

# 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, touch screen 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

- LTE FDD/TDD
- GSM/GPRS/EDGE
- W-CDMA/HSPA+
- TD-SCDMA/HSPA+
- CDMA/EV-DO
- WiMAX Fixed/Mobile
- PIM Analyzer
- 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)



## 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, 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 $\pm 10$ kHz from the carrier frequency

### Measurement Speed

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

### Return Loss

Measurement Range	0 to 60 dB
Resolution	0.01 dB

### VSWR

Measurement Range	1:1 to 65:1
Resolution	0.01

### Cable Loss

Measurement Range	0 to 30 dB
Resolution	0.01 dB

### 2-Port Gain

Measurement Range	-120 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)	$(1.5 \times 10^8 \times Vp) / \Delta F$ (Vp = velocity propagation constant, $\Delta F$ is F2 - F1 in Hz)
Horizontal Range (m)	0 to (Data Points-1) × Fault Resolution, to a maximum of 1500 m (4921 ft)

**Phase (1- and 2-Port)**

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

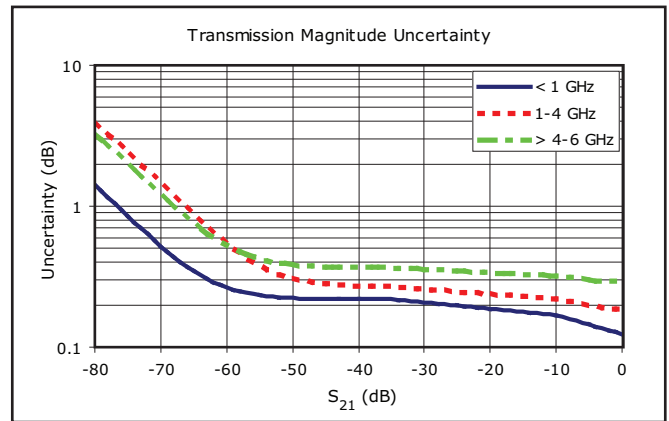
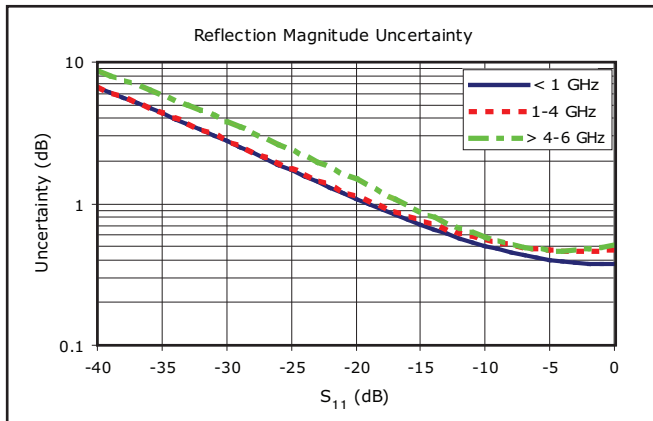
**Smith Chart**

Resolution	0.01
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**Measurement Accuracy**

Corrected Directivity	> 42 dB
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**Measurement Uncertainty**



**Bias-Tee (Option 0010)**

**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



**PIM Analyzer**

(Requires PIM Master™) See MW8208A, MW8209A, MW8219A PIM Master Product Brochure 11410-00546



## Spectrum Analyzer

### Measurements

Smart Measurements	Field Strength (uses antenna calibration tables to measure dBm/m <sup>2</sup> , dBμV/m, dBV/m, dBmV/m, V/m, W/m <sup>2</sup> , dBW/m <sup>2</sup> , A/m, dBA/m and W/cm <sup>2</sup> ) Occupied Bandwidth (measures 99 % to 1 % power channel of a signal) Channel Power (measures the total power in a specified bandwidth) ACPR (adjacent channel power ratio) AM/FM/SSB Demodulation (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 0431) IQ Waveform Capture (requires Option 0024)
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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 0090)
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: ± 1.0 × 10 <sup>-6</sup> /10 years
Frequency Span Accuracy	± 3 × 10 <sup>-7</sup> (25 °C ± 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 (-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 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
>6.5 GHz to 7.1 GHz	-	± 2.00 dB	± 3.00 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
Exceptions	Preamp On (RF input terminated, 0 dB input attenuation) -100 dBm, 10 MHz to 7.1 GHz
Input-Related Spurious	-95 dBm @ 50 MHz, 100 MHz, 150 MHz (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: ± 2.5 × 10 <sup>-8</sup> with GPS On, 3 minutes after satellite lock in selected mode
GPS Lock Accuracy	after antenna is disconnected: ± 5.0 × 10 <sup>-8</sup> 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 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 (Option 0019) (Requires external USB Power Sensor)

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

Power Sensor Model	PSN50	MA24105A	MA24106A	MA24108A/18A/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	350 MHz to 4 GHz	50 MHz to 6 GHz	10 MHz to 8/18/26 GHz
Connector	Type N(m), 50 Ω	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)
Dynamic Range	-30 dBm to +20 dBm (0.001 mW to 100 mW)	+3 dBm to +51.76 dBm (2 mW to 150 W)	-40 dBm to +23 dBm (0.1 μW to 200 mW)	-40 dBm 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 <sup>1</sup>	± 0.17 dB <sup>2</sup>	± 0.16 dB <sup>1</sup>	± 0.18 dB <sup>3</sup>
Data sheet (for complete specifications)	11410-00414	11410-00621	11410-00424	11410-00504

- Notes:
1. Total RSS measurement uncertainty (0 °C to 50 °C) 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.



### Coverage Mapping (Option 0431)

#### 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



### Interference Analyzer (Option 0025)

#### 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)
Signal Strength	Collect data up to one week
Spectrogram	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 0027)

#### 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 <sup>4</sup>
Measurement Range	-110 dBm to +30 dBm
Application Options	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)



### Gated Sweep (Option 0090)

#### 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 μs to 65 ms typical) Zero Span Time



### Zero Span IF Output (Option 0089)

#### General

Mode	Spectrum Analyzer/Span/Zero Span
Center Frequency	140 MHz ± 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



### I/Q Waveform Capture (Option 0024)

#### 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

4. time base error = frequency accuracy x measured frequency



## Vector Signal Generator (Option 0023)

### Setup Parameters

Frequency	Frequency, Signal Standard, Channel Number, Interferer Offset
Amplitude	Signal/Interferer/Noise Level in dBm, Level Offset,
Trigger (for modulated signals)	Signal (CW/Modulated/Off), Interferer (CW/Modulated/Off), Noise (On/Off)
	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 to 0 dBm, CW
	-124 to -8 dBm, Modulated/Noise/Multicarrier
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	$\pm 1.0$ dB	-	$\pm 1.2$ dB	-	$\pm 1.2$ dB	-
-46 dBm to -8 dBm	-	$\pm 1.4$ dB	-	$\pm 1.4$ dB	-	$\pm 1.8$ dB
-84 dBm to < -46 dBm	$\pm 1.1$ dB	$\pm 1.4$ dB	$\pm 1.3$ dB	$\pm 1.4$ dB	$\pm 1.3$ dB	$\pm 2.0$ dB
-104 dBm to < -84 dBm	$\pm 1.4$ dB	$\pm 1.5$ dB	$\pm 1.4$ dB	$\pm 1.5$ dB	$\pm 1.4$ dB	$\pm 2.0$ dB
-124 dBm to < -104 dBm	$\pm 1.7$ dB	$\pm 1.7$ dB	$\pm 1.7$ dB	$\pm 1.7$ dB	$\pm 1.7$ dB	$\pm 2.4$ 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	$\leq 1000$

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





**GSM/GPRS/EDGE Measurements (Option 0880)**

**Measurements**

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

**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, Modulation Measurements

**RF Measurements**

Frequency Error	± 10 Hz + time base error <sup>4</sup> , 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**

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



## W-CDMA/HSPA+ Measurements (Option 0881)

### 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	$E_c/I_0$	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	$\pm 1.25$ dB; $\pm 0.7$ dB typical (temperature range 15 °C to 35 °C)
Occupied Bandwidth Accuracy	$\pm 100$ kHz
Adjacent Channel Leakage Ratio (ACLR)	-54 dB/-59 dB $\pm 0.8$ dB @ 5 MHz/10 MHz offset, typical, 824 MHz to 894 MHz, 1710 MHz to 2170 MHz -54 dB/-57 dB $\pm 1.0$ 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	$\pm 10$ Hz + time base error <sup>4</sup> , 99 % confidence level
EVM Accuracy	$\pm 2.5$ %, $6\% \leq \text{EVM} \leq 25\%$
Residual EVM	2.5 % typical
Code Domain Power	$\pm 0.5$ dB for code channel power $> -25$ dB, 16, 32, 64 DCPH (test model 1), 16, 32 DCPH (test model 2, 3)
CPICH (dBm) Accuracy	$\pm 0.8$ 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 0882)**

**Measurements**

RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth Left Channel Power Left Channel Occ B/W Right Channel Power Right Channel Occ B/W	Code Domain Power/Error (QPSK/8PSK/16QAM/64QAM) Slot Power DwPTS Power Noise Floor Frequency Error Tau Scrambling Code	Code Scan (32) Scrambling Code Group Tau E <sub>c</sub> /I <sub>0</sub> DwPTS Power Pilot Dominance Tau Scan (Six) Sync-DL# Tau E <sub>c</sub> /I <sub>0</sub> DwPTS Power Pilot Dominance	View Pass/Fail Limits All, RF, Demod Available Measurements Occupied Bandwidth Channel Power Channel Power RCC On/Off Ratio Peak-to-Average Ratio Frequency Error EVM Peak EVM Peak Code Domain Error Tau Noise Floor
Power vs. Time Six Slot Powers Channel Power (RRC) DL-UL Delta Power UpPTS Power DwPTS Power On/Off Ratio Slot Peak-to-Average Power Spectral Emission RF Summary	EVM Peak EVM Peak Code Domain Error CDP Marker Modulation Summary	Record Run/Hold	

**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 <sup>4</sup> , 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	± 0.2 μs (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 FDD/TDD Measurements (Option 0883)**

**LTE FDD Measurements**

RF	Modulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth ACPR 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 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	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth ACLR Frequency Error Carrier Frequency Dominance EVM peak, rms RS Power SS, P-SS, S-SS Power PBCH Power PCFICH Power 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
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**LTE FDD RF Measurements**

RF Channel Power Accuracy ± 1.5 dB; ± 1.0 dB typical (RF input -50 dBm to +10 dBm)

**LTE FDD Modulation Measurements**

RS Power Accuracy	± 1.0 dB typical, (RF input -50 dBm to +10 dBm)
Frequency Error	± 10 Hz + time base error <sup>4</sup> , 99 % confidence level
Residual EVM (rms)	2.0 % typical (E-UTRA Test Model 3.1, RF Input -50 dBm to +10 dBm)

**LTE 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)



**LTE FDD/TDD Measurements (Option 0883)** (continued)

**LTE TDD Measurements**

RF	Modulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth	Power vs. Resource Block (RB) RB Power (PDSCH) Active RBs, Utilization % Channel Power, Cell ID	Scanner Cell ID (Group, Sector) S-SS, RSRP, RSRQ, SINR Dominance Modulation Results – On/Off Auto Save - On/Off	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth ACLR
Power vs. Time Frame View Sub-Frame View Total Frame Power DwPTS Power Transmit Off Power Cell ID Timing Error	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	Tx Test Scanner RS Power of MIMO antennas Cell ID, Average Power Delta Power (Max-Min) Graph of Antenna Power Modulation Results – On/Off	Frequency Error Carrier Frequency Dominance EVM peak, rms RS Power SS, P-SS, S-SS Power PBCH Power
ACLR Spectral Emission Mask Category A or B (Opt 1) RF Summary	Control Channel Power Bar Graph or Table View RS, P-SS, S-SS PBCH, PCFICH Total Power (Table View) Modulation Results Antenna Icons Detects active antennas (1 or 2) Modulation Summary	Mapping On-screen S-SS, RSRP, RSRQ, or SINR Scanner Modulation Results – Off	PCFICH Power Cell, Group, Sector ID Frame Power DwPTS Power Transmit Off Power Timing Error

**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
Trigger	No Trigger/Ext Trigger, Rising/Falling
Save/Recall	Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

**LTE TDD RF Measurements**

RF Channel Power Accuracy ± 1.5 dB; ± 1.0 dB typical (RF input -30 dBm to +10 dBm)

**LTE TDD Modulation Measurements**

RS Power Accuracy ± 1.0 dB typical, (RF input -50 dBm to +10 dBm)  
 Frequency Error ± 10 Hz + time base error<sup>4</sup>, 99 % confidence level  
 Residual EVM (rms) 2.0 % typical (E-UTRA Test Model 3.1, RF Input -30 dBm to +10 dBm)

**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)



**CDMA/EV-DO Measurements (Option 0884)**

**CDMA Measurements**

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

**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	$\pm 1.5$ dB; $\pm 1.0$ dB typical (RF input -50 dBm to +20 dBm)
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**CDMA Demodulation Measurements**

Frequency Error	$\pm 10$ Hz + time base error <sup>4</sup> , 99 % confidence level (in slow mode)
Rho Accuracy	$\pm 0.005$ , for Rho > 0.9
Residual Rho	> 0.995, typical, > 0.99 maximum, (RF input -50 dBm to +20 dBm)
PN Offset	1 x 64 chips
Pilot Power Accuracy	$\pm 1.0$ dB typical, relative to channel power
Tau	$\pm 0.5$ $\mu$ s typical, $\pm 1.0$ $\mu$ s maximum

**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 0884)** (continued)

**EV-DO Measurements**

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

**Setup Parameters**

PN Setup	PN Trigger (No Trigger, GPS, External), PN Search Type (Auto, Manual), PN Offset
Walsh Codes	64, 128
Measurement	Speed Fast, Normal, Slow
External Trigger Polarity	Rising, Falling
Slot Type	Auto, Active, Idle
Number of Carriers	1 to 5
Carrier Bandwidth (MHz)	1.23, 1.24, 1.25
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/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)

**EV-DO Demodulation Measurements**

EV-DO Compatibility	Rev 0 and Rev A
Frequency Error	± 10 Hz + time base error <sup>4</sup> , 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 µs typical, ± 1.0 µs 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 0885)**

**WiMAX Fixed Measurements**

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

**Setup Parameters**

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

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

Frequency Error  $7 \times 10^{-8}$  + time base error<sup>4</sup>, 99 % confidence level  
Residual EVM (rms) 3 % typical, 3.5 % maximum (RF Input -50 dBm to +20 dBm)




**WiMAX Fixed/Mobile Measurements (Option 0885)** (continued)

<b>WiMAX Mobile<sup>5</sup> Measurements</b>			
RF	Demodulation	Over-the-Air (OTA)	Pass/Fail
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time Channel Power Preamble Power Downlink Burst Power Uplink Burst Power ACPR Spectral Emission Mask RF Summary	Constellation RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error CINR Base Station ID Sector ID Spectral Flatness Adjacent Subcarrier Flatness EVM vs. Subcarrier/Symbol RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error CINR Base Station ID Sector ID DL-MAP (Tree View) Modulation Summary	Channel Power Monitor Preamble Scanner (Six) Preamble Relative Power Cell ID Sector ID PCINR Dominant Preamble Base Station ID Auto Save - On/Off	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth Downlink Burst Power Uplink Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Sector ID

**Setup Parameters**

Zone Type	PUSC
DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)
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 (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)

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

 Frequency Error  $2 \times 10^{-8}$  + time base error<sup>4</sup>, 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

5. 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

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) Apply when using internal reference and performance sweep mode; 3) 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
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, ± 50 VDC, (Reflection In)
RF In	Type N, female, 50 Ω, Maximum Input +30 dBm, ± 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/Clock Recovery	BNC, female, 50 Ω, Maximum Input ± 5 VDC
IF Out	BNC, female, 50 Ω, 140 MHz

### Display and Keyboard

Display	8.4" Touch Screen, 800 x 600 Resolution
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 ≤ 80 %

### Electromagnetic Compatibility

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

### 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
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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**

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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

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**Indoor Maps**

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

**General**

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









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

**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**

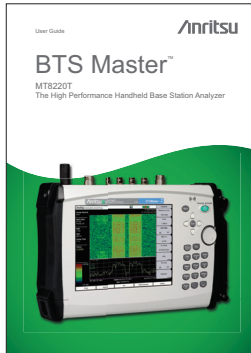
	MT8220T-0010	Bias-Tee
	MT8220T-0019	High-Accuracy Power Meter (requires external power sensor)
	MT8220T-0025	Interference Analyzer
	MT8220T-0027	Channel Scanner
	MT8220T-0089	Zero-Span IF Output
	MT8220T-0431	Coverage Mapping
	MT8220T-0090	Gated Sweep
	MT8220T-0024	I/Q Waveform Capture
	MT8220T-0023	Vector Signal Generator
	MT8220T-0880	GSM/GPRS/EDGE Measurements
	MT8220T-0881	W-CDMA/HSPA+ Measurements
	MT8220T-0882	TD-SCDMA/HSPA+ Measurements
	MT8220T-0883	LTE FDD/TDD Measurements
	MT8220T-0884	CDMA/EV-DO Measurements
	MT8220T-0885	WiMAX Fixed/Mobile Measurements
	MT8220T-0098	Standard Calibration to ISO/IEC 17025:2005
	MT8220T-0099	Premium Calibration to ISO/IEC 17025:2005 plus test data

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



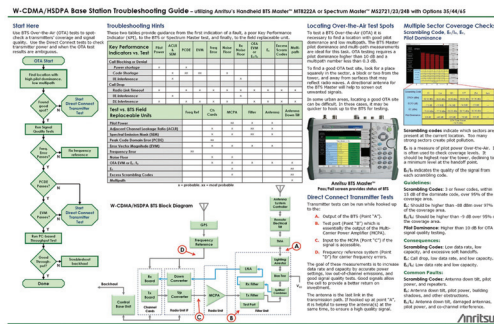
Part Number	Description
PSN50	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +20 dBm
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +51.76 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power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

**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
10580-00367	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
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
2300-498	Master Software Tools (MST) CD Disc
2300-530	Anritsu Tool Box with Line Sweep Tools (LST) DVD Disc
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
1091-379-R	Reinforced-Grip TMA Bypass Adapter, 7/16 DIN(f) - 7/16 DIN(f), DC to 6 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

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



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

**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
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** (ideal for use with tightly spaced connectors and other general use applications)



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

**Miscellaneous Accessories**



Part Number	Description
2000-1374	External Dual Charger for Li-Ion Batteries
633-75	Rechargeable Li-Ion Battery, 7500 mAh
2000-1689	EMI Near Field Probe Kit
2000-1653	Anti-glare Screen Cover (package of 2)
MA2700A	Handheld Interference Hunter (For full specifications, refer to the MA2700A Technical Data Sheet 11410-00692)

**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

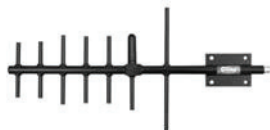
**GPS Antennas**



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	824 MHz to 896 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
2000-1677-R	300 MHz to 3000 MHz, SMA(m), 50 $\Omega$ , 3 m cable (9.8 ft), 0 to 6 dBi gain @ 950 MHz, log periodic
2000-1617	600 MHz to 21 GHz, N(f), 5 to 8 dBi to 12 GHz, 0 to 6 dBi to 21 GHz, log periodic
2000-1726-R	Antenna, Yagi 2500 MHz to 2700 MHz N(f), 12 dBd
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

## Portable Antennas



Part Number	Description
2000-1200-R	806 MHz to 866 MHz, SMA(m), 50 $\Omega$
2000-1473-R	870 MHz to 960 MHz, SMA(m), 50 $\Omega$
2000-1035-R	896 MHz to 941 MHz, SMA(m), 50 $\Omega$ (1/2 wave)
2000-1030-R	1710 MHz to 1880 MHz, SMA(m), 50 $\Omega$ (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 $\Omega$ (1/2 wave)
2000-1475-R	1920 MHz to 1980 MHz and 2110 to 2170 MHz, SMA(m), 50 $\Omega$
2000-1032-R	2400 MHz to 2500 MHz, SMA(m), 50 $\Omega$ (1/2 wave)
2000-1361-R	2400 MHz to 2500, 5000 MHz to 6000 MHz, SMA(m), 50 $\Omega$
2000-1677-R	300 MHz to 3000 MHz, SMA(m), 50 $\Omega$ , 3 m cable (9.8 ft), 0 to 6 dBi gain @ 950 MHz, log periodic
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 $\Omega$

## Mag Mount Broadband Antenna



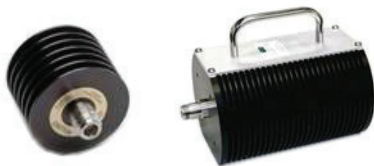
Part Number	Description
2000-1647-R	Cable 1: 698 MHz to 1200 MHz 2 dBi peak gain, 1700 MHz to 2700 MHz 5 dBi peak gain, N(m), 50 $\Omega$ , 3 m (9.8 ft) Cable 2: 3000 MHz to 6000 MHz 5 dBi peak gain, N(m), 50 $\Omega$ , 3 m (9.8 ft) Cable 3: GPS 26 dB gain, SMA(m), 50 $\Omega$ , 3 m (9.8 ft)
2000-1645-R	694 MHz to 894 MHz 3 dBi peak gain, 1700 MHz to 2700 MHz 3dBi peak gain, N(m), 50 $\Omega$ , 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 $\Omega$ , 3 m (9.8 ft)
2000-1648-R	1700 MHz to 6000 MHz 3 dBi peak gain, N(m), 50 $\Omega$ , 3 m (9.8 ft)

**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 797 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

**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)





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• **United States**

**Anritsu Company**

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

• **Canada**

**Anritsu Electronics Ltd.**

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

• **Brazil**

**Anritsu Eletrônica Ltda.**

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

• **Mexico**

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

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

• **United Kingdom**

**Anritsu EMEA Ltd.**

200 Capability Green, Luton, Bedfordshire LU1 3LU,  
U.K.  
Phone: +44-1582-433280  
Fax: +44-1582-731303

• **France**

**Anritsu S.A.**

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

• **Germany**

**Anritsu GmbH**

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

• **Italy**

**Anritsu S.r.l.**

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

• **Sweden**

**Anritsu AB**

Borgafjordsgatan 13A, 164 40 KISTA, Sweden  
Phone: +46-8-534-707-00  
Fax: +46-8-534-707-30

• **Finland**

**Anritsu Finland**

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

• **Denmark**

**Anritsu A/S (for Service Assurance)**

**Anritsu AB (for Test & Measurement)**  
Kay Fiskers Plads 9, DK-2300 Copenhagen S,  
Denmark  
Phone: +45-3691-5035  
Fax: +45-7211-2210

• **Russia**

**Anritsu EMEA Ltd.**

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

• **United Arab Emirates**

**Anritsu EMEA Ltd.**

**Dubai Liaison Office**

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

• **Singapore**

**Anritsu Pte. Ltd.**

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

• **India**

**Anritsu India Pvt. Ltd.**

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

• **P.R. China (Shanghai)**

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

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

• **Hong Kong**

**Anritsu Company Ltd.**

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

• **Japan**

**Anritsu Corporation**

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

• **Korea**

**Anritsu Corporation, Ltd.**

502, 5FL H-Square N B/D, 681  
Sampyeong-dong, Bundang-gu, Seongnam-si,  
Gyeonggi-do, 463-400 Korea  
Phone: +82-31-696-7750  
Fax: +82-31-696-7751

• **Australia**

**Anritsu Pty Ltd.**

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

• **Taiwan**

**Anritsu Company Inc.**

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

List Revision Date: 20130905

This Technical Data Sheet applies to Revision 1 of the MT8220T BTS Master. Refer to the sticker on the back of the instrument. Instruments not indicating a revision level on the sticker are Revision 1 instruments.



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