

Anritsu envision : ensure

BTS Master™

High Performance Handheld
Base Station Analyzer

MT8220T

400 MHz to 6.0 GHz Cable and Antenna Analyzer

150 kHz to 7.1 GHz Spectrum Analyzer

10 MHz to 7.1 GHz Power Meter



Introduction

Anritsu introduces the next generation high performance handheld Base Station Analyzer for installation and maintenance of wireless networks. Delivered with a standard three-year warranty, the MT8220T BTS Master is the only all-in-one, touchscreen handheld tool that combines cable and antenna testing, signal analysis for all cellular standards, ultra-sensitive spectrum analysis, sophisticated interference tracking, and a vector signal generator for receiver testing in a compact, easy-to-use instrument.

Cable and Antenna Analyzer Highlights

- Measurements: RL, VSWR, Cable Loss, DTF, Phase, Gain
- 2-port Gain Measurement Uncertainty: < 0.45 dB
- 2-port Dynamic Range: > 100 dB
- RF Immunity: +17 dBm on-channel, +10 dBm on-frequency
- Calibration: OSL and FlexCal™
- Bias Tee: 32 V internal

Spectrum and Interference Analyzer Highlights

- Measurements: Occupied Bandwidth, Channel Power, ACPR, C/I, Field Strength, Spectral Emissions
- Interference Analyzer: Spectrogram, Signal Strength, RSSI, Signal ID
- Dynamic Range: > 95 dB in 1 Hz RBW
- DANL: -163 dBm in 1 Hz RBW
- Phase Noise: -100 dBc/Hz @ 10 kHz offset
- Frequency Accuracy: $\pm 2.5 \times 10^{-8}$ with GPS On
- Burst Detect™ Sweep Mode: sweep 1000x in 15 MHz span
- Coverage Mapping: plot RSSI on on-screen map
- Interference Mapping: on-screen mapping with triangulation

Capabilities and Functional Highlights

- CPRI RF Measurements
- LTE/LTE-A FDD/TDD
- GSM/GPRS/EDGE
- W-CDMA/HSPA+
- TD-SCDMA/HSPA+
- CDMA/EV-DO
- WiMAX Fixed/Mobile
- Vector Signal Generator
- Zero-span IF Output
- Gated Sweep
- Standard GPS receiver, GPS information on stored traces
- Standard Internal Preamp
- Internal Power Meter
- High Accuracy Power Meter
- USB Power Sensors up to 26 GHz
- Channel Scanner
- 2.5 hour battery operation time
- < 5 minute warm-up time
- Ethernet/USB data transfer
- Remote Access Tool
- Line Sweep Tools
- Standard 3-year warranty



BTS Master™ MT8220T Base Station Analyzer featuring Vector Signal Generator
Handheld Size: 315 mm x 211 mm x 77 mm (12.4 in x 8.3 in x 3.0 in), Lightweight: 4.6 kg (10.2 lb)

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Definitions

	All specifications and characteristics apply to Revision 2 instruments under the following conditions, unless otherwise stated:
Warm-Up Time	After 10 minutes of warm-up time, where the instrument is left in the ON state.
Temperature Range	Over the 23 °C ± 5 °C temperature range.
Reference Signal	When using internal reference signal.
Time Base Error	Time base error = frequency accuracy x measured frequency
Typical Performance	Typical specifications in parenthesis () represent the mean value of measured units and do not include any guard-bands or uncertainties. They are not warranted. Typical specifications that are not in parenthesis are not tested and not warranted. They are generally representative of characteristic performance.
Uncertainty	A coverage factor of x1 is applied to the measurement uncertainties to facilitate comparison with other industry handheld analyzers.
Calibration Cycle	Calibration is within the recommended 12 month period (residual specifications also require calibration kit calibration cycle adherence.)



Cable and Antenna Analyzer

Measurements

Measurements	VSWR, Return Loss, Cable Loss, Distance-to-Fault (DTF) VSWR, Distance-to-Fault (DTF) Return Loss, 1-port Phase, 2-port Phase, 2-port Gain, Smith Chart
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Setup Parameters

Frequency	Start/Stop, Signal Standard, Start Cal
DTF	Start/Stop, DTF Aid, Units (m/ft), Cable Loss, Propagation Velocity, Cable, Windowing
Windowing	Rectangular, Normal Side Lobe, Low Side Lobe, Minimum Side Lobe
Amplitude	Top, Bottom, Auto Scale, Full Scale
Sweep	Run/Hold, Single/Continuous, RF Immunity (High/Low), Data Points, Averaging/Smoothing, Output Power (High/Low)
Data Points	137, 275, 551
Markers	Markers 1 to 6 each with a Delta Marker, Marker to Peak/Valley, Time Marker (DTF), Marker Table (On/Off), All Markers Off
Traces	Recall, Copy to Display Memory, No Trace Math, Trace $\pm$ Memory, Trace Overlay (On/Off)
Limit Line	On/Off, Single Limit, Multi-segment Edit, Limit Alarm (On/Off), Pass Fail Message (On/Off), Warning Limit Offset, Clear Limit
Limit Line Edit	Frequency, Amplitude, Add Point, Delete Point, Next Point Left, Next Point Right, Move Limit
Calibration	Start Cal, 1/2-port, Low/High Power, Standard/FlexCal™, DUT Connector, Configure DUT
Save/Recall	Setups, Measurements, Screen Shots (JPEG - save only)
Application Options	Bias-Tee (On/Off)

Frequency

Frequency Range	400 MHz to 6 GHz
Frequency Accuracy	$\pm 3.0 \times 10^{-6}$
Frequency Resolution	1 kHz (RF immunity low) 100 kHz (RF immunity high)

Output Power

High	-7 dBm, typical, 1 or 2-port
Low	-40 dBm, typical, 2-port

Dynamic Range (output power high, 25-trace average)

400 MHz to 2800 MHz	> 100 dB, 110 dB typical
> 2800 MHz to 4000 MHz	> 90 dB
> 4000 MHz to 6000 MHz	> 85 dB

Interference Immunity

On-Channel	+17 dBm @ >1.0 MHz from carrier frequency
On-Frequency	+10 dBm within ± 10 kHz from the carrier frequency

Measurement Speed

Return Loss	≤ 4.5 ms/data point, RF immunity low, typical
Distance-to-Fault	≤ 4.5 ms/data point, RF immunity low, typical

Return Loss

Measurement Range	0 dB to 60 dB
Resolution	0.01 dB

VSWR

Measurement Range	1:1 to 65:1
Resolution	0.01

Cable Loss

Measurement Range	0 dB to 30 dB
Resolution	0.01 dB

2-Port Gain

Measurement Range	-120 dB to +100 dB
Resolution	0.01 dB



Cable and Antenna Analyzer (continued)

Distance-to-Fault

Vertical Range Return Loss	0 dB to 60 dB
Vertical Range VSWR	1 to 65
Fault Resolution (m)	$(1.5 \times 10^8 \times V_p) / \Delta F$ (V_p = velocity propagation constant, ΔF is $F_2 - F_1$ in Hz)
Horizontal Range (m)	0 to (Data Points-1) $\times$ Fault Resolution, to a maximum of 1500 m (4921 ft)

Phase (1- and 2-Port)

Measurement Range	-180° to +180°
Resolution	0.01°

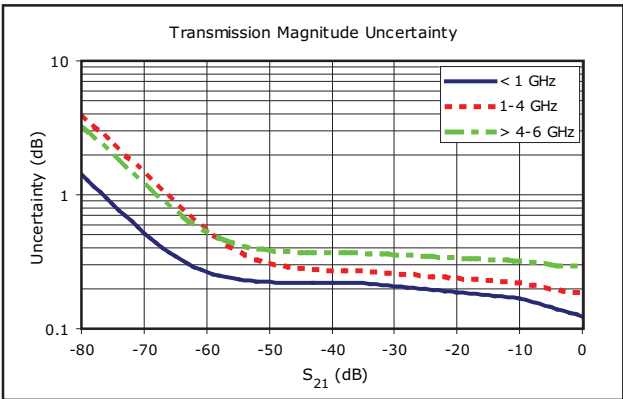
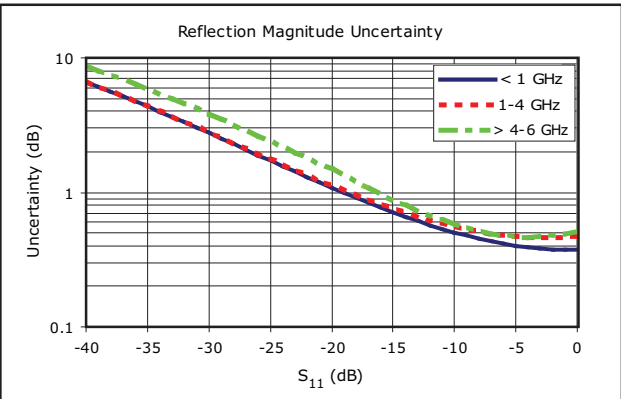
Smith Chart

Resolution	0.01
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Measurement Accuracy

Corrected Directivity	> 42 dB
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Measurement Uncertainty





Spectrum Analyzer

Measurements

Smart Measurements	Field Strength (uses antenna calibration tables to measure dBm/m ² , dBμV/m, dBV/m, dBmV/m, V/m, W/m ² , dBW/m ² , A/m, dBA/m and W/cm ²) 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 (AM, wide/narrow FM, upper/lower SSB), (audio out only) C/I (carrier-to-interference ratio) Emission Mask (recall limit lines as emission mask) Coverage Mapping (requires Option 431) IQ Waveform Capture (requires Option 24)
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Setup Parameters

Frequency	Center/Start/Stop, Span, Frequency Step, Frequency Offset, Signal Standard, Channel #
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 Ratio, Span/RBW Ratio
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 (requires Option 90)
Sweep Mode	Fast (100x Performance), Performance, No FFT, Burst Detect (1000x Fast in 15 MHz span)
Detection	Peak, RMS/Avg, 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/Large), 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 offset and amplitude

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, Number of Points (41), Offset, Shape Square/Slope
Limit Line Advanced	Type (Absolute/Relative), Mirror, Save/Recall

Frequency

Frequency Range	150 kHz to 7.1 GHz (usable to 0 Hz)
Maximum Continuous Input	+30 dBm
Tuning Resolution	1 Hz
Frequency Reference	Aging: $\pm 1.0 \times 10^{-6}/10$ years
Frequency Span Accuracy	$\pm 3 \times 10^{-7}$ (25 °C $\pm$ 25 °C) + aging, 10 Hz to 7.1 GHz including zero span
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 % (-3 dB bandwidth)
Video Bandwidth (VBW)	1 Hz to 3 MHz in 1-3 sequence ± 10 % (-3 dB bandwidth)
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
VBW/Average Type	Linear/Log

Spectral Purity

SSB Phase Noise	-100 dBc/Hz @ 10 kHz, 20 kHz, and 30 kHz offset from carrier -102 dBc/Hz @ 100 kHz offset from carrier
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Spectrum Analyzer (continued)

Amplitude Ranges

Dynamic Range	> 95 dB (600 MHz, 3.5 GHz), 2/3 (TOI-DANL) in 1 Hz RBW
Measurement Range	DANL to +30 dBm
Display Range	1 to 15 dB/div in 1 dB steps, ten divisions displayed
Reference Level Range	-120 dBm to +30 dBm
Attenuator Resolution	0 dB to 65 dB, 5.0 dB steps
Amplitude Units	Log Scale Modes: dBm, dBV, dBmV, dBμV, dBW, dBA Linear Scale Modes: nV, μV, mV, V, kV, nW, μW, mW, W, kW, fA, pA, nA, μA, mA, A

Amplitude Accuracy (Power level > -50 dBm)

Input attenuation	Preamp Off (≤ 35 dB)	Preamp Off (40 to 55 dB)	Preamp Off (60 to 65 dB)	Preamp On (0 or 10 dB)
150 kHz to ≤10 MHz	± 1.50 dB	± 1.50 dB	± 1.50 dB	-
150 kHz to 4.0 GHz	-	-	-	± 1.50 dB
>10 MHz to 4.0 GHz	± 1.25 dB	± 1.75 dB	± 1.75 dB	-
>4.0 GHz to 6.5 GHz	-	± 1.75 dB	± 1.75 dB	-
>4.0 GHz to 7.1 GHz	± 1.75 dB	-	-	± 1.75 dB

Displayed Average Noise Level (DANL)

DANL in 1 Hz RBW, 0 dB attenuation	Preamp Off (Reference level -20 dBm)		Preamp On (Reference level -50 dBm)	
	Maximum	Typical	Maximum	Typical
3 MHz to 1.0 GHz	-137 dBm	-150 dBm	-161 dBm	-163 dBm
> 1.0 GHz to 2.2 GHz	-133 dBm	-147 dBm	-159 dBm	-160 dBm
> 2.2 GHz to 4.0 GHz	-133 dBm	-143 dBm	-156 dBm	-159 dBm
> 4.0 GHz to 7.1 GHz	-130 dBm	-138 dBm	-154 dBm	-156 dBm

Spurs

Residual Spurs	Preamp Off (RF input terminated, 0 dB input attenuation) -90 dBm, 150 kHz to 3.2 GHz -84 dBm, > 3.2 GHz to 7.1 GHz
Exceptions	-70 dBm @ 3200 MHz Preamp On (RF input terminated, 0 dB input attenuation) -100 dBm, 10 MHz to 7.1 GHz
Exceptions	-95 dBm @ 50 MHz, 100 MHz, 150 MHz
Input-Related Spurious	(0 dB attenuation, -30 dBm input, span < 1.7 GHz, carrier offset > 4.5 MHz) -60 dBc, -70 dBc typical
Exceptions	-40 dBc, -60 dBc typical @ 1672 MHz

Third-Order Intercept (TOI)

Preamp Off	
600 MHz	+8 dBm typical
3.5 GHz	+9 dBm typical

Second Harmonic Distortion

Preamp Off	-50 dBc maximum -70 dBc typical
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VSWR

< 4.0 GHz	1.5:1 typical
4.0 GHz to 7.1 GHz	1.8:1 typical



GPS Receiver

General

Setup	On/Off, Antenna Voltage 3.3 V/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, Wireless Measurements when GPS Antenna is connected: $\pm 2.5 \times 10^{-8}$ with GPS On, 3 minutes after satellite lock in selected mode
GPS Lock Accuracy	after antenna is disconnected: $\pm 5.0 \times 10^{-8}$ for 3 days, 0 °C to 50 °C ambient temperature
Connector	SMA, female
Supplied Antenna	2000-1760-R GPS Antenna, SMA(m), 25 dB gain, 2.5 VDC to 3.7 VDC



Power Meter

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 7.1 GHz
Span	1 kHz to 100 MHz
Display Range	-140 dBm to +30 dBm, ≤ 40 dB span
Measurement Range	-120 dBm to +30 dBm
Offset Range	0 dB to +100 dB
VSWR	1.5:1 typical
Maximum Power	+30 dBm without attenuator
Accuracy	Same as Spectrum Analyzer
Application Options	Impedance (50 Ω , 75 Ω , Other)



High Accuracy Power Meter (Requires external USB power sensor, sold separately)

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 High Power Sensor	High Accuracy RF 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 Ω	Type N(m), 50 Ω	Type N(m), 50 Ω (8/18 GHz) Type K(m), 50 Ω (26 GHz)	Type N(m), 50 Ω
Dynamic Range	+3 dBm to +51.76 dBm (2 mW to 150 W)	-40 dBm to +23 dBm (0.1 μ W to 200 mW)	-40 dBm to +20 dBm (0.1 μ W to 100 mW)	-60 dBm to +20 dBm (1 nW to 100 mW)
Measurand	True-RMS	True-RMS	True-RMS, Slot Power, Burst Average Power	True-RMS, Slot Power, Burst Average Power
Measurement Uncertainty	± 0.17 dB ^a	± 0.16 dB ^b	± 0.18 dB ^c	± 0.17 dB ^d
Data sheet (for complete specifications)	11410-00621	11410-00424	11410-00504	11410-00841

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 °C to 50 °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.

**Bias-Tee (Option 10)****General**

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

**Vector Signal Generator (Option 23)****Setup Parameters**

Frequency	Frequency, Signal Standard, Channel Number, Interferer Offset
Amplitude	Signal/Interferer/Noise Level in dBm, Level Offset, Signal (CW/Modulated/Off), Interferer (CW/Modulated/Off), Noise (On/Off)
Trigger (for modulated signals)	Type (None/Positive/Negative), Delay, Manual, Pattern Manager
Pattern Manager	Add, Erase
Modulation	Signal Pattern Select, Interferer Pattern Select, Edit
Modulation Edit	Analog, Digital, Custom, Spectrum Inversion (Normal/Reverse)
RF	On/Off
Active Pattern Memory	256 MB
Frequency Range	400 MHz to 6 GHz
Frequency Resolution	1 Hz
Frequency Accuracy	$\pm 3 \times 10^{-7}$ (25 °C $\pm$ 25 °C) + aging
Output Power	-124 dBm to 0 dBm, CW -124 dBm to -8 dBm, Modulated/Noise/Multi-carrier
Step Size	0.1 dB nominal
Bandwidth	1 signal to 10 MHz or 2 signals to 5 MHz each + AWGN
Waveform Addition	Desired Signal + Interfering Signal + AWGN

Level Accuracy, Single Channel (at least 30 minutes warm-up after 1 hour non-operating at 15 °C to 35 °C ambient, excludes load match errors, excludes radiated immunity)

VSG Output Power	(400 MHz to 2.0 GHz)		(>2.0 to 4.0 GHz)		(>4.0 to 6.0 GHz)	
	CW Mode	W-CDMA	CW Mode	W-CDMA	CW Mode	W-CDMA
-46 dBm to 0 dBm						
-46 dBm to -8 dBm	± 1.0 dB	-	± 1.2 dB	-	± 1.2 dB	-
-84 dBm to < -46 dBm	-	± 1.4 dB	-	± 1.4 dB	-	± 1.8 dB
-104 dBm to < -84 dBm	± 1.1 dB	± 1.4 dB	± 1.3 dB	± 1.4 dB	± 1.3 dB	± 2.0 dB
-124 dBm to < -104 dBm	± 1.4 dB	± 1.5 dB	± 1.4 dB	± 1.5 dB	± 1.4 dB	± 2.0 dB

Standard Signal Patterns

AM (Frequency/Depth)	400 Hz/5 %, 1 kHz/10 %, 3 kHz/20 %, 5 kHz/30 %, 10 kHz/50 %, 15 kHz/70 %, 20 kHz/90 %
FM (Rate/Deviation)	1 kHz/100 Hz, 5 kHz/500 Hz, 10 kHz/1 kHz, 50 kHz/5 kHz, 100/10 kHz, 500 kHz/50 kHz, 500 kHz/100 kHz, 500 kHz/500 kHz
Pulsed CW (Duty Cycle/Period)	50 %/0.1 ms (10 kHz), 50 %/1 ms (1 kHz), 50 %/2.5 ms (400 Hz)
EDGE - Continuous	3n/8-8PSK, 270.833 KSPS, Linearized Gaussian filtered, Data = PN9
W-CDMA Pilot	QPSK, 3.84 MSPS, RRC filtered, alpha=0.22, Data = PN9
DECT 16QAM - Continuous	1.152 MSPS, RRC filtered, alpha = 0.5, Data = PN9
DECT 64QAM - Continuous	16QAM, 6.84 MSPS, RRC filtered, alpha = 0.15, Data = PN9
DVB-C	1.152 MSPS, RRC filtered, alpha = 0.5, Data = PN9
J.83C Digital Cable	16QAM, 5 MSPS, RRCC filtered, alpha = 0.13
64QAM - US Digital Cable	5.056941 MSPS, RRC filtered, alpha = 0.18

Customized Signal Patterns (contact Anritsu)

Input Waveform for MST Pattern Converter	ASCII Text or MATLAB® file format
Number of Waveforms	≤ 1000

Sampling Rate	12.500 MHz	6.250 MHz	1.625 MHz
Bandwidth	10.0 MHz	5.0 MHz	1.2 MHz
Time	≤ 4 s	≤ 8 s	≤ 32 s
Length	$N \times 8$ Samples	$N \times 4$ Samples	$N \times 4$ Samples



I/Q Waveform Capture (Option 24)

General

Mode	Spectrum Analyzer
Capture Mode	Single or Continuous
Trigger	Free Run, External (Rising/Falling), Delay
Maximum Capture Length	800 ms
Maximum Sample Rate	40 MHz
Maximum Signal Bandwidth	32 MHz



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 (RSSI)	Collect data up to one week
Signal ID	ID up to 12 FM, GSM, W-CDMA, CDMA or Wi-Fi signals based on RF bandwidth
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)



Channel Scanner (Option 27)

General

Number of Channels	1 to 20 Channels (Power Levels)
Measurements	Graph/Table, Max Hold (On/5 sec/Off), Frequency/Channel, Current/Maximum, 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	150 kHz to 7.1 GHz
Frequency Accuracy	± 10 Hz + time base error
Measurement Range	-110 dBm to +30 dBm
Application Options	Bias-Tee (On/Off), Impedance (50 Ω , 75 Ω , Other)



Zero Span IF Output (Option 89)

General

Mode	Spectrum Analyzer/Span/Zero Span
Center Frequency	140 MHz $\pm$ 130 kHz
Output Level	-25 dBm typical
Reference Level	-57 dBm to +30 dBm (Preamp Off) -87 dBm to -40 dBm (Preamp On)
IF Bandwidth	Up to 30 MHz (3 dB bandwidth)
RF Attenuation	Auto
Connector	BNC female



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 μ s to 65 ms typical) Zero Span Time



Coverage Mapping (Option 431)

Measurements

Indoor Mapping	RSSI, ACPR
Outdoor Mapping	RSSI, ACPR

Setup Parameters

Mode	Spectrum Analyzer
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 Ratio, Span/VBW Ratio
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



CPRI Measurements (Option 750) (operating temperature range -10 °C to +45 °C)

Measurements¹ (Powered by Absolute Analysis)
 Spectrum
 Spectrogram Collect data up to one week

Setup Parameters

Frequency	Center, Span (Span, Full Span, Last Span), Signal Standard, Channel #, CF Reference (On/Off)
Amplitude	Reference Level (RL), Scale, RL Offset
Bandwidth	RBW, Auto RBW, VBW, Auto VBW, VBW/Average Type, RBW/VBW, Span/RBW
Measurements	CPRI Configure, CPRI Spectrum, Spectrogram
CPRI Configure	Line Rate, AxC Container #, CPRI BW, Radio Presets, Auto Detect
Radio Presets	Ericsson (12 bit), Ericsson (15 bit), Alcatel (12 bit), Alcatel (15 bit) Advanced
Advanced	IQ Bit Width, No. of Reserve Bits, Aggregation (On/Off)
Auto Detect	Radio Preset, IQ Bit Width, Reserve Bit, Aggregation, Start Auto Detect

Sweep Functions

Sweep	Single/Continuous, Sweep Once, Sweep 10 Averages
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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/Large), 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 offset and amplitude

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, Number of Points (41), Offset, Shape Square/Slope
Limit Line Advanced	Type (Absolute/Relative), Mirror, Save/Recall

Bandwidth

Resolution Bandwidth (RBW)	300 Hz to 1 MHz in 1-3-10 sequence ±10 % (-3 dB bandwidth point) typical
Video Bandwidth (VBW)	30 Hz to 1 MHz in 1-3-10 sequence ± 10 % (-3 dB bandwidth) typical
Line Bit Rate	Line bit rate 1: 614.4 Mbit/s Line bit rate 2: 1228.8 Mbit/s Line bit rate 3: 2457.6 Mbit/s Line bit rate 4: 3072.0 Mbit/s Line bit rate 5: 4915.2 Mbit/s Line bit rate 6: 6144.0 Mbit/s Line bit rate 7: 9830.4 Mbit/s

CPRI Parameters

IQ Sample Width	10 bits, 12 bits, 15 bits, 16 bits
AxC (Antenna Carrier)	AxC 0 to AxC 10
Bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz
Aggregation	On/Off

CPRI Interfaces

Small form factor pluggable (SFP) optical transceiver port.	
SFP 4.25G	850 nm
SFP+ 8G-FC/10G-SR	850 nm
SFP 2.7G	1310 nm
SFP+ 10G-LR	1310 nm

1. CPRI measurements support the LTE technology.


GSM/GPRS/EDGE Measurements (Option 880)
Measurements

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum	Phase Error	There are no additional OTA Measurements	View Pass/Fail Limits
Channel Power	EVM		GSM, EDGE
Occupied Bandwidth	Origin Offset	RF and Demodulation Measurements can be made OTA	Available Measurements
Burst Power	C/I		Channel Power
Average Burst Power	Modulation Type		Occupied Bandwidth
Frequency Error	Magnitude Error		Burst Power
Modulation Type	BSIC (NCC, BCC)		Average Burst power
BSIC (NCC, BCC)			Frequency Error
Multi-channel Spectrum			Phase Error
Power vs. Time (Frame/Slot)			EVM
Channel Power			Origin Offset
Occupied Bandwidth			C/I
Burst Power			Magnitude Error
Average Burst Power			Script Master™
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 Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screen	Overall Measurements

RF Measurements

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 Measurements

GMSK Modulation Quality (RMS Phase)	
Measurement Accuracy	$\pm 1^\circ$
Residual Error (GMSK)	1°
8PSK Modulation Quality (EVM)	
Measurement Accuracy	± 1.5 %
Residual Error (8PSK)	2.5 %



W-CDMA/HSPA+ Measurements (Option 881)

Measurements

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

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/W)
Marker	Six Markers, Table On/Off
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

RF Measurements

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 Measurements

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, 16QAM, 64QAM
Frequency Error	± 10 Hz + time base error, 99 % confidence level
EVM Accuracy	± 2.5 %, $6\% \leq \text{EVM} \leq 25\%$
Residual EVM	2.5 % 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

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



TD-SCDMA/HSPA+ Measurements (Option 882)

Measurements

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum	Code Domain Power/Error (QPSK/8PSK/16QAM/64QAM)	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_0	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_0	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, 8PSK, 16QAM, 64QAM
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/W)
Sweep	Hold/Run, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

RF Measurements

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 Measurements

Supported Modulation	QPSK, 8PSK, 16QAM, 64QAM
Residual EVM (rms)	3 % typical, P-CCPH Slot Power > -50 dBm
PN Offset	Within 1×64 chips
Pilot Power Accuracy	± 1.0 dB typical
Timing Error (Tau) for Dominant SYNC-DL	$\pm 0.2 \mu\text{s}$ (external trigger)
Spreading Factor	1, 16

Over-the-Air (OTA) Measurements

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



LTE/LTE-A FDD/TDD Measurements (Option 883)

LTE/LTE-A FDD Measurements

RF	Modulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth 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, 16QAM, 64QAM 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 or 2)	Scanner Cell ID (Group, Sector) S-SS, 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, 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

Setup Parameters

Frequency	E-UTRA Bands 1 - 14, 17 - 21, 23 - 28 (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
EVM Mode	Auto, PBCH only, Max Hold
Cyclic Prefix (CP)	Auto, Normal, Extended
Sync Type	Normal (SS), RS/Cell ID
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

LTE/LTE-A FDD RF Measurements

RF Channel Power Accuracy	± 1.5 dB; ± 1.0 dB typical (RF input –50 dBm to +10 dBm)
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LTE/LTE-A FDD Modulation Measurements

RS Power Accuracy	± 1.0 dB typical, (RF input –50 dBm to +10 dBm)
Frequency Error	± 10 Hz + time base error, 99 % confidence level
Residual EVM (rms)	2.0 % typical (E-UTRA Test Model 3.1, RF Input –50 dBm to +10 dBm)

LTE/LTE-A FDD Over-the-Air (OTA) Measurements

Scanner	Six strongest signals if present Auto Save – Sync Signal power and Modulation Results with GPS information
Tx Test	Scanner – Three strongest signals if present RS Power – Strongest Signal
Mapping	Map On-screen S-SS, 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


LTE/LTE-A FDD/TDD Measurements (Option 883) (Continued)

LTE/LTE-A TDD Measurements

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

Setup Parameters

Frequency	E-UTRA 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
EVM Mode	Auto, PBCH only, Max Hold
Cyclic Prefix (CP)	Auto, Normal, Extended
Trigger	No Trigger/Ext Trigger, Rising/Falling
Uplink/Downlink Configuration	0 to 6
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

LTE/LTE-A TDD RF Measurements

RF Channel Power Accuracy	± 1.5 dB; ± 1.0 dB typical (RF input –30 dBm to +10 dBm)
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LTE/LTE-A TDD Modulation Measurements

RS Power Accuracy	± 1.0 dB typical, (RF input –50 dBm to +10 dBm)
Frequency Error	± 10 Hz + time base error, 99 % confidence level
Residual EVM (rms)	2.0 % typical (E-UTRA Test Model 3.1, RF Input –30 dBm to +10 dBm)

LTE/LTE-A TDD Over-the-Air (OTA) Measurements

Scanner	Six strongest signals if present Auto Save – Sync Signal power and Modulation Results with GPS information
Tx Test	Scanner – Three strongest signals if present RS Power – Strongest Signal
Mapping	Map On-screen S-SS, 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



CDMA/EV-DO Measurements (Option 884)

CDMA Measurements

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

CDMA 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/W)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

CDMA RF Measurements

RF Channel Power Accuracy	± 1.5 dB; ± 1.0 dB typical (RF input -50 dBm to +20 dBm)
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CDMA Demodulation Measurements

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 dBm to +20 dBm)
PN Offset	1×64 chips
Pilot Power Accuracy	± 1.0 dB typical, relative to channel power
Tau	± 0.5 μ s typical, ± 1.0 μ s maximum

CDMA Over-the-Air (OTA) Measurements

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


CDMA/EV-DO Measurements (Option 884) (continued)

EV-DO Measurements

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

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/W)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

EV-DO RF Measurements

RF Channel Power Accuracy	± 1.5 dB; ± 1.0 dB typical (RF input -50 dBm to +20 dBm)
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EV-DO Demodulation Measurements

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 1×64 chips
Pilot Power Accuracy	± 1.0 dB typical, relative to channel power
Tau	± 0.5 μ s typical, ± 1.0 μ s maximum

EV-DO Over-the-Air (OTA) Measurements

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



WiMAX Fixed/Mobile Measurements (Option 885)

WiMAX Fixed Measurements

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

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

WiMAX Fixed RF Measurements (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)
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WiMAX Fixed Demodulation Measurements (temperature range 15 °C to 35 °C)

Frequency Error	7×10^{-8} + time base error, 99 % confidence level
Residual EVM (rms)	3 % typical, 3.5 % maximum (RF Input -50 dBm to +20 dBm)


WiMAX Fixed/Mobile Measurements (Option 885) (continued)

WiMAX Mobile¹ Measurements

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

Setup Parameters

Zone Type	PUSC
DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)
Bandwidths (MHz)	3.50, 5.00, 7.00, 8.75, 10.00
Cyclic Prefix Ratio (CP)	1/8
Span (MHz)	5, 10, 20, 30
Frame Lengths (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

WiMAX Mobile RF Measurements (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)
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WiMAX Mobile Demodulation Measurements (temperature range 15 °C to 35 °C)

Frequency Error	2×10^{-8} + time base error, 99 % confidence level
Residual EVM (rms)	2.5 % typical, 3.0 % maximum (RF Input -50 dBm to +20 dBm)

WiMAX Mobile Over-the-Air (OTA) Measurements

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

1. Mobile WiMAX conforms 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



General Specifications

Setup Parameters

System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed) Self Test, Application Self Test, GPS
System Options	Name, Date and Time, Ethernet Configuration, Volume, Display (Brightness, Blank, Default, Black & White, Night Vision, High Contrast, Invert Black & White) Share Center Frequency and Power Offset (All Modes or Not Shared) Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, User defined) Reset (Factory Defaults, Master Reset, Update Firmware)
File	Save As, Save Meas, Save, Save On Event, Recall Meas, Recall, Copy, Delete
Save/Recall	Setups, Measurements, Screen Shots (JPEG - save only)
Delete	By File Type, All, Selected
Internal Trace/Setup Memory	> 30,000 traces
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 , Maximum Input +23 dBm, $\pm$ 50 VDC, (Reflection In)
RF In	Type N, female, 50 Ω , Maximum Input +30 dBm, $\pm$ 50 VDC
GPS	SMA, female
External Power	5.5 mm barrel connector, 12 VDC to 14.5 VDC, < 5.0 A
LAN Connection	RJ48C, 10/100 Mbps, Connect to PC or LAN for Remote Access
USB Interface	Two Type A, Connect Flash Drive and Power Sensor One 5-pin mini-B, Connect to PC for data transfer
Headset Jack	3.5 mm 3-wire headset jack
External Reference In	BNC, female, 50 Ω , Maximum Input +10 dB
Reference Out	BNC, female, 50 Ω , 10 MHz
External Trigger In	BNC, female, 50 Ω style, 100 k Ω input impedance (nominal), TTL levels, Maximum Input $\pm$ 5 VDC
IF Out	BNC, female, 50 Ω , 140 MHz

Display and Keyboard

Display	8.4 inch touchscreen, 800 x 600 resolution
Pixel Defects	No more than one defective pixel (99.9997%)
Keyboard	Backlit (Red for Night Vision, White for all other display modes)

Battery

Type	Li-Ion
Battery Operation	2.5 hours, typical
Battery Charging Limits	0 °C to +45 °C, Relative Humidity $\leq$ 80 %

Electromagnetic Compatibility

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

Safety

Safety Class	EN 61010-1 Class 1, Pollution Degree 2
Product Safety	IEC 60950-1 when used with Anritsu supplied Power Supply

Warranty

Duration	Standard three-year warranty One-year warranty on battery
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Environmental

Operating Temperature	-10 °C to +55 °C
Maximum Humidity	85 % RH, non-condensing
Shock	MIL-PRF-28800F Class 2
Storage	-51 °C to +71 °C
Altitude	4600 m, operating and non-operating
Explosive Atmosphere	MIL-PRF-28800F Section 4.5.6.3 MIL-STD-810G, Method 511.5, Procedure 1

Size and Weight

Size	315 mm x 211 mm x 77 mm (12.4 in x 8.3 in x 3.0 in)
Weight	4.6 kg (10.2 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 Handheld 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, Smith Chart, and PIM
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, and USB memory stick
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Master Software Tools™ (for your PC)

Mapping (GPS Required)

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

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
Product Updates	Auto-checks Anritsu website for latest revision firmware
Pass/Fail	Create, download, or edit Signal Analysis Pass/Fail Limits
Languages	Add custom language or modify non-English language menus

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/HSPA+ Mode	Automate Signal Analysis testing requirements with annotated how-to pictures

Connectivity

Connections	Connect to PC using USB or Ethernet
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easyMap Tools™ (for 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

Web Remote Control

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 – Newer versions of Chrome, Firefox, Internet Explorer and others
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 connections and a HTML 5 Compliant browser
Download	Individual instrument files downloaded via browser Multiple instrument files and directories zipped and downloaded via browser 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
Available Drivers	LabView (visit NI.com for driver)

Ordering Information – Instrument Options

MT8220T Description

400 MHz to 6 GHz Cable and Antenna Analyzer



150 kHz to 7.1 GHz Spectrum Analyzer



10 MHz to 7.1 GHz Power Meter

Options

MT8220T-0010 Bias-Tee



MT8220T-0019 High-Accuracy Power Meter (requires external power sensor)



MT8220T-0025 Interference Analyzer



MT8220T-0027 Channel Scanner

MT8220T-0089 Zero-Span IF Output



MT8220T-0431 Coverage Mapping



MT8220T-0090 Gated Sweep

MT8220T-0024 I/Q Waveform Capture



MT8220T-0023 Vector Signal Generator



MT8220T-0750 CPRI RF Measurements



MT8220T-0880 GSM/GPRS/EDGE Measurements



MT8220T-0881 W-CDMA/HSPA+ Measurements



MT8220T-0882 TD-SCDMA/HSPA+ Measurements



MT8220T-0883 LTE/LTE-A FDD/TDD Measurements



MT8220T-0884 CDMA/EV-DO Measurements



MT8220T-0885 WiMAX Fixed/Mobile Measurements

MT8220T-0098 Standard Calibration to ISO/IEC 17025

MT8220T-0099 Premium Calibration to ISO/IEC 17025 plus test data

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

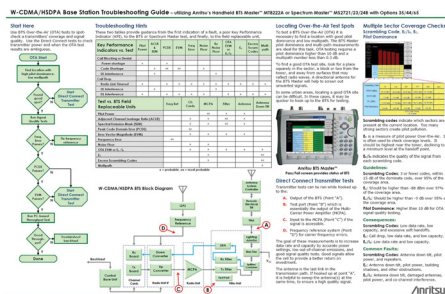


Part Number	Description
PSN50	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +20 dBm
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +51.76 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm
MA24208A	Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 dBm to -60 dBm
MA24218A	Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 dBm to -60 dBm
MA25100A	RF Power Indicator

Manuals (soft copy included on Handheld Instruments Documentation Disc and at www.anritsu.com)

Part Number	Description
10920-00060	Handheld Instruments Documentation Disc
10580-00366	BTS Master User Guide
10580-00230	Cable and Antenna Analyzer Measurement Guide
10580-00349	Spectrum Analyzer Measurement Guide
10580-00240	Power Meter Measurement Guide
10580-00232	Vector Signal Generator Measurement Guide
10580-00234	3GPP Signal Analyzer Measurement Guide
10580-00235	3GPP2 Signal Analyzer Measurement Guide
10580-00236	WiMAX Signal Analyzer Measurement Guide
10580-00415	CPRI Analyzer Measurement Guide
10580-00367	Programming Manual
10580-00368	Maintenance Manual

Troubleshooting Guides (soft copy at www.anritsu.com)



Part Number	Description
11410-00473	Cable, Antenna and Components
11410-00551	Spectrum Analyzers
11410-00472	Interference
11410-00566	LTE eNodeB Base Stations
11410-00615	TD-LTE eNodeB Base Stations
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
10920-00060	Handheld Instruments Documentation Disc
2300-577	Anritsu Software Tool Box for Handheld RF Instruments Disc
2000-1685-R	Soft Carrying Case
2000-1760-R	GPS Antenna, SMA(m), 25 dB gain, 2.5 VDC to 3.7 VDC
2000-1691-R	Stylus with Coiled Tether
633-75	Rechargeable Li-Ion Battery, 7500 mAh
40-187-R	AC/DC Power Supply
806-141-R	Automotive Power Adapter, 12 VDC, 60 Watts
2000-1371-R	Ethernet Cable, 213 cm (7 ft)
3-2000-1498	USB A-mini B Cable, 305 cm (10 ft)
	Certificate of Calibration

Optional Accessories

Calibration Components, 50 Ω 

Part Number	Description
OSLN50-1	Precision Open/Short/Load, N(m), 42 dB, 6.0 GHz, 50 Ω
OSLNF50-1	Precision Open/Short/Load, N(f), 42 dB, 6.0 GHz, 50 Ω
2000-1618-R	Precision Open/Short/Load, 7/16 DIN(m), DC to 6.0 GHz 50 Ω
2000-1619-R	Precision Open/Short/Load, 7/16 DIN(f), DC to 6.0 GHz 50 Ω
22N50	Open/Short, N(m), DC to 18 GHz, 50 Ω
22NF50	Open/Short, N(f), DC to 18 GHz, 50 Ω
SM/PL-1	Precision Load, N(m), 42 dB, 6.0 GHz
SM/PLNF-1	Precision Load, N(f), 42 dB, 6.0 GHz

Calibration Components, 75 Ω 

Part Number	Description
22N75	Open/Short, N(m), DC to 3 GHz, 75 Ω
22NF75	Open/Short, N(f), DC to 3 GHz, 75 Ω
26N75A	Precision Termination, N(m), DC to 3 GHz, 75 Ω
26NF75A	Precision Termination, N(f), DC to 3 GHz, 75 Ω
12N50-75B	Matching Pad, DC to 3 GHz, 50 Ω to 75 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)

InterChangeable Adaptor Phase Stable Test Port Cables, Armored w/Reinforced Grip (recommended for cable and antenna line sweep applications. It uses the same ruggedized grip as the Reinforced grip series cables. Now you can also change the adaptor interface on the grip to four different connector types)



Part Number	Description
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15RCN50-1.5-R	1.5 m, DC to 6 GHz, N(m), N(f), 7/16 DIN(m), 7/16 DIN(f), 50 Ω
15RCN50-3.0-R	3.0 m, DC to 6 GHz, N(m), N(f), 7/16 DIN(m), 7/16 DIN(f), 50 Ω

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



Part Number	Description
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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 (ideal for use with tightly spaced connectors and other general use applications)



Part Number	Description
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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

Miscellaneous Accessories



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

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

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), 2 dBi to 10 dBi gain, 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

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 and 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	LTE Dipole, 698-960/1710-2170/2500-2700 MHz, SMA(m), 2 dBi, typical, 50 Ω

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, 3 m (9.8 ft) Cable 2: 3000 MHz to 6000 MHz 5 dBi peak gain, N(m), 50 Ω, 3 m (9.8 ft) Cable 3: GPS 26 dB gain, SMA(m), 50 Ω, 3 m (9.8 ft)
2000-1645-R	694 MHz to 894 MHz 3 dBi peak gain, 1700 MHz to 2700 MHz 3dBi peak gain, N(m), 50 Ω, 3 m (9.8 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, 3 m (9.8 ft)
2000-1648-R	1700 MHz to 6000 MHz 3 dBi peak gain, N(m), 50 Ω, 3 m (9.8 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)

CPRI Accessories

Part Number	Description
67-12-R	Optical Tap; Single Mode/Multi Mode
67-13-R	Optical Tap; Single Mode
68-5-R	SFP (Optical Module), 4.25G, 850 nm, 500 m
68-6-R	SFP+ (Optical Module), 8G FC/10G SR 850 nm
68-7-R	SFP (Optical Module), 2.7G, 1310 nm, 15 km
68-8-R	SFP+ (Optical Module), 10G LR, 1310 nm
2100-29-R	Fiber Optic Cable, 3 m, LC/UPC, Single Mode (SM), Simplex
2100-30-R	Fiber Optic Cable, 10 m, LC-SC, Multi Mode (MM), Simplex
2100-31-R	Fiber Optic Cable, 3 m, LC/UPC, Single Mode (SM), Duplex
971-14-R	Ferrule Cleaner, 2.5 mm SC
971-15-R	Ferrule Cleaner, 1.25 mm LC
971-16	Fiber Ferrule Cleaner

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)

Training at Anritsu

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