MG3671A/B

Digital Modulation Signal Generator

Operation Manual

Seventh Edition

Read this manual before using the equipment.
Keep this manual with the equipment.

Measuring Instruments Division
Measurement Group

ANRITSU CORPORATION

NOV.
1999

Document No.: M-W0932AE-7.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.

Symbols used in manual

DANGER This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

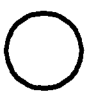
WARNING This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

CAUTION This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

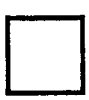
Safety Symbols Used on Equipment and in Manual

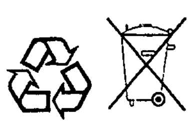
(Some or all of the following five symbols may not be used on all Anritsu equipment. In addition, there may be other labels attached to products which are not shown in the diagrams in this manual.)
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.


This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.


This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.


This indicates warning or caution. The contents are indicated symbolically in or near the triangle.


This indicates a note. The contents are described in the box.


These indicate that the marked part should be recycled.

MG3671A/B Digital Modulation Signal Generator
Operation Manual

March 1995 (First Edition)
September 1998 (Seventh Edition)

Printed in japan

For Safety

WARNING

1. Always refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

or

2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Repair

WARNING ⚠

3. This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

Falling Over

4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

For Safety

Changing Fuse

CAUTION ⚠

CAUTION

1. Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. Always use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.

   T □□□ A indicates a time-lag fuse.
   □□□A or F □□□ A indicate a normal fusing type fuse.

   There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

Cleaning

2. Keep the power supply and cooling fan free of dust.

   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

⚠CAUTION/注意

>18kg

HEAVY WEIGHT/重量物

3. Use two or more people to lift and move this equipment, or use a trolley. There is a risk of back injury, if this equipment is lifted by one person.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory of Metrology and the Communications Research Laboratory, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault, provided that this warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to misoperation, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding and earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Corporation or its representatives at the address in this manual.

'IBM' is a registered trademark of the IBM Corporation.
'HP' is a registered trademark of the Hewlett-Packard Company.
'NEC' is a registered trademark of the NEC Corporation.

MEMORY BACK-UP BATTERY REPLACEMENT

The power for memory back-up is supplied by a Poly-carbomonofluoride Lithium Battery. This battery should only be replaced by a battery of the same type; since replacement can only be made by Anritsu, contact the nearest Anritsu representative when replacement is required.

STORAGE MEDIUM

This equipment stores data and programs using backed - up memories. Data and programs may be lost due to improper use or failure.

ANRITSU CANNOT COMPENSATE FOR ANY MEMORY LOSS.

Please pay careful attention to the following points.

(Backed-up memory)

- Isolate the memory from static electricity.

Note: *The battery life is about 7 years. Early battery replacement is recommended.*

DISPOSAL

The MG3671A/B contains semiconductors containing arsenic compounds, a mercurial timer, and fluorinated graphite lithium batteries. When disposing of the MG3671A/B, be sure to handle it according to the regional regulations.

Precautions on Extension Units

(1) Always use the following combination when the π/4DQPSK modulation unit and burst function unit are used in combination. For any other combinations, performance is not guaranteed.

- Combination of MG0301A and MG0303A
- Combination of the modulation unit (MG0301B/C, MG0305A, MG0307A, or MG0311A) and the burst unit (MG0303B)

(2) Since the MG3671A cannot be used with the MG0310A CDMA Modulation Unit, the format-upgrade by Option 25 is required for the MG3671A to use the MG0310A.

(3) When the MG0302A is used in combination with the MG0303B, version up is required for certain MG0302A. Be sure to check necessity of version up before operation using the following procedure.

Step	Procedure
1	Turn power of the MG3671A/B off.
2	Install MG0302A to the MG3671A/B. For the installation procedure, refer to Section 2 of the MG0302A Operation Manual. Even if other modulation and burst function units are kept installed simultaneously, there is no trouble.
3	Turn power of the MG3671A/B on.
4	Press the 【 F6: etc 】 key.
5	Press the 【 F5: Setup/Parameter Memory 】 key.
6	Press the 【 F3: Interface Setup 】 key.
7	Check the GMSK modulation unit name indicated and take the necessary action, if needed.

(1) No version up is required when indication is as shown below:

Unit □

MG0302A
GMSK

(2) Version up is required when indication is as shown below. So, contact an Anritsu office or its representative in your area.

Unit □

GMSK

Note: *For checking the current combination of the extension units, operate steps 1 and 3 through 6 above.*
For π/4DQPSK modulation unit: Judge as model A if no model (MG0301B or MG0301C) is indicated.
For burst function unit: A model (MG0303A or MG0303B) is indicated.

CE Marking

Anritsu affix the CE Conformity Marking on the following product (s) accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC directive of the European Union (EU).

CE Conformity Marking

1. Product Name/Model Name

Product Name: Digital Modulation Signal Generator and Expansion Units

Model Name: MG3671A/B and MG03××□

2. Applied Directive

EMC: Council Directive 89/336/EEC

Safety: Council Directive 73/23/EEC

3. Applied Standards

EMC:

Electromagnetic radiation:

EN55011 (ISM, Group 1, Class A equipment)

Immunity:

EN50082-1

		Performance criteria*
IEC801-2 (ESD)	4 kVCD, 8 kVAD	B
IEC801-3 (Rad.)	3 V/m	A
IEC801-4 (EFT)	1 kV	B

*: Performance criteria

A: No performance degradation or function loss

B: Self-recovered temporary degradation of performance or temporary loss of function

Harmonic current emissions:

EN61000-3-2 (Class A equipment)

Safety: EN61010-1 (Installation Category Ⅱ, Pollution Degree 2)

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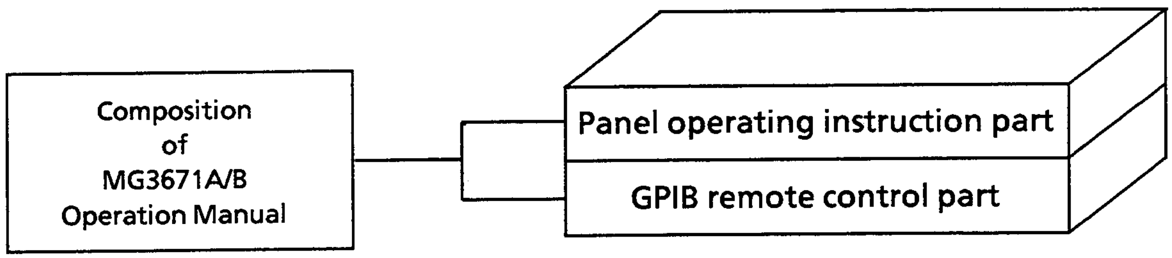
ABOUT THIS MANUAL

(1) Composition of MG3671A/B Operation Manual

The MG3671A/B Digital Modulation Signal Generator operation manual of the standard type is composed of the following two parts. Use them properly according to the usage purpose.



Panel operating instruction part: Panel Operating Instructions: Provides information on the MG3671A/B outline, preparation before use, panel description, basic operation, performance tests, calibration, storage / transportation, and quick reference for screen transition and error messages.

GPIB remote control part: Provides information on the MG3671A/B remote control which conforms with IEEE488.2 standards. To assist creating GPIB programs, this manual gives examples of N$_{88}$ BASIC language programs that run on the NEC PC9800 series of personal computers.

The operation manuals of the MG0301C, the MG0302A etc. modulation units which can be used with the MG3671A/B are prepared and sold separately. The operations of the MG0303B (Burst Function Unit) are explained in each the MG0301C/MG0302A operation manual description related to the burst function.

(2) GPIB Basic Guide (sold separately)

The GPIB Basic Guide is sold separately in addition to the above GPIB operation manual. It is composed of two parts: GPIB Basic Knowledge, and GPIB Control statements in the ANRITSU PACKET V BASIC.

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MG3671A/B

Digital Modulation Signal Generator

Operation Manual

(Panel Operating Instructions)

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TABLE OF CONTENTS

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SECTION 1
GENERAL

This section outlines the MG3671A/B Digital Modulation Signal Generator and explains the composition of this manual, the configuration of the MG3671A/B with the standard accessories, the expansion unit/options, optional accessories, and peripherals for expanding the MG3671A/B capabilities, and the specifications.

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SECTION 1
GENERAL

1.1 Product Outline

The 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.

The MG3671A/B covers the frequency range from 300 kHz to 2.75 GHz, and provides a stable and precise output level as well as spectral purity, even with modulation. In addition, it provides 50 Ω/CMOS level modes, and level-balance/offset adjustment functions for the I/Q input signals in the wide frequency range.

To better meet users' needs, expansion units enable flexible configuration of a digital modulation signal generator suited to different mobile communication systems. The MG3671A/B can be combined with up to four expansion units simultaneously, including the MG0301C $\pi/4$ DQPSK Modulation Unit, the MG0302A GMSK Modulation Unit, and the MG0303B Burst Function Unit.

The MG0301C/MG0302A etc. modulation units have a continuous data generator capable of generating arbitrarily-programmable data signals and band-limiting filters, as well as CCITT-specification PN9/PN15-stage PRBS signals, and they can output I/Q baseband signals.

The MG0303B 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.

Installing these expansion units enables use with communication systems including Japan's mobile telephones (PDC) and digital cordless telephones (PHS); North-American mobile telephone (NADC), terrestrial flight telephone services (TFTS), digital cordless telephone systems (PACS, WCPE), and Digital Cellular Systems (IS-95); and European digital mobile telephones (GSM), digital cordless telephones (CT2), digital portable telephones (PCN), digital mobile radio systems (TETRA), and digital cordless telephone systems (DECT).

1.2 Composition of Operation Manual

This operation manual is composed of eight sections and two appendixes. Each section is outlined below.

Section composition	Explanation
SECTION 1 GENERAL	Provides information about product outline, composition of manual, equipment configuration with standard accessories, options, optional accessories, peripherals , and MG3671A/B specifications
SECTION 2 PREPARATIONS BEFORE MEASUREMENT	Provides information about all preparations to be performed before using MG3671A/B (before power-on)
SECTION 3 PANEL LAYOUT AND OPERATION OUTLINE	Provides information about locations and functions of front- and rear-panel keys, connectors, rotary knob, and indicators, etc.
SECTION 4 PANEL OPERATING INSTRUCTIONS	Provides information about detailed manual operation methods
SECTION 5 MEASUREMENT	Provides information about typical measurement examples for the digital mobile radio.
SECTION 6 PERFORMANCE TESTS	Provides information about equipment required for executing MG3671A/B performance tests, setup, and procedure of performance tests
SECTION 7 CALIBRATION	Provides information about equipment required for executing MG3671A/B calibration, setup, and procedure of calibration
SECTION 8 STORAGE AND TRANSPORTATIONS	Provides information about regular care and long-term storage as well as repacking and transportation
APPENDIX A SCREEN TRANSITION	Provides information about screen menu transition of setting items and function keys
APPENDIX B ERROR MESSAGES	Provides information about list of error messages.

1.3 Equipment Configuration

This paragraph describes the configuration of the MG3671A/B with standard accessories and the expansion units/options to expand the functions.

1.3.1 Standard configuration

The table below shows the configuration of the MG3671A/B with the standard accessories.

Table 1-1 Standard Composition

Item	Model / Order No.	Name	Qty.	Remarks
Main instrument	MG3671A/B	Digital Modulation Signal Generator	1	
Accessories	J0576B	Coaxial cable	1	Approx. 1 m (N-P·5D-2W·N-P)
	J0127A	Coaxial cable	1	Approx. 1 m (BNC-P·RG-58A/U·BNC-P)
	J0017F	Power cord	1	Approx. 2.5 m
	B0325	GPIB shield cap	1	
	F0014 (6.3A) or F0012 (3.15A)	Fuse	2	For 100 V system or For 200 V system
	W0932AE	Operation manual	1 set	● Panel operating instruction part ● GPIB remote control part

1.3.2 Expansion Units / Options

The table below shows the expansion units / options for the MG3671A/B which are sold separately.

Table 1-2 Expansion Units / Options

Modulation units for Communication Systems:

Model No.	Name	System to be used
MG0301C	$\pi/4$ DQPSK Modulation Unit	PDC, PDC_H, PHP, NADC, TFTS
MG0302A	GMSK Modulation Unit	GSM, PCN, CT2
MG0305A	GFSK Modulation Unit	DECT
MG0307A	$\pi/4$ DQPSK Modulation Unit	PHS, PACS, WCPE
MG0310A	CDMA Modulation Unit	IS-95
MG0311A	$\pi/4$ DQPSK Modulation Unit	TETRA
MG0312A	QPSK Modulation Unit	

Burst Function Unit: used with the modulation units for Communication Systems

Model No.	Name	System to be used
MG0303B	Burst Function Unit	PDC, PHP, PDC_H, NADC, TFTS, GSM, PCN, CT2, DECT, PACS, WCPE, TETRA

Options:

Option No.	Name	Aging rate
01	Reference crystal oscillator	5×10^{-9} / day
02	Reference crystal oscillator	2×10^{-9} / day
03	Reference crystal oscillator	5×10^{-10} / day
25	Format Upgrade	Option to enable for the MG3671A to use the MG0310A

1.4 Optional Accessories and Peripherals

The following table shows the optional accessories and peripherals for the MG3671A/B which are all sold separately.

Table 1-3 Optional Accessories

Model † / Order No. †	Name †	Remarks
J0127C	Coaxial cable	Approx. 0.5 m (BNC-P · RG-58A / U · BNC-P)
J0003A	Coaxial cable	Approx. 1 m (SMA-P·Special 3D-2W·SMA-P)
J0004	Coaxial adapter	N-P · SMA-J
J0007	GPIB cable	Approx. 1 m (408JE-101)
J0008	GPIB cable	Approx. 2 m (408JE-102)
B0329D	Protective cover	
B0331D	Front handle	2 pcs / set
B0332	Coupling plate	4 pcs / set
B0333D	Rack mounting kit	
B0334D	Carrying case	Protective cover, with casters

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

Table 1-4 Peripherals

Model † / Order No. †	Name †	Remarks
MS8604A	Digital Mobile Radio Transmitter Tester	100 kHz to 8.5 GHz
MD1620B	Signaling Tester	PDC, 800 MHz
MN3101A	Digital MCA Modulation Adaptor	M16QAM modulation
MD6420A	Data Transmission Analyzer	50 bps to 10 Mbps
MP1201C	Error Rate Teste	40 Hz to 100 kHz
MS2602A	Spectrum Analyzer	100 Hz to 8.5 GHz
MG3633A	Synthesized Signal Generator	10 kHz to 2.7 GHz
MS2653A	Spectrum Analyzer	9 kHz to 8.1 GHz
MS2663A	Spectrum Analyzer	9 kHz to 8.1 GHz

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

1.5 Specifications

The MG3671A/B and its option specifications are listed in the following table.

1.5.1 MG3671A/B specifications

The MG3671A/B specifications are listed in Table 1-5.

Table 1-5 MG3671A/B Specifications (1/2)

Carrier frequency	Frequency range	300 kHz to 2750 MHz		
	Accuracy	Depends on installed reference oscillator†1		
	Internal reference oscillator	Frequency: 10 MHz Start-up characteristics: $\leqq 1 \times 10^{-7}$/day (after 30-min. warm-up) $\leqq 5 \times 10^{-8}$/day (after 60-min. warm-up) Aging rate: $\leqq 2 \times 10^{-8}$/day (after 24-h warm-up) Temperature characteristics: $\leqq \pm 5 \times 10^{-8}$ (0 to 50 ℃)		
	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 selection	dBm, dBμ, μV, mV, V (dBμ, μV, mV, and V allow terminate/open voltage to be displayed.)		
	Interference radiation	≦1μV (at ≦ +5 dBm carrier output, and for a 50 Ω-terminated voltage when measured with a two-turn 25 mm diameter loop antenna at a point which is 25 mm away from the frame except rear panel)		
Signal purity	Spurious	At ≦ +5 dBm output: ≦ −65 dBc (≧100 kHz offset, ≦ ±100 MHz bandwidth) ≦ −50 dBc (≧100 kHz offset, full band) ≦ −30 dBc (harmonics) ≦ −40 dBc (Spurious defined by the next expressions, Carrier frequency ≧2.65 GHz F_{SP} = 5.4 GHz − F_{OUT} F_{SP} = Spurious frequency F_{OUT} = Carrier frequency)		
	SSB phase noise	≦ −120 dBc/Hz (100 kHz offset, carrier wave)		

†1 Internal reference oscillator accuracy: 2×10^{-8}/day (23° ± 5 ℃), calibrated after 24-h operation

Table 1-5 MG3671A/B Specifications (2/2)

Digital modulation	Internal modulation	Depends on installed modulation unit
	External modulation	Any modulation using I/Q input signal Input frequency: DC to 1.2 MHz Input level: For 50 Ω, 500 mVrms: $\sqrt{I^2+Q^2} \leqq$ 0.5 Vrms and $\sqrt{I^2+Q^2} \leqq$ 0.75 Vp-p For CMOS: Range between 10% and 100% of $\sqrt{I^2+Q^2} \leqq$ 0.5 Vrms and $\sqrt{I^2+Q^2} \leqq$ 0.75 Vp-p Vector error: $\leqq$ 1.8%rms (I/Q input level: 0.5 Vrms/50 Ω, at $\leqq$ +5 dBm output)
	I/Q output	Outputs I/Q signal at internal modulation (When modulation unit installed)
Pulse modulation	Input	TTL level, BNC connector, polarity selectable
	On/off ratio	$\geqq$ 40 dB (at $\geqq$ 0 dBm output)
	Transition time	$\leqq$ 2 μs, minimum pulse width: 10 μs
Memory function	Frequency memory	1000 carrier frequencies (store and recall)
	Parameter memory	100 panel settings (store 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 ($\geqq$ 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, and E2
General	Ambient temperature, rated range	0 to 50 ℃
	Power	100 to 120/200 to 240 Vac, 47.5 to 63 Hz, $\leqq$ 550 VA
	Dimensions and mass	221.5 (H) × 426 (W) × 451 (D) mm, $\leqq$ 27 kg

1.5.2 MG3671A/B option specifications

The reference-crystal-oscillator specifications of the MG3671A/B option are listed in Table 1-6.

Table 1-6 Reference-Crystal-Oscillator Option Specifications

Item	Reference-Crystal-Oscillator Option No.		
	Option 01	Option 02	Option 03
Start-up characteristics	7×10^{-8}/day (after 30- min. operation) 3×10^{-8}/day (after 60- min. operation)	2×10^{-8}/day (after 60 min. operation)	———
Aging rate	5×10^{-9}/day (after 24-h operation)	2×10^{-9}/day (after 24-h operation)	5×10^{-10}/day (after 48-h operation)
Temperature characteristics (0 to 50 °C)	$\pm5\times10^{-8}$/day	$\pm1.5\times10^{-8}$/day	$\pm5\times10^{-9}$/day

SECTION 2
PREPARATIONS BEFORE USE

This section explains the preparations and safety procedures that should be performed before using the MG3671A/B Digital Modulation Signal Generator. The safety procedures are to prevent the risk of injury to the operator and damage to the equipment. Insure that you understand the contents of the pre-operation preparations before using the MG3671A/B.

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SECTION 2
PREPARATIONS BEFORE USE

2.1 Installation Site and Environmental Conditions

2.1.1 Locations to be avoided

The MG3671A/B operates normally at temperatures from 0 to 50 °C. However, for the best performance, the following locations should be avoided.

- Where there is severe vibration
- Where the humidity is high
- Where the equipment will be exposed to direct sunlight
- Where the equipment will be exposed to active gases

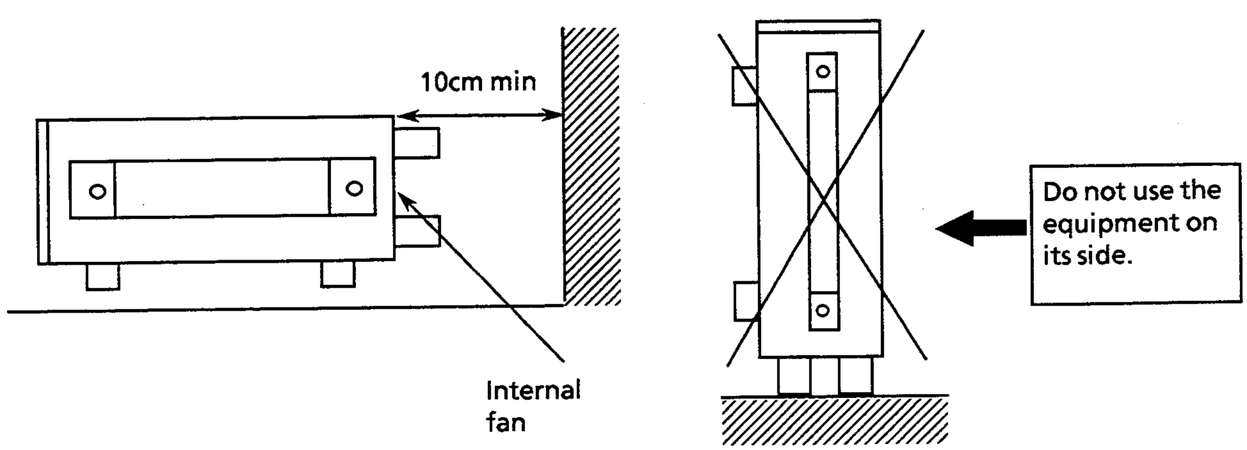
In addition to meeting the above conditions, to insure long-term trouble-free operation, the equipment should be used at room temperature and in a location where the power supply voltage does not fluctuate greatly.

CAUTION

If the MG3671A/B is used at normal temperatures after it has been used or stored for a long time at low temperatures, there is a risk of short-circuiting caused by condensation. To prevent this risk, do not turn the MG3671A/B on until it has been allowed to dry out sufficiently.

2.1.2 Fan clearance

To suppress any internal temperature increase, the MG3671A/B has a fan on the rear panel as shown in the diagram below. Leave a gap of at least 10 cm between the rear panel and the wall, nearby equipment or obstructions so that fan ventilation is not blocked.



2.2 Safety Measures

This paragraph explains the safety procedures which should be followed under all circumstances not to counter the risk of an accidental electric shock, damage to the equipment or a major operation interruption.

2.2.1 Power-on

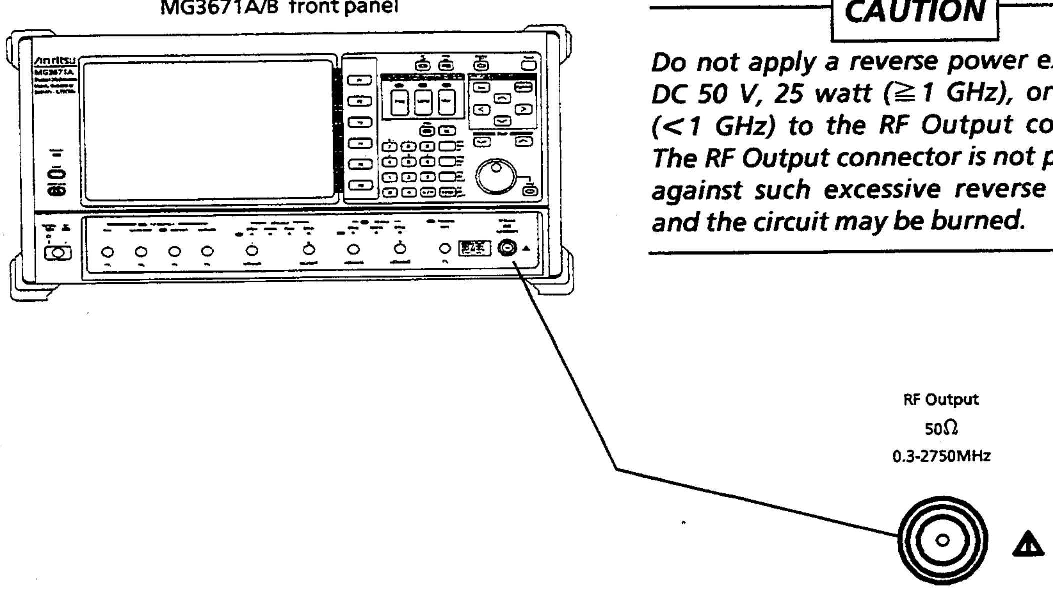
WARNING

- *Before power-on:* *The MG3671A/B must be connected to protective ground. If the power is switched on without taking this countermeasure, there is a risk of receiving a accidental electric shock. In addition, it is essential to check the power supply voltage. If an abnormal voltage that exceeds the specified value is input, there is a accidental risk of damage to the MG3671A/B and fire.*
- *During power-on:* *To maintain the MG3671A/B , sometimes it is necessary to make internal checks and adjustments with the top, bottom or side covers removed while power is supplied. Very-high, dangerous voltages are used in the MG3671A/B; if insufficient care is taken, there is a risk of a accidental electric shock being received or of damage to the equipment. To maintain the MG3671A/B, request service by a service personnel who has received the required training.*

In the following, special notes on safety procedures are extracted from sections other than Section 2. To prevent accidents, read this section together with the related sections before beginning operation.

2.2.2 Maximum reverse power to RF Output connector

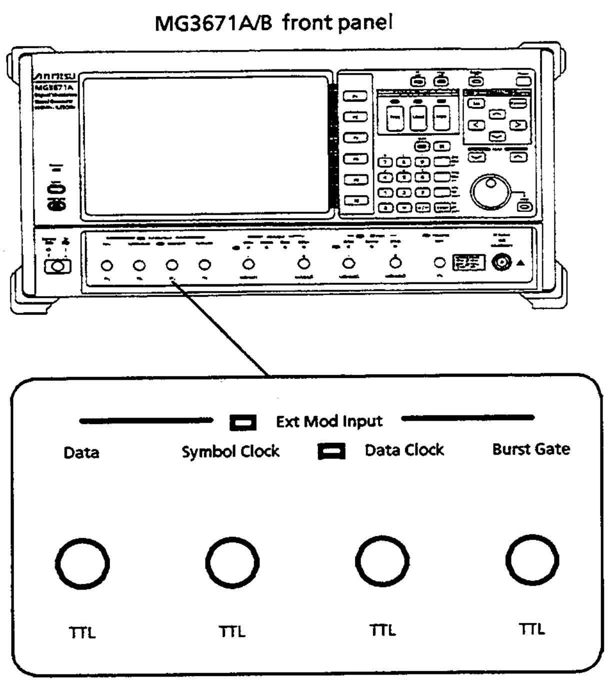
MG3671A/B front panel

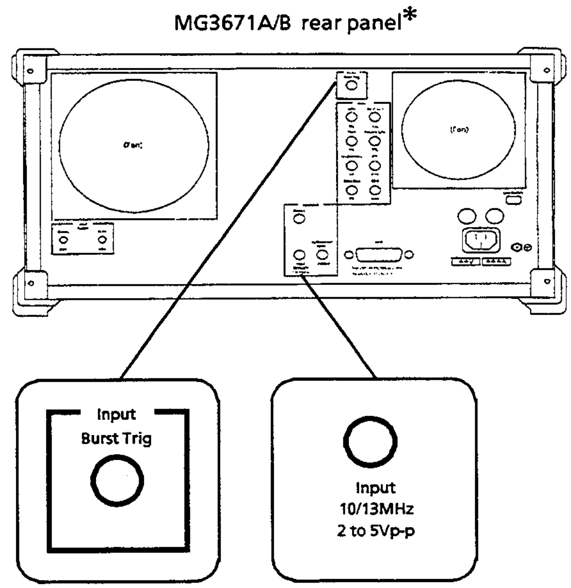


CAUTION

Do not apply a reverse power exceeding DC 50 V, 25 watt (≧1 GHz), or 50 watt (<1 GHz) to the RF Output connector. The RF Output connector is not protected against such excessive reverse power, and the circuit may be burned.

2.2.3 Maximum power to external pattern and reference input connectors





*This rear panel figure shows that of the MG3671A. The same caution is also required for the MG3671B.

CAUTION

Do not apply a power exceeding TTL level to the six input connectors of Data/Symbol Clock/Data Clock/Burst Gate/Burst Trig Input/Ref Input. These input connectors are not protected against the power exceeding TTL level, and the circuit may be burned..

2.3 Preparations before Power-on

To operate the MG3671A/B normally, it requires a single phase ac power source of 100 to 120 Vac for 100 Vac system or 200 to 240 Vac for the 200 Vac system, and 47.5 to 63 Hz.
To prevent the following problems, take the necessary procedures described on the following pages before power is supplied.

- Accidental electric shock
- Damage caused by abnormal voltage
- Ground current problems

Note:
- *The voltage and current ratings are indicated on the rear panel when the instrument is shipped from the factory.*
- *In this manual, the power supply voltage and current ratings are represented by **Vac and ***A, respectively.*

To protect the operator, the following WARNING and CAUTION notices are attached to the rear panel of the MG3671A/B.

WARNING ⚠

NO OPERATOR SERVICE-ABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL.

CAUTION ⚠

FOR CONTINUED FIRE PROTECTION REPLACE ONLY WITH SPECIFIED TYPE AND RATED FUSE.

WARNING

Disassembly, adjustment, maintenance, or other access inside this instrument by unqualified personnel should be avoided. Maintenance of this instrument should be performed only by Anritsu trained service personnel who are familiar with the risks involved of fire and electric shock. Potentially lethal voltages existing inside this instrument, if contacted accidentally, may result in personal injury or death, or in the possibly of damage to precision components.

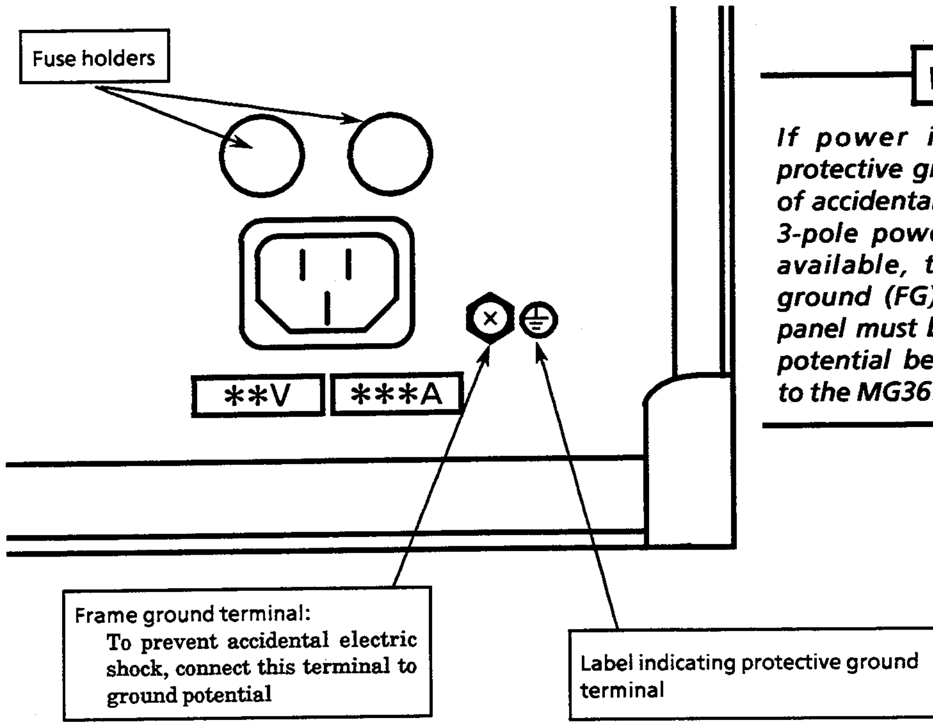
Always follow the instructions on the following pages.

2.3.1 Protective grounding

(1) Grounding with 3-pole power outlet

When connecting to a 3-pole (grounded, 2-pole type) ac power-supply outlet, the frame of the MG3671A/B is connected to ground potential. As a result, it is not necessary to connect the FG terminal to ground.

(2) Grounding with frame ground (FG) terminal



WARNING

If power is supplied without protective grounding, there is a risk of accidental electric shock. When a 3-pole power-supply outlet is not available, the protective frame-ground (FG) terminal on the rear panel must be connected to ground potential before power is supplied to the MG3671A/B.

When there is no 3-pole ac power-supply outlet, the protective frame-ground (FG) terminal on the rear panel must be connected directly to ground potential.

2.3.2 Replacing fuse

WARNING

- *If the fuses are replaced while power is being supplied, there is a serious risk of electric shock. Before replacing the fuses, set the power switch to OFF and remove the power cord from the power outlet.*
- *If power is supplied without protective grounding, there is a risk of accidental electric shock. In addition, if the AC power supply voltage is unsuitable, there is a risk of the internal circuits of the MG3671A/B being damaged by the abnormal voltage. Before supplying power again after changing the fuses, check that the protective grounding described previously is still connected, and check that the AC power supply voltage is suitable. Then, set the power switch to ON.*

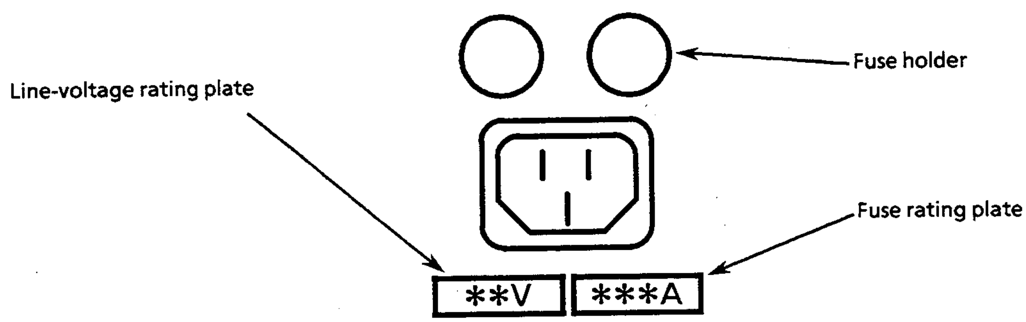
CAUTION

When there are no supplied spare fuses, the replacement fuses must have the same rated voltage and current as the fuses in the fuse holders.

- *If the replacement fuses are not of the same type, they may not fit correctly, there may be a faulty connection, or the time taken to for the fuses to blow may be too long.*
- *If the voltage and current rating of the fuses is incorrect, when an abnormality occurs again, the fuses may not blow with a consequent risk of damage to the equipment by fire.*

The MG3671A/B with standard accessories has two spare *** A fuses. The fuses are mounted in the fuse holder as shown in the figure below and must be replaced if they blow. If the fuses must be replaced, locate and remedy the cause before replacing the blown fuses. In addition to this fuse replacement, make sure that each item shown in the table below is properly selected for the power supply system.

Power supply system	Line-voltage rating plate	Fuse rating plate	Fuse rating	Fuse name	Model/ Order No.
100 Vac	100 – 120V	T 6.3 A	6.3 A, 250V	T6.3A250V	F0014
200 Vac	200 – 240V	T 3.15 A	3.15 A, 250V	T3.15A250V	F0012



After performing the safety procedures described on the preceding page, replace the fuses according to the following procedure.

Step	Procedure
1	Set the front-panel [Power] switch to Standby and the rear-panel [Line] switch to OFF. Then, remove the power cord from the power-supply outlet.
2	Use a flat-bladed screwdriver to turn the fuse-holder cap counterclockwise. The cap and fuse are removed as a unit from the fuse holder.
3	Remove the fuse from the fuse cap and replace it with a spare fuse. (The direction does not matter.)
4	Return the fuse cap with fuse to the fuse holder and fasten it by turning it clockwise with the flat-bladed screwdriver.

2.4 Installation

2.4.1 Rack mounting

The B0333D Rack Mounting Kit (sold separately, Table 1-3) is required to mount the MG3671A/B in a rack.
The installation method is included in the rack mount kit diagram.

2.4.2 Stacking

When stacking several MG3671A/Bs or stacking the MG3671A/B with equipment of the same width as the MG3671A/B, the B0332 Coupling Plate (sold separately, Table 1-3) are required.

SECTION 3
PANEL LAYOUT AND OPERATION OUTLINE

This section describes the layout, function and operation of the keys, connectors and indicators on the front and rear panels of the MG3671A/B Digital Modulation Signal Generator. For detailed operating instructions of this instrument, see Section 4.

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SECTION 3
PANEL LAYOUT AND OPERATION OUTLINE

3.1 Panel Layout

The front and rear panel illustrations are shown in Figs. 3-1 and 3-2 on page 3-8 in this operation manual. Controls and connector descriptions have index numbers that are linked to the panel illustrations. The following tables describe the functions of the keys, switches, LED indicators and connectors on the MG3671A/B front and rear panels.

3.1.1 Keys and rotary knob on the front panel

The types, attributes and functions of the keys and rotary knob located on the front panel are explained below.

Keys and Rotary Knob on the Front Panel (1/3)

No.	Key		Functional description
	Type (marking)	Attribute	
1	Main function keys	——	• Group of keys used in selecting the function to be set
	Freq	Momentary	• Key that selects the carrier frequency setting mode • The frequency setting function mode indicator LED lights when this key is pressed
	Level	Momentary	• Key that selects the output level setting mode • The output level setting mode indicator LED lights when this key is pressed
	Mod	Momentary	• Key that selects the modulation parameter setting mode • The modulation parameter setting mode indicator LED lights when this key is pressed. (When this key is pressed, modulation is switched ON.)
2	RF Off	Momentary	• Key that switches the output on and off • The LED indicator lights when the output is off
3	Mod On	Momentary	• Key that switches modulation on and off • The LED indicator lights when modulation is on
4	Display Off	Momentary	• Key that switches the display on and off • The LED indicator lights when the display is off. Under this condition, leakage power from the panel is decreased.

Keys and Rotary Knob on the Front Panel (2/3)

No.	Key: Type (marking)	Key: Attribute	Functional description
5	Preset	Momentary	● Key that initializes the parameter settings
6	Local	Momentary	● Key that switches MG3671A/B from GPIB remote mode to local mode ● The remote LED lights in the GPIB remote mode
7	Panel Lock	Momentary	● Key that engages/disengages the panel lock ● The LED lights when the panel lock is engaged
8	Cursor keys	——	● Keys used in selecting the item to be set on the display screen and in manipulating a window
8	Set	Momentary	● Key that opens/closes a window and validates a data input
8	Cancel	Momentary	● Key that closes a window (cancels a data input)
8	∧, ∨, >, <	Repeat	● Keys that move the cursor on the display screen and in the window screen
9	Data entry keys		● Keys that are used in inputting data
9	0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F,.,+/−	Momentary	● Numeric and data keys used in inputting data; to input any of letters A to F, SHIFT must be turned on.
9	BS	Repeat	● Key used in correcting or deleting numeric data entered using the numeric keys
9	Shift	Momentary	● Key that selects the function of a shiftable key; the LED indicator lights when shift is on.
9	Unit keys	——	● Keys that validate data that has been entered using the numeric keys
9	[GHz/dBm/dB]	Momentary	● Validates a data input having a GHz/dBu/dB unit
9	[MHz/dBμ/sec]	Momentary	● Validates a data input having a MHz/dBu/sec unit
9	[kHz/mV/msec]	Momentary	● Validates a data input having a kHz/mV/msec unit
9	[Hz/μV/μsec/Enter]	Momentary	● Validates a data input having a Hz/μV/μsec unit ● Validates a data input having no unit system
9	Step (∧, ∨)	Repeat	● Key that increments or decrements numeric data ● [∧] increments, while [∨] decrements numeric data.
9	Hold	Momentary	● Key that enables/disables the encoder ● The LED indicator lights when the encoder is disabled. However, if a window is open, the encoder remains in activated condition even if disabled.

Keys and Rotary Knob on the Front Panel (3/3)

No.	Key		Functional description
	Type (marking)	Attribute	
10	Function keys (F1,F2,F3,F4,F5,F6)	Momentary	● Keys that select and execute the menu displayed on the right side of the display screen ● An '*' at the right end of a key label indicates that the key has a lower hierarchy key label and an '→' indicates that the screen will switch to another one if the key is pressed.
11	Rotary knob	——	● Knob used in inputting data ● Numeric data increases with a clockwise rotation and decreases with a counter-clockwise rotation
12	Power switch	Momentary	● Switch that sets the power to standby or ON when the LINE ON/OFF switch on the rear panel is on. When the power is set to standby, only the reference oscillator is supplied with power.

3.1.2 Connectors and controls on the front panel

Connectors and Controls on the Front Panel (1/1)

No.	Connector and control marking		Functional description
13	Ext Mod Input*1		● Inputs external TTL level signals required for external modulation. The LED indicator lights when modulation data or the modulation data clock is externally fed.
		Data	● Inputs external modulation data signals
		Symbol Clock	● Inputs external modulation symbol clock signals
		Data Clock	● Inputs external modulation data clock signals. The LED indicator lights when the correct signal is fed.
		Burst Gate	● Inputs external modulation burst gate signals
14	I / Q Output		● Output adjustment and output connector for the internally generated I/Q signal ● When the I/Q OUTPUT adjustment is on, the LED indicator lights to indicate that the output can be adjusted.
		Offset	● Adjusts the offset of the I/Q signal
		Balance	● Adjusts the balance of the I/Q signal
		Phase	● Adjusts the phase of the I/Q signal
		I, Q	● Outputs the I/Q signal (50/600 Ω)
15	I / Q Input		● Input adjustment and input connector for the external I/Q signal. When the I/Q signal is externally fed, the I/Q INPUT LED indicator lights. When the I/Q Input adjustment is on, the LED lights to indicate that the input can be adjusted.
		Offset	● Adjusts the offset of the I/Q signal
		Balance	● Adjusts the balance of the I/Q signa
		I, Q	● Inputs the I/Q signal (50/100 kΩ)
16	Pulse Mod Input		● Connector for feeding a TTL pulse modulation signal; when the pulse modulation signal is fed externally, the LED indicator lights.
17	RF Output 50 Ω 0.3-2750 MHz		● Connector for outputting the RF signal ● Provided with a reverse-power protection circuit

*1 The connector label and function maybe differs from the above, depending on the expansion unit.
Please, read each the Operation Manual, carefully.

3.1.3 Rear panel layout

Rear Panel Layout (1/1)

No.	Marking		Functional description
18	Local 1.5GHz Output / Input		● Output connector for the internal local signal and input connector for the external local signal. Normally, these two connectors are connected with a U-link.
19	Input Burst Trig*1		● Input connector for the external burst trigger signals
20	Output*1		● Output connector for monitoring the internal modulation signals (TTL level except for I/Q DC signal)
		Data	● Output connector for the modulation data signal
		Clock	● Output connector for the clock signal
		Symbol Clock	● Output connector for the symbol clock signal
		Burst Gate	● Output connector for the burst gate signal
		Burst Trig	● Output connector for the burst trigger signal
		Pattern Sync	● Output connector for the modulation pattern synchronous signal
		I DC	● Output connector for the I signal (DC), (600 Ω)
		Q DC	● Output connector for the Q signal (DC), (600Ω)
21	Fan		● Internal cooling fan
22	Reference		● Output connector for the internal reference signal (10 MHz) and input connector for external reference signals. Normally, the Output and the Input connectors are connected with a U-link.
		Output	● Output connector for the internal reference signal (10 MHz)
		Input	● Input connector for external reference signals (10/13 MHz)
		Buffered Out	● General purpose buffered output connector for the reference signal (10 MHz) used
23	GPIB		● GPIB connector; when the GPIB cable is not connected, cover this connector with the attenuation cap to prevent power leakage.
24	Line On / Off		● Switches the power on and off. If this switch is off, the power cannot be switched on even if the power switch on the front panel is turned on.
25	Fuse		● Power fuse; use only fuses with the specified rating to ensure safety.
26	Chassis ground terminal		● Two-core power cords must be connected to ground to ensure safety
27	Power inlet		● Use only voltage supplies with the specified rating in order to ensure safety
28	Extension Connector*2		● Output connector for extended use. (BNC connectors: 3 pc, 25-pin connector: 1 pc)

*1 The connector label and function maybe differs from the above, depending on the expansion unit. Please, read each the operation Manual, carefully.

*2 This Extension Connector is not provided on the MG3671A.

3.1.4 Panel layout diagram

Figures 3-1 and 3-2 illustrate the MG3671A front and rear panels.

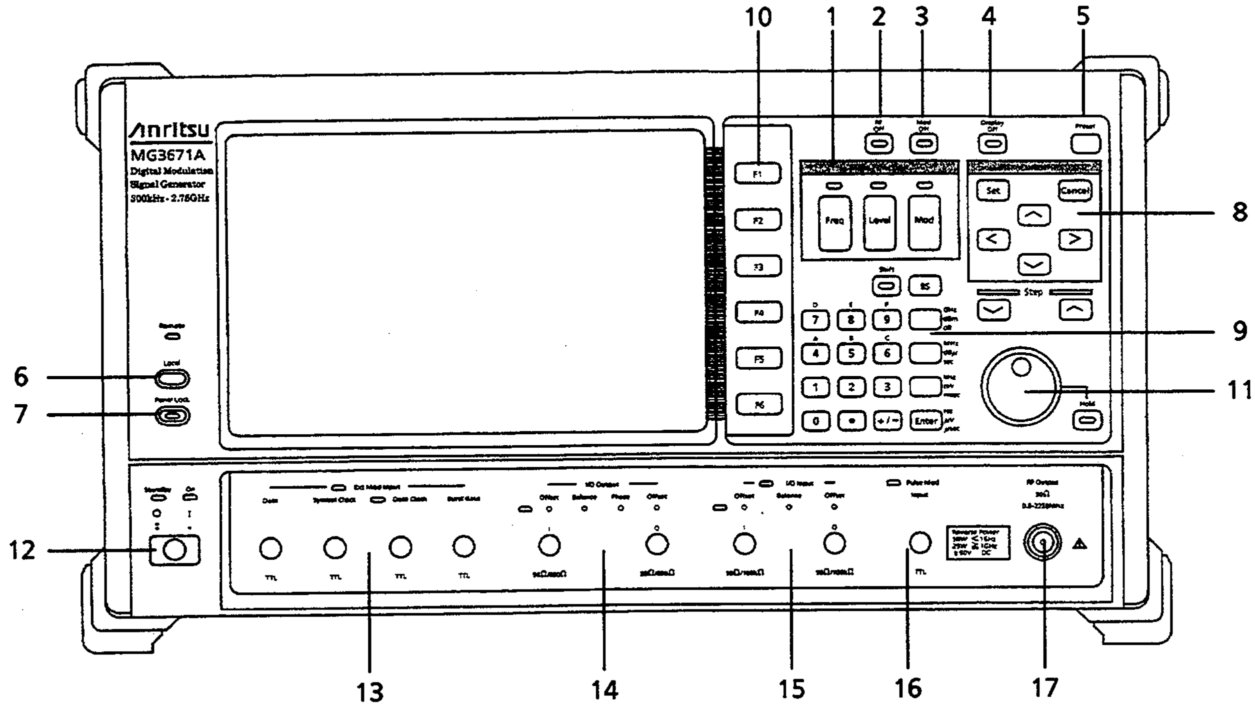


Fig. 3-1 Front Panel (MG3671A)

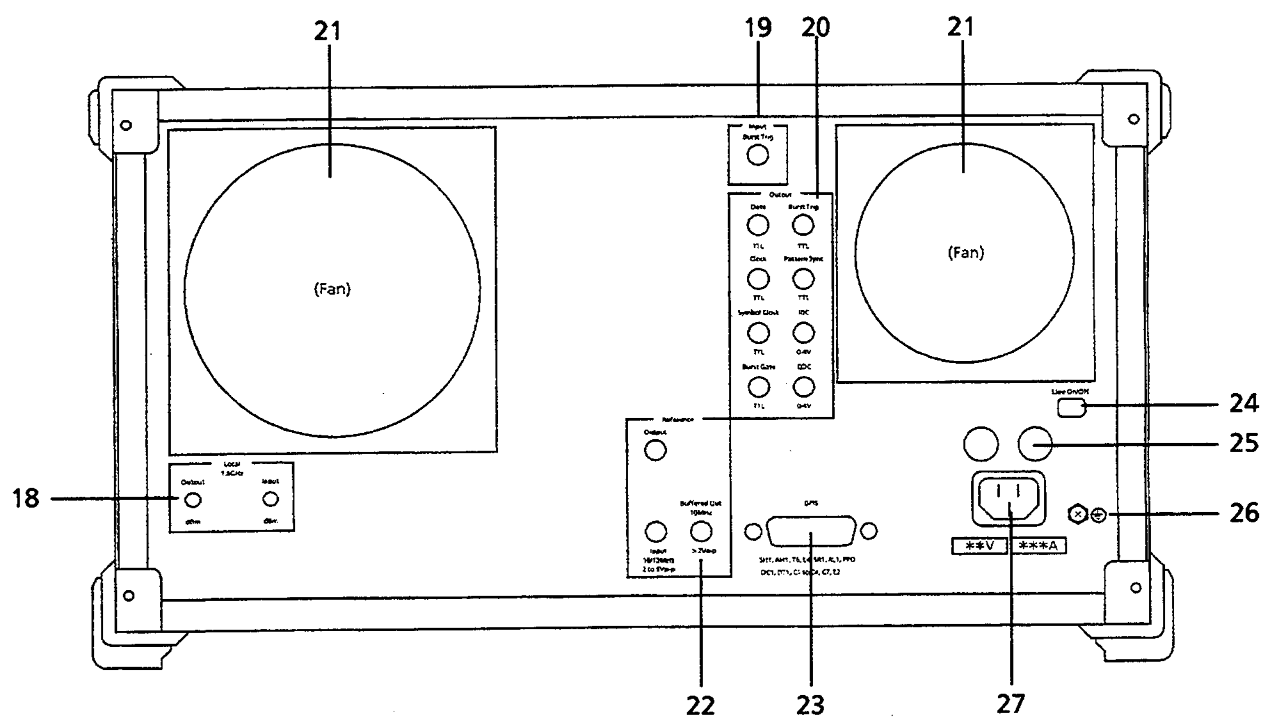


Fig. 3-2 Rear Panel (MG3671A)

Figures 3-3 and 3-4 illustrate the MG3671B front and rear panels.

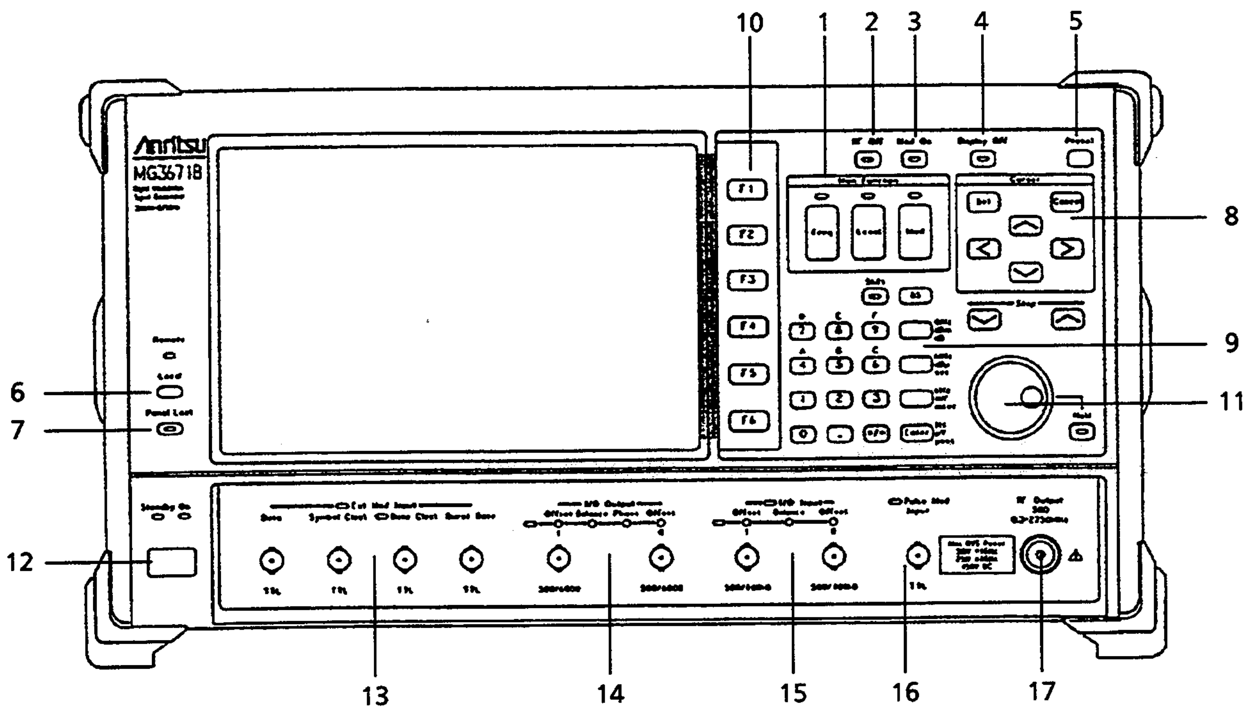


Fig. 3-3 Front Panel (MG3671B)

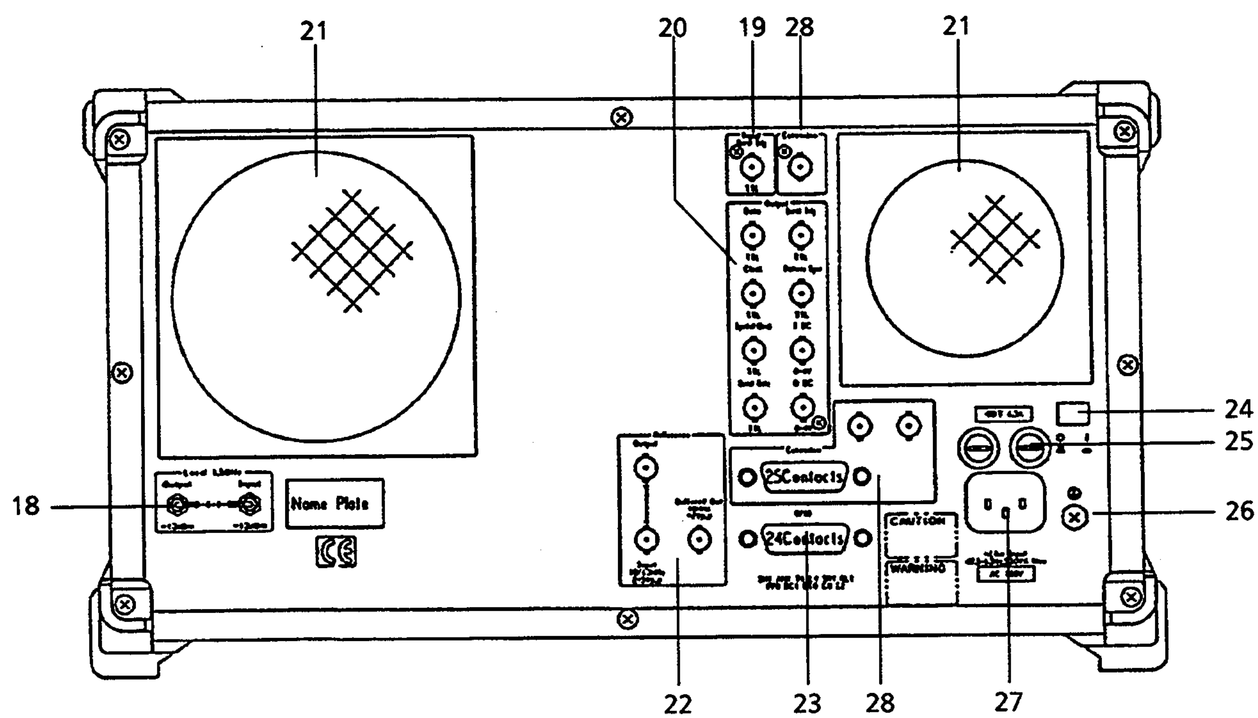


Fig. 3-4 Rear Panel (MG3671B)

3.2 Outline of Operation

The MG3671A/B digital modulation signal generator is operated based on the display shown on its screen. The screen transition diagram is shown on page 3-11. The settings made in each screen are outlined below.

Note: *See Section 4 for details on how to operate the MG3671A/B digital modulation signal generator. Appendix A 'Screen Transition' shows the screen flow as well as the setting items and function keys of each screen.*

(1) Parameter setting screen:

- Frequency setting mode .... Sets the frequency.

  Set items: Frequency, incremental step, offset, display resolution

  Display mode: Offset, relative

  Memory: Stores, recalls and deletes up to 1,000 frequency settings

- Output level setting mode .... Sets the output level.

  Set items: Output level incremental step, offset, display resolution, display unit

  Display mode: Offset, relative

  Output mode: Normal mode, continuous variable mode (20 dB width)

- Modulation parameter setting mode ..... Sets the modulation parameter.

  Items set: I/Q signal source, system, filter, burst, pattern, burst trigger and others (setting items depend on the system.)

- Screen transition mode .... Switches to the IF/RF setup screen, baseband setup screen, interface setup screen, setup screen, hardware check screen and the parameter save/recall/delete/list screen.

(2) Internal modulation data setting screen:

Item set: Slot frame pattern

Memory: Up to 100 sets of modulation data can be stored, deleted and displayed in each system.

(3) IF/RF setup screen:

Items set: Reference frequency, output level upper limit, external I/Q signal and its corresponding I/O compensation, pulse modulation

(4) Baseband setup screen:

Items set: Modulation data and data clock, external I/O modulation signal (data, data clock, symbol clock, burst gate), burst trigger I/O signal, pattern synchronous output signal

(5) Interface setup screen

Items set: GPIB address, buzzer,

Display of installed units

(6) Hardware check screen

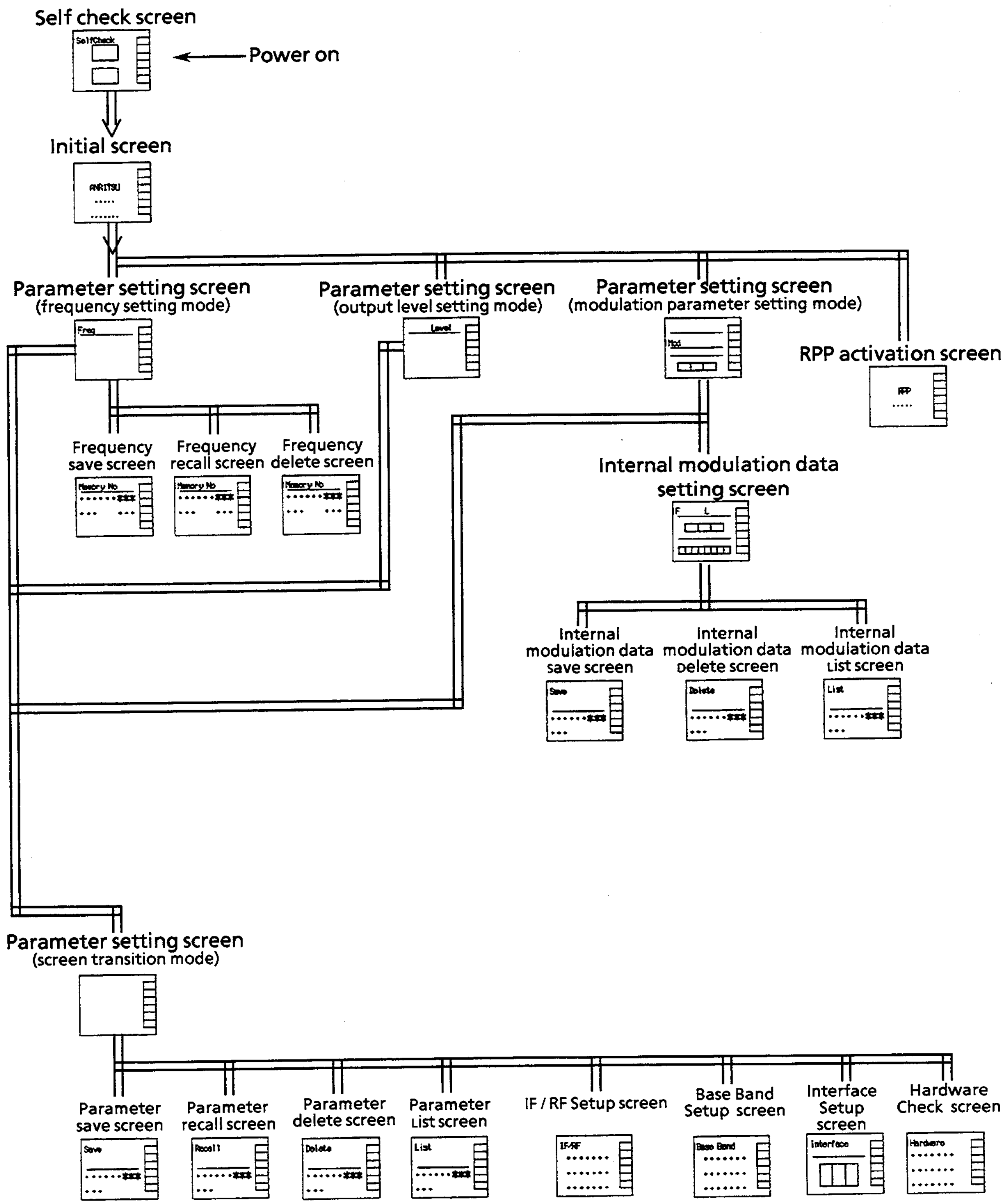
Display of self-check results at power on

(7) Parameter save/recall/delete/list screen

Memory: Stores, recalls, deletes and lists up to 100 parameter combinations set on the front panel.

(8) RPP activation screen ... This screen is displayed when the reverse power protection (RPP) circuit is activated. In this case, reset the RPP circuit to return the MG3671A/B Digital Modulation Signal Generator to its previous operating condition.

Screen Transition Diagram



SECTION 4
PANEL OPERATING INSTRUCTIONS

This section explains the manual operation of the MG3671A/B Digital modulation Signal Generator. See the Section on "GPIB Remote Operation" for details on remote operation.
The setting screens, setting items, and key operations may differ a little from the description in this section, depending on the unit to be used. Please, also refer to the operation manual of the unit.

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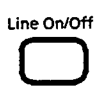
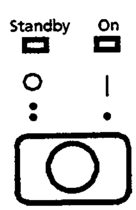
SECTION 4
PANEL OPERATING INSTRUCTIONS

4.1 Initial Power On

CAUTION

*If the AC line voltage is unsuitable, the MG3671A/B may be damaged by an abnormal voltage. Before turning on the power, confirm that the AC line voltage is the rated value ** Vac.*

Switch on the power in accordance with the following procedures:

Step	Action	Verification
1	Verify that the power supply has reached the specified level and that protective grounding has been implemented.	• See paragraphs 2.2 and 2.3.
2	 Set the rear-panel Line On / Off switch to On.	• Power is supplied to the thermostatic oven heater of the reference crystal oscillator and the Standby lamp of the power switch on the front panel lights. Leave the MG3671A/B in this condition for more than 30 minutes to warm it up in order to stabilize the reference crystal oscillator.
3	 Set the front-panel Power Standby / On switch to On.	• The On lamp of the power switch on the front panel lights. Power is then supplied to all circuits.

When the power is switched on, all LEDs are turned on and the main instrument and the units are automatically self-diagnosed. In the Self Check screen, the decision result displays 'Pass' or 'Fail' successively if it is acceptable,or unacceptable, respectively. If either the CPU, ROM or timer of the main instrument fails, or if a part (ASP-1, ASP-2, PANEL) of the PCB is not connected, self-diagnosis stops in the Self Check screen.

If no defects are found, the initial screen (Anritsu, MG3671A/B display) is displayed for one second and then the parameter setting screen appears. The panel settings return to their conditions before the power was switched off (i.e., preceding settings).

If the power is switched off while pressing the Preset key located in the upper right-hand corner of the front panel, all settings including the memory are initialized. To initialize the panel settings only without initializing, press the Preset key. (☞ See paragraph 4.8).
If power is interrupted momentarily, the settings before power interruption are retained

MG3671A Digital Modulation Signal Generator

Self Check

Main

1. CPU -------- Pass
2. ACRTC -------- Pass
3. ROM -------- Pass
4. RAM -------- Pass
5. GPIB -------- Pass
6. TIMER -------- Pass

Unit

1. MG0303B ROM ---- Pass
2. MG0303B RAM ---- Pass
3. MG0301C ROM ---- Pass
4. MG0302A ROM ---- Pass

<Initial screen>

MG3671A Digital Modulation Signal Generator

Anritsu

MG3671A

DIGITAL MODULATION SIGNAL GENERATOR

4.2 Description of Each Screen

The contents of a screen depend on the settings being made. However, there are some contents that are common to all screens, and these are explained as follows:
The figures of the screens used in this section are described with those of the MG3671A, unless otherwise noticed.
The screens on the MG3671B are the same as the MG3671A, excepting the model name display at the top. Use the screens for the MG3671B after changing the model name.

(1) Screen layout

In the parameter setting screen, the frequency is displayed on the upper left, the output level on the upper right, the modulation parameter on the lower left and the function keys on the right side of the screen.

(2) Cursor

- The cursor is displayed in reverse-video. However, there is no cursor in GPIB remote mode.
- The cursor can be navigated through items enclosed within '[' and ']'.
- If the cursor is moved and the Set key is pressed, a window will open.

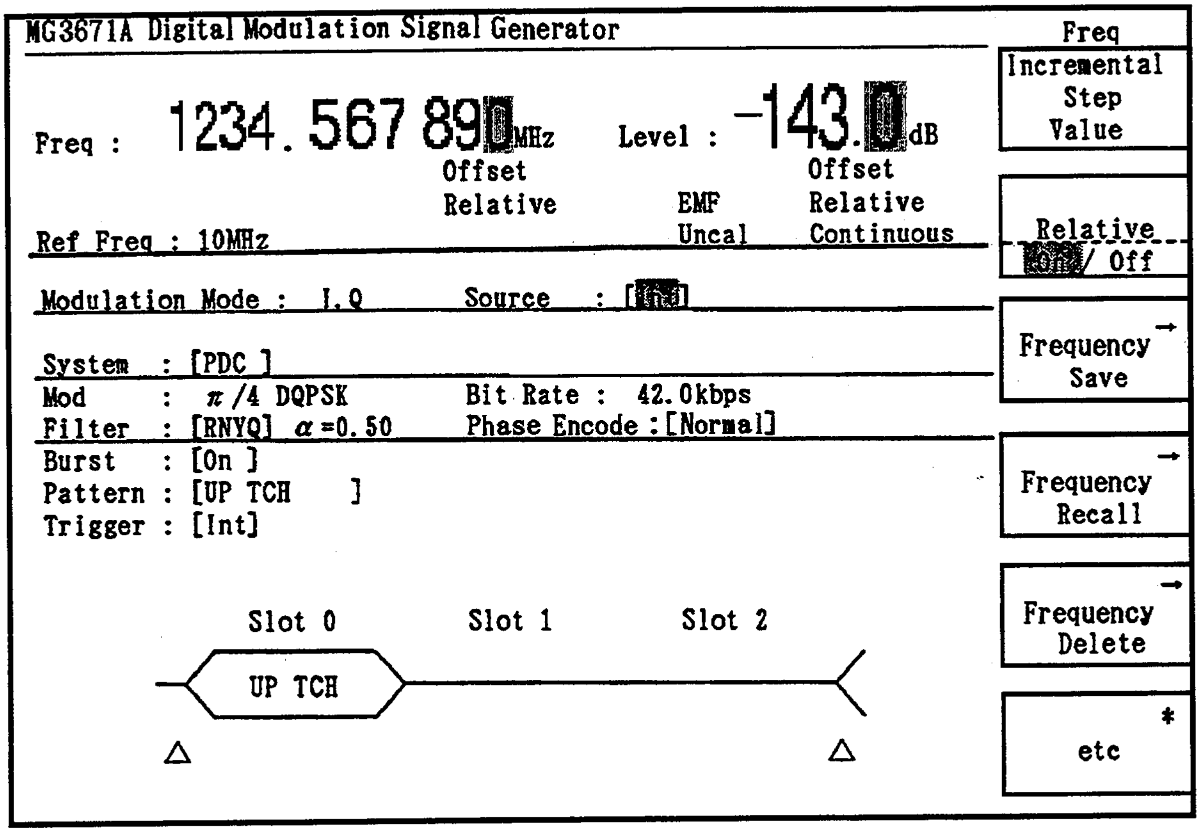
(3) Inputting data

Parameter data are input in window format as shown below.

Step	Procedure
1	Move the cursor to the parameter to be set using the [∧], [∨], [<], and [>] Cursor keys.
2	Press the Set key to open a window.
3	To input or select a number, use the [∧] and [∨] Cursor keys, [∧] and [∨] Step keys, and the rotary knob. To correct an entry, use the BS key to delete the entry and then re-input it.
4	If a ▷ mark is indicated in the window, press the Set or Enter key to advance to a sub-window (window of lower hierarchy) in which data will be set.
5	Press the Set or ENTER key to validate the settings and close the window.
6	To return the setting values to the previous settings and close the window, press the Cancel key.

(4) Function keys

- If an '*' is displayed inside the frame of a function key, press that key to display the sub-function keys (lower hierarchy keys) that belong to it. If an '→' is displayed inside the frame of a function key, press that key to switch from the current screen to another.
- For items having two selections, press the appropriate function key to switch between the two selections.



4.3 Setting Carrier Frequency

4.3.1 Setting the carrier frequency

Press the Main Function section Freq key on the front panel to switch to carrier frequency (hereinafter referred to as frequency) setting mode. The Freq key's LED will light and the cursor is displayed in the frequency setting area.

There are three methods of setting the frequency:

- Setting the frequency using the data keys
- Setting the frequency using the rotary knob
- Setting the frequency using [∧] and [∨] Step keys

Frequency setting range	0 to 2.75 GHz
Minimum frequency resolution	1 Hz
Initial frequency setting	10 MHz

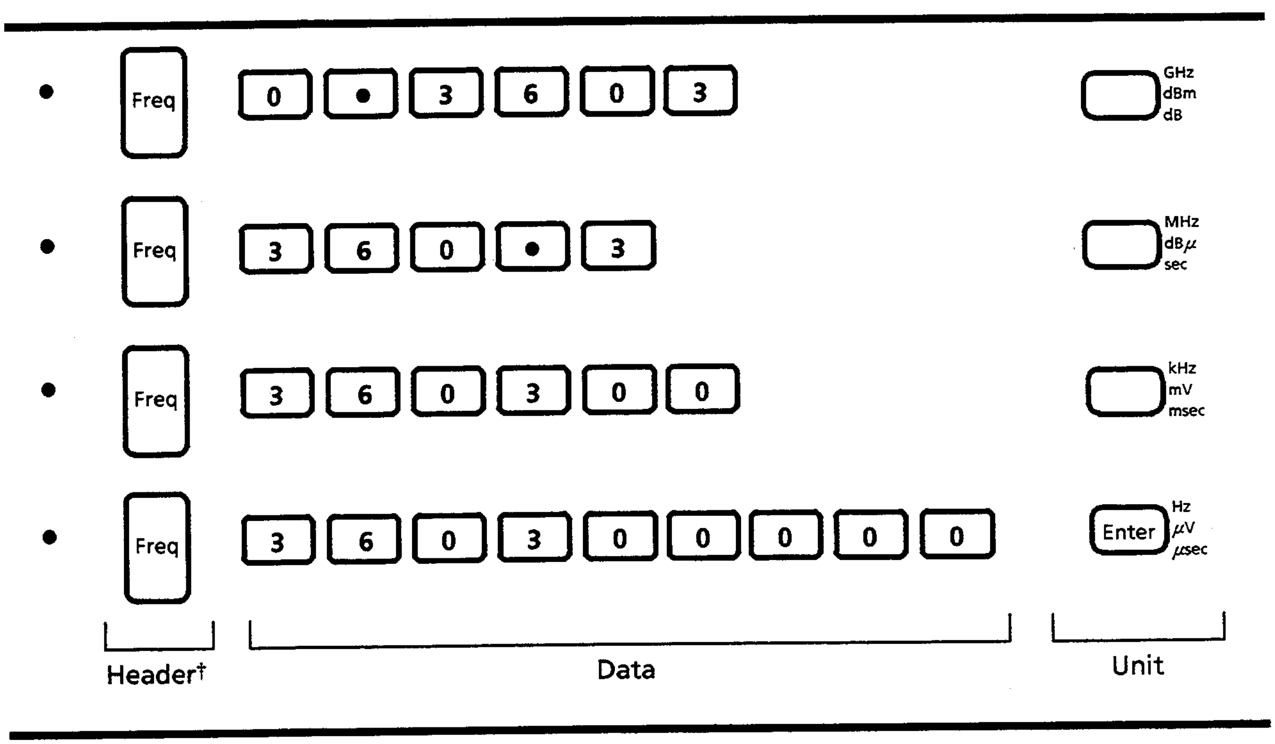
Note: *An error occurs if the upper (2.75 GHz) and lower (0 Hz) frequency limits are exceeded. 'Uncal' is indicated when the frequency is set within the 0 to 300 kHz range. The lower frequency limit depends on the system. Refer to the user's manual of each modulation unit.*

(1) Setting the frequency using the data keys

When a data key is pressed in the frequency setting mode, the frequency setting window opens and the data entered is echoed back in the window. After data is entered and a unit key is pressed, the set frequency is displayed in the frequency setting field.

To set the frequency using data keys, follow the procedures below.

Example: Shown below are four key operation methods for setting 360.3 MHz.



† If the Freq key's LED is already lit, there is no need to press the Freq key.

The window display will be as shown below when the second key operation method on the preceding page is used.

Step	Action	Window display
1	Freq	Enters the frequency setting mode and lights the Freq key's LED. `Entry[3 ] Min: 0Hz Max:2.75GHz`
2	3	If a data key is pressed, the frequency setting window opens and the data entered is echoed back in the window.
3	6	`Entry[36 ] Min: 0Hz Max:2.75GHz`
4	0	`Entry[360 ] Min: 0Hz Max:2.75GHz`
5	•	`Entry[360. ] Min: 0Hz Max:2.75GHz`
6	3	`Entry[360.3 ] Min: 0Hz Max:2.75GHz`
7	MHz dBμ sec	Press the unit key, and the data entered is validated and the window closes. The frequency displayed will be 360.300000 MHz.

Notes:
- *If the Set key is pressed instead of the unit key, the data entered is treated as Hz.*
- *If a number less than 1 Hz is attempted to be set, the number is truncated.*
- *An error message is displayed if a frequency beyond the displayed range is attempted to be set. The current frequency setting is then displayed without setting the attempted frequency.*

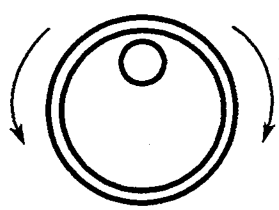
(2) Setting the frequency using the rotary knob

The rotary knob can be used to increment or decrement the frequency by the amount (increment or decrement resolution) set using the [<] and [>] Cursor keys.

The resolution can be set between 1 Hz and 1 GHz. The initial resolution is 1 Hz. The position of the resolution setting column is displayed in reverse video. If the CURSOR keys are held down continuously, the cursor moves one digit at a time.

To set the frequency using the rotary knob, follow the procedures below.

Example: This example sets the frequency to 360.3 MHz and continuously varies the frequency at a resolution of 10 Hz.

Step	Action	Verification
1	[Freq]†	Enters the frequency setting mode and lights the Freq key's LED. The cursor is then displayed on the resolution setting column in the frequency setting field.
2	[3] [6] [0] [•] [3] [MHz/dBμ/sec]	Sets the frequency to 360.3 MHz.
3	Cursor [<] or [>] Set the resolution in the frequency setting field to 10 Hz.	The resolution is set to 10Hz.
4	Down  Up	Use of the rotary knob allows the frequency to vary continuously in 10 Hz steps

† If the Freq key's LED is already lit, there is no need to press the Freq key.

Notes: *Disabling the rotary key using the Hold key*

- *If the Hold key is pressed, the Hold key's LED lights and the frequency cannot be varied even if the rotary knob is turned.*
- *If the Hold key is pressed again, the Hold key's LED is turned off and the rotary knob is released from its hold condition.*

The hold condition does not change even if other header keys are pressed.

(3) Setting the frequency using the Step key

hen the Step key is pressed in the frequency setting mode, the frequency is incremented or decremented by an amount equal to the incremental step frequency that has been set. If the Step key is held down continuously, the frequency is incremented or decremented continuously.

■ Setting the incremental step frequency

When the ' Incremental Step Value ' F1 soft key is pressed in the frequency setting mode, the incremental step frequency setting window opens and the currently set incremental step frequency is displayed.

At this time, set the incremental step frequency using the data and unit keys. If the incremental step frequency is set using the Step key or rotary knob, press the Set key after setting.

Incremental step frequency setting range .... 1 Hz to 2.75 GHz
Minimum incremental step frequency resolution .... 1 Hz
Initial incremental step frequency setting .... 1 MHz

To set the frequency using the Step key, follow the procedures below.

Example: This example sets the frequency to 360.3 MHz and increments or decrements the frequency in 12.5 kHz steps.

Step	Action	Verification
1	[Freq]†	Enters the frequency setting mode and lights the Freq key's LED.
2	[3] [6] [0] [•] [3] [MHz/dBμ/sec]	Sets the frequency to 360.3 MHz.
3	[Incremental Step Value] [F1]	Opens the incremental step frequency setting window and displays the current incremental step frequency setting.
4	[1] [2] [•] [5] [kHz/mV/msec]	Sets the incremental step frequency to 12.5 kHz.
5	Press the [⌃] Step key.	Increments the frequency by 12.5 kHz to 360.3125 kHz.
6	Press the [⌄] Step key.	Decrements the frequency by 12.5 kHz to 360.3 MHz.

† If the Freq key's LED is already lit, there is no need to press the Freq key.

Notes: *If the incremental step frequency is entered using the data keys, the incremental step frequency is entered in Hz unit when the Set key is pressed instead of the unit key.*

4.3.2 Setting the carrier frequency display mode

Normally, the frequency displayed is the actual frequency value. However, the following modes can be set to change the displayed value.

- Frequency offset mode .... Mode in which the displayed value and the actual output value differ by an amount referred to as the Offset Value.
- Relative frequency display mode .... Mode in which the displayed value is relative to a given value

(1) Frequency offset mode

If the ' Offset On/Off ' F2 soft key is pressed and switched on in the frequency setting mode, the offset mode is set and Offset is displayed.

At this time, the actual output frequency does not change, but the displayed frequency increases by an amount equal to the offset value.

Displayed frequency = Actual output frequency + frequency offset value

When the offset mode is on, press the ' Current Frequency ' F3 soft key to display the actual output frequency in 1-second intervals for verification.

■ Setting the offset frequency value

When the ' Offset Value ' F1 soft key is pressed in the frequency setting mode, the offset frequency setting window opens and the currently set offset frequency is displayed. At this time, set the offset frequency using the data and unit keys.

If the offset frequency is set using the Step key or rotary knob, press the Set key after setting.

Offset frequency setting range .... −2.75 to +2.75 GHz
Minimum offset frequency setting resolution .... 1 Hz
Initial offset frequency setting value .... 0 Hz

Notes:
- *If the offset frequency is entered using the data keys, the offset frequency is entered in Hz unit when the Set key is pressed instead of the unit key.*
- *' Current Frequency ' F3 soft key appears only at the offset frequency mode.*

Example: In this example, the offset frequency is set to 25 kHz and the output frequency to 360.3 MHz. The displayed frequency in offset mode will be 360.325 MHz.

Step	Action	Verification
1	[Freq]†	Enters the frequency setting mode and lights the Freq key's LED.
2	etc [F6]	Freq menu 2 is displayed. (☞ See Appendix A.)
3	Offset Value [F1]	The offset setting window opens and the current offset value is displayed. (☞ See Appendix A.)
4	[2] [5] [kHz mV msec]	Set the offset value to 25 kHz.
5	[3] [6] [0] [•] [3] [MHz dBμ sec]	Sets the frequency to 360.3 MHz.
6	Offset On/Off [F2]	The offset mode is set and a frequency of 360.325 MHz is displayed.

† If the Freq key's LED is already lit, there is no need to press the Freq key.

(2) Relative frequency display mode

If the 'Relative On/Off' F2 soft key is pressed and switched on in the frequency setting mode, the relative frequency display mode is set and Relative is displayed. At this time, the frequency value relative to the frequency value before the key was switched on is displayed. A frequency of 0 Hz is displayed immediately after On is set.

When the Relative soft key is on and the relative frequency is varied using the rotary knob or Step key, the actual frequency output is as follows:

Output frequency = Relative frequency display value + preceding frequency set to On

When the Relative soft key is on and the frequency is set using the data key, the actual frequency is set and the displayed value is as follows:

Relative frequency display value = output frequency − preceding frequency set to On

When the relative mode is on, press the 'Current Frequency' F3 soft key to display the actual output frequency in 1-second intervals for verification.

Example: In this example, the incremental step frequency is set to 12.5 kHz and the output frequency to 360.3 MHz. The frequency in relative mode is incremented by 12.5 kHz.

Step	Action	Verification
1	[Freq]†	Enters the frequency setting mode and lights the Freq key's LED.
2	Incremental Step Value [F1]	The incremental step setting window opens and the current incremental step value is displayed. (☞ See Appendix A.)
3	[1] [2] [•] [5] [kHz/mV/msec]	Sets the incremental step value to 12.5 kHz. (☞ See Appendix A.)
4	[3] [6] [0] [•] [3] [MHz/dBμ/sec]	Sets the frequency to 360.3 MHz.
5	Offset On/Off [F2]	The offset mode is set and a frequency of 0 Hz is displayed.
6	Press the [︿] Step key.	The frequency is incremented by 12.5 kHz and a frequency of 12.5 kHz is displayed.

† If the Freq key's LED is already lit, there is no need to press the Freq key.

4.3.3 Carrier frequency memory

The MG3671A/B can store, recall and delete as much as 1,000 carrier frequency settings.
The ' Frequency Recall ' F4 soft key and the ' Frequency Delete ' F5 soft key are displayed for recall and deletion when frequency data are stored.

Memory location number range .... 0 to 999
Initial memory location number 0

(1) Frequency save (storing a frequency setting)

If the ' Frequency Save ' F3 soft key is pressed in the frequency setting mode, the frequency save screen is displayed. Specify the memory location number using the data keys, rotary knob, Step keys or the Cursor keys. Press the Set or Enter key to store the frequency in the specified memory location.

The initial memory location is the currently available memory having the smallest number.

If a frequency setting is already stored in the memory location that was specified, a Yes/No window opens to verify if the current frequency setting will be overwritten or not. The initial value is No. Use the Cursor keys to select Yes and then press the Set key to overwrite the frequency currently stored. After the frequency has been saved, the MG3671A/B returns to the frequency setting mode.

Example: In this example, the output frequency is set to 360.3 MHz and then saved in memory location number 10.

Step	Action	Verification
1	[Freq]†	Enters the frequency setting mode and lights the Freq key's LED.
2	[3] [6] [0] [•] [3] [MHz/dBμ/sec]	Sets the frequency to 360.3 MHz.
3	[Frequency Save] [F3]	The frequency save screen appears.
4	[1] [0] [Set]	Specifies memory location number 10. (If a frequency setting is already stored in memory location 10, a Yes/No window opens to verify if the current frequency setting will be overwritten or not. The initial value is No. Use the CURSOR keys to select Yes and then press the Set key to overwrite the current frequency setting.)

† If the Freq key's LED is already lit, there is no need to press the Freq key.

(2) Frequency recall (Retrieving a frequency from memory)

If the 'Frequency Recall' F4 soft key is pressed in the frequency setting mode, the frequency recall screen is displayed. Specify the memory location number using the data keys, rotary knob, Step keys or the Cursor keys. Press the Set or Enter key to retrieve the frequency from the specified memory location.

The initial memory location is the currently saved memory having the smallest number.

If there is no frequency stored in the specified memory location, the cursor moves only to the memory location. After the frequency has been retrieved, the MG3671A/B returns to the frequency setting mode.

Example: In this example, the output frequency is set to 360.3 MHz, saved into memory location number 10 and then retrieved for confirmation.

Step	Action	Verification
1	[Freq]†	Enters the frequency setting mode and lights the Freq key's LED.
2	[3] [6] [0] [•] [3] [MHz dBμ sec]	Sets the frequency to 360.3 MHz.
3	Frequency Save [F3]	The frequency save screen appears.
4	[1] [0] [Set]	Specifies memory location number 10. (The frequency is stored into memory location 10 and then the MG3671A/B returns to the frequency setting mode.)
5	Frequency Recall [F4]	The frequency recall screen appears.
6	[1] [0] [Set]	Retrieves the frequency stored in memory location 10.

† If the Freq key's LED is already lit, there is no need to press the Freq key.

(3) Frequency Delete (Deleting a frequency from memory)

When the ' Frequency Delete ' F5 soft key is pressed in the frequency setting mode, the frequency delete screen appears. Specify the memory location number using the data keys, rotary knob, Step keys or the Cursor keys and then press the Enter or the Set key.

A Yes/No window opens to verify whether to delete the frequency or not. The initial value is No. Use the Cursor keys to select Yes and then press the Set key to delete the frequency.

After the frequency has been deleted, the MG3671A/B does not return to the frequency setting screen, allowing other frequency settings to be deleted. The initial memory location is the currently saved memory having the smallest number. If there is no frequency stored in the specified memory location, the cursor moves only to that memory location.

When the ' Delete All ' F4 soft key is pressed in the frequency delete screen, ' All ' is displayed in the memory number item and all the frequency settings are displayed in reverse-video. A Yes/No windows opens to verify whether or not to delete all frequency settings. The initial value is No. Use the Cursor keys to select Yes and then press the Set key to delete all of the frequency settings.

Example: In this example, the output frequency is set to 360.3 MHz, saved into memory location number 10 and then deleted.

Step	Action	Verification
1	[Freq]†	Enters the frequency setting mode and lights the Freq key's LED.
2	[3] [6] [0] [•] [3] [MHz/dBμ/sec]	Sets the frequency to 360.3 MHz.
3	Frequency Save [F3]	The frequency save screen appears.
4	[1] [0] [Set]	Specifies memory location number 10. (The frequency is stored into memory location 10 and then the MG3671A/B returns to the frequency setting mode.)
5	Frequency Delete [F4]	The frequency delete screen appears.
6	[1] [0] [Set]	Specifies memory location number 10. (A Yes/No window opens to verify whether or not to delete the frequency setting. The initial value is No.)

† If the Freq key's LED is already lit, there is no need to press the Freq key.

4.4 Setting Output Level

4.4.1 Setting the output level

Press the Main function section Level key on the front panel to switch to output level setting mode. The Level key's LED will light and the cursor key is displayed in the output level setting area.

There are three methods of setting the output level:

- Setting the output level using the data keys
- Setting the output level using the rotary knob
- Setting the output level using [∧] and [∨] Step keys

Output level setting range .... −143 to +13 dBm
Minimum output level setting resolution .... 0.1 dB
Initial output level setting .... −30 dBm

The minimum output level setting resolution is 0.1 dB, regardless of the unit. The table below shows the setting ranges for each output level unit and the minimum resolution for each range.

Unit	Output level	Minimum	
		Display resolution	Output level resolution
dBm	−143.0 to 13.0 dBm	0.1 dB	0.1 dB
dBμ	−30.0 to 126.0 dBμ (−36.0 to 120.0 dBμ)†	0.1 dB	0.1 dB
V	2.00 to 1.00 V (1.00)	0.01 V	0.1 dB
mV	999 to 100 mV 99.9 to 10.0 mV 9.99 to 1.00 mV	1 mV 0.1 mV 0.01 mV	0.1 dB 0.1 dB 0.1 dB
μV	999 to 100 μV 99.9 to 10.0 μV 9.99 to 1.00 μV 0.999 to 0.032 μV (0.016)	1 μV 0.1 μV 0.01 μV 0.001 μV	0.1 dB 0.1 dB 0.1 dB 0.1 dB

† Items enclosed in parentheses represents terminated voltage display.

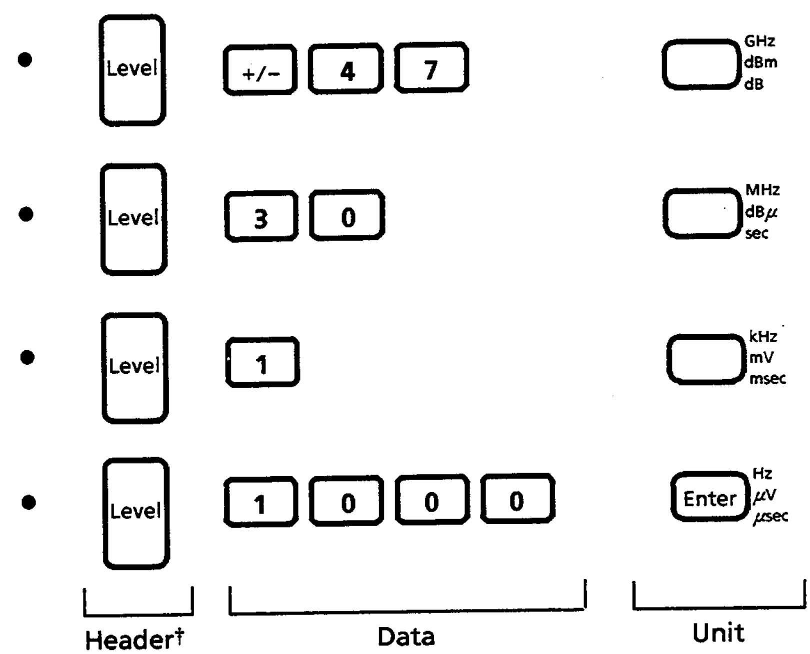
Notes:
- *If the output level specified exceeds the upper (13.0 dBm) or lower limit (−143.0 dBm) level defined in the IF/RF setup screen, error occurs.*
- *If the output level is set between −143.0 to −136.1 dBm, "Uncal" is displayed.*

(1) Setting the output level using the data keys

When a data key is pressed in the output level setting mode, the output level setting window opens and the data entered is echoed back in the window. After data is entered and a unit key is pressed, the set output level is displayed in the output level setting field.

To set the output level using data keys, follow the procedures below.

Example: Shown below are four methods of setting −47 dBm (30 dBμ, 1 mV, 1000μV) using the data keys.



† If the Level key's LED is already lit, there is no need to press the Level key.

The window display will be as shown below when the first key operation method on the preceding page is used.

Step	Action	Window display
1	Level	Enters the output level setting mode and lights the Level key's LED. Entry[-]Min:-143.0dB■Max:13.0dB■
2	+/-	If a data key is pressed, the output level setting window opens and the data entered is echoed back in the window.
3	4	Entry[- 4]Min:-143.0dB■Max:13.0dB■
4	7	Entry[- 47]Min:-143.0dB■Max:13.0dB■
5	GHz dBm dB	If the unit key is pressed, the data entered is validated and the window closes. The output level displayed will be −47.0 dBm.

Notes:
- *If the Set key is pressed instead of the unit key, the unit currently displayed is used.*
- *If a number less than 0.1 dB is set, the number is truncated.*
- *An error message is displayed if an output level beyond the displayed range is set. The current output level setting is then displayed without setting the attempted output level.*

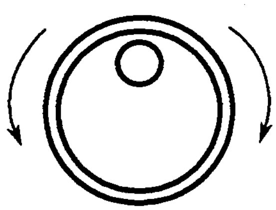
(2) Setting the output level using the rotary knob

The rotary knob can be used to increment or decrement the output level by the amount (increment or decrement resolution) set using the 【 < 】 and 【 > 】 Cursor keys.

If the Cursor keys are held down continuously, the cursor moves one digit at a time. The initial column is the rightmost column. The position of the resolution setting column is displayed in reverse video.

To set the output level using the rotary knob, follow the procedures below.

Example: This example sets the output level to 30 dBμ and varies the level at a resolution of 1 dB.

Step	Action	Verification
1	[Level]†	Enters the output level setting mode and lights the Level key's LED. The cursor is then displayed on the resolution setting column in the output level setting field.
2	[3] [0] [GHz/dBm/dB]	Sets the output level to 30 dBμ.
3	Cursor [<] or [>]	Sets the resolution in the output level setting field to 1 dB.
4	Down  Up	Use the rotary knob to vary the output level in a resolution of 1 dB steps.

† If the Level key's LED is already lit, there is no need to press the Level key.

Notes: *Disabling the rotary key using the Hold key:*

- *If the Hold key is pressed, the Hold key's LED lights and the output level cannot be varied even if the rotary knob is turned.*
- *If the Hold key is pressed again, the Hold key's LED is turned off and the rotary knob is released from its hold condition.*

The hold condition does not change even if other header keys are pressed.

(3) Setting the output level using the Step key

When the Step key is pressed in the output level setting mode, the output level is incremented or decremented by an amount equal to the step output level that has been set. If the Step key is held down continuously, the level is incremented or decremented continuously.

■ Setting the incremental step output level

When the ' Incremental Step Value ' F1 soft key is pressed in the output level setting mode, the step output level setting window opens and the currently set step output level is displayed. At this time, set the step output level using the data and GHz/dBm/dB unit key.

If the step output level is set using the Step key or the rotary knob, press the GHz/dBm/dB key after setting.

Incremental step output level setting range .... 0.1 to 156 dB
Minimum incremental step output level .... 0.1 dB
Initial incremental step output level setting .... 1 dB

To set the output level using the Step key, follow the procedures below.

Example: This example sets the output level to 30 dBμ and increments or decrements it in 1 dB steps.

Step	Action	Verification
1	[Level]†	Enters the output level setting mode and lights the Level key's LED.
2	[3] [0] [GHz/dBm/dB]	Sets the output level to 30 dBμ.
3	Incremental Step Value [F1]	Opens the step output value setting window and displays the current step output value setting.
4	[1] [GHz/dBm/dB]	Sets the step output level to 1 dB.
5	Press the [⌃] Step key.	Increments the output level by 1 dB to 31 dBμ.
6	Press the [⌄] Step key.	Decrements the frequency by 1 dB to 30 dBμ.

† If the Level key's LED is already lit, there is no need to press the Level key.

Notes: *If the incremental step output level is entered using the data keys, the step output level is entered in dB unit. when the Set key is pressed instead of the unit key.*

4.4.2 Setting the output level display mode

Normally, the output level displayed is the actual value of the output level. However, the following modes can be set to change the displayed value.

- Level offset mode .... Mode in which the displayed value and the actual output value differ by an amount referred to as the Offset Value.
- Relative level display mode .... Mode in which the displayed value is relative to a given value

(1) Level offset mode

If the 'Offset On/Off' F2 soft key is pressed and switched on in the output level setting mode, the offset mode is set and Offset is displayed.

At this time, the actual output level does not change, but the displayed output level increases by an amount equal to the offset value.

Displayed output level = Actual output level + output level offset value

When the offset mode is on, press the 'Current Level' F3 soft key to display the actual output level in 1-second intervals for verification.

■ Setting the output level offset value

When the 'Offset Value' F1 soft key is pressed in the output level setting mode, the offset frequency setting window opens and the currently set offset level is displayed. At this time, set the offset level using the data and GHz/dBm/dB keys.

Offset level setting range .... −55.0 to 55.0 dB
Minimum offset level setting resolution .... 0.1 dB
Initial offset level setting value .... 0 dB

Notes: • If the output level offset is entered using the data keys, the offset level is entered in dB unit when the Set key is pressed instead of the unit key.

• *'Current Level' F3 soft key appears only at the offset level mode.*

Example: In this example, the output level offset is set to 3 dB and the output level to 30 dBμ. The displayed output level in offset mode will be 33 dBμ.

Step	Action	Verification
1	[Level]† [3] [0] [GHz/dBm/dB]	Enters the output level setting mode and lights the Level key's LED.
2	etc [F6]	Level menu 2 is displayed. (☞ See Appendix A.)
3	Offset Value [F1]	The output level offset setting window opens and the current output level offset value is displayed.
4	[3] [GHz/dBm/dB]	Sets the output level offset value to 3 dB.
5	[3] [0] [MHz/dBμ/sec]	Sets the actual output level to 30 dBμ.
6	Offset On/Off [F2]	The offset mode is set and an output level of 33 dBμ is displayed.

† If the Level key's LED is already lit, there is no need to press the Level key.

(2) Relative level display mode

If the 'Relative On/Off' F2 soft key is pressed and switched on in the output level setting mode, the relative level display mode is set and Relative is displayed. 0 dB is displayed immediately after the Relative soft key is switched on.

When the Relative soft key is on and the relative output level is varied using the rotary knob or Step key, the actual output level is as follows:

Output level = Relative level display value + preceding output level set to On

When the Relative soft key is on and the level (relative level) is set using the data key, the actual output level is set and the displayed value is as follows:

Relative value = output frequency − preceding level set to On

When the relative mode is on, press the 'Current Level' F3 soft key to display the actual output level in 1-second intervals for verification.

Example: In this example, the incremental step value is set to 1 dB and the output level to 30 dBμ. The output level in relative mode is incremented by 3 dB.

Step	Action	Verification
1	[Level]†	Enters the level setting mode and lights the Level key's LED.
2	[Incremental Step Value] [F1]	The incremental step setting window opens and the current incremental step value is displayed. (☞ See Appendix A.)
3	[1] [GHz/dBm/dB]	Sets the incremental step value to 1 dB.
4	[3] [0] [MHz/dBμ/sec]	Sets the output level to 30 dBμ.
5	[Relative On/Off] [F2]	The relative mode is set and an output level of 0 dB is displayed.
6	Press the [∧] Step key three times	The output level is incremented by 3 dB and an output level of 3 dB is displayed.

† If the Level key's LED is already lit, there is no need to press the Level key.

4.4.3 Switching On / Off the output

When the RF Off key on the front panel is pressed, the output is switched between On and Off alternately. Also, the operation mode can be selected by the Release function. Operation in each mode is described below. The LED lights with the RF Off key set to off.

Normal mode

When the RF Off key is pressed, the RF output is set to Off. The RF Of key pressed again, the output level before it was switched Off is set. Also, the RF output is set to On by the operation below.

- Press the Unit key.
- Move the rotary knob by one click.
- Press the step key once.

When the output level is set, the level is output. Even when the output level is Off, an increment step value and offset value can be set.

Alternate mode

When the RF Off key is pressed, the RF output is set to Off. To set the RF output level to On, press the RF Off key. The RF output cannot be set to On by other operation(except for Preset key operation). Even when the output level is Off, an output level, increment step value, and offset value can be set. However, the output level settings are effective only by the ten keys.

Example: In this example, the output level is set to 30 dBμ and the output is switched off and then on.

Step	Action	Verification
1	Level †	Enters the level setting mode and lights the Level key's LED.
2	3 0 GHz/dBm/dB	Sets the output level to 30 dBμ.
3	RF Off	Switches the output level off.
4	RF Off	Switches the output level on and outputs 30 dBμ.

† If the Level key's LED is already lit, there is no need to press the Level key.

4.4.4 Selecting between open-circuit (EMF) voltage / terminated (TERM) voltage

For output levels in voltage units (dBμ, V, mV, μV), the ' Unit EMF/TERM ' F4 soft key can be used to select between open-circuit (EMF) voltage and terminated (TERM) voltage. When open voltage is selected, EMF is displayed.

This function does not work if the output level is in power unit (dBm) or relative level unit (dB).

● Initial setting .... Open-circuit (EMF) voltage

Example: This example sets the output level to terminated (TERM) voltage at 1 mV.

Step	Action	Verification
1	[Level]†	Enters the output level setting mode and lights the Level key's LED.
2	[1] [kHz/mV/msec]	Sets the output level to 1 mV.
3	Unit EMF/TERM [F4]	Specifies terminated (TERM) voltage

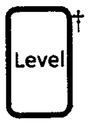
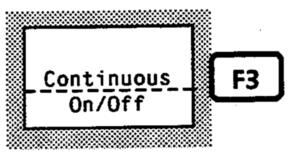
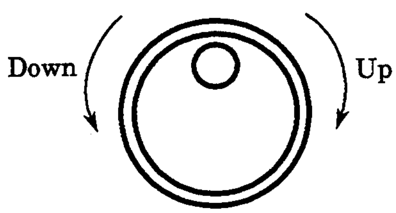
† If the Level key's LED is already lit, there is no need to press the Level key.

4.4.5 Continuous mode

Press the ' Continuous On/Off ' soft F3 key to activate continuous mode. In this mode, the rotary knob can be used to continuously vary the output level currently set by −12 to 8 dB (20 dB range) without signal interruption. In this mode, the Step and data keys cannot be used.

- Initial setting .... Continuous Off

Example: In this example, the output level is set to 30 dBμ and varied within the 38 to 18 dBμ range.

Step	Action	Verification
1		Enters the output level setting mode and lights the Level key's LED.
2		Sets the output level to 30 dBμ.
3		Activate Continuous mode.
4		Varies the output level using the rotary knob.

† If the Level key's LED is already lit, there is no need to press the Level key.

4.4.6 Changing the output level unit

Press the [dBm], [dBμ], [mV] or [μV] key on the front panel to change the displayed unit of the output level without changing the actual output.

● Initial setting .... dBm

Example: In this example, the output level is set to 30 dBμ and the unit is changed to dBm.

Step	Action	Verification
1	[Level]†	Enters the output level setting mode and lights the Level key's LED.
2	[3] [0] [MHz/dBμ/sec]	Sets the output level to 30 dBμ (−77 dBm).
3	[GHz/dBm/dB]	Sets the output level unit to dBm. (−77 dBm is displayed.)

† If the Level key's LED is already lit, there is no need to press the Level key.

4.4.7 Level calibration

The output level can be calibrated by pushing the ' CAL ' F5 soft key under the following conditions.

- When modulation is On and the I/Q signal source is external
- When modulation and the burst function are On and the trigger is external
- When modulation and the burst function are On and the data is external
- When pulse modulation is external

Example: In this example, the output level is set to 30 dBμ, modulation is switch on, the external IQ signal is fed and the output level is calibrated.

Step	Action	Verification
1	[Level] †1	Enters the output level setting mode and lights the Level key's LED.
2	[3] [0] [MHz/dBμ/sec]	Sets the output level to 30 dBμ.
3	[Mod]	The modulation parameter setting mode is activated.
4	[Set]	The Source window opens (set to Int).
5	Press the [∨] Cursor key, then [Set] .	Changes Int to Ext and closes window.
6	I Q	Feeds external I/Q signal.
7	Cal [F5] †2	Calibrates the output level.

†1 If the Level key's LED is already lit, there is no need to press the Level key.

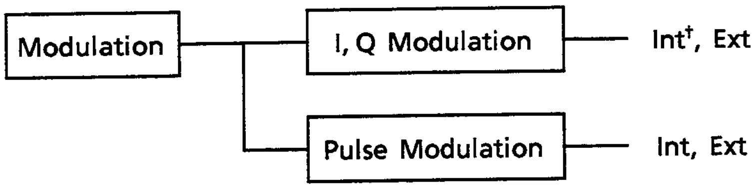
†2 When [Cal: F5] key is pressed, the MG3671A/B calibrates the RF output level using the internal I/Q signal. When an external I/Q signal is used, input the specified level I/Q signal†3 to match the RF output level with the indication.

†3 Set the I/Q signal input level to the value set on the IF/RFSetup menu (see 4.6.1) of the MG3671A/B. The input level error affects the RF output level error.

4.5 Modulation Settings

The MG3671A/B provides I, Q modulation, pulse modulation, and simultaneous modulation combining these two modulation methods. However, if Source Int is specified when Burst On is set, pulse modulation using external pulse modulation signals is not possible.

■ **Modulation tree structure**



† To select I and Q modulation and modulate using the internal I and Q signals, an optional modulation unit is required (☞see paragraph 1.3.2). If no modulation unit is installed, the modulation signal input is fixed to Ext IQ signal.

4.5.1 Modulation using I and Q signals

There are two methods of feeding I and Q signals to be used for modulation: namely, the external feeding method and the internal feeding method. (Refer to the user's manual of the modulation unit for details on setting Source Int/Ext.) To feed I and Q signals from an external source, use the I and Q input connectors on the front panel.

Note: *To modulate using the internal I and Q signals, a modulation unit for generating the I and Q signals is necessary. Refer to the user's manual of the modulation unit for details on how to modulate using the internal I and Q signals..*

(1) I and Q signal input level

The input level of the I and Q signals must be adjusted to meet the input and output (I/O) level requirements. The table below shows the appropriate input level for each setting. (☞See paragraph 4.6.1 for details on how to set the input and output (I/O) levels of the I and Q signals.)

I/O Level Setting and Input Level

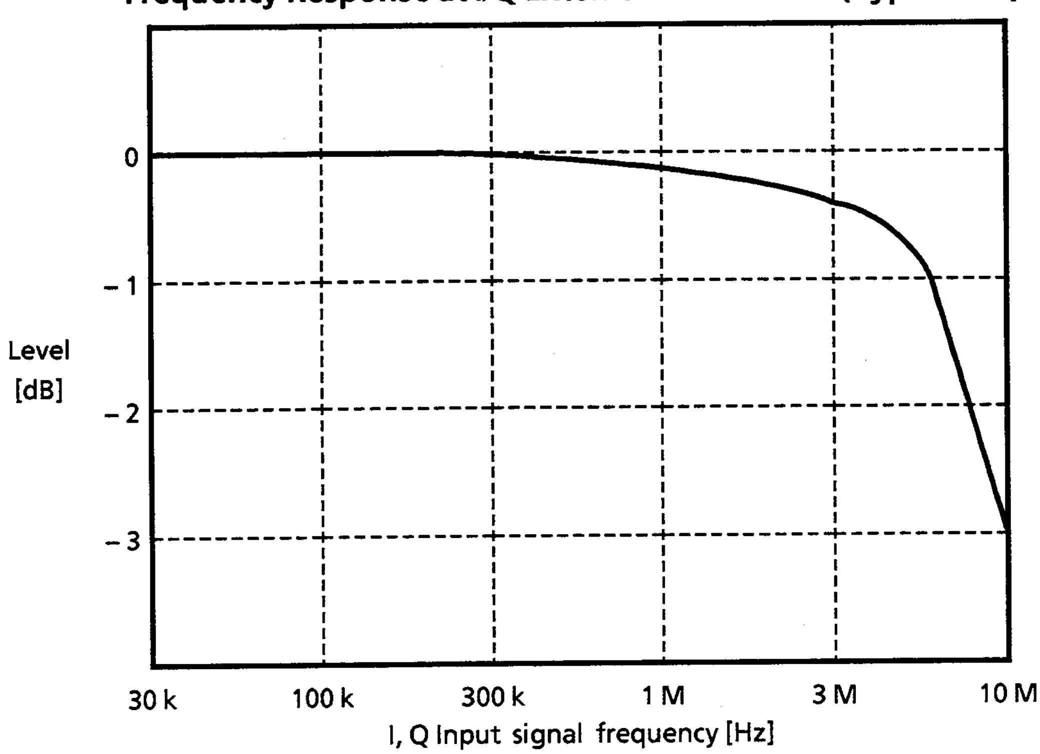
Setting	Input level
50 Ω 500 mV selection	$\sqrt{I^2+Q^2}$ = 500 [mVrms], and $\sqrt{I^2+Q^2} \leqq$ 750 [mVp-p]
CMOS selection	$\sqrt{(I-\text{Offset})^2+(Q-\text{Offset})^2}$ = Amp [mVrms] and $\sqrt{(I-\text{Offset})^2+(Q-\text{Offset})^2}$ = (Amp×1.5) [mVp-p] Amp: Input level setting (50 to 500 mVrms in 50 mVrms steps) Offset: Offset voltage setting (0 to 4,000 mV in 1 mV steps)

Note: *The values of I and Q are terminated voltage values.*
Terminating impedance : 50 Ω (when 50 Ω, 500 mVrms is selected)
100 kΩ (when CMOS is selected)
The error between I/Q signal input level and set value affects the RF output level error. It is, therefore, required to input an I/Q signal having the same level as the set value in order to obtain the RF output level indicated on the screen.

(2) Frequency of input I/Q signals

The input frequency ranges of I/Q signals from 0 to 1.2 MHz. The graph below shows the relationship between the input frequency and the output level (At 50 Ω, 500 mVrms)

Frequency Response at I/Q External Modulation (Typ. Value)



(3) Balance and offset adjustment functions for the I and Q input signals

When the trimmer function for the I/Q input is switched on, the I/Q input adjustment trimmers on the front panel are activated. (☞ See paragraph 4.6.1 for more details.)

When the I/Q input trimmers on the front panel are activated, they can be twisted to adjust the balance and the offset of the I/Q signal.

■ Balance adjustment function

This function adjusts the amplitude balance of the I/Q signal. The adjustment circuit fixes the amplitude of the Q signal, while the amplitude of the I signal is varied within ±20%.

■ Offset adjustment function

This function adjusts the offset voltages of the I and Q signals. The adjustment circuit adds an offset voltage within the ±0.1 volt range to the input signal.

4.5.2 Pulse modulation

The MG3671A/B modulates signals using either external (TTL) or internal pulse modulation signals. The internal pulse modulation signal is generated by the burst function unit, hence, if there is no burst unit installed, external pulse modulation signals must be fed. The table below shows the status of the pulse modulation function with respect to the setting.

<table>
<tr><th>Modulation</th><th>Burst</th><th>I-Q Modulation</th><th>Pulse Modulation</th><th>Status of modulation function</th></tr>
<tr><td rowspan="7">On</td><td rowspan="3">On</td><td>Int</td><td>Int†</td><td>Pulse modulation using the burst unit</td></tr>
<tr><td rowspan="2">Ext</td><td>Int</td><td>Pulse modulation using the burst unit</td></tr>
<tr><td>Ext</td><td>Pulse modulation using externally fed signals</td></tr>
<tr><td rowspan="4">Off</td><td rowspan="2">Int</td><td>Int</td><td>No pulse modulation</td></tr>
<tr><td>Ext</td><td>Pulse modulation using externally fed signals</td></tr>
<tr><td rowspan="2">Ext</td><td>Int</td><td>No pulse modulation</td></tr>
<tr><td>Ext</td><td>Pulse modulation using externally fed signals</td></tr>
<tr><td rowspan="2">OFF</td><td rowspan="2">—</td><td rowspan="2">—</td><td>Int</td><td>No pulse modulation</td></tr>
<tr><td>Ext</td><td>Pulse modulation using externally fed signals</td></tr>
</table>

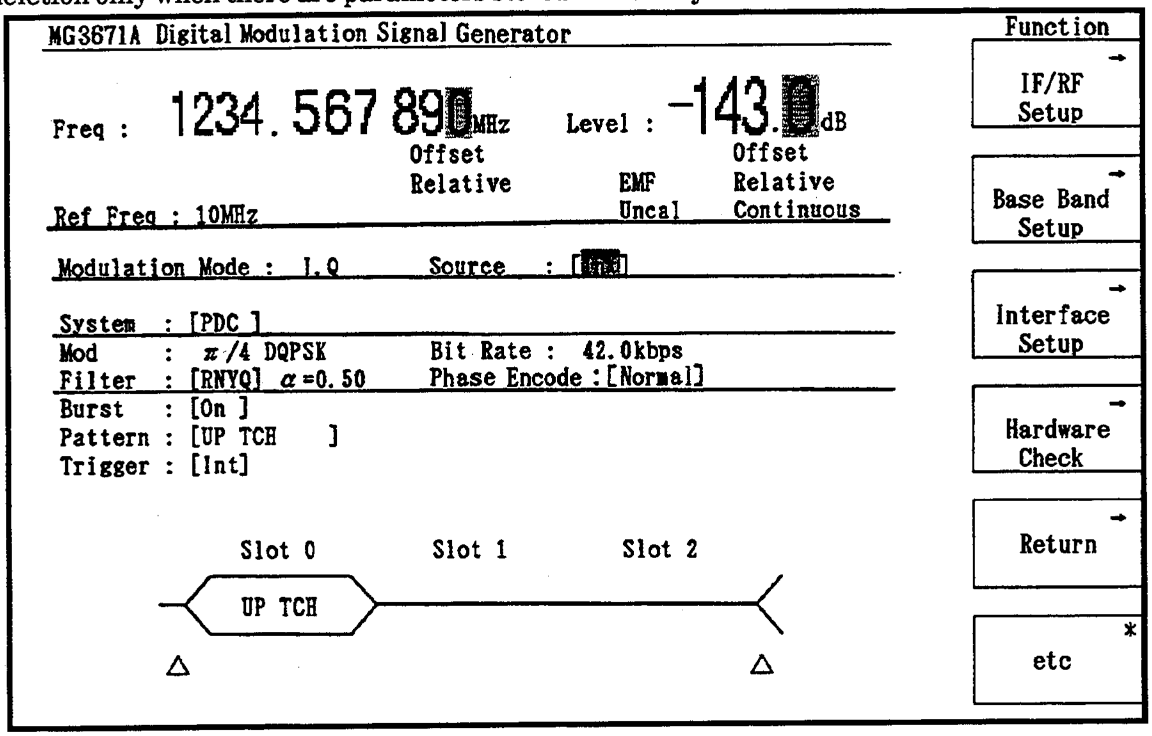
† When Burst is On and the I/Q signal source is set to Int, the pulse modulation signal source is fixed to Int.

4.6 Setup Using Screen Transition

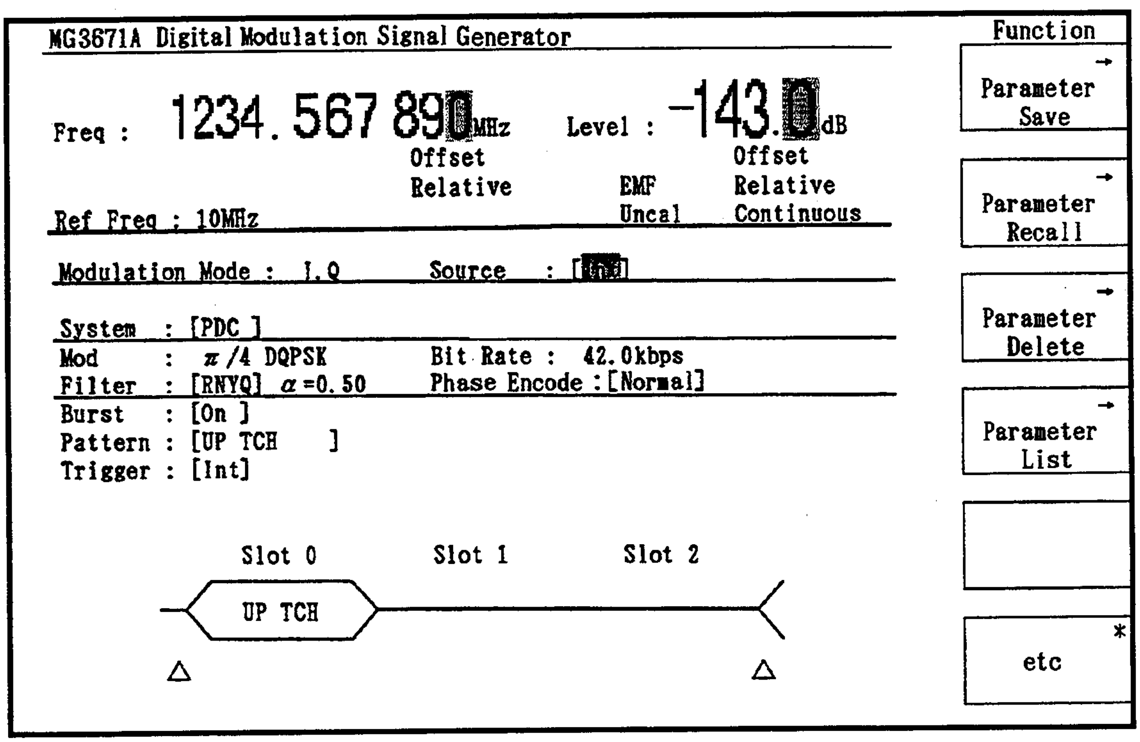
When the ' Setup/Parameter Memory ' F5 soft key is pressed in the parameter setting screen (frequency setting mode, output level setting mode, modulation parameter setting mode), the following screen transition function keys are displayed (screen transition mode). Press any of these keys to switch to any of the setup or parameter memory screens.

The ' Parameter Recall ' F2 soft key and the ' Parameter Delete ' F3 soft key are displayed for recall or deletion only when there are parameters stored in memory.

<Menu 1>



<Menu 2>



■ IF/RF setup screen

Screen where the reference frequency, output level upper limit, external I/Q signal and I/O compensation and pulse modulation parameters are set.

■ Baseband setup screen

Screen where windows are used to switch the modulation data and data clocks between internal and external, to select the polarity of the external modulation I/O signals (data, data clock, symbol clock and burst gate signals) and the burst trigger I/O signals, and to set the pattern synchronous output signal parameters.

■ Interface setup screen

Sets the GPIB address and buzzer. This screen also displays the units installed in the main instrument.

■ Hardware check screen

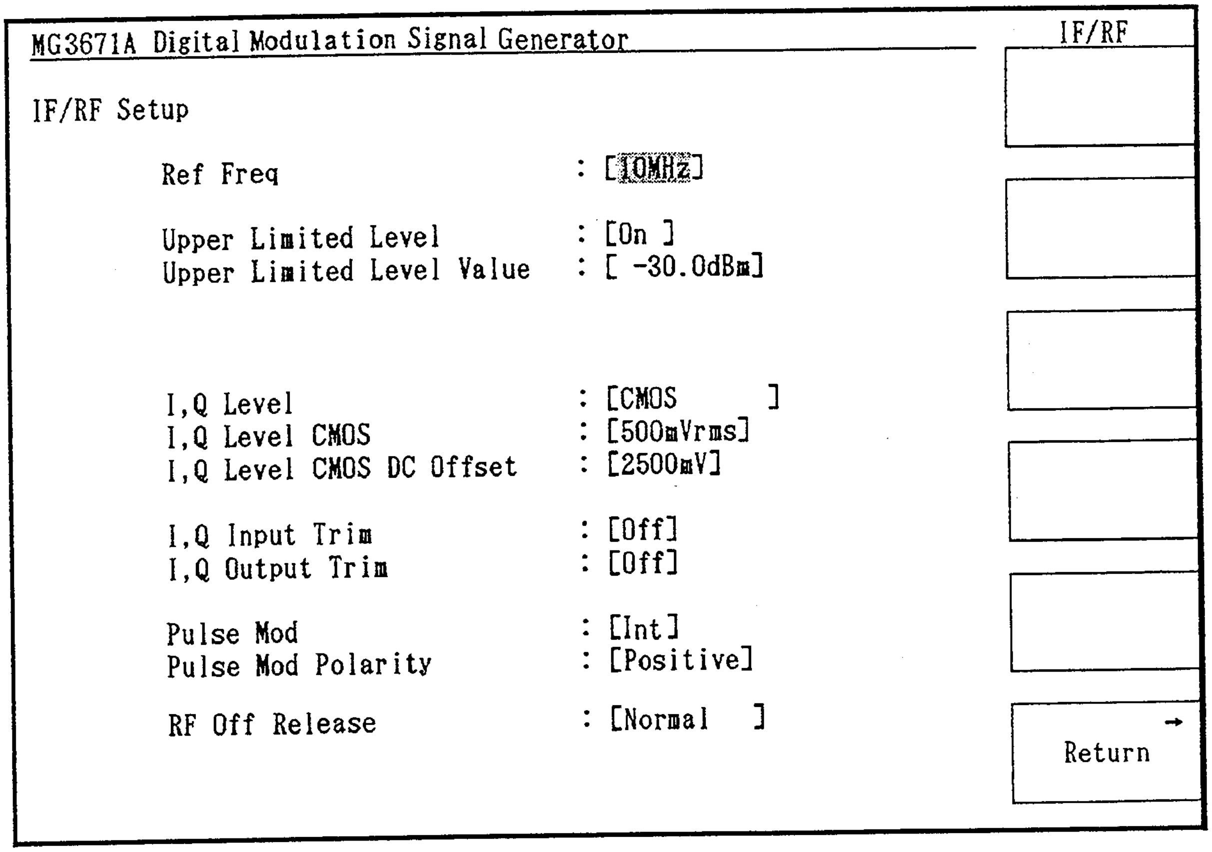
Screen where Pass and Fail are displayed to indicate the results of self-check at power on.

■ Parameter Save/Recall/Delete/List screen

Up to 100 parameter combinations set on the front panel can be stored into memory.

4.6.1 IF / RF setup screen

When the ' IF/RF Setup ' F1 soft key is pressed in the screen transition mode of the parameter setting screen, the IF/RF Setup screen shown below appears.



In this screen, windows are used to set the reference frequency, the output level upper limit, output I/Q signals and I/O compensation, and pulse modulation parameters. Each of the setting items are explained below.

(1) Ref Freq

Ref Freq: The reference frequency can be selected between 10 MHz and 13 MHz (externally fed for GSM system).

- Initial reference frequency: 10 MHz

(2) Setting the output level upper limit

(a) Upper Limited Level: The 'Upper Limited Level' is switched On or Off in order to use or not use the upper limit of the output level

- Initial setting: Off

(b) Upper Limited Level Value: This value specifies the maximum output level in dBm, dBμ, mV or μV. If the Set key is pressed instead of a unit key, dBm is selected as the unit. The 'Upper Limited Level Value' can be set even if the 'Upper Limited Level' is set to Off.

- Setting range: -143.0 to 13.0 dBm
- Initial setting: -10 dBm

(3) I-Q signal settings

The I-Q signal settings is performed to set the input and output (I/O) requirements for the I and Q signals.

(a) I, Q Level: Sets the I-Q signal level to either 50 Ω 500 mVrms or CMOS.

- Initial setting: 50 Ω 500 mVrms

(b) I, Q Level CMOS: Sets the CMOS level when the I-Q signal level has been selected for CMOS.

- Setting range: 50 to 500 mVrms
- Setting resolution: 50 mVrms
- Initial setting: 500 mVrms

(C) I, Q Level CMOS DC Offset: Sets the CMOS level DC offset value when the I-Q signal level has been selected for CMOS.

- Setting range: 0 to 4000 mV
- Setting resolution: 1 mV
- Initial setting: 2500 mV

(d) I, Q Input Trim: Sets to On when adjusting the offset/balance of the IQ input signals using the controls on the front panel. When this item is On, the LED on the left side of the controls lights.

- Initial setting: Off

(e) I, Q Output Trim: Sets to On when adjusting the offset/balance of the IQ output signals using the controls on the front panel. When this item is On, the LED on the left side of the controls lights.

- Initial setting: Off

(4) Pulse modulation settings

(a) Pulse Mod: Sets the pulse modulation source to either internal (Int) or external (Ext).

- Initial setting: Int

(b) Pulse Mod Polarity: Sets the polarity of pulse modulation to either Positive or Negative.

- Initial setting: Positive

(5) RF Off Release function settings

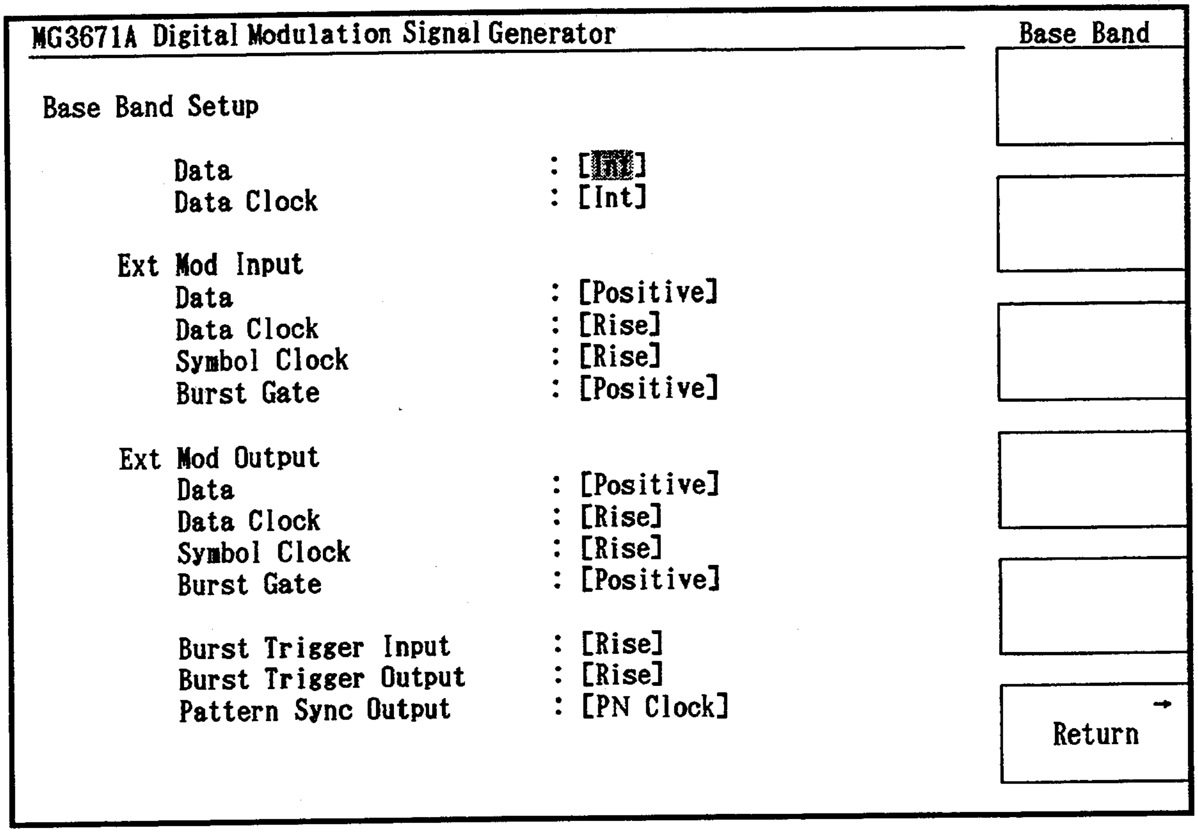
Sets the RF Off key operation mode. (Normal/Alternate)

Initial setting: Normal

Note: See paragraph 4.4.3 for details.

4.6.2 Baseband setup screen

When the ' Baseband Setup ' F2 soft key is pressed in the screen transition mode of the parameter setting screen, the Base Band Setup screen shown below appears.



In this screen, windows are used to set the following items:

■ Setting modulation signal to Int or Ext

Data	Int / Ext	Initial setting: Int
Data Clock	Int / Ext	Initial setting: Int

■ Polarity of external I/O modulation signals

Ext Mod Input		
Data	Positive / Negative	Initial setting: Positive
Data Clock	Rise /Fall	Initial setting: Rise
Symbol Clock	Rise / Fall	Initial setting: Rise
Burst Gate	Positive / Negative	Initial setting: Positive
Ext Mod Output		
Data	Positive / Negative	Initial setting: Positive
Data Clock	Rise / Fall	Initial setting: Rise
Symbol Clock	Rise / Fall	Initial setting: Rise
Burst Gate	Positive / Negative	Initial setting: Positive

■ Polarity of burst trigger I/O signals

Burst Trigger Input	Rise / Fall	Initial setting: Rise
Burst Trigger Output	Rise / Fall	Initial setting: Rise

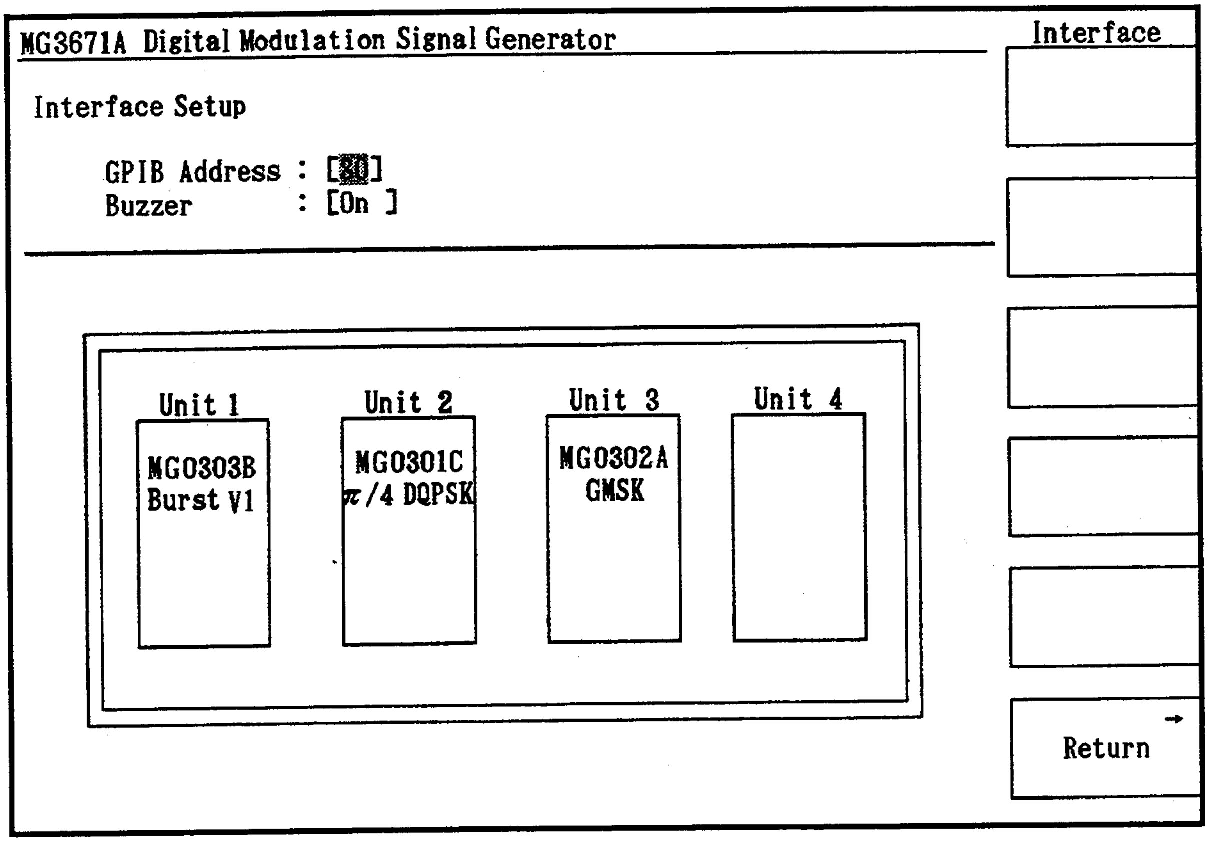
■ Pattern synchronous output signal

Pattern Sync Output	PN Clock / PN Gate / RF Gate	Initial setting: PN Clock

Note:
- *The 'Baseband Setup' F2 soft key is not displayed if there is no modulation unit installed.*
- *The 'Burst Gate', 'Burst Trigger Input', 'Burst Trigger Output' and 'Pattern Sync Output' items under the 'Ext Mod Input/Output' headings are displayed if burst unit is installed.*
- *If 'Data' is set to Ext, the 'Pattern,' 'Trigger' and 'Trigger Select' items and the 'Pattern Edit' F2 soft key are not displayed in the parameter setting screen.*

4.6.3 Interface setup screen

When the 'Interface Setup' F3 soft key is pressed in the screen transition mode of the parameter setting screen, the Interface Setup screen shown below appears.

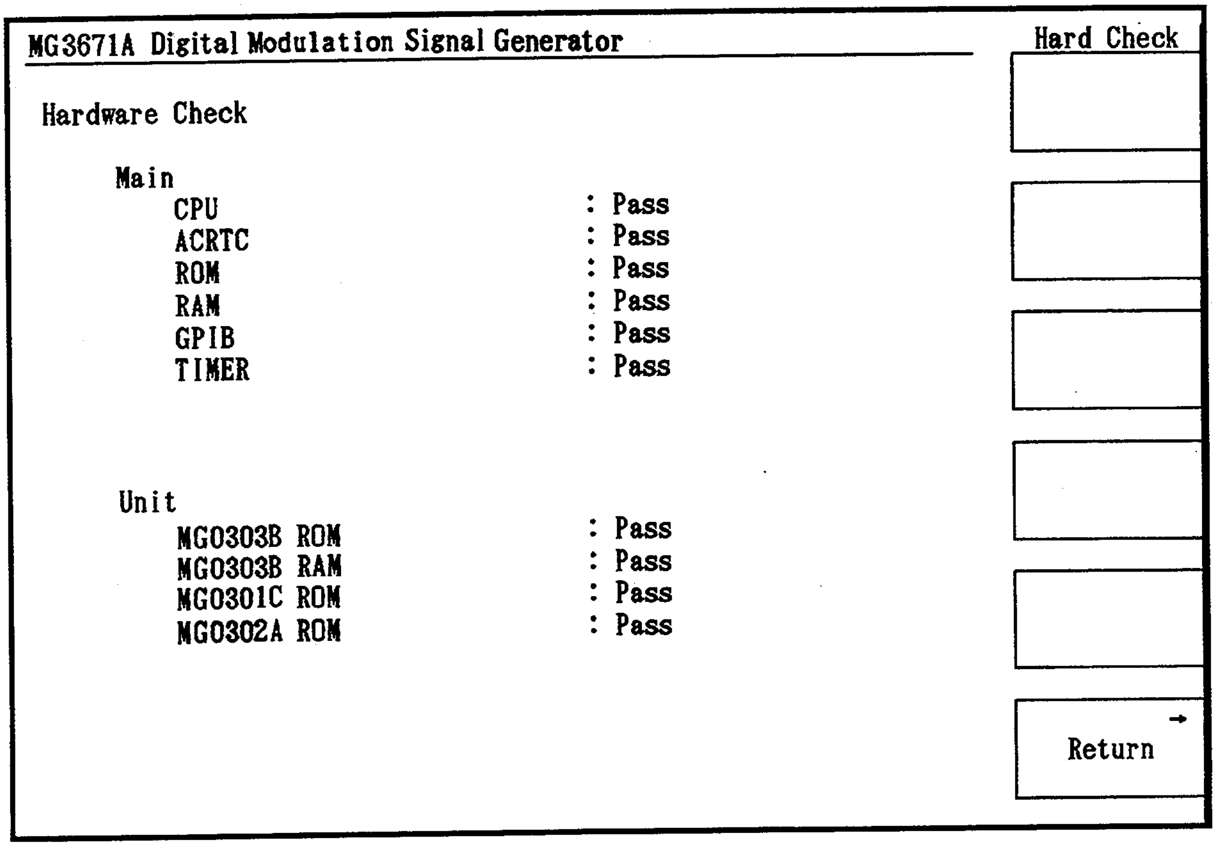


The GPIB address (0 to 30) and the buzzer (On and Off) are set in this screen using windows. The units installed on the main instrument are also displayed in this screen.

If the buzzer is set to On, a buzzer alarm is sounded when an error occurs.

4.6.4 Hardware check screen

When the 'Hardware Check' F4 soft key is pressed in the screen transition mode of the parameter setting screen, the results of the self-check performed at power on are displayed as shown below. 'Pass' is displayed if acceptable and 'Fail' if unacceptable.



4.6.5 Storing, recalling, deleting and listing the front panel setting parameters

When the 'Parameter Save ' F1, 'Parameter Recall' F2, 'Parameter Delete' F3 or 'Parameter List' F4 key is pressed in the screen transition mode of the parameter setting screen, the Parameter Save, Parameter recall, Parameter Delete or Parameter List screens shown below appears and up to 100 (0 to 99) combinations of parameters set on the panel can be stored, retrieved, deleted or listed.

Memory location number range .... 0 to 99
Initial memory location number 0

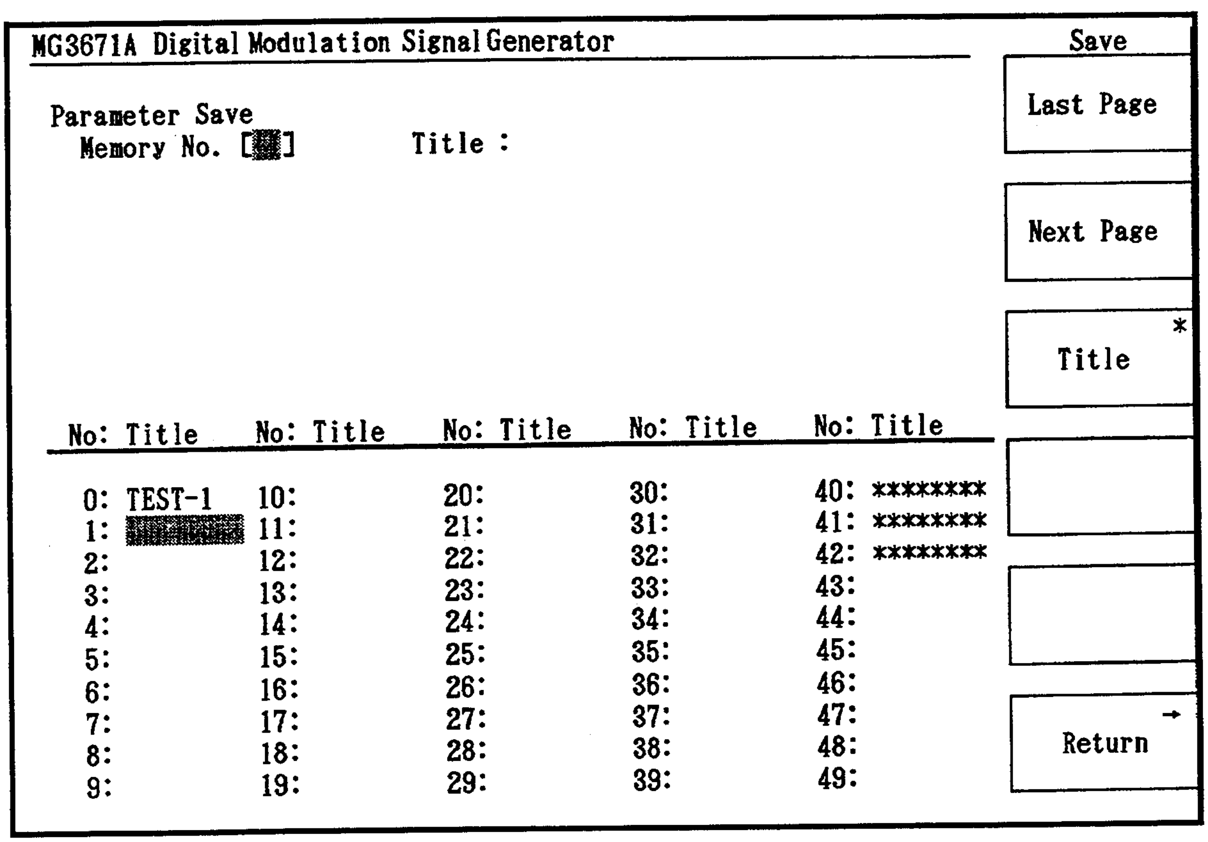
Note :
- *The 'Parameter Recall' F2 and 'Parameter Delete' F3 soft keys are displayed for recall and deletion only when there are parameters stored in memory.*
- *When the contents of the 0 to 49 memory location numbers are displayed, the 'Next Page' F1 soft key appears to display the contents of the 50 to 99 memory location numbers; when the contents of the 50 to 99 memory location numbers are displayed, the 'Last Page' F2 soft key appears to display the contents of the 0 to 49 memory location numbers.*

(a) Parameter save

In the parameter setting screen, if the 'Setup/Parameter Memory' F5, 'Etc' F6 and 'Parameter Save' F1 keys are sequentially pressed, the Parameter Save screen appears. Specify the memory location number using the data keys, rotary knob, Step keys or the cursor keys and then press the Set or Enter key to save the parameters currently set.

To store, specify the title up to eight characters long. If no title is specified, ******** is displayed in the title field.

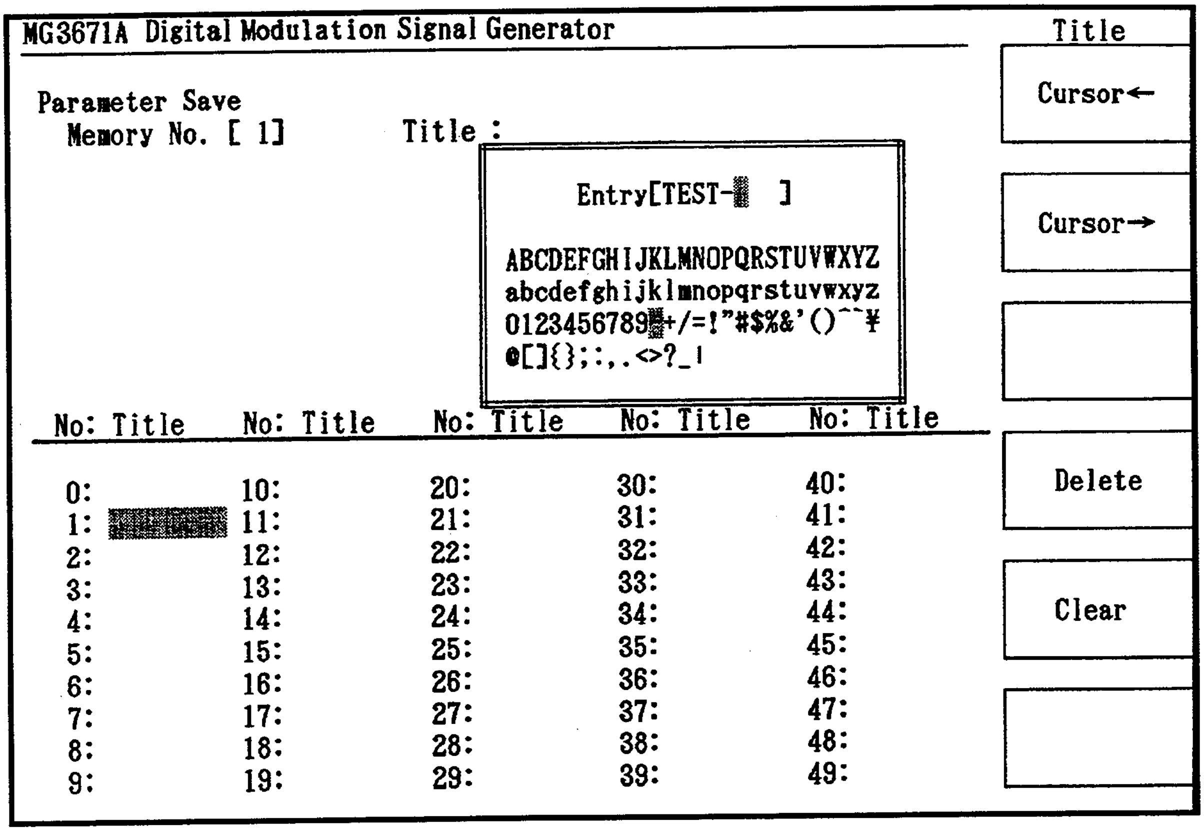
Shown below is an example of a parameter save screen and its contents.



Example 1: Gives the title 'Anritsu' to the parameters setting parameter memory.

Step	Action	Verification
1	Setup/ Parameter Memory F5	Switches to screen transition menu 1 from any of the frequency setting mode/output level setting mode/modulation parameter setting mode in the parameter setting screen.
2	etc F6	Switches to screen transition menu 2.
3	Parameter Save F1	Switches to parameter save screen.
4	Title * F3	Opens the window for setting the title.
5	Clear F5	Deletes the old title.
6	Cursor ← F1, Cursor → F2	Sets the position within the title field where the title will be entered.
7	Cursor keys or rotary knob	Selects the characters to be used for the title from the title character list.
8	Enter	Enters the selected character in the Entry field.
9	Delete F4	Deletes an incorrect entry.
10	Repeat steps 6, 7 and 8 to enter Anritsu in the title field.	
11	Set	Closes the window after completing entry of the title. (After this, specify the memory location number where to store the parameters.)

***Note:** Each time the BS key on the panel is pressed, the character before the cursor in the* Entry *field* is erased one-by-one.



Example 2: Stores the parameters currently set on the panel in memory location 10.

Step	Action	Verification
1	[Setup/ Parameter Memory] [F5]	Switches to screen transition menu 1 from any of the frequency setting mode/output level setting mode/modulation parameter setting mode in the parameter setting screen.
2	[etc] [F6]	Switches to screen transition menu 2.
3	[Parameter Save] [F1]	Switches to parameter save screen.
4	[1] [0] [Enter]	Specifies memory location 10. (At this point, the parameters currently set on the panel are stored in memory location 10 and then returns to the previous status [i.e., frequency setting mode, output level setting mode or modulation parameter setting mode]).

(b) Parameter Recall

To retrieve a combination of parameters stored into memory and set them into the MG3671A/B, specify the memory location number (0 to 99) using the data keys, rotary knob, Step keys or cursor keys. If no parameter data is stored in the specified memory, the cursor moves to that memory location without doing anything. ******** is displayed in the title field if no title has been specified.

(c) Parameter Delete

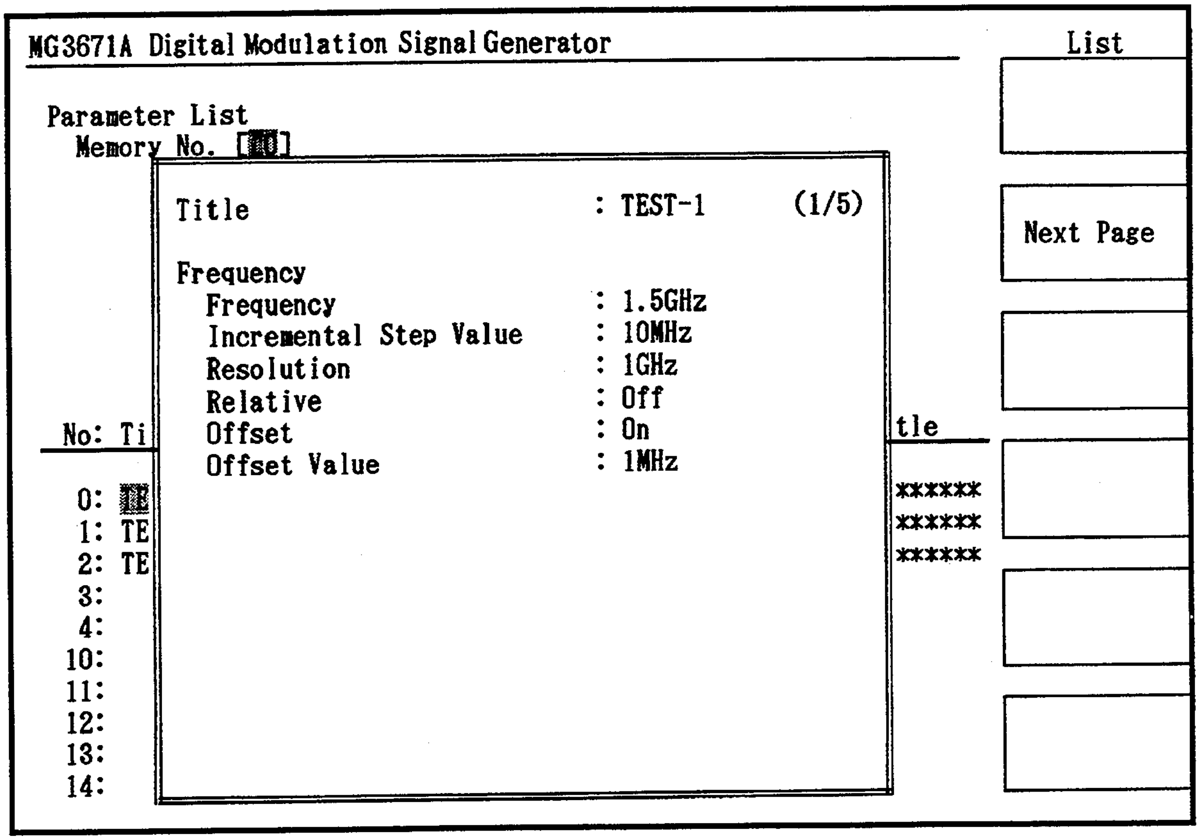
- To delete a combination of parameter settings from memory, specify the memory location number using the data keys, rotary knob, Step keys or cursor keys. A Yes/No window appears to verify whether or not to delete the parameter settings. The initial setting is No. Specify Yes to delete the parameter settings.
- After the parameters are deleted, the screen remains unchanged, hence, another parameter combination can be deleted.
- If the 'Delete All' F4 soft key is pressed, 'ALL' is displayed in the 'Memory No.' field and all titles are displayed in reverse-video. A Yes/No window opens for verification. The initial setting is No. Specify Yes to delete the entire parameter memory.

(d) Parameter List

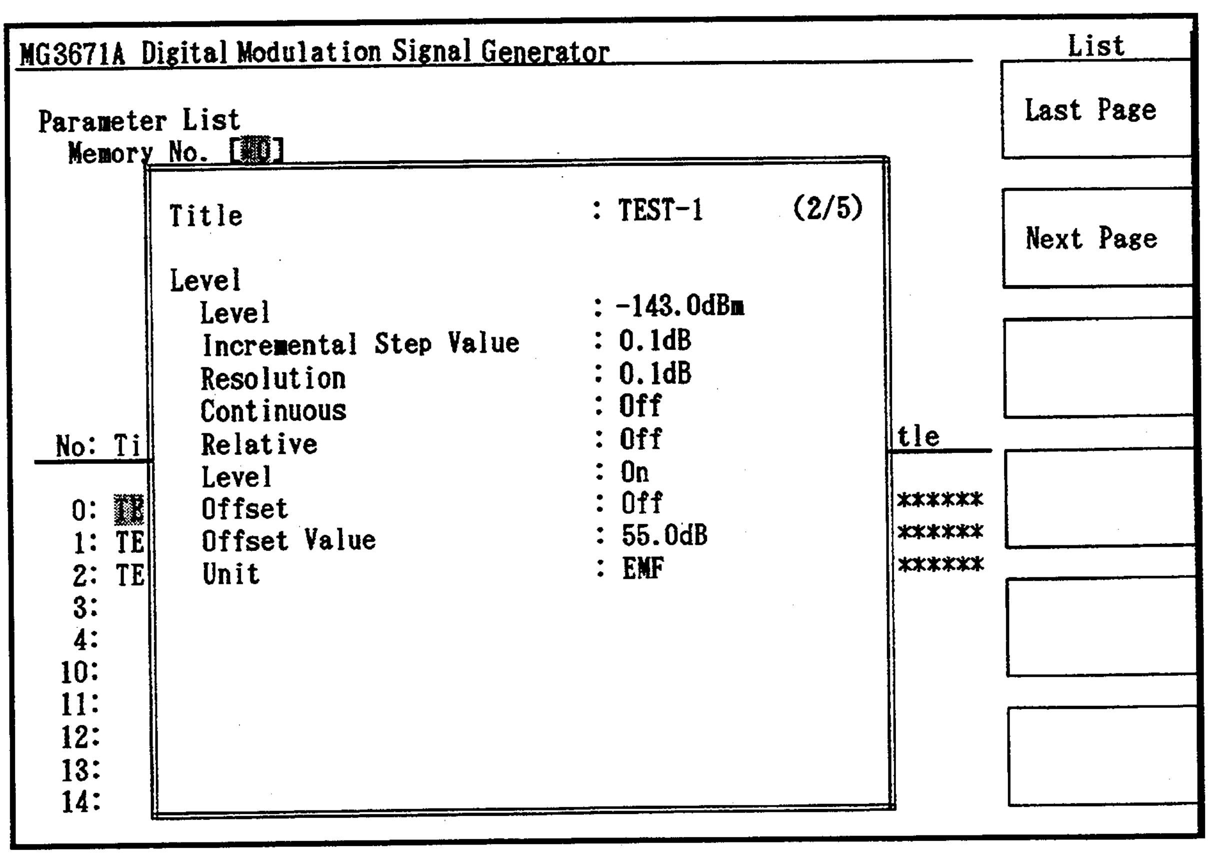
- If the memory location number (0 to 99) is specified using the data keys, rotary knob, Step keys or the cursor keys, the parameter settings stored in that memory location are displayed on five separate pages.

  (1 / 5) Frequency
  (2 / 5) Level
  (3 / 5) Modulation
  (4 / 5) IF / RF
  (5 / 5) Base band

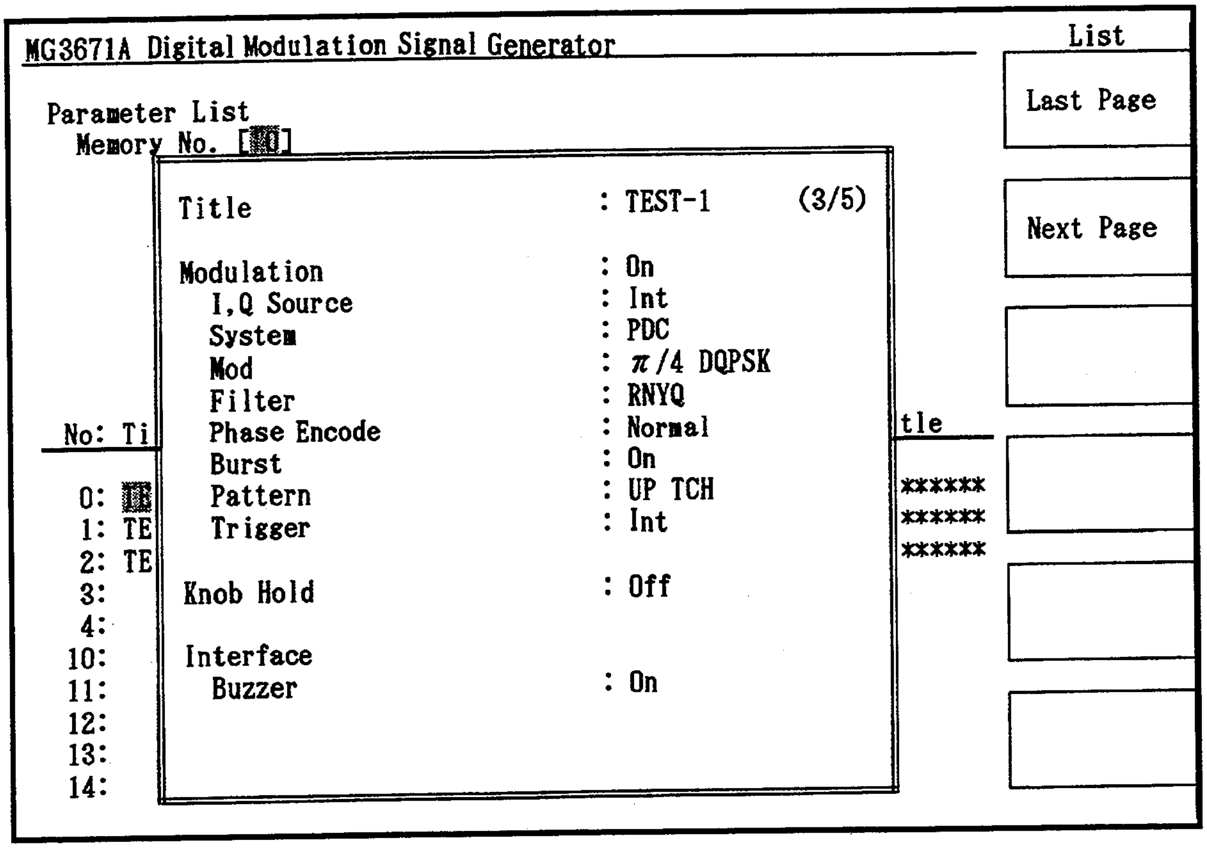
<Frequency List>



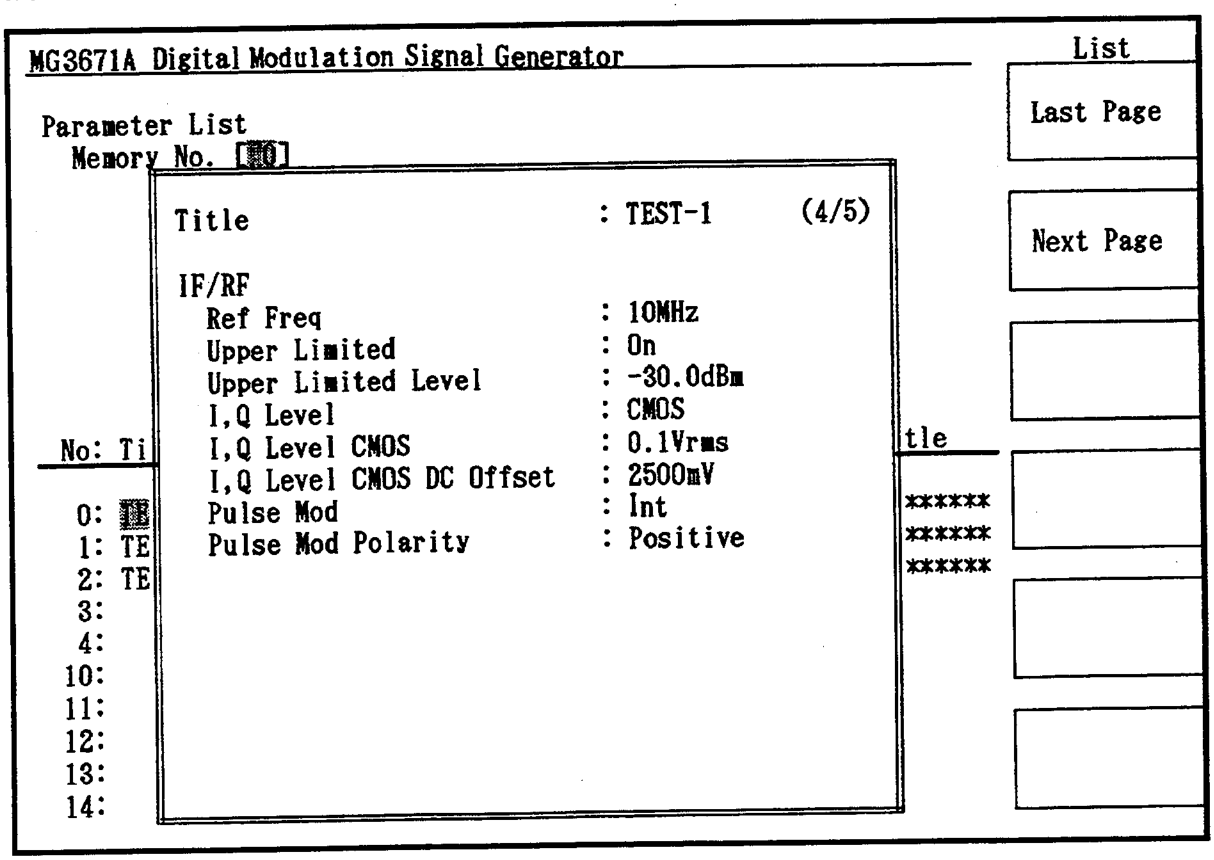
<Level List>



<Modulation List>



<IF / RF List>



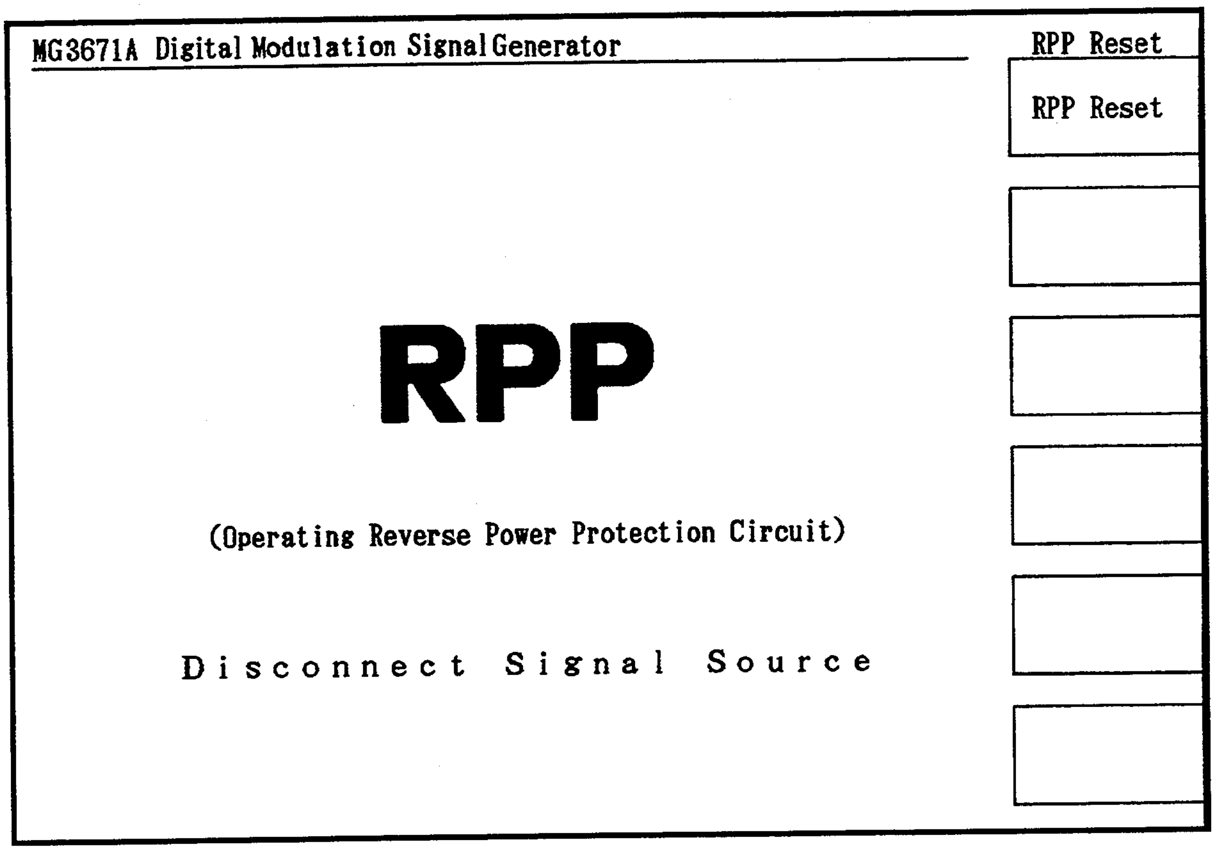
<Base Band List>

```
MG3671A Digital Modulation Signal Generator                  List

Parameter List                                               Last Page
  Memory No. [ 0]
        Title                        : TEST-1        (5/5)

        Base Band
            Data                     : Int
            Data Clock               : Int
          Ext Mod Input
            Data                     : Positive
 No: Ti     Data Clock               : Rise          tle
            Symbol Clock             : Rise
  0: TE     Burst Gate               : Positive      ******
  1: TE   Ext Mod Output                             ******
  2: TE     Data                     : Positive      ******
  3:        Data Clock               : Rise
  4:        Symbol Clock             : Rise
 10:        Burst Gate               : Positive
 11:        Burst Trigger Input      : Rise
 12:        Burst Trigger output     : Rise
 13:        Pattern Sync Output      : PN Clock
 14:
```

4.7 Reverse Power Protection Function

The MG3671A/B is equipped with a reverse power protection circuit (RPP) that automatically disconnects the internal circuits to protect them from damage when a large amount of reverse power is applied to the RF Output connector. When the RPP circuit works, the RPP activation screen shown below appears and the buzzer is sounded. At this time, only the 'RPP Reset' F1 soft key functions. Immediately disconnect the unit from the input power. When the 'RPP Reset' F1 soft key is pressed, the RPP circuit is reset and the MG3671A/B returns to its previous condition.

The buzzer is sounded when the RPP circuit is activated even if the buzzer has been set to Off.



Notes :
- *The RPP circuit uses a mechanical switch. Therefore, repeated application of power to this switch may cause deterioration of its contacts. Avoid application of reverse power, as much as possible.*
- *Never reset the RPP circuit while reverse power is applied. This may cause damage to the RPP circuit.*
- *The RPP circuit can protect internal circuit against reverse power surges of up to ±50Vdc, 50 W (up to 1 GHz), and 25 W (1 to 2.75 GHz). Never apply a reverse power exceeding these limits.*
- *Since the RF Output connector is opened while the RPP circuit is operating, care should be taken not to damage the transmitter or the device under test.*

4.8 Initialization Function

When the Preset key on the front panel is pressed, the following parameters are initialized and the parameter setting screen (frequency setting mode) appears. The data stored in memory remains unchanged.

To clear the contents of memory, reset the power while holding down the Preset key.

■ **The contents of preset items:**

Group	Preset item	Initial setting data
Frequency	Frequency	10 MHz
	Incremental step frequency	1 MHz
	Frequency resolution	1 Hz
	Relative frequency display mode	Off
	Frequency offset mode	Off
	Frequency offset value	0 Hz
Output	Output level	−30 dBm
	Incremental step output level	1 dB
	Output level resolution	0.1 dB
	Continuous mode	Off
	Relative level display mode	Off
	Output level (On / Off)	On
	Output level offset mode	Off
	Output level offset value	Off
	Open-circuit / terminated voltage display	Open-circuit voltage display
Modulation	Modulation	Off
	I/Q signal input (Modulation mode source)	I/Q INT
	Baseband filter	Root Nyquist
	Burst function	Off
	Pattern	PN9
	Burst trigger input	Int (PHP is selected for system)
	Burst trigger select	Uplink

Group	Preset item	Initial setting data
IF/RF settings	Reference frequency	10 MHz
	Output level upper limit	−10 dBm
	Output level upper limit (On/Off)	Off
	I / Q LEVEL	50 Ω 500 mVrms CMOS 50 mVrms CMOS DC Offset 2500 mV
	I/Q trim setting	Input: Off Output: Off
	Pulse modulation	Pulse Modulation: Int Pulse Modulation Polarity: Positive
	RF Off Release function	RF Off Release: Normal
Baseband settings	Data	Int
	Data Clock	Int
	IEXT Mod Input	Data: Positive Data Clock: Rise Symbol Clock: Rise Burst Gate: Positive
	EXT Mod Output	Data: Positive Data Clock: Rise Symbol Clock: Rise Burst Gate: Positive Burst Trigger Input: Rise Burst Trigger Output: Rise Pattern Sync Output: PN Clock Panel lock: Released Buzzer On/Off: On Display On/Off: On Rotary knob hold On/Off: Off

Note: *The modulation parameter settings differ on each modulation unit. For details, refer to the user's manual of your modulation unit. The MG0301C π/4 DQPSK modulation unit is used in this manual for explanation example.*

4.9 Panel Lock Function

When the Panel Lock key on the front panel is pressed, all keys including the rotary knob are disabled and only the power switch, Local key and Panel Lock key remains functional. Press the Panel Lock key again to release the panel lock.

The Panel Lock key's LED lights when the panel is in locked condition.

4.10 Panel Display On/Off Function

When the Display Off key on the front panel is pressed, the screen display is turned off. When the screen display is off, all keys including the rotary knob are disabled and only the power switch, Local key and Display Off key remains functional. This feature reduces generation of interference waves from the display. (GPIB is activated.) Press the Display Off key again to turn on the display. The Display Off key's LED lights when the display is off.

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SECTION 5
MEASUREMENT

This section describes demodulator evaluation measurement, DUT error rate measurement, and receiver evaluation measurements (including receiver sensitivity (static), receiver sensitivity (fading), adjacent channel selectivity, intermodulation characteristics, and spurious response) as typical measurement examples using the MG3671A/B Digital Modulation Signal Generator.

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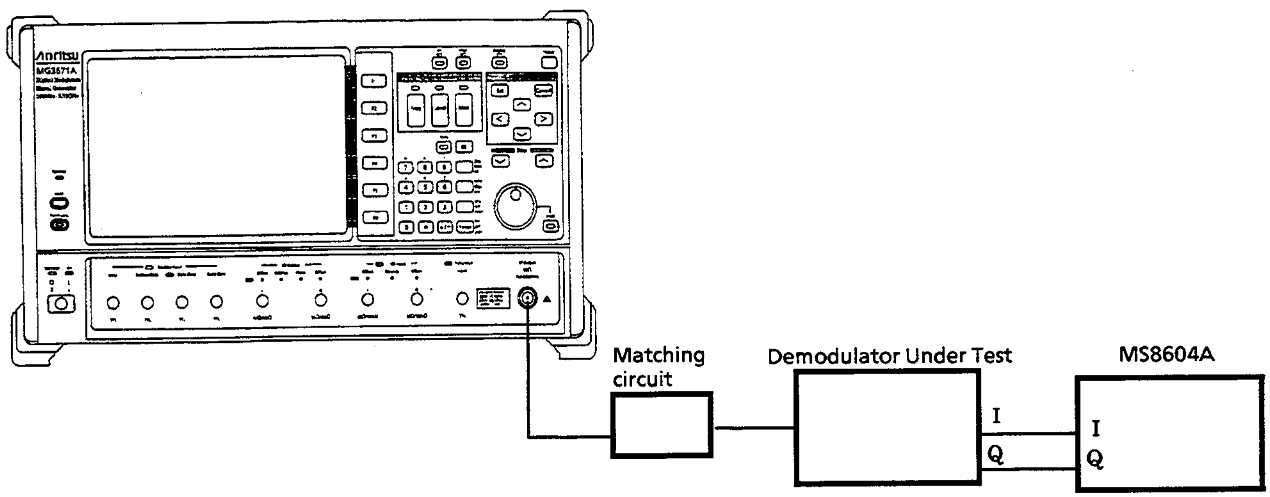
SECTION 5
MEASUREMENT

5.1 Demodulator Evaluation Measurement

The performance of the $\pi/4$ DQPSK demodulator is tested by evaluating the demodulator I-Q signal outputs with the use of the I and Q signal input function†2 of MS8604A†1.

(1) Setup



(2) Measurement procedure

Step	Procedure
1	For instance, set the MG3671A/B output frequency and level to 1500 MHz and 0 dBm, respectively.
2	Set the MG3671A/B system to PDC†3, and connect the MG3671A/B RF output to the input of the Demodulator to be tested through the matching circuit. Use the matching circuit to match the output and input levels.
3	Connect the MS8604A I and Q inputs to the I and Q outputs of the Demodulator to be tested, respectively.
4	Set the MG3671A/B to the desired pattern. Set to PN9 or PN15 when burst = OFF.
5	Set the MG3671A/B to the constellation measurement mode to enable the observation of signal trace and modulation accuracy.
6	Change the MG3671A/B pattern or frequency to evaluate its performance.

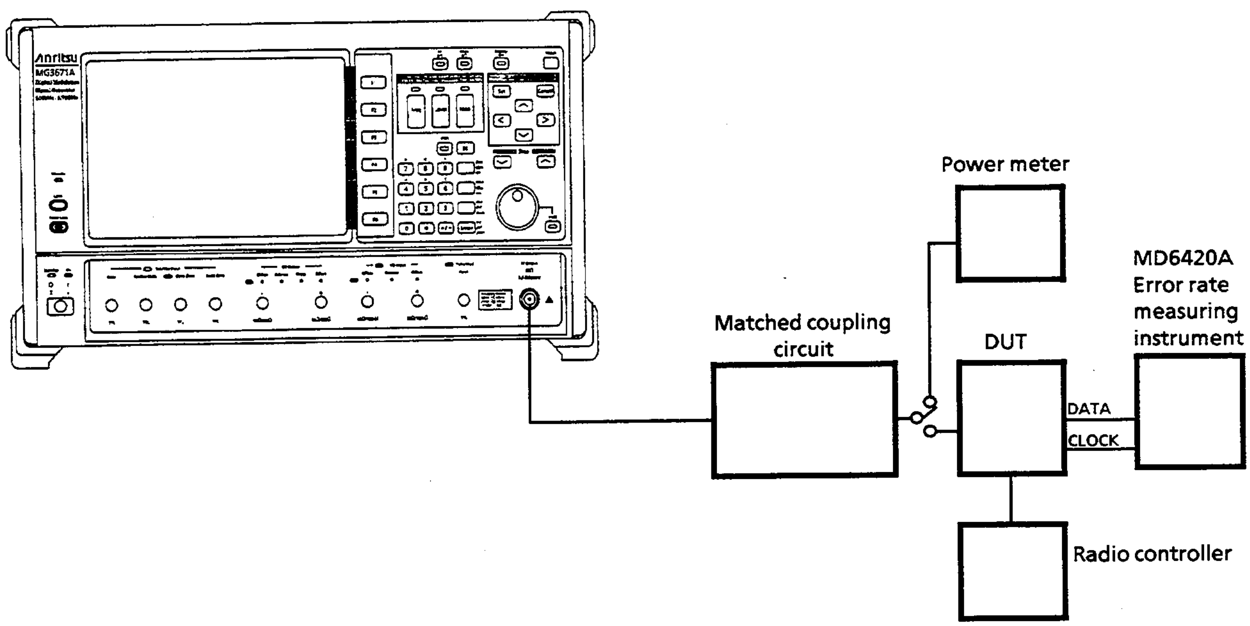
†1 PDC software (option 11) is needed for the MS8604A.
†2 I-Q input (option 03) is needed for the MS8604A.
†3 MG0301C $\pi/4$ DQPSK modulation unit is needed for the MG3671A/B.

5.2 DUT Error Rate Measurement

This measurement evaluates the bit errors in the data detected by the demodulator under test using the PN9 standard encoding test signal incorporated in the MG3671A/B. (A modulation unit for DUT†1 is needed for the MG3671A/B.)

For this measurement, the demodulator under test must have a control mode for receiving a continuous wave.

(1) Setup



(2) Measurement procedure

Step	Procedure
1	Set the MG3671A/B to the frequency to be tested.
2	Set the MG3671A/B to the proper system for the DUT. (The modulation unit†2 for that system is needed.)
3	Set the MG3671A/B pattern to PN9.
4	Apply the MG3671A/B RF Output signal to the power meter through the matched coupling circuit, and adjust the output level from MG3671A/B so that the sensitivity test level is obtained.
5	Set the DUT to a mode that can communicate with a continuous wave from the radio controller.

†1 DUT: Device Under Test
†2 The MG0301C $\pi/4$ DQPSK modulation unit is compatible with the PDC, PHP, NADC, TFTS and PDC_H systems.
The MG0302A GMSK modulation unit is compatible with the CT2, GSM and PCN systems.
For other modulation units, see the table of the Modulation units for communication systems on the page 1-5.

Step	Procedure
6	Apply the output from the matched coupling circuit to the DUT to operate it. Supply the DATA and CLOCK demodulated by the DUT to the RD and RT connectors of the MD0626 Interface Unit plugged in the MD6420 rear panel, respectively.
7	Set the MD6420A reception timing. Select 'RT' mode if output is produced by sampling the data at the falling edge of the clock from the DUT; Select '$\overline{\text{RT}}$' mode if output is produced by sampling the data at the rising edge of the clock from the DUT.
8	Set the MD6420A PATTERN to 2^9-1(PN9)NORMAL.
9	Press the MD6420A MEAS key to measure bit error rate.
10	If necessary, make a simulation test measurement by varying the output level of the MG3671A/B.

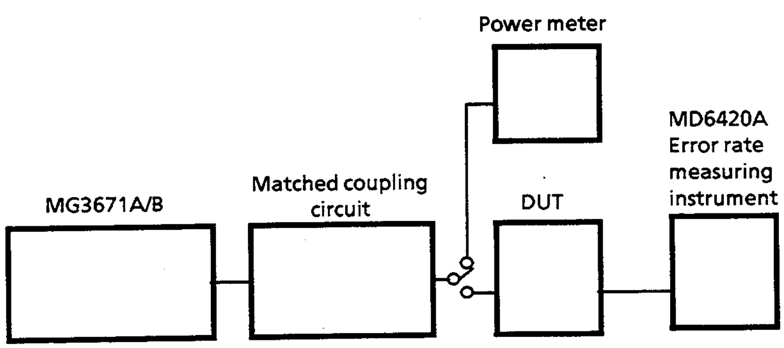
5.3 Receiver Evaluation measurements

The following evaluation measurements can be performed for receivers:

- Receiver sensitivity (static)
- Receiver sensitivity (fading)
- Adjacent channel selectivity
- Intermodulation characteristics
- Spurious response

5.3.1 Receiver sensitivity (static)

(1) Setup



(2) Measurement procedure

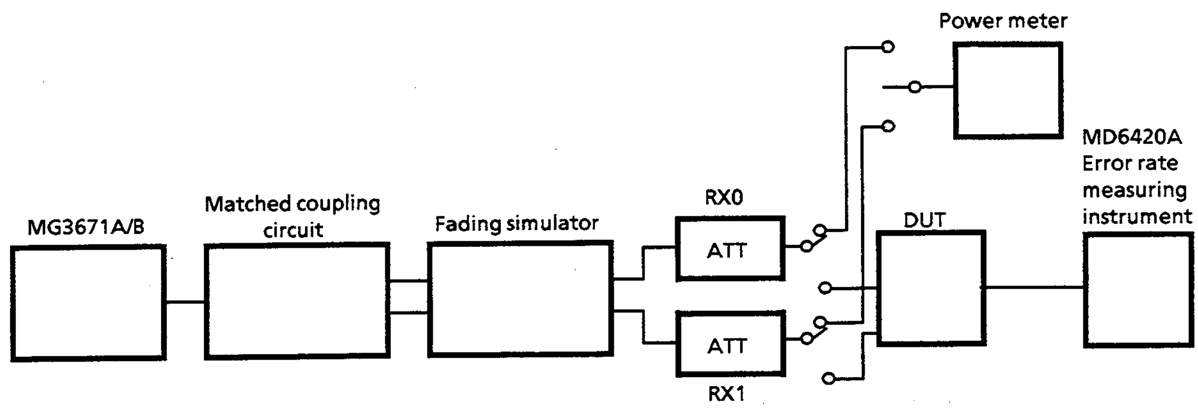
Step	Procedure
1	Set the MG3671A/B as follows: Frequency .... Frequency to be tested Output level .... Off Modulation: Burst .... On User data transfer channel TCH .... PN9 Other than TCH channel ..... Specific pattern necessary for communications
2	Set the receiver to the test frequency. Use the user data transfer channel TCH for the demodulated data.
3	Measure the MG3671A/B output level with a power meter and adjust it to the standard sensitivity level (static).
4	Operate the switch to apply signals to the receiver to be tested.
5	Accumulate the bit strings of the user data transfer channel TCH and measure the error rate for 2,556 bits or more using the MD6420A. Verify that the measured error rate is within standard

* Use the burst trigger signal to synchronize the burst wave output timing of the MG3671A/B with that of the testing equipment. For details, refer to the section on the trigger function of MG0301C or MG0302A Operation Manual.

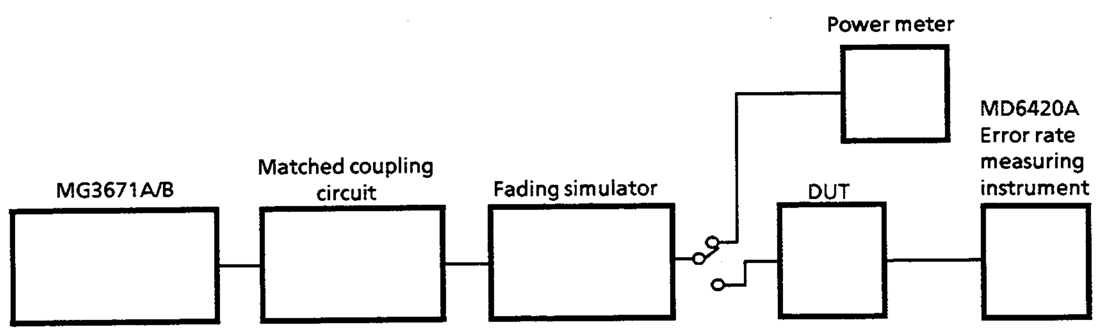
5.3.2 Receiver sensitivity (fading) measurement

(1) Setup

(a) With diversity



(b) Without diversity

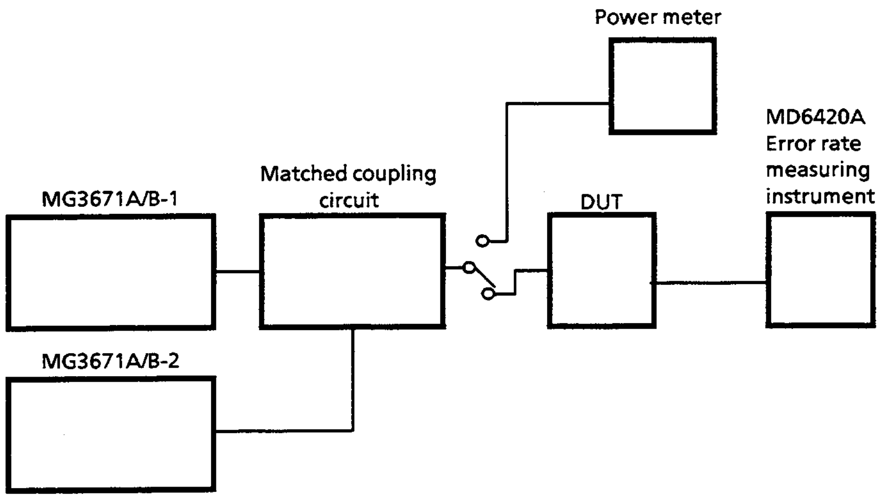


(2) Measurement procedure

Step	Procedure
1	Set the MG3671A/B as follows: Frequency .... Frequency to be tested Output level .... Off Modulation: Burst .... On User data transfer channel TCH .... PN9 Other than TCH channel ..... Specific pattern necessary for communications
2	Set the fading simulator to Rayleigh fading for a maximum Doppler frequency of 40 Hz (IEC Pub. 489-6 Appendix C).
3	Set the receiver to the test frequency. Use the user data transfer channel TCH for the demodulated data.
4	Measure the MG3671A/B output level with a power meter and adjust it to the standard sensitivity level (center value when fading).
5	Operate the switch to apply signals to the receiver to be tested.
6	Using the MD6420A, accumulate the bit strings of the user data transfer channel TCH and measure the error rate for 2,556 bits or [43,200 x bit rate (bps)]/[velocity of travel (kph) x test frequency (MHz)], whichever is bigger (Where bit rate = 42,000). Verify that the measured error rate is within standard.

5.3.3 Adjacent channel selectivity measurement

(1) Setup

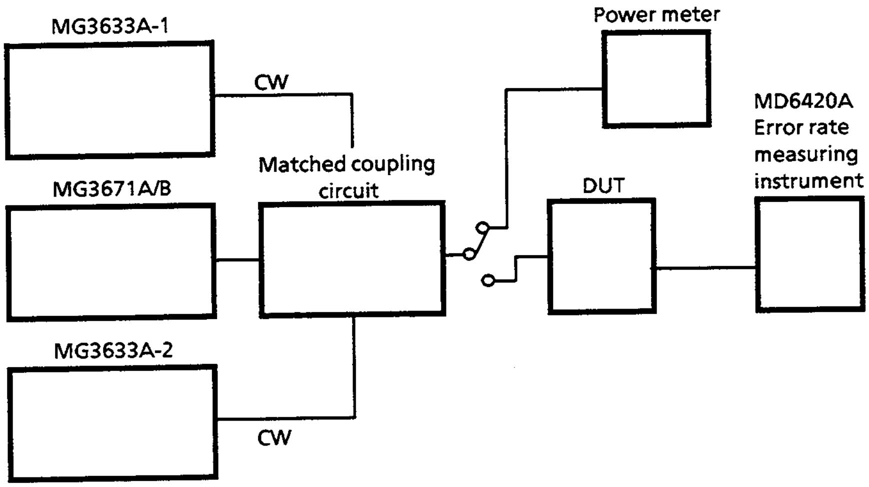


(2) Measurement procedure

Step	Procedure
1	Set the MG3671A/B-1 as follows: Frequency .... Frequency to be tested Output level .... Off Modulation: Burst .... On User data transfer channel TCH .... PN9 Other than TCH channel ..... Specific pattern necessary for communications
2	Set the MG3671A/B-2 as follows: Frequency .... Adjacent channel frequency Output level .... Off Modulation: Burst .... Off Pattern PN15
3	Measure the MG3671A/B-1 output level with a power meter and adjust it to [Standard sensitivity level + 3 dB].
4	Measure the MG3671A/B-2 output level with a power meter and adjust it to [(Standard sensitivity level + 3 dB) + (Standard adjacent channel selectivity) dB].
5	Operate the switch to apply signals to the receiver to be tested.
6	Using the MD6420A, accumulate the bit strings of the user data transfer channel TCH and measure the error rate for 2,556 bits or more. Verify that the measured error rate is within standard (1×10^{-2}).

5.3.4 Intermodulation characteristics measurement

(1) Setup

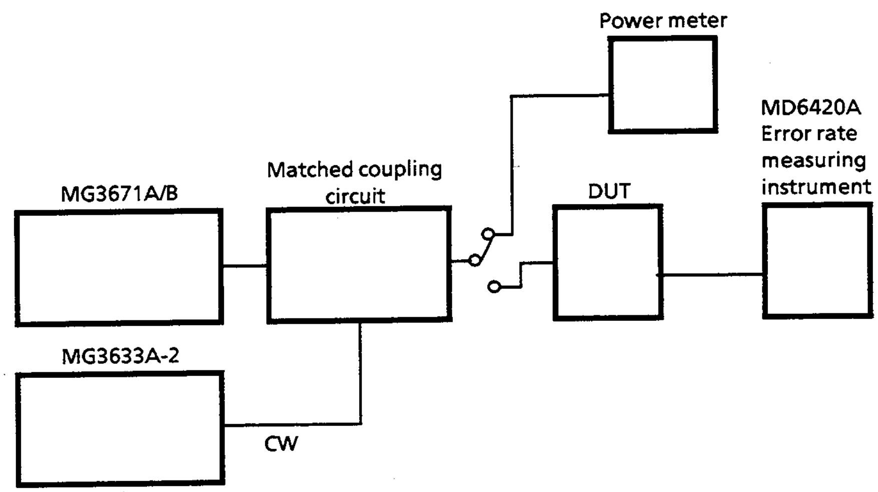


(2) Measurement procedure

Step	Procedure
1	Set the MG3671A/B as follows: Frequency .... Frequency to be tested Output level .... Off Modulation: Burst .... On User data transfer channel TCH .... PN9 Other than TCH channel ..... Specific pattern necessary for communications
2	Set the MG3633A-1 as follows: Frequency .... Frequency to be tested + 100 kHz (or −100 kHz) Output level .... Off Modulation .... Off (CW)
3	Set the MG3633A-1 as follows: Frequency .... Frequency to be tested + 200 kHz (or −200 kHz) Output level .... Off Modulation .... Off (CW)
4	Set the receiver to the test frequency. Use the user data transfer channel TCH for the demodulated data.
5	Measure the MG3671A/B output level with a power meter and adjust it to [Standard sensitivity level + 3 dB].
6	Measure the output levels of MG3633A-1 and MG3633A-2 with a power meter and adjust them to [(Standard sensitivity level + 3 dB) + (Standard intermodulation characteristic value) dB].
7	Operate the switch to apply signals to the receiver to be tested.
8	Using the MD6420A, accumulate the bit strings of the user data transfer channel TCH and measure the error rate for 2,556 bits or more. Verify that the measured error rate is within standard (1×10^{-2}).

5.3.5 Spurious response measurement

(1) Setup



(2) Measurement procedure

Step	Procedure
1	Set the MG3671A/B as follows: Frequency .... Frequency to be tested Output level .... Off Modulation: Burst .... On User data transfer channel TCH .... PN9 Other than TCH channel ..... Specific pattern necessary for communications
2	Set the MG3633A as follows: Frequency .... Spurious frequency Output level .... Off Modulation .... Off (CW)
3	Set the receiver to the test frequency. Use the user data transfer channel TCH for the demodulated data.
4	Measure the MG3671A/B output level with a power meter and adjust it to [Standard sensitivity level + 3 dB].
5	Measure the output levels of MG3633A-1 and MG3633A-2 with a power meter and adjust them to [(Standard sensitivity level + 3 dB) + (Standard spurious response) dB].
6	Operate the switch to apply signals to the receiver to be tested.
7	Using the MD6420A, accumulate the bit strings of the user data transfer channel TCH and measure the error rate for 2,556 bits or more. Verify that the measured error rate is within standard (1×10^{-2}).

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SECTION 6
PERFORMANCE TESTS

This section lists the equipment required for performing the performance tests, and explains each setup and the performance test items.

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SECTION 6
PERFORMANCE TESTS

6.1 Performance Tests Requirement

Performance tests are performed as preventive maintenance to prevent performance deterioration. Performance tests are required at acceptance inspection, periodic inspection, and post-repair performance verification. Execute the performance tests listed below at these times.

- Carrier frequency
- Output level frequency response
- Output level accuracy
- Spurious
- Modulation accuracy

Execute performance tests periodically as preventive maintenance for important items. They should be executed at least once or twice a year to check performance. Contact the ANRITSU service department if the MG3671A/B fails to meet the specifications during performance tests.

6.2 Instruments Required for Performance Tests

The table below lists the measuring instruments required for the performance tests.

Table 6-1 Instruments for Performance Tests

Recommended instrument (Anritsu model)	Required performance†	Test items
Power meter (ML4803A) Power sensor (MA4601A)	100 kHz to 3 GHz -20 to $+10$ dBm	• Output level accuracy • Output level frequency response
Spectrum analyzer (MS2602A)	100 kHz to 8.5 GHz	• Spurious
Frequency counter (MF1603A)	100 kHz to 3 GHz 1 Hz resolution	• Frequency
Digital mobile radio transmitter tester (MS8604A)	Vector error: less than 1.8%	• Modulation accuracy

† Only part of the performance that covers the test item measurement range is extracted.

6.3 Performance Tests

Before executing the performance tests explained on the following pages, unless otherwise specified, the instrument under test and all the other measuring instruments must be warmed-up for at least 30 minutes so the test is executed under stable conditions. To measure at the highest accuracy, the tests must be performed at room temperature, ac power-supply voltage fluctuations must be minimized, and there must be no problems with noise, vibration, dust, and humidity, etc.

6.3.1 Carrier frequency

Check the carrier frequency.

(1) Test specifications

- Frequency range .... 300 kHz to 2750 MHz
- Measurement resolution .... 1 Hz

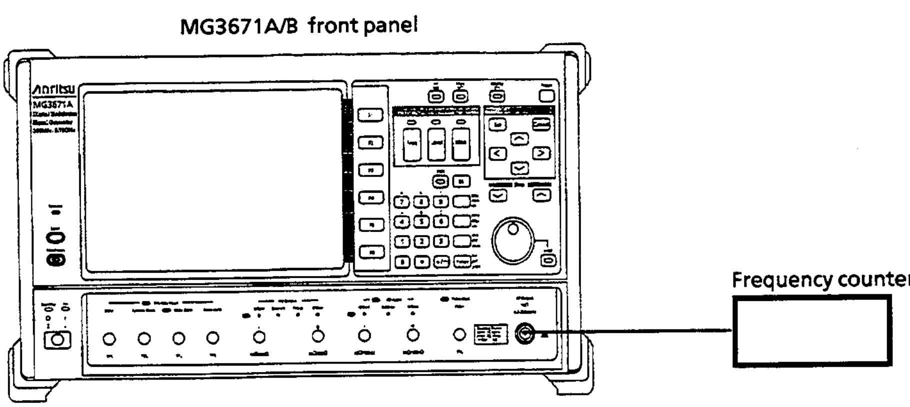
(2) Test instrument

- Frequency counter MF1603A

(3) Test precautions

The counter may read the frequency with ±1 count error included.

(4) Setup



(5) Test procedure

Step	Procedure
1	Set the MG3671A/B to the frequency to be measured and set the output level to 0 dBm, modulation Off.
2	Check if the set measurement frequency of the MG3671A/B and the frequency indicated by the counter are equal.
3	Repeat steps 1 and 2 using another frequency setting.

6.3.2 Output level accuracy

(1) Test specifications

Output level	≦1GHz	>1GHz
−33 to +13 dBm	±1 dB	±2 dB
(−123 to −33.1 dBm	±1.5 dB	±2 dB
−133 to −123.1 dBm)	±3 dB	±4 dB)

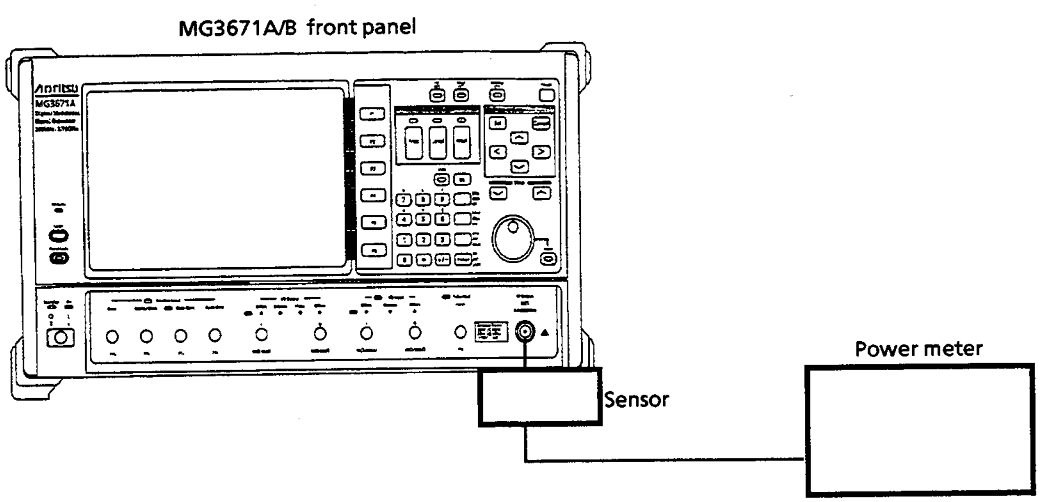
(2) Test instrument

- Power meter ML4803A
- Power sensor MA4601A

(3) Test precautions

The power meter sensor must be directly connected to the output connector of the MG3671A/B.

(4) Setup



(5) Test procedure

Step	Procedure
1	Set the RF off key of the MG3671A/B to Off.
2	Zero-adjust the power meter and calibrate the sensor sensitivity.
3	Set the MG3671A/B output level to the desired value (for instance, 0 dBm)

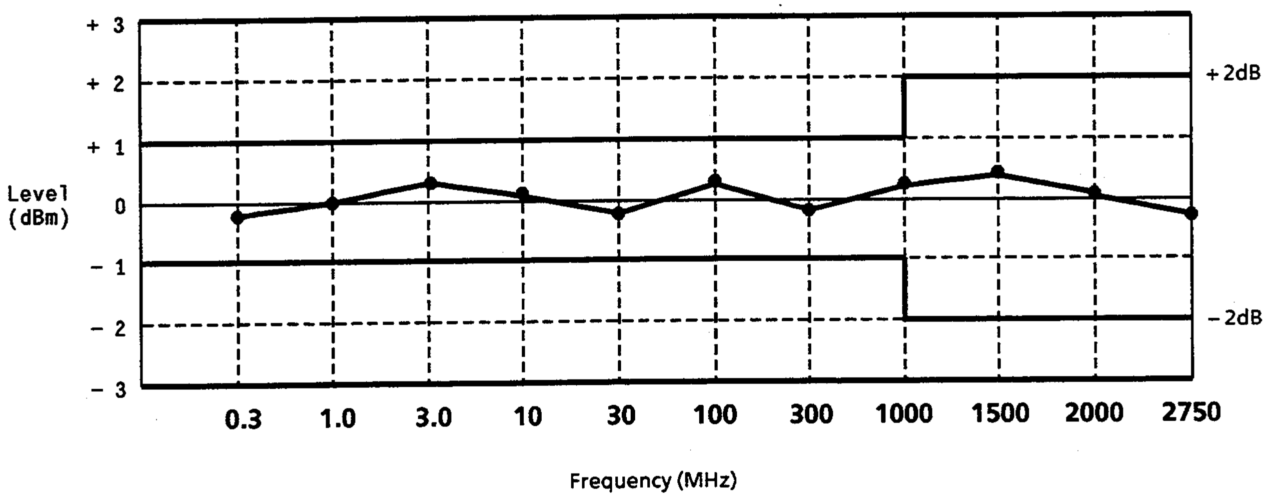
Step	Procedure
4	Set the MG3671A/B to the frequency to be measured (for example, as the table below).

Freq(GHz)	0.3	1.0	3.0	10	30	100	300	1000	1500	2250	2750
Output level (dBm)											
Deviation from 0 dBm (dB)											

5 Set the calibration factor of the power meter sensor and read the MG3671A/B output level.

6 Obtain the deviation between the read value and 0 dBm and enter it in the above table.

7 Repeat steps 4 through 6, and check that the deviation from −10 dBm is within ±1 dB (f ≦ 1GHz), ±2dB (f > 1GHz).



6.3.3 Output level frequency response

(1) Test specifications

- Within ±1 dB (at 0 dBm output)

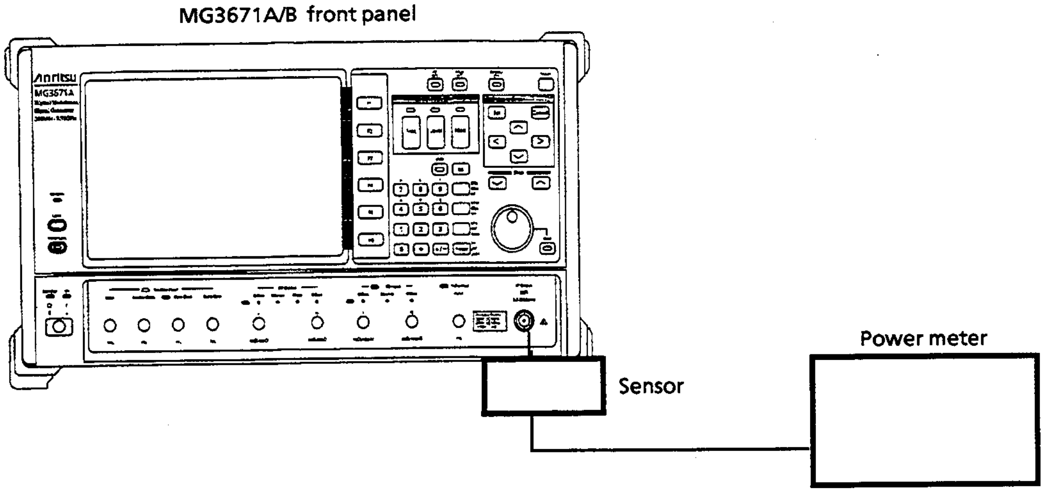
(2) Test instrument

- Power meter ML4803A
- Power sensor MA4601A

(3) Test precautions

The power meter sensor must be directly connected to the output connector of the MG3671A/B.

(4) Setup

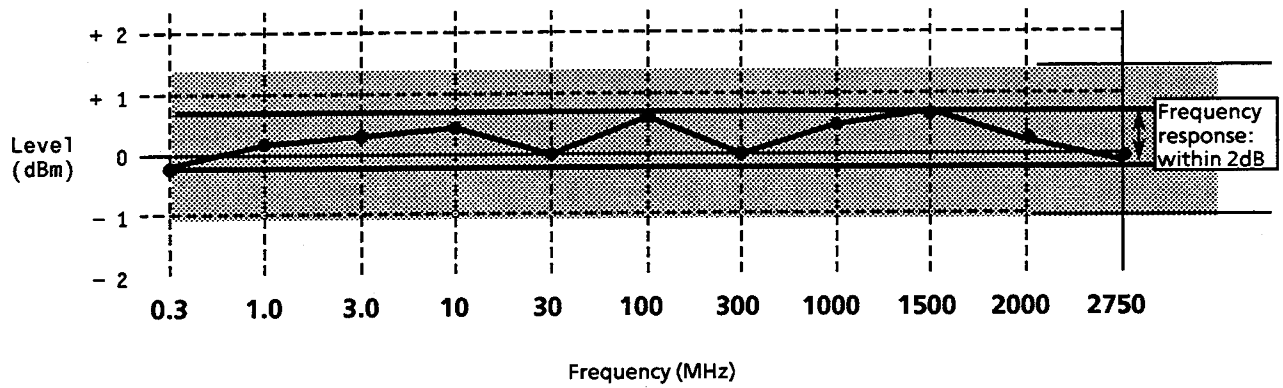


(5) Test procedure

Step	Procedure
1	Set the RF off key of the MG3671A/B to Off.
2	Zero-adjust the power meter and calibrate the sensor sensitivity.
3	Set the MG3671A/B output level to 0 dBm.
4	Record the power meter reading each time the MG3671A/B output frequency is changed as in the table below.

Frequency(MHz)	0.3	1.0	3.0	10	30	100	300	1000	1500	2000	2750
Level(dBm)											

Step	Procedure
5	Check that the difference between the maximum and minimum output level values are within 2 dB (±1 dB).



6.3.4 Spurious

(1) Test specifications

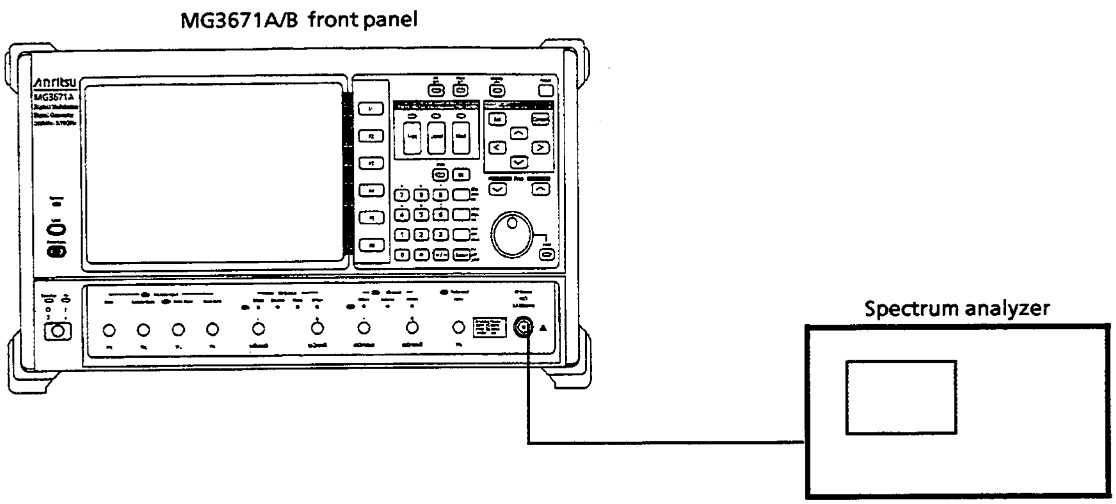
At modulation off and ≦ +5 dBm output

- Harmonics: ≦ −30 dBc
- Non-harmonics: ≦ −65 dBc (≧100 kHz offset, ≦ ±100 MHz bandwidth)
  ≦ −50 dBc (≧100 kHz offset, full band)
  ≦ −40 dBc ; Spurious defined by the next expressions (Carrier frequency≧2.65GHz)
  F_{SP} = 5.4GHz − F_{OUT} F_{SP} = Spurious frequency (GHz)
  F_{OUT} = Carrier frequency (GHz)

(2) Test instrument

- Spectrum analyzer MS2602A

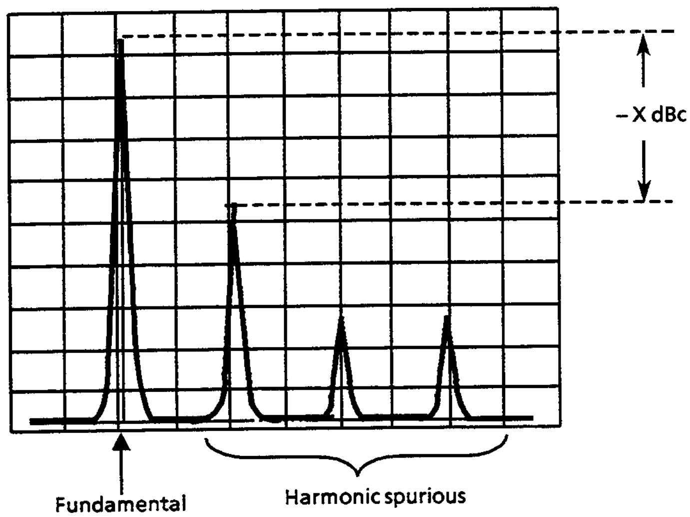
(3) Setup



(4) Test procedure: Harmonic spurious measurement

Step	Procedure
1	Set the Mod Off key of the MG3671A/B to Off.
2	Set the MG3671A/B output level to the desired measurement value (for example, 0 dBm).
3	Set the MG3671A/B frequency to the frequency to be measured.

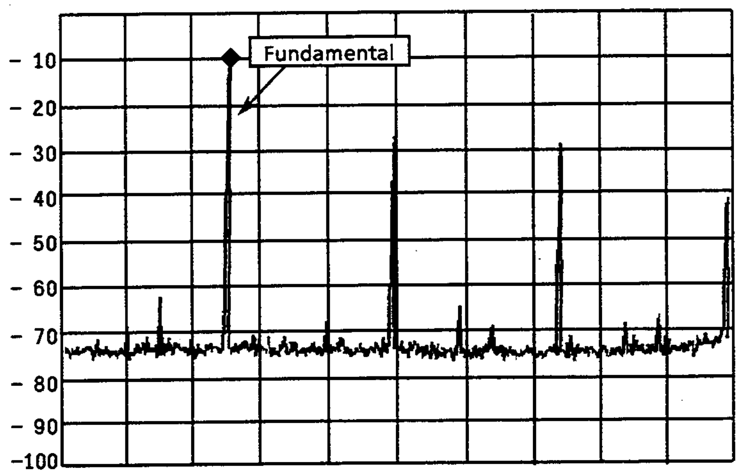
Step	Procedure
4	Set the spectrum analyzer start frequency, stop frequency, span, etc., to suitable values so that the level differences between the fundamental frequency and the harmonics can be measured at the same time, as shown in the figure below.



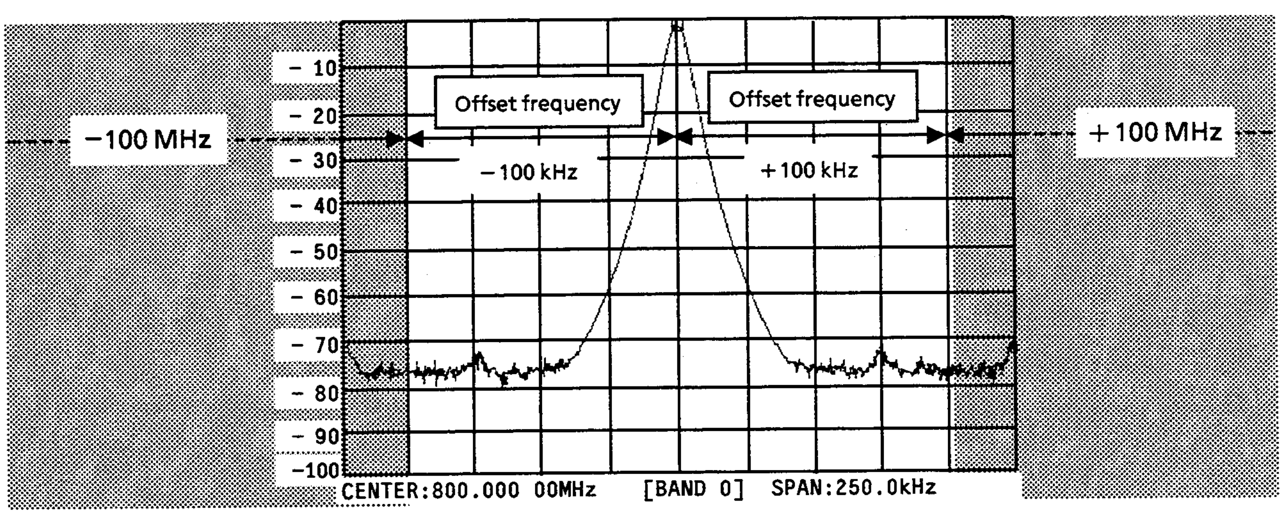
Step	Procedure
5	Match the fundamental wave level to the reference level.
6	Set the analyzer to the delta-marker mode and position the current marker to the highest-level harmonic wave. Check that the level difference is < −30 dBc.

(5) Test procedure: Non-harmonic spurious measurement

Step	Procedure
1	Set the Mod Off key of the MG3671A/B to Off.
2	Set the MG3671A/B output level to the desired measurement value (for example, 0 dBm).
3	Select the desired frequency to be measured (fundamental frequency), and set the MG3671A/B output frequency.
4	Match the fundamental wave level to the reference level.



Step	Procedure
5	Set the spectrum analyzer to delta marker mode. Move the current marker to the non-harmonic component having the highest level of the ±100 kHz to ±100 MHz offset frequency range and check if the level difference is ≦−65 dBc. As shown in the figure below, measurements are made within the ±100 kHz to ±100 MHz offset frequency range.



Moreover, check that the level difference is ≦−50 dBc across the entire bandwidth exceeding the ±100 kHz offset frequency.

6.3.5 Modulation accuracy

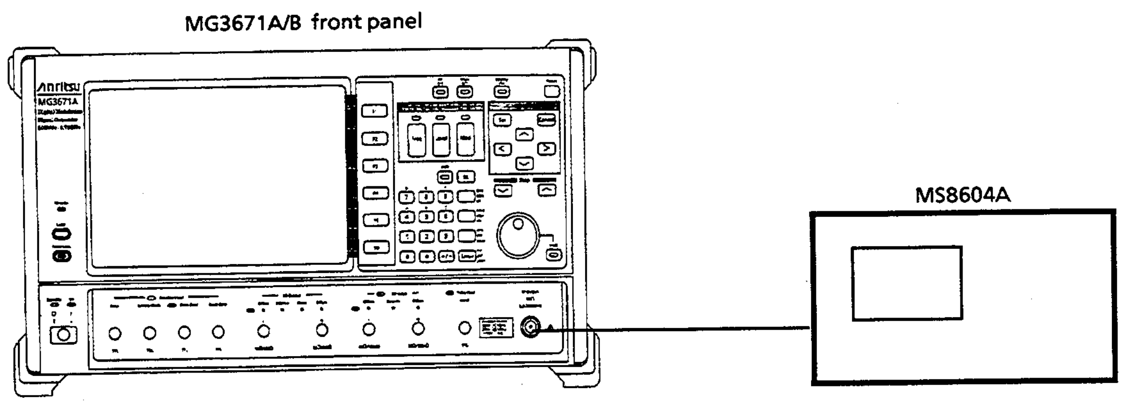
(1) Test specifications

- Modulation accuracy .... $\pi/4$ DQPSK unit vector error: ≦1.8% rms (when output level is ≦ 5 dBm)
  GMSK unit phase error: ≦5° peak (when output level is ≦ 5 dBm)

(2) Test instrument

- Digital modulation waveform analyzer MS8604A

(3) Setup



(4) Test procedure

Step	Procedure
1	Set the MG3671A/B output level to +5 dBm, and set the carrier frequency to the frequency to be measured.
	<u>$\pi/4$ DQPSK modulation unit test</u>
2	Set the MG3671A/B modulation to ON and the system to PDC.
3	Connect the MG3670 RF Output to the MS8604A RF Input.
4	Measure the modulation accuracy on the MS8604A.
	<u>GMSK modulation unit test</u>
5	Set the MG3671A/B system to GSM.
6	Connect the MG3671A/B RF Output to the MS8604A RF Input.
7	Measure the modulation accuracy on the MS8604A.

Note: *For information on the operation of the MS8604A, refer to the MS8604A user's manual. In order to use MS8604A, the optional PDC software (option 11) is necessary.*

SECTION 7
CALIBRATION

This section describes the measuring instruments required for calibration of the MG3671A/B, their setup and the calibration method.

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SECTION 7
CALIBRATION

7.1 Requirement for Calibration

Calibration is carried out to help prevent degradation of performance of the MG3671A/B. Calibration should be performed periodically even if the MG3671A/B is operating normally. Calibration should be executed periodically once or twice a year.

Contact Anritsu if the MG3671A/B fails to meet the specifications during calibration.

7.2 Equipment Required for Calibration

The table below lists the equipment required for calibrating each item.

Table of Equipment Required for Calibration

Equipment	Major specification†	Calibration item
Oscilloscope	Capable of measuring 10 MHz (external trigger possible)	Reference-crystal-oscillator frequency accuracy
Frequency standard	Standard radio-wave receiver or equipment having equivalent function (accuracy better than 1×10^{-9})	Reference-crystal-oscillator frequency accuracy

† Extracts part of performance which can cover the measurement range of the test item.

7.3 Calibration

Before executing the MG3671A/B calibration explained on the following pages, unless otherwise specified, the instruments under calibration and all the other measuring instruments must be warmed-up for at least 30 minutes so that the calibration is executed under stable conditions. To measure at the highest accuracy, calibration must be performed at room temperature, ac power-supply voltage fluctuations must be minimized, and there must be no problems with noise, vibration, dust, and humidity, etc.

7.3.1 Calibrating reference-crystal-oscillator frequency

This paragraph describes the calibration method using an Oscilloscope.

To calibrate the MG3671A/B, its internal reference oscillator frequency should be calibrated once or twice a year. The stability of the MG3671A/B reference crystal oscillator is $\pm 2 \times 10^{-8}$/day. The following describes the method for calibrating the frequency of the reference crystal oscillator by using a reference signal generator generating a reference signal that is either locked to a standard wave, or to a received color-television sub-carrier (signal locked to rubidium atomic standard).

(1) Specifications

Reference crystal oscillator	Frequency	Aging rate	Temperature characteristics
Standard type	10 MHz	2×10^{-8}/day (after 24-h operation)	$\pm5\times10^{-8}$ (0 to 50 °C)
Option 01	10 MHz	5×10^{-9}/day (after 24-h operation)	$\pm5\times10^{-8}$ (0 to 50 °C)
Option 02	10 MHz	2×10^{-9}/day (after 24-h operation)	$\pm1.5\times10^{-8}$ (0 to 50 °C)
Option 03	10 MHz	$\pm5\times10^{-10}$/day (after 48-h operation)	$\pm5\times10^{-9}$ (0 to 50 °C)

(2) Instruments required for calibration

- Oscilloscope .... 10 MHz, external trigger possible
- Frequency standard ...... Standard radio wave receiver or equipment having equivalent function (accuracy better than 1×10^{-9})

(3) Setup

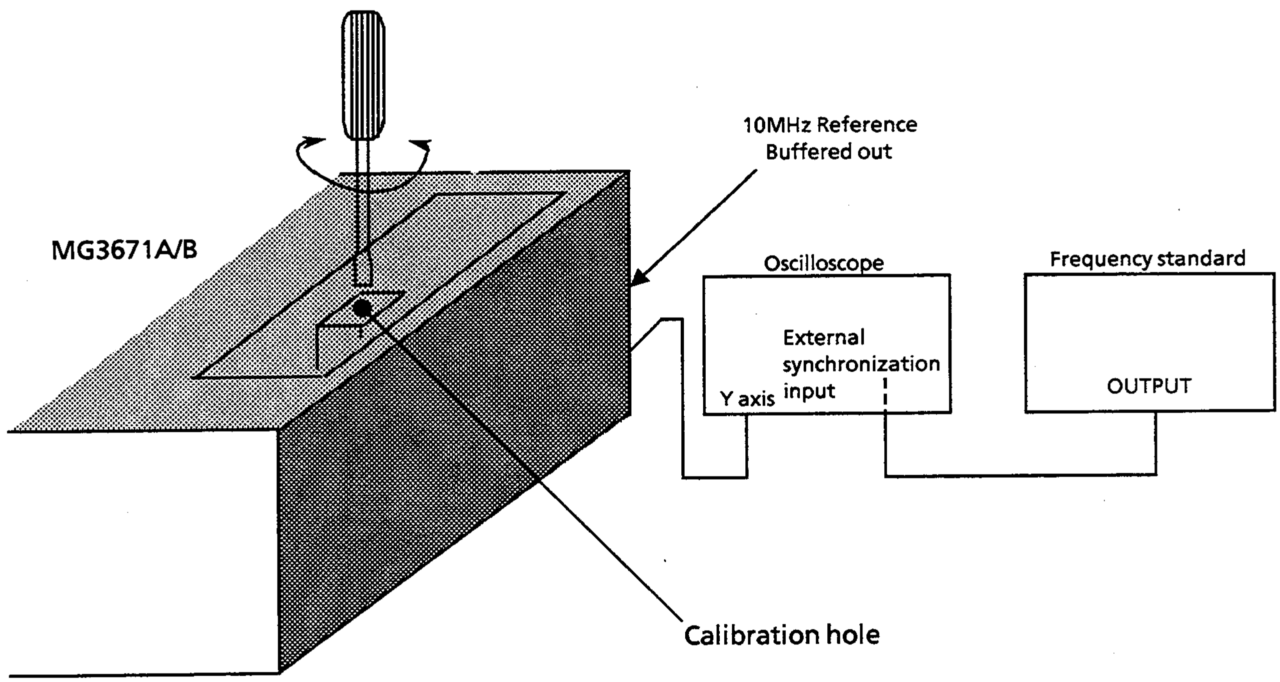
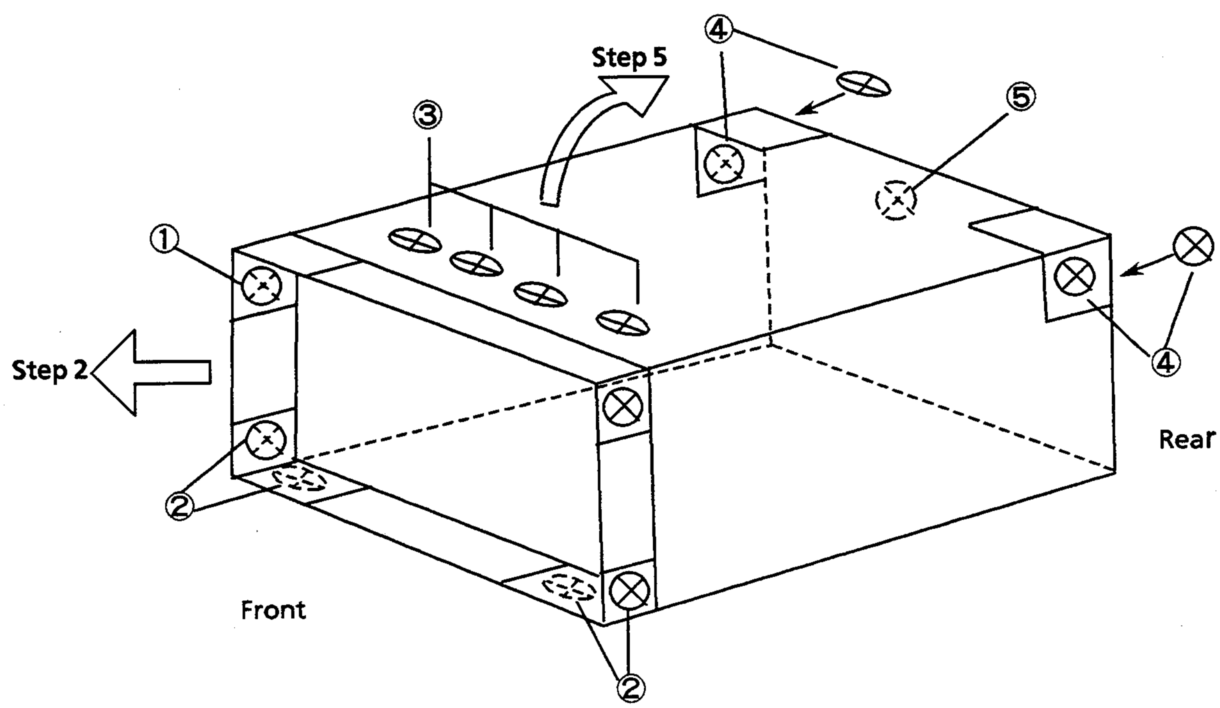


Fig. 7-1 Calibration of reference-crystal-oscillator frequency

Note: *Removing the top cover is explained below:*



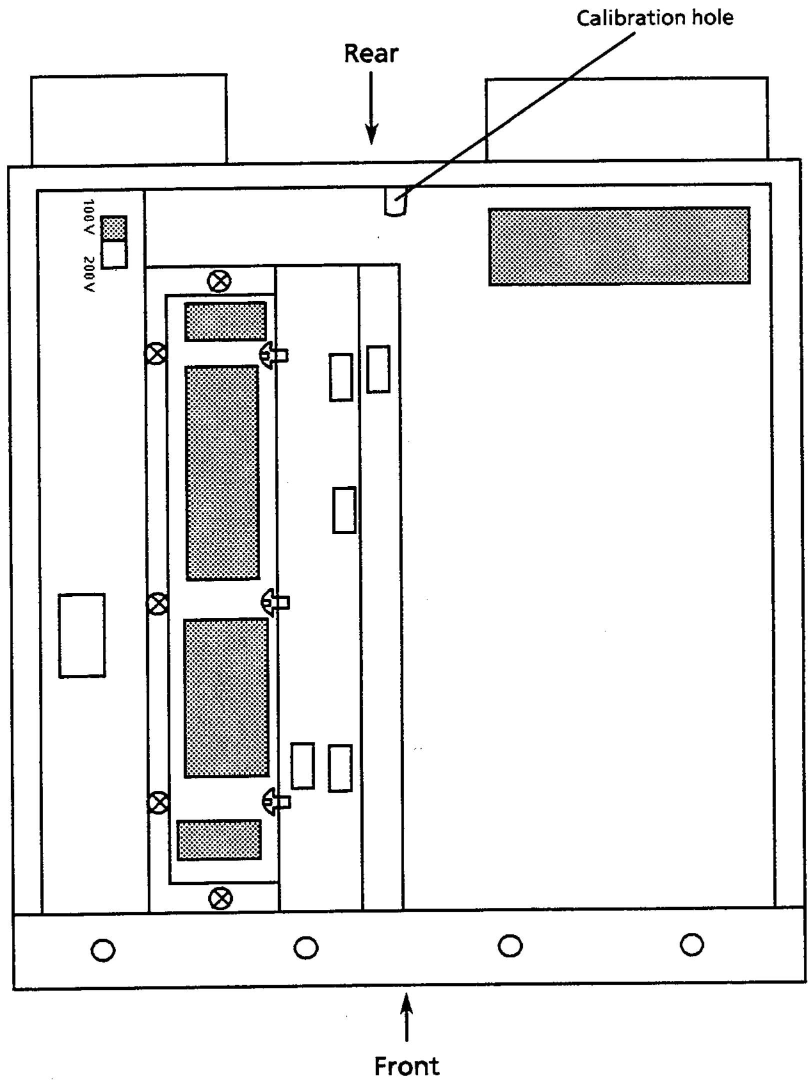


Fig.7-3 Top View after Removing Top Cover

Step	Procedure
1	Remove the screws ①(2pc) and ②(4pc) at the front protectors.
2	Pull out the front section, slowly, by a few cm .
3	Remove the screws ③(4pc) at the front top section.
4	Remove the screws ④(4pc) at rear protectors and ⑤(1pc) at the rear side.
5	Lifting up the front side of the top cover, remove the top cover.

(4) Calibration procedure

Step	Procedure
1	Set-up the equipment as shown in the figure on the previous pages. The ambient temperature should be 25 °C ±5 °C.
2	Allow the reference crystal oscillator to warm-up for 24 hours by setting the Power switch on the front panel to the Standby position.
3	Then set the Power switch to On.
4	Apply the standard frequency signal to the external synchronization input of the oscilloscope, and the signal output from the Buffered Out connector on the MG3671A/B rear panel to the Y axis.
5	Adjust the oscilloscope so that the input waveform can be observed. If the input waveform moves right or left on the screen and synchronization is not possible, this means that the frequency of the reference crystal oscillator does not match the standard frequency.
6	Adjust the potentiometer in the calibration hole inside the reference-crystal-oscillator case so that the input waveform stops moving left or right on the oscilloscope screen.

(5) Precautions for Calibration

Applying a standard 10 MHz signal to the oscilloscope Y-axis produces a lissajous waveform. Adjust the reference oscillator frequency so that the waveform becomes a stationary circularity at Step 6.

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SECTION 8
STORAGE AND TRANSPORTATION

This section describes the long-term storage, repacking and transportation of the MG3671A/B as well as the regular care procedures and the timing.

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SECTION 8
STORAGE AND TRANSPORTATION

8.1 Cleaning Cabinet

Always turn the MG3671A/B Power switch Off and disconnect the power plug from the ac power inlet before cleaning the cabinet.

To clean the external cabinet:

- Use a soft, dry cloth for wiping off.
- Use a cloth moistened with diluted neutral cleaning liquid if the instrument is very dirty or before long-term storage.

  After insuring that the cabinet has been thoroughly dried, use a soft, dry cloth for wiping off.
- If loose screws are found, tighten them with the appropriate tools.

CAUTION

Never use benzene, thinner, or alcohol to clean the external cabinet; it may damage the coating, or cause deformation or discoloration.

8.2 Storage Precautions

This paragraph describes the precautions to take for long-term storage of the MG3671A/B and expansion units.

8.2.1 Precautions before storage

(1) Before storage, wipe dust, finger-marks, and other dirt off the MG3671A/B.

(2) Avoid storing the MG3671A/B and expansion units where:

1) It may be exposed to direct sunlight or high dust levels.
2) It may be exposed to high humidity.
3) It may be exposed to active gases.
4) It may be exposed to extreme temperatures (< -40°C or > 70°C) or high humidity ($\geqq 90\%$).

8.2.2 Recommended storage precautions

The recommended storage conditions are as follows:

- Temperature .... 0 to 30°C
- Humidity .... 40% to 80%
- Stable temperature and humidity over 24-hour period

8.3 Repacking and Transportation

The following precautions should be taken if the MG3671A/B and expansion units must be returned to Anritsu Corporation for servicing.

8.3.1 Repacking

Use the original packing materials. If the equipment is packed in other materials, observe the following packing procedure:

(1) Wrap the MG3671A/B in a plastic sheet or similar material. For the expansion units, wrap them in an electro-conductive sheet or similar material.

(2) Use a cardboard, wooden box, or aluminum case which allows shock-absorbent material to be inserted on all sides of the equipment.

(3) Use enough shock-absorbent material to protect the equipment from shock during transportation and to prevent it from moving in the container.

(4) Secure the container with packing straps, adhesive tape or bands.

8.3.2 Transportation

Do not subject the equipment to severe vibration during transport. It should be transported under the storage conditions recommended in paragraph 8.2.

APPENDIXES

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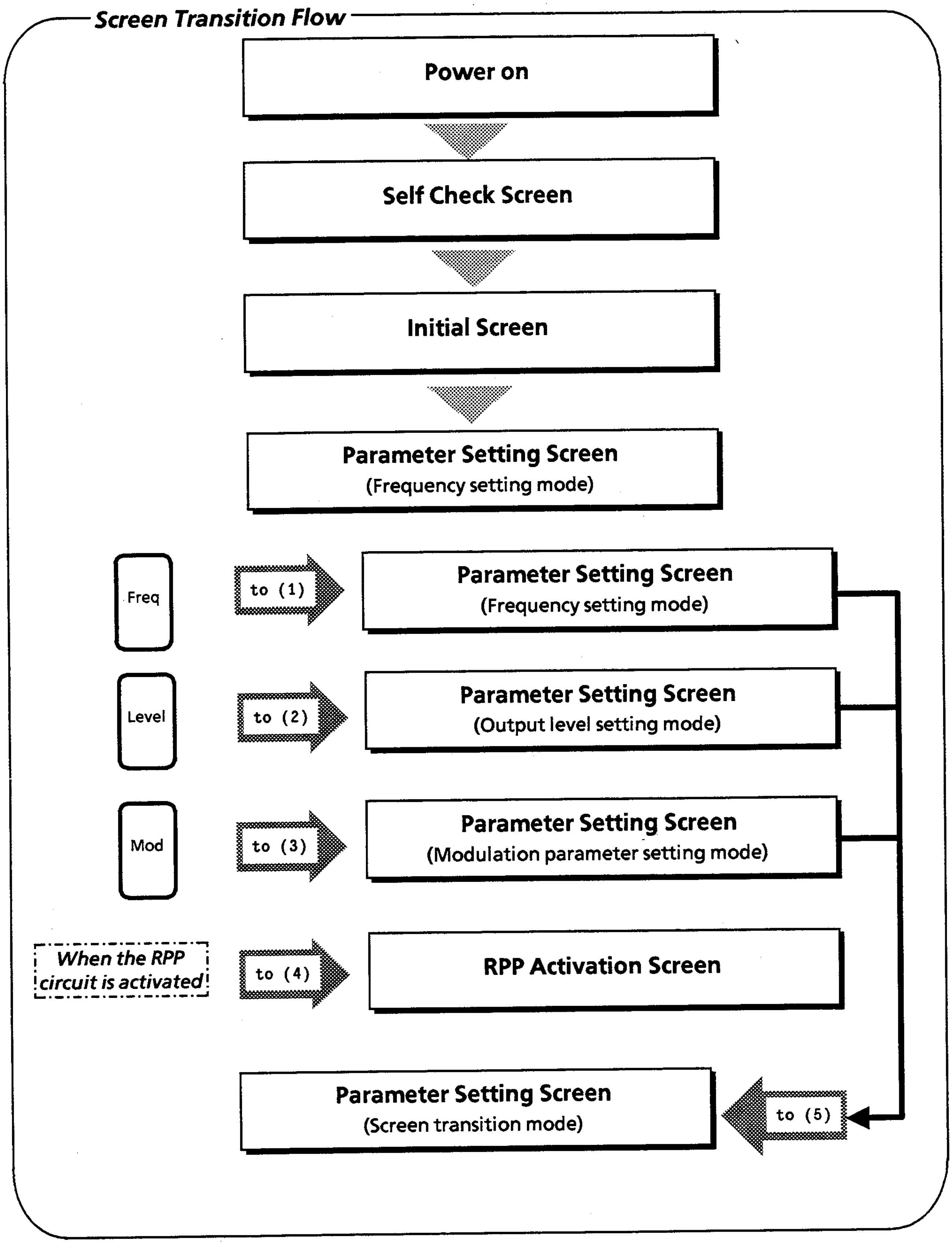
APPENDIX A
SCREEN TRANSITION

This Appendix A summarizes the screen transition of the MG3671A/B. For detailed descriptions, see Section 3 and Section 4.
The screen transition may differ a little from the description in this appendix, depending on the unit to be used. Please, also refer to the operation manual of the unit.



Screen Transition Flow
Power on
Self Check Screen
Initial Screen
Parameter Setting Screen
(Frequency setting mode)
Freq
to (1)
Parameter Setting Screen
(Frequency setting mode)
Level
to (2)
Parameter Setting Screen
(Output level setting mode)
Mod
to (3)
Parameter Setting Screen
(Modulation parameter setting mode)
When the RPP circuit is activated
to (4)
RPP Activation Screen
Parameter Setting Screen
(Screen transition mode)
to (5)

(1) Parameter Setting Screen (Frequency setting mode)

<Menu 1>

Incremental Step Value	F1	Incremental step frequency
Relative On/Off	F2	Relative frequency display mode (On/Off)
→ Frequency Save	F3	→ to Frequency Save Screen
→ Frequency Recall	F4	→ to Frequency Recall Screen
→ Frequency Delete	F5	→ to Frequency Delete Screen
* etc	F6	→ to Menu 2

<Menu 2>

Offset Value	F1	Frequency offset value
Offset On/Off	F2	Frequency offset (On/Off)
Current Frequency	F3	Checks output frequency.
	F4	
Setup/ → Parameter Memory	F5	→ to Parameter Setting Screen (Screen transition mode)
* etc	F6	→ to Menu 1

<Frequency Save Screen>

Last Page	F1	Displays preceding page.
Next Page	F2	Displays next page.
Return →	F6	→ to Parameter Setting Screen (Frequency setting mode)

<Frequency Recall Screen>

Last Page	F1	Displays preceding page.
Next Page	F2	Displays next page.
Return →	F6	→ to Parameter Setting Screen (Frequency setting mode)

<Frequency Delete Screen>

Last Page	F1	Displays preceding page.
Next Page	F2	Displays next page.
Delete All	F4	Deletes all frequency data in memory.
Return →	F6	→ to Parameter Setting Screen (Frequency setting mode)

(2) Parameter Setting Screen (Output level setting mode)

<Menu 1>

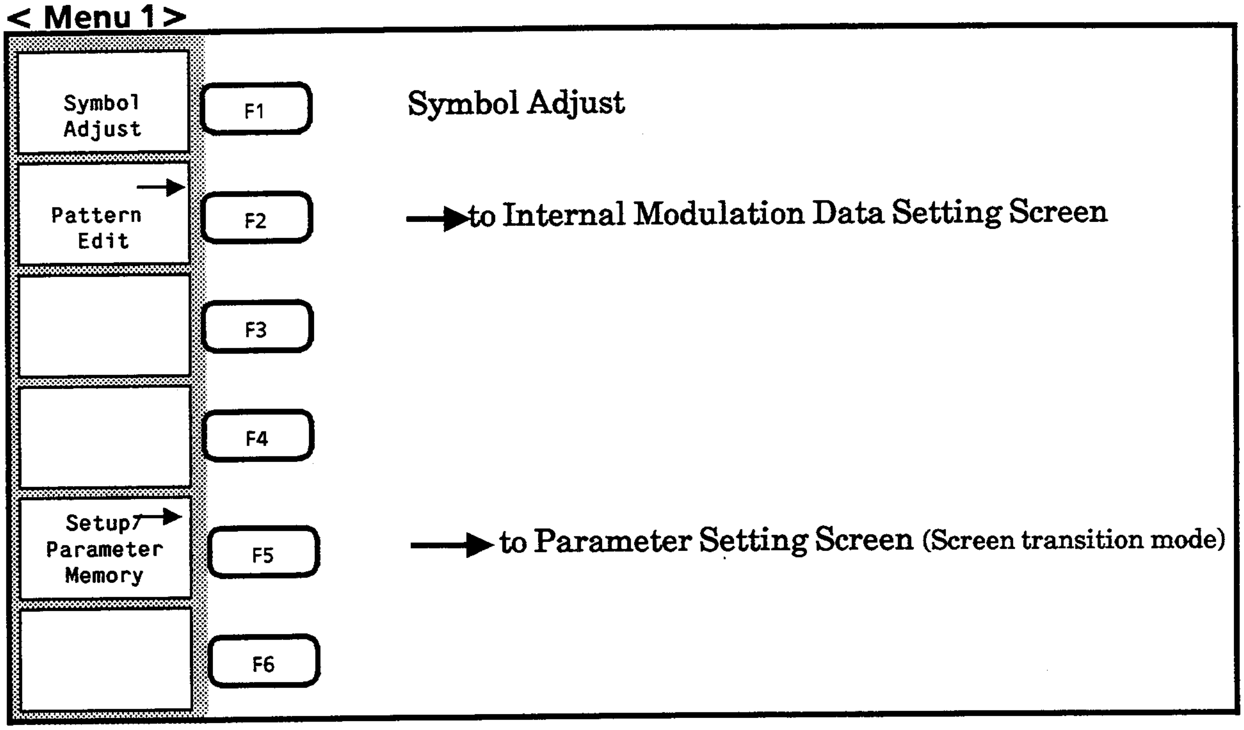
Incremental Step Value	F1	Incremental step output level
Relative On/Off	F2	Relative level display mode (On/Off)
Continuous ON/Off	F3	Continuous mode (On/Off)
Unit EMF/TERM	F4	Displays open-circuit voltage/terminated voltage
Cal	F5	Calibrates output level.
etc *	F6	→ to Menu 2

<Menu 2>

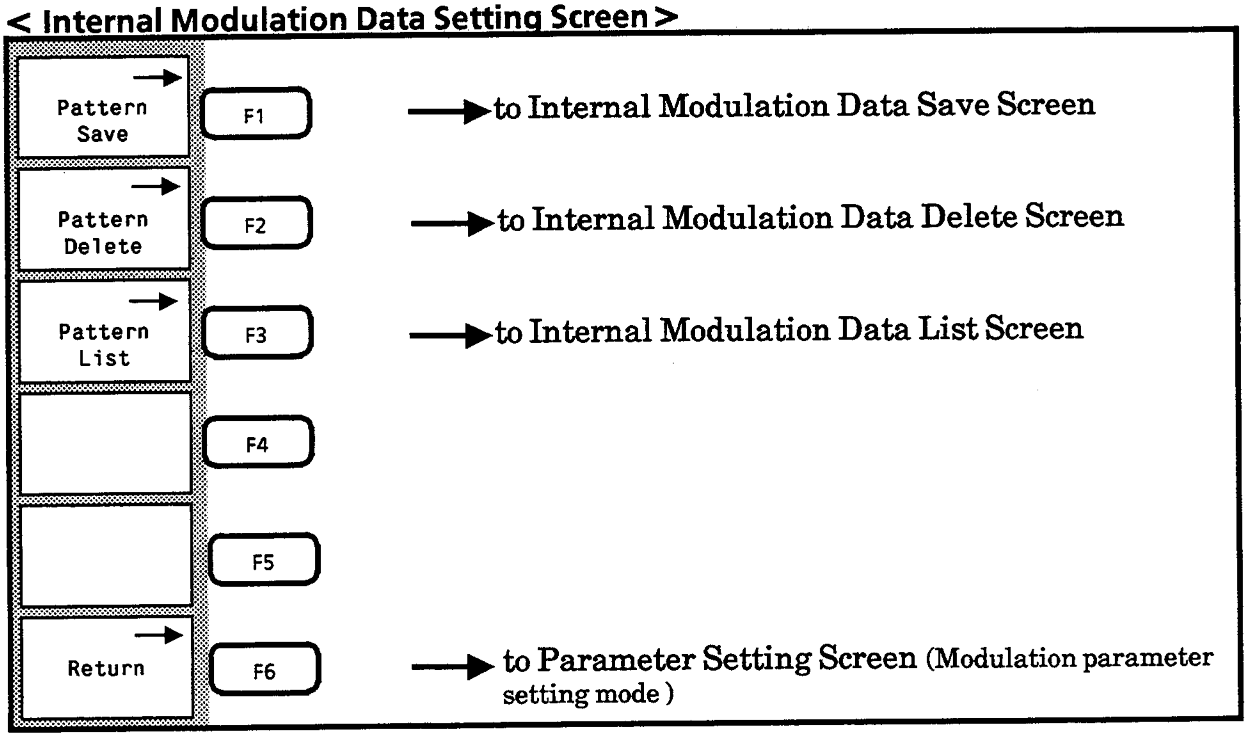
Offset Value	F1	Output level offset value
Offset On/Off	F2	Output level offset (On/Off)
Current Level	F3	Checks output level.
	F4	
Setup/ Parameter Memory	F5	→ to Parameter Setting Screen (Screen transition mode)
etc *	F6	→ to Menu 1

(3) Parameter Setting Screen (Modulation parameter setting mode)

< Menu 1 >



< Internal Modulation Data Setting Screen >



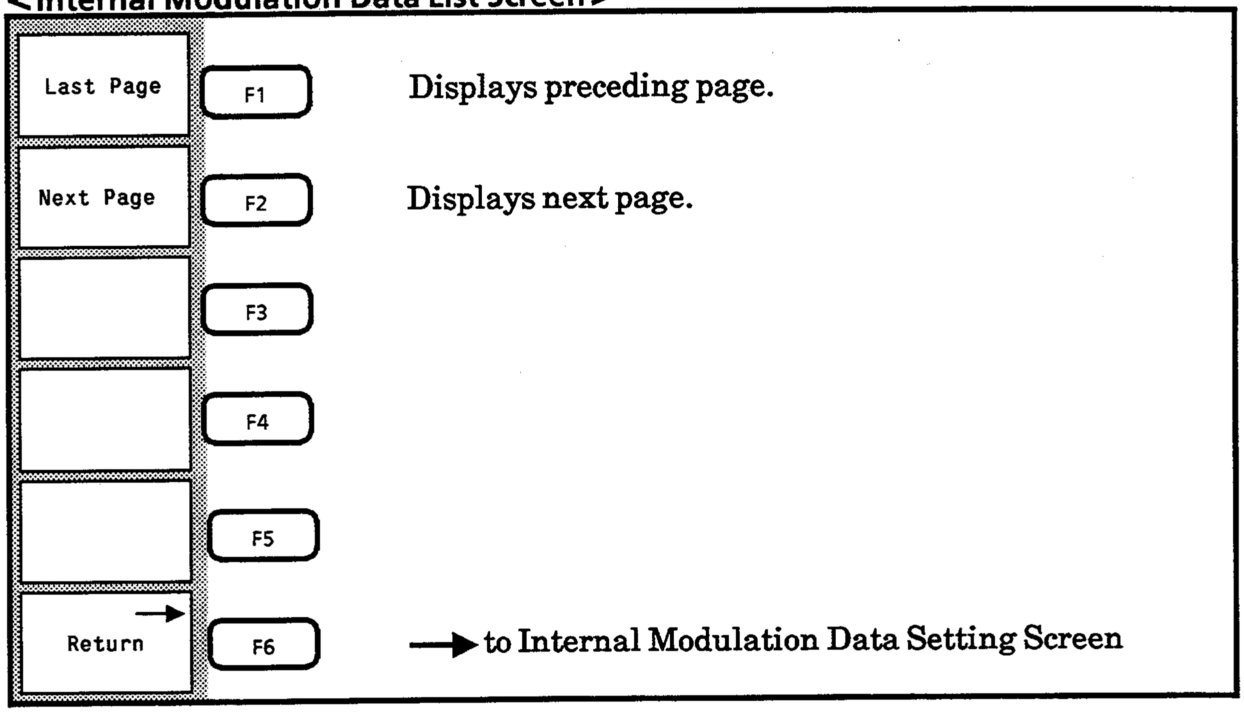
<Internal Modulation Data Save Screen>

Soft key	Key	Function
Last Page	F1	Displays preceding page
Next Page	F2	Displays next page
Title *	F3	Title entry
	F4	
	F5	
Return →	F6	→ to Internal Modulation Data Setting Screen

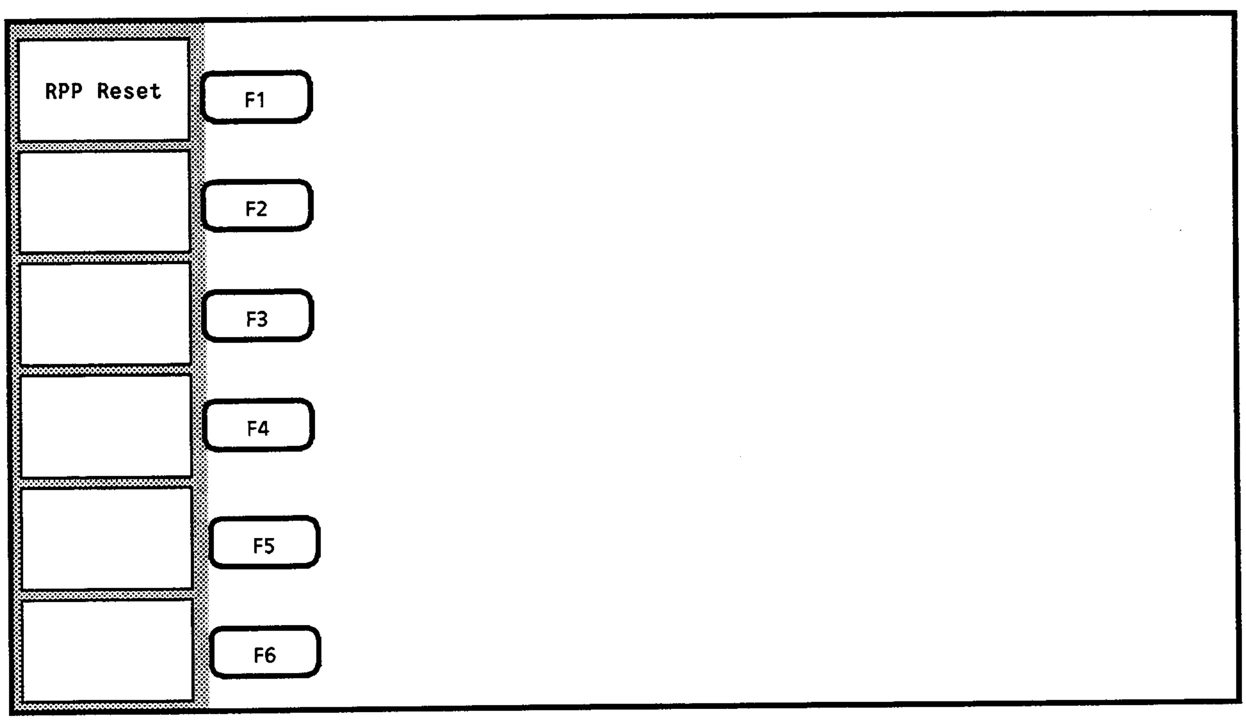
<Internal Modulation Data Delete Screen>

Soft key	Key	Function
Last Page	F1	Displays preceding page
Next Page	F2	Displays next page
	F3	
Delete All	F4	Deletes all internal modulation data in memory.
	F5	
Return →	F6	→ to Internal Modulation Data Setting Screen

<Internal Modulation Data List Screen>



(4) RPP Activation Screen



(5) Parameter Setting Screen (Screen transition mode)

<Menu 1>

→ IF/RF Setup	F1	→ to IF/RF Setup Screen
→ Base Band Setup	F2	→ to Base Band Setup Screen
→ Interface Setup	F3	→ to Interface Setup Screen
→ Hardware check	F4	→ to Hardware Setup Screen
→ Return	F5	→ to Parameter Setting Screen (Frequency setting mode, Output level setting mode, Modulation parameter setting mode)
* etc	F6	→ to Menu 2

<Menu 2>

→ Parameter Save	F1	→ to Parameter Save Screen
→ Parameter Recall	F2	→ to Parameter Recall Screen
→ Parameter Delete	F3	→ to Parameter Delete Screen
→ Parameter List	F4	→ to Parameter List Screen
	F5	
* etc	F6	→ to Menu 1

<IF / RF Setup Screen>

Return →	F6	→ to Parameter Setting Screen (Screen transition mode)

<Base Band Setup Screen>

Return →	F6	→ to Parameter Setting Screen (Screen transition mode)

<Interface Setup Screen>

Return →	F6	→ to Parameter Setting Screen (Screen transition mode)

<Hardware Setup Screen>

Return →	F6	→ to Parameter Setting Screen (Screen transition mode)

<Parameter Save Screen>

Last Page	F1	Displays preceding page.
Next Page	F2	Displays next page.
Title *	F3	Title entry
	F4	
	F5	
Return →	F6	→ to Parameter Setting Screen (Screen transition mode)

<Parameter Recall Screen>

Last Page	F1	Displays preceding page.
Next Page	F2	Displays next page.
	F3	
	F4	
	F5	
→ Return	F6	→ to Parameter Setting Screen (Screen transition mode)

<Parameter Delete Screen>

Last Page	F1	Displays preceding page
Next Page	F2	Displays next page
	F3	
Delete All	F4	Deletes all parameters in memory.
	F5	
→ Return	F6	→ to Parameter Setting Screen (Screen transition mode)

<Parameter List Screen>

Last Page	F1	Displays preceding page.
Next Page	F2	Displays next page.
	F3	
	F4	
	F5	
Return →	F6	→ to Parameter Setting Screen (Screen transition mode)

<Title Entry>

Cursor ←	F1	Moves cursor in the arrow mark.
Cursor →	F2	Moves cursor in the arrow mark.
	F3	
Delete	F4	Erases the character on the cursor.
Clear	F5	Clears title entry area..
	F6	

APPENDIX B
ERROR MESSAGE

B.1 General

Using buzzer, error message display, and status byte, the MG3671A/B Digital Modulation Generator warns users the cause of an error generated by improper panel operation or GPIB control. Every error message is displayed reversely at the bottom area of the screen.

B.2 Error Disposal

Any of the disposal below is executed when an error has occurred for improper panel operation or GPIB remote control:

- Sounds the buzzer.
- Displays error message.
- Sets Event Status Register and Status byte.

Error message is cleared when the following measures are taken.

B.2.1 Command error (CME)

MAIN CODE	SUB CODE	Error message
300	1	300 Undefined command
301	1	301 Invalid numeric data
302	1	302 Invalid unit
303	1	303 Insufficient data
310	1	310 Command error

B.2.2 Execution error (EXE)

MAIN CODE	SUB CODE	Error message
400	1	400 Out of range
401	1	401 Invalid string data
402	1	402 String too long
403	1	403 Recall memory error
404	1	404 Memory not found
405	1	405 Insufficient Memory
410	1	410 Execution error

B.2.3 Exception error

MAIN CODE	SUB CODE	Error message
600	1	600 Level uncal
601	1	601 Self check error†

† The self check error does not set Standard Event Status Register and Status Byte.

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MG3671A/B

Digital Modulation Signal Generator

Operation Manual

(GPIB Remote Control)

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SECTION 1
GENERAL

This section outlines the GPIB functions of the MG3671A/B Digital Modulation Signal Generator.

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SECTION 1
GENERAL

1.1 General

The MG3671A/B Digital Modulation Signal Generator, when combined with an external controller, can automate your measurement system. For this purpose the MG3671A/B is equipped with a GPIB interface bus (IEEE std 488.2 1987) as a standard feature.

1.2 Functions of GPIB

The functions of the MG3671A/B GPIB are as follows:

(1) Controls all functions except the power switch and some keys including the [LOCAL] key

(2) Reads out all setting conditions

(3) Sets the GPIB address from the panel

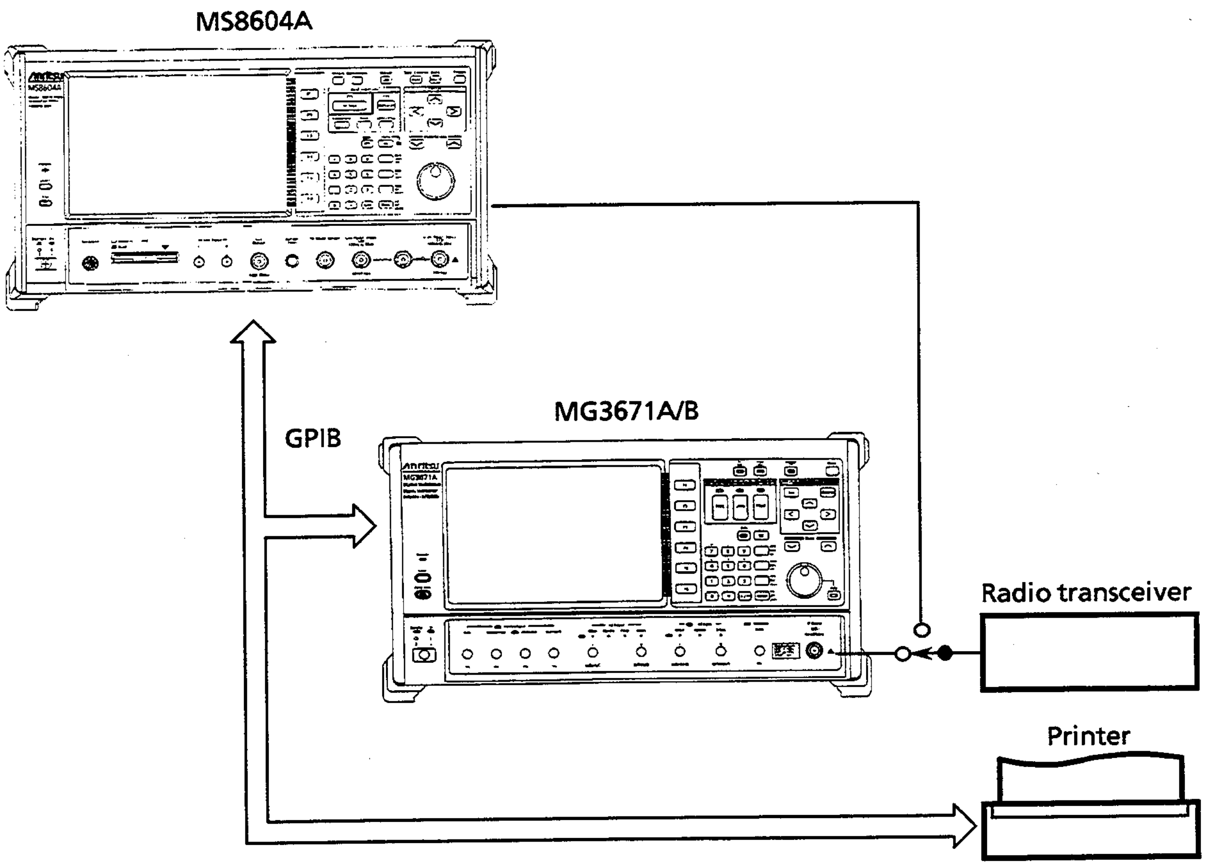
(4) Executes interrupts and serial polling

(5) Configures the automatic measurement system when the MG3671A/B is combined with a personal computer and other measuring instruments

1.3 Examples of System Configuration Using GPIB

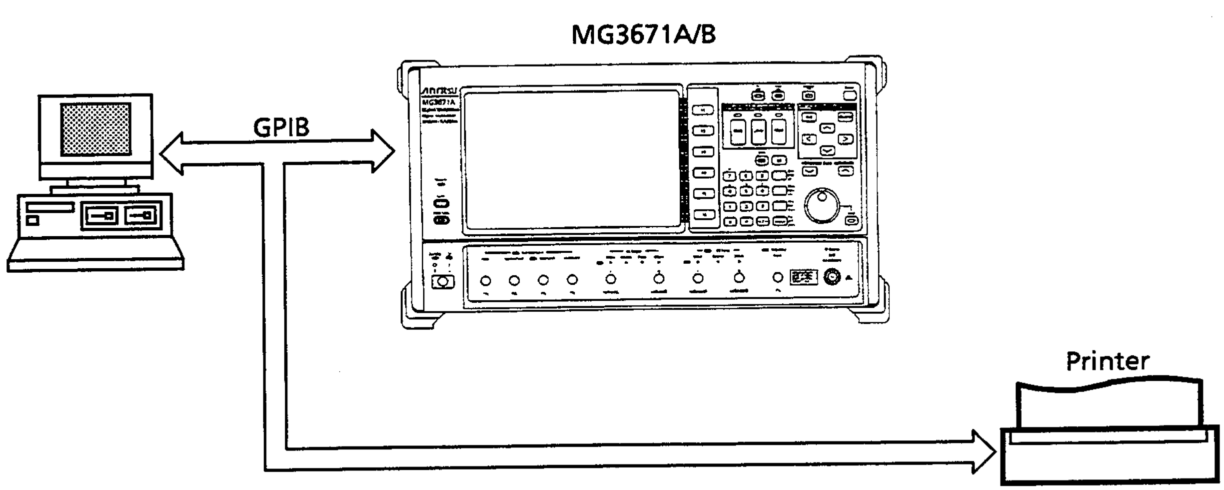
(1) PTA control by the MS8604A

The waveforms and parameters etc. measured by controlling the MG3671A/B with the MS8604A via GPIB can be output to the printer.



(2) Control by the host computer

The parameters etc. can be output to the printer by controlling the MG3671A/B with the host computer via GPIB.



1.4 Specifications

The MG3671A/B GPIB provides the IEEE488.1 subsets listed in the code columns of the table below.

GPIB 1 Interface Functions

Code	Interface function
SH1	All source handshake functions are provided. Synchronizes the timing of data transmission.
AH1	All acceptor handshake functions are provided. Synchronizes the timing for receiving data.
T6	Basic talker functions are provided. The serial poll function is provided. The talk-only function is not provided. The talker can be canceled by MLA.
L4	Basic listener functions are provided. The listen-only function is not provided. The listener can be canceled by MTA.
SR1	All service request and status byte functions are provided.
RL1	All remote / local functions are provided. The local lockout function is provided.
PP0	Parallel poll functions are not provided.
DC1	All device clear functions are provided.
DT0	Device trigger functions are not provided.
C0	Controller functions are not provided.

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SECTION 2
DEVICE MESSAGE LIST

This section lists the device messages of the MG3671A/B.

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SECTION 2
DEVICE MESSAGE LIST

2.1 IEEE 488.2 Common Commands and MG3671A/B Supported Commands

The table below lists 39 types of common commands specified in the IEEE 488.2 standard. IEEE 488.2 common commands which are supported by the MG3671A/B are indicated with ◎ symbol in the table.

Mnemonic	Command name	IEEE488.2 Standard	MG3671A/B supported commands
*AAD	Accept Address Command	Optional	
*CAL?	Calibration Query	Optional	
*CLS	Clear Status Command	Mandatory	◎
*DDT	Define Device Trigger Command	Optional	
*DDT?	Define Device Trigger Query	Optional	
*DLF	Disable Listener Function Command	Optional	
*DMC	Define Macro Command	Optional	
*EMC	Enable Macro Command	Optional	
*EMC?	Enable Macro Query	Optional	
*ESE	Standard Event Status Enable Command	Mandatory	◎
*ESE?	Standard Event Status Enable Query	Mandatory	◎
*ESR?	Standard Event Status Register Query	Mandatory	◎
*GMC?	Get Macro Contents Query	Optional	
*IDN?	Identification Query	Mandatory	◎
*IST?	Individual Status Query	Optional	
*LMC?	Learn Macro Query	Optional	
*LRN?	Learn Device Setup Query	Optional	
*OPC	Operation Complete Command	Mandatory	◎
*OPC?	Operation Complete Query	Mandatory	◎
*OPT?	Option Identification Query	Optional	
*PCB	Pass Control Back Command	Mandatory if other than C0	
*PMC	Purge Macro Command	Optional	
*PRE	Parallel Poll Register Enable Command	Optional	
*PRE?	Parallel Poll Register Enable Query	Optional	
*PSC	Power On Status Clear Command	Optional	
*PSC?	Power On Status Clear Query	Optional	
*PUD	Protected User Data Command	Optional	
*PUD?	Protected User Data Query	Optional	
*RCL	Recall Command	Optional	
*RDT	Resource Description Transfer Command	Optional	
*RDT?	Resource Description Transfer Query	Optional	

Mnemonic	Command name	IEEE488.2 Standard	MG3671A/B supported commands
*RST	Reset Command	Mandatory	◎
*SAV	Save Command	Optional	
*SRE	Service Request Enable Command	Mandatory	◎
*SRE?	Service Request Enable Query	Mandatory	◎
*STB?	Read Status Byte Query	Mandatory	◎
*TRG	Trigger Command	Mandatory if DT1	
*TST?	Self Test Query	Mandatory	◎
*WAI	Wait to Continue Command	Mandatory	◎

Note: *The first character of a common command or query starts with the asterisk symbol(*).*

2.2 MG3671A/B Device Message List

The tables on the following pages list the command messages, query messages, and response messages specific to the MG3671A/B.

2.2.1 How to read the MG3671A/B device message tables

(1) Command Messages (Command Msg)/Query Message (Query Msg)

(a) Upper-case:	Reserved word
(b) Number:	Reserved word (Number code)
(c) Lower-case argument	
f (Frequency):	Numeric data (NR1,NR2,NR3 format)
Suffix code:	GHZ, GZ, MHZ, MZ, KHZ, KZ, HZ, None=HZ
ℓ_1 (Level):	Numeric data (NR1,NR2,NR3 format)
Suffix code:	DBM, DM, DBU, DU, V, MV, UV, None=DBM
ℓ_2 (Level):	Numeric data (NR1,NR2,NR3 format)
Suffix code:	DB None=DB
ℓ_3 (Level):	Numeric data (NR1,NR2,NR3 format)
Suffix code:	V, MV, UV None=MV
n (Integral number):	Numeric data (NR1 format)
h (hexadecimal number):	Numeric data (hexadecimal data)
s:	Character string enclosed by double quotation marks (" ") or single quotation marks (' ')

(2) Response message(Response Msg)

(a) Upper-case:	Reserved word
(b) Number:	Reserved word (Number code)
(c) Lower-case argument	
f (Frequency):	Numeric data (NR1 format)
Suffix code:	HZ
ℓ_1 (Level):	Numeric data (NR2 format)
Suffix code:	DBM, DBU, V, MV, UV (Transfers the unit which is represented in the current output level units)
ℓ_2 (Level):	Numeric data (NR2 format)
Suffix code:	DB
ℓ_3 (Level):	Numeric data (NR2 format)
Suffix code:	MV
n (Integral number):	Numeric data (NR1 format)
h (hexadecimal number):	Numeric data (hexadecimal data)

Note:
- *In the device message list compatible with the MG3633A, the netted messages, which overlap with the MG3671A/B, can be used for MG3671A/B.*
- *If the header is set to Off, then the response message header and the numeric data suffix code are not transferred. (Initial setting: Header Off)*
- *␣ means a space of one character.*
- *Ø indicates a zero.*

2.2.2 MG3671A/B device message list

(1) Frequency

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets frequency	Frequency	FREQ␣f	FREQ?	FREQ␣f
Sets frequency using incremental step	Frequency Incremental Step			
	Value	FIS␣f	FIS?	FIS␣f
	Up	FRS␣UP	—	—
	Down	FRS␣DN	—	—
Sets frequency using rotary knob	Frequency Knob			
	Up	FRK␣UP	—	—
	Down	FRK␣DN	—	—
Sets frequency resolution	Frequency Resolution			
	1 Hz	FRR␣1HZ	FRR?	FRR␣1HZ
	10 Hz	FRR␣10HZ	FRR?	FRR␣10HZ
	100 Hz	FRR␣100HZ	FRR?	FRR␣100HZ
	1 kHz	FRR␣1KHZ	FRR?	FRR␣1KHZ
	10 kHz	FRR␣10KHZ	FRR?	FRR␣10KHZ
	100 kHz	FRR␣100KHZ	FRR?	FRR␣100KHZ
	1 MHz	FRR␣1MHZ	FRR?	FRR␣1MHZ
	10 MHz	FRR␣10MHZ	FRR?	FRR␣10MHZ
	100 MHz	FRR␣100MHz	FRR?	FRR␣100MHz
	1 GHz	FRR␣1GHz	FRR?	FRR␣1GHz
	Right	FRR␣R	FRR?	FRR␣1HZ~1GHZ
	Left	FRR␣L	FRR?	FRR␣1HZ~1GHZ
Turns relative frequency mode on or off	Frequency Relative			
	Reference Value	—	FRLR?	FRLR␣f
	Value	—	FRLV?	FRLV␣f
	On	FRL␣ON	FRL?	FRL␣ON
	Off	FRL␣OFF	FRL?	FRL␣OFF
Sets frequency offset	Frequency Offset			
	Value	FOS␣f	FOS?	FOS␣f
	On	FOF␣ON	FOF?	FOF␣ON
	Off	FOF␣OFF	FOF?	FOF␣OFF

(2) Output level

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets output level	Output Level	OLVL␣ℓ_1	OLVL?	OLVL␣ℓ_1
Sets output level using incremental Step	Output Level Incremental Step			
	Value	OIS␣ℓ_2	OIS?	OIS␣ℓ_2
	Up	OLS␣UP	—	—
	Down	OLS␣DN	—	—
Sets output level using rotary knob	Output Level Knob			
	Up	OLK␣UP	—	—
	Down	OLK␣DN	—	—
Sets output level resolution	Output Level Resolution			
	0.1 dB	OLR␣Ø.1DB	OLR?	OLR␣Ø.1DB
	1 dB	OLR␣1DB	OLR?	OLR␣1DB
	10 dB	OLR␣1ØDB	OLR?	OLR␣1ØDB
	Right	OLR␣R	OLR?	OLR␣Ø.1DB~1ØDB
	Left	OLR␣L	OLR?	OLR␣Ø.1DB~1ØDB
Turns output level Continuous Mode on or off	Output Level Continuous Mode			
	On	OCNT␣ON	OCNT?	OCNT␣ON
	Off	OCNT␣OFF	OCNT?	OCNT␣OFF
Turns relative output Level mode on or off	Output Level Relative			
	Reference Value	—	ORLR?	ORLR␣ℓ_1
	Value	—	ORLV?	ORLV␣ℓ_2
	On	ORL␣ON	ORL?	ORL␣ON
	Off	ORL␣OFF	ORL?	ORL␣OFF
Sets output level offset	Output Level Offset			
	Value	OOS␣ℓ_2	OOS?	OOS␣ℓ_2
	On	OOF␣ON	OOF?	OOF␣ON
	Off	OOF␣OFF	OOF?	OOF␣OFF
Turns output level on or off	Output Level			
	On	LVL␣ON	LVL?	LVL␣ON
	Off	LVL␣OFF	LVL?	LVL␣OFF
Selects voltage display	Voltage Display			
	Electro Motive Force (EMF)	VDSPL␣EMF	VDSPL?	VDSPL␣EMF
	Terminated (TERM)	VDSPL␣TERM	VDSPL?	VDSPL␣TERM
Changes output level unit	Output Level Unit			
	Change to dBm	OLDBM	—	—
	Change to dBμ	OLDBU	—	—
	Change to V	OLV	—	—
Calibrates output level	Calibration	CAL	—	—

(3) Modulation

〔 Main instrument 〕

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Turns modulation on or off	Modulation			
	On	MOD␣ON	MOD?	MOD␣ON
	Off	MOD␣OFF	MOD?	MOD␣OFF

(4) IF / RF Setup

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets output level Upper limit	Output Level Limit			
	Value	OLM␣ℓ_1	OLM?	OLM␣ℓ_1
	On	OLL␣ON	OLL?	OLL␣ON
	Off	OLL␣OFF	OLL?	OLL␣OFF
Sets reference frequency	Reference Frequency			
	10 MHz	REF␣10MHZ	REF?	REF␣10MHZ
	13 MHz	REF␣13MHZ	REF?	REF␣13MHZ
Sets I,Q levels	I, Q Level			
	50 Ω 500 mVrms	IQL␣500MV	IQL?	IQL␣500MV
	CMOS	IQL␣CMOS	IQL?	IQL␣CMOS
	CMOS Amplitude	CAPL␣ℓ_3	CAPL?	CAPL␣ℓ_3
	CMOS DC Offset	COS␣ℓ_3	COS?	COS␣ℓ_3
Turns I,Q input trim on or of	I, Q Input Trim			
	On	ITR␣ON	ITR?	ITR␣ON
	Off	ITR␣OFF	ITR?	ITR␣OFF
Turns I,Q output trim on or off	I, Q Output Trim			
	On	OTR␣ON	OTR?	OTR␣ON
	Off	OTR␣OFF	OTR?	OTR␣OFF
Sets pulse modulation signal input	Pulse Modulation			
	Int	PM␣INT	PM?	PM␣INT
	Ext	PM␣EXT	PM?	PM␣EXT
Sets pulse modulation signal polarity	Pulse Modulation Polarity			
	Positive	PMP␣POS	PMP?	PMP␣POS
	Negative	PMP␣NEG	PMP?	PMP␣NEG
Selects RF Off key operation mode	RF Off Release			
	Normal	RFOFF␣NORM	RFOFF?	RFOFF␣NORM
	Alternate	RFOFF␣ALTN	RFOFF?	RFOFF␣ALTN

(5) Base Band Setup

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets data and data clock source	Mod Input Data			
	Int	MID␣INT	MID?	MID␣INT
	Ext	MID␣EXT	MID?	MID␣EXT
	Mod Input Data Clock			
	Int	MIC␣INT	MIC?	MIC␣INT
	Ext	MIC␣EXT	MIC?	MIC␣EXT
Sets external modulation input data polarity	Ext Mod Input			
	Data			
	Positive	EID␣POS	EID?	EID␣POS
	Negative	EID␣NEG	EID?	EID␣NEG
	Data Clock			
	Rise	EIC␣RISE	EIC?	EIC␣RISE
	Fall	EIC␣FALL	EIC?	EIC␣FALL
	Symbol Clock			
	Rise	EIS␣RISE	EIS?	EIS␣RISE
	Fall	EIS␣FALL	EIS?	EIS␣FALL
	Burst Gate			
	Positive	EIB␣POS	EIB?	EIB␣POS
	Negative	EIB␣NEG	EIB?	EIB␣NEG
Sets external modulation output data polarity	Ext Mod Output			
	Data			
	Positive	EOD␣POS	EOD?	EOD␣POS
	Negative	EOD␣NEG	EOD?	EOD␣NEG
	Data Clock			
	Rise	EOC␣RISE	EOC?	EOC␣RISE
	Fall	EOC␣FALL	EOC?	EOC␣FALL
	Symbol Clock			
	Rise	EOS␣RISE	EOS?	EOS␣RISE
	Fall	EOS␣FALL	EOS?	EOS␣FALL
	Burst Gate			
	Positive	EOB␣POS	EOB?	EOB␣POS
	Negative	EOB␣NEG	EOB?	EOB␣NEG

(Continued)

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets burst trigger input/output edge	Burst Trigger			
	Input			
	Rise	BTI␣RISE	BTI?	BTI␣RISE
	Fall	BTI␣FALL	BTI?	BTI␣FALL
	Output			
	Rise	BTO␣RISE	BTO?	BTO␣RISE
	Fall	BTO␣FALL	BTO?	BTO␣FALL
Selects the pattern sync output signal	Pattern Sync Output			
	PN Clock	PSYNC␣PNCLK	PSYNC?	PSYNC␣PNCLK
	PN Gate	PSYNC␣PNGAT	PSYNC?	PSYNC␣PNGAT
	RF Gate	PSYNC␣RFGAT	PSYNC?	PSYNC␣RFGAT

(6) Save / Recall

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Saves or recalls frequency memory	Frequency Memory			
	Save	FSAV␣n	———	———
	Recall	FRCL␣n	———	———
Saves or recalls parameter memory	Parameter Memory			
	Save	PSAV␣n[,s]†	———	———
	Recall	PRCL␣n	———	———

† Entering a title (s) may be omitted.

(7) Control Command

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Turns buzzer switch on or off	Buzzer			
	On	BUZ␣ON	———	———
	Off	BUZ␣OFF	———	———
Turns display switch on or off	Display On / Off			
	On	DSPL␣ON	———	———
	Off	DSPL␣OFF	———	———
Resets RPP circuit	RPP Reset	RS	———	———
Initializes device in level 3	Preset	PRE	———	———

(8) Screen Transition

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Displays parameter setting Screen	Parameter	PRMTR	—	—
Displays burst internal modulation data	Burst Pattern	BURST	—	—
Displays IF/RF setup screen	IF / RF Setup	IFRF	—	—
Displays base band setup	Base Band Setup	BASE	—	—
Displays hardware check screen	Hardware Check	CHECK	—	—
Diplays interface setup screen	Interface Setup	INTFC	—	—

(9) GPIB

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Turns GPIB response header on or off	Header On Off	 HEAD␣ON HEAD␣OFF	 — —	 — —
Sets GPIB terminater	Terminater LF CR / LF	 TRM␣Ø TRM␣1	 TRM? TRM?	 TRM␣Ø TRM␣1
Sets Extend Status Enable Register and Extend Status Register	Extend Status Enable Register (END)	ESE2␣n	ESE2?	ESE2␣n
	Extend Status Register (END)	—	ESR2?	ESR2␣n
	Extend Status Enable Register (ERR)	ESE3␣n	ESE3?	ESE3␣n
	Extend Status Register (ERR)	—	ESR3?	ESR3␣n

2.2.3 Device message list compatible with the MG3633A

(1) Frequency

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets frequency	Frequency	FR␣f	FROA	FR␣f
		FC␣f	FCOA	FR␣f
		CF␣f	CFOA	FR␣f
Sets frequency using incremental step	Frequency Incremental Step			
	Value	FIS␣f	FISOA	FIS␣f
	Up	UFR	—	—
	Down	DFR	—	—
Sets frequency using rotary knob	Frequency Knob			
	Up	TFR	—	—
	Down	EFR	—	—
Sets frequency resolution	Frequency Resolution			
	1 Hz	R2	—	—
	10 Hz	R3	—	—
	100 Hz	R4	—	—
	1 kHz	R5	—	—
	10 kHz	R6	—	—
	100 kHz	R7	—	—
	1 MHz	R8	—	—
	10 MHz	R9	—	—
	Right	FSR	—	—
	Left	FSL	—	—
Turns relative frequency mode on or off	Frequency Relative			
	Reference Value	—	REFOA	REF␣f
	Value	—	RLFOA	RLF␣f
	On	FO	—	—
	Off	FF	—	—
Sets frequency offset	Frequency Offset			
	Value	FOS␣f	FOSOA	FOS␣f
	On	SP12	—	—
	Off	SP11	—	—

(2) Output level

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets output level	Output Level	OL␣ℓ_1 AP␣ℓ_1	OLOA APOA	OL␣ℓ_1 OL␣ℓ_1
Sets output level using incremental Step	Output Level Incremental Step Value Up Down	 OIS␣ℓ_2 UOL DOL	 OISOA — —	 OIS␣ℓ_2 — —
Sets output level using rotary knob	Output Level Knob Up Down	 TOL EOL	 — —	 — —
Sets output level resolution	Output Level Resolution 0.1 dB 1 dB 10 dB Right Left	 LØ L1 L2 OSR OSL	 — — — — —	 — — — — —
Turns output level Continuous Mode on or off	Output Level Continuous Mode On Off	 LC LN	 — —	 — —
Turns relative output Level mode on or off	Output Level Relative Reference Value Value On Off	 — — LO LF	 REOOA RLOOA — —	 REO␣ℓ_1 RLO␣ℓ_2 — —
Sets output level offset	Output Level Offset Value On Off	 OOS␣ℓ_2 SPØ8 SPØ7	 OOSOA — —	 OOS␣ℓ_2 — —
Turns output level on or off	Output Level On Off	 RO RF	 — —	 — —
Selects voltage display	Voltage Display Electro-Motive Force (EMF) Terminated (TERM)	 SPØ3 SPØ4	 — —	 — —

(Continued)

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Changes output level unit	Output Level Unit Change to dBm Change to dBμ Change to V	 OLDBM OLDM APDBM APDM OLDBU OLDU APDBU APDU OLV APV	 — — — — — — — — — —	 — — — — — — — — — —
Sets output level Upper limit	Output Level Limit Value On Off	 OLM ℓ_1 SPØ6 SPØ5	 OLMOA — —	 OLM ℓ_1 — —

(3) Save / Recall

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Saves or recalls frequency memory	Frequency Memory Save Recall	 FQnST FQnRC	 — —	 — —
Saves or recalls parameter memory	Parameter Memory Save Recall	 FNnST FNnRC	 — —	 — —

(4) Others

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Resets RPP circuit	RPP Reset	RS	—	—
Initializes device in level 3	Preset	SPØØ	—	—
Turns buzzer switch on or off	Buzzer On Off	 SPØ2 SPØ1	 — —	 — —
Turns GPIB response header on or off	Header On Off	 SP6Ø SP61	 — —	 — —

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SECTION 3
CONNECTING BUS AND SETTING ADDRESS

This section describes how to connect the GPIB cable and set the addresses in order to set-up the system before using the GPIB.

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SECTION 3
CONNECTING BUS AND SETTING ADDRESS

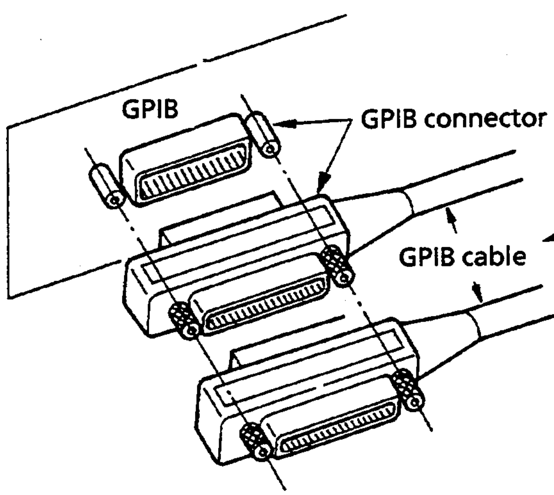
3.1 Connecting Devices with GPIB Cables

CAUTION

The cables must be connected to the connector before the power is switched on.

The rear panel has a connector for connecting GPIB cables.

A maximum of 15 devices, including the controller, can be connected to one system. The restrictions indicated at the right of the diagram below should be observed when connecting many devices to one system.



Total cable length	≦ 20 m
Each cable length between devices	≦ 4 m
Number of devices which can be connected	≦ 15

3.2 Checking and Setting GPIB address

The following shows how to set GPIB address.

Step	Action	Verification
1	Freq † or Level † or Mod †	Enters the frequency, output level, or modulation setting mode under the parameter setting screen and lights the Freq, Level, or Mod key's LED. (any one of the parameter setting screens including the 'Setup/Parameter Memory' F5 soft key can be used when the Freq, Level, or Mod panel key is pressed.)
2	etc * F6	Switches to screen transition menu 2.
3	Setup/ Parameter Memory → F5	Switches to screen transition menu 1 from any of the frequency setting mode/output level setting mode/modulation parameter setting mode in the parameter setting screen.
4	Interface Setup → F3	Switches to the Interface setup screen and displays a current GPIB address. Set the desired address. (☞For further details, see paragraph 4.6.3 in the Panel Operating Instruction Part of this manual)
5	Return → F6	Returns to the parameter setting screen (screen transition state).

† If the Freq, Level, or Mod key's LED is already lit, there is no need to press its key.

Notes: *GPIB address has been set to 00 at shipment from the factory.*

SECTION 4
INITIAL SETTINGS

The MG3671A/B initializes the GPIB interface system using three levels in accordance with the IEEE488.2 specifications. This section describes how these three level initializations are processed and how to instruct the initialization from the controller.

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SECTION 4
INITIAL SETTINGS

In the IEEE488.2 standard, the initialization levels are stipulated to be divided into three: the first level is " bus initialization ", the second level is " initialization for message exchange ", and the third level is " device initialization ". This standard also stipulates that a device must be set to a known state when the power is turned on.

Level	Initialization type	Description	Level combination and sequence
1	Bus initialization	The IFC message from the controller initializes all interface functions connected to the bus	Can be combined with other levels, level 1 must be executed before level 2
2	Initialization for message exchange	The message exchanges of all devices and specified devices on the GPIB are initialized respectively by the DCL (Device Clear) and SDC (Selected Device Clear) GPIB bus commands, which also nullify the function that reports to the controller that operation has completed	Can be combined with other levels, level 2 must be executed before level 3
3	Device initialization	The *RST or PRE command returns the specified device to the device-dependent known state, regardless of the conditions under which they were previously being used	Can be combined with other levels, level 3 must be executed after levels 1 and 2

The following paragraph describes the commands for executing levels 1, 2, and 3 and the items that are initialized by the execution. It also describes the known state which is set when the power is switched on.

4.1 Bus Initialization by the IFC Statement

■ Example

```
ISET IFC
```

■ Explanation

The IFC statement initializes the interface functions of all devices connected to the GPIB bus line.

The initialization of interface functions involves erasing the settings made by the controller and resetting them to their initial states. In the table below, ○ indicates the functions which are initialized; △ indicates the functions which are partially initialized.

No	Function	Symbol	Initialization by IFC
1	Source handshake	SH	○
2	Acceptor handshake	AH	○
3	Talker or extended talker	T or TE	○
4	Listener or extended listener	L or LT	○
5	Service request	SR	△
6	Remote/local	RL	
7	Parallel poll	PP	
8	Device clear	DC	
9	Device trigger	DT	
10	Controller	C	○

Bus initialization by the IFC statement does not affect the device-operating state (frequency settings, lamp on / off, etc)

4.2 Initialization for Message Exchange by DCL and SDC Bus Commands

■ Example

`WBYTE &H3F, &H14;` .... Initializes all devices under the bus for message exchange (sending DCL)

`WBYTE &H3F,` .... Initializes only the device whose address is 3 for message exchange (sending SDC)

■ Explanation

This statement executes the initialization for message exchange of all devices or only the specified device on the GPIB of the specified select code.

■ Items to be initialized for message exchange

The MG3671A/B by which the DCL or SDC bus command is accepted executes the following.

① Input buffer and Output Queue .... Cleared, at the same time the MAV bit is also cleared.

② Parser, Execution Controller, and Response Formatter .... Reset

③ Device commands including *RST .... Clears all commands that prevent these commands from executing.

④ Processing the *OPC command .... Puts a device in OCIS (Operation Complete Command Idle State). As a result, the operation complete bit cannot be set in the Standard Event Status Register.

⑤ Processing the *OPC? query .... Puts a device in OQIS (Operation Complete Query Idle State). As a result, the operation complete bit 1 cannot be set in the Output Queue.

⑥ Device functions .... Puts all functions associated with the message exchange in the idle state. The device continues to wait for a message from the controller.

CAUTION

The items listed below are not affected even if processing the DCL and SDC commands is executed.

① *The current data set or stored in the device*

② *Front panel settings*

③ *Other status byte state except MAV bit*

④ *Device operation in progress*

4.3 Device Initialization by the *RST Command

■ Syntax

```
*RST
```

■ Example

```
PRINT @1;"*RST" ............  Initializes the device ( MG3671A/B ) whose address is 1 with level 3
```

■ Explanation

The *RST command is an IEEE488.2 common command which resets a device with level 3.

The *RST (Reset) command is used to reset a device (MG3671A/B) to a specific initial state.

Note: *The *RST command does not affect the items listed below.*

① *IEEE488.1 interface state*
② *Device address*
③ *Output Queue*
④ *Service Request Enable register*
⑤ *Standard Event Status Enable register*
⑥ *Power-on-status-clear flag setting*
⑦ *Calibration data affecting device specifications*
⑧ *Parameters preset for controlling external devices etc*

The following tables list the initial settings of MG3671A/B.

Group	Preset item	Initial setting data
Frequency	Frequency	10 MHz
	Incremental step frequency	1 MHz
	Frequency resolution	1 Hz
	Relative frequency display mode	Off
	Frequency offset mode	Off
	Frequency offset value	0 Hz
Output	Output level	−30 dBm
	Incremental step output level	1 dB
	Output level resolution	0.1 dB
	Continuous mode	Off
	Relative level display mode	Off
	Output level (On / Off)	On
	Output level offset mode	Off
	Output level offset value	0 dB
	Open-circuit / terminated voltage display	Open-circuit voltage display
Modulation	Modulation	Off

Group	Preset item	Initial setting data
IF/RF settings	Reference frequency	10 MHz
	Output level upper limit	−10 dBm
	Output level upper limit (On/Off)	Off
	I, Q LEVEL	50 Ω 500 mVrms CMOS 50 mVrms CMOS DC Offset 2500 mV
	I, Q trim setting	Input: Off Output: Off
	Pulse modulation	Pulse Modulation: Int Pulse Modulation Polarity: Positive
Baseband settings	Data	Int
	Data Clock	Int
	EXT Mod Input	Data: Positive Data Clock: Rise Symbol Clock: Rise Burst Gate: Positive
	EXT Mod Output	Data: Positive Data Clock: Rise Symbol Clock: Rise Burst Gate: Positive Burst Trigger Input: Rise Burst Trigger Output: Rise Pattern Sync Output: PN Clock
Others		Panel lock: Released Buzzer On/Off: On Display On/Off: On Rotary knob hold On/Off: Off

4.4 Device Initialization by the PRE Command

■ Syntax

PRE

■ Example

PRINT @1;"PRE" .... Initializes the device (MG3671A/B) whose address is 1 with level 3

■ Explanation

The PRE command is MG3671A/B device-dependent messages which initialize a device with level 3.

The items and the initial settings which are initialized by the PRE commands are the same as those of the *RST command listed i n paragraph 4.3.

4.5 Device Status at Power-on

When the power is switched on:

① The device status is set to the status when the power was last switched off.

② The Input Buffer and Output Queue are cleared

③ The Parser, Execution Controller, and Response Formatter are initialized

④ The device is put into the OCIS (Operation Complete Command Idle State)

⑤ The device is put into the OQIS (Operation Complete Query Idle State)

⑥ The Standard Event Status and Standard Event Status Enable Registers are cleared. Events can be recorded after the registers have been cleared.

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SECTION 5
DEVICE MESSAGE FORMAT

This section describes the format of the device messages transmitted on the bus between a controller and devices via the GPIB system.

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SECTION 5
DEVICE MESSAGE FORMAT

5.1 General Description

The device messages are data messages that are transmitted between the controller and devices. There are two types of data messages: program messages that are transferred from the controller to the MG3671A/B (device), and response messages that are sent from the MG3671A/B (device) to the controller. There are also two types of program commands and program queries in the program message. The program command is used to set the MG3671A/B's parameters and to instruct it to execute processing. The program query is used to query the values of parameters and measured results.

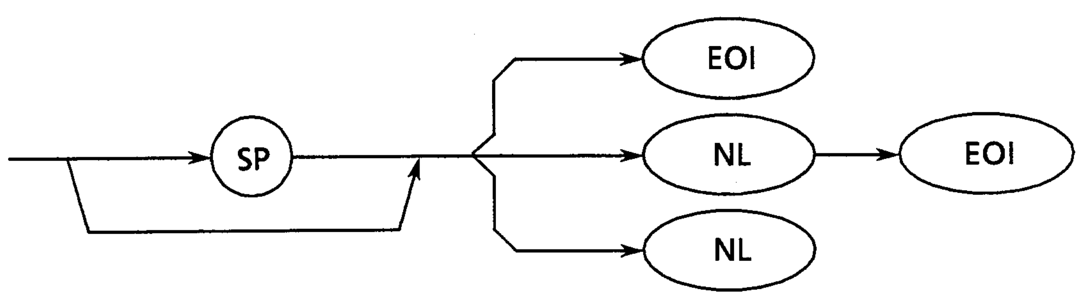
5.2 Program Message Format

To transfer the program messages from the controller program to the MG3671A/B using the PRINT statement, the program message formats are defined as follows.


```
PRINT  @1;"FREQ 1GHZ"
```

Program message: When the program message is transmitted from the controller to the MG3671A/B, the specified terminator is attached to the end of the program message to terminate its transmission

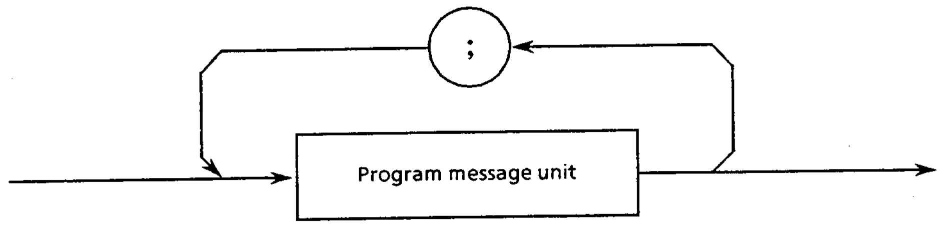
(1) Program message terminator



NL: Called New line or LF (Line Feed)

Note: *Carriage Return (CR) is ignored, and is not processed as a terminator.*

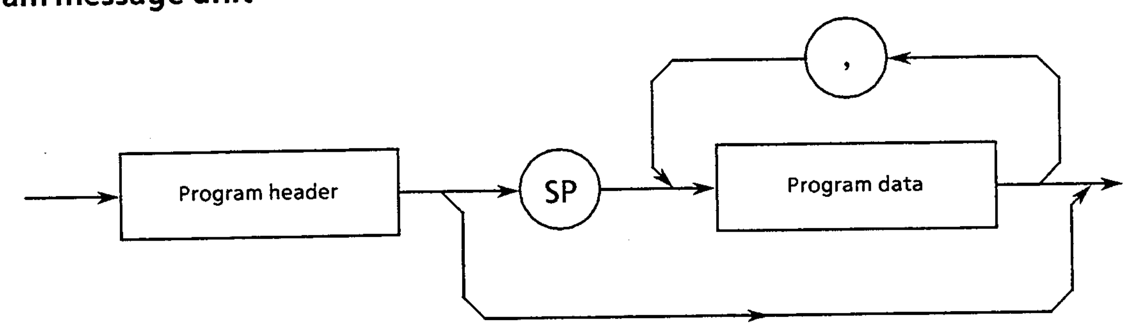
(2) Program message



The program messages consisting of one or more program message units can be output sequentially by concatenating each of them with a semicolon.

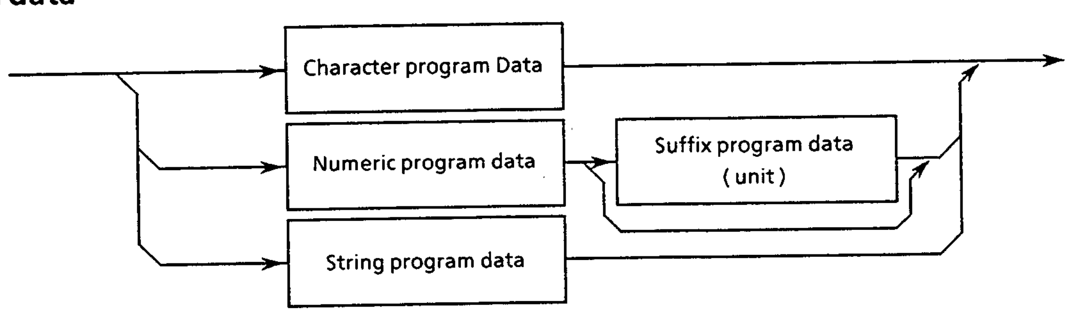
<Example> `PRINT @1;"FREQ 1GHZ;OLVL ØDBM"`

(3) Program message unit



- The IEEE488.2 common command has a leading asterisk " * " that is always placed before the program header.
- The program query has a trailing question mark " ? " that is always added at the end of the program header.

(4) Program data



(5) Character program data

Character program data consists of the upper-case alphabetic characters from A to Z, lower-case alphabetic characters from a to z, the underline of "_" , and the numbers 0 to 9. They can be used in a specified combination.

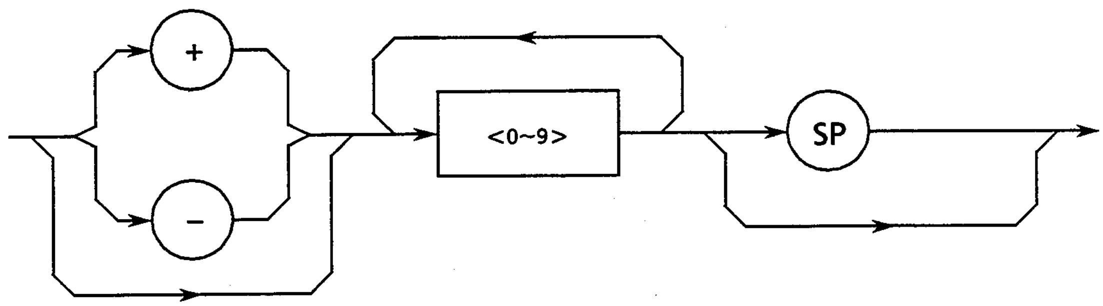
<Example>

`PRINT @1 ;"VDSPL TERM"` .... Displays an output level voltage as the terminated voltage

(6) Numeric program data

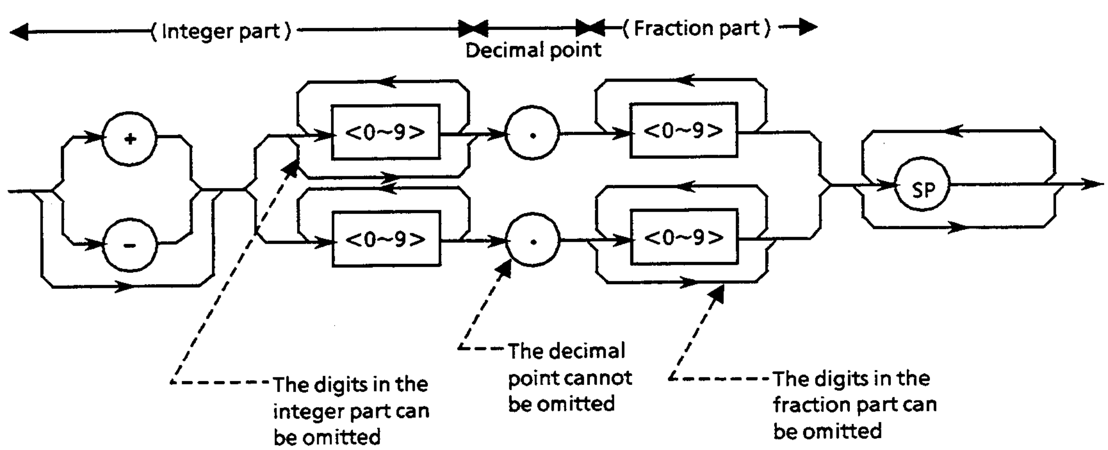
Numeric program data has four types of formats: integer format (NR1), fixed-point format (NR2), floating point format (NR3), and hexadecimal number.

< Integer Format (NR1) >



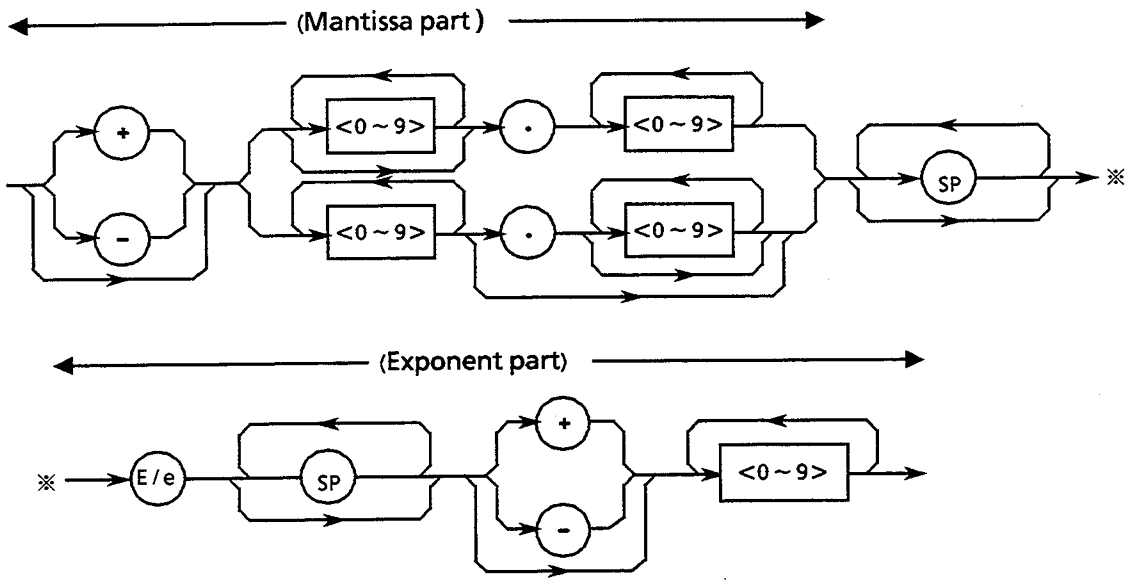
- Zeros can be inserted at the beginning → 005, +000045
- No spaces can be inserted between a + or − sign and a number → +5 , +␣5 (×)
- Spaces can be inserted after a number → +5␣␣␣
- The + sign is optional → +5, 5
- Commas cannot be used to separate digits → 1,234,567 (×)

< Fixed-Point Format (NR2) >



- The numeric expression of the integer format is applied to the integer part
- No spaces can be inserted between numbers and the decimal point
  → +753␣.123 (×)
- Spaces can be inserted after the digits in the fraction part → +753.123␣␣␣␣
- A number may not always be placed before the decimal point → .05
- A + or − sign can be placed before the decimal point → +.05, −.05
- A number can end with a decimal point → 12.

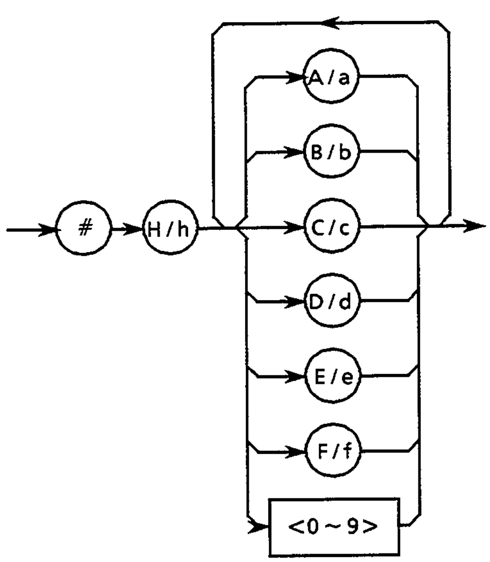
< Floating point format (NR3) >



- E is power of 10 and indicates the start of exponent part.
- E can be either upper or lower-case → 1.234E+12, 1.234e+12
- A space can be inserted before and/or after E/e → 1.234△E△+1
- If the sign is plus, it can be omitted from both mantissa and exponent parts→
  +1.234E+4, → 1.234E4
- Numbers may not be omitted at the mantissa part → −1E2, −E2(×), −.E2(×)

×: not allowable

< Hexadecimal Number >



Characters after #H and #h are received by a device as hexadecimal numbers with no sign.

The number in parenthesis ( ) is the corresponding decimal number.

#Habc123Ø	(11,256,099D)
#hAbC123	
#H2DC3	(11,715D)
#h2dc3	
#H83Ø1	(33,537D)
#h83Ø1	

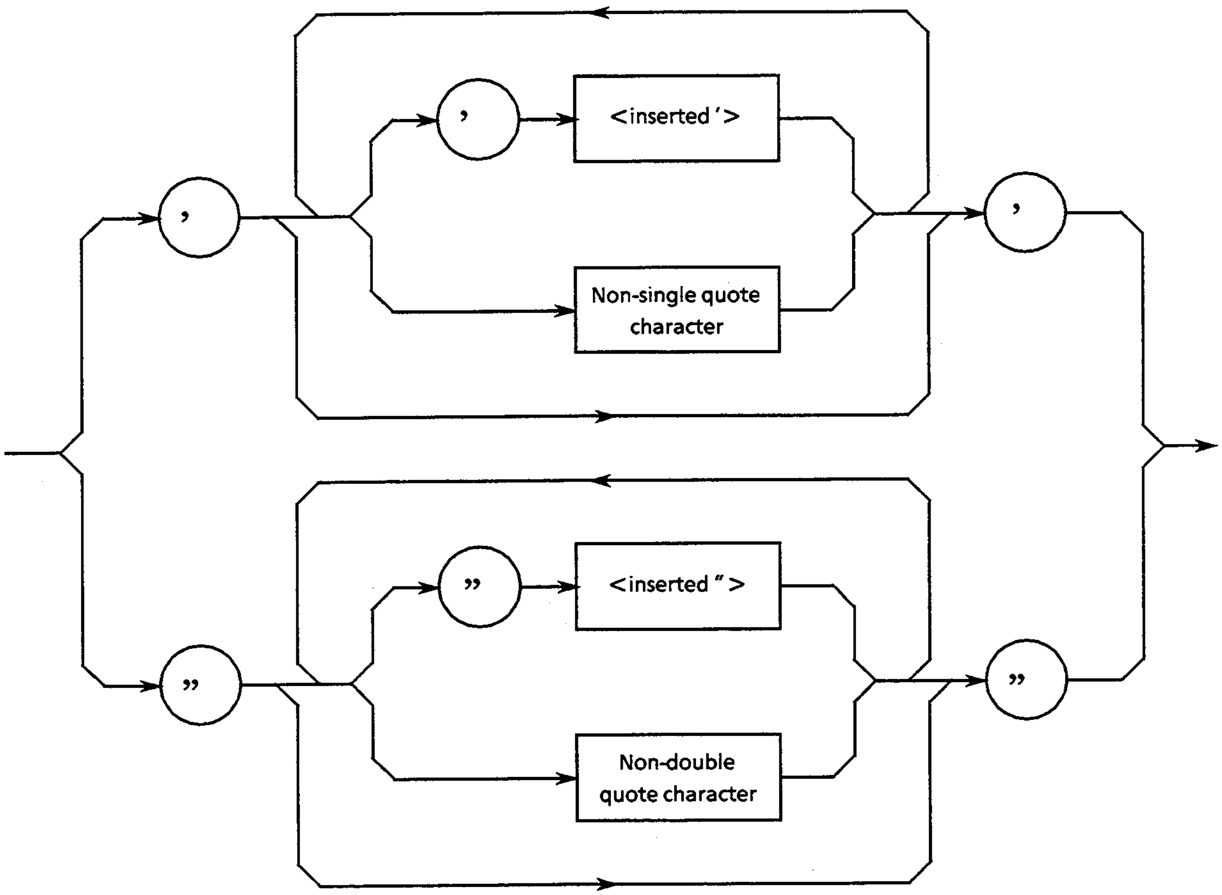
(7) Suffix program data (unit)

The table below shows the suffixes used for the MG3671A/B.

Table of MG3671A/B Suffix Codes

Classification	Unit	Suffix code
Frequency	GHz	GHZ, GZ
	MHz	MHZ, MZ
	kHz	KHZ, KZ
	Hz	HZ
Output level	dB	DB
	dBm	DBM, DM
	dBμ	DBU, DU
	V	V
	mV	MV
	μ	UV

(8) STRING PROGRAM DATA



- Both ends of string program data must have a pair of single quotation marks '.....'

```
PRINT  @ 1; "PSAV 1,'MG3671A/B'"
```

A single quotation mark used within the character string must be repeated as shown in "

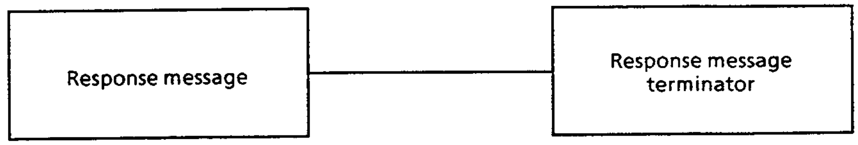
```
PRINT  @ 1; "PSAV 1,'DSG''1'''"
```

Executing PSAVE results in DSG '1'.

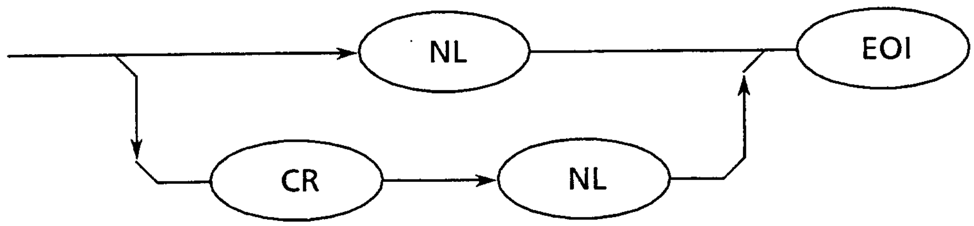
Note: To use the double quotation mark " in the PRINT statement, specify CHR$ (&H22).

5.3 Response Message Format

To transfer the response messages from the MG3671A/B to the controller using the INPUT statement, the response message formats are defined as follows.

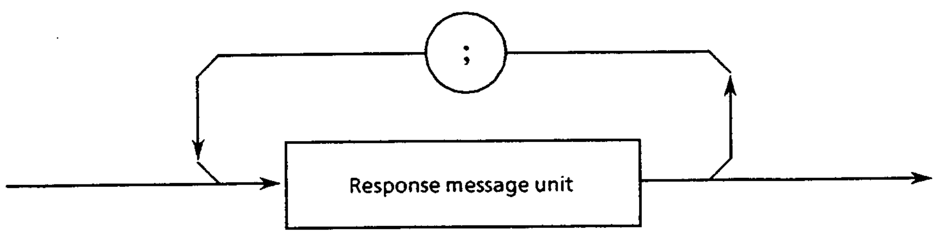


(1) Response message terminator



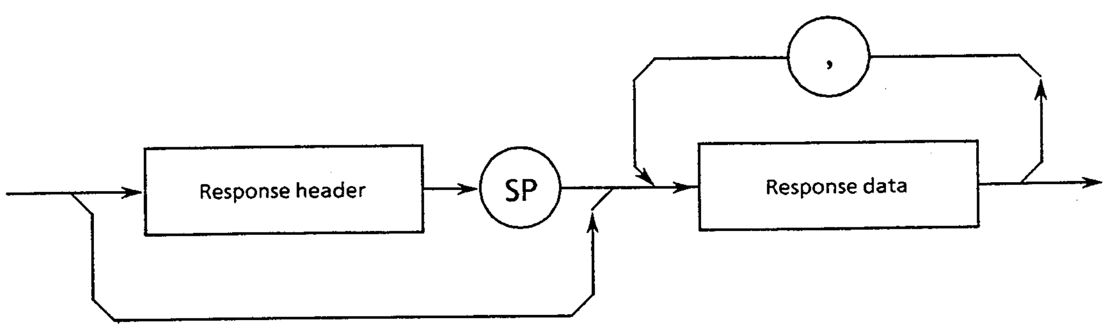
The response message terminator to be used depends on the TRM command.

(2) Response message

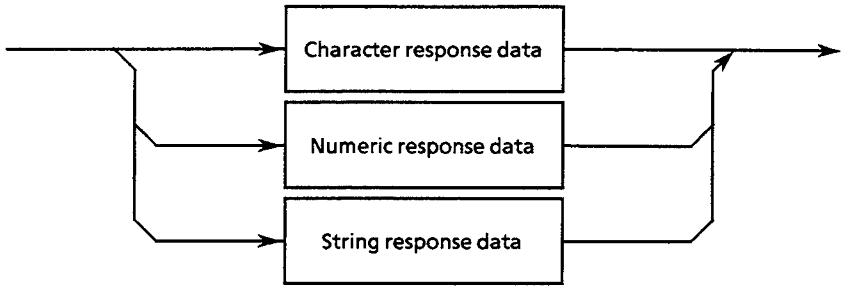


When a query is sent by the PRINT statement with one or more program queries, the response message also consists of one or more response message units.

(3) Response message unit (example)



(4) Response data

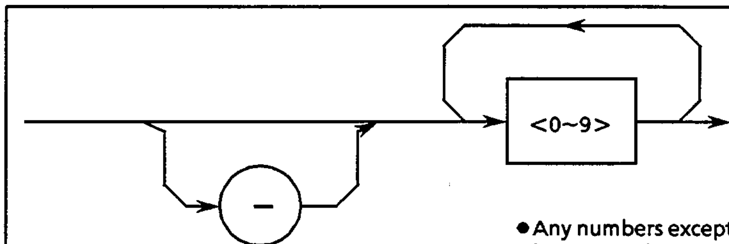


(5) character response data

Character response data consists of the upper-case alphabetic characters from A to Z, lower-case alphabetic characters from a to z, the underline "_" , and the numbers 0 to 9. They can be used in a specified combination.

(6) Numeric response data

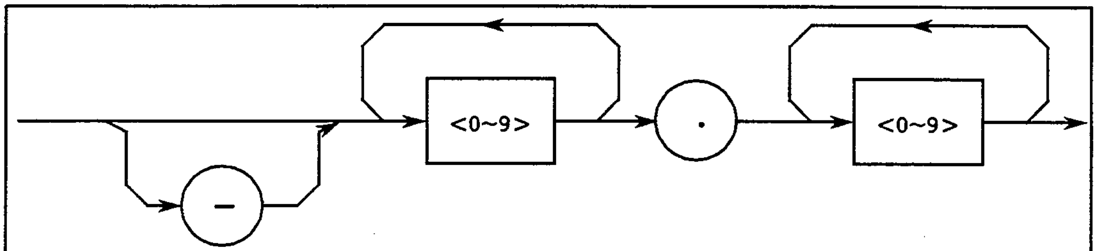
< Integer format (NR1) >



<Example>
123
– 1234

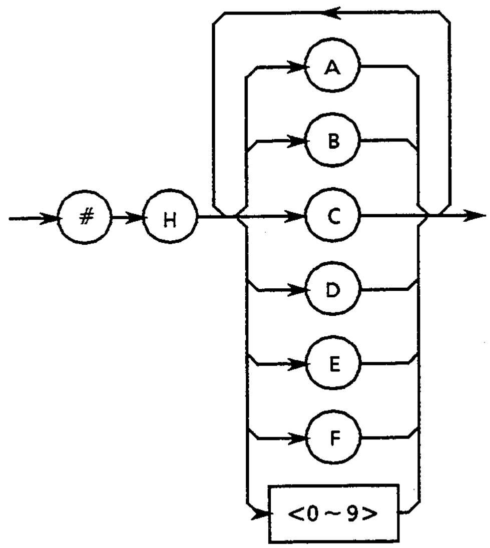
- Any numbers except 0 are placed at the beginning digit
- There is no need for a + sign before a positive number

< Fixed-point format (NR2) >



- Any numbers except 0 are placed at the beginning digit
- There is no need for a + sign before a positive number
- If there are zeros after the decimal point, the numeric data is transmitted in the integer format

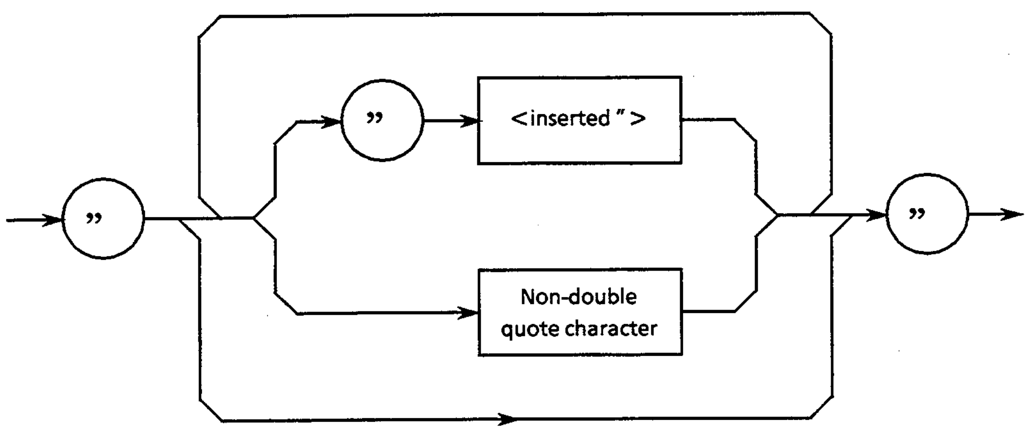
< Hexadecimal Number >



<Example>

#HABC123
#H2DC3
#H83Ø1

(7) String response data



String response data is transmitted as an ASCII character string, which is enclosed with double quotation marks.

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SECTION 6
COMMON COMMANDS

This section describes the common commands and common query commands specified in the IEEE 488.2 standard. Like device messages, common commands are a type of data message used in the bus data mode. They can be used for all measuring instruments, including those made by other companies, as long as they conform to the IEEE 488.2 standard. IEEE 488.2 common commands must start with an *.

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SECTION 6
COMMON COMMANDS

6.1 Classification by Function of Common Commands Supported by the MG3671A/B

The table below shows the classification by function of the IEEE 488.2 common commands supported by the MG3671A/B. Supported commands are listed on the following pages in alphabetical order.

Group	Function	Mnemonic
System data	Data specific to each device connected to the GPIB system, e.g. manufacturer, model, serial number, etc.	*IDN?
Internal operation	Device internal control: ① Resetting device in level 3 ② Device self testing and error detection	*RST *TST?
Synchronization	Synchronization of device to controller by: ① Waiting for a service request ② Waiting for a response from the device output queue ③ Forced sequential execution	*OPC *OPC? *WAI
Status and event	A status byte consists of seven single-bit summary messages. The summary bits of the message are supplied by the standard event register, the output queue, and the extended event register or extended queue. Three commands and four queries are available to set or clear the data in the registers and queues, to enable or disable them and to obtain the settings status of the registers.	*CLS *ESE *ESE? *ESR? *SRE *SRE? *STB?

6.2 Common Commands List

Command	Function
*CLS	Clears the Status Byte Register
*ESE NR1	Sets or clears the Sstandard Event Status Enable Register
*ESE?	Returns the current value of the Standard Event Status Enable Register
*ESR?	Returns the current value in the Standard Event Status Register
*IDN?	Returns manufacturer's name,model name,serial numbers,firmware level Returns manufacturer's name · model name · serial numbers · firmware level 1 0SET MG3671A/B ANRITSU
*OPC	Sets the status of bit 0 of the Standard Event Status Register when device operation is completed
*OPC?	Sets 1 in the output queue to generate a MAV summary message when device operation has been completed
*RST	Resets device in third level
*SRE NR1	Sets or clears the status of bits in the Service Request Enable Register
*SRE?	Returns the current value of the Service Request Enable Register
*STB?	Returns the current values of status bytes including MSS bits
*TST?	Returns self-test error results
*WAI	Keeps the next command on stand-by if the device is currently executing a command

*CLS Clear Status Command

(Clears the Status Byte Register)

■ Format

```
*CLS
```

■ Example

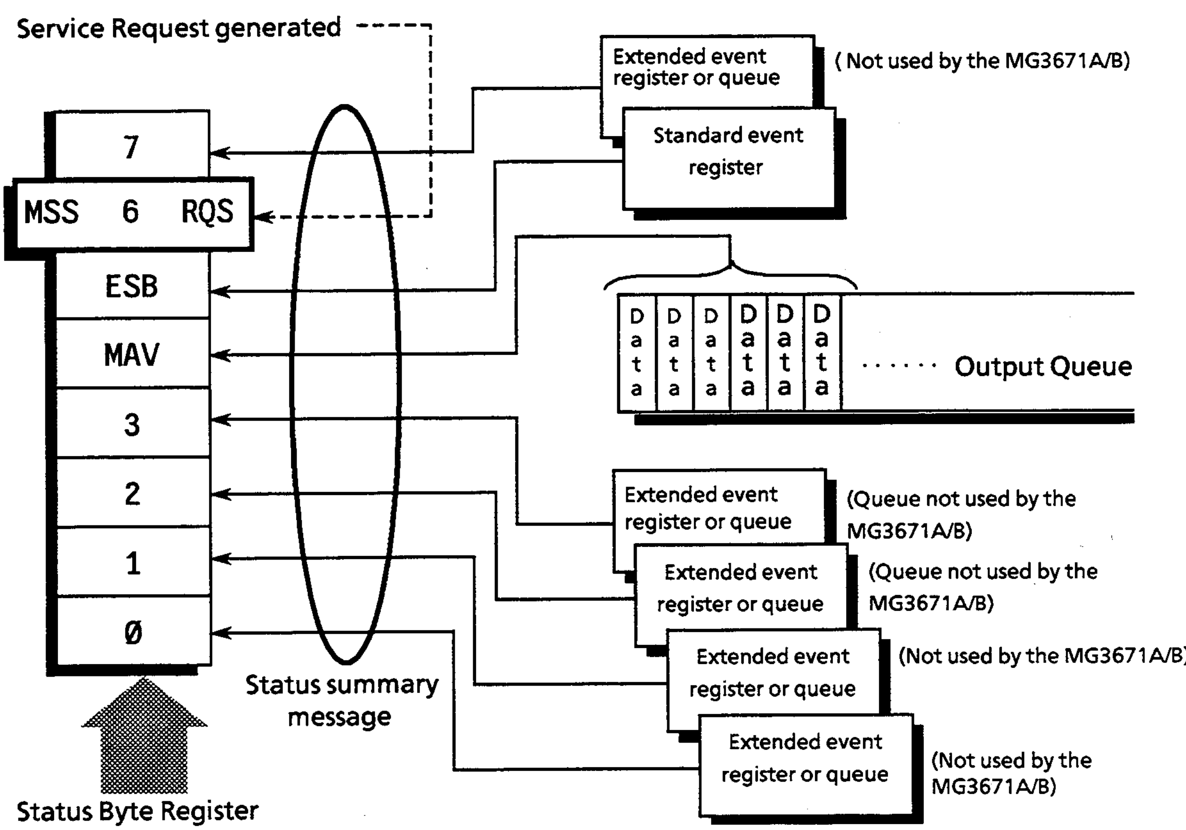
```
30 PRINT @ADR;"*CLS"
```

■ Explanation

The *CLS common command clears all status data (i.e their event registers and queues) except for the output queue and its MAV summary messages. It also clears the summary messages corresponding to these structures.

In the example below, the output queue and its MAV summary messages are also cleared.

That is to say, if a *CLS command is sent after a <Program message terminator> or before <Query message unit> elements, all status bytes are cleared. This command also clears all unread messages in the output queue.
*CLS has no effect on settings in enable registers.



*ESE Standard Event Status Enable Command

(Sets or clears the Standard Event Status Enable Register)

■ Format

*ESE <Header separator> <Decimal numeric program data>

In this format:

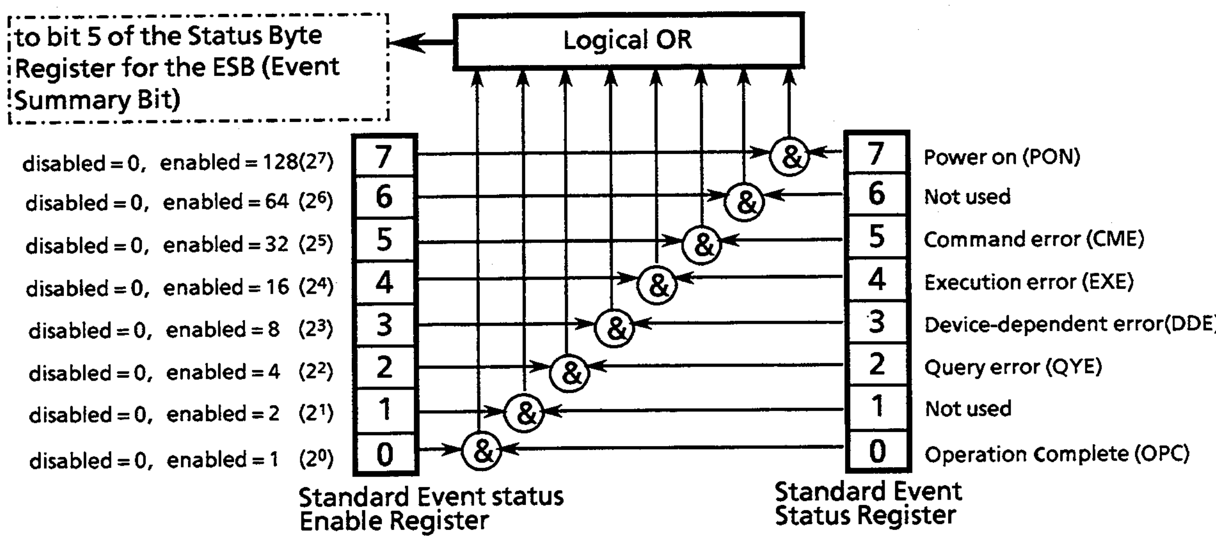
<Decimal numeric program data> = Value rounded to an integer from 0 to 255 (Binary weighted with a base value of 2)

■ Example

PRINT @ADR;"*ESE 2Ø"! .... Sets bits 2 and 4 of Enable Register

■ Explanation

The program data is the sum of weighted bit-digit values when the weighted value for bits to be enabled are selected from among the values $2^0=1$, $2^1=2$, $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$ or $2^7=128$; corresponding to the Standard Event Enable Register bits 0, 1, 2, 3, 4, 5, 6 or 7. The value of bits to be disabled is 0.



*ESE? Standard Event Status Enable Query

(Returns current value of Standard Event Status Enable Register)

■ Format

*ESE?

■ Example

2Ø is the response if *ESE? is sent after executing *ESE 2Ø

```
3Ø PRINT @ADR;"*ESE?"
4Ø INPUT @ADR;NR1
5Ø PRINT NR1
```

■ Explanation

Returns NR1, the value of the Standard Event Status Enable Register.

■ Response message

NR1 = 0 to 255

*ESR?: Standard Event Status Register Query

(Returns the current value in the Standard Event Status Register)

■ Format

*ESR?

■ Example

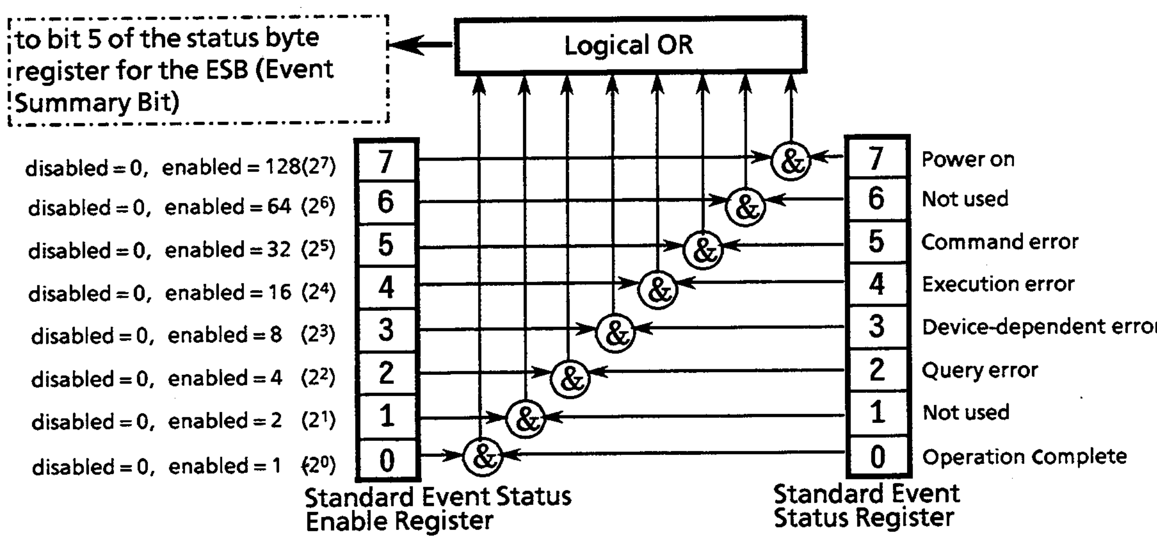
```
30 PRINT @ADR;"*ESR?"
40 INPUT @ADR;NR1! ............................  A command error is issued if the value of the variable is 32
50 PRINT NR1
```

■ Response Message

NR1 = 0 to 255

■ Explanation

The current value of the Standard Event Status Register is returned by NR1. NR1 is the total of weighted bit-digit values of bits (enabled by the standard event status enable register) which are selected from among the values $2^0=1$, $2^1=2$, $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$ or $2^7=128$: corresponding to the Standard Event Status Register bits 0, 1, 2, 3, 4, 5, 6 or 7. This register is cleared when the response is read (e.g. line 40).



*IDN? Identification Query

(Returns manufacturer name, model name etc. of product)

■ Format

```
*IDN?
```

■ Example

```
30 PRINT @ADR;"*IDN?"
40 INPUT @ADR;IDEN$!
```
.... Stores names of manufacturer, model, etc.

■ Explanation

Returns manufacturer's name · model name · serial numbers · firmware level

ANRITSU

MG3671A/B

0SET

1

A response message comprising the four fields shown below is returned.

① Field 1 .... Manufacturer's name (Anritsu)

② Field 2 .... Model name

③ Field 3 .... (usually 0)

④ Field 4 .... Firmware version (In the case of Anritsu, versions are from 1 to 99. The version is 1 when no changes have been made to hardware and software.)

■ Response message

A response message comprising of the above four fields separated by commas is sent by <Arbitrary ASCII response data>.

```
<field 1>, <field 2>, <field 3>, <field 4>
```

For the above example:

```
ANRITSU,MG3671A/B,0,1
```

The total length of a response message is ≦72 characters

*OPC Operation Complete Command

(Sets the status of bit 0 of the Standard Event Status Register when device operation is completed)

■ **Format**

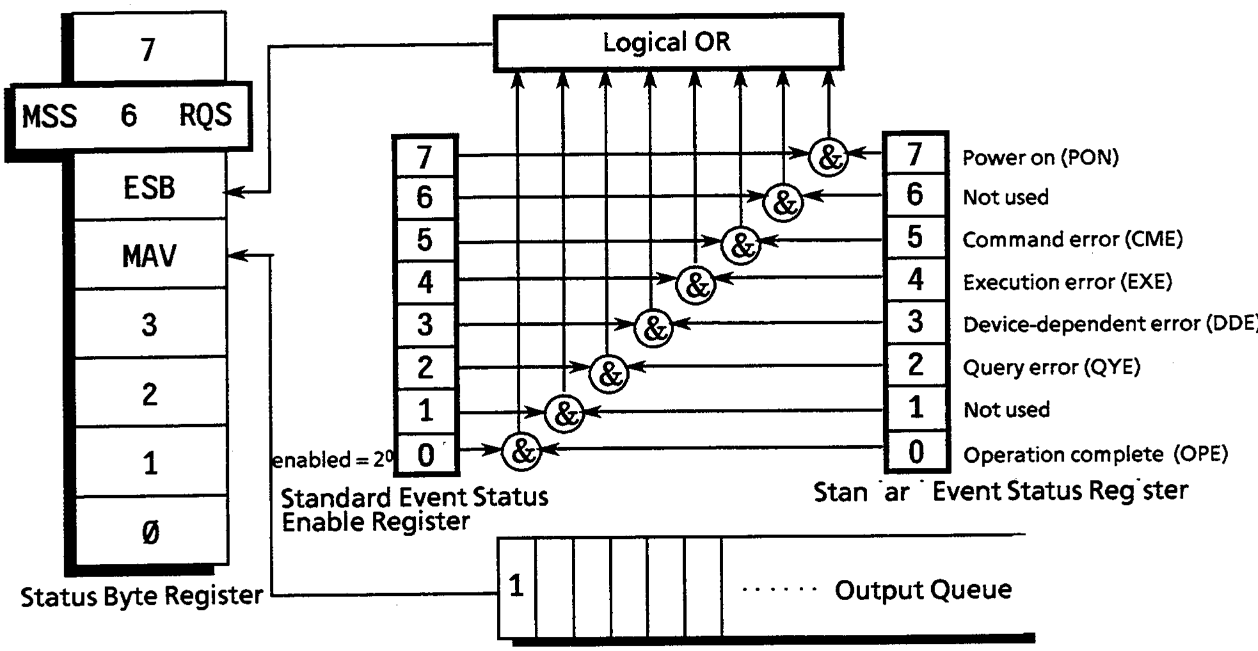
```
*OPC
```

■ **Example**

```
PRINT @ADR;"*OPC"
```

■ **Explanation.**

Sets the status of bit 0, i.e. the operation complete bit, in the Standard Event Status Register when selected device operations have been completed. This is an overlap command.



*OPC? Operation Complete Query

(Sets 1 in the output queue to generate a MAV summary message when device operation has been completed)

■ **Format**

```
*OPC?
```

■ **Example**

```
30 PRINT @ADR;"*OPC?"
40 INPUT @ADR;N
```

■ **Explanation**

When selected device operations have been completed, sets 1 in the output queue and waits for the MAV summary message to be generated.

■ **Response message**

A single ASCII-encoded byte for '1' (31hex) is returned by <NR1 numeric response data>.

*RST Reset Command

(Resets device in third level)

■ Format

```
*RST
```

■ Example

```
PRINT @ADR;"*RST" ........................ Initializes only 3-addressed device in the third level
```

■ Explanation

The *RST command resets a device in the third level. (See Section 4.) The third-level initialization items are as follows:

① The device-dependent functions and condition are set to a known state that is independent of the past-use history of the device. The MG3671A/B is set as shown in paragraph 4.3.

② The device is forced to OCIS (Operation Complete Command Idle State). As a result, the operation-complete bit cannot be set in the Standard Event Status Register.

③ The device is forced to OQIS (Operation Complete Query Idle State). As a result, the operation-complete bit 1 cannot be set in the output queue. The MAV bit in the Status Byte Register is cleared.

The *RST command does not affect the items listed below

① IEEE 488.1 interface state
② Device address
③ Output queue
④ Service Request Enable Register
⑤ Standard Event Status Enable Register
⑥ Power-on-status-clear flag setting
⑦ Calibration data affecting device specification

*SRE Service Request Enable Command

(Sets status of bits in the Service Request Enable Register)

■ **Format**

*SRE <Header separator><Decimal numeric program data>

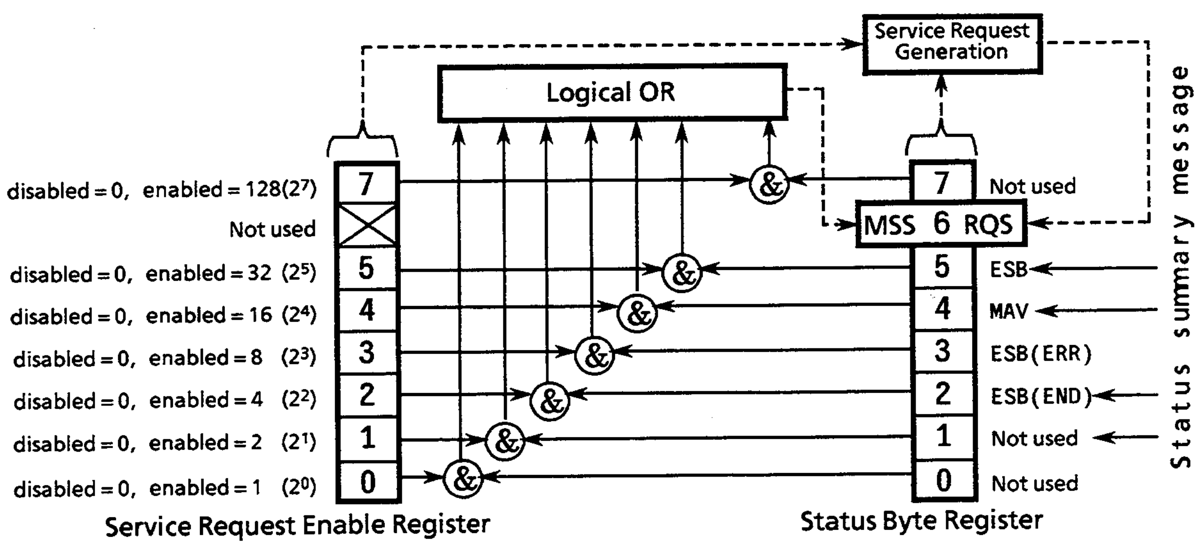
<Decimal numeric program data> = Values rounded to an integer from 0 to 255 (binary weighted with a base value of 2)

■ **Example**

PRINT @ADR;"*SRE 16"! Sets bit 4 (16=0001 0000) of the enable register

■ **Explanation**

The program data is the sum of weighted bit-digit values when the weighted value for bits to be enabled are selected from among the values $2^0=1$, $2^1=2$, $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$ or $2^7=128$: corresponding to the Service Request Enable Register bits 0, 1, 2, 3, 4, 5, 6 or 7. The value of bits to be disabled is 0.



*SRE? Service Request Enable Query

(Returns the current value of the Service Request Enable Register)

■ **Format**

*SRE?

■ **Example**

A 16 is sent in response if *SRE? is sent after executing *SRE 16.

■ **Explanation**

Returns NR1, the value of the Service Request Enable Register.

```
30 PRINT @ADR;"*SRE?"
40 INPUT @ADR;NR1
50 PRINT NR1
```

■ **Response message**

As NR1 (bit 6 : RQS bit) cannot be set, NR1 = 0 to 63 or 128 to 191)

*STB? Read Status Byte Command

(Returns the current values of status bytes including MSS bits)

■ Format

```
*STB?
```

■ Example

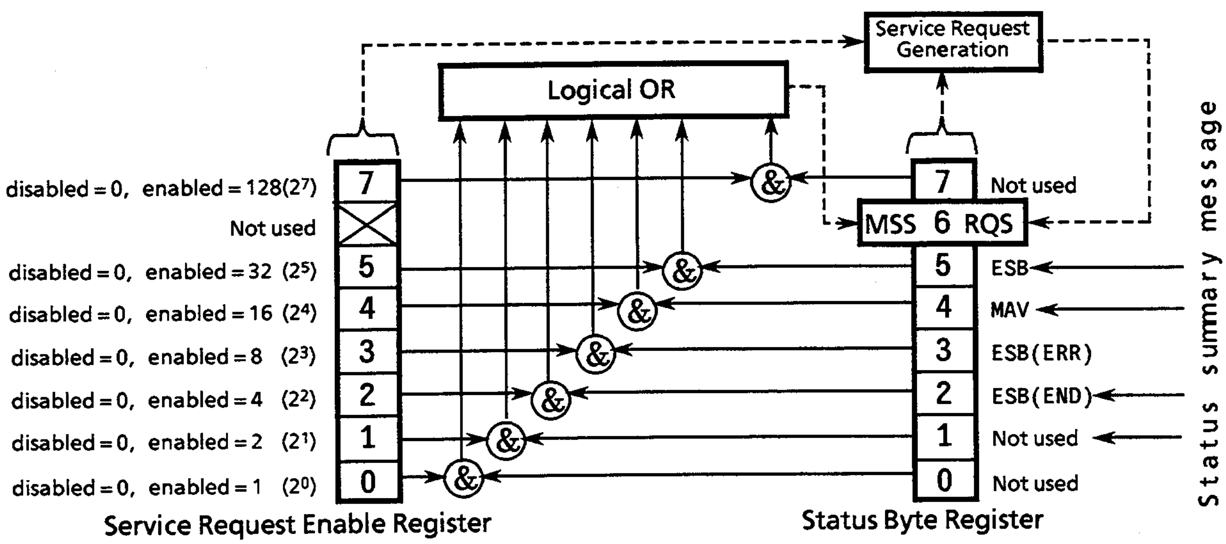
```
30 PRINT @ADR;"*STB?"
40 INPUT @ADR;NR1
50 PRINT NR1
```

■ Explanation

The *STB? query returns the total of the binary weighted values of the Status Byte Register and of the MSS summary message with <NR1 numeric response data>.

■ Response message

The response message is a <NR1 numeric response data> integer in the range 0 to 255 representing the total of the binary weighted values of the bits in the Status Byte Register. Status Byte Register bits 0 to 5 and 7 are weighted to 1, 2, 4, 8, 16, 32 and 128, respectively, and the MSS (Master Summary Status) bit to 64. MSS message indicates that a request has at least one cause. The table below shows the conditions for the MG3671A/B's status byte register.



Bit	Bit weight	Bit name	Status-byte-register conditions	
7	128	——	0=Not used	
6	64	MSS	0= Service not requested	1 = Service requested
5	32	ESB	0 = Event status not generated	1 = Event status generated
4	16	MAV	0 = No data in output queue	1 = Data in output queue
3	8	ESB(ERR)	0 = Event status not generated	1 = Event status generated
2	4	ESB(END)	0 = Event status not generated	1 = Event status generated
1	2	——	0 = Not used	
0	1	——	0 = Not used	

*TST? Self-test Query

(Returns self-test error results.)

■ Format

```
*TST?
```

■ Example

```
3Ø PRINT @ADR;"*TST?"
4Ø INPUT @ADR;NR1
5Ø PRINT NR1
```

■ Explanation

The *TST? query generates an internal self-test and places the test results into the output queue to indicate whether or not the device completed the self-test without detected errors. Operator intervention is not required to execute the self-test. The MG3671A/B returns the results of the self-test executed at power-on. A bit with detected errors is set to 1.

The MG3671A/B test range is as follows:

```
bit Ø: CPU test
bit 1: ROM test
bit 2: Non-backup RAM test
bit 3: Backup RAM test
bit 4: ACRTC test
bit 5: GPIB test
bit 6: Programmable timer test
bit 7: Burst-unit ROM test
bit 8: Burst-unit RAM test
bit 9 to 15:(Not used)
```

■ Response message

The response message is sent by <NR1 numeric response data>. The data range is 0 to 4095.

NR1=Ø .... Indicates that self-test completed without errors detected

NR1≠Ø .... Indicates that self-test not completed or completed with errors detected

*WAI Wait-to-Continue Command

(Keeps the next command on stand-by if the device is currently executing a command)

■ Format

```
*WAI
```

■ Example

```
PRINT @ADR;"*WAI"
```

■ Explanation

The *WAI common command executes overlap commands as sequential commands.

An command or query (sent from the controller to a device) is called an overlap command if the next command can start execution while it is executing some function in the device.

Executing the *WAI command (after an overlap command) set the next command on hold and permits it to execute its function once the first command has finished. This is the same as sequential commands.

However, since overlap commands are not available with the MG3671A/B, so this command is not necessary.

SECTION 7
STATUS STRUCTURE

This section describes the device-status reporting and its data structure defined by the IEEE488.2 standard. It also describes the synchronization techniques between a controller and devices.

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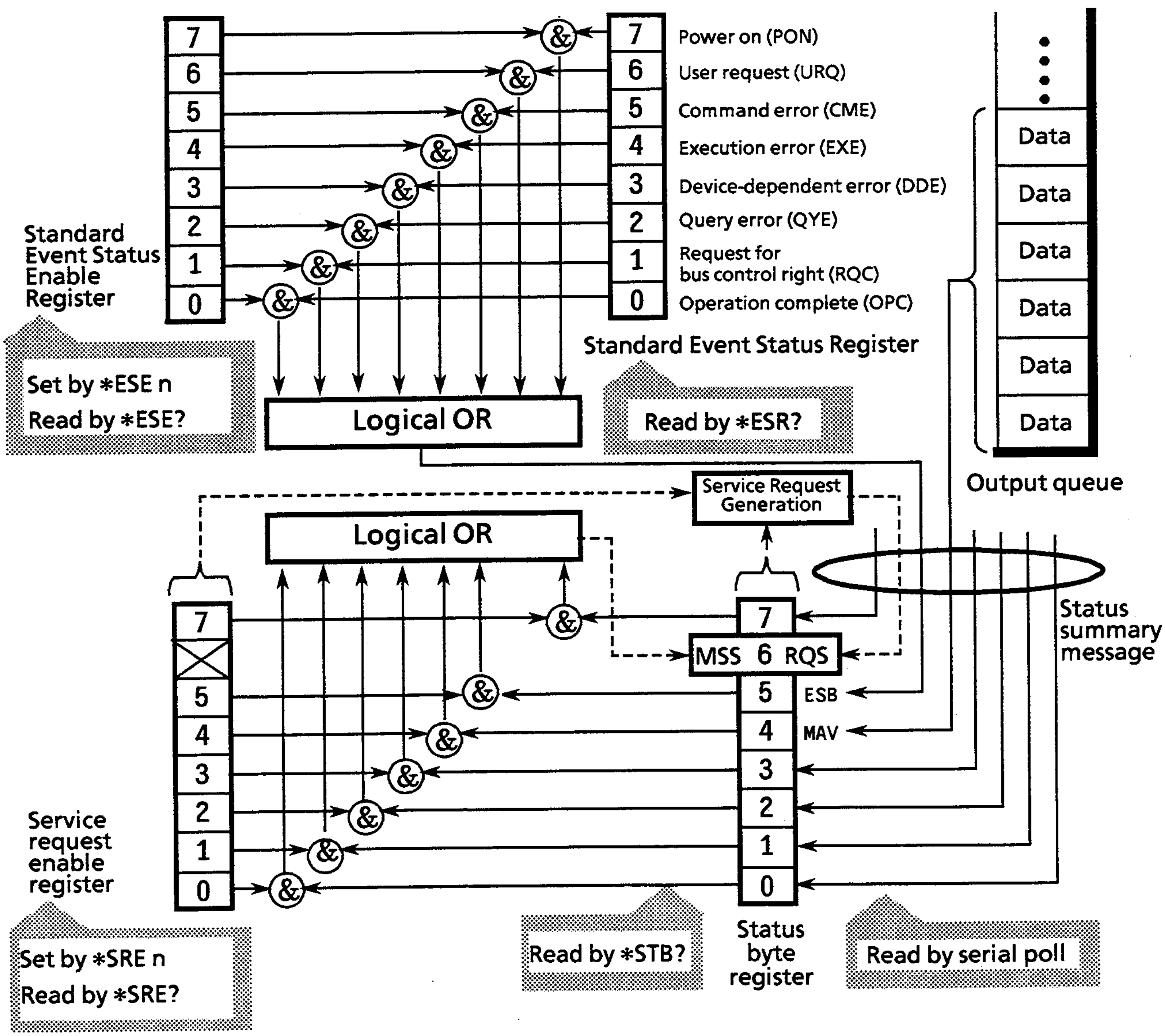
SECTION 7
STATUS STRUCTURE

The status Byte (STB) sent by the controller is based on the IEEE488.1 standard. The bits comprising it are called a status summary message because they represent a summary of the current data contained in registers and queues.

7.1 IEEE488.2 Standard Status Model

The diagram below shows the standard model for the status data structures stipulated in the IEEE488.2 standard.



Standard Status Model Diagram

In the status model, the IEEE488.1 status bytes are used as the lowest grade status. This status byte is composed of seven summary message bits from the higher grade status structure. In order to create these bits, the status data structure is composed of two types of register and queue models.

Register model	Queue model
The register model consists of the two registers used for recording events and conditions encountered by a device. These two registers are the Event Status Register and Event Status Enable Register. When the results of the AND operation of both register contents is not 0, the corresponding bit of the status bit becomes 1. In other cases, it becomes 0. And, when the result of their Logical OR is 1, the summary message bit becomes also 1. If the Logical OR result is 0, the summary message bit becomes 0, too.	The queue in the queue model is used for sequentially recording the waiting status values and data. The queue structure summary message becomes 1 if the queue is not empty and 0 if it is empty.

In IEEE488.2, there are 3 standard models for status data structure-2 register models and 1 queue model-based on the register model and queue model explained above. They are:

① Standard Event Status Register and Standard Event Status Enable Register
② Status Byte Register and Service Request Enable Register
③ Output queue

Standard Event Status Register	Status Byte Register	Output Queue
The Standard Event Status Register has the structure of the previously described register model. In this register, the bits for 8 types of standard events encountered by a device are set as follows: ① Power on ② User request ③ Command error ④ Execution error ⑤ Device-dependent error ⑥ Query error ⑦ Request for bus control right ⑧ Operation complete The Logical OR output bit is represented by Status Byte Register bit 5 (DIO6) as a summary message for the Event Status Bit (ESB).	The Status Byte Register is a register in which the RQS bit and the 7 summary message bits from the status data structure can be set. It is used together with the Service Request Enable Register. When the results of the OR operation of both register contents is not 0, SRQ becomes ON. To indicate this, bit 6 of the Status Byte Register (DIO7) is reserved by the system as the RQS bit which means that there is a service request for the external controller. The mechanism of SRQ conforms to the IEEE 488.1 standard.	The Output Queue has the structure of the queue model mentioned above. Status Byte Register bit 4 (DIO5) is set as a summary message for Message Available (MAV) to indicate that there is data in the output queue.

7.2 Status Byte (STB) Register

The STB register consists of the STB and RQS (or MSS) messages of the device.

7.2.1 ESB and MAV summary messages

This paragraph describes the ESB and MAV summary messages.

(1) ESB summary message

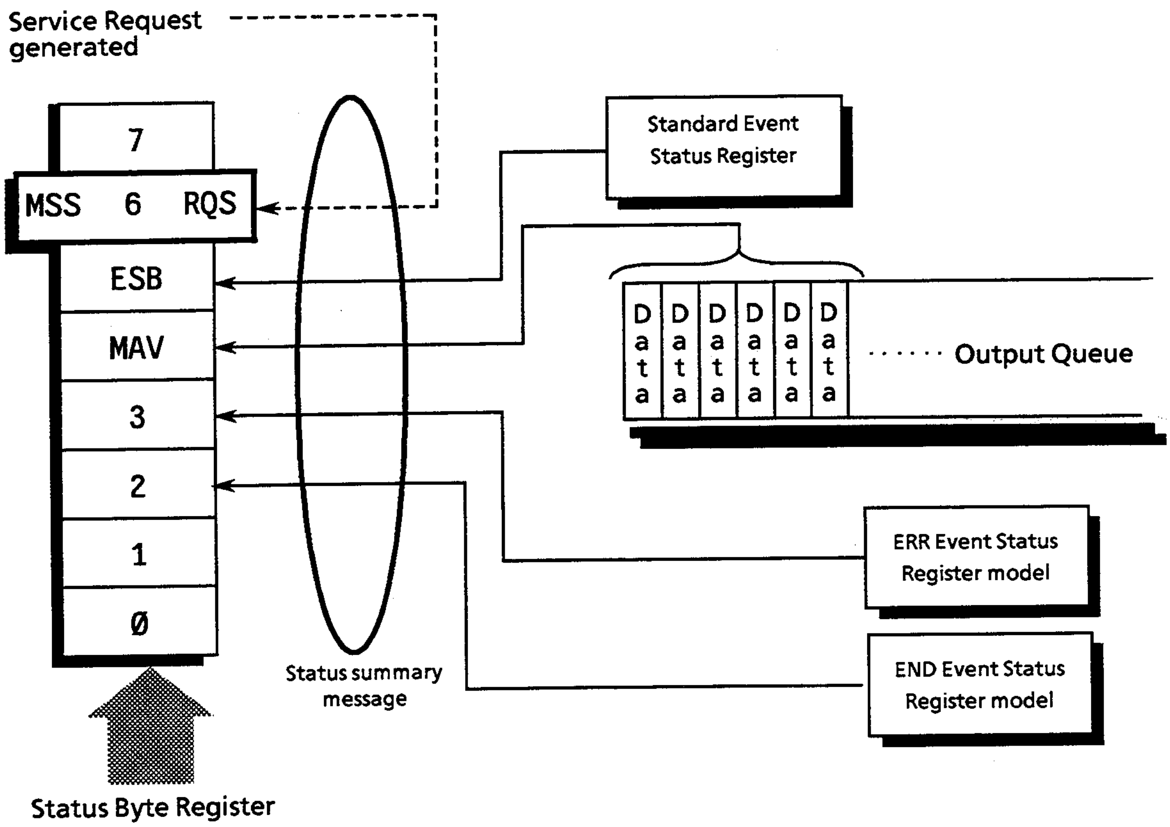
The ESB (Event Summary Bit) is a message defined by IEEE488.2, which uses bit 5 of the STB register. The ESB summary message bit becomes 1 when the setting permits events to occur if any one of the events recorded in the Standard Event Status Register becomes 1. Conversely, it becomes 0 if none of the recorded events occurs, even if events are set to occur.
This bit becomes 0 when the ESR register is read out by the ESR? query or when cleared by the *CLS command.

(2) MAV summary message

The MAV (Message Available) summary bit is a message defined by IEEE488.2, which uses bit 4 of the STB register. This bit status indicates whether the output queue is empty or not. The MAV summary message bit is set to 1 when a device is ready to receive a request for a response message from the controller, and to 0 when the output queue is empty. This message is used to synchronize the information exchange with the controller. For example, it is available when, after setting a query command to a device, the controller waits until MAV becomes 1. While the controller is waiting a response from the device, it can process other jobs. Reading the Output Queue without first checking MAV will cause all system bus operations to be delayed until the device responds.

7.2.2 Device-dependent summary messages

As shown below, the MG3671A/B does not use bits 0, 1, and 7, and uses bits 2 and 3 as the summary bit of the Event Status Registers.



7.2.3 Reading and clearing STB register

Serial polling or the *STB common query allows the contents of the STB register to be read. The 488.1 STB message can be read by either method, but the value set to bit 6 is different for each method. The STB register contents can be cleared by the *CLS command.

(1) Reading by serial polling

The IEEE488.1 serial polling allows the device to return a 7-bit status byte and an RQS message bit which conforms to IEEE488.1. The value of the status byte is not changed by serial polling. The device sets RQS message to 0 immediately after being polled.

(2) Reading by the *STB? common query

The *STB? common query requires the devices to send the contents of the STB register and the integer format response messages including the MSS (Master Summary Status) summary message. Thus, except bit 6 which represents the MSS summary message, the response to *STB? is identical to that of serial polling.

(3) Definition of MSS (Master Summary Status)

MSS indicates that there is at least one cause for a service request. The MSS message is represented at bit 6 in a device response to the *STB? query, but it is not produced as a response to serial polling. It should not be taken as part of the status byte specified by IEEE488.1. MSS is configured by the overall logical OR in which the STB register and SRQ Enable (SRE) register are combined.

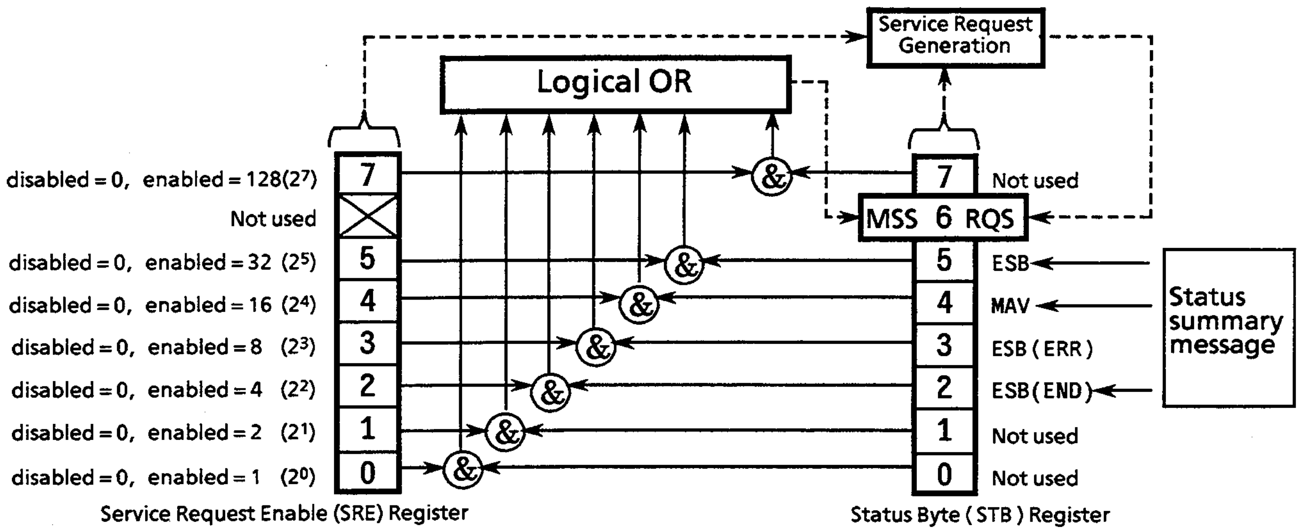
(4) Clearing the STB register by the *CLS common command

The *CLS common command clears all status data structure as well as the summary messages corresponding to them. The *CLS command does not affect settings in the Enable Registers.

7.3 Service Request (SRQ) Enabling Operation

The bit status (0 or 1) of the Service Request Enable Register (SRE) determines which bit of the corresponding STB register may generate SRQ.

Bits in the Service Request Enable Register correspond to bits in the status byte register. If a bit in the Status Byte Register corresponding to an enabled bit in the Service Request Enable Register is set to 1, the device makes a service request to the controller with the RQS bit set to 1.



(1) Reading the SRE register

The contents of the SRE register are read using the *SRE? common query. The response message to this query is an integer from 0 to 255 which is the sum of the bit digit weighted values in the SRE register.

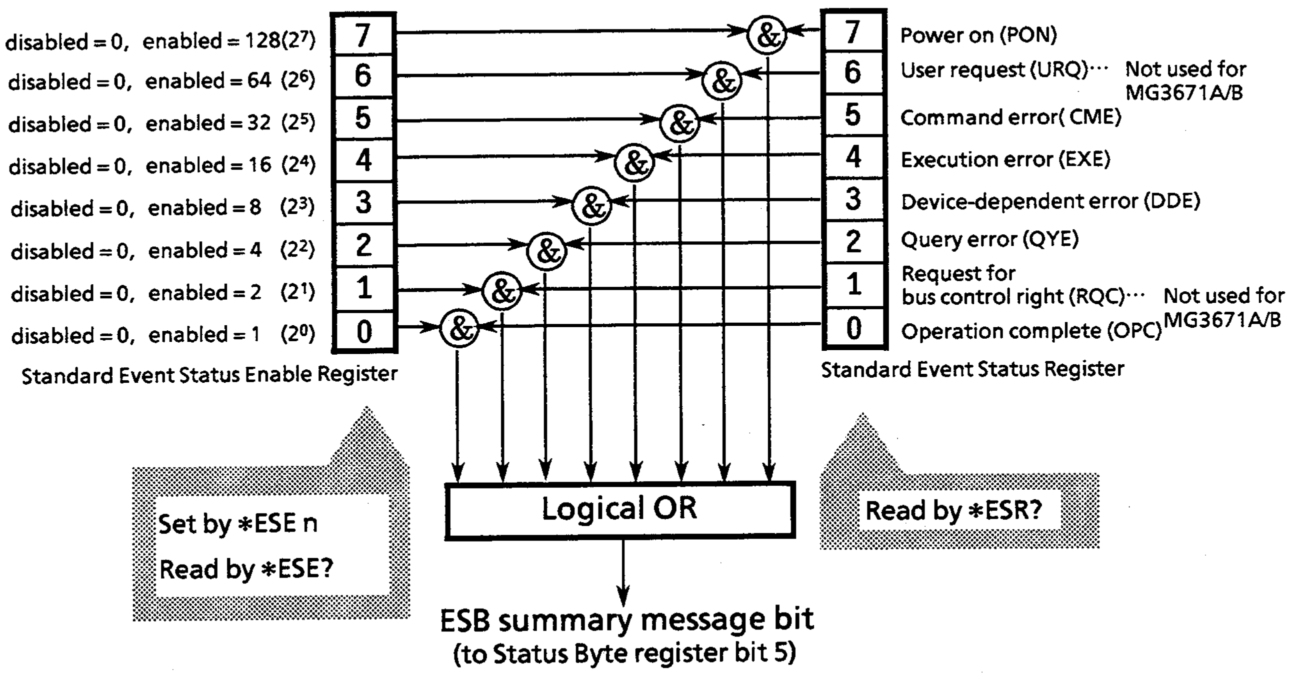
(2) Updating the SRE register

The SRE register is written to by using the *SRE common command. An integer from 0 to 255 is assigned as a parameter to set the SRE register bit to 0 / 1. The value of bit 6 is ignored.

7.4 Standard Event Status Register

7.4.1 Bit definition of Standard Event Status Register

The diagram below shows the operation of the Standard Event Status Register.



The Standard Event Status Enable Register on the left is used to select which bits in the corresponding Event Register will cause a TRUE summary message when set.

Bit	Event name	Description
7	Power on (PON–Power on)	A transition from power-off to power-on occurred during the power-up procedure
6	(Not used)	
5	Command error (CME–Command Error)	An illegal program message or a misspelled command was received
4	Execution error (EXE–Execution Error)	A legal but unexecuted program was received
3	Device-dependent error (DDE–Device-dependent Error)	An error caused by other than CME, EXE, or QYE occurred (parameter etc.)
2	Query error (QYE–Query Error)	An attempt was made to read data in an empty Output Queue. Or, before data in the Output Queue was read, the data had already been lost.
1	(Not used)	
0	Operation complete (OPC–Operation Complete)	This bit becomes 1 when this instrument has processed the *OPC command

7.4.2 Reading, writing to, and clearing Standard Event Status Register

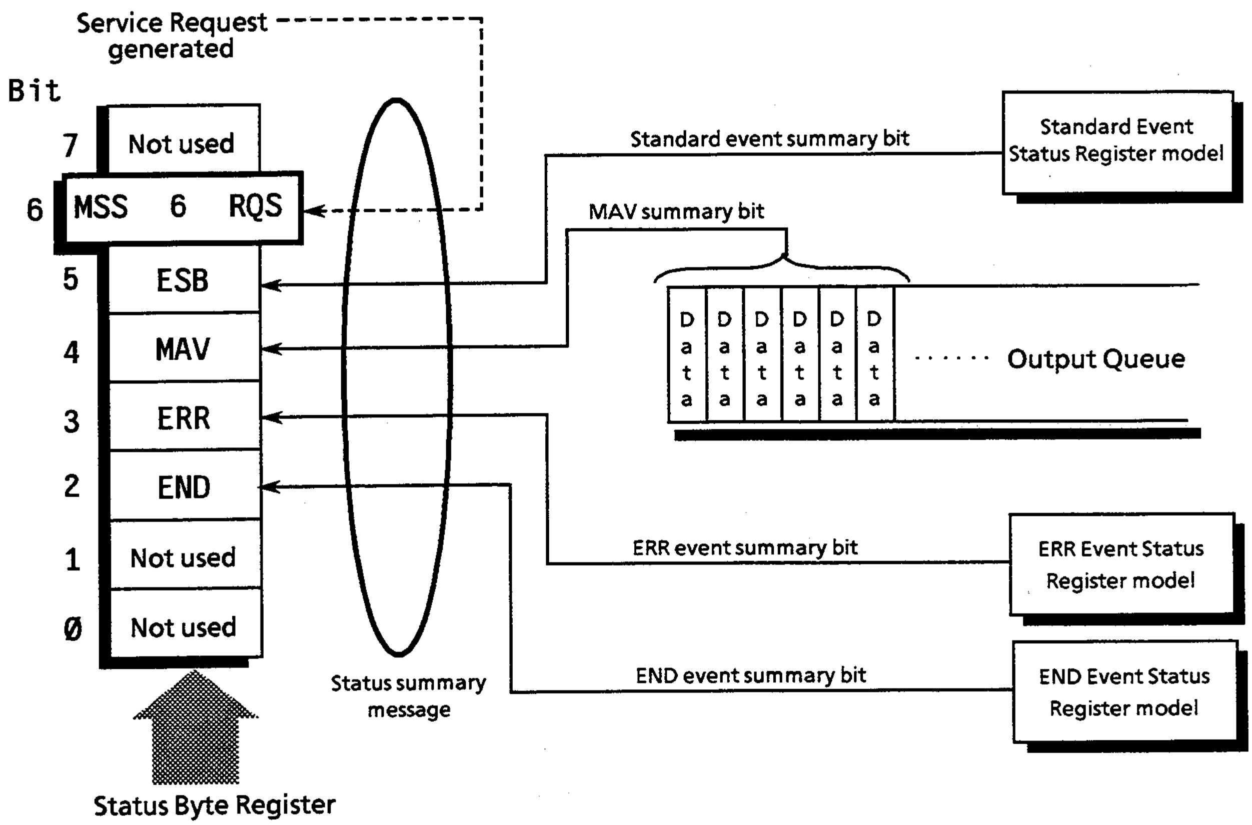
Reading	The *ESR? common query is used to read the ESR register, which is cleared after being read. The response message is integer-format data for which the sum of the binary-weighted event bit is converted to decimals.
Writing	With the exception of clearing, it is impossible to write to the register from outside
Clearing	The register is cleared in the following cases. ① When a *CLS command is received ② When the power is turned on, bit 7 is set to ON, and the other bits are cleared to 0 ③ An event is read for the *ESR? query command

7.4.3 Reading, writing to, and clearing Standard Event Status Enable Register

Reading	The register is read by the *ESE? common query. The response message is an integer-format data for which the sum of the binary-weighted event bit is converted to decimals.
Writing	The register is written to by the *ESE common command
Clearing	The register is cleared in the following cases. ① When an *ESE command with a data value of 0 is received ② When the power is turned on The Standard Event Status Enable Register is not affected by the following. ① When the device clear function status of IEEE488.1 is changed ② When a *RST common command is received ③ When a *CLS common command is received

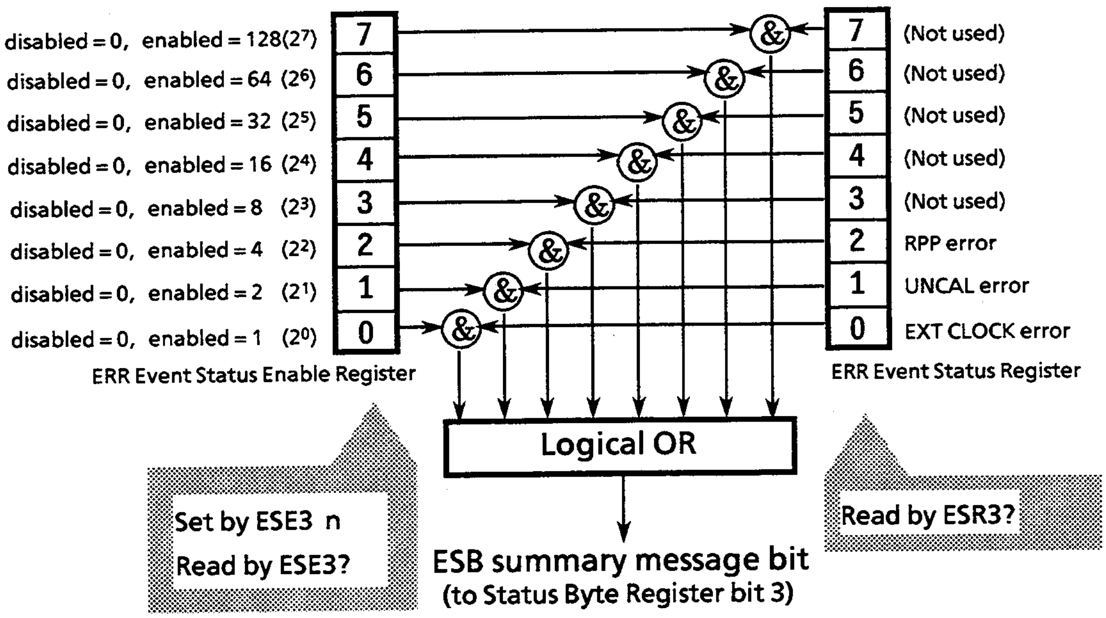
7.5 Extended Event Status Register

As shown below, bits 0, 1, and 7 are unused and bits 2 and 3 are assigned to the END and ERR event summary bits as the status-summary bit supplied by the extended register model.



7.5.1 Bit definition of Extended ERR Event Status Register

The diagram below describes the operation, event-bit names, and their meanings of the ERR Event Status Register.

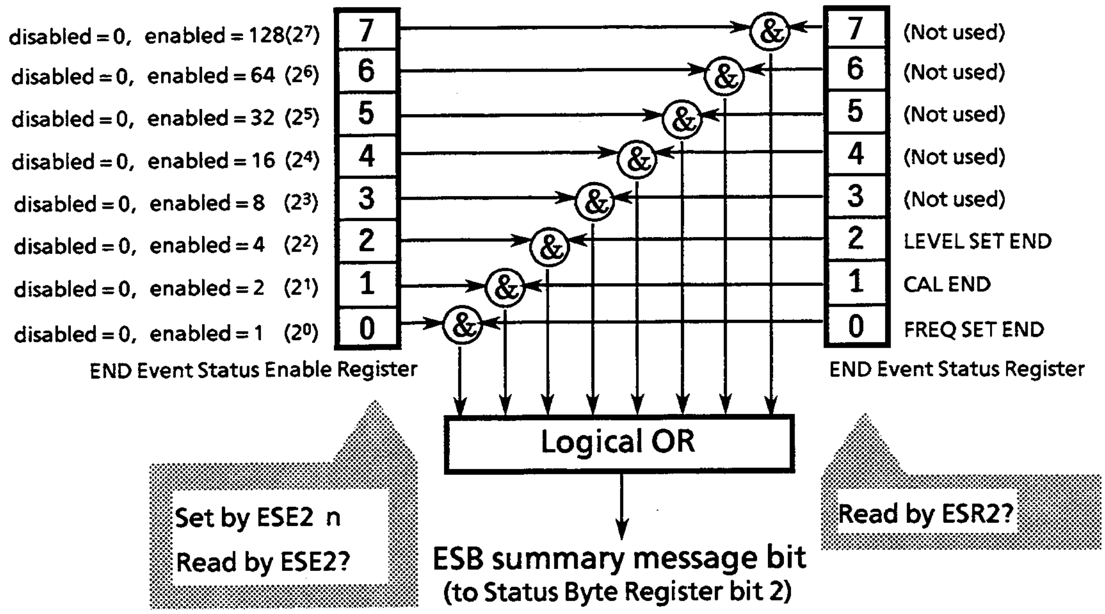


The ERR Event Status Enable Register on the left is used to select which bits in the corresponding Event Register will cause a TRUE summary message when set.

Bit	Event name	Description
7	(Not used)	(Not used)
6	(Not used)	(Not used)
5	(Not used)	(Not used)
4	(Not used)	(Not used)
3	(Not used)	(Not used)
2	RPP error	Sets 1 when the RPP (Reverse Power Protection circuit) has operated
1	UNCAL error	Sets 1 when output level has reached to an UNCAL level
0	EXT CLOCK error	Sets 1 when external baseband clock input signal improper during external data clock selection

7.5.2 Bit definition of Extended END Event Status Register

The diagram below describes the operation, event-bit names, and their meanings of the END Event Status Register.



The END Event Status Enable Register on the left is used to select which bits in the corresponding Event Register will cause a TRUE summary message when set.

Bit	Event name	Description
7	(Not used)	(Not used)
6	(Not used)	(Not used)
5	(Not used)	(Not used)
4	(Not used)	(Not used)
3	(Not used)	(Not used)
2	LEVEL SET END	Sets 1 when output level setting completed
1	CAL END	Sets 1 when output level calibration completed
0	FREQ SET END	Sets 1 when frequency setting completed

7.5.3 Reading, writing to, and clearing Extended Event Status Register

Reading	The ESR2? or ESR3? common query is used to read the register, which is cleared after being read. The response message is an integer-format data for which the sum of the binary-weighted event bit is converted to decimals.
Writing	With the exception of clearing, it is impossible to write to the register from outside
Clearing	The register is cleared in the following cases. ① When a *CLS command is received ② When the power is turned on ③ An event is read for the ESR2? or ESR3? query command

7.5.4 Reading, writing to, and clearing Extended Event Status Enable Register

Reading	The register is read by the ESE2? or ESE3? common query. The response message is integer-format data for which the sum of the binary-weighted event bit is converted to decimals.
Writing	The register is written to by the ESE2? or ESE3? program command. Since bits 0 to 7 of the registers are weighted respectively to 1, 2, 4, 8, 16, 32, 64, and 128, the write data is transmitted as integer format data that is the sum of the desired-bit digits selected from the weighted values.
Clearing	The register is cleared in the following cases. ① When an ESE2 or ESE3 program command with a data value of 0 is received ② When the power is turned on The Extended Event Status Enable Register is not affected by the following. ① When the device clear function status of IEEE488.1 is changed ② When a *RST common command is received ③ When a *CLS common command is received

7.6 Techniques for Synchronizing MG3671A/B with a Controller

The MG3671A/B usually treats program messages as sequential commands that do not execute the processing of newly-received commands until the previous command has been processed. Thus, special consideration need not be taken for pair-synchronization between MG3671A/B and the controller.

If the controller controls one or more devices and synchronizes with them, after all the commands specified for the MG3671A/B have been processed, the next commands must be sent to other devices.

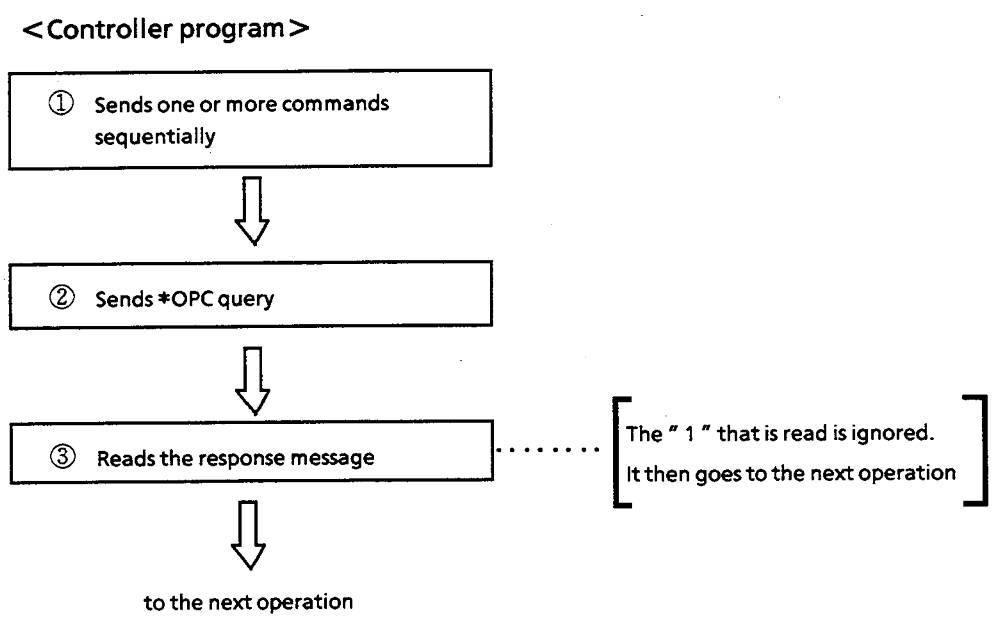
There are two ways of synchronizing the MG3671A/B with the controller.

① Wait for a response after *OPC? query is sent

② Wait for SRQ after *OPC is sent

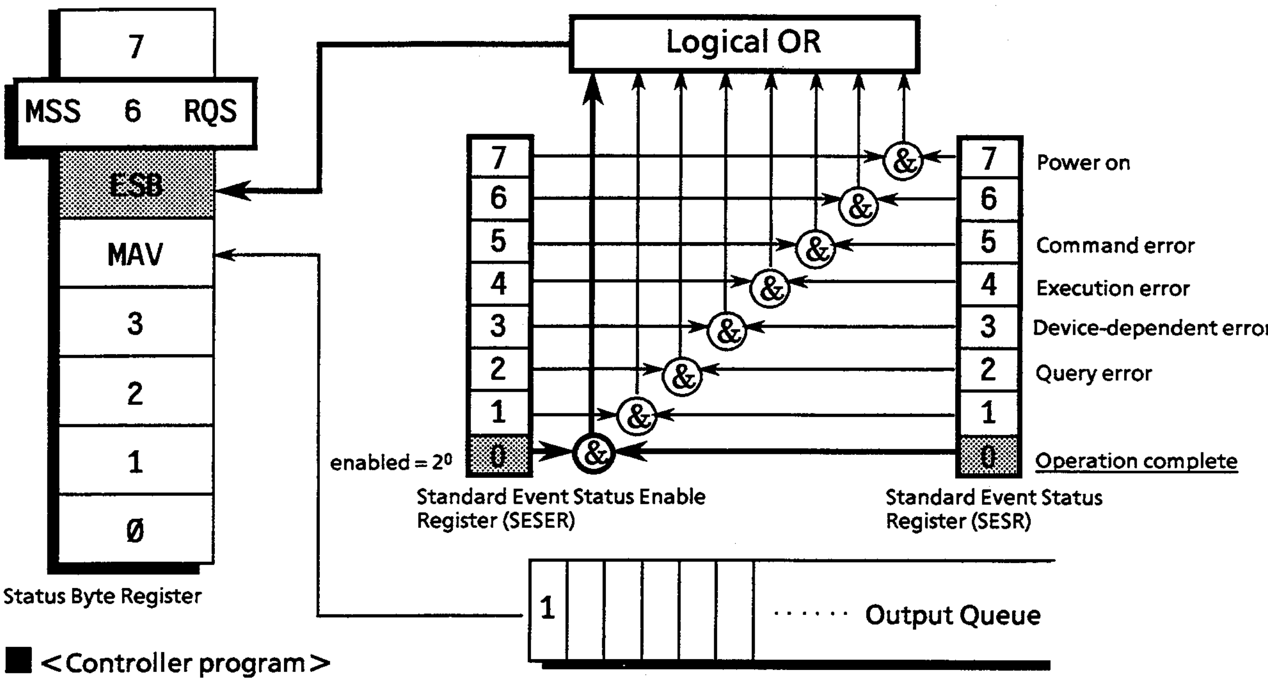
7.6.1 Wait for response after *OPC? query is sent

The MG3671A/B outputs " 1 " as the response message when executing the *OPC? query command.
The controller is synchronized with the MG3671A/B by waiting for the response message to be entered.



7.6.2 Wait for service request after *OPC is sent

The MG3671A/B sets the operation-complete bit (bit 0) to 1 when executing the *OPC command. The controller is synchronized with the MG3671A/B by waiting for SRQ when the operation-complete bit is set for SRQ.



■ <Controller program>

① Enables the 2^0 bit of the Standard Event Status Enable Register — `PRINT @1;"*ESE 1"`

⇩

② Enables the 2^5 bit of the Service Request Enable Register — `PRINT @1;"*SRE 32"`

⇩

③ Makes the device execute the specified operation

⇩

④ Sends the *OPC command — `PRINT @1;"*OPC"`

⇩

⑤ Wait for an SRQ interrupt (ESB summary message) .... Value of status byte: $2^6 + 2^5 = 96$

SECTION 8
DETAILS OF MG3671A/B DEVICE MESSAGES

This section lists the device messages specific to the MG3671A/B, which are given in Section 2, in alphabetical order and also lists the messages compatible with the MG3633A in functional types to explain the detailed functions of each device message.

TABLE OF CONTENTS

SECTION 8
DETAILS OF MG3671A/B DEVICE MESSAGES

The pages that follow explain the device messages in alphabetical order in the format shown below

Message header | Message name spelled out | Alphabetical index of message

F

FREQ Frequency

■ Function Sets the frequewncy.

Program command message | Program query message | Response message

Header	Program command	Query	Response
FREQ	FREQ␣a	FREQ?	FREQ␣a (a=0 to 2750 000 000 Hz)

■ Value of a 0 Hz to 2.75 GHz

■ Suffix code

HZ: Hz
KHZ, KZ: kHz
MHZ, MZ: MHz
GHZ, GZ: GHz
None: Hz

- The left side of the colon is part of the program or response data
- The right side of the colon describes the data

■ Initial setting 10MHZ

■ Example FREQ␣123MHZ

8.1 Device Messages Specific to the MG3671A/B

BASE Base Band Setup

■ Function
Switches to the base band setup screen.
(When the modulation unit is supported,this function is available.)

Header	Program command	Query	Response
BASE	BASE	——	——

■ Suffix code None

■ Example BASE

BTI Burst-Trigger Input Edge

■ Function
Sets the burst trigger input edge.
(When the modulation unit and the burst function unit are supported, this function is available)

Header	Program command	Query	Response
BTI	BTI␣a	BTI?	BTI␣a

■ Value of a
RISE: Rising edge
FALL: Falling edge

■ Suffix code None

■ Initial setting RISE

■ Example BTI␣FALL

BTO Burst-Trigger Output Edge

■ Function
Sets the burst trigger output edge.
(When the modulation unit and the burst function unit are supported, this function is available)

Header	Program command	Query	Response
BTO	BTO␣a	BTO?	BTO␣a

■ Value of a
RISE: Rising edge
FALL: Falling edge

■ Suffix code None

■ Initial setting RISE

■ Example BTO␣FALL

BURST Burst Pattern

■ Function
Switches to the burst internal modulation data setting screen.
(When the modulation unit and the burst function unit are supported, this function is available)

Header	Program command	Query	Response
BURST	BURST	——	——

■ Suffix code None

■ Example BURST

BUZ Buzzer On / Off

■ **Function** Turns the buzzer switch On or Off.

Header	Program command	Query	Response
BUZ	BUZ␣a	——	——

■ **Value of a**
ON: On
OFF: Off

■ **Suffix code** None

■ **Initial setting** ON

■ **Example** BUZ␣OFF

CAL Calibration

■ Function Calibrates output level.

Header	Program command	Query	Response
CAL	CAL	——	——

■ Suffix code None

■ Example CAL

CAPL CMOS Amplitude

■ Function Sets the CMOS level when I,Q signal level has been selected for CMOS .

Header	Program command	Query	Response
CAPL	CAPL␣a	CAPL?	CAPL␣a (a=50 to 500 mVrms)

■ Value of a 50 to 500mVrms (50mVrms step)

■ Suffix code
V: Vrms
MV: mVrms
UV: μVrms
None: mVrms

■ Initial setting 5ØØMV

■ Example CAPL␣5ØMV

CHECK Hardware Check

■ Function Switches to the hardware check screen.

Header	Program command	Query	Response
CHECK	CHECK	——	——

■ Suffix code None

■ Example CHECK

COS CMOS DC Offset

■ Function Sets the CMOS level DC offset value when I,Q signal level has been selected for CMOS.

Header	Program command	Query	Response
COS	COS␣a	COS?	COS␣a (a = 0 to 4000 mV)

■ Value of a 0 to 4000mV (1mV step)

■ Suffix code
V: V
MV: mV
UV: μV
None: mV

■ Initial setting 2500MV

■ Example COS␣1000MV

DSPL Display On / Off

■ Function Turns the Display switch On or Off.

Header	Program command	Query	Response
DSPL	DSPL␣a	——	——

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting ON

■ Example DSPL␣OFF

EIB External-Modulation-Input Burst-Gate Polarity

■ Function
Sets the burst gate signal polarity of external modulation input data.
(When the modulation unit and the burst function unit are supported, this function is available)

Header	Program command	Query	Response
EIB	EIB␣a	EIB?	EIB␣a

■ Value of a
POS: Positive
NEG: Negative

■ Suffix code None

■ Initial setting POS

■ Example EIB␣POS

EIC External-Modulation-Input Data Clock Edge

■ Function
Sets the clock signal edge of external modulation input data.
(When the modulation unit is supported, this function is available)

Header	Program command	Query	Response
EIC	EIC␣a	EIC?	EIC␣a

■ Value of a
RISE: Rising edge
FALL: Falling edge

■ Suffix code None

■ Initial setting RISE

■ Example EIC␣FALL

EID External-Modulation-Input Data Polarity

■ Function Sets the data signal polarity of external modulation input data.
(When the modulation unit is supported, this function is available)

Header	Program command	Query	Response
EID	EID␣a	EID?	EID␣a

■ Value of a
POS: Positive
NEG: Negative

■ Suffix code None

■ Initial setting POS

■ Example EID␣POS

EIS External-Modulation-Input Symbol Clock Edge

■ Function Sets the symbol clock signal edge of external modulation input data.
(When the modulation unit is supported, this function is available)

Header	Program command	Query	Response
EIS	EIS␣a	EIS?	EIS␣a

■ Value of a
RISE: Rising edge
FALL: Falling edge

■ Suffix code None

■ Initial setting RISE

■ Example EIS␣FALL

EOB External-Modulation-Output Burst-Gate Polarity

■ Function

Sets the burst gate signal polarity of external modulation output data.
(When the modulation unit and the burst function unit are supported, this function is available)

Header	Program command	Query	Response
EOB	EOB␣a	EOB?	EOB␣a

■ Value of a

POS: Positive
NEG: Negative

■ Suffix code None

■ Initial setting POS

■ Example EOB␣POS

EOC External-Modulation-Output Data Clock Edge

■ Function

Sets the data clock signal edge of external modulation output data.
(When the modulation unit is supported, this function is available)

Header	Program command	Query	Response
EOC	EOC␣a	EOC?	EOC␣a

■ Value of a

RISE: Rising edge
FALL: Falling edge

■ Suffix code None

■ Initial setting RISE

■ Example EOC␣FALL

EOD External-Modulation-Output Data Polarity

■ Function

Sets the data signal polarity of external modulation output data.
(When the modulation unit is supported, this function is available)

Header	Program command	Query	Response
EOD	EOD␣a	EOD?	EOD␣a

■ Value of a

POS: Positive
NEG: Negative

■ Suffix code None

■ Initial setting POS

■ Example EOD␣POS

EOS External-Modulation-Output Symbol Clock Edge

■ Function

Sets the symbol clock signal edge of external modulation output data.
(When the modulation unit is supported, this function is available)

Header	Program command	Query	Response
EOS	EOS␣a	EOS?	EOS␣a

■ Value of a

RISE: Rising edge
FALL: Falling edge

■ Suffix code None

■ Initial setting RISE

■ Example EOS␣FALL

ESE2 Event Status Enable Register (END)

■ **Function**

Allows the END Event Status Enable Register to select which bit in the corresponding Event Register causes a TRUE ESB summary message bit 2 when set.

Header	Program command	Query	Response
ESE2	ESE2␣a	ESE2?	ESE2␣a (a=0 to 255)

■ **Value of a**

0 to 255:
Represents the sum of weighted bit-digit values when the weighted value for bits to be enabled are selected from among the values $2^0=1$, $2^1=2$, $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$ or $2^7=128$; corresponding to the END Event Status Enable Register bits 0, 1, 2, 3, 4, 5, 6 or 7.

■ **Suffix code**

None

■ **Example**

ESE2␣3

ESE3 Event Status Enable Register (ERR)

■ **Function**

Allows the ERR Event Status Enable Register to select which bit in the corresponding Event Register causes a TRUE ESB summary message bit 3 when set.

Header	Program command	Query	Response
ESE3	ESE3␣a	ESE3?	ESE3␣a (a=0 to 255)

■ **Value of a**

0 to 255:
Represents the sum of weighted bit-digit values when the weighted value for bits to be enabled are selected from among the values $2^0=1$, $2^1=2$, $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$ or $2^7=128$; corresponding to the ERR Event Status Enable Register bits 0, 1, 2, 3, 4, 5, 6 or 7.

■ **Suffix code**

None

■ **Example**

ESE3␣5

ESR2? Event Status Register (END)

■ Function

Allows the sum of the binary-weighted event bit value of the END Event Status Register to be read out by converting them to decimals. After readout, the END Event Status Regoster is reset to 0.

Header	Program command	Query	Response
ESR2?	———	ESR2?	ESR2␣a (a=0 to 255)

■ Value of a 0 to 255

■ Suffix code None

■ Example ESR2?

ESR3? Event Status Register (ERR)

■ Function

Allows the sum of the binary-weighted event bit value of the ERR Event Status Register to be read out by converting them to decimals. After readout, the ERR Event Status Regoster is reset to 0.

Header	Program command	Query	Response
ESR3?	———	ESR3?	ESR3␣a (a=0 to 255)

■ Value of a 0 to 255

■ Suffix code None

■ Example ESR3?

FIS Frequency-Incremental-Step Value

■ Function Sets the frequency incremental step value

Header	Program command	Query	Response
FIS	FIS␣a	FIS?	FIS␣a (a = 1 to 2750 000 000 Hz)

■ Value of a 1Hz to 2.75GHz

■ Suffix code
HZ: Hz
KHZ, KZ: kHz
MHZ, MZ: MHz
GHZ, GZ: GHz
None: Hz

■ Initial setting 1MHZ

■ Example FIS␣12.5KHZ

FOF Frequency-Offset On / Off

■ Function Turns the frequency offset mode On or Off

Header	Program command	Query	Response
FOF	FOF␣a	FOF?	FOF␣a

■ Value of a
ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example FOF␣ON

F

FOS Frequency-Offset Value

■ Function Sets the frequency Offset value

Header	Program command	Query	Response
FOS	FOS␣a	FOS?	FOS␣a (a = −2750 000 000 to 2750 000 000 Hz)

■ Value of a −2.75 to 2.75GHz

■ Suffix code
HZ: Hz
KHZ, KZ: kHz
MHZ, MZ: MHz
GHZ, GZ: GHz
None: Hz

■ Initial setting ØHZ

■ Example FOS␣25KHZ

FRCL Frequency-Memory Recall

■ Function Recalls frequency from frequency memory.

Header	Program command	Query	Response
FRCL	FRCL␣a	——	——

■ Value of a 0 to 999

■ Suffix code None

■ Example FRCL␣15

FREQ Frequency

■ Function — Sets the frequency.

Header	Program command	Query	Response
FREQ	FREQ␣a	FREQ?	FREQ␣a (a = 0 to 2750 000 000 Hz)

■ Value of a — 0 Hz to 2.75 GHz

■ Suffix code —
HZ: Hz
KHZ, KZ: kHz
MHZ, MZ: MHz
GHZ, GZ: GHz
None: Hz

■ Initial setting — 10MHZ

■ Example — FREQ␣123MHZ

FRK Frequency Rotary-Knob Up / Down

■ Function — Increases (or decreases) the frequency by frequency Resolution.

Header	Program command	Query	Response
FRK	FRK␣a	——	——

■ Value of a —
UP: Up
DN: Down

■ Suffix code — None

■ Example — FRK␣UP

FRL Frequency-Relative On / Off

■ Function Turns the relative frequency mode On or Off.

Header	Program command	Query	Response
FRL	FRL␣a	FRL?	FRL␣a

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example FRL␣ON

FRLR? Frequency-Relative Reference Value

■ Function Reads out the reference frequency of relative frequency mode.

Header	Program command	Query	Response
FRLR?	———	FRLR?	FRLR␣a (a=0 to 2750 000 000 Hz)

■ Value of a 0 Hz to 2.75 GHz

■ Suffix code HZ: Hz

■ Example FRLR?

FRLV Frequency-Relative Value

■ Function Reads out the relative frequency.

Header	Program command	Query	Response
FRLV	———	FRLV?	FRLV␣a (a = −2750 000 000 to 2750 000 000 Hz)

■ Value of a −2.75 to 2.75 GHz

■ Suffix code HZ: Hz

■ Example FRLV?

FRR Frequency Resulution

■ Function Sets the frequency resolution.

Header	Program command	Query	Response
FRR	FRR␣a	FRR?	FRR␣a

■ Value of a

1HZ:	1 Hz
10HZ:	10 Hz
100HZ:	100 Hz
1KHZ:	1 kHz
10KHZ:	10 kHz
100KHZ:	100 kHz
1MHZ:	1 MHz
10MHZ:	10 MHz
100MHZ:	100 MHz
1GHZ:	1 GHz
R:	Shifts the frequency resolution to right digit
L:	Shifts the frequency resolution to left digit

■ Suffix code None

■ Initial setting 1HZ

■ Example FRR␣1KHZ

FRS Frequency-Incremental-Step Up / Down

■ Function Increases (or decreases) the frequency by frequency incremental step value.

Header	Program command	Query	Response
FRS	FRS␣a	——	——

■ Value of a UP: Up
DN: Down

■ Suffix code None

■ Example FRS␣UP

FSAV Frequency-Memory Save

■ Function Saves frequency to frequency memory.

Header	Program command	Query	Response
FSAV	FSAV␣a	——	——

■ Value of a 0 to 999

■ Suffix code None

■ Example FSAV␣15

HEAD   Header On / Off

■ Function   Selects whether or not to add header to response message.

Header	Program command	Query	Response
HEAD	HEAD␣a	——	——

■ Value of a   ON: On
OFF: Off

■ Suffix code   None

■ Initial setting   OFF

■ Example   HEAD␣ON

IFRF IF / RF Setup

■ **Function** Switches to IF/RF setup screen.

Header	Program command	Query	Response
IFRF	IFRF	——	——

■ **Suffix code** None

■ **Example** IFRF

INTFC Interface Setup

■ **Function** Switches to interface setup screen.

Header	Program command	Query	Response
INTFC	INTFC	——	——

■ **Suffix code** None

■ **Example** INTFC

IQL I, Q Level

■ Function Sets the I,Q signal levels.

Header	Program command	Query	Response
IQL	IQL␣a	IQL?	IQL␣a

■ Value of a 5ØØMV: 50 Ω 500 mVrms
CMOS: CMOS level

■ Suffix code None

■ Initial setting 5ØØMV

■ Example IQL␣CMOS

ITR I, Q Input Trim On / Off

■ Function Turns on or off the offset and balance adjustment function of I,Q input signals.

Header	Program command	Query	Response
ITR	ITR␣a	ITR?	ITR␣a

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example ITR␣ON

LVL Output-Level On / Off

■ Function Turns the output level on or off.

Header	Program command	Query	Response
LVL	LVL␣a	LVL?	LVL␣a

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting ON

■ Example LVL␣OFF

MIC Modulation Input Data Clock

■ Function

Sets the modulation data clock signal to either internal (Int) or external (Ext). (When the modulation unit is supported, this function is available)

Header	Program command	Query	Response
MIC	MIC␣a	MIC?	MIC␣a

■ Value of a

INT : Internal data clock signal
EXT : External data clock signal

■ Suffix code None

■ Initial setting INT

■ Example MIC␣EXT

MID Modulation Input Data

■ Function

Sets the modulation data signal to either internal (Int) or external (Ext). (When the modulation unit is supported, this function is available)

Header	Program command	Query	Response
MID	MID␣a	MID?	MID␣a

■ Value of a

INT : Internal data signal
EXT : External data signal

■ Suffix code None

■ Initial setting INT

■ Example MID␣EXT

MOD Modulation On / Off

■ Function Turns the modulation function on or off.

Header	Program command	Query	Response
MOD	MOD␣a	MOD?	MOD␣a

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example MOD␣ON

OCNT Output-Level Continuous-Mode On / Off

■ Function Turns the output level continuous mode on or off.

Header	Program command	Query	Response
OCNT	OCNT␣a	OCNT?	OCNT␣a

■ Value of a
ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example OCNT␣ON

OIS Output-Level-Incremental-Step Value

■ Function Sets the output level incremental step value.

Header	Program command	Query	Response
OIS	OIS␣a	OIS?	OIS␣a (a=0.1 to 156 dB)

■ Value of a 0.1 to 156 dB (0.1dB step)

■ Suffix code DB: dB

■ Initial setting 1DB

■ Example OIS␣60DB

OLDBM Output-Level Unit to dBm

■ **Function** Changes output level units to dBm.

Header	Program command	Query	Response
OLDBM	OLDBM	——	——

■ **Suffix code** None

■ **Example** OLDBM

OLDBU Output-Level Unit to dBμ

■ **Function** Changes output level units to dBμ.

Header	Program command	Query	Response
OLDBU	OLDBU	——	——

■ **Suffix code** None

■ **Example** OLDBU

OLK Output-Level Rotary-Knob Up / Down

■ **Function** Increase(or decrease) the output level by output level Resolution.

Header	Program command	Query	Response
OLK	OLK␣a	——	——

■ **Value of a**
UP: Up
DN: Down

■ **Suffix code** None

■ **Example** OLK␣UP

OLL Output-Level-Limit On / Off

■ **Function** Turns the output level limit mode on or off.

Header	Program command	Query	Response
OLL	OLL␣a	OLL?	OLL␣a

■ **Value of a**
ON: On
OFF: Off

■ **Suffix code** None

■ **Initial setting** OFF

■ **Example** OLL␣ON

OLM Output-Level-Limit Value

■ Function Sets the output level limit value.

Header	Program command	Query	Response
OLM	OLM␣a	OLM?	OLM␣a (a:Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM,DM: −143 to 13 dBm

When unit is DBU,DU: −30 to 126 dBμ ---open voltage
−36 to 120 dBμ ---terminated voltage

When unit is V,MV,UV: 0.032 μV to 2 V ---open voltage
0.016 μV to 1 V ---terminated voltage

■ Suffix code

DBM, DM: dBm
DBU, DU: dBμ
V: V
MV: mV
UV: μV
None: dBm

■ Initial setting -1ØDBM

■ Example OLM␣ØDBM

OLR Output-Level Resolution

■ Function Sets the output level resolution.

Header	Program command	Query	Response
OLR	OLR␣a	OLR?	OLR␣a

■ Value of a

Ø.1DB: 0.1 dB
1DB: 1 dB
1ØDB: 10 dB
R: Shifts the output level resolution to right digit
L: Shifts the output level resolution to left digit

■ Suffix code None

■ Initial setting Ø.1DB

■ Example OLR␣1DB

OLS Output-Level-Incremental-Step Up / Down

■ **Function** Increases (or decreases) the output level by output level incremental step value.

Header	Program command	Query	Response
OLS	OLS␣a	——	——

■ **Value of a**
UP: Up
DN: Down

■ **Suffix code** None

■ **Example** OLS␣UP

OLV Output-Level Unit to volt

■ **Function** Changes output level units to volt.

Header	Program command	Query	Response
OLV	OLV	——	——

■ **Suffix code** None

■ **Example** OLV

OLVL Output Level

■ Function Sets the output level.

Header	Program command	Query	Response
OLVL	OLVL␣a	OLVL?	OLVL␣a (a:Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM,DM:	−143 to 13 dBm	
When unit is DBU,DU:	−30 to 126 dBμ	---open voltage
	−36 to 120 dBμ	---terminated voltage
When unit is V,MV,UV:	0.032 μV to 2 V	---open voltage
	0.016 μV to 1 V	---terminated voltage

■ Suffix code

DBM, DM: dBm
DBU, DU: dBμ
V: V
MV: mV
UV: μV
None: dBm

■ Initial setting -30DBM

■ Example OLVL␣-60DBM

OOF Output-Level-Offset On / Off

■ Function Turns the output level offset mode on or off

Header	Program command	Query	Response
OOF	OOF␣a	OOF?	OOF␣a

■ Value of a

ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example OOF␣ON

OOS Output-Level-Offset Value

■ Function Sets the output level offset value

Header	Program command	Query	Response
OOS	OOS␣a	OOS?	OOS␣a (a = −55.0 to 55.0 dB)

■ Value of a −55 to 55 dB (0.1dB step)

■ Suffix code DB: dB
None: dB

■ Initial setting ØDB

■ Example OOS␣3DB

ORL Output-Level-Relative On / Off

■ Function Turns the relative output level mode on or off.

Header	Program command	Query	Response
ORL	ORL␣a	ORL?	ORL␣a

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example ORL␣ON

ORLR? Output-Level-Relative Reference Value

■ Function — Reads out the reference output level of relative output level mode.

Header	Program command	Query	Response
ORLR?	———	ORLR?	ORLR␣a (a:Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM,DM: −143 to 13 dBm

When unit is DBU,DU: −30 to 126 dBμ ---open voltage
−36 to 120 dBμ ---terminated voltage

When unit is V,MV,UV: 0.032 μV to 2 V ---open voltage
0.016 μV to 1 V ---terminated voltage

■ Suffix code

DBM: dBm
DBU: dBμ
V: V
MV: mV
UV: μV

■ Example — ORLR?

ORLV? Output-Level-Relative Value

■ Function — Reads out the relative output level.

Header	Program command	Query	Response
ORLV?	———	ORLV?	ORLV␣a

■ Value of a — −156 to 156 dB (0.1dB step)

■ Suffix code — DB: dB

■ Example — ORLV?

OTR — I, Q Output Trim On / Off

■ **Function** Turns on or off the offset and balance adjustment function of I,Q output signals .

Header	Program command	Query	Response
OTR	OTR␣a	OTR?	OTR␣a

■ **Value of a** ON: On
OFF: Off

■ **Suffix code** None

■ **Initial setting** OFF

■ **Example** OTR␣ON

PM Pulse-Modulation

■ Function Sets the pulse modulation signal to either internal (Int) or external (Ext).

Header	Program command	Query	Response
PM	PM␣a	PM?	PM␣a

■ Value of a
INT: Internal pulse modulation signal
EXT: External pulse modulation signal

■ Suffix code None

■ Initial setting INT

■ Example PM␣EXT

PMP Pulse-Modulation Polarity

■ Function Sets the pulse modulation signal polarity.

Header	Program command	Query	Response
PMP	PMP␣a	PMP?	PMP␣a

■ Value of a
POS: Positive
NEG: Negative

■ Suffix code None

■ Initial setting POS

■ Example PMP␣POS

PRCL Parameter-Memory Recall

■ Function Recalls parameter from parameter memory.

Header	Program command	Query	Response
PRCL	PRCL␣a	——	——

■ Value of a 0 to 99

■ Suffix code None

■ Example PRCL␣15

PRE Preset

■ Function Initializes parameters.

Header	Program command	Query	Response
PRE	PRE	——	——

■ Suffix code None

■ Example PRE

PRMTR Parameter

■ Function Switches to parameter setting screen.

Header	Program command	Query	Response
PRMTR	PRMTR	——	———

■ Suffix code None

■ Example PRMTR

PSAV Parameter-Memory Save

■ Function Saves parameter to parameter memory.

Header	Program command	Query	Response
PSAV	PSAV␣a[,b]	——	———

■ Value of a 0 to 99

■ Value of b Character string whithin 8 characters enclosed by double quotation marks or single quotation marks.
Saves the title which sets currently If b is omitted.
Saves the title which is the first eight characters if b is over eight characters.

■ Suffix code None

■ Example PSAV␣5,"MG3671A/B"

PSYNC Pattern Sync Output

■ Function Selects the pattern sync output signal.
(When the modulation unit and the burst function unit are supported, this function is available)

Header	Program command	Query	Response
PSYNC	PSYNC␣a	PSYNC?	PSYNC␣a

■ Value of a
PNCLK: PN Clock
PNGAT: PN Gate
RFGAT: RF Gate

■ Suffix code None

■ Initial setting PNCLK

■ Example PSYNC␣PNGAT

REF Reference Frequency

■ Function Selects the reference frequency.

Header	Program command	Query	Response
REF	REF␣a	REF?	REF␣a

■ Value of a
10MHZ: 10 MHz
13MHZ: 13 MHz

■ Suffix code None

■ Initial setting 10MHZ

■ Example REF␣13MHZ

RFOFF RF Off Release

■ Function Selects the operation mode of the RF output ON/Off key.

Header	Program command	Query	Response
REF	RFOFF␣a	RFOFF?	RFOFF␣a

■ Value of a NORM: Normal
ALTN: Alternate

■ Suffix code None

■ Initial setting NORM

■ Example RFOFF ALTN

RS RPP Reset

■ Function Reset the RPP(Revers Power Protection) circuit to return to the original state.

Header	Program command	Query	Response
RS	RS	——	——

■ Suffix code None

■ Example RS

TRM Terminater

■ Function Sets the terminator of the response data sent out from GPIB.

Header	Program command	Query	Response
TERM	TERM␣a	TERM?	TERM␣a

■ Value of a Ø: LF
1: CR / LF

■ Suffix code None

■ Initial setting Ø (but not to be initialized)

■ Example TERM␣1

VDSPL Voltage Display

■ Function Selects the output level display for open voltage or terminated voltage .

Header	Program command	Query	Response
VDSPL	VDSPL␣a	VDSPL?	VDSPL␣a

■ Value of a EMF : Electro-Motive Force (open voltage display)
TERM : Terminated (terminated voltage display)

■ Suffix code None

■ Initial setting EMF

■ Example VDSPL␣TERM

8.2 Control by MG3633A Device Messages

This paragraph describes MG3633A Device Messages, which can be used for MG3671A/B, calssified by the function type.

Note: *The query message has a trailing "OA" that is always added at the end of the program header. There must be a space between program header and program data.*

8.2.1 Frequency

FR FRequency
FC Frequency Center
CF Center Frequency

■ Function Sets the frequency.

Header	Program command	Query	Response
FR	FR␣a	FROA	FR␣a
FC	FC␣a	FCOA	FR␣a
CF	CF␣a	CFOA	FR␣a (a=0 to 2750 000 000 Hz)

■ Value of a 0 Hz to 2.75 GHz

■ Suffix code
HZ: Hz
KHZ, KZ: kHz
MHZ, MZ: MHz
GHZ, GZ: GHz
None: Hz

■ Initial setting 1ØMHZ

■ Example FR␣123MHZ

FIS Frequency Incremental Step Value

■ Function Sets the frequency incremental step value.

Header	Program command	Query	Response
FIS	FIS␣a	FISOA	FIS␣a (a=1 to 2750 000 000 Hz)

■ Value of a 1 Hz to 2.75 GHz

■ Suffix code
HZ: Hz
KHZ, KZ: kHz
MHZ, MZ: MHz
GHZ, GZ: GHz
None: Hz

■ Initial setting 1MHZ

■ Example FIS␣12.5KHZ

UFR Frequency Incremental Step Up
DFR Frequency Incremental Step Down

■ Function

Increases (or decreases) the frequency by frequency incremental step value.
UFR: Increase the frequency.
DFR: Decrease the frequency.

Header	Program command	Query	Response
UFR	UFR	——	——
DFR	DFR	——	——

■ Suffix code None

■ Example DFR

TFR Frequency Rotary Knob Up
EFR Frequency Rotary Knob Down

■ **Function**

Increases (or decreases) the frequency by frequency Resolution.
TFR: Increase the frequency.
EFR: Decrease the frequency.

Header	Program command	Query	Response
TFR	TFR	——	———
EFR	EFR	——	———

■ **Suffix code** None

■ **Example** EFR

R2 Frequency Resulution 1 Hz
R3 Frequency Resulution 10 Hz
R4 Frequency Resulution 100 Hz
R5 Frequency Resulution 1 kHz
R6 Frequency Resulution 10 kHz
R7 Frequency Resulution 100 kHz
R8 Frequency Resulution 1 MHz
R9 Frequency Resulution 10 MHz
FSR Frequency Resulution to Right
FSL Frequency Resulution to Left

■ Function

Sets the frequency resolution.
R2: 1 Hz
R3: 10 MHz
R4: 100 Hz
R5: 1 kHz
R6: 10 kHz
R7: 100 kHz
R8: 1 MHz
R9: 10 MHz
FSR: Shifts the frequency resolution to right digit.
FSL: Shifts the frequency resolution to left digit.

Header	Program command	Query	Response
R2	R2	——	——
R3	R3	——	——
R4	R4	——	——
R5	R5	——	——
R6	R6	——	——
R7	R7	——	——
R8	R8	——	——
R9	R9	——	——
FSR	FSR	——	——
FSL	FSL	——	——

■ Suffix code None

■ Initial setting R2

■ Example R3

REFOA Frequency Relative Reference Value

■ Function Reads out the reference frequency of relative frequency mode.

Header	Program command	Query	Response
REFOA	———	REFOA	REF␣a (a=0 to 2750 000 000 Hz)

■ Value of a 0 Hz to 2.75 GHz

■ Suffix code HZ: Hz

■ Example REFOA

RLFOA Frequency Relative Value

■ **Function** Reads out the relative frequency.

Header	Program command	Query	Response
RLFOA	———	RLFOA	RLF␣a (a = −2750 000 000 to 2750 000 000 Hz)

■ **Value of a** −2.75 to 2.75 GHz

■ **Suffix code** HZ: Hz

■ **Example** RLFOA

FO Frequency Relative On
FF Frequency Relative Off

■ **Function**
Turns the relative frequency mode on or off.
FO: On
FF: Off

Header	Program command	Query	Response
FO	FO	——	——
FF	FF	——	——

■ **Suffix code** None

■ **Initial setting** FF

■ **Example** FO

FOS Frequency Offset Value

■ Function Sets the frequency offset value.

Header	Program command	Query	Response
FOS	FOS␣a	FOSOA	FOS␣a (a = −2750 000 000 to 2750 000 000 Hz)

■ Value of a −2.75 to 2.75 GHz

■ Suffix code
HZ: Hz
KHZ, KZ: kHz
MHZ, MZ: MHz
GHZ, GZ: GHz
None: Hz

■ Initial setting ØHZ

■ Example FOS␣25KHZ

SP12 Frequency Offset On
SP11 Frequency Offset Off

■ Function

Turns the frequency offset mode on or off.
SP12: On
SP11: Off

Header	Program command	Query	Response
SP12	SP12	——	——
SP11	SP11	——	——

■ Suffix code None

■ Initial setting SP11

■ Example SP12

8.2.2 Output level

OL Output Level
AP Amplitude

■ **Function** Sets the output level.

Header	Program command	Query	Response
OL AP	OL␣a AP␣a	OLOA APOA	OL␣a OL␣a (a: Tranfer the unit which is represented in the current output level units.)

■ **Value of a**

When unit is DBM, DM : −143 to 13 dBm

When unit is DBU, DU : −30 to 126 dBμ ---open voltage
−36 to 120 dBμ ---terminated voltage

When unit is V, MV, UV : 0.032 μV to 2 V ---open voltage
0.016 μV to 1 V ---terminated voltage

■ **Suffix code**

DBM, DM: dBm
DBU, DU: dBμ
V: V
MV: mV
UV: μV
None: dBm

■ **Initial setting** -3ØDBM

■ **Example** OL␣-6ØDBM

OIS Output Level Incremental Step Value

■ **Function** Sets the output level incremental step value.

Header	Program command	Query	Response
OIS	OIS␣a	OISOA	OIS␣a (a=0.1 to 156 dB)

■ **Value of a** 0.1 to 156 dB (0.1 dB step)

■ **Suffix code** DB: dB
None: dB

■ **Initial setting** 1DB

■ **Example** OIS␣6ØDB

UOL Output Level Incremental Step Up
DOL Output Level Incremental Step Down

■ Function

Increases (or decreases) the output level by output level incremental step value.
UOL: Up
DOL: Down

Header	Program command	Query	Response
UOL	UOL	——	——
DOL	DOL	——	——

■ Suffix code None

■ Example DOL

TOL Output Level Rotary Knob Up
EOL Output Level Rotary Knob Down

■ **Function**

Increases (or decreases) the output level by output level Resolution.
TOL: Up
EOL: Down

Header	Program command	Query	Response
TOL	TOL	—	—
EOL	EOL	—	—

■ **Suffix code** None

■ **Example** EOL

L0 Output Level Resolution 0.1 dB
L1 Output Level Resolution 1 dB
L2 Output Level Resolution 10 dB
OSR Output Level Resolution to Right
OSL Output Level Resolution to Left

■ Function

Sets the output Level resolution.
L0: 0.1 dB
L1: 1 dB
L2: 10 dB
OSR: Shifts the output level resolution to right digit.
OSL: Shifts the output level resolution to left digit.

Header	Program command	Query	Response
LØ	LØ	——	——
L1	L1	——	——
L2	L2	——	——
OSR	OSR	——	——
OSL	OSL	——	——

■ Suffix code None

■ Initial setting LØ

■ Example L2

LC Output Level Continuous Mode On
LN Output Level Continuous Mode Off

■ **Function**

Turns the output level continuous mode On or Off.
LC: On
LN: Off

Header	Program command	Query	Response
LC	LC	——	——
LN	LN	——	——

■ **Suffix code** None

■ **Initial setting** LN

■ **Example** LC

REOOA Output Level Relative Reference Value

■ Function Reads out the reference output level of relative output level mode.

Header	Program command	Query	Response
REOOA	———	REOOA	REO␣a (a: Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM : −143 to 13 dBm

When unit is DBU : −30 to 126 dBμ ---open voltage
−36 to 120 dBμ ---terminated voltage

When unit is V, MV, UV : 0.032 μV to 2 V ---open voltage
0.016 μV to 1 V ---terminated voltage

■ Suffix code

DBM: dBm
DBU: dBμ
V: V
MV: mV
UV: μV

■ Example REOOA

RLOOA Output Level Relative Value

■ **Function** Reads out the relative output level.

Header	Program command	Query	Response
RLOOA	———	RLOOA	RLO␣a

■ **Value of a** −156 to 156 dB (0.1 dB step)

■ **Suffix code** DB: dB

■ **Example** RLOOA

LO Output Level Relative On
LF Output Level Relative Off

■ Function

Turns the relative output level mode on or off.
LO: On
LF: Off

Header	Program command	Query	Response
LO	LO	——	——
LF	LF	——	——

■ Suffix code None

■ Initial setting LF

■ Example LO

OOS Output Level Offset Value

■ Function Sets the output level offset value.

Header	Program command	Query	Response
OOS	OOS␣a	OOSOA	OOS␣a (a = −55.0 to 55.0 dB)

■ Value of a −55 to 55 dB (0.1 dB step)

■ Suffix code DB: dB
None: dB

■ Initial setting ØDB

■ Example OOS␣3DB

SP08 Output Level Offset On
SP07 Output Level Offset Off

■ Function

Turns the output level offset mode on or off.
SP08: On
SP07: Off

Header	Program command	Query	Response
SPØ8	SPØ8	——	——
SPØ7	SPØ7	——	——

■ Suffix code None

■ Initial setting SPØ7

■ Example SPØ8

RO Output Level On
RF Output Level Off

■ Function

Turns the output level on or off.
RO: On
RF: Off

Header	Program command	Query	Response
RO	RO	——	——
RF	RF	——	——

■ Suffix code None

■ Initial setting RO

■ Example RF

SP03 EMF: Electro-Motive Force (open voltage display)
SP04 TERM: Terminated (terminated voltage display)

■ Function

Selects the output level display for open voltage or terminated voltage.
SP03: EMF
SP04: TERM

Header	Program command	Query	Response
SPØ3	SPØ3	—	—
SPØ4	SPØ4	—	—

■ Suffix code None

■ Initial setting SPØ3

■ Example SPØ4

OLDBM OLDM APDBM APDM — Output Level Unit to dBm

■ Function — Changes output level units to dBm.

Header	Program command	Query	Response
OLDBM	OLDBM	—	—
OLDM	OLDM	—	—
APDBM	APDBM	—	—
APDM	APDM	—	—

■ Suffix code — None

■ Example — OLDM

OLDBU OLDU APDBU APDU — Output Level Unit to dBμ

■ Function — Changes output level units to dBμ.

Header	Program command	Query	Response
OLDBU	OLDBU	——	——
OLDU	OLDU	——	——
APDBU	APDBU	——	——
APDU	APDU	——	——

■ Suffix code — None

■ Example — OLDU

OLV
APV

Output Level Unit to volt

■ Function — Changes output level units to volt.

Header	Program command	Query	Response
OLV	OLV	——	——
APV	APV	——	——

■ Suffix code — None

■ Example — APV

OLM Output Level Limit Value

■ **Function** Sets the output level limit value.

Header	Program command	Query	Response
OLM	OLM␣a	OLMOA	OLM␣a (a = Tranfer the unit which is represented in the current output level units.)

■ **Value of a**

When unit is DBM, DM : −143 to 13 dBm

When unit is DBU, DU : −30 to 126 dBμ ---open voltage
−36 to 120 dBμ ---terminated voltage

When unit is V, MV, UV : 0.032 μV to 2 V ---open voltage
0.016 μV to 1 V ---terminated voltage

■ **Suffix code**

DBM, DM: dBm
DBU, DU: dBμ
V: V
MV: mV
UV: μV
None: dBm

■ **Initial setting** -10DBM

■ **Example** OLM␣0DBM

SP06 Output Level Limit On
SP05 Output Level Limit Off

■ **Function** Turns the output level limit mode on or off.
SP06: On
SP05: Off

Header	Program command	Query	Response
SPØ6	SPØ6	——	——
SPØ5	SPØ5	——	——

■ **Suffix code** None

■ **Initial setting** SPØ5

■ **Example** SPØ6

8.2.3 Save/recall

FQaST Frequency Memory Save

■ Function Saves frequency to frequency memory.

Header	Program command	Query	Response
FQaST	FQaST	——	——

■ Value of a 0 to 999

■ Suffix code None

■ Example FQ15ST

FQaRC Frequency Memory Recall

■ Function Recalls frequency from frequency memory.

Header	Program command	Query	Response
FQaRC	FQaRC	——	——

■ Value of a 0 to 999

■ Suffix code None

■ Example FQ15RC

FNaST Parameter Memory Save

■ **Function** Saves parameter to parameter memory.

Header	Program command	Query	Response
FNaST	FNaST	——	——

■ **Value of a** 0 to 99

■ **Suffix code** None

■ **Example** FN5ST

FNaRC Parameter Memory Recall

■ Function Recalls parameter from parameter memory.

Header	Program command	Query	Response
FNaRC	FNaRC	——	——

■ Value of a 0 to 99

■ Suffix code None

■ Example FN15RC

8.2.4 Others

RS RPP Reset

■ **Function** Resets the RPP (Revers Power Protection) circuit to return to the original state.

Header	Program command	Query	Response
RS	RS	——	——

■ **Suffix code** None

■ **Example** RS

SP00 Preset

■ Function Initializes parameters.

Header	Program command	Query	Response
SPØØ	SPØØ	——	——

■ Suffix code None

■ Example SPØØ

SP02 Buzzer On
SP01 Buzzer Off

■ Function

Turns the buzzer switch on or off.
SP02: On
SP01: Off

Header	Program command	Query	Response
SPØ2	SPØ2	——	——
SPØ1	SPØ1	——	——

■ Suffix code None

■ Initial setting SPØ2

■ Example SPØ1

SP60 Header On
SP61 Header Off

■ Function

Selects whether or not to add header to response message.
SP60: On
SP61: Off

Header	Program command	Query	Response
SP6Ø	SP6Ø	—	—
SP61	SP61	—	—

■ Suffix code None

■ Initial setting SP61

■ Example SP6Ø

SECTION 9
SAMPLE PROGRAMS

This section describes some sample programs with the common commands and the program commands, queries, and response messages specific to the MG3671A/B.

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SECTION 9
SAMPLE PROGRAMS

9.1 Precautions on Creating the GPIB Program

Note the following points when writing GPIB control programs.

No.	Precaution	Description
1	Be sure to initialize each device.	There may be a number of the state in which each device is not proper to be actually used due to operation on its own panel or execution of other programs. It is necessary to using individual devices with a prescribed condition resulting from initializing them. Execute the following. ① Initializing the interface functions (ISET IFC) ② Initializing message exchange functions of each device (WBYTE &H3F, &H14) ③ Initializing the functions proper to each device (PRE or *RST)
2	Turn the device to the remote state of RWLS (Remote With Lockout State).	In a simple remote state, pressing the Local key turns the device to the local state. Pressing a panel key in this moment causes device's automatic measurement to function improperly, thus measurement data are likely to turn out unreliable. Set the device to the locally locked out state with WBYTE &H3F, &H11 to prevent it from returning to the local state. (Turn every device to the locally controlled state with WBYTE &H3F, listener address, secondary address, &H01.)
3	Do not send any command (related to the device) other than the INPUT @ statement immediately after sending a query.	If MLA is received when a command other than the INPUT @ statement is sent to the controller before the response to a query is read, the output buffer is cleared, and the response message disappears. For this reason, write the INPUT @ statement in immediate succession to a query.
4	Create a program that avoids an exception processing of the protocol	Avoid stoppage of execution (caused by an error) by means of providing a program with exception-processing section against exceptions that can be foreseen.
5	Confirm the interface functions of each device (subset).	Execution of program does not advance if necessary subset (s) has (have) not been prepared in the device. Be sure to confirm the subset (s) of each device. Also confirm that each device complies with IEEE488.2.

9.2 Sample Programs

9.2.1 Initializing MG3671A/B

< Example 1 > Initializes MG3671A/B.

```
 10  '------------------------------
 20  ' MG3671A/B GPIB SAMPLE PROGRAM
 30  ' INITIALIZE
 40  '------------------------------
 50  ISET IFC ............................ Initializes the interface function
 60  ISET REN ............................ Sets remote enable to true
 70  CMD DELIM=0 ......................... Selects CR + LF as the delimiter
 80  LET DSG=1 ........................... Assigns MG3671A/B address to variable DSG
 90  PRINT @DSG;"PRE" .................... Initializes MG3671A/B
100  END
```

There is a '*RST' command in another GPIB command for executing initialization.

For general usage of PRE and *RST, first initialize the MG3671A/B device functions with the PRE or *RST command, then use the program commands to set only the functions to be changed. This prevents the MG3671A/B from being controlled while unnecessary functions are set.

9.2.2 Setting frequency and output level

<Example 2> Sets the frequency to 100 MHz and output level to 0 dBm, and then performs serial polling to confirm the end of setting parameter.

```
 10  '------------------------------
 20  ' MG3671A/B GPIB SAMPLE PROGRAM
 30  ' FREQUENCY & LEVEL SET
 40  '------------------------------
 50  ISET IFC
 60  ISET REN
 70  CMD DELIM=0
 80  LET DSG=1
 90  PRINT @DSG;"PRE"
100  SRQ ON ..................................  Permits the receipt of SRQ
110  PRINT @DSG;"*CLS ........................  Clears Status Byte Register
120  PRINT @DSG;"*SRE 4" .....................  Masks bits other than SRE bit 2
130  PRINT @DSG;"ESE2 4" .....................  Masks bits other than ESE2 bit 2
140  PRINT @DSG;"FREQ 100MHZ" ................  Sets the frequency to 100MHz
150  PRINT @DSG;"OLVL 0DBM" ..................  Sets the output level 0dBm
160  POLL DSG,N ..............................  Performs serial polling
170  IF N<>68 THEN GOTO 160 ..................  Terminates this program when STB ESB(bit 2) is 1
180  END
```

Executing the SRQ command at line 100 permits the receipt of SRQ.

Lines 110 to 130 clear and mask the Status Byte Register.

Lines 140 and 150 set the frequency and the output level.

The serial polling at lines 160 and 170 is executed to check the end of setting parameter.

9.2.3 Setting frequency using increment step frequency

<Example 2> Sets the frequency to 100MHz, increment step frequency to 250kHz and then increases the frequency in 250kHz steps from 100 MHz to 200MHz.

```
10  '-------------------------------
20  ' MG3671A/B GPIB SAMPLE PROGRAM
30  ' FREQUENCY INCREMENTAL STEP SET
40  '-------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  LET DSG=1
90  PRINT @DSG;"PRE"
100 SRQ ON
110 PRINT @DSG;"*CLS
120 PRINT @DSG;"*SRE 4" ........................ Masks bits other than SRE bit 2
130 PRINT @DSG;"ESE2 1" ........................ Masks bits other than ESE2 bit 2
140 PRINT @DSG;"FREQ 100MHZ" ................... Sets the frequency to 100MHz
150 PRINT @DSG;"FIS 250KHZ" .................... Sets the incremental step frequency to 250kHz
160 FOR I=1 TO 400 ......... Repeats the FOR-NEXT loop 400 times until the frequency becomes 200 MHz
170 PRINT @DSG;"FRS UP" ........................ Increase the frequency by 250kHz
180 POLL DSG,N
190 IF N<>68 THEN GOTO 180
200 NEXT I
210 END
```

Lines 140 and 150 set the frequency (100MHz) and incremental step frequency.

Lines 160 to 200 increase the frequency in 250kHz steps from 100 MHz to 200MHz.

Lines 180 to 190 executes waiting until setting frequency parameter is completed.

9.2.4 Calibrating by external I,Q signal input

<Example 2> Sets the frequency to 100MHz, output level to 0dBm, I,Q signals source to external input, and then calibrates the output level.

```
 10  '------------------------------
 20  ' MG3671A/B GPIB SAMPLE PROGRAM
 30  ' CALIBRATION
 40  '------------------------------
 50  ISET IFC
 60  ISET REN
 70  CMD DELIM=0
 80  LET DSG=1
 90  PRINT @DSG;"PRE"
100  SRQ ON
110  PRINT @DSG;"*CLS"
120  PRINT @DSG;"*SRE 4" ..................... Masks bits other than SRE bit 2
130  PRINT @DSG;"ESE2 2" ..................... Masks bits other than ESE2 bit 1
140  PRINT @DSG;"FREQ 100MHZ" ................ Sets the frequency to 100MHz
150  PRINT @DSG;"OLVL 0DBM" .................. Sets the output level to 0dBm
160  PRINT @DSG;"MOD ON" ..................... Turns modulation on
170  PRINT @DSG;"MODE EXT" ................... Sets the I,Q signals source to external input
180  PRINT @DSG;"CAL" ........................ Calibrates the output level
190  POLL DSG,N
200  IF N<>68 THEN GOTO 190
210  END
```

Lines 140 and 150 set the frequency and the output level.

The modulation is turned on and I,Q signals source is set to external input at lines 160 and 170, respectively.

Line 180 calibrates the output level.

Lines 190 and 200 check that calibration execution is terminated.

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APPENDIX A
ASCII*CODE TABLE

BITS B7 B6 B5 / B4 B3 B2 B1	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0 0	20 DLE 10 16	40 SP 20 32	60 0 30 48	100 @ 40 64	120 P 50 80	140 ` 60 96	160 p 70 112
0 0 0 1	1 GTL SOH 1 1	21 LLO DC1 11 17	41 ! 21 33	61 1 31 49	101 A 41 65	121 Q 51 81	141 a 61 97	161 q 71 113
0 0 1 0	2 STX 2 2	22 DC2 12 18	42 " 22 34	62 2 32 50	102 B 42 66	122 R 52 82	142 b 62 98	162 r 72 114
0 0 1 1	3 ETX 3 3	23 DC3 13 19	43 # 23 35	63 3 33 51	103 C 43 67	123 S 53 83	143 c 63 99	163 s 73 115
0 1 0 0	4 SDC EOT 4 4	24 DCL DC4 14 20	44 $ 24 36	64 4 34 52	104 D 44 68	124 T 54 84	144 d 64 100	164 t 74 116
0 1 0 1	5 PPC ENO 5 5	25 PPU NAK 15 21	45 % 25 37	65 5 35 53	105 E 45 69	125 U 55 85	145 e 65 101	165 u 75 117
0 1 1 0	6 ACK 6 6	26 SYN 16 22	46 & 26 38	66 6 36 54	106 F 46 70	126 V 56 86	146 f 66 102	166 v 76 118
0 1 1 1	7 BEL 7 7	27 ETB 17 23	47 ' 27 39	67 7 37 55	107 G 47 71	127 W 57 87	147 g 67 103	167 w 77 119
1 0 0 0	10 GET BS 8 8	30 SPE CAN 18 24	50 (28 40	70 8 38 56	110 H 48 72	130 X 58 88	150 h 68 104	170 x 78 120
1 0 0 1	11 TCT HT 9 9	31 SPD EM 19 25	51) 29 41	71 9 39 57	111 I 49 73	131 Y 59 89	151 i 69 105	171 y 79 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 * 2A 42	72 : 3A 58	112 J 4A 74	132 Z 5A 90	152 j 6A 106	172 z 7A 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 ÷ 2B 43	73 ; 3B 59	113 K 4B 75	133 [5B 91	153 k 6B 107	173 { 7B 123
1 1 0 0	14 FF C 12	34 FS IC 28	54 , 2C 44	74 < 3C 60	114 L 4C 76	134 \ 5C 92	154 l 6C 108	174 ¦ 7C 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 – 2D 45	75 = 3D 61	115 M 4D 77	135] 5D 93	155 m 6D 109	175 } 7D 125
1 1 1 0	15 SO E 14	36 RS 1E 30	56 . 2E 46	76 > 3E 62	116 N 4E 78	136 ^ 5E 94	156 n 6E 110	176 ~ 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 / 2F 47	77 UNL ? 3F 63	117 O 4F 79	137 UNT — 5F 95	157 o 6F 111	177 RUBOUT (DEL) 7F 127
	Address command	Universal command	Listen address		Talk address		Secondary address or command	

KEY

octal	25 PPU	GPIB code
	NAK	ASCII character
hex	15 21	decimal

† USA Standard Code for Information Interchange

Table of GPIB Interface Messages (extended)

b4	b3	b2	b1	b7 b6 b5 →	0 0 0	① MSG	0 0 0	MSG	0 1 0	MSG	0 1 1	MSG	1 0 0	MSG	1 0 1	MSG	1 1 0	MSG	1 1 1	MSG
↓	↓	↓	↓	COLUMN → / ROW ↓	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL		DLE		SP	Listener address to be assinged to devices (MLA)	0	Listener address to be assinged to devices (MLA)	@	Talker addresses to be assinged to devices (MTA)	P	Talker addresses to be assinged to devices (MTA)		The meanings are definied by PCG.	p	The meanings are definied by PCG.
0	0	0	1	1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q	
0	0	1	0	2	STX		DC2		"		2		B		R		b		r	
0	0	1	1	3	ETX		DC3		#		3		C		S		c		s	
0	1	0	0	4	EOT	SDC	DC4	DCL	$		4		D		T		d		t	
0	1	0	1	5	ENQ	PPC	NAK	PPU	%		5		E		U		e		u	
0	1	1	0	6	ACK		SYN		&		6		F		V		f		v	
0	1	1	1	7	BEL		ETB				7		G		W		g		w	
1	0	0	0	8	BS	GET	CAN	SPE	(		8		H		X		h		x	
1	0	0	1	9	HT	TCT	EM	SPD	)		9		I		Y		i		y	
1	0	1	0	A	LF		SUB		*		:		J		Z		j		z	
1	0	1	1	B	VT		ESC		+		;		K		[		k		{	
1	1	0	0	C	FF		FS		,		<		L		\		l		|	
1	1	0	1	D	CR		GS		—		=		M		]		m		}	
1	1	1	0	E	SO		RS		.		>		N		∧		n		~	
1	1	1	1	F	SI		US		/		?	UNL	O		—	UNT	o		DEL	

Bits ②

Address command group (ACG)

Universal command group (UCG)

Listen address group (LAG)

Talk address group (TAG)

Primary command group (PGG)

Secondary command group (SCG)

Notes :

① *MSG = INTERFACE MESSAGE (Sent by ATN of True: Low level.)*

② *b_1=DI 01 ····· b_7=DI 07 (b1 through b7 correspond to DIO1 to DIO7 sequence.)*

GTL	Go to Local
SDC	Select Device Clear
PPC	Parallel Poll Configure
GET	Group Execute Trigger
TCT	Take Control
LLO	Local Lockout
(ACG)	Addressed Command Group
(UCG)	Universal Command Group
(LAG)	Listen Address Group
(TAG)	Talk Address Group
(PCG)	Primary Command Group
(SGG)	Secondary Command Grout
DCL	Device Clear
PPU	Parallel Poll Unconfigure
SPE	Serial Poll Enable
SPD	Serial Poll Disable
UNL	Unlisten
UNT	Untalk

Table of Interface Message Group

DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	Interface message group (G)
×	0	0	0	b_4	b_3	b_2	b_1	Addressed command G
×	0	0	1	b_4	b_3	b_2	b_1	Universal command G
×	0	1	b_5	b_4	b_3	b_2	b_1	Listen address G
×	0	1	1	1	1	1	1	Unlisten (UNL)
×	1	0	b_5	b_4	b_3	b_2	b_1	Talker address G
×	1	0	1	1	1	1	1	Untalk (UNT)
×	1	1	b_5	b_4	b_3	b_2	b_1	Secondary command G

Table of Address Assignments

Address character		Address switch setting					Primary address	Factory address set device
Talk	Listen	5	4	3	2	1		
b_7 b_6	b_7 b_6	b_5	b_4	b_3	b_2	b_1		
1 0	0 1	↓	↓	↓	↓	↓	10 Decimal	
@	SP	0	0	0	0	0	0	
A	!	0	0	0	0	1	1	
B	"	0	0	0	1	0	2	
C	#	0	0	0	1	1	3	
D	$	0	0	1	0	0	4	
E	%	0	0	1	0	1	5	
F	&	0	0	1	1	0	6	
G	'	0	0	1	1	1	7	
H	(	0	1	0	0	0	8	
I	)	0	1	0	0	1	9	
J	*	0	1	0	1	0	10	
K	+	0	1	0	1	1	11	
L	,	0	1	1	0	0	12	
M	–	0	1	1	0	1	13	Printer
N	.	0	1	1	1	0	14	Plotter
O	/	0	1	1	1	1	15	
P	0	1	0	0	0	0	16	
Q	1	1	0	0	0	1	17	
R	2	1	0	0	1	0	18	
S	3	1	0	0	1	1	19	
T	4	1	0	1	0	0	20	
U	5	1	0	1	0	1	21	
V	6	1	0	1	1	0	22	
W	7	1	0	1	1	1	23	
X	8	1	1	0	0	0	24	
Y	9	1	1	0	0	1	25	
Z	:	1	1	0	1	0	26	
[	;	1	1	0	1	1	27	
\	<	1	1	1	0	0	28	
]	=	1	1	1	0	1	29	
∧	>	1	1	1	1	0	30	
?	—	1	1	1	1	1	31	UNL,UNT

(Blank)

APPENDIX B
COMPARISON TABLE OF CONTROLLERS' GPIB INSTRUCTIONS

Function	Controller			
	PACKET V	PC9800	IBM-PC	HP9000 series
Outputs data to a device	WRITE @ device number:data	PRINT @ listener address; data	CALL IBWRT( )	OUTPUT device selector;data
Output binary data to a device	BIN WRITE @ device number:data	WBYTE command; data		
Assigns data entered from a device to a variable	READ @ device number: variable	INPUT @ talker address,listener address;variable LINE INPUT @ talker address,listener address;variable	CALL IBRD( )	ENTER device selector; variable
Assigns binary data entered from a device to a variable	BIN READ @ device number: variable	RBYTE command;variable		
Initializes an interface	IFC @ select code	ISET IFC	CALL IBSIC( )	ABORT select code
Turns REN line on	REN @ select code	ISET REN	CALL IBSRE( )	REMOTE device selector (select code)
Turns REN line off	LCL @ select code (sets all devices local) LCL @ device number (sets only specified devices to listeners, and sends out GTL command)	IRESET REN WBYTE &H3F,listener address, secondary address, &HØ1;	CALL IBSRE( ) CALL IBLOC( )	LOCAL device selector (select code) LOCAL device selector (select code + primary address)

Function	Controller			
	PACKET V	PC9800	IBM-PC	HP9000 series
Outputs interface message(s) and data	COMMAND @ select code: character string for message [;data]		CALL IBCMD( ) CALL IBCMDA( ) (asynchronous)	SEND select code;message string
Triggers a specified device	TRG @ device number	WBYTE & H3F,listener address, secondary address, &H08;	CALL IBTRG( )	TRIGGER device selector
Initializes devices	DCL @ select code (all devices bearing a specified select code) DCL @ device number (specified devices only)	WBYTE &H3F,&H14; WBYTE &H3F, listener address, secondary address,&H04;	CALL IBCLR( )	CLEAR device selector (select code) CLEAR device selector (select code + primary address)
Disables a device from being switched over from remote to local	LLO @ select code	WBYTE &H3F, &H11;		LOCAL LOCKOUT
Transfers control to a specified device	RCT @ device number	WBYTE,talker address,&H09;	CALL IBRSV ( )	PASS CONTROL
Sends out a service request	SRQ @ select code	ISET SRQ	CALL IBRSV( )	REQUEST select code
Performs serial polling	STATUS @ device number	POLL	CALL IBRSP( )	SPOLL (device selector) (function)
Sets a terminator code	TERM IS	CMD DELIM	CALL IBEOS( ) CALL IBEOT( )	
Sets a limit value for checking a timeout		CMD TIMEOUT	CALL IBTOM( )	