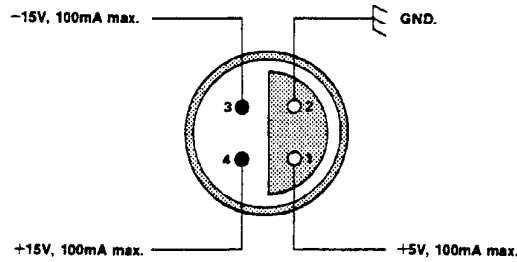


General Information and Specification—492/492P Operators

PROBE POWER. The PROBE POWER connector on the rear panel of this instrument provides operating power for active probe systems. It is not recommended that these connectors be used as a power source for applications other than the compatible probes or other accessories which are specifically designed for use with this source.



2726-21

Fig. 1-1. Probe Power Connector.

Characteristic	Performance Requirement	Supplemental Information
GENERAL CHARACTERISTICS		
Sweep		Triggered, auto, manual, and external.
Sweep Time	20 μ s/Div to 5 s/Div in 1-2-5 sequence (10 s/Div in Auto).	
Accuracy	$\pm 5\%$.	
Triggering	≥ 2.0 division of signal for internal, and 1.0 V peak minimum for external.	Internal, external, free run, and single sweep. Internal is ac coupled (15 Hz to 1 MHz).
Crt Readout		Displays: Reference level, frequency, vertical display mode, frequency span/div, frequency range, resolution bandwidth and RF attenuation.
POWER REQUIREMENTS		
Characteristic	Description	
Input Voltage	90 to 132 Vac or 180 to 250 Vac, 48 to 440 Hz.	
Power (Options 01, 02, 02)	At 115 V, 60 Hz; 210 watts maximum, 3.2 amperes.	
Leakage Current	5 mA maximum.	

NOTE

If power to this instrument is interrupted, it may be necessary to re-initialize the microcomputer; when power is restored, turn the POWER switch Off for 5 seconds then back On.

Table 1-2
ENVIRONMENTAL CHARACTERISTICS

Meets MIL T-28800B, type III class 3, style C specifications, comprised of the following:													
Characteristic	Description												
Temperature													
Operating and humidity	-15°C to +55°C/95% (+5%, -0%) relative humidity.												
Non-operating	-62°C to +75°C.												
NOTE													
After storage at temperatures below the operating range, the microcomputer may not initialize on power-up. If so, allow the instrument to warm up for 20 minutes and re-initialize the microcomputer by turning the POWER Off for 5 seconds then back On.													
Altitude													
Operating	15,000 feet.												
Non-operating	40,000 feet.												
Humidity (non-operating)	Five cycles (120 hours) of MIL-Std-810.												
Vibration	Method 514 Procedure X MIL-Std 810C (modified).												
Operating (Instrument secured to a vibration platform during test)	Resonant searches along all three axes at 0.025 inch, frequency varied from 10-55 Hz, 15 minutes. All major resonances must be minimum per axis plus dwell at resonant frequency of 55 Hz for 10 minutes minimum per axis. Instrument secured to vibration platform during test. Total vibration time about 75 minutes.												
Shock (Operating and Non-operating)	Three shocks of 30 g, one-half sine, 11 ms duration, each direction along each major axis. Guillotine-type shocks. Total of 18 shocks.												
Transit drop (free fall)	12 inch, one per each of six faces and eight corners.												
Electromagnetic Interference (EMI)	Within limits described in MIL-Std-461.												
	<table border="1"> <thead> <tr> <th>Test Method</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>CE01</td> <td>10 kHz to 20 kHz only.</td> </tr> <tr> <td>CE03 20 kHz to 50 MHz power leads.</td> <td>Except 30 kHz to 35 kHz, relaxed by 15 dB.</td> </tr> <tr> <td>CS01 30 Hz to 50 kHz power leads.</td> <td>Full limits.</td> </tr> <tr> <td>CS02 50 kHz to 400 MHz power leads.</td> <td>Full limits.</td> </tr> <tr> <td>CS06 spike power leads.</td> <td>Full limit.</td> </tr> </tbody> </table>	Test Method	Remarks	CE01	10 kHz to 20 kHz only.	CE03 20 kHz to 50 MHz power leads.	Except 30 kHz to 35 kHz, relaxed by 15 dB.	CS01 30 Hz to 50 kHz power leads.	Full limits.	CS02 50 kHz to 400 MHz power leads.	Full limits.	CS06 spike power leads.	Full limit.
Test Method	Remarks												
CE01	10 kHz to 20 kHz only.												
CE03 20 kHz to 50 MHz power leads.	Except 30 kHz to 35 kHz, relaxed by 15 dB.												
CS01 30 Hz to 50 kHz power leads.	Full limits.												
CS02 50 kHz to 400 MHz power leads.	Full limits.												
CS06 spike power leads.	Full limit.												
Conducted emissions													
Conducted susceptibility													

General Information and Specification—492/492P Operators

Table 1-2 (cont)

Characteristic	Description	
	Test Method	Remarks
Radiated emissions	RE01 30 Hz to 30 kHz magnetic field	Relaxed by 10 dB for fundamental, 2nd and 3rd harmonic of power line.
	RE02 14 to 10 GHz.	Full limit.
Radiated susceptibility	RS01 30 Hz to 30 kHz magnetic field.	Full limit.
	RS03 up to 1 GHz.	Full limit.

Table 1-3
PHYSICAL CHARACTERISTICS

Characteristics	Description
Weight (standard accessories and cover except manuals)	44 pounds (20 kg) maximum.
Dimensions (Fig. 1-2)	
Without front cover and handle or feet	6.9 X 12.87 X 19.65 inches (1750 mm X 3269 mm X 4991 mm).
With front cover, feet and handle	9.15 X 15.03 X 23.1 inches (handle folded back over instrument), 25.85 inches (handle fully extended).

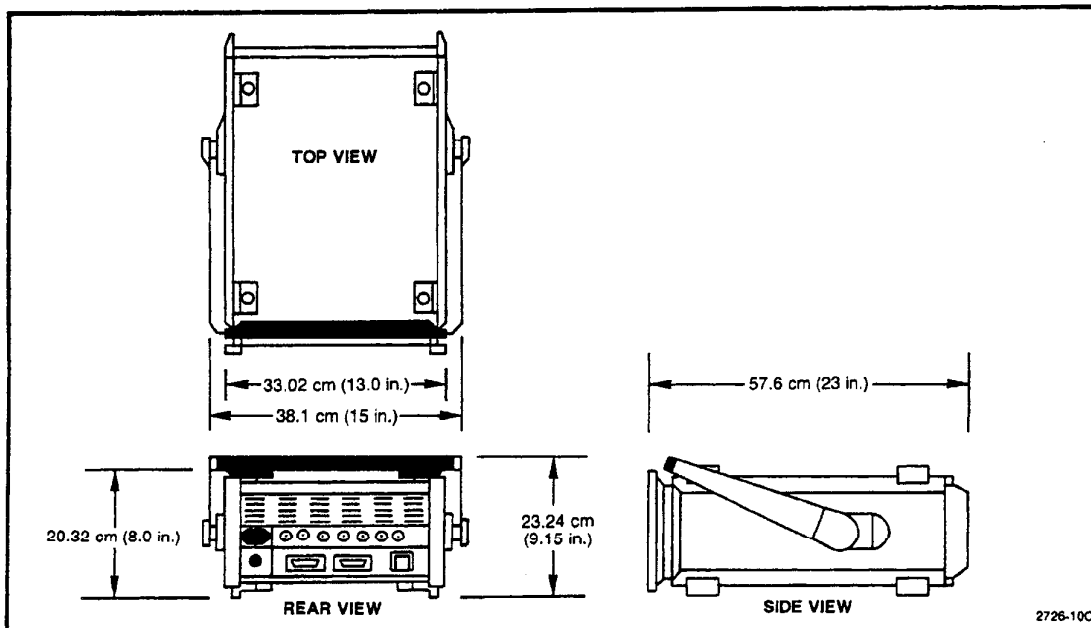


Fig. 1-2. Dimensions.

ACCESSORIES

Table 1-4

STANDARD ACCESSORIES

(Refer to Accessories listing in the service manual for part numbers.)

Description	Qty.	Storage
50 Ω Coax Cable, n to n conn, 6 Feet	1	Front Cover or Drawer
50 Ω Coax Cable, bnc to bnc conn, 18 Inch	1	Front Cover or Drawer
Manual, Operators	1	
Manual, Operators, Handbook	1	Front Cover or Drawer
Manual, Programmer's (492P only)	1	Front Cover or Drawer
Manual, Service, Volume 1	1	
Manual, Service, Volume 2	1	
Adapter, n Male to bnc Female	1	Front Cover or Drawer
Fuses 4 A, fast ^a	2	Front Cover or Drawer
Power Cord (115 V nominal)	1	Front Cover or Drawer
Cord Clamp	1	Front Cover or Drawer
Crt Light Filter, Amber	1	Front Cover or Drawer
Crt Light Filter, Grey	1	Front Cover or Drawer
Crt Mesh Filter	1	Front Cover or Drawer
Diplexer Assembly ^b	1	Front Cover or Drawer
Adapter, tnc-to-sma	1	Part of Diplexer Assembly
Cable, Semi-rigid, 50 Ω	1	Part of Diplexer Assembly
GPIB Interconnect Cable (492P only)		

^aIf the instrument is wired for 220-240 V operation (Options A1, A2, A3, or A4) the fuses are replaced with 2A slow blow.

^bOption 08 deletes the Diplexer assembly.

OPTIONS

Options available for the 492/492P and their resultant changes to the specifications are listed below. Options are factory installed at the time of the initial order. Contact your local Tektronix Field Office for additional information.

OPTION 01

This option provides calibrated preselection to the first (1st) mixer for the 1.7 to 18 GHz frequency range and limiter protection below 1.8 GHz. Band 1 becomes 100 kHz to 1.8 GHz using an input low-pass filter; the preselector starts at Band 2 (1.7 GHz).

Table 1-5

OPTION 01 ELECTRICAL CHARACTERISTICS

The following changes and additions in electrical characteristics apply:

Characteristic	Performance Requirement	Supplemental Information
Spurious Responses		
Intermodulation Products		
1.8—18 GHz	At least -70 dBc from any two on-screen signals within any frequency span.	≥ -100 dBc when signals are separated 100 MHz or more.
1.7—1.8 GHz	At least -70 dBc from any two -40 dBm signals within any frequency span.	
Harmonic Distortion (cw signal 1.7—18 GHz)	-100 dBc or more for full screen signal (MIN DISTORTION mode).	
LO emission, referenced to input mixer and with zero RF attenuation	Less than -70 dBm to 18 GHz.	
Input Level		
Maximum Safe Input with zero RF attenuation		1 watt or +30 dBm.
1 dB Compression Point (minimum):		
1.7—2.0 GHz		-28 dBm, no RF attenuation.
Otherwise		-18 dBm, no RF attenuation.

Table 1-5 (cont)

Characteristic	Performance Requirement		Supplemental Information
Frequency Response and Display Flatness			Frequency response is measured with 10 dB of RF attenuation and PEAKING optimized for each center frequency setting, when applicable. Response includes the effects of input vswr, mixing mode (n), gain variation, preselector, and mixer. Display flatness is typically 1 dB greater than the frequency response.
Coaxial (direct) Input	About the mean	Referenced to 100 MHz	
Band 1 100 kHz—1.8 GHz 50 kHz—1.8 GHz	± 1.5 dB		
Band 2 1.7—5.5 GHz	± 2.5 dB	± 3.5 dB	
Band 3 3.0—7.1 GHz	± 2.5 dB	± 3.5 dB	
Band 4 5.4—18.0 GHz	± 3.5 dB	± 4.5 dB	
Band 5 15.0—21.0 GHz	± 5.0 dB		
External High Performance Waveguide Mixers	About the mean	Referenced to 100 MHz	TEKTRONIX High Performance Waveguide Mixers.
Band 6 18.0—26 GHz	± 3.0 dB	± 6.0 dB	
Band 7 26—40.0 GHz	± 3.0 dB	± 6.0 dB	
Band 8 40—60 GHz	± 3.0 dB	± 6.0 dB	
Band 9 60—90 GHz			Dependent on external mixer.
Band 10 90—140 GHz			Dependent on external mixer.
Band 11 140—220 GHz			Dependent on external mixer.

General Information and Specification—492/492P Operators

**SENSITIVITY
(OPTION 01)**

Sensitivity

The following tabulation shows the equivalent maximum input noise for each resolution bandwidth, with the internal mixer for frequency bands 1—5 (100kHz—18 GHz), and TEKTRONIX High Performance Waveguide Mixers for bands 6—10 (18 GHz—140 GHz). The NARROW video filter is activated, for narrow resolutions (1 kHz or less); WIDE filter for wide resolution.

Frequency/Band	Equivalent Input Noise for Resolution Bandwidths			
	1 kHz	10 kHz	100 kHz	1 MHz
50 kHz—7.1 GHz (Bands 1—3)	-110 dBm	-100 dBm	-90 dBm	-80 dBm
5.4—12.0 GHz (Band 4)	-95dBm	-85 dBm	-75 dBm	-65 dBm
12.0—18.0 GHz (Band 4)	-90 dBm	-80 dBm	-70 dBm	-60 dBm
15.0—21.0 GHz (Band 5)	-85 dBm	—	—	—
18.0—26.5 GHz (Band 6)*	-100 dBm	-90 dBm	-80 dBm	-70 dBm
26.5—40.0 GHz (Band 7)*	-95 dBm	-85 dBm	-75 dBm	-65 dBm
40.0—60.0 GHz (Band 8)*	-95 dBm	-85 dBm	-75 dBm	-65 dBm
60.0—90.0 GHz (Band 9)	External Mixer Dependent			
90.0—140 GHz (Band 10)	External Mixer Dependent			
140—220 GHz (Band 11)	External Mixer Dependent			

*High Performance TEKTRONIX Waveguide Mixers.

OPTION 02

This option provides digital storage. The following are the changes and additions to the instrument.

Multiple memory (A & B) display storage is provided with: Save A, Max Hold, B memory minus Save A memory, digital display averaging, and storage bypass for non-store display.

When digital storage is used, an additional quantization error of 0.5% of full screen must be added to the measured amplitude characteristics (i.e., frequency response, sensitivity, etc.).

OPTION 03

This option provides first (1st) local oscillator stabilization by phase locking to an internal reference to reduce residual FM when narrow bands are selected. The microcomputer automatically selects phase lock for a span/division of 50 kHz or less in Bands 1 through 3, 100 kHz or less in Band 4, and 200 kHz or less in Bands 5 and above. This option also adds a 100 Hz resolution filter. The instrument characteristics that are changed are listed below.

**Table 1-6
OPTION 03 ELECTRICAL CHARACTERISTICS**

Characteristic	Performance Requirement	Supplemental Information			
		Band	Narrow Span	Wide Span	
Frequency Span/Div Range		1—3 (0—7.1 GHz)	500 Hz/Div	200 MHz/Div	
		4—5 (5.4—21 GHz)	500 Hz/Div	500 MHz/Div	
		6 (18—26 GHz)	500 Hz/Div	1 GHz/Div	
		7—8 (26—60 GHz)	500 Hz/Div	2 GHz/Div	
		9 (60—90 GHz)	500 Hz/Div	2 GHz/Div	
		10 (90—140 GHz)	500 Hz/Div	5 GHz/Div	
		11 (140—220 GHz)	500 Hz/Div	10 GHz/Div	
		Two additional positions provide full band display (MAX span) or 0 Hz (time domain display).			
		Accuracy	Within 5% of the span/div selected over the center eight divisions of a ten division display.		
		Resolution	Additional resolution bandwidth of 100 Hz with 7.5:1 shape factor except instruments prior to B040000 that have the cavity 2nd LO A20, Part No. 119-1022-00 and 119-1022-01. Shape factor for these instruments with 100 Hz resolution is 15:1.		
Noise Sidebands	At least -75 dBc at 30 times the resolution bandwidth offset (-70 dBc for 100 Hz resolution bandwidth) for fundamental mixing.				

General Information and Specification—492/492P Operators

Table 1-6 (cont)

OPTION 03 (cont)

Characteristic	Performance Requirement	Supplemental Information
Residual FM (short term) after 2 hour warmup	$\leq (50 \text{ Hz peak-to-peak}) / n$ for a period of 20 ms. n is the 1st LO harmonic number used in the 1st mixer conversion, and related to the selected frequency range (band).	No video filter.
Frequency Drift, at a fixed frequency and stable ambient temperature		
B039999 and below, after a 2 hour warmup	$\leq 25 \text{ kHz/hour}$, fundamental mixing.	
B040000 and up, after a 30 minute warmup	$\leq 15 \text{ kHz/10 minutes}$, fundamental mixing.	$\leq 5 \text{ kHz/10 minutes}$, typical
B040000 and up, after a 1 hour warmup.	$\leq 3 \text{ kHz/10 minutes}$, fundamental mixing	$\leq 1 \text{ kHz/10 minutes}$, typical.
Sensitivity (100 Hz)	8 dB better than 1 kHz sensitivity.	

OPTION 08

Deletes Extnal Mixer capability. Standard accessories do not include the Diplexer cable, and adapter (see Accessories listing). Frequency range of the instrument is 50 kHz to 21 GHz.

OPTION 11

Provides internal automatic preselector, and external mixer peaking for 492P's ordered with Option 01, 02, 03 or 492P's with Option 01, 02, 03, 08.

OPTION 20

Includes: General Purpose Waveguide Mixers: 12.5 to 40 GHz. Tektronix Part No. 016-0640-00.

Table 1-7
OPTION 20 ELECTRICAL CHARACTERISTICS

Frequency Range	Part No.	Sensitivity: Equivalent Input Noise @ 1 kHz Bandwidth (Typical)
12.4—18 GHz	119-0097-00	-75 dBm
18.0—28.5 GHz	119-0098-00	-70 dBm
25.6—40 GHz	119-0099-00	-60 dBm

Cable: TNC to SMA male connectors, 012-0748-00

OPTION 21

(WM-490-2)

Includes: High Performance Waveguide Mixers: 18 to 40 GHz. Mixers and cable as listed.

Table 1-8
OPTION 21 ELECTRICAL CHARACTERISTICS

Frequency Range	Nomenclature	Sensitivity: Equivalent Input Noise @ 1 kHz Bandwidth (Maximum)	Frequency Response	
			About the Mean	Referenced to 100 MHz
18.0—26.5 GHz	WM 490K	-100 dBm	± 3.0 dB	± 6 dB
26.5—40 GHz	WM 490A	-95 dBm	± 3.0 dB	± 6 dB

Cable: SMA to SMA connector, 012-0649-00

OPTION 22

(WM-490-3)

Includes: High Performance Waveguide Mixers: 18 to 60 GHz mixers and cable as listed.

Table 1-9
OPTION 22 ELECTRICAL CHARACTERISTICS

Frequency Range	Nomenclature	Sensitivity: Equivalent Input Noise @ 1 kHz Bandwidth (Maximum)	Frequency Response	
			About the Mean	Referenced to 100 MHz
18.0—26.5 GHz	WM 490K	-100 dBm	± 3.0 dB	± 6 dB
26.5—40 GHz	WM 490A	-95 dBm	± 3.0 dB	± 6 dB
40—60 GHz	WM 490U	-95 dBm	± 3.0 dB	± 6 dB

Cable: SMA to SMA male connector, 012-0649-00

NOTE

These characteristics assume that the waveguide mixer is connected to a cw signal source and that the PEAKING control is adjusted for maximum signal amplitude. The signal must be stable (not frequency modulated more than the resolution bandwidth), otherwise, frequency response specifications cannot be met.

Two additional millimeter waveguide mixers are also available. The type and frequency are: WM 490E (40—90 GHz) and WM 490F (90—140 GHz).

General Information and Specification—492/492P Operators

OPTION 30

This is a rackmount version of the 492/492P. The instrument is installed in a rackmount cabinet. Additional cooling is provided and a front panel accessories drawer provides storage for most accessories used with the 492/492P. Rackmount versions subjected to external vibrations, from rack cooling fans or surrounding equipment, may show degradation of the FM characteristic. Because of different rack configurations, this degradation cannot be specified. In a typical fan cooled rack, degradation increases by a factor of two.

The following changes to environmental characteristics apply.

ENVIRONMENTAL

Rackmount versions meet MIL T-28800B, type III, class 5, style F, specification. Benchtop versions meet MIL T-28800B, type III, class 5, style E specification.

For vibrations specifications, the rackmount version (Option 30 and 31) shall have the instrument secured to the rack at the front and back. Option 31 instruments shall also have the semi-rigid cables, between the front panel connectors and the cabinet grill connectors, removed.

**Table 1-10
ENVIRONMENTAL CHARACTERISTICS FOR RACKMOUNT/BENCHTOP VERSIONS**

Characteristic	Performance Information	
	Temperature °C	Relative Humidity %
Operating	0 to 25	95 +5, -0
	25 to 40	75 ±5
	40 to 50	45 ±5
Non-operating	- 55 to 75	95 ±5, -0
Humidity (non-operating)	Same as 492/492P	
Altitude		
Operating	10,000 Feet	
Non-operating	40,000 Feet	
Vibration		
Operating	Method 514 Procedure X (modified)/MIL-STD-810C. Vibration limit is 1 G. Resonance searches along all three axes at 0.0065 inch, frequency varied from 10 to 55 Hz, 15 minutes per axis, plus dwell at resonant frequency of 33 Hz for 10 minutes per axis. Total vibration time 75 minutes. Instrument secured to vibration platform during test.	
Transportation		
Package Vibration	Meets National Safe Transit Association's pre-shipment test (project 1A-B-1) when correctly packaged. One hour vibration of 1 G.	
Package Drop	Operable after a 24 inch drop on any corner or flat surface.	

Electromagnetic Interference (EMI)

Within limits described in MIL-STD-461 (same as 492/492P)

Table 1-11
PHYSICAL CHARACTERISTICS FOR RACKMOUNT/BENCHTOP VERSIONS

Characteristic	Description
Weight (standard accessories except manual)	70 pounds maximum for the rackmount version. 68 pounds maximum for the benchtop version.
Dimensions	
Rackmount (without side rails)	8.75 X 16.89 X 25.00 inch (2225 X 4290 X 6350 mm)
Benchtop (with feet and handles)	9.25 X 17.9 X 25.00 inch (2350 X 4547 X 6350 mm)
Benchtop (without feet or handles)	8.75 X 16.89 X 25.00 inch (2225 X 4290 X 6350 mm)

ACCESSORIES

STANDARD

Standard accessories are the same as the 492/492P with the addition of rack slides for the rackmount (Tektronix Part No. 351-0375-01). An accessories drawer provides the storage space in place of the front cover.

OPTIONAL

Same as the 492/492P except the transit case.

OPTION 31

Option 31 includes the necessary cabling to provide access of all the front panel connectors at the cabinet rear panel. This provision may degrade the response flatness and sensitivity at the high end of the frequency range. Degradation above 3.0 GHz is typically up to -2 dB.

Environmental characteristics are the same as Option 30 instruments. The semi-rigid cables between the front panel connectors and the connectors on the cabinet grill must be removed for vibration shock, and bench handling, tests.

OPTION 32

Option 32 is a benchtop version of the 492/492P and consists of the rackmount version with the side rails removed. Environmental and electrical characteristics are the same as the Option 30 instrument. The bail for tilting the instrument must be folded for bench-top handling characteristics.

OPTION 41

Option 41 (formerly Custom Mod UB) provides enhanced measurement capability for certain types of pulse-modulated signals used in Digital Microwave Radio. These include:

- A wider bandwidth preselector for better signal symmetry in digital radio bands.
- A narrow 30 Hz video filter for resolution bandwidth setting of 100 kHz (approximately 1/3000 of the resolution bandwidth) to improve amplitude variation analysis at specific frequencies and frequency spans unique to the digital radio measurements.
- Improved frequency span/div accuracy at 5 MHz/Div span to enable accurate signal bandwidth measurements.

Table 1-12
OPTION 41 SPECIFICATION

Characteristic	Performance Requirement	Supplemental Information
Frequency Span/Div at Center Frequency of 6 and 11 GHz	5 MHz/Div is within +0, -1% over the center 6 divisions of the display	30 MHz equals 6.00 to 6.06 div.

OPTION 42

In Option 42 instruments the MARKER/VIDEO input port on the rear panel is replaced with a 110 MHz IF output port. It provides a signal with a bandwidth greater than 5 MHz, which makes the spectrum analyzer suitable for broadband swept-receiver applications.

Table 1-13
OPTION 42 ELECTRICAL CHARACTERISTICS

Characteristic	Performance Requirement	Supplemental Information
110 MHz		
center frequency	108.5 MHz-111.5 MHz	
3 dB bandwidth	>5 MHz	
bandpass ripple	<0.5 dB	
symmetry about 110 MHz	± 1.0 MHz	
Power output with -30 dB input and signal at full screen (band 1)	≤0 dBm	nominal output impedance 50 Ω
(band 5)	≥ -40 dBm	in MIN DISTORTION Mode only
		1 dB compression of output ≥0 dBm

OPTIONS FOR POWER CORD CONFIGURATION

Tektronix has implemented options that provide international approved power cord and plug configurations. These are shown and illustrated in Fig. 1-3.

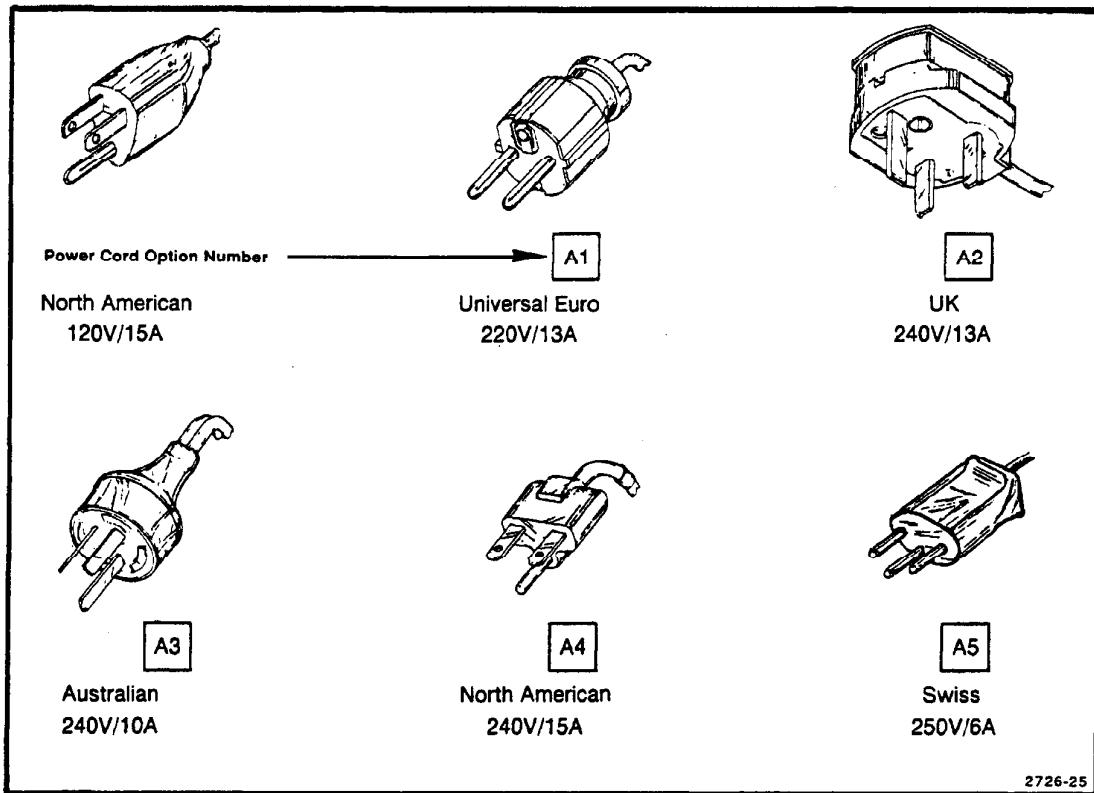


Fig. 1-3. International power cord and plug configuration for the 492/492P.