

- **LARGE 8 x 10-cm DISPLAY AREA**
- **1/2 RACK SIZE**
- **TWO VIDEO INPUTS**
- **PICTURE MONITOR OUTPUT**
- **SELECTABLE 1-VOLT AND 4-VOLT FULL SCALE DEFLECTION FACTORS**
- **YRGB AND RGB INPUTS**
- **ALL SOLID-STATE—LOW POWER CONSUMPTION**

The solid-state Type 528 Television Waveform Monitor provides bright, easy-to-read video waveform displays on a 5-in. CRT, yet requires only 5-1/4-inch vertical height and 1/2-rack width mounting space. This compact instrument is especially well suited for monitoring signals from camera outputs, video system output lines, transmitter video input lines, closed-circuit TV systems and educational TV systems.

Either of two video inputs, selectable from the front panel, may be displayed. The displayed video signal is also provided at a video output jack for viewing on a picture monitor. Calibrated, 1-volt and 4-volt full scale (140 IRE unit) sensitivities are provided for displaying common video and sync signal levels. A variable sensitivity control permits uncalibrated displays from 0.25-volt to 4.0-volt full scale. The built-in 1-volt calibration signal may be switched on to check vertical sensitivity calibration. Flat, IRE, Chroma, and Diff Gain frequency response positions permit observation of various signal characteristics.

Horizontal Sweep selection provides 2 H (two line), 1 μ s/div (expanded two line), 2 V (two field) and 2 V MAG (expanded two field). Displays of RGB and YRGB waveforms from color processing amplifiers are provided for with interconnection through a rear-panel 9-pin receptacle.

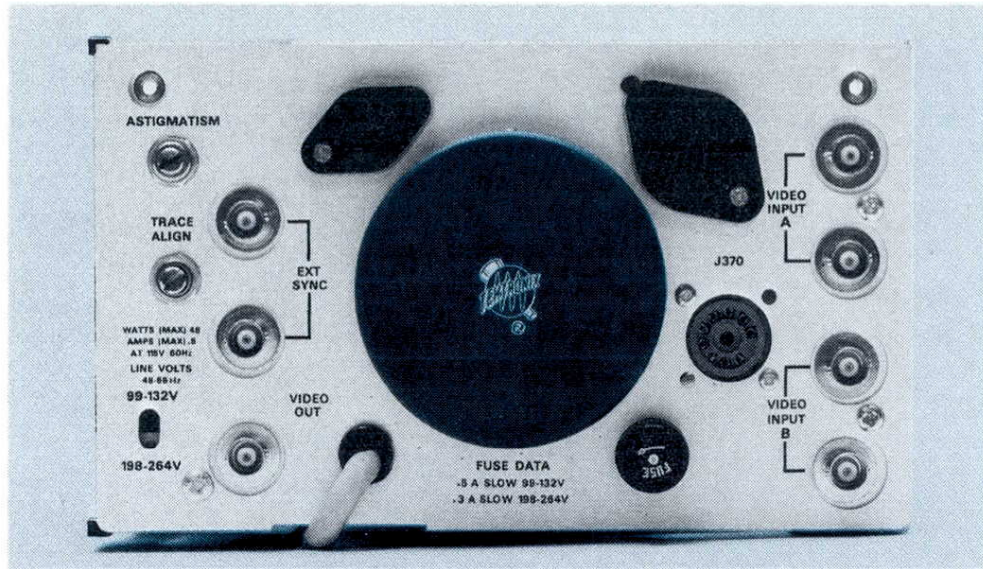
A DC Restorer maintains the back porch at an essentially constant level despite changes in signal amplitude, APL and color burst. May be turned off when not needed.

All solid-state circuitry provides low power consumption, and long-term reliability.

VIDEO FEATURES

INPUTS

Rear-panel BNC connectors provide two unbalanced inputs (A & B) which may be used with either 75- Ω loop-through or bridging connection. Maximum return loss for A and B video inputs, terminated in 75 Ω , operating or non-operating is 46 dB or greater to 5 MHz. Normally AC coupled but may be easily modified by user for DC coupling.



Rear panel of Type 528 Waveform Monitor.

DEFLECTION FACTOR

Calibrated 1-volt and 4-volt (for 140 IRE unit deflection) positions are provided for video inputs A or B with accuracy within 1% for the 1-volt positions and 3% for the 4-volt positions. A variable sensitivity control permits uncalibrated displays from 0.25-volt to 4.0-volt full scale.

FREQUENCY RESPONSE

4 response positions are provided: FLAT—25 Hz to 3.6 MHz within 1% of response at 50 kHz, 3.6 MHz to 5 MHz +1%, -3% of response at 50 kHz, and +1%, -3% of response at 3.58 MHz; IRE—per 1958 IRE STD 23S-1 (amended). Response at 4.43 MHz attenuated at least 22 dB; CHROMA—30% down between 3.1 MHz and 3.4 MHz, 30% down between 3.8 MHz and 4.1 MHz. Response at 3.58 MHz does not vary between FLAT and CHROMA by more than 1%. DIFF GAIN—same as CHROMA response with additional gain for displaying 100 IRE units of 90 mV to 143 mV subcarrier levels.

DIFFERENTIAL GAIN

1% or less with 10 to 90% APL changes using DIFF GAIN operating mode with modulated staircase signal, baseline adjusted to 50 IRE units position, and signal adjusted to 100 IRE units P-P.

TRANSIENT RESPONSE

1-volt or 4-volt calibrated deflection factor, FLAT response position, using 125-ns HAD \sin^2 pulse and bar test signal: preshoot is not more than 1 IRE unit, overshoot not more than 2 IRE units, ringing not more than 2 IRE units and pulse to bar ratio within 0.99:1 to 1.01:1.

LOW FREQUENCY TILT

% or less tilt on the vertical window or 60 Hz squarewave (DC Restorer off).

MAXIMUM INPUT LEVEL

MAXIMUM DC INPUT

5 volts \ddagger for all response positions using AC coupling.

MAXIMUM AC INPUT

Flat and IRE response—Signal levels should be limited to produce displays not exceeding 200 IRE units.

CHROMA response—Chroma levels up to 140 IRE units may be displayed, provided the chroma plus luminance level does not exceed 200 IRE units when viewed in the FLAT response mode.

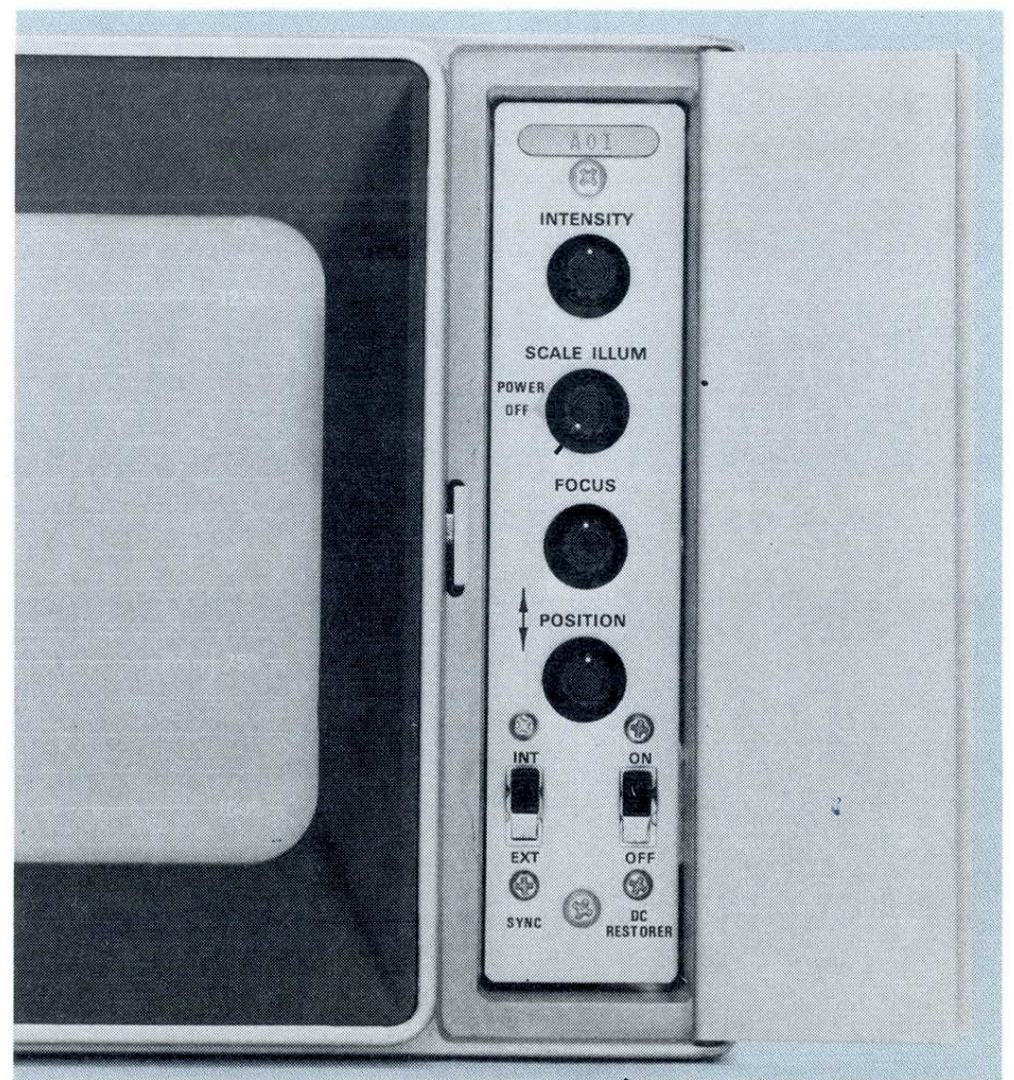
DIFF GAIN—Subcarrier signal levels of 90 mV to 143 mV peak to peak may be expanded, using the variable gain control, to 100 IRE units for measurement of differential gain with 10 to 90% APL.

DC RESTORER

Slow acting back porch DC restoration. Blanking level shift due to presence or absence of burst or changes in APL from 10% to 90% will not exceed 2 IRE units. May be disabled when desired.

VIDEO OUTPUT

The displayed signal is provided at a rear-panel BNC connector. Frequency response is 25 Hz to 5 MHz within 3%. Output signal amplitude is 1 volt within 15% for 140 IRE unit display using the FLAT response mode. DC level is 2 volts \ddagger or less into 75- Ω load. Nominal output impedance is 75 Ω . Return loss is 30 dB \ddagger or greater from 25 Hz to 5 MHz.



Infrequently used operating controls are conveniently located behind a front-panel hinged door.

\ddagger Exceeds CCIR recommendation 451-2 paragraph 3.1.

\ddagger Exceeds CCIR recommendation 451-2 paragraph 3.2.

TIME BASE FEATURES

SYNCHRONIZATION

Internal or external sync is provided and is selectable by a switch behind the front panel hinged door. Internal sync is derived from composite video input. External sync is via a rear panel BNC loop-through connector and requires 1.5-volts to 4.5-volts composite sync input. The unterminated sync input impedance is approximately 15 k Ω paralleled by approximately 5 pF and maximum input voltage is 20 volts.[‡]

SWEEP MODES

4 sweep modes are provided: 2-V SWEEP—repetition equal to frame rate of applied video or external sync; 2-V MAG SWEEP—expands the vertical blanking interval (approximately 20X magnification of 2 V); 2-H SWEEP—repetition rate equal to half-line rate of applied video or external sync; 1- μ s/div SWEEP—calibrated sweep with accuracy within 3% for center 10 div of 12-div sweep, and linearity within 3% throughout horizontal POSITION range, excluding first and last div.

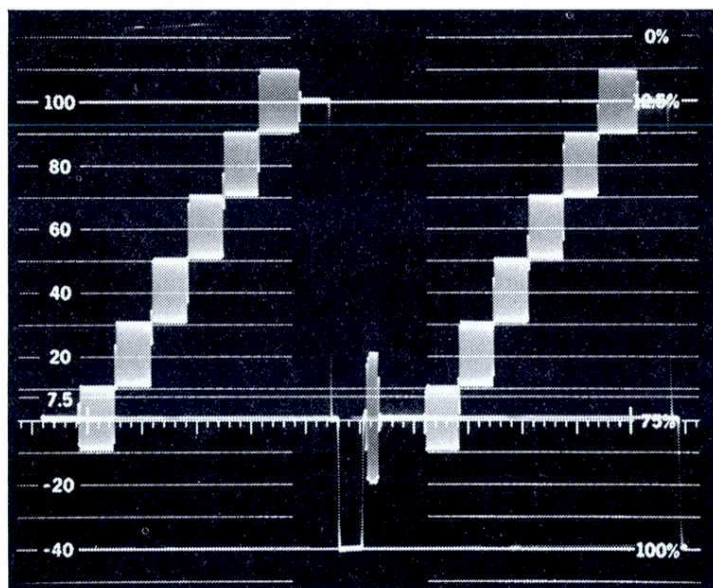


Fig 1. Modulated staircase signal. 2 H SWEEP, FLAT response.

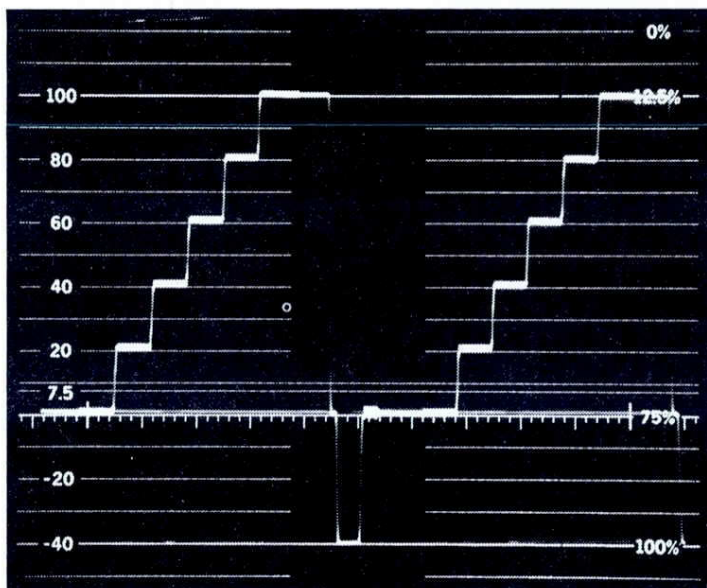


Fig 2. Modulated staircase signal. 2 H SWEEP, IRE response.

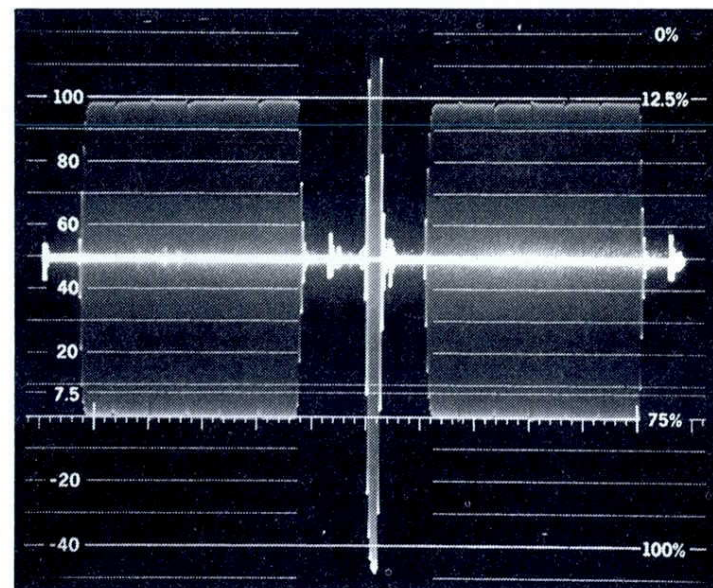


Fig 3. Modulated staircase signal. 2 H SWEEP, DIFF GAIN response.

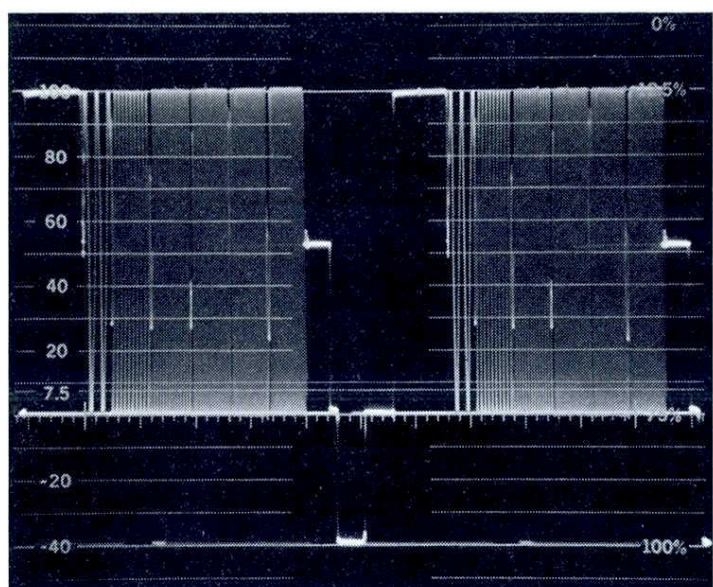


Fig 4. Multiburst signal. 2-H SWEEP, FLAT response.

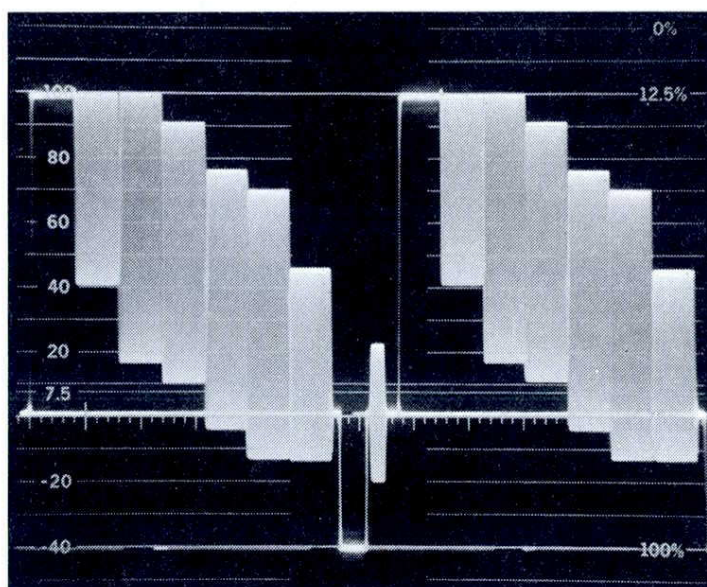


Fig 5. 75% saturated color bar signal. 2-H SWEEP, FLAT response.

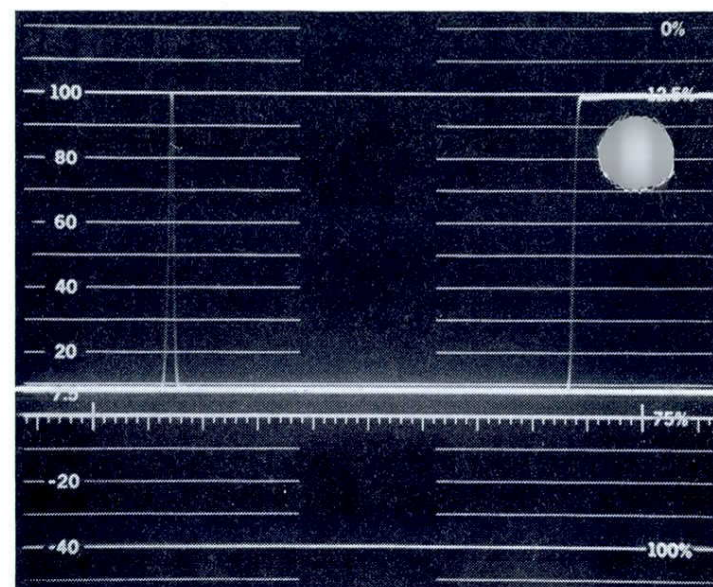


Fig 6. .125 μ s HAD Sin² Pulse and Bar. 1- μ s/div calibrated sweep, FLAT response.

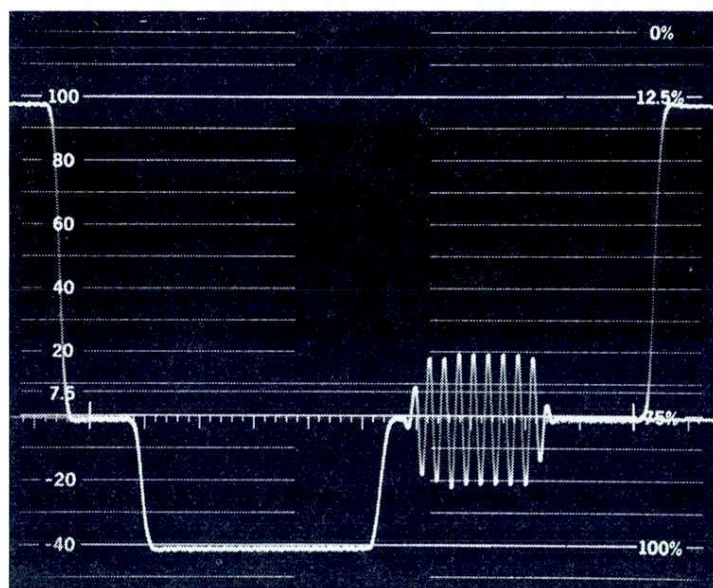


Fig 7. Horizontal Blanking Interval. 1- μ s/div calibrated sweep.

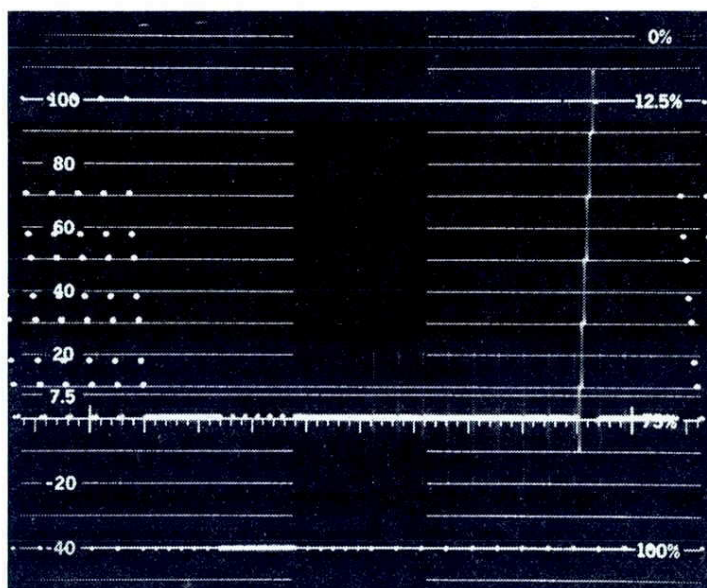


Fig 8. Vertical Blanking Interval. 2-V MAG SWEEP. 20X magnification permits convenient vertical blanking interval observation.

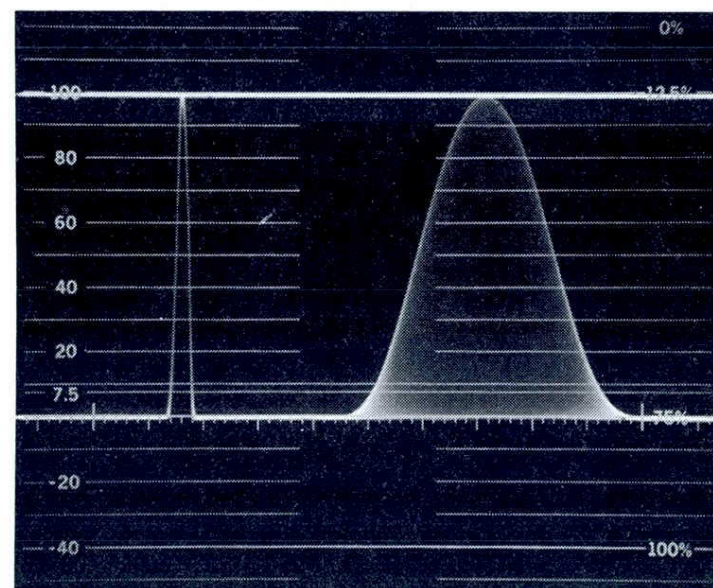


Fig 9. .250 μ s HAD Sin² Pulse (left) and Modulated 20 T Sin² Pulse (right) with superimposed Bar Signal (top).

[‡]Exceeds CCIR recommendation 451-2, paragraph 3.2

YRGB AND RGB DISPLAYS

The Type 528 can be used with color camera processing amplifiers which provide the necessary sequential signal switching and staircase signals. A rear panel 9-pin receptacle provides the necessary interconnections. Factory wired for RGB (3 step) input.

STAIRSTEP AMPLITUDE

A 10-volt amplitude stairstep signal will produce a 9-div display length within 15%.

STAIRSTEP DC LEVEL

Peak AC plus DC signal levels shall not exceed limits of -12 to +12 volts. Maximum AC signal level is 12-volts peak-to-peak.

CONTROL SIGNALS

The RGB or YRGB modes may be initiated through the use of external voltage (12 volts to 15 volts) or ground connection at the rear panel 9-pin receptacle. A 9-pin plug is supplied with the included standard accessories.

OTHER FEATURES

REGULATED POWER SUPPLY

Operates on 99 volts AC to 132 volts AC and 198 volts AC to 264 volts AC, 48 Hz to 66 Hz line frequency. Operates on 115 volts $\pm 10\%$ or 230 volts $\pm 10\%$ at line frequencies from 66 Hz to 440 Hz. POWER CONSUMPTION: approx 48 watts at 115 volts AC, 60 Hz.

TEKTRONIX CATHODE-RAY TUBE

Flat-faced 5-inch rectangular CRT providing an 8 x 10-cm display area. P31 phosphor supplied. External graticule with variable illumination.

CALIBRATOR

An internal calibration signal provides a convenient reference for verifying deflection factor. Amplitude is 1.0 volt within 1%.

DIMENSIONS AND WEIGHTS

Type 528: Height	5 $\frac{1}{4}$ in	13.3 cm
Width	8 $\frac{1}{2}$ in	21.6 cm
Depth	18 $\frac{1}{2}$ in	47.0 cm
Net weight	15 lb	6.8 kg

INCLUDED STANDARD ACCESSORIES

9-pin connector (136-0099-00), connector cover (200-0249-00), two instruction manuals (070-0800-00).

ORDERING INFORMATION

ORDER TYPE 528 FOR 525-LINE, 30-FRAME TELEVISION STANDARDS

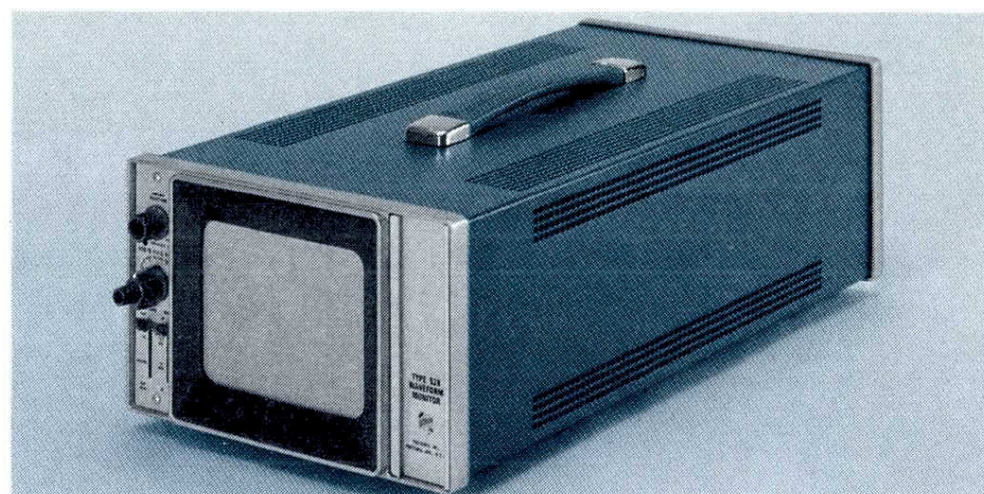
TYPE 528 WAVEFORM MONITOR \$890

TYPE 528 MOD 146B WAVEFORM MONITOR \$865

As above, but less cover, for mounting in Tektronix rack adapter (016-0115-02).

ORDER TYPE 528 MOD 188G FOR 625-LINE, 25-FRAME TELEVISION STANDARDS, CALIBRATED WITH CCIR SIGNALS WITH CHROMA RESPONSE CENTERED AT 4.43 MHz.

TYPE 528 MOD 188G WAVEFORM MONITOR \$890

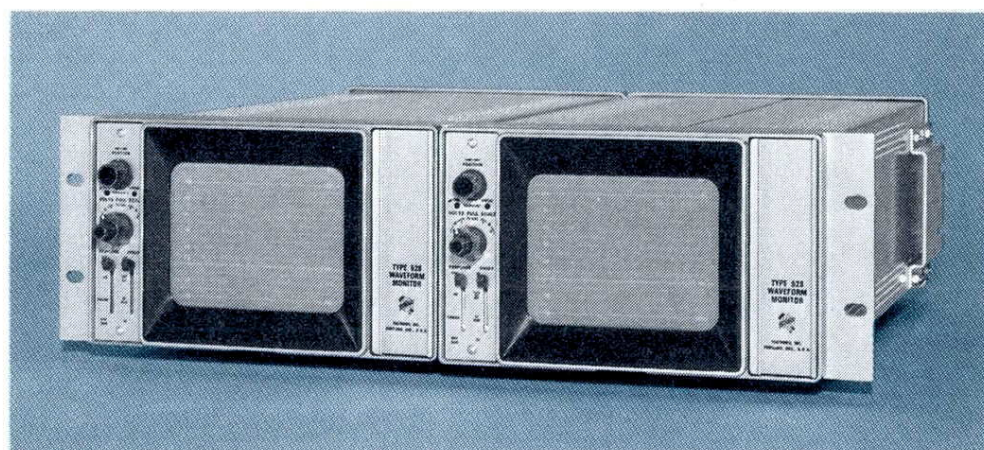


TYPE 528 WITH PROTECTIVE CABINET

The Type 528 MOD 147B is a standard Type 528 provided with a protective cabinet for table-top use or portable applications. Cabinet is aluminum construction, blue vinyl finish.

TYPE 528 MOD 147B WAVEFORM MONITOR \$920

OPTIONAL ACCESSORIES

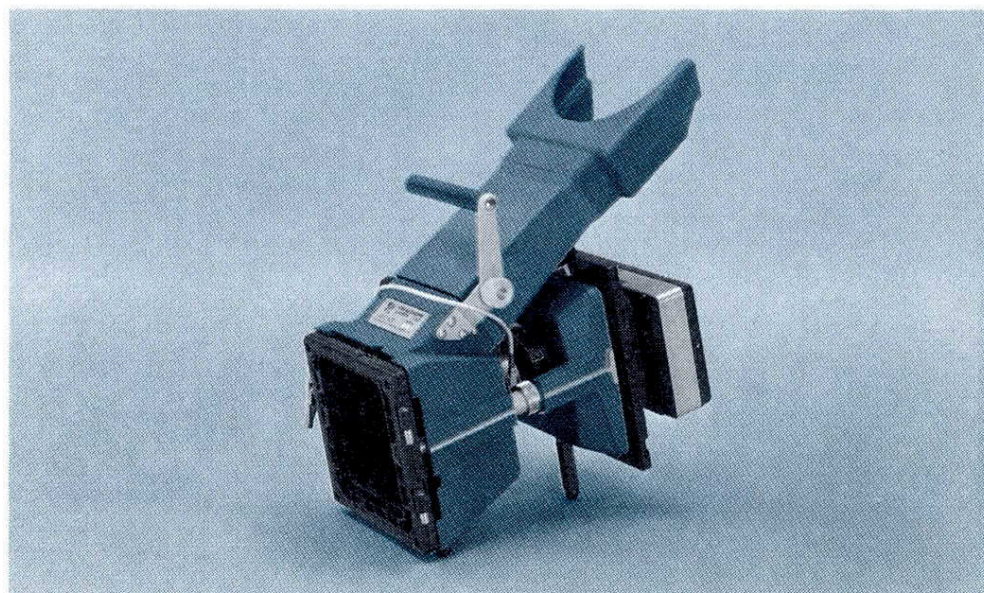


RACK ADAPTER

For mounting two Type 528's side-by-side in a standard 19-inch rack, order 016-0115-02 \$ 95.00

PANEL ASSEMBLY

For covering $\frac{1}{2}$ of rack adapter when only one Type 528 is rackmounted, order 016-0116-00 \$ 8.00



C-27 CAMERA

f/1.9, 1:85 lens, Polaroid Land* Pack-Film back, order C-27 \$460.00

Type 528 to C-27 camera adapter, 016-0249-01 \$ 16.00

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