DIGITAL MODULATION SIGNAL GENERATOR

MG3670B/C, MG3671A/B

300 kHz to 2.25/2.75 GHz

CE GPIB

The MG3670B/C, MG3671A/B is a digital modulation signal generator equipped with a high-performance quadrature modulator. It outputs the signals needed to develop, test and evaluate digital mobile communications equipment and related devices with expansion units. The MG3670B/C, MG3671A/B covers the frequency range from 300 kHz to 2.25 GHz (MG3670B/C)/300 kHz to 2.75 GHz (MG3671A/B), and provides a stable and precise output as well as spectrum purity up to a maximum output of +13 dBm, even with modulation. In addition to testing receiver sensitivity and excess input, it can be used for testing IF stage performance and for evaluating device quality. A CMOS-level mode is provided for I/Q signal input. The input frequency band covers the CDMA spread spectrum band, expanding the range of applications.

The MG3670C and MG3671B are expanded applications by rear panel extension connectors to use for auxiliary signal output function special to communication system. MG3670B/C and MG3671A/B can be used in combination with up to seven modulation units, and a burst function unit, simultaneously.

The MG0301C/0302A/0305A/0307A/0311A modulation units have a continuous data generator capable of generating arbitrarily-programmable data signals and ITU-T specification PN9/15 stage PRBS signals, as well as band-limiting filters, and they can output I/Q baseband signals.

The MG0303A Burst Function Unit uses the frame and slot configuration stipulated by various communication systems, and has a modulation pattern generator function and a function for ramp control of carrier burst signals. It can also handle data editing and scrambling.

The MG0310A Modulation Unit generates SS + QPSK/OQPSK modulated (1.2288 Mcps) I/Q baseband signals, supporting the CDMA system (TIA/EIA/IS-95) used in US Digital Cellular Systems and the US Personal Communications Service (PCS).

Anritsu-developed DSP and ASIC technology is used in the MG0310A to achieve superior waveform quality factor (ρ) and spurious emission characteristics. Channel multiplexed signals are supported for both forward and reverse links.

With two MG0310A units mounted in the MG3670C/3671B, all the test signals required to conform to TIA/EIA/IS-95, -97 & -98 can be generated. Simultaneous outputs from the rear extension connectors using long & short codes, etc., support a wide range of applications including RF related tests, IF stage performance tests, and device and module quality evaluation. (Option 25 is required to install the MG0310A in the MG3670B/3671A. The auxiliary signal output function is not installed, so long/short codes cannot be output.)

The MG0312A QPSK Modulation Unit generates QPSK/OQPSK modulated I/O baseband signals at 8 high speed bit rates between 500 kbps and 2.4576 Mbps. Built in modulation data includes NP7/PN9/PN15/PN23 pseudorandom patterns. Use over a wide range is supported by multiple baseband filters, and the Phase Encoding function which allows modulation data to be voluntarily phase mapped onto a constellation.

At the 2.4576 Mbps bit rate, the evaluation of transmission section devices and modules can be performed such as RF power amplifier for CDMA mobile station.

Communication systems	Units	
PHS, PDC, PDC_H, NADC, TFTS	MG0301C π/4 DQPSK Modulation Unit	MG0303B Burst Function Unit
GSM, PCN, CT2	MG0302A GMSK Modulation Unit	
DECT	MG0305A GFSK Modulation Unit	
PACS, WCPE, PHS	MG0307A π/4 DQPSK Modulation Unit	
TETRA	MG0311A π/4 DQPSK Modulation Unit	
IS-95	MG0310A CDMA Modulation Unit	
	MG0312A QPSK Modulation Unit	

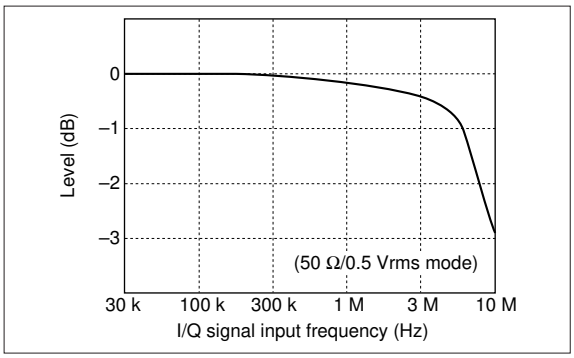
Features

- Compatible with communication system measurement signals of Japan, North America and Europe
- High modulation accuracy (≤1.8% rms vector error)
- Outputs modulation signals suited to each communication systems
- Internal pattern generator with data-editing and scrambling functions
- Outputs IS-95 channel multiplex signal

Basic performance

• I/Q signal I/O over broad frequency range

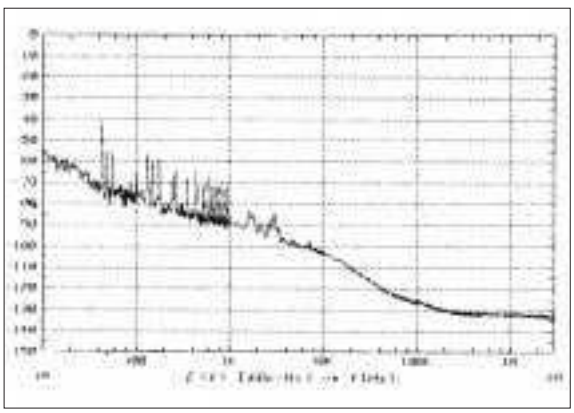
A quadrature modulator is built in, and external I/Q signals can be input to enable use with a variety of digital modulation modes, including QPSK, 8PSK and M16QAM. The modulation band for I/Q input signals is broad, covering the CDMA spread spectrum bandwidth. Further, by adding an expansion unit, I/Q signal output can be obtained from the internal data generator. Either 50 Ω or CMOS-level compatibility can be selected for I/Q signals. Functions for adjusting the level balance, offset and phase are also provided for greater utility in evaluating modulators/demodulators and other devices.



Frequency response for I/Q external modulation (typical values)

• Excellent spectral purity

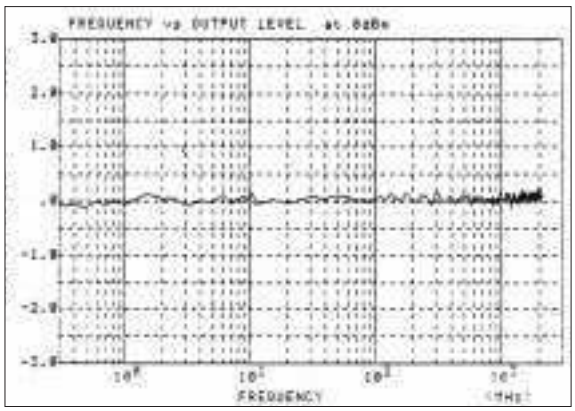
The SSB phase noise characteristic is an excellent –120 dBc/Hz or less (100 kHz offset). The adjacent channel power characteristic excels as the interference signal source during modulation.



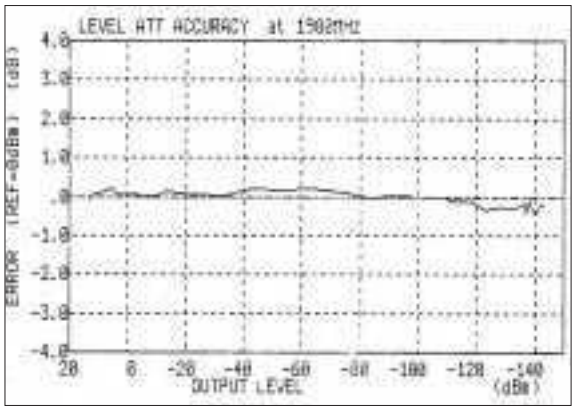
SSB phase noise at 1.9 GHz

• Large output level

Through use of new AGC circuitry, the MG3670B/C, MG3671A/B produces a highly precise output at levels down to –143 dBm with stable frequency characteristics, not only for output of unmodulated signals, but also with π/4 DQPSK modulation accompanied by amplitude fluctuations, and when outputting burst signals. The MG3670B/C, MG3671A/B can generate a high output level of up to +13 dBm over a broad range of frequencies, so amplifiers are not needed even when testing receivers for excess input, and in testing other devices.



Output level frequency characteristics



Output level accuracy at 1.9 GHz

• High modulation accuracy

A vector error of less than 1.8%rms is assured for output levels up to +5 dBm over the entire operating frequency range. This high modulation accuracy is also achieved when the expansion units are used. Even when the MG0301C and MG0303B units are installed and π/4 DQPSK modulation burst signals are generated, the vector error is less than 1.8%rms. The MG3670B/C, MG3671A/B enables measurement and quality evaluation of receivers and other devices with more than adequate precision.

Functions and performances with expansion unit

• Frame structure and data

TDMA

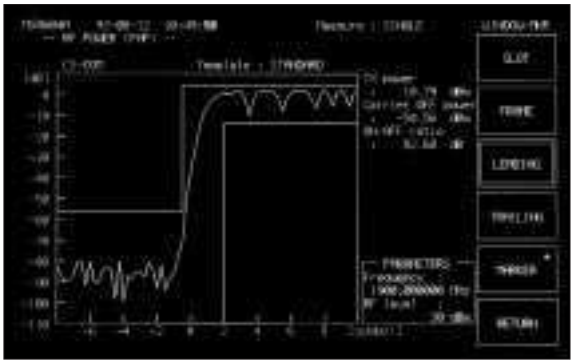
The MG0303B incorporates TDMA frames for various kinds of communication systems, as well as modulation patterns for each time slot.

Modulation patterns for device evaluation and for up/down communication channels are provided, and are output at the timing required by the system. Hence the MG3670B/C, MG3671A/B can generate the burst signals needed to measure various digital communication systems.

Time slots specified for different communication systems can be selected freely. There is considerable freedom in choosing the modulation pattern within slots; either a PN9 or PN15 TCH segment can be chosen, and part of the data outside the TCH segment can be edited. The pattern memory function can be used to store and recall patterns. A data scrambling function is provided as standard, and any initial code can be set permitting more sophisticated evaluations and diagnostics using the MG3670B/C, MG3671A/B as a supposed base station and mobile equipment.

The internal modulation pattern can also be driven by an external clock, so margin tests can be conducted by varying the clock pulse.

Pattern edit display



Slot rise time waveform

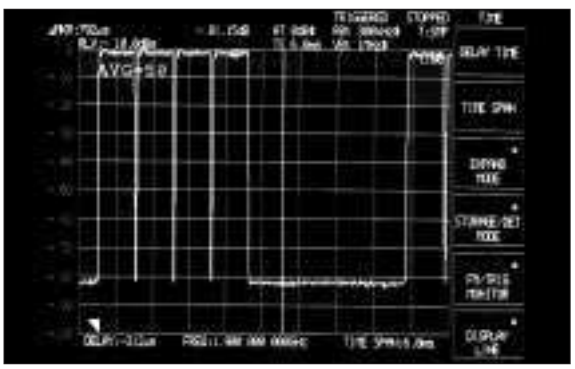
CDMA

MG0310A has various TIA/EIA/IS-95 frame format and encoder functions built-in for each channel types. For example, frame format of signalling, communication and Multiplex Option 1 are provided to support Rate Set 1 (1200 ... 9600 bps) and Rate Set 2 (1800 ... 14400 bps) for the Traffic Channel. In combination with the Burst Randomizer function, this allows system support at all rates, even for reverse links. For internal data you can select either a PN7, 9 or 15 pseudo-random pattern, or a user settable 16-bit data repeating pattern, all fully editable. Operation can be from internal RAM user-definable sequence data or from external serial data.

Pattern setting display

• Excellent leakage power characteristics during carrier-off

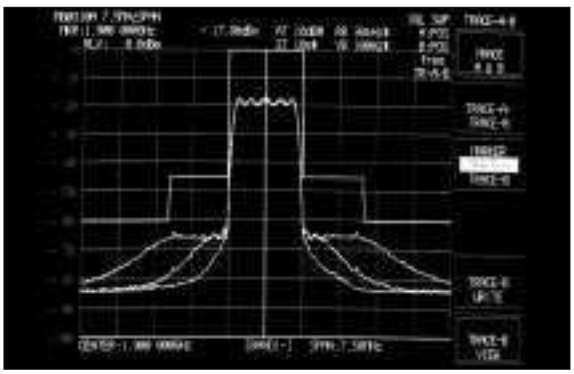
The rising and falling edges of burst signals have a gentle waveform with a duration equivalent to two symbols, and the leakage power during carrier-off characteristics are excellent.



PHS

• Superior spurious emission characteristics

Spurious emissions are guaranteed to be lower than –60 dBc (±900 kHz detuning, 30 kHz bandwidth) and –70 dBc (±1.98 MHz detuning, 30 kHz bandwidth) with MG0310A installed in the MG3670C/3671B mainframe (for output level: 0dBm, baseband filter: SPEC 2). Using this baseband filter gives a waveform quality factor (ρ) of 0.999 or better. This filter conforms to IS-95, providing 3-step switching. Selecting the best step for each evaluation item gives even higher performance. This excellent basic performance in a standard digital modulation signal generator makes it the ideal choice for the development and manufacture of digital mobile wireless equipment and related devices/modules.



Modulation spectrum
(with MG0310A installed in the MG3670C/3671B)

Specifications (refer to the MG3670B/C, MG3671A/B data sheet for more details.)

• MG3670B/C, MG3671A/B Digital Modulation Signal Generator

Carrier frequency	Frequency range	300 kHz to 2250 MHz (MG3670B/C), 300 kHz to 2750 MHz (MG3671A/B)		
	Accuracy	Depends on installed reference oscillator*1		
	Internal reference oscillator	Frequency: 10 MHz Start-up characteristics: ≤1 x 10^{-7}/day (after 30-min. warm-up), ≤5 x 10^{-8}/day (after 60-min. warm-up) Aging rate: ≤2 x 10^{-8}/day (after 24-h warm-up) Temperature characteristics: ≤±5 x 10^{-8} (0˚ to 50˚C)		
	External reference input	10 MHz or 13 MHz (±10 ppm), 2 to 5 Vp-p, BNC connector (rear panel)		
	Reference output	10 MHz, 2 to 5 Vp-p, BNC connector (rear panel)		
Output	Level range	–143 to +13 dBm (resolution: 0.1 dB)		
	Frequency response	≤±1 dB (at 0 dBm output)		
	Level accuracy	Output level/frequency	≤1000 MHz	>1000 MHz
		–33 to +13 dBm	±1 dB	±2 dB
		–123 to –33.1 dBm	±1.5 dB	±2 dB
		–136 to –123.1 dBm	±3 dB	±4 dB
	Impedance	50 Ω, N-type connector		
	Continuously variable level	Continuously variable output over 20 dB range (+8 to –12 dB) in 0.1 dB steps within upper and lower limits of any output level		
	Level unit	dBm, dBμ, μV, mV, V (dBμ, μV, mV, V selected terminate/open voltage display)		
	Interference radiation	≤1 μV ⋆Measured 25 mm from cabinet (except rear panel) with two-turn 25 mm diameter loop antenna, terminated with 50 Ω load, ≤+5 dBm output, carrier wave		
Signal purity	Spurious	≤–65 dBc (≥100 kHz offset, ≤±100 MHz bandwidth), ≤–50 dBc (≥100 kHz offset, full band), ≤–40 dBc [spurious of (5.4–Fout) GHz at ≥2.65 GHz], ≤–30 dBc (harmonics)		
	SSB phase noise	≤–120 dBc/Hz (100 kHz offset, carrier wave)		
Digital modulation	Internal modulation	Depends on installed modulation unit (MG0301C/0302A/0305A/0307A/0310A/0311A/0312A)		
	External modulation	Any modulation using I/Q input signal Input frequency: DC to 1.2 MHz*2 Input level: $\sqrt{I^2 \pm Q^2}$ ≤0.5 Vrms, BNC connector ⋆I/Q ≤1.5 Vp-p (50 Ω), I/Q ≤10% to 100% of 1.5 Vp-p (CMOS) Vector error: ≤1.8%rms (I/Q input level: 1 Vrms/50 Ω, at ≤+5 dBm output)		
	I/Q output	Outputs I/Q signal at internal modulation (MG0301C/0302A/0305A/0307A/0310A/0311A/0312A installed)		
Pulse modulation	Input	TTL level, BNC connector, polarity selectable		
	On/off ratio	≥40 dB (at ≥0 dBm output)		
	Transition time	≤2 μs, minimum pulse width: 10 μs		
Memory function	Frequency memory	1000 carrier frequencies (save and recall)		
	Parameter memory	100 panel settings (save and recall)		
Other functions	Relative display	Carrier frequency, output level		
	I/Q signal adjustment	Offset, balance, phase (only output) of I/Q input/output signal		
	Backup	Last settings stored at power-off		
	Reverse power protection	Maximum reverse input power: 50 W (<1000 MHz), 25 W (≥1000 MHz), ±50 V (DC)		
	GPIB	All functions except power switch and panel lock switch controlled Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2		
Operating temperature		0˚ to 50˚C		
Power		100 to 120/200 to 240 Vac (switchable), 47.5 to 63 Hz, ≤550 VA		
Dimensions and mass		(426±5) W x (221.5±4) H x (451±5) D mm, ≤27 kg		
EMC*3		EN55011: 1991, Group 1, Class A EN50082-1: 1992		
Safety		EN61010-1: 1993 (Installation Category II, Pollution Degree II)		

⋆1: Internal reference oscillator accuracy: 2 x 10^{-8}/day (23˚ ±5˚C), calibrated after 24-h operation
⋆2: Refer to the "Frequency response for I/Q external modulation (typical value)" on page 237 for the input frequency range. Typical values are given for reference only to assist in the use of this instrument, and are not guaranteed specifications.
⋆3: Electromagnetic compatibility

MG0301C π/4 DQPSK Modulation Unit (incorporated in the MG3670B/C, MG3671A/B)

Applicable communication system	PDC, PDC_H, PHS, NADC, TFTS
Modulation system	π/4 DQPSK
Vector error	I/Q signal: ≤1.5%rms (at 1 Vrms/50 Ω output), RF signal: ≤1.8%rms (at ≤+5 dBm output)
Internal modulation data	Pseudorandom pattern: PN15, PN9 Free 4-bit repetition pattern (ex: 1010, 1111)
External modulation data	DATA CLOCK: Covering ±5% of bit rate DATA: Digital data synchronized with DATA CLOCK SYMBOL CLOCK: Clock specified by DATA synchronized with DATA CLOCK TTL level, BNC connector, polarity selectable

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I/Q signal output	Selectable 50 Ω or CMOS (600 Ω), BNC connector 50 Ω setting: 1 Vp-p ±2% (modulation data: 0000, TFTS: 1111) CMOS setting: Variable in 10% steps over range of 10% to 100% of 1 Vp-p ±2% Variable offset voltage; 0 to 4 V (1 mV steps)
PDC, PDC_H	Carrier frequency range: 300 kHz to 2250 MHz*1 (incorporated in the MG3670B/C), 300 kHz to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 42 kbps Baseband filter: Root Nyquist (α = 0.5), Nyquist (α = 0.5)
PHS	Carrier frequency range: 1 to 2250 MHz*1 (incorporated in the MG3670B/C), 1 to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 384 kbps Baseband filter: Root Nyquist (α = 0.5), Nyquist (α = 0.5) Adjacent channel leakage power ratio: ≤–74 dB (600/900 kHz offset, ±96 kHz band, ≥10 MHz)*2
NADC	Carrier frequency range: 300 kHz to 2250 MHz*1 (incorporated in the MG3670B/C), 300 kHz to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 48.6 kbps Baseband filter: Root Nyquist (α = 0.35), Nyquist (α = 0.35)
TFTS	Carrier frequency range: 300 kHz to 2250 MHz*1 (incorporated in the MG3670B/C), 300 kHz to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 44.2 kbps Baseband filter: Root Nyquist (α = 0.4), Nyquist (α = 0.4)

*1: The upper frequency is limited by the specifications of the main frame in which this unit is installed.
*2: Applicable when this unit is installed in MG3670B/C, MG3671A/B.
Not applicable when this unit is installed in MG3670A.

MG0302A GMSK Modulation Unit (incorporated in the MG3670B/C, MG3671A/B)

Applicable communication system	GSM, DCS1800 (PCN), CT2
Modulation system	GMSK
Phase error	I/Q signal: ≤1° rms, ≤3° peak (at 1 Vrms/50 Ω output, 25° ±5°C, after 30 min. warm-up) ≤2° rms, ≤5° peak (at 1 Vrms/50 Ω output) RF signal: ≤1° rms, ≤3° peak (at ≤+5 dBm output, 25° ±5°C, after 30 min. warm-up) ≤2° rms, ≤5° peak (at ≤+5 dBm output)
Internal modulation data	Pseudorandom pattern: PN15, PN9, free 4-bit repetition pattern (ex: 1010, 1111)
External modulation data	DATA CLOCK: Covering ±5% of bit rate DATA: Digital data synchronized with DATA CLOCK TTL level, BNC connector, polarity selectable
I/Q signal output	Selectable 50 Ω or CMOS (600 Ω), BNC connector 50 Ω setting: 1 Vp-p ±2% (modulation data: 0000) CMOS setting: Variable in 10% steps over range of 10% to 100% of 1 Vp-p ±2% (modulation data: 0000) Variable offset voltage; 0 to 4 V (1 mV steps)
GSM/PCN (DCS1800)	Carrier wave frequency range: 1 to 2250 MHz*1 (incorporated in the MG3670B/C), 1 to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 270.833 kbps Baseband filter: Gaussian filter BbT = 0.3
CT2	Carrier wave frequency range: 300 kHz to 2250 MHz*1(incorporated in the MG3670B/C), 300 kHz to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 72 kbps Baseband filter: Gaussian filter BbT = 0.5

*1: The upper frequency is limited by the specifications of the main frame in which this unit is installed.

MG0305A GFSK Modulation Unit (incorporated in the MG3670B/C, MG3671A/B)

Applicable communication system	DECT
Modulation system	GFSK
Vector error	I/Q signal: ≤12 kHz (at 1 Vrms/50 Ω output), RF signal: ≤12 kHz (at ≤+5 dBm output, modulation data: FFFF)
Internal modulation data	Pseudorandom pattern: PN15/PN9 Free 16-bit repetition pattern (ex: 0F0F, 00FF)
External modulation data	DATA CLOCK: Covering ±5% of bit rate DATA: Digital data synchronized with DATA CLOCK TTL level, BNC connector, polarity selectable
I/Q signal output	Selectable 50 Ω or CMOS (600 Ω), BNC connector At modulation data 50 Ω setting: 1 Vp-p ±6% (modulation data: 0000) CMOS setting: Variable in 10% steps over range of 10% to 100% of 1 Vp-p ±6% Variable offset voltage; 0 to 4 V in 1 mV steps (modulation data: 0000)
Phase polarity	Polarity reversal of frequency deviation during modulation is possible.
DECT	Carrier frequency range: 5 to 2250 MHz*1 (incorporated in the MG3670B/C), 5 to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 1152 kbps Deviation ratio: 70% (202 kHz), 90% (259 kHz), 100% (288 kHz), 140% (403 kHz), at BbT=0.5 Baseband filter: Gaussian filter BbT = 0.4, 0.5, 0.6, at deviation ratio = 100%

*1: The upper frequency is limited by the specifications of the main frame in which this unit is installed.

MG0307A π/4 DQPSK Modulation Unit (incorporated in the MG3670B/C, MG3671A/B)

Applicable communication system	PACS, WCPE, PHS
Modulation system	π/4 DQPSK
Vector error	I/Q signal: ≤1.5%rms (at 1 Vrms/50 Ω output) RF signal: ≤1.8%rms (at ≤+5 dBm output)
Internal data mode	Pseudorandom pattern: PN15, PN9 Free 16-bit repetition pattern (ex: 0F0F, 00FF): WCPE Free 4-bit repetition pattern (ex: 0101, 0011): PACS, PHS
External data mode	DATA CLOCK: Covering ±5% of bit rate DATA: Digital data synchronized with DATA CLOCK SYMBOL CLOCK: Clock specified by DATA synchronized with DATA CLOCK TTL level, BNC connector, polarity selectable
I/Q signal output	Selectable 50 Ω or CMOS (600 Ω), BNC connector 50 Ω setting: 1 Vp-p ±5% (modulation data: 0000) CMOS setting: Variable in 10% steps over range of 10% to 100% of 1 Vp-p ±5%; variable offset voltage: 0 to 4 V in 1 mV steps (modulation data: 0000)
Phase encode function	Invertible phase polarity at modulation
PACS	Carrier frequency range: 1 to 2250 MHz*1 (incorporated in the MG3670B/C), 1 to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 384 kbps Baseband filter: Root Nyquist (α = 0.5), Nyquist (α = 0.5)
WCPE	Carrier frequency range: 5 to 2250 MHz*1 (incorporated in the MG3670B/C), 5 to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 1152 kbps Baseband filter: Root Nyquist (α = 0.5), Nyquist (α = 0.5)
PHS	Carrier frequency range: 1 to 2250 MHz*1 (incorporated in the MG3670B/C), 1 to 2750 MHz (incorporated in the MG3671A/B) Bit rate: 384 kbps Baseband filter: Root Nyquist (α = 0.5), Nyquist (α = 0.5) Adjacent channel leakage power ratio: ≤–74 dB (600/900 kHz offset, ±96 kHz band, ≥10 MHz)*2

∗1: The upper frequency is limited by the specifications of the main frame in which this unit is installed.
∗2: Applicable when this unit is installed in MG3670B/C, MG3671A/B.
Not applicable when this unit is installed in MG3670A.

MG0311A π/4 DQPSK Modulation Unit (incorporated in MG3670B/C, MG3671A/B)

Applicable communication system		TETRA
Modulation system		π/4 DQPSK
Vector error		I/Q signal: ≤1.5%rms (at 50 Ω output) RF signal: ≤1.8%rms (at ≤+5 dBm output)
Internal modulation data		Pseudorandom pattern: PN15/PN9 Free 4-bit repetition pattern (ex: 0101, 0011)
External modulation data		DATA CLOCK: Covering ±5% of bit rate DATA: Digital data synchronized with DATA CLOCK SYMBOL CLOCK: Clock specified by DATA synchronized with DATA CLOCK ∗TTL level, BNC connector, polarity selectable
I/Q signal output		Selectable 50 Ω or CMOS (600 Ω), BNC connector 50 Ω setting: 1 Vp-p ±5% (modulation data: 0000) CMOS setting: Variable in 10% steps over range of 10% to 100% of 1 Vp-p ±5%; Variable offset voltage: 0 to 4 V in 1 mV steps (modulation data: 0000)
Phase encode function		Invertible phase change polarity at modulation
TETRA	Carrier frequency	300 kHz to 2250 MHz*1 (incorporated in MG3670B/C), 300 kHz to 2750 MHz (incorporated in MG3671A/B)
	Bit rate	36 kbps
	Baseband filter	Root Nyquist (α = 0.35), Nyquist (α = 0.35)
	Adjacent channel leakage power ratio	≤–48 dB (25 kHz offset, ±9 kHz band) ≤–67 dB (50 kHz offset, ±9 kHz band)

∗1: The upper frequency is limited by the specifications of the main frame in which this unit is installed.

MG0303B Burst Function Unit (incorporated in the MG3670B/C, MG3671A/B)

Applicable communication system		PDC, PDC_H, PHS, NADC, TFTS (with MG0301C) GSM, PCN (DCS1800), CT2 (with MG0302A) DECT (with MG0305A) PACS, WCPE, PHS (with MG0307A) TETRA (with MG0311A)
Modulation signal	Internal data mode	TDMA framing specified for each system; modulation in each time slot using any internal modulation data
	Internal data	Pseudorandom pattern: PN15/PN9*1 (for device) Specified pattern based on communication channel format specified for each system: Up/down communication channel, VOX signal control TCH section consists of pseudorandom pattern PN15/PN9*1
	External data mode	DATA CLOCK: Covering ±5% of bit rate DATA: Digital data synchronized with DATA CLOCK SYMBOL CLOCK: Clock specified by DATA synchronized with DATA CLOCK BURST GATE: Burst signal synchronized with DATA CLOCK (on: ≥14 symbols, off: ≥8 symbols) TTL level, BNC connector, polarity selectable

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Burst trigger input		Burst wave output synchronized with trigger input signal of burst repetition rate (frame cycle) at internal modulation Input period: ≤burst repetition rate ±1 symbol [PDC, PDC_H, PHS, NADC, GSM, PCN (DCS1800), CT2, DECT, PACS, WCPE, TETRA], ≤burst repetition rate ±1/2 symbol (TFTS) TTL level, BNC connector (rear panel), polarity selectable
Control signal output	Burst trigger output	Outputs 1-symbol wide pulse at same cycle as burst waveform output at internal modulation TTL level, BNC connector (rear panel), polarity selectable
	Pattern sync output	Following outputs selectable at internal modulation PN CLOCK: Data clock corresponding to pseudorandom pattern part PN GATE : Gate signal corresponding to pseudorandom pattern part RF GATE : Signal for controlling pulse modulator in accordance with burst signal output TTL level, BNC connector (rear panel)
	Burst gate output	Outputs gate signal corresponding to burst waveform output at internal modulation TTL level, BNC connector (rear panel), polarity selectable
RF output	Burst on/off ratio	≥80 dB (+5 dBm output, PDC, PDC_H, NADC, CT2, TFTS, TETRA), ≥75 dB (+5 dBm output, PHS, GSM, PCN, PACS), ≥70 dB (+5 dBm output, DECT, WCPE)
	Rise/fall time	Equivalent to 2 symbols
Memory (pattern memory)		Max. 100 patterns/system (save and recall of internal modulation pattern data)
NADC	Burst repetition rate	20 ms
	Slot configuration	For device, up/down communication channel
	Output slot select	On/off selectable for any slots of slot 0 to slot 2 (excluding all slots off)
	Edit function	SYNC/SACCH/CDVCC: Any data, DATA: PN9, PN15*1 selectable
PDC PDC_H	Burst repetition rate	20 ms (PPC), 40 ms (PDC_H)
	Slot configuration	For device, up/down communication channel, up VOX control
	Output slot select	On/off selectable for any slots of slot 0 to slot 2 (PDC)/slot 5 (PDC_H) ⋆excluding all slots off
	Edit function	SW/CC/SACCH: Any data, TCH: PN9, PN15*1 selectable
	Scramble function	TCH + SF + SACCH scramble on/off, any scramble code setting
PHS	Burst repetition rate	5 ms
	Slot configuration	For device, up/down communication channel, VOX control
	Output slot select	On/off selectable for any slots of slot 1 to slot 4 (excluding all slots off)
	Edit function	UW/SA: Any data, TCH: PN9, PN15*1 selectable
	Scramble function	TCH + CRC, scramble and secret scramble on/off, any scramble code setting
	Adjacent channel power leakage ratio	≤–74 dB (600/900 kHz offset, ±96 kHz band, ≥10 MHz)*2
TFTS	Burst repetition rate	80 ms
	Slot configuration	For device, up/down communication channel
	Output slot select	On/off selectable for any slots of slot 0 to slot 16 (Device/UP TCH: Slots 16 is off at all time, excluding all slots off.)
	Edit function	S: Any data, DATA: PN9, PN15*1 selectable
GSM, PCN (DCS1800)	Burst repetition rate	4.615 ms
	Slot configuration	For device, normal burst (communication channel)
	Output slot select	On/off selectable for any slots of slot 0 to slot 7 (excluding all slots off)
	Edit function	TS: Any data, E: PN9, PN15*1 selectable
CT2	Burst repetition rate	2 ms
	Slot configuration	Up/down communication channel (MUX 1.2, MUX 1.4, MUX 2)
	Edit function	D, B, Da, Db, CHM/SYNC data selectable
	Scramble function	B scramble on/off, any scramble code setting
DECT	Burst repetition rate	10 ms
	Slot configuration	For device, up/down communication channel
	Output slot select	Full slot: Slot 0 to slot 11 (down channel), slot 12 to slot 23 (up channel) Half slot: Slot 0-0 to slot 11-1 (down channel), slot 12-0 to slot 23-1 (up channel) Double slot: Slot 0 to slot 10 (down channel), slot 12 to slot 22 (up channel) ⋆On/off selectable for any slots (excluding all slots off)
	Edit function	S, H, T: Any data D: PN15/PN9*1, all-0 or all-1 selectable (for device evaluation) D: PN15/PN9*1, TEST or REP-8 bits any data selectable (for communication channel)
PACS	Burst repetition rate	2.5 ms
	Slot configuration	For device, up/down communication channel
	Output slot select	On/off selectable for any slots of slot 0 to slot 7 (excluding all slots off)
	Edit function	PN: PN9, PN15*1 selectable (for device), DE/SC/R/SYC/PCC: Any data, FC: PN9*1, PN15*1, all-0 or all-1 selectable (PN15 selectable only for 1 slot)
WCPE	Burst repetition rate	10 ms
	Slot configuration	For device, up/down communication channel
	Output slot select	Full slot: Slot 0 to slot 11 (down), slot 12 to slot 23 (up), Half slot: Slot 0-0 to slot 11-1 (down), slot 12-0 to slot 23-1 (up) Double slot: Slot 0 to slot 10 (down), slot 12 to slot 22 (up) ⋆On/off selectable for any slots (excluding all slots off)
	Edit function	S/H/T: Any data D: PN9*1, PN15*1, all-0 or all-1 selectable (for device) D: PN9*1, PN15*1, TEST or REP 8-bits any data selectable (for communication channel)

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PHS	Burst repetition rate	5 ms
	Slot configuration	For device, up/down communication channel, VOX control, sync burst
	Output slot select	On/off selectable for any slots of slot 1 to slot 4 (excluding all slots off)
	Edit function	UW/SA etc.: Any data, TCH: PN9, PN15*1 selectable
	Scramble function	TCH + CRC, scramble on/off, any scramble code setting
	Adjacent channel leakage power ratio	≤–74 dB (600/900 kHz offset, ±96 kHz band, ≥10 MHz)*2
TETRA	Burst repetition rate	V + D mode: 1.02; Excluding CH13, 255 to 30000 symbols; CH13 PDO mode: 1.00; Excluding CH14, 126 to 30000 symbols; CH14
	Burst pattern	Following channel types selectable V + D mode: CH1, CH2, CH3, CH4, CH13; Downlink, CH7, CH8, CH9, CH10, CH11; Uplink PDO mode: CH5, CH6, CH14; Downlink, CH12; Uplink
	Slot configuration	V + D mode: DEVICE, NORMAL, SYNC; Downlink, DEVICE NORMAL, CONTROL; Uplink PDO mode: NORMAL, SYNC; Downlink, START, EVEN, ODD, END; Uplink
	Output slot select	V + D mode: On/off selectable for any slots of slot 1 to slot 4 (excluding CH13 and all slots off) Frame 1 to Frame 17 set to the same values PDO mode: Variable slot numbers of slot 1 to slot 150 (excluding CH14)
	Edit function	V + D mode: Downlink NORMAL; Any SB, SSB, NTS field data SYNC; Any FC, SSB1, STS, SBB, SB2 field data Uplink NORMAL; Any SB, NTS field data CONTROL; Any SCB, ETS field data PDO mode: Downlink SYNC; Any FC, SB, STS field data NORMAL; Any SB, NTS field data Uplink START; Any ETS, SB field data, R bit Length EVEN; Any NTS field data
	Scramble function	Any scramble code setting

∗1: The pseudorandom pattern in each slot has a different phase, and its pattern is continuous within the data field of slots.
∗2: Applicable when this unit is installed in MG3670B/C, MG3671A/B. Not applicable when this unit is installed in MG3670A.

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MG0310A CDMA Modulation Unit (incorporated in the MG3670C/3671B)

Carrier frequency range		4 kHz to 2250 MHz (MG3670C), 4 kHz to 2750 MHz (MG3671B)
RF output level		–143 to +8 dBm, 0.1 dB steps (1 channel only on, PCB MUX must be off when traffic present) –143 to +4 dBm, 0.1 dB steps (multiplex channel) Frequency response, level accuracy: Depends on main frame (after level calibration)
Supported systems		IS-95: US Digital Cellular System
Modulation format		Forward link: SS + QPSK, Reverse link: SS + OQPSK
Chip rate		1.2288 Mcps
Baseband filters		IS-95 recommended filters: SPEC 1, SPEC 2, SPEC 3, SPEC 1 + EQ, SPEC 2 + EQ, SPEC 3 + EQ Nyquist filters: α = 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5 Root Nyquist filters: α = 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5
Forward link	Multiplex channels	Channels 1 to 5
	Supported channels	CH 1: Current Pilot, Off CH 2 to CH 5: Nth Pilot, Sync, Paging, Traffic, OCNS, Off (Sync available for 1 selected channel only, all channels cannot be turned off simultaneously.)
	Spread code	Walsh code + Short code
	Walsh code	Point: 0, Sync: 32, Paging: 1 to 7, Traffic: 8 to 31/33 to 63, OCNS: 0 to 63 (Except for Pilot code, same code number cannot be set for multiple channels.)
	Short code offset	0 to 3276 chips in 64 chip steps (for Current Pilot), 1 chip steps (for Nth Pilot)
	Data rate	Sync 1200 bps, Paging: 4800/9600 bps, OCNS: 19200 sps, Traffic: 1200/2400/4800/9600 bps, 1800/3600/7200/14400 bps (Single channel selection only, except for 9600/14400 bps)
	Channel level	(RF output level + upper limit for each no. of multiplex channels) to –20 dB in 0.1 dB steps Upper limit for each no. of multiplex channels: –3 dB (2 channels), –5 dB (3 channels), –6 dB (4 channels), –7 dB (5 channels) ∗Level is set automatically for channel with highest CH number, user setting not possible.
	Scramble function	Long code scramble on/off (for Paging/Traffic/OCNS)
	PCB MUX function	Power control bit transmission on/off (for Traffic) PCB data: Selectable 256 bit data repeating pattern
	Long code mask	42 bits can be set by user in each channel (scramble On, PCB MUX On)
Reverse link	Multiplex channels	Channels 1 to 4
	Supported channels	CH 1: Traffic, Access, Interfered CH 2 to CH 4: Traffic, Access, Interfered, Off
	Spread code	Long code + short code
	Long code mask	42 bits can be set by user in each channel.
	Data rates	Access: 4800 bps, Interfered: 28800 sps Traffic: 1200/2400/4800/9600 bps, 1800/3600/7200/14400 bps (For CH1 only on, except for 9600/14400 bps)
	Channel level	(RF output level + upper limit for each no. of multiplex channels) to –15 dB in 0.1 dB steps, Upper limit for each No. of multiplex channels: 0 dB (2 channels), 2 dB (3 channels), –3 dB (4 channels) CH 1 is fixed on upper limit, user setting not possible.
	Power monitor function	CH 1 to CH 4 composite output level, CH 2 to CH 4 composite output level (N), S/N ratio of CH 1 output level (S), CH 1 Eb/N (Multiplex channel only)

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Frame offset	0 to 15 power control group (PCG) in 1 PCG steps
Internal frame structure	Frame formats for all channel types specified by IS-95
Internal modulation data	Pseudo-random patterns: PN7, PN9, PN15 Fixed pattern: User settable 16 bit data repeating pattern Sequence data: User can set sequence data in internal RAM (2048 bits x 7 blocks) as repeating pattern of 1 to 8192 frames.
External modulation data	Using internal time reference clock Data Clock: Data rate clock synched to Ref Clock and Frame Clock Data: Digital data synched to Data Clock ESTM Clock: 0.5 pulse/s clock synched to Ref Clock and Data Clock Frame Clock: Channel frame clock synched to Ref Clock and ESTM Clock BNC connector, TTL level, polarity switchable Using external time reference clock Ref Clock: ±2% of 19.6608, 9.8304, 4.9152, 2.4576 or 1.2288 MHz Data: Digital data synched to Data Clock ESTM Clock: 0.5 pulse/s clock synched to Ref Clock and Data Clock Frame Clock: Channel frame clock synched to Ref Clock and ESTM Clock BNC connector, TTL level, polarity switchable
I/Q signal output	50 Ω or CMOS (600 Ω), BNC connector
Modulation accuracy (VEM), Waveform quality (ρ)	≤0 dBm output, CH1 only on, level control program function Off VEM ≤2.5%rms, ρ ≤0.9992 (With SPEC 1 baseband filter) VEM ≤3.5%rms, ρ ≤0.999 (With SPEC 2 baseband filter) VEM ≤9.7%rms, ρ ≤0.99 (With SPEC 3 baseband filter) VEM ≤3.0%rms (With Nyquist/Root Nyquist baseband filter)
Spurious emissions	0 dBm output, 30 kHz bandwidth (Forward link/Reverse link, Default)

Offset frequency / Baseband filter	≥750 kHz	≥900 kHz	≥1.98 MHz
SPEC 1 + EQ/SPEC 1	≤–45 dBc	≤–55 dBc	≤–60 dBc
SPEC 2 + EQ/SPEC 2		≤–60 dBc	≤–70 dBc
SPEC 3 + EQ/SPEC 3		≤–65 dBc	≤–75 dBc

Level control program function	Variable level in 1 dB steps from RF output level to 0 to –20 dB range in 1.25 ms units (program interval: 800 ms)
Control signal I/O	Long code trigger input, ESTM output, ESTM alignment output, data output, data clock output, frame clock output, time reference clock output, TTL level, BNC connector (rear panel)
Auxiliary signal outputs*1	Long code, short code I/Q: TTL level, BNC connector (rear panel) Long code trigger, 26.7 ms clock, 80 ms clock,TTL level, D sub connector (rear panel)

*1: MG3670B/3671A can mount MG0310A fitted with Option 25, but in this case the auxiliary signal output function is not available.

MG0312A QPSK Modulation Unit (incorporated in the MG3670C/3671B)

Carrier frequency range	10 to 2250 MHz (MG3670B/C), 10 to 2750 MHz (MG3671A/B)
RF output level	–143 to +8 dBm, 0.1 dB steps
Continuously variable level range	Variable in steps of 0.1 dB in a range of 12 dB (+8 to –4 dB) from any RF output level to the upper or lower limit level.
Modulation system	QPSK, OQPSK
Bit rate	0.5, 0.512, 1.0, 1.204, 1.5, 2.0, 2.048, 2.4576 Mbps
Baseband filters	FIR filter*1: FIR 1, FIR 2, FIR 3 (at a bit rate of 2.4576 Mbps) Root Nyquist: α = 0.3, 0.4, 0.5 (operable at all bit rates) Nyquist: α = 0.2, 0.3, 0.4, 0.5 (operable at all bit rates)
Vector error (RF output)	≤1.8%rms (bit rate: ≤1.5 Mbps), ≤3%rms (bit rate: ≥2 Mbps, Nyquist/Root Nyquist filters), ≤2.2%rms*2 (bit rate: 2.4576 Mbps, FIR 1 filter), ≤3%rms*2 (bit rate: 2.4576 Mbps, FIR 2 filter), ≤10%rms*2 (bit rate: 2.4576 Mbps, FIR 3 filter) *At ≤0 dBm output
Internal modulation data	Pseudo-random patterns: PN7, PN9, PN15, PN23 Fixed pattern: Iteration of any 16-bit data (Example: $2D2D_H$)
External modulation data	DATA CLOCK: ±5% of the bit rate DATA: Digital data synchronized with the data clock SYMBOL CLOCK: Symbol definition clock synchronized with the data clock (BNC connector, TTL level, polarity selectable)
I/Q signal output	Selectable between 50 Ω or CMOS (600 Ω), BNC connector
Phase encoding function	The phase mapping of data on a constellation can be set.
Spurious emissions	At 2.4576 Mbps bit rate, 0 dBm output level, 30 kHz bandwidth

Offset frequency / Baseband filter	≥900 kHz	≥1.98 MHz
FIR 1	≤–55 dBc	≤–60 dBc
FIR 2, Nyquist α = 0.2	≤–55 dBc	≤–70 dBc
FIR 3	≤–60 dBc	≤–75 dBc

*1: Finite Impulse Response filter conforming to the TIA/EIA/IS-95 specifications
*2: The waveform quality ρ conforming to the TIA/EIA/IS-95 specifications is ≥0.9995 (FIR 1), ≥0.999 (FIR 2), ≥0.99 (FIR 3).

• **Options**

Model	Start-up characteristics	Aging rate	Temperature characteristic (0˚ to 50˚C)
MG3670/3671 Option 01	7×10^{-8}/day (after 30 min. warm-up) 3×10^{-8}/day (after 60 min. warm-up)	5×10^{-9}/day (after 24-h warm-up)	$\pm 5 \times 10^{-8}$/day
MG3670/3671 Option 02	2×10^{-8}/day (after 60 min. warm-up)	2×10^{-9}/day (after 24-h warm-up)	$\pm 1.5 \times 10^{-8}$/day
MG3670/3671 Option 03	–	5×10^{-10}/day (after 48-h warm-up)	$\pm 5 \times 10^{-9}$/day
MG3670 Option 20	RF off release function (When RF is off, level display and level setting is enabled.)		
MG0301C Option 22	PHS LCCH super frame control pattern function (artificial base station signal output for field strength measurement: A PS connection test is impossible.)		
MG0302A Option 23	CT2 MUX3 control pattern function		
MG3670B/3671A Option 25	Format upgrade (enables MG0310A to be used in MG3670B/3671A)		

Ordering information

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

Model/Order No.	Name	
	Main frame	
MG3670B	Digital Modulation Signal Generator	
MG3670C	Digital Modulation Signal Generator	
MG3671A	Digital Modulation Signal Generator	
MG3671B	Digital Modulation Signal Generator	
	Expansion units (factory installed)	
MG0301C	π/4 DQPSK Modulation Unit (for PDC, PDC_H, PHS, NADC and TFTS communication systems)	
MG0302A	GMSK Modulation Unit [for GSM, PCN (DCS1800) and CT2 communication systems]	
MG0303B	Burst Function Unit [for PDC, PDC_H, PHS, NADC, TFTS, GSM, PCN (DCS1800), CT2, DECT, PACS and WCPE communication systems]	
MG0305A	GFSK Modulation Unit (for DECT communication system)	
MG0307A	π/4 DQPSK Modulation Unit (for PACS, WCPE, PHS communication systems)	
MG0310A	CDMA Modulation Unit (for IS-95 communication system)	
MG0311A	π/4 DQPSK Modulation Unit (for TETRA communication system)	
MG0312A	QPSK Modulation Unit	
	Standard accessories (for main frame)	
J0576B	Coaxial cord, N-P•5D-2W•N-P, 1 m:	1 pc
J0127A	Coaxial cord, BNC-P•RG-58A/U•BNC-P, 1 m:	2 pcs
J0017F	Power cord, 2.5 m:	1 pc
B0325	Shielded cover for GPIB:	1 pc
F0014	Fuse, 6.3 A (for 100 Vac power supply):	2 pcs
F0012	Fuse, 3.15 A (for 200 Vac power supply):	2 pcs
W0689AE	MG3670B/C operation manual (supplied with MG3670B/C):	1 copy
W0932AE	MG3671A/B operation manual (supplied with MG3671A/B):	1 copy
W0869BE	MG3670B/C, MG3671A/B service manual (supplied with MG3670B/C, MG3671A/B):	1 copy
	Standard accessories (for expansion units)	
W0872AE	MG0301C/0303B operation manual (supplied with MG0301C):	1 copy
W0691AE	MG0302A/0303B operation manual (supplied with MG0302A):	1 copy
W0851AE	MG0305A/0303B operation manual (supplied with MG0305A):	1 copy
W0949AE	MG0307A/0303B operation manual (supplied with MG0307A):	1 copy
W1183AE	MG0310A operation manual (supplied with MG0310A):	1 copy
B0405A	Exchange sheet for front panel (supplied with MG0310A):	1 pc
B0406A	Exchange sheet for real panel (supplied with MG0310A):	1 pc
W1050AE	MG0312A operation manual: (supplied with MG0310A):	1 copy

Model/Order No.	Name
	Options (for main frame)
MG3670/3671-01	Reference oscillator
MG3670/3671-02	Reference oscillator
MG3670/3671-03	Reference oscillator
MG3670-20	RF off release function
MG3670B/3671A-25	Format upgrade
	Options (for expansion units)
MG0301C-22	PHS LCCH super frame control pattern
MG0302A-23	CT2 MUX3 control pattern
	Optional accessories
J0127C	Coaxial cord, BNC-P•RG-58A/U•BNC-P, 0.5 m
J0003A	Coaxial cord, SMA-P•3D-2W•SMA-P, 1 m
J0576D	Coaxial cord, N-P•5D-2W•N-P, 2 m
J0004	Coaxial adapter, N-P•SMA-J
J0007	GPIB cable, 1 m
J0008	GPIB cable, 2 m
B0329D	Protective cover
B0331D	Front handle kit (2 pcs/set)
B0332	Joint plate (4 pcs/set)
B0333D	Rack mount kit
B0334D	Carrying case (with casters and protective cover)
	Optional equipment
MS8604A	Digital Mobile Radio Transmitter Tester
MT8801B	Radio Communication Analyzer
MD1620B	Signalling Tester [PDC 800 MHz, PDC 1.5 GHz (MD1620B-01)]
MD1620C	Signalling Tester (PHS 1.9 GHz)
MD6420A	Data Transmission Analyzer
MP1201C	Error Rate Tester
MS2602A	Spectrum Analyzer

For additional units and version upgrades, consult your Anritsu sales representative.