Technical Data Sheet

BTS Master™

High Performance Handheld Base Station Analyzer

MT8221B

400 MHz to 4.0 GHz Cable & Antenna Analyzer
150 kHz to 7.1 GHz Spectrum Analyzer
10 MHz to 7.1 GHz Power Meter

Introduction

Anritsu introduces its next generation high performance handheld Base Station Analyzer for installation and maintenance of wireless networks. The BTS Master features the latest support for HSPA+ and LTE and is a future-proof platform with 20 MHz demodulation bandwidth and a Vector Signal Generator for receiver testing.

Cable and Antenna Analyzer Highlights

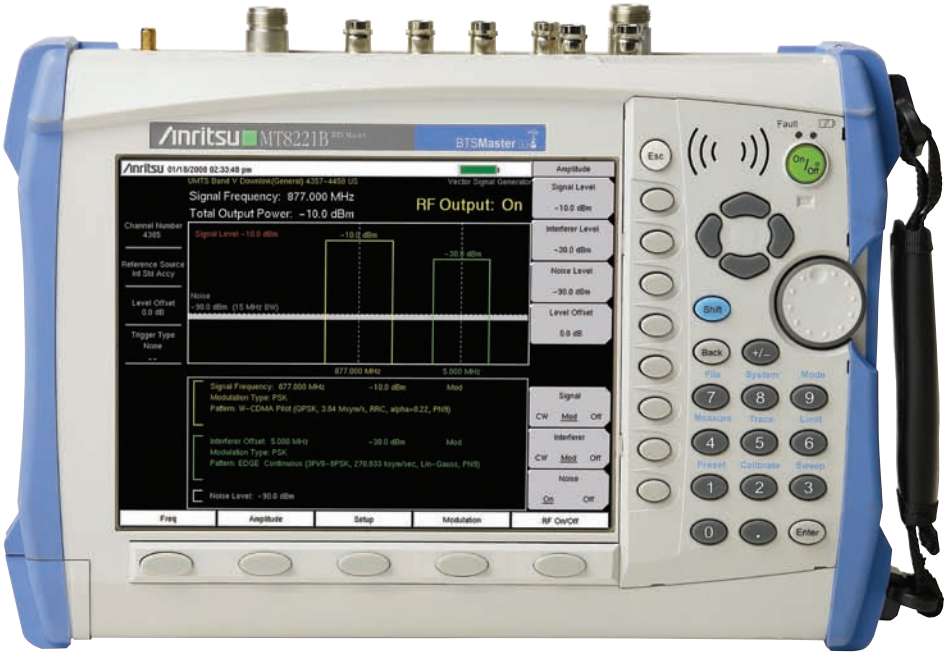
- Measurements: RL, VSWR, Cable Loss, DTF, Phase, Gain
- 2-port Gain Measurement Uncertainty: < 0.45 dB
- 2-port Dynamic Range: > 80 dB
- RF Immunity: +17 dBm on-channel, +10 dBm on-frequency
- Calibration: OSL and FlexCal™
- Bias Tee: 32 V internal

Spectrum and Interference Analyzer Highlights

- Measurements: Occupied Bandwidth, Channel Power, ACPR, C/I
- 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: < ±25 ppb with GPS On

Capabilities and Functional Highlights

- LTE, GSM/EDGE
- W-CDMA/HSDPA
- TD-SCDMA/HSDPA
- CDMA, EV-DO
- WiMAX - Fixed, Mobile
- Vector Signal Generator
- Zero-span IF Output
- Gated Sweep
- GPS tagging of stored traces
- Internal Preamplifier standard
- Internal Power Meter
- High Accuracy Power Meter
- 4, 6, 8, 18 GHz USB Sensors
- Channel Scanner
- 8.4” Display
- E1, T1, T3 Backhaul Analyzer
- < 5 minute warm-up time
- 2.5 hour battery operation time
- Ethernet/USB Data Transfer
- MST Remote Access Tool



BTS Master™ MT8221B Base Station Analyzer featuring Vector Signal Generator
Handheld Size: 315 x 211 x 94 mm (12.4 x 8.3 x 3.7 in), Lightweight: 4.9 kg (10.7 lbs)

BTS Master™ MT8221B Base Station Analyzer Specifications



Cable and Antenna Analyzer

Measurements			
	Measurements	VSWR	1-port Phase
		Return Loss	2-port Phase
		Cable Loss	2-port Gain
		Distance-to-Fault (DTF) Return Loss	Smith Chart
		Distance-to-Fault (DTF) VSWR	
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 1-6 each with a Delta Marker, Marker to Peak/Valley, Marker Table (On/Off)	
	Traces	Recall, Copy to Display Memory, No Trace Math, Trace ± Memory, Trace Overlay (On/Off)	
	Limit Line	On/Off, Single Limit, Multi-segment (41), Limit Alarm, Clear	
	Limit Line Edit	Frequency, Amplitude, Add Point, Delete Point, Next Point Left/Right, Move Limit	
	Calibration	Start Cal, 1/2-port, Low/High Power, Standard/FlexCal™, DUT Connector, Configure DUT	
	File	Save, Recall, Delete, Directory Management	
	Save/Recall	Setups, Measurements, Screen Shots Jpeg (save only)	
	Delete	Selected File, All Measurements, All Mode Files, All Content	
	Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy, Format USB	
	Application Options	Bias-Tee (On/Off), Impedance (50Ω, 75Ω, Other)	
Frequency			
	Frequency Range	400 MHz to 4 GHz	
	Frequency Accuracy	±3.0 ppm	
	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			
	400 MHz to 3.0 GHz	80 dB	
	>3.0 GHz to 4.0 GHz	70 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 msec/data point, RF immunity low, typical	
	Distance-to-Fault	≤4.5 msec/data point, RF immunity low, typical	
Return Loss			
	Measurement Range	0 to 60 dB	
	Resolution	0.01 dB	
VSWR			
	Measurement Range	1 to 65	
	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 to 60 dB
Vertical Range VSWR	1 to 65
Fault Resolution (meters)	$(1.5 \times 10^8 \times vp)/\Delta F$ (vp = velocity propagation constant, ΔF is F2-F1 in Hz)
Horizontal Range (meters)	0 to (Data Points-1) x Fault Resolution, to a maximum of 1500 meters (4921 ft)

Phase (1 and 2-Port)

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

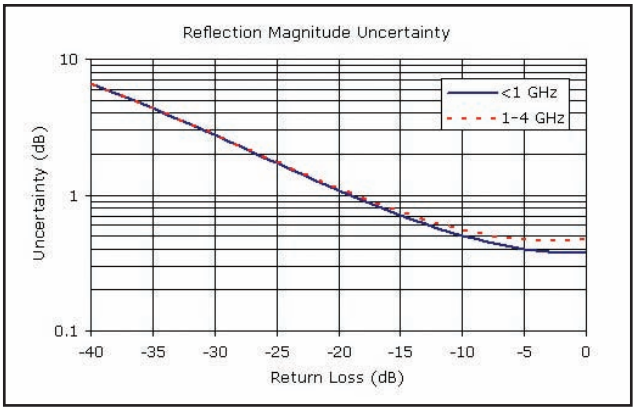
Smith Chart

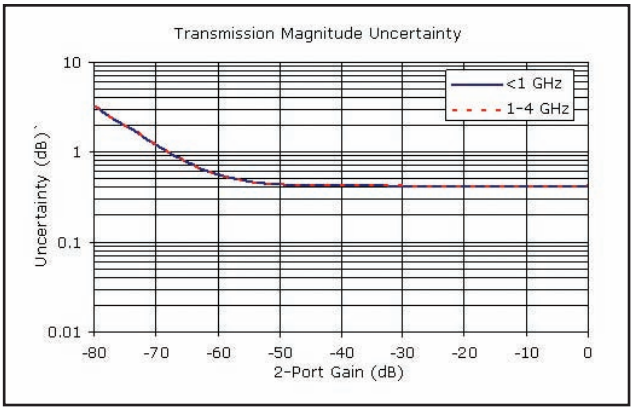
Resolution	0.01

Measurement Accuracy

Corrected Directivity	>42 dB

Measurement Uncertainty





Bias-Tee (Option 0010)

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

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

Setup	On/Off, Antenna Voltage 3.3/5.0 V, GPS Info
GPS Time/Location Indicator	Time, Latitude, Longitude and Altitude on display Time, Latitude, Longitude and Altitude with trace storage
High Frequency Accuracy	Spectrum Analyzer, Interference Analyzer, Signal Analyzers
when GPS Antenna is connected	< ±25 ppb with GPS On, 3 minutes after satellite lock in selected mode
GPS Lock – after antenna is disconnected	< ±50 ppb for 3 days, 0 ºC to 50 ºC ambient temperature
Connector	SMA, female

BTS Master™ MT8221B Base Station Analyzer Specifications



Spectrum Analyzer

Measurements	
Smart Measurements	Field Strength (uses antenna calibration tables to measure dBm/m² or dBmV/m)
	Occupied Bandwidth (measures 99% to 1% power channel of a signal)
	Channel Power (measures the total power in a specified bandwidth)
	ACPR (adjacent channel power ratio)
	AM/FM/SSB Demodulation (wide/narrow FM, upper/lower SSB), (audio out only)
	C/I (carrier-to-interference ratio)
	Emission Mask (recall limit lines as emission mask)
Setup Parameters	
Frequency	Center/Start/Stop, Span, Frequency Step, 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/WBW, Span/RBW
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Limit Lines, Screen Shots Jpeg (save only), Save-on-Event
Save-on-Event	Crossing Limit Line, Sweep Complete, Save-then-Stop, Clear All
Delete	Selected File, All Measurements, All Mode Files, All Content
Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy, Format USB
Application Options	Bias-Tee (On/Off), Impedance (50Ω, 75Ω, Other)
Sweep Functions	
Sweep	Single/Continuous, Manual Trigger, Reset, Detection, Minimum Sweep Time, Trigger Type, Gated Sweep (see Option 0090)
Detection	Peak, RMS, Negative, Sample, Quasi-peak
Triggers	Free Run, External, Video, Change Position, Manual
Trace Functions	
Traces	Up to three Traces (A, B, C), View/Blank, Write/Hold, Trace A/B/C Operations
Trace A Operations	Normal, Max Hold, Min Hold, Average, # of Averages, (always the live trace)
Trace B Operations	A→ B, B←→C, Max Hold, Min Hold
Trace C Operations	A → C, B←→C, Max Hold, Min Hold, A - B → C, B - A → C, Relative Reference (dB), Scale
Marker Functions	
Markers	Markers 1-6 each with a Delta Marker, or Marker 1 Reference with Six Delta Markers, Marker Table (On/Off), All Markers Off
Marker Types	Style (Fixed/Tracking), Noise Marker, Frequency Counter Marker
Marker Auto-Position	Peak Search, Next Peak (Right/Left), Peak Threshold %, Set Marker to Channel, Marker Frequency to Center, Delta Marker to Span, Marker to Reference Level
Marker Table	1-6 markers frequency and amplitude plus delta markers frequency 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 ppm/10 years
Frequency Span	Accuracy: ±0.3 ppm (25 °C ±25 °C) + aging 10 Hz to 7.1 GHz including zero span
Sweep Time	Minimum 100 ms, 10 µs to 600 seconds in zero span
Sweep Time Accuracy	±2% in zero span
Bandwidth	
Resolution Bandwidth (RBW)	1 Hz to 3 MHz in 1–3 sequence ±10% (1 MHz max in zero-span) (–3 dB bandwidth)
Video Bandwidth (VBW)	1 Hz to 3 MHz in 1–3 sequence (–3 dB bandwidth)
RBW with Quasi-Peak Detection	200 Hz, 9 KHz, 120 kHz (-6 dB bandwidth)
VBW with Quasi-Peak Detection	Auto VBW is On, RBW/VBW = 1

Spectrum Analyzer (continued)

Spectral Purity

SSB Phase Noise	–100 dBc/Hz @ 10, 20 and 30 kHz offset from carrier –102 dBc/Hz @ 100 kHz offset from carrier

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 Linear Scale Modes: nV, µV, mV, V, kV, nW, µW, mW, W, kW

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)

	Preamp Off (Reference level -20 dBm)		Preamp On (Reference level -50 dBm)	
(DANL in 1 Hz RBW, 0 dB attenuation)	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, 100, 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 max
	–70 dBc typical

VSWR

<4.0 GHz	1:5:1 typical
4.0 GHz to 7.1 GHz	1.8:1 typical

BTS Master™ MT8221B Base Station Analyzer Specifications



Power Meter (Option 0029)

Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Full Band
Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale
Average	Acquisition Fast/Med/Slow, # of Running Averages
Limits	Limit On/Off, Limit Upper/Lower
Frequency Range	10 MHz to 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(s))

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

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

Notes:
1) Total RSS measurement uncertainty (0 ºC to 50 ºC) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
2) Expanded uncertainty with K=2 for power measurements of a CW signal greater than +20 dBm with a matched load. Measurement results referenced to the input side of the sensor.
3) Expanded uncertainty with K=2 for power measurements of a CW signal greater than-20 dBm with zero mismatch errors.

BTS Master™ MT8221B Base Station Analyzer Specifications

Interference Analyzer (Option 0025)

Measurements	Spectrum
	Field Strength
	Occupied Bandwidth
	Channel Power
	Adjacent Channel Power (ACPR)
	AM/FM/SSB Demodulation (Wide/Narrow FM, Upper/Lower SSB), (audio out only)
	Carrier-to-Interference ratio (C/I)
	Spectrogram (Collect data up to one week)
	Signal Strength (Gives visual and aural indication of signal strength)
	Received Signal Strength Indicator (RSSI) (collect data up to one week)
	Gives visual and aural indication of signal strength
	Signal ID (up to 12 signals)
	Center Frequency
	Bandwidth
	Signal Type (FM, GSM, W-CDMA, CDMA, Wi-Fi)
	Closest Channel Number
	Number of Carriers
Application Options	Signal-to-Nose Ratio (SNR) >10 dB
	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)

Channel Scanner (Option 0027)

Number of Channels	1 to 20 Channels (Power Levels)
Measurements	Graph/Table, Max Hold (On/5 sec/Off), 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)

Gated Sweep (Option 0090)

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

Zero Span IF Output (Option 0089)

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



Vector Signal Generator Option (Option 0023)

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	±0.3 ppm (25 °C ±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 to 35 °C ambient, excludes load VSWR effects)

	(400 MHz to 2.0 GHz)		(>2.0 to 4.0 GHz)		(>4.0 to 6.0 GHz)	
VSG Output Power	CW Mode	W-CDMA	CW Mode	W-CDMA	CW Mode	W-CDMA
-46 to 0 dBm	±1.0 dB		±1.2 dB		±1.2 dB	
-46 to -8 dBm		±1.4 dB		±1.4 dB		±1.8 dB
-84 to <-46 dBm	±1.1 dB	±1.4 dB	±1.3 dB	±1.4 dB	±1.3 dB	±2.0 dB
-104 to <-84 dBm	±1.4 dB	±1.5 dB	±1.4 dB	±1.5 dB	±1.4 dB	±2.0 dB
-124 to <-104 dBm	±1.7 dB	±1.7 dB	±1.7 dB	±1.7 dB	±1.7 dB	±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 msec (10 kHz), 50%/1 msec (1 kHz), 50%/2.5 msec (400 Hz)
EDGE – Continuous	3Pi/8-8PSK, 270.833 ksym/sec, Linearized Gaussian filtered, Data = PN9
W-CDMA Pilot	QPSK, 3.84 Msym/s, RRC filtered, alpha=0.22, Data = PN9
DECT 16 QAM – Continuous	1.152 Msym/s, RRC filtered, alpha = 0.5, Data = PN9
DECT 64 QAM – Continuous	16 QAM, 6.84 Msym/s. RRC filtered, alpha = 0.15, Data = PN9
DVB-C	1.152 Msym/s, RRC filtered, alpha = 0.5, Data = PN9
J.83C Digital Cable	16 QAM, 5 Msym/s, RRCC filtered, alpha = 0.13
64 QAM – US Digital Cable	5.056941 Msym/s, RRC filtered, alpha = 0.18

User-defined Signal Patterns

Input Waveform for MST Pattern Converter	ASCII Text or MATLAB® file format		
Number of Waveforms	≤1000		
Sampling Rate	Bandwidth	Time	Length
12.500 MHz	10.0 MHz	≤ 4 seconds	N x 8 Samples
6.250 MHz	5.0 MHz	≤ 8 seconds	N x 4 Samples
1.625 MHz	1.2 MHz	≤32 seconds	N x 4 Samples

LTE Signal Analyzers (Options 0541, 0542, 0546)

Measurements

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

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

Setup Parameters

Bandwidth	10 MHz
Span	1.4, 3, 5, 10, 15, 20, 30 MHz
Frame Length	2.5, 5.0, 10.0 msec
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0541)

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

Modulation (Option 0542)

Frequency Error	±10 Hz + time base error, 99% confidence level
Residual EVM (rms)	2.5% typical (E-UTRA Test Model 3.1) (RF Input -50 dBm to +10 dBm)

Over-the-Air (OTA) Measurements (Option 0546)

Scanner	Six strongest Sync Signals
Auto Save	Yes
GPS Tagging and Logging	Yes

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

Measurements

RF (Option 0040)	Demodulation (Option 0041)	Over-the-Air (OTA)	Pass/Fail (User Editable)
Channel Spectrum 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)	Phase Error EVM Origin Offset C/I Modulation Type Magnitude Error BSIC (NCC, BCC)	There are no additional OTA Measurements. RF Measurements and Demodulation can be made OTA	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 Shot (save only), to Internal/External Memory
Measurement Summary Screen	Overall Measurements

RF Measurements (Option 0040)

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

Demodulation (Option 0041)

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

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

Measurements

RF (Option 0044)	Demodulation (Option 0045 or 0065)	Over-the-Air (OTA) (Option 0035)	Pass/Fail (User Editable)

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

Setup Parameters	
Scrambling Code, Threshold	Auto, Manual
User Selectable	Scrambling Code, S-CCPCH Spread, S-CCPCH Code, PICH Code, Threshold, Max Amp Power, CPICH Power, Frequency Error Average
Maximum Spreading Factor	256, 512
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Marker	Six Markers, Table On/Off
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements
RF Measurements (Option 0044)	
RF Channel Power Accuracy	±1.25 dB, ±0.7 dB typical, (temperature range 15 ºC to 35 ºC)
Occupied Bandwidth Accuracy	±100 kHz
Adjacent Channel Leakage Ratio (ACLR)	-54 dB/-59 dB ±0.8 dB @ 5 MHz/10 MHz offset, typical, 824 to 894, 1710 to 2170 MHz -54 dB/-57 dB ±1.0 dB @ 5 MHz/10 MHz offset, typical, 2300 to 2700 MHz
Demodulation (Option 0045 for W-CDMA only or 0065 for W-CDMA and HSDPA)	
W-CDMA Modulations	QPSK, QPSK-DTX (Codecs: AMR 4.75, 5.9, 7.4, 12.2 kbps, DTX 7.4, 12,2 kbps)
HSDPA Modulations	QPSK, 16 QAM, 64 QAM
Frequency Error	±10 Hz + time base error, 99% confidence level
EVM Accuracy	±2.5%, 6% ≤EVM ≤25%
Residual EVM	2.5%
Code Domain Power	±0.5 dB for code channel power >–25 dB, 16, 32, 64 DCPH (test model 1), 16, 32 DCPH (test model 2, 3)
CPICH (dBm) Accuracy	±0.8 dB typical
Over-the-Air (OTA) Measurements (Option 0035)	
Scrambling Code Scanner	Six strongest Scrambling Codes
Multipath Scanner	Six multipaths' power relative to strongest pilot

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

Measurements

RF (Option 0042)	Demodulation (Option 43)	Over-the-Air (OTA) (0ption 33)	Pass/Fail (User Editable)
Channel Spectrum 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	Measurements Channel Power Occupied Bandwidth Peak-to-Average Power Spectral Mask Test Frequency Error Channel Frequency Frequency error Pilot Power Noise Floor Rho Carrier Feed Through Tau RMS Phase Error Code Utilization Measured PN Pilot Dominance Multipath Power

Setup Parameters

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

RF Measurements (Option 0042)

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

Demodulation (Option 0043)

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

Over-the-Air (OTA) Measurements (Option 0033)

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

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

Measurements

RF (Option 0062)	Demodulation (Option 0063)	Over-the-Air (OTA) (Option 0034)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Peak-to-Average Power Power vs. Time Pilot & MAC Power Channel Power Frequency Error Idle Activity On/Off Ratio Spectral Emission Mask Multi-carrier ACPR RF Summary	MAC Code Domain Power Graph Pilot & MAC Power Channel Power Frequency Error Rho Pilot Rho Overall Data Modulation Noise Floor MAC Code Domain Power Table Code Status Power Code Utilization Data Code Domain Power Active Data Power Data Modulation Rho Pilot Rho Overall Maximum Data CDP Minimum Data CDP Modulation Summary	Pilot Scanner (Nine) PN E_C/I_O Tau Pilot Power Channel Power Pilot Dominance Mulitpath Scanner (Six) E_C/I_O Tau Channel Power Multipath Power	Measurements Channel Power Occupied Bandwidth Peak-to-Average Power Carrier Frequency Frequency Error Spectral Mask Noise Floor Pilot Power RMS Phase Error Tau Code Utilization Measured PN Pilot Dominance Mulitpath 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	1.23, 1.24, 1.25 MHz
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0062)

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

Demodulation (Option 0063)

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

Over-the-Air (OTA) Measurements (Option 0034)

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

BTS Master™ MT8221B Base Station Analyzer Specifications

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

Measurements

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

Setup Parameters

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

RF Measurements (Option 0060)

RF Channel Power Accuracy (RRC)	±1.5 dB, ±1.0 dB typical, (slot power -40 to +10 dBm)
Frequency Error	±20 Hz + time base error, in the presence of a downlink slot

Demodulation (Option 0061)

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

Over-the-Air (OTA) Measurements (Option 0038)

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

Fixed and Mobile WiMAX Signal Analyzers (Options 0046, 0047, 0066, 0067, 0037)

Measurements

RF (Option 0046 - Fixed) (Option 0066 - Mobile)	Demodulation (Option 0047 - Fixed) (Option 0067 - Mobile)	Over-the-Air (OTA) (Option 0037 - Mobile)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time Channel Power Preamble Power Downlink Burst Power (Mobile) Uplink Burst Power (Mobile) Data Burst Power (Fixed) Crest Factor (Fixed) ACPR 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 (Mobile) Base Station ID Sector ID (Mobile) DL-MAP (Tree View) (Mobile) Modulation Summary	Channel Power Monitor Preamble Scanner (Six) Preamble Relative Power Cell ID Sector ID PCINR Dominant Preamble Base Station ID	Pass Fail All Pass/Fail RF Pass Fail Demod Measurements Channel Power Occupied Bandwidth Downlink Bust Power Uplink Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Sector ID (Mobile)

Setup Parameters

Fixed WiMAX Bandwidth	1.25, 1.50, 2.50, 3.50, 5.00, 5.50, 6.00, 7.00, 10.00 MHz
Fixed WiMAX Cyclic Prefix Ratio (CP)	1/4, 1/8, 1/16, 1/32
Fixed WiMAX Span	5, 10, 15, 20 MHz
Fixed WiMAX Frame Length	2.5, 5.0, 10.0 msec
Mobile WiMAX Zone Type	PUSC
Mobile WiMAX DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)
Mobile WiMAX Bandwidths	3.50, 5.00, 7.00, 8.75, 10.00 MHz
Mobile WiMAX Cyclic Prefix Ratio (CP)	1/8
Mobile WiMAX Span	5, 10, 20, 30 MHz
Mobile WiMAX Frame Lengths	5, 10 msec
Mobile WiMAX Demodulation	Auto, Manual, FCH
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

RF Measurements (Option 0046 – Fixed, Option 0066 - Mobile)

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

Demodulated Signal Analyzer (Option 0047 – Fixed, Option 0067, Mobile)

Frequency Error	0.02 ppm + time base error, 99% confidence level
Fixed WiMAX Residual EVM (rms)	3% typical, 3.5% maximum (RF Input -50 dBm to +20 dBm)
Residual EVM (rms)	2.5% typical, 3.0% maximum, (RF Input -50 dBm to +20 dBm)

Over-the-Air (OTA) Measurements (Option 0037)

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

Backhaul Analyzers (Options 0051, 0052, 0053)

T1 Bit-Error-Rate Tester (BERT) (Option 0051)

Measurements	
Error Detection	Frame Bits, Bit Errors, BER, BPV, CRC, PATLS
Error Analysis (ITU G-821)	Errored Seconds (ES), Error Free Seconds (EFS), Severely Errored Seconds (SES), Unavailable Seconds (UAS), Available Seconds (AS), Degraded Minutes (DGRM)
Rx Signal	Frequency (±5 ppm, Max/Min), Vpp (±5%) (Max/Min), dBdsx, Clock Slips, Frame Slips
VF	Frequency (100 Hz to 3000 Hz, ±3 Hz), Power (-40.0 to +3.0 dBm, ±0.2 dBm)
Status (Historical and Current)	Rx (Signal, Frame Sync, Pattern Sync), DS1 (Alarms, Errors, B8ZS)
Status (Current)	Tx (Alarm On, Error On, Loop On)
Setup	
BERT Display	Table, Histogram, Event List, Clear History
VF	Tx (Off/On), Channel (1-24), Tx Freq, Tx Level (-30 to 0 dBm), Volume, Audio, Clear
Line Code	AMI, B8ZS
Tx Clock	Internal (1.544 MHz ±5 ppm), Recovered, External
Tx LBO	0.0 dB, -7.5 dB, -15.0 dB
Rx Input	Terminate (Bantam connector 100 Ω balanced), Monitor (Connect via 20 dB pad in DSX, 20 dB flat gain) Bridge (≥1000 Ω, -36 dB to +6 dB)
Framing	ESF, SF-D4
Payload	T1 (1.544 Mbps), Fractional T1 (Nx64, 64, 56, 16, 8 kbps)
Pulse Shapes	Conform to ANSI T1.403 and ITU G.703
Patterns	QRSS, PRBS (2-9, 2-11, 2-15, 2-20, 2-23), All Ones, All Zeros, 1-in-8 (1-in-7), 2-in-8, 3-in-24 T1 Daly, Six User defined (≤32 bits), Inverse Patterns (On/Off), Remote Loop Up/Down
Loop Codes	CSU, NIU, Link Type (In-Band, Data-Link), Self Loop Up/Down, Loop Code User Defined
Error Insertion	Bit Error, Bit Error Rate (BER), BPV, Frame Bit Error, Error (On/Off)
Alarm Insertion	AIS On/Off (Blue Alarm), RAI On/Off (Yellow Alarm)
Data Log	1 minute to 3 days

E1 Bit-Error-Rate Tester (BERT) (Option 0052)

Measurements	
Error Detection	Frame Bits, Bit Errors, BER, BPV, CRC, E Bits
Error Analysis (ITU G-821)	Errored Seconds (ES), Error Free Seconds (EFS), Severely Errored Seconds (SES), Unavailable Seconds (UAS), Available Seconds (AS), Degraded Minutes (DGRM)
Rx Signal	Frequency (±5 ppm, Max/Min), Vpp (±5%) (Max/Min), dBdsx, Clock Slips, Frame Slips
VF	Frequency (100 Hz to 3000 Hz), Power (-40.0 to +3.0 dBm, ±0.2 dBm)
Status (Historical and Current)	Rx (Signal, FAS, Pattern Sync), E1 (Alarms, Errors)
Status (Current)	Tx (Alarm On, Error On)
Setup	
BERT Display	Table, Histogram, Event List, Clear History
VF	Tx (Off/On), Channel (1-31), Tx Freq, Tx Level (–30 to 0 dBm), Volume, Audio, Clear
Line Code	AMI, HDB3
Tx Clock	Internal (2.048 MHz ±5 ppm), Recovered, External
Rx Input	Terminate (RJ48 120/75 Ω balanced, BNC 75 Ω unbalanced, -43 dB to +6 dB) Bridge (≥1000 Ω, -43 dB to +6 dB) Monitor (Connect via 20 dB pad in DSX, 20 dB flat gain)
Framing	PCM30, PCM30 CRC-4, PCM31, PCM31 CRC-4
Pulse Shapes	Conform to ITU G.703
Payload	E1 (2.048 Mbps), Fractional E1 (N x 64, 64, 16, 8 kbps)
Patterns	QRSS, PRBS (2-9, 2-11, 2-15, 2-20, 2-23), All Ones, All Zeros, 1010, 1-in-8 (1-in-7), 2-in-8, 3-in-24, Six User defined (≤32 bits), Inverse Patterns (On/Off)
Loopback Mode	Self loop
Error Insertion	Bit Error, Bit Error Rate (BER), Frame Bit Error, Error (On/Off)
Alarm Insertion	AIS (On/Off) (Blue Alarm), RAI (On/Off) (Yellow Alarm)
Data Log	1 minute to 3 days

Backhaul Analyzers (Options 0051, 0052, 0053)

T3 Bit-Error-Rate Tester (BERT) (Option 0053)

Measurements	
Error Detection	Frame Bits, Bit Errors, BER, BPV, Lof Count, P-bit Errors, C-bit Errors, FEBE Errors
Error Analysis (ITU G-821)	Excess Zeros, Errored Seconds (ES), Error Free Seconds (EFS), Severely Errored Seconds (SES), Unavailable Seconds (UAS), Available Seconds (AS), Degraded Minutes (DGRM), Pattern Loss Seconds (PATLS)
Rx Signal	Frequency (±5 ppm, Max/Min), Vpp (±5%) (Max/Min), dBdsx
VF	Frequency (100 Hz to 3000 Hz, ±3 Hz), Power (-30.0 to +0.0 dBm, ±0.2 dBm)
Status (Historical and Current)	Rx (Signal, Frame Sync, Pattern Sync), DS3 (Alarms, Errors, DS3ZS)
Status (Current)	Insert (Alarm On, Error On, Loop On)
Setup	
BERT Display	Table, Histogram, Event List, Clear History
VF	Tx (Off/On), Channel #, Tx Freq, Tx, Level, Volume, Audio (On/Off)
Line Code	AMI, B3ZS
Tx Clock	Internal (44.736 MHz ±5 ppm), Recovered
Tx LBO	Low, DSX
Rx Input	DSX3 (Bantam connector 100 Ω balanced) Monitor (Connect via 20 dB pad in DSX)
Framing	M13, C-Bit, Unframed
Test Mode	Auto, DS3, DS1
Pulse Shapes	Carrier present, Frame ID and Sync, Pattern ID and Sync
Patterns	QRSS, PRBS (2-9, 2-11, 2-15, 2-20, 2-23), All Ones, All Zeros, 1010, 1-in-8 (1-in-7), 2-in-8, 3-in-24 T1 Daly, Six User defined (≤32 bits), Inverse Patterns (On/Off), Loop Up/Down
Loop Codes	Stuff Bit, DS3 C-Bit FEAC, DS3 Self Loop
Error Insertion	Bit Error, BPV, DS3 Frame Bit Error, C-bit, P-bit, FEBE, Error Insert (On/Off)
Alarm Insertion	AIS (Blue Alarm), RAI (Yellow Alarm), Idle Alarm , Alarm (On/Off)
Data Log	1 minute to 3 days

DS1 Test Mode

Measurements	
Error Detection	Frame Bits, Bit Errors, BER, BPV, CRC, PATLS
Error Analysis (ITU G-821)	Errored Seconds (ES), Error Free Seconds (EFS), Severely Errored Seconds (SES), Unavailable Seconds (UAS), Available Seconds (AS), Degraded Minutes (DGRM)
Rx Signal	Frequency (±5 ppm, Max/Min), Vpp (±5%) (Max/Min), dBdsx, Clock Slips, Frame Slips
VF	Frequency (100 Hz to 3000 Hz, ±3 Hz), Power (-40.0 to +3.0 dBm, ±0.2 dBm)
Status (Historical and Current)	Rx (Signal, Frame Sync, Pattern Sync), DS1 (Alarms, Errors, B8ZS)
Status (Current)	Tx (Alarm On, Error On, Loop On)
Setup	
BERT Display	Table, Histogram, Event List, Clear History
VF	Tx (Off/On), Channel (1-24), Tx Freq, Tx Level (-30 to 0 dBm), Volume, Audio, Clear
Line Code	AMI, B8ZS
Tx Clock	Internal (1.544 MHz ±5 ppm), Recovered, External
Tx LBO	0.0 dB, -7.5 dB, -15.0 dB
Rx Input	Terminate (Bantam connector 100 Ω balanced) Monitor (Connect via 20 dB pad in DSX, 20 dB flat gain) Bridge (≥1000 Ω, -36 dB to +6 dB)
Framing	ESF, SF-D4
Payload	T1 (1.544 Mbps), Fractional T1 (Nx64, 64, 56, 16, 8 kbps)
Pulse Shapes	Conform to ANSI T1.403 and ITU G.703
Patterns	QRSS, PRBS (2-9, 2-11, 2-15, 2-20, 2-23), All Ones, All Zeros, 1-in-8 (1-in-7), 2-in-8, 3-in-24 T1 Daly, Six User defined (≤32 bits), Inverse Patterns (On/Off), Remote Loop Up/Down
Loopback Mode	CSU, NIU, Link Type (In-Band, Data-Link), Self Loop Up/Down, Loop Code User Defined
Error Insertion	Bit Error, Bit Error Rate (BER), BPV, Frame Bit Error, Error (On/Off)
Alarm Insertion	AIS On/Off (Blue Alarm), RAI On/Off (Yellow Alarm)
Data Log	1 minute to 3 days

BTS Master™ MT8221B Base Station Analyzer Specifications

General Specifications

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

Setup Parameters	
System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed) Self Test, Application Self Test GPS (see Option 0031)
System Options	Name, Date and Time, Ethernet Configuration, Brightness, Volume Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, User defined) Reset (Factory Defaults, Master Reset, Update Firmware)
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Screen Shots Jpeg (save only)
Delete	Selected File, All Measurements, All Mode Files, All Content
Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy, Format USB
Internal Trace/Setup Memory	>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
T1, T3	Bantam Jacks
E1	RJ48C
External Power	5.5 mm barrel connector, 12 to 15 VDC, <5.0 Amps
LAN Connection	RJ48C, 10/100 Mbps, Connect to PC or LAN for Remote Access
USB Interface (2)	Type A, Connect Flash Drive and Power Sensor
USB Interface	5-pin mini-B, Connect to PC for data transfer
Headset Jack	2.5 mm barrel connector
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	
Size	8.4”
Resolution	800 x 600
Battery	
Type	Li-Ion
Battery Operation	2.5 hours, typical
Electromagnetic Compatibility	
European Union	CE Mark, EMC Directive 89/336/EEC, 92/31/EEC, 93/68/EEC and Low Voltage Directive 73/23/EEC, 93/68/EEC
Australia and New Zealand	C-tick N274
Interference	EN 61326-1
Emissions	EN 55011
Immunity	EN 61000-4-2/-4-3/-4-4/-4-5/-4-6/-4-11
Safety	
Safety Class	EN 61010-1 Class 1
Product Safety	IEC 60950-1 when used with Company supplied Power Supply
Environmental	
Operating Temperature	-10 ºC to 55 ºC
Maximum Humidity	85%
Shock	MIL-PRF-28800F Class 2
Storage	-51 ºC to 71 ºC
Altitude	4600 meters, operating and non-operating
Size and Weight	
Size	315 x 211 x 94 mm, (12.4 x 8.3 x 3.7 in)
Weight	4.9 kg, (10.7 lbs)

Master Software Tools (for your PC)

Database Management	
Full Trace Retrieval	Retrieve all traces from instrument into one PC directory
Trace Catalog	Index all traces into one catalog
Trace Rename Utility	Rename measurement traces
Group Edit	Titles, subtitles, plot scaling, markers and limit lines, simultaneously on similar files
DAT File Converter	Converts HHST files to MST file format and vice-versa
Data Analysis	
Trace Math and Smoothing	Compare multiple traces
Data Converter	Convert from/to Return Loss/ VSWR/ Cable Loss/ DTF and also into Smith Charts
Measurement Calculator	Translates into other units
Report Generation	
Report Generator	Includes GPS, power level, and calibration status along with measurements
Edit Graph	Change scale, limit lines, and markers
Report Format	Create reports in HTML for PDF format
Export Measurements	Export measurements to *.s2p, *.jpg or *.csv format
Notes	Annotate measurements
Mapping (GPS Required)	
Spectrum Analyzer Mode	MapInfo, MapPoint
Mobile WiMAX OTA Option	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
Antennas, Cables, Signal Standards	Modify instrument's Antenna, Cable, and Signal Standard List
Product Updates	Auto-checks Anritsu website for latest revision firmware
Firmware Upload	Upload new firmware into the instrument
Pass/Fail	Create, download, or edit Signal Analysis Pass/Fail Limits
VSG Pattern Converter	Import user-defined patterns (ASCII text or MATLAB file format required)
Languages	Add up to two languages or modify non-English language menus
Mobile WiMAX	DL-MAP Parameters
Display	Modify display settings
Script Master™	
Channel Scanner Mode	Automate scan up to 1200 channels, repeat for sets of 20 channels, repeat all channels
GSM/GPRS/EDGE or W-CDMA/HSDPA Mode	Automate Signal Analysis testing requirements with annotated how-to pictures
Connectivity	
Connections	Connect to PC using USB, LAN, or Direct Ethernet connection
Download	Download measurements and live traces to PC for storage and analysis
Upload	Upload measurements from PC to instrument
Firmware Updates	Product Update: download latest firmware version
Remote Access Tool	Remote control and monitoring of instrument (via Ethernet port) over the Internet

BTS Master™ MT8221B Base Station Analyzer Specifications

Ordering Information

MT8221B	Description
400 MHz to 4 GHz	Cable and Antenna Analyzer
150 kHz to 7.1 GHz	Spectrum Analyzer
150 kHz to 7.1 GHz	Power Meter
Options	
MT8221B-0010	Bias-Tee
MT8221B-0031	GPS Receiver (Requires Antenna P/N 2000-1528-R)
MT8221B-0019	High-Accuracy Power Meter
MT8221B-0025	Interference Analyzer
MT8221B-0027	Channel Scanner
MT8221B-0089	Zero-Span IF Output
MT8221B-0090	Gated Sweep
MT8221B-0023	Vector Signal Generator
MT8221B-0040	GSM/GPRS/EDGE RF Measurements
MT8221B-0041	GSM/GPRS/EDGE Demodulation
MT8221B-0044	W-CDMA/HSDPA RF Measurements
MT8221B-0045	W-CDMA Demodulation
MT8221B-0065	W-CDMA/HSDPA Demodulation
MT8221B-0035	W-CDMA/HSDPA Over-the-Air Measurements*
MT8221B-0060	TD-SCDMA/HSDPA Measurements
MT8221B-0061	TD-SCDMA/HSDPA Demodulation
MT8221B-0038	TD-SCDMA/HSDPA Over-the-Air Measurements
MT8221B-0541	LTE RF Measurements
MT8221B-0542	LTE Modulation Quality
MT8221B-0546	LTE Over-the-Air Measurements
MT8221B-0042	cdmaOne/CDMA2000 1X RF Measurements
MT8221B-0043	cdmaOne/CDMA2000 1X Demodulation
MT8221B-0033	cdmaOne/CDMA2000 1X Over-the-Air Measurements*
MT8221B-0062	CDMA2000 1xEV-DO RF Measurements
MT8221B-0063	CDMA2000 1xEV-DO Demodulation
MT8221B-0034	CDMA2000 1xEV-DO Over-the-Air Measurements*
MT8221B-0046	IEEE 802.16 Fixed WiMAX RF Measurements
MT8221B-0047	IEEE 802.16 Fixed WiMAX Demodulation
MT8221B-0066	IEEE 802.16 Mobile WiMAX RF Measurements
MT8221B-0067	IEEE 802.16 Mobile WiMAX Demodulation
MT8221B-0037	IEEE 802.16 Mobile WiMAX Over-the-Air Measurements
MT8221B-0051	T1 Analyzer
MT8221B-0052	E1 Analyzer
MT8221B-0053	T3/T1 Analyzer
MT8221B-0098	Standard Calibration to Z540
MT8221B-0099	Premium Calibration to Z540 plus test data

*Requires GPS Receiver Option 0031

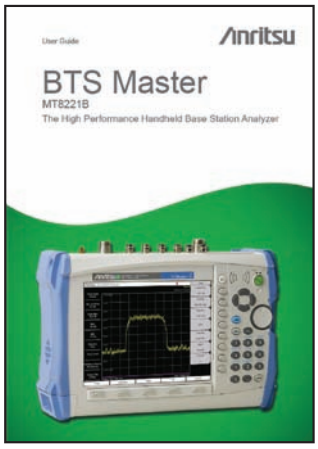
Power Sensors (For complete ordering information see the respective datasheets of each sensor)



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

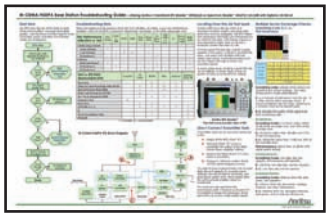
BTS Master™ MT8221B Base Station Analyzer Specifications

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



MT8221B	Description
10580-00207	BTS Master User Guide (Hard copy included) - Bias-Tee, GPS Receiver
10580-00230	Cable and Antenna Analyzer Measurement Guide
10580-00231	Spectrum Analyzer Measurement Guide - Interference Analyzer, Channel Scanner, IF Output, Gated Sweep
10580-00240	Power Meter Measurement Guide - High Accuracy Power Meter
10580-00232	Vector Signal Generator Measurement Guide
10580-00234	3GPP Signal Analyzer Measurement Guide - GSM/EDGE, W-CDMA/HSDPA, TD-SCDMA/HSDPA, LTE
10580-00235	3GPP2 Signal Analyzer Measurement Guide - CDMA, EV-DO
10580-00236	WiMAX Signal Analyzer Measurement Guide - Fixed WiMAX, Mobile WiMAX
10580-00238	Backhaul Analyzer Measurement Guide - T1, E1, T3/T1
10580-00208	Programming Manual
10580-00209	Maintenance Manual

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



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

Standard Accessories (included with instrument)



MT8221B	Description
10580-00207	BTS Master User Guide (includes Bias-Tee and GPS Receiver)
65681	Soft Carrying Case
2300-498	MST CD: Master Software Tools, User/Measurement Guides, Programming Manual, Troubleshooting Guides, Application Notes
633-44	Rechargeable Li-Ion Battery
40-168-R	AC/DC Power Supply
806-141-R	Automotive Cigarette Lighter 12 Volt DC Adapter
3-806-152	Cat 5e Crossover Patch Cable, 7 feet/213 cm
2000-1371-R	Ethernet Cable, 7 feet/213 cm
3-2000-1498	USB A-mini B Cable, 10 feet/305 cm
2000-1520-R	USB Memory Drive
1091-27-R	Type-N male to SMA female adapter
1091-172	Type-N male to BNC female adapter
11410-00442	BTS Master™ MT8221B Technical Data Sheet One Year Warranty (Including battery, firmware, and software) Certificate of Calibration and Conformance

Optional Accessories

Calibration Components, 50 Ω



Part Number	Description
OSLN50-1	Precision Open/Short/Load, N(m), 42dB, 6.0 GHz, 50 Ω
OSLNF50-1	Precision Open/Short/Load, N(f), 42dB, 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



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

Phase-Stable Test Port Cables, Armored w/ Reinforced Grip (ideal for contractors and other rugged applications)



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

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



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

Adapters



1091-26	SMA(m) - N(m), DC to 18 GHz, 50 Ω
1091-27	SMA(f) - N(m), DC to 18 GHz, 50 Ω
1091-80-R	SMA(m) - N(f), DC to 18 GHz, 50 Ω
1091-81-R	SMA(f) - N(f), DC to 18 GHz, 50 Ω
1091-172	BNC(f) - N(m), DC to 1.3 GHz, 50 Ω
510-90	7/16 DIN(f) - N(m), DC to 7.5 GHz, 50 Ω
510-91	7/16 DIN(f) - N(f), DC to 7.5 GHz, 50 Ω
510-92	7/16 DIN(m) - N(m), DC to 7.5 GHz, 50 Ω
510-93	7/16 DIN(m) - N(f), DC to 7.5 GHz, 50 Ω
510-96	7/16 DIN(m) - 7/16 DIN (m), DC to 7.5 GHz, 50 Ω
510-97	7/16 DIN(f) - 7/16 DIN (f), DC to 7.5 GHz, 50 Ω
1091-379-R	7/16 DIN(f) - 7/16 DIN(f), DC to 6 GHz, 50 Ω, w/ Reinforced Grip
510-102-R	N(m) - N(m), DC to 11 GHz, 50 Ω, 90 degrees right angle

Precision Adapters



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

Miscellaneous Accessories

2000-1528-R	GPS Antenna, SMA(m)
2000-1374	External Charger for Li-Ion Batteries

Backpack and Transit Case

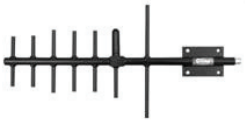




67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle

Optional Accessories (continued)

Directional Antennas



Part Number	Description
2000-1411	824-896 MHz, N(f), 10 dBd, Yagi
2000-1412	885-975 MHz, N(f), 10 dBd, Yagi
2000-1413	1710-1880 MHz, N(f), 10 dBd. Yagi
2000-1414	1850-1990 MHz, N(f), 9.3 dBd, Yagi
2000-1415	2400-2500 MHz, N(f), 10 dBd, Yagi
2000-1416	1920-2170 MHz, N(f), 10 dBd, Yagi
2000-1519	500-3000 MHz, log periodic
2000-1617	600-21000 MHz, N(f), 5-8 dBi to 12 GHz, 0-6 dBi to 21 GHz, log periodic

Portable Antennas



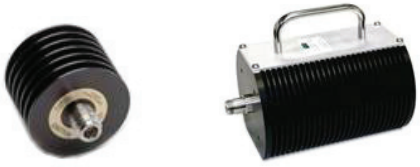
2000-1200	806-866 MHz, SMA(m), 50 Ω
2000-1473	870-960 MHz, SMA(m), 50 Ω
2000-1035	896-941 MHz, SMA (m), 50 Ω (1/4 wave)
2000-1030	1710-1880 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1474	1710-1880 MHz with knuckle elbow (1/2 wave)
2000-1031	1850-1990 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1475	1920-1980 MHz and 2110-2170 MHz, SMA(m), 50 Ω
2000-1032	2400-2500 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1361	2400-2500, 5000-6000 MHz, SMA(m), 50 Ω
2000-1616	20-21000 MHz, N(f), 50 Ω
61532	Antenna Kit (Consists of: 2000-1030, 2000-1031, 2000-1032-R, 2000-1200, 2000-1035, 2000-1361, and carrying pouch)

Bandpass Filters



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

Attenuators



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

T1/E1 Extender Cables

806-16-R	Bantam Plug to Bantam Plug
3-806-116	Bantam Plug to BNC
3-806-117	Bantam " Y " Plug to RJ48
3-806-169	72 inch (1.8 m) BNC to BNC, 75 1/2 RG59 Type Coax Cable
806-176-R	Bantam Plug to Alligator Clips

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