MX882002C
CDMA2000 Measurement Software

MX882003C
1xEV-DO Measurement Software

For MT8820B Radio Communication Analyzer
MX882002C
CDMA2000 Measurement Software

Advanced high-speed measurement method and batch measurement supporting the manufacture of CDMA2000® terminals

The MX882002C CDMA2000 Measurement Software is for measuring Rx and Tx performance of mobile terminals conforming to the IS-2000 standard, today’s most widespread 3G technology. It uses advanced DSP and parallel measurement to cut manufacturing inspection times for mobile terminals. Multiple measurements can be selected for simultaneous processing and individual sample sizes can be set for each measurement. User-selected measurements can be grouped and measured with just one function, offering fast Pass/Fail evaluation and reliable repeatability optimized for high-speed production. The built-in GPIB interface supports easy configuration of automated test systems for CDMA2000 1X terminal manufacturing, R&D, and application development.

CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).

- **CDMA2000 1X Measurement Items**

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Transmitter Measurements

Transmitter Power

The CDMA2000 1X terminal Tx power can be measured with the power control bits set to maximum or minimum, alternating bits, or with closed loop power control. In addition, maximum, minimum, and average values of measured power results are displayed when the number of measurement samples is 2 or more. This is very useful for evaluating statistical variations in mobile terminal characteristics. This feature also supports other measurements.

Access Probe Power

The first access probe from the CDMA2000 1X terminal is captured by the level trigger to measure average power. This value is held after terminating the probe measurement once even in the Continuous Measurement mode, which is convenient for the Open Loop Output Power measurement described in C.S0011 of the 3GPP2 standard.

Modulation Analysis

Frequency, frequency error (in kHz and ppm), $\rho$ (waveform quality), $\tau$ (time error), EVM, peak vector error, phase error, magnitude error and origin offset are measured simultaneously.

Code Domain Power

The CDMA2000 1X terminal code domain power and error are measured when Reverse RC is set to 3 or more. The R-PICH, R-FCH, and R-SCH powers are all displayed along with the maximum power and channel numbers for inactive channels. In addition, Pass/Fail evaluation is performed to determine whether or not the inactive channel power satisfies the specifications.
**Occupied Bandwidth**

Occupied bandwidth measurement can be user-defined in the range of 80% to 99.9% for the ratio of in-band power to total power.

**Spurious Emission**

Pass/Fail evaluation of spurious emissions is easy. Spurious levels within ±4 MHz of the center frequency are compared with the template. The default for each band is a standard 3GPP2 template, saving setup time. In addition, the templates can be customized for any requirement and either 1 or 1.23 MHz bandwidth measurements can be performed as necessary.

**Gated Power Measurement**

Gated Power is measured at RC1 or 2. Gated On Power, Gated Off Power and the On/Off Ratio are measured simultaneously on screen.

A graph of the spurious emission waveform offers an at-a-glance check of whether the waveform satisfies the 3GPP2 standard template.
Access Probe Power Measurement

The Access Probe Power screen measures the Access Probe transmitted continuously from a CDMA2000 1X terminal. (During measurement, Ack is not returned to the Access Probe from a CDMA2000 1X terminal.) In addition to the level of each probe, the difference from the last probe level, probe detection time, probe transmission time and probe interval are measured simultaneously.

Open Loop Time Response Screen

The Open Loop Time Response screen is used to measure the time response of the CDMA2000 1X terminal open loop power control. Changes in the mobile terminal Tx power are measured between 100 ms from the point where the power of the forward link signal power changed.

Receiver Measurements

Frame Error Rate

The Frame Error Rate (FER) and Pass/Fail evaluation can be performed in SO2, SO9, SO55 and SO32 (TDSO) to display the FER, error frame count, Tx frame count, confidence level and Pass/Fail results.
Call Processing

Connection Test

The Call Processing function supports connection tests, such as location registration, origination, termination, disconnection from network, and disconnection from mobile terminal. Service Options 1, 2, 3, 9, 33, 55, and 32768 are supported. A basic voice function can be tested by using loopback during a call.

Handoff Function

The Handoff window is used to set parameters after Handoff [Band Class Channel, Protocol Revision (P_REV), Radio Configuration Service Option], and to perform Handoff according to the preset parameters.

Mobile Terminal Report Monitor

This screen displays the periodically reported CDMA2000 1X terminal status.
### Specifications

**MT8820B-003 CDMA2000 Measurement Hardware, MX882002C CDMA2000 Measurement Software**

| **Amplitude measurement** | Frequency: 300 to 2700 MHz  
Input level: -65 to +35 dBm (Main Input/Output)  
Measurement accuracy: ±0.5 dB (−25 to +35 dBm), ±0.7 dB (−55 to −25 dBm), ±0.9 dB (−65 to −55 dBm)  
(Filtered Power measurement, after Full cal, Input Level Setting)  
Linearity: ±0.2 dB (0 to −40 dB, ≥−55 dBm), ±0.4 dB (0 to −40 dB, ≥−65 dBm)  
(Filtered Power measurement, Input Level Setting for reference) |
| --- | --- |
| **Frequency/Modulation measurement** | Frequency: 300 to 2700 MHz  
Input level: −30 to +35 dBm  
Carrier frequency accuracy: ±(Set frequency × 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.  
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 2700 MHz (1 Hz step)  
Channel level [Relative level to Ior (total level)]  
Pilot channel: −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  
OPC 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  
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: BC 0 to 10  
Call control: Location registration, Origination, Termination, Disconnection from network, Disconnection from mobile terminal  
Paging channel data rate: Full  
Radio configuration: F-RC1 + R-RC1, F-RC2 + R-RC2, F-RC3 + R-RC3, F-RC4 + R-RC4  
Service option: SO 1, 2, 3, 9, 32, 33, 55, 32768.  
PCH Data Rate: Full  
OPC Data Rate: Full  
Fwd. FCH Data Rate: Full, half, quarter, eighth  
Fwd. FCH Walsh Code: 10, 14, 26, 30, 42, 46, 58, 62  
Fwd. DCCH Data Rate: Full (RC3, RC4, RC5)  
Fwd. DCCH Walsh Code: 10, 14, 26, 30, 42, 46, 58, 62  
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: Access Ch.  
Rev. closed loop power control mode: Closed loop, All 1 (all down), Alternate, All 0 (all up)  
Handoff: Universal Handoff, Band Class/Channel Handoff, Protocol Revision Handoff, RC/SO Handoff, Analog Handoff (only when the MT8815B/MT8820B-011 audio board is installed.) }
The MX882002C-002 CDMA2000 External Packet Data is an optional software application that adds CDMA2000 1X packet data communications to the MX882002C Measurement Software option. It supports transfer of packet data between a local or network application server and an Internet-enabled CDMA2000 1X terminal via an Ethernet connection to the MT8820B. The following two packet data transfer modes are supported.

### Data Loopback Mode

In this test mode, Radio Link Protocol (RLP) data is looped back to the RLP stack in the MT8820B and transmitted via forward link.

### IP Data Communications Mode

This mode provides a predictable and controllable test "pipe" between the Internet (or other local application server) and CDMA2000 1X terminal in the native RF environment that is simulated by the base station emulator in the MT8820B hardware. This mode provides an IP network connection to a CDMA2000 1X terminal and supports the CDMA2000 Packet Data Service Option (SO33), RLP, Point to Point Protocol (PPP), Internet Protocol (IP), and direct Ethernet connection.

![Diagram of IP Data Communications Mode](image)

**Example of IP Data Communications Mode**
## Specifications

**MX882002C-002 CDMA2000 External Packet Data**

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<tr>
<td>Signaling ch</td>
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| Supplemental ch | Encoding: Convolutional, Turbo  
Data rates: 9.6, 19.2, 38.4, 76.8, 153.6 Kbps |
| RLP (Radio Link Protocol) | RLP3 |
| Packet data mode | RLP loopback, PPP/IP  
RLP loopback: The mode to loopback the RLP data unit received in reverse link to forward link  
PPP/IP: The mode to transfer IP packet data between a CDMA2000 1X terminal and a server |


American Mobile Phone System (AMPS)

Transmitter Measurements

When the MX882002C CDMA2000 Measurement Software is installed in a main frame with the MT8820B Audio Board (Option 011), measurement of the RF characteristics of AMPS terminals as well as output and measurement of audio signals (requires MT8820B-011) are supported.

Transmitter Power

This function measures the output power of an AMPS terminal.

Frequency Error

The Frequency (kHz) and frequency error (ppm) are measured simultaneously on one screen.

FM Measurement

The FM Deviation, AF Level, Distortion, and Audio Frequency are measured simultaneously on one screen.

Audio Measurement

Frequency, Level, SINAD (Signal to Noise And Distortion) and Distortion are measured simultaneously on one screen.
**Specifications**

MT8820B-011 Audio board, MX882002C CDMA Measurement Software (requires option 003)

| Frequency/Amplitude measurement | Frequency range: 800 to 960 MHz  
Measurement level range: –65 to +35 dBm (Main Input/Output)  
Accuracy: (After calibration, at Input Level setting value)  
±0.5 dB (–25 to +35 dBm), ±0.7 dB (–55 to –25 dBm), ±0.9 dB (–65 to –55 dBm)  
*Main Input/Output, after calibrated by 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: ± (set frequency × 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 |
| Deviation measurement | Accuracy: Indicated value ±2% + residual FM (at 1 kHz demodulation frequency)  
Frequency response: ±0.5 dB (demodulation frequency 30 Hz to 20 kHz, referenced to 1 kHz, 5-kHz deviation)  
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 steps  
Deviation: 0 to 20 kHz, 5 Hz steps  
Modulation signal: Internal modulation only, sine wave, setting frequency range 20 Hz to 10 kHz,  
(5 Hz steps)  
Deviation accuracy: ± (3.5 + 10 Hz)  
(at 1 kHz modulation frequency, demodulation bandwidth 300 Hz to 3 kHz)  
Frequency response: ±0.5 dB (modulation frequency: 0.3 to 3 kHz)  
±1.0 dB (modulation frequency: 20 Hz to 10 kHz)  
(4 Hz deviation, modulation frequency: referenced to 1 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, 6000, 6030 Hz, Off  
Deviation: 2 kHz fixed |
| AF measurement | 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  
± (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  
Measurement range: ≥60 dB (≥1000 mV peak), ≥54 dB (≥50 mV peak), ≥46 dB (≥10 mV peak)  
(At Frequency: 1 kHz)  
Distortion ratio measurement  
Measurement range (At Frequency: 1 kHz):  
≤–60 dB (≥1000 mV peak), ≤–54 dB (≥50 mV peak), ≤–46 dB (≥10 mV peak)  
Input impedance  
100 kΩ |
| AF output | Output Frequency  
Frequency range: 30 Hz to 10 kHz, 1 Hz step  
Accuracy: ± (Set frequency × reference oscillator accuracy + 0.1 Hz)  
Output level  
Set range: 0 to 5 V peak (AF Output connector)  
Set resolution: 1 mV (≤5 V peak), 100 µV (≤500 mV peak), 10 µV (≤50 mV rms)  
Accuracy: ±0.2 dB (≥10 mV peak, ≥50 Hz), ±0.3 dB (≥10 mV peak, <50 Hz)  
Waveform distortion (At Band ≤30 kHz)  
≤–60 dB (≥500 mV peak, ≤5 kHz)  
≤–54 dB (≥70 mV peak)  
Output impedance: ≤1 Ω  
Maximum output current: 100 mA |
MX882003C

1xEV-DO Measurement Software

Advanced high-speed measurement method and batch measurement supporting the manufacture of 1xEV-DO terminals

The MX882003C 1xEV-DO Measurement Software is for measuring the performance of mobile terminals conforming to the 1xEV-DO standard (CDMA2000® 1X Evolution Data Only defined in the 3GPP2 standard). It uses advanced DSP and parallel measurements to cut manufacturing and inspection times for 1xEV-DO terminals. Several measurement items can be selected freely for batch measurement and a one-touch operation allows each selected batch measurement item to be executed repeatedly for the specified number of times. Pass/Fail evaluation of the main measurement items, including transmission frequency, modulation accuracy, output power, Code Domain power, and PER, is quick and easy.

The built-in GPIB interface supports easy configuration of automated test systems for 1xEV-DO production lines and on-site maintenance.

1: Requires MT8820B-003, MT8820B-004 and MX882002C

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1. 1xEV-DO Measurement Items

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Transmitter Measurements

**Code Domain Power**

The 1xEV-DO terminal code domain error is measured. The PICH (pilot-ch), RRI, DRC, ACK and Data powers are all displayed along with the maximum power and channel numbers of inactive channels on one screen. In addition, Pass/Fail evaluation is performed to determine whether or not the inactive channel power satisfies the specifications.

**Access Probe Power**

The first access probe from the 1xEV-DO terminal is captured by the level trigger to measure the average power. This value is held after terminating the probe measurement once even in the Continuous Measurement mode, which is convenient for the Open Loop Output Power measurement described in C.S0033 of the 3GPP2 standard.

**Open Loop Time Response Screen**

The Open Loop Time Response screen is used to measure the time response of the 1xEV-DO terminal open loop power control. Changes in the terminal transmitted power are measured between 100 ms from the point where the power of the forward link signal changed.

*Output power, modulation analysis, occupied bandwidth, etc., can be measured similarly to the MX882002C.*
Connection Test

The Call Processing function supports connection tests, such as Open Session, Closed Session, AT Origination, AN Release, and AT Release.

Packet Error Rate

PER (Packet Error Rate) measurement and Pass/Fail evaluation can be performed in FTAP to display the PER, error packet count, transmission packet count, confidence level, and Pass/Fail results.

Terminal Report Monitor

This screen displays the periodically reported 1xEV-DO terminal status.
## Specifications

**MT8820B-004 1xEV-DO Measurement Hardware, MX882003C 1xEV-DO Measurement Software**

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<th>Dependent on the performance of MX882002C</th>
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| **Modulation analysis** | Frequency: 300 to 2700 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 2700 MHz (1 Hz step)  
Channel level: Pilot channel, MAC channel, Control channel, Traffic channel, All 0 dB (reference Ior)  
PN offset: 0 to 511  
Wave quality: >0.99 (pilot only, AWGN Off)  
AWGN:  
AWGN Level: –20 to +12 dB (relative to 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, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10  
Call control: Open Session, Close Session, AT Origination, NW Origination, AT Release, NW Release,  
Hard Handoff, Soft Handoff  
Rev. closed loop power control mode: Closed loop, Alternate, All 0 (all up), All 1 (all down)  
Test application protocol: RTAP, FTAP, FTAP + RTAP |
The MX882003C-002 1xEV-DO External Packet Data is an optional software application that adds 1xEV-DO external packet data communications to the MX882003C 1xEV-DO External Measurement Software option. It supports transfer of packet data between a local or network application server and an Internet-enabled CDMA2000 1xEV-DO terminal via an Ethernet connection to the MT8820B. The IP data communications mode is supported as described below.

**IP Data Communications Mode**

This mode provides a predictable and controllable test “pipe” between the Internet (or other local application server) and 1xEV-DO terminal in the native RF environment that is simulated by the base station simulator in the MT8820B hardware. This mode provides an IP network connection to a 1xEV-DO terminal and supports Default Packet Point to Point Protocol (PPP), Internet Protocol (IP), and direct Ethernet connection.

**Example of IP Data Communications Mode**

**Specifications**

**MX882003C-002 1xEV-DO external packet data**

| Application Protocol Packet Data Mode | Default Packet PPP/IP (transfers IP packet data between 1xEV-DO terminal and server) |
CDMA2000 1X/1xEV-DO Synchronous Function

For Functional Tests of CDMA2000 1X and CDMA2000 1xEV-DO

By using the MX882002C and MX882003C with two MT8820B units or one MT8820B unit with the Parallelphone\(^*1\) measurement option, the CDMA2000 1X and 1xEV-DO forward link signals can be output with synchronized system times, supporting function tests of terminals for both CDMA2000 1X and 1xEV-DO systems.\(^*2\)

\(^*1\): Parallelphone is the registered trademark of Anritsu Corporation

\(^*2\): This function cannot be used when MX882000C W-CDMA Measurement Software is loaded

Please perform unload, when MX882000C is loaded
### Ordering Information

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

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<th>Model/Order No.</th>
<th>Name</th>
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<td>1xEV-DO Measurement Hardware (requires MT8820B-003, MT8815B-004 and MX882002C)</td>
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<td>MX882003C-002</td>
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<td>MX882010C</td>
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<td>Parallel Phone Measurement Software*1 (requires MT8820B-012, two identical measurement hardware sets (2 board/set) and one measurement Software)*1</td>
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<td>MX882050C</td>
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<td>W-CDMA Call Processing Software*2 (requires MX882000C)</td>
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<td>MX882071C</td>
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<td>W-CDMA Ciphering Software*2 (requires MX882051C)</td>
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**Options**

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<td>MT8820B-ES310</td>
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**Application parts**

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<td>MX88207xC Operation manual (CD-ROM): 1 copy</td>
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<td>CA68ADP</td>
<td>PC card Adapter: 1 pc</td>
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<td>Z0906A</td>
<td>ANR-CFX007T64 (CF card, 64 MB): 1 pc</td>
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<td>W2779AE</td>
<td>MX882002C Operation Manual (booklet)</td>
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*1: The measurement hardware supporting the Parallel Phone Measurement Software are the MT8820B-001, MT8820B-002, MT8820B-003, MT8820B-004, which can be installed simultaneously

*2: For terminal connection, contact your Anritsu sales representative

*3: The MX882050C pre-installs the integrity protection functionality

*4: Supplied as CD-ROM

*5: The Test USIM001 only supports the W-CDMA mode. When GSM connection is required, use the P0027

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• CF card is a registered trademark of SanDisk Corporation in the USA and is licensed to the CFA (Compact Flash Association)
Note: