

# Spectrum Master™

## Compact Handheld Spectrum Analyzer

MS2712E  
9 kHz to 4 GHz

MS2713E  
9 kHz to 6 GHz

### Introduction

Anritsu introduces its next generation compact handheld Spectrum Analyzers to meet the needs for portability. Whether it is for spectrum monitoring, broadcast proofing, interference analysis, RF and microwave measurements, or Wi-Fi and wireless network measurements, the Spectrum Master is the ideal instrument for making fast and reliable measurements.

### Spectrum Analyzer Highlights

- Measurements: Occupied Bandwidth, Channel Power, ACPR, C/I
- Interference Analyzer: Spectrogram, Signal Strength, RSSI, Mapping
- Dynamic Range: > 102 dB in 1 Hz RBW
- DANL: -162 dBm in 1 Hz RBW
- Phase Noise: -100 dBc/Hz max @ 10 kHz offset at 1 GHz
- Frequency Accuracy: < ± 50 ppb with GPS On
- Traces: Normal, Max Hold, Min Hold, Average, # of Averages
- Detectors: Peak, Negative, Sample, Quasi-peak, and true RMS
- Markers: 6, each with a Delta Marker, or 1 Reference with 6 Deltas
- Limit Lines: up to 41 segments with one-button envelope creation
- Trace Save-on-Event: crossing limit line or sweep complete

### Capabilities and Functional Highlights

- LTE/LTE-A FDD/TDD
- CDMA, EV-DO
- GSM/EDGE
- W-CDMA/HSPA+
- TD-SCDMA/HSPA+
- Fixed, Mobile WiMAX
- EMF Test
- ISDB-T, ISDB-T SFN
- DVB-T/H, DVB-T/H SFN
- Gated Sweep
- Tracking Generator
- Internal Preamplifier standard
- Internal Bias-Tee
- Internal Power Meter
- High Accuracy Power Meter
- 4, 6, 8, 18, 26 GHz Power Sensors
- GPS tagging of saved traces
- Channel Scanner
- < 5 minute warm-up time
- 3 hour battery operation time
- New Fast Sweep Speed Mode
- On-Screen Coverage Mapping
- Touchscreen keyboard
- USB or optional Ethernet data transfer
- Increase throughput by automating repetitive or operator intensive tasks via Ethernet or USB. Remote programming provided via Ethernet (Option 411).
- Master Software Tools™
- Line Sweep Tools™
- easyTest Tools™
- Web Remote Control with Ethernet option



Spectrum Master™ MS2712E Spectrum Analyzer featuring 8.4 inch Daylight Viewable Touchscreen  
Compact Size: 273 mm x 199 mm x 91 mm (10.7 in x 7.8 in x 3.6 in), Lightweight: 3.45 kg (7.6 lb)

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**Definitions**

Specifications	All specifications and characteristics apply to Revision 2 instruments under the following conditions, unless otherwise stated: <ul style="list-style-type: none"> <li>• After 5 minutes of warm-up time, where the instrument is left in the ON state.</li> <li>• Sweep Mode set to Performance.</li> <li>• When using the internal reference signal.</li> </ul>
Typical Specifications	Typical specifications are not tested and not warranted. They are generally representative of characteristic performance.
Nominal	Design parameters are not tested and not warranted.
Calibration Cycle	Recommended calibration cycle is 12 months.
Time Base Error	Input Frequency × Frequency Reference Error

**Spectrum Analyzer****Measurements**

Measurements	Field Strength (uses antenna calibration tables to measure dBm/m <sup>2</sup> , dBmV/m, dBV/m, dBμV/m, Volt/m, Watt/m <sup>2</sup> , dBW/m <sup>2</sup> , A/m, dBA/m and Watt/cm <sup>2</sup> ) Occupied Bandwidth (measures 99 % to 1 % power channel of a signal) Channel Power (measures the total power in a specified bandwidth) ACPR (Adjacent Channel Power Ratio) AM/FM/SSB Demodulation (wide/narrow FM, USB and LSB), (audio out only) C/I (carrier-to-interference ratio) Emission Mask Coverage Mapping (requires Option 431)
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**Setup Parameters**

Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Channel Increment
Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
Bandwidth	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/RBW
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Limit Lines, Screen Shots (.jpg) (save only), Save-on-Event
Save-on-Event	Crossing Limit Line, Sweep Complete, Save-then-Stop, Clear All
Delete	Selected File, All Measurements, All Mode Files, All Content
Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy, Format USB
Application Options	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)

**Sweep Functions**

Sweep	Single/Continuous, Sweep Mode (Fast, Performance, No FFT), Reset, Detection, Minimum Sweep Time, Trigger Type, Gated Sweep (see Option 90)
Detection	Peak, RMS, Negative, Sample, Quasi-peak
Triggers	Free Run, External, Video, Change Position, Manual

**Trace Functions**

Traces	Up to three Traces (A, B, C), View/Blank, Write/Hold, Trace A/B/C Operations
Trace A Operations	Normal, Max Hold, Min Hold, Average, # of Averages, (always the live trace)
Trace B Operations	A → B, B ↔ C, Max Hold, Min Hold
Trace C Operations	A → C, B ↔ C, Max Hold, Min Hold, A - B → C, B - A → C, Relative Reference (dB), Scale

**Marker Functions**

Markers	Markers 1-6 each with a Delta Marker, or Marker 1 Reference with Six Delta Markers, Marker Table (On/Off), All Markers Off
Marker Types	Style (Fixed/Tracking), Noise Marker, Frequency Counter Marker
Marker Auto-Position	Peak Search, Next Peak (Right/Left), Peak Threshold %, Set Marker to Channel, Marker Frequency to Center, Delta Marker to Span, Marker to Reference Level
Marker Table	1-6 markers frequency and amplitude plus delta markers frequency amplitude and offset

**Limit Line Functions**

Limit Lines	Upper/Lower, On/Off, Edit, Move, Envelope, Advanced, Limit Alarm, Default Limit
Limit Line Edit	Frequency, Amplitude, Add Point, Add Vertical, Delete Point, Next Point Left/Right
Limit Line Move	To Current Center Frequency, By dB or Hz, To Marker 1, Offset from Marker 1
Limit Line Envelope	Create Envelope, Update Amplitude, Points (41 max), Offset, Shape Square/Slope
Limit Line Advanced	Type (Absolute/Relative), Mirror, Save/Recall

**Frequency**

Frequency Range	9 kHz to 4 GHz (MS2712E), 9 kHz to 6 GHz (MS2713E) (tunable to 0 Hz)
Tuning Resolution	1 Hz
Frequency Reference	Aging: ± 1.0 ppm/year Accuracy: ± 1.5 ppm (25 °C ± 25 °C) + aging, < ± 50 ppb with GPS On
Frequency Span	10 Hz to 4 GHz including zero span (MS2712E), 10 Hz to 6 GHz including zero span (MS2713E)
Sweep Time	Minimum 100 ms, 10 μs to 600 s in zero span
Sweep Time Accuracy	± 2 % in zero span

**Bandwidth**

Resolution Bandwidth (RBW)	1 Hz to 3 MHz in 1-3 sequence ± 10% (1 MHz max in zero-span) (-3 dB bandwidth)
Video Bandwidth (VBW)	1 Hz to 3 MHz in 1-3 sequence (-3 dB bandwidth) (auto or manually selectable)
RBW with Quasi-Peak Detection	200 Hz, 9 kHz, 120 kHz (-6 dB bandwidth)
VBW with Quasi-Peak Detection	Auto VBW is On, RBW/VBW = 1

**Spectrum Analyzer** (Continued)**Spectral Purity**

SSB Phase Noise @ 1 GHz	-100 dBc/Hz, -110 dBc/Hz typical @ 10 kHz offset -105 dBc/Hz, -112 dBc/Hz typical @ 100 kHz offset -115 dBc/Hz, -121 dBc/Hz typical @ 1 MHz offset
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**Amplitude Ranges**

Dynamic Range	> 102 dB (2.4 GHz), 2/3 (TOI-DANL) in 1 Hz RBW
Measurement Range	DANL to +26 dBm ( $\geq$ 50 MHz) DANL to 0 dBm (< 50 MHz)
Display Range	1 dB to 15 dB/div in 1 dB steps, ten divisions displayed
Reference Level Range	-120 dBm to +30 dBm
Attenuator Range	0 dB to 55 dB in 5 dB steps
Maximum Continuous Input	+30 dBm
Amplitude Units	Log Scale Modes: dBm, dBV, dBmV, dB $\mu$ V, dBW, dBmW, dB $\mu$ W, dBA, dBmA, dB $\mu$ A Linear Scale Modes: nV, $\mu$ V, mV, V, kV, nW, $\mu$ W, mW, W, kW, nA, $\mu$ A, mA, A

**Amplitude Accuracy**

9 kHz to 100 kHz	$\pm$ 2.0 dB typical (Preamp Off)
100 kHz to 4.0 GHz	$\pm$ 1.25 dB, $\pm$ 0.5 dB typical
> 4.0 GHz to 6 GHz	$\pm$ 1.50 dB, $\pm$ 0.5 dB typical

**Displayed Average Noise Level (DANL)**

(RBW = 1 Hz, 0 dB attenuation)	Preamp Off (Reference Level -20 dBm)		Preamp On (Reference Level -50 dBm)	
	Maximum	Typical	Maximum	Typical
10 MHz to 2.4 GHz	-141 dBm	-146 dBm	-157 dBm	-162 dBm
> 2.4 GHz to 4 GHz	-137 dBm	-141 dBm	-154 dBm	-159 dBm
> 4 GHz to 5 GHz	-134 dBm	-138 dBm	-150 dBm	-155 dBm
> 5 GHz to 6 GHz	-126 dBm	-131 dBm	-143 dBm	-150 dBm

**Spurs**

Residual Spurious	< -90 dBm (RF input terminated, 0 dB input attenuation, > 10 MHz)
Input-Related Spurious	< -75 dBc (0 dB attenuation, -30 dBm input, span < 1.7 GHz, carrier offset > 4.5 MHz)
Exceptions, typical	< -70 dBc @ <2.5 GHz, with 2072.5 MHz Input < -68 dBc @ F1 - 280 MHz with F1 Input < -70 dBc @ F1 + 190.5 MHz with F1 Input < -52 dBc @ 7349 - (2F2) MHz, with F2 Input, where F2 < 2437.5 MHz < -55 dBc @ 190.5 $\pm$ (F1/2) MHz, F1 < 1 GHz

**Third-Order Intercept (TOI)**

	Preamp Off (-20 dBm tones 100 kHz apart, 10 dB attenuation)
800 MHz	+16 dBm
2400 MHz	+20 dBm
200-2200 MHz	+25 dBm, typical
> 2.2 GHz to 5.0 GHz	+28 dBm, typical
> 5.0 GHz to 6.0 GHz	+33 dBm, typical

**Second Harmonic Distortion**

	Preamp Off, 0 dB input attenuation, -30 dBm input
50 MHz	-56 dBc
> 50 MHz to 200 MHz	-60 dBc, typical
> 200 MHz to 3000 MHz	-70 dBc, typical

**VSWR**

2:1, typical

**Bias-Tee (Option 10)**

Setup	On/Off, Voltage, Current (Low/High)
Voltage Range	+12 V to +32 V
Current (Low/High)	250 mA/450 mA, 1 A surge for 100 ms
Resolution	0.1 V

**Coverage Mapping (Option 431)****Measurements**

Indoor Mapping	Outdoor Mapping
RSSI	RSSI
ACPR	ACPR

**Setup Parameters**

Frequency	Center/Start/Stop, Span, Freq Step, Signal Standard, Channel #, Channel Increment
Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
BW	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/VBW
Measurement Setup	ACPR, RSSI
Point Distance / Time Setup	Repeat Type Time Distance
Save Points Map	Save KML, JPEG, Tab Delimited
Recall Points Map	Recall Map, Recall KML Points only, Recall KML Points with Map, Recall Default Grid

**Electromagnetic Field Test (EMF) (Option 444)****Measurements**

Setup	Limit lines, axis dwell time, measurement time, auto-logging, measurement units, trace display
Spectrum Analyzer	Field strength is measured
LTE OTA, TD-LTE OTA	P-SS, S-SS, and RS are measured and displayed based on each Cell ID received
W-CDMA OTA	P-CPICH signals are measured and displayed for each Scrambling Code measured
Units	Spectrum Analyzer: dBm/m <sup>2</sup> , dBV/m, dBmV/m, dBuV/m, V/m, W/m <sup>2</sup> , dBW/m <sup>2</sup> , A/m, dBA/m, W/cm <sup>2</sup> LTE OTA, TD-LTE OTA: dBm/m <sup>2</sup> , V/m, W/m <sup>2</sup> W-CDMA OTA: dBm/m <sup>2</sup> , V/m, W/m <sup>2</sup> , % of Limit (V/m), % of Limit (W/m <sup>2</sup> )
Results	Maximum, minimum, and average of all measurements conducted
Display	Measurement status, number of measurements taken, pass/fail indicators

**Frequency Range**

MS2712E	700 MHz to 4 GHz using 2000-1791-R antenna
MS2713E	700 MHz to 6 GHz using 2000-1791-R antenna

**Supported Antennas**

700 MHz to 6 GHz, Anritsu 2000-1791-R

**Modes where EMF Measurements Available**

Spectrum Analyzer  
 LTE OTA (Options 546, 883)  
 TD-LTE OTA (Options 556, 883)  
 W-CDMA OTA (Options 35, 881)

**Ethernet Connectivity (Option 411)**

Connector	RJ45
LAN Speed	10 Mbps
Mode	Static, DHCP
Static IP settings	IP address Subnet Mask IP Gateway
Remote Control	Remote capability provided with Web Remote Control
Data Upload	With Line Sweep Tools through LAN connection

 **Interference Analyzer (Option 25)**
**Measurements**

Spectrum	Field Strength Occupied Bandwidth Channel Power Adjacent Channel Power Ratio (ACPR) AM/FM/SSB Demodulation (Wide/Narrow FM, Upper/Lower SSB - audio out only) Carrier-to-Interference ratio (C/I)
Spectrogram	Collect data up to one week
Signal Strength	Gives visual and aural indication of signal strength
Received Signal Strength Indicator	Collect data up to one week
Signal ID	Up to 12 signals Center Frequency Bandwidth Signal Type (FM, GSM, W-CDMA, CDMA, Wi-Fi) Closest Channel Number Number of Carriers Signal-to-Noise Ratio (SNR) > 10 dB
Interference Mapping	Draw multiple bearings of signal strength from GPS location on on-screen map Pan and Zoom on-screen maps Support for MA2700A Handheld Interference Hunter (see Optional Accessories)
Application Options	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)

**GPS Receiver Option (Option 31)** (Antenna sold separately)
**General**

Setup	On/Off, Antenna Voltage 3.3/5.0 V, GPS Info
GPS Time/Location Indicator	Time, Latitude, Longitude and Altitude on display Time, Latitude, Longitude and Altitude with trace storage
High Frequency Accuracy	Spectrum Analyzer, Interference Analyzer, CW Signal Analyzers < ± 50 ppb with GPS On, GPS antenna connected, 3 minutes after satellite lock in selected mode
Connector	SMA, Female

 **Tracking Generator Option (Option 20)**
**Setup Parameters**

Measure Set-up	Off/On, Output Power, Reset Sweep, Insertion Loss, Abs Max, Min, Avg (On/Off)
Insertion Loss Set-up	Normalize (Off/On), Rel Reference, Rel Scale, Transmission, Min, Avg (Off, On) RL Offset
Frequency Range	500 kHz to 4.0 GHz (MS2712E), 500 kHz to 6.0 GHz (MS2713E)
Output Power Range	-50 dBm to 0 dBm
Step Size	0.1 dB nominal
Output Flatness	± 1.0 dB max, ± 0.3 dB typical*
Zero Span Behavior	CW Output
Output Connector	Type N female, 50 Ω
Damage Level	+ 23 dBm ± 50 VDC (limited dv/dt)

\* Using field calibration, relative to spectrum analyzer input with ≥ 3 dB attenuator

 **Channel Scanner (Option 27)**
**General**

Number of Channels	1 to 20 Channels
Measurements	Graph/Table, Max Hold (On/5 s/Off), Freq/Channel, Current/Max, Single/Dual Color
Scanner	Scan Channels, Scan Frequencies, Scan Customer List, Scan Script Master™
Amplitude	Reference Level, Scale
Custom Scan	Signal Standard, Channel, # of Channels, Channel Step Size, Custom Scan
Frequency Range	9 kHz to 4 GHz (MS2712E), 9 kHz to 6 GHz (MS2713E)
Frequency Accuracy	± 10 Hz + Time base error
Measurement Range	-110 dBm to +26 dBm
Application Options	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)

**Gated Sweep (Option 90)****General**

Mode	Spectrum Analyzer, Sweep
Trigger	External TTL
Setup	Gated Sweep (On/Off)
	Gate Polarity (Rising, Falling)
	Gate Delay (0 ms to 65 ms typical)
	Gate Length (1 $\mu$ s to 65 ms typical)
	Zero Span Time

**20 MHz BW Demod (Option 9)**

Required for all signal analyzers except AM/FM/PM Signal Analyzer, Option 509

**Power Meter (Option 29)****General**

Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Full Band
Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale
Average	Acquisition Fast/Med/Slow, # of Running Averages
Limits	Limit On/Off, Limit Upper/Lower
Frequency Range	10 MHz to 4 GHz (MS2712E), 10 MHz to 6 GHz (MS2713E)
Span	1 kHz to 100 MHz
Display Range	-140 dBm to +30 dBm, $\leq$ 40 dB span
Measurement Range	-120 dBm to +26 dBm
Offset Range	0 dB to +100 dB (External Gain or Loss)
VSWR	2:1 typical
Maximum Power	+30 dBm without attenuator
Accuracy	Same as Spectrum Analyzer
Application Options	Impedance (50 $\Omega$ , 75 $\Omega$ , Other)

**High Accuracy Power Meter (Option 19)** (Requires external USB Power Sensor)

Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale
Average	# of Running Averages, Max Hold
Zero/Cal	Zero On/Off, Cal Factor (Center Frequency, Signal Standard)
Limits	Limit On/Off, Limit Upper/Lower

Power Sensor Model	MA24105A	MA24106A	MA24108A/18A/26A	MA24208A/18A
Description	Inline Peak Power Sensor	RF USB Power Sensor	Microwave USB Power Sensor	Microwave Universal USB Power Sensor
Frequency Range	350 MHz to 4 GHz	50 MHz to 6 GHz	10 MHz to 8/18/26 GHz	10 MHz to 8/18 GHz
Connector	Type N(f), 50 $\Omega$	Type N(m), 50 $\Omega$	Type N(m), 50 $\Omega$ (8/18 GHz) Type K(m), 50 $\Omega$ (26 GHz)	Type N(m), 50 $\Omega$
Dynamic Range	+3 dBm to +51.76 dBm (2 mW to 150 W), +33 dBm to +45.77 dBm (2 W to 300 W)	-40 dBm to +23 dBm (0.1 $\mu$ W to 200 mW)	-40 dBm to +20 dBm (0.1 $\mu$ W to 100 mW)	-60 dBm to +20 dBm (1 nW to 100 mW)
Measurand	True-RMS and Peak (4 MHz VBW)	True-RMS	True-RMS, Slot Power, Burst Average Power	True-RMS, Slot Power
Measurement Uncertainty	$\pm$ 0.17 dB <sup>1</sup>	$\pm$ 0.16 dB <sup>2</sup>	$\pm$ 0.18 dB <sup>3</sup>	$\pm$ 0.17 dB <sup>4</sup>
Data Sheet (for complete specifications)	11410-00621	11410-00424	11410-00504	11410-00841A

- Notes:
- Expanded uncertainty with  $K = 2$  for power measurements of a CW signal greater than +20 dBm with a matched load. Measurement results referenced to the input side of the sensor.
  - Total RSS measurement uncertainty (0  $^{\circ}$ C to 50  $^{\circ}$ C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
  - Expanded uncertainty with  $K = 2$  for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
  - Power uncertainty expressed with two sigma confidence level for CW measurement after zero operation. Includes calibration factor and linearity over temperature uncertainties, but not the effects of mismatch, zero set and drift, or noise.

**LTE/LTE-A Signal Analyzers (Options 541, 542, 546, 551, 552, 556, or 883)**

**Measurements**

(Option 883 - combines functionality of Options 541, 542, 546, 551, 552, and 556)

<b>RF (Option 541 FDD) (Option 551 TDD)</b>	<b>Modulation (Option 542 FDD) (Option 552 TDD)</b>	<b>Over-the-Air (OTA) (Option 546 FDD) (Option 556 TDD)</b>	<b>Pass/Fail (User Editable)</b>
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time (TDD only) Frame View Sub-Frame View Total Frame Power DwPTS Power Transmit Off Power Cell ID Timing Error ACLR Spectral Emission Mask Category A or B (Opt 1) RF Summary	Power vs. Resource Block (RB) RB Power (PDSCH) Active RBs, Utilization % Channel Power, Cell ID OSTP, Frame EVM by modulation Constellation QPSK, 16 QAM, 64 QAM Modulation Results Ref Signal Power (RS) Sync Signal Power (SS) EVM - rms, peak, max hold Frequency Error - Hz, ppm Carrier Frequency Cell ID Control Channel Power Bar Graph or Table View RS, P-SS, S-SS PBCH, PCFICH, PHICH, PDCCH Total Power (Table View) EVM per Control Channel Tx Time Alignment Modulation Summary Includes EVM by modulation Antenna Icons Detects active antennas (1/2)	Scanner Cell ID (Group, Sector) S-SS Power, RSRP, RSRQ, SINR Dominance Modulation Results - On/Off Auto Save - On/Off Tx Test Scanner RS Power of MIMO antennas Cell ID, Average Power Delta Power (Max-Min) Graph of Antenna Power Modulation Results - On/Off Mapping On-screen S-SS Power, RSRP, RSRQ, or SINR Scanner Modulation Results - Off Carrier Aggregation Up to 5 component carriers (CC1 to CC5) CP, MIMO status, RS & SS Power, EVM, Frequency Error, Time Alignment Error, Cell ID	View Pass/Fail Limits All, RF, Modulation  Available Measurements Channel Power Occupied Bandwidth ACLR Frequency Error Carrier Frequency Dominance EVM peak, rms Frame EVM, rms Frame EVM by mod type RS, SS Power RS EVM P-SS, S-SS, Power, EVM PBCH, PCFICH, PHICH, PDCCH Power, EVM Cell, Group, Sector ID OSTP Tx Time Alignment Frame Power (TDD only) DwPTS Power (TDD only) Transmit Off Power (TDD only) Timing Error (TDD only)

**Setup Parameters**

Frequency	E-UTRA FDD bands 1 - 14, 17 - 21, 23 - 28 (tunable 10 MHz to 4.0 GHz) E-UTRA TDD bands 33 - 44 (tunable 10 MHz to 4.0 GHz) Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Bandwidth (MHz)	1.4, 3, 5, 10, 15, 20
Span (MHz)	Auto, 1.4, 3, 5, 10, 15, 20, 30
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Cyclic Prefix (CP)	Auto, Normal, Extended
EVM Mode	Auto, PBCH only, Max Hold
Sync Type	Normal (SS), RS/Cell ID
Trigger	No Trigger/Ext Trigger, Rising/Falling (TDD Only)
Uplink/Downlink Configuration	0 to 6 (TDD Only)
Save/Recall	Setup, Measurement, Screen Shot (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements



**LTE/LTE-A Signal Analyzers (Options 541, 542, 546, 551, 552, 556, or 883)** (Continued)**LTE/LTE-A RF Measurements (Options 541, 551, 883)**

RF Channel Power Accuracy	± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +10 dBm) (Option 541) ± 1.5 dB, ± 1.0 dB typical, (RF input -30 dBm to +10 dBm) (Option 551)
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**LTE/LTE-A Modulation Measurements (Options 542, 552, 883)**

Frequency Error	± 10 Hz + time base error, 99 % confidence level
Residual EVM (rms) (FDD only)	2.0% typical (E-UTRA Test Model 3.1, RF Input -50 dBm to +10 dBm) for BW ≤ 10 MHz 2.5% typical (E-UTRA Test Model 3.1, RF Input -50 dBm to +10 dBm) for BW > 10 MHz
Residual EVM (rms) (TDD only)	2.0% typical (E-UTRA Test Model 3.1, RF Input -30 dBm to +10 dBm) for BW ≤ 10 MHz 2.5% typical (E-UTRA Test Model 3.1, RF Input -30 dBm to +10 dBm) for BW > 10 MHz

**LTE/LTE-A Over-the-Air (OTA) Measurements (Options 546, 556, 883)**

Scanner	Six strongest signals if present Auto Save — Sync Signal Power and Modulation Results with GPS tagging information
Tx Test	Scanner — three strongest signals if present RS Power — strongest signal
Mapping	Map On-screen S-SS Power, RSRP, RSRQ, or SINR of Cell ID with strongest signal Scanner — three strongest signals if present Save and Export Mapping data: KML, MTD (tab delimited)
Carrier Aggregation	Up to 5 component carriers specified (CC1 to CC5) Automatic detection of CP and MIMO status for each active CC RS Power & RS Delta Power, SS Power, EVM (peak and rms), Freq Error (Hz & ppm), TAE, Cell ID

**GSM/EDGE Signal Analyzers (Options 40, 41, or 880)****Measurements****(Option 880 - combines functionality of Options 40 and 41)**

<b>RF (Option 40)</b>	<b>Demodulation (Option 41)</b>	<b>Over-the-Air (OTA)</b>	<b>Pass/Fail (User Editable)</b>
Channel Spectrum	Phase Error	There are no additional OTA Measurements RF and Demodulation measurements can be made OTA	View Pass/Fail Limits GSM, EDGE
Channel Power	EVM		Available Measurements
Occupied Bandwidth	Origin Offset		Channel Power
Burst Power	C/I		Occupied Bandwidth
Average Burst Power	Modulation Type		Burst Power
Frequency Error	Magnitude Error		Average Burst Power
Modulation Type	BSIC (NCC, BCC)		Frequency Error
BSIC (NCC, BCC)			Phase Error
Multi-channel Spectrum			EVM
Power vs. Time (Frame/Slot)			Origin Offset
Channel Power			C/I
Occupied Bandwidth			Magnitude Error
Burst Power			Script Master™
Average Burst Power			
Frequency Error			
Modulation Type			
BSIC (NCC, BCC)			

**Setup Parameters**

GSM/EDGE Select	Auto, GSM, EDGE
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements

**RF Measurements (Options 40, 880)** (Temperature range 15 °C to 35 °C)

Frequency Error	± 10 Hz + time base error, 99 % confidence level
Occupied Bandwidth	Bandwidth within which lies 99 % of the power transmitted on a single channel
Burst Power Error	± 1.5 dB, ± 1 dB typical, (-50 dBm to +20 dBm)

**Demodulation (Options 41, 880)** (Temperature range 15 °C to 35 °C)

GMSK Modulation Quality (RMS Phase)	
Measurement Accuracy	± 1 deg
Residual Error (GMSK)	1 deg
8 PSK Modulation Quality (EVM)	
Measurement Accuracy	± 1.5 %
Residual Error (8 PSK)	2.5 %

 **W-CDMA/HSPA+ Signal Analyzers (Options 44, 65, 35, or 881)**

**Measurements**

(Option 881 - combines functionality of Options 44, 65, and 35)

<b>RF (Option 44)</b>	<b>Demodulation (Option 65)</b>	<b>Over-the-Air (OTA) (Option 35)</b>	<b>Pass/Fail (User Editable)</b>
Band Spectrum Channel Spectrum Channel Power Occupied Bandwidth Peak-to-Average Power Spectral Emission Mask Single Carrier ACLR Multi-carrier ACLR RF Summary	Code Domain Power Graph P-CPICH Power Channel Power Noise Floor EVM Carrier Feed Through Peak Code Domain Error Carrier Frequency Frequency Error Control Channel Power Abs/Rel/Delta Power CPICH, P-CCPCH S-CCPCH, PICH P-SCH, S-SCH HSPA+ Power vs. Time Constellation Code Domain Power Table Code, Status EVM, Modulation Type Power, Code Utilization Power Amplifier Capacity Codogram Modulation Summary	Scrambling Code Scanner (Six) Scrambling Codes CPICH $E_c/I_0$ $E_c$ Pilot Dominance OTA Total Power Multipath Scanner (Six) Six Multipaths Tau Distance RSCP Relative Power Multipath Power	View Pass/Fail Limits All, RF, Demod Available Measurements Max Output Power Frequency Error EVM CPICH Occupied Bandwidth Spectral Mask ACLR PCDE P-CCPCH S-CCPCH Code Spread 3 PICH Code 128 Script Master™ Test Models 1 (16), (32), (64) 2 3 (16), (32) 4 (+CPICH), (-CPICH) 5 (2 HS), (4 HS), (8 HS)

**Setup Parameters**

Scrambling Code, Threshold User Selectable	Auto, Manual Scrambling Code, S-CCPCH Spread, S-CCPCH Code, PICH Code, Threshold, Max Amp Power, CPICH Power, Frequency Error Average
Maximum Spreading Factor	256, 512
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Marker	Six Markers, Table On/Off
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**RF Measurements (Options 44, 881)** (Temperature range 15 °C to 35 °C)

RF Channel Power Accuracy	± 1.25 dB, ± 0.7 dB typical, (temperature range 15 °C to 35 °C)
Occupied Bandwidth Accuracy	± 100 kHz
Adjacent Channel Leakage Ratio (ACLR)	-54 dB/-59 dB ± 0.8 dB @ 5 MHz/10 MHz offset, typical, 824 MHz to 894 MHz, 1710 MHz to 2170 MHz -54 dB/-57 dB ± 1.0 dB @ 5 MHz/10 MHz offset, typical, 2300 MHz to 2700 MHz

**Demodulation (Options 65, 881)** (Temperature range 15 °C to 35 °C)

W-CDMA Modulations	QPSK, QPSK-DTX (Codecs: AMR 4.75, 5.9, 7.4, 12.2 kbps, DTX 7.4, 12,2 kbps)
HSPA+ Modulations	QPSK, 16 QAM, 64 QAM
Frequency Error	± 10 Hz + time base error, 99% confidence level
EVM Accuracy	± 2.5 %, 6% ≤ EVM ≤ 25%
Residual EVM	3.25% typical
Code Domain Power	± 0.5 dB for code channel power > -25 dB, 16, 32, 64 DCPH (test model 1), 16, 32 DCPH (test model 2, 3)
CPICH (dBm) Accuracy	± 0.8 dB typical

**Over-the-Air (OTA) Measurements (Options 35, 881)**

Scrambling Code Scanner	Six strongest Scrambling Codes
Multipath Scanner	Multipath power of six signals relative to strongest pilot

**CDMA Signal Analyzers (Options 42, 43, 33, or 884)****Measurements****(Option 884 - combines functionality of Options 42, 43, 33, 62, 63, and 34)**

<b>RF (Option 42)</b>	<b>Demodulation (Option 43)</b>	<b>Over-the-Air (OTA) (Option 33)</b>	<b>Pass/Fail (User Editable)</b>
Channel Spectrum Channel Power Occupied Bandwidth Peak-to-Average Power Spectral Emission Mask Single Carrier ACPR Multi-carrier ACPR RF Summary	Code Domain Power Graph Pilot Power Channel Power Noise Floor Rho Carrier Feed Through Tau RMS Phase Error Frequency Error Abs/Rel/ Power Pilot Page Sync Q Page Code Domain Power Table Code Status Power Multiple Codes Code Utilization Modulation Summary	Pilot Scanner (Nine) PN $E_C/I_0$ Tau Pilot Power Channel Power Pilot Dominance Multipath Scanner (Six) $E_C/I_0$ Tau Channel Power Multipath Power Limit Test - 10 Tests Averaged Rho Adjusted Rho Multipath Pilot Dominance Pilot Power Pass/Fail Status	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth Peak-to-Average Power Spectral Mask Test Frequency Error Channel Frequency Pilot Power Noise Floor Rho Carrier Feed Through Tau RMS Phase Error Code Utilization Measured PN Pilot Dominance Multipath Power

**Setup Parameters**

PN Setup	PN Trigger (No Trigger, GPS, External), PN Search Type (Auto, Manual), PN Offset
Walsh Codes	64, 128
Measurement Speed	Fast, Normal, Slow
External Trigger Polarity	Rising, Falling
Number of Carriers	1 to 5
Carrier Bandwidth (MHz)	1.23, 1.24, 1.25
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**RF Measurements (Options 42, 884)** (Temperature range 15 °C to 35 °C)RF Channel Power Accuracy  $\pm 1.5$  dB,  $\pm 1.0$  dB typical, (RF input -50 dBm to +20 dBm)**Demodulation (Options 43, 884)** (Temperature range 15 °C to 35 °C)

Frequency Error	$\pm 10$ Hz + time base error, 99 % confidence level (in slow mode)
Rho Accuracy	$\pm 0.005$ , for Rho > 0.9
Residual Rho	> 0.995, typical, > 0.99 maximum, (RF input -50 dBm to +20 dBm)
PN Offset	1 x 64 chips
Pilot Power Accuracy	$\pm 1.0$ dB typical, relative to channel power
Tau	$\pm 0.5$ $\mu$ s typical, $\pm 1.0$ $\mu$ s maximum

**Over-the-Air (OTA) Measurements (Options 33, 884)**

Pilot Scanner	Nine strongest pilots
Multipath Scanner	Multipath power of six signals relative to strongest pilot
Limit Test	Average of ten tests compared to limit

 **EV-DO Signal Analyzers (Options 62, 63, 34, or 884)**

**Measurements**

(Option 884 - combines functionality of Options 42, 43, 33, 62, 63, and 34)

<b>RF (Option 62)</b>	<b>Demodulation (Option 63)</b>	<b>Over-the-Air (OTA) (Option 34)</b>	<b>Pass/Fail (User Editable)</b>
Channel Spectrum Channel Power Occupied Bandwidth Peak-to-Average Power Power vs. Time Pilot & MAC Power Channel Power Frequency Error Idle Activity On/Off Ratio Spectral Emission Mask Single Carrier ACPR Multi-carrier ACPR RF Summary	MAC Code Domain Power Graph Pilot & MAC Power Channel Power Frequency Error Rho Pilot Rho Overall Data Modulation Noise Floor MAC Code Domain Power Table Code Status Power Code Utilization Data Code Domain Power Active Data Power Data Modulation Rho Pilot Rho Overall Maximum Data CDP Minimum Data CDP Modulation Summary	Pilot Scanner (Nine) PN E <sub>c</sub> /I <sub>0</sub> Tau Pilot Power Channel Power Pilot Dominance Multipath Scanner (Six) E <sub>c</sub> /I <sub>0</sub> Tau Channel Power Multipath Power	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth Peak-to-Average Power Carrier Frequency Frequency Error Spectral Mask Noise Floor Pilot Power RMS Phase Error Tau Code Utilization Measured PN Pilot Dominance Multipath Power

**Setup Parameters**

PN Setup	PN Trigger (No Trigger, GPS, External), PN Search Type (Auto, Manual), PN Offset
Walsh Codes	64, 128
Measurement Speed	Fast, Normal, Slow
External Trigger Polarity	Rising, Falling
Slot Type	Auto, Active, Idle
Number of Carriers	1 to 5
Carrier Bandwidth (MHz)	1.23, 1.24, 1.25
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**RF Measurements (Options 62, 884)** (Temperature range 15 °C to 35 °C)

RF Channel Power Accuracy ± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +20 dBm)

**Demodulation (Options 63, 884)** (Temperature range 15 °C to 35 °C)

EV-DO Compatibility	Rev 0 and Rev A
Frequency Error	± 10 Hz + time base error, 99 % confidence level
Rho Accuracy	± 0.01, for Rho > 0.9
Residual Rho	> 0.995 typical, > 0.99, maximum (RF input -50 dBm to +20 dBm)
PN Offset	Within 1 x 64 chips
Pilot Power Accuracy	± 1.0 dB typical, relative to channel power
Tau	± 0.5 µs typical, ±1.0 µs maximum

**Over-the-Air (OTA) Measurements (Options 34, 884)**

Pilot Scanner	Nine strongest pilots
Multipath Scanner	Multipath power of six signals relative to strongest pilot

**Fixed WiMAX Signal Analyzers (Options 46, 47, or 885)****Measurements****(Option 885 - combines functionality of Options 46, 47, 66, 67, and 37)**

<b>RF (Option 46)</b>	<b>Demodulation (Option 47)</b>	<b>Over-the-Air (OTA)</b>	<b>Pass/Fail (User Editable)</b>
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time Channel Power Preamble Power Data Burst Power Crest Factor ACPR RF Summary	Constellation RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error Carrier Frequency Base Station ID Spectral Flatness Adjacent Subcarrier Flatness EVM vs. Subcarrier/Symbol RCE EVM Frequency Error Carrier Frequency Base Station ID Modulation Summary	There are no additional OTA Measurements RF and Demodulation measurements can be made OTA	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Base Station ID

**Setup Parameters**

Bandwidth (MHz)	1.25, 1.50, 2.50, 3.50, 5.00, 5.50, 6.00, 7.00, 10.00
Cyclic Prefix Ratio (CP)	1/4, 1/8, 1/16, 1/32
Span (MHz)	5, 10, 15, 20
Frame Length (ms)	2.5, 5.0, 10.0
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**RF Measurements (Options 46, 885)** (Temperature range 15 °C to 35 °C)

RF Channel Power Accuracy ± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +20 dBm)

**Demodulation (Options 47, 885)** (Temperature range 15 °C to 35 °C)

Frequency Error 0.07 ppm + time base error, 99 % confidence level  
Residual EVM (rms) 3 % typical, 3.5 % maximum (RF Input -50 dBm to +20 dBm)



**Mobile WiMAX Signal Analyzers (Options 66, 67, 37, or 885)**

**Measurements**

(Option 885 - combines functionality of Options 46, 47, 66, 67, and 37)

<b>RF (Option 66)</b>	<b>Demodulation (Option 67)</b>	<b>Over-the-Air (OTA) (Option 37)</b>	<b>Pass/Fail (User Editable)</b>
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time Channel Power Preamble Power Downlink Burst Power Uplink Burst Power ACPR Spectral Emission Mask RF Summary	Constellation RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error CINR Base Station ID Sector ID Spectral Flatness Adjacent Subcarrier Flatness EVM vs. Subcarrier/Symbol RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error CINR Base Station ID Sector ID DL-MAP (Tree View) Modulation Summary	Channel Power Monitor Preamble Scanner (Six) Preamble Relative Power Cell ID Sector ID PCINR Dominant Preamble Base Station ID Auto Save - On/Off	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth Downlink Burst Power Uplink Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Sector ID

**Setup Parameters**

Zone Type	PUSC
DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)
Bandwidth (MHz)	3.50, 5.00, 7.00, 8.75, 10.00
Cyclic Prefix Ratio (CP)	1/8
Span (MHz)	5, 10, 20, 30
Frame Length (ms)	5, 10
Demodulation	Auto, Manual, FCH
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**RF Measurements (Options 66, 885)** (Temperature range 15 °C to 35 °C)

RF Channel Power Accuracy ± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +20 dBm)

**Demodulation (Options 67, 885)** (Temperature range 15 °C to 35 °C)

Frequency Error 0.02 ppm + time base error, 99 % confidence level  
Residual EVM (rms) 2.5 % typical, 3.0 % maximum, (RF Input -50 dBm to +20 dBm)

**Over-the-Air (OTA) Measurements (Options 37, 885)**

Channel Power Monitor	Over time (one week), measurement time interval 1 s to 60 s
Preamble Scanner	Six Strongest Preambles
Auto Save	Yes
GPS Logging	Yes

\*These options conform to IEEE Std. 802.16e-2005, WiMAX Forum® Air Interface - Mobile System Profile - Release 1.0 Certified, System Profiles according to WMF-T24-001-R010v07.

**TD-SCDMA/HSPA+ Signal Analyzers (Options 60, 61, 38, or 882)****Measurements****(Option 882 - combines functionality of Options 60, 61, and 38)**

<b>RF (Option 60)</b>	<b>Demodulation (Option 61)</b>	<b>Over-the-Air (OTA) (Option 38)</b>	<b>Pass/Fail (User Editable)</b>
Channel Spectrum	Code Domain Power/Error (QPSK/8 PSK/16 QAM/64 QAM)	Code Scan (32)	View Pass/Fail Limits
Channel Power	Slot Power	Scrambling Code Group	All, RF, Demod
Occupied Bandwidth	DwPTS Power	Tau	Available Measurements
Left Channel Power	Noise Floor	$E_C/I_O$	Occupied Bandwidth
Left Channel Occ B/W	Frequency Error	DwPTS Power	Channel Power
Right Channel Power	Tau	Pilot Dominance	Channel Power RCC
Right Channel Occ B/W	Scrambling Code	Tau Scan (Six)	On/Off Ratio
Power vs. Time	EVM	Sync-DL#	Peak-to-Average Ratio
Six Slot Powers	Peak EVM	Tau	Frequency Error
Channel Power (RRC)	Peak Code Domain Error	$E_C/I_O$	EVM
DL-UL Delta Power	CDP Marker	DwPTS Power	Peak EVM
UpPTS Power	Modulation Summary	Pilot Dominance	Peak Code Domain Error
DwPTS Power		Record	Tau
On/Off Ratio		Run/Hold	Noise Floor
Slot Peak-to-Average Power			
Spectral Emission			
RF Summary			

**Setup Parameters**

Slot Selection	Auto, 0-6
Trigger	Trigger Type (No Trigger/GPS/External), External Trigger (Rising/Falling), Tau Offset
SYNC-DL Code	Auto, 0 – 31
Scrambling/Midamble Code	Auto, 0 – 127
Maximum Users	Auto, 2, 4, 6, 8, 10, 12, 14, 16
Measurement Speed	Fast, Normal, Slow
User Selectable	Uplink Switch Point, Number of Carriers (1, 3), Tau Offset
Demodulation Type	Auto, QPSK, 8 PSK, 16 QAM, 64 QAM
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Sweep	Hold/Run, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**RF Measurements (Options 60, 882)** (Temperature range 15 °C to 35 °C)

RF Channel Power Accuracy (RRC)	± 1.5 dB, ±1.0 dB typical, (slot power -40 dBm to +10 dBm)
Frequency Error	±10 Hz + time base error, in the presence of a downlink slot

**Demodulation (Options 61, 882)** (Temperature range 15 °C to 35 °C)

Supported Modulation	QPSK, 8 PSK, 16 QAM, 64 QAM
Residual EVM (rms)	3% typical, P-CCPH slot power > -50 dBm
PN Offset	Within 1 x 64 chips
Pilot Power Accuracy	± 1.0 dB typical
Timing Error (Tau) for Dominant SYNC-DL	± 0.2 μs (external trigger)
Spreading Factor	1, 16

**Over-the-Air (OTA) Measurements (Options 38, 882)**

Code Scanner	32 Sync Codes and associated Scrambling Code Groups
Tau Scanner	Six strongest Sync Codes
Auto Save	Yes
GPS Logging	Yes



**ISDB-T Measurements (Options 30, 79, 32)**

For full specifications, refer to the Digital Broadcast Analysis Options Technical Data Sheet 11410-00624

**Measurements**

ISDB-T RF (Option 30)	ISDB-T Signal Analysis (Option 30)	ISDB-T BER Analysis (Option 79)	ISDB-T SFN Analysis (Option 32)
Signal Power Channel Power Termination Voltage Open Terminal Voltage Field Strength	Constellation (w/zoom) Layer A, B, C, TMCC Sub-carrier MER Delay Profile (w/zoom) Frequency Response	Layer A, Layer B, Layer C BER and Error Count per Layer Before RS Before Viterbi PER and Error Count per Layer	Impulse Response (w/zoom) In-band Spectrum Measured Data Channel Power Delay DU Ratio
Spectrum Monitor Channel Power Zone Center Channel Zone Center Frequency Spectrum Mask Mask (Standard A) Japan Mask (Standard B) Japan Mask (Critical) Brazil Mask (Sub-critical) Brazil Mask (Non-critical) Brazil Phase Noise Spurious Emissions	Measured Data Frequency Frequency Offset MER (Total, Layer A/B/C, TMCC, AC1) Modulation (Layer A/B/C) Mode, GI Sub-carrier MER w/marker Delay w/marker Frequency Response w/marker	MPEG Bit Rate per Layer TMCC Information per Layer Modulation Code Rate Interleave Segments Channel Power Mode, GI Signal Sync Status ASI Out	Power Field Strength
<b>ISDB-T Measurement Modes</b>			
Custom: User specified measurements and setup parameters			
Easy: User specified measurements. Some setup parameters are automatically set or detected.			
Batch: User specified measurements and channels for automatic measurement, and display and storage of results			

**Setup Parameters**

Channel Map	UHF (Japan), UHF (Brazil), IF (37.15 MHz), None
Channel	13 to 62 (Japan), 14 to 69 (Brazil)
Frequency	35 MHz to 806 MHz
Bandwidths	6 MHz, 8 MHz
Partial Reception	Recognized when layer A segment count is 1
One-Seg	On: synchronizes with single segment transmission (Bandwidth 6 MHz only) Off: synchronizes with normal 13 segment signal
Pre-amp	On, Off
Reference Level Setting	-25 dBm to +20 dBm/5 dB steps (Preamp Off), -50 dBm to -10 dBm/10 dB steps (Preamp On)

**ISDB-T Digital Video Measurements (Option 30)**

Channel Power Accuracy	± 2 dB, (RF input -84 dBm to -10 dBm)
Frequency Lock Range	± 90 kHz
Frequency Offset Accuracy	± (measurement frequency x reference frequency accuracy) ± 0.3 Hz
Residual MER	≥ 42 dB, typical (Preamp Off, Reference level: -20 dBm) ≥ 37 dB, typical (Preamp On, Reference level: -50 dBm)
Sub-carrier MER Display Range	± 2.785 MHz from center frequency (Bandwidth 6 MHz) ± 3.714 MHz from center frequency (Bandwidth 8 MHz)
Delay Profile Resolution	0.12 µs (Bandwidth 6 MHz) 0.09 µs (Bandwidth 8 MHz)
Frequency Response Resolution	1 kHz, 0.1 dB
Phase Noise Range	-40 dBc/Hz to -140 dBc/Hz
Spurious Emissions Search Range	5 MHz to 5x input signal frequency

**ISDB-T BER Measurements (Option 79)** (Operating temperature range 0 °C to 40 °C)

BER Measurement Display per Layer	Rate and Error count: Before Viterbi, Before RS
PER Measurement Display per Layer	Rate and Error count
TMCC Information Display per Layer	Modulation, Code Rate, Interleave, Number of segments
ASI Output	BNC-J 75 Ω

**ISDB-T SFN Measurements (Option 32)**

Delay Profile Display Range	-1008 µs to +1008 µs (Bandwidth 6 MHz)
Delay Wave Estimated Level Accuracy	± 2.5 dB typical (-10 dBm to -79 dBm)
DU Ratio Accuracy	± 1 dB typical (-10 dBm to -70 dBm)
Inband Spectrum Range	± 2.74 MHz (Mode 2), ± 2.76 MHz (Mode 3) (Bandwidth 6 MHz)



**DVB-T/H (Options 64, 57, 78)**

For full specifications refer to the Digital Broadcast Analysis Options Technical Data Sheet 11410-00624

**Measurements**

<b>DVB-T/H RF (Option 64)</b>	<b>DVB-T/H Signal Analysis (Option 64)</b>	<b>DVB-T/H BER Analysis (Option 57)</b>	<b>DVB-T/H SFN Analysis (Option 78)</b>
Signal Power Channel Power Termination Voltage Open Terminal Voltage Field Strength Spectrum Monitor Channel Power Zone Center Channel Zone Center Frequency Shoulder Attenuation Channel Power Zone Center Channel Zone Center Frequency Lower Shoulder Attenuation Upper Shoulder Attenuation	Composite or Individual Views Constellation Impulse Response (w/zoom) Carrier MER (w/zoom) Freq Response (composite view only) Measured Data Mode, GI Modulation Hierarchy Freq Offset Channel Power MER (Total/Data/TPS) TPS Warning Message TPS Info Interleave Type Cell ID Code Rate (HP/LP) Time Slicing (HP/LP) MPE-FEC (HP/LP)	BER Before RS Before Viterbi PER (Packet) Channel Power MER (Quick) Bit Rate TPS Info Length Indicator Mode, GI Modulation Hierarchy Interleave Type Cell ID Code Rate Time Slicing MPE-FEC TPS Warning Message ASI Out	Impulse Response (w/zoom) Inband Spectrum Measured Data Channel Power Delay DU Ratio Power Field Strength

**Setup Parameters**

Channel Map	UHF (Australia), UHF (Europe), VHF (Europe), None
Channel	28 to 69 (Australia), 21 to 69 (Europe), 5 to 12 (Europe)
Frequency Offset	± 166.666 kHz, ± 333.333 kHz, ± 499.999 kHz, None
Frequency	30 MHz to 2.8 GHz when Channel Map is None
Bandwidth	5*, 6*, 7, 8 MHz
Pre-amp	On, Off
Reference Level	-25 dBm to +20 dBm/5 dB steps (Preamp Off), -50 dBm to -10 dBm/10 dB steps (Preamp On)

**DVB-T/H Digital Video Measurements (Option 64)**

Channel Power Accuracy	± 2 dB, (RF input -84 dBm to -10 dBm)
Frequency Lock Range	± 90 kHz
Frequency Offset Accuracy	± (measurement frequency x reference frequency accuracy) ± 0.3 Hz
Residual MER	≥ 42 dB (Preamp Off, Reference Level: -20 dBm) ≥ 37 dB (Preamp On, Reference Level: -50 dBm)
Impulse Response Resolution	0.11 μs (Bandwidth: 8 MHz), 0.1 dB
Carrier MER Marker	Carrier Number, Offset Frequency and MER
Composite View	Simultaneous display of Constellation (Data and TPS), Impulse Response, Carrier MER and Frequency Response

**DVB-T/H BER Measurements (Option 57)**

Bit Count Setting	Range 1E+6 to 1E+12
Service Type	In Service: BER measurement of normal in-service data traffic Simultaneous BER measurement Before Viterbi and Before RS error correction Out of Service: BER measurement of a PRBS23 data sequence BER measurement point can be selected Before Viterbi, Before RS or After RS
TPS Information	Length indicator, Mode, GI, Modulation, Hierarchy, Inner Interleave, Cell ID, Code Rate, Time Slicing, MPE-FEC
ASI Output	BNC-J 75 Ω

**DVB-T/H SFN Measurements (Option 78)**

Impulse Response Display Range	-896 μs to +896 μs (Bandwidth 8 MHz)
Resolution	0.11 μs (33 m) (Bandwidth 8 MHz)
Marker	Delay time, relative level (DU ratio), power and field strength or termination voltage
Inband Spectrum Range	± 3.804 MHz (Bandwidth 8 MHz)

\*Not available for BER measurements

 **AM/FM/PM Signal Analyzers (Option 509)**

**Measurements**

Display Type	RF Spectrum AM/FM/PM	Audio Spectrum (AM)	Audio Spectrum (FM/PM)	Audio Waveform (AM)	Audio Waveform (FM/PM)	Summary (AM)	Summary (FM/PM)
Graphic Display	Power (dBm) vs. Frequency	Depth (%) vs. Modulation Frequency	Deviation (kHz/rad) vs. Modulation Frequency	Depth (%) vs. Time	Deviation (kHz/rad) vs. Time	None	None
Numerical Displays	Carrier Power Carrier Frequency Occupied Bandwidth	AM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	FM/PM Rate RMS Deviation (Pk-Pk)/2 Deviation SINAD* THD* Distortion/Total Vrms*	AM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	FM/PM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	RMS Depth (AM) Peak + Depth Peak - Depth (Pk-Pk)/2 Depth Carrier Power Carrier Frequency Occupied Bandwidth AM Rate SINAD* THD* Distortion/Total Vrms*	RMS Deviation (FM/PM) Peak + Depth Peak - Depth (Pk-Pk)/2 Depth Carrier Power Carrier Frequency Occupied Bandwidth AM Rate SINAD* THD* Distortion/Total Vrms*

\* Requires Sinewave modulation

**Setup Parameters**

Frequency	Center Freq, Span, Freq Step, Signal Standard, Channel, Channel Increment, Set Carrier Freq
Amplitude	Scale, Power Offset, Adjust Range
Setup	Demod Type (AM, FM, PM), IFBW, Auto IFBW
Measurements	RF Spectrum AM/FM/PM, Audio Spectrum (AM/FM/PM), Audio Waveform (AM/FM/PM), Summary (AM/FM/PM), Average
Marker	On/Off, Delta, Peak Search, Marker Freq to Center, Marker to Ref Lvl, Marker Table, All Markers Off

**Specifications**

AM	Modulation Rate: ± 1 Hz (< 100 Hz), ± 2% (> 100 Hz) Depth: ± 5% for (Modulation rates 10 Hz to 100 kHz)
FM	Modulation Rate: ± 1 Hz (< 100 Hz); ± 2% (100 Hz to 100 kHz) Deviation Accuracy: ± 5% (100 Hz to 100 kHz)**
PM	Modulation Rate: ± 1 Hz (< 100 Hz); ± 2% (100 Hz to 100 kHz) Deviation Accuracy: ± 5% (deviation 0 to 93 Rad, rate 10 Hz to 5 kHz)**
IF bandwidth	1 kHz to 300 kHz in 1-3 sequence
Frequency Span	RF Spectrum: 10 kHz to 10 MHz Audio Spectrum: 2 kHz, 5 kHz, 10 kHz, 20 kHz, 70 kHz, 140 kHz
RBW/VBW	30
Span/RBW	100
Sweep time	50 µs to 50 ms (Audio Waveform)

\*\* IFBW must be greater than 95 % occupied BW

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**General Specifications**


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**Setup Parameters**

System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed) Self Test, Application Self Test GPS (see Option 31)
System Options	Name, Date and Time, Brightness, Volume Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, User defined) Reset (Factory Defaults, Master Reset, Update Firmware)
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Screen Shots (.jpg) (save only)
Delete	Selected File, All Measurements, All Mode Files, All Content
Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy, Format USB
Internal Trace/Setup Memory	2,000 Traces, 2,000 Setups
External Trace/Setup Memory	Limited by size of USB Flash drive
Mode Switching	Auto-Stores/Recalls most recently used Setup Parameters in the Mode

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**Connectors**

RF Out	Type N, female, 50 $\Omega$
RF Out Damage Level	23 dBm, $\pm$ 50 VDC
RF In	Type N, female, 50 $\Omega$
RF In Damage Level	+33 dBm peak, $\pm$ 50 VDC, Maximum Continuous Input ( $\geq$ 10 dB attenuation)
GPS	SMA(f)
External Power	5.5 mm barrel connector, 11.0 to 14.5 VDC, < 4.0 Amps
USB Interface (2)	Type A, Connect USB Flash Drive and Power Sensor
USB Interface	5-pin mini-B, Connect to PC for data transfer
Ethernet Interface	RJ45 connector for Ethernet 10-Base T (available with Ethernet Option 411)
Headset Jack	3.5 mm mini-phone plug
External Reference In	BNC, female, 50 $\Omega$ , Maximum Input +10 dBm, 1 MHz, 5 MHz, 10 MHz, 13 MHz
External Trigger/Clock Recovery	BNC, female, 50 $\Omega$ , Maximum Input $\pm$ 5 VDC

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**Display**

Type	Resistive Touchscreen
Size	8.4 inch daylight viewable color LCD
Resolution	800 x 600
Pixel Defects	No more than one defective pixel (99.9997% good pixels)

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**Battery**

Type	Li-Ion
Battery Operation	3.0 hours, typical
Battery Charging Limits	0 $^{\circ}$ C to +45 $^{\circ}$ C, Relative Humidity $\leq$ 80 %

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**Electromagnetic Compatibility**

European Union	CE Mark, EMC Directive 2004/108/EC Low Voltage Directive 2006/95/EC
Australia and New Zealand	C-tick N274
Interference	EN 61326-1
Emissions	EN 55011
Immunity	EN 61000-4-2/-4-3/-4-4/-4-5/-4-6/-4-11

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**Safety**

Safety Class	EN 61010-1 Class 1
Product Safety	IEC 60950-1 when used with Company supplied Power Supply

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**Warranty**

Duration	Standard three-year warranty One-year warranty on battery
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**General Specifications** (Continued)

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**Environmental**

Operating Temperature	-10 °C to +55 °C
Maximum Humidity	95 % RH (non-condensing) at 40 °C
Shock	MIL-PRF-28800F Class 2
Storage	-40 °C to +71 °C
Altitude	4600 meters, operating and non-operating
Explosive Atmosphere	MIL-PRF-28800F Section 4.5.6.3 MIL-STD-810G, Method 511.5, Procedure 1

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**ESD**

RF Port Center Pin	Withstands up to ± 15 kV
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**Size and Weight**

Size	273 mm x 199 mm x 91 mm (10.7 in x 7.8 in x 3.6 in)
Weight	3.45 kg (7.6 lb)

 **Line Sweep Tools** (for your PC)
**Trace Capture**

Browse to Instrument	View and copy traces from the test equipment to your PC using Windows Explorer
Open Legacy Files	Open DAT files captured with Hand Held Software Tools v6.61
Open Current Files	Open VNA or DAT files
Capture plots To	The Line Sweep Tools screen, DAT files, Database, or JPEG

**Traces**

Trace Types	Return Loss, VSWR, DTF-RL, DTF-VSWR, Cable Loss, and Smith Chart
Trace Formats	DAT, VNA, CSV, PNG, BMP, JPG, HTML, Data Base, and PDF

**Report Generation**

Report Generator	Includes GPS location along with measurements
Report Format	Create reports in HTML or PDF format
Report Setup	Report Title, Company, Prepared for, Location, Date and Time, Filename, Company logo
Trace Setup	1 trace Portrait Mode, 2 Trace Portrait Mode, 1 Trace Landscape Mode

**Trace Validation**

Presets	7 presets allow "one click" setting of up to 6 markers and one limit line
Marker Controls	6 regular Markers, Marker Peak, Marker valley, Marker between, and frequency entry
Delta Markers	6 Delta markers
Limit Line	Enable and drag or value entry. Also works with presets
Next Trace Button	Next Trace and Previous trace arrow keys allow quick switching between traces

**Tools**

Cable Editor	Allows creation of custom cable parameters
Distance to Fault	Converts a Return Loss trace to a Distance to Fault trace
Measurement Calculator	Converts Real, Imaginary, Magnitude, Phase, RL, VSWR, Rho, and Transmit power
Signal Standard Editor	Creates new band and channel tables
Renaming Grid	36 user definable phrases for creation of file names, trace titles, and trace subtitles

**Connectivity**

Connections	Ethernet, USB cable, USB Memory Stick
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 **easyTest Tools™** (for your PC)
**Instrument Modes**


Spectrum Analyzer  
Interference Analyzer  
Channel Scanner  
AM/FM/PM Analyzer

**Commands**

Display Image	Allows putting a custom image on the instrument screen
Recall Setup	Places the instrument into a known state; auto-advance to next command available
Prompt	Displays instructional messages on the instrument screen; timed advance to next command available; instrument users can be allowed or disallowed from making setup adjustments
Save	Allows automatic or manual saving of traces; auto-advance to next command available

**Connectivity**

Connections	Ethernet, USB cable, USB Memory Stick
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 **easyMap Tools™** (create instrument-compatible maps on your PC)
**Outdoor Maps**

On-Line Sources	Google Maps, Cloud Made Open-Source Maps
Pan & Zoom Mode	AZM map file format allows pan and zoom on-instrument
Legacy Mode	MAP format is compatible with older firmware
Geo-Referenced	Works with instrument based GPS
Map Conversion	Convert scanned maps to geo-referenced

**Indoor Maps**

Sources	Scanned images in JPG, JPEG, JPE, JFIF, GIF, TIF, TIFF, PNG
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**General**

Color Filter	Grayscale, High Contrast
Coverage	Worldwide
Zoom Levels	16 total zoom levels, 7 available in any one map
Map Size	Less than 1 MB to over 1 GB


**Master Software Tools** (for your PC)
**Measurement Viewing**

Display	Modify display settings, including scale
Spectrum Traces	Add, delete, and modify limit lines and markers. Overlay traces.
Spectrum Analyzer Measurements	Field Strength, Occupied Bandwidth, Channel Power, ACPR, Emission Mask, C/I <sup>1</sup>
Interference Analyzer Measurements	Spectrograms, Signal Strength Meter, RSSI <sup>2</sup>
Non-Spectrum Measurements	Hi Accuracy Power Meter, Channel Scanner, GSM, WCDMA/HSPA, LTE, TD-LTE, TD-SCDMA, CDMA, EV-DO, Fixed WiMAX, Mobile WiMAX, Screen captures (JPEGs)

1. Spurious Emissions results viewable in a browser  
2. Coverage Mapping and Interference Mapping files viewable in spreadsheet, Google Earth, or Google Maps

**Database Management**

Full Trace Retrieval	Retrieve all traces from instrument into one PC directory (limited to approximately 15,000 files)
Trace Catalog	Index all traces in selected folder & subfolder on PC into one catalog
Trace Rename Utility	Rename measurement traces
Group Edit	Titles, subtitles, plot scaling, markers and limit lines, simultaneously on similar files

**Data Analysis**

Trace Math and Smoothing	Compare multiple traces
Measurement Calculator	Translate into other units

**Report Generation**

Report Generator	Includes GPS, power level, and measurements
Edit Graph	Change scale, limit lines, and markers
Report Format	Create reports in HTML
Export Measurements	Export measurements or entire folders to *.jpg or *.csv format
Notes	Annotate measurements

**Mapping** (GPS required on instrument)

Spectrum Analyzer Mode	MapInfo, MapPoint
Mobile WiMAX OTA, LTE OTA Options	Google Earth, Google Maps, MapInfo

**Spectrogram** (Spectrum Monitoring for Interference Analysis and Spectrum Clearing)

Source	Recorded Spectrogram or multiple spectrum traces
Folder Spectrogram	2D View creates a composite file of multiple traces
Available Displays	Spectrogram, Peak Power vs. Time, Variation in Total Power vs. Time, Peak Frequency vs. Time, Number of Traces Saved vs. Time (useful with Save on Limit Exceeded), Maximum/Average/Minimum Power vs. Time File Filter (Violations over limit lines or deviations from averages) Playback
Display Functions per Trace	Markers, GPS location altitude and time (when recorded), instrument time Filename per trace for Folder Spectrogram
Export to Video	Create AVI file of 2D Spectrogram for management review/reports
Export to 3D Spectrogram	Views (Set Threshold, Markers) - 3D (Rotate X, Y, Z Axis, Level Scale, Signal ID) - 2D (Frequency or Time Domain, Signal ID) - Top Down Playback (Frequency and/or Time Domain)

**List/Parameter Editors**

Antennas, Cables, Signal Standards	Modify instrument's Antenna, Cable, and Signal Standard List
Pass/Fail	Create, download, or edit Signal Analysis Pass/Fail Limits
Script Master	Create Script Master files for GSM/WCDMA or Channel Scanner
Languages	Modify non-English language menus
Mobile WiMAX	DL-MAP Parameters

**Connectivity**

Connections	Connect to PC using USB, LAN, or Direct Ethernet connection
Network Search	Find all Anritsu handheld instruments on local network
Download	Download measurements and live traces to PC for storage and analysis
Upload	Upload measurements and other files from PC to instrument
Export	Measurements can be saved in various formats, depending on the measurement type, including JPEG, CSV, and Anritsu DAT format
Printing	Print individual or all measurement screens


















**Web Remote Control** (enabled with Option 411)

Control	Full instrument control through a browser – all instrument functions except power switch and rotary knob
Connections	RJ45 Ethernet jack Third party Wi-Fi router
Protocol	HTTP/TCP/IP
Physical Layer	Cat 5 Cable, Wi-Fi router compatible
Software Required	HTML 5-compliant browser – Google Chrome, Mozilla Firefox
Operating System	iOS, Windows, Linux, Android operating systems that can host the HTML 5-compliant browser
Remote Hardware	PCs, tablets, and smart phones with Ethernet or Wi-Fi connection and an HTML 5-compliant browser
Download	Individual instrument files downloaded via browser Multiple instrument files and directories zipped and downloaded via browser File downloads are not supported by iOS Screen capture capability
Display Modes	Normal: All modes & displays supported Fast: Spectrum traces update faster (up to 5 updates per second)
Password	The instrument can be password protected Passwords may be used to manage who is controlling the instrument
Users/Instruments	One user/device can view and control many instruments

**Programmable Remote Control**

Functionality	Many instrument functions are programmable. See the Programming Manual for details.
Programming Language	Standard Commands for Programmable Instruments (SCPI)
Interfaces	USB, LAN, and Ethernet
Available Drivers	LabView. Visit NI.com for driver.

Ordering Information – Options

	<b>MS2712E</b>	<b>MS2713E</b>	<b>Description</b>
	9 kHz to 4 GHz	9 kHz to 6 GHz	Spectrum Analyzer
	<b>Options</b>	<b>Options</b>	
	MS2712E-0010	MS2713E-0010	Bias-Tee
	MS2712E-0009	MS2713E-0009	20 MHz Bandwidth Demod
	MS2712E-0031	MS2713E-0031	GPS Receiver (requires Antenna)
	MS2712E-0019	MS2713E-0019	High-Accuracy Power Meter (requires External Power Sensor)
	MS2712E-0029	MS2713E-0029	Power Meter
	MS2712E-0025	MS2713E-0025	Interference Analyzer (Option 31 recommended)
	MS2712E-0027	MS2713E-0027	Channel Scanner
	MS2712E-0431	MS2713E-0431	Coverage Mapping (requires Option 31)
	MS2712E-0444	MS2713E-0444	EMF Measurements (requires Anritsu Isotropic Antenna)
	MS2712E-0090	MS2713E-0090	Gated Sweep
	MS2712E-0020	MS2713E-0020	Tracking Generator
	MS2712E-0509	MS2713E-0509	AM/FM/PM Analyzer
	MS2712E-0040	MS2713E-0040	GSM/EDGE RF Measurements* (cannot be ordered with Option 880)
	MS2712E-0041	MS2713E-0041	GSM/EDGE Demodulation* (cannot be ordered with Option 880)
	MS2712E-0880	MS2713E-0880	GSM/GPRS/EDGE Measurements* (combines functionality of Options 40 and 41. Cannot be ordered with Option 40 or 41)
	MS2712E-0044	MS2713E-0044	W-CDMA/HSPA+ RF Measurements* (cannot be ordered with Option 881)
	MS2712E-0065	MS2713E-0065	W-CDMA/HSPA+ Demodulation* (cannot be ordered with Option 881)
	MS2712E-0035	MS2713E-0035	W-CDMA/HSPA+ OTA Measurements* (Option 31 recommended. Cannot be ordered with Option 881)
	MS2712E-0881	MS2713E-0881	W-CDMA/HSPA+ Measurements* (Option 31 recommended. Combines functionality of Options 44, 65, and 35. Cannot be ordered with Option 44, 65, or 35)
	MS2712E-0060	MS2713E-0060	TD-SCDMA/HSPA+ Measurements* (cannot be ordered with Option 882)
	MS2712E-0061	MS2713E-0061	TD-SCDMA/HSPA+ Demodulation* (cannot be ordered with Option 882)
	MS2712E-0038	MS2713E-0038	TD-SCDMA/HSPA+ OTA Measurements* (requires Option 31 for full functionality. Cannot be ordered with Option 882)
	MS2712E-0882	MS2713E-0882	TD-SCDMA/HSPA+ Measurements* (requires Option 31 for full functionality. Combines functionality of Options 60, 61, and 38. Cannot be ordered with Option 60, 61, or 38)
	MS2712E-0541	MS2713E-0541	LTE/LTE-A RF Measurements* (cannot be ordered with Option 883)
	MS2712E-0542	MS2713E-0542	LTE/LTE-A Modulation Measurements* (cannot be ordered with Option 883)
	MS2712E-0546	MS2713E-0546	LTE/LTE-A OTA Measurements* (requires Option 31 for full functionality. Cannot be ordered with Option 883)
	MS2712E-0551	MS2713E-0551	TD-LTE/LTE-A RF Measurements* (cannot be ordered with Option 883)
	MS2712E-0552	MS2713E-0552	TD-LTE/LTE-A Modulation Measurements* (cannot be ordered with Option 883)
	MS2712E-0556	MS2713E-0556	TD-LTE/LTE-A OTA Measurements* (requires Option 31 for full functionality. Cannot be ordered with Option 883)
	MS2712E-0883	MS2713E-0883	LTE/LTE-A FDD/TDD Measurements* (requires Option 31 for full functionality. Combines functionality of Options 541, 542, 546, 551, 552, and 556. Cannot be ordered with Option 541, 542, 546, 551, 552, or 556)
	MS2712E-0042	MS2713E-0042	CDMA RF Measurements* (cannot be ordered with Option 884)
	MS2712E-0043	MS2713E-0043	CDMA Demodulation* (cannot be ordered with Option 884)
	MS2712E-0033	MS2713E-0033	CDMA OTA Measurements* (requires Option 31. Cannot be ordered with Option 884)
	MS2712E-0062	MS2713E-0062	EV-DO RF Measurements* (cannot be ordered with Option 884)
	MS2712E-0063	MS2713E-0063	EV-DO Demodulation* (cannot be ordered with Option 884)
	MS2712E-0034	MS2713E-0034	EV-DO OTA Measurements* (requires Option 31. Cannot be ordered with Option 884)
	MS2712E-0884	MS2713E-0884	CDMA/EV-DO Measurements* (requires Option 31 for full functionality. Combines functionality of Options 42, 43, 33, 62, 63, and 34. Cannot be ordered with Option 42, 43, 33, 62, 63, or 34)
	MS2712E-0046	MS2713E-0046	Fixed WiMAX RF Measurements* (cannot be ordered with Option 885)
	MS2712E-0047	MS2713E-0047	Fixed WiMAX Demodulation* (cannot be ordered with Option 885)

\*Requires Option 9



## Ordering Information – Options (continued)

**Options**

MS2712E-0066  
MS2712E-0067  
MS2712E-0037

**Options**

MS2713E-0066  
MS2713E-0067  
MS2713E-0037

Mobile WiMAX RF Measurements\* (cannot be ordered with Option 885)  
Mobile WiMAX Demodulation\* (cannot be ordered with Option 885)  
Mobile WiMAX OTA Measurements\* (requires Option 31 for full functionality. Cannot be ordered with Option 885)

MS2712E-0885

MS2713E-0885

WiMAX Fixed/Mobile Measurements\* (requires Option 31 for full functionality. Combines functionality of Options 46, 47, 66, 67, and 37. Cannot be ordered with Option 46, 47, 66, 67, or 37)



MS2712E-0030  
MS2712E-0032  
MS2712E-0079

MS2713E-0030  
MS2713E-0032  
MS2713E-0079

ISDB-T Digital Video Measurements\*  
ISDB-T SFN Measurements\*  
ISDB-T BER Measurements (requires Option 30. Cannot be ordered with Option 411)



MS2712E-0064  
MS2712E-0078  
MS2712E-0057  
MS2712E-0411  
MS2712E-0098  
MS2712E-0099

MS2713E-0064  
MS2713E-0078  
MS2713E-0057  
MS2713E-0411  
MS2713E-0098  
MS2713E-0099

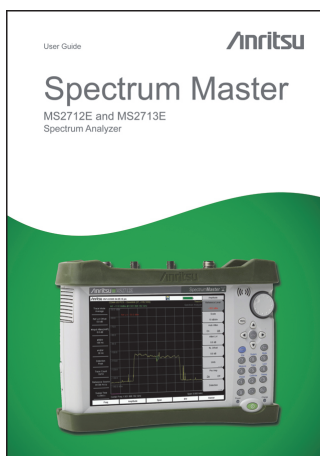
DVB-T/H Digital Video Measurements\*  
DVB-T/H SFN Measurements\*  
DVB-T/H BER Measurements (requires Option 64. Cannot be ordered with Option 411)  
Ethernet Connectivity (cannot be ordered with Option 57 or 79)  
Standard Calibration (ANSI Z540-1-1994)  
Premium Calibration (ANSI Z540-1-1994) plus printed test data

\*Requires Option 9

## Standard Accessories (Included with instrument)

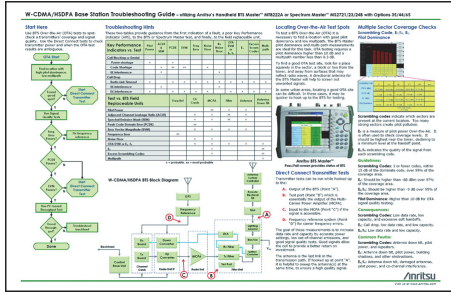
**Part Number Description**

10920-00060	Handheld Instruments Documentation Disc
2300-577	Anritsu Software Tool Box for Handheld RF Instruments Disc
2000-1654-R	Soft Carrying Case
2000-1691-R	Stylus with Coiled Tether
2000-1797-R	Touchscreen Protective Film, 8.4 in
633-75	Rechargeable Li-Ion Battery, 7500 mAh
40-187-R	AC-DC Adapter
806-141-R	Automotive Power Adapter, 12 VDC, 60 W
3-2000-1498	USB A/5-pin mini-B Cable, 10 ft/305 cm

Manuals (Soft copy included on Handheld Instruments Documentation Disc and at [www.anritsu.com](http://www.anritsu.com))**Part Number Description**

10920-00060	Handheld Instruments Documentation Disc
10580-00251	Spectrum Master User Guide
10580-00349	Spectrum Analyzer Measurement Guide
10580-00234	3GPP Signal Analyzer Measurement Guide
10580-00235	3GPP2 Signal Analyzer Measurement Guide
10580-00236	WiMAX Signal Analyzer Measurement Guide
10580-00237	Digital TV Measurement Guide
10580-00240	Power Meter Measurement Guide
10580-00256	Programming Manual

**Troubleshooting Guides** (Soft copy at [www.anritsu.com](http://www.anritsu.com))



Part Number	Description
11410-00551	Spectrum Analyzers
11410-00472	Interference
11410-00466	GSM/GPRS/EDGE Base Stations
11410-00566	LTE eNodeB Testing
11410-00615	TD-LTE eNodeB Testing
11410-00463	W-CDMA/HSDPA Base Stations
11410-00465	TD-SCDMA/HSDPA Base Stations
11410-00467	cdmaOne/CDMA2000 1X Base Stations
11410-00468	CDMA2000 1xEV-DO Base Stations
11410-00470	Fixed WiMAX Base Stations
11410-00469	Mobile WiMAX Base Stations

**Power Sensors** (For complete ordering information, see the respective data sheets of each sensor)

Model Number	Description
PSN50	RF USB Power Sensor, 50 MHz to 6 GHz, +20 dBm (see data sheet 11410-00414 for details)
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 dBm to +51.76 dBm
MA24106A	RF USB Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm
MA24208A	Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24218A	Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA25100A	RF Power Indicator



**Optional Accessories**

**Directional Antennas**



Part Number	Description
2000-1411-R	822 MHz to 900 MHz, N(f), 10 dBd, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 10 dBd, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 10 dBd, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 9.3 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 10 dBd, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 10 dBd, Yagi
2000-1659-R	698 MHz to 787 MHz, N(f), 8 dBd, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N(f), 12.2 dBd, Yagi
2000-1715-R	Directional Antenna, 698 MHz to 2500 MHz, N(f), gain of 2 dBi to 10 dBi, typical
2000-1726-R	Antenna, 2500 MHz to 2700 MHz, N(f), 12 dBd, Yagi
2000-1747-R	Antenna, Log Periodic, 300 MHz to 5000 MHz, N(f), 5.1 dBi, typical
2000-1748-R	Antenna, Log Periodic, 1 GHz to 18 GHz, N(f), 6 dBi, typical
2000-1777-R	Portable Directional Antenna, 9 kHz to 20 MHz, N(f)
2000-1778-R	Portable Directional Antenna, 20 MHz to 200 MHz, N(f)
2000-1779-R	Portable Directional Antenna, 200 MHz to 500 MHz, N(f)
2000-1812-R	Portable Yagi Antenna, 450 MHz to 512 MHz, N(f), 5 dBd
2000-1825-R	Portable Yagi Antenna, 380 MHz to 430 MHz, N(f), 5 dBd

**Optional Accessories** (Continued)**GPS Antennas**

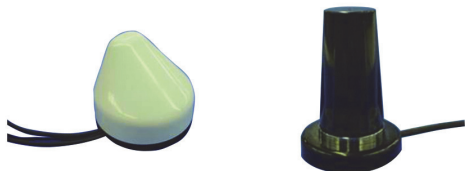
Part Number	Description
2000-1528-R	GPS Antenna, SMA(m) with 5 m (15 ft) cable, 3 dBi gain, requires 5 VDC
2000-1652-R	GPS Antenna, SMA(m) with 0.3 m (1 ft) cable, 5 dBi gain, requires 3.3 VDC or 5 VDC
2000-1760-R	GPS Antenna, SMA(m), 25 dB gain, 2.5 VDC to 3.7 VDC

**Portable Antennas**

Part Number	Description
2000-1200-R	806 MHz to 866 MHz, SMA(m), 50 Ω
2000-1473-R	870 MHz to 960 MHz, SMA(m), 50 Ω
2000-1035-R	896 MHz to 941 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1030-R	1710 MHz to 1880 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1474-R	1710 MHz to 1880 MHz with knuckle elbow (1/2 wave)
2000-1031-R	1850 MHz to 1990 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1475-R	1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA(m), 50 Ω
2000-1032-R	2400 MHz to 2500 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA(m), 50 Ω
2000-1636-R	Antenna Kit (Consists of: 2000-1030-R, 2000-1031-R, 2000-1032-R, 2000-1200-R, 2000-1035-R, 2000-1361-R, and carrying pouch)
2000-1751-R	TE Dipole, 698-960/1710-2170/2500-2700 MHz, SMA(m), 2 dBi, typical, 50 Ω

**Isotropic Antenna**

Part Number	Description
2000-1791-R	Isotropic Antenna, 700 MHz to 6000 MHz, N(m)

**Mag Mount Broadband Antennas**

Part Number	Description
2000-1647-R	Cable 1: 698 MHz to 1200 MHz 2 dBi peak gain, 1700 MHz to 2700 MHz 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 3: GPS 26 dB gain, SMA(m), 50 Ω, 10 ft
2000-1645-R	694 MHz to 894 MHz 3 dBi peak gain, 1700 MHz to 2700 MHz 3 dBi peak gain, N(m), 50 Ω, 10 ft
2000-1646-R	750 MHz to 1250 MHz 3 dBi peak gain, 1650 MHz to 2000 MHz 5 dBi peak gain, 2100 MHz to 2700 MHz 3 dBi peak gain, N(m), 50 Ω, 10 ft
2000-1648-R	1700 MHz to 6000 MHz 3 dBi peak gain, N(m), 50 Ω, 10 ft

**Optional Accessories** (Continued)**Filters****Part Number Description**

1030-114-R	806 MHz to 869 MHz, N(m) to SMA(f), 50 Ω
1030-109-R	824 MHz to 849 MHz, N(m) to SMA(f), 50 Ω
1030-110-R	880 MHz to 915 MHz, N(m) to SMA(f), 50 Ω
1030-111-R	1850 MHz to 1910 MHz, N(m) to SMA(f), 50 Ω
1030-112-R	2400 MHz to 2484 MHz, N(m) to SMA(f), 50 Ω
1030-105-R	890 MHz to 915 MHz, N(m) to N(f), 50 Ω
1030-106-R	1710 MHz to 1790 MHz, N(m) to N(f), 50 Ω
1030-107-R	1910 MHz to 1990 MHz, N(m) to N(f), 50 Ω
1030-149-R	High Pass, 150 MHz, N(m) to N(f), 50 Ω
1030-150-R	High Pass, 400 MHz, N(m) to N(f), 50 Ω
1030-151-R	High Pass, 700 MHz, N(m) to N(f), 50 Ω
1030-152-R	Low Pass, 200 MHz, N(m) to N(f), 50 Ω
1030-153-R	Low Pass, 550 MHz, N(m) to N(f), 50 Ω
1030-155-R	2500 MHz to 2700 MHz, N(m) to N(f), 50 Ω
1030-178-R	1920 MHz to 1980 MHz, N(m) to N(f), 50 Ω
1030-179-R	777 MHz to 798 MHz, N(m) to N(f), 50 Ω
1030-180-R	2500 MHz to 2570 MHz, N(m) to N(f), 50 Ω
2000-1684-R	791 MHz to 821 MHz, N(m) to N(f), 50 Ω
2000-1734-R	Bandpass Filter, 699 MHz to 715 MHz, N(m) and N(f), 50 Ω
2000-1735-R	Bandpass Filter, 776 MHz to 788 MHz, N(m) and N(f), 50 Ω
2000-1736-R	Bandpass Filter, 815 MHz to 850 MHz, N(m) and N(f), 50 Ω
2000-1737-R	Bandpass Filter, 1711 MHz to 1756 MHz, N(m) and N(f), 50 Ω
2000-1738-R	Bandpass Filter, 1850 MHz to 1910 MHz, N(m) and N(f), 50 Ω
2000-1739-R	Bandpass Filter, 880 MHz to 915 MHz, N(m) and N(f), 50 Ω
2000-1740-R	Bandpass Filter, 1710 MHz to 1785 MHz, N(m) and N(f), 50 Ω
2000-1741-R	Bandpass Filter, 1920 MHz to 1980 MHz, N(m) and N(f), 50 Ω
2000-1742-R	Bandpass Filter, 832 MHz to 862 MHz, N(m) and N(f), 50 Ω
2000-1743-R	Bandpass Filter, 2500 MHz to 2570 MHz, N(m) and N(f), 50 Ω
2000-1799-R	Bandpass Filter, 2305 MHz to 2320 MHz, N(m) and N(f), 50 Ω

**Attenuators****Part Number Description**

3-1010-122	20 dB, 5 W, DC to 12.4 GHz, N(m) to N(f)
42N50-20	20 dB, 5 W, DC to 18 GHz, N(m) to N(f)
42N50A-30	30 dB, 50 W, DC to 18 GHz, N(m) to N(f)
3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N(m) to N(f)
1010-127-R	30 dB, 150 W, DC to 3 GHz, N(m) to N(f)
3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N(m) to N(f), Uni-directional
1010-121	40 dB, 100 W, DC to 18 GHz, N(m) to N(f), Uni-directional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N(m) to N(f)

**Optional Accessories** (Continued)**Phase-Stable Test Port Cables, Armored w/ Reinforced Grip** (Recommended for cable & antenna line sweep applications)

Part Number	Description
15RNFN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15RDFN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15RDN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω
15RNFN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15RDFN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15RDN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω

**Phase-Stable Test Port Cables, Armored** (Recommended for use with tightly spaced connectors and other general purpose applications)

Part Number	Description
15NNF50-1.5C	1.5 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15NN50-1.5C	1.5 m, DC to 6 GHz, N(m) to N(m), 50 Ω
15NDF50-1.5C	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15ND50-1.5C	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω
15NNF50-3.0C	3.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15NN50-3.0C	3.0 m, DC to 6 GHz, N(m) to N(m), 50 Ω
15NNF50-5.0C	5.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15NN50-5.0C	5.0 m, DC to 6 GHz, N(m) to N(m), 50 Ω

**Adapters**

Part Number	Description
1091-26-R	SMA(m) to N(m), DC to 18 GHz, 50 Ω
1091-27-R	SMA(f) to N(m), DC to 18 GHz, 50 Ω
1091-80-R	SMA(m) to N(f), DC to 18 GHz, 50 Ω
1091-81-R	SMA(f) to N(f), DC to 18 GHz, 50 Ω
1091-172-R	BNC(f) to N(m), DC to 1.3 GHz, 50 Ω
1091-417-R	N(m) to QMA(f), DC to 6 GHz, 50 Ω
1091-418-R	N(m) to QMA(m), DC to 18 GHz, 50 Ω
510-90-R	7/16 DIN(f) to N(m), DC to 7.5 GHz, 50 Ω
510-91-R	7/16 DIN(f) to N(f), DC to 7.5 GHz, 50 Ω
510-92-R	7/16 DIN(m) to N(m), DC to 7.5 GHz, 50 Ω
510-93-R	7/16 DIN(m) to N(f), DC to 7.5 GHz, 50 Ω
510-96-R	7/16 DIN(m) to 7/16 DIN (m), DC to 7.5 GHz, 50 Ω
510-97-R	7/16 DIN(f) to 7/16 DIN (f), DC to 7.5 GHz, 50 Ω
510-102-R	N(m) to N(m), DC to 11 GHz, 50 Ω, 90 degrees right angle

**Precision Adapters**

Part Number	Description
34NN50A	Precision Adapter, N(m) to N(m), DC to 18 GHz, 50 Ω
34NFN50	Precision Adapter, N(f) to N(f), DC to 18 GHz, 50 Ω

**Optional Accessories** (Continued)

**Miscellaneous Accessories**



Part Number	Description
2000-1374	External Dual Charger for Li-Ion Batteries
633-75	Rechargeable Li-Ion Battery, 7500 mAh
69793	CW Signal Generator Kit
2000-1689	EMI Near Field Probe Kit
MA2700A	Handheld Interference Hunter (For full specifications, refer to the MA2700A Technical Data Sheet 11410-00692)
2000-1691-R	Stylus with Coiled Tether
2000-1797-R	Touchscreen Protective Film, 8.4 in
2000-1798-R	Port Extender, DC to 6 GHz, N(m) to N(f)

**Backpack and Transit Case**



Part Number	Description
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle
760-271-R	Transit Case for Portable Directional Antennas and Port Extender (2000-1777-R, 2000-1778-R, 2000-1779-R, 2000-1798-R)





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# Anritsu

### • United States

#### Anritsu Company

1155 East Collins Blvd, Suite 100  
Richardson, TX 75081, U.S.A.  
Toll Free: 1-800-267-4878  
Phone: +1-972-644-1777  
Fax: +1-972-671-1877

### • Canada

#### Anritsu Electronics Ltd.

700 Silver Seven Road, Suite 120  
Kanata, Ontario K2V 1C3, Canada  
Phone: +1-613-591-2003  
Fax: +1-613-591-1006

### • Brazil

#### Anritsu Eletrônica Ltda.

Praça Amadeu Amaral, 27 - 1 Andar  
01327-010 Bela Vista, São Paulo, Brazil  
Phone: +55-11-3283-2511  
Fax: +55-11-3288-6940

### • Mexico

#### Anritsu Company, S.A. de C.V.

Av. Ejército Nacional No. 579 Piso 9, Col. Granada  
11520 México, D.F., México  
Phone: +52-55-1101-2370  
Fax: +52-55-5254-3147

### • United Kingdom

#### Anritsu EMEA Ltd.

200 Capability Green  
Luton, Bedfordshire LU1 3LU  
United Kingdom  
Phone: +44-1582-433280  
Fax: +44-1582-731303

### • France

#### Anritsu S.A.

12 Avenue du Québec  
Bâtiment Iris 1-Silic 612  
91140 Villebon-sur-Yvette, France  
Phone: +33-1-60-92-15-50  
Fax: +33-1-64-46-10-65

### • Germany

#### Anritsu GmbH

Nemetschek Haus, Konrad-Zuse-Platz 1  
81829 München, Germany  
Phone: +49-89-442308-0  
Fax: +49-89-442308-55

### • Italy

#### Anritsu S.r.l.

Via Elio Vittorini 129  
00144 Roma, Italy  
Phone: +39-06-509-9711  
Fax: +39-06-502-2425

### • Sweden

#### Anritsu AB

Kistagången 20B  
164 40 KISTA, Sweden  
Phone: +46-8-534-707-00  
Fax: +46-8-534-707-30

### • Finland

#### Anritsu AB

Teknobulevardi 3-5  
FI-01530 Vantaa, Finland  
Phone: +358-20-741-8100  
Fax: +358-20-741-8111

### • Denmark

#### Anritsu A/S

Kay Fiskers Plads 9  
2300 Copenhagen S, Denmark  
Phone: +45-7211-2200  
Fax: +45-7211-2210

### • Russia

#### Anritsu EMEA Ltd.

##### Representation Office in Russia

Tverskaya str. 16/2, bld. 1, 7th floor  
Moscow, 125009, Russia  
Phone: +7-495-363-1694  
Fax: +7-495-935-8962

### • Spain

#### Anritsu EMEA Ltd.

##### Representation Office in Spain

Edificio Cuzco IV, Po. de la Castellana, 141, Pta. 8  
28046, Madrid, Spain  
Phone: +34-915-726-761  
Fax: +34-915-726-621

### • United Arab Emirates

#### Anritsu EMEA Ltd.

##### Dubai Liaison Office

P O Box 500413 - Dubai Internet City  
Al Thuraya Building, Tower 1, Suite 701, 7th Floor  
Dubai, United Arab Emirates  
Phone: +971-4-3670352  
Fax: +971-4-3688460

### • India

#### Anritsu India Private Limited

2nd & 3rd Floor, #837/1, Binnamangla 1st Stage  
Indiranagar, 100ft Road, Bangalore - 560038, India  
Phone: +91-80-4058-1300  
Fax: +91-80-4058-1301

### • Singapore

#### Anritsu Pte. Ltd.

11 Chang Charn Road, #04-01, Shriro House  
Singapore 159640  
Phone: +65-6282-2400  
Fax: +65-6282-2533

### • P.R. China (Shanghai)

#### Anritsu (China) Co., Ltd.

27th Floor, Tower A  
New Caohejing International Business Center  
No. 391 Gui Ping Road Shanghai, Xu Hui Di District  
Shanghai 200233, P.R. China  
Phone: +86-21-6237-0898  
Fax: +86-21-6237-0899

### • P.R. China (Hong Kong)

#### Anritsu Company Ltd.

Unit 1006-7, 10/F., Greenfield Tower  
Concordia Plaza  
No. 1 Science Museum Road, Tsim Sha Tsui East  
Kowloon, Hong Kong, P. R. China  
Phone: +852-2301-4980  
Fax: +852-2301-3545

### • Japan

#### Anritsu Corporation

8-5, Tamura-cho, Atsugi-shi  
Kanagawa, 243-0016 Japan  
Phone: +81-46-296-1221  
Fax: +81-46-296-1238

### • Korea

#### Anritsu Corporation, Ltd.

5FL, 235 Pangyoyeok-ro, Bundang-gu  
Seongnam-si  
Gyeonggi-do, 463-400 Korea  
Phone: +82-31-696-7750  
Fax: +82-31-696-7751

### • Australia

#### Anritsu Pty Ltd.

Unit 21/270 Ferntree Gully Road  
Notting Hill, Victoria, 3168, Australia  
Phone: +61-3-9558-8177  
Fax: +61-3-9558-8255

### • Taiwan

#### Anritsu Company Inc.

7F, No. 316, Sec. 1, Neihu Rd, Taipei 114, Taiwan  
Phone: +886-2-8751-1816  
Fax: +886-2-8751-1817

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