

MG3681A
Digital Modulation Signal
Generator
Operation Manual

13th Edition

**For safety and warning information, please read this manual before attempting to use the equipment.
Keep this manual with the equipment.**


ANRITSU CORPORATION


Document No.: M-W1708AE-13.0


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. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

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

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure 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 a 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.

MG3681A
Digital Modulation Signal Generator
Operation Manual

17 April 2000 (First Edition)
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Printed in Japan

For Safety



DANGER

NEVER touch parts where the label shown on the left is attached. Such parts have high voltages of at least 1 kV and there is a risk of receiving a fatal electric shock.



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 advice in the operation manual is not followed there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.

2. IEC 61010 Standard

The IEC 61010 standard specifies four categories to ensure that an instrument is used only at locations where it is safe to make measurements. This instrument is designed for measurement category I (CAT I). DO NOT use this instrument at locations specified as category II, III, or IV as defined below.

Measurement category I (CAT I):

Secondary circuits of a device that is not directly connected to a power outlet.

Measurement category II (CAT II):

Primary circuits of a device that is directly connected to a power outlet, e.g., portable tools or home appliance.

Measurement category III (CAT III):

Primary circuits of a device (fixed equipment) to which power is supplied directly from the distribution panel, and circuits running from the distribution panel to power outlet.

Measurement category IV (CAT IV):

Building service-line entrance circuits, and circuits running from the service-line entrance to the meter or primary circuit breaker (distribution panel).

For Safety

WARNING

Electric Shock

3. To ensure that the instrument is earthed, always use the supplied 3-pin power cord, and insert the plug into an outlet with an earth terminal. If power is supplied without earthing the equipment, there is a risk of receiving a severe or fatal electric shock or causing damage to the internal components.

Repair

WARNING 

4. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. Only qualified service personnel 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 components.

Calibration



5. The performance-guarantee seal verifies the integrity of the equipment. To ensure the continued integrity of the equipment, only Anritsu service personnel, or service personnel of an Anritsu sales representative, should break this seal to repair or calibrate the equipment. If the performance-guarantee seal is broken by you or a third party, the performance of the equipment cannot be guaranteed. Be careful not to break the seal by opening the equipment or unit covers.

Falling Over

6. This equipment should always be positioned in the correct manner. 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.

Always set up the equipment in a position where the power switch can be reached without difficulty.

LCD

7. This instrument uses a Liquid Crystal Display (LCD). DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.

This liquid is very caustic and poisonous.

DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

For Safety

CAUTION

Fuse Replacement

CAUTION 

1. Always remove the mains power cable from the power outlet before replacing blown fuses. There is a risk of electric shock if fuses are replaced with the power cable connected. Always use new fuses of the type and rating specified on the rear panel of the instrument. There is a risk of fire if a fuse of a different rating is used.

T6.3A indicates a time-lag fuse.

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

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.

Cleaning

 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.

Check Terminal



4. Never input a signal of more than the indicated value between the measured terminal and ground. Input of an excessive signal may damage the equipment.

For Safety

CAUTION

Replacing Memory Back-up Battery

This equipment uses a Poly-carbomonofluoride lithium battery to backup the memory. This battery must be replaced by service personnel when it has reached the end of its useful life; contact the Anritsu sales section or your nearest representative.

Note: The battery used in this equipment has a maximum useful life of 7 years. It should be replaced before this period has elapsed.

External Storage Media

This equipment uses memory cards as external storage media for storing data and programs.

If this media is mishandled or becomes faulty, important data may be lost. To prevent this chance occurrence, all important data and programs should be backed-up.

Anritsu will not be held responsible for lost data.

Pay careful attention to the following points.

- Never remove the memory card from the pulse tester while it is being accessed.
- The memory card may be damaged by static electric charges.
- Anritsu has thoroughly tested all external storage media shipped with this instrument. Users should note that external storage media not shipped with this instrument may not have been tested by Anritsu, thus Anritsu cannot guarantee the performance or suitability of such media.

Lifetime of Parts

The life span of certain parts used in this instrument is determined by the operating time or the power-on time. Due consideration should be given to the life spans of these parts when performing continuous operation over an extended period. The safety of the instrument cannot be guaranteed if component parts are used beyond their life spans. These parts must be replaced at the customer's expense even if within the guaranteed period described in Warranty at the beginning of this manual.

For details on life-span, refer to the corresponding section in this manual.

Step attenuator: Refer to "5.3 Consumables."

Cooling Fan: Refer to "5.3 Consumables."

Back light of LCD: Refer to "5.3 Consumables."

Use in a residential environment

This instrument is designed for an industrial environment.

In a residential environment this instrument may cause radio interference in which case the user may be required to take adequate measures.

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 National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault, under the condition that this warranty is void when:

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to mishandling, 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, 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 shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Anritsu Corporation Contact

In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

Crossed-out Wheeled Bin Symbol

Equipment marked with the Crossed-out Wheeled Bin Symbol complies with council directive 2002/96/EC (the “WEEE Directive”) in European Union.



For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

Notice

The following actions are strictly prohibited for all of the software installed in this product or otherwise provided by Anritsu:

1. Copying, except for archival purposes.
2. Transferring to a third party separately from this product.
3. Analyzing the incorporated software including but not limited to modifying, decompiling, disassembling, and reverse engineering.
4. Using the software other than in connection with this product.

CE Conformity Marking

Anritsu affixes the CE conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking



1. Product Model

Model:	MG3681A Digital Modulation Signal Generator and
Plug-in Units:	MU368010A TDMA Modulation Unit MU368030A Universal Modulation Unit MU368040A CDMA Modulation Unit MU368060A AWGN Unit and
Software:	MX368011A PDC Software MX368012A GSM Device Test Software MX368031A Device Test Signal Generation Software MX368033A CDMA2000 1XEV-DO Signal Generation Software MX368034A PDC PACKET Software MX368035A PHS Signal Generation Software MX368037A RCR STD-39 $\pi/4$ DQPSK Signal Generation Software MX368037B ARIB STD-T61 $\pi/4$ DQPSK Signal Generation Software MX368037C ARIB STD-T79 $\pi/4$ DQPSK Signal Generation Software MX368041B W-CDMA Software MX368042A IS-95 Device Test Software and
Accessories:	MA2512A Band Pass Filter

2. Applied Directive

EMC:	Council Directive 2004/108/EC
LVD:	Council Directive 2006/95/EC

3. Applied Standards

- EMC: Emission: EN 61326-1: 2006(Class A)
Immunity: EN 61326-1: 2006(Table 2)
(Annex A)

	Performance Criteria*
IEC 61000-4-2 (ESD)	B
IEC 61000-4-3 (EMF)	A
IEC 61000-4-4 (Burst)	B
IEC 61000-4-5 (Surge)	B
IEC 61000-4-6 (CRF)	A
IEC 61000-4-11 (V dip/short)	B,C

*: Performance Criteria

A: During testing, normal performance within the specification limits.

B: During testing, temporary degradation, or loss of function or performance which is self-recovering.

C: During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.

Harmonic current emissions:

EN 61000-3-2: 2006 (Class A equipment)

- LVD: EN 61010-1: 2001 (Pollution Degree 2)

4. Authorized representative

Name: Loic Metais
European Quality Manager
ANRITSU S.A. France

Address, city: 16/18 Avenue du Québec SILIC 720 Zone de
Courtaboeuf
91951 Les Ulis Cedex

Country: France

C-tick Conformity Marking

Anritsu affixes the C-tick mark on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

C-tick marking



1. Product Model

Model:	MG3681A Digital Modulation Signal Generator and
Plug-in Units:	MU368010A TDMA Modulation Unit MU368030A Universal Modulation Unit MU368040A CDMA Modulation Unit MU368060A AWGN Unit and
Software:	MX368011A PDC Software MX368012A GSM Device Test Software MX368031A Device Test Signal Generation Software MX368033A CDMA2000 1XEV-DO Signal Generation Software MX368034A PDC PACKET Software MX368035A PHS Signal Generation Software MX368037A RCR STD-39 $\pi/4$ DQPSK Signal Generation Software MX368037B ARIB STD-T61 $\pi/4$ DQPSK Signal Generation Software MX368037C ARIB STD-T79 $\pi/4$ DQPSK Signal Generation Software MX368041B W-CDMA Software MX368042A IS-95 Device Test Software and
Accessories:	MA2512A Band Pass Filter

2. Applied Standards

EMC: Emission: EN 61326-1: 2006
(ISM, Group 1, Class A equipment)

Power Line Fuse Protection

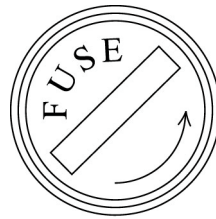
For safety, Anritsu products have either one or two fuses in the AC power lines as requested by the customer when ordering.

Single fuse: A fuse is inserted in one of the AC power lines.

Double fuse: A fuse is inserted in each of the AC power lines.

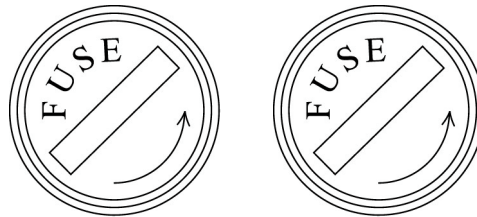
Example 1: An example of the single fuse is shown below:

Fuse Holder



Example 2: An example of the double fuse is shown below:


Fuse Holders



About This Manual

This manual (MG3681A Digital Modulation Signal Generator Main Frame Operation Manual) mainly describes operation, maintenance, and remote control of MG3681A Digital Modulation Signal Generator.

Basic functions and the outline of operation are described in Section 3 “Operation.”

 in this manual represents front panel keys.

In addition, the operation of Extended Unit to be installed in this equipment is explained in a separate volume of the manuals.

Use the operation manual along with this manual, according to the usage purpose.

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Section 1 Outline

This section describes the outline and the composition of the product.

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1.1 Outline of the Product

The MG3681A is a standard digital modulation signal generator equipped with a wide-band quadrature modulator, capable of outputting complex and high-precision signals that are necessary in processes from development to mass-production of digital mobile communication equipment and of related devices.

MG3681A covers frequencies between 250 kHz and 3000 MHz, thus covering the main mobile communication frequency bands. Furthermore, since quadrature modulators show an excellent basic performance in terms of frequency characteristics, distortion characteristics, signal-to-noise ratio and so on, they can accurately perform sensitivity tests for receivers, adjacent channel leakage power characteristic tests for transmitters, for high baud-rate communication system.

The MG3681A incorporates a digital modulation unit for various digital communication systems, allowing test of radio equipment and other devices without preparing an external base band signal source.

1.2 Composition of the Product

1.2.1 Standard Composition

The table below shows the standard composition of the MG3681A. After opening the package, confirm if you have all the products described below. If anything is missing or damaged, contact our company or its agencies.

Item	Model/No.	Product	Quantity	Remarks
Main unit	MG3681A	Digital modulation signal generator	1	
Accessory		Power cord	1	
Accessory	B0325	GPIB shield cap	1	
Accessory	F0014	Fuse 6.3A	2	T6.3A250V
Accessory	W1708AE	Operation manual	1	

1.2.2 Unit and Options

Shown in the table below are the extension units of the MG3681A. They are all sold separately.

Model	Modulation unit	Remarks
MU368010A	TDMA modulation unit	Corresponding systems PDC, GSM, etc.
MG368030A	Universal Modulation unit	Depends on installed modulation software.
MU368040A	CDMA modulation unit	Corresponding systems W-CDMA, IS-95
MU368060A	AWGN unit	Generate AWGN signal for W-CDMA

Shown in the table below are some options for the MG3681A. They are all sold separately.

Option No.	Product	Remarks
MG3681A-01	Reference crystal oscillator	$\pm 5 \times 10^{-9}$ /day
MG3681A-02	Reference crystal oscillator	$\pm 5 \times 10^{-10}$ /day
MG3681A-11	Additional function of I/Q signal output	Level setting, offset setting, balanced output
MG3681A-21	AF synthesizer	0.01 Hz to 400 kHz, sine wave, triangular wave, rectangular wave, sawtooth wave
MG3681A-42	Band Pass Filter	1.9 to 2.3 GHz, 8 dB for W-CDMA

1.2.3 Peripheral Equipment

The table below shows the peripheral equipment for the MG3681A. They are all sold separately.

Model/No.	Product	Remarks
J0576B	Coaxial cord	Approx. 1 m long (N-P, 5D-2W, N-P)
J0576D	Coaxial cord	Approx. 2 m long (N-P, 5D-2W, N-P)
J0127C	Coaxial cord	Approx. 0.5 m long (BNC-P, RG-58A/U, BNC-P)
J0127A	Coaxial cord	Approx. 1 m long (BNC-P, RG-58A/U, BNC-P)
J0007	GPIB connection cable	Approx. 1 m long (408JE-101)
J0008	GPIB connection cable	Approx. 2 m long (408JE-102)
B0329C	Protect cover	1MW4U
B0331C	Front handle kit	2 pcs/set
B0332	Joint plate	4 pcs/set
B0333C	Rack mount kit	
B0334C	Carrying case	Hard type, equipped with protect cover and caster
MA2512A	Band Pass Filter	For W-CDMA, Pass Band : 1.92 to 2.17 GHz

Section 2 For Using MG3681A Safely

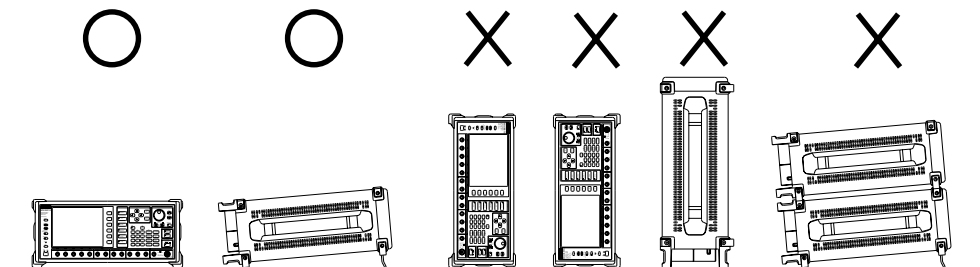
This section describes items that you should know before using the MG3681A. As it also contains tips for safety and for avoiding failures during use, be sure to read it at least once.

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2.1 Installation

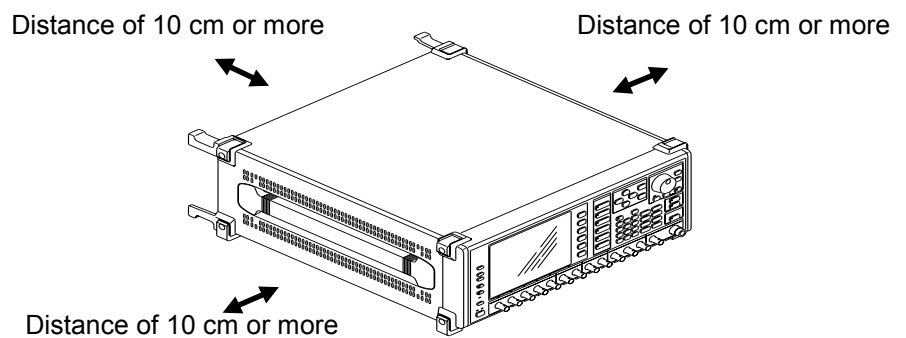
2.1.1 Installation place

Set the MG3681A either horizontally or at an angle using a tilt stand, as shown in the figure below. When it is tilted, do not put any object on the MG3681A.



2.1.2 Distance from the Fan

A fan is installed at the back of the MG3681A to prevent the internal temperature from rising. When installing the MG3681A, be sure to keep its rear and sides at a distance of 10 cm or more from surrounding obstacles such as walls and peripheral units, so that there is sufficient space around the fan.



2.1.3 Conditions of the Place Where MG3681A is to be Installed

While the MG3681A can operate normally in places with temperatures between 0 and 50 °C, however, do not use it in places described below to avoid failures.

- Places with a lot of vibration
- Places with a lot of moisture or dust
- Sunny places
- Places with possible penetration of active gases
- Places with large power voltage variations



2.2 Items to be Confirmed before Use

2.2.1 Safety Protection Labels



For safety, WARNING and CAUTION labels shown below are affixed on the back panel. Please observe the instructions on the labels.



2.2.2 Reverse-Power Protection Circuit

The RF power output connector of the MG3681A has a reverse-power protection circuit that automatically protects internal circuits when an external high-power signal is supplied by mistake. When the reverse-power protection circuit is in operation, the signal is cut off. To release this state, first stop the signal that caused the operation of the reverse-power protection circuit, and then press  and next 

RF Output
RPP Reset
Off

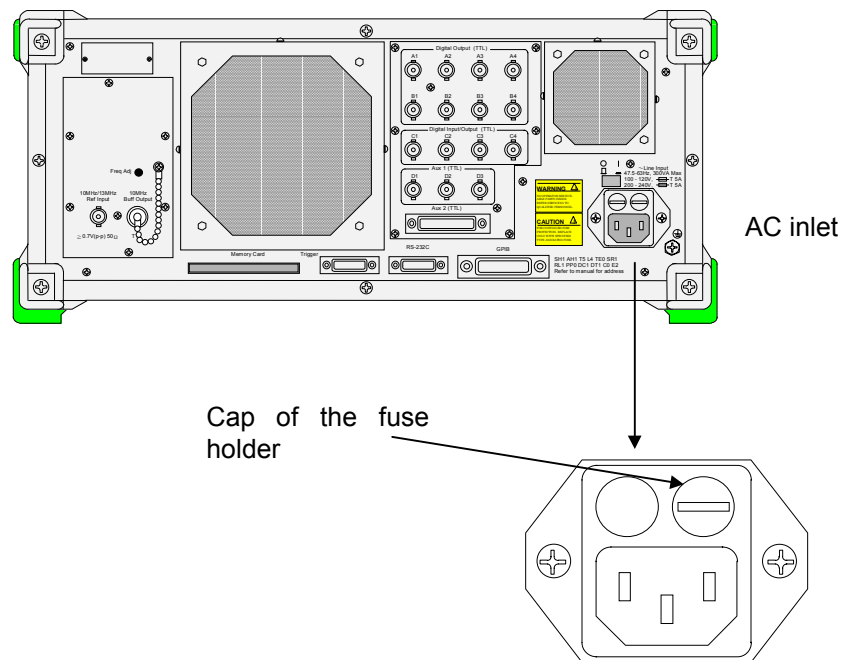
tion of the reverse-power protection circuit, and then press  and next 

2.2.3 Fuse

Confirm if the T6.3A250V fuse is placed inside. When the fuse blows, first eliminate the cause, and then replace the fuse by the following procedure. The accessories package contains two T6.3A250V fuses.

Procedure for replacing the fuse

- <1> Turn off the power-supplies on the front and back panels, and disconnect the power cord from the socket.
- <2> Turn the cap of the fuse holder on the back panel counterclockwise with a screwdriver to separate the cap and the fuse of the holder as a single unit from the AC inlet.



- <3> Remove the blown fuse from the fuse holder and replace it with a new one.
- <4> Put the fuse holder back into its original position and turn it clockwise with a screwdriver until it cannot be turned any further.

CAUTION

When replacing the fuse, first disconnect the power cord from the socket, and then replace the fuse. If you replace the fuse without disconnecting the power cord, you may receive an electric shock. Note that the new fuse to be replaced must have the same rate and characteristics as the T6.3A250V fuse. If you use a fuse of different rate and characteristics, you may receive an electric shock. Moreover, such a fuse may not blow out in some cases, causing fire and damage to the equipment.

2.3 Power Connection

This section describes the procedures for supplying power.

2.3.1 Power Requirements

For normal operation of the instrument, observe the power voltage range described below.

Power source	Voltage range	Frequency
100 Vac system	100 to 120 V	47.5 to 63 Hz
200 Vac system	200 to 240 V	47.5 to 63 Hz

Changeover between 100 and 200 V systems is made automatically.

CAUTION

Supplying power exceeding the above range may result in electrical shock, fire, failure, or malfunction.

2.3.2 Connecting the Power Cord

Check that the OI switch on the rear panel is turned off (switched to the (O) side). Insert the power plug into an outlet, and connect the other end to the power inlet on the rear panel. To ensure that the instrument is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with a ground terminal.

WARNING

If the power cord is connected without the instrument grounded, there is a risk of receiving a fatal electric shock. In addition, the peripheral devices connected to the instrument may be damaged.

When connecting to the power supply, DO NOT connect to an outlet without a ground terminal. Also, avoid using electrical equipment such as an extension cord or a transformer.

CAUTION


If an emergency arises causing the instrument to fail or malfunction, disconnect the instrument from the power supply by either turning off the OI switch on the rear panel (switch to the (O) side), or by pulling out the power cord or the power inlet.

When installing the instrument, place the instrument so that an operator may easily operate the OI switch.

If the instrument is mounted in a rack, a power switch for the rack or a circuit breaker may be used for power disconnection.

It should be noted that, the power switch on the front panel of the instrument is a standby switch, and cannot be used to cut the main power.

Section 3 Operation

This section describes the names of the parts of the MG3681A, the method to set its basic parameters, its operation method for modulation and its convenient functions that you should know in order to actually operate the unit. Keys displayed with  are panel keys.

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Section 3 Operation

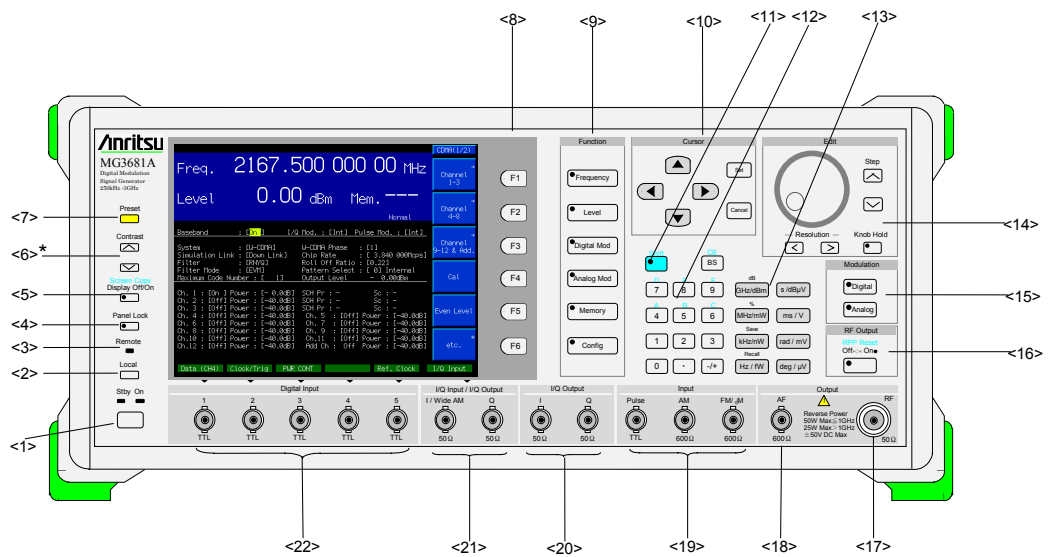
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3.1 Names of Parts and Turning the Power-Supply On/Off

3.1.1 Names of the Parts

Names on the front panel

The keys and connectors on the front panel are described here.



*: When the LCD screen consists of TFT, the contrast key is not provided.

<1> **Stby On**

Power Switch

Switches between the Stand-by state and the On state. The “Stby” lamp (green) or the “On” lamp (orange) lights up for the Stand-by state or the On state respectively. Press the power switch for a reasonably long duration (for about 1 second).

<2> **Local**

Local Key

Recovers the local state from the remote state caused by GPIB, RS-232C, etc. and makes the panel setting effective.

<3> **Remote**

Remote Lamp

Lights up when the equipment is in a remote state controlled by GPIB or RS-232C.

<4> **Panel Lock**

Panel Lock Key


Makes all key operations invalid except for the power switch, the Local key, the Panel Lock key and the Contrast key. The lamp on this key lights up in red under a panel lock state.



Section 3 Operation

<5>  Screen Copy
Display Off/On

Display Off/On Key



Sets the display On or Off. The lamp on the key lights up in red under an Off state.

If this key is pressed after  is pressed, the display state of the current screen can be copied to a memory card in a bit-mapped format.

<6> 
 Contrast


Contrast Keys

Adjusts the contrast (darkness and brightness) of the screen.

The screen becomes brighter when  is pressed, and darker when  is pressed.

Note:


When the LCD screen consists of TFT, the contrast key is not provided.

<7>  Preset

Preset Key

Recovers the initial parameter-setting state.

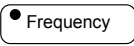
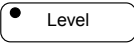
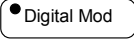
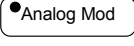
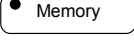
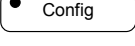
<8> 






Soft Function Keys

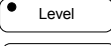
Used for executing the menus displayed on the right side of the screen. (Contents of the menus displayed on the screen change every time the screen is switched using a soft function key or a main function key.)

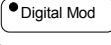
<9> 






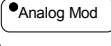
Main Function Keys

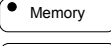
Used to set or execute the main functions of the MG3681A.

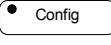
When  is pressed, the frequency parameter setting screen appears.

When  is pressed, the output level parameter setting screen appears.

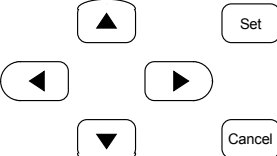
When  is pressed, digital modulation parameter setting screen appears.

When  is pressed, the analog modulation parameter setting screen appears.







When  is pressed, the memory parameter setting screen appears.

When  is pressed, the environment setting parameter setting screen appears.

Each parameter setting screen belongs to one of the above six main functions.

<10> 

Cursor Moving Keys and Control Keys

The reverse-cursor displayed on the screen can be moved by pressing    or . When  is pressed, the input or selected data is established. When  is pressed, the input or selected data becomes invalid.

<11>



Shift Key

When operating any key to work a function described in blue characters shown above the key, first press this key, and then, after its lamp is illuminated, press the target key.

<12>



Section 3 Operation

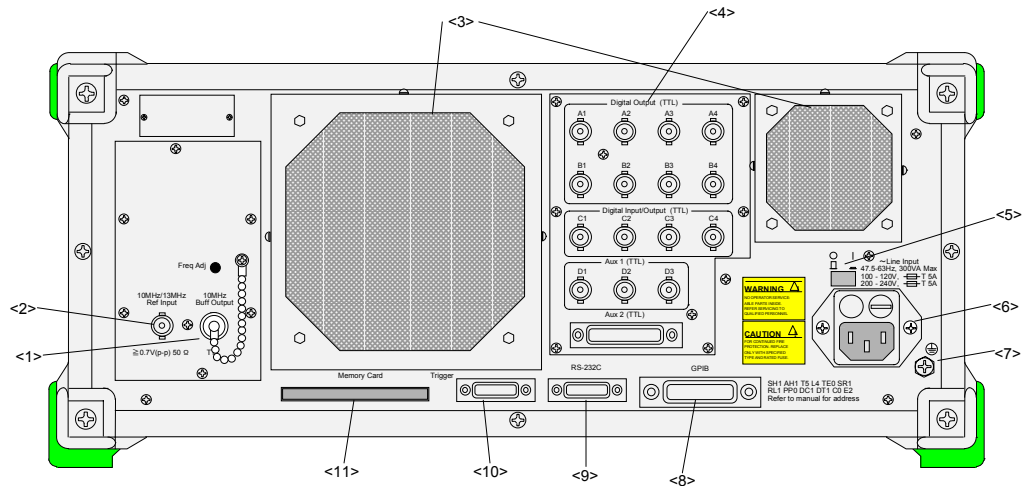
<17>


50

3.1 Names of Parts and Turning the Power-Supply On/Off

Names on the back panel


Names of keys and connectors on the back panel are described here.



- <1> 10MHz
Buff Output
- 
- TTL

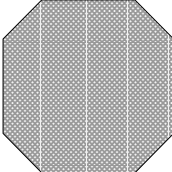
Reference Frequency Signal Output Connector

Outputs the reference frequency signal (10 MHz) that is inside the MG3681A. Used for synchronizing the MG3681A with other equipment by referring to its reference frequency signal.

- <2> 10MHz/13MHz
Ref Input
- 
- $\geq 0.7V(p-p)$ 50 Ω

Reference Frequency Signal Input Connector

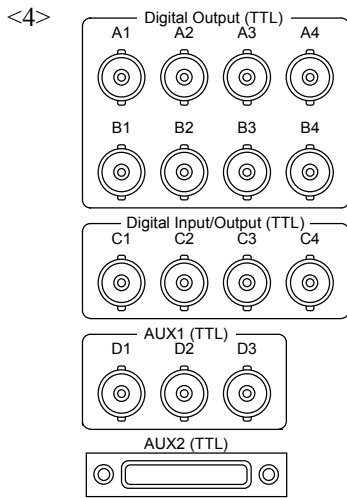
Inputs an external reference frequency signal (either 10 MHz or 13 MHz). Used for inputting reference frequency signal with accuracy higher than those inside the MG3681A, or for synchronizing reference frequency signal of the MG3681A with that of other equipment. Switching between 10 MHz and 13 MHz is automatically performed.

- <3>
- 

Air Cooling Fan

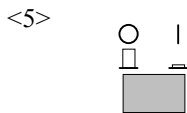
An air cooling fan used for preventing the rise in the internal temperature of the MG3681A.

Section 3 Operation



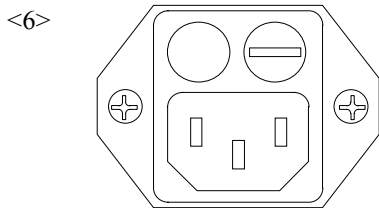
Digital Signal Input/Output Connectors

Auxiliary input connectors of the digital modulation unit. The connector functions vary with each system.



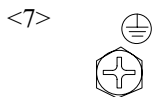
OI Switch

Main power switch of MG3681A.



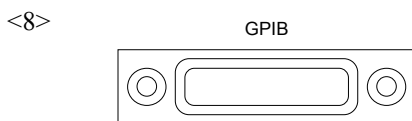
AC Inlet

Inlet for supplying power.



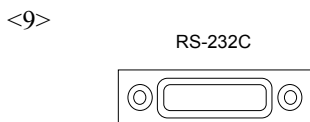
Protective Grounding Terminal

A protective grounding terminal. Connect this terminal to the ground potential if the power cord can not be grounded.



GPIB Connector

For external control using GPIB.



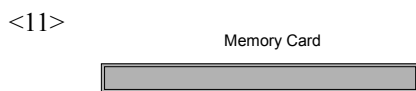
RS-232C Connector

For external control using RS-232C.



Trigger Input Connector

For external control using trigger signals.



PC Card Slot

Slot where a memory card is to be inserted.

3.1.2 Turning the Power-Supply On/Off

Turning power on

The procedure for turning the power on is described below.

- <1> Switch the OI switch on the back panel to O (Off).
- <2> Plug in the jack-side of the power cord into the AC power inlet on the back panel. Make sure that it is securely plugged deep into the inlet.
- <3> Plug in the plug-side of the power cord into the AC power outlet.
- <4> Switch the OI switch on the back panel to I (On). The MG3681A goes into the power stand-by state, the stby lamp of the power switch lights up and warm up begins.
- <5> Press the power switch on the front panel for about one second to turn it on.

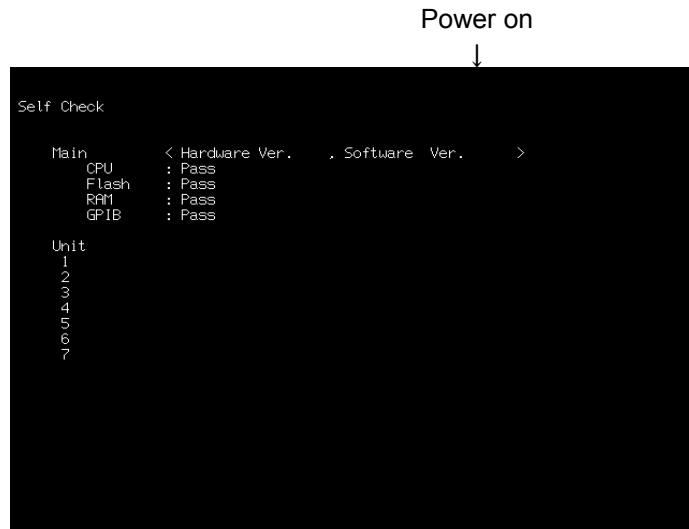
Turning power off

The procedure for turning the power off is described below.

- <1> Press the power switch on the front panel for about one second to go into the Stby state.
- <2> Switch the OI switch on the back panel to O (Off).

Initial Screen

Turning on the power switch allows all the lamps to turn on, and self-checks of the instrument (Main) and Digital Modulation Units (Unit) to begin. The results of the self-checks are indicated as “Pass” (passed) or “Fail” (failed) on the Self Check screen.



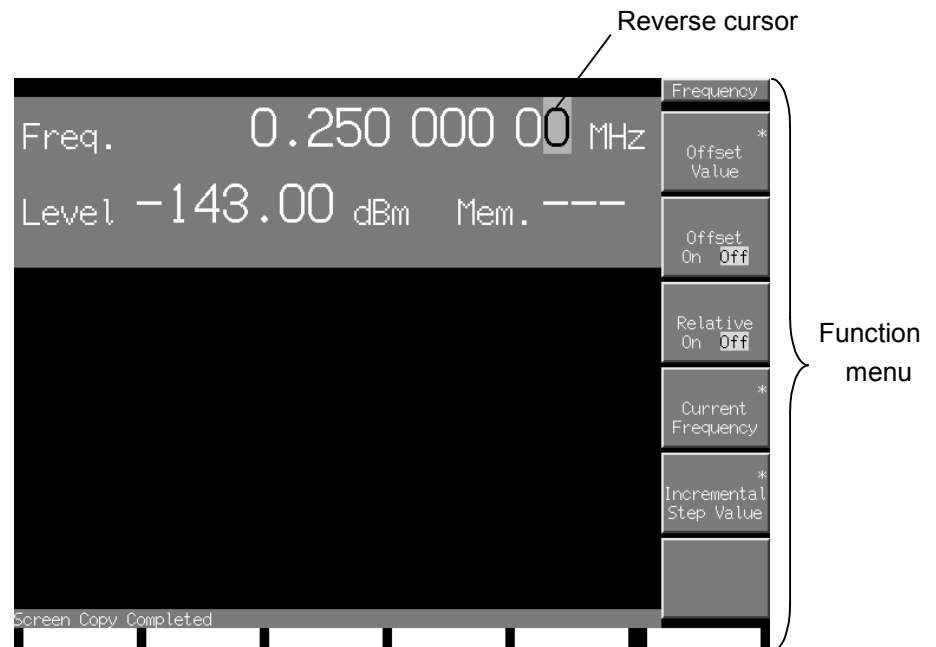
If a self-check fails, “Fail” appears and the Self Check screen remains open. Since a failure may have occurred in this case, contact your nearest regional office, branch, sales office or agent.

If all the self-checks succeed, “Pass” appears and the initial screen (shown below) is displayed for one second.



3.1 Names of Parts and Turning the Power-Supply On/Off

After the initial screen is displayed for one second, a frequency setup screen (shown below) appears.



Reverse Cursor

The reverse cursor appears onscreen in reverse video. The reverse cursor does not appear in a remote control state. The reverse video points to the resolution digit of the rotary knob while a frequency or output level is being set. Use \leftarrow \rightarrow to move the resolution digit position.

While a frequency or output level is not being set, the reverse cursor points to the item that can be set (which is enclosed in []). Use \uparrow \downarrow \leftarrow \rightarrow to change the item in focus.

Function Menu





A function menu appears on the right side of each parameter setting screen. Each function menu contains screen-specific function names.

When “ \rightarrow ” is displayed within a function menu, it indicates that the entire screen may update. When “*” is displayed, it means that the screen has lower-level screens.


3.1.3 Common Setup Operations

This section describes the basic operation common for all screens, before introducing the setting of detailed parameters.



Set Parameters Directly

Main function parameters, such as frequency and output level, depth of analog modulation, and certain other parameters can be directly set on the displayed screen without having to open a window. Select a main function by pressing the main function key or point the reverse cursor to the parameter enclosed in [] by using     to set that parameter.

Entering a numeric value



When a numeric value is entered with the numeric keypad, a window opens containing the value recently entered. After the entry, press a unit key or  to accept that numeric value and close the window. Pressing Cancel closes the window by discarding the numeric value entered.

Increasing/Decreasing a numeric value with the rotary knob

After selecting a resolution digit (appearing in reverse video) with  , turn the rotary knob one click clockwise to increment the numeric value at that digit position by 1; or turn the knob one click counterclockwise to decrement the numeric value by 1.

The rotary knob allows numeric values to be set in real-time.

Increasing/Decreasing a numeric value with the step keys

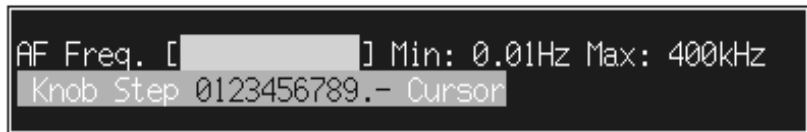
Use   to change a numeric value. The step in which a numeric value is updated each time a step key is pressed varies with each parameter.

The step keys allow numeric values to be set in real-time.

Open a Setup Window to Set the Parameters

Point the reverse cursor to the parameter enclosed in [] to see an additional item that requires opening another setup window to set it. To open the window, press , or turn the rotary knob by one click or press either once.

The window displays help regarding the keys that can be used to set the parameter (numeric keypad, step keys, and the rotary knob).



Entering a numeric value

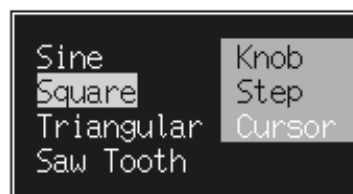
A window is opened with the current numeric value setting when it has been set for numeric entry. When a numeric value is entered with the numeric keypad, it is displayed in the window. After the entry, press a unit key or to accept the numeric value and the unit, and close the window. Pressing closes the window by discarding the numeric value entered.

Changing a numeric value

A window is opened with the current numeric value setting, with the resolution digit appearing in reverse video, when it has been set for numeric entry. Using , move the resolution digit position. After selecting a resolution digit, turn the rotary knob one click clockwise or press once to increment the numeric value at that digit position by 1; or turn the knob one click counterclockwise or press once to decrement the numeric value by 1. After the entry, press to accept the numeric value and close the window. Pressing closes the window by discarding the numeric value entered.

Selecting an item


A window is opened with items arranged in a vertical row when it has been set for numeric entry. Among them, the item of current choice appears in reverse video. Turn the rotary knob one click counter clockwise or press once to move up the reverse cursor; or turn the knob one click clockwise or press once to move down the reverse cursor. After the selection, press to accept the value and close the window. Pressing closes the window by discarding the entered choice.

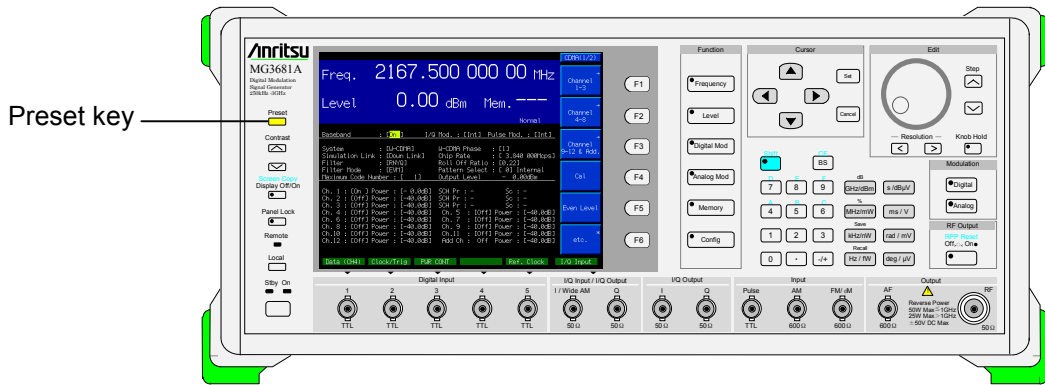



3.2 Setting the Key Parameters


3.2.1 Presetting

This instrument can be initialized to its default settings listed in Appendix C by

pressing  .



To initialize the entire instrument to the status in which it has been purchased, turn the power on by holding down  while the power is off. Continue pressing

 until all the lamps are turned on. Note that this operation will erase all the data that has been saved in the memories (BPM, APM).

3.2.2 Setting the frequency

Press front-panel main function key **Frequency** to open the frequency setup screen, with the onscreen cursor appearing at any digit position in the frequency reading. The key lamp will also light up.

Unless otherwise noted in this section, it is assumed that the frequency setup screen is open with **Frequency** being pressed.



Use one of these methods to set a frequency:

- Use the numeric keypad.
- Use the rotary knob.
- Use the step keys.

Instructions for setting a frequency by these methods are described on the pages that follow.

Frequency setup range and minimum resolution setting

Frequency setup range: 0 Hz to 3000 MHz

Minimum frequency resolution setting: 0.01 Hz

If a frequency exceeds the upper limit (3000 MHz) or falls below the lower limit (0 Hz), it cannot be either set or accepted and an error indication appears on the screen.

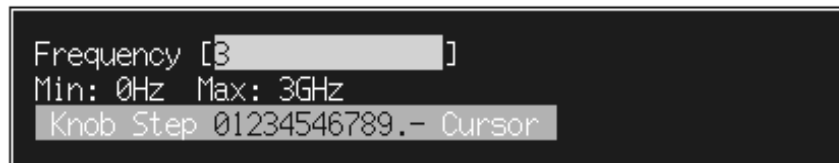
A frequency setting of less than 250 kHz would cause “Uncal” to be displayed, making successful performance unpredictable.

Using the Numeric Keypad to Set Frequency

Follow these steps to use the numeric keypad to set frequency:

Sample operation: Set a frequency of 360.3 MHz.

<1> Press any key of the numeric keypad (in this example, first) to open the frequency setup window. “3” is displayed in the window.



<2> Proceed to type

Use the Rotary Knob to Set Frequency

Use of the rotary knob makes it possible to increment or decrement the numeric value at the resolution digit position (pointed to by the reverse cursor) selected with . To use the rotary knob to set a frequency, follow these steps:

Resolution digit (reverse cursor) default: 0.01 Hz digit



Sample operation: Vary a frequency from 360.3 MHz to 360.7 MHz in steps of 10 kHz.

<1> Using , move the reverse cursor to the 10 kHz digit position. (Press six times to move to the 10 kHz digit position.)



<2> Turn the rotary knob one click clockwise to increment the frequency by 10 kHz; turn the knob one click counterclockwise to decrement the frequency by 10 kHz. In this way, turn the rotary knob 40 clicks clockwise to set a frequency of 360.7 MHz.

Using the Step Keys to Set Frequency

Use   to vary a frequency in steps of a preset frequency. To use the step keys to set a frequency, follow these steps:

Frequency step default: 1 MHz

Sample operation: Set a frequency of 360.3 MHz, varying it in steps of 12.5 kHz.

<1> Type    

Set a Frequency Offset

Frequency offset setting is a feature whereby the frequency that is set from the panel or under external control is shifted by a certain offset frequency for output.

This feature addresses the need to set a converted frequency as in a converter test.

$$[\text{Actual output frequency}] = [\text{Set and displayed frequency}] - [\text{Offset}]$$

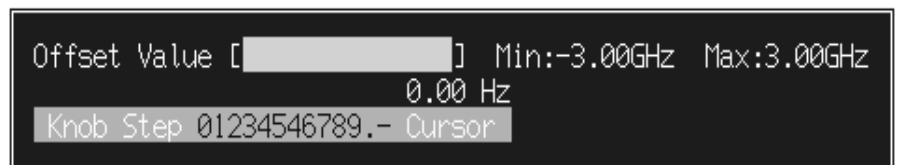
Offset frequency setup range: -3 to +3 GHz

Offset frequency setting minimum resolution: 0.01 Hz

To set an offset frequency, follow these steps:

Sample operation: Set an offset frequency to output a frequency of 460.3 MHz from a panel setting of 360.3 MHz.

<1> Press (Offset Value) to open the offset frequency setup window.



<2> Type

Display a Relative Frequency

Relative frequency display is a feature whereby a frequency is displayed in relation to a base frequency of 0 Hz.

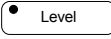
[Set and displayed frequency] = [Actual output frequency] – [Frequency displayed as a relative frequency]

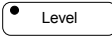
To set a relative frequency, follow these steps:

Sample operation: Display an output frequency in relation to a base frequency of 360.3 MHz, incrementing it by 12.5 kHz.

<1> Type

3.2.3 Setting output level

Press the front-panel main function key  to open the output level setup screen, with the onscreen cursor appearing at any digit position in the output level reading. The key lamp will also light up.

Unless otherwise noted in this section, it is assumed that an output level setup screen is now open with  being pressed.



Use one of these methods to set an output level:

- Use the numeric keypad.
- Use the step keys.
- Use the rotary knob.

Instructions for setting an output level by these methods are described on the pages that follow.

Output level setup ranges and minimum resolution settings

Output level setup ranges:

- 143 to +17 dBm (power, in dBm)
- 5.01 aW to 50.1 mW (power, in W)
- 36.01 to +123.99 dB μ V (terminating voltage, in dB μ V)
- 29.99 to +130.01 dB μ V (emf voltage, in dB μ V)
- 0.016 μ V to 1.58 V (terminating voltage, in V)
- 0.032 μ V to 3.17 V (emf voltage, in V)

Minimum output level resolution settings:


- 0.01 dB (in dB units)
- 3 digits (in V or W units)

If an output level exceeds the upper limit (+17 dBm) or falls below the lower limit (–143 dBm), it cannot be either set or accepted, with an error indication appearing onscreen.

Section 3 Operation

An invalid output level setting (dependent on the modulation condition; +13.01 dBm or more in CW mode) would cause “Uncal” to be displayed, making successful performance unpredictable.

Turn RF Output On/Off

Press  on the front panel to toggle RF Output between on and off. The key lamp will glow red when RF output is turned off.


RF output, when set to On, enables preset signal output.

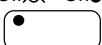
Note:

It is recommended that the setting of parameters of this instrument be completed with RF output off before RF Output is turned on, to avoid possible damage to the device under test connected to the RF output.

To turn RF output on or off, follow these steps:

Sample operation: Turn RF output off, then on.

<1> Press  to turn off RF output. (The lamp will light).

<2> Press  again to turn on RF output and the signal is outputted at the output level indicated.

Use the Numeric Key Pad to Set Output Level

To use the numeric keypad to set output levels, follow these steps:

Sample operation: Set an output level of -47 dBm.

<1> Press to open the output level setup window.

<2> Press any key of the numeric keypad (in this example,)

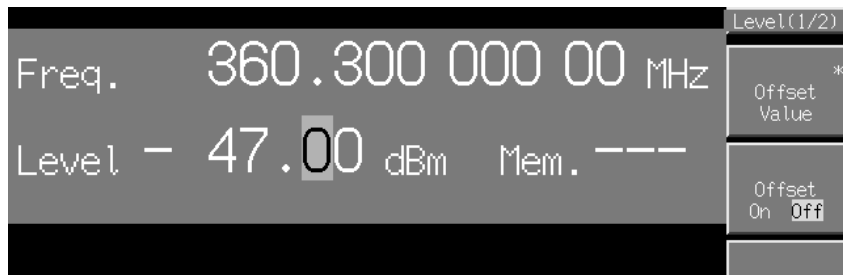
Use the Rotary Knob to Change Output Level

Using the rotary knob, it is possible to increment or decrement the numeric value at the resolution digit position (pointed to by the reverse cursor) selected with the Resolution key. Follow these steps to use the rotary knob to set output levels:

Resolution digit (reverse cursor) default: 0.01 dB digit

Sample operation: Vary an output level from the current setting -47 dBm to -37 dBm in steps of 0.1 dB.

<1> Using \leftarrow \rightarrow , move the reverse cursor to the 0.1 dB digit position. (Press \leftarrow once to move to the 0.1 dB digit position.)



<2> Turn the rotary knob one click clockwise to increment the output level by 0.1 dB; turn the knob one click counterclockwise to decrement the output level by 0.1 dB. In this way, turn the rotary knob 100 clicks clockwise to set an output level of -37 dBm.

Use the Step Keys to Change Output Level

Use to vary an output level in steps of a preset value. To use the step keys to set an output level, follow these steps:

Output level step default: 1 dB

Sample operation: Set an output level of -47 dBm, varying it in steps of 6 dB.

<1> Type

Set an Output Level Offset

Output level offset setting is a feature whereby the output level that is set from the panel or under external control is shifted by a certain offset.

This feature addresses the need to correct the attenuation in a cable connected to an output.

$$[\text{Actual output level}] = [\text{Set and displayed output level}] - [\text{Offset level}]$$

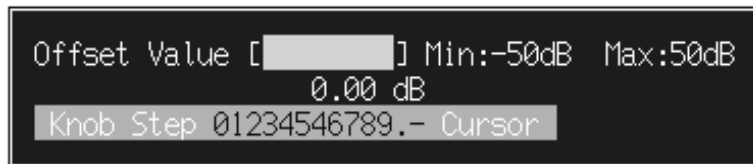
Offset output level setup range: -50 to + 50 dB

Offset level setting minimum resolution: 0.01 dB

To set an output level offset, follow these steps:

Sample operation: Set an offset to generate an output level of -45.3 dBm from a panel setting of -47 dBm.

<1> Press (Offset Value) to open the offset setup window.



<2> Type

The output level may also be set using the rotary knob or step keys.

The offset setting feature works only if the output level unit of dB (dBm or dB μ V) is selected.

Display a Relative Level

Relative output level display is a feature whereby an output level is displayed in relation to a base output level of 0 dB.

$$\text{[Set and displayed output level]} = \text{[Actual output level]} - \text{[Output level displayed as a relative output level]}$$

To set a relative output level, follow these steps:

Sample operation: Display an output level in relation to a base output level of 47 dBm, incrementing it by 7.5 dB.

<1> Type

Select a Voltage Display Mode

The voltage units (V, dB μ V) are selectable from EMF (Electro Motive Force) voltage and terminating voltage display modes.

To set either release voltage mode or terminating voltage display mode, follow these steps:

Voltage display mode default: emf voltage display

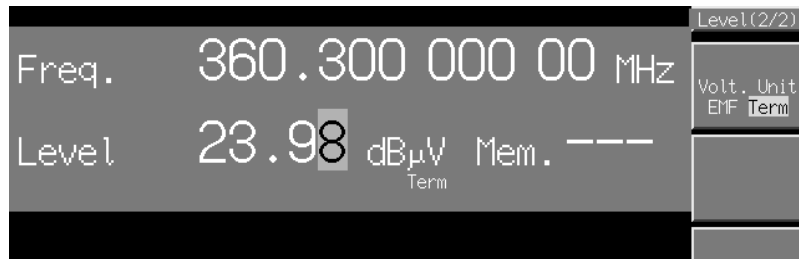
Sample operation: Set an output level of 30 dB μ V in emf voltage display mode and then switch it to display in terminating voltage display mode.

<1> Type to set an output level of 30 dB μ V. “EMF” (Electro Motive Force) appears under the output level reading onscreen, indicating that release voltage display mode is now effective.



<2> Press (etc) to switch to Level (2/2). Then, press (Volt. Unit EMF Term) to move the reverse cursor from EMF voltage display mode (EMF) to terminating voltage display mode (Term).

<3> The output level reading will change to 23.98 dB μ V in terminating voltage display mode. “Term” appears under the output level reading onscreen, indicating that terminating voltage display mode is in effect.



Use Continuous Mode

This instrument uses a mechanical attenuator to vary the output level. The mechanical attenuator is susceptible to momentary signal interruptions or spike noises. Choose Continuous mode when such momentary signal interruptions or spike noises pose a concern during measurement tasks. In Continuous mode, the action of the mechanical attenuator is locked, so that the output level can be continuously varied within a range of ± 10 dB using the high-resolution setup electronic attenuator alone. To set Continuous mode, follow these steps:

Sample operation: Vary the output level between -57 and -37 dBm in Continuous mode.

<1> Type

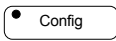
Use Safety Mode

When modifications are made to parameters of this instrument, a large signal larger than the output level setting may be outputted depending on the setup procedure used.


Safety mode is used if it is feared that such excessive-level signal output may damage the device under test.

In Safety mode, when a parameter that is likely to produce excessive-level signal output is set, the output is withheld until the setup completes, to prevent excessive-level signal output. Note, however, that Safety mode adds to the time needed to set parameters, such as the output level.

To set Safety mode, follow these steps:


<1> Press  to open the configuration parameter setup screen.



<2> Press  (IF/RF Setup) to open the IF/RF Setup screen.

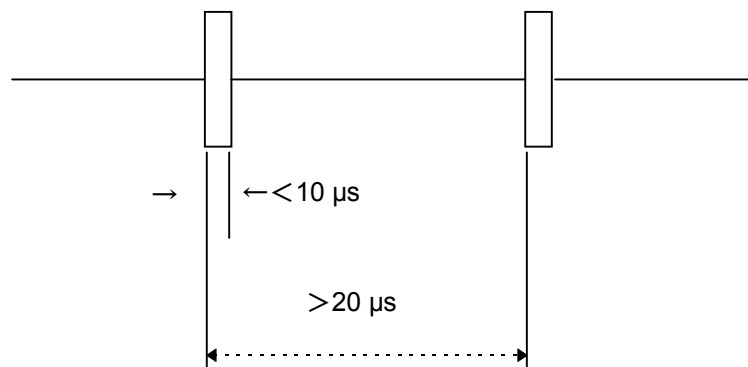


<3> Move the reverse cursor to Level Safety Mode to open the setup window.

<4> After selecting On, press . "Safety" appears under the output level reading onscreen, indicating that Safety mode is now in effect.

Using the ALC (Automatic Level Control) Off Mode

MG3681A normally outputs a level-stabilized signal using the ALC loop circuit. However, the ALC loop circuit does not operate normally when it performs modulation for a pulse that has a short RF output time and a long loop interval. Thus, MG3681A sometimes does not output a stable signal.



Use the ALC Off mode when using such a modulation signal. In the ALC Off mode, the pulse modulation signal is directly modulated. In this case, level calibration is required because the ALC loop circuit is released in the ALC Off mode.

Level calibration is performed automatically when the ALC Off mode is set, and when frequency and output level settings are changed.

The procedure to set the ALC Off mode is shown below:

<1> Press **F6** (etc) to open the Level (2/2) window, then press **F3** (ALC On Off) (On is the default).



<2> Select "Off" to execute the ALC Off mode. Level calibration is then automatically performed.

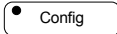
In the ALC Off mode, the Continuous mode cannot be used and amplitude modulation cannot be performed.

Changing the ALC Time Constant


In the ALC On mode, you can set a desired ALC time constant. Normally, set the ALC time constant to “Auto”.

When performing external digital modulation (vector modulation), wide-band amplitude modulation (Wide AM), or pulse modulation, change the ALC time constant as required. Generally, setting an ALC time constant greater than the modulation rate reduces the level fluctuation and the influence of modulation upon the modulation accuracy, but it affects the output level switching time and the frequency characteristic of amplitude modulation.

Sample operation: Setting the ALC time constant to 5 μ s.

<1> Press  to open the Configuration Setting screen.

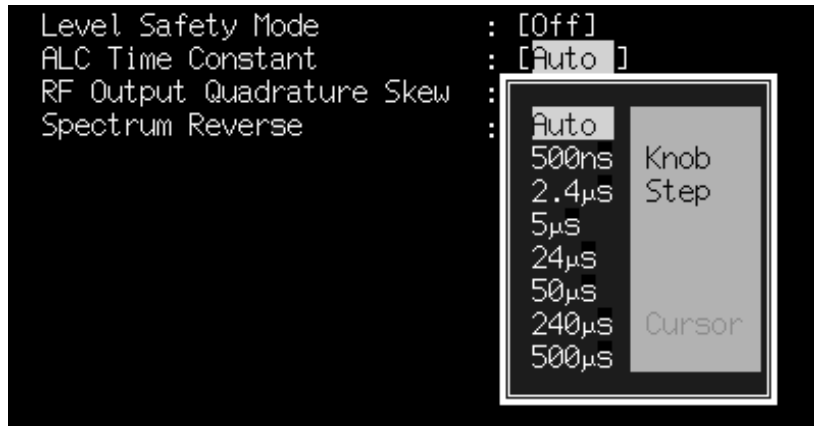


<2> Press  (IF/RF Setup) to display the IF/RF Setup screen.



3.2 Setting the Key Parameters

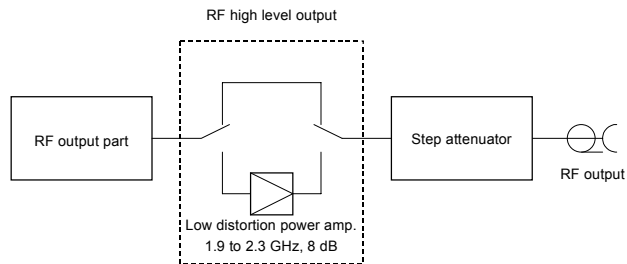
<3> Move the reverse cursor to ALC Time Constant to open the setting window.



<4> Select “5 µs,” then press to accept it as the ALC time constant.

Using the RF High Level Output Mode

Installing Option 42, RF High Level Output, enables the low-distortion power-amplifier for W-CDMA band to be inserted at the end of RF circuit.



The maximum RF level of W-CDMA modulated wave within the range of 1.9 to 2.3 GHz can be increased 8 dB by turning on the RF High Level Output mode. Also, it is possible to gain the RF Output Signal, which is 8 dB higher, without encouraging the adjacent-channel leakage-power.

W-CDMA Multiplex nos.	RF level upper limit	
	Normal	RF high level (Output mode: on)
1 to 7	+5 dBm	+13 dBm
8 to 12	+4 dBm	+12 dBm
13 to 15	+3 dBm	+11 dBm
16 to 19	+2.14 dBm	+10.14 dBm
20 to 31	+2 dBm	+10 dBm
32 to 50	+1 dBm	+9 dBm
51 or more	0 dBm	+8 dBm

To output the W-CDMA modulated wave, MU368040A CDMA Modulation Unit and MX368041A W-CDMA Software are required.

Example: Turning on the RF High Level Output Mode

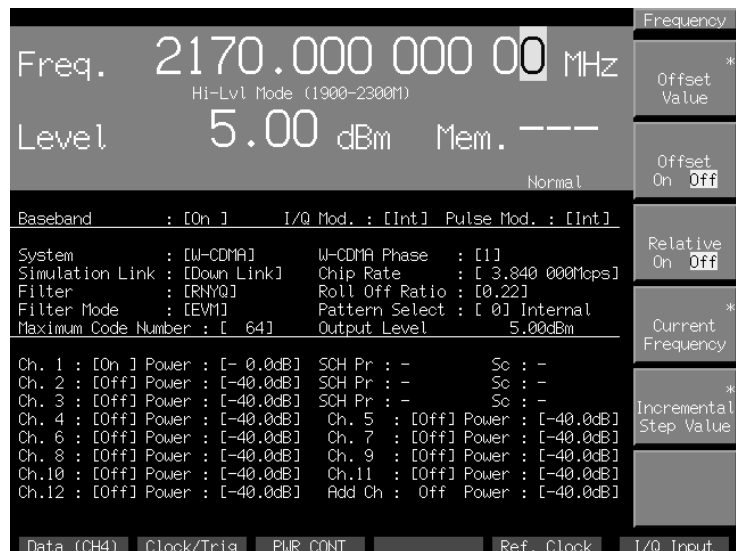
- <1> Press to display the environment setting screen.
- <2> Press (IF/RF Setup) to display the IF/RF Setup screen.
- <3> Move the cursor to "RF High level Output." The setting window appears.



3.2 Setting the Key Parameters

<4> Select “On” and press **Set**.

When the RF High Level Output mode is turned on, “Hi-Lvl Mode (1900-2300M)” appears above the display of output level. It indicates that the RF High Level Output mode is being turned on with the available frequency range displayed.



The performance of the RF High Level Output mode is assured only in the range of 1.9 to 2.3 GHz. When the set frequency is out of the range, “Uncal” appears.

Turning on the RF High Level Output mode while the unit of output level is set to either V or W sets dBm as a unit of output level. In the RF High Level Output mode, note that you cannot change the unit to V or W.

The RF High Level Output mode is unavailable when output level is set to less than -135 dBm. In the RF High Level Output mode with the output level set to higher than +17 dBm, turning off the RF High Level mode automatically causes the output level to be +17 dBm.

Switching the RF High Level Output mode invalidates the continuous mode, the output-level offset-mode and the relative-level display mode that have been set.

3.2.4 Using Memory Functions

With its memory functions, this instrument enables the user to save, recall, and delete parameters, such as frequency, output level, and modulation.

The following memory modes are supported:

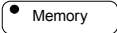

1. Save and recall frequencies and output levels (up to 512 sets)
2. Save and recall all parameters (up to 100 sets)

The memory to which frequency and output level settings are saved is called “basic parameter memory (BPM)”. The memory to which all parameters are saved is called “all-parameter memory (APM)”. When parameters are saved to APM, each memory location can be assigned a title (consisting of a string of eight or fewer alphanumeric characters and symbols).

BPM (Basic Parameter Memory)

BPM stores up to 512 sets of hardware settings of frequencies and output levels. It allows either frequency or output level settings or both to be recalled selectively, as well as by memory location number or by sweep.

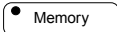
BPM: Save to Memory

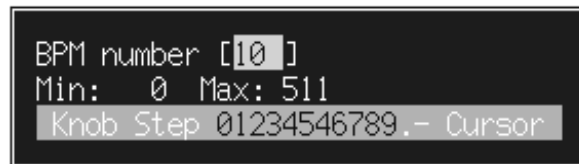
To save data to BPM, press front-panel main function key  to enable the memory facility and then type a memory location number and . Data can be saved up to 512 pairs of memory locations.


Sample operation: Save the frequency and output level currently on display to memory location number 10.

Note:

The current settings are saved. Set the relevant parameters before proceeding to save them.


<1> Press  and any key of the numeric keypad to enter the memory location number (0 to 511).



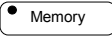

<2> Press  to save the current frequency and output level settings to memory.

If the same memory location number already exists, a Yes/No window opens asking if the user wants to overwrite the existing settings.

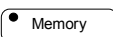



<3> Select Yes and press  to close the window after saving the frequency and output level settings to memory location number 10.

BPM: Recall from Memory

To recall stored data from BPM, press front-panel main function key  to enable the memory facility. Then, enter a memory location number and press ; or turn the rotary knob; or press the step keys.

Sample operation: Recall the frequency and output level settings stored at memory location number 10.

<1> Press  and then any key of the numeric keypad to enter the memory location number (0 to 511).

<2> Press  to read and set the current frequency and output level settings from memory location number 10.

Stored data can also be recalled from memory locations by continuously addressing them with the rotary knob or step keys. With continuous addressing, those memory locations that have step mode set to On are skipped.

While two parameters, frequency and output level, are stored in BPM, there are three different ways to recall their settings: recall frequencies only, recall output levels only, and recall both frequencies and output levels.

Instructions on setting skip mode and recall patterns are explained in “Edit Memory Attributes.

The unit of the output level is converted into “dBm”, independent of the state when BPM was stored.

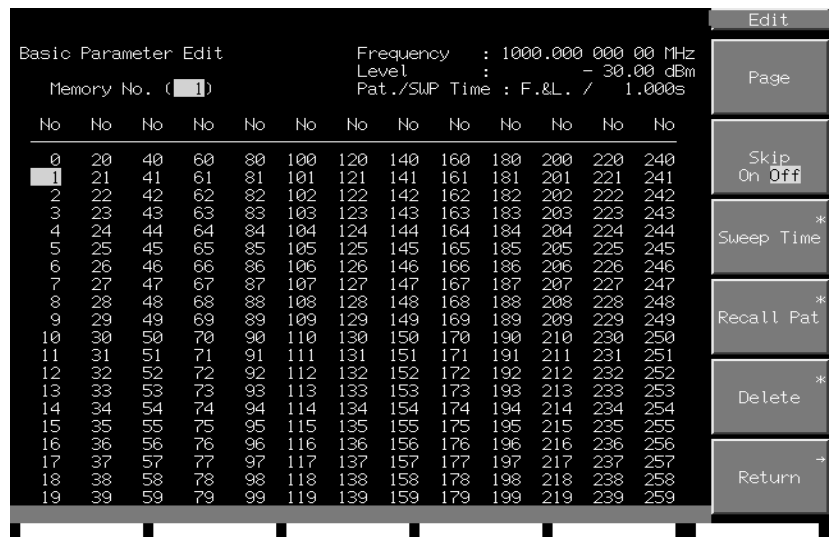
BPM: Edit Memory Attributes

The following two attributes can be set on BPM for each memory location number:

- 1 Recall pattern (parameters to be recalled)
- 2 Skip mode (disable recall with the rotary knob or step keys)

These two attributes can be set in the Basic Parameter Edit screen that is invoked by the memory facility.

<1> Press **Memory**, then **F2** (Basic Parameter Edit) to open the Basic Parameter Edit screen. The current frequency and output level settings stored in BPM are displayed in the upper right corner of the screen. (The frequency and output level fields will appear blank if no data is saved.)



<2> Using the cursor keys, move the reverse cursor to memory location number 1, and then Memory No. in the upper left of the screen will also change to 1.




<3> Press function keys on the Edit screen to set the individual attributes.

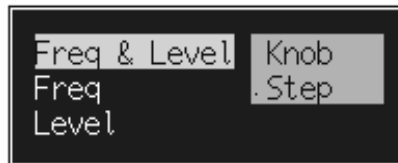
The reverse cursor may also be moved using the rotary knob or step keys. And the BPM number can also be set by using the numeric keypad. In this case, press **Set** after the window appearing in order to accept the BPM number.


BPM: Select a Recall Pattern

There are three different ways to recall stored data from basic parameter memory: frequencies only, recall output levels only, and recall both frequencies and output levels. Edit BPM attributes on the Basic Parameter Edit screen to select a recall pattern. To select a recall pattern, follow these steps:

Sample operation: Recall both the frequency and output level settings stored at memory location number 10.

- <1> Press , then  (Basic Parameter Edit) to open the Basic Parameter Edit screen.
- <2> Using the cursor keys, move the reverse cursor to memory location number 10, and then Memory No. in the upper left of the screen will also change to 10.
- <3> Press  (Recall Pat) to open the Recalling Pattern setup window. Using the rotary knob or step keys, move the reverse cursor in the window to “Freq & Level”.

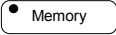





- <4> Press  to accept “Freq & Level” and close the window.

BPM: Set Skip Mode

When BPM skip mode is turned on for a given memory location, that location can be skipped from the scope of recall by the rotary knob or step keys. The selected memory location can also be hidden from the scope of a sweep and also from the scope of triggering under external control. To set skip mode, follow these steps:

Sample operation: Turn on skip mode for memory location number 10.

- <1> Press , then  (Basic Parameter Edit) to open the Basic Parameter Edit screen.
- <2> Using the cursor keys or rotary knob, move the reverse cursor to memory location number 10, and then Memory No. in the upper left of the screen will also change to 10.
- <3> Press  (Skip On Off) to turn on skip mode. (There is no need to press  if the reverse cursor is already at On.)

BPM: Delete Memory

To delete BPM, follow these steps:

Sample operation: Delete stored data from memory location 10.

- <1> Press , then (Basic Parameter Edit) to open the Basic Parameter Edit screen.
- <2> Using the cursor keys, move the reverse cursor in the memory location number field to memory location number 10, and then Memory No. in the upper left corner of the screen will also change to 10.
- <3> Press (Delete) and a Yes/No window opens asking if the user wants to delete the stored settings.



- <4> After selecting “Yes”, press to close the window after deleting the stored settings from memory location number 10.

The reverse cursor in the memory location number field can also be moved using the rotary knob or step keys. The memory location number can also be set by using the numeric keypad. In this case, press after the window appearing in order to accept the memory location number.

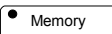

BPM: Sweeping

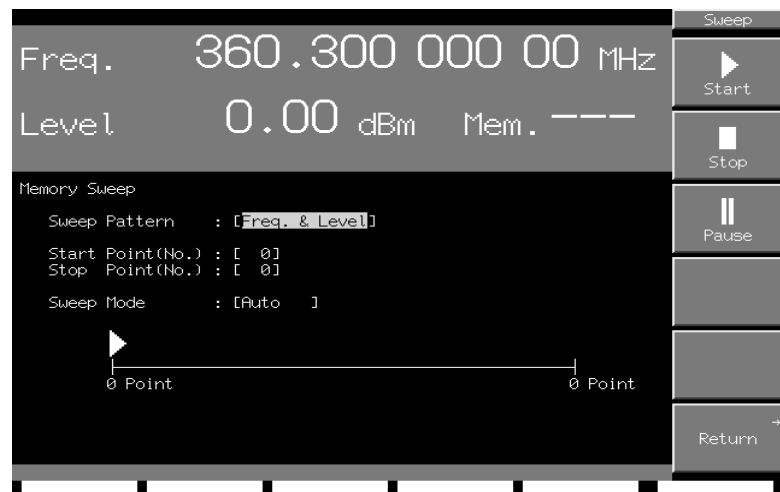
You can sweep frequencies and/or output levels stored in BPMs.

Frequencies and/or output levels are swept between the specified start point and the specified end point in the order of memory numbers. The sweep time is the same to the sweep times specified set for each BPM.


Sample operation: Sweeping only frequencies stored in memories No.5 to No.10 of the BPM shown below, repeatedly

BPM No.1	:	500 MHz	,	0 dBm	,	50 ms
BPM No.2	:	600 MHz	,	-30 dBm	,	50 ms
BPM No.3	:	700 MHz	,	-30 dBm	,	10 ms
BPM No.4	:	1000 MHz	,	+5 dBm	,	10 ms
BPM No.5	:	1010 MHz	,	+5 dBm	,	100 ms
BPM No.6	:	1050 MHz	,	-47 dBm	,	200 ms
BPM No.7	:	520 MHz	,	-37 dBm	,	200 ms
BPM No.8	:	800 MHz	,	0 dBm	,	10 ms
BPM No.9	:	2000 MHz	,	-20 dBm	,	10 ms
BPM No.10	:	10 MHz	,	-20 dBm	,	50 ms


<1> Press , then press  (Sweep) to open the Sweep screen.



<2> Move the reverse cursor to the Sweep Pattern parameter.

<3> Select “Frequency” using the step key or rotary knob, then press  to determine it.

<4> Move the reverse cursor to Start Point (No.).

<5> Enter “5” using a numeric key, then press  to determine it.

<6> Move the reverse cursor to Stop Point (No.).

Section 3 Operation

- <7> Enter “10” using numeric keys, then press to determine it.
- <8> Move the reverse cursor to Sweep Mode.
- <9> Select “Auto” using the step key or rotary knob, then press to determine it.
- <10> Pressing (▶ Start) starts sweeping.

APM (All-Parameter Memory)

With up to 100 memory locations, APM has enough capacity to store all parameters that can be set from the instrument panel (except for memory parameters and remote control parameters). These parameters include the settings of the digital modulation units. To recall a stored parameter from APM, select its memory location number on the All Parameter Recall screen. A function is also available for listing data stored in APM.

APM: Save to Memory

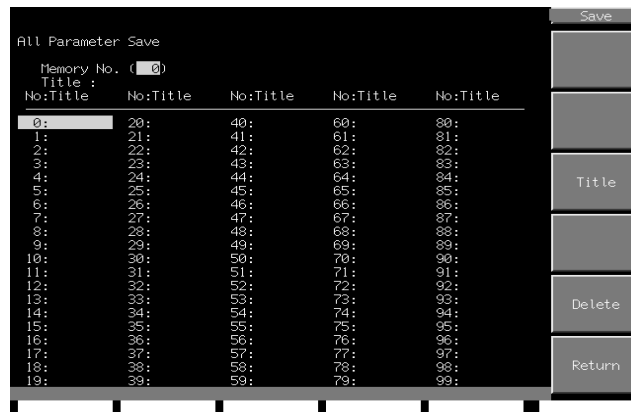
The task of saving all parameter settings to memory can be set in the All Parameter Save screen that is invoked by the memory facility.

Sample operation: Save the parameter currently on display to memory location number 10 under the title name “ABCDEF.”

Note:

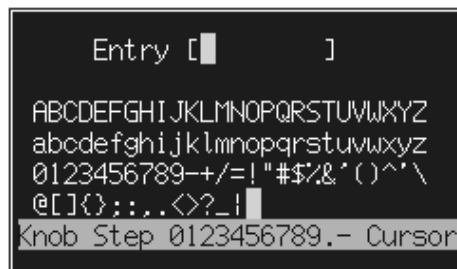
The current setting is saved. Set the relevant parameters before proceeding to save it.

<1> Press Memory and then (All PRM Save) to open the All Parameter Save screen.



<2> Using the cursor keys, move the reverse cursor in the memory location number field to memory location number 10, and then Memory No. in the upper left corner of the screen will also change to 10.

<3> Press (Title) to open the title entry screen.



<4> Using the cursor keys, move the reverse cursor in the character set to “A”. “A” will appear at the reverse cursor in Entry.

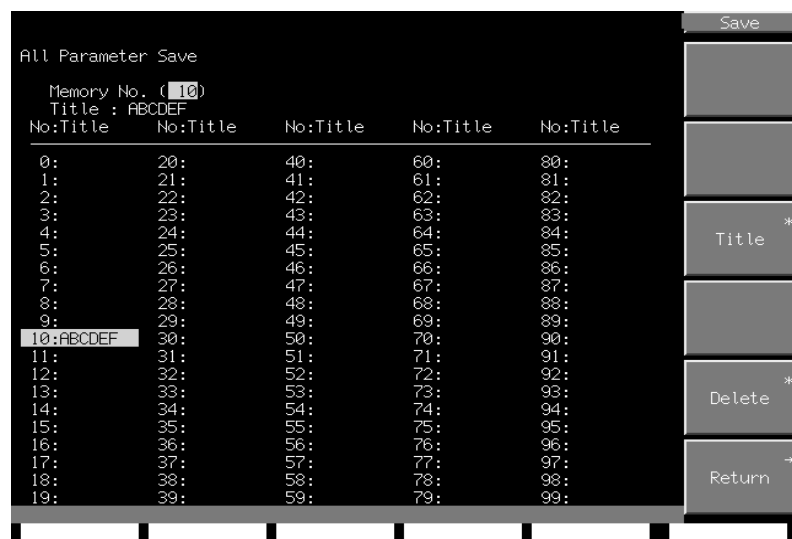
<5> Press (right arrow) to move the reverse cursor in Entry to right. Next, move the reverse cursor in the character set to “B” and “B” also appears at the reverse cursor in Entry.

3.2 Setting the Key Parameters

- <6> Repeat step <5> until character string “ABCDEF” is displayed in Entry, and then press **Set**. The title name of memory location number 10 is set to “ABCDEF”.
- <7> Pressing **Set** once, The parameter is saved to memory location number 10 at the same time.

Note:

Step <6> is registration of title only, it can't save the Parameter.



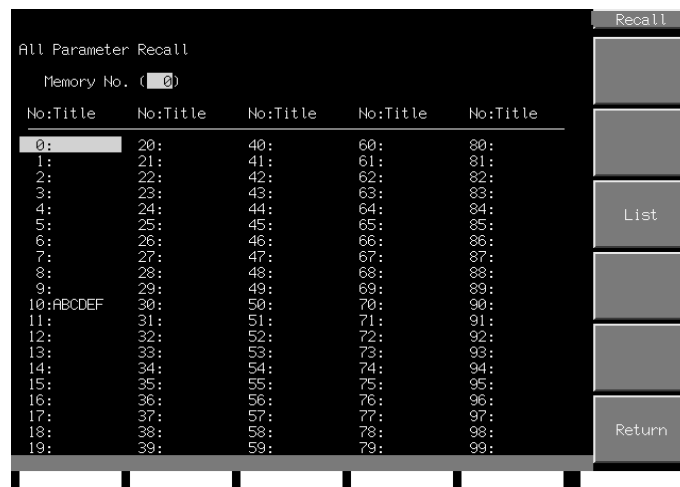
The reverse cursor in the memory location number field and that in the character set can also be moved using the rotary knob or step keys. The digits (0 to 9) and certain letters (A to F) can be entered using the numeric keypad as well. If the numeric keypad is used, the reverse cursor in Entry moves to right without **F2** being pressed.

APM: Recall from Memory

To recall data that has been saved to APM on the All Parameter Save screen, follow these steps:

Sample operation: Recall title name “ABCDEF” of memory location number 10 at which parameters are stored.

<1> Press **Memory** and then **F5** (All Parameter Recall) to open the All Parameter Recall screen.



<2> Using the cursor keys, move the reverse cursor in the memory location number field to memory location number 10, and then Memory No. in the upper left of the screen will also change to 10.

<3> Press **Set** to recall the data stored at memory location number 10.

The reverse cursor in the memory location number field can also be moved using the rotary knob or step keys.

Then the window opens, and pressing **Set**, the memory location number can be set.

To view data stored in APM, specify a memory location number on the All Parameter Recall screen and press **F3** (List). Then, an itemized list of the data stored at the specified memory location is displayed in a window. (The list is displayed as Frequency. To change the view, press **F1** (Previous) or **F2** (Next). When the viewing is finished, press **F6** (Close) to close the window.

APM: Delete Memory

To delete data that has been saved on the All Parameter Save screen, follow these steps:

Sample operation: Delete stored data from memory location 10.

- <1> Press , then (All PRM Save) to open the Basic Parameter Edit screen.
- <2> Using the cursor keys, move the reverse cursor in the memory location number field to memory location number 10, and then Memory No. in the upper left corner of the screen will also change to 10.
- <3> Press (Delete) and a Yes/No window opens asking if the user wants to delete the stored settings.



- <4> After selecting Yes, press to close the window after deleting the stored settings from memory location number 10.

The reverse cursor in the memory location number field can also be moved using the rotary knob or step keys. The reverse cursor in the memory location number field can also be moved using the rotary knob or step keys. And the memory location number can also be set by pressing Ten key. then the Window opens, and pressing , the memory location number can be set.

When the contents stored in APM involve the system data related to the digital modulation, and if the system data is deleted; all the contents of the APM memory number is also deleted at the same time.

Example:

When the MX368041A W-CDMA Modulation Software is installed, and the APM memory No. 20 stores the condition of the Pattern 10 of system data; all the contents of the APM memory No. 20 are also deleted in addition to the Pattern 10, if the Download Data Clear is executed.

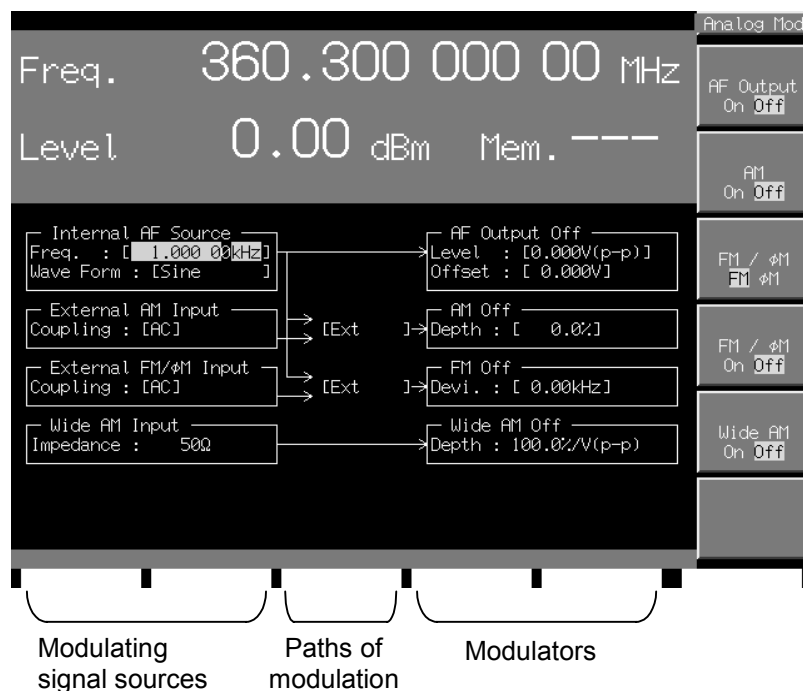
3.3 Setting the Modulation Function

3.3.1 Analog modulation

Press the front-panel main function key **Analog Mod** to open the analog modulation setup screen, with the key lamp illuminated.

Set analog modulation on this screen.

Unless otherwise noted in this section, it is assumed that the analog modulation setup screen is now open with **Analog Mod** being pressed.



The analog modulation setup screen shows the flow of signals from the modulating signal sources to analog modulation.

The modulating signal sources at the leftmost end of the screen indicate the frequency and waveform for the internal modulating signal source (Internal AF Source) and the coupling, input impedance, etc. for external modulation input.

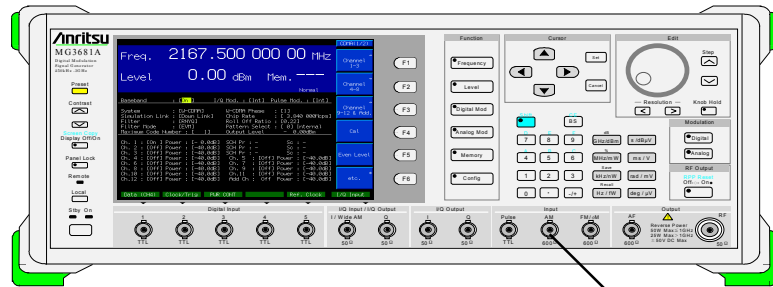
The paths of modulation in the middle of the screen use arrow marks to designate the flow of signals from the modulating signal sources to the modulators.

The modulators at the rightmost end of the screen indicate the on/off states, depth of modulation and other parameters of the modulators. The settings that can be modified are enclosed in brackets []. These settings can be modified by moving the reverse cursor on them with the cursor keys.

Carry Out Amplitude Modulation (AM) with an External Modulating Signal

To set amplitude modulation (AM) with external signal input, follow these steps:

Connecting an external modulating signal

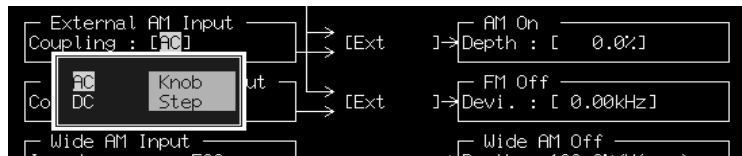


Amplitude modulation input connector

The amplitude modulation input connector is internally terminated at 600Ω. Input a 2V (p-p) signal in the 600Ω termination state.

Sample operation: Carry out amplitude modulation with the external AM input coupling set to AC and the depth of AM modulation set to 50%.

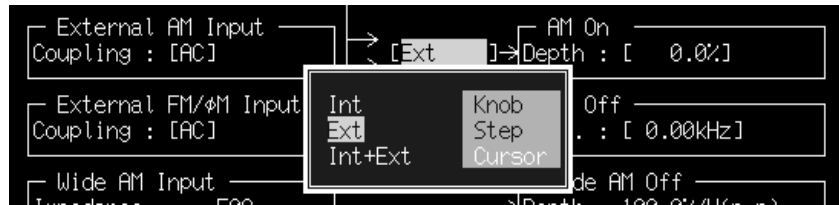
- <1> Press **F2** (AM On/Off) to turn on AM modulation. (There is no need to press **F2** if the reverse cursor is already at On.)
- <2> Using the cursor keys, move the reverse cursor to the Coupling parameter in External AM Input.
- <3> Using the step keys or the rotary knob, open the window and move the reverse cursor in the window to AC.



- <4> Press **Set** to accept AC and close the window.
- <5> Using the cursor keys, move the reverse cursor to the path of amplitude modulation.

Section 3 Operation

<6> Using the step keys or the rotary knob, open the window and move the reverse cursor to Ext.



<7> Press **Set** to accept Ext and close the window.

<8> Using the cursor keys, move the reverse cursor to the AM Depth setup parameter.

<9> Using the numeric keypad, enter a value of 50.



<10> Press **MHz/mW** to accept the numeric value and the units and close the window.

<11> Press **Analogue** to start amplitude modulation with the key lamp turned on.

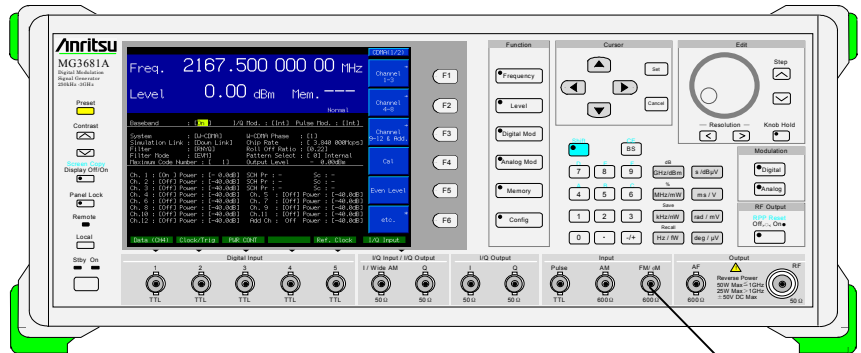
The depth of modulation may also be varied using the rotary knob or step keys.

The polarity of the modulating signal reverses when a negative value is entered for the depth of modulation.

Carry Out Frequency Modulation (FM) with an External Modulating Signal

To set frequency modulation (FM) with external signal input, follow these steps:

Connecting an external modulating signal



Frequency modulation input connector

The frequency modulation input connector is internally terminated at 600Ω. Input a 2V (p-p) signal in the 600Ω termination state.

Sample operation: Carry out frequency modulation with the external FM/φM input set to AC and FM Deviation set to 500 kHz.

- <1> Press **F3** (FM/φM) to select FM. (There is no need to press **F3** if the reverse cursor is already at FM.)
- <2> Press **F4** (FM/φM On Off) to carry on FM modulation. (There is no need to press **F4** if the reverse cursor is already at FM.)
- <3> Using the cursor keys, move the reverse cursor to the Coupling parameter in External FM Input.
- <4> Using the step keys or the rotary knob, open the window and move the reverse cursor in the window to AC.



- <5> Press **Set** to accept AC and close the window.
- <6> Using the cursor keys, move the reverse cursor to the path of frequency modulation.

Section 3 Operation

<7> Using the step keys or the rotary knob, open the window and move the reverse cursor to Ext.



<8> Press **Set** to accept Ext and close the window.

<9> Using the cursor keys, move the reverse cursor to the FM Deviation setup parameter.

<10> Using the numeric keypad, enter a value of 500.



<11> Press **Save kHz/nW** to accept the numeric value and the unit and close the window.

<12> Press **Analog** to start frequency modulation with the key lamp turned on.

The frequency deviation may also be varied using the rotary knob or step keys.

Although frequency deviations of up to 2000 kHz can be set irrespective of the output frequency, actual frequency deviations are limited to 1000 kHz with an output frequency of 1010 MHz or lower. In this case, “Uncal” is displayed onscreen.

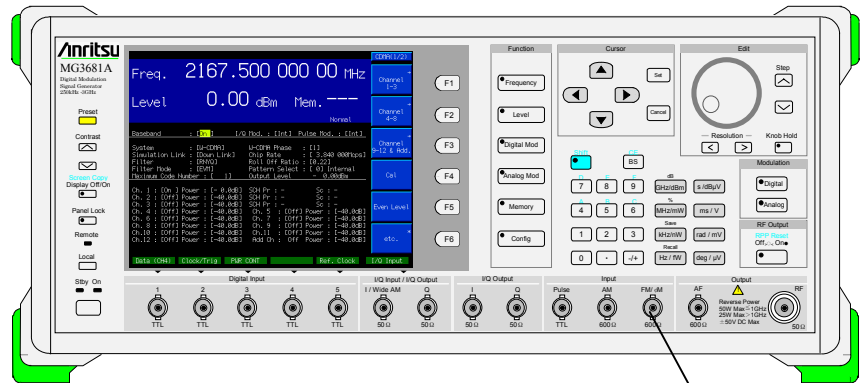
The polarity of the modulating signal reverses when a negative value is entered for the frequency deviation.

Frequency modulation cannot be carried out concurrently with phase modulation.

Carry Out Phase Modulation (ϕ M) with an External Modulating Signal

To set phase modulation (ϕ M) with external signal input, follow these steps:

Connecting an external modulating signal



Phase modulation input connector

The phase modulation input connector is internally terminated at 600 Ω . Input a 2V (p-p) signal in the 600 Ω termination state.

Sample operation: Carry out phase modulation with the external FM/ ϕ M input set to AC.

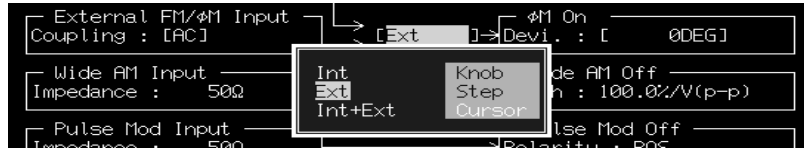
- <1> Press **F3** (FM/ ϕ M) to select ϕ M. (There is no need to press **F3** if the reverse cursor is already at ϕ M.)
- <2> Press **F4** (FM/ ϕ M On/Off) to turn on ϕ M modulation. (There is no need to press **F4** if the reverse cursor is already at On.)
- <3> Using the cursor keys, move the reverse cursor to the Coupling parameter in External FM/ ϕ M Input.
- <4> Using the step keys or the rotary knob, open the window and move the reverse cursor in the window to AC.



- <5> Press **Set** to accept AC and close the window.
- <6> Using the cursor keys, move the reverse cursor to the path of phase modulation.

Section 3 Operation

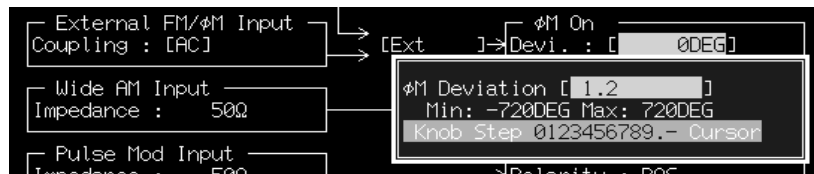
<7> Using the step keys or the rotary knob, open the window and move the reverse cursor to Ext.



<8> Press **Set** to accept Ext and close the window.

<9> Using the cursor keys, move the reverse cursor to the φM Deviation setup parameter.

<10> Using the numeric keypad, set a value of 1.2.



<11> Press **rad/mV** to accept the numeric value and the units and close the window.

<12> Press **Analog** to start phase modulation with the key lamp turned on.

The phase deviation may also be varied using the rotary knob or step keys.

Although phase deviations up to 12.56 rad can be set irrespective of the output frequency, actual phase deviations are limited to 6.28 rad with an output frequency of 1010 MHz or lower. In this case, “Uncal” is displayed onscreen.

The polarity of the modulating signal reverses when a negative value is entered for the phase deviation.

Phase modulation cannot be carried out concurrently with frequency modulation.

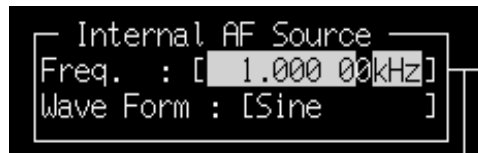
Carry Out Analog Modulation (AM, FM, ϕ M) with an Internal Modulating Signal

An AF synthesizer (option 21) is a prerequisite for carrying out modulation with an internal modulating signal. Remember also to set a frequency and waveform as Internal AF Source setup parameters. Further, it is necessary to set the path of modulation to “Int”. Other operation of AM, FM, ϕ M modulation performed by internal modulating signals are the same as those of modulations performed by external signals.

Setting Internal AF Source setting items

<Frequency>

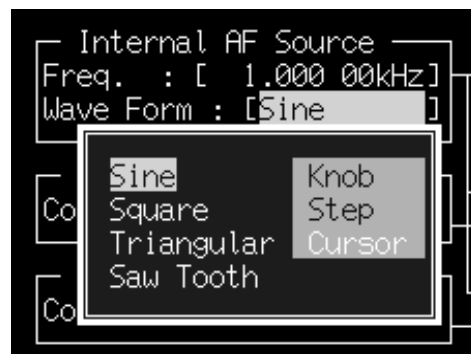
- <1> Move the reverse cursor to the Internal AF Source Frequency setup parameter.
- <2> Using the numeric keypad, set an optional numeric value. (A numeric value may also be set using the rotary knob or step keys.)



- <3> Press a unit key or to accept the numeric value and the unit. The numeric value is accepted in the units Hz when is pressed.

<Waveform>

- <1> Move the reverse cursor to the Internal AF Source Waveform setup parameter.
- <2> Using the step keys, open the Waveform setup window.



- <3> Select an optional waveform from the item window and press to accept the wave for and then close the window.

Section 3 Operation

<Waveform patterns>

- Sine: Sine wave
- Square: Square wave
- Triangular: Triangular wave
- Saw Tooth: Sawtooth wave

<Path of modulation>

<1> Move the reverse cursor to the path of modulation.

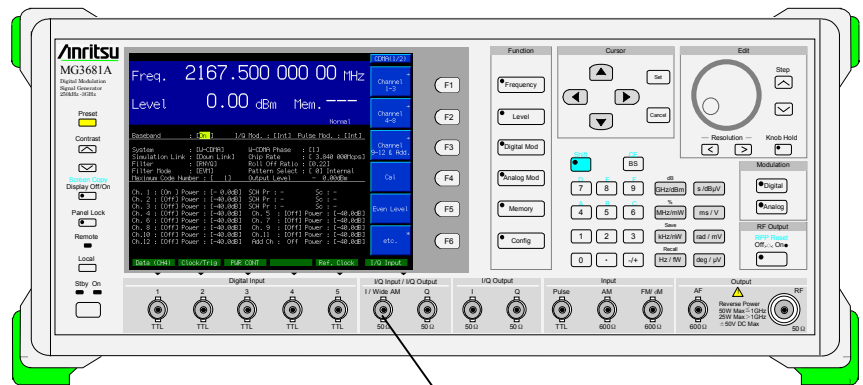
<2> Using the rotary knob or step keys, open the window and move the reverse cursor in the window to “Int”.

<3> Press to accept “Int” and close the window.

Carry Out Wide-band Amplitude Modulation (Wide AM) with an External Modulating Signal

To set wide-band amplitude modulation (wide AM) with external signal input, follow these steps:

Connecting an external modulating signal



Wide-band amplitude modulation input connector

- <1> Press **F5** (Wide AM On Off) to turn on wide AM. (There is no need to press **F5** if the reverse cursor is already at On.)
- <2> Press **Analog** to start wide-band amplitude modulation with the key lamp illuminated.

The external input impedance is fixed at 50Ω.

The modulation sensitivity is fixed at 100%/1 V (p-p). To adjust the depth of modulation, change the amplitude of the external input signal.

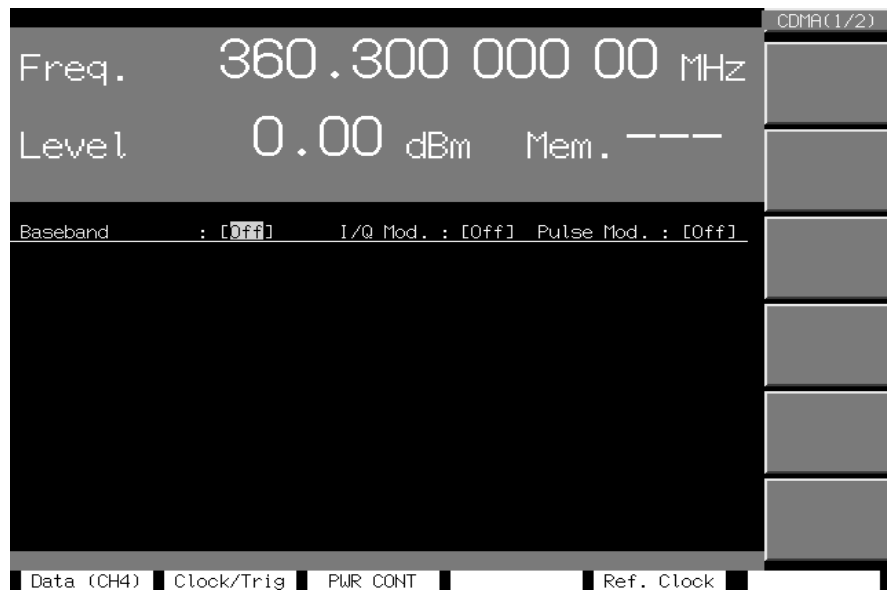
Wide range amplitude modulation can not be used when vector modulation is set to On.

3.3.2 Digital modulation

Press the front-panel main function key Digital Mod to open the digital modulation setup screen, with the key lamp turned on.

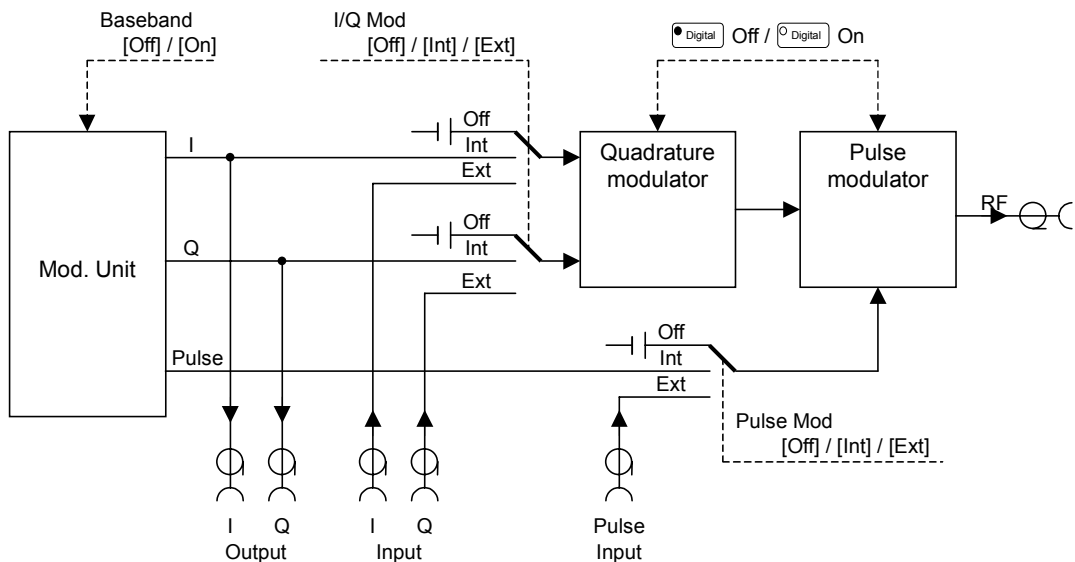
Set digital modulation on this screen.

Unless otherwise noted in this section, it is assumed that the digital modulation setup screen is now open with Digital Mod being pressed.



The settings (by Baseband, I/Q Mod., and Pulse Mod. on the digital modulation setup screen, and by front-panel key Digital) depend on the switch selection in the below diagram, which shows the modulation signal flow.

The I/Q signal outputs and digital modulation status at each setting are shown on the table below.



3.3 Setting the Modulation Function

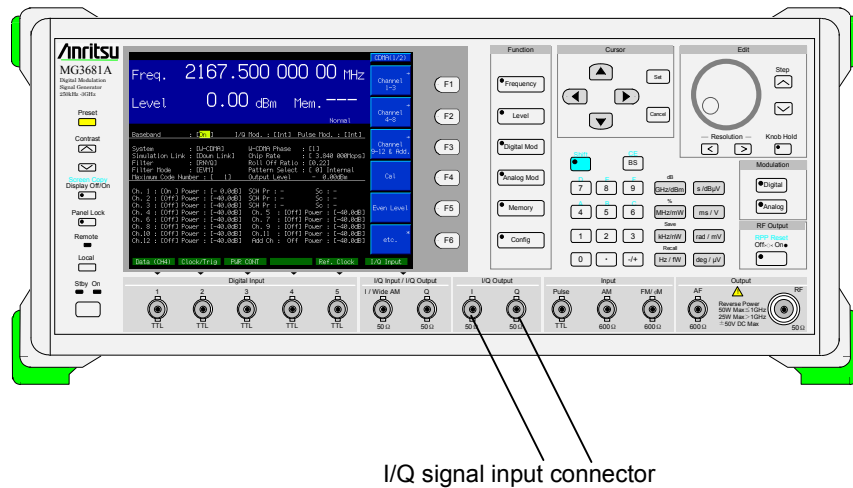
I/Q signal outputs and digital modulation status at each setting

Setting				Output signal	
Baseband	I/Q Mod.	Pulse Mod.	Digital	I/Q Output	RF Output
[Off]	[Off], [Int], [Ext]	[Off], [Int], [Ext]	<input checked="" type="radio"/> Digital Off	Nothing are output.	CW
	[Off]	[Off]	<input type="radio"/> Digital On		External vector modulation
	[Ext]	[Off]			External pulse modulation
	[Off]	[Ext]			Ext. vector mod. + Ext. pulse mod.
	[Ext]	[Ext]			Un-definable (Depends on stop state of mod. unit.)
	[Int]	[Off], [Int], [Ext]			
	[Off], [Int], [Ext]	[Int]			
[On]	[Off], [Int], [Ext]	[Off], [Int], [Ext]	<input checked="" type="radio"/> Digital Off	Int. I/Q signals are output.	CW
	[Off]	[Off]	<input type="radio"/> Digital On		CW
	[Int]	[Off]			Internal vector modulation
	[Ext]	[Off]			External vector modulation
	[Off]	[Int]			Internal pulse modulation
	[Off]	[Ext]			External pulse modulation
	[Int]	[Int]			Int. vector mod. + Int. pulse mod.
	[Ext]	[Ext]			Ext. vector mod. + Ext. pulse mod.
	[Ext]	[Int]			Ext. vector mod. + Int. pulse mod.
	[Int]	[Ext]			Int. vector mod. + Ext. pulse mod.

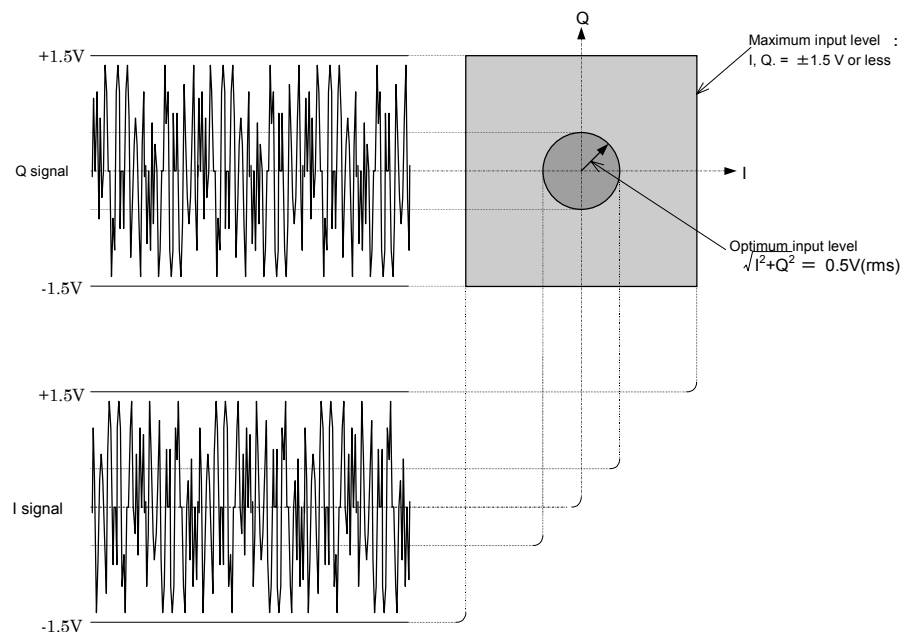
Section 3 Operation

Carry out Vector Modulation with External I/Q Signals

To set digital (vector) modulation with external I/Q signal input, follow these steps:



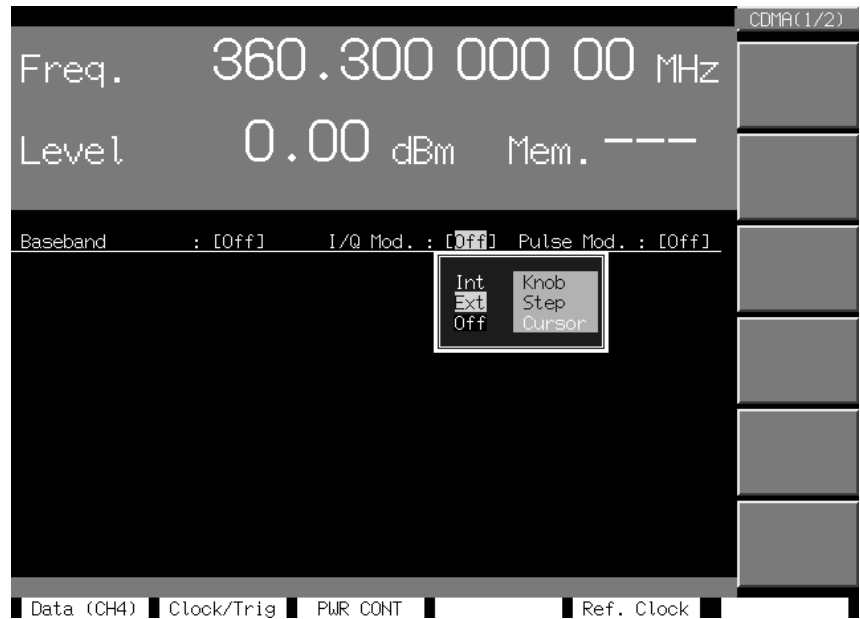
The I/Q signal input connectors are internally terminated at 50Ω. If the rms voltage of $\sqrt{I^2 + Q^2}$ is 0.5 V in the 50Ω termination state, an RF signal matching the output level setting is outputted. For carrying out vector modulation, input I/Q signals that make the rms voltage of $\sqrt{I^2 + Q^2}$ equal to 0.5 V. Also set the maximum values of the I/Q signals so that they do not exceed ±1.5 V.



3.3 Setting the Modulation Function

Sample operation: Carry out digital (vector) modulation with external I/O signal input.

- <1> Using the cursor keys, move the reverse cursor to the I/Q Mod setup parameter.
- <2> Using the rotary knob or step keys, open the window and move the reverse cursor in the window to “Ext”.



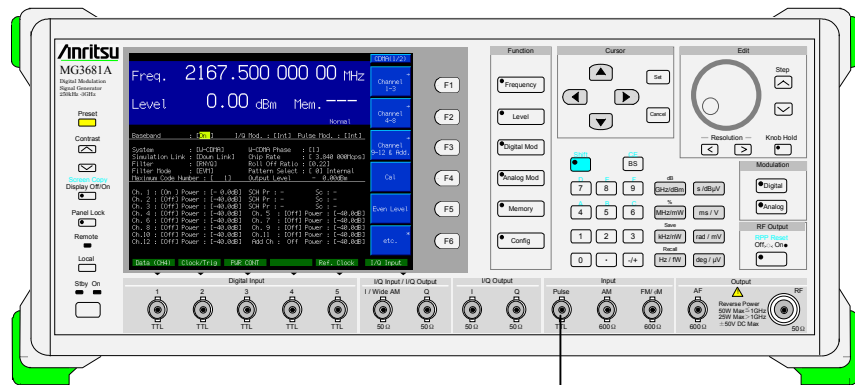
- <3> Press **Set** to accept “Ext” and close the window.
- <4> Press **Digital** to start digital (vector) modulation with the key lamp turned on.

Section 3 Operation

Carry Out Pulse Modulation with an External TTL Signal

To set pulse modulation with external signal input, follow these steps:

Connecting an external TTL signal

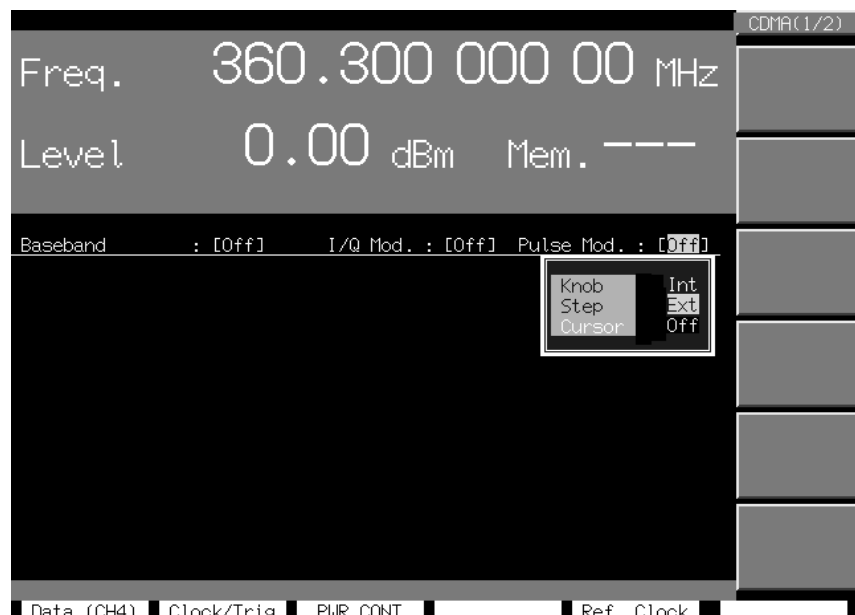


Pulse modulation input connector

The external input impedance is fixed at 50Ω. The polarity of pulse modulation is fixed at “Positive”. This means that an RF signal is output when the external modulating signal is logical high level but not when the external modulating signal is logical low level.

Sample operation: Carry out pulse modulation with external TTL signal input

- <1> Using the cursor keys, move the reverse cursor to the setup parameter of Pulse Mod.
- <2> Using the rotary knob or step keys, open the window and move the reverse cursor in the window to "Ext".



3.3 Setting the Modulation Function

<3> Press to accept "Ext" and close the window.

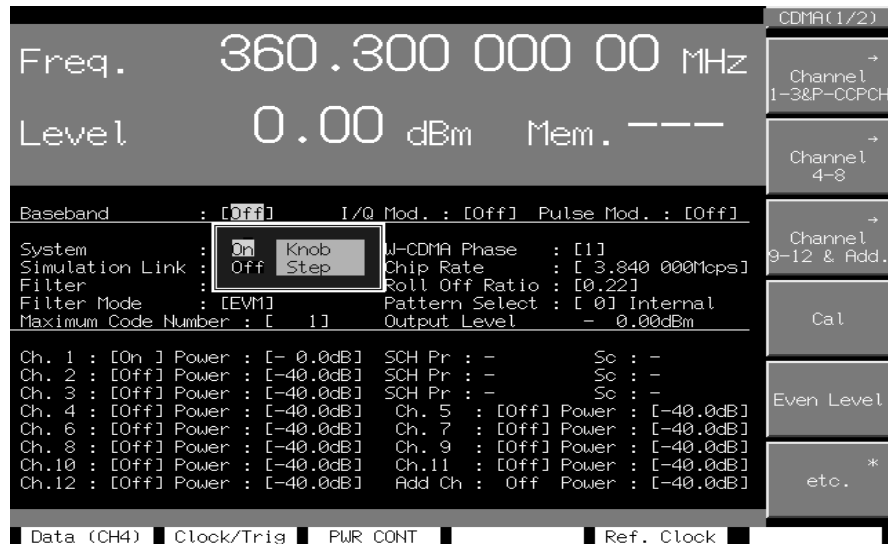
<4> Press to light the key lamp and then start the pulse modulation.

Carry out Modulation with a Digital Modulation Unit

To set digital (vector) modulation with a built-in digital Modulation Unit, follow these steps:

Sample operation: Carry out digital (vector) modulation by using the built-in MU368040A CDMA digital modulation Unit and installed MX368041A W-CDMA software.

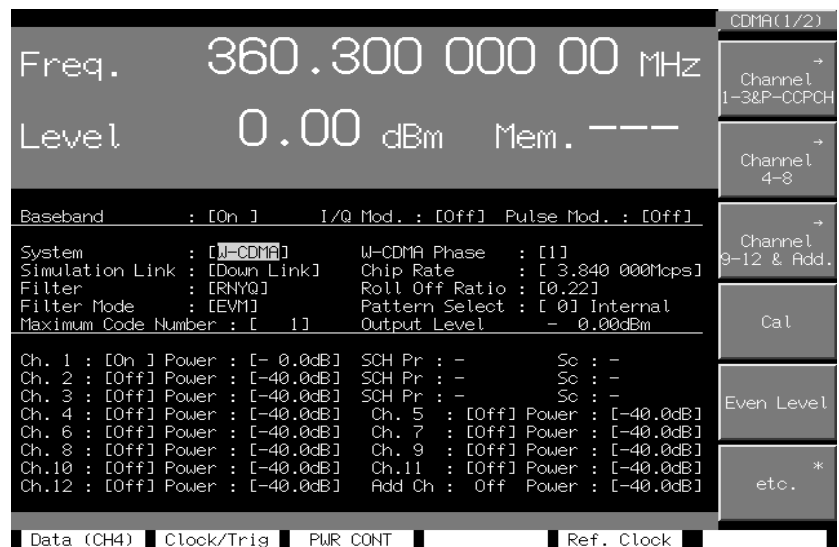
- <1> Using the cursor keys, move the reverse cursor to the Baseband setup parameter.
- <2> Using the rotary knob or step keys, open the window and move the reverse cursor in the window to “On”.



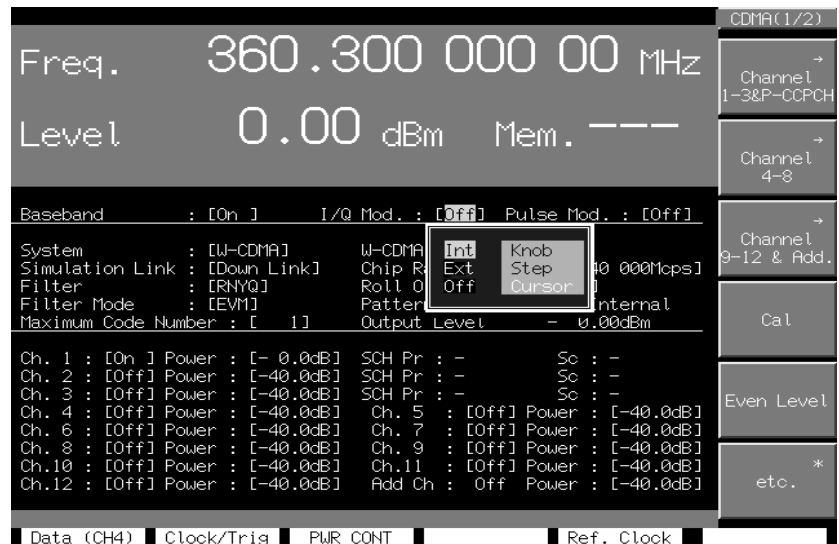
- <3> Press **Set** to accept “Ext” and close the window.

- <4> Move the reverse cursor to the setup parameters of modulation unit using the cursor keys and complete the setup. For more information, refer to the user’s guide pertaining to the digital modulation unit and each system software.

3.3 Setting the Modulation Function



- <5> Using the cursor keys, move the reverse cursor to the setup parameter of I/Q Mod.
- <6> Using the rotary knob or step keys, open the window and move the reverse cursor in the window to "Int".



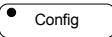
- <7> Press **Set** to accept "Int" and close the window.
- <8> Press **Digital** to start digital (vector) modulation with the key lamp turned on.

When the modulated signal of digital modulation unit is a burst wave, set the Pulse Mod. setup parameter to "Int".


Changing Vector Quadrature Ratio

This section shows the procedure for changing the vector quadrature ratio during performing digital modulation using an external modulation signal and digital modulation unit.

Sample operation: Adjusting quadrature ratio to correct I and Q phases deviation when performing digital modulation using an external modulation signal

<1> Press  to open the Configuration Setting screen.



<2> Press  (IF/RF Setup) to open the IF/RF Setup screen.



<3> Move the reverse cursor to RF Output Quadrature Skew.

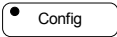
<4> Adjust quadrature ratio using the step key or rotary knob.

Quadrature ratio settings are represented by unitless integers (-1000 to +1000). Quadrature ratio cannot be set with a quantitative value.


Reversing the RF Spectrum

You can reverse the spectrum of the modulated RF signal by interchanging the I and Q signals.

Sample operation: Reversing the RF spectrum


<1> Press  to open the Configuration Setting screen.



<2> Press  (IF/RF Setup) to open the IF/RF Setup screen.



<3> Move the reverse cursor to the RF Spectrum to open the setting window.

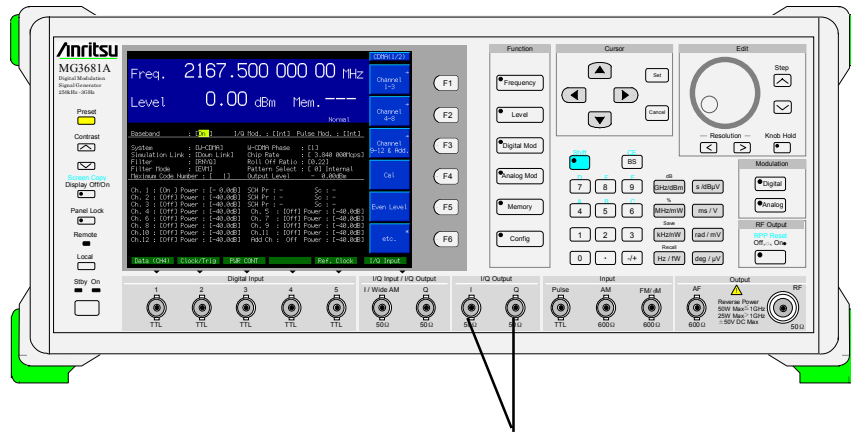
<4> Select “Reverse”, then press .

The I and Q signals for vector modulation will be interchanged and the RF signal spectrum will be reversed.

3.4 Setting the Baseband Signal Output

3.4.1 Outputting I/Q signals

I/Q signals generated by the digital modulation unit can be outputted from the I/Q signal connectors on the front panel.



I/Q signal output connectors

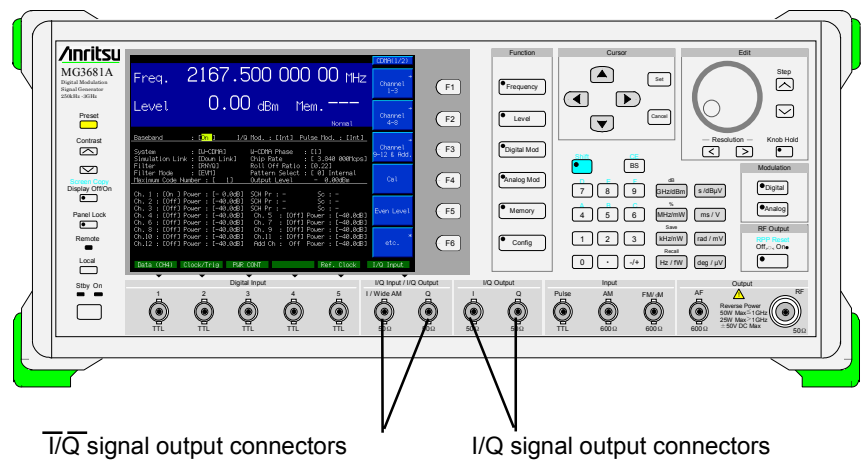
The I/Q signal output connectors have an output impedance of 50Ω. Set a load impedance of 50Ω if the I/Q signal output connectors are used for I/Q signals.

The output signal level depends on the setting of the digital modulator. For more information, refer to the user's guide pertaining to the type of digital modulation unit and each system software used.

I/Q signals are outputted continuously when the Baseband setting is set to "On".

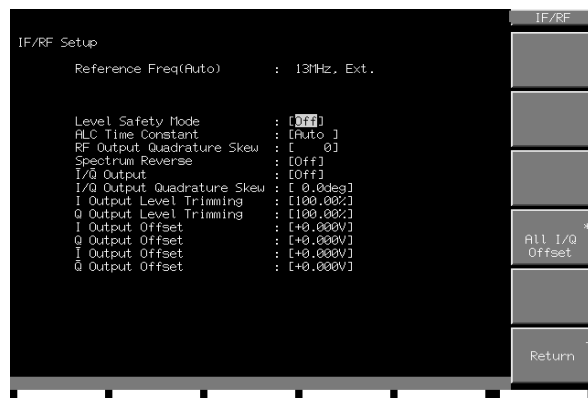
Output Differential Signals I/Q

If the additional function of I/Q signal output option (option 11) is mounted, along with $\overline{I}/\overline{Q}$ signals, or I/Q signals can be outputted. The $\overline{I}/\overline{Q}$ signals are available from the front-panel $\overline{I}/\overline{Q}$ signal output connectors (which are also used as I/Q input connectors).



Sample operation: Output $\overline{I}/\overline{Q}$ signals .

- <1> Press **Config** to open the configuration parameter setup screen.
- <2> Press **F1** (IF/RF Setup) to open the IF/RF Setup screen.
- <3> Move the reverse cursor to the $\overline{I}/\overline{Q}$ Output parameter.



- <4> Using the rotary knob or step keys, open the window and move the reverse cursor in the window to "On".
- <5> Press **Set** to accept "On" and close the window.

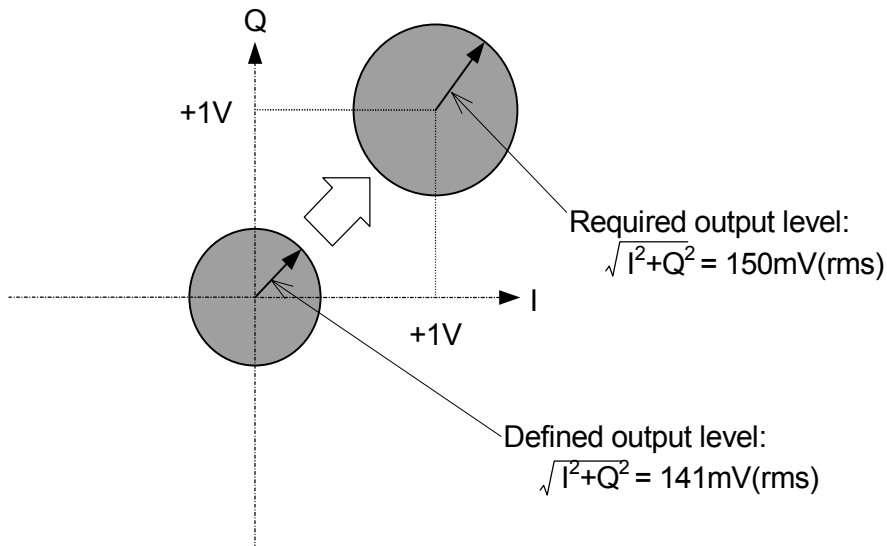
Adjust I/Q Signal Output

If the enhanced I/Q signal output option (option 11) is mounted, the output voltage, the DC offset, and quadrature of the I/Q and $\overline{I/\overline{Q}}$ signals can be varied.

The level is variable in a range of 80 to 120% of the output voltage defined by the setting of the digital modulation unit for the two sets of I, \overline{I} and Q, \overline{Q} .

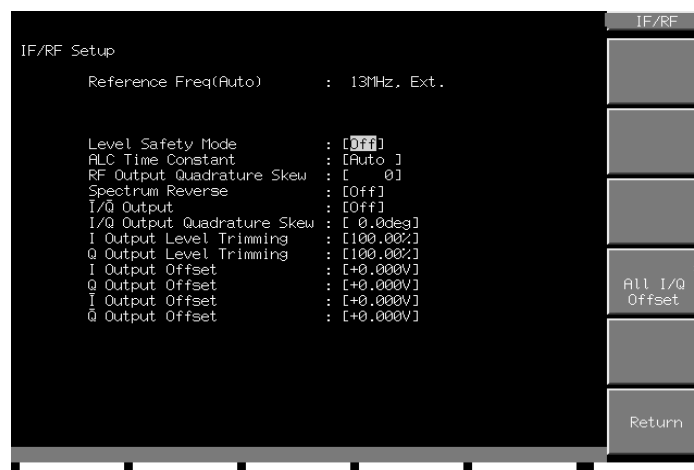
The DC offset is independently variable in a range of -0.5 to +1.5V of the output of I, \overline{I} and Q, \overline{Q} .

Sample operation: Trim the quadrature of the I/Q signals after setting them to an output voltage of 150 mV (rms) and a DC offset of +1 V. (An output voltage of 141 mV (rms) defined by the setting of the digital modulation unit is assumed.)



<1> Press **Config** to open the configuration parameter setup screen.

<2> Press **F1** (IF/RF Setup) to open the IF/RF Setup screen.



<3> Move the reverse cursor to the I Output Level Trimming parameter.

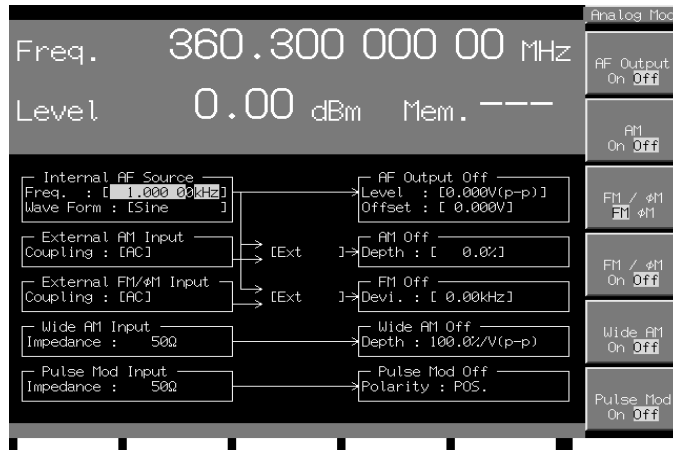
3.4 Setting the Baseband Signal Output

- <4> Using the numeric keypad, enter a numeric value of 106 (150 mV (rms)/141 mV (rms) \times 100%).
- <5> Press to accept the numeric value and the units and close the window.
- <6> Likewise, set the Q Output Level Trimming parameter to 106%.
- <7> Move the reverse cursor to the I Output Offset parameter.
- <8> Using the numeric keypad, enter a numeric value of 1.
- <9> Press to accept the numeric value and the units and close the window.
- <10> Likewise, set the Q Output Offset to 1 V.
- <11> Move the reverse cursor to the I/Q Quadrature Skew parameter.
- <12> Using the rotary knob or step keys, vary the value of quadrature.

3.4.2 AF output

The AF output signal is output with an impedance of 600Ω. An AF synthesizer (option 21) is required to output the AF output signal.

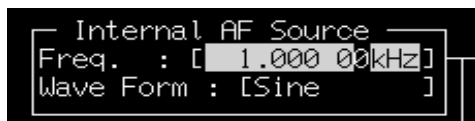
<1> Press **Analog Mod** to open the analog modulation setup screen.



<2> Press **F1** (AF Output On Off) to turn on the AF output signal. (There is no need to press **F1** if the reverse cursor is already at On.)

<3> Move the reverse cursor to the Internal Source Frequency setup parameter.

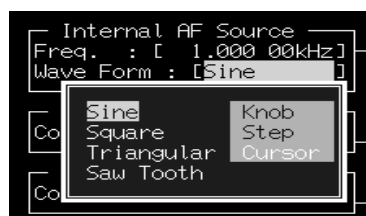
<4> Using the numeric keypad, set an optional numeric value. (A numeric value may also be set using the rotary knob or step keys.)



<5> Press a unit key or **Set** to accept the numeric value and the unit. The numeric values are accepted in the unit Hz when **Set** is pressed.

<6> Move the reverse cursor to the Internal AF Source Waveform setup parameter.

<7> Using the step keys, open the Waveform setup window.



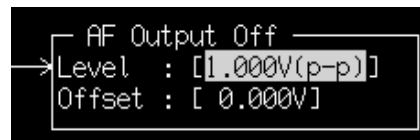
3.4 Setting the Baseband Signal Output

<8> Select an optional waveform from the item window and press **Set** to accept the waveform and then close the window.

<Waveform patterns>

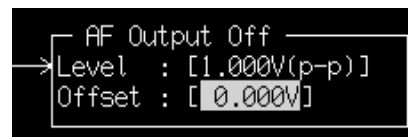
- Sine: Sine wave
- Square: Square wave
- Triangular: Triangular wave
- Saw Tooth: Sawtooth wave

<9> Move the reverse cursor to the AF Output On Level parameter.



<10> After entering an optional value with the numeric keypad, press a unit key or **Set** to accept the numeric value and the units.

<11> Move the reverse cursor to the AF Output On Offset parameter.




<12> After entering an optional value with the numeric keypad, press a unit key or **Set** to accept the numeric value and the units.


Numeric values may also be set using the rotary knob or step key.


3.5 Useful Features

3.5.1 Locking the panel

The panel lock feature disables all the keys, except for the front-panel power switch, the Local key, the Panel Lock key and the Contrast keys. With the panel locked, the user can perform measurement tasks with confidence, because the settings are protected against alteration due to inadvertent pressing of a key.

Press  to lock the panel with the key lamp turned on.

If  is pressed while a setup window is open, the screen is reset to the status it was in before the window was opened, and all the keys are disabled.


Press  again to unlock the panel with the key lamp going off.


3.5.2 Backup feature

When the instrument is turned off, its current status is backed up in internal memory. When the instrument is turned on subsequently, the status in which the instrument was when it was turned off is recovered (except for data then being entered, remote state, data then being transferred by GPIB, RPP operating status, display transitions, and main function selection conditions).



3.5.3 Setting display features

Display on/off feature

Press  on the front panel to turn off the display so that electromagnetic radiation from the display surface can be reduced. When the display is off, all the keys are disabled, except for the power switch, the Local key, and the Contrast keys.

Press  again to turn on the display.

Contrast adjustment

The Contrast keys adjust the display contrast (brightness and darkness). Press  to brighten the display or  to darken it.

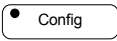
Note:


When the LCD screen consists of TFT, the contrast key is not provided.

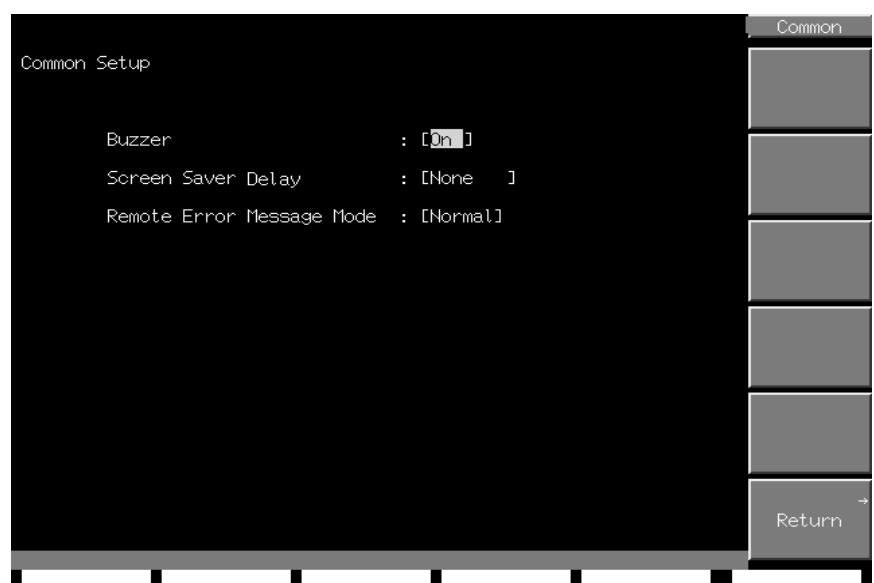
Screen saver

The screen saver launches when the instrument panel is left idle for a certain period of time, with the display being turned off. The backlight turns off at the same time. To set the screen saver, follow these steps:

Sample operation: Set the screen saver to be launched after 1 hour.

<1> Press  to open the configuration parameter setup screen.

<2> Press  (Common Setup) to open the Common Setup screen.

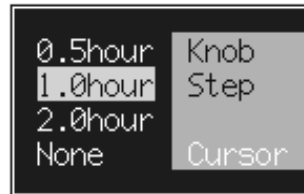


<3> Using the rotary knob, move the reverse cursor to the Screen Saving Time setup parameter.

<4> Using the rotary knob, open the setup window.

Section 3 Operation

<5> Using the rotary knob, move the reverse cursor to “1.0hour”.



<6> Press to accept the choice and close the setup window.


The setup window can also be opened and the reverse cursor can be moved by using the step keys.

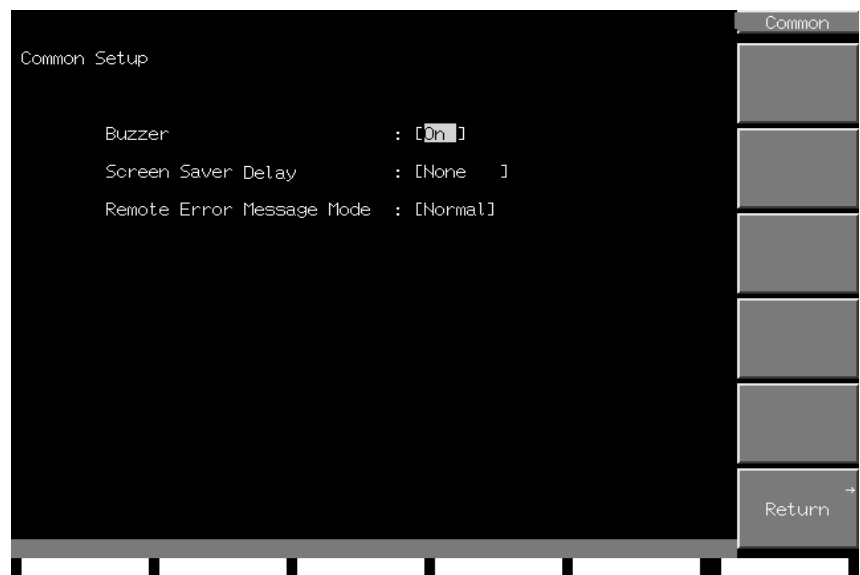
3.5.4 Turning On/Off the Buzzer

You can turn on/off the buzzer that sounds to alert you to a wrong operation.

Sample operation: Turning off the buzzer


<1> Press  to open Config Parameter Setting screen.

<2> Press  (Common Setup) to open the Common Setup screen.



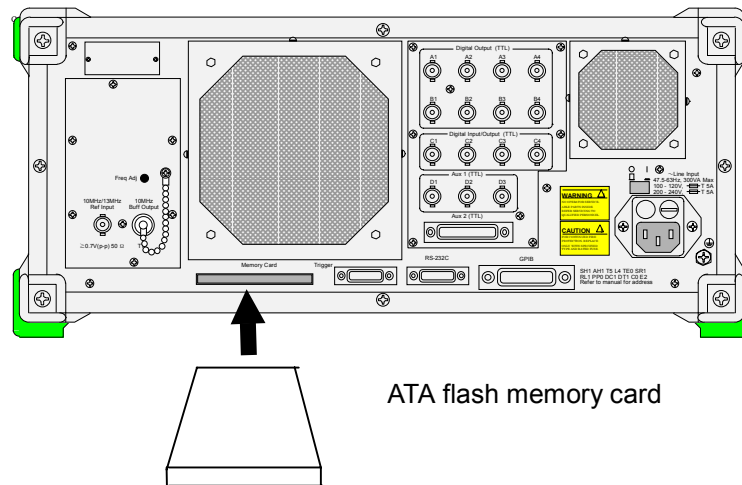
<3> Move the reverse cursor to the Buzzer Setup parameter.

<4> Move the reverse cursor to "Off" using the rotary knob or step key.

<5> Press  to determine the setting and close the setting window.

3.5.5 Making a Hardcopy of the Screen

You can store the data displayed on the screen in the ATA flash memory card as a bitmap file. Insert the ATA flash memory card into the memory card slot in the rear panel of this unit.



With the target screen displayed, pressing and then stores the screen data in the root directory of the ATA flash memory card as a bitmap file. Bitmap file names are automatically assigned in the specified order:

SG00.bmp -> SG01.bmp -> SG02.bmp -> ...-> SG99.bmp.

After SG99.bmp is assigned to a bitmap file, SG00.bmp is assigned again to the next bitmap file.

When this unit is powered off and on again, the bitmap file names are assigned again starting with SG00.bmp and new bitmap files are overwritten the old ones.

Without an ATA flash memory card to be inserted in the memory card slot, the screen copy data is stored to the internal memory temporarily as a bit map data when

and are pressed. After the ATA flash card is inserted, the bit map data stored in the internal memory can be saved to the ATA flash memory card by using the remote control. A device message “SCPEXP” is used.

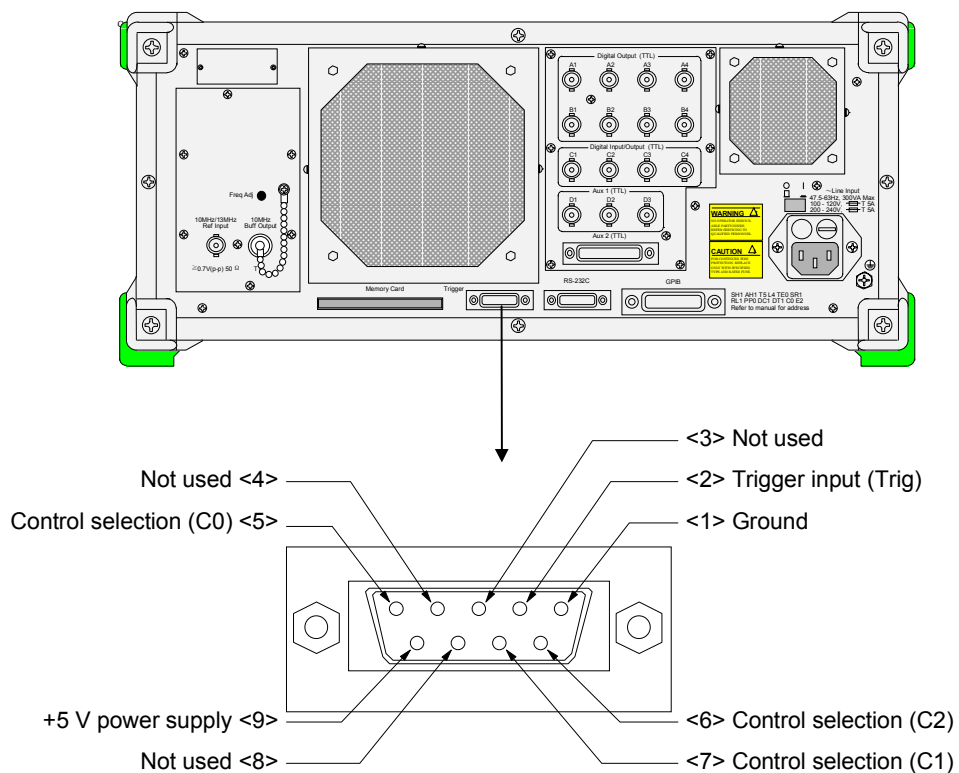
Refer to Section 4 for the details of the remote control and device messages.

In addition, the internally stored bit map data is erased if the next screen copy data is saved or this equipment is turned off.

3.5.6 Using a Trigger Function to Perform Remote Control

Using the trigger function, you can control the following eight operations with the TTL level signals input to the trigger connector on the rear panel of this unit.

- Frequency step down
- Output level step up
- Output level step down
- BPM recall address up
- RF recall address down
- RF output On
- RF output Off



Section 3 Operation

Set the type of operation to be controlled by assigning to the control selection (C0 to C2) in advance as shown below, and the operation of the selected type is controlled at the falling edge of the trigger input (Trig).

Input				Operation
C2	C1	C0	Trig	
L	L	L	$\overline{\downarrow}$	RF output Off
L	L	H	$\overline{\downarrow}$	RF output On
L	H	L	$\overline{\downarrow}$	Output level step down
L	H	H	$\overline{\downarrow}$	Output level step up
H	L	L	$\overline{\downarrow}$	Frequency step down
H	L	H	$\overline{\downarrow}$	Frequency step up
H	H	L	$\overline{\downarrow}$	BPM address down
H	H	H	$\overline{\downarrow}$	BPM address up

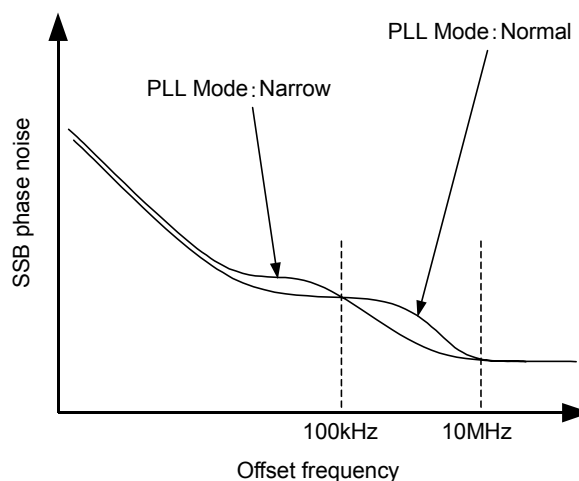
The +5 VDC power supplied from the trigger connector can be used as power for the external logic circuit and so on. The maximum current is 100 mA.

3.5.7 Changing the PLL mode

By changing the loop characteristics of the PLL synthesizer in the MG3681A, the SSB phase noise characteristics of the RF output can be changed.

PLL Mode Normal: The SSB phase noise characteristics at 100 kHz and near offset frequency is good.

PLL Mode Narrow: The SSB phase noise characteristics at 100 kHz and far offset frequency is good.



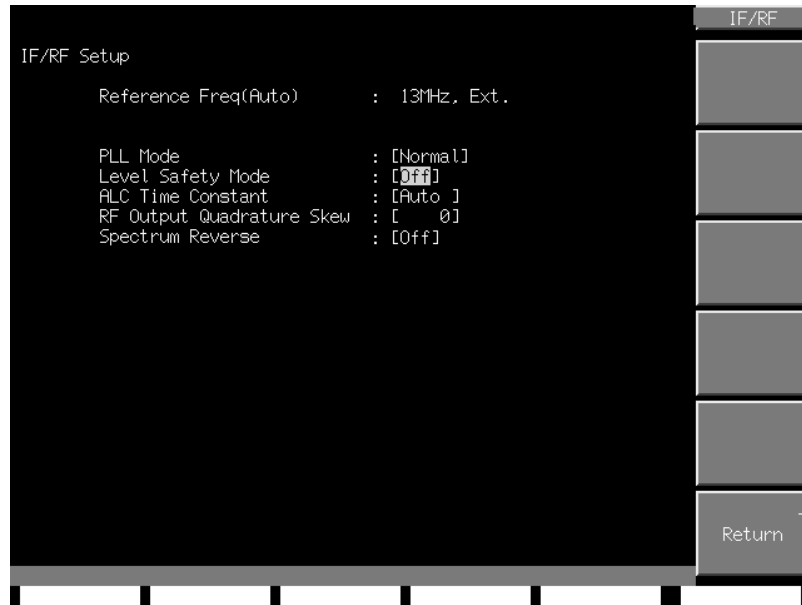
Sample operation: Improves the SSB phase noise characteristics at far offset frequency in PLL Mode: Narrow.

<1> Press to open the Config. Parameter Setting screen.



Section 3 Operation

<2> Press **F1** (IF/RF Setup) to open IF/RF Setup screen.



<3> Move the reverse cursor at PLL Mode, then display the setup window.

<4> Select “Narrow”, and press **Set**.

The PLL Mode becomes Narrow, then the SSB phase noise at a few hundred kHz is improved.

3.5.8 Changing error message display mode in remote control

The MG3681A can select one of the following error-message display modes, as shown below.

See Section 4 for the remote control and error messages.

Remote Error Mode Normal: Error message is erased when the next command is received from the controller or the message of status change is displayed.

Remote Error Mode Remain: Error message is not erased if the next command is received from the controller.
If the message of status change is displayed, the error message is erased.

Remote Error Mode Stop: When a error is occurred in remote control, the error message is displayed and the following remote commands are refused to receive.
This stop status continues until the Local key is pressed for Local status.

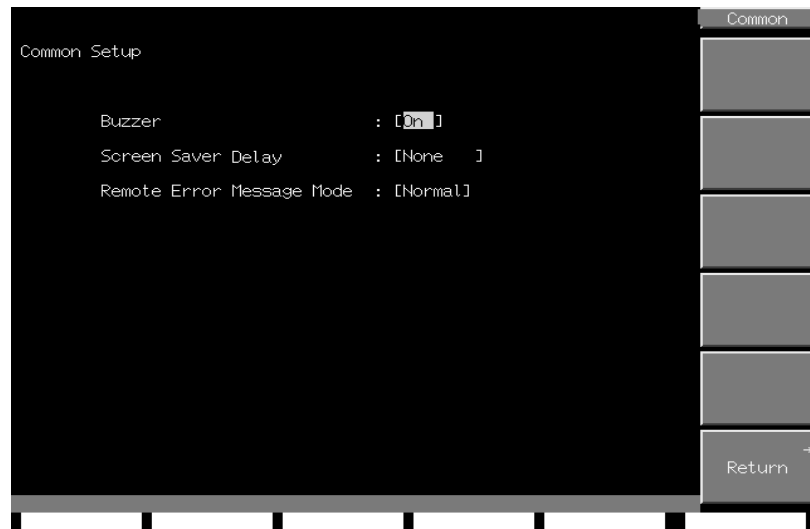
Sample operation: Sets the Remote Error Mode to Remain, and the error message is remained.

<1> Press [Config.] to open the Config. Parameter Setting screen.



<2> Press **[F4]** (Common Setup) to open the Common Setup screen.

Section 3 Operation



- <3> Move the reverse cursor to Remote Error Mode setting parameter.
- <4> Using the rotary knob or step keys, move the reverse cursor to “Remain”.
- <5> Press to accept “Remain” and close the set window.

Section 4 Remote Control

This section describes the concepts of the instrument's remote control.

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4.2.2	Example of System Atization with GPIB	4-6
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4.1 Overview

This instrument supports a GPIB interface (IEEE Standard 488.2-1987) and RS-232C interface so it can team up with an external controller to automate measurement tasks.

The remote control facility of this instrument does the following:

- Controls all functions, except for the front-panel power switch, Local key, Contrast key, and Panel Lock key.
- Recalls all the status and settings, except for contrast adjustment.
- Allows the GPIB address to be set from the panel.
- Raises interrupts and launches serial polls (GPIB).
- Allows uses of the interface to be chosen from the panel.
- Works in conjunction with an external controller or any other measuring instrument to build an automatic measurement system.

4.2 System Atization

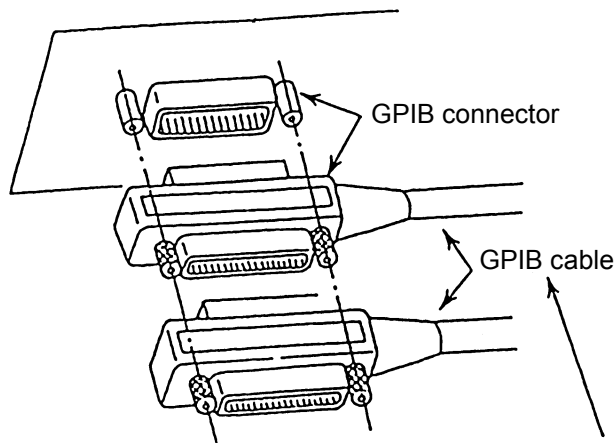
4.2.1 Connecting devices by a GPIB cable

Connect the GPIB connector on the rear panel of this equipment to the GPIB connector of an external device with a GPIB cable.

Note:

Be sure to connect the GPIB cable before turning the equipment power on.

Up to 15 devices, including the controller, can be connected to one system. Connect devices as shown below.



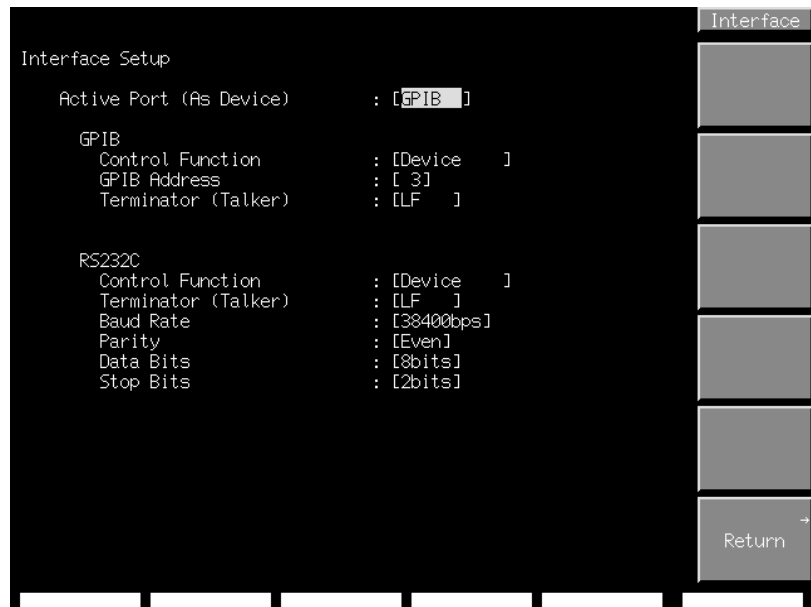
Total cable length: Up to 20 m

Cable length between devices: Up to 4 m

Number of devices that can be connected: Up to 15

Set Up GPIB Interface Conditions

Press **Config**, then **F3** (Interface Setup) to open the interface setup screen. GPIB interface conditions can be set up on this screen. To set up GPIB interface conditions, follow these steps:

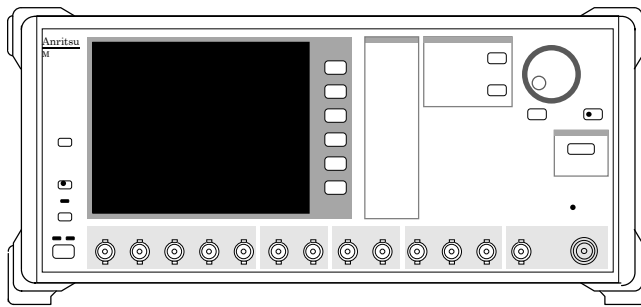


- <1> Active Port
Set "GPIB".
- <2> Control Function
Set "Device".
- <3> GPIB Address
Set an optional address.
GPIB Address: 0 to 30
- <4> Terminator (Talker)
Set a terminator as a talker.
Terminator: LF, CR/LF

4.2.2 Example of System Atization with GPIB

Host computer control

When this instrument and the wave analyzer (e.g. MS8608A Digital Mobile Radio Transmitter Tester) are controlled from a host computer via GPIB, a performance test system can be configured.



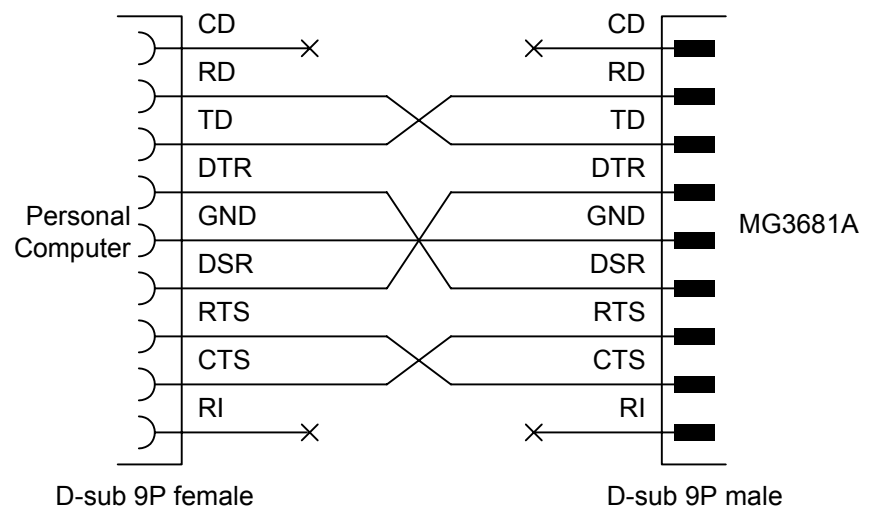
4.2.3 Connecting devices by a RS-232C cable

Connect the RS-232C connector at rear panel of the MG3681A to the RS-232C connector of the external device using a RS-232C cross cable.

Note:

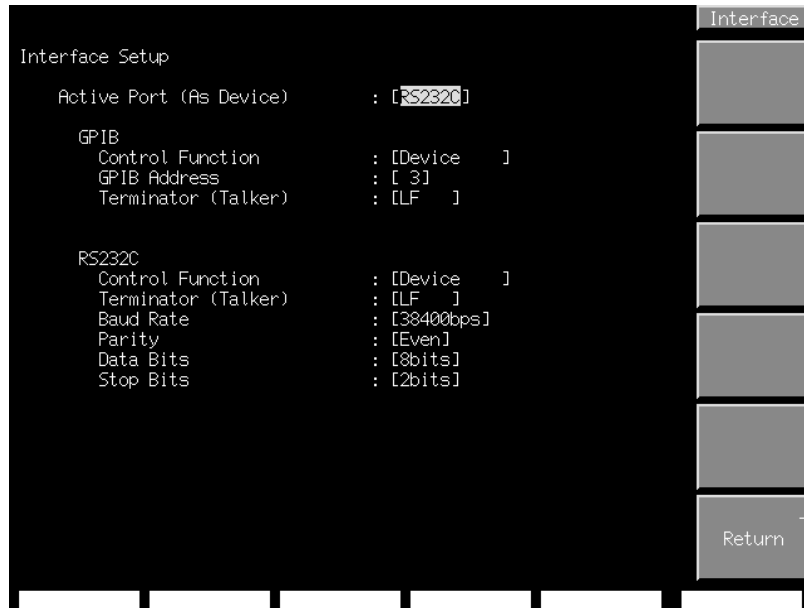
The connection of the RS-232C cable must be performed before turning on the power of the MG3681A.

- Connection to the IBM PC/AT compatible PC.



Set Up RS-232C Interface Conditions

Press **Config**, then **F3** (Interface Setup) to open the interface setup screen. RS-232C interface conditions can be set up on this screen. To set up RS-232C interface conditions, follow these steps:



- <1> Active Port
Set "RS-232C".
- <2> Control Function
Set "Device".
- <3> Terminator (Talker)
Set a terminator as a talker.
Terminator: LF, CR/LF
- <4> Baud Rate
Set a baud rate.
Baud Rate: 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps
- <5> Parity
Set a parity bit.
Parity: Even, Odd, Off
- <6> Data Bits
Set a data bit length.
Data bits: 7 bits, 8 bits
- <7> Stop Bits
Set a stop bit.
Stop bits: 1 bit, 2 bits

4.3 Initialization

IEEE488.2 classifies the process of initializing a GPIB system into three levels and defines them as bus initialization, message exchange initialization, and device initialization. It also requires the devices to be initialized to predefined status when they are powered on. Details are given in the table below.

Level	Kind of initialization	Summary	Level combination and sequence
1	Bus initialization	Initializes the interface functions of all the devices connected to the bus by issuing an IFC message from the controller.	Can be used with other levels, but level 1 initialization must be executed before level 2 initialization.
2	Message exchange initialization	Initializes message exchanges on all devices on the GPIB interface with GPIB bus command DCL (Device Clear) or on a selected device with GPIB bus command SDC (Selected Device Clear) and disables the function of reporting of the end of operations to the controller.	Can be used with other levels, but level 2 initialization must be executed before level 3 initialization.
3	Device initialization	*Resets a selected device on the GPIB interface to the status specific to that device, regardless of its past usage with the *RST command.	Can be used with other levels, but level 3 initialization must be executed before level 1 and 2 initializations.

The discussions below focus on the commands used to execute level 1, 2, and 3 initializations and the resulting items initialized and the known status to which devices are initialized when powered on.

4.3.1 Initializing the bus with IFC commands

Explanation

IFC commands initialize the interface functions of all the devices connected to the GPIB bus line. Initialization of the interface functions is used for initializing the status (talker, listener, etc.) of the interface functions of the devices that have been configured by the controller. In the table below, the functions marked by ○ are initialized in their entirety; the functions marked by △ are initialized in part.

No	Function	Symbol	IFC initialization
1	Source handshaking	SH	○
2	Acceptor handshaking	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	○

The initialization of the device by IFC commands does not affect the operation status of the devices (such as frequency setting and lamp on/off states).

Use example

Use examples depend on the computer and the program being run. Refer to the relevant users documentation.

4.3.2 Initializing message exchanges with DCL and SDC bus commands

Explanation Initializes message exchanges on all devices on the GPIB interface having a specified select code or on a selected device.

Items of message exchanges that are initialized

When this instrument receives DCL and SDC bus commands, it carries out the following functions:

- <1> Input buffer and output queue: Cleared, along with the MAV bit.
- <2> Parser, executive, and response generator Reset.
- <3> Device commands containing *RST All commands that interfere with the execution of these commands are cleared.
- <4> *OPC command processing Devices are put into the OCIS (Operation Complete Command Idle State) state. The Operation Complete bit cannot be set in the Standard Event Status register as a consequence.
- <5> *OPC? query processing Devices are put into the OQIS (Operation Complete Query Idle State) state. The Operation Complete bit can be set to 1 in the output queue as a consequence.
- <6> Device function All portions pertaining to message exchanges are kept idle. The device continues to wait for messages from the controller.

Use example Use examples depend on the computer and the program being run. Refer to the relevant users documentation.

Note:

The execution of DCL and SDC bus commands does not affect the following:

- Current device settings and data that has been saved
- Front panel status
- Status of status bytes other than the MAV bit
- Ongoing operations of devices

4.3.3 Initializing devices with the *RST command

Format *RST

Explanation One of the IEEE488.2 common commands, the *RST (Reset) command gives Level 3 initialization to a device.
The *RST (Reset) command is used to initialize the device (this instrument) to a pre-defined status.

Note:

The execution of the *RST command does not affect the followings:

- IEEE488.1 interface status
- Device address (this instrument's GPIB address)
- Output queue
- Service Request Enable register
- Standard Event Status Enable register
- Power-on-Status-Clear flag
- Calibration data affecting specifications of the device (this instrument).
- Setup parameters pertaining, for example, to the control of external equipment

Application example Use examples depend on the computer and the program being run. Refer to the relevant users documentation.

4.3.4 Status in which the device (this instrument) goes into when powered on

The device (this instrument), when powered on, goes into the following status:

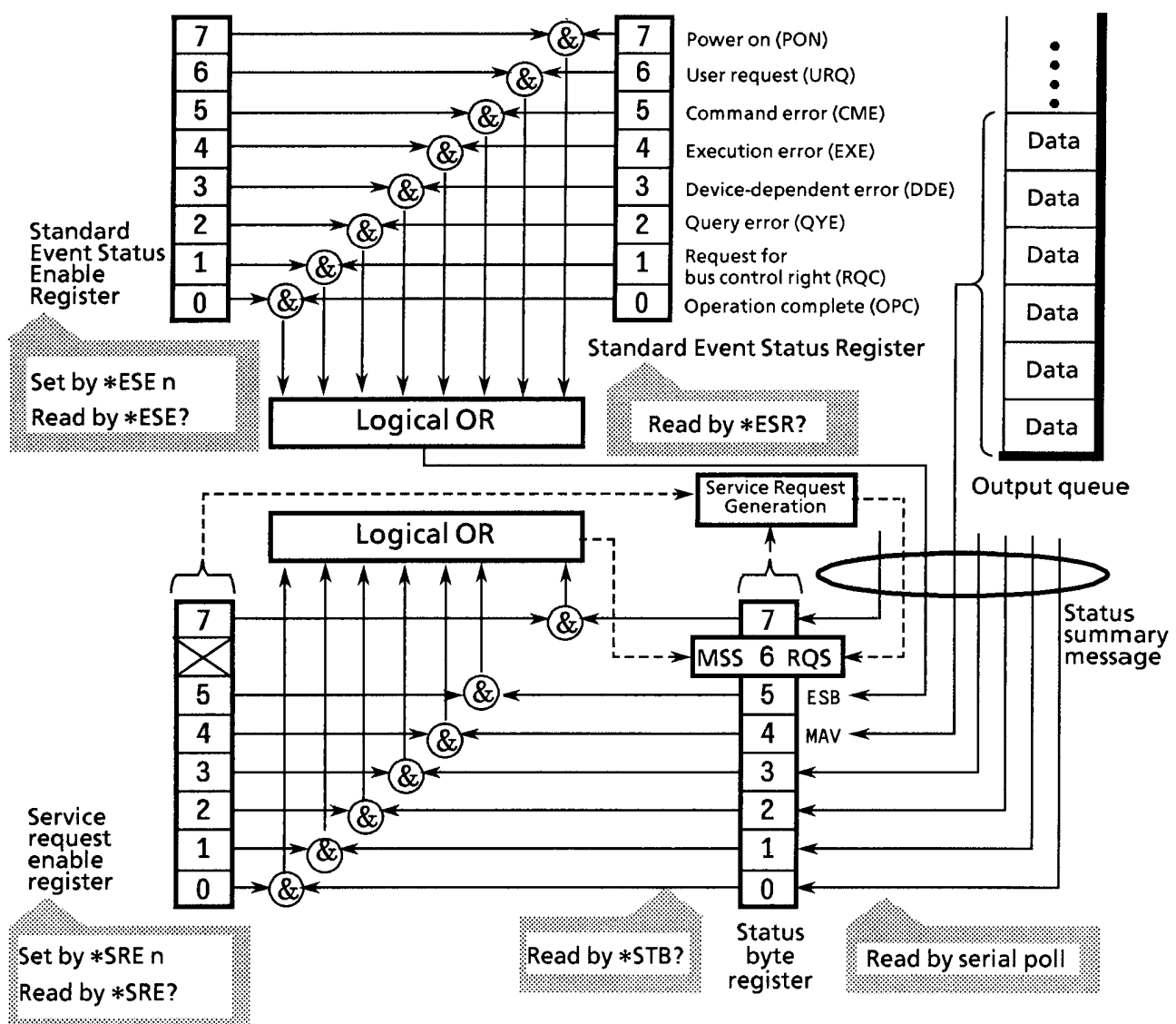
- <1> The device is set in the status in which it was when it was last turned off. The device, however, is reset to its defaults (see Appendix C) when it is turned on while holding down on the front panel.
- <2> The input buffer and output queue are cleared.
- <3> The parser, executive, and response generator are reset.
- <4> The device is put into the OCIS (Operation Complete Command Idle State) state.
- <5> The device is put into the OQIS (Operation Complete Query Idle State) state.
- <6> The standard Event Status register and the Standard Event Status Enable register are cleared. Events are recorded after they are cleared.

4.4 Status Structure

The status byte (STB) that is transmitted to the controller is based on the specifications of IEEE488.1. Its component bits are called a “status summary message” and provide a summary description of the current data stored in the registers and queues.

4.4.1 IEEE488.2 standard status model

The standard model in the status structure defined by IEEE488.2 is shown below.



4.4 Status Structure

In the status model, an IEEE488.1 status byte is used as the lowest-level status, which consists of seven summary message bits that are supplied from an upper status structure. The status data structure is organized into a register model and a queue model to generate these summary message bits.

Register model	Queue model
A set of registers used to keep a record of the events and conditions that have been encountered in the device. Its structure is built of an Event Status register and an Event Status Enable register. If their AND operation results in non-zero, the corresponding bit of the status byte is set to 1; otherwise, it is set to 0. If their OR operation results in 1, the corresponding summary bit is set to 1; otherwise, it is set to 0.	A queue used to keep a sequential record of status or information. In the queue structure, a bit is set to 1 only if data exists at the corresponding position in the queue; otherwise, a bit is 0.

On the basis of the register model and the queue model thus explained, the standard model in the IEEE488.2 status data structure is assembled of two kinds of register models and one queue model.

<1> Standard Event Status register and Event Status Enable register

<2> Status Byte register and Standard Event Enable register Output queue

Standard Event Status register	Status Byte Register	Output Queue
The Standard Event Status register is structured in the register model described above. Among all the events that the device may encounter, this register holds bits that represent eight kinds of standard events: <1> power-on, <2> user request, <3> command error, <4> execution error, <5> device-dependent error, <6> query error, <7> bus control request, and <8> operation complete. Bit 6 (DIO6) of the Status Byte Register works as an OR output bit to report an Event Summary Bit (ESB) summary message.	The Status Byte register holds an RQS bit seven summary message bits from the status data structure. Bit 6 (DIO7) of the Service Request Enable register is system-reserved as an RQS bit to report a service request to the external controller. The mechanism of this SRQ conforms to the specifications of IEEE488.1	The Output Queue is structured in the queue model described above. Bit 4 (DIO5) of the Status Byte Register works as a Message Available (MAV) summary message to report the availability of data in the output buffer.

4.4.2 Status Byte (STB) register

The STB register consists of an STB device and an RQS (or MSS) message.

ESB and MAV summary messages

The ESB and MAV summary messages are described below.

ESB summary message

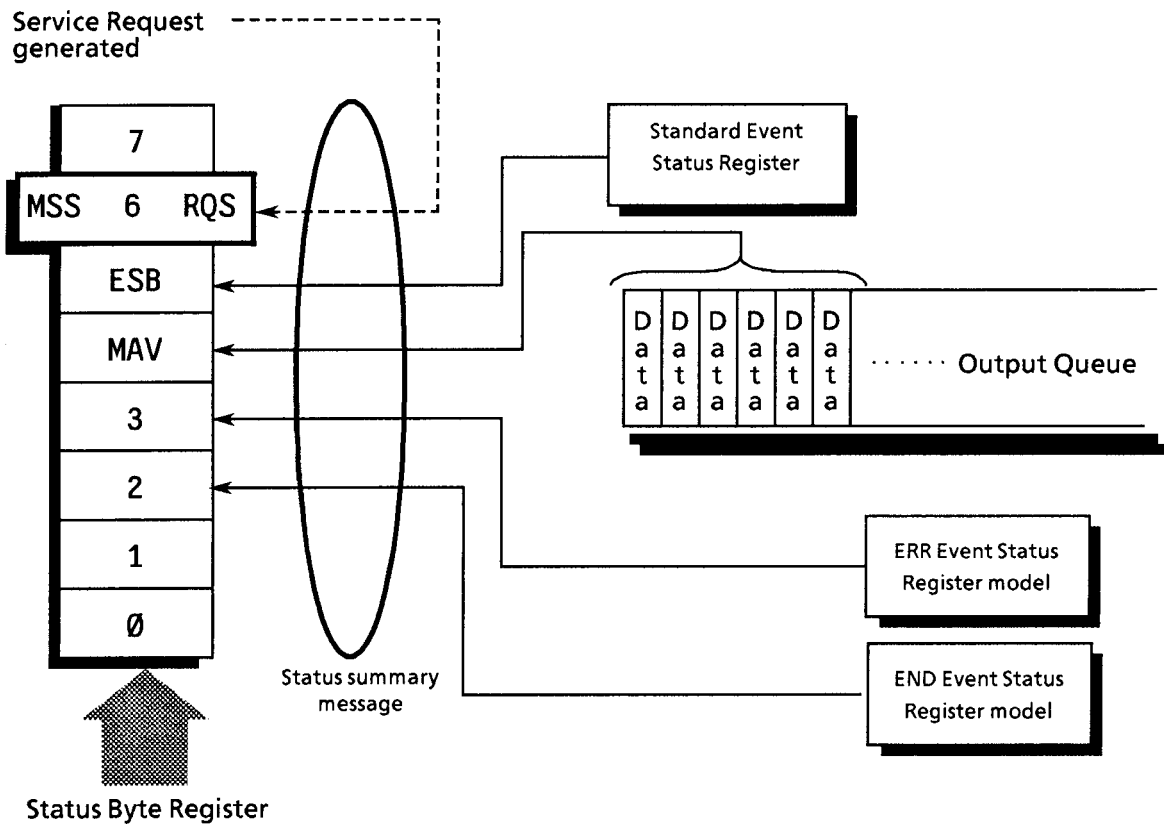
The ESB (Event Summary Bit) summary message is a message defined by IEEE488.2. It is reported by STB register bit 5. The ESB summary message is set to 1 when any one of the bits registered in the Standard Event Status register is set to 1 where event occurrence is enabled. The ESB summary bit is in turn set to 0 when none of the events registered in the Status Event Status register occur where event occurrence is enabled.

MAV summary message

The MAV (Message Available) summary message is a message defined by IEEE488.2. It is reported by STB register bit 4. This bit indicates whether the output queue is empty or not. It is used by the device to synchronize message exchanges with the controller. For example, the controller might transmit a query command to the device and wait for MAV to be set to 1. If reading from the output queue is begun without first checking MAV, all system bus actions are deferred until the device responds.

4.4.3 Device-dependent summary messages

Bit 0, bit 1, and bit 7 are not used in this instrument, but bits 2 and 3 are used as Event Status register summary bits. The Status Byte register is described below.



4.4.4 Reading from and clearing the STB register

The STB register is read from by serial polling or by using an *STB? query. Either way, an STB message as defined by IEEE488.1 is read, but the value that is transmitted to bit 6 (position) varies with each method used. The STB register can be cleared using the *CLS command.

Use Serial Polling to Read from the STB Register

If serial polling is implemented under IEEE488.1, a 7-bit status byte and an RQS message bit based on IEEE488.1 are returned. Serial polling does not alter the value of the status byte. The device will set the RQS message bit to 0 immediately on polling.

Use an *STB Common Query to Read from the STB Register

Issuing an *STB common query causes the device to transmit a response message, in the integer format, comprising the MSS (Master Summary Status) message in the STB register. Hence, a response to *STB? matches one to serial polling, except that an MSS summary message appears at the bit 6 position, instead of an RQS message.

Define *MSS (Master Summary Status)

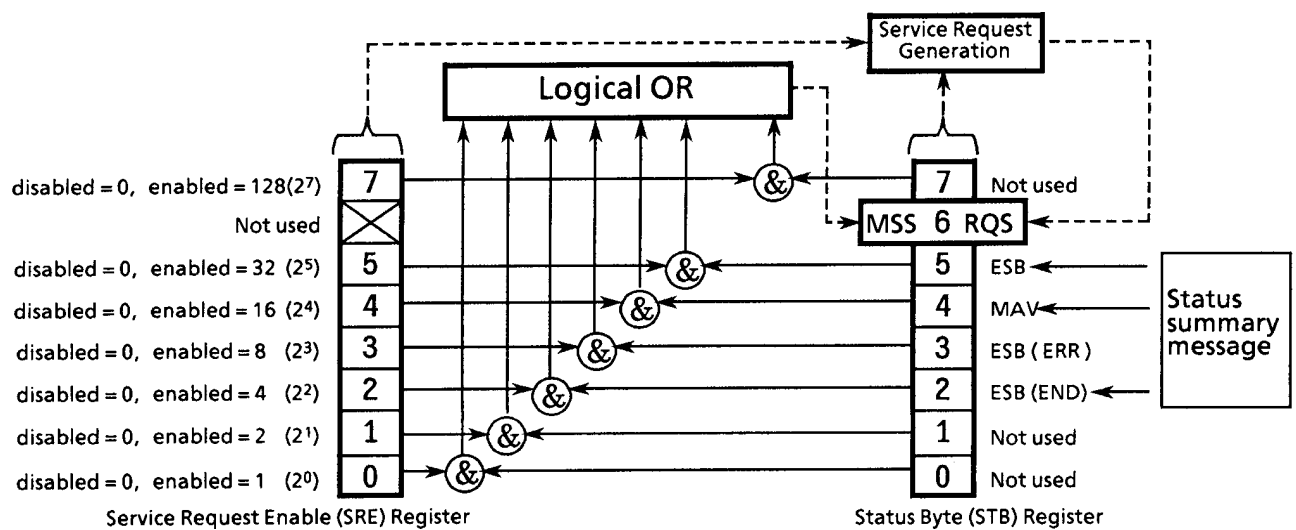
The MSS message indicates that the device has at least one service request condition. The MSS message appears at the bit 6 position as a device response to an *STB query, but not as a response to serial polling. It must not be viewed as part of the IEEE488.1 status byte. MSS is built by totally ORing the bits of the STB register and the SRQ Enable (SRE) register with one another.

Use the *CLS Common Command to Clear the STB Register

The *CLS common command clears the entire status structure and also summary messages responding to it. The execution of *CLS does not affect the settings of the enable registers.

4.4.5 Service request (SRQ) enable operation

Bits 0 to 7 of the Service Request Enable (SRE) register control whether the corresponding bits of the STB register will generate an SRQ or not. The SRB register bits are associated with the STB register bits. If the STB register bit associated with a SRE register bit that is 1 is set to 1, the device sets the RQS bit to 1, issuing a service request to the controller.



Read from the SRE register

The SRE register is read from using an *SRE? common query. A response message to this query is given as an integer between 0 and 255, equaling the sum of the values of the SRE register bits.

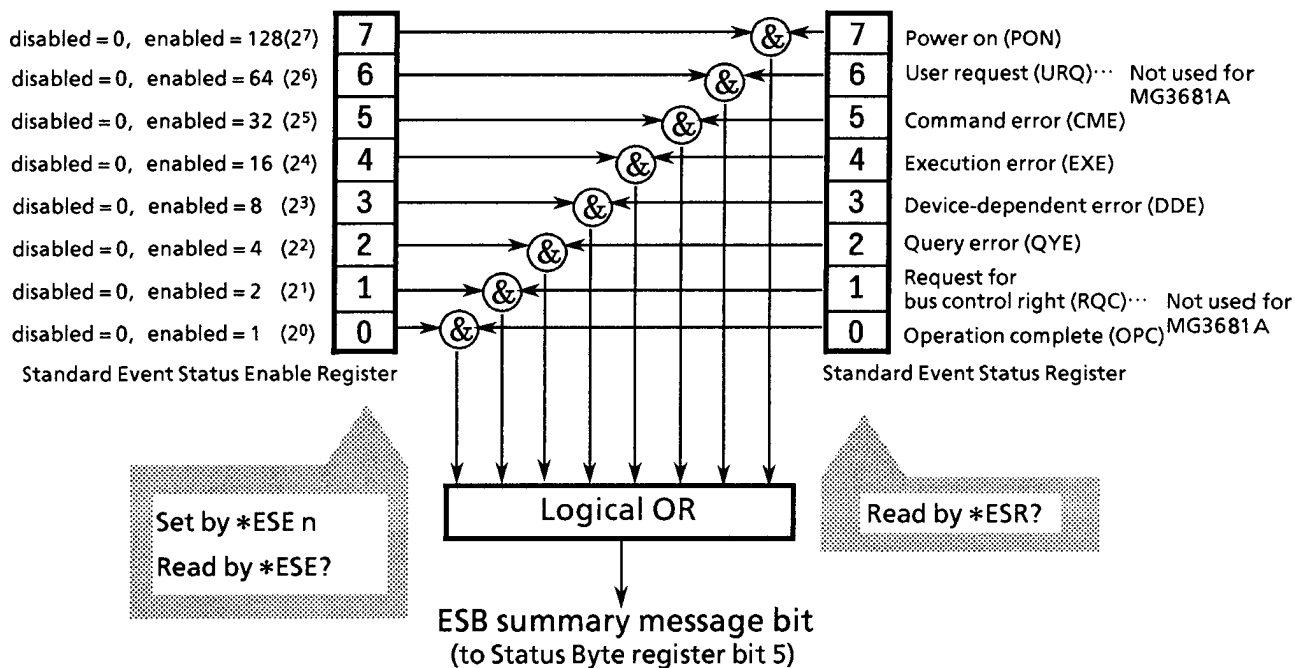
Update the SRE register

The SRE register is written to using an *SRE common command with an integer between 0 and 255 as a parameter and with the SRE register bits being set to 0 or 1. The value of bit 6 is ignored.

4.4.6 Standard Event Status register

Bit definitions of the Standard Event Status register

The operations of the Standard Event Status register are shown below.



The Standard Event Status Enable (ESE) register specifies which bit of the Event Status register will cause a summary message to become true when it is set.

bit	Event name	Explanation
7	Power-on (PON)	Power transition from Off to On
6	Not used	—
5	Command error (CME)	Illegal program message or misspelled command received
4	Execution error (EXE)	Legal yet unexecutable program message received
3	Device-dependent error (DDE)	Error caused by a condition other than CME, EXE, and QYE (such as a parameter error)
2	Query error (QYE)	Attempt to read data from the output queue when it is empty or queued data lost before it is read
1	Not used	—
0	Operation complete (OPC)	Set to 1 when this instrument has processed the *OPC command.

Reading from, Writing to, and Clearing the Standard Event Status register

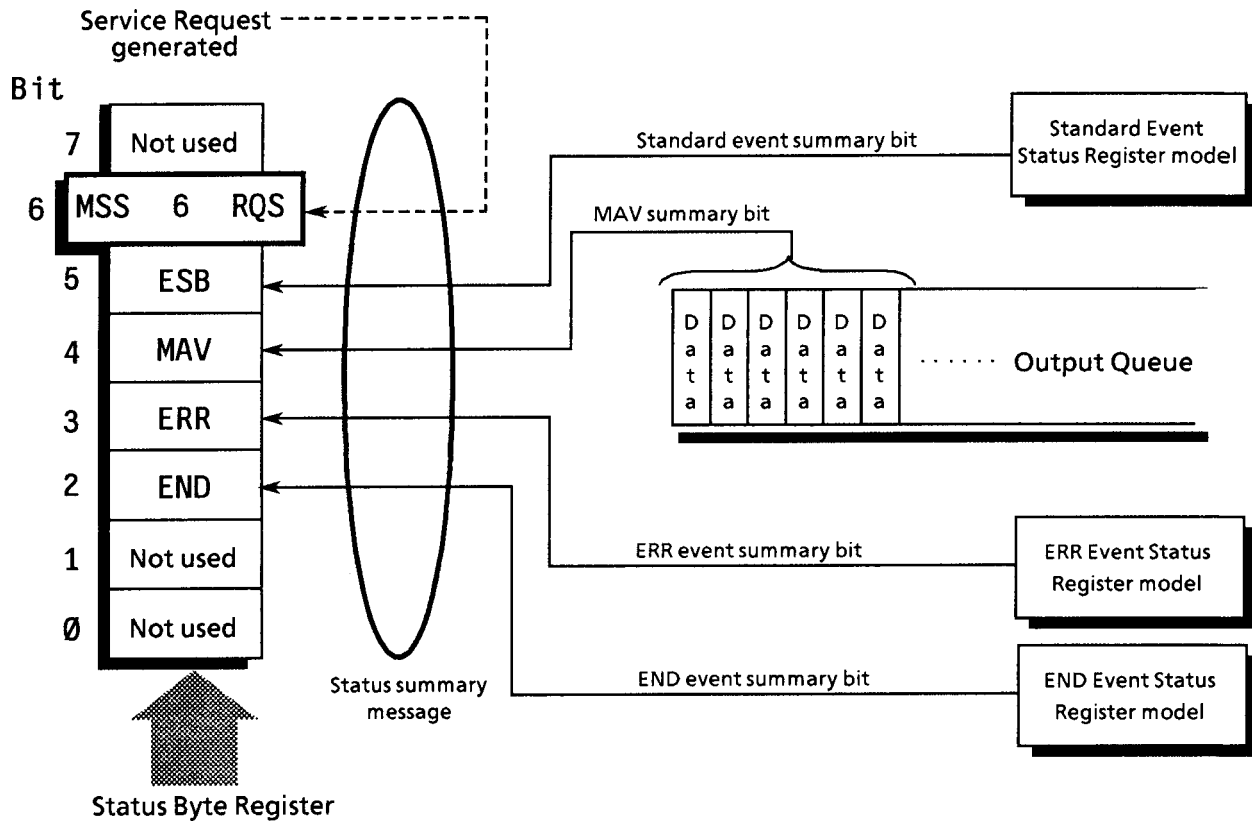
Read	This register is read from using an *ESR? common query. It is cleared when read from. A response message is given as a binary-weighted sum of the event bits to a decimal integer.
Write	Except for clear, this register cannot be written externally.
Clear	This register is cleared when: <1> The *CLS command is received. <2> The power is turned on (bit 7 is turned on, with all other bits being cleared to 0). <3> An event is read in response to an *ESR? query command.

Reading from, Writing to, and Clearing the Standard Event Status Enable register

Read	This register is read from using an *ESE? common query. A response message is given as a binary-weighted sum of the event bits to a decimal integer.
Write	This register is written to using an *ESE common command.
Clear	<1> An *ESE command with a data value of 0 is received. <2> The power is turned on. The contents of the Standard Event Status Enable register are not affected by the following: <1> IEEE488.1 device clear function state changes <2> Receipt of an *RST common command <3> Receipt of a *CLS common command

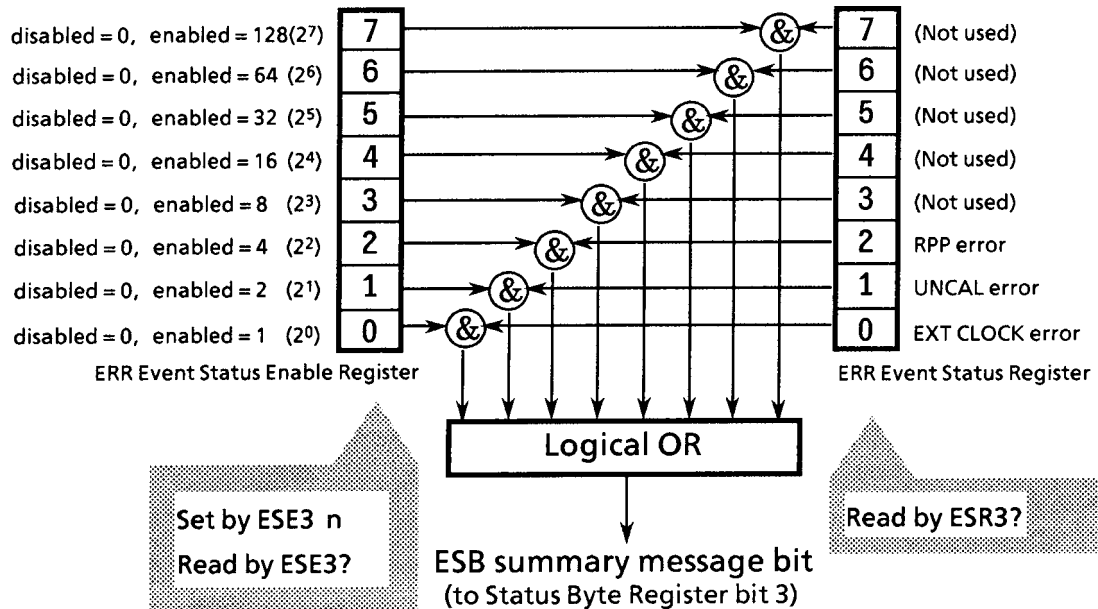
4.4.7 Extended Event Status register

This instrument has bit 1, bit 2, and bit 7 unused and has bits 2 and 3 assigned as an END and an ERR summary bit for use as status summary bits that are available from the extended register model.



ERR Event Status register bit definitions

The operations of the ERR Event Status register are shown below.

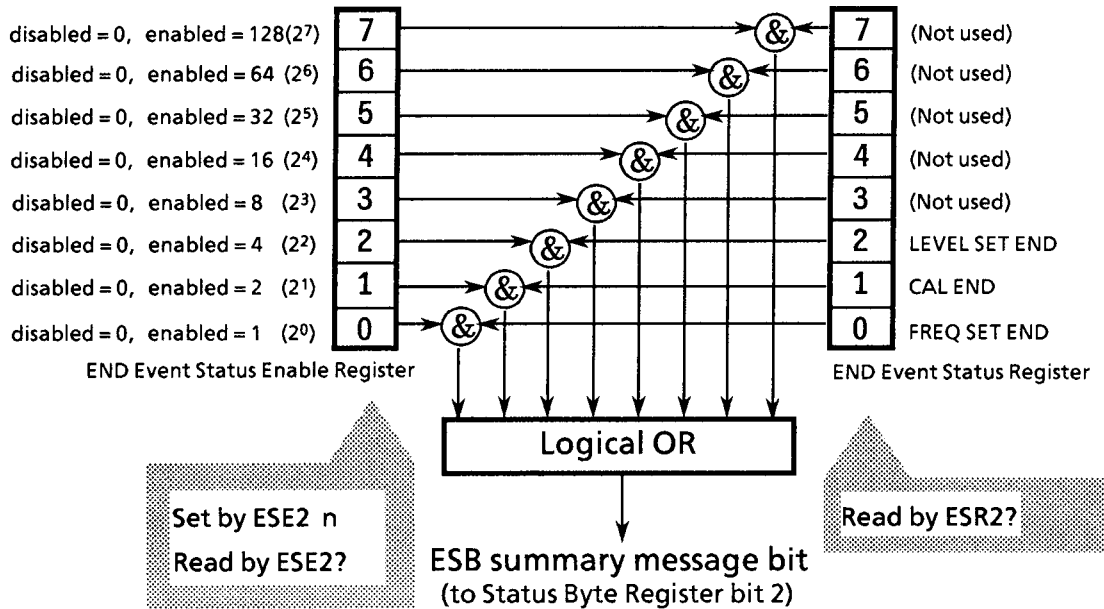


The ERR Event Status Enable register specifies which bit of the Event Status register will cause a summary message to become true when it is set.

bit	Event name	Explanation
7	Not used	Not used
6	Not used	Not used
5	Download error	Set to 1 when a download of system or other data has failed.
4	Not used	Not used
3	PLL Unlock error	Set to 1 when a hardware error (PLL Unlock) is detected.
2	RPP	Set to 1 when the reverse power relay is tripped.
1	UNCAL error	Set to 1 when the output level is set to UNCAL.
0	External clock error	Set to 1 when the external modulation clock input signal is no longer valid.

END Event Status register bit definitions

The operations of the END Event Status register are shown below.



The END Event Status Enable register specifies which bit of the Event Status register will cause a summary message to become true when it is set.

bit	Event name	Explanation
7	Not used	Not used
6	Not used	Not used
5	Download end	Set to 1 when a download of system or other data has ended.
4	BPM sweep end	Set to 1 when a BMP sweep has ended.
3	Not used	Not used
2	Level setting end (LEVEL SET END)	Set to 1 when level setting has ended.
1	Level CAL end (CAL END)	Set to 1 when level CAL has ended.
0	Frequency setting end (FREQ SET END)	Set to 1 when frequency setting has ended.

Reading from, Writing to, and Clearing the Extended Event Status register

Read	This register is read from using an ESR2? or *ESR3? common query. It is cleared when read from. A response message is given as a binary-weighted sum of the event bits to a decimal integer.
Write	This register cannot be written to externally except that it is cleared.
Clear	This register is cleared when: <1> The *CLS command is received. <2> The power is turned on. <3> An event is read in response to an *ESR? query command.

Reading from, Writing to, and Clearing the Extended Event Status Enable register

Read	This register is read from using an ESE2? or ESE3? query. A response message is given as a binary-weighted sum of the event bits to a decimal integer.
Write	This register is written to using an *ESE2 or ESE3 program command. Since register bits 0 to 7 are weighted to 1, 2, 4, 8, 16, 32, 64, and 128, respectively, write data is transmitted in the form of an integer representing a sum total of the desired bit digits.
Clear	This register is cleared when: <1> An ESE2 or ESE3 program command with a data value of 0 is received. <2> The power is turned on. The contents of the Extended Event Status Enable register are not affected by the following: <1> IEEE488.1 device clear function state changes <2> Receipt of an *RST common command <3> Receipt of a *CLS common command

4.4.8 Synchronizing This Instrument with the Controller

Because this instrument handles specified program messages each as a sequential command (completing each command before proceeding to process the next), one-to-one synchronization between this instrument and the controller does not require special consideration.

In order for the controller to be able to control multiple devices while keeping them synchronized, it is necessary to let the instrument complete all the commands that have been given to it before transmitting commands to other devices.

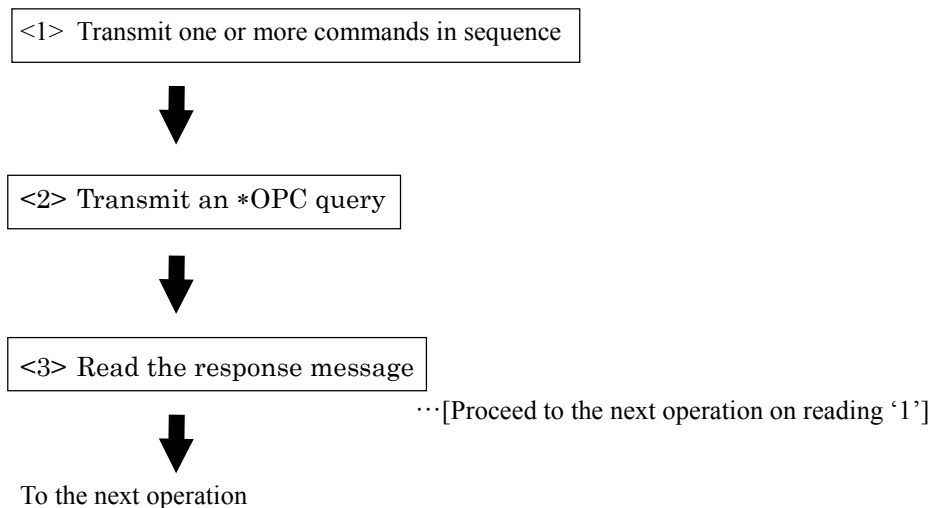
There are two ways to achieve synchronism between this instrument and the controller as follows:

- <1> *OPC query response wait
- <2> *OPC SRQ interrupt wait

*OPC Query Response Wait

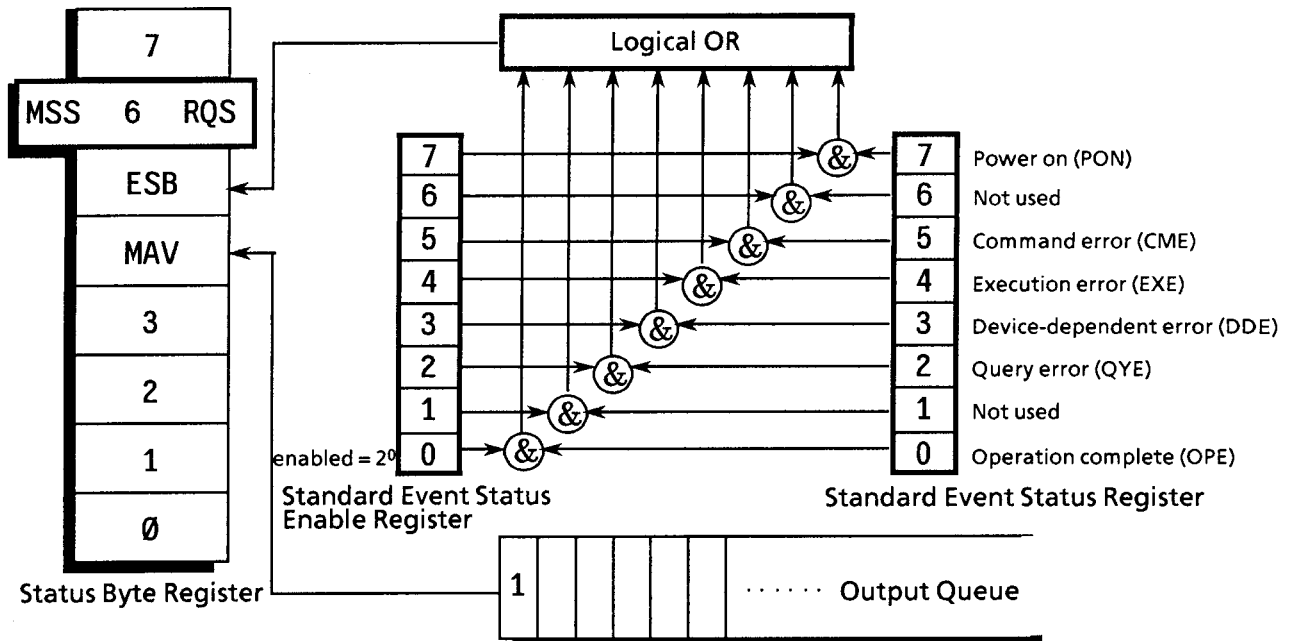
This instrument generates '1' as a response message when it has executed an *OPC query. The controller achieves synchronism by waiting for the arrival of this response message.

Controller program



***OPC Service Request Wait**

This instrument sets the Operation complete bit (bit 0) of the Standard Event Status register when it has executed an *OPC command. The controller achieves synchronism by waiting for the arrival of an SRQ interrupt.



Controller program

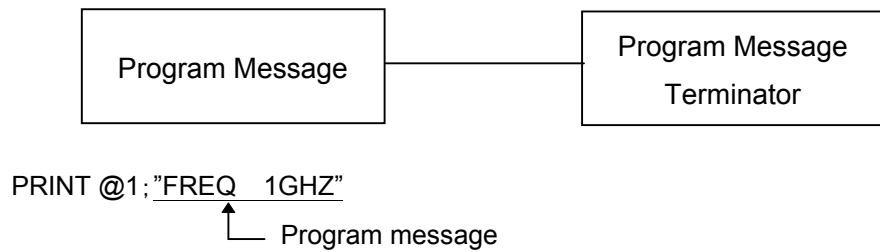
- <1> Set bit 2⁰ of the Standard Event Status Enable register to Enable.
- ↓
- <2> Set bit 2⁵ of the Service Request Enable register to Enable.
- ↓
- <3> Let the device (this instrument) execute a specified operation.
- ↓
- <4> Transmit an *OPC command.
- ↓
- <5> Wait for an SRQ interrupt to occur (ESB summary message)

4.5 Device Message Details

4.5.1 Program message formats

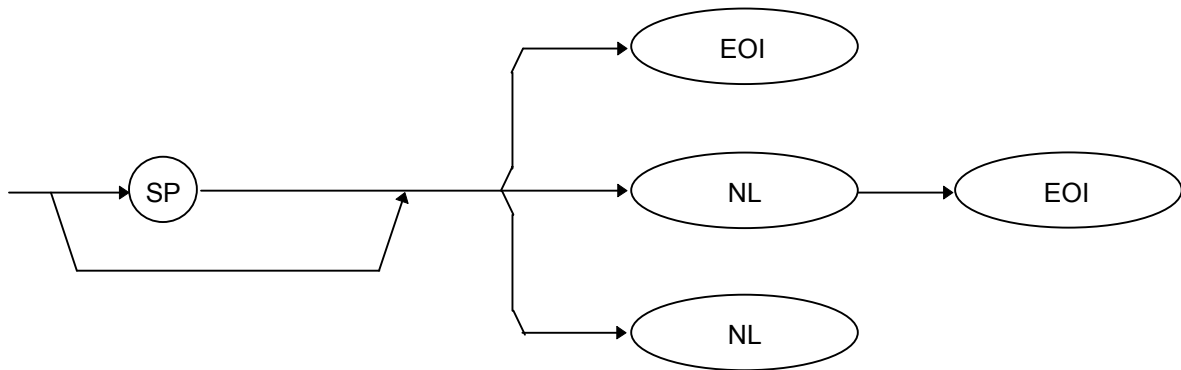
Among all device messages, those that are transmitted from the controller to this instrument are called “program messages”. Program messages fall into two groups: program commands (commands), which set or specify instrument parameters, and program queries (queries), which request for parameters and measurement results.

An example of transmitting a program message from a controller program to this instrument with a PRINT or any other statement is shown below.



A program message, when transmitted from the controller to this instrument, is terminated by a specified terminator.

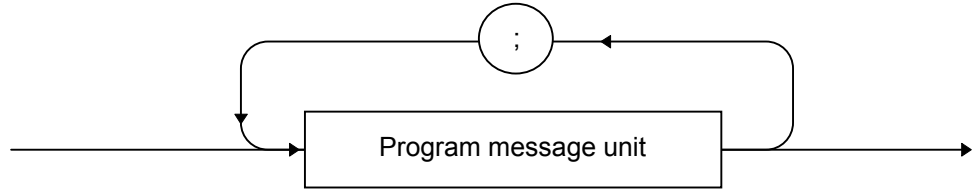
Program Message Terminator



NL: New Line, also called Line Feed (LF).

CR (Carriage Return) is ignored without being processed as a terminator.

Program Message

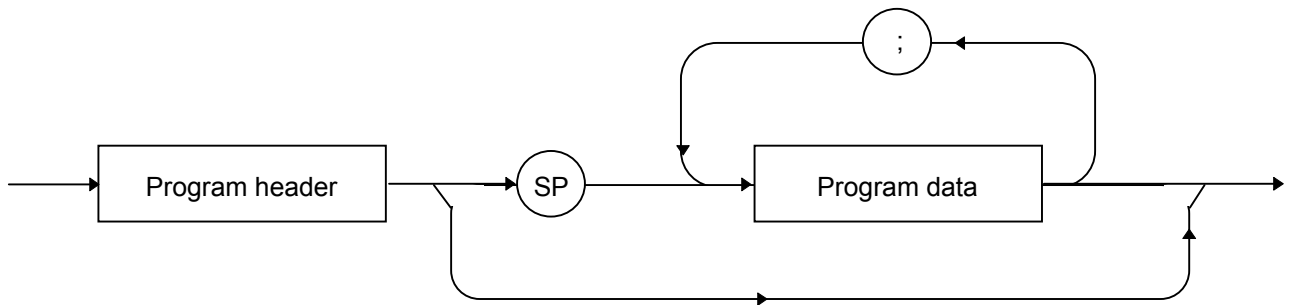


<Example>

```
PRINT @1; "FREQ 1GHZ; OVLV 0DBM"
```

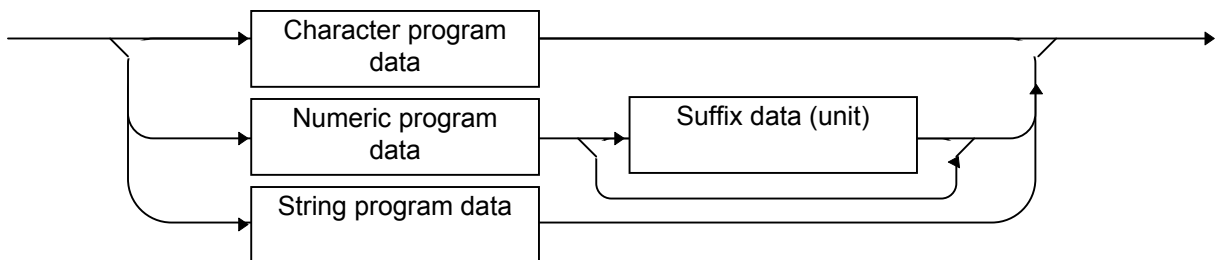
Multiple commands can be transmitted separately by separating them with semicolons (;).

Program Message Unit



The program header of each IEEE488.2 common command begins with an asterisk (*). The program header of each program query (query) generally ends with a question mark (?).

Program Data



Character Program Data

Defined strings of data are composed of any of the alphabetical lower case and upper case characters A to Z, the digits 0 through 9, and the underscore (_).

<Examples>

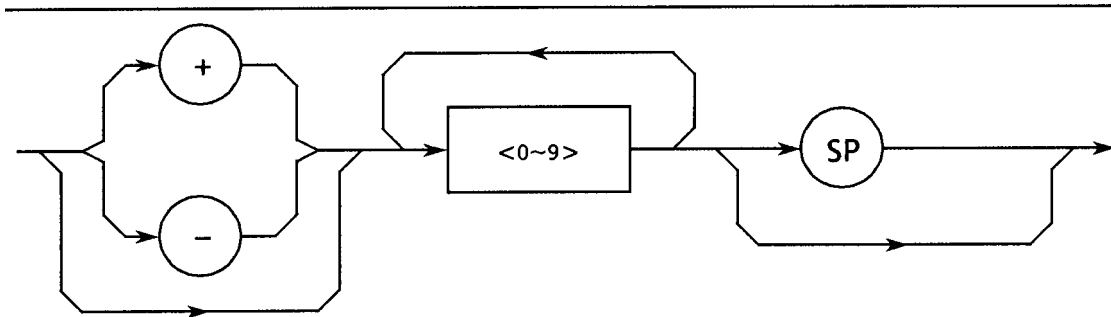
VDSPL TERM: Sets the output level voltage for display as a terminating voltage.

HEAD OFF: Attaches no header to the response message.

Numeric Program Data

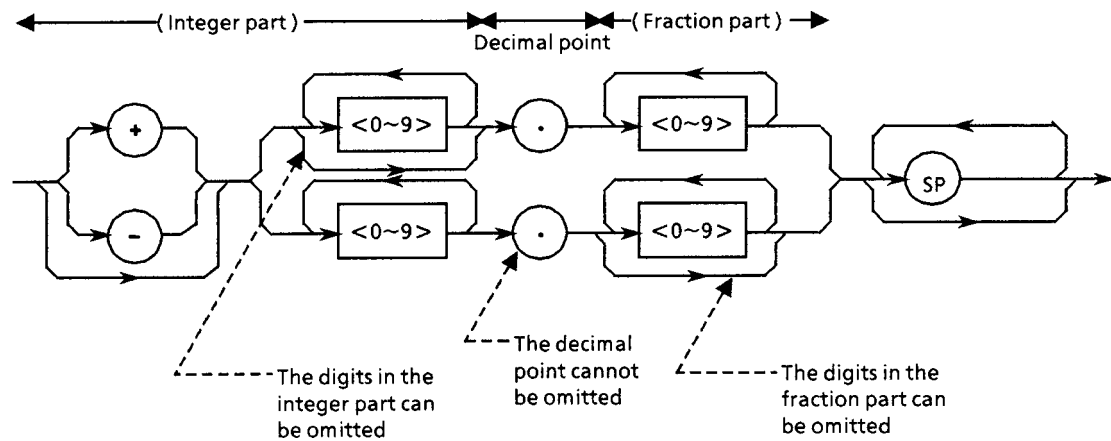
Numeric program data is grouped into four types: integral (NR1), fixed-point decimal (NR2), floating-point decimal (NR3), and hexadecimal.

Integral (NR1)



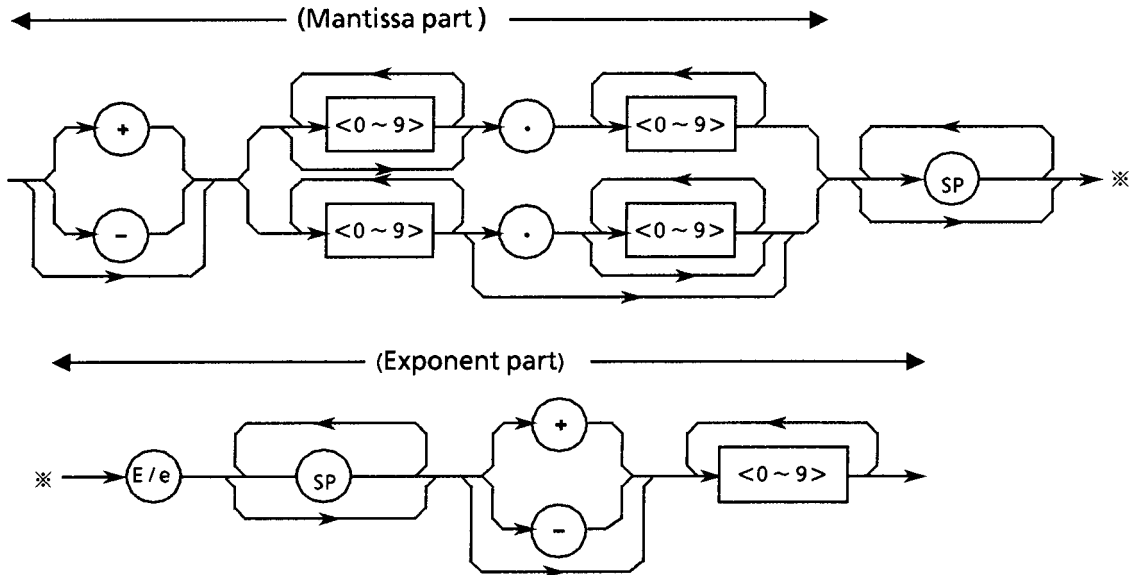
- Integral data can have leading zeros (e.g., 005, +005, -20).
- No space is allowed between a sign (+ or -) and the numeric value that follows it.
- The + sign can be omitted (e.g., 005, +005, -20).

Fixed-point decimal (NR2)



- An integer is represented in the integral part.
- No space is allowed between a digit and the decimal point that follows it.
- The + sign can be omitted.
- The digit 0 in the integral part may be omitted.
- Any number of zeros may precede the numeric value in the integral part (e.g., -0.5, +.204, -5).

Floating-point decimal (NR3)



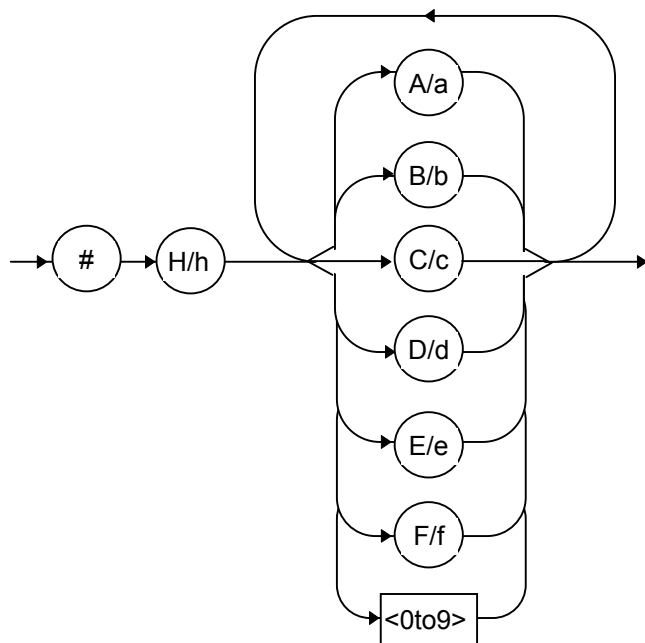
- E denotes raising to the power of 10, or the exponent part.
- Spaces are allowed both before and after, only before or only after E/e.
- A numeric value is required in the mantissa part.
- The + sign can be omitted (from both the mantissa and exponent parts).

<Examples>

-22.34E+6 → -22.34 × 10⁶ (= -22340000)

5.3e-4 → 5.3 × 10⁻⁴ (= 0.00053)

Hexadecimal Data

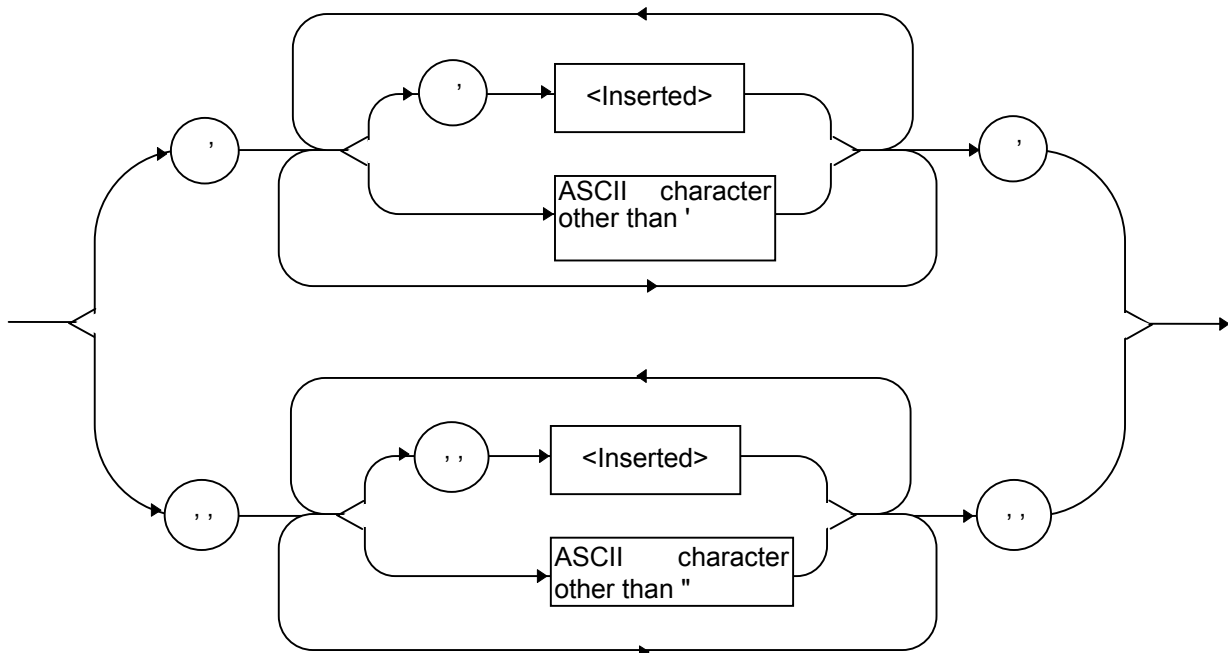


Suffix Data

The table below lists the suffixes that are used in this instrument.

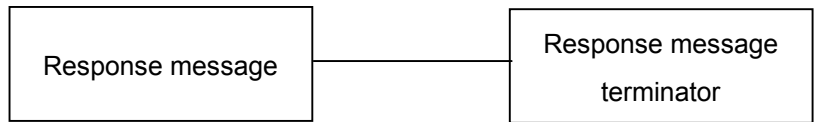
Category	Unit	Suffix code
Frequency	GHz	GHZ, GZ
	MHz	MHZ, MZ
	kHz	KHZ, KZ
	Hz	HZ
Output level	dB	DB
	dBm	DBM
	dB μ V	DBU
	V	V
	mV	MV
	μ V	UV
	mW	MW
	aW	AW
	μ W	UW
	nW	NW
	pW	PW
	fW	FW
Deviation (angle)	rad	RAD
	deg	DEG

String Program Data

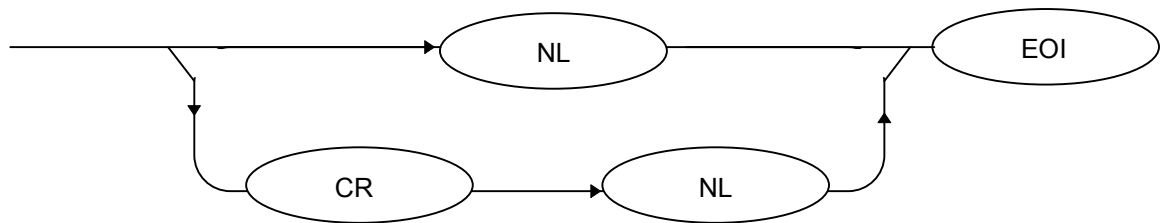


4.5.2 Response message formats

The formats in which the controller transmits response messages from this instrument by way of INPUT and other statements are described below.

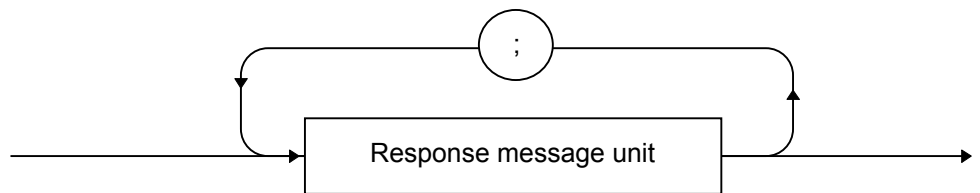


Response Message Terminator



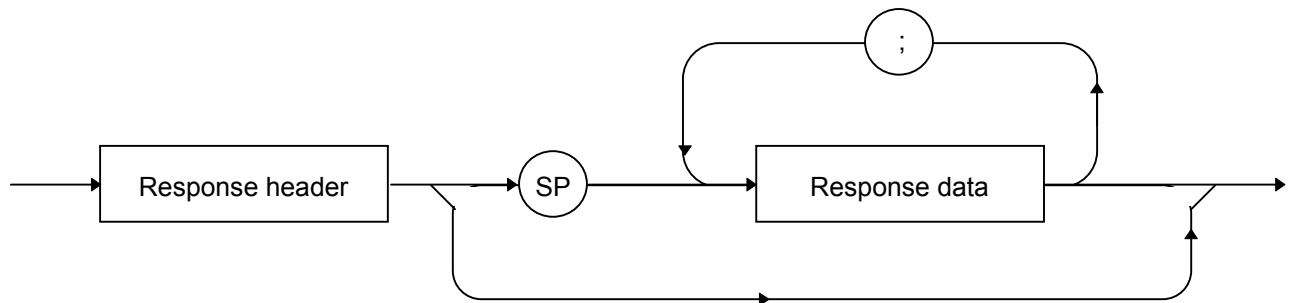
Use a TRM command to specify whether a response message or a terminator is used.

Response Message

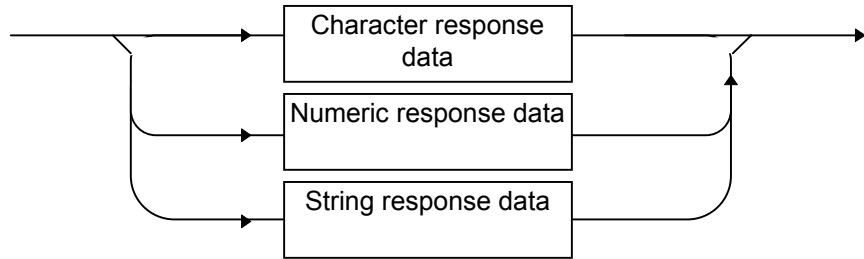


A response message is composed of one or more response message units to one or more program queries issued with one PRINT statement.

Normal Response Message Unit



Response Data

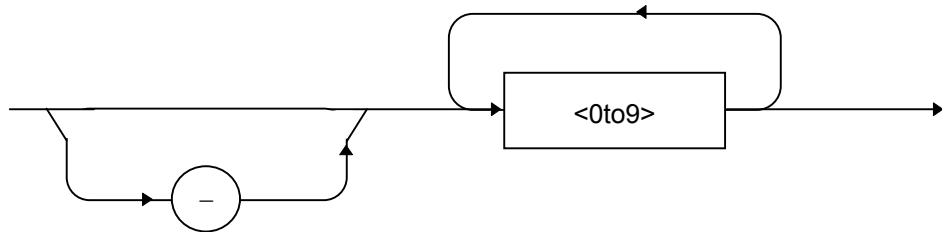


Character Response Data

Defined strings of data are composed of any of the alphabetical lower case and upper case characters A to Z, the digits 0 through 9, and the underscore (_).

Numeric Response Data

Integral (NR1)

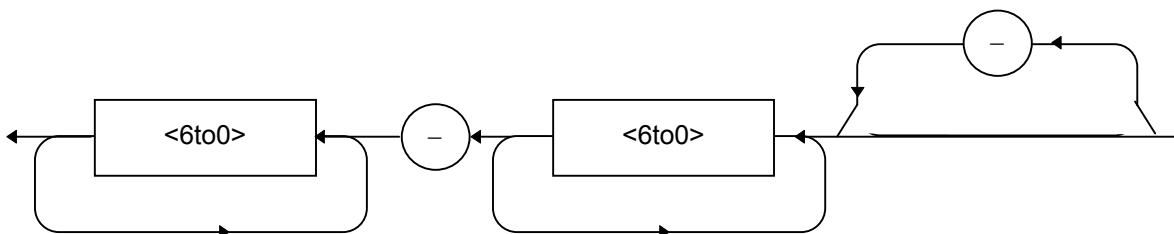


- The leading digit must be non-zero.

<Example>

123, -1234

Fixed-point decimal (NR2)

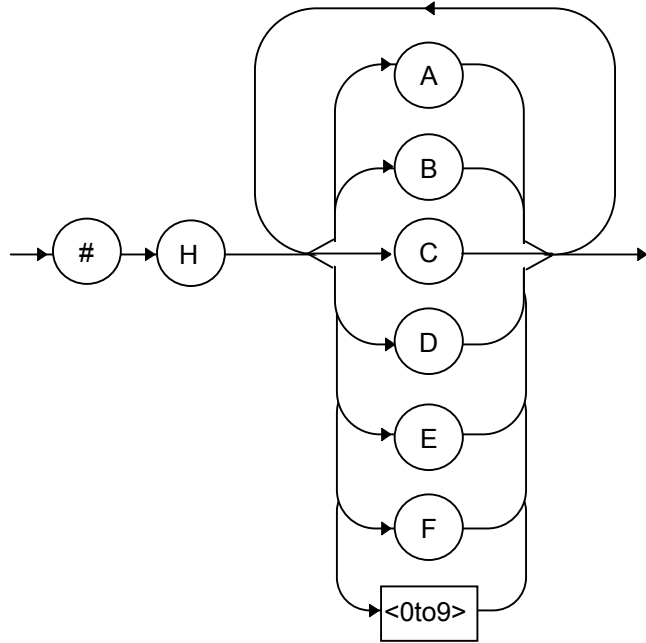


- The leading digit must be non-zero.
- A fixed-point decimal number having a value of 0 in its decimal place is outputted as an integer.

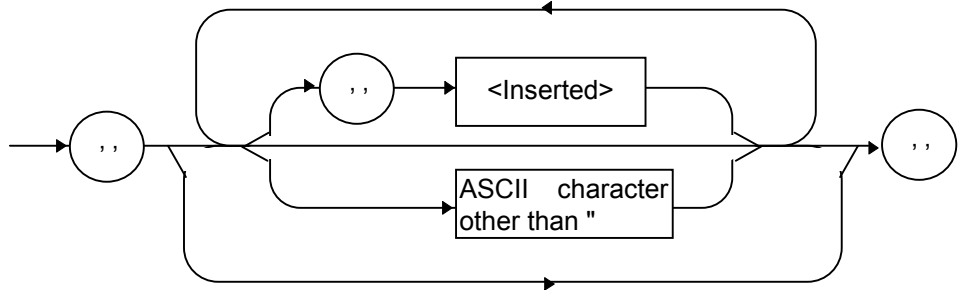
<Example>

12.34, -12.345

Hexadecimal Data



String Response Data



4.5.3 Common commands and supported commands

The table below lists the 39 kinds of common commands that are defined by the IEEE488.2 standard. The commands marked by a double circle are IEEE488.2 commands used with this instrument.

Mnemonic	Full command name	IEEE488.2 default	Supported command
*AAD	Accept Address Command	Optional	
*CAL?	Calibration Query	Optional	
*CLS	Clear Status Command	Required	⊙
*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	Required	⊙
*ESE	Standard Event Status Enable Command	Required	⊙
*ESE?	Standard Event Status Enable Query	Required	⊙
*ESR?	Standard Event Status Register Query	Optional	
*GMC?	Get Macro Contents Query	Required	⊙
*IDN?	Identification Query	Optional	
*IST	Individual Status Query	Optional	
*LMC?	Learn Macro Query	Optional	
*LRN?	Learn Device Setup Query	Required	⊙
*OPC	Operation Complete Command	Required	⊙
*OPC?	Operation Complete Query	Optional	
*OPT?	Option Identification Query	Required if not C0	⊙ (to be supported in future)
*PCB	Pass Control Back Command	Optional	
*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	
*RST	Reset Command	Required	⊙
*SAV	Save Command	Optional	
*SRE	Service Request Enable Command	Required	⊙
*SRE?	Service Request Enable Query	Required if DT1	⊙
*STB?	Read Status Byte Query	Required	⊙
*TRG	Trigger Command	Required	⊙
*TST?	Self Test Query	Required	⊙
*WAI	Wait to Continue Command	Required	⊙

Note:

All IEEE488.2 common commands begin with an asterisk (*).

4.5.4 Common commands classified by group function

The table below lists the IEEE488.2 common commands supported by this instrument as classified by group function.

Group	Group function	Mnemonic
System data	Provides information dependent on a device connected to the GPIB system (such as its manufacturer's name, type name, and serial number).	*IDN?
Internal action	Controls the internal action of a device. <1> Level 3 device reset <2> Internal device self-testing and error detection	*RST *TST?
Synchronization	Achieves synchronism between the device and controller in the following ways: <1> Service request wait <2> Device output queue response wait <3> Forced sequential execution	*OPC *OPC? *TRG *WAI
Status and event	The status byte consists of a 7-bit summary message, the individual summary bits of which are available from the Standard Event Register, the output queue, and the Extended Event register or extended queue. Three commands and four queries are supported to set, clear, enable, disable, and query these registers and the output queue.	*CLS *ESE *ESE? *ESR? *SRE *SRE? *STB?

4.5.5 Function description of common commands

The table below provides a summary of the common command functions.

Command	Function
*IDN?	Returns a character string that indicates “manufacturer's name, type name, serial number, firmware version number”
*RST	Gives Level 3 initialization to the device.
*TST?	Returns the result of an internal self-test run. Free from error: 0 Any error detected: The result of OR operation of the following values is returned in the NR1 format: Lower 8 bits of the hexadecimal representation: CPU error (FAIL reported by the self-test) Upper 8 bits of the hexadecimal representation: Base machine error (UNLOCK or any other error reported)
*OPC	Sets SESR bit 0 when the execution of the preceding instruction has ended. (This is because more than one command, including an IEEE488.2 common command, cannot be processed at the same time.)
*OPC?	Always returns 1 when the execution of the preceding instruction has ended. (This is because more than one command, including an IEEE488.2 common command, cannot be processed at the same time.)
*TRG	BPM Recall (UP): Similar to the [Step Up] key
*WAI	Defers the start of execution of an instruction until the end of the execution of the preceding instruction.
*CLS	Clears the Status Byte register.
*ESE	Sets (or clears) specified bits of the Standard Event Status Enable register.
*ESE?	Returns the current value of the Standard Event Status Enable register in the NR1 format (0 to 255).
*ESR?	Returns the current value of the Standard Event Status register.
*SRE	Sets (or clears) specified bits of the Service Request Enable register.
*SRE?	Returns the current value of the Service Status Enable register in the NR1 format.
*STB?	Returns the value of the status byte defined by IEEE488.1 in the NR1 format.

4.5.6 List of Device Messages by Function

Command and query messages

The header of a command message is expressed in uppercase letters as a reserved word. The header of a query message is ended by a question mark (?). Command and query messages may have multiple arguments delimited from one another by a comma (.). The kinds of arguments that can be used are described below.

<1> Uppercase	: Reserved word
<2> Numeric	: Reserved word
<3> Arguments in lowercase f (frequency)	: Numeric data (NR1, NR2, NR3 formats) : GHZ, GZ, MHZ, KHZ, KZ, HZ; HZ if no unit is specified.
I_1 (level) (absolute type)	: Numeric data (NR1, NR2, NR3 formats) : DB, DBM, DBU, DU, V, MV, UV, W, MW, UW, NW, PW, FW, AW; DBM if no unit is specified.
I_2 (level) (relative type)	: Numeric data (NR1, NR2, NR3 formats) : DB DB if no unit is specified.
I_3 (level) (voltage value)	: Numeric data (NR1, NR2, NR3 formats) : V, MV, UV MV if no unit is specified.
I_4 (angle value)	: Numeric data (NR1, NR2, NR3 formats) : DEG, RAD DEG if no unit is specified.
t (time)	: Numeric data (NR1, NR2 formats) : S, MS S if no unit is specified.
n (no-unit integer)	: Numeric data (NR1 format)
h (non-unit hexadecimal)	: Numeric data (hexadecimal)
s (string)	: Alphanumeric characters enclosed with “ ” or ‘ ’

Note:

With the header set to off, the header of a response message and the numeric data suffix code are not outputted.

Response Messages

A response message is a reply to an incoming query message that is returned to an external controller. A response message is represented by a mix of a response header and response data. A response message may have multiple sets of response data delimited from one another by a comma (,). The kinds of response data that can be used are described below.

<1> Uppercase	: Reserved word
<2> Numeric	: Reserved word
<3> Arguments in lowercase	:
f (Frequency)	: Numeric data (NR1 format) : HZ,
l ₁ (level) (absolute type)	: Numeric data (NR2 format) : (transmitted in the unit that has been set by the output level)
l ₂ (level) (relative type)	: Numeric data (NR2 format) : DB
l ₃ (level) (voltage value)	: Numeric data (NR2 format) : V, MV, UV
l ₄ (angle value)	: Numeric data (NR2 format) : DEG, RAD
t (time)	: Numeric data (NR1, NR2 formats)
Suffix codes	: S, MS; S if no unit is specified.
n (no-unit integer)	: Numeric data (NR1 format)
r (no-unit real)	: Numeric data (NR2 format)
h (non-unit hexadecimal)	: Numeric data (hexadecimal)

Note:

With the header set to off, the header of a response message and the numeric data suffix code are not outputted.

List of Device Messages by Function

<Frequency>

Item	Device message		
	Control item	Command message	Query message
Frequency value	FREQ f	FREQ?	FREQ f
Step up	FRS UP	—	—
Step down	FRS DN	—	—
Knob up	FRK UP	—	—
Knob down	FRK DN	—	—
Offset frequency	FOS f	FOS?	FOS f
Offset on	FOF ON	FOF?	FOF ON
Offset off	FOF OFF	FOF?	FOF OFF
Relative frequency on	FRL ON	FRL?	FRL ON
Relative frequency off	FRL OFF	FRL?	FRL OFF
Resolution digit 0.01 Hz	FRR 0.01HZ	FRR?	FRR 0.01HZ
Resolution digit 0.1 Hz	FRR 0.1HZ	FRR?	FRR 0.1HZ
Resolution digit 1 Hz	FRR 1HZ	FRR?	FRR 1HZ
Resolution digit 10 Hz	FRR 10HZ	FRR?	FRR 10HZ
Resolution digit 100 Hz	FRR 100HZ	FRR?	FRR 100HZ
Resolution digit 1 kHz	FRR 1KHZ	FRR?	FRR 1KHZ
Resolution digit 10 kHz	FRR 10KHZ	FRR?	FRR 10KHZ
Resolution digit 100 kHz	FRR 100MHZ	FRR?	FRR 100MHZ
Resolution digit 1 MHz	FRR 1MHZ	FRR?	FRR 1MHZ
Resolution digit 10 MHz	FRR 10MHZ	FRR?	FRR 10MHZ
Resolution digit 100 MHz	FRR 100MHZ	FRR?	FRR 100MHZ
Resolution digit 1 GHz	FRR 1GHZ	FRR?	FRR 1GHZ
Resolution digit move right (lower)	FRR R	—	—
Resolution digit move left (upper)	FRR L	—	—
Incremental step frequency	FIS f	FIS?	FIS f
Reference frequency at relative frequency ON	FRLR f	FRLR?	FRLR f
Relative frequency (at relative frequency ON)	FRLV f	FRLV?	FRLV f

Section 4 Remote Control

<Output Level>

Item	Device message		
	Control item	Command message	Query message
RF on	LVL ON	LVL?	LVL ON
RF off	LVL OFF	LVL?	LVL OFF
Output level	OLVL I ₁	OLVL?	OLVL I ₁
Step up	OLS UP	—	—
Step down	OLS DN	—	—
Knob up	OLK UP	—	—
Knob down	OLK DN	—	—
Select unit dBm	OLDBM	—	—
Select unit dB μ V	OLDBU	—	—
Select unit V	OLV	—	—
Select unit W	OLW	—	—
Set voltage display to EMF	VDSPL EMF	VDSPL?	VDSPL EMF
Set voltage display to TERM	VDSPL TERM	VDSPL?	VDSPL TERM
Offset output level	OOS I ₂	OOS?	OOS I ₂
Offset on	OOF ON	OOF?	OOF ON
Offset off	OOF OFF	OOF?	OOF OFF
Relative frequency on	ORL ON	ORL?	ORL ON
Relative frequency off	ORL OFF	ORL?	ORL OFF
Continuous mode on	OCNT ON	OCNT?	OCNT ON
Continuous mode off	OCNT OFF	OCNT?	OCNT OFF
Resolution digit 0.01 dB	OLR 0.01DB	OLR?	OLR 0.01DB
Resolution digit 0.1 dB	OLR 0.1DB	OLR?	OLR 0.1DB
Resolution digit 1 dB	OLR 1DB	OLR?	OLR 1DB
Resolution digit 10 dB	OLR 10DB	OLR?	OLR 10DB
Resolution digit 100 dB	OLR 100DB	OLR?	OLR 100DB
Move resolution digit to right (lower)	OLR R	—	—
Move resolution digit to left (upper)	OLR L	—	—
Incremental step output level	OIS I ₂	OIS?	OIS I ₂
ALC mode on	ALC ON	ALC?	ALC ON
ALC mode off	ALC OFF	ALC?	ALC OFF
CAL execution	CAL	—	—
Reference level at relative output level ON	ORLR I ₁	ORLR?	ORLR I ₁
Relative output level (at relative level ON)	ORLV I ₁	ORLV?	ORLV I ₂
RF high level output mode ON	RFHIGH ON	RFHIGH?	RFHIGH ON
RF high level output mode OFF	RFHIGH OFF	RFHIGH?	RFHIGH OFF
RF high level output mode gain	—	RFHLVL?	RFHLVL I ₂

<Memory>

Item	Device message		
	Control item	Command message	Query message
Recall from BPM (Last recalled BPM location number)	RECBPM n n : 0 to 511	RECBPM?	RECBPM n
Step up	RBS UP	—	—
Step down	RBS DN	—	—
Knob up	RBK UP	—	—
Knob down	RBK DN	—	—
Save to BPM	SAVBPM n n : 0 to 511	—	—
Delete from BPM	DELBPM n n : 0 to 511	—	—
Move to BPM edit screen	MEMBPMED	—	—
Recall from APM (Last recalled APM location number)	RECAPM n n : 0 to 99	RECAPM?	RECAPM n
Save to APM	SAVAPM n n : 0 to 99	—	—
Save to APM (with a title)	SAVAPM n, s n : 0 to 99 s : "title"	—	—
Delete from APM	DELAPM n n : 0 to 99	—	—
Move to APM recall screen	MEMAPMREC	—	—
Move to APM save screen	MEMAPMSAV	—	—
Selected BPM location recall mode Frequency + Level	BPMMOD n, 0 n : 0 to 511	BPMMOD? n	BPMMOD 0
Selected BPM location recall mode Frequency only	BPMMOD n, 1 n : 0 to 511	BPMMOD? n	BPMMOD 1
Selected BPM location recall mode Level only	BPMMOD n, 2 n : 0 to 511	BPMMOD? n	BPMMOD 2
Selected BPM location skip on	BPMSKP n, ON n : 0 to 511	BPMSKP? n	BPMSKP ON
Selected BPM location skip off	BPMSKP n, OFF n : 0 to 511	BPMSKP? n	BPMSKP OFF
Selected BPM location Sweep Time	SWPTIM n, t n : 0 to 511 t : 1MS to 600S	SWPTIM? n	SWPTIM t
Move to APM edit screen	MEMBPMSWP	—	—
BPM Sweep Pattern: Frequency + Level	SWPPAT 0	SWPPAT?	SWPPAT 0
BPM Sweep Pattern: Frequency only	SWPPAT 1	SWPPAT?	SWPPAT 1
BPM Sweep Pattern: Level only	SWPPAT 2	SWPPAT?	SWPPAT 2
BPM Sweep Mode: Auto	SWPMOD 0	SWPMOD?	SWPMOD 0

Section 4 Remote Control

<Memory (continued)>

Item	Device message		
	Control item	Command message	Query message
BPM Sweep Mode: Single	SWPMOD 1	SWPMOD?	SWPMOD 1
Sweep Begin BPM location	SWPBEG n n : 0 to 511	SWPBEG?	SWPBEG n
Sweep End BPM location	SWPEND n n : 0 to 511	SWPEND?	SWPEND n
BPM Sweep Start	SWP START	SWP?	SWP START
BPM Sweep Stop	SWP STOP	SWP	SWP STOP
BPM Sweep Pause	SWP PAUSE	SWP?	SWP PAUSE
Export BMP	BPMEXP	—	—
Import BPM	BPMIMP	—	—
Export APM	APMEXP	—	—
Import APM	APMIMP	—	—
Move to memory screen (basic parameter display)	MEMORY	—	—

<Analog Modulation>

Item	Device message		
	Control item	Command message	Query message
Modulation on	AMOD ON	AMOD?	AMOD ON
Modulation off	AMOD OFF	AMOD?	AMOD OFF
Frequency	AF f	AF?	AF f
AF source sine wave	AFWAV SINE	AFWAV?	AFWAV SINE
AF source square wave	AFWAV SQUARE	AFWAV?	AFWAV SQUARE
AF source triangular wave	AFWAV TRIANGULAR	AFWAV?	AFWAV TRIANGULAR
AF source sawtooth wave	AFWAV SAWTOOTH	AFWAV?	AFWAV SAWTOOTH
AF source output on	AFO ON	AFO?	AFO ON
AF source output off	AFO OFF	AFO?	AFO OFF
AF source output level	AFOLVL I ₃	AFOLVL?	AFOLVL I ₃
AF source output offset level	AFOOS I ₃	AFOOS?	AFOOS I ₃
External AM input coupling AC	AMCP AC	AMCP ?	AMCP AC
External AM input coupling DC	AMCP DC	AMCP ?	AMCP DC
External FM/φM input coupling AC	FMCP AC	FMCP?	FMCP AC
External FM/φM input coupling DC	FMCP DC	FMCP?	FMCP DC
Wide-AM AM input on	WAM ON	WAM?	WAM ON
Wide-AM AM input off	WAM OFF	WAM?	WAM OFF
Internal AM modulation source	AMSRC INT	AMSRC?	AMSRC INT
External AM modulation source	AMSRC EXT	AMSRC?	AMSRC EXT
Internal and external AM modulation source	AMSRC INTEXT	AMSRC?	AMSRC INTEXT
AM on	AMO ON	AMO?	AMO ON
AM off	AMO OFF	AMO?	AMO OFF
AM modulation depth	AM r r : -100.0 to 100.0	AM?	AM r
Internal FM/φM modulation source	FMSRC INT	FMSRC?	FMSRC INT
External FM/φM modulation source	FMSRC EXT	FMSRC?	FMSRC EXT
Internal and external FM/φM modulation source	FMSRC INTEXT	FMSRC?	FMSRC INTEXT
FM/φM mode FM	FMPHM FM	FMPHM?	FMPHM FM
FM/φM mode φM	FMPHM PHM	FMPHM?	FMPHM PHM
FM/φM on	FMO ON	FMO?	FMO ON
FM/φM off	FMO OFF	FMO?	FMO OFF
FM frequency deviation	FMf	FM?	FM f
φM phase deviation	PHM I ₄	PHM?	PHM I ₄
Move to Analog Modulation edit screen	ANAROG	—	—

Section 4 Remote Control

<Configuration Functions>

Item	Device message		
	Control item	Command message	Query message
Base frequency and base frequency source 10 MHz, internal 10 MHz, external 13 MHz, external	—	REF?	10MHZ, INT 10MHZ, EXT 13MHZ, EXT
Manual ALC time constant 500ns	ALCPT 500NS	ALCPT?	ALCPT 500NS
Manual ALC time constant 2.4 μs	ALCPT 2400NS	ALCPT?	ALCPT 2400NS
Manual ALC time constant 5.0 μs	ALCPT 5000NS	ALCPT?	ALCPT 5000NS
Manual ALC time constant 24 μs	ALCPT 24000NS	ALCPT?	ALCPT 24000NS
Manual ALC time constant 50 μs	ALCPT 50000NS	ALCPT?	ALCPT 50000NS
Manual ALC time constant 240 μs	ALCPT 240000NS	ALCPT?	ALCPT 240000NS
Manual ALC time constant 500 μs	ALCPT 500000NS	ALCPT?	ALCPT 500000NS
RF output quadrature ratio adjustment	IQQSKEW n n : -1000 to 1000	IQQSKEW?	IQQSKEW n
I/Q output on	IQBOUT ON	IQBOUT?	IQBOUT ON
I/Q output off	IQBOUT OFF	IQBOUT?	IQBOUT OFF
I-output quadrature ratio adjustment	IQQQSK I ₄ I ₄ : -5DEG to 5DEG	IQQQSK?	IQQQSK I ₄
I- output level adjustment	IOLTR r r : 80.00 to 120.00	IOLTR?	IOLTR r
Q-output level adjustment	QOLTR r r : 80.00 to 120.00	QOLTR?	QOLTR r
Total I/Q output offset	IQOOS I ₃	IQOOS?	IQOOS I ₃
I output offset	IOUTOS I ₃	IOUTOS?	IOUTOS I ₃
Q output offset	QOUTOS I ₃	QOUTOS?	QOUTOS I ₃
I output offset	IBOUTOS I ₃	IBOUTOS?	IBOUTOS I ₃
Q output offset	QBOUTOS I ₃	QBOUTOS?	QBOUTOS I ₃
Built-in buzzer on	BUZ ON	BUZ?	BUZ ON
Built-in buzzer off	BUZ OFF	BUZ?	BUZ OFF
Launch screen saver in 30 minutes	SCRSAV HALFH	SCRSAV?	SCRSAV HLAFFH
Launch screen saver in 1 hour	SCRSAV ONEH	SCRSAV?	SCRSAV ONEH
Launch screen saver in 2 hours	SCRSAV TWOH	SCRSAV?	SCRSAV TWOH
Disable screen saver	SCRSAV NONE	SCRSAV?	SCRSAV NONE
Safety mode on	SAFE ON	SAFE?	SAFE ON

<Configuration Functions (continued)>

Item	Device message		
	Control item	Command message	Query message
Safety mode off	SAFE OFF	SAFE?	SAFE OFF
PLL mode normal	PLLMOD NORM	PLLMOD?	PLLMOD NORM
PLL mode narrow	PLLMOD NARR	PLLMOD?	PLLMOD NARR
Remote error display mode normal	REMDISP NORM	REMDISP?	REMDISP NORM
Remote error display mode Remain	REMDISP REMA	REMDISP?	REMDISP REMA
Remote error display mode Stop	REMDISP STOP	REMDISP?	REMDISP STOP
RF spectrum normal	SPREV OFF SPREV NORM	SPREV?	SPREV OFF
RF spectrum reverse	SPREV ON SPREV REV	SPREV?	SPREV ON
GPIB Terminator LF	TRM 0	TRM?	TRM 0
GPIB Terminator CR/LF	TRM 1	TRM?	TRM 1
Move to Config screen	CONFIG	—	—
Move to Config screen : IF/RF Setup screen	CONFRF	—	—
Move to Config screen : Baseband screen	CONFBB	—	—
Move to Config screen : Interface Setup screen	CONFIF	—	—
Move to Config screen : Common Setup screen	CONFCO	—	—
Move to Config screen : Hardware Check screen	CONFHW	—	—
Move to Config screen : Maintenance Check screen	CONFMC	—	—
Move to Config screen : Rear Panel Information screen	CONFRP	—	—

Section 4 Remote Control

<Measuring Instrument Common Functions>

Item	Device message		
	Control item	Command message	Query message
RPP RESET	RS	—	—
Display on	DSPL ON	DSPL?	DSPL ON
Display off	DSPL OFF	DSPL?	DSPL OFF
GPIB Status: END Enable	ESE2 n n : 0 to 256	ESE2?	n n : 0 to 256
GPIB Status: END	—	ESR2?	n n : 0 to 256
GPIB Status: ERR Enable	ESE3 n n : 0 to 256	ESE3?	n n : 0 to 256
GPIB Status: ERR	—	ESR3?	n n : 0 to 256
Screen copy	SCOPY	—	—
Export Screen copy	SCPEXP	—	—
Add Response Header to Response Message	HEAD ON	—	—
Omit Response Header to Response Message	HEAD OFF	—	—
Trigger	*TRG	—	—

For more information on *TRG, see Section 4.5.3, “IEE488.2 common commands”.

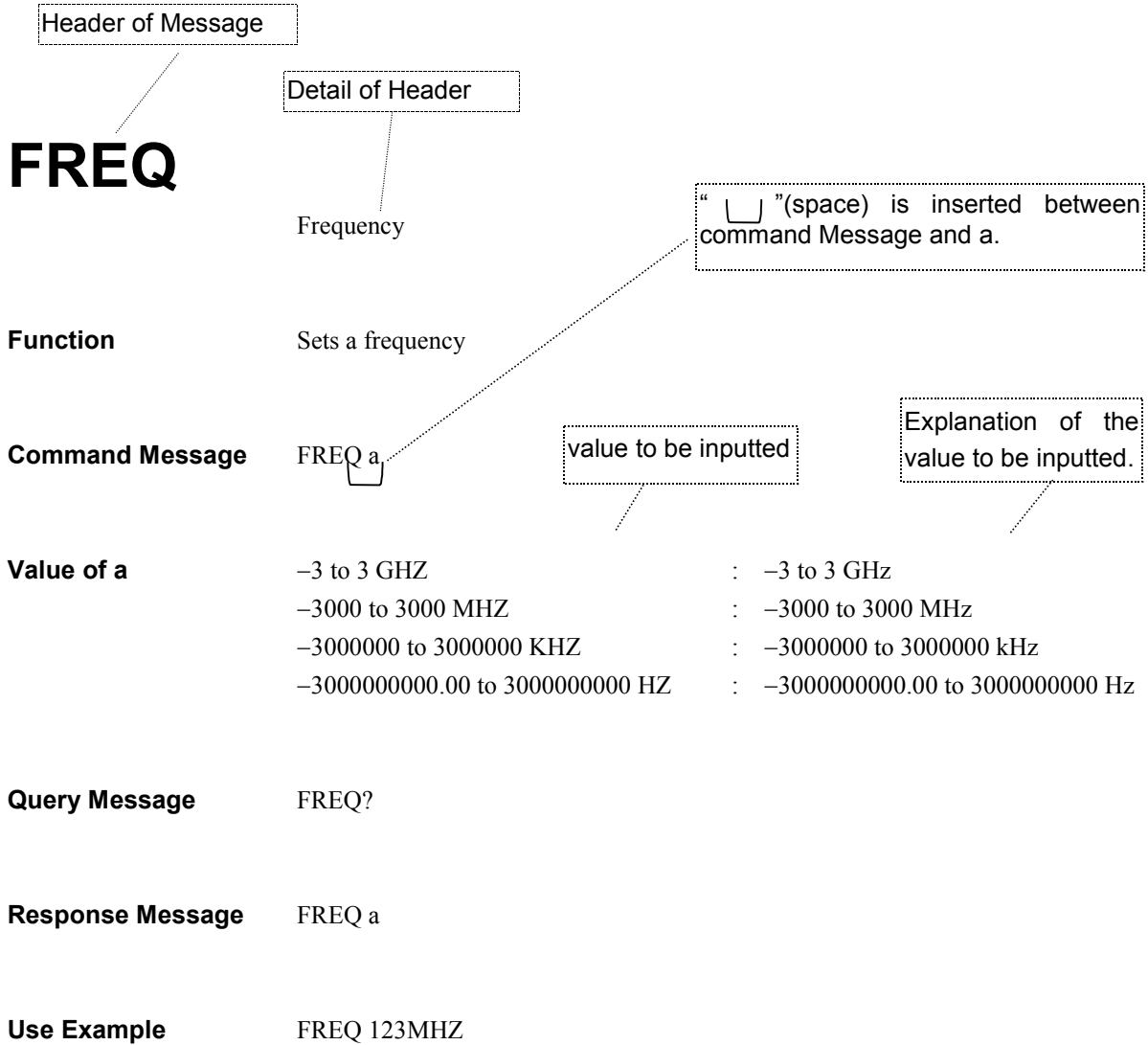
< Digital modulation Functions >

Item	Device message		
	Control item	Command message	Query message
Digital modulation on	DMOD ON	DMOD?	DMOD ON
Digital modulation off	DMOD OFF	DMOD?	DMOD OFF
I/Q source off	IQSRC OFF	IQSRC?	IQSRC OFF
I/Q source internal	IQSRC INT	IQSRC?	IQSRC INT
I/Q source external	IQSRC EXT	IQSRC?	IQSRC EXT
PM source off	PMO OFF	PMO?	PMO OFF
PM source internal	PMO INT	PMO?	PMO INT
PM source external	PMO EXT PMO ON	PMO?	PMO EXT
Baseband ON	BASEBAND ON	BASEBAND?	BASEBAND ON
Baseband OFF	BASEBAND OFF	BASEBAND?	BASEBAND OFF
Select PDC system (as fullrate)	SYS PDC	SYS?	SYS PDC
Select PDC system (as Halfrate)	SYS PDC_H	SYS?	SYS PDC_H
Select GSM system	SYS GSM	SYS?	SYS GSM
Select W-CDMA system	SYS W-CDMA SYS WCDMA	SYS?	SYS W-CDMA
Select IS-95 system	SYS IS-95 SYS IS95	SYS?	SYS IS-95
Digital modulation units not installed	—	SYS?	SYS NONE
Move to Digital modulation Edit screen (Basic Parameter screen)	DIGITAL	—	—

SYS commands are valid when the corresponding Digital modulation unit and software are installed.

4.5.7 Device message Details in alpha-numerical order

< Example >



***CLS**

Clear Status Command

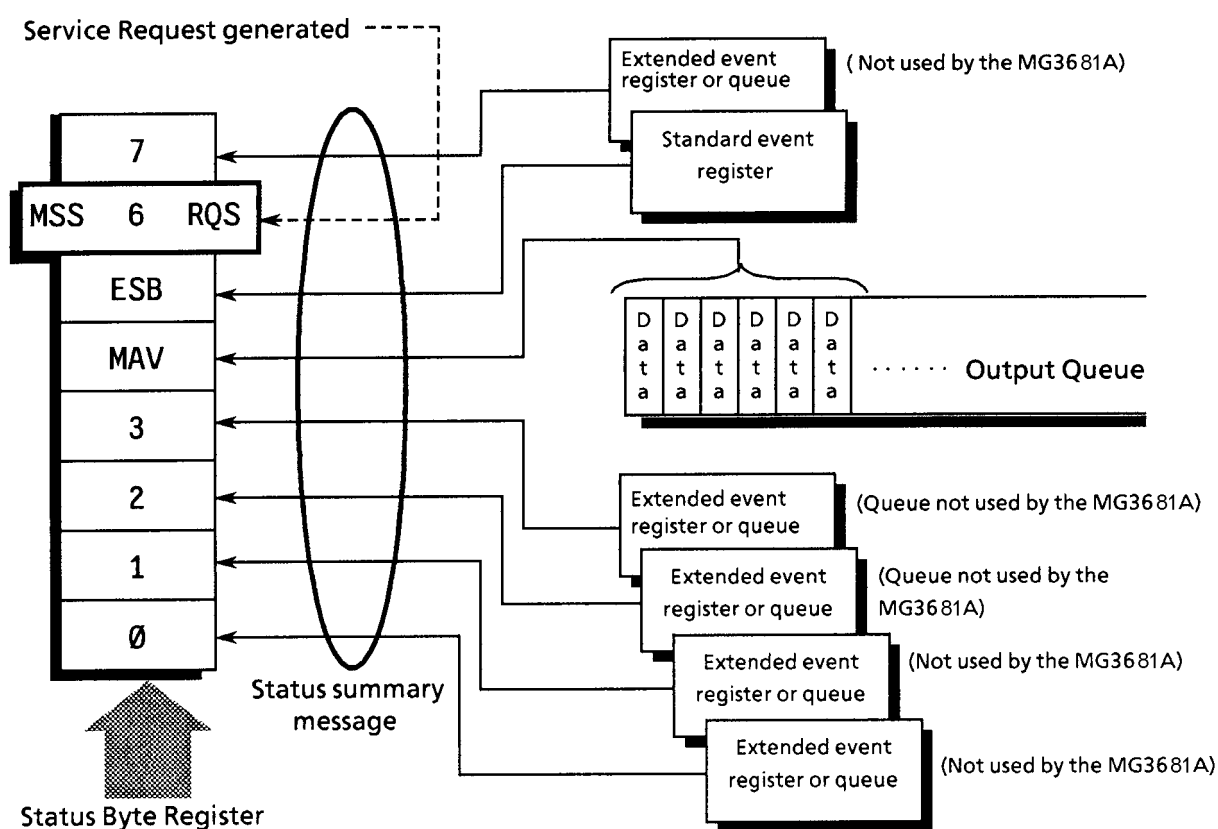
Function Clears the Status Byte register

Command Message *CLS

Use Example *CLS

Explanation *CLS all status data (namely, event registers and queues), except for the output queue and its MAV summary message, and also the associated summary messages.

If a *CLS command is transmitted after a program message terminator or before a query message unit element, the entire status byte is cleared. In this way, the output queue is cleared along with any unread messages. The execution of *CLS does not affect the setting of each enable register.



*E

*ESE

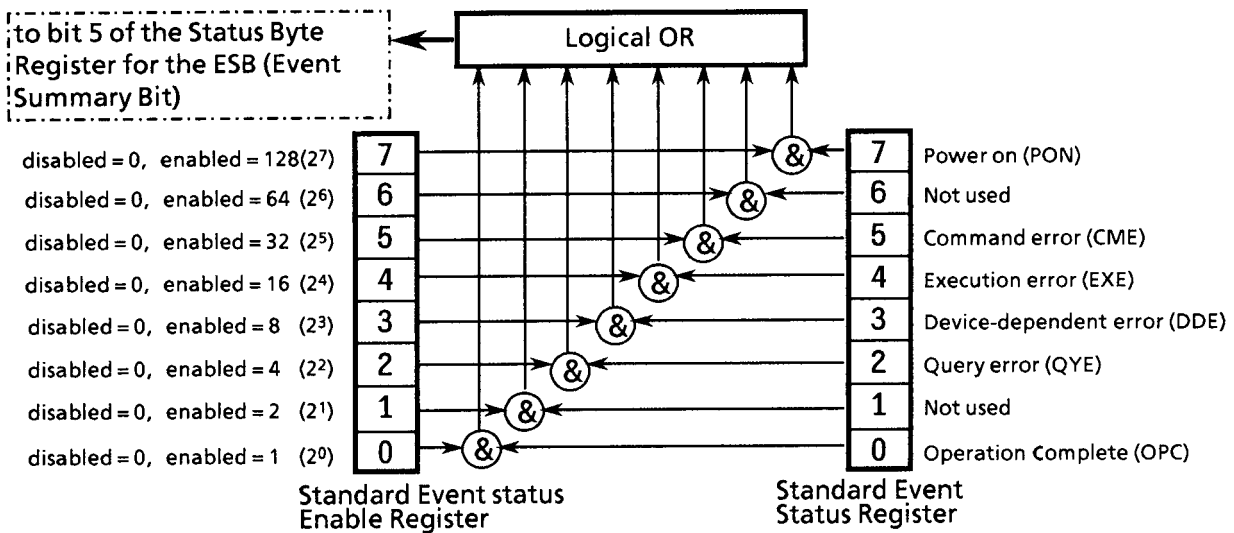
Standard Event Status Enable Command

Function Sets or clears the Standard Event Status Enable register.

Command Message *ESE

Explanation Program data equals the sum total of the digit values of the bits that are chosen to be enabled from among $2^0=1$, $2^1=2$, $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$, and $2^7=128$ associated with Standard Event Status Enable register bits 0, 1, 2, 3, 4, 5, 6, and 7. The bits to be disabled have a digit value of 0.

Use Example *ESE40 Controller → This instrument Enable CMD (bit 5) and RQC (bit3).



***ESE?**

Standard Event Status Enable Query

Function	Returns the current value of the Standard Event Status Enable register.
Command Message	*ESE?
Explanation	*ESE? returns the current value of the Standard Event Status Enable register in the NR1 format.
Response Message	NR1 = 0 to 255
Use Example	*ESE? Controller → This instrument

*E

*ESR?

Standard Event Status Register Query

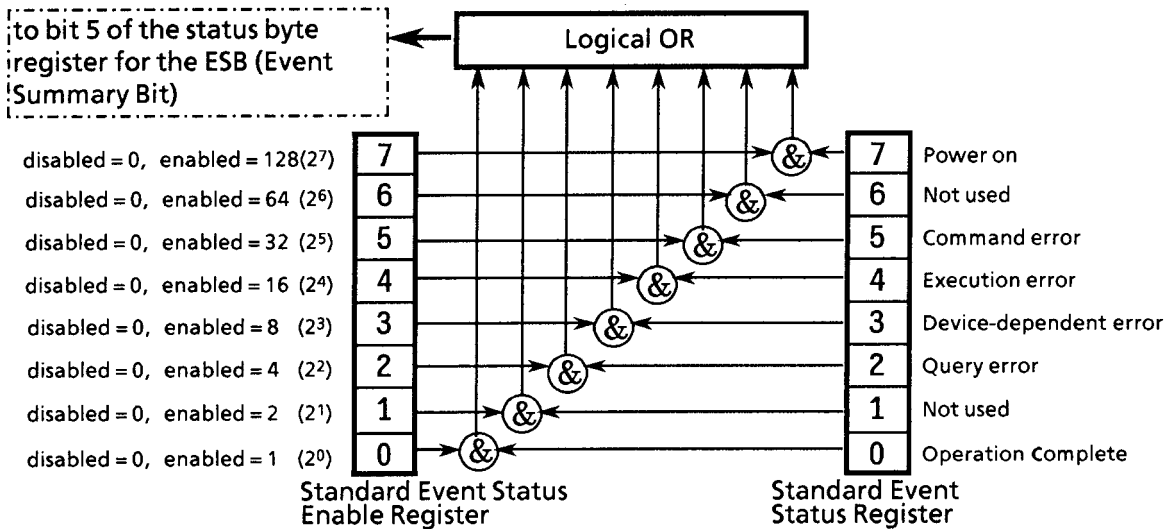
Function Returns the current value of the Standard Event Status register.

Command Message *ESR?

Explanation *ESR? returns the current value of the Standard Event Status register in the NR1 format. This value equals the sum total of the digit values of the bits that are chosen to be enabled from among $2^0 = 1$, $2^1 = 2$, $2^2 = 4$, $2^3 = 8$, $2^4 = 16$, $2^5 = 32$, $2^6 = 64$, and $2^7 = 128$ associated with Standard Event Status register bits 0, 1, 2, 3, 4, 5, 6, and 7. This register will be cleared on reading of a response (i.e. line 40).

Response Message NR1 = 0 to 255

Use Example
*ESR? Controller → This instrument
3 This instrument → Controller



***IDN?**

Identification Query

Function	Returns the product manufacturer's name, type name and so on.				
Command Message	IDN?				
Explanation	<p>Returns the manufacturer's name, type name, serial number, and firmware version number.</p> <p>*IDN? returns a response message comprising the four fields described above.</p> <p><1> Field 1: Product manufacturer's name (in this case, ANRITSU)</p> <p><2> Field 2: Type name (for this instrument, MG3681A)</p> <p><3> Field 3: Serial number (10-digit number)</p> <p><4> Field 4: Firmware version number (for this instrument, 1.0 to 9.99)</p>				
Response Message	<p>*IDN? returns a response message comprising the above four fields separated from one another by a comma (,) ASCII string data.</p> <p><Field 1>,<Field 2>,<Field 3>,<Field 4></p> <p>In the example cited in the explanation, the response message should look like: ANRITSU, MG3681A, serial_number,1</p> <p>The response message is up to 72 characters long.</p>				
Use Example	<table border="0"> <tr> <td>*IDN?</td> <td>Controller → This instrument</td> </tr> <tr> <td>ANRITSU, MG3681A, 0123456789, 2.11</td> <td>This instrument → Controller</td> </tr> </table>	*IDN?	Controller → This instrument	ANRITSU, MG3681A, 0123456789, 2.11	This instrument → Controller
*IDN?	Controller → This instrument				
ANRITSU, MG3681A, 0123456789, 2.11	This instrument → Controller				

*O

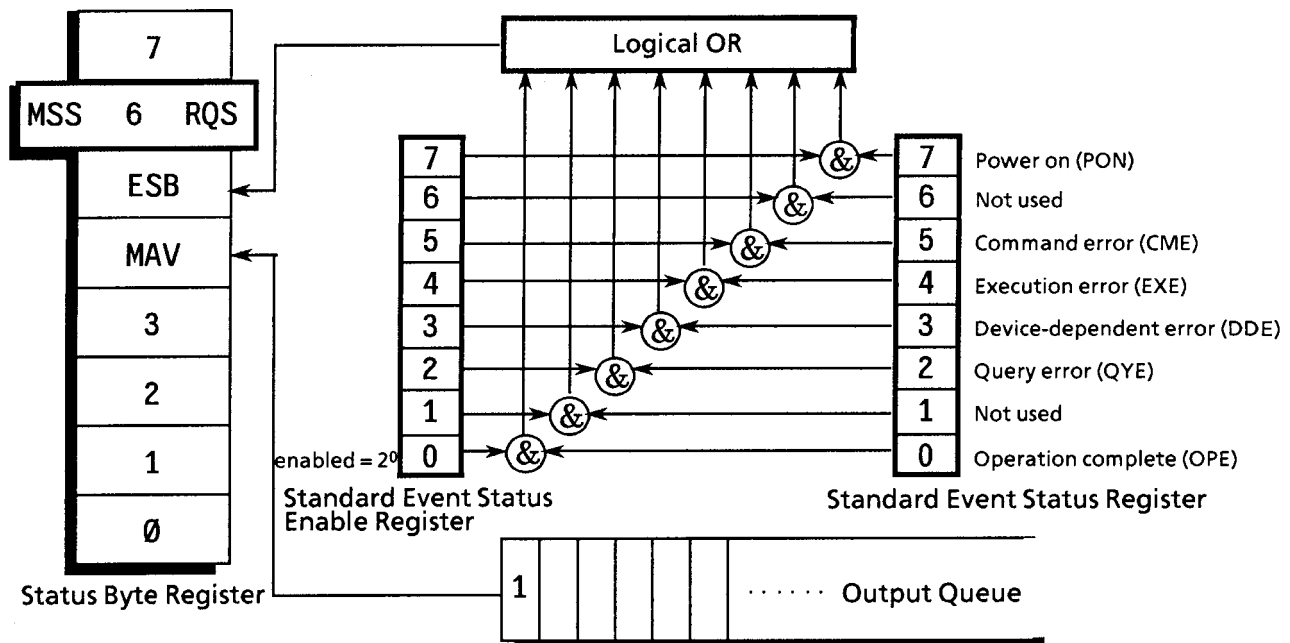
*OPC

Operation Complete Command

Function Sets bit 0 of the Standard Event Status register when the device operation is completed.

Command Message *OPC

Explanation *OPC sets bit 0, or Operation Complete Bit, of the Standard Event Status register when the entire device operation that has been selected is completed. This command is an overlap command.



Use Example *OPC

*OPC?

Operation Complete Query

Explanation *OPC? sets '1' in the output queue when the entire selected device operation is completed to wait for a MAV summary message to be issued.

Command Message *OPC?

Response Message ASCII coded byte 31 hex representing '1' is returned as numeric data in the NR1 format.

Use Example *OPC? Controller → This instrument
1 This instrument → Controller

***RST**

Reset Command

Function Performs Level 3 initialization of the device**Command Message** *RST**Explanation** The RST (Reset) command performs Level 3 initialization of the device. The items of Level 3 initialization are as follows:

- <1> Device-dependent functions and states are reset to predefined status. This instrument is reset to the status described in Appendix C.
- <2> The device is put into the OCIS state (Operation Complete Command Idle State). The Operation Complete bit cannot be set in the Standard Event Status register with the *OPC command.

The device is put into the OQIS state (Operation Complete Query Idle State). The Operation Complete bit cannot be set in the output queue as a consequence. The MAV bit of the Status Byte register is cleared.

Note:

The execution of the *RST command does not affect the following:

- IEEE4488.1 interface status
- Device address
- Output queue
- Service Request Enable register
- Standard Event Status Enable register
- Calibration data affecting device specifications

Use Example *RST Controller → This instrument

*S

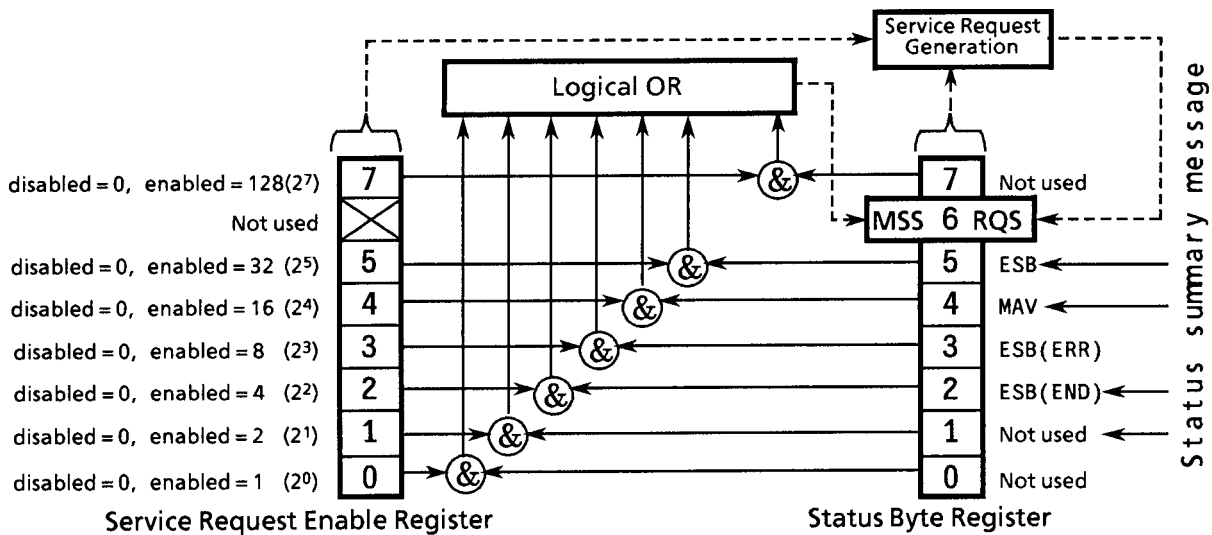
*SRE

Service Request Enable Command

Function Sets the Service Request Status register bits.

Command Message *SRE

Explanation Program data equals the sum total of the digit values of the bits that are chosen to be enabled from among $2^0 = 1$, $2^1 = 2$, $2^2 = 4$, $2^3 = 8$, $2^4 = 16$, $2^5 = 32$, $2^6 = 64$, and $2^7 = 128$ associated with Service Request Enable register bits 0, 1, 2, 3, 4, 5, 6, and 7. The bits to be disabled have a digit value of 0.



Use Example *SRE48 Controller → This instrument
ESB (bit 5) and MAV (bit 4) are set to Enable.

***SRE?**

Service Request Enable Query

Function	Sets Service Request Enable register bits.
Command Message	*SRE?
Explanation	*SRE? returns the current value of the Service Request Enable register in the NR1 format.
Response Message	Since NR1 = bit 6 cannot be set, the value of NR1 falls somewhere between 0 and 64 and between 128 and 191.
Use Example	*SRE? Controller → This instrument 48 This instrument → Controller (following the execution of *SRE in the format above)

*S

*STB?

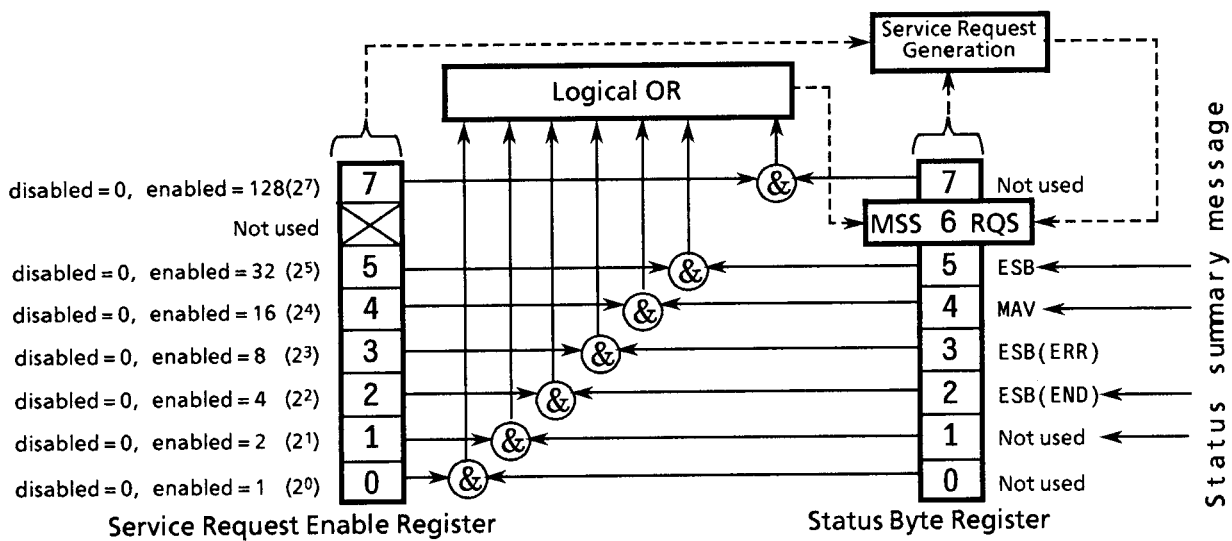
Read Status Byte Command

Function Returns the current value of the status byte, including the MSS bit.

Command Message *STB?

Explanation *STB? returns the sum of the current value of the status byte register weighted with binary and the MSS summary message as a response data in the NR1 numeric format.

Response Message The response message is an integer in the NR1 format between 0 and 255 equaling the sum total of the digit values of the bits of the Status Byte register. Bits 0 to 5 and bit 7 of the Status Byte register are weighted by 1, 2, 4, 8, 16, 32, and 128, respectively; the MSS (Master Summary Status) bit is weighted by 64. MSS reports that there is at least one condition of a service request. The status byte conditions of this instrument are shown below.



Bit	Bit weight	Bit name	Status Byte register condition
7	128	—	0 =: Not used
6	64	MSS	0 =: Service not requested; 1 =: service requested
5	32	ESB	0 =: Event status not occurring; 1 = event status occurring
4	16	MAV	0 =: No data in the output queue; 1 = data available in the output queue
3	8	ESB(ERR)	0 =: Service not requested; 1 =: service requested
2	4	ESB(END)	0 =: Service not requested; 1 =: service requested
1	2	—	0 =: Not used
0	1	—	0 =: Not used

Use Example *STB Controller → This instrument
4 This instrument → Controller (END event occurring)

*TRG

Trigger Command


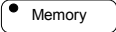
Function

Requests the execution of a trigger.

Command Message

*TRG

Explanation

*TRG executes a triggered action. With this instrument, the contents of the next recallable BPM location are recalled. This will produce the same effect as pressing  while holding down .

Use Example

*TRG Controller → This instrument

*T

*TST?

Self-Test Query

Function

Runs an internal self-test to report on the presence or absence of errors.

Command Message

*TST?

Explanation

*TST? executes a self-test within the device. The test result is placed on the output queue to report whether the test has completed successfully without encountering errors. The self-test can be run without operator intervention. With this instrument, the results of the self-test at power-on time and information about hardware errors detected during its operation are returned. Any bit for which an error has been detected is set to 1.

Response Message

A response message is returned in the NR1 numeric format.
Data range = 0 to 65535

NR1 = 0: The test has ended without encountering errors.

NR1 ≠ 0: The test has encountered errors.

Response: 540 = 512 + 16 + 2

Errors detected in flash memory and battery by the power-on self-test, with an UNLOCK state being found in the PLL of the audio/clock unit.

Power-on CPU test: +1 if an error is detected

Power-on flash memory test: +2 if an error is detected

Power-on SDRAM test: +4 if an error is detected

Power-on SRAM test: +8 if an error is detected

Power-on backup battery test: +16 if an error is detected

Current local PLL status: +256 if UNLOCK is detected

Current audio/clock PLL status: +512 if UNLOCK is detected

Current base frequency oscillator PLL operating status: +1024 if UNLOCK is detected

Current ALC operating status: +2048 if ABNORMAL is detected

Use Example

*TST? Controller → This instrument

256 This instrument → Controller (hardware error)

***WAI**

Wait-to-Continue Command

Function	Keep the next command on stand-by if the device is currently executing a command
Command Message	*WAI
Explanation	<p>the *WAI common command executes overlap commands as sequential commands. An command or query (sent from 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.</p> <p>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.</p> <p>However, since over lap commands are not available with the MG3681A, so this command is not necessary.</p>
Use Example	*WAI Controller → This instrument

A

AF

Audio Frequency

Function	Sets the oscillation frequency of the AF source in the analog modulation function.
Command Message	AF f
Value of f	0.01HZ to 400000HZ : 0.01 Hz to 400000 Hz 0.00001KHz to 400KHz : 0.0001 kHz to 400 kHz
Query Message	AF?
Response Message	AF a
Limitation	This command is functional only if an AF synthesizer (option 21) is mounted.
Use Example	AF 123HZ

AFO

Audio Frequency-Output (ON/OFF)

Function	Sets AF source output to on or off.
Command Message	AFO a
Value of a	ON : AF output on OFF : AF output off
Query Message	AFO?
Response Message	AFO a
Limitation	This command is functional only if an AF synthesizer (option 21) is mounted.
Use Example	AFO ON

AFOLVL

Audio-Frequency-Output Level

Function	Sets the AF output level of the analog modulation function.
Command Message	AFOLVL I ₃
Value of I₃	0V to 4V : 0 V to 4 V 0MV to 4000MV : 0 mV to 4000 mV
Query Message	AFOLVL?
Response Message	AFOLVL I ³
Limitation	This command is functional only if an AF synthesizer (option 21) is mounted.
Use Example	AFOLVL 1V

AFOOS

Audio-Frequency-Output Offset

Function	Sets an offset of the AF source output level in the analog modulation function.
Command Message	AFOOS I ₃
Value of I₃	-2V to 2V, : -2 V to 2 V -2000Mv to 2000MV : -2000 mV to 2000 mV
Query Message	AFOOS?
Response Message	AFOOS I ₃
Limitation	This command is functional only if an AF synthesizer (option 21) is mounted.
Use Example	AFOOS 2V

A

AFWAV

Audio-Frequency Wave

Function	Sets the AF source waveform for analog modulation.
Command Message	AFWAV a
Value of a	SINE : Sine wave SQUARE : Square wave TRIANGULAR : Triangular wave SAWTOOTH : Sawtooth wave
Query Message	AFWAV?
Response Message	AFWAV a
Limitation	This command is functional only if an AF synthesizer (option 21) is mounted
Use Example	AFWAV SQUARE

ALC

Auto Level Control (ON/OFF)

Function	Sets ALC on or off.
Command Message	ALC a
Value of a	ON : ALC on (continuous enabled) OFF : ALC off (manual CAL enabled)
Query Message	ALC?
Response Message	ALC a
Use Example	ALC OFF

ALCPT

Manual ALC Parameter

Function	Sets ALC time constant f.
Command Message	ALCPT a
Value of a	AUTO : Time constant is set automatically 500NS : Time constant 500ns 2400NS : Time constant 2.4 μ s (2400ns) 5000NS : Time constant 5 μ s (5000ns) 24000NS : Time constant 24 μ s (24000ns) 50000NS : Time constant 50 μ s (50000ns) 240000NS : Time constant 240 μ s (240000ns) 500000NS : Time constant 500 μ s (500000ns)
Query Message	ALCPT?
Response Message	ALCPT a
Use Example	ALCPT 500NS

AM

Amplitude Modulation

Function	Sets the depth of amplitude modulation (AM) of the analog modulation function.
Command Message	AM r
Value of r	-100.0 to 100.0 : -100.0 to 100.0 %
Query Message	AM?
Response Message	AM r
Use Example	AM 50

A

AMCP

Amplitude Modulation (AC/DC)

Function	Selects between AC and DC external AM input coupling of the analog modulation function.
Command Message	AMCP a
Value of a	AC : AC coupling DC : DC coupling
Query Message	AMCP?
Response Message	AMCP a
Use Example	AMCP DC

AMO

Amplitude Modulation (ON/OFF)

Function	Sets amplitude modulation (AM) on or off of the analog modulation function.
Command Message	AMO a
Value of a	ON : AM On OFF : AM Off
Query Message	AMO?
Response Message	AMO a
Use Example	AMO ON

AMOD

Analog Modulation (ON/OFF)

Function	Selects between analog modulation on and off.
Command Message	AMOD a
Value of a	ON : Analog modulation On OFF : Analog modulation Off
Query Message	AMOD a
Response Message	AMOD?
Use Example	AMOD ON

AMSRC

Amplitude Modulation Source

Function	Selects a source of amplitude modulation (AM) of the analog modulation function.
Command Message	AMSRC a
Value of a	INT : Internal modulation source EXT : External modulation source INTEXT : Internal and external simultaneous modulation source
Query Message	AMSRC?
Response Message	AMSRC a
Limitation	The modulation source is fixed at EXT (external modulation source) if an AF synthesizer (option 21) is not mounted.
Use Example	AMSRC INT

A

ANALOG

Analog Modulation Screen

Function	Displays the analog modulation setting screen.
Command Message	ANALOG
Query Message	None
Response Message	None
Use Example	ANALOG

APMEXP

All Parameter Memory Export

Function	Exports all-parameter memory contents to an ATA card.
Command Message	APMEXP
Query Message	None
Response Message	None
Limitation	An execution error occurs if an ATA card is not inserted.
Use Example	APMEXP

APMIMP

All Parameter Memory Import

Function	Imports all-parameter memory data stored on an ATA card to the MG3681A's internal all-parameter memory.
Command Message	APMIMP
Query Message	None
Response Message	None
Limitation	An execution error occurs if an ATA card is not inserted or a file that has been created with the APMEXP command is not found.
Use Example	APMIMP

B

BASEBAND Baseband (On/Off)

Function	Selects On/Off of generating the internal I/Q signal.
Command Message	BASEBAND a
Value of a	ON : On of generating the internal I/Q signal OFF : Off of generating the internal I/Q signal
Query Message	BASEBAND?
Response Message	BASEBAND a
Limitation	This command is functional only if an extension unit is mounted.
Use Example	BASEBAND ON

BPMEXP Basic Parameter Memory Export

Function	Exports basic parameter memory contents to an ATA card.
Command Message	BPMEXP
Query Message	None
Response Message	None
Limitation	An execution error occurs if an ATA card is not inserted in position.
Use Example	BPMEXP

BPMIMP

Basic Parameter Memory Import

Function	Imports basic parameter memory data stored on an ATA card to the MG3681A's internal basic parameter memory.
Command Message	BPMIMP
Query Message	None
Response Message	None
Limitation	An execution error occurs if an ATA card is not inserted or a file that has been created with the APMEXP command is not found.
Use Example	BPMIMP

BPMMOD

Basic Parameter Memory Mode

Function	Sets the mode for recalling stored data from a selected Basic Parameter Memory (BPM) location.
Command Message	BPMMOD n, 0 BPMMOD n, 1 BPMMOD n, 2
Value of n	n = 0 to 511: Basic Parameter Memory (BPM) numbers 0 to 511 0: Both (frequency and level) 1: Freq (frequency only) 2: Level (level only)
Query Message	BPMMOD? n
Response Message	BPMMOD 0 BPMMOD 1 BPMMOD 2
Use Example	BPMMOD 511, 0

B

BPMSKP

Basic Parameter Memory SKIP (ON/OFF)

Function	Selects between skip on and off for a selected Basic Parameter Memory (BPM) location.
Command Message	BPMSKP n, ON BPMSKP n, OFF
Value of n	n=0 to 511 : Basic Parameter Memory (BPM) numbers 0 to 511 ON : Skip On OFF : Skip Off
Query Message	BPMSKP? n
Response Message	BPMSKP ON or BPMSKP OFF
Use Example	BPMSKP 55, ON

BUZ

Buzzer (ON/OFF)

Function	Sets the built-in buzzer on or off.
Command Message	BUZ a
Value of a	ON : Buzzer On OFF : Buzzer Off
Query Message	BUZ?
Response Message	BUZ a
Use Example	BUZ ON

CAL

Calibration

Function	Calibrates the level. The bit 1 of END event status register becomes 1.
Command Message	CAL
Query Message	None
Response Message	None
Limitation	This command is functional only if ALC is off.
Use Example	CAL

CONFBB

Config Baseband Setup Screen

Function	Displays the Baseband Setup screen of the Config screen.
Command Message	CONFBB
Query Message	None
Response Message	None
Limitation	This command is available when the digital modulation unit is installed and auxiliary signal is inputted from the front/rear panel.
Use Example	CONFBB

C

CONFCO

Config Common Setup Screen

Function	Displays the Common Setup screen of the Config screen.
Command Message	CONFCO
Query Message	None
Response Message	None
Use Example	CONFCO

CONFHW

Config Hardware Check Screen

Function	Displays the Hardware Check screen of the Config screen.
Command Message	CONFHW
Query Message	None
Response Message	None
Use Example	CONFHW

CONFIG

Configuration Setup Screen

Function	Displays the Config screen. The Config screen, in this case, indicates the screen on which a frequency and output level are displayed.
Command Message	CONFIG
Query Message	None
Response Message	None
Use Example	CONFIG

CONFIF

Config Interface Setup Screen

Function	Displays the Interface Setup screen of the Config screen.
Command Message	CONFIF
Query Message	None
Response Message	None
Use Example	CONFIF

C

CONFMC

Config Maintenance Check Screen

Function	Displays the Maintenance Check screen of the Config screen.
Command Message	CONFMC
Query Message	None
Response Message	None
Use Example	CONFMC

CONFRF

Config IF/RF Setup Screen

Function	Displays the IF/RF Setup screen of the Config screen.
Command Message	CONFRF
Query Message	None
Response Message	None
Use Example	CONFRF

CONFRP

Config Rear Panel Information Screen

Function	Displays the Rear Panel Information screen of the Config screen.
Command Message	CONFRP
Query Message	None
Response Message	None
Limitation	This command is available when the digital modulation unit is installed and auxiliary signal is inputted from the rear panel.
Use Example	CONFRP

D

DELAPM

Delete All Parameter Memory

Function	Deletes all-parameter memory contents addressed by an All Parameter Memory (APM) number.
Command Message	DELAPM n
Value of n	0 to 99 : All Parameter Memory (APM) number 0 to 99
Query Message	None
Response Message	None
Limitation	An execution error occurs if no data is stored at the specified All Parameter Memory (APM) location.
Use Example	DELAPM 99

DELBPM

Delete Basic Parameter Memory

Function	Deletes basic parameter memory contents addressed by an Basic Parameter Memory (BPM) number.
Command Message	DELBPM n
Value of n	0 to 511 : Basic Parameter Memory (BPM) number 0 to 511
Query Message	None
Response Message	None
Limitation	An execution error occurs if no data is stored at the specified Basic Parameter Memory (BPM) location.
Use Example	DELBPM 511

DIGITAL

Digital Modulation

Function	Moves to digital modulation setting screen. Though the digital modulation setting screen varies depending on the modulation signal source and the selected system, this command displays the screen with frequency and output level indication.
Command Message	DIGITAL
Query Message	None
Response Message	None
Use Example	DIGITAL

DMOD

Digital Modulation (ON/OFF)

Function	Sets digital modulation on or off.
Command Message	DMOD a
Value of a	ON : Digital modulation On OFF : Digital modulation Off
Query Message	DMOD
Response Message	DMOD a
Use Example	DMOD OFF

D

DSPL

Display (ON/OFF)

Function	Sets the display on or off.
Command Message	DSPL a
Value of a	ON : Display On OFF : Display Off
Query Message	DSPL?
Response Message	DSPL a
Use Example	DSPL ON

ESE2

Event Status Enable Register (END)

Function	Specifies which bit of the event register associated with the END Event Status Enable register will make ESB summary-message bit 2 true when it is set.
Command Message	ESE2 n
Value of n	0 to 255
Query Message	ESE2?
Response Message	ESE2 n
Use Example	ESE2 5

ESE3

Event Status Enable Register (ERR)

Function	Specifies which bit of the event register associated with the END Event Status Enable register will make ESB summary-message bit 3 true when it is set.
Command Message	ESE3 n
Value of n	0 to 255
Query Message	ESE3?
Response Message	ESE3 n
Use Example	ESE3 5

E

ESR2?

Event Status Register (END)

Function	Reads the event bits of the END Event Status register converted to a binary-weighted sum total. The END Event Status register is reset to 0 after its read.
Command Message	None
Query Message	ESR2?
Response Message	ESR2 n
Value of n	0 to 255
Use Example	ESR2?

ESR3?

Event Status Register (ERR)

Function	Reads the event bits of the ERR Event Status register converted to a binary-weighted sum total in decimal. The ERR Event Status register is reset to 0 after its read.
Command Message	None
Query Message	ESR3?
Response Message	ESR3 n
Value of n	0 to 255
Use Example	ESR3?

FIS

Frequency-Incremental-Step Value

Function	Sets a frequency incremental step value.
Command Message	FIS f
Value of a	0.00000000001 to 1GHZ : 0.00000000001 to 1 GHz 0.00000001 to 1000MHZ : 0.00000001 to 1000 MHz 0.00001 to 1000000KHZ : 0.00001 to 1000000 kHz 0.01 to 1000000000HZ : 0.01 to 1000000000 Hz
Query Message	FIS?
Response Message	FIS f
Use Example	FIS 2000KHZ

FM

Frequency Modulation

Function	Sets a deviation frequency for frequency modulation (FM) of the analog modulation function.
Command Message	FM f
Value of f	-2 to 2MHZ : -2 to 2 MHz -2000 to 2000KHZ : -2000 to 2000 kHz -2000000 to 2000000HZ : -2000000 to 2000000 Hz
Query Message	FM?
Response Message	FM
Use Example	FM 2000KHZ

F

FMCP

Frequency Modulation /Phase Modulation Coupling (AC/DC)

Function	Selects external FM/ ϕ M input coupling of the analog modulation function between AC and DC.
Command Message	FMCP a
Value of a	AC : Coupling AC DC : Coupling DC
Query Message	FMCP?
Response Message	FMCP a
Use Example	FMCP DC

FMO

Frequency Modulation/ Phase Modulation (On/Off)

Function	Selects frequency modulation (FM) or phase modulation (ϕ M) of the analog modulation function between on and off.
Command Message	FMO a
Value of a	ON : FM/ ϕ M on OFF : FM/ ϕ M off
Query Message	FMO?
Response Message	FMO a
Use Example	FMO ON

FMPHM

Frequency Modulation /Phase Modulation (FM/PHM)

Function	Selects analog modulation between frequency modulation (FM) and phase modulation (ϕ M).
Command Message	FMPHM a
Value of a	FM : FM PHM : ϕ M
Query Message	FMPHM?
Response Message	FMPHM a
Use Example	FMPHM PHM

FMSRC

Frequency Modulation /Phase Modulation Source

Function	Sets a modulation source for FM or ϕ M of the analog modulation function.
Command Message	FMSRC a
Value of a	INT : Internal modulation source EXT : External modulation source INTEXT : Internal and external simultaneous modulation
Query Message	FMSRC?
Response Message	FMSRC a
Limitation	The modulation source is fixed at EXT (external modulation source) if an AF synthesizer (option 21) is not mounted.
Use Example	FMSRC INT

F

FOF

Frequency Offset (ON/OFF)

Function	Sets frequency offset mode on or off.
Command Message	FOF a
Value of a	ON : Frequency offset mode On OFF : Frequency offset mode Off
Query Message	FOF?
Response Message	FOF a
Limitation	Frequency offset mode may not be set to On depending on the frequency offset value.
Use Example	FOF ON

FOS

Frequency Offset

Function	Sets a frequency offset.
Command Message	FOS f
Value of f	-3G to 3GHZ : -3 to 3 GHz -3000 to 3000MHZ : -3000 to 3000 MHz -3000000 to 3000000KHZ : -3000000 to 3000000 kHz -3000000000.00 to 3000000000.00HZ : -3000000000.00 to 3000000000.00 Hz
Query Message	FOS?
Response Message	FOS f
Limitation	With frequency offset mode on, a frequency offset may not be set depending on the frequency setting.
Use Example	FOS 3000MHZ

FREQ

Frequency

Function	Sets a frequency.
Command Message	FREQ f
Value of f	-3 to 3GHZ : -3 to 3 GHz -3000 to 3000MHZ : -3000 to 3000 MHz -3000000 to 3000000KHZ : -3000000 to 3000000 kHz -3000000000.00 to 3000000000.00HZ : -3000000000.00 to 3000000000.00 Hz
Query Message	FREQ?
Response Message	FREQ f
Limitation	Certain conditions, such as frequency offset on or off and relative frequency display on or off, may not allow a frequency to be set.
Use Example	FREQ 123MHZ

FRK

Frequency Rotary-Knob (Up/Down)

Function	Increases or decreases a frequency in increments of a preset frequency resolution.
Command Message	FRK a
Value of a	UP : Resolution digit frequency Up DN : Resolution digit frequency Down
Query Message	FRK?
Response Message	FRK a
Use Example	FRK UP

F

FRL

Frequency-Relative (On/Off)

Function	Sets relative frequency display mode on or off.
Command Message	FRL a
Value of a	ON : Relative frequency display mode On OFF : Relative frequency display mode Off
Query Message	FRL?
Response Message	FRL a
Use Example	FRL ON

FRLR?

Frequency-Relative, Reference Value

Function	Returns the reference frequency (which was set when the relative-frequency display mode was set to ON).
Command Message	None
Query Message	FRLR?
Response Message	FRLR f
Value of f	0.00 to 3000000000.00HZ : 0.00 to 3000000000.00 Hz
Use Example	FRLR?

FRLV?

Frequency-Relative, Displayed Value

Function	Returns the displayed frequency when the relative-frequency mode is On.
Command Message	None
Query Message	FRLV?
Response Message	FRLV f
Value of f	-3000000000.00 to 3000000000.00HZ : -3000000000.00 to 3000000000.00 Hz
Use Example	FRLV?

F

FRR

Frequency-Resolution

Function	Sets a frequency setup resolution.	
Command Message	FRR a	
Value of a	0.01HZ	: 0.01 Hz
	0.1HZ	: 0.1 Hz
	1HZ	: 1 Hz
	10HZ	: 10 Hz
	100HZ	: 100 Hz
	1KZ, 1KHZ	: 1 KHz
	10KZ, 10KHZ	: 10 kHz
	100KZ, 100KHZ	: 100 kHz
	1MZ, 1MHZ	: 1 MHz
	10MZ, 10MHZ	: 10 MHz
	100MZ, 100MHZ	: 100 MHz
	1GHZ	: 1 GHz
	R	: Move resolution digit to right (lower)
	L	: Move resolution digit to left (upper)
Query Message	FRR?	
Response Message	FRR a	
Use Example	FRR 100 HZ	

FRS

Frequency-Incremental-Step (Up/Down)

Function	Ups and downs a frequency in increments of a preset frequency step.
Command Message	FRS a
Value of a	UP : Incremental step frequency Up DN : Incremental step frequency Down
Query Message	FRS?
Response Message	FRS a
Use Example	FRS UP

H

HEAD

Response Message Header (On/Off)

Function	Sets On/Off of the addition of the response message header.
Command Message	HEAD a
Value of a	ON : Adds the response header and the unit. OFF : Adds no response header and unit.
Query Message	None
Response Message	None
Use Example	HEAD OFF

IBOUTOS

\bar{I} Output Offset

Function	Sets an \bar{I} -output (differential I signal) offset.
Command Message	IBOUTOS I ₃
Value of I₃	-0.5 to 1.5V : -0.5 to 1.5 V -500.0 to 1500.0mV: -500.0 to 1500.0 mV (0.5 mV step)
Query Message	IBOUTOS?
Response Message	IBOUTOS I ₃
Limitation	This command is functional only if the additional function of I/Q signal output option (option 11) is mounted.
Use Example	IBOUTOS 1.5V

IOLTR

I Output-Level Trim

Function	Trims the I-output level.
Command Message	IOLTR r
Value of r	80.00 to 120.00 : 80.00 to 120.00 %
Query Message	IOLTR?
Response Message	IOLTR r
Limitation	This command is functional only if the enhanced I/Q signal output option (option 11) is mounted.
Use Example	IOLTR 80.00

I

IOUTOS

I Output Offset

Function	Sets an I-output offset.
Command Message	IOUTOS I3
Value of I3	-0.5 to 1.5V : -0.5 to 1.5 V -500.0 to 1500.0MV: -500.0 to 1500.0 mV (0.5 mV step)
Query Message	IOUTOS?
Response Message	IOUTOS I ₃
Limitation	This command is functional only if the additional function of I/Q signal output option (option 11) is mounted.
Use Example	IOUTOS 1.5V

IQBOUT

\bar{I}/\bar{Q} Output (ON/OFF)

Function	Sets \bar{I}/\bar{Q} output (I/Q differential signal output) on or off.
Command Message	IQBOUT a
Value of a	ON : \bar{I}/\bar{Q} output On OFF : \bar{I}/\bar{Q} output Off
Query Message	IQBOUT?
Response Message	IQBOUT a
Limitation	This command is functional only if the additional function of I/Q signal output option (option 11) is mounted. I/Q output cannot be set on if the digital modulation source (IQ signal source) is EXT.
Use Example	IQBOUT ON

IQOOS

I/Q Output Offset

Function	Sets an I/O output level offset.
Command Message	IQOOS I ₃
Value of I₃	-0.5 to 1.5V : -0.5 to 1.5 V -500.0 to 1500.0MV: -500.0 to 1500.0 mV (0.5 mV step)
Query Message	IQOOS?
Response Message	IQOOS I ₃
Limitation	This command is functional only if the additional function of I/Q signal output option (option 11) is mounted.
Use Example	IQOOS 1.5MV

IQQSKEW

RF Output I/Q Quadrature Skew

Function	Adjusts the I/O Quadrature Skew of the RF output signal.
Command Message	IQQSKEW n
Value of n	-1000 to 1000 : Quadrature Skew (integer with no-unit)
Query Message	IQQSKEW?
Response Message	IQQSKEW n
Use Example	IQQSKEW -1000

I

IQOQSK

I/Q Output I/Q Quadrature Skew

Function	Adjusts the I/O Quadrature Skew of the I/Q signal output terminal.
Command Message	IQOQSK n
Value of n	-5.0 to 5.0DEG : -5.0 to 5.0 deg (0.5 deg Step)
Query Message	IQOQSK?
Response Message	IQOQSK n
Limitation	This command is functional only if the additional function of I/Q signal output option (option 11) is mounted.
Use Example	IQOQSK -4.5DEG

IQSRC

I/Q Signal Source

Function	Sets a source (I/Q signal source) for digital modulation unit.
Command Message	IQSRC a
Value of a	INT : Internal modulation source EXT : External I/Q signal source OFF : Internal I/Q signal off
Query Message	IQSRC?
Response Message	IQSRC a
Limitation	The source of digital modulation can not select to INT (Internal I/Q signal source) if a digital modulation unit (expansion unit) is not mounted.
Use Example	IQSRC INT

LVL

Level (ON/OFF)

Function	Sets the RF output level on or off.
Command Message	LVL a
Value of a	ON : RF output level On OFF : RF output level Off
Query Message	LVL?
Response Message	LVL a
Use Example	LVL ON

M

MEMAPMREC

Memory All Parameter Memory Recall

Function	Opens the All Parameter Memory (APM) recall screen of the memory function.
Command Message	MEMAPMREC
Query Message	None
Response Message	None
Use Example	MEMAPMREC

MEMAPMSAV

Memory All Parameter Memory Save

Function	Opens the All Parameter Memory (APM) save screen of the memory function.
Command Message	MEMAPMSAV
Query Message	None
Response Message	None
Use Example	MEMAPMSAV

MEMBPMED

Memory Basic Parameter Memory Edit Screen

Function	Opens the Basic Parameter Memory (BPM) edit screen of the memory function.
Command Message	MEMBPMED
Query Message	None
Response Message	None
Use Example	MEMBPMED

MEMBPMSWP

Memory-Basic Parameter Memory Sweep Screen

Function	Displays the Basic Parameter Memory Sweeping screen of the memory function.
Command Message	MEMBPMSWP
Query Message	None
Response Message	None
Use Example	MEMBPMSWP

O

OCNT

Output-Continuous (ON/OFF)

Function	Sets output-level continuous mode on or off.
Command Message	OCNT a
Value of a	ON : Continuous mode On OFF : Continuous mode Off
Query Message	OCNT?
Response Message	OCNT a
Limitation	When ALC is Off, or output-level unit system is W or V; the continuous mode becomes Off. (When the continuous mode is set to On, it changes to Off, automatically.)
Use Example	OCNT OFF

OIS

Output Level Increment Step Value

Function	Sets an output level incremental step value.
Command Message	OIS I ₂
Value of I₂	0.01 to 100DB : 0.01 to 100 dB
Query Message	OIS?
Response Message	OIS I ₂
Use Example	OIS 100DB

OLDBM

Output-Level Unit to dBm

Function	Switches the output level unit to dBm.
Command Message	OLDBM
Query Message	None
Response Message	None
Use Example	OLDBM

OLDBU

Output-Level Unit to DBU

Function	Switches the output level unit to dB μ V.
Command Message	OLDBU
Query Message	None
Response Message	None
Use Example	OLDBU

O

OLK

Output-Level Rotary-Knob (Up/Down)

Function	Ups and downs the output level in increments of a preset output level resolution.
Command Message	OLK a
Value of a	UP : Up by preset output level resolution DN : Down by preset output level resolution Down
Query Message	OLK?
Response Message	OLK a
Use Example	OLK UP

OLR

Output-Level Resolution

Function	Sets an output level setup resolution.
Command Message	OLR a
Value of a	0.01DB : 0.01 dB 0.1DB : 0.1 dB 1DB : 1 dB 10DB : 10 dB 100DB : 100 dB R : Move resolution digit to right (lower) L : Move resolution digit to left (upper)
Query Message	OLR?
Response Message	OLR a
Limitation	When the level unit system on screen display is V or W, the specification of 0.01 DB to 100 DB becomes invalid.
Use Example	OLR 0.1DB

OLS

Output-Level-Incremental-Step Up/Down

Function	Ups and downs the output level in increments of a preset step.
Command Message	OLS a
Value of a	UP : Up by incremental step output level DN : Down by incremental step output level
Query Message	OLS?
Response Message	OLS a
Use Example	OLS DOWN

OLV

Output-Level Unit to volt

Function	Switches the output level unit to V.
Command Message	OLV
Query Message	None
Response Message	None
Use Example	OLV

O

OLVL

Output Level

Function	Sets an output level.															
Command Message	OLVL l_1															
Value of l_1	<table><tr><td>-193 to 67DBM</td><td>:</td><td>-193.00 to 67.00 dBm</td></tr><tr><td>5.0AW to 50.1MW</td><td>:</td><td>5.0 aW to 50.1 mW</td></tr><tr><td>-79.99 to 180.01DBU</td><td>:</td><td>-79.99 to 180.01 dBμV</td></tr><tr><td>0.016UV to 1.58V</td><td>:</td><td>0.016 μV to 1.58 V</td></tr><tr><td>0.032UV to 3.16V</td><td>:</td><td>0.032 μV to 3160 mV</td></tr></table>	-193 to 67DBM	:	-193.00 to 67.00 dBm	5.0AW to 50.1MW	:	5.0 aW to 50.1 mW	-79.99 to 180.01DBU	:	-79.99 to 180.01 dB μ V	0.016UV to 1.58V	:	0.016 μ V to 1.58 V	0.032UV to 3.16V	:	0.032 μ V to 3160 mV
-193 to 67DBM	:	-193.00 to 67.00 dBm														
5.0AW to 50.1MW	:	5.0 aW to 50.1 mW														
-79.99 to 180.01DBU	:	-79.99 to 180.01 dB μ V														
0.016UV to 1.58V	:	0.016 μ V to 1.58 V														
0.032UV to 3.16V	:	0.032 μ V to 3160 mV														
Query Message	OLVL?															
Response Message	OLVL l_1															
Limitation	Certain conditions (such as output level offset on or off, relative level display mode on or off, and continuous mode on or off) may not allow an output level to be set.															
Use Example	OLVL 10.00DBM															

OLW

Output-Level Unit to watt.

Function	Switches the output level unit to W.
Command Message	OLW
Query Message	None
Response Message	None
Use Example	OLW

OOF

Output-Level-Offset (ON/OFF)

Function	Sets output level offset mode on or off.
Command Message	OOF a
Value of a	ON : Output level offset mode On OFF : Output level offset mode Off
Query Message	OOF?
Response Message	OOF a
Limitation	With output level unit W or V, output level offset mode is fixed at off. (If output level offset mode has been set to on, it is set at off automatically.)
Use Example	OOF OFF

OOS

Output-Level Offset Value

Function	Sets an output level offset.
Command Message	OOS I ₂
Value of I₂	-50.00 to 50.00DB : -50.0 to 50.00 dB (0.01 dB steps)
Query Message	OOS?
Response Message	OOS I ₂
Limitation	With output level offset mode on, an output level offset may not be set depending on its setting.
Use Example	OOS 15DB

O

ORL

Output-Level-Relative (ON/OFF)

Function	Sets relative output level display mode on or off.
Command Message	ORL a
Value of a	ON : Relative output level display mode On OFF : Relative output level display mode Off
Query Message	ORL?
Response Message	ORL a
Limitation	With output level unit W or V, relative output level display mode is fixed at off. (If relative output level display mode has been set to on, it is set at off automatically.)
Use Example	ORL OFF

ORLR?

Output-Level-Relative, Reference Value

Function	Returns the reference output level which was set when the relative output level display mode was set to ON.
Command Message	None
Query Message	ORLR?
Response Message	ORLR I ₁
Value of I₁	-143 to 17DBM : -143.00 to 17.00 dBm
Use Example	ORLR?

ORLV?

Output-Level-Relative, Displayed Value

Function	Returns the output level displayed on the screen when the relative output level display mode is ON.
Command Message	None
Query Message	ORLV?
Response Message	ORLV I ₁
Value of I₁	-160 to 160DB : -160.00 to 160.00 dB
Use Example	ORLV?

P

PHM

Phase Modulation

Function	Sets a phase modulation (ϕ M) deviation.
Command Message	PHM I ₄
Value of I₄	-12.56 to 12.56RAD : -12.56 to 12.56 rad (0.01 rad steps) -720 to 720DEG : -720 to 720 deg (1 deg step)
Query Message	PHM?
Response Message	PHM I ₄
Use Example	PHM 10.00RAD

PLLMODE

PLL Mode

Function	Selects the loop characteristics of PLL synthesizer circuit.
Command message	PLLMOD a
Value of a	NORM : Normal (SSB phase noise characteristics at near to carrier are good.) NARR : Narrow (SSB phase noise characteristics at far from carrier are good.)
Query Message	PLLMOD
Response Message	PLLMOD a
Use Example	PLLMOD NARR

PMO

Pulse-Modulation (ON/OFF)

Function	Sets pulse modulation (PM) signal source of digital modulation function.
Command Message	PMO a
Value of a	ON : External pulse-modulation signal source OFF : Pulse modulation Off INT : Internal pulse-modulation signal source EXT : External pulse-modulation signal source
Query Message	PMO?
Response Message	PMO a
Limitation	The source of pulse modulation can not select to INT (internal pulse-modulation signal source) if a digital modulation unit (expansion unit) is not mounted.
Use Example	PMO OFF

Q

QBOUTOS

\overline{Q} Output Offset

Function	Sets a \overline{Q} output (differential Q signal) offset.
Command Message	QBOUTOS I ₃
Value of I₃	-0.5 to 1.5V : -0.5 to 1.5 V -500.0 to 1500.0MV: -500.0 to 1500.0 mV (0.5 mV steps)
Query Message	QBOUTOS?
Response Message	QBOUTOS I ₃
Limitation	This command is functional only if the additional function of I/Q signal output option (option 11) is mounted.
Use Example	QBOUTOS 1500MV

QOLTR

Q Output Level Trim

Function	Trims the Q output level.
Command Message	QOLTR r
Value of r	80.00 to 120.00 : 80.00 to 120.00 %
Query Message	QOLTR?
Response Message	QOLTR r
Limitation	This command is functional only if the additional function of I/Q signal output option (option 11) is mounted.
Use Example	QOLTR 110

QOUTOS

Q-Output Offset

Function	Sets a Q output offset.
Command Message	QOUTOS I ₃
Value of I₃	-0.5 to 1.5V : -0.5 to 1.5 V -500.0 to 1500.0MV: -500.0 to 1500.0 mV (0.5 mV steps)
Query Message	QOUTOS?
Response Message	QOUTOS I ₃
Limitation	This command is functional only if the additional function of I/Q signal output option (option 11) is mounted.
Use Example	QOUTOS 1500MV

R

RBK

Recall Basic Parameter Memory UP/Down

Function	Increments or decrements the basic parameter memory location number to read the stored data.
Command Message	RBK a
Value of a	UP : Basic Parameter Memory (BPM) number Up DN : Basic Parameter Memory (BPM) number Down
Query Message	None
Response Message	None
Use Example	RBK UP

RBS

Recall Basic Parameter Memory UP/DOWN

Function	Increments or decrements the basic parameter memory location number to read the stored data.
Command Message	RBS a
Value of a	UP : Basic Parameter Memory (BPM) number Up DN : Basic Parameter Memory (BPM) number Down
Query Message	None
Response Message	None
Use Example	RBS DN

RECAPM

Recall All Parameter Memory

Function	Recalls the stored data from a specified all-parameter memory location.
Command Message	RECAPM n
Value of n	0 to 99 : All Parameter Memory (APM) number 0 to 99
Query Message	RECAPM?
Response Message	RECAPM n
Limitation	If the digital modulation unit in use is not mounted when the data is to be saved, parameters corresponding to the unit cannot be recalled.
Use Example	RECAPM 55

RECBPM

Recall Basic Parameter Memory

Function	Recalls the stored data from a specified basic parameter memory location.
Command Message	RECBPM n
Value of n	0 to 511 : Basic Parameter Memory (BPM) number 0 to 511
Query Message	RECBPM?
Response Message	RECBPM n
Use Example	RECBPM 55

R

REF ?

Reference Frequency Source

Function	Retrieves information about the reference frequency signal for this instrument.
Command Message	None
Query Message	REF?
Response Message	REF a1, a2
Value of a1	10MHZ : 10 MHz 13MHZ : 13 MHz
Value of a2	INT : Internal reference oscillator EXT : External reference oscillator
Use Example	REF?

REMDISP

Remote Error Message Display Mode

Function	Selects the error message display mode at error on remote control.
Command message	REMDISP a
Value of a	NORM : Normal (Error message is erased by the next command reception.) REMA : Remain (Error message is not erased by the next command reception.) STOP : Stop (Neglects the following commands.)
Query Message	REMDISP?
Response Message	REMDISP a
Use Example	REMDISP REMA

RFHIGH

RF high level output On/Off

Function	Sets a RF high level output mode.
Command Message	RFHIGH a
Value of n	ON : RF high level output mode On OFF : RF high level output mode Off
Query Message	RFHIGH?
Response Message	RFHIGH a
Limitation	This command is functional only if an RF high level output (option 42) is mounted.
Use Example	RFHIGH ON

RFHLVL?

RF high level value

Function	Returns the level gain (which was set when the RF high level output mode was set to ON).
Command Message	None
Query Message	RFHLVL?
Response Message	RFHLVL l ₂
Value of l₂	0 to 20 DB : 0 to 20 dB (Option 42 is 8 dB fix)
Limitation	This command is functional only if an RF high level output (option 42) is mounted.
Use Example	RFHLVL?

S

SAFE

Safety-Mode (ON/OFF)

Function	Sets safety mode on or off at the time of output level setup.
Command Message	SAFE a
Value of a	ON : Safety mode On OFF : Safety mode Off
Query Message	SAFE?
Response Message	SAFE a
Use Example	SAFE OFF

SAVAPM

Save All Parameter Memory

Function	Saves a parameter to a specified all parameter memory location.
Command Message	SAVAPM n, SAVAPM n, s
Values of n and s	n = 0 to 99 : All Parameter Memory (APM) number 0 to 99 s = "Title name" or 'Title name' 8 or less alphanumeric characters (upper case or lower case), and symbol marks (-+/=!#\$%&()^[]{}<?_)
Query Message	SAVAPM?
Response Message	SAVAPM n, s
Limitation	If data already exists at the specified All Parameter Memory (APM) number, it is overwritten without a request for confirmation.
Use Example	SAVAPM 56, "ABCDEF"

SAVBPM

Save Base Parameter Memory

Function	Saves a parameter to a specified Basic Parameter Memory location.
Command Message	SAVBPM n
Value of n	0 to 511 : Basic Parameter Memory (BPM) number 0 to 511
Query Message	SAVBPM?
Response Message	SAVBPM n
Limitation	If data already exists at the specified Basic Parameter Memory (BPM) number, it is overwritten without a request for confirmation.
Use Example	SAVBPM 55

SCOPY

Screen Copy

Function	Copies the current display image. It is outputted to it as a bitmap file, If an ATA card is inserted. Refer to paragraph 3.5.5 for the file name of bit map file. When the ATA card is not inserted, the screen data is temporally saved in the internal memory.
Command Message	SCOPY
Query Message	None
Response Message	None
Limitation	When the power is turned Off, the screen data temporally saved in the internal memory is erased. Export the copied screen data at ATA card using SCPEXP command, before power off.
Use Example	SCOPY

S

SCPEXP

Screen Copy Export

Function	Outputs the screen copy (Bit Map file) to the ATA card.
Command Message	SCPEXP
Query Message	None
Response Message	None
Limitation	This command is available when the ATA card is installed.
Use Example	SCPEXP

SCRSAV

Screen Saver

Function	Sets a period of time that should expire before the screen saver is launched.
Command Message	SCRSAV a
Value of a	HALFH : 30 minutes ONEH : 60 minutes TWOH : 120 minutes NONE : Disable screen saver
Query Message	SCRSAV?
Response Message	SCRSAV a
Use Example	SCRSAV TWOH

SPREV

RF Spectrum Reverse

Function	Sets RF spectrum reversing (Exchange I phase for Q phase.)								
Command Message	SPREV a								
Value of a	<table> <tr> <td>ON</td> <td rowspan="2">}</td> <td rowspan="2">: Spectrum reverse</td> </tr> <tr> <td>REV</td> </tr> <tr> <td>OFF</td> <td rowspan="2">}</td> <td rowspan="2">: Spectrum normal</td> </tr> <tr> <td>NORM</td> </tr> </table>	ON	}	: Spectrum reverse	REV	OFF	}	: Spectrum normal	NORM
ON	}	: Spectrum reverse							
REV									
OFF	}	: Spectrum normal							
NORM									
Query Message	SPREV a								
Response Message	SPREV?								
Use Example	SPREV ON								

SWP

Sweep Control

Function	Controls the Basic Parameter Memory Sweeping function.						
Command Message	SWP a						
Value of a	<table> <tr> <td>START</td> <td>: Sweeping On</td> </tr> <tr> <td>STOP</td> <td>: Sweeping Off</td> </tr> <tr> <td>PAUSE</td> <td>: Sweeping temporarily Off</td> </tr> </table>	START	: Sweeping On	STOP	: Sweeping Off	PAUSE	: Sweeping temporarily Off
START	: Sweeping On						
STOP	: Sweeping Off						
PAUSE	: Sweeping temporarily Off						
Query Message	SWP?						
Response Message	SWP a						
Use Example	SWP START						

S

SWPBEG

Sweep Begin

Function	Specifies the number of the Basic Parameter Memory with which a sweep starts.
Command Message	SWPBEG n
Value of n	0 to 511 : Basic Parameter Memory number 0 to 511
Query Message	SWPBEG ?
Response Message	SWPBEG n
Use Example	SWPBEG 62

SWPEND

Sweep End

Function	Specifies the number of the Basic Parameter Memory with which a sweep finishes.
Command Message	SWPEND n
Value of n	0 to 511 : Basic Parameter Memory number
Query Message	SWPEND?
Response Message	SWPEND n
Use Example	SWPEND 511

SWPMOD

Sweep Mode

Function	Sets the sweep mode when the Basic Parameter Memory is swept.
Command Message	SWPMOD a
Value of a	0 : Auto (Repeated sweeping) 1 : Single (Single sweeping)
Query Message	SWPMOD?
Response Message	SWPMOD a
Use Example	SWPMOD 0

SWPPAT

Sweep Pattern

Function	Sets the pattern to read the specified Basic Parameter Memory being swept.
Command Message	SWPPAT a
Value of a	0 : Both (Frequency and level) 1 : Frequency (Only frequency) 2 : Level (Only level)
Query Message	SWPPAT?
Response Message	SWPPAT a
Use Example	SWPPAT 2

S

SWPTIM

Sweep Time

Function	Sets the interval to read the specified Basic Parameter Memory number being swept.
Command Message	SWPTIM a1 a2
Value of a	a1 = 0 to 511 : Basic Parameter Memory number a2 = 1MS to 600S : Interval (1ms to 600s, 1ms steps)
Query Message	SWPTIM? SWPTIM? a1
Response Message	SWPTIM a2
Use Example	SWPTIM 511 1MS

SYS

System

Function	Sets up a digital modulation system.
Command Message	SYS a
Value of a	NONE : A digital modulation unit is not mounted. WCDMA : W-CDMA (Differs depending on the system being used.)
Query Message	SYS?
Response Message	SYS a
Use Example	SYS WCDMA

TRM

GPIB Terminator

Function	Switches the response message terminator.
Command Message	TRM a
Value of a	0 : LF 1 : CR/LF
Query Message	TRM?
Response Message	TRM? a
Use Example	TRM 1

V

VDSPL

Volt Unit for Display

Function	Switches the voltage unit.
Command Message	VDSPL a
Value of a	EMF : EMF (emf voltage display) TERM : TERM (Terminating voltage display)
Query Message	VDSPL?
Response Message	VDSPL a
Use Example	VDSPL EMF

WAM

Wide Band Amplitude Modulation (ON/OFF)

Function	Sets wide-band amplitude modulation (W-AM) of analog modulation function on or off.
Command Message	WAM a
Value of a	ON : W-AM On OFF : W-AM Off
Query Message	WAM ?
Response Message	WAM a
Limitation	When the digital modulation is On, the W-AM is fixed to Off. (When the digital modulation is set to On at W-AM On; the W-AM becomes Off, automatically.)
Use Example	WAM ON

Section 5 Calibration and Performance Test

This section describes the type of measuring apparatus and equipment required to perform calibration and performance test of the instrument as preventive maintenance, how to set them up, and how to perform calibration and performance test of the instrument.

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5.1 Calibration

5.1.1 Calibration

Even if the unit is functioning normally, calibrate it periodically to keep its performance from being degraded.

Calibrating the unit once or twice a year is recommended.

If the unit fails to meet specifications after calibration, contact our service department.

CAUTION

Before performing the calibration, let the unit and calibration apparatus warm up for at least 30 minutes to allow them to fully stabilize. For optimal measuring accuracy, run the unit at room temperature (0 to 50 °C) from an AC voltage source with low fluctuations (100 to 120 VAC, 200 to 240 VAC), in an environment free from noise, vibration, dust, moisture, and other harmful ambient conditions.

5.1.2 Calibration apparatus

The table below specifies the types of apparatus used to calibrate this unit.

Recommended apparatus name	Performance requirement	Calibration item
Oscilloscope	Capable of measuring 10 MHz External triggering available	Reference oscillator frequency accuracy
Frequency standard	Standard radio receiver or having an equivalent capability (accuracy: on the order of 1×10^{-9} or better)	Reference oscillator frequency accuracy

NOTE: Some of the performance characteristics required to cover the measuring ranges of the individual tests are listed above.

5.1.3 Calibrating frequencies with an oscilloscope

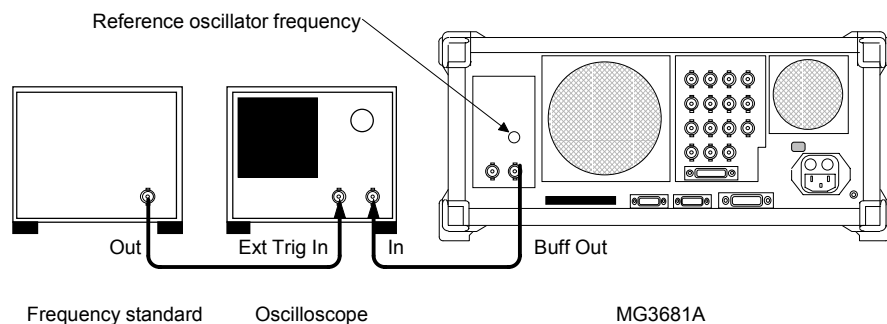
Use an oscilloscope to calibrate the reference oscillator frequency. Use a frequency standard (signal synchronized with a standard radio signal or with a rubidium atomic standard) offering better accuracy than the reference oscillator installed in this unit.

Calibration Specifications

Reference oscillator	Aging rate	Temperature stability
Internal reference oscillator	$\pm 1 \times 10^{-6}$ /year	$\pm 1 \times 10^{-6}$ (0 to 50 °C)
Option 01	$\pm 5 \times 10^{-9}$ /day	$\pm 3 \times 10^{-8}$ (0 to 50 °C)
Option 02	$\pm 5 \times 10^{-10}$ /day	$\pm 5 \times 10^{-9}$ (0 to 50 °C)

Calibration Procedure

The flow of calibration using an oscilloscope is described below.



- <1> Keep turned off.
- <2> Connect the reference signal output (Buff Output) on the rear panel of the unit to the Y-axis terminal of the oscilloscope.
- <3> Connect the reference signal output from the frequency standard to the external trigger input terminal of the oscilloscope.

- <4> Turn on .
- <5> Adjust the oscilloscope to observe the input waveform. If the input waveform appearing on the oscilloscope swings to the left or right out of synchronism, it means that the frequency of the unit's reference oscillator does not match the standard frequency. There will be no swing if synchronism is achieved.

- <6> If synchronism is not achieved, turn the trimmer in the reference oscillator frequency calibration hole on the unit's rear panel with a screwdriver until the input waveform appearing on the oscilloscope comes to rest.

If a 10 MHz standard signal is applied from this unit to the X-axis terminal of the oscilloscope, a Lissajous waveform will be generated. In this case, adjust the reference oscillator to bring the Lissajous waveform to rest.

CAUTION

Allow the unit to warm up for at least 30 minutes before starting it, or for 24 hours if it is to be started at a low temperature.

5.2 Performance Test

5.2.1 Performance test

Perform the performance test of the unit as preventive maintenance to keep its performance from being degraded.

Carry out the performance test if verification of the unit performance is required, such as after an inspection, after a scheduled inspection, or after a repair period.

If the unit fails to meet the specifications as a result of performance test, contact our service department.

The performance test that is performed on this unit involves tests with respect to the following characteristics:

- Output frequency
- Output level frequency response
- Output level accuracy
- Harmonic spurious output
- Amplitude modulation frequency response
- Frequency modulation frequency response
- Phase modulation frequency response
- Vector modulation frequency response

Carry out the performance test periodically as preventive maintenance with respect to those characteristics that are considered critical. We recommend carrying out the performance test once or twice a year.

CAUTION

Before proceeding with performance test, allow the unit and the calibration apparatus to warm up for at least 30 minutes to fully stabilize. For optimal measuring accuracy, run the unit at room temperature from an AC voltage source with low fluctuation, in an environment free from noise, vibration, dust, moisture, and other harmful ambient conditions.

5.2.2 Test apparatus for MG3681A

The apparatuses used for testing the unit are shown below:

Performance test	Performance requirement*	Recommended apparatus name (Anritsu model name)
Output frequency	100 kHz to 3 GHz, resolution 10 mHz	Frequency counter (MF2412A)
Output level frequency response	Resolution 0.01 dB	Power meter (ML4803A)
	100 kHz to 3 GHz, -30 to +20 dBm	Power sensor (MA4601A)
Output level accuracy	100 kHz to 3 GHz	Calibration receiver (ML2530A)
Harmonic spurious output	100 kHz to 10.5 GHz	Spectrum analyzer (MS2665C)
Amplitude modulation frequency response	400 kHz to 3 GHz, AM 100 %	Modulation analyzer (MS616B)
	20 Hz to 20 kHz, 2 V(p-p) / 600Ω	Low-frequency oscillator
Frequency modulation frequency response	10 MHz to 3 GHz, FM 400 kHz	Modulation analyzer (MS616B)
	20 Hz to 20 kHz, 2 V(p-p) / 600Ω	Low-frequency oscillator
Phase modulation frequency response	10 MHz to 3 GHz, φM 400 rad	Modulation analyzer (MS616B)
	20 Hz to 20 kHz, 2 V(p-p) / 600Ω	Low-frequency oscillator
Vector modulation frequency response	100 Hz to 30 MHz, 1 V(p-p) / 50Ω, 2 ch	Two-channel synthesizer
	100 MHz to 3 GHz	Spectrum analyzer (MS2665C)

NOTE: Some of the performance characteristics needed to cover the measuring ranges of the individual tests are listed above.

5.2.3 Testing the output frequency

Using a frequency counter, check if the preset signal is generated correctly.

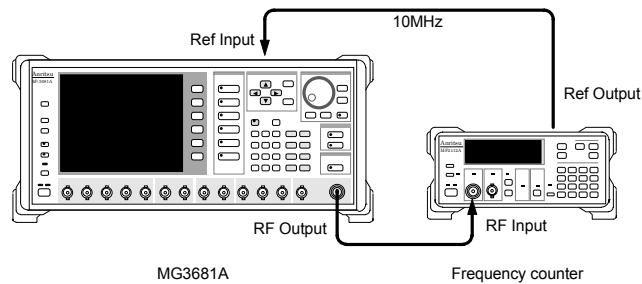
Test Specifications

Frequency Range: 250 kHz to 3000 MHz

Resolution setting: 0.01 Hz

Test Procedure

The sequence of testing the output frequency with a frequency counter is described below.



- <1> Connect the reference signal output (10 MHz) of the frequency counter to the external reference input terminal (Ref Input) of this unit to achieve frequency synchronism.
- <2> Set the frequency counter to 10 mHz measuring resolution.
- <3> Press to preset the unit.
- <4> Set the unit to a 0 dB output level.
- <5> Set the unit to an optional output frequency.
- <6> Check if the frequency counter correctly reads the frequency set with the unit.
- <7> By varying the frequency setting, repeat the measurement sequence above.

The frequency counter reading includes a \pm count error.

5.2.4 Testing the output level frequency response

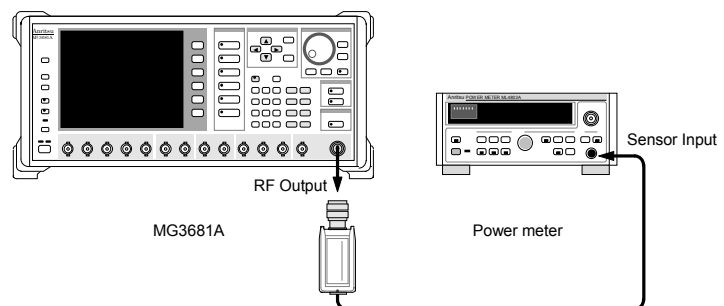
Using a power sensor and a power meter, test the output level frequency response.

Test Specification

± 1 dB or less (0 dBm output)

Test Procedure

The sequence for testing the output level frequency response is described below.



- <1> Press to preset the unit.
- <2> Calibrate the sensor (zero point, sensitivity).
- <3> Connect the power sensor directly to the unit's RF output connector.
- <4> Set the unit to a 0 dBm output level.
- <5> Set the unit's frequency. Also, set the power sensor correction coefficient at the set frequency to the power meter
- <6> Read the output level with the power meter and record it.
- <7> By varying the frequency setting, repeat Steps <5> and <6> above.

5.2.5 Testing the output level accuracy

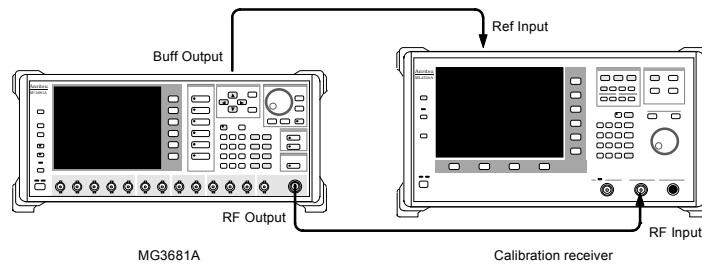
Using a calibration receiver, test the output level accuracy.

Test Specifications

Output level	≤ 1 GHz	> 1 GHz
≤ +13 dBm, ≥ -127 dBm	± 1 dB	± 2 dB
< -127 dBm	± 2 dB	± 3 dB

Test Procedure

The sequence of testing the output level accuracy is described below.



<1> Connect the unit's reference signal output (Buff Output) to the external reference input terminal (Ref Input) of this unit to achieve frequency synchronism.

<2> Press to preset the unit.

<3> Set the calibration receiver to a 1 Hz resolution bandwidth and calibrate the calibration receiver for each measuring frequency (for range-to-range errors).

<4> Set frequencies for the unit and the calibration receiver.

<5> After setting the unit's output level, measure the level with the calibration receiver.

<6> Sum up and record the deviation between the unit's output level and the level measured at a 0 dBm setting and the value measured at the same frequency in Section 5.2.4.

$$[\text{Level error}] = [\text{Level measurement value}] - [\text{Level measurement value at 0 dBm}] + [\text{Value recorded at the same frequency in Section 5.2.4}]$$

<7> Vary the output level setting and repeat Steps <5> and <6>.

<8> Vary the frequency setting and repeat Steps <4> to <7>.

Note:

To protect the measurement from the external input noise and residual response of measuring instrument, set the measurement frequency value to that (such as 100.012 345 MHz) apart from an integer value (such as 100.000 000 MHz).

5.2.6 Testing the harmonic spurious output

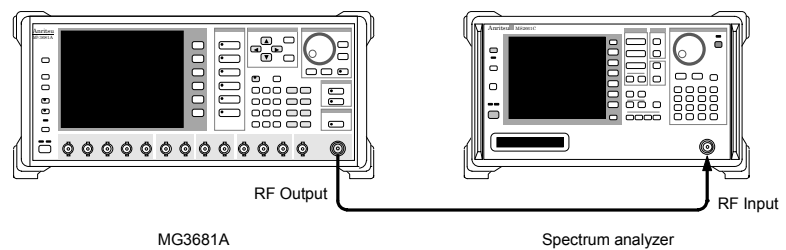
Using a spectrum analyzer, test the harmonic spurious output.

Test Specification

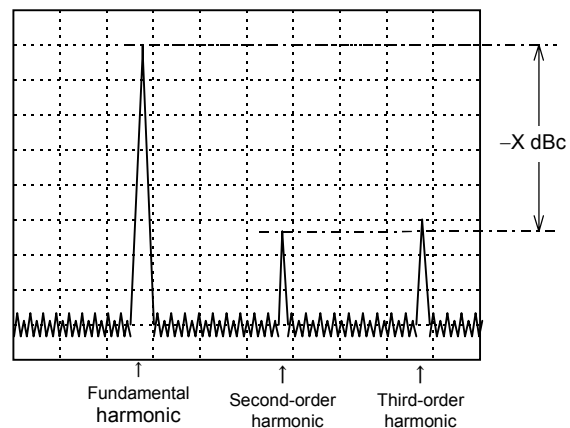
< -30 dBc (CW, ≤ 0 dBm output)

Test Procedure

The sequence of testing the harmonic spurious output is described below.



- <1> Press to preset the unit.
- <2> Set the spectrum analyzer to a +10 dBm reference level. Also, set the unit to a 0 dBm output level.
- <3> Set the unit's frequency.
- <4> Set the spectrum analyzer to a frequency range of 0 Hz to the measuring frequency x 3.5.
- <5> Measure and record the second- and third-order harmonic level deviations relative to the fundamental wave using the spectrum analyzer.



- <6> Vary the frequency setting and repeat Steps <3> to <5>.

5.2.7 Testing the amplitude modulation frequency response

Carry out amplitude modulation using a low-frequency oscillator as a modulating signal source and then test the amplitude modulation frequency response using a modulation analyzer.

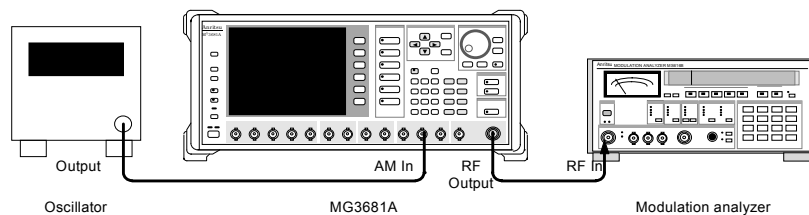
Test Specifications

≤0 dBm, with a ±1.5 dB bandwidth relative to a 1 kHz modulating frequency

Frequency	AM 30%	AM 80%
≥0.4 MHz, <2 MHz	DC/20 Hz to 3 kHz	DC/20 Hz to 1 kHz
≥2 MHz, <10 MHz	DC/20 Hz to 10 kHz	DC/20 Hz to 10 kHz
≥10 MHz	DC / 20 Hz to 10 kHz	

Test Procedure

The sequence for testing the amplitude modulation frequency response is described below.



- <1> Press to preset the unit.
- <2> Set the low-frequency oscillator to 2 V (p-p) output (600Ω terminating voltage).
- <3> Set the unit to a 0 dBm output level and the source of amplitude modulation to external (Ext), and then turn on amplitude modulation.
- <4> Set the modulation analyzer to demodulation mode AM and detection mode Average.
- <5> Set frequencies for the unit and the modulation analyzer.
- <6> Set a depth of amplitude modulation for the unit.
- <7> Vary the frequency setting of the low-frequency oscillator and measure the depth of modulation with the modulation analyzer and record the deviation from the depth of modulation at 1 kHz.
- <8> Vary the depth of amplitude modulation setting for this unit and repeat Steps <6> to <7>.
- <9> Vary the frequency setting and repeat Steps <5> to <8>.

5.2.8 Testing the frequency modulation frequency response

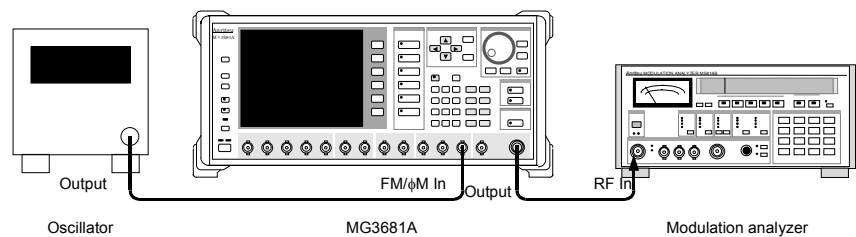
Carry out frequency modulation using a low-frequency oscillator as a modulating signal source and then test the frequency modulation frequency response using a modulation analyzer.

Test Specifications

DC/20 kHz (With a ± 1 dB bandwidth relative to a 1 kHz modulating frequency).

Test Procedure

The sequence for testing the frequency modulation frequency response is described below.



- <1> Press to preset the unit.
- <2> Set the low-frequency oscillator to 2 V (p-p) output (600 Ω terminating voltage).
- <3> Set the unit to a 0 dBm output level and the source of frequency modulation to external (Ext), and then turn on frequency modulation.
- <4> Set the modulation analyzer to demodulation mode FM and detection mode Average.
- <5> Set frequencies for the unit and the modulation analyzer.
- <6> Set a frequency modulation deviation for the unit.
- <7> Vary the frequency setting of the low-frequency oscillator and measure the frequency deviation with the modulation analyzer and record the deviation from the deviation at 1 kHz.
- <8> Vary the frequency deviation for this unit and repeat Steps <6> to <7>.
- <9> Vary the frequency setting and repeat Steps <5> to <8>.

5.2.9 Testing the phase modulation frequency response

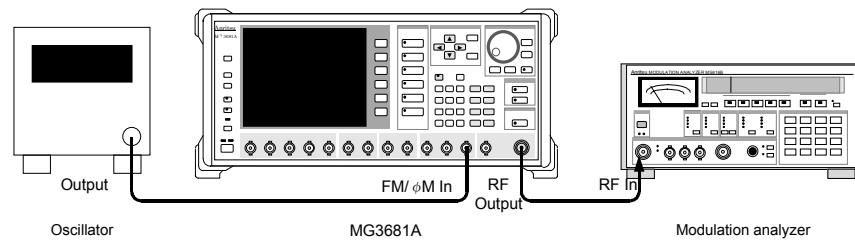
Carry out phase modulation using a low-frequency oscillator as a modulating signal source and then test the phase modulation frequency response using a modulation analyzer.

Test Specifications

DC/20 Hz to 20 kHz (with a ± 1 dB band with relative to a 1 kHz modulating frequency)

Test Procedure

The sequence for testing the phase modulation frequency response is described below.



- <1> Press to preset the unit.
- <2> Set the low-frequency oscillator to 2 V (p-p) output (600Ω terminating voltage).
- <3> Set the unit to a 0 dBm output level and the source of phase modulation to external (Ext), and then turn on phase modulation.
- <4> Set the modulation analyzer to demodulation mode φM and detection mode Average.
- <5> Set frequencies for the unit and the modulation analyzer.
- <6> Set a phase modulation deviation for the unit.
- <7> Vary the frequency setting of the low-frequency oscillator and measure the frequency deviation with the modulation analyzer and record the deviation from the deviation at 1 kHz.
- <8> Vary the frequency deviation for this unit and repeat Steps <6> to <7>.
- <9> Vary the frequency setting and repeat Steps <5> to <8>.

5.2.10 Testing the vector modulation frequency response

Carry out vector modulation using a complex sine wave generated from a two-channel synthesizer, and then the vector modulation frequency response using a spectrum analyzer.

Test Specifications

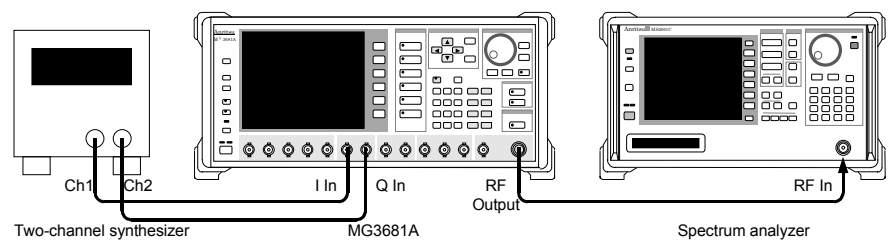
≥ 100 MHz, ≤ 0 dBm, I/Q = 0.5 V (rms)

DC to 15 MHz (± 2 dB bandwidth)

DC to 30 MHz (± 3 dB bandwidth)

Test Procedure

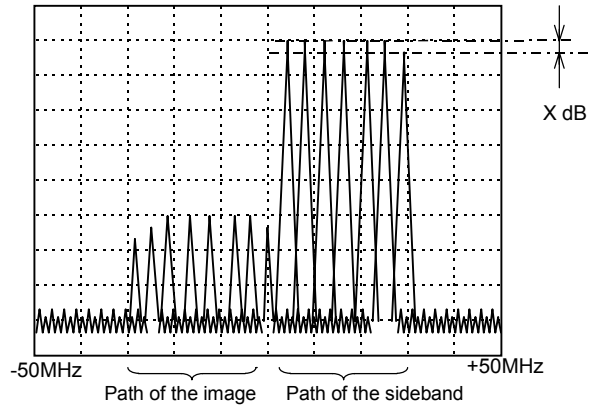
The sequence for testing the vector modulation frequency response is described below.



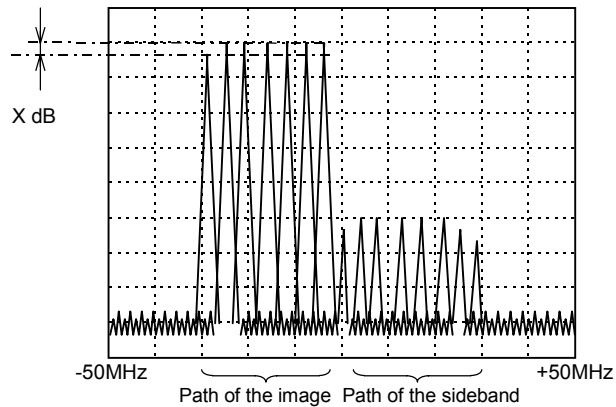
- <1> Press to preset the unit.
- <2> Set the two-channel synthesizer to 1 V (p-p) output (50 Ω terminating voltage) and a phase gap of 90° between CH1 and CH2.
- <3> Set the unit to a 0 dBm output level and the source of digital modulation to external (Ext), and then turn on digital modulation.
- <4> Set the unit to an ALC off.
- <5> Set the spectrum analyzer to a frequency span of 100 MHz and a reference level of +10 dBm.
- <6> Set a frequency for the unit and a central frequency for the spectrum analyzer.

Section 5 Calibration and Performance Test

- <7> Vary the frequency setting of the two-channel synthesizer and measure and record the sideband signal level with the spectrum analyzer.



- <8> Set the two-channel synthesizer to a phase gap of 90° between CH1 and CH2.
<9> Vary the frequency setting of the two-channel synthesizer and measure and record the sideband signal level deviation with the spectrum analyzer.



- <10> Vary the frequency setting and repeat Steps <6> to <9>.

5.3 Consumables

5.3.1 About Consumable Supplies

The following parts installed in MG3681A have the lifetimes according to the number of times of the operation or the electrified time.

Pay attention to the lifetimes of the parts when using the equipment continuously.

Step attenuator

It is a mechanical attenuator to vary the output level.

Along with the number of operations, the accuracy of the output level and the reproducibility are influenced.

It depends on environment, but it is recommended that the attenuator be replaced when it is used approximately 3,000,000 times.

Cooling Fan

There are two cooling fans on the rear side panel.

If the following phenomenon is confirmed, contact Anritsu or agencies immediately.

- A wind does not come from the cooling fan.
- They sound unusually.
- The equipment becomes hot unusually.

The cold cathode-ray tube has been adopted as the back light of the LCD.

Along with time to turn on the display, luminosity falls.

The lifetime of a back light can be prolonged by turning off the equipment or using a screen saver function.

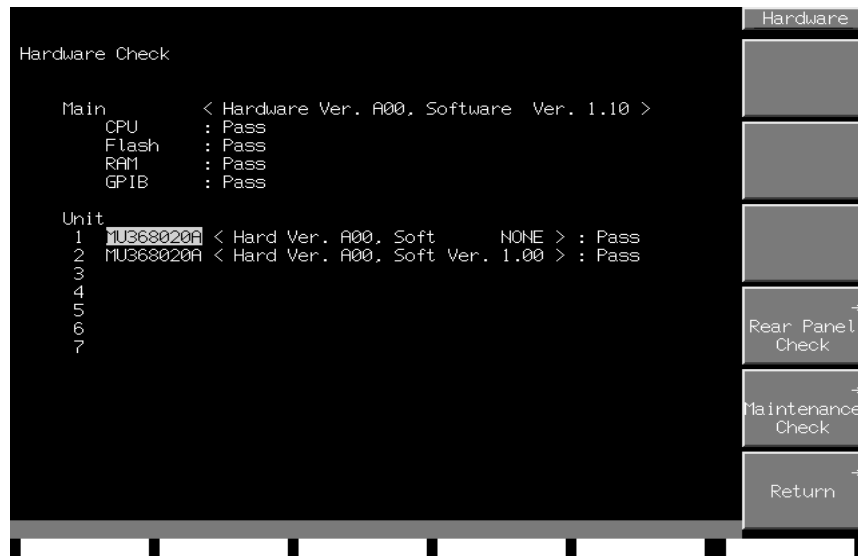
The lifetime of a back light is approximately 5,000 hours.

5.3.2 Checking on the Maintenance Screen

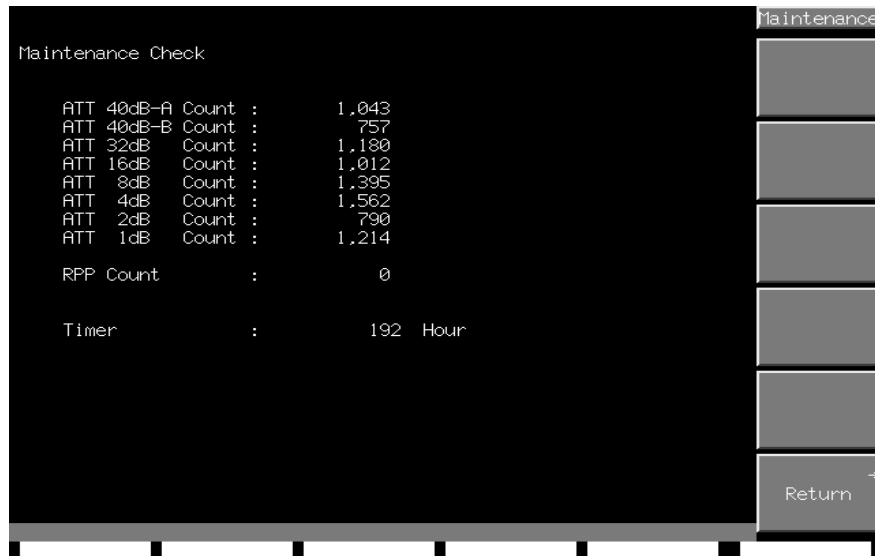
Using the Maintenance screen, you can check the operation time of this unit and the operation count of the step attenuator (consumable supply).

The procedure to open the Maintenance screen is as follows:

<1> Press **Config**, then press **F5** (Hardware Check) to open the Hardware Check screen.



<2> Press **F5** (Maintenance Check) to open the Maintenance window.



Section 6 Storage and Transportation

Before daily maintenance of the unit, be sure to turn it off and unplug it from the AC outlet.

6.1	Daily Maintenance	6-3
6.2	Tips on Storing the Unit for an Extended Period	6-3
6.3	Repackaging and Shipping.....	6-4
6.4	Storing Memory Cards.....	6-4

6.1 Daily Maintenance

Before daily maintenance of the unit, be sure to turn the power off and unplug it from the AC outlet.

Unit surface dirt

When surface dirt is noticeable, after the unit has been used in a dusty environment, or when the unit has not been used for an extended period of time, wipe its surface with a cloth moistened in detergent.

Screen surface dirt

If the screen surface is dirty, first wipe it dry with a soft cloth. If the dirt persists, wipe the surface gently with a cloth dipped in detergent.

Loose screws

Use Phillips and flat-head screwdrivers to tighten screws.

6.2 Tips on Storing the Unit for an Extended Period

Wipe off dust, fingerprint marks, stains, spots, etc. from the surface of the unit before storing it. Avoid storing the unit in these places:

- Places that are exposed to direct sunlight
- Dusty places
- Damp places where condensation may occur on the unit surface
- Places where the unit may be corroded by active gases
- Places where the unit may be oxidized
- Places having temperatures and relative humidities in the following ranges:
 - Temperature: $< -20\text{ }^{\circ}\text{C}$, $> 60\text{ }^{\circ}\text{C}$
 - Relative humidity: $\geq 90\%$

Recommended storage conditions

It is recommended that the unit be stored in a place that meets the ambient conditions suggested above, plus the following conditions, if it is not to be used for a long period of time:

- Temperature: 0 to 50 °C
- Relative humidity: 40 to 80 %
- Little temperature and relative humidity variations within one day

6.3 Repackaging and Shipping

When shipping the unit, consider these instructions:

Recapping

Repack the unit in the packing material (box) in which it had been delivered. If the packing material has been scrapped or damaged, repack the unit in the following manner:

- <1> Wrap the unit in vinyl or a similar material.
- <2> Procure a corrugated fiberboard box, wooden box, or aluminum box that is large enough to house the instrument and the cushioning material around it.
- <3> Put the unit in the box, and then the cushioning material to secure the unit in the box.
- <4> Fasten the box firmly with strings, adhesive tapes, or other materials.

Shipping

Shipping the unit with maximum protection against vibration and in compliance with the suggested storage conditions is recommended.

6.4 Storing Memory Cards

Store memory cards at temperatures of 4 to 53 °C and relative humidities of 8 to 90 % (no condensation). Avoid storing memory cards in places that are:

- Dusty or damp
- Close to magnetic substances
- Exposed to direct sunlight
- Close to heat sources

Appendix A Specifications

Appendix A Specifications

Basic Performance

<Frequency>

Item	Specification
Range	250 kHz to 3000 MHz (setting range: 0 to 3000 MHz)
Resolution	0.01 Hz
Accuracy	Based on the reference oscillator accuracy Accuracy during frequency modulation: Accuracy of reference oscillator \pm (5% of FM deviation + 5 Hz)
Internal reference oscillator <ul style="list-style-type: none">• Aging rate• Temperature stability	$\pm 1 \times 10^{-6}$ /year $\pm 1 \times 10^{-6}$ (0 to 50°C)
External reference input <ul style="list-style-type: none">• Frequency• Working range• Input level• Connector	10 MHz, 13 MHz (Selected automatically) ± 10 ppm ≥ 0.7 V(p-p) / 50 Ω (AC coupling) Rear panel, Ext Ref Input, BNC connector
Buffer output <ul style="list-style-type: none">• Frequency• Output level• Connector	10 MHz TTL level (DC coupling) Rear panel, Buff Input, BNC connector
Switching time	Response time from issue of the last command to attainment within ± 500 Hz of the set frequency (CW, ALC On, GPIB): 20 ms (excluding the times of passing by 600 MHz and 1010 MHz)

Appendix A Specifications

<Output Level>

Item	Specification									
Range	-143 to +13 dBm (setting range: -143 to +17 dBm)									
Unit	Power units : dBm (-143.00 to +17.00 dBm) W (5.01 to 999 aW, 1.00 to 999 fW, 1.00 to 999 pW, 1.00 to 999 nW, 1.00 to 999 μ W, 1.00 to 50.1 mW) Voltage units : dB μ V (Terminating voltage display: -36.01 to +123.99 dB μ V) (Open voltage display: -29.99 to +130.01 dB μ V) V (Terminating voltage display: -0.016 to 999 μ V, 1.00 to 999 mV, 1.00 to 1.58 V) (Open voltage display: -0.032 to 999 μ V, 1.00 to 999 mV, 1.00 to 3.16 V)									
Resolution	dBm, dB μ V unit : 0.01 dB V, W unit : 3 digits									
Frequency response	± 1 dB at 0 dBm with CW and ALC on									
Accuracy	With CW and ALC on <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Level range</th> <th>≤ 1GHz</th> <th>> 1GHz</th> </tr> </thead> <tbody> <tr> <td>$\leq +13$ dBm, ≥ -127 dBm</td> <td>± 1 dB</td> <td>± 2 dB</td> </tr> <tr> <td>< -127 dBm</td> <td>± 2 dB</td> <td>± 3 dB</td> </tr> </tbody> </table>	Level range	≤ 1 GHz	> 1 GHz	$\leq +13$ dBm, ≥ -127 dBm	± 1 dB	± 2 dB	< -127 dBm	± 2 dB	± 3 dB
Level range	≤ 1 GHz	> 1 GHz								
$\leq +13$ dBm, ≥ -127 dBm	± 1 dB	± 2 dB								
< -127 dBm	± 2 dB	± 3 dB								
Output connector										
• Impedance	50 Ω									
• Connector	Front panel, RF Output, N-type connector									
Switching time	Response time from issue of the last command to attainment within ± 0.5 dB of the last level (CW, ALC On, GPIB): ≤ 50 ms (Normal mode) ≤ 100 ms (Safety mode) ≤ 10 ms (Continuous mode)									
Special setup modes										
• Continuous mode	The level can be changed within ± 10 dB (CW) of the set value without interrupting the output. This mode is effective only when dB unit is used.									
• Safety mode	When vector modulation is performed by the digital modulation unit, the modulation settings take effect. While the mechanical attenuator is operating, the level is lowered to prevent large spike signals from being generated.									

<Output Level (continued)>

Item	Specification
ALC mode • ALC On	Application : Used to generate a continuous wave or a pulse modulation wave (burst wave) whose RF On time is 10 μ s or longer. ALC time constant: Auto/500ns/2.4 μ s/5 μ s/24 μ s/50 μ s/240 μ s/500 μ s In the Auto mode, the ALC time constant is selected automatically according to the frequency, amplitude modulation state, and vector modulation state (when a digital modulation unit is used). Even when a time constant is specified, the minimum value is forcibly limited according to the set frequency value.
• ALC Off	Application : Used to generate a pulse modulation wave (burst wave) whose RF On time is less than 10 μ s. Restriction : Amplitude modulation is disabled. ALC Cal : ALC Cal is executed automatically when ALC Cal operation is performed or a set frequency or level is changed.

<Signal Purity>

Item	Specification												
Spurious • Harmonic • Nonharmonic	≤ 0 dBm at CW, Continuous mode off < -30 dBc <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Carrier frequency</th> <th>15 kHz to 300 MHz offset</th> <th>>300 MHz offset</th> <th>Fixed frequency spurious</th> </tr> </thead> <tbody> <tr> <td>≤ 2500 MHz</td> <td>< -60 dBc</td> <td>< -30 dBc</td> <td>-50 dBc (660 MHz, 1320 MHz)</td> </tr> <tr> <td>> 2500 MHz</td> <td>< -30 dBc</td> <td></td> <td>—</td> </tr> </tbody> </table>	Carrier frequency	15 kHz to 300 MHz offset	>300 MHz offset	Fixed frequency spurious	≤ 2500 MHz	< -60 dBc	< -30 dBc	-50 dBc (660 MHz, 1320 MHz)	> 2500 MHz	< -30 dBc		—
Carrier frequency	15 kHz to 300 MHz offset	>300 MHz offset	Fixed frequency spurious										
≤ 2500 MHz	< -60 dBc	< -30 dBc	-50 dBc (660 MHz, 1320 MHz)										
> 2500 MHz	< -30 dBc		—										
• Power supply-related item	< -40 dBc												
SSB phase noise	20 kHz offset at CW < -118 dBc/Hz (≥ 10 MHz, ≤ 1010 MHz) < -112 dBc/Hz (> 1010 MHz)												

Modulation Function

<Amplitude Modulation (AM)>

Item	Specification																		
Range	0 to 100% (INT AM and EXT AM cannot be set separately when they are modulated at the same time.)																		
Resolution	0.1 %																		
Modulation frequency response	<p>≤ 0 dBm, ALC On, reference modulation frequency = 1 kHz, ±1.5 dB bandwidth:</p> <p>Lower frequency limit : DC (INT AM or EXT AM DC Coupling) 20 Hz (EXT AM AC Coupling)</p> <p>Upper frequency limit : See the table below.</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th rowspan="2">Carrier frequency</th> <th colspan="2">Vector modulation and Wide AM Off</th> <th>Vector modulation or Wide AM On</th> </tr> <tr> <th>AM30%</th> <th>AM80%</th> <th>AM30%</th> </tr> </thead> <tbody> <tr> <td>≥0.4 MHz <2 MHz</td> <td>3 kHz</td> <td>1 kHz</td> <td rowspan="2">1 kHz</td> </tr> <tr> <td>≥2 MHz <10 MHz</td> <td>10 kHz</td> <td>10 kHz</td> </tr> <tr> <td>≥10 MHz</td> <td colspan="2">10 kHz</td> <td></td> </tr> </tbody> </table>	Carrier frequency	Vector modulation and Wide AM Off		Vector modulation or Wide AM On	AM30%	AM80%	AM30%	≥0.4 MHz <2 MHz	3 kHz	1 kHz	1 kHz	≥2 MHz <10 MHz	10 kHz	10 kHz	≥10 MHz	10 kHz		
Carrier frequency	Vector modulation and Wide AM Off		Vector modulation or Wide AM On																
	AM30%	AM80%	AM30%																
≥0.4 MHz <2 MHz	3 kHz	1 kHz	1 kHz																
≥2 MHz <10 MHz	10 kHz	10 kHz																	
≥10 MHz	10 kHz																		
Internal modulation (INT AM)	Comply with the specification of AF synthesizer (option 21)																		
External modulation (EXT AM) <ul style="list-style-type: none"> • Proper input level • Coupling • Input impedance • Input connector 	Approx. 2 V (p-p) Switchable between AC/DC 600Ω Front panel, AM input, BNC connector																		
Modulation signal polarity	Switchable between positive and negative (To switch to negative polarity, input a negative value as a modulation depth.)																		

<High-Speed Analog Modulation (Wide AM)>

Item	Specification
Modulating frequency response	External modulation, input level = 0.9 V (p-p), carrier frequency \geq 100MHz, output level \leq 0 dBm, reference modulation frequency = 1 kHz: DC to 15 MHz (\pm 2 dB) DC to 30 MHz (\pm 3 dB)
Internal modulation	Depends on the attached digital modulation unit
External modulation	
• Input level	\leq 1 V (p-p)
• Input sensitivity	1 V (p-p) = 100%
• Coupling	DC
• Input connector	Impedance : 50 Ω Connector : Front panel, Wide AM Input (also used as I Input), BNC connector
Modulating signal polarity	Fixed at positive polarity

<Pulse Modulation (PM)>

Item	Specification
On/Off ratio	>60 dB
Rise/fall time	<100 ns
Minimum pulse width	<500 ns
Pulse repetition frequency	DC to 1 MHz (at ALC off)
Maximum delay time	<150 ns
Overshoot ringing	<20%
Internal modulation	Depends on the attached digital modulation unit
External modulation	
• Input level	Range : 0 to 5 V
• Logic	Threshold : Applox. 1 V Positive logic
• Input connector	Impedance : 50 Ω Connector : Front panel, Pulse Input, BNC connector

Appendix A Specifications

<Vector Modulation>

Item	Specification
Modulating frequency response	External modulation, input level = 0.5 V (rms), carrier frequency \geq 100 MHz, and output level \leq 0 dBm, reference modulation frequency = 1 kHz: DC to 15 MHz (± 2 dB) DC to 30 MHz (± 3 dB)
Vector accuracy	External modulation, input level = 0.5 V (rms), carrier frequency \geq 100 MHz, and output level \leq 0 dBm, 3.84 Msps QPSK modulation $\leq 2.5\%$ (rms)
Internal modulation	Depends on the attached digital modulation unit
External modulation	
<ul style="list-style-type: none"> • Level • Input connector 	$\sqrt{I^2 + Q^2} = 0.5$ V(rms) (Level at which the output level matches its setting) -1.5 V(peak) \leq I, Q \leq +1.5 V (peak) Impedance : 50 Ω Connector : Front panel, I/Q Input, BNC connector
Quadrature skew adjustment	Adjustment range : ± 1 deg or more
I/Q change	I and Q signals interchangeable (Reverse RF spectrum)

<Simultaneous Modulation>

Item	Specification
Simultaneous modulation	Simultaneous modulation is enabled excluding the following combinations: <ul style="list-style-type: none"> • Frequency modulation and phase modulation • Wide band amplitude modulation and vector modulation • Vector modulation (internal) and vector modulation (external) • Vector modulation (internal) and pulse modulation The modulation factors and deviations are the same for the following combinations: <ul style="list-style-type: none"> • Internal modulation and external modulation of amplitude • Internal modulation and external modulation of frequency • Internal modulation and external modulation of phase The signal source frequencies/waveforms are the same for the following combinations: <ul style="list-style-type: none"> • Amplitude modulation (internal) and frequency modulation (internal) • Amplitude modulation (internal) and phase modulation (internal)

<AF Signal Output> *Only when the AF synthesizer (option 21) is installed

Item	Specification
Level	Depends on the installed AF synthesizer
Output signal source	Depends on the installed AF synthesizer
Output connector	Impedance : 600Ω Connector : Front panel, AF Output, BNC connector

<I/Q Signal Output> *Performance upgradable with option 11 installed

Item	Specification
Level	Depends on the attached digital modulation unit
Output signal source	Depends on the attached digital modulation unit
Output connector	Impedance : 50Ω Connector : Front panel, I/Q Output, BNC connector

<Clock Signal Generation Feature>

Item	Specification
Internal clock signal	
• Range	4 kHz to 240 MHz
• Resolution	1 Hz
• Accuracy	Same as the reference oscillator
External clock signal	
• Input frequency range	10 kHz to 32 MHz
• Buffered clock frequency range	Same as the external clock signal frequency
• Sync clock frequency range	Two, four, eight, and 16 times the buffered clock signal frequency (Up to eight times when buffered clock signal frequency > 3.75 MHz)
• External clock input	Input level : TTL level or 0.5 V (p-p) (50Ω termination AC coupling) The input level may be limited by the digital modulation Unit mounted. Logic : Positive or negative logic, selectable Connector : Front panel, Digital Input 5, BNC connector

Other Functions

<Memory Function>

Item	Specification
Basic parameter memory • Kinds of items stored • Memory capacity • Memory recall modes • Memory attributes	Frequency and level 512 sets • Frequency only : Only frequencies are recalled and set. • Output level only : Only output levels are recalled and set. • Both frequency and output level: Both frequencies and output levels are recalled and set. The following memory attribute can be set for each memory location: • Skip setting : Selected memory locations can be removed from the scope of incremental or decremental recall using sweep function or trigger function.
All-parameter memory • Kinds of items stored • Memory capacity • Memory attribute	All parameters, including those related to analog and digital modulation units Max. 100 sets. The following memory attribute can be set for each memory location: • Memory name: Each memory location can be named using a string of up to eight alphanumeric characters and symbols.

<Sweep Function>

Item	Specification
Sweep parameter	Basic parameter memory address
Sweep pattern	Start address → Stop address
Sweep time	1 ms to 600 s per memory (The lower limit depends on the time required for memory recall.)
Sweep mode	Auto (repetitive sweep), Single (single sweep)

<Relative Value Display>

Item	Specification
Parameters	Frequency and output level (dB unit only)
Setting and display in relative value display mode	Entered and displayed as relative values. [Current setting] = [Entered and displayed value] + [Setting in relative value display mode]
Current display	The actual frequency and output level can be displayed in relative value display mode.

<Offset Display>

Item	Specification
Parameters	Frequency and output level (dB unit only)
Setting and display in offset value display mode	Entered and displayed as offset values. [Current setting] = [Entered and displayed value] – [Offset value]
Offset range	
• Frequency	–3 to +3 GHz
• Output level	–50 to +50 dB
Current display	The actual frequency and output level can be displayed in offset value display mode.

<Display>

Item	Specification
Screen size	7.2-inch, 480×640 dots, color DSTN, or 6.5-inch, 480×640 dots, color TFT
ON/OFF setting	The panel display can be turned on and off.
Contrast control	The display control can be adjusted. (When the LCD screen consists of TFT, the contrast cannot be adjusted.)
Screen saver	The screen saver is launched when the instrument's panel is left idle for a certain period of time, with the display being turned off. The backlight turns off at the same time. The display and backlight turn on when any key is pressed. Time to launch: 0.5h, 1h, 2h or infinite selectable
Screen copy	The current display image can be saved to a PC card as an image file. Image format: 256-color bitmap

<Backup Facility>

Item	Specification
Backup items	All the items are restored when the power is turned on again, except for: <ul style="list-style-type: none"> • Data then being entered • Remote state • Data then being transferred by GPIB • RPP operating status • Display transitions • Main function selection conditions

<Panel Lock Feature>

Item	Specification
Panel lock	Disables all the keys, except for the front-panel power switch, the Local key, the Panel Lock key, and the Contrast keys.
Knob hold	Disables the front-panel rotary knob.

External Control

<GPIB>

Item	Specification
Controlled items	All functions, except for the power switch, the Local key, the Panel lock key, and the Contrast key, can be controlled.
Interface	SH1, AH1, T5, L4, TE0, SR1, RL1, DP0, PP0, DC1, DT1, C1, E2
Connector	Rear panel

<RS-232C>

Item	Specification
Controlled items	All functions, except for the power switch, the Local key, the Panel lock key, and the Contrast key, can be controlled.
Communication method	Asynchronous (start-stop method), Half Duplex
Communication control method	X-ON/OFF control by commands
Baud rate	1200, 2400, 4800, 9600, 19200, 38400 bps
Data bit	7 or 8 bits
Parity	Odd, Even, None
Start bit	1 bit
Stop bit	1 or 2 bits
Connector	D-sub 9-pin, female

<PC Cards>

Item	Specification
Function	Memory card (Screen hard copy)
Connector	Rear panel, JEID Rear panel, JEIDA Ver4/4.1 PCMCIA Rel2.0-compatible, 1 slot

<Trigger>

Item	Specification
Controlled items	Among the following items, those specified by the command input signal (3 bit) are executed: <ul style="list-style-type: none"> • Frequency incrementing/decrementing • Output level incrementing/decrementing • Basic parameter memory recall address incrementing/decrementing • Output level on/off
Interface	<ul style="list-style-type: none"> • Command input signal : TTL level (pull up) × 3 • Trigger input signal : TTL level (pull up), run on the rising edge • Auxiliary power output : +5 V, 100 mA (built-in short-circuit and overcurrent protective circuits)
Connector	Rear panel, D-sub, 9-pin, female

Protective Circuit

<Reverse Power Protection>

Item	Specification
Protective means	The RF output circuit is cut off upon application of External Electric power to the RF output, to protect the internal circuit. The RF output circuit is released by reset input from the panel or under external control.
Maximum reverse input power	≤ 1 GHz : 50 W > 1 GHz : 25 W DC : ± 50 V

General Performance

<General Performance>

Item	Specification
Power supply	AC 100 to 120 V, 200 to 240 V (-15/+10%, up to 250 V; 100 and 200 V sources switched automatically) 47.5 to 63 Hz ≤ 300 VA
Temperature range	Operating temperature : 0 to 50°C Storage temperature : -20 to 60°C
Conducted disturbance	EN 61326-1: 2006 (Class A)
Radiated disturbance	EN 61326-1: 2006 (Class A)
Harmonic Current Emission	EN 61000-3-2: 2006 (Class A)
Electrostatic Discharge	EN 61326-1: 2006 (Table 2)
Electromagnetic Field Immunity	EN 61326-1: 2006 (Table 2)
Fast Transient / Burst	EN 61326-1: 2006 (Table 2)
Surge	EN 61326-1: 2006 (Table 2)
Conducted RF	EN 61326-1: 2006 (Table 2)
Voltage Dips / Short Interruptions	EN 61326-1: 2006 (Table 2)
Physical dimensions and mass	177 mm \times 426 mm \times 451 mm (H \times W \times D) (excluding protrusions) ≤ 25 kg (excluding the expansion unit)

Options

<Reference Crystal Oscillator, Option 01>

Item	Specification
Frequency	10 MHz
Aging rate	$\pm 5 \times 10^{-9}$ /day
Startup characteristics	$\pm 1 \times 10^{-7}$ (after 10 minutes of operation, relative to 24 hours after power was turned on)
Temperature stability	$\pm 3 \times 10^{-8}$ (0 to 50°C)

<Reference Crystal Oscillator, Option 02>

Item	Specification
Frequency	10 MHz
Aging rate	$\pm 5 \times 10^{-10}$ /day
Startup characteristics	$\pm 1 \times 10^{-7}$ (after 10 minutes of operation, relative to 24 hours after power was turned on)
Temperature stability	$\pm 5 \times 10^{-9}$ (0 to 50°C)

<Additional Function of I/Q Signal Output, Option 11>

Item	Specification
Summary	Level and offset setup and differential output capabilities added to the I/Q signal output
Level	At 50Ω termination
• Range	80 to 120% of the specified output (The two sets of $I\bar{I}$ and $Q\bar{Q}$ can be independently fine-tuned)
• Resolution	0.1%
Offset	At 50Ω termination
• Range	-0.5 to +1.5 V (The four sets of I, \bar{I}, Q, \bar{Q} can be independently fine-tuned)
• Resolution	0.5 mV
Differential output	\bar{I} and \bar{Q} signals available for output (via the I/Q Input connector as it is switched)
Output signal source	Depends on the attached digital modulation unit
Output connector	
• Impedance:	50Ω
• Connector	Front panel, I/Q Output, \bar{I}/\bar{Q} Output, BNC connector

<AF Synthesize, Option 21>

Item	Specification
Summary	Can be used as an AF output facility and as a source of internal modulating signals for analog modulation
Frequency <ul style="list-style-type: none"> • Range • Resolution • Accuracy • Waveforms 	0.01 Hz to 400 kHz 0.01 Hz Same as the reference oscillator accuracy Sine, triangular, square, sawtooth waves
Frequency response	Sine wave, Level = 2 V (p-p), Offset = 0 V, 600 Ω termination, ± 1 dB in a range of 10 Hz to 100 kHz relative to 1 kHz
Harmonic distortion	Sine wave, Level = 2 V (p-p), Offset = 0 V, 600 Ω termination, ≤ -50 dB at 1 kHz
Waveforms	Sine, triangular, square, sawtooth waves
Level <ul style="list-style-type: none"> • Range • Resolution • Accuracy 	At 600 Ω termination 0 to 4 V (p-p) 1 mV (p-p) \pm (8% of setting + 2 V (p-p)) at 1 kHz, Sine wave
Offset <ul style="list-style-type: none"> • Range • Resolution • Accuracy 	At 600 Ω termination -2 to +2 V 1 mV \pm (8% of setting +2 V) at 1 kHz, Sine wave
Output connector <ul style="list-style-type: none"> • Impedance • Connector: 	600 Ω Front panel, AF Output, BNC connector

<RF High Level Output, Option 42>

Item	Specification
Summary	8 dB increases a maximum output level in the W-CDMA band.
Frequency range	1900 to 2300 MHz
Gain	8 dB ± 1 dB (At 2.1 GHz, relative to RF high level output Off, -3 dBm)
Gain frequency response	± 1 dB (At +5 dBm output, relative to 2.1 GHz)

Appendix B Message Displays

Appendix B Message Displays

Error Messages

Filing Errors

Error message	Explanation
No ATA PC Card	Invalid ATA PC card
Down Load Failure	Download failure
Invalid File Version	Unmatched version number (Download failure)
Invalid File Format	Invalid file format
No Spaces In PC Card	Not enough space
Card Removed During Access	PC card removed while being accessed (The validity of filed and imported data becomes unpredictable)

Operational Error

Error message	Explanation
Entry Out Of Range	Entry out of range

Memory Errors

Error message	Explanation
Memory Area Full	Not enough space to save
Memory Number Full	Not enough space at the save destination (remote control)
No Target Units (Related Parameters Not Recalled)	No unit to recall to (unit not mounted). Parameters not recalled.
Memory Not Found	Memory number not saved
Invalid Version (Exported By Old Version)	Memory import failure (memory exported by using an older version of software)

Remote Control Errors

Error message	Explanation
REMOTE: Undefined Command	Undefined (illegal) command
REMOTE: Invalid Numeric Data	Invalid parameter format (number)
REMOTE: Invalid Unit	Invalid parameter format (unit)
REMOTE: Invalid Parameter	Invalid parameter format (defined character string)
REMOTE: Invalid Format	Invalid parameter format (such as a parameter count)
REMOTE: Command Not Accepted	Command rejected
REMOTE: Invalid Status	Not available in the current state
REMOTE: Out of Range	Invalid parameter format (range)

Appendix B Message Displays

Internal Errors

Error message	Explanation
Backup Failure, All Parameter Initialized	Corrupted SRAM (Backup failure)
REMOTE: Response Failure	Remote message response failure
Unlock	Hardware error

Status Messages

Operation in progress

Status Messages	Explanation
Wait A Moment: File Downloading	File being downloaded
Wait A Moment: Memory Storing	Writing to internal memory
Wait A Moment: File Exporting	File being exported
Wait A Moment: File Importing	File being imported
Wait A Moment: Calculating	Pattern being calculated

*The messages will be erased when the operation is completed.

Completion Notices

Status Messages	Explanation
All Parameter Are Initialized	Parameters initialized
File Export Complete	Export completed
File Import Complete, Parameter Restorted	Import completed
Software Updated	Software update completed
Screen Copy Completed	Screen copy completed

Reports

Status Messages	Explanation
PC Card Inserted	PC card inserted
PC Card Removed	PC card remove
Uncal	UNCAL detected

Appendix C Default Value List

<Frequency Functions>

Screen display frequency	0.250 000 00 MHz
Offset frequency	0.00 Hz
Offset On/Off	Off
Relative On/Off	Off
Resolution digit (reverse digit)	0.01 Hz (least significant digit)
Incremental step frequency	0.01 Hz

<Output Level Functions>

RF On/Off	On
Output level	-143.00 dBm
Display unit	dBm
Voltage unit	EMF
Offset output level	0.00 dB
Offset On/Off	Off
Relative On/Off	Off
Continuous On/Off	Off
Resolution digit (reverse digit)	0.01 dBm (least significant digit)
Incremental step output level	0.01 dB
SAFETY mode on/off	Off
ALC On/Off	ALC On
ALC time constant	Auto
RF high level output	Off

<Memory Functions>

Screen display BPM location number	——— (display)
Attribute-edited BPM location number	1
Last saved BPM location number	0
APM recall result	None
All APM location titles	None
Selected BPM location recall	Both
Selected BPM location skip mode	Off

*: BPM= Base Parameter Memory
APM = All Parameter Memory

Appendix C Default Value List

<Analog Modulation Functions>

Analog modulation on/off	Off
Internal AF source oscillation frequency *	1,000.00 Hz
frequency resolution digit *	0.01 Hz digit
Internal AF source waveform *	Sine
Internal AF source output on/off *	Off
Internal AF source output level *	0.000 V (p-p)
Internal AF source output offset *	0.000 V (p-p)
External AM input coupling	AC
External FM/φM input coupling	AC
Wide AM (external input) on/off	Off
AM modulation source *f	Ext
AM on/off	Off
AM modulation depth	0.0 %
FM/φM modulation source *	Ext
FM/φM selection	FM
FM/φM On/Off	Off
Frequency modulation deviation	0 Hz
φM deviation	0 rad
φM deviation unit	rad
PM modulation on/off	Off

* Displayed only if an AF synthesizer option is installed.

<Digital Modulation Function>

I/Q source Int/Ext	Unit available, Int Unit not available, Ext
--------------------	--

<Configuration Functions>

RF output quadrature ratio adjustment	0
RF spectrum reverse	Off
I/Q output on/off *	Off
I/Q output quadrature ratio adjustment	0 deg
\overline{I} -output level adjustment *	100.0 %
\overline{Q} -output level adjustment *	100.0 %
I-output offset *	0.00 V
\overline{I} -output offset *	0.00 V
Q-output offset *	0.00 V
\overline{Q} -output offset *	0.00 V
Remote control port *	None
GPIB operation mode*	Device
GPIB address*	3
GPIB Terminator (as Talker) *	LF
Internal buzzer on/off	On
Screen saver launch time	None

* Displayed only if an additional function of I/Q signal output option is installed.

** Not initialized by pressing the Preset key or entering the *RST command.

<Measuring Instrument Control Functions>

Knob Hold (Knob operation)	Normal (Knob operation)
Display On/Off	On
Panel Lock	Unlock

Appendix D Performance Test Report Form

Appendix D Performance Test Report Form

Test Location _____ Report No. _____
 _____ Date _____
 _____ Test Officer _____

Instrument Name MG3681A digital modulation signal generator
 Serial No. _____ Ambient Temperature _____ °C
 Power _____ Relative Humidity _____ %
 Frequency _____ Hz

Remarks:

Output Level Frequency Responses (Section 5.2.3)

Setting	Result
1 MHz	<input type="checkbox"/> OK <input type="checkbox"/> NG
10 MHz	<input type="checkbox"/> OK <input type="checkbox"/> NG
100 MHz	<input type="checkbox"/> OK <input type="checkbox"/> NG
300 MHz	<input type="checkbox"/> OK <input type="checkbox"/> NG
600 MHz	<input type="checkbox"/> OK <input type="checkbox"/> NG
1000 MHz	<input type="checkbox"/> OK <input type="checkbox"/> NG
2000 MHz	<input type="checkbox"/> OK <input type="checkbox"/> NG
3000 MHz	<input type="checkbox"/> OK <input type="checkbox"/> NG

Output Level Frequency Responses (Section 5.2.4)

Setting		Minimum Rating	Result	Maximum Rating	Measurement Uncertainty
Frequency	Output Level				
1 MHz	0 dBm	-1.0 dBm	_____	+1.0 dBm	±0.4 dB
10 MHz		-1.0 dBm	_____	+1.0 dBm	
100 MHz		-1.0 dBm	_____	+1.0 dBm	
300 MHz		-1.0 dBm	_____	+1.0 dBm	
600 MHz		-1.0 dBm	_____	+1.0 dBm	
1000 MHz		-1.0 dBm	_____	+1.0 dBm	
1500 MHz		-1.0 dBm	_____	+1.0 dBm	
2000 MHz		-1.0 dBm	_____	+1.0 dBm	
2500 MHz		-1.0 dBm	_____	+1.0 dBm	
3000 MHz		-1.0 dBm	_____	+1.0 dBm	

Output Level Accuracy (Section 5.2.5)

Output Level Setting	Minimum Rating	Result					Maximum Rating	Measurement Uncertainty
		10 MHz	100 MHz	300 MHz	600 MHz	1000 MHz		
+13 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	±0.3 dB
+10 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
+5 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
0 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-5 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-10 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-15 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-20 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-30 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-40 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-50 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-60 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-70 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-80 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-90 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-100 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-110 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-120 dBm	-1.0 dB	_____	_____	_____	_____	_____	+1.0 dB	
-130 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	±1.0 dB
-140 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	

Output Level Setting	Minimum Rating	Result					Maximum Rating	Measurement Uncertainty
		1500 MHz	2000 MHz	2500 MHz	3000 MHz			
+13 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	±1.0 dB
+10 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
+5 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
0 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-5 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-10 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-15 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-20 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-30 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-40 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-50 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-60 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-70 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-80 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-90 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-100 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-110 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-120 dBm	-2.0 dB	_____	_____	_____	_____	_____	+2.0 dB	
-130 dBm	-3.0 dB	_____	_____	_____	_____	_____	+3.0 dB	±1.5 dB
-140 dBm	-3.0 dB	_____	_____	_____	_____	_____	+3.0 dB	

Harmonic Spurious Output (Section 5.2.6)

Settings		Result		Maximum Rating	Measurement Uncertainty
Frequency	Output level	2nd harmonics	3rd harmonics		
1 MHz	0 dBm	_____	_____	-30 dBc	±3.0 dB
10 MHz		_____	_____	-30 dBc	
100 MHz		_____	_____	-30 dBc	
300 MHz		_____	_____	-30 dBc	
600 MHz		_____	_____	-30 dBc	
1000 MHz		_____	_____	-30 dBc	
1500 MHz		_____	_____	-30 dBc	
2000 MHz		_____	_____	-30 dBc	
2500 MHz		_____	_____	-30 dBc	
3000 MHz		_____	_____	-30 dBc	

Amplitude Modulation Frequency Responses (Section 5.2.7)

Settings		Maximum Rating	Result			Maximum Rating	Measurement Uncertainty
Frequency	Output level		1 kHz AM 30% / 80%	3 kHz AM 30% / 80%	10 kHz AM 30% / 80%		
0.4 MHz	0 dBm	-1.5 dB	0dB / 0dB	/ -	- / -	+1.5 dB	±0.2 dB
2 MHz			0dB / 0dB	/	/		
10 MHz			0dB / 0dB	/	/		
100 MHz			0dB / 0dB	/	/		
600 MHz			0dB / 0dB	/	/		
1000 MHz			0dB / 0dB	/	/		
2000 MHz			0dB / 0dB	/	/		
3000 MHz			0dB / 0dB	/	/		

Frequency Modulation Frequency Responses (Section 5.2.8)

Settings		Minimum Rating	Result				Maximum Rating	Measurement Uncertainty
Frequency	Output level		1 kHz FM 5k / 100k	3 kHz FM 5k / 100k	10 kHz FM 5k / 100k	20 kHz FM 5k / 100k		
10 MHz	0 dBm	-1 dB	0dB / 0dB	/	/	/	+1 dB	±0.2 dB
100 MHz			0dB / 0dB	/	/	/		
600 MHz			0dB / 0dB	/	/	/		
1000 MHz			0dB / 0dB	/	/	/		
2000 MHz			0dB / 0dB	/	/	/		
3000 MHz			0dB / 0dB	/	/	/		

Appendix D Performance Test Report Form

Phase Modulation Frequency Responses (Section 5.2.9)

Settings		Minimum Rating	Result				Maximum Rating	Measurement Uncertainty
Frequency	Output level		1 kHz ϕ M 1rad / 5rad	3 kHz ϕ M 1rad / 5rad	10 kHz ϕ M 1rad / 5rad	20 kHz ϕ M 1rad / 5rad		
10 MHz	0 dBm	-1 dB	0dB / 0dB	/	/	/	+1 dB	±0.2 dB
100 MHz			0dB / 0dB	/	/	/		
600 MHz			0dB / 0dB	/	/	/		
1000 MHz			0dB / 0dB	/	/	/		
2000 MHz			0dB / 0dB	/	/	/		
3000 MHz			0dB / 0dB	/	/	/		

Vector Modulation Frequency Responses (Section 5.2.10)

Settings			Minimum Rating	Result		Maximum Rating	Measurement Uncertainty
Frequency	Output level	I/Q Frequency		LSB	USB		
100 MHz	0 dBm	1 kHz	-	0 dB	0 dB	-	±0.2 dB
		15 MHz	-2 dB			+2 dB	
		30 MHz	-3 dB			+3 dB	
600 MHz		1kHz	-	0 dB	0 dB	-	
		15 MHz	-2 dB			+2 dB	
		30 MHz	-3 dB			+3 dB	
1000 MHz		1 kHz	-	0 dB	0 dB	-	
		15 MHz	-2 dB			+2 dB	
		30 MHz	-3 dB			+3 dB	
2000 MHz		1 kHz	-	0 dB	0 dB	-	
	15 MHz	-2 dB			+2 dB		
	30 MHz	-3 dB			+3 dB		
3000 MHz	1 kHz	-	0 dB	0 dB	-		
	15 MHz	-2 dB			+2 dB		
	30 MHz	-3 dB			+3 dB		

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