

GPIB

## 496P/496

**GPIB**  
IEEE-488

The 496P complies with IEEE Standard 488 1978, and with Tektronix *Standard Codes and Formats*

**50 Ω/75 Ω Selectable Inputs**

**1 kHz to 1800 MHz Coverage**

**Amplitude Comparison in 0.25 dB Steps**

**1 kHz Frequency Resolution in ΔF Mode**

**Fully Calibrated Amplitude in dBm or dBmV**

**80 dB Dynamic Range**

**GPIB/Fully Programmable (496P)**

The 496 provides high performance spectrum analysis and measurements in the 1 kHz to 1.8 GHz range. Its high stability and 80 dB dynamic range meet your demands for proof-of-performance measurements, on site or on the bench.

The 496 offers state-of-the-art performance and rugged portability. Resolution bandwidth can be varied from 1 MHz to 30 Hz over the entire frequency range. Automatic phase lock stabilization reduces incidental FM to 10 Hz p-p; phase noise sidebands are at least -75 dBc at 30 times the resolution bandwidth offset. Frequency drift with phase lock is typically 1 kHz in ten minutes after 30 minute warmup. And the 496 provides 1 kHz frequency resolution in ΔF mode.

### Easy to Use—Anywhere

Simple 1, 2, 3 knob adjustment sets center frequency, frequency span and reference level. Power on sequence automatically normalizes operational settings and provides maximum input protection.

Digital storage eliminates time-consuming display adjustments. Save A, B Minus Save A, Max Hold and Average modes let you compare, subtract, save maximum values or noise average (smooth) your spectral displays. Constant tuning rate lets you position the signal quickly and accurately at any frequency span.

Microprocessor-aided controls take care of the rest. Most-used functions are automatically controlled.

### The 496 Goes Where You Go

Lightweight and compact size combine to provide unmatched portability in a laboratory quality spectrum analyzer. With its single-handle carry, the 496 is easily moved around the design lab or systems test area, to the field, or wherever it may be needed. It even fits under an airplane seat.

### 75 Ω Measurement Capability

Option 07 offers two inputs and calibrations to select from. The standard 50 Ω input calibrated in dBm is accessed via the Type N connector. The 75 Ω input connector is BNC and provides calibrated dBmV measurement capability when activated. This option includes a 300 kHz resolution filter to enhance VHF/UHF measurements.

### Automate Your Spectrum Analysis with the 496P and TekSPANS Software

The 496P is the fully programmable/GPIB compatible version of the 496 Spectrum Analyzer. Operation, features and benefits of the 496P are essentially the same as the 492P.

Enhance the 496P measurement capability with the *NEW* TekSPANS general RF applications software. See page 158 for a complete description.

Manual instruments can be converted to programmable instruments at a later time. Contact your Tektronix sales engineer for details.

SPECTRUM ANALYZERS

## CHARACTERISTICS

The following characteristics and features apply to the 496/496P Spectrum Analyzers after a 30 minute warm-up period unless otherwise noted.

### FREQUENCY RELATED

**Center Frequency Range** — 1 kHz to 1800 MHz.

**Frequency Accuracy** —  $\pm(5 \text{ MHz} + 20\% \text{ of span/div})$ .

**Frequency Readout Resolution\*\*** — Within 1 MHz. 496P Tune Command Accuracy (Span/div  $\leq 50 \text{ kHz}$ ):  $\pm 7\%$  or  $\pm 100 \text{ Hz}$ , whichever is greater.

**Delta Frequency Readout Accuracy (Span/Division  $\leq 50 \text{ kHz}$ )\*\*** —  $\pm 5\%$ .

**Frequency Span/Division Range** — From 50 Hz/div to 100 MHz/div in a 1-2-5 sequence.

**Maximum Span** — When selected, the entire effective frequency range is scanned and displayed.

**Zero Span** — When selected, the horizontal axis of the CRT is calibrated in time (instead of frequency). The span/div readout is changed to time/div.

**Frequency Span/Division Accuracy** — Within 5% of the selected span/div over the center eight division of the ten division CRT display.

**Resolution Bandwidth (-6 dB)** — 30 Hz, then 100 Hz to 1 MHz in decade steps, plus an Auto position. Accuracy: Within 20%.

**Resolution Shape Factor (60 dB/6 dB)** — 7.5:1 or less. 15:1 or less for 30 Hz resolution bandwidth.

**Residual FM (Short Term), Phase Lock On** —  $\leq 10 \text{ Hz p-p}$  over 20 ms.

**Residual FM (Short Term), Phase Lock Off** —  $\leq 1 \text{ kHz p-p}$  over 20 ms.

**Long Term Drift (at Constant Temperature and Fixed Center Frequency)** — 330 Hz/10 minutes after one hour warm-up phase locked.

**Noise Sidebands** — At least -75 dBc at 30 times the resolution bandwidth offset from the center frequency (-70 dBc for 100 Hz resolution bandwidth or less).

\*\*  $\Delta f$  mode provides measurements to the nearest kHz plus direct center frequency readout to the nearest kHz between 1 kHz and 500 kHz.

### AMPLITUDE RELATED

**Reference Level Range (Full Screen, Top of Graticule)** — -123 dBm to +40 dBm (+40 dBm includes maximum safe input of +30 dBm and 10 dB of IF gain reduction) for 10 dB/div and 2 dB/div Log modes. 20 nV/div to 2 V/div (1 W maximum safe input) in Lin mode.

**Reference Level Steps** — 10 dB, 1 dB, and 0.25 dB for relative level ( $\Delta$ ) measurements in Log mode. 1-2-5 sequence and 1 dB equivalent increments in Lin mode. The RF attenuator steps 10 dB for reference level changes above -30 dBm (-20 dBm when Minimum Noise is active) unless Minimum RF attenuation is greater than normal. The IF gain increases 10 dB for each Reference Level change below -30 dBm (-20 dBm when Minimum Noise is active).

**Display Dynamic Range** — 80 dB at 10 dB/div, 16 dB at 2 dB/div, and eight division in Linear mode.

**Reference Level Accuracy** — Accuracy is a function of the following characteristics.

**Calibrator: (Cal out).** See output signal characteristics.

**Input Attenuator Accuracy:** 0.3 dB/10 dB to a maximum of 0.7 dB over the 60 dB range, 1 kHz to 1.8 GHz.

**Display Amplitude Accuracy:**  $\pm 1.0 \text{ dB}/10 \text{ dB}$  to a maximum cumulative error of  $\pm 2.0 \text{ dB}$  over the 80 dB window and  $\pm 0.4 \text{ dB}/2 \text{ dB}$  to a maximum cumulative error of  $\pm 1.0 \text{ dB}$  over the 16 dB window. Lin mode is 5% of full scale.

**Resolution Bandwidth Gain Variation:**  $\pm 0.5 \text{ dB}$ . **IF Gain Variation:**  $\pm 0.2 \text{ dB}/\text{dB}$  to a maximum of  $\pm 2 \text{ dB}$  over the 90 dB range.

**Display Flatness** —  $\pm 1.5 \text{ dB}$ , 1 kHz to 1800 MHz measured with  $\geq 10 \text{ dB}$  RF attenuation.

### Sensitivity

Resolution Bandwidth	Average Noise Level
30 Hz	-127 dBm
100 Hz	123 dBm
1 kHz	-115 dBm
10 kHz	-105 dBm
100 kHz	95 dBm
1 MHz	-85 dBm

### SPURIOUS RESPONSE

**Residual (No Input Signal Referenced to Mixer Input)** — -100 dBm or less.

**Harmonic Distortion (cw Signal, Minimum Distortion Mode)** — Typically -60 dBc for a full-screen signal.

**Third-Order Intermodulation Distortion (Minimum Distortion Mode)** — At least -70 dBc below any two on-screen signals within any frequency span.

**LO Emissions (0 dB Attenuation)** — -70 dBm maximum.

**Zero Frequency Spur (Referenced to Input Mixer)** — -20 dBm or less.

### INPUT SIGNAL

**RF Input** — Type N female connector.

**Input Impedance** — 50  $\Omega$ ; vswr 1.3:1 maximum (1.2:1 typical) with 10 dB or more RF attenuation. 2.0:1 (1.9:1 typical) with 0 dB attenuation.

**Input Level (Optimum Level for Linear Operation)** — -30 dBm referred to input mixer. Full screen not exceeded and Min Distortion control setting.

**1 dB Compression Point** — -18 dBm, no RF attenuation.

**Maximum Input Level (RF Attenuation at 0 dB)** — +30 dBm.

**Maximum Input Level (with 20 dB or More RF Attenuation)** — +30 dBm (1 W) continuous 75 W peak, pulse width 1  $\mu\text{s}$  or less with a maximum duty factor of 0.001 (attenuation limit). Dc must never be applied to RF input.

### OUTPUT SIGNAL

**Calibrator** — (Cal Out) -20 dBm  $\pm 0.3 \text{ dB}$  at 100 MHz  $\pm 1.7 \text{ kHz}$ .

**1st and 2nd LO** — Provides access to the output of the respective local oscillators (1st LO +6 dBm minimum to a maximum of +15 dBm, 2nd LO -16 dBm minimum to a maximum of +15 dBm). These ports must be terminated in 50  $\Omega$  at all times.

**Vertical Out** — Provides 0.5 V  $\pm 5\%$  of signal/div of video above and below the centerline.

**Horizontal Out** — Provides 0.5 V either side of center. Full range -2.5 V to +2.5 V  $\pm 10\%$ .

**Pen Lift** — TTL compatible, nominal +5 V to lift pen.

**IF Out** — Output of the 10 MHz IF. Level is  $\approx -16 \text{ dBm}$  for a full screen signal at -30 dBm input reference level. Nominal impedance 50  $\Omega$ .

**IEEE Standard 488-1978 Interface Function Subsets Implemented (496P)** — Handshake: SH1. Acceptor Handshake: AH1. Talker: T5. Listener: L3. Service Request: SR1. Remote/Local: RL1. Parallel Poll: PP1. Device Clear: DC1. Device Trigger: DT1. Controller: CO.

**Probe Power** — Provides operating voltages (+5 V, +15 V, -15 V, and ground) for active probes.

### GENERAL CHARACTERISTICS

For detailed specifications refer to the 492 on page 164.

**Configuration** — (Portable) 496/496P total weight including front cover and standard accessories 20 kg (44 lb), 17.5 cm x 32.7 cm x 49.9 cm (6.9 in x 12.9 in x 19.7 in) without handle or cover.

### ENVIRONMENTAL CHARACTERISTICS

Per MIL-T-28800C Type III, Class 3, Style C.

**Temperature** — Operating: -15°C to +55°C. Nonoperating: -62°C to +85°C.

**Altitude** — Operating: 4500 m (15,000 ft). Nonoperating: 12 000 m (40,000 ft).

**Vibration** — 5 Hz to 55 Hz at 0.020 inch excursion.

**Humidity** — Operating: 95%. Nonoperating: 120 hours per MIL-STD-810.

**Shock** — 30 g of half sine 11 ms duration.

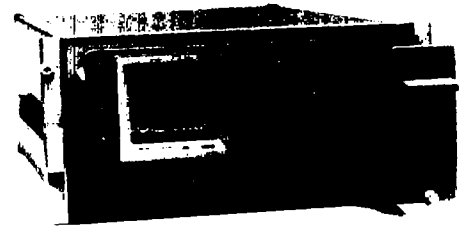
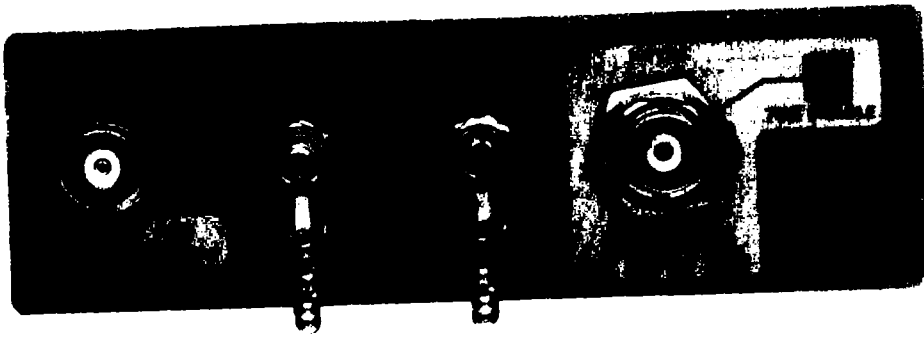
**Rain Resistance** — Drip proof at 16 liters/hour/square foot.

**Drop** — 12 inches.

**Electromagnetic Compatibility** — 490 Series spectrum analyzers meet the requirements of MIL-STD-461B, operating from 48 Hz to 440 Hz power sources, with the exceptions shown below. Conducted Emissions: CE01: 1 kHz to 15 kHz only. CE03 (Narrowband): Full limits. CE03 (Broadband): 15 dB relaxation from 15 kHz to 50 kHz. Conducted Susceptibility: CS01: Full limits. CS02: Full limits. CS06: Full limits.

**Radiated Emissions: RE01:** 10 dB relaxation for first ten harmonics of power line frequency, and excepted from 30 kHz to 36 kHz. RE02: Full limits.

**Radiated Susceptibility: RS01:** Full limits. RS02-1: Full limits. RS02-2: To 5 A only. RS03: Up to 1 GHz only.



GPIB

Option 07 75 Ω Input.

**OPTION 07 CHARACTERISTICS**  
**50 Ω INPUT RELATED**

Characteristics are the same as the base instruments except for the following:

**300 kHz Resolution Filter** — Replaces the 100 kHz filter.

**Sensitivity** — Average noise level at 300 kHz bw is -90 dBm.

**75 Ω INPUT RELATED**

**Center Frequency Range** — 1 MHz to 1000 MHz

**Frequency Response** — 5 MHz to 1000 MHz ± 2.0 dB. 1 MHz response typically ≤ -3 dB from 5 MHz response.

**Reference Level Range** — +88 dBmV to -75 dBmV.

**RF Input** — Type BNC female connector.

**Input Impedance** — 75 Ω; vswr 1.35:1 maximum; 5 MHz to 800 MHz; vswr 1.6:1 maximum, 800 MHz to 1000 MHz (with 10 dB or more of RF attenuation).

**Maximum Input Level (0 dB Attenuation)** — +78 dBmV.

**Input Coupling** — 100 Vdc maximum (dc + ac peak).

**Calibrator (Cal Out)** — +20 dBmV ± 0.5 dB, 75 Ω at 100 MHz ± 1.7 kHz.

**ORDERING INFORMATION**

**496 Spectrum Analyzer \$24,300**

**Includes:** 18 in BNC to BNC connectors 50 Ω coax cable (012-0076-00); 6 ft N to N connectors 50 Ω coax cable (012-0114-00); 115 V power cord (161-0118-00); N male to BNC female adaptor (103-0045-00); two 4 A fast blow fuse (159-0017-00); 2 A fast blow fuse (159-0021-00); cord clamp (343-0170-00); CRT visor (016-0653-00); blue CRT light filter (378-0115-00); amber CRT light filter (378-0115-01); gray CRT light filter (378-0115-02); CRT mesh filter (378-0726-01); operator manual (070-3480-00); operator handbook (070-3483-00); service manual Volume 1 (070-3481-00); service manual Volume 2 (070-3482-00).

**496P Fully Programmable/GPIB Spectrum Analyzer \$28,950**

**Includes:** In addition to the above a 2 meter double shield GPIB cable (012-0630-03); programmers manual (070-3484-00).

**OPTIONS (496/496P)**

- Option 07** — 75 Ω/50 Ω Input. **+ \$750**
- Option 30** — Rackmount 19 inch rack width with front panel input/outputs **+ \$790**

**Option 31** — Rackmount 19 inch rack width with rear panel input/output capability **+ \$840**

**Option 32** — Benchmount Adds side and top panels, carrying handles and feet for a stackable benchtop configuration. **+ \$940**

**Option 42** — 110 MHz IF Output. Provides 5 MHz bandwidth at 6 dB points. **\$1,500**

**CONVERSION KIT**

**496 to 496P** — Conversions are made by your nearest Tektronix service center. Order 040-1046-04 **\$5,500**

**INTERNATIONAL POWER PLUG OPTIONS**

- Option A1** — Universal Euro 220 V/16 A, 50 Hz
- Option A2** — UK 240 V/13 A, 50 Hz
- Option A3** — Australian 240 V/10 A, 50 Hz
- Option A4** — North American 240 V/15 A, 60 Hz
- Option A5** — Switzerland 220 V/10 A, 50 Hz

**OPTIONAL ACCESSORIES**

**TR 503 Tracking Generator** — (For more information see page 172) **\$6,620**

**75 Ω to 50 Ω Power Splitter** — Order 067-1232-00 **\$250**

**75 Ω to 50 Ω Minimum Loss Attenuator** — Order 011-0112-00 **\$60**

**Dc Block N to N** — Order 015-0509-00 **\$250**

**P6201 FET Probe to 900 MHz** — Order 010-6201-01 **\$1,220**

**1405 TV Sideband Adaptor** — 525/60 Markers (See page 173) **\$5,780**

**TV Trigger Synchronizer** — Order 015-0261-01 **\$450**

**Hard Case (Transit)** — Order 016-0658-00 **\$725**

**Soft Case** — Order 016-0659-00 **\$100**

**Rear Panel Protective Cover** — Order 337-3274-00 **\$5**

**Lab Cart** — K213 (See page 424) **\$595**

**Camera** — C-5C (See page 416) **\$495**

*Note: The 490 Series spectrum analyzers are compatible with all Tektronix C-50 Series cameras. Battery pack 016-0270-02 is required for C-50, C-51, C-52 and C-53 cameras.*

**PERIPHERAL PRODUCTS FOR 494P SPECTRUM ANALYZER**

- 4041 System Controller** (See page 298) **\$3,995**
- 4105A Color Terminal** (See page 58) **\$3,995**
- 4695 Color Graphics Copier** (See page 77) **\$1,595**

**490 Series Spectrum Analyzers**  
**Rackmount/Benchmount Options**

Option 30 is a rackmount configuration for the 490 Series with standard front panel input/outputs. Option 31 is a rackmount configuration with rear panel input/output capability. Option 32 adds side covers and trim to an Option 31, making it into a stackable bench top configuration.

Options 30 and 31 Rackmount are a standard 19 inch rack width and come with standard rackmount fittings. A spectrum analyzer accessories storage drawer is also included. Dimensions are 22.23 cm x 42.9 cm x 63.5 cm (8.75 in x 16.89 in x 25.0 in). Weight is 32.7 kg (72 lb); including the spectrum analyzer.

The Option 32 Benchmount is approximately the same size as the Rackmount but is dressed with side and top panels and carrying handles and feet. The Benchmount provides a convenient surface for stacking other instruments. Dimensions are 23.5 cm x 45.7 cm x 63.5 cm (9.25 in x 17.9 in x 25.0 in). Weight is 31.8 kg (70 lb); including the spectrum analyzer.

SPECTRUM ANALYZERS