



MOBILE/WIRELESS COMMUNICATIONS MEASURING INSTRUMENTS

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Mobile Communication Measurement Equipment

(example of an application; various other types of measurement equipment are also available)

Anritsu Model	Mobile Communication System																	Mobile Equipment			Base Station														
	5G NR	LTE-Advanced	LTE FDD	LTE TDD	Cat-M	NB-IoT	W-CDMA	HSDPA	HSUPA	HSPA Evolution	CDMA2000 1X	1xEV-DO	GSM/GPRS	EGPRS	TD-SCDMA	W-LAN (11a/b/g/n)	W-LAN (11ac)	W-LAN (11ax)	W-LAN (11j)	W-LAN (11p)	Mobile WiMAX	Bluetooth	ISDB-T	DVB-T/H	CPRI	R&D	Manufacture	Maintenance/Service	R&D	Manufacture	Construction/Service				
MT8000A Radio Communication Test Station	✓	✓	✓	✓																							✓								
MD8430A Signalling Tester		✓	✓	✓	✓	✓	✓	✓	✓				✓	✓														✓							
MX800050A/MX786201A Rapid Test Designer (RTD)	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓														✓							
ME7834NR 5G NR Mobile Device Test Platform	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓*1													✓							
ME7834LA LTE-Advanced Mobile Device Test Platform		✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓*1													✓							
ME7873NR New Radio RF Conformance Test System	✓																										✓								
ME7873LA LTE-Advanced RF Conformance Test System		✓	✓	✓	✓	✓	✓	✓	✓				✓*1	✓*1														✓							
ME7803NR RF Regulatory Test System	✓																										✓								
ME7800L Simple Conformance Test System		✓	✓	✓	✓	✓																					✓								
MD8475B Signalling Tester		✓	✓	✓			✓	✓	✓			✓	✓	✓	✓												✓								
MT8821C Radio Communication Analyzer		✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓												✓								
MT8870A/MT8872A Universal Wireless Test Set	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓							
MG3710E Vector Signal Generator	✓	✓	✓	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MS2690A/MS2691A/MS2692A Signal Analyzer	✓	✓	✓	✓*2			✓	✓	✓	✓	✓*2	✓*2	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓	
MS2850A Signal Analyzer	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓	✓													✓	✓	✓	✓	✓	✓	✓	✓
MS2840A Signal Analyzer																												✓*3			✓*3				
MS2830A Signal Analyzer		✓	✓	✓*2			✓	✓	✓	✓	✓*2	✓*2	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓	✓	✓
MS2090A Field Master Pro	✓	✓	✓	✓																															✓
MS2720T Spectrum Master		✓	✓	✓		✓*4	✓				✓	✓	✓		✓						✓													✓	
MS2713E Spectrum Master		✓	✓	✓		✓*4	✓	✓			✓	✓	✓		✓						✓		✓	✓										✓	
MT8213E Cell Master		✓	✓	✓		✓*4	✓	✓			✓	✓	✓		✓						✓		✓	✓										✓	
MT8852B Bluetooth Test Set																						✓					✓	✓							
MT8862A Wireless Connectivity Test Set																✓	✓	✓									✓	✓							
MA8100A NEON Signal Mapper											✓	✓			✓						✓														✓
S820E Microwave Site Master																																			✓
S412E LMR Master			✓	✓									✓																						✓
S331E S332E S361E S362E Site Master																																			✓
S331L Site Master																																			✓
S331P Site Master																																			✓

*1: Measurement items for InterRAT Handover are available.
 *2: Downlink/Forward link only
 *3: Available for Spectrum measurement without modulation analysis.
 *4: Guard Band, Standalone only

Radio Communication Test Station

MT8000A

Remote Control
Ethernet

All-in-One 5G Signaling, RF and Functional Tests



Expandability Supporting 5G

5G NR is a new communications standard intended to increase communications speed and capacity to more than 100 times that of the current LTE standard. It is required to support advances in wireless communications technologies, such as greatly expanded communications bandwidth and use of mmWave, which is not supported by earlier mobile communications.

Anritsu is releasing its new MT8000A solution supporting 5G NR RF Tx measurements, Protocol and Functional tests needed to support advances in communications technologies in line with the development of 5G NR.

Three Features of 5G Test Platform MT8000A

1. Support for Various Test Requirements

MT8000A supports Non-signalling/Signalling RF TRx measurements as well as Protocol tests and Functional Test on all-in-one hardware by switching applications. The leading-edge design with flexibility and scalability uses a modular architecture; in addition to supporting high-order 4x4 MIMO and 8 Carrier Aggregation (8CA) by implementing eMBB (Enhanced Mobile Broadband), the MT8000A offers a flexible test environment for future new applications covering a wide application area by supporting new 5G test needs, including URLLC (Ultra-Reliable and Low Latency Communications) and mMTC (massive Machine Type Communications).

2. Support for 5G mm-Wave Bands

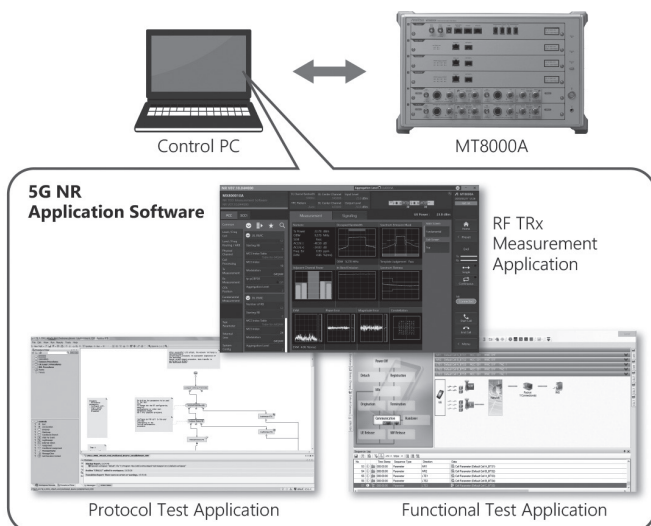
An OTA environment is required to evaluate 5G NR UE in the mmW. The MT8000A also supports the evaluation of 5G NR UEs in the millimeter wave band by combining with the OTA Chamber according to the application.



Beam management test can be performed using RF Chamber MA8171A, which can irradiate millimeter wave signals to UEs from various angles.



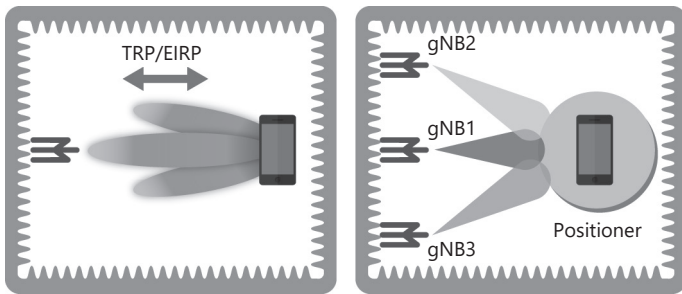
Tests related to communication protocols such as mmW Throughput tests and Functional tests use Shield Box MA8161A. Because it saves space, you can easily test on the desktop.



RF TRx Measurement and Protocol Test , Functional Test Environment Image



MA8172A is Far Field Measurement & Black Box Approach OTA test requirements for mmWave RF measurements are supported. The CATR chamber is TRx test main platform for 5G NR chipsets, modules and terminals mmWave development.



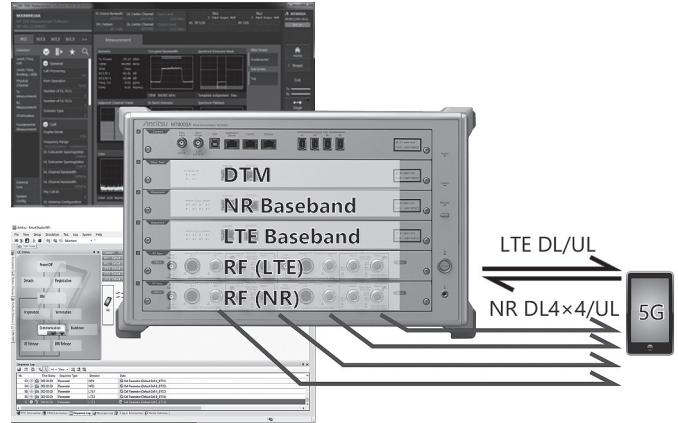
RF TRP/EIRP Measurement

Beam Management Test

Example of Millimeter-wave Band RF/Protocol Test in Combination with RF Chamber

Support 5G NR and LTE in one unit

MT8000A supports 5G NR and LTE in one unit. EPS Fallback and EN-DC configuration test (such as ENDC of LTE multiple CA, NR SA after referral) can be supported by one unit. It supports an IP T-put environment sufficient for actual application evaluation, and RF and functional tests can be easily performed simply by switching the FW, realizing an efficient test environment.



3. Early Support for NSA/SA Test Environments

The MT8000A supports both NSA test solution (for Non-Standalone, 5G NR and LTE network architectures) and SA test solution (for Standalone, 5G NR-only architectures). In addition, customer can utilize Anritsu LTE measurement solutions such as stable LTE test environment and existing test scenario resource, and easy to configure a 5G-LTE coupled test environment.

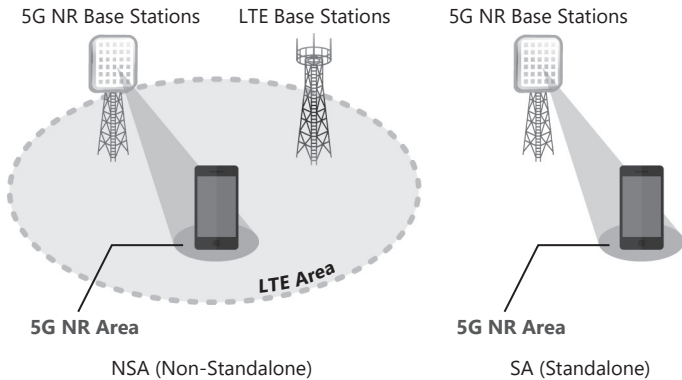


Image of 5G NR NSA/SA Configuration



Specifications

Dimensions	426 (W) × 265 (H) × 578 (D) mm (excluding projections)	
Mass	≤50 kg (with all options)	
Environmental Conditions	Operating: +5°C to +40°C (no condensation) Storage: -20°C to +71°C (no condensation)	
Power Supply	100 VAC to 120 VAC/200 VAC to 240 VAC 50 Hz/60 Hz ≤1500 VA	
CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

Please contact us for other detailed specifications.

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names.
The actual name of the item may differ from the Order Name.

Model/Order No.	Name	
MT8000A	Main Frame Radio Communication Test Station	
J1211	Standard Accessories POWER CORD.3M:	1 pc
J1440A	LAN Cable :	1 pc
W3955AE	MT8000A Radio Communication Test Station Operation Manual:	1 pc
MX800000A	Platform Software	
MT8000A-001 MT8000A-009 MT8000A-011 MT8000A-012 MT8000A-020 MT8000A-021 MT8000A-022 MT8000A-023 MT8000A-024 MT8000A-031 MT8000A-032	Options Control Module Multi-box Data connection Baseband Module Data Test Module RF Base Module 0.4 GHz-6 GHz RF Sub Module 3 GHz-12 GHz RF Sub Module Extend RF 2.4 GHz - 3 GHz Extend RF 6 GHz-7.125 GHz 0.4 GHz-6 GHz Multi RF Module 0.4 GHz-6 GHz Multi RF Extension Please inquire about other options.	
MA80001A MA80002A MA80003A	Converter 28 GHz RF Converter 39 GHz RF Converter Multiband RF Converter	
MA8171A MA8174A MA8175A	RF Chamber Related Products RF Chamber Position Controller Positioner	
MA8172A MA8178A MA8179A	CATR Chamber Related Products CATR Anechoic Chamber Position Controller Positioner	
MA8161A	Shield Box Related Products Shield Box	
MX800010A MX800030A MX800050A MX800070A	Software Options NR TDD Measurement Software NR Protocol Platform Software Rapid Test Designer Platform (RTD) SmartStudio NR	
MX800010A-SS101 MX800050A-SS100 MX800070A-SS110	Support Service 5G NR RF Measurement Support Service (Per Year) RTD Support Service (Per Year) SmartStudio NR Support Service (Per Year)	
	Application Parts Please inquire details.	

For details, please contact our sales department.

Shield Box

MA8161A



The Shield Box MA8161A provides simple mmW OTA test environment for 5G protocol test.

- Small footprint for easy benchtop use and good handling
- Can be installed on a desktop in a small space
- Easy to test 5G NR mmW call connection

Specifications

Only key specifications are listed. See detail for OTA Product Catalog, or contact your Anritsu sales representative.

Frequency	600 MHz to 6 GHz, 24 GHz to 43.5 GHz
Dimensions and Mass	434 (W) × 271 (H) × 328 (D) mm (excluding projection) ≤16 kg (maximum configuration)

Ordering Information

Only key components are listed. Contact your Anritsu sales representative for detailed ordering information.

The names listed in the chart below are Order Names.
The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MA8161A	Main Frame Shield Box
MA8161A-002 MA8161A-AK010	Options Connector Panel 2 Shield Tube
Z1999A Z2000A K241C	Application Parts 28 GHz Antenna Unit 39 GHz Antenna Unit Precision Power Splitter, DC to 40 GHz

RF Chamber

MA8171A

Remote Control
Ethernet



The RF Chamber MA8171A supports 5G NR mmW OTA environment for RF/protocol tests.

- Since multiple antennas can be installed, an OTA test environment can be built flexibly
- Supports 5G NR mmWave TRP/EIRP measurements, etc.

Specifications

Only key specifications are listed. See detail for OTA Product Catalog, or contact your Anritsu sales representative.

Frequency	800 MHz to 3.8 GHz, 24 GHz to 40 GHz
Dimensions and Mass	Main frame of chamber 1460 (W) × 1210 (H) × 1000 (D) mm (excluding projection) ≤150 kg Including chamber rack and converter rack 2080 (W) × 1785 (H) × 1000 (D) mm (excluding projection)

Ordering Information

Only key components are listed. Contact your Anritsu sales representative for detailed ordering information.

The names listed in the chart below are Order Names.
The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MA8171A	Main Frame RF Chamber
MA8174A MA8175A MA8181A Z1996A Z2031A Z1974A Z2009A B0746A B0747A	Application Units and Parts Position Controller Positioner 28 GHz Test Antenna 28 GHz/39 GHz Test Antenna Test Antenna Reference Antenna Link Antenna Chamber Rack Converter Rack

CATR Anechoic Chamber

MA8172A

Remote Control
Ethernet



The CATR Anechoic Chamber MA8172A supports 5G NR OTA environment using 3GPP-compliant Compact Antenna Test Range (CATR) method.

- Compatible with Indirect Far Field & Black Box Approach required for mmWave measurement
- Contributing to the development of mmWave 5G NR chipsets, modules and UEs
- Evaluation of beam characteristics of 5G NR UEs, etc. is possible in a short time
- Compatible with 5G NR mmWave band spurious tests in RF conformance tests

Specifications

Only key specifications are listed. See detail for OTA Product Catalog, or contact your Anritsu sales representative.

Frequency	600 MHz to 87 GHz
Dimensions and Mass	2200 (W) × 1980 (H) × 1200 (D) mm (Including main frame of chamber and rack. Excluding projection) ≤700 kg (Including all options. Excluding rack)

Ordering Information

Only key components are listed. Contact your Anritsu sales representative for detailed ordering information.

The names listed in the chart below are Order Names.
The actual name of the item may differ from the Order Name.

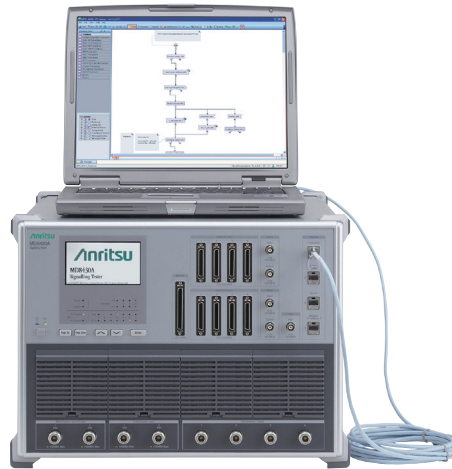
Model/Order No.	Name
MA8172A	Main Frame CATR Anechoic Chamber
MA8172A-010	Application Units and Parts Temperature Testing Option
MA8172A-021	Test Antenna
MA8172A-022	Test Antenna
MA8172A-AK022	NR FR2 Link Antenna Kit
MA8172A-AK023	LTE Link Antenna Kit
MA8172A-AK024	NR FR2 Link Antenna Kit
MA8178A	Position Controller
MA8179A	Positioner
MA8179A-AK010	DUT-supporting Structure
MA8179A-AK011	DUT Holder
Z1974A	Reference Antenna
Z2032A	Reference Antenna
Z2096A	Heater Controller

Signalling Tester

MD8430A

Remote Control
Ethernet

Early Support for Developing 5G NSA/LTE-Advanced Pro (CA/MTC) Chipsets and Mobile UEs



LTE-Advanced Pro is faster than LTE/LTE-Advanced and becoming effect radio communications network.

The Signalling Tester MD8430A is a key LTE-Advanced Pro base station simulator for developing LTE/LTE-Advanced/LTE-Advanced Pro-compliant chipsets and mobile UEs. Also supports 5G NSA protocol testing is possible by using in combination with Radio Communication Test Station MT8000A.

Using its extensive experience in 3G markets, Anritsu has developed the MD8430A as a powerful LTE-Advanced Pro protocol R&D test solution to help developers bring LTE/LTE-Advanced/LTE-Advanced Pro terminals to market as fast as possible.

Key Features

- Support LTE-Advanced Pro testing with 6CCs Carrier Aggregation (CA) and less
- Early support 3GPP LTE-Advanced FDD/TDD Release 13
 - TDD-FDD joint operation including CA
 - DL 256QAM
 - LTE MTC (Machine Type Communication)
- One MD8430A support CA handover, 4x4 MIMO, 8x4 MIMO, etc.
- Available to testing of full digital fading
- Support DL 2 Gbps, UL 300 Mbps data throughput
- Optimized investment from first R&D to protocol conformance testing
- Full development and analysis toolset cuts L1, L2 and L3 scenario development time and costs
- Support UMTS Release 10, HSPA Evolution, GSM/GPRS/EGPRS
- Supports 5G NSA protocol testing is possible by using in combination with MT8000A

Main Applications

- Coding/Decoding tests (RF/Baseband)
- Protocol sequence tests
- Throughout and stress tests (Performance test)
- Intra-RAT/Inter-RAT performance tests
- LTE Pre-conformance/Conformance tests
- Network interoperability tests
- LTE network operator acceptance tests (CAT)
- Troubleshooting field test problems
- UE QC inspection
- W-CDMA/HSPA protocol sequence tests

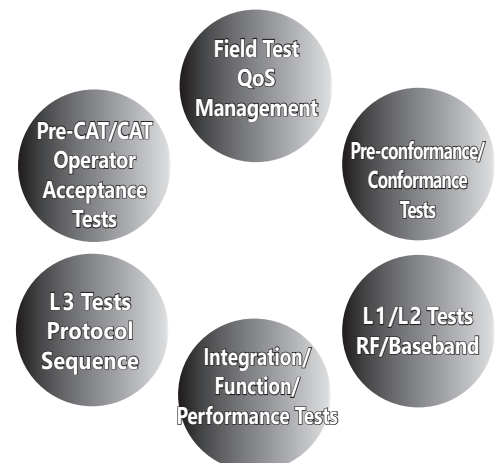
Main Test Functions

- LTE-Advanced Intra-RAT CA handover test (Hard handover)
- LTE ↔ UTRAN/GERAN Inter-RAT handover test
- eMBMS test
- Digital baseband slow clock test
- Protocol sequence analysis (Log analysis)
- Throughput monitoring
- UE scheduling function (Time/MCS/Lowest RB/RB)
- H-ARQ Test (ACK/NACK/DTX)
- VoLTE test (SPS, TTI Bundling, DRX, RoHC, CA+VoLTE)
- W-CDMA/HSPA handover test
- Dual Connectivity
- Licensed Assisted Access (LAA)
- Cellular Internet of Things (C-IoT) Test (Cat-M/NB-IoT)

Basic Functions (LTE-Advanced)

- Transmit downlink (DL) signal (Up to 6 GHz)
- Receive uplink (UL) signal (Up to 6 GHz)
- Call processing
- Transmit power Control (TPC)
- Baseband interface
- DL 2x2/4x2 MIMO, DL 4x4/8x2/8x4 MIMO, UL 2x2 MIMO (Test Model: ETM)
- CA 2CCs/3CCs/4CCs/5CCs/6CCs (Test Model: ETM)
- Ciphering (option)

See Specifications of "Signalling Tester MD8430A models" for detail..



Supports Newest UE Categories

The MD8430A follows UE categories defined on 3GPP specifications, and will support new future categories.

UE category table: 3GPP TS 36.306 V14.5.0 (2017-12)

☐ : MD8430A supported ☐ : MD8430A not supported

UE Category (DL)

UE Category	Maximum number of DL-SCH transport block bits received within a TTI	Maximum number of bits of a DL-SCH transport block received within a TTI	Total number of soft channel bits	Maximum number of supported layers for spatial multiplexing in DL
Category 1	10296	10296	250368	1
Category 2	51024	51024	1237248	2
Category 3	102048	75376	1237248	2
Category 4	150752	75376	1827072	2
Category 5	299552	149776	3667200	4
Category 6	301504	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	3654144	2 or 4
Category 7	301504	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	3654144	2 or 4
Category 8	2998560	299856	35982720	8
Category 9	452256	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	5481216	2 or 4
Category 10	452256	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	5481216	2 or 4
Category 11	603008	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM)	7308288	2 or 4
Category 12	603008	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM)	7308288	2 or 4

UE DL Category

UE DL Category	Maximum number of DL-SCH transport block bits received within a TTI	Maximum number of bits of a DL-SCH transport block received within a TTI	Total number of soft channel bits	Maximum number of supported layers for spatial multiplexing in DL
DL Category M1	1000	1000	25344	1
DL Category M2	4008	4008	73152	1
DL Category 0	1000	1000	25344	1
DL Category 1bis	10296	10296	250368	1
DL Category 4	150752	75376	1827072	2
DL Category 6	301504	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	3654144	2 or 4
DL Category 7	301504	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	3654144	2 or 4
DL Category 9	452256	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	5481216	2 or 4
DL Category 10	452256	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	5481216	2 or 4
DL Category 11	603008	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM)	7308288	2 or 4
DL Category 12	603008	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM)	7308288	2 or 4
DL Category 13	391632	195816 (4 layers, 256QAM) 97896 (2 layers, 256QAM)	3654144	2 or 4
DL Category 14	3916560	391656 (8 layers, 256QAM)	47431680	8
DL Category 15	749856-807744	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	9744384	2 or 4
DL Category 16	978960-1051360	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	12789504	2 or 4
DL Category 17	25065984	391656 (8 layers, 256QAM)	303562752	8
DL Category 18	1174752-1211616	[299856 (8 layers, 64QAM) 391656 (8 layers, 256QAM)] 149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	14616576	2 or 4 [or 8]

NB-IoT (DL)

UE Category	Maximum number of DL-SCH transport block bits received within a TTI	Maximum number of bits of a DL-SCH transport block received within a TTI	Total number of soft channel bits
Category NB1	680	680	2112
Category NB2	2536	2536	6400

UE Category (UL)

UE Category	Maximum number of UL-SCH transport block bits transmitted within a TTI	Maximum number of bits of an UL-SCH transport block transmitted within a TTI	Support for 64QAM in UL
Category 1	5160	5160	No
Category 2	25456	25456	No
Category 3	51024	51024	No
Category 4	51024	51024	No
Category 5	75376	75376	Yes
Category 6	51024	51024	No
Category 7	102048	51024	No
Category 8	1497760	149776	Yes
Category 9	51024	51024	No
Category 10	102048	51024	No
Category 11	51024	51024	No
Category 12	102048	51024	No

UE DL Category	Maximum number of DL-SCH transport block bits received within a TTI	Maximum number of bits of a DL-SCH transport block received within a TTI	Total number of soft channel bits	Maximum number of supported layers for spatial multiplexing in DL
DL Category 19	1566336-1658272	[299856 (8 layers, 64QAM) 391656 (8 layers, 256QAM)] 149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	19488768	2 or 4 [or 8]
DL Category 20	1948064 - 2019360	[299856 (8 layers, 64QAM) 391656 (8 layers, 256QAM)] 149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	24360960	2 or 4 [or 8]

UE UL Category

UE UL Category	Maximum number of UL-SCH transport block bits transmitted within a TTI	Maximum number of bits of an UL-SCH transport block transmitted within a TTI	Support for 64QAM in UL	Support for 256QAM in UL
UL Category M1	1000 or 2984	1000 or 2984	No	No
UL Category M2	6968	6968	No	No
UL Category 0	1000	1000	No	No
UL Category 1 bis	5160	5160	No	No
UL Category 3	51024	51024	No	No
UL Category 5	75376	75376	Yes	No
UL Category 7	102048	51024	No	No
UL Category 8	1497760	149776	Yes	No
UL Category 13	150752	75376	Yes	No
UL Category 14	9585664	149776	Yes	No
UL Category 15	226128	75376	Yes	No
UL Category 16	105528	105528	Yes	Yes
UL Category 17	2119360	211936	Yes	Yes
UL Category 18	211056	105528	Yes	Yes
UL Category 19	13563904	211936	Yes	Yes
UL Category 20	316584	105528	Yes	Yes
UL Category 21	301504	75376	Yes	No

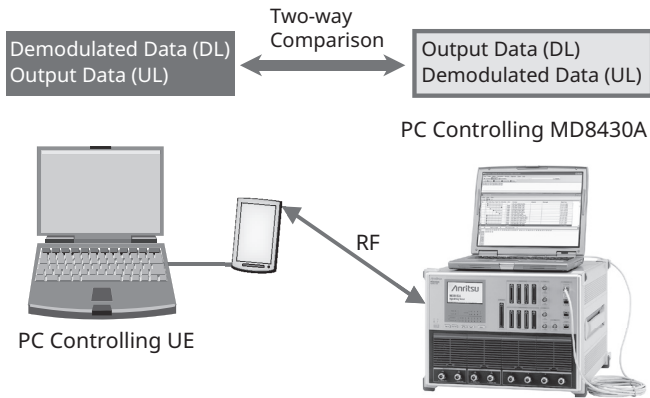
NB-IoT (UL)

UE Category	Maximum number of UL-SCH transport block bits transmitted within a TTI	Maximum number of bits of an UL-SCH transport block transmitted within a TTI
Category NB1	1000	1000
Category NB2	2536	2536

For Developing LTE-Advanced Pro Chipsets and Mobile UEs RF/Baseband Tests

Coding/Decoding Test

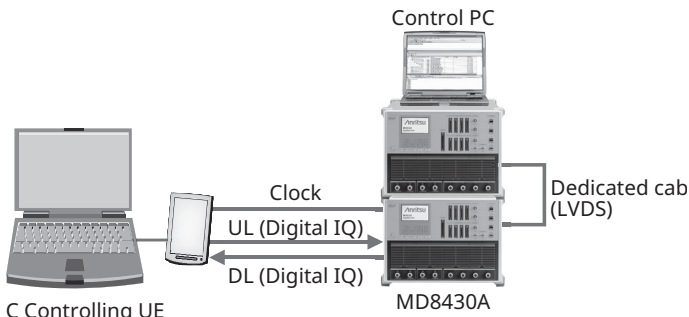
Coding/Decoding tests of LTE-Advanced Pro terminals are performed by making the RF connections shown in the following diagram.



Coding/Decoding Test Example (RF, Non-call-processing Test)

The MD8430A supports digital baseband I/O as standard functions. Using the baseband interface offers high-reproducibility coding/decoding tests free from the RF section, supporting stable evaluation of LTE chipset baseband performance.

Moreover, LTE coding/decoding tests are supported because the baseband chip can be evaluated using a slower clock than the clock frequency. And connecting the second MD8430A fading function to the digital baseband interface supports slow clock evaluations in a fading environment, which are difficult to perform with an RF fading simulator.



Slow Clock Test Setup (Digital Baseband, Fading)

Easy MIMO Test Configuration Settings

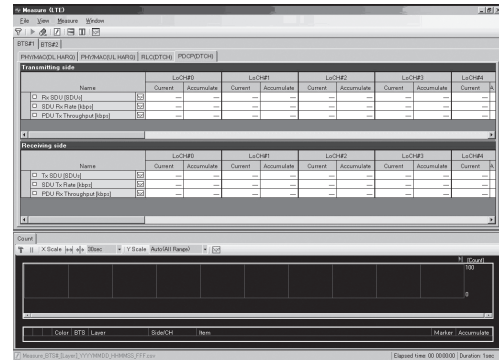
The MD8430A has 8 main and sub RF connectors as well as 8 digital IQ connectors as standard equipment for use with the MX843010A/E LTE Control Software to easily configure and monitor various settings, including RF parameters, channel power, MIMO, fading, connector selections, frame timing, BTS cell selections, etc.



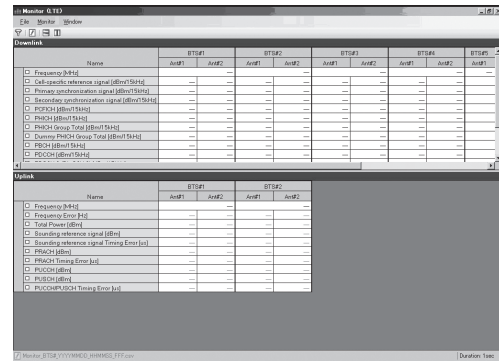
Setup Screen Example

Fully Versatile L1/L2 Monitoring Functions

The MX843010A/E software supports LTE development by processing large volumes of low-layer data at very high speeds using a full line of versatile power monitoring, throughput monitoring and log analysis functions. The Measure (Counter) functions can monitor Layer 1/2 (L1/L2) throughputs in real time by counting parameter values such as ACK/NACK/DTX/CQI.



Measurement (Counter and Throughput) Screens



Monitor Screen Example

Complete LTE-Advanced Pro Protocol Test Environment Intelligent Test Creation

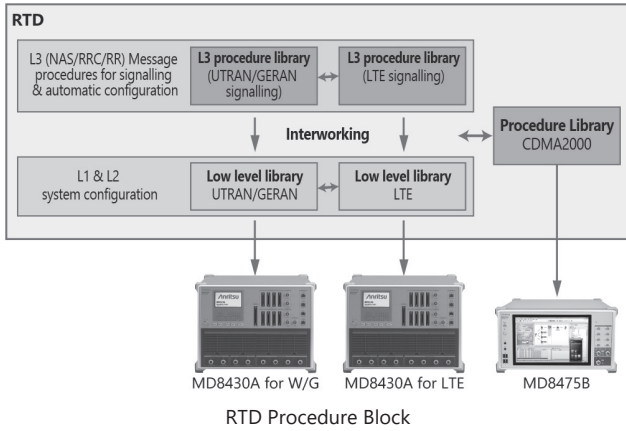
The Rapid Test Designer (RTD) MX800050A/MX786201A software tools gives users power to create tests that cannot be done with traditional language based tools. RTD Supports L1/L2/L3 testing using Lower Layer Configuration library and Layer 3 procedure library of UE development. Moreover, each procedure auto-sets the connection with the lower Layers (L1/L2) based on full compliance with the 3GPP standards. RTD can simulate LTE ↔ UMTS Inter-RAT and LTE ↔ CDMA2000 Interworking by connecting MD8430A and/or MD8475B. The Reference Library test cases provides a reference to build the customized test cases and libraries with ease.



Cuts Test Case Development Time

The RTD GUI offers intuitive test case creation by linking procedures with parameters, such as network conditions and message data, at easy-to-understand setting screens, quickly increasing the number of working test cases.

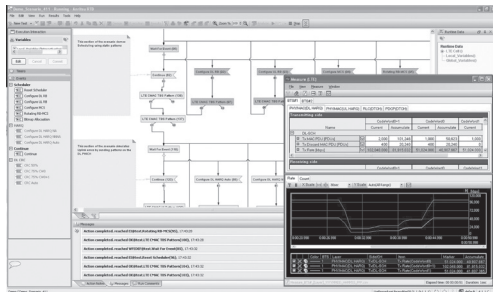
In addition, the Built-in Analyzer function checks for programming errors prior to testing, which can start immediately without recompiling after editing and changing settings.



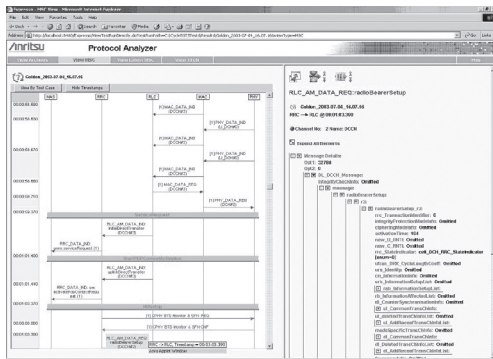
RTD Procedure Block

Flexibility in Testing & Analysis

When the test finishes the execution, the RTD provides a preliminary judgment against predetermined criteria. This avoids the need to study complex message sequences and can show a test outcome explained in a local language. The Integrated protocol analyzer with RTD supports very detailed Message Sequence Analysis and provides a facility to export the Protocol Test logs in to HTML format which can be viewed at any PC with a Browser without a RTD license.



Test Execution Screen (RTD)



Log Analysis Screen (RTD)

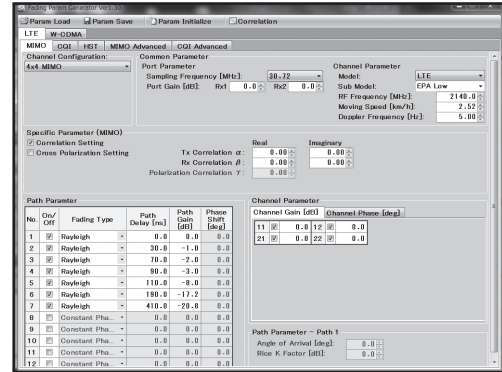
Efficient UE Integration and Performance Tests

Testing Throughput for Various Conditions

The MD8430A supports the latest UE categories with download speeds of 2 Gbps and uploads speeds of 300 Mbps.

The bundled sample scenarios make it easy to change parameters such as bandwidth, scheduling, HARQ, etc., for testing LTE throughputs under various conditions.

In addition, combination with second MD8430A fading function supporting LTE MIMO via the dedicated digital interface simplifies complex power control procedures for easy throughput testing in a fading environment with simple test setup.

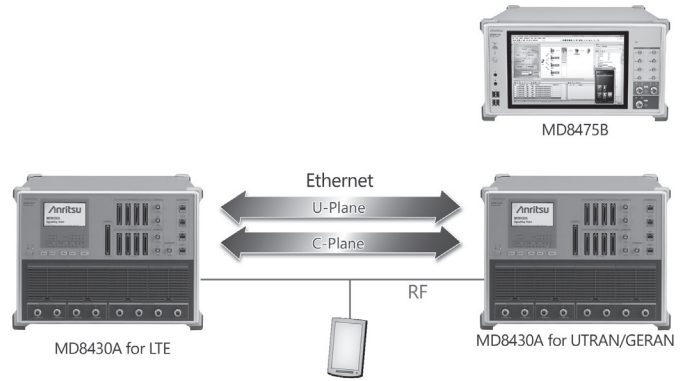


Fading Setting Screen (MF6900A Fading Simulator)

Handover Tests Optimizing Hardware Investment

The MD8430A supports up to six cells (Four active cells) allowing handover tests between two LTE BTS with one tester. In addition, LTE-UTRAN/GERAN Inter-RAT handover tests are supported by connecting 2boxes of MD8430A.

With the Signalling Tester MD8475B, CDMA2000 Interworking tests are supported too, maximizing support for both worldwide communications technologies and investment in hardware.



LTE-UTRAN/GERAN Handover Test Setup

Specifications of Signalling Tester MD8430A Model (ETM)

Model/Name	MD8430A-035 LTE Enhanced Test Model (ETM)	
Interface	RF, Digital IQ, Baseband Fading*1	
Frequency Band	Max. 20 MHz	
UE Category	Category 1, 2, 3, 4, 5, 6, 7, 9*2, 10*2, 11*2, 12*2 DL Category M1, 0, 1 bis, 4, 6, 7, 9*2, 10*2, 11*2, 12*2, 13*2, 15*2, 16*2, 18*2, 19*2, 20*2 UL Category M1, 0, 1 bis, 3, 5, 7, 13, 15, 20 NB Category NB1	
Max. Data Rate (DL)	1 Gbps (PHY: 2 Gbps)	
Max. Data Rate (UL)	300 Mbps	
MIMO	2 x 2 MIMO 4 x 2 MIMO 8 x 2 MIMO	4 x 4 MIMO*3 8 x 4 MIMO*4
Max. No. of Base Station	Active + adjacent BTS: 8*5 (Max. Active BTS: 6)	
Hard Handover (including at MIMO)	Available*6	
Carrier Aggregation: No. of Component Carriers (DL)*7	6*8, *9, *10	
Carrier Aggregation: No. of Component Carriers (UL)*7	3*11	

- *1: Requires MD8430A-067 and two MD8430A sets for Baseband Fading. (ETM & ETM or ETM & BTM)
- *2: Requires two MD8430A sets. (ETM & ETM or ETM & BTM)
- *3: Requires MD8430A-075.
- *4: Requires MD8430A-076.
- *5: Requires two MD8430A sets. (ETM & ETM).
- *6: For inter-frequency handover with Carrier Aggregation, requires two MD8430A sets. (ETM & ETM or ETM & BTM)
- *7: Requires MD8430A-085.
- *8: DL 4 CA operation requires MD8430A-088, DL 5 CA operation requires MD8430A-089, and DL 6 CA operation requires MD8430A-044.
- *9: For 3 CA MIMO and 4 CA MIMO, requires two MD8430A sets. (ETM & ETM or ETM & BTM)
- *10: For DL 5 CA MIMO and 6 CA MIMO, requires two MD8430A sets (only ETM 2 sets configuration)
- *11: UL 3 CA operation requires MD8430A-045.

Powerful Platform for Both Conformance and Operator Acceptance Tests

Optimized Hardware Investment

The MD8430A supports to design for early chipset and mobile UE, function tests, and performance tests ranging from carrier acceptance tests to protocol conformance tests as well as retrofit upgrades between models allows developers to tailor their hardware investment to current needs with future flexible upgrade options.

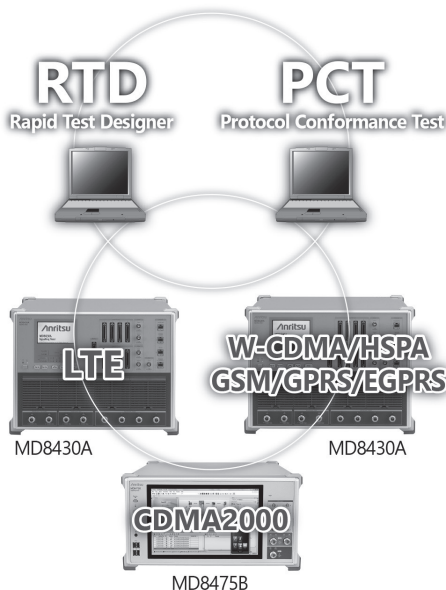
The Protocol Conformance Test Toolkit (PCT) with MD8430A and GCF/PTCRB approved TTCN test package provide an optimum environment for LTE protocol conformance testing. Hence, a Single Hardware Platform that extends its usage from Platform development to Conformance Testing and Operator Acceptance Test.

Instant Firmware Switching

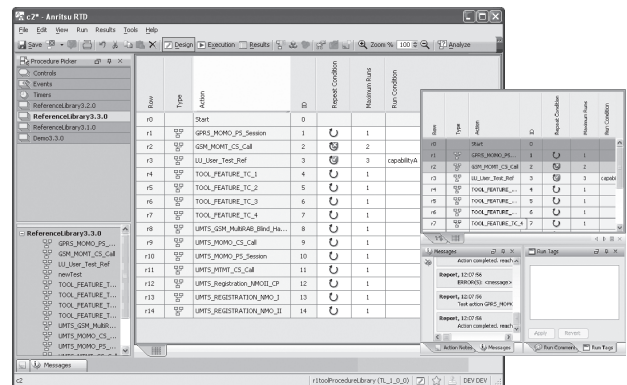
Because the MD8430A saves up to ten firmware versions, the right firmware is selected easily at startup. There is no need to install/uninstall firmware when executing a test case that determines the firmware version.

Powerful Automated Testing

The RTD software supporting the UE control interface makes it easy to setup automated test systems. Furthermore, multiple test cases can be executed continuously and test reports generated automatically, and many functions, including repeat testing under different conditions with multiple settings, can be automated, offering carriers, etc., an ideal turnkey solution for acceptance testing.



Full Line of Versatile L3 Analysis Tools



Example of Test Case Campaign

**Easy Test Case Maintenance**

Test cases created by the RTD software can be updated easily when new 3GPP standard evolves, reducing the need for re-editing. In addition, guaranteed test case compatibility even when the MD8430A firmware version is changed removes the need to recompile, etc., resulting in greatly reduced costs for maintaining test cases to support regression testing when rolling out new terminals and performing pre-IOT to assure compatibility with network equipment worldwide.

Test Models/Options/Software**Test Models**

Basic Test Model (BTM)	MD8430A-025
M2M Test Model (MTM)	MD8430A-027
LTE Enhanced Test Model (ETM)	MD8430A-035

Choose one of the above three models.

*: Please refer to Specifications of Signalling Tester MD8430A Models.

Test Model Upgrade

Required option when upgrading to higher order model.

Upgrade from Function Test Model (FTM)

LTE FTM to ETM Upgrade Kit	Z1670A
LTE FTM to ETM Upgrade Kit (FO)	Z1789A

Upgrade from Standard Test Model (STM)

LTE STM to ETM Upgrade Kit	Z1671A
LTE STM to ETM Upgrade Kit (FO)	Z1790A

Upgrade from Performance Test Model (STM)

LTE PTM to ETM Upgrade Kit	Z1672A
LTE PTM to ETM Upgrade Kit (FO)	Z1791A

Upgrade from Basic Test Model

LTE BTM to ETM Upgrade Kit	Z1873A
LTE BTM to MTM Upgrade Kit	Z1976A

Upgrade from M2M Test Model

LTE MTM to ETM Upgrade Kit	Z1977A
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Options**Extended Frequency Range to 3.8 GHz MD8430A-002**

Required software option when extending maximum frequency of MD8430A (Tx/Rx) to 3.8 GHz.

Extended Frequency Range to 3.8 GHz Hardware MD8430A-003

Required hardware option when extending maximum frequency of MD8430A (Tx/Rx) to 3.8 GHz.

Enhanced DL Frequency Bandwidth Option MD8430A-004

Required software option when extending downlink frequency bandwidth of MD8430A (Tx) to 60 MHz.

Extended Frequency Range to 3.8 GHz Hardware 2 MD8430A-005

Required hardware option when extending maximum frequency of MD8430A (Tx/Rx) to 3.8 GHz. (Test Model: BTM, ETM)

Extended Frequency Range to 6 GHz MD8430A-006

Required software option when extending maximum frequency of MD8430A (Tx/Rx) to 6 GHz.

Extended Frequency Range to 6 GHz Hardware MD8430A-007

Required hardware option when extending maximum frequency of MD8430A (Tx/Rx) to 6 GHz.

LTE DL 6 Carrier Aggregation Option MD8430A-044

Option for adding Carrier Aggregation (CA) function supporting transmission of up to six component carriers on downlink.

LTE UL 3 Carrier Aggregation Option MD8430A-045

Option for adding Carrier Aggregation (CA) function supporting reception of up to three component carriers on uplink.

W-CDMA Fading Option MD8430A-052

Required software option when W-CDMA fading testing.

SCME Fading Option MD8430A-053

Required software option when SCME fading testing.

LTE 2x2 MIMO Fading Option MD8430A-055

Required software option when LTE 2x2 MIMO fading testing.

LTE 4x2 MIMO Fading Option MD8430A-056

Required software option when LTE 4x2 MIMO fading testing.

LTE 4x4 MIMO Fading Option MD8430A-057

Required software option when LTE 4x4 MIMO fading testing.

LTE 8x2 MIMO Fading Option MD8430A-058

Required software option when LTE 8x2 MIMO fading testing.

LTE 8x4 MIMO Fading Option MD8430A-059

Required software option when LTE 8x4 MIMO fading testing.

LTE FDD Option MD8430A-060

Required option when simulating 3GPP LTE FDD.

LTE TDD Option MD8430A-061

Required option when simulating TD-LTE.

LTE Enhanced MTC Option MD8430A-062

Required option when simulating LTE eMTC.

Narrow Band IoT Option MD8430A-063

Required option when simulating NB-IoT.

LTE Anchor For5G NSA Option MD8430A-064

Option for Protocol tests and IP data evaluations using the 5G NSA in coordination with the MT8000A.

W-CDMA Option MD8430A-065

Required option when simulating W-CDMA.

GSM Option MD8430A-066

Required option when simulating GSM.

RF/Fading Driver Option MD8430A-067

Required software option when extending RF for MD8430A-025 BTM and executing the fading function. (MD8430A-055, 056, 057, 058)

HSPA Multi Carrier Option MD8430A-070

Required option when HSPA multi carrier testing.

W-CDMA/GSM Ciphering Option MD8430A-071

Option for adding ciphering function for W-CDMA, GSM and GPRS. Supporting KASUMI and SNOW 3G to W-CDMA. A5/1, A5/2, A5/3 and A5/4 to GSM. GEA1, GEA2, GEA3 and GEA4 to GPRS.

LTE Licensed Assisted Access (LAA) Option MD8430A-072

Required software option for executing LTE Licensed Assisted Access function.

LTE Dual Connectivity Option MD8430A-073

Required software option for executing Dual Connectivity function.

LTE DL 4x4 MIMO Option MD8430A-075

Required software option when LTE 4x4 MIMO testing.

LTE DL 8x4 MIMO Option MD8430A-076

Required software option when LTE 8x4 MIMO testing.

LTE Internal server Option MD8430A-077

Required software option when IP data communications testing with the built-in server. IP Data Throughput tests up to 1.6Gbps are supported.

LTE UL 2x2 MIMO Option MD8430A-078

Required software option when LTE UL 2x2 MIMO testing.

LTE UL 256QAM Option MD8430A-079

Required software option when LTE UL 256QAM testing.

LTE Ciphering Option MD8430A-080

Option for adding ciphering function supporting EEA0, EEA1, and EEA2 (TS 33.401, TS 36.323) algorithms to LTE.

LTE ROHC Option MD8430A-081

Option for adding LTE ROHC function supporting RTP/UDP/IP (RFC3095, RFC4815), UDP/IP (RFC3095, RFC4815), ESP/IP (RFC3095, RFC4815), and IP (RFC3843, RFC4815). Required this option for VoLTE testing.

LTE MBMS Option MD8430A-082

Option for adding LTE MBMS function supporting (P) MCH Transmission Scheduling, MCCH Message Transmission, MSI MAC control element Transmission and MTCH Message Transmission described in 3GPP (TS 36.211, TS36.221).

LTE ZUC Ciphering Option MD8430A-083

Option for adding ciphering function supporting EEA3 and EIA3 (TS 33.401, TS 35.221) algorithms to LTE.

LTE Carrier Aggregation Option MD8430A-085

Option for adding Carrier Aggregation (CA) function supporting transmission of up to two component carriers on downlink.

Ciphering Option MD8430A-086

Option for adding ciphering function supporting EEA0, EEA1, EEA2, EEA3 and EIA3 (TS 33.401, TS 35.221, TS 36.323) algorithms to LTE.

LTE CoMP Option MD8430A-087

Required software option when 3GPP Release 11 CoMP feature. It is available to test Dynamic Point Selection.

LTE DL 4 Carrier Aggregation Option MD8430A-088

Option for adding Carrier Aggregation (CA) function supporting transmission of up to four component carriers on downlink.

LTE DL 5 Carrier Aggregation Option MD8430A-089

Option for adding Carrier Aggregation (CA) function supporting transmission of up to five component carriers on downlink.

Software

LTE Control Software MX843010A

Software for simulating L1 and L2 with test cases in C.

LTE Control Software MX843010E

Software for simulating L1 and L2 with test case in C. (Test Model: ETM)

W-CDMA/GSM Control Software MX843070E

Software for simulating L1 and L2 with test cases in C. (Test Model: W-CDMA/GSM)

Rapid Test Designer (RTD) MX800050A/MX786201A

Software for simulating L1 to L3 with test cases described by GUI for automating testing, analyzing test cases and creating reports.

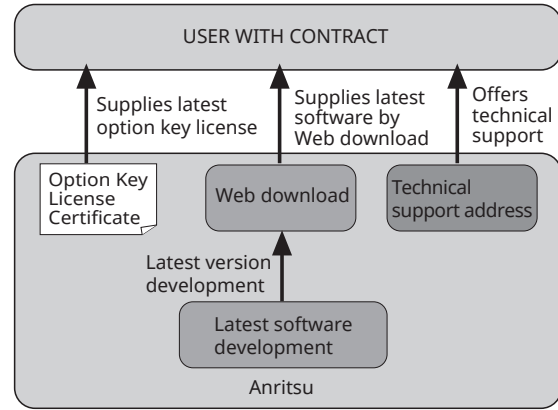
Software Maintenance Contract

Service Provided

- Contract for adding/revising software functions in line with 3GPP revisions
- Technical support for troubleshooting user problems

Annual Support Service (1 year)

Option providing 1 year of service support for MD8430A test functions including web downloads of latest software and technical enquiries. Services depend on option configuration.



MD8430A Support Services

MD8430A Support (FDD)	1 Year Support Service LTE FDD (ETM)	MD8430A-SS135
MD8430A Support (TDD)	1 Year Support Service LTE TDD (ETM)	MD8430A-SS136
MD8430A Support (W-CDMA/GSM)	1 Year Support Service W-CDMA/GSM	MD8430A-SS170
MD8430A Support (LTE eMTC)	1 Year Support Service for LTE eMTC	MD8430A-SS171
MD8430A Support (NB-IoT)	1 Year Support Service for NB-IoT	MD8430A-SS172
LTE Control Software Support MX843010A	1 Year Support Service	MX843010A-SS120
LTE Control Software Support MX843010E	1 Year Support Service (Test Model: ETM)	MX843010E-SS120

Specifications

Signalling Tester MD8430A

Reference Oscillator	Reference Frequency	10 MHz
	Activation Characteristics	±5 × 10 ⁻⁷ (2 minutes after turning on the power) ±5 × 10 ⁻⁸ (5 minutes after turning on the power) At 25°C, Based on the frequency 24 hours after turning on the power
	Aging Rate	±1 × 10 ⁻⁸ /day (Specification per day, based on the frequency 48 hours after turning on the power) ±1 × 10 ⁻⁷ /year (Specification per day, based on the frequency 10 days after turning on the power)
	Temperature Characteristics	±2 × 10 ⁻⁸ (0°C to 45°C) Based on the frequency at 25°C
	External Reference Input	Frequency: 10 MHz Operating range: ±1 ppm Input level: -15 dBm ≤ level ≤ +20 dBm (50Ω, AC coupling) Connector: BNC-J, 50Ω (nominal)
	Internal Reference Output	Frequency adjusted at shipment: 10 MHz ±0.02 ppm Output level: ≥0 dBm (50Ω, AC coupling) Connector: BNC-J, 50Ω (nominal)
Transmission Signal	Maximum Output Level	Main connector: -40 dBm (Maximum setting level at Main connector: -20 dBm) Sub connector: 0 dBm
	Level Accuracy	±1.5 dB (350 MHz ≤ Frequency ≤ 3800 MHz) ±2.0 dB (3800 MHz < Frequency ≤ 6000 MHz) Main connector: -113 dBm ≤ Level ≤ -40 dBm Sub connector: -113 dBm ≤ Level ≤ 0 dBm After calibration, 18°C to 28°C, for calibration CW
	Frequency	LTE: 350 MHz to 3.0 GHz, 350 MHz to 3.8 GHz (with MD8430A-002), 350 MHz to 6.0 GHz (with MD8430A-006) W-CDMA: 400 MHz to 3.0 GHz, 400 MHz to 3.8 GHz (with MD8430A-002/006) GSM: 400 MHz to 2.0 GHz Setting resolution: 100 kHz

Continued on next page



Transmission Signal	Access Method	LTE: OFDMA, W-CDMA: CDMA, GSM: TDMA
	Modulation Method	LTE: QPSK, 16QAM, 64QAM, 256QAM W-CDMA: QPSK, 16QAM, 64QAM GSM: GMSK, 8PSK
	Modulation Accuracy	LTE: ≤2%, Sub output: 0 dBm, LTE (OFDM, 64QAM, 20 MHz band) W-CDMA: ≤3.5%, Sub output: 0 dBm, W-CDMA (transmitting CPICH, ICH) GSM: ≤1.5deg., Sub output: 0 dBm, GMSK ≤3.5%, Sub output: 0 dBm, 8PSK * At 18°C to 28°C
Received Signal	Input Level	Setting demodulation range Based on the value set for the reference power QPSK: -28 to +15 dB 16QAM: -21 to +15 dB 64QAM: -15 to +15 dB (Input signal: EVM ≤1%, BER ≤1 × 10 ⁻¹² , 20 MHz band, SC-FDMA) Main connector input: Reference Power setting range: -20 to +20 dBm However, within the input level range from -30 to +35 dBm Sub connector input: Reference power setting range: -35 to +5 dBm However, within the input level range from -45 to +20 dBm
	Level Accuracy	Main connector: ±3.0 dB Sub connector: ±3.0 dB At 18°C to 28°C, for calibration CW, within the Main input level range from -30 to +35 dBm, the Sub input level range from -45 to +20 dBm, and the reference power range of ±15 dB
	Frequency	LTE: 350 MHz to 3.0 GHz, 350 MHz to 3.8 GHz (with MD8430A-002), 350 MHz to 6.0 GHz (with MD8430A-006) W-CDMA: 400 MHz to 3.0 GHz, 400 MHz to 3.8 GHz (with MD8430A-002/006) GSM: 400 MHz to 2.0 GHz (setting resolution: 100 kHz)
	Access Method	LTE: SC-FDMA, W-CDMA: CDMA, GSM: TDMA
	Modulation Method	LTE: QPSK, 16QAM, 64QAM, 256QAM W-CDMA: BPSK, 4PAM GSM: GMSK, 8PSK
RF Connector	Synchronization Acquirable Range	LTE: ±100 μs (PRACH), ±30 μs (PUSCH) W-CDMA: ±100 chips (PRACH), ±100 chips (DPCCH) GSM: 0 to 63 symbols (SACCH)
	Main	Connector: N-J, 50Ω (nom.) VSWR: ≤1.3 (Frequency Range: ≥350 MHz to ≤3800 MHz) ≤1.4 (Frequency Range: >3800 MHz to ≤6000 MHz)
	Sub (Downlink)	Connector: N-J, 50Ω (nom.) VSWR: ≤1.5 (Frequency Range: ≥350 MHz to ≤3800 MHz) ≤1.6 (Frequency Range: >3800 MHz to ≤6000 MHz)
Front Panel Interface	Sub (Uplink)	Connector: N-J, 50Ω (nom.) VSWR: ≤1.5 (Frequency Range: ≥350 MHz to ≤3800 MHz) ≤1.6 (Frequency Range: >3800 MHz to ≤6000 MHz)
	Digital IQ I/F	DX20 connector (50 pin) × 8 Digital IQ signal, IQ: 16 bit
	Monitor I/F	DX20 connector (80 pin), 3.3 V-CMOS level Connection with the Monitor board (G0091)
	Sync Out	BNC connector, 3.3 V-CMOS level Internal Sync Start signal output
	Sync In	BNC connector, 3.3 V-CMOS level External Sync Start signal input
	Clock In	BNC connector, 3.3 V-CMOS level, 10 kHz to 30.72 MHz External Clock signal input
MF6900A Interface	Clock Out	BNC connector, 3.3 V-CMOS level Internal Clock signal output
	Sync Out	Without MD8430A-008/108/208: BNC connector × 3, 3.3 V-CMOS level With MD8430A-008/108/208: BNC connector × 2, 3.3 V-CMOS level Connection with the MF6900A (Sync Start signal)
CE	Port	Without MD8430A-008/108/208: HIB-B16LFYGA connector × 6, LVDS level With MD8430A-008/108/208: HIB-B16LFYGA connector × 2 (Digital IQ: 2ports/connector), LVDS level HIB-B16LFYGA connector × 4 (Digital IQ: 8ports/connector), LVDS level Connection with the MF6900A (Digital IQ signal)
	EMC	2014/30/EU, EN61326-1, EN61000-3-2
Temperature	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018
	Operating	0°C to +45°C, ≤90% RH (no condensation) 0°C to +40°C, ≤90% RH (no condensation) (with Enhanced Hardware)
Power Supply	Storage	-20°C to +60°C, ≤85% RH (no condensation)
	Voltage	100 VAC to 120 VAC/200 VAC to 240 VAC (Automatic switching system)
	Frequency	50 Hz/60 Hz (Automatically changeover system)
Dimensions and Mass	Power Consumption	≤1200 VA
	Dimensions	426 (W) × 310 (H) × 500 (D) mm
	Mass	≤40 kg



Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MD8430A MD8430A-005 MD8430A-025	LTE Basic Test Model Signalling Tester Extended Frequency Range to 3.8 GHz Hardware 2 Basic Test Model (BTM)
MD8430A MD8430A-005 MD8430A-027	M2M Test Model Signalling Tester Extended Frequency Range to 3.8 GHz Hardware 2 M2M Test Model (MTM)
MD8430A MD8430A-005 MD8430A-035	LTE Enhanced Test Model Signalling Tester Extended Frequency Range to 3.8 GHz Hardware 2 LTE Enhanced Test Model (ETM)
J1440A J1211 J0127A J0576B J1398A G0091 J1005 J1459A	Standard Accessories CD-ROM (Operation Manual and Maintenance Software): 1 pc LAN Cable: 2 pcs Power Cord, 3.0 m (15 A): 1 pc Coaxial Cord, 1.0 m (BNC-P · RG58A/U · BNC-P): 1 pc Coaxial Cord, 1.0 m (N-P · 5D-2W · N-P): 2 pcs N-SMA Adaptor: 6 units Monitor Board: 1 pc Monitor Cable 80: 1 pc Digital IQ Cable (50 cm): 1 pc
MD8430A-002 MD8430A-004 MD8430A-006 MD8430A-007 MD8430A-044 MD8430A-045 MD8430A-052 MD8430A-053 MD8430A-055 MD8430A-056 MD8430A-057 MD8430A-058 MD8430A-059 MD8430A-060 MD8430A-061 MD8430A-062 MD8430A-063 MD8430A-064 MD8430A-065 MD8430A-066 MD8430A-067 MD8430A-070 MD8430A-071 MD8430A-072 MD8430A-073 MD8430A-075 MD8430A-076 MD8430A-077 MD8430A-078 MD8430A-079 MD8430A-080 MD8430A-081 MD8430A-082 MD8430A-083 MD8430A-085 MD8430A-086 MD8430A-087 MD8430A-088 MD8430A-089	Options Extended Frequency Range to 3.8 GHz Enhanced DL Frequency Bandwidth Option Extended Frequency Range to 6 GHz Extended Frequency Range to 6 GHz Hardware LTE DL 6 Carrier Aggregation Option LTE UL 3 Carrier Aggregation Option W-CDMA Fading Option SCME Fading Option LTE 2x2 MIMO Fading Option LTE 4x2 MIMO Fading Option LTE 4x4 MIMO Fading Option LTE 8x2 MIMO Fading Option LTE 8x4 MIMO Fading Option LTE FDD Option LTE TDD Option LTE Enhanced MTC Option Narrow Band IoT Option LTE Anchor For 5G NSA Option W-CDMA Option GSM Option RF/Fading Driver Option HSPA Multi Carrier Option W-CDMA/GSM Ciphering Option LTE Licensed Assisted Access (LAA) Option LTE Dual Connectivity Option LTE DL 4x4 MIMO Option LTE DL 8x4 MIMO Option LTE Internal server Option LTE UL 2x2 MIMO Option LTE UL 256QAM Option LTE Ciphering Option LTE ROHC Option LTE MBMS Option LTE ZUC Ciphering Option LTE Carrier Aggregation Option Ciphering Option LTE CoMP Option LTE DL 4 Carrier Aggregation Option LTE DL 5 Carrier Aggregation Option
MD8430A-103 MD8430A-107 MD8430A-117 MD8430A-203 MD8430A-207 MD8430A-217	Extended Frequency Range to 3.8 GHz Hardware Retrofit (for Asia, Oceania) Extended Frequency Range 3 GHz to 6 GHz Hardware Retrofit (for Asia, Oceania) Extended Frequency Range 3.8 GHz to 6 GHz Hardware Retrofit (for Asia, Oceania) Extended Frequency Range to 3.8 GHz Hardware Retrofit (FO) Extended Frequency Range 3 GHz to 6 GHz Hardware Retrofit (FO) Extended Frequency Range 3.8 GHz to 6 GHz Hardware Retrofit (FO)

Model/Order No.	Name
MX843010A MX843010E MX843070E MX786201A MX800050A	Software Options LTE Control Software LTE Control Software W-CDMA/GSM Control Software Rapid Test Designer (RTD) Rapid Test Designer Platform (RTD)
MD8430A-SS125 MD8430A-SS135	Main frame Support Service [FDD] 1 Year Support Service for LTE FDD (BTM) 1 Year Support Service for LTE FDD (ETM)
MD8430A-SS126 MD8430A-SS136	[TDD] 1 Year Support Service for LTE TDD (BTM) 1 Year Support Service for LTE TDD (ETM)
MD8430A-SS170	[W-CDMA/GSM] 1 Year Support Service for W-CDMA/GSM
MD8430A-SS171	[LTE eMTC] 1 Year Support Service for LTE eMTC
MD8430A-SS172	[NB-IoT] 1 Year Support Service for NB-IoT
MX843010A-SS120 MX843010E-SS120	LTE Control Software Support Service 1 Year Support Service 1 Year Support Service
Z1670A Z1789A Z1671A Z1790A Z1672A Z1791A Z1873A Z1976A Z1977A	Upgrade Options LTE FTM to ETM Upgrade Kit LTE FTM to ETM Upgrade Kit (FO) LTE STM to ETM Upgrade Kit LTE STM to ETM Upgrade Kit (FO) LTE PTM to ETM Upgrade Kit LTE PTM to ETM Upgrade Kit (FO) LTE BTM to ETM Upgrade Kit LTE BTM to MTM Upgrade Kit LTE MTM to ETM Upgrade Kit
MN8150A J1416A J1609A	Application Products RF Combiner Unit LVDS CABLE Signal Divider

*: A PC*1 running Microsoft Visual C++ 2010 Express Edition or Microsoft Visual Studio Express 2015 is required to use the MD8430A. It must be supplied by the customer.

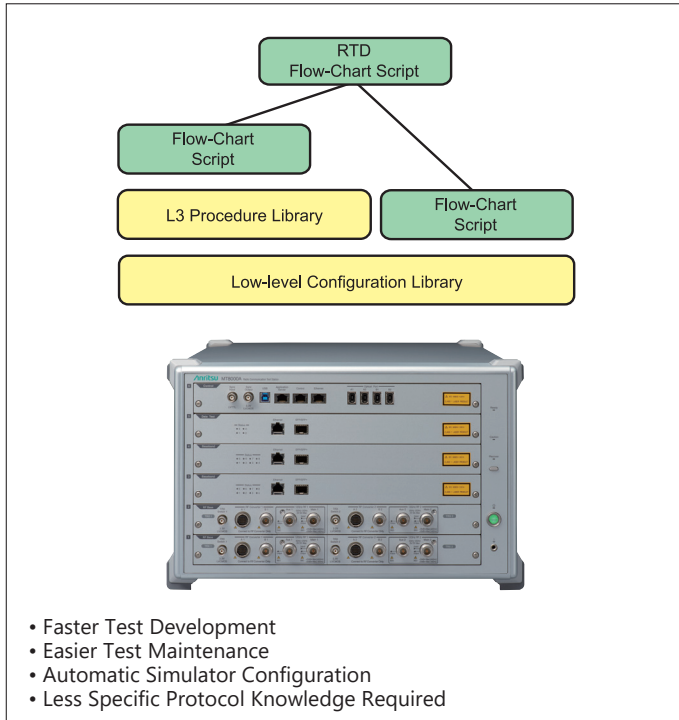
*1: The PC controller for the MD8430A must meet or exceed the following specifications:
OS: Windows 10 Pro (64 bit) or later
CPU: Intel Core i7-6700 3.4 GHz or more
RAM: 8 GB or more
NIC: 1000 BASE-T

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Rapid Test Designer (RTD)

MX800050A/MX786201A



Terminal Development from R&D to Conformance and Beyond

R&D teams will spend thousands of hours developing, integrating and proving their terminal designs. The RTD provides LTE design teams with procedures that test low level configuration as well as L3 protocol. Individually the procedure libraries provide tools for teams at different parts of the design process. By combining and merging them, very detailed proving and integration of designs is possible. As specifications evolve, the RTD provides a roadmap that reflects the fast moving needs of the developers. As a consequence increased dependence upon regression testing to ensure changes do not affect the designs. RTD provides all the tools for immediate test definition, analysis and execution.

Time to Market

With competition being so great and staff movement an issue, teams cannot afford to add time to development of new products. The RTD provides an intuitive interface that is easy to learn and provides flexible and informative feedback to the operator. This allows developers to accelerate the learning curve for new technology and the tools needed for successful designs.

RTD Supports

- | | |
|----------------|----------|
| NR (NSA/SA) | GSM |
| LTE | GPRS |
| LTE-Advanced | EGPRS |
| UMTS | TD-SCDMA |
| HSPA Evolution | |

The Rapid Test Designer (RTD) MX800050A/MX786201A is a revolutionary tool which speeds up the testing of UMTS and LTE terminals significantly by greatly simplifying the way in which tests are created, executed and analyzed. For 5G, Radio Communication Test Station MT8000A is used, and for LTE, MT8000A and MD8430A can be selected according to the application. This combination makes a comprehensive and flexible solution for the most powerful protocol development system for next generation wireless terminals.

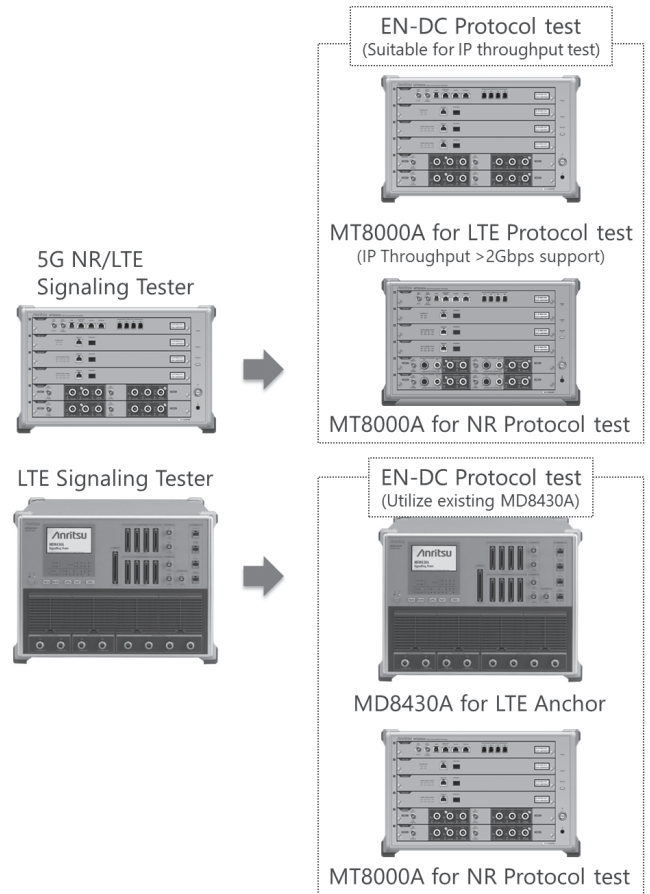
The RTD is already established as a proven multi-standard graphical flow chart tool for many organizations. RTD has the ability to create almost limitless network simulations and is complimented by the MT8000A/MD8430A for LTE, MT8000A for NR and MD8475A for TD-SCDMA.

The RTD is the fastest and most efficient way to ensure that modern terminal behaviour can be comprehensively exercised. Its ability to simulate network scenarios with actual network settings takes it beyond conformance testing and into real world situations.

Network Operators are making use of the RTD's intelligent test tools to ensure that terminals behave correctly on their networks. Terminal development teams simulate conditions in networks that may be thousands of miles away and may not yet support the new functionality present in new handsets hence saving time and money.

Finally, the RTD provides one click, instant execution with no test case build or compilation phase necessary to enable very effective and efficient development of test case libraries for a wide variety of purposes:

- Acceptance Testing
- Integration Testing
- Generating Variants
- Application Testing
- Regression Testing
- Pre-conformance Testing
- Prototyping Testing
- Hardware and Software Integration
- Software Development



Key Facts

- Development environment for layer 1 to layer 3 signalling
- Integration test packages and software tools for developing LTE terminals
- Extensive procedure library with preconfigured messages and signalling
- Integration of legacy scenarios
- One button upgrade process for existing tests

Regression Testing

Regression testing needs to be performed as new software is introduced into networks. RTD makes it possible to modify test scripts simply by applying a new set of network parameters or making a change to a reference that can populate a suite of tests. The test suite can then be run overnight or unattended, presenting the operator with an executive summary to enable software stability trends to be mapped.

Maintaining Tests

Wireless network developers will build up large libraries of tests for ongoing development and regression testing of their designs. The RTD has the ability to update these libraries using the latest 3GPP Release automatically, saving many hours of test re-creation and debugging.

Beyond Conformance

Although conformance tests prove adherence to specifications, they play little part in simulating “real world” conditions where consideration to interfering signals and user plane data is involved. The RTD makes test scenarios easy to create and then iterate as there is no lengthy compilation stage and tests may be adjusted at run time if required.

Roaming and Network Selection

With multi-mode capability, terminals will have complex algorithms that select preferred networks and still maintain acceptable performance. Revenue streams will be threatened if UEs do not behave correctly and Network Operators will exercise them to ensure the best possible behaviour on their network configurations. RTD provides this type of testing which will be crucial to terminal selection - and rejection.

Why a Graphical Flow Chart?

The RTD’s unique flowchart display provides a more natural way of creating scenarios and observing test flow and outcomes. Debugging is especially straightforward as tests can be run and iterative changes made. Because there is no compilation phase, tests can be run immediately and aborted if the wrong path is taken. With well annotated tests, sharing and consolidation is possible and productive.

Simulating Live Network Conditions

Traditionally protocol and RF tests have been kept separate. In order to reduce test times there is a trend to combine fading with protocol tests. The RTD provides a convenient way to add digital baseband fading by using the Signalling Tester MD8430A to the system.



The screenshot displays the Anritsu RTD software interface. The main window shows a graphical flowchart for a test scenario. Annotations highlight key features:

- Real time monitoring of parameters is possible during test execution.** (Pointing to the 'Measure (LTE)' window)
- Branches can be created for detailed analysis and performance testing.** (Pointing to decision nodes in the flowchart)
- Soft keys can be created to provide flexibility.** (Pointing to 'Continue' nodes in the flowchart)

 The 'Measure (LTE)' window shows real-time data for two BTSes. The data table below is a reproduction of the 'Transmitting side' data shown in the screenshot.

Name	CodeWord0+1		CodeWord0		CodeWord1	
	Current	Accumulate	Current	Accumulate	Current	Accumulate
DL-SCH						
Tx MAC PDU [PDU _s]	52	2,000	101,246	1,000	50,623	1,000
Tx Discard MAC PDU [PDU _s]	52	400	20,240	400	20,240	0
Tx Rate [kbps]	52	102,048,000	81,815,032	51,024,000	40,907,667	51,024,000

At the bottom of the interface, a 'Messages' window shows the following log entries:

```

Action completed, reached EI@test.Rotating RB-MCS(95), 17:43:28
Action completed, reached OK@test.LTE CMAC TBS Pattern(100), 17:43:28
Action completed, reached WFDEF@test.Wait For Event(85), 17:43:32
Action completed, reached EI@test.Reset Scheduler(96), 17:43:32
Action completed, reached OK@test.LTE CMAC TBS Pattern(104), 17:43:32
Action completed, reached OK@test.LTE CMAC TBS Pattern(103), 17:43:32
    
```



Acceptance Testing for Network Operators

With finite bandwidth and ever more traffic generated, the biggest challenge is for network operators to optimize their networks and ensure that terminals obey the rules they set. LTE attempts to make more efficient use of the spectrum available but still needs to inter-work with legacy systems. There are also regional variations and network specific requirements that terminals will be expected to conform to. Load balancing may be important to make best use of network resources and although aesthetics and applications may define a terminal's popularity, the behaviour under specific conditions needs to be tested to ensure a reliable and friendly user experience.

Cell Selection and Re-selection

The compromise between battery life and continuous caretaking activities will always challenge terminal designers. Thousands of hours of field trials may still not be able to identify why a terminal fails to maintain service on a preferred network.

Many conditions can only be reliably exercised using a simulation of network conditions in the laboratory. The RTD has the ability to use network logs and create tests that closely resemble the field environment. Iteration of the test is then straightforward to discover and rectify the problem.

Application Testing

As we move to an all packet delivery network, data throughput and integrity is becoming more important. Scenarios with a variety of radio bearers and configurations are possible with RTD, proving that data is not lost during handovers and reselection. As traffic builds up and volume driven state transitions occur the user needs to remain connected.

Simultaneous applications are now commonplace, so interaction and priority between services needs simulating. Where high value applications such as financial transactions take place handovers or link failures may be serious. Gaming and social networking may seem less important to test, but is proving to be a differentiator for a young and influential market.

Roaming Partners

Simulation of foreign networks using the RTD's many advanced features allows a convenient way to test roaming between networks with different configurations/parameters and even different ways of implementing procedures. Today the cost of sending engineering teams to perform network testing over many weeks can be a very significant portion of a Network Operator's proving budget.

New Network Services

Most Networks will not allow new terminals onto their live service without some proving. RTD provides a way to test new terminals and also new services that may be ready to be deployed. Future functionality and applications can be proved in a controlled way using a system simulator and problems resolved ahead of deployment.

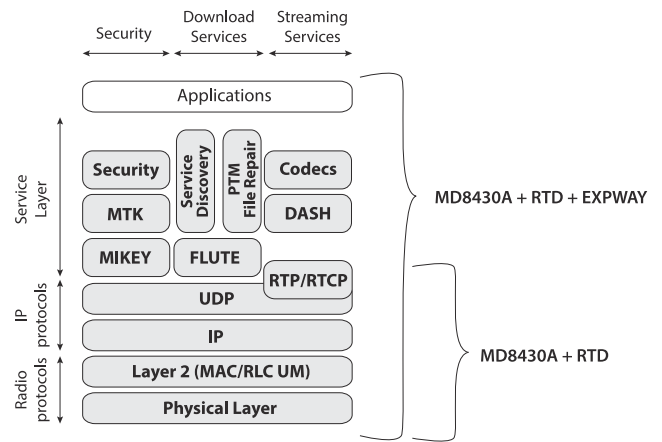
Stress Testing

Terminal stress testing can be automated and run overnight using RTD. With the ability to make thousands of reselections, calls, hand-overs etc. Tests that exercise the extremes and limits of the terminal provide quantitative and qualitative data for terminal selection.

RTD for eMBMS Testing

The evolved Multimedia Multicast Broadcast Service (eMBMS) enables the efficient delivery of media content simultaneously to a high number of subscribers. Operators are upgrading their networks to utilize eMBMS technology in order to keep up with the demand for services such as mobile TV.

Devices not only have to implement support for additional radio channels and protocols, but also need to implement a service layer to communicate with additional core network elements for eMBMS. The most important of these is the Broadcast Multicast Service Center (BM-SC). Anritsu partners with Expway – the leading supplier of BM-SC technology components, top deliver a complete end-to-end eMBMS test solution consisting of the MD8430A Signaling Tester, RTD software and a BM-SC adapted for test purposes. This provides a complete lab simulation to test not only LTE Layer 1 and Layer 2 operation, but also the eMBMS service layer and interactions between the radio modem and the eMBMS middleware.



RTD Top Features



Edit

- Intuitive editing means faster test development
- Easier test maintenance
- Automatic simulator configuration
- Code re-use



Analyze

- Detailed protocol analysis
- Parameter changes can be made at RunTime
- Real time control can be achieved within tests



Automate

- Campaigns created using graphical interface
- Reports generated
- Export to other databases



Regression

- Tests and entire archives can be updated to the latest 3GPP release using a single command
- Backup generated and archived automatically for regression tests



Control

- AT commands can be included in all tests
- Automation of tests using campaigns or from a host system using CLI

Automation

The RTD provides many ways that test execution can be made more efficient using remote control, terminal control and campaign management tools.

Remote Control Interface MX787401A-012

The RTD may be controlled using remote commands and integrated into a total test system. The RTD is compatible with a number of remote commands that allow Tests to be RUN, ANALYZED, etc. In this mode the RTD works as a secondary to an existing test system where existing equipment and data is controlled and collected.

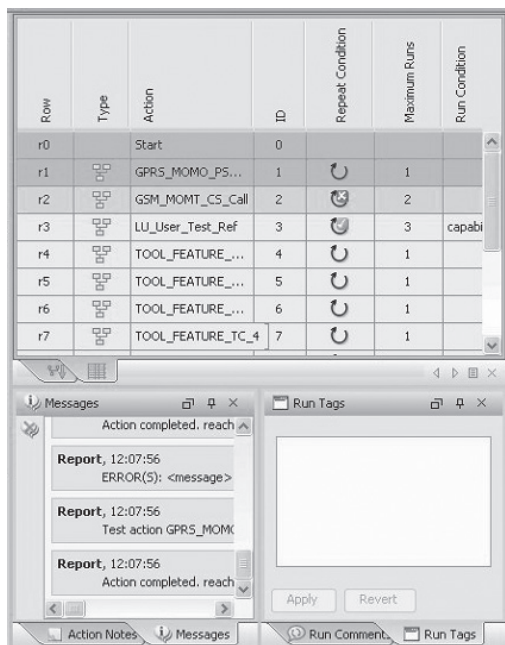
Signalling Application Tool for Terminal Automation MX787401A-013

The RTD provides proxy control of the AT command set to the terminal through the RTD Test Cases. It enables automated testing to be achieved through a serial port on the control PC. The system maybe configured to map the AT/MMI commands to match those supported by the terminal. Prompts on the screen can be suppressed when automation is used. In general automated testing can be carried out via the use of the AT command set [3GPP TS 27.007].

Signalling Application Tool for Test Sequencing MX787401A-014

The RTD includes a campaign management tool. This provides the user with the ability to create test runs that can be run remotely without the need for any further control equipment. Tests can be repeated depending on rules set by the user. Results are generated in a tabular form and can be exported to form part of a formal report.

A campaign may be used to run an entire suite of conformance tests, or inter-operability tests, or any other large grouping of tests. Rules may be set to run all tests and then retest those that fail, making best use of time.



The Total System Solution

For some, the RTD will be a new concept and we aim to provide the tools and support to make the experience productive and logical.

Using the RTD

An RTD test is constructed and edited using a graphical environment, which supports procedures, loops, delays and interactive dialogs. Compared to traditional "C" and "TTCN" based languages this GUI provides fast and simple test creation. Typically a test that may have taken several days to create may be created in hours using the RTD.

Reference Tests

These reference tests are samples of commonly used functions to act as templates for the user. They allow Network specific parameters to be added manually or by means of a "catalogue" function. Packages of other test cases are also available on request.

Test Execution Engine

RTD tests are run immediately after they have been checked for simple errors, without a compile or build cycle.

Test Criteria Editor

The test operative may use this tool to automatically make objective decisions on whether the right actions have been made by the UE. Criteria may be changed post testing and applied to existing results. This avoids the need to re-run the tests.

Detailed Test Log Analyzer

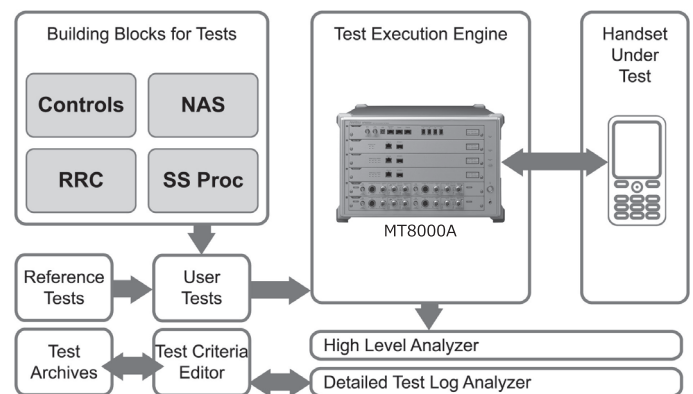
The protocol log analyzer, which maintains the same look and feel as other Anritsu products, is provided to examine the message sequences that are produced by the terminal under test.

Procedure Libraries

Procedures are the building blocks from which all tests are created. The RTD Procedures can be selected from a palette and added to the Test simply by dragging onto the edit page. Compound procedures can be created to allow frequently used scripts to be added in a single action, further simplifying test creation.

These procedures are configured using parameters, which can be changed at three levels :

- 1) Parameter sets held in catalogues can be selected to parameterise groups of procedures rapidly.
- 2) The user can edit individual parameters after they have been selected from catalogue components, overriding values if they wish to. These parameters are used to populate the actual protocol messages sent by the procedure.
- 3) The expert user can edit the individual messages sent by the procedure, if needed, overriding any parameters previously selected or changed.





Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MX800050A MX786201A MX787201A	Main Frame Rapid Test Designer Platform (RTD) RAPID TEST DESIGNER (RTD) MULTI-RAT FRAME WORK For SIGNALLING TESTING APPLICATIONS
MX787401A MX787401A-012 MX787401A-013	SET OF SIGNALLING APPLICATION SUPPORT TOOLS REMOTE CONTROL INTERFACE SIGNALLING APPLICATION TOOL FOR TERMINAL AUTOMATION
MX787401A-014	SIGNALLING APPLICATION TOOL FOR TEST SEQUENCING
MX800050A-001	Options 5G NSA Framework For RTD
MX800050A-002	RTD LL/L3 Procedure Libraries (5G)
MX800050A-003 MX787201A-027	Core LTE Framework For RTD LTE CORE FRAMEWORK FOR SIGNALLING TESTING APPLICATIONS
MX787201A-028	LTE FDD FRAMEWORK FOR SIGNALLING TESTING APPLICATIONS
MX787201A-029	LTE TDD FRAMEWORK FOR SIGNALLING TESTING APPLICATIONS
MX787201A-035 MX786201A-028 MX786201A-031 MX786201A-038 MX786201A-40	LTE Framework Technology MD8430 ETM Driver LAYER 1/LAYER 2 STATISTICS MONITOR (LTE) RTD LAYER 3 PROCEDURE LIBRARY (LTE) LOW-LEVEL CONFIGURATION LIBRARY FOR RTD (LTE) Ciphering
MX800050A-004 MX787201A-021	UTRAN/GERAN Framework For RTD GERAN FRAMEWORK FOR SIGNALLING TESTING APPLICATIONS
MX787201A-023 MX787201A-025 MX787201A-026 MX787201A-032 MX787201A-037 MX786201A-041 MX786201A-048	FRAMEWORK UTRAN CORE (INCL. HSPA) FRAMEWORK HSPA EVO (R7, R8) FRAMEWORK HSPA EVO (REL-8) UTRAN LCR TDD FRAMEWORK CORE (INCL. HSPA) UTRAN Framework MC-HSDPA (REL-10) RTD LAYER 3 PROCEDURE LIBRARY (UTRAN/GERAN) LOW-LEVEL CONFIGURATION LIBRARY (UTRAN/GERAN)
MX800050A-005 MX786201A-027 MX787401A-017 MX787401A-018 MX787401A-019 MX787401A-020	IMS Framework For RTD RTD IMS Signaling Library IMS Audio calls on RTD PC (AMR codec) IMS over 3G IMS over WiFi IMS RCS
MX800050A-006 MX787201A-053 MX787201A-054	IoT Framework For RTD LTE Enhanced MTC Framework Narrow band IoT Framework
MX800050A-007 MX787201A-030 MX787201A-036 MX787201A-041 MX787201A-045 MX787201A-057 MX787201A-039 MX787201A-043	LTE-A Framework For RTD LTE ADVANCED CARRIER AGGREGATION FRAMEWORK LTE-A 3 Carrier Aggregation Framework LTE-A 4 Carrier Aggregation Framework LTE-A 5 Carrier Aggregation Framework LTE-A UL 3 Carrier Aggregation Framework LTE CoMP Framework LTE Dual Connectivity Framework
MX800050A-008 MX787201A-056	LTE-A Pro Framework For RTD LTE-A 6 Carrier Aggregation Framework
MX800050A-009 MX787201A-013 MX787201A-038 MX787201A-042	LTE MIMO Framework For RTD LTE UL 2x2 MIMO FRAMEWORK LTE DL 4x4 MIMO FRAMEWORK LTE DL 8x4 MIMO FRAMEWORK
MX800050A-010 MX787201A-047 MX787201A-048 MX787201A-050 MX787401A-061	LTE Unlicensed Framework For RTD LTE Unlicensed 6GHz Framework Extended DL Frequency Bandwidth Framework LTE Licensed Assisted Access (LAA) Framework RTD WLAN Access Point Control Library
MX800050A-011 MX787401A-065 MX787401A-066 MX787401A-070 MX787401A-074 MX787401A-075 MX787401A-076 MX787401A-043 MX787401A-062	LTE/UTRAN/GERAN Fading Library For RTD RTD Fading Library RTD Fading Library (Higher Order MIMO) RTD Fading Library (UTRAN) RTD Fading Library (LTE 8x2/8x4 MIMO 2Cell extension) RTD Fading Library (LTE 8x2/8x4 MIMO 3Cell extension) RTD Fading Library (SCME) OCNS DRIVER INTERFACE DRIVER FOR MF6900A (FADING SIMULATOR)
MX800050A-012	5G Fading Library for RTD
MX800050A-013	5G SA Framework for RTD

Model/Order No.	Name
MX800050A-014 MX786201A-025 MX787460A	eMBMS Framework For RTD eMBMS BM-SC Procedure Library eMBMS BM-SC Server
MX800050A-040 MX786201A-45	RTD Test Creation and Editing Tools RTD TEST CREATION AND EDITING TOOLS
MX800050A-041 MX787201A-012 MX786201A-46	RTD Test Execution Tools ENABLER FOR MULTIPLE SIGNALLING TESTERS RTD RUN TIME ENGINE
MX800050A-042 MX787401A-011 MX787401A-033	RTD Protocol Analyser PROTOCOL ANALYSER (RTD) Protocol Analyzer 3- Real Time Log Capture Tool
	Support Services
MX800050A-SS100	RTD Support Service (Per Year)
MX800050A-SS101	5G NSA Support Service (Per Year)
MX800050A-SS103	LTE Support Service (Per Year)
MX800050A-SS104	UTRAN/GERAN Support Service (Per Year)
MX800050A-SS105	IMS Support Service (Per Year)
MX800050A-SS106	IoT Support Service (Per Year)
MX800050A-SS107	LTE-A Support Service (Per Year)
MX800050A-SS108	LTE-A Pro Support Service (Per Year)
MX800050A-SS109	MIMO Support Service (Per Year)
MX800050A-SS110	LTE Unlicensed Support Service (Per Year)
MX800050A-SS111	LTE/UTRAN/GERAN Fading Support Service (Per Year)
MX800050A-SS112	5G Fading Support Service
MX800050A-SS113	5G SA Support Service (Per Year)
MX800050A-SS114	eMBMS Support Service (Per Year)

5G NR Mobile Device Test Platform

ME7834NR

Remote Control
Ethernet**Supporting Protocol Test for 5G NR Mobile Devices**

Anritsu has been working on Conformance Test developments from the start of 3G communications until today's upcoming 5G services, and continues providing solutions meeting customers' expectations. Based on our long experience, we deliver timely, trusted solutions incorporating state-of-the-art technology to customers.

All-in-One 5G NR Support for Protocol Conformance Test and Carrier Acceptance Test

The 5G NR Mobile Device Test Platform ME7834NR is for 3GPP- based Protocol Conformance Tests (PCT) and Carrier Acceptance Tests (CAT) of mobile devices incorporating Multiple Radio Access Technologies (RAT). The ME7834NR supports 5G New Radio (NR) Technology in both Standalone (SA) and Non-Standalone (NSA) modes, as well as LTE, LTE-Advanced (LTE-A), LTE-A Pro, and GSM/W-CDMA.

Supports 3GPP-Defined Bands from Sub-6 GHz to mmWave

The ME7834NR covers the 3GPP 5G frequency bands including Sub-6 GHz and mmWave when combined with Anritsu's new OTA Chamber MA8171A and RF converters.

Upgrade Current ME7834 System for 5G

The ME7834NR provides a smooth transition to 5G while still supporting LTE, LTE-A, LTE-A Pro and legacy GSM/W-CDMA technologies. Existing customers can upgrade to 5G while capitalizing on a proven LTE-A test environment and staying abreast of the latest technology evolution.

Adds Support for 3GPP Main Carrier Acceptance Tests

Protocol Conformance Tests continue to follow the 3GPP standards, and the Global Certification Forum (GCF)/PCS Type Certification Review Board (PTCRB) have approved the various test cases for the ME7834NR is registered as a GCF/PTCRB recommended platform TP 251. The Carrier Acceptance Tests support acceptance inspection by major 5G operators worldwide.

Comprehensive Support System

To assure effective use, each subscription package includes comprehensive after-sales support offering:

- Latest software updates matching latest changes to 3GPP standards
- Consultation and technical support for troubleshooting test problems

These after-sales services assure smooth support for customers' business development.



Specifications

Dimensions

System Rack:

- 570 (W) × 1980 (H) × 797 (D) mm (1 Rack, excluding protrusions)
- 1140 (W) × 1980 (H) × 797 (D) mm (2 Rack, excluding protrusions)

OTA Chamber:

- 2080 (W) × 1785 (H) × 1000 (D) mm
- (Including one Converter Rack, excluding protrusions)

Mass

System Rack: ≤650 kg (2 Racks)

OTA Chamber: ≤400 kg
(Including one Converter Rack, excluding protrusions)

Temperature Range

Operating: 15°C to 30°C
(With rack, 30-cm space at back and sides, no condensation)

Storage: 0°C to 30°C (No condensation)

Power Supply

Voltage: 100 VAC to 120 VAC/200 VAC to 240 VAC

Frequency: 50 Hz/60 Hz

Power consumption: ≤8500 VA (Full system configuration)

CE

EMC: 2014/30/EU, EN61326-1, EN61000-3-2

LVD: 2014/35/EU, EN61010-1

RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

Test Standards

Protocol Conformance Test (PCT)

3GPP TS 38.523-1 (5G NR)

3GPP TS 37.571-2 (Positioning)

3GPP TS 36.523-1 (LTE)

3GPP TS 34.229-5 (5G IMS)

3GPP TS 34.229-1 (IMS)

3GPP TS 34.123-1 (UMTS)

Carrier Acceptance Test (CAT)

Complies with standard of each supported carrier

Contact your Anritsu sales representative for detailed electrical characteristics, specifications, supported test cases, and carriers.

Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names.

The actual name of the item may differ from the Order Name.

Model/Order No.	Name
ME7834NR	Main Frame 5G NR Mobile Device Test Platform
MN8142B MT8000A MD8430A	Configuration Items RF Combiner Unit Radio Communication Test Station Signalling Tester Consult us for other configurations.
	Options Converters OTA Measurement Hardware Software Options Support Services Application Parts Consult us for details.

Contact your Anritsu sales representative for detailed electrical specification, other detailed specification values, supported test cases and supported communication carriers.

LTE-Advanced Mobile Device Test Platform

ME7834LA

Remote Control
Ethernet

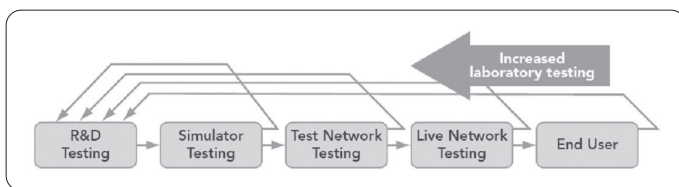
GCF/PTCRB, and Carrier Approved Test System for Mobile Protocol Testing



The ME7834LA is a configurable system that provides flexible protocol test solutions throughout the lifecycle of modern wireless terminals. ME7834LA systems are able to address applications in development and conformance and evolve to provide advanced system simulation. Anritsu led the way with 3G/LTE mobile development programs. It is now delivering intelligent test solutions to LTE-Advanced development teams that need to accelerate their designs to stay competitive.

Protocol Test Solutions

- 2G/3G/LTE/LTE-Advanced
- 4x4 MIMO, 3CC CA/4CC CA/5CC CA
- Development
- Conformance
- Carrier Acceptance



Reduce Costs by finding errors earlier in the process

ME7834LA for Conformance Testing to Meet Evolving Specifications

The Global Certification Forum (GCF) and the PCS Type Certification Review Board (PTCRB) include the ME7834LA as an approved platform to provide test coverage for GERAN, UTRAN, HSPA+, LTE and LTE-Advanced technologies.

The ME7834LA is registered as GCF/PTCRB TP119 and tracks TS 36.523 for LTE and TS 34.123 for UTRAN. It has met critical deadlines set by the industry for test platform approval. The system may also be configured to meet tests mandated by several network operators.

ME7834LA for Acceptance Testing for Carriers

Carriers are making use of the intelligent test tools to ensure that terminals behave correctly on their networks. Terminal development teams simulate conditions in networks that may be thousands of miles away and may not yet support the updated functionality present in new handsets.

The tests are created and validated with the RTD to take advantage of the graphical layout. This makes it straight forward to visualize test flow and hence verify and debug the terminals behavior.

These tests are validated against stringent requirements before they are provided as a commercial test package.

Test packages that keep pace with network requirements Anritsu are able to provide and support a number of carrier specific tests.

(Note: some test packages may need to be obtained directly from carriers) ME7834LA users now have the ability to purchase carrier acceptance test packages outright or subscribe to them on an annual basis to suit their fiscal needs.

**Specifications**

Input and Output Connector		N-type, 50Ω
Max. Input Level		+33 dBm
Frequency Range		450 MHz to 6 GHz
Temperature Range		15°C to 35°C (operating), 0°C to 50°C (storage)*1
Power Supply (Rating)		Select either 100 VAC to 120 VAC or 200 VAC to 240 VAC, 50 Hz/60 Hz ≤5000 VA (Full system configuration)
Dimensions		1140 (W) × 1980 (H) × 797 (D) mm*2 (Full system configuration)
Mass		≤650 kg*3 (Full system configuration)
CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

*1: Ambient temperature

Basic calibration at acceptance inspection must meet this requirement.

Use in air-conditioned room recommended for stable measurement.

*2: Topple prevention

Secure using hooks at rack top recommended.

*3: Mass/Floor Loads

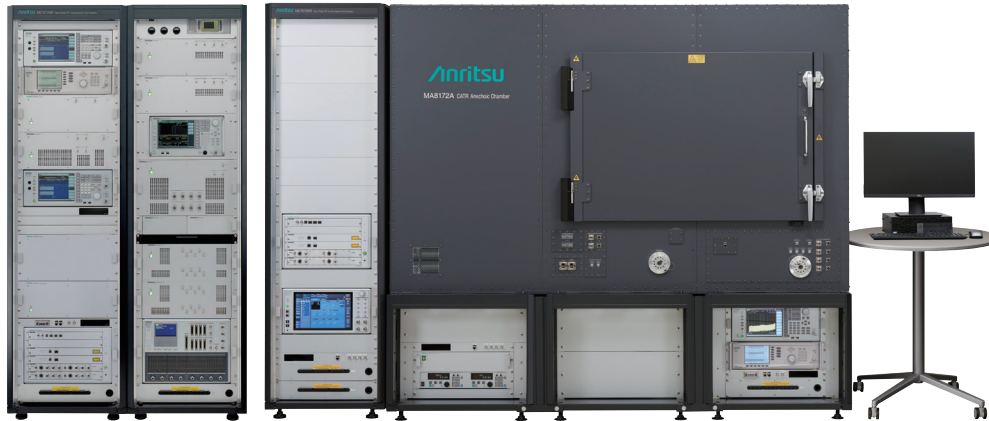
The installation location must be able to safely bear the above floor loads plus 100 kg for basic calibration equipment at acceptance inspection.

Please specify the model/order number, name and quantity when ordering.

Contact your Anritsu sales representative for detailed electrical specification, other detailed specification values, supported test cases and supported communication carriers.

New Radio RF Conformance Test System

ME7873NR

Remote Control
Ethernet*From 5G NR Sub-6 GHz to mmWave—RF/RRM Conformance Test System Supporting SA & NSA Modes*

The New Radio RF Conformance Test System ME7873NR automates 3GPP-defined 5G NR RF/RRM tests. With GCF and PTCRB registration as test platform TP250 for 5G NR RF/RRM tests, it provides users with certified results for both the 5G NR standalone (SA) and non-standalone (NSA) modes. In addition to supporting the Sub-6 GHz band, mmWave band tests are supported in a 5G OTA environment by combined use with the CATR Anechoic Chamber MA8172A.

The ME7873NR system configuration is customized easily for the measurement conditions using the wide line of hardware and software options. Furthermore, the earlier ME7873LA supporting LTE, LTE-Advanced (LTE-A), LTE-A Pro, and legacy W-CDMA RF tests as well as Carrier Acceptance Tests (CAT) can be upgraded for 5G support to configure a cost-effective RF conformance test system matching customers' needs.

Feature**Pioneering for GCF*1/PTCRB*2 5G Validation**

The New Radio RF Conformance Test System ME7873NR test platform is GCF/PTCRB certified. After its market-leading*3 release in November 2018, it became the first system to start GCF certification for 5G tests in January 2019 and subsequently started PTCRB certification tests in February. Since then, the number of supported test cases has been increasing at each quarterly GCF/PTC RB meeting.

The ME7873NR executes 5G NR Standalone and Non-Standalone mode RF/RRM tests with various types of measuring equipment and dedicated test software when used with the Radio Communication Test Station MT8000A simulating a 5G NR base station and the Signalling Tester MD8430A simulating an LTE base station.

*1: GCF (Global Certification Forum):

Certifies conformance to standards for mobile terminals and test systems. Composed mainly of operators, mobile terminal vendors and chipset vendors and performs certification for frequency bands used in Europe.

*2: PTCRB (PCS Type Certification Review Board):

A similar test system certification organization to GCF composed mainly of N. American carriers and UE vendors and performing conformance certification for frequency bands used in N. America.

*3: According to our research result on the news releases of each company.

Supports Latest 3GPP Standards

It supports execution of 3GPP-compliant 5G mobile RF TRx and RRM performance tests in accordance with the latest 3GPP standards updated every 3 months.

Supports Carrier Acceptance Tests

In addition to 3GPP RF/RRM Conformance Tests, North-American carrier acceptance tests are also supported, offering a wider application range with the same platform.

Easy Upgrade from ME7873LA

A cost-effective easy upgrade to the ME7873NR from the LTEAdvanced RF Conformance Test System ME7873LA is readily available by adding the minimum required hardware. Upgrading to the ME7873NR not only adds 5G NR test items but also keeps support for the ME7873LA test items too.

Supports Global Mobile Terminals

In addition to supporting GCF/PTCRB-certified bands (5G NR bands and LTE bands in 5G NSA mode) now being deployed or expected to be deployed in North America, Europe, and Asia, 3GPP-defined FR1 and FR2 bands are also widely supported. Currently supported bands are shown below. Currently unsupported bands are expected to be supported one-by-one according to market demand.

Please consult our business section for more details.



Easy Control of External Devices

The system software has built-in functions for controlling the DC power supply* and temperature chamber* in the same way as selecting test items. Using these standard functions makes automation easy.

*: Users must provide the DC power supply and temperature chamber. Refer to the ordering information for recommended models.

Improve Reliability using Correction Function

System measurement stability and reliability are improved by the following three calibration and correction methods:

- Basic calibration at acceptance inspection
- Auto-calibration at work start
- Individual measurement correction

Individual measurement correction immediately before measurement eliminates temperature-related drift and greatly improves the reliability of measurements.

In addition, Anritsu engineers perform basic calibration when installing the system at acceptance inspection, eliminating the need for operators to perform this complex calibration and correction work.

Detailed Support System

An Anritsu Support Service contract keeps the system operating at peak performance, maximizing return on investment, minimizing downtime, and keeping work on schedule.

- Latest software updates matching the latest changes to the 3GPP standards
- Information on 3GPP trends, consultation and technical support for troubleshooting test problems
- Free hardware repair and maintenance with a back-up loan unit

Specifications

Supported Tests

3GPP TS 38.521

NR: User Equipment (UE) conformance specification; Radio transmission and reception

3GPP TS 38.533

NR: User Equipment (UE) conformance specification; Radio Resource Management (RRM)

Dimensions

System Rack:

- 570 (W) × 1980 (H) × 797 (D) mm (1 rack for FR2 system)
- 1140 (W) × 1980 (H) × 797 (D) mm (2 racks for FR1 system)
- 1710 (W) × 1980 (H) × 797 (D) mm (3 racks for FR1+LTE system)

*: Excluding projecting parts.

OTA Chamber:

- 2200 (W) × 1980 (H) × 120 (D) mm

*: With OTA rack, excluding projecting parts.

Enquire for other details.

Ordering Information

This table lists the key configuration parts only. Consult our sales representative before ordering. The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
ME7873NR	Main Unit New Radio RF Conformance Test System
MT8000A MD8430A MS2692A MG3692C MG3710E MA24218A MN7446G MN7447A MN7447B MN7462E MN7463E MN7463F Z2014A Z2015A	Configuration Parts (FR1) Radio Communication Test Station Signalling Tester Signal Analyzer 2 GHz - 20 GHz Signal Generator Vector Signal Generator Universal USB Power Sensor Filter Unit LTE Uplink Signal Filter UL Amplifier RF Front End Combining Unit Combiner Unit System control PC (EN) System control PC (JP)
MT8000A MT8821C MD8430A MS2840A MS2850A MG3697C MA8172A MN74000A MN74000B MN74001A MA80003A Z2014A Z2015A	Configuration Parts (FR2) Radio Communication Test Station Radio Communication Analyzer Signalling Tester Signal Analyzer Signal Analyzer Signal Generator CATR Anechoic Chamber Spurious Measurement Unit Spurious Measurement Unit LTE Anchor Unit Multiband RF Converter System control PC (EN) System control PC (JP)
MX787300NR MX787301NR MX787302NR MX787303NR MX787311NR MX787313NR MX787321NR MX787322NR MX787333NR MX787342NR MX787361NR MX787363NR MX787371NR MX787372NR MX787373NR MX787381NR MX787382NR	Software Platform Functionality LTE Band Capability Software Extension Extension Test Software FDD NR NSA FR1 Test Software FDD NR NSA FR1 3CC Test Software FDD NR SA FR1 Test Software FDD NR SA FR1 2CC Test Software FDD-TDD NR NSA FR1 3CC Test Software FDD-TDD NR SA FR1 2CC Test Software TDD NR NSA FR1 Test Software TDD NR NSA FR1 3CC Test Software TDD NR NSA FR2 Test Software TDD NR NSA FR2 UL CA Test Software TDD NR NSA FR2 DL CA Test Software TDD NR SA FR1 Test Software TDD NR SA FR1 2CC Test Software

For details, refer to the Product Brochure or consult our sales representative.

LTE-Advanced RF Conformance Test System

ME7873LA

Remote Control
Ethernet

RF/RRM Conformance Test System Supporting Most and First GCF/PTCRB Approved TCs



Supporting Most and First GCF*1/PTCRB*2 Approved Test Cases*3

This GCF/PTCRB-compatible test platform targets the most and first Test Cases approved at quarterly GCF/PTCRB meetings. It uses the Signalling Tester MD8430A as a LTE base station simulator, and is configured from various test instruments and dedicated software. It supports RF/RRM tests while communicating with LTE mobile terminals.

LTE-Advanced RF Conformance Test System ME7873LA

This system is for testing the RF TRx characteristics, performance requirements, and RRM performance of FDD/TDD LTE mobile terminals in compliance with the requirements of 3GPP TS 36.521-1 Chapter 6 (Transmitter Characteristics), Chapter 7 (Receiver Characteristics), Chapter 8 (Performance Requirement), Chapter 9 (Reporting of Channel State Information), Chapter 10 (MBMS Performance) and TS 36.521-3 RRM*4 including LTE → GSM/UMTS/CDMA2000/TD-SCDMA Inter-RAT tests.

TS 34.121-1 UMTS → LTE and TS 34.122 TD-SCDMA → LTE Inter-RAT tests are also supported.

Moreover, UMTS 3GPP TS 34.121-1 tests are supported.*5

Supports Mobile Terminal Carrier Acceptance Tests

This single, multi-purpose platform supports acceptance tests mainly for North American operators, as well as 3GPP RF/RRM conformance tests.

*1: GCF (Global Certification Forum):

Certifies conformance to standards for mobile terminals and test systems. Composed mainly of operators, mobile terminal vendors and chipset vendors and performs certification for frequency bands used in Europe.

*2: PTCRB (PCS Type Certification Review Board):

A similar test system certification organization to GCF composed mainly of N. American carriers and UE vendors and performing conformance certification for frequency bands used in N. America.

*3: As of June, 2018.

*4: RRM: Radio Resource Management

*5: In principle, defined by GCF Work Item*6 and targeting measurement items certified by GCF/PTCRB.
(Contact your Anritsu sales representative for timing of supported items and option configurations.)

*6: Work Item:

Name of function test items selected by GCF for mobile terminal approval.

Supports Global Mobile Terminals

Worldwide Frequency Bands

Not only are GCF/PTCRB-approved Bands planned for use in Europe and North America fully supported, but the following bands defined by 3GPP are also supported too.

Unlisted bands can be supported by request.

Operating Band	UL Frequencies (MHz)	DL Frequencies (MHz)
1	1920 to 1980	2110 to 2170
2	1850 to 1910	1930 to 1990
3	1710 to 1785	1805 to 1880
4	1710 to 1755	2110 to 2155
5	824 to 849	869 to 894
6	830 to 840	875 to 885
7	2500 to 2570	2620 to 2690
8	880 to 915	925 to 960
9	1749.9 to 1784.9	1844.9 to 1879.9
10	1710 to 1770	2110 to 2170
11	1427.9 to 1447.9	1475.9 to 1495.9
12	698 to 716	728 to 746
13	777 to 787	746 to 756
14	788 to 798	758 to 768
17	704 to 716	734 to 746
18	815 to 830	860 to 875
19	830 to 845	875 to 890
20	832 to 862	791 to 821
21	1447.9 to 1462.9	1495.9 to 1510.9
24	1626.5 to 1660.5	1525 to 1559
25	1850 to 1915	1930 to 1995
26	814 to 849	859 to 894
27	807 to 824	852 to 869
28	703 to 748	758 to 803
29	N/A	717 to 728
30	2305 to 2315	2350 to 2360
31	452.5 to 457.5	462.4 to 467.5
32	N/A	1452 to 1496
33	1900 to 1920	1900 to 1920
34	2010 to 2025	2010 to 2025
35	1850 to 1910	1850 to 1910
36	1930 to 1990	1930 to 1990
37	1910 to 1930	1910 to 1930
38	2570 to 2620	2570 to 2620

Continued on next page



Operating Band	UL Frequencies (MHz)	DL Frequencies (MHz)
39	1880 to 1920	1880 to 1920
40	2300 to 2400	2300 to 2400
41	2496 to 2690	2496 to 2690
42	3400 to 3600	3400 to 3600
46	5150 to 5925	5150 to 5925
48	3550 to 3700	3550 to 3700
66	1710 to 1780	2110 to 2200
71	663 to 698	617 to 652

Focus on Improving Test Efficiency, Measurement Stability and Reliability

Continuous Testing of Multiple Terminals

Since the standard system configuration has four RF interfaces, it can test up to four terminals continuously. Fully automated testing of multiple terminals is supported by DC power supply and serial control line auto-switching.

Control via Networks

The PC server in the rack can be operated remotely over a network. Measurement progress can be monitored remotely and measurement sequences can be created and edited, allowing tests to be run while working elsewhere.

Easy Control of External Devices

The system software has built-in functions for controlling the DC power supply* and temperature chamber* in the same way as selecting test items. Using these standard functions makes automation easy.

*: Users must provide the DC power supply and temperature chamber.

Refer to the ordering information for recommended models.

Specifications

LTE-Advanced RF Conformance Test System ME7873LA

Input and Output Connector	N-type, 50Ω	
Max. Input Level	+35 dBm	
Reference Oscillator	MS2692A (with option-001/037 Rubidium Reference Oscillator) as standard External oscillator signal input available (Frequency: 10 MHz, Connector: BNC)	
Frequency Range	Defined by 3GPP E-UTRA Operating Band 1 to 14, 17 to 21, 24 to 42, 66, 71	
Temperature Range	15°C to 35°C (operating), 0°C to 50°C (storage)*1	
Power Supply (Rating)	Select either 100 VAC to 120 VAC or 200 VAC to 240 VAC, 50 Hz/60 Hz ≤7700 VA*2 (Full system configuration)	
Dimensions	1710 (W) × 1980 (H) × 797 (D) mm*3 (Full system configuration)	
Mass	≤830 kg*4 (Full system configuration)	
CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

*1: Ambient temperature

Basic calibration at acceptance inspection must meet this requirement.

Use in air-conditioned room recommended for stable measurement.

*2: Power consumption

Sufficient power (600 VA) for basic calibration at acceptance inspection as well as for ME7873LA must be supplied.

*3: Topple prevention

Secure using hooks at rack top recommended.

*4: Mass/Floor Loads

The installation location must be able to safely bear the above floor loads plus 100 kg for basic calibration equipment at acceptance inspection.

Supported Test Standards

The system design is based on the following standards:

3GPP TS 36.521-1 E-UTRA UE Conformance Specification Radio Transmission and Reception Part 1: Conformance Testing

3GPP TS 36.521-3 E-UTRA UE Conformance Specification Radio Transmission and Reception Part 3: RRM Conformance Testing

3GPP TS 34.121-1 User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 1: Conformance specification

Release 8, 9, 10, 11, 12 and 13 of above standards is also supported. Contact our sales representative for detailed of the supported versions.

RED-compliant Test Items (option)

This option is fully compliant with the European ETSI-defined Radio Equipment Directive (RED) RF TRx test items. Anritsu launched this European-test-house approved option ahead of market competitors. Simple operation supports easy RED-compliant tests like normal test items.

Improve Reliability using Correction Function

System measurement stability and reliability are improved by the following three calibration and correction methods:

1. Basic calibration at acceptance inspection
2. Auto-calibration at work start
3. Individual measurement correction

Individual measurement correction immediately before measurement eliminates temperature-related drift and greatly improves the reliability of measurements.

In addition, Anritsu engineers perform basic calibration when installing the system at acceptance inspection, eliminating the need for operators to perform this complex calibration and correction work.

Detailed Support System

An Anritsu Support Service contract keeps the system operating at peak performance, maximizing return on investment, minimizing downtime, and keeping work on schedule.

- Latest software updates matching the latest changes to the 3GPP standards
- Information on 3GPP trends, consultation and technical support for troubleshooting test problems
- Free hardware repair and maintenance with a back-up loan unit



Ordering Information

This table lists the key configuration part only. For details, refer to the Product Brochure or consult our sales representative. The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
ME7873LA	Main Frame LTE-Advanced RF Conformance Test System
	Configuration Items
MN7462E	RF Front End
MN7463E	Combining Unit
MN7463F	Combiner Unit
MN7446A	Filter Unit
MN7446B1	Filter Block
MN7446C	Filter Block2
MN7446D	Filter Block3
MN7446G	Filter Unit
MN7447A	LTE Uplink Signal Filter
MN7448A	Uplink Signal Filter
MA24218A	Universal USB Power Sensor
MS2692A	Signal Analyzer
MD8430A	Signalling Tester
MG3710E	Vector Signal Generator
MG3692C	2 GHz - 20 GHz Signal Generator
Z1396F	User Operation PC
Z1397F	User Operation PC
Z1392D	Server PC
	Standard Accessory ME7873LA Operation Manual (CD-ROM): 1 set
	Options
ME7873LA-001	Common Kit
ME7873LA-002	Antenna Extension
ME7873LA-005	Additional Rack
ME7873LA-011	SS1 Accessory
ME7873LA-012	SS2 Accessory
ME7873LA-013	SS3 Accessory
ME7873LA-014	SS4 Accessory
ME7873LA-017	SS7 Accessory
ME7873LA-021	VSG1 Accessory
ME7873LA-022	VSG2 Accessory
ME7873LA-023	CWSG1 Accessory
ME7873LA-051	Spurious Filter
ME7873LA-052	Spurious Filter2
ME7873LA-064	SS4 Accessory (Fading)
	Software Options
MX787301LA	4Rx Capability
MX787302LA	Flexible Band Combination
MX787310LA	W-CDMA Test Software
MX787311LA	FDD LTE Test Software
MX787361LA	TD-LTE Test Software
MX787312LA	FDD CA Test Software
MX787362LA	TD-LTE CA Test Software
MX787313LA	FDD 3CA Test Software
MX787363LA	TD-LTE 3CA Test Software
MX787314LA	FDD 4CA Test Software
MX787364LA	TDD 4CA Test Software
MX787315LA	FDD 5CA Test Software
MX787322LA	FDD-TDD 2CA Test Software
MX787323LA	FDD-TDD 3CA Test Software
MX787324LA	FDD-TDD 4CA Test Software
MX787325LA	FDD-TDD 5CA Test Software
MX787330LA	LAA Test Software
MX787332LA	LAA 2CA Test Software
MX787371LA	HD-FDD CAT-M1 Test Software
MX787376LA	HD-FDD NB-IoT Test Software
MX787340LA	Supplementary Test Software for Vzw
MX787341LA	Supplementary Test Software for AT&T
MX787343LA	Supplementary Test Software for T-Mobile
MX787350LA	R&TTE Test Software
MX787351LA	TRCC Test Software
MX787300LA	Platform Functionality

In addition to the above-described accessories, the following items are required to use the ME7873LA.

DC Power Supply

One of the following models is required when controlling the power supply using the ME7873LA.

Model	Name	pcs	Manufacturer
N6700C	Main frame	1	Keysight Technologies Inc.
N6732B	8 V, 6.25 A, 50 W DC Power Module*1	4	
N6709C	Low-Profile MPS Mainframe Rack Mount Kit	1	
2306-PJ	Dual-Channel Battery/Charger Simulator with 500 mA Range	2*2	Keithley Instruments Inc.

*1: Up to four modules are required according to connected mobiles.

Filler Panel Kit N6708A is required if the number of DC power modules are less than four.

At rack mounting, the maximum current is 2 A. To draw more than 2 A of current, use a separate cable to supply DC to the terminal. However, since this will prevent rack mounting, decide on the installation location for the DC power supply in advance.

When using other DC power module, ask the power supply manufacturer for details.

*2: Two sets of the 2306-PJ are required when testing up to four mobiles continuously.

Temperature Chamber

One of the following equipments is required to control the temperature chamber from the ME7873LA.

Model	Name	Manufacturer
SH-241*1	Temperature & Humidity Chamber	ESPEC Corp.
SH-242*1		
VT4002*2	EMC Shielding with Temperature	Votsch Industrietechnik GmbH
105*1	Benchtop Temperature Chamber	TestEquity LLC
107*1		
115*1		

*1: GPIB Cable (Double-Shield, 2 m) is required to control this chamber automatically.

*2: USB-RS232C Converter Cable (2 m) is required to control this chamber automatically.

For details, refer to the Product Brochure or consult our sales representative.

RF Regulatory Test System

ME7803NR

Remote Control
Ethernet

Tests in Compliance with National and Regional Radio Regulations



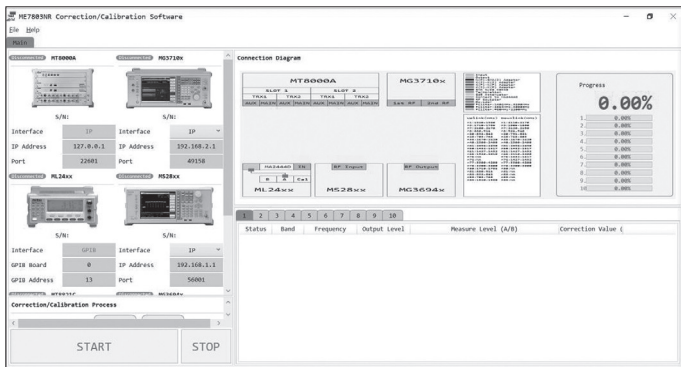
Supports ARIB/ETSI/FCC 5G RF Regulatory FR1 Tests with Maximizing Customer's Equipment Investment

The 5G RF Regulatory Test System ME7803NR test solution is in compliance with the ARIB/ETSI/FCC-defined TRCC/RED/CFR FR1 tests. Future test changes and updates will also be supported.

This can be combined with customers' own test equipment, such as the MT8000A, MT8821C, MS2840A/MS2850A, MG3710E, and MG3694C to configure the Regulatory Test System by adding just the minimum required hardware, maximizing previous investments in Anritsu equipment. Especially for MT8000A and MT8821A are available for SAR/OTA/EMC multiuse.

Correction Function for Increased Reliability

Calibration when starting testing is recommended to improve measurement stability and measured-result reliability. Easy-to-understand procedure and execution navigation guides simplify calibration tasks.



Correction/Calibration Main Screen

Supports Regional Frequency Bands

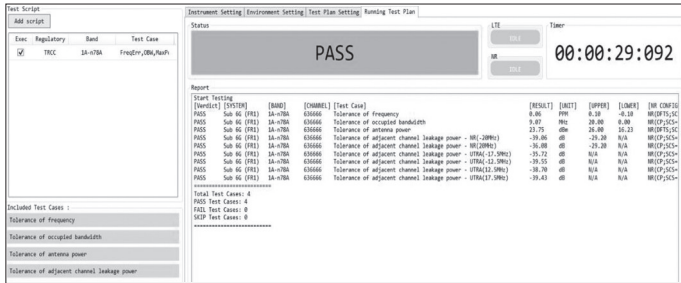
All certified frequency bands (5G NR and LTE band in 5G NSA mode) now deployed or about to be deployed in N. America, Europe, and Asia are supported. In addition, currently unsupported bands will be supported in future according to market requirements.

NR Support Band List

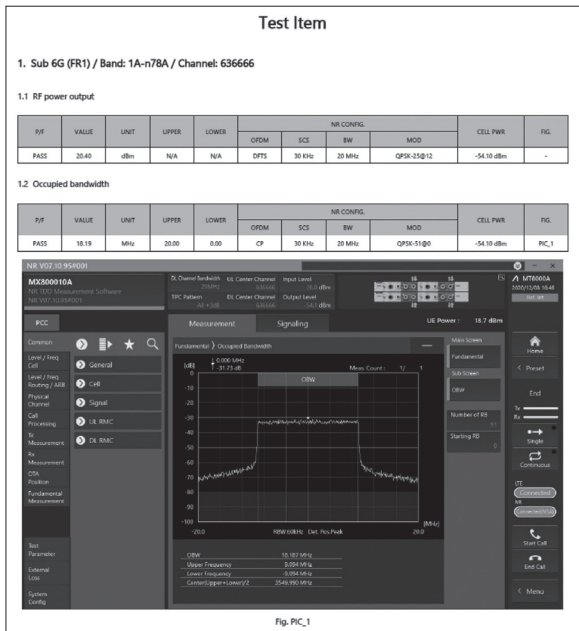
TRCC		
Operating Band	UL Frequencies (MHz)	DL Frequencies (MHz)
77	3300 to 4200	3300 to 4200
78	3300 to 3800	3300 to 3800
79	4400 to 5000	4400 to 5000
RED		
Operating Band	UL Frequencies (MHz)	DL Frequencies (MHz)
1	1920 to 1980	2110 to 2170
3	1710 to 1785	1805 to 1880
7	2500 to 2580	2620 to 2690
8	880 to 915	925 to 960
20	832 to 862	791 to 821
28	703 to 748	758 to 803
38	2570 to 2620	2570 to 2620
40	2300 to 2400	2300 to 2400
41	2496 to 269	2496 to 2690
50	1432 to 1517	1432 to 1517
51	1427 to 1432	1427 to 1432
65	1920 to 2010	2110 to 2200
77	3300 to 4200	3300 to 4200
78	3300 to 3800	3300 to 3800
CFR		
Operating Band	UL Frequencies (MHz)	DL Frequencies (MHz)
5	824 to 849	869 to 894
41	2496 to 2690	2496 to 2690
71	663 to 698	617 to 652

Measured Data Management Function

In addition to confirming ME7803NR measurement results at the Measurement Results screen, results can also be saved either as easy-to-read PDF files or as CSV files for management using the customer's database software.



Measurement Result Screen



Measurement Report (PDF)

Test Standards

TRCC (Japan Regulatory): Article 2-1-11-30

RED (ETSI): ETSI EN 301 908-25

CFR (FCC): Tille47 CFR part 2 (common), Part 22, Part 24, Part 27 (FR1)

* Contact our Business Section for details about versions supporting each standard.

Ordering Information

Please specify the model/order number, name and quantity when ordering. Names in this list may differ slightly from names on the actual equipment.

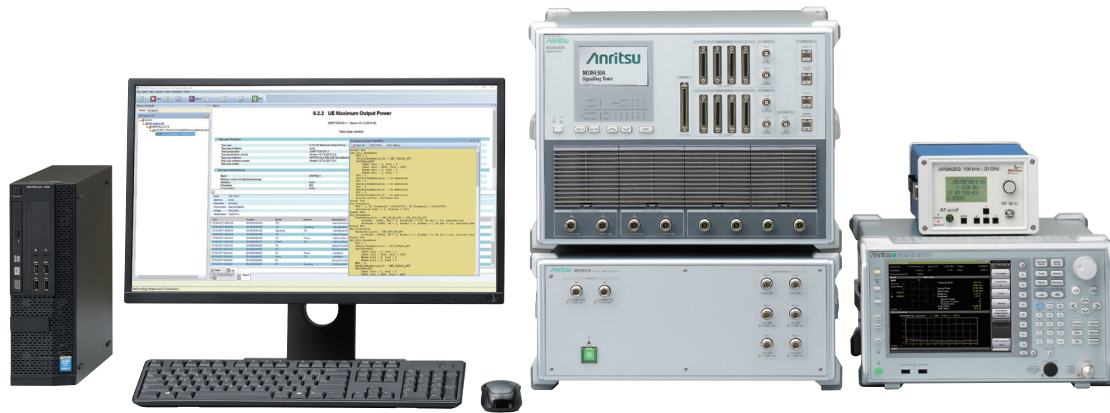
Choose any required Anritsu parts, ancillaries, accessories, etc.

For more details, contact our Business Section.

Model/Order No.	Name
ME7803NR	Main Unit RF Regulatory Test System
MT8000A	Ancillary Equipment Radio Communication Test Station
MT8821C	Radio Communication Analyzer
MG3694C	2 GHz to 40 GHz Signal Generator
MG3710E	Vector Signal Generator
MS2850A	Signal Analyzer
ML2437A	POWER METER
MA2444D	10 MHz-40 GHz High Accuracy Power Sensor
ME7803NR-AK001	Other Accessories and Application Parts Accessory Kit for FR1 (In-band)
ME7803NR-AK002	Accessory Kit for FR1 (spurious)
ME7803NR-AK011	Accessory Kit for FR1 Correction (In-band)
ME7803NR-AK012	Accessory Kit for FR1 Correction (spurious/interferer)
Z2102A	HPF (1700 MHz to 5000 MHz)
Z2103A	HPF (3000 MHz to 7000 MHz)
Z2104A	LPF (DC to 2200 MHz)
J1806A	VJ-VJ Adaptor
Z2091A	GPiB-Ethernet Converter
Z2114A	Control PC (EN)
Z2090A	Ethernet Hub
	Standard Accessory ME7803NR Instruction Manual (DVD-ROM)
	Options
MX780300NR	Platform Functionality
MX780302NR	RED Test Software for CE
MX780303NR	CFR Test Software for FCC
MX780304NR	TRCC Test Software for Japan Regulatory

Simple Conformance Test System

ME7800L

Remote Control
Ethernet*The First Step in Future Communications***Partners with Anritsu Conformance Test System**

Anritsu's Simple Conformance Test System ME7800L is the ideal system for introducing RF and Protocol Conformance tests of 3GPP-compliant LTE mobile terminals. It covers all the basic LTE test items and also supports evolving communications standards. Both RF/Performance/RRM tests and protocol tests can be selected and introduced as necessary and work efficiency is maximized by the full range of built-in functions for every stage, ranging from assuring network quality to developing mobile terminals. The series top-of-the-line LTE-Advanced RF Conformance Test System has won more LTE-Advanced-related certifications than any other company and Anritsu promises to bring the benefits of its long experience in conformance test systems to customers meeting the challenges of verification.

All-in-One RF and Conformance Tests

Using one Signalling Tester MD8430A as a base station simulator with installed RF/RRM and protocol test software supports both RF/RRM and protocol conformance tests.

Support for Spurious Tests

Even the base model in the product line supports the spurious test required at RF measurement.

Compliance with 3GPP Standards include Latest IoT Tests

In addition to RF/RRM and protocol tests, the ME7800L continuously tracks new 3GPP standards include the latest Cat-M and NB-IoT tests to maintain compliance.

Refer to the Specifications section for the supported tests.

GCF*1/PTCRB*2 Approved Conformance Tests

The Simple Conformance Test System ME7800L is a GCF/PTCRB approved test platform with RF/RRM and protocol test cases certified*3 by GCF/PTCRB.

*1: Abbreviation for Global Certification Forum, an organization certifying mobile equipment and test platform standards compliance. GCF is composed of operators, mobile equipment and chipset makers and certifies standards compliance for the frequency bands used principally in Europe.

*2: Abbreviation for PCS Type Certification Review Board, an organization like the GCF mobile equipment and test platform standards compliance. Unlike GCF, its main target is frequency bands used principally in N. America.

*3: Registered as GCF Test Platform (TP) 160.

Support for Regional Frequency Bands

In addition to the GCF/PTCRB-certified bands used principally in Europe and N. America, 3GPP-defined bands are also supported.

We also plan increasing support for other bands, depending on market requirements.

Refer to the standards page for the frequency bands.

Easy Control of Peripheral Equipment

A function for controlling the DC power supply and constant temperature chamber required by RF/RRM tests is built-in as standard. Control is easy and performed in the same manner as selecting test items for simple automated testing.

*: The DC power supply and constant temperature chamber must be supplied by the customer. Refer to the ordering information page for recommended models.

Calibration/Correction Functions for Higher Reliability

The following built-in calibration and correction functions improve measurement stability and reliability:

- Factory shipping basic correction
- Start-up auto-calibration
- Correction at each measurement

Since measurement correction is performed immediately before measurement, temperature-related changes in the measurement system are eliminated to greatly improve the measured value reliability.

Moreover, factory shipping basic correction eliminates the need for customers to perform complex operations, such as daily calibration and correction.

Excellent Support System

Various support packages provide after-purchase services to help ensure this system is used at its highest efficiency.

They include:

- Software updates assuring full compliance with new 3GPP standards
- Technical support consultations for troubleshooting testing problems

These versatile services help ensure efficient and effective testing work.

Specifications

Connector

TRx port: N-J, 50Ω, Maximum input +35 dBm
 Rx port: N-J, 50Ω, Maximum input +30 dBm

Reference Oscillator

10 MHz Buffered Output of MD8430A as standard
 External oscillator signal input available
 (Frequency: 10 MHz, Connector: BNC)

Temperature Range

Operating: 15°C to 35°C
 Storage: 0°C to 50°C

Power Supply

Power voltage: 100 VAC to 120 VAC/200 VAC to 240 VAC
 Frequency: 50 Hz/60 Hz
 Power consumption: ≤2500 VA

EU Standards (CE Marking)

EMC: 2014/30/EU, EN61326-1, EN61000-3-2
 LVD: 2014/35/EU, EN61010-1
 RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

Supported Test Standards

Both RF/RRM and Protocol Testing support Release 8, 9 and 10 (only 2 Downlink Carrier Aggregation) and Release 13 (IoT only) of below standards.

RF/RRM Testing

3GPP TS 36.521-1
 E-UTRA UE Conformance Specification Radio Transmission and Reception Part1: Conformance Testing
 3GPP TS 36.521-3
 E-UTRA UE Conformance Specification Radio Transmission and Reception Part3: RRM Conformance Testing

Protocol Testing

3GPP TS 36.523-1
 Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification
 3GPP TS34.229-1
 Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification

Frequency Range

Operating Band	UL Frequencies (MHz)	DL Frequencies (MHz)
1	1920 to 1980	2110 to 2170
2	1850 to 1910	1930 to 1990
3	1710 to 1785	1805 to 1880
4	1710 to 1755	2110 to 2155
5	824 to 849	869 to 894
7	2500 to 2570	2620 to 2690
8	880 to 915	925 to 960
9	1749.9 to 1784.9	1844.9 to 1879.9
10	1710 to 1770	2110 to 2170
11	1427.9 to 1447.9	1475.9 to 1495.9
12	698 to 716	728 to 746
13	777 to 787	746 to 756
14	788 to 798	758 to 768
17	704 to 716	734 to 746
18	815 to 830	860 to 875
19	830 to 845	875 to 890
20	832 to 862	791 to 821
21	1447.9 to 1462.9	1495.9 to 1510.9
24	1626.5 to 1660.5	1525 to 1559

Operating Band	UL Frequencies (MHz)	DL Frequencies (MHz)
25	1850 to 1915	1930 to 1995
26	814 to 849	859 to 894
27	807 to 824	852 to 869
28	703 to 748	758 to 803
29	N/A	717 to 728
30	2305 to 2315	2350 to 2360
31	452.5 to 457.5	462.4 to 467.5
32	N/A	1452 to 1496
33	1900 to 1920	1900 to 1920
34	2010 to 2025	2010 to 2025
35	1850 to 1910	1850 to 1910
36	1930 to 1990	1930 to 1990
37	1910 to 1930	1910 to 1930
38	2570 to 2620	2570 to 2620
39	1880 to 1920	1880 to 1920
40	2300 to 2400	2300 to 2400
41	2496 to 2690	2496 to 2690
42	3400 to 3600	3400 to 3600
48	3550 to 3700	3550 to 3700
66	1710 to 1780	2110 to 2200
71	663 to 698	617 to 652

Ordering Information

Please specify the model/order number, name and quantity when ordering. The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
ME7800L	Main Frame Simple Conformance Test System
MN8160A Z1938B ME7800L-AK000 MD8430A MS2692A MA24218A G0378B	Configuration Items Combiner Unit Standard PC for SimpleCT (with monitor) Accessory Kit for ME7800L Signalling Tester Signal Analyzer Microwave Universal USB Power Sensor (10 MHz-18 GHz) APSIN20 G-HC-AZ1 Signal Generator
	Standard Accessory ME7800L Operation Manual (CD-ROM) 1 set
ME7800L-001 ME7800L-011 ME7800L-051 ME7800L-061	Options LTE Protocol Test Package IoT Protocol Test Package LTE RF/RRM Test Package IoT RF/RRM Test Package

The following DC power supplies and temperature chamber used for the RF tests can be controlled by the ME7800L.

DC Power Supply

The DC power supply to the mobile can be controlled.

Model	Name	pcs	Manufacturer
N6700C	Main frame	1	Keysight Technologies Inc.
N6732B*1	8 V, 6.25 A, 50 W DC Power Module	1	
N6708A	Filler Panel Kit	1	
2306-PJ	Dual-Channel Battery/Charger Simulator with 500 mA Range	1	Keithley Instruments Inc.

*1: When using DC power modules other than the N6732B, the customer must confirm whether the power supply can be installed in the N6700C main unit.

Temperature Chamber

The temperature chamber can be controlled for the mobile temperature test.

Model	Name	Manufacturer
SH-241*2	Bench-Top Type Temperature & Humidity Chamber	Espec Corp.
SH-242*2		
VT4002*3	EMC Shielding with Temperature	Votsch Industrietechnik GmbH
105*2	Benchtop Temperature Chamber	TestEquity LLC
107*2		
115*2		

*2: GPIB cable is required to control this chamber automatically.

*3: USB-RS232C converter cable is required to control this chamber automatically.

Signalling Tester

MD8475B

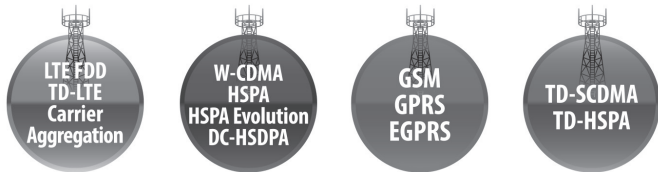
Total Smartphone Application Testing



SmartStudio

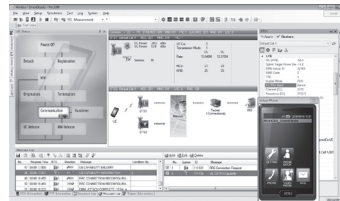
All-in-One Support for LTE and Other Communications Systems

All the world's main communications technologies, such as triple-system LTE/W-CDMA/GSM/GPRS mobiles and TD-LTE/TD-SCDMA/GSM as well as LTE hybrids, can be tested using the all-in-one MD8475B. (Requires installation of optional units and software for each systems).



Scenario-less Smartphone Tests using SmartStudio

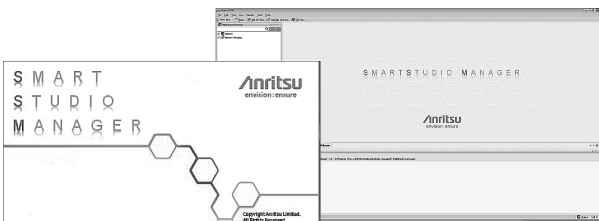
Unlike earlier base station simulators requiring time-consuming creation of complex scenarios, the SmartStudio MX847570B interactive user interface eliminates the need to create scenarios, smoothing UE testing.



SmartStudio

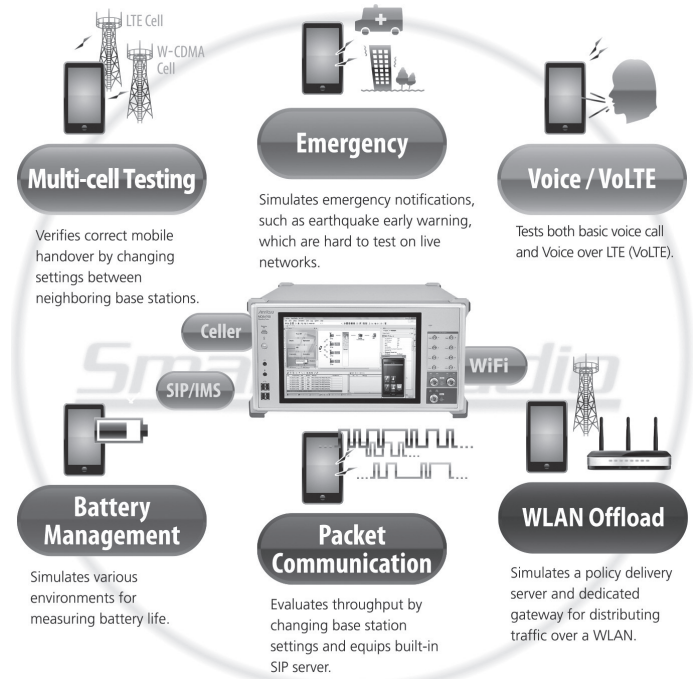
Verifying Existing Smartphone Functions using SmartStudio Manager

Smartphone development requires verification of existing functions. Testing of items that have already been tested many times over, such as voice tests and SMS sending/receiving, are automated using SmartStudio Manager MX847503A to improve development efficiency.



Supports Versatile Smartphone Tests

Complex tests of multifunction smartphones are supported by the all-in-one MD8475B with interactive SmartStudio interface.

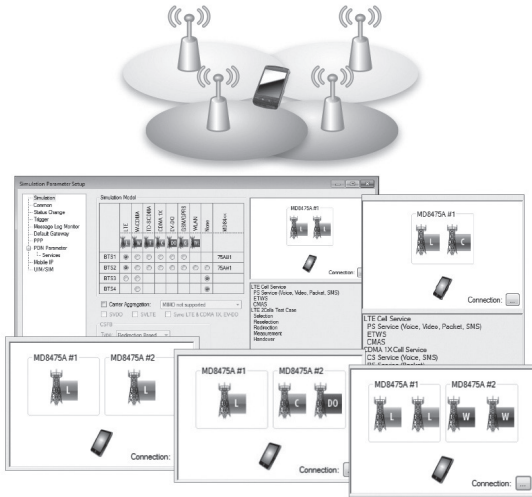


Configuring Multi-cell Test Environment

Performing UE tests between communications systems (handover tests) usually requires set-up of several measuring instruments and creation of complex scenarios. SmartStudio eliminates these problems by providing a simple test environment for fast and efficient testing.

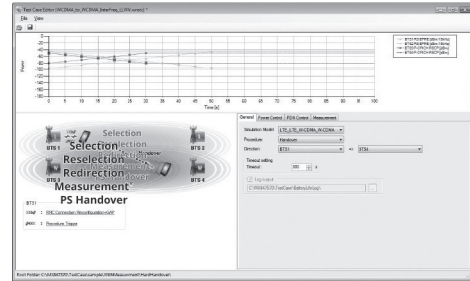
Multi System Configuration

Roaming and power consumption tests of UEs require multi-cell connections. The MD8475B supports up to 8RF tests. The SmartStudio GUI makes it easy to set multi-system test environments, especially for the latest Carrier Aggregation (CA) wireless standards.



Multi-cell Test Configurations

Tests of UEs moving between cells take the Selection, Redirection, Handover, and other conditions into consideration, depending on the UE and base station conditions. SmartStudio can register these UE and base station conditions, including the RF power, as a test case, making it quick and easy to evaluate UE behaviors and reproduce failures. Test cases are also useful for general UE evaluations when reproducing Handover failures.



Small-cell Switching Tests

Macrocell, small-cell, and femtocell base stations are being installed to provide wide coverage for people moving freely between base stations; SmartStudio provides easy test sequences for preferential capture of small-cells.

2-cell Testing Support by SmartStudio

✓: Supported

Cell 1 \ Cell 2	LTE FDD/TDD	W-CDMA/HSPA/HSPA Evolution/DC-HSDPA	GSM/GPRS/EGPRS	TD-SCDMA/TD-HSPA*	WLAN
LTE FDD/TDD	✓	✓	✓	✓	✓*
W-CDMA/HSPA/HSPA Evolution/DC-HSDPA	✓	✓	✓	—	✓*
GSM/GPRS/EGPRS	✓	✓	✓	✓	✓*
TD-SCDMA/TD-HSPA*	✓	—	✓	✓	✓*
WLAN	✓*	✓*	✓*	✓*	—

*: The WLAN Offload test requires a separate WLAN access point.

Multi-cell Testing Support by SmartStudio

Cell 1	Cell 2	Cell 3	Cell 4
LTE	LTE	LTE	—
LTE	LTE	W-CDMA	—
LTE	LTE	GSM	—
LTE	LTE	TD-SCDMA	—
LTE	LTE	LTE	LTE

Carrier Aggregation Tests

The MD8475B supports LTE CA 2CC/3CC/4CC/5CC for throughput performance tests of UEs, such as smartphones using high-speed data networks.

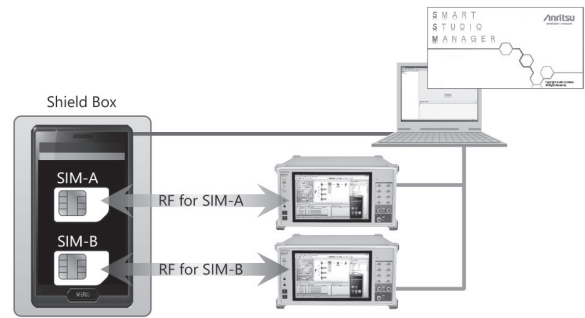
Configuration	
Operation Software	SmartStudio
Required CA Option	MX847550B-040, MX847550B-041 (3CC), MX847550B-042 (4CC), MX847550B-043 (5CC), MX847570B-051
RF	4TX/2RX (standard), 8TX/4RX (option)
Support for DL CA	2CC SISO, 2CC MIMO (2x2), 2CC MIMO (4x4), 3CC SISO, 3CC MIMO (2x2), 3CC MIMO (4x4), 4CC SISO, 4CC MIMO (2x2), 4CC MIMO (4x4), 5CC MIMO (4x4)
UE Category	See 3GPP TS 36.306 V14.10.0 (2019-03) Category List at System Configurations/Option/Software LTE chapter

SIM Connectivity Test

Dual SIM Dual Standby (DSDS) and Dual SIM Dual Active (DSDA) tests of dual-SIM UE can be performed using two sets of MD8475B. Additionally, Single SIM Dual Standby (SSDS) and Single SIM Dual Active (SSDA) of single-SIM UE can be performed using one MD8475B. These test environments can be fully automated using SmartStudio Manager.

Test Example:

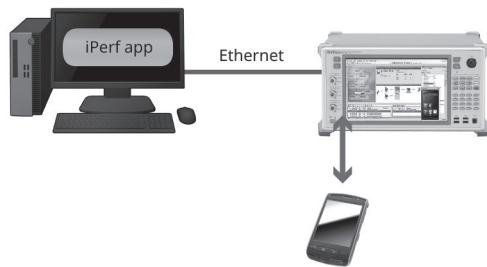
The power consumption and throughput of a dual-SIM UE can be confirmed while the UE is making a voice call using SIM1 and transferring packet data using SIM2.



Simple Throughput Test Environment

Throughput testing until now

- It needs to be adjusted for each application about radio layer settings and server settings.
- Performance depends on the PC specification and the load of Ethernet.



Throughput Testing

- Single GUI supports to adjust for each application about radio layer settings and server settings.
- Performance is independent from PC specification and the load of Ethernet.



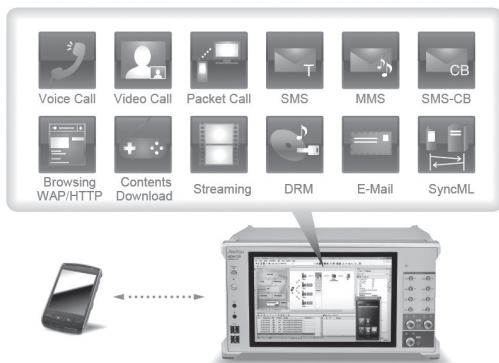
For the transmission and reception of the UE, use iPerf application which is widely used for throughput testing.

Data Packet Communications

Data packet communication environments are complex, but SmartStudio makes it easy to resolve troublesome packet bottlenecks, shortening evaluation times.

Versatile Server Environment

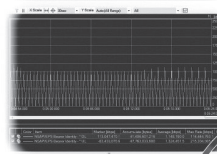
Because the MD8475B pre-installs Windows 10, commercial application servers can be easily installed.



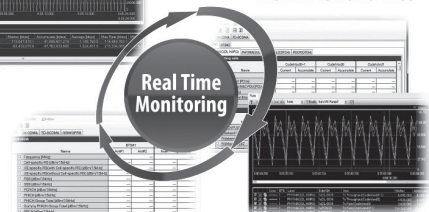
Status Evaluation

A full line of function tools can be used to check communication status, including throughput, ACK/NACK counts, and RF monitoring. Simultaneous checking of multiple layers allows quick troubleshooting during data communications.

Throughput Monitor
Checks data communications each layer for each BTS

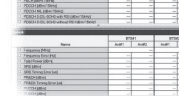


Counter
Displays detailed information, including ACK/NACK and MCS



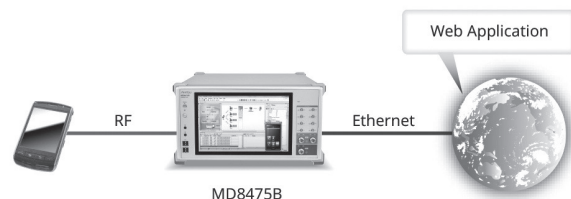
Real Time Monitoring

RF Monitor
Displays TRx power for frequency and channels



Genuine Application Test Environment

Connecting the MD8475B to the Internet supports Web application tests using UEs under development to verify actual in-use power consumption and throughput before market release.



Voice Call Evaluation Environment

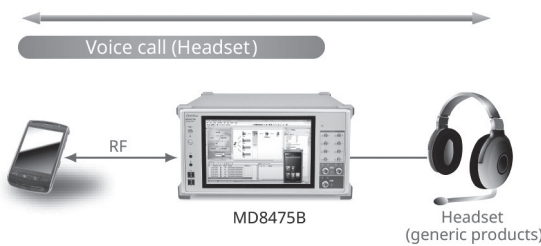
The need for voice-call evaluations has not changed even with the spread of LTE services. However, some voice-call test items, such as the access barred condition and emergency calls, are not easily evaluated on live networks. SmartStudio supports comprehensive evaluation of UE under high-load conditions, such as testing of simultaneous voice calls and other functions.

3G/2G Voice Calling Test

Just making voice settings using SmartStudio is all that is necessary for voice tests with the MD8475B.

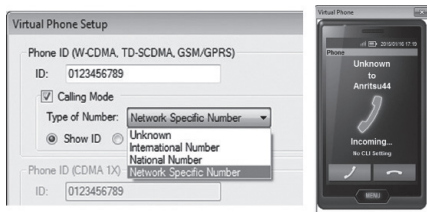


- Multimedia Interface Software MX847508B



*: Not supported for LTE.

- Setting Roaming and Registering Address Book
When performing incoming-call tests of W-CDMA/GSM UE, SmartStudio can display any of 'Public', 'National', 'International', and 'Unknown' on the UE. Additionally, when the incoming call number matches a preregistered number in the address book, the name associated with the number is displayed.



- Setting Identify Type

When performing incoming call tests of W-CDMA/GSM UEs, either IMSI or TMSI can be chosen for the UE Caller ID using Paging.



Voice over LTE Tests

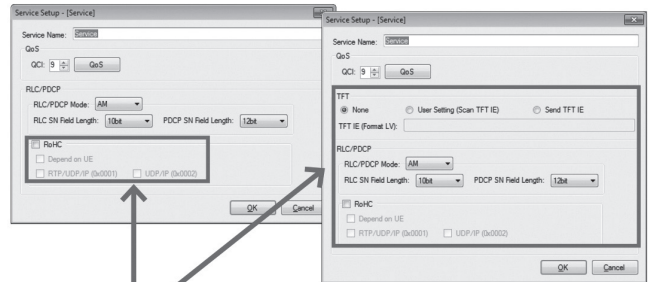
Since LTE uses the data network, Voice over LTE (VoLTE) communications also use the data network; SmartStudio simplifies VoLTE tests.

- Loopback Tests of VoLTE/Video

The SmartStudio CSCF function supports VoLTE tests (AMR/W-AMR Codec, etc.) in the loopback mode.

In addition to an IMS server, VoLTE tests require a variety of LTE settings about multi-PDN*1, but it also supports packet filter and QoS settings. Additionally, loopback audio data can be changed using the RTP function.

At VoLTE loopback testing, as well as looping voice data sent to the terminal from the network back from the terminal, the voice data can be changed to the MUTE status or to a fixed pattern to perform communications quality tests and battery consumption measurements requiring good reproducibility.*2



Sets RoHC*3 and TFT filter at Default Bearer and Dedicated Bearer

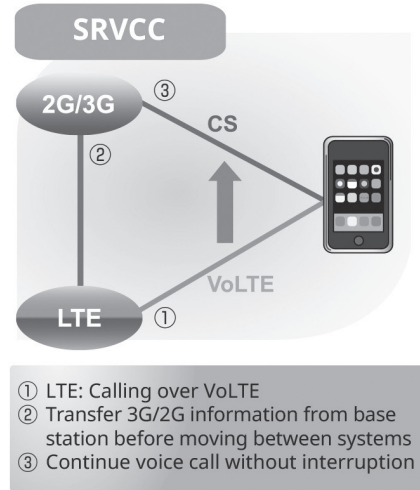
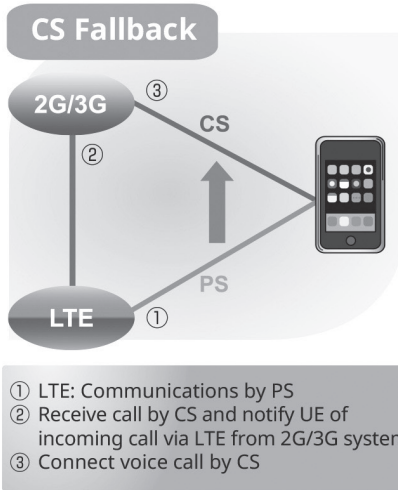
*1: GSM and TD-SCDMA are not supported.

*2: Requires MX847570B-086.

*3: RoHC settings require the MX847550B-060 option. The RTP/VDP/IP (0x0001) and UDP/IP RoHC (0x0002) profiles are supported.

Testing Voice Calls from LTE to 3G/2G

A variety of technologies are used when a UE moves between systems from an LTE to 3G/2G cell. Configuring a 2-cell test environment using SmartStudio supports LTE and 2G/3G system voice call tests such as CS Fallback and SV-LTE (Simultaneous Voice and LTE).

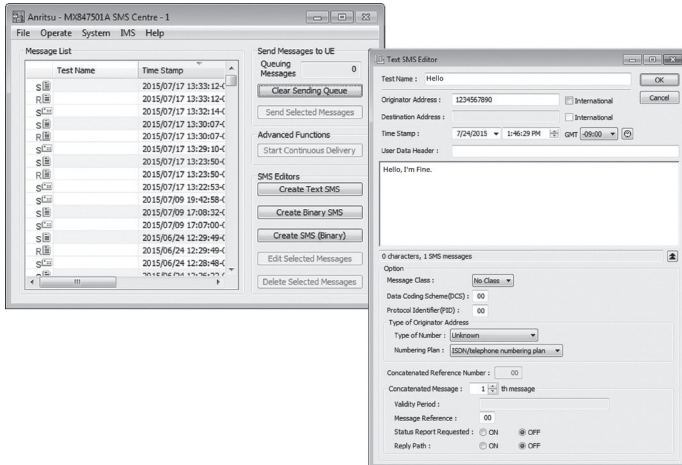


SMS Tests

SMS and MMS are popular messaging services used worldwide. Exchanges between UEs as well as the number of verification items are both increasing because more direct control of UE is being attempted now.

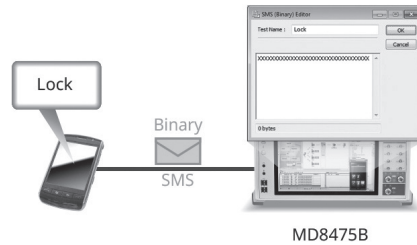
Sending/Receiving SMS Text Messages

SmartStudio has a dedicated SMS server supporting sending and receiving of SMS messages at any PS or CS network setting. Multiple SMS messages can be preregistered for continuous sending and CBS messages can be sent too.



Sending Binary SMS

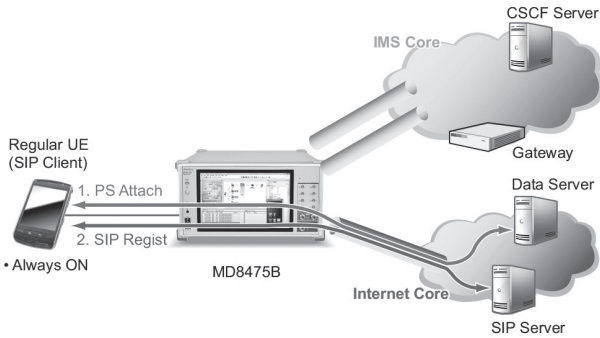
The MD8475B can send binary messages as SMS supporting remote control of the UE. Additionally, general evaluations, such as behavior when receiving an SMS during a voice call, can be evaluated to help prevent problems occurring in the field.



IMS Service Tests

SmartStudio has a built-in standard server environment for running IMS server functions for easy service tests, including VoLTE, SMS over IMS, etc.

- SIP Registration of a Non-IMS UE

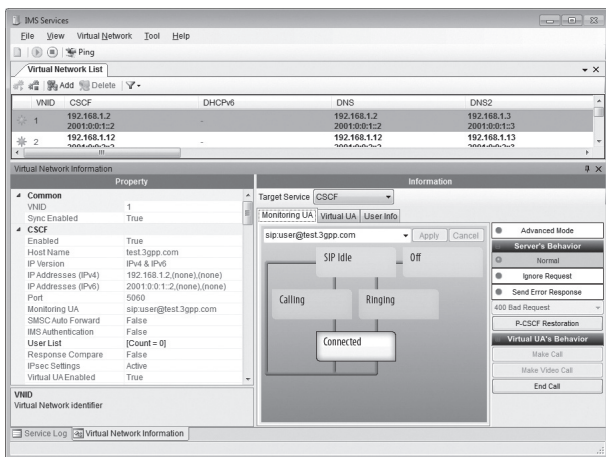


Typical Connection Procedure

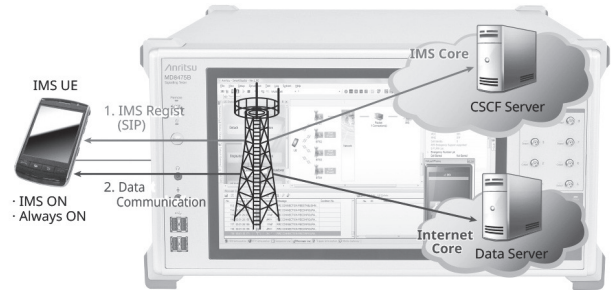
1. PS Attach: Connect to Data server.
→ Get address using DNS, etc.
 2. SIP Registration:
→ Depends on application.
- ⇒ One PDN is required.

Standard IMS Server Function

- CSCF (Call Session Control Function)
Supports standard server function for VoLTE and SMS over IMS tests as well as voice data loopback function. IPsec is supported too.
- DHCPv6 (Dynamic Host Configuration Protocol v6)
Allocates IPv6 address and notifies DNS/SIP server address to network node.
- DNS (Domain Name System)
Operates as DNS cache server.
- NDP (Neighbor Discovery Protocol)
Supports function to transmit RA (Router Advertisement) and periodically transmit RA to RS (Router Solicitation).
- NTP (Network Time Protocol)
The UE and MD8475B are synchronized by sending time data in response to an NTP request.
- PSAP (Public Safety Answering Point)
The UA (User Agent) and voice data loopback function support PSAP simulation for running IMS Emergency tests.
- XCAP (XML Configuration Access Protocol)
This function supports updating, referencing, and deleting of XML format file data (XCAP documents).



- SIP Registration of an IMS UE

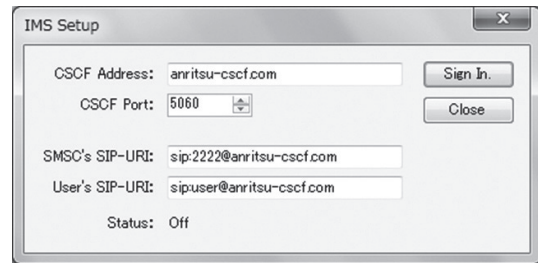


Typical Connection Procedure

1. IMS Registration: Connect to CSCF server using SIP.
 2. Data Communication: Connect to Data server.
- ⇒ Consequently, two or more PDN required.

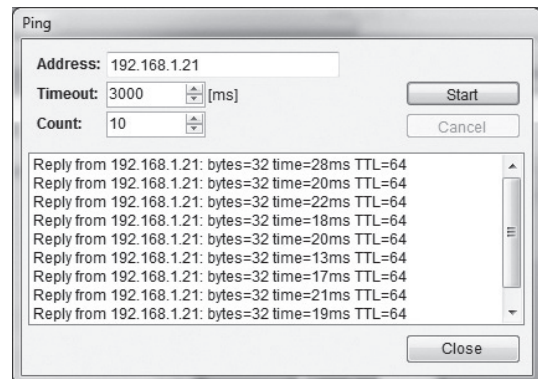
SMS over IMS Setting

UE can register with CSCF server, and can transmit and receive SMS over IMS.



Ping Sending Function

The Ping sending function is used to verify the connection of the device under test to the network.



IMS Options

Extended CSCF Option MX847570B-080

Various conditions can be set for VoLTE/Video quasi-normal and abnormal tests. Moreover, VoLTE call and hang-up sequences can both be confirmed from SmartStudio. In addition, VoLTE/Video audio codec switchover tests are supported as well.

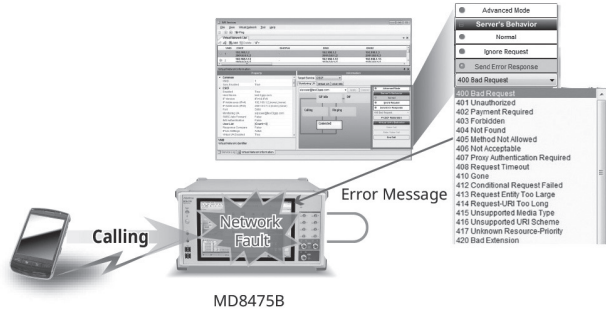
Virtual UA Calling/Release

VoLTE calling from the SmartStudio simulated UE (Virtual UA) is supported. In addition, any Virtual UA response can be set.



Network Fault

The occurrence of a server or network fault can be created.



Message Blocking

Ignore and Reply responses to specific messages can be changed arbitrarily.



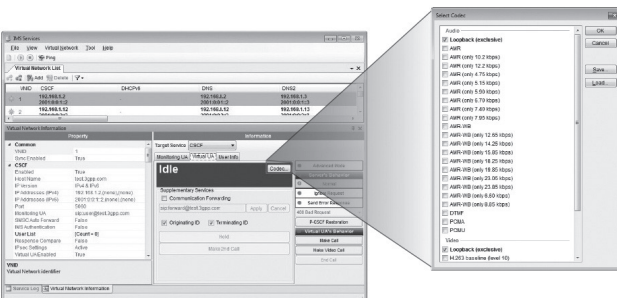
Multi-P-CSCF Settings

Up to three types of P-CSCF addresses can be notified to UE by one PDN to confirm correct UE operation for multiple addresses.



Voice Codec Switchover

Any codec can be sent from the MD8475B to the UE, and switchover tests, such as VoLTE → Video, are supported too.

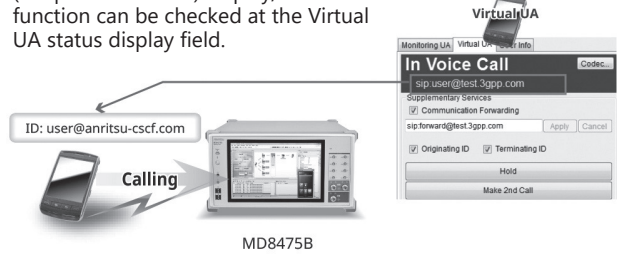


IMS Supplementary Service Option MX847570B-081

This option adds functions for simulating VoLTE/Video caller ID, call transfer and call hold. Various CSCF and XCAP service settings as well as supplementary service functions can be set.

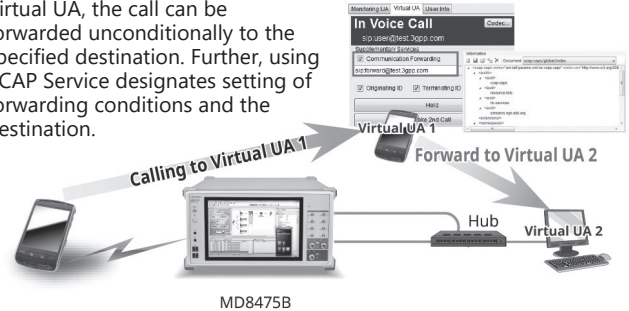
Caller ID Display ON/OFF Function

After a call from the test UE, the caller ID (telephone number) display/block function can be checked at the Virtual UA status display field.



Forwarding Function

At calling from the test UE to the Virtual UA, the call can be forwarded unconditionally to the specified destination. Further, using XCAP Service designates setting of forwarding conditions and the destination.



Call Hold/Resume Function

Both test UE and Virtual UA hold operations can be verified. In addition, the call can be resumed by pressing the Resume button.



VoLTE Conference Test

The 3GPP TS 24.605 defined VoLTE Conference Call functions can be tested.



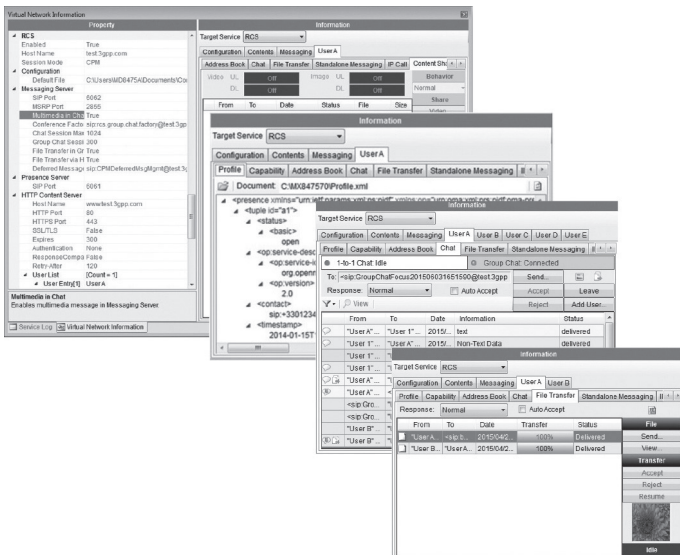
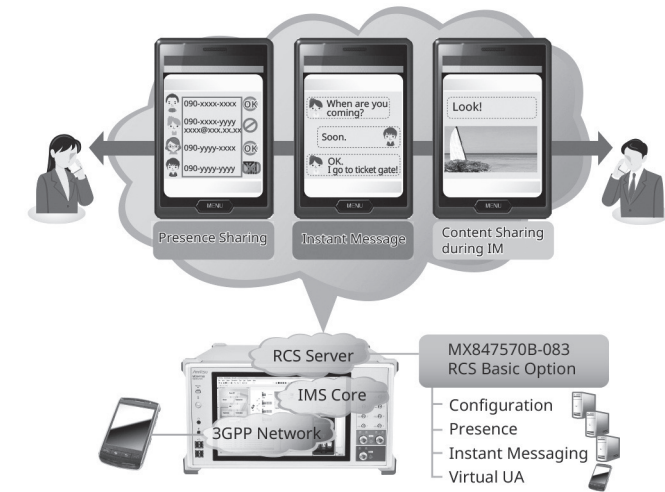
3GPP TS 24.605	
4.5.2.1.1	User joining a conference
4.5.2.1.2	User inviting another user to a conference
4.5.2.1.3	User leaving a conference
4.5.2.1.4	User creating a conference
4.5.2.1.5	Subscription for the conference event package
4.5.2.2.1	Conference focus
4.5.2.2.2	Conference notification service
4.5.2.7	Actions at the destination UE
4.6.1	Communication HOLD (HOLD)
4.6.3	Terminating Identification Restriction (TIR)
4.6.5	Originating Identification Restriction (OIR)

RCS Basic Option MX847570B-083

Rich Communication Suite (RCS) is the next evolutionary step in deploying existing simple voice and messaging (SMS, MMS) services with "rich" communications. Installing this software supports RCS defined tests of Instant Messaging (IM), Address Book, and Contents sharing.

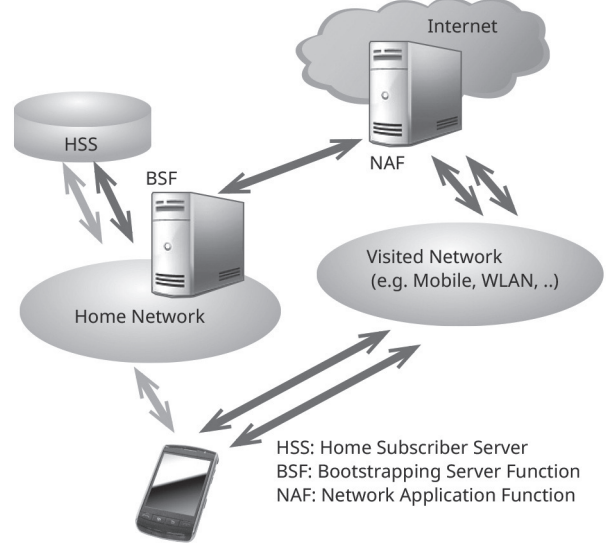
Item	Note
Configuration & Registration	HTTP (S) based support
Capability Discovery	
Standalone Messaging	
1-to-1 Chat	
Group Chat	
File Transfer	
Content Sharing	
Social Presence Information	Geolocation service not supported
IP Voice Call	IR.92 based support Interaction with other RCS services not supported
IP Video Call (IR.94)	IR.94 based support

RCS Service Image



GBA Authentication Option MX847570B-084

The software option references the 3GPP GBA Authentication algorithm to simulate the authentication procedure required when connecting to the Internet via networks other than Home Networks.

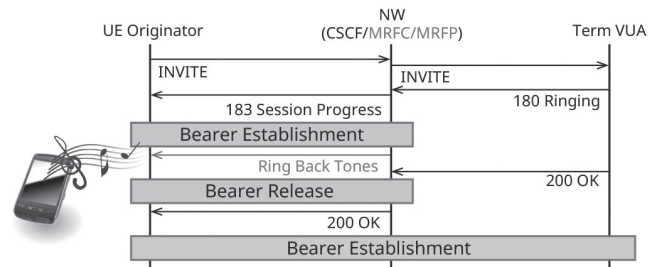


IMS Early Media Option MX847570B-085

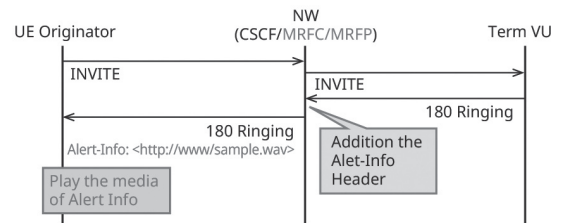
The software option simulates the IMS Early Media sequence. It supports MRFC, MRFP, etc., nodes and can authenticate service functions such as customized ringtones from the network side.

NRBT: Function for recovering RBT (ring back tone) from network rather than from UE

The recovery status (recovery possible/not possible/recovering/stopped) for each session is displayed on the Information screen.

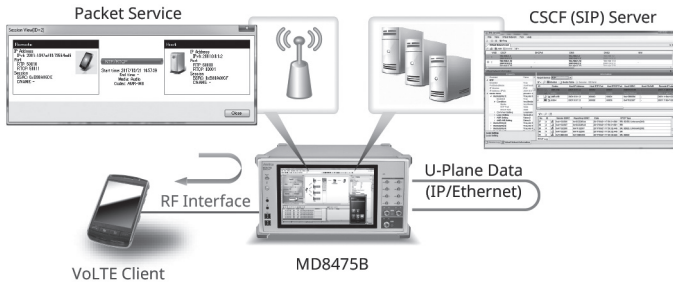


Alert-Info: Provides substitute ring back tone using Alert-Info, one of the Early Media switching function



RTP Frame Control Option MX847570B-086

This software controls the media data (RTP packets) during VoLTE communications. In addition to the MUTE condition and Fixed pattern, the data itself can be delayed; it can be used to configure the static stage required at audio evaluation and battery consumption measurement.



IMS Script Basic Option MX847570B-060
XCAP Script Option MX847570B-061

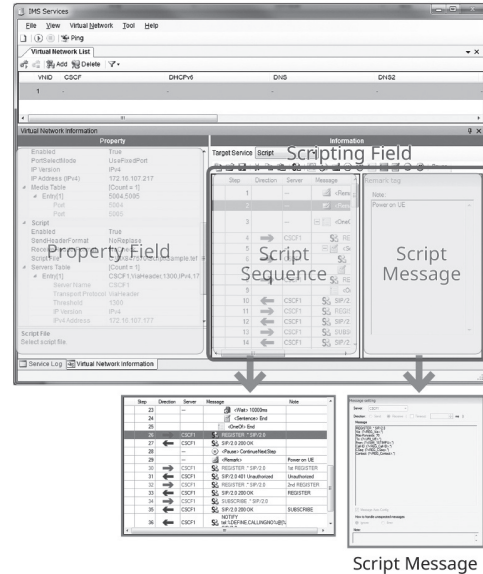
The software option can be used to edit and create SIP messages/XCAP messages using a ladder sequence to simulate the CSCF server/XCAP server behavior. Not only can configure a test environment from the service designing specification stage, but also user-specific tests, such as quasi-normal and abnormal conditions, can also be tested to easily support every test requirement.

Property Field:

Network parameters such as IP address are set here.

Scripting Field:

Sequence messages between the UE and CSCF are edited and executed here.



IMS Options

✓: Supported

Section	Function	Outline	GUI Option							Scripting Option ^{*2}		
			MX847570B	MX847570B-080	MX847570B-081	MX847570B-083	MX847570B-084	MX847570B-085	MX847570B-086	MX847570B-060	MX847570B-061	
General	SIP REGIST Test	Function for verifying CSCF server Bind/Unbind operation	✓	—	—	—	—	—	—	—	✓	—
	IPsec	Function for on/off of IPsec (3DES, AES).	✓	—	—	—	—	—	—	—	✓	—
	DNS Server	Function for resolving address using DNS	✓	—	—	—	—	—	—	—	—	—
	NTP Server	Function for synchronizing time using NTP	✓	—	—	—	—	—	—	—	—	—
	PSAP Server	Function for looping-back voice for IMS Emergency	✓	—	—	—	—	—	—	—	✓	—
	X-CAP Server	Function for verifying service using XML file	✓	—	—	—	—	—	—	—	—	✓
	BSF Server	Function for verifying GBA	—	—	—	—	✓	—	—	—	—	—
	No Server (Network) Response Test	Function for verifying operation when no response due to error at server or network	—	✓	—	—	—	—	—	—	✓	✓
	Server Error Test	Function for verifying operation when error response received from server due to the error at server	—	✓	—	—	—	—	—	—	✓	✓
Multi P-CSCF	Function for reporting up to three P-CSCF servers to UE	—	✓	—	—	—	—	—	—	—	—	
VoLTE/ Video Telephony	Calling Sequence Test	Function for verifying call sequence from UE	✓	—	—	—	—	—	—	—	✓	—
	Incoming Call Sequence Test	Function for verifying call sequence to UE	—	✓*1	—	—	—	—	—	—	✓	—
	Voice Loopback Test	Function for looping-back and sending uplink voice data to verify call at UE side	✓	—	—	—	—	—	—	—	✓	—
	Voice Loopback Test (fixed pattern)	Function for configuring the static stage required at audio evaluation and battery consumption measurement	✓	—	—	—	—	—	—	✓	—	—
	Early media Test	Function for verifying early media sequence and Ring Back Tone	—	—	—	—	—	✓	—	—	—	—
	Disconnection (from UE) Sequence Test	Function for verifying disconnection sequence from UE	✓	—	—	—	—	—	—	—	✓	—
	Disconnection (from NW) Sequence Test	Function for verifying disconnection sequence from network	—	✓*1	—	—	—	—	—	—	✓	—
	Called Party Busy Test	Function for verifying operation when called party busy	—	✓	—	—	—	—	—	—	✓	—
	Called Party Not Found Test	Function for verifying operation when called party not found	—	✓	—	—	—	—	—	—	✓	—
	Called Party No Response Test	Function for verifying operation when no response from called party	—	✓	—	—	—	—	—	—	✓	—
	Codec Selection	Function for confirming VoLTE/VT traffic with any codec; also performs loopback	—	✓	—	—	—	—	—	—	✓	—
	VoLTE/Video Telephony Upgrade/Downgrade	Switches VoLTE/Video Telephony during call	—	✓	—	—	—	—	—	—	✓	—
	Call ID Display/Block	TS 24.607 verifies IMS test UE caller ID display ON/OFF	—	—	✓	—	—	—	—	—	✓	✓
	Incoming Call ID Display/Block	TS 24.608 verifies IMS test UE incoming caller ID display ON/OFF	—	—	✓	—	—	—	—	—	✓	✓
	Call Forwarding, Holding, Catchphone	Function for simulating TS 24.604, TS 24.610, TS 24.615 call forwarding, call holding, and catchphone functions	—	—	✓	—	—	—	—	—	—	✓
	VoLTE Conference Environment	Function for verifying TS 24.605 VoLTE Conference related tests (Event message, HOLD, etc.)	—	—	✓	—	—	—	—	—	✓	✓
Message Waiting Indication	Function for notifying users of voice mail services about arriving voice mail	—	—	✓	—	—	—	—	—	✓	✓	
RCS	Configuration	Function for creating and updating UE configuration data using XML file	—	—	—	✓	—	—	—	—	—	—
	Presence	Function for referring UE configuration data using XML file	—	—	—	✓	—	—	—	—	—	—
	Instant Messaging	Function for sending and receiving Instant Message using XML file	—	—	—	✓	—	—	—	—	—	—
	RCS Address Book	Function for registering and saving UE contacts using RCS	—	—	—	✓	—	—	—	—	—	—
	1 to 1 Chat (CPM)	Function for 1 to 1 chat by connecting with CPM mode	—	—	—	✓	—	—	—	—	—	—
	Group Chat	Function for multi party chat (Maximum 5 users)	—	—	—	✓	—	—	—	—	—	—
	File Transfer	Function for sending and receiving same files between users	—	—	—	✓	—	—	—	—	—	—
Contents Sharing	Function for sharing same files between users	—	—	—	✓	—	—	—	—	—	—	
SMS over IMS	SMS Message Send Test	Function for verifying UE SMS message sending	✓	—	—	—	—	—	—	—	✓	✓
	SMS Message Receive Test	Function for verifying UE SMS message receiving	✓	—	—	—	—	—	—	—	✓	✓
IPv6 Addressing	IP Address Allocation Test (RA)	Function for verifying IP address setting at RA receiving	✓	—	—	—	—	—	—	—	—	—
	IP Address Allocation Test (DHCPv6)	Function for verifying IP address setting allocated from DHCPv6 server	✓	—	—	—	—	—	—	—	—	—
VoLTE Emergency Call	VoLTE Emergency Call (Voice)	Function for verifying IP VoLTE Emergency Call	—	✓	—	—	—	—	—	—	—	

*1: This option is unnecessary when a separate network-side UE is prepared.

*2: The user must create the test message script.

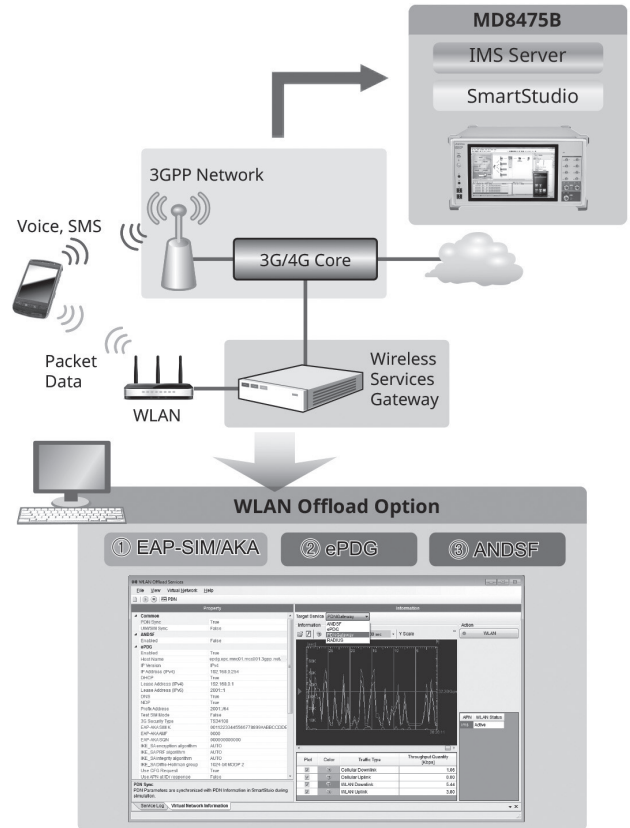
New Services

New network services are being deployed at an increasing rate, requiring more-and-more tests for UEs supporting such new services. The MD8475B makes it easy to support new mobile test environments.

WLAN Offload Tests

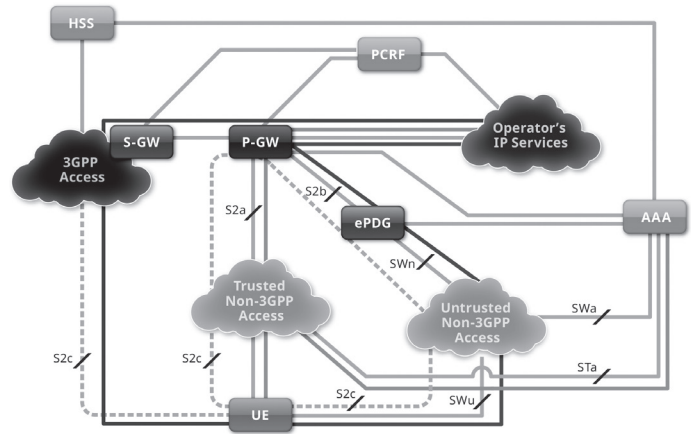
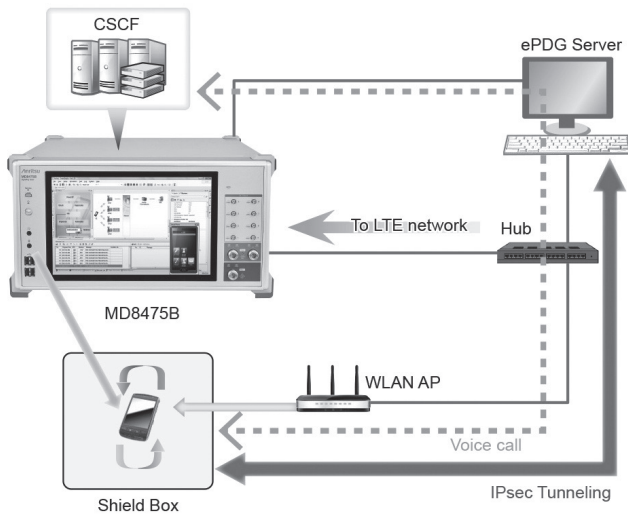
Offloading data traffic to WLAN networks is being deployed as a technology for preventing traffic congestion on mobile networks. The MD8475B supports a WLAN data offload test environment.

- **WLAN Offload Basic Option MX847570B-070**
The software option provides functions for forwarding packets between the UE and networks with both Trusted non-3GPP Access and Untrusted non-3GPP Access authentication functions, as well as for monitoring packets graphically.
- **ePDG Option MX847570B-071**
The software option supports the IKEv2 key exchange procedure and IPsec communications functions for Untrusted non-3GPP Access network authentication.
- **ANDSF Option MX847570B-072**
The software option supports the function for setting and distributing the system selection policy between 3GPP and WLAN (distributes Policy and Discovery Information according to request from UE, and receives Location and Profile reports from UE).
- **Extended ePDG Option MX847570B-073**
The software option supports configuration of an ePDG status fault test environment for inserting errors into the ePDG sequence, setting timeouts, etc. Additionally, this option can be used to support Fast Re-Authentication (EAP-SIM/EAP-AKA) tests without the need to generate UE-side authentication keys.



Wi-Fi Calling Evaluation Environment

Wi-Fi Calling is a function for making voice calls and sending/receiving SMS over WLAN. Using this function, voice calls can be made using the telephone number registered inside the SIM card. Combining the MD8475B with the WLAN option supports verification of Wi-Fi Calling voice calls as well as handover tests from VoLTE to Wi-Fi Calling and vice versa.

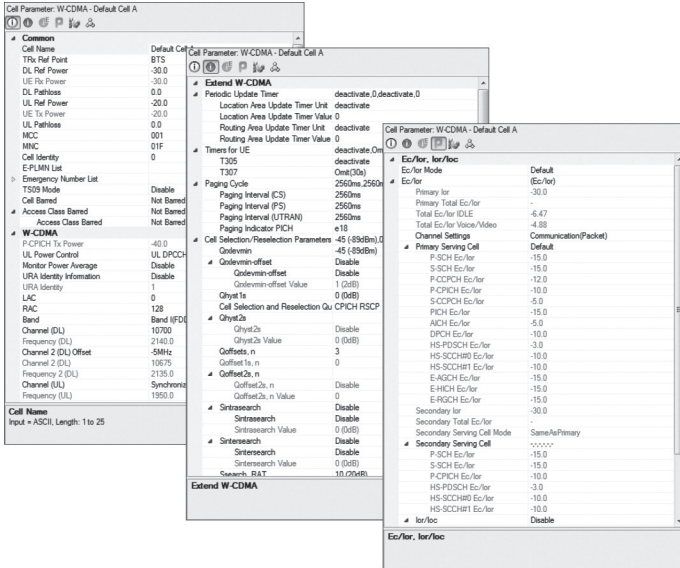


Power Consumption Test

SmartStudio supports detailed settings such as changes to the UE RF output and stopping packet communications.

Base Station Settings

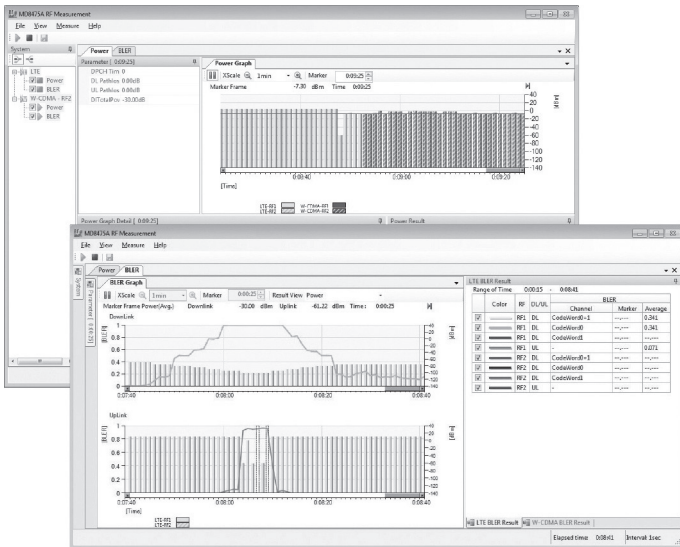
Any messages, such as Paging Cycle, UL TPC, etc., can be sent to the UE*.
Support W-CDMA CPC, Ec/Ior, etc.



*: The settable items differ by the systems.

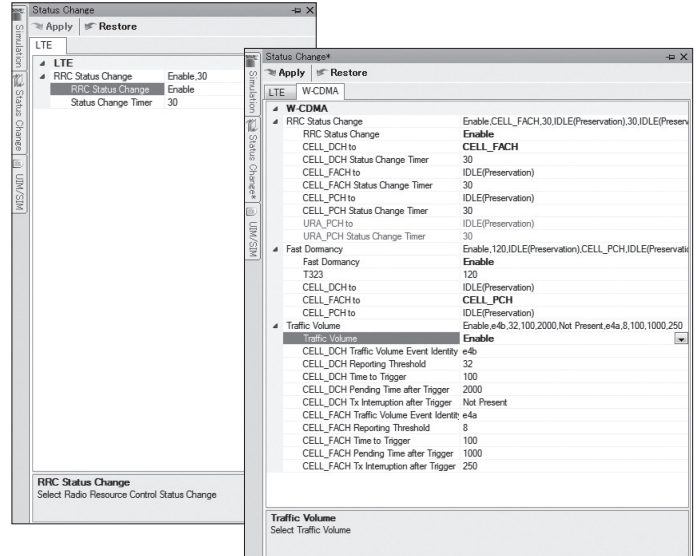
Check UE Tx RF Power

- Quick TRX Diagnosis MX847506B
- Adding RF Measurement supports verification of UE Tx RF power.
- A UE power consumption test environment can be configured easily by combined use with SmartStudio base station settings from the UE.
- Further, BLER can be verified using graphical or tabulated data.



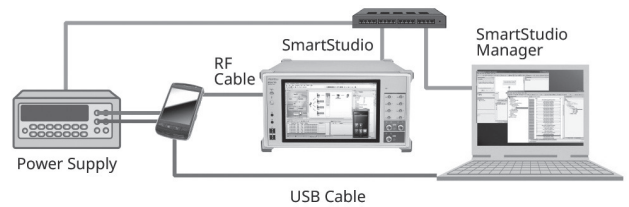
Packets Communication State (RRC State Change) Settings

When packets stop passing over the network during data packet communications, the Cell Status can be transitioned at a specific timing to switch the UE to any RRC State. This is useful for configuring a test environment simulating a real network when testing battery life.



Power Consumption Test using SmartStudio Manager

The SmartStudio Manager software MX847503A is bundled with test cases for measuring the UE power consumption. In addition, the MX847503A can also control peripheral devices simultaneously, shortening the time required for configuring UE test environments.



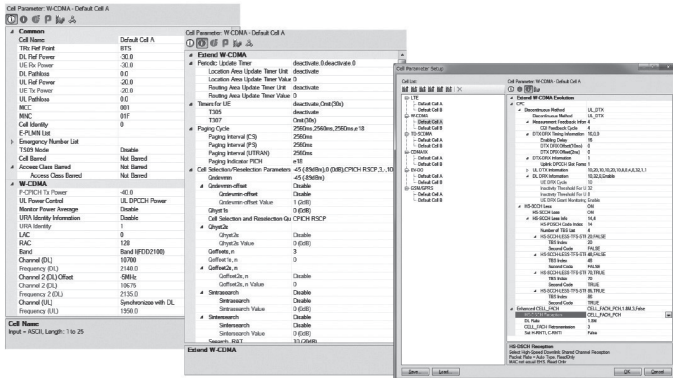
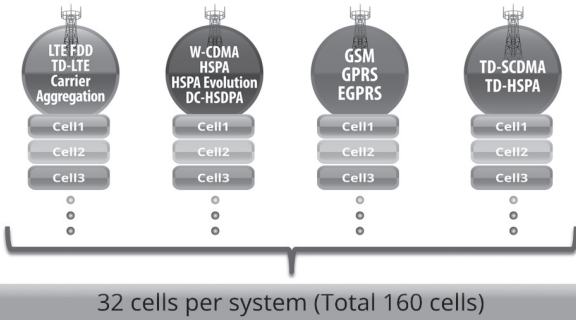
Flexible Base Station Settings

Base station settings are essential for testing UE connections. Not only does SmartStudio support frequency band and Tx and Rx power settings, it can also be set to behave as a real base station.

Setting Base Station Parameters

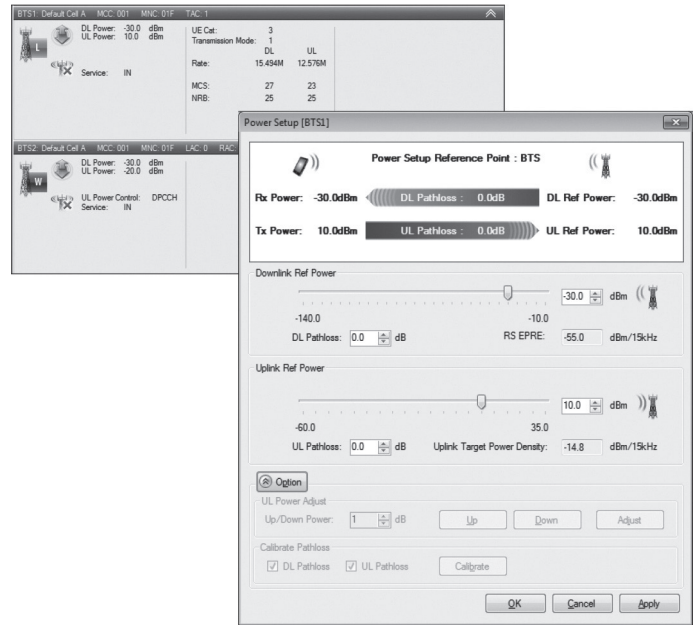
Cell Parameter Settings

Up to 32 base station parameters can be saved in one file to prevent setting errors and assure fast, smooth testing when making slight changes to frequency and bandwidth before retesting.



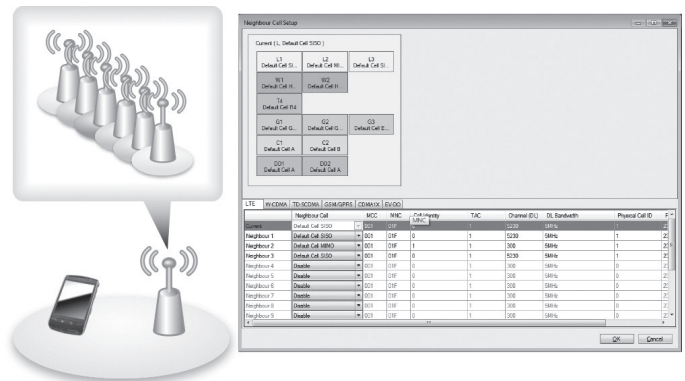
Base Station Power Settings

The Tx/Rx power of the base station can be changed during testing to simulate Out-of-Service tests by stopping RF on Smartstudio.



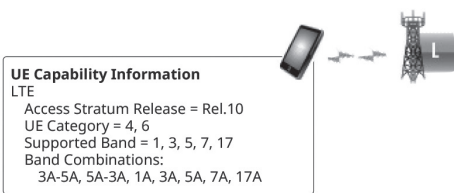
Setting Neighbor Cells

Neighbor cells can be set to display the mix of multiple cells for a UE graphically.



At-a-Glance Confirmation of UE Performance

Moving the mouse cursor over the SmartStudio UE icon displays a summary of the UE capability information for easy confirmation of the categories, bands, etc., supported by the UE under test.



UE Capability Information
 LTE
 Access Stratum Release = Rel.10
 UE Category = 4, 6
 Supported Band = 1, 3, 5, 7, 17
 Band Combinations:
 3A-5A, 5A-3A, 1A, 3A, 5A, 7A, 17A

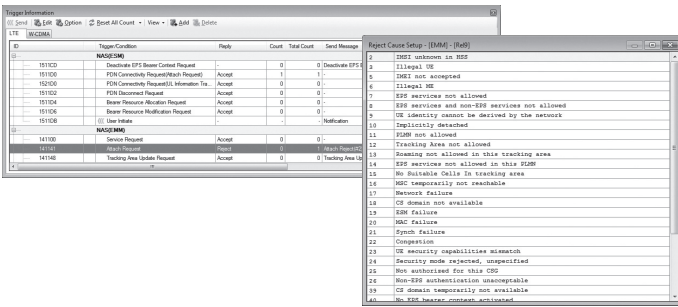
System	Information Element	Example
LTE	Access Stratum Release	Rel.12
	UE Category	4, 6, 9
	Supported Band	1, 2, 3, 4
	Band Combination	1A-2A, 3C
	Band Combination (Rel.11)	1A-2A, 3C
W-CDMA	Access Stratum Release	Rel.10
	HSDPA Category (Rel.7/Rel.8)	10 (14/24)
	HSUPA Category	6
	Supported Band	I, II
TD-SCDMA	Access Stratum Release	Rel.9
	HSDPA Category	15
	HSUPA Category	6
GSM/GPRS	Supported Band	a, f
	GPRS Multislot Class	12
	EGPRS Multislot Class	12
	Supported Band	GSM E

Creating Environment for Difficult Tests on Live Network

Some UE tests cannot be run on a commercial live network and are difficult on a test network. SmartStudio makes it easy to support these tests.

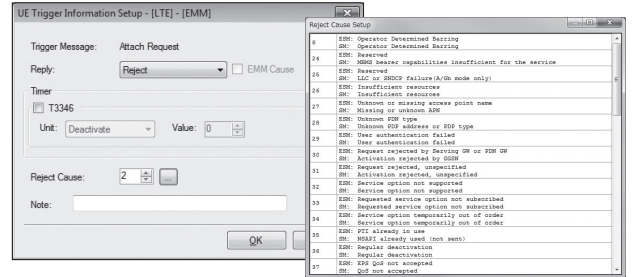
Reject Tests

- **Attach Reject/Ignore**
By setting specific messages, UE connection request can be rejected when the UE tries to connect the base station. In addition, the base station ignores messages from the UE by setting 'Ignore', enabling confirmation of the UE behavior when messages are ignored.



APN Reject

- By setting specific messages, UE connection request can be rejected when the UE connects to the network.



Emergency Alerts Tests

Using the built-in SmartStudio PWS center function supports sending of emergency alerts like earthquake and tsunami warnings to the UE*. ETWS/CMAS messages can be sent at any timing simply by selecting created/edited messages.

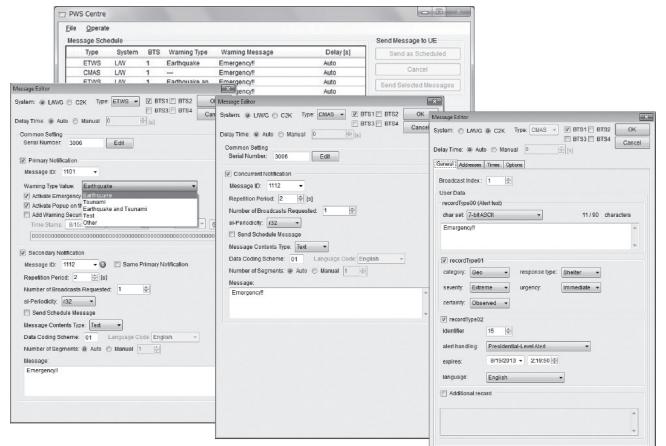
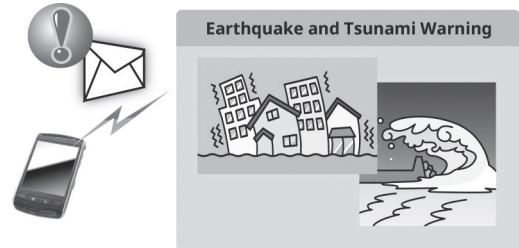
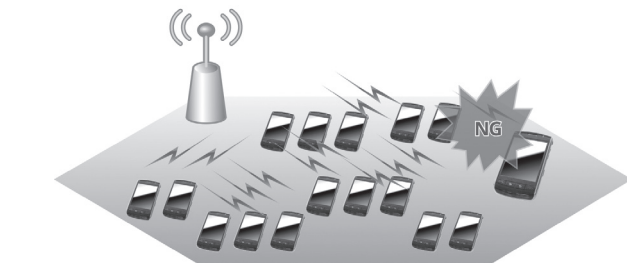
Barred Call and Emergency Call Tests

- **Access Class Control**
Sometimes, carriers limit access at events where there are too many people trying to call at once or during abnormally busy times like New Year. SmartStudio can configure an access control test environment, which is difficult to do on a live network.
- **Emergency Call Test**
Obviously, emergency calls cannot be tested on a live network but this is an essential test that must be performed. SmartStudio offers emergency call test settings and execution.

System	Control Method	Operation
W-CDMA/ GSM	Not Barred	No Access Control
	Barred	Call barring for all communications
	Emergency	Call barring for communications except emergency call

- ETWS (Earthquake and Tsunami Warning System used in Japan)
- CMAS (Commercial Mobile Alert System) North American Federal and state government system for sending standard-format text and audio messages to TV broadcast stations

*: Supports LTE/W-CDMA/GSM.

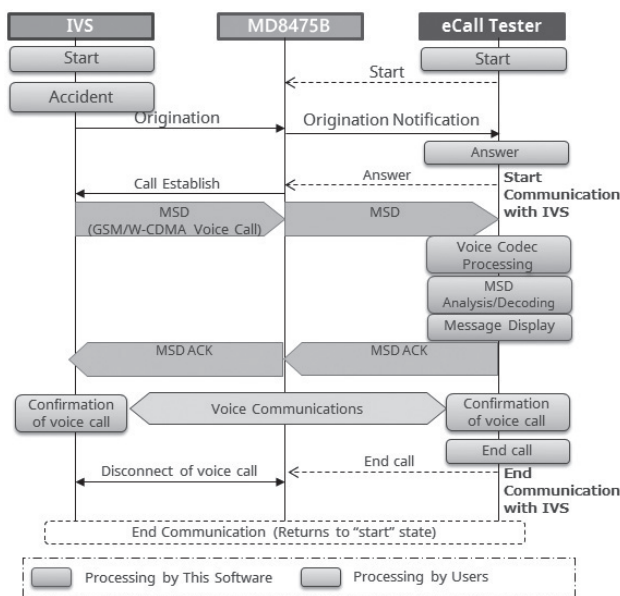
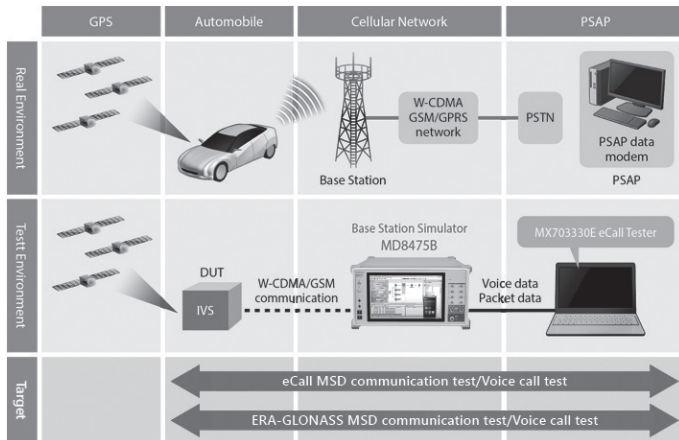


Configuring eCall Compliance to Application Test Environments

This solution makes it easy to configure an environment for emulating the eCall emergency rescue information system for automatically transmitting traffic accident information, including accident location, as well as for making voice calls to an emergency assistance Public Safety Answering Point (PSAP). Since emergency calls cannot be tested on live communications networks, combining the Signalling Tester MD8475B and eCall Tester MX703330E software is the perfect answer to testing IVS (In Vehicle System) communications functions.

eCall Tester MX703330E

The MX703330E emulates the eCall system IVS and PSAP communications sequence. It supports quasi-normal test of MSD timeout that are hard to simulate on a live network, as well as comparison of reference MSD (expected) and received data.



Features

- EN16454-compliant
- Implements communications sequence tests between IVS and PSAP
- Trace-displays status of eCall communications (MSD-Voice) and MSD communications (in-band modem)
- Displays in-band modem sequence and MSD decode data (conversion to meaningful data) execution results and outputs as data file
- Sets reference MSD (expected values) and displays results of comparison with received MSD
- Simulates base station operation in eCall Tester background, making specialist mobile protocol knowledge unnecessary for eCall evaluation
- Performs external control of eCall tester using SmartStudio Manager automation tool to perform PSAP operations

EU eCall Compliance Test

European Commission regulation (EU) 2017/79 approved sale of new M1 and N1 category in-vehicle eCall equipment from 31 March 2018. eCall is an emergency rescue information system for automatically transmitting traffic accident information, including accident location, as well as for making voice calls to an emergency assistance centre, or Public Safety Answering Point (PSAP).

The eCall Tester with EN 16454 PSAP server function supports configuration of the type-certification test environment. Additionally, the interactive GUI simplifies parameter changes, while display of real-time MSD analysis data improves the efficiency of pre-compliance testing, including debugging.

- * M1 Category: Passenger vehicles with driver and 8 or less seats
- * N1 Category: Trucks up to 3.5 tonnes max. load weight

MSD Result (sequence and decode)
Save: MSD result save at XML file

NG-eCall Test

This test evaluates the in-vehicle system (IVS) supporting next-generation eCall over LTE (NG-eCall). Previous eCall systems transmit eCall data (MSD) using 2G GSM and 3G UMTS networks based on the ETSI and CEN standards. On the other hand, European network operators are beginning to abandon GSM and UMTS networks after 10 years of operations as they transition to 4G LTE and 5G infrastructure. eCall systems are also following suit and are progressing with development of next-generation NG-eCall emergency response systems using 4G LTE and 5G. Adding the NG112 LTE eCall option MX703330E-041 to the MX703330E supports performance of the NG-eCall test and end-to-end voice evaluation defined in CEN/TS 17240: 2018 using a simulated LTE network. Furthermore, adding the NG112 LTE eCall Semi Normal Test Option MX703330E-042 facilitates support for the semi-normal test specified in the same standard.

Korean eCall Test

This test evaluates IVS supporting the South Korean eCall over LTE (using NG-eCall standard). Adding the South Korean eCall Option MX703330E-047 to the MX703330E supports performance of the South Korean eCall test and end-to-end voice evaluation defined in ITSK-WD-19003*.

- * ITSK-WD-19003: Standard related to methods for testing interface between ITS Korea eCall (uses NG-eCall standard) terminal and remote server.

eCall Application Testing

Some IVS have requirements for both calling and Telematics functions while driving. Figure shows the handover between base stations during driving.

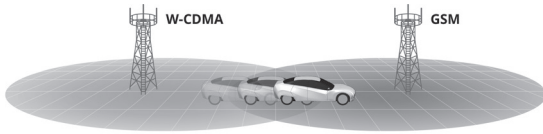
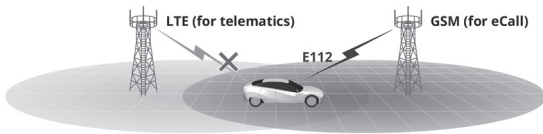


Figure shows the situation when the IVS switches from a 4G network connection used by Telematics services during driving to a 2G/3G network connection for eCall functions when an accident occurs. To emulate this type of test environment, the MD8475B and eCall Tester software perform the handover and CS Fallback switching tests in combination with the eCall function test.

Requires Multi-Cell Option MX703330E-061.



One-touch handover test settings save time and eliminate user worries. The following cells are supported.

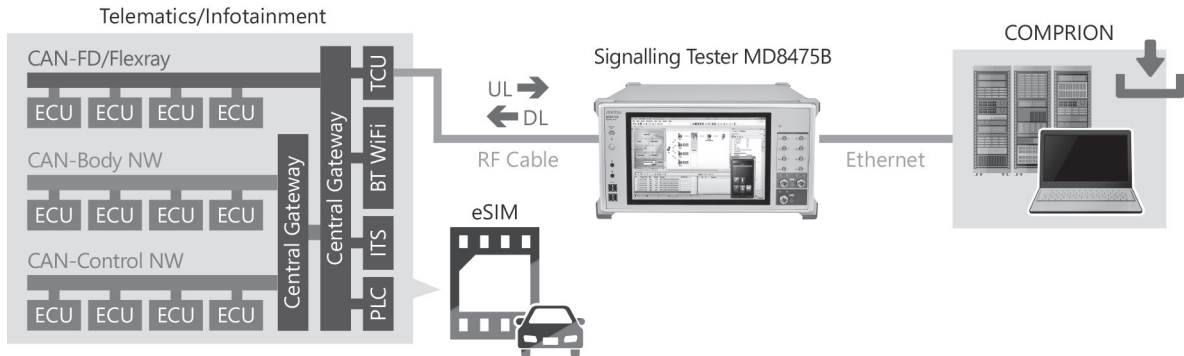
	LTE	W-CDMA	GSM
LTE*	—	✓	✓
W-CDMA	✓	✓	✓
GSM	✓	✓	✓

*: VoLTE not supported

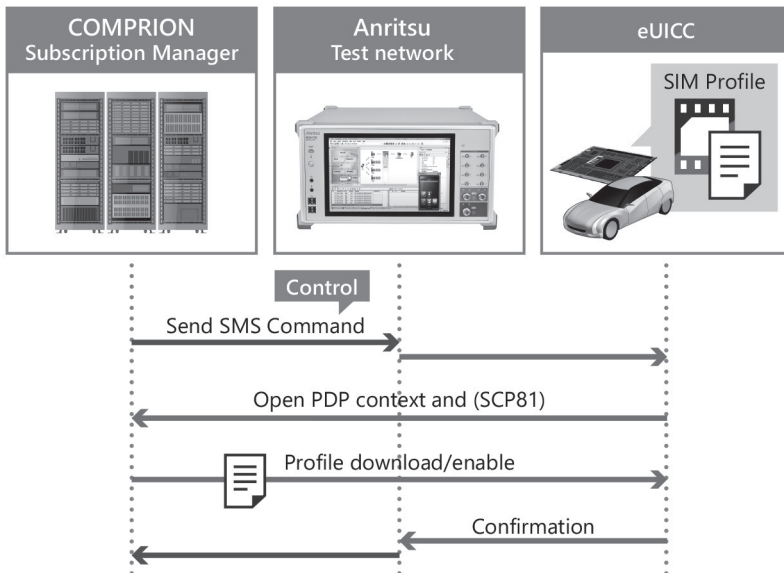
These tests help to greatly improve IVS quality and reliability.

eSIM OTA Verification Solution eUICC Profile Manager Z2002A

MD8475B with COMPRION's software eUICC Profile Manager can performing eSIM (Embedded SIM) test. eSIM allows the communication protocol information on a SIM to be changed via an OTA (Over the Air) environment.



Sequence Flow



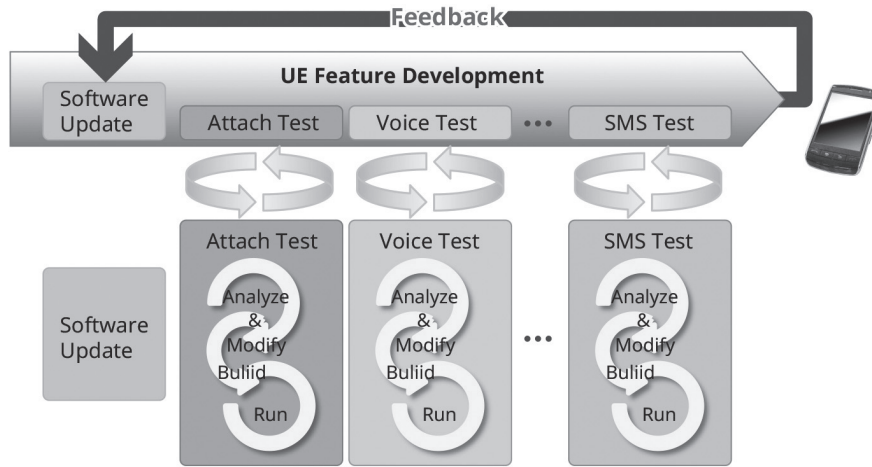
Z2002A include following Software and USB dongle 1pc made by COMPRION.

Model No.	Model name	Quantity
31000449	eUICC Profile Manager Package for Anritsu Z2002A	1

Automation Functions

Regression Tests Necessity

Verification of existing functions and regression testing are key elements of software update testing during UE development. Automated and repeated testing of known items to confirm the absence of new software bugs plays a major role in improving development efficiency and cutting costs.



Automated Testing with SmartStudio: SmartStudio Manager MX847503A

The SmartStudio Manager MX847503A software is for editing test sequences and running created test sequences automatically and continuously. This software automates manual testing using the SmartStudio MX847570A software. Automated, unmanned operation test improves efficiency. Additionally, Pass/Fail results can be reported along with the continuous test.

Test Sequence Editing Screen

1. Configure RAT & Network (SimParameters)
2. Configure BTS (Cell Parameters)
3. Start Simulation
4. Wait UE response

Test Sequence Continuous Execution Screen

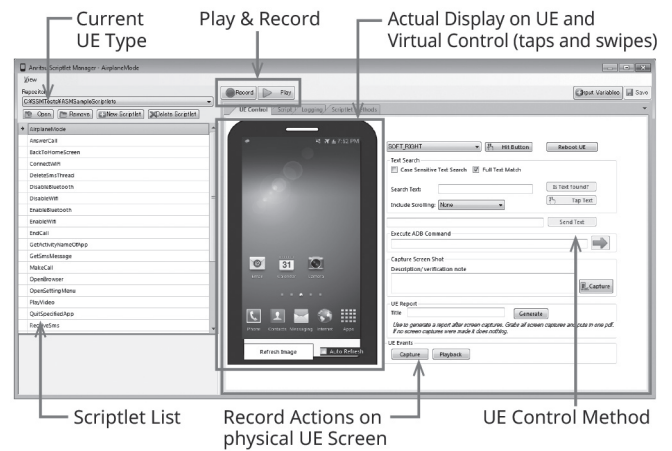
Execution Order	Result	Test	Duration	ID
0	✓	Service_L2W_CSFB_MOMR	5m. 14s	1
1	✓	Service_L2W_CSFB_MOMR	4m. 54s	1
2	✗	Registration_C_OutOfService	4m. 1s	3

Test Sequence Continuous Execution Results Display

Test Run Report (Failed)	Test Run Report (Passed)
Start: 2015-09-18 16:44:24, 15 seconds	Start: 2015-09-18 16:44:06, 15 seconds
Status: Failed, ran to completion	Status: Passed, ran to completion
Watermark: Not Watermarked	Watermark: Not Watermarked
Comments: n/a	Comments: n/a
Run name: SampleTestcase	Run name: SampleTestcase_2015-09-18_16:44:06
Criteria Evaluation: Path_Criteria_Group_1 None Achieved	Criteria Evaluation: Path_Criteria_Group_1 All Achieved
Criteria Detail: Path_Criteria_Group_1 / Path_Criteria_1 NOT achieved	Criteria Detail: Path_Criteria_Group_1 / Path_Criteria_1 Achieved
Version: n/a	Version: n/a
Last modified: 2015-09-18 16:2	Last modified: 2015-09-18 16:29:03
Procedure Library: SmartStudio Pro	Procedure Library: SmartStudio Procedures (1.13.0, 1.13.0)
Defaults Procedure: None	Defaults Procedure: None

**UE Operation Auto-Recording/Auto-Executing:
Smartphone Control Platform MX847504A**

The MX847504A software option can records Android OS smartphone operations and offers an environment for creating, editing and running UE automated control scripts. Regression and stable operation confirmation testing of UE are easy using the intuitive editing environment with pre-installed scripts and GUI.



Android™ is a trademark of Google Inc.

Regression Tests and Test Sequences

SmartStudio Manager has various test sequences over 180. These test sequences can be used to confirm basic UE operations, such as making and answering voice calls and SMS messages, as well as measuring throughput. Users can use the AT command interface and Smartphone Control Platform MX847504A to control the UE remotely and perform continuous testing without hands-on UE operation.

Test Sequences (extract)

Category	Procedure	Comment
Registration	Attach	Testing UE and base station registration, etc.
	Out of Service	
Voice/Packet/SMS	Voice	Basic UE tests such as voice, data, CFSB, etc.
	Packet	
	SMS over SGs	
	MOMR/MTNR CSFB	
PWS	ETWS Primary + Secondary Notification	Emergency message tests
	CMAS Concurrent Notification	
	CMAS	
Cell Barred	Cell Barred	Network restriction tests
	Access Class Barred	
	PSIST	
CS Emergency	CS emergency	Emergency call tests
	CS emergency CSFB	
Stress Test	Voice	Basic function tests and throughput tests
	Handover	
	Throughput testing	
Mobility	Cell Selection/Reselection	Handover tests
	Handover	
	MOMR/MTNR SRVCC	
WLAN Offload	Untrusted non-3GPP access	WLAN Offload tests
	Trusted non-3GPP access	
IMS/RCS	MO/MT SMS over IMS	IMS/RCS tests
	MOMR: Voice/Video Call Establishment/Release	
	RCS Registration	
TS 09	Stand-by test	TS 09 power consumption tests
	MOMR: Talk time Test	
	MTNR: Talk time Test	
	Packet Switch Transfer Test	
	Browsing Test	
	Streaming Content Test (Video/Audio)	
	Video Telephony Test	
FTP Download Test		



SmartStudio Test Functions

✓: Supported

Function	Description	MD8475B			
		LTE	W-CDMA*2	GSM*2	TD-SCDMA*2
General					
Position Registration*1	Connects UE and creates test environment	✓	✓	✓	✓
L1/L2 Counter	Counts values for each L1/L2 channel every second	✓	✓	—	✓
Throughput Counter	Simultaneously displays PHY layer and IP Throughput (SDU)	✓	✓	✓	✓
Trace	Displays events for each layer as arrows	✓	✓	✓	✓
Reject	Returns arbitrary reject message when UE connected	✓	✓	✓	✓
Neighbor Cell Setting	Reports information to UE about BTS adjacent to BTS under test	✓	✓	✓	✓
RF Related					
TRx Power Setting	Changes TRx power of BTS during Idle Communication	✓	✓	✓	✓
No Network Setting	Sets BTS Power output to OFF and switches UE to no network status	✓	✓	✓	✓
RF Monitor	Displays frequency, frequency error, and power for each channel such as PDSCH, PUSCH, etc.	✓	✓	✓	✓
TPC Setting	Changes TPC (Transmit Power Control) arbitrarily	✓	✓	✓	✓
AWGN	Sends AWGN in conjunction with normal signal	✓	✓	—	—
RF Measurement Options	Measures UE RF power at each second	✓	✓	✓	—
External Control					
Ethernet	Controls SmartStudio operation (parameter selection, start, etc.) from external PC	✓	✓	✓	✓
GPIO	Controls SmartStudio setting parameters from external PC	✓	✓	✓	✓
Voice/Video Communications					
LTE FDD/TDD					
VoLTE/Video Telephony Calling/Answering (Loopback)	Executes call test for UE supporting Voice over LTE/Video over LTE	✓			
Emergency Call/Originating System	Sets emergency call, and VoLTE/Video call control at LTE	✓			
Codec Change	Changes audio and video codecs arbitrarily and executes UE switchover test	✓			
LTE FDD/TDD, W-CDMA, GSM, TD-SCDMA					
CSFB/eCSFB*3	Auto-switches communication method when other system voice call received during LTE call	✓	✓	✓	✓
SRVCC*3	Performs seamless switch to CS voice call during VoLTE call	✓	✓	✓	—
W-CDMA, GSM, TD-SCDMA					
Voice Call/Answer/On-hook (Loopback/Echoback)	Performs loopback call test*4		✓	✓	✓
Voice Call/Answer/On-hook (Handset)	Performs call test using headset		✓	✓	✓
Emergency Call/Originating	Performs emergency call test with and without Test SIM		✓	✓	✓
Caller ID Setting	Sets Caller ID notification/non-notification/notification disabled/public phone/international call answer		✓	✓	✓
Call Blocking (Release99) <Barred>	Sets call conditions for Release99 for W-CDMA, GSM, TD-SCDMA and bars all calls		✓	✓	✓
Call Blocking (Release99) <Emergency>	Sets call conditions for Release99 for W-CDMA, GSM, TD-SCDMA and bars all calls except emergency calls		✓	✓	✓
W-CDMA, TD-SCDMA					
Videophone Call/Answer/On-hook (Loopback)	Performs loopback call test*4		✓		✓
Packet Data Communications					
IPv4 Packet Test	Performs data TRx using IPv4	✓	✓	✓	✓
IPv6 Packet Test	Performs data TRx using IPv6	✓	✓	✓	✓
Packet Preservation/Dormant Test	Releases RRC Connection while preserving PDP Context	✓	✓	—	✓
Multiple PDP Context/PDN Connect	Connects multiple PDN and performs multisession packet data test	✓	✓	—	—
State Change	Changes state from BTS during packet data communications	✓	✓	—	✓
IP Data Traffic Functions	Uses built-in packet generator to implement simple measurement system with automated high-reproducibility data throughput test	✓	✓	✓	✓
LTE FDD/TDD					
SISO/MIMO Packet Calling/Answering		✓			
SISO/MIMO Packet UE Side Disconnect	Connects server and performs application test using packet data communications	✓			
SISO/MIMO Packet Network Side Disconnect		✓			
DL2CC Carrier Aggregation	Performs DL2CC carrier application tests	✓			
DL3CC Carrier Aggregation	Performs DL3CC carrier application tests	✓			
DL4CC Carrier Aggregation	Performs DL4CC carrier application tests	✓			
DL5CC Carrier Aggregation	Performs DL5CC carrier application tests	✓			
UL2CC Carrier Aggregation	Performs UL2CC carrier application tests	✓*5			
FDD/TDD Joint Operation	Performs FDD and TDD Joint Operation test	✓*6			
W-CDMA					
W-CDMA/HSPA/HSPA Evolution Packet Calling/Answering			✓		
W-CDMA/HSPA/HSPA Evolution Packet UE Side Disconnect	Connects server and performs application test using packet data communications		✓		
W-CDMA/HSPA/HSPA Evolution Packet Network Side Disconnect			✓		
PPP Packet Calling	Performs DL2CC carrier application tests		✓		
PPP Packet UE Side Disconnect	Performs DL3CC carrier application tests		✓		
PPP Packet Network Side Disconnect	Performs UL2CC carrier application tests		✓		
GSM					
GPRS/EGPRS Packet Calling/Answering				✓	
GPRS/EGPRS Packet UE Side Disconnect	Connects server and performs application test using packet data communications			✓	
GPRS/EGPRS Packet Network Side Disconnect				✓	
TD-SCDMA					
TD-SCDMA/HSPA*7 Packet Calling/Answering					✓
TD-SCDMA/HSPA*7 Packet UE Side Disconnect	Connects server and performs application test using packet data communications				✓
TD-SCDMA/HSPA*7 Packet Network Side Disconnect					✓
Messaging					
ETWS Message Sending	Performs ETWS message send test during Idle or Communication state	✓	✓	—	—
CMAS Message Sending	Performs CMAS message send test during Idle or Communication state	✓	✓	—	—
CBS Message Sending	Performs CBS message send test during Idle or Communication state	—	✓	✓	—
SMS Message Sending/Receiving	Performs SMS (7 bit-ASCII, Unicode, Binary) test using PS and CS networks*4	✓	✓	✓	✓
SMS over IMS Test	Performs SMS send/receive test via IMS server	✓	—	—	—
SMS Message Continuous Sending	Sends selected multiple SMS to UE continuously	✓	✓	✓	✓
MMS Sending/Receiving*8	Performs MMS send/receive test	✓	✓	✓	✓

*1: Ciphering function not supported

*2: Support for installing the Enhanced Multi-signalling Unit (MD8475B-071) is expected in future.

*3: Only dual system configuration supported

*4: Two-way tests using two UEs not supported

*5: Limited to 50 Mbps throughput when MD8475B-070 installed

*6: Requires MD8475B-071

*7: DCH Measurement Occasion/Idle Interval Measurement function not supported

*8: Requires separate MMS server



System Configurations/Option/Software

Main Frame Options

Extended RF MD8475B-002

This option is required to simulate the operation of three or more base-station cells. It supports 8Tx/4RX using the MD8475B.

Fading IO Option MD8475B-004

Combining the Signalling Tester MD8430A with the fading option and the MD8475B supports configuration of a fading test environment.

IP Extension Option MD8475B-005

This option enables FTP throughput testing with multiple external servers.

Multi-cell Software MX847502B

This option is required when simultaneously activating two or more cells such as at handover tests within the same system, Inter-RAT tests between different systems, LTE Carrier Aggregation tests, etc.

Multimedia Interface Software MX847508B

This option is required when performing end-to-end voice tests with microphones and speakers (headset) connected to the MD8475B. It can be used for W-CDMA and GSM AMR-NB (AMR Narrowband), GSM EFR (Enhanced Full Rate Speech), FR (Full Rate Speech), and HR (Half Rate Speech) codecs.

AMR-WB MX847508B-001

This option supports the W-CDMA AMR-WB (AMR Wideband) codec. It requires the MX847508B.

Supported voice codec list

Supported Codecs	Multimedia Interface Software MX847508B	AMR-WB MX847508B-001
AMR-NB (W-CDMA/GSM)	✓	—
GSM-EFR (GSM)	✓	—
GSM-FR (GSM)	✓	—
GSM-HR (GSM)	✓	—
AMR-WB (W-CDMA)	—	✓

SmartStudio MX847570B

This software supports the user interface for scenario-less testing. In addition to offering functions such as sending and receiving SMS messages, sending and receiving ETWS/CMAS messages, making and receiving voice calls, and sending and receiving data packets, it also supports CSCF server functions required for IMS service tests.

• Support Service

MX847570B 1Year Support Service MX847570B-SS110

This service contract offers customers 1 year of support for technical enquiries as well as updates to the latest software versions adding extra functionality and bug fixes via downloads from the web page.

W-CDMA

• Basic Configuration (Voice/Video/Packet)

Multi-signalling Unit MD8475B-070
W-CDMA Simulation Software MX847510B
W-CDMA Option MX847570B-010

These are for basic W-CDMA configuration. These tests support voice, videophone, packet, and SMS tests.

• Options

HSPA Evolution/DC-HSDPA Option MX847510B-011
HSPA Evolution/DC-HSDPA Option MX847570B-011

These options support HSPA Evolution and DC-HSPA packet communications tests for high-speed packet services used by W-CDMA systems.

3GPP TS 25.306 Category List

HSDPA

HS-DSCH Category	HS-DSCH Codes	Minimum Inter-TTI	TB-Sizes	Total Number of Soft Channel Bits	Modulation	Maximum Throughput [bps]
5*	5	1	7298	57600	QPSK/16QAM	3649000
6	5	1	7298	67200	QPSK/16QAM	3649000
7*	10	1	14411	115200	QPSK/16QAM	7205500
8	10	1	14411	134400	QPSK/16QAM	7205500
9	15	1	20251	172800	QPSK/16QAM	10125500
10	15	1	27952	172800	QPSK/16QAM	13976000
12	5	1	3630	28800	QPSK	1815000
13	15	1	35280	259200	Not Applicable (dual cell operation not supported)	17640000
14	15	1	42192	259200		21096000
21	15	1	23370	345600	QPSK/16QAM	23370000
22	15	1	27952	345600	QPSK/16QAM	27952000
23	15	1	35280	518400	QPSK/16QAM 64QAM	35280000
24	15	1	42192	518400		42192000

HSUPA

E-DCH Category	E-DCH Codes	Minimum Spreading Factor	Support for TTI EDCH	TB-Sizes E-DCH TTI	Maximum Throughput [bps]
3	2	SF4	10 ms TTI	14484	1459500
5	2	SF2	10 ms TTI	20000	2918500
6	4	SF2	10 ms TTI	14484	5760000

*: Not supported when UE specifies a category



LTE

• Basic Configuration

- Multi-signalling Unit MD8475B-070
- Enhanced Multi-signalling Unit MD8475B-071
- LTE Simulation Software MX847550B
- LTE Option MX847570B-050

These are for basic LTE FDD/TDD configuration. It supports both FDD and TDD technologies. These tests support confirmation of connections with LTE UEs during SISO, packet communications, and SMS sending/receiving. In addition, multi-cell tests are supported by installing the Multi-cell Software MX847502B.

3GPP TS 36.306 V14.10.0 (2019-03) Category List
Downlink physical layer parameter values set by the field UE-Category

UE DL Category	Maximum number of DL-SCH transport block bits received within a TTI	Maximum number of bits of a DL-SCH transport block received within a TTI	Total number of soft channel bits	Maximum number of supported layers for spatial multiplexing in DL
DL Category M1	1000	1000	25344	1
DL Category M2	4008	4008	73152	1
DL Category 0	1000	1000	25344	1
DL Category 1 bis	10296	10296	250368	1
DL Category 4	150752	75376	1827072	2
DL Category 6	301504	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	3654144	2 or 4
DL Category 7	301504	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	3654144	2 or 4
DL Category 9	452256	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	5481216	2 or 4
DL Category 10	452256	149776 (4 layers, 64QAM) 75376 (2 layers, 64QAM)	5481216	2 or 4
DL Category 11	603008	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM)	7308288	2 or 4
DL Category 12	603008	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM)	7308288	2 or 4
DL Category 13	391632	195816 (4 layers, 256QAM) 97896 (2 layers, 256QAM)	3654144	2 or 4
DL Category 14	3916560	391656 (8 layers, 256QAM)	47431680	8
DL Category 15	749856-807744	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	9744384	2 or 4
DL Category 16	978960-1051360	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	12789504	2 or 4
DL Category 17	25065984	391656 (8 layers, 256QAM)	303562752	8
DL Category 18	1174752-1211616	[299856 (8 layers, 64QAM) 391656 (8 layers, 256QAM)] 149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	14616576	2 or 4 [or 8]

UE DL Category	Maximum number of DL-SCH transport block bits received within a TTI	Maximum number of bits of a DL-SCH transport block received within a TTI	Total number of soft channel bits	Maximum number of supported layers for spatial multiplexing in DL
DL Category 19	1566336-1658272	[299856 (8 layers, 64QAM) 391656 (8 layers, 256QAM)] 149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	19488768	2 or 4 [or 8]
DL Category 20	1948064-2019360	[299856 (8 layers, 64QAM) 391656 (8 layers, 256QAM)] 149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	24360960	2 or 4 [or 8]
DL Category 21	1348960-1413120	149776 (4 layers, 64QAM) 195816 (4 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 201936 (4 layers, 256QAM, if alternativeTBS-Index-r14 is supported) 75376 (2 layers, 64QAM) 97896 (2 layers, 256QAM, if alternativeTBS-Index-r14 is not supported) 100752 (2 layers, 256QAM, if alternativeTBS-Index-r14 is supported)	17052672	2 or 4

Uplink physical layer parameter values set by the field UE-Category

UE UL Category	Maximum number of UL-SCH transport block bits transmitted within a TTI	Maximum number of bits of an UL-SCH transport block transmitted within a TTI	Support for 64QAM in UL	Support for 256QAM in UL
UL Category M1	1000 or 2984	1000 or 2984	No	No
UL Category M2	6968	6968	No	No
UL Category 0	1000	1000	No	No
UL Category 1 bis	5160	5160	No	No
UL Category 3	51024	51024	No	No
UL Category 5	75376	75376	Yes	No
UL Category 7	102048	51024	No	No
UL Category 8	1497760	149776	Yes	No
UL Category 13	150752	75376	Yes	No
UL Category 14	9585664	149776	Yes	No
UL Category 15	226128	75376	Yes	No
UL Category 16	105528	105528	Yes	Yes
UL Category 17	2119360	211936	Yes	Yes
UL Category 18	211056	105528	Yes	Yes
UL Category 19	13563904	211936	Yes	Yes
UL Category 20	316584	105528	Yes	Yes
UL Category 21	301504	75376	Yes	No

* These UE Category tables show the case when MD8475B-071 is installed.



• Options

- LTE 2x2 MIMO Option MX847550B-020
This option adds 2x2 MIMO to the MX847550B.
- LTE 4x4 MIMO Option MX847550B-021
This option adds 4x4 MIMO to the MX847550B.
- LTE Licensed Assisted Access (LAA) Option MX847550B-030
This software option provides LTE Licensed Assisted Access (LAA) capability that can be used with the MIMO options and the Carrier Aggregation Options.
- LTE Carrier Aggregation Option MX847550B-040
This software option supports LTE 2CC Carrier Aggregation. It supports the 2CC SISO test environment. Additionally, installing the MX847550B-020 software supports the 2CC MIMO test environment.
- LTE Carrier Aggregation DL3CCs Option MX847550B-041
This software option supports LTE 3CC Carrier Aggregation. It supports the 3CC SISO test environment. Additionally, installing the MX847550B-020 software supports the 3CC MIMO test environment.
- LTE Carrier Aggregation DL4CCs Option MX847550B-042
This software option supports LTE 4CC Carrier Aggregation. It supports the 4CC SISO test environment. Additionally, installing the MX847550B-020 software supports the 4CC MIMO test environment.
- LTE Carrier Aggregation DL5CCs Option MX847550B-043
This software option supports LTE 5CC Carrier Aggregation. It supports the 5CC SISO test environment. Additionally, installing the MX847550B-020 software supports the 5CC MIMO test environment.
- LTE RoHC Option MX847550B-060
This option adds better compression algorithms to improve LTE IP packet transfer efficiency.

Supported Profiles

IP	Profile
0x0000	No compression (LTE)/Uncompressed (UMTS)
0x0001	RTP/UDP/IP
0x0002	UDP/IP

- LTE 20 Layers Extension Option MX847550B-070
This option enables LTE 20 Layers (LTE 5CC, 4x4 MIMO) testing. If this option is not installed, LTE 16 Layers (4x4 MIMO for 3CCs and 2x2 MIMO for 2CCs out of LTE 5CCs) is maximum.

GSM

- Basic Configuration
GSM Signalling Unit MD8475B-020
GSM/GPRS Simulation Software MX847520B
GSM Option MX847570B-020
This is the basic configuration for performing GSM/GPRS tests. It supports voice and packet communications tests, SMS sending and receiving, etc. Additionally, it can be used for evaluating application functions using EGPRS communications for EGPRS high-speed data communications.

Supported EGPRS Specifications

Layer 1	Frequency Bandwidth	850, 900, 1800, 1900 MHz
	Modulation & Coding Scheme	MCS 1, 2, 3, 4 (GMSK) MCS 5, 6, 7, 8, 9 (8PSK)
	Number of Slots	Up to Multi Slot Class 12 (DL: 4/UL: 4/SUM: 5)
	Channel Combination	Combination 11 & 13
Layer 2, 3	Broadcasting Control Channel	BCCH/CCCH, PBCCH/PCCH
	ARQ Type	Type 1
	Window Size	64 to 192
Standard		3GPP Release 99

**TD-SCDMA**

- Basic Configuration
 - TD-SCDMA Signalling Unit MD8475B-040
 - TD-SCDMA Simulation Software MX847540B
 - TD-SCDMA Option MX847570B-040
 These are for basic TD-SCDMA/TD-HSUPA*1 configuration which support voice, videophone, packet, and SMS tests.

3GPP TS 25.306

TD-HSDPA

HS-DSCH category	Maximum number of HSDSCH codes per timeslot	Maximum number of HSDSCH timeslots per TTI	Maximum number of HSDSCH transport channel bits can be received within an HSDSCH TTI	Total number of soft channel bits	Maximum Throughput [bps]
Category 1 to 3	16	2	2788	11264	557600
Category 4 to 6	16	2	5600	22528	1120000
Category 7 to 9	16	3	8416	33792	1688200
Category 10 to 12	16	4	11226	45056	2245200
Category 13 to 15	16	5	14043	56320	2808600

TD-HSUPA

E-DCH category	Maximum number of E-DCH timeslots per TTI	Maximum number of E-DCH transport channel bits that can be received within an E-DCH TTI	Maximum Throughput [bps]
Category 1	2*2	2754	550800
Category 2	3*2	4162	832400
Category 3	2*2	5532	1106400
Category 4	3*2	8348	1669600
Category 5	4*2	11160	2232000
Category 6	5*2	11160	2232000

*1: MX847570B supports Category 6 only.

*2: One timeslot supports two physical channels when 16QAM not used.

IMS Options**IMS Script Basic Option MX847570B-060**

This software supports scripting of the communication procedure between the test UE and CSCF server using a ladder sequence to provide a very flexible and expandable test environment.

XCAP Script Option MX847570B-061

This option provides a test environment with high flexibility and expandability for creating scripts using a ladder sequence to edit XCAP messages between the UE and server without the need to prepare an actual server.

IMS Log Import Option MX847570B-062

This software option enables importing Wireshark logs, and create IMS script automatically. This Script is editable using Add-in Sever window. This option help flexible evaluation of IMS.

Extended CSCF Option MX847570B-080

This software option adds functions for calling from the network to UE as well as extended functions for CSCF-server-side network congestion and no response status.

IMS Supplementary Service Option MX847570B-081

This software option adds other service tests, including VoLTE caller ID display, call forwarding, call holding, etc.

RCS Basic Option MX847570B-083

This software option simulates RCS services. It is used to perform tests including RCS Configuration, Registration, Instant Messaging, etc.

GBA Authentication Option MX847570B-084

This option has the 3GPP GBA Authentication algorithm, authentication procedure and parameter settings for simulating GBA operations.

IMS Early Media Option MX847570B-085

This software supports IMS Early Media sequence tests. It can be used to confirm customized call tone services at the network side, such as NRBT (Network Ring Back Tone) and CAT (Customized Alerting Tone).

RTP Frame Control Option MX847570B-086

This option is for controlling media data (RTP packets) during VoLTE communications. It can be used to configure a voice environment in the MUTE status and with fixed data; a measurement environment can be configured for abnormal audio quality verification and battery power consumption tests in a fixed state. This option also supports UN-R144 compliant VoLTE (EVS) audio call tests. It can be used for WB AMR 12.65 kbps and EVS 13.2 kbps codecs.

- Support Service (IMS options)

MX847570B-060 1-Year Technical Support Service MX847570B-TS160
This contract offers customers support for technical enquiries for 1 year.

MX847570B-061 1 Year Technical Support Service MX847570B-TS161
This contract offers customers support for technical enquiries for 1 year.

WLAN Offload Options**WLAN Offload Basic Option MX847570B-070**

This software option provides an EAP authentication server for performing EAP over RADIUS communications (EAP-SIM/EAP-AKA) between a WLAN access point and the EAP authentication server. Additionally, data access by the physical bearers is displayed to verify the 3GPP/WLAN switchover.

ePDG Option MX847570B-071

This software option provides an ePDG server for testing the UE functions at Untrusted non-3GPP Access by running IKEv2 key exchanges and IPsec communications between the UE and ePDG. It requires the MX847570B-070 option as well.

ANDSF Option MX847570B-072

This software option provides the ANDSF function for testing the UE functions after ANDSF policy distribution to the UE. It requires the MX847570B-070 options as well.

Extended ePDG Option MX847570B-073

This software option supports configuration of an ePDG status fault test environment for inserting errors into the ePDG sequence, setting timeouts, etc. Additionally, this option can be used to support Fast Re-Authentication (EAP-SIM/EAP-AKA) tests without the need to generate UE-side authentication keys. It requires the MX847570B-070/MX847570B-071.



eCall Options

eCall Tester (USB License) MX703330E-PL010
eCall Tester (Software License) MX703330E-PL020
This option simulates the PSAP used by eCall services to support the eCall sequence (MSD call → Voice call) between the IVS and PSAP at a road accident.

The following test standards are supported:

- TS 26 .267 V8.6.0 (2011-03)
- TS 26 .268 V8.6.0 (2011-03)
- EN15722: 2015
- EN16062: 2015
- EN16454: 2015
- ISO3779: 2009

This option can be used as a test environment for model authentication in accordance with the EN16454 recommendations. This option provides audio replay and record functions. The MX703330E-PL010 license is supplied using a USB stick (dongle); use it by inserting the USB dongle into the PC. The MX703330E-PL020 license is supplied as software; use it by installing the software in the PC without using a USB dongle. Either license method can be selected.

MSD ERA GLONASS Option MX703330E-031

This option supports the MSD data communications function over SMS used by the ERA-GLONASS system
The following test standards are supported:

- GOST R 54619-2011
- GOST R 54620-2011
- GOST R 54721-2011
- GOST R 55530-2013

EGTS Server ERA GLONASS Option MX703330E-032

This option provides a test environment to send/receive and encode/decode EGTS messages defined in the GOST R 54619/54620. MX703330E-031 is separately required.

NG112 LTE eCall Option MX703330E-041

This option provides functional tests for MSD data communication and voice call over IMS defined in the CEN/TS 17240: 2018 standard.

NG112 LTE eCall Semi Normal test Option MX703330E-042

Supports semi-normal test defined in CEN/TS 17240: 2018.

South Korean eCall Option MX703330E-047

Supports South Korean eCall test and end-to-end voice evaluation defined in ITSK-WD-19003.

Multi-Cell Option MX703330E-061

This option provides the handover test environment required when setting two or more cells as well as the CS Fallback test environment at the eCall environment. Practical eCall module tests are supported using this option.

The cell combinations are as follows:

	LTE	W-CDMA	GSM
LTE*	—	✓	✓
W-CDMA	✓	✓	✓
GSM	✓	✓	✓

*: VoLTE is not supported

• Support Service

MX703330E 1-Year Support Service MX703330E-SS110

This service contract offers customers 1 year of support for technical enquiries as well as updates to the latest software versions adding extra functionality and bug fixes via downloads from the web page.

SSM Test PKG European eCall MX847503A-601

This test package provides automated test environment. Opening the test case on the SSM, it shows test procedures of test items defined in the (EC) 2017/79 and EN16454, and automatically configures the setting of MD8475B and eCall tester. This test package also has report functions for each standards.

SSM Test PKG GOST 33467 MX847503A-701

This test package provides automated test environment. Opening the test case on the SSM, it shows test procedures of test items defined in the GOST33467, and automatically configures the setting of MD8475B and eCall tester. This test package also has report functions for each standards.

Scenario Tools

SIDE Software MX847580B
SIP Option MX847580B-018

These software are for executing scenarios created using the MX843080A Scenario Integrated Development Environment in combination with the MX847510B, MX847520B, and MX847550B software.

Ciphering Option

W-CDMA Ciphering Option MX847510B-050

This option adds the W-CDMA ciphering function*1,*2 and supports for KASUMI (3GPP-recommended algorithm).

GSM/GPRS Ciphering Option MX847520B-050

This option adds the GSM/GPRS ciphering function*1,*2 and supports both the GSM A5/1, A5/2, and A5/3 ciphering algorithms as well as the GPRS GEA/1, GEA/2, and GEA/3 ciphering algorithms.

TD-SCDMA Ciphering Option MX847540B-050

This option adds the TD-SCDMA ciphering function*1,*2 and supports SNOW 3G (3GPP-recommended algorithm).

LTE Ciphering Option MX847550B-050

This option adds the LTE ciphering function*1,*2 and supports SNOW 3G (3GPP-recommended algorithm) and AES.

*1: Does not work with MX847570B.

*2: The Integrity Algorithm does not require this option.

Upgrade Kits*

- MD8475A to MD8475B Upgrade MD8475B-UG101
- MD8475A to MD8475B Upgrade (with Ciphering) MD8475B-UG102
- MD8475A to MD8475B Upgrade (with SIDE) MD8475B-UG103
- MD8475A to MD8475B Upgrade (with Ciphering/SIDE) MD8475B-UG104
- Windows 7 to Windows 10 Upgrade MD8475B-UG105
- MD8475A to MD8475B Upgrade MD8475B-UG201
- MD8475A to MD8475B Upgrade (with Ciphering) MD8475B-UG202
- MD8475A to MD8475B Upgrade (with SIDE) MD8475B-UG203
- MD8475A to MD8475B Upgrade (with Ciphering/SIDE) MD8475B-UG204
- Windows 7 to Windows 10 Upgrade MD8475B-UG205

These retrofit kits upgrade the MD8475A in use to the MD8475B.

MSU Upgrade MD8475B-UG170

MSU Upgrade MD8475B-UG270

When upgrading the MD8475A in use to the MD8475B specifications, if a legacy unit such as the MD8475A-010 or MD8475A-040 is installed that cannot be transferred to the MD8475B-070 Multi-signalling Unit, the legacy unit must be changed to the MD8475B-070 with these retrofit kits.

*: Upgrade kit models vary according to the configuration of the MD8475A options in use; contact our sales section for more details.

eMSU Upgrade MD8475B-UG171

eMSU Upgrade MD8475B-UG271

The MD8475A-011, MD8475A-050 and MD8475A-070 can be changed to the MD8475B-071 when upgrading the MD8475A to the MD8475B.

eMSU Upgrade MD8475B-UG179

eMSU Upgrade MD8475B-UG279

The MD8475B-070 can be changed to the MD8475B-071.

Automation Tool

SmartStudio Manager MX847503A

This option increases the efficiency of evaluations by automating manual tests performed by the MX847570B SmartStudio software. In addition, the package includes test sequences required for evaluating basic functions.

Smartphone Control Platform MX847504A

Using this option, Android OS smartphone operations can be recorded via ADB and UE automated control scripts can be created, edited and run. As well as supporting automated control from the MX847503A, two-way automatic control of the measuring instrument and UE supports an operator-free test environment for higher test efficiency.



SmartStudio System Configuration

System		LTE		W-CDMA	TD-SCDMA	GSM
		LTE-A	LTE			
Unit		Signalling Tester MD8475B				
Unit Option		Extended RF MD8475B-002				
		Fading IO Option MD8475B-004				
Platform Software		Multi-cell Software MX847502B				
		—			Multimedia Interface Software MX847508B	
		—			AMR-WB MX847508B-001	—
Basic Configuration	Hardware	Multi Signalling Unit MD8475B-070				GSM Signalling Unit MD8475B-020
	Software	Enhanced Multi-signalling Unit MD8475B-071		—	—	—
		LTE Simulation Software MX847550B		W-CDMA Simulation Software MX847510B	TD-SCDMA Simulation Software MX847540B	GSM/GPRS Simulation Software MX847520B
Options	LTE 2x2 MIMO Option MX847550B-020		—	HSPA Evolution/ DC-HSDPA Option MX847510B-011	—	—
	LTE 4x4 MIMO Option MX847550B-021					
	LAA Option MX847550B-030					
	LTE Carrier Aggregation Option MX847550B-040					
	LTE Carrier Aggregation DL3CCs Option MX847550B-041					
	LTE Carrier Aggregation DL4CCs Option MX847550B-042					
	LTE Carrier Aggregation DL5CCs Option MX847550B-043					
LTE RoHC Option MX847550B-060						
Support Service		MX847570B 1 Year Support Service MX847570B-SS110				
User Interface		SmartStudio MX847570B				
SmartStudio Licence	System Option	LTE Option MX847570B-050		W-CDMA Option MX847570B-010	TD-SCDMA Option MX847570B-040	GSM Option MX847570B-020
		LTE Carrier Aggregation Option MX847570B-051		HSPA Evolution/ DC-HSDPA Option MX847570B-011		
		LTE Licensed Assisted Access (LAA) Option MX847570B-052				
	IMS	Extended CSCF Option MX847570B-080				
		IMS Supplementary Service Option MX847570B-081				
		RCS Basic Option MX847570B-083				
		GBA Authentication Option MX847570B-084				
		IMS Early Media Option MX847570B-085				
	WLAN	RTP Frame Control Option MX847570B-086				
		WLAN Offload Basic Option MX847570B-070				
		ePDG Option MX847570B-071				
		ANDSF Option MX847570B-072				
	Scripting Option	Extended ePDG Option MX847570B-073				
IMS Script Basic Option MX847570B-060						
Technical Support Service	XCAP Script Option MX847570B-061					
	MX847570B-060 1 Year Technical Support Service MX847570B-TS160					
		MX847570B-061 1 Year Technical Support Service MX847570B-TS161				
Remote Interface		Quick TRX Diagnosis MX847506B				
		SmartStudio Manager MX847503A				
		Smartphone Control Platform MX847504A				
eCall Option	eCall Tester (USB License) MX703330E-PL010		eCall Tester (USB License) MX703330E-PL010		—	eCall Tester (USB License) MX703330E-PL010
	eCall Tester (Software License) MX703330E-PL020		eCall Tester (Software License) MX703330E-PL020		—	eCall Tester (Software License) MX703330E-PL020
	—		MSD ERA GLONASS Option MX703330E-031		—	MSD ERA GLONASS Option MX703330E-031
	—		EGTS Server ERA GLONASS Option MX703330E-032		—	EGTS Server ERA GLONASS Option MX703330E-032
	NG112 LTE eCall Option MX703330E-041		—		—	—
	NG112 LTE eCall Semi Normal Test Option MX703330E-042		—		—	—
	South Korean eCall Option MX703330E-047		—		—	—
	Multi-Cell Option MX703330E-061		Multi-Cell Option MX703330E-061		—	Multi-Cell Option MX703330E-061
MX703330E		MX703330E		—	MX703330E	
1-Year Support Service MX703330E-SS110		1-Year Support Service MX703330E-SS110		—	1-Year Support Service MX703330E-SS110	



Specifications

RF Connector	<p>RF Input/Output connector (Main, Aux 1, Aux 2) Connector: N (j) type, Impedance: 50Ω VSWR (Main): ≤1.9 (350 MHz to 3.8 GHz), ≤2.0 (3.8 GHz to 6.0 GHz) VSWR (Aux1, 2): ≤1.5 (350 MHz to 3.8 GHz), ≤1.6 (3.8 GHz to 6.0 GHz) Output connector (DL Output 1 to 8) Connector: SMA (j) type, Impedance: 50Ω VSWR: ≤1.5 (350 MHz to 3.8 GHz), ≤1.6 (3.8 GHz to 6.0 GHz)</p> <p>Reference oscillator Frequency: 10 MHz Level: TTL level Connector: BNC (j) type Startup characteristics: $\leq 5 \times 10^{-8}$ (10 minutes after power-on, referenced to frequency 24 hours after power-on) Aging rate: 2×10^{-8}/day, $\leq 1 \times 10^{-7}$/year (referenced to frequency 24 hours after power-on) Temperature characteristics: $\leq 5 \times 10^{-8}$ Frequency Accuracy at Shipment: $\pm 2.2 \times 10^{-8}$ (At +20°C to +30°C, 1 hour after power-up)</p> <p>External reference input Frequency: 10 MHz, Acceptable frequency range: ±1.0 ppm, Level: ≥0 dBm, Impedance: 50Ω, Connector: BNC (j) type</p>	
Transmission Characteristics	<p>Frequency Frequency range: 350 MHz to 6.0 GHz Setting resolution: 100 kHz (Depending on MX847501B used) Accuracy: Based on reference oscillator accuracy</p> <p>Output level Level range: (Main, Aux1, Aux2): LTE : -130 to -27 dBm (350 MHz to 3.8 GHz), -130 to -32 dBm (3.8 GHz to 6.0 GHz) W-CDMA : -130 to -27 dBm (350 MHz to 3.6 GHz) Others: -130 to -25 dBm (350 MHz to 3.6 GHz) Level Range (DL Output 1 to 8): LTE : -115 to -5 dBm (350 MHz to 3.8 GHz), -115 to -10 dBm (3.8 GHz to 6.0 GHz) W-CDMA: -115 to -5 dBm (350 MHz to 3.6 GHz) Others: -115 to -3 dBm (350 MHz to 3.6 GHz)</p> <p>Resolution: 0.1 dB Level Accuracy (Main): -120 dBm ≤ Output Level, after CAL, excluding other effects of internal signal generator ±1.7 dB (350 MHz to 3.8 GHz, +20°C to +30°C) ±2.0 dB (3.8 GHz to 6.0 GHz, +20°C to +30°C) Level Accuracy (Aux 1, Aux 2): -120 dBm ≤ Output Level, after CAL, excluding other effects of internal signal generator ±1.0 dB ±1.0 dB (350 MHz to 3.8 GHz, +20°C to +30°C) ±1.3 dB (3.8 GHz to 6.0 GHz, +20°C to +30°C) Level Accuracy (DL Output 1 to 8): -110 dBm ≤ Output Level, after CAL ±1.0 dB (350 MHz to 3.8 GHz, +20°C to +30°C) ±1.3 dB (3.8 GHz to 6.0 GHz, +20°C to +30°C)</p> <p>Signal purity Non-harmonic spurious: ≤-30 dBc (at ≥100 kHz frequency offset) Harmonics: ≤-25 dBc</p> <p>Modulation Accuracy : At +20°C to +30°C W-CDMA: ≤3.5%rms (350 MHz to 2.7 GHz) GSM: ≤1.5%rms (350 MHz to 2.7 GHz) LTE: ≤3.5%rms (400 MHz to 6.0 GHz)</p>	
Reception Characteristics	<p>Frequency Frequency range: 350 MHz to 6.0 GHz Setting resolution: 100 kHz (Depending on MX847501B used)</p> <p>Level Maximum input level: +35 dBm (Average)</p>	
General	<p>Display: Color TFT LCD screen, 12.1 inches (WXGA), 1280 × 800 dots</p> <p>External interface Trigger I/O: BNC (j) Call Processing Timing I/O: 15-pin mini D-Sub (f) connector Call Processing Ethernet A/B: RJ-45 connector, 10Base-T/100Base-TX/1000Base-T Measure Ethernet: RJ-45 connector, 10Base-T/100Base-TX/1000Base-T Headphone: 3.5-mm dia. headphone jack Microphone: 3.5-mm dia. microphone jack USB (Type-A) × 2 (Back Panel) USB (Type-A) × 4 (Front Panel) GPIB: IEEE488 connector VGA: Mini D-Sub connector Ethernet 0/1: RJ-45 connector, 10Base-T/100Base-TX/1000Base-T ARB : Mini D-sub connector Sync Input: BNC (j) × 1, Output : BNC (j) × 2</p>	
Power Supply	<p>100 VAC to 120 VAC (±10%)/200 VAC to 240 VAC (-10%/+10%, Max.: 250 Vac), 50 Hz to 60 Hz (Rating), ≤1350 VA (Max.)</p>	
Dimensions and Mass	<p>426 (W) × 221.5 (H) × 578 (D) mm (excl. protrusions), <40 kg (with all options)</p>	
Temperature Range & Humidity	<p>Operation: +5°C to +40°C, Storage: -20°C to +60°C, ≤90% (no condensation)</p>	
CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018



Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MD8475B	Main Frame Signalling Tester
MX847500B MX847501B J1211 P0031A P0035B P0035B7 J1440A Z0541A Z0975A A0131A	Standard Accessories Platform Software Control Software POWER CORD.3M USB Memory W-CDMA/GSM Test USIM (Standard UICC size) W-CDMA/GSM Test USIM (Micro UICC Size) LAN Cable (3 m) USB Mouse Keyboard (USB) Handset
MD8475B-002 MD8475B-004 MD8475B-005	Hardware Options Extended RF Fading IO Option IP Extension Option
MX847502B MX847506B MX847508B MX847508B-001	Software Options Multi-cell Software Quick TRX Diagnosis Multimedia Interface Software AMR-WB
MX847570B MX847570B-010 MX847570B-011 MX847570B-020 MX847570B-050 MX847570B-051 MX847570B-052 MX847570B-060 MX847570B-061 MX847570B-062 MX847570B-070 MX847570B-071 MX847570B-072 MX847570B-073 MX847570B-080 MX847570B-081 MX847570B-083 MX847570B-084 MX847570B-085 MX847570B-086	User Interface SmartStudio W-CDMA Option HSPA Evolution/DC-HSDPA Option GSM Option LTE Option LTE Carrier Aggregation Option LTE Licensed Assisted Access (LAA) Option IMS Script Basic Option XCAP Script Option IMS Log Import Option WLAN Offload Basic Option ePDG Option ANDSF Option Extended ePDG Option Extended CSCF Option IMS Supplementary Service Option RCS Basic Option GBA Authentication Option IMS Early Media Option RTP Frame Control Option
MD8475B-070 MD8475B-071 MX847550B MX847550B-020 MX847550B-021 MX847550B-030 MX847550B-040 MX847550B-041 MX847550B-042 MX847550B-043 MX847550B-060 MX847550B-070 MX847550B-090	LTE System Multi-signalling Unit Enhanced Multi-signalling Unit LTE Simulation Software LTE 2x2 MIMO Option LTE 4x4 MIMO Option LTE Licensed Assisted Access (LAA) Option LTE Carrier Aggregation Option LTE Carrier Aggregation DL3CCs Option LTE Carrier Aggregation DL4CCs Option LTE Carrier Aggregation DL5CCs Option LTE RoHC Option LTE 20 Layers Extension Option LTE Anchor For 5G NR Option
MD8475B-070 MX847510B MX847510B-011	W-CDMA System Multi-signalling Unit W-CDMA Simulation Software HSPA Evolution/DC-HSDPA Option
MD8475B-020 MX847520B	GSM System GSM Signalling Unit GSM/GPRS Simulation Software
MD8475B-070 MD8475B-071 MX847540B	TD-SCDMA System Multi-signalling Unit Enhanced Multi-signalling Unit TD-SCDMA Simulation Software
MX847503A MX847503A-601 MX847503A-701 MX847503A-923 MX847504A Z1813A	Automation Tools SmartStudio Manager SSM Test PKG European eCall SSM Test PKG GOST 33467 eCall Tester Control Library Smartphone Control Platform USB Dongle (Automation)
MX847580B MX847580B-018	Scenario Tools SIDE Execution Software SIP Execution Option

Model/Order No.	Name
MX703330E-PL010 MX703330E-PL020 MX703330E-UP020 MX703330E-031 MX703330E-032 MX703330E-041 MX703330E-042 MX703330E-047 MX703330E-061	Automotive Applications eCall Tester (USB License) eCall Tester (Software License) eCall Tester (Switching from USB license to software license) MSD ERA GLONASS Option EGTS Server ERA GLONASS Option NG112 LTE eCall Option NG112 LTE eCall Semi Normal Test Option South Korean eCall Option Multi-Cell Option
MX847510B-050 MX847520B-050 MX847540B-050 MX847550B-050	Ciphering Options W-CDMA Ciphering Option GSM/GPRS Ciphering Option TD-SCDMA Ciphering Option LTE Ciphering Option
MX847570B-SS110 MX703330E-SS110	Software Support Services MX847570B 1 Year Support Service MX703330E 1 Year Support Service
MX847570B-TS160 MX847570B-TS161 MX703330E-TS110	Technical Support Services MX847570B-060 1 Year Technical Support Service MX847570B-061 1 Year Technical Support Service MX703330E 1 Year Technical Support Service
MD8475B-UG□01 MD8475B-UG□02 MD8475B-UG□03 MD8475B-UG□04 MD8475B-UG□05 MD8475B-UG□70 MD8475B-UG□71 MD8475B-UG□79	Upgrade Kits* MD8475A to MD8475B Upgrade MD8475A to MD8475B Upgrade (with Ciphering) MD8475A to MD8475B Upgrade (with SIDE) MD8475A to MD8475B Upgrade (with Ciphering/SIDE) Windows 7 to Windows 10 Upgrade MSU Upgrade eMSU Upgrade (MD8475A to MD8475B) eMSU Upgrade (MD8475B-070 to MD8475B-071)
MD8475B-ES210 MD8475B-ES310 MD8475B-ES510	Warranty 2 Years Extended Warranty Service 3 Years Extended Warranty Service 5 Years Extended Warranty Service
B0703A B0726A J0004 J0127A J0127B J0322B J0322D J0658 J0576B J0576D J1263 J1287 J1333A J1398A J1416A J1440A J1489A J1524A J1609A J1651A J1674A J1674E J1674K MN8150A P0035B P0035B7 P0135C6 P0135C7 P0250C6 P0250C7 P0260C6 P0260C7 Z0749 Z1858A Z1859A Z1908E Z1919B	Application Parts Rack Mount Kit Carrying Case Coaxial Adaptor (N (male)-SMA (female)) Coaxial Cord, 1.0 m (BNC-P · RG58A/U · BNC-P) Coaxial Cord, 2.0 m (BNC-P · RG58A/U · BNC-P) Coaxial Cord, 1.0 m Coaxial Cord, 2.0 m Adapter (SMA male-female L-type) Coaxial Cord, 1.0 m (N-P · 5D-2W · N-P) Coaxial Cord, 2.0 m (N-P · 5D-2W · N-P) W-CDMA Interface Cable (UE connection cable) HDD-SUB15P Cable (milli-inch, for connecting MN8110B) HDD-SUB15P Crossover Cable (inch) N-SMA ADAPTOR LVDS Cable LAN Cable PP2S OUTPUT CABLE Dsub15-BNC Conversion Cable Signal Divider MD8475A Sync In Cable (for 3CC Test) SMA/P-SMA/P Soft Rigid Cable SMA/P-SMA/P Soft Rigid Cable (5 pcs) SMA/P-SMA/P Soft Rigid Cable (10 pcs) RF Combiner Unit W-CDMA/GSM Test USIM (Standard UICC Size) W-CDMA/GSM Test USIM (Micro UICC Size) Anritsu Test UICC GA (nano UICC Size) Anritsu Test UICC GA (Micro UICC Size) Anritsu Test UICC GT (nano UICC Size) Anritsu Test UICC GT (Micro UICC Size) Anritsu Test UICC GM (nano UICC Size) Anritsu Test UICC GM (Micro UICC Size) MN8110B + Inch Screw Cable (for call processing I/O) Divider (2 way) Divider (3 way) Standard Desktop for SSM Standard Desktop for WLAN

*: MD8475B-UG □ ##

□: Select from the following according to the option type.

1: Retrofit option (Must be returned to factory in Japan)

2: Retrofit option (Must be returned to service center outside of Japan)

Radio Communication Analyzer

MT8821C

30 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (Option)

Remote Control
GPIOB | Ethernet

Tomorrow's Wireless Test Capability Today



The Radio Communication Analyzer MT8821C is designed for R&D into mobile devices (User Equipment: UE), such as smartphones, tablets and M2M modules. It builds on the technologies of its popular predecessor, the MT8820C used worldwide by UE and chipset vendors. It operates as a base station simulator using standard call processing sequences compliant with test standards to support a versatile test lineup, starting with RF tests.

Support Systems

- LTE/LTE-Advanced/Cat-M/NB-IoT (Cat-NB1, 2)
- W-CDMA/HSPA
- GSM/EGPRS
- TD-SCDMA/HSPA

More Efficient RF Testing Supporting LTE-Advanced UE Measurement

With the introduction of LTE-Advanced, wireless communications are starting to use Carrier Aggregation (CA) technology offering continuing extendibility to wider bandwidths and more frequency bands. Additionally, such as 2x2 and 4x4 Multiple Input Multiple Output (MIMO) to improve frequency usage efficiency, means that measurement technologies are also becoming increasingly complex.

Enhanced GUI for Efficient Operability

Better operability and visibility have been achieved using an enhanced next-generation GUI and easy-to-use large touch panel. As well as operating screens by touching and swiping, easy operation is supported by one-touch switching between grouped/individual graph lists and results outline/detail displays. Further, the efficiency of complex setting work is improved by a parameter search function, bookmarking function for commonly used parameters, and a function for setting test parameters using one-touch button operation.

3.2 Gbps
 PHY TPWT

Supports physical layer downlink maximum throughput 3.2 Gbps measurement*
 *: Under the condition of 8CC 4x4 MIMO (32 layer)

8CA
 4x4MIMO

Supports LTE-Advanced 8CC 4x4 MIMO tests

4CA
 2x2MIMO

Supports LTE-Advanced 4CC 2x2 MIMO tests in one unit

160
 MHz BW

160 MHz wide frequency bandwidth (Generator/Analyzer) supports evolving UE technologies

Cellular IoT

Support RF measurement and IP data transfer test of LTE Category M1 and NB-IoT Category NB1,2

LAA

Supports tests of 5 GHz Unlicensed Band used by LAA and LTE-U

HPUE

Supports tests of HPUE (High Power User Equipment) which is the specification to improve communication environment by increasing out put power of UE

5G NSA Anchor

Supports 5G NSA (Non-Standalone) tests by interlocking with Radio Communication Test Station MT8000A

RF TRX Measurement

3GPP UE RF Measurement

The UE TRX characteristics must be evaluated for compliance with 3GPP/3GPP2 standards at chipset and UE development, evaluation, and acceptance testing by network operators, etc. UE circuits are becoming increasingly complex as more communications technologies and frequency bands are supported; with built-in support for the UE RF TRX tests compliant with the various communications standards, the MT8821C is the ideal test solution whatever the measurement scenario.

Supported 3GPP/3GPP2 Standards

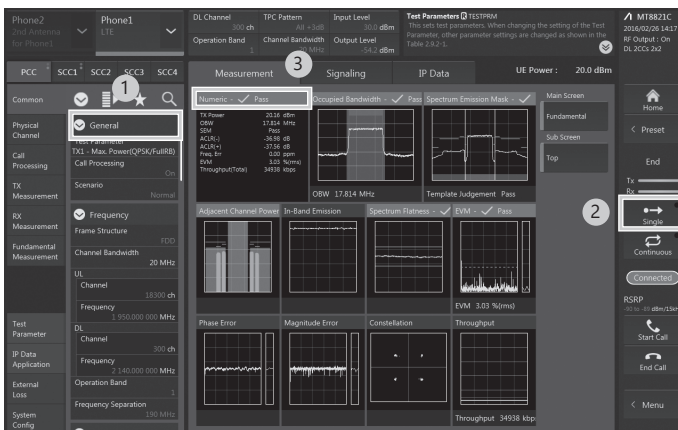
Support Systems	RF TRX Measurements
LTE FDD/TDD (DL CA 2CC/3CC/4CC/5CC/6CC/ 7CC/8CC, UL CA 2CC)	3GPP TS 36.521-1 Chapter 6, 7
Cat-M1	
NB-IoT (Cat-NB1, 2)	
W-CDMA (HSPA, HSPA Evolution, (DB-)DC-HSDPA, 3C/4C-HSDPA, DC-HSUPA)	3GPP TS 34.121-1 Chapter 5, 6
GSM (GPRS, EGPRS)	3GPP TS 51.010-1 Chapter 12, 13, 14
TD-SCDMA (HSPA, HSPA Evolution)	3GPP TS 34.122 Chapter 5, 6

One-touch Settings and PASS/FAIL Judgment

With preset measurement parameters based on the 3GPP RF test standard cases, the MT8821C simplifies measurement. In addition, PASS/FAIL judgment of measurement results according to the test standard conditions is automated and results are confirmed at a glance. Until now, LTE CA measurements have required complex Component Carrier (CC) settings, making operation difficult, but the MT8821C integrates multiple related parameters settings into one operation, greatly simplifying each operation stage to reduce setting operations and time.

For example, only the following three steps are required using the LTE measurement software to measure the 3GPP TS 36.521-1 6.5.2.1 Error Vector Magnitude (EVM):

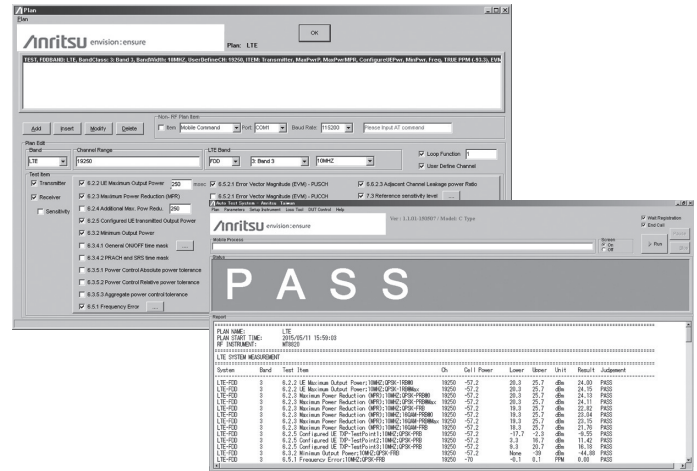
- 1 Select test parameters
- 2 Start measurement
- 3 Confirm PASS/FAIL judgment



3GPP RF Test Example

Remote Control Sample Tool

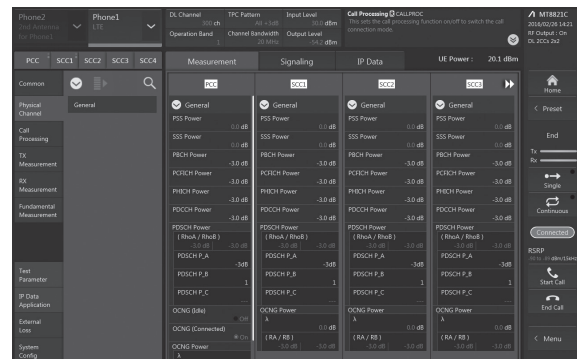
The MT8821C can be configured in an automated test system using either GPIB or Ethernet for remote control. Anritsu also provides the 3GPP RF test standard compliant automatic remote control sample tool. Operation is as simple as selecting the required test case from RF test items in the remote control sample tool, so even new users can easily configure automated test environment.



Remote Control Sample Tool

Flexible Parameter Setting

The MT8821C runs TRX measurements using parameters specified by the 3GPP/3GPP2 RF test standards. In addition, flexible parameter settings support both RF parametric and a range of protocol testing.

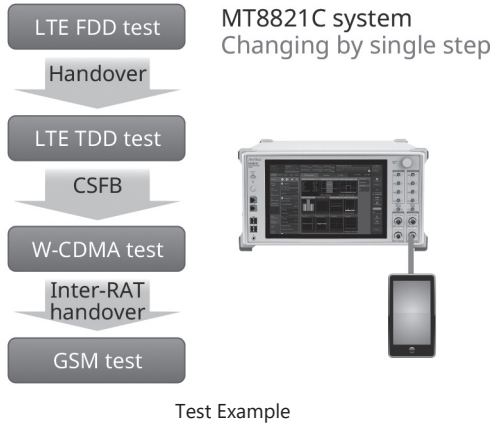


LTE Parameters Example



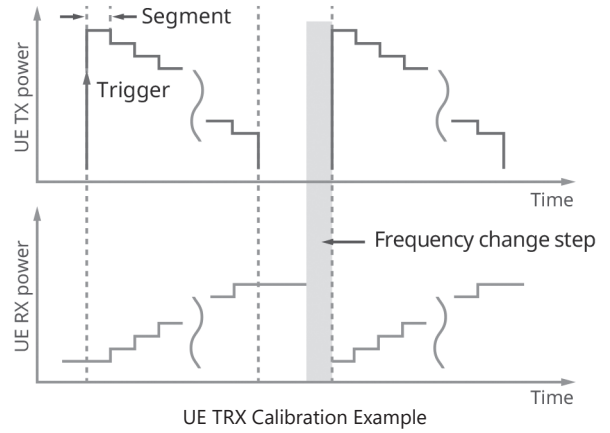
High Efficiency with Shorter Test Time

Test time is shortened for better efficiency by integrating multi-systems (several communications technologies) into one test by leveraging functions such as Circuit Switched fallback (CSFB), Inter-RAT handover, etc. These functions support testing without needing to switch between tester RF connectors or power-down and up again repeatedly.



RF Calibration

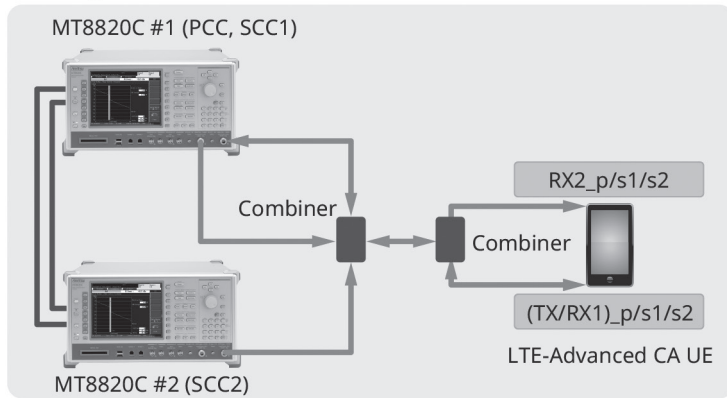
Recent UE designs support multiple frequency bands, requiring a lot of time for RF calibration. With high-speed measurement supported by chipsets vendors, the MT8821C increases measurement efficiency by reducing time required for RF calibration.



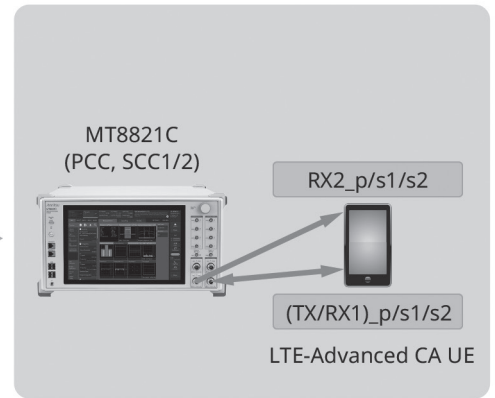
Built-in Combiner

With its built-in combiner, the MT8821C eliminates the need to configure a complex test system using external parts, as well as troublesome calibration.

Existing Model



MT8821C

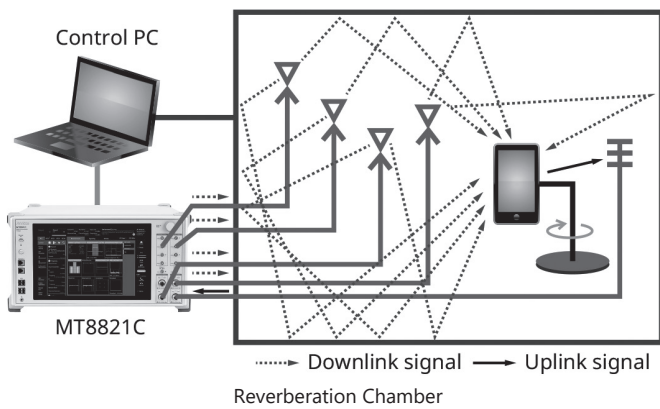
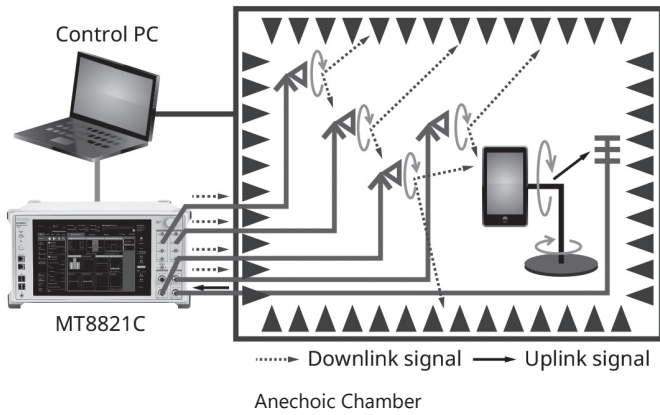


LTE-Advanced DL CA 3CC (SISO) Connection Example

Functional Testing

Over The Air (OTA) Testing

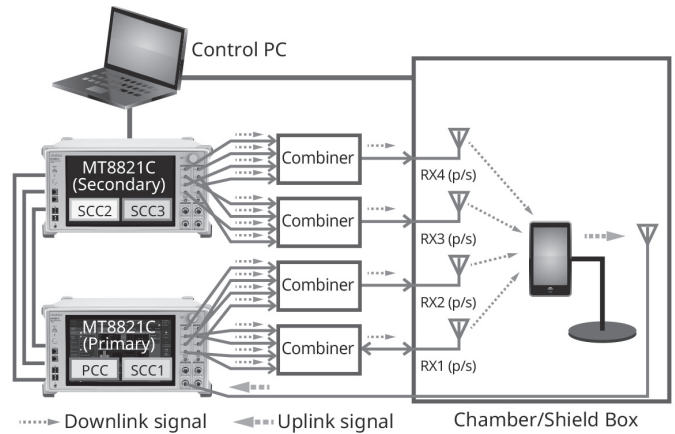
The UE TRX performance is affected by factors such as the antenna form and characteristics. The OTA test measures the total UE TRX performance using actual radio waves reaching the antennas. The MT8821C supports the various OTA vendor test system configurations in compliance with the 3GPP TS 34.114 and CTIA Total Radiated Power (TRP), and Total Radiated Sensitivity (TRS) test standards.



Moreover, it also supports the increasing number of test conditions demanded by higher antenna counts in UE units supporting LTE-Advanced CA and MIMO standards. Last, the shorter test time resulting from stable call processing performance is a key advantage of the MT8821C in various OTA test systems.

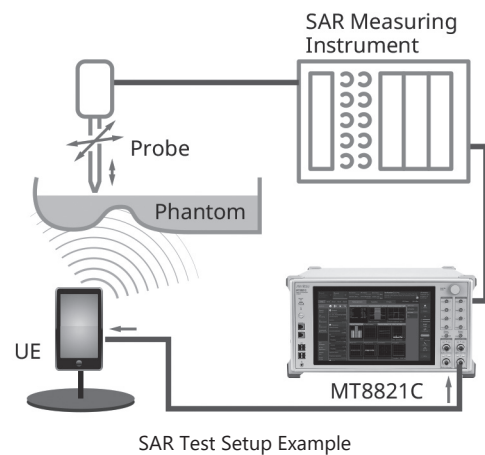
Support Systems	TRP	TRS	Comment
LTE FDD	✓	✓	SISO, 2x2 MIMO, 4x4 MIMO, DL CA 2CC/3CC/4CC/5CC/6CC/7CC/8CC, UL CA 2CC
LTE TDD	✓	✓	SISO, 2x2 MIMO, 4x4 MIMO, DL CA 2CC/3CC/4CC/5CC/6CC/7CC/8CC, UL CA 2CC
Cat-M1	✓	✓	
NB-IoT	✓	✓	Cat-NB1, 2
W-CDMA	✓	✓	HSPA, HSPA Evolution, DC-HSDPA
GSM	✓	✓	
GPRS/EGPRS	✓	✓	
TD-SCDMA	✓	✓	HSPA

Although one MT8821C unit can output up to 8 independent signals, DL 4CA 4x4 MIMO measurements require output of 16 signals. Using two linked MT8821C units supports unrestricted frequency allocation and bandwidth settings for all four CCs, enabling DL 4CA 4x4 MIMO measurements.



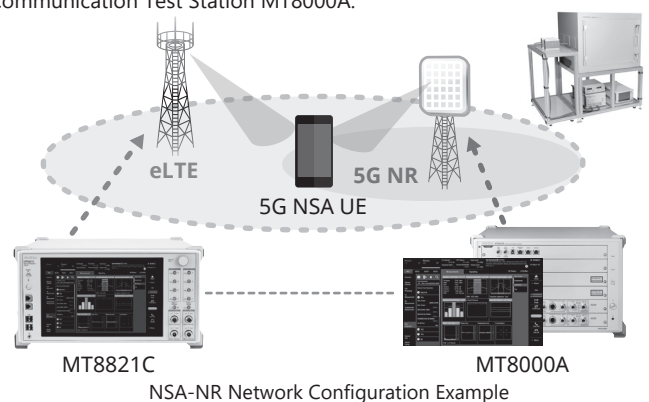
SAR (Specific Absorption Rate) Test

The SAR test evaluates the amount of energy in the electromagnetic waves radiated from a UE that is absorbed by a jig called a 'phantom' mimicking the human body. This test is designed to protect the health of UE users from the effects of electromagnetic waves. The basic amount of absorbed energy is determined by the standard for each country and region. The MT8821C supports the SAR test for each type of communication system.



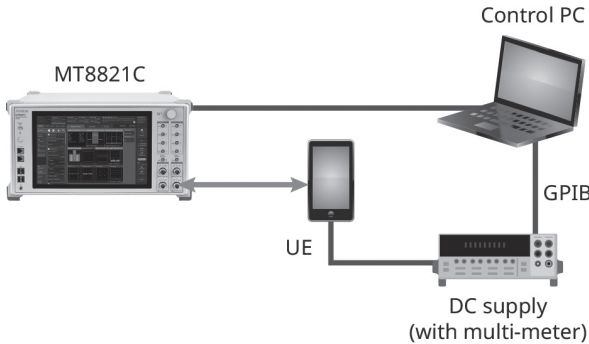
5G NSA (Non-Standalone) Testing

At the initial stage of 5G, NSA is considered as the main service form by many network operators who consider to realize 5G first network by adding 5G cell function to the existing LTE network. MT8821C can be the Anchor at 5G NSA call processing test by combining with Radio Communication Test Station MT8000A.



Power Consumption Testing

Battery power consumption is a key point in differentiating chipsets and smartphones. As well as supporting the GSMA-defined power consumption tests, the MT8821C also supports power consumption tests at the maximum IP data throughput.

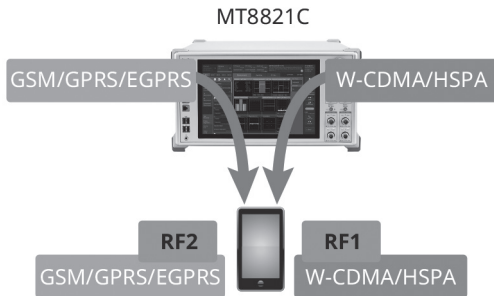


Power Consumption Test Example

Category	Procedure	Support Systems	Packet Rate (bps)
Power Consumption	Stan dBy Time Test	GSM	
		W-CDMA	
		LTE	
	MOMR: Talk Time Test	GSM	
		W-CDMA	
	MTNR: Talk Time Test	GSM	
		W-CDMA	
	Video Telephony Test	W-CDMA	
	Packet Switch Transfer Test (Download)	LTE	DL 5.16M, UL 5.54M @ 10 MHz
	Packet Switch Transfer Test (Upload)	LTE	DL 5.16M, UL 5.54M @ 10 MHz
Packet Switch Transfer Test (Download/Upload)	LTE	DL 21.4M, UL 22.9M @ 10 MHz	

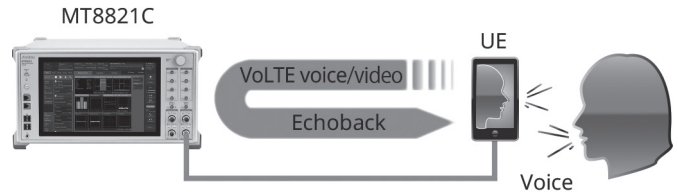
Inter-RAT Measurement, DSDA RF Testing

The all-in-one MT8821C can test two communications technologies simultaneously. As well as testing two UE units at the same time, it can also perform RF tests of a Dual SIM Dual Active (DSDA) dual-mode UE with two separate communications technologies for stan dBy and communications. It also supports Inter-RAT tests reporting the TX powers of base stations using different communications technologies to the UE.



VoLTE Voice/Video Echoback Testing

As VoLTE offering high-quality and low-latency voice calls becomes the de facto communications technology for recent UE, there is increasing demand for power consumption measurements during VoLTE calls as well as for confirmation of VoLTE call operations. However, setting the VoLTE IMS server is difficult. With its built-in IMS server, the MT8821C reduces test preparation time and supports efficient VoLTE voice/video echoback tests, because the LTE measurement software GUI operations are also reflected at the IMS server.



End-to-End Communication Testing

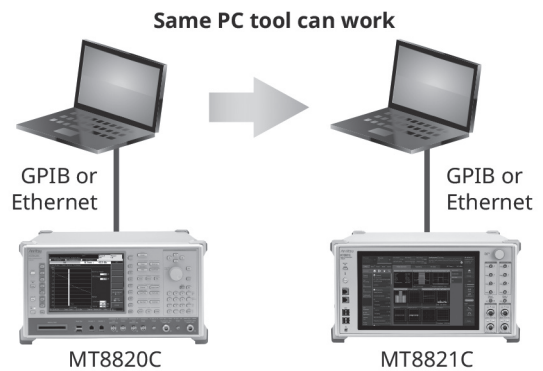
As well as evaluating UE RF performance, the MT8821C also supports functional tests, such as IP data throughput, audio/video tests, etc. Video calls between two UE units can be tested using one MT8821C with installed Parallel Phone measurement option. Furthermore, with its built-in application server function, smartphone and tablet IP data throughput tests require only the MT8821C and UE.



Backwards Compatibility

Remote Command

Since the MT8821C remote commands maintain good backwards compatibility with legacy MT8820 series, previously used remote tools are supported, helping reduce costs when configuring automated test environments.



MT8820C to MT8821C Upgrade

Anritsu offers an upgrade path from the MT8820C to the MT8821C making full use of the existing MT8820C hardware and software to maximize previous investment in the MT8820C and keep MT8821C costs down.



System Configurations/Options/Software

Support Systems		LTE		IoT		W-CDMA	GSM	TD-SCDMA	HSPA	SEQ
		FDD	TDD	Cat-M	NB-IoT					
Main Frame		MT8821C Radio Communication Analyzer								
Unit Options		MT8821C-012 Parallel Phone Measurement Hardware								
		MT8821C-025 2nd RF for Phone1								
		MT8821C-026 3rd RF for Phone1								
		MT8821C-027 4th RF for Phone1								
		MT8821C-028 2nd RF for Phone2								
		MT8821C-029 3rd RF for Phone2								
MT8821C-030 4th RF for Phone2										
Basic Configurations	Soft ware	MX882112C LTE FDD Measurement Software	MX882113C LTE TDD Measurement Software	MX882116C LTE Category M1 Measurement Software	MX882117C NB-IoT Measurement Software	MX882100C W-CDMA Measurement Software	MX882101C GSM Measurement Software	MX882107C TD-SCDMA Measurement Software	MX882115C W-CDMA HSPA Evolution IP Data Transfer	MX882120C Sequence Measurement Software
	Hard ware	MT8821C-008 LTE Measurement Hardware				MT8821C-001 W-CDMA Measurement Hardware	MT8821C-002 TDMA Measurement Hardware	MT8821C-001 W-CDMA Measurement Hardware MT8821C-007 TD-SCDMA Measurement Hardware	MT8821C-008 LTE Measurement Hardware	—
Options		MX882164C LTE VoLTE Echoback		—						
		MX882112C-010 LTE FDD Anchor For 5G NSA	MX882113C-010 LTE TDD Anchor For 5G NSA	MX882116C-006 LTE Category M1 IP Data Transfer	M882117C-001 NB-IoT Category NB-2 Measurement Software	MX882100C-019 W-CDMA HSPA Measurement Software	MX882101C-011 EGPRS Measurement Software	MX882107C-011 TD-SCDMA HSDPA Measurement Software	MX882115C-001 DC-HSDPA IP Data Transfer	MX882120C-001 W-CDMA Measurement Software
		MX882112C-021 LTE-Advanced FDD DL CA Measurement Software	MX882113C-021 LTE-Advanced TDD DL CA Measurement Software		MX882117C-002 NB-IoT Multi Carrier	MX882100C-032 DC-HSDPA Measurement Software		MX882107C-012 TD-SCDMA HSDPA Evolution Measurement Software		MX882120C-002 GSM Measurement Software
		MX882112C-022 LTE-Advanced FDD UL CA Measurement Software	MX882113C-022 LTE-Advanced TDD UL CA Measurement Software		MX882117C-006 NB-IoT IP Data Transfer	MX882100C-033 DC-HSUPA Measurement Software		MX882107C-021 TD-SCDMA HSUPA Measurement Software		MX882120C-004 LTE Measurement Software
		MX882112C-031 LTE-Advanced FDD DL CA 3CCs Measurement Software	MX882113C-031 LTE-Advanced TDD DL CA 3CCs Measurement Software			MX882100C-034 4C-HSDPA Measurement Software				MX882120C-005 TD-SCDMA Measurement Software
		MX882112C-041 LTE-Advanced FDD DL CA 4CCs Measurement Software	MX882113C-041 LTE-Advanced TDD DL CA 4CCs Measurement Software							
		MX882112C-051 LTE-Advanced FDD DL CA 5CCs Measurement Software	MX882113C-051 LTE-Advanced TDD DL CA 5CCs Measurement Software							
		MX882112C-061 LTE-Advanced FDD DL CA 6CCs Measurement Software	MX882113C-061 LTE-Advanced TDD DL CA 6CCs Measurement Software							
		MX882112C-071 LTE-Advanced FDD DL CA 7CCs Measurement Software	MX882113C-071 LTE-Advanced TDD DL CA 7CCs Measurement Software							
		MX882112C-081 LTE-Advanced FDD DL CA 8CCs Measurement Software	MX882113C-081 LTE-Advanced TDD DL CA 8CCs Measurement Software							
		MX882112C-011 LTE FDD 2x2 MIMO DL	MX882113C-011 LTE TDD 2x2 MIMO DL							
		MX882112C-012 LTE FDD 4x4 MIMO DL	MX882113C-012 LTE TDD 4x4 MIMO DL							
		MX882112C-006 LTE FDD IP Data Transfer	MX882113C-006 LTE TDD IP Data Transfer							
		MX882112C-026 LTE-Advanced FDD DL CA IP Data Transfer	MX882113C-026 LTE-Advanced TDD DL CA IP Data Transfer							
		MX882112C-036 LTE-Advanced FDD DL CA 3CCs IP Data Transfer	MX882113C-036 LTE-Advanced TDD DL CA 3CCs IP Data Transfer							
		MX882112C-046 LTE-Advanced FDD DL CA 4CCs IP Data Transfer	MX882113C-046 LTE-Advanced TDD DL CA 4CCs IP Data Transfer							



Specifications

Radio Communication Analyzer MT8821C

Receiver	<p>Frequency range: 30 MHz to 3.8 GHz 30 MHz to 6.0 GHz (with MT8821C-019)</p> <p>Maximum input level: +35 dBm (Main 1, 2) +10 dBm (SG Input)</p>
Transmitter	<p>Frequency Output frequency range: 30 MHz to 3.8 GHz 30 MHz to 6.0 GHz (with MT8821C-019)</p> <p>Setting resolution: 1 Hz Accuracy: Depends on reference oscillator accuracy</p> <p>Output level Level range Main 1, 2: -140 to -10 dBm (Internal signal generator TX 1 output) -140 to -16 dBm (Internal signal generator TX 2, 3, or 4 output) (with MT8821C-025, 026, 027 or with MT8821C-012, 028, 029, 030)</p> <p>Aux 1, 2, 3, 4: -125 to +5 dBm (Aux 2, 3, 4: With MT8821C-025, 026, 027 or with MT8821C-012, 028, 029, 030)</p> <p>Resolution: 0.1 dB Level accuracy 10°C to 40°C, After Cal Main 1, 2 Level: ≥ -120 dBm, SG Input: Off When outputting from either of Main 1 or 2. Except effect of noise floor from the other internal signal generators. ± 1.5 dB (Frequency < 350 MHz, Internal signal generator TX 1 output) ± 1.0 dB, ± 0.7 dB (typ.) (350 MHz \leq Frequency \leq 3.8 GHz) ± 1.3 dB, ± 1.0 dB (typ.) (3.8 GHz < Frequency \leq 6.0 GHz)</p> <p>Aux 1, 2, 3, 4 Level: ≥ -110 dBm ± 1.5 dB (Frequency < 350 MHz) ± 1.0 dB, ± 0.7 dB (typ.) (350 MHz \leq Frequency \leq 3.8 GHz) ± 1.3 dB, ± 1.0 dB (typ.) (3.8 GHz < Frequency \leq 6.0 GHz)</p> <p>Signal purity Non-harmonic spurious: ≤ -30 dBc (offset frequency: ≥ 100 kHz) Harmonics: ≤ -25 dBc</p>
Reference Oscillator	<p>Reference oscillator Frequency: 10 MHz Start-up characteristics: $\leq 5 \times 10^{-8}$ (10 min. after power-on referenced to frequency 24-hour after power-on) Aging rate: $\leq 2 \times 10^{-8}$/day, $\leq 1 \times 10^{-7}$/year (referenced to frequency 24-hour after power-on) Temperature characteristics: $\leq 5 \times 10^{-8}$ Frequency accuracy before shipment: $\pm 2.2 \times 10^{-8}$ (20°C to 30°C, 1 hour after power-on) Output connector: BNC-J, Level: TTL</p> <p>External reference input Frequency: 10 MHz or 13 MHz Operating range: ± 1 ppm</p>
Display	<p>12.1-inch WXGA, 1280 \times 800 pixels, color TFT LCD Touch panel: Projected capacitive type, multi-touch gestures</p>
Front-panel Connectors	<p>RF input/output Main 1, 2 Connector: N-J, 50Ω (nom.) VSWR: ≤ 1.35 (30 MHz \leq Frequency < 350 MHz) ≤ 1.30 (350 MHz \leq Frequency < 450 MHz) ≤ 1.20 (450 MHz \leq Frequency \leq 1.6 GHz) ≤ 1.30 (1.6 GHz < Frequency \leq 3.8 GHz) (Main 1) ≤ 1.30 (1.6 GHz < Frequency \leq 2.7 GHz) (Main 2) ≤ 1.35 (2.7 GHz < Frequency < 2.9 GHz) (Main 2) ≤ 1.30 (2.9 GHz \leq Frequency \leq 3.8 GHz) (Main 2) ≤ 1.40 (3.8 GHz < Frequency \leq 6.0 GHz)</p> <p>Aux 1, 2, 3, 4 Connector: SMA-J, 50Ω (nom.) VSWR: SG output level: ≤ -10 dBm ≤ 1.40 (30 MHz \leq Frequency < 300 MHz) ≤ 1.30 (300 MHz \leq Frequency \leq 3.8 GHz) ≤ 1.60 (3.8 GHz < Frequency \leq 6.0 GHz)</p> <p>SG Input Connector: SMA-J, 50Ω (nom.) VSWR: ≤ 1.40 (300 MHz \leq Frequency \leq 3.8 GHz) ≤ 1.60 (3.8 GHz < Frequency \leq 6.0 GHz)</p> <p>Monitor Connector: SMA-J, 50Ω (nom.) VSWR: ≤ 1.30 (300 MHz \leq Frequency \leq 3.8 GHz) ≤ 1.60 (3.8 GHz < Frequency \leq 6.0 GHz)</p> <p>Other Handset 1, 2: For dedicated handset Connector: RJ-12 USB Connector: USB 2.0, 4 ports</p>

Continued on next page



Rear-panel Connectors	<p>Reference signal</p> <p>10 MHz Buf Out: For internal reference oscillator output Connector: BNC-J Frequency: 10 MHz Level: TTL</p> <p>10 MHz/13 MHz Ref In: For external reference signal input Connector: BNC-J, 50Ω (nom.) Level: ≥0 dBm</p> <p>Control</p> <p>GPIB 1, 2: For remote control Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2 Connector: GPIB (IEEE 488)</p> <p>Remote 1, 2 (Ethernet): For remote control Connector: RJ-45 (10/100/1000BASE-T)</p> <p>Data input/output</p> <p>Application Server 1, 2: For data transfer tests Connector: RJ-45 (1000BASE-T)</p> <p>RS-232C 1, 2: For data transfer tests Connector: D-sub 9-pin (RS-232)</p> <p>Call Proc I/O 1, 2: For call processing timing signal input/output Connector: Mini D-sub 15-pin Signal level: TTL, LVCMOS</p> <p>10BASE-T 1, 2: For data transfer tests Connector: RJ-45 (10BASE-T)</p> <p>1000BASE-T 1, 2: For data transfer tests Connector: RJ-45 (1000BASE-T)</p> <p>Aux: For ARB input/output Connector: Mini D-sub 15-pin Signal level: LVCMOS</p> <p>Trigger</p> <p>Frame Trig Output 1, 2: For frame trigger output</p> <p>Event Trig Input 1, 2: For event trigger input</p> <p>Event Trig Output 1, 2: For event trigger output Connector: BNC-J Signal level: TTL</p> <p>Audio</p> <p>AF Output 1, 2: For AF output Connector: BNC-J</p> <p>AF Input 1, 2: For AF input Connector: BNC-J Maximum input level: 30 V (RMS)</p> <p>Other</p> <p>USB: For general-purpose I/F Connector: USB 3.0, 2 ports</p> <p>VGA: For external display Connector: Mini D-sub 15-pin Signal level: Analog RGB</p> <p>MEAS 1, 2: Not used Connector: RJ-45</p>	
Storage Device	2.5-inch SSD	
Power Supply	100 VAC to 120 VAC/200 VAC to 240 VAC (250 V max.), 50 Hz/60 Hz ≤1200 VA (with all options)	
Dimensions and Mass	426 (W) × 221.5 (H) × 578 (D) mm (excluding projections) ≤40 kg (with all options)	
Environmental Conditions	Temperature and Humidity Operating: +5°C to +40°C, ≤90% RH (no condensation) Storage: -20°C to +60°C, ≤85% RH (no condensation)	
CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

LTE Measurement Hardware MT8821C-008, LTE FDD Measurement Software MX882112C, LTE TDD Measurement Software MX882113C

Frequency/Modulation Measurement	<p>Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -40 to +35 dBm (Main1, 2)</p> <p>Carrier frequency accuracy: ± (Set frequency × Reference oscillator accuracy + 15 Hz)</p> <p>Modulation accuracy (residual vector error): ≤2.5% (400 MHz ≤ frequency ≤ 3.8 GHz, Measurement count: 20) ≤3.5% (3.8 GHz < frequency ≤ 5.0 GHz, Measurement count: 20)</p> <p>In-band emissions: ≤-40 dB (≥-10 dBm, Allocated RB: ≤18)</p> <p>Measurement object: PUSCH, PRACH, PUCCH</p>
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Amplitude Measurement	<p>Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -60 to +35 dBm (Main1, 2)</p> <p>Measurement accuracy 10°C to 40°C, After Cal, 400 MHz \leq frequency \leq 3.8 GHz ± 0.3 dB (typ.), ± 0.5 dB (-20 to +35 dBm), ± 0.7 dB (-50 to -20 dBm), ± 0.9 dB (-60 to -50 dBm) 20°C to 30°C, After Cal, 3.8 GHz < frequency \leq 5.0 GHz ± 0.7 dB (-20 to +35 dBm), ± 0.9 dB (-50 to -20 dBm), ± 1.1 dB (-60 to -50 dBm)</p> <p>Linearity 400 MHz to 5.0 GHz, -40 to 0 dB ± 0.2 dB (≥ -50 dBm), ± 0.4 dB (≥ -60 dBm)</p> <p>Measurement object: PUSCH, PUCCH, PRACH</p>
Occupied Bandwidth	<p>Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2)</p> <p>Channel bandwidth: 1.4, 3, 5 MHz (452.5 MHz \leq UL frequency \leq 457.5 MHz) 1.4, 3, 5, 10, 15, 20 MHz (500 MHz \leq UL frequency)</p>
Adjacent Channel Leakage Power	<p>Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2)</p> <p>Measurement point: E-UTRA ACLR 1, UTRA ACLR 1, UTRA ACLR 2</p> <p>Measurement range: ≥ 45 dB (E-UTRA ACLR1), ≥ 50 dB (UTRA ACLR1), ≥ 55 dB (UTRA ACLR2)</p> <p>Channel bandwidth: 1.4, 3, 5 MHz (452.5 MHz \leq UL frequency \leq 457.5 MHz) 1.4, 3, 5, 10, 15, 20 MHz (500 MHz \leq UL frequency)</p>
Spectrum Emission Mask	<p>Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2)</p> <p>Channel bandwidth: 1.4, 3, 5 MHz (452.5 MHz \leq UL frequency \leq 457.5 MHz) 1.4, 3, 5, 10, 15, 20 MHz (500 MHz \leq UL frequency)</p>
RF Signal Generator	<p>Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz steps</p> <p>Output level Main: -140 to -10 dBm (Modulation: Off), -142 to -12 dBm (Modulation: On) Aux: -125 to +5 dBm (Modulation: Off), -127 to +3 dBm (Modulation: On)</p> <p>AWGN level: Off, -20 to +5 dB (0.1 dB steps, relative level to Ior)</p> <p>AWGN level accuracy: ± 0.2 dB (relative level accuracy to Ior)</p>
Throughput Measurement	<p>Measures throughput using RMC</p> <p>Measurement object: ACK and NACK reported from UE</p>
Call Processing	<p>Call control: Location registration, Call processing using RMC (executes each 3GPP-defined processing and performs Pass/Fail evaluation)</p> <p>UE control: Output level (executes each 3GPP-defined UE control)</p>

LTE FDD/TDD Anchor For 5G NSA MX882112C/13C-010

Function	Supports call processing test of 5G Non-Standalone environment as the Anchor between 5G supported UE.
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LTE Category M1 Measurement Software MX882116C

Function	RF TRX measurement for LTE Category M1
Frequency/Modulation Measurement	<p>Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz \leq frequency \leq 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -40 to +35 dBm (Main1, 2)</p> <p>Carrier frequency accuracy: \pm (Set frequency \times Reference oscillator accuracy + 15 Hz)</p> <p>Modulation accuracy (residual vector error): $\leq 2.5\%$ (400 MHz \leq frequency \leq 3.8 GHz, Measurement count: 20) $\leq 3.5\%$ (3.8 GHz < frequency \leq 5.0 GHz, Measurement count: 20) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz \leq frequency \leq 457.5 MHz (LTE Operating Band 31)</p> <p>In-band Emissions: ≤ -40 dB (≥ -10 dBm, Allocated RB ≤ 18)</p> <p>Measurement object: PUSCH</p>
Amplitude Measurement	<p>Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz \leq frequency \leq 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -60 to +35 dBm (Main1, 2)</p> <p>Measurement accuracy: ± 0.5 dB, ± 0.3 dB (typ.) (-20 to +35 dBm), ± 0.7 dB (-50 to -20 dBm), ± 0.9 dB (-60 to -50 dBm), 400 MHz \leq frequency \leq 3.8 GHz, After Cal, 10°C to 40°C ± 0.7 dB (-20 to +35 dBm), ± 0.9 dB (-50 to -20 dBm), ± 1.1 dB (-60 to -50 dBm), 3.8 GHz < frequency \leq 5.0 GHz, After Cal, 20°C to 30°C ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz \leq frequency \leq 457.5 MHz (LTE Operating Band 31)</p> <p>Linearity: ± 0.2 dB (-40 to 0 dB, ≥ -50 dBm), ± 0.4 dB (-40 to 0 dB, ≥ -60 dBm), 400 MHz \leq frequency \leq 5000 MHz ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz \leq frequency \leq 457.5 MHz (LTE Operating Band 31)</p> <p>Measurement object: PUSCH</p>

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Occupied Bandwidth	Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -10 to +35 dBm (Main1, 2) Channel bandwidth: 1.4 MHz, 3 MHz, 5 MHz (452.5 MHz≤UL frequency≤457.5 MHz) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz (500 MHz≤UL frequency)
Adjacent Channel Leakage Power	Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -10 to +35 dBm (Main1, 2) Measurement point: E-UTRA ACLR1, UTRA ACLR1, UTRA ACLR2 Measurement range: ≥45 dB (E-UTRA ACLR1), ≥50 dB (UTRA ACLR1), ≥55 dB (UTRA ACLR2) Channel bandwidth: 1.4 MHz, 3 MHz, 5 MHz (452.5 MHz≤UL frequency≤457.5 MHz) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz (500 MHz≤UL frequency)
Spectrum Emission Mask	Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -10 to +35 dBm (Main1, 2) Channel bandwidth: 1.4 MHz, 3 MHz, 5 MHz (452.5 MHz≤UL frequency≤457.5 MHz) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz (500 MHz≤UL frequency)
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz (1Hz steps) 3.8 GHz to 6.0 GHz (1Hz steps) (With MT8821C-019)
Throughput Measurement	Measures throughput using RMC Measurement object: ACK and NACK reported from UE
Call Processing	Call control: Location registration, Call processing using RMC (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level (executes each 3GPP-defined UE control)

NB-IoT Measurement Software MX882117C, NB-IoT Category NB-2 Measurement Software NX882117C-001

Function	RF TRX measurement for NB-IoT
Frequency/Modulation Measurement	Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz≤frequency≤457.5 MHz (LTE Operating Band 31) Input level: -40 to +35 dBm (Main1, 2) Carrier frequency accuracy: ± (Set frequency × Reference oscillator accuracy + 15 Hz) Modulation accuracy (residual vector error): ≤2.5% (400 MHz≤frequency≤3.8 GHz, Measurement count: 20) ≤3.5% (3.8 GHz<frequency≤5.0 GHz, Measurement count: 20) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz≤frequency≤457.5 MHz (LTE Operating Band 31) In-band Emissions: ≤-40 dB (≥-10 dBm, Allocated RB≤18) Measurement object: NPUSCH
Amplitude Measurement	Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz≤frequency≤457.5 MHz (LTE Operating Band 31) Input level: -60 to +35 dBm (Main1, 2) Measurement accuracy: ±0.5 dB, ±0.3 dB (typ.) (-20 to +35 dBm), ±0.7 dB (-50 to -20 dBm), ±0.9 dB (-60 to -50 dBm), 400 MHz≤frequency≤3.8 GHz, After Cal, 10°C to 40°C ±0.7 dB (-20 to +35 dBm), ±0.9 dB (-50 to -20 dBm), ±1.1 dB (-60 to -50 dBm), 3.8 GHz<frequency≤5.0 GHz, After Cal, 20°C to 30°C ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz≤frequency≤457.5 MHz (LTE Operating Band 31) Linearity: ±0.2 dB (-40 to 0 dB, ≥-50 dBm), ±0.4 dB (-40 to 0 dB, ≥-60 dBm), 400 MHz≤frequency≤5000 MHz ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz≤frequency≤457.5 MHz (LTE Operating Band 31) Measurement object: NPUSCH
Occupied Bandwidth	Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -10 to +35 dBm (Main1, 2)
Adjacent Channel Leakage Power	Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -10 to +35 dBm (Main1, 2) Measurement point: GSMACLR, UTRA ACLR Measurement range: ≥33 dB (GSMACLR), ≥50 dB (UTRA ACLR)
Spectrum Emission Mask	Frequency range: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (With MT8821C-019) ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -10 to +35 dBm (Main1, 2)
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz (1Hz steps) 3.8 GHz to 6.0 GHz (1Hz steps) (With MT8821C-019)
Throughput Measurement	Measures throughput using RMC Measurement object: ACK and NACK reported from UE
Call Processing	Call control: Location registration, Call processing using RMC (executes each 3GPP-defined processing) UE control: Output level (executes each 3GPP-defined UE control)

LTE-Advanced FDD/TDD DL CA Measurement Software MX882112C/13C-021

Function	This option for the MX882112C/13C measures DL CA RX performance.	
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz steps	
	Output level	(CC output levels at Carrier Aggregation)
	Main output	-140 to -16 dBm (Modulation Off) -142 to -18 dBm (Modulation On)
Aux output	-125 to +5 dBm (Modulation Off) -127 to +3 dBm (Modulation On)	
Throughput Measurement	Function	Throughput measurement using RMC
	Measurement target	ACK and NACK reported from UE

LTE-Advanced FDD/TDD UL CA Measurement Software MX882112C/13C-022

Function	This option for the MX882112C/13C measures the UL CA 2CC TRX performance.	
Frequency/Modulation Measurement	Depends on MX882112C/13C performance except frequency range and modulation accuracy at CC measurement.	
	Frequency range: 500 MHz to 3.8 GHz, 3.8 GHz to 4.2 GHz (with MT8821C-019) Modulation accuracy (residual vector error): $\leq 2.5\%$ (500 MHz \leq frequency \leq 3.8 GHz, Measurement count: 20) $\leq 3.5\%$ (3.8 GHz < frequency \leq 4.2 GHz, Measurement count: 20) Measurement object: PUSCH	
Amplitude Measurement	Depends on MX882112C/13C performance except frequency range, measurement accuracy and linearity at CC measurement.	
	Frequency range: 500 MHz to 3.8 GHz, 3.8 GHz to 4.2 GHz (with MT8821C-019) Measurement accuracy	
	Except intraband contiguous CA SCC and PCC+SCC measurement	
	10°C to 40°C, After Cal, 500 MHz \leq frequency \leq 3.8 GHz ± 0.3 dB (typ.), ± 0.5 dB (-20 to +35 dBm), ± 0.7 dB (-50 to -20 dBm), ± 0.9 dB (-60 to -50 dBm) 20°C to 30°C, After Cal, 3.8 GHz < frequency \leq 4.2 GHz ± 0.7 dB (-20 to +35 dBm), ± 0.9 dB (-50 to -20 dBm), ± 1.1 dB (-60 to -50 dBm) Intraband contiguous CA SCC and PCC+SCC measurement 10°C to 40°C, After Cal, 500 MHz \leq frequency \leq 3.0 GHz ± 0.7 dB (-50 to +35 dBm), ± 0.9 dB (-60 to -50 dBm) 10°C to 40°C, After Cal, 3.0 GHz \leq frequency \leq 3.8 GHz ± 1.0 dB (-50 to +35 dBm), ± 1.3 dB (-60 to -50 dBm) 20°C to 30°C, After Cal, 3.8 GHz < frequency \leq 4.2 GHz ± 1.0 dB (-50 to +35 dBm), ± 1.3 dB (-60 to -50 dBm) Linearity 20°C to 30°C, -40 to 0 dB ± 0.2 dB (≥ -50 dBm), ± 0.4 dB (≥ -60 dBm)	
Occupied Bandwidth	Depends on MX882112C/13C performance except frequency range at CC or contiguous CC measurement. Frequency range: 500 MHz to 3.8 GHz, 3.8 GHz to 4.2 GHz (with MT8821C-019) Measurement object: PUSCH	
Adjacent Channel Leakage Power	Depends on MX882112C/13C performance except frequency range and measurement range at CC or contiguous CC measurement. Frequency range: 500 MHz to 3.8 GHz, 3.8 GHz to 4.2 GHz (with MT8821C-019) Measurement range: ≥ 45 dB (E-UTRA ACLR1), ≥ 50 dB (UTRA ACLR1), ≥ 55 dB (UTRA ACLR2) Measurement object: PUSCH	
Spectrum Emission Mask	Depends on MX882112C/13C performance except frequency range at CC or contiguous CC measurement. Frequency range: 500 MHz to 3.8 GHz, 3.8 GHz to 4.2 GHz (with MT8821C-019) Measurement object: PUSCH	
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz steps	
	Output level range (output level range for each CC when CC signals combined and output)	
	Main:	-140 to -16 dBm (Modulation: Off), -142 to -18 dBm (Modulation: On) Aux: -125 to +5 dBm (Modulation: Off), -127 to +3 dBm (Modulation: On)
Throughput Measurement	Function	Throughput measurement using RMC
	Measurement target	ACK and NACK reported from UE

LTE-Advanced FDD/TDD DL CA 3CCs Measurement Software MX882112C/13C-031

Function	This option for the MX882112C/13C measures DL CA 3CC/UL CA 1CC RX performance.	
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz steps	
	Output level	(CC output levels at Carrier Aggregation)
	Main output	-140 to -16 dBm (Modulation Off) -142 to -18 dBm (Modulation On)
	Aux output	-125 to +5 dBm (Modulation Off) -127 to +3 dBm (Modulation On)
Throughput Measurement	Function	Throughput measurement using RMC
	Measurement target	ACK and NACK reported from UE

LTE-Advanced FDD/TDD DL CA 4CCs Measurement Software MX882112C/13C-041

Function	This option for the MX882112C/13C measures DL CA 4CC/UL CA 1CC RX performance.	
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz steps	
	Output level	
	Main output	(CC output levels at Carrier Aggregation) -140 to -16 dBm (Modulation Off) -142 to -18 dBm (Modulation On)
	Aux output	-125 to +5 dBm (Modulation Off) -127 to +3 dBm (Modulation On)
Throughput Measurement	Function	Throughput measurement using RMC
	Measurement target	ACK and NACK reported from UE

LTE-Advanced FDD/TDD DL CA 5CCs Measurement Software MX882112C/13C-051

Function	This option for the MX882112C/13C measures DL CA 5CC/UL CA 1CC RX performance	
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz per step	
	Output level	
	Main output	(CC output levels at Carrier Aggregation) -140 to -16 dBm (Modulation Off), -142 to -18 dBm (Modulation On)
	Aux output	-125 to +5 dBm (Modulation Off), -127 to +3 dBm (Modulation On)
Throughput Measurement	Function	Throughput measurement using RMC
	Measurement target	ACK and NACK reported from UE

LTE-Advanced FDD/TDD DL CA 6CCs Measurement Software MX882112C/13C-061

Function	This option for the MX882112C measures DL CA 6CC/UL CA 1CC RX performance	
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz per step	
	Output level	
	Main output	(CC output levels at Carrier Aggregation) -140 to -16 dBm (Modulation Off), -142 to -18 dBm (Modulation On)
	Aux output	-125 to +5 dBm (Modulation Off), -127 to +3 dBm (Modulation On)
Throughput Measurement	Function	Throughput measurement using RMC
	Measurement target	ACK and NACK reported from UE

LTE-Advanced FDD/TDD DL CA 7CCs Measurement Software MX882112C/13C-071

Function	This option for the MX882112C measures DL CA 7CC/UL CA 1CC RX performance	
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz per step	
	Output level	
	Main output	(CC output levels at Carrier Aggregation) -140 to -16 dBm (Modulation Off), -142 to -18 dBm (Modulation On)
	Aux output	-125 to +5 dBm (Modulation Off), -127 to +3 dBm (Modulation On)
Throughput Measurement	Function	Throughput measurement using RMC
	Measurement target	ACK and NACK reported from UE

LTE-Advanced FDD/TDD DL CA 8CCs Measurement Software MX882112C/13C-081

Function	This option for the MX882112C measures DL CA 8CC/UL CA 1CC RX performance	
RF Signal Generator	Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz per step	
	Output level	
	Main output	(CC output levels at Carrier Aggregation) -140 to -16 dBm (Modulation Off), -142 to -18 dBm (Modulation On)
	Aux output	-125 to +5 dBm (Modulation Off), -127 to +3 dBm (Modulation On)
Throughput Measurement	Function	Throughput measurement using RMC
	Measurement target	ACK and NACK reported from UE

W-CDMA Measurement Hardware MT8821C-001, W-CDMA Measurement Software MX882100C

Frequency/ Modulation Measurement	Frequency range: 350 MHz to 2.7 GHz ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -30 to +35 dBm (Main1, 2) Carrier frequency accuracy: \pm (Set frequency \times Reference oscillator accuracy + 10 Hz) Modulation accuracy (residual vector error): $\leq 2.5\%$ (input signal: one DPCCH and one DPDCH)
Amplitude Measurement	Frequency range: 350 MHz to 2.7 GHz ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -65 to +35 dBm (Main1, 2) Measurement accuracy 10°C to 40°C, After Cal ± 0.3 dB (typ.), ± 0.5 dB (-30 to +35 dBm), ± 0.7 dB (-55 to -30 dBm), ± 0.9 dB (-65 to -55 dBm) Linearity: ± 0.2 dB (-40 to 0 dB, ≥ -55 dBm), ± 0.4 dB (-40 to 0 dB, ≥ -65 dBm) Relative Measurement Error: ± 0.10 dB (-40 to 0 dB, ≥ -50 dBm) (range: < 2 dB) Measurement object: DPCH, PRACH
Occupied Bandwidth	Frequency range: 350 MHz to 2.7 GHz ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -10 to +35 dBm (Main1, 2)
Adjacent Channel Leakage Power	Frequency range: 350 MHz to 2.7 GHz ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -10 to +35 dBm (Main1, 2) Measurement range: ≥ 50 dB (± 5 MHz), ≥ 55 dB (± 10 MHz)
RF Signal Generator	Output frequency range: 300 MHz to 2.7 GHz, 1 Hz steps Channel level CPICH, P-CCPCH, SCH, PICH, DPCH, S-CCPCH, AICH: Off, -30 to 0 dB (0.1 dB steps, relative level to Ior) OCNS: Off, Automatic setting Channel level accuracy: ± 0.2 dB (relative level accuracy to Ior) AWGN level: Off, -20 to +5 dB (0.1 dB steps, relative level to Ior) AWGN level accuracy: ± 0.2 dB (relative level accuracy to Ior)
Error Rate Measurement	Measures BER, BLER Measurement object: Loopback data on uplink DTCH Serial data input from call processing I/O port (rear panel) (BER)
Call Processing	Call control: Location registration, Call origination, Call termination, Network-side release, UE-side release (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level, Loopback (executes each 3GPP-defined UE control)

W-CDMA HSPA Measurement Software MX882100C-019

Function	This option for the MX882100C measures W-CDMA HSPA/HSPA Evolution TRX performance, and performs HSDPA-related peak-rate throughput tests for H-Set 6 and 8, and Category 6, 8, 9, 10, 13 and 14 UE.
Amplitude Measurement	Depends on MX882100C performance Measurement object: DPCH, HS-DPCCH, E-DPCCH, E-DPDCH
Throughput Measurement	Measures throughput using H-Set or throughput using peak-rate equivalent HS-SCCH and HS-PDSCH at H-Set 6 and 8 Category 6, 8, 9, 10, 13 and 14 UE. Measurement object: HS-DPCCH ACK and NACK
Call Processing	Call control: Location registration, Fixed Reference Channel, E-DCH RF Test (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level (executes each 3GPP-defined UE control) Monitoring: Monitors E-TFCI included in uplink E-DPCCH and measures E-DCH throughput

DC-HSDPA Measurement Software MX882100C-032

Function	This option for the MX882100C measures DC-HSDPA RX performance.
Throughput Measurement	Measures throughput using H-Set or throughput using peak-rate equivalent HS-SCCH and HS-PDSCH at H-Set 6 and 8 Category 22 and 24 UE. Measurement object: HS-DPCCH ACK and NACK
CQI Measurement	Measurement object: HS-DPCCH CQI reported periodically from UE
Call Processing	Call control: Location registration, Fixed Reference Channel (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level (executes each 3GPP-defined UE control)

DC-HSUPA Measurement Software MX882100C-033

Function	This option for the MX882100C measures DC-HSUPA TX performance.
Amplitude Measurement	Depends on MX882100C performance Measurement object: DPCH, HS-DPCCH, E-DPCCH, E-DPDCH
Call Processing	Call control: Location registration, E-DCH RF Test (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level (executes each 3GPP-defined UE control)

**4C-HSDPA Measurement Software MX882100C-034**

Function	This option for the MX882100C measures 4C-HSDPA RX performance.
Throughput Measurement	Measures throughput using H-Set or throughput using peak-rate equivalent HS-SCCH and HS-PDSCH at H-Set 6 and 8 Category 29 and 31 UE. Measurement object: HS-DPCCH ACK and NACK
CQI Measurement	Measurement object: HS-DPCCH CQI reported periodically from UE
Call Processing	Call control: Location registration, Fixed Reference Channel (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level (executes each 3GPP-defined UE control)

TDMA Measurement Hardware MT8821C-002, GSM Measurement Software MX882101C

Frequency/Modulation Measurement	Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 380.2 MHz to 389.8 MHz (T-GSM380 band) 410.2 MHz to 419.8 MHz (T-GSM410 band) 450.4 MHz to 457.6 MHz (GSM450 band) 478.8 MHz to 486.0 MHz (GSM480 band) Input level: -30 to +40 dBm (Main1, 2) (average power in bursts) Carrier frequency accuracy: ± (Set frequency × Reference oscillator accuracy + 10 Hz) (Normal burst) ± (Set frequency × Reference oscillator accuracy + 20 Hz) (RACH) Modulation accuracy (Residual phase error): ≤0.5° RMS, 2° peak Measurement object: Normal burst, RACH
Amplitude Measurement	Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 380.2 MHz to 389.8 MHz (T-GSM380 band) 410.2 MHz to 419.8 MHz (T-GSM410 band) 450.4 MHz to 457.6 MHz (GSM450 band) 478.8 MHz to 486.0 MHz (GSM480 band) Input level: -30 to +40 dBm (Main1, 2) (average power in bursts) Measurement accuracy 10°C to 40°C, After Cal ±0.3 dB (typ.), ±0.5 dB (-30 to +40 dBm) Linearity: ±0.2 dB (-40 to 0 dB, ≥-30 dBm) Power measurement range (carrier off): ≥65 dB (≥-10 dBm), ≥45 dB (≥-30 to -10 dBm) Burst wave display: Rise, Fall, Slot, On-interval Measurement object: Normal burst, RACH
Output Spectrum Measurement (Output RF Spectrum)	Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 380.2 MHz to 389.8 MHz (T-GSM380 band) 410.2 MHz to 419.8 MHz (T-GSM410 band) 450.4 MHz to 457.6 MHz (GSM450 band) 478.8 MHz to 486.0 MHz (GSM480 band) Input level: -10 to +40 dBm (Main1, 2) (average power in bursts) Measurement range (modulation) Averaged with 10 measurements ≤-55 dB (≤250 kHz offset), ≤-66 dB (≥400 kHz offset) Measurement range (transient): ≤-57 dB (≥400 kHz offset) Measurement point: ±100 kHz, ±200 kHz, ±250 kHz, ±400 kHz, ±600 kHz, ±800 kHz, ±1000 kHz, ±1200 kHz, ±1400 kHz, ±1600 kHz, ±1800 kHz, ±2000 kHz Measurement object: Normal burst
RF Signal Generator	Output frequency range: 350 MHz to 2.7 GHz, 1 Hz steps Output pattern: CCH, TCH, CCH + TCH Channel coding: FS, EFS, HS0, HS1, AFS, AHS0, AHS1, CS-1, CS-2, CS-3, CS-4 TCH data: PN9, PN15, All0, All1, Fixed pattern (PAT0 to PAT9) USF: 0 to 7 (GPRS)
Error Rate Measurement	Measures error rate of frame, bit, and CRC Measurement object: Loopback data on uplink TCH Serial data input from call processing I/O port (rear panel) UE RX block count on GPRS uplink TCH GPRS UE USF RX block count
Call Processing	Call control: Location registration, Call origination, Call termination, Network-side termination, UE-side termination, Connection, termination and data transfer via GPRS UE control: Output level, Time slot, Timing advance, Loopback On/Off, GPRS test mode Channel coding: FS, EFS, HS0, HS1, AFS, AHS, CS-1, CS-2, CS-3, CS-4 Frequency band: GSM450, GSM480, GSM850, P-GSM, E-GSM, R-GSM, GSM710, T-GSM810, GSM750, DCS1800, PCS1900



EGPRS Measurement Software MX882101C-011

Function	This option for the MX882101C measures EGPRS TRX performance.
Frequency/Modulation Measurement	<p>Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 380.2 MHz to 389.8 MHz (T-GSM380 band) 410.2 MHz to 419.8 MHz (T-GSM410 band) 450.4 MHz to 457.6 MHz (GSM450 band) 478.8 MHz to 486.0 MHz (GSM480 band)</p> <p>Input level: -30 to +40 dBm (Main1, 2) (average power in bursts) Carrier frequency accuracy: ± (Set frequency × Reference oscillator accuracy + 10 Hz) (Normal burst) ± (Set frequency × Reference oscillator accuracy + 20 Hz) (RACH)</p> <p>Modulation accuracy (Residual phase error): ≤0.5° RMS, 2° peak Residual EVM: ≤1.5% RMS (8PSK) Measurement object: Normal burst (GMSK, 8PSK), RACH</p>
Amplitude Measurement	<p>Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 380.2 MHz to 389.8 MHz (T-GSM380 band) 410.2 MHz to 419.8 MHz (T-GSM410 band) 450.4 MHz to 457.6 MHz (GSM450 band) 478.8 MHz to 486.0 MHz (GSM480 band)</p> <p>Input level: -30 to +40 dBm (Main1, 2) (average power in bursts) Measurement accuracy 10°C to 40°C, After Cal ±0.3 dB (typ.), ±0.5 dB (-30 to +40 dBm) Linearity: ±0.2 dB (-40 to 0 dB, ≥-30 dBm) Power measurement range (carrier off): ≥65 dB (≥-10 dBm), ≥45 dB (≥-30 to -10 dBm) Burst wave display: Rise, Fall, Slot, On-interval Measurement object: Normal burst (GMSK, 8PSK), RACH</p>
Output Spectrum Measurement (Output RF Spectrum)	<p>Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 380.2 MHz to 389.8 MHz (T-GSM380 band) 410.2 MHz to 419.8 MHz (T-GSM410 band) 450.4 MHz to 457.6 MHz (GSM450 band) 478.8 MHz to 486.0 MHz (GSM480 band)</p> <p>Input level: -10 to +40 dBm (Main1, 2) (average power in bursts) Measurement range (modulation) Averaged with 10 measurements ≤-55 dB (≤250 kHz offset), ≤-66 dB (≥400 kHz offset) Measurement range (transient): ≤-57 dB (≥400 kHz offset) Measurement point: ±100 kHz, ±200 kHz, ±250 kHz, ±400 kHz, ±600 kHz, ±800 kHz, ±1000 kHz, ±1200 kHz, ±1400 kHz, ±1600 kHz, ±1800 kHz, ±2000 kHz Measurement object: Normal burst (GMSK, 8PSK)</p>
RF Signal Generator	<p>Output frequency range: Depends on MX882101C performance Phase error: Depends on MX882101C performance Modulation accuracy: ≤3% (RMS) Output pattern: CCH, TCH, CCH + TCH Coding scheme: MCS-1, MCS-2, MCS-3, MCS-4, MCS-5, MCS-6, MCS-7, MCS-8, MCS-9 Puncturing scheme: P1, P2, P3 TCH data: PN9, PN15, All0, All1, Fixed pattern (PAT0 to PAT9)</p>
Error Rate Measurement	<p>Measures bit error rate Measurement object: Loopback data on uplink TCH (GMSK, 8PSK) UE RX block count on EGPRS uplink TCH EGPRS UE USF RX block count</p>
Call Processing	<p>Call control: Location registration, Connection, termination and data transfer via EGPRS UE control: Output level, Time slot, Timing advance, EGPRS test mode Coding scheme: MCS-1, MCS-2, MCS-3, MCS-4, MCS-5, MCS-6, MCS-7, MCS-8, MCS-9 Puncturing scheme: P1, P2, P3 Frequency band: GSM450, GSM480, GSM710, GSM750, T-GSM810, GSM850, P-GSM, E-GSM, R-GSM, DCS1800, PCS1900</p>

W-CDMA Measurement Hardware MT8821C-001, TD-SCDMA Measurement Hardware MT8821C-007, TD-SCDMA Measurement Software MX882107C

Frequency/Modulation Measurement	<p>Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -30 to +35 dBm (Main1, 2) Carrier frequency accuracy: ± (Set frequency × Reference oscillator accuracy + 10 Hz) Modulation accuracy (residual vector error): ≤2.5% (single code)</p>
Amplitude Measurement	<p>Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -70 to +35 dBm (Main1, 2) Measurement accuracy 10°C to 40°C, After Cal ±0.3 dB (typ.), ±0.5 dB (-30 to +35 dBm), ±0.7 dB (-55 to -30 dBm), ±0.9 dB (-70 to -55 dBm) Linearity: ±0.2 dB (-40 to 0 dB, ≥-55 dBm), ±0.4 dB (-40 to 0 dB, ≥-65 dBm) Measurement object: DPCH, UpPCH</p>

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Occupied Bandwidth	Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -10 to +35 dBm (Main1, 2)
Adjacent Channel Leakage Power	Frequency range: 350 MHz to 2.7 GHz ≤500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -10 to +35 dBm (Main1, 2) Measurement point: ±1.6 MHz, ±3.2 MHz Measurement range: ≥50 dB (±1.6 MHz), ≥55 dB (±3.2 MHz)
RF Signal Generator	Output frequency range: 300 MHz to 2.7 GHz, 1 Hz steps Channel level: -30.0 to 0.0 dBm (DPCH), 0.1 dB steps Channel level accuracy: ±0.2 dB AWGN level: Off, -20 to +5 dB, 0.1 dB steps AWGN level accuracy: ±0.2 dB EVM: ≤3% RMS
Error Rate Measurement	Function: Applying PN9 or PN15 pattern to DTCH Measures BER, BLER Measurement object: Loopback data on uplink DTCH
Call Processing	Call control: Location registration, Call origination, Call termination, Network-side release, UE-side release (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level, Loopback (executes each 3GPP-defined UE control)

TD-SCDMA HSDPA Measurement Software MX882107C-011

Function	This option for the MX882107C measures HSDPA RX performance.
Reference Channel	RMC 0.5Mbps UE class (QPSK), RMC 1.1Mbps UE class (QPSK), RMC 1.1Mbps UE class (16QAM), RMC 1.6Mbps UE class (QPSK), RMC 1.6Mbps UE class (16QAM), RMC 2.2Mbps UE class (QPSK), RMC 2.2Mbps UE class (16QAM), RMC 2.8Mbps UE class (QPSK), RMC 2.8Mbps UE class (16QAM)
Throughput Measurement	Measures throughput using RMC Measurement object: HS-SICH ACK and NACK
CQI Measurement	Measurement object: HS-SICH CQI (RTBS, RMF) reported periodically from UE
Call Processing	Call control: Location registration, Call processing using RMC (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level (executes each 3GPP-defined UE control)

TD-SCDMA HSDPA Evolution Measurement Software MX882107C-012

Function	This option for the MX882107C measures HSDPA Evolution RX performance.
Reference Channel	RMC Category 16 to 18 UE (64QAM), RMC Category 19 to 21 UE (64QAM), RMC Category 22 to 24 UE (64QAM), RMC Category 18 max., RMC Category 21 max., RMC Category 24 max.
Throughput Measurement	Throughput measurement using RMC Measurement object: HS-SICH ACK and NACK
CQI Measurement	Measurement object: HS-SICH CQI (RTBS) reported periodically from UE
Call Processing	Call control: Location registration, Call processing using RMC (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level (executes each 3GPP-defined UE control)

TD-SCDMA HSUPA Measurement Software MX882107C-021

Function	This option for the MX882107C measures HSUPA, HSUPA Evolution TX performance.
Modulation Measurement	Depends on MX882107C performance
Call Processing	Call control: Location registration, Call processing using FRC1 and FRC2 (executes each 3GPP-defined processing and performs Pass/Fail evaluation) UE control: Output level (executes each 3GPP-defined UE control)

CDMA2000 Measurement Software Lite MX882132C

Electrical Characteristics	Typical values (typ.) are only for reference and are not guaranteed.
Frequency/Modulation Measurement	Frequency range: 300 MHz to 2.7 GHz Input level: -30 to +35 dBm Carrier frequency accuracy: ± (Set frequency × Reference oscillator + 10 Hz) Modulation accuracy Residual waveform quality: >0.999
Amplitude Measurement	Frequency range: 300 MHz to 2.7 GHz Input level: -65 to +35 dBm (Main1/2) Measurement accuracy Filtered power measurement, after Full Cal, Input level setting, 10°C to 40°C ±0.5 dB (-30 to +35 dBm), typ. ±0.3 dB (-30 to +35 dBm), ±0.7 dB (-55 to -30 dBm), ±0.9 dB (-65 to -55 dBm) Linearity Filtered power measurement, Input level setting for reference ±0.2 dB (-40 to 0 dB, ≥-55 dBm), ±0.4 dB (-40 to 0 dB, ≥-65 dBm)
Occupied Bandwidth	Frequency range: 300 MHz to 2.7 GHz Input level: -10 to +35 dBm (Main1/2)
Code Domain Power	Can be measured when Reverse-RC is set to RC 3 or RC 4. Measurement level range: -30 to +35 dBm Measurement accuracy: ±0.2 dB (Code power ≥-15 dBc), ±0.4 dB (Code power ≥-23 dBc)

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RF Signal Generator	Output frequency range: 300 MHz to 2.7 GHz, 1 Hz steps CDMA2000 1X Waveform quality: >0.99
AF Input	Input frequency Frequency range: 50 Hz to 10 kHz Input level Input voltage range: 1 mV peak to 5 V peak (AF input connector) Maximum allowable input voltage: 30 V rms Frequency measurement accuracy: \pm (Reference oscillator accuracy + 0.5 Hz) Level measurement accuracy: ± 0.2 dB (≥ 10 mV peak), ± 0.4 dB (≥ 1 mV peak, ≥ 1 kHz) SINAD measurement range At frequency 1 kHz ≥ 60 dB (≥ 1000 mV peak), ≥ 54 dB (> 50 mV peak), ≥ 46 dB (≥ 10 mV peak) Distortion measurement range At frequency 1 kHz ≤ -60 dB (≥ 1000 mV peak), ≤ -54 dB (> 50 mV peak), ≤ -46 dB (≥ 10 mV peak) Input impedance: 100 k Ω
AF Output	Output frequency Frequency range: 30 Hz to 10 kHz Resolution: 1 Hz Accuracy: \pm (Set frequency \times Reference oscillator accuracy + 0.1 Hz) Output level Range: 0 to 5 V peak (AF output connector) Resolution: 1 mV (≤ 5 V peak), 100 μ V (≤ 500 mV peak), 10 μ V (≤ 50 mV peak) Accuracy: ± 0.2 dB (≥ 10 mV peak, ≥ 50 Hz), ± 0.3 dB (≥ 10 mV peak, < 50 Hz) Waveform distortion: ≤ 30 kHz band ≤ -60 dB (≥ 500 mV peak, ≤ 5 kHz), ≤ -54 dB (≥ 70 mV peak) Output impedance: $\leq 1 \Omega$ Max. output current: 100 mA

1xEV-DO Measurement Software Lite MX882136C

Frequency/Modulation Measurement	Frequency range: 300 MHz to 2.7 GHz Input level: -30 to $+35$ dBm (Main1/2) Carrier frequency accuracy: \pm (Set frequency \times Reference oscillator accuracy + 10 Hz) Modulation accuracy Residual waveform quality: >0.999
Amplitude Measurement	Depends on MX882132C performance
Occupied Bandwidth	Depends on MX882132C performance
Code Domain Power	Input level: -30 to $+35$ dBm (Main1, 2) Measurement accuracy: ± 0.2 dB (Code power: ≥ -15 dBc), ± 0.4 dB (Code power: ≥ -23 dBc)
RF Signal Generator	Output frequency range: 300 MHz to 2.7 GHz, 1 Hz steps Channel level (relative level to Ior): 0 dB (Pilot channel, MAC channel, Control channel, Traffic channel) Waveform quality: >0.999

LTE FDD Measurement Software Lite MX882142C, LTE TDD Measurement Software Lite MX882143C

Frequency/Modulation Measurement	Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -40 to $+35$ dBm (Main1, 2) Carrier frequency accuracy: \pm (Set frequency \times Reference oscillator accuracy + 15 Hz) Modulation accuracy (residual vector error): $\leq 2.5\%$ (400 MHz \leq frequency \leq 3.8 GHz, Measurement count: 20) $\leq 3.5\%$ (3.8 GHz $<$ frequency \leq 5.0 GHz, Measurement count: 20) In-band Emissions: ≤ -40 dB (≥ -10 dBm, Allocated RB: ≤ 18) Measurement object: PUSCH
Amplitude Measurement	Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -60 to $+35$ dBm (Main1, 2) Measurement accuracy 10°C to 40°C, After Cal, 400 MHz \leq frequency \leq 3.8 GHz ± 0.3 dB (typ.), ± 0.5 dB (-20 to $+35$ dBm), ± 0.7 dB (-50 to -20 dBm), ± 0.9 dB (-60 to -50 dBm) 20°C to 30°C, After Cal, 3.8 GHz $<$ frequency \leq 5.0 GHz ± 0.7 dB (-20 to $+35$ dBm), ± 0.9 dB (-50 to -20 dBm), ± 1.1 dB (-60 to -50 dBm) Linearity 400 MHz to 5.0 GHz, -40 to 0 dB ± 0.2 dB (≥ -50 dBm), ± 0.4 dB (≥ -60 dBm) Measurement object: PUSCH
Occupied Bandwidth	Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications. 452.5 MHz to 457.5 MHz (LTE operating band 31) Input level: -10 to $+35$ dBm (Main1, 2) Channel bandwidth: 1.4, 3, 5 MHz (452.5 MHz \leq UL frequency \leq 457.5 MHz) 1.4, 3, 5, 10, 15, 20 MHz (500 MHz \leq UL frequency)

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Adjacent Channel Leakage Power	<p>Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications: 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2)</p> <p>Measurement range: ≥ 45 dB (E-UTRA ACLR1), ≥ 50 dB (UTRA ACLR1), ≥ 55 dB (UTRA ACLR2)</p> <p>Channel bandwidth: 1.4, 3, 5 MHz ($452.5 \text{ MHz} \leq \text{UL frequency} \leq 457.5 \text{ MHz}$) 1.4, 3, 5, 10, 15, 20 MHz ($500 \text{ MHz} \leq \text{UL frequency}$)</p>
Spectrum Emission Mask	<p>Frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 5.0 GHz (with MT8821C-019) ≤ 500 MHz: Only the following frequency range meets the specifications: 452.5 MHz to 457.5 MHz (LTE operating band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2)</p> <p>Channel bandwidth: 1.4, 3, 5 MHz ($452.5 \text{ MHz} \leq \text{UL frequency} \leq 457.5 \text{ MHz}$) 1.4, 3, 5, 10, 15, 20 MHz ($500 \text{ MHz} \leq \text{UL frequency}$)</p>
RF Signal Generator	<p>Output frequency range: 400 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (with MT8821C-019) 1 Hz steps</p> <p>Output level Main: -140 to -10 dBm (Modulation: Off), -142 to -12 dBm (Modulation: On) Aux: -125 to +5 dBm (Modulation: Off), -127 to +3 dBm (Modulation: On)</p>

Sequence Measurement Software MX882120C

Amplitude Measurement	<p>Frequency: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (when MT8821C-019 is installed)</p> <p>For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31) 410.0 MHz to 419.975 MHz (CDMA2000 Band Class 5, 11) 450.0 MHz to 459.990 MHz (CDMA2000 Band Class 5, 11) 479.0 MHz to 483.480 MHz (CDMA2000 Band Class 5, 11) 410.2 MHz to 419.8 MHz (Band T-GSM410) 450.4 MHz to 457.6 MHz (Band GSM450) 478.8 MHz to 486.0 MHz (Band GSM480)</p> <p>Input level: -70 to +35 dBm (Main1, 2)</p> <p>Measurement accuracy ± 0.5 dB (-20 to +35 dBm) (typ.) ± 0.3 dB (-20 to +35 dBm), ± 0.7 dB (-50 to -20 dBm), ± 0.9 dB (-60 to -50 dBm) For measurement bandwidth of ≤ 5 MHz ± 0.5 dB (-30 to +35 dBm) (typ.) ± 0.3 dB (-30 to +35 dBm), ± 0.7 dB (-55 to -30 dBm), ± 0.9 dB (-65 to -55 dBm) For measurement bandwidth of ≤ 2 MHz ± 0.5 dB (-30 to +35 dBm) (typ.) ± 0.3 dB (-30 to +35 dBm), ± 0.7 dB (-55 to -30 dBm), ± 0.9 dB (-70 to -55 dBm), 400 MHz \leq freq. \leq 3.8 GHz, after calibration, 10 to 40°C ± 0.7 dB (-20 to +35 dBm), ± 0.9 dB (-50 to -20 dBm), ± 1.1 dB (-60 to -50 dBm), 3.8 GHz < freq. \leq 5.0 GHz, after calibration, 20°C to 30°C</p> <p>Linearity ± 0.2 dB (-40 to 0 dB, ≥ -50 dBm), ± 0.4 dB (-40 to 0 dB, ≥ -60 dBm) For measurement bandwidth of ≤ 5 MHz ± 0.2 dB (-40 to 0 dB, ≥ -55 dBm), ± 0.4 dB (-40 to 0 dB, ≥ -65 dBm), 400 MHz \leq freq. \leq 3.8 GHz, 10°C to 40°C ± 0.2 dB (-40 to 0 dB, ≥ -50 dBm), ± 0.4 dB (-40 to 0 dB, ≥ -60 dBm), 3.8 GHz < freq. \leq 5.0 GHz, 10°C to 40°C</p> <p>Relative measurement error: Range < 2 dB (typ.) ± 0.10 dB (-40 to 0 dB, ≥ -50 dBm)</p>
RF Signal Generator	<p>Output frequency: 400 MHz to 3.8 GHz, 3.8 GHz to 6 GHz (when MT8821C-019 is installed) 1 Hz steps</p> <p>Output level Main output -140.0 to -10.0 dBm (Modulation Off), -142.0 to -12.0 dBm (Modulation On) AUX output -125.0 to +5.0 dBm (Modulation Off), -127.0 to +3.0 dBm (Modulation On)</p>

W-CDMA Measurement Software MX882120C-001

Frequency/Modulation Measurement	<p>Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -30 to +35 dBm (Main1, 2)</p> <p>Carrier frequency accuracy: \pm (Set frequency \times Reference oscillator accuracy + 10 Hz)</p> <p>Modulation accuracy: $\leq 2.5\%$ (when one DPCCCH and one DPDCH are input)</p>
Amplitude Measurement	<p>Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -65 to +35 dBm (Main1, 2)</p> <p>Measurement accuracy: ± 0.5 dB (-30 to +35 dBm) (typ.) ± 0.3 dB (-30 to +35 dBm), ± 0.7 dB (-55 to -30 dBm), ± 0.9 dB (-65 to -55 dBm), after calibration, 10°C to 40°C</p> <p>Linearity: ± 0.2 dB (-40 to 0 dB, ≥ -55 dBm), ± 0.4 dB (-40 to 0 dB, ≥ -65 dBm), 10°C to 40°C</p> <p>Measurement object: DPCH</p>
Occupied Bandwidth	<p>Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2)</p>
Adjacent Channel Leakage Power	<p>Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2)</p> <p>Measurement range: ≥ 50 dB (± 5 MHz), ≥ 55 dB (± 10 MHz)</p>



GSM Measurement Software MX882120C-002

Frequency/Modulation Measurement	<p>Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 410.2 MHz to 419.8 MHz (Band T-GSM410) 450.4 MHz to 457.6 MHz (Band GSM450) 478.8 MHz to 486 MHz (Band GSM480)</p> <p>Input level: -30 to +35 dBm (average power in bursts, Main1, 2) Carrier frequency accuracy: \pm (Set frequency \times Reference oscillator accuracy + 10 Hz) Modulation accuracy: Residual phase error \leq0.5 deg. (rms), \leq2 deg. (peak) (GMSK) Residual EVM \leq1.5% (rms) (8PSK) Measurement object: Normal burst (GMSK, 8PSK)</p>
Amplitude Measurement	<p>Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 410.2 MHz to 419.8 MHz (Band T-GSM410) 450.4 MHz to 457.6 MHz (Band GSM450) 478.8 MHz to 486 MHz (Band GSM480)</p> <p>Input level: -30 to +35 dBm (average power in bursts, Main1, 2) Measurement accuracy: \pm0.5 dB (-30 to +35 dBm) (typ.) \pm0.3 dB (-30 to +35 dBm), after calibration, 10°C to 40°C Linearity: \pm0.2 dB (-40 to 0 dB, \geq-30 dBm), 10°C to 40°C Power measurement range when carrier Off: \geq65 dB (\geq-10 dBm), \geq45 dB (-30 to -10 dBm) Measurement object: Normal burst (GMSK, 8PSK)</p>
Output Spectrum Measurement (Output RF Spectrum)	<p>Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 410.2 MHz to 419.8 MHz (Band T-GSM410) 450.4 MHz to 457.6 MHz (Band GSM450) 478.8 MHz to 486 MHz (Band GSM480)</p> <p>Input level: -10 to +35 dBm (average power in bursts, Main1, 2) Measurement point: \pm100 kHz, \pm200 kHz, \pm250 kHz, \pm400 kHz, \pm600 kHz, \pm800 kHz, \pm1000 kHz, \pm1200 kHz, \pm1400 kHz, \pm1600 kHz, \pm1800 kHz, \pm2000 kHz Modulation part measurement range: Averaged over 10 measurements, \leq-55 dB (\leq250 kHz offset), \leq-66 dB (\geq400 kHz offset) Transient part measurement range: \leq-57 dB (\geq400 kHz offset) Measurement object: Normal burst (GMSK, 8PSK)</p>

LTE Measurement Software MX882120C-004

Frequency/Modulation Measurement	<p>Frequency: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (when MT8821C-019 is installed) For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -40 to +35 dBm (Main1, 2) Carrier frequency accuracy: \pm (Set frequency \times Reference oscillator accuracy + 15 Hz) Modulation accuracy: Residual vector error \leq 2.5% (400 MHz \leq freq. \leq 3.8 GHz) (when measurement count is 20), \leq3.5% (3.8 GHz < freq. \leq 5.0 GHz) (when measurement count is 20) For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31) In-Band Emissions: \leq -40 dB (\geq-10 dBm, Allocated RB \leq18) Measurement object: PUSCH</p>
Amplitude Measurement	<p>Frequency: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (when MT8821C-019 is installed) For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -60 to +35 dBm (Main1, 2) Measurement accuracy: \pm0.5 dB (-20 to +35 dBm) (typ.) \pm0.3 dB (-20 to +35 dBm), \pm0.7 dB (-50 to -20 dBm), \pm0.9 dB (-60 to -50 dBm), 400 MHz \leq freq. \leq 3.8 GHz, after calibration, 10°C to 40°C \pm0.7 dB (-20 to +35 dBm), \pm0.9 dB (-50 to -20 dBm), \pm1.1 dB (-60 to -50 dBm), 3.8 GHz < freq. \leq 5.0 GHz, after calibration, 20°C to 30°C Linearity: \pm0.2 dB (-40 to 0 dB, \geq-50 dBm), \pm0.4 dB (-40 to 0 dB, \geq-60 dBm), 400 MHz \leq freq. \leq 3.8 GHz, 10°C to 40°C \pm0.2 dB (-40 to 0 dB, \geq-50 dBm), \pm0.4 dB (-40 to 0 dB, \geq-60 dBm), 3.8 GHz < freq. \leq 5.0 GHz, 10°C to 40°C Measurement object: PUSCH</p>
Occupied Bandwidth	<p>Frequency: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (when MT8821C-019 is installed) For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2) Channel bandwidth: 1.4, 3, 5 MHz (452.5 MHz \leq UL frequency \leq 457.5 MHz) 1.4, 3, 5, 10, 15, 20 MHz (500 MHz \leq UL frequency)</p>
Adjacent Channel Leakage Power	<p>Frequency: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (when MT8821C-019 is installed) For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2) Measurement range: \geq45 dB (E-UTRA ACLR1), \geq50 dB (UTRA ACLR1), \geq55 dB (UTRA ACLR2) 400 MHz to 5.0 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Channel bandwidth: 1.4, 3, 5 MHz (452.5 MHz \leq UL frequency \leq 457.5 MHz) 1.4, 3, 5, 10, 15, 20 MHz (500 MHz \leq UL frequency)</p>
Spectrum Emission Mask	<p>Frequency: 400 MHz to 3.8 GHz 3.8 GHz to 5.0 GHz (when MT8821C-019 is installed) For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31)</p> <p>Input level: -10 to +35 dBm (Main1, 2) Channel bandwidth: 1.4, 3, 5 MHz (452.5 MHz \leq UL frequency \leq 457.5 MHz) 1.4, 3, 5, 10, 15, 20 MHz (500 MHz \leq UL frequency)</p>



TD-SCDMA Measurement Software MX882120C-005

Frequency/Modulation Measurement	Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -30 to +35 dBm (Main1, 2) Carrier frequency accuracy: ± (Set frequency × Reference oscillator accuracy + 10 Hz) Modulation accuracy: Residual vector error ≤2.5% (Single code)
Amplitude Measurement	Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -70 to +35 dBm (Main1, 2) Measurement accuracy: ±0.5 dB (-30 to +35 dBm) (typ.) ±0.3 dB (-30 to +35 dBm), ±0.7 dB (-55 to -30 dBm), ±0.9 dB (-70 to -55 dBm), after calibration, 10°C to 40°C Linearity: ±0.2 dB (-40 to 0 dB, ≥-55 dBm), ±0.4 dB (-40 to 0 dB, ≥-65 dBm), 10°C to 40°C Measurement object: DPCH
Occupied Bandwidth	Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -10 to +35 dBm (Main1, 2)
Adjacent Channel Leakage Power	Frequency: 400 MHz to 2.7 GHz For the frequencies below 500 MHz, only the following range meets the specifications: 452.5 MHz to 457.5 MHz (LTE Operating Band 31) Input level: -10 to +35 dBm (Main1, 2) Measurement point: ±1.6 MHz, ±3.2 MHz Measurement range: ≥50 dB (±1.6 MHz), ≥ 55 dB (±3.2 MHz)

Typical (typ.): Performance not warranted. Most products meet typical performance.
Nominal (nom.): Values not warranted. Included to facilitate application of product.

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name	Remarks
MT8821C	Main Frame Radio Communication Analyzer	
	Standard Accessories	
P0031A	Power Cord: 1 pc	
W3753AE	USB Memory: 1 pc MT8821C Operation Manual: 1 pc	USB memory
	Options	
MT8821C-001	W-CDMA Measurement Hardware	Requires MT8821C-001
MT8821C-002	TDMA Measurement Hardware	
MT8821C-007	TD-SCDMA Measurement Hardware	
MT8821C-008	LTE Measurement Hardware	
MT8821C-012	Parallel Phone Measurement Hardware*1	
MT8821C-019	Extended RF 3.8 GHz to 6 GHz	
MT8821C-025	2nd RF for Phone1	Requires MT8821C-025 Requires MT8821C-026 Requires MT8821C-012 Requires MT8821C-028 Requires MT8821C-029
MT8821C-026	3rd RF for Phone1	
MT8821C-027	4th RF for Phone1	
MT8821C-028	2nd RF for Phone2	
MT8821C-029	3rd RF for Phone2	
MT8821C-030	4th RF for Phone2	
	Retrofit Options*2	
MT8821C-□01	W-CDMA Measurement Hardware Retrofit	Requires MT8821C-001
MT8821C-□02	TDMA Measurement Hardware Retrofit	
MT8821C-□07	TD-SCDMA Measurement Hardware Retrofit	
MT8821C-□08	LTE Measurement Hardware Retrofit	
MT8821C-□12	Parallel Phone Measurement Hardware Retrofit*1	

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Model/Order No.	Name	Remarks
	Software Options	
MX882100C	W-CDMA Measurement Software	Requires MT8821C-001
MX882100C-002	W-CDMA External Packet Data	Requires MX882100C
MX882100C-003	W-CDMA Video Phone Test* ³	Requires MX882100C
MX882100C-005	W-CDMA A-GPS	Requires MX882100C
MX882100C-019	W-CDMA HSPA Measurement Software* ³	Requires MX882100C
MX882100C-032	DC-HSDPA Measurement Software	Requires MT8821C-001 (2 sets), MT8821C-012, MX882100C and MX882100C-019
MX882100C-033	DC-HSUPA Measurement Software	Requires MX882100C-032
MX882100C-034	4C-HSDPA Measurement Software	Requires MX882100C-032
MX882170C	W-CDMA Ciphering Software* ³	Requires MX882100C
MX882101C	GSM Measurement Software	Requires MT8821C-002
MX882101C-002	GSM External Packet Data	Requires MX882101C
MX882101C-005	GSM A-GPS	Requires MX882101C
MX882101C-011	EGPRS Measurement Software	Requires MX882101C
MX882107C	TD-SCDMA Measurement Software	Requires MT8821C-007
MX882107C-002	TD-SCDMA External Packet Data	Requires MX882107C
MX882107C-003	TD-SCDMA Video Phone Test	Requires MX882107C
MX882107C-011	TD-SCDMA HSDPA Measurement Software	Requires MX882107C
MX882107C-012	TD-SCDMA HSDPA Evolution Measurement Software	Requires MX882107C-011
MX882107C-021	TD-SCDMA HSUPA Measurement Software	Requires MX882107C-011
MX882112C	LTE FDD Measurement Software	Requires MT8821C-008
MX882112C-006	LTE FDD IP Data Transfer	Requires MX882112C
MX882112C-010	LTE FDD Anchor For 5G NSA	Requires MT8000A and MX882112C
MX882112C-011	LTE FDD 2x2 MIMO DL	Requires MT8821C-012 and MX882112C
MX882112C-012	LTE FDD 4x4 MIMO DL	Requires MT8821C-026, MT8821C-029 and MX882112C-011
MX882112C-016	LTE FDD CS Fallback to W-CDMA/GSM	Requires MX882112C and MX882100C or MX882101C
MX882112C-021	LTE-Advanced FDD DL CA Measurement Software	Requires MT8821C-025 and MX882112C
MX882112C-022	LTE-Advanced FDD UL CA Measurement Software	Requires MT8821C-028 when MX882112C-011 installed
MX882112C-026	LTE-Advanced FDD DL CA IP Data Transfer	Requires MX882112C-021
MX882112C-031	LTE-Advanced FDD DL CA 3CCs Measurement Software	Requires MX882112C-006 and MX882112C-021
MX882112C-036	LTE-Advanced FDD DL CA 3CCs IP Data Transfer	Requires MT8821C-008 (2 sets), MT8821C-026 and MX882112C-021
MX882112C-041	LTE-Advanced FDD DL CA 4CCs Measurement Software	Requires MT8821C-029 when MX882112C-011 installed
MX882112C-046	LTE-Advanced FDD DL CA 4CCs IP Data Transfer	Requires MX882112C-026 and MX882112C-031
MX882112C-051	LTE-Advanced FDD DL CA 5CCs Measurement Software	Requires MT8821C-030 when MX882112C-011 installed
MX882112C-061	LTE-Advanced FDD DL CA 6CCs Measurement Software	Requires MX882112C-036 and MX882112C-041
MX882112C-071	LTE-Advanced FDD DL CA 7CCs Measurement Software	Requires MT8821C-012 and MX882112C-041
MX882112C-081	LTE-Advanced FDD DL CA 8CCs Measurement Software	Requires MX882112C-051
MX882113C	LTE TDD Measurement Software	Requires MX882112C-061
MX882113C-006	LTE TDD IP Data Transfer	Requires MX882112C-071
MX882113C-010	LTE TDD Anchor For 5G NSA	Requires MT8821C-008
MX882113C-011	LTE TDD 2x2 MIMO DL	Requires MX882113C
MX882113C-012	LTE TDD 4x4 MIMO DL	Requires MT8000A and MX882113C
MX882113C-016	LTE TDD CS Fallback to W-CDMA/GSM	Requires MT8821C-012 and MX882113C
MX882113C-018	LTE TDD CS Fallback to TD-SCDMA/GSM	Requires MT8821C-026, MT8821C-029 and MX882113C-011
MX882113C-021	LTE-Advanced TDD DL CA Measurement Software	Requires MX882113C and MX882100C or MX882101C
MX882113C-022	LTE-Advanced TDD UL CA Measurement Software	Requires MX882113C and MX882101C or MX882107C
MX882113C-026	LTE-Advanced TDD DL CA IP Data Transfer	Requires MT8821C-025 and MX882113C
MX882113C-031	LTE-Advanced TDD DL CA 3CCs Measurement Software	Requires MT8821C-028 when MX882113C-011 installed
MX882113C-036	LTE-Advanced TDD DL CA 3CCs IP Data Transfer	Requires MX882113C-021
MX882113C-041	LTE-Advanced TDD DL CA 4CCs Measurement Software	Requires MX882113C-006 and MX882113C-021
MX882113C-046	LTE-Advanced TDD DL CA 4CCs IP Data Transfer	Requires MT8821C-008 (2 sets), MT8821C-026 and MX882113C-021
MX882113C-051	LTE-Advanced TDD DL CA 5CCs Measurement Software	Requires MT8821C-029 when MX882113C-011 installed
MX882113C-061	LTE-Advanced TDD DL CA 6CCs Measurement Software	Requires MX882113C-026 and MX882113C-031
MX882113C-071	LTE-Advanced TDD DL CA 7CCs Measurement Software	Requires MT8821C-030 when MX882113C-011 installed
MX882113C-081	LTE-Advanced TDD DL CA 8CCs Measurement Software	Requires MX882113C-036 and MX882113C-041
MX882115C	W-CDMA HSPA Evolution IP Data Transfer	Requires MT8821C-012 and MX882113C-041
MX882116C	DC-HSDPA IP Data Transfer	Requires MX882113C-051
MX882116C-006	LTE Category M1 Measurement Software	Requires MX882113C-061
MX882117C	LTE Category M1 IP Data Transfer	Requires MX882113C-071
MX882117C-001	NB-IoT Measurement Software	Requires MT8821C-008
MX882117C-002	NB-IoT Category NB-2 Measurement Software	Requires MX882115C
MX882117C-006	NB-IoT Multi Carrier	Requires MT8821C-008
MX882120C	NB-IoT IP Data Transfer	Requires MX882116C
MX882120C-001	Sequence Measurement Software	Requires MT8821C-008
MX882120C-002	W-CDMA Measurement Software	Requires MX882117C
MX882120C-004	GSM Measurement Software	Requires MX882117C
MX882120C-005	LTE Measurement Software	Requires MX882117C
MX882132C	TD-SCDMA Measurement Software	Requires MX882120C
MX882136C	CDMA2000 Measurement Software Lite	Requires MX882120C
MX882142C	1xEV-DO Measurement Software Lite	Requires MX882120C
MX882143C	LTE FDD Measurement Software Lite	Requires MX882120C
MX882164C	LTE TDD Measurement Software Lite	Requires MX882120C
	LTE VoLTE Echoback	Requires MX882112C for LTE FDD, requires MX882113C for LTE TDD

Continued on next page



Model/Order No.	Name	Remarks
MT8821C-UG□01 MT8821C-UG□02 MT8821C-UG□03 MT8821C-UG□04 MT8821C-UG011 MT8821C-UG□10	Upgrade Kits*2 SPM Upgrade Kit from MT8820C PPM Upgrade Kit from MT8820C SPM Upgrade Kit from MT8820C with MX88207xC PPM Upgrade Kit from MT8820C with MX88207xC Software Upgrade Kit CPU/Windows10 Upgrade Retrofit	Required for additional purchase of software options, etc.
MT8821C-ES210 MT8821C-ES310 MT8821C-ES510	Warranty Service 2 years Extended Warranty Service 3 years Extended Warranty Service 5 years Extended Warranty Service	
P0035B P0035B7 P0135A6 P0135A7 P0135B6 P0135B7 P0250A6 P0250A7 P0250B6 P0250B7 P0260A6 P0260A7 P0260B6 P0260B7 P0435A6 P0435A7 A0058A P0031A Z0541A Z1898A J1643A J1644A J0004 J1195A J1249 J1267 J1606A J0576B J0576D J0127A J0127C J0007 J0008 J1261A J1261B MN8110B B0332 B0703A B0701A B0702A Z1858A Z1859A J0322A J0322B J0322C J0322D J1398A J1802A	Application Parts W-CDMA/GSM Test USIM W-CDMA/GSM Test USIM*4 Anritsu Test UICC GA*4, *5 Anritsu Test UICC GA*4, *5 Anritsu Test UICC GA*4, *5 Anritsu Test UICC GA*4, *5 Anritsu Test UICC GT*4, *5 Anritsu Test UICC GT*4, *5 Anritsu Test UICC GT*4, *5 Anritsu Test UICC GT*4, *5 Anritsu Test UICC GM*4, *5 Anritsu Test UICC GM*4, *5 Anritsu Test UICC GM*4, *5 Anritsu Test UICC GM*4, *5 Anritsu Test UICC GA for eDRX*4 Anritsu Test UICC GA for eDRX*4 Handset USB Memory USB Mouse Connector Cap U Link U Link Coaxial Adaptor PP2S Output Cable CDMA2000 Cable CDMA2000 Cross Cable Cable Coaxial Cord, 1 m Coaxial Cord, 2 m Coaxial Cord, 1 m Coaxial Cord, 0.5 m GPIB Cable, 1 m GPIB Cable, 2 m Ethernet Cable (Shield Type) Ethernet Cable (Shield Type) I/O Adaptor Joint Plate Rack Mount Kit (MT8821C) Carrying Case*6 Carrying Case Divider Divider Coaxial Cord, 0.5 m Coaxial Cord, 1.0 m Coaxial Cord, 1.5 m Coaxial Cord, 2.0 m N-SMA ADAPTOR Sync Cable	Micro UICC size Nano UICC size Micro UICC size Nano UICC size Micro UICC size Nano UICC size Micro UICC size Nano UICC size Micro UICC size Nano UICC size Micro UICC size Nano UICC size Micro UICC size Nano UICC size Micro UICC size Nano UICC size (for eDRX test) Micro UICC size (for eDRX test) N-P · UT-141 · SMA-P (for connecting Phone 2 Main1 - SG input) N-P · UT-141 · SMA-P (for connecting Phone 2 Main1 - Monitor) D-sub (15-pin, P-type) · D-sub (15-pin, P-type), used in combination with J1267 (sold separately) D-sub (9-pin, P-type) · D-sub (9-pin, P-type), reverse cable used in combination with J1249 (sold separately) D-sub (15-pin, P-type) · D-sub (15-pin, P-type) · D-sub (15-pin, P-type) N-P · 5D-2W · N-P N-P · 5D-2W · N-P BNC-P · RG58A/U · BNC-P BNC-P · RG58A/U · BNC-P 1 m, straight 3 m, straight For call processing I/O 4 pcs/set Hard type (with protective cover and casters) Hard type (with protective cover, without casters) 2-way divider 3-way divider SMA-P · SMA-P, DC to 18 GHz, 50Ω SMA-P · SMA-P, DC to 18 GHz, 50Ω SMA-P · SMA-P, DC to 18 GHz, 50Ω SMA-P · SMA-P, DC to 18 GHz, 50Ω

*1: The following measurement hardware support the Parallelphone measurement option: MT8821C-001, MT8821C-002, MT8821C-007 and MT8821C-008.

All the measurement hardware can be installed simultaneously.

*2: MT8821C- □ ##

□: Select from the following according to the option type.

- 1: Retrofit option (Must be returned to factory in Japan)
- 2: Retrofit option (Must be returned to service center outside of Japan)

*3: For UE connectivity, contact your Anritsu sales representative.

*4: A commercial SIM adapter CANNOT be used. If used, it may jam and break in the UE.

*5: Refer to the P0135Ax/P0250Ax/P0260Ax/P0135Bx/P0250Bx/P0260Bx leaflet for details.

*6: RoHS non-compliant product. Cannot be shipped to the EU, UK and EFTA.

Parallelphone™ is a trademark of Anritsu Corporation.

Universal Wireless Test Set

MT8870A/MT8872A

MU887000A/MU887001A/MU887002A

Remote Control
GPIB | Ethernet

For Production Lines for Smartphones and Wireless Modules



NEW
MT8872A



Supports 5G NR Sub-6 GHz and IEEE 802.11ax (Wi-Fi 6E) with Efficient Non-Signaling Measurements

Wireless communications devices, such as smartphones and IoT devices, continue remarkable development and the market is expanding. In addition, wireless standards are also evolving with more products supporting diversifying standards. Against this background, manufacturers of wireless communication devices require flexible test equipment supporting various communication standards while improving production efficiency.

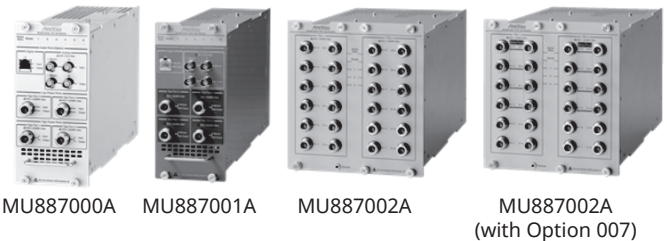
The Universal Wireless Test Set MT8870A/MT8872A main chassis are two Anritsu solutions with the flexibility to swap plug-in test units according to the production-line rate. They support 5G NR Sub-6 GHz and IEEE 802.11ax (Wi-Fi 6E) for efficient non-signaling measurements.

Versatile Modular Design



The versatile modular MT8870A/MT8872A design supports tailored infrastructure investment by swapping test units according to the customer's line density and operation rate. The standard MT8870A 19-inch rackmount chassis has four slots for test units, supporting efficient tests even on high-density production lines and contributing to higher productivity. The more compact MT8872A chassis is fully compatible with the MT8870A. It is designed for use in tighter spaces than the standard rackmount for better space saving. In addition, the measurement software supports evolving wireless standards. Licenses are installed in the MT8870A/MT8872A, and one license is shared by multiple test units, helping cut costs.

High-Performance Test Units with Flexibility and Expandability

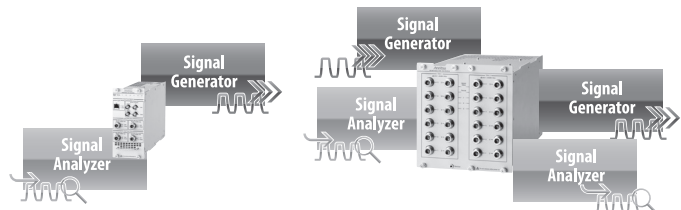


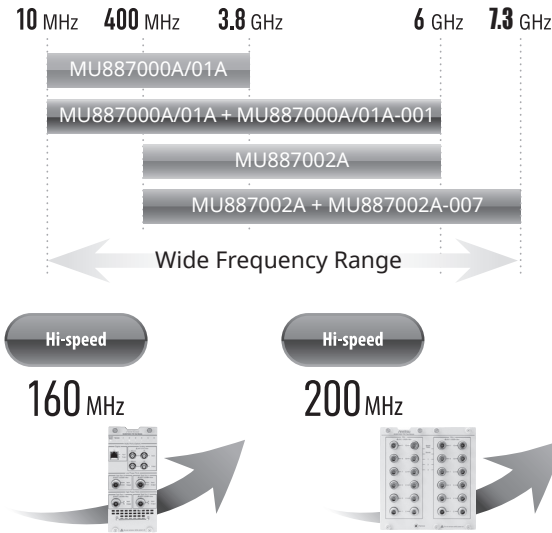
Customers can select the three MU887000A/MU887001A/MU887002A test units for the MT8870A/MT8872A according to measurement requirements.

The MU887000A/MU887001A units have four RF test ports per unit and one high-performance signal generator and signal analyzer set. The standard RF frequency upper limit is 3.8 GHz, which can be extended to 6 GHz as an option. A 160-MHz measurement bandwidth is supported as standard. In addition, installing the Audio Measurement Hardware option provides one high-performance audio analyzer and audio generator set to measure stereo and monaural audio.

The MU887002A test unit with 24 RF test ports and two high-performance signal generators and signal analyzers occupies two slots. The standard RF frequency upper limit is 6 GHz, which can be extended to 7.3 GHz as an option. A 200-MHz measurement bandwidth is supported as standard. In addition, the MU887002A can output the same signal from up to 12 RF test ports simultaneously, contributing to configuration of a more efficient production line.

Since each test unit is functionally compatible, changes to the customer's measurement system are minimized even when replacing a test unit.



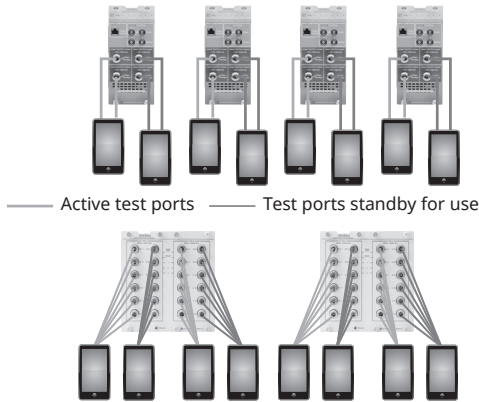


Various Efficient Measurement Methods

Anritsu supports various efficient measurement methods using the MT8870A/MT8872A.

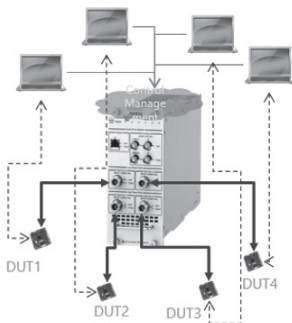
Ping-Pong Method

The Ping-Pong measurement method alternately measures two Devices Under Test (DUT) connected to the tester to increase production-line efficiency. Since up to four test modules can be installed in the MT8870A, four connected devices can be tested alternately. Using the MT8872A, two connected devices can be tested alternately.



Multi-DUT Measurement Scheduler

Installing the Multi-DUT Measurement Scheduler MX887090A software supports management of the tester software and hardware resources by the internal controller, so one test unit can be operated virtually as multiple testers, which optimizes the test unit operation rate and shortens the test time per device.



Specifications

MT8870A/MT8872A

	MT8870A	MT8872A
Slots	4	2
Dimensions	426 (W) × 221.5 (H) × 498 (D) mm	250 (W) × 221.5 (H) × 498 (D) mm
Mass	≤11.5 kg (excluding options and modules) ≤30 kg (including options and modules)	≤9.5 kg (excluding options and modules) ≤17.5 kg (including options and modules)

MU887000A/MU887001A/MU887002A

	MU887000A/MU887001A	MU887002A
RF Test Ports	4	12 × 2
VSA/VSG	1	2
Frequency Range	10 MHz to 3.8 GHz, 3.8 GHz to 6.0 GHz (Option)	400 MHz to 6.0 GHz, 6.0 GHz to 7.3 GHz (Option, Ports 5 to 12)
Remote Control	Ethernet, GPIB (Option)	Ethernet
Broadcast Output	Not supported	Supported
FM/Audio	Supported	Not supported

Ordering Information

Please specify the model/order number, name and quantity when ordering. The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

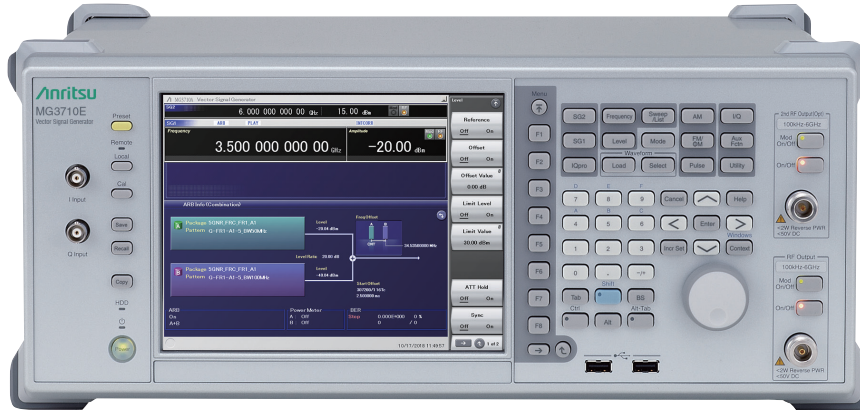
Model/Order No.	Name
MT8870A MT8872A	Main Chassis Universal Wireless Test Set Universal Wireless Test Set
MU887000A MU887001A MU887002A	Test Module TRX Test Module TRX Test Module TRX Test Module
MU887000A-001 MU887000A-002 MU887001A-001 MU887001A-002 MU887002A-007	Options 6 GHz Frequency Extension Audio Measurement Hardware 6 GHz Frequency Extension Audio Measurement Hardware 7 GHz Extension Function

* Refer to the catalog for details of functions and specifications, or contact your Anritsu sales representative for details.

Vector Signal Generator

MG3710E

100 kHz to 2.7 GHz/4.0 GHz/6.0 GHz

Remote Control
 GPIB | Ethernet | USB**Multi-Band/Multi-System/Multi-Channel – Cut Costs for New Wireless Tests –**

The MG3710E is a vector signal generator with 6-GHz upper frequency limit and 160-MHz*/120-MHz wide RF modulation baseband generator. It outputs various radio systems signals for cellular communications, such as 5G, LTE FDD/TDD, W-CDMA, GSM as well as narrowband communications, such as WLAN, Bluetooth and GPS.

Cuts Equipment Costs

The dual waveform memory cuts equipment costs for tests, such as ACS, Blocking and IM, which require two modulation signal sources. The dual RF cuts MIMO equipment costs and reduces workloads for phase synchronization between equipment. It is important for tests using separate signals, such as Multi-Standard Radio (MSR) and multi-band.

Improves Yield

The high quality signal generator ACLR and SSB phase noise reduces the effect on wideband and narrow-band measurements to improve test margins and yields.

–68 dBc @W-CDMA, TestModel1, 64DPCH, 2 GHz
 <math>< -140 \text{ dBc/Hz (nom.) @100 MHz, 20 kHz offset, CW}</math>

Cuts Tact Time

The List/Sweep mode switches the frequency and level faster than 600 μ s. Moreover, the 4-GB waveform memory upgrade can load many waveform patterns while instantaneous switching eliminates time wasted reloading waveform patterns.

*: Supports firmware version 2.00.00 and later. Can generate 160-MHz bandwidth signals (WLAN 802.11ac) only when using WLAN IQproducer MX370111A and 802.11ac (160 MHz) option MX370111A-002.

The latest version can be downloaded from the Anritsu homepage.
 https://my.anritsu.com/home



Key Features

Dual RF & Dual Waveform Memory

- One Unit Supports Two RF Outputs Max.
 - Frequency Range
 - 1stRF: 100 kHz to 2.7/4.0/6.0 GHz [Option 032/034/036]
 - 2ndRF: 100 kHz to 2.7/4.0/6.0 GHz [Option 062/064/066]
 - Independent Baseband and RF Outputs
- Output Two Signals from One RF Out [Option 048/078]
 - Wanted Signal + Interfere Signal
 - Wanted Signal + Delayed Signal, etc.

Basic Performance

- ACLR Performance
 - 68 dBc @W-CDMA, TestModel1, 64 DPCH, 2 GHz
- High-power Output [Option 041/071]
 - +23 dBm @CW, 400 MHz to 3 GHz
- High-speed Switching
 - < 600 μ s @List/Sweep mode
- High Level Accuracy
 - Absolute Level Accuracy: ± 0.5 dB
 - Linearity: ± 0.2 dB (typ.)
- Choice of Reference Oscillators
 - Standard
 - Aging rate $\pm 1 \times 10^{-6}$ /year, $\pm 1 \times 10^{-7}$ /day
 - High Stability Reference Oscillator [Option 002]
 - Aging rate $\pm 1 \times 10^{-7}$ /year, $\pm 1 \times 10^{-8}$ /day
 - Rubidium Reference Oscillator [Option 001]
 - Aging rate $\pm 1 \times 10^{-10}$ /month
- SSB Phase Noise Performance
 - <-140 dBc/Hz (nom.) @100 MHz, 20-kHz offset, CW
 - <-131 dBc/Hz (typ.) @1 GHz, 20-kHz offset, CW
 - <-125 dBc/Hz (typ.) @2 GHz, 20-kHz offset, CW

High All-purpose Baseband Performance

- Wide Vector Modulation Bandwidth
 - 160 MHz*/120 MHz (using Internal baseband signal generator)
 - 160 MHz (using External IQ input)
- *: Supports firmware version 2.00.00 and later. Can generate 160-MHz bandwidth signals (WLAN 802.11ac) only when using WLAN IQproducer MX370111A and 802.11ac (160 MHz) option MX370111A-002.
- Large-capacity Waveform Memory
- Arbitrary Waveform Generation

Expandability

- BER Test Function [Option 021]
- Built-in analog modulation (AM/FM/ Φ M) functions and pulse modulation (PM) functions [Standard]
- Adding additional analog modulation input options [Option 050/080]
- AWGN Generator [Option 049/079]
- USB Power Sensors [Sold separately]
- Local Signal I/O for MIMO Signal Source [Option 017]

Operability

- Simple Touch-panel Operation
- Signal Flowcharts with Signal Block Diagrams
- Frequency Channel Table

Connections with External Equipment

- Remote Control Interfaces
- USB Connections
- Analog IQ Input/Output [Option 018]
- Trigger Input
- Marker Output Editing
 - Marker 1 output [Standard]
 - Marker 2 and 3 output [Requires J1539A AUX Conversion Adapter]

Security

- User Data Storage on 2ndary HDD [Option 011]

Pre-installed Key Waveform Patterns

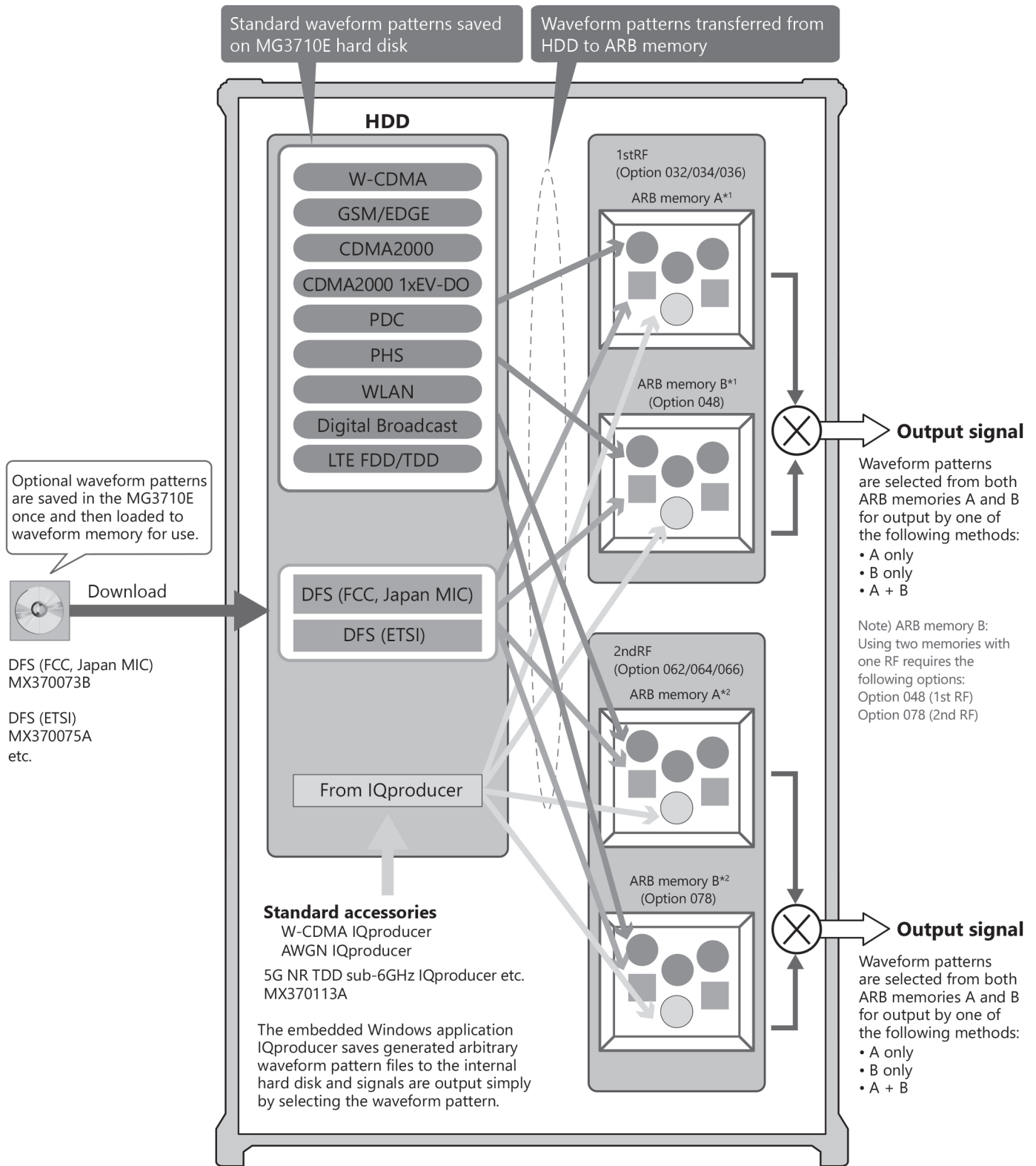
- Waveform Patterns [Pre-installed]
 - Waveform patterns for the world's main communications systems (below) are pre-installed in the MG3710E for license-free use.

LTE FDD (E-TM1.1 to E-TM3.3)
 LTE TDD (E-TM1.1 to E-TM3.3)
 W-CDMA/HSDPA
 GSM/EDGE
 CDMA2000 1X/1xEV-DO
 Bluetooth®
 GPS
 PDC
 PHS
 Digital Broadcast (ISDB-T/BS/CS/CATV)
 WLAN (802.11a/b/g)

Waveform Pattern Options and Generation

- Optional Waveform Pattern [Optional License]
 - DFS Radar Pattern (For FCC & Japan MIC)
 - DFS (ETSI) Waveform Pattern
 - ISDB-Tmm Waveform Pattern
- IQproducer Waveform Generation Software [Optional License]
 - 5G NR TDD sub-6 GHz
 - 5G NR FDD sub-6 GHz
 - LTE FDD/LTE-Advanced FDD
 - LTE TDD/LTE-Advanced TDD
 - HSDPA/HSUPA/W-CDMA
 - TD-SCDMA
 - CDMA2000 1xEV-DO
 - WLAN (802.11a/b/g/n/j/p/ac)
 - TDMA (PDC, PHS, PMR/LMR)
 - DVB-T/H
 - Multi-carrier
 - Fading

Vector Signal Generator MG3710E



*1: 1stRF ARB memory size
 256 MB × 1 pc = 64 Msamples (Std.)
 1 GB × 1 pc = 256 Msamples × 1 pc (Option 045)
 1 GB × 2 pcs = 256 Msamples × 2 pcs (Option 045 + Option 048)
 4 GB × 1 pc = 1024 Msamples × 1 pc (Option 046)
 4 GB × 2 pcs = 1024 Msamples × 2 pcs (Option 046 + Option 048)

*2: 2ndRF ARB memory size
 256 MB × 1 pc = 64 Msamples (Std.)
 1 GB × 1 pc = 256 Msamples × 1 pc (Option 075)
 1 GB × 2 pcs = 256 Msamples × 2 pcs (Option 075 + Option 078)
 4 GB × 1 pc = 1024 Msamples × 1 pc (Option 076)
 4 GB × 2 pcs = 1024 Msamples × 2 pcs (Option 076 + Option 078)

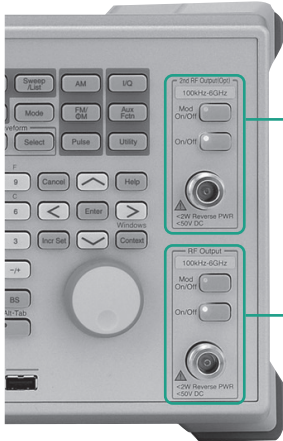
Dual RF & Dual Waveform Memory

Dual VSG: Two RF Outputs

The MG3710E supports two RF outputs (1stRF/2ndRF) max. in one unit. Moreover, different frequencies can be set independently at 1stRF and 2ndRF.

Not only different frequencies but also different levels and waveform patterns can be set independently at each SG while each is tracking the other. This is convenient in the R&D phase for evaluating interference between two different systems using different frequency bands.

Notes: Supported frequency bands cannot be changed after shipment.
IQ input is supported only by SG1 (1stRF) and requires Option 017.



2ndRF

Frequency Range:
2ndRF 100 kHz to 2.7 GHz [Option 062]
2ndRF 100 kHz to 4.0 GHz [Option 064]
2ndRF 100 kHz to 6.0 GHz [Option 066]
* Whether or not install and the frequency model can be selected at any time.

1stRF

Frequency Range:
1stRF 100 kHz to 2.7 GHz [Option 032]
1stRF 100 kHz to 4.0 GHz [Option 034]
1stRF 100 kHz to 6.0 GHz [Option 036]
* Must install any one of these.

Dual Waveform Memory: Four Waveform Outputs Max.

In the standard configuration, one VSG (1stRF or 2ndRF) has one waveform memory. However, adding the baseband signal combine option (Option 048/078) upgrades to two memories for one VSG. In other words, models with two VSGs (1stRF and 2ndRF) installed can have a maximum of four waveform memories. Two waveform patterns can be set easily on-screen for one VSG, each with different frequency offset, level offset and delay time settings to output a combined baseband RF signal. With this setup, one MG3710E supports the following test environment — a setup that previously required two expensive signal generators:

- Wanted Signal + Interference Signal
- Wanted Signal + Delayed Signal

Synthesizing Signals with Different Sampling Rates

- Rate Matching Function -

When signals with different sampling rates are set in memory A and memory B, a synthesized signal maintaining each of the different sampling rates can be output. This is useful when synthesizing signals for standards with different rates, such as multi-standard signals. However, depending on the combination of waveform sampling rates, sometimes it may not be possible to match rates due to internal operation clock limitations. The Mismatch warning dialog is displayed in this case.

The screenshot shows the MG3710A Vector Signal Generator interface. The main display shows two signal generators (SG2 and SG1) with their respective frequencies and amplitudes. The ARB (Arbitrary Waveform Memory) setup is shown on the right, with two patterns (A and B) selected. The ARB Info (Combination) section shows the combination of the two patterns, including level and frequency offset settings. The ARB Setup section shows the configuration for each pattern, including level, frequency offset, center signal, start offset, and sampling rate.

Level Setting
Setting Range: -80 to +80 dB
Resolution: 0.01 dB

Frequency Offset Setting
Setting Range: -100 to +100 MHz
Resolution: 1 Hz

Center Frequency Selection
A: Pattern A center
B: Pattern B center
Baseband DC:
Centered at baseband DC position

Time Offset Setting
Setting Range: 0 to pattern B sampling data count - 1

Waveform Pattern A Example: Wanted Signal

Waveform Pattern B Example: Interference Signal, Delayed Signal

Baseband Signal Combine Example



Basic Performance

Vector Accuracy (EVM)

- W-CDMA (Test Model 4)
Output Frequency: 800 MHz to 900 MHz, 1.8 GHz to 2.2 GHz
≤0.62%(rms)
≤0.6%(rms) (typ.)
- LTE (20 MHz Test Model 3.1)
Output Frequency: 600 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz
≤0.82%(rms)
≤0.8%(rms) (typ.)

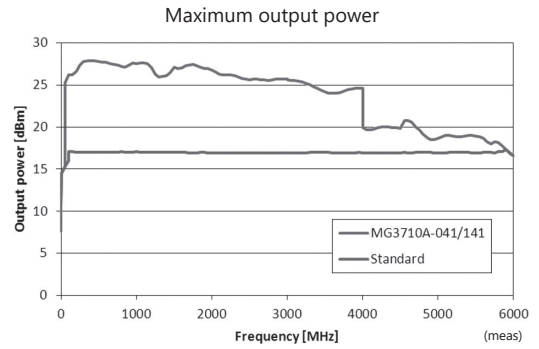
High-power Output [Option 041*1/071*2]

- *1: High Power Extension for 1stRF [Option 041]
- *2: High Power Extension for 2ndRF [Option 071]

Level Accuracy is assured at high levels (CW)

Frequency Range	Standard	Option 041/071
100 kHz ≤ f < 10 MHz	+5 dBm	+5 dBm
10 MHz ≤ f < 50 MHz	+10 dBm	+10 dBm
50 MHz ≤ f < 400 MHz	+13 dBm	+20 dBm
400 MHz ≤ f ≤ 3 GHz		+23 dBm
3 GHz < f ≤ 4 GHz		+20 dBm
4 GHz < f ≤ 5 GHz		+13 dBm
5 GHz < f ≤ 6 GHz	+11 dBm	+11 dBm

These options expand the MG3710E RF output upper limit. They are used when compensating for level losses of parts in the measurement path.

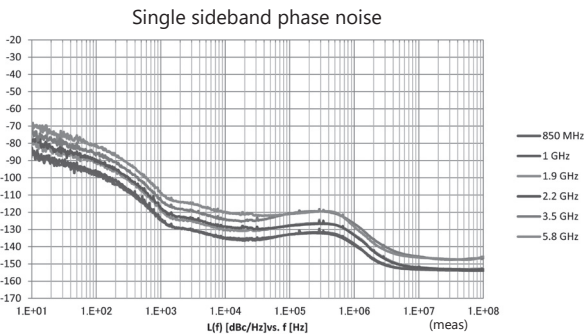
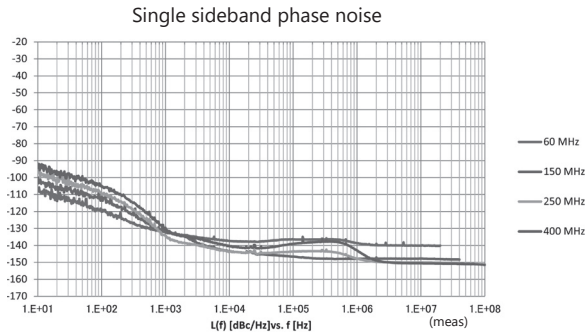


SSB Phase Noise

- <-140 dBc/Hz (nom.) @100 MHz, 20-kHz offset, CW
- <-131 dBc/Hz (typ.) @1 GHz, 20-kHz offset, CW
- <-125 dBc/Hz (typ.) @2 GHz, 20-kHz offset, CW

SSB phase noise is an important performance index for signal generators. For example, when using a signal generator for the following purposes, it is important to pre-confirm that the signal generator performance satisfies the measurement specifications.

- Communications with narrow bandwidth of several kHz
- OFDM Signals with narrow subcarrier gap
- CW interference waveforms



SSB Phase Noise
(Phase Noise Optimization <200 kHz, CW,
Optimize S/N Off, with Option 002)

High-speed Switching

<600 μs @List/Sweep mode

To shorten tact times on production lines the MG3710E supports two standard modes each with high-speed frequency and level switching.

• Sweep Mode

In this mode, the dwell time per point or number of points is split between the frequency range and level range (Start/Stop). This mode is used when matching dwell time per point and frequency/level steps.

Frequency Range: 999.500 000 00 MHz, -20.00 dBm
 Level Range: 1.000 000 000 00 GHz, -144.00 dBm
 Points: 10
 Dwell Time: 500 μs
 Step Shape: Sawtooth/Triangle



10 points, 500-μs Dwell Time

• List Mode

In this mode, the frequency, level and dwell time can be set for each of up to 500 points. This mode is used when wanting to set any dwell time, and frequency/level step per point.

Seq	Frequency	Level	Dwell T.
1	999.5000000 MHz	-20.00 dBm	500 μs
2	499.5000000 MHz	-20.00 dBm	1 μs
3	500.0000000 MHz	-20.00 dBm	2 μs
4	500.1000000 MHz	-40.00 dBm	3 μs
5	500.4000000 MHz	-20.00 dBm	10 μs

5 points, Any Dwell Time



High Level Accuracy

Absolute Level Accuracy: ± 0.5 dB*1

Linearity: ± 0.2 dB (typ.)*2

*1: 400 MHz to 3 GHz, -110 to +10 dBm

*2: 50 MHz to 3 GHz, -110 to -1 dBm

Excellent level accuracy and linearity are key factors with a large impact on measurement accuracy.

Supports Rubidium Reference Oscillator (Option)

Three reference oscillator options are supported. Select the high-stability reference oscillator option [Option 002] when requiring high accuracy depending on the measurement conditions; for even higher accuracy, select the rubidium reference oscillator [Option 001]. However, if external high-accuracy reference signals are available, selecting the standard reference oscillator option helps reduce unnecessary costs.

• Reference Oscillator

Standard

Aging Rate: $\pm 1 \times 10^{-6}$ /year, $\pm 1 \times 10^{-7}$ /day

Temperature Stability: $\pm 2.5 \times 10^{-6}$ (5°C to 45°C)

High Stability Reference Oscillator [Option 002]

Aging Rate: $\pm 1 \times 10^{-7}$ /year, $\pm 1 \times 10^{-8}$ /day

Temperature Stability: $\pm 2 \times 10^{-8}$ (5°C to 45°C)

Start-up Characteristics*: $\pm 5 \times 10^{-7}$ (2 minutes after power-on)

$\pm 5 \times 10^{-8}$ (5 minutes after power-on)

Rubidium Reference Oscillator [Option 001]

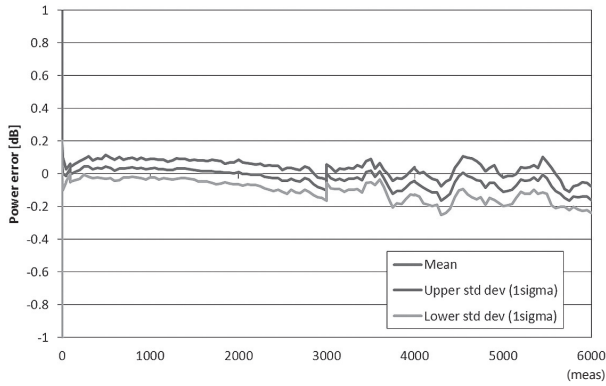
Aging Rate: $\pm 1 \times 10^{-10}$ /month

Temperature Stability: $\pm 2 \times 10^{-9}$ (5°C to 45°C)

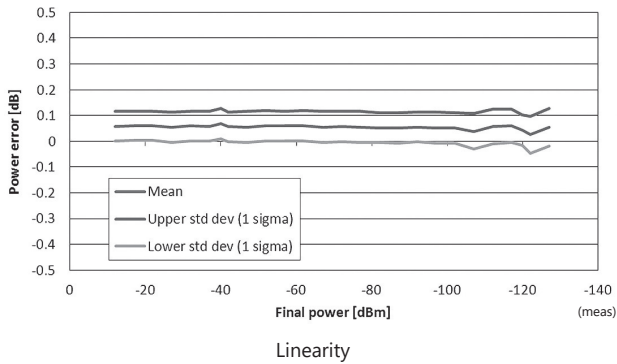
Start-up Characteristics*: $\pm 1 \times 10^{-9}$ (7.5 minutes after power-on)

*: Compared to frequency after 24-h warm-up at 23°C

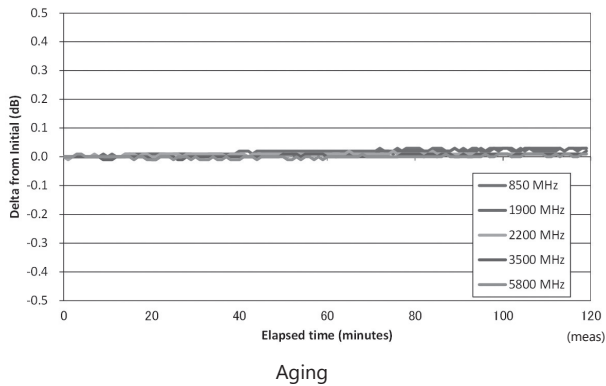
Level accuracy at -112 dBm



Relative level accuracy at 850 MHz initial power +10 dBm



Amplitude repeatability +5 dBm ALC on





High All-purpose Baseband Performance

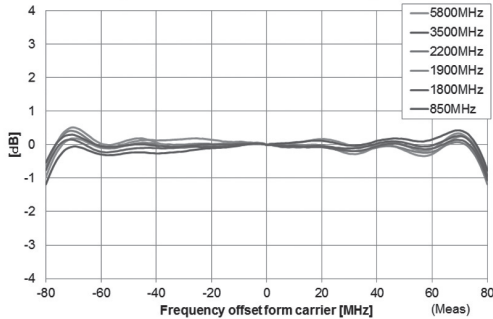
Wide Vector Modulation Bandwidth

160 MHz*/120 MHz (using Internal baseband signal generator)
160 MHz (using External IQ input)

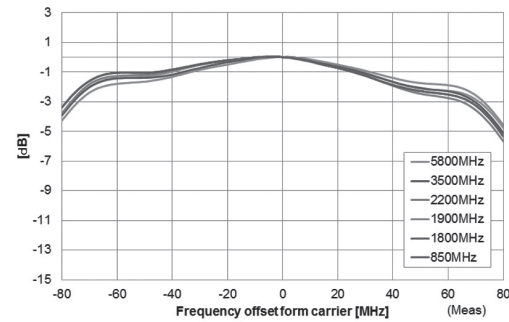
Using the standard internal baseband signal generator offers a wide vector modulation bandwidth of 160 MHz.

*: Supports firmware version 2.00.00 and later. Can generate 160-MHz bandwidth signals (Wireless LAN IEEE802.11ac) only when using WLAN IQproducer MX370111A and 802.11ac (160 MHz) option MX370111A-002. The latest version can be downloaded from the Anritsu homepage. <<https://my.anritsu.com/home>>

I/Q bandwidth plot using optional internal baseband generator (Internal Channel Corrections ON)



I/Q bandwidth plot using optional internal baseband generator



Point:

- One unit supports WLAN 802.11ac signal generation and output.
- Upper Frequency Limit: 6 GHz
- RF Modulation Bandwidth: 160 MHz
- Dual RF: Two RF Outputs
- Waveform Generation Software: WLAN IQproducer (MX370111A & MX370111A-002)

The MG3710E supports output from 160-MHz bandwidth signals to non-contiguous 80 MHz + 80 MHz signals in one unit, which generally requires two signal generators.

Example: Support WLAN 802.11ac signal generation and output

11ac Bandwidth	20/40/80/160 MHz	80 MHz + 80 MHz (non-contiguous)
MG3710E*1	✓	✓*2

*1: WLAN IQproducer MX370111A and 802.11ac (160 MHz) option MX370111A-002 installed. For detail, refer to the IQproducer catalog.
*2: 2ndRF option MG3710E-062 (2.7 GHz)/064 (4 GHz)/066 (6 GHz) installed.

Large-capacity Waveform Memory

64 Msamples (256 MB) [with 1stRF, 2ndRF]
256 Msamples (1 GB) [Option 045*1/075*2]
1024 Msamples (4 GB) [Option 046*1/076*2]

*1: ARB Memory Upgrade 256 Msample for 1stRF [Option 045]
ARB Memory Upgrade 1024 Msample for 1stRF [Option 046]
*2: ARB Memory Upgrade 256 Msample for 2ndRF [Option 075]
ARB Memory Upgrade 1024 Msample for 2ndRF [Option 076]

Memory size is the most important specification for arbitrary waveform memory. If the memory is small, large waveform patterns cannot be handled and the number of cases when multiple waveform patterns cannot be loaded increases. When this happens, the time to reload another waveform pattern wastes evaluation time and lowers efficiency. The MG3710E has a large 64 Msamples memory as standard and this can be upgraded to either 4 times (256 Msamples) or 16 times (1024 Msamples) by adding these options.

Point

Adding the baseband signal combine function (Option 048/078) supports waveform memories which can either be used separately or linked to multiply the memory size.

*: When attempting to load a waveform pattern exceeding the size of one memory, the memories are linked automatically to load the large pattern. However, in this case, other waveform patterns cannot be loaded into any remaining free space. When dealing with many waveform patterns, we recommend upgrading the ARB memory size. If the waveform pattern can be handled by one memory, other waveform patterns can be loaded into the remaining free space and the other memory. The maximum size per waveform pattern supported by the MG3710E varies with the IQproducer version.

Maximum Waveform Pattern Size and Required Options for Simultaneous Use

1stRF (Option 032/034/036)

Combination of Baseband Signal (Option 048)	ARB Memory Upgrade 256 Msample (Option 045) ARB Memory Upgrade 1024 Msample (Option 046)		
	W/O	With Option 045	With Option 046
W/O	64 Msamples × 1 pc	256 Msamples × 1 pc	1024 Msamples × 1 pc*1
With Option 048*2	64 Msamples × 2 pcs 128 Msamples × 1 pc	256 Msamples × 2 pcs 512 Msamples × 1 pc	1024 Msamples × 2 pcs*1

2ndRF (Option 062/064/066)

Combination of Baseband Signal (Option 078)	ARB Memory Upgrade 256 Msample (Option 075) ARB Memory Upgrade 1024 Msample (Option 076)		
	W/O	With Option 075	With Option 076
W/O	64 Msamples × 1 pc	256 Msamples × 1 pc	1024 Msamples × 1 pc*1
With Option 078*2	64 Msamples × 2 pcs 128 Msamples × 1 pc	256 Msamples × 2 pcs 512 Msamples × 1 pc	1024 Msamples × 2 pcs*1

*1: The maximum size per waveform pattern supported by the MG3710E varies with the IQproducer version.

*2: The Baseband Signal Combine option supports two ARB memories and can either set two different waveform patterns or combine them as one memory to support one large waveform pattern.

Free Waveform Generation

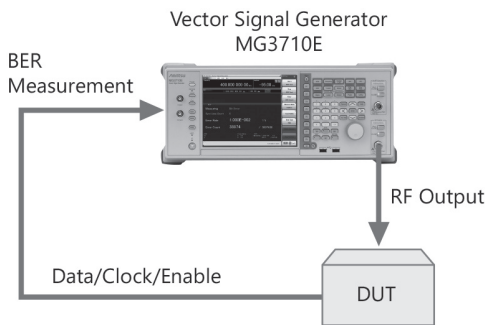
ASCII-format IQ sample data files created by other general-purpose EDA tools, such as MATLAB, can be converted into MG3710E waveform pattern files. Support for customer waveform pattern file creation makes the MG3710E ideal for R&D simulation applications too.

Expandability

BER Test Function [Option 021]

This option installs a BER measurement function for measuring error rates between 100 bps and 40 Mbps using the DUT demodulated Data/Clock/Enable signals. The results are displayed on the MG3710E screen.

- Input Bit Rate: 100 bps to 40 Mbps
- Input Signal: Data, Clock, Enable (Polarity reversal supported)
- Input Level: TTL
- Measured Patterns: PN9/11/15/20/23, ALL1, ALL0, Alternate (0101...), User Data, PN9fix/11fix/15fix/20fix/23fix
- Count Mode
 - Data: Measures until specified Data count
 - Error: Measures until specified Error count
- Measurable Bit Count: $\leq 2^{32} - 1$ (4,294,967,295 bits)
- Measurement Mode
 - Single: Measures specified measurement bit count once
 - Continuous: Repeats Single measurement
 - Endless: Continues measurement to upper limit of measurement bits

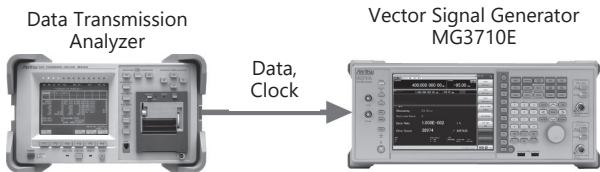


The BER can be measured using the DUT-demodulated Data/Clock/Enable.

BER Measurement Upper Limit

The table below shows one example of a BER measurement that indicates SyncLoss. Actual results depend on the specific communication systems and data rate, and will not necessarily match the measurement values below.

Error Rate	PN9	PN11	PN15	PN20	PN23
6.0%	-	-	-	-	-
5.0%	OK	-	-	-	-
4.0%	OK	OK	-	-	-
3.0%	OK	OK	OK	-	-
2.5%	OK	OK	OK	-	-
2.0%	OK	OK	OK	OK	OK
1.0%	OK	OK	OK	OK	OK



AM/FM/ΦM/PM Function

This option supports the following modulation functions as standard. Analog modulations (AM/FM/ΦM) are performed on CW signals or arbitrary (ARB) waveform pattern signals.

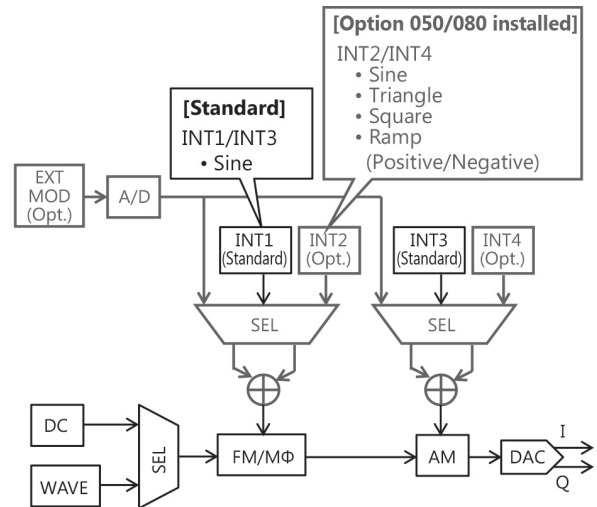
Pulse modulation can be performed at any cycle or timing and also supports modulation using an external input signal.

- Amplitude Modulation (Internal Modulation Source)
 - Depth: 0 to 100% (Linear)
 - 0 to 10 dB (Exponential)
 - Modulation Frequency: 0.1 Hz to 50 MHz
- Frequency Modulation (Internal Modulation Source)
 - Deviation: 0 to 40 MHz
 - Modulation Frequency: 0.1 Hz to 40 MHz, or (50 MHz-FM Rate), whichever smaller
- Φ-Modulation (Internal Modulation Source)
 - Deviation angle: 0 to 160 rad.
 - or (40 MHz/ΦM Rate) rad., whichever smaller
 - Modulation Frequency: 0.1 Hz to 40 MHz, or (40 MHz/ΦM Deviation), whichever smaller
- Pulse Modulation (Internal Modulation Source)
 - Modulation Frequency: 0.1 Hz to 10 MHz
 - Modulation Period: 10 ns to 20 s
- Additional Analog Modulation Input [Option 050/080]

Adding additional analog modulation input options (Option 050/080) extends to two internal modulation sources (AM/FM/ΦM) and one external modulation source supporting simultaneous two-signal modulation.

 - AM + FM
 - AM + ΦM
 - Internal 1 + Internal 2
 - Internal + External

*: FM + ΦM does not support.

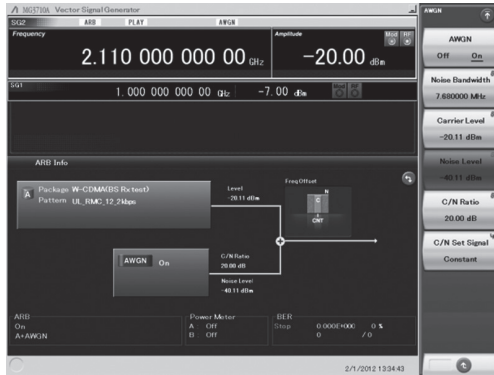


AWGN Generator [Option 049*1/079*2]

*1: AWGN for 1stRF [Option 049]
 *2: AWGN for 2ndRF [Option 079]

This option adds internally generated AWGN to the wanted signal. The AWGN output is switched on and off just by pressing the On/Off button.

Absolute C/N Ratio: ≤ 40 dB



AWGN Signal Addition Screen

USB Power Sensors [Sold separately]

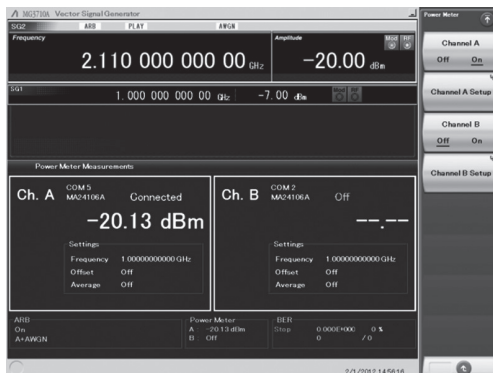
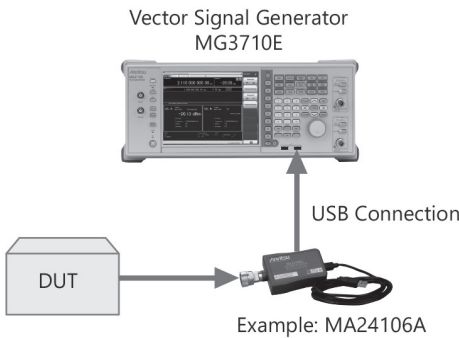
Up to two USB power sensors can be connected to the MG3710E to display the measurement results on the MG3710E screen.

Compatible USB power sensors

Model	Frequency Range	Dynamic Range
MA24104A*	600 MHz to 4 GHz	+3 to +51.76 dBm
MA24105A	350 MHz to 4 GHz	+3 to +51.76 dBm
MA24106A	50 MHz to 6 GHz	-40 to +23 dBm
MA24108A	10 MHz to 8 GHz	-40 to +20 dBm
MA24118A	10 MHz to 18 GHz	-40 to +20 dBm
MA24126A	10 MHz to 26 GHz	-40 to +20 dBm

*: MA24104A has been discontinued. Replacement model is MA24105A.

Level Offset: -100 to +100 dB
 Average: 1 to 2048
 Unit: dBm, W
 COM Port: 2 to 8



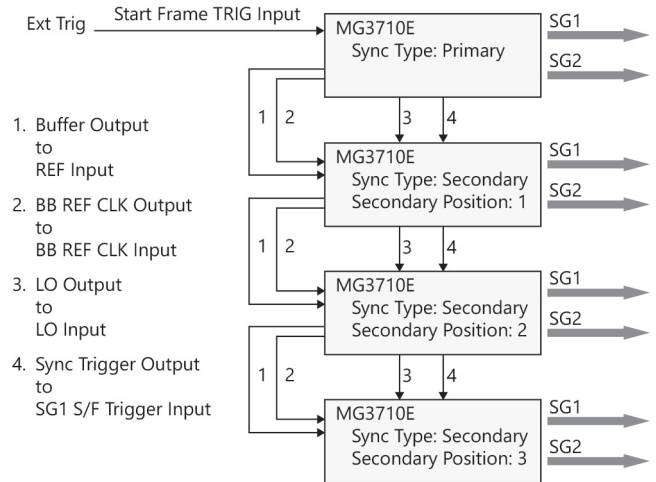
Power Meter Measurement Screen

Local Signal I/O for MIMO Signal Source [Option 017]

The Sync Multi SG function shares local, baseband and trigger signals between multiple MG3710E units to output phase coherency signals synchronized with the signal output timing. An 8x8 MIMO test system is configured easily from four MG3710E units composed of one primary and three secondaries.

Synchronization mode: Primary, Secondary, SG1 & 2
 Number of Secondaries: 1 to 3
 Secondary Position: 1 to 3
 Local Synchronization: On/Off
 IQ Phase Adjustment: -360 deg. to +360 deg., Resolution 0.01 deg.
 IQ Delay: -400 ns to +400 ns, Resolution 1 ps

Common Setting
 Number of Secondaries: 3
 LO Sync: On



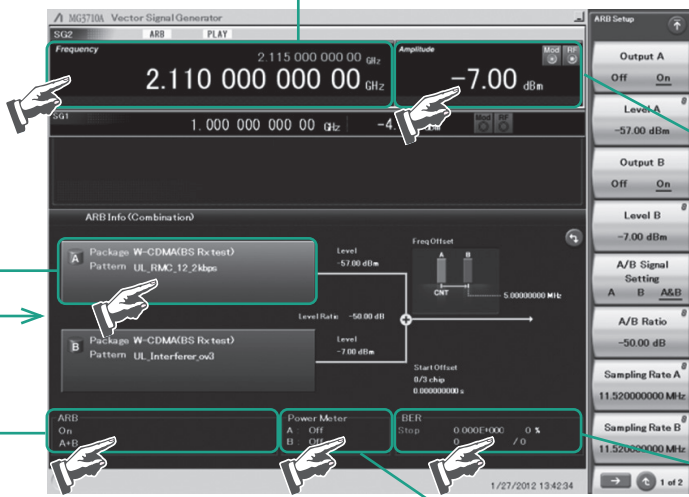
Note: Option-017 is not required when synchronizing the local signal and baseband clock of SG1 (1stRF) and SG2 (2ndRF) installed in one MG3710E unit.

Operability

Easy Touch-panel Operation

Simply touching parts of the screen display with a finger fetches related function keys and numeric inputs, offering a fast and easy way of navigating through multilayer menus.

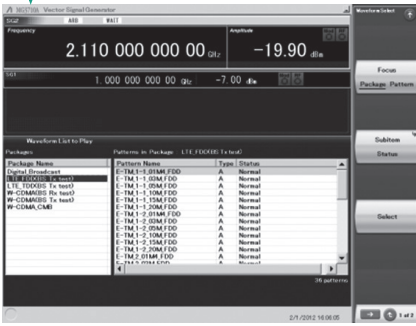
Modulation Screen (Mode)



Frequency Setting



Level Setting



Waveform Pattern Selection



Power Meter Function

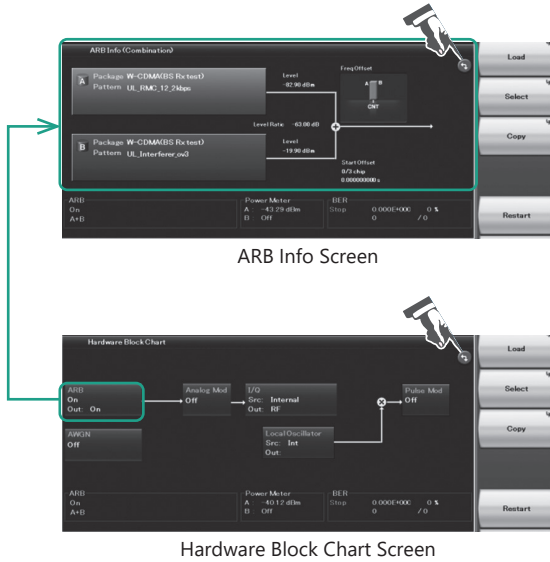


BER Function

Two Signal Flowcharts

Pressing the on-screen button toggles instantly between the Hardware Block Chart and the ARB Info screens.

The Hardware Block Chart is a quick-and-easy way to grasp the status of each block (ARB, AWGN, I/Q, Analog Mod, Pulse Mod, Local) at a glance. The ARB Info screen displays more details about the ARB/AWGN block showing the baseband signal combine status of memory A + memory B, memory A + AWGN, etc.



Connection with External Equipment

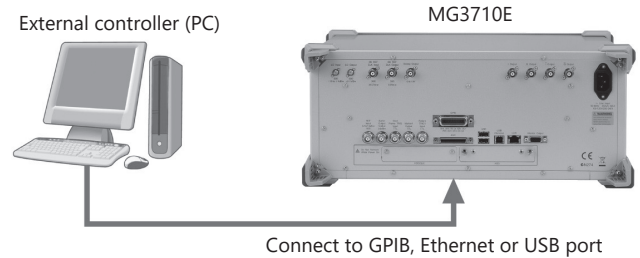
Remote Control Interfaces

The MG3710E has GPIB, Ethernet and USB interfaces as standard, supporting the following functions:

- Control all functions, except power switch
- Read all status conditions and settings
- Interrupts and serial polls

While in the Local status, the interface is determined automatically by the communication start command from the external controller (PC). To change the interface, put the MG3710E into the Local status again by pressing the Local key on the front panel and then send a command via the desired interface.

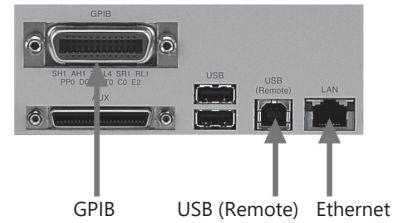
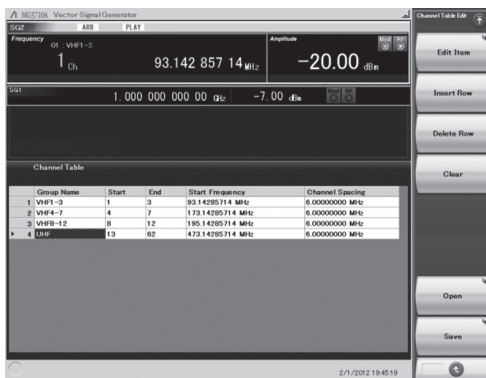
- GPIB: Conforms to IEEE 488.1/IEEE 488.2 standards
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2
- Ethernet: Conforms to VXI-11 protocol using TCP/IP Control programs
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0
- USB: Conforms to USBTMC-USB488 protocols
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0n



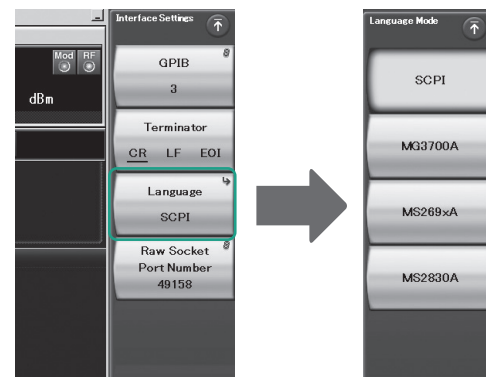
Frequency Channel Table

Sometimes frequencies need setting by Channel No. The built-in frequency channel table where frequencies are set by channel number is ideal for this application. Once set and saved, these pre-settings can be read whenever needed.

- Channel Table Setting
 - Group: 1 to 19
 - Start Channel: 0 to 20000
 - End Channel: (Start Channel) to 20000
 - Start Frequency
 - Channel Spacing



Remote control command is in common with the MG3710A and the MG3710E. Either select the SCPI mode command format defined by the SCPI Consortium, or select backwards compatible modes supporting earlier MG3700A, MS269xA, and MS2830A commands.



Channel Table Setting Screen

Command Format Setting Example

USB Connections

The two type-A USB2.0 connectors on the front and rear panels support keyboard, mouse and USB memory connections. Supported USB power sensors can be connected too.

USB Power Sensor [Sold separately]

Frequency Range: 600 MHz to 4 GHz	[MA24104A]*
350 MHz to 4 GHz	[MA24105A]
50 MHz to 6 GHz	[MA24106A]
10 MHz to 8 GHz	[MA24108A]
10 MHz to 18 GHz	[MA24118A]
10 MHz to 26 GHz	[MA24126A]

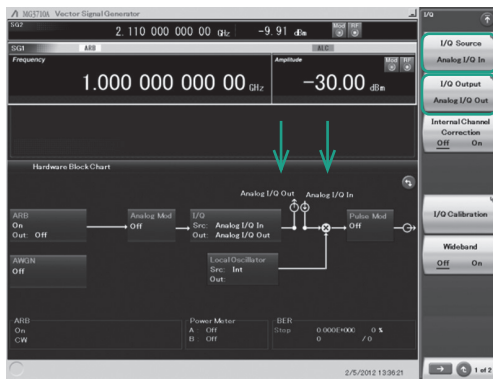
*: MA24104A has been discontinued. Replacement model is MA24105A.

Analogue IQ Input/Output [Option 018]

This option adds analogue IQ input and output connectors to the front and rear panels, respectively. It only supports SG1 (1stRF).

Input: I Input, Q Input

Output: I Output, I-bar Output, Q Output, Q-bar Output,



Analog IQ I/O Setting Screen

- Analog IQ Input Adjustment
Setting Range: -100 mV to +100 mV
- Analog IQ Output Adjustment
Output Voltage: 0.0 to 120.0%
In-phase DC offset: -2.5 V to +5.0 V
Differential DC offset: -50 mV to +50 mV

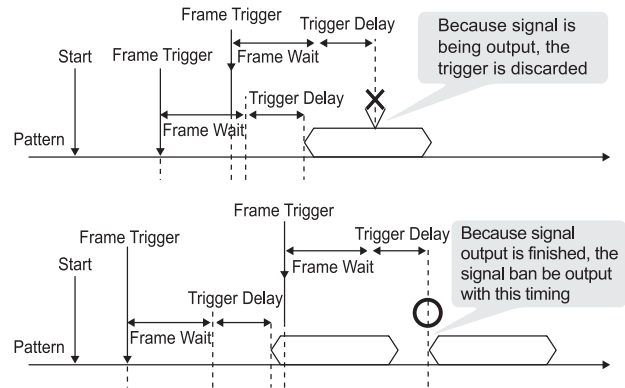
Trigger Input

Start and Frame triggers are installed as standard for outputting waveform patterns synchronized with externally input trigger signals.

- Start Trigger Operation
At Start Trigger operation, after the waveform pattern is selected, output is started and continued by the rise timing of the first external trigger signal. Second and subsequent input external trigger signals are disabled. This is used when receiving a Start Trigger signal and reference frequency signal from the DUT at the MG3710E.
- Frame Trigger Operation
At Frame Trigger operation, one frame of the waveform pattern is output at the rise timing of the external trigger signal. When frame output is finished, the trigger wait state is returned. This is used when receiving a Frame Trigger signal from the DUT at the MG3710E. Frame Trigger supports three operations as follows:

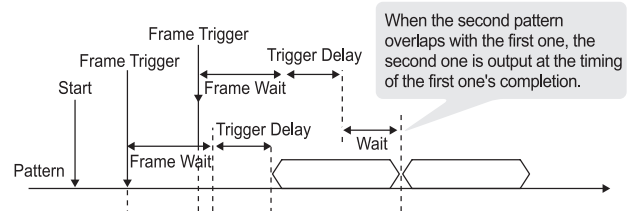
(1) No Retrigger

Ignores triggers received during pattern output (default setting)



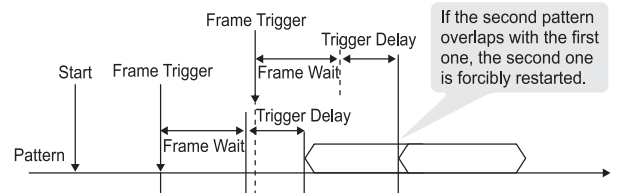
(2) Buffered Trig

Holds triggers received during pattern output until current pattern output completed and then outputs next frame



(3) Restart on Trig

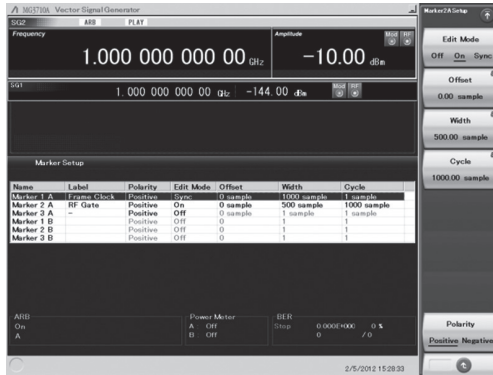
Immediately restarts pattern when trigger received during pattern output



Marker Output Editing

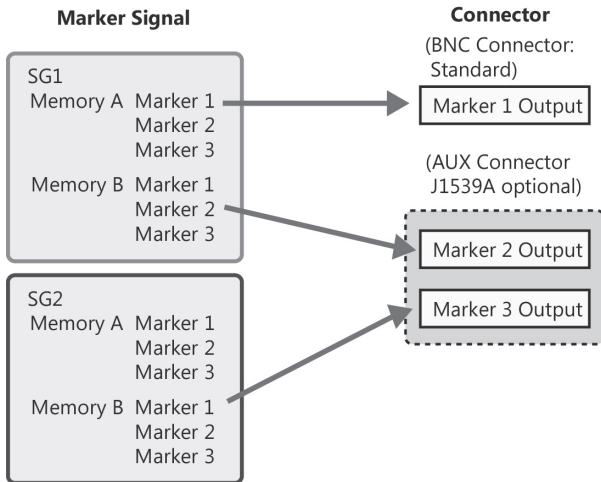
- Marker 1 Output [Standard]
- Marker 2 & Marker 3 Output [Requires J1539A AUX Conversion Adapter]

When the Marker Setup function Edit Mode is Off, a marker signal combining the preset waveform pattern with marker information is output. When the Edit Mode is On, any marker for output can be set at the MG3710E screen. Up to 12 markers can be set for SG1/SG2, memory A/B and Marker 1 to 3.



SG2 Marker Setup Screen
Memory A (1A/2A/3A), Memory B (1B/2B/3B)

There are three output connectors: Marker 1 Output on the rear panel and the AUX connector (Marker 2 Output and Marker 3 Output). The connector output signal layout can be selected freely.



The defaults are as follows:
Marker Signal

- SG1/Memory A/Marker 1
- SG1/Memory A/Marker 2
- SG1/Memory A/Marker 3

Connector

- Marker 1 Output
- Marker 2 (@AUX)
- Marker 3 (@AUX)

Waveform Patterns & License

* Read the "Waveform Pattern catalog" for details.

DFS Radar Pattern MX370073B

Sets pulse signals for testing 5-GHz band WLAN DFS functions. The MX370073B supports the waveform patterns for the FCC and Japan MIC test specifications. Pulse signals are output simply by selecting the pattern.

DFS (ETSI) Waveform Pattern MX370075A

Sets pulse signals for testing 5-GHz band WLAN DFS functions. The MX370075A supports the waveform patterns for the ETSI specifications. Pulse signals are output simply by selecting the pattern.

What is DFS?
5-GHz band wireless LAN devices like meteorological radar, marine radar, etc., have a Dynamic Frequency Selection (DFS) function for switching to an empty channel when detecting a radio wave. At testing, pulse, chirping and hopping signals like those used by radar are output from the SG to the WLAN equipment to check that it does not output signals in that channel.

ISDB-Tmm Waveform Pattern MX370084A

Archive of ARIB STD-B46 waveform patterns. Supports MER and spectrum evaluation of Tx characteristics tests and sensitivity/simple BER tests at Rx characteristics tests.

IQproducer License

IQproducer is PC application software for generating waveform patterns. The parameters are set using IQproducer and the waveform pattern is created to output the signal by selection at the MG3710E. This one software application includes all the following systems. Since it runs on any PC, the supported functions and parameter range can be verified before purchase.

When outputting a waveform pattern from the MG3710E, no signal is output unless a license for that system is installed in the main frame.

*: Read the "IQproducer catalog" for details.

HSDPA/HSUPA IQproducer MX370101A

Sets parameters according to HSDPA/HSUPA (Uplink and Downlink) specifications, and generates HSDPA/HSUPA waveform patterns including Fixed Reference Channel (3GPP TS 25.101 Annex A.7).

TDMA IQproducer MX370102A

Sets required parameters for TDMA waveform patterns and generates various waveform patterns. Setting parameters include Modulation, Frame, Slot, Data, Filter, etc. Supports wide application range including public wireless.

CDMA2000 1xEV-DO IQproducer MX370103A

Sets parameters according to CDMA2000 1xEV-DO Forward/Reverse specifications and generates 1xEV-DO waveform patterns.

Multi-carrier IQproducer MX370104A

Generates multi-carrier waveform patterns combination files using MG3710E Baseband Signal Combine function.

*: Requires Option 048/078.

DVB-T/H IQproducer MX370106A

Sets parameters according to ETSI EN 300 744 V1.5.1 (2004-11) physical layer standard and generates DVB-T/H waveform patterns. Generated waveform patterns can be used for device TRx characteristics evaluation tests (Error Correction, BER graphics).

Fading IQproducer MX370107A

Performs IQ channel fading processing, correlation matrix calculation, AWGN combination. Input data file created by selecting waveform pattern file created with other IQproducer software, and IQ data (ASCII) created with other general-purpose simulation tools.

LTE IQproducer MX370108A

Generates wanted waveform patterns with parameters modified according to 3GPP TS 36.211, TS 36.212, TS 36.213 LTE FDD specifications.

LTE-Advanced FDD Option MX370108A-001

Installing in the MX370108A supports simple generation of carrier aggregation signals added by 3GPP Rel. 10. Additionally, clustered SC-FDMA signals can be generated at Uplink.

*: Requires MX370108A

LTE TDD IQproducer MX370110A

Generates wanted waveform patterns with parameters modified according to 3GPP TS 36.211, TS 36.212, TS 36.213 LTE TDD specifications.

LTE-Advanced TDD Option MX370110A-001

Installing in the MX370110A supports simple generation of carrier aggregation signals added by 3GPP Rel. 10. Additionally, clustered SC-FDMA signals can be generated at Uplink.

*: Requires MX370110A

WLAN IQproducer MX370111A

Generates waveform patterns for IEEE Std 802.11-2007 and IEEE Std 802.11n-2009 IEEE 802.11a/b/g/j/n/p specifications.

802.11ac (160 MHz) Option MX370111A-002

Installing in the MX370111A supports waveform patterns generation compliant with WLAN 802.11ac specifications.

*: Requires MX370111A. Only for MG3710E.

TD-SCDMA IQproducer MX370112A

Generates wanted waveform patterns with parameters modified according to TD-SCDMA specifications standardized by TRx characteristics evaluation tests (excluding performance tests) for 3GPP TS 25.221, TS 25.222, TS 25.223, TS 25.105, TS 25.142

5G NR TDD sub-6 GHz IQproducer MX370113A

5G NR FDD sub-6 GHz IQproducer MX370114A

Generates 3GPP TS 38.211, TS 38.212, and TS 38.213 defined waveform patterns in compliance with the 5G NR FR1 (sub-6 GHz) specifications.

Supported LTE-Advanced Carrier Aggregation Modes (Vector Signal Generator series)

Vector Signal Generator Series	Vector Signal Generator		Vector Signal Generator Option for Signal Analyzer	
	MG3710E/MG3710A*1	MG3700A*1	MS2690A series Option 020*2	MS2830A Option 020/021*2
Carrier Aggregation Mode				
Intra-band contiguous Carrier Aggregation, Intra-band non-contiguous Carrier Aggregation	✓ (1 unit)	✓ (1 unit)	✓ (1 unit)	✓ (1 unit)
Inter-band non-contiguous Carrier Aggregation	✓ (2 RF 1 unit*3, or 1 RF 2 units)	✓ (2 units)	✓ (2 units)	✓ (2 units)

*1: LTE IQproducer MX370108A and LTE-Advanced FDD Option MX370108A-001 installed.

LTE TDD IQproducer MX370110A and LTE-Advanced TDD Option MX370110A-001 installed.

*2: LTE IQproducer MX269908A and LTE-Advanced FDD Option MX269908A-001 installed.

LTE TDD IQproducer MX269910A and LTE-Advanced TDD Option MX269910A-001 installed.

*3: 2ndRF Option MG3710E-062 (2.7 GHz)/064 (4 GHz)/066 (6 GHz) or MG3710A-062 (2.7 GHz)/064 (4 GHz)/066 (6 GHz) installed.

Supported WLAN 802.11ac Signal Bandwidth (Vector Signal Generator series)

Vector Signal Generator Series	Vector Signal Generator		Vector Signal Generator Option for Signal Analyzer	
	MG3710E/MG3710A*1	MG3700A*2	MS2690A series Option 020*3	MS2830A Option 020/021*3
IEEE802.11ac Signal Bandwidth				
20 MHz/40 MHz/80 MHz	✓ (1 unit)	✓ (1 unit)	✓ (1 unit)	✓ (1 unit)
160 MHz	✓ (1 unit)	—	—	—
80 MHz + 80 MHz (non-contiguous)	✓ (2 RF 1 unit*4, or 1 RF 2 units)	✓ (2 units)	✓ (2 units)	✓ (2 units)

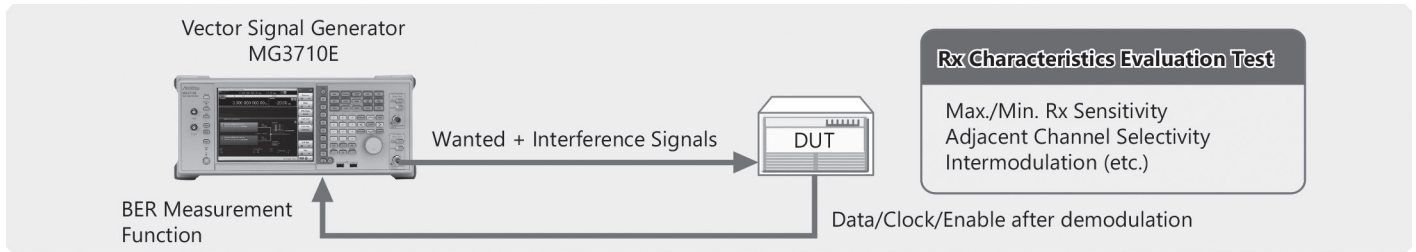
*1: WLAN IQproducer MX370111A and 802.11ac (160 MHz) Option MX370111A-002 installed.

*2: WLAN IQproducer MX370111A and 802.11ac (80 MHz) Option MX370111A-001 installed.

*3: WLAN IQproducer MX269911A and 802.11ac (80 MHz) Option MX269911A-001 installed.

*4: 2ndRF Option MG3710E-062 (2.7 GHz)/064 (4 GHz)/066 (6 GHz) or MG3710A-062 (2.7 GHz)/064 (4 GHz)/066 (6 GHz) installed.

Rx Characteristics Evaluation Tests for Digital Narrowband Communications, Public Safety, etc.



Supports SSB Phase Noise Performance -140 dBc/Hz nom. (@100 MHz)
 Phase noise performance affects measurement results at narrow bandwidths of several kHz. In particular, high phase-noise performance is required for interference waveforms.

Improved SSB phase noise supports wider specification margins and stable measurements to improve yields.

- < -140 dBc/Hz (nom.) @100 MHz, 20-kHz offset, CW
- < -131 dBc/Hz (typ.) @1 GHz, 20-kHz offset, CW
- < -125 dBc/Hz (typ.) @2 GHz, 20-kHz offset, CW



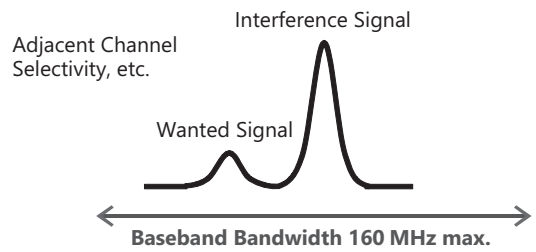
TDMA IQproducer [MX370102A] Supports Following Modulation Methods

- BPSK, DBPSK, PI/2DBPSK, QPSK, DQPSK, PI/4DQPSK,
- 8PSK, D8PSK, 16QAM, 32QAM, 256QAM, ASK, 2FSK, 4FSK,

The TDMA IQproducer PC software generates waveform patterns with any frame format or filter settings. One software package supports various narrowband digital communications.

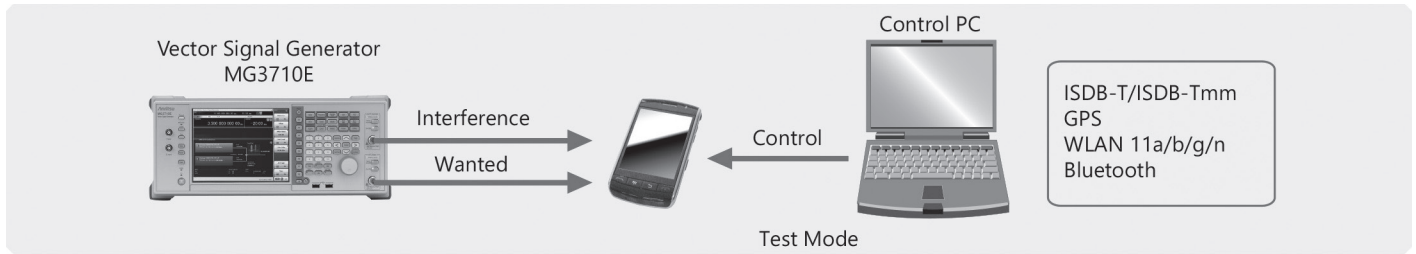
Two modulation signals can be output from one RF output using the baseband signal combine function (Option 048/078). The level ratio (C/N = 80 dB) and the frequency offset (± 80 MHz max.) can be set as well. Usually, tests using two modulation signals, such as adjacent channel selectivity (ACS) and intermodulation characteristics (IM) require two signal generators as well as a software license for each signal generator.

The MG3710E has two waveform memories for each RF output for setting and outputting different waveform data. One RF outputs the combined wanted + interference signals for a baseband bandwidth. Not only are equipment costs greatly reduced, but fewer external equipment, such as couplers, level adjusters, etc., as well as less setup time are required.



Supports BER Measurement Function [Option 021]
 The BER can be measured using the DUT-demodulated Data/Clock/Enable. The measurement results are displayed on the MG3710E screen.
 Input Bit Rate: 100 bps to 40 Mbps

Rx Sensitivity Tests for Multi-system Mobile Terminals, etc.



The MG3710E can save up to 1024 Msamples (4 GB) per RF. Memory size is one of the most important specifications for an arbitrary waveform signal generator. Small memory cannot save multiple waveform data and requires time-wasting reloading and measurement to output different signals each time.

With large waveform memory

- Switch loaded waveform data instantaneously
 - Load multiple test waveforms
- Reduce number of reloads → Cuts times



License-free Pre-installed Waveform Patterns

WLAN 11a/b/g, Bluetooth, GPS, etc.

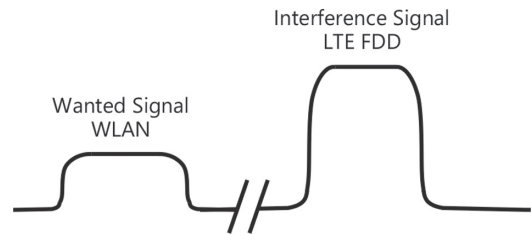
The following waveform patterns are available as options.
ISDB-Tmm (MX370084A)

Optional waveform generation tools are also available (license separately sold):

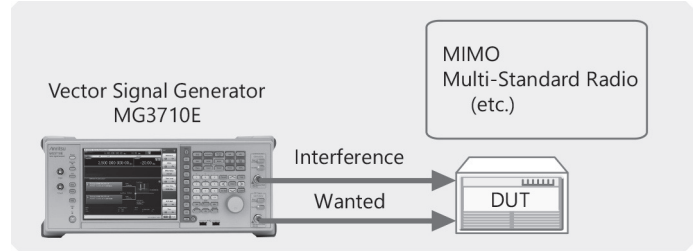
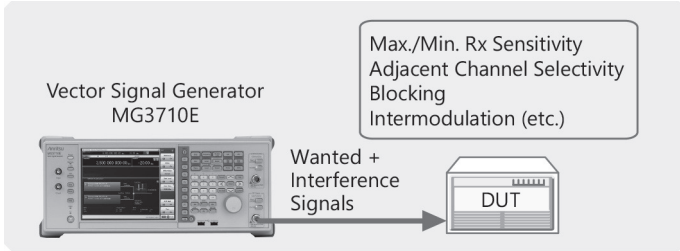
- DVB-T/H (MX370106A)
- WLAN 11a/b/g/n/j/p (MX370111A)
- WLAN 11ac (MX370111A-002)

Two RF outputs can be installed as an option.

Additionally, two RF output models with different frequencies can be installed. For example, if WLAN 11b/g are the wanted waveforms, mobile signals for LTE FDD, LTE TDD, W-CDMA, GSM, etc., are considered interference signals. Generally, these tests have high hardware and software costs because two separate signal generators are required. Using the MG3710E, the total investment costs for interference tests under simulated service conditions, such as WLAN + LTE FDD, or ISDB-T + W-CDMA, are reduced by selecting models with different frequencies for the 1stRF and 2ndRF outputs.



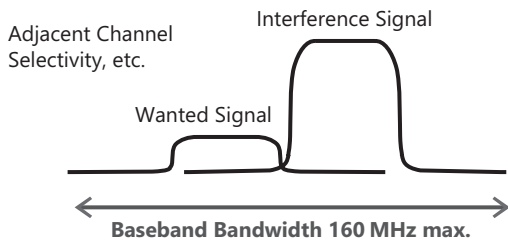
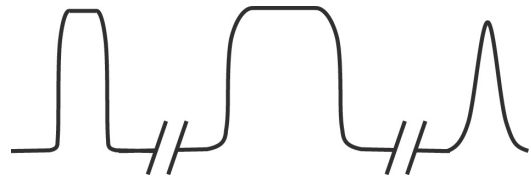
Wanted and Interference Waveforms for Rx Characteristics Evaluations of Cellular Base Station, etc.



Two modulation signals can be output from one RF output using the baseband signal combine function (Option 048/078). The level ratio (CN = 80 dB) and the frequency offset (± 80 MHz max.) can be set as well. Tests using two modulation signals, such as Adjacent Channel Selectivity (ACS), Blocking, and Intermodulation (IM), etc., require two separate signal generators and a license for each, greatly increasing equipment costs and setting work loads. The MG3710E has two waveform memories for each RF output for setting and outputting different waveform data. One RF outputs the combined wanted + interference signals for a baseband bandwidth. Not only are equipment costs greatly reduced, but fewer external equipment, such as couplers, level adjusters, etc., as well as less setup time are required. In comparison to previous Anritsu instruments, frequency offsets can be set for both memory A and B, and the sampling rate for memory A and B can be adjusted automatically.

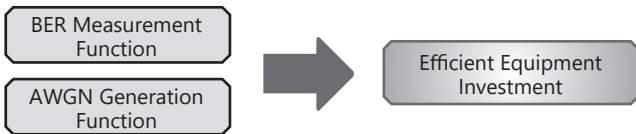
Two RF outputs can be installed as an option. A different frequency, level and waveform pattern/CW can be set for each RF output, which is ideal for Rx tests using two signals for frequency offset that cannot be set using the baseband combine function. For example, sometimes at MSR, multiple signals must be output simultaneously in the 200-MHz band, requiring two RF outputs.

Multi-Standard Radio Rx Characteristics Tests



Installing two RF units in one MG3710E unit makes it easy to synchronize between channels. And adding the Universal Input/Output option (Option 017) supports Local Signal I/O for synchronizing with other MG3710E units.

The IQproducer waveform generation software can be used with one license when two RF units are installed. For example, for LTE 2x2 MIMO tests, LTE IQproducer can generate two patterns for the Tx antenna signals and Fading IQproducer can generate two patterns with spatial multiplexing for the Rx antennas. Previously, using two signal generators required two separate licenses for LTE and fading, but now only one license is required to use IQproducer with the MG3710E with two RF units installed, helping cut software costs too.



Installing the BER measurement (Option 021) and AWGN Generation (Option 049/079) options supports the extra functions required for Rx tests of each type of communications system.

Specifications

Refer to the Data Sheet for specification details such as guaranteed setting ranges, etc.

Frequency Setting Range

1stRF	
MG3710E-032	9 kHz to 2.7 GHz
MG3710E-034	9 kHz to 4 GHz
MG3710E-036	9 kHz to 6 GHz
2ndRF	
MG3710E-062	9 kHz to 2.7 GHz
MG3710E-064	9 kHz to 4 GHz
MG3710E-066	9 kHz to 6 GHz

Switching Speed (List Mode)

Frequency	≤600 μs
Level	≤600 μs

Amplitude Setting Range

Options	Setting Range [dBm]	
	without Reverse Power Protection	with Reverse Power Protection
Standard	-110 to +17	-110 to +17
with High-power Extension	-110 to +30	-110 to +25
with Low-power Extension	-144 to +17	-144 to +17
with High-power Extension and Low-power Extension	-144 to +30	-144 to +25

Level Accuracy is assured at high levels (CW)

Frequency Range	Standard	Option 041/071
100 kHz ≤ f < 10 MHz	+5 dBm	+5 dBm
10 MHz ≤ f < 50 MHz	+10 dBm	+10 dBm
50 MHz ≤ f < 400 MHz	+13 dBm	+20 dBm
400 MHz ≤ f ≤ 3 GHz		+23 dBm
3 GHz < f ≤ 4 GHz		+20 dBm
4 GHz < f ≤ 5 GHz		+13 dBm
5 GHz < f ≤ 6 GHz	+11 dBm	+11 dBm

Absolute Level Accuracy

CW, 18°C to 28°C, -110 to +5 dBm	
±0.5 dB (typ.)	(100 kHz ≤ f < 50 MHz)
±0.5 dB	(50 MHz ≤ f ≤ 3 GHz)
±0.7 dB	(3 GHz < f ≤ 4 GHz)
±0.8 dB	(4 GHz < f ≤ 6 GHz)

Harmonics

<-30 dBc

Non-Harmonics

Output level ≤ +5 dBm, CW, Frequency offset ≥ 10 kHz
 <-62 dBc (100 kHz ≤ f ≤ 187.5 MHz)
 <-68 dBc (187.5 MHz < f ≤ 750 MHz)
 <-62 dBc (750 MHz < f ≤ 1.5 GHz)
 <-56 dBc (1.5 GHz < f ≤ 3 GHz)
 <-50 dBc (3 GHz < f ≤ 6 GHz)

Single Sideband Phase Noise

CW, 20 kHz offset
 <-140 dBc/Hz (nom.) (100 MHz)
 <-131 dBc/Hz (typ.) (1 GHz)
 <-125 dBc/Hz (typ.) (2 GHz)

Analog Modulation

- Amplitude Modulation (Internal Modulation Source)
 Depth: 0 to 100% (Linear)
 0 to 10 dB (Log)
 Modulation Frequency: 0.1 Hz to 50 MHz
- Frequency Modulation (Internal Modulation Source)
 Deviation: 0 Hz to 40 MHz
 Modulation Frequency: 0.1 Hz to 40 MHz, or (50-MHz FM Rate), whichever smaller
- Φ-Modulation (Internal Modulation Source)
 Deviation angle: 0 to 160 rad., or (40 MHz/ΦM Rate) rad., whichever smaller
 Modulation Frequency: 0.1 Hz to 40 MHz, or (40 MHz/ΦM Deviation), whichever smaller
- Pulse Modulation (Internal Modulation Source)
 Modulation Frequency: 0.1 Hz to 10 MHz
 Modulation Period: 10 ns to 20 s

Baseband Performance

- RF Modulation Bandwidth
 160 MHz*/120 MHz (using Internal baseband signal generator)
- ARB Memory Size
 64 Msamples (256 MB) [with 1stRF, 2ndRF]
 256 Msamples (1 GB) [Option 045/075]
 1024 Msamples (4 GB) [Option 046/076]

- Sampling Rate
 20 kHz to 200 MHz*/160 MHz
- DAC Resolution
 14/15/16 bits

*: Supports firmware version 2.00.00 and later. Only when using WLAN IQproducer MX370111A and 802.11ac (160 MHz) option MX370111A-002.

EVM Performance

18°C to 28°C, After CAL

- W-CDMA (Test Model 4):
 Output Frequency: 800 MHz to 900 MHz, 1.8 GHz to 2.2 GHz
 ≤0.62% (rms)
 ≤0.6% (rms) (typ.)
- GSM:
 Output Frequency: 800 MHz to 900 MHz, 1.8 GHz to 1.9 GHz
 ≤0.84° (rms)
 ≤0.8° (rms) (typ.)
- EDGE:
 Output Frequency: 800 MHz to 900 MHz, 1.8 GHz to 1.9 GHz
 ≤0.84% (rms)
 ≤0.8% (rms) (typ.)
- LTE (20 MHz Test Model 3.1):
 Output Frequency: 600 MHz to 2.7 GHz
 ≤0.82% (rms)
 ≤0.8% (rms) (typ.)

Dimensions, Mass

426 (W) × 177 (H) × 390 (D) mm
 ≤13.7 kg (with 1stRF, excluding other option)

Power Supply

100 VAC to 120 VAC, 200 VAC to 240 VAC
 50 Hz to 60 Hz

EU Standards (CE Marking)

EMC: 2014/30/EU, EN61326-1, EN61000-3-2
 LVD: 2014/35/EU, EN61010-1
 RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

Typical (typ.): Performance not warranted. Must products meet typical performance.
 Nominal (nom.): Values not warranted. Included to facilitate application of product.
 Measured (meas): Performance not warranted. Data actually measured by randomly selected measuring instruments.



Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name	Remarks
MG3710E	Main Frame Vector Signal Generator	
P0031A	Standard Accessories Power Cord: USB Memory Install CD-ROM	1 pc USB2.0 Flash Driver, ≥256 MB Operation manual (PDF) and application software (IQproducer)
MG3710E-001 MG3710E-002 MG3710E-011 MG3710E-017	Options (Common Parts) Rubidium Reference Oscillator High Stability Reference Oscillator 2ndary HDD Universal Input/Output	Select when ordering main frame, aging rate: $\pm 1 \times 10^{-10}$ /month Select when ordering main frame, aging rate: $\pm 1 \times 10^{-7}$ /year Select when ordering main frame, spare HDD for saving user data without Windows OS Select when ordering main frame, Adds BNC connectors for following signals to rear panel of main frame, includes AUX Conversion Adapter J1539A (Baseband Reference Clock Input/Output, Sweep Output, Local Signal Input/Output)
MG3710E-021	BER Test Function	Select when ordering main frame, Built-in BER measurement, Bit Rate: 100 bps to 40 Mbps AUX Conversion Adapter J1539A required for Data/Clock/Enable signal input
MG3710E-101 MG3710E-102 MG3710E-111 MG3710E-117 MG3710E-121 MG3710E-182 MG3710E-282	Rubidium Reference Oscillator Retrofit High Stability Reference Oscillator Retrofit 2ndary HDD Retrofit Universal Input/Output Retrofit BER Test Function Retrofit CPU/Windows10 Upgrade Retrofit CPU/Windows10 Upgrade Retrofit	Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Option 2xx is the option for customers to upgrade at their nearest local service center outside Japan.
MG3710E-032	(For 1stRF) 1stRF 100 kHz to 2.7 GHz	Select when ordering main frame, select 1stRF frequency range, frequency cannot be changed after installation
MG3710E-034	1stRF 100 kHz to 4 GHz	Select when ordering main frame, select 1stRF frequency range, frequency cannot be changed after installation
MG3710E-036	1stRF 100 kHz to 6 GHz	Select when ordering main frame, select 1stRF frequency range, frequency cannot be changed after installation
MG3710E-041 MG3710E-042 MG3710E-043 MG3710E-045 MG3710E-046 MG3710E-048 MG3710E-049 MG3710E-050	High Power Extension for 1stRF Low Power Extension for 1stRF Reverse Power Protection for 1stRF ARB Memory Upgrade 256 Msample for 1stRF ARB Memory Upgrade 1024 Msample for 1stRF Combination of Baseband Signal for 1stRF AWGN for 1stRF Additional Analog Modulation Input for 1stRF	Select when ordering main frame, increases upper limit of output signal power setting range Select when ordering main frame, increases lower limit of output signal power setting range Select when ordering main frame, prevents damage caused by reverse input to output connector Select when ordering main frame, expands ARB memory capacity Select when ordering main frame, expands ARB memory capacity Select when ordering main frame, adds baseband combine function Select when ordering main frame, adds AWGN combine function Select when ordering main frame, Adds BNC connector for inputting external signals to rear panel of mainframe.
MG3710E-018 MG3710E-141 MG3710E-142 MG3710E-143 MG3710E-145 MG3710E-146 MG3710E-148 MG3710E-149 MG3710E-150 MG3710E-118	Analog IQ Input/Output High Power Extension for 1stRF Retrofit Low Power Extension for 1stRF Retrofit Reverse Power Protection for 1stRF Retrofit ARB Memory Upgrade 256 Msample for 1stRF Retrofit ARB Memory Upgrade 1024 Msample for 1stRF Retrofit Combination of Baseband Signal for 1stRF Retrofit AWGN for 1stRF Retrofit Additional Analog Modulation Input for 1stRF Retrofit Analog IQ Input/Output Retrofit	Select when ordering main frame, installs IQ input/output BNC connector in main frame Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E
MG3710E-062	(For 2ndRF) 2ndRF 100 kHz to 2.7 GHz	Select when ordering main frame, select 2ndRF frequency range, frequency cannot be changed after installation
MG3710E-064	2ndRF 100 kHz to 4 GHz	Select when ordering main frame, select 2ndRF frequency range, frequency cannot be changed after installation
MG3710E-066	2ndRF 100 kHz to 6 GHz	Select when ordering main frame, select 2ndRF frequency range, frequency cannot be changed after installation
MG3710E-071 MG3710E-072 MG3710E-073 MG3710E-075 MG3710E-076 MG3710E-078 MG3710E-079 MG3710E-080	High Power Extension for 2ndRF Low Power Extension for 2ndRF Reverse Power Protection for 2ndRF ARB Memory Upgrade 256 Msample for 2ndRF ARB Memory Upgrade 1024 Msample for 2ndRF Combination of Baseband Signal for 2ndRF AWGN for 2ndRF Additional Analog Modulation Input for 2ndRF	Select when ordering main frame, increases upper limit of output signal power setting range Select when ordering main frame, increases lower limit of output signal power setting range Select when ordering main frame, prevents damage caused by reverse input to output connector Select when ordering main frame, expands ARB memory capacity Select when ordering main frame, expands ARB memory capacity Select when ordering main frame, adds baseband combine function Select when ordering main frame, adds AWGN combine function Select when ordering main frame, Adds BNC connector for inputting external signals to rear panel of mainframe.
MG3710E-162 MG3710E-164 MG3710E-166 MG3710E-171 MG3710E-172 MG3710E-173 MG3710E-175 MG3710E-176 MG3710E-178 MG3710E-179 MG3710E-180	2ndRF 100 kHz to 2.7 GHz Retrofit 2ndRF 100 kHz to 4 GHz Retrofit 2ndRF 100 kHz to 6 GHz Retrofit High Power Extension for 2ndRF Retrofit Low Power Extension for 2ndRF Retrofit Reverse Power Protection for 2ndRF Retrofit ARB Memory Upgrade 256 Msample for 2ndRF Retrofit ARB Memory Upgrade 1024 Msample for 2ndRF Retrofit Combination of Baseband Signal for 2ndRF Retrofit AWGN for 2ndRF Retrofit Additional Analog Modulation Input for 2ndRF Retrofit	Retrofitted to shipped MG3710E when 2ndRF not installed Retrofitted to shipped MG3710E when 2ndRF not installed Retrofitted to shipped MG3710E when 2ndRF not installed Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E Retrofitted to shipped MG3710E
MG3710E-ES210 MG3710E-ES310 MG3710E-ES510	Maintenance Service 2 Years Extended Warranty Service 3 Years Extended Warranty Service 5 Years Extended Warranty Service	

Continued on next page



Model/Order No.	Name	Remarks
MX370073B	Softwares (Waveform Pattern) DFS Radar Pattern	(License for waveform patterns) WLAN 5.3/5.6 GHz band DFS tests (for FCC and Japan MIC) waveform pattern, license for main frame, manual (PDF)
MX370075A MX370084A	DFS (ETSI) Waveform Pattern ISDB-Tmm Waveform Pattern	WLAN 5.3/5.6 GHz DFS test (ETSI) waveform pattern, license for main frame, manual (PDF) ISDB-Tmm Waveform Patterns, license for main frame, manual (PDF)
MX370101A MX370102A MX370103A MX370104A MX370106A MX370107A MX370108A MX370108A-001 MX370110A MX370110A-001 MX370111A MX370111A-002 MX370112A MX370113A MX370114A	Softwares (IQproducer) HSDPA/HSUPA IQproducer TDMA IQproducer CDMA2000 1xEV-DO IQproducer Multi-carrier IQproducer DVB-T/H IQproducer Fading IQproducer LTE IQproducer LTE-Advanced FDD Option LTE TDD IQproducer LTE-Advanced TDD Option WLAN IQproducer 802.11ac (160 MHz) Option TD-SCDMA IQproducer 5G NR TDD sub-6 GHz IQproducer 5G NR FDD sub-6 GHz IQproducer	(License for IQproducer) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF). Requires MX370108A. IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF). Requires MX370110A. IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF). Only for MG3710E/MG3710A. Requires MX370111A IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF) IQproducer software, license for main frame, manual (PDF)
W3580AE W2496AE W3581AE W3986AE W3597AE W3508AE W2915AE W2916AE W2505AE W2917AE W2798AE W2995AE W3023AE W3221AE W3488AE W3582AE W3984AE W4033AE	Optional Accessories MG3710A/MG3710E/MG3740A Operation Manual (Main Unit) MG3710A/MG3710E/MG3740A Operation Manual (IQproducer) MG3710A/MG3710E Operation Manual (Pre-installed Waveform Patterns) MX370073B Operation Manual MX370075A Operation Manual MX370084A Operation Manual MX370101A Operation Manual MX370102A Operation Manual MX370103A Operation Manual MX370104A Operation Manual MX370106A Operation Manual MX370107A Operation Manual MX370108A Operation Manual MX370110A Operation Manual MX370111A Operation Manual MX370112A Operation Manual MX370113A Operation Manual MX370114A Operation Manual	Booklet, for MG3710A/MG3710E/MG3740A Main Frame (Operation, Remote Control) Booklet, for IQproducer (Operation for Common Parts) Booklet, for Pre-installed Waveform Patterns (Usage, Detailed Parameters) Booklet, for DFS (for FCC and Japan MIC) Waveform Patterns Booklet, for DFS (ETSI) Waveform Patterns Booklet, for ISDB-Tmm Waveform Patterns Booklet, for HSDPA/HSUPA IQproducer Booklet, for TDMA IQproducer Booklet, for CDMA2000 1xEV-DO IQproducer Booklet, for Multi-carrier IQproducer Booklet, for DVB-T/H IQproducer Booklet, for Fading IQproducer Booklet, for LTE IQproducer/LTE-Advanced FDD Option Booklet, for LTE TDD IQproducer/LTE-Advanced TDD Option Booklet, for WLAN IQproducer/802.11ac Option Booklet, for TD-SCDMA IQproducer Booklet, for 5G NR TDD sub-6 GHz IQproducer Booklet, for 5G NR FDD sub-6 GHz IQproducer
J1539A Z1572A Z1594A MA24105A MA24106A MA24108A MA24118A MA24126A K240B	AUX Conversion Adapter Installation Kit Standard Waveform Pattern for Backup Inline Peak Power Sensor USB Power Sensor Microwave USB Power Sensor Microwave USB Power Sensor Microwave USB Power Sensor Power Divider (K connector)	Converts MG3710E/MG3710A rear-panel AUX connector to BNC connector Required when retrofitting hardware options or installing IQproducer (MX3701xxA) Latest MG3710E/MG3710A Pre-installed waveform pattern set for backup 350 MHz to 4 GHz, Inline type, with USB A to micro-B Cable 50 MHz to 6 GHz, with USB A to mini-B Cable 10 MHz to 8 GHz, with USB A to micro-B Cable 10 MHz to 18 GHz, with USB A to micro-B Cable 10 MHz to 26 GHz, with USB A to micro-B Cable DC to 26.5 GHz, K-J, 50Ω, 1 Wmax
MA1612A J0576B J0576D J0127A J0127B J0127C J0322A J0322B J0322C J0322D J0004 J1261B J1261D J0008 B0635A B0657A B0636C B0671A Z0975A Z0541A	Four-Port Junction Pad Coaxial Cord, 1.0 m Coaxial Cord, 2.0 m Coaxial Cord, 1.0 m Coaxial Cord, 2.0 m Coaxial Cord, 0.5 m Coaxial Cord, 0.5 m Coaxial Cord, 1.0 m Coaxial Cord, 1.5 m Coaxial Cord, 2.0 m Coaxial Adapter Ethernet Cable (Shield Type) Ethernet Cable (Shield Type) GPIB Cable, 2.0 m Rack Mount Kit Rack Mount Kit (JIS) Carrying Case Front Cover for 1MW4U Keyboard (USB) USB Mouse	5 MHz to 3 GHz, N-J N-P · 5D-2W · N-P N-P · 5D-2W · N-P BNC-P · RG-58A/U · BNC-P BNC-P · RG-58A/U · BNC-P BNC-P · RG-58A/U · BNC-P SMA-P · SMA-P, DC to 18 GHz, 50Ω SMA-P · SMA-P, DC to 18 GHz, 50Ω SMA-P · SMA-P, DC to 18 GHz, 50Ω SMA-P · SMA-P, DC to 18 GHz, 50Ω N-P · SMA-J Conversion Adapter, DC to 12.4 GHz Straight-through, 3 m Crossover, 3 m EIA JIS Hard Type. With Casters and Front Cover B0671A

The following option is installed as standard when ordering the MG3710E. It does not require a separate order.

MX371099A MG3710A Standard Waveform Pattern

Trademarks:

IQproducer™ is a registered trademark of Anritsu Corporation.

MATLAB® is a registered trademark of The MathWorks, Inc.

CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).

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IQ Fiber Master

MT2780A

9 kHz to 9/14/20/26.5/32/43.5/54 GHz

Remote Control
Ethernet

The IQ Fiber Master is a standalone and economical multi-port CPRI-based RF and PIM analyzer



PIM and RF analysis have never been so light weight, portable, and easy-to-use. Anritsu’s PIM over CPRI measurements (option 754), LTE RF over CPRI measurements (option 752), and PIM analytics (option 755) are ideal tools for troubleshooting interference and PIM issues in LTE networks from ground level by accessing the CPRI IQ data stream (uplink (UL) and downlink (DL)) between the baseband unit (BBU) and the remote radio head (RRH). The IQ Fiber Master MT2780A PIM and RF analyzer is a CPRI-based solution that provides critical PIM diagnosis across multiple bands and sectors using live traffic. Cell sites remain active during testing as this instrument uses a non-invasive process to report real-time results. The IQ Fiber Master can identify PIM levels, locations, and conduct RF spectrum analysis to efficiently hunt and debug PIM and interference issues. By using live traffic to get an accurate picture of cell site environments, there is no site turn down and no tower climb needed. The MT2780A can monitor up to three downlinks and one uplink during PIM over CPRI testing for analysis of multi-band sites or 4x4 MIMO antennas. It can also resolve intermittent PIM problems by continuously monitoring cell sites remotely for days or weeks automatically record and capture PIM events with time stamping to make debugging easier.

Key Features

- RF over CPRI for interference measurements
- PIM over CPRI for any frequency PIM measurement
- PIM analytics for long-term PIM monitoring
- 4 SFP ports
- 4x4 MIMO support
- CPRI line Rate 1 – 8 support
- PIM location (distance-to-PIM = DTP)
- Support all Tier 1 LTE base station radio manufacturers
- Up to 12 AxC traces simultaneously for multiple sector/carriers
- Uses MX280020A PC software; free download from Anritsu.com website

Specifications

IQ Fiber Master MT2780A (Requires Option 752)

Optical Inputs		Up to four Small Form Pluggable (SFP) transceivers Supports Rate 1 to Rate 8 CPRI (SFP dependent) Line bit rate 1 614.1 Mbit/s Line bit rate 2 1228.8 Mbit/s Line bit rate 3 2457.6 Mbit/s Line bit rate 4 3072.0 Mbit/s Line bit rate 5 4915.2 Mbit/s Line bit rate 6 6144.0 Mbit/s Line bit rate 7 9830.4 Mbit/s Line bit rate 8 10137.6 Mbit/s
Rear Panel Connectors	VDC	Input voltage 12 VDC @ 2 A
	Ethernet 1	PC connection
	Ethernet 2 and 3	For future applications
	USB B	For future applications
Power Requirements	USB C	For future applications
	Voltage	12 VDC from supplied AC adapter
	Current	2 A
PC Requirements (Minimum specifications)	Power Consumption	30 W
	Processor	Intel core i3-6100 or AMD FX4350 processor (Recommended, Intel core i7)
	RAM	8 GB of RAM (recommended 16 GB)
	Ports	Ethernet, USB C and USB 2.0
	Operating System	Windows 7 (or higher, 64-bit only)

Continued on next page



Regulatory Compliance	CE	EMC: 2014/30/EU, EN61326-1, EN61000-4-2 LVD: 2014/35/EU, EN61010-1 RoHS: (EU) 2015/863
	Australia and New Zealand	RCM AS/NZS 4417:2012
	South Korea	KCC-REM-A21-0004
Environmental	Operating Temperature	0°C to +45°C (based on SFP specs)
	Storage Temperature Range	-40°C to +71°C
	Maximum Relative Humidity	95% RH at 40°C, non-condensing
Dimensions and Mass		133 (W) × 55 (H) × 185 (D) mm (7.3 × 5.2 × 2.1 in), 1 kg (2.2 lbs.)
Warranty	Duration	Standard, 3-year on the sensor, 1-year on the accessories

LTE RF over CPRI (Option 752) (Requires MT2780A)

General	Supported Vendors	ALU, Ericsson, Huawei, Nokia, Samsungs
	LTE Bandwidth	5 MHz, 10 MHz, 15 MHz, and 20 MHz
Measurement	Measurements	Spectral analysis of CPRI IQ streams, absolute or relative frequency LTE UL or DL
Setup Parameters	Auto-detect	CPRI parameter set up support (detects CPRI line rate, LTE air std (5 MHz, 10 MHz, 15 MHz, and 20 MHz BW), sampling, and number of antenna ports) and AxC group
	LTE Bandwidth	5 MHz, 10 MHz, 15 MHz, and 20 MHz (LTE5, LTE10, LTE15, and LTE20)
	Plot	Up to six plots containing up to 12 AxC traces (up to 12 AxC traces in one plot or distributed across six plots)
	Windowing	Rectangle, Hamming, Hanning, Bartlett, Blackman, Gaussian, Flat top
	Axes	x-axis (center, span, and auto-scale) y-axis (ref level, dB/div, and number of divisions)
	Sweep	Normal, max hold, min hold, hold, average, # averages (1 to 100)
	Resolution	Resolution Bandwidth (RBW) 117 Hz to 30 KHz, #FFTs 1024 to 262144, based on 30.72 MB/s CPRI data rate, will vary for other CPRI data rates
	Markers	Markers 1 to 6, each with a Delta marker, marker-to-peak, marker-to-center, marker-to-ref, and marker delta-to-span; also frequency, power, or combined marker
	Traces	Normal, max hold, min hold, hold, average. Persistence, restart, add, and remove Up to 12 simultaneous traces per plot or one per plot
	Spectrogram	Waterfall feature, scalable from 25 to 75 % of display window
Frequency	Frequency Range	Supports all LTE bands (CPRI IQ is baseband information)
Measurement Update	Rate	100 ms (10 frames per second) (typical) (dependent on PC performance, number of streams, data volume to be transferred to PC)
Results		Spectrum plots can be exported as PNG (whole screen, center only, or current plot)

PIM over CPRI (Option 754) (Requires Option 752)

General	Supported Vendors	ALU, Ericsson, Huawei, Nokia, Samsung
	LTE Bandwidth	5 MHz, 10 MHz, 15 MHz, and 20 MHz
	MIMO Support	SISO, 1×2, 2×2, 2×4, 4×4
PIM Measurements	Supported PIM Configuration	Multiband dual carrier: IM3 to IM5 Single carrier: IM3 to IM5 Single carrier harmonic: H2 and H3
	PIM Power Level	PIM measurement in dB relative to thermal noise floor (measurements in dBm or dBfs)
	PIM Power Level Accuracy	±1 dB (typical) (RMS level of digital PIM power on CPRI). Absolute (dBm) PIM accuracy will depend on UL gain accuracy of RRH
	PIM Power Level Range	-10 dB below to +50 dB above RRH thermal noise (-112 to -57 dBm for LTE 10 RRH with 2.5 dB NF (typical))
	Measurement Time - Acquisition	One minute (typical), subsequent measurement 4 seconds per UL (typical)
Setup Parameters	Advanced Settings	PIM Desensitization pass/fail limit (dB) Noise floor auto-calibration of RRH under test Measurement result units (dBm, dBFS)
	LTE Bandwidth	5 MHz, 10 MHz, 15 MHz, and 20 MHz (LTE5, LTE10, LTE15, and LTE20)
	IQ Fiber Master Status	Connected/disconnected, SFP status indication (LOS, LOF, CPRI data), internal temperature
	Configuration Check	Color-coded, interactive fiber diagram associated with each test scenario Rules-based check (editable by user): Optical connectivity, CPRI connectivity, IQ stream capture, RSSI/TSSI, bandwidth, and LTE ID TX configuration
	Measurement State	Measurement process update (acquiring, measuring, switching UL)
Distance-to-PIM Measurements	UL Under Test	Cycle sequentially through all ULs Test ULs individually (UL1, UL2, UL3, UL4) against all DLs
	Accuracy	±1 m (typical) PIM 10 dB or more above UL noise, quiet channel, single PIM source)
	Calibration	Verified PIM source (PIM source; part number 2000-1982-R) required. Calibration reference is antenna radome)
	Range	0 to 1000 m (free space, typical)
Results and Reports	Measurement Time	60 seconds per UL (typical)
	Report Header	Site, Operator, and instrument details (report saved in PDF format)
	Configuration Check	Pass/fail with detail
	Pass/Fail	Pass/fail per UL, with internal/external indication and PIM level (dBm or dBFS)
	Spectrum	UL spectrum and PIM spectrum per antenna branch
DTP (Distance-to-PIM)	Graph showing distance (from a calibration point) to dominant PIM source	

PIM Analytics (Option 755) (Requires Options 752 and 754)

PIM Analytics Measurements	PIM vs. Time	Long-term monitoring function (limited only by available hard drive space). Provides daily reports, graphs, and summary reports. Basic event report available (CSV format) for post-processing
	PIM Distribution	CDF plot (depicting distribution of measurements exceeding predefined) and editable threshold (percent) against PIM level (dBm)
	PIM Daily	Histogram (of percentage of measurements exceeding threshold) against time-of-day (24 hour)
	Heat Map	Visual matrix to highlight the dominant RF power source causing PIM at the cell site
Setup Parameters	Advanced Settings	PIM Desensitization pass/fail limit (dB) Noise floor auto-calibration of RRH under test Bandwidth: 5 MHz, 10 MHz, 15 MHz, and 20 MHz Measurement result units (dBm, dBFS)
	IQ Fiber Master Status	Connected/disconnected, SFP status indication (LOS, LOF, CPRI data), and internal temperature
	Configuration Check	Color-coded, interactive fiber diagram associated with each test scenario Rules-based check (editable by user): Optical connectivity, CPRI connectivity, IQ stream capture, RSSI/TSSI, bandwidth, and LTE ID TX configuration
	Measurement State	Measurement process update (acquiring, measuring, switching UL)
Results and Reports (Includes all the PIM Analytics Measurements)	UL Under Test	Cycle sequentially through all ULs Test ULs individually (UL1, UL2, UL3, UL4) against all DLs
	Report Header	Site, operator, and instrument details (report saved in PDF format)
	Configuration Check	Pass/fail with detail
	Long Term Monitoring	Graph per 24-hour period. Summary report (maximum, minimum, and mean PIM level, and occurrence and duration of maximum PIM level)
	Pass/Fail	Pass/fail per UL with internal/external indication and PIM level (dBm or dBFS)
	Spectrum	UL spectrum and PIM spectrum per antenna branch

Optical 3-Port Tap

Tap Wavelength Connectors	Single-Mode (SM) 2000-1977-R	1310/1550 nm
	Multi-Mode (MM) 2000-1978-R	850/1300 nm
	Optical Split	50/50 optical split, three fiber taps
	Fiber Standard	For SM Om3, Om4, and Om5 for MM
Dimensions and Mass		185 × 133 × 55 mm (2.1 in × 7.3 in × 5.2 in), 0.75 kg (1.6 lbs.)

Ordering Information

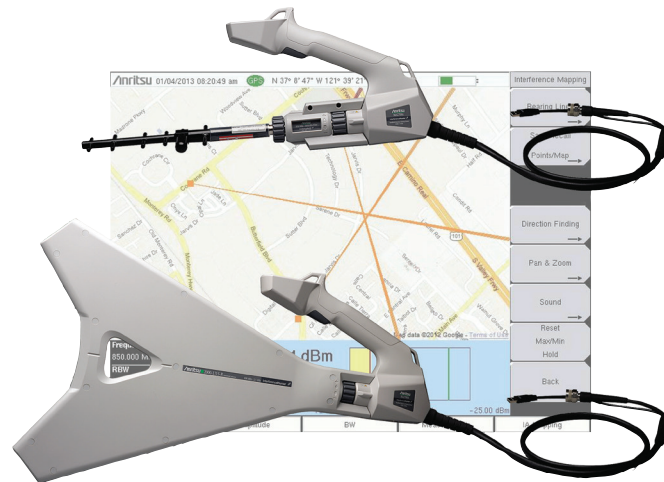
Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names.
The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MX280020A	IQ Fiber Master Control Software (no cost; download from Anritsu.com)
MT2780A	IQ Fiber Master (requires option 752 minimum); shown with optional SPFs. See Optional Accessories
MT2780A-0752	LTE RF over CPRI (requires MT2780A)
MT2780A-0754	PIM over CPRI (requires option 752)
MT2780A-0755	PIM Analytics (requires options 752 and 754)
Standard Accessories	
2000-1979-R	SM Fiber Optic Cable Kit, 30 cm, Simplex
2000-1980-R	MM Fiber Optic Cable Kit, 30 cm, Simplex
2000-1371-R	Ethernet Cable, 2 m
40-187-R	AC Power Supply (and adapter for local AC line outlets)
Optional Accessories	
68-11-R	SFP+ (Optical Module), SM 10.5 Gbps, 1310 nm (common for front-haul CPRI)
68-12-R	SFP+ (Optical Module), MM 10.5 Gbps, 850 nm (common for front-haul CPRI)
68-16-R	SFP+ (Optical Module), SM 9.83 Gbps, 1310 nm (common for front-haul CPRI)
808-16-R	Fiber Optic Cable, 3 m, Duplex MM 1.6 mm LC/PC LC/PC 50 μm
808-17-R	Fiber Optic Cable, 3 m, Simplex MM 1.6 mm LC/UPC LC/UPC 50 μm
808-18-R	Fiber Optic Cable, 3 m, Ruggedized Simplex SM LC/UPC LC/UPC
808-19-R	Fiber Optic Cable, 3 m, Ruggedized Duplex SM LC/UPC LC/UPC
2100-29-R	Fiber Optic Cable, 3 m, Simplex SM LC/UPC
2100-30-R	Fiber Optic Cable, 10 m, Simplex MM LC-SC
2100-31-R	Fiber Optic Cable, 3 m, Duplex SM LC/UPC
971-14-R	Ferrule Cleaner, 2.5 mm SC
971-15-R	Ferrule Cleaner, 1.25 mm LC
971-16-R	Fiber Ferrule Cleaner
2000-1849-R	SFP 4-slot ESD Box
2000-1977-R	3-port SM 1310/1550 nm TAP (includes 2000-1979-R) (shown)
2000-1978-R	3-port MM 850/1300 nm TAP (includes 2000-1980-R)
2000-1982-R	PIM Calibration Kit
2000-1981-R	Hard transit case

Handheld Direction Finding System

MA2700A Handheld InterferenceHunter™

Includes GPS and Electronic Compass



Simplify your interference hunting tasks with the Handheld InterferenceHunter™ from Anritsu Company. This broadband, easy-to-use handheld direction finding antenna system includes everything you need to find the sources of signals. With a broadband preamplifier, the system is sensitive. With a GPS receiver, it knows where it is. With the electronic compass it knows where it is aimed. With an antenna attached, the InterferenceHunter captures a direction and signal level when the user presses the trigger on the ergonomic handle. The adjustable shoulder strap conveniently holds the handheld InterferenceHunter MA2700A when out in the field. The ergonomic handle can be used with antennas having a female Type-N connector located at the back of the antenna. The coupling nut allows for easy antenna connection. Compatible antennas in many cellular bands are available from Anritsu. For details on these antennas including frequency range, gain, and pattern information, refer to the Directional Antennas Technical Data Sheet (11410-00376) available for download from the Anritsu website.

Combined with Interference Analysis (Option 25) on Anritsu handheld instruments with spectrum analyzers, the captured location and bearing data is displayed on the instrument.

How to Use the MA2700A

Connections

- Connect an antenna to the male N-connector (inside the coupling nut).
- Connect USB cable between the MA2700A and the instrument. Connect coaxial cable between the MA2700A and the instrument's RF Input connector.

Instrument Setup

- Confirm that the instrument has SPA module V6.00 or higher.
- Select the Interference Analysis (Option 25) mode on the instrument, then select Interference Mapping measurement.
- The instrument will detect the connected MA2700A and display the message **MA2700 detected – Device is ready to use**. After GPS lock, the instrument will use GPS data from the MA2700A.
- To manually select the MA2700A: In the Measurements menu, press Interference Mapping twice. Choose the Direction Finding submenu then Direction Finding Antenna Selection, and select MA2700A Handheld.

Mapping

- Anritsu easyMap Tools™ is used to create maps that are displayed on the Anritsu instrument. The software is available from the Anritsu website: www.anritsu.com



Specifications

All specifications and characteristics apply to Revision 1 instruments. All published specifications are typical.

Power Consumption	Preamplifier On: 0.6 Watts Preamplifier Off: 0.5 Watts
Bandwidth	9 kHz to 6 GHz
Preamplifier	Bandwidth: 10 MHz to 6 GHz Gain: ≥8 dB: 10 MHz to 2.4 GHz ≥5 dB: >2.4 GHz to 4 GHz ≥3 dB: >4 GHz to 6 GHz
Electronic Compass	Power: Powered from USB Accuracy: ≤5° (nom.) Interface: USB
GPS Receiver	Satellites Tracked: 12 (max.) GPS Locking Time Cold start: 30 s (typ.), with a clear view of the sky Warm start: 2 s (typ.), with a clear view of the sky Position Uncertainty: ±2 m (typ.)
Cables	USB cable terminated with a USB Type A Female Plug, 1.5 m Coaxial cable with Type-N male connector, 1.5 m
Tripod Mount	1/4 - 20 UNC × 7 mm
CE	EMC: 2014/30/EU, EN61326-1, EN61000-4-2 LVD: 2014/35/EU, EN61010-1 RoHS: (EU) 2015/863
RCM	Australia and New Zealand RCM AS/NZS 4417:2012
KCC	South Korea KCC-REM-A21-0004
Environmental	Operating Temperature: -10°C to +55°C Storage: -40°C to +71°C Maximum Humidity: 95% non-condensing Altitude: 4600 m Shock: MIL-PRF-28800F Class 2
Dimensions and Mass (antenna not included)	303 (W) × 220 (H) × 70 (D) mm (11.9 × 8.7 × 2.76 in), <1 kg (2.2 lb)

Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MA2700A	Main Frame InterferenceHunter™
2000-1729-R	Standard Accessories (included with instrument) Shoulder Strap
	Optional Accessories
	Directional Antennas
2000-1777-R	9 kHz to 20 MHz, N (f), Loop (requires Port Extender 2000-1798-R)
2000-1778-R	20 MHz to 200 MHz, N (f), Loop (requires Port Extender 2000-1798-R)
2000-1779-R	200 MHz to 500 MHz, N (f), Loop (requires Port Extender 2000-1798-R)
2000-1812-R	450 MHz to 512 MHz, N (f), 5 dBd, Yagi
2000-1659-R	698 MHz to 787 MHz, N (f), 8 dBd, Yagi
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
2000-1660-R	1425 MHz to 1535 MHz, N (f), 12 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
2000-1416-R	1920 MHz to 2170 MHz, N (f), 10 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N (f), 10 dBd, Yagi
2000-1726-R	2500 MHz to 2700 MHz, N (f), 12 dBd, Yagi
2000-1747-R	300 MHz to 5000 MHz, N (f), Log Periodic
2000-1748-R	1 GHz to 18 GHz, N (f), Log Periodic
2000-1715-R	698 MHz to 2.5 GHz, N (f), Bi-blade Directional Antenna
	Bandpass Filters and Port Extender
2000-1825-R	Portable Yagi Antenna, 450 MHz to 512 MHz, N (f), 7.1 dBi
2000-1798-R	Portable Yagi Antenna, 380 MHz to 430 MHz, N (f), 7.1 dBi
2000-1734-R	699 MHz to 715 MHz, N (m) to N (f), 50Ω
2000-1735-R	776 MHz to 788 MHz, N (m) to N (f), 50Ω
2000-1736-R	815 MHz to 850 MHz, N (m) to N (f), 50Ω
2000-1737-R	1711 MHz to 1756 MHz, N (m) to N (f), 50Ω
2000-1738-R	1850 MHz to 1910 MHz, N (m) to N (f), 50Ω
2000-1739-R	880 MHz to 915 MHz, N (m) to N (f), 50Ω
2000-1740-R	1710 MHz to 1785 MHz, N (m) to N (f), 50Ω
2000-1741-R	1920 MHz to 1980 MHz, N (m) to N (f), 50Ω
2000-1742-R	832 MHz to 862 MHz, N (m) to N (f), 50Ω
2000-1743-R	2500 MHz to 2570 MHz, N (m) to N (f), 50Ω
2000-1799-R	2305 MHz to 2320 MHz, N (m) to N (f), 50Ω
2000-1911-R	703 MHz to 748 MHz, N (m) to N (f), 50Ω
2000-1912-R	788 MHz to 798 MHz, N (m) to N (f), 50Ω
2000-1925-R	663 MHz to 698 MHz, N (m) to N (f), 50Ω
2000-1926-R	776 MHz to 806 MHz, N (m) to N (f), 50Ω

Model/Order No.	Name
	MA2700A Transit Cases
760-261-R	Large Transit Case with Wheels and Handle 63.1 × 50 × 30 cm (24.83" × 19.69" × 11.88"), space for MA2700A, antennas, filters, instrument inside soft case, and other interferencehunting accessories/tools
760-262-R	Transit Case for MA2700A, holds several Yagi antennas and filters/port extender 96.8 × 40.6 × 15.5 cm (38.12" × 16.00" × 6.12")
2000-1727	Monopod, extends to 180 cm (72 in)
	Additional Documents and Software
	<ul style="list-style-type: none"> The <i>User Guide</i> and <i>Spectrum Analyzer Measurement Guide</i> applicable for your Anritsu instrument. The Interference Analysis chapter will include a section on "Interference Mapping" with information on setup and selecting the MA2700A as the Direction Finding Antenna. Anritsu easyMap Tools software creates Geo-enabled maps which are viewed on the Anritsu instruments during interference hunting. Directional Antennas Technical Data Sheet (11410-00376) lists compatible antennas in many frequency bands and applications. These documents and programs, along with additional applications notes, white papers, and videos covering interference analysis are available from the Anritsu website (www.anritsu.com).

Mobile Interference Hunting System

MX280007A InterferenceHunter™

**Anritsu Mobile InterferenceHunter™ – 5G Ready**

Network operators have a strong interest in interference reduction that is driven by their customer's adoption of an online lifestyle. The increasing demand for connectivity anytime and anywhere leads directly to the need to rapidly increase capacity and throughput. Anritsu's Mobile InterferenceHunter MX280007A is well-equipped to locate many types of interference. The RF power mapping capability, guided Area Scan mode, optional hand-offs from Anritsu's remote spectrum monitoring systems, and the data-generated heat map enable users to locate interference sources quickly and reliably.

Applications

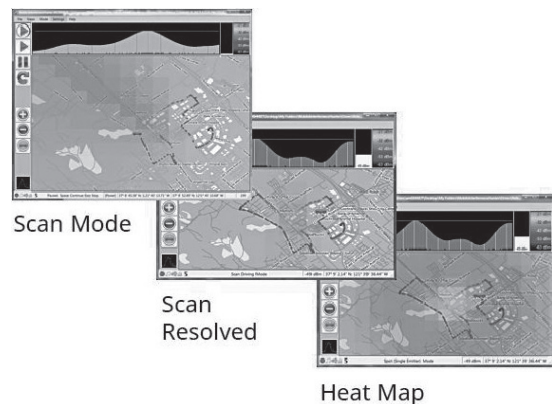
- Locating interference – even in the presence of uplink signals
- CATV leakage location
- Simplified spectrum clearing

Key Features

- 5G ready to 54 GHz
- Guided Area Scan™ mode
- Post-capture analysis
- Deals with RF reflections, shadows, and multi-path
- Accepts spectrum monitor hand-offs
- Signal library
- Quick setup

Hunting Equipment Faults or Intentional Interference

Traditionally, interference hunts are done with a spectrum analyzer and a directional (Yagi) antenna. Directional antennas have trouble differentiating between the direct signal and reflections (multi-path) and can lead even the most experienced user astray. They also have issues with RF shadows caused by buildings or terrain. This creates somewhat erratic power measurements as the antenna is moved around. The MX280007A RF power mapping, Area Scan, and heat map capabilities get around this problem by taking and processing many measurements per minute, averaging them, and plotting the result. This is done while the user is driving. There is no need to stop the car, get out and take a bearing, then drive to a new location and repeat the process. Because so many power measurements are taken and averaged, multi-path does not affect the results. Reflections tend to be eliminated because of increased path loss, as well as absorption from the reflecting surface. RF shadowing becomes apparent, since areas of low signal power can quickly be spotted and either allowed for or ignored. Also, since the MX280007A uses channel power for its measurements, it can deal with signals that wander in frequency, such as oscillating cell phone repeaters.





Field Master Pro MS2090A



Dash-mounted Windows PC Tablet with Mobile InterferenceHunter MX280007A Software and 2000-1801-R mounting hardware



2000-1647-R Broadband Magnet Mount Omnidirectional Antenna 700 MHz to 6 GHz with GPS Antenna in one housing (recommended antenna for users operating in this frequency range)

Anritsu Mobile Interference Hunting System Overview

Available through Anritsu:

MX280007A Configuration Guide	Handheld Spectrum Analyzer	Remote Spectrum Monitor MS27101A	Anritsu P/N
Mobile InterferenceHunter with key	x	x	MX280007A
Instrument GPS option	x	x	Opt 31Inst
Instrument ethernet port	x	x	Opt 411 if not standard
Omni antenna with GPS	x	x	2000-1647-R
USB-based GPS			2000-1723-R
USB 3.0 hub			2000-1910-R
Bandpass filters	x	x	See accessory list
Directional antenna	x	x	See accessory list
N-to-N cable for antenna	x	x	15NN50-1.5C
Mounting hardware for tablet	x	x	2000-1801-R
Pocket Wi-Fi router	x	x	2000-1552-R
Automotive power adapter for instrument	x	x	806-141-R
Antenna or antenna cable to instrument adapter			

Available through third parties:

- Tablet/laptop running Windows 7, 8, or 10 with Wi-Fi capability. A computer with a Core i5 processor equivalent or greater is preferred.

Maps

Three types of mapping solutions are available using the MX280007A:

- **Google Maps** – a free service offering the user the flexibility to automatically download maps for many parts of the world. However, an internet connection must be set up and maintained during the entirety of the interference hunt. In many cases, a cellular USB modem is used for this connection.
- **Baidu Maps** – a free service popular in Asia (similar to Google Maps). An internet connection must be maintained to use this map source.
- **OpenStreetMap** – an open source database of maps that must be downloaded to the hard drive of the tablet before the interference hunt begins. Users can create their own maps using an easy 4-step process, or Anritsu has provided downloads for many metro areas worldwide.
- **Picture Files** – picture files (JPG and PNG supported) can be used for off-line mapping. These maps have GPS coordinates embedded to enable geo-location. Picture maps can be panned and zoomed quickly. This is helpful in urban areas where large file sizes are used. Information on using picture files for off-line mapping can be found in the Mobile InterferenceHunter User’s Guide 10580-00416.

Summary – 5G Ready to 54 GHz

The MX280007A is a quick and reliable way to find multiple or single emitters even in difficult reception conditions. The ability to work with multiple signal sources, reflections, RF shadows, and multi-path distinguish the MX280007A from conventional systems that depend solely on directional antennas. The ability to work with signals that are intermittent, bursty, or drift rapidly in frequency separate this solution from more expensive ones targeted at a single, fixed-frequency interferer.

The MX280007A’s post-capture analysis capability allows users to modify search parameters without re-driving the route. This allows re-analysis of the captured data and the opportunity to consult with experts when needed.

The MX280007A works with the broad array of Anritsu handheld spectrum analyzers, providing interference hunting and spectrum clearing capability from 9 kHz to 54 GHz. The MX280007A is a quick, reliable, and multi-emitter enabled solution to your interference hunting and spectrum clearing needs.



OpenStreetMap™ displayed on Windows PC tablet. Interference hunt screen capture. Dots shown along drive path are colored according to signal strength.



Compatible Analyzers

The following current Anritsu handheld spectrum analyzer models may be utilized in the Anritsu mobile interference hunting system.

Spectrum Master™	MS2712E/MS2713E MS2720T
BTS Master™	MT8220T
Cell Master™	MT8213E
Site Master™	S332E/S362E
LMR Master™	S412E
VNA Master™	MS2034B/MS2035B MS2036C/MS2037C/MS2038C
Field Master Pro™	MS2090A

Ordering Information

Mobile InterferenceHunter™ Software	Model Number	Description
	MX280007A	Mobile InterferenceHunter Software (Spectrum Analyzer must have GPS Receiver)
Important: When placing order, an email address is always needed. For Spectrum Analyzers previously owned, the model and serial number of the analyzer must also be provided.		
	Part Number	Description
	MX280007A-PL001	Perpetual license ordered with a new Spectrum Analyzer
	MX280007A-PL002	Perpetual license ordered with an existing Spectrum Analyzer

Note: Customers order one of the two part numbers listed above to obtain a license. An email is then sent with a link to download the MX280007A along with the license key. Multiple licenses may also be ordered that work with a corresponding number of Anritsu handheld spectrum analyzers.

Accessories

- Tablet/laptop running Windows 7, 8 or 10 (tablet running Windows 10 highly recommended for touchscreen capability)
- Off-the-shelf magnet mount omnidirectional antenna (Anritsu P/N 3-2000-1647-R or equivalent) This part also contains an integrated GPS antenna.
- Mounting hardware for tablet (Anritsu P/N 2000-1801-R or equivalent)
- Magnet mount GPS antenna (Anritsu P/N 2000-1528-R or equivalent) Required only if omnidirectional antenna used does not incorporate a GPS antenna.
- USB A - 5-PIN Mini-B Cable (Anritsu P/N 3-2000-1498 or equivalent) This cable is provided as an accessory for compatible Anritsu handheld spectrum analyzers.
- Optional audio cable or Bluetooth transmitter to connect the tablet speaker to the car audio system

Model/Order No.	Name
	Additional Accessories
	Bandpass Filters
1030-106-R	1710 MHz to 1790 MHz, N (m) to N (f), 50Ω
1030-107-R	1910 MHz to 1990 MHz, N (m) to N (f), 50Ω
1030-109-R	824 MHz to 849 MHz, N (m) to SMA (f), 50Ω
1030-110-R	880 MHz to 915 MHz, N (m) to SMA (f), 50Ω
1030-111-R	1850 MHz to 1910 MHz, N (m) to SMA (f), 50Ω
1030-112-R	2400 MHz to 2484 MHz, N (m) to SMA (f), 50Ω
1030-114-R	806 MHz to 869 MHz, N (m) to SMA (f), 50Ω
1030-155-R	2496 MHz to 2690 MHz, N (m) to N (f), 0.8 dB loss, 50Ω
1030-178-R	1920 MHz to 1980 MHz, N (m) to N (f), 50Ω
1030-179-R	777 MHz to 798 MHz, N (m) to N (f), 50Ω
1030-180-R	2500 MHz to 2570 MHz, N (m) to N (f), 50Ω
2000-1684-R	791 MHz to 821 MHz, N (m) to N (f), 50Ω
	Bandpass Filters
	(used with InterferenceHunter™ MA2700A)
2000-1734-R	699 MHz to 715 MHz, N (m) to N (f), 50Ω
2000-1735-R	776 MHz to 788 MHz, N (m) to N (f), 50Ω
2000-1736-R	815 MHz to 850 MHz, N (m) to N (f), 50Ω
2000-1737-R	1711 MHz to 1756 MHz, N (m) to N (f), 50Ω
2000-1738-R	1850 MHz to 1910 MHz, N (m) to N (f), 50Ω
2000-1739-R	880 MHz to 915 MHz, N (m) to N (f), 50Ω
2000-1740-R	1710 MHz to 1785 MHz, N (m) to N (f), 50Ω
2000-1741-R	1920 MHz to 1980 MHz, N (m) to N (f), 50Ω
2000-1742-R	832 MHz to 862 MHz, N (m) to N (f), 50Ω
2000-1743-R	2500 MHz to 2570 MHz, N (m) to N (f), 50Ω
2000-1799-R	2305 MHz to 2320 MHz, N (m) to N (f), 50Ω
	Highpass/Lowpass Filters
1030-149-R	Hi-Pass, 150 MHz, N (m) to N (f), 50Ω
1030-150-R	Hi-Pass, 400 MHz, N (m) to N (f), 50Ω
1030-151-R	Hi-Pass, 700 MHz, N (m) to N (f), 50Ω
1030-152-R	Lo-Pass, 200 MHz, N (m) to N (f), 50Ω
1030-153-R	Lo-Pass, 550 MHz, N (m) to N (f), 50Ω

Model/Order No.	Name
	Directional Antennas
2000-1677-R	300 MHz to 3 GHz, SMA (m), Log Periodic
2000-1659-R	698 MHz to 787 MHz, N (f), 8 dBd, Yagi
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
2000-1416-R	1920 MHz to 2170 MHz, N (f), 10 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N (f), 10 dBd, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N (f), 12 dBd, Yagi
2000-1715-R	Directional Antenna, 698 MHz to 2500 MHz N (f), gain of 2 dBi to 10 dBi, typical
2000-1726-R	Antenna, Yagi 2500 MHz to 2700 MHz N (f), 12 dBd
2000-1747-R	Antenna, Log Periodic, 300 MHz to 5000 MHz N (f), 5.1 dBi (typ.)
2000-1748-R	Antenna, Log Periodic, 1 GHz to 18 GHz, N (f), 6 dBi (typ.)
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)
	Other Accessories
2000-1647-R	Mag mount broadband antenna Cable 1: 698 MHz to 1200 MHz 2 dBi peak gain, 1700 MHz to 2700 MHz, 5 dBi peak gain, N (m) 50Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N (m), 50Ω, 10 ft Cable 3: GPS 26 dB gain, SMA (m), 50Ω, 10 ft
2000-1946-R	Magnet mount broadband antenna Cable 1: 617 MHz to 960 MHz, 3 dBi peak gain, 1710 MHz to 3700 MHz, 4 dBi peak gain, N (m) 50Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N (m), 50Ω, 10 ft Cable 3: GPS 26 dB gain, SMA (m), 50Ω, 10 ft
2000-1723-R	USB-based GPS
2000-1910-R	USB 3.0 Hub
15NN50-1.5C	N (m) to N (m) cable for external antennas
2000-1801-R	Hardware for mounting Windows tablet onto car dash
2000-1648-R	Mag mount omnidirectional antenna, 1700 MHz to 6000 MHz, 3 dBi peak gain, N (m) 50Ω, 10 ft
2000-1752-R	Wireless Router (TP Link Model TL-WR802N)
2000-1689	EMI Near Field Probe Kit
2000-1653	Anti-glare Screen Cover (package of 2)
633-75	High Capacity Battery Pack, 7500 mAh
806-141-R	Automotive Power Adapter, 12 VDC, 60 W
MA2700A	Handheld InterferenceHunter
2000-1528-R	(Refer to TDS 11410-00692 for full specifications) GPS Antenna, SMA (m) with 5 m (15 ft) cable, 3 dBi gain, requires 5 VDC

Cell Master

MT8213E

Cable & Antenna Analyzer: 2 MHz to 6 GHz, Spectrum Analyzer: 9 kHz to 6 GHz, Power Meter: 10 MHz to 6 GHz

Remote Control
GPIB | Ethernet**Compact Handheld Base Station Analyzer**

Anritsu introduces its compact handheld Base Station Analyzer for installation and maintenance of wireless networks. Designed as a lightweight base station analyzer meeting virtually all the testing needs of an RF technician, the Cell Master features Signal Analyzer options for 2G, 3G, and 4G cellular networks including LTE, WiMAX, and digital broadcast.

Cable and Antenna Analyzer Highlights

- Measurements: RL, VSWR, Cable Loss, DTF, Phase
- 2-port Transmission Measurement: High/Low Power
- Sweep Speed: 1 ms/data point (typ.)
- Display: Single or Dual Measurement Touchscreen
- Calibration: OSL, InstaCal™, and Flex Cal™
- Bias-Tee: 32 V internal

Spectrum and Interference Analyzer Highlights

- Measurements: Occupied Bandwidth, Channel Power, ACPR, C/I
- Interference Analyzer: Spectrogram, Signal Strength, RSSI, Interference Mapping
- Dynamic Range: > 102 dB in 1 Hz RBW
- DANL: -162 dBm in 1 Hz RBW
- Phase Noise: -100 dBc/Hz max @ 10 kHz offset at 1 GHz
- Frequency Accuracy: ±50 ppb with GPS On

Capabilities and Functional Highlights

- LTE/LTE-A FDD/TDD; MIMO (2×2, 4×4)
- NB-IoT Measurement
- GSM/EDGE
- W-CDMA/HSPA+
- TD-SCDMA/HSPA+
- CDMA, EV-DO
- Fixed, Mobile WiMAX
- EMF Test
- USB Power Sensors up to 50 GHz
- Coverage Mapping
- 3 hour battery operation time
- USB or Ethernet data transfer
- PIM Alert Application
- PIM Hunting
- ISDB-T, ISDB-T SFN
- DVB-T/H, DVB-T/H SFN
- Interference Analyzer
- GPS information on stored traces
- Built-in Bias Tee
- Internal Power Meter
- High Accuracy Power Meter
- Master Software Tools™
- Line Sweep Tools™
- easyTest Tools™
- Web Remote Control with Ethernet option

Cable and Antenna Analyzer Specifications

Measurements	Measurements	VSWR Return Loss Cable Loss Distance-to-Fault (DTF) Return Loss Distance-to-Fault (DTF) VSWR 1-port Phase Smith Chart (50Ω/75Ω Selectable)
Setup Parameters	Measurement Display	Single/Dual Measurement Display with independent markers
	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), RF Pwr When Hold (On/Off)
	Data Points	137, 275, 551, 1102, 2204
	Markers	Markers 1-6 (On/Off), Delta Makers 1-6 (On/Off), Marker to Peak/Valley, Peak/Valley Auto, Marker Table (On/Off), All Markers Off
	Traces	Recall, Copy to Display Memory, No Trace Math, Trace ± Memory, (Trace + Memory)/2 and Trace Overlay (On/Off)
	Limit Line	On/Off, Single Limit, Multi-segment Edit, Limit Alarm (On/Off), Pass Fail Message (On/Off), Pass/Fail (Unbounded/Bounded), Warning Limit Offset, Clear Limit
Calibration	Start Cal, Cal Type (Standard/FlexCal™), Disp Valid Cal Temp Range	
Save	Setups (.stp), Measurements (.dat, .vna, .csv*), Screen Shots (.jpg) *Requires V4.00 firmware or higher	
Recall	Setups (.stp), Measurements (.dat, .vna)	
Frequency	Frequency Range	2 MHz to 6 GHz
	Frequency Accuracy	±2.5 ppm @ 25°C
	Frequency Resolution	1 kHz (RF immunity low) 100 kHz (RF immunity high)
Output Power	High	0 dBm (typ.)
	Low	2 MHz to 1.5 GHz: -40 dBm, (typ.) >1.5 GHz to 6 GHz: -30 dBm, (typ.)
Interference Immunity	On-Channel	+17 dBm @ >1.0 MHz from carrier frequency
	On-Frequency	0 dBm within ±10 kHz of the carrier frequency
Measurement Speed	Return Loss	≤1.00 ms/data point, RF immunity low (typ.)
	Distance-to-Fault	≤1.25 ms/data point, RF immunity low (typ.)
Return Loss	Measurement Range	0 to 60 dB
	Resolution	0.01 dB
VSWR	Measurement Range	1:1 to 65:1
	Resolution	0.01
Cable Loss	Measurement Range	0 to 30 dB
	Resolution	0.01 dB
Distance-to-Fault	Vertical Range Return Loss	0 to 60 dB
	Vertical Range VSWR	1:1 to 65:1
	Fault Resolution (meters)	$(1.5 \times 10^9 \times vp) / \Delta F$ (vp = velocity propagation constant, ΔF is F2 - F1 in Hz)
	Horizontal Range (meters)	0 to (Data Points - 1) × Fault Resolution, to a maximum of 1500 meters (4921 ft)
1-Port Phase	Measurement Range	-180° to +180°
	Resolution	0.01°
Smith Chart	Resolution	0.01, 50Ω/75Ω Selectable
Measurement Accuracy	Corrected Directivity	>42 dB, OSL Calibration >38 dB, InstaCal™ Calibration

Spectrum Analyzer Specifications

Measurements	Smart Measurement	Field Strength (uses antenna calibration tables to measure dBm/m ² , dBmV/m, dBV/m, dBμV/m, Volt/m, Watt/m ² , dBW/m ² , A/m, dBA/m and Watt/cm ²) Occupied Bandwidth (measures 99% to 1% power channel of a signal) Channel Power (measures the total power in a specified bandwidth) ACPR (adjacent channel power ratio) AM/FM/SSB Demodulation (wide/narrow FM, USB and LSB), (audio out only) C/I (carrier-to-interference ratio) Emission Mask Coverage Mapping (requires Option 431) PIM Alert Application (available for download) PIM Hunting
Setup Parameters	Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Channel Increment
	Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
	Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
	Bandwidth	RBW, Auto RBW, VBW, Auto VBW, RBW/WBW, Span/RBW
	File	Save, Save-on-Event, Recall, Copy, Delete
	Save/Recall	Setups, Measurements, Screen Shots (JPEG), Limit Lines, Spurious Emission Mask
	Save-on-Event	Crossing Limit Line, Sweep Complete, Save-then-Stop, Clear All
	Copy	Selected file or files to internal/external memory (USB)
	Delete	Selected file or files from internal/external memory (USB)
Application Options	Bias-Tee (On/Off), Impedance (50Ω, 75Ω, Other)	

Continued on next page



Sweep Functions	Sweep	Single/Continuous, Sweep Mode (Fast, Performance, No FFT), Reset, Detection, Minimum Sweep Time, Trigger Type, Gated Sweep (see Option 90)			
	Detection	Peak, RMS, Negative, Sample, Quasi-peak			
	Triggers	Free Run, External, Video, Change Position, Manual			
Trace Functions	Traces	Up to three Traces (A, B, C), View/Blank, Write/Hold, Trace A/B/C Operations			
	Trace A Operations	Normal, Max Hold, Min Hold, Average, # of Averages, (always the live trace)			
	Trace B Operations	A → B, B ↔ C, Max Hold, Min Hold			
	Trace C Operations	A → C, B ↔ C, Max Hold, Min Hold, A – B → C, B – A → C, Relative Reference (dB), Scale			
Marker Functions	Markers	Markers 1-6 each with a Delta Marker, or Marker 1 Reference with Six Delta Markers, Marker Table (On/Off), All Markers Off			
	Marker Types	Style (Fixed/Tracking), Noise Marker, Frequency Counter Marker			
	Marker Auto-Position	Peak Search, Next Peak (Right/Left), Peak Threshold %, Set Marker to Channel, Marker Frequency to Center, Delta Marker to Span, Marker to Reference Level			
	Marker Table	1-6 markers frequency and amplitude plus delta markers frequency amplitude and offset			
Limit Line Functions	Limit Lines	Upper/Lower, On/Off, Edit, Move, Envelope, Advanced, Limit Alarm, Default Limit			
	Limit Line Edit	Frequency, Amplitude, Add Point, Add Vertical, Delete Point, Next Point Left/Right			
	Limit Line Move	To Current Center Frequency, By dB or Hz, To Marker 1, Offset from Marker 1			
	Limit Line Envelope	Create Envelope, Update Amplitude, Points (41 max), Offset, Shape Square/Slope			
	Limit Line Advanced	Type (Absolute/Relative), Mirror, Save/Recall			
Frequency	Frequency Range	9 kHz to 6 GHz			
	Tuning Resolution	1 Hz			
	Frequency Reference	Aging: ±1.0 ppm/year Accuracy: ±1.5 ppm (25°C±25°C) + aging, <±50 ppb with GPS On			
	Frequency Span	10 Hz to 6 GHz including zero span			
	Sweep Time	Minimum 100 ms, 7 μs to 3600 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			
Spectral Purity	SSB Phase Noise @ 1 GHz	–100 dBc/Hz, –110 dBc/Hz (typ., 10 kHz offset) –105 dBc/Hz, –112 dBc/Hz (typ., 100 kHz offset) –115 dBc/Hz, –121 dBc/Hz (typ., 1 MHz offset)			
Amplitude Ranges	Dynamic Range	>102 dB (2.4 GHz), 2/3 (TOI-DANL) in 1 Hz RBW			
	Measurement Range	DANL to +26 dBm (≥50 MHz) DANL to 0 dBm (<50 MHz)			
	Display Range	1 to 15 dB/div in 1 dB steps, ten divisions displayed			
	Reference Level Range	–150 to +30 dBm			
	Maximum Continuous Input	+30 dBm			
	Attenuator Resolution	0 to 55 dB in 5 dB steps			
	Amplitude Units	Log Scale Modes: dBW, dBm, dBμW, dBV, dBmV, dBμV, dBA, dBmA, dBμA Linear Scale Modes: nV, μV, mV, V, kV, nW, μW, mW, W, kW, nA, μA, mA, A			
Amplitude Accuracy	9 kHz to 100 kHz	±2.00 dB (typ.) (Preamp Off)			
	100 kHz to 4 GHz	±1.25 dB, ±0.5 dB (typ.)			
	>4 GHz to 6 GHz	±1.50 dB, ±0.5 dB (typ.)			
Displayed Average Noise Level (DANL)	(RBW = 1 Hz, 0 dB attenuation)	Preamp Off (Reference level –20 dBm)		Preamp On (Reference level –50 dBm)	
		Maximum	Typical	Maximum	Typical
	10 MHz to 2.4 GHz	–141 dBm	–146 dBm	–157 dBm	–162 dBm
	>2.4 GHz to 4 GHz	–137 dBm	–141 dBm	–154 dBm	–159 dBm
	>4 GHz to 5 GHz	–134 dBm	–138 dBm	–150 dBm	–155 dBm
>5 GHz to 6 GHz	–126 dBm	–131 dBm	–143 dBm	–150 dBm	
Spurs	Residual Spurious	<–90 dBm (RF input terminated, 0 dB input attenuation, > 10 MHz)			
	Input-Related Spurious	<–75 dBc (0 dB attenuation, –30 dBm input, span <1.7 GHz, carrier offset >4.5 MHz)			
	Exceptions, typical	<–70 dBc @ <2.5 GHz, with 2072.5 MHz Input <–68 dBc @ F1 – 280 MHz with F1 Input <–70 dBc @ F1 + 190.5 MHz with F1 Input <–52 dBc @ 7349 – (2F2) MHz, with F2 Input, where F2 < 2437.5 MHz <–55 dBc @ 190.5 ± (F1/2) MHz, where F1 < 1 GHz			
Third-Order Intercept (TOI)	Preamp Off (–20 dBm tones 100 kHz apart, 10 dB attenuation)				
	800 MHz	+16 dBm			
	2400 MHz	+20 dBm			
	200 MHz to 2200 MHz	+25 dBm (typ.)			
	>2.2 GHz to 5.0 GHz	+28 dBm (typ.)			
>5.0 GHz to 6.0 GHz	+33 dBm (typ.)				
Second Harmonic Distortion	Preamp Off, 0 dB input attenuation, –30 dBm input				
	50 MHz	–56 dBc			
	>50 MHz to 200 MHz	–60 dBc (typ.)			
>200 MHz to 3000 MHz	–70 dBc (typ.)				
VSWR	2:1 (typ.)				



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 and is not warranted; 5) Recommended calibration cycle is 12 months; 6) Performance Sweep Mode.

Setup Parameters	System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed) Self Test, Application Self Test, GPS (see Option 31)
	System Options	Name, Date and Time, Brightness, Volume Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, Portuguese) Reset (Factory Defaults, Master Reset, Update Firmware)
	Internal Trace/Setup Memory	2,000 traces, 2,000 setups
	External Trace/Setup Memory	Limited by size of USB Flash drive
	Mode Switching	Auto-Stores/Recalls most recently used Setup Parameters in the Mode
File Management	File Types	Vary with measurement mode
	File	Save, Recall, Copy, Delete
	Save	Setups, Measurements, Screen Shots (JPEG)
	Recall	Setups, Measurements
	Copy	Selected file or files to internal/external memory (USB)
	Delete	Selected file or files from internal/external memory (USB)
	File Sort Method	By Name/Date/Type, Ascend/Descend
Connectors	RF Out	Type N, female, 50Ω (Reflection In)
	RF Out Damage Level	+42 dBm, ±50 VDC
	RF In	Type N (f), 50Ω
	RF Input Damage Level	+30 dBm peak, ±50 VDC, Maximum Continuous Input (≥10 dB attenuation)
	ASI Output Connector	BNC-J 75Ω (with Option 57 or Option 79)
	GPS	SMA (f)
	External Power	5.5 mm barrel connector, 12.5 VDC to 15 VDC, <4.0 Amps
	USB Interface (2)	Type A (Connect USB Flash Drive and Power Sensor)
	USB Interface	5-pin mini-B (Connect to PC for data transfer and/or remote control)
	Ethernet Interface	RJ45 connector for Ethernet 10-Base T
	Headset Jack	3.5 mm mini-phone plug
	External Reference In	BNC, female, Maximum Input +10 dBm, 1 MHz, 5 MHz, 10 MHz, 13 MHz
	External Trigger/Clock Recovery	BNC, female, Maximum Input ±5 VDC
RF over Fiber	SFP/SFP+ compatible socket (available with Option 759)	
Display	Type	Resistive Touchscreen
	Size	8.4-inch daylight viewable color LCD
	Resolution	800 × 600
	Pixel Defects	No more than five defective pixels (99.9989% good pixels)
Battery	Type	Li-Ion
	Battery Operation	3 hours (typ.)
	Battery Charging Limits	0°C to +45°C, Relative Humidity ≤80%
CE	EMC	2014/30/EU, EN61326-1, EN61000-4-2
	LVD	2014/35/EU, EN61010-1
	RoHS	(EU) 2015/863
RCM	Australia and New Zealand	RCM AS/NZS 4417:2012
KCC	South Korea	KCC-REM-A21-0004
		MIL-PRF-28800F Class 2
Environmental	Operating Temperature Range	-10°C to +55°C
	Storage Temperature Range	-51°C to +71°C
	Maximum Relative Humidity	95% RH at +30°C, none condensing
	Vibration, Sinusoidal	5 Hz to 55 Hz
	Vibration, Random	10 Hz to 500 Hz
	Half Sine Shock	30 gn
	Altitude	4600 meters, operating and non-operating
ESD	Explosive Atmosphere	MIL-PRF-28800F Section 4.5.6.3 MIL-STD-810G, Method 511.5, Procedure 1
	RF Port Center Pin	Withstands up to ±15 kV
Dimensions and Mass		273 (W) × 199 (H) × 91 (D) mm, (10.7 × 7.8 × 3.6 in), 3.71 kg, (8.2 lbs)



Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MT8213E	Main Frame Cable and Antenna Analyzer (2 MHz to 6 GHz) Spectrum Analyzer (9 kHz to 6 GHz) Power Meter (10 MHz to 6 GHz)
MT8213E-0021	Options 2-port Transmission Measurement
MT8213E-0010	Bias-Tee
MT8213E-0031	GPS Receiver (requires Antenna)
MT8213E-0019	High-accuracy Power Meter*3
MT8213E-0025	Interference Analyzer*4
MT8213E-0027	Channel Scanner
MT8213E-0431	Coverage Mapping*1
MT8213E-0444	EMF Measurement*6
MT8213E-0090	Gated Sweep
MT8213E-0028	C/W Signal Generator (Requires CW Signal Generator Kit, P/N 69793)
MT8213E-0880	GSM/GPRS/EDGE Measurement
MT8213E-0881	W-CDMA/HSPA+ Measurements*4
MT8213E-0882	TD-SCDMA/HSPA+ Measurements*5
MT8213E-0883	LTE/LTE-A FDD/TDD Measurements*5
MT8213E-0884	CDMA/EV-DO Measurements*5
MT8213E-0885	WiMAX Fixed/Mobile Measurements*5
MT8213E-0886	LTE 256 QAM Demodulation (Requires Option 883)
MT8213E-0887	NB-IoT Measurement
MT8213E-0030	ISDB-T Digital Video Measurements
MT8213E-0032	ISDB-T SFN Measurements
MT8213E-0079	ISDB-T BER Measurements (requires Option 30)
MT8213E-0064	DVB-T/H Digital Video Measurements
MT8213E-0078	DVB-T/H SFN Measurements
MT8213E-0057	DVB-T/H BER Measurements*2
MT8213E-0098	Standard Calibration to ISO17025 and ANSI/NCSL Z540-1. Includes calibration certificate
MT8213E-0099	Premium Calibration to ISO17025 and ANSI/NCSL Z540-1. Includes calibration certificate, test report, and uncertainty data
	Power Sensors (for complete ordering information, see the respective datasheets of each sensor)
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 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 (available at www.anritsu.com)
10100-00065	Product Information Compliance, and Safety
10580-00250	Cell Master User Guide
10580-00241	Cable and Antenna Analyzer Measurement Guide
10580-00242	2-Port Transmission Measurement
10580-00349	Spectrum Analyzer Measurement Guide
10580-00240	Power Meter Measurement Guide
10580-00234	3GPP Signal Analyzer Measurement Guide
10580-00235	3GPP2 Signal Analyzer Measurement Guide
10580-00236	WiMAX Signal Analyzer Measurement Guide
10580-00237	Digital TV Measurement Guide
10580-00238	Backhaul Analyzer Measurement Guide
10580-00455	EMF Measurement Guide
10580-00256	Programming Manual

*1: Requires Option 31

*2: Requires Option 64

*3: Requires External Power Sensor

*4: Option 31 recommended

*5: Requires Option 31 for full functionality

*6: Requires Anritsu Isotropic Antenna

Model/Order No.	Name
	Troubleshooting Guides (available at www.anritsu.com)
11410-00472	Interference
11410-00473	Cable, Antenna and Components
11410-00551	Spectrum Analyzers
11410-00566	LTE eNodeB Testing
11410-00615	TD-LTE eNodeB Testing
11410-00466	GSM/GPRS/EDGE Base Stations
11410-00552	T1/DS1 Backhaul Testing
11410-00553	E1 Backhaul Testing
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
11410-00522	T1/DS1 Backhaul Testing
11410-00553	E1 Backhaul Testing
	Standard Accessories (included with instrument)
2000-1371-R	Ethernet Cable, 7 ft (213 cm)
2000-1654-R	Soft Carrying Case
2000-1691-R	Stylus with Coiled Tether
2000-1797-R	Touchscreen Protective Film, 8.4 in
633-75	Rechargeable Li-Ion Battery, 7500 mAh
40-187-R	AC-DC Adapter
806-141-R	Automotive Power Adapter, 12 VDC, 60 W
3-2000-1498	USB A/5-pin mini-B Cable, 10 ft/305 cm
	Optional Accessories
ICN50B	Calibration Components, 50Ω InstaCal™ Calibration Module, 38 dB, 2 MHz to 6.0 GHz, N (m), 50Ω
OSLN50A-8	High Performance Type N (m), DC to 8 GHz, 50Ω
OSLNF50A-8	High Performance Type N (f), DC to 8 GHz, 50Ω
2000-1914-R	Precision Open/Short/Load, 4.3-10 (f), DC to 6 GHz, 50Ω
2000-1915-R	Precision Open/Short/Load, 4.3-10 (m), DC to 6 GHz, 50Ω
2000-1618-R	Precision Open/Short/Load, 7/16 DIN (m), DC to 6.0 GHz, 50Ω
2000-1619-R	Precision Open/Short/Load, 7/16 DIN (f), DC to 6.0 GHz, 50Ω
22N50	Open/Short, N (m), DC to 18 GHz, 50Ω
22NF50	Open/Short, N (f), DC to 18 GHz, 50Ω
SM/PL-1	Precision Load, N (m), 42 dB, 6.0 GHz, 50Ω
SM/PLNF-1	Precision Load, N (f), 42 dB, 6.0 GHz, 50Ω
22N75	Open/Short, N (m), DC to 3 GHz, 75Ω
22NF75	Open/Short, N (f), DC to 3 GHz, 75Ω
26N75A	Precision Termination, N (m), DC to 3 GHz, 75Ω
26NF75A	Precision Termination, N (f), DC to 3 GHz, 75Ω
12N50-75B	Matching Pad, DC to 3 GHz, 50Ω to 75Ω
	Phase-Stable Test Port Cables, Armored w/Reinforced Grip (recommended for cable & antenna line sweep applications)
15RNFN50-1.5-R	1.5 m, DC to 6 GHz, N (m) - N (f), 50Ω
15RDFN50-1.5-R	1.5 m, DC to 6 GHz, N (m) - 7/16 DIN (f), 50Ω
15RDN50-1.5-R	1.5 m, DC to 6 GHz, N (m) - 7/16 DIN (m), 50Ω
15RNFN50-3.0-R	3.0 m, DC to 6 GHz, N (m) - N (f), 50Ω
15RDFN50-3.0-R	3.0 m, DC to 6 GHz, N (m) - 7/16 DIN (f), 50Ω
15RDN50-3.0-R	3.0 m, DC to 6 GHz, N (m) - 7/16 DIN (m), 50Ω
	Interchangeable Adaptor Phase Stable Test Port Cables, Armored w/Reinforced Grip (recommended for cable and antenna line sweep applications. It uses the same ruggedized grip as the Reinforced grip series cables. Now you can also change the adaptor interface on the grip to four different connector types)
15RCN50-1.5-R	1.5 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω
15RCN50-3.0-R	3.0 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω

Continued on next page



Model/Order No.	Name
	Phase-Stable Test Port Cables, Armored (recommended for use with tightly spaced connectors and other general purpose applications)
15NNF50-1.5C	1.5 m, DC to 6 GHz, N (m) - N (f), 50Ω
15NN50-1.5C	1.5 m, DC to 6 GHz, N (m) - N (m), 50Ω
15NDF50-1.5C	1.5 m, DC to 6 GHz, N (m) - 7/16 DIN (f), 50Ω
15ND50-1.5C	1.5 m, DC to 6 GHz, N (m) - 7/16 DIN (m), 50Ω
15NNF50-3.0C	3.0 m, DC to 6 GHz, N (m) - N (f), 50Ω
15NN50-3.0C	3.0 m, DC to 6 GHz, N (m) - N (m), 50Ω
15NNF50-5.0C	5.0 m, DC to 6 GHz, N (m) - N (f), 50Ω
15NN50-5.0C	5.0 m, DC to 6 GHz, N (m) - N (m), 50Ω
15N43M50-1.5C	Test Port Extension Cable, Armored, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (m)
15N43F50-1.5C	Test Port Extension Cable, Armored, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (f)
15N43M50-3.0C	Test Port Extension Cable, Armored, 3 m, DC to 6 GHz, N (m) to 4.3-10 (m)
15N43F50-3.0C	Test Port Extension Cable, Armored, 3 m, DC to 6 GHz, N (m) to 4.3-10 (f)
15NF43M50-1.5C	Test Port Extension Cable, Armored, 1.5 m, DC to 6 GHz, N (f) to 4.3-10 (m)
15NF43F50-1.5C	Test Port Extension Cable, Armored, 1.5 m, DC to 6 GHz, N (f) to 4.3-10 (f)
15NF43M50-3.0C	Test Port Extension Cable, Armored, 3 m, DC to 6 GHz, N (f) to 4.3-10 (m)
15NF43F50-3.0C	Test Port Extension Cable, Armored, 3 m, DC to 6 GHz, N (f) to 4.3-10 (f)
	Adapters
1091-417-R	DC to 6 GHz, N (m) to QMA (f), 50Ω
1091-418-R	DC to 18 GHz, N (m) to QMA (m), 50Ω
1091-465-R	DC to 6 GHz, 4.3-10 (f) to N (f), 50Ω
1091-467-R	DC to 6 GHz, 4.3-10 (m) to N (f), 50Ω
1091-26-R	DC to 18 GHz, N (m) to SMA (m), 50Ω
1091-27-R	DC to 18 GHz, N (m) to SMA (f), 50Ω
1091-80-R	DC to 18 GHz, N (f) to SMA (m), 50Ω
1091-81-R	DC to 18 GHz, N (f) to SMA (f), 50Ω
1091-172-R	DC to 1.3 GHz, N (m) to BNC (F), 50Ω
510-90-R	DC to 7.5 GHz, 7/16 DIN (f) to N (m), 50Ω
510-91-R	DC to 7.5 GHz, 7/16 DIN (f) to N (f), 50Ω
510-92-R	DC to 7.5 GHz, 7/16 DIN (m) to N (m), 50Ω
510-93-R	DC to 7.5 GHz, 7/16 DIN (m) to N (f), 50Ω
510-96-R	DC to 7.5 GHz, 7/16 DIN (m) to 7/16 DIN (m), 50Ω
510-97-R	DC to 7.5 GHz, 7/16 DIN (f) to 7/16 DIN (f), 50Ω
510-102-R	DC to 11 GHz, N (m)-N (m), 90 degrees, 50Ω
	Precision Adapters
34NN50A	Precision Adapter, N (m) to N (m), DC to 18 GHz, 50 Ω
34NFNF50	Precision Adapter, N (f) to N (f), DC to 18 GHz, 50 Ω
	Miscellaneous Accessories
69793	CW Signal Generator Kit
2000-1374-R	External Dual Charger for Li-Ion Batteries
2000-1689-R	EMI Near Field Probe Kit
MA2700A	Handheld Interference Hunter (for full specifications, refer to the MA2700A Technical Data Sheet, 11410-00692)
633-75	Rechargeable Li-Ion Battery, 7500 mAh
2000-1797-R	Touchscreen Protective Film, 8.4 in.
2000-1691-R	Stylus with Coiled Tether
2000-1798-R	Port Extender, DC to 6 GHz, N (m) to N (f)
MA25401A	Atomic Clock, External, 10 MHz Frequency Reference (see 11410-01134 for details)
2000-1884-R	PIM Hunter™ Test Probe (For full specifications, refer to the 2000-1884-R Technical Data Sheet 11410-00999)
66864	Rack Mount Kit, Master Platform
	Backpack and Transit Case
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle, 56 × 45.5 × 26.5 cm (22.07" × 17.92" × 10.42")
760-261-R	Large Transit Case with Wheels and Handle 63.1 × 50 × 30 cm (24.83" × 19.69" × 11.88"), space for MA2700A, antennas, filters, instrument inside soft case, and other interference hunting accessories/tools
760-262-R	Transit Case for MA2700A, several Yagi antennas and filters
760-286-R	Compact Transit Case with Wheels and Handle 55.6 × 35.5 × 22.9 cm (21.89" × 13.98" × 9.01")
460-271-R	Transit Case for Portable Directional Antennas and Port Extender, 52.4 × 42.8 × 20.6 cm (20.62" × 16.87" × 8.12") (for 2000-1777-R, 2000-1778-R, 2000-1779-R, 2000-1798-R)
	Isotropic Antennas
2000-1791-R	700 MHz to 6000 MHz, N (m)
2000-1792-R	30 MHz to 3000 MHz, N (m)
2000-1800-R	9 kHz to 300 MHz, N (m)

Model/Order No.	Name
	GPS Antennas
2000-1528-R	SMA (m) with 5 m (15 ft) cable, 3 dBi gain, requires 5 VDC
2000-1652-R	SMA (m) with 0.3 m (1 ft) cable, 5 dBi gain, requires 3.3 VDC or 5 VDC
2000-1760-R	SMA (m), 25 dB gain, 2.5 VDC to 3.7 VDC
	NEON® MA8100A Signal Mapper
MA8100A-000	NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service (PN: 2300-607).
MA8100A-001	NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service.
MA8100A-003	NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes 3 year NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service.
MA8100A-005	NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes 5 year NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service.
MA8100A-100	NEON Signal Mapper with Anritsu Integration and Tracking Unit. Includes Perpetual NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service.
2300-606	Perpetual NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service. Part number can also be used to order a perpetual license after a limited term license has expired.
2300-612	Renewal of 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service.
2300-613	Renewal of 3 year NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service.
2300-614	Renewal of 5 year NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service.
2000-1852-R	NEON Tracking Unit (includes USB cable and belt clip, Worldwide version)
2000-2015-R	NEON Tracking Unit (includes USB cable and belt clip, Japan version)
2000-1853-R	Belt clip (for NEON Tracking Unit)
	Directional Antennas
2000-1411-R	824 MHz to 896 MHz, N (f), 12.3 dBd, Yagi
2000-1412-R	885 MHz to 975 MHz, N (f), 12.6 dBd, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N (f), 12.3 dBd, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N (f), 11.4 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N (f), 14.1 dBd, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N (f), 14.3 dBd, Yagi
2000-1659-R	698 MHz to 787 MHz, N (f), 10.1 dBd, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N (f), 14.3 dBd, Yagi
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), 14.1 dBi, Yagi
2000-1747-R	Antenna, Log Periodic, 300 MHz to 7000 MHz, N (f), 5.1 dBi (typ.)
2000-1748-R	Antenna, Log Periodic, 1 GHz to 18 GHz, N (f), 6 dBi (typ.)
2000-1777-R	Portable Directional Antenna, 9 kHz to 20 MHz, N (f)
2000-1778-R	Portable Directional Antenna, 20 MHz to 200 MHz, N (f)
2000-1779-R	Portable Directional Antenna, 200 MHz to 500 MHz, N (f)
2000-1812-R	Portable Yagi Antenna, 450 MHz to 512 MHz, N (f) 7.1 dBd
2000-1825-R	Portable Yagi Antenna, 380 MHz to 430 MHz, N (f) 7.1 dBd
	Portable Antennas
2000-1200-R	806 MHz to 866 MHz, SMA (m), 50Ω
2000-1473-R	870 MHz to 960 MHz, SMA (m), 50Ω
2000-1035-R	896 MHz to 941 MHz, SMA (m), 50Ω (1/2 wave)
2000-1030-R	1710 MHz to 1880 MHz, SMA (m), 50Ω (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), 50Ω (1/2 wave)
2000-1475-R	1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA (m), 50Ω
2000-1032-R	2400 MHz to 2500 MHz, SMA (m), 50Ω (1/2 wave)
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA (m), 50Ω
2000-1636-R	Antenna Kit (Consists of: 2000-1030-R, 2000-1031-R, 2000-1032-R, 2000-1200-R, 2000-1035-R, 2000-1361-R, and carrying pouch)
2000-1751-R	Dipole, 698 to 960/1710 to 2170/2500 MHz to 2700 MHz, SMA (m), 2 dBi (typ.), 50Ω

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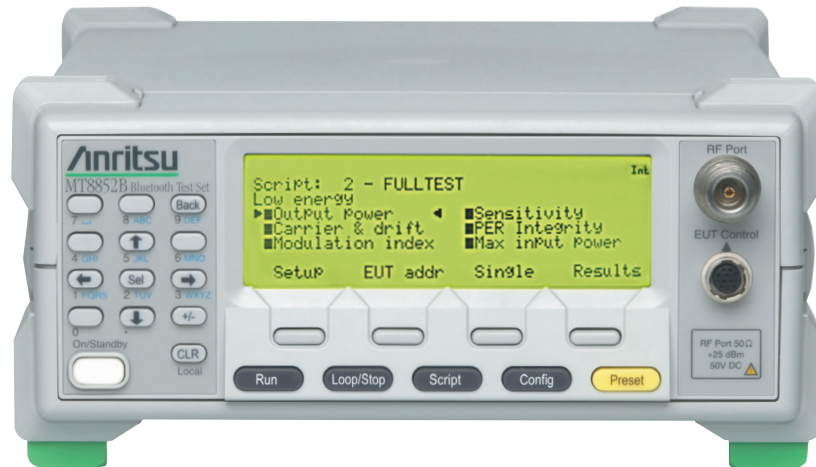


Model/Order No.	Name
	Mag mount broadband antennas
2000-1616-R	20 MHz to 21000 MHz, N (f), 50 Ω
2000-1647-R	Cable 1: 698 MHz to 1200 MHz, 2 dBi peak gain, 1700 MHz to 2700 MHz, 5 dBi peak gain, N (m), 50Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N (m), 50Ω, 10 ft Cable 3: GPS 26 dB gain, SMA (m), 50Ω, 10 ft
2000-1645-R	694 MHz to 894 MHz, 3 dBi peak gain, 1700 MHz to 2700 MHz, 3 dBi peak gain, N (m), 50Ω, 10 ft
2000-1646-R	750 MHz to 1250 MHz, 3 dBi peak gain, 1650 MHz to 2700 MHz, 5 dBi peak gain
2000-1648-R	1700 MHz to 6000 MHz, 3 dBi peak gain, N (m), 50Ω, 10 ft
2000-1946-R	Cable 1: 617 MHz to 960 MHz, 3 dBi peak gain, 1710 MHz to 3700 MHz, 4 dBi peak gain, N (m), 50Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N (m), 50Ω, 10 ft Cable 3: GPS 26 dB gain, SMA (m), 50Ω, 10 ft
	Filters
1030-114-R	806 MHz to 869 MHz, N (m) - SMA (f), 50Ω
1030-109-R	824 MHz to 849 MHz, N (m) - SMA (f), 50Ω
1030-110-R	880 MHz to 915 MHz, N (m) - SMA (f), 50Ω
1030-105-R	890 MHz to 915 MHz, N (m) - SMA (f), 50Ω
1030-111-R	1850 MHz to 1910 MHz, N (m) - SMA (f), 50Ω
1030-112-R	2400 MHz to 2484 MHz, N (m) - SMA (f), 50Ω
1030-106-R	1710 MHz to 1790 MHz, N (m) - SMA (f), 50Ω
1030-107-R	1910 MHz to 1990 MHz, N (m) - SMA (f), 50Ω
1030-112-R	2400 MHz to 2484 MHz, N (m) - SMA (f), 50Ω
1030-149-R	High Pass, 150 MHz, N (m) to N (f), 50Ω
1030-150-R	High Pass, 400 MHz, N (m) to N (f), 50Ω
1030-151-R	High Pass, 700 MHz, N (m) to N (f), 50Ω
1030-152-R	Low Pass, 200 MHz, N (m) to N (f), 50Ω
1030-153-R	Low Pass, 550 MHz, N (m) to N (f), 50Ω
1030-155-R	2500 MHz to 2700 MHz, N (m) - N (f), 50Ω
1030-178-R	1920 MHz to 1980 MHz, N (m) to N (f), 50Ω
1030-179-R	777 MHz to 798 MHz, N (m) to N (f), 50Ω
1030-180-R	2500 MHz to 2570 MHz, N (m) to N (f), 50Ω
2000-1684-R	791 MHz to 821 MHz, N (m) to N (f), 50Ω
2000-1734-R	Bandpass Filter, 699 MHz to 715 MHz, N (m) to N (f), 50Ω
2000-1735-R	Bandpass Filter, 776 MHz to 788 MHz, N (m) to N (f), 50Ω
2000-1736-R	Bandpass Filter, 815 MHz to 850 MHz, N (m) to N (f), 50Ω
2000-1737-R	Bandpass Filter, 1711 MHz to 1756 MHz, N (m) to N (f), 50Ω
2000-1738-R	Bandpass Filter, 1850 MHz to 1910 MHz, N (m) to N (f), 50Ω
2000-1739-R	Bandpass Filter, 880 MHz to 915 MHz, N (m) to N (f), 50Ω
2000-1740-R	Bandpass Filter, 1710 MHz to 1785 MHz, N (m) to N (f), 50Ω
2000-1741-R	Bandpass Filter, 1920 MHz to 1980 MHz, N (m) to N (f), 50Ω
2000-1742-R	Bandpass Filter, 832 MHz to 862 MHz, N (m) to N (f), 50Ω
2000-1743-R	Bandpass Filter, 2500 MHz to 2570 MHz, N (m) to N (f), 50Ω
2000-1799-R	Bandpass Filter, 2305 MHz to 2320 MHz, N (m) and N (f), 50Ω
2000-1911-R	Bandpass Filter, 703 MHz to 748 MHz, N (m) and N (f), 50Ω
2000-1912-R	Bandpass Filter, 788 MHz to 798 MHz, N (m) and N (f), 50Ω
2000-1925-R	Bandpass Filter, 663 MHz to 698 MHz, N (m) and N (f), 50Ω
2000-1926-R	Bandpass Filter, 776 MHz to 806 MHz, N (m) and N (f), 50Ω
	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, 50 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-R	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)

Bluetooth Test Set

MT8852B

2.4 GHz Reference Bluetooth Transceiver

Remote Control
GPIB**Test Bluetooth® Modules and Products with a Bluetooth Interface**

The Bluetooth Test Set MT8852B is the market leading RF measuring instrument for design proving and production test of a wide range of products that integrate *Bluetooth*® technology, including phones, headsets, computers, audio-visual and gaming products as well as modules. Anritsu is the leading supplier of instruments to test the quality of products manufactured with embedded Bluetooth technology. As members of the Bluetooth Special Interest Group (SIG) since 1999, Anritsu has actively participated in the development of the standard from the first Core Specification version 1.0 release through to the current Core Specification version 5.3 release. The MT8852B Bluetooth Test Set builds on this experience to offer an optimized radio layer test instrument. And, MT8852B supports tests for new direction finding technology (Angle of Arrival/ Angle of Departure) added in core specification version 5.1 (No RF test additions or changes in version 5.3).

As a manufacturer of Bluetooth products, you need above all else to maintain your reputation for quality and reliability. The complex demands of new technologies such as Bluetooth will require the adoption of new testing techniques. When tested on the MT8852B, you can ship products to your customers with confidence that they will work perfectly.

The *Bluetooth*® mark and logos are owned by Bluetooth SIG, Inc. and are used by Anritsu under license.

Features

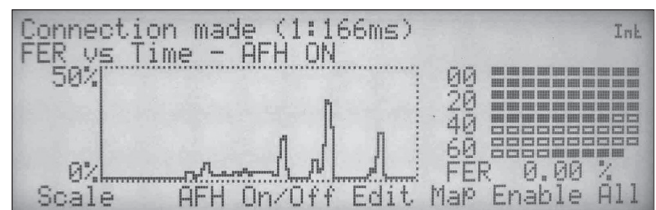
- Qualified by Bluetooth SIG for measurements
- Compliant with Bluetooth Test Specification RF.TS.p31 and RFPHY.TS.p16
- Basic Rate and EDR measurement performed in Bluetooth test mode – Loopback or Tx mode supported
- Signal generator and transmitter analyzer modes for protocol free applications
- “Quick Test” script validates Basic Rate, EDR and Bluetooth low energy test performance in under 15 seconds
- “Full Test” script performs full Bluetooth SIG compliant testing from single key press
- For design proving and production test
- Full implementation of Basic Rate, EDR and Bluetooth low energy dirty transmitter for Bluetooth SIG RF test specification compliant measurements
- Audio test capability, 3 SCO channels with CVSD, μ -Law and A-Law air interface
- Adaptive Frequency Hopping (AFH) measurements (MT8852B-015)
- Easy operation – one-touch testing with “Run” key
- BlueSuite Pro3 PC software displays; FSK modulation, power burst profile, PSK constellation diagrams and sensitivity searches graphically

- CombiTest software automates tests with test script generator and results data base
- GPIB and RS232 remote programming interfaces
- Initialization and control of test devices through USB, RS232 and USB-Adapter HCI control port
- Built-in support for Bluetooth low energy 2-Wire control interface
- Small size (half rack) and low weight (≤ 3.8 kg)

Options**Adaptive Frequency Hopping (AFH) Option MT8852B-015**

- Connect to an EUT using the Bluetooth Core Specification v1.2 faster connection and display the connection time in milliseconds.
- Read the EUT Local Assessment Scheme in the presence of an external interfering signal (e.g. WLAN).
- Manually define additional channels to mask in the MT8852B Pseudo Local Assessment Map.
- Display a graph of channel utilization against time to measure the speed with which an EUT masks channels when an interfering source is activated.
- Display a graph of Frame Error Rate (FER) against time to validate that an EUT identifies all “Bad” channels and maintains a zero or low FER.
- Establish an audio SCO link so that the audio quality can be monitored in the presence of interfering signals, and ensure that the AFH functionality maintains a high quality audio path.

This screen presents a graph with 1 second resolution of the FER of the Bluetooth link with AFH enabled. When an interfering source such as a 802.11 WLAN access point is activated, the FER can be seen to increase immediately. As the EUT’s local assessment scheme identifies the “bad” channels and reports its assessment to the MT8852B, the FER will decrease as the channels are removed from the hopping plan.

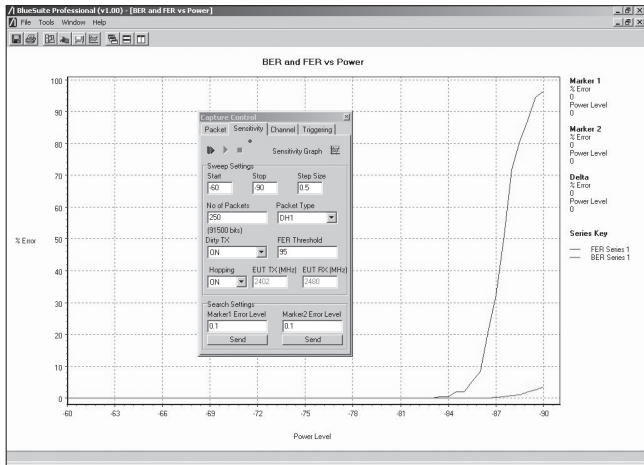


Frame Error Rate against time with AFH active

BlueSuite Pro3

BlueSuite Pro3 is a comprehensive software tool that enables a greater understanding of all aspects of a device's RF characteristics. Running on a standard PC, BlueSuite Pro3 interfaces to the MT8852B through a GPIB interface. Use BlueSuite Pro3 to;

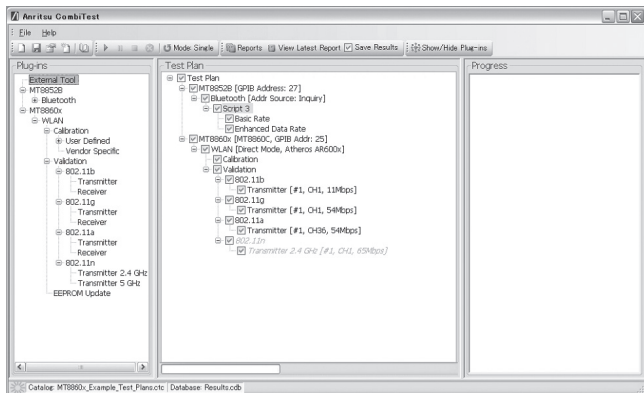
- Monitor the real-time state of the EUT through the display of frequency deviation, power burst, IQ constellation and vector graphs.
- Configure and run sensitivity sweeps and display the results graphically.
- Configure and run measurement sweeps for seven different tests and display the results graphically for each of the 79 Bluetooth channels.
- Configure and run audio tests and display the results graphically.
- Configure and run a power control test and display the results graphically.
- Read and write script and limit settings to and from the MT8852B.
- Edit and run a complete test script and generate a detailed report of the results.
- Step through individual connection and test mode controls to determine the cause of problems otherwise difficult to isolate.



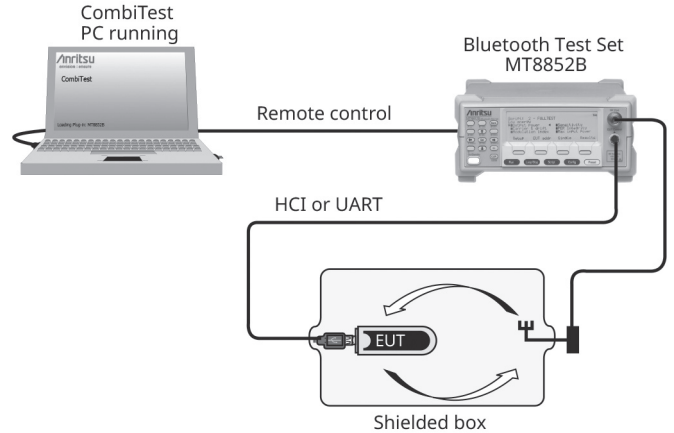
Automatic sensitivity search measurements display the FER/BER performance of an EUT with decreasing power into the receiver. Tests can be performed on all supported standard rate and EDR packet types.

CombiTest

CombiTest is a software application used to remotely control Anritsu Bluetooth test sets using a user-configured test plan of measurements. It is ideal for creating design-verification or production test plans for Bluetooth radios.



Setup



CombiTest features:

- Plug-in for Bluetooth Test Set MT8852B
- Bluetooth test mode measurements
- Rapid creation and execution of test plans
- Run an entire test plan or just the selected components
- Detailed report of test results with database of previous tests



CombiTest reports clearly present full set up and results details of each device tested. Results are automatically archived into a database.

**Specifications****Basic Rate Measurements**

Basic Rate measurements made in compliance with Bluetooth RF Test Specification RF.TS.p31.

Characteristic/Parameter	Specification
Output Power (RF/TRM/CA/BV-01-C)	
Measurement Configuration	Hopping: Off or On – measure at defined, all, or any frequencies Loopback, Tx mode Payload: PRBS9 Packet type: DH1, DH3, DH5
Displayed Results	Average power Peak power
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Measurement Range	-50 to +22 dBm (average power), +23 dBm (peak power)
Resolution	0.1 dB
Accuracy	±1.0 dB (-35 to +20 dBm) ±1.5 dB (+20 to +22 dBm)
Power Control (RF/TRM/CA/BV-03-C)	
Measurement Configuration	Hopping: Off Loopback, Tx mode Payload: PRBS9 Packet type: DH1, DH3, DH5
Displayed Result	Maximum power, Minimum power, Maximum step size, Minimum step size, Power at each power step
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Measurement Range	-35 to +22 dBm (average power), +23 dBm (peak power)
Resolution	0.1 dB
Accuracy	±1.0 dB (-35 to +20 dBm) ±1.5 dB (+20 to +22 dBm)
Modulation Characteristics (RF/TRM/CA/BV-07-C)	
Measurement Configuration	Hopping: Off Loopback, Tx mode Payload: 11110000 and 10101010 Packet type: DH1, DH3, DH5
Displayed Results	Frequency deviation: $\Delta f1_{max}$, $\Delta f2_{max}$, $\Delta f1_{avg}$, $\Delta f2_{avg}$, $\Delta f1_{avg}/\Delta f2_{avg}$ plus % of $\Delta f2_{max}$ <115 kHz
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
RF Input Measurement Range	-35 to +20 dBm
Deviation Measurement Range	0 to 350 kHz (peak power)
Deviation Resolution	1 kHz
Accuracy	1% for modulation index 0.32
Initial Carrier Frequency Tolerance (RF/TRM/CA/BV-08-C)	
Measurement Configuration	Hopping: Off or On – measure at defined, all, or any frequencies Loopback, Tx mode Payload: PRBS9 Packet type: DH1
Displayed Results	Average initial frequency error Maximum positive frequency error Maximum negative frequency error
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
RF Input Measurement Range	-35 to +20 dBm
Initial Frequency Error Measurement Range	0 to ±150 kHz
Frequency Resolution	1 kHz
Accuracy	500 Hz ±frequency standard
Carrier Frequency Drift (RF/TRM/CA/BV-09-C)	
Measurement Configuration	Hopping: Off or On – measure at defined, all, or any frequencies Loopback, Tx mode Payload: 10101010 Packet type: DH1, DH3, DH5
Displayed Results	Carrier frequency drift Drift rate
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
RF Input Measurement Range	-35 to +20 dBm
Frequency Drift Measurement Range	0 to 200 kHz, and >2000 μ s/50 μ s
Frequency Resolution	1 kHz

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Characteristic/Parameter	Specification
Enhanced Power Control (RF/TRM/CA/BV-14-C)	
Measurement Configuration	Hopping: Off Loopback, Tx mode Payload: PRBS9 Packet type: DH1, 3, 5, 2-DH1, 3, 5 and 3-DH1, 3, 5
Displayed Result	Maximum power for each packet type Minimum power for each packet type Maximum power step for each packet type Minimum power step for each packet type Maximum power difference at any step between DHn and 2DHn or 3DHn packets
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Measurement Range	-35 to +22 dBm (average power), +23 dBm (peak power)
Resolution	0.1 dB
Accuracy	±1.0 dB (-35 to +20 dBm) ±1.5 dB (+20 to +22 dBm)
Sensitivity – single slot packets (RF/RCV/CA/BV-01-C)	
Measurement Configuration	Hopping: Off or On, user selectable Loopback only Payload: PRBS9 Packet type: DH1 Dirty transmitter (as defined in the RF test spec): On or Off, user defined
Displayed Results	BER (percentage) Total number of bit errors and FER
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Number of Measured Bits	1 to 10000 packets (216 bits to 2160000 bits)
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	±1 dB (-80 to 0 dBm)
BER/FER Measurement Range	0 to 100%
BER/FER Resolution	0.001%
Sensitivity – multi-slot packets (RF/RCV/CA/BV-02-C)	
Measurement Configuration	Hopping: Off or On, user selectable Loopback only Payload: PRBS9 Packet type: DH3, DH5 Dirty transmitter (as defined in RF test spec): On or Off, user defined
Displayed Results	BER (percentage) Total number of bit errors and FER
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Number of Measured Bits	1 to 10000 packets (for DH3, 1464 bits to 14640000 bits), (for DH5, 2712 bits to 27120000 bits)
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	±1 dB (-80 to 0 dBm)
BER/FER Measurement Range	0 to 100%
BER/FER Resolution	0.001%
Maximum Input Level (RF/RCV/CA/BV-06-C)	
Measurement Configuration	Hopping: Off Loopback only Payload: PRBS9 Packet type: DH1
Displayed Results	BER (percentage) Total number of bit errors and FER
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Number of Measured Bits	1 to 10000 packets (216 bits to 2160000 bits)
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	±1 dB (-80 to 0 dBm)

Enhanced Data Rate (EDR) Measurements

Enhanced Data Rate measurements made in compliance with Bluetooth RF Test Specification RF.TS.p31.

Characteristic/Parameter	Specification
EDR Relative Transmit Power (RF/TRM/CA/BV-10-C)	
Measurement Configuration	Hopping: Off and On – measure at defined, all, or any frequencies Modulations: π/4DQPSK and 8DPSK Packet type: 2-DH1, 3, 5 and 3-DH1, 3, 5 Loopback, Tx mode EUT power level: Max. and Min.
Displayed Results	Max. differential power (from all packets) Min. differential power (from all packets) Average differential power (over all packets)
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Measurement Range	-35 to +20 dBm (average power), +23 dBm (peak power)
Relative Power Resolution	0.01 dB, GFSK to π/4DQPSK and 8DPSK
Relative Power Accuracy	Relative power measurement accuracy between GFSK and π/4DQPSK or 8DPSK, 0.2 dB typical for a power difference of <6 dB
Relative Power Measurement Range	Relative power measurement range between GFSK and π/4DQPSK or 8DPSK, (P _{GFSK} - 8 dB) < P _{DPSK} < (P _{GFSK} + 4 dB)

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Characteristic/Parameter	Specification
EDR Carrier Frequency Stability and Modulation Accuracy (RF/TRM/CA/BV-11-C)	
Measurement Configuration	Hopping: Off and On – measure at defined, all, or any frequencies Modulations: $\pi/4$ DQPSK and 8DPSK Packet type: 2-DH1, 3, 5 and 3-DH1, 3, 5 Loopback, Tx mode EUT power level: Max. and Min.
Displayed Results	Initial frequency error ω_i Frequency error ω_o Frequency error $\omega_i + \omega_o$ RMS DEVM (block with greatest DEVM value displayed) Peak DEVM 99% DEVM Average RMS DEVM (average DEVM for all blocks measured)
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Carrier Frequency Stability Measurement Range	0 to ± 100 kHz
Carrier Frequency Stability Accuracy	500 Hz \pm frequency standard
Carrier Frequency Stability Resolution	1 kHz
RMS DEVM Range	30% $\pi/4$ DQPSK, 20% 8DPSK
RMS DEVM Resolution	0.1% $\pi/4$ DQPSK and 8DPSK
Peak DEVM Range	0 to 50% $\pi/4$ DQPSK, 0 to 30% 8DPSK
Peak DEVM Resolution	0.1% $\pi/4$ DQPSK and 8DPSK
EDR Differential Phase Encoding (RF/TRM/CA/BV-12-C)	
Measurement Configuration	Hopping: Off and On, user selectable Modulations: $\pi/4$ DQPSK and 8DPSK Packet type: 2-DH1, 3, 5 and 3-DH1, 3, 5. Number of test packets: default 100 Tx mode only
Displayed Results	Number of packets received Number of packets with payload data errors Percentage of errored packets
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
EDR Guard Time (RF/TP/TRM/CA/BV-15-C)	
Measurement Configuration	Hopping: Off Modulations: $\pi/4$ DQPSK and 8DPSK Packet type: 2-DH1, 3, 5 and 3-DH1, 3, 5. Number of test packets: default 100 Loopback or Tx mode
Displayed Results	Maximum guard time Minimum guard time Packet in error Percentage of passed packets
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
EDR Synchronization Sequence and Trailer (RF/TP/TRM/CA/BV-16-C)	
Measurement Configuration	Hopping: Off Modulations: $\pi/4$ DQPSK and 8DPSK Packet type: 2-DH1, 3, 5 and 3-DH1, 3, 5. Number of test packets: default 50 Loopback or Tx mode
Displayed Results	Number of synchronization sequence bits received Number of synchronization sequence error bits Number of trailer bits received Number of trailer error bits
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
EDR Sensitivity (RF/RV/CA/BV-07-C)	
Measurement Configuration	Hopping: Off and On, user selectable Modulations: $\pi/4$ DQPSK and 8DPSK Packet type: 2-DH1, 3, 5 and 3-DH1, 3, 5. Bit threshold control: Threshold 1, 1.6 million bits, Threshold 2, 16 million bits (user editable) Loopback only Dirty transmitter (as defined in RF test spec): On or Off, user selectable
Displayed Results	Overall BER (displayed in exponential format) Number of bits in error Number of packets sent by test set Number of packets received in error by EUT
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	± 1 dB (-80 to 0 dBm)

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Characteristic/Parameter	Specification
EDR BER Floor Performance (RF/RCV/CA/BV-08-C)	
Measurement Configuration	Hopping: Off and On, user selectable Modulations: $\pi/4$ DQPSK and 8DPSK Packet type: 2-DH1, 3, 5 and 3-DH1, 3, 5 Bit threshold control: Threshold 1, 8 million bits, Threshold 2, 160 million bits (user editable) Loopback only
Displayed Results	Overall BER (displayed in exponential format) Number of bits in error Number of packets sent by test set Number of packets received in error by EUT
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	± 1 dB (-80 to 0 dBm)
EDR Maximum Input Level (RF/RCV/CA/BV-10-C)	
Measurement Configuration	Hopping: Off and On, user selectable Modulations: $\pi/4$ DQPSK and 8DPSK Packet type: 2-DH1, 3, 5 and 3-DH1, 3, 5 Number of bits: default 1.6 million (user editable) Loopback only
Displayed Results	Overall BER (displayed in exponential format) Number of bits in error Number of packets sent by test set Number of packets received in error by EUT
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	± 1 dB (-80 to 0 dBm)

Bluetooth Low Energy Measurements

Bluetooth Low Energy measurements made in compliance with Bluetooth RF test specification RFPHY.TS.p16.

Characteristic/Parameter	Specification
Output power (RFPHY/TRM/BV-01-C, RFPHY/TRM/BV-15-C, RFPHY/TRM/BV-18-C)	
Measurement Configuration	EUT configured to transmit test reference packets Packet payload: PRBS9 AoA Constant Tone Extensions
Displayed Results	Average power Peak to average power
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Measurement Range	-50 to +22 dBm (average power), +23 dBm (peak power)
Resolution	0.1 dB
Accuracy	± 1.0 dB (-35 to +20 dBm) ± 1.5 dB (+20 to +22 dBm)
Modulation Characteristics (TRM-LE/CA/BV-05-C, TRM-LE/CA/BV-10-C, TRM-LE/CA/BV-13-C)	
Measurement Configuration	EUT configured to transmit test reference packets Packet payload: 10101010 and 11110000 (BLE and 2LE) Packet payload: 11111111 (BLR S = 8)
Displayed Results	Frequency deviation: Δf_{1max} , Δf_{2max} (BLE and 2LE), Δf_{1avg} , Δf_{2avg} (BLE and 2LE), $\Delta f_{2avg}/\Delta f_{1avg}$ ratio (BLE and 2LE), $\% \Delta f_{2max} > 185$ kHz (BLE), $\% \Delta f_{2max} > 370$ kHz (2LE)
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Measurement Range	RF input: -35 to +20 dBm Deviation: 0 to 500 kHz peak (except 2LE)
Resolution	Deviation: 1 kHz
Accuracy	1% for modulation index 0.5
Carrier frequency offset and drift (RFPHY/TRM/BV-06-C, RFPHY/TRM/BV-12-C, RFPHY/TRM/BV-14-C, RFPHY/TRM/BV-16-C, RFPHY/TRM/BV-17-C)	
Measurement Configuration	EUT configured to transmit test reference packets Packet payload: 10101010 (BLE and 2LE) Packet payload: 11111111 (BLR S = 8) Packet payload: 11110000 (BLE-CTE and 2LE-CTE) AoA Constant Tone Extensions
Displayed Results	Carrier frequency error Frequency drift Drift rate Initial drift rate
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Measurement Range	RF input: -35 to +20 dBm Frequency: 500 kHz
Frequency Resolution	1 kHz
Accuracy	500 Hz \pm frequency standard
Receiver sensitivity (RFPHY/RCV/BV-01-C, RFPHY/RCV/BV-08-C, RFPHY/RCV/BV-26-C, RFPHY/RCV/BV-27-C)	
Measurement Configuration	EUT configured to receive test reference packets Packet payload: PRBS9 Full support of dirty transmitter as defined in test specification
Displayed Results	Receiver PER. Requires EUT to support HCI or 2-Wire interface for automated PER results
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	± 1 dB (-80 to 0 dBm)

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Characteristic/Parameter	Specification
Maximum input signal level (RFPHY/RCV/BV-06-C, RFPHY/RCV/BV-12-C)	
Measurement Configuration	EUT configured to receive test reference packets Packet payload: PRBS9
Displayed Results	Receiver PER. Requires EUT to support HCI or 2-Wire interface for automated PER results
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	±1 dB (-80 to 0 dBm)
PER Report Integrity (RFPHY/RCV/BV-07-C, RFPHY/RCV/BV-13-C, RFPHY/RCV/BV-30-C, RFPHY/RCV/BV-31-C)	
Measurement Configuration	EUT configured to receive test reference packets Packet payload: PRBS9 CRC corruption: Alternate packets Number of test packets: Random [100 ≤ RND ≤ 1500]
Displayed Results	Receiver PER. Requires EUT to support HCI or 2-Wire interface for automated PER results
Number of Measurement Frequencies	One, default to RF Test Specification or user defined
Output Power Range	-90 to 0 dBm, resolution: 0.1 dB
Output Power Accuracy	±1 dBm (-80 to 0 dBm)
Tx Power Stability (RFPHY/TRM/PS/BV-01-C, RFPHY/TRM/PS/BV-02-C, RFPHY/TRM/PS/BV-03-C, RFPHY/TRM/PS/BV-04-C)	
Measurement Configuration	EUT configured to transmit Test Reference Packets No payload AoD Constant Tone Extensions
Displayed Results	Maximum deviation to average power during reference period Maximum deviation to average power for each transmit slot
Number of Measurement Frequencies	Three, default to RF Test Specification or user defined
Measurement Range	-50 to +22 dBm (average power), +23 dBm (peak power)
Resolution	0.01 dB

Signal Generator

Characteristic/Parameter	Specification
Frequency	
Frequency Range	2.4 GHz to 2.5 GHz
Frequency Resolution	1 kHz
Frequency Accuracy	As frequency standard ±500 Hz
Level	
Amplitude Range	-90 to 0 dBm
Amplitude Accuracy	±1 dB (-80 to 0 dBm)
Amplitude Resolution	±0.1 dB
Output Impedance	50Ω (nom.)
Output VSWR	1.5:1 1.3:1 (typ.) Adjacent channels 3 or higher -40 dBc
GFSK Modulation * Supports low energy signal generator compliant with Bluetooth Core Specification v5.3	
Modulation Index	Variable, 0.25 to 0.50 (125 kHz to 250 kHz)
Modulation Index Resolution	0.01
Modulation Index Accuracy	1% (nom.) for modulation index = 0.32
Baseband Filter	BT = 0.5
π/4DQPSK Modulation	
Modulation Index Accuracy	<5% RMS DEVM
Baseband Filter	BT = 0.4
8DPSK Modulation	
Modulation Index Accuracy	<5% RMS DEVM
Baseband Filter	BT = 0.4

Measuring Receiver

Characteristic/Parameter	Specification
Frequency	
Frequency Range	2.4 GHz to 2.5 GHz
Frequency Resolution	1 kHz
Frequency Accuracy	As frequency standard ±500 Hz
Level	
Range	-55 to +22 dBm (average power)
Power Measurement Accuracy	±1 dB (-35 to +20 dBm)
Input VSWR	1.5:1
Damage Level	+25 dBm
Resolution	0.1 dB
GFSK Modulation	
Deviation Measurement Range	0 to 350 kHz (peak power)
Accuracy	1% for modulation index 0.32

EUT Control Interface

Characteristic/Parameter	Specification
RS232 HCI Commands	The EUT control interface provides RS232 HCI commands to the EUT through a standard RS232 interface. The interface meets the requirements of the Bluetooth specification for HCI UART transport layer. An RS232 cable is supplied.
USB HCI Commands	The EUT control interface provides USB HCI commands to the EUT through a standard USB interface. The interface meets the requirements of the Bluetooth specification section H.2. A USB cable is supplied.
2-Wire Control	For test control of Bluetooth Low Energy devices the EUT control interface supports the 2-Wire specification
USB to RS232 HCI Command	For use with EUTs fitted with USB to RS232 FTDI chips

Audio Specifications

Characteristic/Parameter	Specification
Number of SCO Channels Supported	3
Codec Air Interfaces Supported	CVSD, A-Law, μ -Law
Frequency Response	(-3 dB) measured CODEC in to CODEC out: 160 Hz to 3.5 kHz Measured with 50 Ω source impedance and 10M Ω load impedance
Maximum Input/Output Signal Level	3.4 V _{pk-pk} = 1.2 V RMS
Distortion/Noise	A law: -37 dB (typical) (1 kHz, 1 V RMS) μ law: -37 dB (typical) (1 kHz, 1 V RMS) CVSD: -30 dB (typical) (300 Hz, 1 V RMS)
Input/Output Connectors	3.5 mm audio jack plugs (one for each SCO channel)
Input Impedance	20k Ω
Minimum Output Load	600 Ω
Internal Audio Source	1 kHz fixed frequency

Adaptive Frequency Hopping (MT8852B-015)

Supported in ACL and SCO connections

Characteristic/Parameter	Specification
Displays	Active channel vs. time, FER vs. time
Other Features	ACL connection timer, resolution: 1 ms

Electrical Characteristics

Characteristic/Parameter	Specification
Frequency Standard	
Frequency	10 MHz
Temperature Stability	± 0.5 ppm (-10°C to +85°C)
Aging (1st year)	± 1.0 ppm
Aging (over 10 years)	± 2.5 ppm (including year 1)
Rear Panel Connectors	
External Frequency Standard Input	Rear panel, BNC connector, 50 Ω , 1 V
Output 1	TTL output for TX ON, TX DATA, RX DATA, and correlator
Output 2	TTL output for RX ON, TX DATA, RX DATA, and correlator
Input 1	For service use only
GPIO	
IEEE 488.2	Offers full instrument control as standard
RS232	
RS232	Offers full instrument control as standard

General

Characteristic/Parameter	Specification	
Power Supply		
Rated Voltage	100 VAC to 120 VAC/200 VAC to 240 VAC	
Rated Frequency	50 Hz/60 Hz	
Power Consumption	150 VA Max.	
Environmental		
Operating Temperature	+5°C to +40°C	
Operating Humidity	20 to 75%	
CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018
Dimensions and Mass		
Dimensions	216.5 (W) \times 88 (H) \times 380 (D) mm	
Mass	<3.8 kg	



Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names.

The actual name of the item may differ from the Order Name.

Model/Order No.	Description
MT8852B	Main frame
MT8852B-040	Bluetooth Test Set (With EDR and Audio)
MT8852B-041	Bluetooth Test Set (With no EDR and no Audio)
MT8852B-042	Bluetooth Test Set (With no EDR and with Audio)
MT8852B-043	Bluetooth Test Set (With EDR and no Audio)
MT8852B-043	Bluetooth Test Set (With Low Energy Measurements only)
J1783A	Standard accessories
J1784A	MT8852B Bluetooth Test Set Operation Manual
J1785A	MT8852B Bluetooth Test Set Operation Manual Remote Control
	USB HCI control interface lead
	RS232 HCI Control Interface Lead
	RS232 Cable for Firmware Updates
	Power Cord
	BlueSuite Software (Standard version)
	Bluetooth Low Energy Measurement Software application
	MT8852B Bootloader
J1786A	3.5 mm Jack Plugs (Qty. 3, Audio Version Only)
MT8852B-015	Options and accessories
MT8852B-017	Adaptive Frequency Hopping option
MT8852B-027	IQ data output
MT8852B-034*1	Bluetooth low energy measurements
MT8852B-035*1, *2	BLE Data Length Extension Option
MT8852B-036*1, *2, *3	BLE 2LE Option (2 Mbps Low Energy)
MT8852B-037*1, *2, *3	BLE BLR Option (Bluetooth Long Range)
MT8852B-070	BLE AoA/AoD Option (Angle of Arrival/Angle of Departure)
	Platform Enhancement Option
MT8852B-315*4	Retrofit Adaptive Frequency Hopping option
MT8852B-317*4	Retrofit IQ data output
MT8852B-319*4	Retrofit Audio to MT8852B
MT8852B-325*4	Retrofit EDR to MT8852B
MT8852B-327	Retrofit Bluetooth low energy measurements
MT8852B-330	Retrofit Basic Rate Measurement to MT8852B
MT8852B-334*1	Retrofit BLE Data Length Extension Option
MT8852B-335*1, *2	Retrofit BLE 2LE Option
MT8852B-336*1, *2, *3	BLE BLR Option Retrofit
MT8852B-337*1, *2, *3	BLE AoA/AoD Option Retrofit
MT8852B-170	Platform Enhancement Option Retrofit (For units where the first three characters of the serial number are not "6A6 or 626")
MT8852B-270	Platform Enhancement Option Retrofit (For units where the first three characters of the serial number are not "6A6 or 626" (FO))
MT8852B-370	Platform Enhancement Option Retrofit (For units where the first three characters of the serial number are "6A6 or 626")
MX885201B	BlueSuite Pro3 software application
MX885201B-301	BlueSuite Pro2 to Pro3 Upgrade
Z1992A	2.4 GHz Antenna and Adapter
B0748A	Soft Carry Bag
B0749A	Rack Mount Kit
J0006	GP-IB CABLE, 0.5M
J0007	GPIB CABLE, 1.0M
J0008	GPIB CABLE, 2.0M
J0127A	COAXIAL CORD, 1.0M
J0127B	COAXIAL CORD, 2.0M
J0127C	COAXIAL CORD, 0.5M

*1: MT8852B-034 (334) requires MT8852B-027 (327) or MT8852B-043.

*2: MT8852B-035 (335), MT8852B-036 (336) and MT8852B-037 (337) requires MT8852B-034 (334).

*3: MT8852B-036 (336) and MT8852B-037 (337) requires MT8852B-070 (270, 370).

*4: When installing MT8852B-315/317/319/325 to MT8852B-043, MT8852B-330 is necessary.

Wireless Connectivity Test Set

MT8862A

2.4 GHz/5 GHz/6 GHz bands

Remote Control
Ethernet

Ideal for RF TRx Tests of WLAN Devices



RF TRx Measurements of WLAN Equipment

The Wireless Connectivity Test Set MT8862A is designed for measuring the RF TRx characteristics of WLAN equipment. It has standard WLAN protocol messaging (WLAN signalling) to connect with the device under test (DUT) for measuring the TRx performance items as Network Mode. It is the biggest feature of MT8862A. MT8862A gives manifold inspections for WLAN equipment because it also supports Direct Mode.

Supported Communications Standards • Security encryption

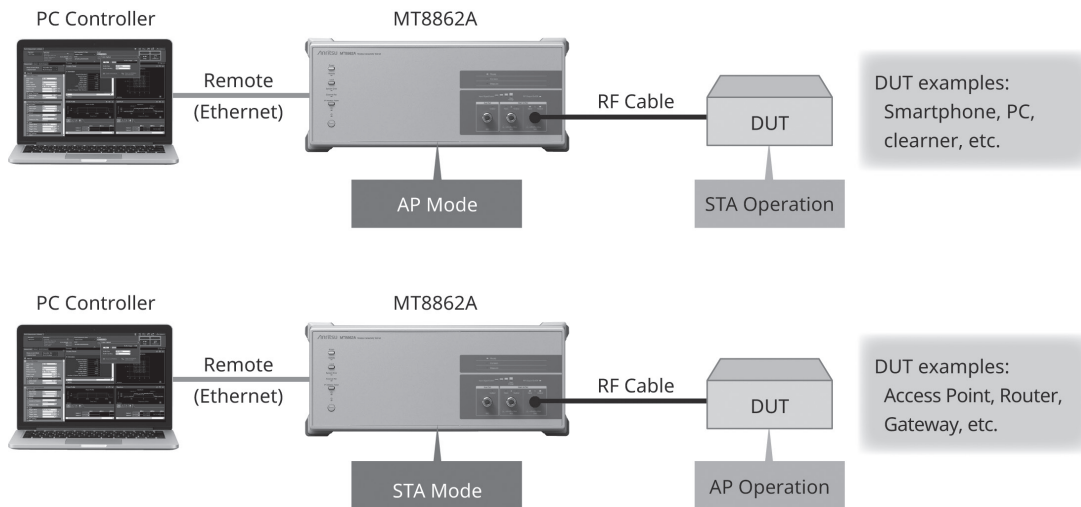
WLAN IEEE802.11a/b/g/n/ac/ax (2.4 GHz, 5 GHz and 6 GHz bands)
[AP/STA]
WEP, WPA-Personal, WPA2-Personal and WPA3-Personal

RF Performance Measurement under Actual Operation Conditions (Network Mode)

By using the MT8862A Network Mode, RF TRx characteristics, such as Tx power, modulation accuracy (EVM), etc., can be measured with the WLAN device in actual operation conditions. It is not necessary to put the DUT into dedicated test mode and directly control the DUT. The DUT RF performance can be quantified under the firmware conditions at actual shipment.

Easy Measurement Environment Configuration

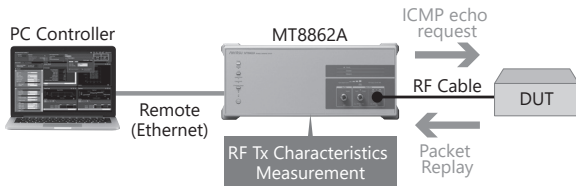
The MT8862A can simulate access points (AP) and station (STA) to establish the DUT network connection using IEEE802.11a/b/g/n/ac/ax WLAN protocol messaging. Each WEP, WPA-Personal, WPA2-Personal and WPA3-Personal secure connection method is supported, and TKIP and AES encryption schemes can be selected by combination with each standard. When the connection is established, RF measurements can be made using general WLAN communications procedures without requiring special tools and control procedures, eliminating the need for configuring a special measurement environment.



WLAN Measurement Software MX886200A Features

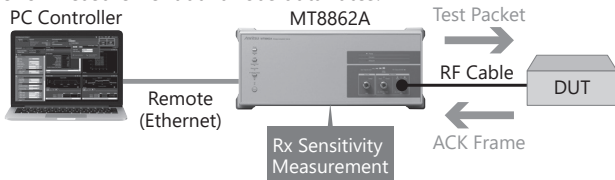
ICMP Echo Request for Tx Measurement

With the ICMP echo request, the MT8862A can measure RF Tx characteristics of reply packets from the DUT. The measurement targets are both data frames and ACK frames.



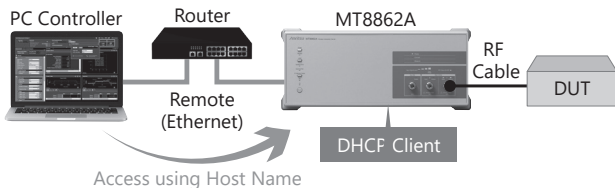
Rx Sensitivity Measurements using ACK Frame Count for Bathtub Curve Generation

The MT8862A supports Rx sensitivity measurements using the ACK frame count; counting the ACK frames sent by the DUT versus the test packets sent from the MT8862A supports calculation of the packet error rate (PER). Packets can be sent while lowering the power level by setting the power level range (0 to -120 dBm) and step size, and the Rx sensitivity Bathtub curve can be generated automatically. Packets including MAC address and payload length can be configured in real-time for measurement at various data rates.



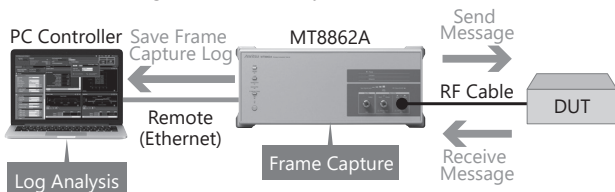
Web Browser GUI Operation Immediately after Connection

Connect the MT8862A to the external PC using an Ethernet cable for instant access from the Web browser to complete setup of the GUI operation environment without requiring test setup operation. The Web-browser based GUI eliminates usage worries about version matching with the main frame firmware. Additionally, the MT8862A remote control port supports the DHCP client function and both host and domain name settings offer easy control simply by connecting the PC controller and MT8862A to the same network.



Function Test

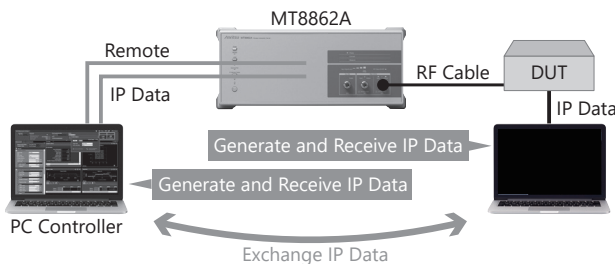
Frame Capture Logging for Troubleshooting Connection Problems
With built-in frame capture logging function, the MT8862A can capture and save frame logs for troubleshooting DUT connection problems. Captured logs are in the *.pcap format for viewing by supported applications, making it easier to analyze DUT connection problems.



IP Data Transfer using Connection Verification Test

The Ethernet port on the back panel of the MT8862A can be used for exchanging IP data with an external server; IP connections between the client PC connected to the DUT and the external server connected to the MT8862A can be checked using the ping function, etc.

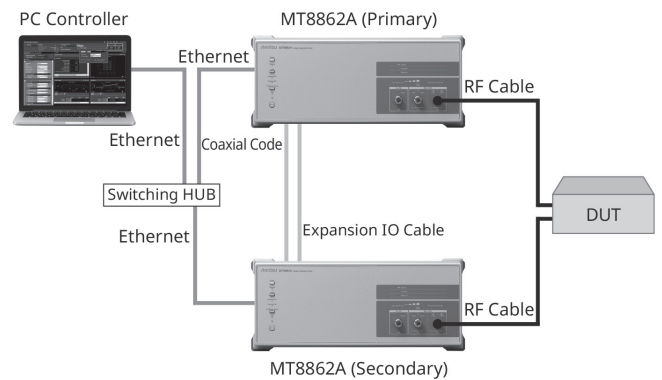
*: MT8862A supports IP data transfer on IEEE802.11 a/b/g/n/ac and SISO



Receiver Sensitivity and Transmit Power Measurement Function for 2x2 MIMO

Receiver sensitivity and transmit power measurement under 2x2 MIMO communication can be tested by using 2 sets of MT8862A. This is suitable for RF performance evaluation for completed products.

*: MT8862A supports 2x2 MIMO on IEEE802.11n/ac.

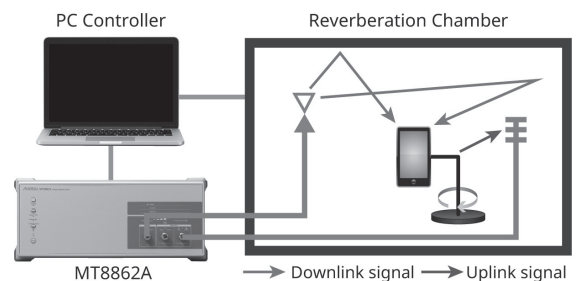
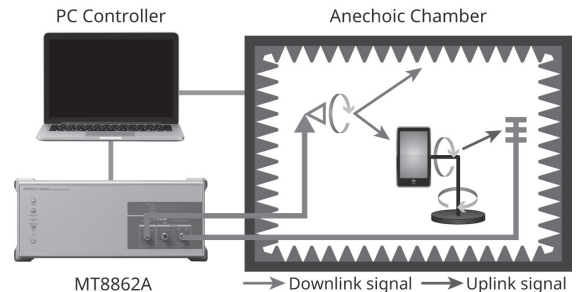


Application Test

Network Mode for Over The Air (OTA) Test

The TRx performance of wireless terminals is affected by factors such as the terminal form and antenna characteristics. The OTA test measures the general TRx performance of the wireless terminal using actual radio waves. The WLAN OTA test measures RF performance specifications in accordance with the recommendations of CTIA* and the Converged Wireless Group (CWG) of the Wi-Fi Alliance, including Total Radiated Power (TRP), Total Isotropic Sensitivity (TIS), System integrators have test solution using MT8862A.

*: Cellular Telecommunications & Internet Association; international non-profit organization composed of wireless-communications-related businesses, manufacturers, service providers, etc.



Auto-ID information display

MT8862A displays header information of packets used for transmit measurement as Auto-ID Information.

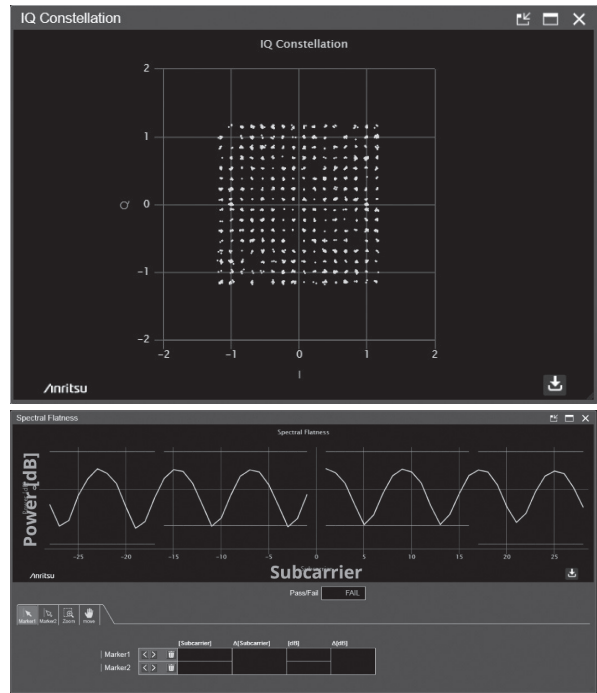
Auto-ID Information	
Auto-ID Standard	AC
Guard Interval	LONG
PPDU Type	VHT80
MCS Index	9
Coding Type	BCC
PSDU Length	1096
L-SIG Parity Status	PASS
VHT-SIG CRC	PASS
Number of Space Time Streams	2
STBC	0

WLAN Measurement Software MX886200A Key Functions

RF Tx Test

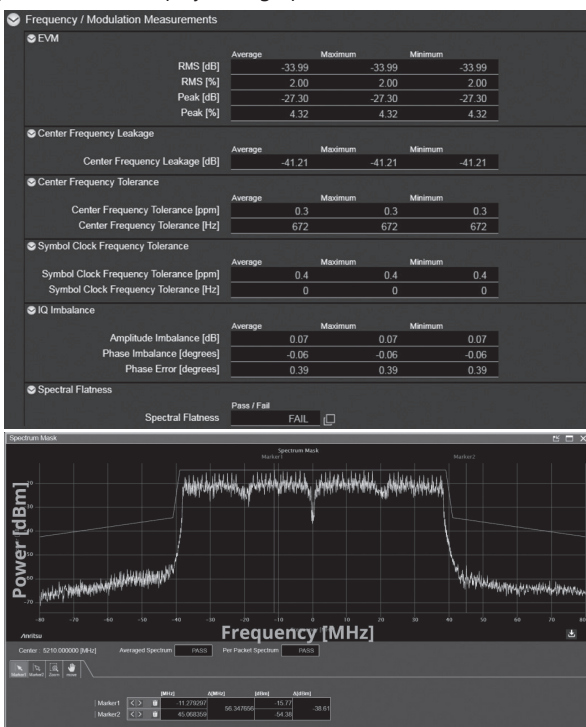
Tx Power Measurement and Power Profile Display

The MT8862A measures the Tx power and displays the average and peak power. The crest factor indicating the difference between the average power and peak power and the power-on ramp time and power-off ramp time indicating the time of ringing and falling are also displayed. The power profile is displayed as a graph of the power vs time for the signal.



Frequency and Modulation Analysis/IQ Constellation Display/Spectrum Display

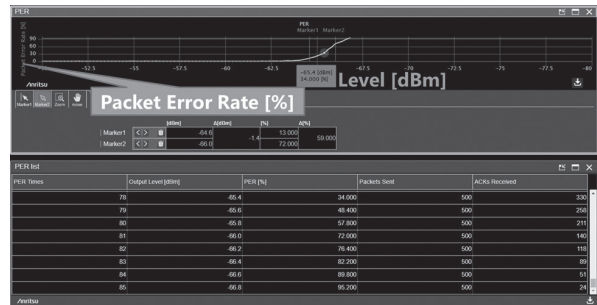
The MT8862A performs frequency and modulation analyses to measure the Error Vector Magnitude (EVM), which is a good of overall indicator of transmitter quality. When the numerical EVM is bad, the Packet Error Rate (PER) is usually high at WLAN connection. The RMS EVM and Peak EVM for DSSS- and OFDM-modulated carrier waves are expressed as % and dB values, respectively. In case of OFDM modulation, in addition to EVM, Center Frequency Leakage, Center Frequency Tolerance, Symbol Clock Frequency Tolerance, IQ Imbalance, and Spectral Flatness are also displayed. In case of DSSS modulation, in addition to EVM, Center Frequency Tolerance, IQ Offset, Phase & Magnitude Error, IQ Imbalance, Chip Clock Frequency Tolerance, and Carrier Suppression from IQ Offset are also displayed. Furthermore, the IQ constellation, spectrum flatness, and spectrum analysis results are displayed as graphs.



RF Rx Test

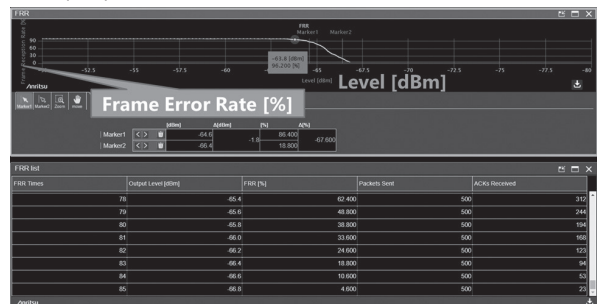
Packet Error Rate (PER)

The MT8862A Network Mode is a unique function that can use general communication method and instead automatically implements the 802.11a/b/g/n/ac device sensitivity search measurement to output the Bathtub curve. By using this function, the device performance can be analyzed at high speed for each data rate, offering a convenient measurement solution for verifying compliance with the 802.11b minimum receiver sensitivity test specifications. This is a flexible test solution because the number of packets sent at each power level can be specified both as the start and stop search level and as step size.



Frame Rx rate (FRR)

The Frame Rx Rate can be displayed instead of displaying the Packet Rx Error Rate (PER).



WLAN Measurement Software MX886200A Measurement Items

Tx Measurements

Items by Standards

IEEE 802.11-2020: 802.11b Tx Measurements

802.11b	Measurement Items
16.3.7.2	Transmit power levels
16.3.7.4	Transmit spectral mask
16.3.7.5	Transmit center frequency tolerance
16.3.7.6	Chip clock frequency tolerance
16.3.7.7	Transmit power-on and power-down ramp
16.3.7.9	Transmit modulation accuracy

IEEE 802.11ax-2021: 802.11ax Tx Measurements*3

802.11ax	Measurement Items
27.3.15.3	Pre-correction accuracy requirements*4
27.3.19.1	Transmit spectral mask*5
27.3.19.2	Spectral flatness
27.3.19.3	Transmit center frequency and symbol clock frequency tolerance
27.3.19.4.2	Transmit center frequency leakage
27.3.19.4.3	Transmitter constellation error
27.3.19.4.4	Transmitter modulation accuracy (EVM) test

*1: 802.11ac Tx measurement requires MX886200A-001

*2: Frequency SPAN of 802.11ac Direct Mode supports up to ±240 MHz, Network Mode supports up to ±80 MHz

*3: 802.11ax Tx measurement requires MX886200A-002

*4: Measure the error between DUT transmission power and Target RSSI

*5: Frequency SPAN of 802.11ax Direct Mode supports up to ±240 MHz, Network Mode supports up to ±80 MHz

IEEE802.11-2020: 802.11a/g/n/ac Tx Measurements*1

802.11a	802.11g	802.11n	802.11ac	Measurement Items
17.3.9.2	18.4.7.2	19.3.18.3	N/A	Transmit power levels
17.3.9.3	18.4.7.3	19.3.18.1	21.3.17.1	Transmit spectrum mask*2
17.3.9.5	18.4.7.4	19.3.18.4	21.3.17.3	Transmit center frequency tolerance
17.3.9.6	18.4.7.5	19.3.18.6	21.3.17.3	Symbol clock frequency tolerance
17.3.9.7.2	17.3.9.7.2	19.3.18.7.2	21.3.17.4.2	Transmitter center frequency leakage
17.3.9.7.3	17.3.9.7.3	19.3.18.2	21.3.17.2	Transmitter spectral flatness
17.3.9.7.4	17.3.9.7.4	19.3.18.7.3	21.3.17.4.3	Transmitter constellation error
17.3.9.8	17.3.9.8	19.3.18.7.4	21.3.17.4.4	Transmitter modulation accuracy test

Measurement Items

MT8862A 11b	MT8862A 11a/g/n/ac	MT8862A 11ax HE SU (Single User)	MT8862A 11ax HE TB (Multi User)
Transmit power Crest factor Power ramp EVM (Transmit modulation accuracy) Center frequency tolerance IQ offset Phase error Magnitude error Amplitude imbalance Phase imbalance Chip clock frequency tolerance Carrier suppression from IQ offset Spectrum mask	Transmit power Crest factor Power ramp EVM (Transmit modulation accuracy) Center frequency leakage Center frequency tolerance Symbol clock frequency tolerance Amplitude imbalance Phase imbalance Phase error Spectrum flatness Spectrum mask	Transmit power Crest factor Power ramp EVM (Transmit modulation accuracy) Center frequency leakage Center frequency tolerance Symbol clock frequency tolerance Amplitude imbalance Phase imbalance Phase error Spectrum flatness Spectrum mask	Transmit power Power pre-correction accuracy Crest factor Power ramp EVM (Transmit modulation accuracy) Unused tone error Center frequency leakage Center frequency tolerance Center frequency offset Amplitude imbalance Phase imbalance Phase error Spectrum flatness Spectrum mask

Graph Display Items

MT8862A 11b Graph Display Items	MT8862A 11a/g/n/ac Graph Display Items	MT8862A 11ax Graph Display Items
IQ Constellation Power Profile Spectrum Mask	IQ Constellation Power Profile Spectrum Mask Spectrum Flatness	IQ Constellation Power Profile Spectrum Mask Spectrum Flatness Carrier Frequency Offset Error (CCDF)* Unused Tone Error

*: Available on HETB format.

Rx Measurements

Items by Standards

IEEE802.11-2020: 802.11b Rx Measurements

802.11b	Measurement Item
16.3.8.2	Receiver minimum input level sensitivity
16.3.8.3	Receiver maximum input level
16.3.8.4	Receiver adjacent channel rejection*1

IEEE 802.11ax-2021: 802.11ax Rx Measurements*3

802.11ax	Measurement Item
27.3.20.2	Receiver minimum input sensitivity
27.3.20.3	Adjacent channel rejection*1
27.3.20.4	Nonadjacent channel rejection*1
27.3.20.5	Receiver maximum input level

IEEE802.11-2020: 802.11a/g/n/ac Rx Measurements*2

802.11a	802.11g	802.11n	802.11ac	Measurement Item
17.3.10.2	18.4.8.2	19.3.19.1	21.3.18.1	Receiver minimum input level sensitivity
17.3.10.3	18.4.8.3	19.3.19.2	21.3.18.2	Adjacent channel rejection*1
17.3.10.4	17.3.10.4	19.3.19.3	21.3.18.3	Nonadjacent channel rejection*1
17.3.10.5	18.4.8.4	19.3.19.4	21.3.18.4	Receiver maximum input level

*1: Sold separately; requires signal generator

*2: 802.11ac Rx measurement requires MX886200A-001

*3: 802.11ax Rx measurement requires MX886200A-002

Graph Display Items

Measurement Item
Packet Error Rate (PER)
Frame Reception Rate (FRR)

WLAN Measurement Software MX886200A Connectivity

Connectivity

802.11a	
Frequency Range	5180 MHz to 5885 MHz*1
Operation Mode	—
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Data Rate	6, 9, 12, 18, 24, 36, 48, 54 Mbps
Security*2	WEP, WPA-Personal, WPA2-Personal, WPA3-Personal

802.11b		802.11g	
Frequency Range	2412 MHz to 2484 MHz		
Operation Mode	—	ERP-OFDM	
Modulation	DSSS, CCK	OFDM (BPSK, QPSK, 16QAM, 64QAM)	
Data Rate	1, 2, 5.5, 11 Mbps	6, 9, 12, 18, 24, 36, 48, 54 Mbps	
Security*2	WEP, WPA-Personal, WPA2-Personal, WPA3-Personal		

802.11n		802.11ac*5	
Frequency Range	2412 MHz to 2484 MHz and 5180 MHz to 5885 MHz*1	5180 MHz to 5885 MHz*1	
Bandwidth	20 MHz, 40 MHz	20, 40, 80, 160 MHz*6	
MCS	MCS0 to MCS7, MCS0 to MCS15*3	MCS0 to MCS9*6	
FEC	BCC	BCC	
PPDU Format	HT-mixed, HT-greenfield*4	VHT	
Guard Interval Type	Long, Short	Long, Short	
RF Chain	Single (SISO), 2x2MIMO*3	Single (SISO), 2x2MIMO*3	
Security*2	WPA-Personal, WPA2-Personal, WPA3-Personal		

802.11ax*7	
Frequency Range	2412 MHz to 2484 MHz, 5180 MHz to 5885 MHz, 5955 MHz to 7115 MHz*1
Bandwidth	20, 40 MHz (2.4 GHz Band) 20, 40, 80, 160 MHz (5 GHz Band)*8 20, 40, 80, 160 MHz (6 GHz Band)*8
MCS	MCS0 to MCS11
FEC	BCC, LDPC
PPDU Format	Tx measurement: HE SU, HE TB
Guard Interval Type	Rx measurement: HE SU
Guard interval and HE-LTF type	HE SU 0.8 μs GI, 1xHE-LTF 0.8 μs GI, 2xHE-LTF 1.6 μs GI, 2xHE-LTF 0.8 μs GI, 4xHE-LTF 3.2 μs GI, 4xHE-LTF HE TB 1.6 μs GI, 2xHE-LTF 3.2 μs GI, 4xHE-LTF
RF Chain	Single (SISO)
Security*2	WPA-Personal, WPA2 -Personal, WPA3-Personal

- *1: The frequencies above 5825 MHz require MT8862A-002 and MT8862A-010.
- *2: Secure connections require the MX886200A-020
- *3: Available when measure 2x2MIMO receiver sensitivity using MX886200A-010.
- *4: Only receiver sensitivity testing is supported in 2x2MIMO.
- *5: 802.11ac connection requires MX886200A-001
- *6: MCS9 is only available on 40 MHz or 80 MHz bandwidth.
- *7: 802.11ax connection requires MX886200A-002
- *8: 160 MHz bandwidth require MX886200A-030.

Wireless Connectivity Test Set MT8862A Configuration

System Configurations/Options/Software/PC Controller Operation Environment

System	Wireless LAN
Main Frame	Wireless Connectivity Test Set MT8862A
Basic Configuration (Hardware)	RF Frequency 2.4 GHz, 5 GHz MT8862A-001
Basic Configuration (Software)	WLAN Measurement Software MX886200A
Options (Hardware)	RF Frequency 6 GHz MT8862A-002 Extended RF Hardware MT8862A-010
Options (Software)	WLAN 802.11ac Option MX886200A-001 WLAN 802.11ax Option MX886200A-002 2x2MIMO Measurement Software MX886200A-010 WLAN Security Function MX886200A-020 160 MHz Bandwidth MX886200A-030

Verified PC Operation Environment

PC	Software OS: Windows 10 Browser: Chrome CPU: Intel Core i5 processor Clock: 2.5 GHz Memory: 1 GB minimum Hard Disk: 500 MB minimum free space LAN: 100 Base-T LAN (1000-base T preferred)
Peripherals	Display: WXGA 1024 × 768 minimum

Options Configuration Guide

Hardware

✓ = Can be installed, R = Require

Name	Retrofit	Combination with "Option" (Refer to the left line)		
		001	002	010
RF Frequency 2.4 GHz, 5 GHz MT8862A-001	No		✓	✓
RF Frequency 6 GHz MT8862A-002		R		R
Extended RF Hardware MT8862A-010		R	R	

Software

Model	Hardware configurations that can be installed ✓ = Can be installed, No = Cannot be installed		Note
	001 (2.4 GHz, 5 GHz)	001, 002, 010 (2.4 GHz, 5 GHz, 6 GHz)	
WLAN Measurement Software MX886200A	✓	✓	Support 802.11b/g/a/n.
WLAN 802.11ac Option MX886200A-001	✓	✓	
WLAN 802.11ax Option MX886200A-002	✓	✓	
2x2MIMO Measurement Software MX886200A-010	✓	✓	Support 802.11n/ac.
WLAN Security Function MX886200A-020	✓	✓	
160 MHz Bandwidth MX886200A-030	No	✓	



Wireless Connectivity Test Set MT8862A Specifications

Receiver	<p>Frequency Range MT8862A-001 installed: 2.4 GHz to 2.5 GHz, 5.0 GHz to 6.0 GHz MT8862A-002, 010 installed: 6.0 GHz to 7.3 GHz Setting Resolution: 1 Hz Accuracy: Depends on reference oscillator accuracy</p> <p>Level Setting Range: -65 to +25 dBm Setting Resolution: 0.1 dB Accuracy Measurement Conditions: CW, Measurement Bandwidth: 300 kHz, 20°C to 30°C, Input signal lower than setting level and excluded influence of linearity error, after calibration</p> <p>2.4 GHz ≤ Frequency ≤ 2.5 GHz ±0.7 dB (-30 dBm ≤ Setting Level ≤ +25 dBm) ±0.9 dB (-55 dBm ≤ Setting Level < -30 dBm) ±1.1 dB (-65 dBm ≤ Setting Level < -55 dBm)</p> <p>5.0 GHz ≤ Frequency ≤ 6.0 GHz ±0.7 dB (-30 dBm ≤ Setting Level ≤ +25 dBm) ±0.9 dB (-55 dBm ≤ Setting Level < -30 dBm) ±1.1 dB (-65 dBm ≤ Setting Level < -55 dBm)</p> <p>6.0 GHz < Frequency ≤ 7.3 GHz ±0.7 dB (-30 dBm ≤ Setting Level ≤ +25 dBm) ±0.9 dB (-55 dBm ≤ Setting Level < -30 dBm) ±1.1 dB (-65 dBm ≤ Setting Level < -55 dBm)</p> <p>Measurement Conditions: CW, Measurement Bandwidth: 160 MHz, 20°C to 30°C, Input signal lower than setting level and excluded influence of linearity error, after calibration</p> <p>2.4 GHz ≤ Frequency ≤ 2.5 GHz ±0.7 dB (-30 dBm ≤ Setting Level ≤ +25 dBm) ±1.0 dB (-50 dBm ≤ Setting Level < -30 dBm)</p> <p>5.0 GHz ≤ Frequency ≤ 6.0 GHz ±0.7 dB (-30 dBm ≤ Setting Level ≤ +25 dBm) ±1.0 dB (-50 dBm ≤ Setting Level < -30 dBm)</p> <p>6.0 GHz < Frequency ≤ 7.3 GHz ±0.7 dB (-30 dBm ≤ Setting Level ≤ +25 dBm) ±1.0 dB (-50 dBm ≤ Setting Level < -30 dBm)</p> <p>Linearity Measurement Conditions: CW, Measurement Bandwidth: 300 kHz, 0 to -40 dB of setting level ±0.2 dB (-55 dBm ≤ Input Level) ±0.4 dB (-65 dBm ≤ Input Level < -55 dBm) Measurement Conditions: CW, Measurement Bandwidth: 160 MHz, 0 to -40 dB of setting level ±0.4 dB (-40 dBm ≤ Input Level)</p>
Transmitter	<p>Frequency Output Frequency Range MT8862A-001 installed: 2.4 GHz to 2.5 GHz, 5.0 GHz to 6.0 GHz MT8862A-002, 010 installed: 6.0 GHz to 7.3 GHz Setting Resolution: 1 Hz Accuracy: Depends on reference oscillator accuracy</p> <p>Level Setting Range: -120 to 0 dBm Setting Resolution: 0.1 dB Accuracy Output Setting: CW 20°C to 30°C, Output Level: ≥-110 dBm, after Calibration ±1.0 dB, ±0.7 dB (typ.) (2.4 GHz ≤ Frequency ≤ 2.5 GHz) ±1.3 dB, ±1.0 dB (typ.) (5.0 GHz ≤ Frequency ≤ 6.0 GHz) ±1.3 dB, ±1.0 dB (typ.) (6.0 GHz < Frequency ≤ 7.3 GHz)</p> <p>Signal Purity Harmonic: ≤-25 dBc</p>
Reference Oscillator	<p>At Start: $\pm 5 \times 10^{-7}$ (2 minutes after power-on, at 25°C referenced to frequency at 24 hour after power-on) $\pm 5 \times 10^{-8}$ (5 minutes after power-on, at 25°C referenced to frequency at 24 hour after power-on)</p> <p>Aging Rate: $\pm 1 \times 10^{-7}$/year Temperature Characteristics: $\pm 2 \times 10^{-8}$ (5°C to 45°C) Shipped Frequency Accuracy: $\pm 2.2 \times 10^{-8}$ (1 hour after power-on at 20°C to 30°C)</p>
Front Panel Connectors	<p>RF Input/Output Main1, 2 Connector: N-J, 50Ω (nominal) VSWR: ≤1.5 (2.4 GHz ≤ Frequency ≤ 2.5 GHz) ≤1.7 (5.0 GHz ≤ Frequency ≤ 6.0 GHz) ≤1.7 (6.0 GHz < Frequency ≤ 7.3 GHz)</p> <p>Aux Out Connector: N-J, 50Ω (nominal) VSWR: ≤1.5 (2.4 GHz ≤ Frequency ≤ 2.5 GHz) ≤1.6 (5.0 GHz ≤ Frequency ≤ 6.0 GHz) ≤1.6 (6.0 GHz < Frequency ≤ 7.3 GHz)</p>

Continued on next page



Back Panel Connectors	<p>Reference Signal External Reference Input Connector: BNC-J Frequency: 10 MHz, Impedance: 50Ω Operation range: ±1 ppm, Input Level: -15 dBm ≤ Level ≤ +20 dBm, 50Ω (AC coupled) Reference Signal Output Connector: BNC-J Frequency: 10 MHz, Impedance: 50Ω Output Level: ≥0 dBm (AC coupled)</p> <p>External Trigger Trigger Input 1/2 Connector: BNC 1/2, Input Level: TTL Trigger Output 1/2 Connector: BNC 1/2, Output Level: TTL</p> <p>External Interfaces Ethernet (Remote): Required for remote control from external controller Connector: RJ-45, Speed: 1000BASE-T USB: General Purpose, USB 2.0 Connector: USB-A, 2 Ports Expansion I/O: Connector for function expansion Connector: 50 pin (DX10A-50S) Ethernet (IP Data): IP Data Transfer Connector: RJ-45, Speed: 1000BASE-T</p>
Dimensions and Mass	426 (W) × 177 (H) × 390 (D) mm (excluding projections), ≤14 kg
Power Supply	<p>Rated voltage: 100 V(ac) to 120 V(ac) or 200 V(ac) to 240 V(ac) Rated frequency: 50 Hz/60 Hz Power consumption: ≤350 VA</p>
Operating Conditions	<p>Temperature Operating: +5°C to +45°C, Storage: -20°C to +60°C</p>
CE	<p>EMC: 2014/30/EU, EN61326-1, EN61000-3-2 LVD: 2014/35/EU, EN61010-1 RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018</p>

WLAN Measurement Software MX886200A Specifications

Frequency Range	<p>2.4 GHz Band: 2412 MHz to 2484 MHz (with MT8862A-001 installed) 5 GHz Band: 5180 MHz to 5825 MHz (with MT8862A-001 installed) 5180 MHz to 5885 MHz (with MT8862A-001, 002, 010 installed) 6 GHz Band: 5955 MHz to 7115 MHz (with MT8862A-001, 002, 010 installed)</p>
Amplitude Measurement	<p>Input Level Range: -50 to +25 dBm Input Level Accuracy: After calibration at 20°C to 30°C ±0.7 dB (-30 dBm ≤ Input Level ≤ +25 dBm) ±1.0 dB (-50 dBm ≤ Input Level < -30 dBm) Linearity: ±0.4 dB (-40 dBm ≤ Input Level, 0 to -30 dB range compared to setting level) Bandwidth: 40 MHz/20 MHz (802.11n), 20 MHz (802.11a/b/g), 160/80/40/20 MHz (802.11ac, with MX886200A-001 installed), 160/80/40/20 MHz (802.11ax, with MX886200A-002, 030 installed)</p>
Spectrum Measurement	Input Level Range: -10 to +25 dBm
EVM (Modulation Accuracy)	<p>EVM Measurement Range: -20 to +25 dBm Residual EVM DSSS: <-28 dB (-20 dBm ≤ Input Level, Average of 20 Packets) OFDM (802.11a/g/n): <-40 dB (-20 dBm ≤ Input Level, Average of 20 Packets, Channel Estimate: Full Packets) OFDM (802.11ac, with MX886200A-001 installed): <-38 dB (-10 dBm ≤ Input Level, Average of 20 Packets, Channel Estimate: Full Packets) OFDM (802.11ac, 160 MHz bandwidth, with MX886200A-001, 030 installed): <-44 dB (nom.) (-10 dBm ≤ Input Level, Average of 20 Packets, Channel Estimate: Full Packets, MCS9) OFDM (802.11ax, with MX886200A-002 installed): <-42 dB (nom.) (-10 dBm ≤ Input Level, Average of 20 Packets, Channel Estimate: Full Packets) OFDM (802.11ax, with MX886200A-002, 030 installed): <-44 dB (nom.) (-10 dBm ≤ Input level, Average of 20 Packets, Channel Estimate: Full packet, MCS11) EVM Data Format: % or dB Measurement Resolution: 0.01% or 0.01 dB</p>
Carrier Frequency Measurement	<p>Measurement Level Range: -20 to +25 dBm Carrier Frequency Accuracy 802.11b: ± (Setting Frequency × Reference Oscillator Accuracy + 1 kHz) (Average of 20 Packets) 802.11a/g/n/ac: ± (Setting Frequency × Reference Oscillator Accuracy + 1 kHz) (Average of 20 Packets, Channel Estimate: Full Packets) 802.11ax: ± (Setting Frequency × Reference Oscillator Accuracy + 5 Hz) (nom.) (more than 100 symbol and 242 tones, and Channel Estimate: Full Packets, Frequency error range: Full packet)</p>
RF Signal Generator	<p>Level Setting Range: -120 to 0 dBm (Aux Out Connector) -120 to 0 dBm (Main 1/2 Connector, Frequency ≤ 6 GHz and Channel Band 2.4 GHz/5 GHz) -120 to -5 dBm (Main 1/2 Connector, Frequency > 6 GHz or Channel Band 6 GHz)</p> <p>EVM: Packet Length 1472 byte 802.11b: ≤-38 dB rms (2412 MHz to 2484 MHz, Long Preamble, Gaussian Filter BT0.5, 5°C to 45°C) 802.11g (OFDM): ≤-40 dB rms (2412 MHz to 2484 MHz, 20°C to 30°C) 802.11a: ≤-38 dB rms (5180 MHz to 5885 MHz, 20°C to 30°C) 802.11n: ≤-40 dB rms (2412 MHz to 2484 MHz, Long GI, HT-mixed format, Channel Bandwidth 40 MHz, 20°C to 30°C) ≤-38 dB rms (5180 MHz to 5885 MHz, Long GI, HT-mixed format, Channel Bandwidth 40 MHz, 20°C to 30°C) 802.11ac: ≤-37 dB rms (5180 MHz to 5885 MHz, Long GI, Channel Bandwidth 80 MHz, 20°C to 30°C) ≤-41 dB rms (5180 MHz to 5885 MHz, Long GI, MCS9, Channel Bandwidth 160 MHz, 20°C to 30°C) 802.11ax: ≤-40 dB rms (nom.) (5180 MHz to 5885 MHz, 0.8 μs GI, Channel Bandwidth 80 MHz, 20°C to 30°C) ≤-41 dB rms (nom.) (5180 MHz to 5885 MHz, 0.8 μs GI, MCS11, Channel Bandwidth 160 MHz, 20°C to 30°C) ≤-41 dB rms (nom.) (5995 MHz to 7115 MHz, 0.8 μs GI, MCS11, Channel Bandwidth 160 MHz, 20°C to 30°C)</p>

Continued on next page



Functions	<p>Network Functions Connection: Network Connection using Messages defined by IEEE802.11 Role: Access Point (AP/STA) Frame Capture: 1, 2, 4, 8, 16, 32, 64, 128, 256 MB</p> <p>Tx Test Measurement Type: Data, ACK</p> <p>Rx Test Measurement Type: Packet Error Rate (PER), Frame Reception Rate (FRR) Payload Type: All 0's, 0101, 1010, PN7, PN9, Random, Counting MIMO signal transmission (with MX886200A-010) – MIMO signals available for receiver testing. Spatial stream N_{SS}: 1 to 2 Space-time-stream N_{STS}: 1 to 2 RF chain N_{TX}: 2 STBC: Supported only with N_{SS} = 1 and N_{STS} = 2 Spatial mapping: Direct mapping Beamforming: Not supported Security encryption (with MX886200A-020 installed) WEP, WPA-Personal, WPA2-Personal, WPA3-Personal</p>
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Typical (typ.): Performance not warranted. Most products meet typical performance.
 Nominal (nom.): Values not warranted. Included to facilitate application of product.

Ordering Information

Please specify the model/order number, name and quantity when ordering.
 The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MT8862A	Main Frame Wireless Connectivity Test Set
J0017F	Standard Accessories Power Code: 1 DVD (Operation Manual): 1
W3901AE W3902AE W3903AE W3904AE	MT8862A Operation Manual (Operation) [DVD] MT8862A Operation Manual (Remote Control) [DVD] MX886200A WLAN Measurement Software Manual (Operation) [DVD] MX886200A WLAN Measurement Software Manual (Remote Control) [DVD]
MT8862A-001 MT8862A-002 MT8862A-010	RF Options RF Frequency 2.4 GHz, 5 GHz RF Frequency 6 GHz Extended RF Hardware
MT8862A-102 MT8862A-202 MT8862A-110 MT8862A-210 MT8862A-310	Retrofit RF Options*1 RF Frequency 6 GHz Retrofit RF Frequency 6 GHz Retrofit Extended RF Hardware Retrofit Extended RF Hardware Retrofit Extended RF Hardware Retrofit
MX886200A MX886200A-001 MX886200A-002 MX886200A-010 MX886200A-020 MX886200A-030 MX886200A-070	Software Options WLAN Measurement Software (Requires MT8862A-001) WLAN 802.11ac Option WLAN 802.11ax Option 2x2MIMO Measurement Software WLAN Security Function 160 MHz Bandwidth Remote Control Expansion

Model/Order No.	Name
MT8862A-ES210 MT8862A-ES310 MT8862A-ES510	Warranty Service 2 Years Extended Warranty Service 3 Years Extended Warranty Service 5 Years Extended Warranty Service
J0127A J0127B J0127C J0576B J0576D J0322A J0322B J0322C J0322D J0004 J1261A J1261B J1261C J1261D J1777A B0635A B0657A B0636C*2 B0671A	Application Parts Coaxial Cord, 1 m (BNC-P, RG-58A/U, BNC-P) Coaxial Cord, 2 m (BNC-P, RG-58A/U, BNC-P) Coaxial Cord, 0.5 m (BNC-P, RG-58A/U, BNC-P) Coaxial Cord, 1 m (N-P, 5D-2W, N-P) Coaxial Cord, 2 m (N-P, 5D-2W, N-P) Coaxial Cord, 0.5 m (SMA-P, SMA-P) Coaxial Cord, 1.0 m (SMA-P, SMA-P) Coaxial Cord, 1.5 m (SMA-P, SMA-P) Coaxial Cord, 2.0 m (SMA-P, SMA-P) Coaxial Adapter (N-P, SMA-J) Ethernet Cable (Straight, 1 m) Ethernet Cable (Straight, 3 m) Ethernet Cable (Cross, 1 m) Ethernet Cable (Cross, 3 m) Expansion IO Cable Rack Mount Kit (EIA) Rack Mount Kit (JIS) Carrying Case (Hard type, with a front cover and casters) Front Cover (1MW4U)

*1: MT8862A- □ ##
 □: Select from the following according to the option type.
 1: Retrofit option (Must be returned to factory in Japan)
 2: Retrofit option (Must be returned to service center outside of Japan)
 3: Retrofit option (No need to return)

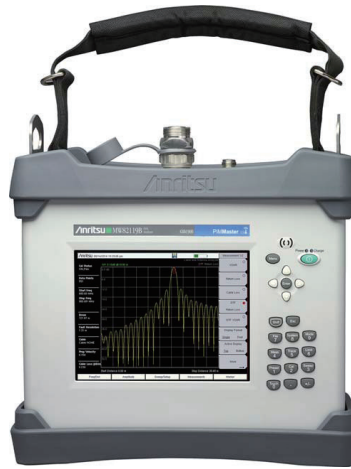
*2: The Carrying Case B0636C includes a Front Panel Protective Cover (B0671A).

PIM Master™ Available with Cable & Antenna Analyzer Option

MW82119B PIM Master™

Remote Control
Ethernet | USB

Passive Intermodulation Analyzer with Site Master™ Option



Anritsu introduces the first fully integrated Passive Intermodulation (PIM) Analyzer plus Cable and Antenna Analyzer (Option 331) suitable for commissioning and maintaining global wireless networks. This high performance, battery operated unit allows operators to fully characterize infrastructure quality by measuring Return Loss, VSWR, Cable Loss, Passive Intermodulation, Distance-to-Fault, and Distance-to-PIM. Measure PIM with a portable test solution, large outdoor viewable display, intuitive user interface, and optimized for field conditions, available in 1- and 2-port options.

The available 2-port PIM Master solution (Option 0703) for the LTE 700 band now allows technicians to send F1 and F2 CW tones through Bands 17 and 14 antennas simultaneously, with isolation performance of 25 dB between the two ports. Making testing and PIM hunting a FirstNet deployment more efficient. This versatile solution also works as a traditional 1-port LTE 700 PIM test set, ideal for finding PIM in cable and antenna systems and tap testing connectors.

Passive Intermodulation (PIM) Analyzer Highlights

- PIM vs. Time, Swept PIM, Noise Floor, Distance-to-PIM
- 3rd, 5th, and 7th order intermodulation products detected
- 2-Port LTE 700 MHz PIM testing (with option 703)
- Test power: 20 to 46 dBm
- Residual PIM: -125 dBm (typ.)

Definitions

All specifications and characteristics apply to Revision 2 instruments under the following conditions, unless otherwise stated:

Warm-Up Time	After 10 minutes of warm-up time, where the instrument is left in the ON state.
Typical Performance	Typical specifications are not tested and are not warranted. They are generally representative of the nominal characteristic performance.
Uncertainty	A coverage factor of K = 2 is applied to measurement uncertainties.
Calibration Cycle	Recommended calibration cycle is 12 months. All specifications subject to change without notice. For the most current data sheet, please visit the Anritsu web site: www.anritsu.com

Cable and Antenna Analyzer (Option 331)

- Measurements: RL, VSWR, Cable Loss, DTF, Phase
- Frequency range: 2 MHz to 3 GHz
- Sweep Speed: 1 ms/data point (typ.)
- Calibration: OSL and FlexCal™

Capabilities and Functional

- Integrated solution
- Battery operated: >3.0 hour run time
- Display: 8.4 in (213 mm) daylight viewable
- IP54 rated for dust and water spray
- MIL-STD-810G drop test rated
- Stainless steel lifting rings
- Padded soft case for extra protection
- Easy-to-use, menu driven user interface
- Quick Name Matrix simplifies naming in the field
- GPS tag measurements (Option 31)
- High Accuracy Power Meter (Option 19)



General Specifications

PIM Master Connectors	PIM Test Port	7/16 DIN (f) 50Ω
	Port 2 Out	4.3-10 (f) (option 703 only)
	Port 2 Return	SMA (f) (option 703 only)
	Dual USB Type A	2x Type A (connect USB Flash Drive and USB Power Sensor)
	USB Mini-B	1x Mini-B (connect to PC for data transfer)
	GPS	SMA (f) (with GPS option only)
	External Power	2.1 × 5.5 mm barrel connector, 12 VDC to 15 VDC, <5.0 A
	PIM Test Port Damage Level	+10 dBm (10 mW) continuous, (PIM Rx band) +35 dBm (3 W) continuous, (PIM Tx band)*
	VNA Test Port	Type N (f) 50Ω (Option 331)
Display	VNA Test Port Damage Level	40 dBm continuous * Able to survive full reflection of 2 × 46 dBm PIM test tones generated by the MW82119B.
	Size	213 mm (8.4 in) touch screen
Battery	Resolution	800 × 600 Pixel Defects: No more than five defective pixels (99.9989% good pixels)
	Type	Li-Ion
Power	Battery Operation	3.0 hours (typ.)
	Charging Limits	While charging, battery must be 0°C to +45°C, Relative Humidity ≤80%
	AC/DC Adapter	Input: 100 VAC to 240 VAC, 50 Hz/60 Hz Output: 12 VDC
CE	EMC	2014/30/EU, EN61326-1, EN61000-4-2
	LVD	2014/35/EU, EN61010-1
	RoHS	(EU) 2015/863
RCM	Australia and New Zealand RCM AS/NZS 4417:2012	
KCC	South Korea KCC-REM-A21-0004	
Canada	ICES-001	
Environmental, MIL-PRF-28800F Class 2	Operating Temperature Range	-10°C to +55°C
	Storage Temperature Range	-51°C to +71°C
	Maximum Relative Humidity	95% RH at 30°C, non-condensing
	Vibration, Sinusoidal	5 Hz to 55 Hz
	Vibration, Random	10 Hz to 500 Hz
	Half Sine Shock	30 gn
	Altitude	4600 meters, operating and non-operating
	Explosive Atmosphere	MIL-PRF-28800F, Section 4.5.6.3 MIL-STD-810G, Method 511.5, Procedure 1
ESD	Ingress Protection (IP)	IP54, IP67 when enclosed in optional transit case
	PIM Test Port Connector Center Pin	Withstands up to ±15 kV
Dimensions and Mass	VNA RF Out Connector Center Pin	Withstands up to ±15 kV
	Dimensions: 350 (W) × 314 (H) × 152 (D) mm (13.8 × 12.4 × 6.0 in) Mass: 9.2 kg to 12.6 kg (20 lb to 27.8 lb), varies by frequency option	

PIM Analyzer Specifications

Measurements	PIM vs. Time Noise Floor Distance-to-PIM Swept PIM	
Setup Parameters	Frequency	Carrier F1, Carrier F2, Intermodulation Order
	Amplitude	Ref Value, Scale, Auto Range (On/Off), Amplitude Tone (On/Off)
	Setup	Output Power, Test Duration (1 s to 1,200 s)
	Limit Lines	Limit (Upper/Lower), On/Off, Limit Move, Limit Alarm (On/Off, PASS/FAIL indicator)
	Markers	Markers 1-6 (On/Off), Delta Markers 1 - 6 (On/Off), Marker to Peak/Valley, All Markers Off
	GPS	On/Off, 3.3 V/5.0 V
	DTP	Cable Velocity, Distance
1-Port PIM Measurement Ranges	Save/Recall	Setups (.stp), Measurements (.pim), Limit Lines (.lim), Screen Shots (.jpg) (save only)
	RF Test Power (Both 1-Port and 2-Port)	Two CW tones 20 to 46 dBm, 0.1 dBm steps, Accuracy ±5 dB (excluding uncertainty)
	RF Test Frequency	Accuracy: ±1.0 ppm at 23°C Stability: ±1.0 ppm from -10°C to +55°C (typ.) Aging: ±1.0 ppm/yr aging (typ.)
	Residual PIM Performance	<-117 dBm, <-125 dBm (typ.) (2 × 43 dBm test tones) <-134 dBm, <-140 dBm (typ.) (2 × 20 dBm test tones)
PIM Measurement Range	-70 to -140 dBm (Revision 1 instruments) -50 to -140 dBm (Revision 2 instruments)	

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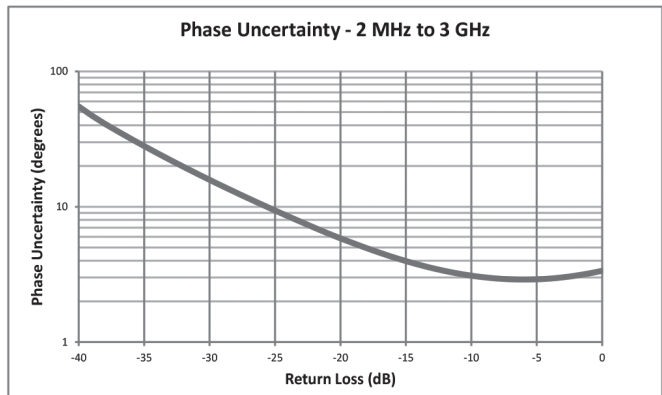
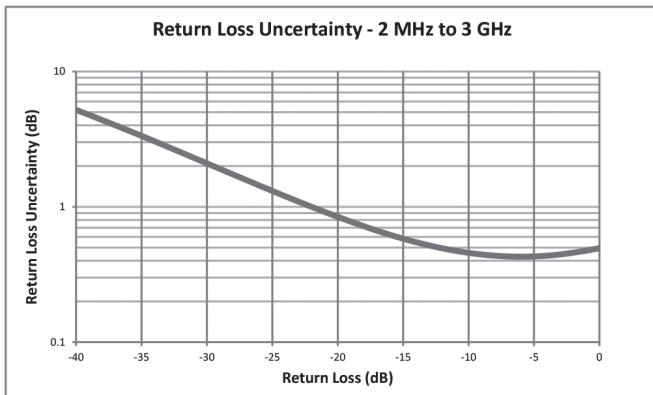


Option	Band	Frequency Range
Option 600	LTE 600 w/1900 MHz	Tx ₁ : 617 MHz to 618 MHz, Tx ₂ : 633 MHz to 652 MHz Rx ₁ : 663 MHz to 698 MHz, Rx ₂ : 1867 MHz to 1888 MHz
Option 700	LTE 700	Tx ₁ : 731 MHz to 734.5 MHz, Tx ₂ : 746 MHz to 768 MHz Rx _{Lower} : 698 MHz to 717 MHz, Rx _{Upper} : 777 MHz to 806 MHz
Option 701	APT 700	Tx ₁ : 758 MHz to 776 MHz, Tx ₂ : 788 MHz to 803 MHz Rx _{Lower} : 710 MHz to 748 MHz, Rx _{Upper} : 825 MHz to 845 MHz
Option 703	2-Port LTE 700	Tx ₁ : 731 MHz to 734.5 MHz, Tx ₂ : 746 MHz to 768 MHz Rx _{Lower} : 698 MHz to 717 MHz, Rx _{Upper} : 777 MHz to 806 MHz
Option 800	LTE 800	Tx ₁ : 791 MHz to 795 MHz, Tx ₂ : 811.5 MHz to 821 MHz Rx: 832 MHz to 862 MHz
Option 850	Cellular 850	Tx ₁ : 869 MHz to 871 MHz, Tx ₂ : 881.5 MHz to 894 MHz Rx: 824 MHz to 849 MHz
Option 900	E-GSM 900	Tx ₁ : 925 MHz to 937.5 MHz, Tx ₂ : 951.5 MHz to 960 MHz Rx: 880 MHz to 915 MHz
Option 180	DCS 1800	Tx ₁ : 1805 MHz to 1837 MHz, Tx ₂ : 1857.5 MHz to 1880 MHz Rx: 1710 MHz to 1785 MHz
Option 194	PCS/AWS	Tx ₁ : 1930 MHz to 1945 MHz, Tx ₂ : 1965 MHz to 1995 MHz, Tx ₃ : 2110 MHz to 2155 MHz Rx ₁ : 1850 MHz to 1910 MHz (using Tx ₁ and Tx ₂), Rx ₂ : 1710 MHz to 1755 MHz (using Tx ₁ and Tx ₃)
Option 210	UMTS 2100	Tx ₁ : 2110 MHz to 2112.5 MHz, Tx ₂ : 2130 MHz to 2170 MHz Rx _{Lower} : 1920 MHz to 1980 MHz, Rx _{Upper} : 2050 MHz to 2090 MHz
Option 260	LTE 2600	Tx ₁ : 2620 MHz to 2630 MHz, Tx ₂ : 2650 MHz to 2690 MHz Rx: 2500 MHz to 2570 MHz
1-Port PIM vs. Time	IM product magnitude vs. time	
	Test Frequencies	F1, F2, and IM product frequencies fixed, user selectable
	Measurements	Peak PIM over measurement duration, Instantaneous PIM
1-Port Noise Floor (Time View)	Noise level vs. frequency	
	Test Frequencies	IM product frequency fixed, user selectable
	Measurements	Peak signal level over measurement duration, Instantaneous signal level
1-Port Noise Floor (Spectrum View)	Noise level vs. frequency	
	Test Frequencies	Swept measurement over Rx band of instrument
	Measurements	Peak signal level, Instantaneous signal level
1-Port Distance-to-PIM	IM product magnitude vs. distance	
	Test Frequencies	F1 or F2 frequency swept to produce range of IM product frequencies for analysis
	Fault Resolution	Varies by frequency option, <3 m (<10 ft) (typ.) with Enhanced Resolution activated
	Maximum Range	Varies by frequency option and number of Data Points selected
	Markers	Standard marker functions plus Marker Table (On/Off)
	Trace Overlay	DTP/DTP, DTP/DTF
1-Port Swept PIM	IM product magnitude vs. frequency	
	Test Frequencies	F1 and F2 frequencies swept to produce range of IM product frequencies
	Measurements	Peak PIM over measurement duration, Instantaneous PIM
2-Port PIM Measurement Ranges	RF Test Frequency	Accuracy: ±0.5 ppm at 23°C Stability: ±1.0 ppm from -10°C to +55°C (typ.) Aging: ±1.0 ppm/yr aging (typ.)
	Residual PIM Performance	<-123 dBm (typ.) (2 × 43 dBm test tones) <-115 dBm (typ.) (2 × 46 dBm test tones)
	PIM Isolation Residual PIM Performance	-123 dBm (typ.) (2 × 43 dBm test tones) -115 dBm (typ.) (2 × 46 dBm test tones)
2-Port PIM vs. Time	IM product magnitude vs. time	
	Test Frequencies	F1 PIM Test Port, Port 2 Out, and IM product frequencies fixed, user selectable
	Measurements	Peak PIM over measurement duration, Instantaneous PIM
2-Port Noise Floor (Time View)	Noise level vs. time at IM product frequency	
	Test Frequencies	IM product frequency fixed, user selectable
	Measurements	Peak signal level over measurement duration, Instantaneous signal level
2-Port Noise Floor (Spectrum View)	Noise level vs. frequency	
	Test Frequencies	Swept measurement over Rx band of instrument
	Measurements	Peak signal level, Instantaneous signal level
2-Port Distance-to-PIM	IM product magnitude vs. distance	
	Test Frequencies	F1 PIM Test Port, F2 Port 2 Out frequencies swept to produce range of IM product frequencies for analysis
	Fault Resolution	Varies by frequency option, <3 m (<10 ft) typical with Enhanced Resolution activated
	Maximum Range	Varies by frequency option and number of Data Points selected
	Markers	Standard marker functions plus Marker Table (On/Off)
	Trace	Overlay DTP/DTP, DTP/DTF
2-Port Swept PIM	IM product magnitude vs. frequency	
	Test Frequencies	F1 PIM Test Port, F2 Port 2 Out frequencies swept to produce range of IM product frequencies
	Measurements	Peak PIM over measurement duration, Instantaneous PIM

Cable and Antenna Analyzer (Option 331)

Measurements		VSWR Return Loss Cable Loss Distance-to-Fault (DTF) Return Loss Distance-to-Fault (DTF) VSWR 1-Port Phase Smith Chart (50/75Ω selectable)
Setup Parameters	Measurement Display	Single/Dual Measurement Display with independent markers
	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), RF Pwr When Hold (On/Off)
	Data Points	137, 275, 551, 1102, 2204
	Markers	Markers 1-6 (On/Off), Delta Makers 1-6 (On/Off), Marker to Peak/Valley, Peak/Valley Auto, Marker Table (On/Off), All Markers Off
	Traces	Recall, Copy to Display Memory, No Trace Math, Trace ± Memory, Trace Overlay (On/Off)
	Limit Line	On/Off, Single Limit, Multi-segment Edit, Limit Alarm (On/Off), Pass Fail Message (On/Off), Pass/Fail (Unbounded/Bounded), Warning Limit Offset, Clear Limit
	Calibration	Start Cal, Cal Type (Standard/FlexCal™), Disp Valid Cal Temp Range
	Save/Recall	Setups (.stp), Measurements (.vna, .dat), Screen Shots (.jpg) (save only)
Frequency	Application Options	Impedance (50Ω, 75Ω, Other)
	Frequency Accuracy	±1.0 ppm at 23°C
	Stability	±1.0 ppm from -10°C to +55°C (typ.)
Output Power	Aging	±1.0 ppm/yr (typ.)
	Power Level	-4 dBm (typ.)
Interference Immunity	On-Channel	+17 dBm @ > 1.0 MHz from carrier frequency
	On-Frequency	0 dBm within ±10 kHz of the carrier frequency
Measurement Speed	Return Loss	≤1.00 ms/data point, RF immunity low (typ.)
	Distance-to-Fault	≤1.25 ms/data point, RF immunity low (typ.)
Return Loss	Measurement Range	0 to 60 dB
	Resolution	0.01 dB
VSWR	Measurement Range	1:1 to 65:1
	Resolution	0.01
Cable Loss	Measurement Range	0 to 30 dB
	Resolution	0.01 dB
Distance-to-Fault	Vertical Range Return Loss	0 to 60 dB
	Vertical Range VSWR	1:1 to 65:1
	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) × Fault Resolution, to a maximum of 1500 meters (4921 ft)
1-Port Phase	Measurement Range	-180° to +180°
	Resolution	0.01°
Smith Chart	Resolution	0.01 50Ω/75Ω Selectable
Measurement Accuracy	Corrected Directivity	>42 dB, OSL Calibration

Measurement Uncertainty



GPS Receiver Option (Option 31) (Antenna sold separately)

Setup	On/Off, Antenna Voltage 3.3 V/5.0 V, GPS Info
GPS Time/ Location Indicator	Time, Latitude, Longitude and Altitude on display Time, Latitude, Longitude and Altitude with trace storage
Connector	SMA (f)

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 GHz/18 GHz	10 MHz to 33/40/50 GHz
Connector	Type N (f), 50Ω	Type N (m), 50Ω	Type N (m), 50Ω (8 GHz/18 GHz) Type K (m), 50Ω (26 GHz)	Type N (m), 50Ω	Type K (m), 50Ω (33 GHz/40 GHz) Type V (m), 50Ω (50 GHz)
Dynamic Range	+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)	-60 to +20 dBm (1 nW to 100 mW)	-70 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*1	± 0.16 dB*2	± 0.18 dB*3	± 0.17 dB*4	± 0.17 dB*5
Data sheet (for complete specifications)	11410-00621	11410-00424	11410-00504	11410-00841	11410-00906

- *1: 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.
- *2: Total RSS measurement uncertainty (0°C to 50°C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
- *3: Expanded uncertainty with K = 2 for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
- *4: 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.
- *5: Includes linearity over temperature uncertainties, but not the effects of calibration factor, mismatch, zero set and drift, and noise.

Line Sweep Tools (for your PC)

Trace Capture	Browse to Instrument	View and copy traces from the test equipment to your PC using Windows Explorer
	Open Current Files	Open PIM or DAT files
	Capture Plots To	The Line Sweep Tools screen, DAT files, Database, or JPEG
Traces	Trace Types	Return Loss, VSWR, DTF-RL, DTF-VSWR, Cable Loss, Smith Chart, PIM vs. Time, Swept PIM, Noise Floor, and DTP
	Trace Formats	DAT, PIM, CSV, PNG, BMP, JPG, HTML, Data Base, and PDF
Report Generation	Report Generator	Includes GPS location along with measurements
	Report Format	Create reports in HTML or PDF format
	Report Setup	Report Title, Company, Prepared for, Location, Date and Time, Filename, Company logo
	Trace Setup	1 Trace Portrait Mode, 2 Trace Portrait Mode, 1 Trace Landscape Mode
Trace Validation	PIM Report	Tabular summary report with pass/fail analysis
	Presets	7 presets allow "one click" setting of up to 6 markers and one limit line
	Marker Controls	6 regular Markers, Marker Peak, Marker Valley, Marker between, and frequency entry
	Delta Markers	6 Delta markers
	Limit Line	Enable and drag or value entry. Also works with presets
Tools	Next Trace Button	Next Trace and Previous trace arrow keys allow quick switching between traces
	Cable Editor	Allows creation of custom cable parameters
	Distance-to-Fault	Converts a Return Loss trace to a Distance-to-Fault trace
	Measurement Calculator	Converts Real, Imaginary, Magnitude, Phase, RL, VSWR, Rho, and Transmit power
	Signal Standard Editor	Creates new band and channel tables
Connectivity	Renaming Grid	36 user definable phrases for creation of file names, trace titles, and trace subtitles
	Connections	USB cable, USB Memory Stick

easyTest Tools (for your PC)

Instrument Mode	PIM Analyzer Mode, Cable & Antenna Analyzer Mode (Option 331)	
Commands	Display Image	Allows putting a custom image on the instrument screen
	Recall Setup	Places the instrument into a known state
	Prompt	Displays instructional messages on the instrument screen
	Save	Allows automatic or manual saving of traces
Connectivity	Connections	Ethernet, USB cable or USB memory stick



Web Remote Control

Control	Full instrument control through a browser – all instrument functions except power switch
Connections	RJ45 Ethernet jack Third party Wi-Fi router
Protocol	HTTP/TCP/IP
Physical Layer	Cat 5 Cable, Wi-Fi router compatible
Browser	Designed for use with HTML 5 Compliant Browsers (Google Chrome or Mozilla Firefox preferred)
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
Download	Individual instrument files downloaded via browser Multiple instrument files and directories zipped and downloaded via browser Screen capture capability File downloads are not supported by iOS
Display Modes	Normal: All modes & displays supported Fast: Not currently supported
Password	The instrument can be password protected Passwords may be used to manage who is controlling the instrument
Users and Devices to Instruments Ratio	One user/device can view and control many instruments

Programmable Remote Control

Functionality	Instrument functionality is available via remote programming. See the MW82119B Programming Manual for details.
Programming Language	Standard Commands for Programmable Instruments (SCPI)
Interfaces	USB, LAN



Ordering Information

Please specify the model/order number, name and quantity when ordering.

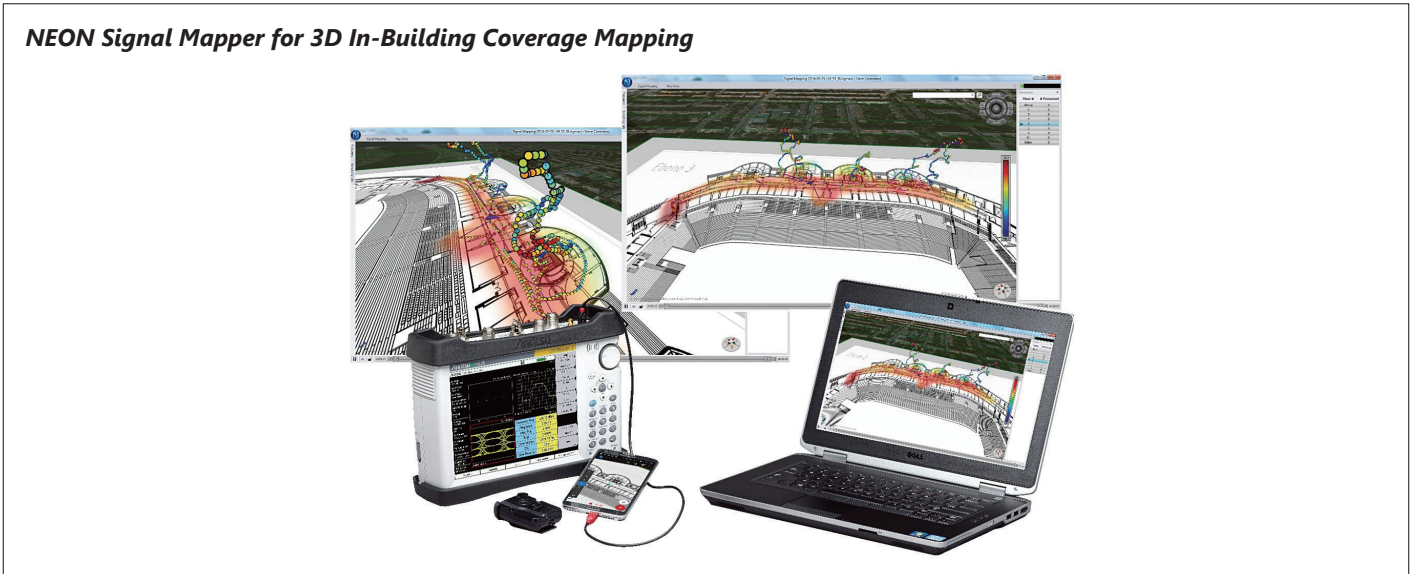
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MW82119B	Main Frame PIM Master™ Passive Intermodulation Analyzer (must be ordered with ONE frequency option)
MW82119B-0600 MW82119B-0700 MW82119B-0701 MW82119B-0703 MW82119B-0800 MW82119B-0850 MW82119B-0900 MW82119B-0180 MW82119B-0194 MW82119B-0210 MW82119B-0260	Frequency Options (must order one, and only one) LTE 600 w/1900 MHz LTE 700 APT 700 2-Port LTE 700 LTE 800 Cellular 850 E-GSM 900 DCS 1800 PCS/AWS 1900/2100 UMTS 2100 LTE 2600
MW82119B-0019 MW82119B-0031 MW82119B-0331 MW82119B-0098 MW82119B-0099	Other Options High Accuracy Power Meter (Requires USB power sensor) GPS Receiver (Requires GPS antenna) Site Master™ Cable and Antenna Analyzer Standard Calibration to ISO 17025 and/or Z540.1 Premium Calibration to ISO 17025 and/or Z540.1 plus test data
2000-1786-R 2000-1714-R 2000-1691-R 2000-1797-R 1091-422-R 633-75 40-187-R 806-141-R 2000-1371-R 3-2000-1498 2000-1991-R	Standard Accessories Soft Carrying Case, Screen Access Shoulder Strap Stylus with Coiled Tether (Country dependent) AC Power Cable Adapter, 7/16 DIN (f) to 7/16 DIN (m), 50Ω (Connector Saver) Rechargeable Li-Ion Battery 7500 mAh AC/DC adapter (Country dependent) AC Power Cable Automotive Power Adapter, 12 VDC, 60 W Ethernet Cable, 7 ft/213 cm USB A to Mini B Cable, 10 ft/305 cm 2-Port Loop Cable assembly (Option 703 only)
2000-1374 633-75 2000-1884-R 2000-1691-R 01-201 01-510 01-513-R 01-528-R 971-9-R 971-10-R	Miscellaneous Accessories External Dual Charger for Li-Ion Batteries Rechargeable Li-Ion Battery, 7500 mAh PIM Hunter™ Test Probe (For full specifications, refer to the 2000-1884-R Technical Data Sheet 11410-00999) Stylus with Coiled Tether Orque End Wrench, 5/16 in, 0.9 N-m (8 lbf-in), For tightening male devices, for SMA, 3.5 mm, 2.4 mm, K, and V connectors Adjustable Wrench 1-1/4 in Torque Wrench Torque Wrench for coupling torque of 4.3-10 connectors, 22 mm opening Cleaning Wipes Cleaning Swabs
MA24105A MA24106A MA24108A MA24118A MA24126A MA24208A MA24218A MA24330A MA24340A MA24350A MA25100A	Power Sensors Requires Option 19. (For complete ordering information, see the respective datasheet of each sensor) Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 to +51.76 dBm RF USB Power Sensor, 50 MHz to 6 GHz, +23 dBm Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 dBm Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 dBm Microwave CW USB Power Sensor, 10 MHz to 33 GHz, +20 dBm Microwave CW USB Power Sensor, 10 MHz to 40 GHz, +20 dBm Microwave CW USB Power Sensor, 10 MHz to 50 GHz, +20 dBm RF Power Indicator
3-1010-122 3-1010-123 3-1010-124	Attenuators (Recommended for power measurements only. Not Low PIM.) Attenuator (Bi-directional), 20 dB, 5 W, DC to 12.4 GHz, N (m) to N (f) Attenuator (Bi-directional), 30 dB, 50 W, DC to 8.5 GHz, N (m) to N (f) Attenuator (Bi-directional), 40 dB, 100 W, DC to 8.5 GHz, N (m) to N (f)

Model/Order No.	Name
15RNFN50-1.5-R 15RDFN50-1.5-R 15RDN50-1.5-R 15RNFN50-3.0-R 15RDFN50-3.0-R 15RDN50-3.0-R	Phase-Stable Test Port Cables, Armored w/Reinforced Grip (Recommended for cable and antenna line sweep applications only. Not low PIM.) 1.5 m, DC to 6 GHz, N (m) to N (f), 50Ω 1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (f), 50Ω 1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (m), 50Ω 3.0 m, DC to 6 GHz, N (m) to N (f), 50Ω 3.0 m, DC to 6 GHz, N (m) to 7/16 DIN (f), 50Ω 3.0 m, DC to 6 GHz, N (m) to 7/16 DIN (m), 50Ω
15RCN50-1.5-R 15RCN50-3.0-R	Inter Changeable Adaptor Phase Stable Test Port Cables, Armored w/Reinforced Grip (Recommended for cable and antenna line sweep applications only. Not low PIM.) 1.5 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω 3.0 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω
15NNF50-1.5C 15NN50-1.5C 15NDF50-1.5C 15ND50-1.5C 15NNF50-3.0C 15NN50-3.0C 15NNF50-5.0C 15NN50-5.0C 15N43M50-1.5C 15N43F50-1.5C 15N43M50-3.0C 15N43F50-3.0C 15NF43M50-1.5C 15NF43F50-1.5C 15NF43M50-3.0C 15NF43F50-3.0C	Phase-Stable Test Port Cables, Armored (Recommended for cable and antenna line sweep applications only. Not Low PIM. Use with tightly spaced connectors and other general purpose applications.) 1.5 m, DC to 6 GHz, N (m) to N (f), 50Ω 1.5 m, DC to 6 GHz, N (m) to N (m), 50Ω 1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (f), 50Ω 1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (m), 50Ω 3.0 m, DC to 6 GHz, N (m) to N (f), 50Ω 3.0 m, DC to 6 GHz, N (m) to N (m), 50Ω 5.0 m, DC to 6 GHz, N (m) to N (f), 50Ω 5.0 m, DC to 6 GHz, N (m) to N (m), 50Ω Test Port Extension Cable, Armored, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (m) Test Port Extension Cable, Armored, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (f) Test Port Extension Cable, Armored, 3 m, DC to 6 GHz, N (m) to 4.3-10 (m) Test Port Extension Cable, Armored, 3 m, DC to 6 GHz, N (m) to 4.3-10 (f) Test Port Extension Cable, Armored, 1.5 m, DC to 6 GHz, N (f) to 4.3-10 (m) Test Port Extension Cable, Armored, 1.5 m, DC to 6 GHz, N (f) to 4.3-10 (f) Test Port Extension Cable, Armored, 3 m, DC to 6 GHz, N (f) to 4.3-10 (m) Test Port Extension Cable, Armored, 3 m, DC to 6 GHz, N (f) to 4.3-10 (f)
34NN50A 34NFF50 1091-26-R 1091-27-R 1091-80-R 1091-81-R 1091-172-R 1091-465-R 1091-467-R 510-90-R 510-91-R 510-92-R 510-93-R 510-96-R 510-97-R 510-102-R	Precision Adapters (Recommended for cable and antenna line sweep applications only. Not Low PIM.) N (m) to N (m), DC to 18 GHz, 50Ω N (f) to N (f), DC to 18 GHz, 50Ω SMA (m) to N (m), DC to 18 GHz, 50Ω SMA (f) to N (m), DC to 18 GHz, 50Ω SMA (m) to N (f), DC to 18 GHz, 50Ω SMA (f) to N (f), DC to 18 GHz, 50Ω BNC (f) to N (m), DC to 1.3 GHz, 50Ω Adapter, DC to 6 GHz, 4.3-10 (f) to N (f), 50Ω Adapter, DC to 6 GHz, 4.3-10 (m) to N (f), 50Ω 7/16 DIN (f) to N (m), DC to 7.5 GHz, 50Ω 7/16 DIN (f) to N (f), DC to 7.5 GHz, 50Ω 7/16 DIN (m) to N (m), DC to 7.5 GHz, 50Ω 7/16 DIN (m) to N (f), DC to 7.5 GHz, 50Ω 7/16 DIN (m) to 7/16 DIN (m), DC to 7.5 GHz, 50Ω 7/16 DIN (f) to 7/16 DIN (f), DC to 7.5 GHz, 50Ω N (m) to N (m), DC to 11 GHz, 50Ω, 90 degrees right angle
10100-00065 10580-00400 10580-00402 10580-00403 10580-00240 10580-00241 10580-00252 11410-00473 11410-00726	Manuals (Soft copy at www.anritsu.com) Product Information Safety and Compliance PIM Master User Guide PIM Master Measurement Guide PIM Master Programming Manual Power Meter Measurement Guid Cable and Antenna Analyzer Measurement Guide Site Master User Guide Troubleshooting Guide – Cable, Antenna, and Components Equipment Verification Process
	Anritsu Training Anritsu has designed courses to help you stay up to date with technologies important to your job. For available training courses, visit: www.anritsu.com/training

NEON[®] Signal Mapper

MA8100A-00x Series



The NEON Signal Mapper (MA8100A-00x) 3D in-building coverage mapping solution can be used with many Anritsu handheld instruments with spectrum analyzer mode. Instruments supported include: Spectrum Master, LMR Master, Site Master, BTS Master, Cell Master, and VNA Master. The NEON Signal Mapper application provides an intuitive Android user interface enabling lightly trained users to map signal and sensor information within buildings. Users can initialize their location, start/stop mapping and load mapping data to the cloud.

RF data is captured by an Anritsu Handheld spectrum analyzer product and the data is sent to the Android device via a USB connection. The NEON Command PC Software, enables creation and visualization of 3D building maps and provides centralized access to the NEON Cloud Service to access stored maps and measurement data. Android device and PC are NOT included with the MA8100A-00x. Customers must purchase their own Android device and PC.

The MA8100A-00x consists of both hardware and software from Systems, a 3rd party partner. The MA8100A-00x consists of a NEON Tracking Unit, NEON Signal Mapper Software for Android devices and the NEON Command Software for a PC.

The NEON Tracking Unit supports collection and processing of sensor data that delivers 3D location information. The Tracking Unit connects to the NEON Signal Mapper application, which is run on an Android device via a Bluetooth connection.

Key Features

Integrating NEON's capability to automatically collect geo-referenced test data with Anritsu handheld spectrum analyzer products saves valuable time and money by:

- Eliminating the need to manually perform "check-ins" at each test point by automatically calculating indoor location
- Providing vastly more data than is possible with manual processes by recording data with every step
- Removing typical data recording errors caused by "guesstimating" locations in large buildings through automatic indoor location and path estimation
- Delivering actionable data in areas not easily analyzed such as stairways and elevators by recording and referencing measurements in 3D
- Enabling quick analysis of signal coverage and faster problem resolution by delivering the industry's only geo-referenced 3D visualization
- Provides color-graded measurement results in 2D and 3D views. Measurement values can be seen by clicking on each point. A .csv file of all measurements is also provided.

EU Standards (CE Marking)

2011/65/EU, (EU)2015/863

Ordering Information

Please specify the model/order number, name and quantity when ordering. The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MA8100A-000	NEON[®] Signal Mapper Bundles* NEON Signal Mapper with Anritsu Integration and Tracking Unit (P/N 2000-1852-R). (Includes 3-Month NEON Trial Software License with 3 months of maintenance and support and 3 months of Cloud Service (P/N 2300-607))
MA8100A-001	NEON Signal Mapper with Anritsu Integration and Tracking Unit (P/N 2000-1852-R) (Includes 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service (P/N 2300-574))
MA8100A-003	NEON Signal Mapper with Anritsu Integration and Tracking Unit (P/N 2000-1852-R) (Includes 3 years NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service (P/N 2300-575))
MA8100A-005	NEON Signal Mapper with Anritsu Integration and Tracking Unit (P/N 2000-1852-R) (Includes 5 years NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service (P/N 2300-576))
MA8100A-100	NEON Signal Mapper with Anritsu Integration and Tracking Unit (P/N 2000-1852-R). (Includes Perpetual NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service (P/N 2300-606))
2300-612	License Renewal 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service
2300-613	3 years NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service
2300-614	5 years NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service
2300-606	Perpetual NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service

* IMPORTANT: The primary end-user's name, phone number and email address must be provided when the order is placed.

Note: NEON Command Software, which is cloud based, requires a renewable license. 1, 3 or 5 year licenses are available and are ordered as per the available part numbers outlined above. These licenses can be extended when they expire.

LMR Master™ LMR Master Land Mobile Radio Modulation Analyzer

S412E

VNA: 500 kHz to 1.6 GHz/Spectrum Analyzer: 9 kHz to 1.6 GHz

Land Mobile Radio Modulation Analyzer and Signal Analyzer, Vector Network Analyzer, Spectrum Analyzer



The LMR Master S412E is Anritsu’s solution for installing and maintaining public safety systems. Built on Anritsu’s handheld platform, the S412E combines a high performance receiver/spectrum analyzer with the world’s most advanced handheld vector network analyzer plus a powerful vector signal generator with internally adjustable power from 0 to -130 dBm.

Spectrum Analyzer Highlights

- Measurements: Occupied Bandwidth, Channel Power, ACPR, C/I, Coverage Mapping
- Interference Analyzer: Spectrogram, Signal Strength, RSSI, Mapping
- 9 kHz to 1.6 GHz frequency coverage (Optional extension to 6 GHz)
- Dynamic Range: >95 dB in 10 Hz RBW
- DANL: -152 dBm in 10 Hz RBW
- Phase Noise: -100 dBc/Hz max @ 10 kHz offset at 1 GHz
- Frequency Accuracy: 120 ppb standard (25°C±25°C); <50 ppb after 3 minutes with GPS lock
- PIM Hunting

VNA Analyzer Highlights

- 1-path, 2-port Vector Network Analyzer (VNA) w/ quad trace display
- 500 kHz to 1.6 GHz frequency coverage (Optional extension to 6 GHz)
- Intuitive Graphical User Interface (GUI) with convenient Touch Screen
- VNA-quality error correction for directivity and source match
- Outstanding calibration stability, up to 16 hours
- Arbitrary data points up to 4001
- IF Bandwidth selections of 10 Hz to 100 kHz
- 100 dB transmission dynamic range
- 850 μs/data point sweep speed

Signal Generator Highlights

- 500 kHz to 1.6 GHz CW/FM/AM Modulation
- FM, 100 Hz to 10 kHz rate, adjustable deviation
- AM, 100 Hz to 10 kHz rate, adjustable depth
- 0.1 dB resolution, 0 to -130 dBm
- CW, FM with CTCSS/DCS/DTMF, FM with CTCSS/DCS/DTMF + Tone Modulation, FM + Tone Modulation

Land Mobile Radio Signal Analyzer Highlights

- Analyzes Narrowband FM analog systems
- Analyzes P25 (TIA-102.CAAA-C), P25 Phase 2 (TIA-102.CCAA), DMR (MOTOTRBO™), NXDN™, dPRM, ITC-R PTC, and TETRA digital systems
- 100 kHz to 1.6 GHz frequency coverage (Optional extension to 6 GHz)
- Internal signal generator: 0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
- 2.0 dB signal generator accuracy (typ.)
- P25/P25p2, NXDN, and ETSI DMR BER test patterns including 1011 Hz, 1031 Hz, and V.52/O.153
- Duplex test: Simultaneous analysis and generation of analog or digital LMR signals
- Independent control of both receive/transmit frequencies and test patterns
- TETRA Base Station Receiver Sensitivity Measurements

Capabilities and Functional Highlights

- Analog FM and digital LMR analyzer
- High accuracy internal power meter
- On-screen LMR Coverage Mapping (Outdoor and Indoor)
- GPS tagging of saved traces
- USB data transfer
- Complies with MIL-PRF-28800F Class 2 and MIL-STD-810G
- Certified for use in Explosive Atmosphere per MIL-PRF-28800F 8.4 inch daylight-viewable TFT LCD color resistive touchscreen – allows use while wearing gloves
- Touchscreen keyboard
- USB and Ethernet data transfer
- Web Remote Control
- Master Software Tools™
- 3 hour battery operation time

Definitions

All specifications and characteristics apply under the following conditions, unless otherwise noted:

Warm-Up Time	After 15 minutes of warm-up time in VNA mode, where the instrument is left in the ON state.
Temperature Range	Over the 23°C±5°C temperature range, unless otherwise noted.
Reference Signal	When using internal reference signal.
Typical Performance	Typical specifications that are not in parenthesis are not tested and not warranted. They are generally representative of characteristic performance. Typical specifications in parenthesis () represent the mean value of measured units and do not include any guard-bands or uncertainties. They are not warranted.
Uncertainty	A coverage factor of x1 is applied to the measurement uncertainties to facilitate comparison with other industry handheld analyzers.
Calibration Cycle	Calibration is within the recommended 12 month period (residual specifications also require calibration kit calibration cycle adherence.) All specifications subject to change without notice. For the most current data sheet, please visit the Anritsu web site: www.anritsu.com

Spectrum Analyzer Specifications

Measurements	Smart Measurements	Field Strength (uses antenna calibration tables to measure dBm/m ² 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 Audio Demodulation (Wide/Narrow FM, AM, Upper/Lower SSB) C/I (carrier-to-interference ratio) Emission Mask Coverage Mapping (requires option 431) PIM Alert Application (available for download) PIM Hunting
	Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Channel Increment
Setup Parameters	Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
	Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
	Bandwidth	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/RBW
	File	Save, Recall, Delete, Directory Management
	Save	Setups, Measurements, Screen Shots (JPEG), Limit Lines, Spurious Emission Mask
	Save-on-Event	Crossing Limit Line, Sweep Complete, Save-then-Stop, Clear All
	Recall	Setups, Measurements, Limit Lines, Spurious Emission Mask
	Copy	Selected file or files to internal/external memory (USB)
	Delete	Selected file or files from internal/external memory (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
	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, Points (41 max), Offset, Shape Square/Slope
	Limit Line Advanced	Type (Absolute/Relative), Mirror, Save/Recall
Frequency	Frequency Range	9 kHz to 1.6 GHz, (6 GHz with Option 6)
	Tuning Resolution	1 Hz
	Frequency Reference Aging	±1.0 ppm/year
	Frequency Reference Accuracy	±120 ppb (25°C±25°C) + aging, <50 ppb + aging with GPS lock
	Frequency Span	10 Hz to 1.6 GHz including zero span (10 Hz to 6 GHz with Option 6)
	Sweep Time	100 ms, 7 μs to 3600 seconds in zero span
	Sweep Time Accuracy	±2% in zero span
Bandwidth	Resolution Bandwidth (RBW)	10 Hz to 3 MHz in 1–3 sequence ±10% (1 MHz max in zero-span) (–3 dB bandwidth)
	Video Bandwidth (VBW)	1 Hz to 3 MHz in 1–3 sequence (–3 dB bandwidth) (auto or manually selectable)
	RBW with Quasi-Peak Detection	200 Hz, 9 kHz, 120 kHz (–6 dB bandwidth)
	VBW with Quasi-Peak Detection	Auto VBW is On, RBW/VBW = 1
Spectral Purity	SSB Phase Noise @ 1 GHz	–100 dBc/Hz, –110 dBc/Hz (typ.) @ 10 kHz offset –105 dBc/Hz, –112 dBc/Hz (typ.) @ 100 kHz offset –115 dBc/Hz, –121 dBc/Hz (typ.) @ 1 MHz offset

Continued on next page

Amplitude Ranges	Dynamic Range	>95 dB (2.4 GHz), 2/3 (TOI-DANL) in 10 Hz RBW			
	Measurement Range	DANL to +26 dBm (≥ 50 MHz) DANL to 0 dBm (< 50 MHz)			
	RF In Port Damage Level	+33 dBm peak, ± 50 VDC, Maximum Continuous Input (≥ 10 dB attenuation)			
	Display Range	1 to 15 dB/div in 1 dB steps, ten divisions displayed			
	Reference Level Range	-150 to +30 dBm			
	Attenuator Resolution	0 to 55 dB, 5.0 dB steps			
	Amplitude Units	Log Scale Modes: dBW, dBm, dB μ W, dBV, dBmV, dB μ V, dBA, dBmA, dB μ A Linear Scale Modes: nV, μ V, mV, V, kV, nW, μ W, mW, W, kW, nA, μ A, mA, A			
Amplitude Accuracy	(Single sine wave, input power <Ref level and >DANL, Attenuation: Auto, Ambient: -10°C to +50°C after 30 minute warm-up)				
	9 kHz to 100 kHz	± 2.0 dB (typ.) (Preamp Off)			
	>100 kHz to 4.0 GHz	± 1.25 dB, ± 0.5 dB (typ.)			
	>4.0 GHz to 6 GHz	± 1.50 dB, ± 0.5 dB (typ.)			
Displayed Average Noise Level (DANL)		Preamp Off (Reference Level -20 dBm)		Preamp On (Reference Level -50 dBm)	
	(RBW = 1 Hz, 0 dB attenuation)	Maximum	Typical	Maximum	Typical
	10 MHz to 2.4 GHz	-141 dBm	-146 dBm	-157 dBm	-162 dBm
	>2.4 GHz to 4 GHz	-137 dBm	-141 dBm	-154 dBm	-159 dBm
	>4 GHz to 5 GHz	-134 dBm	-138 dBm	-150 dBm	-155 dBm
	>5 GHz to 6 GHz	-126 dBm	-131 dBm	-143 dBm	-150 dBm
	(RBW = 10 Hz, 0 dB attenuation)				
	10 MHz to 2.4 GHz	-131 dBm	-136 dBm	-147 dBm	-152 dBm
	>2.4 GHz to 4 GHz	-127 dBm	-131 dBm	-144 dBm	-149 dBm
	>4 GHz to 5 GHz	-124 dBm	-128 dBm	-140 dBm	-145 dBm
>5 GHz to 6 GHz	-116 dBm	-121 dBm	-133 dBm	-140 dBm	
Spurs	Residual Spurious	<-90 dBm (RF input terminated, 0 dB input attenuation, >10 MHz)			
	Input-Related Spurious	<-75 dBc (0 dB attenuation, -30 dBm input, span <1.7 GHz, carrier offset >4.5 MHz)			
	Exceptions, typical	<-70 dBc @ <2.5 GHz with 2072.5 MHz Input <-68 dBc @ F1 - 280 MHz with F1 Input <-70 dBc @ F1 + 190.5 MHz with F1 Input <-52 dBc @ 7349 - 2F2 MHz with F2 Input, where F2 <2437.5 MHz <-55 dBc @ 190.5 \pm F1/2 MHz, F1 <1 GHz			
Third-Order Intercept (TOI)	(Preamp Off (-20 dBm tones, 100 kHz apart, 10 dB attenuation)				
	800 MHz	+16 dBm			
	2400 MHz	+20 dBm			
	200 MHz to 2200 MHz	+25 dBm (typ.)			
	>2.2 GHz to 5.0 GHz	+28 dBm (typ.)			
>5.0 GHz to 6.0 GHz	+33 dBm (typ.)				
Second Harmonic Distortion	(Preamp Off, 0 dB input attenuation, -30 dBm input)				
	50 MHz	-56 dBc			
	>50 MHz to 200 MHz	-60 dBc (typ.)			
>200 MHz to 3000 MHz	-70 dBc (typ.)				
VSWR	2:1 (typ.)				

Vector Network Analyzer

Definitions

All specifications and characteristics apply under the following conditions, unless otherwise stated:

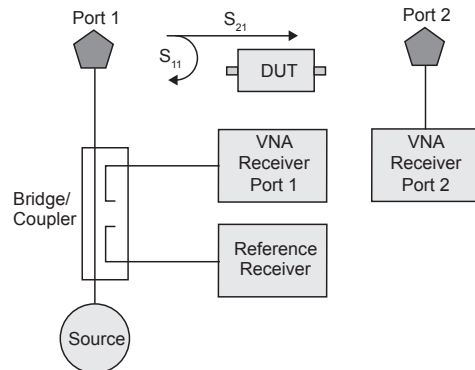
- After 15 minutes of warm-up time, where the instrument is left in the ON state.
- Temperature range is 23°C \pm 5°C.
- All specifications apply when using internal reference.
- All specifications subject to change without notice. Please visit www.anritsu.com for most current data sheet.
- Typical performance is the measured performance of an average unit.
- Recommended calibration cycle is 12 months.

Frequency

Frequency Range: 500 kHz to 1.6 GHz
(500 kHz to 6.0 GHz with Option 16)
Frequency Accuracy: 2.5 ppm
Frequency Resolution: 1 Hz

Block Diagram

As shown in the following block diagram, the LMR Master has a 2-port, 1-path architecture that automatically measures 2 S-parameters with error-correction precision inherent to VNA operation.



The above illustration is a simplified block diagram of LMR Master's 2-port, 1-path architecture. The magnitude and phase information gained from vector network data enables the LMR Master to make significant error corrections and provide improved field measurements.

Test Port Power (typ.)

LMR Master supports selection of either High, Default, or Low test port power. Changing power after calibration can degrade the calibrated performance. Typical test port power by bands is shown in the following table.

Frequency Range	High Port Power	Default Port Power	Low Port Power
500 kHz to ≤3 GHz	+3 dBm	-5 dBm	-25 dBm
3 GHz to ≤6 GHz	0 dBm	-5 dBm	-25 dBm

Transmission Dynamic Range

The transmission dynamic range (the difference between test port power and noise floor) using 10 Hz IF Bandwidth and High Port Power is shown in the following table.

Frequency Range	Dynamic Range
2 MHz to ≤4 GHz	100 dB
4 GHz to ≤6 GHz	90 dB

Sweep Speed (Typ.)

The typical sweep speed for IF Bandwidth of 100 Hz, 1001 data points, and single display is shown in the following table. The two-receiver architecture will simultaneously collect S₂₁ and S₁₁ in a single sweep.

Frequency Range	Typical Sweep Speed
500 kHz to 6 GHz	850 μs/point

Noise Floor (Typ.)

Frequency Range	Typical Noise Floor
500 kHz to 3 GHz	-100 dBm
3 GHz to 4 GHz	-103 dBm
4 GHz to 6 GHz	-93 dBm

Temperature Stability (S₁₁ or S₂₁, Short, 23°C±5°C)

Frequency Range	Magnitude (typ.)	Phase (typ.)
500 kHz to 6 GHz	0.020 dB/°C	0.200 deg/°C

Interference Immunity

On-Channel	+17 dBm at >1.0 MHz from carrier frequency
On-Frequency	0 dBm within ±10 kHz of the carrier frequency

Measurements

Measurement Parameters	S ₁₁ , S ₂₁
Number of Traces	Four: TR1, TR2, TR3, TR4
Trace Format	Single, Dual, Tri, Quad. When used with Number of Traces, overlays are possible including a Single Format with Four trace overlays.
Graph Types	Log Magnitude, SWR, Phase, Real, Imaginary, Group Delay, Smith Chart, Log Mag/2 (1-Port Cable Loss), Linear Polar, Log Polar, Real Impedance, Imaginary Impedance
Domains	Frequency Domain, Distance Domain
Frequency	Start Frequency, Stop Frequency, Center Frequency, Span
Distance	Start Distance, Stop Distance
Frequency Sweep Type: Linear	Single Sweep, Continuous
Data Points	2 to 4001 (arbitrary setting); data points can be reduced without recalibration.
Limit Lines	Upper, Lower, 10 segmented Upper, 10 segmented Lower
Test Limits	Pass/Fail for Upper, Pass/Fail for Lower, Limit Audible Alarm
Data Averaging	Sweep-by-sweep
Smoothing	0 to 20%
IF Bandwidth	10, 20, 50, 100, 200, 500, 1 k, 2 k, 5 k, 10 k, 20 k, 50 k, 100 k (Hz)
Reference Plane	The reference planes of a calibration (or other normalization) can be changed by entering a line length. Assumes no loss, flat magnitude, linear phase, and constant impedance.
Auto Reference Plane Extension	Instead of manually entering a line length, this feature automatically adjusts phase shift from the current calibration (or other normalization) to compensate for external cables (or test fixtures). Assumes no loss, flat magnitude, linear phase, and constant impedance.
Frequency Range	Frequency range of the measurement can be narrowed (reduces number of data points) within the calibration range without recalibration. When Interpolation is On, narrowed frequency range will retain original number of data points.
Group Delay Aperture	Defined as the frequency span over which the phase change is computed at a given frequency point. The aperture can be changed without recalibration. The minimum aperture is the frequency range divided by the number of points in calibration and can be increased to 20% of the frequency range.
Group Delay Range	<180° of phase change within the aperture
Trace Memory	A separate memory for each trace can be used to store measurement data for later display. The trace data can be saved and recalled.

Continued on next page

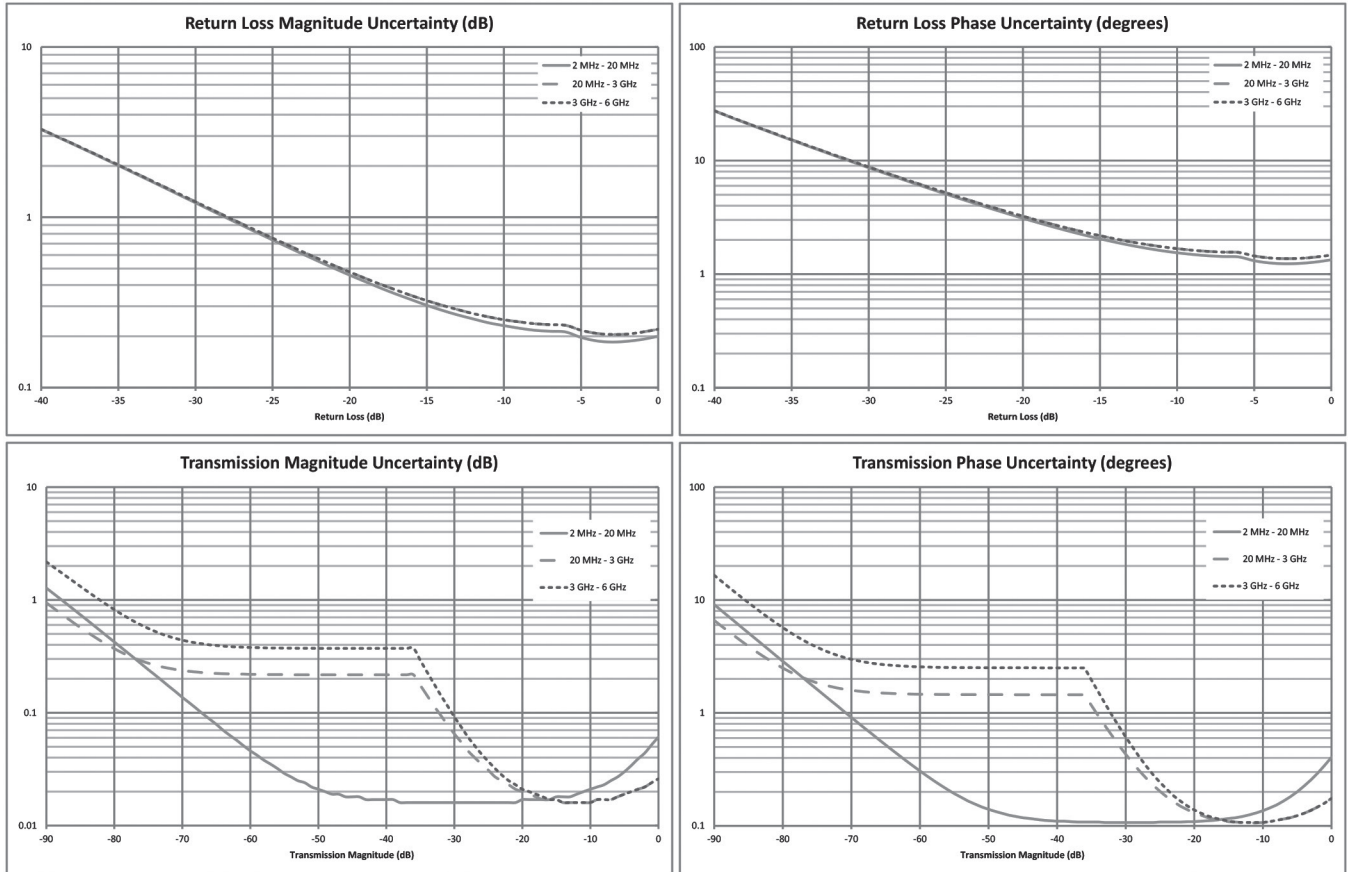
Trace Math	Complex trace math operations of subtraction, addition, multiplication, or division are provided.
Number of Markers	12, arbitrary assignments to any trace
Marker Types	Reference, Delta
Marker Readout Styles	Log Mag, Cable Loss (Log Mag/2), Log Mag and Phase, Phase, Real and Imaginary, SWR, Impedance, Admittance, Normalized Impedance, Normalized Admittance, Polar Impedance, and Group Delay
Marker Search	Peak Search, Valley Search, Find Marker Value
Calibration Type	Full S_{11} , 1-Path, 2-Port (S_{11} and S_{21}), Response S_{11} , Response S_{21}
Calibration Methods	Short-Open-Load-Through (SOLT)
Calibration Standards' Coefficients	Coax: N-Connector, K-Connector, 7/16, TNC, SMA, and four User Defined
Cal Correction Toggle	On/Off
Interpolation	On/Off (Interpolation may be activated before or after calibration)
Impedance Conversion (Smith Chart)	Support for 50Ω and 75Ω are provided.
Units	Meters, Feet
Bias Tee Settings	Internal, Off
Timebase Reference	Internal
File Storage Types	Measurement, Setup (with CAL), Setup (without CAL), S2P (Real/Imag), S2P (Lin Mag/Phase), S2P (Log Mag/Phase), JPEG
Languages	English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, and Portuguese

**Corrected System Performance and Uncertainties — High Port Power, N-Type
Measurement Accuracy* (OSLN50A-8 or OSLNF50A-8, TOSLN50A-8 or TOSLNF50A-8)**

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
<20 MHz	≥42	≥30	±0.01	±0.01
20 MHz to <3 GHz	≥42	≥30	±0.05	±0.01
3 GHz to 6 GHz	≥42	≥30	±0.05	±0.01

*: Full 1-path, 2-port forward path calibration with isolation, high power, 10 Hz IFBW, no averaging, 10 minute warm-up. OSLN50A-8, OSLNF50A-8, TOSLN50A-8, or TOSLNF50A-8 calibration kit. Reflection and Transmission Tracking are typical.

Corrected Measurement Uncertainty (Transmission from Port 1 to Port 2)

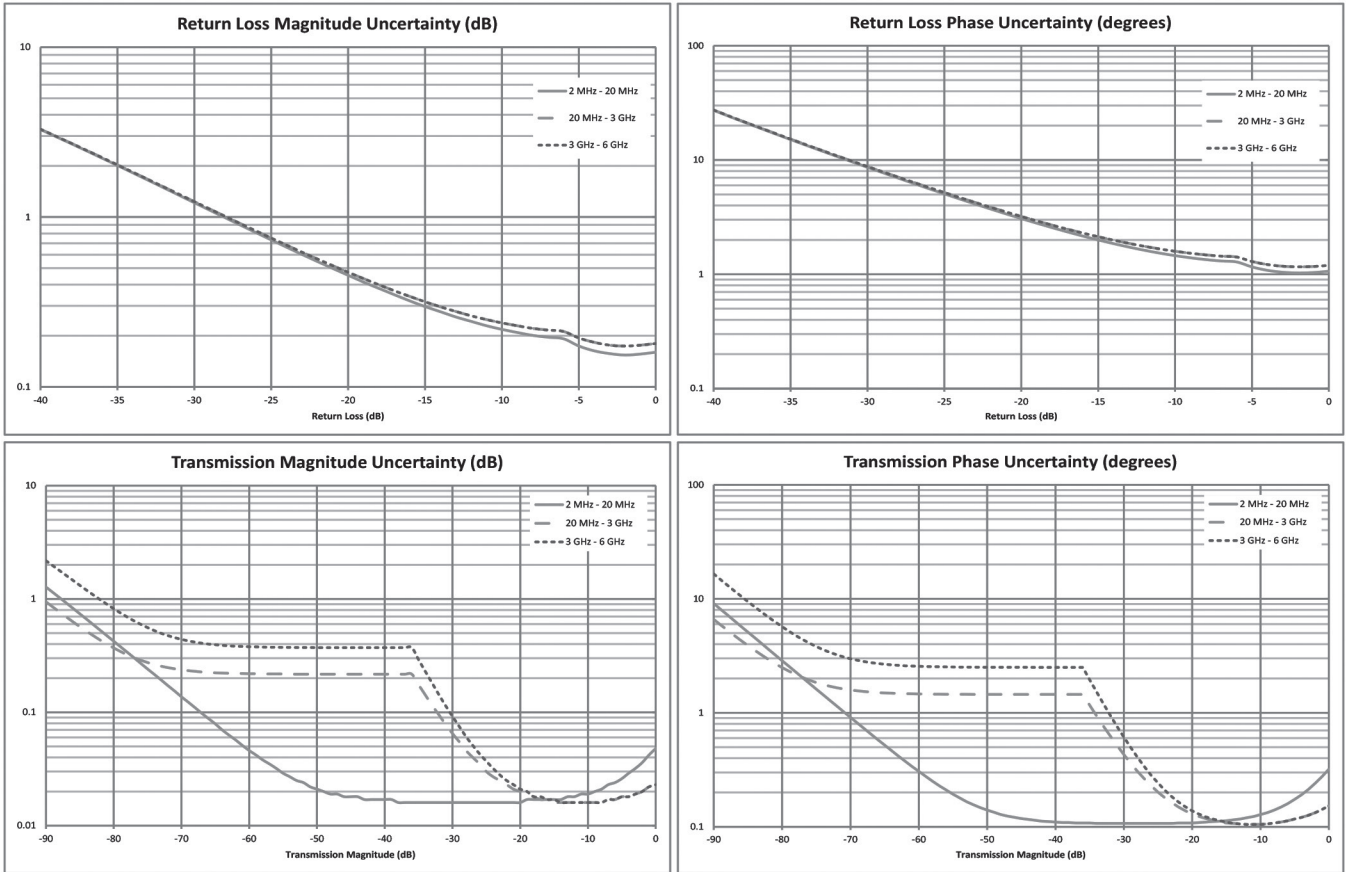


**Corrected System Performance and Uncertainties — High Port Power, K-Type
Measurement Accuracy* (OSLK50A-20 or TOSLKF50A-20. Compatible with 3.5 mm and SMA connectors)**

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
<20 MHz	≥42	≥33	±0.01	±0.01
20 MHz to <3 GHz	≥42	≥33	±0.05	±0.01
3 GHz to 6 GHz	≥42	≥33	±0.05	±0.01

*: Full 1-path, 2-port forward path calibration with isolation, high power, 10 Hz IFBW, no averaging, 10 minute warm-up. TOSLK50A-20, TOSLKF50A-20 calibration kit. Reflection and Transmission Tracking are typical.

Corrected Measurement Uncertainty (Transmission from Port 1 to Port 2)



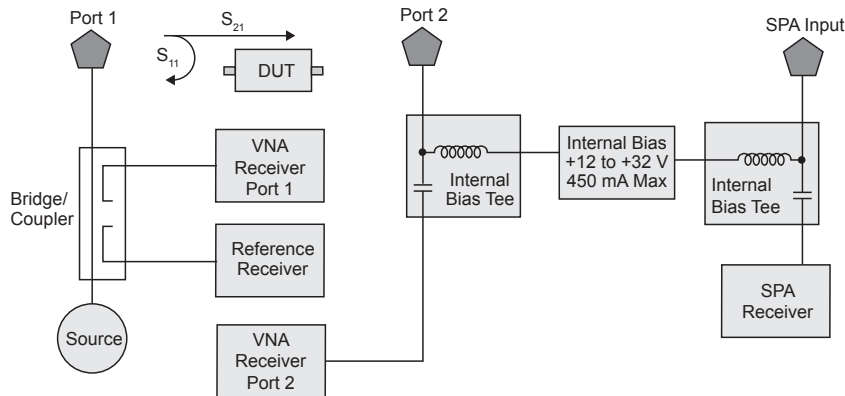
Bias Tee (Option 10)

For tower mounted amplifier tests, the S412E with optional internal bias tees can supply both DC and RF signals on the center conductor of the cable during measurements. For frequency sweeps in excess of 2 MHz, the LMR Master can supply internal voltage control from +12 V to +32 V in 0.1 V steps up to 450 mA. Bias is available on VNA Port 2 and the SPA Input (RF In) for use with antenna pre-amplifiers.

Bias Tee Specifications

Frequency Range	2 MHz to 4 GHz/6 GHz at VNA Port 2
Internal Voltage/Current	+12 V to +32 V at 450 mA (Steady state)
Internal Resolution	0.1 V
Bias Tee Selections	Internal, Off

The Compact LMR Master offers optional integrated bias tee for supplying DC plus RF to the DUT as shown in this simplified block diagram.



Vector Voltmeter (Option 15)

A phased array system relies on phase matched cables for nominal performance. For this class of application, the LMR Master offers this special software mode to simplify phase matching cables at a single frequency. The similarity between the popular vector voltmeter and this software mode ensures minimal training is required to phase match cables. Operation is as simple as configuring the display for absolute or relative measurements. The easy-to-read large fonts show either reflection or transmission measurements using impedance, magnitude, or VSWR readouts. For instrument landing system (ILS) or VHF Omni-directional Range (VOR) applications, a table view improves operator efficiency when phase matching up to twelve cables.

The S412E solution is superior because the signal source is included internally, precluding the need for an external signal generator.

CW Frequency Range	500 kHz to 1.6 GHz (6 GHz with Option 16)
Measurement Display	CW, Table (Twelve Entries, Plus Reference)
Measurement Types	Return Loss, Insertion
Measurement Format	dB/VSWR/Impedance

Distance Domain

Distance-to-Fault Analysis is a powerful field test tool to analyze cables for faults, including minor discontinuities that may occur due to a loose connection, corrosion, or other aging effects. By using Frequency Domain Reflectometry (FDR), the VNA's DTF mode exploits a user-specified band of full power operational frequencies (instead of DC pulses from TDR approaches) to more precisely identify discontinuities. The VNA converts S-parameters from frequency domain into distance domain on the horizontal display axis, using a mathematical computation called Inverse Fourier Transform. Connect a reflection at the opposite end of the cable and the discontinuities appear versus distance to reveal any potential maintenance issues. When access to both ends of the cable is convenient, a similar distance domain analysis is available on transmission measurements. Distance Domain will improve your productivity with displays of the cable in terms of discontinuities versus distance. This readout can then be compared against previous measurements (from stored data) to determine whether any degradations have occurred since installation (or the last maintenance activity). More importantly, you will know precisely where to go to fix the problem and minimize or prevent downtime of the system.

Maximum Distance (4001 data points, 1.6 GHz span)	374.9 m (1,229.9 ft)
Maximum Distance (4001 data points, 6.0 GHz span)	99.9 m (327.75 ft)
Minimum Distance Resolution (1.6 GHz span)	18.7 cm (7.36 in)
Minimum Distance Resolution (6.0 GHz span)	4.99 cm (1.97 in)
Measurement Display	Return Loss, VSWR
Measurement Format	dB, VSWR

**Interference Analyzer (Option 25)** (GPS Option 31 recommended)

Measurements	Spectrum	Field Strength Occupied Bandwidth Channel Power Adjacent Channel Power Ratio (ACPR) AM/FM/SSB Demodulation (Wide/Narrow FM, Upper/Lower SSB - audio out only) Carrier-to-Interference ratio (C/I)
	Spectrogram	Collect data up to 72 hours
	Signal Strength	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
	Signal-to-Noise Ratio (SNR)	> 10 dB
	Interference Mapping	Triangulate location of interference with on-display maps
	Application Options	Bias-Tee (On/Off) Impedance (50Ω, 75Ω, Other) Compatible with the InterferenceHunter™ MA2700A Handheld Direction Finding System

GPS Receiver (Option 31) (Antenna sold separately)

Setup	On/Off, Antenna Voltage 3.3 V/5.0 V, GPS Info
GPS Time/Location Indicator	Time, Latitude, Longitude and Altitude on display Time, Latitude, Longitude and Altitude with trace storage
GPS-Enhanced Frequency Accuracy	<50 ppb with GPS On, 3 minutes after satellite is locked in selected mode (Applies to Spectrum Analyzer, Interference Analyzer, LMR Signal Analyzers)
Connector	SMA (f)

Ethernet Connectivity

Connector	RJ45
LAN Speed	10 Mbps
Mode	Static, DHCP
Static IP settings	IP address Subnet Mask IP Gateway
Remote Control	Remote capability provided with Web Remote Control and SCPI programming
Data Upload	With Line Sweep Tools through Ethernet connection

Coverage Mapping (Options 431)

Measurements	Indoor Mapping	RSSI, ACPR
	Outdoor Mapping	RSSI, ACPR
Setup Parameters	Frequency	Center/Start/Stop, Span, Freq Step, Signal Standard, Channel #, Channel Increment
	Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
	Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
	BW	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/VBW
	Measurement Setup	ACPR, RSSI
	Point Distance/Time Setup	Repeat Type Time Distance
	Save Points Map	Save KML, JPEG, Tab Delimited
Recall Points Map	Recall Map, Recall KML Points only, Recall KML Points with Map, Recall Default Grid	

Channel Scanner (Option 27)

Number of Channels	1 to 20 Channels
Measurements	Graph/Table, Max Hold (On/5 sec/Off), Freq/Channel, Current/Max, Single/Dual Color
Scanner	Scan Channels, Scan Frequencies, Scan Customer List, Scan Script Master™
Amplitude	Reference Level, Scale
Custom Scan	Signal Standard, Channel, # of Channels, Channel Step Size, Custom Scan
Frequency Accuracy	±10 Hz + Frequency Reference
Measurement Range	-110 to +26 dBm
Application Options	Bias-Tee (On/Off), Impedance (50Ω, 75Ω, Other)

**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	P-SS, S-SS, and RS are measured and displayed based on each Cell ID received
	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: 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 OTA (Option 546)	

CW Signal Generator

Setup Parameters	Generator	On/Off
	Tx Output Level	0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
	Tx Pattern	CW, AM w/ 1 kHz, FM w/ 1 kHz
RF Characteristics	Power Level Accuracy	2.0 dB (CW Pattern, temperature range 15°C to 35°C, -120 to 0 dBm) (typ.)
	Frequency Range	500 kHz to 1.6 GHz
	Frequency Accuracy	Same as Spectrum Analyzer

Internal Power Meter

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 1.6 GHz (Standard), 10 MHz to 6 GHz (Option 6)
Span	1 kHz to 100 MHz
Display Range	-140 to +30 dBm, ≤ 40 dB span
Measurement Range	-120 to +26 dBm
Offset Range	0 to +100 dB
VSWR	2:1 (typ.)
Maximum Power	Same as RF In Damage Level
Accuracy	Same as Spectrum Analyzer
Application Options	Impedance (50Ω, 75Ω, Other)

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 GHz (MA24108A) 10 MHz to 18 GHz (MA24118A) 10 MHz to 26 GHz (MA24126A)	10 MHz to 8/18 GHz	10 MHz to 33/40/50 GHz
Connector	Type N (f), 50Ω	Type N (m), 50Ω	Type N (m), 50Ω (MA24108A/18A) Type K (m), 50Ω (MA24126A)	Type N (m), 50Ω	Type K (m), 50Ω (33/40 GHz) Type V (m), 50Ω (50 GHz)
Dynamic Range	+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)	-60 to +20 dBm (1 nW to 100 mW)	-70 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*1	±0.16 dB*2	±0.18 dB*3	± 0.17 dB*4	± 0.17 dB*5
Data sheet (for complete specifications)	11410-00621	11410-00424	11410-00504	11410-00841	11410-00906

*1: 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.

*2: Total RSS measurement uncertainty (0°C to 50°C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.

*3: Expanded uncertainty with K = 2 for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.

*4: 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.

*5: Includes linearity over temperature uncertainties, but not the effects of calibration factor, mismatch, zero set and drift, and noise.

**NBFM Analyzer and Coverage Mapping**

Measurements	
NBFM Analyzer	NBFM Talk-Out Coverage (requires Option 31 GPS and a suitable GPS antenna)
Carrier Power Carrier Frequency Frequency Error FM Deviation (Peak, Average, RMS) Modulation Rate SINAD Quieting THD Occupied Bandwidth (% Int Pwr or >dBc method) Decoded CTCSS/DCS/DTMF Encoded CTCSS/DCS/DTMF	RSSI THD SINAD External SINAD
Graphs	
NBFM Analyzer	NBFM Talk-Out Coverage
Spectrum Audio Spectrum Audio Waveform/Scope Summary Display	Outdoor measured values are overlaid on a geo-tagged map, or displayed on a value vs. time graph. Captured data is exportable to both KML and CSV text (Requires Option 31 GPS and a suitable GPS antenna). Indoor measured values are referenced by creating touchscreen points on a floorplan.

Setup Parameters	Frequency	Receive Frequency, Transmit Frequency, Span, Offset
	Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range
	Setup	Tone Type (CTCSS, DCS, DTMF)
	Filters	High Pass (300 Hz, 3 kHz, None) and Low Pass (300 Hz, 3 kHz, 15 kHz, None) De-emphasis On/Off
	Measurement	NBFM Analyzer, NBFM Coverage, Quieting, SINAD
	Auto Scan	Detection and frequency lock when RF In > +10 dBm, FM or CW signal
	Tx Patterns	CW, FM w/ CTCSS/DCS/DTMF, FM w/ CTCSS/DCS/DTMF + Tone Modulation, FM + Tone Modulation
	NBFM Analyzer	Active Graph, Maximize Active Trace, Graph Type, Audio Span, Audio Sweep Time, Occupied Bandwidth, Frequency Display (Carrier or Error)
	Graph Type	Spectrum, Audio Spectrum, Audio Waveform/Scope, Summary Display
RF Measurements (temperature range 15°C to 35°C)	NBFM Coverage (Requires Option 31 GPS)	Display Type (Map or Time Graph) USB Memory File Format: .nbfm, .kml, both Log data On/Off
	Received Power dBm	±1.25 dB, ±0.5 dB (typ.)
	Frequency Error Hz	±10 Hz + Frequency Reference
	SINAD/Quieting	Audio In port conforms to TIA-603-D for input voltage and impedance
	Additional Summary Measurements	Deviation Modulation Rate THD Occupied Bandwidth
Tone Decode	CTCSS/DCS (standard tones per TIA-603-D), DTMF	
Coverage Measurements	RSSI, SINAD, THD	

NBFM Signal Generator

Setup Parameters	Generator	On/Off
	TX Output Level	0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
	Frequency Accuracy	Same as Spectrum Analyzer



P25/P25p2 Analyzer and P25/P25p2 Talk-Out Coverage (Options 521 and 522)

Measurements	
P25/P25p2 Analyzer (Option 521)	P25/P25p2 Talk-Out Coverage (Option 522, requires Option 31 and GPS)
Received Power Frequency Error Modulation Fidelity NAC (hex) Symbol Rate Error BER (1011 for P25, 1031 for P25p2), O.153, Voice, and Control Channel) Symbol Deviation Hexadecimal Display of Control Channel Traffic	BER RSSI Modulation Fidelity
Graphs	
P25/P25p2 Analyzer (Option 521)	P25/P25p2 Talk-Out Coverage (Option 522, requires Option 31 and GPS)
Constellation (P25 only) Linear Constellation Spectrum [Spans (kHz) = 25, 50, 100, 500, 1000, 5000] Histogram Eye Diagram Demodulation Summary Display Base Station Control Channel Summary Displays (Active Control Channel, Band Plan, Backup Control Channel, Adjacent Site Summary) TDMA Power Profile (P25p2 only)	Outdoor measured values are overlaid on a geo-tagged map, or displayed on a value vs time graph, and are exportable to both KML and CSV text (requires Option 31 GPS and a suitable GPS antenna). Indoor measured values are referenced by creating touchscreen points on a floorplan.

Standards Compliance	P25: Relevant sections of TIA-102.CAAA-C P25 Phase 2: Relevant sections of TIA-102.CCAA	
Setup Parameter	Frequency	Receive Frequency, Transmit Frequency, Span, Offset
	Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range
	Setup	P25 Modulation Types: C4FM, CQPSK P25 BER patterns: 1011 Hz, O.153 (V.52), Voice, Control Channel P25 Phase 2 Modulation Types: Base Station (H-DQPSK) & Mobile Station (H-CPM) P25 Phase 2 BER patterns: 1031 Hz, Silence, Voice, Control Channel Averaging, WACN ID, System ID, Color Code, Descrambling (On/Off)
	Measurement	P25 Analyzer, P25 Coverage
	P25/P25p2 Analyzer	Active Graph, Maximize Active Trace, Graph Type, Symbol Span
	Graph Type	Constellation (P25 only), Linear Constellation, Spectrogram, Histogram, Eye Diagram, Demodulation Summary Display, Base Station Control Channel Summary Displays (Active Control Channel, Band Plan, Backup Control Channel, Adjacent Site Summary)
	Eye Diagram Symbol Span	2, 3, 4, 5
	P25/P25p2 Coverage	USB Memory File Format .p25, .kml, both (Option 522, requires Option 31 GPS)
Log Data	On/Off	

RF Measurements (Option 521) (temperature range 15°C to 35°C)

Received Power dBm	±1.25 dB, ±0.5 dB (typ.)
Frequency Error Hz	±10 Hz + Frequency Reference
Additional Summary Measurements	Modulation Fidelity (%) BER/MER (%) Symbol Deviation (Hz) Network Access Code (Hex) Symbol Rate Error (Hz)

Measurements (Option 522)

RSSI, BER, Modulation Fidelity

P25/P25p2 Signal Generator

Setup Parameters	Generator	On/Off
	Tx Output Level	0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
	P25 Tx Patterns	P25: 1011, 1011 Cal, Interference, Silence, Busy, Idle, High Dev, Low Dev, O.153 (v. 52) p25_lsm_1011, 511 (O.153/v.52), 1011_cal, Interference, Silence, Busy, Idle, Fidelity CW, AM and FM
	P25p2 Tx Patterns	Base Station (H-DQPSK): 1031, 1031 Cal, Silence Mobile Station (H-CPM, Selectable timeslot): 1031, 1031 Cal, Silence CW, AM, FM
RF Characteristics	Power Level Accuracy	2.0 dB (CW Pattern, temperature range 15°C to 35°C, -120 to 0 dBm) (typ.)
	Frequency Accuracy	Same as Spectrum Analyzer
	Frequency Range	500 kHz to 1.6 GHz
	P25 Modulation Fidelity	<1.25% max, <0.75% (typ.)
	P25p2 Modulation Fidelity	<2.0% max, <1.75% (typ.)



DMR (MOTOTRBO) Analyzer and DMR Talk-Out Coverage (Options 591 and 592)

Measurements	
DMR (MOTOTRBO) Analyzer (Option 591)	DMR Talk-Out Coverage (Option 592, requires Option 31 and 591)
Received Power Frequency Error Modulation Fidelity Color Code (decimal) RX Timeslot (Base Station only) Symbol Rate Error Symbol Deviation Base Station: 1031, 1031-1 % BER, O.153, O.153-1 % BER, Silence, tsc Mobile Station: 1031, 1031-1 % BER, O.153, O.153-1 % BER, Silence CW, AM, FM Repeater Receiver Sensitivity Test	BER RSSI Modulation Fidelity
Graphs	
DMR (MOTOTRBO) Analyzer (Option 591)	DMR Talk-Out Coverage (Option 592, requires Option 31 and 591)
Constellation Linear Constellation Spectrum [Spans (kHz) = 25, 50, 100, 500, 1000, 5000] Histogram Eye Diagram Summary Display DMR Summary Power Profile	Outdoor measured values are overlaid on a geo-tagged map, or displayed on a value vs. time graph, and are exportable to both KML and CSV text (requires Option 31 GPS and a suitable GPS antenna). Indoor measured values are referenced by creating touchscreen points on a floorplan.

Setup Parameters	Frequency	Receive Frequency, Transmit Frequency, Span, Rx/Tx Coupling, Coupling Offset
	Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range
	Setup	Modulation Type (Base Station, Mobile Station), BER pattern (1031, O.153, Voice, Silence)
	Measurement	DMR Analyzer, DMR Coverage, DMR Bit Capture
	DMR Analyzer	Active Graph, Maximize Active Trace, Graph Type, Symbol Span
	Graph Type	Constellation, Linear Constellation, Spectrogram, Histogram, Eye Diagram, Summary, DMR Summary, Power Profile
	Eye Diagram Symbol Span	2, 3, 4, 5
DMR Coverage (Option 592, requires Option 31 GPS)	USB Memory File Format .dmr2, .kml, both Log data On/Off	

RF Measurements (Option 591) (temperature range 15°C to 35°C)

Received Power dBm	±1.25 dB, ±0.5 dB (typ.)
Frequency Error Hz	±10 Hz + Frequency Reference
Summary Measurements	Received Power, Frequency Error, Modulation Fidelity, BER, Symbol Deviation, Color Code, Symbol Rate Error
DMR Summary Measurements	MS ID, Target ID, Talk Group ID, FID, Call Type, Base Station ID

Measurements (Option 592)

RSSI, BER, Modulation Fidelity

DMR Signal Generator

Setup Parameters	Generator	On/Off
	Tx Output Level	0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
	Tx Pattern	Base Station: 1031, 1031-1 % BER, O.153, O.153-1 % BER, Silence, tsc Mobile Station: 1031, 1031-1 % BER, O.153, O.153-1 % BER, Silence CW, AM, FM
RF Characteristics	Power Level Accuracy	2.0 dB (CW Pattern, temperature range 15°C to 35°C, -120 to 0 dBm) (typ.)
	Frequency Range	500 kHz to 1.6 GHz
	Modulation Fidelity	1.25% max, 0.75% (typ.)
	Frequency Accuracy	Same as Spectrum Analyzer

**dPMR Analyzer (Option 573 and 572)**

Measurements	
dPMR RF Analyzer (Option 573)	dPMR Talk-Out Coverage (Option 572, requires Option 31 and 573)
Received Power Frequency Error Modulation Fidelity Symbol Rate Error Symbol Deviation	RSSI Modulation Fidelity
Graphs	
dPMR RF Analyzer (Option 573)	dPMR Talk-Out Coverage (Option 572, requires Option 31 and 573)
Constellation Linear Constellation Spectrum [Spans (kHz) = 25, 50, 100, 500, 1000, 5000] Histogram Eye Diagram Summary Display	Outdoor measured values are overlaid on a geo-tagged map and exportable to both KML and CSV text (requires Option 31 GPS and a suitable GPS antenna). Indoor measured values are referenced by creating touchscreen points on a floorplan.

Setup Parameters	Frequency	Receive Frequency, Transmit Frequency, Span, Offset
	Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range
	Setup	Modulation Bandwidth (6.25 kHz)
	Measurement	dPMR Analyzer, dPMR Coverage
	dPMR Analyzer	Active Graph, Maximize Active Trace, Graph Type, Symbol Span
	Graph Type	Constellation, Linear Constellation, Spectrogram, Histogram, Eye Diagram, Summary
	Eye Diagram Symbol Span	2, 3, 4, 5
dPMR Coverage	USB Memory File Format .dpmr, .kml, both Log data on/off	

RF Measurements (Option 573) (temperature range 15°C to 35°C)

Received Power dBm	±1.25 dB, ±0.5 dB (typ.)
Frequency Error Hz	±10 Hz + Frequency Reference
Additional Summary Measurements	Modulation Fidelity (%) Symbol Deviation (Hz) Symbol Rate Error (Hz)

Measurements (Option 572)

RSSI, Modulation Fidelity

Signal Generator

Setup Parameters	Generator	On/Off
	Tx Output Level	0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
	Tx Pattern	CW, AM, FM, O.153
RF Characteristics	Power Level Accuracy	2.0 dB (CW Pattern, temperature range 15°C to 35°C, -120 to 0 dBm) (typ.)
	Frequency Range	500 kHz to 1.6 GHz
	Frequency Accuracy	Same as Spectrum Analyzer

**NXDN Analyzer and NXDN Talk-Out Coverage (Options 531 and 532)**

Measurements	
NXDN Analyzer (Option 531)	NXDN Talk-Out Coverage (Option 532, requires Option 31 and 531)
Received Power Frequency Error Modulation Fidelity RAN (decimal) Symbol Rate Error BER (1031, O.153, Voice, and Control Channel) Symbol Deviation	BER RSSI Modulation Fidelity
Graphs	
NXDN Analyzer (Option 531)	NXDN Talk-Out Coverage (Option 532, requires Option 31 and 531)
Constellation Linear Constellation Spectrum [Spans (kHz) = 25, 50, 100, 500, 1000, 5000] Histogram Eye Diagram Summary Display	Outdoor measured values are overlaid on a geo-tagged map and exportable to both KML and CSV text (Requires Option 31 GPS and a suitable GPS antenna). Indoor measured values are referenced by creating touchscreen points on a floorplan.

Setup Parameters	Frequency	Receive Frequency, Transmit Frequency, Span, Offset
	Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range
	Setup	Modulation Bandwidth (6.25 kHz and 12.5 kHz), BER pattern (1031, O.153, Voice, Control Channel)
	Measurement	NXDN Analyzer, NXDN Coverage
	NXDN Analyzer	Active Graph, Maximize Active Trace, Graph Type, Symbol Span
	Graph Type	Constellation, Linear Constellation, Spectrogram, Histogram, Eye Diagram, Summary
	Eye Diagram Symbol Span	2, 3, 4, 5
	NXDN Coverage (Option 532, requires Option 31 GPS)	USB Memory File Format .nxdn, .kml, both Log data On/Off

RF Measurements (Option 531) (temperature range 15°C to 35°C)

Received Power dBm	±1.25 dB, ±0.5 dB (typ.)
Frequency Error Hz	±10 Hz + Frequency Reference
Additional Summary Measurements	Modulation Fidelity (%) BER/MER (%) Symbol Deviation (Hz) Radio Access Number (RAN) Decimal Symbol Rate Error (Hz)

Measurements (Option 532)

RSSI, BER, Modulation Fidelity

NXDN Signal Generator

Setup Parameters	Modulation Bandwidth	6.25 kHz, 12.5 kHz
	Generator	On/Off
	Tx Output Level	0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
	Tx Patterns (9600 and 4800)	1031, O.153 (v. 52), High Dev, Low Dev, UDCH Pattern 10, CAC, 1031 Hz DTS, FACCH3 DTS, Framed PN9, 1031 Cal. CW, AM, FM
RF Characteristics	Power Level Accuracy	2.0 dB (CW Pattern, temperature range 15°C to 35°C, -120 to 0 dBm) (typ.)
	Frequency Range	500 kHz to 1.6 GHz
	Modulation Fidelity	1.25% max
	Frequency Accuracy	Same as Spectrum Analyzer

TETRA Analyzer and TETRA Coverage Mapping (Options 581 and 582)

Measurements	
TETRA Analyzer (Option 581)	TETRA Coverage (Option 582, requires Option 31 and 581)
Received Power Frequency Error Vector Error, RMS, and Peak Bit Error Rate (BER) Residual Carrier Magnitude IQ Imbalance Magnitude & Phase Error Base Station Extended Color Code Base Station Receiver Sensitivity Test Symbol Rate Error	RSSI BER RMS Vector Error (EVM)
Graphs	
TETRA Analyzer (Option 581)	TETRA Coverage (Option 582, requires Option 31 and 581)
Constellation Spectrum [Spans (kHz) = 25, 50, 100, 500, 1000, 5000] Eye Diagram Summary Display TETRA Summary	Outdoor measured values are overlaid on a geo-tagged map and exportable to both KML and CSV text (requires Option 31 GPS and a suitable GPS antenna). Indoor measured values are referenced by creating touchscreen points on a floorplan.

Setup Parameters	Frequency	Receive Frequency, Tx Frequency, Rx Coupling, Coupling Offset, Span
	Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range, Tx Output Lvl, Tx Power Offset, Units
	Setup	Mod Type, Rx Pattern, Tx Pattern, Squelch Lvl, Numeric Averaging
	Measurements	TETRA Analyzer, TETRA Coverage, TETRA BS Sensitivity
	TETRA Analyzer	Active Graph, Maximize Active Graph, Graph Type, Symbol Span
	Graph Type	Constellation, Spectrogram, Eye Diagram, Summary, TETRA Summary
	Eye Diagram Symbol Span	2, 3, 4, 5
TETRA Coverage (Option 582, requires Option 31 GPS)	USB Memory File Format .tetra, .kml, or both Log data On/Off	

RF Measurements (Option 581) (temperature range 15°C to 35°C)

Received Power dBm	±1.25 dB, ±0.5 dB (typ.)
Frequency Error Hz	±10 Hz + Frequency Reference
Additional Summary Measurements	Vector Error, RMS and Peak (%) BER Residual Carrier Magnitude (%) IQ Imbalance (dB) Phase Error Degrees Magnitude Error (%) Symbol Rate Error (Hz)
TETRA Summary Measurements	Mobile Color Code (Decimal) Mobile Network Code (Decimal) Base Station Color Code (Decimal) Base Station Extended Color Code (Hex) Location Area Code (Decimal) Mobile Station Maximum Transmit Power (dBm)

Measurements (Option 582)

RSSI, BER, Error Vector Magnitude

TETRA Signal Generator

Setup Parameters	Modulation Type	π/4 (Pi/4) DQPSK
	Generator	On/Off
	Tx Output Level	0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
	Base Station Test Patterns	tetra_bs_idle_unallocPCH tetra_bs_busy_allocPCH T1_TCH_7p2 (Airbus TB3, Hytera, Sepura, Motorola, ETELM NeTIS)
RF Characteristics	Power Level Accuracy	2.0 dB (CW Pattern, temperature range 15°C to 35°C, -120 to 0 dBm) (typ.)
	Frequency Range	500 kHz to 1.6 GHz
	EVM	3.5% max
	Frequency Accuracy	Same as Spectrum Analyzer



PTC Analyzer and PTC Talk-Out Coverage (Options 721 and 722)

Measurements	
PTC Analyzer (Option 721)	PTC Talk-Out Coverage (Option 722, requires Option 31 and 721)
Received Power Burst Power Peak Envelope Power Frequency Error $\pi/4$ DQPSK: Error Vector Magnitude, BER, IQ Imbalance, Phase Error, Magnitude Error, Symbol Rate Error	BER RSSI Modulation Fidelity
Graphs	
PTC Analyzer (Option 721)	PTC Talk-Out Coverage (Option 722, requires Option 31 and 721)
Constellation Linear Constellation Spectrum [Spans (kHz) = 25, 50, 100, 500, 1000, 5000] Histogram Eye Diagram Summary Display	Outdoor measured values are overlaid on a geo-tagged map, or displayed on a value vs time graph, and are exportable to both KML and CSV text (requires Option 31 GPS and a suitable GPS antenna). Indoor measured values are referenced by creating touchscreen points on a floorplan.

Setup Parameters	Frequency	Receive Frequency, Transmit Frequency, Span, Offset
	Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range
	Setup	RX Pattern (O.153/V.52, PN9 Normal), Symbol Rate (Half Rate 8 ksps, Full Rate 16 ksps), TX Pattern (O.153 Continuous, PN9 Normal Types 1 - 4, PN9 Normal Continuous), CW, AM 1 kHz tone, FM 1 kHz tone
	Measurement	PTC-ITCR Analyzer, PTC-ITCR Coverage
	PTC-ITCR Analyzer	Active Graph, Maximize Active Trace, Graph Type, Symbol Span
	Graph Type	Constellation, Linear Constellation, Spectrogram, Histogram, Eye Diagram, Summary
	Eye Diagram Symbol Span	2, 3, 4, 5
	PTC-ITCR Coverage (Option 722)	USB Memory File Format .ptc, .kml, both (requires Option 31 and 731)
Log data	On/Off	

RF Measurements (Option 721) (temperature range 15°C to 35°C)

Received Power dBm	± 1.25 dB, ± 0.5 dB (typ.)
Burst Power dBm	± 1.25 dB, ± 0.5 dB (typ.)
Peak Envelope Power dBm	± 1.25 dB, ± 0.5 dB (typ.)
Frequency Error Hz	± 10 Hz + Frequency Reference
Additional Summary Measurements	Error Vector Magnitude (%) BER (%) IQ Imbalance (dB) Phase Error (degrees) Magnitude Error (%) Symbol Rate Error (Hz)

Measurements (Option 722)

RSSI, BER, Modulation Fidelity

PTC Signal Generator

Setup Parameters	Modulation Type	$\pi/4$ DQPSK
	Symbol Rate (ksps)	8 (Half Rate), 16 (Full Rate)
	Generator	On/Off
	Tx Output Level	0.1 dB resolution, 0 to -130 dBm (spec to -120 dBm)
	Tx Pattern	PN9 Continuous, PN9 Burst, CW, AM, FM
RF Characteristics	Power Level Accuracy	2.0 dB (CW Pattern, temperature range 15°C to 35°C, -120 to 0 dBm) (typ.)
	Frequency Range	500 kHz to 1.6 GHz
	EVM	3.5% max.
	Frequency Accuracy	Same as Spectrum Analyzer



AM/FM/PM Signal Analyzers (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 Bandwidth	AM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	FM/PM Rate RMS Deviation (Pk-Pk)/2 Deviation SINAD* THD* Distortion/Total Vrms*	AM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	FM/PM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	RMS Depth (AM) Peak + Depth Peak - Depth (Pk-Pk)/2 Depth Carrier Power Carrier Frequency Occupied Bandwidth AM Rate SINAD* THD* Distortion/Total Vrms*	RMS Deviation (FM/PM) Peak + Depth Peak - Depth (Pk-Pk)/2 Depth Carrier Power Carrier Frequency Occupied Bandwidth AM Rate SINAD* THD* Distortion/Total Vrms*

*: Requires Sinewave modulation

Setup Parameters	Frequency	Center Freq, Span, Freq Step, Signal Standard, Channel, Channel Increment, Set Carrier Freq
	Amplitude	Scale, Power Offset, Adjust Range
	Setup	Demod Type (AM, FM, PM), IFBW, Auto IFBW
	Measurements	RF Spectrum AM/FM/PM, Audio Spectrum (AM/FM/PM), Audio Waveform (AM/FM/PM), Summary (AM/FM/PM), Average
	Marker	On/Off, Delta, Peak Search, Marker Freq to Center, Marker to Ref Lvl, Marker Table, All Markers Off
Specifications	AM	Modulation Rate: ± 1 Hz (<100 Hz), $\pm 2\%$ (>100 Hz) Depth: $\pm 5\%$ for modulation rates 10 Hz to 100 kHz
	FM	Modulation Rate: ± 1 Hz (<100 Hz); $\pm 2\%$ (100 Hz to 100 kHz) Deviation Accuracy: $\pm 5\%$ (100 Hz to 100 kHz, IFBW must be greater than 95% occupied BW)
	PM	Modulation Rate: ± 1 Hz (<100 Hz); $\pm 2\%$ (100 Hz to 100 kHz) Deviation Accuracy: $\pm 5\%$ (deviation 0 to 93 Rad, rate 10 Hz to 5 kHz, IFBW must be greater than 95% occupied BW)
	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
	RBW/VBW	30
	Span/RBW	100
Sweep time	50 μ s to 50 ms (Audio Waveform)	

LTE Signal Analyzers (Options 541, 542 and 546)

Measurements			
RF (Option 541)	Demodulation (Option 542 and 886)	Over-the-Air (OTA) (Option 546)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth ACPR Spectral Emission Mask Category A or B (Opt 0001) 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 256QAM Demod (Option 886) 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 Modulation Results Tx Time Alignment Modulation Summary Includes EVM by modulation Antenna Icons Detects active antennas (1/2)	Scanner Cell ID (Group, Sector) S-SS Power, RSRP, RSRQ, SINR Dominance Modulation Results – On/Off Tx Test Scanner RS Power of MIMO antennas (2 × 2, 4 × 4) Cell ID, Average Power Delta Power (Max-Min) Graph of Antenna Power Modulation Results – On/Off Mapping On-screen S-SS Power, RSRP, RSRQ, or SINR Scanner Modulation Results – Off	View Pass/Fail Limits All, RF, Modulation Available Measurements Channel Power Occupied Bandwidth ACLR Frequency Error Carrier Frequency Dominance EVM peak, rms RS Power RS EVM SS, P-SS, S-SS Power SS, P-SS, S-SS EVM PBCH Power PBCH EVM PCFICH Power PCFICH EVM PHICH Power, EVM PDCCH Power, EVM Cell, Group, Sector ID OSTP Tx Time Alignment

Setup Parameters	Frequency	E-UTRA bands 1 – 5, 7 – 14, 17 – 21, 23 – 32, 66A (tunable 10 MHz to 6.0 GHz with Option 6) Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
	Bandwidth	1.4, 3, 5, 10 MHz
	Span	Auto, 1.4, 3, 5, 10, 15, 20, 30 MHz
	Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
	Sweep	Single/Continuous, Trigger Sweep
	EVM Mode	Auto, PBCH only
	Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
	Measurement Summary Screens	Overall Measurements, RF Measurements, Modulation Measurements

RF Measurements (Options 541)

RF Channel Power Accuracy	±1.5 dB, ±1.0 dB (typ.), (RF input –50 to +10 dBm)
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Demodulation Measurements (Options 542)

Frequency Error	±10 Hz + Frequency Reference, 99% confidence level
Residual EVM (rms)	2.0% (typ.) (E-UTRA Test Model 3.1, RF Input –50 to +10 dBm) for BW ≤10 MHz

Over-the-Air (OTA) Measurements (Options 546)

Scanner	Six strongest signals if present Auto Save — Sync Signal Power and Modulation Results with GPS tagging
Auto Save	Scanner — three strongest signals if present RS Power — strongest signal
Mapping	Map On-screen S-SS Power, RSRP, RSRQ, or SINR of Cell ID with strongest signal Scanner — three strongest signals if present Save and Export Scanner data: *.kml, *.mtd (tab delimited)

IEEE 802.16 Fixed WiMAX Signal Analyzers (Options 46 and 47)

Measurements			
RF (Option 46)	Demodulation (Option 47)	Over-the-Air (OTA)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time Channel Power Preamble Power Data Burst Power Crest Factor ACPR	Constellation RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error Carrier Frequency Base Station ID Spectral Flatness Adjacent Subcarrier Flatness EVM vs. Subcarrier/Symbol RCE EVM Frequency Error Carrier Frequency Base Station ID	There are no additional OTA Measurements. RF Measurements and Demodulation can be made OTA.	Channel Power Occupied Bandwidth Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Base Station ID

Setup Parameters	Bandwidth	1.25, 1.50, 2.50, 3.50, 5.00, 5.50, 6.00, 7.00, 10.00 MHz
	Cyclic Prefix Ratio (CP)	1/4, 1/8, 1/16, 1/32
	Span	5, 10, 15, 20 MHz
	Frame Length	2.5, 5.0, 10.0 ms
	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 46) (temperature range 15°C to 35°C)

RF Channel Power Accuracy	±1.5 dB, ±1.0 dB (typ.), (RF input -50 to +20 dBm) (Option 541)
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Demodulation (Option 47) (temperature range 15°C to 35°C)

Frequency Error	0.07 ppm + Frequency Reference, 99% confidence level
Residual EVM (rms)	3% (typ.), 3.5% max (RF Input -50 to +20 dBm)

IEEE 802.16 Mobile WiMAX Signal Analyzers (Options 66, 67 and 37)

Measurements			
RF (Option 66)	Demodulation (Option 67)	Over-the-Air (OTA) (Option 37)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time Channel Power Preamble Power Downlink Burst Power Uplink Burst Power ACPR	Constellation RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error CINR Base Station ID Sector ID Spectral Flatness Adjacent Subcarrier Flatness EVM vs. Subcarrier/Symbol RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error CINR Base Station ID Sector ID DL-MAP (Tree View)	Channel Power Monitor Preamble Scanner (Six) Preamble Relative Power Cell ID Sector ID PCINR Dominant Preamble Base Station ID	Channel Power Occupied Bandwidth Downlink Burst Power Uplink Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Sector ID

Setup Parameters	Zone Type	PUSC
	DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)
	Bandwidths	3.50, 5.00, 7.00, 8.75, 10.00 MHz
	Cyclic Prefix Ratio (CP)	1/8
	Span	5, 10, 20, 30 MHz
	Frame Lengths	5, 10 ms
	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 66) (temperature range 15°C to 35°C)

RF Channel Power Accuracy	±1.5 dB, ±1.0 dB (typ.), (RF input -50 to +20 dBm)
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**Demodulation (Option 67)** (temperature range 15°C to 35°C)

Frequency Error	0.02 ppm + Frequency Reference, 99% confidence level
Residual EVM (rms)	2.5% (typ.), 3.0% max, (RF Input -50 to +20 dBm)

Over-the-Air (OTA) Measurements (Option 37)

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

General Specifications

System Parameters	System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed) Self Test, Application Self Test, GPS (see Option 31)
	System Options	Name, Date and Time, Brightness, Volume Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, Portuguese) Reset (Factory Defaults, Master Reset, Update Firmware)
	Internal Trace/Setup Memory	2,000 traces, 2,000 setups
	External Trace/Setup Memory	Limited by size of USB Flash drive
	Mode Switching	Auto-Stores/Recalls most recently used Setup Parameters in the Mode
File Management	File Types	Vary with measurement mode
	File	Save, Recall, Copy, Delete
	Save	Setups, Measurements, Screen Shots (JPEG)
	Recall	Setups, Measurements
	Copy	Selected file or files to internal/external memory (USB)
	Delete	Selected file or files from internal/external memory (USB)
	File Sort Method	By Name/Date/Type, Ascend/Descend
Connectors	VNA Port 1, VNA Port 2	N (f), 50Ω
	VNA Port Damage Level	23 dBm, ±50 VDC
	RF In Port	N (f), 50Ω
	RF In Port Damage Level	+33 dBm peak, ±50 VDC, Maximum Continuous Input (≥10 dB attenuation)
	Signal Generator Port	N (f), 50Ω
	Signal Generator Port Damage Level	+27 dBm, ±16 VDC
	GPS	SMA (f)
	External Power	5.5 mm barrel connector, 12.5 VDC to 15 VDC, <4.0 A
	USB Interface (2)	Type A (Connect USB Flash Drive and Power Sensor)
	USB Interface	5-pin mini-B, Connect to PC for data transfer
	Ethernet Interface	RJ45 connector for Ethernet 10-Base T
	Headset Jack	3.5 mm mini-phone plug
	External Reference In	BNC, female, 1 MHz, 1.2288 MHz, 1.544 MHz, 2.048 MHz, 2.4576 MHz, 4.8 MHz, 4.9152 MHz, 5 MHz, 9.8304 MHz, 10 MHz, 13 MHz, and 19.6608 MHz at -10 to +10 dBm
Audio In (SINAD/Quieting)	BNC, female, Impedance 50kΩ, Maximum Voltage > 1.77 Vrms (TIA-603-D compliant)	
External Trigger/Clock Recovery	BNC, female, Maximum Input ±5 VDC	
Display	Type	Resistive TFT Touchscreen
	Size	8.4 inch daylight viewable color LCD
	Resolution	800 × 600
	Pixel Defects	No more than five defective pixel (99.9989% good pixels)
Power	Field Replaceable Battery	Li-Ion, 7500 mAh rated capacity 40 W on battery power only
	DC Power	Universal 110 V/220 V AC/DC Adapter 55 W running off AC/DC adapter while charging battery
	Life Time Charging Cycles	>300 (80% of initial capacity)
	Battery Operation	3.6 hours (typ.)
	Battery Charging Limits	0 to +45°C, Relative Humidity ≤80%
CE	EMC	2014/30/EU, EN 61326:2013, CISPR 11/EN 55011, IEC/EN 61000-4-2/3/4/5/6/8/11
	LVD	2014/35/EU, EN61010-1
	RoHS	(EU) 2015/863
RCM	Australia and New Zealand	RCM AS/NZS 4417:2012
KCC	South Korea	KCC-REM-A21-0004
Environmental	Operating Temperature Range	-10°C to +55°C
	Storage Temperature Range	-51°C to +71°C
	Maximum Humidity	95% RH at +30°C, non-condensing
	Vibration, Sinusoidal	5 Hz to 55 Hz
	Vibration, Random	10 Hz to 500 Hz
	Half Sine Shock	30 g _n
	Explosive Atmosphere	MIL-PRF-28800F, Section 4.5.6.3 MIL-STD-810G, Method 511.5, Procedure 1
	Altitude	4600 m, operating and non-operating
ESD	RF Port Center Pin	Withstands up to ±15 kV
Dimensions and Mass		273 (W) × 199 (H) × 91 (D) mm (10.7 × 7.8 × 3.6 in), 3.6 kg (7.9 lb)
Warranty	Duration	Standard three-year warranty (battery one-year warranty)

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

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

easyTest Tools™ (for your PC)

Instrument Modes	Cable & Antenna Analyzer Spectrum 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

Line Sweep Tools (for your PC)

Line Sweep Tools (LST) is a free PC based program that increases productivity for people who deal with numerous Cable and Antenna traces every day. LST is the next generation of Anritsu's familiar Handheld Software Tools (HHST) and shares its uncomplicated user interface, giving a new face to the term "ease of use."

Trace Capture	Browse to Instrument: View and copy traces from the test equipment to your PC using Windows Explorer Open Legacy Files: Open DAT files captured with Handheld Software Tools v6.61 Open Current Files: Open VNA or DAT files Capture Plots To: The Line Sweep Tools screen, DAT files, Database, or JPEG
Traces	Trace Types: Return Loss, VSWR, DTF-RL, DTF-VSWR, Cable Loss, Smith Chart, and PIM Trace Formats: DAT, VNA, CSV, PNG, BMP, JPG, HTML, Data Base, and PDF
Report Generation	Report Generator: Includes GPS location along with measurements Report Format: Create reports in HTML or PDF format Report Setup: Report Title, Company, Prepared for, Location, Date and Time, Filename, Company logo*1 Trace Setup: One Trace Portrait Mode, Two Trace Portrait Modes, One Trace Landscape Mode
Trace Validation	Presets: 7 presets allow "one click" setting of up to 6 markers and one limit line Marker Controls: 6 regular Markers, Marker Peak, Marker Valley, Marker between, and frequency entry Delta Markers: 6 Delta markers Limit Line: Enable and drag or value entry. Also works with presets Next Trace Button: Next Trace and Previous Trace arrow keys allow quick switching between traces
Tools	Cable Editor*2: Allows creation of custom cable parameters Distance-to-Fault*3: Converts a Return Loss trace to a Distance-to-Fault trace Measurement Calculator: Converts Real, Imaginary, Magnitude, Phase, RL, VSWR, Rho, and Transmit power Signal Standard Editor*2: Creates new band and channel tables Renaming Grid: 36 user definable phrases for creation of file names, trace titles, and trace subtitles
Connectivity	Connections: Ethernet, USB cable, and USB memory stick

*1: Optionally set by user

*2: Instrument type/model must match original

*3: Only *.dat and *.vna file types supported



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 – Google Chrome, Mozilla Firefox
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 connection and an HTML 5-compliant browser
Download	Individual instrument files downloaded via browser Multiple instrument files and directories zipped and downloaded via browser File downloads are not supported by iOS Screen capture capability
Display Modes	Normal: All modes and 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	Ethernet, USB
Available Drivers	LabView. Visit NI.com for driver

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
S412E	Main Frame 500 kHz to 1.6 GHz Vector Network Analyzer 9 kHz to 1.6 GHz Spectrum Analyzer 10 MHz to 1.6 GHz Power Meter 500 kHz to 1.6 GHz CW Signal Generator 10 MHz to 1.6 GHz NBFM Analyzer
S412E-0010 S412E-0031 S412E-0019	Options High Voltage Variable Bias Tee GPS Receiver (requires suitable GPS antenna) High-Accuracy Power Meter (Requires External Power Sensor)
S412E-0025 S412E-0027 S412E-0006 S412E-0016 S412E-0015 S412E-0431 S412E-0444 S412E-0509 S412E-0521 S412E-0522	Interference Analyzer (Option 31 recommended) Channel Scanner 6 GHz Coverage on Spectrum Analyzer 6 GHz Coverage on Vector Network Analyzer Vector Voltmeter Coverage Mapping (Requires Option 31) EMF Measurements (Requires Anritsu Isotropic Antenna) AM/FM/PM Analyzer P25/P25p2 Analyzer Measurements P25/P25p2 Coverage Measurements (Requires Options 31 and 521)
S412E-0531 S412E-0532	NXDN Analyzer Measurements NXDN Coverage Measurements (Requires Options 31 and 531)
S412E-0573 S412E-0572	dPMR RF Analyzer Measurements dPMR Coverage Measurements (Requires Options 31 and 573)
S412E-0581 S412E-0582	TETRA Analyzer Measurements TETRA Coverage Measurements (Requires Options 31 and 581)
S412E-0591 S412E-0592	DMR (MOTOTRBO) Analyzer Measurements DMR (MOTOTRBO) Coverage Measurements (Requires Options 31 and 591)
S412E-0731 S412E-0733 S412E-0721 S412E-0722	PTC-ACSES Analyzer (Requires Options 31) PTC-ACSES Talk-Out Coverage (Requires Options 31 and 731) PTC-ICTR Analyzer PTC-ICTR Coverage Measurements (Requires Options 31 and 721)
S412E-0541 S412E-0542 S412E-0551 S412E-0552 S412E-0556	LTE RF Measurements LTE Modulation Quality TDD LTE RF Measurements (Requires Option 541) TDD LTE Modulation Quality (Requires Option 542) TDD LTE Over-the-Air Measurements (Requires Options 31 and 546)
S412E-0886 S412E-0546 S412E-0046	LTE 256QAM Demodulation (Requires Option 542 or 552) LTE Over-the-Air Measurements (Requires Option 31) IEEE 802.16 Fixed WiMAX RF Measurements (Requires Option 6)

Model/Order No.	Name
S412E-0880 S412E-0047 S412E-0066	GSM/GPRS/EDGE Measurements IEEE 802.16 Fixed WiMAX Demodulation (Requires Option 6) IEEE 802.16 Mobile WiMAX RF Measurements (Requires Option 6)
S412E-0067	IEEE 802.16 Mobile WiMAX Demodulation (Requires Option 6)
S412E-0037	IEEE 802.16 Mobile WiMAX Over-the-Air Measurements (Requires Option 6, Option 31 required for full functionality)
S412E-0098	Standard Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate.
S412E-0099	Premium Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate, test report, and uncertainty data.
2000-1691-R 2000-1797-R 2000-1654-R 633-75 40-187-R 806-141-R 3-2000-1498	Standard Accessories (Included with instrument) Stylus with Coiled Tether Screen Protector Film, 8.4 inch (2, one installed) Soft Carrying Case Rechargeable 7500 mAh Li-Ion Battery AC-DC Adapter Automotive Power Adapter, 12 VDC, 60 W USB A - 5-PIN Mini-B Cable, 3 meters (10 ft) Standard Three Year Warranty (one year on battery) Certificate of Conformance
10100-00065 10580-00318 10580-00289 10580-00243 10580-00241 10580-00349 10580-00240 10580-00234 10580-00236 10580-00319 10580-00455	Manuals, Related Literature (Soft copy at www.anritsu.com) Product Information, Compliance, and Safety LMR Master User Guide Vector Network Analyzer Measurement Guide Land Mobile Radio Measurement Guide Cable and Antenna Analyzer Measurement Guide Spectrum Analyzer Measurement Guide Power Meter Measurement Guide - High Accuracy Power Meter 3GPP Signal Analyzer Measurement Guide - GSM/EDGE, W-CDMA/HSDPA, TD-SCDMA/HSDPA, LTE WiMAX Signal Analyzer Measurement Guide - Fixed WiMAX, Mobile WiMAX Programming Manual EMF Measurement Guide
11410-00551 11410-00472 11410-00566 11410-00466 11410-00473 11410-00427	Troubleshooting Guides (Soft copy at www.anritsu.com) Spectrum Analyzers Interference LTE eNode Testing GSM/GPRS/EDGE Base Stations Cable, Antenna, and Component Troubleshooting Guide Understanding Cable & Antenna Analysis White Paper

Continued on next page



Model/Order No.	Name
	Optional Accessories
	USB Power Sensors (For complete ordering information see the respective datasheets of each sensor)
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 to +51.76 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 to -40 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 to -40 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 to -40 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 to -40 dBm
MA24208A	Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 to -60 dBm
MA24218A	Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 to -60 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
	NEON® Signal Mapper MA8100A Accessories
MA8100A-001	NEON Signal Mapper with Anritsu Integration and Tracking Unit (2000-1852-R). Includes 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service
MA8100A-003	NEON Signal Mapper with Anritsu Integration and Tracking Unit (2000-1852-R). Includes 3 year NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service
MA8100A-005	NEON Signal Mapper with Anritsu Integration and Tracking Unit (2000-1852-R). Includes 5 year NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service.
MA8100A-100	NEON Signal Mapper with Anritsu Integration and Tracking Unit (Includes Perpetual TRX NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service)
2300-606	Perpetual NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service
2300-612	Renewal of 1 year NEON Software License with 1 year of maintenance and support and 1 year of Cloud Service
2300-613	Renewal of 3 years NEON Software License with 3 years of maintenance and support and 3 years of Cloud Service
2300-614	Renewal of 5 years NEON Software License with 5 years of maintenance and support and 5 years of Cloud Service
2000-1852-R	NEON Tracking Unit (World Wide)
2000-2015-R	NEON Tracking Unit (Japan Version)
	Full Temperature N-Type Coaxial Calibration Kits -10°C to +55°C (see individual data sheets on www.anritsu.com)
OSLN50A-8	High Performance Type N (m), DC to 8 GHz, 50Ω
OSLNF50A-8	High Performance Type N (f), DC to 8 GHz, 50Ω
TOSLN50A-8	High Performance with Through, Type N (m), DC to 8 GHz, 50Ω
TOSLNF50A-8	High Performance with Through, Type N (f), DC to 8 GHz, 50Ω
	Coaxial Calibration Components, Other 50Ω, 75Ω
22N50	Precision N (m) Short/Open, 18 GHz
22NF50	Precision N (f) Short/Open, 18 GHz
28N50-2	Precision Termination, DC to 18 GHz, 50Ω, N (m)
28NF50-2	Precision Termination, DC to 18 GHz, 50Ω, N (f)
SM/PL-1	Precision N (m) Load, 42 dB, 6 GHz
SM/PLNF-1	Precision N (f) Load, 42 dB, 6 GHz
2000-1914-R	Precision Open/Short/Load, 4.3-10 (f), DC to 6 GHz, 50Ω
2000-1915-R	Precision Open/Short/Load, 4.3-10 (m), DC to 6 GHz, 50Ω
2000-1618-R	Open/Short/Load, 7/16 DIN (m), DC to 6 GHz 50Ω
2000-1619-R	Open/Short/Load, 7/16 DIN (f), DC to 6 GHz 50Ω
12N50-75B	Matching Pad, DC to 3 GHz, 50Ω to 75Ω
22N75	Open/Short, N (m), DC to 3 GHz, 75Ω
22NF75	Open/Short, N (f), DC to 3 GHz, 75Ω
26N75A	Precision Termination, N (m), DC to 3 GHz, 75Ω
26NF75A	Precision Termination, N (f), DC to 3 GHz, 75Ω
1091-55-R	Open, TNC (f), DC to 18 GHz
1091-53-R	Open, TNC (m), DC to 18 GHz
1091-56-R	Short, TNC (f), DC to 18 GHz
1091-54-R	Short, TNC (m), DC to 18 GHz
1015-54-R	Termination, TNC (f), DC to 18 GHz
1015-55-R	Termination, TNC (m), DC to 18 GHz

Model/Order No.	Name
	Directional Antennas
2000-1411-R	824 MHz to 896 MHz, N (f), 12.3 dBi, Yagi
2000-1412-R	885 MHz to 975 MHz, N (f), 12.6 dBi, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N (f), 12.3 dBi, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N (f), 11.4 dBi, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N (f), 14.1 dBi, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N (f), 14.3 dBi, Yagi
2000-1659-R	698 MHz to 787 MHz, N (f), 10.1 dBi, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N (f), 14.3 dBi, Yagi
2000-1715-R	Directional Antenna, 698 MHz to 2500 MHz, N (f), gain of 2 to 10 dBi, typical
2000-1726-R	Antenna, 2500 MHz to 2700 MHz, N (f), 14.1 dBi, Yagi
2000-1747-R	Antenna, Log Periodic, 300 MHz to 7000 MHz, N (f), 5.1 dBi, typical
2000-1748-R	Antenna, Log Periodic, 1 GHz to 18 GHz, N (f), 6 dBi, typical
2000-1777-R	Portable Directional Antenna, 9 kHz to 20 MHz, N (f)
2000-1778-R	Portable Directional Antenna, 20 MHz to 200 MHz, N (f)
2000-1779-R	Portable Directional Antenna, 200 MHz to 500 MHz, N (f)
2000-1812-R	Portable Yagi Antenna, 450 MHz to 512 MHz, N (f), 7.1 dBi
2000-1825-R	Portable Yagi Antenna, 380 MHz to 430 MHz, N (f), 7.1 dBi
	Portable Antennas
2000-1200-R	806 MHz to 866 MHz, SMA (m), 50Ω*1
2000-1473-R	870 MHz to 960 MHz, SMA (m), 50Ω*1
2000-1035-R	896 MHz to 941 MHz, SMA (m), 50Ω (1/2 wave)*1
2000-1030-R	1710 MHz to 1880 MHz, SMA (m), 50Ω (1/2 wave)*1
2000-1474-R	1710 MHz to 1880 MHz with knuckle elbow (1/2 wave)*1
2000-1031-R	1850 MHz to 1990 MHz, SMA (m), 50Ω (1/2 wave)*1
2000-1475-R	1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA (m), 50Ω*1
2000-1032-R	2400 MHz to 2500 MHz, SMA (m), 50Ω (1/2 wave)*1
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA (m), 50Ω*1
2000-1636-R	Antenna Kit (Consists of: 2000-1030-R, 2000-1031-R, 2000-1032-R, 2000-1200-R, 2000-1035-R, 2000-1361-R, and carrying pouch)
2000-1616	20 MHz to 21000 MHz, N (f), 50Ω
2000-1487-R	Telescoping Whip Antenna, BNC*2
	GPS Antennas (Active)
2000-1652-R	Magnet Mount, SMA (m), 3 VDC to 5 VDC with 1 ft cable
2000-1528-R	Magnet Mount, SMA (m) with 5 m (16.4 ft) cable, requires 5 VDC
2000-1760-R	Mini GPS Antenna, SMA (m), 25 dB gain, 2.5 VDC to 3.7 VDC
2000-1946-R	Mag Mount Broadband Antenna Cable 1: 617 MHz to 960 MHz, 3 dBi peak gain, 1710 MHz to 3700 MHz, 4 dBi peak gain, N (m), 50Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N (m), 50Ω, 10 ft Cable 3: GPS 26 dB gain, SMA (m), 50Ω, 10 ft
	Filters
1030-114-R	806 MHz to 869 MHz, N (m) to SMA (f), 50Ω
1030-109-R	824 MHz to 849 MHz, N (m) to SMA (f), 50Ω
1030-110-R	880 MHz to 915 MHz, N (m) to SMA (f), 50Ω
1030-105-R	890 MHz to 915 MHz, N (m) to N (f), 50Ω
1030-111-R	1850 MHz to 1910 MHz, N (m) to SMA (f), 50Ω
1030-106-R	1710 MHz to 1790 MHz, N (m) to N (f), 50Ω
1030-107-R	1910 MHz to 1990 MHz, N (m) to N (f), 50Ω
1030-112-R	2400 MHz to 2484 MHz, N (m) to SMA (f), 50Ω
1030-149-R	High Pass, 150 MHz, N (m) to N (f), 50Ω
1030-150-R	High Pass, 400 MHz, N (m) to N (f), 50Ω
1030-151-R	High Pass, 700 MHz, N (m) to N (f), 50Ω
1030-152-R	Low Pass, 200 MHz, N (m) to N (f), 50Ω
1030-153-R	Low Pass, 550 MHz, N (m) to N (f), 50Ω
1030-155-R	2500 MHz to 2700 MHz, N (m) to N (f), 50Ω
	Attenuators
3-1010-122	20 dB, 5 W, DC to 12.4 GHz, N (m) to N (f)
42N50-20	20 dB, 5 W, DC to 18 GHz, N (m) to N (f)
42N50A-30	30 dB, 50 W, DC to 18 GHz, N (m) to N (f)
3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N (m) to N (f)
1010-127-R	30 dB, 150 W, DC to 3 GHz, N (m) to N (f)
3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N (m) to N (f), Uni-directional
1010-121	40 dB, 100 W, DC to 18 GHz, N (m) to N (f), Uni-directional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N (m) to N (f)

Continued on next page



Model/Order No.	Name
	Phase-Stable Test Port Cables, Armored
15NNF50-1.5C	1.5 m, DC to 6 GHz, N (m) to N (f), 50Ω
15NN50-1.5C	1.5 m, DC to 6 GHz, N (m) to N (m), 50Ω
15NDF50-1.5C	1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (f), 50Ω
15ND50-1.5C	1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (m), 50Ω
15NNF50-3.0C	3.0 m, DC to 6 GHz, N (m) to N (f), 50Ω
15NN50-3.0C	3.0 m, DC to 6 GHz, N (m) to N (m), 50Ω
15NNF50-5.0C	5.0 m, DC to 6 GHz, N (m) to N (f), 50Ω
15NN50-5.0C	5.0 m, DC to 6 GHz, N (m) to N (m), 50Ω
15N43M50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (m)
15N43F50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (f)
15N43M50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (m) to 4.3-10 (m)
15N43F50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (m) to 4.3-10 (f)
15NF43M50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (f) to 4.3-10 (m)
15NF43F50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (f) to 4.3-10 (f)
15NF43M50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (f) to 4.3-10 (m)
15NF43F50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (f) to 4.3-10 (f)
	Adapters
1091-26-R	SMA (m) to N (m), DC to 18 GHz, 50Ω
1091-27-R	SMA (f) to N (m), DC to 18 GHz, 50Ω
1091-80-R	SMA (m) to N (f), DC to 18 GHz, 50Ω
1091-81-R	SMA (f) to N (f), DC to 18 GHz, 50Ω
1091-465-R	4.3-10 (f) to N (f), DC to 6 GHz, 50Ω
1091-467-R	4.3-10 (m) to N (f), DC to 6 GHz, 50Ω
1091-172	BNC (f) to N (m), DC to 1.3 GHz, 50Ω
510-90-R	7/16 DIN (f) to N (m), DC to 7.5 GHz, 50Ω
510-91-R	7/16 DIN (f) to N (f), DC to 7.5 GHz, 50Ω
510-92-R	7/16 DIN (m) to N (m), DC to 7.5 GHz, 50Ω
510-93-R	7/16 DIN (m) to N (f), DC to 7.5 GHz, 50Ω
510-96-R	7/16 DIN (m) to 7/16 DIN (m), DC to 7.5 GHz, 50Ω
510-97-R	7/16 DIN (f) to 7/16 DIN (f), DC to 7.5 GHz, 50Ω
513-62-R	Adapter, DC to 18 GHz, TNC (f) to N (f), 50Ω
1091-315-R	Adapter, DC to 18 GHz, TNC (m) to N (f), 50Ω
1091-324-R	Adapter, DC to 18 GHz, TNC (f) to N (m), 50Ω
1091-325-R	Adapter, DC to 18 GHz, TNC (m) to N (m), 50Ω
1091-317-R	Adapter, DC to 18 GHz, TNC (m) to SMA (f), 50Ω
1091-318-R	Adapter, DC to 18 GHz, TNC (m) to SMA (m), 50Ω
1091-323-R	Adapter, DC to 18 GHz, TNC (m) to TNC (f), 50Ω
1091-326-R	Adapter, DC to 18 GHz, TNC (m) to TNC (m), 50Ω
510-102-R	N (m) to N (m), DC to 11 GHz, 50Ω, 90 degrees right angle
	Precision Adapters
34NN50A	Precision Adapter, N (m) to N (m), DC to 18 GHz, 50Ω
34NFnF50	Precision Adapter, N (f) to N (f), DC to 18 GHz, 50Ω
	Backpack and Transit Case
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle 56 × 45.5 × 26.5 cm (22.07" × 17.92" × 10.42")
760-261-R	Large Transit Case with Wheels and Handle 63.1 × 50 × 30 cm (24.83" × 19.69" × 11.88"), space for MA2700A, antennas, filters, instrument inside soft case, and other interference hunting accessories/tools
760-262-R	Transit Case for MA2700A, several Yagi antennas and filters
760-271-R	Transit Case for Portable Directional Antennas and Port Extender 52.4 × 42.8 × 20.6 cm (20.62" × 16.87" × 8.12") (for 2000-1777-R, 2000-1778-R, 2000-1779-R, 2000-1798-R)
760-286-R	Compact Transit Case with Wheels and Handle 55.6 × 35.5 × 22.9 cm (21.89" × 13.98" × 9.01")

Model/Order No.	Name
	Miscellaneous Accessories
MA2700A	Handheld Interference Hunter (For full specifications, refer to the MA2700A Technical Data Sheet 11410-00692)
MA25200A	High Power Tx/Rx Input Protection Module
2000-1374	External Dual Charger for Li-Ion Batteries
2000-1797-R	Screen Protector Film, 8.4 inch
66864	Rack Mount Kit, Master Platform
2000-1689	EMI Near Field Probe Kit
	Interchangeable Adaptor Phase Stable Test Port Cables, Armored W/Reinforced Grip (recommended for cable and antenna line sweep applications. It uses the same ruggedized grip as the Reinforced grip series cables. Now you can also change the adaptor interface on the grip to four different connector types)
15RCN50-1.5-R	1.5 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω
15RCN50-3.0-R	3.0 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω

*1: Requires 1091-27-R SMA (f) to N (m) adapter

*2: Requires 1091-172-R BNC (f) to N (m) adapter

Site Master

S331E

2 MHz to 4 GHz

S332E2 MHz to 4 GHz
9 kHz to 4 GHz**S361E**

2 MHz to 6 GHz

S362E2 MHz to 6 GHz
9 kHz to 6 GHzCable & Antenna Analyzer
Spectrum AnalyzerRemote Control
Ethernet | USB
OPTION**Compact Handheld Cable & Antenna Analyzer with Spectrum Analyzer**

The wireless communications market continues to evolve at a rapid pace. Operators and service providers have to maintain existing 2G and 3G networks while deploying 4G LTE networks. They face the additional challenge of needing to ensure their networks are competitive from a reliability, quality, and cost perspective. As a result, more is expected from the contractors and technicians who maintain their networks. To stay competitive, these contractors and technicians must maintain more base stations than before and complete a wide variety of tasks in the shortest time possible.

Built on a trusted history of quality, expertise, and performance, the Site Master S331E/S332E/S361E/S362E compact cable and antenna analyzer series is the leading 2-port solution that provides coverage from 2 MHz to 4/6 GHz. This portable and rugged solution has a variety of configuration options that make it the preferred solution by contractors, installers, and wireless service providers. Because of the Site Master series multi-functional capabilities and options, it eliminates the need for you to carry and learn multiple instruments.

The Site Master reduces per site maintenance expense, maximizes system up-time, and breaks away from the traditional fix-after-failure maintenance mode by finding small problems before major failures occur. Radio frequency (RF) engineers and field technicians for installing and maintaining communication systems use Site Master's frequency domain reflectometry (FDR)-based approach to improve the quality of their communication systems.

Integrated

The Site Master is a 4 GHz or 6 GHz cable and antenna analyzer that can be configured to include either a 4 GHz or 6 GHz spectrum analyzer, 2-port transmission measurement with built-in 32 V bias tee, an interference analyzer with spectrogram displays, a channel scanner, power meter, high accuracy power meter, and GPS receiver for time and location stamping. Because of its multi-functional capabilities, it eliminates the need for you to carry and learn multiple instruments.

Trusted

Anritsu builds upon its expertise in portable compact cable and antenna analyzers and spectrum analyzers. The Site Master is approved by all major operators and service providers worldwide.

Designed for Field Use

The Site Master was designed specifically for field environments. It weighs less than 2.71 kg (6.0 lb, S331E, S361E), 3.71 kg (8.2 lb, S332E, S362E) and its field replaceable Li-Ion battery typically lasts for more than 4.5 hours (typ., S331E, S361E), 3.5 hours (typ., S332E, S362E). A new bright 8.4-inch color display provides visibility even in broad daylight. With an operating temperature range from -10°C to $+55^{\circ}\text{C}$, the Site Master will work in the most extreme weather conditions. The analyzer

is almost impervious to the bumps and bangs typically encountered by portable field equipment, and its ruggedized case and splash proof design allow you to depend on high performance anywhere, anytime.

Functions and Description

- Cable and Antenna Analyzer, 2 MHz to 4 GHz/6 GHz
- Measurements: RL, VSWR, Cable Loss, DTF, Phase
- 2-port Transmission Measurement: High/Low Power
- Sweep Speed: 1 ms/data point, typical
- Display: Single or Dual Measurement Touchscreen
- Calibration: OSL, InstaCal™, and FlexCal™
- Bias Tee: 32 V internal
- Spectrum Analyzer, 9 kHz to 4 GHz/6 GHz
- Measurements: Occupied Bandwidth, Channel Power, ACPR, C/I
- Interference Analyzer: Spectrogram, Signal Strength, RSSI, Signal ID, Interference Mapping
- Dynamic Range: >95 dB in 10 Hz RBW
- DANL: -152 dBm in 10 Hz RBW
- Phase Noise: -100 dBc/Hz max @ 10 kHz offset at 1 GHz
- Frequency Accuracy: $<\pm 50$ ppb with GPS On

Capabilities and Functional Highlights

- AM/FM/PM Analyzer
- EMF Test (S332E & S362E)
- High Accuracy Power Meter
- Up to 50 GHz USB Sensors
- PIM Alert Application (S332E & S362E)
- Master Software Tools™
- Line Sweep Tools™
- easyTest Tools™
- USB & Optional Ethernet (Option 413) for data transfer and instrument control
- PIM Hunting
- Handheld Interference Hunter support (S332E & S362E)
- On-Screen Interference Mapping
- On-Screen Coverage Mapping
- GPS tagging of saved traces
- Increase throughput by automating repetitive or operator intensive tasks via Ethernet or USB. Remote programming provided via Ethernet (Option 413)
- 4.5 hour battery operation time
- Store 2000 Traces internally
- Touchscreen keyboard
- Quick Name Matrix
- <5 minute warm-up time
- E-Learning Training
- Certified Line Sweep Training

Specifications

Cable and Antenna Analyzer

Frequency	Frequency Range	2 MHz to 4 GHz (S331E, S332E), 2 MHz to 6 GHz (S361E, S362E)
	Frequency Accuracy	$\leq \pm 2.5$ ppm @ 25°C
	Frequency Resolution	1 kHz (RF immunity low), 100 kHz (RF immunity high)
Output Power	High	0 dBm (typ.)
	Low	2 MHz to 1.5 GHz: -40 dBm, typical > 1.5 GHz to 4/6 GHz: -30 dBm, typical
Interference Immunity	On-Channel	+17 dBm @ > 1.0 MHz from carrier frequency
	On-Frequency	0 dBm within ± 10 kHz of the carrier frequency
Measurement Speed	Return Loss	≤ 1.00 msec/data point, RF immunity low (typ.)
	Distance-to-Fault	≤ 1.25 msec/data point, RF immunity low (typ.)
Return Loss	Measurement Range	0 to 60 dB
	Resolution	0.01 dB
VSWR	Measurement Range	1:1 to 65:1
	Resolution	0.01
Cable Loss	Measurement Range	0 to 30 dB
	Resolution	0.01 dB
Distance-to-Fault	Vertical Range Return Loss	0 to 60 dB
	Vertical Range VSWR	1:1 to 65:1
	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) \times Fault Resolution, to a maximum of 1500 meters (4921 ft)
1-Port Phase	Measurement Range	-180° to +180°
	Resolution	0.01°
Smith Chart	Resolution	0.01 50/75Ω Selectable
Measurement Accuracy	Corrected Directivity	>42 dB, OSL calibration >38 dB, InstaCal™ calibration >38 dB, InstaCal™ Calibration to a second line

Spectrum Analyzer (S332E, S362E)

Frequency	Frequency Range	9 kHz to 4 GHz (S332E), 9 kHz to 6 GHz (S362E) (usable to 0 Hz)
	Tuning Resolution	1 Hz
	Frequency Reference	Aging: ± 1.0 ppm/year Accuracy: ± 1.5 ppm (25°C \pm 25°C) + aging, $< \pm 50$ ppb with GPS On
	Frequency Span	10 Hz to 4 GHz including zero span (S332E), 10 Hz to 6 GHz including zero span (S362E)
	Sweep Time	Minimum 100 ms, 10 μ s to 600 seconds in zero span
Bandwidth	Sweep Time Accuracy	$\pm 2\%$ in zero span
	Resolution Bandwidth (RBW)	10 Hz to 3 MHz in 1-3 sequence $\pm 10\%$ (1 MHz max in zero-span) (-3 dB bandwidth)
	Video Bandwidth (VBW)	1 Hz to 3 MHz in 1-3 sequence (-3 dB bandwidth) (auto or manually selectable)
	RBW with Quasi-Peak Detection	200 Hz, 9 kHz, 120 kHz (-6 dB bandwidth)
Spectral Purity	VBW with Quasi-Peak Detection	Auto VBW is On, RBW/VBW = 1
	SSB Phase Noise @ 1 GHz	-100 dBc/Hz, -110 dBc/Hz (typ.) @ 10 kHz offset -105 dBc/Hz, -112 dBc/Hz (typ.) @ 100 kHz offset -115 dBc/Hz, -121 dBc/Hz (typ.) @ 1 MHz offset
Amplitude Ranges	Dynamic Range	>95 dB (2.4 GHz), 2/3 (TOI-DANL) in 10 Hz RBW
	Measurement Range	DANL to +26 dBm (≥ 50 MHz), DANL to 0 dBm (<50 MHz)
	Display Range	1 to 15 dB/div in 1 dB steps, ten divisions displayed
	Reference Level Range	-150 to +30 dBm
	Attenuator Range	0 to 55 dB, 5.0 dB steps
	Maximum Continuous Input	+30 dBm
Amplitude Accuracy	Amplitude Units	Log Scale Modes: dBm, dBV, dBmV, dBmV, dBW, dBmW, dBmW, dBA Linear Scale Modes: nV, mV, μ V, V, kV, nW, mW, μ W, W, kW, nA, mA, A
	9 kHz to 100 kHz	± 2.0 dB (typ.) (Preamp Off)
	100 kHz to 4.0 GHz	± 1.25 dB, ± 0.5 dB (typ.)
	>4.0 GHz to 6 GHz	± 1.50 dB, ± 0.5 dB (typ.)

Continued on next page



		Preamp Off (Reference level -20 dBm)		Preamp On (Reference level -50 dBm)	
		Maximum	Typical	Maximum	Typical
Displayed Average Noise Level (DANL)	(RBW Normalized to 1 Hz, 0 dB attenuation)				
	10 MHz to 2.4 GHz	-141 dBm	-146 dBm	-157 dBm	-162 dBm
	>2.4 GHz to 4 GHz	-137 dBm	-141 dBm	-154 dBm	-159 dBm
	>4 GHz to 5 GHz	-134 dBm	-138 dBm	-150 dBm	-155 dBm
	>5 GHz to 6 GHz	-126 dBm	-131 dBm	-143 dBm	-150 dBm
	(RBW = 10 Hz, 0 dB attenuation)				
	10 MHz to 2.4 GHz	-131 dBm	-136 dBm	-147 dBm	-152 dBm
	>2.4 GHz to 4 GHz	-127 dBm	-131 dBm	-144 dBm	-149 dBm
	>4 GHz to 5 GHz	-124 dBm	-128 dBm	-140 dBm	-145 dBm
	>5 GHz to 6 GHz	-116 dBm	-121 dBm	-133 dBm	-140 dBm
Spurs	Residual Spurious	< -90 dBm (RF input terminated, 0 dB input attenuation, > 10 MHz)			
	Input-Related Spurious	< -75 dBc (0 dB attenuation, -30 dBm input, span < 1.7 GHz, carrier offset > 4.5 MHz)			
	Exceptions (typ.)	< -70 dBc @ < 2.5 GHz, with 2072.5 MHz Input < -68 dBc @ F1 - 280 MHz with F1 Input < -70 dBc @ F1 + 190.5 MHz with F1 Input < -52 dBc @ 7349 - 2F2 MHz, with F2 Input, where F2 < 2437.5 MHz < -55 dBc @ 190.5 ± F1/F2 MHz, F1 < 1 GHz			
Third-Order Intercept (TOI)	Preamp Off (-20 dBm tones 100 kHz apart, 10 dB attenuation)				
	800 MHz	+16 dBm			
	2400 MHz	+20 dBm			
	200 MHz to 2200 MHz	+25 dBm (typ.)			
	> 2.2 GHz to 5.0 GHz	+28 dBm (typ.)			
Second Harmonic Distortion	Preamp Off, 0 dB input attenuation, -30 dBm input				
	50 MHz	-56 dBc			
	> 50 MHz to 200 MHz	-60 dBc (typ.)			
	> 200 MHz to 3000 MHz	-70 dBc (typ.)			
VSWR	2:1 (typ.)				

Ethernet Connectivity (Option 413)

Connector	RJ45
LAN Speed	10 Mbps
Mode	Static, DHCP
Static IP Settings	IP address Subnet Mask IP Gateway
Remote Control	Remote Access utility provided with Web Remote Control and SCPI programming
Data Upload	With Line Sweep Tools through Ethernet connection

2-Port Transmission Measurement (Option 21)

Frequency	Frequency Range	2 MHz to 4 GHz (S331E, S332E), 2 MHz to 6 GHz (S361E, S362E)
	Frequency Resolution	10 Hz
Output Power	High	0 dBm (typ.)
	Low	2 MHz to 1.5 GHz: -40 dBm, typical > 1.5 GHz to 4/6 GHz: -30 dBm, typical
Dynamic Range	2 MHz to 4 GHz	80 dB, 95 dB (typ.)
	> 4 GHz to 6 GHz	70 dB, 85 dB (typ.)
Application Options	Bias-Tee (On/Off), Impedance (50Ω, 75Ω, Other)	

Bias-Tee (Option 10) (Requires Option 21 for S331E and S361E)

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

GPS Receiver (Option 31) (Antenna sold separately)

Setup	On/Off, Antenna Voltage 3.3 V/5.0 V, GPS Info
GPS Time/Location Indicator	Time, Latitude, Longitude and Altitude on display Time, Latitude, Longitude and Altitude with trace storage
High Frequency Accuracy	Spectrum Analyzer, Interference Analyzer, CW Signal Analyzers < ±50 ppb with GPS On, GPS antenna connected, 3 minutes after satellite lock in selected mode
Connector	SMA (f)

**Power Meter (Option 29) (S332E, S362E)**

Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Full Band
Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale
Average	Acquisition Fast/Med/Slow, # of Running Averages
Limits	Limit On/Off, Limit Upper/Lower
Frequency Range	10 MHz to 4 GHz (S332E), 10 MHz to 6 GHz (S362E)
Span	1 kHz to 100 MHz
Display Range	-140 to +30 dBm, ≤40 dB span
Measurement Range	-120 to +26 dBm
Offset Range	0 to +100 dB (External Gain or Loss)
VSWR	2:1 (typ.)
Maximum Continuous Input Power	+30 dBm without attenuator
Accuracy	Same as Spectrum Analyzer
Application Options	Impedance (50Ω, 75Ω, Other)

High Accuracy Power Meter (Option 19) (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	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 GHz/18 GHz	10 MHz to 33/40/50 GHz
Connector	Type N (f), 50Ω	Type N (m), 50Ω	Type N (m), 50Ω (8 GHz/18 GHz) Type K (m), 50Ω (26 GHz)	Type N (m), 50Ω	Type K (m), 50Ω (33 GHz/40 GHz) Type V (m), 50Ω (50 GHz)
Dynamic Range	+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)	-60 to +20 dBm (1 nW to 100 mW)	-70 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*1	± 0.16 dB*2	± 0.18 dB*3	± 0.17 dB*4	± 0.17 dB*5
Data sheet (for complete specifications)	11410-00621	11410-00424	11410-00504	11410-00841	11410-00906

*1: 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.

*2: Total RSS measurement uncertainty (0°C to 50°C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.

*3: Expanded uncertainty with K = 2 for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.

*4: 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.

*5: Includes linearity over temperature uncertainties, but not the effects of calibration factor, mismatch, zero set and drift, and noise.

Interference Analyzer (Option 25) (S332E, S362E)

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 72 hours
	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
	Signal-to-Noise Ratio (SNR)	> 10 dB
	Interference Mapping	Triangulate location of interference with on display maps
Application Options	Bias-Tee (On/Off), Impedance (50Ω, 75Ω, Other) Support for MA2700A Handheld Interference Hunter	

AM/FM/PM Signal Analyzers (Option 509) (S332E, S362E only)

Measurements	RF Spectrum (AM/FM/PM)	Audio Spectrum (AM)	Audio Spectrum (FM/PM)	Audio Waveform (AM)	Audio Waveform (FM/PM)	Summary (AM)	Summary (FM/PM)
Display Type Graphic Display	Power (dBm) vs. Frequency	Depth (%) vs. Modulation Frequency	Deviation (kHz/rad) vs. Modulation Frequency	Depth (%) vs. Time	Deviation (kHz/rad) vs. Time	—	—
Numerical Displays	Carrier Power Carrier Frequency Occupied Bandwidth	AM Rate RMS Depth (Pk-PK)/2 Depth SINAD* THD* Distortion/Total Vrms*	FM/PM Rate RMS Deviation (Pk-PK)/2 Deviation SINAD* THD* Distortion/Total Vrms*	AM Rate RMS Depth (Pk-PK)/2 Depth SINAD* THD* Distortion/Total Vrms*	FM/PM Rate RMS Depth (Pk-PK)/2 Depth SINAD* THD* Distortion/Total Vrms*	RMS Depth (AM) Peak + Depth Peak – Depth (Pk-PK)/2 Depth Carrier Power Carrier Frequency Occupied Bandwidth AM Rate SINAD* THD* Distortion/Total Vrms*	RMS Deviation (FM/PM) Peak + Depth Peak – Depth (Pk-PK)/2 Depth Carrier Power Carrier Frequency Occupied Bandwidth AM Rate SINAD* THD* Distortion/Total Vrms*
Setup Parameters	Frequency	Center Freq, Span, Freq Step, Signal Standard, Channel, Channel Increment, Set Carrier Freq					
	Amplitude	Scale, Power Offset, Adjust Range					
	Setup	Demod Type (AM, FM, PM), IFBW, Auto IFBW					
	Measurements	RF Spectrum AM/FM/PM, Audio Spectrum (AM/FM/PM), Audio Waveform (AM/FM/PM), Summary (AM/FM/PM), Average					
	Marker	On/Off, Delta, Peak Search, Marker Freq to Center, Marker to Ref Lvl, Marker Table, All Markers Off					
Specifications	AM	Modulation Rate: ± 1 Hz (<100 Hz), $\pm 2\%$ (>100 Hz) Depth: $\pm 5\%$ for (Modulation rates 10 Hz to 100 kHz)					
	FM	Modulation Rate: ± 1 Hz (<100 Hz); $\pm 2\%$ (100 Hz to 100 kHz) Deviation Accuracy: $\pm 5\%$					
	PM	Modulation Rate: ± 1 Hz (<100 Hz); $\pm 2\%$ (100 Hz to 100 kHz) Deviation Accuracy: $\pm 5\%$ (deviation 0 to 93 Rad, rate 10 Hz to 5 kHz, IFBW must be greater than 95% occupied BW)					
	IF Bandwidth	1 kHz to 300 kHz in 1-3 sequence					
	Frequency Span	RF Spectrum: 10 kHz to 10 MHz Audio Spectrum: 2, 5, 10, 20, 70, 140 kHz					
	RBW/VBW	30					
	Span/RBW	100					
Sweep Time	50 μ s to 50 ms (Audio Waveform)						

*: Requires Sinewave modulation

Channel Scanner (Option 27) (S332E, S362E only)

Number of Channels	1 to 20 Channels
Measurements	Graph/Table, Max Hold (On/5 sec/Off), Freq/Channel, Current/Max, Single/Dual Color
Scanner	Scan Channels, Scan Frequencies, Scan Customer List, Scan Script Master™
Amplitude	Reference Level, Scale
Custom Scan	Signal Standard, Channel, # of Channels, Channel Step Size, Custom Scan
Frequency Range	9 kHz to 4 GHz (S332E), 9 kHz to 6 GHz (S362E)
Frequency Accuracy	± 10 Hz + Time base error
Measurement Range	-110 to +26 dBm
Application Options	Bias-Tee (On/Off), Impedance (50 Ω , 75 Ω , Other)

CW Signal Generator (Option 28) (S332E, S362E only; requires CW Signal Generator Kit, P/N 69793)

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

Gated Sweep (Option 90) (S332E, S362E only)

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

Electromagnetic Field Test (Option 444) (S332E, S362E only)

Measurements	Setup	Limit lines, axis dwell time, measurement time, auto-logging, measurement units, trace display
	Spectrum Analyzer	Field strength is measured
	Units	dBm/m ² , dBV/m, dBmV/m, dBuV/m, V/m, W/m ² , dBW/m ² , A/m, dBA/m, W/cm 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

Coverage Mapping (Option 431) (S332E, S362E only) (Requires Option 31 GPS)

Measurements	Indoor Mapping	RSSI, ACPR
	Outdoor Mapping	RSSI, ACPR
Setup Parameters	Frequency	Center/Start/Stop, Span, Freq Step, Signal Standard, Channel #, Channel Increment
	Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
	Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
	BW	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/VBW
	Measurement Setup	ACPR, RSSI
	Point Distance/Time Setup	Repeat Type Time Distance
	Save Points Map	Save KML, JPEG, Tab Delimited
	Recall Points Map	Recall Map, Recall KML Points only, Recall KML Points with Map, Recall Default Grid

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, and is not warranted; 5) Recommended calibration cycle is 12 months. Performance Sweep Mode.

Setup Parameters	System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed) Self Test, Application Self Test GPS (see Option 31)
	System Options	Name, Date and Time, Brightness, Volume Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, Russian, User defined) Reset (Factory Defaults, Master Reset, Update Firmware)
	Internal Trace/Setup Memory	2,000 traces, 2,000 Setups
	External Trace/Setup Memory	Limited by size of USB Flash drive
	Mode Switching	Auto-Stores/Recalls most recently used Setup Parameters in the Mode
Connectors	RF Out	Type N (f), 50Ω (Reflection In)
	RF Out Damage Level	+42 dBm, ± 50 VDC
	RF In	Type N (f), 50Ω
	RF In Damage Level	+30 dBm peak, ±50 VDC, Maximum Continuous Input (≥10 dB attenuation)
	GPS	SMA (f)
	External Power	5.5 mm barrel connector, 12.5 to 15 VDC, <4.0 Amps
	USB Interface (2)	Type A, Connect USB Flash Drive and Power Sensor
	USB Interface	5-pin mini-B, Connect to PC for data transfer
	Ethernet Interface	RJ45 connector for Ethernet 10BASE-T (Available with Option 413 Ethernet)
	Headset Jack	3.5 mm mini-phone plug
	External Reference In	BNC (f), 50Ω, Maximum Input +10 dBm 1, 5, 10, 13 MHz
External Trigger/Clock Recovery	BNC (f), 50Ω, Maximum Input ±50 VDC	
RF over Fiber	SFP/SFP+ compatible socket (Available with Option 759)	
Display	Type	Resistive Touchscreen
	Size	8.4" daylight viewable color LCD
	Resolution	800 × 600
	Pixel Defects	No more than five defective pixels (99.9989% good pixels)
Battery	Type	Li-Ion
	Battery Operation	4.5 hours (typ.) (S331E, S361E) 3.5 hours (typ.) (S332E, S362E)
Regulatory Compliance	CE	EMC: 2014/30/EU, EN61326-1, EN61000-4-2 LVD: 2014/35/EU, EN61010-1 RoHS: 2011/65/EU, (EU) 2015/863
	Australia and New Zealand	RCM AS/NZS 4417:2012
	South Korea	KCC-REM-A21-0004

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Environmental (MIL-PRF-28800F Class 2)	Operating Temperature Range	-10°C to +55°C
	Storage Temperature Range	-51°C to +71°C
	Maximum Relative Humidity	95% RH at +30°C, non-condensing
	Vibration, Sinusoidal	5 Hz to 55 Hz
	Vibration, Random	10 Hz to 500 Hz
	Half Sine Shock	30 gn
	Altitude	4600 meters, operating and non-operating
ESD	Explosive Atmosphere	MIL-PRF-28800F, Section 4.5.6.3 MIL-STD-810G, Method 511.5, Procedure 1
	RF Port Center Pin	Withstands up to ±15 kV
Dimensions and Mass	Dimensions	273 (W) × 199 (H) × 91 (D) mm (10.7 × 7.8 × 3.6 in)
	Mass	2.71 kg (6.0 lbs, S331E, S361E), 3.71 kg (8.2 lbs, S332E, S362E)

Line Sweep Tools (for your PC)

Trace Capture	Browse to Instrument	View and copy traces from the test equipment to your PC using Windows Explorer
	Open Legacy File	Open DAT files captured with Hand Held Software Tools v6.61
	Open Current File	Open VNA or DAT file
	Capture Plots to:	The Line Sweep Tools screen, DAT files, Database, or JPEG
Traces	Trace Types	Return Loss, VSWR, DTF-RL, DTF-VSWR, Cable Loss, Smith Chart, and PIM
	Trace Formats	DAT, VNA, CSV, PNG, BMP, JPG, HTML, Data Base, and PDF
Report Generation	Report Generator	Includes GPS location along with measurements
	Report Format	Create reports in HTML or PDF format
	Report Setup	Report Title, Company, Prepared for, Location, Date and Time, Filename, Company logo
	Trace Setup	1 trace Portrait Mode, 2 Trace Portrait Mode, 1 Trace Landscape Mode
Trace Validation	Presets	7 presets allow "one click" setting of up to 6 markers and one limit line
	Marker Controls	6 regular Markers, Marker Peak, Marker valley, Marker between, and frequency entry
	Delta Markers	6 Delta markers
	Limit Line	Enable and drag or value entry. Also works with presets
Tools	Next Trace Button	Next Trace and Previous trace arrow keys allow quick switching between traces
	Cable Editor	Allows creation of custom cable parameters
	Distance to Fault	Converts a Return Loss trace to a Distance to Fault trace
	Measurement Calculator	Converts Real, Imaginary, Magnitude, Phase, RL, VSWR, Rho, and Transmit power
	Signal Standard Editor	Creates new band and channel tables
Connectivity	Renaming Grid	36 user definable phrases for creation of file names, trace titles, and trace subtitles
	Connections	USB cable, USB Memory Stick

Master Software Tools (for your PC)

Mapping (GPS Required)	Spectrum Analyzer Mode	MapInfo, MapPoint
	Mobile WiMAX OTA, LTE OTA Options	Google Earth, Google Maps, MapInfo
Folder Spectrogram (Spectrum Monitoring for Interference Analysis and Spectrum Clearing)	Folder Spectrogram – 2D View	Creates a composite file of multiple traces Peak Power, Total Power, Peak Frequency, Histogram, Average Power (Max/Min) File Filter (Violations over limit lines or deviations from averages) Playback
	Video Folder Spectrogram – 2D View	Create AVI file to export for management review/reports
	Folder Spectrogram – 3D View	Views (Set Threshold, Markers) - 3D (Rotate X, Y, Z Axis, Level Scale, Signal ID) Playback (Frequency and/or Time Domain)
List/Parameter Editors	Traces	Add, delete, and modify limit lines and markers
	Product Updates	Auto-checks Anritsu website for latest revision firmware
	Pass/Fail	Create, download, or edit Signal Analysis Pass/Fail Limits
Connectivity	Languages	Add up to two languages and modify non-English language menus
	Connections	Connect to PC using USB or Ethernet (Ethernet requires Option 413)
	Remote Operation	Operate unit remotely with MST Remote Access Tool

easyTest Tools (for your PC)

Instrument Mode		Cable & Antenna Analyzer Mode
Commands	Display Image	Allows putting a custom image on the instrument screen
	Recall Setup	Places the instrument into a known state
	Prompt	Displays instructional messages on the instrument screen
	Save	Allows automatic or manual saving of traces
Connectivity	Connections	Ethernet, USB cable or USB memory stick (Ethernet requires Option 413)



Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name	Model/Order No.	Name
S331E S332E	Site Masters 2 MHz to 4 GHz Cable and Antenna Analyzer 2 MHz to 4 GHz Cable and Antenna Analyzer 9 kHz to 4 GHz Spectrum Analyzer	MA24105A	Power Sensors (For complete ordering information see the respective datasheets of each sensor) Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 to +51.76 dBm
S361E S362E	2 MHz to 6 GHz Cable and Antenna Analyzer 2 MHz to 6 GHz Cable and Antenna Analyzer 9 kHz to 6 GHz Spectrum Analyzer	MA24106A MA24108A MA24118A MA24126A MA24208A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 to -60 dBm
S331E-0010 S331E-0019	S331E Site Master Options Bias-Tee (requires Option 21 for S331E/S361E) High-Accuracy Power Meter (Requires External Power Sensor)	MA24218A	Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 to -60 dBm
S331E-0021 S331E-0031 S331E-0098	2-Port Transmission Measurement GPS Receiver (Requires Antenna) Standard Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate.	MA24330A	Microwave CW USB Power Sensor, 10 MHz to 33 GHz, +20 dBm
S331E-0099	Premium Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate, test report, and uncertainty data.	MA24340A	Microwave CW USB Power Sensor, 10 MHz to 40 GHz, +20 dBm
S331E-0413	Ethernet Connectivity	MA24350A	Microwave CW USB Power Sensor, 10 MHz to 50 GHz, +20 dBm
S332E-0010 S332E-0019	S332E Site Master Options Bias-Tee (requires Option 21 for S331E/S361E) High-Accuracy Power Meter (Requires External Power Sensor)	MA25100A	RF Power Indicator
S332E-0021 S332E-0025 S332E-0027 S332E-0028	2-Port Transmission Measurement Interference Analyzer (recommend Option 31) Channel Scanner C/W Signal Generator (Requires CW Signal Generator Kit, P/N 69793)	10100-00065 10580-00252 10580-00241 10580-00242 10580-00349 10580-00240	Manuals (soft copy at www.us.anritsu.com , website should be www.anritsu.com) Product Information, Compliance, and Safety Site Master User Guide Cable and Antenna Analyzer Measurement Guide 2-Port Transmission Measurement Spectrum Analyzer Measurement Guide Power Meter Measurement Guide - High Accuracy Power Meter EMF Measurement Guide Programming Manual
S332E-0029 S332E-0031 S332E-0090 S332E-0098	Power Meter GPS Receiver (Requires Antenna) Gated Sweep Standard Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate.	2000-1654-R 633-75 2000-1691-R 2000-1797-R 40-187-R 806-141-R 3-2000-1498	Standard Accessories (included with instrument) Soft Carrying Case Rechargeable Li-Ion Battery, 7500 mAh Stylus with Coiled Tether Screen Protector Film, 8.4 inch (2, one installed) AC-DC Adapter Automotive Power Adapter 12 VDC, 60 W USB A/5-pin mini-B Cable, 10 ft/305 cm
S332E-0099	Premium Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate, test report, and uncertainty data.		
S332E-0413 S332E-0431 S332E-0444 S332E-0509	Ethernet Connectivity Coverage Mapping (Requires Option 31) EMF Measurements (requires Anritsu Isotropic Antenna) AM/FM/PM Analyzer		Optional Accessories Calibration Components, 50Ω InstaCal™ Calibration Module, 38 dB, 2 MHz to 6.0 GHz, N (m), 50Ω High Performance Type N (m), DC to 8 GHz, 50Ω High Performance Type N (f), DC to 8 GHz, 50Ω Precision Open/Short/Load, 7/16 DIN (m), DC to 6.0 GHz 50Ω Precision Open/Short/Load, 7/16 DIN (f), DC to 6.0 GHz 50Ω Precision Open/Short/Load, 4.3-10 (f), DC to 6 GHz, 50Ω Precision Open/Short/Load, 4.3-10 (m), DC to 6 GHz, 50Ω Precision Open/Short, N (m), DC to 18 GHz, 50Ω Precision Open/Short, N (f), DC to 18 GHz, 50Ω Precision N (m) Load, 42 dB, 6 GHz Precision N (f) Load, 42 dB, 6 GHz
S361E-0010 S361E-0019	S361E Site Master Options S362E-0010 Bias-Tee (requires Option 21 for S331E/S361E) High-Accuracy Power Meter (Requires External Power Sensor)	ICN50B	
S361E-0021 S361E-0031 S361E-0098	2-Port Transmission Measurement GPS Receiver (Requires Antenna) Standard Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate.	OSLN50A-8 OSLNF50A-8 2000-1618-R 2000-1619-R 2000-1914-R 2000-1915-R 22N50 22NF50 SM/PL-1 SM/PLNF-1	
S361E-0099	Premium Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate, test report, and uncertainty data.		
S361E-0413	Ethernet Connectivity		
S362E-0010 S362E-0019	S362E Site Master Options S362E-0010 Bias-Tee (requires Option 21 for S331E/S361E) High-Accuracy Power Meter (Requires External Power Sensor)	22N75 22NF75 26N75A 26NF75A 12N50-75B	Calibration Components, 75Ω Open/Short, N (m), DC to 3 GHz, 75Ω Open/Short, N (f), DC to 3 GHz, 75Ω Precision Termination, N (m), DC to 3 GHz, 75Ω Precision Termination, N (f), DC to 3 GHz, 75Ω Matching Pad, DC to 3 GHz, 50Ω to 75Ω
S362E-0021 S362E-0025 S362E-0027 S362E-0028	2-Port Transmission Measurement Interference Analyzer (recommend Option 31) Channel Scanner C/W Signal Generator (Requires CW Signal Generator Kit, P/N 69793)		Phase-Stable Test Port Cables, Armored w/Reinforced Grip (recommended for cable & antenna line sweep applications) 1.5 m, DC to 6 GHz, N (m) - N (f), 50Ω 1.5 m, DC to 6 GHz, N (m) - 7/16 DIN (f), 50Ω 1.5 m, DC to 6 GHz, N (m) - 7/16 DIN (m), 50Ω 3.0 m, DC to 6 GHz, N (m) - N (f), 50Ω 3.0 m, DC to 6 GHz, N (m) - 7/16 DIN (f), 50Ω 3.0 m, DC to 6 GHz, N (m) - 7/16 DIN (m), 50Ω
S362E-0031 S362E-0090 S362E-0098	GPS Receiver (Requires Antenna) Gated Sweep Standard Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate.	15RNFN50-1.5-R 15RDFN50-1.5-R 15RDN50-1.5-R 15RNFN50-3.0-R 15RDFN50-3.0-R 15RDN50-3.0-R	
S362E-0099	Premium Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate, test report, and uncertainty data.		
S362E-0413 S362E-0431 S362E-0444 S362E-0509	Ethernet Connectivity Coverage Mapping (Requires Option 31) EMF Measurements (requires Anritsu Isotropic Antenna) AM/FM/PM Analyzer	15RCN50-1.5-R 15RCN50-3.0-R	Interchangeable Adaptor Phase Stable Test Port Cables, Armored W/Reinforced Grip (recommended for cable and antenna line sweep applications. It uses the same ruggedized grip as the Reinforced grip series cables. Now you can also change the adaptor interface on the grip to four different connector types) 1.5 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω 3.0 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω

Continued on next page



Model/Order No.	Name
	Phase-Stable Test Port Cables, Armored
15NNF50-1.5C	1.5 m, DC to 6 GHz, N (m) - N (f), 50Ω
15NN50-1.5C	1.5 m, DC to 6 GHz, N (m) - N (m), 50Ω
15NDF50-1.5C	1.5 m, DC to 6 GHz, N (m) - 7/16 DIN (f), 50Ω
15ND50-1.5C	1.5 m, DC to 6 GHz, N (m) - 7/16 DIN (m), 50Ω
15NNF50-3.0C	3.0 m, DC to 6 GHz, N (m) - N (f), 50Ω
15NN50-3.0C	3.0 m, DC to 6 GHz, N (m) - N (m), 50Ω
15NNF50-5.0C	5.0 m, DC to 6 GHz, N (m) - N (f), 50Ω
15NN50-5.0C	5.0 m, DC to 6 GHz, N (m) - N (m), 50Ω
15N43M50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (m) - 4.3-10 (m)
15N43F50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (m) - 4.3-10 (f)
15N43M50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (m) - 4.3-10 (m)
15N43F50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (m) - 4.3-10 (f)
	Adapters
1091-26-R	DC to 18 GHz, N (m) to SMA (m), 50Ω
1091-27-R	DC to 18 GHz, N (m) to SMA (f), 50Ω
1091-80-R	DC to 18 GHz, N (f) to SMA (m), 50Ω
1091-81-R	DC to 18 GHz, N (f) to SMA (f), 50Ω
1091-172-R	BNC (f) to N (m), DC to 1.3 GHz, 50Ω
1091-465-R	Low PIM Adapter, DC to 6 GHz, 4.3 to 10 (f) to N (f), 50Ω
1091-467-R	Low PIM Adapter, DC to 6 GHz, 4.3 to 10 (m) to N (f), 50Ω
510-90-R	DC to 7.5 GHz, 7/16 DIN (f) to N (m), 50Ω
510-91-R	DC to 7.5 GHz, 7/16 DIN (f) to N (f), 50Ω
510-92-R	DC to 7.5 GHz, 7/16 DIN (m) to N (m), 50Ω
510-93-R	DC to 7.5 GHz, 7/16 DIN (m) to N (f), 50Ω
510-96-R	DC to 7.5 GHz, 7/16 DIN (m) to 7/16 DIN (m), 50Ω
510-97-R	DC to 7.5 GHz, 7/16 DIN (f) to 7/16 DIN (f), 50Ω
1091-433-R	Low PIM Adapter, DC to 3.0 GHz, 4.1 to 9.5 (f) to 7/16 DIN (f), 50Ω
1091-434-R	Low PIM Adapter, DC to 3.0 GHz, 4.1 to 9.5 (m) to 7/16 DIN (f), 50Ω
510-102-R	DC to 11 GHz, N (m)-N (m), 90 degrees 50Ω
	Precision Adapters
34NN50A	Precision Adapter, N (m) - N (m), DC to 18 GHz, 50Ω
34NNF50	Precision Adapter, N (f) - N (f), DC to 18 GHz, 50Ω
	Filters
1030-114-R	806 MHz to 869 MHz, N (m) to SMA (f), 50Ω
1030-109-R	824 MHz to 849 MHz, N (m) to SMA (f), 50Ω
1030-110-R	880 MHz to 915 MHz, N (m) to SMA (f), 50Ω
1030-111-R	1850 MHz to 1910 MHz, N (m) to SMA (f), 50Ω
1030-112-R	2400 MHz to 2484 MHz, N (m) to SMA (f), 50Ω
1030-105-R	890 MHz to 915 MHz, N (m) to N (f), 50Ω
1030-106-R	1710 MHz to 1790 MHz, N (m) to N (f), 50Ω
1030-107-R	1910 MHz to 1990 MHz, N (m) to N (f), 50Ω
1030-149-R	High Pass, 150 MHz, N (m) to N (f), 50Ω
1030-150-R	High Pass, 400 MHz, N (m) to N (f), 50Ω
1030-151-R	High Pass, 700 MHz, N (m) to N (f), 50Ω
1030-152-R	Low Pass, 200 MHz, N (m) to N (f), 50Ω
1030-153-R	Low Pass, 550 MHz, N (m) to N (f), 50Ω
1030-155-R	2500 MHz to 2700 MHz, N (m) to N (f), 50Ω
1030-178-R	1920 MHz to 1980 MHz, N (m) to N (f), 50Ω
1030-179-R	777 MHz to 798 MHz, N (m) to N (f), 50Ω
1030-180-R	2500 MHz to 2570 MHz, N (m) to N (f), 50Ω
2000-1684-R	791 MHz to 821 MHz, N (m) to N (f), 50Ω
2000-1734-R	Bandpass Filter, 699 MHz to 715 MHz, N (m) and N (f), 50Ω
2000-1735-R	Bandpass Filter, 776 MHz to 788 MHz, N (m) and N (f), 50Ω
2000-1736-R	Bandpass Filter, 815 MHz to 850 MHz, N (m) and N (f), 50Ω
2000-1737-R	Bandpass Filter, 1711 MHz to 1756 MHz, N (m) and N (f), 50Ω
2000-1738-R	Bandpass Filter, 1850 MHz to 1910 MHz, N (m) and N (f), 50Ω
2000-1739-R	Bandpass Filter, 880 MHz to 915 MHz, N (m) and N (f), 50Ω
2000-1740-R	Bandpass Filter, 1710 MHz to 1785 MHz, N (m) and N (f), 50Ω
2000-1741-R	Bandpass Filter, 1920 MHz to 1980 MHz, N (m) and N (f), 50Ω
2000-1742-R	Bandpass Filter, 832 MHz to 862 MHz, N (m) and N (f), 50Ω
2000-1743-R	Bandpass Filter, 2500 MHz to 2570 MHz, N (m) and N (f), 50Ω
2000-1799-R	Bandpass Filter, 2305 MHz to 2320 MHz, N (m) and N (f), 50Ω
2000-1911-R	Bandpass Filter, 703 MHz to 748 MHz, N (m) and N (f), 50Ω
2000-1912-R	Bandpass Filter, 788 MHz to 798 MHz, N (m) and N (f), 50Ω
2000-1925-R	Bandpass Filter, 663 MHz to 698 MHz, N (m) and N (f), 50Ω
2000-1926-R	Bandpass Filter, 776 MHz to 806 MHz, N (m) and N (f), 50Ω
	Attenuators
3-1010-122	20 dB, 5 W, DC to 12.4 GHz, N (m) to N (f)
42N50-20	20 dB, 5 W, DC to 18 GHz, N (m) to N (f)
42N50A-30	30 dB, 50 W, DC to 18 GHz, N (m) to N (f)
3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N (m) to N (f)
1010-127-R	30 dB, 150 W, DC to 3 GHz, N (m) to N (f)
3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N (m) to N (f), Uni-directional
1010-121-R	40 dB, 100 W, DC to 18 GHz, N (m) to N (f), Uni-directional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N (m) to N (f)

Model/Order No.	Name
	Miscellaneous Accessories
2000-1528-R	GPS Antenna, SMA (m) with 15 ft cable
69793	CW Signal Generator Kit
2000-1374-R	External Charger for Li-Ion Batteries
633-75	7500 mAh High-capacity Battery Pack
2000-1652-R	GPS Antenna, SMA (m) with 1 ft cable
2000-1689-R	EMI Near Field Probe Kit
2000-1371-R	Ethernet Cable, 7 feet/213 cm
3-806-152	Cat 5e Crossover Patch Cable, 7 feet/213 cm
MA2700A	Handheld Interference Hunter (For full specifications, refer to the MA2700A Technical Data Sheet 11410-00692)
2000-1884-R	PIM Hunter™ Test Probe (For full specifications, refer to the 2000-1884-R Technical Data Sheet 11410-00999)
2000-1797-R	Screen Protector Film, 8.4 inch
66864	Rack Mount Kit, Master Platform
	Backpack and Transit Case
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle 56 × 45.5 × 26.5 cm (22.07" × 17.92" × 10.42")
760-261-R	Large Transit Case with Wheels and Handle 63.1 × 50 × 30 cm (24.83" × 19.69" × 11.88"), space for MA2700A, antennas, filters, instrument inside soft case, and other interference hunting accessories/tools
760-262-R	Transit Case for MA2700A, several Yagi antennas and filters
760-271-R	Transit Case for Portable Directional Antennas and Port Extender 52.4 × 42.8 × 20.6 cm (20.62" × 16.87" × 8.12") (for 2000-1777-R, 2000-1778-R, 2000-1779-R, 2000-1798-R)
760-286-R	Compact Transit Case with Wheels and Handle 55.6 × 35.5 × 22.9 cm (21.89" × 13.98" × 9.01")
	Directional Antennas
2000-1411-R	824 MHz to 896 MHz, N (f), 12.3 dBi, Yagi
2000-1412-R	885 MHz to 975 MHz, N (f), 12.6 dBi, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N (f), 12.3 dBi, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N (f), 11.4 dBi, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N (f), 14.1 dBi, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N (f), 14.3 dBi, Yagi
2000-1659-R	698 MHz to 787 MHz, N (f), 10.1 dBi, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N (f), 14.3 dBi, Yagi
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), 14.1 dBi, Yagi
2000-1747-R	Antenna, Log Periodic, 300 MHz to 7000 MHz, N (f), 5.1 dBi, typical
2000-1748-R	Antenna, Log Periodic, 1 GHz to 18 GHz, N (f), 6 dBi, typical
2000-1777-R	Portable Directional Antenna, 9 kHz to 20 MHz, N (f)
2000-1778-R	Portable Directional Antenna, 20 MHz to 200 MHz, N (f)
2000-1779-R	Portable Directional Antenna, 200 MHz to 500 MHz, N (f)
2000-1812-R	Portable Yagi Antenna, 450 MHz to 512 MHz, N (f), 7.1 dBi
2000-1825-R	Portable Yagi Antenna, 380 MHz to 430 MHz, N (f), 7.1 dBi
	Isotropic Antennas
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)
	Portable Antennas
2000-1200-R	806 MHz to 866 MHz, SMA (m), 50Ω
2000-1473-R	870 MHz to 960 MHz, SMA (m), 50Ω
2000-1035-R	896 MHz to 941 MHz, SMA (m), 50Ω (1/2 wave)
2000-1030-R	1710 MHz to 1880 MHz, SMA (m), 50Ω (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), 50Ω (1/2 wave)
2000-1475-R	1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA (m), 50Ω
2000-1032-R	2400 MHz to 2500 MHz, SMA (m), 50Ω (1/2 wave)
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA (m), 50Ω
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)
	Mag Mount Broadband Antenna
2000-1616-R	20 MHz to 21000 MHz, N (f), 50Ω
2000-1645-R	694 MHz to 894 MHz 3 dBi peak gain, 1700 MHz to 2700 MHz 3 dBi peak gain, N (m), 50Ω, 10 ft
2000-1646-R	750 MHz to 1250 MHz 3 dBi peak gain, 1650 MHz to 2000 MHz 5 dBi peak gain, 2100 MHz to 2700 MHz 3 dBi peak gain, N (m), 50Ω, 10 ft
2000-1647-R	Cable 1: 698 MHz to 1200 MHz 2 dBi peak gain, 1700 MHz to 2700 MHz 5 dBi peak gain, N (m), 50Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz 5 dBi peak gain, N (m), 50Ω, 10 ft
2000-1946-R	Cable 3: GPS 26 dB gain, SMA (m), 50Ω, 10 ft Cable 1: 617 MHz to 960 MHz, 3 dBi peak gain, 1710 MHz to 3700 MHz, 4 dBi peak gain, N (m), 50Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N (m), 50Ω, 10 ft
2000-1648-R	Cable 3: GPS 26 dB gain, SMA (m), 50Ω, 10 ft 1700 MHz to 6000 MHz 3 dBi peak gain, N (m), 50Ω, 10 ft

Site Master™

S331L

Cable & Antenna Analyzer: 2.0 MHz to 4.0 GHz, Power Meter: 50 MHz to 4.0 GHz

Remote Control
USB**Handheld Cable & Antenna Analyzer Featuring Classic and Advanced Modes**

The Site Master S331L is Anritsu's compact handheld Cable & Antenna Analyzer. The S331L was designed based on years of field experience, customer feedback, field trials, and the latest technology advances. The resulting instrument is the best value in a low cost, field optimized, reliable, rugged, easy to use, one port Cable & Antenna analyzer.

Optimized for Field Use

- Rugged and Reliable
- Instant On from Standby Mode
- Highest RF Immunity
- Built-in InstaCal™ Module
 - Fast, One-connection Calibration
- FlexCal™ Calibration
 - One Calibration for All Frequencies
- Optical connector inspection with IEC 61300-3-35 based Pass/Fail standard (Requires USB Video Inspection Probe, sold separately)
- Built-in Power Meter
- High Accuracy USB Power Meter (Requires USB Sensor, sold separately)
- Impact, Dust, and Splash Resistant
- Smallest, Lightest Site Master™

Easy to Use

- Integrated Help Function
- S331D-like Classic Mode
- S331E-like Advanced Mode
 - Additional Markers
 - Customizable Shortcuts
 - Full-screen View
- Multiple USB Ports
- 800 × 480 7" TFT Touch Screen
 - Alphanumeric Keyboard
 - EZ Name Quick Matrix
- Backlit Keypad
- easyTest™

Efficient Sweep Management

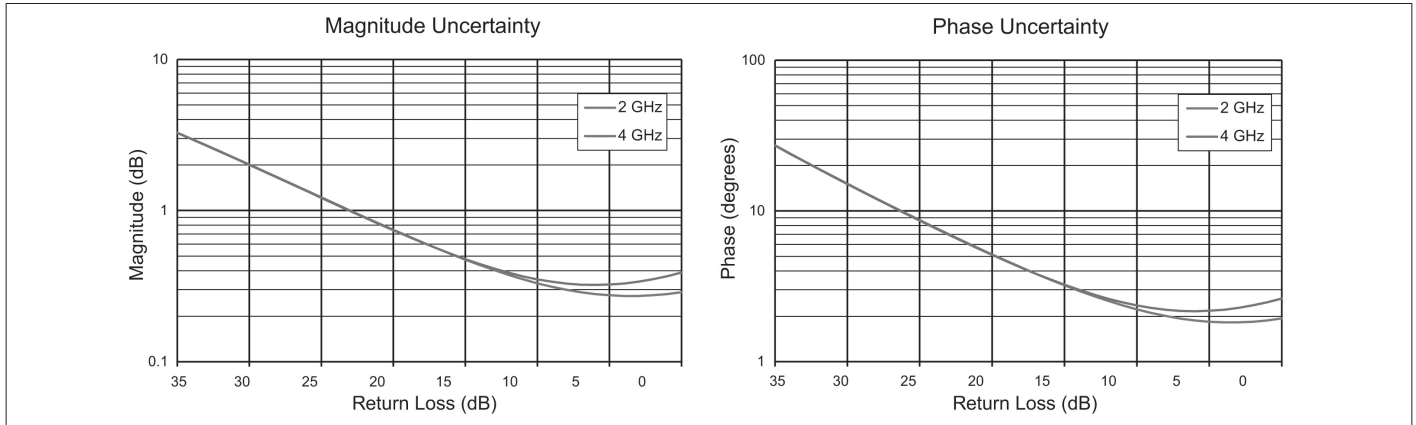
- Internally Store > 1000 Files
 - Sweeps, Setups, Screen Shots
- Fast Preview of Stored Sweeps
- Line Sweep Tools (LST) Software
 - Edit Sweeps, Rename, Archive
 - Generate PDF or HTML Reports
- Standard*.dat Sweep File Format
- Compatible with HHST
 - Widely Accepted by Operators
- Location Data with Compatible USB GPS Module



Cable and Antenna Analyzer Specifications

Measurements	VSWR	
	Return Loss	
	Cable Loss (One Port)	
	Distance-to-Fault (DTF) Return Loss	
	Distance-to-Fault (DTF) VSWR	
	Smith Chart 50Ω/75Ω (Advanced Mode Only)	
	1-Port Phase (Advanced Mode Only)	
	Transmission with External Sensor (Advanced Mode Only)	
Setup Parameters – Classic Mode	Measurement Display	Single Display with independent markers
	Frequency	F1/F2
	DTF	D1/D2 Units m/ft, DTF Aid, Cable Loss, Propagation Velocity, Cable type
	Windowing	Rectangular, Normal Side Lobe, Low Side Lobe, Minimum Side Lobe
	Amplitude	Top, Bottom Auto Scale, Full Scale
	Sweep	Data Points, Run/Hold, Single/Continuous, RF Immunity (High/Low), RF Power in Hold (On/Off), Trace
	Data Points	130, 259, 517, 1033, 2065
	Markers	Markers 1 to 6 (On/Off), Delta Markers 2 to 4 (Ref M1), Marker to Peak/Valley, Marker Table, Marker 5 (Peak/Valley between M1 & M2), Marker 6 (Peak/Valley between M3 & M4)
	Traces	Copy Trace To Memory, Trace Display, Trace Math [Trace – Memory, Trace + Memory, (Trace + Memory)/2]
	Limit Line	On/Off, Edit Value, Limit Alarm, Pass/Fail On/Off, Limit Preset
	Calibration	Start Calibration, Cal Info, Cal Correction (On/Off), Cal Method (OSL, InstaCal™), Cal Type (Standard, FlexCal™)
	Save/Recall	Setups, Measurements, Screen Shots
Setup Parameters – Advanced Mode	Measurement Display	Single/Dual Display with independent markers
	Frequency	Start Frequency (F1), Stop Frequency (F2)
	DTF	Start Distance (D1), Stop Distance (D2), Units m/ft, DTF Aid, Cable List, Cable Loss, Propagation Velocity
	Windowing	Rectangular, Normal Side Lobe, Low Side Lobe, Minimum Side Lobe
	Amplitude	Top, Bottom, Auto Scale, Full Scale
	Sweep	Data Points, Run/Hold, Single/Continuous, RF Immunity (High/Low), RF Power in Hold (On/Off)
	Data Points	130, 259, 517, 1033, 2065
	Markers	Markers 1 to 8 (On/Off), Delta Markers 2 to 8 (Ref M1), Marker Tracking (On/Off), Marker to Peak/Valley, Marker Table, Marker 5 & 7 (Peak/Valley between M1 & M2), Marker 6 & 8 (Peak/Valley between M3 & M4), Independent Markers for Frequency and Distance Measurements
	Traces	Copy Trace to Memory, Trace Display, Trace Math [Trace – Memory, Trace + Memory, (Trace + Memory)/2]
	Limit Line	Active Limit (Upper/Lower), Limit State (On/Off), Move Active Limit, Edit Segments (42 upper and 42 lower segments maximum), Limit Alarm, Pass/Fail On/Off, Limit Preset
	Calibration	Start Calibration, Cal Info, Cal Correction (On/Off), Cal Method (OSL, InstaCal™), Transmission, OSL + Transmission Cal Type (Standard, FlexCal™)
	Save/Recall	Setups, Measurements, Screen Shots
Frequency	Frequency Range	2 MHz to 4 GHz
	Frequency Accuracy	±5 ppm @ 23°C±3°C
	Frequency Resolution	1 kHz
Power	Output Power	–3 dBm (typ.)
Interference Immunity	On-Channel	+17 dBm outside calibrated sweep range
	On-Frequency	+13 dBm within calibrated sweep range
Measurement Speed	Return Loss	≤1.50 ms/data point, RF immunity low (typ.)
	Distance-to-Fault	≤1.75 ms/data point, RF immunity low (typ.)
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
Distance-to-Fault	Vertical Range Return Loss	0 to 60 dB
	Vertical Range VSWR	1 to 65
	Fault Resolution (meters)	$(1.5 \times 10^9 \times vp)/\Delta F$ (vp = propagation velocity, ΔF is F2 – F1 in Hz)
	Horizontal Range (meters)	0 to (Data Points – 1) × Fault Resolution, to maximum of 1500 meters (4921 feet)
1-Port Phase (Advanced Mode Only)	Measurement Display Range	–450° to +450°
	Resolution	0.01°
Smith Chart (Advanced Mode Only)	Impedance	50Ω, 75Ω
	Resolution	0.01
Transmission Ext Sensor (Advanced Mode Only)	Measurement Display Range	–100 to +100 dB
	Resolution	0.01 dB
Measurement Accuracy (at 23°C±3°C)	Corrected Directivity	≥38 dB, InstaCal™ calibration ≥42 dB, OSL calibration (OSLN50A-8, OSLNF50A-8, OSLN50-1, OSLNF50-1)

Return Loss Measurement Uncertainty (Standard OSL calibration. OSLN50-1 Precision Open/Short/Load calibration component.)



Internal Power Meter Specifications

Frequency	Measurement Frequency (for Cal Factor)
Amplitude	Max Value, Min Value, Offset Value, Relative On/Off, Units dBm/Watts, Auto Scale, Fullscale
Calibration	Zero On/Off
Average	Running Average, Max Hold (On/Off), Run/Hold, Average Mode (Continuous/Single)
Limits	Limit On/Off, Upper Value, Lower Value
Frequency Range	50 MHz to 4 GHz
Display Range	-100 to +100 dBm
Measurement Range	-33 to +20 dBm
Offset Range	Max ±100 dB, user settable value
VSWR	1.5:1 (typ.)
Maximum Power	+27 dBm, ±45 VDC (damage level)
Connector	Type N (m), 50Ω
Accuracy	±0.7 dB (0 dBm, 1 GHz CW, @ 23°C±3°C)
Frequency Response and Linearity	Additional ±0.8 dB (±0.5 dB) (typ.)
Temperature Effect	Additional ±0.02 dB per 1°C change (typ.)

High Accuracy Power Meter (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), 50Ω	Type N (m), 50Ω	Type N (m), 50Ω (8 GHz/18 GHz) Type K (m), 50Ω (26 GHz)	Type N (m), 50Ω	Type K (m), 50Ω (33 GHz/40 GHz) Type V (m), 50Ω (50 GHz)
Dynamic Range	+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)	-60 to + 20 dBm (1 nW to 100 mW)	-70 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*1	± 0.16 dB*2	± 0.18 dB*3	± 0.17 dB*4	± 0.17 dB*5
Data sheet (for complete specifications)	11410-00621	11410-00424	11410-00504	11410-00841	11410-00906

- *1: 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.
- *2: Total RSS measurement uncertainty (0°C to 50°C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
- *3: Expanded uncertainty with K = 2 for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
- *4: 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.
- *5: Includes linearity over temperature uncertainties, but not the effects of calibration factor, mismatch, zero set and drift, and noise.

**Video Inspection Probe** (requires external USB Video Inspection Probe, sold separately)

All specifications and characteristics apply to Revision 2 instruments under the following conditions, unless otherwise stated: 1) After 5 minutes of warm-up time, where the instrument has completely stabilized to the ambient temperature; 2) Internal frequency reference is used; 3) Instrument is within the recommended calibration cycle of 12 months. Cable and Antenna Analyzer measurements applicable after standard OSL calibration is performed using Anritsu calibration components; 4) Typical specifications in parentheses () describe performance that will be met by a minimum of 80% of all products. They do not include guard bands and are not warranted; 5) Typical specifications that are not in parentheses are not tested and not warranted. They are generally representative of the nominal characteristic performance; A coverage factor of $k = 2$ is applied to the measurement uncertainties to facilitate comparison with other industry monitors; 6) All specifications subject to change without notice.

Setup Parameters	Probe Model	G0306A or G0306B 400X USB Visual Inspection Probe
	Tip Type (included with G0306B)	SC_APC_F, SC_PC_F, LC_PC_F, FC_PC_F, 2.5APC_M, 2.5PC_M, 1.25PC_M
	Test Profile (IEC 61300-3-35)	SM PC >45, SM APC, SM PC >25, MM PC 62.5, MM PC 50.0
	Auto Analyze	On/Off
	Auto Filename	On/Off
Measurement Parameters	Auto Filename Settings	Location, File Prefix, Start Number, Include Date
	Live	View Live Image
	Captured	Capture Image for Analysis
	Analyze	Analyze Image
	Results Table	Auto/Off
	Overlay	On/Off
Save/Recall Parameters	Zoom Control Help	Displays instruction for image Zoom feature
	Save: Measurement (*.vipi), VIP Image (*.png), Screen Shot (.png) Recall: Measurement (*.vipi), VIP Image (*.png), Screen Shot (.png) File Management: Rename: Create Folder, Copy, Paste, Delete	
Report Parameters	Header Settings: Customer, Project, Operator, Notes, Include Logo Generate Report: Generates pdf report with options to include multiple *.vipi files	

General Specifications

Setup Parameters	System Info	Status, Battery
	System Setups	Date/Time, Language, Display/Audio
	Date/Time	Time and Date Settings, Time Zone Settings
	Language	English, French, German, Italian, Spanish, Russian, Portuguese, Japanese, Korean, Chinese
	Display/Audio	Brightness, Color Schemes, Screen Shot Settings, Volume
	Connectivity	GPS, Ethernet Configuration (DHCP/Static)
	Diagnostics	Self Test
	Preset	Preset, Reset, Update Firmware
	Reset	Factory Reset, Delete All User Files, Delete Custom Files, Master Reset
	File	Save, Recall, File Management
	Save	Measurement (*.dat), Setup (*.stp), Screen Shot (*.png)
	Recall	Recall, Create Folder, Copy, Paste, Delete
	File Management	Rename, Create Folder, Copy, Paste, Delete, Navigation
	Navigation	Top, Bottom, Page Up, Page Down
	Connectors	Help Menu
Internal Trace/Setup Memory		>1000 files (files may be traces, setups, screen shots, or any combination)
External Trace/Setup Memory		Limited only by size of USB Flash drive
RF Out/Reflect In		Type N, female, 50Ω, Maximum Input +42 dBm, ±50 VDC
InstaCal™/Power Meter		Type N, male, 50Ω, Maximum Input +27 dBm, ±45 VDC (Damage Level)
Display	External Power	5.5 mm barrel connector, 11 to 14 VDC, <3.0 A
	USB Ports	USB 2.0 Type A (two ports)
	USB Interface	Type mini-B, Connect to PC for data transfer
	Type	TFT Resistive Touch Screen
GPS Connectivity (external GPS USB module sold separately)	Size	7.0" daylight viewable color LCD
	Resolution	800 × 480
	Pixel Defects	No more than five defective pixels (99.9986% good pixels)
Battery	GPS Time/Location Indicator	Time, Latitude, Longitude and Altitude in GPS dialog (current or last known location) Time, Latitude, Longitude and Altitude with trace storage (current or last known location) Setup: Clear Data, Synchronize system time to GPS
	Type	Li-Ion
CE	Battery Operation	>8.0 Hours (typ.) (70% brightness setting, continuous usage)
	Standby	7 days (typ.) (With fully charged battery. Actual time will vary depending on battery charge level)
	EMC	2014/30/EU, EN61326-1, EN61000-4-2
RCM	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863
KCC	Australia and New Zealand	RCM AS/NZS 4417:2012
	South Korea	KCC-REM-A21-0004

Continued on next page



Environmental (MIL-PRF-28800F Class 2)	Operating Temperature Range	-10°C to +55°C
	Storage Temperature Range	-51°C to +71°C
	Maximum Relative Humidity	95% RH at +30°C, non-condensing
	Vibration, Sinusoidal	5 Hz to 55 Hz
	Vibration, Random	10 Hz to 500 Hz
	Half Sine Shock	30 g _n
	Altitude	4600 meters, operating and non-operating
Explosive Atmosphere	MIL-PRF-28800F, Section 4.5.6.3 MIL-STD-810G, Method 511.5, Procedure 1	
	Dimensions and Mass	250 (W) × 177 (H) × 61 (D) mm (10.0 × 7.1 × 2.4 in) <2.0 kg (4.4 lb), including battery

Anritsu Tool Box and Line Sweep Tools (for your PC)

Line Sweep Tools (LST) is a free PC based program that increases productivity for people who deal with numerous Cable and Antenna traces every day. LST is the next generation of Anritsu's familiar Handheld Software Tools (HHST) and shares its uncomplicated user interface, giving a new face to the term "ease of use."

Cable Editor*1	Instrument Cable Lists may be retrieved from the instrument, modified as required, and uploaded back into instrument.
Distance to Fault*2 (DTF)	Easily convert Return Loss or VSWR traces to Distance to Fault traces with one button press.
Measurement Calculator	Provides quick conversion between commonly used measurement units such as VSWR, RL, and others.
Signal Standard Editor*1	Signal Standard Lists may be retrieved from the instrument, modified as required, and uploaded back into instrument.
Naming Grid	A naming grid function makes changing file names, trace titles, and trace subtitles from field values to those required by contract simple and quick. Once the naming grid is populated with user defined file name segments, a few simple button presses will then fill out the file, title, and sub-title names. Quickly applied to multiple traces, the naming grid can save time, increase efficiency and accuracy.
Presets	Presets make applying markers and a limit line to similar traces quick and easy. They only need to be set once, and recorded. After this, applying them to a similar trace requires only one button push. This speeds up trace processing and makes providing consistent marker and limit line settings easy.
Report Generator	The report generator creates a professional PDF or HTML based report. Reports may include GPS*3 location, power level*3, company logo*4, instrument and calibration status along with a display of all open traces. It also may contain additional information such as addresses and phone numbers.
Capture	Plots to Screen, Database, *.dat, *.jpg
Connect	To PC using USB, Ethernet, Serial
Download/Upload*1	Lists/measurements and live traces to PC for storage and analysis.
Supported File Types	Input: *.dat, *.vna, *.mna, *.pim, *.tm Output: *.dat, *.vna, *.pim, *.tm, *.csv, *.bmp, *.jpg, *.png

*1: Instrument type/model must match original

*2: Only *.dat and *.vna file types supported

*3: Model dependent

*4: Optionally set by user

easyTest Tools (for your PC)

Instrument Mode	Cable & Antenna Analyzer Mode	
Commands	Display Image	Allows putting a custom image on the instrument screen
	Recall Setup	Places the instrument into a known state
	Prompt	Displays instructional messages on the instrument screen
	Save	Allows automatic or manual saving of traces
Connectivity	Connections	USB cable or USB memory stick

Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name	Model/Order No.	Name
S331L	Main Frame Cable and Antenna Analyzer (2 MHz to 4 GHz) Internal InstaCal™ (2 MHz to 4 GHz) Internal Power Meter (50 MHz to 4 GHz) High Accuracy Power Meter (Requires External USB Power Sensor, sold separately) GPS Location/System Time Sync (Requires External GPS Module 2000-1723-R, sold separately) Optical connector inspection with IEC 61300-3-35 based Pass/Fail standard (Requires USB Video Inspection Probe, sold separately)	2000-1676-R	Standard Accessories (included with instrument) Soft Carrying Case
S331L-ES510	Calibration and Extended Warranty Options Warranty Extension to 5 Years, Return to Anritsu	2000-1691-R	Stylus with Coiled Tether
S331L-ES513	Warranty with Z540 Calibration Warranty Extension to 5 Years, Return to Anritsu	2000-1687-R	Torque Multiplier N (m)
S331L-0098	Calibration Only Options Standard Calibration to ISO17025 and ANSI/NCSL Z540-1. Includes calibration certificate.	40-187-R	AC-DC Adapter
S331L-0099	Premium Calibration to ISO17025 and ANSI/NCSL Z540-1. Includes calibration certificate, test report, and uncertainty data.	806-141-R	Automotive Power Adapter, 12 VDC, 60 W
		3-2000-1498	USB A/5-pin mini-B Cable, 10 ft/305 cm Standard Three-Year Warranty (battery one-year warranty) Certificate of Calibration and Conformance
		10100-00065	Documentation (available at www.anritsu.com) Product Information, Compliance, and Safety
		11410-00616	Site Master™ S331L Technical Data Sheet
		10580-00321	Site Master™ S331L User Guide
		11410-00640	Site Master™ S331L Product Brochure (Includes information about additional Site Master models)
		11410-00662	Site Master™ S331L Quick Fact Sheet
		11410-00674	Cable and Antenna Analysis Troubleshooting Guide
		10580-00253	Site Master™ S331L Maintenance Manual

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Model/Order No.	Name
	USB Power Sensors and Transmission Sensors (for complete ordering information, see the respective datasheets of each sensor)
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 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
SC8268	USB Transmission Sensor, K (m), 1 MHz to 40 GHz, +10 to -50 dBm
MA25100A	RF Power Indicator
	USB Extender Kit (for two port cable loss/transmission (external sensor) measurements)
2000-1717-R	USB 1.1 Passive 40 m Extender
2000-1900-R	USB 2.0 Active 100 m Extender (with Type A power cord for USA, Japan, North America, Central America and Caribbean)
2000-1901-R	USB 2.0 Active 100 m Extender (with Type C power cord for use in Europe, India, South Korea, and many countries in Middle East and Africa)
2000-1902-R	USB 2.0 Active 100 m Extender (with Type I power cord for use in Australia, New Zealand, Argentina, and the South Pacific)
2000-1903-R	USB 2.0 Active 100 m Extender (with Type G power cord for use in the UK, and several other countries in Asia, the Middle East, and Africa)
2100-28-R	Cat 5e extension cable for use with USB Extender (22.5 m)
	GPS Module
2000-1723-R	High Performance USB Mag-Mount GPS Module
	Ethernet Adapter
2000-1810-R	Portable USB to Ethernet LAN Adapter
	Video Inspection Probe
G0306B	Video Inspection Probe (400x), including the following standard connector tips:
Universal Tips	H0361A 1.25PC-M, H0360A 2.5PC-M, H0362A 2.5APC-M
Bulkhead Tips	H0363A LC-PC-F, H0364A FC-PC-F, H0375A ST-PC-F, H0366A SC-APC-F
Additional Tips Available	H0372A E2000-PC-F, H0373A FC-APC-F, H0374A MU-PC-F, H0365A SC-PC-F, H0376A 1.25APC-M
	Accessories
971-14-R	Ferrule Cleaner, 2.5 mm SC
971-15-R	Ferrule Cleaner, 1.25 mm LC
971-16	Fiber Ferrule Cleaner
	Optional Accessories
	Calibration Components, 50Ω
OSLN50A-8	Precision Open/Short/Load, N (m), 42 dB, DC to 8.0 GHz, 50Ω
OSLNF50A-8	Precision Open/Short/Load, N (f), 42 dB, DC to 8.0 GHz, 50Ω
2000-1618-R	Precision Open/Short/Load, 7/16 DIN (m), DC to 6.0 GHz 50Ω
2000-1619-R	Precision Open/Short/Load, 7/16 DIN (f), DC to 6.0 GHz 50Ω
2000-1914-R	Precision Open/Short/Load, 4.3-10 (f), DC to 6 GHz, 50Ω
2000-1915-R	Precision Open/Short/Load, 4.3-10 (m), DC to 6 GHz, 50Ω
22N50	Precision Open/Short, N (m), DC to 18 GHz, 50Ω
22NF50	Precision Open/Short, N (f), DC to 18 GHz, 50Ω
SM/PL-1	Precision, N (m) Load, 42 dB, 6 GHz
SM/PLNF-1	Precision, N (f) Load, 42 dB, 6 GHz
	Calibration Components, 75Ω
12N50-75B	Matching Pad, DC to 3 GHz, 50Ω to 75Ω
22N75	Open/Short, N (m), DC to 3 GHz, 75Ω
22NF75	Open/Short, N (f), DC to 3 GHz, 75Ω
26N75A	Precision Termination, N (m), DC to 3 GHz, 75Ω
26NF75A	Precision Termination, N (f), DC to 3 GHz, 75Ω

Model/Order No.	Name
	Adapters
510-90-R	7/16 DIN (f) to N (m), DC to 7.5 GHz, 50Ω
510-91-R	7/16 DIN (f) to N (f), DC to 7.5 GHz, 50Ω
510-92-R	7/16 DIN (m) to N (m), DC to 7.5 GHz, 50Ω
510-93-R	7/16 DIN (m) to N (f), DC to 7.5 GHz, 50Ω
510-96-R	7/16 DIN (m) to 7/16 DIN (m), DC to 7.5 GHz, 50Ω
510-97-R	7/16 DIN (f) to 7/16 DIN (f), DC to 7.5 GHz, 50Ω
510-102-R	N (m) to N (m), DC to 11 GHz, 50Ω, 90 degrees right angle
1091-26-R	SMA (m) to N (m), DC to 18 GHz, 50Ω
1091-27-R	SMA (f) to N (m), DC to 18 GHz, 50Ω
1091-80-R	SMA (m) to N (f), DC to 18 GHz, 50Ω
1091-81-R	SMA (f) to N (f), DC to 18 GHz, 50Ω
1091-172	BNC (f) to N (m), DC to 1.3 GHz, 50Ω
1091-433-R	Low PIM Adapter, 4.1-9.5 (f) to 7/16 DIN (f), DC to 3.0 GHz, 50Ω
1091-434-R	Low PIM Adapter, 4.1-9.5 (m) to 7/16 DIN (f), DC to 3.0 GHz, 50Ω
1091-435-R	Low PIM Adapter, 4.1-9.5 (f) to N (m), DC to 3.0 GHz, 50Ω
1091-436-R	Low PIM Adapter, 4.1-9.5 (m) to N (m), DC to 3.0 GHz, 50Ω
1091-440-R	Low PIM Adapter, 4.3-10 (f) to 7/16 DIN (f), DC to 3.0 GHz, 50Ω
1091-441-R	Low PIM Adapter, 4.3-10 (m) to 7/16 DIN (f), DC to 3.0 GHz, 50Ω
1091-442-R	Low PIM Adapter, 4.3-10 (f) to N (m), DC to 3.0 GHz, 50Ω
1091-443-R	Low PIM Adapter, 4.3-10 (m) to N (m), DC to 3.0 GHz, 50Ω
1091-465-R	4.3-10 (f) to N (f), DC to 6 GHz, 50Ω
1091-467-R	4.3-10 (m) to N (f), DC to 6 GHz, 50Ω
	Precision Adapters
34NN50A	Precision Adapter, N (m) to N (m), DC to 18 GHz, 50Ω
34NFN50	Precision Adapter, N (f) to N (f), DC to 18 GHz, 50Ω
	Attenuators
3-1010-122	20 dB, 5 W, DC to 12.4 GHz, N (m) to N (f)
42N50-20	20 dB, 5 W, DC to 18 GHz, N (m) to N (f)
42N50A-30	30 dB, 50 W, DC to 18 GHz, N (m) to N (f)
3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N (m) to N (f)
1010-127-R	30 dB, 150 W, DC to 3 GHz, N (m) to N (f)
3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N (m) to N (f), Unidirectional
1010-121-R	40 dB, 100 W, DC to 18 GHz, N (m) to N (f), Unidirectional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N (m) to N (f)
	Phase-Stable Test Port Cables, Armored w/Reinforced Grip (recommended for cable & antenna line sweep applications)
15RNF50-1.5-R	1.5 m, DC to 6 GHz, N (m) to N (f), 50Ω
15RDN50-1.5-R	1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (f), 50Ω
15RDN50-1.5-R	1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (m), 50Ω
15RNF50-3.0-R	3.0 m, DC to 6 GHz, N (m) to N (f), 50Ω
15RDN50-3.0-R	3.0 m, DC to 6 GHz, N (m) to 7/16 DIN (f), 50Ω
15RDN50-3.0-R	3.0 m, DC to 6 GHz, N (m) to 7/16 DIN (m), 50Ω
	Interchangeable Adapter Phase Stable Test Port Cables, Armored w/Reinforced Grip (recommended for cable and antenna line sweep applications. It uses the same ruggedized grip as the reinforced grip series cables. Now you can also change the adapter interface on the grip to four different connector types)
15RCN50-1.5-R	1.5 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω
15RCN50-3.0-R	3.0 m, DC to 6 GHz, N (m), N (f), 7/16 DIN (m), 7/16 DIN (f), 50Ω
	Phase-Stable Test Port Cables, Armored
15NNF50-1.5C	1.5 m, DC to 6 GHz, N (m) to N (f), 50Ω
15NN50-1.5C	1.5 m, DC to 6 GHz, N (m) to N (m), 50Ω
15NDF50-1.5C	1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (f), 50Ω
15ND50-1.5C	1.5 m, DC to 6 GHz, N (m) to 7/16 DIN (m), 50Ω
15NNF50-3.0C	3.0 m, DC to 6 GHz, N (m) to N (f), 50Ω
15NN50-3.0C	3.0 m, DC to 6 GHz, N (m) to N (m), 50Ω
15NNF50-5.0C	5.0 m, DC to 6 GHz, N (m) to N (f), 50Ω
15NN50-5.0C	5.0 m, DC to 6 GHz, N (m) to N (m), 50Ω
15N43M50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (m)
15N43F50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (f)
15N43M50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (m) to 4.3-10 (m)
15N43F50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (m) to 4.3-10 (f)
	Backpack and Transit Case
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-286-R	Compact Transit Case with Wheels and Handle 55.6 × 35.5 × 22.9 cm (21.89" × 13.98" × 9.01")

Microwave Site Master™

S820E

1 MHz to 8 GHz, 14 GHz, 20 GHz, 30 GHz, 40 GHz

Remote Control
Ethernet | USB**Cable & Antenna Analyzer Featuring Classic and Advanced Modes**

With microwave frequency coverage up to 40 GHz, Site Master S820E completely redefines the standards for portable handheld analyzers, setting another new industry benchmark for performance and accuracy. The S820E is the culmination of over 50 years of microwave development, utilizing the very latest technologies to deliver accuracy and performance previously reserved only for benchtop instruments. Based on a true 4 channel receiver design, the S820E offers true VNA performance in a portable package. Optional VNA mode provides fully reversing S-parameter measurements anywhere, anytime. Optional vector voltmeter mode (VVM) with standard A/B and B/A ratio may be used as drop-in replacement for legacy VVM products.

Cable and Antenna Analyzer Highlights

- 1-Port Measurements: RL, VSWR, Cable Loss, DTF, Phase, Smith Chart
- 2-Port Measurements: Transmission, Cable Loss
- Display: Single or Dual Measurement Touchscreen
- Calibration: Coaxial (OSL, TOSL), Waveguide (SSL, SSLT)
- Dynamic Range: 110 dB (20 MHz to 40 GHz)
- Frequency Resolution: 1 Hz (1 MHz to 40 GHz)
- Sweep Speed: 550 μ s/data point
- Calibration Temperature Window: $\pm 10^{\circ}\text{C}$
- Full Temperature Calibration Kits: -10°C to $+55^{\circ}\text{C}$

Vector Network Analyzer Highlights

- Fully Reversing Error Corrected Measurements
- Measure All Four S-Parameters Simultaneously
- Flexible Trace Display Layout: 1, 2, 3, or 4, and Overlay on top
- Calibration Interpolation and Through Update
- Independent Markers and Limits Per Trace
- Fast Sweeps (<600 μ s/pt) Even in 5 kHz IFBW
- Arbitrary Data Point Setting
- Port Reference Plane Extension (Distance and/or Loss)

Vector Voltmeter Highlights

- A/B & B/A Ratio Measurement Standard
- Reflection/Transmission Measurement Standard
- Reference Auto-tune reduces or eliminates need for common 10 MHz reference (for A/B & B/A ratio measurement only)
- Vector Error Correction for Absolute Measurement (Reflection/Transmission only)
- 4 Flexible Data Display Formats
- Table Display allows 12 Measurements and 1 Reference, Simultaneously

Capabilities and Functional Highlights

- Benchtop VNA Performance
- Intuitive GUI + Classic Mode
- 2-Port Measurements Standard
- 2-Port Cable Loss
- Std High Accuracy Power Meter (Requires external USB sensor)
- USB Transmission Sensors up to 40 GHz
- Ethernet/USB Connectivity
- USB Peripheral Support
- Touchscreen Popup Keyboard
- easyTest™ Automated Scripts
- Embedded Help (FAQ and UserGuide)
- Optical connector inspection with IEC 61300-3-35 based Pass/Fail standard (Requires USB Video Inspection Probe, sold separately)



Definitions

All specifications and characteristics apply to Revision 2 instruments under the following conditions, unless otherwise stated:

Warm-Up Time	After 10 minutes of warm-up time, where the instrument is left in the ON state.
Reference Signal	When using internal reference signal.
Typical Performance	Typical specifications that are not in parenthesis are not tested and not warranted. They are generally representative of characteristic performance. Typical specifications in parenthesis () represent the mean value of measured units and do not include any guard-bands or uncertainties. They are not warranted.
Uncertainty	A coverage factor of x1 is applied to the measurement uncertainties to facilitate comparison with other industry handheld analyzers.
Calibration Cycle	Calibration is within the recommended 12 month period (residual specifications also require calibration kit calibration cycle adherence.) All specifications subject to change without notice. For the most current data sheet, please visit the Anritsu web site: www.anritsu.com

Cable and Antenna Analyzer Specifications

Measurements	1-Port Measurements	Return Loss Distance-to-Fault (DTF) Return Loss Cable Loss VSWR Distance-to-Fault (DTF) VSWR Smith Chart 50Ω/75Ω (Advanced Mode Only) Phase (Advanced Mode Only)
	2-Port Measurements	Transmission (Advanced Mode Only) Transmission with External Sensor (Advanced Mode Only) Cable Loss (2-Port) with External Sensor (Classic Mode Only)
Setup Parameters Classic Mode	Measurement Display	Single Display with independent markers
	Frequency	F1/F2
	DTF	D1/D2, Units m/ft, DTF Aid, Cable List, Cable Loss, Propagation Velocity
	Windowing	Rectangular, Nominal Side Lobe, Low Side Lobe, Minimum Side Lobe
	Amplitude	Top, Bottom Auto Scale, Full Scale, Scale Preset
	Sweep	Data Points (130, 259, 517, 1033, 2065), Run/Hold, Sweep Type (Single/Continuous), RF Immunity (High/Low), RF Power in Hold (On/Off), Smoothing, Sweep Averaging (1 to 1000), Trace
	Marker	Markers 1 to 6 (On/Off), Delta Makers 2 to 4 (Ref Mk1), Marker to Peak/Valley, Marker Table, Marker 5 (Peak/Valley between M1 and M2), Marker 6 (Peak/Valley between M3 and M4)
	Trace	Copy Trace To Memory, Trace Display, Trace Math
	Limit	On/Off, Edit Value, Limit Alarm (On/ Off), Pass/Fail (On/Off), Limit Preset
	Calibration	Start Calibration, Calibration Info, Calibration Correction (On/ Off)
Calibration Setup	Coax., Waveguide	
Save/Recall/File Management*1	Measurement (.dat), Setups (.stp), Screen Shots (.png), Text (.txt), CSV (.csv)	
Setup Parameters Advanced Mode	Measurement Display	Single/Dual Display with independent markers
	Frequency	Start Frequency (F1), Stop Frequency (F2)
	Distance	Start Distance (D1), Stop Distance (D2), Units (meters/feet), DTF Aid
	DTF Setup	DTF Line Type (Coax/Waveguide), Cable List, Cable Loss, Propagation Velocity, Windowing (Rectangular, Nominal Side Lobe, Low Side Lobe, Minimum Side Lobe)
	Amplitude	Top, Bottom, Auto Scale, Full Scale, Scale Preset
	Sweep	Data Points (130, 259, 517, 1033, 2065), Run/Hold, Sweep Type (Single/Continuous), RF Immunity (High/Low), RF Power in Hold (On/Off), Source Power (High/Low), IFBW (10 Hz, 100 Hz, 1 kHz, 100 kHz), Smoothing, Sweep Averaging (1 to 1000)
	Markers	Markers 1 to 8 (On/Off), Delta Makers 2 to 8 (Ref Mk1), Marker to Peak/Valley, Marker Tracking (On/Off), Marker Table, Marker 5 and 7 (Peak/Valley between M1 and M2), Marker 6 and 8 (Peak/Valley between M3 and M4)
	Trace	Copy Trace to Memory, Trace Display, Trace Math
	Limit	Active Limit (Upper/Lower), Limit State (On/Off), Move Active Limit, Edit Segments (42 upper and 42 lower segments maximum), Pass./Fail (on/Off), Limit Preset
	Calibration	Start Calibration, Calibration Info, Calibration Correction (On/Off)
Save/Recall/File Management*1	Measurement (.dat), Setups (.stp), Screen Shots (.png), Text (.txt), CSV (.csv)	
Frequency	Frequency Range	1 MHz to 8 GHz, 14 GHz, 20 GHz, 30 GHz, 40 GHz (frequency option dependent)
	Frequency Accuracy	±1.0 ppm at 23°C
	Stability	±1.0 ppm from -10°C to +55°C (typ.)
	Aging	±1.0 ppm/yr (typ.)
	Frequency Resolution	1 Hz
IFBW	Advanced Mode Only	10 Hz, 100 Hz, 1 kHz, 100 kHz
Output Power	1 MHz to 8 GHz	+5 dBm (typ.) (High); -20 dBm (typ.) (Low)
	>8 GHz to 40 GHz	-3 dBm (typ.) (High); -20 dBm (typ.) (Low)
RF Immunity*2		+17 dBm (typ.)
Measurement Speed*3	Reflection/Transmission Measurements	≤550 μs/data point, RF immunity low (typ.)
	Transmission Ext. Sensor (2-port Cable Loss)	Determined by USB sensor and may vary with model used, not specified.

Continued on next page



Dynamic Range*4, *5	(High Power, 10 Hz IFBW, 10 averages Port 1 to Port 2)	
	1 MHz to 10 MHz	≥85 dB (105 dB) (typ.)
	>10 MHz to 8 GHz	≥100 dB (115 dB) (typ.)
	>8 GHz to 40 GHz	≥100 dB (110 dB) (typ.)
Receiver Compression Port 1 or Port 2	1 MHz to 40 GHz	+5 dBm (0.1 dB compression) (typ.)
High Level Noise*6	(High Power, 100 Hz IFBW, 20 MHz to 40 GHz)	
	Magnitude	±0.006 dB (±0.001 dB) (typ.) rms
	Phase	±0.090° (±0.060°) (typ.)
Temperature Stability	(10 MHz to 40 GHz, ratio measurement, ports shorted)	
	Magnitude	±0.02 dB/°C (typ.)
	Phase	±0.3 degrees/°C (typ.)
Smoothing	Range	0 to 20%
System Impedance	Port 1 or Port 2	50Ω standard, 75Ω with 50Ω to 75Ω adapter
Return Loss	Measurement Display Range	0 to 1000 dB
	Resolution	0.01 dB
VSWR	Measurement Display Range	1 to 1000
	Resolution	0.01
Cable Loss	Measurement Display Range	0 to 500 dB
	Resolution	0.01 dB
Distance-to-Fault	Vertical Range Return Loss	0 to 1000 dB
	Vertical Range VSWR	1 to 1000
	Fault Resolution (meters)	$(1.5 \times 10^8 \times vp)/\Delta F$ (vp = propagation velocity constant, ΔF is F2 – F1 in Hz)
	Horizontal Range (meters)	0 to (Data Points – 1) × Fault Resolution, to a maximum of 1500 m (4921 ft)
1-Port Phase	Measurement Display Range	–450° to +450°
	Resolution	0.01°
Smith Chart	Impedance	50Ω, 75Ω
	Resolution	0.01
Cable Loss 2-Port	(Classic Mode Only)	
	Measurement Display Range	–1000 to +1000 dB
	Resolution	0.01 dB
Transmission	(Advanced Mode Only)	
	Measurement Display Range	–1000 to +1000 dB
	Resolution	0.01 dB
Transmission Ext Sensor	(Advanced Mode Only)	
	Measurement Display Range	–1000 to +1000 dB
	Resolution	0.01 dB

*1: Text (.txt) and CSV (.csv) files cannot be recalled to the instrument.

*2: +13 dBm for interfering signals landing in-band.

*3: 100 kHz IFBW (typ.).

*4: Dynamic range is defined as the difference between output power and receiver noise floor.

*5: Decrease specification by 5 dB between 8 GHz and 14 GHz. Crosstalk may reduce dynamic range up to 20 dB (typ.) at lower IF bandwidths (≤10 kHz) when measuring highly reflective DUT's from 4 GHz to 8 GHz. Reflection measurements are not affected.

*6: High Level Noise below 20 MHz is increased by a factor of 5.0.
High Level Noise (Phase only) above 20 GHz is increased by a factor of 1.5.

Measurement Accuracy* (OSLN50A-8 or OSLNF50A-8, TOSLN50A-8 or TOSLNF50A-8)

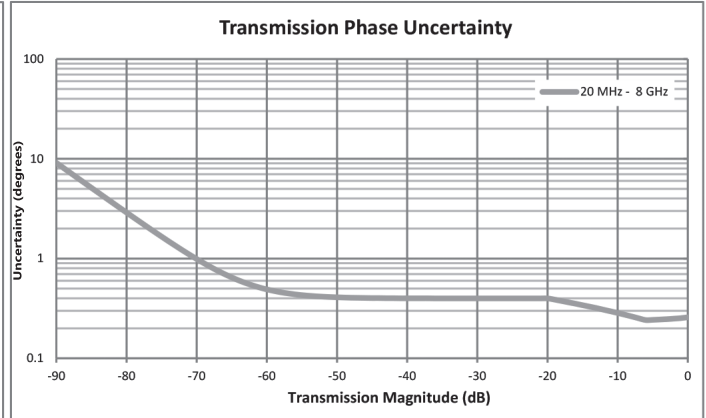
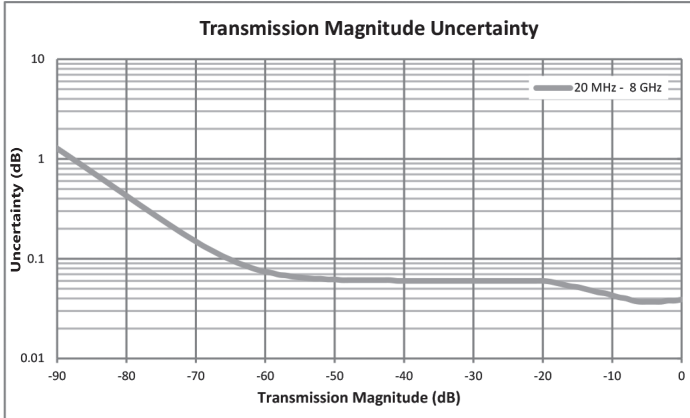
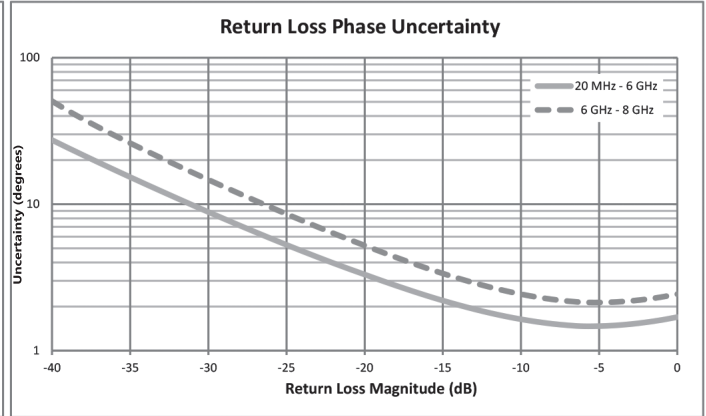
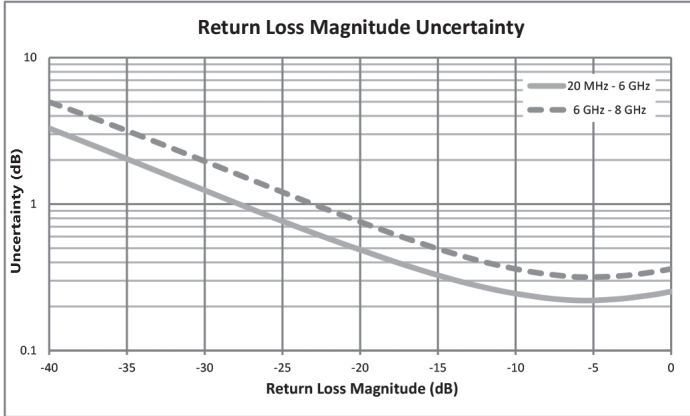
Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
1 MHz to 6 GHz	≥42	≥33	≥42	±0.08	±0.06
>6 GHz to 8 GHz	≥37	≥33	≥37	±0.08	±0.06

*: Full 2-Port calibration with isolation, Default Power, 10 Hz IFBW, No averaging, 10 minute warm-up. OSLN50A-8, OSLNF50A-8, TOSLN50A-8, or TOSLNF50A-8 calibration kit.

Load match specification applicable directly at corrected port only. De-rate by approximately 8 dB if using a 3670 series test port cable.

Reflection and Transmission Tracking are typical.

Corrected Measurement Uncertainty (Transmission from Port 1 to Port 2)

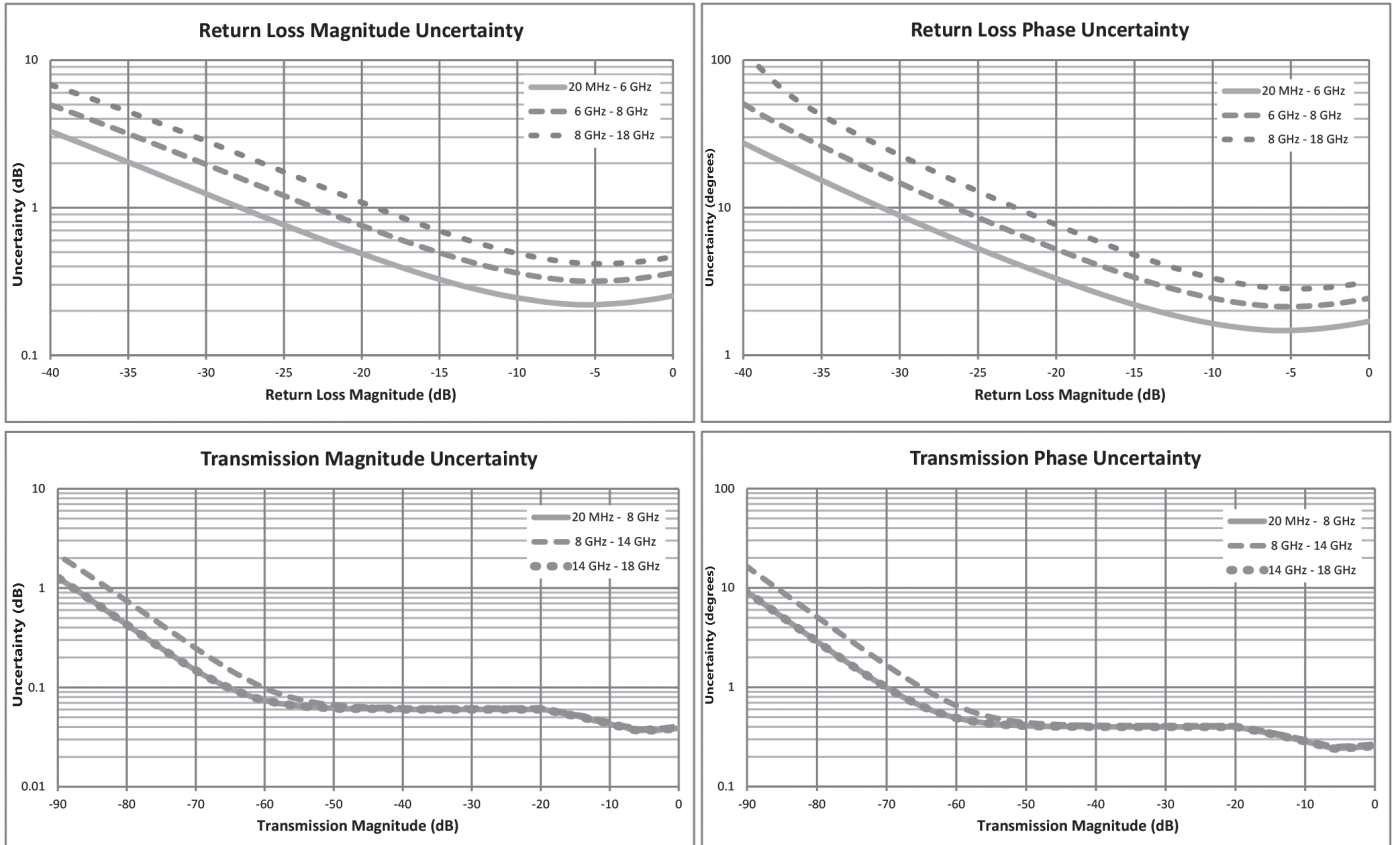


Measurement Accuracy* (OSLN50A-18 or OSLNF50A-18, TOSLN50A-18 or TOSLNF50A-18)

Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
1 MHz to 6 GHz	≥42	≥33	≥42	±0.08	±0.06
>6 GHz to 9 GHz	≥37	≥33	≥37	±0.08	±0.06
>9 GHz to 18 GHz	≥33	≥26	≥33	±0.04	±0.03

*: Full 2-Port calibration with isolation, Default Power, 10 Hz IFBW, No averaging, 10 minute warm-up. OSLN50A-18, OSLNF50A-18, TOSLN50A-18, or TOSLNF50A-18 calibration kit. Load match specification applicable directly at corrected port only. De-rate by approximately 8 dB if using a 3670 series test port cable. Reflection and Transmission Tracking are typical.

Corrected Measurement Uncertainty (Transmission from Port 1 to Port 2)

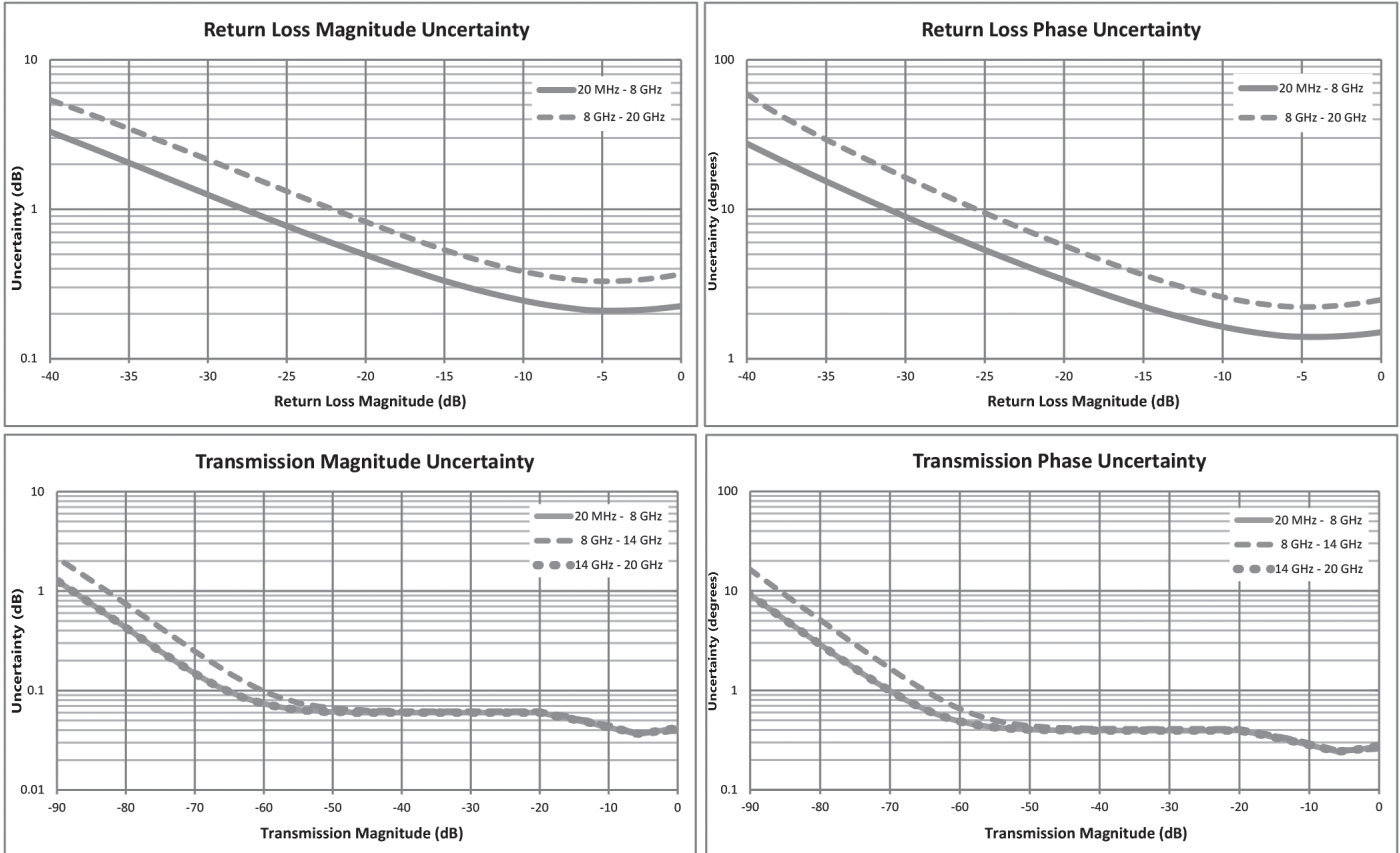


Measurement Accuracy* (TOSLK50A-20 or TOSLKF50A-20)

Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
1 MHz to 10 GHz	≥42	≥33	≥42	±0.08	±0.06
>10 GHz to 20 GHz	≥36	≥26	≥36	±0.04	±0.03

*: Full 2-Port calibration with isolation, Default Power, 10 Hz IFBW, No averaging, 10 minute warm-up. TOSLK50A-20 or TOSLKF50A-20 calibration kit.
 Load match specification applicable directly at corrected port only. De-rate by approximately 8 dB if using a 3670 series test port cable.
 Reflection and Transmission Tracking are typical.

Corrected Measurement Uncertainty (Transmission from Port 1 to Port 2)

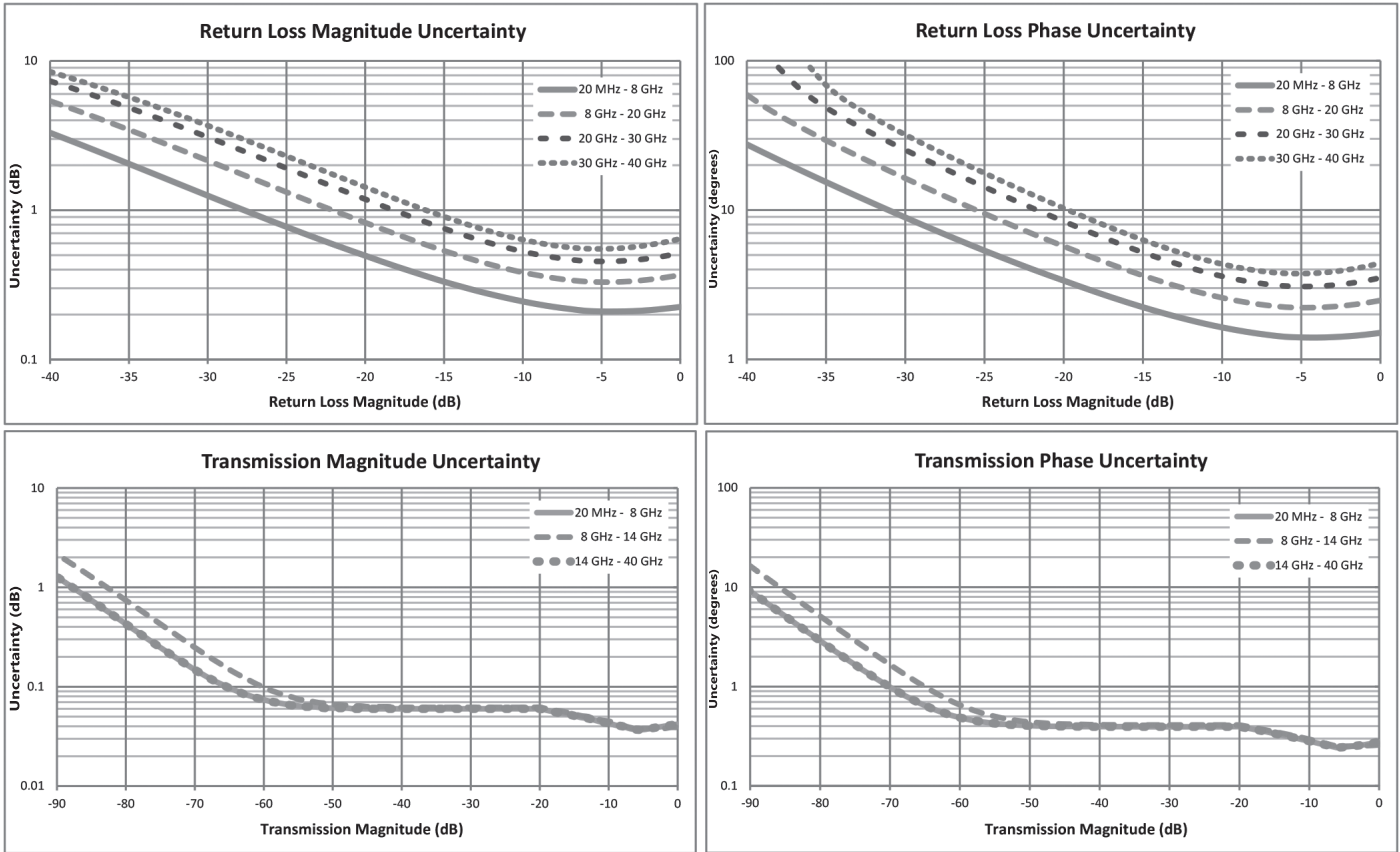


Measurement Accuracy* (TOSLK50A-40 or TOSLKF50A-40)

Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
1 MHz to 10 GHz	≥42	≥33	≥42	±0.08	±0.06
>10 GHz to 20 GHz	≥36	≥26	≥36	±0.04	±0.03
>20 GHz to 30 GHz	≥32	≥22	≥32	±0.04	±0.03
>30 GHz to 40 GHz	≥30	≥20	≥30	±0.04	±0.03

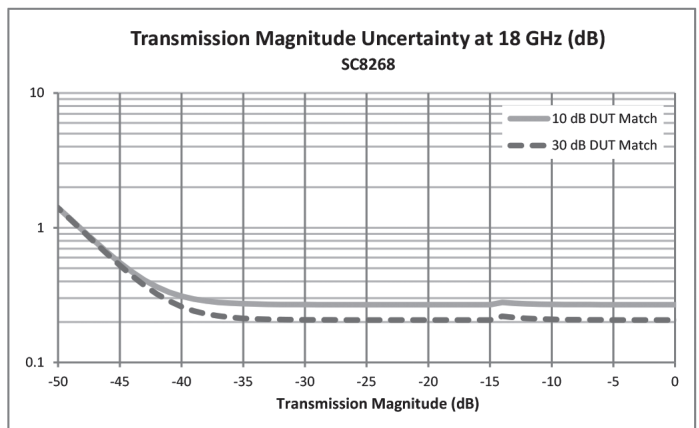
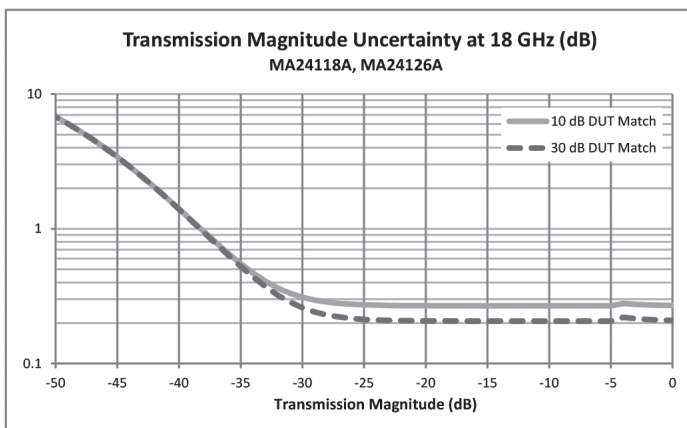
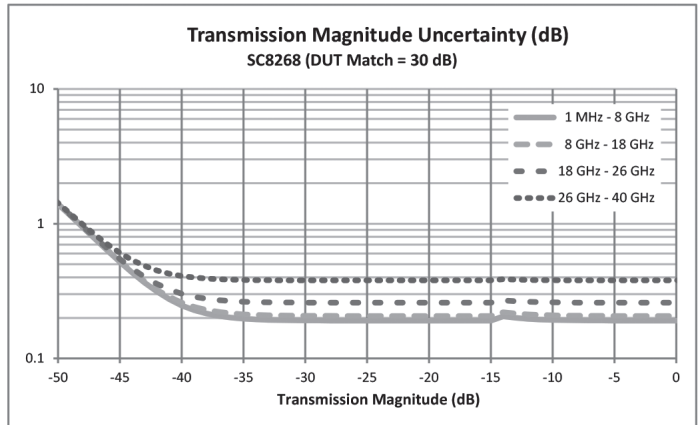
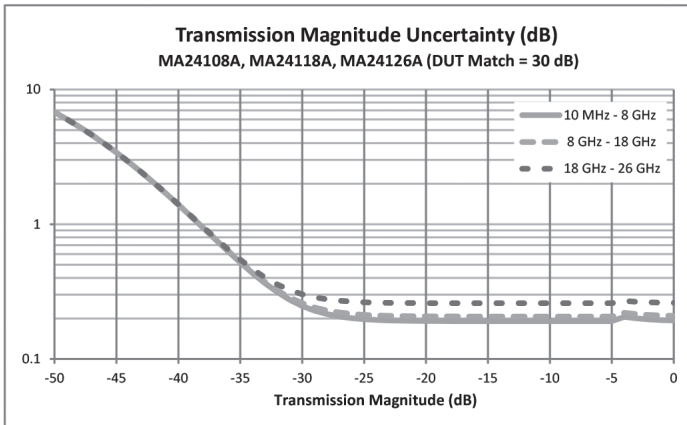
*: Full 2-Port calibration with isolation, Default Power, 10 Hz IFBW, No averaging, 10 minute warm-up. TOSLK50A-40 or TOSLKF50A-40 calibration kit.
 Load match specification applicable directly at corrected port only. De-rate by approximately 8 dB if using a 3670 series test port cable.
 Reflection and Transmission Tracking are typical.

Corrected Measurement Uncertainty (Transmission from Port 1 to Port 2)



External Sensor Transmission Measurement Accuracy* (Corrected Transmission Uncertainty, Magnitude Only)

*: Sensor Transmission Calibration from Port 1 to Sensor, default power, 10 Hz bandwidth. SC8268 specifications below 10 MHz are typical.



High Accuracy Power Meter – Standard (Requires external USB Power Sensor, sold separately)

Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale				
Average	# of Running Averages, Max Hold				
Zero/Cal	Zero On/Off, Cal Factor (Center Frequency, Signal Standard)				
Limits	Limit On/Off, Limit Upper/Lower				
Power Sensor Model	MA24105A	MA24106A	MA24108A/18A/26A	MA24208A/18A	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 GHz/18 GHz	10 MHz to 33/40/50 GHz
Connector	Type N (f), 50Ω	Type N (m), 50Ω	Type N (m), 50Ω (8 GHz/18 GHz) Type K (m), 50Ω (26 GHz)	Type N (m), 50Ω	Type K (m), 50Ω (33 GHz/40 GHz) Type V (m), 50Ω (50 GHz)
Dynamic Range	+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)	-60 to +20 dBm (1 nW to 100 mW)	-70 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*1	± 0.16 dB*2	± 0.18 dB*3	± 0.17 dB*4	± 0.17 dB*5
Data sheet (for complete specifications)	11410-00621	11410-00424	11410-00504	11410-00841	11410-00906

*1: 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.
 *2: Total RSS measurement uncertainty (0°C to 50°C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
 *3: Expanded uncertainty with K = 2 for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
 *4: 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.
 *5: Includes linearity over temperature uncertainties, but not the effects of calibration factor, mismatch, zero set and drift, and noise.

Video Inspection Probe (Requires External USB Video Inspection Probe, sold separately)

Setup Parameters	Probe Model	G0306A or G0306B 400X USB Visual Inspection Probe
	Tip Type (included with G0306A)	SC_APC_F; SC_PC_F; LC_PC_F; FC_PC_F; 2.5APC_M; 2.5PC_M; 1.25PC_M:
	Test Profile (IEC 61300-3-35)	SM PC >45; SM APC; SM PC >25; MM PC 62.5; MM PC 50.0:
	Auto Analyze	On/Off
	Auto Filename	On/Off
Measurement Parameters	Auto Filename Settings	Location, File Prefix, Start Number, Include Date
	Live	View Live Image
	Captured	Capture Image for Analysis
	Analyze	Analyze Image
	Results Table	Auto/Off
Save/Recall Parameters	Overlay	On/Off
	Zoom Control Help	Displays instruction for image Zoom feature
	Save	Measurement (*.vipi), VIP Image (*.png), Screen Shot (.png)
Report Parameters	Recall	Measurement (*.vipi), VIP Image (*.png), Screen Shot (.png)
	File Management	Rename, Create Folder, Copy, Paste, Delete
Report Parameters	Header Settings	Customer, Project, Operator, Notes, Include Logo
	Generate Report	Generates pdf report with options to include multiple *.vipi files

Vector Network Analyzer (Option 440)

Setup Parameters	Active Trace	Tr1, Tr2, Tr3, Tr4
	Measurement (S-Parameter)	S ₁₁ , S ₂₁ , S ₁₂ , S ₂₂
	Graph Types	Log Magnitude, SWR, Phase, Unwrapped Phase, Real, Imaginary, Group Delay, Smith Chart (Impedance), Inverted Smith Chart (Admittance), Log Mag/2 (1-Port Cable Loss), Real Impedance, Imaginary Impedance
	Domain	Frequency Domain, Distance Domain
	Number of Traces	1, 2, 3, 4
	Trace Format	Single, Dual, Tri, Quad. When used with Number of Traces, overlays are possible including a Single Format with Four trace overlays.
	Smoothing	Smoothing 0 to 20 % Independent Trace based.
	Group Delay Aperture	Aperture 0.25 to 20 % Aperture Defined as the frequency span over which the phase change is computed at a given frequency point. The aperture can be changed without recalibration.
	Group Delay Range	<180° of phase change within the aperture
	Frequency	Start Frequency (F1), Stop Frequency (F2)
	Distance	Start Distance (D1), Stop Distance (D2)
	Distance Units	Meters (m), Feet (ft)
	DTF Aid	Provides detailed DTF resolution information based on current instrument settings. Also provides helpful tips to optimize results.
	DTF Setup	DUT Line Type (Coax/WG), Cable List, Cable Loss, Propagation Velocity, Windowing
	Windowing	Rectangular, Nominal Side Lobe, Low Side Lobe, Minimum Side Lobe
	Amplitude	Resolution Per Division, Reference Value, Reference Line, Autoscale, Scale Preset
	Calibration	Start Calibration, Thru Update, Cal Info, Interpolation (On/Off), Cal Correction (On/Off)
	Cal Type	Full 2-Port, Full S ₁₁ , Full S ₂₂ , Full S ₁₁ & S ₂₂ , One-Path Two-Port (S ₁₁ , S ₂₁), One-Path Two-Port (S ₂₂ , S ₁₂), Response S ₁₁ , Response S ₂₂ , Response S ₁₁ & S ₂₂ , Response S ₂₁ , Response S ₁₂ , Response S ₂₁ & S ₁₂
	Cal Line	Coax, Waveguide
	Cal Method	Short-Open-Load-Through (SOLT), Offset-Short (SSLT)
	Calibration Standards' Coefficients	Coax: K-Connector, N-Connector, 7/16, SMA, TNC, and four User defined Waveguide: WG11A, WG12, WG13, WG14, WG15, WG16, WG17, WG18, WG20, WG22, and four User Defined
	Marker	Markers 1 to 8 (On/Off), Delta Makers 2 to 8 (Ref Mk1), Marker to Peak/Valley, Marker Tracking (On/Off), 4 Marker Table, Marker 5 and 7 (Peak/Valley between M1 and M2), Marker 6 and 8 (Peak/Valley between M3 and M4)
	Limit	Active Limit (Upper/Lower), Limit State (On/Off, Single, Segmented), Move Active Limit, Edit Segments (42 upper and 42 lower segments maximum), Limit Alarm (On/Off), Pass/Fail (On/Off), Limit Preset
	Test Limits	Pass/Fail for Upper, Pass/Fail for Lower, Limit Audible Alarm
	Save*1	Measurement (.svna), Setup (.stp), Screen Shot (.png), S2P-Real/Imaginary (.s2p), S2P-Linear Mag/Phase (.s2p), S2P-Log Mag/Phase (.s2p), Text (.txt), CSV (.csv)
	Recall*2	Measurement (.svna), Setup (.stp), Screen Shot (.png)
	File Management	Rename, Create Folder, Copy, Paste, Delete
	Navigation (File Management)	Top, Bottom, Page Up, Page Down
	Frequency Sweep Type	Linear Continuous, Linear Single Sweep
	Data Points	Data Points 2 to 4001 (arbitrary setting)
	Data Averaging	Sweep-by-Sweep, 1 to 1000
	IF Bandwidth (Hz)	10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k, 20k, 50k, 100k
	Reference Plane	Reference Plane The reference planes of a calibration (or other normalization) can be changed by entering a line length or time, and loss. Assumes flat magnitude, linear phase, and constant impedance.

Continued on next page



Setup Parameters	Auto Reference Plane Extension	Instead of manually entering a line length, this feature automatically adjusts phase shift from the current calibration (or other normalization) to compensate for external cables (or test fixtures). Assumes no loss (user can manually enter loss if known), flat magnitude, linear phase, and constant impedance.
	Trace Memory	A separate memory for each trace can be used to store measurement data for later display. The trace data can be saved and recalled.
	Trace Math	Complex trace math operations of subtraction, addition, multiplication, or division are provided.
	Dispersion Compensation	Waveguide correction that improves accuracy of distance-to-fault data by automatically compensating for different wavelengths propagating at different speeds.
	Impedance Conversion	Support for 50Ω and 75Ω Smith Charts are provided.
	Timebase Reference	Internal (default), External 10 MHz (Auto-sense, BNC female, Max +10 dBm)
	Ethernet Configuration	DHCP or Manual (Static) IP configuration, 10/100 Base-T, RJ45 jack
	Languages	English, French, German, Italian, Spanish, Russian, Portuguese, Japanese, Korean, Chinese
Frequency	Frequency Range	1 MHz to 8/14/20/30/40 GHz (Frequency option dependent)
	Frequency Accuracy	±1.0 ppm at 23°C
	Stability	±1.0 ppm from -10°C to +55°C (typ.)
	Aging	±1.0 ppm/yr (typ.)
	Frequency Resolution	1 Hz
Output Power	1 MHz to 8 GHz	+5 dBm (typ.) (High); -20 dBm (typ.) (Low)
	>8 GHz to 40 GHz	-3 dBm (typ.) (High); -20 dBm (typ.) (Low)
RF Immunity*3	RF Immunity High	+17 dBm (nom.)
Measurement Speed*4		≤ 550 μs/pt (S ₁₁ and S ₂₁ , 1001 points, 100 kHz IFBW, RF immunity low (typ.))
Dynamic Range*5, *6	(High Power, 10 Hz IFBW, 10 averages Port 1 to Port 2)	
	1 MHz to 10 MHz	≥85 dB (105 dB) (typ.)
	>10 MHz to 8 GHz	≥100 dB (115 dB) (typ.)
	>8 GHz to 40 GHz	≥100 dB (110 dB) (typ.)
Receiver Compression Port 1 or Port 2 (0.1 dB compression)	1 MHz to 40 GHz	+5 dBm (typ.)
High Level Noise*7	(High Power, 100 Hz IFBW, 20 MHz to 40 GHz)	
	Magnitude	±0.006 dB (±0.001 dB) (typ.) rms
	Phase	±0.090° (±0.060°) (typ.)
Temperature Stability	(Typical, 10 MHz to 40 GHz, ratio measurement, ports shorted)	
	Magnitude	±0.02 dB/°C
	Phase	±0.3 degrees/°C
Log Mag	Resolution Per Division	0.01 to 100 dB
	Reference Value	±1000 dB
	Reference Line	0 to 10
Log Mag/2	Resolution Per Division	0.01 to 100 dB
	Reference Value	±1000 dB
	Reference Line	0 to 10
SWR	Resolution Per Division	0.01 to 100
	Reference Value	1 to 1000
	Reference Line	0 to 10
Phase	Resolution Per Division	0.01° to 90°
	Reference Value	±1000°
	Reference Line	0 to 10
Unwrapped Phase	Resolution Per Division	0.01 degrees to 10 ¹³ degrees
	Reference Value	±10 ¹³ degrees
	Reference Line	0 to 10
Real/Imaginary	Resolution Per Division	0.01 to 260
	Reference Value	±10000
	Reference Line	0 to 10
Real/Imaginary Impedance	Resolution Per Division	0.01Ω to 100,000Ω
	Reference Value	±100,000Ω
	Reference Line	0 to 10
Group Delay	Resolution Per Division	1 fs to 100 s
	Reference Value	±100 s
	Reference Line	0 to 10
Smith Chart/ Inv Smith Chart	Reference Impedance	50Ω, 75Ω

*1: SVNA (.svna) and S2P (.s2p) file formats are available in VNA Mode only.

*2: SVNA (.svna) file format recall is available in VNA Mode only.

*3: +13 dBm for interfering signals landing in-band.

*4: Single trace display, frequency domain. Excludes Group Delay, Smith, or Admittance graph types. Excludes Active Smoothing, Markers, and/or Limits.

*5: Dynamic range is defined as the difference between output power and receiver noise floor.

*6: Decrease specification by 5 dB between 8 GHz and 14 GHz. Crosstalk may reduce dynamic range up to 20 dB (typical) at lower IF bandwidths (≤ 10 kHz) when measuring highly reflective DUT's from 4 GHz to 8 GHz. Reflection measurements are not affected.

*7: High Level Noise below 20 MHz is increased by a factor of 5.0. High Level Noise (Phase only) above 20 GHz is increased by a factor of 1.5.

Measurement Accuracy* (OSLN50A-8 or OSLNF50A-8, TOSLN50A-8 or TOSLNF50A-8)

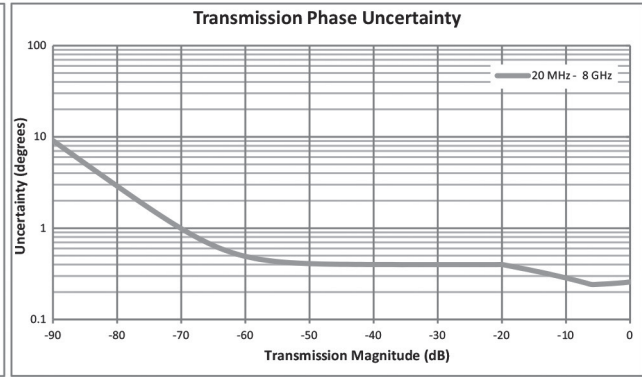
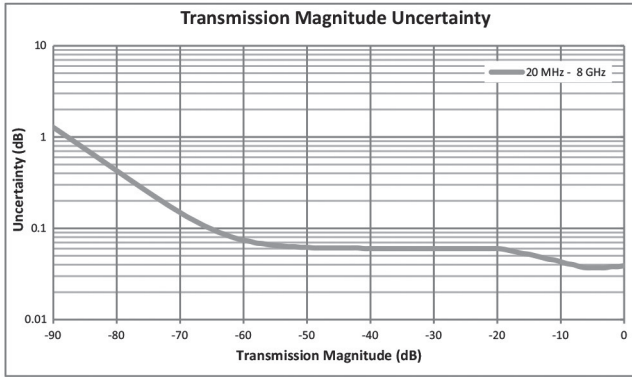
Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
1 MHz to 6 GHz	≥42	≥33	≥42	±0.08	±0.06
>6 GHz to 8 GHz	≥37	≥33	≥37	±0.08	±0.06

*: Full 2-Port calibration with isolation, Default Power, 10 Hz IFBW, No averaging, 10 minute warm-up. OSLN50A-8, OSLNF50A-8, TOSLN50A-8, or TOSLNF50A-8 calibration kit.

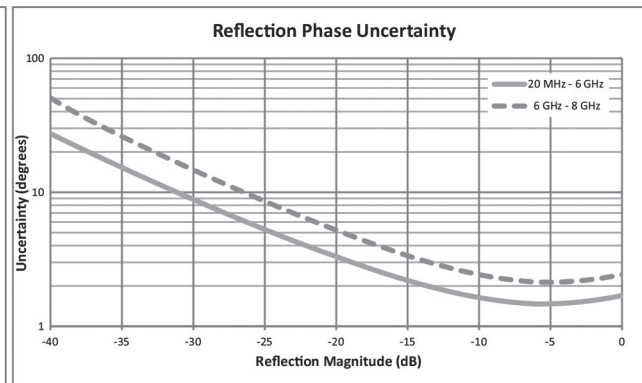
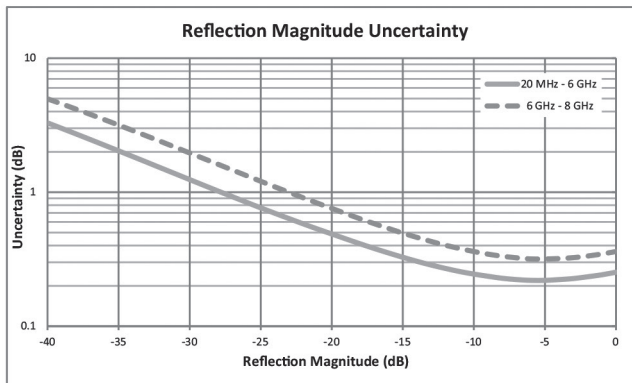
Load match specification applicable directly at corrected port only. De-rate by approximately 8 dB if using a 3670 series test port cable.

Reflection and Transmission Tracking are typical.

Transmission Uncertainty (S_{21} , S_{12}) ($S_{11} = S_{22} = 0$)



Reflection Uncertainty (S_{11} , S_{22}) ($S_{21} = S_{12} = 0$)



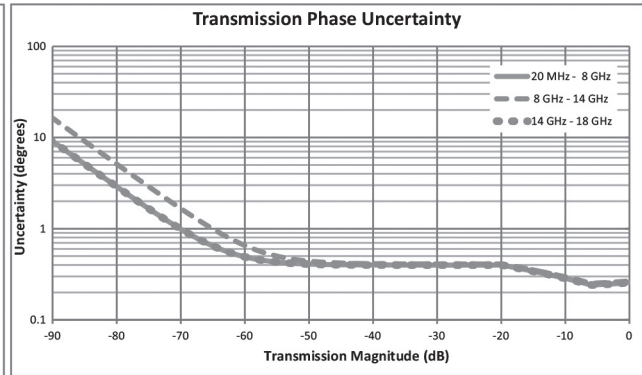
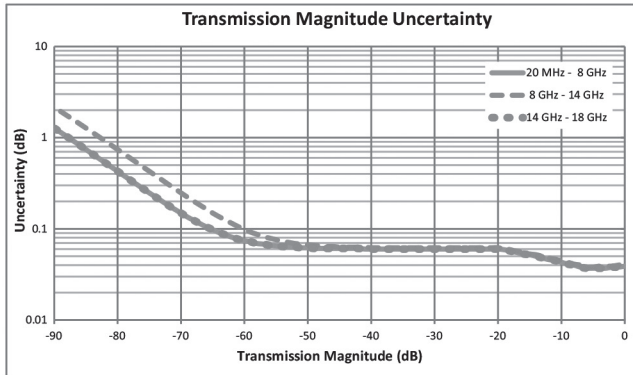


Measurement Accuracy* (OSLN50A-18 or OSLNF50A-18, TOSLN50A-18 or TOSLNF50A-18)

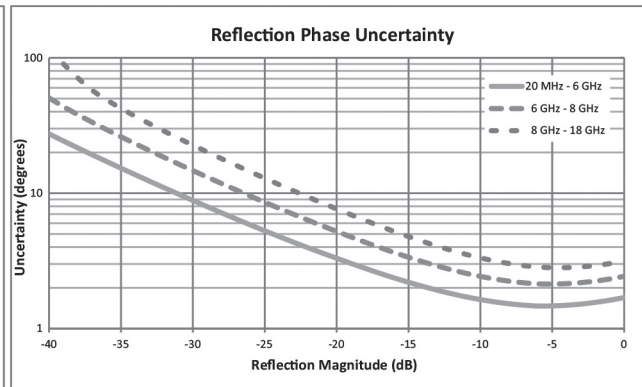
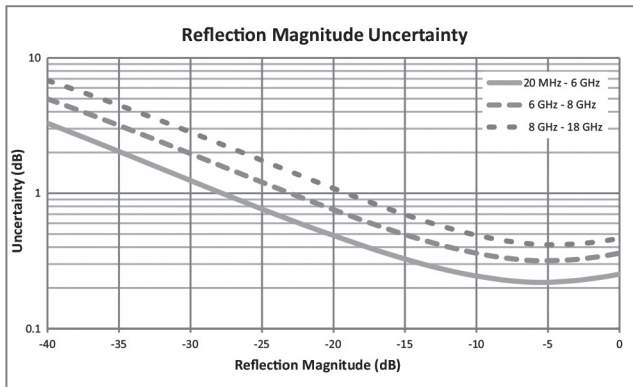
Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
1 MHz to 6 GHz	≥42	≥33	≥42	±0.08	±0.06
>6 GHz to 9 GHz	≥37	≥33	≥37	±0.08	±0.06
>9 GHz to 18 GHz	≥33	≥26	≥33	±0.04	±0.03

*: Full 2-Port calibration with isolation, Default Power, 10 Hz IFBW, No averaging, 10 minute warm-up. OSLN50A-18, OSLNF50A-18, TOSLN50A-18, or TOSLNF50A-18 calibration kit. Load match specification applicable directly at corrected port only. De-rate by approximately 8 dB if using a 3670 series test port cable. Reflection and Transmission Tracking are typical.

Transmission Uncertainty (S₂₁, S₁₂) (S₁₁ = S₂₂ = 0)



Reflection Uncertainty (S₁₁, S₂₂) (S₂₁ = S₁₂ = 0)

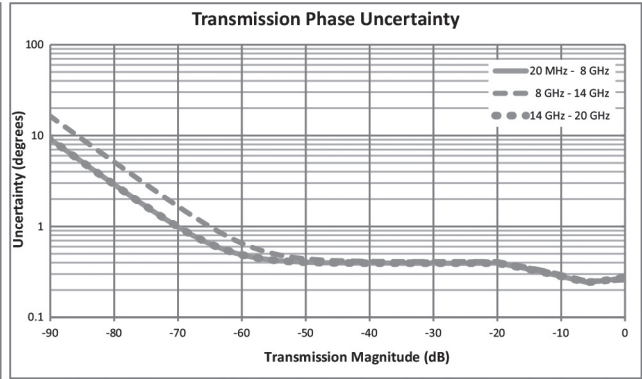
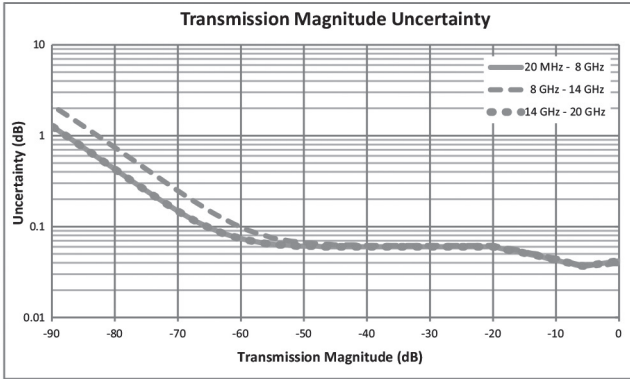


Measurement Accuracy* (TOSLK50A-20 or TOSLKF50A-20)

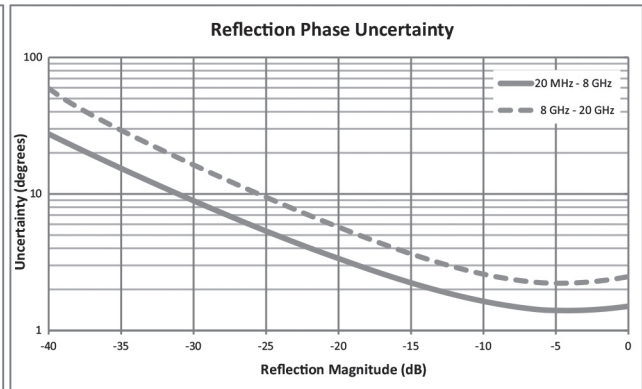
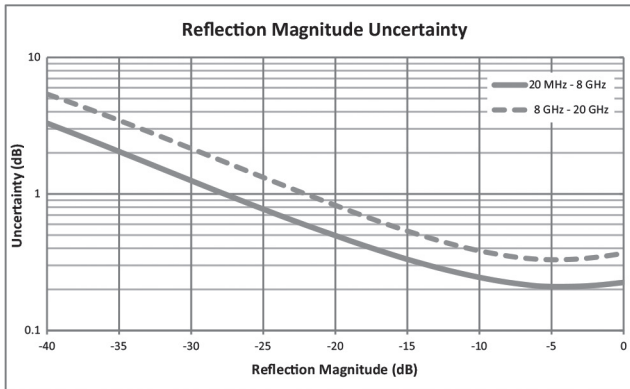
Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
1 MHz to 10 GHz	≥42	≥33	≥42	±0.08	±0.06
>10 GHz to 20 GHz	≥36	≥26	≥36	±0.04	±0.03

*: Full 2-Port calibration with isolation, Default Power, 10 Hz IFBW, No averaging, 10 minute warm-up. TOSLK50A-20 or TOSLKF50A-20 calibration kit. Load match specification applicable directly at corrected port only. De-rate by approximately 8 dB if using a 3670 series test port cable. Reflection and Transmission Tracking are typical.

Transmission Uncertainty (S_{21} , S_{12}) ($S_{11} = S_{22} = 0$)



Reflection Uncertainty (S_{11} , S_{22}) ($S_{21} = S_{12} = 0$)

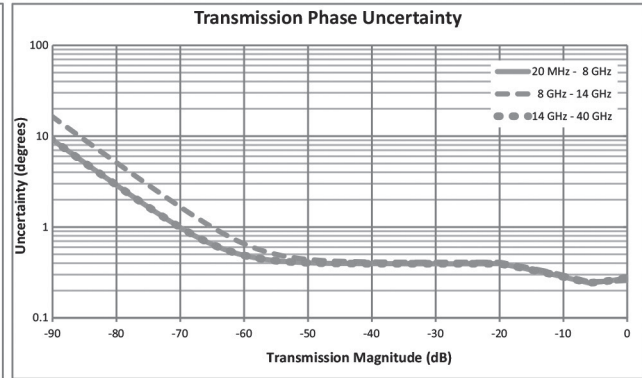
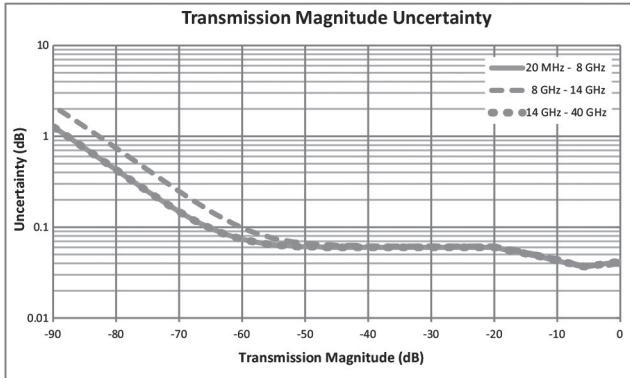


Measurement Accuracy* (TOSLK50A-40 or TOSLKF50A-40)

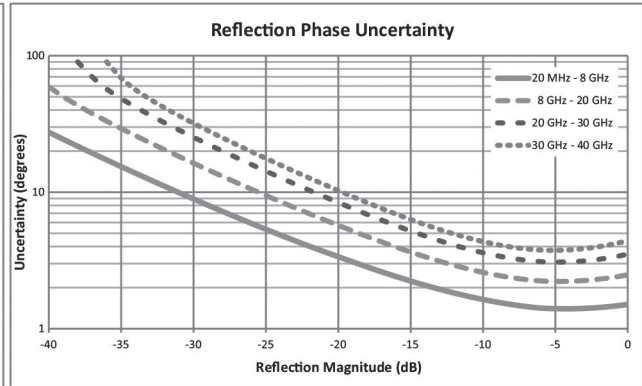
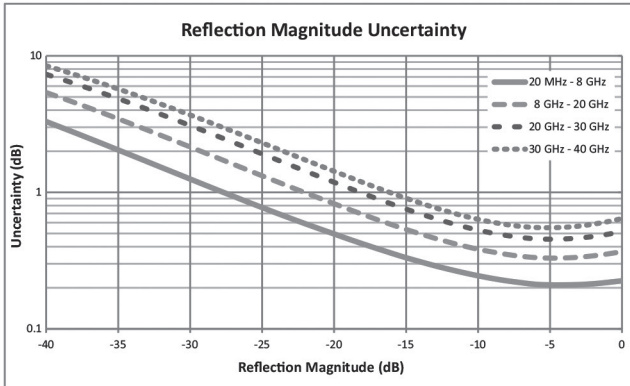
Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
1 MHz to 10 GHz	≥42	≥33	≥42	±0.08	±0.06
>10 GHz to 20 GHz	≥36	≥26	≥36	±0.04	±0.03
>20 GHz to 30 GHz	≥32	≥22	≥32	±0.04	±0.03
>30 GHz to 40 GHz	≥30	≥20	≥30	±0.04	±0.03

*: Full 2-Port calibration with isolation, Default Power, 10 Hz IFBW, No averaging, 10 minute warm-up. TOSLK50A-40 or TOSLKF50A-40 calibration kit.
 Load match specification applicable directly at corrected port only. De-rate by approximately 8 dB if using a 3670 series test port cable.
 Reflection and Transmission Tracking are typical.

Transmission Uncertainty (S_{21} , S_{12}) ($S_{11} = S_{22} = 0$)



Reflection Uncertainty (S_{11} , S_{22}) ($S_{21} = S_{12} = 0$)





Vector Voltmeter (Option 441)

Setup Parameters (Measurement)	Reflection	1-port Reflection (best for cable trimming, stub tuning, magnitude and phase matching of low loss DUTs)
	Transmission	2-port Transmission (best magnitude and phase matching of splitters, high loss DUTs, glide slope, etc.)
	Ratio A/B	Magnitude & Phase Ratio of A & B receivers. Port 1 = A, Port 2 = B. Requires external CW source
	Ratio B/A	Magnitude & Phase Ratio of A & B receivers. Port 1 = A, Port 2 = B. Requires external CW source
	Measurement Format	LogMag/Phase, LinMag/Phase, SWR, Impedance
	Display Format	Single, Table (table holds up to 12 measurements plus reference)
	Save Reference	Normalize response (Measurements become relative to saved reference)
	Clear Reference	Clears normalized response (Measurements are no longer relative to saved reference)
	Clear Table	Clears all values in table
Setup Parameters (Frequency)* ¹	Measurement Frequency	Set CW Frequency, 1 MHz (minimum)
Setup Parameters (Amplitude)	Resolution	1 or 2 Decimal Display Resolution
	Reference Impedance	50Ω or 75Ω (Impedance Measurement Format only)
Setup Parameters (Calibration)	Start Calibration	Measure, Cal Setup
	Thru Update	Updates Thru parameters of active calibration and maintains OSL calibration parameters
	Cal Info	Display current calibration status, including temperature
	Cal Correction	On/Off
Setup Parameters (Sweep)	Run/Hold	Hold stops measurement and freezes display data
	RF Pwr In Hold	On/Off
	Source Power	High/Low
	IFBW	10 Hz, 100 Hz (default), 1 kHz, 100 kHz
	Sweep Averaging	Range 1 to 1000 rolling average
Setup Parameters (File)	Save	Measurement (.vvm), Setup (.stp), Screen Shot (.png), Text (.txt), CSV (.csv)
	Recall	Measurement (.vvm), Setup (.stp), Screen Shot (.png)
	File Management	Rename, Create Folder, Copy, Paste, Delete
Setup Parameters (System)	Navigation (File management)	Top, Bottom, Page Up, Page Down
	Timebase Reference	Internal (default), External 10 MHz (Auto-sense, BNC female, Max +10 dBm)
	Ethernet Configuration	DHCP or Manual (Static) IP configuration, 10/100 Base-T, RJ45 connector
Frequency	Languages	English, French, German, Italian, Spanish, Russian, Portuguese, Japanese, Korean, Chinese
	Frequency Range	1 MHz to 8/14/20/30/40 GHz (frequency option dependent)
	Frequency Accuracy	±1.0 ppm at 23°C
	Stability	±1.0 ppm from -10°C to +55°C (typ.)
	Aging	±1.0 ppm/yr (typ.)
Output Power* ²	Frequency Resolution	1 Hz
	1 MHz to 8 GHz	+5 dBm (typ.) (High); -20 dBm (typ.) (Low)
Reflection/Transmission Uncertainty	>8 GHz to 40 GHz	-3 dBm (typ.) (High); -20 dBm (typ.) (Low)
Receiver Compression* ³ Port 1 or Port 2 (0.1 dB compression)	1 MHz to 40 GHz	See the uncertainty curves in the Cable and Antenna Analyzer section. Applicable only when a vector error correction (calibration) is performed and active. Uncalibrated reflection/transmission uncertainty is not specified.
Reference Level Input Range* ³ (A/B and B/A)	1 MHz to 40 GHz	+5 to -60 dBm (auto ranging) (typ.)
Ratio Accuracy* ⁴ (A/B and B/A)	1 MHz to 1 GHz	± 0.2 dB typical (Relative to stored reference, DUT loss <10 dB)
	>1 GHz to 20 GHz	± 0.5 dB typical (Relative to stored reference, DUT loss <10 dB)
	>20 GHz to 40 GHz	± 1.0 dB typical (Relative to stored reference, DUT loss <10 dB)
Measurement Format	LogMag/Phase	Resolution: 1 or 2 decimal places Magnitude Display: dB Phase Display Range: ±180°
	LinMag/Phase	Resolution: 1 or 2 decimal places Magnitude Display: Linear Phase Display Range: ±180°
	SWR	Resolution: 1 or 2 decimal places Display: Linear SWR
	Impedance	Resolution: 1 or 2 decimal places Display: Real and Imaginary (complex impedance) Ω

*1: Reference receiver (A or B) will Auto-tune approximately ±100 kHz to lock onto external CW signal during A/B & B/A Ratio measurement.

*2: Not applicable in A/B or B/A Ratio Measurement.

*3: Recommend ≤ +3 dBm for A/B or B/A Ratio Measurement.

*4: Reference signal level 0 to -20 dBm at input port.



General Specifications

Setup Parameters	System Info	Status, Battery
	System Setups	Date/Time, Language, Display/Audio, Option Configuration
	Date/Time	Day, Month, Year, Time
	Language	English, French, German, Italian, Spanish, Russian, Portuguese, Japanese, Korean, Chinese
	Display/Audio	Brightness, Color Schemes, Screen Shot Settings, Volume
	Option Configuration	Enable Options Using Key and Enable Options Using File
	Connectivity	GPS (Clear Data, Sync System Time), Ethernet Configuration (DHCP/Static)
	Diagnostics	Self Test
	Preset	Preset, Reset
	Reset	Factory Reset, Delete All User or Custom Files, Master Reset, Update Firmware
	File	Save, Recall, File Management
	File Management	Rename, Create Folder, Copy, Paste, Delete, Navigation
	Save	Measurement (*.dat, *.vipi), Setup (*.stp), Screen Shot and VIP Image (*.png), Text (*.txt), CSV (*.csv)
	Recall	Measurement (*.dat, *.vipi), Setup (*.stp), Screen Shot and VIP Image (*.png)
	Navigation	Top, Bottom, Page Up, Page Down
Internal Trace/Setup Memory	>2000 files, files may be traces, setups, screenshots, or any combination	
External Trace/Setup Memory	Limited only by size of USB Flash drive	
Connectors	Port 1 (models up to 14 GHz)	Type N (f), 50Ω, Maximum Input +23 dBm, ±50 VDC
	Port 2 (models up to 14 GHz)	Type N (f), 50Ω, Maximum Input +23 dBm, ±50 VDC
	Port 1 (models > 14 GHz)	Type Ruggedized K (m), 50Ω, Maximum Input +23 dBm, ±50 VDC
	Port 2 (models > 14 GHz)	Type Ruggedized K (m), 50Ω, Maximum Input +23 dBm, ±50 VDC
	External Reference In	Type BNC (f), 50Ω, 10 MHz, Maximum +10 dBm
	External Trigger In	Type BNC female, 50Ω, 3.3 V or 5 V TTL triggers on positive edge. Maximum +5 VDC
	Headset Jack	3.5 mm mini-jack
	External Power	5.5 mm barrel connector, +11 VDC to +14 VDC, ≤4.0 A
	USB Interface (2)	Type A, Connect USB Flash Drive, GPS Module, Power Sensor, other
	USB Interface	5-pin Mini-B, Connect to PC for data transfer and/or control
	Ethernet	RJ-45, Category 5, 10/100 MB/s. Connect to PC for data transfer and/or control
Display	Type	High Resolution Resistive Touchscreen
	Size	8.4 in daylight viewable color LCD
	Resolution	800 × 600 Pixel Defects No more than five defective pixels (99.9989% good pixels)
Battery	Pixel Defects	No more than five defective pixels (99.9989% good pixels)
	Type	Li-Ion
CE	Battery Operation	5.0 hr (typ.)
	EMC	2014/30/EU, EN61326-1, EN61000-4-2
RCM	LVD	2014/35/EU, EN61010-1
	RoHS	(EU) 2015/863
KCC	Australia and New Zealand	RCM AS/NZS 4417:2012
Environmental MIL-PRF-28800F Class 2	South Korea	KCC-REM-A21-0004
	Operating Temperature Range	-10°C to +55°C
	Storage Temperature Range	-51°C to +71°C
	Maximum Relative Humidity	95% RH at +30°C, non-condensing
	Vibration, Sinusoida	5 Hz to 55 Hz
	Vibration, Random	10 Hz to 500 Hz
	Half Sine Shock	30 g _n
	Altitude	4600 meters, operating and non-operating
Explosive Atmosphere	MIL-PRF-28800F Section 4.5.6.3	
	MIL-STD-810G, Method 511.5, Procedure 1	
Dimensions and Mass	273 (W) × 199 (H) × 91 (D) mm (10.7 × 7.8 × 3.6 in) 3.0 kg (6.6 lb), including battery	

**Line Sweep Tools™** (for your PC)

Trace Capture	Browse to Instrument	View and copy traces from the test equipment to your PC using Windows Explorer
	Open Legacy Files	Open DAT files captured with Handheld Software Tools v6.61
	Open Current Files	Open VNA or DAT files
	Capture Plots To	The Line Sweep Tools screen, DAT files, Database, or JPEG
Traces	Trace Types	Return Loss, VSWR, DTF-RL, DTF-VSWR, Cable Loss, Smith Chart, and PIM
	Trace Formats	DAT, VNA, CSV, PNG, BMP, JPG, HTML, Data Base, and PDF
Report Generation	Report Generator	Includes GPS location along with measurements
	Report Format	Create reports in HTML or PDF format
	Report Setup	Report Title, Company, Prepared for, Location, Date and Time, Filename, Company logo
	Trace Setup	1 Trace Portrait Mode, 2 Trace Portrait Mode, 1 Trace Landscape Mode
Trace Validation	Presets	7 presets allow "one click" setting of up to 6 markers and one limit line
	Marker Controls	6 regular Markers, Marker Peak, Marker Valley, Marker between, and frequency entry
	Delta Markers	6 Delta markers
	Limit Line	Enable and drag or value entry. Also works with presets
Tools	Next Trace Button	Next Trace and Previous Trace arrow keys allow quick switching between traces
	Cable Editor	Allows creation of custom cable parameters
	Distance to Fault	Converts a Return Loss trace to a Distance to Fault trace
	Measurement Calculator	Converts Real, Imaginary, Magnitude, Phase, RL, VSWR, Rho, and Transmit power
	Signal Standard Editor	Creates new band and channel tables
Connectivity	Renaming Grid	36 user-definable phrases for creation of file names, trace titles, and trace subtitles
	Connections	Ethernet, USB cable, and USB memory stick

easyTest Tools™ (for your PC)

Instrument Mode	Cable & Antenna Analyzer Mode	
Commands	Display Image	Allows putting a custom image on the instrument screen
	Recall Setup	Places the instrument into a known state
	Prompt	Displays instructional messages on the instrument screen
	Save	Allows automatic or manual saving of traces

Programmable Remote Control

Functionality: Instrument functionality is available via remote programming.

See the S820E Programming Manual for details.

Programming Language: Standard Commands for Programmable Instruments (SCPI)

Interfaces: USB, LAN



Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
S820E	Standard Configuration Microwave Site Master (Requires one Frequency Option 708, 714, 720, 730, or 740) Three Year Warranty (One year on battery)
S820E-0440 S820E-0441 S820E-0098	Instrument Options Vector Network Analyzer (VNA) Vector Voltmeter (VVM) Standard Calibration to ISO17025 and ANSI/NCSL Z540-1. Includes calibration certificate.
S820E-0099	Premium Calibration to ISO17025 and ANSI/NCSL Z540-1. Includes calibration certificate, test report, and uncertainty data.
S820E-0708 S820E-0714 S820E-0720	Frequency Options (Select one frequency option only) 1 MHz to 8 GHz, type N (f) ports 1 MHz to 14 GHz, type N (f) ports 1 MHz to 20 GHz, type Ruggedized K (m) ports (compatible with 3.5 mm and SMA connectors)
S820E-0730	1 MHz to 30 GHz, type Ruggedized K (m) ports (compatible with 3.5 mm and SMA connectors)
S820E-0740	1 MHz to 40 GHz, type Ruggedized K (m) ports (compatible with 3.5 mm and SMA connectors)
MA24105A	USB Power Sensors (For complete ordering information see the respective data sheets of each sensor) Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 to +51.76 dBm
MA24106A	RF USB Power Sensor and 2-Port Loss/Transmission Sensor, 50 MHz to 6 GHz, +23 to -40 dBm
MA24108A	Microwave USB Power Sensor and 2-Port Loss/Transmission Sensor, 10 MHz to 8 GHz, +20 to -40 dBm
MA24118A	Microwave USB Power Sensor and 2-Port Loss/Transmission Sensor, 10 MHz to 18 GHz, +20 to -40 dBm
MA24126A	Microwave USB Power Sensor and 2-Port Loss/Transmission Sensor, 10 MHz to 26 GHz, +20 to -40 dBm
MA24208A	Microwave Universal USB Power Sensor and 2-Port Loss/ Transmission Sensor, 10 MHz to 8 GHz, +20 to -60 dBm
MA24218A	Microwave Universal USB Power Sensor and 2-Port Loss/ Transmission Sensor, 10 MHz to 18 GHz, +20 to -60 dBm
MA24330A	Microwave CW USB Power Sensor and 2-Port Loss/ Transmission Sensor, 10 MHz to 33 GHz, +20 to -70 dBm
MA24340A	Microwave CW USB Power Sensor and 2-Port Loss/ Transmission Sensor, 10 MHz to 40 GHz, +20 to -70 dBm
MA24350A	Microwave CW USB Power Sensor and 2-Port Loss/ Transmission Sensor, 10 MHz to 50 GHz, +20 to -70 dBm
SC8268	USB Transmission Sensor, K (m), 1 MHz to 40 GHz, +10 to -50 dBm
MA25100A	RF Power Indicator
2000-1717-R*	USB Extender Kit (for use with external 2-port cable loss/transmission sensors; requires Cat 5e extension cable, sold separately)
2000-1900-R	USB 1.1 Passive 40 m Extender
2000-1901-R	USB 2.0 active 100 meter Cat 5e Extender (with Type A power cord for USA, Japan, North America, Central America and Caribbean)
2000-1902-R	USB 2.0 active 100 meter Cat 5e Extender (with Type C power cord for use in Europe, India, South Korea, and many countries in Middle East and Africa)
2000-1903-R	USB 2.0 active 100 meter Cat 5e Extender (with Type I power cord for use in Australia, New Zealand, Argentina, and the South Pacific)
2000-1903-R	USB 2.0 active 100 meter Cat 5e Extender (with Type G power cord for use in the UK, and several other countries in Asia, the Middle East, and Africa)
2100-28-R	Cat 5e extension cable for use with USB Extender (22.5 m)
10100-00065 11410-00749 10580-00343 10580-00344 10580-00345	Documentation (soft copy at www.anritsu.com) Product Information, Compliance, and Safety Technical Data Sheet User Guide Programming Manual Maintenance Manual
2000-1654-R 71693-R 633-75 40-187-R 806-141-R 2000-1691-R 2000-1797-R 3-2000-1498 2000-1371-R	Standard Accessories (included with instrument) Soft Carrying Case Ruggedized K (f) to N (f), 2 pcs (included only with S820E-0720) Rechargeable Li-Ion Battery AC-DC Adapter Automotive Power Adapter, 12 VDC, 60 W Stylus with Coiled Tether Screen Protector Film (one factory installed, one spare) USB A/5-pin Mini-B Cable, 3.05 m (10 ft) Ethernet Cable, 2.13 m (7 ft) Certificate of Calibration and Conformance

Model/Order No.	Name
2000-1723-R 2000-1374-R 67135 760-243-R 760-286-R	Optional Accessories Miscellaneous Accessories High Performance USB Mag-Mount GPS Antenna/Receiver External Charger for Li-Ion Batteries Anritsu Backpack (For Handheld Instrument and PC) Large Transit Case with Wheels and Handle Compact Transit Case with Wheels and Handle 55.6 x 35.5 x 22.9 cm (21.89" x 13.98" x 9.01")
OSLN50A-8 OSLNF50A-8 TOSLN50A-8 TOSLNF50A-8 OSLN50A-18 OSLNF50A-18 TOSLN50A-18 TOSLNF50A-18 TOSLN50A-20 TOSLNF50A-20 TOSLKF50A-20 TOSLKF50A-40 TOSLKF50A-40	Full Temperature Coaxial Calibration Kits (-10°C to +55°C, K Type is compatible with 3.5 mm and SMA connectors see individual data sheets on www.anritsu.com) High Performance Type N (m), DC to 8 GHz, 50Ω High Performance Type N (f), DC to 8 GHz, 50Ω High Performance with Through Type N (m), DC to 8 GHz, 50Ω High Performance with Through Type N (f), DC to 8 GHz, 50Ω High Performance Type N (m), DC to 18 GHz, 50Ω High Performance Type N (f), DC to 18 GHz, 50Ω High Performance with Through Type N (m), DC to 18 GHz, 50Ω High Performance with Through Type N (f), DC to 18 GHz, 50Ω High Performance with Through Type K (m), DC to 20 GHz, 50Ω High Performance with Through Type K (f), DC to 20 GHz, 50Ω High Performance with Through Type K (m), DC to 40 GHz, 50Ω High Performance with Through Type K (f), DC to 40 GHz, 50Ω
22N50 22NF50 28N50-2 28NF50-2 22K50 22KF50 28K50 28KF50	Coaxial Calibration Components, N Type 50Ω, K Type 50Ω (K Type is compatible with 3.5 mm and SMA connectors) Precision Open/Short, N (m), DC to 18 GHz, 50Ω Precision Open/Short, N (f), DC to 18 GHz, 50Ω Precision Load, N (m), DC to 18 GHz, 50Ω Precision Load, N (f), DC to 18 GHz, 50Ω Precision Open/Short, K (m), DC to 40 GHz, 50Ω Precision Open/Short, K (f), DC to 40 GHz, 50Ω Precision Load, K (m), DC to 40 GHz, 50Ω Precision Load, K (f), DC to 40 GHz, 50Ω
2000-1618-R 2000-1619-R 2000-1914-R 2000-1915-R 12N50-75B 22N75 22NF75 26N75A 26NF75A 1091-55-R 1091-53-R 1091-56-R 1091-54-R 1015-54-R 1015-55-R	Coaxial Calibration Components, Other 50Ω, 75Ω Open/Short/Load, 7/16 DIN (m), DC to 6.0 GHz 50Ω Open/Short/Load, 7/16 DIN (f), DC to 6.0 GHz 50Ω Precision Open/Short/Load, 4.3-10 (f), DC to 6 GHz, 50Ω Precision Open/Short/Load, 4.3-10 (m), DC to 6 GHz, 50Ω Matching Pad, DC to 3 GHz, 50Ω to 75Ω Open/Short, N (m), DC to 3 GHz, 75Ω Open/Short, N (f), DC to 3 GHz, 75Ω Precision Termination, N (m), DC to 3 GHz, 75Ω Precision Termination, N (f), DC to 3 GHz, 75Ω Open, TNC (f), DC to 18 GHz Open, TNC (m), DC to 18 GHz Short, TNC (f), DC to 18 GHz Short, TNC (m), DC to 18 GHz Termination, TNC (f), DC to 18 GHz Termination, TNC (m), DC to 18 GHz
G0306B	Video Inspection Probe Video Inspection Probe (400x), including the following standard connector tips: Universal Tips H0361A 1.25PC-M, H0360A 2.5PC-M, H0362A 2.5APC-M Bulkhead Tips H0363A LC-PC-F, H0364A FC-PC-F, H0375A ST-PC-F, H0366A SC-APC-F Additional Tips H0372A E2000-PC-F, H0373A FC-APC-F, H0374A MU-PC-F, H0365A SC-PC-F, H0376A 1.25APC-M 971-14-R Ferrule Cleaner, 2.5 mm SC 971-15-R Ferrule Cleaner, 1.25 mm LC 971-16 Fiber Ferrule Cleaner

Continued on next page

*: Not compatible with sensors MA24208A, MA24218A, MA24330A, MA24340A, MA24350A; must use active extenders with these sensors.



Waveguide Calibration Components, Rectangular Type 50Ω					
Frequency Range (GHz)	1/8 Offset	3/8 Offset	Termination	Coax to Waveguide Adapter	Compatible Flanges
3.95 to 5.85	23UA187-R	24UA187-R	26UA187-R	35UA187N-R	CPR187F-R, CPR187G-R, UG-1352/U-R, UG-1353/U-R, UG-1728/U-R, UG-1729/U-R, UG-148/U-R, UG-149A/U-R
5.85 to 8.20	23UA137-R	24UA137-R	26UA137-R	35UA137N-R	CPR137F-R, CPR137G-R, UG-1356/U-R, UG-1357/U-R, UG-1732/U-R, UG-1733/U-R, UG-343B/U-R, UG-344/U-R, UG-440B/U-R, UG-441/U-R
7.05 to 10.00	23UA112-R	24UA112-R	26UA112-R	35UA112N-R	CPR112F-R, CPR112G-R, UG-1358/U-R, UG-1359/U-R, UG-1734/U-R, UG-1735/U-R, UG-52B/U-R, UG-51/U-R, UG-137B/U-R, UG-138/U-R
8.20 to 12.40	23UA90-R	24UA90-R	26UA90-R	35UA90N-R	CPR90F-R, CPR90G-R, UG-1360/U-R, UG-1361/U-R, UG-1736/U-R, UG-1737/U-R, UG-40B/U-R, UG-39/U-R, UG-135/U-R, UG-136B/U-R
12.40 to 18.00	23UA62-R	24UA62-R	26UA62-R	35UA62N-R	UG-541A/U-R, UG-419/U-R, UG-1665/U-R, UG1666/U-R
17.00 to 26.50	23UA42-R	24UA42-R	26UA42-R	35UA42K-R	UG-596A/U-R, UG-595/U-R, UG-597/U-R, UG-598A/U-R
26.50 to 40.00	23UA28-R	24UA28-R	26UA28-R	35UA28K-R	UG-599/U-R
3.30 to 4.90	23UM40-R	24UM40-R	26UM40-R	35UM40N-R	PDR40-R
3.95 to 5.85	23UM48-R	24UM48-R	26UM48-R	35UM48N-R	CAR48-R, PAR48-R, UAR48-R, PDR48-R
5.85 to 8.20	23UM70-R	24UM70-R	26UM70-R	35UM70N-R	CAR70-R, PAR70-R, UAR70-R, PDR70-R
7.05 to 10.00	23UM84-R	24UM84-R	26UM84-R	35UM84N-R	CBR84-R, UBR84-R, PBR84-R, PDR84-R
8.20 to 12.40	23UM100-R	24UM100-R	26UM100-R	35UM100N-R	CBR100-R, UBR100-R, PBR100-R, PDR100-R
10.00 to 15.00	23UM120-R	24UM120-R	26UM120-R	35UM120N-R	CBR120-R, UBR120-R, PBR120-R, PDR120-R
12.40 to 18.00	23UM140-R	24UM140-R	26UM140-R	35UM140N-R	CBR140-R, UBR140-R, PBR140-R, PDR140-R
17.00 to 26.50	23UM220-R	24UM220-R	26UM220-R	35UM220K-R	CBR220-R, UBR220-R, PBR220-R, PDR220-R
26.50 to 40.00	23UM320-R	24UM320-R	26UM320-R	35UM320K-R	UBR320-R

Model/Order No.	Name
	Phase-Stable Test Port Extension Cables (Armored and Flexible)
14RKFKF50-0.6	0.6 m (24 in), DC to 40 GHz, Ruggedized K (f) to K (f), 50Ω
14RKFKF50-1.0	1.0 m (39 in), DC to 40 GHz, Ruggedized K (f) to K (f), 50Ω
14RKFK50-0.6	0.6 m (24 in), DC to 40 GHz, Ruggedized K (f) to K (m), 50Ω
14RKFK50-1.0	1.0 m (39 in), DC to 40 GHz, Ruggedized K (f) to K (m), 50Ω
14KFKF50-0.6	0.6 m (24 in), DC to 40 GHz, K (f) to K (f), 50Ω
14KFKF50-1.0	1.0 m (39 in), DC to 40 GHz, K (f) to K (f), 50Ω
14KFK50-0.6	0.6 m (24 in), DC to 40 GHz, K (f) to K (m), 50Ω
14KFK50-1.0	1.0 m (39 in), DC to 40 GHz, K (f) to K (m), 50Ω
15NN50-1.0B	1.0 m (39 in), DC to 18 GHz, N (m) to N (m), 50Ω
15NNF50-1.0B	1.0 m (39 in), DC to 18 GHz, N (m) to N (f), 50Ω
15LL50-1.0A	1.0 m (39 in), DC to 20 GHz, 3.5 mm (m) to 3.5 mm (m), 50Ω
15LLF50-1.0A	1.0 m (39 in), DC to 20 GHz, 3.5 mm (m) to 3.5 mm (f), 50Ω
15KK50-1.0A	1.0 m (39 in), DC to 26.5 GHz, K (m) to K (m), 50Ω
15KKF50-1.0A	1.0 m (39 in), DC to 26.5 GHz, K (m) to K (f), 50Ω
15N43M50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (m)
15N43F50-1.5C	Test Port Extension Cable, 1.5 m, DC to 6 GHz, N (m) to 4.3-10 (f)
15N43M50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (m) to 4.3-10 (m)
15N43F50-3.0C	Test Port Extension Cable, 3 m, DC to 6 GHz, N (m) to 4.3-10 (f)
	Phase-Stable 18 GHz and 40 GHz Semi-Rigid Cables (Armored)
3670K50-1	0.3 m (12 in), DC to 40 GHz, K (f) to K (m), 50Ω
3670K50-2	0.6 m (24 in), DC to 40 GHz, K (f) to K (m), 50Ω
3670N50-1	0.3 m (12 in), DC to 18 GHz, N (f) to N (m), 50Ω
3670NN50-1	0.3 m (12 in), DC to 18 GHz, N (m) to N (m), 50Ω
3670N50-2	0.6 m (24 in), DC to 18 GHz, N (f) to N (m), 50Ω
3670NN50-2	0.6 m (24 in), DC to 18 GHz, N (m) to N (m), 50Ω
	Adapters
71693-R	DC to 18 GHz, Ruggedized adapter, K (f) - N (f), 50Ω
1091-26-R	DC to 18 GHz, N (m) to SMA (m), 50Ω
1091-27-R	DC to 18 GHz, N (m) to SMA (f), 50Ω
1091-80-R	DC to 18 GHz, N (f) to SMA (m), 50Ω
1091-81-R	DC to 18 GHz, N (f) to SMA (f), 50Ω
1091-172	DC to 1.3 GHz, BNC (f) to N (m), 50Ω
510-90-R	DC to 7.5 GHz, 7/16 (f) to N (m), 50Ω
510-91-R	DC to 7.5 GHz, 7/16 (f) to N (f), 50Ω
510-92-R	DC to 7.5 GHz, 7/16 (m) to N (m), 50Ω
510-93-R	DC to 7.5 GHz, 7/16 (m) to N (f), 50Ω
510-96-R	DC to 7.5 GHz, 7/16 DIN (m) to 7/16 DIN (m), 50Ω
510-97-R	DC to 7.5 GHz, 7/16 DIN (f) to 7/16 DIN (f), 50Ω
513-62	DC to 18 GHz, TNC (f) to N (f), 50Ω
1091-315	DC to 18 GHz, TNC (m) to N (f), 50Ω
1091-324	DC to 18 GHz, TNC (f) to N (m), 50Ω
1091-325	DC to 18 GHz, TNC (m) to N (m), 50Ω
1091-317	DC to 18 GHz, TNC (m) to SMA (f), 50Ω
1091-318	DC to 18 GHz, TNC (m) to SMA (m), 50Ω
1091-323	DC to 18 GHz, TNC (m) to TNC (f), 50Ω
1091-326	DC to 18 GHz, TNC (m) to TNC (m), 50Ω
1091-465-R	DC to 6 GHz, 4.3-10 (f) to N (f), 50Ω
1091-467-R	DC to 6 GHz, 4.3-10 (m) to N (f), 50Ω
510-102-R	DC to 11 GHz, N (m)-N (m), 90 degrees, 50Ω

Model/Order No.	Name
	Precision Adapters
34NN50A	Precision Adapter, N (m) to N (m), DC to 18 GHz, 50Ω
34NFN50	Precision Adapter, N (f) to N (f), DC to 18 GHz, 50Ω
K220B	Precision Adapter, DC to 40 GHz, K (m) to K (m), 50Ω
K222B	Precision Adapter, DC to 40 GHz, K (f) to K (f), 50Ω
K224B	Precision Adapter, DC to 40 GHz, K (m) to K (f), 50Ω
	Attenuators N Type (Up to 18 GHz)
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, 5 W, DC to 18 GHz, N (m) to N (f)
3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N (m) to N (f)
1010-127-R	30 dB, 150 W, DC to 3 GHz, N (m) to N (f)
3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N (f) to N (m), Uni-directional
1010-121-R	40 dB, 100 W, DC to 18 GHz, N (f) to N (m), Uni-directional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N (m) to N (f)
	Attenuators K Type (Up to 40 GHz)
41KB-3	Precision Fixed Attenuator, K (m) to K (f), 3 dB, DC to 26.5 GHz, 50Ω
41KB-6	Precision Fixed Attenuator, K (m) to K (f), 6 dB, DC to 26.5 GHz, 50Ω
41KB-10	Precision Fixed Attenuator, K (m) to K (f), 10 dB, DC to 26.5 GHz, 50Ω
41KB-20	Precision Fixed Attenuator, K (m) to K (f), 20 dB, DC to 26.5 GHz, 50Ω
41KC-3	Precision Fixed Attenuator, K (m) to K (f), 3 dB, DC to 40 GHz, 50Ω
41KC-6	Precision Fixed Attenuator, K (m) to K (f), 6 dB, DC to 40 GHz, 50Ω
41KC-10	Precision Fixed Attenuator, K (m) to K (f), 10 dB, DC to 40 GHz, 50Ω
41KC-20	Precision Fixed Attenuator, K (m) to K (f), 20 dB, DC to 40 GHz, 50Ω

Site Master

S331P

Compact handheld Cable & Antenna Analyzer: 150 kHz to 4.0 GHz or 6.0 GHz

Remote Control
USB

**Ultraportable Cable & Antenna Analyzer
Featuring Classic and Advanced Modes**



Anritsu introduces its compact handheld Cable & Antenna Analyzer for installation and maintenance of antenna systems. It is available in two frequency ranges starting from 150 kHz and up to 4 GHz or 6 GHz.

Key Features

- FlexCal™ Calibration
 - One Calibration for All Frequencies
- Impact, Dust, and Splash Resistant
- Smallest, Lightest, and Fastest Site Master™

Easy to Use

- Factory default calibration (1-Port ReadyCal) automatically applied to OSL measurements
- S331D-like Classic Mode
- S331E-like Advanced Mode
 - Additional Markers
 - Customizable Shortcuts
 - Full-screen View
- S331L-like Graphical User Interface and Functionality
- Integrated Help Function
- EZ Name Quick Matrix
- easyTest™
- Controlled and Powered by a Windows tablet or PC using standard USB 2.0 (not included)

Efficient Sweep Management

- Internal File Storage (limited only by space on PC or Tablet)
 - Sweeps, Setups, Screen Shots
- Line Sweep Tools (LST) Software
 - Edit Sweeps, Rename, Archive
 - Generate PDF or HTML Reports
- Fast Preview of Stored Sweeps
- Standard *.dat Sweep File Format
- Compatible with HHST
 - Widely Accepted by Operators

Definitions

All specifications and characteristics apply to Revision 2 instruments under the following conditions, unless otherwise stated:

Warm-Up Time	After 10 minutes of warm-up time, where the instrument has completely stabilized to the ambient temperature.
Temperature Range	Over the 23°C±5°C temperature range.
Frequency Reference	Internal frequency reference is used.
Calibration	Instrument is within the recommended calibration cycle of 12 months. Cable and Antenna Analyzer measurements applicable after standard OSL calibration is performed using Anritsu calibration components.
Typical Performance	Typical specifications in parenthesis () describe performance that will be met by a minimum of 80% of all products. They do not include guard bands and are not warranted. Typical specifications that are not in parenthesis are not tested and not warranted. They are generally representative of the nominal characteristic performance.
Uncertainty	A coverage factor of k = 2 is applied to the measurement uncertainties to facilitate comparison with other industry monitors. All specifications subject to change without notice. For the most current data sheet, please visit the Anritsu web site: www.anritsu.com

Cable and Antenna Analyzer Specifications

Measurements

Measurements	VSWR Return Loss Cable Loss (One Port) Distance-to-Fault (DTF) Return Loss Distance-to-Fault (DTF) VSWR Smith Chart 50Ω/75Ω (Advanced Mode Only) 1-Port Phase (Advanced Mode Only) Transmission with External Sensor (Advanced Mode Only)
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Setup Parameters–Classic Mode

Measurement Display	Single Display with independent markers
Frequency	Start Frequency (F1), Stop Frequency (F2)
DTF	Start Distance (D1), Stop Distance (D2), DTF Aid, Cable Loss, Propagation Velocity, Cable type
Windowing	Rectangular, Normal Side Lobe, Low Side Lobe, Minimum Side Lobe
Amplitude	Top, Bottom Auto Scale, Full Scale
Sweep	Data Points, Run/Hold, Single/Continuous, Trace
Data Points	130, 259, 517, 1033, 2065
Markers	Markers 1 to 6 (On/Off), Delta Markers 2 to 4 (Ref M1), Marker to Peak/Valley, Marker Table, Marker 5 (Peak/Valley between M1 & M2), Marker 6 (Peak/Valley between M3 & M4), Independent Markers for Frequency and Distance Measurements
Traces	Copy Trace To Memory, Trace Display, Trace Math [Trace – Memory, Trace + Memory, (Trace + Memory)/2]
Limit Line	On/Off, Edit Value, Limit Alarm, Pass/Fail On/Off, Limit Preset
Calibration	Factory default 1-Port ReadyCal (automatically applied to all measurements) User calibration (User Cal) overrides ReadyCal Start Calibration, Cal Info, User Cal (On/Off), Cal Method: OSL Cal Types: Standard, FlexCal™
Save/Recall	Setups, Measurements, Screen Shots

Setup Parameters–Advanced Mode

Measurement Display	Single/Dual Display with independent markers
Frequency	Start Frequency (F1), Stop Frequency (F2)
DTF	Start Distance (D1), Stop Distance (D2), Units m/ft, DTF Aid, Cable List, Cable Loss, Propagation Velocity
Windowing	Rectangular, Normal Side Lobe, Low Side Lobe, Minimum Side Lobe
Amplitude	Top, Bottom, Auto Scale, Full Scale
Sweep	Data Points, Run/Hold, Single/Continuous
Data Points	130, 259, 517, 1033, 2065
Markers	Markers 1 to 8 (On/Off), Delta Markers 2 to 8 (Ref M1), Marker Tracking (On/Off), Marker to Peak/Valley, Marker Table, Marker 5 & 7 (Peak/Valley between M1 & M2), Marker 6 & 8 (Peak/Valley between M3 & M4), Independent Markers for Frequency and Distance Measurements
Traces	Copy Trace to Memory, Trace Display, Trace Math [Trace – Memory, Trace + Memory, (Trace + Memory)/2]
Limit Line	Active Limit (Upper/Lower), Limit State (On/Off), Move Active Limit, Edit Segments (42 upper and 42 lower segments maximum), Limit Alarm, Pass/Fail On/Off, Limit Preset
Calibration	Factory default 1-Port ReadyCal (automatically applied to all measurements except Transmission) User calibration (User Cal) overrides ReadyCal Start Calibration, Cal Info, User Cal (On/Off), Cal Methods: OSL, Transmission, OSL + Transmission Cal Types: Standard, FlexCal™
Save/Recall	Setups, Measurements, Screen Shots

Frequency

Frequency Ranges	500 kHz to 4 GHz (S331P-0704) 500 kHz to 6 GHz (S331P-0706) Either option can be set as low as 150 kHz
Frequency Accuracy	±2.5 ppm @ 23°C±3°C
Frequency Resolution	1 kHz

Power

Output Power	–5 dBm (typ.)
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Interference Immunity

	On Channel and On Frequency +17 dBm (typ.)
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Measurement Speed

	500 μs/data point (typ.)*
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*: Timing dependent on external computer configuration

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

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 = propagation velocity, ΔF is F2 – F1 in Hz)
Horizontal Range (meters)	0 to (Data Points – 1) × Fault Resolution, to maximum of 1500 meters (4921 ft)

1-Port Phase (Advanced Mode Only)

Measurement Display Range	–450° to +450°
Resolution	0.01°

Smith Chart (Advanced Mode Only)

Impedance	50Ω, 75Ω
Resolution	0.01

Transmission Ext Sensor (Advanced Mode Only)

Measurement Display Range	–100 to +100 dB
Resolution	0.01 dB

Measurement Accuracy (at 23°C±3°C)

Corrected Directivity	≥42 dB, OSL calibration (OSLN50A-8, OSLN50A-8)
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General Specifications

Setup Parameters

System Info	Status
System Setups	Language, Display/Audio
Language	English, French, German, Italian, Spanish, Russian, Portuguese, Japanese, Korean, Chinese
Display/Audio	Brightness, Color Schemes, Screen Shot Settings, Volume
Connectivity	USB
Diagnostics	Self Test
Preset	Preset, Reset
Reset	Factory Reset, Delete All User Files, Delete Custom Files, Master Reset
File	Save, Recall, File Management
Save	Measurement (*.dat), Setup (*.stp), Screen Shot (*.png), System and Self Test Info (*.txt)
Recall	Recall, Create Folder, Copy, Paste, Delete
File Management	Rename, Create Folder, Copy, Paste, Delete
Navigation	Top, Bottom, Page Up, Page Down
Help Menu	System Info, FAQ, User Guide
Internal Trace/Setup Memory	> 1000 files for traces, setups, screen shots, or any combination (limited by PC/Tablet storage)
External Trace/Setup Memory	Limited only by size of USB Flash drive

Connectors

RF Port	Type N (m), 50Ω, Maximum input +23 dBm maximum, ±50 VDC maximum
USB Port	USB 2.0 port for connecting to an external PC controller

Regulatory Compliance

CE	EMC: 2014/30/EU, EN61326-1, EN61000-4-2 LVD: 2014/35/EU, EN61010-1 RoHS: 2011/65/EU, (EU) 2015/863
Australia and New Zealand	RCM AS/NZS 4417:2012
South Korea	KCC-REM-A21-0004

Environmental

Operating Temperature Range	-10°C to +55°C
Storage Temperature Range	-51°C to +71°C
Maximum Relative Humidity	95% RH at +30°C, non-condensing
Vibration, Sinusoidal	5 Hz to 55 Hz
Vibration, Random	10 Hz to 500 Hz
Altitude	4600 m (15092 ft), operating and non-operating

Dimensions and Mass

Dimensions	52 (W) × 148 (H) × 36 (D) mm (2 × 5.8 × 1.4 in)
Mass	<0.4 kg (<0.9 lb) (typ.)

Recommended External PC Configuration

	One USB 2.0 (or higher) port S331P software is compatible with Windows® 7, 8, 8.1, or 10; 32 or 64 bit operating systems. Tested with tablets running Windows 10 and Intel Atom X5-Z8300 processor.
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Anritsu Tool Box and Line Sweep Tools (for your PC)

Line Sweep Tools (LST) is a free PC based program that increases productivity for people who deal with numerous Cable and Antenna traces every day. LST is the next generation of Anritsu’s familiar Handheld Software Tools (HHST) and shares its uncomplicated user interface, giving a new face to the term “ease of use.”

Cable Editor*1	Instrument Cable Lists may be retrieved from the instrument, modified as required, and uploaded back into instrument.
Distance to Fault*2 (DTF)	Easily convert Return Loss or VSWR traces to Distance to Fault traces with one button press.
Measurement Calculator	Provides quick conversion between commonly used measurement units such as VSWR, RL, and others.
Signal Standard Editor*1	Signal Standard Lists may be retrieved from the instrument, modified as required, and uploaded back into instrument.
Naming Grid	A naming grid function makes changing file names, trace titles, and trace subtitles from field values to those required by contract simple and quick. Once the naming grid is populated with user defined file name segments, a few simple button presses will then fill out the file, title, and sub-title names. Quickly applied to multiple traces, the naming grid can save time, increase efficiency and accuracy.
Presets	Presets make applying markers and a limit line to similar traces quick and easy. They only need to be set once, and recorded. After this, applying them to a similar trace requires only one button push. This speeds up trace processing and makes providing consistent marker and limit line settings easy.
Report Generator	The report generator creates a professional PDF or HTML based report. Reports may include GPS*3 location, power level*3, company logo*4, instrument and calibration status along with a display of all open traces. It also may contain additional information such as addresses and phone numbers.
Connection	File transfer.
Supported File Types	Input: *.dat, *.vna, *.mna, *.pim, *.tm Output: *.dat, *.vna, *.pim, *.tm, *.csv, *.bmp, *.jpg, *.png

- *1: Instrument type/model must match original
- *2: Only *.dat and *.vna file types supported
- *3: Model dependent
- *4: Optionally set by user



easyTest Tools (for your PC)

Instrument Mode

	Cable & Antenna Analyzer Mode
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Commands

Display Image	Allows a custom on-screen image
Recall Setup	Places the instrument into a known state
Prompt	Displays instructional messages for the user
Save	Allows automatic or manual saving of traces

Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name	Model/Order No.	Name
S331P	Main Frame Cable and Antenna Analyzer (required one frequency option)	3-1010-122	Attenuators 20 dB, 5 W, DC to 12.4 GHz, N (m) to N (f)
S331P-0704	Frequency Options 150 kHz to 4 GHz	42N50-20	20 dB, 5 W, DC to 18 GHz, N (m) to N (f)
S331P-0706	150 kHz to 6 GHz	42N50A-30	30 dB, 50 W, DC to 18 GHz, N (m) to N (f)
S331P-ES510	Calibration and Extended Warranty Options Warranty Extension to 5 Years	3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N (m) to N (f)
S331P-ES513	Warranty Extension to 5 Years with Z540 Calibration	1010-127-R	30 dB, 150 W, DC to 3 GHz, N (m) to N (f)
S331P-0098	Standard Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate.	3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N (f) to N (m), Unidirectional
S331P-0099	Premium Calibration to ISO17025 and ANSI/NCCL Z540-1. Includes calibration certificate, test report, and uncertainty data.	1010-121	40 dB, 100 W, DC to 18 GHz, N (f) to N (m), Unidirectional
2000-1864-R	Standard Accessories (included with instrument)	1010-128-R	40 dB, 150 W, DC to 3 GHz, N (m) to N (f)
2000-1606-R	Soft Carrying Case	2000-1717-R*	USB Extender Kit (for 2-port cable loss/transmission (external sensor) measurements)
2000-1687-R	USB-A to Micro-B with latch cable, 1.8 m (6 ft) Torque Multiplier N (m) Standard Three-Year Warranty Certificate of Calibration and Conformance	2000-1900-R	USB Extender, Requires Cat 5e extension cable (sold separately)
11410-00964	Reference Documents (Soft copies available at www.anritsu.com)	2000-1901-R	USB 2.0 Active 100 meter Extender (with Type A power cord for USA, Japan, North America, Central America and Caribbean)
10580-00426	Site Master™ S331P Technical Data Sheet	2000-1902-R	USB 2.0 Active 100 meter Extender (with Type C power cord for use in Europe, India, South Korea, and many countries in Middle East and Africa)
11410-00674	Site Master™ S331P User Guide	2000-1903-R	USB 2.0 Active 100 meter Extender (with Type I power cord for use in Australia, New Zealand, Argentina, and the South Pacific)
OSLN50A-8	Optional Accessories Calibration Components, 50Ω	2000-1903-R	USB 2.0 Active 100 meter Extender (with Type G power cord for use in the UK, and several other countries in Asia, the Middle East, and Africa)
OSLNF50A-8	Precision Open/Short/Load, N (m), 42 dB, DC to 8.0 GHz, 50Ω	2100-28-R	Cat 5e extension cable for use with USB Extender (22.5 m)
2000-1618-R	Precision Open/Short/Load, N (f), 42 dB, DC to 8.0 GHz, 50Ω	MA24105A	USB Power Sensors and Transmission Sensors (For complete ordering information see the respective data sheets of each sensor)
2000-1619-R	Precision Open/Short/Load, 7/16 DIN (m), DC to 6.0 GHz, 50Ω	MA24106A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 to +51.76 dBm
2000-1914-R	Precision Open/Short/Load, 7/16 DIN (f), DC to 6.0 GHz, 50Ω	MA24108A	RF USB Power Sensor, 50 MHz to 6 GHz, +23 dBm
2000-1915-R	Precision Open/Short/Load, 4.3-10 (f), DC to 6 GHz, 50Ω	MA24118A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
22N50	Precision Open/Short/Load, 4.3-10 (m), DC to 6 GHz, 50Ω	MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm
22NF50	Open/Short, N (m), DC to 18 GHz, 50Ω	MA24208A	Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
SM/PL-1	Open/Short, N (f), DC to 18 GHz, 50Ω	MA24218A	Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
SM/PLNF-1	Precision Load, N (m), 42 dB, DC to 6.0 GHz	MA24330A	Microwave CW USB Power Sensor, 10 MHz to 33 GHz, +20 dBm
12N50-75B	Precision Load, N (f), 42 dB, DC to 6.0 GHz	MA24340A	Microwave CW USB Power Sensor, 10 MHz to 40 GHz, +20 dBm
22N75	Calibration Components, 75Ω	MA24350A	Microwave CW USB Power Sensor, 10 MHz to 50 GHz, +20 dBm
22NF75	Matching Pad, DC to 3 GHz, 50Ω to 75Ω	SC8268	USB Transmission Sensor, K (m), 1 MHz to 40 GHz, +10 to -50 dBm
26N75A	Open/Short, N (m), DC to 3 GHz, 75Ω	MA25100A	RF Power Indicator
26NF75A	Open/Short, N (f), DC to 3 GHz, 75Ω	67135	Backpack and Transit Case Anritsu Backpack (for instrument and PC)
510-91-R	Adapters	760-283	Transit Case, USB 1 Port VNA
510-96-R	7/16 DIN (f) to N (f), DC to 7.5 GHz, 50Ω		
510-97-R	7/16 DIN (m) to 7/16 DIN (m), DC to 7.5 GHz, 50Ω		
1091-80-R	7/16 DIN (f) to 7/16 DIN (f), DC to 7.5 GHz, 50Ω		
1091-81-R	SMA (m) to N (f), DC to 18 GHz, 50Ω		
1091-81-R	SMA (f) to N (f), DC to 18 GHz, 50Ω		
1091-433-R	Low PIM Adapter, 4.1/9.5 (f) to 7/16 DIN (f), DC to 3.0 GHz, 50Ω		
1091-434-R	Low PIM Adapter, 4.1/9.5 (m) to 7/16 DIN (f), DC to 3.0 GHz, 50Ω		
1091-435-R	Low PIM Adapter, 4.1/9.5 (f) to N (m), DC to 3.0 GHz, 50Ω		
1091-436-R	Low PIM Adapter, 4.1/9.5 (m) to N (m), DC to 3.0 GHz, 50Ω		
1091-440-R	Low PIM Adapter, 4.3/10 (f) to 7/16 DIN (f), DC to 3.0 GHz, 50Ω		
1091-441-R	Low PIM Adapter, 4.3/10 (m) to 7/16 DIN (f), DC to 3.0 GHz, 50Ω		
1091-442-R	Low PIM Adapter, 4.3/10 (f) to N (m), DC to 3.0 GHz, 50Ω		
1091-443-R	Low PIM Adapter, 4.3/10 (m) to N (m), DC to 3.0 GHz, 50Ω		
1091-465-R	DC to 6 GHz, 4.3-10 (f) to N (f), 50Ω		
1091-467-R	DC to 6 GHz, 4.3-10 (m) to N (f), 50Ω		
34NN50A	Precision Adapters		
34NFN50	Precision Adapter, N (m) to N (m), DC to 18 GHz, 50Ω		
	Precision Adapter, N (f) to N (f), DC to 18 GHz, 50Ω		

*: Not compatible with MA24208A, MA24218A, MA24330A, MA24340A and MA24350A sensors; must use active extenders with these sensors.