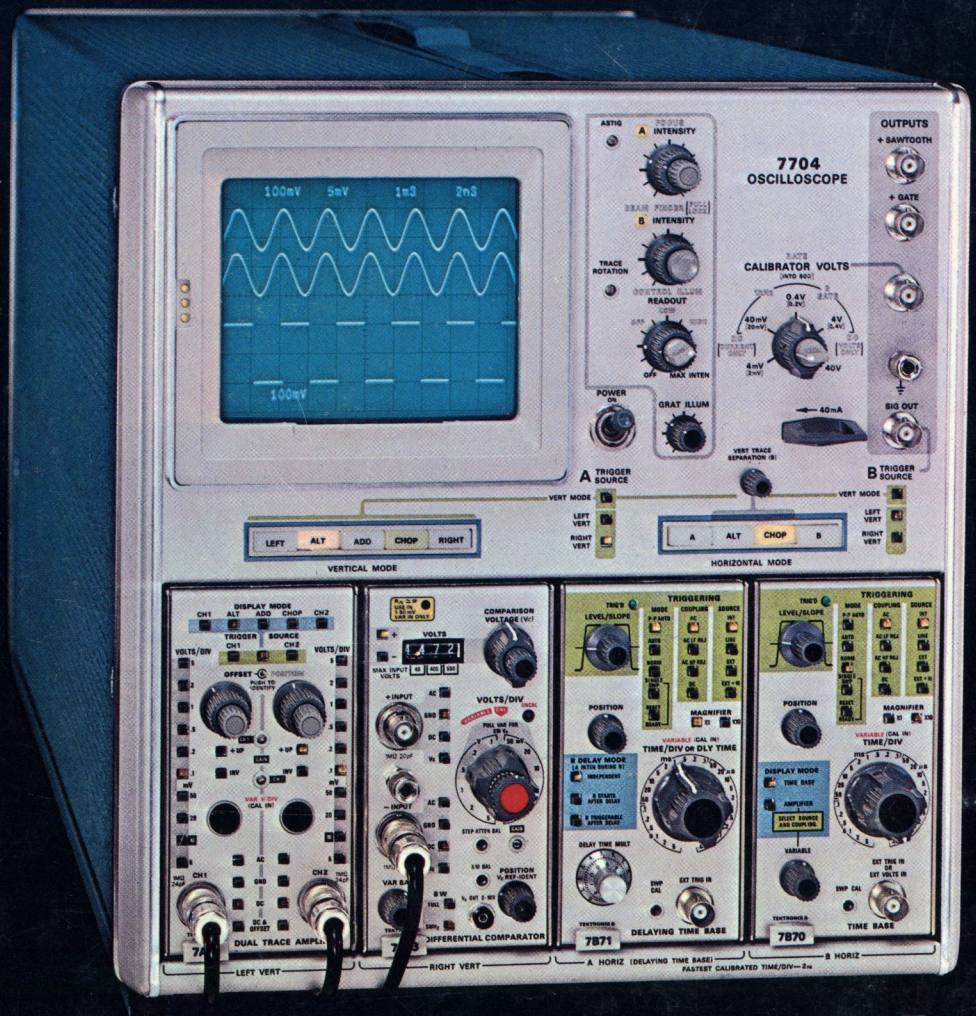
TEKTRONIX®

OSCILLOSCOPES & ASSOCIATED INSTRUMENTS

Including August, 1969 New Products Supplement



. . . Committed to Progress in Waveform Measurement

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Tektronix, Inc.
An Oregon Corporation

CORPORATE OFFICES AND PLANT LOCATED AT
Tektronix Industrial Park
14150 S.W. Karl Braun Drive, Beaverton, Oregon

Mailing Address: P.O. Box 500, Beaverton, Oregon 97005
TWX: 503-291-6805 Telex: 36-691 Cable: TEKTRONIX
Telephone: (503) 644-0161

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TO OUR CUSTOMERS

Throughout its history of product development, Tektronix has sought certain goals:

One relates to technology: To use optimum circuitry, processes and components, tailored to the instrument's intended use and otherwise limited only by the current state of the art.

The other relates to the user: To offer maximum ease of use and maintenance; reliability, and reasonable cost.

In short, we've placed a major emphasis on safeguarding the customer's investment — to be sure that he receives every bit of the performance that was designed into the instrument (and, in some cases, even more).

The Tektronix Type 535, introduced in 1953, was the first oscilloscope that used interchangeable vertical plug-in units to gain a variety of performance characteristics. Thus, for the first time, a user could obtain a very wide range of measurement without having to buy several oscilloscopes. The plug-in approach has since been widely adopted by the industry.

To insure continued maximum value to the customer, *compatibility* of design has been stressed. The result is that, from the 535 and its first four plug-in units, we have expanded to 34 plug-ins, each of which will function in any of 17 mainframes. (For example, the most recent, most advanced plug-in will work in the first 535.)

Together with increased *number* of instruments and plug-ins went widely expanded *performance,* as technology advanced and our engineering skill grew. In mainframes: Storage, sweep-switching and dual-beam capability . . . . In plug-ins: Spectrum analysis, sampling, precision slide-back . . . .

But the technical truths of one day (for instance, scope circuitry in 1953 relied on vacuum tubes) someday become technical limitations. To meet future measurement needs, Tektronix felt, an instrument needed to be designed to optimize the best of today's technology, and a bit of tomorrow's: Transistors, integrated and hybrid circuitry, storage CRT's, and other advanced components — plus the increased sophistication in oscilloscope design peculiar to our company.

Tektronix 7000-Series instruments, the first of which are offered in this supplement, offer initial performance in excess of other general-purpose plug-in oscilloscopes — plus the capability of expanding into new uses. Our array of 13 new plug-ins is a substantial beginning in this direction.

For over 20 years, Tektronix has concentrated on improving oscilloscopes; and we have brought all our accumulated skill and knowledge to bear on these new products. We feel they represent potentially the most expandable line of plug-in scopes ever developed.

We have looked well into the future at known and expected technological developments, and anticipated user needs; and built into these instruments extreme flexibility, through a variety of design innovations. Not the least of these is the four-plug-in capability (compared to one or two on most instruments). Another feature that opens the door to expanded uses is what we call "Scale-Factor Readout" — CRT display of words, symbols and numbers.

A significant portion of Tektronix' last two years' Engineering budget ($28 million) has gone into developing this new instrument line and the many specialized components it demands. We have made comparable very heavy expenditures in people; training; advanced production and testing equipment, and new buildings. The magnitude of this investment is one measure of our commitment to these products.

But, just as we are concerned about the long-term value of this instrument line, we remain concerned about the lasting value of *all* Tektronix products, including our other general-purpose oscilloscopes. Although it's apparent that the route to further technological breakthroughs lies elsewhere than in our wide and highly-developed 530/540/550/580 series, those instruments nevertheless still represent an *excellent* price/performance value (as witness their continued high sales).

The same service, parts support and diligent, technically expert field assistance that has characterized the name "Tektronix" in the past will continue to do so in the future — *whatever* instrument you may own.

Nor is our developmental effort limited to plug-in instruments. As in the past, we will continue to design non-plug-in scopes to meet the needs of users whose requirements are more specific. An example is our new 5030, introduced in this supplement, a superior dual-beam low-frequency oscilloscope with scale-factor readout; voltage and current probe capability, and a 50 per-cent larger display area.

In our unceasing quest to advance the art of waveform measurement, the full satisfaction of *all* our customers will remain an overriding concern.

Howard Vollum
President

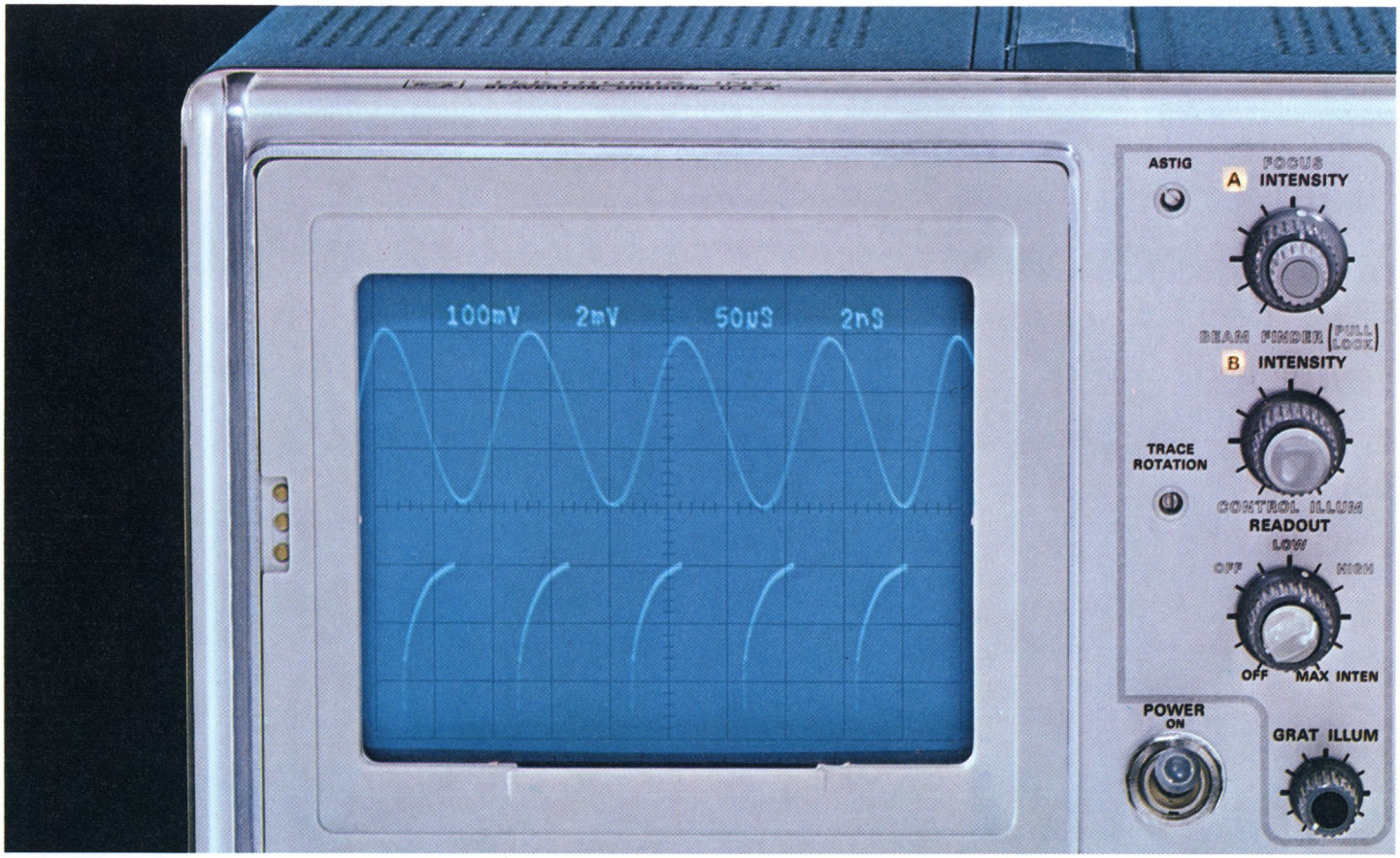
7704

DC to 150 MHz, FOUR PLUG-IN OSCILLOSCOPE

7504

DC to 90 MHz, FOUR PLUG-IN OSCILLOSCOPE

7000-SERIES SYSTEM DESCRIPTION



DISPLAY AREA

The cathode-ray tube is a single-beam 5-inch rectangular display device. The internal, parallax-free graticule is 8 cm x 10 cm with variable illumination. Three independent intensity controls adjust trace brightness for A SWEEP, B SWEEP, and READOUT. A two-position BEAM FINDER will limit deflection within the display area and insure a visible trace.

Auto Scale Factor Readout

The CRT is the focal point of any oscilloscope, and this is particularly true of these instruments. The CRT displays the analog waveform and alphanumeric readout of vertical and horizontal deflection factors. Probe attenuation and the position of deflection controls, magnifiers, polarity controls, and variable attenuators are sensed and the correct scale factors displayed at the top and bottom of the CRT. The readout sequence is from left to right in the same order as the plug-in channels: LEFT, RIGHT, A, and B. If a single channel plug-in is used the readout appears at the top of the CRT; the second channel of a dual-channel unit would appear in a corresponding position at the bottom of the CRT. A trace IDENTIFY push button on each amplifier unit deflects the appropriate trace and identifies the correct readout.

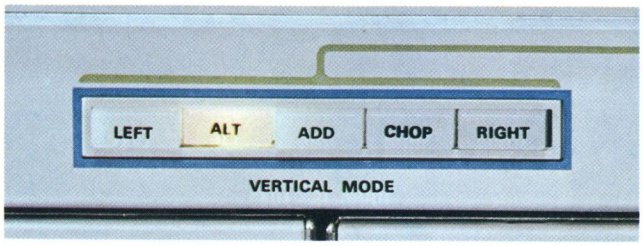
Bright Trace

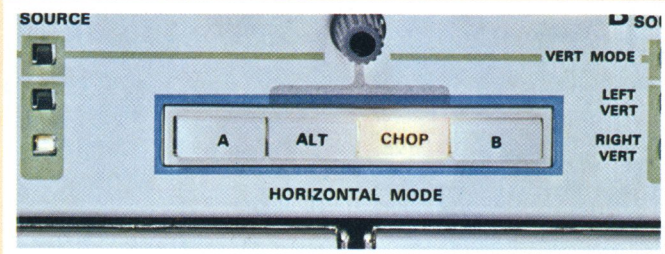
The CRT is operated at 24 kV in the 7704 and 18 kV in the 7504 for improved visual and photographic writing speed. The photographic writing speed is specified at 3300 cm/μs in the 7704; 2500 cm/μs in the 7504, with the standard P31 phosphor. The writing speeds are measured with the C-51 Camera, 10,000 ASA Polaroid* film without film fogging techniques. The lens in the C-51 is an f/1.2; 1:0.5 object-to-image ratio.

*Registered Trademark Polaroid Corporation

7000-SERIES SYSTEM DESCRIPTION

INTERNAL DEFLECTION SYSTEMS





Both vertical and horizontal deflection amplifiers are "dual-trace" with two separate plug-in inputs. Electronic switching in either ALTERNATE or CHOP MODES time-share the CRT beam between channels. Bandwidth, sensitivity, and signal input characteristics are plug-in dependent, as outlined in the System Specifications chart (page 7).

Vertical Switching Modes

The two left-side plug-in channels are labeled LEFT vertical and RIGHT vertical. The MODE is push-button selected as LEFT only, ALT, ADD, CHOP, RIGHT only. Any pair of 7000-Series plug-ins can operate as a vertical combination.

Horizontal Switching Modes

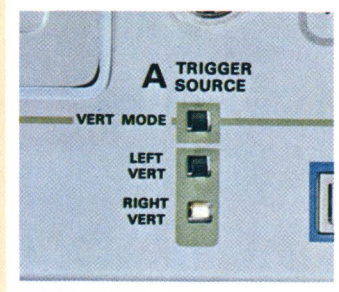
The two right-side plug-in channels are labeled A (left) and B (right). The horizontal MODE is push-button selected as A only, ALT, CHOP, B only. Any pair of 7000-Series plug-ins will operate as a horizontal combination.

Switching Logic

There are 20 possible combinations of vertical and horizontal operating MODES. The chart briefly shows the options and indicates the type of displays obtained.

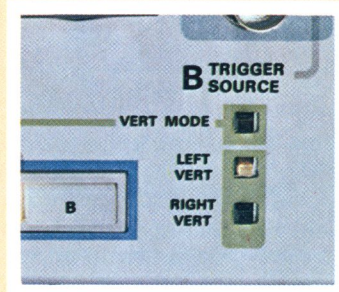
VERT. MODE	HORIZ. MODE	DISPLAY
LEFT	A, B	Single-trace
	ALT, CHOP	(A) independent dual time base (B) simultaneous DELAYING and DELAYED-sweep display
ALT	A, B	Dual-trace
	ALT, CHOP	(A) independent "dual-beam" display (B) X-Y, X-Y display (CHOP ONLY) (C) X-Y, Y-T display (D) "dual-trace" delaying-sweep display
ADD	A, ALT, CHOP, B	Algebraic addition of vertical channels with: (A) single-trace (B) dual time base (C) "dual-trace" delaying-sweep display
CHOP	A, B	Dual-trace
	ALT, CHOP	"dual-trace" delaying-sweep display
RIGHT	A, B	Same display capability as with LEFT above
	ALT, CHOP	

The ALT vertical and ALT or CHOP horizontal MODE combination is a "slaved" operation. RIGHT vertical information will be displayed only by A sweep; LEFT vertical information by B sweep. The result, effectively, is a "dual-beam" type of display as it relates to independent control of deflection factors, position and intensity.

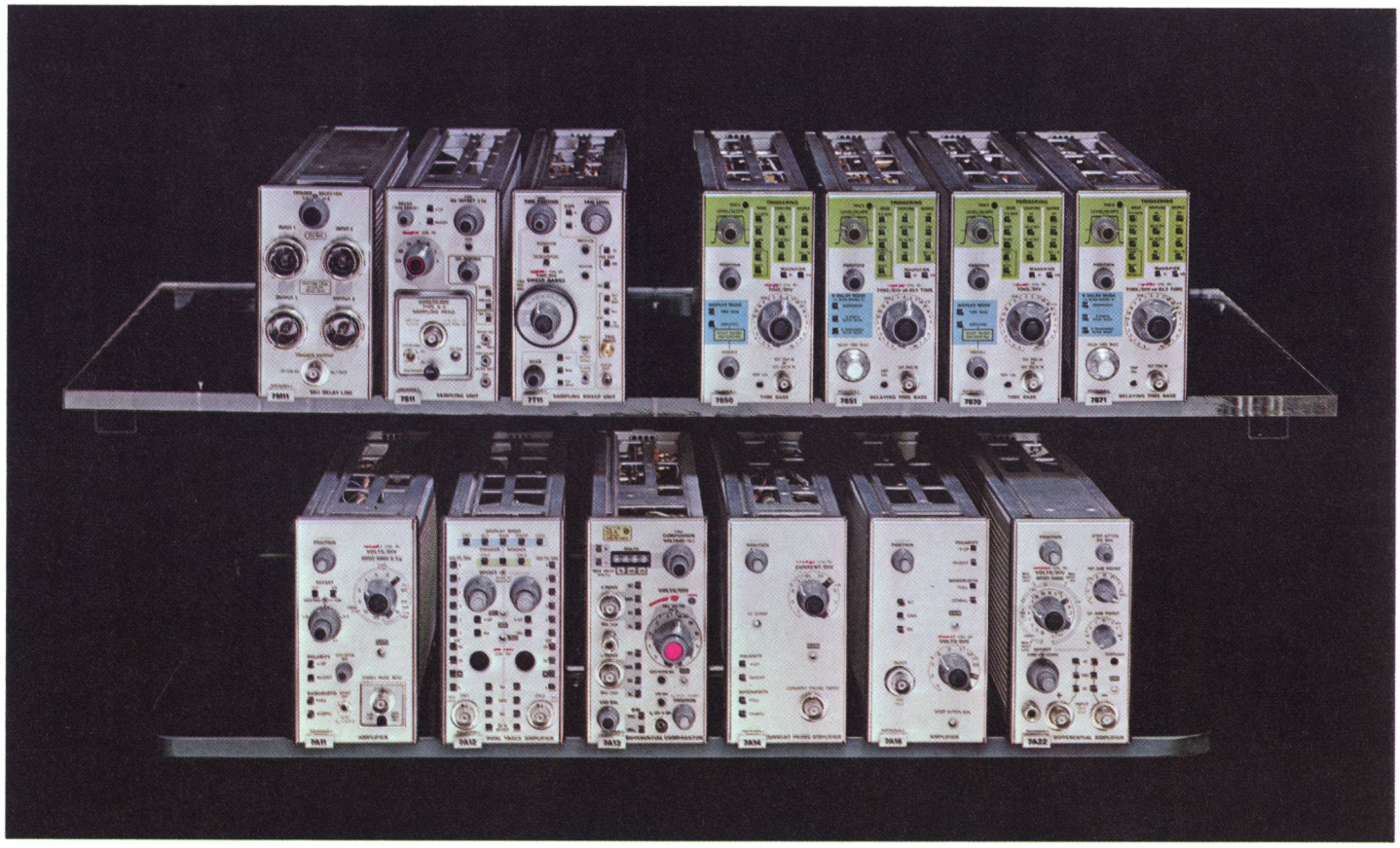


INTERNAL TRIGGER SELECTION

The vertical signal from both LEFT and RIGHT plug-ins is coupled through the trigger logic circuitry and made available to the time-base units for triggering purposes, and to a SIGNAL OUT jack for external use. The trigger signal to the time base is selected by lighted push-button switches for LEFT, RIGHT, or VERT MODE. Actuating the VERT MODE switch slaves the trigger source to the displayed channel for convenience in all modes except CHOP.



7000-SERIES SYSTEM DESCRIPTION



PLUG-IN CAPABILITY

Currently, there are 13 plug-in units available for the 7000-Series mainframes: 6 amplifiers, 4 time-base units, and 3 sampling units. The versatility of the system lies in these building block combinations which allow a more concise matching of instrument to application.

Amplifier Plug-Ins

AMPLIFIERS	BANDWIDTH		MIN DEFL FACTOR	PERFORMANCE FEATURED	SPECS
	7704	7504			
7A11	150 MHz	90 MHz	5 mV/div	Low-capacitance FET Probe Amplifier	p 10
7A12	105 MHz	75 MHz	5 mV/div	Dual-channel Amplifier	p 11
7A13	100 MHz	75 MHz	1 mV/div	Differential DC Offset, High-Freq. CMRR Amplifier	p 12, 13
7A14	50 MHz 105 MHz	45 MHz 75 MHz	1 mA/div	AC Current Probe Amplifier (2 current probes)	p 14
7A16	150 MHz	90 MHz	5 mV/div	Wide-bandwidth Conventional Input Amplifier	p 15
7A22	1 MHz		10 μV/div	DC-Coupled, High-Gain Differential Amplifier	p 16, 17

Combinations

Single Trace—Any single-channel amplifier operating as the only vertical plug-in. A blank plug-in panel is available to cover any unfilled plug-in compartment.

Dual Trace—A single 7A12, or any two single-channel amplifiers utilizing the internal amplifier switching (ALT or CHOP). The two units can be the same or mixed to offer different input configurations.

Three Trace—A dual-channel 7A12 using its own switching capability matched with a single-channel amplifier.

Four Trace—Two dual-channel 7A12's using both plug-in and internal amplifier switching.

X-Y Operation—The amplifiers will operate in vertical or horizontal channels, providing for X-Y operation. The internal amplifier switching presents dual X-Y display with four amplifier units, or X-Y, Y-T display with three amplifiers and a time-base unit.

Time-Base Plug-Ins

There are two time-base units available for each 7000-Series mainframe. The differences are the maximum sweep rate available and the triggering frequency range they are designed to cover. The units for each mainframe are essentially identical, and can be used separately or in combination which provides for DELAYING SWEEP operation.

MAIN-FRAME	TIME-BASE	FUNCTION	MAX SWEEP RATE	TRIGGERING FREQ. RANGE	SPECS
7704	7B71	Delaying Sweep	2 ns/div	DC - 200 MHz	p 18, 19
	7B70	Delayed Sweep & Ext. Amp.			
7504	7B51	Delaying Sweep	5 ns/div	DC - 100 MHz	p 20, 21
	7B50	Delayed Sweep & Ext. Amp.			

7000-SERIES SYSTEM DESCRIPTION

SAMPLING UNITS

The 7S11 SAMPLING UNIT, 7M11 DELAY LINE, and 7T11 SAMPLING TIME BASE are the building blocks for utilizing the Sampling technique with the 7000-Series mainframes. In conjunction with the five plug-in sampling heads and the mainframe switching capability, they offer an extremely versatile combination of operational modes.

The 7S11 accepts a PLUG-IN HEAD which determines the frequency response (to 14 GHz) and input configuration. The 7S11 also controls DEFLECTION FACTOR, DOT RESPONSE, and DC OFFSET functions.

The 7M11 is a dual 75-ns delay line and pretrigger source necessary for viewing the triggering event in the sequential sampling mode of operation. For most applications above 1-kHz repetition rate, the random mode can be used which requires no pretrigger or delay line.

The 7T11 is the sampling time base. It features 10 ps/div to 5 ms/div calibrated sweep rates and random or sequential operation. To cover that wide range of TIME/DIV settings, the 7T11 automatically crosses from EQUIVALENT time to REAL time displays at an appropriate sweep range. The triggering range of the unit is from ≃ 10 Hz to above 12.4 GHz which precludes the requirement for an internal trigger countdown unit. Complete specifications on all sampling units are on pages 22 thru 27.

Combinations

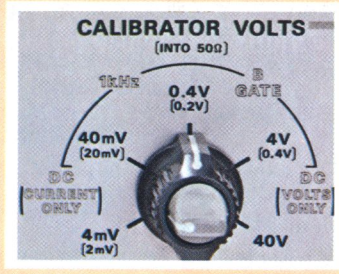
Single Trace—One 7S11, one 7T11 with the 7M11 optional depending on the application. There are direct interconnections between the 7S11 and 7T11 requiring the units to be adjacent in the mainframe. The 7S11 would occupy the RIGHT vertical channel and the 7T11 the A horizontal channel. The 7M11 can occupy an unused plug-in compartment for convenience.

Dual Trace—Two 7S11's can be used with a single time base for time-related displays utilizing the internal vertical switching. The direct interconnections necessary between the LEFT vertical and the time base passes through the RIGHT channel 7S11.

X-Y Sampling—Two 7S11's mounted in RIGHT vertical and A horizontal automatically adopt a common 50-kHz free-running strobe condition for X-Y displays.

Single-Trace Sampling and Single-Trace Real Time—A pair of sampling plug-ins (vertical and horizontal) and a pair of real-time plug-ins can be used simultaneously for convenience in applications which require frequent use of both types of displays.

CALIBRATOR



The multi-function CALIBRATOR supplies accurate time, voltage, and current source for GAIN check and adjustment of all 7000-Series plug-ins. Amplitude accuracy is within 1% and time accuracy (1 kHz) within 0.5%, sufficient to be used as the standard for most system specifications. The 5 open-circuit voltage levels are available as DC, or AC at 1 kHz, or AC at a rate triggered by every other B GATE output. The voltage output into 50 Ω is also indicated. Current amplitude through the loop is 40 mA DC or AC at the selected rate.

OUTPUTS

+Sawtooth—From A or B sweep, internally selectable at 1 V per horizontal division of deflection, into 1 MΩ.

+Gate—Rectangular pulse, 10 V into 1 MΩ, from A or B sweep gate, internally selectable.

Sig Out—Vertical signal determined by B TRIGGER SOURCE, at 0.5 V per vertical division of deflection.

Camera Power—Three-prong connector to the left of the CRT provides power, ground, and remote single sweep reset access for the C-50 and C-51 cameras.

FUNCTIONAL COLOR CODE

Front panel functions are identifiable by background color codes:

BLUE	MODE SELECTION	RED	UNCALIBRATED VARIABLE
GREEN	TRIGGER SOURCE OR CONTROL	GRAY	DENOTES FUNCTIONAL RELATION

X-Y COMPENSATION OPTION

For X-Y applications which require precise phase measurement, the horizontal mainframe amplifiers can be equipped with a network which compensates for the difference between vertical and horizontal signal delay. With correction, the phase shift between vertical and horizontal can be adjusted to be less than 2° from DC to 2 MHz. Without the compensation network, phase shift is 2° or less from DC to 35 kHz. Additional cost and ordering information on page 9.

SYSTEM SPECIFICATIONS

Plug-In Unit	Vertical System								Horizontal System Bandwidth		
	Probe	7704 (6-cm reference)		7504 (8-cm reference)		Accuracy		SIG OUT	With Phase Compensation	Without Phase Compensation	
		BW	Tr	BW	Tr	EXT CAL 0° to 50°C	INT CAL 15° to 35°C	BW		7704	7504
7A11	Integral	150 MHz	2.4 ns	90 MHz	3.9 ns	2%	3%	60 MHz	2 MHz	3 MHz	5 MHz
7A12	None	105 MHz	3.4 ns	75 MHz	4.7 ns	2%	3%	55 MHz			
	P6053	105 MHz	3.4 ns	75 MHz	4.7 ns	3%	4%	55 MHz			
7A13	None	105 MHz	3.4 ns	75 MHz	4.7 ns	1 1/2%	2 1/2%	55 MHz			
	P6053	105 MHz	3.4 ns	75 MHz	4.7 ns	1 1/2%	2 1/2%	55 MHz			
7A14	P6021	50 MHz	7.0 ns	45 MHz	7.8 ns	2%	3%	40 MHz			
	P6022	105 MHz	3.4 ns	75 MHz	4.7 ns	2%	3%	50 MHz			
7A16	None	150 MHz	2.4 ns	90 MHz	3.9 ns	2%	3%	60 MHz			
	P6053	150 MHz	2.4 ns	90 MHz	3.9 ns	3%	4%	60 MHz			
7A22	None or Any	1 MHz	350 ns	1.0 MHz	350 ns	2%	3%	1.0 MHz	800 kHz	900 kHz	950 kHz

System Environmental Specification

Temperature Range — 0° to +50°C, operating.
Altitude — Operating to 15,000 feet; non-operating to 50,000 feet.

SPECIFICATIONS

Specifications are common to both units unless noted.

VERTICAL SYSTEM

Channels—Two left-hand plug-in compartments; compatible with all 7000-Series plug-ins.

Deflection Factor—Determined by plug-in unit.

Bandwidth—Determined by mainframe and plug-in unit. See System Specification chart (page 7).

Chopped Mode—1-MHz repetition rate within 20%.

Trace Separation Range—At least ±4 div from graticule center.

HORIZONTAL SYSTEM

Channels—Two right-hand plug-in compartments; compatible with all 7000-Series plug-ins.

Fastest Calibrated Sweep Rate

7704—2 ns/div with the 7B71 and/or 7B70

7504—5 ns/div with the 7B51 and/or 7B50

Chopped Mode—200-kHz repetition rate within 20%.

X-Y Mode—PHASE SHIFT is within 2° from DC to 35 kHz between vertical and horizontal channels. BANDWIDTH is DC to at least 3 MHz (7704); or 5 MHz (7504).

CALIBRATOR

Output Wave Shape—Rectangular, positive-going from ground.

Voltage Ranges

Open Circuit— +4 mV, +40 mV, +0.4 V, +4 V, +40 V.

Into 50 Ω— +2 mV, +20 mV, +0.2 V, +0.4 V.

Current Output (Loop)—40 mA.

Amplitude. Accuracy—Within 1% (+15°C to +35°C); within 2% (0°C to 50°C) for both voltage and current.

Sources—DC; 1 kHz accurate within 0.5%, duty cycle is 50%, accurate within 0.1%; B GATE, frequency determined by every other B GATE pulse.

Risetime and Falltime— $<0.25\ \mu s$ for all ranges except +40 V which is $<2\ \mu s$ with 10-pF load.

EXTERNAL Z-AXIS INPUTS

HIGH SENSITIVITY INPUT

Sensitivity—2 V P-P for full intensity range from DC to 2 MHz, intensity range diminishes at 10 MHz to an equivalent 0.4 V DC input.

Polarity—Positive signal blanks trace.

Risetime—7704, 30 ns or less
7504, 40 ns or less

Input R—500 Ω within 10%.

Max Input Voltage—7704, 15 V (DC + peak AC)
7504, 50 V (DC + peak AC)

HIGH SPEED INPUT

Sensitivity—60 V P-P for full intensity range.

Polarity—Positive signal blanks trace.

Useful Frequency Range—7704, DC to 100 MHz
7504, DC to 75 MHz

Input Resistance—7.5 kΩ within 10%.

Max Input Voltage

7704, 60 V (DC to peak AC)
7504, 200 V (DC + peak AC)
AC component limited to 60 V P-P.

OUTPUTS

+ SAWTOOTH— Derived from A or B horizontal channel, internally selectable, starting 1 V or less from ground (into 1 MΩ).

Output Voltage—50 mV/div (±15%) into 50 Ω
1 V/div (±10%) into 1 MΩ

Output R—950 Ω within 2%

+ GATE— Positive-going rectangular waveform derived from A, B, or DELAYED gate, internally selectable.

Output Voltage—0.5 V (±10%) into 50 Ω
10 V (±10%) into 1 MΩ

Risetime—20 ns or less into 50 Ω

Output R—950 Ω within 2%

SIG OUT—Selected by B TRIGGER SOURCE switch.

Output Voltage—25 mV/div (±10%) into 50 Ω
0.5 V/div (±10%) into 1 MΩ

Bandwidth—See Systems Specifications, page 7

Output Resistance—950 Ω within 2%.

CRT

Accelerating Potential—7704, 24 kV within 5%
7504, 18 kV within 5%

Graticule—Internal 8 cm x 10 cm with variable illumination.

Phosphor—P31 standard; P1, P2, P7, P11 optional at no additional cost.

Photographic Writing Speed—Measured without film fogging; with standard P31 phosphor.

Mainframe	Writing Speed	Camera	Lens	Film
7704	3300 cm/μs	C-51	f/1.2 1:0.5	10,000 ASA
	2200 cm/μs	C-27	f/1.3 1:0.5	
7504	2250 cm/μs	C-51	f/1.2 1:0.5	10,000 ASA
	1500 cm/μs	C-27	f/1.3 1:0.5	

Beam Finder—Limits display within graticule area.

POWER REQUIREMENTS

Power Connection—This instrument is designed for operation from a power source with its neutral at or near ground (earth) potential. It is not intended for operation from two phases of a multi-phase system, or across the legs of a single-phase, three-wire system. It is provided with a three-wire power cord with a three-terminal polarized plug for connection to the power source. The third wire is directly connected to the instrument frame, and is intended to ground the instrument to protect operating personnel, as recommended by national and international safety codes.

Line Voltage Ranges

	7704	7504
115 V	90 VAC to 136 VAC	Low — 90 VAC to 110 VAC Med — 104 VAC to 126 VAC High — 112 VAC to 136 VAC
230 V	180 VAC to 272 VAC	Low — 180 VAC to 220 VAC Med — 208 VAC to 252 VAC High — 224 VAC to 272 VAC

Line Frequency—48 Hz to 440 Hz

Max Power Consumption

7704, 210 Watts, 2.6 Amps at 115 V line, 60 Hz.
7504, 280 Watts, 3.2 Amps at 115 V line, 60 Hz.

DIMENSIONS AND WEIGHTS

	7704	7504
Height	13.5 in (34.2 cm)	13.5 in (34.2 cm)
Width	12 in (30.5 cm)	12 in (30.5 cm)
Length	23.3 in (59.0 cm)	24.6 in (62.2 cm)
Net Weight	42 lb (19 kg)	54 lb (24.2 kg)

INCLUDED STANDARD ACCESSORIES

Two instruction manuals 7704, (070-0981-00); two instruction manuals 7504, (070-0932-00); BNC-post jack (012-0092-00); two 18-in patch cord BNC-BNC (012-0087-00); 9-pin connector, male insert (134-0049-00); 3-to-2 wire adpater (103-0013-00).

7704 OSCILLOSCOPE **$2500**

7504 OSCILLOSCOPE **$2000**

INSTRUMENT OPTIONS

OPTION 1

Readout Modification

The instruments may be ordered without AUTO SCALE FACTOR READOUT by specifying "Option 1". This deletes the character generator circuitry contained on a single plug-on printed circuit card. The feature may be easily added at any time by ordering the conversion kit.

7704 OSCILLOSCOPE Without Readout, Option 1 .... **$2100**

7704 READOUT CONVERSION KIT (040-0532-00) **$400**

7504 OSCILLOSCOPE Without Readout, Option 1 .... **$1600**

7504 READOUT CONVERSION KIT (040-0533-00) **$400**

OPTION 2

X-Y Horizontal Compensation

A compensation network may be added to equalize the signal delay between the vertical and horizontal amplifiers. When included, the phase shift between vertical and horizontal channels is adjustable to less than 2° from DC to 2 MHz. The option may be included at the time of purchase, or added later with the field conversion kit.

X-Y HORIZONTAL COMPENSATION, Option 2 ..... **Add $75**

7500-SERIES CONVERSION KIT (040-0528-00) **$75**

7700-SERIES CONVERSION KIT (040-0529-00) **$75**

OPTION 3

Electromagnetic Interference (EMI) Modification

The instruments may be ordered to meet the interference specifications of MIL-I-6181D over the following frequency ranges: Radiated from the instrument under test—150 kHz to 1 GHz; conducted through the power cord—150 kHz to 25 MHz. A field conversion kit is available to convert an instrument whenever necessary.

EMI MODIFICATION, Option 3 ..... **Add $ 75**

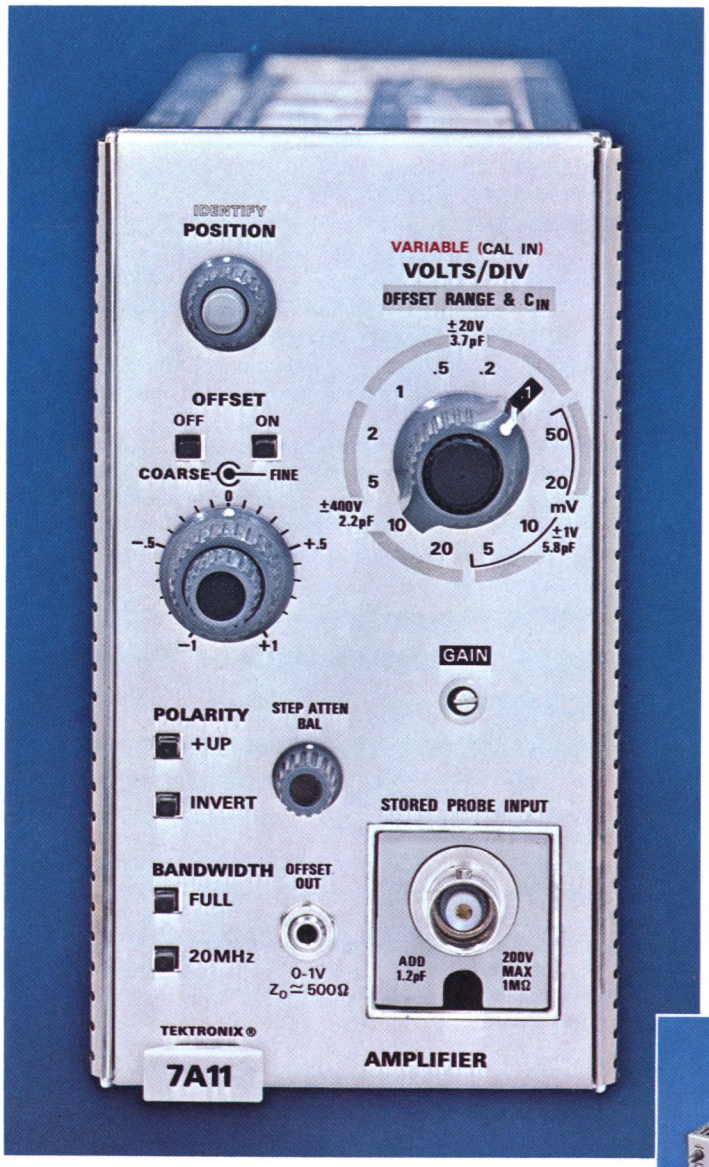
EMI CONVERSION KIT (040-0527-00) **$100**

Blank Plug-In Panel

When operating the 7000-Series instruments with less than the full complement of plug-ins (4), the blank plug-in panel may be used to cover unused channels.

7000-SERIES BLANK PLUG-IN PANEL (016-0155-00) ... **$6**

U.S. Sales Prices FOB Beaverton, Oregon



DESCRIPTION

The 7A11 is a wideband plug-in amplifier for both 7704 and 7504 mainframes. The captive FET probe input configuration optimizes signal acquisition with high resistance (1 MΩ) and low capacitance (5.8 pF max at 5 mV/div) without loss of signal amplitude by probe attenuation. With large amplitude signals it is necessary in any amplifier to insert attenuation before the input stage to keep the signal extremes on-screen. The 7A11 probe has two 20X attenuators, physically mounted in the probe tip, that are relay-switched into the input signal path at the appropriate deflection factor. This frees the operator from concern with manual plug-on attenuators and dynamic signal range. If signal can be positioned or offset to fall within the viewing area, the amplifier is operating linearly.

Other operational features include: trace IDENTIFY, which moves the trace up slightly and identifies the appropriate Auto Scale Factor Readout area; DC OFFSET with an accurate monitor output; and internal probe storage with BNC input for convenience in less demanding applications.

SPECIFICATIONS

DEFLECTION FACTOR

5 mV/div to 20 V/div in 12 calibrated steps (1-2-5 sequence). Accuracy is within 2% with GAIN adjusted at 0.1 V/div. The uncalibrated VARIABLE is continuous between steps.

BANDWIDTH

FULL BANDWIDTH Mode

Mainframe	Bandwidth —3 dB	Risetime
7704	150 MHz	2.4 ns
7504	90 MHz	3.9 ns

20 MHz BANDWIDTH Mode—DC to 20 MHz within 2 MHz.

AC COUPLED INPUT—15 Hz or less (low frequency —3 dB point).

INPUT R and C

RESISTANCE—1 MΩ within 1%.

CAPACITANCE—

5.8 pF within 0.6 pF from 5 mV to 50 mV/div.
3.4 pF within 0.4 pF from 0.1 V to 1 V/div.
2.0 pF within 0.2 pF from 2 V to 20 V/div.

MAX INPUT VOLTAGE

DC COUPLED—200 V (DC + peak AC); AC component derated above 10 MHz.

AC COUPLED—200 V DC.

MAX INPUT GATE CURRENT

≤ 0.5 nA at 25°C; ≤ 2 nA at 50°C.

DC DRIFT

DRIFT WITH TIME (constant ambient temperature and line voltage).

SHORT TERM: 0.1 div or less per minute after 20-minute warm-up.

LONG TERM: 0.1 div or less per hour after 20-minute warm-up.

DRIFT WITH AMBIENT TEMPERATURE (constant line voltage) is 2 mV/10°C or 0.2 div/10°C or less, whichever is greater.

DISPLAYED NOISE

1 mV or 0.2 div, whichever is greater, in FULL BANDWIDTH mode, measured tangentially.

OFFSET FUNCTION

An internal DC SOURCE, continuously variable between +1 V and —1 V, which may be used to offset the trace. (See chart for OFFSET RANGE.) An OFFSET OUT Jack allows monitoring of the offset voltage. OFFSET OUT source resistance is 500 Ω within 3%.

V/DIV	OFFSET RANGE	OFFSET OUT	OFFSET RANGE TO OFFSET OUT
5 mV to 50 mV/div	+1 V to —1 V	+1 V to —1 V all Ranges	1:1 within 1% +0.1 mV
0.1 V to 1 V/div	+20 V to —20 V		20:1 within 1.5% +0.1 mV
2 V to 20 V/div	+400 V to —400 V		400:1 within 2% +0.1 mV

INCLUDED STANDARD ACCESSORIES

Two instruction manuals (070-0984-00); one AC coupler (011-0110-00; one retractable hook tip (013-0106-00); one bayonet ground (013-0085-00); one ground lead (nose), 3″ (175-0849-00); one ground lead (screw-in) 3″ (175-0848-00); one ground lead (screw-in), 12″ (175-0848-02); three minigator clips (344-0046-00); two insulating tubes (166-0404-01); one hook tip (206-0114-00); GR/PROBE adapter termination (50 Ω) (017-0088-00).

7A11 FET PROBE/AMPLIFIER $850

U.S. Sales Prices FOB Beaverton, Oregon

SPECIFICATIONS

DEFLECTION FACTOR

5 mV/div to 5 V/div in 10 calibrated pushbutton steps (1-2-5 sequence). Accuracy is within 2% with GAIN adjusted at 10 mV/div. Uncalibrated VARIABLE is continuous between steps.

BANDWIDTH

Mainframe	Bandwidth —3 dB	Risetime
7704	105 MHz	3.4 ns
7504	75 MHz	4.7 ns

AC COUPLED—10 Hz or less (lower —3 dB point).

INPUT R and C

1 MΩ within 2%; 24 pF within 1 pF for all deflection factors. Product within 1% at all deflection factors.

MAX INPUT VOLTAGE

DC COUPLED—500 V (DC + peak AC at 1 kHz or less).

AC COUPLED—500 V DC.

MAX INPUT GATE CURRENT

1 nA or less from 0°C to 35°C; 3.2 nA from 35°C to 50°C.

DC DRIFT

With ambient temperature, 100 μV/°C or 0.1 div or less, whichever is greater.

DC OFFSET RANGE

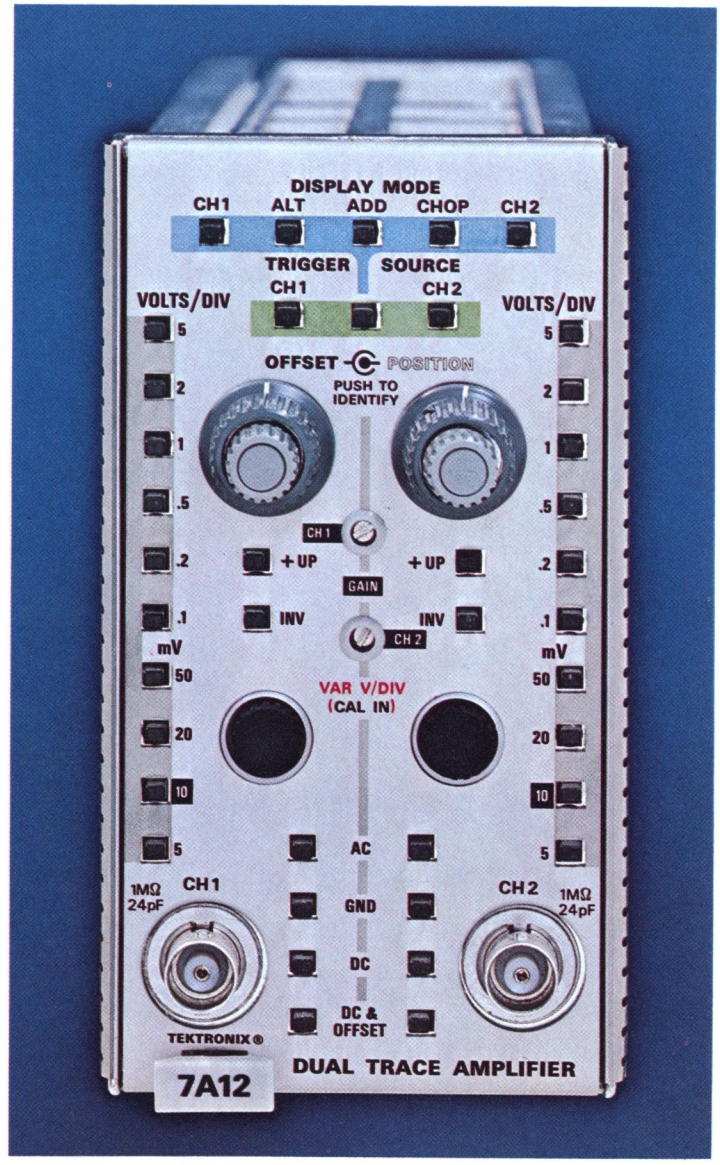
At least +1000 div to —1000 div, all deflection factors.

INCLUDED STANDARD ACCESSORIES

Two instruction manuals 070-0977-00.

7A12 DUAL-CHANNEL AMPLIFIER $700

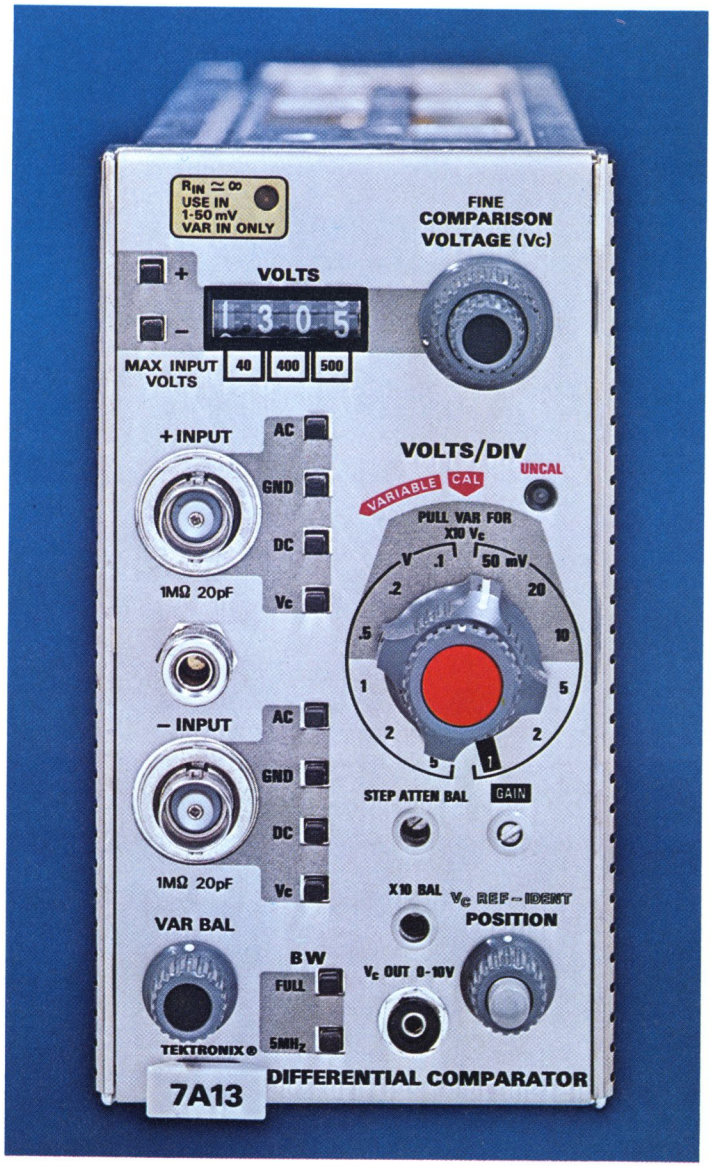
U.S. Sales Price FOB Beaverton, Oregon



DESCRIPTION

The 7A12 is a dual-channel plug-in amplifier for use with both 7704 and 7504 mainframes. It is the basic building block for 3 or 4 trace operation. It features constant bandwidth for all deflection factors, 5 operating modes, trigger source selectivity, trace OFFSET with ±1000 div range, color-keyed control grouping, and a trace IDENTIFY function.

The high density of controls on a 2 5/8″ by 5″ front panel was made possible, and very usable, by the development and use of lighted pushbuttons for all except continuously variable functions. The switches conserve space both in front and behind the panel, provide faster operation (direct steps to any position) and easy readability by backlighting.



DESCRIPTION

The 7A13 is a differential comparator plug-in amplifier for either 7704 or 7504 mainframes. It incorporates a number of performance features which make it particularly versatile, especially in multi-trace combination with other 7000 series vertical plug-ins. Following is a treatment of the three operational areas which describe the functions of the 7A13.

As a convential amplifier the 7A13 has excellent, and constant, bandwidth over the 1 mV/div to 5 V/div deflection factor range. The bandwidth is selectable at FULL (100 MHz in the 7704, 75 MHz in the 7504) or 5 MHz for best displayed noise conditions during low frequency applications. The + or — INPUTS allow normal or inverted displays.

As a differential amplifier the 7A13 maintains its conventional features and provides a balanced (+ and —) input for applications requiring rejection of a common-mode signal. The CMRR is 20,000:1 from DC to 100 kHz, derating to 250:1 at 20 MHz. The unit can reject up to 10 V of common-mode signal at a deflection factor setting of 1 mV/div, increasing to 100 V rejection potential at 10 mV/div (X10 Vc pulled) and 500 V at 0.1 V/div.

As a comparator amplifier the 7A13 utilizes its differential capabilities but provides an accurate (0.1%) positive or negative internal offsetting voltage covering the common-mode signal range of the unit. A signal of up to ±10 V may be applied to an input (+ or —) at a deflection factor setting of 1 mV/div and, with an opposing Vc (offset voltage), viewed in 10,000 segments of 1 mV. The offset voltage is also available as an output for external monitoring.

PROBES

The P6053 (10X attenuation) is recommended with 7A13 for bandwidth and Auto Scale Factor Readout compatibility. Other Tektronix probes may be used but may not be directly compatible (consult your Tektronix field engineer or representative).

SPECIFICATIONS

DEFLECTION FACTOR

1 mV/div to 5 V/div in 12 calibrated steps (1-2-5 sequence). Accuracy is within 1.5% with GAIN adjusted at 1 mV/div. Uncalibrated VARIABLE is continuous between steps.

BANDWIDTH

FULL BANDWIDTH Mode

Mainframe	Bandwidth —3 dB	Risetime
7704	100 MHz	3.5 ns
7504	75 MHz	4.7 ns

5 MHz BANDWIDTH Mode—DC to 5 MHz within 500 kHz.

AC COUPLED—10 Hz or less (lower —3 dB point).

INPUT R and C

1 MΩ within 0.15%; 20 pF within 0.4 pF; product within 1% at all deflection factors.

MAX INPUT VOLTAGE

DC COUPLED (DC + PEAK AC of 1 kHz or less)

40 V — 1 mV to 50 mV/div

400 V — 10 mV to 50 mV/div (X10 Vc out) and 0.1 V to 0.5 V/div

500 V — 0.1 V to 0.5 V/div (X10 Vc out) and 1 V to 5 V/div

AC COUPLED—400 V DC

MAXIMUM GATE CURRENT

0.2 nA or less from 0°C to 35°C; 2 nA or less at 35°C to 50°C.

DC DRIFT

DRIFT WITH TIME (ambient temperature constant).

SHORT TERM—1 mV P-P or 0.1 div, or less (whichever is greater) over any 1-minute interval after 20 minutes warm-up.

LONG TERM—1 mV P-P or 0.1 div, or less (whichever is greater) during any 1-hour interval after 20 minutes warm-up.

DRIFT WITH AMBIENT TEMPERATURE: $\leq$ 2 mV/10°C or $\leq$ 0.2 div/10°C, whichever is greater.

DISPLAYED NOISE

200 μV, in FULL BANDWIDTH mode, measured tangentially.

OVERDRIVE RECOVERY

1 μs or less to recover within 1 mV, and 0.1 ms to recover within 0.5 mV of zero level after removal of a 10 V test signal (duration of 0.3 ms to 1.5 ms; fall time of 5 ns or less).

COMMON-MODE REJECTION RATIO

1 mV to 50 mV/div:
DC to 100 kHz—20,000:1 (20 V P-P signal).
100 kHz to 1 MHz—10,000:1 (10 V P-P signal).
1 MHz to 10 MHz—10,000:1 at 1 MHz, derating linearly to 1000:1 at 10 MHz (10 V P-P signal at 1 MHz derating to 1 V P-P at 10 MHz).
20 MHz—at least 250:1 (1 V P-P signal)

10 mV to 50 mV/div (X10 Vc out) and 0.1 V to 5 V/div	at least 2000:1

AC COUPLED INPUT—at least 500:1 at 60 Hz

COMMON-MODE SIGNAL RANGE

1 mV to 50 mV/div	at least + and − 10 V
10 mV to 50 mV/div (X10 Vc out) and 0.1 V to 0.5 V/div	at least + and − 100 V
0.1 V to 0.5 V/div (X10 Vc out) and 1 V to 5 V/div	at least + and − 500 V

DIFFERENTIAL SIGNAL RANGE

1 mV to 50 mV/div	at least 0.8 V
10 mV to 50 mV/div (X10 Vc out) and 0.1 V to 0.5 V/div	at least 8 V
0.1 V to 0.5 V/div (X10 Vc out) and 1 V to 5 V/div	at least 80 V

LINEARITY— $\leq$1% gain change with amplitude.

INTERNAL COMPARISON VOLTAGE

RANGE—0 V to $\pm$10 V

ACCURACY— $\leq$0.1% of setting, $\pm$5 mV

ELECTRICAL ZERO—0.5 mV or less

Vc OUTPUT R—approximately 15 kΩ

INCLUDED STANDARD ACCESSORIES

Two instruction manuals (070-0978-00)

7A13 DIFFERENTIAL COMPARATOR AMPLIFIER $1100

U.S. Sales Price FOB Beaverton, Oregon

DESCRIPTION

The 7A14 is an AC current probe amplifier for use in both 7704 and 7504 mainframes. It provides constant bandwidth, dependent on the current probe and mainframe over the 1 mA/div to 1 A/div calibrated deflection factors (see bandwidth specifications). POLARITY is selectable, +UP or INVERT, as is BANDWIDTH, FULL or 20 MHz.

PROBES

The P6021 and P6022 AC current probes are designed for use with the 7A14. The probes can be interchanged without gain adjustment due to the special BNC input connector which senses the type of probe and switches internal compensation circuits. Both probes are the quick-connect, locking-jaw type.

P6021—optimized for low-frequency response. The probe/amplifier lower —3 dB point is 30 Hz or less. The upper —3 dB point is 45 MHz and 50 MHz in the 7504 and 7704 mainframes, respectively.

P6022—designed for high-frequency response. The upper —3 dB point is 75 MHz and 105 MHz in the 7504 and 7704 mainframes respectively. Lower frequency —3 dB frequency is 250 Hz or less.

Probes are not supplied with the 7A14 and are ordered separately to fit the application.

SPECIFICATIONS

DEFLECTION FACTOR

1 mA to 1 A/div in 10 calibrated steps (1-2-5 sequence). Accuracy is within 2% with GAIN adjusted at 10 mA/div. Uncalibrated VARIABLE is continuous between steps.

BANDWIDTH

FULL BANDWIDTH mode

Mainframe	Bandwidth w/probe		Risetime w/probe	
	P6021	P6022	P6021	P6022
7704	50 MHz	105 MHz	7.0 ns	3.4 ns
7504	45 MHz	75 MHz	7.8 ns	4.7 ns

20 MHz BANDWIDTH mode—20 MHz within 3 MHz.

LOWER —3 dB BANDWIDTH FREQUENCY—
With P6021—25 Hz or less, +20°C to +75°C; 30 Hz or less, 0°C to +20°C.
With P6022—250 Hz or less.

INPUT CHARACTERISTICS

	WITH P6021	WITH P6022
MAX CW CURRENT	15 A P-P to 5 MHz, decreasing to 1 A P-P at 100 MHz.	6 A P-P to 10 MHz, decreasing to 2 A P-P at 150 MHz.
MAX PULSE CURRENT	25 A peak, limited to an Amp-second product of 2.0 A-ms or 5.3 A RMS.	25 A peak, limited to an Amp-second product of 30A-μs or 2.1 A RMS
MAX VOLTAGE	600 V (DC + peak AC)	600 V (DC + peak AC)
DC SATURATION	0.5 A	0.2 A
INSERTION IMPEDANCE	0.03 Ω at 1 MHz, increasing to 1.0 Ω at 60 MHz.	0.03 Ω at 1 MHz, increasing to 0.7 Ω at 175 MHz.

DISPLAYED NOISE

0.2 div or less throughout the calibrated deflection factor range, measured tangentially.

INCLUDED STANDARD ACCESSORIES

Two instruction manuals (070-0979-00)

7A14 CURRENT PROBE AMPLIFIER $575

U.S. Sales Price FOB Beaverton, Oregon

SPECIFICATIONS

DEFLECTION FACTOR

5 mV/div to 5 V/div in 10 calibrated steps (1-2-5 sequence). Accuracy is within 2% with GAIN adjusted at 10 mV/div. Uncalibrated VARIABLE is continuous between steps.

BANDWIDTH

FULL BANDWIDTH Mode

Mainframe	Bandwidth —3 dB	Risetime
7704	150 MHz	2.4 ns
7504	90 MHz	3.9 ns

20 MHz BANDWIDTH Mode—DC to 20 MHz within 3 MHz.

AC COUPLED—10 Hz or less (lower —3 dB bandwidth).

INPUT R and C

1 MΩ within 2%; 15 pF within 0.5 pF; product within 1% at all deflection factors.

MAX INPUT VOLTAGE

DC COUPLED—500 V (DC + peak AC), AC component of 1 kHz or less.

AC COUPLED—500 V DC.

MAX INPUT GATE CURRENT

0.2 nA or less, +20°C to +30°C.

DC DRIFT

DRIFT WITH TIME (ambient temperature constant).

SHORT TERM—100 μV/min P-P, or 0.02 div (whichever is greater) after 1 hour from turn-on.

LONG TERM—100 μV/hr P-P, or 0.02 div (whichever is greater) after 1 hour from turn-on.

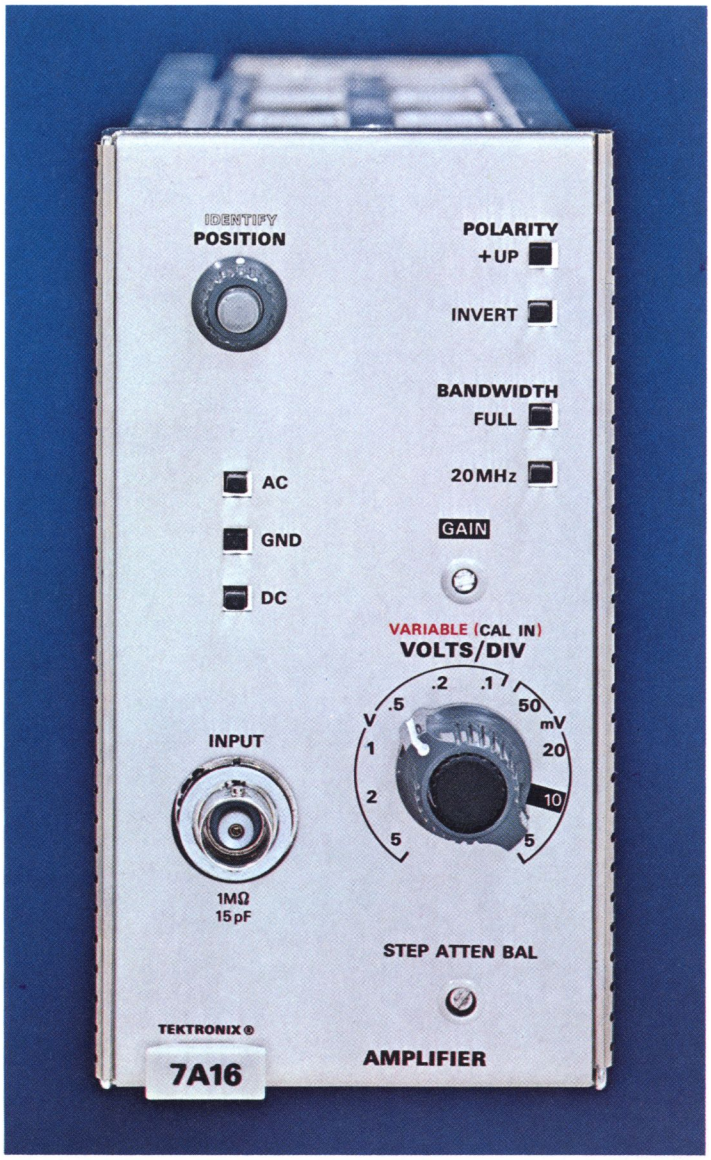
DRIFT WITH AMBIENT TEMPERATURE—100 μV/°C or less.

INCLUDED STANDARD ACCESSORIES

Two instruction manuals (070-0980-00).

7A16 AMPLIFIER $600

U.S. Sales Price FOB Beaverton, Oregon



DESCRIPTION

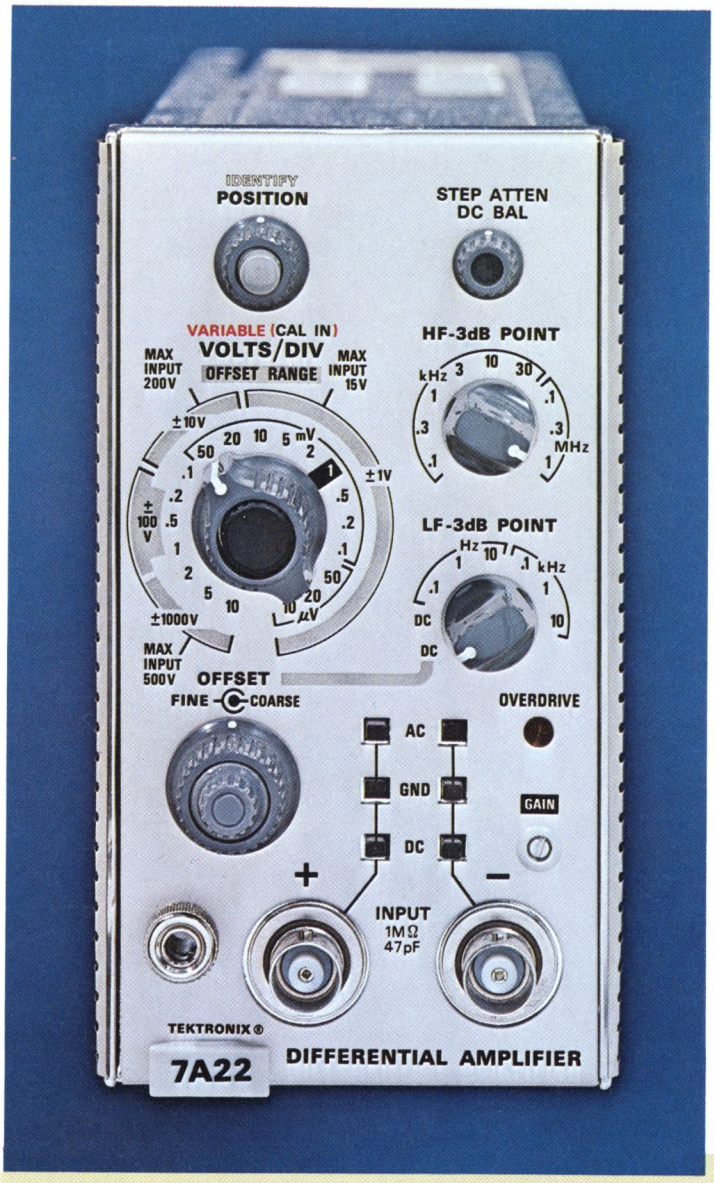
The 7A16 is a wideband plug-in amplifier for both 7704 and 7504 mainframes. It features constant bandwidth (150 MHz in the 7704, 90 MHz in the 7504) over the deflection factor range of 5 mV/div to 5 V/div. Polarity of the display is selectable, as is bandwidth, which can be either FULL or limited to 20 MHz for low frequency applications. The two mainframe channels allow the 7A16 to be used alone, or with another single-trace vertical unit for dual-trace operation. The 7A16 can also be used in the horizontal channels for X-Y operation.

PROBES

The P6053 (10X) probe is recommended for use with the 7A16 for frequency response and Auto Scale Factor Readout compatibility.

HIGH-GAIN DIFFERENTIAL AMPLIFIER

7A22



DESCRIPTION

The 7A22 is a differential amplifier for use with both 7704 and 7504 mainframes. Basic performance features are 10 μV/div to 10 V/div deflection factors, DC to 1 MHz bandwidth with selectable HF and LF —3 dB POINTS, common mode rejection ratio of 100,000:1 at 10 μV/div, DC coupled, differential signal range ±1 V at 10 μV/div, and a DC OFFSET feature with ±1 V range ±100,000 divs at 10 μV/div.

There are many factors which affect the usability of high-gain, wide-band differential amplifiers. Noise (if excessive) can make the high-gain positions unusable. Displayed noise (grounded inputs) is held to 16 μV at 10 μV/div, tangentially measured at full bandwidth. Since noise is related to bandwidth, the displayed noise can be greatly reduced with the HF —3 dB POINT selector when the application allows. DC drift can also hinder measurements if the trace moves offscreen rapidly. Drift with time in the 7A22 is specified at 5 μV per minute and 10 μV per hour at 10 μV/div. Drift with temperature is 50 μV/°C or less. Low amplitude signals often ride a small DC component, perhaps a few millivolts, which would place a DC-coupled display offscreen at 10 μV/div. There are three ways to reject this DC voltage in the 7A22: (1) AC coupled input if the signal frequency is high enough to be unaffected (2 Hz, LOWER —3 dB POINT). (2) AC coupling with the LF —3 dB POINT selector which allows lower bandwidth selection down to 0.1 Hz. (3) DC OFFSET which utilizes the differential feature and supplies an internal DC voltage to offset, or reject, the DC signal component. These factors, and more, make the 7A22 well suited for measurements in the difficult low-amplitude low-frequency area.

PROBES

The P6052 probe is recommended for use with the 7A22 except in high CMRR applications.

SPECIFICATIONS

DEFLECTION FACTOR

10 μV/div to 10 V/div in 19 calibrated steps (1-2-5 sequence). Accuracy is within 2% with GAIN adjusted at 1 mV/div. Uncalibrated VARIABLE is continuous between steps.

BANDWIDTH

HF —3 dB POINT—Selectable in 9 steps (1-3 sequence) from 100 Hz to 1 MHz, accurate within 10% of selected frequency. Risetime in 1 MHz position is ≤350 ns.

LF —3 dB POINT—Selectable in 6 steps (1-10 sequence) from 0.1 Hz to 10 kHz, accurate within 12% of selected frequency. The switch also contains DC and DC with OFFSET positions. AC COUPLED (at INPUT) — 2 Hz or less.

INPUT R and C

1 MΩ within 1%; 47 pF within 2.5 pF; product within 1% for all deflection factors.

MAX INPUT GATE CURRENT

10 μV to 10 mV/div — ±20 pA (+25°C), ±100 pA (50°C) each input; or ±40 pA (+25°C), ±200 pA (+50°C) differential.
20 mV to 10 V/div — ±10 pA (+25°C).

DISPLAY SHIFT—at 10 μV/div (AC coupled) is ±4 div (+25°C) and ±20 div (+50°C).

SIGNAL AND OFFSET RANGE

DEFLECTION FACTOR SETTINGS	10 μV to 10 mV/div	20 mV to 0.1 V/div	0.2 V to 1 V/div	2 V to 10 V/div
Differential Signal Range	±1 V	±10 V	±100 V	±1000 V
Common-mode Signal Range	±10 V	±100 V	±500 V	
Max DC Coupled Input (DC + peak AC at 1 kHz or less)	±15 V	±200 V	±500 V	
Max AC Coupled Input (DC voltage)	±500 V DC rejection, at least 4 x 10^5:1			
DC OFFSET RANGE	+1 V to —1 V	+10 V to —10 V	+100 V to —100 V	+1000 V to —1000 V

DC DRIFT

WITH TIME (ambient temperature constant).

SHORT TERM—5 μV (P-P) or 0.1 div per minute (whichever is greater) after 1 hour warm-up.

LONG TERM—10 μV (P-P) or 0.1 div per hour (whichever is greater) after 1 hour warm-up.

WITH AMBIENT TEMPERATURE—50 μV/°C or less.

DISPLAYED NOISE

16 μV or 0.1 div (whichever is greater) at maximum bandwidth, measured tangentially.

OVERDRIVE RECOVERY

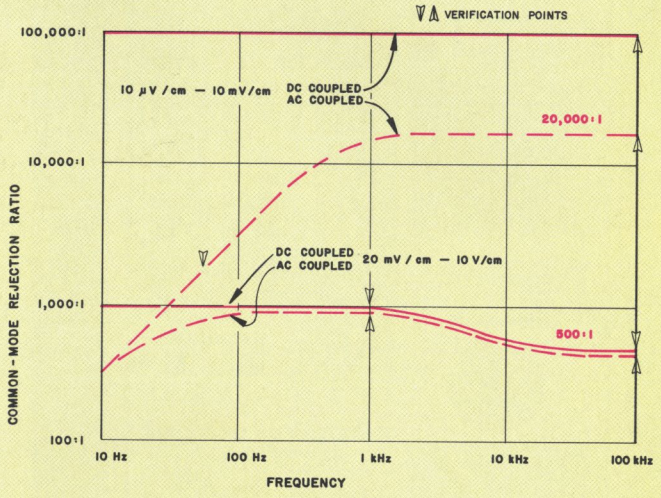
10 μs or less to recover within 0.5% of zero level after removal of a test signal applied for 1 s (signal amplitude not to exceed differential dynamic range). A front panel OVERDRIVE light indicates an overdrive condition is being approached.

INCLUDED STANDARD ACCESSORIES

Two instruction manuals 070-0931-00.

COMMON-MODE REJECTION RATIO vs FREQUENCY

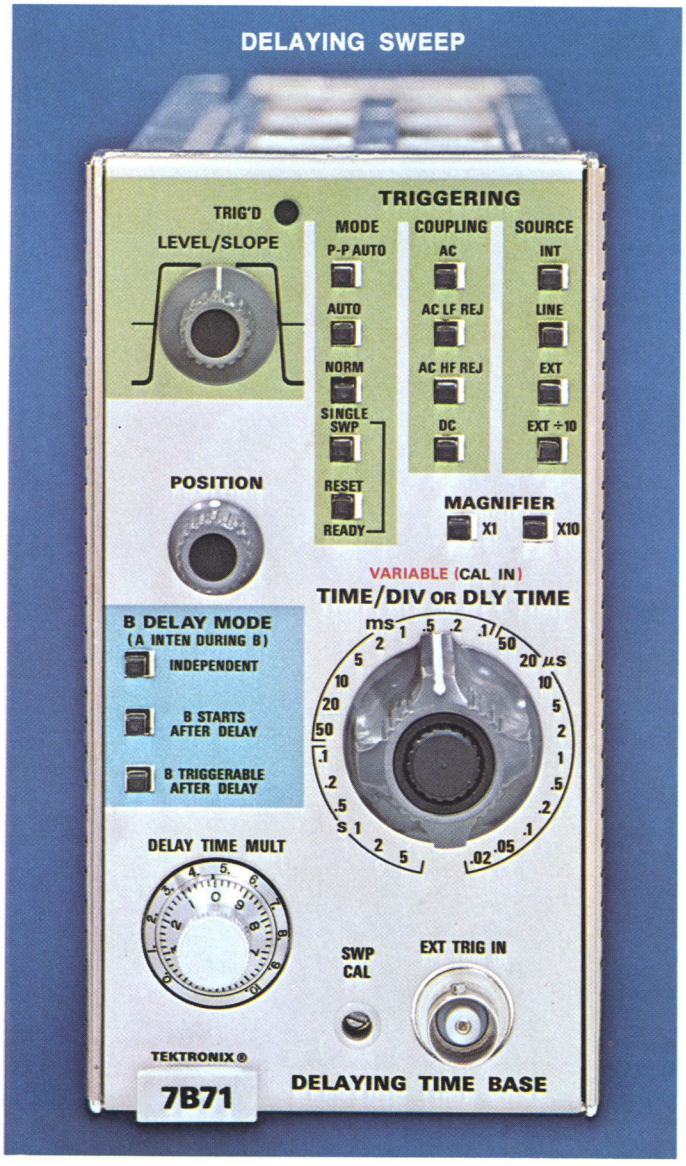
(for signals not exceeding common-mode dynamic range)

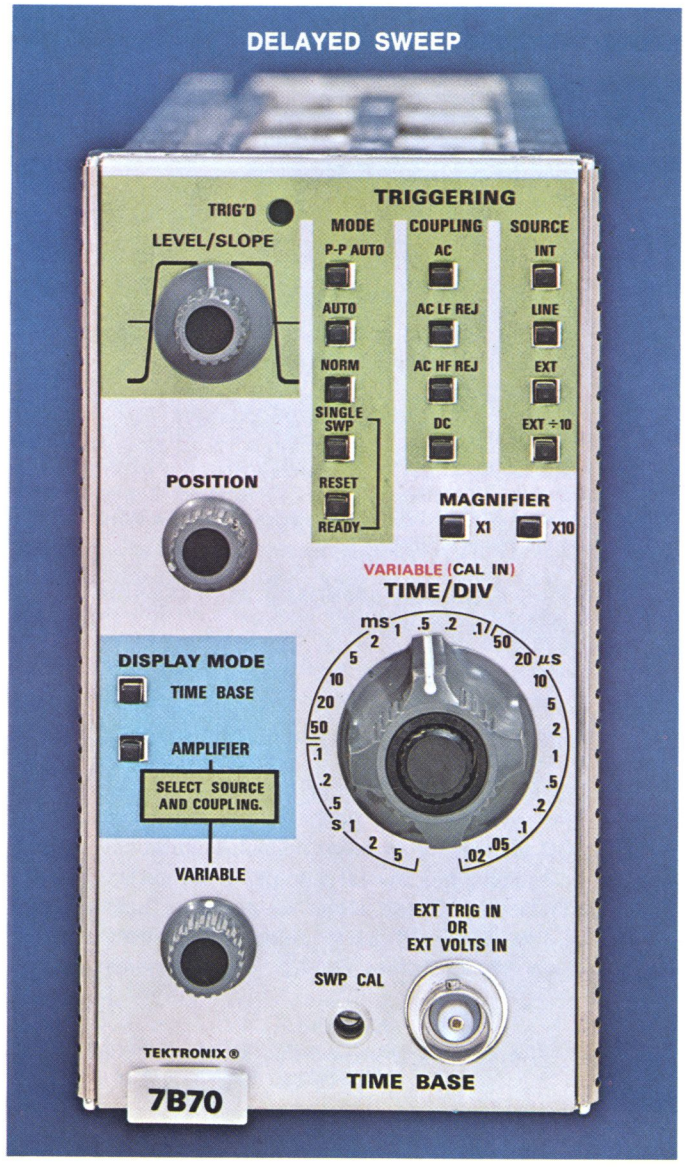


7A22 HIGH-GAIN DIFFERENTIAL AMPLIFIER **$500**

U.S. Sales Price FOB Beaverton, Oregon

7B71 TIME-BASE UNITS 7B70





DESCRIPTION

The 7B71 and 7B70 are horizontal TIME-BASE units for the 7704 mainframe. They are identical units except in two particulars. In combination, they provide a delaying-sweep mode of operation; the 7B71 being the DELAYING SWEEP and the 7B70 the DELAYED SWEEP. The 7B70 also has a horizontal amplifier input for uncalibrated X-axis deflection from an external source.

The calibrated TIME/DIV range is from 2 ns/div to 5 s /div in the 7704 mainframe. The 2 ns/div rate, obtained with the X10 MAGNIFIER, complements the 2.4 ns risetime capability of the vertical system.

Triggering control is very flexible with 12 push-button positions to program MODE, method of COUPLING, and SOURCE. For routine applications, hand-off triggering is accomplished by actuating the three upper-most push-button switches: INT source, AC COUPLING, and P-P AUTO MODE which is the most generally used combination. The new P-P AUTO MODE provides a baseline trace in the absence of a signal and a triggered trace at any position of the LEVEL/SLOPE control when a signal of 0.5 div or greater is present. Except for the selection of + or — SLOPE this mode is completely automatic. The other triggering positions are useful for specific applications.

The triggering frequency range is from DC to 200 MHz, selectable within that range by the method of COUPLING. AC LF REJ attenuates undesirable trigger components below 30 kHz (60 Hz would be almost totally rejected); AC HF REJ attenuates high-frequency components (above 50 kHz) which can cause triggering problems during low-frequency applications. SINGLE-SWEEP functions with lighted READY indicators and manual reset are associated with the trigger MODE controls.

For delaying-sweep operation, the 7B71 (occupying the in-board horizontal channel) contains the DELAY TIME MULTIPLIER and control circuitry to release the 7B70 DELAYED SWEEP (out-board channel) at a predetermined point during the delaying sweep. After release, the delayed sweep can be programmed to begin immediately or wait for the next trigger event.

Both units can be used singly in the 7704, if single horizontal operation is desired, or in combination to add the delaying-sweep function and independent dual-sweep operation possible in the horizontal amplifier CHOPPED or ALT modes.

SPECIFICATIONS

Specifications are common to both units unless otherwise noted.

SWEEP RATE

0.02 μs/div to 5 s/div in 26 steps (1-2-5 sequence). 2 ns/div is the fastest calibrated sweep rate, obtained with the X10 MAGNIFIER. The uncalibrated VARIABLE is continuous between steps and to ≃ 12.5 s/div.

SWEEP ACCURACY

Measured over the center 8 div, with the 7704 mainframe calibrator.

TIME/DIV	unmagnified		magnified	
	+15°C to +35°C	0°C to +50°C	+15°C to +35°C	0°C to +50°C
5 s to 1 s/div	3%	4%	3.5%	5%
0.5 s to 0.02 μs/div	2%	3%	2.5%	4%

SWEEP LENGTH

10 div to 13 div.

SWEEP HOLD-OFF TIME

5 s to 5 μs/div—TIME/DIV setting or less.
2 μs to 0.02 μs/div—2.5 μs or less.

TRIGGERING

COUPLING	Triggering Frequency Range	Min Signal Required INT	EXT
AC	30 Hz - 20 MHz 20 MHz - 200 MHz	0.3 div 1.5 div	75 mV 375 mV
AC LF REJ*	30 kHz - 20 MHz 20 MHz - 200 MHz	0.3 div 1.5 div	75 mV 375 mV
AC HF REJ	30 Hz - 50 kHz	0.3 div	75 mV
DC	DC - 20 MHz 20 MHz - 200 MHz	0.3 div 1.5 div	75 mV 375 mV

*Will not trigger on sinewaves of 3 div or less INT or 1.5 V EXT below 120 Hz.

P-P AUTO OPERATION
0.5 div INT, 250 mV EXT from 200 Hz to 20 MHz.
1.5 div INT, 750 mV EXT from 20 MHz to 200 MHz.

SINGLE SWEEP—Triggering requirements are the same as normal SWEEP. When triggered, sweep generator produces one sweep only until manually or remotely reset.

INTERNAL TRIGGER JITTER—1 ns or less at 150 MHz.

EXT TRIGGER INPUT

Max input voltage—500 V (DC + peak AC of 1 kHz or less).

Input R and C—1 MΩ within 2%, 20 pF within 2 pF.

Level range (excluding P-P AUTO)

EXT—at least +1.5 V to −1.5 V.

EXT ÷ 10—at least +15 V to −15 V.

EXT HORIZONTAL INPUT (7B70 ONLY)

DEFLECTION FACTOR—25 mV/div within 5 mV when in EXT source with variable fully CW; 250 mV/div within 50 mV when in EXT ÷ 10 source position. The VARIABLE range is at least 10:1.

FREQUENCY RESPONSE:

COUPLING	Lower −3 dB	Upper −3 dB
AC	16 Hz	500 kHz
AC LF REJ	16 kHz	500 kHz
AC HF REJ	16 Hz	100 kHz
DC	DC	500 kHz

DELAYING SWEEP CHARACTERISTICS (7B71 ONLY)

DELAY TIME MULTIPLIER RANGE—0 to 10 times the TIME/DIV setting.

ACCURACY—5 s/div to 1 s/div within 2%.
.5 s/div to 1 μs/div within 1%.

MULTIPLIER INCREMENTAL LINEARLY—within 0.2%.

JITTER—1 part or less in 50,000 of 10X the TIME/DIV setting.

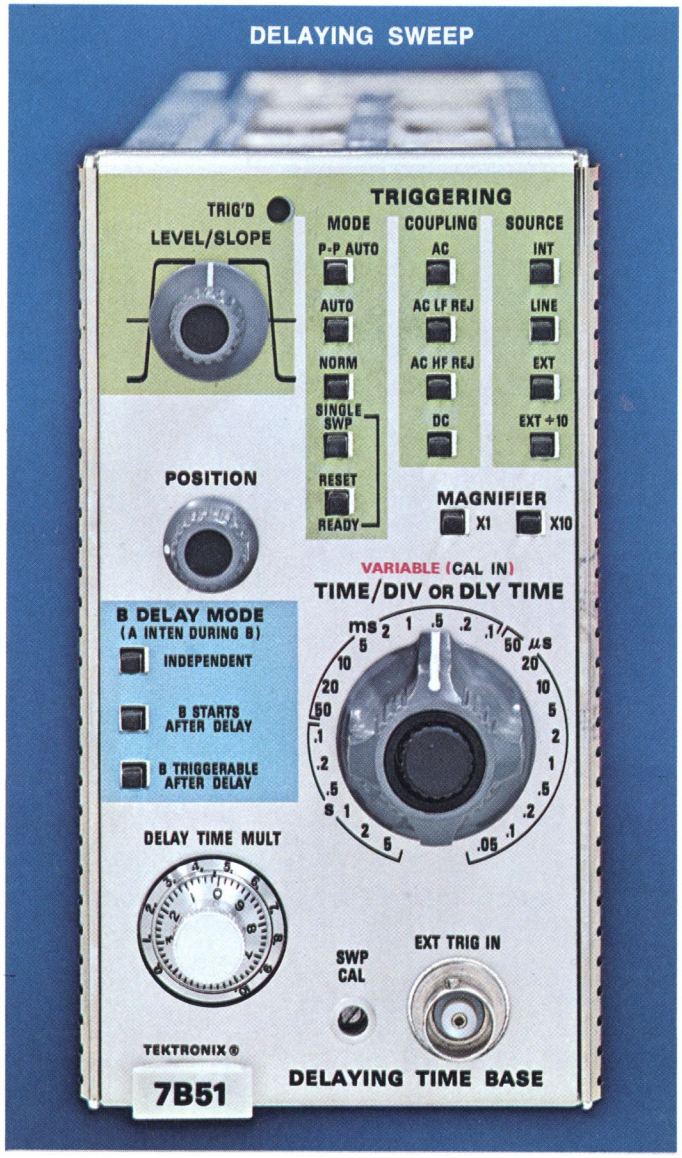
INCLUDED STANDARD ACCESSORIES

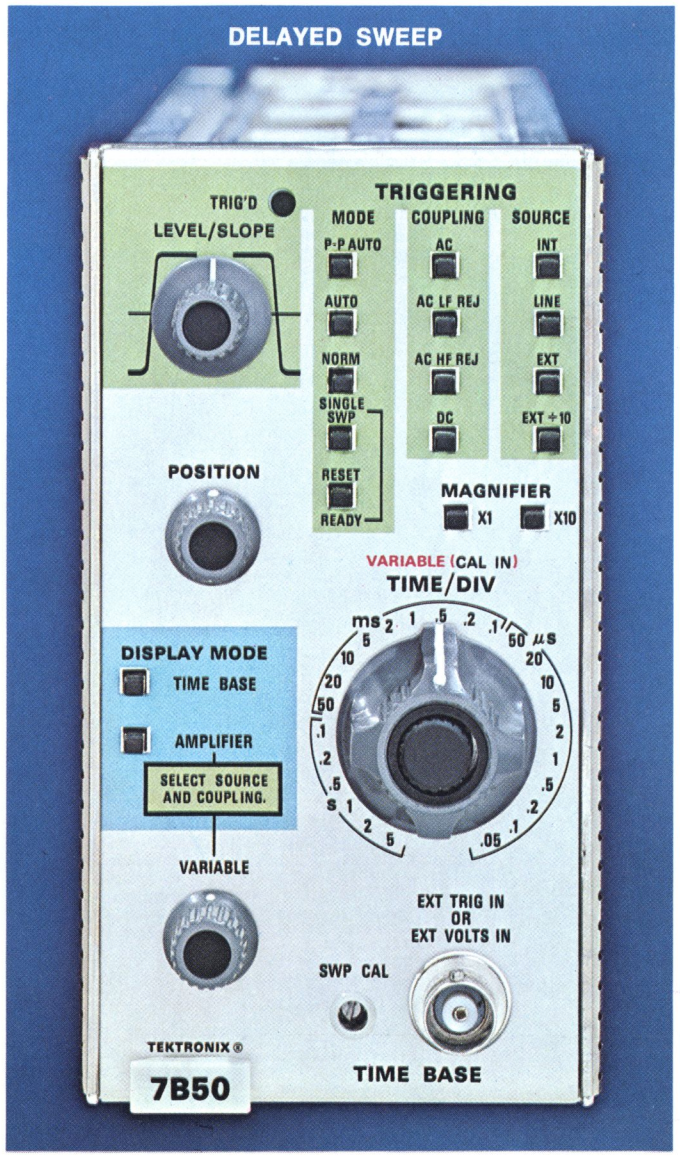
Two instruction manuals 7B70, (070-0982-00).
Two instruction manuals 7B71, (070-0983-00).

7B70 TIME-BASE UNIT **$600**
7B71 TIME-BASE UNIT **$685**

U.S. Sales Prices FOB Beaverton, Oregon

7B51 TIME-BASE UNITS 7B50





DESCRIPTION

The 7B51 and 7B50 are horizontal TIME-BASE units for the 7504 mainframe. They are identical units except in two particulars. In combination, they provide a delaying-sweep mode of operation; the 7B51 being the DELAYING SWEEP and the 7B50 the DELAYED SWEEP. The 7B50 also has a horizontal amplifier input for uncalibrated X-axis deflection from an external source.

The calibrated TIME/DIV range is from 5 ns/div to 5 s /div in the 7504 mainframe. The 5 ns/div rate, obtained with the X10 MAGNIFIER, complements the 3.9-ns risetime capability of the vertical system.

Triggering control is very flexible with 12 push-button positions to program MODE, method of COUPLING, and SOURCE. For routine applications, hands-off triggering is accomplished by actuating the three upper-most push-button switches: INT SOURCE, AC COUPLING, and P-P AUTO MODE—the most commonly used combination. The new P-P AUTO MODE provides a baseline trace in the absence of a signal and a triggered trace at any position of the LEVEL/SLOPE control when a signal of 0.5 div or greater is present. Except for the selection of + or — SLOPE this mode is completely automatic. The other triggering positions are useful for specific applications.

The triggering frequency range is from DC to 100 MHz, selectable within that range by the method of COUPLING. AC LF REJ attenuates undesirable trigger components below 30 kHz (60 Hz would be almost totally rejected); AC HF REJ attenuates high-frequency components (above 50 kHz) which can cause triggering problems during low-frequency applications. SINGLE-SWEEP functions with lighted READY indicators and manual reset are associated with the trigger MODE controls.

For delaying-sweep operation, the 7B51 (occupying the in-board horizontal channel) contains the DELAY TIME MULTIPLIER and control circuitry to release the 7B50 DELAYED SWEEP (out-board channel) at a predetermined point during the delaying sweep. After release, the delayed sweep can be programmed to begin immediately or wait for the next trigger event.

Both units can be used singly in the 7504, if single horizontal operation is desired, or in combination to add the delaying-sweep function and independent dual-sweep operation possible in the horizontal amplifier CHOPPED or ALT modes.

SPECIFICATIONS

Specifications are common to both units unless otherwise noted.

SWEEP RATE

0.05 μs/div to 5 s/div in 25 steps (1-2-5 sequence). 5 ns/div is the fastest calibrated sweep rate, obtained with the X10 MAGNIFIER. The uncalibrated VARIABLE is continuous between steps and to 12.5 s/div.

SWEEP ACCURACY

Measured over the center 8 div, with the 7504 mainframe calibrator.

TIME/DIV	unmagnified		magnified	
	+15°C to +35°C	0°C to +50°C	+15°C to +35°C	0°C to +50°C
5 s to 1 s/div	3%	4%	3.5%	5%
0.5 s to 0.05 μs/div	2%	3%	2.5%	4%

SWEEP LENGTH

10 div to 13 div.

SWEEP HOLD-OFF TIME

5 s to 5 μs/div—TIME/DIV setting or less
2 μs to 0.05 μs/div—2.5 μs or less

TRIGGERING

COUPLING	Triggering Frequency Range	Min Signal Required INT	Min Signal Required EXT
AC	30 Hz - 10 MHz 10 MHz - 100 MHz	0.3 div 1.5 div	150 mV 750 mV
AC LF REJ*	30 kHz - 10 MHz 10 MHz - 100 MHz	0.3 div 1.5 div	150 mV 750 mV
AC HF REJ	30 Hz - 50 kHz	0.3 div	150 mV
DC	DC - 10 MHz 10 MHz - 100 MHz	0.3 div 1.5 div	150 mV 750 mV

*Will not trigger on sinewaves of 3 div or less INT or 1.5 V EXT below 120 Hz.

P-P AUTO OPERATION
0.5 div INT, 250 mV EXT from 200 Hz to 10 MHz.
1.5 div INT, 750 mV EXT from 10 MHz to 100 MHz.

SINGLE SWEEP—Triggering requirements are the same as normal SWEEP. When triggered, sweep generator produces one sweep only until manually or remotely reset.

INTERNAL TRIGGER JITTER—1 ns or less at 75 MHz.

EXT TRIGGER INPUT

Max input voltage—500 V (DC + peak AC of 1 kHz or less).

Input R and C—1 MΩ within 2%, 20 pF within 2 pF.

Level range (excluding P-P AUTO)

EXT—at least +3.5 V to −3.5 V.

EXT ÷ 10—at least +35 V to −35 V.

EXT HORIZONTAL INPUT (7B50 ONLY)

DEFLECTION FACTOR—90 mV/div within 10 mV when in EXT source with variable fully CW; 900 mV/div within 110 mV when in EXT ÷ 10 source position. The VARIABLE range is at least 10:1.

FREQUENCY RESPONSE

COUPLING	Lower −3 dB	Upper −3 dB
AC	16 Hz	500 kHz
AC LF REJ	70 kHz	500 kHz
AC HF REJ	16 Hz	100 kHz
DC	DC	500 kHz

DELAYING SWEEP CHARACTERISTICS (7B51 ONLY)

DELAY TIME MULTIPLIER RANGE—0 to 10 times the TIME/DIV setting.

ACCURACY—5 s/div to 1 s/div within 2%.
0.5 s/div to 1 μs/div within 1%.

MULTIPLIER INCREMENTAL LINEARLY—within 0.2%.

JITTER—1 part or less in 50,000 of 10X the TIME/DIV setting.

INCLUDED STANDARD ACCESSORIES

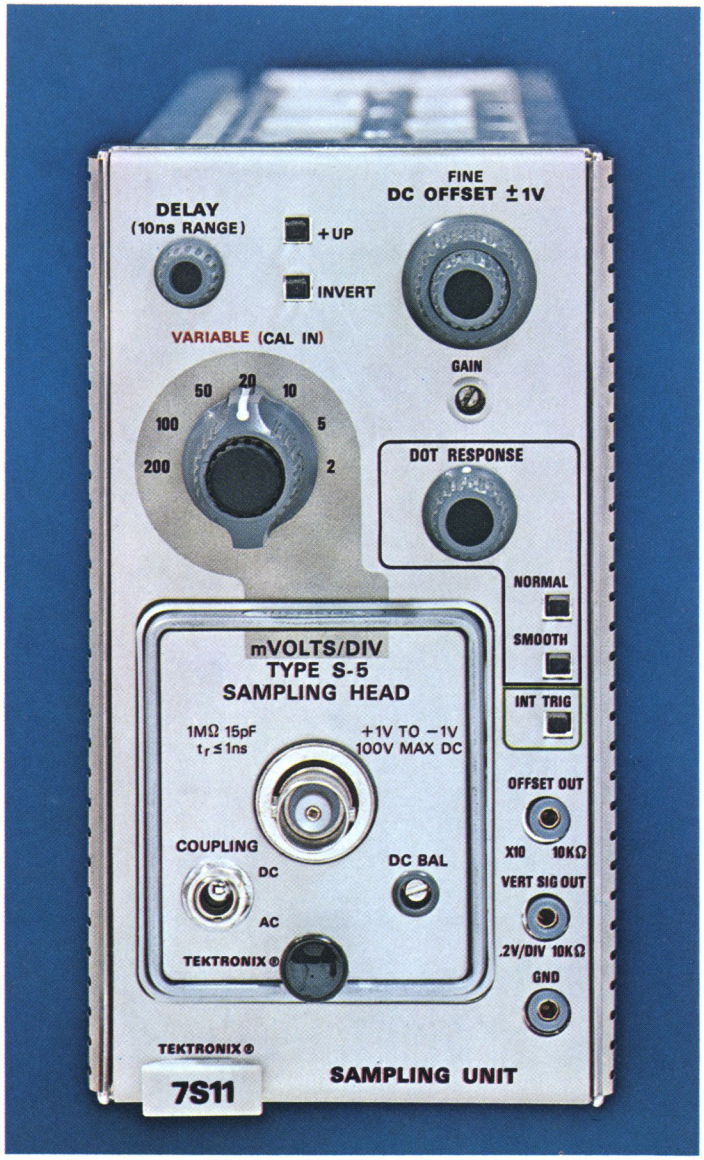
Two instruction manuals 7B50, (070-0975-00).
Two instruction manuals 7B51, (070-0976-00).

7B50 TIME-BASE UNIT **$450**
7B51 TIME-BASE UNIT **$510**

U.S. Sales Prices FOB Beaverton, Oregon

SAMPLING AMPLIFIER UNIT

7S11



DESCRIPTION

The 7S11 is a single-channel sampling unit for use in 7704 and 7504 mainframes. It contains the basic deflection amplifier and control circuitry common to all sampling systems. The input configuration employs the sampling "Plug-In Head" concept for maximum application range. The heads, which mount in the 7S11, cover the impedance/bandwidth spectrum from 1 MΩ/350 MHz to 50 Ω/14 GHz. (See plug-in head descriptions.)

The 7S11 can be used in a variety of combinations. Single channel sampling would use one 7S11, together with a 7T11 Time-Base, and occupy the two center plug-in channels in the mainframe. Two 7S11's and one 7T11 would provide dual-trace sampling utilizing the electronic switching in the mainframe vertical amplifier. Two 7S11's can be used for X-Y operations, using the center two plug-in channels (RIGHT vertical and "A" horizontal channels).

An INTERNAL TRIGGER path is provided from the Plug-In Head (except for the S-3) to the 7T11 Time-Base when the INT trig mode is selected. When operating in dual-trace mode, either vertical channel may be used as the trigger source.

The 7S11 deflection factor is in UNIT/DIV (units parameter determined by the plug-in head) from 2 UNITS/DIV to 200 UNITS/DIV with a continuous VARIABLE control. The DOT RESPONSE control optimizes dot transient response in the NORMAL mode. The SMOOTH position reduces display noise at the more sensitive deflection factor settings.

The ±1 V DC OFFSET can be used as a vertical magnifier/position control to view small segments of a large signal within its range, or to effectively cancel the same range of DC level on the signal. The DC OFFSET voltage is available at the OFFSET OUT jack, amplified X10, for external monitoring.

SPECIFICATIONS

DEFLECTION FACTOR

2 units/div to 200 units/div in 7 calibrated steps (1-2-5 sequence); accurate within 3%. Uncalibrated VARIABLE is continuous with a range of 0.5:1 (CCW) to 2.5:1 (CCW) referenced to the UNITS/DIV setting. Deflection factor (i.e., mV/DIV) is determined by the plug-in sampling head.

BANDWIDTH

Determined by the sampling head.

INPUT R and C

Determined by the sampling head.

DC OFFSET

RANGE– +1 V to −1 V.

OFFSET OUT– X10 the offset voltage within 2%. Source resistance 10 kΩ within 1%

DELAY RANGE

At least 10 ns.

MEMORY SLASH

0.1 div or less at 20 Hz.

VERTICAL SIGNAL OUT

200 mV per displayed div within 3%.

INCLUDED STANDARD ACCESSORIES

Two instruction manuals (070-0985-00).

7S11 SAMPLING AMPLIFIER **$450**

U.S. Sales Prices FOB Beaverton, Oregon

PLUG-IN SAMPLING HEADS

350-ps, 50-Ω INPUT

The Type S-1 is a 350-ps risetime, 1-GHz bandwidth unit with low random noise. Complete specifications on Page 212 of the 1969 catalog.

TYPE S-1 SAMPLING HEAD **$300**

50-ps, 50-Ω INPUT

The Type S-2 is a 50-ps risetime, 7-GHz bandwidth unit. Complete specifications on Page 212 of the 1969 catalog.

TYPE S-2 SAMPLING HEAD **$355**

350-ps, 100-kΩ INPUT

The Type S-3 is a 350-ps risetime, 1-GHz bandwidth unit with a sampling probe input for higher INPUT IMPEDANCE (100 kΩ, 2.3 pF). Complete specifications on Page 213 of the 1969 catalog.

TYPE S-3 SAMPLING HEAD **$435**

25-ps, 50-Ω INPUT

The Type S-4 is a 25-ps risetime, 14-GHz bandwidth unit. The 50-Ω input uses a 3-mm connector. Complete specifications on Page 214 of the 1969 catalog.

TYPE S-4 SAMPLING HEAD **$875**

1-ns, 1-MΩ INPUT

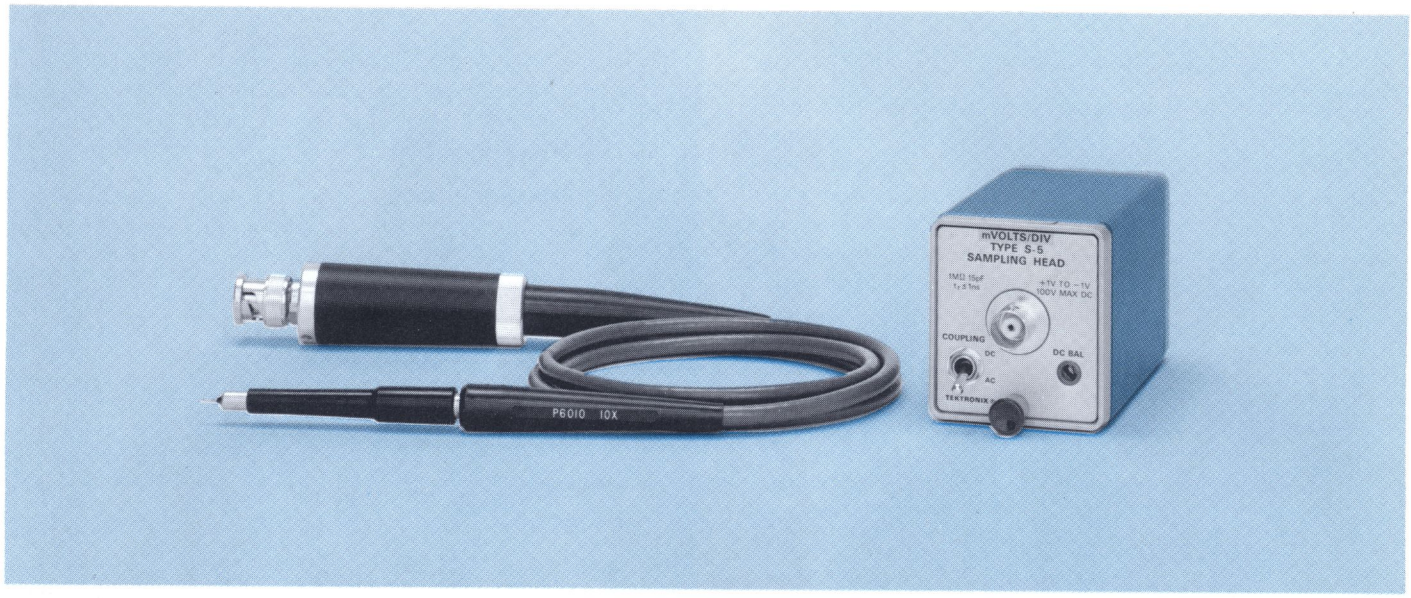
The Type S-5 is a 1-ns risetime, 350-MHz bandwidth unit. The input impedance is 1 MΩ, 15 pF and can be used with conventional passive probes. Complete specifications on next page of this catalog supplement.

TYPE S-5 SAMPLING HEAD **$345**

U.S. Sales Prices FOB Beaverton, Oregon

SAMPLING HEAD

S-5



- ***PASSIVE PROBE***
- ***DC-to-350 MHz BANDWIDTH***
- ***DISPLAYED NOISE LESS THAN 500 μV***
- ***INTERNAL TRIGGER PICKOFF***

The Type S-5 Sampling Head is a low noise, 1-ns risetime sampling unit with a 1-MΩ, 15-pF input impedance. When used with the P6010 passive probe the input impedance increases to 10 MΩ, 10 pF while maintaining the 1-ns t_r at the probe tip. A switch on the sampling head selects either AC or DC coupling of the input.

The Type S-5 Sampling Head is designed for use with the Types 3S2, 3S5 and 3S6 Dual-Trace Sampling Units and can be plugged in or attached by an optional Sampling-Head extender for remote use. When used with the Type 3T2 Random Sampling Sweep Unit, the triggering event may be displayed on the screen without the use of delay lines or a pretrigger.

CHARACTERISTICS

RISETIME

S-5 only, 1 ns or less; with 3.5 foot P6010, 1 ns or less.

BANDWIDTH

Equivalent to DC-to-350 MHz at 3-dB down at input connector or probe tip.

TRANSIENT RESPONSE

(Driven with a 50-Ω source)

S-5 only (terminated in 50 Ω): aberrations +2.5%, —5% or less, total of 7.5% or less P-P within 17 ns after step +0.5%, —2% or less, total of 2.5% or less P-P thereafter.

S-5/P6010 (3.5-foot probe properly compensated): aberrations +5%, —5% or less, total of 10% or less P-P within 17 ns after step; +1%, —3% or less, total of 4% or less P-P thereafter.

DISPLAYED NOISE

S-5 only, 500 μV or less, measured tangentially.

S-5/P6010, 5 mV or less, measured tangentially.

SIGNAL RANGE

S-5 only: DC coupled (DC + peak AC)—1 V P-P; AC coupled, DC voltage—100 V.

S-5/P6010: DC coupled (DC + peak AC)—10 V P-P; AC coupled, DC voltage—100 V.

INPUT CHARACTERISTICS

S-5 only is 1 MΩ within 1% paralleled by 15 pF within 1 pF.

S-5/P6010 is 10 MΩ paralleled by approx 10 pF.

ATTENUATION ACCURACY

Probe attenuation accuracy is 10X within 3%.

WEIGHT

Net Weight	≈ 9 oz	≈ .24 kg

INCLUDED STANDARD ACCESSORIES

P6010 probe package (010-0188-00), 50-Ω termination (011-0049-01), manual (070-0942-00).

TYPE S-5 SAMPLING HEAD **$345**

OPTIONAL ACCESSORIES

Probe tip-to-BNC adapter, order 013-0084-00 ..... $4.75

Probe tip-to-GR adapter, order 017-0076-00 ..... $7.50

U.S. Sales Prices FOB Beaverton, Oregon

SPECIFICATIONS

DELAY LINE

Time Delay— 75 ns within 0.25 ns.

Delay Difference— 30 ps or less between channels.

Risetime— 175 ps or less.

Attenuation— X2 within 2% into 50 Ω.

Input Impedance— 50 Ω within 1%.

Maximum Input Voltage— ±5 V.

TRIGGER OUTPUT

Risetime— 500 ps or less.

Attenuation— X5 within 10% into 50 Ω (referred to INPUT).

Output Impedance— 50 Ω within 10%.

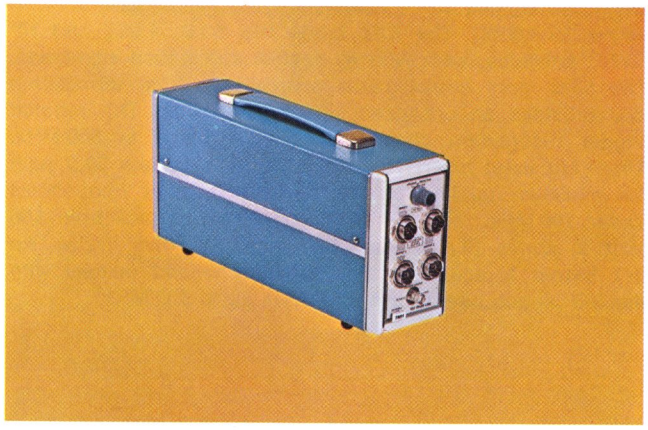
INCLUDED STANDARD ACCESSORIES

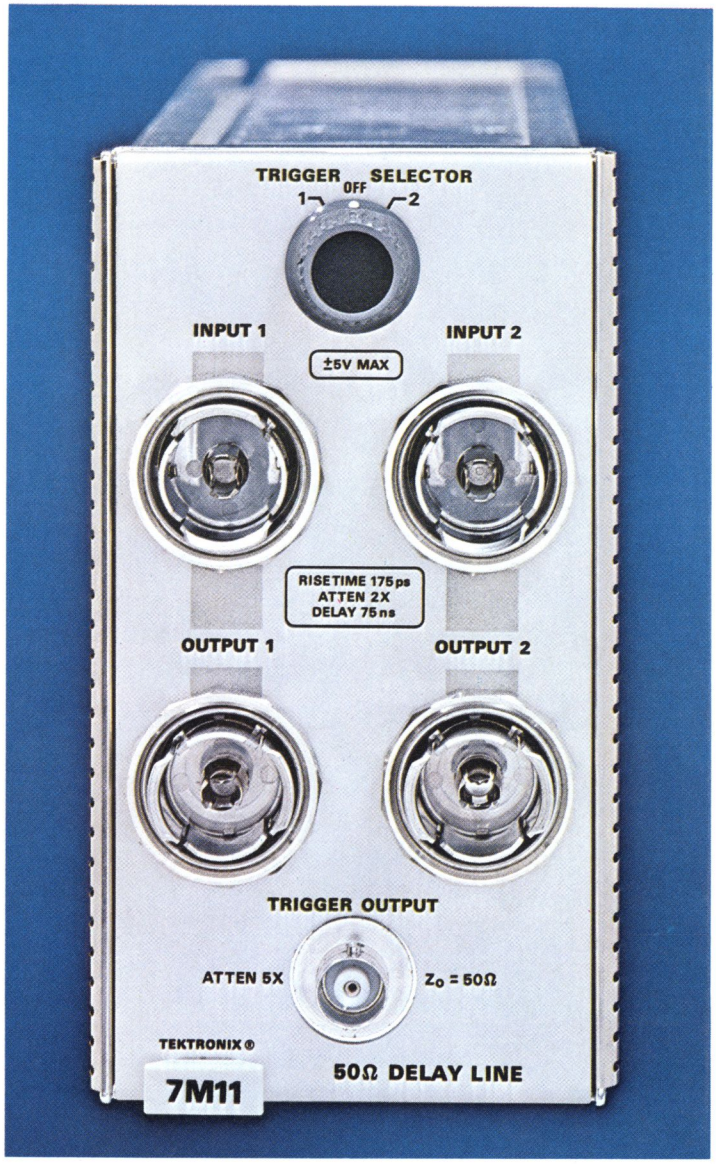
BNC cable (012-0057-01); two instruction manuals (070-0987-00).

7M11 DELAY LINE UNIT **$250**

7M11 CARRYING CASE (437-0106-00) $30

U.S. Sales Prices FOB Beaverton, Oregon

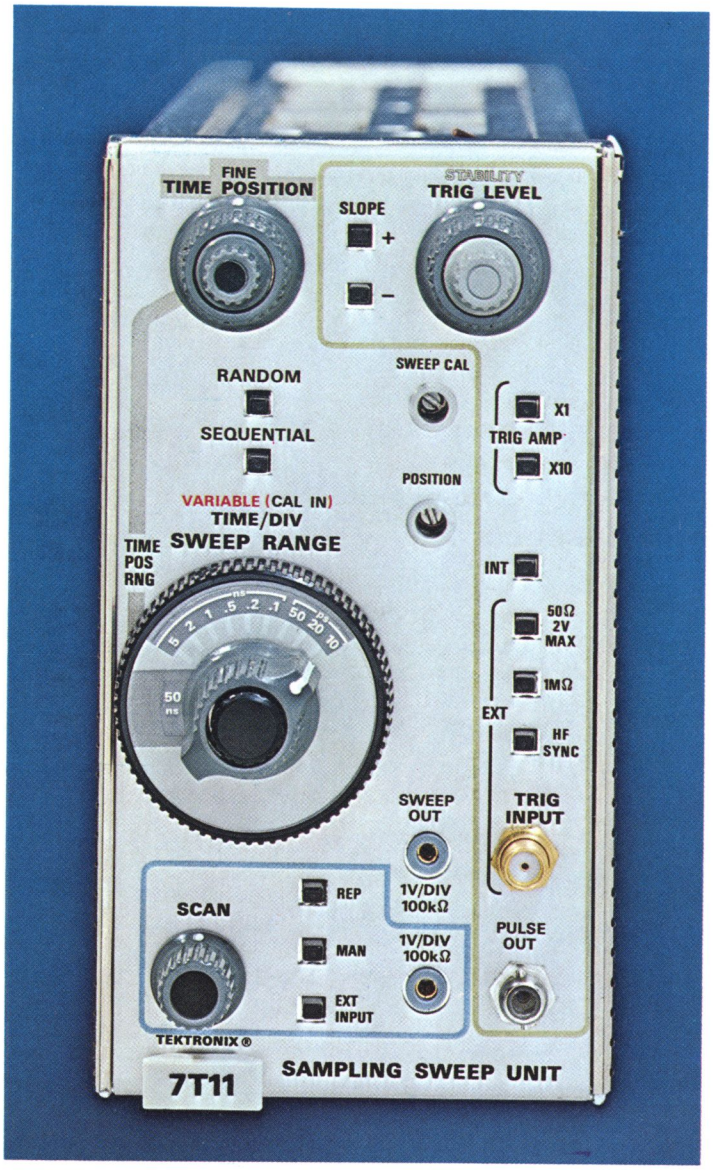




DESCRIPTION

The 7M11 is a passive dual DELAY LINE UNIT for use with the 7000-Series sampling system. In low-repetition rate applications, requiring the sequential mode of operation, the 7M11 provides the trigger source and signal delay necessary to view the triggering event.

Vertical delay for two 7S11 vertical sampling units is available with the dual 50-Ω, 75-ns delay lines. The closely matched (30 ps) lines have GR-874 INPUT-OUTPUT connectors, 175-ps risetime, and 2X signal attenuation. Trigger selection is from either input, 5X attenuated, with a risetime of 500 ps or less.



DESCRIPTION

The 7T11 SAMPLING TIME-BASE provides equivalent-time and real-time horizontal deflection for single or dual-trace sampling in 7000-series oscilloscopes. The TIME/DIV range is calibrated from 10 ps/div to 5 ms/div, selectable with the concentric TIME POSITION RANGE, TIME/DIV and VARIABLE control. Timing accuracy is within 3% (see specifications) and non-linearity is well below 1%, making specification unnecessary. Triggering range is from ≃ 10 Hz (sequential mode) to above 12.4 GHz. The following describes the modes of operation.

RANDOM SAMPLING—In this mode the triggering event may be displayed without the need of a pretrigger or signal delay line. The sampling process is controlled automatically by circuits which allow samples to be taken before, during and after the signal event of interest. The horizontal coordinate of each sample is then determined by a measurement of the time between the instant of sampling and the occurrence of a trigger. The random-sampling mode is most useful for displaying repetitive signals above 1 kHz.

SEQUENTIAL SAMPLING—When the signal repetition rate is between 10 Hz and 1 kHz, the most useful display is obtained in the sequential-sampling mode. In this mode, the sampling process is initiated by the trigger signal. As a result, either a pretrigger or signal delay line (such as the 7M11) is required to display the triggering event. For measurements which do not require display of the trigger-event (i.e., sine-waves) a pre-trigger is not necessary and the decision to use random or sequential mode is based on repetition rate.

REAL TIME SAMPLING—To provide a wide measurement range, the 7T11 automatically crosses from equivalent-time to real-time sampling for the three longest Time Position Ranges (50 ms, 5 ms, 0.5 ms). In this mode, sampling occurs at a free-running (50 kHz) rate with the horizontal coordinate determined in a manner similar to that described above for Random Sampling. Lead-time is fixed at about 3 μs for this mode but time-positioning is available as in equivalent-time sampling.

TIME-POSITION RANGE—Control selects the time window from 50 ms to 50 ns in 7 steps. The TIME/DIV controls can then select all or a portion of the time window for display. Each RANGE has 9 TIME/DIV steps (1-2-5 sequence) associated with it. The displayed portion of the time window is selectable with the TIME POSITION control.

TRIGGERING CONSIDERATIONS—The unit is capable of triggering on signals in the useful sampling range from 10 Hz to above 12.4 GHz. The EXT mode has 50 Ω, 1 MΩ, and HF SYNC positions, each with its special application advantage. The 50 Ω input complements sources requiring termination and provides an optimized signal path to the DC coupled trigger recognition circuit; operation extends to 500 MHz. The 1 MΩ input inserts a X1 FET amplifier in the 50 Ω path for minimum loading of the signal source at frequencies under 100 MHz. The HF SYNC position operates from 500 MHz to above 12.4 GHz as a trigger countdown device. An INT trigger source from the 7S11 is provided (except with the S-3 plug-in head) for frequencies up to 500 MHz.

SPECIFICATIONS

TIME/DIV RANGE—10 ps/div to 5 ms/div (1-2-5 sequence) directly related to TIME POSITION RANGES. Uncalibrated VARIABLE is continuous between TIME/DIV setting and next fastest position.

TIME POSITION RANGE

Equivalent time—50 ns to 50 μs in 4 steps.

Real time—0.5 ms to 50 ms in 3 steps.

TIME/DIV ACCURACY

Within 3% for all TIME/DIV settings in the Equivalent-time Ranges.

Within 3% after 0.5% of TIME POS RNG, or 500 ns of the display window in the 0.5 ms Real-time Range.

Within 3% after 0.5% of TIME POS RNG for all TIME/DIV settings in the 5 ms and 50 ms Real-time Ranges.

TRIGGERING

EXT 50 Ω INPUT

Frequency range—DC to 500 MHz

Sensitivity range—5 mV to 2 V P-P

Input resistance—50 Ω within 5%

Max Input Voltage—2 V (DC + peak AC)

EXT 1 MΩ INPUT

Frequency range—DC to 100 MHz

Sensitivity range—5 mV to 2 V P-P

Input resistance—1 MΩ within 5%

Max Input Voltage—100 V P-P to 1 kHz, derating 6 dB/octave to a minimum 5 V P-P.

EXT HF SYNC

Frequency range—500 MHz to 12.4 GHz

Sensitivity range—10 mV to 500 mV P-P

Input characteristics—50 Ω, 3 mm connector, open-circuit terminated.

Max Input Voltage—2 V P-P

INT TRIGGER SOURCE

Frequency range—DC to 500 MHz

Sensitivity range—50 mV to 1 V P-P referred to the vertical input.

DISPLAY JITTER—10 ps or less in the 50 ns RANGE; 0.2 div or less in the 500 ns to 5 ms RANGES; measured under optimum trigger conditions.

PULSE OUT

Amplitude—at least 400 mV into 50 Ω, positive pulse.

Risetime—1 ns or less.

TRIGGER RATE—100 Hz minimum in RANDOM MODE.

TRIGGER KICKOUT—20 mV or less into 50 Ω. (Except HF SYNC.)

DOT DENSITY

REPETITIVE SCAN—continuously variable from ≤50 dots/div to ≥1000 dots/div.

EXTERNAL SCAN

INPUT RESISTANCE—100 kΩ within 10%

DEFLECTION FACTOR—continously variable from 0 V to ≃ 1 V div.

SWEEP OUT

1 V/div within 2%, source resistance is 10 kΩ within 1%.

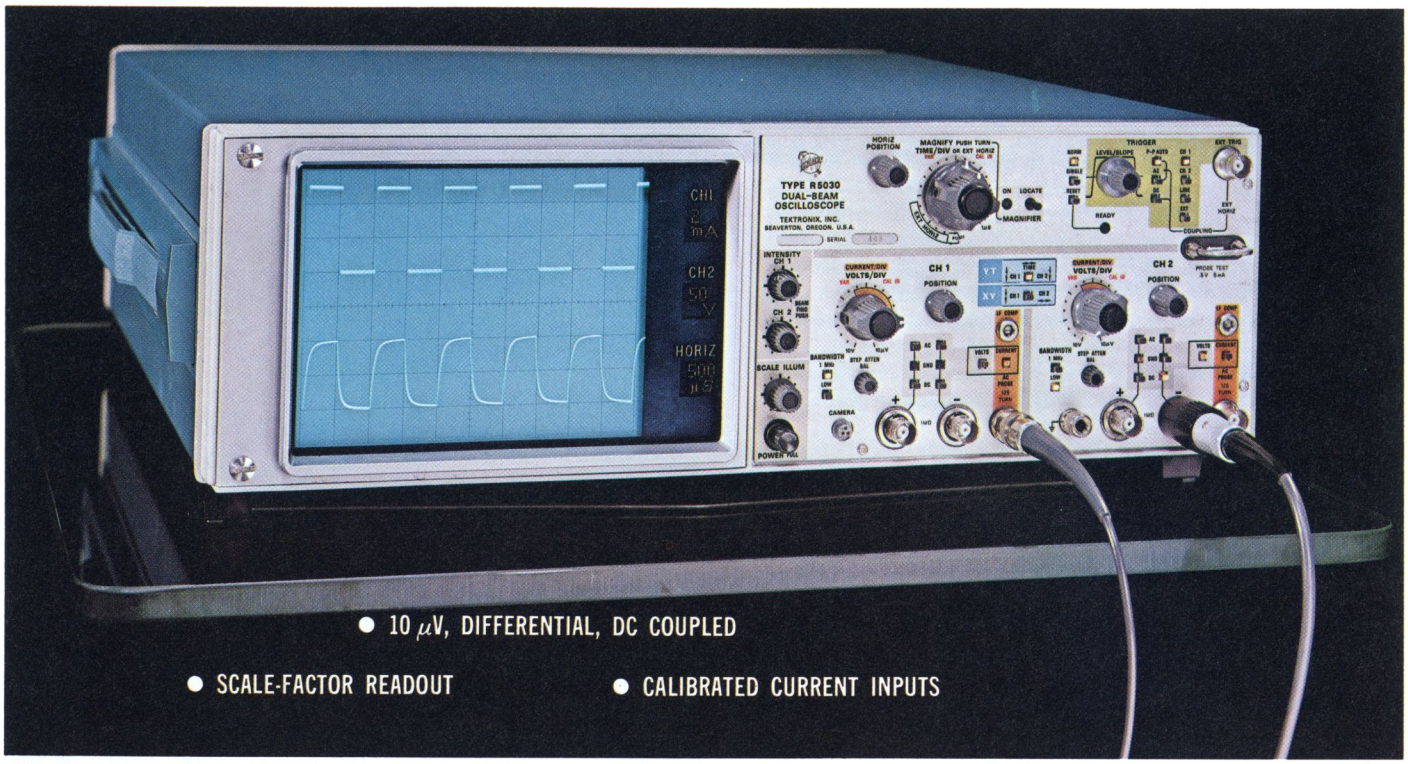
INCLUDED STANDARD ACCESSORIES

Two instruction manuals (070-0986-00)
Cable, 42 inch, 50 Ω, BNC/BNC (012-0057-01)
Attenuator, 10X, 50 Ω, BNC (011-0059-01)
3 mm male to BNC adapter (015-1018-00)
3 mm male to GR874 adapter (015-1007-00)

7T11 SAMPLING TIME-BASE UNIT $1100

U.S. Sales Prices FOB Beaverton, Oregon

R5030 DUAL-BEAM OSCILLOSCOPE R5030



- 10 µV, DIFFERENTIAL, DC COUPLED
- SCALE-FACTOR READOUT
- CALIBRATED CURRENT INPUTS

The Type R5030 is the first dual-beam oscilloscope to offer current inputs, high-gain differential inputs, auto scale-factor readout, and 1-MHz bandwidth.

While adding more capability, the design stresses usability. Controls are color coded to outline functions; switching is simplified; scale-factors are read out via fiber-optics; and the viewing area of the CRT is increased by 50%. Each beam has a full scan of 8 x 10 divisions (1.27 cm per division). Readouts indicate current or voltage amplitude plus the time as set by the deflection controls. When any of the controls is in an uncalibrated position, two visual means to detect this condition are provided. The knob will show red, while the auto scale-factor readout will have a "greater than" (>) sign appear in front of that scale factor. The complementary color scheme aids the user in readily distinguishing different functions. Green panel areas identify trigger controls; mode functions are designated by the color blue; the color salmon distinguishes those functions associated with current inputs; while voltage inputs, time-base controls, as well as CRT controls are outlined in gray.

Unique to this instrument is a LOCATE function associated with the time-base magnifier. When depressed, the time base is returned to a X1 magnification position and the area which will be magnified is intensified. The magnifier, which is direct reading on the auto scale-factor readout offers five positions of magnification on the time-base switch. The locate feature allows the operator to easily pick out where on the trace he has chosen his magnified sweep.

The trigger circuit is greatly simplified by a peak-to-peak auto circuit. When in this mode, the trigger circuit detects the peak-to-peak excursions of the displayed waveform and matches the range of the level control to the range of the displayed signal. The trigger level and slope controls are combined in this new instrument. When used with the peak-to-peak auto position, the operator can go thru the maximum excursions on either slope and never reach an untriggerable position on the control.

Other features to aid the operator are beam finders on the intensity controls, and lamps that indicate the operating mode. When the volts push button is depressed, the AC, GND, or DC switch positions light; when switched to current mode, all the voltage-control function lights are extinguished. When switching from the Y-T mode of operation to the X-Y mode, all trigger-functions lamps are extinguished, indicating that you do not have control with the time base.

Additional capabilities which make the R5030 even more versatile: 1. The vertical sensitivity is 10 µV with a low-noise figure, as well as excellent differential, common-mode-rejection ratio. 2. The vertical channels have current inputs which allow simultaneous measurements of current and voltage. 3. The bandwidth is 1 MHz at all deflection factors. (However, bandwidth may be limited to approximately 5 kHz, allowing the operator to eliminate wide-band noise in his measurement.) These measurement capabilities, plus the many convenience features make this instrument useful in a wide variety of applications.

CHARACTERISTIC SUMMARY

VERTICAL

Bandwidth—Selectable: DC to 1 MHz or DC to 5 kHz (within 10% at —3 dB).

Deflection Factor—10 µV/div to 10 V/div or 1 mA/div to 200 mA/div.

Input RC—1 megohm paralleled by approximately 50 pF.

Common-Mode-Rejection Ratio — at least 100,000:1 (DC to 100 kHz).

HORIZONTAL

Time Base—1 µs/div to 5 s/div.

Magnifier—up to 5 magnification steps (×50 mag max).

External Input—20 mV/div to .5 V/div.

CRT

Display Area—each beam 8x10/div (1.27 cm/div).

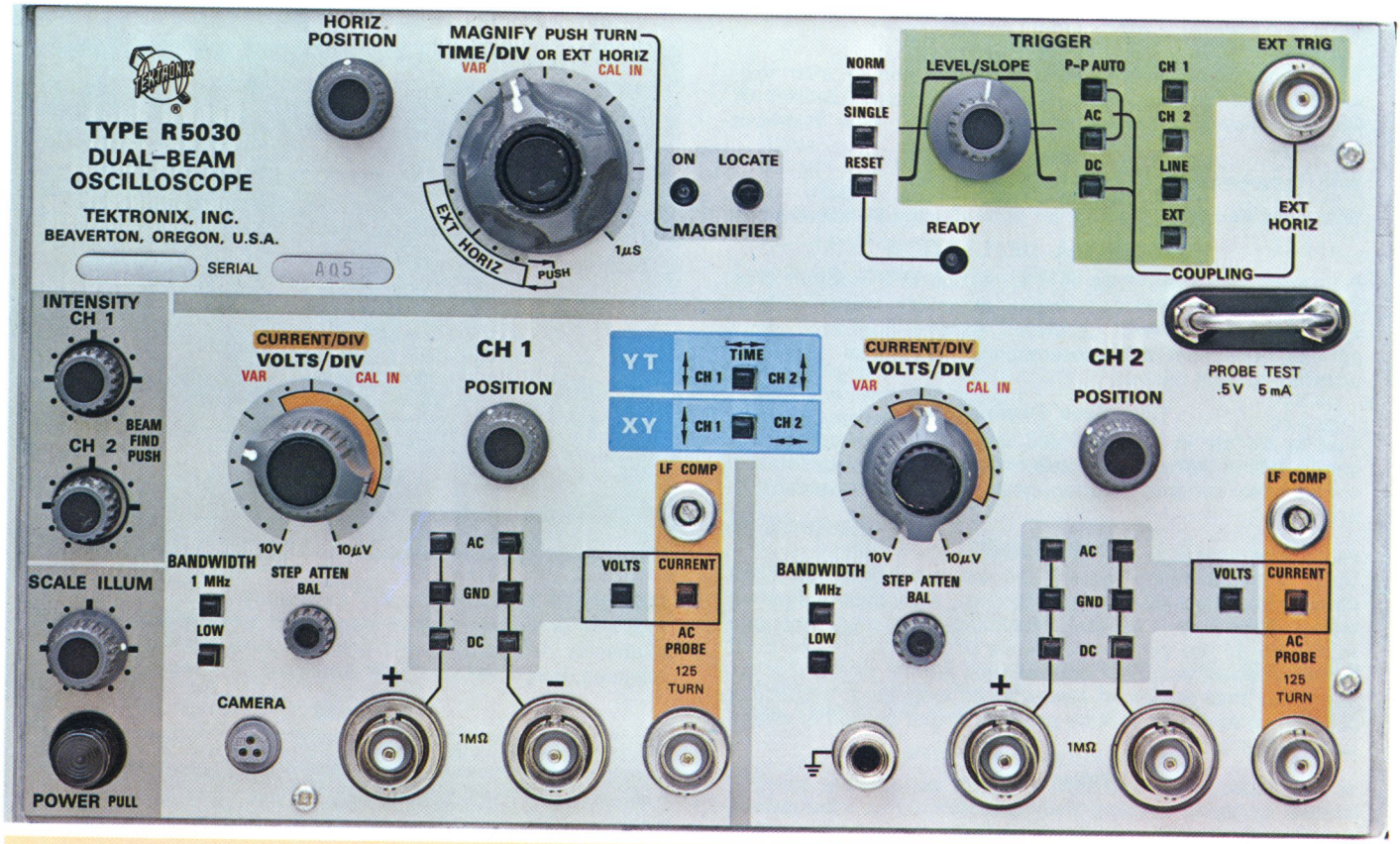
Accelerating Voltage—4 kV.

Phosphor—P31.

OTHER

Amplitude Calibrator—0.5 V and 5 mA, 1-kHz square-wave.

Power Requirements—90 to 140 V or 180 to 280 V, 48 to 440 Hz; 100 watts.



DISPLAY MODES

Y-T (Two-Beam Display)—Normally, Channel 1 and Channel 2 plotted on vertical axes versus time on horizontal axis. Dual-beam curve tracing provided by plotting Channel 1 and Channel 2 on vertical axes against an external horizontal signal on horizontal axis. Y, Y, X phase difference is 5° from DC to 100 kHz, or AC coupled from 1 kHz to 100 kHz. The two vertical deflection systems are independent of each other and share the same horizontal deflection system.

X-Y (Single-Beam Display)—Channel 1 plotted on vertical axis versus Channel 2 on horizontal axis provides curve tracing at full sensitivity of vertical deflection system (10 μV/div). X-Y phase difference with Channel 1 and Channel 2 DC coupled at the same calibrated deflection factor (unused inputs grounded) is ≤1° to 200 kHz, increasing to ≤4° at 1 MHz. In X-Y mode, time and external horizontal systems are disabled and lamps are extinguished. Trace intensity is controlled by Channel 1 intensity control.

VERTICAL DEFLECTION

Two identical channels, each provided with differential voltage inputs and a separate current input. Voltage or current mode is selected by push button.

When current mode is enabled, lamps associated with voltage inputs are extinguished to avoid confusion. Volts switch extinguishes current lamp. Full 1-MHz bandwidth or limited (≈5-kHz) bandwidth for eliminating wideband noise, selectable by push button.

Bandwidth

DC to 1 MHz or DC to 5 kHz, within 10% at —3 dB, selectable by push button. Lower —3 dB limit: AC coupled 2 Hz or less; current mode 10 Hz or less.

Deflection Factor

Voltage Mode—10 μV/div to 10 V/div in 19 calibrated steps (1-2-5 sequence) accurate within 3%. Uncalibrated, continuously variable between steps to approximately 25 V/div.

Current Mode—1 mA/div to 200 mA/div in 8 calibrated steps (1-2-5 sequence) accurate within 5%. Uncalibrated, continuously variable between steps, extends deflection factor to approximately 500 mA/div.

Input RC

1 MΩ within 1% paralleled by 50 pF within 10%.

Maximum Safe Inputs

(Inputs are fuse protected—no damage will occur)

Voltage

RANGE	DC	AC*
10 μV to 100 mV/div	10 V (DC+Peak AC)	300 V (DC)
200 mV to 10 V/div	300 V (DC+Peak AC)	300 V

*Input switch must be initially set to ground when signal is applied to input to charge (or discharge) input coupling capacitor.

Current—10 A peak.

Common-Mode-Rejection Ratio

RANGE	DC COUPLED DC-100 kHz	AC COUPLED 50 Hz-100 kHz
10 μV to 100 mV/div	100,000:1*	1,000:1
200 mV to 10 V/div	1,000:1	1,000:1

*With up to 20-V peak-to-peak sinewave. CMRR is not specified when display is 0.1 div or less from DC to 1 kHz, or 0.2 div or less from 1 kHz to 100 kHz.

Displayed Noise

Voltage Mode: ≤15 μV.
Current Mode: ≤200 μA. (Tangentially Measured)

Input Gate Current

≤200 pA.

DC Drift

With Time: Short term—5 μV or less per minute after five-minute warm-up. Long term—10 μV or less or 0.1 division or less, whichever is greater, during any hour after one-hour warm-up.

With Temperature: ≤50 μV per degree C.

With Line Voltage: ≤100 μV for 10% change in line voltage.

HORIZONTAL DEFLECTION

Full-range time base (1 μs to 5 s/div), up to 5 magnification steps (X50 maximum) and unique magnifier locate feature. Full-bandwidth (1-MHz) calibrated external-horizontal input permits dual-beam X-Y presentations. Horizontal deflection common to both beams.

Time Base Sweep Rate

1 μs to 5 s/div in 21 calibrated steps (1-2-5 sequence) accurate within 3% in the center 8 divisions. Uncalibrated, continuously variable between steps and to approximately 12 s/div.

Sweep Magnifier

Up to 5 magnification steps (1-2-5 sequence) from the initial unmagnified time/div control setting. Maximum magnified sweep limited to 1 μs/div. Magnified time base accurate within 5% in the center 8 divisions of display. Locate push button disables magnifier and restores normal sweep display, intensifies that portion of sweep to be magnified. Horizontal position control acts as time position of that portion of sweep to be magnified.

Sweep Modes

Normal or signal sweep; ready indicator lights when sweep circuit is triggerable.

External Horizontal Input

Bandwidth: DC to at least 1 MHz at —3 dB; lower —3 dB limit is 15 Hz or less.

Deflection Factor: 20 mV/div to 500 mV/div in 8 calibrated steps (1-2-5 sequence) accurate within 3% in the center 8 divisions. Uncalibrated, continuously variable between steps to approximately 1.25 V/div.

Input RC: 1 MΩ within 2% paralleled by 50 pF within 10%.

Maximum Input: 100 V (DC + peak AC) decreasing to 100 V peak-to-peak at 1 MHz.

Y, Y, X Phase Difference: ≤5° from DC to 100 kHz; AC coupled from 1 kHz to 100 kHz.

TRIGGER

A simplified trigger circuit combines the trigger LEVEL and SLOPE controls and provides a peak-to-peak auto mode. When in peak-to-peak auto, the range of level adjustment is automatically established at the positive and negative peaks of the displayed waveforms. Also, the sweep is always triggered, or reverts to a free-running mode in the absence of a trigger signal or when the trigger signal is less than 15 Hz.

Coupling

Peak to Peak auto, AC or DC coupling. These push buttons select the coupling of trigger and external-horizontal input signals.

Source

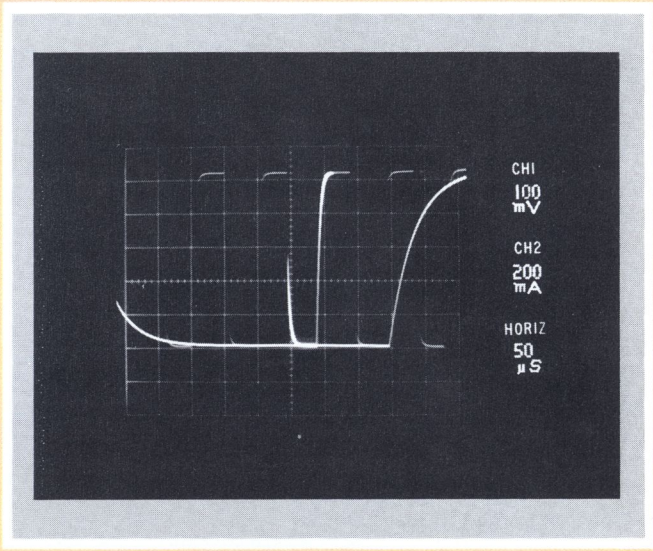
Internal (Channel 1 or Channel 2), Line, or External.

Sensitivity

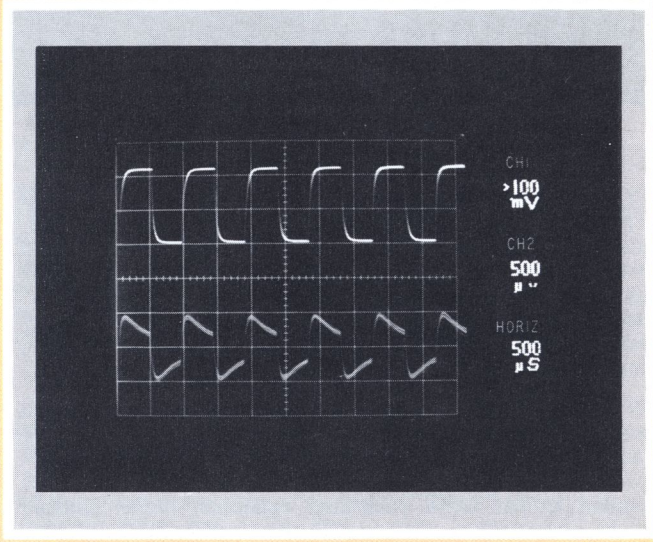
Coupling	Internal	External
Peak to Peak Auto	0.5 div, 15 Hz to 1 MHz	0.5 V, 15 Hz to 1 MHz
AC	0.3 div, 15 Hz to 1 MHz	0.25 V, 15 Hz to 1 MHz
DC	0.3 div, DC to 1 MHz	0.25 V, DC to 1 MHz

Maximum Input

100 V (DC + peak AC).



MAGNIFIER LOCATE (Double Exposure)
Magnifier Locate control depressed returns sweep to X1, intensifies portion of sweep to be magnified. When control is released, magnified sweep is displayed.



SCALE-FACTOR READOUT
Photo shows CH 1 variable volts control in uncalibrated condition, CH 2 mA/div out of range.

CRT AND DISPLAY FEATURES

Auto Scale-Factor Readout

Reads out scale-factors associated with Channel 1, Channel 2 and Horizontal. CH 1 and CH 2 read 10 μV to 10 V in 19 steps or 1 mA to 200 mA in 8 steps (1-2-5 sequence). HORIZ reads 1 μs to 5 s in 21 steps or 20 mV to 500 mV in 8 steps (1-2-5 sequence). Scale illumination control selects intensity of readout.

Tektronix Dual-Beam CRT

8x10 div per beam (1.27 cm/div). Separate vertical deflection plates; common horizontal. 4-kV accelerating potential provides a bright display. P31 phosphor normally supplied; P7 optional without extra charge. Consult your Field Engineer, Representative or Distributor for application information and availability.

Graticule

Internal, variable illumination. 8 x 10-div display area. Vertical and horizontal center lines marked in 0.2 divisions.

Display Controls

Combination push-button beam finder and intensity control for each beam. Dynamic focus eliminates requirement for control.

ENVIRONMENTAL CAPABILITIES

Ambient Temperature

Operating: 0°C to +50°C (−15°C to +55°C with no functional failure)

Non-operating: −55°C to +75°C

Altitude

Operating: 15,000 feet

Non-operating: 50,000 feet

Vibration

Operating: 15 minutes along each axis at 0.015 inch peak-to-peak displacement (1.9 g's at 55 c/s). 10 to 50 to 10 c/s in 1-minute cycles.

Shock

Operating: 30 g's, 1/2 sine, 11-ms duration, 2 shocks in each direction along 3 major axes, total of 12 shocks.

OTHER CHARACTERISTICS

Rear Panel Inputs and Outputs

Z-Axis Inputs: Seperate inputs for Channel 1 and Channel 2 DC to 1 MHz; 0 V to 5 V equal to full-intensity range, negative signal intensifies. Input RC approximately 10 kΩ paralleled by 60 pF. Maximum Input: 50 V.

Vertical Signal Outputs: Channel 1 and Channel 2 outputs provide an output of the vertical deflecting signal (DC coupled), amplitude at least 0.2 V per displayed div. Source impedance—10 kΩ within 10%. DC to ≥100 kHz bandwidth at −3 dB.

Auxiliary Functions: + Gate Output is ≥5 V from source impedance of 10 kΩ. Rise and fall times ≤5 μs into 100 pF.

Sawtooth Output: ≥5 V from source impedance of 10 kΩ.

Camera: Power to and sweep reset from camera to oscilloscope.

Probe Test

0.5 V into 1 MΩ and 5 mA accurate within 2%. Repetition Rate—1 kHz accurate within 10%.

Power Requirements

Quick-change line-voltage selector permits operation from 90 V to 124 V, 102 V to 140 V, 180 V to 248 V, or 204 V to 280 V. The Type R5030 will operate over a line frequency range from 48 Hz to 440 Hz with a power consumption of 100 W at 115 V AC, 60 Hz.

Dimensions and Weights

Rackmount (Type R5030)		
Length	21-7/8 in	55.5 cm
Width	19 in	48.3 cm
Height	5-1/4 in	13.4 cm
Net weight	33 lb	15.0 kg
Domestic shipping weight	49 lb	22.2 kg
Export-packed weight	69 lb	31.4 kg
Low Profile Cabinet (Type R5030 Option 4)		
Length	21-1/2 in	54.7 cm
Width	17-5/8 in	44.8 cm
Height	6-1/16 in	15.4 cm
Net weight	32 lb	14.6 kg
Domestic shipping weight	48 lb	21.8 kg
Export-packed weight	69 lb	31.4 kg

Included Standard Accessories

Two instruction manuals (070-1000-00)

RACKMOUNT

Type R5030 is equipped with a set of tracks and slides for rackmounting.

Order Type R5030 ..... **$1850**

LOW-PROFILE CABINET

Type R5030 Option 4 is equipped with feet, tilt bail and handle for bench top use.

Order Type R5030 Option 4 ..... **$1850**

OPTIONAL ACCESSORIES

Optional accessories increase measurement capabilities and provide added convenience. Cameras, Probes, Scope-Mobile® Carts and other major accessories are completely described in the catalog accessory pages.

Probes

P6052 10X, 1X selectable attenuation probe, order 010-0241-00 ..... $50

P6021 AC current probe, order 010-0237-00 ..... $85

Scope-Mobile® Cart

Model 205-1, storage drawer, and 9-position tilt-lock oscilloscope tray, order 205-1 ..... $150

Cameras

Either the C-12 or C-27 camera can be used with the Type R5030 thru use of an adapter-frame/lens combination. The adapter frame accepts camera mounting adapter normally used for Tektronix 5-inch round CRTs.

C-12/C-27 to Type R5030 Camera Adapter, order 016-0264-00, adapter-frame/corrector lens $35

All cameras are sold without mounting adapter.

Standard C-12 provides no-parallax viewing, f/1.9—1:0.85 lens, Polaroid* Land Pack-Film back, order C-12 ..... $490

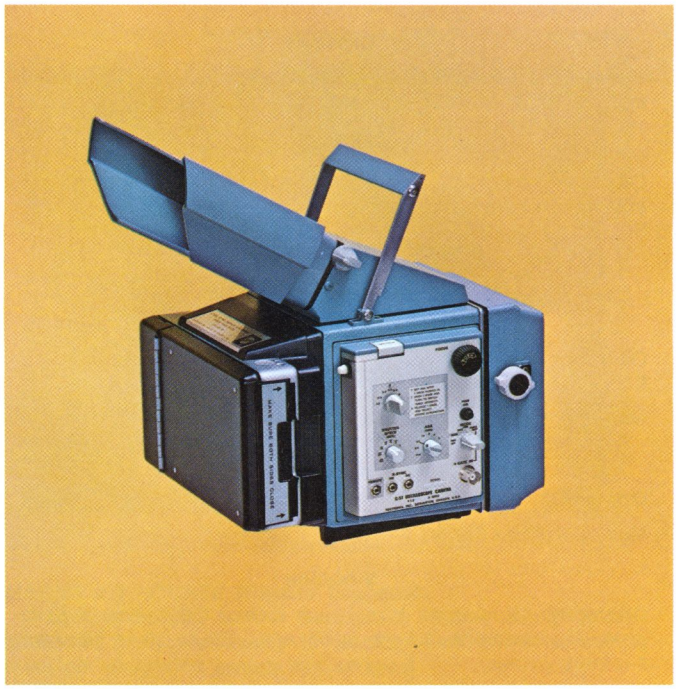
C-12 to 5-inch round CRT adapter, order 016-0226-01 ..... $15

Standard C-27 has a rotating back and removable viewing hood, f/1.9—1:0.85 lens. Polaroid Land Pack-Film back, order C-27 ..... $460

C-27 to 5-inch round CRT adapter, order 016-0225-02 ..... $15

*Registered Trademark, Polaroid Corporation

- ***TRACE-BRIGHTNESS PHOTOMETER***
- ***ELECTRICALLY-CONTROLLED SHUTTER***
- ***RANGE-FINDER FOCUSING***
- ***ACCURATE EXPOSURE CONTROL***



The C-50 and C-51 are compact, light-weight, trace-recording cameras designed primarily for use with all Tektronix 7000-series oscilloscopes. Differing only in the lens system, both cameras feature a trace-brightness photometer, range-finder focusing and accurate exposure control. The shutter is electrically actuated either remotely or by a push button on the control panel. Optional film backs can be rapidly interchanged without refocusing the camera.

The C-50 is provided with a f/1.9, 1:0.7 lens for general-purpose trace recording. The C-51 uses an f/1.2, 1:0.5 lens providing the high-writing speed desired when the 7000-series oscilloscopes are operated single shot at the fastest sweep rates.

MODES

A five-position switch turns the camera power on and selects normal, time, bulb or single-shot operation.

FOCUS

The focus control is a spring-loaded knob that when pushed in projects two vertical bars of light on the CRT. By turning the focus control the light bars can be made to merge, indicating that the camera is properly focused. When the focus-control knob is released, the camera is then locked in proper focus and the lamps are turned off.

EXPOSURE

The proper combination of shutter speed and f number is selected to match the ASA film index and trace brightness as measured by the photometer. A thumbwheel inside the camera housing selects absorption filters for making an approximate visual color match of the photometer spot for the particular color of phosphor in use. Three filters are provided: P-11, P-31 and P2. The ASA index is set, then the f knob is pushed in and turned to match the spot brightness to the trace brightness. When the f knob is released, it locks into the proper relation with the shutter-speed knob. Thus, if either is changed, the other follows to maintain a proper ratio.

CAMERA POWER AND SWEEP RESET CONNECTOR

A 3-pin connector on the bezel of the Tektronix 7000-series oscilloscopes provides +15 V, a ground connection to the camera and a sweep-reset pulse (in single-shot function only) back to the oscilloscope.

SHUTTER ACTUATOR:

Power Source

+15 V DC within 3% from the main frame at 400 mA or less.

Single-Shot Delay

Delays shutter closure 5 seconds (within 20%) after sweep ends, with plus gate applied.

Recovery Time

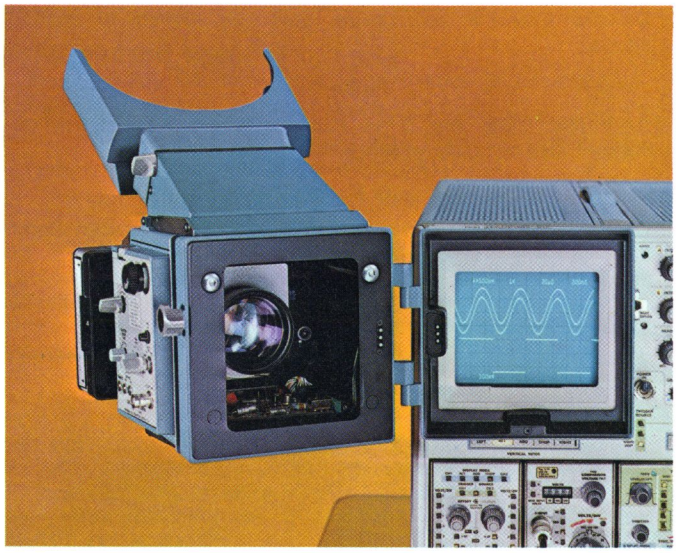
In all modes—two seconds or less between close and open.
In time mode only—at least 500 ms between open and close.

Shutter Closure Delay

In bulb mode only—200 ms or less after release of shutter button.

In single shot only—5 seconds within 20% after sweep ends with plus gate applied.

All the above specifications are common to the C-50 and C-51.



Convenient mounting Swing-away hinging

C-50/C-51 TRACE RECORDING CAMERAS C-50/C-51

FOR C-50 ONLY

LENS
56-mm f/1.9 lens with magnification ratio of 1:0.7 within 10%.

SHUTTER SPEEDS
4, 2, 1, 1/2, 1/4, 1/8, 1/15, 1/30 and 1/60 second plus bulb and time (accurate within 20%).

RELATIVE APERTURE RANGE
f/1.9, 2.8, 4.0, 5.6, 8, 11 and 16.

DIMENSIONS AND WEIGHTS

Length	10¾ inches (with viewing tunnel)	27.3 cm
Width	8 inches (with pack back)	20.3 cm
Height	11½ inches (with viewing tunnel)	29.2 cm
Weight	7.5 lbs. (with f/1.9 lens & pack back)	3.4 kg

INCLUDED STANDARD ACCESSORIES
Two instruction manuals (070-1011-00)

C-50-P CAMERA, Pack-Film Back **$700**
C-50-R CAMERA, Roll-Film Back **$700**
C-50-G CAMERA, 4 x 5 Graflok Back **$670**

FOR C-51 ONLY

LENS
56-mm f/1.2 lens with magnification ratio of 1:0.5 within 10%.

SHUTTER SPEEDS
4, 2, 1, 1/2, 1/4, 1/8, 1/15, 1/30 and 1/60 second plus bulb and time (accurate within 20%).

RELATIVE APERTURE RANGE
f/1.2, 2.0, 2.8, 4.0, 5.6, 8 and 11.

DIMENSIONS AND WEIGHTS

Length	10¾ inches (with viewing tunnel)	27.3 cm
Width	9¾ inches (with roll back)	24.8 cm
Height	11½ inches (with viewing tunnel)	29.2 cm
Weight	9.5 lbs (with f/1.2 lens & roll back)	4.3 kg

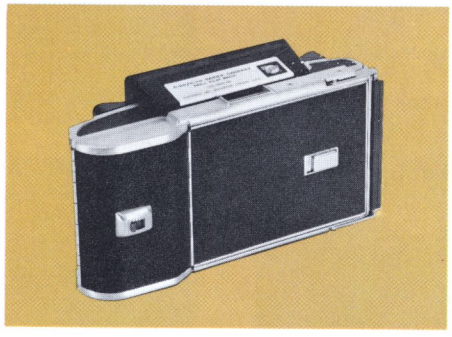
INCLUDED STANDARD ACCESSORIES
Two instruction manuals (070-1011-00)

C-51-R CAMERA, Roll-Film Back **$900**
C-51-P CAMERA, Pack-Film Back **$900**
C-51-G CAMERA, 4 x 5 Graflok Back **$870**

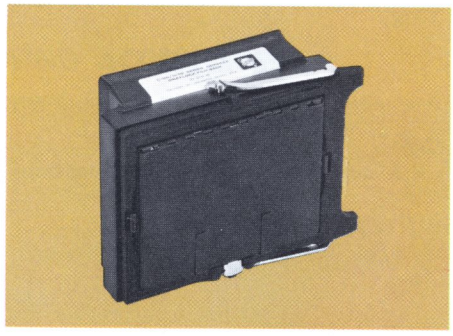
FILM BACKS

Three Film Backs provide flexibility of performance and films. Dark slides are included with all the film backs to permit changing backs without exposing any film.

Pack-Film Back, Polaroid[1] Land Film, 3-¼ x 4-¼, 8 exposure, order 122-0926-00 ..... $75



Roll-Film Back, Polaroid Land Film, 3-¼ x 4-¼, 8 exposure, order 122-0929-00 ..... $75



Graflok[2] Back, 4 x 5. Accepts Polaroid Land 4 x 5 film holder, standard cut-film holders, film-pack adapters, roll-film (120) holders, order 122-0931-00..... $45

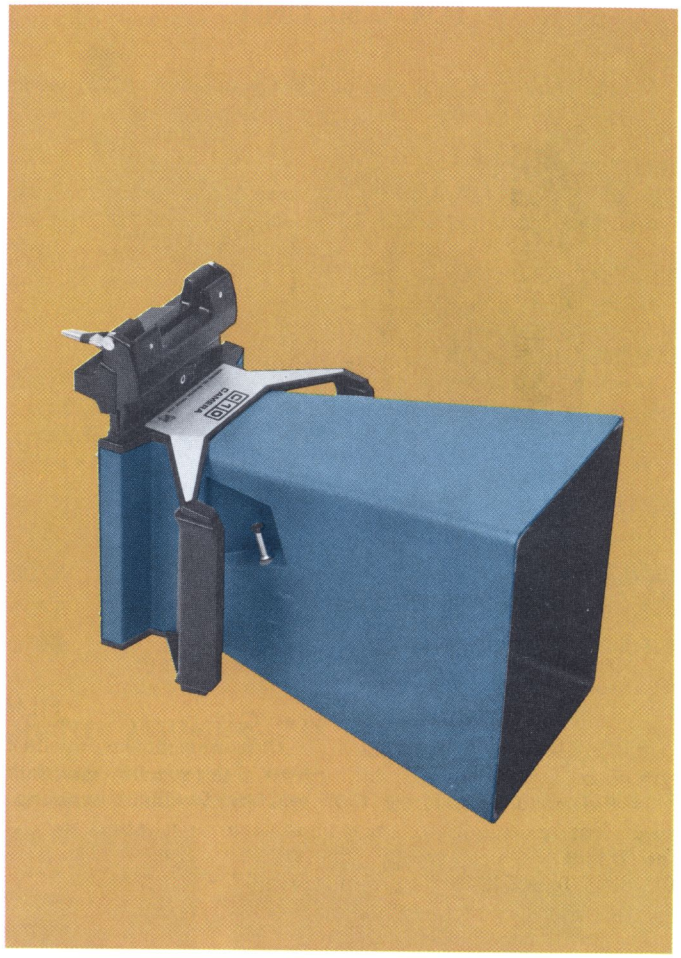
[1]Registered Trademark Polaroid Corporation

[2]Registered Trademark Graflex, Inc.

U.S. Sales Prices F.O.B Beaverton, Oregon

- ***LIGHTWEIGHT***
- ***FIXED FOCUS***

The C-10 is a fixed-focus, light-weight, trace-recording camera designed for use with the Tektronix Type 611, 11-inch storage display unit. An f/8 lens with sufficient depth of field, and convenient hand grips allow the C-10 to be held against the oscilloscope CRT without sacrificing picture quality. The camera housing accommodates a Graflok[1] 4 x 5 film back.



LENS
64.40 mm, f/8 trace-recording lens stops down to f/22.

SHUTTER SPEEDS
1, 1/2, 1/4, 1/8, 1/15, 1/30, 1/60 and 1/125 plus Bulb and Time.

RELATIVE APERTURE
f/8, 11, 16, 22.

OBJECT-TO-IMAGE RATIO
1:0.5, records entire 11-inch CRT display on a standard 3¼ x 4¼ Polaroid[2] cut film.

FILM BACK
Graflok back with Polaroid cut-film holder mounted. Cut-film holder accepts 3,000-speed film which develops outside the camera in about 15 seconds.

[1]Registered Trademark Graflex, Inc.
[2]Registered Trademark Polaroid Corporation.

MECHANICAL
Hand held via convenient hand grips on each side. Camera housing of die-cast high-impact plastic.

DIMENSIONS AND WEIGHTS
(Back in Place)

Length	13¾ in	34.9 cm
Width	10⅜ in	26.4 cm
Height	8¾ in	22.3 cm
Net Weight	5.5 lb	2.5 kg

INCLUDED STANDARD ACCESSORIES
Two instruction manuals (070-0988-00)

C-10 CAMERA **$400**

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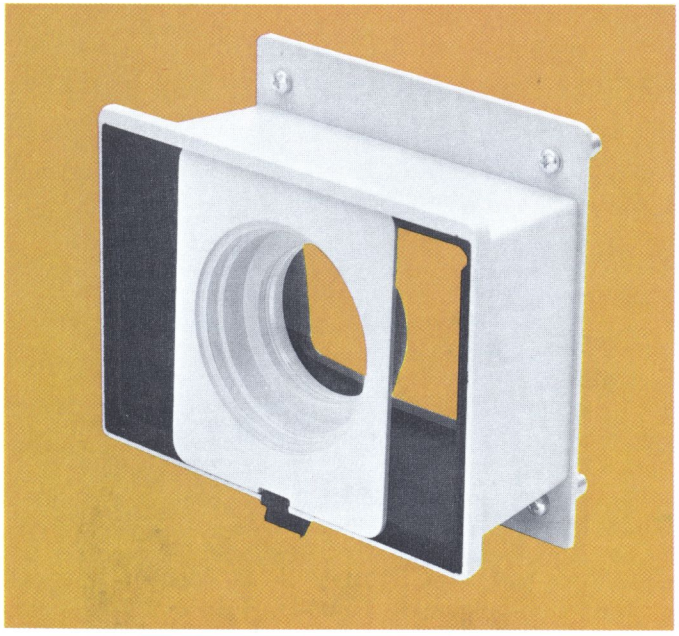
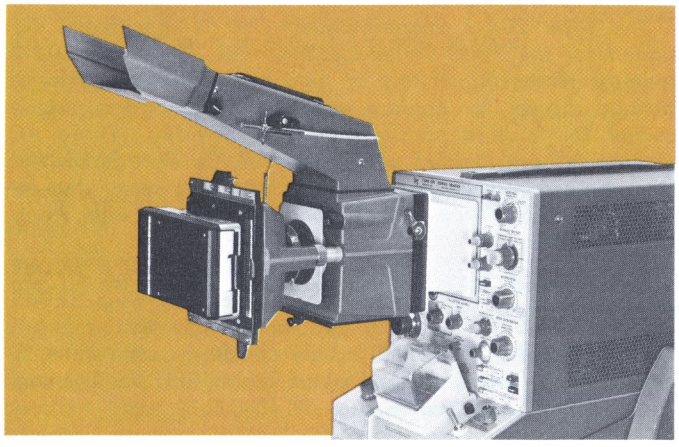
CAMERA ACCESSORIES

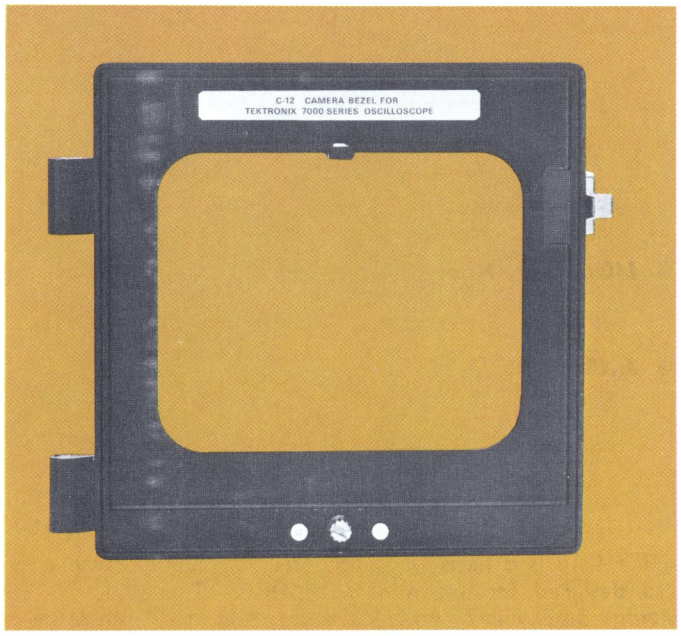


Corrector lens stores conveniently in adapter frame.

Adapter bezel for mounting Types C-12 or C-27 Cameras to the Type 576, or 5000-Series Oscilloscopes. The adapter system consists of a mounting frame and a corrector lens. With the standard C-12 or C-27 lens (f/1.9—1:0.85) the corrector lens reduces the effective magnification to about 1:0.45. The adapter frame accepts the standard camera adapters (016-0226-01 or 016-0225-02, not included) for 5-inch round CRTs. Adapter-frame/corrector lens, order 016-0264-00 ..... $35



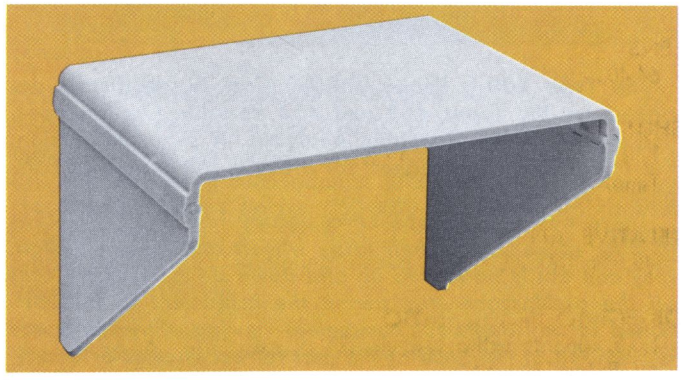
Corrector lens in place. Adapter frame secured to Type 576 accepts C-12 or C-27 with standard 5-inch round CRT adapter.



Adapter bezel for mounting the Type C-12 Camera to the 7000 Series Oscilloscopes. Adapter can also be used with Types 601, 602 and 528, order 016-0263-00 ..... $15

Adapter bezel for mounting the Type C-27 Camera to the 7000-Series Oscilloscopes. Adapter can also be used with Types 601, 602 and 528, order 016-0249-00 ..... $15

VIEWING ACCESSORIES



Folding Viewer—for Types 576, 5000 and 7000 Series Oscilloscopes. Molded gray polycarbonate with non-reflective finish.

FOR TYPES 576, 5000 Series, order 016-0259-00 ..... $8

FOR TYPES 7000 Series, order 016-0260-00 ..... $8

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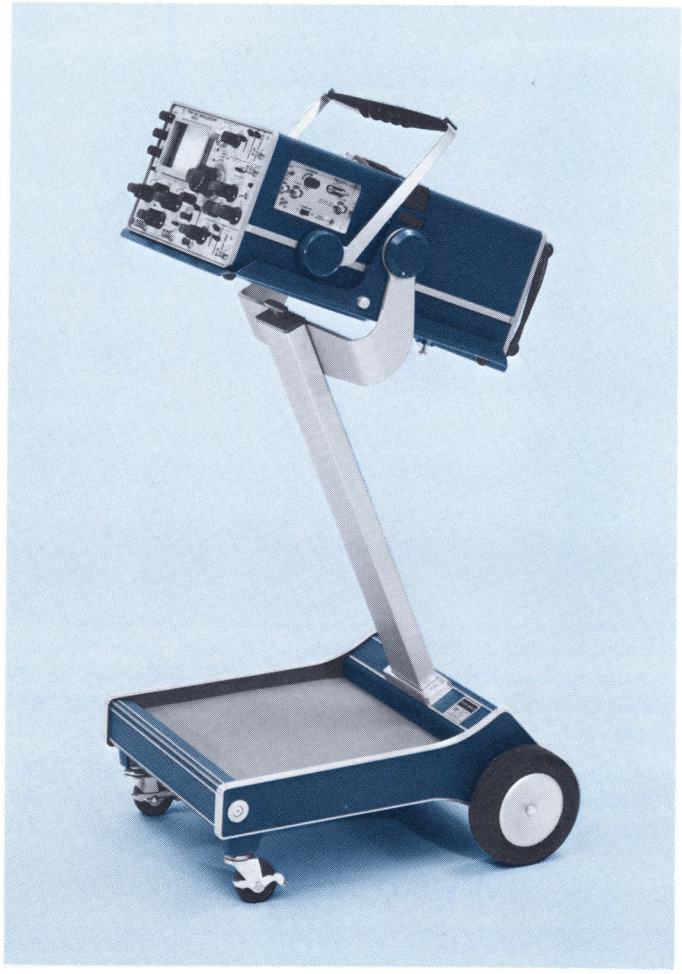
SCOPE-MOBILE® CARTS



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.

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 in the rear and two-inch swivel castors in front.

OVERALL DIMENSIONS are approximately 29 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 lb.

TYPE 200-1 MODEL A SCOPE-MOBILE® CART
for Types 453, 454, 491 ..... **$95**

TYPE 200-2 MODEL A SCOPE-MOBILE® CART
for Type 422 ..... **$95**

The Type 204-2 Scope-Mobile® Cart is specifically designed for the 7000-Series Oscilloscopes. The Type 204-2 features tilt-locking in any of nine tray positions. A large storage drawer for holding accessory items and a plug-in carrier for housing plug-in units are provided. Three AC receptacles are located at the rear of the storage drawer for supplying power to the oscilloscope and associated instruments. The Type 204-2 comes equipped with front-wheel brakes.

ADJUSTABLE TRAY tilt-locks in six 4.5° steps in the upward 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.

NET WEIGHT is 48 lb.

OVERALL DIMENSIONS are approximately 36 inches high by 19-½ inches wide by 29 inches deep.

TYPE 204-2 includes plug-in carrier and storage drawer **$155**

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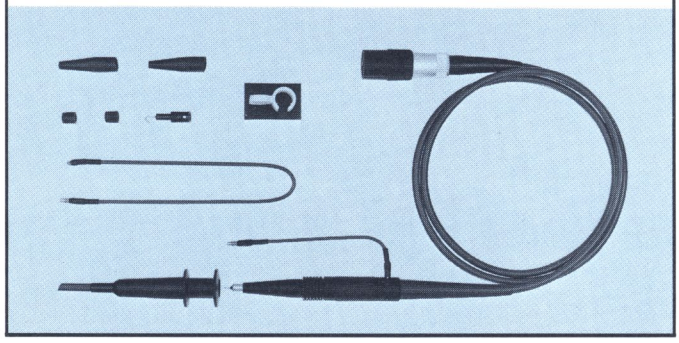
P6052

DC-TO-30 MHz
1X, 10X SELECTABLE ATTENUATION PROBE



The P6052 is a passive dual-attenuation probe designed for 30-MHz Tektronix oscilloscopes that feature scale factor readout and trace-identification functions. A sliding collar on the barrel of the probe selects 1X or 10X attenuation; a pushbutton actuates the trace-identify function. A coding ring on the probe BNC output connector couples the control signals to the main frame. The P6052 can be compensated for use with instruments having an input capacitance of 15 to 46 pF.

ATTENUATION 1X within 2%, 10X within 2%.

INPUT RESISTANCE: 1X position, 1 megohm within 1%; 10X position, 10 megohms within 1%.

INPUT CAPACITANCE for the standard length probe is $\leq$100 pF in the 1X position, $\leq$13 pF in the 10X position. For the six-foot version the input capacitance in the 1X position is $\leq$125 pF, in the 10X position $\leq$15.5 pF.

PROBE RISETIME for the standard length probe in the 1X position is $\leq$60 ns, 10X position $\leq$7 ns. For the six-foot version: 1X position $\leq$65 ns, 10X position $\leq$10 ns.

ABERRATIONS are +1.5%, —1.5%, total of 2% peak to peak excluding aberrations introduced by the oscilloscope.

VOLTAGE RATING is 500 V (DC + Peak AC).

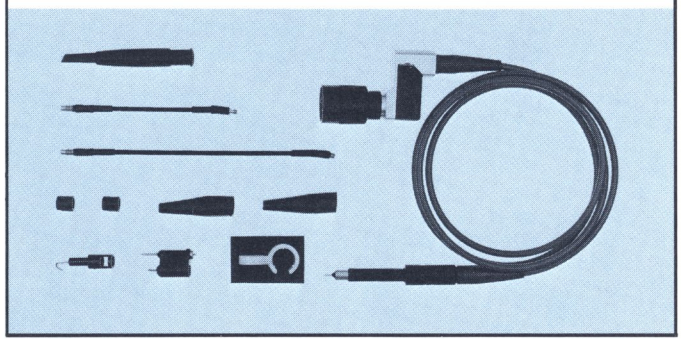
STANDARD CABLE is 3.5-feet long terminated with a BNC connector.

P6052 3.5-FT PROBE, order 010-0241-00 . . . . . **$50**
P6052 6-FT PROBE, order 010-0243-00 . . . . . **$50**
Includes: retractable hook tip, (013-0105-00); hook tip, (206-0114-00); 5-inch ground lead, (175-0339-00); 12-inch ground lead, (175-0339-01); two minigator clips, (344-0046-00); two insulating tubes, (166-0404-00); probe holder, (352-0090-00); instruction manual, (070-0973-00).

U.S. Sales Prices F.O.B Beaverton, Oregon

P6053

DC-TO-290 MHz
10X VOLTAGE PROBE



The P6053 is a miniature fast-rise 10X probe designed primarily for Tektronix 7-series vertical plug-in units. The probe can be compensated for use with all oscilloscopes or vertical units having an input capacitance of 15 to 24 pF. The probe has a pushbutton for actuating the trace-identify function of the oscilloscope main frame.

ATTENUATION is 10X within 3%.

INPUT RESISTANCE is 10 megohms within 2%.

INPUT CAPACITANCE for the standard length probe is 10.3 pF within 0.5 pF; 12 pF within 0.5 pF for the six-foot version.

PROBE RISETIME is 1.2 ns or less.

VOLTAGE RATING is 500 V (DC + Peak AC).*

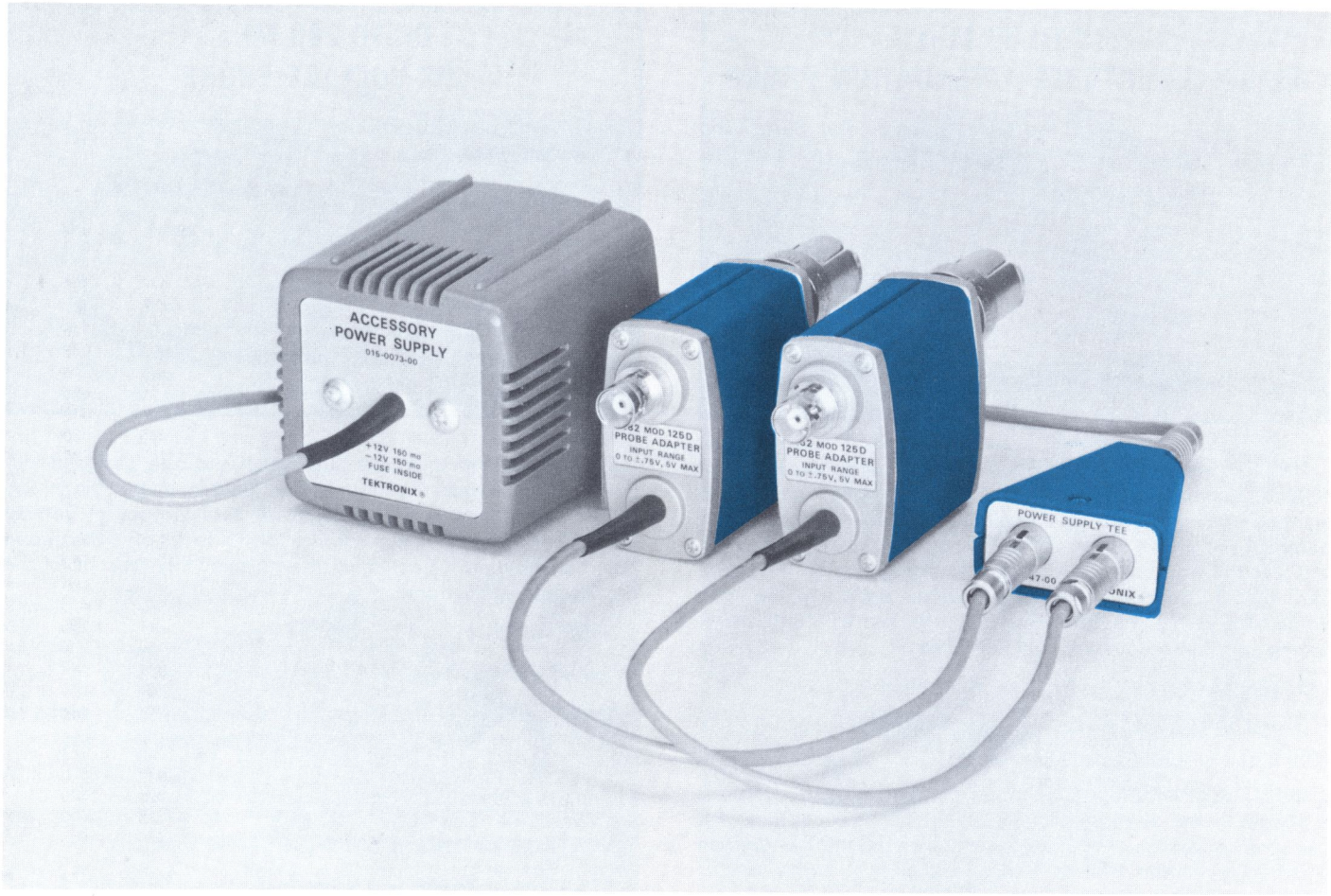
STANDARD CABLE is 3.5-feet long, terminated with a BNC connector.

P6053 3.5-FT PROBE, order 010-0248-00 . . . . . **$50**
P6053 6-FT PROBE, order 010-0250-00 . . . . . **$50**
Includes: hook tip (206-0114-00); retractable-hook tip (013-0107-00); 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 (166-0404-01); insulating sleeve (166-0433-00); instruction manual (070-1001-00).

*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.

U.S. Sales Prices F.O.B Beaverton, Oregon

PROBE ADAPTER



The Type 282 MOD 125D permits the use of conventional high-impedance probes with 50-Ω sampling plug-in heads such as Type S-1 and S-2 in Type 3S2 and 3S5 sampling plug-ins. Power is obtained from the accessory power supply.

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.

RISETIME is 3 ns or less.

GAIN is unity ±3%, non-inverting.

INPUT RESISTANCE is 1 megohm.

INPUT CAPACITANCE is approximately 17 pF.

DYNAMIC RANGE is +750 mV to −750 mV into 50 Ω.

MAXIMUM INPUT is ±5 V (DC + peak AC).

TYPE 282 MOD 125D, order 015-0146-00 ..... **$100**

Each instrument includes: 2—instruction manuals (070-0544-00).

ACCESSORY POWER SUPPLY

The accessory power supply is a small compact voltage supply that provides + 12.5 and — 12.5 V DC operating from 93 V-to-140 V or 186 V-to-280 V line.

POWER SUPPLY, order 015-0073-00 ..... $100

Power Supply includes: power cord (161-0032-01); 2 to 3-wire adapter (103-0013-00); instruction manual (070-0636-00).

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
P6048 (10X)	≈4 ns	1 kΩ 1 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.

†Usable offset limited to dynamic range of probe used.

TEE CONNECTOR

The Tee Connector permits two Type 282 Mod 125D probe adapters to be attached to the output connector of the accessory power supply.

TEE CONNECTOR, order 015-0147-00 ..... $30

U.S. Sales Price FOB Beaverton, Oregon

PRICE LIST

TEKTRONIX CANADA LTD.

Revised Price List

Effective August 4, 1969

These prices supersede all other published prices, including those currently appearing in advertisements, catalogs, booklets, and all other literature.

OSCILLOSCOPES

	duty free d.d. exempts	duty paid d.d. payés	duty + 12% FST d.d. + 12% TVF
310A	$ 905	$ 965	$ 1,060
317	1,190	1,265	1,395
RM17	1,285	1,360	1,500
321A	1,175	1,250	1,375
323	1,080	1,145	1,265
360	385	410	450
410	990	990	990
422	1,680	1,785	1,965
422 MOD 125B	2,070	2,200	2,420
422 MOD 146B	1,650	1,755	1,935
R422	1,770	1,880	2,075
R422 MOD 150B	3,420	3,635	4,005
R422 MOD 150E	1,770	1,880	2,075
453	2,280	2,425	2,675
453 MOD 127C	2,375	2,525	2,785
453 MOD 163D	2,390	2,525	2,785
R453	2,385	2,535	2,795
R453 MOD 127C	2,480	2,635	2,905
R453 MOD 163D	2,495	2,655	2,925
454	3,235	3,440	3,800
454 MOD 163D	3,345	3,555	3,930
R454	3,335	3,545	3,915
R454 MOD 163D	3,445	3,660	4,045
502A	1,435	1,525	1,680
RM502A	1,545	1,640	1,805
503	805	850	935
RM503	825	875	960
RM503 MOD 171A	880	935	1,025
504	695	735	805
RM504	710	755	825
RM504 MOD 171A	770	815	895
507	3,980	4,235	4,680
515A	1,195	1,270	1,400
RM15	1,285	1,360	1,500
516	1,440	1,530	1,685
519	5,125	5,455	6,020
520 (NTSC)	2,400	2,550	2,815
520 MOD 188M (PAL)	2,400	2,550	2,815
R520 (NTSC)	2,425	2,580	2,845
R520 MOD 188M (PAL)	2,425	2,580	2,845
528	1,005	1,070	1,175
528 MOD 146B	980	1,040	1,145
528 MOD 147B	1,040	1,105	1,215
528 MOD 188G	1,005	1,070	1,175
529	1,350	1,435	1,580
529 MOD 188D	1,535	1,630	1,795
R529	1,420	1,505	1,660
R529 MOD 188D	1,595	1,690	1,865
531A	1,310	1,390	1,530
533A	1,445	1,535	1,690
535A	1,720	1,825	2,010
RM35A	1,830	1,945	2,140
536	1,500	1,595	1,755
543B	1,635	1,740	1,915
RM543B	1,745	1,855	2,045
544	1,825	1,940	2,140
RM544	1,940	2,060	2,370
545B	1,910	2,030	2,235
RM545B	2,020	2,150	2,365
546	2,045	2,175	2,395
RM546	2,155	2,295	2,530

OSCILLOSCOPES

	duty free d.d. exempts	duty paid d.d. payés	duty + 12% FST d.d. + 12% TVF
547	$ 2,180	$ 2,320	$ 2,555
RM547	2,295	2,440	2,690
549	2,915	3,100	3,420
551	2,460	2,615	2,885
555	3,500	3,725	5,005
556	4,095	4.355	4,805
R556	4,210	4,480	4,940
561B	695	735	810
R561B	755	800	880
R561B MOD 171A	815	860	950
564B	1,240	1,320	1,455
564B MOD 121N	1,415	1,505	1,660
R564B	1,310	1,390	1,530
R564 MOD 121N	1,475	1,565	1,720
R564B MOD 171A	1,365	1,420	1,595
565	1,880	2,000	2,205
RM565	1,990	2,115	2,335
567	980	1,040	1,145
RM567	1,090	1,160	1,275
568	1,170	1,240	1,365
R568	1,230	1,305	1,435
575	1,470	1,565	1,715
575 MOD 122C	1,780	1,895	2,080
576	2,510	2,670	2,945
576 MOD 301W	2,210	2,350	2,590
581A	1,910	2,030	2,235
585A	2,235	2,375	2,620
RM585A	2,345	2,495	2,750
601	1,320	1,400	1,545
601 MOD 146B	1,290	1,370	1,510
602	855	910	1,000
602 MOD 146B	830	880	965
602 MOD 174K	855	910	1,000
611	2,990	3,180	3,510
611 MOD 162C	2,990	3,180	3,510
647A	1,930	2,055	2,265
R647A	2,070	2,200	2,425
661	1,580	1,680	1,950
R5030	2,060	2,190	2,415
R5030 option 4	2,060	2,190	2,415
7504	2,235	2,375	2,620
7504 option 1	1,800	1,915	2,110
7504 option 2	1,880	2,000	2,205
7504 option 3	1,880	2,000	2,205
7704	2,775	2,955	3,260
7704 option 1	2,340	2,490	2,745
7704 option 2	2,425	2,580	2,845
7704 option 3	2,425	2,580	2,845

PLUG-IN UNITS — TIROIRS

	duty free d.d. exempts	duty paid d.d. payés	duty + 12% FST d.d. + 12% TVF
B	230	245	270
CA	375	395	435
G	275	290	320
H	270	285	315
K	215	225	250
L	305	320	355
M	700	745	820
O	700	745	820
Q	455	485	535

PLUG-IN UNITS — TIROIRS

	duty free d.d. exempts	duty paid d.d. payés	duty + 12% FST d.d. + 12% TVF
S1	$ 345	$ 365	$ 400
S2	405	430	475
S3	490	525	575
S4	970	1,035	1,140
S5	395	415	460
S50	590	625	690
S51	565	600	660
T	345	370	405
W	700	745	820
1A1	730	775	855
1A2	415	440	480
1A4	1,000	1,060	1,170
1A5	700	745	820
1A6	340	360	400
1A7A	590	630	695
1S1	1,550	1,650	1,820
1S2	1,685	1,795	1,980
10A1	1,135	1,210	1,335
10A2A	985	1,045	1,155
11B1	855	905	1,000
11B2A	1,080	1,145	1,265
2A60	170	180	195
2A61	540	570	630
2A63	225	240	260
2B67	275	290	320
2B67 MOD 730A	480	505	555
3A2	730	775	855
3A3	1,055	1,125	1,240
3A5	1,055	1,125	1,240
3A6	620	660	725
3A7	825	890	980
3A72	360	380	420
3A74	780	825	910
3A74 MOD 730A	995	1,010	1,115
3A75	255	270	295
3A8	800	850	940
3A9	590	630	690
3B2	885	940	1,040
3B3	760	810	890
3B4	535	570	630
3B5	1,195	1,270	1,400
3C66	560	595	655
3S1	1,495	1,590	1,755
3S2	1,060	1,125	1,245
3S5	1,875	1,995	2,205
3S6	1,875	1,995	2,205
3T2	1,220	1,300	1,435
3T5	1,985	2,110	2,330
3T6	1,980	2,110	2,330
3T77A	900	950	1,045
4S1	1,820	1,935	2,135
4S2A	1,815	1,935	2,135
4S3	1,815	1,935	2,135
5T3	1,075	1,140	1,260
6R1A	3,405	3,625	4,000
7A11	945	1,005	1,110
7A12	780	825	915
7A13	1,215	1,295	1,430
7A14	645	685	755
7A16	670	715	790
7A22	565	600	660

PLUG-IN UNITS — TIROIRS

	duty free d.d. exempts	duty paid d.d. payes	duty + 12% FST d.d. + 12% TVF
7B50	$ 510	$ 540	$ 595
7B51	575	610	670
7B70	670	715	790
7B71	765	815	895
7M11	510	540	595
7S11	510	545	600
7T11	1,215	1,295	1,430
81A	210	220	245
82	855	905	1,000
86	485	515	565

AUXILIARY INSTRUMENTS — INSTRUMENTS AUXILIAIRES

106	760	810	890
106 MOD 146B	725	770	845
109	495	560	620
111	505	540	590
1121	570	650	715
113	385	435	475
114	405	430	470
114 MOD 146B	375	400	435
115	980	1,040	1,145
115 MOD 146B	940	1,010	1,115
R116	2,045	2,175	2,395
R116 MOD 703L	3.405	3,620	3,990
122	200	225	250
FM122	205	235	255
RM 122	205	235	255
125	400	455	495
FM125	405	460	505
RM125	405	460	505
127	900	1,030	1,130
129	900	1,030	1,130
130	335	350	385
132	635	725	795
133	610	700	770
140	2,005	2,130	2,350
R140	2,005	2,130	2,350
141A	2,005	2,130	2,350
R141A	2,005	2,130	2,350
160A	315	355	385
161	200	210	230
162	200	210	230
163	200	210	230
175	1,995	2,120	2,335
175 MOD 167C	1,995	2,120	2,335
184	865	915	1,010
184 MOD 146B	895	945	1,045
191	575	655	725
191 MOD 146B	550	625	690
230	3,885	4,135	4,565
R230	3,930	4,195	4,630
240	4,845	5,155	5,690
R240	4,900	5,215	5,755
241	2,445	2,605	2,870
R241	2,510	2,665	2,940
R250	1,910	2,030	2,235
262	1,990	2,280	2,520
263	420	480	530

AUXILIARY INSTRUMENTS — INSTRUMENTS AUXILIAIRES

	duty free d.d. exempts	duty paid d.d. payes	duty + 12% FST d.d. + 12% TVF
281	$ 120	$ 135	$ 150
282	120	135	150
282 MOD 125D	125	145	155
284	640	680	745
284 MOD 146B	610	650	715
285	205	235	255
292	405	460	505
R293	1,305	1,390	1,530
R293 MOD 703M	1,646	1,720	1,895

SYSTEMS — SYSTEMES

S-3110	14,470	15,400	17,000
S-3111	16,660	17,735	19,580
S-3120	35,540	37,830	41,770
S-3121	27,650	29,430	32,485
S-3122	33,955	36,140	39,905
S-3130	51,455	54,760	60,450
S-3131	43,510	46,300	51,095
S-3132	49,920	53,125	58,645
T-4002	8,975	10,330	11,420
4501	2,765	3,175	3,510
R4501	2,765	3,175	3,510
4801	705	810	890
4802	625	715	785

SPECTRUM ANALYZERS — ANALYSEURS SPECTRALES

1L10	1,300	1,385	1,530
1L20	2,145	2,285	2,520
1L30	2,145	2,285	2,520
1L40	2,365	2,500	2,780
1L5	1,140	1,210	1,335
3L10	1,410	1,500	1,655
3L5	1,250	1,330	1,465
491	5,375	5,720	6,320
R491	5,490	5,845	6,455

CAMERAS — APPAREILS PHOTOGRAPHIQUES

C-10	455	455	500
C-12, C-12 R	560	560	615
C-12 E, C-12 RE	800	800	880
C-27, C-27 R	525	525	575
C-27 E, C-27 RE	765	765	840
C-30A-G	505	570	625
C-30A-P, C-30A-R	545	545	600
C-30A-PE, C-30A-RE	790	790	870
C-30A-GE	750	845	930
C-31-G	620	700	770
C-31-P, C-31-R	660	660	725
C-31-PE, C-31-RE	905	905	995
C-31-GE	865	975	1,075
C-40	670	670	740
C-50-P, C-50-R	785	785	865
C-51-P, C-51-R	1,005	1,005	1,105

OSCILLOSCOPE CARTS — TABLES ROULANTES

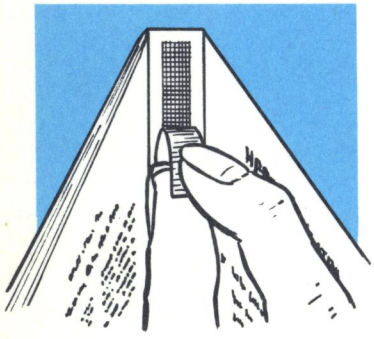
	duty free d.d. exempts	duty paid d.d. payes	duty + 12% FST d.d. + 12% TVF
200-1	$ 130	$ 145	$ 160
200-2	130	145	160
201-1	200	220	240
201-2	210	235	255
202-1	200	225	245
202-1 MOD 52	255	285	310
202-2	210	235	260
204-2	225	250	270
205-1	210	235	255
205-2	220	245	265
205-3	220	245	265

HERE'S HOW TO ATTACH THIS SUPPLEMENT TO YOUR 1969 TEKTRONIX CATALOG

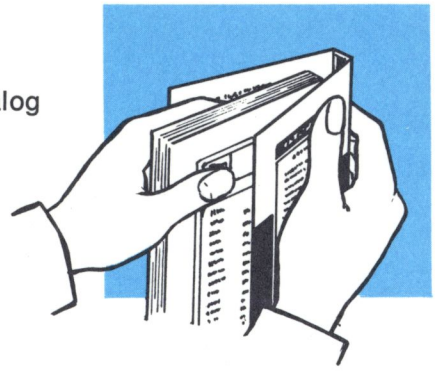
1. This supplement when attached becomes a new cover for your catalog, since it wraps around the old cover.

2. First, note the score on the back cover.

3. Second, fold the back cover toward you at this score line. Check to see if the cover wraps snugly around the catalog.



4. Next, peel the waxed protective strip from the now-formed backbone of the supplement.



5. Now press the backbone of the catalog against the exposed sticky strip.

6. Next remove the waxed protective strip from the right edge of the supplement back cover and press it against the catalog cover.

7. You now have complete information on all current-production Tektronix products.

INDEX OF NEW PRODUCTS

IN THE SUPPLEMENT

IN THE 1969 CATALOG

1969 Catalog

TEKTRONIX®

Including Aug., 1969 NEW PRODUCTS Supplement