

## IMPORTANT FEATURES OF THE NEW 5103N OSCILLOSCOPE SYSTEM

- LOW COST MODULAR OSCILLOSCOPE SYSTEM
- UNEQUALED VERSATILITY USING INTERCHANGEABLE PLUG-INS PLUS INTERCHANGEABLE DISPLAY MODULES PLUS BENCH-TO-RACK CONVERTIBILITY
- LARGE 6½-INCH CRT
- MAINFRAME ACCEPTS UP TO THREE PLUG-INS
- BANDWIDTH UP TO 2 MHz
- 50  $\mu$ V/DIV HIGH GAIN DIFFERENTIAL
- ONE TO FOUR TRACE CAPABILITY
- SIMULTANEOUS DISPLAY OF TWO INDEPENDENT TIME BASES OR DELAYED SWEEP
- Y-T OR X-Y OPERATION
- NEW IMPROVED STORAGE CAPABILITY
- SIMPLIFIED CONSTRUCTION, EASY TO MAINTAIN, RELIABLE
- COLOR CODED FRONT PANELS FOR EASY OPERATION
- LIGHT WEIGHT, EASY TO CARRY
- LIGHTED KNOB SKIRTS FOR SCALE FACTOR READOUT
- SOLID STATE STABILITY

When Tektronix introduced the first plug-in oscilloscope, customer acceptance quickly established this concept as one of the outstanding contributions to instrumentation. The ability to interchange display units in an oscilloscope, and the ability to convert between cabinet and rackmount configurations is expected to represent the same significance to oscilloscopes as did the plug-in.

The new 5103N Oscilloscope System supports the Tektronix commitment to progress in waveform measurement. This oscilloscope system will provide present and future measurement capabilities at a sound price/performance ratio, and the customer will realize continuing benefits from this new concept as it is applied to tomorrow's oscilloscopes.

Users of low frequency oscilloscopes have always been confronted with choosing a non-plug-in oscilloscope designed to meet specific measurement criteria, or a more costly wide bandwidth plug-in oscilloscope.

If a plug-in oscilloscope were selected for greater flexibility it usually covers a broader performance spectrum than the user needs for DC to 2 MHz measurements. To date, plug-in oscilloscopes have been designed for mid or high frequency use and as such were often too expensive for lower frequency requirements. Therefore, the low frequency oscilloscope buyer has been unable to purchase an instrument which suited his particular measurement needs at a price/performance ratio comparable to that which exists for users of higher frequency oscilloscopes.

To solve this problem, Tektronix designed the 5103N oscilloscope system. It's an entirely new series of oscilloscopes which allows the user with lower bandwidth measurements to choose an instrument for his immediate individual requirements and have unequalled ability to change the configuration when his applications change.

The 5103N oscilloscope system offers completely new, unique dimensions in versatility which was previously unavailable in any other oscilloscope system, regardless of bandwidth or price. Now, for the first time, users of low frequency oscilloscopes have the versatility of plug-ins, PLUS the new versatility of interchangeable display units, PLUS the versatility of converting to and from cabinet or rackmount—PLUS prices consistent with his measurement needs.

Currently the 5103N oscilloscope system consists of four interchangeable display modules, six amplifier plug-ins, three time

MAINFRAME AND INTERCHANGEABLE DISPLAY UNITS				
PRODUCT	PAGE	FEATURES		
5103N MAINFRAME	74	Power Supply/Amplifier Unit compatible with each of four interchangeable display units		
INTERCHANGEABLE DISPLAY UNITS		BEAMS	STORAGE	DISPLAY SIZE
D10	75	Single		8 x 10 div (1/2 in/div)
D11	76	Single	Yes	8 x 10 div (1/2 in/div)
D12	77	Dual		8 x 10 div (1/2 in/div)
D13	77	Dual	Yes	8 x 10 div (1/2 in/div)

AMPLIFIER PLUG-INS					
PRODUCT	PAGE	TRACES	MINIMUM DEFLECTION FACTOR	BANDWIDTH —3 dB	CMRR
5A15N	79	Single	1 mV	2 MHz	
5A18N	79	Dual	1 mV	2 MHz	
5A23N	79	Single	10 mV/div	1 MHz	
5A24N	79	Single	50 mV/div	straight through	plug-in
5A20N	80	Single	50 $\mu$ V	1 MHz	100,000:1
5A21N	80	Single (Voltage and Current)	50 $\mu$ V 0.5 mA	1 MHz	100,000:1

TIME BASE PLUG-INS						
PRODUCT	PAGE	DUAL and DELAYED SWEEP	SWEEP RATE	MAG	SINGLE SWEEP	VOLTS/DIV EXT MODE
5B10N	81		1 $\mu$ s to 5 s	X10	Yes	50 mV and 500 mV
5B12N	82	Yes	1 $\mu$ s to 5 s	X10	Yes	50 mV and 500 mV
5B13N	82		5 $\mu$ s to 0.5 s			

base plug-ins and one power supply/amplifier module with three plug-in compartments.

The 5103N mainframe module contains the low voltage power supplies, the vertical and horizontal amplifiers and the electronic switching and logic circuitry for dual trace or dual beam operation. Chopped and alternate modes are selected from a push-button on time base plug-ins.



The four display modules presently available include a single beam unit, a dual beam unit, a single beam storage unit and a dual beam storage unit. Each unit features a large CRT with 8 x 10 divisions (1/2 in/div). All four modules have 3.5 kV accelerating potential and internal gratitudes. P31 phosphor is standard for the non-storage units and a phosphor similar to P1 is standard for the storage units. These modules include the power switch, a voltage-current-time calibrator, a beam finder, the controls related to the CRT display, and the Z-axis input.

In addition to large, bright displays the D10 Single Beam Display Unit has a front panel output which provides current, voltage and timing calibration sources. A Beam Finder positions the beam on screen regardless of the setting of the vertical and horizontal position and intensity controls. A DC coupled Z-axis input requires only 5V to modulate the writing beam.

The D11 Single Beam Storage Unit has a bistable, split-screen storage CRT with increased light output, especially in the stored mode. A brightness control allows the user to vary the stored brightness level to retain information for as long as several hours at specified resolution and without damaging the CRT. Even at high output light levels the storage CRT is highly resistant to burns, and requires only the same operating care as a conventional CRT. The stored brightness control used in conjunction with the other storage controls also allows "integration" to increase the effective writing rate.

The D12 Dual Beam Display Unit is the same as the D10 Single Beam unit except the CRT has two writing guns and two pairs of vertical deflection plates. Both beams cover the full 8 x 10 division screen. The D13 Dual Beam Storage Unit has all of the storage features of the D11 Single Beam Storage Unit plus the dual beam capability of the D12.

All plug-ins in the 5103N oscilloscope system stress simplicity of design and operating ease. Logical grouping of controls and the use of color-coded panel markings by function is used extensively. Six vertical amplifiers are currently available. These include a dual trace, 1 mV/div, 2-MHz amplifier and two 50  $\mu$ V/div, 1-MHz differential amplifiers with CMRR to 100,000:1. Three currently available time bases include a dual-delaying sweep plug-in, and a single sweep plug-in. Both have sweep rate to 100 ns/div.

Scale factor readout is provided by back-lighted skirt knobs which automatically indicate the correct reading when using the X10 magnifier and the recommended 1X and 10X probes. The lights turn off when a plug-in or a channel is switched off.

Scale factor readout prevents many measurement errors and provides an easy, quick means of identifying deflection factors and sweep rates and indicating which channels are in use—even in low ambient room light.

The 5103N is a low frequency oscilloscope system with interchangeable display units with 6 1/2-inch CRT's. The cabinet model converts to and from a rackmount configuration.

**SELECT FROM THESE UNITS**

**The 5103N Mainframe  
(Shown With Plug-Ins)**



**Add The D10  
Single Beam  
CRT Unit**

HERE ▶



OR

HERE ▶



OR

**Add The D11  
Single Beam  
Storage Unit**

HERE ▶



OR

HERE ▶



OR

**Add The D12  
Dual-Beam Unit**

HERE ▶



OR

HERE ▶



OR

**Add The D13  
Dual-Beam  
Storage Unit**

HERE ▶



OR

HERE ▶





# 5103N Mainframe

Shown with D13 Storage Display Unit

OSCILLOSCOPES  
5100 SERIES

- DC-to-2 MHz BANDWIDTH
- USE WITH INTERCHANGEABLE SINGLE BEAM, SINGLE BEAM STORAGE, DUAL BEAM AND DUAL BEAM STORAGE DISPLAY UNITS
- USE IN A CABINET OR 5¼-INCH RACKMOUNT CONFIGURATION
- THREE PLUG-IN COMPARTMENTS

The 5103N Mainframe is the power supply/amplifier unit for an oscilloscope system featuring four interchangeable display units. An oscilloscope is assembled by combining the 5103N with any of the four display units. To complete the oscilloscope system, vertical amplifier and time base units are selected and placed into the 5103N plug-in compartments.

There are three plug-in compartments. Any vertical amplifier in this series is compatible with any compartment. Thus, full X-Y performance is available by using a vertical amplifier in the horizontal compartment. The 5103N operates with one vertical amplifier and a time base installed. A second amplifier may be added as required.

The 5103N and the selected display unit assembles into a cabinet or 5-1/4 inch rackmount configuration and may be converted from one configuration to the other with available kits to save the expense of duplicating equipment to meet individual application requirements.

## CHARACTERISTICS VERTICAL SYSTEM

**Channels**—Two plug-in compartments (left and center) compatible with all 5100-Series Plug-Ins.

**Deflection Factor**—Determined by plug-in unit.

**Bandwidth**—Determined by mainframe and plug-in unit.

**Chopped Mode**—The 5103N will chop between two amplifiers. The chop mode is selected from the time base unit.

**Alternate Mode**—In this mode the 5103N sweeps each amplifier plug-in twice before switching to the next. A single trace amplifier is swept twice and each channel of a dual trace amplifier is swept once before the 5103N switches to the second amplifier. When two vertical amplifiers are used with the 5B12N Dual Time Base, the left amplifier can be slaved to the A sweep, and the right amplifier slaved to the B sweep in the dual-sweep mode.



5103N Mainframe shown complete with display unit and plug-ins  
**5103N/D13 STORAGE OSCILLOSCOPE (without plug-ins) \$1370**

## HORIZONTAL SYSTEM

**Channel**—One right-hand plug-in compartment compatible with all 5100-Series Plug-Ins. Dual sweep is available with the 5B12N Time Base.

**Fastest Calibrated Sweep Rate**—0.1  $\mu$ s/div (X10 mag) with 5B10N or 5B12N.

**X-Y Mode**—PHASE SHIFT is within 1° from DC to 100 kHz, checked with two amplifiers of the same type.

## OTHER CHARACTERISTICS

**Ambient Temperature**—Performance characteristics are valid for the 5103N Mainframe Unit from 0°C to +50°C.

**Power Requirements**—The 5103N operates from 110 to 120 V (quick-change adapter) 60 Hz sources. Specify option 1 (no extra charge) for operation from 50 to 60 Hz sources, 100, 110, 120, 200, 220 and 240 V. Option 1 instruments are factory connected for 220 V operation.

**5103N MAINFRAME (without plug-ins or display unit) . . . . . \$220**  
Includes instruction manual 070-1143-00.

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



### OSCILLOSCOPES 5100 SERIES

- 8 x 10 DIV CRT (1/2 in/DIV)
- BRIGHT DISPLAYS
- USE IN A CABINET OR 5 1/4-INCH RACKMOUNT CONFIGURATION
- DC COUPLED Z-AXIS FRONT PANEL INPUT
- BEAM FINDER
- CURRENT, VOLTAGE AND TIME CALIBRATOR

The D10 provides a single beam conventional display for the 5103N Mainframe. The electrostatic-deflection cathode-ray tube has an 8 x 10 division (1/2 in/div) display area with internal graticule. A bright display is provided by a 3.5 kV accelerating potential. Provision is made for application of Z-axis signals. A front-panel current loop provides a calibration signal. The D10 may be ordered with the 5103N in a cabinet or 5-1/4 inch rackmount configuration. A kit is available for converting the oscilloscope from one configuration to the other at the user's convenience.

### CHARACTERISTICS

**Cathode-Ray Tube**—6-1/2 inches, 8 x 10 divisions (1/2 in/div). P31 phosphor standard, 3.5 kV accelerating potential. Internal graticule.

**External Intensity Input**—5 V will turn the beam on to full brightness from an off level. Frequency range is DC to 1 MHz. Input R and C is  $\approx 10$  k $\Omega$  paralleled by  $\approx 40$  pF. Maximum input is  $\pm 50$  V (DC + peak AC).

**Calibrator**—Voltage amplitude is 400 mV within 1%. Current output (loop) is 4 mA within 1%. Frequency is 2X line.

**Beam Finder**—When pressed, positions beam on screen regardless of the vertical, horizontal and intensity control settings.

### OTHER CHARACTERISTICS

**Ambient Temperature**—Performance characteristics are valid for the 5103N Mainframe and D10 Display Unit from 0°C to +50°C.

**Power Requirements**—The 5103N/D10 and R5103N/D10 operate from 110 to 120 V (quick-change adapter) 60 Hz sources. Specify option 1 (no extra charge) for operation from 50 to 60 Hz sources, 100, 110, 120, 200, 220 and 240 V. Option 1 instruments are factory connected for 220 V operation.



### Dimensions & Weights

	CABINET		RACKMOUNT	
	in	cm	in	cm
Length	20.0	50.9	20.0	50.9
Width	8.5	21.5	19.0	48.0
Height	11.5	29.5	5.25	13.5
	lb	kg	lb	kg
Approx weight with plug-ins	27	12	27	12

**Cabinet**—The 5103N Mainframe Unit and D10 Display Unit may be ordered assembled in a cabinet model configuration equipped with a tilt bail and the instruction manual for each unit.

5103N/D10 OSCILLOSCOPE (without plug-ins) ..... \$540

**Rackmount**—The 5103N Mainframe Unit and D10 display Unit may be ordered assembled in a 5-1/4 inch rackmount configuration equipped with a slide-out assembly and the instruction manual for each unit.

R5103N/D10 OSCILLOSCOPE (without plug-ins) ..... \$540

D10 SINGLE BEAM DISPLAY UNIT ..... \$320  
Includes instruction manual 070-1132-00.

5103N MAINFRAME (without plug-ins or display unit) ..... \$220  
Includes instruction manual 070-1143-00.

### CONVERSION KITS

These oscilloscopes may be converted from one configuration to the other as applications change.

Cabinet-to-rackmount conversion kit order 040-0583-00 .. \$30

Rackmount-to-cabinet conversion kit order 040-0584-00 .. \$30

SCOPE-MOBILE® CART AND CAMERA—See page 78.

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





# D11 Single Beam Storage Display Unit

## 5103N Mainframe

**OSCILLOSCOPES**  
5100 SERIES

- 8 x 10 DIV CRT (1/2 in/div)
- BISTABLE SPLIT-SCREEN STORAGE
- VARIABLE STORED BRIGHTNESS
- STORE FOR HOURS
- VIEW FOR EXTENDED PERIODS
- USE IN A CABINET OR 5 1/4-INCH RACKMOUNT CONFIGURATION
- BEAM FINDER
- DC COUPLED Z-AXIS INPUT
- CURRENT, VOLTAGE AND TIME CALIBRATOR

The D11 Storage Display Unit is a dual beam, 6-1/2 inch 8 x 10 div (1/2 in/div) CRT with bistable, split-screen storage and an internal graticule. Accelerating potential is 3.5 kV and the phosphor is similar to P1. Storage writing speed is at least 20 div/ms.

Simplified storage operation, a characteristic of Tektronix bistable storage, lets the user leave the oscilloscope unattended and still retain transient events in a view mode. This frees the user to concentrate on the test point, confident that the only action needed to retain events is setting the display to store and the time base to single sweep. The oscilloscope does the rest.

The D11 has a Variable Brightness control which adds new versatility to the bistable storage tube. The brightness of a display, stored at normal intensity, may be adjusted to extend storage time to at least 10 hours, to obtain optimum photographic results and to integrate multiple traces.

### CHARACTERISTICS

**Cathode-Ray Tube**—6-1/2 inches, 8 x 10 divisions (1/2 in/div). Phosphor is similar to P1. 3.5 kV accelerating potential. Internal graticule.

**Storage Display**—Writing speed is at least 20 div/ms. Storage time is at least 1 hour at normal intensity increasing to 10 hours at reduced intensity. Erase time is  $\approx$  250 ms.

**External Intensity Input**—5 V will turn the beam on to full brightness from an off level. Frequency range is DC to 1 MHz. Input R and C is  $\approx$  10 k $\Omega$  paralleled by  $\approx$  40 pF. Maximum input is  $\pm$  50 V (DC + peak AC).

**Calibrator**—Voltage output is 400 mV within 1%. Current loop output is 4 mA within 1%. Frequency is 2X line.

**Beam Finder**—When pressed, the beam is positioned on screen, regardless of vertical and horizontal position and intensity control settings.

### OTHER CHARACTERISTICS

**Ambient Temperature**—Performance characteristics are valid for the 5103N Mainframe and D11 Display Unit from 0°C to +50°C.

**Power Requirements**—The 5103N/D11 and R5103N/D11 operate from 110 to 120 V (quick-change adapter) 60 Hz sources. Specify option 1 (no extra charge) for operation from 50 to 60 Hz sources, 100, 110, 120, 200, 220 and 240 V. Option 1 instruments are factory connected for 220 V operation.



### Dimensions & Weights

	CABINET		RACKMOUNT	
	in	cm	in	cm
Length	20.0	50.9	20.0	50.9
Width	8.5	21.5	19.0	48.0
Height	11.5	29.5	5.25	13.5
	lb	kg	lb	kg
Approx weight with plug-ins	27	12	27	12

**Cabinet**—The 5103N Mainframe Unit and D11 Display Unit may be ordered assembled in a cabinet model configuration equipped with a tilt bail and the instruction manual for each unit.

**5103N/D11 STORAGE OSCILLOSCOPE (without plug-ins) . . . . \$1020**

**Rackmount**—The 5103N Mainframe Unit and D11 Display Unit may be ordered assembled in a 5 1/4-inch rackmount configuration equipped with a slide-out assembly and the instruction manual for each unit.

**R5103N/D11 STORAGE OSCILLOSCOPE (without plug-ins) . . . . \$1020**

**D11 SINGLE BEAM STORAGE DISPLAY UNIT . . . . . \$800**  
Includes instruction manual 070-1133-00.

**5103N MAINFRAME (without plug-ins or display unit) . . . . . \$220**  
Includes instruction manual 070-1143-00.

### CONVERSION KITS

These oscilloscopes may be converted from one configuration to the other as applications change.

Cabinet-to-rackmount conversion kit order 040-0583-00 . . \$30

Rackmount-to-cabinet conversion kit order 040-0584-00 . . \$30

SCOPE-MOBILE® CART AND CAMERA—see page 78.

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





5103N/D12

- 8 x 10 DIV CRT (1/2 IN/DIV)
- DUAL BEAM STORAGE OR CONVENTIONAL
- USE IN A CABINET OR 5 1/4-INCH RACKMOUNT CONFIGURATION

**D12 DUAL BEAM DISPLAY UNIT**

The D12 is a dual beam version of the D10 Single Beam Display Unit. Dual beam oscilloscopes are essential to the many applications where two transient events must be compared simultaneously. Application areas include stimulation and reaction events in areas such as medicine, biology, chemistry, engineering mechanics and many other electronic and scientific measurement areas. Both beams of the D12 are driven by a common time base. When two dual trace amplifiers are used, two traces are displayed on each beam.

**D12 CRT CHARACTERISTICS**

**Cathode-Ray Tube**—6-1/2 inches, 8 x 10 divisions (1/2 in/div). P31 phosphor standard, 3.5-kV accelerating potential. Internal graticule.

**D13 DUAL BEAM STORAGE DISPLAY UNIT**

The D13 Storage Display Unit is a dual beam, 6-1/2 inch 8 x 10 div (1/2 in/div) CRT with bistable, split-screen storage and an internal graticule. The storage display characteristics and operation are the same as the D11 Storage Display Unit. New measurement problems are continuously developing which can only be solved with a dual beam storage oscilloscope. Experimenters and researchers in areas such as electronics, mechanics and bio-medicine recognize the expediency and thoroughness of dual beam storage for retaining two related transients.



5103N/D13

**D13 CRT CHARACTERISTICS**

**Cathode-Ray Tube**—6-1/2 inches, 8 x 10 divisions (1/2 in/div). Phosphor is similar to P1. Accelerating potential is 3.5 kV. Internal graticule.

**Storage Display**—Writing speed is at least 20 div/ms. Storage time is at least one hour at normal intensity increasing to 10 hours at reduced intensity. Erase time is ≈250 ms.

**D12 AND D13 COMMON CHARACTERISTICS**

**External Intensity Input**—5 V will turn the beam on to full brightness from an off level. Frequency range is DC to 1 MHz. Input R and C is ≈10 kΩ, paralleled by ≈40 pF. Maximum input is ±50 V (DC + peak AC).

**Calibrator**—Voltage amplitude is 400 mV within 1%. Current output (loop) is 4 mA within 1%. Frequency is 2X line.

**Beam Finder**—When pressed, positions both beams on screen regardless of vertical, horizontal and intensity control settings.

**Ambient Temperature**—Performance characteristics are valid for the 5103N Mainframe, D12 Display Unit and D13 Storage Display Unit from 0°C to +50°C.

**Dimensions & Weights**

	CABINET		RACKMOUNT	
	in	cm	in	cm
Length	20.0	50.9	20.0	50.9
Width	8.5	21.5	19.0	48.0
Height	11.5	29.5	5.25	13.5
	lb	kg	lb	kg
Approx weight with plug-ins	27	12	27	12



# D12 Dual Beam Display Unit

# D13 Dual Beam Storage Display Unit

# 5103N Mainframe

## OSCILLOSCOPES

### 5100 SERIES



**Power Requirements**—The 5103N/D12, 5103N/D13, R5103N/D12 and R5103N/D13 operate from 110 to 120 V (quick-change adapter) 60 Hz sources. Specify option 1 (no extra charge) for operation from 50 to 60 Hz sources, 100, 110, 120, 200, 220 and 240 V. Option 1 instruments are factory connected for 220 V operation.

**Cabinet**—The 5103N Mainframe Unit and D12 Display Unit or D13 Storage Display Unit may be ordered assembled in a cabinet model configuration equipped with a tilt bail and the instruction manual for each unit.

5103N/D12 OSCILLOSCOPE (without plug-ins) ..... \$870  
5103N/D13 STORAGE OSCILLOSCOPE (without plug-ins) ..... \$1370

**Rackmount**—The 5103N Mainframe Unit and D12 Display Unit or D13 Storage Display Unit may be ordered assembled in a 5-1/4 inch rackmount configuration equipped with a slide-out assembly and the instruction manual for each unit.

R5103N/D12 OSCILLOSCOPE (without plug-ins) ..... \$870  
R5103N/D13 STORAGE OSCILLOSCOPE (without plug-ins) .... \$1370  
D12 DUAL BEAM DISPLAY UNIT ..... \$650  
Includes instruction manual 070-1134-00.  
D13 DUAL BEAM STORAGE DISPLAY UNIT ..... \$1150  
Includes instruction manual 070-1135-00.  
5103N MAINFRAME (without plug-ins or display unit) ..... \$220  
Includes instruction manual 070-1143-00.

### CONVERSION KITS

These oscilloscopes may be converted from one configuration to the other as applications change.

Cabinet-to-rackmount conversion kit order 040-0583-00 .. \$30  
Rackmount-to-cabinet conversion kit order 040-0584-00 .. \$30

## OPTIONAL ACCESSORIES

### C-5 CAMERA

This low-cost camera is designed to complement the low-frequency 5100-Series Oscilloscopes. Easy to use, fixed-focus, fixed aperture design simplifies waveform photography. A sliding door in the camera top allows viewing of CRT without removing the camera. When photographs are taken, battery-powered lights inside the camera illuminate the display graticule.

**Lens**—f/11 fixed aperture, prefocused, 1:0.68 magnification ratio.

**Shutter**—3 speeds, Bulb and Time.

**Film Back**—Polaroid\* Pack-film Back accepts 3000-speed film which develops outside the camera in about 15 seconds.

**Mounting**—fits directly on all 5100-Series Oscilloscopes; no additional adapter is required. Also fits Tektronix 7000-Series Oscilloscopes, Type 528 TV Waveform Monitor, 601 and 602 Display Units, and 4501 Scan Converter.

**Dimensions (height, width, length)**—5 1/2 x 7 9/16 x 10 1/2 inches; 14 x 19.2 x 26.7 cm.

C-5 CAMERA ..... \$185

\*Registered Trademark Polaroid Corporation

### P6060 10X PROBE

The P6060 is a general-purpose probe for the 5100-Series Oscilloscopes. A special BNC connector activates sensing circuitry in the vertical plug-in units, to automatically change the scale factor readout on the front panel. This convenience eliminates the need to mentally calculate the true deflection factor when using the probe. Accurate 10X attenuation provides common-mode rejection of 52 dB (400:1) when used with 5A20N and 5A21N Differential Amplifiers. Net weight is 8 oz.

P6060 3.5-FT PROBE, order 010-6060-01 ..... \$35  
P6060 6-FT PROBE, order 010-6060-03 ..... \$35

### P6021 CURRENT PROBE

The P6021 is a 125-turn AC Current Probe which can be used directly with the 5A21N amplifier without a termination or amplifier. Accurate current measurement can be made to the upper frequency range of the 5A21N with the P6021 by simply opening a spring-loaded slide and placing the current path into the probe-head slot.

P6021 PROBE 5-Ft Cable, order 010-0237-02 ..... \$94  
P6021 PROBE 9-ft Cable, order 010-0244-02 ..... \$94

### SCOPE-MOBILE® CART

The model 201-3 cart supports the 5100-Series Oscilloscope in any of nine convenient viewing positions. A storage drawer is provided, as well as a carrier for storing up to three 5-Series plug-in units. Bottom tray dimensions are 15 1/2 by 25 inches.

Order 201-3 ..... \$155

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



**OSCILLOSCOPES**  
 5100 SERIES


- 1 mV/DIV to 5 V/DIV CALIBRATED DEFLECTION FACTORS
- LIGHTED KNOB SKIRTS FOR SCALE FACTOR READOUT—DIRECT READING FOR 1X AND 10X PROBES
- SOLID STATE CIRCUITRY—FET INPUTS

The 5A15N (single channel) and 5A18N (two identical channels) are amplifiers with solid-state circuits. Both feature simplified front panel controls and are used with the 5103N Mainframe. Two 5A18N Plug-ins are used for four trace capability or dual trace X-Y displays; one 5A18N and another amplifier plug-in can be used for three trace capability. The 5A18N and 5A15N may be used in the 5103N horizontal plug-in compartment for X-Y operation. Bandwidth is at least 2 MHz at all deflection factors.

5A18N operating modes include channel one or two only, channels one and two added, and channel one alternate or chopped with channel two. Internal trigger source is selectable from channel one and channel two.

Scale factor readout for each amplifier is provided by illuminating the knob skirt behind the area which identifies the correct scale factor. When the recommended 10X probe is added, the readout is automatically switched to correct the scale factor readout.

### CHARACTERISTICS

**Bandwidth**—DC coupled, DC to at least 2 MHz at all deflection factors. AC coupled, 2 Hz or less to at least 2 MHz at all deflection factors.

**Deflection Factor**—1 mV/div to 5 V/div in 12 calibrated steps (1-2-5 sequence). Accuracy is within 2%. Uncalibrated, continuously variable between calibrated steps and to 12.5 V/div.

**Input R and C**—1 M $\Omega$  within 1% paralleled by approximately 47 pF.

**Maximum Input**—DC coupled, 350 V (DC + peak AC). AC coupled, 350 VDC.

**Channel Isolation (5A18N only)**—At least 50 dB with one or both traces displayed.

### AMBIENT TEMPERATURE

Performance characteristics are valid for the 5A15N and 5A18N from 0°C to +50°C.

**5A15N SINGLE TRACE AMPLIFIER** ..... \$115  
Includes instruction manual 070-1136-00.

**5A18N DUAL TRACE AMPLIFIER** ..... \$265  
Includes instruction manual 070-1137-00.

**5A23N SINGLE TRACE AMPLIFIER** ..... \$65  
DC to 1 MHz. Deflection factors are 10 mV/div to 10 V/div in decade steps variable between steps to 100 V/div. AC or DC coupled. Input R and C, 1 M $\Omega$  within 1% and  $\approx$ 47 pF. Includes instruction manual 070-1144-00.

**5A24N SINGLE TRACE AMPLIFIER** ..... \$25  
50 mV/div straight through amplifier with five-way binding post input connector. Includes instruction manual 070-1145-00.

RECOMMENDED PROBES—see page 78.

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



# 5A20N Differential Amplifier

## 5A21N Differential Amplifier (Current Input)



- DC-TO-1 MHz BANDWIDTH
- 50  $\mu\text{V}/\text{DIV}$  TO 5  $\text{V}/\text{DIV}$  CALIBRATED DEFLECTION FACTORS
- 100,000:1 CMRR
- LIGHTED KNOB SKIRTS FOR SCALE FACTOR READOUT. DIRECT READING FOR 1X AND 10X PROBES
- SOLID-STATE STABILITY, FET INPUTS
- 10-kHz BANDWIDTH LIMITER
- VOLTAGE AND CURRENT PROBE INPUTS (5A21N)

The 5A20N and 5A21N are solid-state, 50  $\mu\text{V}/\text{div}$ , DC coupled differential amplifiers for the 5103N Oscilloscope System. The units are identical except that the 5A21N has a current probe input. Each plug-in is compatible with each compartment of the 5103N Mainframe. By inserting a vertical plug-in unit into the horizontal compartment, the user assembles an X-Y oscilloscope. Thus, the oscilloscope can be adapted to solve individual application problems.

Scale factor readout for each amplifier is provided by illuminating the knob skirt behind the area which identifies the correct scale factor. With the recommended 10X probe(s) added, the readout is automatically switched to the correct scale factor. This frees the user from having to mentally calculate the correct scale factor each time a measurement is made with a 10X probe.

### 5A20N AND 5A21N VOLTAGE CHARACTERISTICS

**Bandwidth**—DC coupled, DC to at least 1 MHz. AC coupled, 2 Hz or less to at least 1 MHz.

**Bandwidth Limit**—DC coupled, DC to approximately 10 kHz. AC coupled, 2 Hz or less to approximately 10 kHz.

**Deflection Factor**—50  $\mu\text{V}/\text{div}$  to 5  $\text{V}/\text{div}$  in 16 calibrated steps (1-2-5 sequence). Accuracy is within 2%. Uncalibrated, continuously variable between calibrated steps and to 12.5  $\text{V}/\text{div}$ .

**Input R and C**—Voltage mode, 1  $\text{M}\Omega$  within 0.5% paralleled by approximately 47 pF.

### Maximum Input Voltage

	DC COUPLED	AC COUPLED
50 $\mu\text{V}/\text{div}$ to 50 $\text{mV}/\text{div}$	10 V (DC + peak AC)	350 VDC (Coupling cap pre-charged), 10 V peak AC
100 $\text{mV}/\text{div}$ to 5 $\text{V}/\text{div}$	350 V (DC + peak AC)	350 V (DC + peak AC)

**Input Gate Current**—100 pA or less (equivalent to 100  $\mu\text{V}$  or less, depending on external loading) at 25°C.

**Displayed Noise**—30  $\mu\text{V}$  or less, tangentially measured.

**Common Mode Rejection Ratio**—AC coupled, 50  $\mu\text{V}/\text{div}$  to 0.5  $\text{mV}/\text{div}$ , at least 20,000:1 at 5 kHz and above decreasing to 400:1 at 10 Hz. DC coupled, at least 100,000:1, DC to 30 kHz at 50  $\mu\text{V}/\text{div}$  and 100  $\mu\text{V}/\text{div}$  with up to 20 V P-P sinewave, decreasing by less than 20 dB/decade on sensitivity ranges up to 50  $\text{mV}/\text{div}$ . From 100  $\text{mV}/\text{div}$  to 5  $\text{V}/\text{div}$ , CMRR is at least 400:1 with up to 100 V P-P sinewave. CMRR with two P606 probes is at least 400:1 at any deflection factor.

### 5A21N CURRENT PROBE INPUT CHARACTERISTICS (WITH P6021 CURRENT PROBE)

**Bandwidth**—15 Hz or less, to at least 1 MHz.

**Deflection Factor**—0.5  $\text{mA}/\text{div}$  to 0.5  $\text{A}/\text{div}$  in 10 calibrated steps (1-2-5 sequence). Accurate within 3%. Uncalibrated, continuously variable between steps and to 1.25  $\text{A}/\text{div}$ .

**Maximum Input Current**—4 A P-P (at probe loop) with 125-turn P6021 Current Probe.

**Displayed Noise**—300  $\mu\text{A}$  or less, tangentially measured. Performance characteristics are valid for the 5A20N and 5A21N from 0°C to +50°C.

**5A20N DIFFERENTIAL AMPLIFIER** ..... \$165  
Includes instruction manual 070-1138-00.

**5A21N DIFFERENTIAL AMPLIFIER** ..... \$185  
Includes instruction manual 070-1139-00.

P6021 5-Ft Current Probe, order 010-0237-02 ..... \$94

P6021 9-Ft Current Probe, order 010-0244-02 ..... \$94

VOLTAGE PROBE—see page 78.

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- 100 ns/DIV to 5 s/DIV CALIBRATED TIME BASE
- TRIGGERING IN EXCESS OF OSCILLOSCOPE BANDWIDTH
- SINGLE SWEEP
- LIGHTED KNOB SKIRTS FOR SCALE FACTOR READOUT
- DIRECT READOUT X10 MAG
- PROVIDES ALTERNATE AND CHOPPED DISPLAYS BETWEEN TWO AMPLIFIERS
- SOLID-STATE STABILITY
- 50 mV/DIV AND 500 mV/DIV CALIBRATED EXTERNAL INPUT



The 5B10N is a time base/amplifier plug-in unit for generating a sweep in the 5103N Oscilloscope System. Sweep rates are 1  $\mu$ s/div to 5 s/div, extended to 100 ns/div with the X10 magnifier. Circuitry is solid-state and the front panel layout and controls make the 5B10N easy to understand and use. A back lighted skirt inscribed with the sweep rates lets the user instantly read the correct sweep rate even when the magnifier is in use. In the external mode the unit becomes a voltage amplifier with calibrated deflection factors of 50 mV/div and 500 mV/div.

Triggering the 5B10N is straightforward even with the many triggering modes which are push button selected. Source positions include left or right plug-in, display (from the mainframe vertical amplifier), line and external. Triggering modes include auto, AC or DC coupled, and single sweep. The 5B10N triggers to frequencies well beyond the oscilloscope bandwidth.

The 5B10N is normally used in the right hand plug-in compartment but is compatible with the vertical amplifier compartments as well.

**CHARACTERISTICS**

**Sweep Rates**—1  $\mu$ s/div to 5 s/div in 21 calibrated steps (1-2-5 sequence). X10 magnifier extends displayed sweep time/div to 100 ns. Uncalibrated, continuously variable between steps and to 12.5 s/div.

**Sweep Accuracy**—Unmagnified, within 3% from 1  $\mu$ s/div to 1 s/div, and within 4% at 2 s/div and 5 s/div. Magnified displays accurate within 1% in addition to specified time base sweep accuracy.

**TRIGGERING**

COUPLING	TRIGGERING FREQUENCY RANGE	MIN SIGNAL REQUIRED	
		INT	EXT
AC	50 Hz to 2 MHz	0.4 div	200 mV
DC	DC to 2 MHz	0.4 div	200 mV

**Auto Trig**—Same as above except signal rate requirements are 15 Hz and above.

**Single Sweep**—Same as for AC and DC coupled.

**External Trigger Input**—Maximum input voltage is 350 V (DC + peak AC). Input R and C is 1 M $\Omega$  within 2% paralleled by  $\approx$ 70 pF. Trigger level voltage range is +5 V to -5 V.

**EXTERNAL HORIZONTAL MODE**

**Deflection Factor**—50 mV/div and 500 mV/div, accurate within 3%. 10X variable extends range to at least 5 V/div.

**Bandwidth**—DC coupled, DC to at least 1 MHz. AC coupled, 50 Hz or less to at least 1 MHz.

**Input R and C**—1 M $\Omega$  within 2% paralleled by  $\approx$ 70 pF.

**Maximum Input Voltage**—350 V (DC + peak AC).

**AMBIENT TEMPERATURE**

Performance characteristics are valid for the 5B10N from 0°C to +50°C.

**5B10N TIME BASE/AMPLIFIER** ..... \$175  
Includes instruction manual 070-1140-00.

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Please refer to General Information page



# 5B12N

## Dual Time Base

- 100 ns/DIV TO 5 s/DIV CALIBRATED TIME BASE
- DUAL and DELAYED SWEEP
- TRIGGERING IN EXCESS OF OSCILLOSCOPE BANDWIDTH
- LIGHTED KNOB SKIRTS FOR SCALE FACTOR READOUT
- DIRECT READOUT X10 MAG

The 5B12N is a time base for generating single, dual or delayed sweeps in the 5103N Oscilloscope System. The unit features solid-state circuitry, simplified front-panel controls and normal sweep rates from 1  $\mu$ s/div to 5 s/div; extended to 100 ns/div with the X10 magnifier. The 5B12N is normally used in the right hand plug-in compartment but is compatible with the vertical amplifier compartment as well.

The display modes are A sweep, B sweep, A intensified—B delayed and dual sweep. Each mode is selectable by push-button switches. Triggering sources for A and B sweep include left and right plug-in, line and display. In the display mode the sweep is triggered from the composite signal being displayed. Auto and external trigger and single sweep are provided for the A sweep. The B sweep is triggerable after the delay time. The 5B12N triggers to frequencies well beyond the oscilloscope bandwidth.

The display mode push button applies logic levels to the main-frame to select Chop (button pushed in) or Alternate (button out) for time-share switching between vertical plug-ins and amplifier channels.

Scale factor readouts for the time base are provided by illuminating the knob skirt behind the area which identifies the correct scale factor. When the X10 magnifier is used the readout is automatically switched to correct the A sweep scale factor readout.

### CHARACTERISTICS

**A Sweep Rates**—1  $\mu$ s/div to 5 s/div in 21 calibrated steps (1-2-5 sequence). X10 magnifier extends displayed sweep time/div to 100 ns. Uncalibrated, continuously variable between steps and to 12.5 s/div.

**A Sweep Accuracy**—Unmagnified, within 3% from 1  $\mu$ s/div to 1 s/div and within 4% at 2 s/div and 5 s/div. Magnified, displays accurate within 1% in addition to specified time base sweep accuracy.

**B Sweep Rates**—0.2  $\mu$ s/div to 0.5 s/div in 20 calibrated steps.

**B Sweep Accuracy**—Within 3% from 0.5  $\mu$ s/div to 0.1 s/div. Within 4% at 0.5 s/div, 0.2 s/div and 0.2  $\mu$ s/div.

### TRIGGER

The following applies to the A and B trigger except as noted.

COUPLING	TRIGGERING FREQUENCY RANGE	MIN SIGNAL REQUIRED	
		INT	EXT (A TRIG ONLY)
AC	50 Hz to 2 MHz	0.4 div	200 mV
DC	DC to 2 MHz	0.4 div	200 mV

B sweep operates in triggered or free-run mode after delay time.

The following characteristics apply to the A trigger only.

**Auto Trig**—Same as above on signal rates of 15 Hz and above.

**Single Sweep**—Same as for AC and DC coupled.

**External Trigger Input**—Maximum input voltage is 350 V (DC + peak AC). Input R and C is 1 M $\Omega$  within 2% paralleled by  $\approx$ 70 pF. Trigger level voltage range is +5 V to -5 V.



### DELAYING SWEEP CHARACTERISTICS

**Delay Time Accuracy**—1  $\mu$ s/div to 5 s/div, within 1%. 1 s/div to 5 s/div, within 2%.

**Delay Time Multiplier Range**—0 to 10 times the Time/Div setting.

**Delay Time Multiplier Incremental Linearity**—Within 0.2%.

**Differential Time Measurement Accuracy**—Within 1% and 2 minor dial divisions for 1  $\mu$ s to 0.5 s delay times. Within 2% and 2 minor dial divisions for 1 s to 5 s delay times.

**Jitter**—1 part or less in 20,000 of 10X the Time/Div setting.

### EXTERNAL HORIZONTAL MODE

**Deflection Factor**—50 mV/div and 500 mV/div accurate within 3%. 10X variable extends range to at least 5 V/div.

**Bandwidth**—DC coupled, DC to at least 1 MHz. AC coupled, 50 Hz or less to at least 1 MHz.

**Input R and C**—1 M $\Omega$  within 2% paralleled by  $\approx$ 70 pF.

**Maximum Input Voltage**—350 V (DC + peak AC).

### AMBIENT TEMPERATURE

Characteristics are valid for the 5B12N from 0°C to +50°C.

**5B12N DUAL TIME BASE** ..... \$550  
Includes instruction manual 070-1141-00.

**5B13N TIME BASE** ..... \$85

A basic time base unit with sweep ranges from 5  $\mu$ s/div to 0.5 s/div in decade steps, variable between steps to 5 s/div. Includes instruction manual 070-1146-00.

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OSCILLOSCOPES		
PRODUCT	PAGE	DESCRIPTION
561B	84	Plug-in oscilloscope
564B	86	Plug-in oscilloscope with storage
564B MOD 121N	86	Plug-in oscilloscope with storage and auto-erase
565	89	Dual-beam oscilloscope with built-in time bases
POWER SUPPLIES		
129	124	Powers up to four plug-in units
285	118	Powers one S-Series head

PLUG-IN UNITS									
PLUG-IN UNIT	PAGE	MINIMUM DEFLECTION FACTOR	BANDWIDTH (-3 dB)	T <sub>R</sub>	PLUG-IN UNIT	PAGE	MINIMUM DEFLECTION FACTOR	BANDWIDTH (-3 dB)	T <sub>R</sub>
<b>SINGLE TRACE</b>					<b>SPECIAL PURPOSE</b>				
2A60	92	50 mV/div	DC to 1 MHz	0.35 μs	3A8 Operational	100	20 mV/div	DC to 3.5 MHz	100 ns
3A75	92	50 mV/div	DC to 4 MHz	90 ns	3A10 Transducer	103	10 μV/div	DC to 1 MHz	350 ns
<b>MULTIPLE TRACE</b>					3C66 Carrier Amp	105	10 μstrain/div	DC to 5 kHz	70 μs
3A3 Dual-Trace	94	100 μV/div	DC to 500 kHz	0.7 μs	2B67 Mod 730A 3A74 Mod 730A	297	Engine Analyzer Plug-ins		
3A6 Dual-Trace	96	10 mV/div	DC to 10 MHz	35 ns	<b>TIME-BASE UNITS</b>				
3A72 Dual-Trace	98	10 mV/div	DC to 650 kHz	0.54 μs	<b>PLUG-IN UNIT</b>	<b>PAGE</b>	<b>FASTEST TIME-BASE RATE</b>	<b>MAGNIFIER</b>	<b>FEATURES</b>
3A74 Four-Trace	99	20 mV/div	DC to 2 MHz	0.18 μs	2B67	106	1 μs/div	X5	single sweep
<b>DIFFERENTIAL</b>					3B3	107	0.5 μs/div	X5	calib delayed sweep; single sweep
2A63	93	1 mV/div	DC to 300 kHz	1.2 μs	3B4	108	0.2 μs/div	X1 to X50	single sweep
3A3	94	100 μV/div	DC to 500 kHz	0.7 μs	<b>SAMPLING</b>				
3A7 Comparator	97	1 mV/div	DC to 10 MHz	35 ns	3S1 Dual Trace	109	2 mV/div	DC to 1 GHz	350 ps
3A9	101	10 μV/div	DC to 1 MHz	350 ns	3S2 Dual Trace	110	2 mV/div	Used with S-Series Heads	
<b>SPECTRUM ANALYZER</b>					3S5 Programmable	111	2 mV/div	Used with S-Series Heads	
3L5	208	10 μV/div	10 Hz to 1 MHz		<b>SAMPLING HEADS</b>				
<b>SAMPLING</b>					S-1	112	50 Ω	DC to 1 GHz	350 ps
3T2	121	0.2 ns/div	X10	random sampling	S-2	112	50 Ω	DC to 4.5 GHz	75 ps
3T5 Programmable	122	0.1 ns/div		calib digital sweep delay	S-3A	113	100 kΩ	DC to 1 GHz	350 ps
3T77A	123	0.2 ns/div	X10	single sweep manual scan sweep delay	S-4	113	50 Ω	DC to 14 GHz	25 ps
<b>TDR SYSTEM</b>					S-5	114	1 MΩ	DC to 350 MHz	1 ns
3S7	119	5 mV/div	140-ps risetime		S-6	115	50 Ω	DC to 11.5 GHz	30 ps
3T7	119	100 ps/div	4920 ft direct-reading		S-50	116	25-ps Pulse Generator Head		
<b>SAMPLING</b>					S-51	116	1-to-18 GHz Trigger Countdown Head		
3S1 Dual Trace	109	2 mV/div	DC to 1 GHz	350 ps	S-52	117	25-ps Pulse Generator Head		
3S2 Dual Trace	110	2 mV/div	Used with S-Series Heads		S-53	117	DC-to-1 GHz Trigger Recognizer Head		
3S5 Programmable	111	2 mV/div	Used with S-Series Heads		S-54	118	1-ns Pulse Generator Head		

The 560 Series offers 28 different plug-in units providing complete versatility in measurement applications. Mainframes include a dual-beam oscilloscope with two independent vertical and horizontal deflection systems (565), a bistable storage oscilloscope with auto-erase (564B MOD 121N) and without auto-erase (564B), and a conventional oscilloscope (561B). The dual plug-in unit feature of the 564B and 561B allows conventional displays or X-Y displays with either single-trace, dual-trace, or four-trace units. Sampling displays, as well as spectrum analysis and raster generation are also available.

With the 565 the horizontal amplifiers are built-in and can be driven by either of its two built-in sweep generators. The vertical amplifiers can be of any 2-Series or 3-Series plug-in units except spectrum analyzer and sampling units.

The 568 is described in the Automated Measurement Systems Section, but can be used with any of the 560-Series plug-ins when digital readout is not required. The 3A2, 3B2, 3S6, and 3T6 Programmable Plug-Ins are described in the Systems Section.