

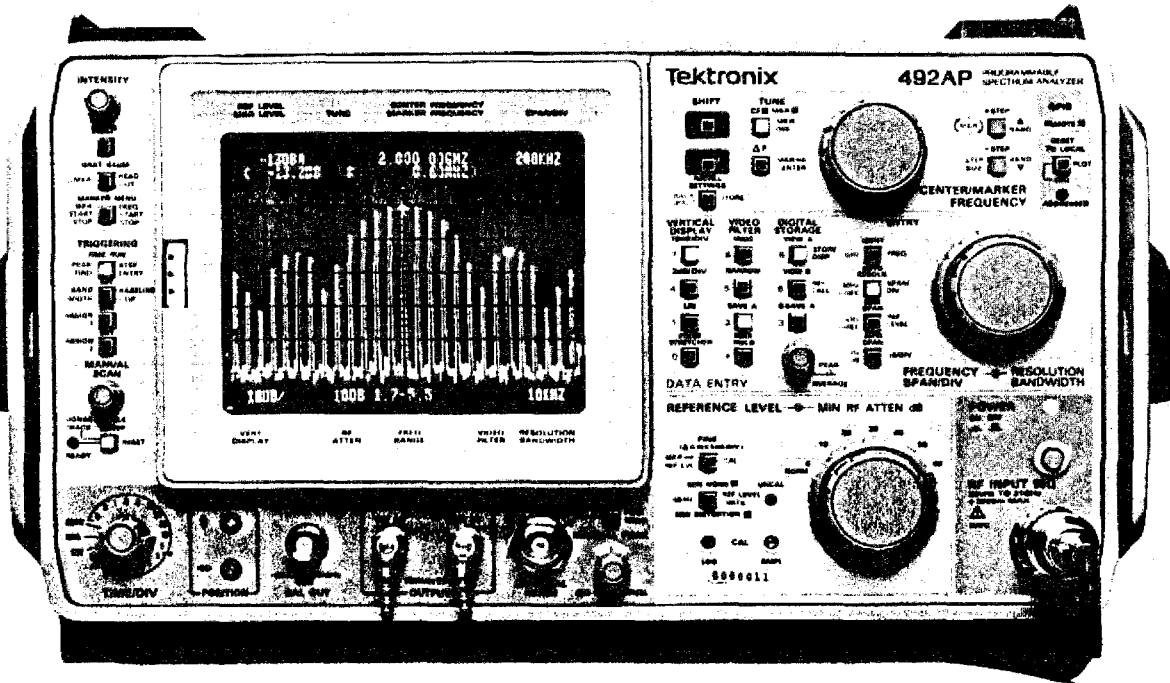


Advanced Test Equipment Rentals

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490
SERIES

50 kHz to 325 GHz
PORTABLE SPECTRUM ANALYZERS



NEW 492A/492AP Spectrum Analyzers

GPIO
IEEE-488

The 492AP complies with IEEE Standard 488-1978, and with Tektronix Standard Codes and Formats.

Dot Markers Accurate in Frequency to 10^{-5}
Frequency Range From 50 kHz to 325 GHz

CW, Pulse and Spurious Signal
Processing Modes

Occupied Bandwidth Function
—dBm, dBV, dBmV and dB μ V Alternate
Reference Units
—Signal Tracking
—Noise Normalization

Keypad Entry of Frequency, Span/Div,
Reference Level and Vertical Scale Factors

Environmentalized per MIL-T-28800C
Type III, Class 3, Style C

Convenience, Accuracy, Intelligence and Value

The 492A and the fully programmable 492AP represent a new benchmark for spectrum analyzers with built-in signal processing intelligence. These spectrum analyzers are designed to offer power to the experienced user, yet offer convenience to the novice, in field environments and in the lab. These lightweight, portable form factor spectrum analyzers deliver maximum utility and benefits at a reasonable cost.

**Counter Center Frequency Accuracy,
Near Zero Long Term Drift, Superior
Range and Resolution All in One Package**
The 492A offers calibrated amplitude and frequency coverage from 50 kHz to 21 GHz in

coax, and to 325 GHz using Tek's WM 490 Series high performance waveguide mixers.

Center frequency accuracy is excellent; typically 1 kHz at 100 MHz, 10 kHz at 10 GHz and 40 kHz at 40 GHz. Negligible long term frequency drift ensures measurement repeatability.

You get 100 Hz resolution bandwidth to 220 GHz and 1 kHz resolution to 325 GHz with high sensitivity and low phase noise—plus built-in preselection to 21 GHz (Option 01).

With its Built-In Marker Intelligence You Can Rely on the 492A as a Decision- Making Tool

Menu-Selectable Signal Processing

Enables the analyzer to mark the peak of a main lobe and the peaks of side lobes at the push of a button—using the pulsed RF signal processing mode in conjunction with other marker functions like Peak Find, Right Next and Left Next. The CW mode will mark only signals exhibiting CW characteristics with regard to span and resolution, ignoring all other signals. The spur mode will locate all signals that meet user-definable or automatic threshold criteria. Threshold criteria is available for all signal processing.

CHARACTERISTICS

The following characteristics apply after a 30 minute warm-up period unless otherwise noted.

FREQUENCY RELATED

Frequency Range — 50 kHz to 21 GHz coaxial input; 50 kHz to 325 GHz external mixer input (amplitude specified from 18 GHz to 325 GHz with Tektronix WM 490 Series Waveguide Mixers).

Center and Marker Frequency Accuracy* —
Phase Locked: $\pm[20\%D + (Fx10^{-5})]$ Hz. Bands 1 and 5-12 with span/div ≤ 200 kHz, and Bands 2-4 with span/div ≤ 100 kHz. Unlocked: $\pm[20\%D + (Fx10^{-5}) + (15 \text{ kHz})N]$ Hz.
Where: D = Span/div or Res BW,
which ever is greater.

F = Center or Marker Frequency
N = Harmonic Mixing Number

Center Frequency Drift (After 1 Hour Warm-Up) — Bands 1 and 5-12 with span/div ≤ 200 kHz, and band 2-4 with span/div ≤ 100 kHz. Phase locked: ≤ 50 Hz per minute of sweep time corrected at least every 30 seconds. Unlocked: $\leq (5 \text{ kHz}) N$ per minute of sweep time.

Frequency Readout Resolution — $\leq 10\%$ span/div to 1 kHz minimum (100 Hz in Delta Marker Mode).

Residual FM — Phase Locked: $\leq (10 + 2N)$ Hz peak-to-peak in 20 ms, Bands 1 and 5-12 with span/div ≤ 200 kHz, and Bands 2-4 with span/div ≤ 100 kHz. Unlocked: $\leq (7 \text{ kHz}) N$ peak-to-peak in 20 ms.

Noise Sidebands

dBc/Hz	Offset From Carrier
≤ -95	3 kHz
≤ -105	30 kHz
≤ -115	300 kHz

Resolution Filters — 100 Hz to 1 MHz (6 dB bandwidth $\pm 20\%$) in decade steps. Shape factor $\leq 7.5:1$ (60 dB/6 dB).

Frequency Span/Div — 0 Hz (ZERO SPAN pushbutton or keypad data entry); 200 Hz to 10 GHz (in a 1-2-5 sequence) via span/div knob; 200 Hz to 15 GHz (to two significant digits) via keypad or start/stop data entry, or marker start/stop; full band via MAX SPAN pushbutton (12 bands). Accuracy $\pm 5\%$ of selected span/div.

* Over the operating temperature extremes of -15°C to $+55^\circ\text{C}$, 1.5×10^{-5}

AMPLITUDE RELATED

Vertical Display Modes — Same as 495. See page 158.

Reference Level Range —

Log Mode: -117 to +40 dBm, +30 dBm maximum; -130 to +27 dBV, +17 dBV maximum; -70 to +87 dBmV, +77 dBmV maximum; -10 to +147 dBμV, +137 dBμV maximum.
Linear Mode: 39.6 nV/div to 2.8 V/div, 1 W maximum.

Reference Level Accuracy — Accuracy is dependent on a combination of RF Attenuator Accuracy, IF Gain Accuracy, Resolution Bandwidth, Display Mode, Calibrator Accuracy, Frequency Band, Frequency Response and Temperature Change (±0.15 dB/°C maximum).

Display Amplitude Accuracy — Same as 495. See page 158.

RF Attenuator Range — 0 to 60 dB in 10 dB steps.

Accuracy — Dc to 1.8 GHz: 0.5 dB/10 dB, 1 dB maximum cumulative error over 60 dB. 1.8 to 18 GHz: 1.5 dB/10 dB, 3 dB maximum cumulative error over 60 dB. 18 to 21 GHz: 3 dB/10 dB, 6 dB maximum cumulative error over 60 dB.

Marker/s Accuracy — Equal to Reference Level Accuracy plus Display Amplitude Accuracy.

SPURIOUS RESPONSES

Residual — ≤ -100 dBm. Rackmount Options 30 and 31: ≤ -90 dBm.

Harmonic Distortion — ≤ -60 dBc for a -40 dBm input 50 kHz to 21 GHz in MIN Distortion mode. Not discernible above the noise (typically -100 dBc) for preselected bands (Option 01 only).

LO Emissions — ≤ -10 dBm. Option 01: ≤ -70 dBm.

Third Order Intermodulation Distortion — ≤ -70 dBc for CW signal (MIN Distortion Mode) Any two on-screen signals within any frequency span (50 kHz to 21 GHz); ≤ -100 dBc for signals spaced ≥ 100 MHz for preselected bands (Option 01 only).

INPUT SIGNAL

RF Input — Type 'N' female 50 Ω nominal impedance.

VSWR

Frequency	0 dB Attenuation (Typical)	10 dB Attenuation
50 kHz to 2.5 GHz	1.9:1	1.3:1 Max; 1.2:1 Typical
2.5 to 6.0 GHz	1.9:1	1.7:1 Max; 1.5:1 Typical
6.0 to 18 GHz	2.3:1	2.3:1 Max; 1.9:1 Typical
18 to 21 GHz	3.0:1	3.5:1 Max; 2.7:1 Typical

Measured at ± 3 MHz of preselector peak for Option 01.

Maximum Safe Input — +30 dBm CW with ≥ 20 dB attenuation; +13 dBm CW with 0 dB attenuation; 0 V dc. Option 01 preselector: +30 dBm (1 W) CW; 75 W peak, 1 μs Pulse width, 0.001 duty; 0 dB attenuation. Do not apply dc.

1 dB Gain Compression — ≥ -18 dBm in MIN Distortion Mode.

OUTPUT SIGNAL

Same as the 495 (see page 158) except for the following:

Calibrator (Cal Out) — -20 dBm ± 0.3 dB at 100 MHz ± 1.0 kHz

1st and 2nd LO — Provides access to the output of the respective local oscillators (1st LO + 7.5 dBm minimum to a maximum of +15 dBm; 2nd LO -22 dBm minimum to maximum of +15 dBm). These ports must be terminated in 50 Ω at all times.

Table 1: SENSITIVITY AND FREQUENCY RESPONSE

Band and Frequency Range	Harmonic Number	Sensitivity at (dBm) Minimum Resolution	Frequency Response (dB)**
1 (50 kHz-4.2 GHz)**	1	-125	± 1.5
2 (1.7-5.5 GHz)**	1	-125	± 1.5
3 (3.0-7.1 GHz)**	1	-125	± 1.5
4 (5.4-18 GHz)**	3	-110	± 2.5
5 (15-21 GHz)**	3	-105	± 3.5
6 (18-27 GHz)	6	-108	± 2.0
7 (26-40 GHz)	10	-103	± 2.0
8 (33-60 GHz)	10	-103	± 2.2 33 to 50 GHz; ± 2.5 40 to 60 GHz
9 (50-90 GHz)**	15	-105 at 50 GHz; -95 at 90 GHz	± 3.0
10 (75-140 GHz)**	23	-100 at 75 GHz; -85 at 140 GHz	± 3.0
11 (110-220 GHz)**	37	-90 at 110 GHz; -75 at 220 GHz	± 3.0
12 (170-325 GHz)**	56	-70 at 170 GHz; -55 at 325 GHz	± 3.0

** Band 1 is limited to 50 kHz to 1.8 GHz for preselected (Option 01) units. The preselector degrades minimum sensitivity by 5 dB (6 dB in BAND 3) and degrades frequency response by ± 1.0 dB to 18 GHz; ± 1.5 dB to 21 GHz.

** Frequency response for any 5 GHz band. Response is within ± 6 dB referenced to 100 MHz.

** Measured with 10 dB RF Attenuation and peaking optimized (when applicable). Frequency response within ± 3.5 dB from 50 kHz to 18 GHz referenced to 100 MHz (± 4.5 dB for Option 01).

IEEE Standard 488-1978 Interface Function Subsets Implemented — 492AP Version: In accordance with IEEE Standard 488-1978, implemented as SH1, AH1, T5, L3, SR1, RL1, PP1, DC1, DT1, and C0. 492A Non-P Version: Implemented as SH1, AH0, T3, L0, SR0, RL0, PP0, DC0, DT0, and C0.

DISPLAY

Same as the 495 (see page 159).

GENERAL CHARACTERISTICS

Same as the 495 (see page 159) except as noted.

Configuration — (Portable) 20 kg (44 lb), all options; 17.5 x 32.7 x 49.9 cm (6.9 x 12.9 x 19.7 in) without handle or cover.

Environmental — Per MIL-T-28800C Type III, Class 3, Style C. Same as 495 (see page 159).

ORDERING INFORMATION

492A Spectrum Analyzer \$29,040

Includes: 50 Ω coax cable, N to N connector, 6 ft (012-0114-00); 50 Ω coax cable, BNC to BNC connector, 18 in (012-0076-00); service manual Vol. 1 (070-5565-00); service manual Vol. 2 (070-5566-00); operator's manual (070-5562-00); N male to BNC female adapter (103-0045-00); 2 Fast-Blo 4A fuses (159-0017-00); power cord (161-0104-00); power cord clamp (343-0170-00); amber CRT light filter (378-0115-01); gray CRT light filter (378-0115-02); CRT mesh filter (378-0887-01).

492AP Programmable Spectrum Analyzer \$35,340

Includes: Same as 492A plus programmer's manual (070-5564-00).

OPTIONS**

Option 01 — Adds preselection for the 1.7 GHz to 21 GHz band and limiter for 1st mixer below 1.8 GHz. **+\$3,995**

Option 07 — 75 Ω dBmV input and calibration in addition to 50 Ω dBm input and calibration. **+\$750**
Includes: BNC male to female adaptor connector (013-0126-00); 75 Ω coax cable, BNC to BNC connector, 42 in (012-0074-00).

Option 08 — Deletes external mixer capability. Frequency range limited to 50 kHz to 21 GHz (not combinable with options 07, 21, 22). **-\$1,750**

Option 21 — High Performance 18 to 40 GHz Waveguide Mixer Set includes two mixers (18 to 26.5 GHz, and 26.5 GHz to 40 GHz). **+\$2,525**
Includes: Diplexer assembly (015-0385-00); BNC to SMA adaptor (015-0388-00); semirigid cable (015-1055-00); SMA to SMA cable (012-0649-00).

Option 22 — High Performance 18 to 60 GHz Waveguide Mixer Set includes three mixers (18 to 26.5 GHz, 26.5 to 40 GHz, 40 to 60 GHz). **+\$4,250**
Includes: Same as Option 21.

Option 30 — Rackmount 19" rack width. **+\$790**
Includes: Rack slides (351-0623-00).

** Options 07, 08, 21, and 22 are not combinable in any form.

Option 31 — Rackmount 19" rack width with rear panel input/output capability. **+\$840**
Includes: Same as Option 30.

Option 39 — Non-Lithium (Silver) batteries for battery-powered memory. **+\$50**

Option 41 — Digital Microwave Radio Enhancement. **+\$450**

Includes: Wider bandwidth preselector for better signal symmetry in digital radio bands; Narrow video filter (app. 1/3000th resolution bandwidth); Improved frequency span/div accuracy at 5 MHz/div span.

Option 42 — Replaces MARKER/VIDEO input port on the rear panel with a 110 MHz IF output port which provides a signal with a 3 dB bandwidth ≥ 5 MHz and makes the 492A suitable for broadband, swept-receiver measurements. **+\$1,500**

Option 45 — (492AP) MATE CIL language. **+\$4,975**

Option 52** — North American 220 V configuration with standard power cord. Fuses are replaced with 2A slo-blo.

**WARRANTY-PLUS SERVICE PLANS
SEE PAGE 497**

M1 — (492A) 2 Calibrations. **+\$1,995**
M1 — (492AP) 2 Calibrations. **+\$2,025**
M2 — (492A) 2 Years Service. **+\$3,380**
M2 — (492AP) 2 Years Service. **+\$3,510**
M3 — (492A) 2 Years Service & 4 Calibrations. **+\$3,995**
M3 — (492AP) 2 Years Service & 4 Calibrations. **+\$4,045**

OPTIONAL ACCESSORIES

GPIB Interconnect Cable** — Order 012-0630-00

Operator's Handbook — Order 070-5563-00 **\$10**

CRT Visor — Order 016-0653-00 **\$34**

External Waveguide Mixers —
(18 to 26.5 GHz) Order WM 490K **\$1,250**
(26.5 to 40 GHz) Order WM 490A **\$1,250**
(33 to 50 GHz) Order WM 490Q **\$1,450**
(40 to 60 GHz) Order WM 490J **\$1,720**
(50 to 75 GHz) Order WM 490V **\$1,950**
(60 to 90 GHz) Order WM 490E **\$2,120**
(75 to 110 GHz) Order WM 490W **\$2,175**
(90 to 140 GHz) Order WM 490F **\$2,330**
(110 to 170 GHz) Order WM 490D **\$3,250**
(140 to 220 GHz) Order WM 490G **\$3,325**

Tapered Transition — (Used with WM 490G) 220 to 325 GHz. Order 119-1728-00 **\$1,200**

Microwave Comb Generator — TM 500 Series compatible. Order 067-0885-00 **\$1,800**

1405 Option 02 — TV Sideband Analyzer Adapter (525/60 markers) **\$5,780**

TR 503 — Tracking Generator, 100 kHz to 1.8 GHz **\$6,620**

Rack Adaptor Kit — (Cradle Mount). Order 016-0844-00 **\$625**

** To order, contact your local Tektronix Sales Office.