

Anritsu envision : ensure

Spectrum Master™

High Performance Handheld Spectrum Analyzer

MS2720T

9 kHz to 9 GHz, 13 GHz, 20 GHz, 32 GHz, 43 GHz



Introduction

From Anritsu, the inventor of the handheld spectrum analyzer first introduced in 1999, we are proud to introduce our 7th generation Spectrum Master MS2720T. The MS2720T represents the highest performance handheld spectrum analyzers available in the world as Anritsu pushes the envelope closer to benchtop quality. This generation introduces a touch screen, full-band tracking generators to 20 GHz, and best-in-class performance for dynamic range, DANL, phase noise, and sweep speed.

Spectrum and Interference Analyzer Highlights

- Measure: Occupied Bandwidth, Channel Power, ACPR, C/I, Field Strength, Spectral Emissions
- Measure Interference: Spectrogram, Signal Strength, RSSI
- Dynamic Range: > 106 dB in 1 Hz RBW
- DANL: -164 dBm in 1 Hz RBW
- Phase Noise: -112 dBc/Hz @ 10 kHz offset at 1 GHz
- Resolution Bandwidth (RBW): 1 Hz to 10 MHz
- Full-band Tracking Generators: 9, 13, 20 GHz
- Full-band Preamplifiers standard
- Channel Scanner: scan up to 20 channels at once
- 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
- Operation to +55 °C: full performance on AC or battery

Capabilities and Functional Highlights

Wireless Measurements

- GSM/GPRS/EDGE
- W-CDMA/HSPA+
- TD-SCDMA/HSPA+
- LTE/LTE-A FDD/TDD
- CDMA/EV-DO
- WiMAX Fixed/Mobile
- EMF Test
- Zero-span IF Output
- I/Q Waveform Capture
- Gated Sweep
- AM/FM/PM Demodulator
- High Accuracy Power Meter up to 26 GHz USB Sensors
- Three Hour Battery

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Definitions

| | |
|------------------------|---|
| Specifications | All specifications and characteristics apply to Revision 3 instruments under the following conditions, unless otherwise stated: <ul style="list-style-type: none"> • After 5 minutes of warm-up time, where the instrument is left in the ON state. • Sweep Mode set to Performance. • When using the internal reference signal. |
| Typical Specifications | Typical specifications are not tested and not warranted. They are generally representative of characteristic performance. |
| Nominal | Design parameters are not tested and not warranted. |
| Calibration Cycle | Recommended calibration cycle is 12 months. |
| Time Base Error | Input Frequency × Frequency Reference Error |
| | All specifications subject to change without notice. For the most current data sheet, please visit the Anritsu web site: www.anritsu.com |

 **Spectrum Analyzer**
Measurements

| | |
|--------------------|---|
| Smart Measurements | Field Strength (dBm/m ² , dBV/m, dBmV/m, dBμV/m, V/m, Watt/m ² , dBW/m ² , A/m, dBA/m, or Watt/cm ²) Occupied Bandwidth (measures 99 % to 1 % power channel of a signal, or N dB from center of signal) Channel Power (measures the total power in a specified bandwidth) ACPR (adjacent channel power ratio) Emission Mask (recall limit lines as emission mask) Spurious Emissions (measures up to 32 segments with independent setups and limits) C/I (carrier-to-interference ratio) AM/FM/SSB Demodulation (AM, wide/narrow FM, upper/lower SSB), (audio only) |
|--------------------|---|

Setup Parameters

| | |
|-----------|---|
| Frequency | Center/Start/Stop, Span, Freq Step, Freq Offset, Signal Standard, Channel #, Channel Increment |
| Amplitude | Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Units (dBm, dBV, dBmV, dBμV, Volt, Watt, dBW, A, dBA), Pre-Amp On/Off, Detection (Peak, RMS/Avg, Negative Peak, Sample, Quasi-Peak) |
| Span | Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span |
| Bandwidth | RBW, Auto RBW, VBW, Auto VBW, VBW/Avg Type (Linear, Log), RBW/VBW Ratio, Span/RBW Ratio |
| Impedance | 50 Ω, 75 Ω; external pad required for 75 Ω operation |

Sweep Functions

| | |
|--------------------|--|
| Sweep | Single/Continuous, Sweep Time, Gated Sweep (see Option 0090) |
| Sweep Mode | Fast (up to 100x faster than Performance), Performance, No FFT, Burst Detect (1000x Fast in 15 MHz span) |
| Triggers | Free Run, External, Video, IF Power, Force Trigger Once |
| Trigger Parameters | Delay, Level, Slope, Hysteresis, Holdoff (availability varies with trigger) |

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

| | |
|---------------------|--|
| Available Spans | > 0 Hz |
| 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 (2-41), Offset, Shape Square/Slope |
| Limit Line Advanced | Type (Absolute/Relative), Mirror, Save/Recall |
| Save on Event | When Limit Crossed |

Frequency

| | | | | | |
|---|---|-----------------|-----------------|-----------------|-----------------|
| Frequency Range | MS2720T-0709 | MS2720T-0713 | MS2720T-0720 | MS2720T-0732 | MS2720T-0743 |
| (usable to 0 Hz) | 9 kHz to 9 GHz | 9 kHz to 13 GHz | 9 kHz to 20 GHz | 9 kHz to 32 GHz | 9 kHz to 40 GHz |
| Tuning Resolution | 1 Hz | | | | |
| Frequency Reference | Aging: $\pm 1.0 \times 10^{-6}$ per 10 years Accuracy: $\pm 0.3 \times 10^{-6}$ (25 °C ± 25 °C) plus aging (see Options 1 and 31 for improved frequency reference aging and accuracy) | | | | |
| Auto-Sensing External Frequency Reference | 1, 1.2288, 1.544, 2.048, 2.4576, 4.8, 4.9152, 5, 9.8304, 10, 13, 19.6608 (MHz) | | | | |
| Sweep Time | 7 μs to 3600 s in zero span | | | | |
| Sweep Time Accuracy | ± 2 % in zero span | | | | |

Bandwidth

| | |
|-------------------------------|---|
| Resolution Bandwidth (RBW) | 1 Hz to 10 MHz in 1-3 sequence ± 10 % (-3 dB bandwidth) |
| Video Bandwidth (VBW) | 1 Hz to 10 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 |

 **Spectrum Analyzer** (Continued)

Spectral Purity – SSB Phase Noise

| Offset from 1 GHz | 9 GHz Instrument | | 13 GHz to 43 GHz Instruments | |
|---------------------|------------------|-------------|------------------------------|-------------|
| | Maximum | Typical | Maximum | Typical |
| 10 kHz | -108 dBc/Hz | -112 dBc/Hz | -102 dBc/Hz | -106 dBc/Hz |
| 100 kHz | -110 dBc/Hz | -115 dBc/Hz | -106 dBc/Hz | -110 dBc/Hz |
| 1 MHz | -118 dBc/Hz | -123 dBc/Hz | -111 dBc/Hz | -116 dBc/Hz |
| 10 MHz | -129 dBc/Hz | -133 dBc/Hz | -123 dBc/Hz | -129 dBc/Hz |
| Offset from 300 MHz | | | | |
| 1 kHz | -107 dBc/Hz | -111 dBc/Hz | | |
| 10 kHz | -112 dBc/Hz | -114 dBc/Hz | | |
| 62.5 kHz | -113 dBc/Hz | -115 dBc/Hz | | |
| 100 kHz | -114 dBc/Hz | -117 dBc/Hz | | |
| 1 MHz | -120 dBc/Hz | -122 dBc/Hz | | |
| 10 MHz | -128 dBc/Hz | -131 dBc/Hz | | |

Amplitude Ranges

| | |
|--------------------------|---|
| Dynamic Range | >106 dB minimum at 2.4 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 | -150 dBm to +30 dBm |
| Attenuator Resolution | 0 to 65 dB, 5.0 dB steps |
| Reference Level Offset | 99.9 dB External Loss to 99.9 dB External Gain |
| Amplitude Units | Log Scale Modes: dBm, dBW, dBV, dBmV, dBµV, dBA Linear Scale Modes: fV, nV, µV, mV, V, fW, pW, nW, µW, mW, W, pA, nA, µA, mA, A |
| Maximum Continuous Input | +30 dBm Peak typical, ± 50 VDC (≥ 10 dB Attenuation) +23 dBm Peak typical, ± 50 VDC (< 10 dB Attenuation) +13 dBm Peak typical, ± 50 VDC (Preamp = ON Option 713, 720, 732, 743; no extra limit for Option 709) |

Amplitude Accuracy (excluding effects of VSWR, noise, and spurs)

| | 20 °C to 30 °C (after 30 minute warm-up) | | -10 °C to 55 °C (after 60 minute warm-up) | |
|-------------------------------|---|----------|--|----------|
| | Maximum | Typical | Maximum | Typical |
| 9 GHz Instrument | | | | |
| 9 kHz to 100 kHz ^a | ± 2.3 dB | ± 0.5 dB | ± 2.3 dB | ± 0.5 dB |
| 100 kHz to 7 GHz | ± 1.3 dB | ± 0.5 dB | ± 2.3 dB | ± 0.5 dB |
| > 7 GHz to 9 GHz | ± 1.8 dB | ± 0.5 dB | ± 2.8 dB | ± 0.5 dB |
| 13/20 GHz Instruments | | | | |
| 100 kHz to 13 GHz | ± 1.3 dB | ± 0.5 dB | ± 2.3 dB | ± 0.5 dB |
| > 13 GHz to 18 GHz | ± 2.3 dB | ± 0.5 dB | ± 3.3 dB | ± 0.5 dB |
| > 18 GHz to 20 GHz | - | ± 1.0 dB | - | ± 1.0 dB |
| 32/43 GHz Instruments | | | | |
| > 100 kHz to 13 GHz | ± 1.3 dB | ± 0.5 dB | ± 2.3 dB | ± 0.5 dB |
| > 13 GHz to 40 GHz | ± 2.3 dB | ± 0.5 dB | ± 3.3 dB | ± 0.5 dB |
| > 40 GHz to 43 GHz | - | ± 1.0 dB | - | ± 1.0 dB |

a. Values below 100 kHz are with the preamplifier turned off.

Displayed Average Noise Level (DANL) (RMS detection, VBW/Avg type = Log, Ref Level = -20 dBm for Preamp Off and -50 dBm for Preamp On, Auto Attenuator On, Performance Sweep Mode)

| | Preamp = Off | | Preamp = On | |
|--------------------------|--------------|----------|-------------|----------|
| | Maximum | Typical | Maximum | Typical |
| 9 GHz Instrument | | | | |
| 10 MHz to 3 GHz | -146 dBm | -149 dBm | -160 dBm | -163 dBm |
| > 3 GHz to 8 GHz | -140 dBm | -143 dBm | -152 dBm | -155 dBm |
| > 8 GHz to 9 GHz | - | -138 dBm | - | -155 dBm |
| 13 to 43 GHz Instruments | | | | |
| 10 MHz to 4 GHz | -145 dBm | -148 dBm | -161 dBm | -164 dBm |
| > 4 GHz to 9 GHz | -142 dBm | -145 dBm | -159 dBm | -162 dBm |
| > 9 GHz to 13 GHz | -136 dBm | -139 dBm | -156 dBm | -159 dBm |
| 20 GHz Instrument | | | | |
| > 13 GHz to 20 GHz | -136 dBm | -142 dBm | -155 dBm | -161 dBm |
| 32 to 43 GHz Instruments | | | | |
| > 13 GHz to 20 GHz | -134 dBm | -141 dBm | -152 dBm | -158 dBm |
| > 20 GHz to 32 GHz | -135 dBm | -140 dBm | -154 dBm | -159 dBm |
| > 32 GHz to 40 GHz | -127 dBm | -130 dBm | -148 dBm | -151 dBm |
| > 40 GHz to 43 GHz | - | -130 dBm | - | -151 dBm |


Spectrum Analyzer (Continued)

Spurs (0 dB input attenuation)

 Residual Spurs (RF input terminated)
 < 13 GHz
 13 to 20 GHz
 > 20 to 32 GHz
 > 32 to 43 GHz

Preamp = Off
 -90 dBm, maximum
 -85 dBm, maximum
 -80 dBm, maximum
 -80 dBm, maximum

Preamp = On
 -100 dBm, maximum
 -100 dBm, maximum
 -100 dBm, maximum
 -95 dBm, maximum

Input-Related Spurious (-30 dBm input)

Maximum^a
 -60 dBc

Typical
 -70 dBc

a. Instrument centered on single signal, span < 1.7 GHz

Third-Order Intercept (TOI) (-20 dBm tones 100 kHz apart, 0 dB Attenuation Preamp OFF, Reference Level -20 dBm)

 2.4 GHz +14 dBm minimum
 50 MHz to 20 GHz +20 dBm typical
 > 20 GHz to 32 GHz +15 dBm typical
 > 32 GHz to 43 GHz +20 dBm typical

P1dB

 < 4 GHz +5 dBm nominal
 4 GHz to 20 GHz +12 dBm nominal
 > 20 GHz to 32 GHz +7 dBm nominal
 > 32 GHz to 43 GHz +12 dBm nominal

Second Harmonic Distortion (0 dB input attenuation, -30 dBm input)

 50 MHz -54 dBc maximum
 < 4 GHz -60 dBc typical
 > 4 GHz -75 dBc typical

VSWR (≥ 10 dB input attenuation)


 9 GHz Instruments
 < 4 GHz 1.5:1 typical
 4 GHz to 8 GHz 1.8:1 typical
 13 GHz to 43 GHz Instruments
 < 20 GHz 1.5:1 typical
 20 GHz to 43 GHz 2.0:1 typical



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

| | | | | | |
|--|--|---------------------------------------|--|---|---|
| Amplitude | Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale | | | | |
| Average | # of Running Averages, Max Hold | | | | |
| Zero/Cal | Zero On/Off, Cal Factor (Center Frequency, Signal Standard) | | | | |
| Limits | Limit On/Off, Limit Upper/Lower | | | | |
| Power Sensor Model | MA24105A | MA24106A | MA24108A/18A/26A | MA24208A/18A | MA24330A/40A/50A |
| Description | Inline High Power Sensor | High Accuracy RF Power Sensor | Microwave USB Power Sensor | Microwave Universal USB Power Sensor | Microwave CW USB Power Sensor |
| Frequency Range | 350 MHz to 4 GHz | 50 MHz to 6 GHz | 10 MHz to 8/18/26 GHz | 10 MHz to 8/18 GHz | 10 MHz to 33/40/50 GHz |
| Connector | Type N(f), 50 Ω | Type N(m), 50 Ω | Type N(m), 50 Ω (8/18 GHz) Type K(m), 50 Ω (26 GHz) | Type N(m), 50 Ω | Type K(m), 50 Ω (33/40 GHz) Type V(m), 50 Ω (50 GHz) |
| Dynamic Range | +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) | -60 dBm to +20 dBm (1 nW to 100 mW) | -70 dBm to +20 dBm (0.1 nW to 100 mW) |
| Measurand | True-RMS | True-RMS | True-RMS, Slot Power, Burst Average Power | True-RMS, Slot Power, Burst Average Power | Average Power |
| Measurement Uncertainty | ± 0.17 dB ^a | ± 0.16 dB ^b | ± 0.18 dB ^c | ± 0.17 dB ^d | ± 0.17 dB ^e |
| Data sheet (for complete specifications) | 11410-00621 | 11410-00424 | 11410-00504 | 11410-00841 | 11410-00906 |

- Notes:
- a. 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.
 - b. Total RSS measurement uncertainty (0 °C to 50 °C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
 - c. Expanded uncertainty with K=2 for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
 - d. Power uncertainty expressed with two sigma confidence level for CW measurement after zero operation. Includes calibration factor and linearity over temperature uncertainties, but not the effects of mismatch, zero set and drift, or noise.
 - e. Includes linearity over temperature uncertainties, but not the effects of calibration factor, mismatch, zero set and drift, and noise.


Tracking Generator (Options 809, 813, and 820)
Setup Parameters

| | |
|-----------------------------------|--|
| Frequency | Center/Start/Stop, Span, Frequency Step, Frequency Offset, Signal Standard, Channel #, Channel Increment |
| Amplitude | Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Units, Pre-Amp, Detection |
| Span | Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span |
| Bandwidth | RBW, Auto RBW, VBW, Auto VBW, VBW/Average Type (Linear/Log), RBW/VBW Ratio, Span/RBW Ratio |
| Generator | On/Off, Output Power, Mode (CW/Tracking), Settings, Transmission Measurement |
| Tracking Generator Settings | External Gain/Loss, Power Statistics (On/Off) |
| Transmission Measurement Settings | Normalize (Off/On), Scale, Reference Position and Amplitude, Transmission Statistics and Offset |
| Maximum Continuous Input | +23 dBm, ± 50 VDC |

Frequency

| | |
|--------------------|---|
| Frequency Range | Frequency Range |
| MS2720T-0809 | 100 kHz to 9 GHz |
| MS2720T-0813 | 100 kHz to 13 GHz |
| MS2720T-0820 | 100 kHz to 20 GHz |
| Frequency Accuracy | Aging: $\pm 1.0 \times 10^{-6}$ per 10 years Accuracy: $\pm 0.3 \times 10^{-6}$ (25 °C ± 25 °C) plus aging |

Output Power

| | |
|-------------------------------|--|
| 100 kHz to 20 GHz | -40 dBm to 0 dBm |
| Step Size | 0.1 dB nominal |
| Dynamic Range | |
| 9 GHz Instrument | > 110 dB typical 100 kHz to 7 GHz > 100 dB typical > 7 GHz to 9 GHz |
| 13 GHz and 20 GHz Instruments | > 100 dB typical 100 kHz to 12 GHz > 80 dB typical > 12 GHz to 20 GHz |

Level Accuracy (At least 30 minute warm-up after 1 hour non-operating at 15 to 35 °C ambient, excludes load VSWR effects)

| Frequency Range | 20 °C to 30 °C (after 30 minute warm-up) | | 0 °C to 50 °C (after 60 minute warm-up) | |
|--------------------|---|--------------|--|--------------|
| | Maximum | Typical | Maximum | Typical |
| 100 kHz to 9 GHz | ± 1.5 dB | ± 0.5 dB | ± 2.0 dB | ± 1.0 dB |
| > 9 GHz to 13 GHz | ± 1.6 dB | ± 1.0 dB | ± 2.1 dB | ± 1.5 dB |
| > 13 GHz to 18 GHz | ± 2.0 dB | ± 1.0 dB | ± 2.5 dB | ± 1.5 dB |

VSWR

| | |
|-------------------|-------------|
| 100 kHz to 5 GHz | 2:1 typical |
| > 5 GHz to 20 GHz | 4:1 typical |


Interference Analyzer (Option 25)
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 3 days |
| Signal Strength | Gives visual and aural indication of signal strength |
| Received Signal Strength Indicator (RSSI) | Collect data up to one week |
| Interference Mapping | Draw multiple bearings of signal strength from GPS location on on-screen map Pan and Zoom on-screen maps Support for Anritsu MA2700A Handheld Interference Hunter |
| Impedance | 50 Ω , 75 Ω ; external pad required for 75 Ω operation |

 **Channel Scanner (Option 27)**

General

| | |
|--------------------|--|
| Number of Channels | 1 to 20 Channels (Power Levels) |
| Measurements | Graph/Table, Max Hold (On/5 s/Off), Frequency/Channel, Current/Maximum, Dual Color |
| Scanner | Scan Channels, Scan Frequencies, Scan Custom List, Scan Script Master™ |
| Amplitude | Reference Level, Scale |
| Custom Scan | Number of Channels, Signal Standard & Channel, Frequency, Bandwidth |
| Frequency Range | 9 kHz to 9, 13, 20, 32, or 43 GHz |
| Frequency Accuracy | ± 10 Hz + time base error |
| Measurement Range | -110 dBm to +30 dBm |
| Impedance | 50 Ω, 75 Ω; external pad required for 75 Ω operation |

 **Coverage Mapping (Option 431)**

Measurements

| | |
|-----------------|------------|
| Indoor Mapping | RSSI, ACPR |
| Outdoor Mapping | RSSI, ACPR |

Setup Parameters

| | |
|------------------------------|--|
| Mode | Spectrum Analyzer |
| Frequency | Center, Span (ACPR only), Freq Step, Signal Standard, Channel #, Channel Increment |
| Amplitude | Reference Level (RL), Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection |
| Span | RSSI Mode: Zero Span ACPR Mode: Span, Span Up/Down (1-2-5), Full Span, Last Span |
| BW | RBW, Auto RBW, VBW, Auto VBW, RBW/VBW Ratio, Span/RBW Ratio |
| Measurement Setup | RSSI: Mapping color thresholds ACPR: Main Ch BW, Adj Ch BW, Ch Spacing, Adjacent Ch dB Offset, Thresholds for Good and Poor main channel levels |
| Mapping Colors | RSSI: Dark Green (Excellent), Light Green (Very Good), Yellow (Good), Orange (Fair), Dark Red (Poor) ACPR: Dark Green (Good), Yellow (between Good and Poor), Dark Red (Poor) |
| Point Distance or Time Setup | Repeat Type: Time (100 ms to 16 s), Distance (1 m to 10,000 m) Distance Units: m, ft |
| 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 |
| Map Types | Outdoor (GPS embedded), Indoor (non-GPS embedded). Import maps using the Anritsu easyMap Tools. Zoomable (.azm) maps are usable, but cannot be zoomed. |

 **Electromagnetic Field Test (Option 444)**

Measurements

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

Frequency Range

Supported Antenna

| | |
|-------------|------------------|
| 2000-1800-R | 9 kHz to 300 MHz |
| 2000-1792-R | 30 MHz to 3 GHz |
| 2000-1791-R | 700 MHz to 6 GHz |

Modes where EMF Measurements available

| |
|--|
| Spectrum Analyzer |
| LTE (both FDD and TDD Modes, Option 883) |
| W-CDMA (Option 881) |

 **GPS Receiver (Option 31)**

| | |
|-----------------------------|---|
| Setup | On/Off, Antenna Voltage 3.3 V/5.0 V, GPS Info |
| Anritsu Antennas | 2000-1528-R GPS antenna (requires +5 VDC) 2000-1652-R GPS antenna (requires +3.3 VDC or +5 VDC) 2000-1760-R GPS antenna (requires +2.5 VDC to +3.7 VDC) |
| GPS Time/Location Indicator | UTC Time, Latitude, Longitude, and Altitude on display (UTC Time and Altitude on GPS Info display) UTC Time, Latitude, Longitude, and Altitude with trace storage |
| High Frequency Accuracy | $< \pm 2.5 \times 10^{-8}$ with GPS On, 3 minutes after satellite lock in selected mode (GPS Antenna connected) $< \pm 5.0 \times 10^{-8}$ for 3 days after GPS lock, 0 °C to 50 °C ambient temperature (GPS Antenna disconnected) |
| Connector | SMA, female |

 **Gated Sweep (Option 90)**

| | |
|------------------|--|
| Mode | Spectrum Analyzer, Sweep |
| Trigger | External TTL, IF Level |
| IF Trigger Level | -80 dBm to +25 dBm typical |
| Setup | Gated Sweep (On/Off) Gate Polarity (Rising, Falling) Gate Delay (0 ms to 10 ms typical) Gate Length (1 μ s to 65 ms typical) Gate View Settings: Zero Span Time , Zero Span RBW, Zero Span VBW |

 **Zero Span IF Output (Option 89)**

| | |
|------------------|---|
| Mode | Spectrum Analyzer/Span/Zero Span |
| Center Frequency | 140 MHz nominal (varies up to ± 10 kHz nominal with center frequency and IF bandwidth) |
| Output Level | -25 dBm typical, for signals at below reference levels, with Auto Attenuation. Maximum -10 dBm typical. |
| Reference Level | -57 dBm to +30 dBm (Preamp Off) -87 dBm to -40 dBm (Preamp On) |
| IF Bandwidths | Up to 30 MHz (3 dB bandwidth) |
| Connector | BNC female |

 **I/Q Waveform Capture (Option 24)**

| | |
|--------------------------|--|
| 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 |

 **Secure Data (Option 7)**

| | |
|----------------|--|
| Set at Factory | Save measurement files on external USB flash drive only Internal memory is permanently disabled |
|----------------|--|

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

Measurements

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

* Requires sine wave modulation

Setup Parameters

| | |
|-------------------|---|
| Frequency | Center Freq, Span, Freq Step, Signal Standard, Channel, Channel Increment, Set (measured) Carrier Freq to Center |
| Amplitude Setup | Scale, Power Offset, Adjust Range |
| Measurements | RF Spectrum, Audio Spectrum (demodulated), Audio Waveform (demodulated), Summary, Coverage Mapping (Option 431 required), Audio Demod (AM/FM only) |
| Measurement Setup | All Measurements: Demod Type (AM, FM, PM), IFBW, Auto IFBW, Squelch Units, Distortion Measurements (Sinewave or Broadcast) RF Spectrum: OBW Method, OBW %, OBW dBC Audio Spectrum: Span, Scale, Squelch Power Audio Waveform: Sweep Time, Scale, Squelch Power Summary: Average count, Squelch Power Coverage Mapping: Measurement (SINAD, Carrier Power, Multiple), Thresholds, Point Distance/Time Audio Demod: Demod Type (AM, USB, LSB, Widband FM, Narrowband FM), Volume, Squelch |
| Mapping Colors | Dark Green (Excellent), Light Green (Very Good), Orange (Good), Yellow (Fair), Dark Red (Poor) |
| Marker | Six markers with Delta for each, Peak Search, Marker Freq to Center, Marker to Ref Lvl, Marker Table |

RF and Modulation Measurements

| | |
|----------------|---|
| AM | Modulation Rate: ± 1 Hz (< 100 Hz), ± 2 % (> 100 Hz) Depth: ± 5 % for (Modulation rates 10 Hz to 100 kHz) |
| FM | Modulation Rate: ± 1 Hz (< 100 Hz); ± 2 % (100 Hz to 100 kHz) Deviation Accuracy: ± 5 % (100 Hz to 100 kHz)** |
| PM | Modulation Rate: ± 1 Hz (< 100 Hz); ± 2 % (100 Hz to 100 kHz) Deviation Accuracy: ± 5 % (deviation 0 to 93 Rad, rate 10 Hz to 5 kHz)** |
| IF Bandwidth | 1 kHz to 300 kHz in 1-3 sequence |
| Frequency Span | RF Spectrum: 10 kHz to 10 MHz Audio Spectrum: 2 kHz, 5 kHz, 10 kHz, 20 kHz, 70 kHz, 140 kHz |
| RBW/VBW | 30 |
| Span/RBW | 100 |
| Sweep Time | 50 μ s to 50 ms (Audio Waveform) |
| ** | IFBW must be greater than 95 % occupied BW |

 **GSM/GPRS/EDGE Measurements (Option 880)**

| 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) | Phase Error EVM Origin Offset C/I Modulation Type Magnitude Error BSIC (NCC, BCC) | 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

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

Demodulation Measurements

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

 W-CDMA/HSPA+ Measurements (Option 881)

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

Setup Parameters

| | |
|-----------------------------|--|
| Scrambling Code, Threshold | 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 Shots (JPEG - save only), to Internal/External Memory |
| Measurement Summary Screens | Overall Measurements, RF Measurements, Modulation Measurements |

RF Measurements

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

Demodulation Measurements

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

Over-the-Air (OTA) Measurements

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

 TD-SCDMA/HSPA+ Measurements (Option 882)

| Measurements | | | |
|----------------------------|--|-----------------------|------------------------|
| RF | Demodulation | Over-the-Air (OTA) | Pass/Fail |
| Channel Spectrum | Code Domain Power/Error (QPSK/8 PSK/16 QAM/64 QAM) | Code Scan (32) | View Pass/Fail Limits |
| Channel Power | Slot Power | Scrambling Code Group | All, RF, Demod |
| Occupied Bandwidth | DwPTS Power | Tau | Available Measurements |
| Left Channel Power | Noise Floor | E_c/I_0 | Occupied Bandwidth |
| Left Channel Occ B/W | Frequency Error | DwPTS Power | Channel Power |
| Right Channel Power | Tau | Pilot Dominance | Channel Power RCC |
| Right Channel Occ B/W | Scrambling Code | Tau Scan (Six) | On/Off Ratio |
| Power vs. Time | EVM | Sync-DL# | Peak-to-Average Ratio |
| Six Slot Powers | Peak EVM | Tau | Frequency Error |
| Channel Power (RRC) | Peak Code Domain Error | E_c/I_0 | EVM |
| DL-UL Delta Power | CDP Marker | DwPTS Power | Peak EVM |
| UpPTS Power | Modulation Summary | Pilot Dominance | Peak Code Domain Error |
| DwPTS Power | | Record | Tau |
| On/Off Ratio | | Run/Hold | Noise Floor |
| Slot Peak-to-Average Power | | | |
| Spectral Emission | | | |
| RF Summary | | | |

Setup Parameters

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

RF Measurements

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

Demodulation Measurements

| | |
|---|--|
| Supported Modulation | QPSK, 8 PSK, 16 QAM, 64 QAM |
| 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 μ s (external trigger) |
| Spreading Factor | 1, 16 |

Over-the-Air (OTA) Measurements

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

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

| LTE/LTE-A FDD Measurements | | | |
|--|--|---|---|
| RF | Modulation | Over-the-Air (OTA) | Pass/Fail |
| Channel Spectrum Channel Power Occupied Bandwidth ACLR Spectral Emission Mask Category A or B (Opt 1) RF Summary | Power vs. Resource Block (RB) RB Power (PDSCH) Active RBs, Utilization % Channel Power, Cell ID OSTP, Frame EVM by modulation Constellation QPSK, 16 QAM, 64 QAM Modulation Results Ref Signal Power (RS) Sync Signal Power (SS) EVM – rms, peak, max hold Frequency Error – Hz, ppm Carrier Frequency Cell ID Control Channel Power Bar Graph or Table View RS, P-SS, S-SS PBCH, PCFICH, PHICH, PDCCH Total Power (Table View) EVM per Control Channel Tx Time Alignment Modulation Summary Includes EVM by modulation Antenna Icons Detects active antennas (1 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 (2x2, 4x4) Cell ID, Average Power Delta Power (Max-Min) Graph of Antenna Power Modulation Results – On/Off Mapping On-screen S-SS, RSRP, RSRQ, or SINR Scanner Modulation Results – Off Carrier Aggregation Up to 5 component carriers (CC1 to CC5) CP, MIMO status, RS & SS Power, EVM, Frequency Error, Time Alignment Error, Cell ID | View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth ACLR Frequency Error Carrier Frequency Dominance EVM peak, rms Frame EVM, rms Frame EVM by mod type RS, SS Power RS EVM P-SS, S-SS, Power, EVM PBCH, PCFICH, PHICH, PDCCH Power, EVM Cell, Group, Sector ID OSTP Tx Time Alignment |

Setup Parameters

| | |
|-----------------------------|--|
| Frequency | E-UTRA Bands 1 - 14, 17 - 21, 23 - 32, 66A (tunable 10 MHz to 4.0 GHz) Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel |
| Bandwidth (MHz) | 1.4, 3, 5, 10, 15, 20 |
| Span (MHz) | Auto, 1.4, 3, 5, 10, 15, 20, 30 |
| Amplitude | Scale/Division, Power Offset, Auto Range, Adjust Range |
| Sweep | Single/Continuous |
| EVM Mode | Auto, PBCH only, Max Hold |
| Cyclic Prefix (CP) | Auto, Normal, Extended |
| Sync Type | Normal (SS), RS/Cell ID |
| Save/Recall | Setup, Measurement, Screen Shots (JPEG - save only), to Internal/External Memory |
| Measurement Summary Screens | Overall Measurements, RF Measurements, Modulation Measurements |

LTE/LTE-A FDD RF Measurements

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

LTE/LTE-A FDD Modulation Measurements

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

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

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

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

| LTE/LTE-A TDD Measurements | | | |
|----------------------------|-------------------------------|---|----------------------------|
| RF | Modulation | Over-the-Air (OTA) | Pass/Fail |
| Channel Spectrum | Power vs. Resource Block (RB) | Scanner | View Pass/Fail Limits |
| Channel Power | RB Power (PDSCH) | Cell ID (Group, Sector) | All, RF, Modulation |
| Occupied Bandwidth | Active RBs, Utilization % | S-SS, RSRP, RSRQ, SINR | Available Measurements |
| Power vs. Time | Channel Power, Cell ID | Dominance | Channel Power |
| Frame View | OSTP, Frame EVM by modulation | Modulation Results - On/Off | Occupied Bandwidth |
| Sub-Frame View | Constellation | Auto Save - On/Off | ACLR |
| Total Frame Power | QPSK, 16QAM, 64QAM | Tx Test | Frequency Error |
| DwPTS Power | Modulation Results | Scanner | Carrier Frequency |
| Transmit Off Power | Ref Signal Power (RS) | RS Power of MIMO antennas (2x2) | Dominance |
| Cell ID | Sync Signal Power (SS) | Cell ID, Average Power | EVM peak, rms |
| Timing Error | EVM - rms, peak, max hold | Delta Power (Max-Min) | Frame EVM, rms |
| ACLR | Frequency Error - Hz, ppm | Graph of Antenna Power | Frame EVM by mod type |
| Spectral Emission Mask | Carrier Frequency | Modulation Results - On/Off | RS, SS Power |
| Category A or B (Opt 1) | Cell ID | Mapping | RS EVM |
| RF Summary | Control Channel Power | On-screen | P-SS, S-SS, Power, EVM |
| | Bar Graph or Table View | S-SS, RSRP, RSRQ, or SINR | PBCH, PCFICH, PHICH, PDCCH |
| | RS, P-SS, S-SS | Scanner | Power, EVM |
| | PBCH, PCFICH, PHICH, PDCCH | Modulation Results - Off | Cell, Group, Sector ID |
| | Total Power (Table View) | Carrier Aggregation | OSTP |
| | EVM per Control Channel | Up to 5 component carriers (CC1 to CC5) | Tx Time Alignment |
| | Tx Time Alignment | CP, MIMO status, RS & SS Power, EVM, | Frame Power |
| | Modulation Summary | Frequency Error, Time Alignment Error, | DwPTS Power |
| | Includes EVM by modulation | Cell ID | Transmit Off Power |
| | Antenna Icons | | Timing Error |
| | Detects active antennas (1/2) | | |

Setup Parameters

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

LTE/LTE-A TDD RF Measurements

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

LTE/LTE-A TDD Modulation Measurements

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

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

Scanner Six strongest signals if present
 Auto Save - Sync Signal power and Modulation Results with GPS information

Tx Test Scanner - Three strongest signals if present
 RS Power - Strongest signal

Mapping Map On-screen S-SS, RSRP, RSRQ, or SINR of Cell ID with strongest signal
 Scanner - three strongest signals if present
 Save and Export Mapping data: KML, MTD (tab delimited)

Carrier Aggregation Up to 5 component carriers specified (CC1 to CC5)
 Automatic detection of CP and MIMO status for each active CC
 RS Power & RS Delta Power, SS Power, EVM (peak and rms), Freq Error (Hz & ppm), TAE, Cell ID

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

CDMA Measurements

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

CDMA Setup Parameters

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

CDMA RF Measurements

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

CDMA Demodulation Measurements

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

CDMA Over-the-Air (OTA) Measurements

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


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

| RF | Demodulation | Over-the-Air (OTA) | Pass/Fail |
|--|--|---|--|
| Channel Spectrum 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 Available Measurements Channel Power |
| 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 | Occupied Bandwidth Peak-to-Average Power Carrier Frequency Frequency Error |
| Spectral Emission Mask Single Carrier ACPR Multi-carrier ACPR RF Summary | 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 | Multipath Scanner (Six) E_c/I_o Tau Channel Power Multipath Power | Spectral Mask Noise Floor Pilot Power RMS Phase Error Tau Code Utilization Measured PN Pilot Dominance Multipath Power |

Setup Parameters

| | |
|-----------------------------|--|
| PN Setup | PN Trigger (No Trigger, GPS, External), PN Search Type (Auto, Manual), PN Offset |
| Walsh Codes | 64, 128 |
| Measurement | Speed Fast, Normal, Slow |
| External Trigger Polarity | Rising, Falling |
| Slot Type | Auto, Active, Idle |
| Number of Carriers | 1 to 5 |
| Carrier Bandwidth (MHz) | 1.23, 1.24, 1.25 |
| Frequency | Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel |
| Amplitude | Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts) |
| Sweep | Single/Continuous, Trigger Sweep |
| Save/Recall | Setup, Measurement, Screen 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, 99 % confidence level |
| Rho Accuracy | ± 0.01 , for Rho > 0.9 |
| Residual Rho | > 0.995 typical, > 0.99 , maximum (RF input -50 dBm to $+20$ dBm) |
| PN Offset | Within 1×64 chips |
| Pilot Power Accuracy | ± 1.0 dB typical, relative to channel power |
| Tau | ± 0.5 μ s typical, ± 1.0 μ s maximum |

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

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

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

WiMAX Fixed Measurements

| RF | Demodulation | Over-the-Air (OTA) | Pass/Fail |
|---|--|--|---|
| Channel Spectrum 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 Channel Power Occupied Bandwidth Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Base Station ID |
| 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 | | |
| RF Summary | EVM vs. Subcarrier/Symbol RCE EVM Frequency Error Carrier Frequency Base Station ID Sector ID (Mobile) Modulation Summary | | |

Setup Parameters

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

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

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

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

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


WiMAX Fixed/Mobile Measurements (Option 885) (Continued)
WiMAX Mobile Measurements¹

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

Setup Parameters

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

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

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

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

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

WiMAX Mobile Over-the-Air (OTA) Measurements

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

1. Mobile WiMAX conforms to IEEE Std. 802.16e-2005, WiMAX Forum[®] Air Interface - Mobile System Profile - Release 1.0 Certified, System Profiles according to WMF-T24-001-R010v07.

 **General Specifications**

Setup Parameters

| | |
|-----------------------------|--|
| System | Status (Temperature, Battery Info, S/N, Firmware Version, Installed Options), Self Test, Application Self Test, GPS (see Option 31), Name, Date and Time, Ethernet Configuration, Volume |
| System Options | Display (Brightness, Auto Dim, Blank, Default, Black & White, Night Vision, High Contrast, Invert Black & White) Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, Portuguese) Reset (Factory Defaults, Master Reset, Update Firmware) Share Center Frequency and Power (All Modes or Not Shared) Power-On (via Power Switch or when DC is Applied) |
| File Save/Recall | Save As, Save Measurement, Save, Save On Event, Recall Measurement, Recall, Copy, Delete Setups, Measurements, Screen Shots JPEG (save only), Limit Lines, Spurious Emissions Mask, Mapping results (for options with mapping), including KML with or without altitude, tab-delimited |
| Delete | By File Type, All, Selected |
| Internal Trace/Setup Memory | > 40,000 single-trace measurements; > 500 Spectrograms, each with 156 traces (with Option 25) |
| External Trace/Setup Memory | Limited by size of USB Flash Drive |

Connectors

| | |
|------------------------|---|
| RF In | 9 GHz to 20 GHz Instruments: Type N, female, 50 Ω 32 GHz to 43 GHz Instruments: Ruggedized Type K, male |
| RF Out | 9 GHz to 20 GHz Instruments: Type N, female, 50 Ω |
| GPS | SMA Female |
| External Power | 5.5 mm barrel connector, 12 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 FAT32 formatted Flash Drive and Power Sensor; 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 dBm |
| External Reference Out | BNC, female, 50 Ω, 10 MHz |
| External Trigger | BNC, female, 50 Ω, TTL-compatible levels, Maximum Input +5 VDC |
| IF Out | BNC, female, 50 Ω, 140 MHz (nominal) |

Display and Keyboard

| | |
|----------|---|
| Display | 8.4 inch Touchscreen, 800 x 600 Resolution |
| Keyboard | Backlit (Red for Night Vision, White for all other display modes) |

Battery

| | |
|-------------------------|--|
| Type | Li-Ion |
| Battery Operation | 3 hour operation, typical |
| Battery Charging Limits | 0 °C to +45 °C, Relative Humidity ≤ 80 % |

Electromagnetic Compatibility

| | |
|---------------------------|--|
| European Union | CE Mark |
| EMC Directive | 2004/108/EC |
| Interference | EN 61326-1 |
| Emissions | EN 55011:2009 +A1:2010 Group 1 Class A |
| Immunity | EN 61000-4-2/3/4/5/11 |
| Australia and New Zealand | RSM |
| South Korea | KCC |

Safety

| | |
|-----------------------|--|
| Low Voltage Directive | 2006/95/EC |
| Product Safety | EN 61010-1:2010, IEC 60950-1 (when used with Anritsu Company supplied Power Supply) |

Environmental

| | |
|---|-------------------------------------|
| Operating Temperature | -10 °C to 55 °C |
| Maximum Humidity | 85 % RH, non-condensing |
| Vibration, Shock, Temperature, Humidity | MIL-PRF-28800F Class 2 |
| Storage | -51 °C to 71 °C |
| Altitude | 4600 m, operating and non-operating |

Warranty

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

Size and Weight


| | |
|--------|--|
| Size | 315 mm x 211 mm x 77 mm, (12.4 in x 8.3 in x 3.0 in) |
| Weight | 3.7 kg to 4.4 kg (8.1 lb to 9.8 lb) depending on Frequency Option and Tracking Generator |

 **easyTest Tools™** (for your PC)
Instrument Modes

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

Commands

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

 **easyMap Tools™** (create instrument-compatible maps on your PC)
Outdoor Maps

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

Indoor Maps

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

General

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

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

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

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

Database Management

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

Data Analysis

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

Report Generation

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

Mapping (GPS required on instrument)

| | |
|------------------------|---------------------------|
| Spectrum Analyzer Mode | MapInfo |
| LTE Mode | Google Earth, Google Maps |

 **Master Software Tools** (Continued)

Spectrogram (Spectrum Monitoring for Interference Analysis and Spectrum Clearing)

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

List/Parameter Editors

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

Connectivity

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















Web Remote Control

| | |
|-------------------|--|
| Control | Full instrument control through a browser - all instrument functions except power switch and rotary knob |
| Connections | RJ45 Ethernet jack |
| | Third party Wi-Fi router |
| Protocol | HTTP/TCP/IP |
| Physical Layer | Cat 5 Cable, Wi-Fi router compatible |
| Software Required | HTML 5 Compliant Browser - Newer versions of Chrome, Firefox, Internet Explorer and others |
| Operating System | iOS, Windows, Linux, Android operating systems that can host the HTML 5 Compliant browser |
| Remote Hardware | PCs, Tablets, and Smart Phones with Ethernet or Wi-Fi connections and a HTML 5 Compliant browser |
| Download | Individual instrument files downloaded via browser |
| | Multiple instrument files and directories zipped and downloaded via browser |
| | Screen capture capability |
| Display Modes | Normal: All modes & displays supported |
| | Fast: Spectrum traces update faster (up to 5 updates per second) |
| Password | The instrument can be password protected |
| | Passwords may be used to manage who is controlling the instrument |
| Users/Instruments | One user/device can view and control many instruments |

Programmable Remote Control

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

Ordering Information – Instrument Options

| | Part Number | Description |
|---|--------------|---|
| | MS2720T | Spectrum Master (Requires Option 709, 713, 720, 732, or 743) |
| | MS2720T-0709 | Frequency Range 9 kHz to 9 GHz |
| | MS2720T-0713 | Frequency Range 9 kHz to 13 GHz |
|  | MS2720T-0720 | Frequency Range 9 kHz to 20 GHz |
| | MS2720T-0732 | Frequency Range 9 kHz to 32 GHz |
| | MS2720T-0743 | Frequency Range 9 kHz to 43 GHz |
| | MS2720T-0809 | 9 GHz Tracking Generator (Requires Option 709) |
|  | MS2720T-0813 | 13 GHz Tracking Generator (Requires Option 713) |
| | MS2720T-0820 | 20 GHz Tracking Generator(Requires Option 720) |
|  | MS2720T-0025 | Interference Analyzer (Option 31 is recommended) |
|  | MS2720T-0027 | Channel Scanner |
|  | MS2720T-0431 | Coverage Mapping (Requires Option 31 for full functionality) |
|  | MS2720T-0444 | EMF Measurements (Requires Anritsu Isotropic Antenna) |
|  | MS2720T-0509 | AM/FM/PM Measurements (Option 431 required for full functionality) |
| | MS2720T-0024 | I/Q Waveform Capture (Requires Option 9) |
| | MS2720T-0089 | Zero-Span IF Output |
| | MS2720T-0090 | Gated Sweep |
|  | MS2720T-0019 | High Accuracy Power Meter (Requires USB Power Sensor, sold separately) |
| | MS2720T-0009 | Demodulation Hardware |
|  | MS2720T-0880 | GSM/GPRS/EDGE Measurements (Requires Option 9) |
|  | MS2720T-0881 | W-CDMA/HSPA+ Measurements (Requires Option 9, Option 31 recommended) |
|  | MS2720T-0882 | TD-SCDMA/HSPA+ Measurements (Requires Option 9, Option 31 required for full functionality) |
|  | MS2720T-0883 | LTE/LTE-A FDD/TDD Measurements (Requires Option 9, Option 31 required for full functionality) |
|  | MS2720T-0884 | CDMA/EV-DO Measurements (Requires Option 9, Option 31 required for full functionality) |
|  | MS2720T-0885 | WiMAX Fixed/Mobile Measurements (Requires Option 9, Option 31 required for full functionality) |
| | MS2720T-0007 | Secure Data Operation |
| | MS2720T-0031 | GPS Receiver (Requires GPS Antenna, sold separately) - 2000-1528-R GPS Antenna, SMA(m) with 5 m (15 ft) cable, requires 5 VDC - 2000-1652-R GPS Antenna, SMA(m) with 0.3 m (1 ft) cable, requires 3.3 VDC or 5 VDC - 2000-1760-R GPS antenna, SMA(m) with no cable, 2.5 VDC to 3.7 VDC |
| | MS2720T-0098 | Standard Calibration (ANSI Z540-1-1994) |
| | MS2720T-0099 | Premium Calibration (ANSI Z540-1-1994 plus test data) |

Standard Accessories (included with instrument)



| Part Number | Description |
|-------------|--|
| 10920-00060 | Handheld Instruments Documentation Disc |
| 2300-577 | Anritsu Software Tool Box for Handheld RF Instruments Disc |
| 2000-1371-R | Ethernet Cable, 7 ft/213 cm |
| 2000-1685-R | Soft Carrying Case |
| 2000-1691-R | Stylus with Coiled Tether |
| 2000-1797-R | Touchscreen Protective Film, 8.4 in (one factory-installed, one spare) |
| 633-75 | High Capacity Li-Ion Battery |
| 40-187-R | AC/DC Power Supply |
| 806-141-R | Automotive Power Adapter, 12 VDC, 60 W |
| 3-2000-1498 | USB A-mini B Cable, 10 ft/305 cm |
| | Certificate of Calibration and Conformance |

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

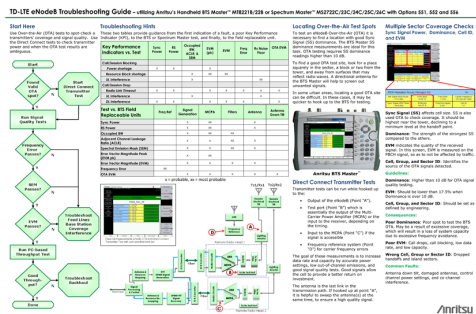


| Model Number | Description |
|--------------|--|
| MA24105A | Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 dBm to +51.76 dBm |
| MA24106A | RF USB Power Sensor, 50 MHz to 6 GHz, +23 dBm |
| MA24108A | Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm |
| MA24118A | Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm |
| MA24126A | Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm |
| MA24208A | Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 dBm |
| MA24218A | Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 dBm |
| MA24330A | Microwave CW USB Power Sensor, 10 MHz to 33 GHz, +20 dBm |
| MA24340A | Microwave CW USB Power Sensor, 10 MHz to 40 GHz, +20 dBm |
| MA24350A | Microwave CW USB Power Sensor, 10 MHz to 50 GHz, +20 dBm |
| MA25100A | RF Power Indicator |

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

| Part Number | Description |
|-------------|---|
| 10920-00060 | Handheld Instruments Documentation Disc |
| 10580-00340 | Spectrum Master User Guide |
| 10580-00349 | Spectrum Analyzer Measurement Guide |
| 10580-00339 | Tracking Generator Measurement Guide |
| 10580-00240 | Power Meter Measurement Guide |
| 10580-00234 | 3GPP Signal Analyzer Measurement Guide - GSM/EDGE, W-CDMA/HSPA+, TD-SCDMA/HSPA+, LTE, TD-LTE |
| 10580-00235 | 3GPP2 Signal Analyzer Measurement Guide - CDMA, EV-DO |
| 10580-00236 | WiMAX Signal Analyzer Measurement Guide - Fixed WiMAX, Mobile WiMAX |
| 10580-00341 | Spectrum Master Programming Manual |
| 10580-00342 | Spectrum Master Maintenance Manual |

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



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

Optional Accessories

GPS Antennas



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

Directional Antennas



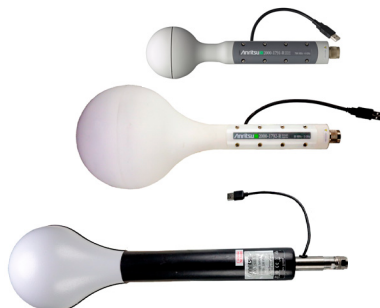
| Part Number | Description |
|-------------|--|
| 2000-1411-R | 822 MHz to 900 MHz, N(f), 10 dBd, Yagi |
| 2000-1412-R | 885 MHz to 975 MHz, N(f), 10 dBd, Yagi |
| 2000-1413-R | 1710 MHz to 1880 MHz, N(f), 10 dBd, Yagi |
| 2000-1414-R | 1850 MHz to 1990 MHz, N(f), 9.3 dBd, Yagi |
| 2000-1415-R | 2400 MHz to 2500 MHz, N(f), 10 dBd, Yagi |
| 2000-1416-R | 1920 MHz to 2170 MHz, N(f), 10 dBd, Yagi |
| 2000-1659-R | 698 MHz to 787 MHz, N(f), 8 dBd, Yagi |
| 2000-1660-R | 1425 MHz to 1535 MHz, N(f), 12.2 dBd, Yagi |
| 2000-1677-R | 300 MHz to 3000 MHz, SMA(m), 50 Ω , 3 m cable (9.8 ft), 0 to 6 dBi gain @ 950 MHz, Log Periodic |
| 2000-1715-R | Directional Antenna, 698 MHz to 2500 MHz, N(f), gain of 2 dBi to 10 dBi, typical |
| 2000-1726-R | Antenna, 2500 MHz to 2700 MHz, N(f), 12 dBd, Yagi |
| 2000-1747-R | Antenna, Log Periodic, 300 MHz to 5000 MHz, N(f), 5.1 dBi, typical |
| 2000-1748-R | Antenna, Log Periodic, 1 GHz to 18 GHz, N(f), 6 dBi, typical |
| 2000-1777-R | Portable Directional Antenna, 9 kHz to 20 MHz, N(f) |
| 2000-1778-R | Portable Directional Antenna, 20 MHz to 200 MHz, N(f) |
| 2000-1779-R | Portable Directional Antenna, 200 MHz to 500 MHz, N(f) |

Portable Antennas



| | |
|-------------|---|
| 2000-1200-R | 806 MHz to 866 MHz, SMA(m), 50 Ω |
| 2000-1473-R | 870 MHz to 960 MHz, SMA(m), 50 Ω |
| 2000-1035-R | 896 MHz to 941 MHz, SMA(m), 50 Ω (1/2 wave) |
| 2000-1030-R | 1710 MHz to 1880 MHz, SMA(m), 50 Ω (1/2 wave) |
| 2000-1474-R | 1710 MHz to 1880 MHz with knuckle elbow (1/2 wave) |
| 2000-1031-R | 1850 MHz to 1990 MHz, SMA(m), 50 Ω (1/2 wave) |
| 2000-1475-R | 1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA(m), 50 Ω |
| 2000-1032-R | 2400 MHz to 2500 MHz, SMA(m), 50 Ω (1/2 wave) |
| 2000-1361-R | 2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA(m), 50 Ω |
| 2000-1751-R | 698 MHz to 960 MHz, 1710 MHz to 2100 MHz, 2500 MHz to 2700 MHz, SMA(m), 2 dB, typical, 50 Ω |
| 2000-1636-R | Antenna Kit (Consists of: 2000-1030-R, 2000-1031-R, 2000-1032-R, 2000-1200-R, 2000-1035-R, 2000-1361-R, and carrying pouch) |

Isotropic Antenna



| Part Number | Description |
|-------------|--|
| 2000-1791-R | Isotropic Antenna, 700 MHz to 6000 MHz, N(m) |
| 2000-1792-R | Isotropic Antenna, 30 MHz to 3000 MHz, N(m) |
| 2000-1800-R | Isotropic Antenna, 9 kHz to 300 MHz, N(m) |

Optional Accessories (Continued)

Mag Mount Broadband Antennas



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

Bandpass Filters



Part Number Description

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



Precision Adapters



Part Number Description

- 34NN50A Precision Adapter, N(m) to N(m), DC to 18 GHz, 50 Ω
- 34NFF50 Precision Adapter, N(f) to N(f), DC to 18 GHz, 50 Ω

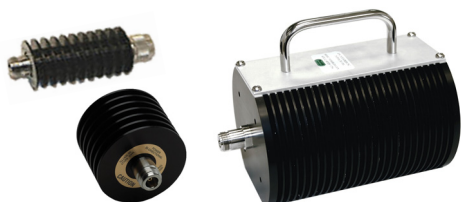
Optional Accessories (Continued)

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 |
| 1091-417-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 |
| 1091-172-R | BNC(f) to N(m), DC to 1.3 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 |
| 71693-R | Ruggedized K(f) to Type N(f) |
| 510-102-R | N(m) to N(m), DC to 11 GHz, 50 Ω, 90 degrees right angle |

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) |
| 1010-121 | Attenuator, 40 dB, 100 W, DC-18 GHz, N(f) input - N(m) output, UniDirectional |
| 3-1010-124 | Attenuator, 40 dB, 100 W, DC-8.5 GHz, N(f) input - N(m) output, Uni-directional |
| 1010-128-R | 40 dB, 150 W, DC to 3 GHz, N(m) to N(f) |

Miscellaneous Accessories



| Part Number | Description |
|-------------|---|
| 2000-1374 | External Dual Charger for Li-Ion Batteries |
| 633-75 | Rechargeable Li-Ion Battery, 7500 mAh |
| 66864 | Rack Mount Kit, Master Platform |
| 2000-1689 | EMI Near Field Probe Kit |
| 2000-1797-R | Touchscreen Protective Film, 8.4 in |
| MA2700A | Handheld Interference Hunter (For full specifications, refer to the MA2700A Technical Data Sheet 11410-00692) |
| 2000-1691-R | Stylus with Coiled Tether |
| 2000-1798-R | Port Extender, DC to 6 GHz, N(m) to N(f) |

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 56 cm x 45.5 cm x 26.5 cm (22.07" x 17.92" x 10.42") |
| 760-261-R | Transit Case, space for MA2700A, antennas, filters, instrument inside softcase, and other interference hunting accessories/tools |
| 760-271-R | Transit Case for Portable Directional Antennas and Port Extender 52.4 cm x 42.8 cm x 20.6 cm (20.62" x 16.87" x 8.12") (for 2000-1777-R, 2000-1778-R, 2000-1779-R, 2000-1798-R) |

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