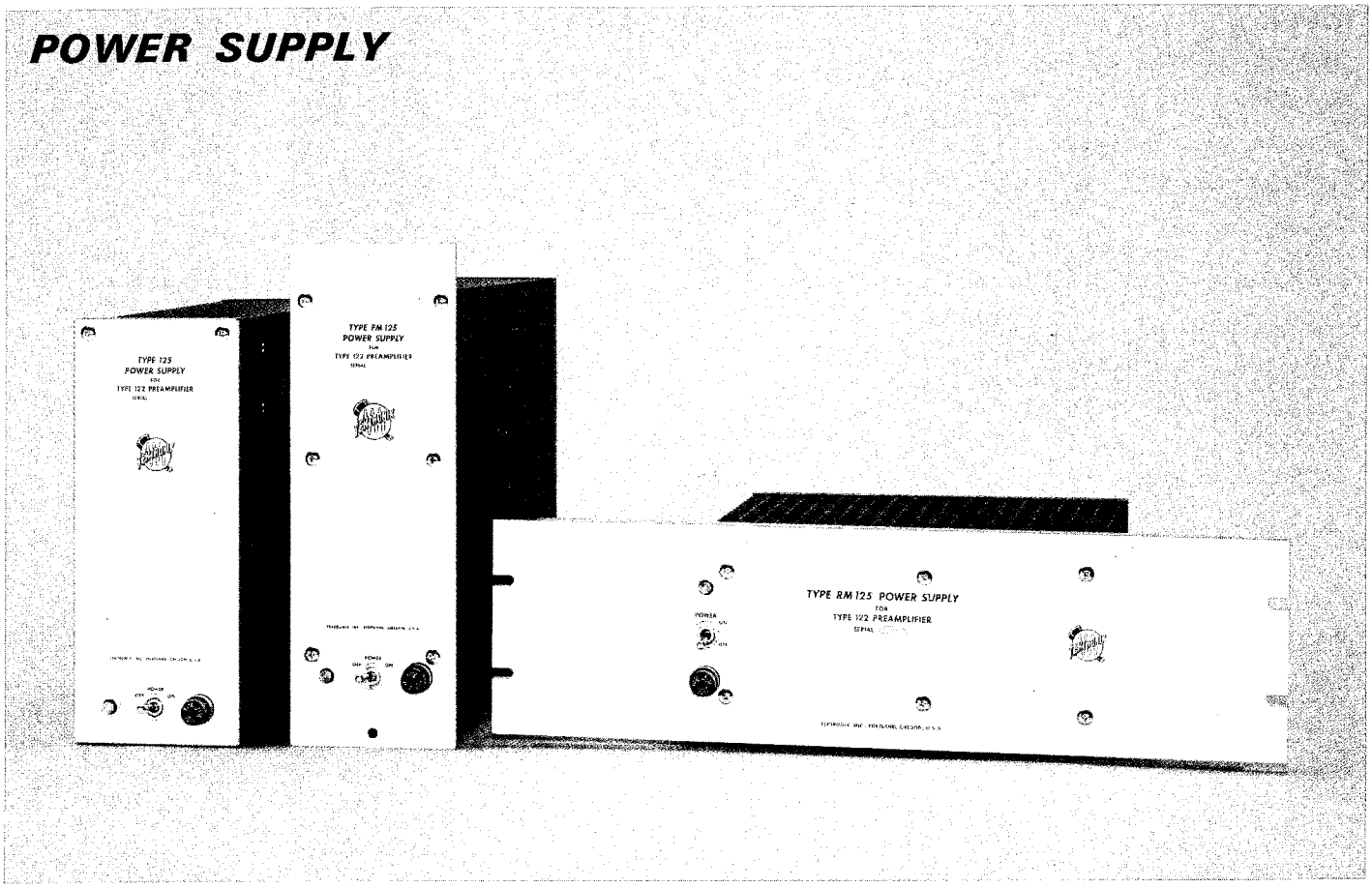
Electrically identical to Type 122, but designed for horizontal mounting in standard 19-in rack.

Height	5¼ in	13.4 cm
Width	19 in	48.3 cm
Depth	7 in	17.8 cm
Net weight	4¾ lb	2.2 kg
Domestic shipping weight	~11 lb	~ 5.0 kg
Export-packed weight	~18 lb	~ 8.2 kg

TYPE 122 PREAMPLIFIER $135
TYPE FM122 (without Mounting Frame) 140
TYPE RM122 140

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

POWER SUPPLY



- ***ELECTRONIC VOLTAGE REGULATION***
- ***POWERS UP TO FOUR TYPE 122 AMPLIFIERS***

POWER OUTPUT

Supply voltages with corresponding ripple: +135 V, <3 mV; −90 V, <2 mV; −6 V, <5 mV. Voltage stability assured by regulated heater supply.

POWER REQUIREMENTS

110 watts, 50 to 60 Hz. Instrument factory wired for 105 V to 125 V (117 V nominal) operation. Transformer taps permit operation at 210 V to 250 V (234 V nominal). Can be ordered factory wired for 210 V to 250 V operation.

STANDARD ACCESSORIES

Four 36-inch interconnecting cables (012-0065-00); 3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0246-00). In addition, Types FM125 and RM125 include mounting hardware.

DIMENSIONS AND WEIGHTS—TYPE 125

Height	14⅝ in	37.2 cm
Width	4⅛ in	10.5 cm
Depth	10⅜ in	26.4 cm
Net weight	14¾ lb	6.7 kg
Domestic shipping weight	~21 lb	~ 9.6 kg
Export-packed weight	~40 lb	~18.2 kg

DIMENSIONS AND WEIGHTS—TYPE FM125

Electrically identical to Type 125, but designed to mount vertically in a standard rack with associated instruments. Can be mounted directly or mounted by Tektronix mounting frame.

Height	12¼ in	31.2 cm
Width	4⅛ in	10.5 cm
Depth	13½ in	34.3 cm
Net weight	14½ lb	6.6 kg
Domestic shipping weight	~21 lb	~ 9.6 kg
Export-packed weight	~40 lb	~18.2 kg

DIMENSIONS AND WEIGHTS—TYPE RM125

Electrically identical to Type 125, but designed for horizontal mounting in a standard 19-in rack.

Height	5¼ in	13.3 cm
Width	19 in	48.3 cm
Rack depth	13½ in	34.3 cm
Net weight	16½ lb	7.5 kg
Domestic shipping weight	~28 lb	~12.7 kg
Export-packed weight	~40 lb	~18.2 kg

TYPE 125 POWER SUPPLY $285
TYPE FM125 POWER SUPPLY 290
TYPE RM125 POWER SUPPLY 290

OPTIONAL ACCESSORIES

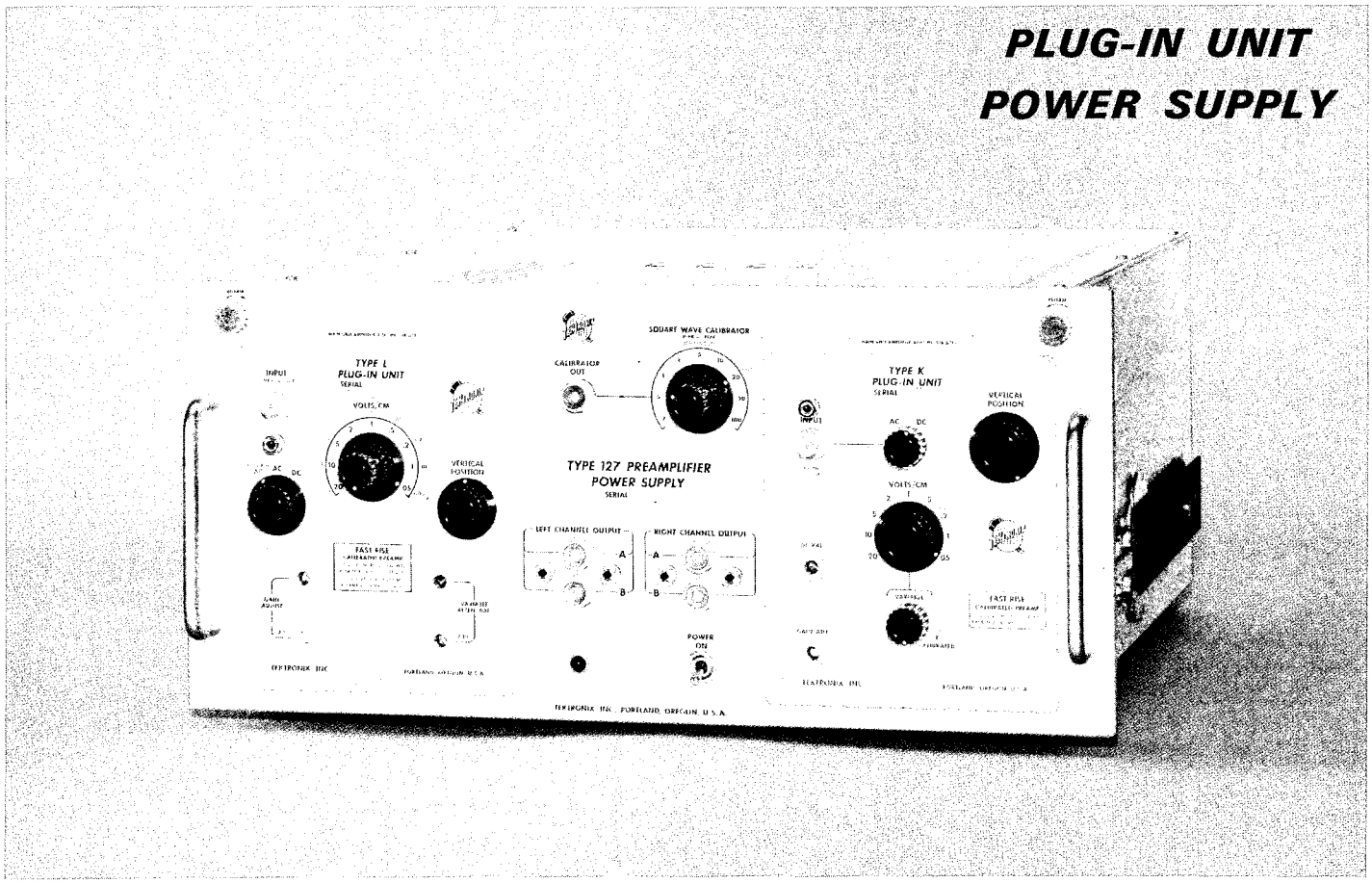
MOUNTING FRAME FOR TYPE FM125

Fits any standard 19-inch rack and is fastened to the front of the rack by four screws. Capacity is four of any combination of Type FM122 Preamplifier, Type FM125 Power Supply, Type 360 Indicator, and Type 160-Series Units. (Note: Because the Type FM122 Preamplifier has high sensitivity, it is recommended that it be mounted at least 4 inches to the left of the Type FM125 Power Supply.)

ORDER PART NUMBER 014-0002-00 ..... $7

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

PLUG-IN UNIT POWER SUPPLY



- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***
- ***DC-to-19 MHz BANDWIDTH***
- ***ELECTRONIC VOLTAGE REGULATION***

The Tektronix Type 127 Preamplifier Power Supply provides operating power to one or any combination of two Tektronix Letter Series or "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 1A7, D, E, or G Plug-In Units—when used in conjunction with a dual-trace oscilloscope.

Also, Triggering Signal Input Terminals are provided at the rear of the instrument to permit the introduction of triggering pulses into a Type CA, 1A1, 1A2, M, or 1A4 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.

Spectrum Analyzer Units require an external sweep voltage (positive going from 0 to at least +90 V). This can be supplied from a Type T Time Base Unit in one compartment, or from an associated oscilloscope with this signal output.

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. Push-pull output swing is linear ±3% over a range of ±0.3 volt into 170-Ω 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-Ω output cables are furnished.

ELECTRONIC REGULATION

All DC supply voltages 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 squarewave 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%. Squarewave frequency is approximately 1 kHz.

TYPE 127 TYPICAL PERFORMANCE†			
PLUG-IN UNIT	MAXIMUM VOLTAGE GAIN	BANDWIDTH (—3 dB)	RISE-TIME
B	2 20	DC to 15 MHz 2 Hz to 11 MHz	24 ns 32 ns
CA	2	DC to 17 MHz	21 ns
D	100	DC to 300 kHz at a gain of 100, increasing to 2 MHz at a gain of 2	
E	2000	0.06 Hz to 20 kHz at full gain, increasing to 60 kHz at a gain of 200	
G	2	DC to 15 MHz	24 ns
H	20	DC to 12 MHz	30 ns
K	2	DC to 19 MHz	19 ns
L	2 20	DC to 19 MHz 3 Hz to 17 MHz	19 ns 21 ns
M	5	DC to 15 MHz	24 ns
O	2	DC to 17 MHz	21 ns
Q	*	DC to 6 kHz	60 μs
W	2 100	DC to 16 MHz DC to 7.5 MHz	22 ns 47 ns
Z	2	DC to 11 MHz	32 ns
1A1	2 20 200	DC to 19 MHz DC to 17 MHz 2 Hz to 11 MHz	19 ns 21 ns 32 ns
1A2	2	DC to 19 MHz	19 ns
1A4	10	DC to 19 MHz	19 ns
1A5	20 100	DC to 19 MHz DC to 18 MHz	19 ns 20 ns
1A6	100	DC to 2 MHz	0.18 μs
1A7	10,000	DC to 500 kHz	0.7 μs
1L5	100	10 Hz to 1 MHz	0.35 μs
1S1	50	Equiv to DC to 1 GHz	0.35 ns
1S2	20	Equiv to DC to 3.9 GHz	90 ps

*A 10 μstrain input produces a 100 mV output.

†Push-pull output terminated in 170 Ω, monitored with DC-to-33 MHz oscilloscope.

POWER REQUIREMENT

105 V to 125 V or 210 V to 250 V, 50 to 60 Hz, 450 watts maximum. Unit factory wired for 117 V. Can be factory wired for 234 V if so indicated on order.

DIMENSIONS AND WEIGHTS

Height	8¾ in	22.3 cm
Width	19 in	48.3 cm
Depth	21⅝ in	55.0 cm
Net weight	37¼ lb	16.9 kg
Domestic shipping weight	~71 lb	~32.3 kg
Export-packed weight	~92 lb	~41.9 kg

RACK MOUNTING

Type 127 can be withdrawn from rack on slide-out tracks, tilted and locked in 4 positions. Further mounting information on catalog instrument dimension page.

STANDARD ACCESSORIES

Four 170-Ω terminations (011-0048-00); four 170-Ω coaxial cables (012-0034-00); four BNC-to-UHF adapters (103-0032-00); four UHF-to-BNC adapters (103-0015-00); 3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); pair mounting tracks (351-0085-00); two instruction manuals (070-0284-00).

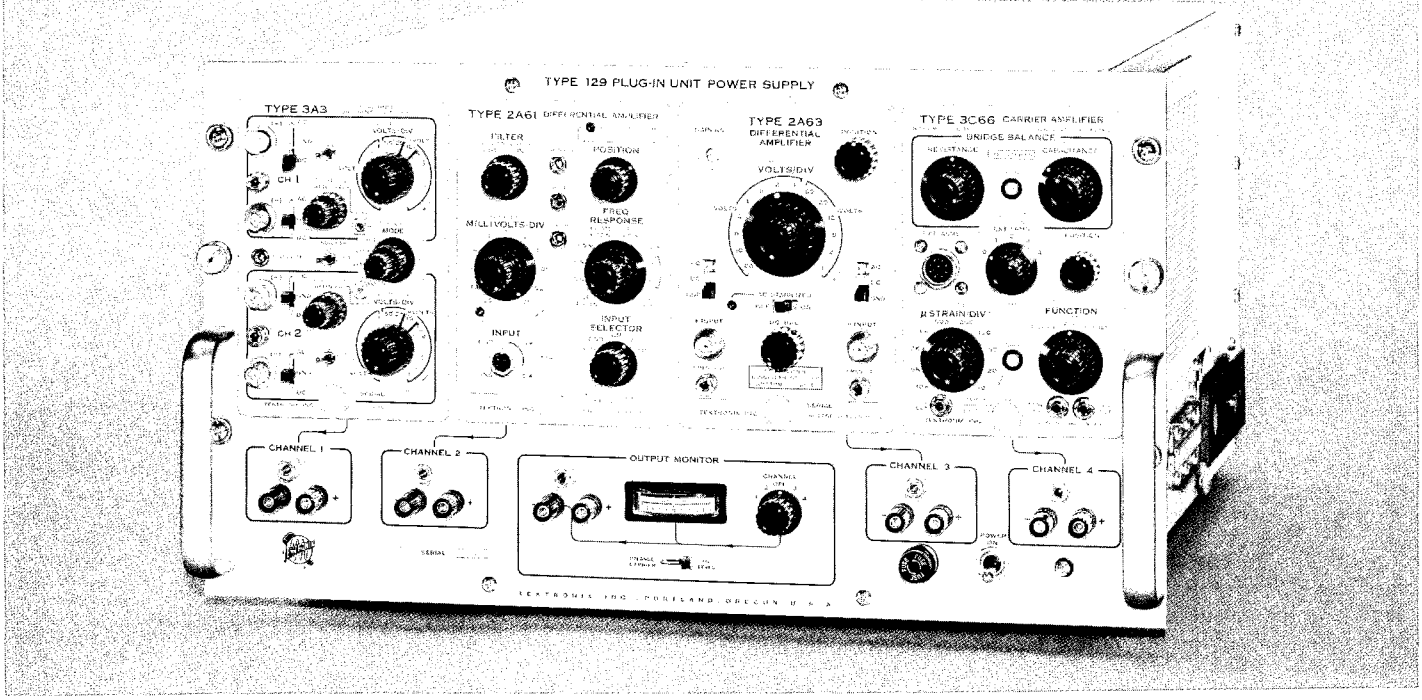
TYPE 127 POWER SUPPLY (without plug-in units) . . . **$650**

SUPPORTING CRADLE

For rear slide support when the instrument is to be mounted in a backless rack, includes necessary mounting hardware.
ORDER PART NUMBER 040-0344-00 ..... $12

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

PLUG-IN UNIT POWER SUPPLY



- ***OPERATES UP TO FOUR PLUG-IN UNITS***
- ***ELECTRONIC VOLTAGE REGULATION***

The Type 129 Plug-In Supply provides a method of utilizing 2- and 3-Series Amplifier Plug-In Units in a wide variety of instrumentation systems. With this power supply, the amplifiers can be used to drive recording equipment, X-Y plotters, oscilloscopes, or other external indicators having requirements within the plug-in unit specifications. The unit is designed to mount in a standard 19 inch rack.

The Type 129 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 bandwidth.

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 compartment 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. All plug-in units that do not have a signal-out provision on the front panel must use one of these cards in order to function properly. Plug-in units with signal-output connectors on the front panel can be used with or without circuit cards.

With the cathode-follower plug-in circuit card installed, push-pull, low impedance signals (to approximately 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. Bandwidth of the cathode-follower output circuit is DC to approximately 1 MHz.

With the passive card installed, a high-impedance push-pull signal is available at the front panel for balancing and a single-ended signal at low impedance (approximately 500 ohms) is available at the rear output connector. Bandwidth of the passive divider output circuit is DC to approximately 100 kHz 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, designed to operate in pairs (one vertical and one sweep), and Spectrum Analyzer or Automatic "Seeking" plug-ins designed to operate in conjunction with another 2 or 3 series plug-in, must be "paired up" in Channels 1 and 2 or 3 and 4.*

TYPICAL APPLICATIONS

PLUG-IN TYPE	INDICATED DEFLECTION FACTOR	APPROXIMATE SYSTEM GAIN		
		With Passive Output Card*	With CF Output Card**	
			Single Ended	Push-Pull
2A60	50 mV/div	50	20	40
2A61	0.01 mV/div (AC)	2.5×10^5	10^5	2×10^5
2A63	1 mV/div (DC)	2.5×10^3	10^3	2×10^3
3A3	100 μV/div	2.5×10^4	10^4	2×10^4
3A5/3B5	1 mV/div to 0.1 μs/div	Automatic/Programmable Amplifier and Time Base for automatic seeking operation.		
3A75	50 mV/div	50	20	40
3C66	10 μstrain/div	0.25 V/μstrain	0.1 V/μstrain	0.2 V/μstrain
3L5	To be used with any 2 or 3-Series Time Base to provide 10 Hz to 1 MHz Spectrum Analysis.			
	1 mV/div	2.5×10^3	10^3	2×10^3
3L10	To be used with any 2 or 3-Series Time Base to provide 1 to 36 MHz Spectrum Analysis.			
3S3/3S76	2 mV/div (max)	Sampling Amplifier (must be paired with Sampling Time Base).		
3T4/3T77A	to 0.2 μs/div	Sampling Time Base (must be paired with Sampling Amplifier).		

*Output single ended at rear connector.

**Output at front or rear connector.

In addition to supplying power for the plug-in compartments, the Type 129 provides regulated voltages at a rear-panel connector for powering accessories. Two low-noise fans provide forced-air cooling for the power supply and plug-in compartments.

POWER REQUIREMENTS

Electronically-regulated DC supplies insure stable operation with as much as −10% to +7% variation from design-center line voltage. The instrument is factory 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, 50 to 60 Hz. Instrument can be ordered factory wired for any of the design centers listed. Power consumption is typically 575 watts maximum under full load.

DIMENSIONS AND WEIGHTS

Height	10½ in	26.8 cm
Width	19 in	48.3 cm
Rack depth	23½ in	59.8 cm
Net weight	49½ lb	22.5 kg
Domestic shipping weight	~ 83 lb	~37.8 kg
Export-packed weight	~107 lb	~48.6 kg

STANDARD ACCESSORIES

Right-angle power cord (161-0024-00); 3 to 2-wire adapter (103-0013-00); pair of mounting tracks (351-0085-00); two instruction manuals (070-0409-00).

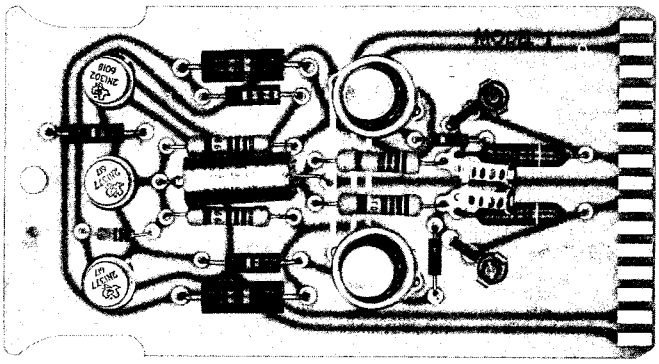
TYPE 129 RACK-MOUNT PLUG-IN UNIT POWER SUPPLY

(without plug-in units or circuit cards) $650

OPTIONAL ACCESSORIES

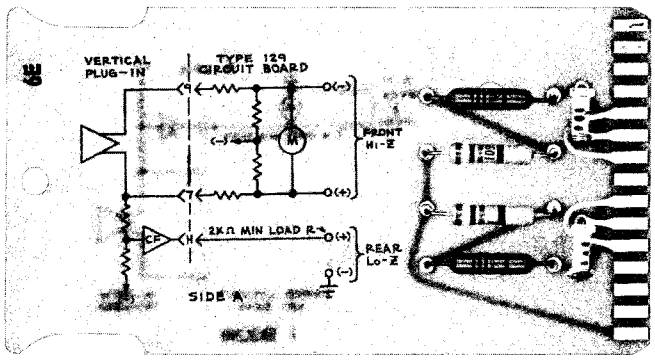
BLANK PLUG-IN CHASSIS

Contains necessary mechanical parts for construction of a custom plug-in. Includes frame, blank front panel, blank chassis, 24-pin connector, latch and small hardware; electrical components not included. Order 040-0245-00 ..... $25



CATHODE-FOLLOWER CIRCUIT CARD

(Part Number 018-0001-00) $40

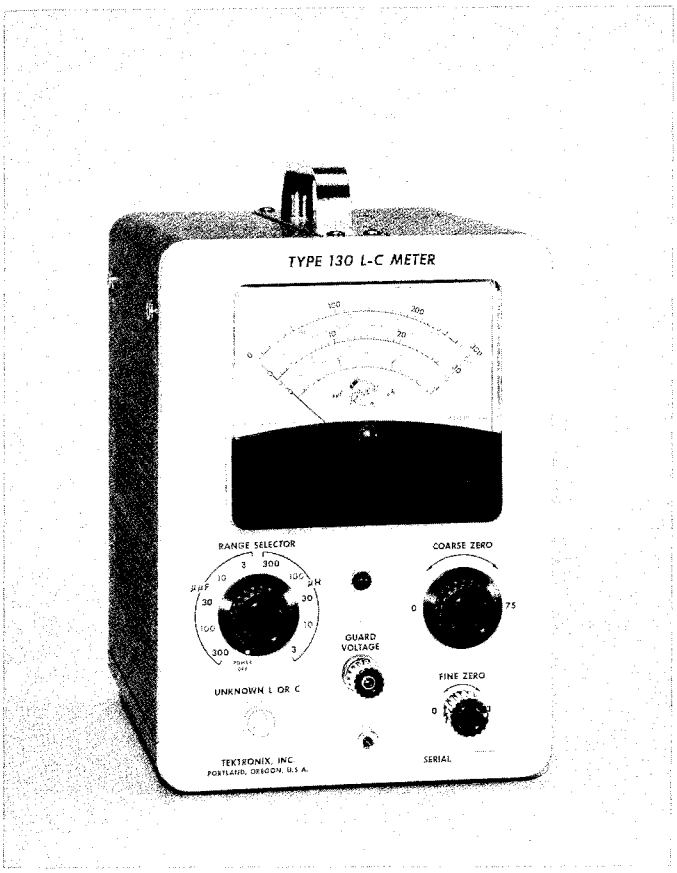


PASSIVE DIVIDER CIRCUIT CARD

(Part Number 018-0002-00) $10

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

DIRECT-READING L-C METER



MEASURES UP TO 300 μH OR 300 $\mu\mu$F

EASY-TO-READ 4½ INCH METER

CONVENIENT OPERATION

The Type 130 L-C Meter is a direct-reading reactance meter that measures small reactances in a series mode at a frequency between 125 kHz and 140 kHz. Meter indicates inductance up to 300 μH and capacitance up to 300 $\mu\mu$F (pF). The unknown inductor or capacitor is part of a resonant circuit whose frequency is compared to a 140-kHz reference oscillator. Meter indicates the two oscillators frequency difference but is calibrated directly in μH and $\mu\mu$F. Measurement of very small reactances is possible by using special measurement procedures that are described in the instrument instruction manual.

The Type 130 is particularly useful for measuring small capacitances in the presence of environmental strays. A front-panel Guard Voltage output connector provides in-phase drive to the environmental capacitance to eliminate strays from the measurement. Thus it is possible to measure vacuum tube interelectrode capacitances. Up to 300 pF environmental capacitance around an unknown capacitor can be guarded if the guard terminal loading is not excessive. Loading limits are outlined in the instruction manual.

Resistance loading compensation is optimized for 117-volts RMS operation. The following loads will not appreciably alter the measurement indication:

Capacitance: as low as 100-kΩ shunt.
Inductance: as low as 20-kΩ shunt, up to 10-Ω series.
Correction tables in instruction manual indicate needed corrections for other values of load resistance. Actual corrections determined for each instrument at time of each recalibration.

RANGE SELECTION

Microhenrys—0 to 3, 10, 30, 100, and 300.
Picofarads—0 to 3, 10, 30, 100, and 300.

ACCURACY

Meter indicates within 3% of full scale. Full scale accuracy of any one range can be improved by special calibration at the time measurement is made.

POWER REQUIREMENTS

40 watts, 50 to 60 Hz. Instrument factory wired for 105 V to 125 V (117 V nominal) operation. Transformer taps permit operation at 210 V to 250 V (234 V nominal). Instrument can be ordered factory wired for 210 V to 250 V operation.

DIMENSIONS AND WEIGHTS

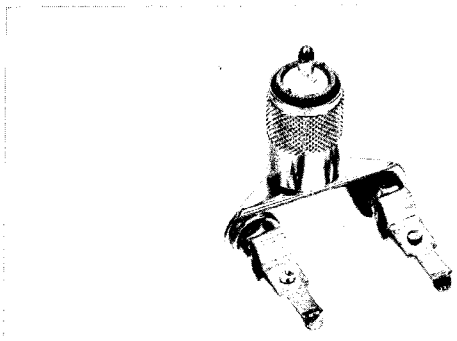
Height	10⅝ in	27.0 cm
Width	7 in	17.8 cm
Depth	11⅛ in	28.3 cm
Net weight	9 lb	4.1 kg
Domestic shipping weight	~14 lb	~ 6.4 kg
Export-packed weight	~21 lb	~ 9.5 kg

STANDARD ACCESSORIES

P93C Probe (010-0003-00); black output lead (012-0014-00); red output lead (012-0015-00); 3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0231-01).

TYPE 130 DIRECT-READING L-C METER $225

OPTIONAL ACCESSORIES



PRODUCTION TEST FIXTURE

Reduces production time required to sort and test capacitors and inductors, order 013-0001-00 ..... $5

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

TYPE 132

PLUG-IN UNIT POWER SUPPLY

- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***
- ***DC-to-16 MHz BANDWIDTH***
- ***ELECTRONIC VOLTAGE REGULATION***

The Type 132 provides an electronically regulated power supply and amplifier for any Tektronix Letter-Series or "1" Series Plug-In Unit.

Convenient front-panel terminals for either push-pull or single-ended output facilitate connections to associated equipment.

CHARACTERISTICS

BANDWIDTH

DC to 16 MHz at 3-dB down, depending on plug-in unit and load impedance. See chart.

GAIN

10 (push-pull) when using a Tektronix Plug-In Unit at 50 mV/cm deflection factor, terminated with a 93-Ω load (approximately 5 into 50-Ω load).

OUTPUT

Push-pull, or single-ended + or — outputs on front panel.

OUTPUT VOLTAGE

High impedance load; ±50 V at each connector and ±100 V push-pull. Source impedance is approximately 5000 Ω with ±10 mA available (unterminated). With 93-Ω load, voltage swing is approximately ±1 V.

DUAL-TRACE OPERATION

Back-panel jacks and switching arrangements provide for use of the alternate and chopped modes of operation including blanking, with a Tektronix Type 1A1, 1A2, CA, 1A4, or M Plug-In Unit.

POWER REQUIREMENTS

Wired for 105 to 125 VAC (117 V nominal); transformer taps permit operation at 110, 117, 124, 220, 234, or 248 VAC; 50 to 60 Hz. Approx 320-W power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

DIMENSIONS AND WEIGHTS

Height	$10\frac{3}{16}$ in	25.9 cm
Width	$6\frac{7}{8}$ in	17.5 cm
Depth	$18\frac{15}{16}$ in	48.1 cm
Net weight	21 lb	9.5 kg
Domestic shipping weight	~26 lb	~11.8 kg
Export-packed weight	~33 lb	~15.0 kg

STANDARD ACCESSORIES

Two 93 Ω terminations (011-0056-00); two 93 Ω cables (012-0075-00); 3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0288-00).

TYPE 132 POWER SUPPLY (without plug-in units) . . . **$460**

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

TYPE 132 TYPICAL PERFORMANCE†

PLUG-IN TYPE	TERMINATED IN 93 Ω		DOUBLE TERMINATED 93 Ω	
	SYSTEM GAIN‡	BANDWIDTH	SYSTEM GAIN‡	BANDWIDTH
B	100 10	10 MHz 14 MHz	50 5	10 MHz 16 MHz
CA	10	14 MHz	5	16 MHz
D	10 500	2 MHz 300 kHz	5 250	2 MHz 300 kHz
E	10,000	See Manual	5000	See Manual
G	10	14 MHz	5	16 MHz
H	100	11 MHz	50	12 MHz
K	10	14 MHz	5	16 MHz
L	100 10	14 MHz 14 MHz	50 5	16 MHz 16 MHz
M	10	14 MHz	5	16 MHz
O	10	14 MHz	5	16 MHz
Q		6 kHz		6 kHz
W	500 10	7 MHz 14 MHz	250 5	7 MHz 16 MHz
Z	10	10 MHz	5	10 MHz
1A1	 1000 100 10	2 Hz to 10 MHz 14 MHz 14 MHz	 500 50 5	2 Hz to 10 MHz 16 MHz 16 MHz
1A2	10	14 MHz	5	16 MHz
1A4	50	14 MHz	25	16 MHz
1A5	500 250	13 MHz 14 MHz	250 125	15 MHz 16 MHz
1A6	500	2 MHz	250	2 MHz
1A7	Useful to 20,000	500 kHz	Useful to 10,000	500 kHz
1L5	500	1 MHz	250	1 MHz
1S1	250	Equiv to 1 GHz	125	Equiv to 1 GHz
1S2	100	Equiv to 3.9 GHz	50	Equiv to 3.9 GHz

†Push-pull output, monitored with DC-to-24 MHz oscilloscope.

‡System Goin = Overall gain from input of plug-in to the push-pull output cables.

Spectrum Analyzer Units require on external sweep voltage (positive going from 0 to at least +90 V). This can be supplied from an associated oscilloscope with this output.

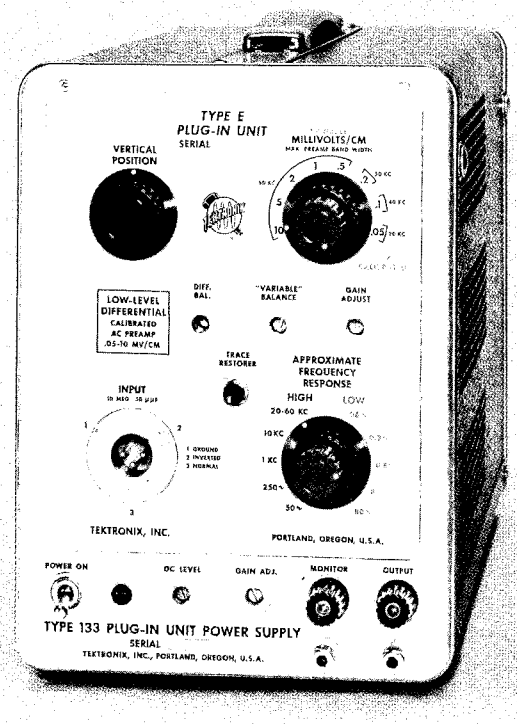
PLUG-IN UNIT POWER SUPPLY

- ***ACCEPTS AMPLIFIER, SPECTRUM ANALYZER, SAMPLING, AND SPECIAL-PURPOSE PLUG-INS***
- ***DC-to-100 kHz BANDWIDTH***
- ***2 Ω SOURCE IMPEDANCE***
- ***ELECTRONIC VOLTAGE REGULATION***

The Type 133 provides power to an internal, transistorized amplifier and any Tektronix Letter-Series or "1" Series Plug-In Unit. 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 at the same time with an oscilloscope. The indicating instrument should have some response at 25 kHz to enable balancing the bridge in the Type Q Unit, otherwise an external monitor must be used.



CHARACTERISTICS

BANDWIDTH
DC to 100 kHz. Specified at —3 dB.

GAIN
10, single-ended.

OUTPUT
±5 V (high-impedance load). 1.5 A (short circuit). Source impedance 2 Ω.

DC ADJUST
The output DC operating level adjusts to ground potential.

PHASE INVERSION
An internal switch permits either output polarity.

MONITOR JACK
Allows observation of the output with an oscilloscope without switching cables.

DUAL-TRACE OPERATION
Back-panel jacks and switching arrangements provide for use of the Alternate mode of operation when using a Tektronix Type 1A1, 1A2, CA, 1A4 or M Plug-In Unit.

POWER REQUIREMENTS
Wired for 105 to 125 VAC (117 V nominal); transformer taps permit operation at 110, 117, 124, 220, 234, or 248 VAC; 50 to 60 Hz. Approx 320-W power consumption. Can be factory wired for any of the above nominal voltages, if so indicated on order.

DIMENSIONS AND WEIGHTS

Height	$10\frac{3}{16}$ in	25.9 cm
Width	$6\frac{7}{8}$ in	17.5 cm
Depth	$18\frac{15}{16}$ in	48.1 cm
Net weight	22 lb	10.0 kg
Domestic shipping weight	~26 lb	~11.8 kg
Export-packed weight	~34 lb	~15.5 kg

STANDARD ACCESSORIES
3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0290-00).

TYPE 133 POWER SUPPLY (without plug-in units) $440

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

TYPE 133 TYPICAL PERFORMANCE

PLUG-IN TYPE	OVERALL GAIN (NO LOAD)	BANDWIDTH (—3 dB)
B	10 100 (AC only)	DC to 100 kHz 2 Hz to 100 kHz
CA	10	DC to 100 kHz
D	500	DC to 100 kHz
E	10,000	See E Unit
G	10	DC to 100 kHz
H	100	DC to 100 kHz
K	10	DC to 100 kHz
L	10 100 (AC only)	DC to 100 kHz 3 Hz to 100 kHz
M	10	DC to 100 kHz
O	10	DC to 100 kHz
Q		DC to 6 kHz
W	10 to 500	DC to 100 kHz
Z	10	DC to 100 kHz
1A1	10 100 1000	DC to 100 kHz DC to 100 kHz 2 Hz to 100 kHz
1A2	10	DC to 100 kHz
1A4	50	DC to 100 kHz
1A5	500	DC to 100 kHz
1A6	500	DC to 100 kHz
1A7	50,000	DC to 100 kHz
1L5	500	10 Hz to 100 kHz
1S1	250	Equiv to DC to 1 GHz
1S2	100	Equiv to DC to 3.9 GHz

Spectrum Anolyzer Units require an externol sweep voltage (positive going from 0 to at least +90 V). This can be supplied from an associated oscilloscope with this output.

TYPE 160A

POWER SUPPLY

- **ELECTRONIC VOLTAGE REGULATION**
- **LARGE LOAD CAPACITY**
- **POWERS UP TO SEVEN INSTRUMENTS**

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.

Electronic regulation compensates for line-voltage variations between 105 and 125 V or 210 and 250 V, and for current-demand differences between instruments.

POWER OUTPUT

REGULATED: +225 V DC at 175 mA with no shunt across the series regulator, increasing to a maximum of 225 mA with a 1500-ohm shunt; +150 V DC at 15 mA; —170 V DC at 125 mA.

UNREGULATED: +300 V DC at 50 mA to 275 mA depending on the current drawn from the regulated +225 V supply; +80 V DC up to 50 mA depending on the current drawn from the regulated —170 V supply; 6.3 V AC at 20 A.

OUTPUT CONNECTORS

Four octal sockets mounted on rear panel.

POWER REQUIREMENTS

350 watts, 50 to 60 Hz. Unit factory wired for 105 V to 125 V (117-V nominal) operation. Transformer taps permit operation at 210 V to 250 V (234-V nominal). Instrument can be ordered factory wired for 210 V to 250 V operation.

DIMENSIONS AND WEIGHTS

Height	12¼ in	31.1 cm
Width	4⅛ in	10.5 cm
Depth	14⅜ in	36.6 cm
Net weight	20 lb	9.1 kg
Domestic shipping weight	~26 lb	~11.8 kg
Export-packed weight	~44 lb	~20.0 kg

STANDARD ACCESSORIES

Two inter-unit power cables (012-0016-00); 3-conductor power cord (161-0010-00); 3 to 2-wire adapter (103-0013-00); mounting hardware; instruction manual (070-0220-00).

TYPE 160A POWER SUPPLY $190

OPTIONAL ACCESSORIES

MOUNTING FRAME

Adapts Type 160A to standard 19 inch rack. Mounts up to four Type 160-Series instruments or up to three Type 160-Series instruments and a Type 360 Indicator Unit. Occupies 12¼ inches rack space, order 014-0002-00 ..... $ 7

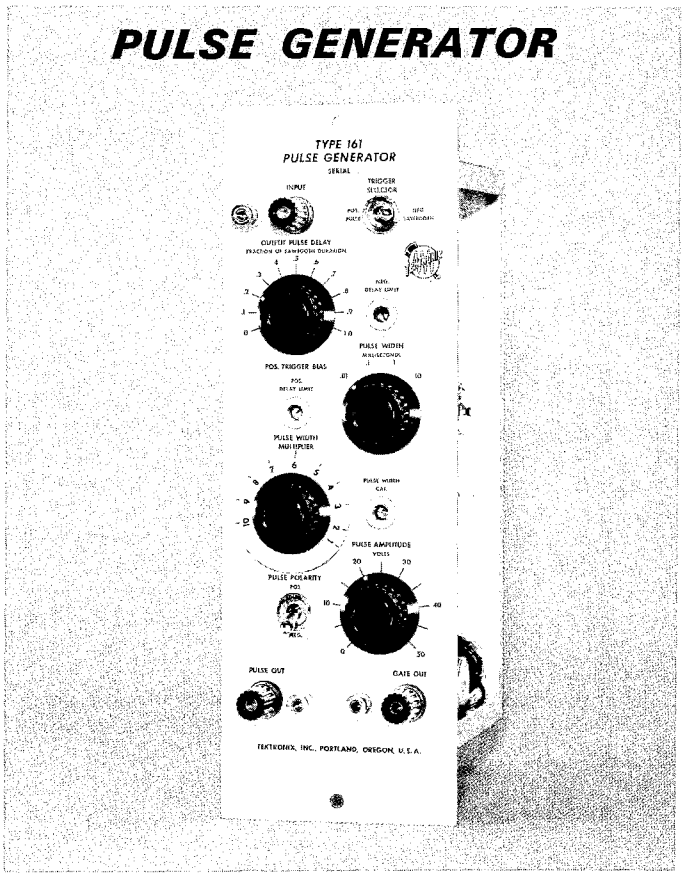
BLANK PANEL

For above mounting frame, occupies same panel area as one instrument, order 333-0157-00 ..... $2.50

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

PULSE GENERATOR

- ***VARIABLE PULSE DELAY***
- ***VARIABLE WIDTH AND AMPLITUDE***
- ***SEPARATE GATE AND PULSE OUTPUTS***
- ***HIGH AMPLITUDE OUTPUT***



The Tektronix Type 161 Pulse Generator is designed to supply calibrated rectangular output pulses from zero to 50-V amplitude and 10 μs to 100 ms 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 output, 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 μs when load capacitance is 10 pF or less, within 0.75 μs for 100 pF or less load capacitance. Negative pulse; within 0.5 μs when load capacitance is 10 pF or less, within 1.5 μs for 100 pF or less load capacitance. Overshoot less than 5%.

Duration—calibrated, variable, 10 μs to 0.1 s.

Delay—continuously variable, 0 to 100% of triggering sawtooth waveform.

AMPLITUDE

Pulse—calibrated, continuously variable, 0 to 50 V, peak to peak.

Gate—fixed, 50-V positive, peak to peak 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 peak to peak minimum. Negative-going sawtooth; must include DC bias sufficient to keep voltage positive. Maximum repetition rate, 50 kHz.

POWER REQUIREMENTS

—170 V DC at 17 mA, +225 VDC at 22 mA, 6.3 VAC at 1.65 A.

DIMENSIONS AND WEIGHTS

Height	12¼ in	31.2 cm
Width	4⅛ in	10.5 cm
Depth	6⅜ in	16.2 cm
Net weight	3½ lb	1.6 kg
Domestic shipping weight	~ 8 lb	~ 3.6 kg
Export-packed weight	~14 lb	~ 6.4 kg

STANDARD ACCESSORIES

Inter-unit cable (012-0017-00); mounting hardware; instruction manual (070-0220-00).

TYPE 161 PULSE GENERATOR $130

OPTIONAL ACCESSORIES

MOUNTING FRAME

Adapts Type 161 to standard 19-inch rack. Mounts up to four Type 160-Series instruments or up to three Type 160-Series instruments and a Type 360 Indicator Unit. Occupies 12¼ inches rack space, order 014-0002-00 ..... $7

BLANK PANEL

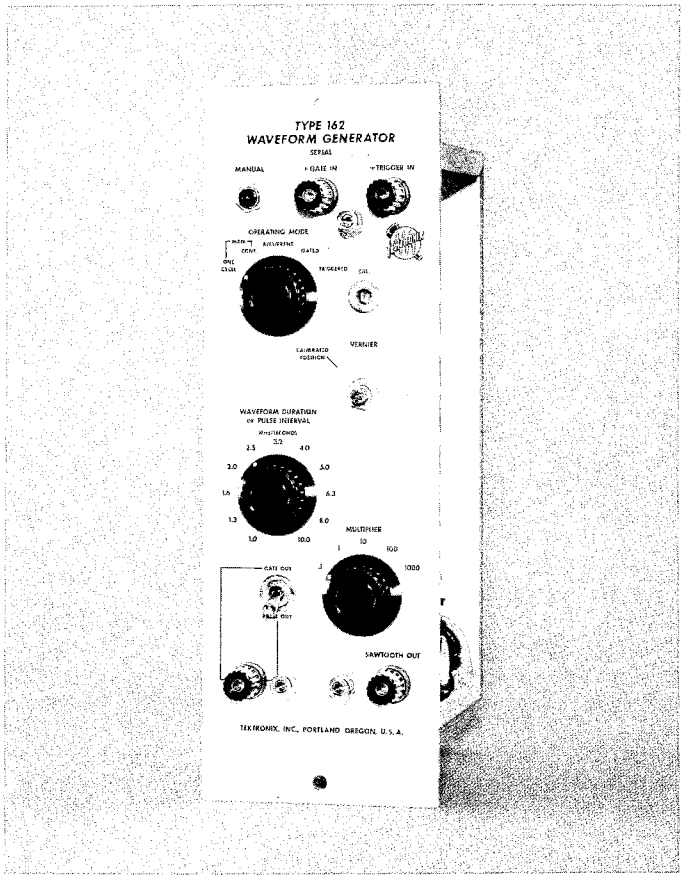
For above mounting frame, occupies same panel area as one instrument, order 333-0157-00 ..... $2.50

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

TYPE 162

WAVEFORM GENERATOR

- ***PULSE OR GATE AND SAWTOOTH OUTPUT***
- ***VARIABLE WAVEFORM DURATION AND PULSE INTERVAL***
- ***5 OPERATING MODES***



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 pushbutton. The unit is designed to operate as a delay generator in conjunction with the Type 161 or Type 163, 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.

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-μs minimum.

Duration—pulse, 10 μs to 0.05 s; gate and sawtooth, 100 μs to 10 s.

Repetition Rate—0.1 Hz to 10 kHz, recurrent operation.

AMPLITUDE

Pulse and gate are fixed, positive, 50-V peak to peak minimum. Sawtooth decreases linearly with time from $\geq$ +145 V to $\leq$ +25 V.

OUTPUT IMPEDANCE

Approximately 1000 ohms for all outputs.

TRIGGER REQUIREMENTS

Positive pulse—15 V. Positive gate—8 V. Sinewave—6 V RMS, frequency from 5 Hz to 50 kHz. At frequencies below 5 Hz, 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 A.

DIMENSIONS AND WEIGHTS

Height	12¼ in	31.2 cm
Width	4⅛ in	10.5 cm
Depth	6⅜ in	16.2 cm
Net weight	3½ lb	1.6 kg
Domestic shipping weight	~ 8 lb	~ 3.6 kg
Export-packed weight	~14 lb	~ 6.4 kg

STANDARD ACCESSORIES

Inter-unit power cable (012-0017-00); mounting hardware; instruction manual (070-0220-00).

TYPE 162 WAVEFORM GENERATOR $130

OPTIONAL ACCESSORIES

MOUNTING FRAME

Adapts Type 162 to standard 19-inch rack. Mounts up to four Type 160-Series instruments or up to three Type 160-Series instruments and a Type 360 Indicator Unit. Occupies 12¼ inches rack space, order 014-0002-00 ..... $ 7

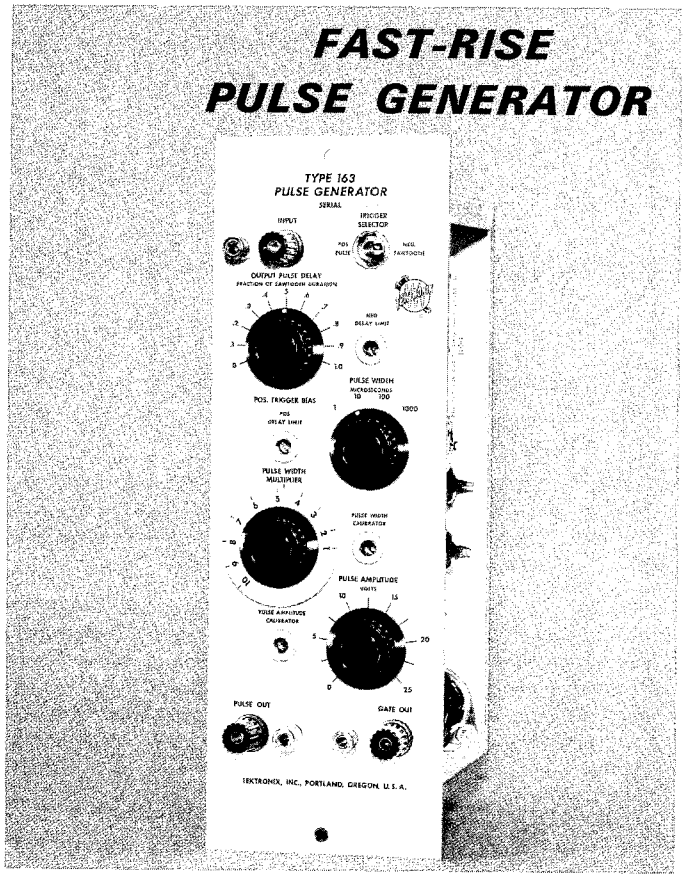
BLANK PANEL

For above mounting frame, occupies same panel area as one instrument, order 333-0157-00 ..... $2.50

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

FAST-RISE PULSE GENERATOR

- **0.2 μs RISETIME**
- **VARIABLE PULSE DELAY**
- **VARIABLE WIDTH AND AMPLITUDE**
- **SEPARATE GATE AND PULSE OUTPUT**



The Tektronix Type 163 Fast-Rise Pulse Generator is designed to supply rectangular output pulses from 0 to 25 V in amplitude and 1 μs to 10 ms 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 of the Type 163 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 can be correspondingly higher. Maximum repetition rate is 500 kHz—with a generated pulse of 1-μs 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 WAVEFORMS

Variable-amplitude positive pulse.
Fixed-amplitude positive gate.

OUTPUT CHARACTERISTICS

Risetime—Within 0.2 μs when load capacitance is 10 pF or less, within 0.25 μs for 100 pF or less load capacitance.

Overshoot can be adjusted to zero.

Duration—calibrated, variable, 1 μs to 10 ms.

Delay—continuously variable, 0 to 100% of triggering sawtooth duration.

Decay Time—0.2 to 0.5 μs.

AMPLITUDE

Pulse—calibrated, continuously variable, 0 to 25 V, peak to peak.
Gate—fixed, positive, 25 V minimum, peak to peak.

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 kHz.

POWER REQUIREMENTS

—170 V DC at 25 mA, +225 V DC at 45 mA. 6.3 V AC at 3.6 A.

DIMENSIONS AND WEIGHTS

Height	12¼ in	31.2 cm
Width	4⅛ in	10.5 cm
Depth	6⅜ in	16.2 cm
Net weight	3½ lb	1.6 kg
Domestic shipping weight	~ 8 lb	~ 3.6 kg
Export-packed weight	~14 lb	~ 6.4 kg

STANDARD ACCESSORIES

Inter-unit power cable (012-0017-00); mounting hardware; instruction manual (070-0220-00).

TYPE 163 PULSE GENERATOR $130

OPTIONAL ACCESSORIES

MOUNTING FRAME

Adapts Type 163 to standard 19-inch rack. Mounts up to four Type 160-Series instruments or up to three Type 160-Series instruments and a Type 360 Indicator Unit. Occupies 12¼ inches rack space, order 014-0002-00 ..... $ 7

BLANK PANEL

For above mounting frame, occupies same panel area as one instrument, order 333-0157-00 ..... $2.50

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

TYPE 184

TIME-MARK GENERATOR

- **16 MARKER INTERVALS, 5 SINEWAVE FREQUENCIES**
- **500-MHz SINEWAVE OUTPUT**
- **CRYSTAL-CONTROLLED OSCILLATOR**

Unique in having a 500-MHz OUTPUT, the Type 184 is a compact, wide-range time-mark generator. It is CRYSTAL-CONTROLLED and provides 16 MARKER INTERVALS, 5 SINEWAVE FREQUENCIES, and 7 TRIGGER-PULSE INTERVALS.

Marker pushbuttons are self-canceling so that when any marker button is pushed, other buttons are automatically released. More than one marker interval (up to two decades apart) can be obtained at one time by pushing the desired buttons simultaneously. Triggers are time-coincident with the corresponding markers.

The Type 184 is transistorized (plus 6 nuvistors) and is frequency controlled by a temperature-stabilized 10-MHz crystal oscillator. This instrument gives you great versatility for many laboratory or production-line applications.

OUTPUT CHARACTERISTICS

CRYSTAL-CONTROLLED OSCILLATOR
10 MHz, adjustable to a primary standard; long-term stability 3 p/m per 24 h; temperature-stabilized.

MARKER OUTPUT
Positive-going markers with 16 intervals of 100 ns to 5 s in 1-5-10 sequence, 1-V minimum amplitude into 50 ohms.

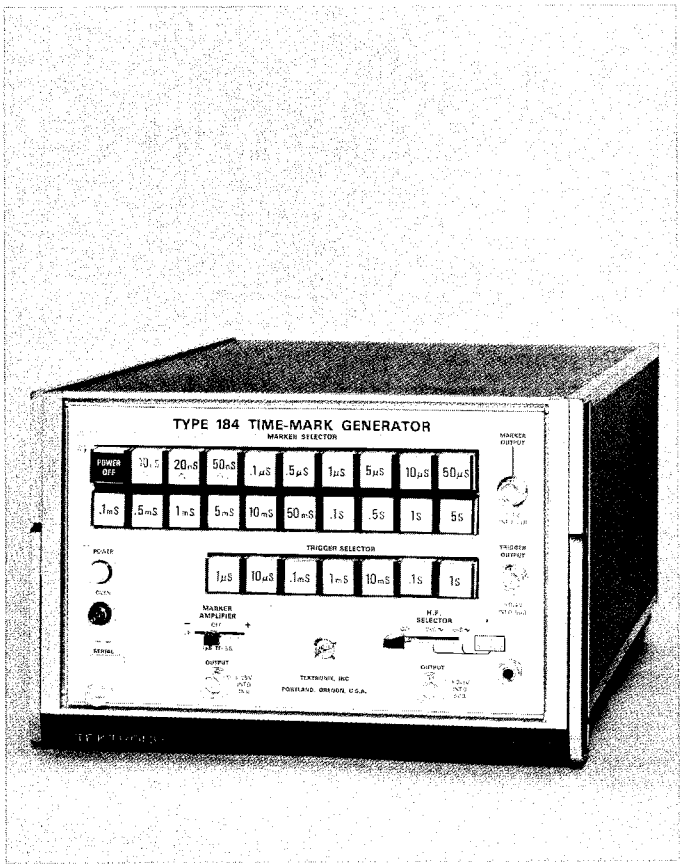
MARKER AMPLIFIER OUTPUT
Positive- or negative-going markers with 14 intervals of 1 μs to 5 s in 1-5-10 sequence, 25-V minimum amplitude into 1 kΩ.

SINEWAVE OUTPUTS
10-ns, 20-ns, and 50-ns sinewave signals at Marker Output connector with 1-V minimum peak to peak amplitude into 50 ohms. 2-ns and 5-ns sinewave signals at HF output connector with 0.3-V minimum peak to peak amplitude into 50 ohms.

TRIGGER OUTPUT
Positive-going pulses with 7 intervals of 1 μs to 1 s in 1-10 sequence, 0.4-V minimum amplitude into 50 ohms.

OTHER

POWER REQUIREMENTS
94.5 V to 137.5 V or 189 V to 275 V, low or high range selected by rear-panel switch. 50 to 400 Hz, approx 40 watts.



DIMENSIONS AND WEIGHTS

Height	6¾ in	17.2 cm
Width	9 in	22.9 cm
Depth	16⅛ in	41 cm
Net weight	13 lbs	5.9 kg
Domestic shipping weight	~19 lbs	~ 8.7 kg
Export-packed weight	~30 lbs	~13.6 kg

STANDARD ACCESSORIES
Two 50-Ω BNC cables (012-0057-01); 50-Ω BNC termination (011-0049-00); right-angle, 3-conductor power cord (161-0024-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0499-00). (Power cord for MOD 146B is 161-0031-00).

TYPE 184 TIME-MARK GENERATOR $675

TYPE 184 TIME-MARK GENERATOR MOD 146B . . $650
As above, but less cabinet, for mounting in rack adapter.

RACK ADAPTER FOR TYPE 106, 114, 184, and 191
Converts these generators for rack mounting. Any combination of two of these instruments can be mounted side by side in a 19-in rack, in only 5¼ in of panel height. Adapter provides forced-air ventilation and shielding between compartments. Blank panel included to cover unused rack opening when only one generator installed. Special power cord (161-0031-00) is required for each instrument installed. These cords are not supplied with the rack adapter.

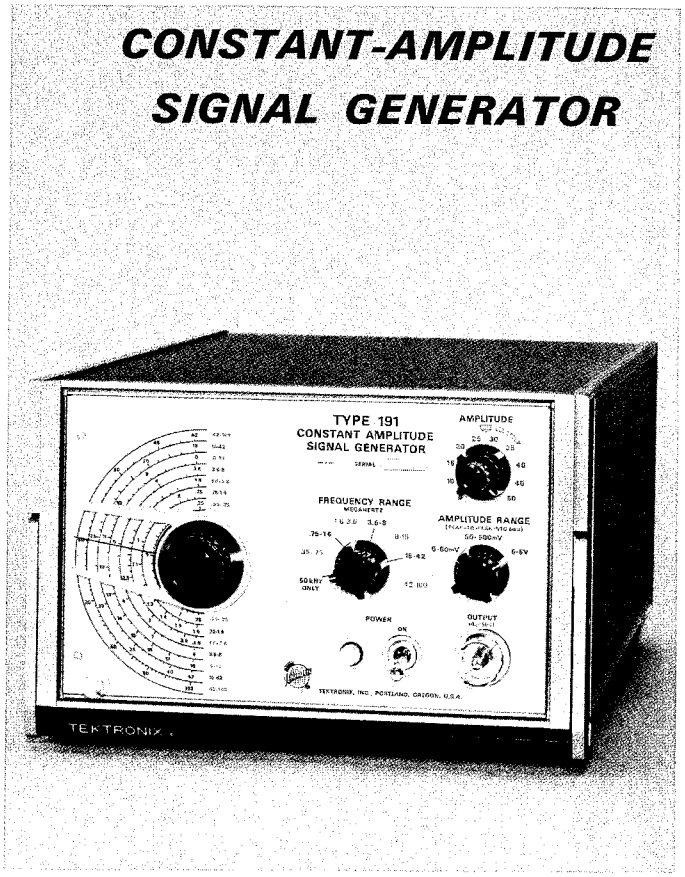
RACK ADAPTER (016-0086-00) $125

POWER CORD FOR RACK ADAPTER (161-0031-00) . $2.55

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

CONSTANT-AMPLITUDE SIGNAL GENERATOR

- ***350 kHz to 100 MHz SINEWAVES***
- ***5 mV to 5.5 V CONSTANT AMPLITUDE***
- ***50 kHz AMPLITUDE REFERENCE***



The Type 191 is a variable-frequency sinewave generator with a constant-amplitude output over the entire frequency range. Both output amplitude and frequency are calibrated. Amplitude is held constant during frequency variations by continuous sampling of peak-to-peak voltage.

OUTPUT CHARACTERISTICS

FREQUENCY RANGE
Continuously variable and calibrated in 7 ranges from 350 kHz to 100 MHz, plus 50-kHz reference output. Accuracy within ±2% of selected frequency with output terminated in 50 Ω or unterminated (except ±5% on 0.5-5 V range with output unterminated).

AMPLITUDE RANGE
5 mV to 5 V peak to peak in 3 ranges (10 calibrated steps per range) into 50 Ω termination. Unterminated output is 2X indicated output. Amplitude is continuously variable (uncalibrated) between steps and to 10% over the top of each range (5.5 V terminated or 11 V unterminated).

AMPLITUDE ACCURACY
50-kHz reference output accurate within ±3% of indicated amplitude on 0.5-5 V range, ±4% on 50-500 mV range, and ±5% on 5-50 mV range, into ±1% 50 Ω termination. Accuracy improved with a more accurate termination. Unterminated output is 2X indicated amplitude, at same accuracy.

AMPLITUDE REGULATION INTO 50 Ω
Output amplitude (at output connector or through 5-ns or less of RG8 cable) varies no more than ±3% from actual amplitude at 50 kHz, when frequency is varied from 350 kHz to 100 MHz, except +3%, −5% from 42 MHz to 100 MHz on 5 mV to 50 mV range.

HARMONIC CONTENT
Typically less than 5%.

OTHER

POWER REQUIREMENT
103.5 V to 126.5 V or 207 V to 253 V, low or high range selected by rear-panel switch. 50 to 400 Hz, 25 watts maximum.

DIMENSIONS AND WEIGHTS

Height	6¾ in	17.1 cm
Width	9 in	22.8 cm
Depth	15¾ in	40 cm
Net weight	14 lbs	6.4 kg
Domestic shipping weight	~20 lbs	~ 9.1 kg
Export-packed weight	~31 lbs	~14.1 kg

STANDARD ACCESSORIES
5-ns cable (017-0502-00); 50-Ω GR to BNC in-line termination (017-0083-00); right-angle 3-conductor power cord (161-0024-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0522-00); (power cord for MOD 146B is 161-0031-00).

TYPE 191 CONSTANT-AMPLITUDE SIGNAL GENERATOR $400

TYPE 191 MOD 146B CONSTANT-AMPLITUDE SIGNAL GENERATOR $375
As above, but less cabinet, for mounting in rack adapter.

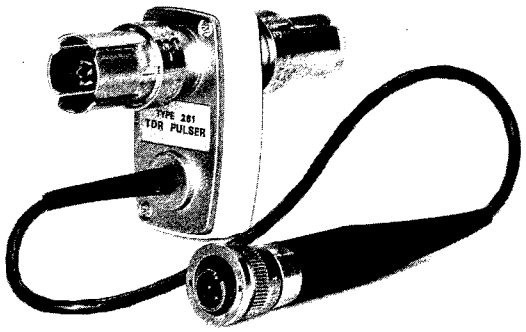
RACK ADAPTER FOR TYPE 106, 114, 184 and 191
Converts these generators for rack mounting. Any combination of two of these instruments can be mounted side by side in a 9-inch rack, in only 5¼ in of panel height. Adapter provides forced-air ventilation and shielding between compartments. Blank panel included to cover unused rack opening when only one generator is installed. Special power cord (161-0031-00) is required for each instrument installed. These cords are not supplied with the rack adapter.

RACK ADAPTER (016-0086-00) $125
POWER CORD FOR RACK ADAPTER (161-0031-00) ... $2.55

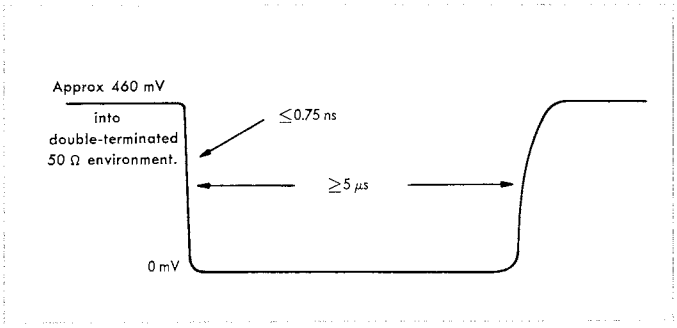
U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.

TYPE 281

TIME-DOMAIN REFLECTOMETER PULSER



This compact current pulse source is designed for use with Tektronix Type 3S76, 4S1, and 1S1 Sampling Units; power is obtained from their probe power connector.



AMPLITUDE
18.5 mA ±1.5 mA.

RISETIME
≤0.75 ns at negative transition.

WIDTH
≥5 μs from negative-going edge to positive-going edge, at 50% amplitude points.

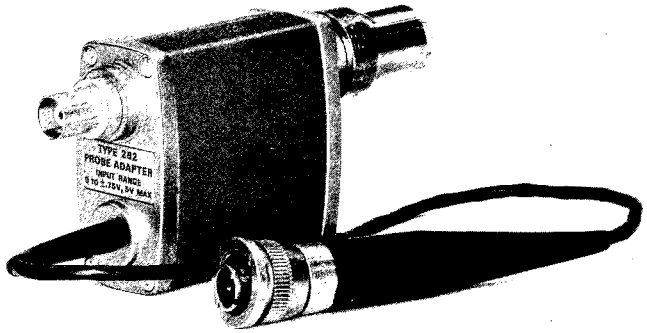
FLATNESS
≤±2% overshoot and ringing following negative-going edge for first 10 ns, ±0.5 % thereafter.

LOADING EFFECT ON 50-Ω SYSTEM
≤10% reflection (capacitive) of 0.75 ns step.

TYPE 281 TDR PULSER (order 015-0060-00) $95
Each instrument includes: 2—instruction manual (070-0515-00).

TYPE 282

PROBE ADAPTER



The Type 282 permits the use of conventional high-impedance probes with 50-Ω sampling plug-in units, such as Types 1S1, 4S1, 4S2, 4S2A, and 3S76. Power is obtained from their probe power connector.

Features of sampling such as DC offset, smoothing and overload recovery not normally available with a conventional oscilloscope are combined with the convenience of a high-impedance probe. With a wide-range time base, one oscilloscope can cover nearly the entire range of signal measurements from power-supply ripple to nanosecond events.

Linearity is excellent over the entire dynamic range; no loss of DC stability with sampling units.

Risetime is ≤3 ns from a 25-Ω source directly into the Type 282 input. Gain is unity ±3%, non-inverting. Dynamic range is up to ±750 mV into 50 Ω. Maximum input is ±5 V.

CHARACTERISTICS REFERRED TO PROBE TIP

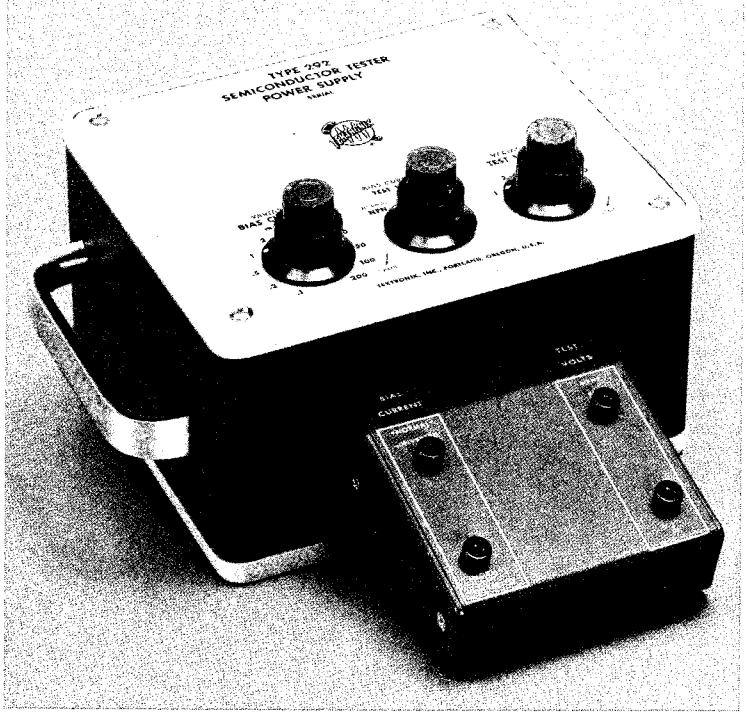
Probe	Overall Risetime	Input RC	Dynamic Range	Deflection Factor	Offset
P6008 (10X)	≈4 ns	10 MΩ, 7.5 pF	±7.5 V	20 mV/cm to 2 V/cm	±10 V
P6009 (100X)	≈3.5 ns	10 MΩ, 2.5 pF	±75 V	200 mV/cm to 20 V/cm	±100 V
P6010 (10X)	≈3.5 ns	10 MΩ, 10 pF	±7.5 V	20 mV/cm to 2 V/cm	±10 V
P6011* (1X)	≈12 ns	1 MΩ, 42 pF	±0.75 V	2 mV/cm to 200 mV/cm	±1 V
P6047 (10X)	2.5 ns	10 MΩ 10 pF	±7.5 V	20 mV/cm 2 V/cm	±10 V

*Care must be used to avoid exceeding the ±5 V max input limits of the Type 282.

TYPE 282 PROBE ADAPTER (order 015-0074-00) $95
Each instrument includes: 2—instruction manual (070-0544-00).

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

SEMICONDUCTOR TESTER POWER SUPPLY



Type 292 provides DC power and sub-nanosecond environment for reading out time and charge data from semiconductor diodes and transistors, and is used between a sub-nanosecond pulse generator and the 50-Ω input of a sampling oscilloscope. Electronically-regulated TEST VOLTS and BIAS CURRENT are connected to the test fixture in use. Polarity of either can be inverted from the front panel; both supplies are short-circuit and open-circuit protected. A transistor test fixture is shipped with each Type 292, and consists of an etched-circuit board with a transistor socket. Isolated tie points are provided to facilitate wiring of experimental circuits.

Banana-pin jacks at the rear of the Type 292 can be used for monitoring TEST VOLTS or BIAS CURRENT, and for connecting external sources of current and voltage. Externally-supplied currents are limited to 1 ampere or less.

TEST VOLTS POWER SUPPLY

Provides fixed DC voltages of 1, 2, 5, 10 and 20 volts, accuracy within ±3% (variable control clockwise). Uncalibrated variable control allows a fixed-voltage step to be divided by any factor between 1 and at least 10. Ripple is ≤4 mV PTP at any voltage, over a current range of 0-200 mA. Maximum short-circuit current approx 400 mA on all ranges.

BIAS CURRENT POWER SUPPLY

Provides fixed DC currents in 11 calibrated steps from 0.1 mA to 200 mA, 1-2-5 sequence, accuracy within ±3% (variable control clockwise). Uncalibrated variable control allows fixed-current step to be divided by any factor between 1 and at least 10. Ripple current listed below applies for any current value from about 2 μA to 200 mA, providing the load on the current supply limits the output voltages to less than 20 volts.

RANGE	RIPPLE
0.1 to 20 mA	less than 5 μA
50 mA	less than 10 μA
100 mA	less than 20 μA
200 mA	less than 100 μA

POWER REQUIREMENTS

Wired for 105 V to 125 V, may be ordered with taps connected for 210 V to 250 V. 50 to 60 Hz, 30 watts maximum.

DIMENSIONS AND WEIGHTS

Height	4⅝ in	11.7 cm
Width	8 in	20.3 cm
Depth	10 in	25.4 cm
Net weight	6½ lb	3.0 kg
Domestic shipping weight	~11 lb	~ 5.0 kg
Export-packed weight	~16 lb	~ 7.3 kg

STANDARD ACCESSORIES

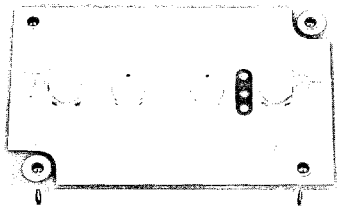
3-wire adapter (103-0013-00); three P6040 probes (010-0133-00); transitor test fixture, unwired (016-0057-00); power cord (161-0015-00); two instruction manuals (070-0410-01).

TYPE 292 SEMICONDUCTOR TESTER POWER SUPPLY $325

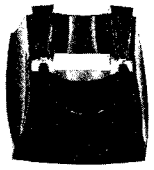
OPTIONAL TEST ACCESSORIES

TRANSISTOR TEST FIXTURE, UNWIRED, Part Number 016-0057-00 . . . . . $20

016-0059-00



013-0080-00



An adapter will be required to mechanically support and electrically connect the diode test fixture to the Type 292 platform.

A special fixture is available for testing axial-lead diodes. Contact-resistance problems are minimized by the use of V-shaped contacts.

Careful design of the fixture and adapter provides high-quality 50-ohm coaxial connections to the diode leads.

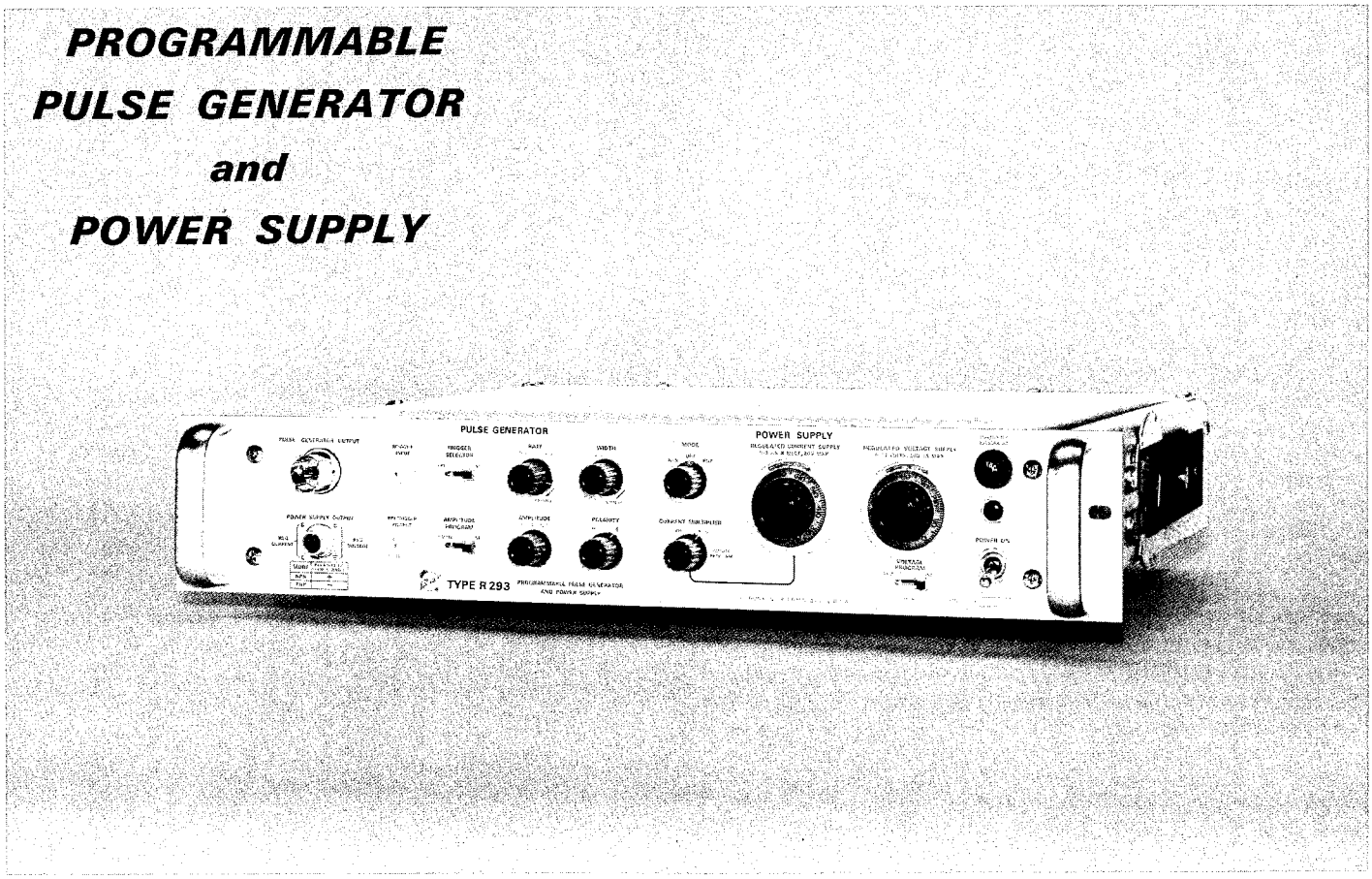
TEST FIXTURE ADAPTER, Part Number 016-0059-00 . . $25

DIODE TEST FIXTURE, Part Number 013-0080-00 . . . $40

U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information Page

TYPE R293

PROGRAMMABLE PULSE GENERATOR and POWER SUPPLY



PROGRAMMABLE PARAMETERS

- **PULSE AMPLITUDE**
- **PULSE WIDTH**
- **PULSE REPETITION RATE**
- **REGULATED VOLTAGE**
- **REGULATED CURRENT**

The Type R293 is a combination pulse generator and power supply which may be used for testing time and charge parameters of semiconductor devices. It can also be used to measure switching and propagation times of micro-logic circuits. The unit is useful in a wide variety of applications which require fast-rise and fast-fall pulses. The remote program capabilities make the instrument useful in production line and systems applications.

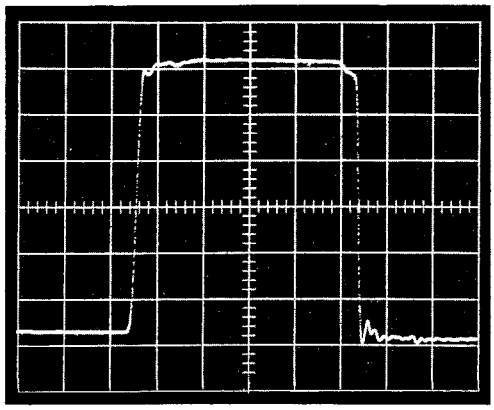
Programming is accomplished by analog resistances connected between appropriate program leads. One program resistor per program is required for each of the five programmable functions. The programmed value for each function is linearly related to the conductance of its respective programming resistor. Any single or combination of programmable parameters can be externally programmed, with the remaining parameters controlled from the front panel.

As an example, programmable parameters can be remotely controlled (automatic sequence optional) with the Type 262 Programmer. The Type 567 Readout Oscilloscope and Type 6R1A Digital Unit may be used to display the results of each measurement and indicate whether results are within, above, or below predetermined limits.

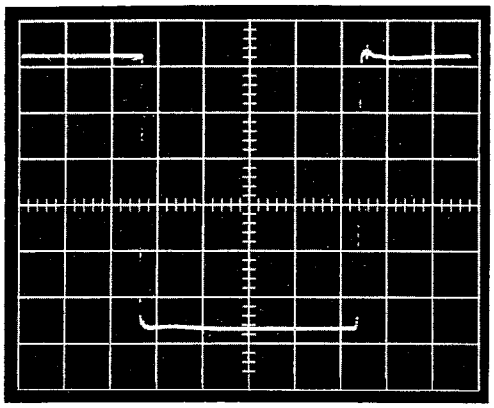
Pulse output is via a GR connector. Regulated voltage and regulated current are available via a 4-pin Bendix connector.

The Type R293 includes slide-out tracks for mounting in a standard 19" rack, and requires only 3½" of panel height.

PULSE OUTPUT



+12-volt pulse, 5 ns/cm.



—12-volt pulse, 50 ns/cm.

PULSE CHARACTERISTICS

CHARACTERISTIC	PERFORMANCE OR OPERATING RANGE	ACCURACY
RISETIME	≤1 ns at maximum amplitude	
FALLTIME	≤1 ns at ≥20-ns width, ≤2 ns at 5 to 20 ns width, at maximum amplitude	
*REPETITION RATE	≤10 kHz (ccw) to 90-100 kHz (cw), continuously variable, uncalibrated	±10% of programmed value
*WIDTH	≤2 ns to ≥250 ns, continuously variable, uncalibrated	±3% of programmed value plus 3 ns; ≤100 ps width jitter
*AMPLITUDE	6 V min to 12 V max, continuously variable, uncalibrated	±5%; or ±3% of programmed value
POLARITY	Positive or negative	
ABERRATIONS	Leading edge (first 10 ns): overshoot ≤3%; rounding ≤5%; ringing ≤3%. (After first 10 ns and before last 15 ns): droop ≤1%; flattop ≤2%. Trailing edge (last 15 ns): overshoot ≤5%; rounding ≤5%; ringing ≤10%; storage ≤5%.	

OTHER

PRETRIGGER PULSE

≥ + ½ V into 50 Ω and ≥ + 2 V into open circuit, occurs approximately 200 ns before leading edge of main pulse. 100-ps maximum jitter between pretrigger and leading edge of main pulse.

EXTERNAL TRIGGER REQUIREMENT

≥2-V; DC to 100 kHz; ≤1-μs risetime; 200 V DC maximum.

POWER SUPPLY

REGULATED CURRENT SUPPLY

300 μA to 300 mA (continuously variable) at up to 20 V, positive or negative polarity. Accuracy* within ± (3% of dial reading) +50 μA, or ± (3% of programmed value) +50 μA. ±1% maximum change with line change from 93.5 V to 135 V. Ripple ≤0.5% or 50 μA, whichever is greater. Overshoot ≤0.5% of change in programmed current.

REGULATED VOLTAGE SUPPLY

0 to ±50 V (continuously variable) at up to 200 mA. Accuracy* within ± (2% of dial reading) +25 mV, or ± (3% of programmed value) +25 mV. ±1% maximum change with line change from 93.5 V to 135 V. Ripple ≤0.05% or 5 mV, whichever is greater. Overshoot ≤5% of change in programmed voltage.

POWER REQUIREMENTS

93.5 V to 135 V or 187 V to 270 V, low or high range selected by rear panel switch. 50 to 400 Hz, 65 watts maximum.

DIMENSIONS AND WEIGHTS

Height	3½ in	8.9 cm
Width	19 in	48.3 cm
Depth	16⅝ in	42.2 cm
Net weight	20¾ lb	9.4 kg
Domestic shipping weight	~55 lb	~25.0 kg
Export-packed weight	~86 lb	~39.1 kg

STANDARD ACCESSORIES

5-ns GR cable (017-0502-00); 4-pin power-supply output connector (131-0268-00); 24-pin remote-program connector (131-0325-00); set mounting tracks (351-0084-00); 3-conductor power cord (161-0015-00); 3 to 2-wire adapter (103-0013-00); two instruction manuals (070-0433-00).

TYPE R293 PROGRAMMABLE PULSE GENERATOR AND POWER SUPPLY $1000

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Please refer to Terms and Shipment, General Information Page

*Programmable parameters. Stated program accuracy is with 1% program resistor.

TYPE 360

INDICATOR

- **DC TO 500 kHz BANDWIDTH**
- **0.05 V/DIV TO 50 V/DIV DEFLECTION FACTOR**

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

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

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

VERTICAL DEFLECTION

BANDWIDTH

DC to 500 kHz at 3-dB down.

DEFLECTION FACTOR

0.05 V/div, 0.5 V/div, 5 V/div and 50 V/div. Continuously variable between steps.

INPUT RC

1 megohm paralleled by approx 40 pF.

MAXIMUM INPUT VOLTAGE

600 V combined DC + peak AC.

HORIZONTAL DEFLECTION

WAVEFORMS REQUIRED

Positive or negative-going sawtooth: 110 to 150 V excursion within the limits of −95 V to +170 V.

Unblanking gate: 45 to 75 V positive, same duration as the sawtooth.

BANDWIDTH

DC to 100 kHz at 3-dB down.

CRT

TEKTRONIX CRT

A flat-faced 3-inch cathode-ray tube provides a bright trace. Accelerating potential is 1.5 kV. A P2 phosphor is normally supplied.

GRATICULE

External, edge-lighted, marked in eight vertical and ten horizontal one-fourth inch major divisions. Center lines are further marked in five minor divisions per major division.

OTHER

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.

POWER REQUIREMENTS

+300 V DC at 20 mA unregulated; +225 V DC at 35 mA regulated; −170 V DC at 23 mA regulated; 6.3 V AC at 3.5 A.

STANDARD ACCESSORIES

P6006 10X Probe Package (010-0125-00); inter-unit power cable (012-0016-00); smoke-gray filter (378-0550-00); mounting hardware; instruction manual (070-0220-00).

DIMENSIONS AND WEIGHTS

Height	12¼ in	31.2 cm
Width	4⅛ in	10.5 cm
Depth	14 in	35.6 cm
Net weight	9¾ lb	4.4 kg
Domestic shipping weight	~16 lb	~ 7.3 kg
Export-packed weight	~26 lb	~11.8 kg

TYPE 360 INDICATOR $270

OPTIONAL ACCESSORIES

MOUNTING FRAME

Adapts Type 360 to a standard 19-in rack. Mounts up to four Type 360 Indicator Units or up to three Type 160-Series instruments and one Type 360. Occupies 12¼ inches of rack space, order 014-0002-00 ..... $ 7

BLANK PANEL

For above mounting frame, occupies same panel area as one instrument, order 333-0157-00 ..... $2.50

C-30 CAMERA

f/1.9 lens, variable magnification; Polaroid Land* Pack-Film back, order C-30 ..... $390

Type 360 to C-30 Camera Adapter, order 016-0241-00 .. 15

PROBES

P6007 100X Probe Package, order 010-0134-00 ..... $22.00

P6027 1X Probe Package, order 010-0070-00 ..... 12.50

*Registered Trade-Mark Polaroid Corporation

U.S. Sales Prices FOB Beaverton, Oregon

Please refer to Terms and Shipment, General Information page.

The instruments described on this page are in limited demand, but represent a desirable choice in a few specialized cases. As such, they remain available for you who still have a need for them. Consult your Tektronix Field Engineer for information on other instruments in the Tektronix product line that generally give greater value in application areas presently filled by these instruments.

TYPE 507 OSCILLOSCOPE

The Tektronix Type 507 is a specialized oscilloscope, designed primarily for high-voltage surge testing of power transformers, high-voltage insulators, lightning arrestors, etc. Careful design of circuitry grounding points ensures minimum sensitivity to extraneous disturbances caused by large voltage transients often introduced into the grounding system.

TYPE 507 OSCILLOSCOPE $2900

TYPE 524AD TELEVISION OSCILLOSCOPE

The Tektronix Type 524AD Oscilloscope is a self-contained instrument for maintenance and adjustment of television transmitter and studio equipment. Features include accurate time markers to facilitate sync-pulse timing, normal response of DC to 10 MHz, flat response within 1% from 60 Hz to 5 MHz for color-television work, variable-duty-cycle amplitude calibrator, and two steps of sweep magnification (3X and 10X) for detailed observations. Bandwidth selections include Normal, Flat, and IRE.

TYPE 524AD OSCILLOSCOPE $1300

TYPE RM31A RACK-MOUNT OSCILLOSCOPE

The Type R422 Oscilloscope, described on page 27, is recommended as a replacement for the Type RM31A. Type R422 is not a plug-in type oscilloscope. If plug-in versatility is required, see Type RM543B, described on page 79.

The Tektronix Type RM31A is a rack-mount oscilloscope with bandwidth from DC to 15 MHz (3-dB down) and a single time-base system with calibrated sweep rates from 0.1 μs/cm to 5 s/cm and with X5 sweep magnifier. The instrument uses a broad selection of Tektronix letter-series and 1-series plug-in units to adapt the vertical deflection system to various application areas. The Type RM31A fits in a standard 19-in rack and requires approx 14 in of panel height.

TYPE RM31A OSCILLOSCOPE, without plug-in units . . $1095

TYPE CA PLUG-IN UNIT

The Type 1A2 Plug-In Unit, described on page 123, is recommended as a replacement for Type CA.

The Tektronix Type CA Plug-In 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 kHz, 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. Bandwidth is DC to 24 MHz when used with current-production Type 540-Series, Type 555, 556, Type 581A,* 585A* Oscilloscopes.

TYPE CA PLUG-IN UNIT $260

TYPE D DIFFERENTIAL PLUG-IN UNIT

The Type 1A6 Plug-In Unit, described on page 129, is recommended as a replacement for the Type D Plug-In Unit.

The Tektronix Type D Plug-In Unit equips Type 530, 540, 550 and 580* Series Oscilloscopes for work requiring DC-coupling at a deflection factor of 1 mV/cm. Differential input with high rejection ratio for in-phase signals permits cancellation of unwanted or interfering signals. Bandwidth is DC to 300 kHz (3-dB down) at 1 mV/cm, increasing to 2 MHz at 50 mV/cm. Common-mode rejection ratio is 10,000:1 for in-phase signals up to 20 kHz at all positions of the mV/cm multiplier switch.

TYPE D PLUG-IN UNIT $170

*Type 81 Adopter is required.

TYPE Z PLUG-IN UNIT

The Type W Differential-Comparator Plug-In Unit, described on page 121, is an excellent replacement for the Type Z.

The Type Z Plug-In Unit is designed for use with Tektronix Type 530, 540, 550 and 580 (with Type 81 Adapter) Series Oscilloscopes. The unit operates as a conventional preamplifier, a differential preamplifier, and a calibrated differential comparator. Resolution to 0.005% can be attained. In the differential mode, accurate DC comparison voltages are added differentially to the input signal via the slide-back technique, providing a vertical scale up to ±2,000 cm.

TYPE Z PLUG-IN UNIT $525

TYPE 3A1 DUAL-TRACE AMPLIFIER

The Type 3A6 Plug-In Unit, described on page 182, has the same characteristics as the 3A1, and in addition, contains an internal delay line that allows viewing of the leading edge of the sweep-triggering waveform.

The Tektronix Type 3A1 is a general-purpose dual-trace plug-in unit having two separate channels, each with identical characteristics. The unit can operate in one of five modes for a variety of single and dual-trace displays. The instrument can be used in Tektronix Type 561A, 564 and 565 Oscilloscopes, and may also be used in the Type 567 Digital Readout Oscilloscope when digital readout is not required. Linear scan is 8 cm. Bandwidth is DC to 10 MHz (3-dB down).

TYPE 3A1 AMPLIFIER UNIT $490

TYPE 3B1 TIME-BASE UNIT

The Type 3B3 Plug-In Unit, described on page 189, has the same characteristics as the Type 3B1 and, in addition, contains a calibrated variable delay-time control for accurate measurements of time delays.

The Tektronix 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, Type 564, Type 565, (raster generation), or Type 567 Oscilloscopes. However, in the Type 567 the measurements will not be presented in digital form. Calibrated sweep range for both normal and delayed sweeps is 0.5 μs/div to 1 s/div in 20 steps (1-2-5 sequence), accurate within 3%. 5X Magnifier increases the calibrated sweep range to 0.1 μs/div.

TYPE 3B1 TIME-BASE UNIT $535

TYPE 261 COAXIAL SWITCH

The Type 261 is designed primarily for use as part of an automated electronic-testing system, such as Types 567/6R1A/262. Type 261 will switch signal offset voltages, trigger signals, loads, attenuators, signal delays, and provide ground references for subnanosecond measurements in a 50-ohm environment. Switching functions are performed by eight single-pole double-throw mercury wetted relays. Signal connections are made with 50-ohm coaxial cables with General Radio Type 874 connectors. The Type 261 is rack-mount in configuration, requiring only 5¼ inches of rack height.

TYPE 261 COAXIAL SWITCH $700

TYPE 1121 AMPLIFIER

The Tektronix Type 1121 Amplifier is a cascaded-input amplifier which increases the amplitude of low-level signals; thus increases the sensitivity of the oscilloscope or other associated instrument with which it is operated. Bandwidth is 5 Hz to 17 MHz (3-dB down). The output, terminated in 93-Ω 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 signal up to ±10 mV at full gain. Risetime is approx 21 ns with the input attenuator control in the 1X, 2X, 5X or 10X positions. Attenuation up to 500X is provided.

TYPE 1121 AMPLIFIER $465

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

CHOOSING A CAMERA

Tektronix cameras, component parts, and accessories meet a wide variety of trace-recording needs. Factors to consider in choosing the most appropriate camera include the ability to up-grade or add to your present camera, type of viewing, compatibility with different oscilloscopes, writing speed, type and size of print desired. Each of these factors are discussed below.

CAMERA FLEXIBILITY

C-12 and C-27 Cameras are designed for maximum flexibility and easy interchange of components. Five interchangeable lenses are available, providing a wide range of object-to-image ratios and maximum aperatures. Lens mounts are pre-focused, for easy interchange. Four interchangeable backs are available: Polaroid[1] Land Pack Film or Roll Film, and Graflok[2] 4 x 5 or 2¼ x 3¼.

The C-40 Camera is equipped with our fastest lens and Polaroid Roll-Film back. Any of the other optional lenses and/or backs are also useable with the Type C-40, if desired.

The C-30 Camera is of integrated design, with a variable object-to-image ratio and permanently attached Polaroid Pack Film back. It is the smallest and most portable camera.

All cameras can be operated electrically with the shutter actuator attachment. A projected graticule attachment is also available for the C-12 Camera.

VIEWING

The C-12 provides the most convenient viewing. Through use of a dichroic mirror, an apparent direct-view of the CRT is obtained, thus eliminating parallax. The viewing tunnel provides comfortable binocular viewing (with or without glasses), and effectively shuts out ambient light.

The C-27 also features comfortable binocular viewing. The viewing tunnel, however, can be removed for stacking of 7-in rack model oscilloscopes. The viewer looks directly down the viewing tunnel at the CRT; a dichroic mirror is not used, as in the C-12.

C-30 and C-40 Cameras both swing open from left or right for viewing.

COMPATIBILITY

Camera adapters allow use of the C-12, C-27, C-30 and C-40 on many Tektronix Oscilloscopes. See page 276 for adapter part numbers and recommended camera/oscilloscope combinations. Some combinations are not recommended (for a number of reasons) even though adapters are available. The C-12, C-30, or C-40, for example, would probably not be used with a Type 502A Oscilloscope, since it is not possible to record a 10-cm vertical scan with these cameras.

PICTURE SIZE

With either Polaroid Land or conventional films, the exposable area of the film must be at least as large as the image from the lens. Image size will depend on the object-to-image ratio of the camera lens and on the size of the oscilloscope display. For example, the Graflok Back with 120 or 620 roll film would probably not be used with a 1:0.85 lens and a 10-cm wide oscilloscope display. This is because the image of the display is 8.5 cm wide and the exposable area (long dimension) of the film is only 7.8 cm maximum (it can be as short as 5.7 cm, depending film format). The film size should be at least 5 mm larger than the size of the image to allow for normal tolerances in the construction of the Camera Backs and for the position of the film in the back.

[1]Registered Trade-Mark Polaroid Corporation

[2]Registered Trade-Mark Graflex, Inc.

FILM TYPES

Polaroid Type 47 and Type 107 (roll film and pack film, respectively) each have an ASA equivalent exposure index of 3000. Polaroid Type 410 roll film is especially suited for high-speed photography. It has an ASA equivalent of 10,000. Each film type has 8 exposures, and develops in 10 seconds. Roll-film develops inside the film back; pack film develops outside.

Polaroid films can also be used in a Polaroid 4 x 5 film holder with the 4 x 5 Graflok Back. This combination, used with Type 57 film (3000 speed), a 1:1 lens, and a C-27 Main Frame will give full-size records of graticule areas as large as 8 x 10 cm. A Standard C-27 Camera (1:0.85 lens) equipped in the same way will make a complete record of a 10 x 10-cm graticule.

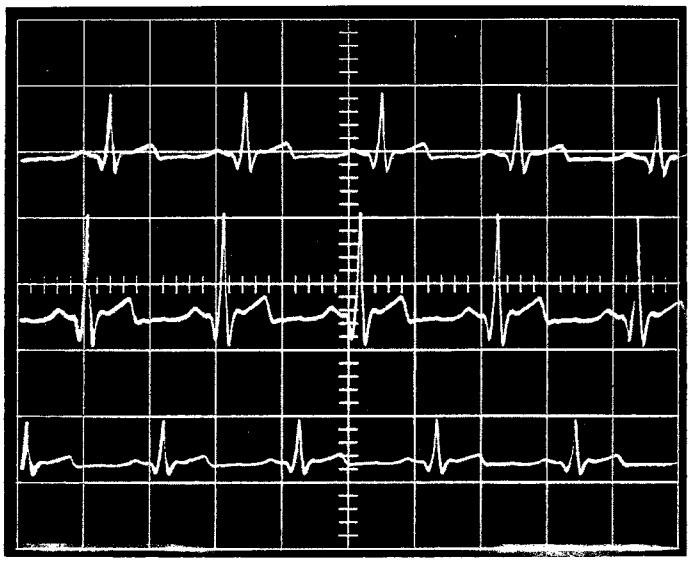
If you want to obtain a negative from which a number of prints can be made, either Type 55 P/N film (which comes in Polaroid Land 4 x 5, only) or conventional film is satisfactory.

Conventional cut film and 120 roll film can be used with either the 4 x 5 or 2¼ x 3¼ Graflok Back and the proper holder or adapter. A number of film types, manufactured by Eastman Kodak, Agfa, Ansco, and others, are available in both forms, at ASA speeds from 64 to 1250.

A detailed list of film types and characteristics of these and other films not mentioned here can be obtained from the respective manufacturer.

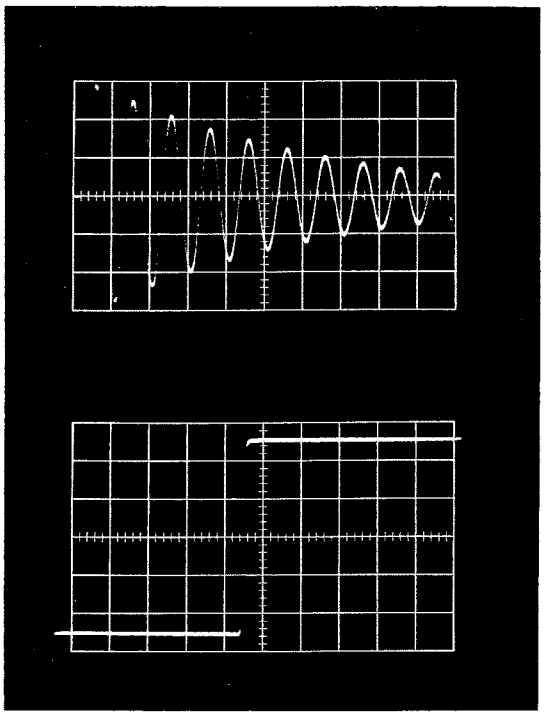
WRITING SPEED

Writing speed is an indication of the relative light-gathering ability of the various lenses or camera systems. Factors within the Camera that affect writing speed include the lens (an arbitrary writing speed index is assigned to each lens), light loss (the special dichroic mirror in the C-12 transmits approximately 65% of the available light to the film), and film type.



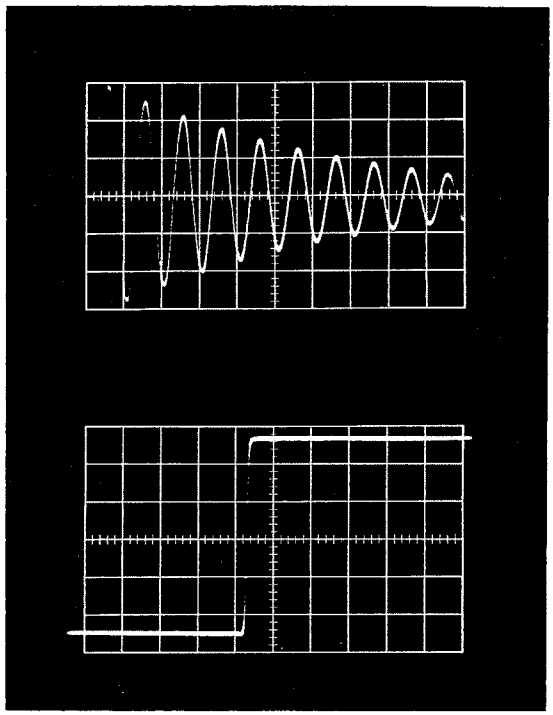
USED IN STANDARD C-12 AND C-27 CAMERAS

GENERAL PURPOSE—f/1.9, 1:0.85 object-to-image ratio . . . image brightness sufficient for most applications. When photographing 8 x 10 cm graticules, or 10 x 10 division graticules such as used on Tektronix Types 575 and 536, provides the largest size image that will still fall within the maximum recording area of 3¼ x 4¼ size Polaroid film.



Photographs taken under identical conditions illustrate relative writing-speed capabilities of the f/1.9 and f/1.3 lenses.

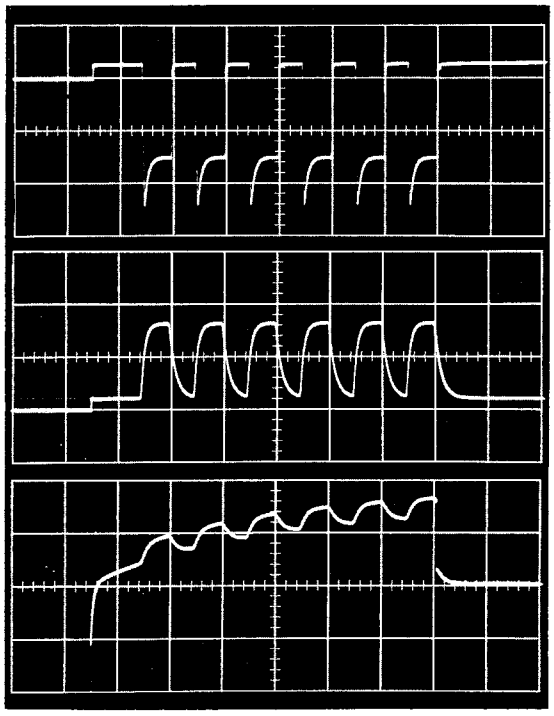
Photographs on these two pages reproduced in the actual size of the print.



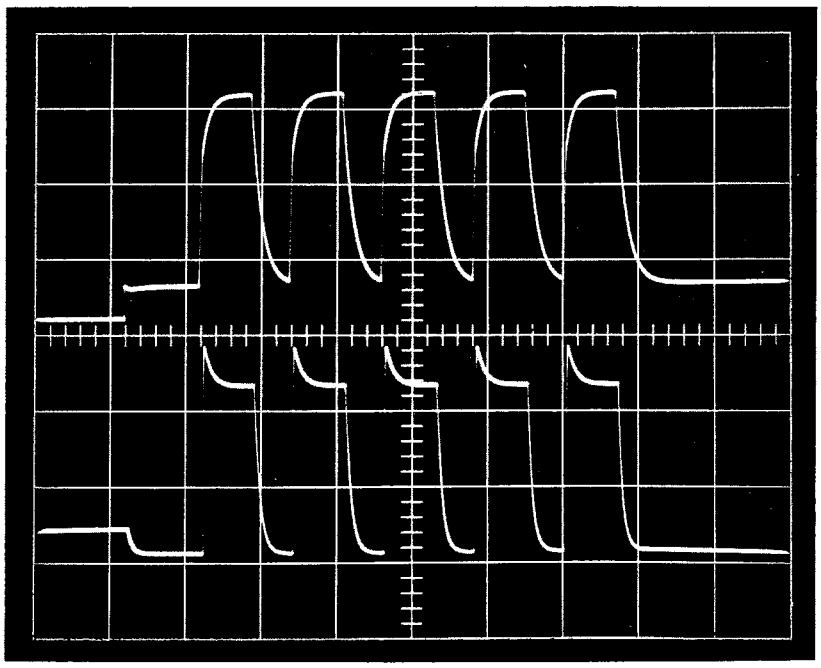
HIGH WRITING SPEED—f/1.9, 1:0.5 object-to-image ratio . . . for high writing speed applications such as single-shot photography of fast transients, writing speed 1.5X general-purpose lens.

USED IN STANDARD C-40 CAMERA

ULTRA-HIGH WRITING SPEED—f/1.3, 1:0.5 object-to-image ratio . . . for applications where writing speed is the prime consideration . . . advances the state of the art and in combination with the C-27 Main Frame records higher-speed phenomena than before, writing speed 3X general-purpose lens.



FILM ECONOMY & MEDIUM WRITING SPEED —f/1.9, 1:0.7 object-to-image ratio . . . efficient use of film, writing speed 1.25X general-purpose lens.

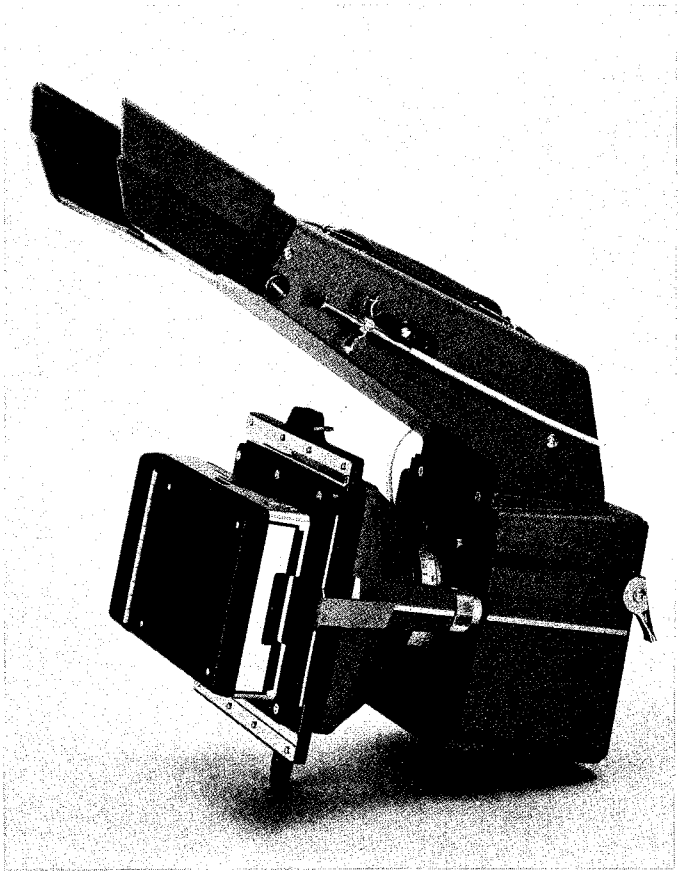


PRECISE FULL-SIZE IMAGE & HIGH WRITING SPEED —f/1.4, 1:1 object-to-image ratio . . . for precise full-size records . . . measurements can be scaled directly off photograph with maximum resolution, writing speed 1.75X general-purpose lens.

C-12

TRACE-RECORDING CAMERAS

- ***NO-PARALLAX BINOCULAR VIEWING***
- ***LIFT-ON MOUNTING, SWING-AWAY HINGING***
- ***EASILY-ACCESSIBLE CONTROLS***
- ***ROTATING & SLIDING BACK***
- ***LENS & BACK OPTIONS***
- ***ACCEPTS PROJECTED GRATICULE ACCESSORY***



The C-12 is a general-purpose trace-recording camera suitable for use with most Tektronix full-size oscilloscopes. The special dichroic mirror in the C-12 (and another conventional mirror) reflects a portion of the image up through the viewing tunnel, giving the viewer the impression of a straight-on view of the CRT. This no-parallax binocular viewing is especially desirable when the oscilloscope has an external graticule. The dichroic mirror also allows use of the Projected Graticule accessory (described on page 275).

The dichroic mirror transmits approximately 65% of available light to the film. For this reason, we recommend an optional lens and/or roll-film back if applications include single-shot photographs at the fastest sweep rates.

STANDARD C-12

LENS
75-mm f/1.9 oscilloscope recording lens, stops down to f/16.

SHUTTER SPEEDS
1 to 1/50 second plus Bulb and Time.

OBJECT-TO-IMAGE RATIO
1:0.85, records 8 x 10-cm graticule on 3¼ x 4¼ Polaroid film.

FILM BACK
Polaroid Pack Film back accepts 3000-speed film which develops outside camera in about 10 seconds.

MECHANICAL
Lift-on mounting and swing-away hinging with C-12 Camera Adapter (not included, see page 276). Accepts Tektronix Shutter Actuator and Projected Graticule.

DIMENSIONS AND WEIGHTS

Height	15⅜ in	39.0 cm
Width	7½ in	19.0 cm
Depth	17¼ in	43.8 cm
Net weight	12¼ lb	5.6 kg
Domestic shipping weight	~16 lb	~ 7.3 kg
Export-packed weight	~33 lb	~15.0 kg

STANDARD ACCESSORIES
Cable release (122-0586-01), focus plate (387-0893-00), two instruction manuals (070-0383-01).

C-12 CAMERA $450

ROLL-FILM CAMERA identical to the Standard C-12, except a Polaroid Roll-Film Back is substituted for the Pack-Film Back.
C-12-R CAMERA $450

ELECTRICALLY-ACTUATED* CAMERA identical to the Standard C-12, but with a shutter actuator and built-in power supply. (See page 274.)
C-12-S CAMERA $605

ELECTRICALLY-ACTUATED* CAMERA with Roll-Film Back combines features of the C-12-R and C-12-S, above.
C-12-RS CAMERA $605

All cameras are sold less mounting adapter; order from page 276.

CUSTOM C-12 CAMERAS				
LENS (Writing speed compared to Standard f/1.9, 1:0.85 lens)	SHUTTER ACTUATOR and BUILT-IN POWER SUPPLY*	POLAROID FILM BACK	ORDER NUMBER	PRICE
FILM ECONOMY & MEDIUM WRITING SPEED—f/1.9, 1:0.7. Records two 6 x 10-cm or three 4 x 10-cm graticules on each film. Writing speed 1.25X Standard Lens.	No	Pack Film Roll Film	C-12-547 C-12-547 R	$470 470
	Yes	Pack Film Roll Film	C-12-547 S C-12-547 RS	625 625
HIGH WRITING SPEED—f/1.9, 1:0.5 Records fast-writing displays such as single-shot transients. Writing speed 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
PRECISE FULL-SIZE IMAGE & HIGH WRITING SPEED—f/1.4, 1:1. Records full-size image of 8 x 10-cm graticule (on 4 x 5 film with optional Graflok Back). Writing speed 1.75X Standard Lens.	No	Pack Film Roll Film	C-12-608 C-12-608 R	565 565
	Yes	Pack Film Roll Film	C-12-608 S C-12-608 RS	720 720
ULTRA-HIGH WRITING SPEED—f/1.3, 1:0.5 Where writing speed is prime consideration. Records two 6 x 10-cm graticules on each film. Writing speed 3X Standard Lens.	No	Pack Film Roll Film	C-12-662 C-12-662 R	615 615
	Yes	Pack Film Roll Film	C-12-662 S C-12-662 RS	770 770

Any C-12 Standard or Custom Trace-Recording Camera can be ordered less back. Use suffix 'G' after the Order Number and deduct $80 from the price. 4 x 5 and 2¼ x 3¼ Graflok Backs and accessories are shown on page 277.

*Power supplies are normally wired for 115 V. For 230 V add suffix 'B' to the Order Number. Price for either is the same.

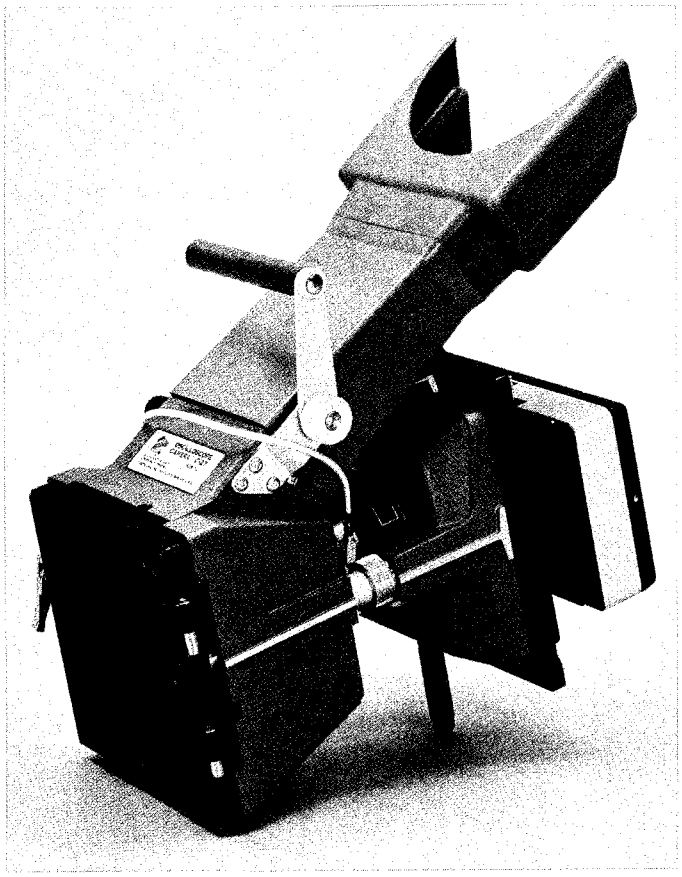
All cameras are sold less mounting adapter; order from page 276.

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

C-27

TRACE-RECORDING CAMERAS

- **COMFORTABLE BINOCULAR VIEWING**
- **LIFT-ON MOUNTING, SWING-AWAY HINGING**
- **EASILY-ACCESSIBLE CONTROLS**
- **ROTATING & SLIDING BACK**
- **LENS & BACK OPTIONS**



The C-27 is a general-purpose trace-recording camera suitable for use with most Tektronix full-size oscilloscopes. The viewer sees the CRT without the use of mirrors. As a result the maximum amount of light is transferred to the film. The viewing tunnel can be easily removed, and the carrying handle folded out of the way. This allows camera mounting on two 7-inch rack-model oscilloscopes placed one over the other. In addition the camera frame can be rotated 90° or 180°, thus positioning the viewing tunnel at either side or at the bottom of the camera. The opening at the camera front allows the complete photographic coverage of large graticules such as the Type 502A Oscilloscope and Type 526 Waveform Monitor (with optional lens or back).

STANDARD C-27

LENS
75-mm f/1.9 oscilloscope recording lens, stops down to f/16.

SHUTTER SPEEDS
1 to 1/50 second plus Bulb and Time.

OBJECT-TO-IMAGE RATIO
1:0.85, records 8 x 10-cm graticule on 3¼ x 4¼ Polaroid film, 10 x 10-cm graticule with optional Graflok back and 4 x 5 film.

FILM BACK
Polaroid Pack Film back accepts 3000-speed film which develops outside camera in about 10 seconds.

MECHANICAL
Lift-on mounting and swing-away hinging with C-27 Camera Adapter (not included, see page 276). Accepts Tektronix Shutter Actuator.

DIMENSIONS AND WEIGHTS

Height with viewing tunnel	17 3/16 in	43.7 cm
Height without viewing tunnel	8 in	20.3 cm
Width	7½ in	19.0 cm
Depth with viewing tunnel	13⅜ in	33.9 cm
Depth without viewing tunnel	12 in	30.5 cm
Net weight	10½ lb	4.8 kg
Domestic shipping weight	~14 lb	~ 6.4 kg
Export-packed weight	~36 lb	~16.4 kg

STANDARD ACCESSORIES
Cable release (122-0586-01), focus plate (387-0893-00), two instruction manuals (070-0383-01).

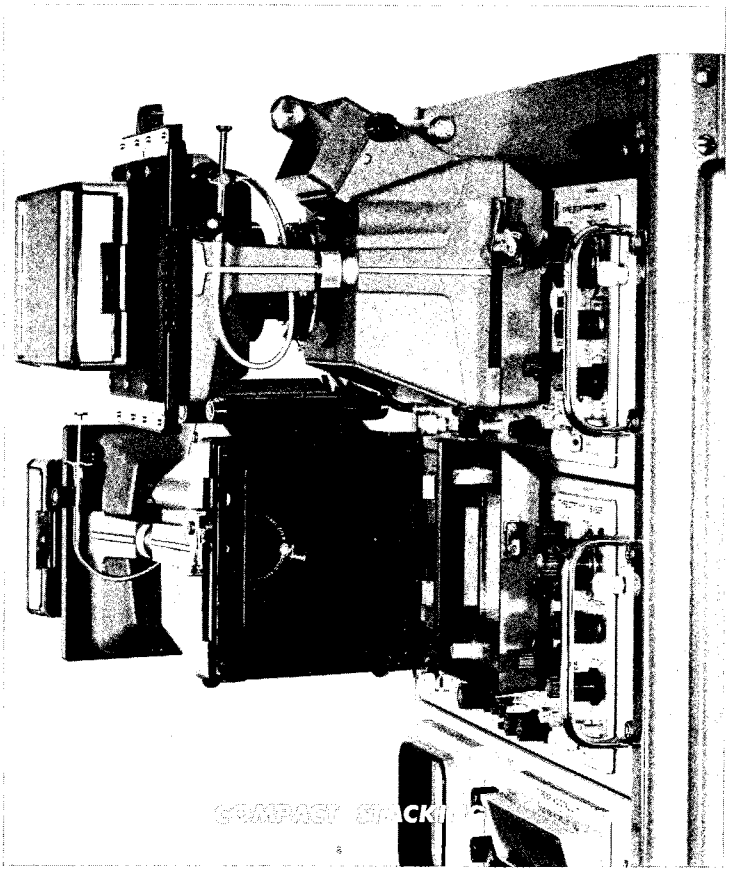
C-27 CAMERA $420

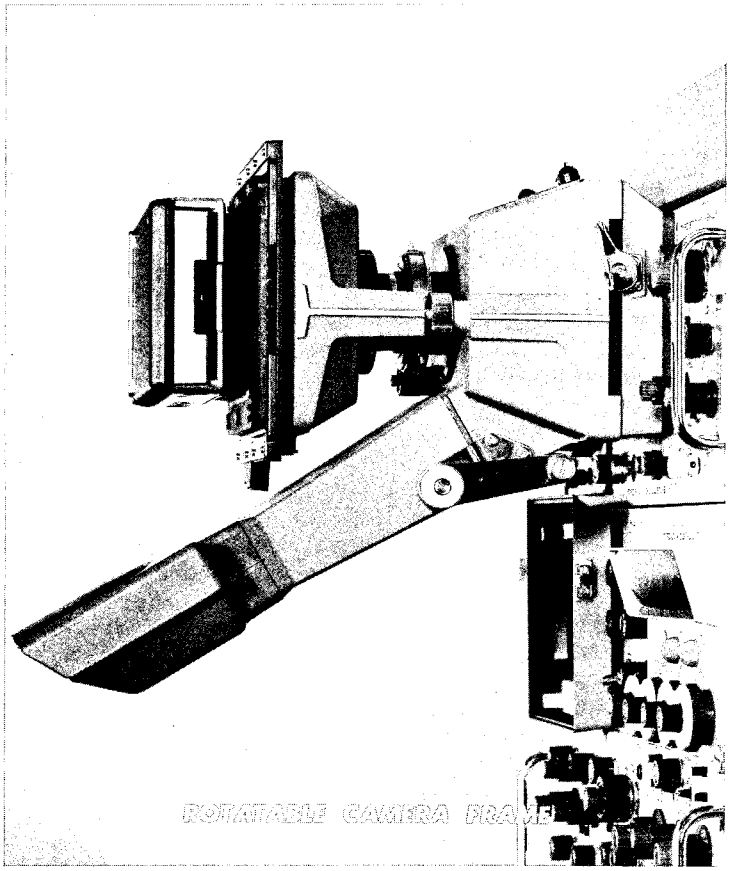
ROLL-FILM CAMERA identical to the Standard C-27, except a Polaroid Roll-Film Back is substituted for the Pack-Film Back.
C-27-R CAMERA $420

ELECTRICALLY-ACTUATED* CAMERA identical to the Standard C-27, but with a shutter actuator and built-in power supply. (See page 274.)
C-27-S CAMERA $575

ELECTRICALLY-ACTUATED* CAMERA with Roll-Film Back combines features of the C-27-R and C-27-S, above.
C-27-RS CAMERA $575

All cameras are sold less mounting adapter; order from page 276.





CUSTOM C-27 CAMERAS				
LENS (Writing speed compared to Standard f/1.9, 1:0.85 lens)	SHUTTER ACTUATOR and BUILT-IN POWER SUPPLY*	POLAROID FILM BACK	ORDER NUMBER	PRICE
FILM ECONOMY & MEDIUM WRITING SPEED—f/1.9, 1:0.7. Records two 6 x 10-cm, three 4 x 10-cm or one 10 x 10 cm graticule on 3¼ x 4¼ film. Writing speed 1.25X Standard Lens.	No	Pack Film Roll Film	C-27-547 C-27-547 R	$440 440
	Yes	Pack Film Roll Film	C-27-547 S C-27-547 RS	595 595
HIGH WRITING SPEED—f/1.9, 1:0.5 Records fast-writing displays such as single-shot transients. Writing speed 1.5X Standard Lens.	No	Pack Film Roll Film	C-27-549 C-27-549 R	460 460
	Yes	Pack Film Roll Film	C-27-549 S C-27-549 RS	615 615
PRECISE FULL-SIZE IMAGE & HIGH WRITING SPEED—f/1.4, 1:1. Records full-size image of 10 x 10-cm graticule (on 4 x 5 film with optional Graflok Back). Writing speed 1.75X Standard Lens.	No	Pack Film Roll Film	C-27-608 C-27-608 R	535 535
	Yes	Pack Film Roll Film	C-27-608 S C-27-608 RS	690 690
ULTRA-HIGH WRITING SPEED—f/1.3, 1:05 Records two 6 x 10-cm graticules on each film. Writing speed 3X Standard Lens.	No	Pack Film Roll Film	C-27-662 C-27-662 R	585 585
	Yes	Pack Film Roll Film	C-27-662 S C-27-662 RS	740 740

Any C-27 Standard or Custom Trace-Recording Camera can be ordered less back. Use suffix 'G' after the Order Number and deduct $80 from the price. 4 x 5 and 2¼ x 3¼ Graflok Backs and accessories are shown on page 277.

*Power supplies are normally wired for 115 V. For 230 V add suffix 'B' to the Order Number. Price for either is the same.

All cameras are sold less mounting adapter; order from page 276.

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

C-30

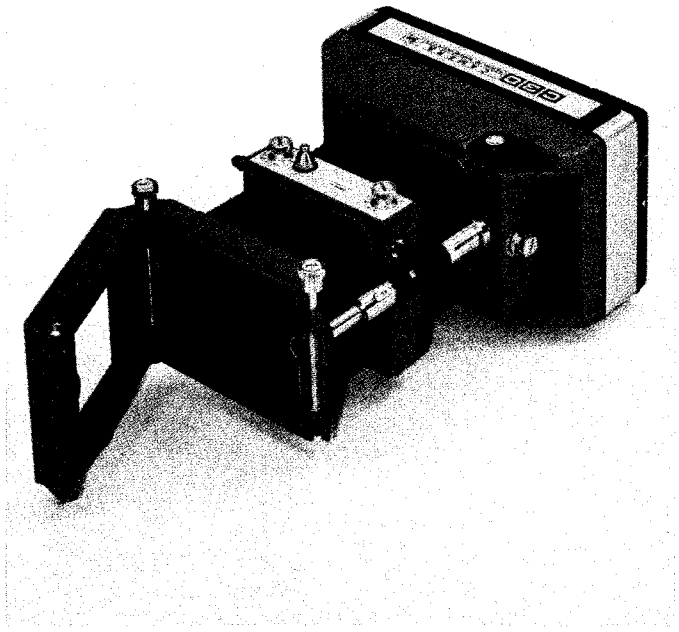
TRACE-RECORDING CAMERA

- ***COMPACT, LIGHT WEIGHT***
- ***LIFT-ON MOUNTING***
- ***LEFT OR RIGHT HINGING***
- ***EASILY-ACCESSIBLE CONTROLS***
- ***VARIABLE MAGNIFICATION***

The C-30 is a compact, light weight trace-recording camera designed for use with Tektronix portable instruments. It mounts directly to Type 422, 453, and 454 Oscilloscopes and Type 491 Spectrum Analyzer. Camera adapters are available for other portable and full-size oscilloscopes. The camera swings open from the left or right, as desired, and can be quickly lifted off the oscilloscope when not needed.

The C-30 is an ideal camera for use with the Type 422 Oscilloscope and Type 491 Spectrum Analyzer. It can also be used for general-purpose trace recording with Type 453 and 454 Oscilloscopes; the C-40 is recommended for single-shot photography at the fastest sweep rates.

Magnification is adjustable from 1:1.5 to 1:0.7. Writing speed at 1:0.7 is equal to the Standard C-27 Camera.



STANDARD C-30

LENS

56-mm f/1.9 oscilloscope recording lens, stops down to f/16.

SHUTTER SPEEDS

1 to 1/50 second plus Bulb and Time.

MAGNIFICATION

Variable in indexed steps of 1.5, 1.4, 1.3, 1.2, 1.1, 1.0, 0.9, 0.85, 0.8 and 0.7. At 0.7 magnification, an 8 x 10-cm or 10 x 10-div graticule (as in Type 536 and 575) can be recorded in its entirety.

FILM BACK

Polaroid Pack Film back accepts 3000-speed film which develops outside camera in about 10 seconds.

MECHANICAL

Lift-on mounting and swing-away hinging from left or right side. Mounts directly to Type 422, 453 and 454 Oscilloscopes and Type 491 Spectrum Analyzer. Camera adapters (not included, see below) allow use with other Tektronix Oscilloscopes. Rear casting recessed for carrying. Accepts Tektronix Shutter Actuator.

DIMENSIONS AND WEIGHTS

Height	$4\frac{5}{8}$ in	11.7 cm
Width	$7\frac{1}{2}$ in	19.0 cm
Depth	$9\frac{13}{16}$ in	24.9 cm
Net weight	$4\frac{3}{4}$ lb	2.2 kg
Domestic shipping weight	~ 9 lb	~ 4.1 kg
Export-packed weight	~14 lb	~ 6.4 kg

STANDARD ACCESSORIES

Light seal for Type 422 and 491 (354-0279-00); light seal for Type 453 and 454 (354-0280-00); focus plate (387-0893-00); two instruction manuals (070-0527-00).

C-30 CAMERA $390

OPTIONAL CAMERA ADAPTERS
($15 each)

FOR OSCILLOSCOPE TYPE	PART NUMBER
310A, 317, 360	016-0241-00
321A	016-0242-00
Tektronix Oscilloscopes with 5-inch round CRT (except Type 519).	016-0243-00
Tektronix 560-Series with rectangular CRT, 529 and RM529.	016-0244-00

OPTIONAL LENS

A portra lens will enable the Type C-30 Camera to photograph test setups.

The depth of field when using the portra lens will vary with the f stop and magnification settings used. Generally, at f/1.9 there will be very little depth of field; while at f/16, the depth of field will allow quite a wide range of distance to be accommodated, depending upon the picture sharpness required. At a distance of 21 inches, a subject area 22 inches in diameter can be covered. Lens stores inside C-30 when not used; hardware included.

Order 016-0246-00 ..... $5

OPTIONAL CARRYING CASE

The C-30 carrying case holds the C-30 Camera, all standard accessories and extra film. The case is constructed of heavy-gage, high-impact plastic, has foam-backed, vacuum-formed styrene liner. Dimensions are $6\frac{7}{8}$ x $11\frac{5}{16}$ x $14\frac{7}{16}$ inches. Net weight is $2\frac{3}{4}$ pounds; domestic shipping weight is ~5 pounds.

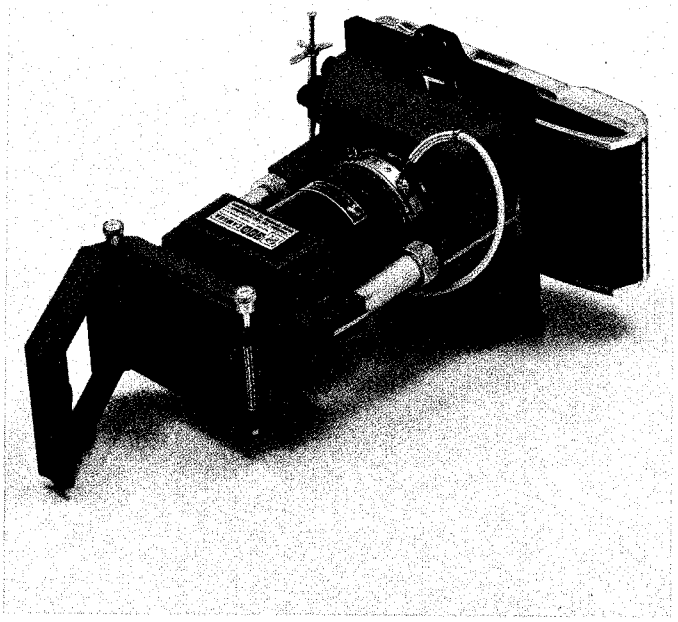
Order 016-0092-00 ..... $25

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

NEW

TRACE-RECORDING CAMERA

- **HIGH WRITING SPEED**
- **LIFT-ON MOUNTING**
- **LEFT OR RIGHT HINGING**
- **EASILY-ACCESSIBLE CONTROLS**
- **ROTATING AND SLIDING BACK**



The C-40 is a high-performance camera designed for Tektronix portable oscilloscopes. It provides the high-writing speed required when Type 453 and 454 Oscilloscopes are operated single-shot at the fastest sweep rates. It mounts directly to these oscilloscopes, and also to the Type 422 and 491. Camera adapters are available for other portable and full-size oscilloscopes. The camera swings open from the left or right, as desired, and can be quickly lifted off the oscilloscope when not needed.

The C-40 uses an f/1.3—1:0.5 lens and Polaroid 10,000-speed film. This combination provides the fastest writing speed available in a Tektronix Standard Camera, a gain of 2 to 3 times over that of the C-30.

STANDARD C-40

LENS
80-mm f/1.3 oscilloscope recording lens, stops down to f/16.

SHUTTER SPEEDS
1 to 1/50 second plus Bulb and Time.

OBJECT-TO-IMAGE RATIO
1:0.5, records up to three 6 x 10-div graticules (Type 453 and 454) or two 8 x 10-div graticules (Type 422 and 491) on 3¼ x 4¼ Polaroid film, using sliding back and multiple exposures.

FILM BACK
Polaroid Roll Film back accepts 10,000-speed film which develops inside camera in about 10 seconds.

MECHANICAL
Lift-on mounting and swing-away hinging from left or right side. Mounts directly to Type 422, 453 and 454 Oscilloscopes and Type 491 Spectrum Analyzer. Camera adapters (not included, see below) allow use with other Tektronix Oscilloscopes. Accepts Tektronix Shutter Actuator.

DIMENSIONS AND WEIGHTS

Height	6¾ in	17.1 cm
Width	9¾ in	24.7 cm
Depth	14 in	35.5 cm
Net weight	9½ lb	4.3 kg
Domestic shipping weight	~14 lb	~ 6.4 kg
Export-packed weight	~22 lb	~10 kg

STANDARD ACCESSORIES
Light seal for Type 422 and 491 (354-0279-00); light seal for Type 453 and 454 (354-0280-00); focus plate (387-0460-00); cable release (122-0586-01); two instruction manuals (070-0616-00).

C-40 CAMERA $540

ELECTRICALLY-ACTUATED CAMERA

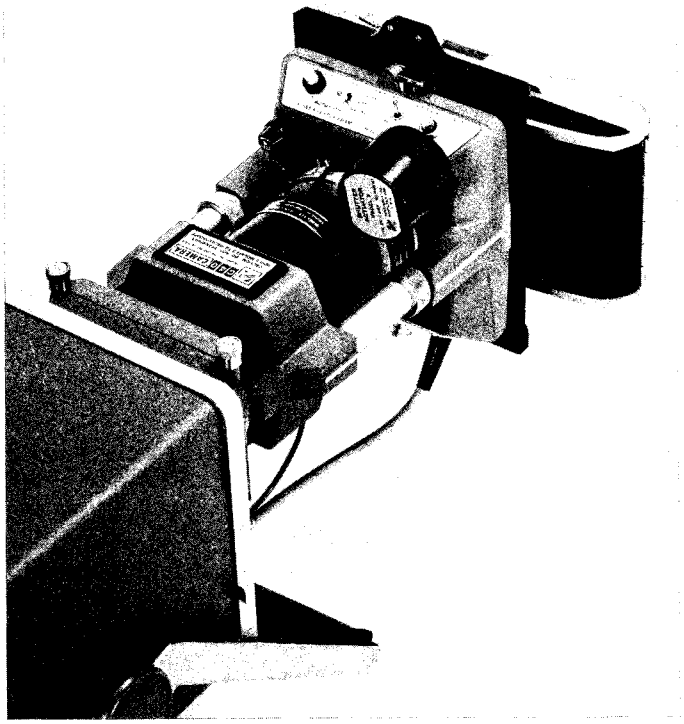
Same as above but with shutter actuator and built-in power supply. See next page for complete description.
For 115-V operation order C-40 S $695
For 230-V operation order C-40 SB $695

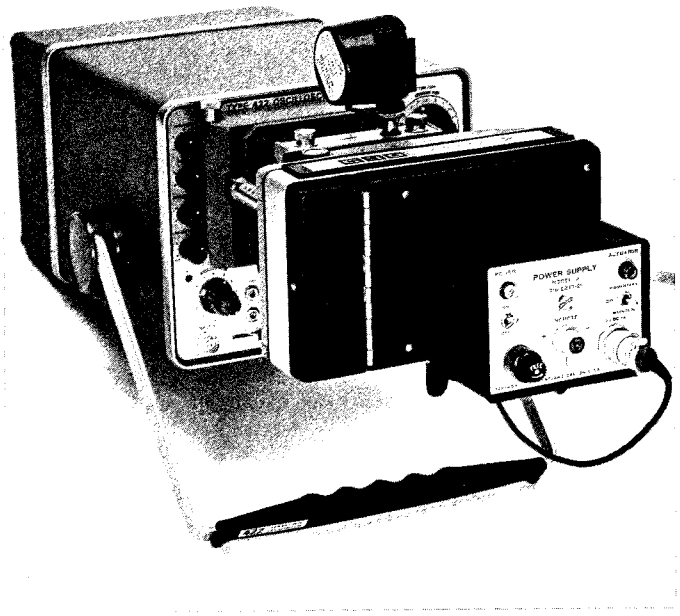
OPTIONAL CAMERA ADAPTERS
($15 each)

FOR OSCILLOSCOPE TYPE	PART NUMBER
310A, 317, 360	016-0241-00
321A	016-0242-00
Tektronix Oscilloscopes with 5-inch round CRT (except Type 519).	016-0243-00
Tektronix 560-Series with rectangular CRT, 529 and RM529.	016-0244-00

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

SHUTTER ACTUATOR





The Shutter Actuator System (Model 3) is a rotary solenoid-operated release that closely simulates the action of a hand-operated cable release. It permits electrical actuation of most Tektronix Trace-Recording Cameras.

A holding circuit in the power supply allows the actuator to be energized indefinitely without overheating. This feature is especially useful in obtaining Time exposures. Several actuators can be operated simultaneously by paralleling their REMOTE inputs and applying 24 VDC.

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-27, and C-40 Camera. The other is a separate small housing which can be mounted to either of the Polaroid Backs, or used remotely. Only the small power supply can be used with the C-30 Camera.

The actuator mounts to the cable release bushing of the C-30 Camera, or Alphax #3 and Ilex #3 shutters. It is not compatible with the Alphax #1 shutter.

Operating time from switch contact to full open blades at 115 VAC is 20 to 25 ms.

Power requirement is 115 VAC, 50 to 400 Hz, or 115 VDC.

Actuator for either supply (016-0218-01) ..... $ 75

Separate Power Supply (016-0230-01) ..... $ 85
Includes hinged mounting bracket (122-0713-00)

Built-in Power Supply (016-0231-01) $125

Power requirement is 230 VAC, 50 to 400 Hz, or 230 VDC.

Actuator for either supply (016-0235-01) ..... $ 75

Separate Power Supply (016-0236-01) ..... $ 85
Includes hinged mounting bracket (122-0713-00)

Built-in Power Supply (016-0237-01) $125

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

PROJECTED GRATICULE

The Projected Graticule eliminates parallax, one of the most common problems in viewing and photographing waveforms on an external graticule.

Parallax is the apparent displacement of the trace in relation to the graticule. Error is introduced since the graticule and CRT phosphor are on different planes.

To eliminate parallax, a virtual image of the graticule is presented at the CRT phosphor plane, as viewed by the operator and as projected to the camera film plane.

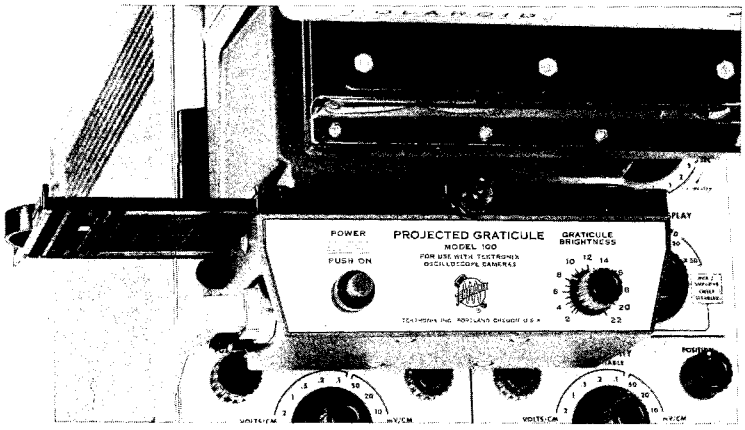
Special graticules, reference waveforms, or any image that can be recorded on a film transparency, can be superimposed on the CRT display. The graticule is held in a slide assembly and is easily slipped in and out of the Projected Graticule case, making possible rapid change of graticules. The included slide assembly has a clear window. Assemblies can be obtained (see below) in several colors to match or contrast the projection with the CRT phosphor.

The projected graticule provides up to an 8 x 10-cm projection, a portion of which can be used for write-in data.

The light source is indexed in approx ½ f stop increments for use as a film exposure guide. This source can also be used for precise prefogging of film for increased sensitivity in fast writing-speed applications.

Operates on 90 to 130 V, or 180 to 260 V, 50 to 440 Hz.

Although the Projected Graticule case is small (it adds only 2¼" to camera height), clearance problems exist with the Type 81 Adapter and a few plug-in unit/probe combinations. If in doubt about compatibility, please consult your Tektronix Field Office or Representative.



PROJECTED GRATICULE for 115 volts (016-0204-00) **$160**

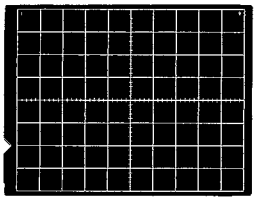
PROJECTED GRATICULE for 230 volts (016-0234-00) **$160**

Includes: 1—power cord (161-0015-00); 1—3 to 2-wire adapter (103-0013-00); 1—graticule, 4 x 10 cm with write-in area and short minor lines (331-0117-00); 1—graticule, 6 x 10-cm with write-in area and short minor lines (331-0111-00); 1—graticule, 8 x 10 cm without write-in area, but with full minor lines (331-0119-00); 1—graticule mask, 4 x 10 cm (331-0118-00); 1—graticule mask, 6 x 10 cm (331-0116-00); 1—instruction manual (070-0383-01).

GRATICULE SLIDE ASSEMBLIES ..... **$3 each**

Clear Window 122-0659-00	Green Window 122-0668-00
Blue Window 122-0667-00	Amber Window 122-0669-00

OPTIONAL GRATICULES and MASKS ..... $0.85 each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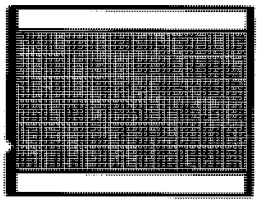
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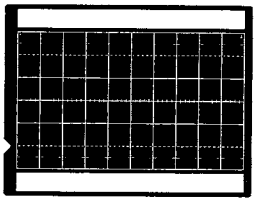
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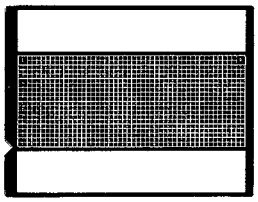
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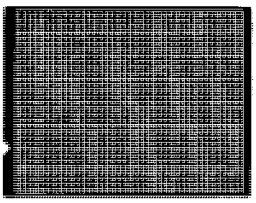
6 x 10 cm Mask 331-0116-00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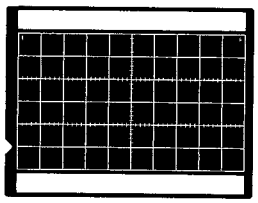
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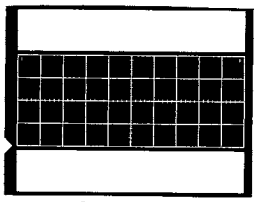
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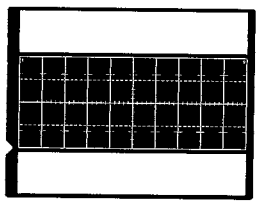
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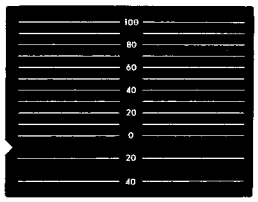
4 x 10 cm Mask 331-0118-00



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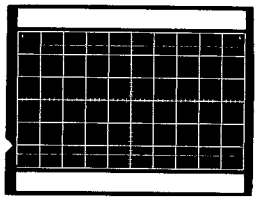
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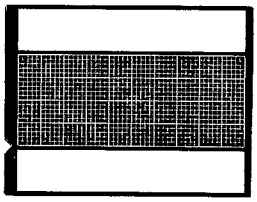
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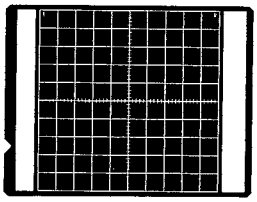
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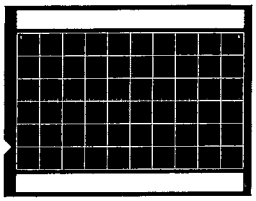
10 x 10 div Mask (for Type 570, 575, 536) 331-0129-00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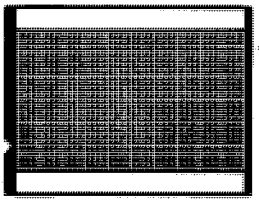
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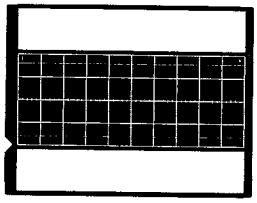
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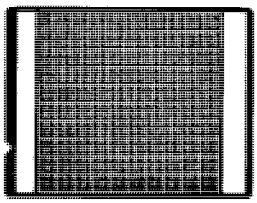
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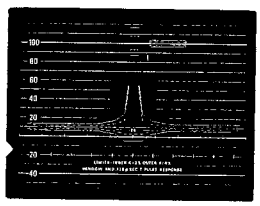
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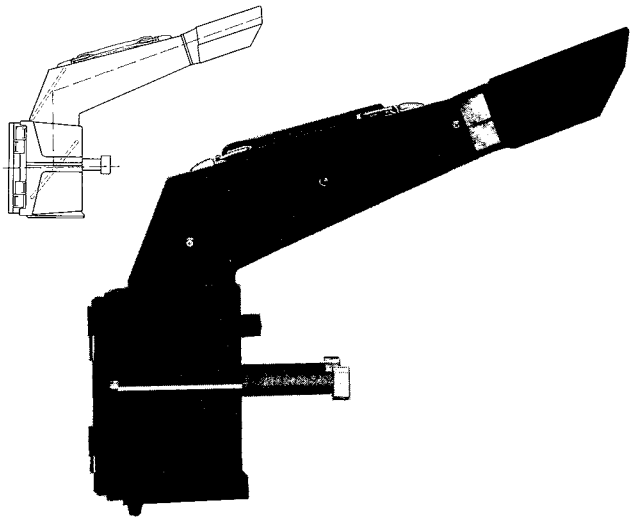
OSCILLOSCOPE/CAMERA ADAPTERS
($15 each)

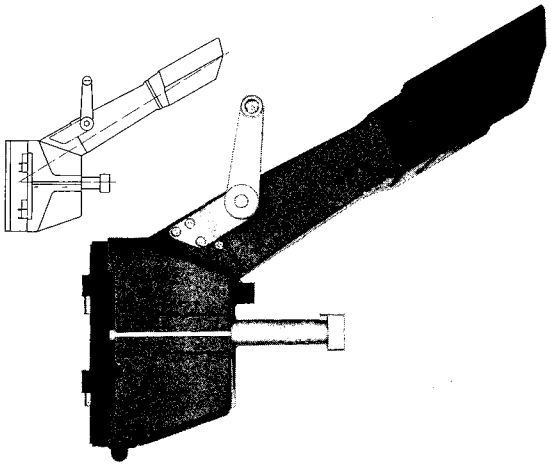
OSCILLOSCOPE TYPE	RECOMMENDED CAMERA	C-12 ADAPTER PART NUMBER	C-27 ADAPTER PART NUMBER	C-30 & C-40 ADAPTER PART NUMBER
310A	C-30			016-0241-00
317	C-30			016-0241-00
321A	C-30			016-0242-00
360	C-30			016-0241-00
422	C-30			integral
453	C-30 or C-40			integral
454	C-30 or C-40			integral
491	C-30			integral
502A	C-27-547 or C-27G	016-0226-00	016-0225-00	016-0243-00
503	C-12 or C-27			
504	C-12 or C-27			
507	C-12			
515A	C-12			
516	C-12			
519	C-27-662R		integral	
524AD	C-12	016-0226-00	016-0225-00	016-0243-00
526	C-27-549		016-0225-00	
529	C-27	016-0217-00*	016-0224-00	016-0244-00
531A	C-12	016-0226-00	016-0225-00	016-0243-00
533A	C-12			
535A	C-12			
536	C-12			
543B	C-12 or C-27			
544	C-12 or C-27			
545B	C-12 or C-27			
546	C-12 or C-27			
547	C-12 or C-27			
549	C-12			
551	C-12			
555	C-12 or C-27			
556	C-12 or C-27			
561A	C-12 or C-27	016-0217-00	016-0224-00	016-0244-00
564	C-12 or C-27			
565	C-27-547 or 27G	016-0226-00	016-0225-00	016-0243-00
567	C-27	016-0217-00	016-0224-00	016-0244-00
568	C-27			
575	C-12	016-0226-00	016-0225-00	016-0243-00
581A	C-27-662R			
585A	C-27-662R			
647A	C-27-662R		016-0223-00	
661	C-12	016-0226-00	016-0225-00	016-0243-00
some Hewlett-Packard	call Tektronix Field Office or Representative	016-0229-00	016-0228-00	
some Fairchild DuMont			016-0227-00	

*Requires slight modification to Type 529.

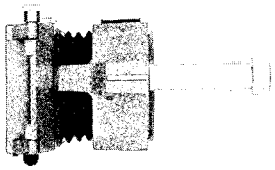
MAIN FRAME ASSEMBLIES



C-12 Main Frame with beam-splitting mirror and on-axis binocular viewing.
Part No. 122-0635-00 ..... $155

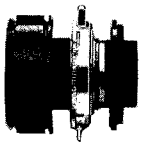


C-27 Main Frame with direct binocular viewing, removable viewing tunnel and maximum light transmission from CRT to film.
Part No. 122-0676-00 ..... $125



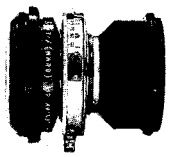
C-40 Main Frame with swing-away hinging for viewing from either side.
Part No. 122-0741-00 ..... $80

INTERCHANGEABLE LENSES

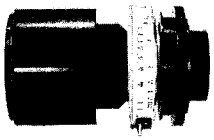


f/1.9—1:0.7
Film Economy
Medium Writing Rate
Pi Alphax or Ilex
No. 3X Shutter
Part No. 122-0547-00 $180

f/1.9—1:0.5
High Writing Rate
Pi Alphax or Ilex
No. 3X Shutter
Part No. 122-0549-00 $200



f/1.4—1:1
Precise full-size Image
High Writing Rate
Pi Alphax No. 3 Shutter
Part No. 122-0608-00 $275

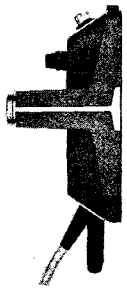


f/1.3—1:0.5
Ultra-High Writing Rate
Ilex No. 3X Shutter
Part No. 122-0662-00 $325

f/1.9—1:0.85
General Purpose
Pi Alphax or Ilex
No. 3X Shutter
Part No. 122-0692-00 $160

REAR FRAMES

Standard Frame
Part No. 122-0591-00 $45



Power Supply Frame for Model 3 Shutter Actuator
Refer to page 274.

ROTATING SLIDE ADAPTER

Adapts Polaroid or Graflok Back to rear frame. Locks in 9 positions for multiple exposures.
Part No. 122-0602-00 $25

INTERCHANGEABLE FILM BACKS

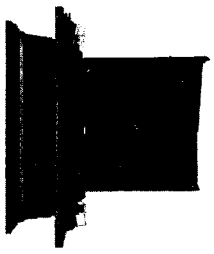
Polaroid Land 3¼ x 4¼
Pack-Film Back, 8 exp
Part No. 122-0671-00 $ 75

Focus Plate for above.
Part No. 387-0893-00 $ 5

Polaroid Land 3¼ x 4¼
Roll-Film Back, 8 exp
Part No. 122-0603-00 $ 75

Focus Plate for above.
Part No. 387-0460-00 $ 5

(Focus Plates not needed if Graflok Back is available.)

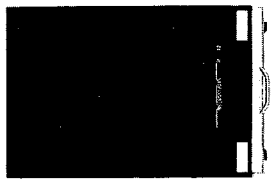


4 x 5 Graflok Back with Focusing Screen accepts standard cut-film holders, film-pack adapters, roll-film (120) holders, Polaroid 4 x 5 Film Holder.
Part No. 122-0604-00 $ 45

2¼ x 3¼ Graflok Back with Focusing Screen accepts standard cut-film holders, film-pack adapters, roll-film (120) holders.
Part No. 016-0233-00 $ 45

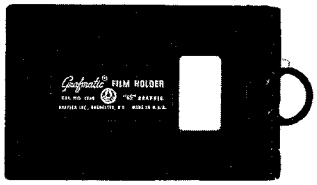
ACCESSORIES FOR GRAFLOK BACKS

Readily available from local camera shops.

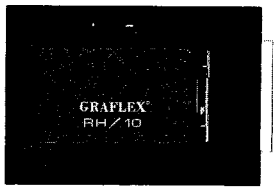


Cut-Film Holder
2 exposures

Film-Pack Adapter
12 exposures



Film Holder
6 exposures



120 Roll-Film Holder
8 exposures, 2¼ x 3¹/₁₆

120 Roll-Film Holder
10 exposures, 2¼ x 2¾

120 Roll-Film Holder
12 exposures, 2¼ x 2¼

Polaroid Land 4 x 5 Film Holder.

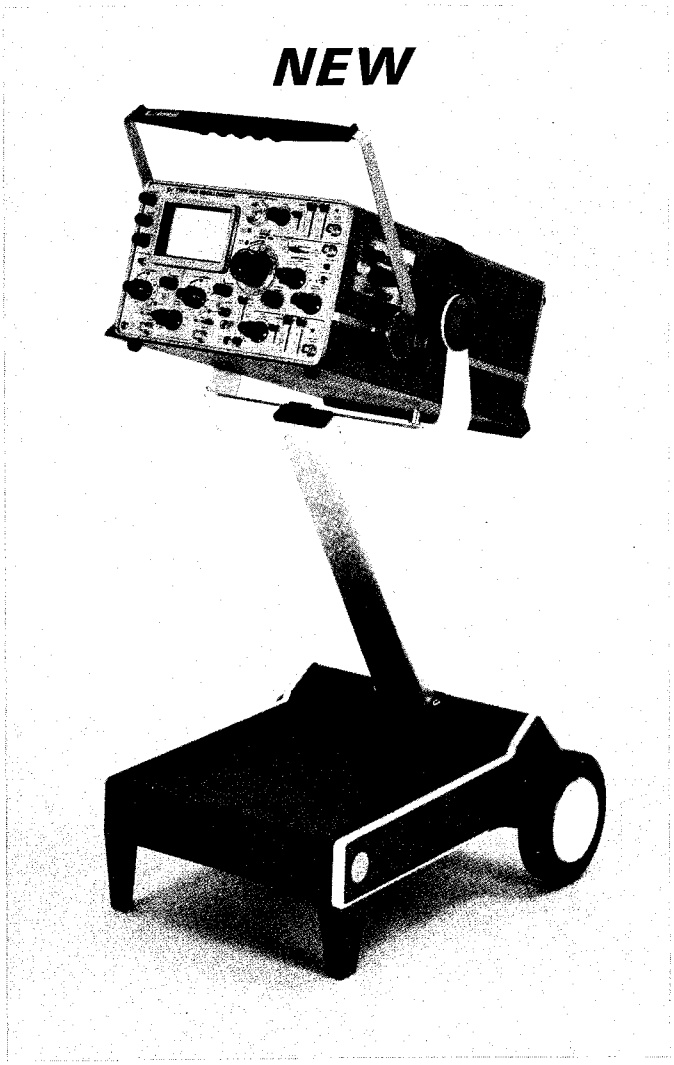
U.S. Sales Price FOB Beavertan, Oregan
Please refer to Terms and Shipment, Generol Information page.

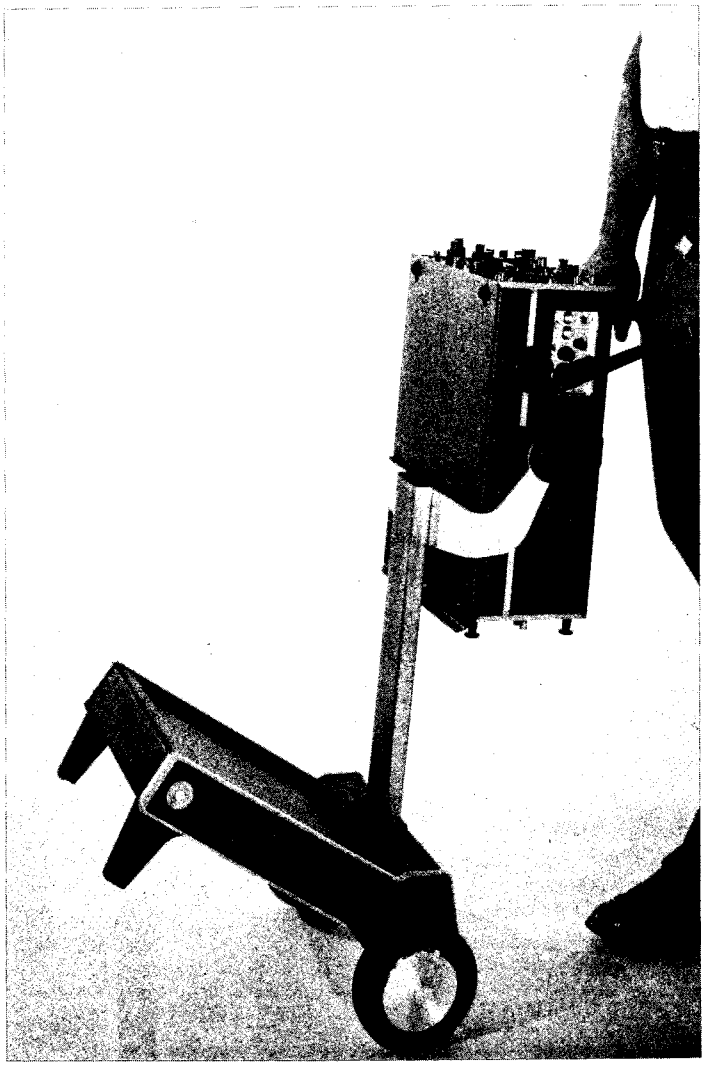
SCOPE-MOBILE CARTS

The Type 200-1 Scope-Mobile® Cart is specifically designed for the Types 453 and 454 Portable Oscilloscopes, and the Type 491 Spectrum Analyzer. A separate version, the Type 200-2, is designed for use with the Type 422 Portable Oscilloscope.

These new oscilloscope carts occupy less than 18 inches of aisle space. With their large wheels and unique design, they can easily be moved up and down stairs. Friction locks on the oscilloscope tray permit the instrument to be positioned at any angle for convenient viewing. Storage space is provided at the base of the cart for accessories or associated instruments.

NEW





ADJUSTABLE TRAY friction-locks in any position from 0° to 60°. A finger-tip latch on the pedestal locks the tray for transporting.

MECHANICAL FEATURES include cast-aluminum construction with six-inch rubber wheels.

OVERALL DIMENSIONS are approximately 28¾ inches high by 17 inches wide by 19 inches deep. Storage area in the base measures 12 inches by 12 inches, and ¾ inches deep.

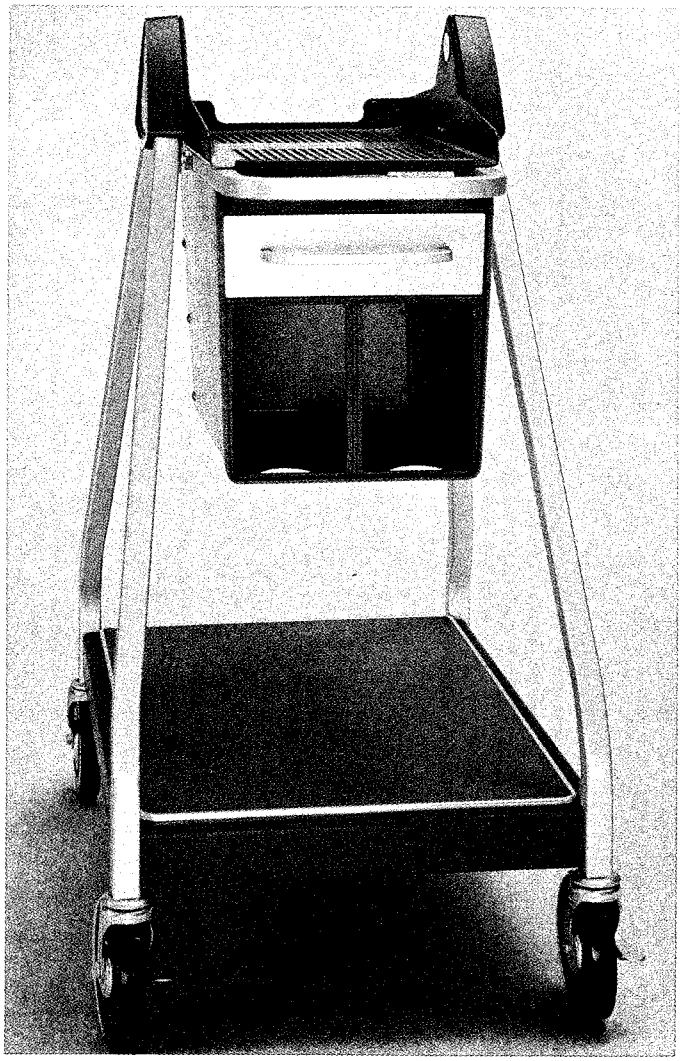
NET WEIGHT is ≈ 19 pounds.

TYPE 200-1 SCOPE-MOBILE CART for Types 453, 454, 491 $60

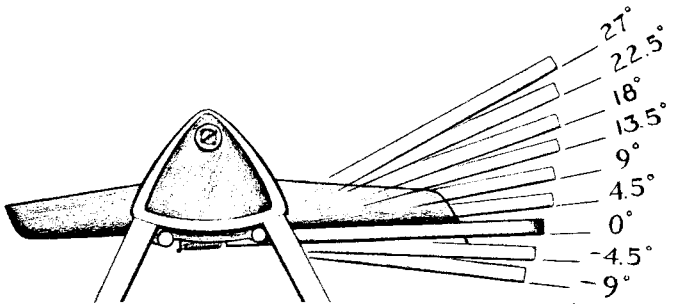
TYPE 200-2 SCOPE-MOBILE CART for Type 422 ..... $60

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

Seven models comprise the 201 through 205-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, 205-1, 205-2, 205-3. The three models ending with -1 have a storage drawer for holding accessory items. The models ending with -2 and -3 have a storage drawer and a plug-in carrier for housing plug-in units. Three AC-receptacles are located at the rear of the storage drawer for supplying power to the oscilloscope and associated instruments. A flange around the receptacles provides convenient storage for the power cord when not in use. All tilt-lock models come equipped with front-wheel brakes.



ADJUSTABLE TRAY tilt-locks in either of six 4.5° steps in the upward direction or two 4.5° steps in the downward direction from the horizontal axis.



MECHANICAL FEATURES include aluminum construction, 5 inch rubber wheels with front wheel brakes, and linoleum-topped steel shelf at the bottom.

OVERALL DIMENSIONS are approximately 36 inches high by 19½ inches wide by 29 inches deep for the 201-1, -2 and 202-1, -2; 36 inches high by 23½ inches wide by 29 inches deep for the 205-1, -2 and -3.

Either the storage drawer or the storage drawer and plug-in carrier combination can be ordered separately to modernize older Scope-Mobile® Carts.

014-0012-00 drawer for 201-1 ..... $40
014-0013-00 drawer/plug-in carrier combination for 201-2 .. 45
014-0014-00 drawer for 202-1 40
014-0015-00 drawer/plug-in carrier combination for 202-2 .. 45
014-0032-00 drawer/1-, 80-, letter-series plug-in carrier combination for 205-2 45
014-0033-00 drawer/2-, 3-, 10-, 11-series plug-in carrier combination for 205-3 45

MODEL	PLUG-IN CARRIER	TRAY WIDTH	TRAY DESIGNED FOR TEKTRONIX OSCILLOSCOPE TYPE	BOTTOM TRAY DIMENSIONS**	NET WEIGHT	PRICE
201-1	NO	10½"	503, 504, 515A, 516, 561A, 564, 647A	15½" x 25"	≈37 lbs	$120.00
201-2	Holds two 2-, 3-, 10-, or 11-series plug-ins				≈38½ lbs	130.00
202-1 MOD 52	NO	14¾"	519		≈43¾ lbs	155.00
202-1	NO	14"	502A*, 507, 524AD, 530-, 540-, 580-series; 551, 555, 575, 661		≈40¾ lbs	120.00
202-2	Holds two 1-, 80-, or letter-series plug-ins				≈42¾ lbs	130.00
205-1	NO	17¾"	556, 565, 567, 568, and rackmount instruments	18½" x 25"	≈45¾ lbs	120.00
205-2	Holds three 1- or letter-series plug-ins				≈48¾ lbs	130.00
205-3	Holds four 2-, or 3-series plug-ins				≈48¾ lbs	130.00

**Requires special adapter, Part Number 040-0365-00 .... $2.75.*

***Usable dimensions may be limited by height required.*

PROBES

Tektronix manufactures both active and passive probes for broadening the applications of Tektronix preamplifiers and oscilloscopes.

A prime consideration in selecting a probe is the attenuation ratio. Probe attenuation allows the measurement of signals that would otherwise over-drive the preamplifier or oscilloscope. In addition, the higher input resistance and lower input capacitance associated with the attenuation reduces the loading effect of the oscilloscope on the circuit under test.

To help you select the right probe for your application, the probes have been grouped in categories: general purpose, high-voltage, current, and sampling. The following factors should be considered in making your selection:

1. Be sure the desired probe will match the input resistance and capacitance of the oscilloscope used, and is equipped with the proper connector.

2. For RF (CW) or high-voltage applications, select a probe with an adequate RF or HV rating. Most probes require derating for RF work, due to heating effects.

3. Select a probe with adequate risetime and bandwidth for the oscilloscope and application.

4. When considering high input impedance, select the shortest cable length, highest attenuation probe compatible with the application. The probe with the lowest input capacitance will generally provide the most accurate measurements.

When ordering any probe, please designate not only the type but also the nine-digit part number.

If you desire help in selecting the right probe for your application, please consult your Tektronix Field Engineer.

PROBE-INSTRUMENT COMPATIBILITY CHART

OSCILLOSCOPES *

	P6006/ P6007	P6008	P6009	P6010	P6011	P6012	P6013A/ P6015	P6019	P6020	P6023	P6027/ P6028	P6030	P6032	P6034/ P6035	P6038	P6045	P6047	CT-1/ P6040	CT-2/ P6041	CT-3
310A	X				X	+	X	X	0		X					0			X	
317	X				X	+	X	X	0		X					0			X	
321A	X				X	+	X	X	0		X					0			X	
360	X				X	X	X	X	0		X								X	
422	X				+	+	X	X	0	0	X					0			X	
453	0	X	X	+	+	0	X	+	X	0	X			0		X	X	0	X	0
454	0	0	X		+		X	X	+	0	X			0		+	+	0	X	0
502A	X				X	X	X	X		X	X								0	
503	X				X	X	X	X		X	X								0	
504	X				X	X	X	X			X								0	
515A	X				X	X	X	X			X					0			X	
516	X			0	X	X	X	X			X					0			X	
519														0				0	0	0
526					X						X					0				
529					X						X					0				

PLUG-IN UNITS

B	X				X	X	X	X	0		X					0			X	
CA	X			0	X	X	X	X	0	0	X					0			X	
D	X				X	X	X	X		X	X					0			X	
G	X				X	X	X	X	0	X	X					0			X	
H	X				X	X	X	X	0		X					0			X	
K	X			0	X	X	X	X	0		X					0			X	
L	X			0	X	X	X	X	0		X					0			X	
M	X				X	X	X	X	0		X					0			X	
O	X				X	X	X	X	0		X					0			X	
W	X			0	X	X	X	X	0	X	X					0			X	
1A1	0	X	X	X	X	0	X	+	X		X			0		X	X	0	X	0
1A2	0	X	X	X	X	0	X	+	X		X			0		X	X	0	X	0
1A4	0	X	X	X	X	0	X	+	X	0	X			0		X	X	0	X	0
1A5	0	X	X	X	X	0	X	+	X	0	X			0		X	X	0	X	0
1A6	X				X	X	X			X	X					0			X	
1A7	X				X	X	0	X		X	X					0			0	
1L5	X				X	X	X	0	0		X								0	
1S1													X	+		X		X	0	X
1S2														+		0		X	0	X
2A60	X				X	X	X	X			X								X	
2A63	X				X	X	X	X		X	X					0			X	
3A1	X				X	X	X	X	0	0	X					0			X	

*Both Cabinet and Rackmount Versions

\+ Specifically designed for use with this instrument

X Recommended

0 These combinations have limitations, but may be very useful in certain applications

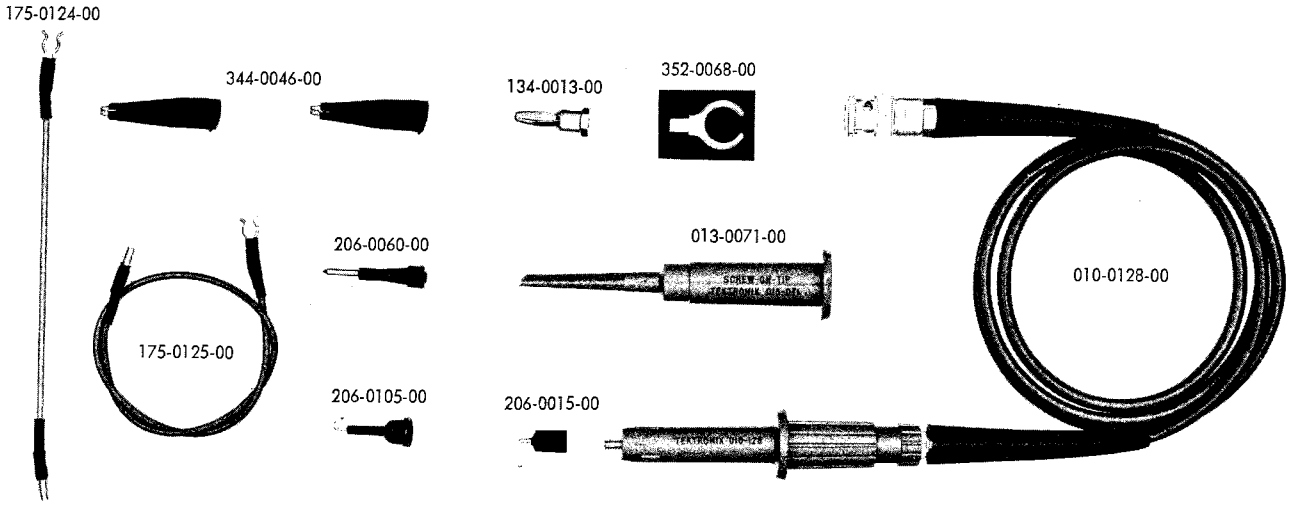
	P6006/ P6007	P6008	P6009	P6010	P6011	P6012	P6013A/ P6015	P6019	P6020	P6023	P6027/ P6028	P6030	P6032	P6034/ P6035	P6038	P6045	P6047	CT-1/ P6040	CT-2/ P6041	CT-3
PLUG-IN UNITS (Cont.)																				
3A2	X				X	X	X	X			X								X	
3A3	X				X	X	X	X		X	X								X	
3A5	0				0	0	0	0	0		0	+				0			0	
3A6	X				X	X	X	X	0	0	X					0			X	
3A7	X			0	X	X	X	X	0	X	X			0		0			X	
3A72	X				X	X	X	X		0	X					0			X	
3A74	X				X	X	X	X			X					0			X	
3A75	X				X	X	X	X			X					0			X	
3A8	X				X	X	X	X			X					0			X	
3L5	X				X	X	X	0	0		X								0	
10A1	0	X	X	X	X	0	X	X	X	X	X			0		X	X	0	X	0
10A2A	0	0	+	0	X		X	X	+	0	X			0		+	+	0	X	0
82	0	+	+	X	0		X	X	+		0			0		+	X	0	X	0
86	0	+	+	X	0		X	X	+		0			0		+	X	0	X	0
3S76													X	+		X		X	0	X
3S3															+			0	0	0
4S1													X	+		X		X	0	X
4S2A													X	+		0		X	0	X
4S3															+			0	0	0
AMPLIFIERS AND ADAPTERS																				
134								+	+											
282	0	X	X	X	0		0										X			
VP-1														+						
VP-2															+					

+ Specifically designed for use with this instrument

X Recommended

0 These combinations have limitations, but may be very useful in certain applications

P6006 10X PASSIVE PROBE



The Type P6006 low input-capacitance probe is designed for use with Tektronix low- and medium-frequency instruments.

By rotating the probe body with respect to its base, the probe time-constant can be made equal to the input time-constant of the oscilloscope or plug-in unit.

At no additional cost, the probe is available with 6 ft, 9 ft and 12 ft cable lengths in addition to the standard 3.5 ft cable length, with either BNC or UHF connectors.

ATTENUATION 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 ns.

TYPICAL RISETIME of probe, Type 1A2 Plug-In Unit, and Type 545B Oscilloscope is 12 ns.

VOLTAGE RATING is 600 V DC or AC peak to peak.*

STANDARD CABLE is 3.5 ft long, terminated with BNC or UHF connector.

P6006 PROBE PACKAGE

(010-0127-00 BNC or 010-0125-00 UHF) $22.00

Package includes: P6006 probe (010-0128-00 BNC) or (010-0126-00 UHF); straight tip (206-0015-00); hook tip (206-0105-00); retractable hook tip (013-0071-00); spring tip (206-0060-00); banana plug (134-0013-00); two minigator clips (344-0046-00); probe holder (352-0068-00); 5 inch ground lead (175-0124-00); 12 inch ground lead (175-0125-00); instruction manual (070-0381-00).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

ADDITIONAL CABLE LENGTH P6006 PROBE PACKAGE WITH CORRESPONDING INPUT C.

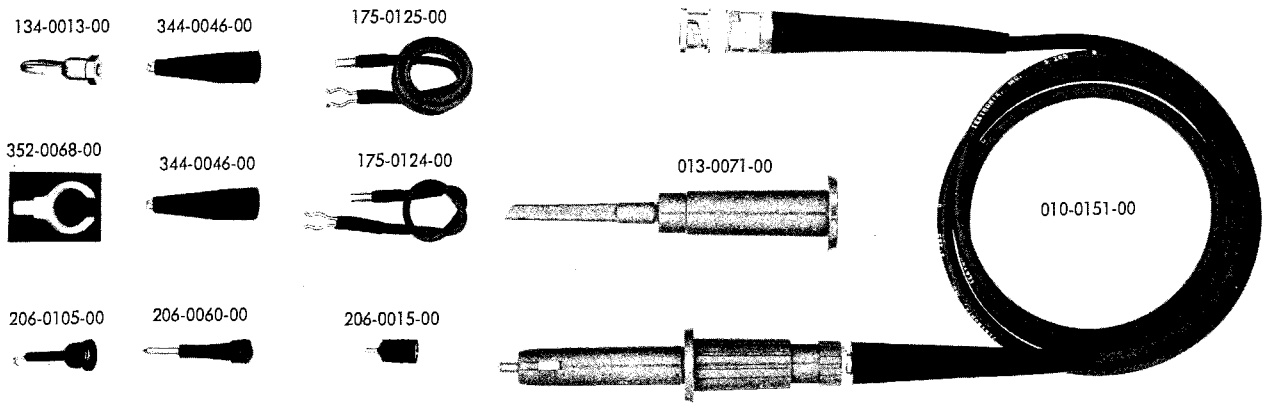
Cable Length	Instrument Input C		Part Number BNC Connector	Part Number UHF Connector	Price
	20 pF	47 pF			
6 ft	8.5 pF	11.0 pF	010-0160-00	010-0158-00	$22.00
9 ft	11.0 pF	13.5 pF	010-0146-00	010-0142-00	22.00
12 ft	13.0 pF	15.5 pF	010-0148-00	010-0144-00	22.00

*Peak to peak voltage derating is necessary for CW frequencies higher than 5.7 MHz when working into a 20 pF input, or higher than 3.6 MHz when working into a 47 pF input.

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

SEE PAGE 280 FOR PROBE COMPATIBILITY

P6007 100X PASSIVE PROBE



The Type P6007 low input-capacitance probe is designed for use with Tektronix low and medium frequency instruments.

By rotating the probe body with respect to its base, the probe time constant can be made equal to the input time constant of the oscilloscope or plug-in unit.

At no additional cost, the probe is available with 6 ft, 9 ft, and 12 ft cable lengths in addition to the standard 3.5 ft cable length, with either BNC or UHF connectors.

ATTENUATION 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 ns.

TYPICAL RISETIME of probe, Type 1A2 Plug-In Unit, and Type 545B Oscilloscope is approx 12.5 ns.

VOLTAGE RATING is 1.5 kV DC or AC RMS, 4.2 kV AC peak to peak.*

*Peak to peak voltage derating is necessary for CW frequencies higher than 200 kHz. At 10 MHz, the maximum allowable peak to peak voltage is 2 kV. Above 10 MHz, additional derating is required depending on the input capacitance of the plug-in or instrument used.

STANDARD CABLE is 3.5 ft long, terminated with BNC or UHF connector.

P6007 PROBE PACKAGE
(010-0150-00 BNC or 010-0134-00 UHF) $22.00
Package includes: P6007 probe (010-0151-00 BNC) or (010-0135-00 UHF); straight tip (206-0015-00); hook tip (206-0105-00); retractable hook tip (013-0071-00); spring tip (206-0060-00); banana plug (134-0013-00); two minigator clips (344-0046-00); probe holder (352-0068-00); 5 inch ground lead (175-0124-00); 12 inch ground lead (175-0125-00); instruction manual (070-0388-00).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

ADDITIONAL CABLE LENGTH P6007 PROBE PACKAGE WITH CORRESPONDING INPUT C.

Cable Length	Instrument Input C		Part Number BNC Connector	Part Number UHF Connector	Price
	20 pF	47 pF			
6 ft	2.2	2.5	010-0165-00	010-0162-00	$22.00
9 ft	2.4	2.7	010-0152-00	010-0136-00	22.00
12 ft	2.6	2.8	010-0154-00	010-0138-00	22.00

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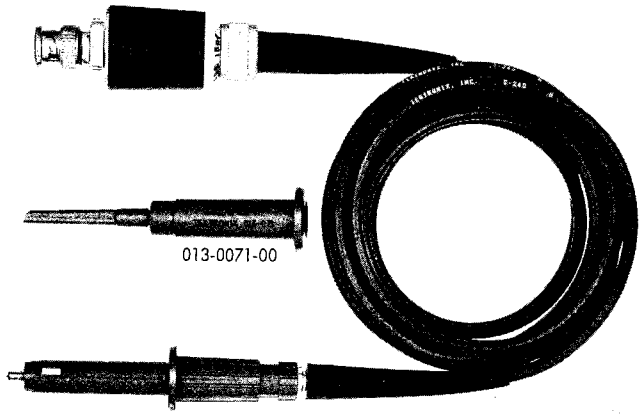
Please refer to Terms and Shipment, General Information page.

SEE PAGE 280 FOR PROBE COMPATIBILITY

P6008 and P6009 PASSIVE PROBES

The P6008 and P6009 low-capacitance probes are designed for use with Tektronix Type 82 and 86 Plug-In Units. They are also recommended for use with Types 1A1, 1A2, or the Type 453 Oscilloscope. In addition, a separate version of the P6009 is available for use with the Type 10A2A.

The probes can be adjusted to match the input time-constant of all Tektronix plug-in units ranging from 8 to 50-pF capacitance. Maximum frequency response (minimum risetime) is obtained when the P6008 or P6009 is used with plug-in units having minimum input capacitance.



P6008 10X PASSIVE PROBE

ATTENUATION is 10X

INPUT RESISTANCE is 10 megohms.

INPUT CAPACITANCE is approximately 7.5 pF.

PROBE RISETIME is less than 3 ns.

TYPICAL RISETIME of probe, Type 82 Plug-In Unit, and Type 580-Series Oscilloscope is 5 ns.

VOLTAGE RATING is 600 V DC or AC peak to peak.*

CABLE is 3.5 ft long, terminated with a BNC connector.

P6008 PROBE PACKAGE (010-0129-00) $35.00

Package includes: P6008 probe (010-0130-00); bayonet adapter (013-0052-00); hook tip (206-0105-00); retractable hook tip (013-0071-00); spring tip (206-0060-00); straight tip (206-0015-00); banana plug (134-0013-00); two minigator clips (344-0046-00); probe holder (352-0068-00); 3-inch ground lead (175-0263-00); 5-inch ground lead (175-0124-00); 12-inch ground lead (175-0125-00); instruction manual (070-0362-01).

*Peak to peak voltage derating is necessary for CW frequencies higher than 20 MHz. At 40 MHz, the maximum allowable peak to peak voltage is 300 V.

P6009 100X PASSIVE PROBE

ATTENUATION is 100X.

INPUT RESISTANCE is 10 megohms.

INPUT CAPACITANCE is 2.5 pF.

PROBE RISETIME is approximately 2 ns.

TYPICAL RISETIME of probe, Type 82 Plug-In Unit, and 580-Series Oscilloscope is 4.5 ns.

VOLTAGE RATING is 1.5 kV DC or AC RMS, 4 kV AC peak to peak.*

CABLE is 9 ft long, terminated with a BNC connector.

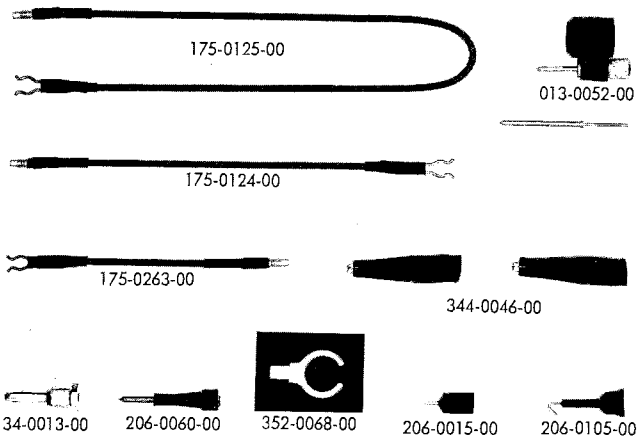
P6009 PROBE PACKAGE (010-0140-00) $55.00

P6009 PROBE PACKAGE for Type 10A2A (010-0219-00) 55.00

Package includes: P6009 probe (010-0141-00) or (010-0220-00); bayonet adapter (013-0052-00); hook tip (206-0105-00); retractable hook tip (013-0071-00); spring tip (206-0060-00); straight tip (206-0015-00); banana plug (134-0013-00); two minigator clips (344-0046-00); probe holder (352-0068-00); 3-inch ground lead (175-0263-00); 5-inch ground lead (175-0124-00); 12-inch ground lead (175-0125-00); instruction manual (070-0401-00).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*Peak to peak voltage derating is necessary for CW frequencies higher than 300 kHz. At 40 MHz, the maximum allowable peak to peak voltage is 575 V.



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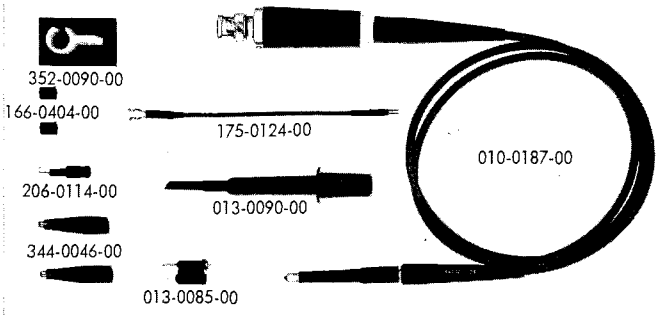
SEE PAGE 280 FOR PROBE COMPATIBILITY

P6010 10X PASSIVE PROBE



The P6010 is a miniature passive probe designed for use with Tektronix wide-band oscilloscopes. The probe is easily compensated for use with any instrument having an input capacitance of 14 to 21 pF.

Extra small in size, the P6010 is well suited for servicing subminiature circuits where easy access is required. In addition to the standard 3.5 ft length, the probe is available with a 6 ft or 9 ft cable at no additional cost.

ATTENUATION is 10X.

INPUT RESISTANCE is 10 megohms.

INPUT CAPACITANCE for the standard length probe is approximately 10 pF when used with instruments having a 14 to 21 pF input capacitance; 12 pF for the 6 ft version, 15.5 pF for the 9 ft version.

PROBE RISETIME is less than 2 ns.

TYPICAL RISETIME of probe with Type 453 Oscilloscope is 7 ns.

VOLTAGE RATING is 500 V DC, AC peak, or DC and AC peak combined.*

STANDARD CABLE is 3.5 ft long, terminated with a BNC connector.

P6010 3.5 FT PROBE PACKAGE (010-0188-00) $30.00

P6010 6 FT PROBE PACKAGE (010-0185-00) 30.00

P6010 9 FT PROBE PACKAGE (010-0201-00) 30.00

Package includes: P6010 probe (010-0187-00), (010-0184-00) or (010-0200-00); hook tip (206-0114-00); retractable hook tip (013-0090-00); bayonet ground adapter (013-0085-00); minigator clip (344-0046-00); probe holder (352-0090-00); 5 inch ground lead (175-0124-00); two insulating tubes (166-0404-00); instruction manual (070-0495-01).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*Peak voltage derating is necessary for CW frequencies higher than 2.5 MHz. At 20 MHz, the maximum allowable peak voltage is 175 V; 60 V at 60 MHz.

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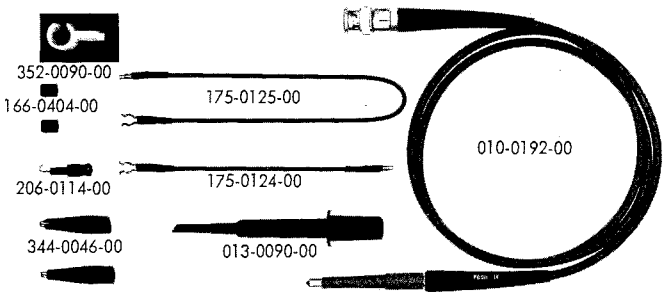
P6011 1X PASSIVE PROBE



The P6011 1X Passive Probe can be used with all Tektronix general-purpose oscilloscopes. Like the P6010, the small size of the probe body makes it ideal for working on compact circuitry.

The probe cable utilizes a resistive center conductor for damping critical reflections, insuring maximum bandwidth. In addition to the standard 3.5 ft length, the probe is available with a 6 ft cable at no additional cost.

ATTENUATION is 1X.

INPUT RESISTANCE is 1 megohm, instrument input R included.

INPUT CAPACITANCE for standard length probe is approx 28 pF; 48 pF for the 6 ft version, instrument excluded.

PROBE RISETIME for the standard cable length is less than 12 ns working into a plug-in with an input capacitance of 15 pF; less than 15 ns working into a plug-in with an input capacitance of 20 pF. The probe risetime of the 6 ft version is less than 15 ns into 15 pF or less than 17 ns into 20 pF.

VOLTAGE RATING is 600 V DC, AC peak, or DC and AC peak combined.*

STANDARD CABLE is 3.5 ft long with a BNC connector.

P6011 3.5 FT PROBE PACKAGE (010-0193-00) $15.00

P6011 6 FT PROBE PACKAGE (010-0190-00) 15.00

Package includes: P6011 probe (010-0189-00) or (010-0192-00); hook tip (206-0114-00); retractable hook tip (013-0090-00); two minigator clips (344-0046-00); probe holder (352-0090-00); two insulating tubes (166-0404-00); 5 inch ground lead (175-0124-00); 12 inch ground lead (175-0125-00); instruction manual (070-0512-00).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*Peak voltage derating is necessary for CW frequencies higher than 0.5 MHz. When the probe is used with a plug-in having an input C of 20 pF, the maximum allowable peak voltage at 1 MHz is 510 V. At 5 MHz, the maximum is 100 V; 46 V at 10 MHz. When the probe is used with a plug-in having a 47 pF input, the allowable voltage will be lower by a ratio of 1:3.

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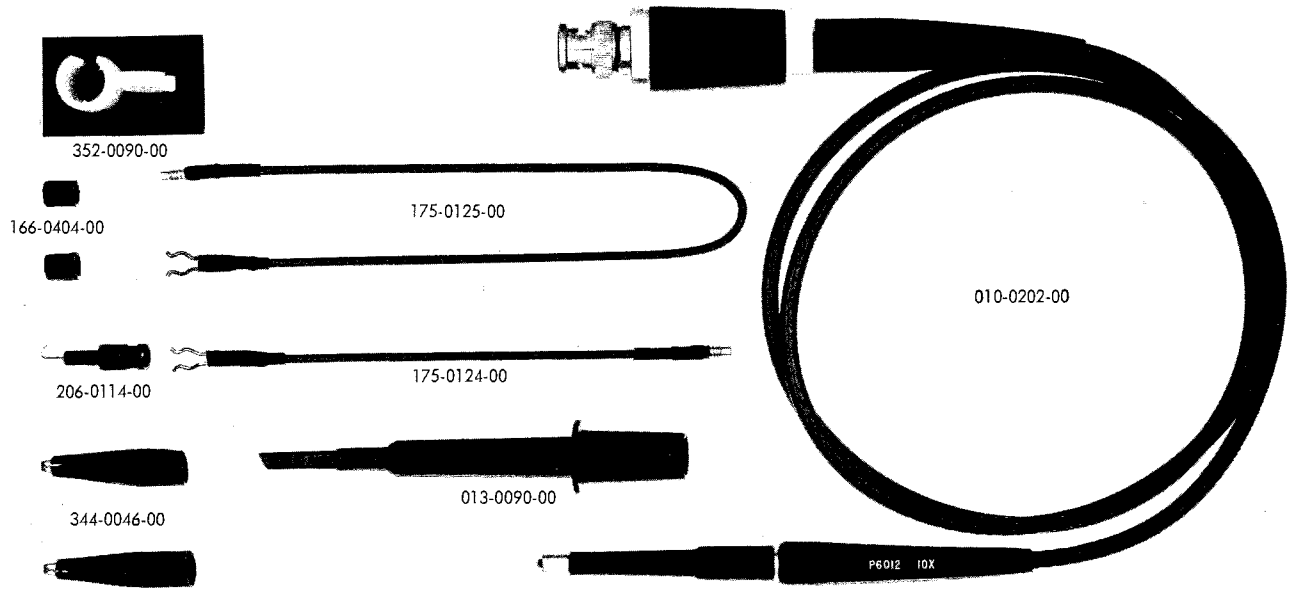
SEE PAGE 280 FOR PROBE COMPATIBILITY

P6012 10X PASSIVE PROBE

NEW



The new P6012 is a miniature general-purpose probe designed for use with oscilloscopes having bandwidths up to 33 MHz. The probe can be compensated to match all Tektronix plug-ins and oscilloscopes with input capacitances of 15 to 47 pF.

Very small in size, the P6012 is well suited for applications involving subminiature circuitry. The probe is available with a 3.5 ft cable, or with a 6 ft cable at no additional cost.

ATTENUATION is 10X.

INPUT RESISTANCE is approximately 10 megohms.

INPUT CAPACITANCE of probe with 3.5 ft cable is 11.5 pF or less; 14.5 pF or less for the 6 ft version.

PROBE RISETIME is 5 ns or less with 3.5 ft cable, 6 ns or less with 6 ft cable.

VOLTAGE RATING is 500 V DC, AC peak, or DC and AC peak combined.*

PROBE CABLE is terminated with a BNC connector.

P6012 3.5 FT PROBE PACKAGE (010-0203-00) . $27.00

P6012 6 FT PROBE PACKAGE (010-0209-00) . . 27.00

Package includes: P6012 probe (010-0202-00) or (010-0208-00); hook tip (206-0114-00); retractable hook tip (013-0090-00); two minigator clips (344-0046-00); probe holder (352-0090-00); 5 inch ground lead (175-0124-00); 12 inch ground lead (175-0125-00); two insulating tubes (166-0404-00); instruction manual (070-0601-00).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*Peak voltage derating is necessary for CW frequencies higher than 6 MHz. At 15 MHz the maximum allowable peak voltage is 210 V; 95 V at 33 MHz.

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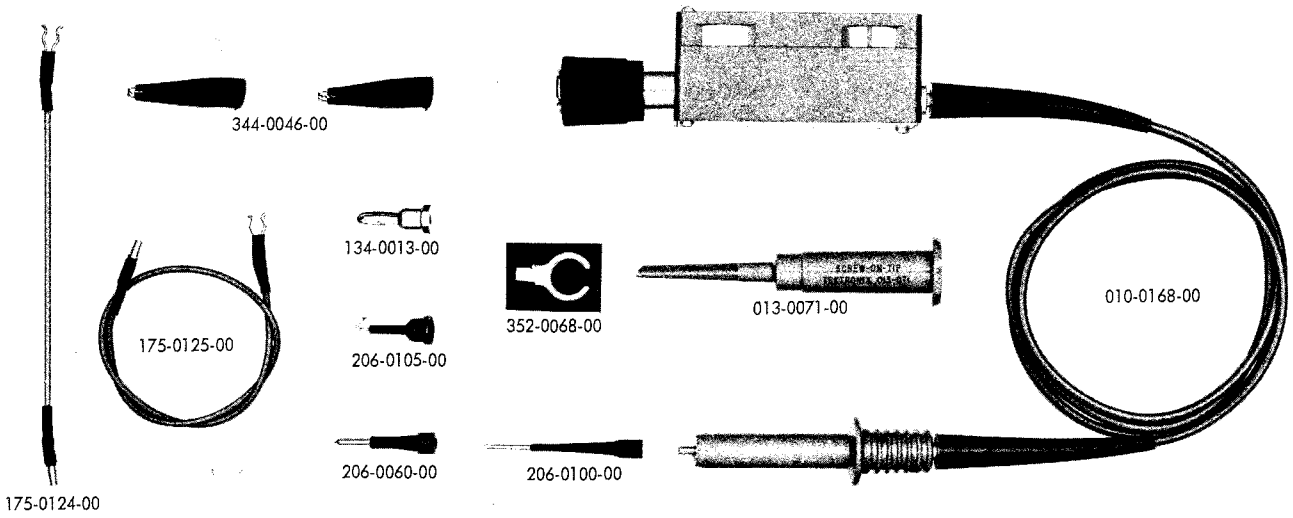
SEE PAGE 280 FOR PROBE COMPATIBILITY

P6023 10X PROBE



The P6023 Low-Capacitance Probe is designed for use with Tektronix differential preamplifiers.

The probe can be adjusted to match plug-in input capacitance ranging from 20 pF to 50 pF. The X10 attenuation ratio is adjustable over a ±2.5% range to compensate for differences in the input resistance of the plug-in unit. When two P6023 probes are used to drive the two inputs of a differential amplifier, the ability to change the attenuation ratio of one probe versus the other helps to maintain the common-mode rejection ratio of the system.

ATTENUATION is 10X, adjustable ±2.5%.

INPUT RESISTANCE is approximately 8 megohms.

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 ns.

TYPICAL RISETIME of probe, Type W Plug-In Unit, and Type 545B Oscilloscope is 17 ns.

VOLTAGE RATING is 1000 V DC or AC peak to peak.*

CABLE is 3.5 ft long, terminated with a locking BNC or UHF connector.

P6023 PROBE PACKAGE

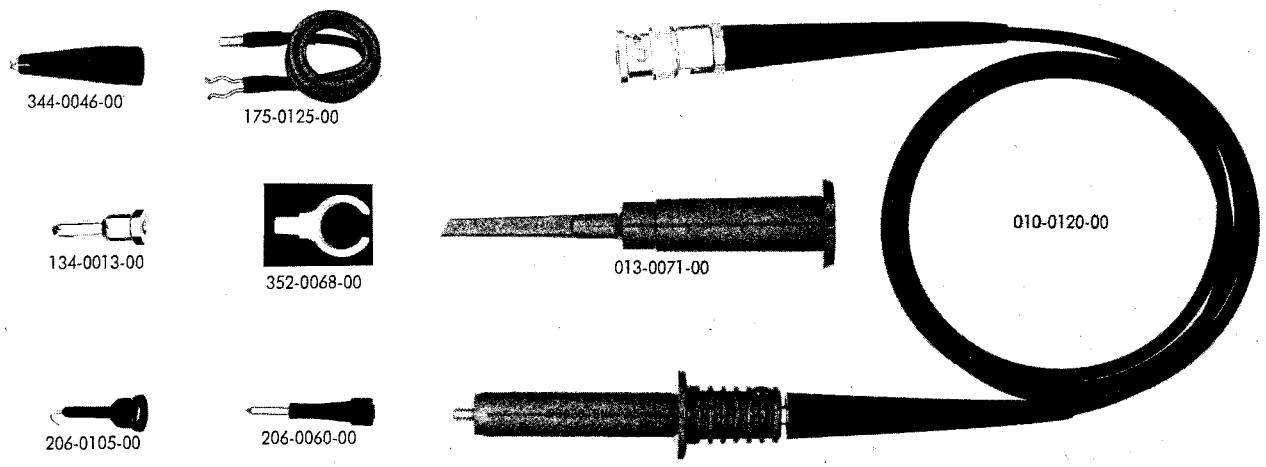
(010-0167-00 LOCKING BNC or 010-0065-00 UHF) . $40.00
Package includes: P6023 probe (010-0168-00 BNC) or (010-0097-00 UHF); spring tip (206-0060-00); hook tip (206-0105-00); retractable hook tip (013-0071-00); calibration tip (206-0100-00); banana plug (134-0013-00); two minigator clips (344-0046-00); probe holder (352-0068-00); 5 inch ground lead (175-0124-00); 12 inch ground lead (175-0125-00); instruction manual (070-0294-00).
OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*Peak to peak voltage derating is necessary for CW frequencies higher than 5 MHz. At 20 MHz, the maximum allowable peak to peak voltage is 300 V.

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

SEE PAGE 280 FOR PROBE COMPATIBILITY

P6027 and P6028 1X PROBE



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 ft cable length, these probes are available in cable lengths of 6 ft, 9 ft and 12 ft, at no additional cost. Insertion loss increases with probe cable length.

ATTENUATION is 1X.

INPUT RESISTANCE is 1 megohm, instrument input R included.

INPUT CAPACITANCE for standard length probe is approx 48 pF, instrument excluded. For total input capacitance of the system, add input C of instrument.

PROBE RISETIME is approximately 10 ns.

TYPICAL RISETIME of probe, Type K Plug-In Unit, and Type 540-Series Oscilloscope is 16 ns.

VOLTAGE RATING is 600 V DC or AC peak to peak.*

*peak to peak voltage derating is necessary for CW frequencies higher than 1 MHz. At 10 MHz, the maximum allowable peak to peak voltage is 60 V.

STANDARD CABLE is 3.5 ft long, terminated with BNC or UHF connector.

P6027 PROBE PACKAGE
with UHF connector (010-0070-00) $12.50

P6028 PROBE PACKAGE
with BNC connector (010-0074-00) $12.50

Package includes: probe (010-0116-00 UHF) or (010-0120-00 BNC); hook tip (206-0105-00); retractable hook tip (013-0071-00); spring tip (206-0060-00); banana plug (134-0013-00); minigator clip (344-0046-00); probe holder (352-0068-00); 12 inch ground lead (175-0125-00); parts list.

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

P6027 and P6028 PROBES *with over 3.5 ft cable length*

Probe	*Cable Length*	*Connector*	*Part Number*	*Input Capacitance†*	*Price*
P6027 P6028	6 ft	UHF BNC	010-0071-00 010-0075-00	≈65 pF	$12.50
P6027 P6028	9 ft	UHF BNC	010-0072-00 010-0076-00	≈88 pF	12.50
P6027 P6028	12 ft	UHF BNC	010-0073-00 010-0077-00	≈110 pF	12.50

†Probe only. Add input C of instrument for total input capacitance.

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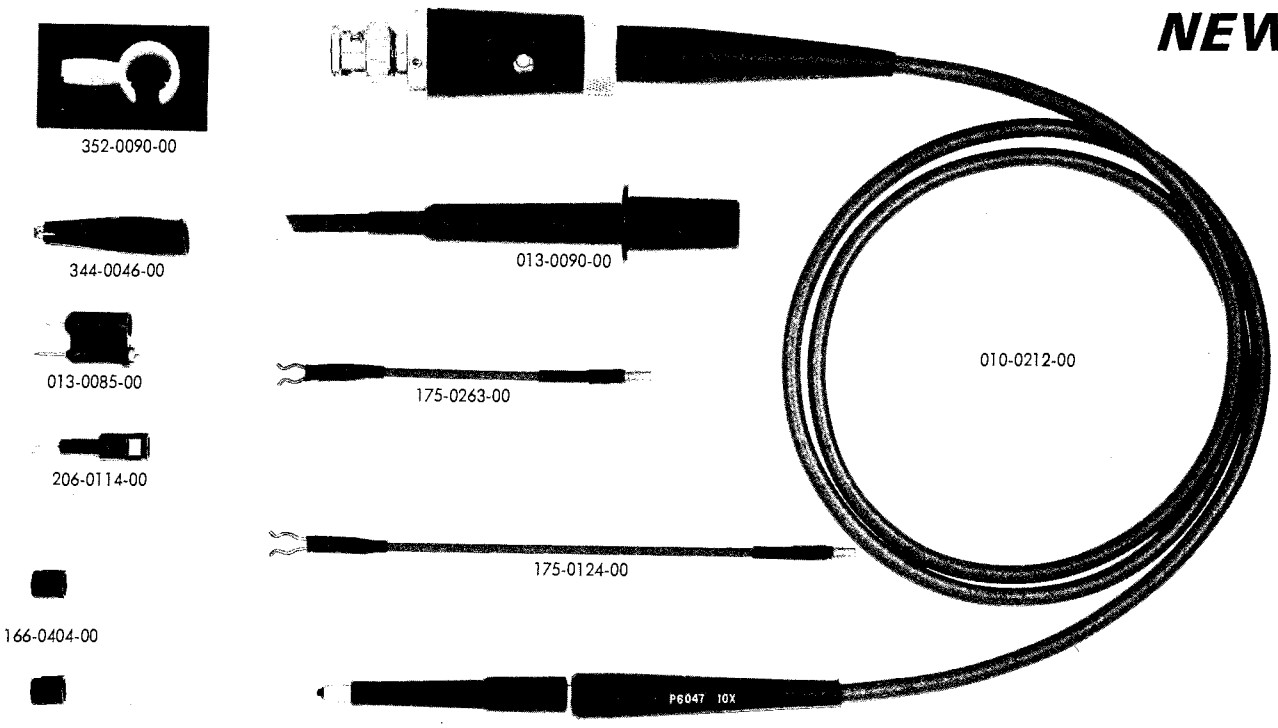
SEE PAGE 280 FOR PROBE COMPATIBILITY

P6047 10X WIDE-BAND PROBE

NEW



The new P6047 is a DC to 290 MHz passive probe designed for use with the Type 454 Portable Oscilloscope or the Type 647A Oscilloscope with Type 10A2A Plug-In Unit. It can also be compensated for use with other instruments that have an input capacitance of 15 to 20 pF.

The P6047 offers a new level of performance in passive probe design. Its small size makes it easy to use, particularly for applications involving compact circuitry. In addition to the standard 3.5-foot cable length, the probe is available with a 6-foot cable at no additional cost.

ATTENUATION is 10X.

INPUT RESISTANCE is 10 megohms.

INPUT CAPACITANCE for the standard length probe is approximately 10 pF when used with instruments having a 15 to 20 pF input capacitance; 12 pF for the 6-foot version. The input capacitance of both probes decreases to less than 7 pF above 100 MHz.

PROBE RISETIME is 1.2 nst† or less.

TYPICAL RISETIME of probe and Type 454 Oscilloscope is 2.4 nst†. Typical risetime with Type 10A2A is 3.5 nst†.

ABERRATIONS are 3% or less.

VOLTAGE RATING is 500 V DC, AC peak, or DC and AC peak combined.*

STANDARD CABLE is 3.5 ft long, terminated with a BNC connector.

P6047 3.5 FT PROBE PACKAGE (010-0211-00) $42.00
P6047 6 FT PROBE PACKAGE (010-0217-00) 42.00
Package includes: P6047 Probe (010-0212-00) or (010-0218-00); hook tip (206-0114-00); retractable-hook tip (013-0090-00); bayonet-ground adapter (013-0085-00); minigator clip (344-0046-00); probe holder (352-0090-00); 3-inch ground lead (175-0263-00); 5-inch ground lead (175-0124-00); two insulating tubes (166-0404-00); instruction manual (070-0628-00).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

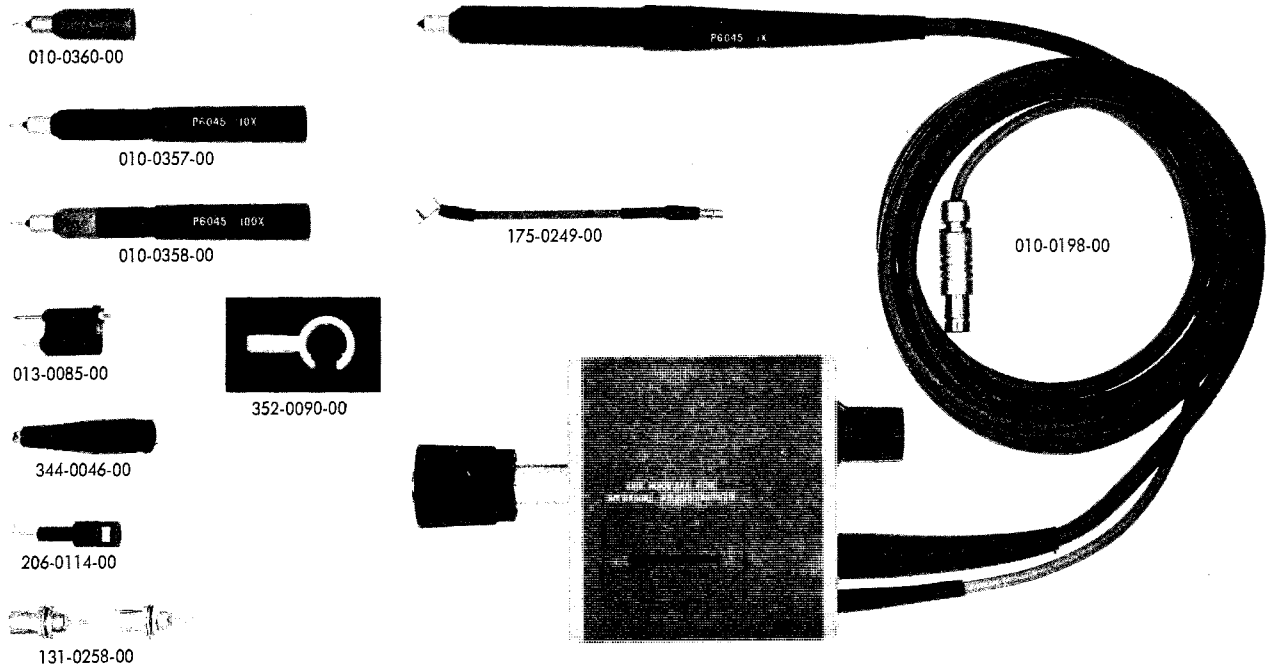
†Due to the fast-rise characteristics of this probe, the input capacitance and generator source impedance must be considered in determining the risetime of the system. Risetimes listed are at a temperature of 25°C.

*peak voltage derating is necessary for CW frequencies higher than 4.5 MHz. At 10 MHz, the maximum allowable peak voltage is 200 V; 23 V at 100 MHz, 18 V at 150 MHz.

SEE PAGE 280 FOR PROBE COMPATIBILITY

P6045 1X WIDE-BAND PROBE

NEW



The P6045 FET Probe offers new capabilities for measuring small, high-frequency signals. Unlike many general-purpose probes which require built-in attenuation to reduce circuit loading, the P6045 utilizes a field effect transistor, resulting in reduced loading without sacrificing the gain of the measurement system.

This new DC to 230 MHz probe can be used with both conventional (real-time) and sampling oscilloscopes. Its small size makes it easy to use, particularly for applications involving compact circuitry. The probe also features a DC-offset control for measuring very small AC signals with DC potentials up to one volt.

Accessories supplied with the probe include 10X and 100X attenuator heads and an AC-coupling capacitor. Optional accessories include a probe power supply, and a tunnel diode pulser for checking the response of the probe.

PROBE GAIN is adjustable to 1X.

RISETIME is 1.5 ns or less.

ABERRATIONS are less than + and —3% when used with real-time oscilloscopes, or less than + and —4% when used with sampling oscilloscopes.

BANDWIDTH is DC to 230 MHz at 3-dB down. Low-frequency 3-dB point with AC-coupling capacitor is less than 16 Hz.

INPUT RESISTANCE is 10 megohms.

INPUT CAPACITANCE is approximately 4 pF.

OUTPUT LOAD IMPEDANCE is 50 Ω. A switch on the compensating amplifier provides internal 50-Ω termination, or the probe can be terminated externally. This switching provision allows the P6045 to be used with either 50-ohm or 1-megohm systems. The probe may require recompensation when the termination is changed. Compensation is adjusted at the factory for 1-megohm systems. The probe is also available compensated for 50-ohm systems upon request.

DC-OFFSET RANGE is ±1 V, selected by variable front-panel control.

OUTPUT DYNAMIC RANGE is ±0.5 V peak.

INPUT DYNAMIC RANGE is ±0.5 V peak around a reference voltage which can be offset by 0 to ±1 V DC.

NOISE is less than 0.4 mV over a bandwidth of DC to 8 MHz, less than 1.5 mV over a bandwidth of DC to 230 MHz.

MAXIMUM INPUT SURGE VOLTAGE is ±100 V DC.

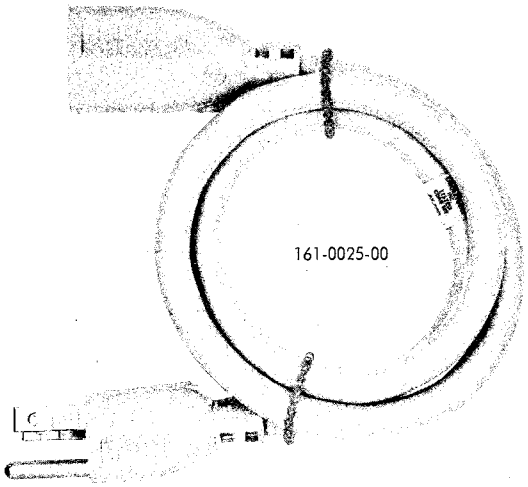
PROBE POWER REQUIREMENTS are +12.0 V, ±1% at approx 50 mA; —12.0 V, ±1% at approx 100 mA.

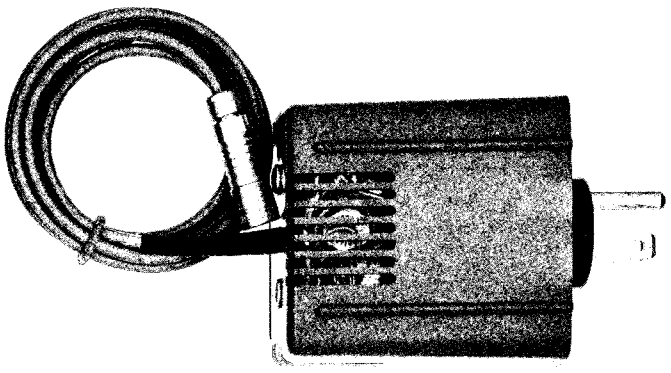
CABLE is 6 ft long. Output connector is locking BNC.

ACCESSORY POWER SUPPLY

Regulated supply operates from 93 V to 140 V or 186 V to 280 V line.

SEE PAGE 280 FOR PROBE COMPATIBILITY

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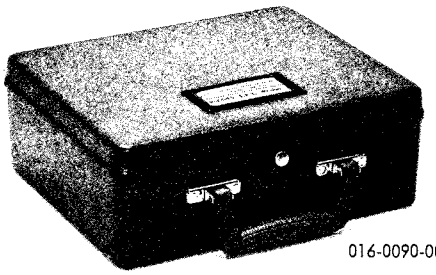
016-0090-00


103-0013-00


015-0088-00

OPTIONAL PROBE PULSER

The tunnel-diode pulser is used to adjust the P6045 FET Probe for optimum response. The pulser is designed to be driven by the 100 V output of the oscilloscope calibrator. Risetime of the probe pulser is less than 0.5 ns.

P6045 PROBE PACKAGE WITH ACCESSORY POWER SUPPLY (010-0205-00) $375

P6045 PROBE PACKAGE ONLY (010-0204-00) .. $275

ACCESSORY POWER SUPPLY ONLY (015-0073-00) $100

PROBE PULSER (015-0088-00) ..... $ 25

Probe package includes: P6045 probe (010-0198-00); 10X attenuator head (010-0357-00); 100X attenuator head (010-0358-00); AC-coupling capacitor head (010-0360-00); 2½-in ground lead (175-0249-00); bayonet ground adapter (013-0085-00); hook tip (206-0114-00); alligator clip (344-0046-00); two test jacks (131-0258-00); probe holder (352-0090-00); carrying case (016-0090-00); two instruction manuals (070-0597-00).

Accessory Power Supply includes: power cord (161-0025-00); 2 to 3-wire adapter (103-0013-00); instruction manual (070-0636-00).

Probe Pulser includes instruction manual (070-0637-00).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

PROBE CHARACTERISTICS WITH ACCESSORY HEADS			
	Max-Voltage Input (DC + Peak AC)	*Attenuator Accuracy*	*Input C*
10X Attenuator	±100 V	±3.5%	≈2.3 pF
100X Attenuator	±100 V	±3.5%	≈1.8 pF
AC-Coupling Capacitor	±200 V		≈6.0 pF

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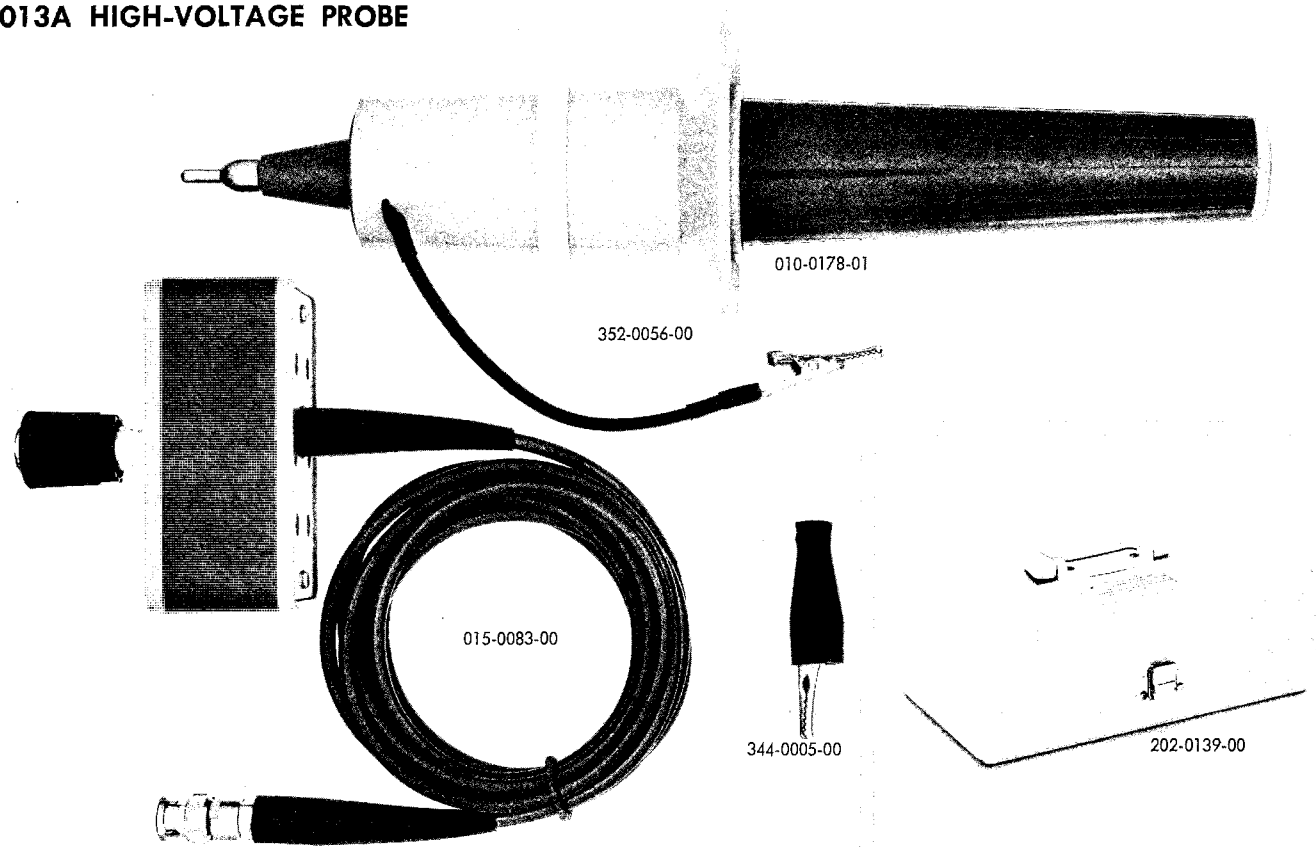
SEE PAGE 280 FOR PROBE COMPATIBILITY

P6013A HIGH-VOLTAGE PROBE



The Type P6013A provides 1000X attenuation for oscilloscope measurements of high amplitude waveforms or DC potentials up to 12 kV. Pulse frequency can be up to 100 kHz at 12 kV. The probe can be compensated for oscilloscope input capacitance up to 60 pF.

ATTENUATION is 1000X.

INPUT RESISTANCE is 100 megohms.

INPUT CAPACITANCE is 3 pF.

PROBE RISETIME is less than 7 ns.

TYPICAL RISETIME of probe, Type 1A1 Plug-In Unit, and Type 545B Oscilloscope is 13 ns.

VOLTAGE RATING is 12 kV DC, peak pulse, or peak AC.*

CABLE is 10 ft long, terminated with a LOCKING BNC or UHF connector.

P6013A PROBE PACKAGE (010-0177-01 LOCKING BNC or 010-0181-01 UHF) $75.00
Package includes: P6013A probe (010-0178-01); compensating box (015-0083-00 BNC) or (015-0081-00 UHF); alligator clip (344-0005-00); probe holder (352-0056-00); storage case (202-0139-00); storage case tray† (436-0062-01); storage case pad† (004-0217-00); instruction manual† (070-0603-00).

†not shown.

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*peak to peak voltage derating is necessary for CW frequencies higher than 100 kHz. At 1 MHz, the maximum allowable peak to peak voltage is 5.5 kV.

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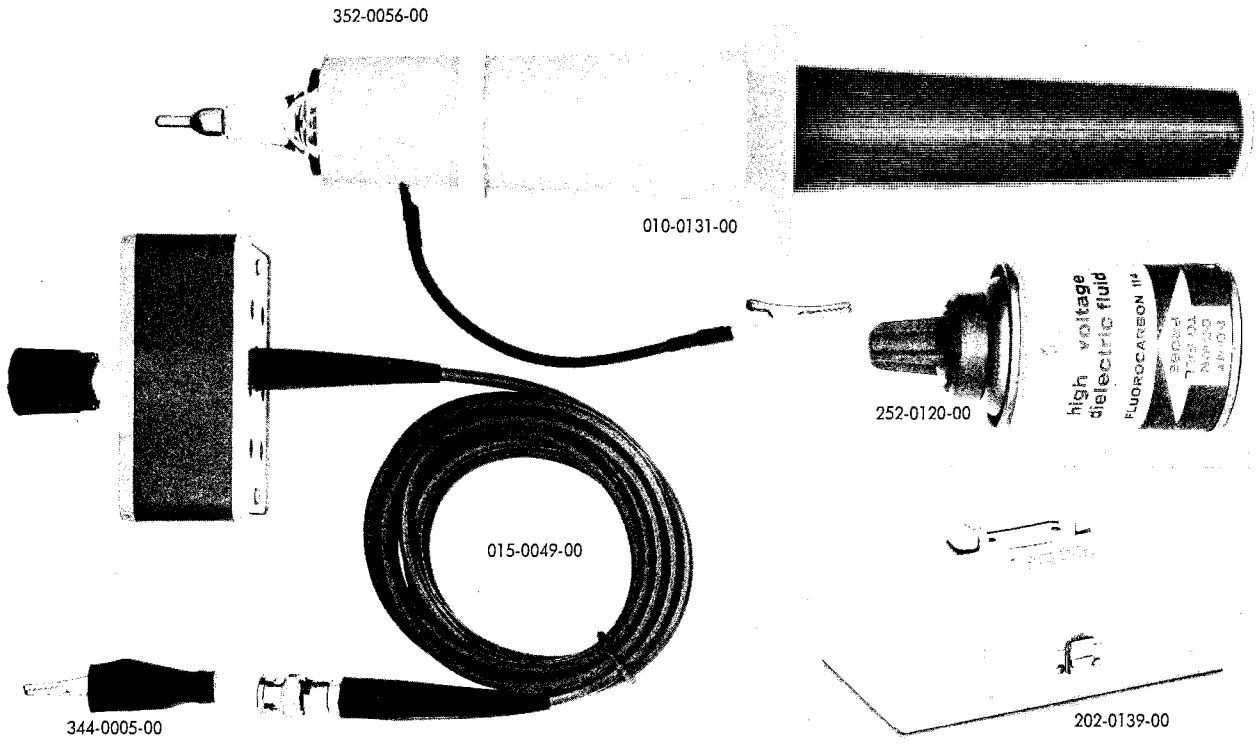
SEE PAGE 280 FOR PROBE COMPATIBILITY

P6015 HIGH-VOLTAGE PROBE



The Type P6015 provides 1000X attenuation for oscilloscope measurements up to 40-kV peak. Voltage or duty cycle derating is necessary for RF voltages at frequencies over 100 kHz, or in environmental temperatures above 25°C.

The probe time constant can be adjusted to equal the oscilloscope input time constant for instruments with 12 pF to 50 pF input capacitance.

ATTENUATION is 1000X, adjustable ±9%.

INPUT RESISTANCE is 100 megohms.

INPUT CAPACITANCE is approximately 2.7 pF.

PROBE RISETIME is approximately 4 ns.

TYPICAL RISETIME of the probe, Type 1A1 Plug-In Unit, and Type 545B Oscilloscope is 11.5 ns.

TEMPERATURE RANGE is 10° C to 55° C environmental temperature. Approximate temperature coefficient of nose resistor is —0.15% per degree centigrade. Calibration adjustments are necessary when environmental or nose resistor temperature changes.

VOLTAGE RATING is 40 kV peak AC or pulse, 20 kV DC or RMS continuous at 25°C environmental temperature.*

CABLE is 10 ft long, terminated with a locking BNC or UHF connector.

P6015 PROBE PACKAGE (010-0172-00 LOCKING BNC or 010-0132-00 UHF) $200.00
Package includes: P6015 probe (010-0131-00); compensating box (015-0049-00 BNC) or (015-0039-00 UHF); alligator clip (344-0005-00); probe holder (352-0056-00); can, dielectric (252-0120-00); silica-gel† (256-0570-00); storage case (202-0139-00); storage case tray† (436-0035-00); storage case pad† (004-0217-00); instruction manual† (070-0373-00).

†not shown.

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*peak to peak voltage derating is necessary for CW frequencies higher than 100 kHz. At 10 MHz, the maximum allowable peak to peak voltage is 13 kV.

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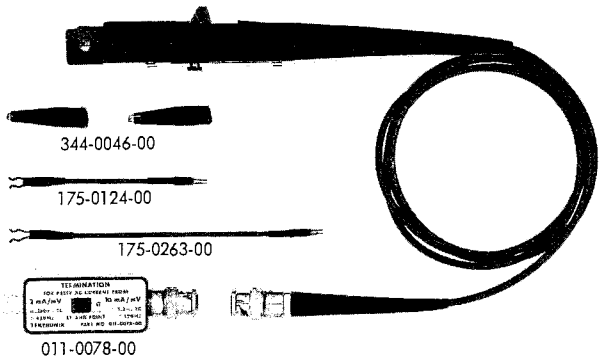
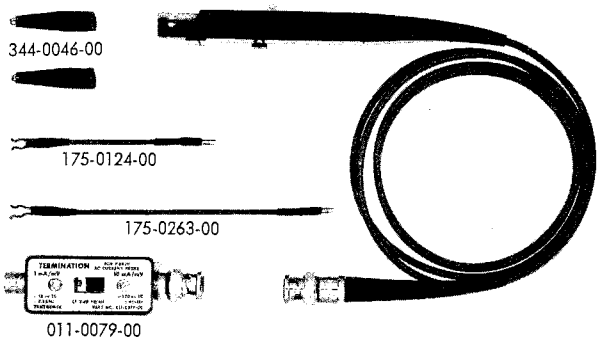
SEE PAGE 280 FOR PROBE COMPATIBILITY

P6019 CURRENT PROBE



P6020 CURRENT PROBE



The P6019 and P6020 AC Current Probes, with passive termination or Type 134 Amplifier, are designed for use with Tektronix real-time oscilloscopes. They provide the facility for accurate current measurements over a wide range of frequencies without breaking the circuit under test. Simply open the spring-loaded slide, place the conductor* in the probe slot, and release the slide . . . no electrical connection required. The shielded probe head is not grounded when the slide is in the open position, eliminating accidental grounding of the circuit under test. Both probes have a five ft cable with a BNC connector.

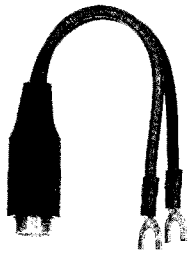
For general-purpose applications, the P6019 offers wide-band performance with excellent low-frequency characteristics. The extra-small size of the P6020 makes it ideally suited for measuring current in compact semiconductor circuits. The low frequency capabilities and sensitivity of both the P6019 and P6020 Probes can be expanded using the Type 134 Current Probe Amplifier. Either probe, with passive termination or with the amplifier, can be used with oscilloscopes having input resistances of 1-megohm or greater. The amplifier can also be used as an auxiliary voltage amplifier.

PERFORMANCE CHARACTERISTICS				
	P6019 PROBE WITH PASSIVE TERMINATION	*P6019 PROBE WITH TYPE 134 AMPLIFIER*	*P6020 PROBE WITH PASSIVE TERMINATION*	*P6020 PROBE WITH TYPE 134 AMPLIFIER*
SENSITIVITY	2 mA/mV or 10 mA/mV; selected by termination switch. Accuracy ±3%.	Switched current amplifier steps from 1 mA/div to 1 A/div (with 50 mV/div oscilloscope setting). Accuracy ±3%.	1 mA/mV or 10 mA/mV; selected by termination switch. Accuracy ±3%.	Switched current amplifier steps from 1 mA/div to 1 A/div (with 50 mV/div oscilloscope setting). Accuracy ±3%.
HIGH FREQ (—3 dB)	60 MHz	≥40 MHz	200 MHz	≥70 MHz
LOW FREQ (—3 dB)	450 Hz at 2 mA/mV. 120 Hz at 10 mA/mV.	≤12 Hz (within 0.4 dB at 30 Hz)	8.5 kHz at 1 mA/mV. 935 Hz at 10 mA/mV.	≤100 Hz
RISETIME	≤5.8 ns	≤9 ns	≤1.75 ns	≤5 ns
ABERRATIONS (first 50 ns of display)	≤4%	≤5% from 1 mA to 20 mA. ≤6% from 50 mA to 1 A.	≤4% to 100 MHz	≤5% from 1 mA to 20 mA. ≤6% from 50 mA to 1 A.
FLATNESS	≤4% of 10 μs square pulse at 2 mA/mV. ≤4% of 35 μs square pulse at 10 mA/mV.	≤3% tilt during 400 μs of displayed square-wave.	≤4% of 1 μs square pulse at 1 mA/mV. ≤4% of 10 μs square pulse at 10 mA/mV.	≤3% tilt during 80 μs of displayed square-wave.
NOISE		≤150 μA		≤150 μA.
MAXIMUM CURRENT	15 A Peak to Peak.	15 A Peak to Peak.	6 A Peak to Peak.	6 A Peak to Peak.
MAXIMUM VOLTAGE	600 V	600 V	600 V	600 V

*Up to 0.150 inch diameter with P6019; up to 0.100 inch with P6020.

SEE PAGE 280 FOR PROBE COMPATIBILITY

TYPE 134 CURRENT AMPLIFIER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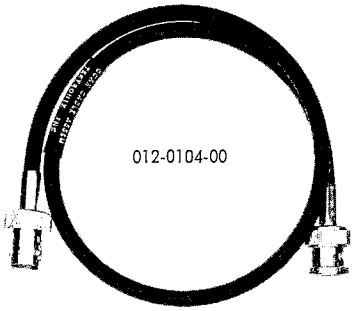
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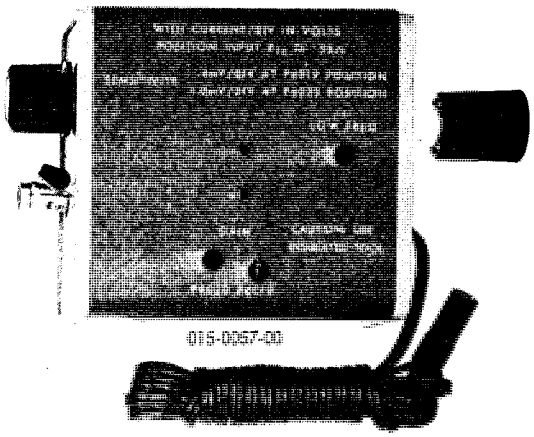
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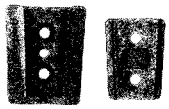
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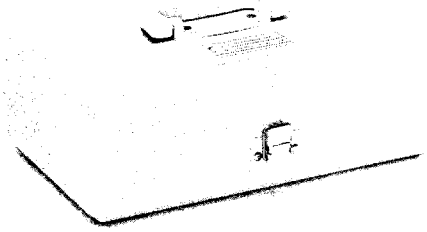
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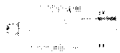
013-0092-00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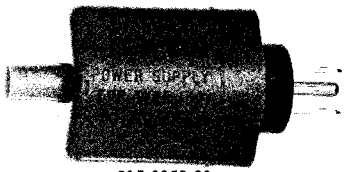
015-0058-00

TYPE 134 CURRENT-PROBE AMPLIFIER

The Type 134 is used to extend the measurement capabilities of the P6019 or P6020 Current Probe. An INPUT switch on the front panel of the amplifier establishes the appropriate gain setting for the probe in use. A CURRENT/DIV switch provides calibrated current steps from 1 mA/div to 1 A/div (with the oscilloscope or plug-in unit adjusted for a deflection factor of 50 mV/div).

The Type 134 can also be used as an auxiliary voltage amplifier by placing the current/div switch in the VOLTS position.

CHARACTERISTICS AS A VOLTAGE AMPLIFIER

DEFLECTION FACTOR: (with 50 mV/div oscilloscope input setting) 1 mV/div or 0.4 mV/div.

GAIN: 50 or 125, ±3%. Selected by lever switch.

IMPEDANCE: (input and output) approx 50 Ω, AC-coupled.

BANDWIDTH: 8 Hz to 54 MHz at a gain of 50; 10 Hz to 30 MHz at a gain of 125 (3-dB down).

ORDERING INFORMATION

CURRENT PROBES WITH TERMINATION

P6019 PROBE WITH PASSIVE TERMINATION (015-0065-00) ..... $ 90.00

P6019 PROBE ONLY (010-0196-00) 75.00

P6019 PASSIVE TERMINATION (011-0078-00) 20.00

P6020 PROBE WITH PASSIVE TERMINATION (015-0066-00) 135.00

P6020 PROBE ONLY (010-0197-00) 110.00

P6020 PASSIVE TERMINATION (011-0079-00) 30.00

Probe includes: 5 inch ground lead (175-0124-00); 3 inch ground lead (175-0263-00); two alligator clips (344-0046-00); two instruction manuals (070-0524-00).

CURRENT PROBES WITH TYPE 134 CURRENT AMPLIFIER

P6019 PROBE, TYPE 134 AMPLIFIER WITH 115 V POWER SUPPLY (015-0067-00) $275.00

P6019 PROBE, TYPE 134 AMPLIFIER WITH 230 V POWER SUPPLY (015-0068-00) 275.00

P6020 PROBE, TYPE 134 AMPLIFIER WITH 115 V POWER SUPPLY (015-0069-00) 310.00

P6020 PROBE, TYPE 134 AMPLIFIER WITH 230 V POWER SUPPLY (015-0070-00) 310.00

TYPE 134 AMPLIFIER ONLY (015-0057-00) 180.00

POWER SUPPLY ONLY, 115 V (015-0058-00) 30.00

POWER SUPPLY ONLY, 230 V (015-0059-00) 30.00

Probe/amplifier includes: hanger assembly (014-0029-00); cable, coax, 18 inches (012-0104-00); carrying case (016-0087-00); 5 inch ground lead (175-0124-00); 3 inch ground lead (175-0263-00) two alligator clips (344-0046-00); two instruction manuals (070-0524-00).

OPTIONAL ACCESSORIES

BATTERY ADAPTER* (013-0050-00) $8.00

CALIBRATOR ADAPTER, BNC (013-0092-00) 3.50

ADAPTER, BNC TO UHF (103-0015-00) 1.15

*For 27 V battery operation of amplifier. Use Eveready E302580 or equivalent.

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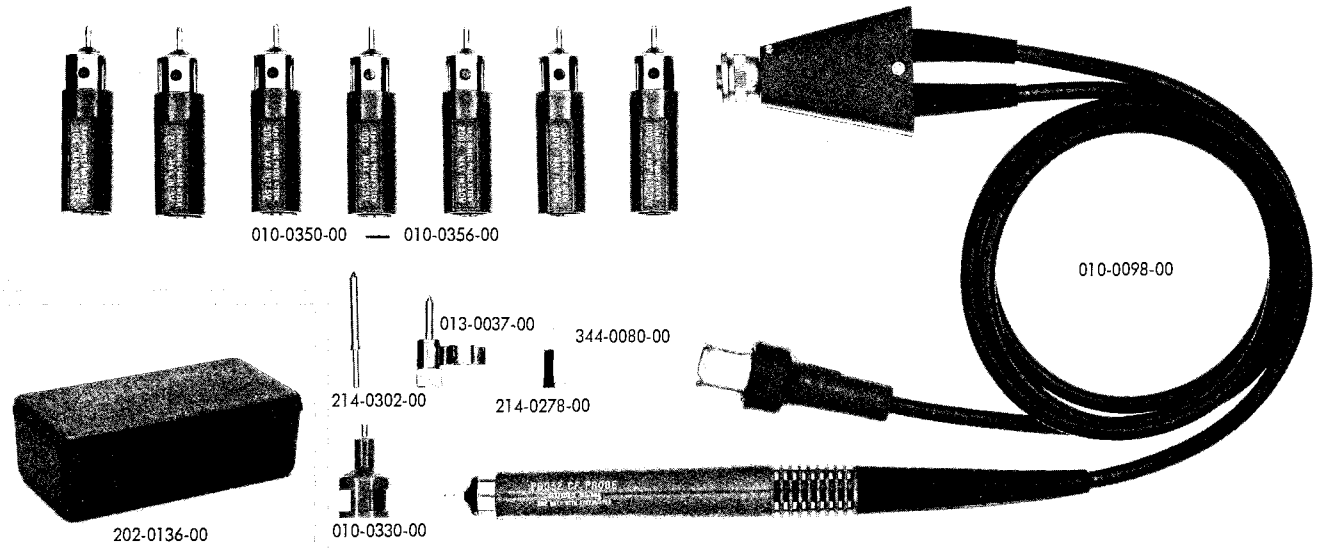
SEE PAGE 280 FOR PROBE COMPATIBILITY

P6032 CATHODE-FOLLOWER PROBE



The P6032 is a wide-band cathode-follower probe designed for use with Tektronix vertical sampling plug-in units, such as the Type 3S76, 4S1, 4S2A, or 1S1.

The attenuator heads are individually adjustable for proper AC attenuation.

RISETIME is typically 0.4 ns for probe and attenuator head.

MAXIMUM OUTPUT is ±150 mV into a 50-Ω load.

SIGNAL DELAY is approximately 10 ns.

POWER REQUIREMENTS are 12.6 V at 180 mA for the filament and +100 V at 12 mA for the plate.

CABLE is 54 in long with GR connector.

CAPACITOR-COUPLER HEAD is rated at 0.001 μF, 600 V DC. Low frequency 3-dB point is 16 Hz.
Order Part Number 010-0330-00 ..... $4.00

P6032 PROBE PACKAGE (010-0108-00) **$220.00**
Package includes: P6032 probe (010-0098-00); capacitor-coupler head (010-0330-00); ground clip (013-0037-00); spring contact (214-0278-00); seven attenuator heads; center pin (214-0302-00); two solderable ground clips (344-0080-00); four indicator rings† (354-0196-00); four indicator rings† (354-0197-00); storage case (202-0136-00) instruction manual† (070-0327-01).

† not shown

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

Part Number	*Attenuator Head*	*Max Input Voltage**	*Input Capacitance (±10%)*
010-0350-00	10X	± 1.5 V	3.6 pF
010-0351-00	20X	± 3.0 V	2.6 pF
010-0352-00	50X	± 7.5 V	1.8 pF
010-0353-00	100X	± 15 V	1.5 pF
010-0354-00	200X	± 30 V	1.4 pF
010-0355-00	500X	± 75 V**	1.3 pF
010-0356-00	1000X	± 150 V**	1.3 pF

*Limited by linearity of cathode follower. This value may be exceeded by 50% for pulses without damage to probe components.

**Must be derated for continuous wave use. Peak to peak voltage derating is necessary at CW frequencies higher than 500 MHz for the 1000X attenuator head and 1000 MHz for the 500X attenuator head.

Attenuator Head	*Max Input Voltage (peak to peak) (at 100% duty factor)*			
	500 MHz	*750 MHz*	*1000 MHz*	*1250 MHz*
500X	150 V	150 V	150 V	125 V
1000X	300 V	200 V	150 V	125 V

INPUT RESISTANCE at DC of all attenuator heads is 10 megohms ±2%.

All Heads ..... *$18.00 ea*

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SEE PAGE 280 FOR PROBE COMPATIBILITY

P6034 10X PASSIVE PROBE

The P6034 low-capacitance, miniature passive probe is designed for use with Tektronix Type 4S1, 4S2A, 1S1, 1S2 or Type 3S76 Pulse-Sampling Plug-In Units for making accurate measurements of high-speed repetitive pulses. Risetime of the probe conforms to the risetime of the plug-in units.

ATTENUATION is 10X.

INPUT RESISTANCE is 500 ohms ±1.5%, approximately 300 ohms at 1 GHz.

INPUT CAPACITANCE is 0.7 pF, DC to 100 MHz.

PROBE RISETIME is less than 100 ps.

BANDWIDTH is DC to 3.5 GHz (3-dB down).

LOW FREQUENCY RESPONSE is approximately 70 kHz at 3-dB down, AC-coupled.

MAXIMUM RINGING AND OVERSHOOT is 2% using a 25-ohm source and coaxial probe ground.

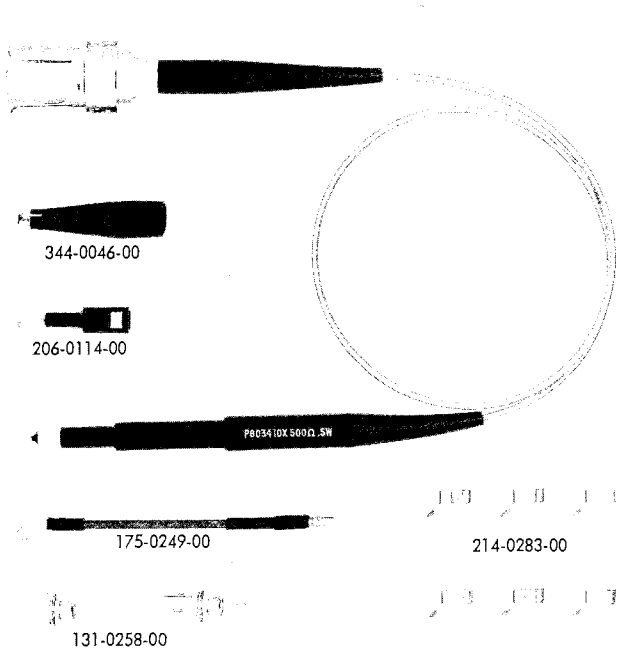
VOLTAGE RATING is 16 V DC or 45 V peak to peak.*

CABLE is 18 inches long with GR connector.

P6034 PROBE PACKAGE (010-0110-00) **$35.00**
Package includes: P6034 probe; hook tip (206-0114-00); six ground clips (214-0283-00); minigator clip (344-0046-00); two test jacks (131-0258-00); 2½ inch ground lead (175-0249-00); instruction manual (070-0368-00)

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*peak to peak voltage derating is necessary for CW frequencies higher than 800 MHz. At 1 GHz, the maximum allowable peak to peak voltage is 25 V.



P6035 100X PASSIVE PROBE

The P6035 low-capacitance miniature passive probe physically resembles the P6034 probe. It is designed for use with the Types 4S1, 4S2A, 1S1, 1S2, and 3S76 Sampling Plug-In Units for making high-speed repetitive-pulse measurements.

ATTENUATION is 100X.

INPUT RESISTANCE is 5 kilohms ±1.5%, approximately 1.5 k at 1 GHz.

INPUT CAPACITANCE is 0.6 pF, DC to 100 MHz.

PROBE RISETIME is less than 200 ps.

BANDWIDTH is DC to 1.7 GHz (3-dB down).

LOW FREQUENCY RESPONSE is approximately 6 kHz 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 peak to peak.*

CABLE is 18 inches long with GR connector.

P6035 PROBE PACKAGE (010-0111-00) **$35.00**
Package includes: P6035 probe; hook tip (206-0114-00); six ground clips (214-0283-00); minigator clip (344-0046-00); two test jacks (131-0258-00); 2½ inch ground lead (175-0249-00); instruction manual (070-0369-00).

OPTIONAL ACCESSORIES—see probe accessories at the rear of probe section.

*peak to peak voltage derating is necessary for CW frequencies higher than 500 MHz. At 1 GHz, the maximum allowable peak to peak voltage is 60 V.

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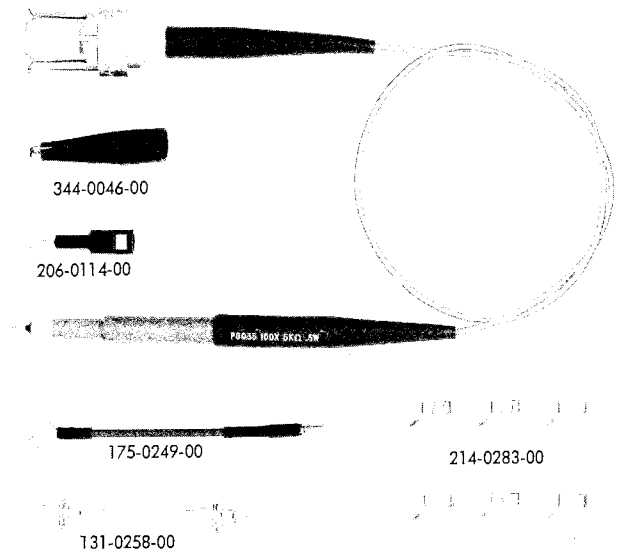
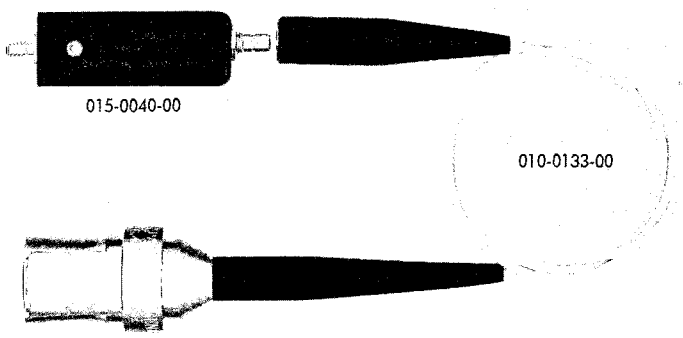


SEE PAGE 280 FOR PROBE COMPATIBILITY

TYPE CT-1 CURRENT TRANSFORMER and P6040 PROBE



When used with Tektronix sampling systems, the CT-1 and P6040 combination will measure milliamp currents at frequencies from 35 kHz to beyond 1 GHz.

Because of its compact size (approx 2 in long, $^{9}/_{16}$ in wide and $^{3}/_{8}$ in thick) the CT-1 is easy to use in compact circuits. Its insulated case eliminates the possibility of shorting out adjacent components or wiring.

SENSITIVITY is 5 mV/mA into a 50-ohm load. Accuracy is better than ±3%.

DECAY TIME CONSTANT is 5 μs, approximated by 1% per 50 ns; limit, 1 μs.

RISETIME is less than 0.35 ns.

FREQUENCY RESPONSE is 35 kHz to 1 GHz (30% down points).

INSERTION IMPEDANCE with a 50-ohm termination is 1 ohm shunted by approximately 5 μH; 2 ohms shunted by approximately 5 μH without a 50-ohm termination.

CAPACITIVE LOADING to a bare wire passing through the CT-1 transformer is typically 1.5 pF for #14 gauge, 0.6 pF for #20 gauge.

MAXIMUM VOLTAGE OF CIRCUIT UNDER TEST is 1000 V DC.

DIRECT CURRENT reduces the L/R time constant by a factor of 2 at 0.6 A.

PULSE CURRENT RATING is 100 A peak, with an amp-second product of 1 A-μs. When the A-s product is exceeded, the core saturates reducing the CT-1 output to zero.

RMS CURRENT RATING is 500 mA maximum.

TEMPERATURE RATING is −25°C to +65°C.

PHYSICAL DIMENSIONS are $^{3}/_{8}$ in x $^{9}/_{16}$ in x $1\,^{13}/_{16}$ in plus $^{1}/_{4}$ in x 6-32 mounting stud.

TYPE P6040 PROBE

The P6040 Probe is an inter-connecting cable for the CT-1, used between the transformer and oscilloscope input.

If several CT-1 Transformers are in a circuit, the P6040 Probe can be used to monitor any one of them.

The P6040 can be used with other test-point connectors, such as Amphenol series 27 Sub-Minax or Sealectro Sub-Miniature RF.

IMPEDANCE is 50 ohms.

ATTENUATION is 1X.

OUTPUT CONNECTOR is a GR type.

CABLE LENGTH is 18 inches. Additional 50-Ω cable can be used in series with the probe. RG8/U or RG58A/U is recommended for best preservation of the CT-1 Transformer high-frequency response.

CT-1 AND P6040 (015-0041-00)	$31.00
CT-1 CURRENT TRANSFORMER (015-0040-00)	17.00
P6040 PROBE (010-0133-00)	14.00

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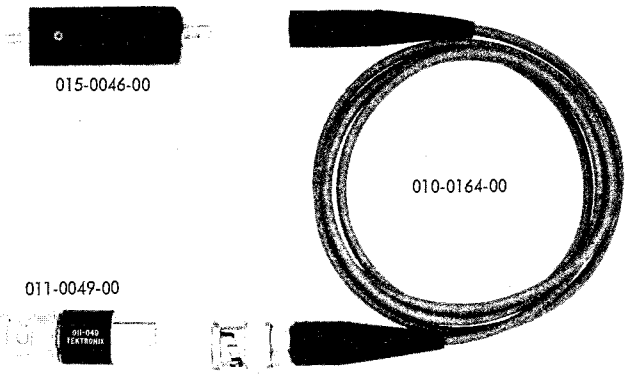
SEE PAGE 280 FOR PROBE COMPATIBILITY

TYPE CT-2 CURRENT TRANSFORMER and 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 MHz, 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 ±3%.

DECAY TIME CONSTANT is 125 μs, approximated by 1% per 1.25 μs; limit, 25 μs.

RISETIME is approximately 0.5 ns.

FREQUENCY RESPONSE is 30% down at 1.2 kHz, 7% down at 200 MHz.

INSERTION IMPEDANCE with a 50-ohm termination is 0.04 ohms shunted by approximately 5 μH; 0.08 ohms shunted by approximately 5 μH without a 50-ohm termination.

CAPACITIVE LOADING to a bare wire passing through the CT-2 Transformer is typically 2.1 pF for #16 gauge, 0.7 pF for #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 A.

PULSE CURRENT RATING is 100 A peak, with an amp-second product of 50 A-μs. When the A-s product is exceeded, the core saturates reducing the CT-2 output to zero.

RMS CURRENT RATING is 2.5 A maximum.

TEMPERATURE RATING is −25° C to +65° C.

PHYSICAL DIMENSIONS are 3/8 in x 9/16 in x 1 13/16 in plus 1/4 in 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 in. Additional 50-ohm cable can be used in series with the probe. RG8/U or RG58A/U cable is recommended to preserve the high-frequency response.

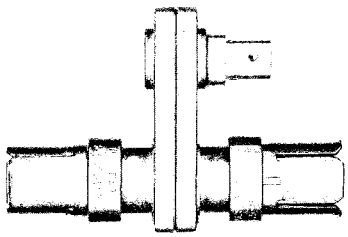
CT-2 AND P6041/50-OHM TERMINATION (015-0047-00) .. $37.75

CT-2 CURRENT TRANSFORMER (015-0046-00) 17.00

P6041 PROBE (010-0164-00) 12.00

50-OHM TERMINATION (011-0049-00) 8.75

TYPE CT-3 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 μs at 0 DC current.

RISETIME is less than 0.4 ns.

FREQUENCY RESPONSE is 50 kHz to 875 MHz at 0 DC current.

INSERTION IMPEDANCE with a 50-ohm termination is 1 ohm shunted by 4.5 μH; 2 ohms shunted by 4.5 μH without a 50-ohm termination.

VSWR is less than 1.2 at 1.5 GHz.

VOLTAGE RATING at 0 V DC is 25 V RMS, 1 kV pulse peak. The volts-second product is 100 V-μs. If exceeded, the L/R decay will decay rapidly toward zero.

ORDER PART NUMBER 017-0061-00 ..... $30.00

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SEE PAGE 280 FOR PROBE COMPATIBILITY

IDENTIFICATION TAGS

Probe identification tags for multi-probe applications help locate correlating probe ends quickly. One package contains 2 each of 10 colors.

For 1/8 in dia cable, order 334-0798-00 ..... $1.00
For 3/16 in dia cable, order 334-0798-01 ..... 1.00

PROBE GROUNDING ADAPTER

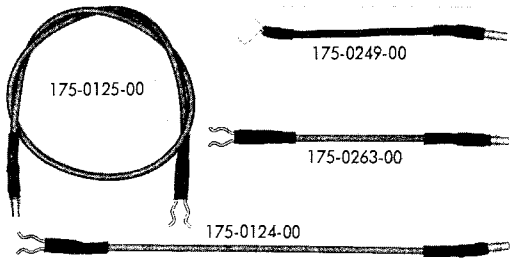
PROBE GROUNDING ADAPTER for Tektronix 10X probes provides a convenient method of establishing the vertical position of the oscilloscope trace in relation to zero volts input at the probe tip. The adapter eliminates the need for moving the probe tip from the signal source to ground.

Push-button operation of the Adapter disconnects the oscilloscope input from the probe and, at the same time, connects the input to ground through a parallel combination of a 9.1 megohm resistor and a 0.03 μF capacitor.

The Probe Grounding Adapter adds 7.5 pF to the input capacitance of the plug-in or oscilloscope. Readjustment of the probe is necessary for proper squarewave response.

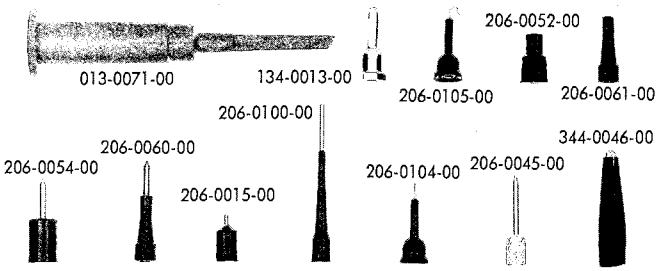
With BNC connectors, order 015-0048-00 ..... $11.00
With UHF connectors, order 015-0044-00 ..... 11.00

PROBE TIPS, GROUND LEADS AND ADAPTERS



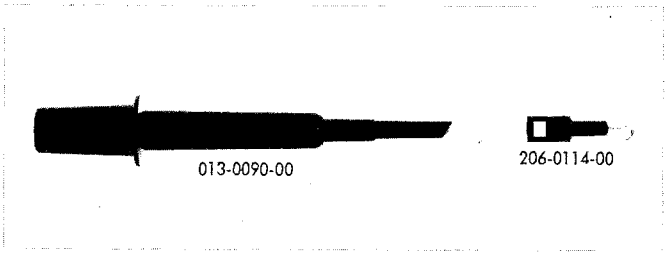
The following Ground Leads have a 6-32 thread size.

DESCRIPTION	PART NUMBER	PRICE
3-inch Ground Lead	175-0263-00	$ .60
5-inch Ground Lead	175-0124-00	.60
12-inch Ground Lead	175-0125-00	.60
2½-inch Ground Lead (for P6034, P6035, P6038, P6045)	175-0249-00	1.70



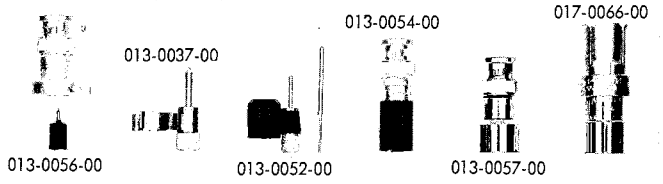
The following tips can be used on all Tektronix Probes that accept a #6-32 screw-on tip.

Calibration Tip (0.063 in shank dia)	206-0100-00	$ .75
Straight Tip (0.082 in shank dia)	206-0045-00	.25
Straight Tip (0.086 in shank dia)	206-0054-00	.25
Long Straight Tip (0.032 in shank dia)	206-0104-00	.25
Spring Tip (0.078 in shank dia)	206-0060-00	.50
Spring Tip w/o shank (accepts 0.078 in pin or plug)	206-0061-00	.40
Recessed Tip (accepts 0.065 in recessed pin or plug)	206-0052-00	.25
Short Straight Tip (0.055 in shank dia)	206-0015-00	.25
Banana Tip	134-0013-00	.20
Minigator Tip	344-0046-00	.20
Hook Tip	206-0105-00	.25
Retractable Hook Tip (for P6006, P6007, P6008, P6009, P6023, P6027, P6028)	013-0071-00	2.00



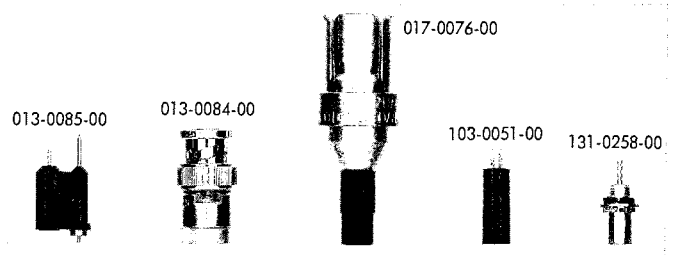
The following tips are for Tektronix Miniature Probes that accept a slip-on tip.

Hook Tip	206-0114-00	$ .75
Retractable Hook Tip (for P6010, P6011, P6012, P6047)	013-0090-00	2.00



The following probe-tip adapters are for the standard-size probes indicated.

Probe Tip to GR Adapter (for P6032)	017-0066-00	$6.25
Probe Tip to GR Adapter (for P6032)	013-0057-00	4.50
Probe Tip to BNC Adapter (for P6006, P6007, P6008, P6009)	013-0054-00	3.00
Probe Tip to BNC Adapter (for P6023, P6027, P6028)	013-0056-00	3.00
Bayonet Ground Assembly (for P6032)	013-0037-00	2.50
Bayonet Ground Assembly (for P6006, P6007, P6008, P6009)	013-0052-00	2.50



The following probe-tip adapters can be used with all Tektronix Miniature Probes that utilize a slip-on tip.

Miniature Probe to 6-32 Adapter (adapts miniature probe for use with all #6-32 screw-on tips)	103-0051-00	$ .50
Probe Tip to GR Adapter	017-0076-00	4.50
Probe Tip to BNC Adapter	013-0084-00	3.00
Bayonet Ground Assembly	013-0085-00	2.50
Chassis Mount Test Jack	131-0258-00	1.35

CABLE ADAPTERS

ADAPTER	PART NUMBER	PRICE
GR to C male	017-0027-00	$7.00
GR to N male	017-0021-00	6.00
GR to UHF female	017-0022-00	5.50
GR to UHF male	017-0023-00	5.00
GR to BNC female	017-0063-00	5.25
GR to BNC male	017-0064-00	7.00
GR to C female	017-0065-00	7.50
GR to N female	017-0062-00	5.00

50-OHM CONNECTING CABLES

(GR-TYPE CONNECTORS)

DELAY	CABLE TYPE	PART NUMBER	PRICE
1 ns	RG58C/U	017-0503-00	$ 8.25
2 ns	RG58C/U	017-0505-00	13.50
5 ns	RG213/U	017-0502-00	13.50
10 ns	RG58C/U	017-0501-00	13.50
20 ns	RG213/U	017-0504-00	16.50

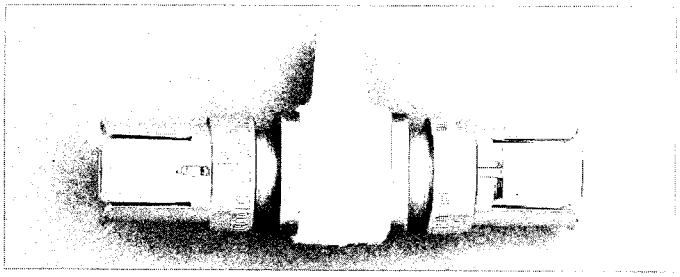
*Connector on one end only.

ATTENUATORS, TERMINATIONS

ITEM	PART NO.	VSWR RATING*	PRICE
10X Atten, GR 874-G20	017-0078-00	<1.3 at 4 GHz	$30.00
5X Atten, GR 874-G14	017-0079-00	<1.1 to 1 GHz	30.00
2X Atten, GR 874-G6	017-0080-00	<1.4 at 4 GHz	30.00
End-line Term, GR 874-W50B	017-0081-00	<1.005 + 0.017 f GHz	25.00
20-cm Airline, GR 874-L20	017-0084-00	—	10.50
Coupling Cap, GR 874-K	017-0028-00	<1.3 at 4 GHz	10.50
Insertion Unit	017-0030-00	—	15.00
90° Elbow, GR 874-EL	017-0070-00	<1.15 at 4 GHz	11.00
Tee, GR 874-T	017-0069-00	—	15.00
50-to-125 Ω Min Loss Atten	017-0052-00	<1.2 at 1 GHz	30.00
Power Divider, GR 874-TPD	017-0082-00	<1.0 at 0.05 f GHz	70.00
Thru-line Term, GR 874-QBPAS2	017-0083-00	—	28.00

*See page 303 for connector characteristics.

50-OHM VOLTAGE PICKOFF "T"



The 50-ohm "T" type pickoff allows signal pickoff from a closed 50-ohm system with minimum disturbance of the system's characteristics. The coaxial "T" incorporates GR Type connectors at each end, with a plastic center collar for probe tip insertions.

TYPE VP-1 is designed for use with the P6034 or P6035 Miniature Passive Probes. The reflection coefficient of the VP-1 alone is approximately 3%. With the P6034 or P6035 inserted, it is typically 2%. The resistive reflection of the VP-1 is ½% when used with the P6035, 5% when used with the P6034.

Order Part Number 017-0073-00 ..... $25.00

TYPE VP-2 is used in conjunction with the P6038 Direct Sampling Probe. The reflection coefficient without the P6038 Probe is approximately 4%. With the probe inserted it is typically 6%. All accessory heads supplied with the P6038 Probe can be used with the VP-2.

Order Part Number 017-0077-00 ..... $30.00

BLANK PLUG-IN CHASSIS

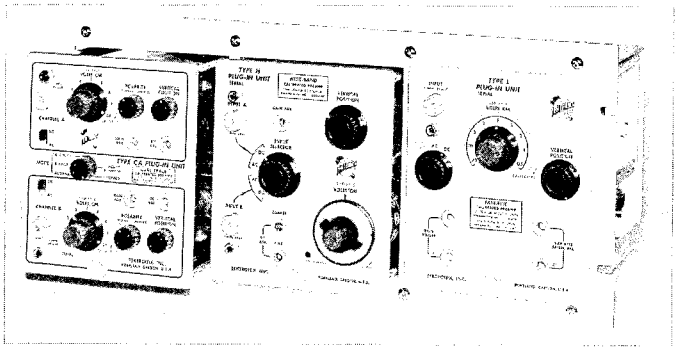
BLANK 1-SERIES AND LETTER-SERIES PLUG-IN CHASSIS—Useful for constructing your own special circuits.

Order Part Number 040-0065-00 ..... $25.00

BLANK TYPE 560-SERIES PLUG-IN CHASSIS—For special circuit construction of sweep or vertical amplifier.

Order Part Number 040-0245-00 ..... $25.00

STORAGE CABINETS



PLUG-IN PREAMPLIFIER STORAGE CABINET mounts in standard rack, available in two types:

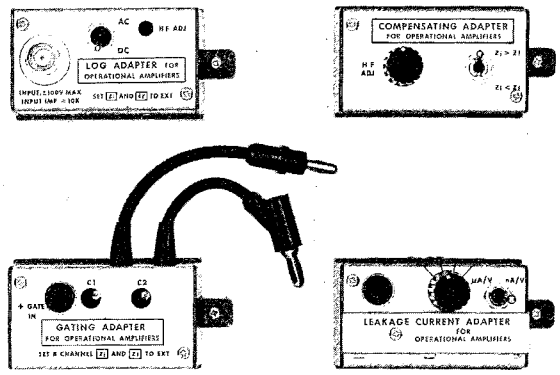
FOR 1-SERIES AND LETTER-SERIES PLUG-IN UNITS—holds 3 plug-in units. Measures 19" wide, 8¾" high, 9⅜" deep.

Order Part Number 437-0031-00 ..... $25.00

FOR 2 AND 3-SERIES PLUG-IN UNITS—holds 4 plug-in units. Measures 19" wide, 7" high, 13 5/16" deep.

Order Part Number 437-0071-00 ..... $30.00

OPERATIONAL AMPLIFIER ADAPTERS



LOGARITHMIC AMPLIFIER ADAPTER

The Logarithmic Amplifier Adapter converts linear amplification characteristics of either operational amplifier in the Type O or 3A8 Plug-In Unit to approximate logarithmic characteristics.

ALLOWABLE INPUT SIGNAL—±100 V maximum, AC or DC-coupled.

INPUT IMPEDANCE—Approximately 10 kilohms.

AMPLIFICATION CHARACTERISTICS—With the Logarithmic Amplifier Adapter, the operational amplifier approximates a logarithmic amplification response for input signals from ±0.1 V to ±100 V.

Signal-In	Deflection	Signal-In	Deflection
±0.1 V	1 cm ±0.5 mm	±10.0 V	3 cm ±1.0 mm
±1.0 V	2 cm ±0.5 mm	±100 V	4 cm ±1.0 mm

Below an input level of ±0.05 V, the amplifier is no longer logarithmic.

RISETIME—Typically 0.2 μs—for a 10-V signal to rise from 0.1 V to 10 V.

FALLTIME—Typically 0.3 μs—for a 10-V signal to fall from 10 V to 0.1 V.

LOW FREQUENCY RESPONSE—65 Hz. (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.)

BANDWIDTH—The —3 dB apparent bandwidth varies with both signal amplitude and signal DC level. It varies typically from 400 kHz to 1 MHz, depending on the input signal.

LOGARITHMIC AMPLIFIER ADAPTER (013-0067-00) . $75.00

GATING ADAPTER

The Gating Adapter permits on and off gating of the Type O Unit from the +20 V gate output of the oscilloscope used. The Adapter can also be used with the Type 3A8 using an external gating signal.

With the Adapter plugged into the lower operational amplifier, the upper operational amplifier is gated on or off. The signal applied is then amplified, integrated or differentiated only during the "on" time.

The Adapter is particularly useful for integration operations where the accumulative voltage of repetitive signals would exceed the voltage rating of the deflection amplifier input.

GATING ADAPTER (013-0068-00) $75.00

COMPENSATING ADAPTER

The Compensating Adapter extends the frequency performance of the Plug-In 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

PLUG-IN AND ADAPTER

TYPICAL FREQUENCY RESPONSE—≥750 kHz (at 10X gain).

INPUT RESISTANCE—0.01 to 1 megohm, determined by Z_i Selector position.

INPUT CAPACITANCE—approximately 40 to 450 pF, depending on the Z_f Selector position. (Maximum at X100 gain)

MAXIMUM INPUT VOLTAGE—400 V DC or 150 V RMS.*

MAXIMUM OUTPUT VOLTAGE— ±50 V peak.

MAXIMUM TEMPERATURE— +55° C.

COMPENSATING ADAPTER (013-0081-00) $35.00

*Voltage derating is necessary for frequencies above 1 MHz.

LEAKAGE CURRENT ADAPTER

The Leakage Current Adapter, used with Tektronix Operational Amplifier Plug-In Units, adapts the plug-in for measuring the reverse leakage current of semiconductor diodes and small-signal transistors. The adapter may also be used for measuring junction resistance or capacitance.

Banana plugs on the base of the adapter allow the unit to be plugged into the jacks on the front panel of the Plug-In Unit. Axial-lead diodes are checked by placing them in a notched retainer mounted on a swing-down cover. When closed, the cover places the leads against spring-contact clips, assuring good electrical contact. A four-pin socket is provided for checking small-signal transistors. The diode clips and the transistor socket are completely shielded to minimize leakage capacitance.

A positive-going sawtooth voltage is required for driving the adapter. Tektronix Oscilloscopes that accept the Type O Plug-In Unit have a sawtooth or sweep out jack conveniently located on the front panel for supplying the required sawtooth voltage. The Type 3A8 requires an external source of the required sawtooth voltage.

VERTICAL DEFLECTION FACTOR—1 microampere/volt or 1 nanoampere/volt, selected by a toggle switch.

VERTICAL DEFLECTION ACCURACY— ±8%.

HORIZONTAL DEFLECTION FACTOR—(with 100-V sawtooth, minimum). 1, 2, 5 and 10-V/cm selected by Horizontal V/CM switch.

HORIZONTAL DEFLECTION ACCURACY— ±3%.

INPUT SAWTOOTH VOLTAGE—100 to 200 V (for 10-V/cm horizontal deflection).

MAXIMUM INTERNAL LEAKAGE—50 picoamperes at 100 V.

LEAKAGE CURRENT ADAPTER (013-0086-00) $85.00

TERMINAL ADAPTERS AND SHIELDS

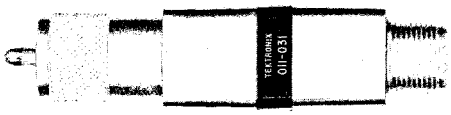
TERMINAL ADAPTER ASSEMBLY has all the mechanical parts for creating a custom adapter for the Operational Plug-In Unit.

Order Part Number 013-0048-01 ..... $10.00

TERMINAL SHIELD protects exposed terminals of the Plug-In Unit from spurious signals.

Order Part Number 013-0049-01 ..... $2.50

INPUT ADAPTERS—ATTENUATORS—TERMINATIONS



ACCESSORIES WITH UHF-TYPE CONNECTORS

Description	Part Number	Price
50-Ω termination	011-0045-00	$15.00
50-Ω 5:1 attenuator	011-0032-00	16.00
50-Ω 10:1 attenuator	011-0031-00	16.00
50-Ω to 75-Ω min loss attenuator	011-0041-00	16.00
50-Ω to 93-Ω min loss attenuator	011-0042-00	16.00
50-Ω to 170-Ω min loss attenuator	011-0043-00	16.00
75-Ω termination	011-0046-00	15.00
75-Ω 5:1 attenuator	011-0034-00	16.00
75-Ω 10:1 attenuator	011-0033-00	16.00
93-Ω termination	011-0047-00	15.00
93-Ω 5:1 attenuator	011-0036-00	16.00
93-Ω 10:1 attenuator	011-0035-00	16.00
170-Ω* termination	011-0048-00	15.00

*VSWR less than 1.25 up to 30 MHz.

ACCESSORIES WITH BNC-TYPE CONNECTORS

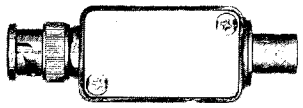
50-Ω termination	011-0049-00	$ 8.75
50-Ω 2:1 attenuator	011-0069-00	10.00
50-Ω 2.5:1 attenuator	011-0076-00	10.00
50-Ω 5:1 attenuator	011-0060-00	10.00
50-Ω 10:1 attenuator	011-0059-00	10.00
50-Ω to 75-Ω min loss attenuator	011-0057-00	10.00
50-Ω to 93-Ω min loss attenuator	011-0058-00	10.00
75-Ω termination	011-0055-00	8.75
75-Ω 10:1 attenuator	011-0061-00	10.00
93-Ω termination	011-0056-00	8.75
93-Ω 10:1 attenuator	011-0062-00	10.00
170-Ω termination (UHF to BNC)	011-0063-00	10.00

ACCESSORIES WITH TEKTRONIX 125-Ω TYPE CONNECTORS

125-Ω termination	017-0051-00	$20.00
125-Ω 2:1 attenuator	017-0071-00	30.00
125-Ω 5:1 attenuator	017-0049-00	30.00
125-Ω 10:1 attenuator	017-0050-00	30.00

ACCESSORIES WITH GR-TEKTRONIX 125-Ω TYPE CONNECTORS

50-Ω to 125-Ω min loss atten	017-0052-00	$30.00
125-Ω adapter N50/N125	017-0053-00	17.50
125-Ω adapter N50/T125	017-0054-00	17.50
125-Ω adapter T50/N125	017-0055-00	23.00



ACCESSORY HOUSINGS W/O ELECTRICAL COMPONENTS

Component housings are useful for applications requiring special circuitry.

Coupler, Test Set with UHF connectors
Order Part Number 011-0080-00 ..... $5.00

Coupler, Test Set with BNC connectors
Order Part Number 011-0081-00 ..... 5.00

CONNECTOR CHARACTERISTICS

Accuracy of Indicated Attenuation Ratio:

UHF	±2% at DC; ±3% at 100 MHz.
GR	±2% at DC; ±3% at 1 GHz.
TEKTRONIX 125 Ω	±2% at DC; ±3% at 1 GHz.
BNC	±2% at DC; ±3% at 100 MHz.

Voltage Standing Wave Ratio:

UHF	less than 1.2 up to 100 MHz.
GR	less than 1.1 up to 1 GHz.
TEKTRONIX 125 Ω	less than 1.1 up to 1 GHz.
BNC	less than 1.1 up to 100 MHz.

Power Rating:

UHF	1.5 watts.
GR	1 watt.
TEKTRONIX 125 Ω	1 watt.
BNC	1 watt.

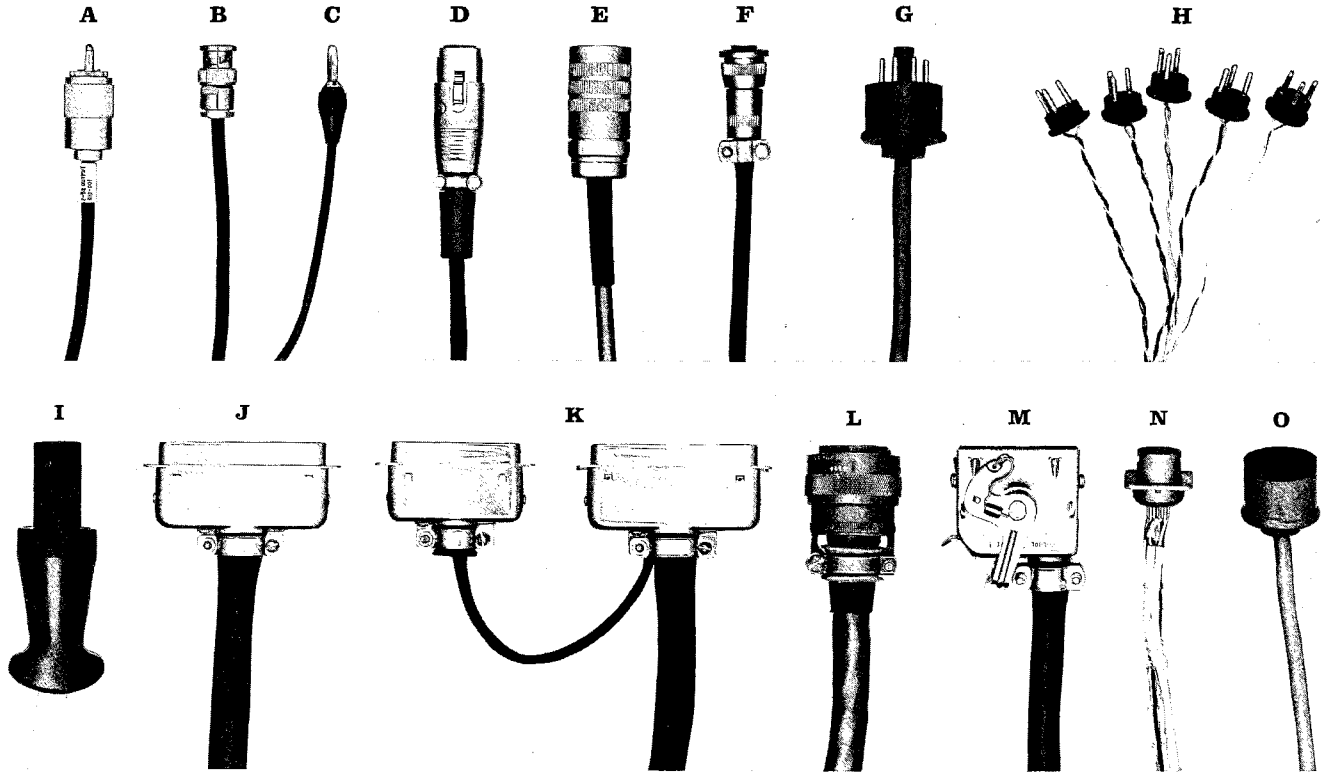
Output to Input Voltage Ratios for Minimum-Loss Attenuators:

When properly terminated the E_{out}/E_{in} ratios for the various minimum-loss attenuators are as follows:

Connection	E_{out}/E_{in}	Connection	E_{out}/E_{in}
50 Ω → 75 Ω	0.63	50 Ω → 125 Ω	0.56
75 Ω → 50 Ω	0.42	125 Ω → 50 Ω	0.23
50 Ω → 93 Ω	0.59	50 Ω → 170 Ω	0.54
93 Ω → 50 Ω	0.32	170 Ω → 50 Ω	0.16

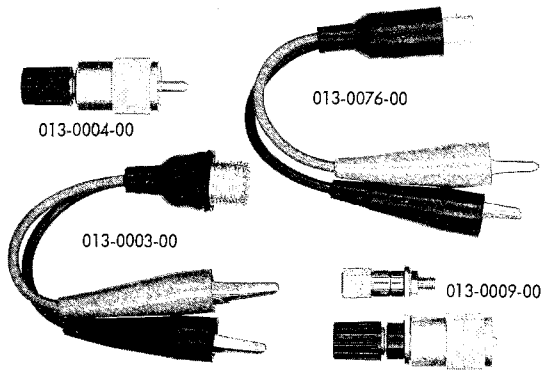
All attenuators, with the exception of minimum-loss types, are T-type attenuators.

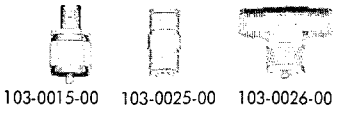
MISCELLANEOUS CABLES

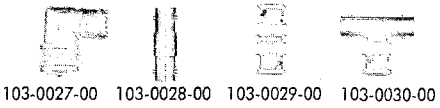


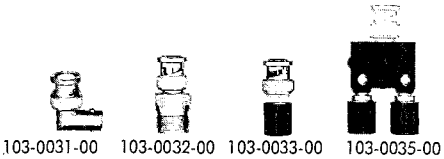
INSTRUMENT TYPE	FUNCTION	LENGTH (INCHES)	IMPEDANCE (OHMS)	CONNECTOR TYPE	CONNECTOR FIG	PART NUMBER	PRICE
GENERAL	Output	42	50	UHF	A-A	012-0001-00	$ 6.50
GENERAL	Output	42	50	BNC	B-B	012-0057-01	4.00
GENERAL	Output	42	75	UHF	A-A	012-0002-00	7.50
GENERAL	Output	42	75	BNC	B-B	012-0074-00	6.50
GENERAL	Output	42	93	UHF	A-A	012-0003-00	6.50
GENERAL	Output	42	93	BNC	B-B	012-0075-00	4.00
GENERAL	Output-Terminated with 93 Ω Resistor	42	93	UHF	A-A	012-0005-00	6.50
GENERAL	Output-Terminated with Variable Attenuator	42	93	UHF	A-A	012-0004-00	13.50
GENERAL	Output	42	170	UHF	A-A	012-0006-00	7.50
GENERAL	Horizontal Input	18	—	Banana	C-C	012-0054-00	2.50
GENERAL	Adapter Cable	5	—	2-Banana to UHF	A-C-C	012-0059-00	3.50
GENERAL	Adapter Cable	24	—	BNC to Banana	B-C	012-0096-00	5.35
E	Input	30	—	Special 3-pin	D	012-0022-00	6.00
Q	Input	15 ft	—	Special 9-pin	E	012-0040-00	12.00
2A61	Input	60	—	Special 4-pin	F	012-0072-00	10.00
122	Battery Cable	7 ft	—	Octal to (5) 3-pin	H-O	012-0009-00	15.00
127	Input	60	170	UHF	A-A	012-0034-00	7.50
160A, 360	Inter-connecting	20	—	Octal	G-O	012-0016-00	7.00
161, 162, 163	Inter-connecting	10	—	Octal	G-O	012-0017-00	5.00
175	Test Cable	30	—	Banana to Alligator	C	012-0056-00	1.75
175	Test Cable-Black Plug	42	—	Special Plug	I	012-0044-00	9.00
175	Test Cable-Red Plug	42	—	Special Plug	I	012-0043-00	9.00
175	Socket Adapter	—	—	Special 9-pin	N	012-0045-00	11.25
262	6R1A Inter-connecting	6 ft	—	36-50 Pin Ribbon Special 41-pin	K-L	012-0081-00	60.00
262	262 Inter-connecting	48	—	50-pin Ribbon	J-J	012-0082-00	60.00
551, 555	Inter-connecting	72	—	16-pin Ribbon	M-M	012-0051-00	28.50

MISCELLANEOUS ADAPTERS









DESCRIPTION	PART NUMBER	PRICE
Adapter, clip lead BNC	013-0076-00	$3.00
Adapter, clip lead UHF	013-0003-00	3.00
Adapter, binding post	013-0004-00	3.00
Binding Post Adapter, with ground terminal, ¾" spacing	013-0009-00	3.50
UHF Male to BNC Female	103-0015-00	1.15
UHF Female to Female	103-0025-00	3.30
UHF T Male to 2 Female	103-0026-00	2.60
UHF Elbow	103-0027-00	2.25
BNC Female to Female	103-0028-00	1.60
BNC Male to Male	103-0029-00	3.00
BNC T Male to 2 Female	103-0030-00	3.50
BNC Elbow	103-0031-00	2.75
Male BNC to Female UHF	103-0032-00	1.70
BNC to Binding Post	103-0033-00	1.60
BNC Dual Binding Post	103-0035-00	5.25
UHF Female to N Male	103-0044-00	2.95
BNC Female to N Male	103-0045-00	1.65
N Female to BNC Male	103-0058-00	2.15
N Female to UHF Male	103-0059-00	2.25

3-WIRE POWER CORDS

The detachable power cords listed are for current production instruments only. Consult your Tektronix Field Engineer or Representative for information on replacement cords for earlier instruments.

INSTRUMENT*	PART NO.	PRICE
Type 109, 111, 125, 127, 130, 132, 133, 160A, 175†, R293, 317, 502A, 515A, 516, 519, 524AD, 526, 530-, 540-, 550-, 560-, 580-Series, 575, 661, 1121	161-0010-00	$2.50
Type 262, 310A, 491, RM503, RM504, RM564, RM565, 647	161-0022-00	3.75
Type 106, 114, 116, 129, 184, 191, 422-AC only, RM561A	161-0024-00	2.75
Type 280, 292, 321A-AC, 422-AC	161-0015-01	3.25
Type 321A-DC, 422-DC	161-0016-01	2.75
Type 453 (115 V)	161-0024-01	2.80
Type 453 (230 V)	161-0027-01	4.00

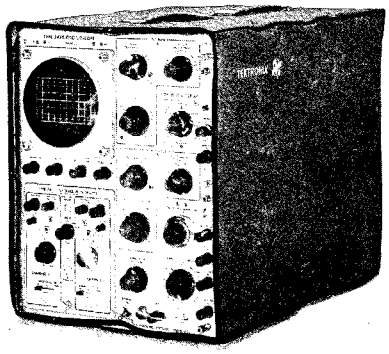
*Also applies to rack-mount version if detachable cord is used (except where rack-mount version is listed separately).

†161-0014-00 @ $1.40 also used with this instrument.

MISCELLANEOUS CORDS AND LEADS

DESCRIPTION	LENGTH (inches)	CONNECTOR	PART NO.	PRICE
Output Lead, Black	30	banana plug to alligator clip	012-0014-00	$2.50
Output Lead, Red			012-0015-00	2.50
Patch Cord, Black	6	banana plug-jack (both ends)	012-0023-00	1.15
Patch Cord, Red			012-0024-00	1.15
Patch Cord, Black		BNC male to BNC male	012-0084-00	3.00
Patch Cord, Red			012-0085-00	3.00
Patch Cord, Black	18		012-0086-00	3.00
Patch Cord, Red			012-0087-00	3.00
Patch Cord, Black	6	BNC male to banana plug	012-0088-00	3.00
Patch Cord, Red			012-0089-00	3.00
Patch Cord, Black	18		012-0090-00	3.00
Patch Cord, Red			012-0091-00	3.00
Patch Cord, Black		banana plug (both ends)	012-0028-00	2.00
Patch Cord, Red			012-0029-00	2.00
Patch Cord, Black			012-0039-00	1.20
Patch Cord, Red			012-0031-00	1.20

OSCILLOSCOPE DUST COVERS

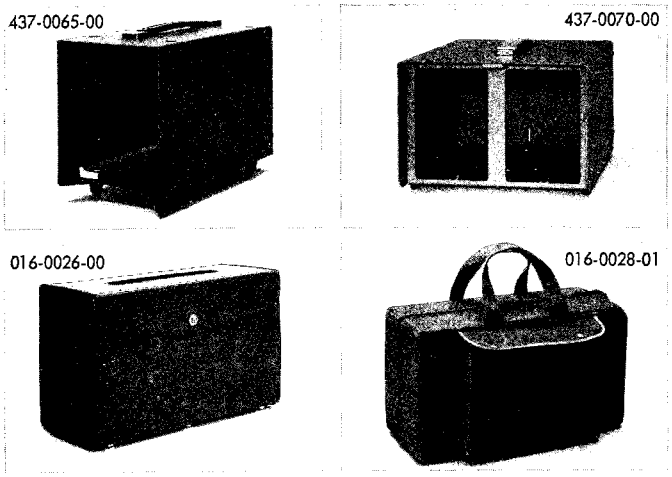


The slip-on cover provides protection for instruments during transport or storage. Made of water-proof blue vinyl, the cover features a clear frontal area for easy identification of the instrument.

INSTRUMENT	PART NUMBER
Type 422 (with battery pack)	016-0075-00
Type 422 (without battery pack)	016-0076-00
Type 453, 454, 491	016-0074-01
Type 502A	016-0070-00
Type 529 (with field case)	016-0085-00
Type 503, 504, 515A, 516, 647A; 560-Series (except Type 565, 567, 568)	016-0067-00
Type 565, 567, 568	016-0069-00
Type 661; 530-, 540-, 550-, and 580-Series (except Type 556)	016-0068-00

OSCILLOSCOPE DUST COVER $7.50

CARRYING CASES



CARRYING CASE FOR LETTER-SERIES OR 1-SERIES PLUG-IN UNITS—Provides protection for one oscilloscope plug-in unit.
Order Part Number 437-0065-00 ..... $20.00

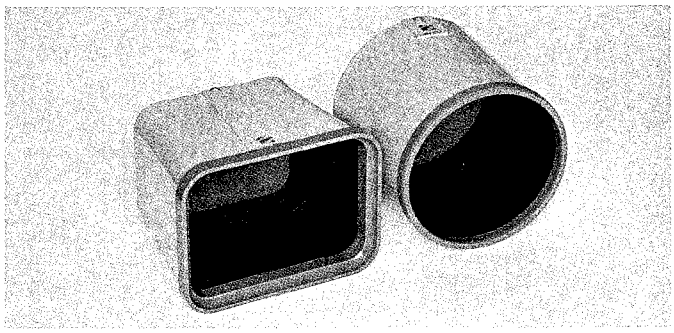
CARRYING CASE FOR 2, 3, 10 and 11 SERIES PLUG-IN UNITS—accommodates two plug-in units.
Order Part Number 437-0070-00 ..... $20.00

CARRYING CASE—For Type 321A Portable Oscilloscope.
Order Part Number 016-0026-00 ..... $35.00

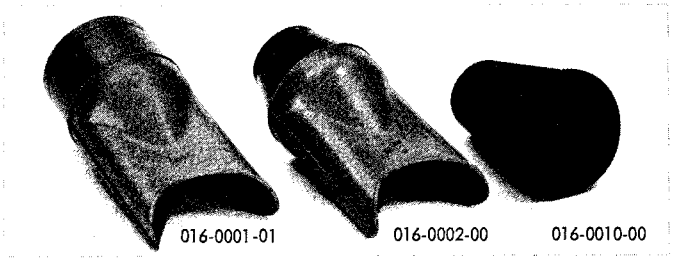
CARRYING CASE—For Type 310A Oscilloscope. Made of sturdy, turquoise-colored canvas.
Order Part Number 016-0028-01 ..... $19.50

VIEWING ACCESSORIES

The viewing accessories listed normally mount on the oscilloscope graticule cover. In many cases, they will also fit camera-mounting bezels. If you intend using a camera on your oscilloscope, check with your Tektronix Field Engineer for bezel-viewer compatibility before ordering.



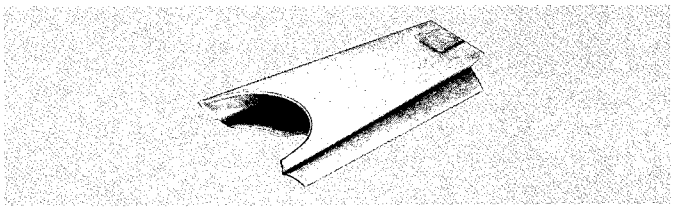
POLARIZED VIEWERS—For Tektronix 5" Oscilloscopes. The viewers reduce troublesome reflections and glare under high ambient-light conditions.
RECTANGULAR VIEWER (016-0039-00) $10.00
PLASTIC ROUND VIEWER (016-0053-00) 10.00



VIEWING HOOD—For Tektronix 5" Oscilloscopes. Includes molded rubber eyepiece and separate tubular light shield.
Order Part Number 016-0001-01 ..... $5.00

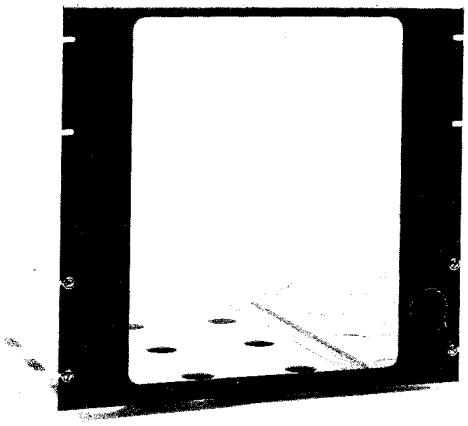
VIEWING HOOD—For Tektronix 3" Oscilloscopes. Includes molded rubber eyepiece and separate tubular light shield.
Order Part Number 016-0002-00 ..... $5.00

COLLAPSIBLE VIEWING HOOD—For Tektronix 3" Oscilloscopes. It is made of black acrylic plastic with handy fastening arrangement.
Order Part Number 016-0010-00 ..... $3.50



COLLAPSIBLE VIEWING HOOD—For portable instruments with rectangular CRT's. Blue-vinyl material, folds flat for convenient storage.
For Types 422, 491, order 016-0082-00 ..... $7.50
For Type 453, 454, order 016-0083-00 ..... 7.50

CRADLE MOUNTS



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 inch relay rack, and a mask to fit over the regular instrument panel. Blue vinyl finish.

For Type 524AD, Type 530-Series, 540-, 570-Series and Type 661 (1 mask, 1 cradle). Rack height requirements 17½ inches.
Order Part Number 040-0281-00 ..... $31.25

For Type 551 Oscilloscope (2 masks, 2 cradles). Rack height requirements: Indicator mask 17½ inches, Power Supply mask 12¼ inches.
Order Part Number 040-0279-00 ..... 75.00

For Type 515A and Type 516 instruments (1 mask, 1 cradle). Rack height requirements 15¾ inches.
Order Part Number 040-0277-00 ..... 45.00

For Type 502A instruments (1 mask, 1 cradle). Rack height requirements 17½ inches.
Order Part Number 040-0278-00 ..... 40.00

For Type 555 (2 masks, 2 cradles). Rack height requirements: Indicator mask 21 inches, Power Supply mask 12¼ inches.
Order Part Number 040-0280-00 ..... 75.00

For Types 503, 504, 561A, 564 instruments (1 mask, 1 cradle). Rack height requirements 15¾ inches.
Order Part Number 040-0321-01 ..... 50.00

MOUNTING FRAME—Holds four of any combination of Type FM122, Type 360, or Type 160-Series units. Mounts to standard 19 inch instrument rack.
Order Part Number 014-0002-00 ..... $7.00

BLANK PANEL—Covers space normally occupied by one instrument mounted in the frame.
Order Part Number 333-0157-00 ..... $2.50

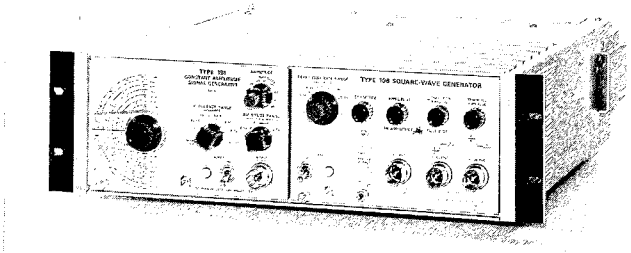
REAR-SUPPORT CRADLES

CRADLE-ASSEMBLY—Provides rear support for rack-mount instruments with slide-out tracks, when mounted in a 19-inch backless rack.

For Types RM15, 526, RM561A, RM564, R647A, and Type 127.
Order Part Number 040-0344-00 ..... $ 12.00

For Types RM565 and RM567.
Order Part Number 040-0345-00 ..... $ 12.00

RACK ADAPTER FOR TYPES 106, 114, 184, 191

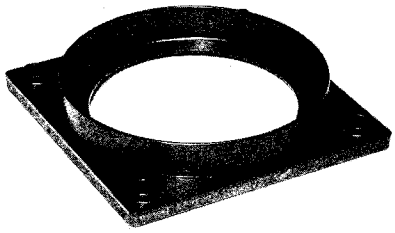


The Rack Adapter converts the latest series of Tektronix Generators for rack mounting. Any combination of two instruments can be mounted side-by-side in 19 inch rack, occupying only 5¼ inches of vertical rack space. Mounting brackets located on the rear of the unit are adjustable for installation in racks of different depths. The brackets can be adjusted for a rear-mounting depth of 8½ inches to 26 inches. The adapter itself occupies a rack depth of 17¾ inches.

Forced air ventilation is provided by two fan assemblies. The fans can be operated from 115 or 230 volt source. Outlets located on the rear of the unit provide a convenient source of power for the instruments. A blank panel is included to cover the opening when only one instrument is installed in the Rack Adapter. A special coiled power cord is required for each instrument mounted.

RACK ADAPTER (016-0086-00) $125.00
COILED POWER CORD (161-0031-00) ea. 2.55

CAMERA MOUNTING ADAPTERS



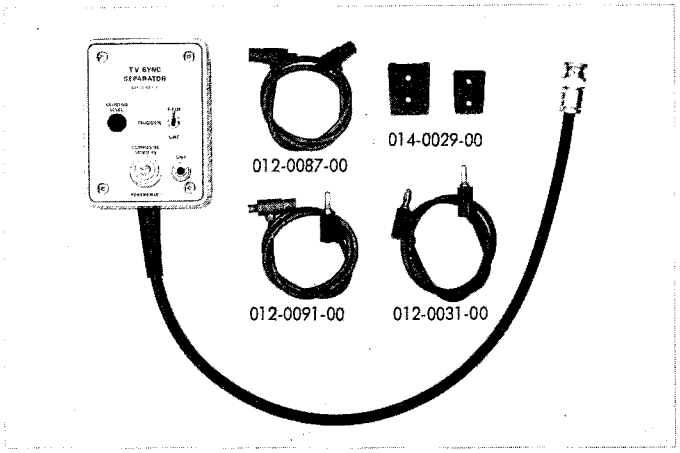
Bezels for mounting commercially available cameras on Tektronix Oscilloscopes. Mounting ring measures 5⅝ inches outside diameter. Die-cast construction.

INSTRUMENT*	PART NUMBER
Type 502A, 503, 504, 515A, 516, 524, 526, 530-, 540-, 550-, 580-Series, 565, 661	014-0018-00
Type 561A, 564, 567, 568	014-0016-00
Type 647A	014-0017-00
Type 529	014-0031-00

CAMERA MOUNTING ADAPTER $4.50

*Also rackmount version.

TV SYNC SEPARATOR



The TV Sync Separator provides the trigger facilities for viewing composite video signals on a conventional oscilloscope. It can be used with Tektronix general-purpose oscilloscopes that have a 100-volt calibrator output. When used with other instruments, a separate 100-V source is required to power the unit.

A front panel switch selects field- or line-rate triggers, and a separate output jack supplies field triggers continuously. The unit has a clipping level control, allowing it to be used with signals ranging from 0.5 V to 8.5 V in amplitude.

POWER REQUIREMENTS—7 mA; operates on 100-V DC, or from the output of an oscilloscope calibrator with a frequency near 1 kHz.

INPUT—Composite video signal from signal source or from Vert Sig Out jack on front panel of oscilloscope.

OUTPUT— ≈10-V negative-going composite sync for line rate triggering or ≈6-V negative-going field-rate triggers. Selected by toggle switch. Also second output for field-rate triggers.

TV SYNC SEPARATOR (015-0062-00) $85.00
Instrument includes: two patch cords, 18 inch red BNC to banana plug (012-0091-00); two patch cords, 18 inch red BNC to BNC (012-0087-00); patch cord, 18 inch red banana plug to banana plug (012-0031-00); hangar assembly (014-0029-00); instruction manuals (070-0542-00).

VIDEO STAIRCASE DIFFERENTIATOR

The Video Staircase Differentiator permits the use of a general-purpose oscilloscope for measuring amplitude linearity in TV systems.

The staircase differentiator is a filter which differentiates the steps of an unmodulated,, linearity staircase (VIT signal) into spikes. The spikes appear on a common-reference level. Amplitude linearity is checked by comparing the amplitude of the spikes on the oscilloscope display. The generator used must supply a staircase having equal risetime, for the output amplitude of the differentiator is proportional to the rate of rise. Input impedance of the differentiator is 75 ohms.

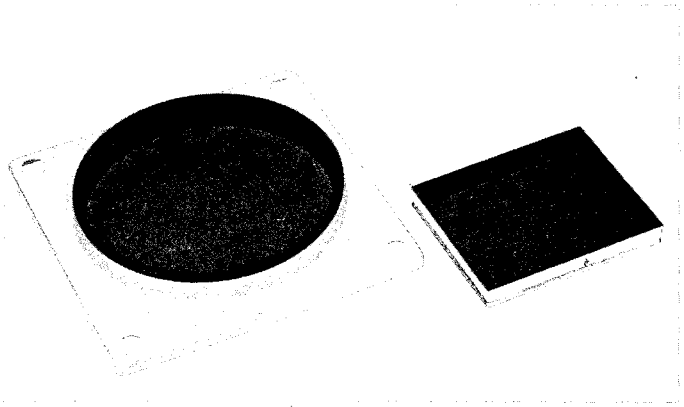
VIDEO STAIRCASE DIFFERENTIATOR (015-0075-00) . $17.50

UNSCRIBED GRATICULES

INSTRUMENT*	PART NUMBER	PRICE
310A, 317, 360	386-0395-00	$1.50
524AD, 526, 536, 551, 555, 575;	331-0093-00	2.00
502A, 503, 504, 515A, 516, 661	331-0105-00	2.00
549	386-0451-00	2.00
531A, 533A, 535A	386-0451-00 (adjustable) 331-0093-00 (not adjustable)	2.00 2.00

*For both cabinet and rack-mount instruments.

CRT MESH FILTERS



The mesh filter improves display contrast for oscilloscope viewing under high-ambient light conditions. The filter is a direct replacement for the existing graticule cover on most Tektronix instruments, or, in the case of the new portable oscilloscopes, snaps in the CRT opening on the front panel.

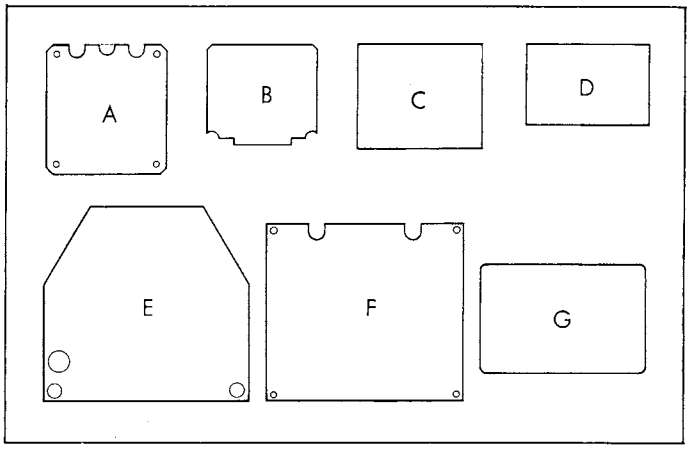
A fine metal screen with a matte black surface is utilized to reduce light reflections. Although light transmission from the CRT is reduced to approximately 28%, the high attenuation of external reflections allows viewing low-intensity displays in room light or other bright surroundings.

The mesh filter also serves as an RFI filter. Installed on the instrument, the metal frame of the filter is grounded, providing effective filtering of the RFI spectrum.

INSTRUMENT*	PART NUMBER	PRICE
Type 321A	378-0577-00	$12.00
Type 422, 491	378-0571-00	12.00
Type 453, 454	378-0573-00	12.00
Type 502A, 503, 504, 515A, 516, 524AD, 526, 661; 530, 540, 550, 580-Series, 565	378-0572-00	15.00
Type 529, 561A, 564, 567, 568	378-0575-00	15.00
Type 647A	378-0574-00	15.00

*For both cabinet and rack-mount instruments.

CATHODE-RAY TUBE LIGHT FILTERS



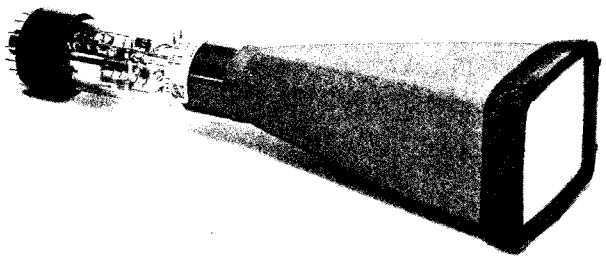
INSTRUMENT*	FIG	COLOR	PART NUMBER	PRICE
Type 310A, 317, RM17, 360	A	Smoke gray†	378-0550-00	$1.35
		Green	378-0551-00	1.35
		Blue	378-0552-00	1.35
		Amber	378-0553-00	1.35
Type 321A	B	Smoke gray†	378-0547-00	1.15
		Green	378-0554-00	1.15
		Blue	378-0555-00	1.15
		Amber	378-0556-00	1.15
Type 422, 491	C	Smoke gray†	378-0549-00	.90
		Green	378-0557-00	.90
		Blue	378-0558-00	.90
		Amber	378-0559-00	.90
Type 453, 454	D	Smoke gray†	378-0576-00	.90
		Green	378-0576-03	.90
		Blue	378-0576-02	.90
		Amber	378-0576-01	.90
Type 502A, 503, 504, 515A, 516, 524AD, 526, 530-, 540-, 550-Series, 565, 580-Series, 661	E	Smoke gray†	378-0567-00	1.60
		Green	378-0568-00	1.60
		Blue	378-0569-00	1.60
		Amber	378-0570-00	1.60
Type 529, 561A, 567, 568	F	Smoke gray†	378-0560-00	1.35
		Green	378-0561-00	1.35
		Blue	378-0562-00	1.35
		Amber	378-0563-00	1.35
Type 647A	G	Smoke gray†	378-0548-00	1.15
		Green	378-0564-00	1.15
		Blue	378-0565-00	1.15
		Amber	378-0566-00	1.15

*For both cabinet and rack-mount instruments unless rack-mount version is listed.

†Standard filter supplied with instrument.

REPLACEMENT CATHODE-RAY TUBES

Replacement CRT's listed are for CURRENT PRODUCTION instruments only. Phosphor types other than indicated are available on special order. (See page 15 for phosphor descriptions). Direct-replacement CRT's for all earlier instruments not listed are also available. Consult your Tektronix Field Engineer for particulars.



Instrument†	Phosphor	Graticule Used	Notes	Part Number	Price
310A, 360	P1 P2* P7 P11 P31*	External	310A: all SN's 360: SN 2577-up P31 is Standard Phosphor for 310A; P2 for 360	154-0362-00 154-0363-00 154-0364-00 154-0365-00 154-0366-00	$ 45.00 45.00 45.00 45.00 45.00
317	P1 P2 P7 P11 P31*	External	For all Serial Numbers	154-0216-00 154-0196-00 154-0217-00 154-0218-00 154-0346-00	75.00 75.00 75.00 75.00 75.00
321A	P2 P7 P11 P31*	External	For all Serial Numbers	154-0442-00 154-0443-00 154-0444-00 154-0433-00	85.00 85.00 85.00 85.00
422	P1 P2 P7 P11 P31*	Internal	For SN 1890 and above only	154-0466-06 154-0466-07 154-0466-08 154-0466-09 154-0466-05	140.00 140.00 140.00 140.00 140.00
453	P1 P2 P7 P11 P31*	Internal	For all Serial Numbers	154-0492-00 154-0492-01 154-0492-02 154-0492-03 154-0492-04	175.00 175.00 175.00 175.00 175.00
454	P1 P2 P7 P11 P31*	Internal	For all Serial Numbers	154-0505-01 154-0505-02 154-0505-03 154-0505-04 154-0505-00	190.00 190.00 190.00 190.00 190.00
491	P7*	Internal	For all Serial Numbers	154-0502-00	95.00
502A	P1 P2* P7 P11 P31	External	For all Serial Numbers	154-0245-00 154-0246-00 154-0247-00 154-0248-00 154-0348-00	125.00 125.00 125.00 125.00 125.00
503, 504	P1 P2* P7 P11 P31	External	For all Serial Numbers	154-0264-00 154-0265-00 154-0266-00 154-0267-00 154-0341-00	60.00 60.00 60.00 60.00 60.00
515A, 516	P1 P2 P7 P11 P31*	External	For all Serial Numbers	154-0125-00 154-0120-00 154-0126-00 154-0127-00 154-0344-00	60.00 60.00 60.00 60.00 60.00
519	P11*	External	For SN 244 and above only	154-0308-00	1000.00
524AD	P1* P11	External	For all Serial Numbers	154-0068-01 154-0070-01	40.00 40.00
526	P31*	External	For all Serial Numbers	154-0289-01	75.00
529	P1 P2 P7 P11 P31*	External	For all Serial Numbers	154-0469-00 154-0470-00 154-0471-00 154-0472-00 154-0473-00	60.00 60.00 60.00 60.00 60.00
531A, 533A 535A	P1 P2* P7 P11 P31	External	For all Serial Numbers	154-0178-00 154-0165-00 154-0179-00 154-0180-00 154-0350-00	75.00 75.00 75.00 75.00 75.00
536	P1 P2 P7 P11 P31*	External	For all Serial Numbers	154-0140-00 154-0133-00 154-0135-00 154-0136-00 154-0351-00	75.00 75.00 75.00 75.00 75.00
543B, 544, 545B, 546, 547	P2 P7 P11 P31*	Internal	543B: 547-up RM543B: 140-up 544: 320-up RM544: 120-up 545B: 2188-up RM545B: 410-up 546: 450-up RM546: 170-up 547: 2070-up RM547: 250-up	154-0478-01 154-0478-02 154-0478-03 154-0478-00	120.00 120.00 120.00 120.00
549	202	External	For all Serial Numbers	154-0498-00	450.00
551	P1 P2* P7 P11 P31	External	For SN 2032 and above only	154-0251-00 154-0252-00 154-0254-00 154-0255-00 154-0352-00	180.00 180.00 180.00 180.00 180.00
555	P2* P7 P11 P31	Internal	For SN 10,410 and above only	154-0476-00 154-0476-01 154-0476-02 154-0476-03	245.00 245.00 245.00 245.00
556	P1 P2 P7 P11 P31*	Internal	For all Serial Numbers	154-0500-01 154-0500-02 154-0500-03 154-0500-04 154-0500-00	245.00 245.00 245.00 245.00 245.00
561A, 567, 568	P2* P7 P11 P31*	Internal	561A: 12696-up RM561A: 6886-up 567: 1999-up RM567: 2000-up P31 is Standard Phosphor for 561A; P2 for 567, 568	154-0454-00 154-0455-00 154-0456-00 154-0449-00	80.00 80.00 80.00 80.00
564	200 201	External	Optimum stored Brightness Optimum Writing Rate	154-0410-00 154-0418-00	300.00 300.00

†Both Cabinet and Rackmount versions unless Rackmount is listed.
*Standard Phosphor shipped with the instrument initially.

REPLACEMENT CATHODE-RAY TUBES

REPLACEMENT GRATICULES

Instrument†	Phosphor	Graticule Used	Notes	Part Number	Price
565	P2* P7 P11 P31	Internal	565: SN 1370-up RM565: SN 1279-up	154-0477-00 154-0477-01 154-0477-02 154-0477-03	195.00 195.00 195.00 195.00
575	P1 P2 P7 P11 P31*	External	SN 1352-up	154-0093-00 154-0097-00 154-0102-00 154-0103-00 154-0343-00	60.00 60.00 60.00 60.00 60.00
581A, 585A	P2 P11 P31*	Internal	581A: SN 5390-up 585A: SN 10,205-up RM585A: 1171-up	154-0479-01 154-0479-02 154-0479-00	195.00 195.00 195.00
647A	P11 P31*	Internal	For all Serial Numbers	154-0434-00 154-0448-00	270.00 270.00
661	P1 P2* P7 P11 P31	External	For SN 310 and above only	154-0264-00 154-0265-00 154-0266-00 154-0267-00 154-0341-00	60.00 60.00 60.00 60.00 60.00

† Both Cabinet and Rackmount versions unless Rackmount is listed.
* Standard Phosphor shipped with the instrument initially.

REPLACEMENT GRATICULES

INSTRUMENT TYPE*	DIVISION	GRATICULE RULING VERTICAL	GRATICULE RULING HORIZONTAL	PART NUMBER	PRICE
310A, 360	1/4"	8	10	331-0027-00	$3.00
317	1/4"	8	10	331-0095-00 (adjustable) 331-0042-00 (not adjustable)	3.00 3.00
321A	1/4"	6	10	331-0055-00	3.00
502A	1 cm	10	10	331-0047-00	4.00
503, 504, 661	1 cm	8	10	331-0056-00	4.00
515A, 516, 531A 533A, 535A, 549	1 cm	6	10	331-0037-00 (adjustable) 331-0016-00 (not adjustable)	4.00 4.00
519	1 cm	2	6	331-0065-00	9.50
524AD	1 cm	6	10	331-0006-00	4.00
524AD	1/8" x 1 cm	17	10	331-0009-00	4.50
524AD	Color TV Bar Dimensions			331-0040-00	4.50
526	Marked in Degrees for Color TV Vector Analysis			331-0104-00	9.50
529	7 cm, composite —50 to +110 IEEE 50 to +120 IEEE and 0 to 100 Modulation non-composite IEEE 7 cm, HAD, sine²; 2%, 4% K Factor; 0.125, 0.250 μs HAD			331-0156-01 331-0157-00 331-0077-01 331-0161-00	4.50 4.50 4.50 4.50
536	For Phase Angle Measurements			331-0057-00	4.50
536, 575	5/16"	10	10	331-0028-00	4.00
551, 555	1 cm	6	10	331-0045-00	4.00
564	1 cm	8	10	331-0097-00	4.00

*For both cabinet and rack-mount instruments.

Shipping Weights and Volumes

Type	Net Weight		Domestic Pack			Export Pack		
			Weight		Volume	Weight		Volume
	lb	Kg	lb	Kg	Cu/ft	lb	Kg	Cu/ft
B	4	1.8	7	3.2	0.9	11	5.0	1.5
CA	4 3/4	2.2	8	3.6	0.9	12	5.5	1.5
C-12	12 1/4	5.6	16	7.3	2.1	33	15.0	4.8
C-27	10 1/2	4.8	14	6.4	2.1	36	16.4	4.8
C-30	4 3/4	2.2	8	3.6	0.9	14	6.4	2.1
C-40	8 1/2	3.8	13	5.9	0.9	22	10.0	2.1
D	4 1/2	2.0	7	3.2	0.9	11	5.0	1.5
E	4 1/4	1.9	7	3.2	0.9	11	5.0	1.5
FM122	4 3/4	2.2	9	4.1	0.8	13	5.9	1.5
FM125	14 1/2	6.6	21	9.6	1.3	40	18.2	4.8
G	4 1/4	1.9	7	3.2	0.9	12	5.5	1.5
H	3 3/4	1.7	7	3.2	0.9	11	5.0	1.5
K	3 1/2	1.6	6	2.7	0.9	11	5.0	1.5
L	4 1/4	1.9	7	3.2	0.9	12	5.5	1.5
M	5 1/4	2.4	9	4.1	0.9	13	5.9	1.5
O	5 1/2	2.5	10	4.5	0.9	14	6.4	1.5
Q	5 1/4	2.4	9	4.1	0.9	14	6.4	1.5
RM15	57	25.8	76	34.6	5.2	96	43.6	9.9
RM17	36 1/2	16.6	65	29.5	5.2	89	40.5	9.9
RM31A	75 1/2	34.3	99	45.0	6.7	122	55.5	9.9
RM35A	78 1/4	35.6	104	47.3	6.7	125	56.8	9.9
RM122	4 3/4	2.2	11	5.0	1.9	18	8.2	3.1
RM125	16 1/2	7.5	28	12.7	3.5	40	18.2	5.6
RM502A	58	26.4	97	44.1	6.7	117	53.2	9.9
RM503	28	12.7	51	23.2	5.2	72	32.7	9.9
RM504	25 1/2	11.6	49	22.3	5.2	69	31.4	9.9
RM529	30 1/2	13.9	59	26.8	5.2	81	36.8	9.9
RM543B	81	36.8	106	48.2	6.7	130	59.1	9.9
RM544	82 1/4	37.4	106	48.2	6.7	130	59.1	9.9
RM545B	85	38.6	111	50.5	6.7	130	59.1	9.9
RM546	85 1/2	38.9	112	51.0	6.7	136	61.8	9.9
RM547	86 1/4	39.2	114	51.8	6.7	137	62.3	9.9
RM561A	32 1/4	14.7	55	25.0	5.2	74	33.6	9.9
RM564	33 3/4	15.3	57	26.0	5.2	79	35.9	9.9
RM565	68	30.9	104	47.3	6.7	124	56.4	9.9
RM567	50	22.7	85	38.6	6.7	106	48.2	9.9
RM585A	83 1/2	38.0	108	49.1	6.7	131	59.5	9.9
R116	25 3/4	11.7	61	27.7	5.2	86	39.1	9.9
R283	4 3/4	2.2	12	5.5		18	8.2	
R293	20 3/4	9.4	55	25.0	5.2	86	39.1	9.9
R422	23 1/4	10.6	50	22.7	5.2			9.9
R4221503			72	32.7	5.2			9.9
R422150E	23 1/4	10.6	50	22.7	5.2			9.9
R453	32 1/4	14.7	63	28.6	5.2			9.9
R454	32 1/4	14.7	63	28.6	5.2			9.9
R491	41	18.6	72	32.7	5.2			9.9
R556	87 3/4	39.9	151	68.6	10.3	162	73.6	11.2
R647A	50	22.2	73	33.2	5.2	96	43.6	9.9
T	4 3/4	2.2	8	3.6	0.9	12	5.5	1.5
W	5	2.3	8	3.6	0.9	12	5.5	1.5
Z	5 3/4	2.6	9	4.1	0.9	13	5.9	1.5
1A1	5 3/4	2.6	11	5.0	0.9	14	6.4	1.5
1A2	4 1/2	2.0	8	3.6	0.9	14	6.4	1.5
1A4	6 1/2	3.1	10	4.5	0.9	16	7.3	1.5
1A5	5	2.3	7	3.2	0.9	13	5.9	1.5
1A6	4 1/4	1.9	8	3.6	0.9	14	6.4	1.5
1A7	4 3/4	2.1	9	4.1	0.9	13	5.9	1.5
1L5	6	2.7	10	4.5	1.2	18	8.2	2.1
1L10	6	2.7	11	5.0	1.2	18	8.2	2.1
1L20	7 1/2	3.4	14	6.4	1.2	20	9.1	2.1

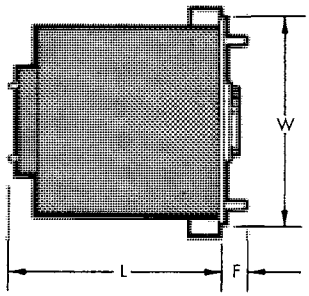
Type	Net Weight		Domestic Pack			Export Pack		
			Weight		Volume	Weight		Volume
	lb	Kg	lb	Kg	Cu/ft	lb	Kg	Cu/ft
1L30	7 1/2	3.4	14	6.4	1.2	20	9.1	2.1
1S1	7 3/4	3.5	17	7.7	1.9	25	11.4	3.1
1S2	7 1/2	3.4	13	5.9	1.9	21	9.5	3.1
2A60	3	1.4	6	2.7	1.0	10	4.5	1.7
2A61	5	2.3	9	4.1	1.0	12	5.5	1.7
2A63	3 3/4	1.7	7	3.2	1.0	11	5.0	1.7
2B67	4 1/4	1.9	7	3.2	1.0	11	5.0	1.7
3A1	5	2.3	9	4.1	1.0	13	5.9	1.7
3A2	5 1/4	2.4	9	4.1	1.0	13	5.9	1.7
3A3	5 3/4	2.6	10	4.5	1.0	14	6.4	1.7
3A5	5 1/4	2.4	11	5.0	1.0	14	6.4	1.7
3A6	5 3/4	2.6	9	4.1	1.0	13	5.9	1.7
3A7	5 1/4	2.4	9	4.1	1.0	14	6.4	1.7
3A72	5	2.3	8	3.6	1.0	13	5.9	1.7
3A74	6 1/4	2.8	10	4.5	1.0	14	6.4	1.7
3A75	3 1/2	1.6	6	2.7	1.0	11	5.0	1.7
3A8	4 1/2	2.0	9	4.1	1.0	13	5.9	1.7
3B1	5	2.3	9	4.1	1.0	13	5.9	1.7
3B2	5	2.3	8	3.6	1.0	13	5.9	1.7
3B3	5 1/4	2.4	9	4.1	1.0	13	5.9	1.7
3B4	4 1/2	2.0	7	3.2	1.0	13	5.9	1.7
3B5	5	2.3	11	5.0	1.0	14	6.4	1.7
3C66	5	2.3	9	4.1	1.0	14	6.4	1.7
3L5	5 3/4	2.6	8	3.6	1.0	12	5.5	1.7
3L10	6 1/4	2.8	10	4.5	1.2	17	7.7	2.1
3S3	6 3/4	3.1	13	5.9	1.0	17	7.7	1.7
3S76	7 3/4	3.5	13	5.9	1.0	17	7.7	1.7
3T2	6 1/2	3.0	11	5.0	1.0	17	7.7	1.7
3T4	5 3/4	2.6	11	5.0	1.0	16	7.3	1.7
3T77A	5 3/4	2.6	11	5.0	1.0	15	6.8	1.7
4S1	15 1/4	6.9	23	10.5	1.9	30	13.6	3.1
4S2A	9 1/4	4.2	17	7.7	1.9	24	10.9	3.1
4S3	9 3/4	4.4	17	7.7	1.9	24	10.9	3.1
5T3	6 3/4	3.1	10	4.5	1.0	16	7.3	1.7
6R1A	14 3/4	6.7	25	11.4	2.4	31	14.1	3.6
10A1	4 3/4	2.2	9	4.1	1.0	13	5.9	1.7
10A2A	5 1/4	2.4	9	4.1	1.0	13	5.9	1.7
11B1	4 3/4	2.2	8	3.6	1.0	13	5.9	1.7
11B2A	6 1/2	3.0	10	4.5	1.0	14	6.4	1.7
21A	4	1.8	7	3.2	1.0	11	5.0	1.7
22A	4	1.8	7	3.2	1.0	11	5.0	1.7
81	4	1.8	7	3.2	1.0	11	5.0	1.7
82	5	2.3	10	4.5	0.9	14	6.4	1.5
86	3 1/2	1.6	8	3.6	0.9	12	5.5	1.5
106	15	6.8	21	9.6	1.3	29	13.2	3.1
109	8 1/4	3.8	17	7.7	1.3	28	12.7	3.1
111	9	4.1	14	6.4	1.2	20	9.1	2.1
113	44 3/4	20.3	60	27.3	4.7	75	34.1	6.8
114	9 1/4	4.2	13	5.9	1.3	23	10.5	2.5
122	4 1/4	1.9	9	4.1	0.8	13	5.9	1.5
125	14 3/4	6.7	21	9.6	1.3	40	18.2	4.8
127	37 1/4	16.9	71	32.3	5.4	92	41.9	9.9
129	49 1/2	22.5	83	37.8	6.7	107	48.6	9.9
130	9	4.1	14	6.4	1.2	21	9.5	2.1
132	21	9.5	26	11.8	1.9	33	15.0	3.1
133	22	10.0	26	11.8	1.9	34	15.5	3.1
160A	20	9.1	26	11.8	1.3	44	20.0	4.8
161	3 1/2	1.6	8	3.6	0.8	14	6.4	1.5
162	3 1/2	1.6	8	3.6	0.8	14	6.4	1.5
163	3 1/2	1.6	8	3.6	0.8	14	6.4	1.5

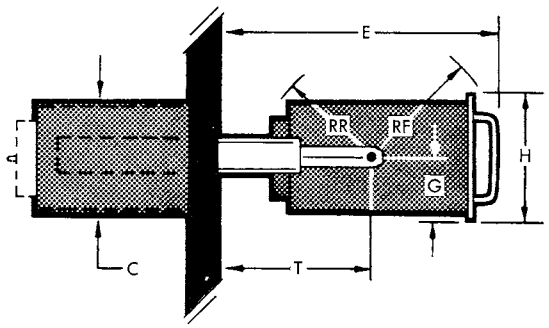
Shipping Weights and Volumes

Type	Net Weight		Domestic Pack			Export Pack		
			Weight		Volume	Weight		Volume
	lb	Kg	lb	Kg	Cu/ft	lb	Kg	Cu/ft
175	83½	38.0	117	53.2	4.9	139	63.2	9.9
184	13	5.9	19	8.7	1.3	30	13.6	3.1
191	14	6.4	20	9.1	1.3	31	14.1	3.1
200-1	19	8.6						
200-2	19	8.6						
201-1	37	16.9	49	22.3	13.2	62	28.2	14.5
201-2	38½	17.5	50	22.7	13.2	68	30.9	14.5
202-1	40¾	18.5	53	24.1	13.2	68	30.9	14.5
202-2	42¾	19.4	55	25.0	13.2	69	31.4	14.5
205-1	45¾	20.8	60	27.3	18.4	78	35.5	20.2
205-2	48¾	22.2			18.4			20.2
205-3	48¾	22.2			18.4			20.2
261	13¼	6.0	40	18.2	5.0	62	28.2	9.9
262	21¾	9.9	57	26.0	5.0	80	36.4	9.9
263	5½	2.5	12	5.5	1.3	22	10.0	3.1
283	3¾	1.7	9	4.1	0.9	13	5.9	1.5
292	6½	3.0	11	5.0	0.9	16	7.3	1.5
310A	23½	10.7	30	13.6	1.9	38	17.3	3.1
317	33	15.0	46	21.0	2.4	57	25.9	3.6
321A w/batt.	17¼	7.8	26	11.8	1.9			
wo/batt.	14¼	6.5	22	10.0	1.9	33	15.0	3.1
360	9¾	4.4	16	7.3	1.3	26	11.8	3.6
422 w/cover	21	9.5	30	13.6	3.7	44	20.0	5.5
422125B w/o batt.	23	10.5	32	14.6	3.7	46	20.9	5.5
422125B w/batt.	30	13.7	42	19.1	3.7			
453 w/cover	30	13.7	42	19.1	3.7	54	24.6	5.5
454 w/cover	30	13.6	42	19.1	3.7	54	24.6	5.5
491 w/cover	38	17.3	50	22.7	3.7	62	28.2	5.5
502A	50¼	22.8	62	28.2	4.1	84	38.2	7.5
503	29½	13.4	38	17.3	3.5	51	23.2	5.6
504	27½	12.5	36	16.4	3.5	50	22.7	5.6
507	52¼	23.8	68	30.9	5.4	88	40.0	7.5
507 P.S.	37¼	16.9	45	20.5	3.5	59	26.8	5.6

Type	Net Weight		Domestic Pack			Export Pack		
			Weight		Volume	Weight		Volume
	lb	Kg	lb	Kg	Cu/ft	lb	Kg	Cu/ft.
515A	42	19.1	51	23.2	3.5	64	29.1	5.6
516	43½	19.8	53	24.1	3.5	66	30.0	5.6
519 (Inc. Access.)	97	44.1	130	59.1	7.8	149	67.7	10.4
524AD	60½	27.5	81	36.8	5.4	99	45.0	7.5
526	44½	20.2	74	33.6	5.2	95	43.2	9.9
529	25½	11.6	34	15.5	2.4	47	21.4	5.6
531A	56½	25.7	75	34.1	5.4	95	43.2	7.5
533A	57½	26.2	76	34.6	5.4	95	43.2	7.5
535A	61¼	27.9	80	36.4	5.4	100	45.5	7.5
536	56¾	25.8	73	33.2	5.4	93	42.3	7.5
543B	60¼	27.4	78	35.5	5.4	97	44.1	7.5
544	61	27.8	80	36.4	5.4	97	44.1	7.5
545B	64	29.1	82	37.3	5.4	101	45.9	7.5
546	65¼	29.7	84	38.2	5.4	102	46.4	7.5
547	65¾	29.9	85	38.6	5.4	103	46.8	7.5
549	67¾	30.8	89	40.5	5.4	114	51.8	7.5
551	51¾	23.8	71	32.3	5.4	92	41.8	7.5
551 P.S.	43½	19.8	52	23.6	3.5	71	32.3	5.6
555	66	30.0	87	39.6	6.4	111	50.5	9.2
555 P.S.	52	23.6	61	27.8	3.5	71	32.3	5.6
556	83	37.7	135	61.5	10.3	148	67.7	11.2
561A	32	14.6	40	18.2	3.5	50	22.7	5.6
564	33¼	15.2	43	19.5	3.5	54	24.6	5.6
565	67	30.5	95	43.2	6.7	117	53.2	9.9
567	48¾	22.2	76	34.6	6.7	97	44.1	9.9
575	66¼	30.1	84	38.2	5.4	102	46.4	7.5
575122C	70	31.8	89	40.5	5.4	106	48.1	7.5
581A	63	28.6	81	36.8	5.4	99	45.0	7.5
585A	67¼	30.6	85	38.6	5.4	104	47.3	7.5
647A	40	18.2	49	22.3	3.5	62	28.2	5.6
661	48½	21.9	66	30.0	5.4	84	38.2	7.5
1121	18¼	8.3	23	10.5	1.9	31	14.1	3.1

weights are approximate and may vary depending upon packing materials used.





RACK MOUNT INSTRUMENTS

EXCLUSIVE OF PLUG-IN UNITS AND PROBES

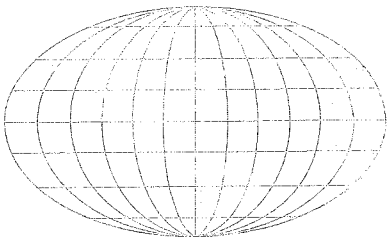
Symbol	Description	Definition
H	Height	Height of front panel.
W	Width	Width of front panel.
L	Length	Rack front to rearmost permanent fixture, excluding cables.
F	Forward Clearance	Back of front panel to foremost protrusion.
G	Vertical Axis	Bottom of front panel to horizontal plane of rotation.
E	Extended Inst.	Maximum forward clearance with instrument out and horizontal.
RF	Radius — front	Front radius of rotation.
RR	Radius — rear	Rear radius of rotation.
T	Track	Rack front to pivot point.
C	Cabinet	Cabinet height.

These instruments mount with sliding tracks in a cabinet that mounts to a standard 19" wide rack.

These instruments mount with sliding tracks to a standard 19" wide rack. Rear support for sliding tracks is required, such as an enclosed rack.

These instruments bolt directly to a standard 19" wide rack. They can be ordered at additional cost, with tilt-lock, sliding tracks. Rear support for tracks is required.

TYPE	MOUNTING DIMENSIONS																	
	H		L		F		G		E		RF		RR		T		C	
	in	cm	in	cm	in	cm	in	cm	in	cm	in	cm	in	cm	in	cm	in	cm
RM15	8 3/4	22.2	22 11/16	57.6	1 3/4	4.5	2 3/8	6.1	29 11/16	75.4	13 11/16	34.8	12 3/8	31.4	16 1/2	41.9	8 1/2	21.6
RM17	7	17.8	18 1/8	46.0	1 3/4	4.5	2 7/8	7.3	21 3/16	53.8	12 7/16	31.8	8 5/16	21.1	9 1/8	23.2	6 13/16	17.3
RM31A, RM35A	14	35.6	22 11/16	57.6	2	5.1	6 15/16	17.8	29 7/16	74.7	14 1/16	35.7	12 7/16	31.9	16 1/4	41.3	13 13/16	35.1
RM122	5 1/4	13.3	6	15.2	15/16	2.4											4	10.2
RM125	5 1/4	13.3	13 9/16	34.5	7/8	2.2											4 1/16	10.3
RM502A	12 1/4	31.1	22 3/4	57.8	1 13/16	4.6	5/8	14.9	28 1/4	71.7	15 5/8	39.7	10 5/16	26.2	13 1/8	33.2	11 1/4	28.6
RM503, RM504	7	17.8	17	43.2	1 3/4	4.5	3 1/2	8.9	22 1/16	57.6	11 5/16	30.3	7 3/4	19.7	11 1/8	28.3	6 7/8	17.5
RM529	5 1/4	13.3	18 1/4	46.4	1 3/4	4.5	2 3/8	6.1	21 1/4	54.0	12 1/8	30.8	8 7/16	21.5	9 3/8	23.8	5 1/8	13.1
RM543B, RM544 RM545B, RM546 RM547	14	35.6	22 11/16	57.7	1 15/16	5.0	6 13/16	17.3	28 3/4	33.0	13 1/2	34.3	12 15/16	32.9	16 1/4	41.3	13 15/16	35.4
RM561A RM564	7	17.8	18 7/16	46.9	1 3/4	4.5	2 3/8	6.1	24 5/16	60.8	13 3/4	34.9	7 7/8	20.0	11	27.9	6 3/4	17.2
	7	17.8	18 7/16	46.9	1 3/4	4.5	2 3/8	6.1	24 5/16	60.8	13 3/4	34.9	7 7/8	20.0	11	27.9	6 3/4	17.2
RM565 RM567	12 1/4	31.1	22 3/16	56.4	1 13/16	4.6	2 3/8	6.1	30 1/2	77.4	15 3/16	39.1	13 1/16	33.2	16 5/8	42.2	12 3/16	31.0
	12 1/4	31.1	22 3/16	56.4	1 13/16	4.6	7 5/8	19.4	31 9/16	80.1	16 1/8	41.0	11 1/16	28.3	16 5/8	42.2	14 15/16	38.0
RM585A	14	35.6	22 11/16	57.7	2	5.1	6 15/16	17.8	29 7/16	74.7	14 1/16	35.7	12 7/16	31.6	16 1/4	41.3	13 13/16	35.1
R116	5 1/4	13.3	17 9/16	44.6	1 5/8	4.1	1 3/4	4.5	25 3/4	65.4	11 9/16	29.4	8 1/4	21.0	14 5/8	37.2	5 1/16	12.8
R293	3 1/2	8.8	16 5/16	41.4	1 7/8	4.8	1 3/4	4.5	22 3/16	56.4	9 5/8	24.5	8 3/16	20.8	12 5/8	32.1	3 3/8	8.6
R422	7	17.8	12 1/2	31.8	1 13/16	4.6	3 1/2	8.9	16 5/8	42.3							6 3/4	17.2
R453	7	17.8	17 3/8	44.1	1 13/16	4.6	3 1/2	8.9	20 11/16	52.6	11 5/8	29.5	7 7/8	20.0	9 5/16	23.7	6 3/4	17.2
R454	7	17.8	17 3/8	44.1	1 13/16	4.6	3 1/2	8.9	20 11/16	52.6	11 5/8	29.5	7 7/8	20.0	9 5/16	23.7	6 3/4	17.2
R556	14	35.6	22 13/16	57.9	1 3/4	4.5	8 1/8	20.7	30 5/16	77.0	13 1/8	33.3	14 1/4	36.2	18 1/2	57.0	13 7/8	35.3
R647A	7	17.8	19	48.3	1 11/16	4.3	2 7/16	6.2	27 7/8	70.9	13 5/8	34.5	8 1/16	22.1	16 3/8	41.6	13 7/8	35.2
127	8 3/4	22.2	21 5/8	55.0	1 3/4	4.5	2 3/8	6.1	28 11/16	72.9	12 3/4	32.4	12 1/4	31.1	16 1/2	41.9	8 1/2	21.6
129	10 1/2	26.6	21 5/8	55.0	2	5.1	1 3/4	4.5	29 1/2	74.9	17 5/8	44.8	11 1/16	28.3	13 1/4	33.7	10 1/2	26.8
261	5 1/4	13.3	16 5/8	42.3	1 5/8	4.1	1 1/2	3.8	20 1/16	51.0							4 1/4	10.8
262	5 1/4	13.3	17 9/16	44.6	1 5/8	4.1	1 3/4	4.5	20 3/4	52.7	11 9/16	29.4	8 1/4	21.0	14 5/8	37.2	5 1/16	12.9
526	8 3/4	22.2	18	45.8	1 3/4	4.5	2 3/8	6.1	23 9/16	59.9	11 13/16	30.0	9 15/16	25.3	12 5/8	32.1	8 7/16	21.5
016-0086-00	5 1/4	13.3	17 15/16	45.6	3/8	1.0											5 3/16	13.8
437-0031-00	8 3/4	22.2	9 11/16	24.6	1/4	0.7											7 1/16	18.0
437-0071-00	6 11/16	17.0	13 3/8	34.0	1 15/16	5.0											6 9/16	16.8



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 317.

TERMS OF SALE

Tektronix' standard terms of sale are NET 30 DAYS. Other credit terms are available for a customer's particular requirements. Credit accommodations and terms of sale are arranged through your Tektronix Field Engineer.

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 Service 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 adjustments or repair of your instruments at a nearby Service 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

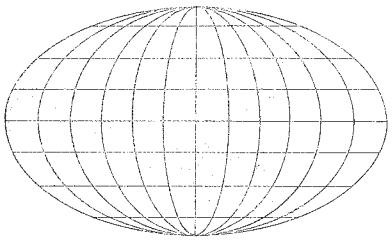
All Tektronix instruments are warranted against defective materials and workmanship for one year. Tektronix transformers, manufactured in our own plant, are warranted for the life of the instrument.

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: (503) 644-0161 TWX—503-291-6805 Telex: 036-636 Cable: TEKTRONIX



GENERAL AND ORDERING INFORMATION

CUSTOMERS OUTSIDE THE UNITED STATES

To provide you with personal assistance in ordering as well as servicing Tektronix instruments, we have established Field Engineering Offices and technically qualified Tektronix distributors in many countries throughout the world. The Tektronix office or distributor in your country will be pleased to help you select the instrument that best suits your requirements in performance, and provide you with prompt ordering service.

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.

COUNTRIES WITH TEKTRONIX FIELD ENGINEERING OFFICES

AUSTRALIA
CANADA
SWITZERLAND
UNITED KINGDOM

Listed on page 318

The Tektronix Field Engineering office in your country will provide you with quotations and accept your orders. Normally, prices quoted are FOB your plant.

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.

PLEASE DO NOT RETURN INSTRUMENTS OR PARTS BEFORE RECEIVING DIRECTIONS.

COUNTRIES WITH TEKTRONIX DISTRIBUTORS

Listed on page 319

Your Tektronix distributor will provide you with quotations FOB your country and accept your orders.

COUNTRIES WITH NO TEKTRONIX DISTRIBUTOR OR TEKTRONIX FIELD ENGINEERING OFFICE

Please address your inquiries and orders to:

Tektronix, Inc.
International Marketing Dept.
P. O. Box 500
Beaverton, Oregon, USA 97005

INFORMATION AND QUOTATIONS

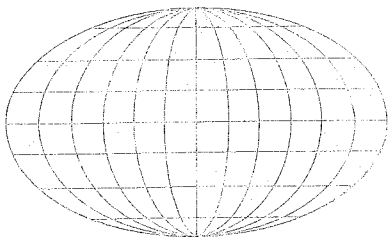
Regional Export Managers will be pleased to provide you with information on Tektronix instruments and answer your technical questions. A pro forma invoice will be issued, if requested, indicating price and sales conditions. When our pro forma invoice or purchase order acknowledgement is issued, we will 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 convertibility, 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. Extended payment terms will be considered, if requested, with approval subject to the conditions listed above.

SHIPMENTS

Unless otherwise requested, shipments will be made by the most economical method.



UNITED STATES FIELD ENGINEERING OFFICES

TEKTRONIX, INC.

Tektronix, Inc., an Oregon Corporation, Home Office & Factory, P. O. Box 500, Beaverton, Oregon 97005
Telephone: (503) 644-0161 TWX—503-291-6805 Telex: 036-691 Cable: TEKTRONIX

FIELD ENGINEERING OFFICES

ALABAMA
Huntsville... 3322 South Memorial Parkway, Suite 27, Huntsville 35801
Telex 05-9422 ... Telephone: (205)881-2912

ARIZONA
Phoenix... 7045 E. Camelback Road, Scottsdale 85251...Telex 066-701 ..... Telephone: (602)946-4273
Tucson Area: Enterprise 383

CALIFORNIA
San Diego... Suite 107, 6150 Mission Gorge Road, San Diego 92120
Telex 069-525 ... Telephone: (714)283-6225

Los Angeles Area
• *Orange*... 1722 E. Rose Avenue, Orange 92667...Telex 6-78432 ..... Telephone: (714)633-3450
Pasadena... 1194 East Walnut Street, Pasadena 91106...TWX: 213-449-1151...Telex 06-74397
Telephone (213)449-2164
From Los Angeles telephones call: 681-0201
• *Van Nuys*... 16930 Sherman Way, Van Nuys 91406...Telex 06-74396 ..... Telephone: (213)987-2600
From Los Angeles telephones: 873-6868
Island of Oahu, Hawaii Area: ENterprise 5-700

San Francisco Bay Area
Walnut Creek... 1709 Mt. Diablo Blvd., Walnut Creek 94596...Telex 033-644 .... Telephone: (415) 935-6101
From Oakland, Berkeley, Richmond, Albany and San Leandro: 254-5353
• *Palo Alto*... 3750 Fabian Way, Palo Alto 94303...Telex 34-8411 ..... Telephone: (415)326-8500

COLORADO
Denver... 2120 South Ash Street, Denver 80222...Telex 045-662 ..... Telephone: (303)757-1249
Salt Lake Area: Zenith 381

CONNECTICUT
Stamford... 144 Morgan Street, Stamford 06905...Telex 096-5917 ..... Telephone: (203)325-3817

FLORIDA
• Orlando... Suite 185, 1010 Executive Center Drive, Orlando 32803
(also serves Puerto Rico) Telex 56-4465 ... Telephone: (305)841-2382
From The Cape Kennedy Area: 636-0343

GEORGIA
• Atlanta... Suite 106, 1680 Tullie Circle, N.E., Atlanta 30329...Telex 05-42233 .... Telephone: (404)633-0344

ILLINOIS
• Chicago... 400 Higgins Road, Park Ridge 60068...Telex 02-53374 ..... Telephone: (312)825-6666
119 East Ogden Avenue, Suite 111, Hinsdale 60521 .. Telex 02-53694 .. Telephone: (312)325-3050

INDIANA
Indianapolis... 3937 North Keystone Avenue, Indianapolis 46205...Telex 027-348
Telephone: (317)LIberty 6-2408

KANSAS
Kansas City... 5845 Horton, Suite 106, Mission 66202...Telex 04-2321 ... Telephone: (913)HEdrick 2-1003
St. Louis Area: ENterprise 6510

MARYLAND
• Baltimore... 1045 Taylor Avenue, Towson 21204...Telex 087-804 ..... Telephone: (301)825-9000
From Harrisburg, Lancaster and York Area call ENterprise 1-0631
• Rockville... 1500 East Jefferson Street, Rockville 20852...Telex 89-2337 ..... Telephone: (301)427-0700

MASSACHUSETTS
• Boston... 244 Second Avenue, Waltham 02154...Telex 094-6301 ..... Telephone: (617)894-4550

MICHIGAN
• Detroit... 27308 Southfield Road, P. O. Box 37, Lathrup Village 48075
Telex 023-400 ... Telephone: (313)358-3122

MINNESOTA
Minneapolis... Suite 115, 7515 Wayzata Boulevard, Minneapolis 55426
Telex 029-699..Telephone: (612) 545-2581

MISSOURI
St. Louis... 119 North Harvey, St. Louis 63135...Telex: 044-851 ..... Telephone: (314) JAckson 4-0900

NEW JERSEY
• Union... 400 Chestnut Street, Union 07083...Telex 01-26344 ..... Telephone: (201)688-2222

NEW MEXICO
• Albuquerque... 1258 Ortiz Drive, S.E., Albuquerque 87108...Telex 074-6421 ..... Telephone: (505)268-3373
Southern New Mexico Area: Enterprise 678

NEW YORK
Buffalo... 965 Maryvale Drive, Buffalo 14225... Telex 091-385 ..... Telephone: (716) 633-7861
• Endicott... 3214 Watson Blvd., Endwell 13763...Telex 093-319 ..... Telephone: (607)PIoneer 8-8291
• Poughkeepsie... 12 Raymond Ave., Poughkeepsie 12603...Telex 96-816 ..... Telephone: (914)471-3620
• Syracuse... East Molloy Road & Pickard Drive, P.O. Box 155, Syracuse 13211
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 07083...Telex 01-26344 .. Telephone: (201)688-2222
Hudson River Valley, Westchester County, Connecticut... 144 Morgan Street, Stamford, Connecticut 06905
Telex: 096-5917 ..... Telephone: (203)325-3817

NORTH CAROLINA
• Greensboro... 1011 Homeland Avenue, Greensboro 27405...Telex 57-4416 ..... Telephone: (919)274-4647

OHIO
Cleveland... 5562 Pearl Road, Suite 101, Cleveland 44129... Telex 098-5217 ..... Telephone: (216)884-6558
Columbus... 12 West Selby Blvd., Suite 5, Worthington 43085
Telex: WOGN 024-684 ... Telephone: (614)888-4040
Dayton... 3309 Office Park Drive, Dayton 45439...Telex 02-88225 ..... Telephone: (513)293-4175

PENNSYLVANIA
• Philadelphia... 126 Presidential Blvd. North, Bala-Cynwyd 19004...Telex 083-4218
Telephone: (215)TEnnyson 9-3111
Pittsburgh... 3834 Northern Pike, Monroeville 15146...Telex 086-761 ..... Telephone: (412)351-3345

Central Pennsylvania
North Central Area — contact our Endicott, New York Office
South Central Area — contact our Baltimore, Maryland Office

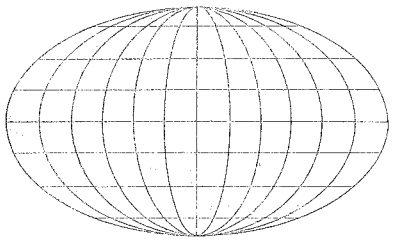
TEXAS
• Dallas... 2600 Stemmons Freeway, Suite 162, Dallas 75207...Telex 073-2217
Telephone: (214)MElrose 1-4560
Houston... 3723 Westheimer, Suite H, Houston 77027...Telex 077-494 ... Telephone: (713)NAtional 2-8141
Austin Area: ENterprise 3093
New Orleans, Louisiana Area: WX 3093
San Antonio... 8031 Broadway, San Antonio 78209...Telex: 76-7456 ..... Telephone: (512)TAylor 6-0686

VIRGINIA
Alexandria... Suite 102, 201 Lincolnia Road, Alexandria 22304...Telex 8-9406 ... Telephone: (703)751-6096
Newport News... 618C Dresden Drive, Newport News 23601...Telex 82-3409 .... Telephone: (703)595-3301

WASHINGTON
Seattle... 236 S.W. 153rd St., Seattle 98166...Telex 032-488 ..... Telephone: (206)CHerry 3-2494
From Portland, Corvallis, Eugene (Oregon): Commerce 9369
From Pullman, Richland, Spokane, Yakima: Zenith 9369

• Also Service Center

Area Code Numbers are in parenthesis preceding telephone number.



INTERNATIONAL FIELD OFFICES AND DISTRIBUTORS

TEKTRONIX INTERNATIONAL FIELD OFFICES

AUSTRALIA

Tektronix Australia Pty. Limited, 4-14 Foster Street, Sydney, N.S.W.; (mail address P. O. Box 488, Darlinghurst, N.S.W.) ... Telephone: 211-2666
Cable: TEKTRONIX AUSTRALIA
Tektronix Australia Pty. Limited, Suite 20, 67 Queen's Road, Melbourne, Victoria ..... Telephone: 51-1592
Tektronix Australia Pty. Limited, 263 Gilbert Street, Adelaide, South Australia ..... Telephone: 51-1395

CANADA

Tektronix Canada Ltd., 5050 de Sorel Street, Montreal 9, Quebec ..... Telephone: (514) 731-3761
Telex: 01-2867
Tektronix Canada Ltd., 28A Northside Road, Bells Corners, Ottawa 6, Ontario ... Telephone: (613) 828-5171
Telex: 01-3419
Tektronix Canada Ltd., 1177 Finch Avenue West, Downsview, Ontario ... Telephone: Toronto (416) 638-6404
Telex: 02-2776
Tektronix Canada Ltd., 2180 West Broadway, Vancouver, British Columbia .. Telephone: (604) 736-0265
Telex: 04-50262

SWITZERLAND

Tektronix International A.G., Alpenstrasse No. 9, 6300 Zug (P. O. Box 57, CH-6301 Zug) .....
Telex: 58408 ... Cable: TEKINTAG ... Telephone: 042 49192

UNITED KINGDOM

Tektronix U.K. Ltd., Beaverton House, Station Approach, Harpenden, Herts .....
Telex No. 25559...Cable: TEKTRONIX HARPENDEN...Telephone: Harpenden 61251

INTERNATIONAL DISTRIBUTORS

SUPPLIED AND SUPPORTED BY TEKTRONIX, INC., P.O. BOX, 500, BEAVERTON, OREGON, U.S.A. 97005
Telephone: (503)644-0161 Telex: 036-691 Cable: TEKTRONIX

ARGENTINA

Coasin S.A., Virrey del Pino 4071, Buenos Aires .. Cable: COASIN, Buenos Aires ... Telephone: 52-3185

BRASIL

Importacáo 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
Importacáo Industria E Comércio Ambriex, S.A., Av. Pacaembu, 811 São Paulo .... Telephone: 37-7611

CHILE

Pentz y Cia., Ltda., Casilla 2839, Santiago ..... Cable: PETIER Santiago .. Telephone: 63010

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

HONG KONG and MACAU

Intronics Limited, 4 Hankow Road, Suite 4A, Kowloon, Hong Kong ..... Telephone: 672141
Cable: INTRONICS Hong Kong

INDIA

Hinditron Services Private Limited, Manesha, 69/A Nepean Sea Road, Bombay 6 .....
Cable: AMIABILITY (BOMBAY)

JAPAN

Midoriya Electric Co., Ltd., 3, 2-Chome, Kyobashi, Chuo-Ku, Tokyo ..... Telephone: 561-9256
Telex: TK4531 ..... Cable: MIDRIYAELEC Tokyo

MEXICO

Fredin S.A., Melchor Ocampo No. 212-505, Mexico 5, D.F., (P. O. Box 53-958, Mexico 17, D.F.) .....
Telephone: 46-44-21, 34-88-61

NEW ZEALAND

W & K McLean, Ltd., 7 Anzac Avenue (P.O. Box 3097) Auckland ..... Telephone: 34-541
Cable: KOSFY Auckland

PAKISTAN

Pak-Land Corporation, Central Commercial Area, Iqbal Road, P.E.C.H. Society, Karachi 29
Cable: PAKLAND Pakistan ..... Telephone: 47315

SINGAPORE

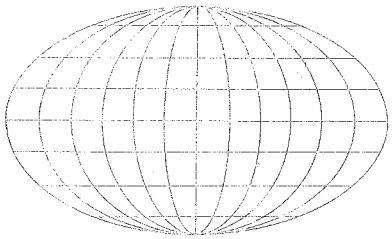
Mechanical & Combustion Engineering Co. Ltd., 9, Jalan Kilang, Redhill Industrial Estate (P.O. Box 46, Alexandra Post Office), Singapore 3 ..... Cable: MECOMB ... Telephone: 642361-3

URUGUAY

Compañia Uruguaya De Rayos X y Electromedicina S.A., Mercedes 1300, Yaguaron 1449, Montevideo .....
Cable: CURZRAY, Montevideo ..... Telephone: 8 58 29

VENEZUELA

Tecnica Nuclear de Venezuela, C.A., (Apartado Del Este 10.507) Plaza Morelos Edificio Eso, Caracas....
Cable: TECNUC Caracas ..... Telephone: 54-39-56



INTERNATIONAL DISTRIBUTORS

INTERNATIONAL DISTRIBUTORS

SUPPLIED AND SUPPORTED BY TEKTRONIX LIMITED, P.O. BOX 36, ST. PETER PORT, GUERNSEY, CHANNEL ISLANDS
Telephone: Guernsey 23411, Telex: 41193

Tektronix Limited maintains a warehouse of United States-made instruments, accessories and parts on the Island of Guernsey to quickly support these distributors in filling customer orders. Technical support of customers and distributors is also available from this facility. In addition, Tektronix has manufacturing facilities within the European Economic Community and European Free Trade Association.

ANGOLA	Equipamentos Tecnicos, Lda., Caixa Postal 6319, Luanda ..... Telephone: Luanda 6917 Cable: EQUIPAL Luanda
AUSTRIA	Inglomark Markowitsch & Co., Mariahilfer Strasse 133, Wien 15 ..... Telephone: 54-75-85-SERIE Telex: Wien 1393...Cable: INGLOMARK Wien
BELGIUM	Régulation Mesure, SPRL, 22, Rue Saint-Hubert, Bruxelles 15..... Telephone: 71.20.20 Telex: 02-21520...Cable: MEREG Bruxelles
DENMARK	Tage Olsen A.S., 1, Ronnegade, Copenhagen O ..... Telephone: (01) 29.48.00 Telex: 5788...Cable: TOCOPEN, Copenhagen
FINLAND	Into O/Y, P. O. Box 153, 11, Meritullinkatu, Helsinki ..... Telephone: 61.133 Cable: INTO, Helsinki
FRANCE	Relations Techniques Intercontinentales, S.A., 134, Avenue de Malakoff, Paris XVI ..... Telex: 25.002 ... Cable: RELATEK, Paris ... Telephone: PASsy 08-36 & PASsy 43-09
	Relations Techniques Intercontinentales, S.A., Bureau Regional de Lyon, 166, Avenue Berthelot, (69) Lyon 7° Telephone: (78) 72.00.70
	Relations Techniques Intercontinentales, S.A., Bureau Regional de Nice, 11, Avenue Valdiletta, (6) Nice Telephone: (93) 84.05.93
	Relations Techniques Intercontinentales, S.A., Bureau Regional de Toulouse, 15, rue Joseph Vie, (31) Toulouse Telephone: (61) 42.04.50
GREECE	Marios Dalleggio Representations, 2, Alopekis Street, Athens 139 ..... Telephone: 710.669 Cable: DALMAR Athens
ISRAEL	Eastronics Limited, 75 Haifa Road, (P.O. Box 21029) Tel Aviv ..... Telephone: 446060 Telex: 033-638...Cable: EASTRONIX Tel Aviv
ITALY	Silverstar Ltd., Via Dei Gracchi N20, Milano ..... Telephone: 469.6551, 2, 3, 4, 5 Cable: SILVERSTAR, Milano
	Silverstar Ltd., Via Paisiello N.30, Roma ... Cable: SILVERSTAR, Roma ... Telephone: 855.366 & 869.009
	Silverstar Ltd., Via Castelfidardo N.21, Torino ..... Telephone: 400.75 & 435.27 Cable: SILVERSTAR, Torino
LEBANON	Projects, P. O. Box 5281, Beirut ..... Cable: PROJECTS Beirut ... Telephone: 241200
The NETHERLANDS	C. N. Rood, N. V., 13, Cort van der Lindenstraat, P. O. Box 4542, Rijswijk ..... Telex: 31238 ... Cable: ROODHOLLAND G.V. ... Telephone: The Hague 98.51.53
NORWAY	Morgenstierne & Co. A/S, Wesselsgt 6, Oslo 1 ..... Telephone: 20-16-35 Telex: 1719 ... Cable: MOROF Oslo
PORTUGAL	Equipamentos de Laboratorio Lda, Rue Pedro Nunes 47, Lisboa 1 ..... Telephone: 73.34.36 & 73.34.37 Cable: EQUILAB, Lisboa
REPUBLIC OF SOUTH AFRICA	Protea Physical & Nuclear Instrumentation (Pty) Ltd., 7, Newton Street (P.O. Box 7793), Wemmer, Johannesburg ... Telex: J7337 ... Cable: MANLU ... Telephone: 838-8351
SPAIN	Carlos Rafael Marés, S.L., Valencia 333, Barcelona (9) ..... Telephone: 257.62.00 Telex: 05676 ..... Cable: SERAM Barcelona
	Carlos Rafael Marés, S.L., Gaztambide, 54-1, Madrid (15)' ..... Telex: 07332 ... Telephone: 243-08-38
SWEDEN	Erik Ferner, A.B., Snormakarvagen 35, Box 56, Bromma ..... Telephone: 08/252870 Telex: 10312 ... Cable: SCIENTRON, Stockholm
	Erik Ferner, A.B., Vastra Annebergsvagen 3H, Partille, Goteborg ..... Telephone: 031/44 41 30
TURKEY	M. Suheyl Erkman, Necatibey Cad No. 207, Galata, Istanbul ..... Telephone: 441546 Cable: INGMESUER Istanbul
WEST GERMANY	Rohde & Schwarz Vertriebs-GmbH, Hohe Strasse 160-168, Köln..... Telephone: 23-30-06 Telex: 08882917...Cable: ROHDESCHWARZ Köln
	Rohde & Schwarz Handels-GmbH, Ernst-Reuter-Platz, 10, Berlin 10 ..... Telephone: 34-05-36 Telex: 0181636...Cable: ROHDESCHWARZ Berlin
	Rohde & Schwarz Vertriebs-GmbH, Kornerstrasse 34, Hamburg .....Telephone: 27.41.41 Telex: 0213749...Cable: ROHDESCHWARZ Hamburg
	Rohde & Schwarz Vertriebs-GmbH, Kriegsstrasse 39, Karlsruhe..... Telephone: 23.97.7 Telex: 0782730 ... Cable: ROHDESCHWARZ Karlsruhe
	Rohde & Schwarz Vertriebs-GmbH, Dachauer Strasse 109, München ..... Telephone: 52.10.41 Telex: 0522953...Cable: ROHDESCHWARZVERTRIEB München

INSTRUMENT INDEX

ACCESSORY INDEX

TEKTRONIX, INC., SERVING CUSTOMERS FROM OVER 100 LOCATIONS AROUND THE WORLD