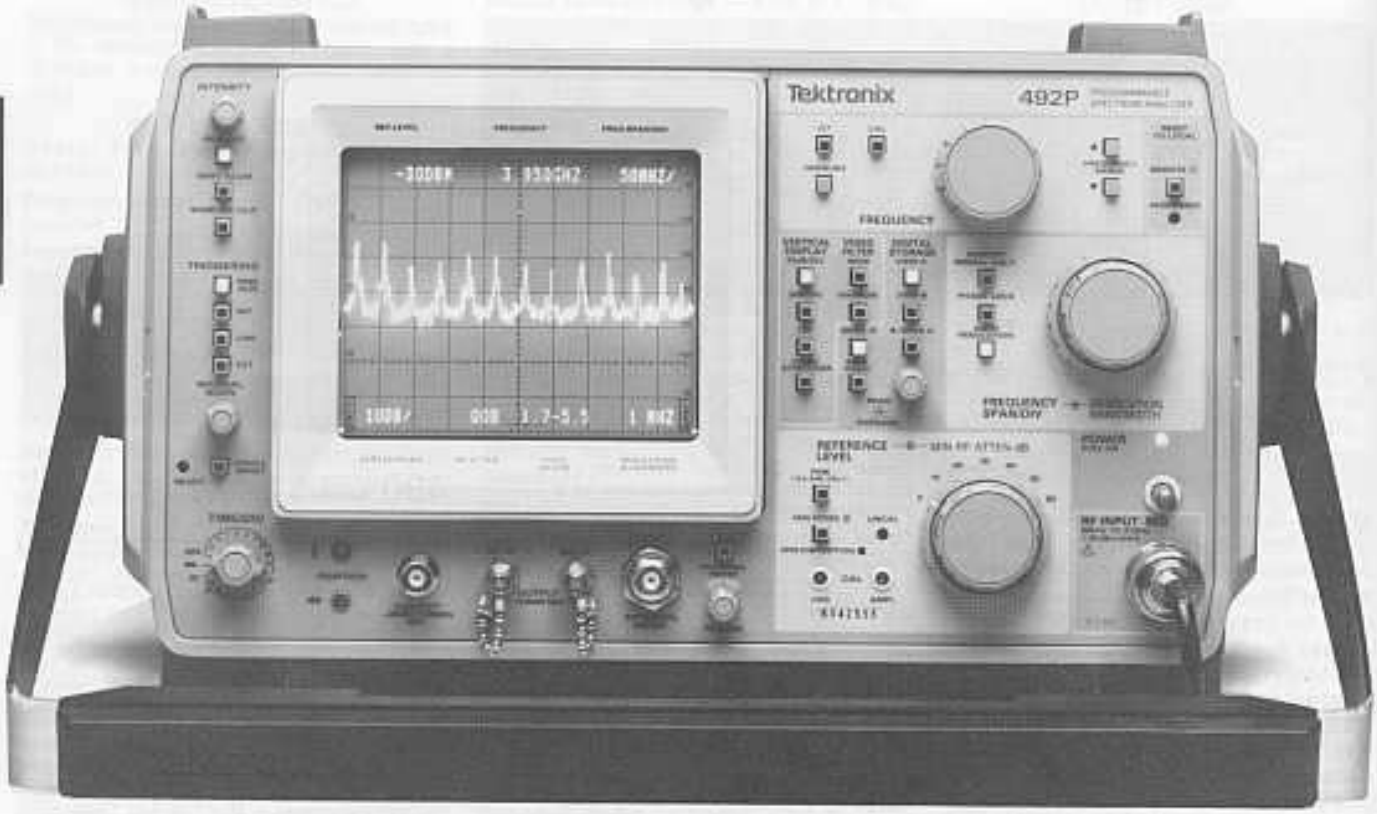


492P/492

GPIB IEEE 488 The 492P complies with IEEE Standard 488-1978, and with Tektronix *Standard Codes and Formats*.

- Portable Form Factor (Compact Size/Lightweight)
- 50 kHz to 220 GHz Frequency Range
- Amplitude Comparison in 0.25 dB Steps
- 80 dB Dynamic Range
- Wide Range of Options
- GPIB/Fully Programmable (492P)
- Freedom from Spurious Responses Through Preselection

Lab Quality You Can Get a Handle On

The 492 is a high performance, rugged, instrument of compact size, with microprocessor logic control. Full programmability via GPIB (IEEE Standard 488-1978) compatibility is available in the 492P version.

Three-knob operation provides use as simple as 1, 2, 3 through microprocessor coupled functions such as resolution bandwidth, video bandwidth, sweep time, frequency span, RF attenuation, and reference level. Measurement accuracy is enhanced through the use of Δ dB mode, which switches in 0.25 dB steps.

Digital storage and processing facilitate trace comparisons and add measurement capability through the Max Hold function for frequency drift and amplitude change measurements. Arithmetic operations can be performed between traces or between a trace and a reference. Digital noise averaging mode results in trace smoothing. With digital storage, the display is steady and without flicker, even at the lowest sweep speeds; plus trace values may be retained as long as power is on.

492P Makes Spectrum Analysis Automatic, and Easy.

Two instruments in one, the 492P is a fully programmable version of the 492 Spectrum Analyzer. It incorporates all of the 492's lab quality performance and ease of use features when used as a manual instrument. Push the "Reset to Local" button and the 492P becomes a 492—with operation from the front panel. But, most important, the 492P opens the way to automated spectrum analysis and documentation via its IEEE Standard 488 (GPIB) interface. This versatility makes the 492P useful in many applications in the lab, factory or field.

ATE Software Enhances Utility

The *NEW* TekSPANS software expands the 492P into a fully automated measurement package for general RF applications. Increase productivity and measurement repeatability of the 492P with a Tek 4041 Controller—or if you prefer your own IBM PC or HP controller. See page 158 for details.

Add Programmability

Programmability/GPIB features can be added to 492 Spectrum Analyzers. This means if you want to delay a programmability/GPIB decision because of budget constraints, or for any other reason, you can convert your 490 Series spectrum analyzer later. Conversions are made at designated Tektronix Service Centers.

Easy to Use

The 492P is designed for ease of operation via the GPIB, just as the 492 is designed for front panel operational ease. Most commands for program control are simply abbreviations of the front panel nomenclature.

The 492P's high level command language and the similarity of commands and responses simplify programming and make program listings easily readable for editing.

Put it to Work

With the programmable 492P on your measurement team, repetitive measurements can be done the same way every time. Your throughput will increase—as will your confidence in results. And, the internal processing and high level programming language makes software development faster. You get high power results with easy programming. When you look at the total performance capability of the 492P, you'll recognize its value: ease of operation both as a programmable and manual instrument. Wide frequency range. The versatility to go where you go, into the lab for automated testing, into the field for data collection.

For more information on the application and benefits of the 490 Series spectrum analyzers under program control, ask for brochure 26W-5177.

CHARACTERISTICS

The following characteristics and features apply to the 492/492P Spectrum Analyzers after a 30 minute warmup period unless otherwise noted.

FREQUENCY RELATED

Center Frequency Range — 50 kHz to 21 GHz standard, amplitude specified coverage to 220 GHz with optional Tektronix waveguide mixers.

Frequency Accuracy — ±(5 MHz +20% of span/div) or ±(0.2% of the center frequency +20% of span/div) whichever is greater after two hour warmup.

Readout Resolution — Within 1 MHz.

Frequency Span/Division Range — 10 kHz to 500 MHz/div in a 1-2-5 sequence in the 50 kHz to 21 GHz center frequency range. Option 03 provides additional span ranges of 500 Hz, 1 kHz, 2 kHz, and 5 kHz/div.

Frequency Span/Division Accuracy — ±5% of span/div, measured over center eight divisions.

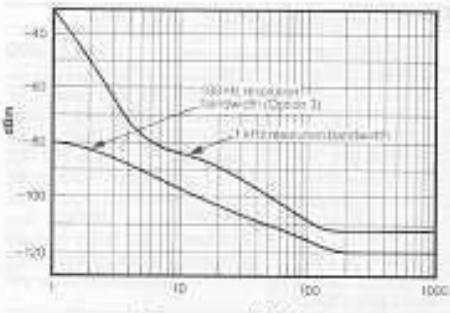
Resolution Bandwidth (−6 dB Points) — 1 MHz to 1 kHz (100 Hz for Option 03) in decade steps, plus an Auto position. Resolution is within 20% of selected bandwidth.

Resolution Shape Factor (60 dB/6 dB) — 7.5:1 or less.

Residual FM — 1 kHz p-p for 2 ms time duration, improves to (50 Hz) for 20 ms with phaselock Option 03.

Long Term Drift (At Constant Temperature and Fixed Center Frequency) — 3 kHz/10 minutes after one hour warmup with Option 03 for fundamental mixing.

Noise Sidebands — At least −75 dBc at 30X resolution offset from the center frequency (−70 dBc for 100 Hz resolution bandwidth Option 03).



Typical low end frequency performance for the 492 with Option 03.

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 gain of IF gain reduction) for 10 dB/div and 2 dB/div log modes. 1 W maximum safe input in the linear mode.

Reference Level Steps — 10 dB, 1 dB, and 0.25 dB for relative level (Δ) 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 listed below.

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, up to 4 GHz; 0.5 dB/10 dB to a maximum of 1.4 dB over the 60 dB range from 4 GHz to 21 GHz.

Frequency Response: See frequency response table above.

Display Amplitude Accuracy: ±1.0 dB/10 dB to a maximum cumulative error of ±2.0 dB over the 80 dB window and ±0.4 dB/2 dB to a maximum cumulative error of ±1.0 dB over the 16 dB window. Lin Mode is 5% of full scale.

Resolution Bandwidth Gain Variation: ±0.5 dB.

IF Gain Variation: ±0.2 dB/dB to a maximum of ±2 dB over the 90 dB range.

SPURIOUS RESPONSES

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

Harmonic Distortion (cw Signal, Minimum Distortion Mode) — Typically −60 dBc for full screen signal in the minimum distortion mode to 21 GHz. At least −100 dBc for preselected Option 01, 1.7 GHz to 21 GHz.

Third-Order Intermodulation Distortion (Minimum Distortion Mode) — At least 70 dB down from two full screen signals within any frequency span. At least 100 dB down for two signals spaced more than 100 MHz apart from 1.7 GHz to 21 GHz for preselected Option 01.

LO Emissions (0 dB Attenuation) — −10 dBm maximum; −70 dBm maximum to 21 GHz for Option 01.

INPUT SIGNAL

RF Input — Type N female connector.

Input Impedance — 50 Ω.

Maximum VSWR*† with ≥10 dB Attenuation

Frequency Range	Typical	Specified Maximum
Dc to 2.5 GHz	1.2:1	1.3:1
2.5 GHz to 6.0 GHz	1.5:1	1.7:1
6.0 GHz to 18 GHz	1.9:1	2.3:1
18 GHz to 21 GHz	2.7:1	3.5:1

**† At Type N female connector to internal mixer.*

SENSITIVITY AND FREQUENCY RESPONSE

Frequency Range	Mixing Number (n)	Average Noise Level for 1 kHz Resolution: No Preselection	Average Noise Level for 1 kHz Resolution: Preselected Option 01	Frequency Response With 10 dB Attenuation: No Preselection	Frequency Response With 10 dB Attenuation: Preselected Option 01
50 kHz to 1.8 GHz*	1	−115 dBm	−110 dBm		±1.5 dB
50 kHz to 4.2 GHz*	1	−115 dBm	−110 dBm	±1.0 dB	
1.7 GHz to 5.5 GHz	1	−115 dBm	−110 dBm	±1.5 dB	±2.5 dB
3.0 GHz to 7.1 GHz	1	−115 dBm	−110 dBm	±1.5 dB	±2.5 dB
5.4 GHz to 18 GHz	3	−100 dBm	−95 dBm (12 GHz) −90 dBm (18 GHz)	±2.5 dB	±3.5 dB
15 GHz to 21 GHz	3	−95 dBm	−85 dBm	±3.5 dB	±5.0 dB
100 MHz to 18 GHz***				±3.5 dB	±4.5 dB

WITH TEKTRONIX OPTIONAL HIGH PERFORMANCE WM 490 SERIES WAVEGUIDE MIXERS **(See Page 165)**

18 GHz to 26 GHz	6	−100 dBm		±2.0 dB	
26 GHz to 40 GHz	10	−95 dBm		±2.0 dB	
33 GHz to 50 GHz	10	−95 dBm		±2.0 dB	
40 GHz to 60 GHz	10	−95 dBm		±2.5 dB	
60 GHz to 90 GHz	15	−95 dBm @ 60 GHz†		±3.0 dB**†	
		−85 dBm @ 90 GHz†		±3.0 dB**†	
90 GHz to 140 GHz	23	−85 dBm @ 90 GHz†		±3.0 dB**†	
		−75 dBm @ 140 GHz†		±3.0 dB**†	
140 GHz to 220 GHz	37	−65 dBm @ 220 GHz†		±3.0 dB**†	

** Low frequency end performance does not include effects due to 0 Hz feedthrough.*

*** Over any 5 GHz bandwidth.*

**** Includes frequency band switching error of 1 dB maximum.*

† Typical

Input Level (Optimum Level for Linear Operation) — −30 dBm referenced to input mixer. Full screen not exceeded and minimum distortion control settings.

1 dB Compression Point — −18 dBm.

Maximum Safe Input Level (RF Attenuation at Zero dB) — +13 dBm without Option 01. +30 dBm (1 W) with Option 01.

Maximum Input Level (with 20 dB or more RF Attenuation) — +30 dBm (1 W) continuous, 75 W peak for 1 µs or less pulse width and 0.001 maximum duty factor (attenuation limit). Dc must never be applied to RF input.

OUTPUT SIGNAL

Calibrator — (Cal Out) −20 dBm ±0.3 dB, 100 MHz ±1.7 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 a maximum of +15 dBm). These ports must be terminated in 50 Ω at all times.

Vertical Out — Provides 0.5 V ±5% of signal div of video above and below the center line.

Horizontal Out — Provides 0.5 V either side of center. Full range −2.5 V to +2.5 V ±10%.

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

IF Out — Output of the 10 MHz IF. Level is approximately −16 dBm for a full screen signal at −30 dBm input reference level. Nominal impedance 50 Ω.

IEEE Standard 488-1978 Interface Function Subsets Implemented (494P) — Source 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: C0.

GENERAL CHARACTERISTICS

Sweep Time — 20 µs to 5 s/div (10 s/div in auto) in 1-2-5 sequence.

CRT Readout — Displays reference level, center frequency, frequency range, vertical display mode, frequency span/div resolution bandwidth and RF attenuation.

CRT — 8 cm x 10 cm, GH (P31) phosphor standard.

Input Voltage — 90 V ac to 132 V ac or 180 V ac to 250 V ac, 48 Hz to 440 Hz.

Power — 210 W maximum with all options, at 115 V and 60 Hz.

Configuration — (Portable) 492/492P: 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. See page 160.

ORDERING INFORMATION

492 Spectrum Analyzer — **$23,500**

Includes: 18 inch BNC to BNC connector 50 Ω coax cable (012-0075-00); 6 ft N to N connector 50 Ω coax cable, (012-0114-00); 2 A fast blow fuse (159-0021-00); N male to BNC female adaptor (103-0045-00); CRT mesh filter (378-0726-01); two 4 A fast blow fuse (159-0017-00); 115 V power cord (161-0118-00); cord clamp (343-0170-00); CRT visor (016-0653-00); diplexer assembly (015-0365-00); amber CRT light filter (378-0115-01); blue CRT light filter (378-0115-00); gray CRT light filter (378-0115-02); operator manual (070-2726-03); operator handbook (070-2729-01); service manual volume 1 (070-3783-01); service manual volume 2 (070-3784-01).

492P Fully Programmable/GPIB/Digital Storage Spectrum Analyzer — **$31,750**

Includes: In addition to the above a 2 m, double shield GPIB cable (012-0630-03); programmer manual (070-3401-00).

OPTIONS (492/492P)

Option 01 — Calibrated Internal Preselection. Filtering of input to first mixer for each frequency band. **+$3,995**

Option 02 — (492 Only) Digital Storage. With Save A, maximum hold, B minus Save A, display averaging, and storage bypass. **+$1,950**

Option 03 — Frequency Stabilization/100 Hz Resolution. Provides first local oscillator stabilization by phase locking the oscillator to an internal reference. **+$3,590**

Option 08 — Delete External Mixer Capability. Deletes internal switching front panel connector and external diplexer to connect and use external waveguide mixers. **−$1,750**

Option 11 — (492P Only) Automatic Preselector Peaking. To store peak preselector values in bands 2, 3, and 4. **+$450**

Option 20 — General Purpose 12.4 GHz to 40 GHz Waveguide Mixer Set. (12.4 GHz to 18 GHz, 18 GHz to 26.5 GHz, and 26.5 GHz to 40 GHz) and attaching hardware to extend the upper frequency. **+$900**

Option 21 — High Performance 18 GHz to 40 GHz Waveguide Mixer Set. (18 GHz to 26.5 GHz and 26.5 GHz to 40 GHz) and attaching hardware to extend the upper frequency. **+$2,525**

Option 22 — High Performance 18 GHz to 90 GHz Waveguide Mixer Set. (18 GHz to 26.5 GHz, 26.5 GHz to 40 GHz, and 40 GHz to 60 GHz) and attaching hardware to extend the upper frequency. **+$4,250**

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 bench top configuration. **+$940**

Option 41 — Digital Radio. Provides wider bandwidth preselector, 30 Hz video filter with 100 kHz resolution bandwidth and 5 MHz span/div optimized for 6 GHz and 11 GHz DR. **$450**

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

CONVERSION KIT

492 to 492P Conversion — Conversion made by your Tektronix service center. For 492's with Options 01, 02, 03, 08. Order 040-1038-02 **$7,550**

For 492's with Options 01, 02, 03. Order 040-1037-03 **$7,560**

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 — (See page 172.) **$6,620**

Microwave Comb Generator TM 500 Series Compatible — Order 067-0685-00 **$1,500**

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

Dc Block N to N — Order 015-0509-00 **$85**

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

1405 TV Sideband Adaptor — 525/60 Markers. (See page 173.) **$5,750**

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 492P SPECTRUM ANALYZER

4041 System Controller. (See page 298.) **$3,995**
4105A Color Terminal. (See page 58.) **$3,495**
4695 Color Graphics Copier. (See page 76.) **$1,595**

See page 158 for complete description of the Tek's GRASP (General RF Applications Software Package).