Product Brochure

For MT8820A Radio Communication Analyzer

MX882001A
GSM Measurement Software

MX882001A-11
EGPRS Measurement Software
## MX882001A

### GSM Measurement Software

**Utilizing an advanced high-speed measuring method and offering batch measurements to support GSM/GPRS/EGPRS terminal production**

The MX882001A GSM Measurement Software supports transmission and reception measurements of digital mobile terminals that conform to GSM/GPRS/EGPRS (MX882001A-11 is required for EGPRS measurement), the most widely used digital mobile standard in the world. With the MX882001A GSM and MX882000B W-CDMA Measurement Softwares installed in the MT8820A mainframe, the user can fully evaluate all the major transmission and reception characteristics of digital mobile terminals for all major GSM standards throughout the world. Anritsu’s advanced DSP (Digital Signal Processing) and parallel-measurement technologies greatly reduce the time required for the production and testing of mobile terminals. Combinations of parameters for batch measurements are freely selectable, and the number of repetitions for each measurement can be set independently. In GSM measurement, selected items for measurement can be batch-processed through one-touch operation, enabling easy, high-speed Pass/Fail evaluation on major test items including transmission frequency, modulation accuracy, transmission power, adjacent channel leakage power and BER.

In GPRS measurement, transmission frequency, modulation accuracy and transmission power are measured when Test Mode A is selected, and Test Mode B or BLER measurement that matches each Multislot class and coding scheme is performed when BLER Measurement is selected, both at high speed.

In EGPRS measurement, transmission frequency, modulation accuracy and transmission power are measured when Test Mode A is selected, and BLER measurement that matches each Multislot class and Multi coding scheme is performed when BLER Measurement is selected, and transmission and reception test is performed by loopback at physical layer when SRB loopback is selected.

The standard GPIB interface enables the MT8820A to be easily incorporated into existing automated production lines or to configure automatic test systems in maintenance sites.

### GSM measurement item

<table>
<thead>
<tr>
<th>Transmission measurement</th>
<th>Power versus time (template mask evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency error</td>
<td></td>
</tr>
<tr>
<td>Phase error (rms and peak)</td>
<td></td>
</tr>
<tr>
<td>Output spectrum</td>
<td></td>
</tr>
<tr>
<td>Reception measurement</td>
<td>FER, BER and CRC error rates</td>
</tr>
<tr>
<td>Call processing</td>
<td>Location registration, terminal call origination, network call origination, communication, handover, disconnection from mobile terminal, disconnection from network</td>
</tr>
<tr>
<td>Mobile terminal report monitor (reception level, reception quality, etc)</td>
<td></td>
</tr>
</tbody>
</table>

### GPRS measurement item

<table>
<thead>
<tr>
<th>Transmission measurement</th>
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</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Reception measurement</td>
<td>BLER</td>
</tr>
<tr>
<td>Call processing</td>
<td>Test Mode A, BLER SRB loopback, communication, disconnection</td>
</tr>
<tr>
<td>Mobile terminal report monitor (Multi Slot Class, etc)</td>
<td></td>
</tr>
</tbody>
</table>

### EGPRS measurement item

<table>
<thead>
<tr>
<th>Transmission measurement</th>
<th>Transmission power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency error</td>
<td></td>
</tr>
<tr>
<td>Modulation accuracy (8PSK)</td>
<td></td>
</tr>
<tr>
<td>Output spectrum</td>
<td></td>
</tr>
<tr>
<td>Reception measurement</td>
<td>BLER, BER</td>
</tr>
<tr>
<td>Call processing</td>
<td>Test Mode A, BLER SRB loopback, communication, disconnection</td>
</tr>
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<td>Mobile terminal report monitor (Multi Slot Class, etc)</td>
<td></td>
</tr>
</tbody>
</table>

*1 Can be measured up to two uplink slot.
Transmission Measurement

Transmission Power

When the number of measurement repetitions is set to two or more, the GSM terminal transmission power; maximum, average and minimum values of measured results are displayed, enabling the distribution of the GSM terminal characteristics to be evaluated. This repeat measurement function is also available for other measurements.

Power versus Time

Power at six measuring points for each burst rise/fall edge can be measured, with measuring time set in increments of 0.1 µs resolution.
### Burst Waveform Display

Graphical display of the burst waveform is also available. Magnified display of the entire time slot and the burst-on area as well as the rising/falling edges enables users to confirm at a glance whether or not the burst waveform meets the GSM standard template.
**Modulation Analysis**

Simultaneous measurement of frequency, frequency error (in kHz and ppm), phase error and peak phase error are performable. Amplitude error at the burst-on area can also be measured.

**Output RF Spectrum**

Power spectrum is measured at a total of 25 frequency points within the range of ±2 MHz from the carrier frequency. “Modulation” is the spectrum resulting from the modulation signal around the center of burst signal, while “Switching” is the spectrum resulting from the rise and fall of the burst signal. In addition to the advanced DSP technology, high-speed measurement is achieved as the output spectrum can be processed in parallel with other measurements.
Reception Measurement

Error Rate Test

By controlling GSM terminals to the loopback conditions, the uplink RF signal, which is looped back from the GSM terminal, is demodulated to measure frame error rate, bit error rate and CRC error rate. These measurements can be processed in parallel with the transmission measurements.

Connection Test

The call processing function enables to perform various connection tests including location registration, terminal call origination, network call origination, disconnection from mobile terminal and disconnection from network. During a call, the user's speech can be looped back from the GSM terminal to provide a simple voice communication test.

Mobile Terminal Report Monitor

GSM terminal status can be displayed as the periodical report that the GSM terminal sends back to the tester. "RX Level" monitoring shows the downlink RF signal level received by the GSM terminal.
The MX882001A GSM Measurement Software is equipped with GPRS measurement function. Measurement functions can be switched between GSM and GPRS through one-touch operation without reinstalling measurement software in the MT8820A. Thus, both GSM and GPRS terminals can be tested at high speed.

**GPRS Measurement Function**

All coding schemes, CS-1 to CS-4, are supported.

**Multislot Class and Channel Coding Scheme**

The combinations of uplink/downlink slots can be selected in GPRS terminals of class 1 to 10 (except class 7).
Connection Type

Test Mode A/B or BLER is selectable for connection type. In Test Mode A, selected for transmission measurement, the GPRS terminal generates the uplink slot inserting pseudo random pattern in PDTCH. In BLER, selected for BLER measurement, the GPRS terminal counts the number of blocks in received downlink data and reports the number of received blocks with uplink slot. The MT8820A performs the BLER measurement on the basis of this report.

Transmission Measurement

Similarly to GSM measurement, the transmission measurement for the following items is carried out for 1 slot specified when Test Mode A is selected.

- Power versus Time (template mask evaluation)*1
- Frequency error
- Phase error (rms and peak)
- Output RF spectrum*1

*1 Can be measured up to two uplink slot.

Reception Measurement

Block Error Rate

When BLER is selected, the number of blocks received from the GPRS terminal is counted for block error rate measurement.

Call Processing Function

The following functions are tested when call processing is set to ON.

- Location registration
- Connection
- Communication
- Disconnection

After connection, GPRS terminal generates uplink slot, enabling Transmission measurement and BLER measurement.
High-speed, Easy-to-use GPIB Control

**Controllable without Displaying the Measurement Window**
Items not currently displayed on the measurement window can be read out or changed freely without requiring display. This dramatically saves time that would otherwise be lost by displaying the relevant measurement window.

**Batch Readout Command for Measured Results**
All results obtained by batch measurement can be read out with the single command: “ALLMEAS?”*. If required, only desired measurement results can be read out using commands such as “ALL MEAS? MOD” (modulation analysis). A decrease in the number of GPIB commands reduces the GPIB traffic on both the MT8820A and control PC, contributing to the increase in measurement throughput. Besides, the step size of the control program is reduced, which provides a real benefit to the user for the creation of a control program that is easy to read and maintain.
Specifications

- MT8820A-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 Input/Output)  
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 Input/Output)  
Measurement items: Normal burst, RACH  
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 Input/Output)  
Measurement points: ±55 dB (≤250 kHz offset), –66 dB (≥400 kHz offset)  
Measurement range in modulation area: ≤55 dB (≤250 kHz offset), ≤66 dB (≥400 kHz offset)

| RF signal generator | Output frequency: 300 to 2200 MHz (1 Hz step)  
Phase error: ≤1° rms, ≤4° peak  
Output patterns: CCH, TCH, CCH + TCH  
TCH data: PN9, PN15, ALL 0, ALL 1, Fixed Pattern (P A T0-P A T9)

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

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

| Channel coding | FS, EFS, HS0, HS1, AFS, AH50, AHS1, CS-1, CS-2, CS-3, CS-4

| Frequency bands | GSM450, GSM480, GSM850, P-GSM, E-GSM, R-GSM, DCS1800, PCS1900
**MX882001A-01 GSM Voice Codec**

**Real-time voice encoding and decoding, audio measurement function**

The MX882001A-01 GSM Voice Codec is optional software that brings real-time voice encoding and decoding to the GSM Measurement Software. The installation of this option and MT8820A Option11 Audio Board enables end-to-end communication testing with a handset. Also, transmission/reception audio measurement is performable in call processing state.

- **End-to-end Communications Testing**
  
  Connection of a handset to the MT8820A RJ11 connector enables end-to-end communications testing between the MT8820A and a GSM terminal.

- **Transmission Audio Measurement**
  
  The tone signal outputted from AF Output connector is inputted to the GSM terminal microphone. Then the MT8820A demodulates uplink RF signal and measures the level, frequency and distortion rate of demodulated tone signal. This function achieves the evaluation of audio characteristic on transmitter side of GSM terminals.

- **Reception Audio Measurement**
  
  The tone signal demodulated by the GSM terminal is inputted to AF Input connector of the MT8820A. The audio characteristic on receiver side of GSM terminal can be evaluated by measuring the level, frequency and distortion rate of the tone signal inputted to AF Input connector.
### Specifications

**MT8820A-11 Audio Board, MX882001A-01 GSM Voice Codec**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voice codec</strong></td>
<td>GSM_EFR, GSM_AMR</td>
</tr>
</tbody>
</table>
| **Codec level adjustment**                 | Encoder input gain: –3 to +3 dB, 0.01 dB step  
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 step  
Setting range: 0 to 5 Vpeak (AF Output)  
Setting resolution: 1 mV (≥5 Vpeak), 100 µV (≥500 mVpeak), 10 µV (≥5 mVpeak)  
Accuracy: ±0.2 dB (≥10 mVpeak, ≥50 Hz), ±0.3 dB (≥10 mVpeak, <50 Hz)  
Waveform distortion: In ≤30 kHz band,  
s–60 dB (≥300 mVpeak), ≤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)  
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,  
s–60 dB (≥1000 mVpeak), s–54 dB (≥50 mVpeak), s–46 dB (≥10 mVpeak) |
**MX882001A-02 GSM External Packet Data**

Verification test function for GPRS packet communication data transfer

The MX882001A-02 GSM External Packet Data option enables data transfer to/from external equipment by using the Ethernet port. Installing the MX882001A-02 enables End-to-End data transfer between an application server connected to the MT8820A and GSM/GPRS terminal or equipment connected to LAN network and GSM/GPRS terminal under near-actual operating environment.

**External Packet Test**

![Sample MT8820A connection diagram](image)
**MX882001A-11**

**EGPRS Measurement Software**

*Utilizing an advanced high-speed measuring method and offering batch measurements to support EGPRS terminal production*

The MX882001A-11 EGPRS Measurement Software supports transmission and reception measurements of mobile terminals conforming to EGPRS which is the advanced system of GPRS. MX882001A-11 EGPRS Measurement Software supports coding scheme of MCS1-MCS4 which uses the modulation type of GMSK and coding scheme of MCS5-MCS9 which uses the modulation type of 8PSK. After installing MX882001A-11 EGPRS Measurement Software, “EGPRS” can be selected from the “Operating Mode” setting on the GSM Measurement Software.
EGPRS

Transmission Measurement

Transmission Power

When the number of measurement repetitions is set to two or more, the EGPRS terminal transmission power: maximum, average and minimum values of measured results are displayed, enabling the distribution of the terminal characteristics to be evaluated. This repeat measurement function is also available for other measurements.

Power versus Time

Power at five measuring points for each burst rise/fall edge can be measured, with measuring time set in increments of 0.1 µs resolution. Graphical display of the burst waveform is also available. Magnified display of the entire time slot and the burst-on area as well as the rising/falling edges enables users to confirm at a glance whether or not the burst waveform meets the GSM standard template.

Modulation Analysis

Simultaneous measurement of frequency, frequency error (in kHz and ppm), phase error and peak phase error are performable for GMSK modulated signal. Amplitude error at the burst-on area can also be measured. Measurement of EVM, PEAK EVM, 95th percentile EVM, origin off-set, are performable for 8PSK modulated signal.

Output RF Spectrum

Power spectrum is measured at a total of 25 frequency points within the range of ±2 MHz from the carrier frequency. "Modulation" is the spectrum resulting from the modulation signal around the center of burst signal, while “Switching” is the spectrum resulting from the rise and fall of the burst signal. In addition to the advanced DSP technology, high-speed measurement is achieved as the output spectrum can be processed in parallel with other measurements.
Reception Measurement

Error Rate Test

By controlling EGPRS terminals to the loopback conditions (Equivalent to EGPRS switched Radio Block Loopback Mode), the uplink RF signal, which is looped back from the EGPRS terminal, is demodulated to measure bit error rate. These measurements can be processed in parallel with the transmission measurements.

Block Error Rate Test

Block error rate can be measured by counting the number of ACK blocks when BLER is selected.

Call Processing

Call Processing Function

The following functions are tested when call processing is set to ON:

• Location registration
• Connection
• Communication
• Disconnection

After connection, EGPRS terminal generates uplink slot, enabling Transmission measurement and BLER measurement.

Mobile Terminal Report Monitor

EGPRS terminal status can be displayed as the periodical report that the EGPRS terminal sends back to the tester. The informations of Multislot Class, BEP (Bit Error Probability), etc can be checked.
Specifications

- MT8820A-02 TDMA Measurement Hardware, MX882001A-11 EGPRS Measurement Software

<table>
<thead>
<tr>
<th>Table Title</th>
<th>Details</th>
</tr>
</thead>
</table>
| Frequency/modulation measurement | Frequency: 300 to 2200 MHz  
Input level: –30 to +40 dBm (average power of burst signal, MAIN Input/Output)  
Measurement items: Normal burst (GMSK, 8PSK), RACH  
Carrier frequency accuracy: reference oscillator accuracy + 10 Hz at normal burst measurement  
Carrier frequency accuracy: 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 versus bit number, Amplitude error versus bit number, EVM versus bit number |
| Amplitude measurement | Frequency: 300 to 2200 MHz  
Input level: –30 to +40 dBm (average power of burst signal, MAIN Input/Output)  
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 Input/Output)  
Measurement item: Normal burst (GMSK, 8PSK)  
Measurement points: ±100 kHz, ±200 kHz, ±250 kHz, ±400 kHz, ±600 kHz, ±1000 kHz, ±1200 kHz, ±1400 kHz, ±1600 kHz, ±2000 kHz  
Measurement range in modulation area: ≤–55 dB (≤250 kHz offset), ≤–66 dB (≥400 kHz offset)  
Measurement range in transient area: ≤–57 dB (≥400 kHz offset) |
| RF signal generator | Output frequency: 300 to 2200 MHz (1 Hz step)  
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, CRC  
Measurement items: Loopback data inserted in uplink TCH, The number of blocks received from the mobile terminal and inserted in uplink TCH |
| Call Processing | Test Mode A, BLER, SRB Loopback |
| Coding scheme | MCS1-MCS4 (GMSK), MCS5-MCS9 (8PSK) |
| Puncturing scheme | P1, P2, P3 |
Please specify the model/order number, name, and quantity when ordering.

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT8820A</td>
<td>Main frame Radio Communication Analyzer</td>
</tr>
<tr>
<td></td>
<td>Power cord, 2.6 m : 1 pc</td>
</tr>
<tr>
<td>H8B8064C8H</td>
<td>CF card (64 MB) : 1 pc</td>
</tr>
<tr>
<td>CA6640P</td>
<td>PC card adapter : 1 pc</td>
</tr>
<tr>
<td>W2458AE</td>
<td>MT8820A/MT8815A operation manual (CD-ROM) : 1 copy</td>
</tr>
<tr>
<td>MT8820A-01</td>
<td>W-CDMA Measurement Hardware</td>
</tr>
<tr>
<td>MT8820A-02</td>
<td>TDMA Measurement Hardware</td>
</tr>
<tr>
<td>MT8820A-03</td>
<td>CDMA2000 Measurement Hardware</td>
</tr>
<tr>
<td>MT8820A-04</td>
<td>1xEVDO Measurement Hardware</td>
</tr>
<tr>
<td>MT8820A-11</td>
<td>Audio Board</td>
</tr>
<tr>
<td>MT8820A-12</td>
<td>Parallel Phone Measurement Hardware</td>
</tr>
<tr>
<td>MT8820A-21</td>
<td>W-CDMA Measurement Hardware retrofit</td>
</tr>
<tr>
<td>MT8820A-22</td>
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</tr>
<tr>
<td>MT8820A-23</td>
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</tr>
<tr>
<td>MT8820A-24</td>
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</tr>
<tr>
<td>MT8820A-31</td>
<td>Audio Board retrofit</td>
</tr>
<tr>
<td>MT8820A-32</td>
<td>Parallel Phone Measurement Hardware retrofit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>MX882009B</td>
<td>W-CDMA Measurement Software (Requires MT8820A-01 and MX88205A)</td>
</tr>
<tr>
<td>MX882010B-01</td>
<td>W-CDMA Voice Codec (Requires MT8820A-11 and MX882009B)</td>
</tr>
<tr>
<td>MX882009B-11</td>
<td>HSDPA Measurement Software (Requires MT8820A-01, MX882009B and MX88205A)</td>
</tr>
<tr>
<td>MX882009A-01</td>
<td>GSM Measurement Software (Requires MT8820A-02)</td>
</tr>
<tr>
<td>MX882009A-01A</td>
<td>GSM Voice Codec (Requires MT8820A-11 and MX882009A)</td>
</tr>
<tr>
<td>MX882009A-01A-01</td>
<td>GSM External Packet Data (Requires MX882009A)</td>
</tr>
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<td>CDMA2000 Measurement Software (Requires MT8820A-03)</td>
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<td>CDMA2000 External Packet Data (Requires MX882009A)</td>
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<td>1xEVDO External Packet Data (Requires MX882009A)</td>
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<td>PDC Measurement Software (Requires MT8820A-02)</td>
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<td>WCDMA Call Processing Software (Requires MX882009B)</td>
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<td>WCDMA Ciphering Software (Requires MX882009A)</td>
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<table>
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<tbody>
<tr>
<td>W2477AE</td>
<td>MT882009B operation manual (Attached to MX882009B)</td>
</tr>
<tr>
<td>W2483AE</td>
<td>MT882001A operation manual (Attached to MX882001A)</td>
</tr>
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<td>W2472AE</td>
<td>MT882002A operation manual (Attached to MX882002A)</td>
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<td>W2473AE</td>
<td>MT882003A operation manual (Attached to MX882003A)</td>
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</tr>
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<td>MT882005A operation manual (Attached to MX882005A)</td>
</tr>
<tr>
<td>W2427AE</td>
<td>MT882007A operation manual (Attached to MX882007A)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Warranty</th>
<th>Extended three year warranty service</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

1: The measurement hardware applied to parallel phone measurement are MT8820A-01, MT8820A-02, MT8820A-03, MT8820A-04. And these hardware can be implemented all together.
2: For terminal connectivity, contact your Anritsu sales representative.
3: MX882005A preinstalls the integrity protection function.
4: Supplied by CD-ROM
5: This Test USIM can be worked on only W-CDMA mode.
Could not find required MT8820A-90, MT8820A-91

1: The test USIM can be worked on only W-CDMA mode.

• Power cord, 2.6 m : 1 pc
• CF® card is a registered trademark of SanDisk Corporation in the United States and is licensed to CFA (Compact Flash Association).
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