Technical Data Sheet

Spectrum Master™
Compact Handheld Spectrum Analyzer

MS2712E 100 kHz to 4 GHz

MS2713E 100 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, Signal ID
- Dynamic Range: > 95 dB in 10 Hz RBW
- DANL: -152 dBm in 10 Hz RBW
- Phase Noise: -100 dBc/Hz max @ 10 kHz offset at 1 GHz
- Frequency Accuracy: < ±50 ppb with GPS On
- 2-port Transmission Measurements: High/Low Power
- 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

- GSM/EDGE, W-CDMA/ HSDPA, TD-SCDMA, CDMA/EV-DO
- WiMAX-Fixed, Mobile
- LTE
- ISDB-T, ISDB-T SFN
- Store 2000 Traces internally
- Gated Sweep
- CW Signal Generator
- Internal Preamplifier standard
- Internal Bias-Tee
- Internal Power Meter
- High Accuracy Power Meter
- GPS tagging of saved traces
- 4, 6, 8, 18 GHz Power Sensors
- Channel Scanner
- < 5 minute warm-up time
- 3 hour battery operation time
- Touchscreen keyboard
- USB Data Transfer
- Master Software Tools

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

Spectrum Master™ MS2712E and MS2713E Specifications

Spectrum Analyzer

Measurements	
Smart Measurements	Field Strength (uses antenna calibration tables to measure dBm/m² or dBmV/m)
	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)
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/WBW, Span/RBW
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Limit Lines, Screen Shots Jpeg (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, Manual Trigger, Reset, Detection, Minimum Sweep Time, Trigger Type, Gated Sweep (see Option 0090)
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	100 kHz to 4 GHz (MS2712E), 100 kHz to 6 GHz (MS2713E) (usable to 0 Hz)
Maximum Continuous Input	+26 dBm
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 seconds in zero span
Sweep Time Accuracy	±2% in zero span
Bandwidth	
Resolution Bandwidth (RBW)	10 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

Amplitude Ranges

Dynamic Range	>95 dB (2.4 GHz), 2/3 (TOI-DANL) in 10 Hz RBW
Measurement Range	DANL to +26 dBm
Display Range	1 to 15 dB/div in 1 dB steps, ten divisions displayed
Reference Level Range	-130 dBm to +30 dBm
Attenuator Range	0 to 55 dB in 5 dB steps
Amplitude Units	Log Scale Modes: dBm, dBV, dBmv, dBµV Linear Scale Modes: nV, µV, mV, V, kV, nW, µW, mW, W, kW

Amplitude Accuracy

100 kHz to 4.0 GHz	±1.25 dB, ±0.5 dB typical
>4.0 GHz to 6 GHz	±1.50 dB, ±0.5 dB typical

Displayed Average Noise Level (DANL)

	Preamp Off (Reference level -20 dBm)		Preamp On (Reference level -50 dBm)	
(RBW Normalized to 1 Hz, 0 dB attenuation)	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
(RBW = 10 Hz, 0 dB attenuation)				
10 MHz to 2.4 GHz	-131 dBm	-136 dBm	-147 dBm	-152 dBm
>2.4 GHz to 4 GHz	-127 dBm	-131 dBm	-144 dBm	-149 dBm
>4 GHz to 5 GHz	-124 dBm	-128 dBm	-140 dBm	-145 dBm
> 5 GHz to 6 GHz	-116 dBm	-121 dBm	-133 dBm	-140 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 < 2424.5 MHz
	<-55 dBc @ 190.5 ± 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

Spectrum Master™ MS2712E and MS2713E Specifications

2-Port Transmission Measurement (Option 0021)

Frequency	
Frequency Range	2 MHz to 4 GHz (MS2712E), 2 MHz to 6 GHz (MS2713E)
Frequency Resolution	10 Hz
Output Power	
High	0 dBm, typical
Low	-30 dBm, typical
Dynamic Range	
2 MHz to 4 GHz	80 dB
>4 GHz to 6 GHz	70 dB
Application Options	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)

Bias-Tee (Option 0010)

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

GPS Receiver Option (Option 0031) (Antenna sold separately, P/N 2000-1528-R)

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 Generator
when GPS Antenna is connected	<±50 ppb with GPS On, 3 minutes after satellite lock in selected modes
Connector	SMA, female

Spectrum Master™ MS2712E and MS2713E Specifications

Power Meter (Option 0029)

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, ≤40 dB span
Measurement Range	-120 dBm to +26 dBm
Offset Range	0 to +100 dB
VSWR	2:1 typical
Maximum Power	+26 dBm without attenuator
Accuracy	Same as Spectrum Analyzer
Application Options	Impedance (50 Ω, 75 Ω, Other)

High Accuracy Power Meter (Option 0019) (Requires external USB Power Sensor(s))

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	**PSN50**	**MA24104A**	**MA24106A**	**MA24108/18/26A**
Description	High Accuracy RF Power Sensor	Inline High Power Sensor	High Accuracy RF Power Sensor	Microwave USB Power Sensor
Frequency Range	50 MHz to 6 GHz	600 MHz to 4 GHz	50 MHz to 6 GHz	10 MHz to 8 GHz (**MA24108A)** 10 MHz to 18 GHz (**MA24118A)** 10 MHz to 26 GHz (**MA24126A)**
Connector	Type N(m), 50 Ω	Type N(m), 50 Ω	Type N(m), 50 Ω	Type N(m), 50 Ω (**MA24108/18A)** Type K(m), 50 Ω (**MA24126A)**
Dynamic Range	-30 to +20 dBm (.001 to 100 mW)	+3 to +51.76 dBm (2 mW to 150 W)	-40 to +23 dBm (0.1 µW to 200 mW)	-40 to +20 dBm (0.1 µW to 100 mW)
VBW	100 Hz	100 Hz	100 Hz	50 kHz
Measurand	True-RMS	True-RMS	True-RMS	True-RMS, Slot Power, Burst Average Power
Measurement Uncertainty	±0.16 dB[1]	±0.17 dB[2]	±0.16 dB[1]	±0.18 dB[3]
Datasheet (for complete specifications)	11410-00414	11410-00483	11410-00424	11410-00504

Notes:
1) Total RSS measurement uncertainty (0 ºC to 50 ºC) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
2) 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.
3) Expanded uncertainty with K=2 for power measurements of a CW signal greater than-20 dBm with zero mismatch errors.

Interference Analyzer (Option 0025)

Measurements	Spectrum
	Field Strength
	Occupied Bandwidth
	Channel Power
	Adjacent Channel Power (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 (RSSI) (collect data up to one week)
	Gives visual and aural indication of signal strength
	Signal ID (up to 12 signals)
	Center Frequency
	Bandwidth
	Signal Type (FM, GSM, W-CDMA, CDMA, Wi-Fi)
	Closest Channel Number
	Number of Carriers
Application Options	Signal-to-Nose Ratio (SNR) >10 dB
	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)

Channel Scanner (Option 0027)

Number of Channels	1 to 20 Channels (Power Levels)
Measurements	Graph/Table, Max Hold (On/5 sec/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	100 kHz to 4 GHz (MS2712E), 100 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)

CW Signal Generator Option (Option 0028) (Requires CW Signal Generator Kit, P/N 69793)

Setup Parameters

Frequency	Frequency, Signal Standard, Channel Number, Display Setup Help
Amplitude	Power Level (Low/High), Offset (dB)
Frequency Range	2 MHz to 2 GHz
Frequency Reference	Accuracy: ±1.5 ppm (25 °C ±25 °C) + aging, < ±50 ppb with GPS On
Output Power	High 0 dBm typical, Low -30 dBm typical Attenuator (included in kit 69793): 0 to 90 dB in 1 dB steps

Gated Sweep (Option 0090)

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

10 MHz BW Demod (Option 0009)

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

AM/FM/PM Signal Analyzers (Option 0509)

Measurements

	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*

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)
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 Hz) Deviation Accuracy: ±5% (deviation 0 to 93 Rad, rate 10 Hz to 5 kHz)**
IF bandwidth	1 to 300 kHz in 1-3 sequence
Frequency Span	RF Spectrum: 10 kHz to 10 MHz Audio Spectrum: 2, 5, 10, 20 kHz
RBW/VBW	30
Span/RBW	100
Sweep time	50 µs to 50 ms (Audio Waveform)

* Requires Sinewave modulation
** IFBW must be greater than 95% occupied BW

TD-SCDMA/HSDPA Signal Analyzers (Options 0060, 0061, 0038)

Measurements

RF (Option 0060)	Demodulation (Option 0061)	Over-the-Air (OTA) (Option 0038)	Pass/Fail (User Editable)
Channel Spectrum	Code Domain Power/Error	Code Scan (32)	Occupied Bandwidth
Channel Power	(QPSK/8 PSK/16 QAM)	Scrambling Code Group	Channel Power
Occupied Bandwidth	Slot Power	Tau	Channel Power RCC
Left Channel Power	DwPTS Power	E_C/I_O	On/Off Ratio
Left Channel Occ B/W	Noise Floor	Pilot Dominance	Peak-to-Average Ratio
Right Channel Power	Frequency Error	Tau Scan (Six)	Frequency Error
Right Channel Occ B/W	Tau	Sync-DL#	EVM
Power vs. Time	Scrambling Code	Tau	Peak EVM
Six Slot Powers	EVM	E_C/I_O	Peak Code Domain Error
Channel Power (RRC)	Peak EVM	DwPTS Power	Tau
DL-UL Delta Power	Peak Code Domain Error	Pilot Dominance	Noise Floor
UpPTS Power			
DwPTS Power			
On/Off Ratio			
Slot Peak-to-Average Power			
Spectral Emission			

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
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 (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0060) (temperature range 15 ºC to 35 ºC)

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

Demodulation (Option 0061) (temperature range 15 ºC to 35 ºC)

Supported Modulation	QPSK, 8 PSK, 16 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 (Option 0038)

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

ISDB-T (Options 0030, 0032) For full specifications, see Technical Data Sheet 11410-00436

Measurements

ISDB-T RF (Option 0030	ISDB-T Signal Analysis (Option 0030)	ISDB-T Measurement Modes (Option 0030)	ISDB-T SFN Analysis (Option 0032)
Signal Power Channel Power Termination Voltage Open Terminal Voltage Field Strength 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	Constellation (w/zoom) Layer A, B, C, TMCC Sub-carrier MER Delay Profile (w/zoom) Frequency Response 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	Custom User specified measurement and setup parameters Easy User specified measurements. Some setup parameters are automatically set or detected Batch User specified measurements and channels for automatic measurement, display of results and storage	Delay Profile (w/zoom) Inband Spectrum Measured Data Channel Power Delay DU Ratio Power Field Strength

Setup Parameters

Channel Map	UHF (Japan), UHF (Brazil), None
Channel	13 to 62 (Japan), 14 to 69 (Brazil)
Frequency	35 to 806 MHz
Pre-amp	On, Off
Reference Level Setting	-25 to +20 dBm/5 dB steps (Pre Amp: Off), –50 to –10 dBm/10 dB steps (Pre Amp: On)

ISDB-T Signal Analyzer (Option 0030)

Channel Power Accuracy	±2 dB, (RF input -84 to -10 dBm)
Frequency Lock Range	±90 kHz
Frequency Offset Accuracy	± (measurement frequency x reference frequency accuracy) ±0.3 Hz
Residual MER	≥42 dB (Pre Amp: Off, Reference level: –20 dBm) ≥37 dB (Pre Amp: On, Reference level: –50 dBm)
Delay Profile Resolution	0.12 µs, 0.1 dB
Frequency Response Resolution	1 kHz, 0.1 dB
Phase Noise Range	-40 to -140 dBc/Hz
Spurious Emissions Search Range	5 MHz to 5x main signal frequency

ISDB-T SFN Analyzer (Option 0032)

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

GSM/GPRS/EDGE Signal Analyzers (Options 0040, 0041)

Measurements

RF (Option 0040)	Demodulation (Option 0041)	Over-the-Air (OTA)	Pass/Fail (User Editable)
Channel Spectrum	Phase Error	There are no additional OTA Measurements. RF Measurements and Demodulation can be made OTA	Channel Power
Channel Power	EVM		Occupied Bandwidth
Occupied Bandwidth	Origin Offset		Burst Power
Burst Power	C/I		Average Burst power
Average Burst Power	Modulation Type		Frequency Error
Frequency Error	Magnitude Error		Phase Error
Modulation Type	BSIC (NCC, BCC)		EVM
BSIC (NCC, BCC)			Origin Offset
Multi-channel Spectrum			C/I
Power vs. Time (Frame/Slot)			Magnitude Error
Channel Power			
Occupied Bandwidth			
Burst Power			
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 (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0040) (temperature range 15 ºC to 35 ºC)

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

Demodulation (Option 0041) (temperature range 15 ºC to 35 ºC)

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

W-CDMA/HSDPA Signal Analyzers (Options 0044, 0045 or 0065, 0035)

Measurements

RF (Option 0044)	Demodulation (Option 0045 or 0065)	Over-the-Air (OTA) (Option 0035)	Pass/Fail (User Editable)
Band Spectrum	Code Domain Power Graph	Scrambling Code Scanner (Six)	Max Output Power
Channel Spectrum	P-CPICH Power	Scrambling Codes	Frequency Error
Channel Power	Channel Power	CPICH	EVM
Occupied Bandwidth	Noise Floor	E_C/I_O	CPICH
Peak-to-Average Power	EVM	E_C	Occupied Bandwidth
Spectral Emission Mask	Carrier Feed Through	Pilot Dominance	Spectral Mask
Single carrier ACLR	Peak Code Domain Error	OTA Total Power	ACLR
Multi-carrier ACLR	Carrier Frequency	Multipath Scanner (Six)	PCDE
	Frequency Error	Six Multipaths	P-CCPCH
	Control Channel Power	Tau	S-CCPCH
	Abs/Rel/Delta Power	Distance	Code Spread 3
	CPICH, P-CCPCH	RSCP	PICH
	S-CCPCH, PICH	Relative Power	Code 128
	P-SCH, S-SCH	Multipath Power	
	HSDPA		Test Models
	Power vs. Time		1 (16), (32), (64)
	Constellation		2
	Code Domain Power Table		3 (16), (32)
	Code, Status		4 (+CPICH), (-CIPCH)
	EVM, Modulation Type		5 (2 HS), (4 HS), (8 HS)
	Power, Code Utilization		
	Power Amplifier Capacity		
	Codogram		

Setup Parameters

Scrambling Code, Threshold	Auto, Manual
User Selectable	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 (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0044) (temperature range 15 ºC to 35 ºC)

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

Demodulation (Option 0045 for W-CDMA only or 0065 for W-CDMA and HSDPA) (temperature range 15 ºC to 35 ºC)

Frequency Error	±10 Hz + time base error, 99% confidence level
EVM Accuracy	±2.5%, 6% ≤EVM ≤25%
Residual EVM (RMS)	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 (Option 0035)

Scrambling Code Scanner	Six strongest Scrambling Codes
Multipath Scanner	Six multipaths' power relative to strongest pilot

cdmaOne/CDMA2000 1X Signal Analyzers (Option 0042, 0043, 0033)

Measurements

RF (Option 0042)	Demodulation (Option 43)	Over-the-Air (OTA) (0ption 33)	Pass/Fail (User Editable)
Channel Spectrum	Code Domain Power Graph	Pilot Scanner (Nine)	Channel Power
Channel Power	Pilot Power	PN	Occupied Bandwidth
Occupied Bandwidth	Channel Power	E_C/I_O	Peak-to-Average Power
Peak-to-Average Power	Noise Floor	Tau	Spectral Mask Test
Spectral Emission Mask	Rho	Pilot Power	Frequency Error
Multi-carrier ACPR	Carrier Feed Through	Channel Power	Channel Frequency
	Tau	Pilot Dominance	Frequency error
	RMS Phase Error	Multipath Scanner (Six)	Pilot Power
	Frequency Error	E_C/I_O	Noise Floor
	Abs/Rel/ Power	Tau	Rho
	Pilot	Channel Power	Carrier Feed Through
	Page	Multipath Power	Tau
	Sync	Limit Test – 10 Tests Averaged	RMS Phase Error
	Q Page	Rho	Code Utilization
	Code Domain Power Table	Adjusted Rho	Measured PN
	Code	Multipath	Pilot Dominance
	Status	Pilot Dominance	Multipath Power
	Power	Pilot Power	
	Multiple Codes	Pass/Fail Status	
	Code Utilization		

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	1.23, 1.24, 1.25 MHz
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 (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0042) (temperature range 15 ºC to 35 ºC)

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

Demodulation (Option 0043) (temperature range 15 ºC to 35 ºC)

Frequency Error	±10 Hz + time base error, 99% confidence level (in slow mode)
Rho Accuracy	±0.005, for Rho >0.9
Residual Rho	>0.995, typical, >0.99 maximum, (RF input -50 to +20 dBm)
PN Offset	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 (Option 0033)

Pilot Scanner	Nine strongest pilots
Multipath Scanner	Six multipaths' power relative to strongest pilot
Limit Test	Average of ten tests compared to limit

CDMA2000 1xEV-DO Signal Analyzers (Option 0062, 0063, 0034)

Measurements

RF (Option 0062)	Demodulation (Option 0063)	Over-the-Air (OTA) (Option 0034)	Pass/Fail (User Editable)
Channel Spectrum	MAC Code Domain Power Graph	Pilot Scanner (Nine)	Channel Power
Channel Power	Pilot & MAC Power	PN	Occupied Bandwidth
Occupied Bandwidth	Channel Power	E_C/I_O	Peak-to-Average Power
Peak-to-Average Power	Frequency Error	Tau	Carrier Frequency
Power vs. Time	Rho Pilot	Pilot Power	Frequency Error
Pilot & MAC Power	Rho Overall	Channel Power	Spectral Mask
Channel Power	Data Modulation	Pilot Dominance	Noise Floor
Frequency Error	Noise Floor	Multipath Scanner (Six)	Pilot Power
Idle Activity	MAC Code Domain Power Table	E_C/I_O	RMS Phase Error
On/Off Ratio	Code	Tau	Tau
Spectral Emission Mask	Status	Channel Power	Code Utilization
Multi-carrier ACPR	Power	Multipath Power	Measured PN
	Code Utilization		Pilot Dominance
	Data Code Domain Power		Multipath Power
	Active Data Power		
	Data Modulation		
	Rho Pilot		
	Rho Overall		
	Maximum Data CDP		
	Minimum Data CDP		

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	1.23, 1.24, 1.25 MHz
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 (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0042) (temperature range 15 ºC to 35 ºC)

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

Demodulation (Option 0063) (temperature range 15 ºC to 35 ºC)

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 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 (Option 0034)

Pilot Scanner	Nine strongest pilots
Multipath Scanner	Six multipaths' power relative to strongest pilot

IEEE 802.16 Fixed WiMAX Signal Analyzers (Options 0046, 0047)

Measurements

RF (Option 0046)	Demodulation (Option 0047)	Over-the-Air (OTA)	Pass/Fail (User Editable)
Channel Spectrum	Constellation	There are no additional OTA	Channel Power
Channel Power	RCE (RMS/Peak)	Measurements.	Occupied Bandwidth
Occupied Bandwidth	EVM (RMS/Peak)		Burst Power
Power vs. Time	Frequency Error	RF Measurements and	Preamble Power
Channel Power	Carrier Frequency	Demodulation can be made OTA	Crest Factor
Preamble Power	Base Station ID		Frequency Error
Data Burst Power	Spectral Flatness		Carrier Frequency
Crest Factor	Adjacent Subcarrier Flatness		EVM
ACPR	EVM vs. Subcarrier/Symbol		RCE
	RCE		Base Station ID
	EVM		
	Frequency Error		
	Carrier Frequency		
	Base Station ID		

Setup Parameters

Bandwidth	1.25, 1.50, 2.50, 3.50, 5.00, 5.50, 6.00, 7.00, 10.00 MHz
Cyclic Prefix Ratio (CP)	1/4, 1/8, 1/16, 1/32
Span	5, 10, 15, 20 MHz
Frame Length	2.5, 5.0, 10.0 msec
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 (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0046) (temperature range 15 ºC to 35 ºC)

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

Demodulation (Option 0047) (temperature range 15 ºC to 35 ºC)

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)

IEEE 802.16 Mobile WiMAX Signal Analyzers (Options 0066, 0067, 0037)

Measurements

RF (Option 0066)	Demodulation (Option 0067)	Over-the-Air (OTA) (Option 0037)	Pass/Fail (User Editable)
Channel Spectrum	Constellation	Channel Power Monitor	Channel Power
Channel Power	RCE (RMS/Peak)	Preamble Scanner (Six)	Occupied Bandwidth
Occupied Bandwidth	EVM (RMS/Peak)	Preamble	Downlink Bust Power
Power vs. Time	Frequency Error	Relative Power	Uplink Burst Power
Channel Power	CINR	Cell ID	Preamble Power
Preamble Power	Base Station ID	Sector ID	Crest Factor
Downlink Burst Power	Sector ID	PCINR	Frequency Error
Uplink Burst Power	Spectral Flatness	Dominant Preamble	Carrier Frequency
ACPR	Adjacent Subcarrier Flatness	Base Station ID	EVM
	EVM vs. Subcarrier/Symbol		RCE
	RCE (RMS/Peak)		Sector ID
	EVM (RMS/Peak)		
	Frequency Error		
	CINR		
	Base Station ID		
	Sector ID		
	DL-MAP (Tree View)		

Setup Parameters

Zone Type	PUSC
DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)
Bandwidths	3.50, 5.00, 7.00, 8.75, 10.00 MHz
Cyclic Prefix Ratio (CP)	1/8
Span	5, 10, 20, 30 MHz
Frame Lengths	5, 10 msec
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 (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0066) (temperature range 15 ºC to 35 ºC)

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

Demodulation (Option 0067) (temperature range 15 ºC to 35 ºC)

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 (Option 0037)

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

LTE Signal Analyzers (Options 0541, 0542, 0546)

Measurements

RF (Option 0541)	Modulation (Option 0542)	Over-the-Air (OTA) (Option 0546)	Pass/Fail (User Editable)

Channel Spectrum
  Channel Power
  Occupied Bandwidth
ACLR
RF Summary
	Constellation
	  Reference Signal Power
	  Sync Signal Power
	  EVM
	  Frequency Error
	  Carrier Frequency
	  Cell ID
	  Sector ID
	  Group ID
	Control Channel Power
	  RS
	  P-SS
	  S-SS
	  PBCH
	  PCFICH
	  Modulation Summary
		Synch Signal Power
		(Six Strongest)
		  Power
		  Cell ID
		  Sector ID
		  Group ID
		Dominance
			Pass Fail All
			Pass/Fail RF
			Pass Fail Demod
			Measurements
			  Channel Power
			  Occupied Bandwidth
			  ACLR
			  Frequency Error
			  Carrier Frequency
			  Dominance
			  EVM (peak)
			  EVM (rms)
			  RS Power
			  SS Power
			  P-SS Power
			  S-SS Power
			  PBCH Power
			  PCFICH Power
			  Cell ID
			  Group ID
			  Sector ID

Setup Parameters	
Bandwidth	10 MHz
Span	1.4, 3, 5, 10, 15, 20, 30 MHz
Frame Length	2.5, 5.0, 10.0 msec
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 (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Quality
RF Measurements (Option 0541)	
RF Channel Power Accuracy	±1.5 dB, ±1.0 dB typical, (RF input -50 to +10 dBm)
Modulation (Option 0542)	
Frequency Error	±10 Hz + time base error, 99% confidence level
Residual EVM (rms)	2.5% typical (E-UTRA Test Model 3.1) (RF Input -50 dBm to +10 dBm)
Over-the-Air (OTA) Measurements (Option 0546)	
Scanner	Six strongest Sync Signals
Auto Save	Yes
GPS Tagging and Logging	Yes

Spectrum Master™ MS2712E and MS2713E Specifications

General Specifications

All specifications and characteristics apply under the following conditions, unless otherwise stated: 1) After 5 minutes of warm-up time, where the instrument is left in the ON state; 2) All specifications apply when using internal reference; 3) All specifications subject to change without notice; 4) Typical performance is the measured performance of an average unit; 5) Recommended calibration cycle is 12 months.

Setup Parameters	
System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed)
	Self Test, Application Self Test
	GPS (see Option 0031)
System Options	Name, Date and Time, Brightness, Volume
	Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, User defined)
	Reset (Factory Defaults, Master Reset, Update Firmware)
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Screen Shots Jpeg (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
Connectors	
RF Out	Type N, female, 50 Ω (Reflection In)
RF Out Damage Level	23 dBm, ±50 VDC
RF In	Type N, female, 50 Ω
RF In Damage Level	+35 dBm peak, ±50 VDC, Maximum Continuous Input (≥10 dB attenuation)
GPS	SMA(f)
External Power	5.5 mm barrel connector, 12.5 to 15 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
Headset Jack	2.5 mm mini-phone plug
External Reference In	BNC, female, 50 Ω, Maximum Input +10 dBm 1 MHz, 5 MHz, 10 MHz, 13 MHz
External Trigger/Clock Recovery	BNC, female, 50 Ω, Maximum Input ±50 VDC
Display	
Type	Resistive Touchscreen
Size	8.4” daylight viewable color LCD
Resolution	800 x 600
Battery	
Type	Li-Ion
Battery Operation	3.0 hours, typical
Electromagnetic Compatibility	
European Union	CE Mark, EMC Directive 89/336/EEC, 92/31/EEC, 93/68/EEC and
	Low Voltage Directive 73/23/EEC, 93/68/EEC
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
Safety	
Safety Class	EN 61010-1 Class 1
Product Safety	IEC 60950-1 when used with Company supplied Power Supply
Environmental	
Operating Temperature	-10 ºC to 55 ºC
Maximum Humidity	85%
Shock	MIL-PRF-28800F Class 2
Storage	-40 ºC to 71 ºC
Altitude	4600 meters, operating and non-operating
Size and Weight	
Size	273 x 199 x 91 mm, (10.7 x 7.8 x 3.6 in)
Weight	3.45 kg, (7.6 lbs)

Master Software Tools (for your PC)

Database Management	
Full Trace Retrieval	Retrieve all traces from instrument into one PC directory
Trace Catalog	Index all traces into one catalog
Trace Rename Utility	Rename measurement traces
Group Edit	Titles, subtitles, plot scaling, markers and limit lines, simultaneously on similar files
DAT File Converter	Converts HHST files to MST file format and vice-versa
Data Analysis	
Trace Math and Smoothing	Compare multiple traces
Data Converter	Convert from/to Return Loss, VSWR, Cable Loss, DTF and also into Smith Charts
Measurement Calculator	Translates into other units
Report Generation	
Report Generator	Includes GPS, power level, and calibration status along with measurements
Edit Graph	Change scale, limit lines, and markers
Report Format	Create reports in HTML for PDF format
Export Measurements	Export measurements to *.s2p, *.jpg or *.csv format
Notes	Annotate measurements
Mapping (GPS Required)	
Spectrum Analyzer Mode	MapInfo, MapPoint
Folder Spectrogram (Spectrum Monitoring for Interference Analysis and Spectrum Clearing)	
Folder Spectrogram – 2D View	Creates a composite file of multiple traces Peak Power, Total Power, Peak Frequency, Histogram, Average Power (Max/Min) File Filter (Violations over limit lines or deviations from averages) Playback
Video Folder Spectrogram – 2D View	Create AVI file to export for management review/reports
Folder Spectrogram – 3D View	Views (Set Threshold, Markers) - 3D (Rotate X, Y, Z Axis, Level Scale, Signal ID) - 2D View (Frequency or Time Domain, Signal ID) - Top Down Playback (Frequency and/or Time Domain)
List/Parameter Editors	
Traces	Add, delete, and modify limit lines and markers
Antennas, Cables, Signal Standards	Modify instrument's Antenna, Cable, and Signal Standard List
Product Updates	Auto-checks Anritsu website for latest revision firmware
Firmware Upload	Upload new firmware into the instrument
Languages	Add up to two languages and modify non-English language menus
Display	Modify display settings
Script Master™	
Channel Scanner Mode	Automate scan up to 1200 channels, repeat for sets of 20 channels, repeat all channels
GSM/GPRS/EDGE or W-CDMA/HSDPA Mode	Automate Signal Analysis testing requirements with annotated how-to pictures
Connectivity	
Connections	Connect to PC using USB
Download	Download measurements and live traces to PC for storage and analysis
Upload	Upload measurements from PC to instrument
Firmware Updates	Create USB Flash Drive for firmware update

Ordering Information – Options

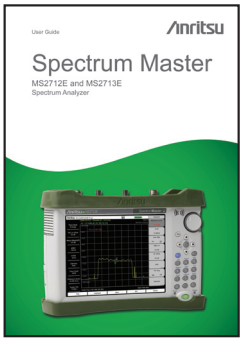
	MS2712E	MS2713E	Description
	100 kHz to 4 GHz	100 kHz to 6 GHz	Spectrum Analyzer
	Options	Options	
	MS2712E-0021	MS2713E-0021	2-Port Transmission Measurement
	MS2712E-0010	MS2713E-0010	Bias-Tee
	MS2712E-0031	MS2713E-0031	GPS Receiver (Requires Antenna P/N 2000-1528-R)
	MS2712E-0019	MS2713E-0019	High-Accuracy Power Meter
	MS2712E-0029	MS2713E-0029	Power Meter
	MS2712E-0025	MS2713E-0025	Interference Analyzer
	MS2712E-0027	MS2713E-0027	Channel Scanner
	MS2712E-0090	MS2713E-0090	Gated Sweep
	MS2712E-0028	MS2713E-0028	C/W Signal Generator (Requires Option 0021) (Requires CW Signal Generator Kit, P/N 69793)
	MS2712E-0009	MS2713E-0009	10 MHz BW Demod
	MS2712E-0040	MS2713E-0040	GSM/GPRS/EDGE RF Measurements*
	MS2712E-0041	MS2713E-0041	GSM/GPRS/EDGE Demodulation*
	MS2712E-0044	MS2713E-0044	W-CDMA/HSDPA RF Measurements*
	MS2712E-0045	MS2713E-0045	W-CDMA Demodulation*
	MS2712E-0065	MS2713E-0065	W-CDMA/HSDPA Demodulation*
	MS2712E-0035	MS2713E-0035	W-CDMA/HSDPA Over-the-Air Measurements**
	MS2712E-0541	MS2713E-0541	LTE RF Measurements*
	MS2712E-0542	MS2713E-0542	LTE Modulation Quality**
	MS2712E-0546	MS2713E-0546	LTE Over-the-Air Measurements**
	MS2712E-0060	MS2713E-0060	TD-SCDMA/HSDPA Measurements*
	MS2712E-0061	MS2713E-0061	TD-SCDMA/HSDPA Demodulation*
	MS2712E-0038	MS2713E-0038	TD-SCDMA/HSDPA Over-the-Air Measurements*
	MS2712E-0042	MS2713E-0042	cdmaOne/CDMA2000 1X RF Measurements*
	MS2712E-0043	MS2713E-0043	cdmaOne/CDMA2000 1X Demodulation*
	MS2712E-0033	MS2713E-0033	cdmaOne/CDMA2000 1X Over-the-Air Measurements**
	MS2712E-0062	MS2713E-0062	CDMA2000 1xEV-DO RF Measurements*
	MS2712E-0063	MS2713E-0063	CDMA2000 1xEV-DO Demodulation*
	MS2712E-0034	MS2713E-0034	CDMA2000 1xEV-DO Over-the-Air Measurements**
	MS2712E-0046	MS2713E-0046	IEEE 802.16 Fixed WiMAX RF Measurements*
	MS2712E-0047	MS2713E-0047	IEEE 802.16 Fixed WiMAX Demodulation*
	MS2712E-0066	MS2713E-0066	IEEE 802.16 Mobile WiMAX RF Measurements*
	MS2712E-0067	MS2713E-0067	IEEE 802.16 Mobile WiMAX Demodulation*
	MS2712E-0037	MS2713E-0037	IEEE 802.16 Mobile WiMAX Over-the-Air Measurements
	MS2712E-0509	MS2713E-0509	AM/FM/PM Analyzer
	MS2712E-0030	MS2713E-0030	ISDB-T Digital Video Measurements*
	MS2712E-0032	MS2713E-0032	ISDB-T SFN Measurements*
	MS2712E-0098	MS2713E-0098	Standard Calibration (ANSI 2540-1-1994)
	MS2712E-0099	MS2713E-0099	Premium Calibration to Z540 plus test data *Requires Option 0009, **Requires Option 0009, and Option 0031

Spectrum Master™ MS2712E and MS2713E Specifications

Power Sensors (For complete ordering information see the respective datasheets of each sensor)

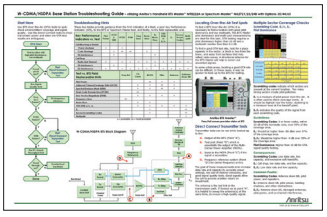
Model Number	Description
PSN50	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +20 dBm
MA24104A	Inline High Power Sensor, 600 MHz to 4 GHz, +51.76 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm

Manuals (soft copy included on MST CD and at www.us.anritsu.com)



Part Number	Description
10580-00251	Spectrum Master User Guide (Hard copy included)
10580-00242	2-Port Transmission Measurement - Bias-Tee
10580-00231	Spectrum Analyzer Measurement Guide - Interference Analyzer, Channel Scanner, Gated Sweep, CW Signal Generator, AM/FM/PM Analyzer
10580-00234	3GPP Signal Analyzer Measurement Guide - GSM/EDGE, W-CDMA/HSDPA, TD-SCDMA/HSDPA, LTE
10580-00235	3GPP2 Signal Analyzer Measurement Guide - CDMA, EV-DO
10580-00236	WiMAX Signal Analyzer Measurement Guide - Fixed WiMAX, Mobile WiMAX
10580-00237	Digital TV Measurement Guide - DVB-T/H, ISDB-T
10580-00240	Power Meter Measurement Guide - High Accuracy Power Meter
10580-00256	Programming Manual

Troubleshooting Guides (soft copy included on MST CD and at www.us.anritsu.com)



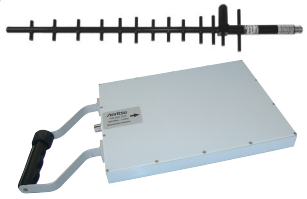
Part Number	Description
11410-00472	Interference
11410-00466	GSM/GPRS/EDGE Base Stations
11410-00463	W-CDMA/HSDPA Base Stations
11410-00465	TD-SCDMA/HSDPA Base Stations
11410-00467	cdmaOne/CDMA2000 1X Base Stations
11410-00468	CDMA2000 1xEV-DO Base Stations
11410-00470	Fixed WiMAX Base Stations
11410-00469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

Standard Accessories (included with instrument)

Part Number	Description
10580-00251	Spectrum Master User Guide (includes Bias-Tee, GPS Receiver)
3-68736	Soft Carrying Case
2300-498	MST CD: Master Software Tools, User/Measurement Guides, Programming Manual, Troubleshooting Guides, Application Notes
633-44	Rechargeable Li-Ion Battery
40-168-R	AC-DC Adapter
806-141-R	Automotive Cigarette Lighter 12 VDC Adapter
3-2000-1498	USB A/5-pin mini-B Cable, 10 feet/305 cm
11410-00511	Spectrum Master™ MS2712E, MS2713E Technical Data Sheet One Year Warranty (Including battery, firmware, and software) Certificate of Calibration and Conformance

Optional Accessories

Directional Antennas



Part Number	Description
2000-1411-R	822-900 MHz, N(f), 10 dBd, Yagi
2000-1412-R	885-975 MHz, N(f), 10 dBd, Yagi
2000-1413-R	1710-1880 MHz, N(f), 10 dBd. Yagi
2000-1414-R	1850-1990 MHz, N(f), 9.3 dBd, Yagi
2000-1415-R	2400-2500 MHz, N(f), 10 dBd, Yagi
2000-1416-R	1920-2170 MHz, N(f), 10 dBd, Yagi
2000-1519	500 MHz to 3 GHz, log periodic

Portable Antennas

2000-1200	806-866 MHz, SMA (m), 50 Ω
2000-1473	870-960 MHz, SMA(m), 50 Ω
2000-1035	896-941 MHz, SMA (m), 50 Ω (1/4 wave)
2000-1030	1710 to 1880 MHz, SMA (m), 50 Ω (1/2 wave)
2000-1474	1750 to 1850 MHz with knuckle elbow (1/2 wave)
2000-1031	1850 to 1990 MHz, SMA (m), 50 Ω (1/2 wave)
2000-1475	1920 to 1980 MHz and 2110 to 2170 MHz, SMA (m), 50 Ω
2000-1032-R	2400 to 2500 MHz, SMA (m), 50 Ω (1/2 wave)
2000-1361	2400 to 2500, 5000 to 6000 MHz, SMA (m), 50 Ω
61532	Antenna Kit (Consists of: 2000-1030, 2000-1031, 2000-1032-R, 2000-1200, 2000-1035, 2000-1361, and carrying pouch)

Bandpass Filters

1030-114-R	806-869 MHz, N(m) - SMA(f), 50 Ω
1030-109-R	824 - 849 MHz, N(m) - SMA (f), 50 Ω
1030-110-R	880 - 915 MHz, N(m) - SMA (f), 50 Ω
1030-105-R	890-915 MHz Band, 0.41 dB loss, N(m) - SMA (f), 50 Ω
1030-111-R	1850 - 1910 MHz, N(m) - SMA (f), 50 Ω
1030-106-R	1710-1790 MHz Band, 0.34 dB loss, N(m) - SMA (f), 50 Ω
1030-107-R	1910-1990 MHz Band, 0.41 dB loss, N(m) - SMA (f), 50 Ω
1030-112-R	2400 - 2484 MHz, N(m) - SMA (f), 50 Ω
1030-155-R	2500-2700 MHz, N(m) – N(f), 50 Ω

Attenuators

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

Phase-Stable Test Port Cables, Armored w/ Reinforced Grip (recommended for cable & antenna line sweep applications)

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

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

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

Optional Accessories (continued)

Adapters

1091-26-R	SMA(m) - N(m), DC to 18 GHz, 50 Ω
1091-27-R	SMA(f) - N(m), DC to 18 GHz, 50 Ω
1091-80-R	SMA(m) - N(f), DC to 18 GHz, 50 Ω
1091-81-R	SMA(f) - N(f), DC to 18 GHz, 50 Ω
1091-172	BNC(f) - N(m), DC to 1.3 GHz, 50 Ω
510-102-R	N(m) - N(m), DC to 11 GHz, 50 Ω, 90 degrees right angle

Precision Adapters

34NN50A	Precision Adapter, N(m) - N(m), DC to 18 GHz, 50 Ω
34NFNF50	Precision Adapter, N(f) - N(f), DC to 18 GHz, 50 Ω

Backpack and Transit Case

67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle

Miscellaneous Accessories

2000-1528-R	GPS Antenna, SMA(m)
69793	CW Signal Generator Kit
2000-1520-R	USB Flash Drive
2000-1374	External Charger for Li-Ion Batteries

Notes

The Master Users Group is an organization dedicated to providing training, technical support, networking opportunities and links to Master product development teams. As a member you will receive the Insite Quarterly Newsletter with user stories, measurement tips, new product news and more.

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