

# MS2717A Economy Spectrum Analyzer

## TECHNICAL DATA SHEET

### Advanced Analysis Tool for General Purpose Test

100 kHz to 7.1 GHz

#### System Description

The Anritsu MS2717A delivers affordable spectrum analysis with superior performance, advanced capabilities, and modern WCDMA signal analysis.



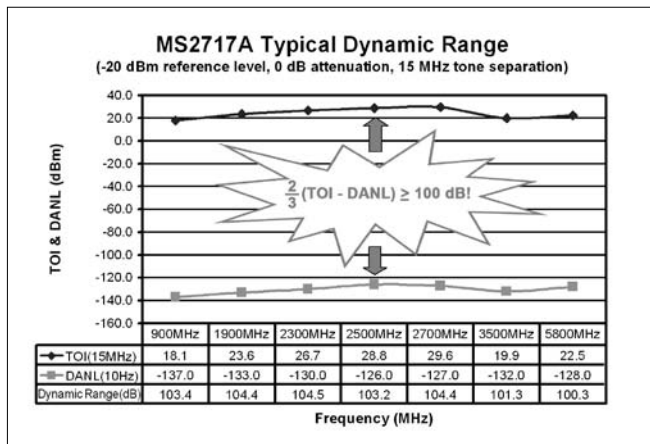
Anritsu MS2717A Economy Spectrum Analyzer

## Introduction

Engineers in R&D and manufacturing need advanced tools for spectrum analysis of wireless components in the critical physical layer of modern communication systems. For best value and overall satisfaction, these general purpose tools must deliver performance, capabilities, and the ability to lower the cost of testing.

The MS2717A is Anritsu's new Economy Spectrum Analyzer with superior performance and advanced capabilities. Take a closer look and we think you will agree that the MS2717A redefines the economy class by delivering superior spectrum analyzer performance at a surprisingly affordable price.

Covering the 100 kHz to 7.1 GHz range, the MS2717A easily handles most wireless frequencies. The hallmark of the MS2717A is the phase noise performance: typical  $-110$  dBc/Hz SSB phase noise at 10 kHz offsets up to 6 GHz, which easily measures most wireless local oscillators and synthesizers. The superior dynamic range of 100 dB means fast and precise testing of wireless components that require exceptional linearity. The wide 8 MHz capture bandwidth supports optional WCDMA/HSDPA and WCDMA demodulator measurements for simplifying test of Node-B transmitters. Best of all, the MS2717A is ergonomically designed so controls are easy-to-learn and easy-to-use for improving productivity in manufacturing, R&D, and general purpose testing.



MS2717A offers superior dynamic range for linear measurements of next generation wireless component

### Typical Performance of the MS2717A

- 100 kHz to 7.1 GHz
- Standard Built-in Preamplifier
- Dynamic Range of 100 dB
- Third Order Intercept of +29 dBm
- DANL (No Preamp) of  $-126$  dBm (RBW = 10 Hz)
- DANL (With Preamp) of  $-150$  dBm (RBW = 10 Hz)
- Phase Noise (800 MHz) of  $-114$  dBc/Hz at 10 kHz Offset
- Amplitude Accuracy of  $\pm 0.6$  dB to 3 GHz
- Sweep Speed of 200 ms in 10 MHz Span (RBW = 30 kHz, VBW = 10 kHz)
- Capture Bandwidth of 8 MHz
- Residual ACLR of  $-60$  dB
- Residual EVM of 1.75%
- True RMS Detection
- 65 dB Attenuation Range, 5 dB Steps
- 20 Watt (+43 dBm) Input Protection

### Standard Measurements

- **ACPR:** Measures power levels in the channels immediately above and below the center channel.
- **Occupied Bandwidth:** Measures 99% to 1% power channel of a spectrum.
- **Channel Power:** Measures the total power in a specified bandwidth.
- **C/I:** Measures carrier to interference ratio.

### Optional Capabilities

- **Rack Mount Chassis:** Conveniently place MS2717A in 19 inch racks.
- **WCDMA/HSDPA Measurements:** Analyze the signal strength and mask.
- **WCDMA Demodulation:** Evaluate transmitter modulation performance using Code Domain Power (CDP).

### Master Software Tools

- **Anritsu Master Software Tools:** Powerful data management and pass/fail setup tool (Windows® 2000/XP compatible).

### General

- Easy-to-Learn Operation
- 8.4 inch Color TFT Display (SVGA)
- Eight Built-in Languages (plus Two Custom)
- 64 MB Storage for 1,000 Traces and 1,000 Setups
- Six Markers, Seven Marker Modes
- Built-in AM/FM/SSB Demodulator
- Output Displays in JPEG Formats
- Connectivity: Ethernet, USB 2.0, Compact Flash
- Remote Programming: Ethernet Only
- Compact Size and Weight: 5.6 kg (12 lbs)
- Operational  $-10^{\circ}\text{C}$  to  $55^{\circ}\text{C}$ , Humidity < 85%
- 1 Year Standard Warranty

## Specifications

### Frequency

**Frequency Range:** 100 kHz to 7.1 GHz

**Frequency Span:** 10 Hz to 7.1 GHz plus 0 Hz (zero span)

**Tuning Resolution:** 1 Hz

### Typical Dynamic Range

Using the popular dynamic range definition of 2/3 (TOI – DANL), the following table shows the excellent dynamic range that is typically available when using the indicated tone spacing for TOI and RBW of 10 Hz.

Frequency	Dynamic Range (Offset = 100 kHz)	Dynamic Range (Offset = 15 MHz)
900 MHz	100 dB	103 dB
1900 MHz	100 dB	104 dB
2300 MHz	100 dB	104 dB
2500 MHz	97 dB	103 dB
2700 MHz	98 dB	104 dB
3500 MHz	99 dB	101 dB
5800 MHz	94 dB	100 dB

### Displayed Average Noise Level (DANL)

Using 10 Hz RBW, the following tables show maximum and typical DANL performance (not including discrete spurious). Reference level is –20 dBm for preamplifier off and –50 dBm for preamplifier on. RMS detection is used and input attenuation is set to 0 dB.

Frequency	DANL Preamplifier On (RBW = 10 Hz)	
	Typical	Max
10 MHz to 1.0 GHz	–155 dBm	–151 dBm
>1.0 to 2.2 GHz	–152 dBm	–149 dBm
>2.2 to 2.8 GHz	–147 dBm	–143 dBm
>2.8 to 4.0 GHz	–150 dBm	–149 dBm
>4.0 to 6.5 GHz	–150 dBm	–144 dBm
>6.5 to 7.1 GHz	–149 dBm	–144 dBm

Frequency	DANL Preamplifier Off (RBW = 10 Hz)	
	Typical	Max
10 MHz to 1.0 GHz	–135 dBm	–127 dBm
>1.0 GHz to 2.2 GHz	–130 dBm	–123 dBm
>2.2 to 2.8 GHz	–125 dBm	–116 dBm
>2.8 to 4.0 GHz	–130 dBm	–126 dBm
>4.0 to 6.5 GHz	–127 dBm	–117 dBm
>6.5 to 7.1 GHz	–121 dBm	–117 dBm

### Noise Figure

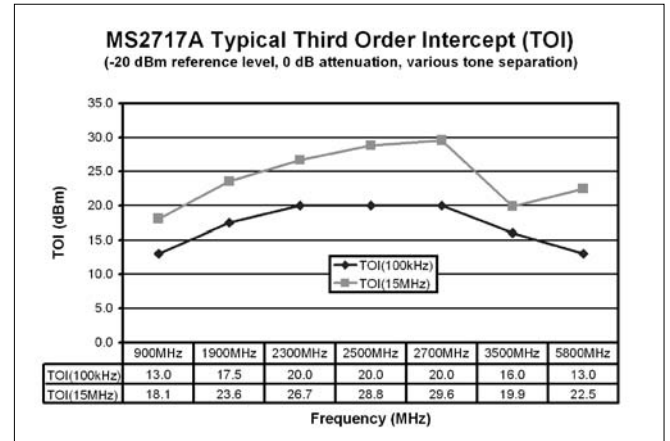
The following table shows the calculated noise figure from DANL measurements for 0 dB attenuation at 23°C with preamplifier on.

Frequency	NF (Typical)
10 MHz to 1.0 GHz	9 dB
>1.0 to 2.2 GHz	12 dB
>2.2 to 2.8 GHz	17 dB
>2.8 to 4.0 GHz	14 dB
>4.0 to 6.5 GHz	14 dB
>6.5 to 7.1 GHz	15 dB

### Third Order Intercept (TOI)

Using two –20 dBm tones separated by 100 kHz, the following table shows the typical TOI performance. Reference level is set to –20 dBm, input attenuation is set to 0 dB, and the preamplifier is off.

Frequency	TOI, Typical (Offset = 100 kHz)
50 MHz to 300 MHz	>8 dBm
>300 MHz to 2.2 GHz	>10 dBm
>2.2 to 2.8 GHz	>15 dBm
>2.8 to 4.0 GHz	>10 dBm
>4.0 to 7.1 GHz	>13 dBm



MS2717A Typical Third Order Intercept for popular wireless frequencies

### Typical TOI

The following table shows the excellent TOI that is typically available for popular wireless frequencies and tone spacings.

Frequency	TOI, Typical (Offset = 100 kHz)	TOI, Typical (Offset = 15 MHz)
900 MHz	13 dBm	18 dBm
1900 MHz	17 dBm	24 dBm
2300 MHz	20 dBm	27 dBm
2500 MHz	20 dBm	29 dBm
2700 MHz	20 dBm	30 dBm
3500 MHz	16 dBm	20 dBm
5800 MHz	13 dBm	23 dBm

### Second Harmonic Distortion

(0 dB input attenuation, –30 dBm input):

Frequency Range	Second Harmonic Distortion
50 MHz to 750 MHz	–50 dBc
>750 MHz to 1.05 GHz	–40 dBc
>1.05 to 1.4 GHz	–50 dBc
>1.4 to 2 GHz	–70 dBc
>2 GHz	–80 dBc

## Amplitude

Maximum Continuous Input: ( $\geq 10$  dB attenuation),  
+30 dBm Input Damage Level\*:

Attenuation Setting	Input Damage Level*
$\geq 10$ dB	$> +43$ dBm, $\pm 50$ Vdc
$< 10$ dB	$> +23$ dBm, $\pm 50$ Vdc

\* Input protection relay opens at  $> 30$  dBm with  $\geq 10$  dB input attenuation and at approximately 10 to 23 dBm with  $< 10$  dB attenuation. ESD Damage Level:  $> 10$  kV with  $\geq 10$  dB attenuation,

## Amplitude Accuracy (20°C to 30°C)

Absolute Amplitude Accuracy:

Condition	Specification
Overall Amplitude Accuracy (95%) 0 dBm to $-50$ dBm, 20 to 30°C, preamplifier off, 10 dB attenuation	$\pm 0.9$ dB $< 3$ GHz $\pm 1.25$ dB $< 7.1$ GHz
Amplitude Accuracy at 50 MHz	$\pm 0.8$ dB
Frequency Flatness	$\pm 0.5$ dB $< 3$ GHz $\pm 1.0$ dB $< 7.1$ GHz

## Amplitude Settings

**Attenuator Range:** 0 to 65 dB

**Attenuator Resolution:** 5 dB steps

**Measurement Range:** DANL to +30 dBm

**Display Range:** 1 to 15 dB/div in 1dB steps  
Ten divisions displayed

## Amplitude Units

Modes	Units
Log Scale	dBm, dBV, dBmV, dB $\mu$ V
Linear Scale	nV, $\mu$ V, mV, V, kV, nW, $\mu$ W, mW, W, kW

## Resolution and Video Bandwidth (RBW,VBW)

**Resolution Bandwidth ( $-3$  dB width):** 10 Hz to 3 MHz

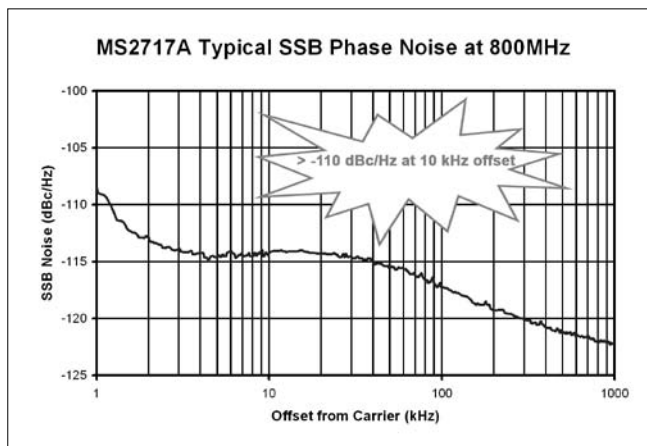
**Resolution Bandwidth steps:** 1-3 sequence  $\pm 10\%$

**Video Bandwidth ( $-3$  dB):** 1 Hz to 3 MHz

**Video Bandwidth steps:** 1-3 sequence

**Demodulation Bandwidth:** 8 MHz

## Phase Noise



MS2717A Typical Phase Noise at 800 MHz

The following table contains the guaranteed and typical single sideband (SSB) phase noise for offsets from carrier from 10 kHz to 100 kHz.

Offset from Carrier	Guaranteed SSB Phase Noise	Typical SSB Phase Noise $< 6$ GHz
10 kHz	$< -100$ dBc/Hz	$-110$ dBc/Hz
20 kHz	$< -100$ dBc/Hz	$-110$ dBc/Hz
30 kHz	$< -100$ dBc/Hz	$-110$ dBc/Hz
100 kHz	$< -102$ dBc/Hz	$-112$ dBc/Hz

## Time Base Stability

Frequency Reference:

Specification	Standard
Aging	$< \pm 1 \times 10^{-6}$ /yr or 1 ppm/yr
Accuracy (25°C $\pm$ 25°C), Standard	$< \pm 1 \times 10^{-6}$ /yr or 1 ppm/yr + long term drift
Accuracy (25°C $\pm$ 25°C), Option 9	$< \pm 0.3 \times 10^{-6}$ /yr or 0.3 ppm/yr + long term drift

**Span Accuracy:** Same as frequency reference accuracy

## Sweep Times

**Sweep Time:** Minimum 200 ms, adjustable to 10  $\mu$ s in zero span

**Sweep Time Accuracy:**  $\pm 2\%$  in zero span

**Sweep Trigger:** Free run, Single, Video, External

**Sweep Span:** Full span, zero span, and span up/span down

Span	RBW	VBW	Typical Sweep Time
6 GHz	3 MHz	1 MHz	1.1 secs
200 MHz	300 kHz	100 kHz	200 ms
10 MHz	30 kHz	10 kHz	200 ms
1 MHz	3 kHz	1 kHz	90 ms
200 kHz	3 Hz	3 MHz	99 ms
2.2 kHz	10 Hz	3 Hz	149 ms

### Optional WCDMA/HSDPA Analysis

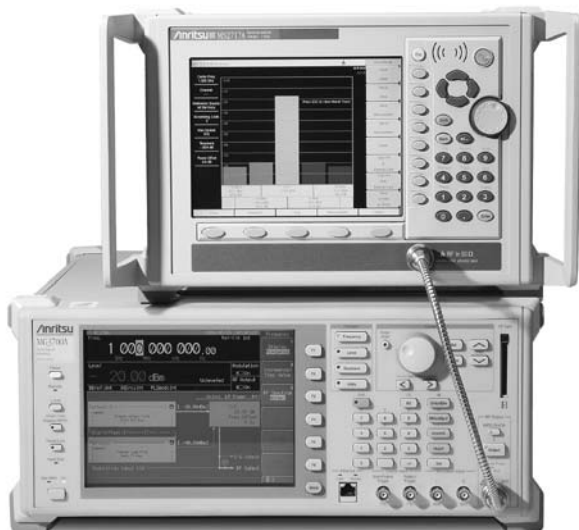
The following table shows the capability of Options 44 and 45 to analyze WCDMA/HSDPA modulation quality. These options require upgrades to the microprocessor, timebase, and FIFO memory (Option 9).

WCDMA/HSDPA Option Comparison Table

WCDMA/HSDPA Measurements	WCDMA/HSDPA RF Measurements Option 44	WCDMA Demodulator Option 45
Band Spectrum	✓	
Channel Spectrum	✓	
Carrier Frequency	✓	✓
Frequency Error	✓	✓
Channel Power	✓	✓
Occupied Bandwidth	✓	
Peak to Average Power	✓	
Noise Floor	✓	
ACLR	✓	
Spectral Emission Mask	✓	
P-CPICH Abs Power		✓
EVM		✓
Symbol EVM		✓
Carrier Feed Through		✓
Peak CD Error		✓
CPICH		✓
P-CCPCH Power		✓
S-CCPCH Power		✓
PICH		✓
P-SCH Power		✓
S-SCH Power		✓
Pass/Fail Mode	✓	✓

### Option 44 Example

The superior performance of the MS2717A ensures precise measurements of Adjacent Channel Leakage Ratio (ACLR) when coupled with a vector signal generator.



MS2717A has optional Adjacent Channel Leakage Ratio (ACLR) measurements when connected to Anritsu's MG3700A Vector Signal Generator.

### WCDMA/HSDPA RF Measurements (Option 44)

The following measurement performance is available for analyzing the modulation quality of selected transmitters (requires Option 9).

Measurement	824-894 MHz, 1710-2170 MHz	2300-2700 MHz
RF Channel Power 15°C to 30°C	±1.25 dB max, ±0.7 dB typical	
Occupied Bandwidth	±100 kHz	
Residual ACLR <sup>1</sup> (5 MHz Offset)	-54 dB typ	
ACLR Accuracy: 5 MHz Offset ACLR ≥ -45 dB	±0.8 dB	±1.0 dB
Residual ACLR (10 MHz Offset)	-59 dB typ	-57 dB typ
ACLR Accuracy: 10 MHz Offset ACLR ≥ -50 dB	±0.8 dB	±1.0 dB
Frequency Error	±10 Hz + Time Base Error, 99% confidence level	

<sup>1</sup>Depends on reference level, input signal level and single channel conditions

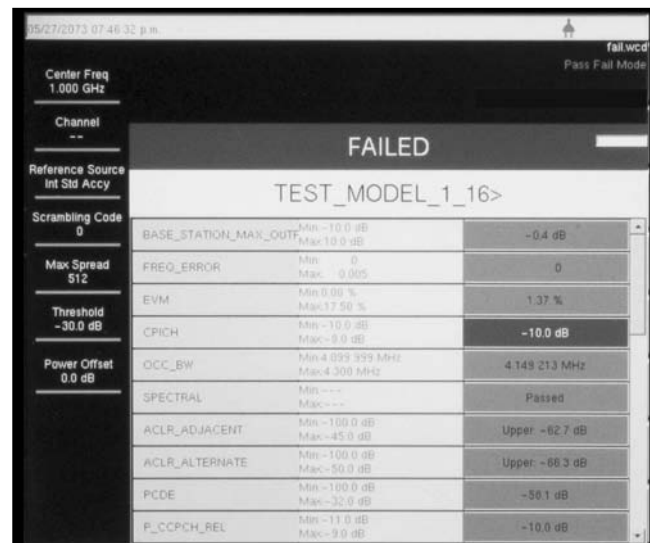
### WCDMA Demodulation (Option 45)

The following measurement performance is available for analyzing the modulation quality of selected transmitters (requires Option 9).

Measurement	824-894 MHz, 1710-2170 MHz	2300-2700 MHz
EVM Accuracy 3GPP Test Model EVM ≤ 25%	±2.5%	±2.5%
EVM Accuracy 3GPP Test Model 5 EVM ≤ 20%	±2.5%	±2.5%
Residual EVM <sup>1</sup>	2.5% typical	
Code Domain Power: Test Model 1, 16, 32, 64, DCPH Channel Power > -25 dB	±0.5 dB	
Code Domain Power: Test Model 2, 3, 16, 32, DCPH Channel Power > -25 dB	±0.5 dB	
CPICH (dBm)	±0.8 dB typ	

### Option 45 Example

Use any of the five 3GPP models covering all eleven test scenarios (TS 125.141) for easy pass/fail testing.



MS2717A has optional PASS/FAIL summary screens to easily verify compliance to 3GPP test models.

## Spurious

Discrete spurious signals are separated into input-related and residual spurious.

### Input-Related Spurious: $-60$ dBc max<sup>1</sup>

<sup>1</sup>For a  $-30$  dBm input with 0 dB attenuation. The typical input-related spurious is  $<-70$  dBc except for the following input frequency conditions.

Input Frequency	Input-Related Spurious Exception
1674 MHz	$-46$ dBc max $-56$ dBc typical 0 to 2800 MHz
$>1674$ to 1774 MHz	$-50$ dBc max $-60$ dBc typical $F_{(input)} - 1674$ MHz

### Residual Spurious, Preamplifier Off:

When RF input is terminated with attenuation set to 0 dB, the following residual spurious is possible.

Frequency	Residual Spurious
100 kHz to 3.2 GHz	$-90$ dBm max <sup>2</sup>
$>3.2$ GHz to 7.1 GHz	$-84$ dBm max <sup>2</sup>

<sup>2</sup>Exceptions to residual spurious are shown in the following table.

Frequency	Residual Spurious Level
$\sim 5084$ MHz	$-70$ dBm max $-83$ dBm typical
$\sim 5894$ MHz	$-75$ dBm max $-87$ dBm typical

### Residual Spurious, Preamplifier On:

When RF input is terminated with attenuation set to 0 dB, the following residual spurious is possible.

Frequency	Residual Spurious
100 kHz to 7.1 GHz	$-100$ dBm max

## Markers and Limit Lines

**6 Markers, 7 Modes:** Normal, Delta, Marker to Peak, Marker to Center, Marker to Reference Level, Next Peak Left, Next Peak Right, All Markers Off, Noise Marker, Frequency Counter Marker (1 Hz resolution).

**Multiple Marker:** Display up to six markers on screen. Each marker includes a delta marker, effectively allowing up to 12 markers on screen.

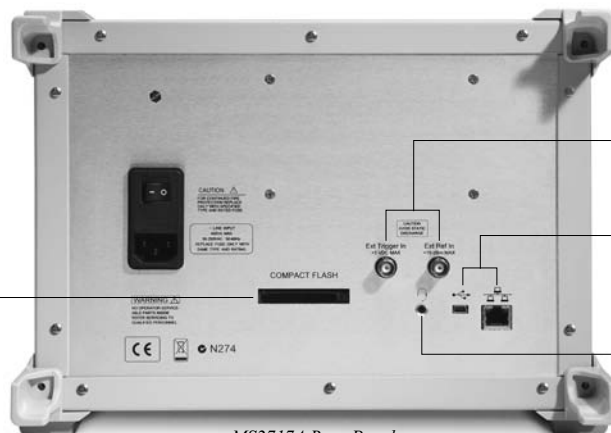
**Marker Table:** Display a table of up to six marker frequency and amplitude values plus delta marker frequency offset and amplitude.

**Limit Lines:** Display upper and lower fixed and segmented limit lines, where each upper and lower limit can be made up of between one and 40 segments.

Light weight: 5.6 kg (12 lbs)

Small footprint: 372W x 242H x 339D mm  
(14.7W x 9.6H x 13.4D in)

Use higher capacity compact flash cards to increase storage capacity for traces and setups



MS2717A Rear Panel

## General

**Detection:** Peak, Negative, Sample, RMS

**Displayed Traces:** Three traces with trace overlay. One trace is always the live data; two traces can be either stored data or traces which have been mathematically manipulated.

**Memory:** Trace and Setup storage is limited only by the capacity of the installed Compact Flash card. For the standard 64 MB card, storage is greater than 1000 traces and 1000 setups.

**Languages:** Built-in English, Spanish, Italian, French, German, Japanese, Korean, and Chinese. The instrument also has the capability to have customized languages and soft key definitions installed from Master Software Tools.

### Display

**Display:** Bright color transmissive LCD, Full SVGA, 8.4 inches

### Interfaces

**RF Input Connector:** Type N female

**RF Input VSWR:** 2.0:1 maximum, 1.5:1 typical ( $\geq 10$  dB attenuation)

**External Reference Input Connector:** BNC female

**External Reference Frequencies:** 1, 1.2288, 1.544, 2.4576, 4.8, 4.9152, 5, 9.8304, 10, 13 and 19.6608 MHz at  $-10$  to  $+10$  dBm

**External Trigger Connector:** BNC female, TTL Signal

**External Headphone Jack**

**Speaker**

### Connectivity

For convenient connection to PCs and networks, the MS2717A offers an RJ45 connector for Ethernet 10/100 Base T connections. Alternatively, a 5-pin Mini-B USB 2.0 (full speed) connection is provided for connection to a PC.

### Remote Programming

SCPI available via Ethernet

### Size and Weight

**Size with handles:** 372W x 242H x 339D mm (14.7W x 9.6H x 13.4D in)

**Size with rack mount:** 483W x 242H x 339D mm (19W x 9.6H x 13.4D in)

**Weight:** 5.6 kg (12 lbs)

### Environmental

**MIL-PRF-28800F class 2**

**Operating:**  $-10^{\circ}\text{C}$  to  $55^{\circ}\text{C}$ , humidity 85% or less

**Storage:**  $-51^{\circ}\text{C}$  to  $71^{\circ}\text{C}$

**Altitude:** 4600 meters, operating and non-operating

### Safety

Conforms to EN 61010-1 for Class 1 portable equipment

Electromagnetic Compatibility

Meets European Community requirements for CE marking.

## Ordering Information

### MS2717A Economy Spectrum Analyzer

100 kHz to 7.1 GHz, including preamplifier  
Standard 1 year warranty  
Certificate of Calibration and Conformance

#### Options

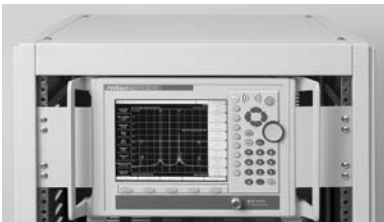
MS2717A-009	Modulation Measurement and Demodulation Hardware Upgrade
MS2717A-044	WCDMA/HSDPA RF Measurements (Requires Option 009)
MS2717A-045	WCDMA Demodulator (Requires Option 009)



#### Standard Accessories

10580-00159	Anritsu User's Guide, Model MS2717A
2300-498	CD ROM containing Master Software Tools
2000-1360	USB A-mini B cable
2000-1371	RJ45 Ethernet Cable
2000-1358	64 MB Compact Flash

#### Optional Rack Mount Kit



MS2717A-001 Rack Mount (No Slides)

#### Optional Transit Case



760-240 MS2717A Transit Case

#### Optional Accessories

1091-27	Type-N male to SMA female adapter
2000-1358	64 MB Compact Flash
42N50A-30	30 dB, 50 watt, Bi-directional, DC to 18 GHz, N(m) to N(f) Attenuator
34NN50A	Precision Adapter, DC to 18 GHz, 50Ω, N(m) to N(m)
34NFN50C	Precision Adapter, DC to 18 GHz, 50Ω, N(f) to N(f)
15NNF50-1.5B	Test port cable, armored, 1.5 meter N(m) to N(f) 18 GHz
15NN50-1.5C	Test port cable armored, 1.5 meter, N(m) to N(m), 6 GHz
15NN50-3.0C	Test port cable armored, 3.0 meter, N(m) to N(m), 6 GHz
15NN50-5.0C	Test port cable armored, 5.0 meter, N(m) to N(m), 6 GHz
15NNF50-1.5C	Test port cable armored, 1.5 meter, N(m) to N(f), 6 GHz
15NNF50-3.0C	Test port cable armored, 3.0 meter, N(m) to N(f), 6 GHz
15NNF50-5.0C	Test port cable armored, 5.0 meter, N(m) to N(f), 6 GHz
15ND50-1.5C	Test port cable armored, 1.5 meter, N(m) to 7/16 DIN(m), 6.0 GHz
15NDF50-1.5C	Test port cable armored, 1.5 meter, N(m) to 7/16 DIN(f), 6.0 GHz
510-90	Adapter, 7/16 DIN (f) to N(m), DC to 7.5 GHz, 50 ohm
510-91	Adapter, 7/16 DIN (f)-N(f), DC to 7.5 GHz, 50 ohm
510-92	Adapter, 7/16 DIN(m)-N(m), DC to 7.5 GHz, 50 ohm
510-93	Adapter, 7/16 DIN(m)-N(f), DC to 7.5 GHz, 50 ohm
510-96	Adapter 7/16 DIN (m) to 7/16 DIN(m), DC to 7.5 GHz, 50 ohm
510-97	Adapter 7/16 DIN(f) to 7/16 DIN(f), 7.5 GHz

#### Literature

10580-00159	Anritsu User's Guide, Model MS2717A
10580-00160	Anritsu Programming Manual, Model MS2717A

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