MG3670B

Digital Modulation Signal Generator

Operation Manual
(GPIB Remote Control)

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WARNING

- *The protective earth terminal of this instrument must be connected to ground. The three-core power cord supplied with the instrument can be plugged into a grounded two pole AC outlet. If no grounded two pole AC outlet is available, the ground pin of the power cord or the earth terminal on the rear panel must be connected to ground before supplying the power to the instrument. Failure to do so could cause dangerous or possibly fatal electric shocks.*
- *Replacing fuses with the power cord still plugged into an AC outlet could also cause electric shocks.*
- *Supplemental explanation about WARNING on the rear panel*

WARNING ⚠

NO OPERATOR SERVICEABLE PARTS INSIDE.
REFER SERVICING TO
QUALIFIED PERSONNEL.

A supplemental explanation about the WARNING labelled on the rear panel is given in the following:

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

■ SAFETY CONSIDERATIONS:

Anritsu uses the following labels to identify safety precautions which should be followed to prevent personal injury or product damage. Please familiarize yourself with them before operating this product.

Labels used in this manual:

WARNING Indicates that the procedure could result in personal injury if not correctly performed. Do not proceed before you fully understand the explanation given with this symbol and meet the required conditions.

CAUTION Indicates that the operating procedure could result in damage to the product if not correctly performed. Do not proceed before you fully understand the explanation given with this symbol and meet the required conditions.

Labels or symbols used on / in the product:

⚡ : This symbol indicates hazardous voltages. Be careful (not used in this instrument).

⚠ : This international caution symbol indicates that the operator should refer to the operation manual before beginning a procedure.

⏚ : This symbol indicates an earth (ground) terminal. The product should be grounded via the earth terminal if a three prong power cord is not used.

CERTIFICATION

ANRITSU CORPORATION certifies that this instrument has been thoroughly tested and inspected, and found to meet published specifications prior to shipping.
Anritsu further certifies that its calibration measurements are based on the Japanese Electrotechnical Laboratory and Radio Research Laboratory standards.

WARRANTY

All parts of this product are warranted by Anritsu Corporation of Japan against defects in material or workmanship for a period of one year from the date of delivery.
In the event of a defect occurring during the warranty period, Anritsu Corporation will repair or replace this product within a reasonable period of time after notification, free-of-charge, provided that: it is returned to Anritsu; has not been misused; has not been damaged by an act of God; and that the user has followed the instructions in the operation manual.

Any unauthorized modification, repair, or attempt to repair, will render this warranty void.

This warranty is effective only for the original purchaser of this product and is not transferable if it is resold.

ALL OTHER EXPRESSED WARRANTIES ARE DISCLAIMED AND ALL IMPLIED WARRANTIES FOR THIS PRODUCT, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. IN NO EVENT SHALL ANRITSU CORPORATION BE LIABLE TO THE CUSTOMER FOR ANY DAMAGES, INCLUDING LOST PROFITS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, ARISING OUT OF THE USE OR INABILITY TO USE THIS PRODUCT.

All requests for repair or replacement under this warranty must be made as soon as possible after the defect has been noticed and must be directed to Anritsu Corporation or its representative in your area.

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

MEMORY BACK-UP BATTERY REPLACEMENT

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

STORAGE MEDIUM

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

ANRITSU CANNOT COMPENSATE FOR ANY MEMORY LOSS.

Please pay careful attention to the following points.

(Backed-up memory)

- Isolate the memory from static electricity.

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

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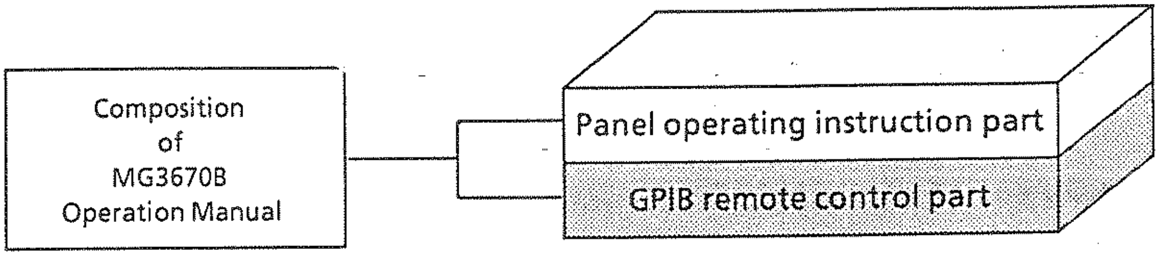
ABOUT THIS MANUAL

(1) Composition of MG3670B Operation Manuals

The MG3670B Digital Modulation Signal Generator operation manual of the standard type is composed of the following two parts. Use them properly according to the usage purpose.


Composition of MG3670B Operation Manual
Panel operating instruction part
GPIB remote control part

Panel operating instruction part: Panel Operating Instructions: Provides information on the MG3670B outline, preparation before use, panel description, basic operation, performance tests, calibration, storage / transportation, and quick reference for screen transition and error messages.

GPIB remote control part: Provides information on the MG3670B remote control which conforms with IEEE488.2 standards. To assist creating GPIB programs, this manual gives examples of N_{88} BASIC language programs that run on the NEC PC9800 series of personal computers.

The operation manuals of the MG0301C (π/4 DQPSK Modulation Unit) and the MG0302A (GMSK Modulation Unit) are prepared and sold separately. The operations of the MG0303B (Burst Function Unit) are explained in each the MG0301C/MG0302A operation manual description related to the burst function.

(2) GPIB Basic Guide (sold separately)

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

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SECTION 1
GENERAL

This section outlines the GPIB functions of the MG3670B Digital Modulation Signal Generator.

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SECTION 1
GENERAL

1.1 General

The MG3670B Digital Modulation Signal Generator, when combined with an external controller, can automate your measurement system. For this purpose the MG3670B is equipped with a GPIB interface bus (IEEE std 488.2 1987) as a standard feature.

1.2 Functions of GPIB

The functions of the MG3670B GPIB are as follows:

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

(2) Reads out all setting conditions

(3) Sets the GPIB address from the panel

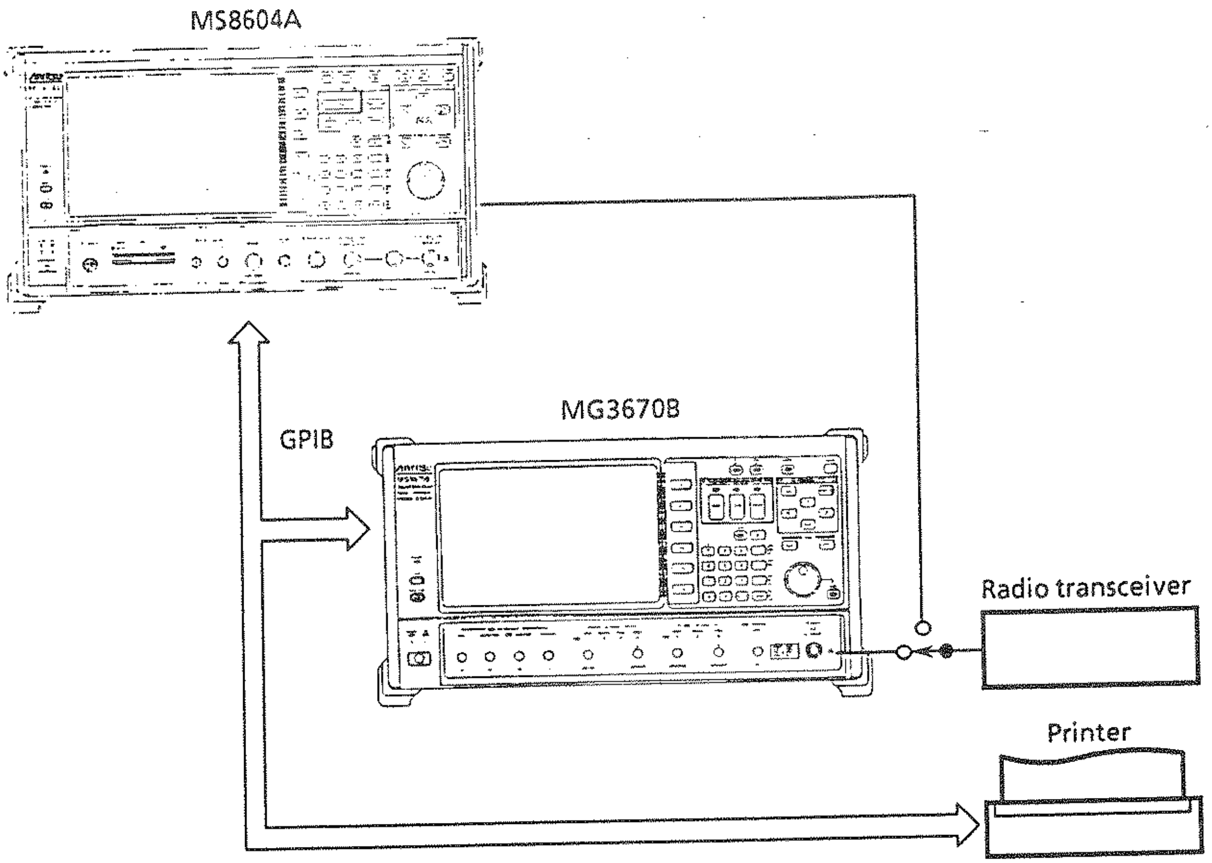
(4) Executes interrupts and serial polling

(5) Configures the automatic measurement system when the MG3670B is combined with a personal computer and other measuring instruments

1.3 Examples of System Configuration Using GPIB

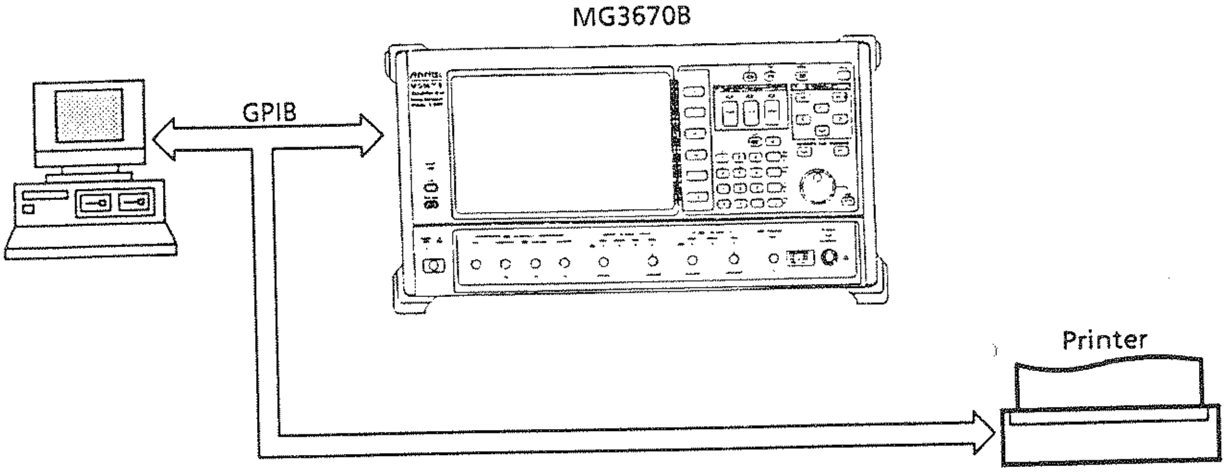
(1) PTA control by the MS8604A

The waveforms and parameters etc. measured by controlling the MG3670B with the MS8604A via GPIB can be output to the printer.



(2) Control by the host computer

The parameters etc. can be output to the printer by controlling the MG3670B with the host computer via GPIB.



1.4 Specifications

The MG3670B GPIB provides the IEEE488.1 subsets listed in the code columns of the table below.

GPIB 1 Interface Functions

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

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SECTION 2
DEVICE MESSAGE LIST

This section lists the device messages of the MG3670B.

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2.1 IEEE 488.2 Common Commands and MG3670B Supported Commands

The table below lists 39 types of common commands specified in the IEEE 488.2 standard. IEEE 488.2 common commands which are supported by the MG3670B are indicated with ◎ symbol in the table.

Mnemonic	Command name	IEEE488.2 Standard	MG3670B supported commands
*AAD	Accept Address Command	Optional	
*CAL?	Calibration Query	Optional	
*CLS	Clear Status Command	Mandatory	◎
*DDT	Define Device Trigger Command	Optional	
*DDT?	Define Device Trigger Query	Optional	
*DLF	Disable Listener Function Command	Optional	
*DMC	Define Macro Command	Optional	
*EMC	Enable Macro Command	Optional	
*EMC?	Enable Macro Query	Optional	
*ESE	Standard Event Status Enable Command	Mandatory	◎
*ESE?	Standard Event Status Enable Query	Mandatory	◎
*ESR?	Standard Event Status Register Query	Mandatory	◎
*GMC?	Get Macro Contents Query	Optional	
*IDN?	Identification Query	Mandatory	◎
*IST?	Individual Status Query	Optional	
*LMC?	Learn Macro Query	Optional	
*LRN?	Learn Device Setup Query	Optional	
*OPC	Operation Complete Command	Mandatory	◎
*OPC?	Operation Complete Query	Mandatory	◎
*OPT?	Option Identification Query	Optional	
*PCB	Pass Control Back Command	Mandatory if other than C0	
*PMC	Purge Macro Command	Optional	
*PRE	Parallel Poll Register Enable Command	Optional	
*PRE?	Parallel Poll Register Enable Query	Optional	
*PSC	Power On Status Clear Command	Optional	
*PSC?	Power On Status Clear Query	Optional	
*PUD	Protected User Data Command	Optional	
*PUD?	Protected User Data Query	Optional	
*RCL	Recall Command	Optional	
*RDT	Resource Description Transfer Command	Optional	
*RDT?	Resource Description Transfer Query	Optional	

Mnemonic	Command name	IEEE488.2 Standard	MG3670B supported commands
*RST	Reset Command	Mandatory	◎
*SAV	Save Command	Optional	
*SRE	Service Request Enable Command	Mandatory	◎
*SRE?	Service Request Enable Query	Mandatory	◎
*STB?	Read Status Byte Query	Mandatory	◎
*TRG	Trigger Command	Mandatory if DT1	
*TST?	Self Test Query	Mandatory	◎
*WAI	Wait to Continue Command	Mandatory	◎

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

2.2 MG3670B Device Message List

The tables on the following pages list the command messages, query messages, and response messages specific to the MG3670B.

2.2.1 How to read the MG3670B device message tables

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

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

(2) Response message(Response Msg)

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

Note:
- *In the device message list compatible with the MG3633A, the netted messages, which overlap with the MG3670B, can be used for MG3670B.*
- *If the header is set to Off, then the response message header and the numeric data suffix code are not transferred. (Initial setting: Header Off)*
- ␣ *means a space of one character.*
- Ø *indicates a zero.*

2.2.2 MG3670B device message list

(1) Frequency

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

(2) Output level

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

(3) Modulation

(Main instrument)

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

(4) IF / RF Setup

Measurement parameter		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets output level Upper limit	Output Level Limit Value On Off	 OLM␣ℓ_1 OLL␣ON OLL␣OFF	 OLM? OLL? OLL?	 OLM␣ℓ_1 OLL␣ON OLL␣OFF
Sets reference frequency	Reference Frequency 10 MHz 13 MHz	 REF␣1ØMHZ REF␣13MHZ	 REF? REF?	 REF␣1ØMHZ REF␣13MHZ
Sets I,Q levels	I, Q Level 50 Ω 500 mVrms CMOS CMOS Amplitude CMOS DC Offset	 IQL␣5ØØMV IQL␣CMOS CAPL␣ℓ_3 COS␣ℓ_3	 IQL? IQL? CAPL? COS?	 IQL␣5ØØMV IQL␣CMOS CAPL␣ℓ_3 COS␣ℓ_3
Turns I,Q input trim on or of	I, Q Input Trim On Off	 ITR␣ON ITR␣OFF	 ITR? ITR?	 ITR␣ON ITR␣OFF
Turns I,Q output trim on or off	I, Q Output Trim On Off	 OTR␣ON OTR␣OFF	 OTR? OTR?	 OTR␣ON OTR␣OFF
Sets pulse modulation signal input	Pulse Modulation Int Ext	 PM␣INT PM␣EXT	 PM? PM?	 PM␣INT PM␣EXT
Sets pulse modulation signal polarity	Pulse Modulation Polarity Positive Negative	 PMP␣POS PMP␣NEG	 PMP? PMP?	 PMP␣POS PMP␣NEG

(5) Base Band Setup

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

(Continued)

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

(6) Save / Recall

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

† Entering a titie (s) may be omitted.

(7) Control Command

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

(8) Screen Transition

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

(9) GPIB

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

2.2.3 Device message list compatible with the MG3633A

(1) Frequency

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

(2) Output level

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

(Continued)

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

(3) Save / Recall

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

(4) Others

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

(Blank)

SECTION 3

CONNECTING BUS AND SETTING ADDRESS

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

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3.1 Connecting Devices with GPIB Cables 3-3

3.2 Checking and Setting GPIB address 3-4

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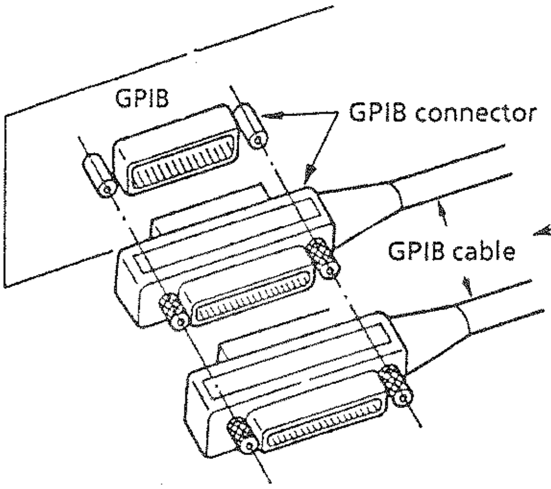
3.1 Connecting Devices with GPIB Cables

CAUTION

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

The rear panel has a connector for connecting GPIB cables.

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



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

3.2 Checking and Setting GPIB address

The following shows how to set GPIB address.

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

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

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

SECTION 4
INITIAL SETTINGS

The MG3670B initializes the GPIB interface system using three levels in accordance with the IEEE488.2 specifications. This section describes how these three level initializations are processed and how to instruct the initialization from the controller.

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4.2 Initialization for Message Exchange by DCL and SDC Bus Commands 4-5

4.3 Device Initialization by the *RST Command 4-6

4.4 Device Initialization by the *PRE Command 4-9

4.5 Device Status at Power-on 4-9

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SECTION 4
INITIAL SETTINGS

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

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

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

4.1 Bus Initialization by the IFC Statement

■ Example

```
ISET IFC
```

■ Explanation

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

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

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

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

4.2 Initialization for Message Exchange by DCL and SDC Bus Commands

■ Example

`WBYTE &H3F, &H14;`	Initializes all devices under the bus for message exchange (sending DCL)
`WBYTE &H3F,`	Initializes only the device whose address is 3 for message exchange (sending SDC)

■ Explanation

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

■ Items to be initialized for message exchange

The MG3670B by which the DCL or SDC bus command is accepted executes the following.

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

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

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

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

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

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

CAUTION

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

① *The current data set or stored in the device*
② *Front panel settings*
③ *Other status byte state except MAV bit*
④ *Device operation in progress*

4.3 Device Initialization by the *RST Command

■ Syntax

```
*RST
```

■ Example

```
PRINT @1;"*RST" ..............  Initializes the device ( MG3670B ) whose address is 1 with level 3
```

■ Explanation

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

The *RST (Reset) command is used to reset a device (MG3670B) to a specific initial state.

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

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

The following tables list the initial settings of MG3670B.

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

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

4.4 Device Initialization by the PRE Command

■ Syntax

```
PRE
```

■ Example

```
PRINT @1;"PRE" ................ Initializes the device ( MG3670B ) whose address is 1 with level 3
```

■ Explanation

The PRE command is MG3670B device-dependent messages which initialize a device with level 3.

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

4.5 Device Status at Power-on

When the power is switched on:

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

② The Input Buffer and Output Queue are cleared

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

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

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

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

(Blank)

SECTION 5
DEVICE MESSAGE FORMAT

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

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5.2 Program Message Format 5-3

5.3 Response Message Format 5-9

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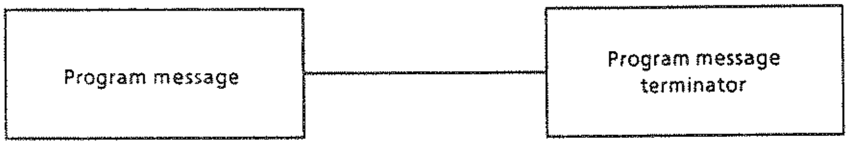
SECTION 5
DEVICE MESSAGE FORMAT

5.1 General Description

The device messages are data messages that are transmitted between the controller and devices. There are two types of data messages: program messages that are transferred from the controller to the MG3670B (device), and response messages that are sent from the MG3670B (device) to the controller. There are also two types of program commands and program queries in the program message. The program command is used to set the MG3670B's parameters and to instruct it to execute processing. The program query is used to query the values of parameters and measured results.

5.2 Program Message Format

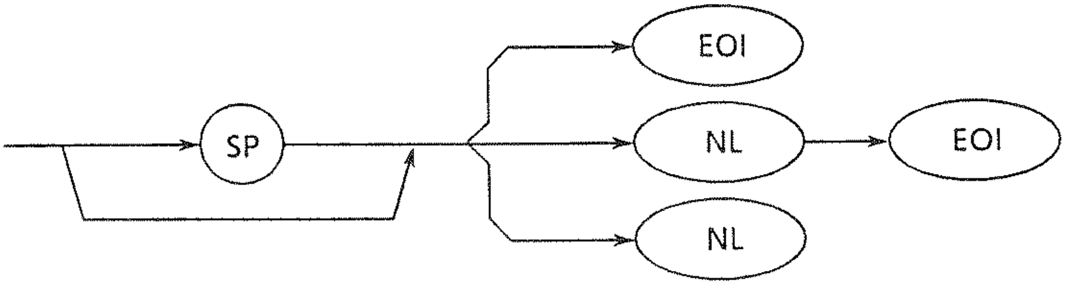
To transfer the program messages from the controller program to the MG3670B using the PRINT statement, the program message formats are defined as follows.



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

Program message: When the program message is transmitted from the controller to the MG3670B, the specified terminator is attached to the end of the program message to terminate its transmission

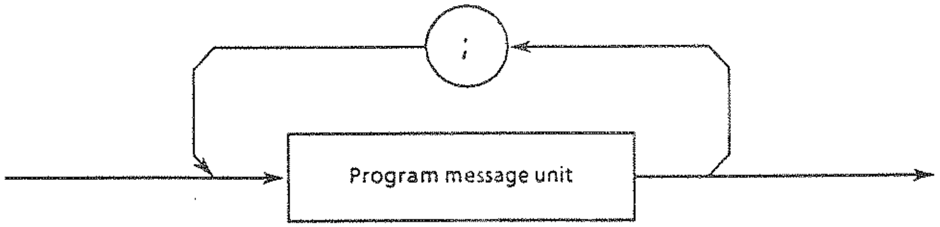
(1) Program message terminator



NL: Called New line or LF (Line Feed)

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

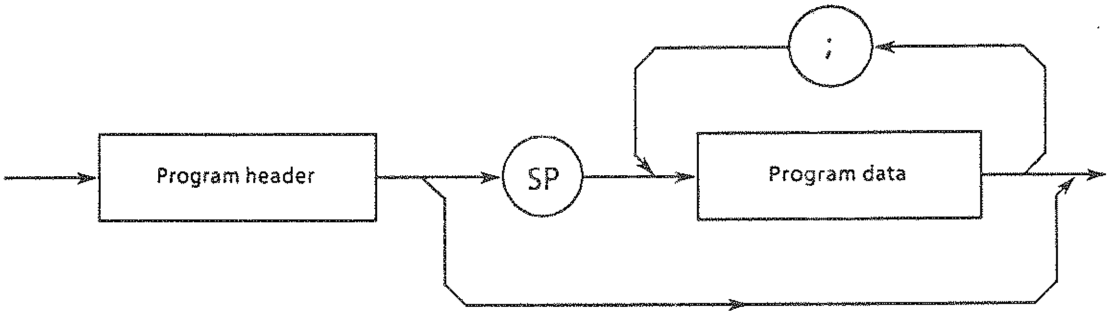
(2) Program message



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

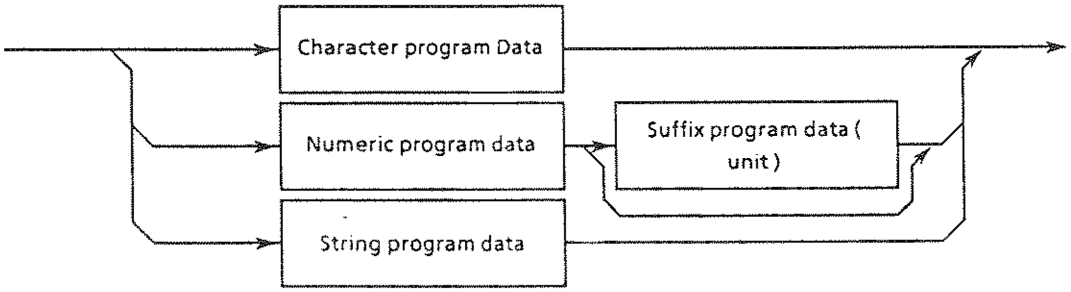
<Example> `PRINT @1;"FREQ 1GHZ;OLVL ØDBM"`

(3) Program message unit



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

(4) Program data



(5) Character program data

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

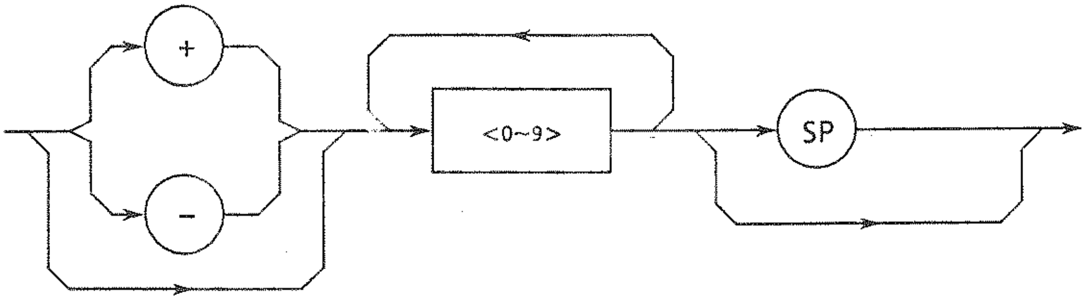
<Example>

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

(6) Numeric program data

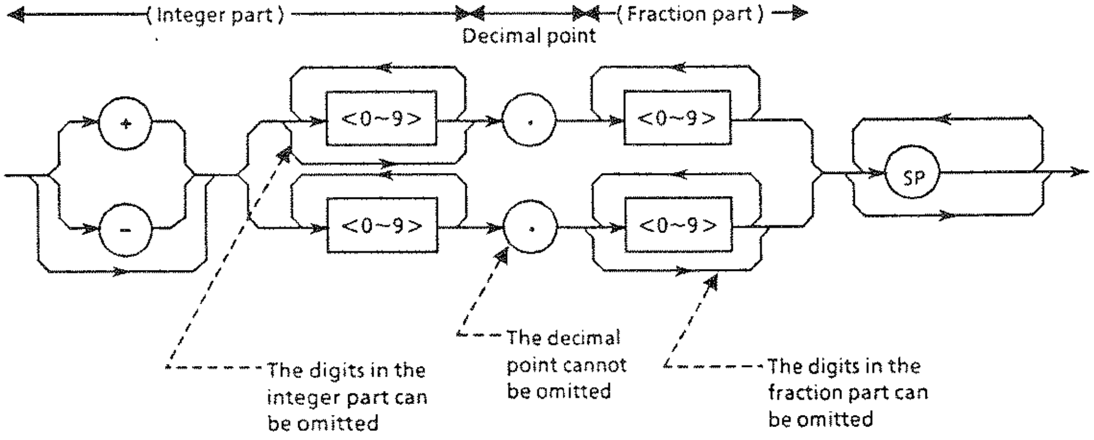
Numeric program data has four types of formats: integer format (NR1), fixed-point format (NR2), floating point format (NR3), and hexadecimal number.

< Integer Format (NR1) >



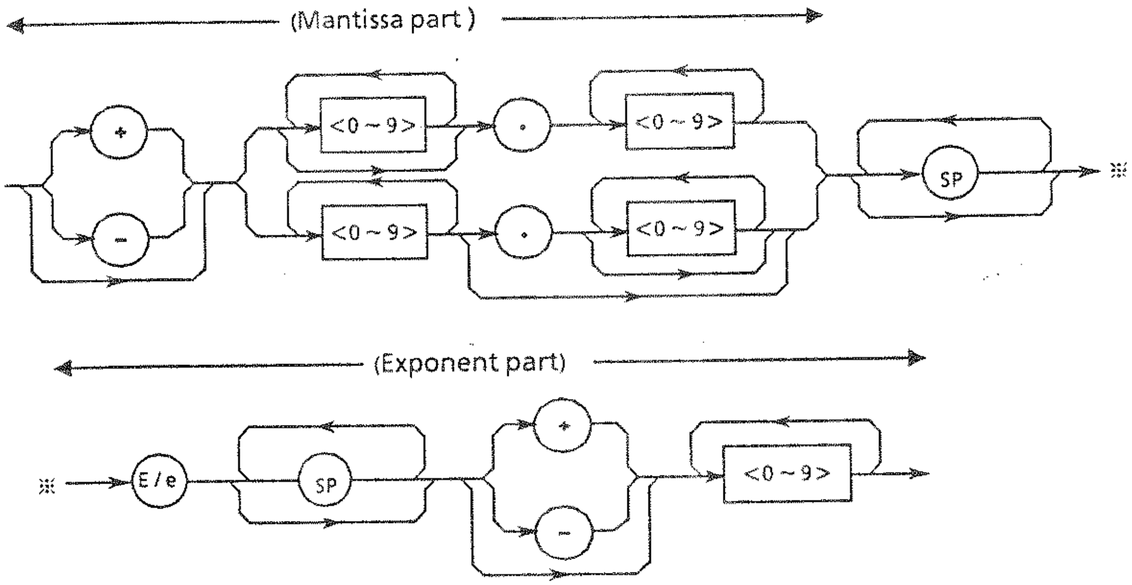
- Zeros can be inserted at the beginning → 005, +000045
- No spaces can be inserted between a + or − sign and a number → +5 , +⎵5 (×)
- Spaces can be inserted after a number → +5⎵⎵⎵
- The + sign is optional → +5, 5
- Commas cannot be used to separate digits → 1,234,567 (×)

< Fixed-Point Format (NR2) >


(Integer part)
Decimal point
(Fraction part)
+
-
<0~9>
.
<0~9>
<0~9>
.
<0~9>
SP
The decimal point cannot be omitted
The digits in the integer part can be omitted
The digits in the fraction part can be omitted

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

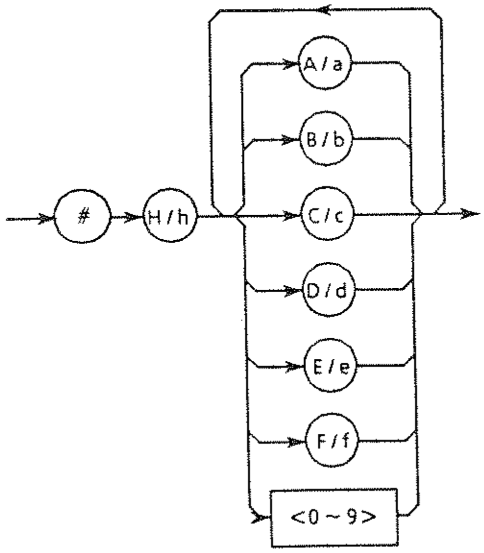
< Floating point format (NR3) >



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

×: not allowable

< Hexadecimal Number >



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

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

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

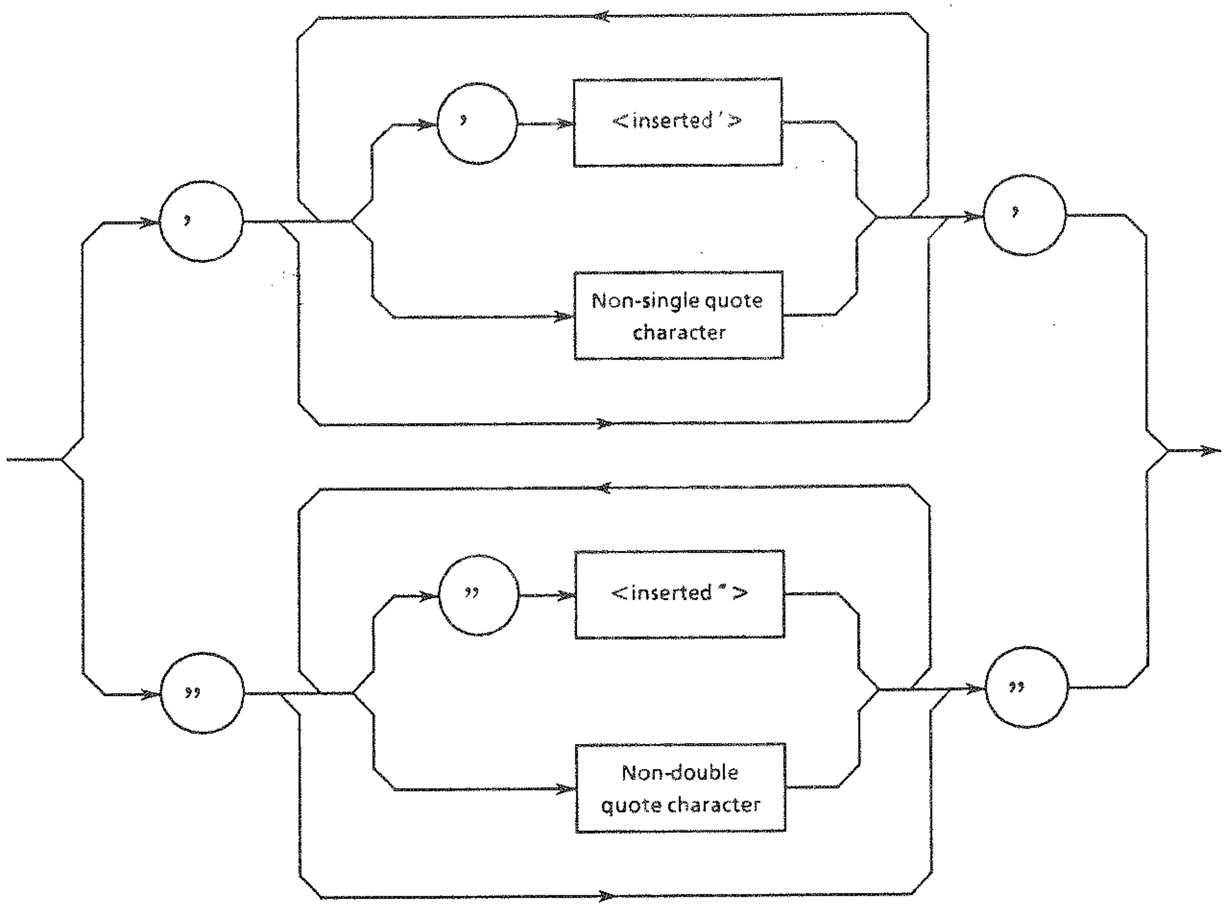
(7) Suffix program data (unit)

The table below shows the suffixes used for the MG3670B.

Table of MG3670B Suffix Codes

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

(8) STRING PROGRAM DATA



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

```
        PRINT  @ 1; "PSAV 1,'MG367ØB'"
```

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

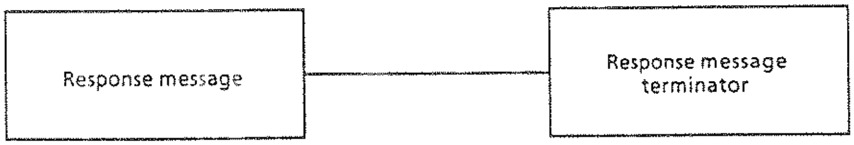
```
        PRINT  @ 1; "PSAV 1,'DSG''1'''"
```

Executing PSAVE results in DSG'1'.

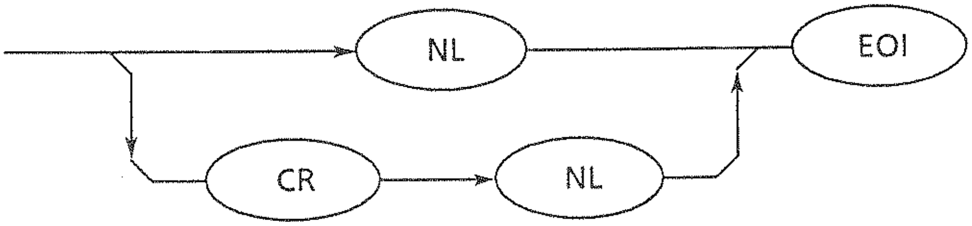
Note: To use the double quotation mark " in the PRINT statement, specify CHR$ (&H22).

5.3 Response Message Format

To transfer the response messages from the MG3670B to the controller using the INPUT statement, the response message formats are defined as follows.

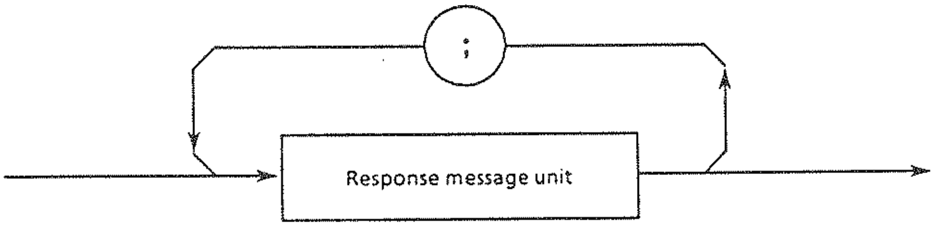


(1) Response message terminator



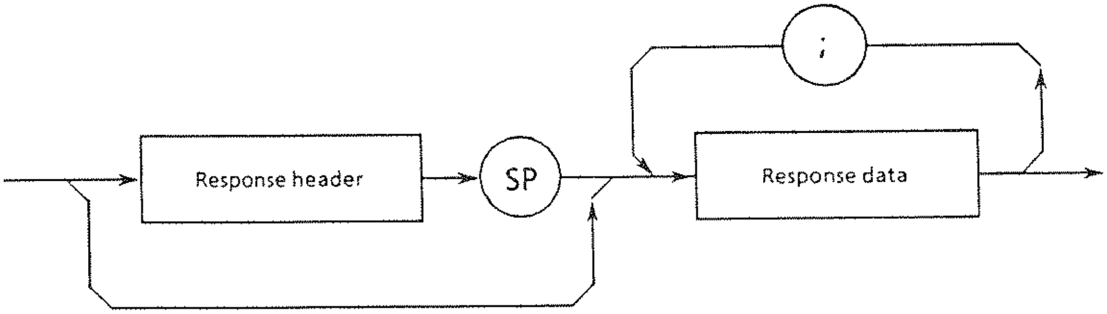
The response message terminator to be used depends on the TRM command.

(2) Response message

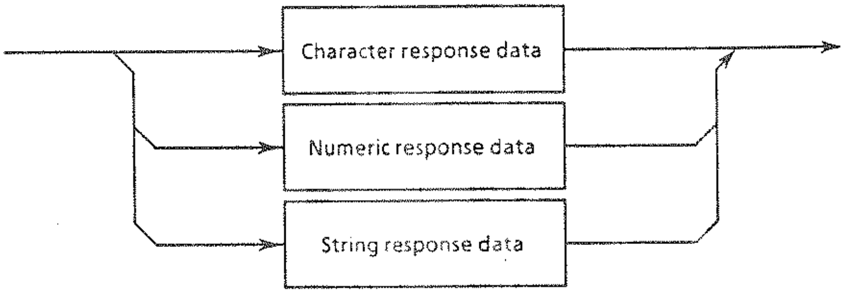


When a query is sent by the PRINT statement with one or more program queries, the response message also consists of one or more response message units.

(3) Response message unit (example)



(4) Response data

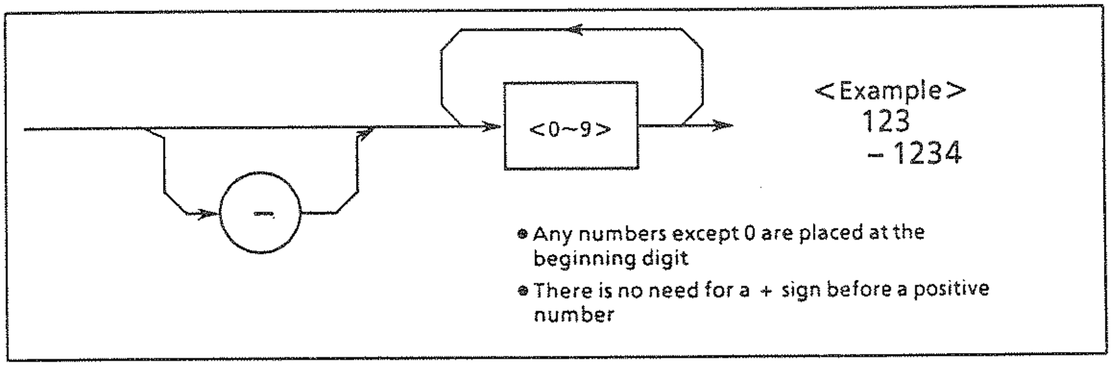


(5) character response data

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

(6) Numeric response data

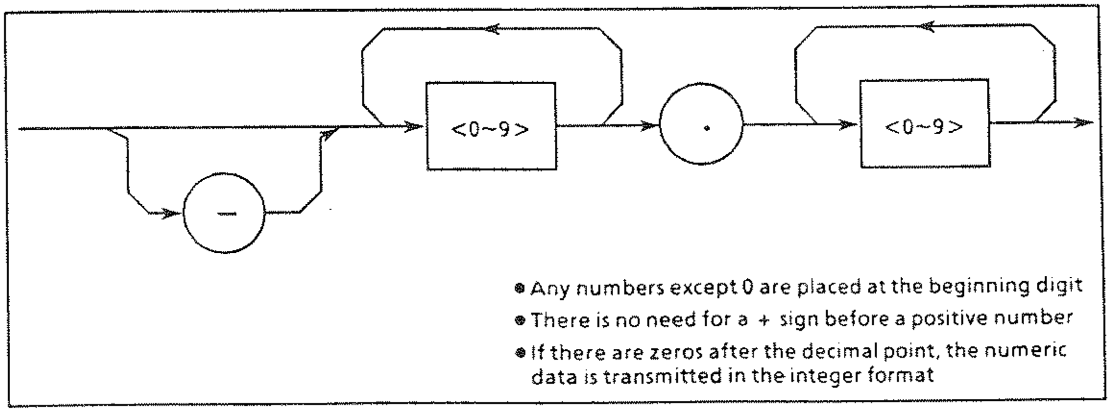
< Integer format (NR1) >



<Example>
123
– 1234

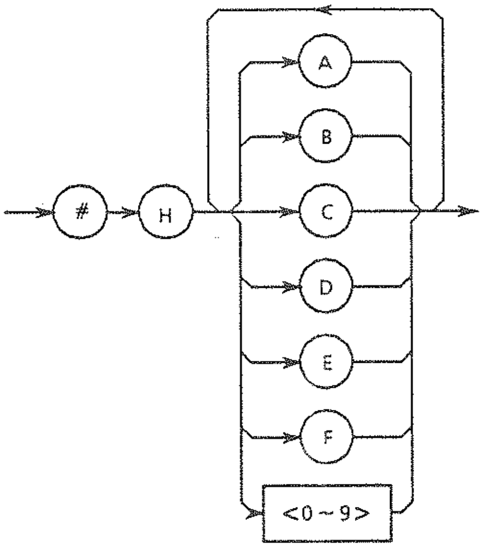
- Any numbers except 0 are placed at the beginning digit
- There is no need for a + sign before a positive number

< Fixed-point format (NR2) >



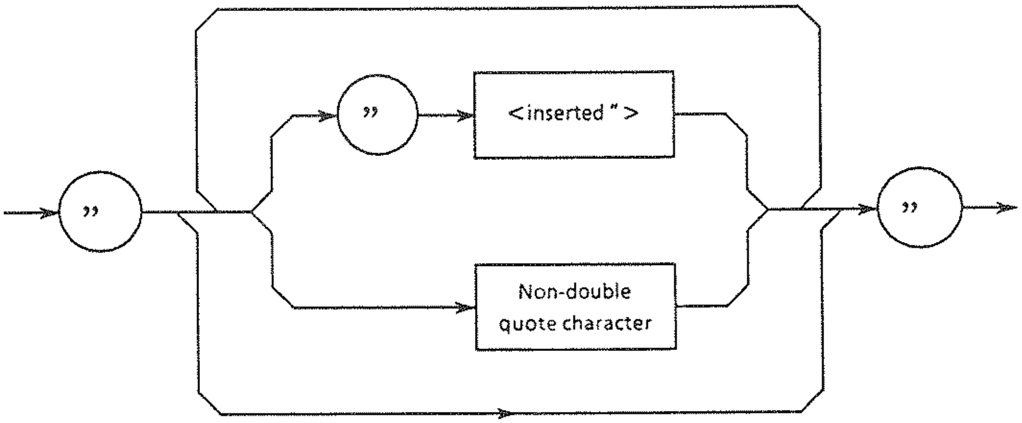
- Any numbers except 0 are placed at the beginning digit
- There is no need for a + sign before a positive number
- If there are zeros after the decimal point, the numeric data is transmitted in the integer format

< Hexadecimal Number >



<Example>
#HABC123
#H2DC3
#H83Ø1

(7) String response data



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

(Blank)

SECTION 6
COMMON COMMANDS

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

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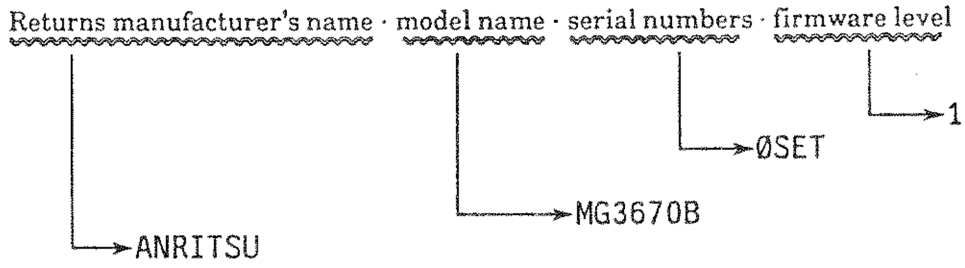
6.1 Classification by Function of Common Commands Supported by the MG3670B

The table below shows the classification by function of the IEEE 488.2 common commands supported by the MG3670B. Supported commands are listed on the following pages in alphabetical order.

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

6.2 Common Commands List

Command	Function
*CLS	Clears the Status Byte Register
*ESE NR1	Sets or clears the Sstandard Event Status Enable Register
*ESE?	Returns the current value of the Standard Event Status Enable Register
*ESR?	Returns the current value in the Standard Event Status Register
*IDN?	Returns manufacturer's name,model name,serial numbers,firmware level  Returns manufacturer's name · model name · serial numbers · firmware level 1 ØSET MG3670B ANRITSU
*OPC	Sets the status of bit 0 of the Standard Event Status Register when device operation is completed
*OPC?	Sets 1 in the output queue to generate a MAV summary message when device operation has been completed
*RST	Resets device in third level
*SRE NR1	Sets or clears the status of bits in the Service Request Enable Register
*SRE?	Returns the current value of the Service Request Enable Register
*STB?	Returns the current values of status bytes including MSS bits
*TST?	Returns self-test error results
*WAI	Keeps the next command on stand-by if the device is currently executing a command

*CLS Clear Status Command

(Clears the Status Byte Register)

■ Format

```
*CLS
```

■ Example

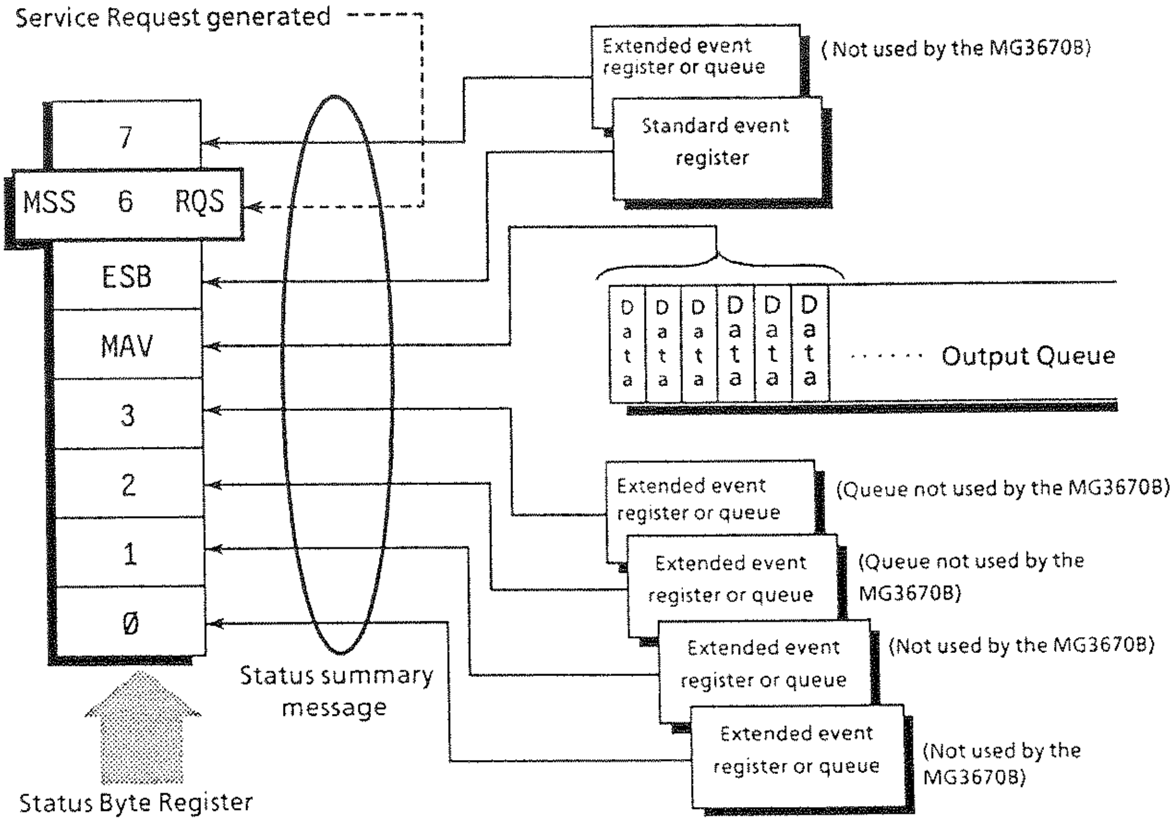
```
30 PRINT @ADR;"*CLS"
```

■ Explanation

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

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

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


Service Request generated
Extended event register or queue
(Not used by the MG3670B)
Standard event register
7
MSS 6 RQS
ESB
MAV
3
2
1
Ø
Data
Data
Data
Data
Data
Data
...... Output Queue
Extended event register or queue
(Queue not used by the MG3670B)
Extended event register or queue
(Queue not used by the MG3670B)
Extended event register or queue
(Not used by the MG3670B)
Extended event register or queue
(Not used by the MG3670B)
Status summary message
Status Byte Register

*ESE Standard Event Status Enable Command

(Sets or clears the Standard Event Status Enable Register)

■ Format

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

In this format:

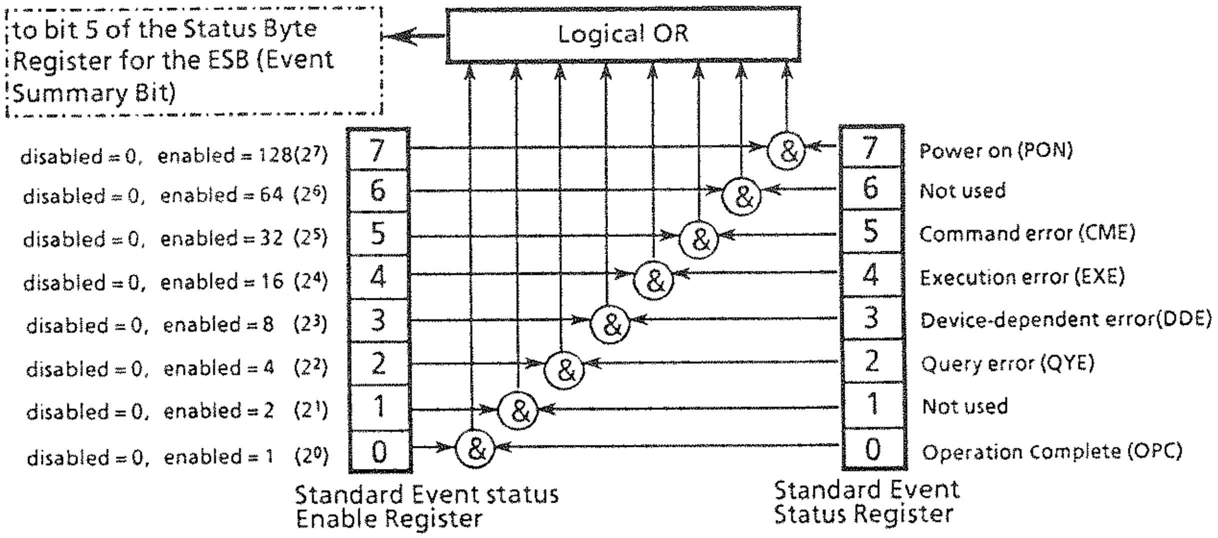
<Decimal numeric program data> = Value rounded to an integer from 0 to 255 (Binary weighted with a base value of 2)

■ Example

```
PRINT @ADR;"*ESE 20"! .................................. Sets bits 2 and 4 of Enable Register
```

■ Explanation

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


to bit 5 of the Status Byte Register for the ESB (Event Summary Bit)
Logical OR
disabled = 0, enabled = 128(2^7)
disabled = 0, enabled = 64 (2^6)
disabled = 0, enabled = 32 (2^5)
disabled = 0, enabled = 16 (2^4)
disabled = 0, enabled = 8 (2^3)
disabled = 0, enabled = 4 (2^2)
disabled = 0, enabled = 2 (2^1)
disabled = 0, enabled = 1 (2^0)
7
6
5
4
3
2
1
0
&
Power on (PON)
Not used
Command error (CME)
Execution error (EXE)
Device-dependent error(DDE)
Query error (QYE)
Not used
Operation Complete (OPC)
Standard Event status Enable Register
Standard Event Status Register

*ESE? Standard Event Status Enable Query

(Returns current value of Standard Event Status Enable Register)

■ Format

```
*ESE?
```

■ Example

`20 is the response if *ESE?` is sent after executing `*ESE 20`

■ Explanation

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

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

■ Response message

NR1 = 0 to 255

*ESR?: Standard Event Status Register Query

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

■ Format

```
*ESR?
```

■ Example

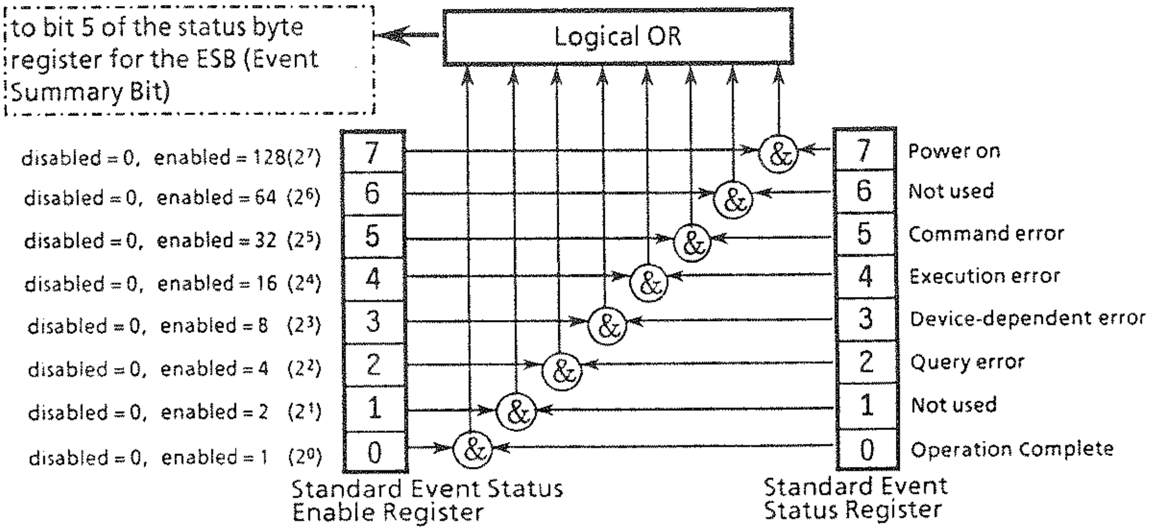
```
3Ø PRINT @ADR;"*ESR?"
4Ø INPUT @ADR;NR1! .............................. A command error is issued if the value of the variable is 32
5Ø PRINT NR1
```

■ Response Message

NR1 = 0 to 255

■ Explanation

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


to bit 5 of the status byte register for the ESB (Event Summary Bit)
Logical OR
disabled = 0, enabled = 128(2⁷)
disabled = 0, enabled = 64 (2⁶)
disabled = 0, enabled = 32 (2⁵)
disabled = 0, enabled = 16 (2⁴)
disabled = 0, enabled = 8 (2³)
disabled = 0, enabled = 4 (2²)
disabled = 0, enabled = 2 (2¹)
disabled = 0, enabled = 1 (2⁰)
7
6
5
4
3
2
1
0
&
Power on
Not used
Command error
Execution error
Device-dependent error
Query error
Not used
Operation Complete
Standard Event Status Enable Register
Standard Event Status Register

*IDN? Identification Query

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

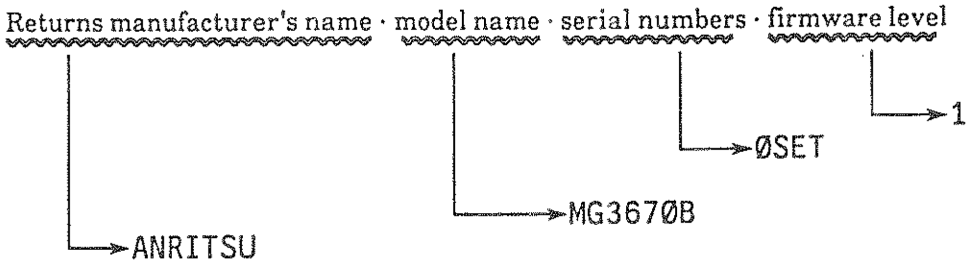
■ Format

```
*IDN?
```

■ Example

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

■ Explanation


Returns manufacturer's name · model name · serial numbers · firmware level
ANRITSU
MG367ØB
ØSET
1

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

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

② Field 2 .... Model name

③ Field 3 .... (usually Ø)

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

■ Response message

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

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

For the above example:

```
ANRITSU,MG367ØB,Ø,1
```

The total length of a response message is ≦72 characters

*OPC Operation Complete Command

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

■ Format

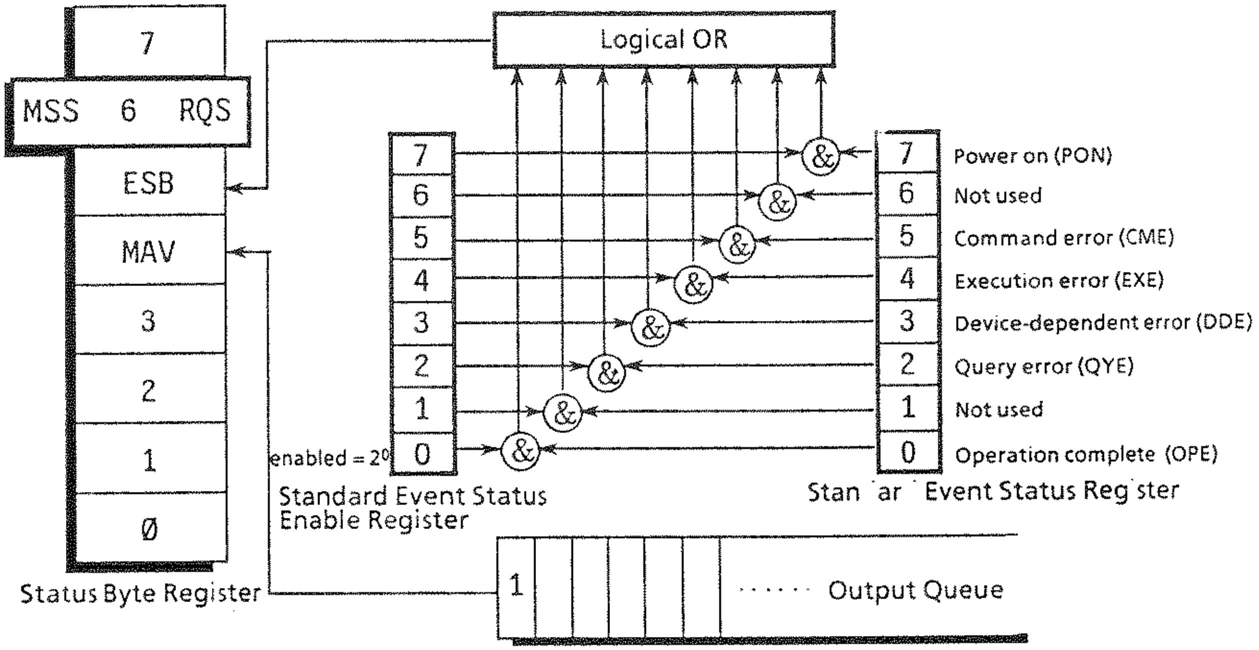
```
*OPC
```

■ Example

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

■ Explanation.

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



*OPC? Operation Complete Query

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

■ Format

```
*OPC?
```

■ Example

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

■ Explanation

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

■ Response message

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

*RST Reset Command

(Resets device in third level)

Format

```
*RST
```

Example

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

Explanation

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

① The device-dependent functions and condition are set to a known state that is independent of the past-use history of the device. The MG3670B is set as shown in paragraph 4.3.

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

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

The *RST command does not affect the items listed below

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

*SRE Service Request Enable Command

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

■ Format

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

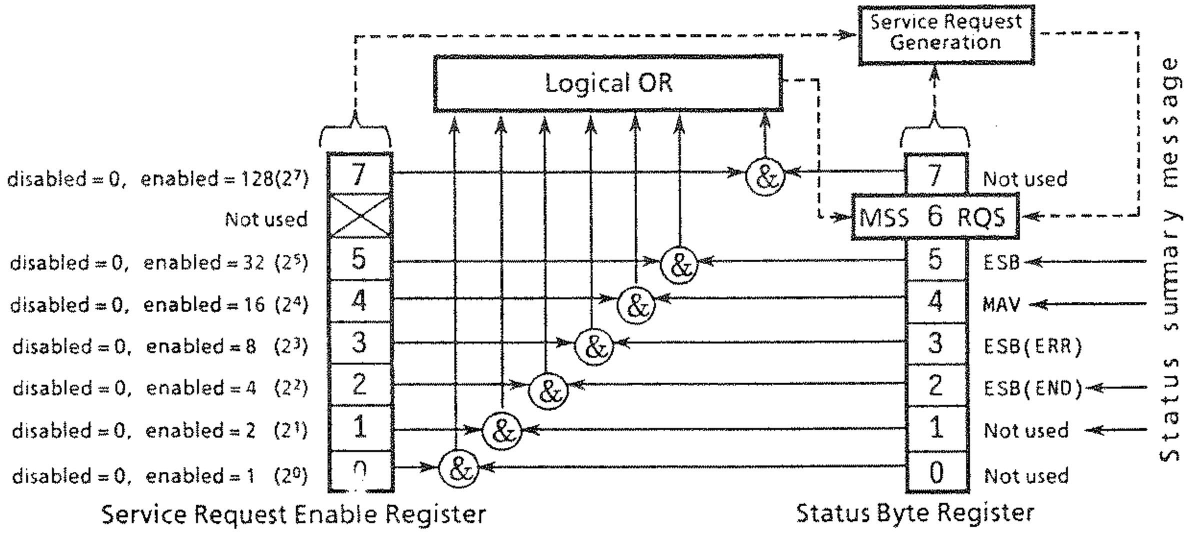
<Decimal numeric program data> = Values rounded to an integer from 0 to 255 (binary weighted with a base value of 2)

■ Example

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

■ Explanation

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


Service Request Generation
Logical OR
Status summary message
disabled = 0, enabled = 128(2⁷)
Not used
disabled = 0, enabled = 32 (2⁵)
disabled = 0, enabled = 16 (2⁴)
disabled = 0, enabled = 8 (2³)
disabled = 0, enabled = 4 (2²)
disabled = 0, enabled = 2 (2¹)
disabled = 0, enabled = 1 (2⁰)
7
5
4
3
2
1
0
&
MSS 6 RQS
7 Not used
5 ESB
4 MAV
3 ESB(ERR)
2 ESB(END)
1 Not used
0 Not used
Service Request Enable Register
Status Byte Register

*SRE? Service Request Enable Query

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

■ Format

```
*SRE?
```

■ Example

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

■ Explanation

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

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

■ Response message

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

*STB? Read Status Byte Command

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

■ Format

```
*STB?
```

■ Example

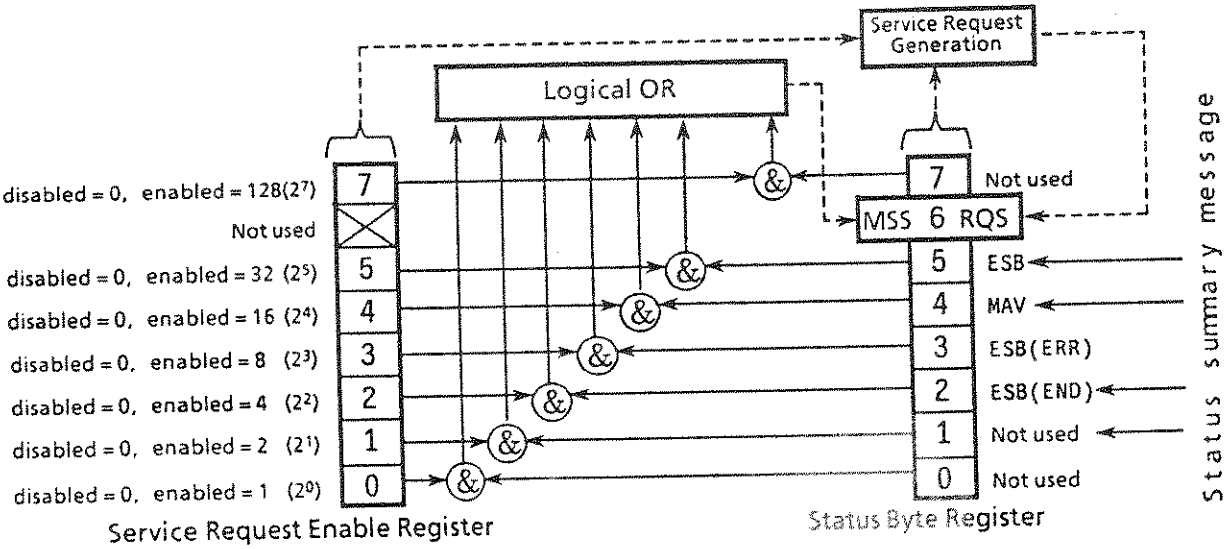
```
30 PRINT @ADR;"*STB?"
40 INPUT @ADR;NR1
50 PRINT NR1
```

■ Explanation

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

■ Response message

The response message is a <NR1 numeric response data> integer in the range 0 to 255 representing the total of the binary weighted values of the bits in the Status Byte Register. Status Byte Register bits 0 to 5 and 7 are weighted to 1, 2, 4, 8, 16, 32 and 128, respectively, and the MSS (Master Summary Status) bit to 64. MSS message indicates that a request has at least one cause. The table below shows the conditions for the MG3670B's status byte register.


Service Request Generation
Logical OR
disabled = 0, enabled = 128(2^7)
Not used
disabled = 0, enabled = 32 (2^5)
disabled = 0, enabled = 16 (2^4)
disabled = 0, enabled = 8 (2^3)
disabled = 0, enabled = 4 (2^2)
disabled = 0, enabled = 2 (2^1)
disabled = 0, enabled = 1 (2^0)
7
5
4
3
2
1
0
&
MSS 6 RQS
7 Not used
5 ESB
4 MAV
3 ESB(ERR)
2 ESB(END)
1 Not used
0 Not used
Status summary message
Service Request Enable Register
Status Byte Register

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

*TST? Self-test Query

(Returns self-test error results.)

■ Format

```
*TST?
```

■ Example

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

■ Explanation

The *TST? query generates an internal self-test and places the test results into the output queue to indicate whether or not the device completed the self-test without detected errors. Operator intervention is not required to execute the self-test. The MG3670B returns the results of the self-test executed at power-on. A bit with detected errors is set to 1.

The MG3670B test range is as follows:

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

■ Response message

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

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

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

*WAI Wait-to-Continue Command

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

■ Format

```
*WAI
```

■ Example

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

■ Explanation

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

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

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

However, since overlap commands are not available with the MG3670B, so this command is not necessary.

SECTION 7
STATUS STRUCTURE

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

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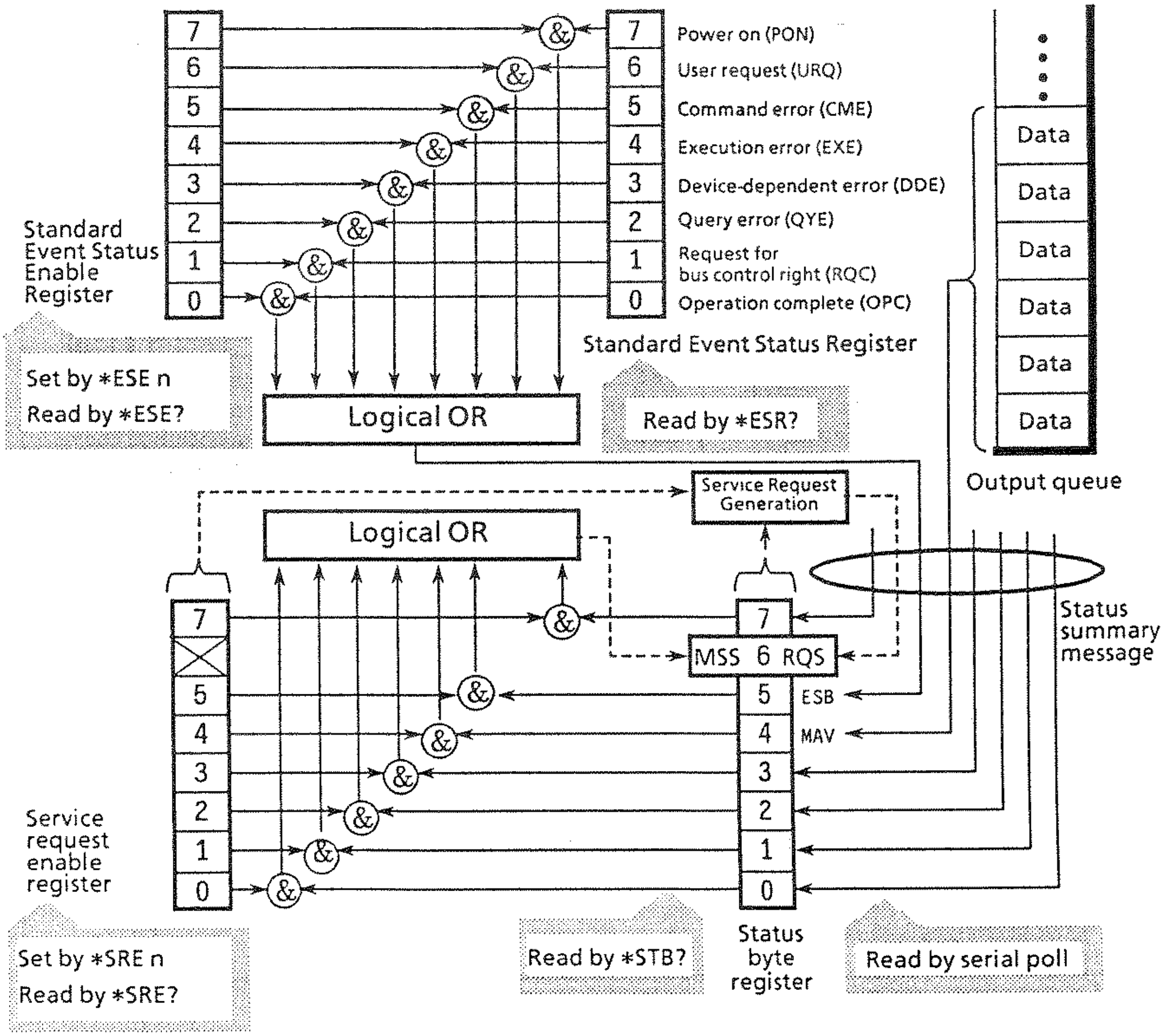
(Blank)

SECTION 7
STATUS STRUCTURE

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

7.1 IEEE488.2 Standard Status Model

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



Standard Status Model Diagram

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

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

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

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

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

7.2 Status Byte (STB) Register

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

7.2.1 ESB and MAV summary messages

This paragraph describes the ESB and MAV summary messages.

(1) ESB summary message

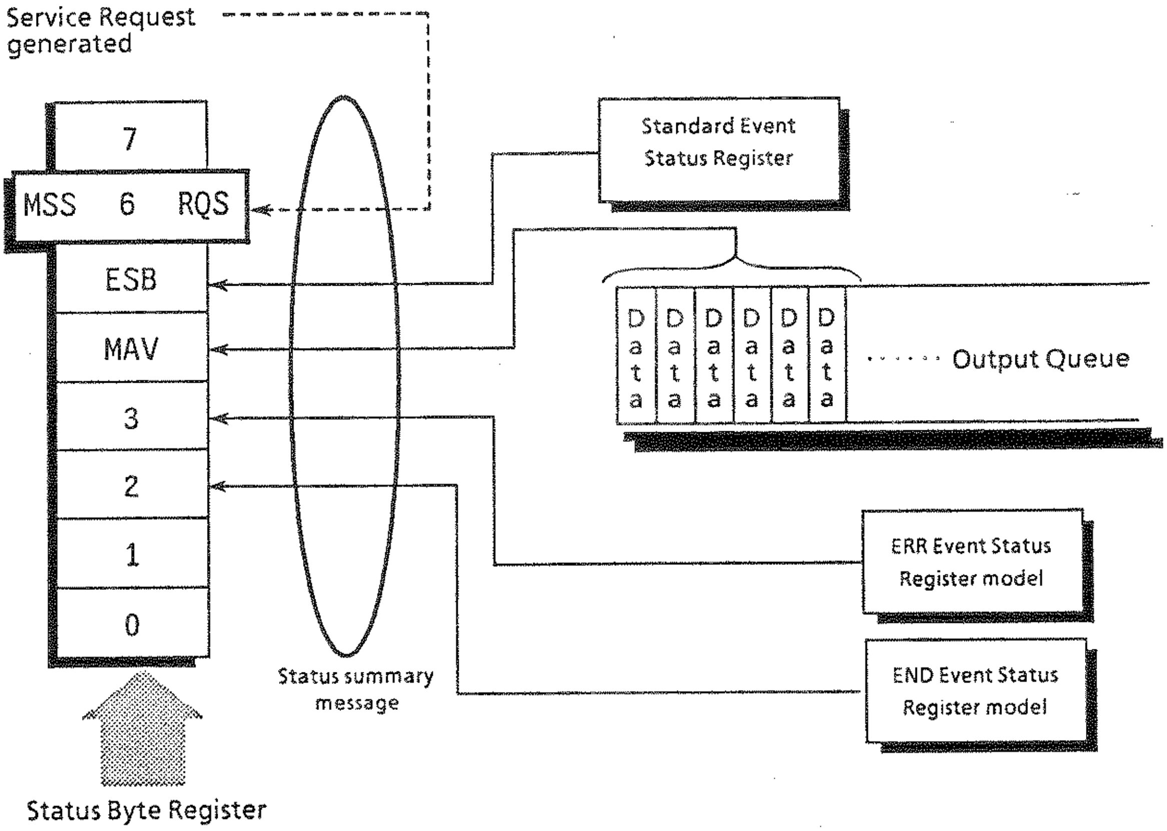
The ESB (Event Summary Bit) is a message defined by IEEE488.2, which uses bit 5 of the STB register. The ESB summary message bit becomes 1 when the setting permits events to occur if any one of the events recorded in the Standard Event Status Register becomes 1. Conversely, it becomes 0 if none of the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

(2) MAV summary message

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

7.2.2 Device-dependent summary messages

As shown below, the MG3670B does not use bits 0, 1, and 7, and uses bits 2 and 3 as the summary bit of the Event Status Registers.



7.2.3 Reading and clearing STB register

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

(1) Reading by serial polling

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

(2) Reading by the *STB? common query

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

(3) Definition of MSS (Master Summary Status)

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

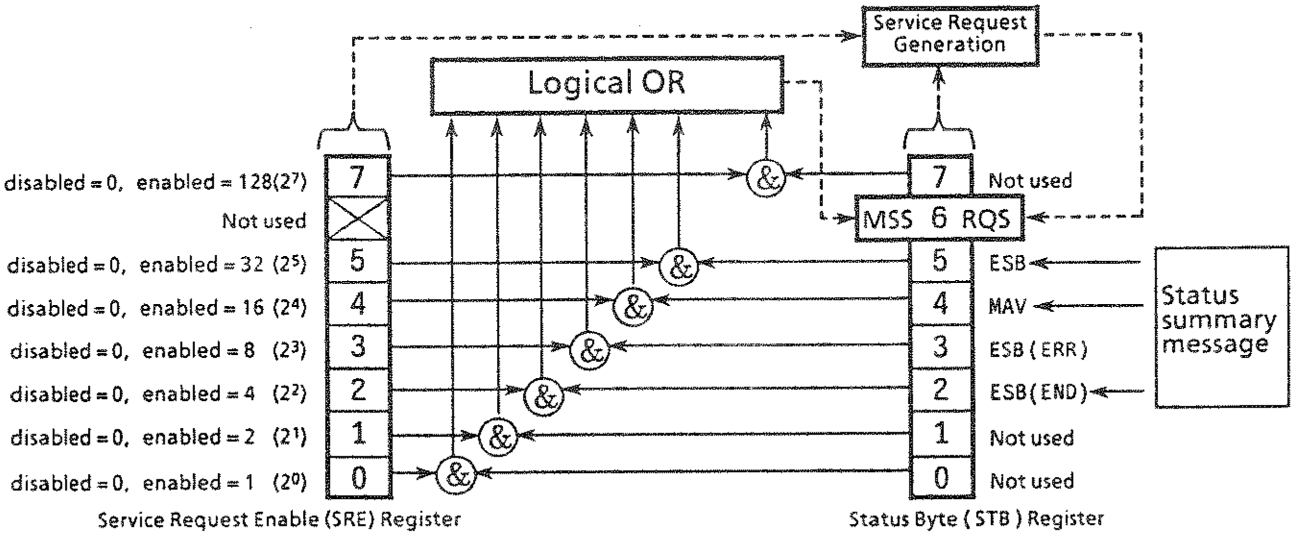
(4) Clearing the STB register by the *CLS common command

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

7.3 Service Request (SRQ) Enabling Operation

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

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


Service Request Generation
Logical OR
disabled = 0, enabled = 128(2⁷)
Not used
disabled = 0, enabled = 32 (2⁵)
disabled = 0, enabled = 16 (2⁴)
disabled = 0, enabled = 8 (2³)
disabled = 0, enabled = 4 (2²)
disabled = 0, enabled = 2 (2¹)
disabled = 0, enabled = 1 (2⁰)
7
5
4
3
2
1
0
&
7 Not used
MSS 6 RQS
5 ESB
4 MAV
3 ESB (ERR)
2 ESB(END)
1 Not used
0 Not used
Status summary message
Service Request Enable (SRE) Register
Status Byte (STB) Register

(1) Reading the SRE register

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

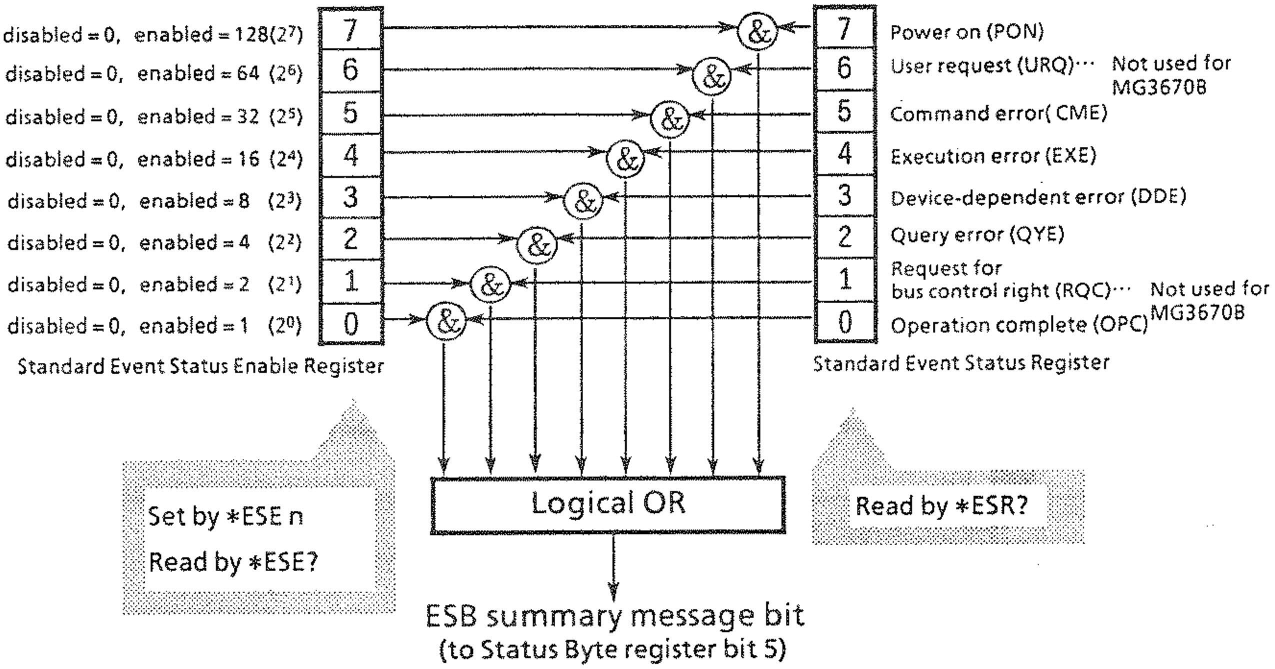
(2) Updating the SRE register

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

7.4 Standard Event Status Register

7.4.1 Bit definition of Standard Event Status Register

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


disabled = 0, enabled = 128(2⁷)
disabled = 0, enabled = 64 (2⁶)
disabled = 0, enabled = 32 (2⁵)
disabled = 0, enabled = 16 (2⁴)
disabled = 0, enabled = 8 (2³)
disabled = 0, enabled = 4 (2²)
disabled = 0, enabled = 2 (2¹)
disabled = 0, enabled = 1 (2⁰)
7
6
5
4
3
2
1
0
Standard Event Status Enable Register
&
Power on (PON)
User request (URQ)··· Not used for MG3670B
Command error(CME)
Execution error (EXE)
Device-dependent error (DDE)
Query error (QYE)
Request for bus control right (RQC)··· Not used for MG3670B
Operation complete (OPC)
Standard Event Status Register
Set by *ESE n
Read by *ESE?
Logical OR
Read by *ESR?
ESB summary message bit
(to Status Byte register bit 5)

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

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

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

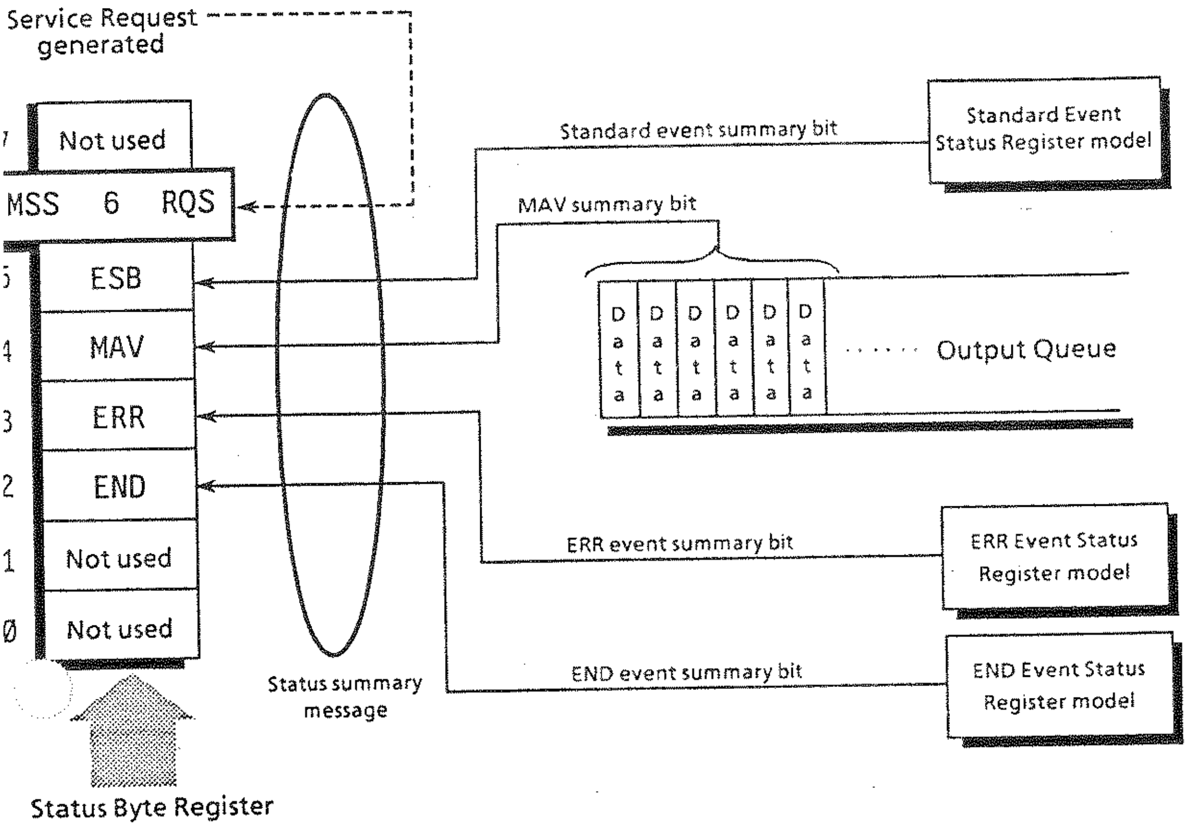
Reading	The *ESR? common query is used to read the ESR register, which is cleared after being read. The response message is integer-format data for which the sum of the binary-weighted event bit is converted to decimals.
Writing	With the exception of clearing, it is impossible to write to the register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

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

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

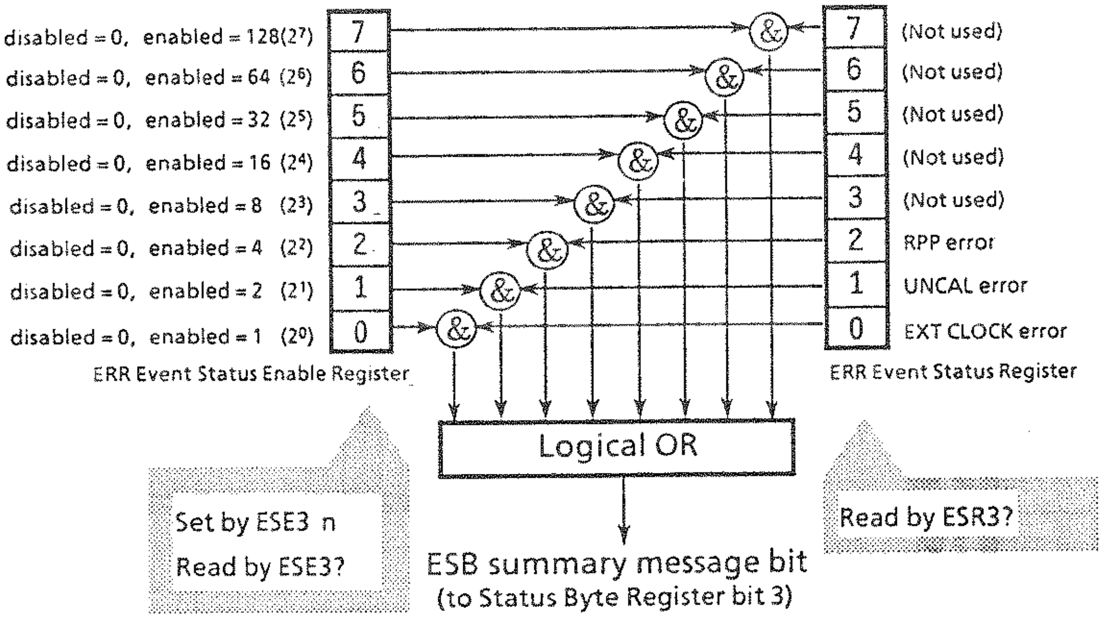
tended Event Status Register

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



7.5.1 Bit definition of Extended ERR Event Status Register

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

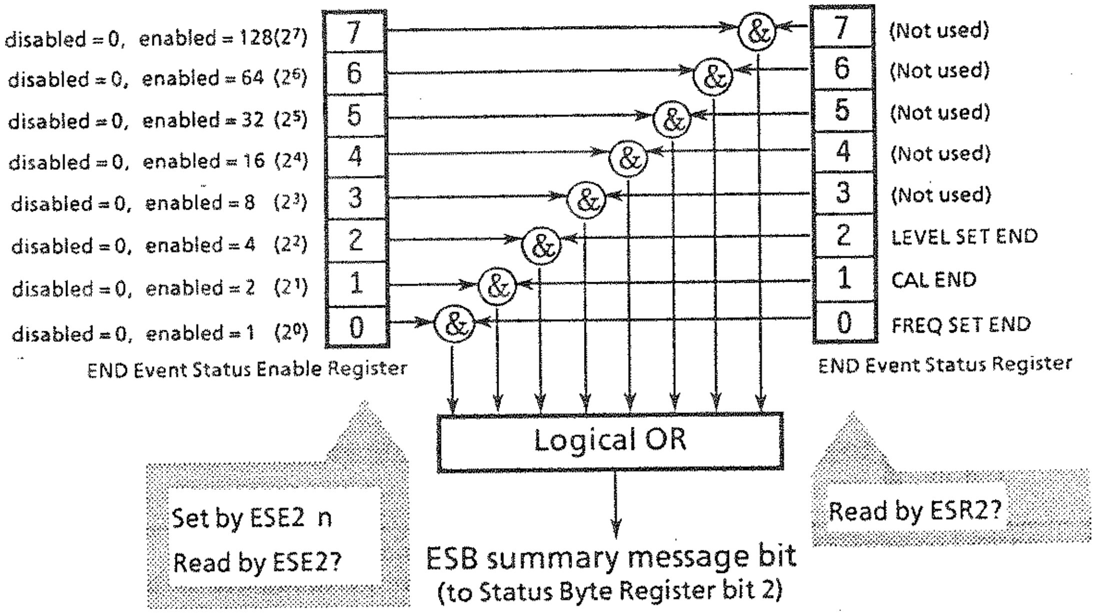

disabled = 0, enabled = 128(2⁷)
disabled = 0, enabled = 64 (2⁶)
disabled = 0, enabled = 32 (2⁵)
disabled = 0, enabled = 16 (2⁴)
disabled = 0, enabled = 8 (2³)
disabled = 0, enabled = 4 (2²)
disabled = 0, enabled = 2 (2¹)
disabled = 0, enabled = 1 (2⁰)
7
6
5
4
3
2
1
0
ERR Event Status Enable Register
&
(Not used)
(Not used)
(Not used)
(Not used)
(Not used)
RPP error
UNCAL error
EXT CLOCK error
ERR Event Status Register
Logical OR
Set by ESE3 n
Read by ESE3?
ESB summary message bit
(to Status Byte Register bit 3)
Read by ESR3?

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

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

7.5.2 Bit definition of Extended END Event Status Register

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


disabled = 0, enabled = 128(2⁷)
disabled = 0, enabled = 64 (2⁶)
disabled = 0, enabled = 32 (2⁵)
disabled = 0, enabled = 16 (2⁴)
disabled = 0, enabled = 8 (2³)
disabled = 0, enabled = 4 (2²)
disabled = 0, enabled = 2 (2¹)
disabled = 0, enabled = 1 (2⁰)
7
6
5
4
3
2
1
0
END Event Status Enable Register
&
Logical OR
7 (Not used)
6 (Not used)
5 (Not used)
4 (Not used)
3 (Not used)
2 LEVEL SET END
1 CAL END
0 FREQ SET END
END Event Status Register
Set by ESE2 n
Read by ESE2?
ESB summary message bit
(to Status Byte Register bit 2)
Read by ESR2?

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

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

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

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

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

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

7.6 Techniques for Synchronizing MG3670B with a Controller

The MG3670B usually treats program messages as sequential commands that do not execute the processing of newly-received commands until the previous command has been processed. Thus, special consideration need not be taken for pair-synchronization between MG3670B and the controller.

If the controller controls one or more devices and synchronizes with them, after all the commands specified for the MG3670B have been processed, the next commands must be sent to other devices.

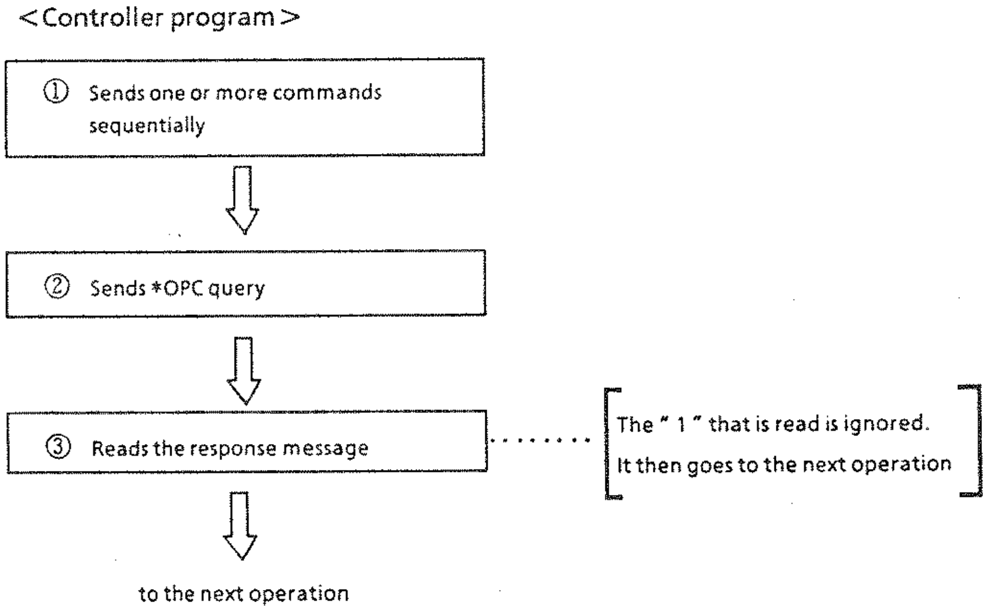
There are two ways of synchronizing the MG3670B with the controller.

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

② Wait for SRQ after *OPC is sent

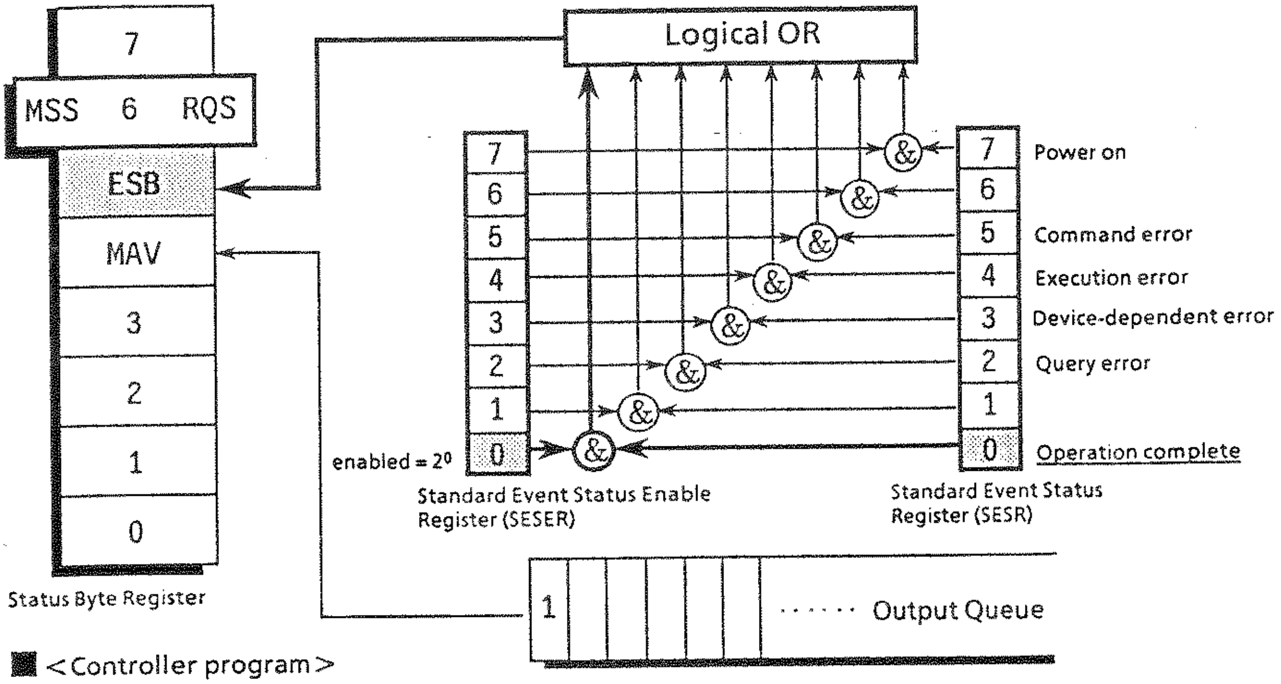
7.6.1 Wait for response after *OPC? query is sent

The MG3670B outputs " 1 " as the response message when executing the *OPC? query command. The controller is synchronized with the MG3670B by waiting for the response message to be entered.


<Controller program>
① Sends one or more commands sequentially
② Sends *OPC query
③ Reads the response message
The " 1 " that is read is ignored. It then goes to the next operation
to the next operation

7.6.2 Wait for service request after *OPC is sent

The MG3670B sets the operation-complete bit (bit 0) to 1 when executing the *OPC command. The controller is synchronized with the MG3670B by waiting for SRQ when the operation-complete bit is set for SRQ.



■ <Controller program>

① Enables the 2^0 bit of the Standard Event Status Enable Register

```
PRINT @1;"*ESE 1"
```

⇩

② Enables the 2^5 bit of the Service Request Enable Register

```
PRINT @1;"*SRE 32"
```

⇩

③ Makes the device execute the specified operation

⇩

④ Sends the *OPC command

```
PRINT @1;"*OPC"
```

⇩

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

SECTION 8

DETAILS OF MG3670B DEVICE MESSAGES

This section lists the device messages specific to the MG3670B, which are given in Section 2, in alphabetical order and also lists the messages compatible with the MG3633A in functional types to explain the detailed functions of each device message.

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

Message header

Message name spelled out

Alphabetical index of message

F

FREQ Frequency

■ Function Sets the frequewncy.

Program command message

Program query message

Response message

Header	Program command	Query	Response
FREQ	FREQ␣a	FREQ?	FREQ␣a (a=0 to 2250 000 000 Hz)

■ Value of a 0 Hz to 2.25 GHz

■ Suffix code

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

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

■ Initial setting 1ØMHZ

■ Example FREQ␣123MHZ

8.1 Device Messages Specific to the MG3670B

BASE Base Band Setup

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

Header	Program command	Query	Response
BASE	BASE	——	——

■ Suffix code None

■ Example BASE

BTI Burst-Trigger Input Edge

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

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

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

■ Suffix code None

■ Initial setting RISE

■ Example BTI␣FALL

BTO Burst-Trigger Output Edge

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

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

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

■ Suffix code None

■ Initial setting RISE

■ Example BTO␣FALL

BURST Burst Pattern

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

Header	Program command	Query	Response
BURST	BURST	——	——

■ Suffix code None

■ Example BURST

BUZ Buzzer On / Off

■ Function Turns the buzzer switch On or Off.

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

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting ON

■ Example BUZ␣OFF

CAL Calibration

■ Function Calibrates output level.

Header	Program command	Query	Response
CAL	CAL	——	——

■ Suffix code None

■ Example CAL

CAPL CMOS Amplitude

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

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

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

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

■ Initial setting 5ØØMV

■ Example CAPL␣5ØMV

CHECK Hardware Check

■ Function Switches to the hardware check screen.

Header	Program command	Query	Response
CHECK	CHECK	——	——

■ Suffix code None

■ Example CHECK

COS CMOS DC Offset

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

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

■ Value of a 0 to 4000mV (1mV step)

■ Suffix code

V:	V
MV:	mV
UV:	μV
None:	mV

■ Initial setting 2500MV

■ Example COS␣1000MV

DSPL Display On / Off

■ Function Turns the Display switch On or Off.

Header	Program command	Query	Response
DSPL	DSPL␣a	—	—

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting ON

■ Example DSPL␣OFF

EIB External-Modulation-Input Burst-Gate Polarity

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

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

- Value of a POS: Positive
NEG: Negative
- Suffix code None
- Initial setting POS
- Example EIB␣POS

EIC External-Modulation-Input Data Clock Edge

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

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

- Value of a RISE: Rising edge
FALL: Falling edge
- Suffix code None
- Initial setting RISE
- Example EIC␣FALL

EID External-Modulation-Input Data Polarity

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

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

■ Value of a POS: Positive
NEG: Negative

■ Suffix code None

■ Initial setting POS

■ Example EID␣POS

EIS External-Modulation-Input Symbol Clock Edge

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

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

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

■ Suffix code None

■ Initial setting RISE

■ Example EIS␣FALL

EOB External-Modulation-Output Burst-Gate Polarity

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

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

■ Value of a

POS :	Positive
NEG :	Negative

■ Suffix code None

■ Initial setting POS

■ Example EOB␣POS

EOC External-Modulation-Output Data Clock Edge

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

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

■ Value of a

RISE :	Rising edge
FALL :	Falling edge

■ Suffix code None

■ Initial setting RISE

■ Example EOC␣FALL

EOD External-Modulation-Output Data Polarity

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

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

■ Value of a POS: Positive
NEG: Negative

■ Suffix code None

■ Initial setting POS

■ Example EOD␣POS

EOS External-Modulation-Output Symbol Clock Edge

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

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

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

■ Suffix code None

■ Initial setting RISE

■ Example EOS␣FALL

ESE2 Event Status Enable Register (END)

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

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

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

■ Suffix code
None

■ Example
ESE2␣3

ESE3 Event Status Enable Register (ERR)

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

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

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

■ Suffix code
None

■ Example
ESE3␣5

ESR2? Event Status Register (END)

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

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

■ Value of a 0 to 255

■ Suffix code None

■ Example ESR2?

ESR3? Event Status Register (ERR)

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

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

■ Value of a 0 to 255

■ Suffix code None

■ Example ESR3?

FIS Frequency-Incremental-Step Value

■ Function Sets the frequency incremental step value

Header	Program command	Query	Response
FIS	FIS␣a	FIS?	FIS␣a (a = 1 to 2250 000 000 Hz)

■ Value of a 1Hz to 2.25GHz

■ Suffix code

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

■ Initial setting 1MHZ

■ Example FIS␣12.5KHZ

FOF Frequency-Offset On / Off

■ Function Turns the frequency offset mode On or Off

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

■ Value of a

ON:	On
OFF:	Off

■ Suffix code None

■ Initial setting OFF

■ Example FOF␣ON

FOS Frequency-Offset Value

■ Function Sets the frequency Offset value

Header	Program command	Query	Response
FOS	FOS␣a	FOS?	FOS␣a (a = −2250 000 000 to 2250 000 000 Hz)

■ Value of a −2.25 to 2.25GHz

■ Suffix code

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

■ Initial setting ØHZ

■ Example FOS␣25KHZ

FRCL Frequency-Memory Recall

■ Function Recalls frequency from frequency memory.

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

■ Value of a 0 to 999

■ Suffix code None

■ Example FRCL␣15

FREQ Frequency

■ Function: Sets the frequency.

Header	Program command	Query	Response
FREQ	FREQ␣a	FREQ?	FREQ␣a (a = 0 to 2250 000 000 Hz)

■ Value of a: 0 Hz to 2.25 GHz

■ Suffix code:

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

■ Initial setting: 1ØMHZ

■ Example: FREQ␣123MHZ

FRK Frequency Rotary-Knob Up / Down

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

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

■ Value of a:

UP:	Up
DN:	Down

■ Suffix code: None

■ Example: FRK␣UP

FRL Frequency-Relative On / Off

■ Function Turns the relative frequency mode On or Off.

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

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example FRL␣ON

FRLR? Frequency-Relative Reference Value

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

Header	Program command	Query	Response
FRLR?	———	FRLR?	FRLR␣a (a = 0 to 2250 000 000 Hz)

■ Value of a 0 Hz to 2.25 GHz

■ Suffix code HZ: Hz

■ Example FRLR?

FRLV Frequency-Relative Value

■ Function Reads out the relative frequency.

Header	Program command	Query	Response
FRLV	———	FRLV?	FRLV␣a (a = −2250 000 000 to 2250 000 000 Hz)

■ Value of a −2.25 to 2.25 GHz

■ Suffix code HZ: Hz

■ Example FRLV?

FRR Frequency Resulution

■ Function Sets the frequency resolution.

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

■ Value of a

1HZ:	1 Hz
1ØHZ:	10 Hz
1ØØHZ:	100 Hz
1KHZ:	1 kHz
1ØKHZ:	10 kHz
1ØØKHZ:	100 kHz
1MHZ:	1 MHz
1ØMHZ:	10 MHz
1ØØMHZ:	100 MHz
1GHZ:	1 GHz
R:	Shifts the frequency resolution to right digit
L:	Shifts the frequency resolution to left digit

■ Suffix code None

■ Initial setting 1HZ

■ Example FRR␣1KHZ

FRS Frequency-Incremental-Step Up / Down

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

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

■ Value of a UP : Up
DN : Down

■ Suffix code None

■ Example FRS␣UP

FSAV Frequency-Memory Save

■ Function Saves frequency to frequency memory.

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

■ Value of a 0 to 999

■ Suffix code None

■ Example FSAV␣15

HEAD Header On / Off

■ Function Selects whether or not to add header to response message.

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

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example HEAD␣ON

IFRF IF / RF Setup

■ Function Switches to IF/RF setup screen.

Header	Program command	Query	Response
IFRF	IFRF	——	——

■ Suffix code None

■ Example IFRF

INTFC Interface Setup

■ Function Switches to interface setup screen.

Header	Program command	Query	Response
INTFC	INTFC	——	——

■ Suffix code None

■ Example INTFC

IQL I, Q Level

■ Function Sets the I,Q signal levels.

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

■ Value of a 500MV: 50 Ω 500 mVrms
CMOS: CMOS level

■ Suffix code None

■ Initial setting 500MV

■ Example IQL␣CMOS

ITR I, Q Input Trim On / Off

■ Function Turns on or off the offset and balance adjustment function of I,Q input signals.

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

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example ITR␣ON

LVL Output-Level On / Off

■ Function Turns the output level on or off.

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

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting ON

■ Example LVL␣OFF

MIC Modulation Input Data Clock

■ Function Sets the modulation data clock signal to either internal (Int) or external (Ext). (When the modulation unit is supported, this function is available)

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

■ Value of a INT : Internal data clock signal
EXT : External data clock signal

■ Suffix code None

■ Initial setting INT

■ Example MIC␣EXT

MID Modulation Input Data

■ Function Sets the modulation data signal to either internal (Int) or external (Ext). (When the modulation unit is supported, this function is available)

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

■ Value of a INT : Internal data signal
EXT : External data signal

■ Suffix code None

■ Initial setting INT

■ Example MID␣EXT

MOD Modulation On / Off

■ Function Turns the modulation function on or off.

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

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example MOD␣ON

OCNT Output-Level Continuous-Mode On / Off

■ Function Turns the output level continuous mode on or off.

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

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example OCNT␣ON

OIS Output-Level-Incremental-Step Value

■ Function Sets the output level incremental step value.

Header	Program command	Query	Response
OIS	OIS␣a	OIS?	OIS␣a (a = 0.1 to 156 dB)

■ Value of a 0.1 to 156 dB (0.1dB step)

■ Suffix code DB: dB

■ Initial setting 1DB

■ Example OIS␣60DB

OLDBM Output-Level Unit to dBm

■ Function Changes output level units to dBm.

Header	Program command	Query	Response
OLDBM	OLDBM	——	——

■ Suffix code None

■ Example `OLDBM`

OLDBU Output-Level Unit to dBμ

■ Function Changes output level units to dBμ.

Header	Program command	Query	Response
OLDBU	OLDBU	——	——

■ Suffix code None

■ Example `OLDBU`

OLK Output-Level Rotary-Knob Up / Down

■ Function Increase(or decrease) the output level by output level Resolution.

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

■ Value of a UP : Up
DN : Down

■ Suffix code None

■ Example OLK␣UP

OLL Output-Level-Limit On / Off

■ Function Turns the output level limit mode on or off.

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

■ Value of a ON : On
OFF : Off

■ Suffix code None

■ Initial setting OFF

■ Example OLL␣ON

OLM Output-Level-Limit Value

■ Function Sets the output level limit value.

Header	Program command	Query	Response
OLM	OLM␣a	OLM?	OLM␣a (a:Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM,DM:	−143 to 13 dBm	
When unit is DBU,DU:	−30 to 126 dBμ	---open voltage
	−36 to 120 dBμ	---terminated voltage
When unit is V,MV,UV:	0.032 μV to 2 V	---open voltage
	0.016 μV to 1 V	---terminated voltage

■ Suffix code

DBM, DM:	dBm
DBU, DU:	dBμ
V:	V
MV:	mV
UV:	μV
None:	dBm

■ Initial setting -1ØDBM

■ Example OLM␣ØDBM

OLR Output-Level Resolution

■ Function Sets the output level resolution.

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

■ Value of a

Ø.1DB:	0.1 dB
1DB:	1 dB
1ØDB:	10 dB
R:	Shifts the output level resolution to right digit
L:	Shifts the output level resolution to left digit

■ Suffix code None

■ Initial setting Ø.1DB

■ Example OLR␣1DB

OLS Output-Level-Incremental-Step Up / Down

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

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

■ Value of a UP : Up
DN : Down

■ Suffix code None

■ Example OLS␣UP

OLV Output-Level Unit to volt

■ Function Changes output level units to volt.

Header	Program command	Query	Response
OLV	OLV	——	——

■ Suffix code None

■ Example OLV

OLVL Output Level

■ Function Sets the output level.

Header	Program command	Query	Response
OLVL	OLVL␣a	OLVL?	OLVL␣a (a:Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM,DM:	−143 to 13 dBm	
When unit is DBU,DU:	−30 to 126 dBμ	---open voltage
	−36 to 120 dBμ	---terminated voltage
When unit is V,MV,UV:	0.032 μV to 2 V	---open voltage
	0.016 μV to 1 V	---terminated voltage

■ Suffix code

DBM, DM:	dBm
DBU, DU:	dBμ
V:	V
MV:	mV
UV:	μV
None:	dBm

■ Initial setting -3ØDBM

■ Example OLVL␣-6ØDBM

OOF Output-Level-Offset On / Off

■ Function Turns the output level offset mode on or off

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

■ Value of a

ON:	On
OFF:	Off

■ Suffix code None

■ Initial setting OFF

■ Example OOF␣ON

OOS Output-Level-Offset Value

- Function Sets the output level offset value

Header	Program command	Query	Response
OOS	OOS␣a	OOS?	OOS␣a (a = −55.0 to 55.0 dB)

- Value of a −55 to 55 dB (0.1dB step)
- Suffix code DB: dB
None: dB
- Initial setting ØDB
- Example OOS␣3DB

ORL Output-Level-Relative On / Off

- Function Turns the relative output level mode on or off.

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

- Value of a ON: On
  OFF: Off
- Suffix code None
- Initial setting OFF
- Example ORL␣ON

ORLR? Output-Level-Relative Reference Value

■ Function Reads out the reference output level of relative output level mode.

Header	Program command	Query	Response
ORLR?	———	ORLR?	ORLR␣a (a:Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM,DM: −143 to 13 dBm

When unit is DBU,DU: −30 to 126 dBµ ---open voltage
−36 to 120 dBµ ---terminated voltage

When unit is V,MV,UV: 0.032 µV to 2 V ---open voltage
0.016 µV to 1 V ---terminated voltage

■ Suffix code

DBM:	dBm
DBU:	dBµ
V:	V
MV:	mV
UV:	µV

■ Example ORLR?

ORLV? Output-Level-Relative Value

■ Function Reads out the relative output level.

Header	Program command	Query	Response
ORLV?	———	ORLV?	ORLV␣a

■ Value of a −156 to 156 dB (0.1dB step)

■ Suffix code DB: dB

■ Example ORLV?

OTR I, Q Output Trim On / Off

■ Function Turns on or off the offset and balance adjustment function of I,Q output signals .

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

■ Value of a ON : On
OFF : Off

■ Value of a	ON : On OFF : Off
■ Suffix code	None
■ Initial setting	OFF
■ Example	OTR␣ON

PM Pulse-Modulation

■ Function Sets the pulse modulation signal to either internal (Int) or external (Ext).

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

■ Value of a INT: Internal pulse modulation signal
EXT: External pulse modulation signal

■ Suffix code None

■ Initial setting INT

■ Example PM␣EXT

PMP Pulse-Modulation Polarity

■ Function Sets the pulse modulation signal polarity.

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

■ Value of a POS: Positive
NEG: Negative

■ Suffix code None

■ Initial setting POS

■ Example PMP␣POS

PRCL Parameter-Memory Recall

■ Function Recalls parameter from parameter memory.

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

■ Value of a 0 to 99

■ Suffix code None

■ Example PRCL␣15

PRE Preset

■ Function Initializes parameters.

Header	Program command	Query	Response
PRE	PRE	——	——

■ Suffix code None

■ Example PRE

PRMTR Parameter

■ Function Switches to parameter setting screen.

Header	Program command	Query	Response
PRMTR	PRMTR	——	——

■ Suffix code None

■ Example PRMTR

PSAV Parameter-Memory Save

■ Function Saves parameter to parameter memory.

Header	Program command	Query	Response
PSAV	PSAV␣a[,b]	——	——

■ Value of a 0 to 99

■ Value of b Character string whithin 8 characters enclosed by double quotation marks or single quotation marks.
Saves the title which sets currently If b is omitted.
Saves the title which is the first eight characters if b is over eight characters.

■ Suffix code None

■ Example PSAV␣5,"MG367ØA"

PSYNC Pattern Sync Output

■ Function

Selects the pattern sync output signal.
(When the modulation unit and the burst function unit are supported, this function is available)

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

■ Value of a

PNCLK:	PN Clock
PNGAT:	PN Gate
RFGAT:	RF Gate

■ Suffix code None

■ Initial setting PNCLK

■ Example PSYNC␣PNGAT

REF Reference Frequency

■ Function Selects the reference frequency.

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

■ Value of a 1ØMHZ : 10 MHz
13MHZ : 13 MHz

■ Suffix code None

■ Initial setting 1ØMHZ

■ Example REF␣13MHZ

RS RPP Reset

■ Function Reset the RPP(Revers Power Protection) circuit to return to the original state.

Header	Program command	Query	Response
RS	RS	——	——

■ Suffix code None

■ Example RS

TRM Terminater

■ Function Sets the terminator of the response data sent out from GPIB.

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

■ Value of a Ø: LF
1: CR/LF

■ Suffix code None

■ Initial setting Ø (but not to be initialized)

■ Example TERM␣1

VDSPL Voltage Display

■ Function Selects the output level display for open voltage or terminated voltage .

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

■ Value of a EMF : Electro-Motive Force (open voltage display)
TERM: Terminated (terminated voltage display)

■ Suffix code None

■ Initial setting EMF

■ Example VDSPL␣TERM

8.2 Control by MG3633A Device Messages

This paragraph describes MG3633A Device Messages, which can be used for MG3670B, calssified by the function type.

Note: *The query message has a trailing "OA" that is always added at the end of the program header. There must be a space between program header and program data.*

8.2.1 Frequency

FR FRequency
FC Frequency Center
CF Center Frequency

■ Function Sets the frequency.

Header	Program command	Query	Response
FR	FR␣a	FROA	FR␣a
FC	FC␣a	FCOA	FR␣a
CF	CF␣a	CFOA	FR␣a (a=0 to 2250 000 000 Hz)

■ Value of a 0 Hz to 2.25 GHz

■ Suffix code

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

■ Initial setting 1ØMHZ

■ Example FR␣123MHZ

FIS Frequency Incremental Step Value

■ Function Sets the frequency incremental step value.

Header	Program command	Query	Response
FIS	FIS␣a	FISOA	FIS␣a (a = 1 to 2250 000 000 Hz)

■ Value of a 1 Hz to 2.25 GHz

■ Suffix code

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

■ Initial setting 1MHZ

■ Example FIS␣12.5KHZ

UFR Frequency Incremental Step Up
DFR Frequency Incremental Step Down

■ Function

Increases (or decreases) the frequency by frequency incremental step value.
UFR: Increase the frequency.
DFR: Decrease the frequency.

Header	Program command	Query	Response
UFR	UFR	—	—
DFR	DFR	—	—

■ Suffix code None

■ Example DFR

TFR Frequency Rotary Knob Up
EFR Frequency Rotary Knob Down

■ Function

Increases (or decreases) the frequency by frequency Resolution.
TFR: Increase the frequency.
EFR: Decrease the frequency.

Header	Program command	Query	Response
TFR EFR	TFR EFR	—— ——	—— ——

■ Suffix code None

■ Example EFR

R2 Frequency Resulution 1 Hz

R3 Frequency Resulution 10 Hz

R4 Frequency Resulution 100 Hz

R5 Frequency Resulution 1 kHz

R6 Frequency Resulution 10 kHz

R7 Frequency Resulution 100 kHz

R8 Frequency Resulution 1 MHz

R9 Frequency Resulution 10 MHz

FSR Frequency Resulution to Right

FSL Frequency Resulution to Left

■ Function

Sets the frequency resolution.
R2: 1 Hz
R3: 10 MHz
R4: 100 Hz
R5: 1 kHz
R6: 10 kHz
R7: 100 kHz
R8: 1 MHz
R9: 10 MHz
FSR: Shifts the frequency resolution to right digit.
FSL: Shifts the frequency resolution to left digit.

Header	Program command	Query	Response
R2	R2	—	—
R3	R3	—	—
R4	R4	—	—
R5	R5	—	—
R6	R6	—	—
R7	R7	—	—
R8	R8	—	—
R9	R9	—	—
FSR	FSR	—	—
FSL	FSL	—	—

■ Suffix code None

■ Initial setting R2

■ Example R3

REFOA Frequency Relative Reference Value

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

Header	Program command	Query	Response
REFOA	———	REFOA	REF␣a (a = 0 to 2250 000 000 Hz)

■ Value of a 0 Hz to 2.25 GHz

■ Suffix code HZ : Hz

■ Example REFOA

RLFOA Frequency Relative Value

■ Function Reads out the relative frequency.

Header	Program command	Query	Response
RLFOA	———	RLFOA	RLF␣a (a = −2250 000 000 to 2250 000 000 Hz)

■ Value of a −2.25 to 2.25 GHz

■ Suffix code HZ: Hz

■ Example RLFOA

FO Frequency Relative On
FF Frequency Relative Off

■ Function

Turns the relative frequency mode on or off.
FO: On
FF: Off

Header	Program command	Query	Response
FO	FO	——	——
FF	FF	——	——

■ Suffix code None

■ Initial setting FF

■ Example FO

FOS Frequency Offset Value

■ Function Sets the frequency offset value.

Header	Program command	Query	Response
FOS	FOS␣a	FOSOA	FOS␣a (a = −2250 000 000 to 2250 000 000 Hz)

■ Value of a −2.25 to 2.25 GHz

■ Suffix code

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

■ Initial setting ØHZ

■ Example FOS␣25KHZ

SP12 Frequency Offset On
SP11 Frequency Offset Off

■ Function

Turns the frequency offset mode on or off.
SP12: On
SP11: Off

Header	Program command	Query	Response
SP12	SP12	——	——
SP11	SP11	——	——

■ Suffix code None

■ Initial setting SP11

■ Example SP12

8.2.2 Output level

OL Output Level
AP Amplitude

■ Function Sets the output level.

Header	Program command	Query	Response
OL AP	OL␣a AP␣a	OLOA APOA	OL␣a OL␣a (a: Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM, DM :	−143 to 13 dBm	
When unit is DBU, DU :	−30 to 126 dBμ	---open voltage
	−36 to 120 dBμ	---terminated voltage
When unit is V, MV, UV :	0.032 μV to 2 V	---open voltage
	0.016 μV to 1 V	---terminated voltage

■ Suffix code

DBM, DM:	dBm
DBU, DU:	dBμ
V:	V
MV:	mV
UV:	μV
None:	dBm

■ Initial setting -3ØDBM

■ Example OL␣-6ØDBM

OIS Output Level Incremental Step Value

■ Function Sets the output level incremental step value.

Header	Program command	Query	Response
OIS	OIS␣a	OISOA	OIS␣a (a = 0.1 to 156 dB)

■ Value of a 0.1 to 156 dB (0.1 dB step)

■ Suffix code DB: dB
None: dB

■ Initial setting 1DB

■ Example OIS␣60DB

UOL Output Level Incremental Step Up
DOL Output Level Incremental Step Down

■ Function

Increases (or decreases) the output level by output level incremental step value.
UOL: Up
DOL: Down

Header	Program command	Query	Response
UOL	UOL	——	——
DOL	DOL	——	——

■ Suffix code None

■ Example DOL

TOL Output Level Rotary Knob Up
EOL Output Level Rotary Knob Down

■ Function

Increases (or decreases) the output level by output level Resolution.
TOL: Up
EOL: Down

Header	Program command	Query	Response
TOL	TOL	——	——
EOL	EOL	——	——

■ Suffix code None

■ Example EOL

L0 Output Level Resolution 0.1 dB
L1 Output Level Resolution 1 dB
L2 Output Level Resolution 10 dB
OSR Output Level Resolution to Right
OSL Output Level Resolution to Left

■ Function

Sets the output Level resolution.
L0: 0.1 dB
L1: 1 dB
L2: 10 dB
OSR: Shifts the output level resolution to right digit.
OSL: Shifts the output level resolution to left digit.

Header	Program command	Query	Response
LØ	LØ	——	——
L1	L1	——	——
L2	L2	——	——
OSR	OSR	——	——
OSL	OSL	——	——

■ Suffix code None

■ Initial setting LØ

■ Example L2

LC Output Level Continuous Mode On
LN Output Level Continuous Mode Off

■ Function Turns the output level continuous mode On or Off.
LC: On
LN: Off

Header	Program command	Query	Response
LC LN	LC LN	——— ———	——— ———

■ Suffix code None

■ Initial setting LN

■ Example LC

REOOA Output Level Relative Reference Value

■ Function Reads out the reference output level of relative output level mode.

Header	Program command	Query	Response
REOOA	———	REOOA	REO␣a (a: Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM :	−143 to 13 dBm	
When unit is DBU :	−30 to 126 dBμ	---open voltage
	−36 to 120 dBμ	---terminated voltage
When unit is V, MV, UV :	0.032 μV to 2 V	---open voltage
	0.016 μV to 1 V	---terminated voltage

■ Suffix code

DBM:	dBm
DBU:	dBμ
V:	V
MV:	mV
UV:	μV

■ Example REOOA

RLOOA Output Level Relative Value

■ Function Reads out the relative output level.

Header	Program command	Query	Response
RLOOA	———	RLOOA	RLO␣a

■ Value of a −156 to 156 dB (0.1 dB step)

■ Suffix code DB : dB

■ Example RLOOA

LO Output Level Relative On
LF Output Level Relative Off

■ Function Turns the relative output level mode on or off.
LO: On
LF: Off

Header	Program command	Query	Response
LO	LO	——	——
LF	LF	——	——

■ Suffix code None

■ Initial setting LF

■ Example LO

OOS Output Level Offset Value

■ Function Sets the output level offset value.

Header	Program command	Query	Response
OOS	OOS␣a	OOSOA	OOS␣a (a = −55.0 to 55.0 dB)

■ Value of a −55 to 55 dB (0.1 dB step)

■ Suffix code DB: dB
None: dB

■ Initial setting ØDB

■ Example OOS␣3DB

SP08 Output Level Offset On
SP07 Output Level Offset Off

■ Function

Turns the output level offset mode on or off.
SP08: On
SP07: Off

Header	Program command	Query	Response
SPØ8	SPØ8	——	——
SPØ7	SPØ7	——	——

■ Suffix code None

■ Initial setting SPØ7

■ Example SPØ8

RO Output Level On
RF Output Level Off

■ Function

Turns the output level on or off.
RO: On
RF: Off

Header	Program command	Query	Response
RO	RO	——	——
RF	RF	——	——

■ Suffix code None

■ Initial setting RO

■ Example RF

SP03 EMF: Electro-Motive Force (open voltage display)
SP04 TERM: Terminated (terminated voltage display)

■ Function

Selects the output level display for open voltage or terminated voltage.
SP03: EMF
SP04: TERM

Header	Program command	Query	Response
SPØ3	SPØ3	——	——
SPØ4	SPØ4	——	——

■ Suffix code None

■ Initial setting SPØ3

■ Example SPØ4

OLDBM
OLDM
APDBM
APDM — Output Level Unit to dBm

■ Function Changes output level units to dBm.

Header	Program command	Query	Response
OLDBM	OLDBM	—	—
OLDM	OLDM	—	—
APDBM	APDBM	—	—
APDM	APDM	—	—

■ Suffix code None

■ Example OLDM

OLDBU Output Level Unit to dBμ
OLDU
APDBU
APDU

■ Function Changes output level units to dBμ.

Header	Program command	Query	Response
OLDBU	OLDBU	———	———
OLDU	OLDU	———	———
APDBU	APDBU	———	———
APDU	APDU	———	———

■ Suffix code None

■ Example OLDU

OLV Output Level Unit to volt
APV

■ Function Changes output level units to volt.

Header	Program command	Query	Response
OLV APV	OLV APV	— —	— —

■ Suffix code None

■ Example APV

OLM Output Level Limit Value

■ Function Sets the output level limit value.

Header	Program command	Query	Response
OLM	OLM␣a	OLMOA	OLM␣a (a = Tranfer the unit which is represented in the current output level units.)

■ Value of a

When unit is DBM, DM :	−143 to 13 dBm	
When unit is DBU, DU :	−30 to 126 dBμ	---open voltage
	−36 to 120 dBμ	---terminated voltage
When unit is V, MV, UV :	0.032 μV to 2 V	---open voltage
	0.016 μV to 1 V	---terminated voltage

■ Suffix code

DBM, DM:	dBm
DBU, DU:	dBμ
V:	V
MV:	mV
UV:	μV
None:	dBm

■ Initial setting -1ØDBM

■ Example OLM␣ØDBM

SP06 Output Level Limit On
SP05 Output Level Limit Off

■ Function Turns the output level limit mode on or off.
SP06: On
SP05: Off

Header	Program command	Query	Response
SPØ6	SPØ6	——	——
SPØ5	SPØ5	——	——

■ Suffix code None

■ Initial setting SPØ5

■ Example SPØ6

8.2.3 Save/recall

FQaST Frequency Memory Save

■ Function Saves frequency to frequency memory.

Header	Program command	Query	Response
FQaST	FQaST	——	——

■ Value of a 0 to 999

■ Suffix code None

■ Example FQ15ST

FQaRC Frequency Memory Recall

- Function: Recalls frequency from frequency memory.

Header	Program command	Query	Response
FQaRC	FQaRC	——	——

- Value of a: 0 to 999
- Suffix code: None
- Example: FQ15RC

FNaST Parameter Memory Save

■ Function Saves parameter to parameter memory.

Header	Program command	Query	Response
FNaST	FNaST	——	——

■ Value of a 0 to 99

■ Suffix code None

■ Example FN5ST

FNaRC Parameter Memory Recall

- Function Recalls parameter from parameter memory.

Header	Program command	Query	Response
FNaRC	FNaRC	——	——

- Value of a 0 to 99
- Suffix code None
- Example FN15RC

8.2.4 Others

RS RPP Reset

■ Function Resets the RPP (Revers Power Protection) circuit to return to the original state.

Header	Program command	Query	Response
RS	RS	——	————

■ Suffix code None

■ Example RS

SP00 Preset

■ Function Initializes parameters.

Header	Program command	Query	Response
SPØØ	SPØØ	——	——

■ Suffix code None

■ Example SPØØ

SP02 Buzzer On
SP01 Buzzer Off

- Function: Turns the buzzer switch on or off.
  SP02: On
  SP01: Off

Header	Program command	Query	Response
SPØ2	SPØ2	——	——
SPØ1	SPØ1	——	——

- Suffix code: None
- Initial setting: SPØ2
- Example: SPØ1

SP60 Header On
SP61 Header Off

■ Function

Selects whether or not to add header to response message.
SP60: On
SP61: Off

Header	Program command	Query	Response
SP6Ø	SP6Ø	——	——
SP61	SP61	——	——

■ Suffix code None

■ Initial setting SP61

■ Example SP6Ø

SECTION 9
SAMPLE PROGRAMS

This section describes some sample programs with the common commands and the program commands, queries, and response messages specific to the MG3670B.

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SECTION 9
SAMPLE PROGRAMS

9.1 Precautions on Creating the GPIB Program

Note the following points when writing GPIB control programs.

No.	Precaution	Description
1	Be sure to initialize each device.	There may be a number of the state in which each device is not proper to be actually used due to operation on its own panel or execution of other programs. It is necessary to using individual devices with a prescribed condition resulting from initializing them. Execute the following. ① Initializing the interface functions (ISET IFC) ② Initializing message exchange functions of each device (WBYTE &H3F, &H14) ③ Initializing the functions proper to each device (PRE or *RST)
2	Turn the device to the remote state of RWLS (Remote With Lockout State).	In a simple remote state, pressing the Local key turns the device to the local state. Pressing a panel key in this moment causes device's automatic measurement to function improperly, thus measurement data are likely to turn out unreliable. Set the device to the locally locked out state with WBYTE &H3F, &H11 to prevent it from returning to the local state. (Turn every device to the locally controlled state with WBYTE &H3F, listener address, secondary address, &H01.)
3	Do not send any command (related to the device) other than the INPUT @ statement immediately after sending a query.	If MLA is received when a command other than the INPUT @ statement is sent to the controller before the response to a query is read, the output buffer is cleared, and the response message disappears. For this reason, write the INPUT @ statement in immediate succession to a query.
4	Create a program that avoids an exception processing of the protocol	Avoid stoppage of execution (caused by an error) by means of providing a program with exception-processing section against exceptions that can be foreseen.
5	Confirm the interface functions of each device (subset).	Execution of program does not advance if necessary subset (s) has (have) not been prepared in the device. Be sure to confirm the subset (s) of each device. Also confirm that each device complies with IEEE488.2.

9.2 Sample Programs

9.2.1 Initializing MG3670B

< Example 1 > Initializes MG3670B.

```
 10  '------------------------------
 20  ' MG3670B GPIB SAMPLE PROGRAM
 30  ' INITIALIZE
 40  '------------------------------
 50  ISET IFC .................................................. Initializes the interface function
 60  ISET REN .................................................. Sets remote enable to true
 70  CMD DELIM=0 ............................................... Selects CR + LF as the delimiter
 80  LET DSG=1 .......................................... Assigns MG3670B address to variable DSG
 90  PRINT @DSG;"PRE" ............................................... Initializes MG3670B
100  END
```

There is a '*RST ' command in another GPIB command for executing initialization.

For general usage of PRE and *RST, first initialize the MG3670B device functions with the PRE or *RST command, then use the program commands to set only the functions to be changed. This prevents the MG3670B from being controlled while unnecessary functions are set.

9.2.2 Setting frequency and output level

<Example 2> Sets the frequency to 100 MHz and output level to 0 dBm, and then performs serial polling to confirm the end of setting parameter.

```
 1Ø  '------------------------------
 2Ø  ' MG367ØB GPIB SAMPLE PROGRAM
 3Ø  ' FREQUENCY & LEVEL SET
 4Ø  '------------------------------
 5Ø  ISET IFC
 6Ø  ISET REN
 7Ø  CMD DELIM=Ø
 8Ø  LET DSG=1
 9Ø  PRINT @DSG;"PRE"
1ØØ  SRQ ON ....................................................... Permits the receipt of SRQ
11Ø  PRINT @DSG;"*CLS ............................................ Clears Status Byte Register
12Ø  PRINT @DSG;"*SRE 4" ...................................... Masks bits other than SRE bit 2
13Ø  PRINT @DSG;"ESE2 4" ...................................... Masks bits other than ESE2 bit 2
14Ø  PRINT @DSG;"FREQ 1ØØMHZ" ................................. Sets the frequency to 100MHz
15Ø  PRINT @DSG;"OLVL ØDBM" ................................... Sets the output level 0dBm
16Ø  POLL DSG,N ................................................. Performs serial polling
17Ø  IF N<>68 THEN GOTO 16Ø ................ Terminates this program when STB ESB(bit 2) is 1
18Ø  END
```

Executing the SRQ command at line 100 permits the receipt of SRQ .

Lines 110 to 130 clear and mask the Status Byte Register.

Lines 140 and 150 set the frequency and the output level.

The serial polling at lines 160 and 170 is executed to check the end of setting parameter.

9.2.3 Setting frequency using increment step frequency

<Example 2> Sets the frequency to 100MHz, increment step frequency to 250kHz and then increases the frequency in 250kHz steps from 100 MHz to 200MHz.

```
 10  '------------------------------
 20  ' MG3670B GPIB SAMPLE PROGRAM
 30  ' FREQUENCY INCREMENTAL STEP SET
 40  '------------------------------
 50  ISET IFC
 60  ISET REN
 70  CMD DELIM=0
 80  LET DSG=1
 90  PRINT @DSG;"PRE"
100  SRQ ON
110  PRINT @DSG;"*CLS
120  PRINT @DSG;"*SRE 4" ................................  Masks bits other than SRE bit 2
130  PRINT @DSG;"ESE2 1" ................................  Masks bits other than ESE2 bit 2
140  PRINT @DSG;"FREQ 100MHZ" ...........................  Sets the frequency to 100MHz
150  PRINT @DSG;"FIS 250KHZ" ..............  Sets the incremental step frequency to 250kHz
160  FOR I=1 TO 400 ........  Repeats the FOR-NEXT loop 400 times until the frequency becomes 200 MHz
170  PRINT @DSG;"FRS UP" ................................  Increase the frequency by 250kHz
180  POLL DSG,N
190  IF N<>68 THEN GOTO 180
200  NEXT I
210  END
```

Lines 140 and 150 set the frequency (100MHz) and incremental step frequency.

Lines 160 to 200 increase the frequency in 250kHz steps from 100 MHz to 200MHz.

Lines 180 to 190 executes waiting until setting frequency parameter is completed.

9.2.4 Calibrating by external I,Q signal input

<Example 2> Sets the frequency to 100MHz, output level to 0dBm, I,Q signals source to external input , and then calibrates the output level.

```
 10  '-------------------------------
 20  ' MG3670B GPIB SAMPLE PROGRAM
 30  ' CALIBRATION
 40  '-------------------------------
 50  ISET IFC
 60  ISET REN
 70  CMD DELIM=0
 80  LET DSG=1
 90  PRINT @DSG;"PRE"
100  SRQ ON
110  PRINT @DSG;"*CLS"
120  PRINT @DSG;"*SRE 4" ........................................ Masks bits other than SRE bit 2
130  PRINT @DSG;"ESE2 2" ....................................... Masks bits other than ESE2 bit 1
140  PRINT @DSG;"FREQ 100MHZ"................................. Sets the frequency to 100MHz
150  PRINT @DSG;"OLVL 0DBM" ..................................... Sets the output level to 0dBm
160  PRINT @DSG;"MOD ON" ............................................... Turns modulation on
170  PRINT @DSG;"MODE EXT"........................... Sets the I,Q signals source to external input
180  PRINT @DSG;"CAL" .................................................. Calibrates the output level
190  POLL DSG,N
200  IF N<>68 THEN GOTO 190
210  END
```

Lines 140 and 150 set the frequency and the output level.

The modulation is turned on and I,Q signals source is set to external input at lines 160 and 170, respectively.

Line 180 calibrates the output level.

Lines 190 and 200 check that calibration execution is terminated.

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APPENDIXES

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APPENDIX A ASCII*CODE TABLE A-1

APPENDIX B COMPARISON TABLE OF CONTROLLER'S GPIB INSTRUCTIONS B-1

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A ASCII[†] CODE TABLE

B7 B6 B5	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
BITS B4 B3 B2 B1	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0 0	20 DLE 10 16	40 SP 20 32	60 0 30 48	100 @ 40 64	120 P 50 80	140 ` 60 96	160 p 70 112
0 0 0 1	1 GTL SOH 1 1	21 LLO DC1 11 17	41 ! 21 33	61 1 31 49	101 A 41 65	121 Q 51 81	141 a 61 97	161 q 71 113
0 0 1 0	2 STX 2 2	22 DC2 12 18	42 " 22 34	62 2 32 50	102 B 42 66	122 R 52 82	142 b 62 98	162 r 72 114
0 0 1 1	3 ETX 3 3	23 DC3 13 19	43 # 23 35	63 3 33 51	103 C 43 67	123 S 53 83	143 c 63 99	163 s 73 115
0 1 0 0	4 SDC EOT 4 4	24 DCL DC4 14 20	44 S 24 36	64 4 34 52	104 D 44 68	124 T 54 84	144 d 64 100	164 t 74 116
0 1 0 1	5 PPC ENO 5 5	25 PPU NAK 15 21	45 % 25 37	65 5 35 53	105 E 45 69	125 U 55 85	145 e 65 101	165 u 75 117
0 1 1 0	6 ACK 6 6	26 SYN 16 22	46 & 26 38	66 6 36 54	106 F 46 70	126 V 56 86	146 f 66 102	166 v 76 118
0 1 1 1	7 BEL 7 7	27 ETB 17 23	47 ' 27 39	67 7 37 55	107 G 47 71	127 W 57 87	147 g 67 103	167 w 77 119
1 0 0 0	10 GET BS 8 8	30 SPE CAN 18 24	50 (28 40	70 8 38 56	110 H 48 72	130 X 58 88	150 h 68 104	170 x 78 120
1 0 0 1	11 TCT HT 9 9	31 SPD EM 19 25	51) 29 41	71 9 39 57	111 I 49 73	131 Y 59 89	151 i 69 105	171 y 79 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 * 2A 42	72 : 3A 58	112 J 4A 74	132 Z 5A 90	152 j 6A 106	172 z 7A 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 ÷ 2B 43	73 ; 3B 59	113 K 4B 75	133 [5B 91	153 k 6B 107	173 { 7B 123
1 1 0 0	14 FF C 12	34 FS 1C 28	54 , 2C 44	74 &lt; 3C 60	114 L 4C 76	134 \ 5C 92	154 l 6C 108	174 ¦ 7C 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 – 2D 45	75 = 3D 61	115 M 4D 77	135] 5D 93	155 m 6D 109	175 } 7D 125
1 1 1 0	15 SO E 14	36 RS 1E 30	56 . 2E 46	76 &gt; 3E 62	116 N 4E 78	136 ∧ 5E 94	156 n 6E 110	176 ~ 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 / 2F 47	77 UNL ? 3F 63	117 O 4F 79	137 UNT —— 5F 95	157 o 6F 111	177 RUBOUT (DEL) 7F 127
	Address command	Universal command	Listen address		Talk address		Secondary address or command	

KEY

octal	25 PPU		GPIB code
	NAK		ASCII character
hex	15 21		decimal

[†] U S A Standard Code for Information Interchange

Table of GPIB Interface Messages (extended)

Bits b7 → b6 → b5 →					0 0 0	① MSG	0 0 1	MSG	0 1 0	MSG	0 1 1	MSG	1 0 0	MSG	1 0 1	MSG	1 1 0	MSG	1 1 1	MSG
b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → ROW ↓	0		1		2		3		4		5		6		7	
② 0	0	0	0	0	NUL		DLE		SP	Listener address to be assinged to devices (MLA)	0	Listener address to be assinged to devices (MLA)	@	Talker addresses to be assinged to devices (MTA)	P	Talker addresses to be assinged to devices (MTA)		The meanings are definied by PCG.	p	The meanings are definied by PCG.
0	0	0	1	1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q	
0	0	1	0	2	STX		DC2		"		2		B		R		b		r	
0	0	1	1	3	ETX		DC3		#		3		C		S		c		s	
0	1	0	0	4	EOT	SDC	DC4	DCL	$		4		D		T		d		t	
0	1	0	1	5	ENQ	PPC	NAK	PPU	%		5		E		U		e		u	
0	1	1	0	6	ACK		SYN		&		6		F		V		f		v	
0	1	1	1	7	BEL		ETB				7		G		W		g		w	
1	0	0	0	8	BS	GET	CAN	SPE	(		8		H		X		h		x	
1	0	0	1	9	HT	TCT	EM	SPD	)		9		I		Y		i		y	
1	0	1	0	A	LF		SUB		*		:		J		Z		j		z	
1	0	1	1	B	VT		ESC		+		;		K		[		k		{	
1	1	0	0	C	FF		FS		,		<		L		\		l		|	
1	1	0	1	D	CR		GS		—		=		M		]		m		}	
1	1	1	0	E	SO		RS		.		>		N		∧		n		~	
1	1	1	1	F	SI		US		/		?	UNL	O		—	UNT	o		DEL	

Address command group (ACG)

Universal command group (UCG)

Listen address group (LAG)

Talk address group (TAG)

Primary command group (PGG)

Secondary command group (SCG)

Notes :

① *MSG = INTERFACE MESSAGE (Sent by ATN of True: Low level.)*

② *b_1 = DI 01 ···· b_7 = DI 07 (b1 through b7 correspond to DIO1 to DIO7 sequence.)*

GTL	Go to Local
SDC	Select Device Clear
PPC	Parallel Poll Configure
GET	Group Execute Trigger
TCT	Take Control
LLO	Local Lockout
(ACG)	Addressed Command Group
(UCG)	Universal Command Group
(LAG)	Listen Address Group
(TAG)	Talk Address Group
(PCG)	Primary Command Group
(SGG)	Secondary Command Grout
DCL	Device Clear
PPU	Parallel Poll Unconfigure
SPE	Serial Poll Enable
SPD	Serial Poll Disable
UNL	Unlisten
UNT	Untalk

Table of Interface Message Group

DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	Interface message group (G)
×	0	0	0	b_4	b_3	b_2	b_1	Addressed command G
×	0	0	1	b_4	b_3	b_2	b_1	Universal command G
×	0	1	b_5	b_4	b_3	b_2	b_1	Listen address G
×	0	1	1	1	1	1	1	Unlisten (UNL)
×	1	0	b_5	b_4	b_3	b_2	b_1	Talker address G
×	1	0	1	1	1	1	1	Untalk (UNT)
×	1	1	b_5	b_4	b_3	b_2	b_1	Secondary command G

Table of Address Assignments

Address character		Address switch setting					Primary address	Factory address set device
Talk	Listen	5	4	3	2	1		
b_7 b_6	b_7 b_6	b_5	b_4	b_3	b_2	b_1		
1 0	0 1	↓	↓	↓	↓	↓	10 Decimal	
@	SP	0	0	0	0	0	0	
A	!	0	0	0	0	1	1	
B	"	0	0	0	1	0	2	
C	#	0	0	0	1	1	3	
D	$	0	0	1	0	0	4	
E	%	0	0	1	0	1	5	
F	&	0	0	1	1	0	6	
G	'	0	0	1	1	1	7	
H	(	0	1	0	0	0	8	
I	)	0	1	0	0	1	9	
J	*	0	1	0	1	0	10	
K	+	0	1	0	1	1	11	
L	,	0	1	1	0	0	12	
M	–	0	1	1	0	1	13	Printer
N	.	0	1	1	1	0	14	Plotter
O	/	0	1	1	1	1	15	
P	0	1	0	0	0	0	16	
Q	1	1	0	0	0	1	17	
R	2	1	0	0	1	0	18	
S	3	1	0	0	1	1	19	
T	4	1	0	1	0	0	20	
U	5	1	0	1	0	1	21	
V	6	1	0	1	1	0	22	
W	7	1	0	1	1	1	23	
X	8	1	1	0	0	0	24	
Y	9	1	1	0	0	1	25	
Z	:	1	1	0	1	0	26	
[	;	1	1	0	1	1	27	
\	<	1	1	1	0	0	28	
]	=	1	1	1	0	1	29	
∧	>	1	1	1	1	0	30	
?	—	1	1	1	1	1	31	UNL,UNT

(Blank)

B COMPARISON TABLE OF CONTROLLERS' GPIB INSTRUCTIONS

Function	Controller			
	PACKET V	PC9800	IBM-PC	HP9000 series
Outputs data to a device	WRITE @ device number:data	PRINT @ listener address; data	CALL IBWRT( )	OUTPUT device selector;data
Output binary data to a device	BIN WRITE @ device number:data	WBYTE command; data		
Assigns data entered from a device to a variable	READ @ device number: variable	INPUT @ talker address,listener address;variable LINE INPUT @ talker address,listener address;variable	CALL IBRD( )	ENTER device selector; variable
Assigns binary data entered from a device to a variable	BIN READ @ device number: variable	RBYTE command;variable		
Initializes an interface	IFC @ select code	ISET IFC	CALL IBSIC( )	ABORT select code
Turns REN line on	REN @ select code	ISET REN	CALL IBSRE( )	REMOTE device selector (select code)
Turns REN line off	LCL @ select code (sets all devices local) LCL @ device number (sets only specified devices to listeners, and sends out GTL command)	IRESET REN WBYTE &H3F,listener address, secondary address, &HØ1;	CALL IBSRE( ) CALL IBLOC( )	LOCAL device selector (select code) LOCAL device selector (select code + primary address)

Function	Controller			
	PACKET V	PC9800	IBM-PC	HP9000 series
Outputs interface message(s) and data	COMMAND @ select code: character string for message [;data]		CALL IBCMD( ) CALL IBCMDA( ) (asynchronous)	SEND select code;message string
Triggers a specified device	TRG @ device number	WBYTE & H3F,listener address, secondary address, &HØ8;	CALL IBTRG( )	TRIGGER device selector
Initializes devices	DCL @ select code (all devices bearing a specified select code) DCL @ device number (specified devices only)	WBYTE &H3F,&H14; WBYTE &H3F, listener address, secondary address,&H04;	CALL IBCLR( )	CLEAR device selector (select code) CLEAR device selector (select code + primary address)
Disables a device from being switched over from remote to local	LLO @ select code	WBYTE &H3F, &H11;		LOCAL LOCKOUT
Transfers control to a specified device	RCT @ device number	WBYTE,talker address,&H09;	CALL IBRSV ( )	PASS CONTROL
Sends out a service request	SRQ @ select code	ISET SRQ	CALL IBRSV( )	REQUEST select code
Performs serial polling	STATUS @ device number	POLL	CALL IBRSP( )	SPOLL (device selector) (function)
Sets a terminator code	TERM IS	CMD DELIM	CALL IBEOS( ) CALL IBEOT( )	
Sets a limit value for checking a timeout		CMD TIMEOUT	CALL IBTOM( )	