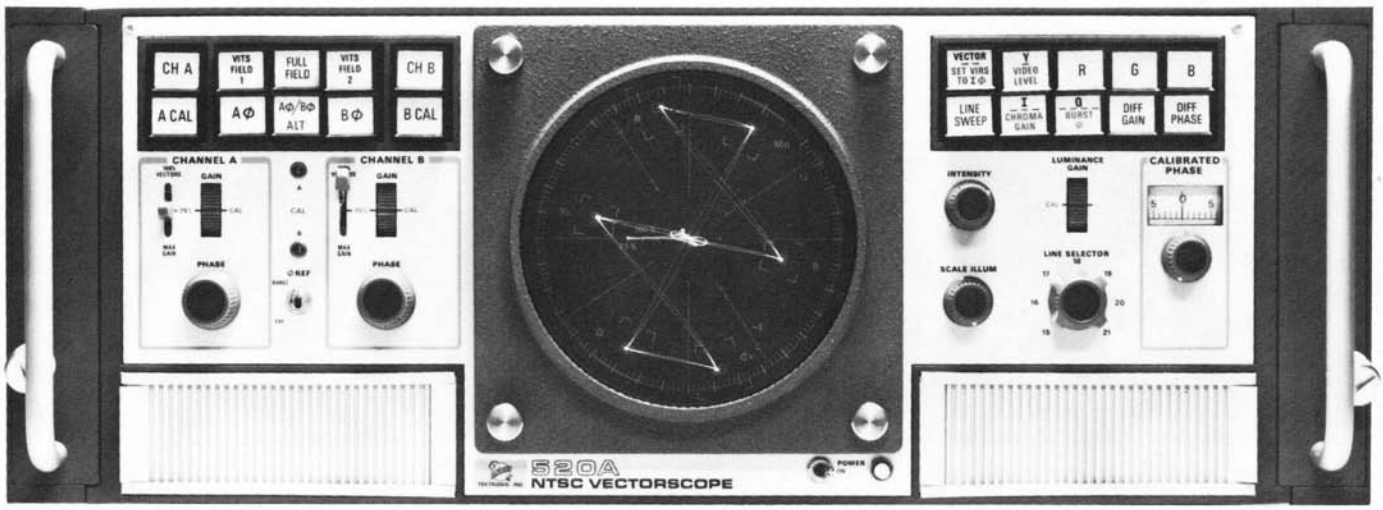


R520A NTSC Vectorscope

520A/521A/522A

The Tektronix 520A Series vectorscopes include three basic instruments available in both cabinet and rackmount configurations. These are the 520A/R520A for NTSC, the 521A/R521A for PAL, and the 522A/R522A for PAL-M.

DISPLAYS

The vector display shows the relative phase and amplitude of the chrominance signal on polar coordinates. To help identify these coordinates, the graticule has points corresponding to the proper phase and amplitude of the primary and complementary colors: R (Red), B (Blue), G (Green), C_Y (Cyan), Y_L (Yellow), and M_G (Magenta).

Any errors in the color encoding, video-tape recording, or transmission processes that change these phase and/or amplitude relationships cause color errors in the television picture. Polar coordinate displays, such as those obtained on the 520A, 521A, and 522A CRT, have proven to be the best method for displaying these errors.

The polar display permits measurement of hue in terms of relative phase of the chrominance signal with respect to the color burst. Amplitude is expressed in terms of the displacement from center (radial length) toward the color point which corresponds to 75% (or 100%) amplitude of the particular color being measured.

The outer boxes around the color points correspond to phase and amplitude error limits (±10°, ±20%). For the 520A (NTSC) the inner boxes indicate ±2.5° and 2.5 IRE units, and correspond to phase and amplitude error limits per EIA specification RS-189, amended for 7.5% setup. For the 521A (PAL) and 522A (PAL-M), the inner boxes indicate ±3° phase angle and ±5% amplitude.

An internally generated test circle, used with the vector graticule, verifies quadrature accuracy, horizontal to vertical gain balance, and gain calibration for chrominance signal amplitude measurements. Two methods of measuring phase shifts are provided. You can accurately read large phase shifts from the parallax-free vector graticule. A precision calibrated phase shifter with a range of 30°, spread over 30 inches of dial length, is provided for measuring small phase shifts.

Dual Vector Display

In dual-channel operation, successive samples of channels A and B are displayed on a time-shared basis. The switching rate is locked to horizontal sync, and switching transients are blanked. You can conveniently compare input/output signals from video equipment on Channel A or B for phase and/or amplitude distortion.

The subcarrier processing channel contains two uncalibrated 0° to 360° phase-shifters and one 30° calibrated phase shifter. While viewing Channel A or B, you can switch either of the uncalibrated phase-shifters, AØ or BØ into the subcarrier processing channel. Each phase shifter locks to its respective channel when A and B channels are time-shared, permitting independent phase control of the Channel A and B displays. Unequal signal paths causing phase shifts are easily cancelled, leaving only phase and amplitude distortion caused by equipment deficiencies.

Video cable lengths may be accurately matched for time delay at color subcarrier frequency to less than 0.5° phase difference.

You can make accurate amplitude measurements of chrominance and luminance from the CRT display. Use the internal one volt luminance amplitude calibration test signal to check the gain accuracy of Channel A and B amplifiers and the luminance channel.

Time Base Displays

The linear time base operates at the line rate. Color signals may be demodulated along any desired axis, I, Q, and R-Y (for NTSC), and U, and V (for PAL and PAL-M), and displayed at the line rate on a linear time base.

Luminance-Color Separation

A luminance channel permits the separation and display of the luminance (Y) component from the composite color signal. You can also combine the Y component with the output of the chrominance demodulators for R, G, and B displays at a line rate. Amplitude measurements of color signal components can be made with an accuracy of 3%.

Vertical Interval Test Signal Observation

You can display VITS (Vertical Interval Test Signals) from front-panel selected lines of either field 1 or 2 on the 520A Vectorscope. For the 521A (PAL) and the 522A (PAL-M), you can display ITS from either fields 1 and 3 or fields 2 and 4.

Differential Gain and Differential Phase Measurements

The two main chrominance signal distortions — differential gain and differential phase — can be measured on the 520A (NTSC), 521A (PAL), and 522A (PAL-M) Vectorscopes. Differential gain (Figure 1) is a change in color subcarrier amplitude as a function of luminance level. In the reproduced color picture, saturation will be distorted in the areas between the light and dark portions of the scene. The 520A, 521A, and 522A permit differential gain measurements with accuracy to better than 1%.

Differential phase (Figure 2) is a phase modulation of the chrominance signal caused by changes in the luminance signal level. The hue will vary with scene brightness in the reproduced color picture. Differential gain and differential phase occur separately or together. You can read differential phase errors from the precision calibrated phase shift control or directly from the differential phase markings on the graticule.

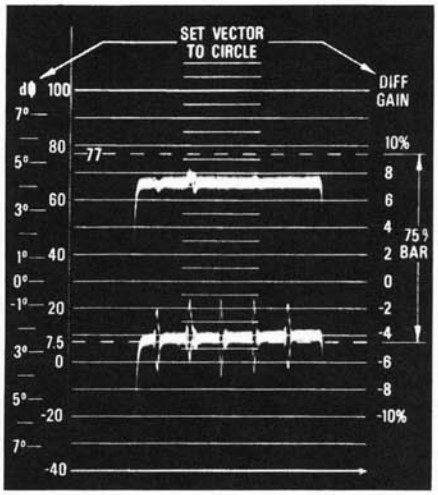
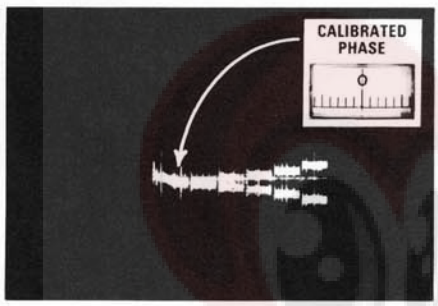


Figure 1. Differential Gain display from the 520A. Luminance is on in lower trace. On upper trace, luminance is off. Minor divisions of graticule indicate 1% differential gain. Double exposure.



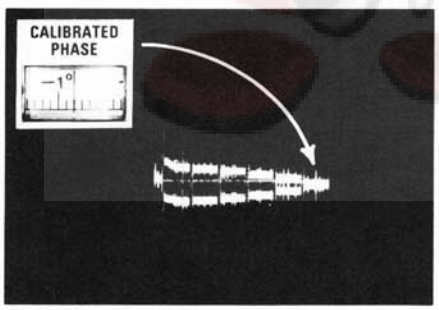


Figure 2. Differential Phase presentation from the 520A using a modulated staircase signal. Trace overlay technique provides excellent resolution for measuring small phase changes. The differential phase error from the reference point in top photo (first step of staircase signal overlayed) to point of measure in bottom photo (sixth step overlayed) is 1.2°.

CHARACTERISTICS

Graticule — Two separate graticules provide reference for vector and line sweep displays. The parallax-free vector graticule, or the luminance graticule, is automatically selected and edge-lighted concurrent with operating mode selection.

Z-Axis Input — The Z-Axis Input connector accepts external trace-brightening pulses for intensifying a portion of the display during the time of interest.

Video Inputs — Dual BNC input connectors for each channel permit 75 Ω loop-through operation with a return loss >46 dB to 5 MHz (exceeds CCIR recommendation 567, Part D and D.2). Amplitude range is 0.7 V to 1.4 V Video (sync tip to peak white).

AC POWER

Mains Voltage Range — 90 V ac to 136 V ac or 180 V ac to 272 V ac.

Mains Frequency — 47 Hz to 63 Hz.

As displayed on 520A

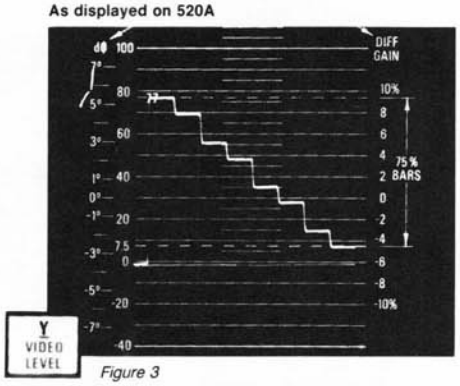


Figure 3

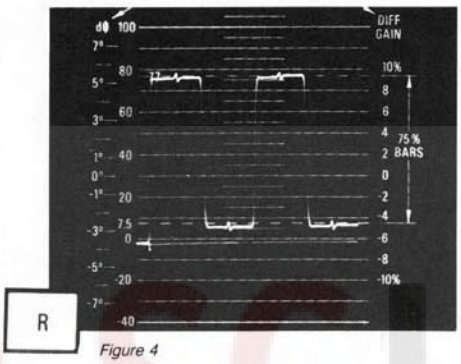


Figure 4

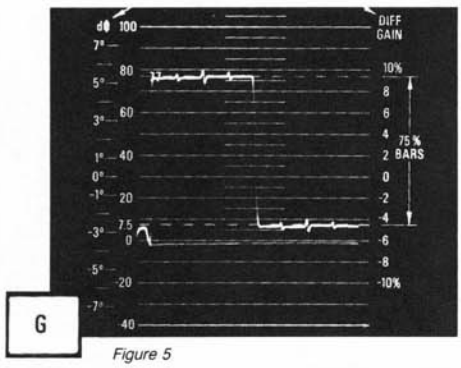


Figure 5

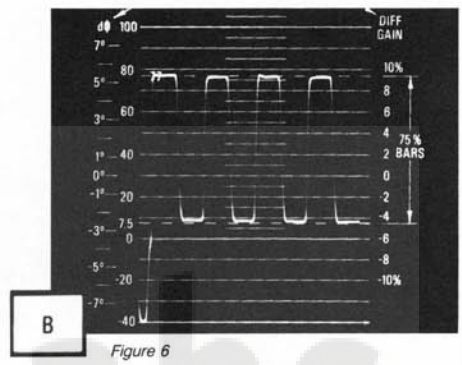


Figure 6

75% amplitude Color Bar Signal displayed on the line sweep graticule. Pushbuttons select line-sweep displays of luminance (Figure 3), decoded Red (Figure 4), decoded Green (Figure 5), and decoded Blue (Figure 6).

Power Consumption — 95 W maximum at 115 V ac/60 Hz. (Rear panel selector provides rapid accommodation to six line-voltage ranges. Factory set at 115 V ac for the 520A and 522A and 230 V ac for the 521A.)

ENVIRONMENTAL CHARACTERISTICS

Operating Temperature Range — 0°C to +50°C ambient.

MECHANICAL CHARACTERISTICS

The vectorscopes are available in two mechanical configurations, a cabinet model and a rackmount model. These versions are electrically identical. The rackmount models fit in a 19 in rack and are provided with slide-out assemblies for convenient access to internal components.

PHYSICAL CHARACTERISTICS

Dimensions	Cabinet		Rackmount	
	mm	in	mm	in
Width	429	16.9	483	19.0
Height	178	7.0	178	7.0
Depth	487	19.2	483	19.8
Weights	**kg**	**lb**	**kg**	**lb**
Net	15.0	33.0	15.0	33.0
Shipping≈	27.7	61.0	27.7	61.0

INCLUDED ACCESSORIES

Smoke-gray filter, installed (378-0581-00); Rackmount: same as cabinet but includes rackmounting hardware, and slide-out assembly (351-0195-01); manual.

ORDERING INFORMATION

520A NTSC Vectorscope (Cabinet) **$7,750**
R520A NTSC Vectorscope (Rackmount) **$7,750**
521A PAL Vectorscope (Cabinet) **$8,050**
R521A PAL Vectorscope (Rackmount) . **$8,050**
522A PAL-M Vectorscope (Cabinet) ... **$8,670**
R522A PAL-M Vectorscope (Rackmount) **$8,670**

OPTIONAL ACCESSORIES

75 Ω Voltage Step-Up Termination — When used with a Tektronix vectorscope, the 75 Ω Voltage Step-up Termination provides an X5 increase in chrominance amplitude and lets you make more accurate Differential Gain and Differential Phase measurements. Input impedance to the termination is a constant 75 Ω. Use of the termination requires a source of external sync to the vectorscope.

Voltage Step-up Termination — For use with 520A (NTSC), 522A (PAL-M) Vectorscopes. Order 011-0100-01 ..... **$74**

Voltage Step-up Termination — For use with the 521A Vectorscope. Order 011-0109-00 ..... **$100**

Single Sideband Chroma Amplitude Corrector — Designed for use with a Tektronix vectorscope in transmitter applications where a vestigial sideband signal is being demodulated with a detecting diode. The corrector provides an X2 increase in chrominance amplitude and passes luminance components with little or no attenuation. Input impedance is 75 Ω.

Chroma Amplitude Corrector — For use with 520A (NTSC), 522A (PAL-M) Vectorscopes. Order 011-0107-01 ..... **$84**

Chroma Amplitude Corrector — For use with 521A Vectorscope.
Order 011-0108-01 ..... **$111**

Recommended Camera — For display photographs: C-59AP with adaptor 016-0295-01. See camera section of this catalog for information.

R520A Cradle Assembly — For mounting the 520A in a WECO backless rack. Order 426-0667-00 ..... **$40**