/Inritsu

MT8815A

Radio Communication Analyzer

30 MHz to 2.7 GHz

*For Mobile Phone Service and Repair*

Service Test Platform for
2G, 2.5G, 3G, 3.5G Mobile Phones with *1* unit

The MT8815A Radio Communication Analyzer is a multi-system service test platform that covers W-CDMA/HSDPA, GSM/GPRS/EGPRS, cdma2000® 1x/1xEV-DO, and AMPS with just 1 unit.
This platform supports detailed failure diagnosis and evaluation of all the main mobile phone transmission/reception test items.

The combination of the MT8815A and the MT8510B Service Tester provides coverage from the "Service Point" to the "Advanced Repair Center" for service of individual W-CDMA/GSM or GSM mobile phones.
The MT8510B performs the primary failure diagnosis with a pass/fail judgment, and the MT8815A detects detailed points with additional tests and measurements made with higher accuracy.

cdma2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).

W-CDMA/GSM Mobile Phone Service Model
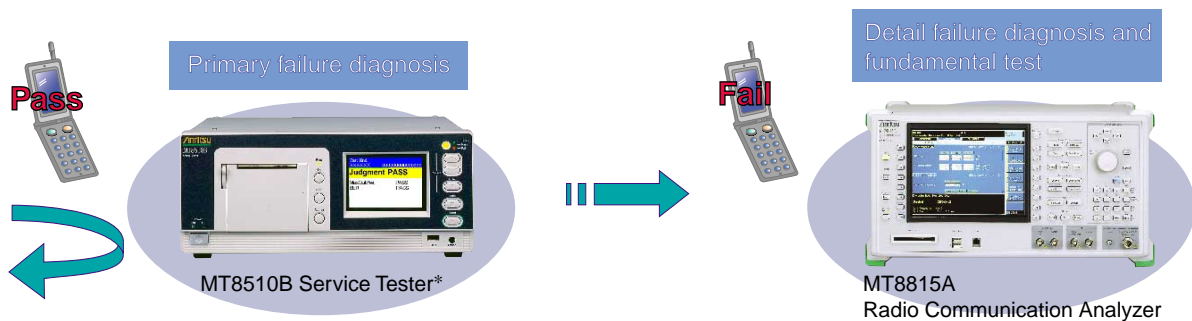
∗: Please refer to the MT8510B datasheet for details.

Detailed failure diagnosis

The MX881580A Mobile Phone Test Software is user-friendly automation software installed in an external PC. Users can edit test sequences and set Pass/Fail thresholds for every test.
By using the diagnosis in the test report, users can execute repeat tests for failed items to detect the point of failure in the mobile phone.

MX881580A
Mobile Phone Test Software for W-CDMA/GSM/cdma2000 mobile phones

MX881580A
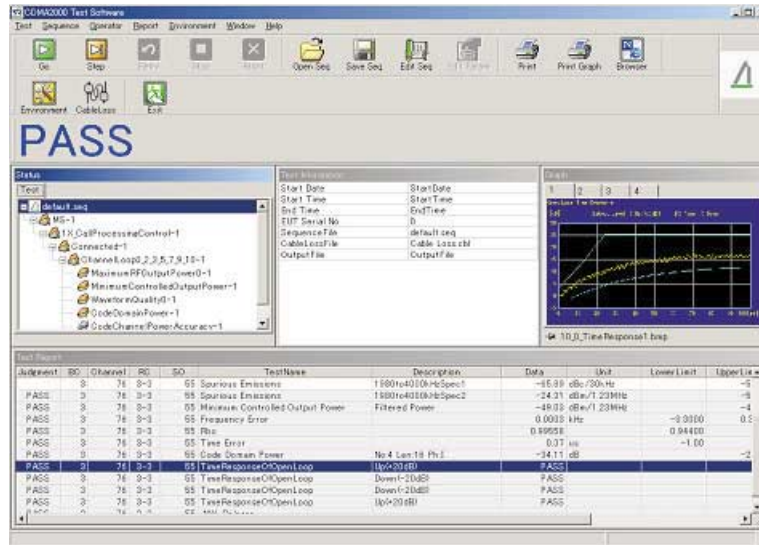
Test Sequence Screen
Provides flexible editing for test sequences: selecting test items, changing the test order, and the number of tests.

Graph
Waveform display for transmitter tests (W-CDMA, cdma2000)
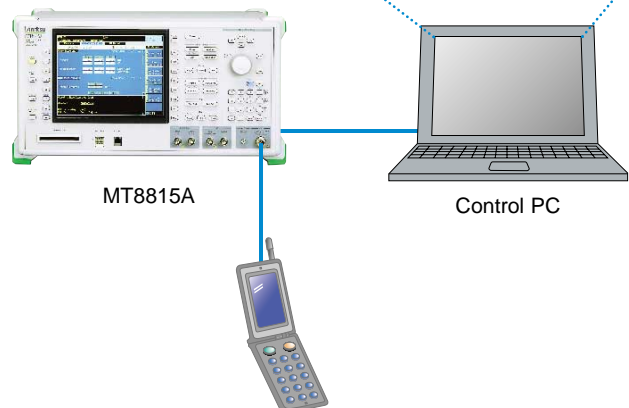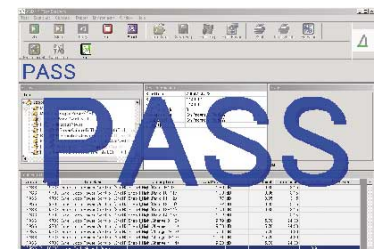
Test Information Screen
Displays test information such as the executing test sequence file, test date, and measurement time.

Test Report
Displays the test report. Users can set the Pass/Fail threshold.

MT8815A

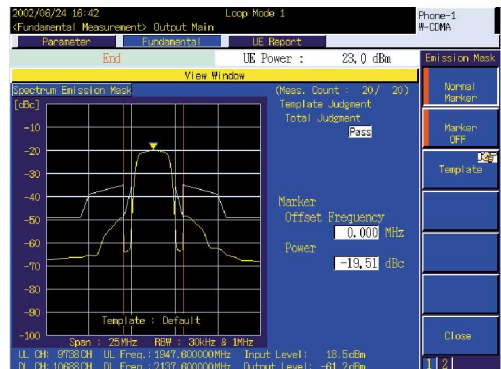Control PC

Transmitter and Receiver Measurements

W-CDMA Test Items

Tests	3GPP TS34.121	Test items
Transmitter tests	5.2	Maximum Output Power
	5.3	Frequency Error
	5.4.1	Open Loop Power Control in the Uplink
	5.4.2	Inner Loop Power Control in the Uplink
	5.4.3	Minimum Output Power
	5.4.4	Out-of-synchronisation Handling of Output Power
	5.5.1	Transmit OFF Power
	5.6	Change of TFC
	5.8	Occupied Bandwidth (OBW)
	5.9	Spectrum Emission Mask
	5.10	Adjacent Channel Leakage Power Ratio (ACLR)
	5.13.1	Error Vector Magnitude (EVM)
	5.13.2	Peak Code Domain Error
	5.13.3	UE Phase Discontinuity
	5.13.4	PRACH Preamble Quality
Receiver tests	6.2	Reference Sensitivity Level
	6.3	Maximum Input Level
Performance test	7.2.1	DCH Demodulation

Examples of W-CDMA Measurement Screens

Output Power

Occupied Bandwidth
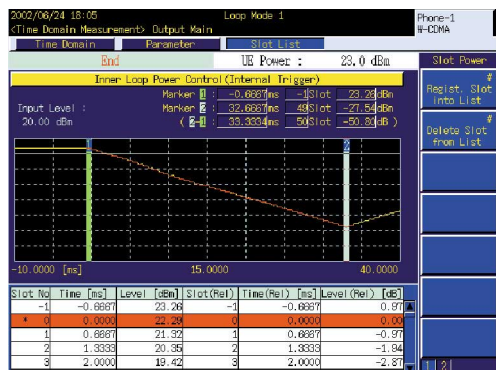
Inner Loop Power Control

Bit Error Rate

4
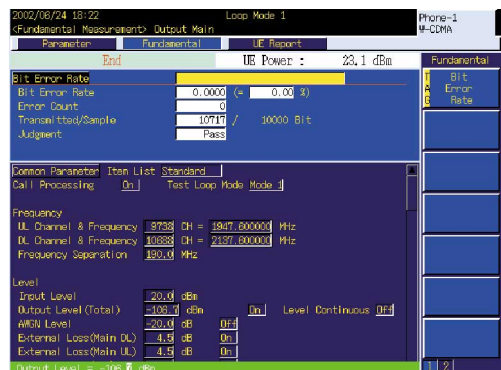
HSDPA Measurement Items

Tests	3GPP TS34.121	Test items
	5.2A	Maximum Output Power with HS-DPCCH
	5.7A	HS-DPCCH
Transmitter tests	5.9A	Spectrum Emission Mask with HS-DPCCH
	5.10A	Adjacent Channel Leakage Power Ratio (ACLR) with HS-DPCCH
	5.13.1A	Error Vector Magnitude (EVM) with HS-DPCCH
Receiver tests	6.3A	Maximum Input Level with HS-PDSCH Reception (16QAM)

Examples of HSDPA Measurement Screens
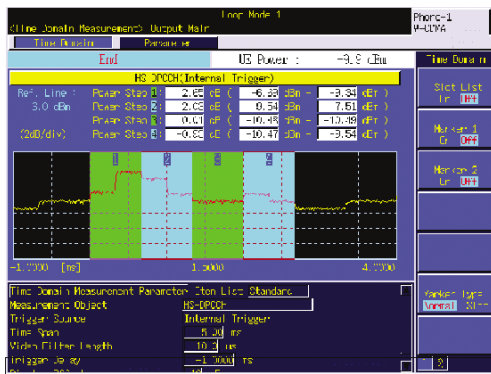
HS-DPCCH
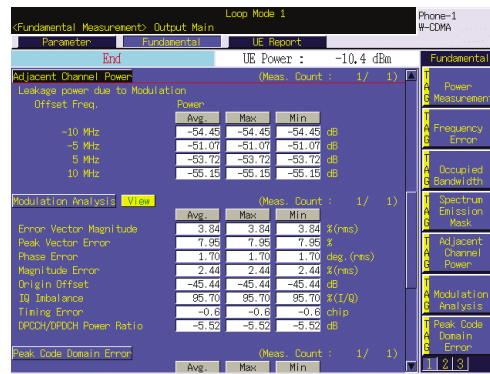
ACLR and EVM
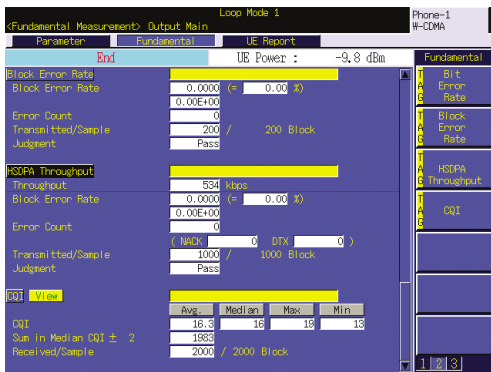
Throughput

CQI measurement

GSM Test Items

● GSM measurement items

Transmission measurement	Transmission power
	Power vs time (template mask evaluation)
	Frequency error
	Phase error (rms and peak)
	Output spectrum
Reception measurement	FER, BER and CRC error rates

● GPRS measurement items

Transmission measurement	Transmission power
	Power vs time (template mask evaluation)*1
	Frequency error
	Phase error (rms and peak)
	Output spectrum*1
Reception measurement	BLER

*1: Can be measured up to two uplink slot.

● EGPRS measurement items

Transmission measurement	Transmission power
	Power vs time (template mask evaluation)*1
	Frequency error
	Phase error (GMSK)
	Modulation accuracy (8PSK)
	Output spectrum*1

*1: Can be measured up to two uplink slot.

Examples of GSM/GPRS/EGPRS Measurement Screens

Output Power (GMSK)

Output Power (8PSK)

Output RF Spectrum

FAST BER Measurement

cdma2000 1x Test Items

| Tests	3GPP2 C.S0011	Test items
Receiver tests	3.4.1	Demodulation of forward traffic channel in additive white gaussian noise
	3.5.1	Receiver sensitivity and dynamic range
Transmitter tests	4.1	Frequency accuracy
	4.3.1	Time reference
	4.3.4	Waveform quality and frequency accuracy
	4.3.5	Code domain power
	4.4.1	Range of open loop output power (Access channel)
	4.4.3	Access probe output power
	4.4.4	Range of closed loop power control
	4.4.5	Maximum RF output power
	4.4.6	Minimum controlled output power
	4.4.9	Code channel to reverse pilot channel output power accuracy (2.2)
	4.5.1	Conducted spurious emissions
	4.5.3	Occupied bandwidth

1xEV-DO Test Items

Tests	3GPP2 C.S0033	Test items
Transmitter measurements	3.1.2.1.2	Frequency accuracy
	3.1.2.2.2	Waveform quality and frequency accuracy
	3.1.2.3.3	Range of closed loop power control
	3.1.2.3.4	Maximum RF output power
	3.1.2.3.5	Minimum controlled output power
	3.1.2.3.8	Code domain power
	3.1.2.3.8.1	DRC channel output power
	3.1.2.3.8.2	ACK channel output power
	3.1.2.3.8.3	Data channel output power
	3.1.2.4.1	Conducted spurious emissions
	3.1.2.4.3	Occupied bandwidth

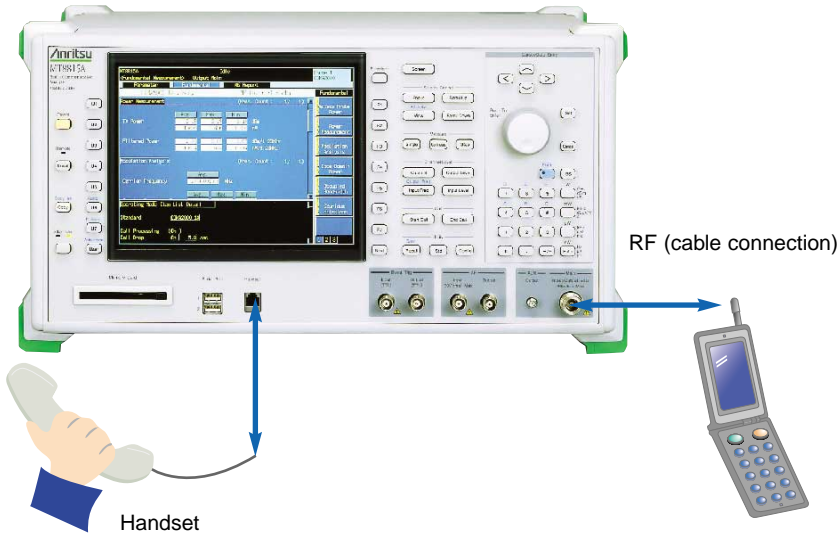## Examples of cdma2000 1x/1xEV-DO Measurement Screens
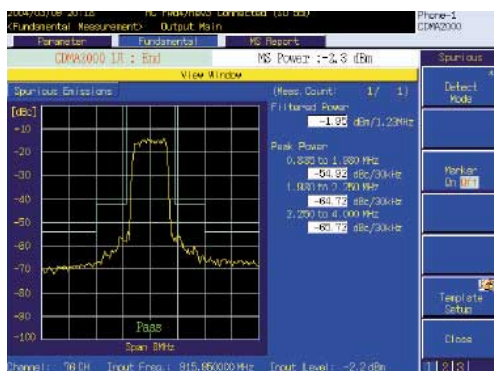
Spectrum Emission Mask
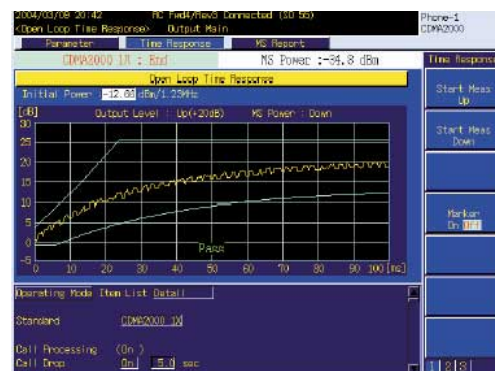

Open Loop Time Response

End-to-End Communications Testing

Connecting a handset to the MT8815A RJ-11 connector enables end-to-end communications testing between the MT8815A and a mobile terminal.

RF (cable connection)

Handset

Transmission Audio Measurement

The tone signal output from the AF Output connector is input to the terminal microphone. Then the MT8815A demodulates the up-link RF signal and measures the level, frequency, and distortion rate of the demodulated tone signal.

This function evaluates the audio characteristics of the transmitter side of mobile terminals.

RF (cable connection)

AF output

Speaker
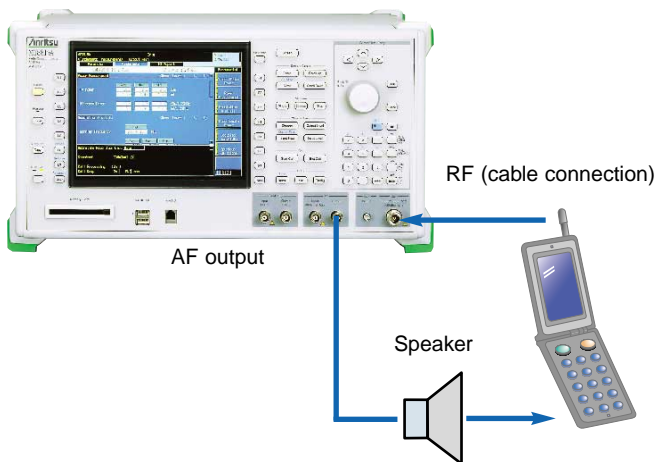
Reception Audio Measurement

The tone signal demodulated by the mobile terminal is input to the MT8815A AF Input connector. The audio characteristics of the receiver side of mobile terminals can be evaluated by measuring the level, frequency, and distortion rate of the tone signal inputted to the AF Input connector.

RF (cable connection)

AF input

Microphone
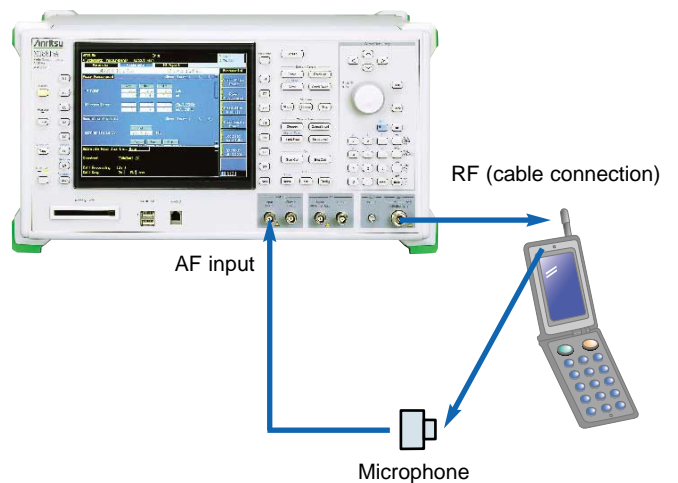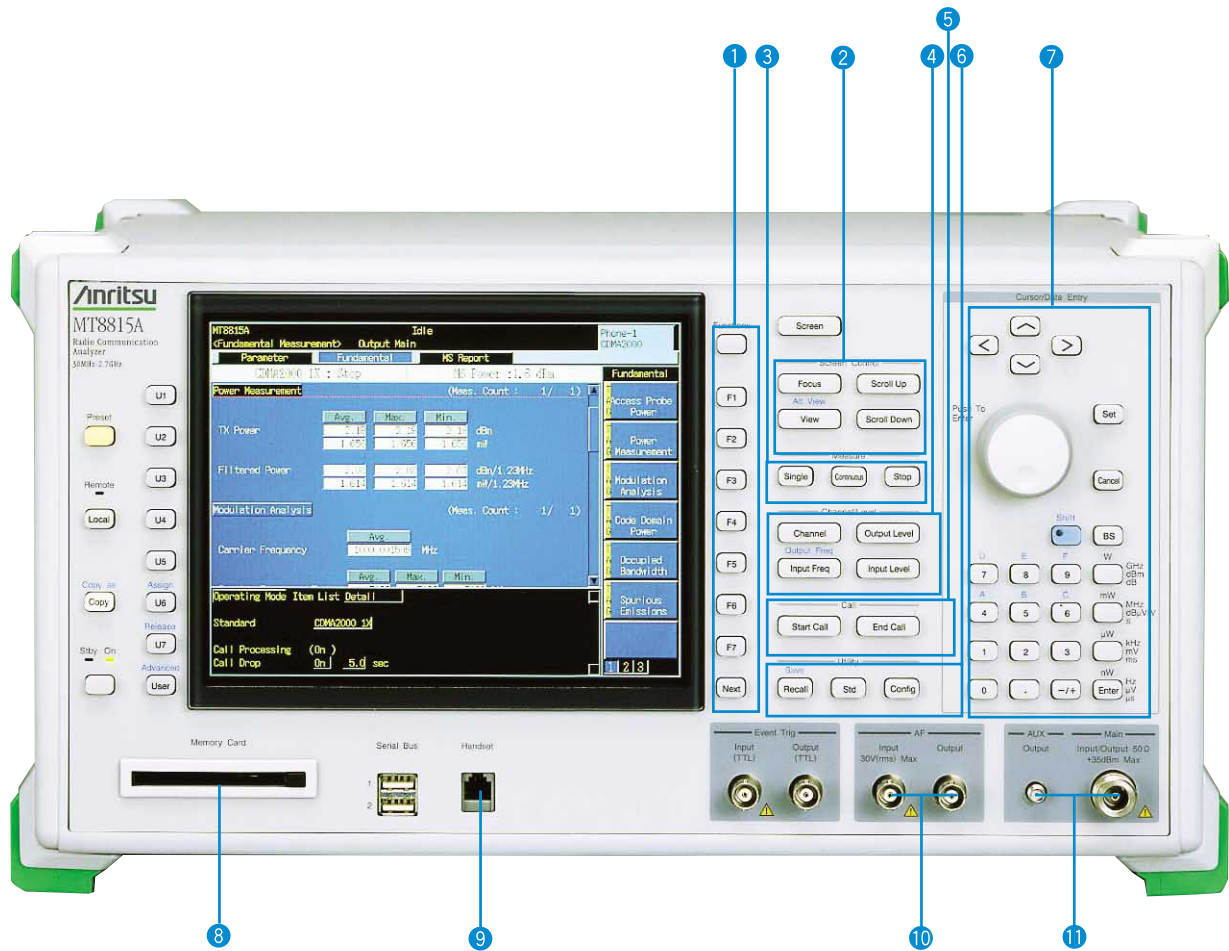
❶ Functions: Executes function menu

❷ Screen Control: Switches screen views, such as between the operation window and display window

❸ Measure: Selects measurement mode and starts and stops measurement

❹ Channel/Level: Sets input/output channels, frequency, and level

❺ Call: Calls mobile station and disconnects communications link

❻ Utility: Saves and reads parameter settings and controls configuration

❼ Cursor/Data Entry: Confirms cursor movement and input of parameter settings

❽ Memory Card: Slot for Type II PCMCIA Compact Flash card used to save and recall measured data and measurement conditions, and to update measurement software.

❾ Handset: A handset can be connected to this RJ-11 connector. End-to-end tests between a station and the MT8815A can be performed

❿ AF: Input/output connectors for audio measurements

⓫ Connectors for mobile station: For RF measurement of mobile station (N and SMA types)

⓬ 10BASE-T: For external data transmission when using the external packet data option.

Specifications

• MT8815A (Main frame)

General	Frequency range: 30 to 2700 MHz
	Max. input level: +35 dBm (MAIN 1)
	MAIN 1 I/O
	    Impedance: 50 Ω
	    VSWR: ≤1.2 (<1.6 GHz), ≤1.25 (1.6 to 2.2 GHz), ≤1.3 (>2.2 GHz)
	    Connector: N type
	AUX 1 output
	    Impedance: 50 Ω
	    VSWR: ≤1.3 (at SG Output level: ≤−10 dBm)
	    Connector: SMA type
	Reference oscillator
	    Frequency: 10 MHz
	    Level: TTL
	    Startup characteristics: $\leq\pm5 \times 10^{-8}$ (at 10 min after startup referenced to frequency 24 h after startup)
	    Aging rate: $\leq\pm2 \times 10^{-8}$/day, $\leq\pm1 \times 10^{-7}$/year (referenced to frequency 24 h after startup)
	    Temperature characteristics: $\leq\pm5 \times 10^{-8}$
	    Connector: BNC type
	External reference input
	    Frequency: 10 MHz or 13 MHz (±1 ppm)
	    Level: ≥0 dBm
	    Impedance: 50 Ω
	    Connector: BNC type

RF signal generator	Frequency
	    Frequency range: 30 to 2700 MHz (setting range: 0.4 to 2700 MHz)
	    Setting resolution: 1 Hz
	    Accuracy: Due to reference oscillator accuracy
	Output level
	    Level range: −140 to −10 dBm (MAIN 1), −130 to 0 dBm (AUX 1)
	    Resolution: 0.1 dB
	    Accuracy: ±1.0 dB (−120 to −10 dBm, MAIN 1, after calibration), ±1.0 dB (−110 to 0 dBm, AUX 1, after calibration)
	Signal purity
	    Non-harmonic spurious:
	      ≤−50 dBc (at offset frequency: ≥100 kHz, except Uplink frequency − Downlink frequency + 4.1825 GHz),
	      ≤−40 dBc [spurious of (4.8 −F out) GHz at ≥2.1 GHz]
	    Harmonics: ≤−25 dBc
	Uninterrupted level variation
	    Variable range: 0 to −30 dB
	    Setting resolution: 1 dB

Others	Display
	    Color 8.4" TFT LCD, 640 x 480 dots
	External control
	    GPIB: Control from external host with main unit as device (excluding some functions such as power-on), no
	        external device control
	    Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2, RS232C

Power supply	100 to 120/200 to 240 Vac (−15/+15%, 250 V max.), 47.5 to 63 Hz, ≤300 VA
Dimensions and mass	426 (W) x 221.5 (H) x 351 (D) mm (excluding projections), ≤19 kg (with Option 01), ≤20 kg (with all Options)

Environmental conditions	Operating temperature and humidity: 0 to +50˚C, ≤95% (no condensation)
	Storage temperature and humidity: −20 to +60˚C, ≤95% (no condensation)
	EMC
	    EN61326: 1997/A2: 2001 (Class A), EN61000-3-2: 2000 (Class A), EN61326: 1997/A2: 2001 (Annex A)
	LVD
	    EN61010-1: 2001 (Pollution Degree 2)

• MT8815A-01 W-CDMA Measurement Hardware, MX882000B W-CDMA Measurement Software

Modulation analysis	Frequency: 300 to 2200 MHz Input level: −30 to +35 dBm (MAIN) Carrier frequency accuracy: Reference oscillator accuracy + 10 Hz Modulation accuracy (residual vector error): ≤2.5% (at input of 1-DPCCH and 1-DPDCH)
RF power	Frequency: 300 to 2200 MHz Input level: −65 to +35 dBm (MAIN) Measurement accuracy: ±0.5 dB (−25 to +35 dBm), ±0.7 dB (−55 to −25 dBm), ±0.9 dB (−65 to −55 dBm) ∗After calibration Linearity: ±0.2 dB (−40 to 0 dB, ≥−55 dBm), ±0.4 dB (−40 to 0 dB, ≥−65 dBm) Measurement object: DPCH, PRACH
Occupied bandwidth	Frequency: 300 to 2200 MHz, Input level: −10 to +35 dBm (MAIN)
Adjacent channel leakage power	Frequency: 300 to 2200 MHz Input level: −10 to +35 dBm (MAIN) Measurement points: ±5 MHz, ±10 MHz Measurement range: ≥50 dB (at ±5 MHz), ≥55 dB (at ±10 MHz)
RF signal generator	Output frequency: 300 to 2200 MHz (1 Hz step) Channel level (CPICH, P-CCPCH, SCH, PICH, DPCH, S-CCPCH, AICH): Off, −30.0 to 0.0 dB [0.1 dB step, relative level for Ior (total level)] Channel level (OCNS): Auto-setting Channel level accuracy: ±0.2 dB (relative level accuracy for Ior) AWGN level: Off, −20 to +5 dB (0.1 dB step) AWGN level accuracy: ±0.2 dB (relative level accuracy for Ior)
Bit error rate measurement	Functions: Insert PN9 or PN15 pattern in DTCH Measurement items: BER, BLER Measurement objective: Loop-back data imposed on uplink DTCH (BER, BLER), serial data inputted from rear- panel call processing I/O port (BER)

Call processing	Origination control:
	  Registration, origination, termination, handover, disconnection from network, disconnection from mobile
	  station (executes each processing conforming to 3GPP standards and performs pass/fail evaluation)
	Mobile station control:
	  Output level, loop-back (executes each mobile function control conforming to 3GPP standards)

• MT8815A-11 Audio Board, MX882000B-01 W-CDMA Voice Codec

Voice codec	AMR 12.2 kbps
Codec level adjustment	Encoder input gain: −3.00 to 3.00 dB, in increments of 0.01 dB Handset microphone volume: 0, 1, 2, 3, 4, 5 Handset speaker volume: 0, 1, 2, 3, 4, 5
AF output	Frequency range: 30 Hz to 10 kHz, 1 Hz resolution Setting range: 0 to 5 Vpeak (AF Output connector) Setting resolution: 1 mV (≤5 V peak), 100 µV (≤500 mVpeak), 10 µV (≤50 mVpeak) Accuracy: ±0.2 dB (≥10 mVpeak, ≥50 Hz), ±0.3 dB (≥10 mVpeak, <50 Hz) Waveform distortion: ≤30 kHz band ≤−60 dB (≥500 mV peak, ≤5 kHz), ≤−54 dB (≥70 mVpeak) Output impedance: ≤1 Ω Max. output current: 100 mA
AF input	Frequency range: 50 Hz to 10 kHz Input voltage range: 1 mVpeak to 5 Vpeak (AF Input connector) Max. allowable input voltage: 30 Vrms Input impedance: 100 kΩ
Frequency measurement	Accuracy: Reference oscillator accuracy + 0.5 Hz
Level measurement	Accuracy: ±0.2 dB (≥10 mVpeak), ±0.4 dB (≥1 mVpeak, ≥1 kHz)
SINAD measurement	Frequency: 1 kHz in ≤30 kHz band ≥60 dB (≥1000 mVpeak), ≥54 dB (>50 mVpeak), ≥46 dB (≥10 mVpeak)
Distortion rate measurement	Frequency: 1 kHz in ≤30 kHz band ≤−60 dB (≥1000 mVpeak), ≤−54 dB (>50 mVpeak), ≤−46 dB (≥10 mVpeak)

• MT8815A-01 W-CDMA Measurement Hardware, MX882000B-11 HSDPA Measurement Software

Modulation analysis	Frequency: 300 to 2200 MHz Input level: −30 to +35 dBm Carrier frequency accuracy: ±(Setting frequency x Reference oscillator accuracy + 10 Hz) Modulation accuracy (residual vector error): ≤2.5% (at input of a single DPCCH, a single DPDCH, and a single HS-DPCCH)
RF power	Frequency: 300 to 2200 MHz Input level: −65 to +35 dBm (MAIN) Measurement accuracy: ±0.5 dB (−25 to +35 dBm), ±0.7 dB (−55 to −25 dBm), ±0.9 dB (−65 to −55 dBm) ∗After calibration Linearity: ±0.2 dB (−40 to 0 dB, ≥−55 dBm), ±0.4 dB (−40 to 0 dB, ≥−65 dBm) Measurement object: DPCH and HS-DPCCH
Adjacent channel leakage power ratio	Frequency: 300 to 2200 MHz Input level: −10 to +35 dBm (MAIN) Measurement points: ±5 MHz, ±10 MHz Measurement range: ≥50 dB (at ±5 MHz), ≥55 dB (at ±10 MHz)
RF signal generator	Output frequency: 300 to 2200 MHz (1 Hz step) Channel level (CPICH, P-CCPCH, SCH, PICH, DPCH, S-CCPCH, AICH, HS-SCCH, HS-PDSCH): Off, −30.0 to 0.0 dB [0.1 dB step, relative level for Ior (total level)] Channel level (OCNS): Auto-setting Channel level accuracy: ±0.2 dB (relative level accuracy for Ior) AWGN level: Off, −20 to +5 dB (0.1 dB step) AWGN level accuracy: ±0.2 dB (relative level accuracy for Ior)
Throughput measurement	Functions: Transmit HS-SCCH, HS-PDSCH based on Fixed Reference Channel Measurement items: BLER, Throughput Measurement objective: ACK and NACK data imposed on uplink HS-DPCCH
CQI measurement	Statistical analysis of CQI values reported from a Mobile Station
Call Processing	Origination control: Registration, Connection based on Fixed reference Channel (executes each processing conforming to 3GPP standards and performs pass/fail evaluation) Mobile station control: Output level (executes each mobile function control conforming to 3GPP standards)

• MT8815A-02 TDMA Measurement Hardware, MX882001A GSM Measurement Software

Frequency/modulation measurement	Frequency: 300 to 2200 MHz
	Input level: −30 to +40 dBm (average power of burst signal, MAIN connector)
	Measurement items: Normal burst, RACH
	Carrier frequency accuracy:
	   reference oscillator accuracy + 10 Hz at normal burst measurement
	   reference oscillator accuracy + 20 Hz at RACH measurement
	Residual phase error: ≤0.5° rms, 2° peak

Amplitude measurement	Frequency: 300 to 2200 MHz Input level: −30 to +40 dBm (average power of burst signal, MAIN connector) Measurement items: Normal burst, RACH Measurement accuracy: ±0.5 dB (−20 to +40 dBm), ±0.7 dB (−30 to −20 dBm) ∗After calibration Linearity: ±0.2 dB (0 to −40 dB, ≥−30 dBm) Carrier-off power: ≥65 dB (input level ≥−10 dBm), ≥45 dB (input level ≥−30 dBm) Burst waveform display: Rise, fall, time slot, burst-on

Output RF spectrum measurement	Frequency: 300 to 2200 MHz
	Input level: −10 to +40 dBm (average power of burst signal, MAIN connector)
	Measurement item: Normal burst
	Measurement points: ±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 range in modulation area: ≤−55 dB (≤250 kHz offset), ≤−66 dB (≥400 kHz offset)
	                      ∗Average of 10-time measurement
	Measurement range in transient area: ≤−57 dB (≥400 kHz offset)

RF signal generator	Output frequency: 300 to 2200 MHz (in increments of 1 Hz) Phase error: ≤1° rms, ≤4° peak Output patterns: CCH, TCH, CCH + TCH TCH data: PN9, PN15, ALL 0, ALL 1, Fixed Pattern (PAT0-PAT9)

Error rate measurement	Function: Error rate measurement of frame, bit and CRC
	Measurement items:
	   GSM
	   Loop-back data inserted in up-link TCH
	   Serial data inputted through the call processing I/O port on the rear panel
	   GPRS
	   The number of blocks received from the terminal and inserted in up-link TCH
	   The number of USF reception blocks of a terminal

Call processing	Call controlling:
	   GSM
	   Location registration, terminal call origination, network call origination, network disconnect,
	   terminal disconnect
	   GPRS
	   Connection, disconnection, data transfer
	Terminal controlling:
	   GSM
	   Output level, time slot, timing advance, loop-back on/off
	   GPRS
	   Test Mode A, Test Mode B, BLER

Channel coding	FS, EFS, HS0, HS1, AFS, AHS0, AHS1, CS-1, CS-2, CS-3, CS-4
Frequency bands	GSM450, GSM480, GSM850, P-GSM, E-GSM, R-GSM, DCS1800, PCS1900

• MT8815A-02 TDMA Measurement Hardware, MX882001A-11 EGPRS Measurement Software

Frequency/modulation measurement	Frequency: 300 to 2200 MHz
	Input level: −30 to +40 dBm (average power of burst signal, MAIN connector)
	Measurement items: Normal burst (GMSK, 8PSK), RACH
	Carrier frequency accuracy:
	   reference oscillator accuracy + 10 Hz at normal burst measurement
	   reference oscillator accuracy + 20 Hz at RACH measurement
	Residual phase error (GMSK) : ≤0.5° rms, 2° peak
	Residual EVM (8PSK) : ≤1.5% rms
	Waveform display: phase error VS. bit number, Amplitude error VS. bit number, EVM VS. bit number

Amplitude measurement	Frequency: 300 to 2200 MHz Input level: −30 to +40 dBm (average power of burst signal, MAIN connector) Measurement items: Normal burst (GMSK, 8PSK), RACH Measurement accuracy: ±0.5 dB (−20 to +40 dBm), ±0.7 dB (−30 to −20 dBm) ∗After calibration Linearity: ±0.2 dB (0 to −40 dB, ≥−30 dBm) Carrier-off power: ≥65 dB (input level ≥−10 dBm), ≥45 dB (input level ≥−30 dBm) Burst waveform display: Rise, fall, time slot, burst-on

Output RF spectrum measurement	Frequency: 300 to 2200 MHz
	Input level: −10 to +40 dBm (average power of burst signal, MAIN connector)
	Measurement item: Normal burst (GMSK, 8PSK)
	Measurement points: ±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 range in modulation area: ≤−55 dB (≤250 kHz offset), ≤−66 dB (≥400 kHz offset)
	       ∗Average of 10-time measurement
	Measurement range in transient area: ≤−57 dB (≥400 kHz offset)

RF signal generator	Output frequency: 300 to 2200 MHz (in increments of 1 Hz) Phase error: ≤1° rms, ≤4° peak Modulation accuracy (8PSK): ≤3% rms Output patterns: OCH, TCH, OCH + TCH TCH data: PN9, PN15, ALL 0, ALL 1, Fixed Pattern (PAT0-PAT9)
Error rate measurement	Function: Error rate measurement of bit Measurement items: Loop-back data inserted in up-link TCH
Coding scheme	MCS1-MCS4 (GMSK), MCS5-MCS9 (8PSK)
Puncturing scheme	P1, P2, P3

• MT8815A-11 Audio Board, MX882001A-01 GSM Voice Codec

Voice codec	GSM_EFR, GSM_AMR
Codec level adjustment	Encoder input gain: −3.00 to 3.00 dB, in increments of 0.01 dB Handset microphone volume: 0, 1, 2, 3, 4, 5 Handset speaker volume: 0, 1, 2, 3, 4, 5
AF output	Frequency range: 30 Hz to 10 kHz, 1 Hz resolution Setting range: 0 to 5 Vpeak (AF Output connector) Setting resolution: 1 mV (≤5 V peak), 100 μV (≤500 mVpeak), 10 μV (≤50 mVpeak) Accuracy: ±0.2 dB (≥10 mVpeak, ≥50 Hz), ±0.3 dB (≥10 mVpeak, <50 Hz) Waveform distortion: In ≤30 kHz band, ≤−60 dB (≥500 mV peak, ≤5 kHz), ≤−54 dB (≥70 mVpeak) Output impedance: ≤1 Ω Max. output current: 100 mA
AF input	Frequency range: 50 Hz to 10 kHz Input voltage range: 1 mVpeak to 5 Vpeak (AF Input connector) Max. allowable input voltage: 30 Vrms Input impedance: 100 kΩ
Frequency measurement	Accuracy: Reference oscillator accuracy + 0.5 Hz
Level adjustment	Accuracy: ±0.2 dB (≥10 mVpeak), ±0.4 dB (≥1 mVpeak, ≥1 kHz)
SINAD measurement	At frequency 1 kHz in ≤30 kHz band, ≥60 dB (≥1000 mVpeak), ≥54 dB (>50 mVpeak), ≥46 dB (≥10 mVpeak)
Distortion rate measurement	At frequency 1 kHz in ≤30 kHz band, ≤−60 dB (≥1000 mVpeak), ≤−54 dB (>50 mVpeak), ≤−46 dB (≥10 mVpeak)

• MT8815A-03 CDMA2000 Measurement Hardware, MX882002A CDMA2000 Measurement Software

Amplitude measurement	Frequency: 300 to 2200 MHz Input level: −65 to +35 dBm (Main connector) Measurement accuracy: ±0.5 dB (−25 to +35 dBm), ±0.7 dB (−55 to −25 dBm), ±0.9 dB (−65 to −55 dBm) ∗After calibration, at filtered power measurement Linearity: ±0.2 dB (0 to −40 dB, ≥−55 dBm), ±0.4 dB (0 to −40 dB, ≥−65 dBm)
Frequency/Modulation measurement	Frequency: 300 to 2200 MHz Input level: −30 to +35 dBm Carrier frequency accuracy: ± (reference oscillator accuracy + 10 Hz) Residual waveform quality: >0.999 Residual EVM: <2% rms
Occupied bandwidth	Input level: −10 to +35 dBm
Code domain power	Can be measured at Reverse RC3/RC4. Frequency: 300 to 2200 MHz Input level: −30 to +35 dBm Measurement accuracy: ±0.2 dB (code power: ≥−15 dBc), ±0.4 dB (code power: ≥−23 dBc)

RF signal generator	Output frequency: 300 to 2200 MHz (1 Hz step)
	Channel level [Relative level to Ior (total level)]
	  Pilot Ch: −30 to 0 dB, 0.25 dB step or off
	  FCH, SCH: −30 to 0 dB, 0.1 dB step or off
	  SYNC, PCH: −30 to 0 dB, 0.25 dB step or off
	  OCNS: Auto, 0.01 dB step or off
	QPCH channel level (relative level to pilot channel): −5 to +2 dB (1 dB step) or off
	Channel level accuracy: <±0.2 dB typ. (≥−20 dB)
	PN offset: 0 to 511 settable
	Waveform quality: >0.99 (pilot only, AWGN off)
	AWGN
	  AWGN level: −20 to +12 dB (relative level to CDMA signal) or off
	  Maximum CDMA signal output level at AWGN On: −28 dBm (at MAIN output), −18 dBm (at AUX output)

Error rate measurement	FER (Frame Error Rate) measurement: FER measurement with service Option 2, 9, 55 and 32 (TDSO) Display items: FER, confidence level, sample frame count, error frame count

Call processing	Band class: Conforms to BC 0 to 10
	Call control: Location registration, origination, termination, network disconnect, terminal disconnect
	Paging channel data rate: Full
	Radio configuration: F-RC1 + R-RC1, F-RC2 + R-RC2, F-RC3 + R-RC3, F-RC4 + R-RC3, F-RC5 + R-RC4
	Service option: Conforms to SO 1, 2, 3, 9, 32, 33, 55, 32768.
	Fwd. FCH data rate: Full, half, quarter, eighth settable
	Fwd. SCH: Max. 1 channel
	Fwd. SCH data rate
	  RC3: 9.6, 19.2, 38.4, 76.8, 153.6 kbps
	  RC4: 9.6, 19.2, 38.4, 76.8, 153.6 kbps
	  RC5: 14.4, 28.8, 57.6, 115.2, 230.4 kbps
	Access channel: Conforms to access Ch.
	Rev. closed loop power control mode: closed loop, alternate, All 0 (all up), All 1 (all down)
	Conformed protocol: IS-95B, J-STD-008C, ARIB T-53, Korean PCS, IS-2000 (SR1)

• MT8815A-04 1xEV-DO Measurement Hardware, MX882003A 1xEV-DO Measurement Software

Amplitude measurement	Dependent on the performance of MX882002A
Modulation analysis	Frequency: 300 to 2200 MHz Input level: −30 to +35 dBm Carrier frequency accuracy: reference oscillator accuracy + 10 Hz Residual waveform quality: >0.999 Residual EVM: <2% rms
Code domain power	Input level: −10 to +35 dBm Measurement accuracy: ±0.2 dB (code power ≥−15 dBc), ±0.4 dB (code power ≥−23 dBc)

RF signal generator	Output frequency: 300 to 2200 MHz (1 Hz step)
	Channel level: Pilot Ch, MAC channel, Control channel, Traffic channel, all 0 dB (reference Ior)
	PN offset: Can be setup 0 to 511
	Wave quality: >0.99 (pilot only, AWGN Off)
	AWGN:
	    AWGN Level: −20 to +12 dB (relative level with a CDMA signal) or Off
	    Maximum output level of CDMA signal at AWGN on:
	    −28 dBm (at MAIN output)
	    −18 dBm (at AUX output)

Error rate measurement	PER (Packet Error Rate) measurement: PER measurement with FTAP Display items: PER, confidence level, sample packet count, error packet count
Call processing	Band Class: BC0, support to 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 Call control: Close Session, Open Session Origination,Termination, Network disconnect, Terminal disconnect Rev. Closed Loop Power Control Mode: Closed Loop, Alternate, All 0 (All up), All 1 (All down) Test Application Protocol: support to RTAP, FTAP, FTAP + RTAP

• AMPS MT8815A-11 Audio board, MX882002A CDMA2000 Measurement Software

Frequency/Amplitude measurement	Frequency range: 800 to 960 MHz Measurement level range: –65 to +35 dBm (MAIN connector) Accuracy: (after calibration, at Input Level setting value) 　±0.5 dB (–25 dB to +35 dBm), ±0.7 dB (–55 dB to –25 dBm), ±0.9 dB (–65 dB to –55 dBm) 　∗MAIN connector, after calibrated at internal power meter Linearity: (Filter Power measurement, referenced to Input Level setting value) 　±0.2 dB (0 to –40 dB, ≥–55 dBm), ±0.4 dB (0 to –40 dB, ≥–65 dBm)
RF Frequency	Measurement level range: –30 to +35 dBm Carrier frequency accuracy: Reference oscillator accuracy + 10 Hz
FM measurement	Measurement level range: –30 to +35 dBm Measurement deviation: 0 Hz to 20 kHz Demodulation frequency range: 30 Hz to 20 kHz
Distortion measurement	Accuracy: ±2% of indicated value + Residual FM (demodulation frequency 1 kHz) Frequency response: ±0.5 dB (demodulation frequency 30 Hz to 20 kHz, referenced to 1 kHz, deviation 5 kHz) Residual FM: <10 Hz rms (demodulation frequency 300 Hz to 3 kHz)
Demodulation distortion	Demodulation distortion: 　<0.3% (demodulation frequency: 1 kHz, demodulation bandwidth 0.3 to 3 kHz, deviation 5 kHz)
Analog RF signal generator (FM)	Output frequency range: 800 to 960 MHz, 1 Hz step Deviation: 0 to 20 kHz, resolution 5 Hz Modulation signal: 　Internal modulation only, sine wave, setting frequency range 20 Hz to 10 kHz, (resolution 5 Hz) Deviation accuracy: ± (3.5 + 10 Hz) 　　　　　　　　(at modulation frequency 1 kHz, demodulation bandwidth 300 Hz to 3 kHz) Frequency response: (deviation 4 Hz, modulation frequency: referenced to 1 kHz) 　　　　　　　　±0.5 dB (modulation frequency: 0.3 to 3 kHz) 　　　　　　　　±1.0 dB (modulation frequency: 20 Hz to 10 kHz) Modulation deviation: 　≤–50 dB (modulation frequency: 1 kHz, deviation: ≥4 kHz, demodulation bandwidth: at 0.3 to 3 kHz)
Analog RF signal generator (SAT)	Modulation frequency: 5970 Hz, 6000 Hz, 6030 Hz, Off Deviation: 2 kHz fixed
AF output	Frequency range: 30 Hz to 10 kHz, 1 Hz resolution Setting range: 0 to 5 Vpeak (AF Output connector) Setting resolution: 1 mV (≤5 V peak), 100 µV (≤500 mV peak), 10 µV (≤50 mV rms) Accuracy: ±0.2 dB (≥10 mVpeak, ≥50 Hz), ±0.3 dB (≥10 mVpeak, <50 Hz) Waveform distortion: ≤30 kHz band ≤–60 dB (≥500 mV peak, ≤5 kHz), ≤–54 dB (≥70 mV peak) Output impedance: ≤1 Ω Max. output current: 100 mA
AF input	Frequency range: 50 Hz to 10 kHz Input voltage range: 1 mVpeak to 5 Vpeak (AF Input connector) Max. allowable input voltage: 30 Vrms Input impedance: 100 kΩ
Frequency measurement	Accuracy: Reference oscillator accuracy + 0.5 Hz
Level measurement	Accuracy: ±0.2 dB (≥10 mVpeak, ≥50 Hz), ±0.4 dB (≥1 mVpeak, ≥1 kHz)
SINAD measurement	Frequency: 1 kHz in ≤30 kHz band ≥60 dB (≥1000 mVpeak), ≥54 dB (≥50 mVpeak), ≥46 dB (≥10 mVpeak)
Distortion rate measurement	Frequency: 1 kHz in ≤30 kHz band ≤–60 dB (≥1000 mVpeak), ≤–54 dB (≥50 mVpeak), ≤–46 dB (≥10 mVpeak)

• MT8815A-02 TDMA Measurement Hardware, MX882005A PHS Measurement Software

Frequency/modulation measurement	Frequency: 300 to 2200 MHz Input level (Average power within burst, Main connector): 　−30 to +40 dBm (Measurement object: PS-TCH, PS-SYNC, CS-TCH, CS-SYNC) 　−30 to +35 dBm (Measurement object: Continuous wave) Carrier frequency accuracy: ± (reference oscillator accuracy + 10 Hz) Modulation accuracy: ± (2% of indicated value + 0.7%) Origin offset accuracy: ±0.5 dB to signal level of −30 dBc Transmission rate: ±1 ppm (Measurement range 384 kbps ±100 ppm)
Amplitude measurement	Frequency: 300 to 2200 MHz Input level (Average power within burst, Main connector): 　−30 to +40 dBm (Measurement object: PS-TCH, PS-SYNC, CS-TCH, CS-SYNC) 　−30 to +35 dBm (Measurement object: Continuous wave) Measurement accuracy: After calibration 　±0.5 dB (−20 to +40 dBm), ±0.7 dB (−30 to −20 dBm) Linearity: ±0.2 dB (0 to −40 dB, ≥−30 dBm) Carrier-off power measurement range: 　≥55 dB (Input level: ≥−10 dBm), ≥70 dB (Wide dynamic range power measurement)
Occupied bandwidth	Frequency: 300 to 2200 MHz Input level (Average power within burst, Main Connector): 　−10 to +40 dBm (Measurement object: PS-TCH, PS-SYNC, CS-TCH, CS-SYNC) 　−10 to +35 dBm (Measurement object: Continuous wave)
Adjacent channel power	Frequency: 300 to 2200 MHz Input level (Average power within burst, Main connector): 　−10 to +40 dBm (Measurement object: PS-TCH, PS-SYNC, CS-TCH, CS- SYNC) 　−10 to +35 dBm (Measurement object: Continuous wave) Measurement range: ≤−60 dB (600 kHz offset), ≤−65 dB (900 kHz offset)
RF signal generator	Output frequency: 300 to 2200 MHz, 1 Hz step Modulation accuracy: ≤3% rms Modulation data: PN9, PN15 and arbitrary 4-bit data repetitive patterns
Error rate measurement	Function: Bit error rate measurement Measurement items: Serial data inputted from the Call Proc. I/O terminal on the rear panel

• MT8815A-02 TDMA Measurement Hardware, MX882004A PDC Measurement Software

Frequency/Modulation measurement	Frequency: 300 to 2200 MHz Input level range: 　−30 to +40 dBm (measurement object: TCH), −30 to +35 dBm (measurement object: UPCH continuous wave) Measurement items: TCH, UPCH, continuous wave Carrier frequency accuracy: ± (reference oscillator accuracy + 1 Hz) Modulation accuracy: ± (2% of indicated value + 0.7%) rms Origin offset accuracy: ±0.5 dB (relative to signal of −30 dBc) Transmission rate: ±1 ppm (measurement range: 42 kbps ±100 ppm)
Amplitude measurement	Frequency range: 300 to 2200 MHz Input level range: 　−30 to +40 dBm (measurement object: TCH), −30 to +35 dBm (measurement object: UPCH continuous wave) Measurement items: TCH, UPCH, continuous wave Measurement accuracy: ±0.5 dB (−20 to +40 dBm), ±0.7 dB (−30 to −20 dBm) ∗After calibration Linearity: ±0.2 dB (0 to −40 dB, ≥−30 dBm) Power measurement range at carrier off: 　≥65 dB (input level: ≥−10 dBm), ≥ (Amplitude measurement value [dBm] + 80) dB (wide dynamic range power measurement)
Occupied bandwidth measurement	Frequency range: 300 to 2200 MHz Input level range: 　−10 to +40 dBm (measurement object: TCH), −10 to +35 dBm (measurement object: UPCH continuous wave) Measurement items: TCH, UPCH, continuous wave
Adjacent channel power measurement	Frequency range: 300 to 2200 MHz Input level range: 　−10 to +40 dBm (measurement object: TCH), −10 to +35 dBm (measurement object: UPCH continuous wave) Measurement items: TCH, UPCH, continuous wave Measurement range: ≤−60 dB (50 kHz offset), ≤−65 dB (100 kHz offset)
RF signal generator	Output frequency: 300 to 2200 MHz, 1 Hz step Modulation accuracy: ≤3%rms Modulation data 　Continuous wave output: PN9, PN15 and repetition of arbitrary 4-bit data 　Burst wave output: PN9, PN15
Error rate measurement	Function: Bit error rate measurement Measurement items: Serial data inputted from the Call Proc. I/O terminal on the back panel
Call processing	Call control: 　Location registration, call origination, call termination, communication, network-side termination, phone-side termination Phone control: Output level, time slot, time alignment
Channel coding	Full rate, Half rate
Frequency band	800 MHz-1, 800 MHz-2, 800 MHz-3, 1.5 GHz

Ordering Information

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

Model/Order No.	Name
MT8815A	**Main frame**
	Radio Communication Analyzer
	Standard accessories
HB28B064C8H	Power cord, 2.6 m : 1 pc
	CF card (64 MB) : 1 pc
CA68ADP	PC card adapter : 1 pc
W2458AE	MT8815A/MT8820A operation manual (CD-ROM) : 1 copy
	Options
MT8815A-01	W-CDMA Measurement Hardware
MT8815A-02	TDMA Measurement Hardware
MT8815A-03	CDMA2000 Measurement Hardware
MT8815A-04	1xEV-DO Measurement Hardware
MT8815A-11	Audio Board
MT8815A-21	W-CDMA Measurement Hardware retrofit
MT8815A-22	TDMA Measurement Hardware retrofit
MT8815A-23	CDMA2000 Measurement Hardware retrofit
MT8815A-24	1xEV-DO Measurement Hardware retrofit
MT8815A-31	Audio Board retrofit
	Softwares
MX882000B	W-CDMA Measurement Software
	(requires MT8815A-01 and MX88205xA)
MX882000B-01	W-CDMA Voice Codec
	(requires MT8815A-11 and MX882000B)
MX882000B-11	HSDPA Measurement Software
	(requires MT8815A-01, MX882000B and MX882050A)
MX882050A	W-CDMA Call Processing Software
	(requires MX882000B)
MX882050A-02	W-CDMA External Packet Data(requires MX882050A)
MX882050A-03	W-CDMA video phone test (requires MX882050A)
MX882050A-11	HSDPA External Packet Data (requires MX882000B-11)
MX882070A	W-CDMA Ciphering Software(requires MX882050A)
MX882051A	W-CDMA Call Processing Software(requires MX882000B)
MX882051A-02	W-CDMA External Packet Data(requires MX882051A)
MX882051A-03	W-CDMA video phone test (requires MX882051A)
MX882071A	W-CDMA Ciphering Software(requires MX882051A)
MX882001A	GSM Measurement Software (requires MT8815A-02)
MX882001A-01	GSM Voice Codec (requires MT8815A-11, MX882001A)
MX882001A-02	GSM External Packet Data (requires MX882001A)
MX882001A-11	EGPRS Measurement Software (requires MX882001A)
MX882002A	CDMA2000 Measurement Software (requires MT8815A-03)
MX882002A-02	CDMA2000 External Packet Data (requires MX882002A)
MX882022A	CDMA2000 Wireless Application Test Software
MX882003A	1xEV-DO Measurement Software
	(requires MT8815A-03, MT8815A-04 and MX882003A)
MX882003A-02	1xEV-DO External Packet Data (requires MX882003A)
MX882004A	PDC Measurement Software
MX882005A	PHS Measurement Software
MX881580A	Mobile Phone Test Software

Model/Order No.	Name
W2477AE	MX882000B operation manual*1 (attached to MX882000B)
W2480AE	MX88205xA operation manual*1 (attached to MX88205xA)
W2478AE	MX88207xA operation manual*1 (attached to MX88207xA)
W2463AE	MX882001A operation manual*1 (attached to MX882001A)
W2472AE	MX882002A operation manual*1 (attached to MX882002A)
W2473AE	MX882003A operation manual*1 (attached to MX882003A)
W2464AE	MX882004A operation manual*1 (attached to MX882004A)
W2465AE	MX882005A operation manual*1 (attached to MX882005A)
	Warranty
MT8815A-90	Extended three year warranty service
MT8815A-91	Extended five year warranty service
	Application parts
P0019	Test USIM001
P0027	W-CDMA/GSM Test USIM
A0012	Handset
J1249	CDMA2000 cable
J0576B	Coaxial cord (N-P · 5D-2W · N-P), 1 m
J0576D	Coaxial cord (N-P · 5D-2W · N-P), 2 m
J0127A	Coaxial cord (BNC-P · RG58A/U · BNC-P), 1 m
J0127C	Coaxial cord (BNC-P · RG58A/U · BNC-P), 0.5 m
J0007	GPIB cable, 1 m
J0008	GPIB cable, 2 m
MN8110B	I/O Adapter (for call processing I/O)
B0332	Joint plate (4 pcs/set)
B0333G	Rack mount kit
B0499	Carrying case (hard type, with protective cover and casters)
B0499B	Carrying case (hard type, with protective cover, without casters)
W2457AE	MT8820A/MT8815A operation manual (booklet)
W2476AE	MX882000B operation manual (booklet)
W2466AE	MX882001A operation manual (booklet)
W2470AE	MX882002A operation manual panel operation (booklet)
W2471AE	MX882002A operation manual remote control (booklet)
W2474AE	MX882003A operation manual panel operation (booklet)
W2475AE	MX882003A operation manual remote control (booklet)
W2468AE	MX882005A operation manual (booklet)

∗1: Supplied by CD-ROM

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