Discover What's Possible™

Anritsu

MX3680031A

Device Test Signal Generation Software

(For MG3681A Digital Modulation Signal Generator)

For Evaluating Devices for Worldwide Digital Mobile Communications Systems

Generates Modulation Signals for Various Communications Systems

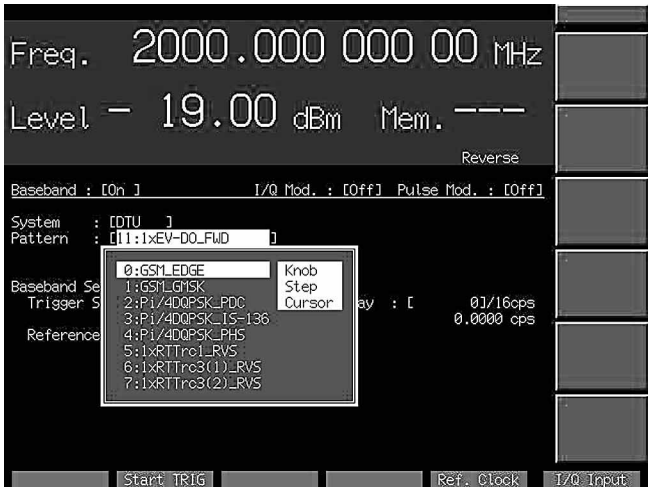
The MX368031A Device Test Signal Generation Software is the installed in the MU368030A Universal Modulation Unit, when the MU368030A is housed in the MG3681A Digital Modulation Signal Generator. It can output modulation signals for the world's leading communications systems.
Each modulation signal is generated using the best parameters to evaluate the various devices and equipment for the communications systems.

Simple operation and high-speed modulation signal change

A modulation signal is changed at high speed by selecting the waveform data stored in the large capacity waveform memory, without setting complicated parameters of a communication system.
13 types of modulation signal supporting the following systems from TDMA to CDMA2000 specified by 3GPP2 can be outputted.

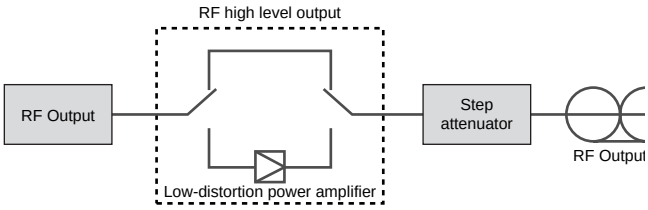
TDMA	GSM (EDGE) Continuous GSM (GMSK) Continuous PDC Continuous IS-136 (NADC) Continuous PHS Continuous
CDMA2000	1x RC1 Reverse 1x RC3 Reverse* 1x RC1-2 Forward 1x RC3-5 Forward 1xEV-DO Forward 1xEV-DO Reverse

*The channel composition has three different types of waveform.



RF Level-up at CDMA2000 Modulation

When the RF high level output (Option 42) is installed in the MG3681A, the RF level can be outputted with 8 dB gain without degrading the adjacent channel leakage power ratio within 1.9 to 2.3 GHz. This is very useful for signal source of power amplifier requiring a high input level.



RF high level output option installation diagram

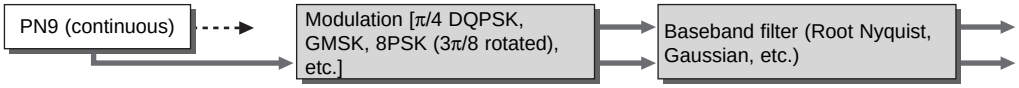
TDMA System Modulation Signals

Modulation signals used for worldwide digital cellular communications systems can be selected and output.

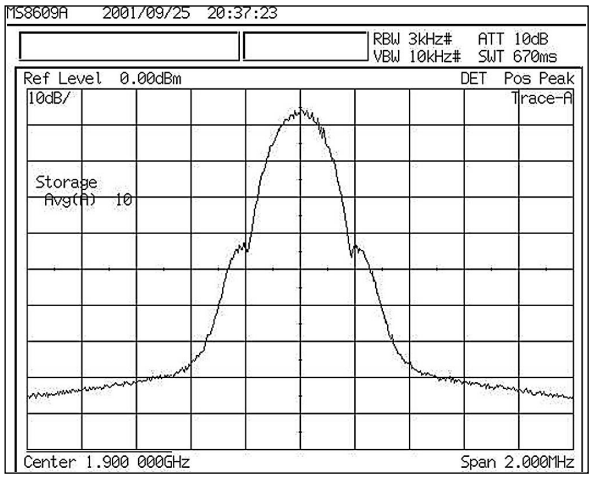
Communications system	Pattern	Modulation method	Baseband filter	Symbol data
GSM	GSM_EDGE	8PSK (3π/8 rotated)	Gaussian linear	270.833 ksps PN9 data*1
	GSM_GMSK	GMSK	Gaussian (Bbt = 0.3)	
PDC	Pi/4DQPSK_PDC	π/4 DQPSK	Root Nyquist (α = 0.5)	21 ksps PN9 data*1
IS-136/NADC	Pi/4DQPSK_IS-136	π/4 DQPSK	Root Nyquist (α = 0.35)	24.3 ksps PN9 data*1
PHS	Pi/4DQPSK_PHS	π/4 DQPSK	Root Nyquist (α = 0.5)	192 ksps PN9 data*1

*1: The continuous signal without frame coding (error correction encoding/CRC addition, interleave, etc.).

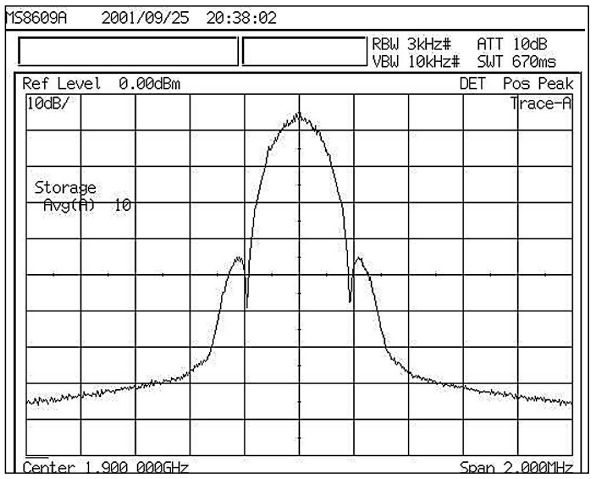
● **Waveforms**



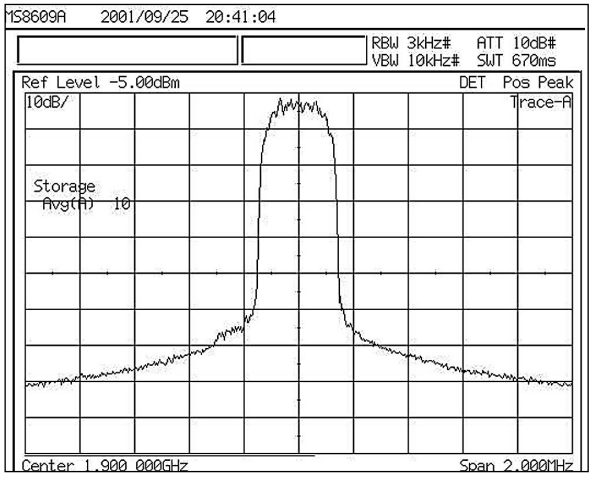
● **Modulation Waveform Spectrum**



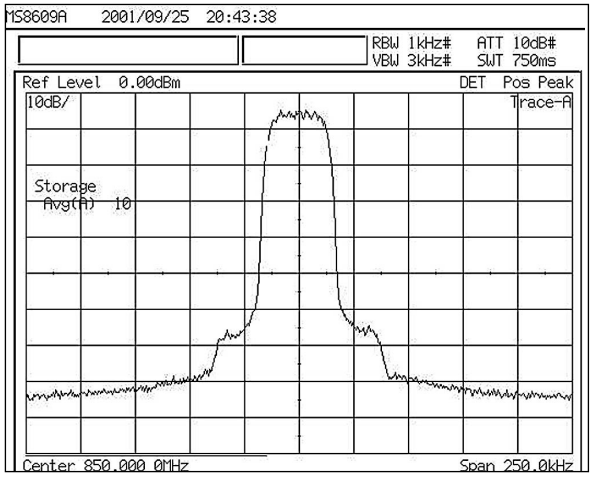
GSM (GMSK)



GSM (EDGE)



PHS



IS-136

CDMA2000 1x System Modulation Signals

Modulation signals for the CDMA2000 1x system standardized by 3GPP2 C.S0002-0-2 can be output. Since reverse channel signals are output by channel coding (convolutional encoding, etc.) of 4-frame length PN9 fix*2 data, in addition to base stations can also be measured FER (frame error rate)*3.

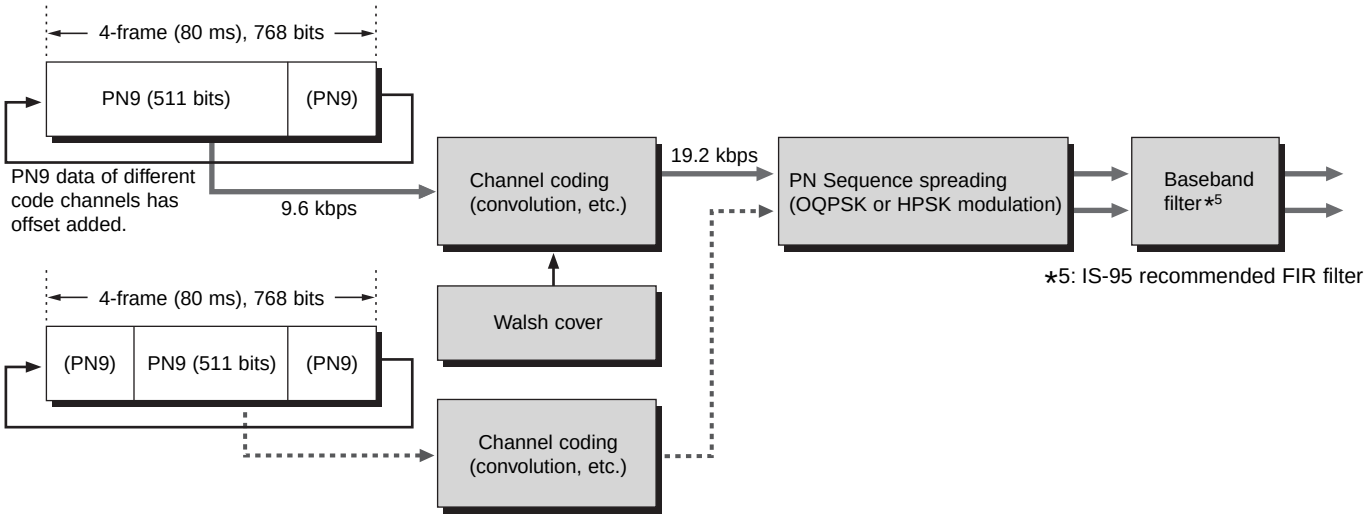
*2: Data length is not an integer multiple of PN sequence length (511 bits for PN9); the PN sequence is discontinuous.

*3: When able to input timing signal and 8x 1.2288 Mcps clock signal (or 10 MHz reference) from base station to MG3681A for synchronizing frame start and chip clock.

Pattern	Modulation method	Function channel composition, symbol data
1xRTTrc1_RVS RC1 Reverse	BPSK + OQPSK (spreading)	Traffic channel (9.6 kbps): 1 signal Channel-coded 4-frame length (80 ms) PN9 fix data
1xRTTrc3(1)RVS RC3 Reverse (1)	BPSK + HPSK (spreading)	FCH + pilot channel: 2 signals FCH (Fundamental Channel): Walsh cover 4, 9.6 kbps Channel-coded 4-frame length (80 ms) PN9 fix data
1xRTTrc(2)_RVS RC3 Reverse (2)	BPSK +HPSK (spreading)	FCH + SCH + pilot channel: 3 signals FCH (Fundamental Channel) Walsh cover 4, 9.6 kbps Channel-coded 4-frame length (80 ms) PN9 fix data*4 SCH (Supplemental Channel) Walsh cover 2, 9.6 kbps Channel-coded 4-frame length (80 ms) PN9 fix data*4
1xRTTrc(3)_RVS RC3 Reverse (3)	BPSK + HPSK (spreading)	DCCH + pilot channel: 2 signals DCCH (Dedicated Control Channel): Walsh cover 8, 9.6 kbps Channel-coded 4-frame length (80 ms) PN9 fix data
1xRTTrc1-2_FWD RC1-2 Forward	BPSK + QPSK (spreading)	Pilot + sync + paging + traffic channel (x 6): 9 signals Sync channel: Walsh cover 32, 4.8 kbps Paging channel: Walsh cover 1, 9.6 kbps Traffic channel: Walsh cover 8 to 13, each 19.2 ksps Direct BPSK modulation of 4-frame length (80 ms) PN9 fix data*4
1xRTTrc3-5_FWD RC3-5 Forward	QPSK (traffic)/ BPSK (other) + QPSK (spreading)	Pilot + sync + paging + traffic channel (x 6): 9 signals Sync channel: Walsh cover 32, 4.8 kbps Paging channel: Walsh cover 1, 9.6 kbps Traffic channel: Walsh cover 8 to 13, each 38.4 ksps Direct QPSK (traffic) or PSK (sync, paging) modulation of 4-frame length (80 ms) PN9 fix data*4

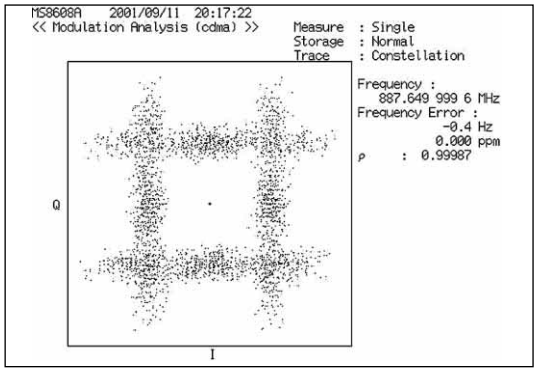
*4: The PN9 phase between different code channels is offset.

● **Reverse Channel Waveform**

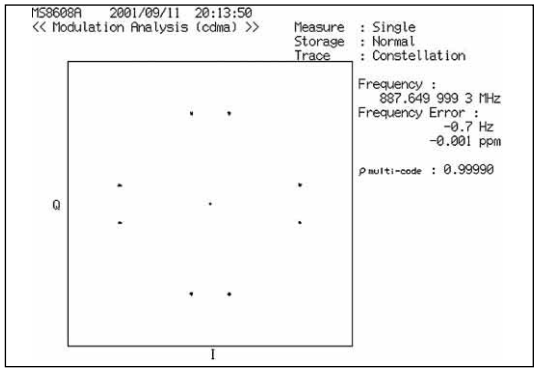


*5: IS-95 recommended FIR filter

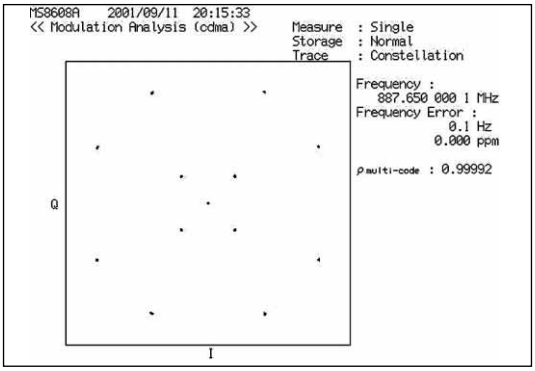
● **Waveform Constellation**



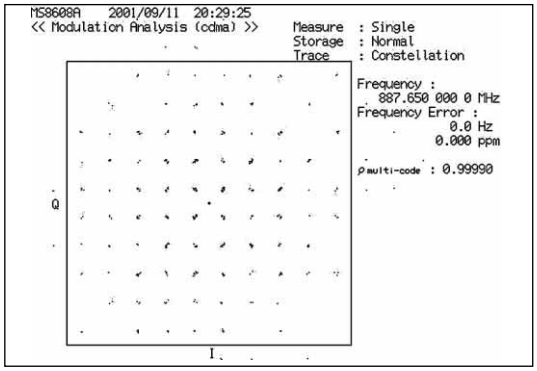
CDMA2000 RC1 Reverse



CDMA2000 RC3 Reverse (1)



CDMA2000 RC3 Reverse (2)



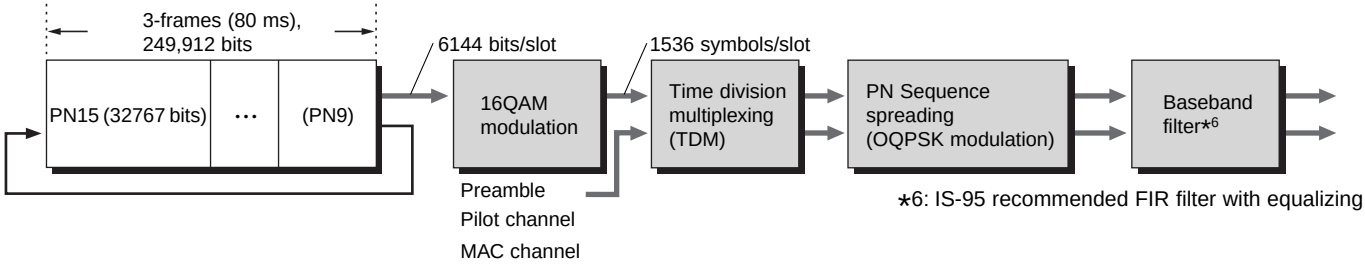
CDMA2000 RC3-5 Forward

CDMA2000 1xEV-DO System Modulation Signals

Modulation signals for the CDMA2000 1xEV-DO system standardized by 3GPP2 C.S0024 can be output.

System	Modulation method	Function channel composition, data contents, etc.
1xEV-DO_FWD	16QAM + QPSK (spreading)	Forward: Pilot channel + MAC channel + Traffic channel Traffic channel: Direct 1536 symbol/slot 16QAM modulation of 3-frame length (80 ms) PN15 fix data (at 1 slot time division multiplexing) MAC channel: RPC bit and RA bit are all 0s; DRC lock bit are all 0s
1xEV-DO_REV	BPSK + HPSK (spreading)	Reverse: Pilot channel + DRC channel + ACK channel + Data channel Data channel: Direct BPSK modulation of frame length (80 ms) PN9 fix data equivalent to 512 bits/slot

● **Forward Channel Waveform**



*6: IS-95 recommended FIR filter with equalizing

Specifications

● **MX368031A Device Test Signal Generation Software**

Supported system/modulation method		EDGE: 8PSK (3π/8 rotated) GSM: GMSK PDC/PHS/IS-136 (NADC): π/4 DQPSK CDMA2000 1x RC1 Reverse: BPSK (data), OQPSK (spreading) documentation 3GPP2 C.S0002-02 CDMA2000 1x RC3 Reverse: BPSK (data), HPSK (spreading) documentation 3GPP2 C.S0002-02 CDMA2000 1x RC1-2 Forward: BPSK (data), QPSK (spreading) documentation 3GPP2 C.S0002-02 CDMA2000 1x RC3-5 Forward: BPSK + QPSK (data), QPSK (spreading) documentation 3GPP2 C.S0002-02 CDMA2000 1xEV-DO Forward: 16QAM (data), QPSK (spreading) documentation 3GPP2 C.S0024 CDMA2000 1xEV-DO Reverse: BPSK (data), QPSK (spreading) documentation 3GPP2 C.S0024
Baseband filter		EDGE: Linearized Gaussian GSM: Gaussian, BbT = 0.3 PDC/PHS: Root Nyquist, α = 0.5 IS-136: Root Nyquist, α = 0.35 CDMA2000 1x RC1 Reverse/RC3 Reverse/1xEV-DO Reverse: IS-95 recommended FIR filter CDMA2000 1x RC1-2 Forward/RC3-5 Forward/1xEV-DO Forward: IS-95 recommended FIR Filter with equalizing
Modulation data		EDGE/GSM/PDC/PHS/IS-136: PN9 data continuous (burst not supported) CDMA2000 1x, 1xEV-DO: Depending of each channel composition
Channel composition*1	CDMA2000 1x RC1 Reverse	Number of multiplex: 1 Traffic channel: QPSK, data rate = 9600 bps Modulation by channel coding 4-frame length PN9 fix data, long code mask: 0, no MAC layer
	CDMA2000 1x RC3 Reverse (1)	Number of multiplex: 2 Pilot channel: Code channel power = –5.278 dB FCH: Data rate = 9600 bps, Walsh cover = 4, code channel power = –1.528 dB Modulation by channel coding 4-frame length PN9 fix data, long code mask: 0, no MAC layer
	CDMA2000 1x RC3 Reverse (2)	Number of multiplex: 3 Pilot channel: Code channel power = –7.5912 dB FCH: Data rate = 9600 bps, Walsh cover = 4, code channel power = –3.8412 dB SCH: Data rate = 9600 bps, Walsh cover = 2, code channel power = –3.8412 dB Modulation by channel coding 4-frame length PN9 fix data, long code mask = 0, no MAC layer
	CDMA2000 1x RC3 Reverse (3)	Number of multiplex: 2 Pilot channel: Code channel power = –5.278 dB DCCH: Data rate = 9600 bps, Walsh cover = 8, code channel power = –1.528 dB Modulation by channel coding 4-frame length PN9 fix data, long code mask: 0, no MAC layer
	CDMA2000 1x RC1-2 Forward	Number of multiplex: 9 Pilot channel: Code channel power = –7.0 dB Sync channel: BPSK, symbol rate = 4.8 ksps, Walsh cover = 32, code channel power = –13.3 dB Paging channel: BPSK, symbol rate = 19.2 ksps, Walsh cover = 1, code channel power = –7.3 dB Traffic channel: BPSK, symbol rate = 19.2 ksps, Walsh cover = 8 to 13, code channel power = –10.3 dB Modulation by channel coding 4-frame length PN9 fix data, long code mask: 0, no TPC MUX
	CDMA2000 1x RC3-5 Forward	Number of multiplex: 9 Pilot channel: Code channel power = –7.0 dB Sync channel: BPSK, symbol rate = 4.8 ksps, Walsh cover = 32, code channel power = –13.3 dB Paging channel: BPSK, symbol rate = 19.2 ksps, Walsh cover = 1, code channel power = –7.3 dB Traffic channel: QPSK, symbol rate = 38.4 ksps, Walsh cover = 8 to 13, code channel power = –10.3 dB Modulation by channel coding 4-frame length PN9 fix data, long code mask: 0, no TPC MUX
	CDMA2000 1xEV-DO Forward	Preamble: MAC Index = 5 Pilot channel: All 0s, Walsh cover = 0 MAC channel RPC bit: All 0s, MAC Index = 5, channel power = –3 dB MAC channel DRC lock bit: All 0s, MAC Index = 4, channel power = –3 dB MAC channel RA bit: All 0s, channel power = –3 dB Traffic channel: 16QAM, symbol rate = 1536 symbols/slot, direct modulation of 3-frame length PN15 fix data Number of time division multiplex: 1 slot
	CDMA2000 1xEV-DO Reverse	Pilot channel: Channel power = –18.68 dB RRI symbol: 101, Channel power = –18.68 dB, DRC channel: 001, DRC cover symbol = 0, channel power = –18.68 dB, ACK channel: All 0s, channel power = –18.68 dB Data channel: BPSK, symbol rate = 307.2 ksps, channel power = (0.18 dB, BPSK modulation of 3-frame length PN9 fix data, long code mask: MI = 33333333333 (hexadecimal), MQ = 26666666667 (hexadecimal)

RF Signal	Frequency range	10 to 3000 MHz
	Output level	GSM/PDC/PHS/IS-136: –143 to +13 dBm EDGE: –143 to +8 dBm CDMA2000 RC1 Reverse/RC1-2 Forward: –143 to +8 dBm, –135 to +16 dBm (At Option 42: RF high level output On, 1900 to 2300 MHz) CDMA2000 others: –143 to +5 dBm, –135 to+13 dBm (At Option 42: RF high level output On, 1900 to 2300 MHz)
	Level accuracy	Compared with CW level PDC/PHS/IS-136/GSM/EDGE: ±1.0 dB (≤+5 dBm) CDMA2000 RC1 Reverse/RC3 Reverse (1): ±1.0 dB (≤–3 dBm) CDMA2000 others: ±1.2 dB (≤–3 dBm)
	Vector accuracy	PDC/PHS: ≤1.8% (rms), IS-136: ≤2.0% (rms), EDGE: ≤2.5% (rms)
	Phase accuracy	GSM: ≤1˚ (rms), ≤3˚ (peak) ★At 100 to 2100 MHz, +5 dBm output, 18˚ to 35˚C
	Waveform quality	CDMA2000 1x ρ: ≥0.997 (at 100 to 2300 MHz, 18˚ to 35˚C, –3 dBm output)
	Adjacent channel leakage power ratio	At +5 dBm output PDC (PLL mode: Normal, 100 to 1600 MHz, RBW: 1 kHz, VBW: 3 kHz): ≤–63 dBc (50 kHz offset, BW: 21 kHz), ≤–67 dBc (100 kHz offset, BW: 21 kHz) PHS (PLL mode: Narrow, 100 to 1000 MHz, 1750 to 2500 MHz, RBW: 3 kHz, VBW: 10 kHz): ≤–66 dBc (600 kHz offset, BW: 192 kHz), ≤–69 dBc (900 kHz offset, BW: 192 kHz) IS-136 (PLL mode: Normal, 100 to 2100 MHz, RBW: 1 kHz, VBW: 3 kHz): ≤–42 dBc (30 kHz offset, BW: 24.3 kHz), ≤–64 dBc (60 kHz offset, BW: 24.3 kHz), ≤–64 dBc (90 kHz offset, BW: 24.3 kHz) GSM (PLL mode: Narrow, 100 to 3000 MHz, RBW: 3 kHz, VBW: 10 kHz): ≤–35 dBc (200 kHz offset, BW: 30 kHz), ≤–66 dBc (400 kHz offset, BW: 30 kHz) EDGE (PLL mode: Narrow, 100 to 3000 MHz, RBW: 3 kHz, VBW: 10 kHz): ≤–38 dBc (200 kHz offset, BW: 30 kHz), ≤–67 dBc (400 kHz offset, BW: 30 kHz) ★ Excluding performance degradation due to spurious of MG3681A main frame
	Spurious	CDMA2000 1x RC1-2 Forward: ≤–62 dBc (885 kHz to 1.98 MHz offset), ≤–67 dBc (1.98 to 2.5 MHz offset), ≤–77 dBc (2.5 to 5.0 MHz offset) CDMA2000 others: ≤–62 dBc (885 kHz to 1.98 MHz offset), ≤–70 dBc (1.98 to 2.5 MHz offset), ≤–77 dBc (2.5 to 5.0 MHz offset) ★ 100 to 2300 MHz, –3 dBm, PLL Mode: Normal (At Option 42: RF high level output On, 1900 to 2300 MHz, +5 dBm, typical) Excluding performance degradation due to spurious of MG3681A main frame
I/Q signal	Output level	PDC/PHS/IS-136: 359 mV (rms) GSM: 357 mV (rms) EDGE: 287 mV (rms) CDMA2000 1x RC1 Reverse: 287 mV (rms) CDMA2000 1x RC3 Reverse: 203 mV (rms) CDMA2000 1x Forward: 101 mV (rms) CDMA2000 1xEV-DO: 101 mV (rms)
	Output level accuracy	±5% (without MG3681A-11 additional function of I/Q output) ±10% (with MG3681A-11 additional function of I/Q output)
Transmission rate	Symbol rate	PDC: 21 ksps PHS: 192 ksps, IS-136: 24.3 ksps GSM/EDGE: 270.833 ksps
	Chip rate	CDMA2000: 1.2288 Mcps
	Transmission rate accuracy	Depends on reference signal of MG3680 series (excluding external sync)
Firmware backup space		CPU: 137.3 KB, FPGA: 49.5 KB

★1: PN9 fix/PN15 fix: Not continuous repetition of PN sequence; fixed-length (3 frames, etc.) data
FCH: Fundamental Channel, SCH: Supplemental Channel, DCCH: Dedicated Control Channel

Ordering Information

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

Model/Order No.	Name
	Main frame
MG3681A*1	Digital Modulation Signal Generator
	Expansion unit
MU368030A*1	Universal Modulation Unit
	Software
MX368031A	Device Test Signal Generation Software*2
	Standard accessories
W1974AE	MX368031A operation manual: 1 copy

*1: Refer to the separate catalogs for the MG3681A and MU368030A.
*2: With compact flash card (with adapter) or ATA flash memory card accessory
CompactFlash™ is a registered trademark of SanDisk Corporation.

Anritsu

Specifications are subject to change without notice.

ANRITSU CORPORATION

5-10-27, Minamiazabu, Minato-ku, Tokyo 106-8570, Japan
Phone: +81-3-3446-1111
Telex: J34372
Fax: +81-3-3442-0235

● **U.S.A.**
ANRITSU COMPANY
North American Region Headquarters
1155 East Collins Blvd., Richardson, Tx 75081, U.S.A.
Toll Free: 1-800-ANRITSU (267-4878)
Phone: +1-972-644-1777
Fax: +1-972-671-1877

● **Canada**
ANRITSU ELECTRONICS LTD.
700 Silver Seven Road, Suite 120, Kanata,
ON K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

● **Brasil**
ANRITSU ELETRÔNICA LTDA.
Praia de Botafogo 440, Sala 2401 CEP 22250-040,
Rio de Janeiro, RJ, Brasil
Phone: +55-21-5276922
Fax: +55-21-537-1456

● **U.K.**
ANRITSU LTD.
200 Capability Green, Luton, Bedfordshire LU1 3LU, U.K.
Phone: +44-1582-433200
Fax: +44-1582-731303

● **Germany**
ANRITSU GmbH
Grafenberger Allee 54-56, 40237 Düsseldorf, Germany
Phone: +49-211-96855-0
Fax: +49-211-96855-55

● **France**
ANRITSU S.A.
9, Avenue du Québec Z.A. de Courtabœuf 91951 Les Ulis Cedex, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

● **Italy**
ANRITSU S.p.A.
Via Elio Vittorini, 129, 00144 Roma EUR, Italy
Phone: +39-06-509-9711
Fax: +39-06-502-24-25

● **Sweden**
ANRITSU AB
Botvid Center, Fittja Backe 1-3 145 84 Stockholm, Sweden
Phone: +46-853470700
Fax: +46-853470730

● **Spain**
ANRITSU ELECTRÓNICA, S.A.
Europa Empresarial Edificio Londres, Planta 1, Oficina 6 C/ Playa de Liencres, 2 28230 Las Rozas. Madrid, Spain
Phone: +34-91-6404460
Fax: +34-91-6404461

● **Singapore**
ANRITSU PTE LTD.
10, Hoe Chiang Road #07-01/02, Keppel Towers, Singapore 089315
Phone: +65-6282-2400
Fax: +65-6282-2533

● **Hong Kong**
ANRITSU COMPANY LTD.
Suite 719, 7/F., Chinachem Golden Plaza, 77 Mody Road, Tsimshatsui East, Kowloon, Hong Kong, China
Phone: +852-2301-4980
Fax: +852-2301-3545

● **Korea**
ANRITSU CORPORATION
14F Hyun Juk Bldg. 832-41, Yeoksam-dong, Kangnam-ku, Seoul, Korea
Phone: +82-2-553-6603
Fax: +82-2-553-6604~5

● **Australia**
ANRITSU PTY LTD.
Unit 3/170 Forster Road Mt. Waverley, Victoria, 3149, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

● **Taiwan**
ANRITSU COMPANY INC.
6F, 96, Sec. 3, Chien Kou North Rd. Taipei, Taiwan
Phone: +886-2-2515-6050
Fax: +886-2-2509-5519

Catalog No. MX368031A-E-A-3-(1.00) Printed in Japan 2002-7 20ddc