MS2681A/MS2683A/MS2687A/MS2687B
Spectrum Analyzer
Operation Manual
Vol. 3
(Programming)

11th Edition

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

ANRITSU CORPORATION

Document No.: M-W1754AE-11.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following five symbols may not be used on all Anritsu equipment. In addition, there may be other labels attached to products which are not shown in the diagrams in this manual.

Symbols used in manual

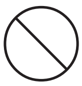
DANGER ⚠ This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

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

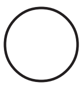
CAUTION ⚠ This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

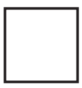


This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

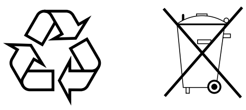


This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

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



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



These indicate that the marked part should be recycled.

MS2681A/MS2683A/MS2687A/MS2687B
Spectrum Analyzer
Operation Manual Vol. 3 (Programming)

20 April 2000 (First Edition)
9 September 2005 (11th Edition)

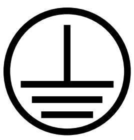
Printed in Japan

For Safety

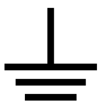
WARNING ⚠

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

2. Measurement Categories
   This instrument is designed for Measurement category I (CAT I). Don't use this instrument at the locations of measurement categories from CAT II to CAT IV.
   In order to secure the safety of the user making measurements, IEC 61010 clarifies the range of use of instruments by classifying the location of measurement into measurement categories from I to IV.
   The category outline is as follows:
   Measurement category I (CAT I):
   Secondary circuits of a device connected to an outlet via a power transformer etc.
   Measurement category II (CAT II):
   Primary circuits of a device with a power cord (portable tools, home appliance etc.) connected to an outlet.
   Measurement category III (CAT III):
   Primary circuits of a device (fixed equipment) to which power is directly supplied from the power distribution panel, and circuits from the distribution panel to outlets.
   Measurement category IV (CAT IV):
   All building service-line entrance circuits through the integrating watt-meter and primary circuit breaker (power distribution panel).



or



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

For Safety

WARNING ⚠

Repair

WARNING ⚠

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

Calibration

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

Falling Over

6. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.
   And also DO NOT use this equipment in the position where the power switch operation is difficult.

Battery Fluid

7. DO NOT short the battery terminals and never attempt to disassemble it or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak.
   This fluid is poisonous.
   DO NOT touch it, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

LCD

8. This instrument uses a Liquid Crystal Display (LCD); DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
   This liquid is very caustic and poisonous.
   DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

For Safety

CAUTION ⚠

Replacing Fuse

CAUTION ⚠

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

   T6.3A indicates a time-lag fuse.

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

Cleaning

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

Check Terminal

3. Maximum DC voltage ratings:

RF Input	±DC 0 V

   Maximum AC power (continuous wave) ratings:

RF Input	+30 dBm (RF ATT ≥10 dB)

   NEVER input a over maximum ratings to RF Input, excessive power may damage the internal circuits.

For Safety

CAUTION ⚠

Replacing Memory Back-up Battery

The power for memory backup is supplied by a Poly-carbonmonofluoride 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.

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

External Storage Media

This equipment stores data and programs using Plug-in Memory card.
Data and programs may be lost due to improper use or failure.
ANRITSU therefore recommends that you backup the memory.

<u>Anritsu Corporation will not accept liability for lost data.</u>

Pay careful attention to the following points.

- Do not remove the memory card from equipment being accessed.
- Isolate the card from static electricity.
- The PC-ATA card or Compact Flash card operation is not guaranteed generally.

Disposing of The Product

This equipment uses chemical compound semiconductor including arsenide.
At the end of its life, the equipment should be recycled or disposed properly according to the local disposal regulations.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

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

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

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

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

Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Service and Sales offices at the address at the end of paper-edition manual or the separate file of CD-edition manual.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.
Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.
When you dispose of export-controlled items, the products/manuals are needed to be broken/shredded so as not to be unlawfully used for military purpose.

Front Panel Power Switch

To prevent malfunction caused by accidental touching, the front power switch of this equipment turns on the power if it is pressed continuously for about one second in the standby state. If the switch is pressed continuously for one second in the power-on state, the equipment enters the standby state.

In the power-on state, if the power plug is removed from the outlet, then reinserted into it, the power will not be turned on. Also, if the lines is disconnected due to momentary power supply interruption or power failure, the power will not be turned on (enters the standby state) even if the line is recovered.

This is because this equipment enters the standby state and prevents incorrect data from being acquired when the line has to be disconnected and reconnected.

For example, if the sweep time is 1,000 seconds and data acquisition requires a long time, momentary power supply interruption (power failure) might occur during measurement and the line could be recovered automatically to power-on. In such a case, the equipment may mistake incorrect data for correct data without recognizing the momentary power supply interruption.

If this equipment enters the standby state due to momentary power supply interruption or power failure, check the state of the measuring system and press the front power switch to restore power to this equipment.

Further, if this equipment is built into a system and the system power has to be disconnected then reconnected, the power for this equipment must also be restored by pressing the front power switch.

Consequently, if this equipment is built into remote monitoring systems that use MODEMs, please install option 46 “Auto Power Recovery” to equipment.

ABOUT DETECTION MODE

This instrument is a spectrum analyzer which uses a digital storage system. The spectrum analyzer makes level measurements in frequency steps obtained by dividing the frequency span by the number of measurement data points (501). This method of measurement cannot detect the signal peak level if the spectrum of a received signal is narrower than these frequency steps.
To resolve this problem, this instrument usually operates in positive peak detection mode and normal detection mode. In the positive peak detection mode, the highest level within the frequency range between the sample points can be held and traced. In the normal detection mode, both the positive peak and the negative peak can be traced.
Positive peak detection mode should be used for almost all measurements including normal signal level measurement, pulsed noise analysis, and others. <u>It is impossible to measure the signal level accurately in sample detection mode or in negative peak detection mode.</u>
Use of sample detection mode is restricted to random noise measurement, occupied frequency bandwidth measurement for analog communication systems, and adjacent-channel leakage power measurement, etc.

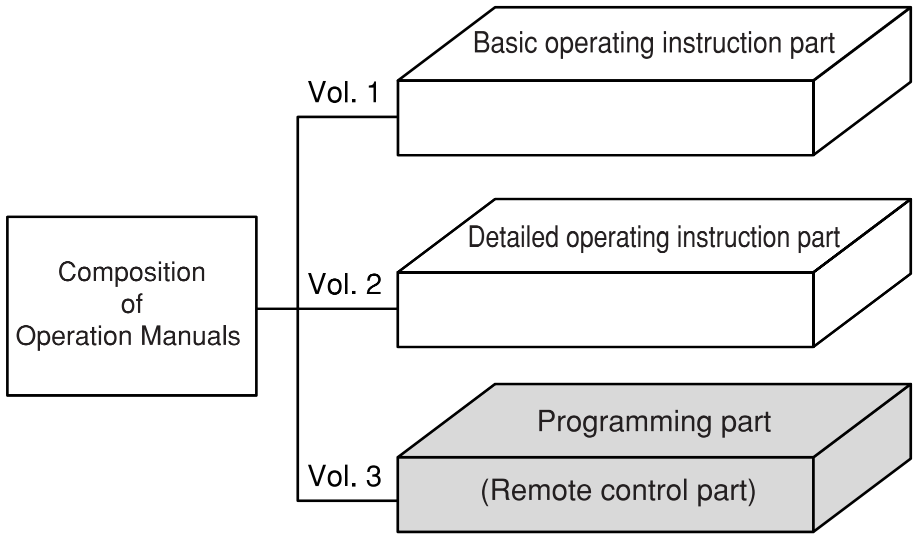
Measurement	Item
• Normal signal	POS PEAK
• Random noise	SAMPLE
• Pulsed noise	NORMAL (POSI-NEG)
• Occupied frequency bandwidth, adjacent-channel leakage power (for analog communication systems)	SAMPLE
• Occupied frequency bandwidth, adjacent-channel leakage power (for digital communication systems)	POS PEAK or SAMPLE

When a detection mode is specified as one of the measurement methods, make the measurement in the specified detection mode.

About This Manual

(1) Composition of MS2681A/MS2683A/MS2687A/MS2687B spectrum analyzer Operation Manuals

The MS2681A/MS2683A/MS2687A/MS2687B Spectrum Analyzer operation manuals of the standard type are composed of the following three documents. Use them properly according to the usage purpose.



Basic operating instruction part:
: Provides information on the MS2681A/MS2683A/MS2687A/MS2687B outline, preparation before use, panel description, basic operation, soft-key menu and performance tests.

Detailed operating instruction part:
: Provides information on the detailed panel operating instructions on MS2681A/MS2683A/MS2687A/MS2687B that expand on the basic operation and soft-key menu in the Basic Operating Instruction Part.

Programming part (Remote control part):
: Provides information on RS-232C remote control, GPIB remote control and sample programs.

Table of Contents

Section 1 General

This section outlines the remote control and gives examples of system upgrades.

General

MS2681A/MS2683A/MS2687A/MS2687B Spectrum Analyzer, when combined with an external controller (host computer, personal computer, etc.), can automate your measurement system. For this purpose, the spectrum analyzer is equipped with an RS-232C interface port, GP-IB interface bus (IEEE std 488.2-1987). Ethernet interface can be installed as Option 09.

Remote control functions

The remote control functions of the MS2681A/MS2683A/MS2687A/MS2687B are used to do the following:

(1) Control all functions except a few like the power switch and [LOCAL] key

(2) Read all parameter settings.

(3) Set the RS-232C interface settings from the panel

(4) Set the GP-IB address from the panel

(5) Set the IP address for Ethernet interface from the panel. (Option 09)

(6) Select the interface port application from the panel

(7) Configure the automatic measurement system when the spectrum analyzer is combined with a personal computer and other measuring instruments.

Interface port selection functions

MS2681A/MS2683A/MS2687A/MS2687B Spectrum Analyzer has a standard RS-232C interface, and an optional GP-IB interface bus and parallel (Centro) interface. Use the panel to select the interface port to be used to connect external devices as shown below.

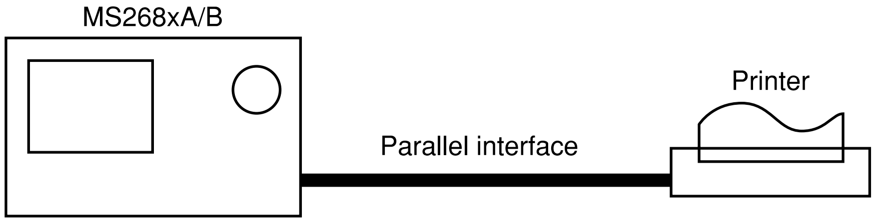
Port for the external controller: Select RS-232C, GP-IB or Ethernet (Option 09).

Port for the printer or plotter: Parallel interface.

Examples of system upgrades using RS-232C and GP-IB

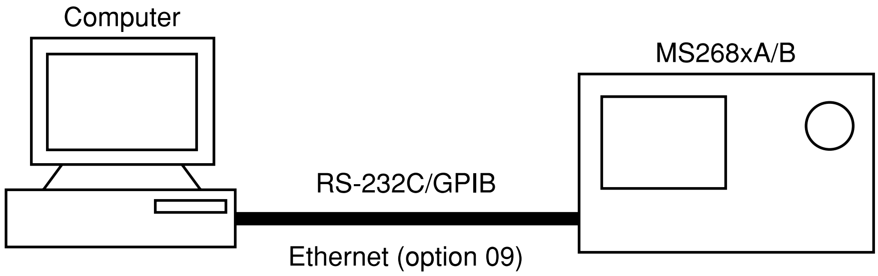
(1) Stand-alone type 1

Waveforms measured with MS2681A/MS2683A/MS2687A/MS2687B are output to the printer and plotter.



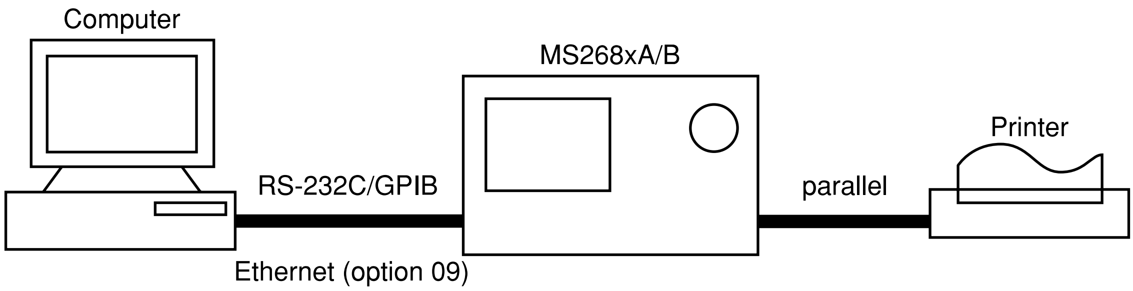
(2) Control by the host computer (1)

The spectrum analyzer is controlled automatically or remotely from the computer.



(3) Control by the host computer (2)

The waveforms measured by controlling spectrum analyzer automatically or remotely are output to the printer and plotter. The external controller, printer, and plotter must be connected using different interfaces.



Specifications of RS-232C

The table below lists the specifications of the RS-232C provided as standard in MS2681A/MS2683A/MS2687A/MS2687B.

Item	Specification
Function	Outputs printing data to the printer and plotter. Control from the external controller (except for power-ON/OFF)
Communication system	Asynchronous (start-stop synchronous system), half-duplex
Communication control system	X-ON/OFF control
Baud rate	1200, 2400, 4800, 9600, 19.2 k, 38.4 k, 56 k, 115 k (bps)
Data bits	7 or 8 bits
Parity	Odd number (ODD), even number (EVEN), none (NON)
Start bit	1 bit
Stop bit (bits)	1 or 2 bits
Connector	D-sub 9-pin, male

Specifications of GP-IB

The table below lists the specifications of the GP-IB provided for MS2681A/MS2683A/MS2687A/MS2687B.

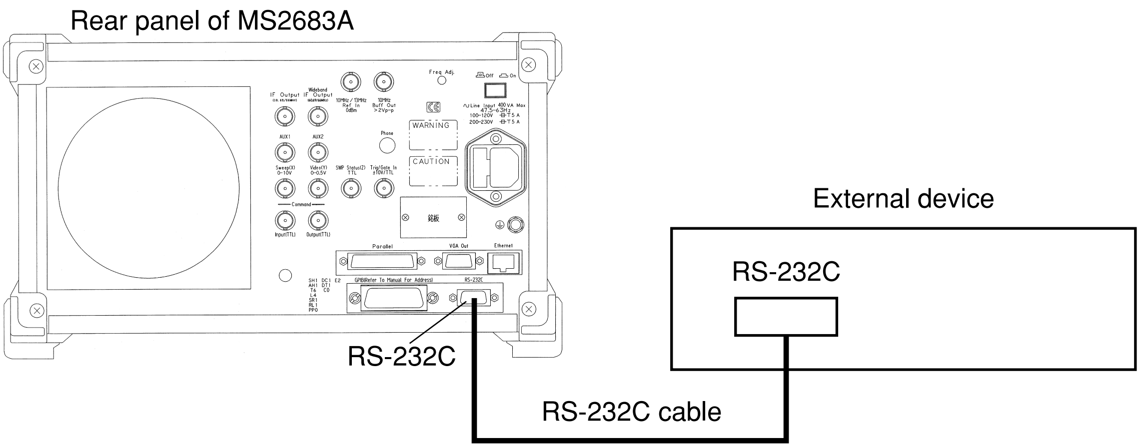
Item	Specification and supplementary explanation
Function	Conforms to IEEE488.2 The spectrum analyzer is controlled from the external controller (except for power-on/off).
Interface function	SH1: All source handshake functions are provided. Synchronizes the timing of data transmission. AH1: All acceptor handshake functions are provided. Synchronizes the timing of data reception. T6: The basic talker functions and serial poll function are provided. The talk only function is not provided. The talker can be canceled by MLA. L4: The basic listener functions are provided. The listenonly 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: The parallel poll functions are not provided. DC1: All device clear functions are provided. DT1: Device trigger functions are provided. C0: System controller functions are not provided. E2: Output is tri-state.

Section 2 Connecting Device

This section describes how to connect external devices such as the host computer, personal computer, and printer with RS-232C and GP-IB cables. This section also describes how to setup the interfaces of the spectrum analyzer.

Connecting an external device with an RS-232C cable

Connect the RS-232C connector (D-sub 9-pin, female) on the rear panel of the spectrum analyzer to the RS-232C connector of the external device with an RS-232C cable.

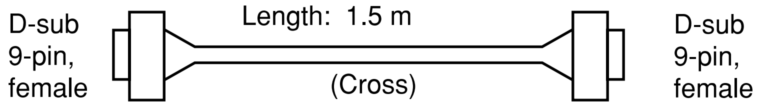


Notes:

RS-232C connectors with 9 pins and 25 pins are available. When purchasing the RS-232C cable, check the number of pins on the RS-232C connector of the external device. Also, the following RS232C cable is provided as peripheral parts of the spectrum analyzer.

• RS-232C cable (for IBM PC/AT Compatible)

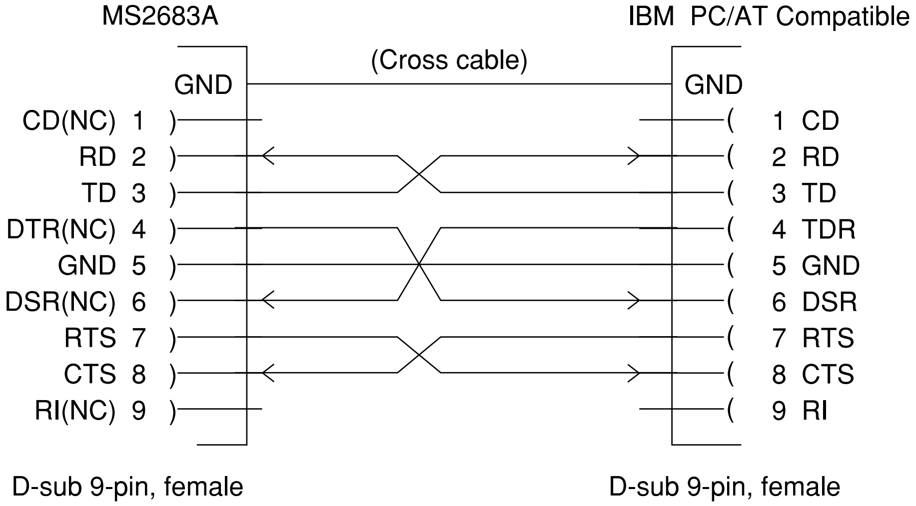
• Spectrum analyzer side AT Compatible personal computer side



Connection diagram of RS-232C interface signals

The diagram below shows the RS-232C interface signal connections between the spectrum analyzer and devices such as a personal computer.

- Connection with IBM PC/AT Compatible personal computer



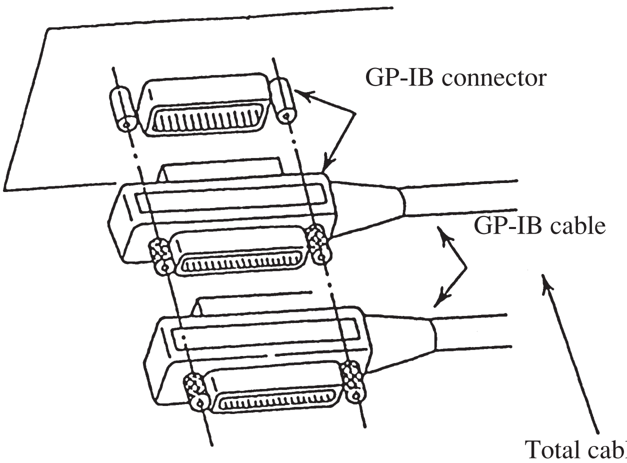
Connecting a device with a GP-IB cable

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

Note:

Be sure to connect the GP-IB cable before turning the equipment power on.

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



Total cable length: Up to 20 m
Cable length between devices: Up to 4 m
Number of devices that can be connected: Up to 15

Setting the GP-IB address

Set the GPIB address of this equipment as follows:

Config ⟶ Interface ⟶ (move cursor) My Address 1 ⟶ set

Use the 10-key pad to enter the GP-IB address of this equipment, next press the set key to confirm address.
The initial value is 1.

Section 3 Device Message Format

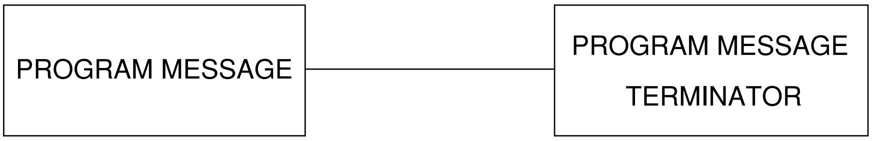
This section describes the format of the device messages transmitted on the bus between a controller (host computer) and device MS2681A/MS2683A/MS2687A/MS2687B via the RS-232C, GP-IB or Ethernet system.

General description

The device messages are data messages transmitted between the controller and devices, program messages transferred from the controller to this instrument (device), and response messages input from this instrument (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 this instrument's parameters and to instruct it to execute processing. The program query is used to query the values of parameters and measured results.

Program message format

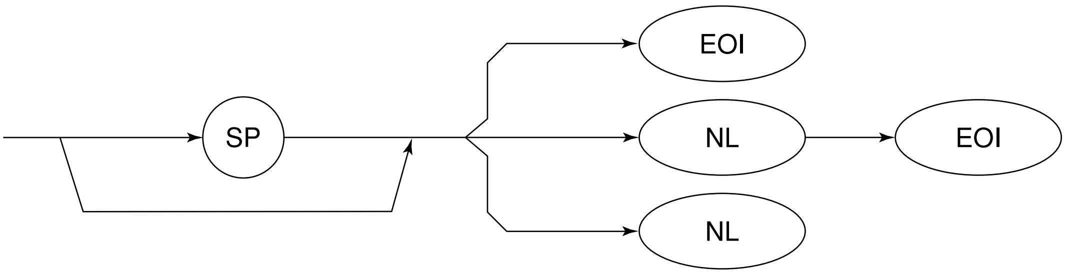
To transfer a program message from the controller program to this instrument using the WRITE statement, the program message formats are defined as follows:




```
WRITE  #1,"CF :1GHZ"
```

PROGRAM MESSAGE: When the program message is transmitted from the controller to this instrument, the specified terminator is attached to the end of the program message to terminate its transmission.

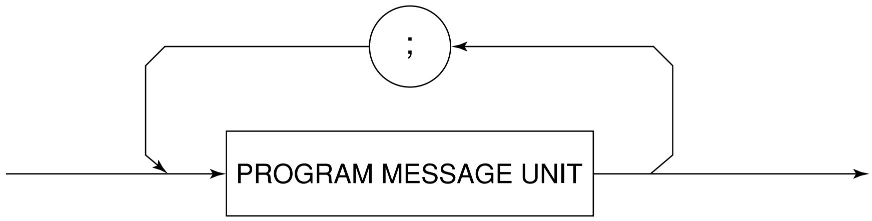
(1) PROGRAM MESSAGE TERMINATOR



NL: Called New line or LF (Line Feed)

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

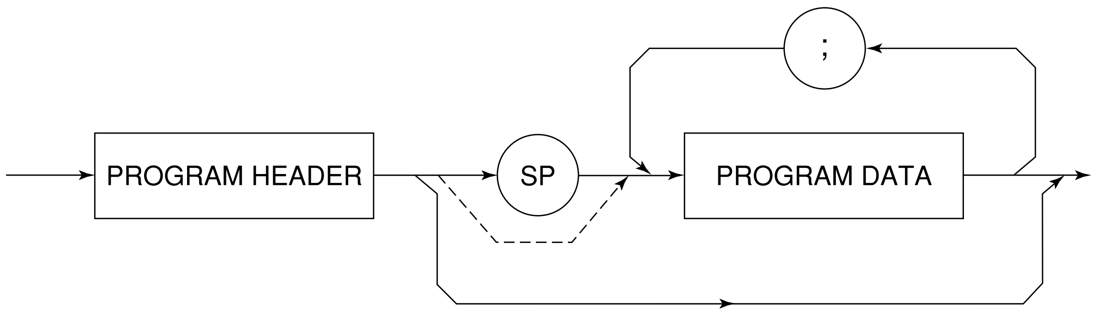
(2) PROGRAM MESSAGE



Multiple program message units can be output sequentially by separating them with a semicolon.

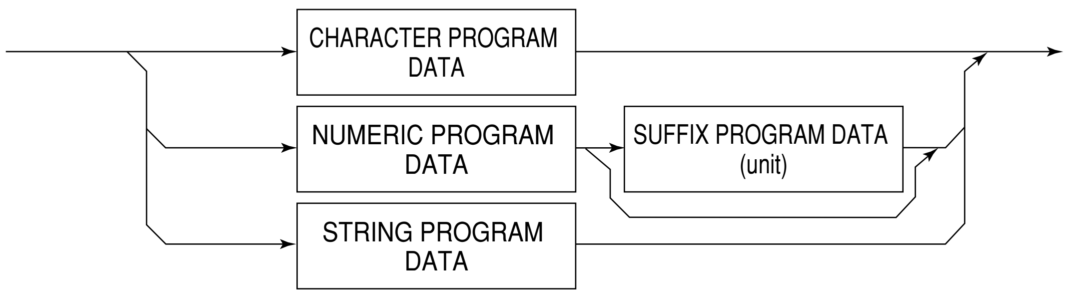
<Example> `WRITE #1;"CF 1GHZ;SP 5ØØKHZ`

(3) PROGRAM MESSAGE UNIT



- The program header of an IEEE488.2 common command always begins with an asterisk.
- For numeric program data, the SP between the header and data can be omitted.
- The program header of a program query always ends with a question mark.

(4) PROGRAM DATA



(5) CHARACTER PROGRAM DATA

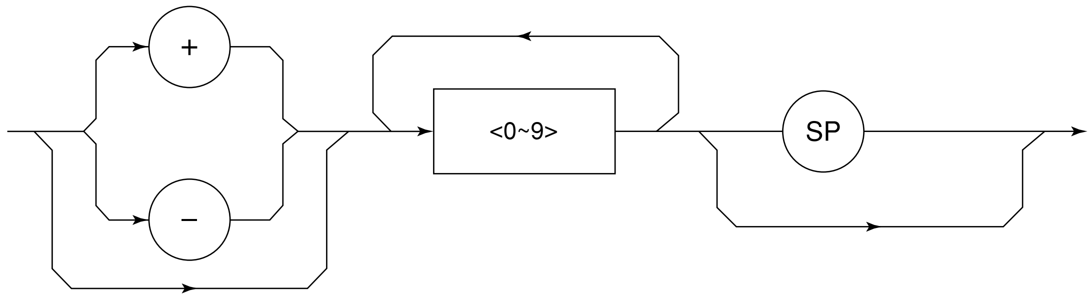
Character program data is specific character string data consisting of the uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, numbers 0 to 9, and underline (_).

<Example> `WRITE #1;"ST AUTO"`.............. Sets Sweep Time to AUTO.

(6) NUMERIC PROGRAM DATA

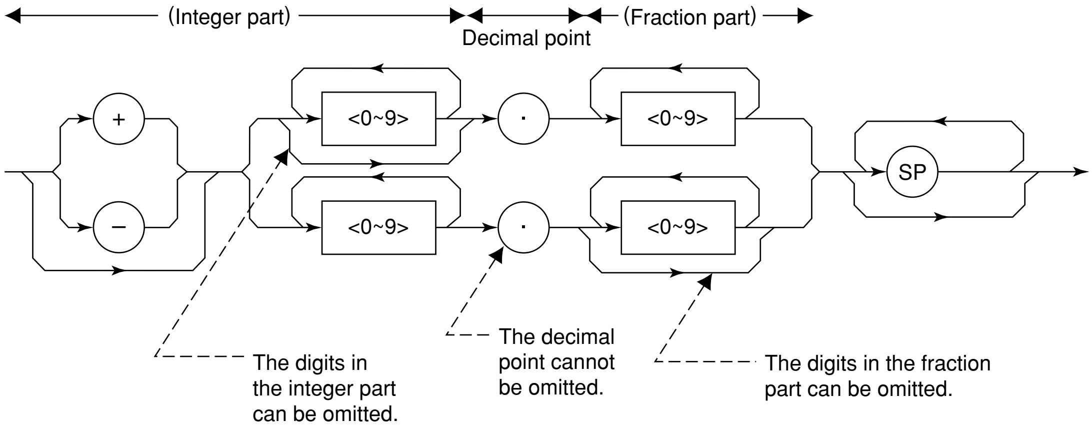
Numeric program data has two types of formats: integer format (NR1) and fixed-point format (NR2).

< Integer format (NR1) >



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

<Fixed-point format (NR2)>



- The numeric expression of the integer format applies to the integer part.
- There must be no spaces between numbers and the decimal point → +753△.123 (×)
- Spaces can be inserted after the digits in the fraction part → +753.123△△△
- A number need not 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.

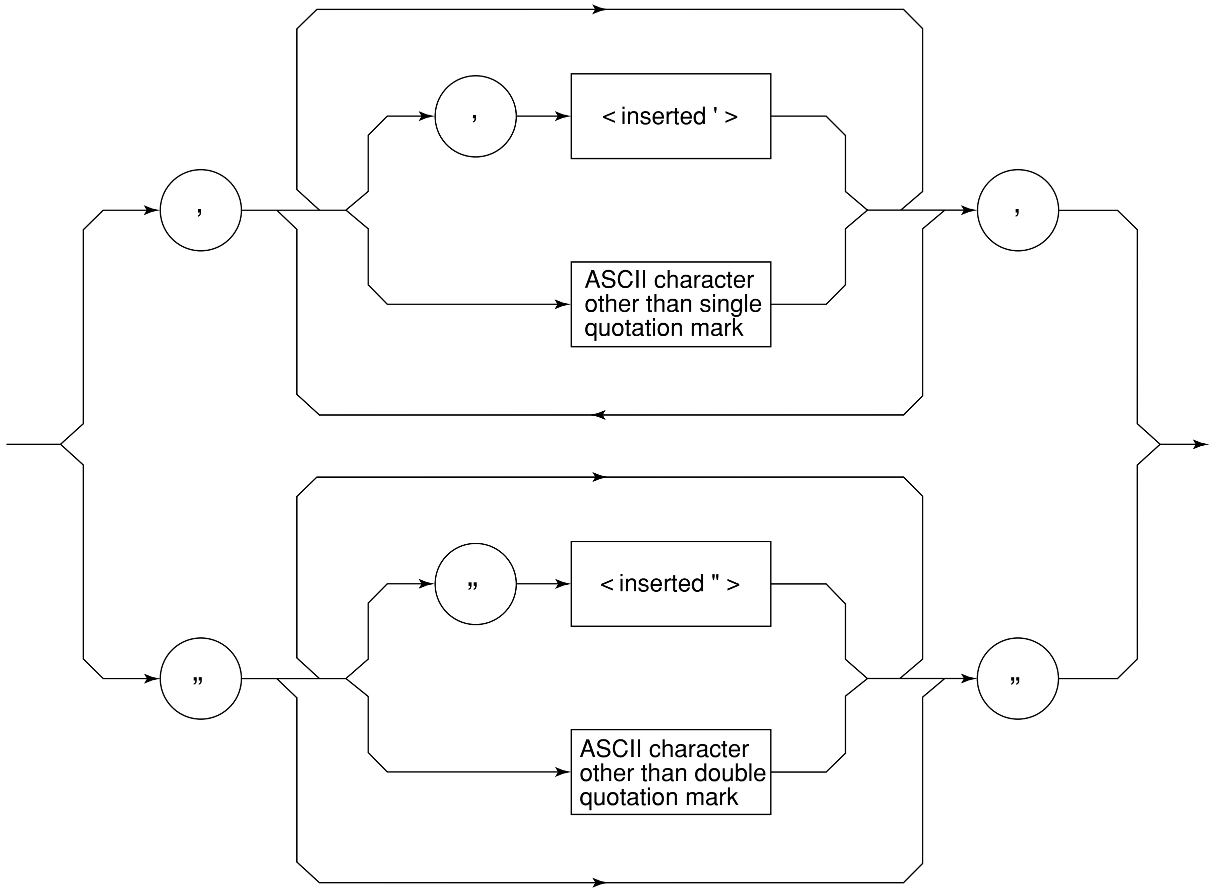
(7) SUFFIX PROGRAM DATA (unit)

The table below lists the suffixes used for MS2681A/MS2683A/MS2687A/MS2687B.

Table of Suffix Codes

Classification	Unit	Suffix code
Frequency	GHz	GHZ, GZ
	MHz	MHZ, MZ
	kHz	KHZ, KZ
	Hz	HZ
	Default	HZ
Time	second	S
	m second	MS
	μ second	US
	Default	MS
Level (dB system)	dB	DB
	dBm	DBM,DM
	dBμV	DBUV
	dBmV	DBMV
	dBμV(emf)	DBUVE
	Default	Determined in conformance with the set scale unit
Level (V system)	V	V
	mV	MV
	μV	UV
	Default	UV
Level (W system)	W	W
	mW	MW
	μW	UW
	nW	NW
	pW	PW
	fW	FW
	Default	UW

(8) STRING PROGRAM DATA



- String program data must be enclosed with single quotation marks ('...').

```
WRITE #1:"TITLE'MS268xA'"
```

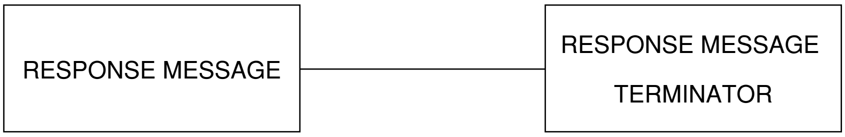
A single quotation mark used within a character string must be repeated as shown in the double quotation marks.

```
WRITE #1;"TITLE'MS268xA''NOISE MEAS'''"
```

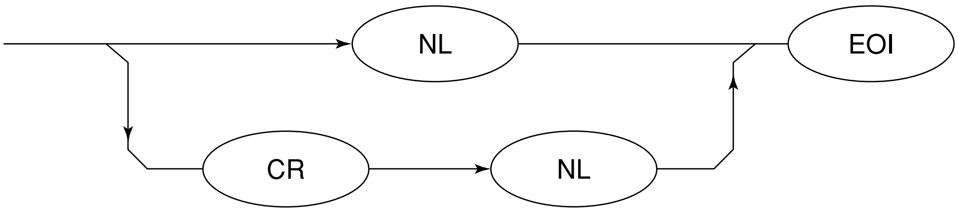
'NOISE MEAS' is set as the title.

Response message format

To transfer the response messages from this instrument to the controller using the READ statement, the response message formats are defined as follows:

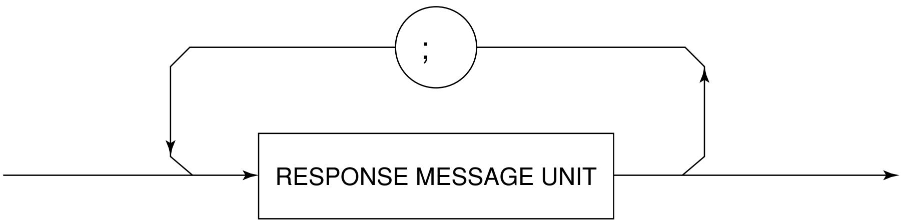


(1) RESPONSE MESSAGE TERMINATOR



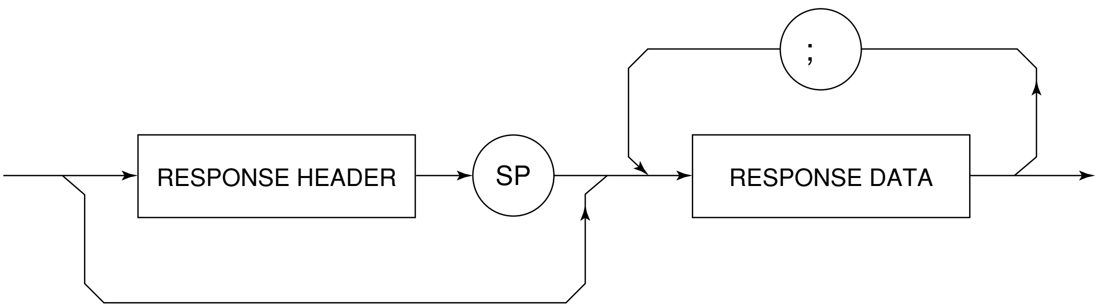
The response message terminator to be used depends on the TRM command specification.

(2) RESPONSE MESSAGE

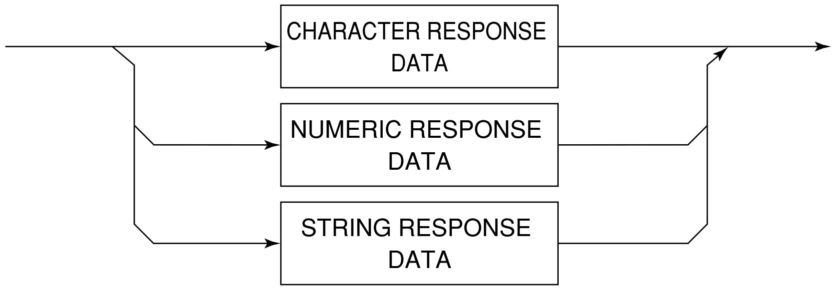


When a query is sent by the WRITE statement with one or more program queries, the response message also consists of one or more response message units.

(3) Usual RESPONSE MESSAGE UNIT



(4) RESPONSE DATA

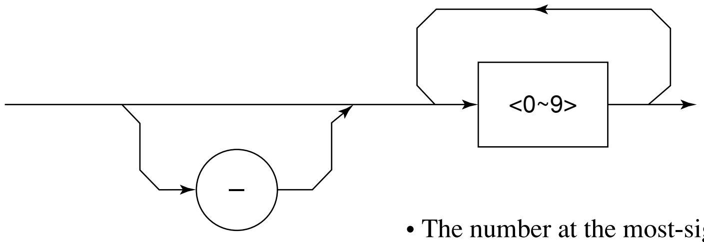


(5) CHARACTER RESPONSE DATA

Character response data is specific character string data consisting of the uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, numbers 0 to 9, and underline (_).

(6) NUMERIC RESPONSE DATA

< Integer format (NR1) >

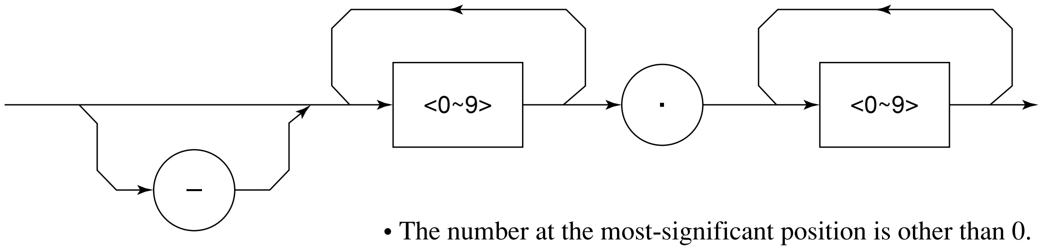


< Example >

```
123
-1234
```

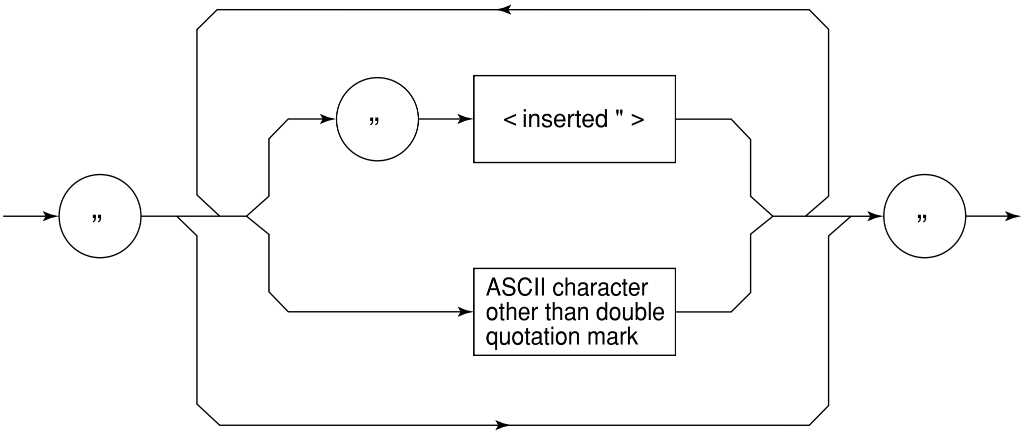
- The number at the most-significant position is other than 0.
- A + sign need not be placed before a positive number.

< Fixed-point format (NR2) >



- The number at the most-significant position is other than 0.
- A + sign need not be placed before a positive number.
- If there are zeros after the decimal point, the numeric data is transmitted in the integer format.

(7) CHARACTER RESPONSE DATA



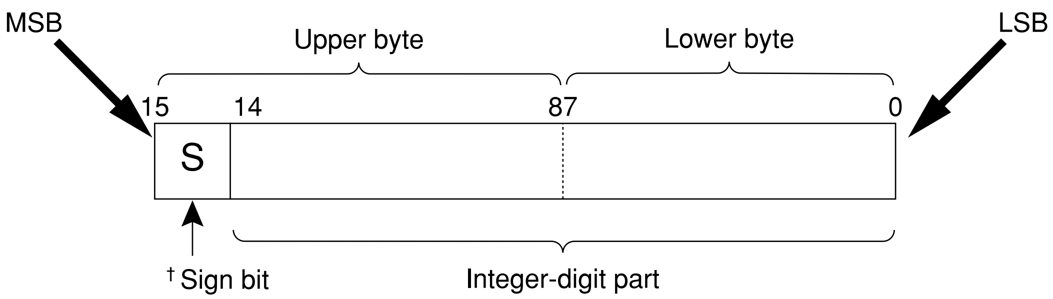
String response data is transmitted as an ASCII character enclosed with double quotation marks.

(8) Response message for input of waveform data using binary data

The waveform binary data is two-byte 65536 integer data from -32768 to 32767, as shown below; and sent in the sequence of upper byte and lower byte.

16-Bit Binary	With Sign	No Sign
1000000000000000	-32768	32768
1000000000000001	-32767	32769
1000000000000010	-32766	32770
1111111111111101	-3	65533
1111111111111110	-2	65534
1111111111111111	-1	65535
0000000000000000	0	0
0000000000000001	1	1
0000000000000010	2	2
0000000000000011	3	3
0111111111111101	32765	32765
0111111111111110	32766	32766
0111111111111111	32767	32767

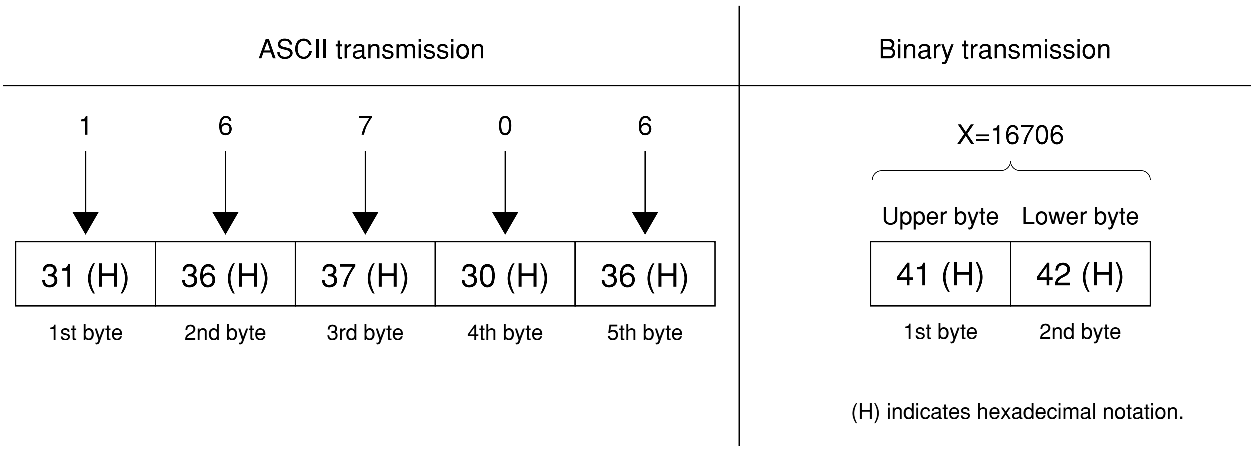
Sign bit:	Bit 15(MSB) is used.
Integer-digit part:	Bits 0 to 14 are used.
	So, 16 bits(two bytes) are used.



Internal Representation of 2-byte Bynary Data

† When a negative number is stored in a numeric variable, the sign bit 1 is set in the MSB to indicate the negative value. The value is stored in a numeric variable in a 2's complement format.

For an example, to transmit an integer of 16706, the ASCII format is compared with the Binary format, below. The ASCII format requires 5 bytes. Whereas, the Binary format requires only 2 bytes, and does not need the data format transformation. So, The Binary format is used for a high-speed transmission.



$$16706\ (D) = 4 \times 16^3 + 1 \times 16^2 + 4 \times 16^1 + 2 \times 16^0$$

Binary notation

	Upper byte								Lower byte							
bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
X=16706	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0

1st byte → 2nd byte (Transmission order)

bit	7	6	5	4	3	2	1	0	
1st byte	0	1	0	0	0	0	0	1	(Upper byte)＝ 41 (H)
2nd byte	0	1	0	0	0	0	1	0	(Lower byte)＝ 42 (H)

The waveform binary data has a number of bytes for

(Number of points to be specified) X 2 bytes + termination code.

Where, termination code is specified by the TRM command, and is LF(0D(H): 1 byte) or CR+LF(0A0D(H): 2 bytes).

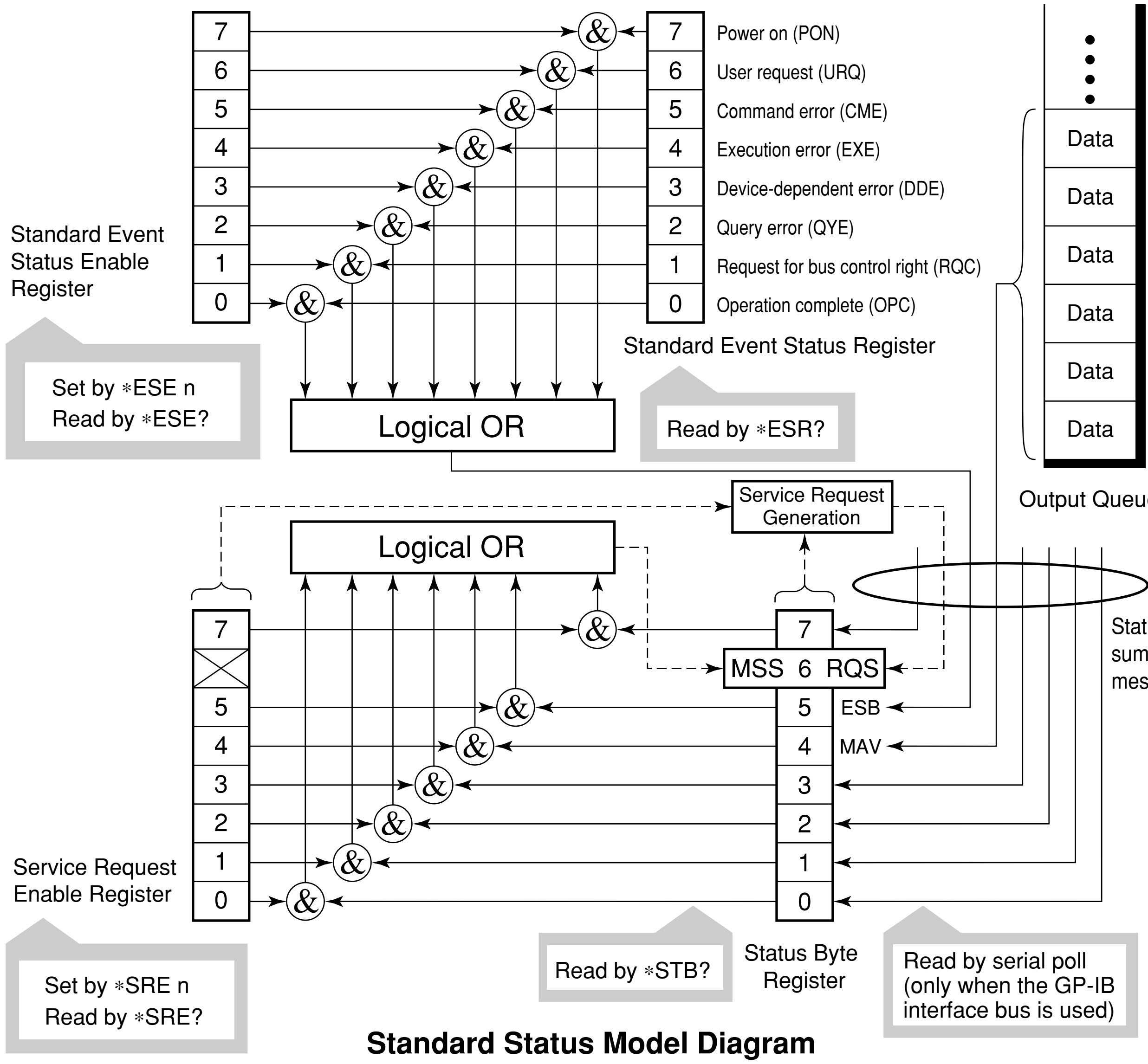
Section 4 Status Structure

This section describes the device-status reporting and its data structure defined by the IEEE488.2 when the GP-IB interface bus is used. This section also describes the synchronization techniques between a controller and device.
These functions are used to control a device from an external controller using the GP-IB interface bus. Most of these functions can also be used to control a device from an external controller using the RS-232C interface.

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

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

Register model	Queue model
The register model consists of 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 are other than 0, the corresponding bit of the status bit becomes 1. In other cases, the corresponding bit becomes 0. When the result of their Logical OR is 1, the summary message bit also becomes 1. If the Logical OR result is 0, the summary message bit also becomes 0.	The queue in the queue model is used to sequentially record the waiting status values or information. If the queue is not empty, the queue structure summary message becomes 1. If the queue is empty, the message becomes 0.

In IEEE488.2, there are three standard models for the status data structure. Two are register models and one is a queue model based on the register model and queue model described above. The three standard models are:

[1] Standard Event Status Register and Standard Event Status Enable Register
[2] Status Byte Register and Service Request Enable Register Output Queue

Standard Event Status Register	Status Byte Register	Output Queue
The Standard Event Status Register has the same structure as the previously described register model. In this register, the bits for eight 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 seven summary message bits from the status data structure can be set. This register is used together with the Service Request Enable Register. When the results of the OR operation of both register contents are other than 0, SRQ becomes ON. To indicate this, bit 6 of the Status Byte Register (DIO7) is reserved by the system as the RQS bit. The RQS bit is used to indicate that there is a service request for the external controller. The mechanism of SRQ conforms to the IEEE488.1 standard.	The Output Queue has the structure of the queue model described 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 buffer.

Status Byte (STB) Register

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

ESB and MAV summary messages

This paragraph describes the ESB and MAV summary messages.

(1) ESB summary message

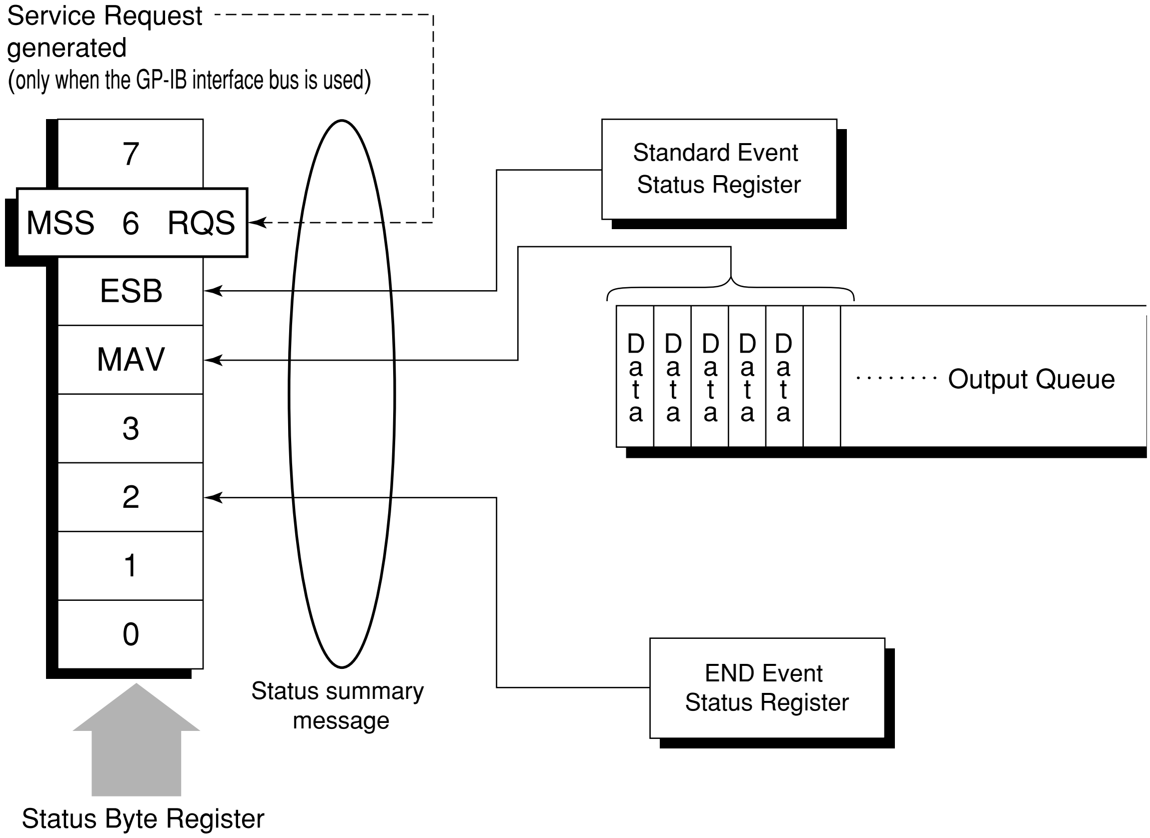
The ESB (Event Summary Bit) is a message defined by IEEE488.2 which uses bit 5 of the STB register. When the setting permits events to occur, the ESB summary message bit becomes 1 if any one of the events recorded in the Standard Status Register becomes 1. Conversely, the ESB summary message bit becomes 0 if one of the recorded events occurs, even if events are set to occur.
This bit becomes 0 when the ESR register is read by the ∗ESR? query or when it is 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 indicates whether the output queue is empty. 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. When the output queue is empty, this bit is set to 0. This message is used to synchronize the information exchange with the controller. For example, this message is available when, after the controller sends a query command to a device, the controller waits until MAV becomes 1. While the controller is waiting for a response from the device, other jobs can be processed. Reading the Output Queue without first checking MAV will cause all system bus operations to be delayed until the device responds.

Device-dependent summary messages

As shown in the diagram below, the spectrum analyzer does not use bits 0, 1, 3, and 7, and it uses bit 2 as the summary bit of the Event Status Register.



Reading and clearing the STB register

The STB register can be read using serial polling or the ∗STB? common query. The IEEE488.1 STB message can be read by either method, but the value sent to bit 6 (position) is different for each method.
The STB register contents can be cleared using the ∗CLS command.

(1) Reading by serial polling (only when the GP-IB interface bus is used)

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 the 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. Therefore, except for 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 Message)

MSS indicates that there is at least one cause for a service request. The MSS message is represented at bit 6 response to an ∗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.

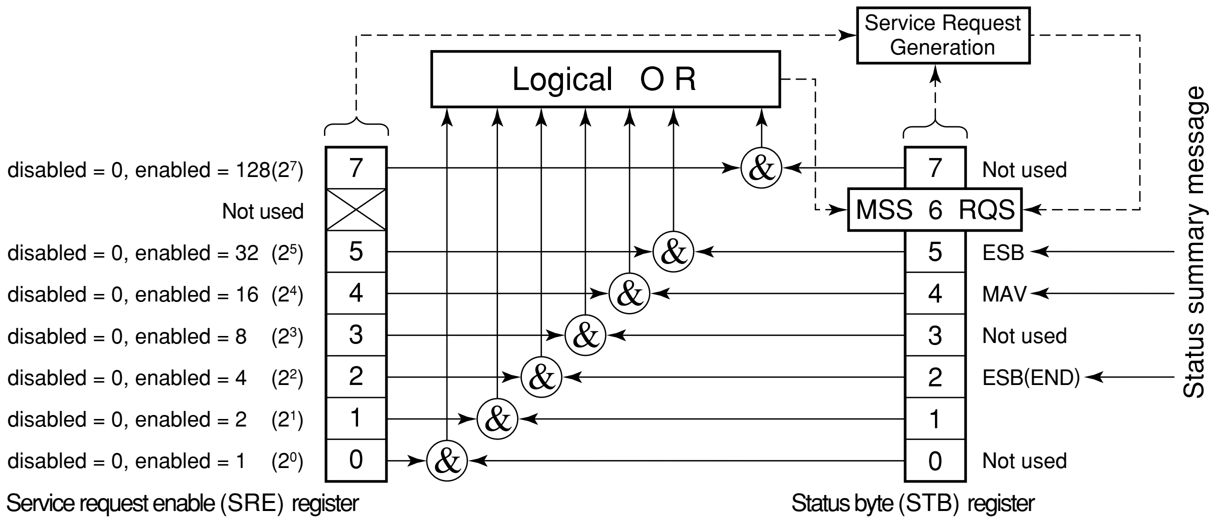
(4) Clearing the STB register using the ∗CLS common command

The ∗CLS common command clears all status data structures as well as the summary messages corresponding to them.
The ∗CLS command does not affect the settings in the Enable Register.

Service Request (SRQ) Enabling Operation

Bits 0 to 7 of the Service Request Enable Register (SRE) determine which bit of the corresponding STB register can generate SRQ.

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



(1) Reading the SRE register

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

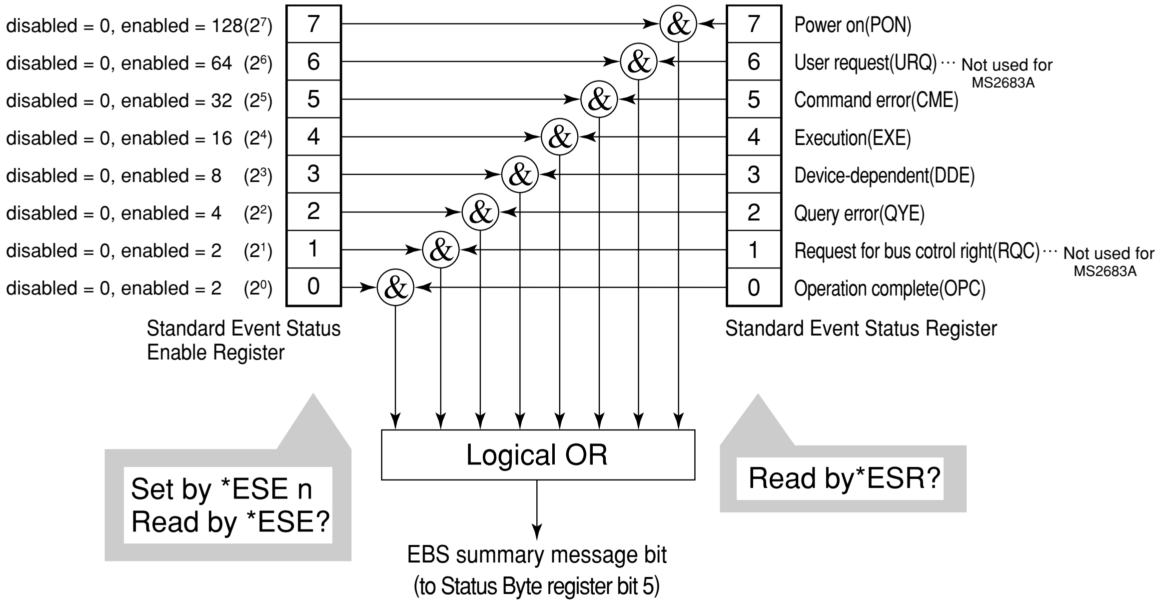
(2) Updating the SRE register

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

Standard Event Status Register

Bit definition of Standard Event Status Register

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



The Standard Event Status Enable (ESE) 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 unexecutable program message was received.
3	Device-dependent error (DDE-Device-dependent Error)	An error not caused by CME, EXE, or QYE occurred (parameter error, etc.).
2	Query error (QYE-Query Error)	An attempt was made to read data in the Output Queue when it was empty. Or, the data in the Output Queue was lost before it was read.
1	Not used	
0	Operation complete (OPC-Operation Complete)	This bit becomes 1 when this instrument has processed the *OPC command.

Reading, writing, and clearing the Standard Event Status Register

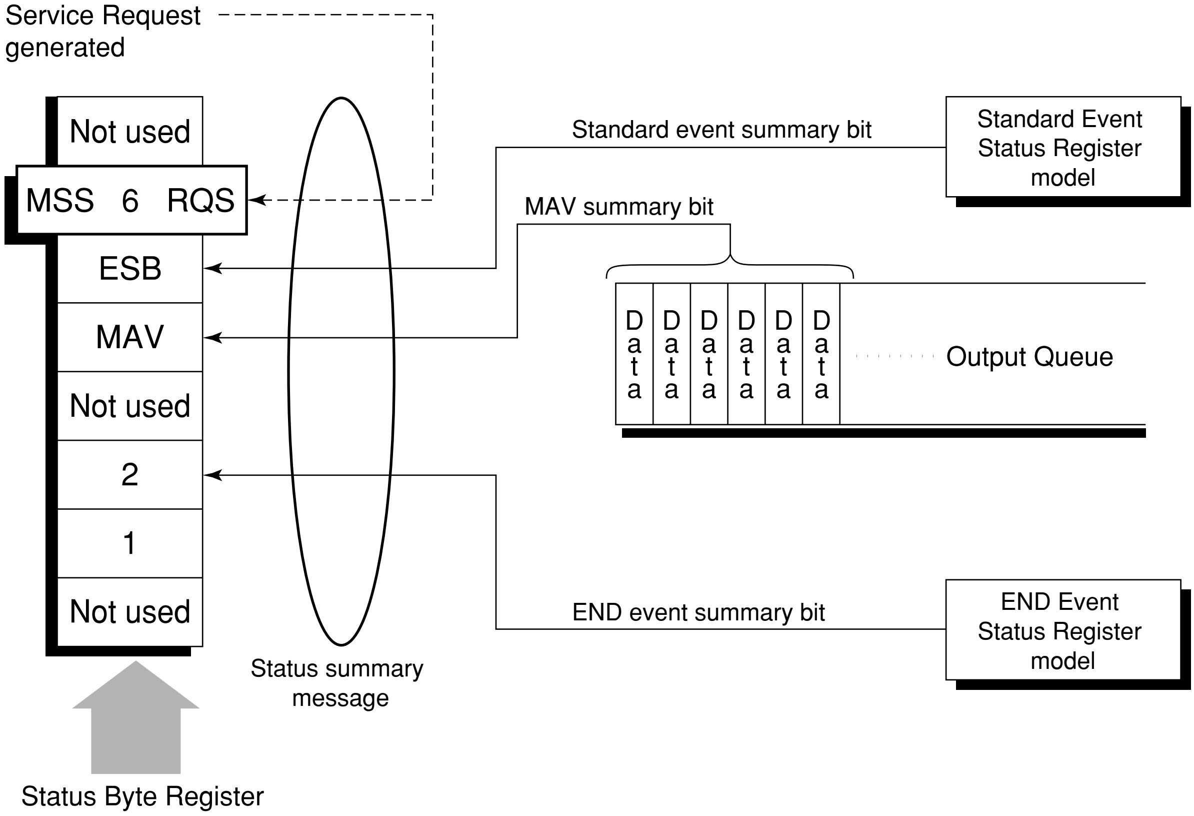
Reading	The register is read using the ∗ESR? command query. The register is cleared after being read. The response message is integer-format data with the binary weight added to the event bit and the sum converted to decimal.
Writing	With the exception of clearing, data cannot be written to the register from outside.
Clearing	The register is cleared when: [1] A ∗CLS command is received [2] 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

Reading, writing, and clearing the Standard Event Status Enable Register

Reading	The registers is read using the ∗ESE? command. The response message is integer-format data with the binary weight added to the event bit and the sum converted to decimal.
Writing	The register is written using the ∗ESE common command.
Clearing	The register is cleared when: [1] An ∗EXE command with a data value of 0 is received [2] The power is turned on The Standard Event Enable Register is not affected when: [1] The device clear function status of IEEE488.1 is changed [2] An ∗RST common command is received [3] A ∗CLS common command is received

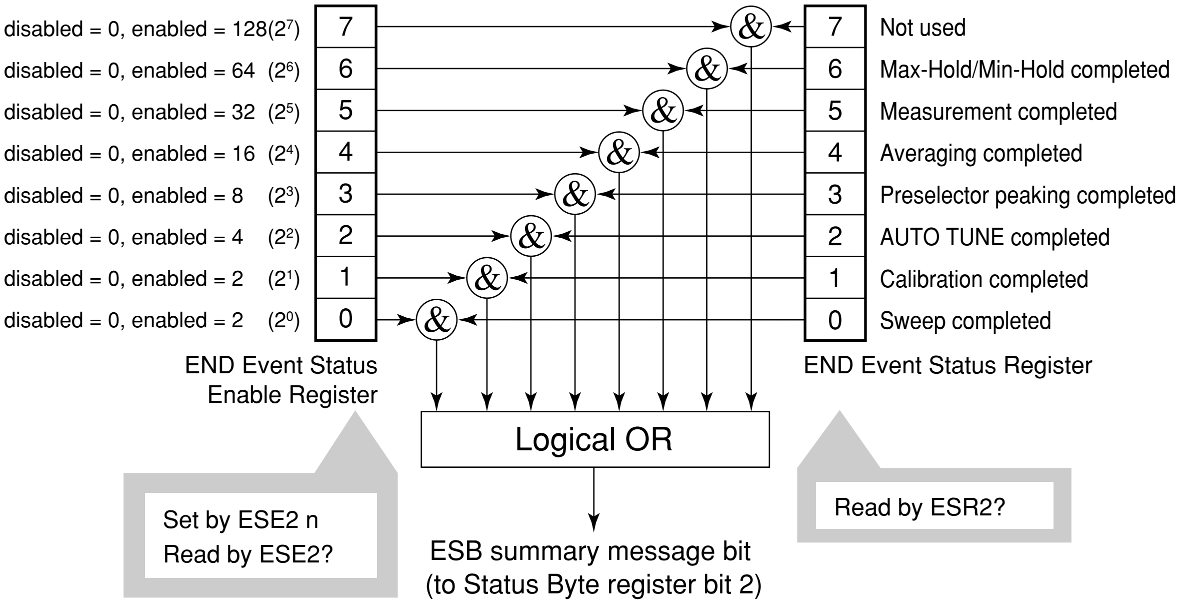
Extended Event Status Register

For MS2681A/MS2683A/MS2687A, bits 7, 3, 1, and 0 are unused. Bit 2 is assigned to the END summary bit as the status-summary bit supplied by the extended register model as shown below.



Bit definition of END Event Status Register

The diagram below shows the operation and event-bit names of the END Event Status Register.



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

Bit	Event name	Description
7	Not used	Not used
6	Max Hold/Min Hold	Sweeping according to the specified HOLD number has been completed.
5	Measurement completed	Calculation processing for measurements (frequency count, noise, etc.) has been completed.
4	Averaging completed	Sweeping according to the specified AVERAGE number has been completed.
3	Preselector peaking completed	Preselector peaking has been completed
2	AUTO TUNE completed	AUTO TUNE has been completed.
1	Calibration completed	ALL CAL, LEVEL CAL, or FREQ CAL has been completed.
0	Sweep completed	A single sweep has been completed or is in standby.

Reading, writing, and clearing the Extended Event Status Register

Reading	The ESR? common query is used to read the register. The register is cleared after being read. The response message is integer-format data with the binary weight added to the event bit and the sum converted to decimal.
Writing	With the exception of clearing, data cannot be written to the register from outside.
Clearing	The register is cleared when: [1] A ∗CLS command is received [2] The power is turned on [3] An event is read for the ESR2? query command

Reading, writing, and clearing the Extended Status Enable Register

Reading	The ESE2? query is used to read the register. The response message is integer-format data with the binary weight added to the event bit and the sum converted to decimals.
Writing	The ESE2 program command is used to write the register. Because bits 0 to 7 of the registers are weighted with values 1, 2, 4, 8, 16, 32, 64, and 128, respectively, the write data is transmitted as integer-format data that is the sum of the requiredbit digits selected from the weighted value.
Clearing	The register is cleared when: [1] An ESE2 program command with a data value of 0 is received [2] The power is turned on The Extended Event Status Enable register is not affected when: [1] The device clear function status of IEEE488.1 is changed [2] An ∗RST common command is received [3] A ∗CLS common command is received

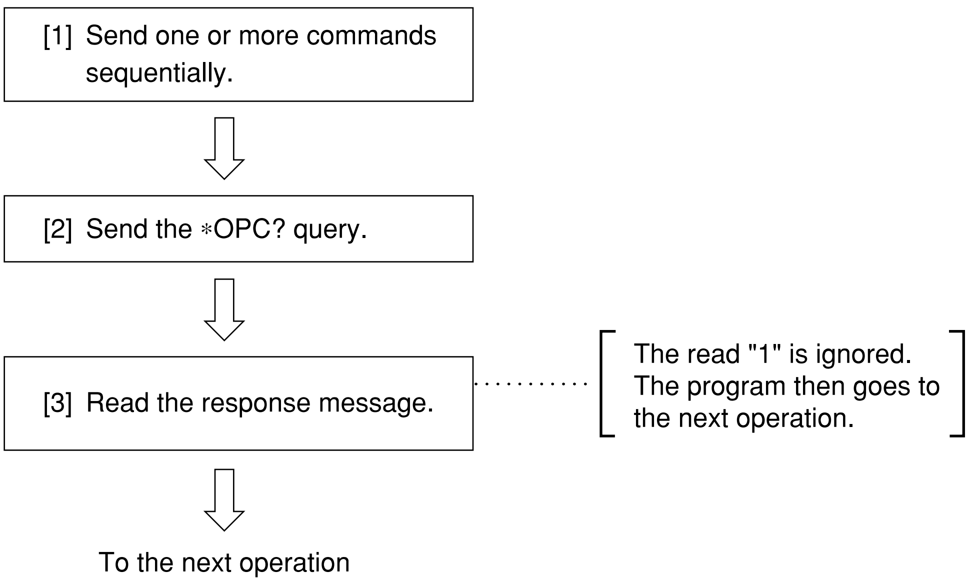
Techniques for Synchronizing MS2681A/MS2683A/MS2687A/MS2687B with a Controller

MS2681A/MS2683A/MS2687A/MS2687B usually treats program messages as sequential commands that do not process newly-received commands until they complete the processing of the previous command. Therefore, no special consideration is necessary for pair-synchronization between MS2681A/MS2683A/MS2687A/MS2687B and the controller.
If the controller controls and synchronizes with one or more devices, after all the commands specified for MS2681A/MS2683A/MS2687A/MS2687B have been processed, the next commands must be sent to other devices.
There are two ways of synchronizing MS2681A/MS2683A/MS2687A/MS2687B with the controller:
[1] Wait for a response after the *OPC? query is sent.
[2] Wait for SRQ after *OPC is sent.

Wait for a response after the *OPC? query is sent.

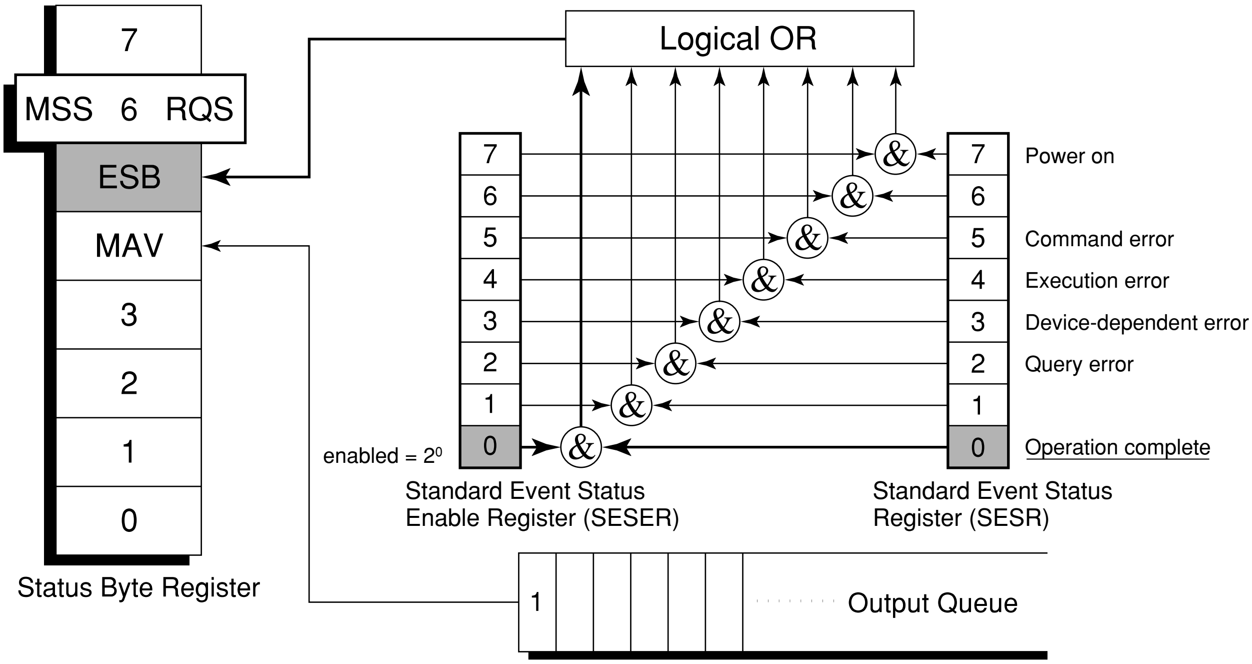
MS2681A/MS2683A/MS2687A/MS2687B outputs "1" as the response message when executing the *OPC? query command. The controller is synchronized with MS2681A/MS2683A/MS2687A/MS2687B by waiting for the response message to be entered.

< Controller program >



Wait for a service request after *OPC is sent (only when the GP-IB interface bus is used).

The MS2681A/MS2683A/MS2687A/MS2687B sets the operation-complete bit (bit 0) to 1 when executing the *OPC command. The controller is synchronized with the spectrum analyzer for SRQ when the operation-complete bit is set for SRQ.



■ < Controller program >

[1] Enable the 2^0 bit of the Standard Event Status Enable Register. `PRINT @1;"*ESE 1"`

⇩

[2] Enable the 2^5 bit of the Service Request Enable Register. `PRINT @1;"*SRE 32"`

⇩

[3] Make the device execute the specified operation.

⇩

[4] Send the *OPC command. `PRINT @1;"*OPC"`

⇩

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

Section 5 Initial Settings

MS2681A/MS2683A/MS2687A/MS2687B initializes the GP-IB interface system at three levels in accordance with the IEEE488.2 specifications. This section describes how these three levels of initialization are processed, and how to instruct initialization from the controller.

In the IEEE488.2 standard, there are three levels of initialization. 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.	Level 1 can be combined with other levels, but must be executed before level 2.
2	Initialization for message exchange	Message exchanges of all devices and specified devices on the GP-IB are initialized using the SDC and DCL GP-IB bus commands, respectively. These commands also nullify the function that reports operation completion to the controller.	Level 2 can be combined with other levels, but must be executed before level 3.
3	Device initialization	The *RST or INI/IP command returns a specified device to a known device-specific state, regardless of the conditions under which it was being used.	Level 3 can be combined with other levels, but must be executed after levels 1 and 2.

When using the standard RS-232C interface port or Option 09 Ethernet interface port to control MS2681A/ MS2683A/MS2687A/MS2687B from the controller, the level-3 device initialization function of can be used, and the level-2 initialization function cannot be used. When using the GP-IB interface bus to control MS2681A/ MS2683A/MS2687A/MS2687B from the controller, the initialization functions of levels 1, 2, and 3 can be used.

The following paragraph describes the commands for initialization at levels 1, 2, and 3 and the items that are initialized. This paragraph also describes the known state which is set when the power is turned on.

Bus Initialization using the IFC Statement

■ Example

```
board% = 0
CALL SendIFC (board%)
```

■ Explanation

This function is available when using the GP-IB interface bus to control the spectrum analyzer from the controller. The IFC statement initializes the interface functions of all devices connected to the GP-IB bus line.

The initialization of interface functions involves clearing the interface function states of devices set by the controller, and resetting them to their initial states. In the table below, indicates the functions which are initialized, and 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, LED on/off, etc.).

Initialization for Message Exchange by DCL and SDC Bus Commands

■ Example

Initializes all devices on the bus for message exchange (sending DCL).

```
board% = 0
addresslist% = NOADDR
CALL DevClearList(board%, addresslist%)
```

Initializes only the device at address 3 for message exchange (sending SDC).

```
board% = 0
address% = 3
CALL DevClear(board%, address%)
```

■ Explanation

This function is available when the GP-IB interface is used to control the spectrum analyzer from the controller. This statement executes initialization for message exchange of all devices or a specified device on the GP-IB having the specified select code.

■ Items to be initialized for message exchange

When the spectrum analyzer accepts the DCL or SDC bus command, it does the following:

[1] Input buffer and Output Queue:	Clears them and also clears the MAV bit.
[2] Parser, Execution Controller, and Response Formatter:	Resets them.
[3] Device commands including ∗RST:	Clears all commands that prevent these commands from being executed.
[4] Processing of 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 of 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 message exchange in the idle state. The device continues to wait for a message from the controller.

CAUTION

The following are not affected even if the DCL and SDC commands are processed:

[1] Current data set or stored in the device
[2] Front panel settings
[3] Status of status byte other than MAV bit
[4] A device operation in progress

Device Initialization using the ∗RST Command

■ Syntax

```
*RST
```

■ Example

For RS-232C or Ethernet

`WRITE #1,"*RST"` .... Initializes the spectrum analyzer at address 1 at level 3.

For GPIB

```
SPA%=1
CALL Send(0,SPA,"*RST",NLend)
```

■ Explanation

The ∗RST (Reset) command is an IEEE488.2 common command that resets a device at level 3.
The ∗RST (Reset) command is used to reset a device (spectrum analyzer) to a specific initial state. For details of the items that are initialized and the settings after initialization, see Appendix A.

Note:

The ∗RST command does not affect the following:

[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 control of external device, etc.

☞For details of the settings of the spectrum analyzer after initialization, see Appendix A.

Device Initialization using the INI/IP Command

■ Syntax

```
INI
IP
```

■ Example (program message)

For RS-232C or Ethernet

`WRITE #1,"INI"` .... Initializes the device (spectrum analyzer) at address 1 at level 3.

For GPIB

```
SPA%=1
CALL Send(0,SPA%,"INI",NLend)
```

■ Explanation

The INI and IP commands are the spectrum analyzer device-dependent messages that initialize a device at level 3.

For details of the items that are initialized by the INI and IP commands, and the settings after initialization, see Appendix A.

Device Status at Power-on

When the power is turned on:

[1] The device is set to the status it was in at power-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 OCIS (Operation Complete Command Idle State).

[5] The device is put into 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.

As the special case of [1], when the spectrum analyzer is powered on for the first time after delivery, the spectrum analyzer settings are those listed in the Initial Settings Table(☞Appendix A).

Section 6 Sample Programs

This section gives some examples of the Microsoft Quick Basic program that controls the spectrum analyzer from a personal computer which is used as a controller.
Note: Microsoft Quick Basic is a registered trade mark of the Microsoft Corporation.

Precautions on Creating the Remote Control Program

Note the following points when writing remote control programs.

No.	Precaution	Description
1	Be sure to initialize each device.	each device. 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.
2	Do not send any command (related to the device) other than the INPUT #statement immediately after sending a query.	No.2 described above is one type of exception processing of the protocol. Avoid exception processing from occurring as requested. Avoid stoppage of execution caused by an error by providing a program with exception-processing section against exceptions that can be foreseen.
3	Create a program that avoids the exception processing of the protocol.	There may be a number of the state in which each device is not proper to be actually sued 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 initialization (INIT or *RST) of the functions proper to
4	Protect RS-232C or Ethernet buffer overflow.	The RS-232C or Ethernet interface has a 512-byte data area as the internal receive buffer. The buffer overflow may occur depending on the processing. To protect the overflow, don't send a large amount of data (i.e. control commands) at a time for remote control using RS-232C or Ethernet. After sendind a command group, send *OPC? command to check the response for the synchronization before sending the next command.

Sample Programs

Initializing

<Example 1> Initializes the Spectrum Analyzer

```
'++++++++++++++++++++++++++++++++++++++
' Spectrum Analyzer Sample program
'  <<Initialize>>
'++++++++++++++++++++++++++++++++++++++
'
' Setup parameter of PC Com. port
'   BAUD       :24ØØ BPS
'   Parity     : NONE
'   Data bit   : 8 bits
'   Stop bit   : 1 bit
'   Terminator : LineFeed
'
OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
'
PRINT #1, "INI"'   Initialize the Spectrum Analizer
'
END
```

The parameters initialized by the above program are shown in Appendix A.

There is a '*RST' command in another command for executing initialization. The '*RST' command is used to execute initialization over a wider range. For the range of initialization level, refer to Section 5. The usage of the 'IP' command is identical to the 'INI' command.

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

Reading the frequency and level at marker point

<Example 2> Sets the center frequency to 500 MHz and span to 10 MHz, then displays the frequency and level reading at the peak point on the controller screen when a signal to be measured is received.

```
 1 '+++++++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Read out marker frequency & level>>
 4 '+++++++++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:2400,N,8,1,CD500,DS0,LF" FOR RANDOM AS #1
 9 '
10 PRINT #1, "INI"'          Initialize Spectrum Analizer
11 '
12 PRINT #1, "CF 500MHZ"'    Center fequency :500MHz
13 PRINT #1, "SP 10MHZ"'     Span frequency  :10MHz
14 PRINT #1, "TS"'           Take a sweep
15 '
16 PRINT #1, "PCF"'          Set peak to center frequency
17 PRINT #1, "PRL"'          Set peak to reference level
18 PRINT #1, "MKPK"'         Search peak
19 '
20 PRINT #1, "MKF?"'         Query marker frequency
21 INPUT #1, FREQ'           Input marker frequency data
22 PRINT #1, "MKL?"'         Query marker level
23 INPUT #1, LEVEL'          Input marker level data
24 '
25 '                         Print out the result(Frequency/Level)
26 PRINT USING "Marker  Frequency=####.### MHz";FREQ/1000000
27 PRINT USING "Marker  LEVEL=####.##  dBm";LEVEL
28 '
29 END
```

The center frequency and frequency span are set at line 12 and line 13 respectively. The TS sweep command at line 14 does not execute the next message unless the sweep is completed. This command thus prevents the peak search and other program lines from being executed before the sweep is completed.

The PCF and PRL commands at lines 16 and 17 operate as follows: The former sets the peak point on the screen to the center frequency, and the latter sets its peak level center frequency to the reference level.

The "MKF?" and "MKL?" at lines 20 and 22 query the frequency and level at the marker point respectively, and the data is read with the INPUT#statement on the next line. When a command other than the INPUT#statement is sent before the response to a query is read, the output buffer is cleared, and the response message is deleted. For this reason, write the INPUT#statement immediately after a query.

Program execution result of <Example 2>

Marker Frequency=501.251△MHz

Marker LEVEL=–15.53dBm

Note:

△is a space.

Reading trace data

<Example 3-1> Reads the trace level at all points when CF and SPAN are set to 500 MHz and 10 MHz respectively.

```
 1 '++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Read out trace data(ASCII)>>
 4 '++++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
 9 '
1Ø PRINT #1, "INI"'     Initialize Spectrum Analizer
11 '
12 PRINT #1, "CF 5ØØMHZ"'    Center fequency :5ØØMHz
13 PRINT #1, "SP 1ØMHZ"'     Span frequency  :1ØMHz
14 PRINT #1, "TS"'           Take a sweep
15 '
16 DIM TRACE(5Ø1)'           Define read data area
17 PRINT #1, "BIN Ø"'        Set read out data type to ASCII
18 '
19 FOR I = Ø TO 5ØØ'         Repeat trace(Ø) to trace(5ØØ):5Ø1 points
2Ø PRINT #1, "XMA? " + STR$(I) + ",1"'   Query trace data
21 INPUT #1, TRACE(I)'       Read out trace data
22 '                         Print out trace data
23 PRINT USING "###.##dBm"; TRACE(I) / 1ØØ
24 NEXT I
25 '
26 END
```

The "BIN_0" at line 17 is a command for specifying ASCII as the response data format. The ASCII or BINARY transfer format can be specified for the "XMA?", "XMB?", "XMG?", and "XMT?" queries for reading trace data.

The example 3-2 blocks the trace data at every 10 points, and reads it.

<Example 3-2> Blocks the trace data at every 10 points, and reads it.

```
 1 '++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Read out trace data(ASCII) BLOCKING>>
 4 '++++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
 9 '
1Ø PRINT #1, "INI"'     Initialize Spectrum Analizer
11 '
12 PRINT #1, "CF 5ØØMHZ"'    Center fequency :5ØØMHz
13 PRINT #1, "SP 1ØMHZ"'     Span frequency  :1ØMHz
14 PRINT #1, "TS"'           Take a sweep
15 '
16 DIM TRACE(5Ø1)'           Define read data area
17 PRINT #1, "BIN Ø"'        Set read out data type to ASCII
18 '
19 FOR I = Ø TO 49Ø STEP 1Ø
2Ø                           Repeat trace(Ø) to trace(499):5ØØ points
21                           Blocking 1Ø trace data
22     PRINT #1, "XMA? " + STR$(I) + ",1Ø"'   Query trace data
23                                            Read out trace data
24      INPUT #1, TRACE(I), TRACE(I + 1), TRACE(I + 2), TRACE(I + 3),
TRACE(I + 4), TRACE(I + 5), TRACE(I + 6), TRACE(I + 7), TRACE(I + 8),
TRACE(I + 9)
25     PRINT TRACE(I), TRACE(I + 1), TRACE(I + 2), TRACE(I + 3), TRACE(I
+ 4), TRACE(I + 5), TRACE(I + 6), TRACE(I + 7), TRACE(I + 8),TRACE(I + 9)
26 NEXT I
27 PRINT #1, "XMA? 5ØØ,1"'  Query last trace data:trace(5ØØ)"
28 INPUT #1, TRACE(5ØØ)
29'
3Ø FOR I = Ø TO 5ØØ'         Print out trace data
31     PRINT USING "###.##dBm"; TRACE(I) / 1ØØ
32 NEXT I
33 '
34 END
```

Delta marker

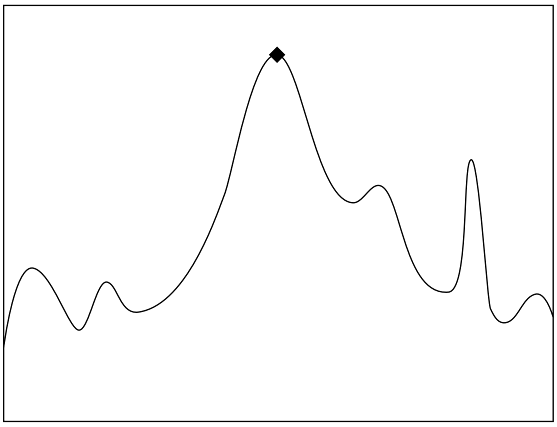
<Example 4> Using a delta marker, reads out the frequency and level differences between a peak point and the next peak point.

```
 1 '++++++++++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Read out delta marker frequency & level>>
 4 '++++++++++++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:2400,N,8,1,CD500,DS0,LF" FOR RANDOM AS #1
 9 '
10 PRINT #1, "INI"'          Initialize Spectrum Analizer
11 '
12 PRINT #1, "FA 50MHZ"'     Start fequency :500MHz"
13 PRINT #1, "FB 2GHZ"'      Stop frequency   :2GHz
14 PRINT #1, "TS"'           Take a sweep
15 '
16 PRINT #1, "MKR 0"'        Set marker to "Normal"
17 PRINT #1, "MKPK"'         search peak
18 PRINT #1, "MKR 1"'        Set marker to "Delta"
19 PRINT #1, "MKPK NH"'      search Next peak
20 '
21 PRINT #1, "MKF?"'         Query Delta marker frequency
22 INPUT #1, DFREQ'          Input Delta marker frequency data
23 PRINT #1, "MKL?"'         Query Delta marker level
24 INPUT #1, DLEVEL'         Input Delta marker level data
25 '                         Print out the result(Frequency/Level)
26 PRINT USING "Delta Frequency=####.### MHz"; DFREQ / 1000000
27 PRINT USING "Delta     level=####.##  dB"; DLEVEL
28 '
29 END
```

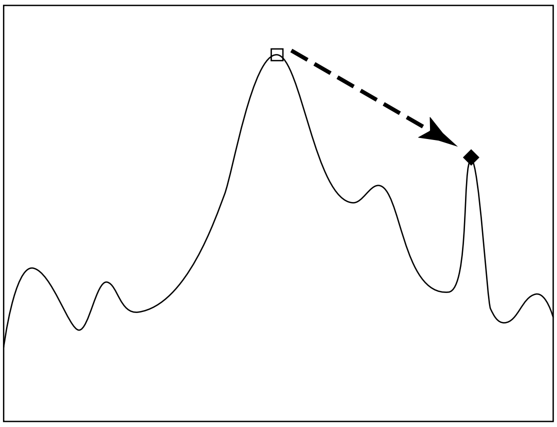
The "MKR_1" at line 18 is used to set the marker mode to DELTA, so that the reference marker can also be set together to the current marker position.

The "MKPK_NH" at line 19 sets the marker search to NEXT PEAK to move the current marker to NEXT PEAK point.

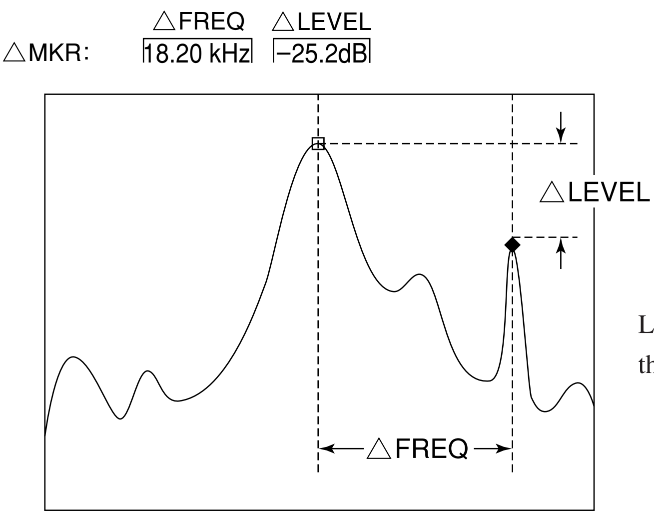
The "MKF?" and "MKL?" at lines 21 and 23 query reading the frequency and level at the current marker position while the marker mode is NORMAL. It is also used to query reading the frequency and level differences between the current marker and the reference marker while the marker mode is DELTA.



Executing PEAK SEARCH (MKPK) at line 17 allows the current marker to be set to the peak point.



Line 19 allows the reference marker to be set together to the current marker position. Executing NEXT PEAK SEARCH MKPK_NH at line 18 allows the current marker



Lines 21 to 24 read out the FREQ and LEVEL displayed in the upper left of screen.

Multimarker function

<Example 5-1> Using the multimarker function, measures the frequency/level at 10 points in descending order.

```
 1 '++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Multi Marker Highest-1Ø>>
 4 '++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
 9 '
10 PRINT #1, "INI"'          Initialize Spectrum Analizer
11 '
12 PRINT #1, "CF 5ØØMHZ"'    Center fequency 5ØØMHz
13 PRINT #1, "SP 2ØKHZ"'     Span frequency  2ØKHz
14 PRINT #1, "TS"'           Take a sweep
15 '
16 PRINT #1, "MKMHI"'        Multi marker On &
17 '                         Perform Highest-1Ø function
18 '
19 FOR I = 1 TO 1Ø
20 PRINT #1, "MKMP? " + STR$(I)
21 INPUT #1, FREQ'           Input marker frequency data
22 PRINT #1, "MKML? " + STR$(I)
23 INPUT #1, LEVEL'          Input marker frequency data
24 '
25  PRINT USING "Marker No. ## #,###.####MHz ####.##dBm"; I; FREQ / 1ØØØØØØ;
LEVEL
26 NEXT I
27 '
28 END
```

The Spectrum Analyzer multimarker function allows up to ten markers to be set at a time. The "MKMHI" at line 130 is used to set the multimarker to HIGHEST 10 mode which sets up to ten markers in descending order.

The frequency and level at each marker are read out by lines 19 to 26.

This program allows harmonics to be observed if the program is modified. <Example 5-2> shows the program for observing the harmonics from a fundamental to the fifth order.

<Example 5-2> Harmonic frequency measurement (measures 500 MHz fundamental and up to its fifth order harmonics)

```
 1 '+++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Multi Marker Harmonics>>
 4 '+++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
 9 '
1Ø PRINT #1, "INI"'          Initialize Spectrum Analizer
11 '
12 PRINT #1, "FA ØHZ"'       Start fequency :ØHz
13 PRINT #1, "FB 3GHZ"'      Stop frequency :3GHz
14 PRINT #1, "MKZF 5ØØMHZ"'  Marker center  :5ØØMHz
15 PRINT #1, "TS"'           Take a sweep
16 '
17 PRINT #1, "MKMHRM"'       Multi marker On & Perform harmonics function
18 '
19 FOR I = 1 TO 5
20 PRINT #1, "MKMP? " + STR$(I)
21 INPUT #1, FREQ'           Input marker frequency data
22 PRINT #1, "MKML? " + STR$(I)
23 INPUT #1, LEVEL'          Input marker frequency data
24 '
25 PRINT USING "Marker No. ## #,###.####MHz ####.##dBm"; I; FREQ / 1ØØØØØØ;
LEVEL
26 NEXT I
27 '
28 END
```

This program allows the frequency to be set using the START-STOP at lines 12 and 13. The "MKZF_500MHZ" at line 14 moves the zone marker center to 500 MHz so that marker can capture a fundamental. (In the initial state, the zone is positioned in the center of the screen. The "MKMHRM" at line 17 sets the multimarker to HARMONICS mode (harmonic frequency measurement).

Respective frequencies and levels at five markers can be read out by setting the number of loops to 5 in the FOR...NEXT statement from line 19 to line 26. The other parts of this program are the same as <Example 5-1>.

Gate functions

<Example 6> Reads out spectrum data by observing the burst wave using the gate function.

```
 1 '+++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Gate sweep>>
 4 '+++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
1Ø '
11 PRINT #1, "INI"'          Initialize Spectrum Analizer
12 '
13 DIM TRACE(5Ø1)'                 Define read data area
14 PRINT #1, "CF 5ØØMHZ"'          Center fequency :5ØØMHz
15 PRINT #1, "SP 1ØMHZ"'           Span frequency  :1ØMHz
16 PRINT #1, "RB 1ØØKHZ"'          Resolution BW   :1ØØkHz
17 PRINT #1, "TRGSOURCE WIDEVID"'  Trigger source  :Wide IF video
18 PRINT #1, "GD 5ØUS"'            Gate delay      :5Ø usec
19 PRINT #1, "GL 4ØØUS"'           Gate length     :4ØØ usec
2Ø PRINT #1, "GE INT"'             Gate            :Internal timer
21 PRINT #1, "GATE ON"'            Gate sweep On
22 '
23 FOR TMR = Ø TO 25ØØØ
24 NEXT TMR'                       Wait
25 '
26 FOR I = Ø TO 5ØØ'               Read out & print trace data
27     PRINT #1, "XMA? " + STR$(I) + ",1"
28     INPUT #1, TRACE(I)
29     PRINT USING "###.##dBm"; TRACE(I) / 1ØØ
3Ø NEXT I
31 '
32 END
```

When the burst waveform shown in Fig. 6-1 is observed, the spectrum shown in Fig. 6-2 (a) is output. This function can conveniently be used to observe the spectrum of the ON interval (interval shown by A in Fig.6-1) in this waveform. This program uses the wide IF video trigger signal as a gate source signal.

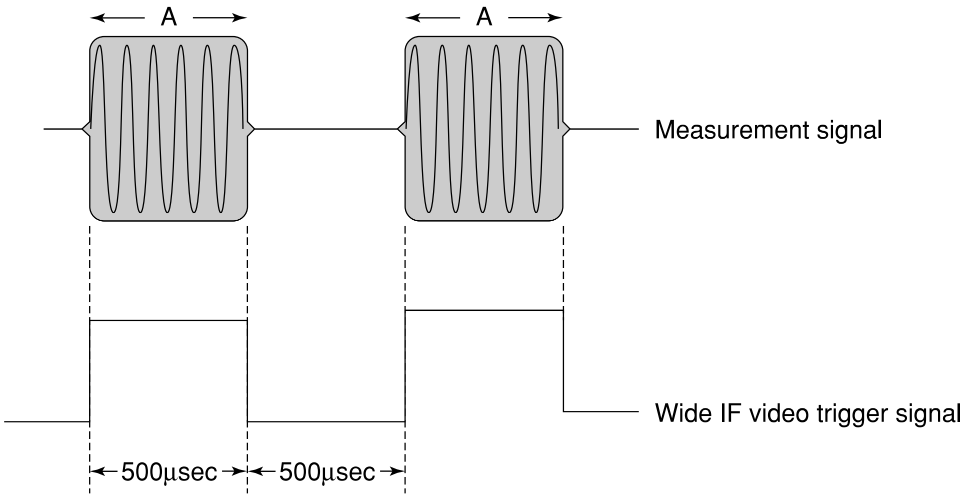


Fig. 6-1 Burst Waveform

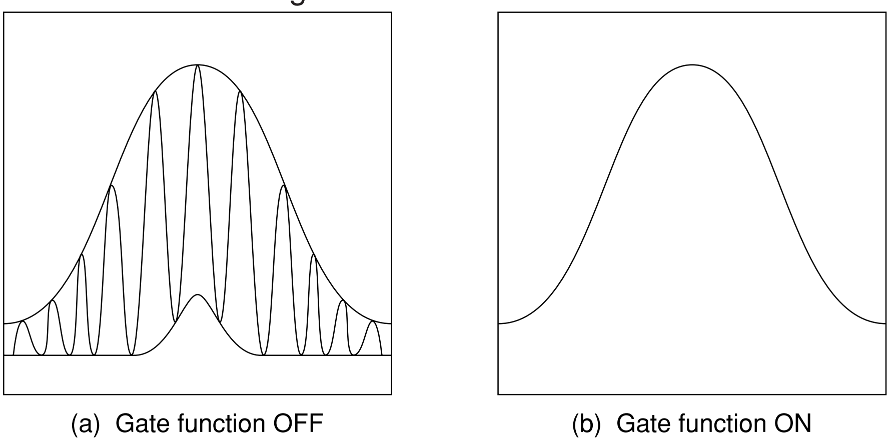


Fig. 6-2 Burst Wave Spectrum

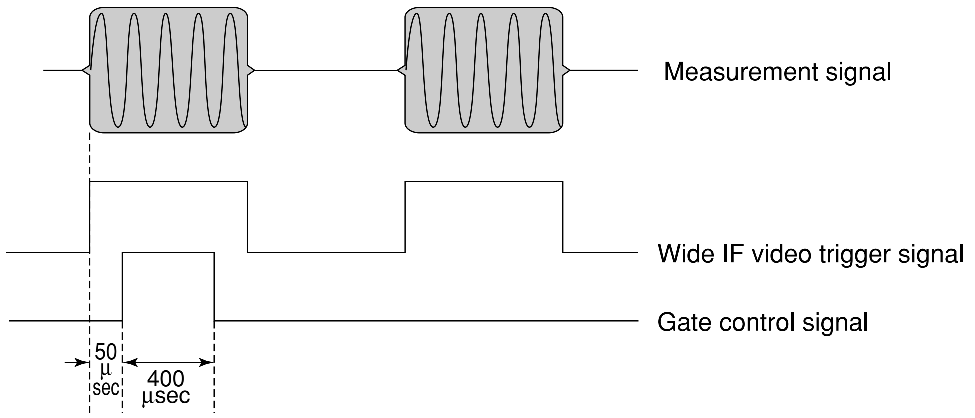


Fig. 6-3 Sample Program for Gate-Control Signal Generation Timing

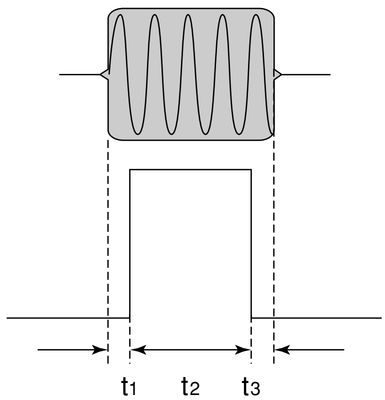
The RBW command at line 16 sets RBW to the optimum value depending on the GATE conditions (GATE DELAY: t1, GATE LENGTH: t2) as shown in Table 6-1 below.

The block from line 17 sets the trigger signal, and the block from lines 18 to 20 sets the gate conditions. The gate function is set to ON at line 21. The waiting time is granted at lines 23 and 24 because it takes time to form a perfect waveform which is fully connected.

The block from lines 26 to 30 allows trace data to be output by the "XMA?" query. The spectrum can be observed as shown in Fig. 6-2(b) by executing this program.

Table 6-1 RBW Optimum Values

RBW	t_1	t_2	t_3
1 kHz	≥3 msec		
3 kHz	≥1 ms		
10 kHz	≥230 µsec		
30 kHz	≥200 µsec	≥20 µsec	≥1 µsec
100 kHz	≥20 µsec		
300kHz	≥15 µsec		
1 MHz 3 MHz	≥10 µsec		



Saving and recalling data

<Example 7> Saves and recalls data to and from memory card.

■ Saving data

```
'++++++++++++++++++++++++++++++++++++++++++++++++++++
' Spectrum Analyzer Sample program
'  <<Save parameter & trace data to Memory Card>>
'++++++++++++++++++++++++++++++++++++++++++++++++++++
'
' Setup parameter of PC Com. port
'
OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
'
GOSUB SAVMEMCARD'           Call Save subroutine
'
END
'
'[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[
 ' SAVE TO MemoryCard SUBROUTINE
 ']]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]
SAVMEMCARD:
 '
INPUT "INPUT TITLE"; TTL$'  Enter save file comment(Title)
PRINT #1, "TITLE '" + TTL$ + "'"
'
INPUT "FILE No."; FILE'     Enter save file No.
PRINT #1, "SVM" + STR$(FILE)' Perform save procces
RETURN
```

■ Recalling data

```
'+++++++++++++++++++++++++++++++++++++++++++++++++++++++++
' Spectrum Analyzer Sample program
'  <<Recall parameter &/or trace data from memory card>>
'+++++++++++++++++++++++++++++++++++++++++++++++++++++++++
'
' Setup parameter of PC Com. port
'
OPEN "COM1:24Ø Ø ,N,8,1,CD5Ø Ø ,DSØ ,LF" FOR RANDOM AS #1
'
GOSUB RCLMEMCARD'                        Call recall subroutine
END
'
'[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[
' Recall from memory card SUBROUTINE
']]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]
```

```
16 RCLMEMCARD:
17 '
18 '                                          Enter recall data type
19 INPUT "SELECT RECALL DATA  1=TRACE&PARAM  2=PARAM"; RCD
2Ø IF RCD = 2 THEN RCDATA$ = "P" ELSE RCDATA$ = "TP"
21 PRINT #1, "RDATA " + RCDATA$'             Set recall data type
22 '
23 INPUT "FILE No."; FILE'                   Enter recall file No.
24 PRINT #1, "RCM" + STR$(FILE)'             Perform recall procces
25 RETURN
```

These two programs are used as subroutines called from other programs. Each subroutine can be called by placing GOSUB SAVMEMCARD or GOSUB RCLMEMCARD at the line number where the program data is to be saved or restored.

<Example>

```
          .
          .

2ØØ PRINT #1,"SWP"
21Ø GOSUB SAVMEMCARD
          .
          .
          .
```

The block from lines 19 and 20 of SAVMEMCARD sets the title. When the saved data is displayed if the title has been set, this title is also displayed. This can conveniently be used to find data.

FILE No. is input at line 22 and data is saved to the FILE No. at line 23.

Line 19 of RCLMEMCARD selects the data to be recalled for trace data including parameters or parameters only. Line 21 declares the item to be recalled, and the specified file is recalled at lines 23 and 24.

Adjacent-channel leakage power measurement

<Example 8> Subroutine for adjacent-channel leakage power measurement

```
 1 '+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Adj ch Power measure>>
 4 '+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:2400,N,8,1,CD500,DS0,LF" FOR RANDOM AS #1
 9 '
10 PRINT #1, "INI"'            Initialize Spectrum Analizer
11 '
12 PRINT #1, "CF 500MHZ"'      Center fequency :500 MHz
13 PRINT #1, "SP 80KHZ"'       Span frequency  :80 kHz
14 '
15 GOSUB ADJ'                  Call Adj. CH. Power measure subroutine
16 END
17 '
18 '[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[
19 ' Adj ch Power MEASURE SUBROUTINE
20 ']]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]
21 ADJ:
22 '
23 PRINT #1, "ADJCH BOTH"
24 PRINT #1, "ADJCHBW 8.5KHZ"
25 PRINT #1, "ADJCHSP 12.5KHZ"
26 PRINT #1, "ADJCHSPF 25KHZ"
27 PRINT #1, "MADJMOD MOD"
28 '
29 PRINT #1, "TS"
30 PRINT #1, "MEAS ADJ,EXE"
31 '
32 PRINT #1, "RES?"'           Query the result
33 INPUT #1, LWLVL1, UPLVL1, LWLVL2, UPLVL2' Read out the result data
34 '                           response-1:Lower channel power (near)
35 '                           response-2:Upper channel power (near)
36 '                           response-3:Lower channel power (Far)
37 '                           response-4:Upper channel power (Far)
38 '
39 PRINT USING "Lower side CH1 Level=####.###dBm"; LWLVL1
40 PRINT USING "Upper side CH1 Level=####.###dBm"; UPLVL1
41 PRINT USING "Lower side CH2 Level=####.###dBm"; LWLVL2
42 PRINT USING "Upper side CH3 Level=####.###dBm"; UPLVL2
43 '
44 RETURN
```

This ADJ program is a subroutine, which requires the center frequency and frequency span to be set to appropriate values in the main program. Then it is executed.

The block from lines 23 to 26 sets adjacent-channel measurement conditions, which is both the upper and lower channels, the 8.5 kHz channel width, 12.5 kHz channel 1 separation , and 25.0 kHz channel 2 separation. After the sweep is executed by the "TS" command at line 29, the adjacent-channel leakage power is measured at line 30. Line 32 queries reading the measured value at line 33.

The program in <Example 8> for measuring a modulated wave relative to the total power can be changed to a program for measurement relative to the reference level by rewriting line 27 as shown below:

```
PRINT #1, "MADJMOD UNMD"
```

In this case, perform the following operations before activating this subroutine.

Put the input signal in the unmodulated state and execute PEAK -> CF and PEAK -> REF. Then return to the modulated state.

Occupied frequency bandwidth measurement

<Example 9> Subroutine for occupied frequency bandwidth measurement using N% of POWER method

```
 1 '++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Occ BW measure>>
 4 '++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
 9 '
1Ø PRINT #1, "INI"'          Initialize Spectrum Analizer
11 '
12 PRINT #1, "CF 5ØØMHZ"'   Center fequency :5ØØMHz
13 PRINT #1, "SP 5ØKHZ"'    Span frequency  :5ØkHz
14 '
15 GOSUB OBW'               Call Occ BW measure subroutine
16 END
17 '
18 '[[[[[[[[[[[[[[[[[[[[[[[[[
19' OBW MEASURE SUBROUTINE
2Ø ']]]]]]]]]]]]]]]]]]]]]]]]]
21 OBW:
22 '
23 PRINT #1, "MOBW N"'      OccBW measure method : n% method
24 PRINT #1, "OBWN 99"'     n%                   : 99%
25 PRINT #1, "DET SMP"'     Detection mode       : Sample
26 PRINT #1, "VAVG 16"'     Average sweep count  : 16
27 PRINT #1, "VAVG ON"'     Average sweep On
28 '
29 PRINT #1, "TSAVG"'       Take average sweep
1Ø '
31 PRINT #1, "MEAS OBW,EXE"'Perform OccBW measure
32 '
33 PRINT #1, "RES?"'        Query the result
34 INPUT #1, OBWFREQ, CNTRFRQ'   Read out the result data
35 '                         response-1:Occ BW frequency
37 '                        response-2:Signal center frequency
38 '
39 PRINT USING "CENTER FREQ=####.###MHz"; CNTRFRQ / 1ØØØØØØ!
4Ø PRINT USING "##%BW  FREQ=####.###kHz"; NPC; OBWFREQ / 1ØØØ
41 '
42 RETURN
```

Line 24 sets the N% value to set n = 99% in <Example 9> by sending the OBWN command for setting the occupied frequency bandwidth at line 23 and 24. Line 25 sets the detection mode to SAMPLE. Line 26 set the averaging count and line 27 averaging to ON respectively.

Line 29 issues the "TSAVG command to repeat the sweep by the required number of times for averaging processing. Line 31 measures the occupied frequency bandwidth of the averaging-processed waveform. Line 33 queries reading the occupied frequency bandwidth and the center frequency of the frequency bandwidth at line 34.

To make a measurement using X dB DOWN, rewrite lines 23 and 24 as shown below:

```
            .
            .
PRINT @SPA;"OBWXDB 25"
PRINT @SPA;"MOBW XDB"
            .
            .
```

Setting template data

<Example 10> Subroutine for template data

```
 1 '++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Makeup template>>
 4 '++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:2400,N,8,1,CD500,DS0,LF" FOR RANDOM AS #1
 9 '
10 GOSUB MAKETM'   Call makeup template subroutine
11 END
12 '
13 '[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[
14 ' makeup template SUBROUTINE
15 ']]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]
16 MAKETM:
17 '
18 PRINT #1, "MTEMP 1"' Select template No. 1 for making template
19 PRINT #1, "MTEMPREL ABS"' Set template level to "Absolute"
20 PRINT #1, "MTEMPINI UP1"' Initialize Limit line-1 upper data
21 PRINT #1, "MTEMPINI LW1"' Initialize Limit line-1 lower data
22 '
23 PRINT #1, "MTEMPL UP1"'   Select Limit line-1 upper for write limit data
24 RESTORE LMTUP1
25 '== Limit line-1 upper data ==
26 LMTUP1:
27 DATA 8: '  Limit line-1 upper data count
28 DATA "-50US","-65.2DBM":
29 DATA "-24US","-65.2DBM":
30 DATA "-24US","18.8DBM":
31 DATA "6.643MS","18.8DBM":
32 DATA "6.643MS","-45.2DBM":
33 DATA "6.714MS","-45.2DBM":
34 DATA "6.714MS","-65.2DBM":
35 DATA "6.950MS","-65.2DBM":
36 '
37 READ N
38 FOR I = 1 TO N
39 ' Read each limit data & write to limit line area
40   READ TM$, LEV$
41   PRINT #1, "MTEMPIN" + STR$(I) + "," + TM$ + "," + LEV$
42 NEXT I
43 '
44 PRINT #1, "MTEMPL LW1"'   Select Limit line-1 lower for write limit data
45 RESTORE LMTLW1
46 '== Limit line-1 lower data ==
47 LMTLW1:
48 DATA 4: '  Limit line-1 Lower data count
49 DATA "95US","-200DBM":
50 DATA "95US","0.8DBM":
```

```
52 DATA "6.524MS","Ø.8DBM":
53 DATA "6.524MS","-2ØØDBM":
54 '
55 READ N
56 FOR I = 1 TO N
57 ' Read each limit data & write to limit line area
58   READ TM$, LEV$
59   PRINT #1, "MTEMPIN" + STR$(I) + "," + TM$ + "," + LEV$
6Ø NEXT I
61 '
62 RETURN
63
64
```

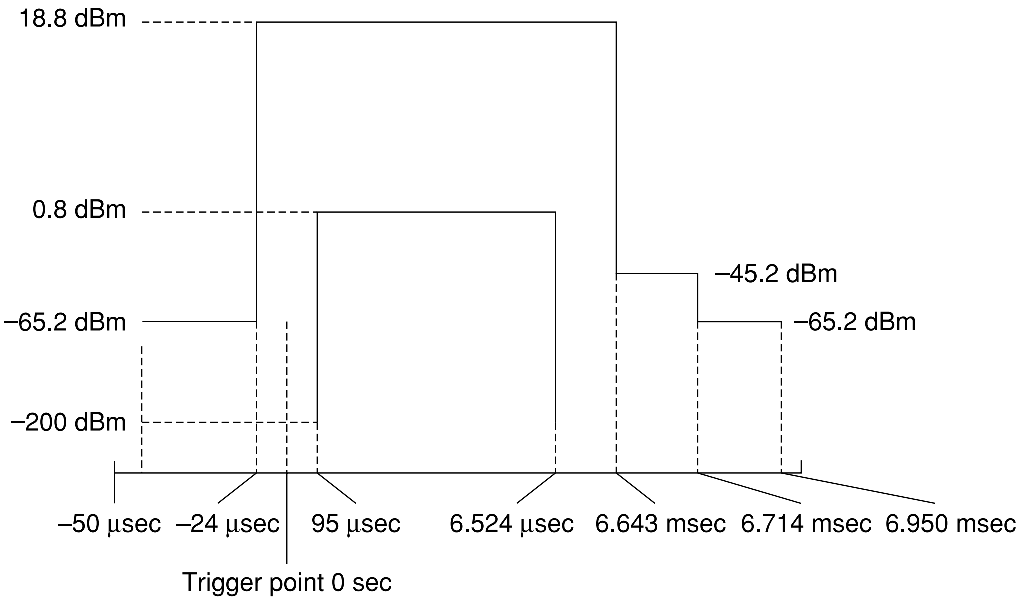


Fig. 6-4 Setting Data

The block from line 18 selects the template No. to be set. The block from line 19 specifies the template data as an absolute value. The block from lines 20 and 21 initializes the current data settings. The block from lines 23 and 37 to 42 sets LIMIT LINE 1 UPPER. Line 23 sets the data to be set in LIMIT LINE1 UPPER. Line 24 specifies the line where setting data is written.

Line 37 reads the number of data points to set the number of loops to N in the FOR ...NEXT statement at lines 38 to 42. Various data settings are read in the FOR...NEXT block.

The block from lines 44 and 54 to 59 sets LIMIT LINE 1 LOWER like the block from lines 23 and 37 to 42.

The block from lines 26 to 35 and 47 to 52 contains the DATA statements for setting the data included in these lines as template data. Lines 26 and 47 are label lines for the RESTORE statement.

Each data item in lines 27 and 48 is numeric, and shows the number of data points. In the DATA statements following the DATA statement with this numeric data, the string expressions are listed as string data with units in order of time and level.

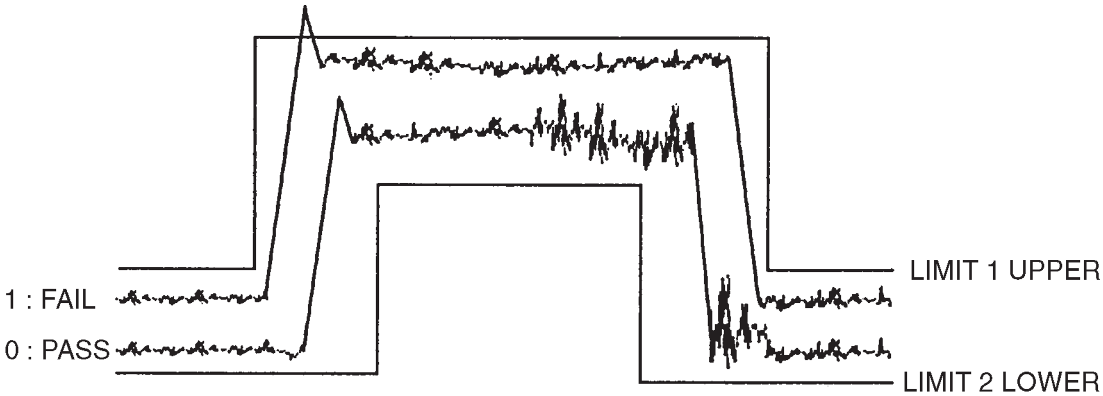
Measuring template

<Example 11> Subroutine for template measurement

```
 1 '++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Check template limit>>
 4 '++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
 9 '
1Ø PRINT #1, "INI"'          Initialize Spectrum Analizer
11 '
12 PRINT #1, "CF 5ØØMHZ"'    Center fequency :5ØØMHz
13 PRINT #1, "DFMT TIME"'    Display         :Trace-Time(Zero span mode)
14 PRINT #1, "TRGSOURCE WIDEVID"'Trigger source  :Wide IF video
15 PRINT #1, "TRGS TRGD"'    Trigger sweep On
16 PRINT #1, "TDY -6ØUS"'    Delay time      :-6Ø usec
17 PRINT #1, "TSP 12MS"'     Time span       :12 msec
18 PRINT #1, "TS"'           Take a sweep
19 '
2Ø GOSUB MEASTMP'            Call template measure subroutine
21 '
22 END
23 '
24 '[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[
25 ' Template measure SUBROUTINE
26 ']]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]
27 MEASTMP:
28 '
29 PRINT #1, "TEMP 1"'       Select template 1
3Ø PRINT #1, "TEMPSLCT UP1,ON"'  Limit line-1 upper On
31 PRINT #1, "TEMPSLCT LW1,ON"'  Limit line-1 lower On
32 '
33 PRINT #1, "MEAS TEMP,CHECK"'  Perform template limit check
34 '
35 PRINT #1, "RES?"'         Query the result
36 INPUT #1, CHK1$, CHK2$'   Read out the result
37 '
39 PRINT "LIMIT LINE 1"
4Ø IF CHK1$ = "Ø" THEN
5Ø     PRINT "  CHECK PASS!"
6Ø ELSE
7Ø     PRINT "  CHECK FAIL!"
8Ø END IF
9Ø '
91 RETURN
```

This subroutine checks whether or not a burst signal waveform satisfies the specification using the set template data.

Line 29 specifies the template No. used for a go/no-go decision. Line 30 and 31 specify LIMIT 1 UPPER and LIMIT 1 LOWER as limit lines respectively. Line 33 executes template measurement, line 35 requests data, and line 36 receives data.



When part of a waveform is beyond LIMIT LINE, a response of "1" is generated to indicate FAIL. When the waveform is not beyond LMIT LINE, a response of "0" is generated to indicate PASS.

Burst wave average power measurement

<Example 12> Subroutine for burst wave average power measurement Fig.

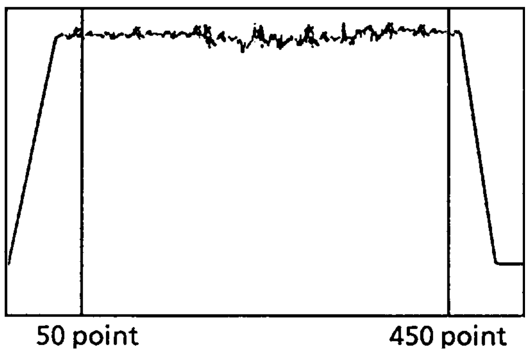
```
 1 '++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer Sample program
 3 '  <<Burst power measure>>
 4 '++++++++++++++++++++++++++++++++++++++
 5 '
 6 ' Setup parameter of PC Com. port
 7 '
 8 OPEN "COM1:24ØØ,N,8,1,CD5ØØ,DSØ,LF" FOR RANDOM AS #1
 9 '
10 PRINT #1, "INI"'          Initialize Spectrum Analizer
11 '
12 PRINT #1, "CF 5ØØMHZ"'           Center fequency :5ØØMHz
13 PRINT #1, "DFMT TIME"'           Display         :Trace-Time(Zero span
mode)
14 PRINT #1, "TRGSOURCE WIDEVID"'   Trigger source  :Wide IF video
15 PRINT #1, "TRGS TRGD"'           Trigger sweep On
16 PRINT #1, "TDY -6ØUS"'           Delay time      :-6Ø usec
17 PRINT #1, "TSP 12MS"'                     Time span       :12 msec
18 PRINT #1, "TS"'                  Take a sweep
19 '
20 GOSUB MEASPWR'                   Call burst power measure subroutine
21 '
22 END
23 '
24 '[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[
25 ' Burst power measure SUBROUTINE
26 ']]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]
27 MEASPWR:
28 '
29 PRINT #1, "PWRSTART 5Ø"'         Power measure start point :5Ø point(1
div)
30 PRINT #1, "PWRSTOP 45Ø"'         Power measure stop point  :45Ø point(9
div)
31 '
32 PRINT #1, "MEAS POWER,EXE"'       Perform power measure
33 '
34 PRINT #1, "RES?"'                Query the result
35 INPUT #1, PWRDB, PWRW'           Read out the result
36 '
37 PRINT USING "####.##dBm ####.##mW"; PWRDB; PWRW / 1E+Ø9
38 RETURN
```

This program is a subroutine that measures the burst wave average power.

Lines 29 and 30 set the measurement start and stop points on the screen display.

The average power is measured at line 32.

Data can be obtained as a value with dBm units or pW UNITS.



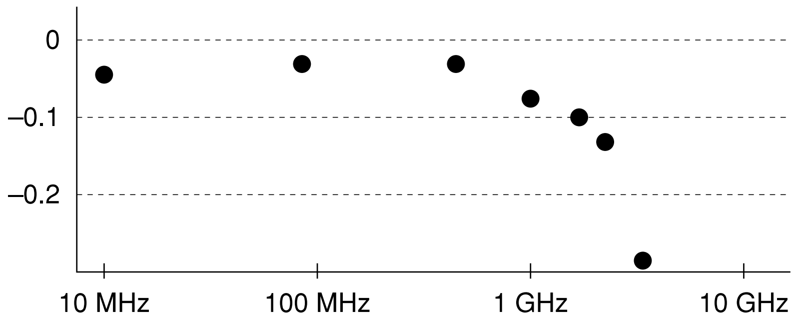
When a waveform is displayed on the screen as shown in the left diagram (TIME domain), the average power between 50 point and 450 point is measured

Before calling the subroutine, lines 12 to 18 set the center frequency, time delay, etc. to execute the sweep.

Frequency characteristic correction data setting

<Example 13>

```
'++++++++++++++++++++++++++++++++++++++++
' Spectrum Analyzer Sample program
'  <<Makeup correction factor table>>
'++++++++++++++++++++++++++++++++++++++++
'
' Setup parameter of PC Com. port
'
OPEN "COM1:2400,N,8,1,CD500,DS0,LF" FOR RANDOM AS #1
'
GOSUB MAKECORR'            Call makeup correction factor table subroutine
END
'
'[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[
' makeup correction factor table SUBROUTINE
']]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]
MAKECORR:
'
PRINT #1, "CORR 1"'       Select template No. 1 for making template
PRINT #1, "CORC"'         Initialize Limit line-1 upper data
'
RESTORE CORRDATA
'== correction factor data ==
CORRDATA:
DATA 7: '                 correction factor data count
DATA "10MHZ","-0.04DB":
DATA "100MHZ","-0.03DB":
DATA "500MHZ","-0.03DB":
DATA "1GHZ","-0.08DB":
DATA "1.5GHZ","-0.10DB":
DATA "2GHZ","-0.13DB":
DATA "3GHZ","-0.29DB":
'
READ N
FOR I = 0 TO N - 1
'                         Read each correction factor data
'                         & write to limit line area
READ FR$, LEV$
PRINT "CORD " + STR$(I) + "," + FR$ + "," + LEV$
PRINT #1, "CORD " + STR$(I) + "," + FR$ + "," + LEV$
 NEXT I
'
RETURN
```



The line 18 selects the correction No. to be set.

The line 19 initializes the correction data being set currently.

The line 21 specifies the line on which data to be set is written.

The lines 25 to 31 specifies the correction data to be set together with the frequency and level data.

The lines 33 to 40 is the frequency characteristic correction data setting section.

The line 33 reads the number of data items to be set. The block from lines 34 to 40 writes the correction data in the loop of the FOR --- NEXT statement. Note that the data No. starts from 0.

When this subroutine MAKECORR executed, the set correction data is written. The frequency correction processing is validated from the subsequent sweep after setting.

Precautions on Creating the GPIB Program

Note the following points when writing remote control programs using GPIB Interface.

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 (Send IFC) [2] Initializing message exchange functions of each device (DevClear) [3] Initializing the functions proper to each device (INI or *RTS)
2	Do not send any command (related to the device) other than the Receive statement immediately after sending a query.	If MLA is received when a command other than the Receive 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 Receive statement in immediate succession to a query.
3	Create a program that avoids the 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.
4	Confirm the interface function 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.

Initializing (GPIB)

<Example 14> Initializes the Device (Spectrum Analyzer).

```
 1 '+++++++++++++++++++++++++++++++++++++++
 2 ' Spectrum Analyzer GPIB control sample program
 3 '  <<Initialize GPIB bus & Device>>
 4 '+++++++++++++++++++++++++++++++++++++++
 5 REM $INCLUDE: 'C:¥YAT-GPIB¥QBASIC¥QBEDECL.BAS'
 6 DECLARE SUB gpiberr (msg&)
 7 '
 8 SPA% = 1'  Set SPA GPIB adress
 9 CALL SendIFC(Ø)'     Send GPIB bus interface clear
1Ø CALL DevClear(Ø, SPA%)'   Send DeviceClear to Spectrum Analyzer
11 CALL Send(Ø, SPA%, "IP", NLend)'   Send Initialize comand "IP"
12 END
13 '
```

Line 9: Interface-clears GPIB bus.

Line 10: Specifies Device address, and sends device-clear.

Line 11: Sends "IP" command to for initialization.

There is a ‘∗RST’ command in another GPIB command for executing initialization. The ‘∗RST’ command is used to execute initialization over a winder range. For the range of initialization level, see SECTION 5. The usage of the ‘IP’ command is identical to the ‘INI’ command.

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

Reading trace data (GPIB)

<Example 15> Performs the same operation as Example 3-1, using GPIB.

```
' +++++++++++++++++++++++++++++++++++++++++
' Spectrum Analyzer GPIB control sample program i
' <<Read out Trace data>>
' +++++++++++++++++++++++++++++++++++++++++
REM $INCLUDE: 'C : ¥AT-GPIB¥QBASIC¥QBDECL.BAS'
DECLARE SUB gpiberr (msg$)
'
SPA% = 1'                              Set SPA GPIB address
'
'        Initialize GPIB bus & Device
CALL SendIFC(0)
CALL DevClear(0, SPA%)
CALL Send(0, SPA%, "IP", NLend)
'
'
CALL Send(0, SPA% "CF 500MHZ", NLend)'  Center frequnecy :500MHz
CALL Send(0, SPA%, "SP 10MHZ", NLend)'  Span frequnecy :10MHz
CALL Send(0, SPA%, "TS", NLend)         Take a sweep
'
DIM TRACE(501)'                         Define read data area
CALL Send(0, SPA%, "BIN 0", NLend)'     Set read out data type to ASCII
'
FOR I = 0 TO 500'                       Repeat trace(0) to trace(500):501 points
CMD$ = "XMA?" + STR$(I) + ",1"
CALL Send(0, SPA%, CMD$, NLend)'        Query trace data
'
DATA$ = SPACE$(100)
CALL Receive(0, SPA%, DATA$, NLend)'    Read out trace data
'
TRACE(I) = VAL(DATA$)'                  Store readout data to trace data area
'                                       Print out trace data
PRINT USING "Trace-A(###) ####.##"; I; TRACE(I)/100
NEXT I
'
'
END
```

Lines 11 to 13: Initializes GPIB bus and Device.

CALL Send( ) statements after line 13:

Sends Device commands. Command termination code is specified to NLend (line-feed code, New-Line or LF).

CALL Receive( ) statements at line 28:

Reads out trace data from Device.

Termination code of the read data is specified to NLend.

Line 30: Converts the read character-string data to numeric data, and stores it at trace-data store area.

Section 7 Tables of Device Messages

This section gives information about the device messages of the Spectrum Analyzer in the form of tables. The messages are arranged according to function, as shown below. For detailed descriptions of commands, refer to Section 8, "Detailed Descriptions of Commands."

How To Read the Command List

Program Messages and Query Messages

(a) Upper case letters: Reserved word
(b) Numerical values: Reserved word (Numerical value code)
(c) Lower case letters in Argument

Argument	Meaning	Type	Unit/Suffix code
f	frequency	Real number with decimal point or integer	GHZ, MHZ, KHZ, HZ, GZ, MZ, KZ, None (HZ)
t	time	Real number with decimal point or integer	S, SC, MS, US, None (MS)
l	level	Real number with decimal point or integer	DB, DBM, DM, DBMV, DBUV, DBUVE, V, MV, UV, W, MW ,UW, NW, None (fixed unit)
n	Non-unit integer or integer with specified unit	Decimal integer	None or specified
o	Non-unit integer	Octal integer	None
h	Non-unit integer	Hexadecimal integer	None
r	Non-unit real number or real number with specified unit	Real number	None or specified
txt	Character string	Character string enclosed within double quotation marks	None

Response Messages

(a) Upper case letters: Reserved word
(b) Numerical values: Reserved word (Numerical value code)
(c) Lower case letters in Argument

Argument	Meaning	Type	Unit
f	frequency	Real number with decimal point or integer	Hz
t	time	Real number with decimal point or integer	ms
l	level	Real number with decimal point or integer	Fixed or specified
n	Non-unit integer or integer with specified unit	Decimal integer, Number of digits can be changed (valid digits output.)	None or specified
o	Non-unit integer	Octal integer	None
h	Non-unit integer	Hexadecimal integer	None
r	Non-unit real number or real number with specified unit	Real number with decimal point, Number of digits can be changed (valid digits output.)	None or specified
j	Numerical value judgment	PASS (passed) or FAIL (failed)	None
u	Unit specification	DB, DBM, DM, DBMV, DBUV, DBUVE, V, MV, UV, W, MW ,UW, NW	None
txt	Character string	Character string	None

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (1 /46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Frequency/ Amplitude	**FREQUENCY/ AMPLITUDE**			
• Frequency	**FREQUENCY**			
Selects the mode fo™r setting the frequency band.	FREQ MODE			
	CENTER-SPAN	FRQ△Ø	FRQ?	FRQ△Ø
	START-STOP	FRQ△2	FRQ?	FRQ△2
Sets the center frequency.	CENTER FREQ	CNF△f	CNF?	CNF△f
		CF△f	CF?	f
Steps up the center frequency.	FREQ STEP UP	FUP	———	———
		CF△UP	———	———
Steps down the center frequency.	FREQ STEP DOWN	FDN	———	———
		CF△DN	———	———
Sets the start frequency.	START FREQ	STF△f	STF?	STF△f
		FA△f	FA?	f
Sets the stop frequency.	STOP FREQ	SOF△f	SOF?	SOF△f
		FB△f	FB?	f
Sets the frequency step size.	FREQ STEP SIZE	FSS△f	FSS?	FSS△f
		SS△f	SS?	f
Sets the scroll step size.	SCROLL STEP SIZE			
	1 div	SSS△1	SSS?	SSS△1
	2 div	SSS△2	SSS?	SSS△2
	5 div	SSS△5	SSS?	SSS△5
	10 div	SSS△1Ø	SSS?	SSS△1Ø
Sets the maximum peak point within BG to the center frequency.	AUTO TUNE	ATUN	———	———
Shifts the spectrum in the left or right direction.	SCROLL			
	LEFT	SCR△Ø	———	———
		SCR△LEFT	———	———
	RIGHT	SCR△1	———	———
		SCR△RIGHT	———	———
Frequency offset ON and OFF in the mode	FREQUENCY OFFSET MODE			
	OFF	FOFMD△0	FOFMD?	Ø
		FOFMD△OFF		
	ON	FOFMD△1	FOFMD?	1
		FOFMD△ON		
Offset frequency	OFFSET FREQUENCY	FOFFSET△f	FOFFSET?	f

Note: △ is a space.

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (2 /46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Frequency/ Amplitude	**FREQUENCY AMPLITUDE**			
• Span	**SPAN**			
Sets the frequency span.	FREQ SPAN	SPF△f SP△f	SPF? SP?	SPF△f f
Steps up the frequency span.	FREQ SPAN STEP UP	SPU SP△UP	――― ―――	――― ―――
Steps down the frequency span.	FREQ SPAN STEP DOWN	SPD SP△DN	――― ―――	――― ―――
Sets to full span.	FULL SPAN	FS	―――	―――
Sets to zero span.	ZERO SPAN	SPF△Ø	SPF?	SPF△Ø
Selection of a band (MS2683A)	BAND SELECT AUTO: 0 Hz to 7.9 GHz	 BANDC△AUTO BND△Ø HNLOCK△OFF HNUNLK	 BNDC? BND? HNLOCK? ―――	 AUTO BND△Ø OFF ―――
	0: 0 Hz to 3.2 GHz	BANDC△Ø BND△1 HNLOCK△Ø HN△Ø	BNDC? BND? HNLOCK? HN?	Ø BND△1 ON Ø
	1-L: 1.6 to 3.2 GHz	BANDC△1-L BND△8 HNLOCK△7 HN△7	BNDC? BND? HNLOCK? HN?	1-L BND△8 ON 7
	1-: 3.15 to 6.3 GHz	BANDC△1- BND△2 HNLOCK△1 HN△1	BNDC? BND? HNLOCK? HN?	1- BND△2 ON 1
	1+: 6.2 to 7.9 GHz	BANDC△1+ BND△3 HNLOCK△2 HN△2	BNDC? BND? HNLOCK? HN?	1+ BND△3 ON 2
Selection of a band (MS2687A)	BAND SELECT AUTO: 0 Hz to 30.0 GHz	 BANDC△AUTO BND△Ø HNLOCK△OFF HNUNLK	 BNDC? BND? HNLOCK? ―――	 AUTO BND△Ø OFF ―――
	0: 0 Hz to 3.2 GHz	BANDC△Ø BND△1 HNLOCK△Ø HN△Ø	BNDC? BND? HNLOCK? HN?	Ø BND△1 ON Ø

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (3 /46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Frequency/ Amplitude	**FREQUENCY AMPLITUDE**			
• Span	**SPAN**			
Selection of a band (MS2687A)	1-: 3.15 to 6.3 GHz	BANDC△1- BND△2 HNLOCK△1 HN△1	BNDC? BND? HNLOCK? HN?	1- BND△2 ON 1
	1+: 6.2 to 7.9 GHz	BANDC△1+ BND△3 HNLOCK△2 HN△2	BNDC? BND? HNLOCK? HN?	1+ BND△3 ON 2
	2+: 7.8 to 15.2 GHz	BANDC△2+ BND△4 HNLOCK△3 HN△3	BNDC? BND? HNLOCK? HN?	2+ BND△4 ON 3
	3+: 15.1 to 22.5 GHz	BANDC△3+ BND△5 HNLOCK△4 HN△4	BNDC? BND? HNLOCK? HN?	3+ BND△5 ON 4
	4+: 22.4 to 30.0 GHz	BANDC△4+ BND△6 HNLOCK△5 HN△5	BNDC? BND? HNLOCK? HN?	4+ BND△6 ON 5
(MS2687A Opt22 loading)	BAND SELECT AUTO: 0 Hz to 30.0 GHz	BANDC△AUTO BND△0 HNLOCK△OFF HNUNLK	BNDC? BND? HNLOCK? ———	AUTO BND△0 OFF ———
	0: 0 Hz to 3.2 GHz	BANDC△0 BND△1 HNLOCK△0 HN△0	BNDC? BND? HNLOCK? HN?	0 BND△1 ON 0
	1-: 3.15 to 5.8 GHz	BANDC△1- BND△2 HNLOCK△1 HN△1	BNDC? BND? HNLOCK? HN?	1- BND△2 ON 1
	1+(n=1): 5.7 to 7.9 GHz	BANDC△1+ BND△3 HNLOCK△2 HN△2	BNDC? BND? HNLOCK? HN?	1+ BND△3 ON 2
	1+(n=2): 7.8 to 14.05 GHz	BANDC△1++ BND△4 HNLOCK△3 HN△3	BNDC? BND? HNLOCK? HN?	1++ BND△4 ON 3

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (4 /46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Frequency/ Amplitude	**FREQUENCY/ AMPLITUDE**			
• Span	**SPAN**			
(MS2687A Opt22 loading)	2-: 14.0 to 26.5 GHz	BANDC△2- BND△5 HNLOCK△4 HN△4	BNDC? BND? HNLOCK? HN?	2- BND△5 ON 4
	3-: 26.4 to 30.0 GHz	BANDC△3- BND△6 HNLOC△5 HN△5	BNDC? BND? HNLOCK? HN?	3- BND△6 ON 5
Selection of a band (MS2687B)	BAND SELECT AUTO: 0 Hz to 30.0 GHz	BANDC△AUTO BND△Ø HNLOCK△OFF HNUNLK	BNDC? BND? HNLOCK? ———	AUTO BND△Ø OFF ———
	0: 0 Hz to 3.2 GHz	BANDC△Ø BND△1 HNLOCK△Ø HN△Ø	BNDC? BND? HNLOCK? HN?	Ø BND△1 ON Ø
	1-: 3.15 to 6.3 GHz	BANDC△1- BND△2 HNLOCK△1 HN△1	BNDC? BND? HNLOCK? HN?	1- BND△2 ON 1
	1+: 6.2 to 7.9 GHz	BANDC△1+ BND△3 HNLOCK△2 HN△2	BNDC? BND? HNLOCK? HN?	1+ BND△3 ON 2
	2+: 7.8 to 15.3 GHz	BANDC△2+ BND△4 HNLOCK△3	BNDC? BND? HNLOCK?	2+ BND△4 ON
	4+: 15.2 to 30.0 GHz	BANDC△4+ BND△6 HNLOCK△5 HN△5	BNDC? BND? HNLOCK? HN?	4+ BND△6 ON 5

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (5 /46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Frequency/ Amplitude	**FREQUENCY/ AMPLITUDE**			
• Level	**AMPLITUDE**			
Sets the reference level.	REFERENCE LEVEL	RLV△l RL△l	RLV? RL?	RLV△l l
Steps up the reference level.	REF LEVEL STEP UP	LUP RL△UP	———	———
Steps down the reference level.	REF LEVEL STEP DOWN	LDN RL△DN	———	———
Sets the LOG scale.	LOG SCALE STEP SIZE MANUAL	LSS△l	LSS?	LSS△l
	AUTO 1 div	LSSA△1	LSSA?	LSSA△1
	2 div	LSSA△2	LSSA?	LSSA△2
	5 div	LSSA△5	LSSA?	LSSA△5
	10 div	LSSA△10	LSSA?	LSSA△10
	LOG SCALE RANGE			
	1 dB/div	SCL△0 LG△1DB	SCL? LG?	SCL△0 1
	2 dB/div	SCL△1 LG△2DB	SCL? LG?	SCL△1 2
	5 dB/div	SCL△2 LG△5DB	SCL? LG?	SCL△2 5
	10 dB/div	SCL△3 LG△10DB	SCL? LG?	SCL△3 10
	SCALE UP	LG△UP	———	———
	SCALE DOWN	LG△DN	———	———
Sets the LIN scale.	SCALE LIN RANGE			
	LIN scale switching	LN LG△0	——— ———	——— ———
	1%/div	SCL△4	SCL?	SCL△4
	2%/div	SCL△5	SCL?	SCL△5
	5%/div	SCL△6	SCL?	SCL△6
	10%/div	SCL△7	SCL?	SCL△7

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (6 /46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Frequency/ Amplitude	**FREQUENCY/ AMPLITUDE**			
• Level	**AMPLITUDE**			
Sets the display unit system.	DISPLAY UNIT			
	dBm	UNT△Ø	UNT?	UNT△Ø
		AUNITS△DBM	AUNITS?	DBM
		KSA	———	———
	dBμV	UNT△1	UNT?	UNT△1
		AUNITS△DBUV	AUNITS?	DBUV
		KSC	———	———
	dBmV	UNT△2	UNT?	UNT△2
		AUNITS△DBMV	AUNITS?	DBMV
		KSB	———	———
	V	UNT△3	UNT?	UNT△3
		AUNITS△V	AUNITS?	V
		KSD	———	———
	dBμV(emf)	UNT△4	UNT?	UNT△4
		AUNITS△DBUVE	AUNITS?	DBUVE
	W	UNT△5	UNT?	UNT△5
		AUNITS△W	AUNITS?	W
	dBμV/m	UNT△6	UNT?	UNT△6
		AUNITS△DBUVM	AUNITS?	DBUVM
• Display line	**DISPLAY LINE**			
Sets the Display line ON/OFF.	DISPLAY LINE			
	OFF	DL△OFF	DL?	OFF
	ON	DL△ON	———	———
Sets the Display line level.	DISPLAY LINE LEVEL	DL△l	DL?	l
Marker level/ waveform data Absolute/relative display line	ABS/REL			
	ABS	DSPLV△ABS	DSPLV?	ABS
	REL	DSPLV△REL	DSPLV?	REL
	TRACE-A ABS	DSPLVM△TRA,ABS	DSPLVM?△TRA	ABS
	REL	DSPLVM△TRA,REL	DSPLVM?△TRA	REL
	TRACE-B ABS	DSPLVM△TRB,ABS	DSPLVM?△TRB	ABS
	REL	DSPLVM△TRB,REL	DSPLVM?△TRB	REL
	TRACE-TIME ABS	DSPLVM△TRTIME,ABS	DSPLVM?△TRTIME	ABS
	REL	DSPLVM△TRTIME,REL	DSPLVM?△TRTIME	REL
	TRACE-BG ABS	DSPLVM△TRBG,ABS	DSPLVM?△TRBG	ABS
	REL	DSPLVM△TRBG,REL	DSPLVM?△TRBG	REL

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (7 /46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Frequency/ Amplitude	**FREQUENCY/ AMPLITUDE**			
• Reference level offset	**REFERENCE LEVEL OFFSET**			
Offset	OFFSET			
Offset value	OFF	ROFFSET△OFF LVO△Ø	ROFFSET?	OFF
	ON	ROFFSET△ON LVO△1	ROFFSET?	1
	OFFSET VALUE	ROFFSET△l LOS△l	ROFFSET? LOS?	l LOS△l
• Correction factor relevant	**CORRECTION**			
Selects the type of correction factor.	CORRECTION FACTOR SELECT			
	OFF	CORR△OFF CORR△Ø CDT△Ø	――― CORR? CDT?	――― CORR△Ø CDT△Ø
	ON	CORR△ON CDT△1	――― CDT?	――― CDT△1
	CORR1	CORR△1	CORR?	CORR△1
	CORR2	CORR△2	CORR?	CORR△2
	CORR3	CORR△3	CORR?	CORR△3
	CORR4	CORR△4	CORR?	CORR△4
	CORR5	CORR△5	CORR?	CORR△5
Registers the correction factor.	CORRECTION FACTOR† ENTRY	CORD△n,f,l	CORD△n	CORD△f,l
Registers the correction factor name.	CORRECTION FACTOR† LABEL ENTRY	CORRLABEL△n, "text"	CORRLABEL?△n	"text"
Initializes the correction factor.	CORRECTION FACTOR† INITIALIZATION	CORC	―――	―――
Selects the input impedance.	INPUT IMPEDANCE			
	50Ω	INZ△5Ø	INZ?	5Ø
	75Ω	INZ△75	INZ?	75
75Ω impedance transformer.	IMPEDANCE TRANSFORMER			
	ON	INPTRNS△ON	INPTRNS?	ON
(MA1621A)	OFF	INPTRNS△OFF	INPTRNS?	OFF

† Manual setting is unavailable because the commands are used only for GP-IB.

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (8 /46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Display function	**DISPLAY**			
• Sample points	**SAMPLE POINTS**			
Setting Sample point	SAMPLE POINTS			
	501POINT	DPOINT△NRM	DPOINT?	NRM
	1001POINT	DPOINT△DOUBLE	DPOINT?	DOUBLE
• Display mode	**DISPLAY FUNCTION**			
Selects the display format.	DISPLAY FORMAT			
	TRACE-A	DFMT△A	DFMT?	A
	TRACE-B	DFMT△B	DFMT?	B
	TRACE-TIME	DFMT△TIME	DFMT?	TIME
	TRACE-A/B (A&B)	DFMT△AB1	DFMT?	AB1
	TRACE-A/B (A>B)	DFMT△AB2	DFMT?	AB2
	TRACE-A/B (A<B)	DFMT△AB3	DFMT?	AB3
	TRACE-A/BG (BG>A)	DFMT△ABG1	DFMT?	ABG1
	TRACE-A/BG (BG<A)	DFMT△ABG2	DFMT?	ABG2
	TRACE-A/TIME (TIME>A)	DFMT△ATIME1	DFMT?	ATIME1
	TRACE-A/TIME (TIME<A)	DFMT△ATIME2	DFMT?	ATIME2
• Waveform writing	**WRITE SWITCH**			
Controls writing of the waveform to trace A.	TRACE-A WRITE SWITCH			
	VEIW	AWR△Ø	——	——
		AWR△OFF	AWR?	AWR△OFF
		VIEW△TRA	——	——
	WRITE	AWR△1	——	——
		AWR△ON	AWR?	AWR△ON
		CLRW△TRA	——	——
		A1	——	——

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (9 /46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Display function	DISPLAY			
• Waveform writing	DISPLAY FUNCTION			
Controls writing of the waveform to trace B.	TRACE-B WRITE SWITCH			
	VIEW	BWR△Ø	———	———
		BWR△OFF	BWR?	BWR△OFF
		VIEW△TRB	———	———
	WRITE	BWR△1	———	———
		BWR△ON	BWR?	BWR△ON
		CLRW△TRB	———	———
		B1	———	———
Controls writing of the waveform to trace BG.	TRACE-BG WRITE SWITCH			
	VIEW	BGWR△Ø	———	———
		BGWR△OFF	BGWR?	BGWR△OFF
		VIEW△TRBG	———	———
	WRITE	BGWR△1	———	———
		BGWR△ON	BGWR?	BGWR△ON
		CLRW△TRBG	———	———
Controls writing of the waveform to trace TIME.	TRACE-TIME WRITE SWITCH			
	VIEW	TMWR△Ø	———	———
		TMWR△OFF	TMWR?	TMWR△OFF
		VIEW△TRTIME	———	———
	WRITE	TMWR△1	———	———
		TMWR△ON	TMWR?	TMWR△ON
		CLRW△TRTIME	———	———
• Storage mode	STORAGE MODE			
Selects the mode for processing the trace A waveform.	TRACE MODE (A)			
	NORMAL	AMD△Ø	AMD?	AMD△Ø
	MAX HOLD	AMD△1	AMD?	AMD△1
		MXMH△TRA	———	———
		A2	———	
	AVERAGE	AMD△2	AMD?	AMD△2
	MIN HOLD	AMD△3	AMD?	AMD△3
	CUMULATIVE	AMD△4	AMD?	AMD△4
	OVER WRITE	AMD△5	AMD?	AMD△5
	LINEAR AVERAGE	AMD△6	AMD?	AMD△6

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (10/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ **Display function**	**DISPLAY**			
• **Storage mode**	**STORAGE MODE**			
Selects the mode for processing the trace B waveform.	TRACE MODE (B)			
	NORMAL	BMD△Ø	BMD?	BMD△Ø
	MAX HOLD	BMD△1	BMD?	BMD△1
		MXMH△TRB	———	———
		B2	———	———
	AVERAGE	BMD△2	BMD?	BMD△2
	MIN HOLD	BMD△3	BMD?	BMD△3
	CUMULATIVE	BMD△4	BMD?	BMD△4
	OVER WRITE	BMD△5	BMD?	BMD△5
	LINEAR AVERAGE	BMD△6	BMD?	BMD△6
Selects the mode for processing the trace TIME waveform.	TRACE MODE (TIME)			
	NORMAL	TMMD△Ø	TMMD?	TMMD△Ø
	MAX HOLD	TMMD△1	TMMD?	TMMD△1
	AVERAGE	TMMD△2	TMMD?	TMMD△2
	MIN HOLD	TMMD△3	TMMD?	TMMD△3
	CUMULATIVE	TMMD△4	TMMD?	TMMD△4
	OVER WRITE	TMMD△5	TMMD?	TMMD△5
	LINEAR AVERAGE	TMMD△6	TMMD?	TMMD△6
Average processing	AVERAGE			
	OFF	VAVG△Ø	———	———
		VAVG△OFF	———	———
		KSH	———	———
	ON	VAVG△1	———	———
		VAVG△ON	———	———
		KSG	———	———
Number of trace averaged	NUMBER of TRACE AVERAGE			
	4	AVR△Ø	AVR?	AVR△Ø
	8	AVR△1	AVR?	AVR△1
	16	AVR△2	AVR?	AVR△2
	32	AVR△3	AVR?	AVR△3
	128	AVR△4	AVR?	AVR△4
	2	AVR△5	AVR?	AVR△5
	64	AVR△6	AVR?	AVR△6
	512	AVR△7	AVR?	AVR△7
	1024	AVR△8	AVR?	AVR△8
	n	VAVG△n	VAVG?	n
Average sweep stop mode	AVERAGE SWEEP MODE			
	CONTINUOUS	AVGPAUSE△OFF	AVGPAUSE?	OFF
	PAUSE	AVGPAUSE△ON	AVGPAUSE?	ON

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (11/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ **Display function**	**DISPLAY**			
• Storage mode (Cont)	**STORAGE MODE**			
Hold control stop mode	HOLD SWEEP MODE			
	CONTINUOUS	HOLDPAUSE△Ø	HOLDPAUSE?	Ø
	PAUSE (Times specified)	HOLDPAUSE△n	HOLDPAUSE?	n
Selects detection mode	DETECTION MODE			
	POS PEAK	DET△Ø	—	—
		DET△POS	DET?	POS
	SAMPLE	DET△1	—	—
		DET△SMP	DET?	SMP
	MEG PEAK	DET△2	—	—
		DET△NEG	DET?	NEG
	NORMAL	DET△3	—	—
		DET△NRM	DET?	NRM
	AVERAGE	DET△4	—	—
		DET△AVE	DET?	AVE
	RMS	DET△5	—	—
		DET△RMS	DET?	RMS
Selects detection mode	TRACE-A DETECTION MODE			
	POS PEAK	DETM△TRA,POS	DETM?△TRA	POS
		DETM△TRA,Ø	—	—
	SAMPLE	DETM△TRA,SMP	DETM?△TRA	SMP
		DETM△TRA,1	—	—
	NEG PEAK	DETM△TRA,NEG	DETM?△TRA	NEG
		DETM△TRA,2	—	—
	NORMAL	DETM△TRA,NRM	DETM?△TRA	NRM
		DETM△TRA,3	—	—
	AVERAGE	DETM△TRA,AVE	DETM?△TRA	AVE
		DETM△TRA,4	—	—
	RMS	DETM△TRA,RMS	DETM?△TRA	RMS
		DETM△TRA,5	—	—

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (12/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Display function	**DISPLAY**			
• Storage mode (Cont)	**STORAGE MODE**			
	TRACE-B DETECTION MODE			
	POS PEAK	DETM△TRB,POS DETM△TRB,Ø	DETM?△TRB ———	POS ———
	SAMPLE	DETM△TRB,SMP DETM△TRB,1	DETM?△TRB ———	SMP ———
	NEG PEAK	DETM△TRB,NEG DETM△TRB,2	DETM?△TRB ———	NEG ———
	NORMAL	DETM△TRB,NRM DETM△TRB,3	DETM?△TRB ———	NRM ———
	AVERAGE	DETM△TRB,AVE DETM△TRB,4	DETM?△TRB ———	AVE ———
	RMS	DETM△TRB,RMS DETM△TRB,5	DETM?△TRB ———	RMS ———
	TRACE-TIME DETECTION MODE			
	POS PEAK	DETM△TRTIME,POS DETM△TRTIME,Ø	DETM?△TRTIME ———	POS ———
	SAMPLE	DETM△TRTIME,SMP DETM△TRTIME,1	DETM?△TRTIME ———	SMP ———
	NEG PEAK	DETM△TRTIME,NEG DETM△TRTIME,2	DETM?△TRTIME ———	NEG ———
	NORMAL	DETM△TRTIME,NRM DETM△TRTIME,3	DETM?△TRTIME ———	NRM ———
	AVERAGE	DETM△TRTIME,AVE DETM△TRTIME,4	DETM?△TRTIME ———	AVE ———
	RMS	DETM△TRTIME,RMS DETM△TRTIME,5	DETM?△TRTIME ———	RMS ———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (13/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Display function	DISPLAY			
• Time	TIME			
Sets the time delay in the time axis sweep mode.	DELAY TIME	TDLY△t DLT△t	TDLY? DLT?	t DLT△t
Sets the time span in the time axis sweep mode.	TIME SPAN	TSP△t	TSP?	t
Sets the time expand mode ON/OFF.	EXPAND ZONE OFF ON	 TZONE△Ø TZONE△OFF TZONE△1 TZONE△ON	 ——— TZONE? ——— TZONE?	 ——— OFF ——— ON
Sets the time expand mode ON/OFF.	EXPAND OFF ON	 TEXPAND△Ø TEXPAND△OFF TEXPAND△1 TEXPAND△ON	 ——— TEXPAND? ——— TEXPAND?	 ——— OFF ——— ON
Sets the start time of the expansion.	ZONE START	TZSTART△t TZSTARTP△p	TZSTART? TZSTARTP?	t p
Sets the magnified range of time expansion.	ZONE SPAN	TZSP△t TZSPP△t	TZSP? TZSPP?	t p
• A/B Active marker Trace	ACTIVE MARKER TRACE TRACE A TRACE B	 MKTRACE△TRA MKTRACE△TRB	 MKTRACE? MKTRACE?	 TRA TRB
■ Trace move/ calculation	TRACE MOVE/CALC			
• Trace move	TRACE MOVE			
Moves trace A to B.	A → B	ATB MOV△TRA,TRB	——— ———	——— ———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (14/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Trace move/ calculation	**TRACE MOVE/CALC**			
• Trace move (Cont)	**TRACE MOVE**			
Moves trace B to A.	B → A	BTA MOV△TRB,TRA	——— ———	——— ———
Replaces trace A by B.	A ↔ B	AXB EX XCH△TRA,TRB XCH△TRB,TRA	——— ——— ——— ———	——— ——— ——— ———
• Trace calculation	**TRACE CALC**			
A-B → A	A-B → A OFF	 AMB△Ø AMB△OFF C1	 ——— AMB? ———	 ——— OFF ———
	ON	AMB△1 AMB△ON C2	——— AMB? ———	——— ON ———
Calculates A - B.	REFERENCE LINE TOP MIDDLE BOTTOM	 RLN△Ø RLN△1 RLN△2	 RLN? RLN? RLN?	 RLN△Ø RLN△1 RLN△2
A+B → A	A+B → A	APB	———	———
NORMALIZE (A-B+DL → A)	NORMALIZE (A-B+DL → A) OFF ON	 AMBPL△Ø AMBPL△OFF AMBPL△1 AMBPL△ON	 ——— AMBPL? ——— AMBPL?	 ——— OFF ——— ON
■ Signal search	**SIGNAL SEARCH**			
Sets the maximum peak point to the center frequency.	PEAK to CF	PCF	———	———
Sets the maximum peak point to the REF level.	PEAK to REF	PRL	———	———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (15/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Marker function	**MARKER**			
Selects the marker mode.	MARKER MODE			
	MORMAL	MKR△Ø	MKR?	Ø
		M2	——	——
	DELTA	MKR△1	MKR?	1
		MKD	——	——
		M3	——	——
	OFF	MKR△2	MKR?	2
		MKOFF	——	——
		MKOFF△ALL	——	——
		M1	——	——
Specifies the zone marker center position as a point.	ZONE POSITION (point)	MKZ△p	MKZ?	MKZ△p
		MKP△p	MKP?	p
Specifies the zone marker center position as a frequency or time.	ZONE POSITION (freq or time)			
	FREQ SET	MKZF△f	MKZF?	f
		MKN△f	MKN?	f
	UP	MKN△UP	——	——
	DOWN	MKN△DN	——	——
	TIME SET	MKZF△t	MKZF?	t
		MKN△t	MKN?	t
	UP	MKN△UP	——	——
	DOWN	MKN△DN	——	——
Specifies the zone marker width as a point.	ZONE WIDTH (point)	MZW△p	MZW?	MZW△p
Specifies the zone marker width as a frequency.	ZONE WIDTH (freq)	MZWF△f	MZWF?	f
Specifies the zone marker width as a division.	ZONE WIDTH (div)			
	SPOT	MKW△1	MKW?	MKW△1
	0.5 div	MKW△Ø	MKW?	MKW△Ø
	1 div	MKW△5	MKW?	MKW△5
	2 div	MKW△6	MKW?	MKW△6
	5 div	MKW△7	MKW?	MKW△7
	10 div	MKW△2	MKW?	MKW△2
Marker search mode	MARKER SEARCH MODE			
	PEAK MARKER	MKSRCH△PEAK	MKSRCH?	PEAK
	DIP MARKER	MKSRCH△DIP	MKSRCH?	DIP

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (16/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Marker function	**MARKER**			
• Marker function (Cont)	**MARKER FUNCTION**			
Moves the marker frequency to the center frequency.	MKR to CF	MKR△3 MKCF E2	——— ——— ———	——— ——— ———
Sets the level at the marker point to the REF level.	MKR to REF	MKR△4 MKRL E4	——— ——— ———	——— ——— ———
Sets the marker frequency to the CF step.	MKR to CFstep	MKR△5 MKSS E3	——— ——— ———	——— ——— ———
Sets the delta marker frequency to the span.	△MKR to SPAN	MKR△6 MKSP KSO	——— ——— ———	——— ——— ———
Sets the zone frequency to the span.	ZONE to SPAN	MKR△7	———	———
• Multimarker	**MULTI MARKER**			
Multimarker	MULTI MARKER			
	OFF	MKMULTI△Ø MKMULTI△OFF MLO	——— MKMULTI? ———	——— OFF ———
	ON	MKMULTI△1 MKMULTI△ON	——— MKMULTI?	——— ON
Multimarker mode	MULTI MARKER MODE			
	Registers multimarkers on the peak point in descending order from the maximum level down to the tenth.	MKMHI MHI	———	———
	Registers multimarkers on the harmonic frequency ranging from the reference multimarker frequency up to the tenth.	MKMHRM MHM	———	———
	Registers multimarkers on each the nearest 5 peak points from the current marker to the right/ left sides.	MKMPKH	———	———
	PEAK COUNT	———	PCOUNT?	a,b
Selects the multimarker.	SELECT MULTI MARKER			
	nth marker:			
	Sets to OFF.	MKSLCT△n,Ø MKSLCT△n,OFF MSE△n,Ø	——— MKSLCT?△n MSE?	——— OFF MSE△Ø
	Sets to ON.	MKSLCT△n,1 MKSLCT△n,ON MSE△n,1	——— MKSLCT?△n MSE?	——— ON MSE△1

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (17/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Marker function (Cont)	**MARKER**			
• Multimarker	**MULTI MARKER**			
Selects the active marker of the multimarkers.	ACTIVE MARKER	MKACT△n MAC△n	MKACT? MAC?	n MAC△n
Specifies the frequency of the designated multimarker number.	MARKER POSITION	MKMP△n,f MPS△n,p	MKMP?△n MPS?△n	f MPS△p
Clears all registered multimarkers.	CLEAR MULTI MARKER	MKMCL MCL	———	———
Multimarker list	MULTI MARKER LIST OFF ON	 MKLIST△Ø MKLIST△OFF MLI△Ø MKLIST△1 MKLIST△ON MLI△1	 ——— MKLIST? MLI? ——— MKLIST? MLI?	 ——— OFF MLI△Ø ——— ON MLI△1
Multimarker list Sets the level data by distinguishing the absolute value from the relative value.	MULTI MARKER LIST LEVEL ABSOLUTE RELATIVE	 MKLLVL△ABS MKLLVL△REL	 MKLLVL? MKLLVL?	 ABS REL
Multimarker list Sets the frequency data by distinguishing the relative value from the absolute value.	MULTI MARKER LIST FREQUENCY ABSOLUTE RELATIVE	 MKLFREQ△ABS MKLFREQ△REL	 MKLFREQ? MKLFREQ?	 ABS REL
Reads the multimarker level.	MULTI MARKER LEVEL QUERY	———	MKML?△n MLR?△n	l l
Reads the multimarker frequency.	MULTI MARKER FREQUENCY QUERY	———	MFR?△n	f
Reads the multimarker all level/frequency.	MULTI MARKER ALL LEVEL/FREQ QUERY	———	MKMFL?	f_1,l_1,f_2,l_2

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (18/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Marker function (Cont)	**MARKER**			
• Peak search	**PEAK SEARCH**			
Peak search mode	PEAK SEARCH MODE PEAK	MKS△Ø	———	———
		MKPK	———	———
		MKPK△HI	———	———
		E1	———	———
	NEXT PEAK	MKS△1	———	———
		MKPK△NH	———	———
	DIP	MKS△2	———	———
		MKMIN	———	———
	NEXT DIP	MKS△11	———	———
Search resolution	SEARCH RESOLUTION	MKPX△l	MKPX?	l
Search threshold value	SEARCH THRESHOLD OFF	SRCHTH△Ø	———	———
		SRCHTH△OFF	SRCHTH?	OFF
	ON	SRCHTH△1	———	———
		SRCHTH△ON	———	———
	ABOVE	SRCHTH△ABOVE	SRCHTH?	ABOVE
	BELOW	SRCHTH△BELOW	SRCHTH?	BELOW
• Input position	**INPUT POSITION**			
Reads the reference marker position.	REFERENCE MARKER POSITION	———	RMK?	RMK△p
Reads the current marker position.	CURRENT MARKER POSITION	———	CMK?	CMK△p
Reads the frequency at the marker point.	MARKER FREQ QUERY FREQ	———	MKF?	f
	TIME	———	MKF?	t
Reads the level at the marker point.	MARKER LEVEL	———	MKL?	l
		———	MKA?	l

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (19/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Coupled function	**COUPLED FUNCTION**			
Sets the resolution bandwidth.	RESOLUTION BANDWIDTH			
	MANUAL	ARB△Ø	ARB?	ARB△Ø
	AUTO	ARB△1	ARB?	ARB△1
		RB△AUTO	———	———
		CR	———	———
	1 Hz	RB△1HZ	RB?	1
		RBW△16	RBW?	RBW△16
	3 Hz	RB△3HZ	RB?	3
		RBW△17	RBW?	RBW△17
	10 Hz	RB△10HZ	RB?	10
		RBW△13	RBW?	RBW△13
	30 Hz	RB△30HZ	RB?	30
		RBW△0	RBW?	RBW△0
	100 Hz	RB△100HZ	RB?	100
		RBW△1	RBW?	RBW△1
	300 Hz	RB△3ØØHZ	RB?	3ØØ
		RBW△2	RBW?	RBW△2
	1 kHz	RB△1KHZ	RB?	1ØØØ
		RBW△3	RBW?	RBW△3
	3 kHz	RB△3KHZ	RB?	3ØØØ
		RBW△4	RBW?	RBW△4
	10 kHz	RB△1ØKHZ	RB?	1ØØØØ
		RBW△5	RBW?	RBW△5
	30 kHz	RB△3ØKHZ	RB?	3ØØØØ
		RBW△6	RBW?	RBW△6
	100 kHz	RB△1ØØKHZ	RB?	1ØØØØØ
		RBW△7	RBW?	RBW△7
	300 kHz	RB△3ØØKHZ	RB?	3ØØØØØ
		RBW△8	RBW?	RBW△8
	1 MHz	RB△1MHZ	RB?	1ØØØØØØ
		RBW△9	RBW?	RBW△9
	3 MHz	RB△3MHZ	RB?	3ØØØØØØ
		RBW△14	RBW?	RBW△14
	5 MHz	RB△5MHZ	RB?	5ØØØØØØ
		RBW△15	RBW?	RBW△15
	10 MHz	RB△1ØMHZ	RB?	1ØØØØØØØ
		RBW△18	RBW?	RBW△18
	20 MHz	RB△2ØMHZ	RB?	2ØØØØØØØ
		RBW△19		RBW△19
			RBW?	
	RBW UP	RB△UP	———	———
	RBW DOWN	RB△DN	———	———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (20/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Coupled function	**COUPLED FUNCTION**			
Sets the video bandwidth.	VIDEO BANDWIDTH			
	MANUAL	AVB△Ø	AVB?	AVB△Ø
	AUTO	AVB△1	AVB?	AVB△1
		VB△AUTO	———	———
		CV	———	———
	1 Hz	VB△1HZ	VB?	1
		VBW△Ø	VBW?	VBW△Ø
	3 Hz	VB△3ØHZ	VB?	3
		VBW△8	VBW?	VBW△8
	10 Hz	VB△1HZ	VB?	1Ø
		VBW△1	VBW?	VBW△1
	30 Hz	VB△3ØHZ	VB?	3Ø
		VBW△9	VBW?	VBW△9
	100 Hz	VB△1ØØHZ	VB?	1ØØ
		VBW△2	VBW?	VBW△2
	300 Hz	VB△3ØØHZ	VB?	3ØØ
		VBW△1Ø	VBW?	VBW△1Ø
	1 kHz	VB△1KHZ	VB?	1ØØØ
		VBW△3	VBW?	VBW△3
	3 kHz	VB△3KHZ	VB?	3ØØØ
		VBW△11	VBW?	VBW△11
	10 kHz	VB△1ØKHZ	VB?	1ØØØØ
		VBW△4	VBW?	VBW△4
	30 kHz	VB△3ØKHZ	VB?	3ØØØØ
		VBW△12	VBW?	VBW△12
	100 kHz	VB△1ØØKHZ	VB?	1ØØØØØ
		VBW△5	VBW?	VBW△5
	300 kHz	VB△3ØØKHZ	VB?	3ØØØØØ
		VBW△13	VBW?	VBW△13
	1 MHz	VB△1MHZ	VB?	1ØØØØØØ
		VBW△7	VBW?	VBW△7
	3 MHz	VB△3MHZ	VB?	3ØØØØØØ
		VBW△14	VBW?	VBW△14
	OFF	VB△OFF	VB?	OFF
		VBW△6	VBW?	VBW△6
		AVB△2	AVB?	AVB△2
	VBW UP	VB△UP	———	———
	VBW DOWN	VB△DN	———	———
Sets the VBW/RBW ratio (where VBW = AUTO).	VBW/RBW RATIO RATIO=r	VBR△r	VBR?	r

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (21/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Coupled function (Cont)	**COUPLED FUNCTION**			
Sets the RBW/Span ON/OFF (Where RBW=AUTO).	RBW/Span			
	OFF	RBSPAN△OFF RBSPAN△Ø	RBSPAN?	OFF
	ON	RBSPAN△ON RBSPAN△1	RBSPAN?	ON
Sets the RBW/Span Ratio.	RBW/Span RATIO	RBR△r	RBR?	r
Sets the RBW mode	RBW			
	Digital	RBM△DGTL	RBM?	DGTL
	Analog	RBM△NRM	RBM?	NRM
	FFT	RBM△FFT	RBM?	FFT
	AUTO	RBM△AUTO	RBM?	AUTO
Sets the sweep time.	SWEEP TIME			
	MANUAL	AST△Ø	AST?	AST△Ø
	AUTO	AST△1 STØ CT	AST? ——— ———	AST△1 ——— ———
	SWEEP TIME SET			
	TIME=t	SWT△t ST△t	SWT? ST?	SWT△t t
	UP	ST△UP	———	———
	DOWN	ST△DN	———	———
Sets the RF attenuator.	RF ATTENUATOR			
	MANUAL	AAT△Ø	AAT?	AAT△Ø
	AUTO	AAT△1 AT△AUTO CA	AAT? ——— ———	AAT△1 ——— ———
Sets the steps of RF attenuator (MS2687A is only for 10 dB step)	RF ATTENUATOR STEPS			
	10 dB	RFAT△Ø	RFAT?	Ø
	2 dB	RFAT△1	RFAT?	1
	0 dB	ATT△Ø AT△Ø	ATT? AT?	ATTØ Ø
	10 dB	ATT△1 AT△1Ø	ATT? AT?	ATT△1 1Ø
	20 dB	ATT△2 AT△2Ø	ATT? AT?	ATT△2 2Ø
	30 dB	ATT△3 AT△3Ø	ATT? AT?	ATT△3 3Ø
	40 dB	ATT△4 AT△4Ø	ATT? AT?	ATT△4 4Ø
	50 dB	ATT△5 AT△5Ø	ATT? AT?	ATT△5 5Ø
	60 dB	ATT△12 AT△6Ø	ATT? AT?	ATT△12 6Ø
	70 dB	ATT△13 AT△7Ø	ATT? AT?	ATT△13 7Ø

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (22/46)

Parameter		Program command	Query	Response
Outline	Control item			
	2 dB	ATT△15 AT△2	ATT? AT?	ATT△15 2
	4 dB	ATT△16 AT△4	ATT? AT?	ATT△16 4
	6 dB	ATT△17 AT△6	ATT? AT?	ATT△17 6
	8 dB	ATT△18 AT△8	ATT? AT?	ATT△18 8
	12 dB	ATT△19 AT△12	ATT? AT?	ATT△19 12
	14 dB	ATT△2Ø AT△14	ATT? AT?	ATT△2Ø 14
	16 dB	ATT△21 AT△16	ATT? AT?	ATT△21 16
	18 dB	ATT△22 AT△18	ATT? AT?	ATT△22 18
	22 dB	ATT△23 AT△22	ATT? AT?	ATT△23 22
	24 dB	ATT△24 AT△24	ATT? AT?	ATT△24 24
	26 dB	ATT△25 AT△26	ATT? AT?	ATT△25 26
	28 dB	ATT△26 AT△28	ATT? AT?	ATT△26 28
	32 dB	ATT△27 AT△32	ATT? AT?	ATT△27 32
	34 dB	ATT△28 AT△34	ATT? AT?	ATT△28 34
	36 dB	ATT△29 AT△36	ATT? AT?	ATT△29 36
	38 dB	ATT△3Ø AT△38	ATT? AT?	ATT△3Ø 38
	42 dB	ATT△31 AT△42	ATT? AT?	ATT△31 42
	44 dB	ATT△32 AT△44	ATT? AT?	ATT△32 44
	46 dB	ATT△33 AT△46	ATT? AT?	ATT△33 46
	48 dB	ATT△34 AT△48	ATT? AT?	ATT△34 48
	52 dB	ATT△35 AT△52	ATT? AT?	ATT△35 52
	54 dB	ATT△36 AT△54	ATT? AT?	ATT△36 54
	56 dB	ATT△37 AT△56	ATT? AT?	ATT△37 56
	58 dB	ATT△38 AT△58	ATT? AT?	ATT△38 58
	62 dB	ATT△39 AT△62	ATT? AT?	ATT△39 62
	UP	AT△UP	——	——
	DOWN	AT△DN	——	——

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (23/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Coupled function (Cont)	**COUPLED FUNCTION**			
Sets the bandwidth/ sweep time to AUTO mode.	RBW,VBW/SWEEP TIME AUTO	BSAUTO	———	———
Sets the coupled function to AUTO mode.	COUPLED FUNCTION AUTO	AUTO	———	———
Sets the coupled function at the frequency domain/ time domain.	COUPLE MODE			
	COMMON	VBCOUPLE△COM	VBCOUPLE?	COM
	INDEPENDENCE	VBCOUPLE△IND	VBCOUPLE?	IND
■ Sweep function	**SWEEP CONTROL**			
Sets the zone sweep ON/OFF.	ZONE SWEEP			
	OFF	PSW△Ø	———	———
		PSW△OFF	PSW?	PSW△OFF
	ON	PSW△1	———	———
		PSW△ON	PSW?	PSW△ON
Sets the tracking function.	TRACKING			
	OFF	MKTRACK△Ø	———	———
		MKTRACK△OFF	MKTRACK?	OFF
		MTØ	———	———
	ON	MKTRACK△1	———	———
		MKTRACK△ON	MKTRACK?	ON
		MT1	———	———
Sets the sweep mode to single.	SINGLE SWEEP MODE	SNGLS	———	———
		S2	———	———
Executes/checks single sweep.	SINGLE SWEEP/ SWEEP STATUS			
	Executing single sweep	SWP	———	———
		TS	———	———
	Checking the sweep status			
	Sweep completed	———	SWP?	SWP△Ø
	Sweep in progress	———	SWP?	SWP△1
Executes average sweep.	TAKE AVERAGE SWEEP	TSAVG	———	———
Executes hold sweep.	TAKE HOLD SWEEP	TSHOLD	———	———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (24/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Sweep function	**SWEEP CONTROL**			
Continuous sweep mode.	COTINUOUS SWEEP MODE	CONTS S1	——— ———	——— ———
Stops the sweep.	SWEEP STOP	SWSTOP	———	———
Restarts the sweep.	SWEEP RESTART	SWSTART	———	———
■ Save/Recall	**SAVE/RECALL**			
Recalls data from the internal memory.	RECALL DATA FROM INTERNAL MEMORY	RGRC△r RC△r	——— ———	——— ———
Recalls data from the memory card.	RECALL DATA FROM MEMORY CARD	RCM△r	———	———
Recalls data from the memory card. Changes the storage mode to View.	WRITE OFF RECALL DATA	RCS△r	———	———
Saves data in the internal memory.	SAVE DATA INTO INTERNAL MEMORY	RGSV△s SV△s	——— ———	——— ———
Saves data on the memory card.	SAVE DATA INTO MEMORY CARD	SVM△s	———	———
Sets the recall data	RECALLED DATA TRACE&PARAM PARAM ONLY TRACE&PARAM(VIEW) PARAM(EXCEPT REF LEVEL)	 RDATA△TP RDATA△P RDATA△TPV RDATA△PER	 RDATA? RDATA? RDATA? RDATA?	 TP P TPV PER
■ Hard copy	**HARD COPY**			
Direct plot	DIRECT PLOT START	PLS△Ø PRINT	——— ———	——— ———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (25/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Hard copy (cont)	**HARD COPY**			
• Controls hard copy.	**COPY CONTROL**			
Selects the printer.	PRINTER			
	BJ-M70(ESC/P)	PMOD△6	PMOD?	6
	HP-815C	PMOD△3	PMOD?	3
	BMP FORMAT (Monochrome)	PMOD△13	PMOD?	13
	BMP FORMAT (Color)	PMOD△14	PMOD?	14

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (26/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Measure function	**MEASURE**			
Sets the measure function to OFF.	MEASURE FUNCTION ALL OFF	MEAS△OFF	MEAS?	OFF
Display position of measured results	MEASURE WINDOW POSITION			
	UP LEFT	WINDPOS△UPLEFT	WINDPOS?	UPLEFT
	UP RIGHT	WINDPOS△UPRIGHT	WINDPOS?	UPRIGHT
	LOW LEFT	WINDPOS△LOWLEFT	WINDPOS?	LOWLEFT
	LOW RIGHT	WINDPOS△LOWRIGHT	WINDPOS?	LOWRIGHT
• Noise measurement	**NOISE MEASURE**			
Measures the noise.	NOISE MEASURE			
	OFF	MEAS△NOISE,OFF	――	――
		NLV△Ø	NLV?	Ø
	ON	MEAS△NOISE,ON	MEAS?	NOISE
		NLV△1	NLV?	1
	ABSOLUTE executed	MEAS△NOISE,ABS	MEAS?	NOISE
	C/N RATIO executed	MEAS△NOISE,CN	MEAS?	CN
	Transferring measured results (dBm/ch or dBm/Hz)	――	RES?	l
Calculation method	ABSOLUTE	MNOISE△ABS	MNOISE?	ABS
	C/N RATIO	MNOISE△CN	MNOISE?	CN
• Occupied frequency bandwidth measurement	**OBW MEASURE**			
Measures the occupied frequency bandwidth.	OBW MEASURE			
	Executes calculation.	MEAS△OBW,EXE	MEAS?	OBW
	Executes (X dB DOWN).	MEAS△OBW,XDB	MEAS?	OBW
	Executes (N%).	MEAS△OBW,N	MEAS?	OBW
	Transferring measured results (f1: Occupied bandwidth f2: Center frequency)	――	RES?	f1,f2
Calculation method	X dB DOWN method	MOBW△XDB	MOBW?	XDB
	N% method	MOBW△N	MOBW?	N
Sets the conditions of occupied frequency bandwidth.	OBW VALUE			
	x dB	OBWXDB△XDB	OBWXDB?	x
	n%	OBWN△n	OBWN?	n

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (27/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Measure function (Cont)	**MEASURE**			
• Adjacent channel measurement	**ADJACENT CH MEASURE**			
Measures the adjacent channel.	ADJACENT CH MEASURE			
	Executes calculation.	MEAS△ADJ,EXE	MEAS?	ADJ
	Executes (UNMODULATED CARRIER).	MEAS△ADJ,UNMD	MEAS?	ADJ
	Executes(MODULATED CARRIER)	MEAS△ADJ,MOD	MEAS?	ADJ
	Executes(INBAND)	MEAS△ADJ,INABAND	MEAS?	ADJ
	Transferring measured results (l_L1: CH1 lower sideband l_U1: CH1 upper sideband l_L2: CH2 lower sideband l_U2: CH2 upper sideband l_L3: CH3 lower sideband l_U3: CH3 upper sideband)	———	RES?	l_L1,l_U1 l_L2,l_U2 l_L3,l_U3
Selects the adjacent channel.	ADJACENT CH SELECT			
	BOTH SIDES	ADJCH△BOTH	ADJCH?	BOTH
	UPPER SIDE	ADJCH△UP	ADJCH?	UP
	LOWER SIDE	ADJCH△LOW	ADJCH?	LOW
	OFF	ADJCH△OFF	ADJCH?	OFF
Sets the adjacent channel bandwidth.	ADJACENT CH BANDWIDTH	ADJCHBW△f	ADJCHBW?	f
Sets adjacent channel 1 separation.	ADJACENT CH1 SEPARATION	ADJCHSP△f	ADJCHSP?	f
Sets adjacent channel 2 separation.	ADJACENT CH2 SEPARATION	ADJCHSPF△f	ADJCHSPF?	f
Sets adjacent channel 3 separation.	ADJACENT CH3 SEPARATION	ADJCHSPFF△f	ADJCHSPFF?	f
Selects the calculation method.	R:TOTAL POWER(MOD)	MADJMOD△MOD	MADJMOD?	MOD
	R:REF LEVEL (UNMOD)	MADJMOD△UNMD	MADJMOD?	UNMD
	R:INBAND	MADJMOD△INABAND	MADJMOD?	INBAND
Sets the graph display ON/OFF.	GRAPH			
	OFF	MADJGRAPH△OFF	MADJGRAPH?	OFF
	ON	MADJGRAPH△ON	MADJGRAPH?	ON
Inband ch Bandwidth Setting	INBAND:CH BANDWIDTH	ADJINBW△f	ADJINBW?	f

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (28/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Measure function	MEASURE			
• Adjacent channel measurement (Cont)	ADJACENT CH MEASURE			
Sets the channel center line display ON/OFF.	CHANNEL CENTER LINE			
	OFF	MADJCTRLN△OFF	MADJCTRLN?	OFF
	ON	MADJCTRLN△ON	MADJCTRLN?	ON
Sets the channel range line display ON/OFF.	CHANNEL BAND LINE			
	OFF	MADJBWLN△OFF	MADJBWLN?	OFF
	ON	MADJBWLN△ON	MADJBWLN?	ON
Sets the Inband ch range line display ON/OFF.	INBAND CHANNEL BAND LINE			
	OFF	MADJINBWLN△OFF	MADJINBWLN?	OFF
	ON	MADJINBWLN△ON	MADJINBWLN?	ON
• Template measurement	TEMPLATE			
Measures the template.	TEMPLATE MEASURE			
	OFF	MEAS△TEMP,OFF	———	———
	ON	MEAS△TEMP,ON	———	———
	CHECK TEMP	MEAS△TEMP,CHECK	MEAS?	TEMP
	Transferring measured results (c1:LIMIT1 check result) (c2:LIMIT2 check result)	———	RES?	c1,c2 (PASS=Ø, FAIL=1)
Moves the template.	TEMPLATE MOVE			
	MOVE X	TEMPMVX△t	TEMPMVX?	t
	MOVE Y	TEMPMVY△l	TEMPMVY?	l
	SAVE	TEMPMSV	———	———
	CANCEL	TEMPMCL	———	———
Selects the template.	SELECT TEMPLATE No.			
	1	TEMP△1	TEMP?	1
	2	TEMP△2	TEMP?	2
	3	TEMP△3	TEMP?	3
	4	TEMP△4	TEMP?	4
	5	TEMP△5	TEMP?	5

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (29/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Measure function	MEASURE			
• Template measurement (Cont)	TEMPLATE			
Selects the LIMIT line.	SELECT LIMIT LINE LIMIT1 UPPER OFF	TEMPSLCT△UP1,Ø	——	——
		TEMPSLCT△UP1,OFF	TEMPSLCT?UP1	OFF
	ON	TEMPSLCT△UP1,1	——	——
		TEMPSLCT△UP1,ON	TEMPSLCT?UP1	ON
	LIMIT2 UPPER OFF	TEMPSLCT△UP2,Ø	——	——
		TEMPSLCT△UP2,OFF	TEMPSLCT?UP2	OFF
	ON	TEMPSLCT△UP2,1	——	——
		TEMPSLCT△UP2,ON	TEMPSLCT?UP2	ON
	LIMIT1 LOWER OFF	TEMPSLCT△LW1,Ø	——	——
		TEMPSLCT△LW1,OFF	TEMPSLCT?LW1	OFF
	ON	TEMPSLCT△LW1,1	——	——
		TEMPSLCT△LW1,ON	TEMPSLCT?LW1	ON
	LIMIT2 LOWER OFF	TMPSLCT△LW2,Ø	——	——
		TMPSLCT△LW2,OFF	TEMPSLCT?LW2	OFF
	ON	TMPSLCT△LW2,1	——	——
		TMPSLCT△LW2,ON	TEMPSLCT?LW2	ON
• Power measurement	POWER MEASURE			
Measures the power.	POWER MEASURE MEASURE	MEAS△POWER,EXE	MEAS?	POWER
	Transferring measured results (l:dBm value w: pW value) (Valid only for Trace-Time)	——	RES?	l,w
Sets the Correction Factor.	Correction Factor	PWRFACT△l	PWRFACT?	l
Sets the point where power measurement starts.	POWER MEASURE START	PWRSTART△p	PWRSTART?	p
Sets the point where power measurement ends.	POWER MEASURE STOP	PWRSTOP△p	PWRSTOP?	p

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (30/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ **Measure function** (Cont)	**MEASURE**			
• **Mask measurement**	**MASK**			
Measures the mask.	MASK MEASURE			
	OFF	MEAS△MASK,OFF	———	———
	ON	MEAS△MASK,ON	———	———
	CHECK TEMP	MEAS△MASK,CHECK	MEAS?	MASK
	Result input c_1:LIMIT1 Check result c_2:LIMIT2 Check result	———	RES?	C1,C2 (PASS=Ø FAIL=1)
Moves the mask.	MASK MOVE			
	MOVE X	MASKMVX△f	MASKMVX?	f
	MOVE Y	MASKMVY△l	MASKMVY?	l
	SAVE	MASKMSV	———	———
	CANCEL	MASKMCL	———	———
Selects the mask.	SELECT MASK No.			
	1	MASK△1	MASK?	1
	2	MASK△2	MASK?	2
	3	MASK△3	MASK?	3
	4	MASK△4	MASK?	4
	5	MASK△5	MASK?	5

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (31/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Measure function	MEASURE			
• Mask measurement (Cont)	MASK			
Selects the LIMIT line.	SELECT LIMIT LINE			
	LIMIT1 UPPER			
	OFF	MASKSLCT△UP1,Ø	———	———
		MASKSLCT△UP1,OFF	MASKSLCT?UP1	OFF
	ON	MASKSLCT△UP1,1	———	———
		MASKSLCT△UP1,ON	MASKSLCT?UP1	ON
	LIMIT2 UPPER			
	OFF	MASKSLCT△UP2,Ø	———	———
		MASKSLCT△UP2,OFF	MASKSLCT?UP2	OFF
	ON	MASKSLCT△UP2,1	———	———
		MASKSLCT△UP2,ON	MASKSLCT?UP2	ON
	LIMIT1 LOWER			
	OFF	MASKSLCT△LW1,Ø	———	———
		MASKSLCT△LW1,OFF	MASKSLCT?LW1	OFF
	ON	MASKSLCT△LW1,1	———	———
		MASKSLCT△LW1,ON	MASKSLCT?LW1	ON
	LIMIT2 LOWER			
	OFF	MASKSLCT△LW2,Ø	———	———
		MASKSLCT△LW2,OFF	MASKSLCT?LW2	OFF
	ON	MASKSLCT△LW2,1	———	———
		MASKSLCT△LW2,ON	MASKSLCT?LW2	ON
• Template management function	MANAGE TEMPLATE			
Selects the template number.	SELECT TEMPLATE No.			
	1	MTEMP△1	MTEMP?	1
	2	MTEMP△2	MTEMP?	2
	3	MTEMP△3	MTEMP?	3
	4	MTEMP△4	MTEMP?	4
	5	MTEMP△5	MTEMP?	5
Selects the LIMIT line.	SELECT LIMIT LINE			
	LIMIT1 UPPER	MTEMPL△UP1	MTEMPL?	UP1
	LIMIT2 UPPER	MTEMPL△UP2	MTEMPL?	UP2
	LIMIT1 LOWER	MTEMPL△LW1	MTEMPL?	LW1
	LIMIT2 LOWER	MTEMPL△LW2	MTEMPL?	LW2

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (32/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Measure function	**MEASURE**			
• Template management function (Cont)	**MANAGE TEMPLATE**			
Sets the level data by distinguishing the relative value from the absolute value.	TEMPLATE LEVEL MODE			
	ABSOLUTE	MTEMPREL△OFF	MTEMPREL?	OFF
	RELATIVE	MTEMPREL△ON	MTEMPREL?	ON
Adds 1 point to template data.	INSERT TEMPLATE POINT DATA	MTEMPIN△p,t,l	———	———
Changes 1 point of template data.	REPLACE TEMPLATE POINT DATA	MTEMPRP△p,t,l	———	———
Reads 1 point of template data.	READ TEMPLATE POINT DATA	———	MTEMPPD?△p	t,l
Deletes 1 point of template data.	TEMPLATE POINT DATA DELETE	MTEMPDEL△p	———	———
Initializes the template data.	INITIATE LINE/TEMPLATE			
	LIMIT1 UPPER	MTEMPINI△UP1	———	———
	LIMIT2 UPPER	MTEMPINI△UP2	———	———
	LIMIT1 LOWER	MTEMPINI△LW1	———	———
	LIMIT2 LOWER	MTEMPINI△LW2	———	———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (33/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Measure function	**MEASURE**			
• Template management function (Cont)	**MANAGE TEMPLATE**			
Specifies how the template data is displayed.	DISPLAY TEMPLATE MODE			
	GRAPH	MTEMPDSP△GRAPH	MTEMPDSP?	GRAPH
	LIST	MTEMPDSP△LIST	MTEMPDSP?	LIST
Sets the template label.	TEMP LABEL	MTEMPLABEL△n, 'text'	MTEMPLABEL?n	text
• Mask management function	**MANAGE MASK**			
Selects the mask number.	SELECT MASK No.			
	1	MMASK△1	MMASK?	1
	2	MMASK△2	MMASK?	2
	3	MMASK△3	MMASK?	3
	4	MMASK△4	MMASK?	4
	5	MMASK△5	MMASK?	5
Selects the LIMIT line.	SELECT LIMIT LINE			
	LIMIT1 UPPER	MMASKL△UP1	MMASKL?	UP1
	LIMIT2 UPPER	MMASKL△UP2	MMASKL?	UP2
	LIMIT1 LOWER	MMASKL△LW1	MMASKL?	LW1
	LIMIT2 LOWER	MMASKL△LW2	MMASKL?	LW2
Sets the level data by distinguishing the relative value from the absolute value.	MASK LEVEL MODE			
	ABSOLUTE	MMASKREL△OFF	MMASKREL?	OFF
	RELATIVE	MMASKREL△ON	MMASKREL?	ON
Adds 1 point to mask data.	INSERT MASK POINT DATA	MMASKIN△p,t,l	———	———
Changes 1 point of mask data.	REPLACE MASK POINT DATA	MMASKRP△p,t,l	———	———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (34/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Measure function	**MEASURE**			
• Mask management function (Cont)	**MANAGE MASK**			
Reads 1 point of mask data.	READ MASK POINT DATA	———	MMASKPD?△p	t,l
Deletes 1 point of mask data.	DELETE MASK POINT DATA	MMASKDEL△p	———	———
Initializes the mask data.	INITIATE LINE/MASK			
	LIMIT1 UPPER	MMASKINI△UP1	———	———
	LIMIT2 UPPER	MMASKINI△UP2	———	———
	LIMIT1 LOWER	MMASKINI△LW1	———	———
	LIMIT2 LOWER	MMASKINI△LW2	———	———
Specifies how the mask data is displayed.	DISPLAY MASK MODE			
	GRAPH	MMASKDSP△GRAPH	MMASKDSP?	GRAPH
	LIST	MMASKDSP△LIST	MMASKDSP?	LIST
Sets the mask label.	MASK LABEL	MMASKLABEL△n, 'text'	MMASKLABEL?n	text
• Channel Power Measure	**Channel Power Measure**			
Measuring Channel Power	ON	MEAS△CHPWR,ON	MEAS?	CHPWR
	OFF	MEAS△CHPWR,OFF	———	———
Sets the Channel Power Average	Channel Power Average			
	OFF	CHAVG△Ø	———	———
		CHAVG△OFF	———	———
	ON	CHAVG△1	———	———
		CHAVG△ON	———	———
Average processes	n	CHAVG△n	CHAVG?	n
Sets the graph display ON/OFF.	GRAPH			
	OFF	CHPWRGRAPH△OFF	CHPWRGRAPH?	OFF
	ON	CHPWRGRAPH△ON	CHPWRGRAPH?	ON
Correction Factor	Correction Factor	CHPWRFACT△l	CHPWRFACT?	l

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (35/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Calibration	**CALIBRATION**			
Executes calibration with the internal CAL signal.	CALIBRATION			
	ALL	CAL△Ø	——	——
	FREQ	CAL△1	——	——
	LEVEL	CAL△2	——	——
	FM	CAL△3	——	——
	QP/EMC	CAL△4	——	——
Sets the frequency calibration function ON/OFF.	FREQ CAL			
	OFF	FCAL1Ø△Ø	FCAL1Ø?	Ø
	ON	FCAL1Ø△1	FCAL1Ø?	1
	PRESELECTOR TUNE			
	MANUAL	PRESEL△a	PRESEL?	a
	AUTO	PRESEL△AUTO PP	—— ——	—— ——
	PRESET	PRESEL△PRESET	——	——
■ RS-232C	**RS-232C**			
Sets the baud rate.	BAUD RATE			
	1200	BAUD△12ØØ	BAUD?	12ØØ
	2400	BAUD△24ØØ	BAUD?	24ØØ
	4800	BAUD△48ØØ	BAUD?	48ØØ
	9600	BAUD△96ØØ	BAUD?	96ØØ
	19200	BAUD△19200	BAUD?	19200
	38400	BAUD△38400	BAUD?	38400
	57600	BAUD△57600	BAUD?	57600
	115200	BAUD△115200	BAUD?	115200
Sets the parity.	PARITY			
	EVEN	PRTY△EVEN	PRTY?	EVEN
	ODD	PRTY△ODD	PRTY?	ODD
	OFF	PRTY△OFF	PRTY?	OFF
Sets the data bit.	DATA BIT			
	7bit	DATB△7	DATB?	7
	8bit	DATB△8	DATB?	8
Sets the stop bit.	STOP BIT			
	1bit	STPB△1	STPB?	1
	2bit	STPB△2	STPB?	2
Sets the period of reception time-out.	TIME OUT	TOUT△t	TOUT?	t

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (36/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Ethernet	**ETHERNET**			
My IP address	IP ADDRESS	IPADRS△n1,n2,n3,n4	IPADRS?	n1,n2,n3,n4
Net Mask address	NET MASK ADDRESS	NETMASK△n1,n2,n3,n4	NETMASK?	n1,n2,n3,n4
Gateway address	GATEWAY ADDRESS	GATEWAY△n1,n2,n3,n4	GATEWAY?	n1,n2,n3,n4
Host address	HOST ADDRESS	HOSTADRS△n1,n2,n3,n4	HOSTADRS?	n1,n2,n3,n4
Port address	PORT ADDRESS	PORTADRS△n	PORTADRS?	n
■ Title	**TITLE**			
Title entry	TITLE ENTRY	TITLE△'text'	TITLE?	text
		KSE△'text'	———	———
		TEN△x,y,'text'	———	———
Title display	TITLE DISPLAY			
	OFF	TTL△Ø	———	———
		TTL△OFF	TTL?	OFF
	ON	TTL△1	———	———
		TTL△ON	TTL?	ON
■ CAL/UNCAL	**CAL/UNCAL**			
Couple failure	UNCAL			
	UNCAL DISPLAY			
	OFF	UNC△Ø	———	———
		UNC△OFF	UNC?	UNC△OFF
	ON	UNC△1	———	———
		UNC△ON	UNC?	UNC△ON
	UNCAL STATUS			
	NORMAL	———	UCL?	UCL△Ø
	UNCAL	———	UCL?	UCL△1
■ Spectrum data	**SPECTRUM DATA**			
Trace A memory	TRACE-A MEMORY	XMA△p,b	XMA?△p,b	b
Trace B memory	TRACE-B MEMORY	XMB△p,b	XMB?△p,b	b
Trace BG memory	TRACE-BG MEMORY	XMG△p,b	XMG?△p,b	b
Trace TIME memory	TRACE-TIME MEMORY	XMT△p,b	XMT?△p,b	b
Selects ASCII/ Binary.	ASCII DATA	BIN△Ø	———	———
		———	———	
	BINARY DATA	BIN△1	———	———
		———	———	

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (37/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Others	ETC.			
Terminator	TERMINATOR			
	LF	TRM△Ø	——	——
	CR/LF	TRM△1	——	——
Performs level-3 initialization of measurement control parameters.	INITIALIZE	INI	——	——
		IP	——	——
		PRE	——	——
Partial initialization	PARTIAL PRESET			
	PRESET ALL	PINI△Ø	——	——
	PRESET SWEEP CONTLOL	PINI△1	——	——
	PRESET TRACE PARAMETER	PINI△2	——	——
	PRESET LEVEL PARAMETER	PINI△3	——	——
	PRESET FREQ/TIME PARAMETER	PINI△4	——	——
Buzzer switch Sets the built-in clock.	TIMER SET			
	DATE	DATE△yyyy,mm,dd	DATE?	yyyy,mm,dd
	TIME	TIME△hh,mm,ss	TIME?	hh,mm,ss
Calculates how long the device has been powered on.	TIME COUNT READ	——	TMCNT?	t(hr)
LCD display	LCD DISPLAY			
	OFF	DISPLAY△OFF	DISPLAY?	OFF
	ON	DISPLAY△ON	DISPLAY?	ON
Power-on state	POWER ON STATE			
	FIXED STATE (PRESET)	POWERON△IP	POWERON?	IP
	BEFORE POWER OFF	POWERON△LAST	POWERON?	LAST
	RECALL MEMORY	POWERON△n	POWERON?	n
Sets the NLP-1200	NLP-1200 CORRECTION	EXTLPF△OFF	EXTLPF?	OFF
		EXTLPF△ON	EXTLPF?	ON
Erase error message	ERASE ERROR MESSAGE	HOLD	——	——

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (38/46)

Parameter: Outline	Parameter: Control item	Program command	Query	Response
■ Others (Cont)	**ETC.**			
Time display	TIME DISPLAY			
	OFF	TIMEDSP△OFF	TIMEDSP?	OFF
	ON	TIMEDSP△ON	TIMEDSP?	ON
Selects the date display mode.	DATE DISPLAY MODE			
	YY/MM/DD	DATEMODE△YMD	DATEMODE?	YMD
	DD-MM-YY	DATEMODE△DMY	DATEMODE?	DMY
	MMM-DD-YY	DATEMODE△MDY	DATEMODE?	MDY
Selects the comment column display type.	COMMENT DISPLAY			
	FULL	COMMENT△FULL	COMMENT?	FULL
	TITLE	COMMENT△TITLE	COMMENT?	TITLE
	TIME	COMMENT△TIME	COMMENT?	TIME
	OFF	COMMENT△OFF	COMMENT?	OFF
Selects the display color pattern.	COLOR PATTERN			
	PATTERN-1	COLORPTN△COLOR1	COLORPTN?	COLOR1
	PATTERN-2	COLORPTN△COLOR2	COLORPTN?	COLOR2
	PATTERN-3	COLORPTN△COLOR3	COLORPTN?	COLOR3
	PATTERN-4	COLORPTN△COLOR4	COLORPTN?	COLOR4
	USER PATTERN	COLORPTN△USERCOLOR	COLORPTN?	USERCOLOR
Copies the display color pattern to the user pattern.	COPY COLOR PATTERN			
	PATTERN-1	COPYCOLOR△COLOR1	———	———
	PATTERN-2	COPYCOLOR△COLOR2	———	———
	PATTERN-3	COPYCOLOR△COLOR3	———	———
	PATTERN-4	COPYCOLOR△COLOR4	———	———
Adjusts brightness.	BRIGHTNESS ADJUST			
	SETTING	BRIGHT△n	BRIGHT?	n
	OFF	BRIGHT△OFF	BRIGHT?	OFF
Defines the user color pattern.	DEFINE USER COLOR	COLORDEF△ n,r,g,b	COLORDEF?△	n,r,g,b
Reads the error code.	READ OUT ERROR CODE	———	ERROR?	e1,e2
Erase Warm up message	ERASE WARM UP MESSAGE	ERASEWUP	———	———
			POWERON?	IP
Sets sweep time, automatically.	AUTO SWEEP TIME			
	FAST	ASWT△FAST	ASWT?	FAST
	NORMAL (HI-LEVEL AC CURACY)	ASWT△SLOW	ASWT?	SLOW
RGB output on rear panel	RGB OUTPUT			
	OFF	RGB△OFF	RGB?	OFF
	ON	RGB△ON	RGB?	ON
Buzzer	BUZZER			
	OFF	ALARM△OFF	ALARM?	OFF
	ON	ALARM△ON	ALARM?	ON

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (39/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Common command and event status	**GPIB COMMON COMMAND:EVENT STATUS**			
Clears the Status Byte Register.	CLEAR STATUS COMMAND	*CLS	———	———
Sets the bit in the Service Request Enable Register.	SERVICE REQUEST ENABLE	*SRE△n	*SRE?	n
Returns the current value of the Status Byte.	READ STATUS BYTE	———	*STB?	n
Executes single sweep.	TRIGGER COMMAND	*TRG	———	———
Executes the self test.	SELF TEST	———	*TST	n
Keeps the next command on standby during execution of a device command.	WAIT TO CONTINUE	*WAI	———	———
Returns the manufacturer name, model name, etc. of the product.	IDENTIFICATION QUERY	———	*IDN?	ANRITSU...
Perform a level-3 device reset.	RESET COMMAND	*RST	———	———
Synchronization mode between device and controller	OPERATION COMPLETE			
	WAITING FOR SERVICE REQUEST	*OPC	———	———
	WAITING FOR OUTPUT QUEUE IN DEVICE	———	*OPC?	1
Sets or clears the Standard Event Status Enable Register.	STANDARD EVENT ENABLE STATUS	*ESE△n	*ESE?	n
Reads the Standard Event Status Enable Register.	STANDARD EVENT STATUS REGISTER	———	*ESR?	n
Controls masking of the Extended Event Status.	EVENT STATUS ENABLE	ESE2△n	ESE2?	n
Reads the Extended Event Status.	EVENT STATUS REGISTER	———	ESR2?	n

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (40/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Frequency counter	**FREQUENCY COUNT**			
• Frequency measurement	**FREQ MEASURE**			
Measures the frequency.	FREQ MEASURE			
	OFF	MKC△Ø	MKC?	MKC△Ø
		MC△OFF	———	———
		MKFC△Ø	MKFC?	Ø
		MKFC△OFF	———	———
		MEAS△FREQ,OFF	———	———
	ON	MKC△1	MKC?	MKC△1
		MC△ON	———	———
		MKFC△1	MKFC?	1
		MKFC△ON	———	———
		MEAS△FREQ,ON	MEAS?	FREQ
	Transferring measured results	———	RES?	f
Sets the counter to the specified resolution.	COUNT RESOLUTION			
	1 Hz	CRS△Ø	CRS?	CRS△Ø
		MKFCR△1HZ	MKFCR?	1
	10 Hz	CRS△1	CRS?	CRS△1
		MKFCR△1ØHZ	MKFCR?	1Ø
	100 Hz	CRS△2	CRS?	CRS△2
		MKFCR△1ØØHZ	MKFCR?	1ØØ
	1 kHz	CRS△3	CRS?	CRS△3
		MKFCR△1KHZ	MKFCR?	1ØØØ
	FREQ UP	MKFCR△UP	———	———
	FREQ DOWN	MKFCR△DN	———	———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (41/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Trigger/gate sweep	**TRIGGER/GATE SWEEP**			
Gate function	GATE MODE			
	OFF	GATE△Ø	—	—
		GATE△OFF	GATE?	OFF
		GMD△Ø	GMD?	GMD△Ø
	ON	GATE△1	—	—
		GATE△ON	GATE?	ON
		GMD△1	GMD?	GMD△1
Sets the gate delay time.	GATE DELAY TIME	GD△t	GD?	t
		GDL△t	GDL?	GDL△t
Sets the gate length.	GATE LENGTH	GL△t	GL?	t
		GLN△t	GLN?	GLN△t
Sets internal or external termination of the gate interval.	GATE END			
	INTERNAL	GE△INT	GE?	INT
		GED△Ø	GED?	GED△Ø
	EXTERNAL	GE△EXT	GE?	EXT
		GED△1	GED?	GED△1
Sets the trigger mode (sets the trigger source/trigger switch).	TRIGGER MODE			
	FREERUN	TM△FREE	TM?	FREE
		TRG△Ø	TRG?	TRG△Ø
	VIDEO	TM△VID	TM?	VID
		TRG△1	TRG?	TRG△1
	LINE	TM△LINE	TM?	LINE
		TRG△2	TRG?	TRG△2
	EXT	TM△EXT	TM?	EXT
		TRG△3	TRG?	TRG△3
	WIDE IF VIDEO	TM△WIDEVID	TM?	WIDEVID
		TRG△7	TRG?	TRG△7
Sets the trigger switch.	TRIGGER SWITCH			
	FREERUN	TRGS△FREE	TRGS?	FREE
	TRIGGERD	TRGS△TRGD	TRGS?	TRGD
■ Sweep function	**SWEEP CONTROL**			
Sets the trigger source.	TRIGGER SOURCE			
	VIDEO	TRGSOURCE△VID	TRGSOURCE?	VID
	LINE	TRGSOURCE△LINE	TRGSOURCE?	LINE
	EXT	TRGSOURCE△EXT	TRGSOURCE?	EXT
	WIDE IF VIDEO	TRGSOURCE△WIDEVID	TRGSOURCE?	WIDEVID
Sets the external trigger level type (when the trigger source = EXT).	EXT TRIGGER TYPE			
	±10 V	EXTTYPE△1ØV	EXTTYPE?	1ØV
	TTL	EXTTYPE△TTL	EXTTYPE?	TTL

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (42/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Sweep function (Cont)	SWEEP CONTROL			
Sets the sweep trigger threshold level.	TRIGGER LEVEL	TRGLVL△l	TRGLVL?	l
		TLV△l	TLV?	TLV△l
Selects the sweep trigger slope.	TRIGGER SLOPE			
	RISE	TRGSLP△RISE	TRGSLP?	RISE
		TSL△1	TSL?	TSL△1
	FALL	TRGSLP△FALL	TRGSLP?	FALL
		TSL△Ø	TSL?	TSL△Ø
Sets the time-out period for the trigger sweep wait (this is also the time-out period of the GP-IB talker function).	SWEEP TIME OUT	GTOUT△t	GTOUT?	t
■ Y-OUT				
Selects the Y-Out amplitude	Y-OUT AMPLITUDE	YAMP△a	YAMP?	a
Selects the Y-Out polarity	Y-OUT POLARITY			
	POS	YPOL△POS	YPOL?	POS
	NEG	YPOL△NEG	YPOL?	NEG
Sets the Y-Out voltage offset	Y-OUT OFFSET	YOFFSET△a	YOFFSET?	a
■ RF preamplifier	RF PRE-AMP			
	OFF	PREAMP△OFF	PREAMP?	OFF
	ON	PREAMP△ON	PREAMP?	ON
■ GP-IB interface	GP-IB			
Sets the period for the trigger sweep wait time-out.	GPIB TIME OUT	GTOUT△t	GTOUT?	t
■ Memory Card	MEMORY CARD			
Saves the template data file.	SAVE TEMPLATE FILE	TEMPSAVE△n	———	———
Loads the template data file.	LOAD TEMPLATE FILE	TEMPLOAD△n	———	———

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (43/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Memory Card (Cont)	**MEMORY CARD**			
Saves the template data file in CSV format	SAVE TEMPLATE CSV FILE	SVCSVTMP△n	——	——
Loads the template data file in CSV format	LOAD TEMPLATE CSV FILE	RCCSVTMP△n	——	——
Saves the mask data file.	SAVE MASK FILE	MASKSAVE△n	——	——
Loads the mask data file.	LOAD MASK FILE	MASKLOAD△n	——	——
Saves the mask data file in CSV format	SAVE MASK CSV FILE	SVCSVMSK△n	——	——
Loads the mask data file in CSV format	LOAD MASK CSV FILE	RCCSVMSK△n	——	——
Saves the correction data file.	SAVE CORRECTION FILE	CORRSAVE△n	——	——
Loads the correction data file.	LOAD CORRECTION FILE	CORRLOAD△n	——	——
Saves the correction data file in CSV format	SAVE CORRECTION CSV FILE	SVCSVCOR△n	——	——
Loads the correction data file in CSV format	LOAD CORRECTION CSV FILE	RCCSVCOR△n	——	——
Saves the user antenna data file.	SAVE USERANTENNA FILE	ANTSAVE△n	——	——
Loads the user antenna data file.	LOAD USERANTENNA FILE	ANTLOAD△n	——	——
Saves the user antenna data file in CSV format	SAVE USER ANTENNA CSV FILE	SVCSVANT△n	——	——
Loads the user antenna data file in CSV format	LOAD USER ANTENNA CSV FILE	RCCSVANT△n	——	——
Saves the waveform data file in CSV format	SAVE WAVEFORM CSV FILE	SVCSVWAVE△n	——	——

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (44/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ EMC	EMC			
Antenna factor	ANTENNA FACTOR			
	OFF	ANT△5	ANT?	ANT△5
	DIPOLE	ANT△Ø	ANT?	ANT△Ø
	LOG-PERI (1)	ANT△1	ANT?	ANT△1
	LOG-PERI (2)	ANT△2	ANT?	ANT△2
	LOOP	ANT△3	ANT?	ANT△3
	USER1	ANT△4	ANT?	ANT△4
	USER2	ANT△6	ANT?	ANT△6
	USER3	ANT△7	ANT?	ANT△7
	USER4	ANT△8	ANT?	ANT△8
User antenna factor	USER ANTENNA FACTOR			
	SET TABLE DATA	ANTFACT△n,f,l	ANTFACT?△n	f,l
	CLEAR TABLE	ANTFCLR	———	———
	LOAD USER ANTENNA FACTOR	ANTLOAD△n	———	———
	SAVE USER ANTENNA FACTOR	ANTSAVE△n	———	———
	SELECT SETTING USER ANTENNA FACTOR TABLE NUMBER	UANTF△n	UNATF?	n
	USER ANTENNA FACTOR LABEL	ANTLABEL△n,'text'	ANTLABEL?	text
■ Signal Analysis	SIGINAL ANALYSIS			
Change Mode	SYSTEM MODE			
	SPECTRUM ANALYZER	PNLMD SPECT	PNLMD?	SPECT
	SIGNAL ANALYSIS	PNLMD SYSTEM	PNLMD?	SYSTEM
	CONFIGRATION	PNLMD CONFIG	PNLMD?	CONFIG
Change Measurement Software	SYSTEM CHANGE			
	SYSTEM-1	SYS△1	SYS?	1
	SYSTEM-2	SYS△2	SYS?	2
	SYSTEM-3	SYS△3	SYS?	3
Information of Measurement Software	SYSTEM VERSION	———	MCMSV?△n	text1,text2

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (45/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ External Mixer (Only MS2687B)	**External Mixer**			
Selection in the mixer mode	External Mixer MIXER MODE			
	INTERNAL	MXRMODE△INT	MXRMODE?	INT
	EXTERNAL	MXRMODE△EXT	MXRMODE?	EXT
Setting mixer bias	MIXER BIAS	MBIAS△n	MBIAS?	n
Setting conversion loss	CONVERSION LOSS	CNVLOSS△l	CNVLOSS?	l
Setting external mixer band	BAND SELECT			
	K: 18 to 26.5 GHz	FULBAND△K	FULBAND?	K
	A: 26.5 to 40.0 GHz	FULBAND△A	FULBAND?	A
	Q: 33.0 to 50.0 GHz	FULBAND△Q	FULBAND?	Q
	U: 40.0 to 60.0 GHz	FULBAND△U	FULBAND?	U
	V: 50.0 to 75.0 GHz	FULBAND△V	FULBAND?	V
	E: 60.0 to 90.0 GHz	FULBAND△E	FULBAND?	E
	W: 75.0 to 110.0 GHz	FULBAND△W	FULBAND?	W
	F: 90.0 to 140.0 GHz	FULBAND△F	FULBAND?	F
	D: 110.0 to 170.0 GHz	FULBAND△D	FULBAND?	D
	G: 140.0 to 220.0 GHz	FULBAND△G	FULBAND?	G
	J: 220.0 to 325.0 GHz	FULBAND△J	FULBAND?	J
Signal ID	SIGNAL IDENTIFIER			
	OFF	SIGID△0 SIGID△OFF	SIGID?	0
	ON	SIGID△1 SIGID△ON	SIGID?	1

Table of MS2681A/MS2683A/MS2687A/MS2687B Device Messages (46/46)

Parameter		Program command	Query	Response
Outline	Control item			
■ Power Meter Function (with MS2687A/B pt21, MS2687B Opt23 supplied)	**POWER METER**			
• Power Measurement				
Power Meter ON/ OFF	POWER METER			
	ON	PWRMTR△ON	PWRMTR?	ON
	OFF	PWRMTR△OFF	PWRMTR?	OFF
Measurment Range Switching	RANGE			
	1	PMRNG△1	PMRNG?	1
	2	PMRNG△2	PMRNG?	2
	3	PMRNG△3	PMRNG?	3
	4	PMRNG△4	PMRNG?	4
	5	PMRNG△5	PMRNG?	5
Range AUTO/ HOLD Switching	RANGE HOLD			
	HOLD	RNGHLD△HOLD	RNGHLD?	HOLD
	AUTO	RNGHLD△AUTO	RNGHLD?	AUTO
Measurement Value Readout	POWER METER RESPONSE			
	in dBm	———	PMRES?△DBM	n (0.01 dBm Resolution)
	in Relative	———	PMRES?△REL	n (0.01 dB Resolution)
	in Watt	———	PMRES?△W	n (Significant figure, 3 digits)
Setting of reference value in relative	SET RELATIVE	SETREL	———	———
• Measurement Parameter Setting				
Cal Factor Value	CALFACTOR	PMCALF△n (n = –10.00 to +10.00)	PMCALF?	n (n = –10.00 to +10.00)
Offset Level Value	LEVEL OFFSET	PMOFFSET△n (n = –100.00 to +100.00)	PMOFFSET?	n (n = –100.00 to +100.00)
Reference Factor Value	REFERENCE FACTOR	PMREFFACT△n (n = –100.00 to +100.00)	PMREFFACT?	n (n = –100.00 to +100.00)
Surveyratio of Power Meter	DUTY	DUTY△n (n = 0.01 to +100.0)	DUTY?	n (n = 0.01 to +100.0)
Average processing	AVERAGE			
	ON	PMAVG△ON	PMAVG?	ON
	OFF	PMAVG△OFF	PMAVG?	OFF
Average count	AVERAGE COUNT	PMAVGCNT△n (n = 2 to 10)	PMAVGCNT?	n (n = 2 to 10)
Initialization of measurement Power Meter	ALL CLEAR	PMALLCLR	———	———
• Calibration				
Execution of Power Meter Calibration	CAL	CALADJ	———	———
Execution of Zero Adjust	ZERO	ZEROADJ	———	———
Execution of Zero Calibration	ZERO CAL	ZEROCAL	———	———

Section 8 Detailed Description of Commands

This section describes the usable device and response messages in alphabetic order.

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

This section gives detailed descriptions of the device messages for MS2683A spectrum analyzer in alphabetical order.

Message name spelled out

Message headline

CNF

CNF Center Frequnecy

■ Function Sets the center frequency (same function as CF).

Program command message

Program query message

Response message

Header	Program command	Query	Response
CNF	CNF△f	CNF?	CNF△f f=-100000000 to 0 to 3000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f -100MHz to 3.0GHz

■ Suffix code

None:	Hz(10^0)
HZ:	Hz(10^0)
KHZ,KZ:	kHz(10^3)
MHZ,MZ:	MHz(10^6)
GHZ,GZ:	GHz(10^9)

• The data to the left of the colon is part of the program or response data
• The data is to the right of the colon.

■ Initial setting Value of f=1.50 GHz

Device-dependent initial setting value

■ Example

```
CNF△123456
CNF△5ØMHz
CNF?
```

■ Restrictions according to the model type and options

None

A1

A1 Trace A Write ON

■ Function Clears trace A waveform data to set the write mode to ON (same function as AWR△1/CLRW△TRA).

Header	Program command	Query	Response
A1	A1	———	———

■ Example A1

A2

A2 Trace A Max Hold

■ Function Controls writing of the waveform data to trace BG.

Header	Program command	Query	Response
A2	A2	———	———

■ Example A2

AAT

AAT RF Attenuator

■ Function Switches the RF attenuator setting mode to AUTO or MANUAL.

Header	Program command	Query	Response
AAT	AAT△sw	AAT?	AAT△sw

■ Value of sw Ø: MANUAL
1: AUTO
■ Suffix code None
■ Initial setting 1:AUTO
■ Example AAT△1

ADJCH

ADJCH Adjacent CH Select

■ Function Selects the subject channel to be calculated for an adjacent channel.

Header	Program command	Query	Response
ADJCH	ADJCH△a	ADJCH?	a

■ Value of a BOTH: BOTH SIDES
UP: UPPER SIDE
LOW: LOWER SIDE
OFF: OFF
■ Suffix code None
■ Initial setting BOTH: BOTH SIDES
■ Example ADJCH△BOTH
ADJCH△LOW

ADJCHBW

ADJCHBW Adjacent CH Bandwidth

■ Function Sets the bandwidth of the adjacent channel.

Header	Program command	Query	Response
ADJCHBW	ADJCHBW△f	ADJCHBW?	f f=10 to 1000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f 10 Hz to 1 GHz (10 Hz resolution. Data below 10 Hz is truncated.)
■ Suffix code None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)
■ Initial setting 8.5KHZ: 8.5 kHz
■ Example ADJCHBW△8.5KHZ

ADJCHSP

ADJCHSP Adjacent CH Sepalation

■ Function Sets the separation of adjacent channel 1.

Header	Program command	Query	Response
ADJCHSP	ADJCHSP△f	ADJCHSP?	f f=0 to 1000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f 0 Hz to 1 GHz (10 Hz resolution. Data below 10 Hz is truncated.)
■ Suffix code None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)
■ Initial setting 12.5KHZ: 12.5 kHz
■ Example ADJCHSP△12.5kHz

ADJCHSPF

ADJCHSPF Adjacent CH2 Separation

■ Function Sets the separation of adjacent channel 2.

Header	Program command	Query	Response
ADJCHSPF	ADJCHSPF△f	ADJCHSPF?	f f=0 to 1000000000 Transfers the data with no suffix code in unit of 1 Hz.

■ Value of f 0 Hz to 1 GHz (10 Hz resolution. Data below 10 Hz is truncated.)
■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)
■ Initial setting 12.5KHZ: 12.5 kHz
■ Example ADJCHSPF△12.5kHz

ADJCHSPFF

ADJCHSPFF Adjacent CH3 Separation

■ Function Sets the separation of adjacent channel 3.

Header	Program command	Query	Response
ADJCHSPFF	ADJCHSPFF△f	ADJCHSPFF?	f

■ Value of f 0 Hz to 1 GHz (10 Hz resolution. Data below 10 Hz is truncated.)
■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)
■ Initial setting 5ØKHZ: 50 kHz
■ Example ADJCHSPFF△50kHz

ADJINBW

ADJINBW Adjacent Inband CH Bandwidth

■ Function Sets the bandwidth of the adjacent inband channel

Header	Program command	Query	Response
ADJINBW	ADJINBW△f	ADJINBW?	f f=10 to 1000000000 Transfers the data with no suffix code in unit of 1 Hz.

■ Value of f 10 Hz to 1 GHz (10 Hz resolution, Data below 10 Hz is truncated)

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial setting 8.5KHZ: 8.5 kHz

■ Example ADJINBW△8.5kHz

ALARM

ALARM

■ Function Sets the buzzer that sounds when error occurs and at other times.

Header	Program command	Query	Response
ALARM	ALARM sw	ALARM?	sw

■ Value of sw
ON: Sets the buzzer to On.
OFF: Sets the buzzer to Off

■ Suffix code None

■ Initial setting ON: Sets the buzzer to On.

■ Example ALARM△ON

AMB

AMB A - B → A

■ Function Finds the difference between Trace-A and Trace B, and saves the result in Trace-A.

Header	Program command	Query	Response
AMB	AMB△sw	AMB?	sw sw=0,1

■ Value of sw 1,ON:On
Ø,OFF:Off
■ Suffix code None
■ Initial setting OFF
■ Example AMB△ON

AMBPL

AMBPL Normalize (A - B + DL → A)

■ Function Performs normalization (Trace-A - Trace-B + Display line level → Trace-A).

Header	Program command	Query	Response
AMBPL	AMBPL△sw	AMBPL?	sw

■ Value of sw 1,ON:On
Ø,OFF:Off
■ Suffix code None
■ Initial setting OFF
■ Example AMBPL△ON

AMD

AMD Trace A Storage Mode

■ Function Selects the mode for processing the trace A waveform.

Header	Program command	Query	Response
AMD	AMD△n	AMD	AMD△n

■ Value of n
Ø: NORMAL
1: MAXHOLD
2: AVERAGE
3: MINHOLD
4: CUMULATIVE
5: OVERWRITE
6: LINEAR AVERAGE

■ Suffix code None
■ Initial setting Ø: NORMAL
■ Example AMD△Ø

ANT

ANT Select Antenna Factor

■ Function Selects the antenna factor.

Header	Program command	Query	Response
ANT	ANT△n	ANT	ANT△n

■ Value of n
Ø: Dipole
1: Log-Peri(1)
2: Log-Peri(2)
3: loop
4: User1
5: OFF
6: User2
7: User3
8: User4

■ Suffix code None
■ Initial setting ANT△5: OFF
■ Example ANT△1

ANTFACT

ANTFACT User Antenna Factor Data

■ Function Sets the user antenna factor data.

Header	Program command	Query	Response
ANTFACT	ANTFACT△n,f,l	ANTFACT?△n	f,l

■ Value of n 0 to 149

■ Value of f 0 to 3.0 GHz (MS2681A)
0 to 7.9 GHz (MS2683A)
0 to 325 GHz (MS2687A/MS2687B)

■ Value of l –100.00 to 100.00 dB (0.01 dB step)

■ Suffix code
f: None : Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)
l: None : dB
DB : dB

■ Example
ANTFACT△Ø.1kHz, ØDB
ANTFACT△1, 1ØØØØ, -Ø.34
If $f_{n-1} < f_n < f_{n+1}$ is not satisfied when $n-1 < n < n+1$, an error occurs.

ANTFCLR

ANTFCLR Clear User Antenna Factor Data

■ Function Initializes the user antenna factor data.

Header	Program command	Query	Response
ANTFCLR	ANTFCLR	———	———

■ Example ANTFCLR

ANTLABEL

ANTLABEL User Antenna Factor Label

■ Function Controls writing of the user antenna factor label.

Header	Program command	Query	Response
ANTLABEL	ANTLABEL△n,text	ANTLABEL?n	text

■ Value of n 1 to 4 Number of the user antenna factor data table

■ Value of text Character string within 30 words enclosed by single or double quotes.

■ Suffix code None

■ Initial setting (None)

■ Example ANTLABEL△1,"Log-peri-High"

ANTLABEL△2,'ANTENNAØ1'

ANTLOAD

ANTLOAD Load User Antenna Factor

■ Function Loads the user antenna facter data to memory card.

Header	Program command	Query	Response
ANTLOAD	ANTLOAD△n	———	———

■ Value of n 1 to 99
■ Suffix code None
■ Example ANTLOAD△1

ANTSAVE

ANTSAVE Save User Antenna Factor

■ Function Saves the user antenna facter data to memory card.

Header	Program command	Query	Response
ANTSAVE	ANTSAVE△n	———	———

■ Value of n 1 to 99
■ Suffix code None
■ Example ANTSAVE△1

APB

APB A + B → A

■ Function Adds Trace-A and Trace-B waveform data, and stores the result in Trace-A.

Header	Program command	Query	Response
APB	APB	———	———

■ Example APB

ARB

ARB Resolution Bandwidth

■ Function Switches the mode for setting the resolution bandwidth to AUTO or MANUAL.

Header	Program command	Query	Response
ARB	ARB△sw	ARB?	ARB△sw

■ Value of sw Ø: MANUAL
1: AUTO

■ Suffix code None

■ Initial setting 1: AUTO

■ Example ARB△Ø
ARB△1

AST

AST Sweep Time

■ Function Switches the mode for setting the frequency sweep time to AUTO or MANUAL.

Header	Program command	Query	Response
AST	AST△sw	AST?	AST△sw

■ Value of sw Ø: MANUAL
1: AUTO

■ Suffix code None

■ Initial setting 1: AUTO

■ Example AST△Ø
AST△1

ASWT

ASWT Auto Sweep Time

■ Function Sets auto sweep time.

Header	Program command	Query	Response
ASWT	ASWT△n	ASWT?	n

■ Value of n FAST: FAST
SLOW: NORMAL

■ Suffix code None

■ Initial setting SLOW: NORMAL

■ Example ASWT△FAST

AT

AT RF Attenuator

■ Function Sets the RF attenuator.

Header	Program command	Query	Response
AT	AT△a AT△n	AT?	n

■ Value of a
AUTO: AUTO
UP: UP
DN: DOWN

■ Value of n
[MS2681A/MS2683A]
Ø to 62 (2step): 0 to 62 dB (2 dB step mode)
Ø to 6Ø(1Østep): 0 to 60 dB (10 dB step mode)
[MS2687A]
Ø to 70(10step): 0 to 70 dB

■ Suffix code
None: dB
DB : dB

■ Initial setting ATT=Calculated value when AUTO is selected for ATT

■ Example
AT△1Ø
AT△5Ø

ATB

ATB Trace-A → Trace-B

■ Function Copies the waveform data of Trace-A onto Trace-B.

Header	Program command	Query	Response
ATB	ATB	————	————

■ Example ATB

ATT

ATT RF Attenuator

■ Function Sets the RF attenuator.

Header	Program command	Query	Response
ATT	ATT△n	ATT?	ATT△n

■ Value of n

Ø:	0 dB	18:	8 dB	29:	36 dB
1:	10 dB	19:	12 dB	3Ø:	38 dB
2:	20 dB	2Ø:	14 dB	31:	42 dB
3:	30 dB	21:	16 dB	32:	44 dB
4:	40 dB	22:	18 dB	33:	46 dB
5:	50 dB	23:	22 dB	34:	48 dB
12:	60 dB	24:	24 dB	36:	52 dB
13:	70 dB	25:	26 dB	37:	54 dB
15:	2 dB	26:	28 dB	38:	58 dB
16:	4 dB	27:	32 dB	39:	62 dB
17:	6 dB	28:	34 dB		

■ Suffix code None
■ Initial setting Calculated value when AUTO is selected for ATT
■ Example ATT△1

ATUN

ATUN Auto Tune

■ Function

Detects the maximum peak point in the specified frequency band of the BG (background) band, and displays its spectrum in the center of the screen in CENTER-SPAN mode.

Header	Program command	Query	Response
ATUN	ATUN	———	———

■ Example

ATUN

AUNITS

AUNITS Unit for Log Scale

■ Function

Sets the display units when the LOG scale is selected.

Header	Program command	Query	Response
AUNITS	AUNITS△a	AUNITS?	a

■ Value of a

DBM : dBm
DBUV: dBμV
DBMV: dBmV
DBUVE: dBmV(emf)
V: V
W: W
DBUVM: dBμV/m

■ Suffix code None

■ Initial setting DBM: dBm (provided the address already allocated is not initialized)

■ Example

AUNITS△DBM
AUNITS△V

AUTO

AUTO Coupled Function All Auto

■ Function Executes all coupled functions (RBW, VBW, SWT, and ATT) in AUTO mode.

Header	Program command	Query	Response
AUTO	AUTO	————	————

■ Example AUTO

AVB

AVB Video Bandwidth

■ Function Switches the mode for setting the video bandwidth to AUTO or MANUAL.

Header	Program command	Query	Response
AVB	AVB△n	AVB?	AVB△n

■ Value of n
Ø: MANUAL
1: AUTO
2: OFF

■ Suffix code None

■ Initial setting 1: AUTO

■ Example
AVB△Ø
AVB△1

AVGPAUSE

AVGPAUSE Average Sweep Mode

■ Function

Specifies the processing (pause or continue) executed after the specified average sweeps.

Header	Program command	Query	Response
AVGPAUSE	AVGPAUSE△sw	AVGPAUSE?	sw sw=ON,OFF

■ Value of sw

Ø,OFF : Continue
1,ON : Pause

■ Suffix code None

■ Initial setting ON : Pause

■ Example AVGPAUSE△ON

AVR

AVR Number of Trace Average

■ Function

Sets the averaging rate (number of sweep repetitions).

Header	Program command	Query	Response
AVR	AVR△n	AVR?	AVR△n

■ Value of n

Ø:	4 times	5:	2 times
1:	8 times	6:	64 times
2:	16 times	7:	512 times
3:	32 times	8:	1024 times
4:	128 times		

■ Suffix code None

■ Initial setting 1: 8 times

■ Example

AVR△Ø
AVR△3

AWR

AWR Trace A Write Switch

■ Function Controls writing of the waveform data to trace A.

Header	Program command	Query	Response
AWR	AWR△sw SW=ON,1,OFF,0	AWR?	AWR△sw sw=ON,OFF

■ Value of sw 1,ON: TRACE A WRITE ON (same function as CLRW△TRA)
Ø,OFF: TRACE A WRITE OFF (same function as VIEW△TRA)
■ Suffix code None
■ Initial setting 1: TRACE A WRITE ON
■ Example AWR△Ø

AXB

AXB Exchange Trace-A and Trace-B

■ Function Exchanges the waveform data of Trace-A and Trace-B.

Header	Program command	Query	Response
AXB	AXB	———	———

■ Example AXB

B1

B1 Trace B Write ON

■ Function Clears the trace B waveform data to set the write mode to ON (same function as BWR△1, CLRW△TRB).

Header	Program command	Query	Response
B1	B1	————	————

■ Example `B1`

B2

B2 Trace B Max Hold

■ Function Allows the trace B waveform to be processed in MAX HOLD mode (same function as BMD△1).

Header	Program command	Query	Response
B2	B2	————	————

■ Example `B2`

BAUD

BAUD Baud rate

■ Function Changes the baud rate of the RS232C.

Header	Program command	Query	Response
BAUD	BAUD△n	BAUD?	n

■ Value of n
1200:1200 BPS
2400:2400 BPS
4800:4800 BPS
9600:9600 BPS
19200:19.2 KBPS
38400:38.4 KBPS
57600:57.6 KBPS
115200:115.2 KBPS

■ Suffix code None

■ Initial setting 9600:9600 BPS

■ Example BAUD△9600

BGWR

BGWR Trace BG Write Switch

■ Function Controls writing of the waveform data to trace BG.

Header	Program command	Query	Response
BGWR	BGWR△sw	BGWR?	BGWR△sw sw=ON,OFF

■ Value of sw
1,ON: TRACE BG WRITE ON (same function as CLRW△TRBG)
0,OFF: TRACE BG WRITE OFF (same function as VIEW△TRBG)

■ Suffix code None

■ Initial setting ON: TRACE BG WRITE ON

■ Example BGWR△ON

BIN

BIN ASCII / Binary Data Out

■ Function Sets the format of output trace data to ASCII or BINARY.

Header	Program command	Query	Response
BIN	BIN△sw	BIN?	sw sw=ON, OFF

■ Value of sw
Ø,OFF: ASCII
1,ON: BINARY

■ Suffix code None

■ Initial setting Ø: ASCII

■ Example
BIN△Ø
BIN△ON

BMD

BMD Trace B Storage Mode

■ Function Selects the mode for processing the trace B waveform.

Header	Program command	Query	Response
BMD	BMD△n	BMD?	BMD△n

■ Value of n
Ø: NORMAL
1: MAX HOLD
2: AVERAGE
3: MIN HOLD
4: CUMULATIVE
5: OVER WRITE
6: LINEAR AVERAGE

■ Suffix code None

■ Initial setting Ø: NORMAL

■ Example BMD△Ø

BND

BND Band Select

■ Function Sets the frequency band.

Header	Program command	Query	Response
BND	BND△n	BND?	BND△n

■ Value of n

[MS2683A]	Ø:	BAND AUTO=	0 Hz to 7.9 GHz
	1:	BAND 0=	0 Hz to 3.2 GHz
	2:	BAND 1^-=	3.15 to 6.3 GHz
	3:	BAND 1^+=	6.2 to 7.9 GHz
	8:	BAND 1^-L=	1.6 to 3.2 GHz
[MS2687A]	Ø:	BAND AUTO=	0 Hz to 30.0 GHz
	1:	BAND 0=	0 Hz to 3.2 GHz
	2:	BAND 1^-=	3.15 to 6.3 GHz
	3:	BAND 1^+=	6.2 to 7.9 GHz
	4:	BAND 2^+=	7.8 to 15.2 GHz
	5:	BAND 3^+=	15.1 to 22.5 GHz
	6:	BAND 4^+=	22.4 to 30.0 GHz
[MS2687A Opt22 loading]	0:	BAND AUTO=	0 Hz to 30.0 GHz
	1:	BAND 0=	0 Hz to 3.2 GHz
	2:	BAND 1^-=	3.15 to 5.8 GHz
	3:	BAND 1^+=	5.7 to 7.9 GHz
	4:	BAND 1^{++}=	7.8 to 14.05 GHz
	5:	BAND 2^-=	14.0 to 26.5 GHz
	6:	BAND 3^-=	26.4 to 30.0 GHz
[MS2687B]	Ø:	BAND AUTO=	0 Hz to 30.0 GHz
	1:	BAND 0=	0 Hz to 3.2 GHz
	2:	BAND 1^-=	3.15 to 6.3 GHz
	3:	BAND 1^+=	6.2 to 7.9 GHz
	4:	BAND 2^+=	7.8 to 15.3 GHz
	6:	BAND 4^+=	15.2 to 30.0 GHz

■ Suffix code None

■ Initial configuration value

[MS2683A]	0:	BAND AUTO=	0 Hz to 7.9 GHz
[MS2687A/MS2687B]	0:	BAND AUTO=	0 Hz to 30.0 GHz

■ Example

```
BND△Ø
BND△3
```

■ Restrictions by apparatus and the option

- This command is effective about MS2683A and MS2687A/B.
- n=8 is effective when equipped with an option 03 “Extension of pre-selctor lower limit to 1.6 GHz”.

BNDC

BNDC Band Select

■ Function Sets the frequency band.

Header	Program command	Query	Response
BNDC	BNDC△a a=AUTO,0,1^-,1^+,1^-L,2^+,3^+,4^+ 1^{++},2^-,3^-	BNDC?	a a=AUTO,0,1^-,1^+,1^-L,2^+,3^+,4^+ 1^{++},2^-,3^-

■ Value of n

[MS2683A]	AUTO:	BAND AUTO=	0 Hz to 7.9 GHz
	Ø:	BAND 0=	0 Hz to 3.2 GHz
	1^-L:	BAND 1^-=	1.6 to 3.2 GHz
	1^-:	BAND 1^+=	3.15 to 6.3 GHz
	1^+:	BAND 1^-L=	6.2 to 7.9 GHz
[MS2687A]	AUTO:	BAND AUTO=	0 Hz to 30.0 GHz
	Ø:	BAND 0=	0 Hz to 3.2 GHz
	1^-:	BAND 1^-=	3.15 to 6.3 GHz
	1^+:	BAND 1^+=	6.2 to 7.9 GHz
	2^+:	BAND 2^+=	7.8 to 15.2 GHz
	3^+:	BAND 3^+=	15.1 to 22.5 GHz
	4^+:	BAND 4^+=	22.4 to 30.0 GHz
[MS2687A Opt22 loading]	AUTO:	BAND AUTO=	0 Hz to 30.0 GHz
	0:	BAND 0=	0 Hz to 3.2 GHz
	1-:	BAND 1^-=	3.15 to 5.8 GHz
	1+:	BAND 1^+=	5.7 to 7.9 GHz
	1++:	BAND 1^{++}=	7.8 to 14.05 GHz
	2-:	BAND 2-=	14.0 to 26.5 GHz
	3-:	BAND 3^-=	26.4 to 30.0 GHz
[MS2687B]	AUTO:	BAND AUTO=	0 Hz to 30.0 GHz
	Ø:	BAND 0=	0 Hz to 3.2 GHz
	1^-:	BAND 1^-=	3.15 to 6.3 GHz
	1^+:	BAND 1^+=	6.2 to 7.9 GHz
	2^+:	BAND 2^+=	7.8 to 15.3 GHz
	4^+:	BAND 4^+=	15.2 to 30.0 GHz

■ Suffix code None

■ Initial configuration value

[MS2683A]	AUTO:	BAND AUTO=	0 Hz to 7.9 GHz
[MS2687A/MS2687B]	AUTO:	BAND AUTO=	0 Hz to 30.0 GHz

■ Example `BND△1+`

■ Restrictions by apparatus and the option

- This command is effective about MS2683A and MS2687A/B.
- a=1^-L is effective when equipped with an option 03 “Extension of pre-selctor lower limit to 1.6 GHz”.

BNDSP

BNDSP Pre-selector start frequency

■ Function Sets the start frequency of the pre-selector

Header	Program command	Query	Response
BNDSP	BNDSP△sw	BNDSP?	sw

■ Value of sw
- ON: Pre-selector start frequency is 1.6 GHz
- OFF: Pre-selector start frequency is 3.15 GHz

■ Suffix code None

■ Initial Setting OFF: Pre-selector start frequency is 3.15 GHz

■ Example BNDSP△ON

■ Restrictions according to model type and option

This command is effective when equiped with the option 03 “Extension of pre-selctor lower limit to 1.6 GHz” of MS2683A.

BRIGHT

BRIGHT Adjust Brightness

■ Function Selects the LCD display brightness.

Header	Program command	Query	Response
BRIGHT	BRIGHT△n BRIGHT△OFF	BRIGHT?	n OFF

■ Value of n 1 to 5

■ Suffix code None

■ Initial Setting 5

■ Example BRIGHT△3

BSAUTO

BSAUTO BW / SWT Auto

■ Function Allows RBW, VBW, and the sweep time to be set in AUTO mode.

Header	Program command	Query	Response
BSAUTO	BSAUTO	————	————

■ Example BSAUTO

BTA

BTA Trace-B → Trace-A

■ Function Copies the data of the Trace-B waveform to Trace-A.

Header	Program command	Query	Response
BTA	BTA	————	————

■ Example BTA

BWR

BWR Trace B Write Switch

■ Function Controls writing of the waveform data to trace B.

Header	Program command	Query	Response
BWR	BWR△sw	BWR?	BWR△sw sw=ON,OFF

■ Value of sw 1,ON: TRACE B WRITE ON (same function as CLRW△TRB)
Ø,OFF: TRACE B WRITE OFF (same function as VIEW△TRG)
■ Suffix code None
■ Initial setting 1: TRACE B WRITE ON
■ Example BWR△Ø

C1

C1   0A - B Off

■ Function   Turns the A-B function to OFF.

Header	Program command	Query	Response
C1	C1	———	———

■ Example   C1

C2

C2   A - B On

■ Function   Turns the A-B function to ON.

Header	Program command	Query	Response
C2	C2	———	———

■ Example   C2

CA

CA RF Attenuator Auto

■ Function Sets the attenuator to AUTO mode (same function as AAT1, AT△AUTO).

Header	Program command	Query	Response
CA	CA	————	————

■ Example CA

CAL

CAL Calibration

■ Function Performs calibration using the internal CAL signal.

Header	Program command	Query	Response
CAL	CAL△n	————	————

■ Value of n
Ø: All
1: Frequency
2: Level

■ Suffix code None

■ Example CAL△Ø

CALADJ

CALADJ Cal

■ Function Power meter is rectified in the signal input of 50 MHz 0 dBm.

Header	Program command	Query	Response
CALADJ	CALADJ	———	———

■ Example CALADJ

■ Restrictions by apparatus and the option

This command is effective about MS2687A/B Option21/23 Power Meter.

CDT

CDT Set Correction factor on

■ Function Controls correction of the frequency characteristics.

Header	Program command	Query	Response
CDT	CDT△sw	CDT?	CDT△sw SW=0,1

■ Value of sw Ø,OFF: Off
1,ON: On

■ Suffix code None

■ Initial setting Ø: Off

■ Example CDT△1

CF

CF Center Frequency

■ Function Sets the center frequency (same function as CNF).

Header	Program command	Query	Response
CF	CF△f CF△a	CF?	f f=–100000000 to 3000000000, =–100000000 to 7900000000 =–100000000 to 30000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] –100 MHz to 3.0 GHz
[MS2683A] –100 MHz to 7.9 GHz
[MS2687A/MS2687B] –100 MHz to 30.0 GHz

■ Value of a
UP: CENTER FREQSTEP UP (same function as FUP)
DN: CENTER FREQSTEP DOWN (same function as FDN)

■ Suffix code
f: None: Hz(10^0)
HZ: HZ(10^0)
KHZ,KZ kHz(10^3)
MHZ,MZ MHz(10^6)
GHZ,GZ GHz(10^9)
a: None

■ Initial cofiguration value
[MS2681A] 1.5 GHz
[MS2683A] 3.95 GHz
[MS2687A/MS2687B] 15 GHz

■ Example
CF△1235456
CF△5ØMHz
CF△UP

CHAVG

CHAVG Channel Power Average

■ Function Sets the Average function ON/OFF of Channel Power measurement.

Header	Program command	Query	Response
CHAVG	CHAVG△sw △n	CHAVG?	n

■ Value of sw
Ø,OFF: Channel Power Average Off
1,ON: Channel Power Average On

■ Value of n 2 to 1024 Nunber of average processes

■ Initial setting 8: 8 times

■ Example
CHAVG△ON
CHAVG△128

CHPWRFACT

CHPWRFACT Channel Power Correction Factor

■ Function Sets the Channel power correction factor.

Header	Program command	Query	Response
CHPWRFACT	CHPWRFACT△l	CHPWRFACT?	l

■ Value of l –99.99 to 99.99 dB
■ Suffix code None: dB
DB, DBM, DM: dB
■ Initial setting Ø: 0 dB
■ Example CHPWRFACT△-2.5DB

CHPWRGRAPH

CHPWRGRAPH Channel Power Graph

■ Function Displays the Graph of Channel Power Measure.

Header	Program command	Query	Response
CHPWRGRAPH	CHPWRGRAPH△sw	CHPWRGRAPH?	sw

■ Value of sw 1,ON: On
Ø,OFF: Off
■ Suffix code None
■ Initial setting OFF
■ Example CHPWRGRAPH△ON

CLRW

CLRW Clear & Write

■ Function Clears the trace waveform data to set the write mode to ON.

Header	Program command	Query	Response
CLRW	CLRW△tr	———	———

■ Value of tr TRA: Trace A (same function as AWR△1)
TRB: Trace B (same function as BWR△1)
TRBG: Trace BG (same function as BGWR△1)
TRTIME: Trace TIME (same function as TMWR△1)
■ Example CLRW△TRA

CMK?

CMK? Current Marker Position

■ Function Reads the current marker position.

Header	Program command	Query	Response
CMK?	————	CMK?	CMK△p

■ Value of p 0 to 500, 1000

■ Example `CMK?`

CNF

CNF Center Freqency

■ Function Sets the center frequency (same function as CF).

Header	Program command	Query	Response
CNF	CNF△f	CNF?	CNF△f f=–100000000 to 3000000000, =–100000000 to 7900000000 =–100000000 to 30000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] –100 MHz to 3.0 GHz
[MS2683A] –100 MHz to 7.9 GHz
[MS2687A/MS2687B] –100 MHz to 30.0 GHz

■ Suffix code
None : Hz(10^0)
HZ: HZ(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial cofiguration value
[MS2681A] 1.5 GHz
[MS2683A] 3.95 GHz
[MS2687A/MS2687B] 15 GHz

■ Example
```
CNF△123456
CNF△5ØMHZ
CNF?
```

CNVLOSS

CNVLOSS Ext Mixer Conversion Loss

■ Function Sets the conversion loss of an external mixer.

Header	Program command	Query	Response
CNVLOSS	CNVLOSS△l	CNVLOSS?	l l=0.00 to 99.99

■ Value of l 0.00 to 99.99 (0.01 dB Resolution)
■ Suffix code None: dB
DB: dB
■ Initial cofiguration value
15.00: 15.00 dB
■ Example CNVLOSS△99.99DB
CNVLOSS?
■ Restrictions by apparatus and the option
- This command is effective about MS2687A/B.

COLORDEF

COLORDEF Define user color pattern

■ Function Sets each frame color of user definition patterns.

Header	Program command	Query	Response
COLORDEF	COLORDEF△n,r,g,b	COLORDEF?△n	r,g,b

■ Value of n 0 to 32: Frame number
■ Value of r,g,b 0 to 15: Strength of the display color of r (red), g (green), and b (blue)
■ Suffix code None
■ Initial setting Set value of color pattern 1
■ Example COLORDEF△1,15,10,5

COLORPTN

COLORPTN Color pattern

■ Function Selects the display color from the display color patterns.

Header	Program command	Query	Response
COLORPTN	COLORPTN△a	COLORPTN?	a

■ Value of a
COLOR1: Color pattern-1
COLOR2: Color pattern-2
COLOR3: Color pattern-3
COLOR4: Color pattern-4
USERCOLOR: User definition pattern

■ Suffix code None

■ Initial setting COLOR1: Color pattern-1

■ Example COLORPTN△USERCOLOR

COMMENT

COMMENT Comment display

■ Function Sets the display method for the comment column.

Header	Program command	Query	Response
COMMENT	COMMENT△a	COMMENT?	a

■ Value of a
FULL: Displays the title and time.
TITLE: Displays the title.
TIME: Displays the time.
OFF: No comment is displayed .

■ Suffix code None

■ Initial setting OFF: No comment is displayed.

■ Example COMMENT△TITLE

CONTS

CONTS Continuous Sweep Mode

■ Function Sets the sweep mode to continuous mode (same function as S1).

Header	Program command	Query	Response
CONTS	CONTS	————	————

■ Example `CONTS`

COPYCOLOR

COPYCOLOR Copy into user pattern from Color pattern

■ Function Selects the display color pattern, and copies it to the user definition pattern.

Header	Program command	Query	Response
COPYCOLOR	COPYCOLOR△a	————	————

■ Value of a
```
COLOR1:  Color pattern 1
COLOR2:  Color pattern 2
COLOR3:  Color pattern 3
COLOR4:  Color pattern 4
```

■ Suffix code None

■ Example `COPYCOLOR△COLOR4`

CORC

CORC Correction Factor Initialization

■ Function

Initializes the correction factor currently selected by the CORR command.

Header	Program command	Query	Response
CORC	CORC	————	————

■ Example

CORC

All frequency data and level data are initialized. The initialized data is used as the 0 dB correction values in each frequency range.

CORD

CORD Correction Factor Entry

■ Function

Registers the correction factor currently selected by the CORR command.
If the correction factor is set to OFF, it is not valid.

Header	Program command	Query	Response
CORD	CORD△n,f,l n=0 to 149 f=0 to 400GHz l=-100.00 to +100.00dB (incremented in 0.01 dB steps)	CORD?△n	CORD△f,l f = 0 to 400 000 000 000 (no units) l= -100.00 to +100.00 dB (incremented in 0.01 steps)

■ Value of n 0 to 149

■ Value of f 0 to 400 GHz

■ Value of l –100.00 to +100.00 dB (incremented in 0.01 dB steps)

■ Suffix code

f:	None:	Hz(10^0)
	HZ:	HZ(10^0)
	KHZ,KZ:	kHz(10^3)
	MHZ,MZ:	MHz(10^6)
	GHZ,GZ:	GHz(10^9)
l:	None:	dB
	DB:	dB

■ Example

CORD△Ø,1MHZ,1Ø
CORD△1,2ØØØØØ,1Ø

If fn - 1<fn<fn + 1 is not satisfied when n-1<n<n+1, an error occurs.

CORR

CORR Correction Factor Select

■ Function Selects the type of correction factor.

Header	Program command	Query	Response
CORR	CORR△n	CORR?	CORR△n

■ Value of n
Ø,OFF: OFF
ON: ON
1: CORR1
2: CORR2
3: CORR3
4: CORR4
5: CORR5

■ Suffix code None

■ Initial setting Ø: OFF (the correction factor already registered is not initialized)

■ Example
CORR△Ø
CORR△2
CORR△4

CORRLABEL

CORRLABEL Correction Factor Label

■ Function Registers the name of the correction factor currently selected by the CORR command.

Header	Program command	Query	Response
CORRLABEL	CORRLABEL△n,text	CORRLABEL?△n	"text"

■ Value of n 1 to 5

■ Value of text String of up to 30 characters enclosed by single or double quotes.

■ Suffix code None

■ Example
CORRLABEL△1,"CORRECTION FACTOR"
CORRLABEL△2,'MS2683A'

CORRLOAD

CORRLOAD Load Correction data

■ Function Reads the correction data from the memory card file.

Header	Program command	Query	Response
CORRLOAD	CORRLOAD△n	————	————

■ Value of n 1 to 999
■ Suffix code None
■ Example CORRLOAD△1

CORRSAVE

CORRSAVE Save Correction data

■ Function Saves the internal correction data to the memory card.

Header	Program command	Query	Response
CORRSAVE	CORRSAVE△n	————	————

■ Value of n 1 to 999
■ Suffix code None
■ Example CORRSAVE△1

CR

CR Resolution Bandwidth Auto

■ Function Sets the resolution bandwidth selection to the AUTO mode (same function as ARBV△1, RB△AUTO).

Header	Program command	Query	Response
CR	CR	————	————

■ Example CR

CRS

CRS Count Resolution

■ Function Selects the resolution of the frequency counter.

Header	Program command	Query	Response
CRS	CRS△n	CRS?	CRS△n

■ Value of n
Ø: 1Hz
1: 10Hz
2: 100Hz
3: 1kHz

■ Suffix code None

■ Initial setting 3: 1kHz

■ Example
CRS△Ø
CRS△3

CT

CT Sweep Time Auto

■ Function

Sets the frequency sweep time to AUTO mode
(same function as AST△1, ST△AUTO).

Header	Program command	Query	Response
CT	CT	————	————

■ Example

CT

CV

CV Video Bandwidth Auto

■ Function

Sets the video bandwidth to AUTO mode
(same function as AVB△1, VB△AUTO).

Header	Program command	Query	Response
CV	CV	————	————

■ Example

CV

DATB

DATB Data bit

■ Function Specifies the data length of the RS232C.

Header	Program command	Query	Response
DATB	DATB△n	DATB?	n

■ Value of n 7: 7 bit
8: 8 bit
■ Suffix code None
■ Initial setting 8: 8 bit
■ Example DATB△7

DATE

DATE Date

■ Function Sets the built-in clock of the spectrum analyzer to the specified date.

Header	Program command	Query	Response
DATE	DATE△yyyy,mm,dd	DATE?	yyyy,mm,dd

■ Value of yyyy 1980 to 2079 (year)
■ Value of mm 01 to 12 (month)
■ Value of dd 01 to 31 (day)
■ Suffix code None
■ Example DATE△2ØØØ,Ø3,31

DATEMODE

DATEMODE Date Display mode

■ Function Sets the display method for the date display column.

Header	Program command	Query	Response
DATEMODE	DATEMODE△a	DATEMODE?	a

■ Value of a
YMD : Year/month/date
DMY : Day-month-year
MDY : Month-day-year

■ Suffix code None

■ Initial setting YMD : Year/month/day

■ Example DATEMODE△MDY

DET

DET Detection Mode

■ Function Selects the detection mode for the waveform data being displayed.

Header	Program command	Query	Response
DET	DET△d	DET?	d d=POS,SMP,NEG

■ Value of d
Ø: POSITIVE PEAK
1: SAMPLE
2: NEGATIVE PEAK
3: NORMAL
4: AVERAGE
5: RMS
POS: POSITIVE PEAK
SMP: SAMPLE
NEG: NEGATIVE PEAK
NRM: NORMAL
AVE: AVERAGE
RMS: RMS

■ Suffix code None

■ Initial setting Ø: POSITIVE PEAK

■ Example
DET△Ø
DET△SMP

■ Restrictions according to model type and options
"d = 5 and RMS" are available when Option 04: Digital Resolution Bandwidth is installed.

DETM

DETM Detection Mode

■ Function Selects the detection mode for the specified trace.

Header	Program command	Query	Response
DETM	DETM△tr,a	DETM?△tr	a

■ Value of tr

TRA: Trace A
TRB: Trace B
TRIME: Trace TIME

■ Value of a

POS or 0: POSITIVE PEAK
SMP or 1: SAMPLE
NEG or 2: NEGATIVE PEAK
NRM or 3: NORMAL
NRM or 4: NORMAL
AVE or 5: AVERAGE
RMS or 6: RMS

■ Suffix code None

■ Initial setting POS: POSITIVE PEAK

■ Example

```
DETM△TRA,POS
DETM△TRB,SMP
DETM△TRIME,SMP
```

■ Restrictions according to model type and options

"a = RMS" is available when Option 04: Digital Resolution Bandwidth is installed.

DFMT

DFMT Display Format

■ Function Specifies the display mode/format.

Header	Program command	Query	Response
DFMT	DFMT△a	DFMT?	a

■ Value of a
A: Trace A
B: Trace B
TIME: Trace TIME
AB1: Trace A/Trace B (A & B)
AB2: Trace A/Trace B (A/B)
AB3: Trace A/Trace B (A < B)
ABG1: Trace A/Trace BG (BG>A)
ABG2: Trace A/Trace BG (BG<A)
ATIME1: Trace A/Trace TIME (TIME>A)
ATIME2: Trace A/Trace TIME (TIME<A)

■ Suffix code None

■ Initial setting A: Trace A

■ Example DFMT△TIME

DISPLAY

DISPLAY LCD Display On/Off

■ Function Specifies whether the LCD display is on or off.

Header	Program command	Query	Response
DISPLAY	DISPLAY△sw	DISPLAY?	sw

■ Value of sw
OFF: LCD display is off.
ON: LCD display is on.

■ Suffix code None

■ Initial setting ON: LCD display is on.

■ Example DISPLAY△OFF

DL

DL Display line,Display-line Level

■ Function Turns the display line on or off, and sets its level.

Header	Program command	Query	Response
DL	DL△sw DL△l	DL?	OFF l: A vailable for the current scale unit, provided that μV units are selected for V, and W units are selected for W.

■ Value of sw
ON: ON
OFF: OFF

■ Value of l
Value equivalent to full scale of current Y-axis.
For LOG scale: RLV-100 to RLV
For LIN scale: 0 to RLV.
For A-B: -100.00 to 100.00 dB

■ Suffix code
None: Available for the current scale unit, provided V units are always selected in LIN mode.
DB, DBM, DM: dBm
DBMV: dBmV
DBUV: dBμV
DBUVE: dBμV (emf)
V: V
MV: mV
UV: uV
W: W
MW: mW
UW: μW
NW: nW
PW: pW
FW: fW

■ Initial setting –60.00 dBm(Level equivalent to center point of the scale)

■ Example
DL△OFF
DL△-1Ø.ØDBM

DLT

DLT Time Delay

■ Function Sets the delay time in trace-time.

Header	Program command	Query	Response
DLT	DLT△t	DLT?	DLT△t

■ Value of t -1000sec to 65.5ms
■ Suffix code US: μs
MS: ms
S: s
■ Initial setting Ø: s
■ Example DLT△-2ØMS

DPOINT

DPOINT SAMPLE POINTS

■ Function The number of sample points of trace data is set up.

Header	Program command	Query	Response
DPOINT	DPOINT△n	DPOINT?	n

■ Value of n NRM: 501 point
DOUBLE: 1001 point
■ Suffix code None
■ Initial cofiguration value
NRM: 501 point
■ Example of use DPOINT△DOUBLE

DSPLV

DSPLV Marker Level Absolute ; Relative

■ Function
Specifies the marker level in the absolute value display or in the relative value display when seen from the display line.

Header	Program command	Query	Response
DSPLV	DSPLV△a	DSPLV?	a

■ Value of a
ABS: Absolute value
REL: Relative value

■ Suffix code
None

■ Initial setting
ABS: Absolute value

■ Example
DSPLV△REL

DSPLVM

DSPLVM Marker Level Absolute/Relative

■ Function
With the trace mode specified, also specifies the marker level in the absolute value display or in the relative value display when seen from the display line.

Header	Program command	Query	Response
DSPLVM	DSPLVM△tr,a	DSPLVM?△tr	a

■ Value of tr
TRA: Trace A
TRB: Trace B
TRTIME: Trace Time
TRBG: Trace BG

■ Value of a
ABS: Absolute value
REL: Relative value

■ Suffix code
None

■ Initial setting
ABS: Absolute value

■ Example
DSPLVM△TRA,REL

DUTY

DUTY Duty

■ Function The survey ratio of Power Meter measurement is set up and an actual output is computed.

Header	Program command	Query	Response
DUTY	DUTY△n	DUTY?	n

■ Value of n 0.01 to +100.0
■ Suffix code None
■ Initial setting 100.00
■ Example DUTY△0.01
■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

E1

E1 Peak Search

■ Function Executes the function for peak search (same function as MKS△0, MKMP).

Header	Program command	Query	Response
E1	E1	————	————

■ Example E1

E2

E2 Marker to CF

■ Function Sets the marker to the center frequency (same function as MKR△3, MKCF).

Header	Program command	Query	Response
E2	E2	————	————

■ Example E2

E3

E3 Marker to CF Step Size

■ Function Sets the marker to the frequency step size (same function as MKR△5M, MKSS).

Header	Program command	Query	Response
E3	E3	————	————

■ Example E3

E4

E4 Marker to REF

■ Function Sets the marker to the reference level (same function as MKR△4, MKRL).

Header	Program command	Query	Response
E4	E4	———	———

■ Example E4

ERASEWUP

ERASEWUP Erase warm up message

■ Function Erases the message of warm up.

Header	Program command	Query	Response
ERASEWUP	ERASEWUP	———	———

■ Example ERASEWUP

ERROR?

ERROR? Read out error code

■ Function Reads the contents of error codes, for example, details of an execution error.

Header	Program command	Query	Response
ERROR?	————	ERROR?	e1,e2

■ Value of e1,e2 Main code and subcode which indicate the error details.
Main code
300 to 399: Syntax error
400 to 499: Communication error
450 to 459: Media error
500: Range error
501: Inhibit error
502: Execution error
503: Setting condition not enough
504: Hardware error
600: Warning

ESE2

ESE2 Event Status Enable (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△n	ESE2?	n

■ Value of n `Ø to 255:` Represents the sum of the bit-weighted values enabled by the $2^0=1,2^1=2,2^2=4,2^3=8,2^4=16,2^5=32,2^6=64,2^7=128$ corresponding to bits 0, 1, 2, 3, 4, 5, 6, 7 of theEND Event Status Register.

■ Suffix code None

■ Example `ESE2△1`

ESR2?

ESR2? Event Status Regiser (END)

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

Header	Program command	Query	Response
ESR2?	————	ESR2?	n

■ Value of n 0 to 255
■ Suffix code None
■ Example `ESR2?`

EX

EX Exchange Trace-A and Trace-B

■ Function
Exchanges the trace-A and trace-B wave data.

Header	Program command	Query	Response
EX	EX	————	————

■ Example `EX`

EXTLPF

EXTLPF External Low Pass Filter

■ Function Selects External Low Pass Filter (NLP-1200).

Header	Program command	Query	Response
EXTLPF	EXTLPF△sw	EXTLPF?	sw

■ Value of a
ON: External Low Pass Filter used
OFF: External Low Pass Filter not used

■ Suffix code None

■ Initial setting OFF

■ Example EXTLPF△ON

EXTTYPE

EXTTYPE Ext Trigger Input Type

■ Function Chooses the level of the external trigger when EXT is selected for the trigger source.

Header	Program command	Query	Response
EXTTYPE	EXTTYPE△a	EXTTYPE?	a

■ Value of a
1ØV: ±10 V input Level
TTL: TTL input Level

■ Suffix code None

■ Initial setting 1ØV: ±10 V input Level

■ Example
EXTTYPE△1ØV
EXTTYPE△TTL

FA

FA Start Frequency

■ Function Sets the start frequency (same function as STF).

Header	Program command	Query	Response
FA	FA△f	FA?	f f=–100000000 to 0 to 3000000000, f=–100000000 to 0 to 7900000000 f=–100000000 to 0 to 30 00000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] –100 MHz to 3.0 GHz
[MS2683A] –100 MHz to 7.9 GHz
[MS2687A/MS2687B] –100 MHz to 30.0 GHz

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial setting Initial value of f = 0 Hz

■ Example FA△1GHZ

FB

FB Stop Frequency

■ Function Sets the stop frequency (same function as SOF).

Header	Program command	Query	Response
FB	FB△f	FB?	f f=–100000000 to 0 to 3000000000, f=–100000000 to 0 to 7900000000 f=–100000000 to 0 to 30 00000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] –100 MHz to 3.0 GHz
[MS2683A] –100 MHz to 7.9 GHz
[MS2687A/MS2687B] –100 MHz to 30.0 GHz

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial cofiguration value
[MS2681A] 3.0 GHz
[MS2683A] 7.9 GHz
[MS2687A/MS2687B] 30.0 GHz

■ Example FB△2GHZ

FCAL10

FCAL10 Frequency Cal On/Off

■ Function Specifies whether the Freq Cal is performed.

Header	Program command	Query	Response
FCAL1Ø	FCAL1Ø△sw	FCAL1Ø?	sw

■ Value of sw
1: On
Ø: Off

■ Suffix code None

■ Initial setting 1: On

■ Example FCAL1Ø△Ø

FDN

FDN Center Frequency Step Down

■ Function Decreases the center frequency by the frequency step size if it has been set (same function as CF△DN).

Header	Program command	Query	Response
FDN	FDN	————	————

■ Example FDN

FOFFSET

FOFFSET Frequency Offset

■ Function Sets the frequency offset value.

Header	Program command	Query	Response
FOFFSET	FOFFSET△c	FOFFSET?	C=0 to 100GHz

■ Value of c 0Hz to 100GHz (1MHz step)

■ Suffix code
None : Hz (10∧0)
HZ: Hz (10∧0)
KHZ: kHz (10∧3)
MHZ: MHz (10∧6)
GHZ: GHz (10∧9)

■ Initial setting ØHz

■ Example
FOFFSET△5ØØMHZ
FOFFSET?

FOFMD

FOFMD Frequency Offset Mode

■ Function Turns the frequency offset ON/OFF.

Header	Program command	Query	Response
FOFMD	FOFMD△a	FOFMD?	a=0,1

■ Value of n
0,OFF: OFF
1,ON: ON

■ Suffix code None

■ Initial setting 0: OFF

■ Example
FOFMD△Ø
FOFMD?

FRQ

FRQ Frequency Mode

■ Function Selects the mode for setting the FG frequency band.

Header	Program command	Query	Response
FRQ	FRQ△n	FRQ?	FRQ△n

■ Value of n
Ø: CENTER-SPAN
2: START-STOP
■ Suffix code None
■ Initial setting 2: START-STOP
■ Example FRQ△Ø

FS

FS Full Span

■ Function Sets the frequency span to the maximum value settable in the frequency band being set.

Header	Program command	Query	Response
FS	FS	————	————

■ Example FS

FSS

FSS Frequency Step Size

■ Function Sets the frequency step size for stepping up/down the frequency (same function as SS).

Header	Program command	Query	Response
FSS	FSS△f	FSS?	FSS△f f=1 to 3000000000 =1 to 7900000000 =1 to 30000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] 1 Hz to 3.0 GHz
[MS2683A] 1 Hz to 7.9 GHz
[MS2687A/MS2687B] 1 Hz to 30.0 GHz

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial setting 1GHz

■ Example
FSS△1GHZ
FSS△1ØØØ

FULBAND

FULBAND EXT Mixer Band Select

■ Function Sets an external mixer's band is set up. A band can set up eleven bands from K to J.

Header	Program command	Query	Response
FULBAND	FULBAND△a	FULBAND?	A

■ Value of a
K: K Band (18.0 to 26.5 GHz)
A: A Band (26.5 to 40.0 GHz)
Q: Q Band (33.0 to 50.0 GHz)
U: U Band (40.0 to 60.0 GHz)
V: V Band (50.0 to 75.0 GHz)
E: E Band (60.0 to 90.0 GHz)
W: W Band (75.0 to 110.0 GHz)
F: F Band (90.0 to 140.0 GHz)
D: D Band (110.0 to 170.0 GHz)
G: G Band (140.0 to 220.0 GHz)
J: J Band (220.0 to 325.0 GHz)

■ Suffix code None

■ Initial cofiguration value
K: K Band (18.0 to 26.5 GHz)

■ Related matters If this command is executed, external mixer function will also be set to On.

■ Example of use
```
FULBAND△K
FULBAND?
```

■ Restrictions by apparatus and the option
- This command is effective about MS2687A/B.

FUP

FUP Center Frequency Step Up

■ Function Increases the center frequency by the frequency step size if it has been set (same function as CF△UP).

Header	Program command	Query	Response
FUP	FUP	———	———

■ Example FUP

GATE

GATE Gate Sweep ON / OFF

■ Function Sets the gate function to be set to ON or OFF.

Header	Program command	Query	Response
GATE	GATE△sw	GATE?	sw sw=ON,OFF

■ Value of sw 1,ON: ON
Ø,OFF: OFF
■ Suffix code None
■ Initial setting OFF: OFF
■ Example GATE△ON

GATEWAY

GATEWAY

■ Function Sets the Gateway address of Ethernet.

Header	Program command	Query	Response
GATEWAY	GATEWAY△n1,n2,n3,n4	GATEWAY?	n1,n2,n3,n4

■ Value of n1, n2, n3, n4
0 to 255
■ Suffix code None
■ Example GATEWAY△192,168,0,1
■ Restrictions according to model type and options
This command is available when Option 09: Ethernet interface is installed.

GD

GD Gate Delay

■ Function Sets the delay time of the gate.

Header	Program command	Query	Response
GD	GD△t	GD?	t t=0 to 65500 Transfers the data with no suffix code in units of 1 µs.

■ Value of t 0 to 65.5 ms

■ Suffix code
None : ms
US : µs
MS : ms
S : s

■ Initial setting Initial value of a = 0 s

■ Example GD△2ØMS

GDL

GDL Gate Delay

■ Function Sets the GATE delay time.

Header	Program command	Query	Response
GDL	GDL△t	GDL?	GDL△t t=0 to 65500 Transfers the data with no suffix code in units of 1 µs.

■ Value of t 0 to 65.5 ms

■ Suffix code
None : ms
US : µs
MS : ms
S : s

■ Initial setting Ø : 0s

■ Example GDL△2ØMS

GE

GE Gate End

■ Function Allows the gate interval to be terminated internally or externally.

Header	Program command	Query	Response
GE	GE△a sw=INT,EXT	GE?	a

■ Value of a INT: INTERNAL(Internal Timer)
EXT: EXTERNAL(External Signal)
■ Suffix code None
■ Initial setting INT: INTERNAL(Internal Timer)
■ Example GE△INT

GED

GED Gate End

■ Function Sets internal or external termination of the gate interval.

Header	Program command	Query	Response
GED	GED△n	GED?	GED△n

■ Value of n Ø: INTERNAL (Internal timer)
1: EXTERNAL (External signal)
■ Suffix code None
■ Initial setting Ø: INTERNAL (Internal timer)
■ Example GED△1

GL

GL Gate Length

■ Function Sets the width of the gate.

Header	Program command	Query	Response
GL	GL△t	GL?	t t=2 to 65500 Transfers the data with no suffix code in units of 1 µs.

■ Value of t 2 µsec to 65.5 msec

■ Suffix code
None : ms
US : µs
MS : ms
S : s

■ Initial setting Initial value of t = 1 ms

■ Example GL△2ØMS

GLN

GLN Gate Length

■ Function Sets the gate width.

Header	Program command	Query	Response
GLN	GLN△t	GLN?	GLN△t t=2 to 65500 Transfers the data with no suffix code in units of 1 µs.

■ Value of t 2 µsec to 65.5 ms

■ Suffix code
US : µs
MS : ms
S : s

■ Initial setting Initial value of t = 1 msec

■ Example GLN△2ØMS

GMD

GMD Gate Sweep On/Off

■ Function Sets the gate on or off.

Header	Program command	Query	Response
GMD	GMD△sw	GMD?	GMD△sw sw=0,1

■ Value of sw Ø,OFF: Off
1,ON: On
■ Suffix code None
■ Initial setting Ø: Off
■ Example GMD△1

GTOUT

GTOUT GPIB Talker time out

■ Function This time-out includes the sweep wait time of trigger sweeping.

Header	Program command	Query	Response
GTOUT	GTOUT△t	GTOUT?	t

■ Value of t 1 to 255: 1sec to 255 s
Ø: No time-out (infinite wait state)
■ Suffix code None
■ Initial setting 3Ø: 30 s
■ Example GTOUT△6Ø

HN

HN Band Select

■ Function Sets the band.

Header	Program command	Query	Response
HN	HN△sw sw=0 to 2, 7	HN?	sw sw=0 to 7 ***

■ Value of a

[MS2683A]
Ø: BAND0
1: BAND1-
2: BAND1+
7: BAND1-L

[MS2687A]
0: BAND0
1: BAND1-
2: BAND1+
3: BAND2+
4: BAND3+
5: BAND4+

[MS2687A Opt22 loading]
0: BAND 0
1: BAND 1-
2: BAND 1+
3: BAND 1++
4: BAND 2-
5: BAND 3-

[MS2687B]
0: BAND0
1: BAND1-
2: BAND1+
3: BAND2+
5: BAND4+

■ Suffix code None

■ Initial setting BAND AUTO

■ Example HN△Ø

■ Note If BAND is AUTO, response is "***".

■ Restrictions according to model type and options

This command is effective about MS2683A and MS2687A/MS2687B.
“sw = 7” is available when Option 03: Extension Pre-selector Lower Limit is installed.

HNLOCK

HNLOCK Band Select

■ Function Sets the frequency band.

Header	Program command	Query	Response
HNLOCK	HNLOCK△a a=0 to 2, OFF, 7	HNLOCK?	b

■ Value of a

[MS2683A]
0: BAND0 (It is the same function as BNDC△0)
1: BAND1- (It is the same function as BNDC△1-)
2: BAND1+ (It is the same function as BNDC△1+)
7: BAND1-L (It is the same function as BNDC△1-L)
OFF: BAND AUTO (It is the same function as BNDC△AUTO)

[MS2687A]
0: BAND0 (It is the same function as BNDC△0)
1: BAND1- (It is the same function as BNDC△1-)
2: BAND1+ (It is the same function as BNDC△1+)
3: BAND2+ (It is the same function as BNDC△2+)
4: BAND3+ (It is the same function as BNDC△3+)
5: BAND4+ (It is the same function as BNDC△4+)
OFF: BAND AUTO (It is the same function as BNDC△AUTO)

[MS2687A Opt22 loading]
0: BAND 0 (It is the same function as BNDC△0)
1: BAND 1- (It is the same function as BNDC△1-)
2: BAND 1+ (It is the same function as BNDC△1+)
3: BAND 1++ (It is the same function as BNDC△1++)
4: BAND 2- (It is the same function as BNDC△2-)
5: BAND 3- (It is the same function as BNDC△3-)
OFF: BAND AUTO (It is the same function as BNDC△AUTO)

[MS2687B]
0: BAND0 (It is the same function as BNDC△0)
1: BAND1- (It is the same function as BNDC△1-)
2: BAND1+ (It is the same function as BNDC△1+)
3: BAND2+ (It is the same function as BNDC△2+)
5: BAND4+ (It is the same function as BNDC△4+)
OFF: BAND AUTO (It is the same function as BNDC△AUTO)

■ Suffix code None

■ Initial setting OFF: BAND AUTO

■ Example HNLOCK△2

■ Restrictions according to model type and options

This command is effective about MS2683A and MS2687A/B.
"a = 7" is available when Option 03: Extension Pre-selector Lower Limit is installed.

HNUNLK

HNUNLK Band Select

■ Function Sets the band AUTO. (Same function as BNDC△AUTO, HNLOCK△OFF)

Header	Program command	Query	Response
HNUNLK	HNUNLK	————	————

■ Example HNUNLK

HOLD

HOLD Erase Error message

■ Function Erase error message.

Header	Program command	Query	Response
HOLD	HOLD	————	————

HOLDPAUSE

HOLDPAUSE Max/Min Hold Sweep Mode

■ Function Specifies the processing (pause or continue) performed after the specified average sweeping is executed.

Header	Program command	Query	Response
HOLDPAUSE	HOLDPAUSE△a	HOLDPAUSE?	a

■ Value of a Ø,OFF: Continue (∞)
2 to 1024
■ Suffix code None
■ Initial setting Ø: Continue (∞)
■ Example HOLDPAUSE△32

HOSTADRS

HOSTADRS

■ Function Sets the Host address of Ethernet.

Header	Program command	Query	Response
HOSTADRS	HOSTADRS△n1,n2,n3,n4	HOSTADRS?	n1,n2,n3,n4

■ Values of n1, n2, n3, n4
0 to 255

■ Suffix code None

■ Example `HOSTADRS△255,214,65,88`

■ Restrictions according to model type and options
This command is available when Option 09: Ethernet interface is installed.

INI

INI Initialize

■ Function Initializes all measurement control parameters set to be initialized (same function as IP).

Header	Program command	Query	Response
INI	INI	———	———

■ Example `INI`

INPTRNS

INPTRNS Input impedance Transformer

■ Function Selects 75 Ω Input Impedance Transformer (MA1621A).

Header	Program command	Query	Response
INPTRNS	INPTRNS△sw	INPTRNS?	sw

■ Value of sw
ON: 75 Ω Transformer used
OFF: 75 Ω Transformer not used (50 Ω)

■ Suffix code None

■ Initial setting OFF

■ Example `INPTRNS△ON`

INZ

INZ Input impedance

■ Function Selects input impedance.

Header	Program command	Query	Response
INZ	INZ△n	INZ?	n

■ Value of n
50: 50 Ohm
75: 75 Ohm

■ Suffix code None

■ Initial setting 50: 50 Ohm

■ Example INZ△75

IP

IP Initialize

■ Function Initializes all measurement control parameters set to be initialized (same function as INI).

Header	Program command	Query	Response
IP	IP	————	————

■ Example IP

IPADRS

■ Function Sets the IP address of Ethernet of spectrum analyzer.

Header	Program command	Query	Response
IPADRS	IPADRS△n1,n2,n3,n4	IPADRS?	n1,n2,n3,n4

■ Values of n1, n2, n3, and n4
0 to 255
■ Suffix code None
■ Example HOSTADRS△255,214,65,88
■ Restrictions according to model type and options
This command is available when Option 09: Ethernet interface is installed.

KSA

KSA Unit for Log Scale

■ Function Sets the unit of LOG scale to dBm (same function as UNT△0).

Header	Program command	Query	Response
KSA	KSA	————	————

■ Example `KSA`

KSB

KSB Unit for Log Scale

■ Function Sets the unit of LOG scale to dBmV (same function as UNT△2).

Header	Program command	Query	Response
KSB	KSB	————	————

■ Example `KSB`

KSC

KSC Unit for Log Scale

■ Function Sets the unit of LOG scale to dBuV (same function as UNT△1).

Header	Program command	Query	Response
KSC	KSC	———	———

■ Example KSC

KSD

KSD Unit for Log Scale

■ Function Sets the unit of LOG scale to V (same function as UNT△3).

Header	Program command	Query	Response
KSD	KSD	———	———

■ Example KSD

KSE

KSE Title Entry

■ Function Registers the title character string (same function as TITLE).

Header	Program command	Query	Response
KSE	KSE△text	————	————

■ Value of text String of up to 32 characters enclosed by single or double quotes

■ Example
```
KSE△"MS2683A"
KSE△'SPECTRUM ANALYZER'
```

KSG

KSG Average ON

■ Function Enables averaging.

Header	Program command	Query	Response
KSG	KSG	————	————

■ Example KSG

KSH

KSH Average OFF

■ Function Disables averaging to set the mode for waveform processing to NORMAL.

Header	Program command	Query	Response
KSH	KSH	————	————

■ Example KSH

KSO

KSO Delta Marker to Span

■ Function Sets the delta marker frequency to the frequency span
(same function as MKR△6, MKSP).

Header	Program command	Query	Response
KSO	KSO	————	————

■ Example KSO

LDN

LDN Reference Level step down

■ Function Decreases the reference level by one step.

Header	Program command	Query	Response
LDN	LDN	————	————

■ Example LDN

LG

LG Scale

■ Function Sets the Y axis magnification and scale.

Header	Program command	Query	Response
LG	LG△l LG△a	LG?	l

■ Value of l
- Ø: Sets the scaling function to linear mode.
- 1: 1 dB/div (sets the scaling function to logarithmic mode)
- 2: 2 dB/div (sets the scaling function to logarithmic mode)
- 5: 5 dB/div (sets the scaling function to logarithmic mode)
- 1Ø: 10 dB/div (sets the scaling function to logarithmic mode)

■ Value of a
- UP: SCALE UP
- DN: SCALE DOWN

■ Suffix code
- None: dB/div
- DB,DBM,DM: dB/div

■ Initial setting 1Ø: 10 dB/div

■ Example
LG△UP
LG△5DB

LN

LN Linear Scale

■ Function Sets the Y axis scale to linear.

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

■ Example LN

LOS

LOS Level Offset Value

■ Function Sets the offset level.

Header	Program command	Query	Response
LOS	LOS△l	LOS?	LOS△l l=-100.00 to 100.00 Transfers the data with no suffix code in units of 1 dB.

■ Value of l –100 to 100.00 dB

■ Suffix code None : dB
DB : dB

■ Initial setting Ø : 0 dB

■ Example LOS△2.Ø3DB

LSS

LSS Reference Level Step size (Manual)

■ Function Sets the step size (manual values) for increasing and decreasing the reference level.

Header	Program command	Query	Response
LSS	LSS△l	LSS?	LSS△l l=0.01 to 100.00 Transfers the data with no suffix code in units of 1 dB.

■ Value of l 0.01 to 100.00 dB (0.01 dBstep)
■ Suffix code None : dB
DB,DBM,DM: dB
■ Initial setting Value of l = 10 dB
■ Example LSS△6
LSS△1Ø

LSSA

LSSA Reference Level Step Size (Auto)

■ Function Sets the step size (auto values) for increasing and decreasing the reference level during LOG SCALE operation.

Header	Program command	Query	Response
LSSA	LSSA△n	LSSA?	LSSA△n n=1,2,5,10

■ Value of n 1: 1 div
2: 2 div
5: 5 div
1Ø: 10 div
■ Suffix code None
■ Initial setting 1: 1 div
■ Example LSSA△1Ø

LUP

LUP Reference Level step up

■ Function Increases the reference level by one step.

Header	Program command	Query	Response
LUP	LUP	————	————

■ Example LUP

LVO

LVO Level Offset On/Off

■ Function Sets the level offset on or off.

Header	Program command	Query	Response
LVO	LVO△sw	LVO?	LVO△sw

■ Value of sw Ø: Off
1: On
■ Suffix code None
■ Initial setting Ø: Off
■ Example LVO△1

M1

M1 Marker Mode

■ Function Turns off the marker mode (same function as MKR△2).

Header	Program command	Query	Response
M1	M1	————	————

■ Example M1

M2

M2 Marker Mode

■ Function Sets the marker mode to NORMAL mode (same function as MKR△0).

Header	Program command	Query	Response
M2	M2	————	————

■ Example M2

M3

M3 Marker Mode

■ Function Sets the marker mode to delta marker mode (same function as MKR△1).

Header	Program command	Query	Response
M3	M3	————	————

■ Example M3

MAC

MAC Marker Active

■ Function Selects the active multi-marker.

Header	Program command	Query	Response
MAC	MAC△n	MAC?	MAC△n

■ Value of n 1 to 10
■ Suffix code None
■ Initial setting 1: Marker 1
■ Example MAC△5

MADJBWLN

MADJBWLN ADJ-CH Band Line

■ Function Sets the display of the adjacent channel range line ON/OFF.

Header	Program command	Query	Response
MADJBWLN	MADJBWLN△sw	MADJBWLN?	sw

■ Value of sw OFF: OFF
ON: ON
■ Suffix code None
■ Initial setting OFF: OFF
■ Example MADJBWLN△OFF

MADJCTRLN

MADJCTRLN ADJ-CH Center Line

■ Function Sets the display of the adjacent channel center line ON/OFF.

Header	Program command	Query	Response
MADJCTRLN	MADJCTRLN△sw	MADJCTRLN?	sw

■ Value of sw
OFF: OFF
ON: ON

■ Suffix code None

■ Initial setting ON: ON

■ Example MADJCTRLN△OFF

MADJGRAPH

MADJGRAPH Adjacent CH Graph

■ Function Sets the graph display function of ADJ-CH measure ON/OFF.

Header	Program command	Query	Response
MADJGRAPH	MADJGRAPH△sw	MADHGRAPH?	sw

■ Value of sw
OFF: Graph display function OFF
ON: Graph display function ON

■ Suffix code None

■ Initial setting ON: Graph display function ON

■ Example MADJGRAPH△ON

MADJINBWLN

MADJINBWLN INBAND-CH Band Line

■ Function Sets the display of the inband channel range line ON/OFF.

Header	Program command	Query	Response
MADJINBWLN	MADJINBWLN△sw	MADJINBWLN?	MADJINBWLN△sw

■ Value of sw
OFF: OFF
ON: ON

■ Suffix code None

■ Initial setting OFF: OFF

■ Example MADJINBWLN△OFF

MADJMOD

MADJMOD ADJ-CH Measure Method

■ Function Selects the calculation method of ADJ-CH measure.

Header	Program command	Query	Response
MADJMOD	MADJMOD△a	MADJMOD?	a

■ Value of a
MOD: Reference=Total Power (Mod method)
UNMD: Reference=Ref Level (Un-mod method)
INBAND: Reference=Inband (Inband Method)

■ Suffix code None

■ Initial setting MOD: Reference=Total Power (Mod Method)

■ Example MADJMOD△MOD

MASK

MASK Select Mask

■ Function Selects the mask data used by the mask function.

Header	Program command	Query	Response
MASK	MASK△n	MASK?	n

■ Value of n 1 to 5 (Mask No.)
■ Suffix code None
■ Initial setting 1
■ Example MASK△1

MASKLOAD

MASKLOAD Load Mask data

■ Function Reads the mask data from the external file.

Header	Program command	Query	Response
MASKLOAD	MASKLOAD△n	————	————

■ Value of n 1 to 999
■ Suffix code None
■ Example MASKLOAD△1

MASKMCL

MASKMCL Cancel Moving Value

■ Function Cancels moving value of the mask.

Header	Program command	Query	Response
MASKMCL	MASKMCL	————	————

■ Example `MASKMCL`

MASKMSV

MASKMSV Save Moved Mask Data

■ Function Stores the moved mask data in the original mask data area.

Header	Program command	Query	Response
MASKMSV	MASKMSV	————	————

■ Example `MASKSV`

MASKMVX

MASKMVX Mask Move X

■ Function Moves the mask line along the X axis.

Header	Program command	Query	Response
MASKMVX	MASKMVX△f	MASKMVX?	f f=–100000000 to 3000000000 =–100000000 to 7900000000 =–100000000 to 30000000000

■ Value of f [MS2681A] –100 MHz to 3.0 GHz
[MS2683A] –100 MHz to 7.9 GHz
[MS2687A/MS2687B] –100 MHz to 30.0 GHz

■ Suffix code None: Hz
KHZ,KZ: KHz
MHZ,MZ: MHz
GHZ: MHz

■ Initial setting ØHZ

■ Example MASKMVX△1Ø6HZ

MASKMVY

MASKMVY Mask Move Y

■ Function Moves the mask line along the Y axis.

Header	Program command	Query	Response
MASKMVY	MASKMVY△l	MASKMVY?	l

■ Value of l -200.00 to 200.00 dB

■ Suffix code None: dB
DB,DBM,DM: dB

■ Initial setting Ø: 0 dB

■ Example MASKMVY△-2.5dB

MASKSAVE

MASKSAVE Save Mask data

■ Function Stores the interior mask data in the external file.

Header	Program command	Query	Response
MASKSAVE	MASKSAVE△n	————	————

■ Value of n 1 to 999
■ Suffix code None
■ Example MASKSAVE△1

MASKSLCT

MASKSLCT Mask Limit Line Select

■ Function Selects the LIMIT LINE used to evaluate the measured results using the mask functions.

Header	Program command	Query	Response
MASKSLCT	MASKSLCT△a,sw	MASKSLCT?△a	sw sw=ON,OFF

■ Value of a
UP1: Limit1 Upper
UP2: Limit2 Upper
LW1: Limit1 Lower
LW2: Limit2 Lower

■ Value of sw
Ø,OFF: Off
1,ON: On

■ Suffix code None
■ Initial setting off
■ Example MASKSLKT△UP1,ON

MBIAS

MBIAS EXT Mixer Bias

■ Function Sets the external mixer's bias current.

Header	Program command	Query	Response
MBIAS	MBIAS△l	MBIAS?	l l=0 to 20.0

■ Value of l 0 to 20.0 mA (0.1 mA resolution)
■ Suffix code None
■ Initial cofiguration value
0 (It is not initialized)
■ Example of use MBIAS△15.2
MBIAS?
■ Restrictions by apparatus and the option
- This command is effective about MS2687A/B.

MC

MC Frequency Counter

■ Function Turns ON/OFF the function for measuring the marker frequency during display using the counter (same function as MEAS△FREQ).

Header	Program command	Query	Response
MC	MC△sw	————	————

■ Value of sw ON: ON
OFF: OFF
■ Suffix code None
■ Initial setting OFF: OFF
■ Example MC△ON
MC△OFF

MCL

MCL Clear Multi Marker

■ Function Deletes reegistrations of all multi-markers.

Header	Program command	Query	Response
MCL	MCL	————	————

■ Example `MCL`

MCMSV

MCMSV System Version

■ Function Reads out the information of the system (measurement software) in the Signal Analysis mode.

Header	Program command	Query	Response
MCMSV	————	MCMSV?△n	text1, text2

■ Value of n 1 to 3 Signal Analysis system area number
■ Value of text1 the name of the measurement software (30 characters)
■ Value of text2 the revision of the measurement software
■ Example `MCMSV?△1`

MEAS

MEAS Measure Function

■ Function Executes each item of the Measure functions when specified.

Header	Program command	Query	Response
MEAS	MEAS△data1,data2	MEAS?	data1 data1=OFF,FREQ,NOISE,OBW, ADJ,MASK,TEMP,POWER CHPWR,CN

■ Value of data1,data2

Format1:Specifies the measurement item and whether to switch it ON/OFF or execute it.

OFF:	Measurement off
FREQ, ON:	Frequency count ON
FREQ, OFF:	Frequency count OFF
NOISE, ON:	Noise calculation ON
NOISE, OFF:	Noise calculation OFF
OBW, EXE:	Executes the OBW calculation.
ADJ, EXE:	Executes the ADJ-CH calculation.
TEMP, CHECK:	Executes the template check.
MASK, CHECK:	Executes the mask check.
POWER, EXE:	Executes the burst power calculation. (Valid only for Trace-Time)
CHPWR, ON:	Channel Power calculation ON
CHPWR, OFF:	Channel Power calculation OFF
TEMP, ON:	Template function ON
TEMP, OFF:	Template function OFF
MASK, ON:	Mask function ON
MASK, OFF:	Mask function OFF

Format2: Specifies the measurement item and calculation system. Then, specifies whether to switch it ON/OFF or execute it.

NOISE,ABS:	Sets the noisecalculation (Absolute method) to ON.
NOISE,CN:	Sets the noise calculation C/N ratio method) to ON.
OBW, XDB:	Executes the OBW calculation (X dB down method).
OBW, N:	Executes the OBW calculation (N% method).
ADJ, UNMD:	Executes the ADJ-CH calculation (R: Ref Level method).
ADJ, MOD:	Executes the ADJ-CH calculation (R: Total Power method).
ADJ, INBAND:	Executes the ADJ-CH calculation (R: Inband method).

MFR?

MFR? Multi Marker List Query (Frequency)

■ Function Reads the frequency data at the multi marker point.

Header	Program command	Query	Response
MFR?	————	MFR?△n	MFR△f f=–100000000 to 3000000000 =–100000000 to 7800000000 =–100000000 to 30000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of n 1 to 10

■ Suffix code None

MHI

MHI Highest 10 (Multi Marker)

■ Function Registers the multi markers at 10 peak points starting from the highest level.

Header	Program command	Query	Response
MHI	MHI	————	————

■ Example

```
MHI
MZWF△1MHZ
```

MHM

MHM Harmonics (Multi Marker)

■ Function Registers the multi markers to the 10th harmonic max., based on the frequency of the active marker.

Header	Program command	Query	Response
MHM	MHM	————	————

■ Example `MHM`

MKA?

MKA? Read Marker Level

■ Function Reads out the level data at the marker point. At the delta marker point, the level differences are read out (same function as MKL?).

Header	Program command	Query	Response
MKA?	————	MKA?	l v w

■ Value of l No unit. Level data in units of 1 dB (when display unit system for marker level is dB).
Resolution is 0.01 dB.

■ Value of v No unit. Level data in units of 1 n V (when display unit system for marker level is V).
Resolution is 0.1 nV.

■ Value of w No unit. Level data in units of 1 µW (when display unit system for marker level is W).
Resolution is 1 aW.

■ Example `MKA?`

MKACT

MKACT Marker Active

■ Function Selects the active multi markers.

Header	Program command	Query	Response
MKACT	MKACT△n	MKACT?	n

■ Value of n 1 to 10 (Multi marker No.)
■ Suffix code None
■ Initial setting 1: 1
■ Example MKACT△1

MKC

MKC Frequency Counter

■ Function Turns ON/OFF the function for measuring the marker frequency during display using the counter (same function as MEAS△FREQ).

Header	Program command	Query	Response
MKC	MKC△sw	MKC?	MKC△sw

■ Value of sw Ø: OFF
1: ON
■ Suffix code None
■ Initial setting Ø: OFF
■ Example MKC△Ø
MKC△1

MKCF

MKCF Marker to CF

■ Function Sets the marker to the center frequency (same function as MKR△3, E2).

Header	Program command	Query	Response
MKCF	MKCF	———	———

■ Example `MKCF`

MKD

MKD Delta Marker Mode

■ Function Sets the marker mode to the delta marker mode.

Header	Program command	Query	Response
MKD	MKD	———	———

■ Example `MKD`

MKF?

MKF? Marker Frequency Read

■ Function
Reads out the frequency or time data at the marker point. In the delta marker mode, the frequency or time differences are read out.

Header	Program command	Query	Response
MKF?	————	MKF?	f t

■ Value of f — No unit, frequency data with 1 Hz unit, Resolution 0.1 Hz
■ Value of t — No unit, time data with 1 μs unit, Resolution 0.1 μs
■ Example — MKF?

MKFC

MKFC Frequency Counter

■ Function
Turns ON/OFF the function for measuring the marker frequency during display using the counter (same function as MEAS△FREQ).

Header	Program command	Query	Response
MKFC	MKFC△sw	MKFC?	sw

■ Value of sw
1,ON : ON
Ø,OFF: OFF

■ Suffix code
None

■ Initial setting
Ø: OFF

■ Example
MKFC△Ø
MKFC△ON

MKFCR

MKFCR Count Resolution

■ Function Selects the resolution of the frequency counter.

Header	Program command	Query	Response
MKFCR	MKFCR△f MKFCR△a	MKFCR?	f f=1,10,100,1000 Transfers data withno suffix code in units of 1 Hz.

■ Value of f
1Hz
1ØHz
1ØØHz
1kHz

■ Value of a
UP: UP
DN: DOWN

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial setting 1kHz

■ Example
MKFCR△1HZ
MKFCR△UP

MKL?

MKL? Read Marker Level

■ Function — Reads out the level data at the marker point. In the delta marker mode, the level differences are read out.

Header	Program command	Query	Response
MKL?	________	MKL?	l v w

■ Value of l — No unit. Level data in units of 1 dB (when display unit system for marker level is dB).
Resolution is 0.01 dB.

■ Value of v — No unit. Level data in units of 1 nV (when display unit system for marker level is V).
Resolution is 0.1 nV.

■ Value of w — No unit. Level data in units of 1 μW (when display unit system for marker level is W).
Resolution is 1 aW.

■ Example — MKL?

MKLFREQ

MKLFREQ Multi Marker List Freq Absolute/Relative

■ Function — Sets the multi marker list frequency (hour) display to relative or in absolute values.

Header	Program command	Query	Response
MKLFREQ	MKLFREQ△a	MKLFREQ?	a

■ Value of a — ABS: Absolute
REL: Relative

■ Suffix code — None

■ Initial setting — ABS: Absolute

■ Example — MKLFREQ△REL

MKLIST

MKLIST Multi Marker List

■ Function Turns ON/OFF the multi marker list.

Header	Program command	Query	Response
MKLIST	MKLIST sw	MKLIST?	sw sw=ON,OFF

■ Value of sw 1,ON: ON
Ø,OFF: OFF
■ Suffix code None
■ Initial setting OFF: OFF
■ Example MKLIST ON

MKLLVL

MKLLVL Multi Marker List Level Absolute/Relative

■ Function Sets the multi marker list level display to relative or absolute values.

Header	Program command	Query	Response
MKLLVL	MKLLVL△a	MKLLVL?	a

■ Value of a ABS: Absolute
REL: Relative
■ Suffix code None
■ Initial setting ABS: Absolute
■ Example MKLLVL△REL

MKMCL

MKMCL Clear Multi Marker

■ Function Clears all the registered multi markers.

Header	Program command	Query	Response
MKMCL	MKMCL	———	———

■ Example `MKMCL`

MKMFL?

MKMFL? Multi Marker All level/frequency Query

■ Function

Header	Program command	Query	Response
MKMFL?	———	MKMFL?	f1,l1,f2,l2...fn,ln

Multimarkers 1 to 10 sequentially output the frequency/time data and level data when they are ON.

fi: For Trace-A or B, the frequency, no units, and Hz units are output.
For Trace-Time, the time, no units, and 1μs units are output.

li: The following values are output according to the level data, no units, and marker level indication units:

For dB units.	Level data in 1 dB units, resolution:	0.01 dB
For V.	Level data in 1 nV units, resolution:	0.1 nV
For W.	Level data in 1 μW units, resolution:	1 aW

MKMHI

MKMHI Multi Marker

■ Function Registers multi markers at the peak point from the maximum level down to the tenth in descending order. (HIGHEST 10)

Header	Program command	Query	Response
MKMHI	MKMHI	———	———

■ Example MKMHI

MKMHRM

MKMHRM Multi Marker

■ Function Registers multi markers at the harmonic frequency ranging from the reference active marker frequency up to the tenth. (HARMONICS)

Header	Program command	Query	Response
MKMHRM	MKMHRM	———	———

■ Example MKMHRM

MKMIN

MKMIN Minimum Search

■ Function Finds the minimum point of the spectrum being displayed and moves the marker to that point.

Header	Program command	Query	Response
MKMIN	MKMIN	————	————

■ Example `MKMIN`

MKML?

MKML? Multi Marker List Query (Level)

■ Function Reads out the level data at multi markers.

Header	Program command	Query	Response
MKML?	————	MKML?△n	l v w

■ Value of n 1 to 10 (multi marker No.)

■ Value of l No unit. Level data in units of 1 dB (when display unit system for marker level is dB). Resolution is 0.01 dB.

■ Value of v No unit. Level data in units of 1 nV (when display unit system for marker level is V). Resolution is 0.1 nV.

■ Value of w No unit. Level data in units of 1 µW (when display unit system for marker level is W). Resolution is 1 aW.

■ Suffix code None

MKMP

MKMP Marker Position

■ Function Specifies the frequency of a specified multi marker number.

Header	Program command	Query	Response
MKMP	MKMP△n,f	MKMP?△n	f f=-100000000 to 3000000000 (MS2681A) f=-100000000 to 7900000000 (MS2683A) f=-100000000 to 30000000000 (MS2687A/MS2687B)) Transfers the data with no suffix code in units of 1 Hz.

■ Value of n 1 to 10 (multi marker No.)

■ Value of f –100 MHz to 3.0 GHz (MS2681A)
–100 MHz to 7.9 GHz (MS2683A)
–100 MHz to 30.0 GHz (MS2687A/MS2687B)

■ Suffix code None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Example `MKMP△5,24ØØKZ`

MKMPKH

MKMPKH Marker Multi Peak Hold

■ Function Registers multimarkers on each the nearest 5 peak points from the current marker to the right/left sides.

Header	Program command	Query	Response
MKMPKH	MKMPKH	————	————

■ Example `MKMPKH`

MKMULTI

MKMULTI Multi Marker

■ Function Turns ON/OFF the multi marker.

Header	Program command	Query	Response
MKMULTI	MKMULTI△sw	MKMULTI?	sw sw=ON,OFF

■ Value of sw
1,ON: ON
Ø,OFF: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example MKMULTI△ON

MKN

MKN Marker Position

■ Function Specifies the zone marker center position on the X axis in the frequency or time unit.

Header	Program command	Query	Response
MKN	MKN△f MKN△t MKN△a	MKN?	f,t f=–100000000 to 0 to 300000000 f=–100000000 to 0 to 7900000000 f=–100000000 to 0 to 3000000000 Transfers the data with no suffix code in units of 1 Hz. t=-1000000000 to 1000000000 Transfers the data with no suffix code in units of 1 µs.

■ Value of f
[MS2681A]
–100 MHz to 3.0 GHz (It specified, when effective trace is A., B, BG)
[MS2683A]
–100 MHz to 7.9 GHz (It specified, when effective trace is A., B, BG)
[MS2687A/MS2687B]
–100 MHz to 30.0 GHz (It specified, when effective trace is A., B, BG)

■ Value of t –1000 s to 1000 s (specified when the valid trace is TIME)

■ Value of a
UP: UP
DN: DOWN

■ Suffix code
f:
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)
t:
None: ms
US: µs
MS: ms
S: s

■ Example
MKN△1ØØMHZ
MKN△UP
MZWF△1

MKOFF

MKOFF Marker Mode

■ Function Turns off the marker mode.

Header	Program command	Query	Response
MKOFF	MKOFF△a	———	———

■ Value of a
ALL : Marker off
None : Marker off

■ Suffix code None

■ Example
MKOFF△ALL
MKOFF

MKP

MKP Marker Position

■ Function Specifies the zone marker center position on the X axis in the point unit (same function as MKZ).

Header	Program command	Query	Response
MKP	MKP△p	MKP?	p p=0 to 500, 1000

■ Value of p 0 to 500, 1000

■ Suffix code None

■ Initial setting Value of p=250

■ Example
MKP△25Ø
MKP△5ØØ

MKPK

MKPK Peak Search

■ Function: Searches the spectrum being displayed for one of the special points, and moves the marker to that point.

Header	Program command	Query	Response
MKPK	MKPK△a	———	———

■ Value of a
None: SEARCH PEAK(MAX)
HI: SEARCH PEAK(MAX)
NH: SEARCH NEXT PEAK

■ Suffix code None

■ Example MKPK△HI

MKPX

MKPX Peak Resolution (Excursion)

■ Function: Switches the marker mode and executes the 'MKR to 'functions.

Header	Program command	Query	Response
MKPX	MKPX△l	MKPX?	l l=0.01 to 50.00, 1000 Transfers the data with no suffix code in units of 1 dB.

■ Value of l 0.01 to 50.00 dB

■ Suffix code
None: dB
DB: dB

■ Initial setting 5.Ø: 5 dB

■ Example MKPX△1ØDB

MKR

MKR Marker Mode

■ Function Switches the marker mode and executes the 'MKR to 'functions.

Header	Program command	Query	Response
MKR	MKR△n	MKR?	n n=0 to 7

■ Value of n

Ø: NORMAL
1: DELTA
2: OFF
3: MKR to CF
4: MKR to REF
5: MKR to CF step size
6: △MKR to SPAN
7: ZONE to SPAN

■ Suffix code None

■ Initial setting Ø: NORMAL

■ Example MKR△Ø

MKRL

MKRL Marker to REF

■ Function Sets the detection resolution of the peak point.

Header	Program command	Query	Response
MKRL	MKRL	———	———

■ Example MKRL

MKS

MKS Peak Search

■ Function

Searches the spectrum being displayed for one of the special points, and moves the marker to that point.

Header	Program command	Query	Response
MKS	MKS△n n=0 to 2, 11	————	————

■ Value of n

Ø: SEARCH PEAK (MAX)
1: SEARCH NEXT PEAK
2: SEARCH DIP (MIN)
11: SEARCH NEXT DIP

■ Suffix code None

■ Example MKS△Ø

MKSLCT

MKSLCT Select Multi Marker

■ Function

Selects one of the multi markers (1 to 10) and sets it to ON or OFF.

Header	Program command	Query	Response
MKSLCT	MKSLCT△n,sw	MKSLCT?△n	sw sw=ON,OFF

■ Value of n 1 to 10 (multi marker No.)

■ Value of sw

1,ON: ON
Ø,OFF: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example MKSLCT△3,ON

MKSP

MKSP Delta Marker to Span

■ Function Sets the delta marker frequency to the span (same function as MKR△6,KSO).

Header	Program command	Query	Response
MKSP	MKSP	————	————

■ Example MKSP

MKSRCH

MKSRCH Marker Search Mode

■ Function Sets the marker search mode.

Header	Program command	Query	Response
MKSRCH	MKSRCH△a	MKSRCH?	a

■ Value of a PEAK: Peak Marker
DIP: Dip Marker
■ Suffix code None
■ Initial setting PEAK: Peak Marker
■ Example MKSRCH△PEAK

MKSS

MKSS Marker to CF Step Size

■ Function Sets the marker frequency as the frequency step size (same function as MKR△5,E3).

Header	Program command	Query	Response
MKSS	MKSS	————	————

■ Example `MKSS`

MKTRACE

MKTRACE Active Marker Trace

■ Function Specifies the trace for displaying the marker when the display format is trace A on B.

Header	Program command	Query	Response
MKTRACE	MKTRACE△tr	MKTRACE?	tr

■ Value of tr `TRA:` Trace A
`TRB:` Trace B
■ Suffix code None
■ Initial setting `TRA:` Trace A
■ Example `MKTRACE△TRB`

MKTRACK

MKTRACK Tracking ON/OFF

■ Function Sets the signal tracking function to ON/OFF.

Header	Program command	Query	Response
MKTRACK	MKTRACK△sw	MKTRACK?	sw sw=ON.OFF

■ Value of sw 1,ON: ON
Ø,OFF: OFF
■ Suffix code None
■ Initial setting OFF: OFF
■ Example MKTRACK△ON

MKW

MKW Zone Marker Width

■ Function Specifies the zone marker width in the div unit.

Header	Program command	Query	Response
MKW	MKW△n	MKW?	MKW△n a=0 to 2,5 to 7

■ Value of n Ø: 0.5 div
1: Spot
2: 10 div
5: 1 div
6: 2 div
7: 5 div
■ Suffix code None
■ Initial setting 5: 1 div
■ Example MKW△1
MKW△5

MKZ

MKZ Zone Marker Position

■ Function
Specifies the zone marker center position on the X axis in the point unit (same function as MKP).

Header	Program command	Query	Response
MKZ	MKZ△p	MKZ?	MKZ△p

■ Value of p 0 to 500, 1000
■ Suffix code None
■ Initial setting Value of p=250
■ Example
MKZ△25Ø
MKZ△5ØØ

MKZF

MKZF Zone Marker Position

■ Function

Specifies the zone marker center position on the X axis in frequency domain or zero span mode.

Header	Program command	Query	Response
MKZF	MKZF△f MKZF△t	MKZF?	f t f=–100000000 to 3000000000 =–100000000 to 7900000000 =–100000000 to 30000000000 Transfers the data with no suffix code in units of 1 Hz. t=-1000000000 to 1000000000 Transfers the data with no suffix code in units of 1 μs.

■ Value of f

[MS2681A]
–100 MHz to 3.0 GHz (It specifies, when effective trace is A., B, BG)
[MS2683A]
–100 MHz to 7.9 GHz (It specifies, when effective trace is A., B, BG)
[MS2687A/MS2687B]
–100 MHz to 30.0 GHz (It specifies, when effective trace is A., B, BG)

■ Value of t

-1000 s to 1000 s (specified when the valid trace is TIME)

■ Suffix code

f:	None:	Hz(10^0)
	HZ:	Hz(10^0)
	KHZ,KZ:	kHz(10^3)
	MHZ,MZ:	MHz(10^6)
	GHZ,GZ:	GHz(10^9)
t:	None:	ms
	US:	μs
	MS:	ms
	S:	s

■ Example

```
MKZF△1ØØMHZ
MKZF△12ØØØØØØØØ
```

MLI

MLI Multi Marker List

■ Function Executes On/Off to the multi marker list.

Header	Program command	Query	Response
MLI	MLI△sw	MLI?	MLI△sw sw=0,1

■ Value of sw Ø,OFF: Off
1,ON: On
■ Suffix code None
■ Initial setting 1: On
■ Example MLI△Ø

MLO

MLO Multi Marker Off

■ Function Turns OFF the multi marker function.

Header	Program command	Query	Response
MLO	MLO	———	———

■ Example MLO

MLR?

MLR? Multi Marker List Query (Level)

■ Function Reads out the level data at the multi marker point.

Header	Program command	Query	Response
MLR?	————————	MLR?△n	MLR△l v w

■ Value of n 1 to 10

■ Value of l No unit. Level data in units of 1 dB (when display unit system for marker level is dB).
Resolution is 0.01 dB.

■ Value of v No unit. Level data in units of 1 nV (when display unit system for marker level is V).
Resolution is 0.1 nV.

■ Value of w No unit. Level data in units of 1 µW (when display unit system for marker level is W).
Resolution is 1 aW.

MMASK

MMASK Select Mask

■ Function Selects one of masks 1 to 5 used for mask management functions.

Header	Program command	Query	Response
MMASK	MMASK△n	MMASK?	n

■ Value of n 1 to 5 (mask No.)
■ Suffix code None
■ Initial setting 1
■ Example MMASK△1

MMASKDEL

MMASKDEL Delete MASK

■ Function Removes one point from the mask data.

Header	Program command	Query	Response
MMASKDEL	MMASKDEL△p	————	————

■ Value of p 1 to 32 (Point No.)
■ Suffix code None
■ Initial setting (None)
■ Example MMASKDEL△1Ø

MMASKDSP

MMASKDSP Mask Display Mode

■ Function Specifies how the mask management screen is displayed.

Header	Program command	Query	Response
MMASKDSP	MMASKDSP△a	MMASKDSP?	a a=GRAPH,LIST

■ Value of a GRAPH: GRAPH
LIST: LIST
■ Suffix code None
■ Initial setting GRAPH
■ Example MMASKDSP△GRAPH

MMASKIN

MMASKIN Insert Point

■ Function Adds one point to the mask data.

Header	Program command	Query	Response
MMASKIN	MMASKIN△p,f,l	———	———

■ Value of p 1 to 32 (Point No.)

■ Value of f
[MS2681A] 0 to 3.0 GHz
[MS2683A] 0 to 7.9 GHz
[MS2687A/MS2687B] 0 to 325 GHz

■ Value of l
200.00 to 200.00 dBm (ABSOLUTE)
200.00 to 200.00 dB (RELATIVE)

■ Suffix code

p:	None	
f:	None:	Hz
	Hz:	Hz
	KHZ,KZ:	KHz
	MHZ,MZ:	MHz
	GHZ:	GHz
l:	None	
	DB,DBM,DM:	dB or dBm

■ Initial setting (None)

■ Example `MMASKIN△3,1ØØMHZ,-2Ø.5DBM`

MMASKINI

MMASKINI Initiate Line / Mask

■ Function Initializes the template limit line data.

Header	Program command	Query	Response
MMASKINI	MASKINI△a	————	————

■ Value of a

UP1: LIMIT 1 UPPER
UP2: LIMIT 2 UPPER
LW1: LIMIT 1 LOWER
LW2: LIMIT 2 LOWER

■ Suffix code None

MMASKL

MMASKL Select Line

■ Function Selects the type of limit lines used for mask management functions.

Header	Program command	Query	Response
MMASKL	MMASKL△a	MMASKL?	a

■ Value of a

UP1: LIMIT 1 UPPER
UP2: LIMIT 2 UPPER
LW1: LIMIT 1 LOWER
LW2: LIMIT 2 LOWER

■ Suffix code None

MMASKLABEL

MMASKLABEL Mask Label

■ Function Specifies the mask label (name).

Header	Program command	Query	Response
MMASKLABEL	MMASKLABEL△n,text	MMASKLABEL?n	text

■ Value of n 1 to 5 (Mask No.)
■ Value of text Character string within 30 words enclosed by single or double quotes.
■ Suffix code None
■ Initial setting (None)
■ Example MMASKLABEL△1,"std-01"
MMASKLABEL△2,'CHECK01'

MMASKPD?

MMASKPD? Read Limit Line Point Data

■ Function Reads out one point of the mask data.

Header	Program command	Query	Response
MMASKPD?	———	MMASKPD?△p	f l f=0 to 3000000000 =0 to 7900000000 =0 to 325000000000 Transfers the data with no suffix code in units of 1 Hz. l=–200.00 to 200.00 Transfers the data with no suffix code in units of 1 dB.

■ Value of p 1 to 32 (Point No.)
■ Suffix code None
■ Initial setting (None)
■ Example MMASKPD?△1

MMASKREL

MMASKREL Template Level Mode

■ Function — Allows the mask level data to be set in relative or absolute values.

Header	Program command	Query	Response
MMASKREL	MMASKREL△sw	MMASKREL?	sw

■ Value of sw
ON: RELATIVE
OFF: ABSOLUTE

■ Suffix code — None

■ Initial setting — OFF: ABSOLUTE

■ Example — MMASKREL△ON

MMASKRP

MMASKRP Replace Point

■ Function — Replaces one point of the mask data.

Header	Program command	Query	Response
MMASKRP	MMASKRP△p,f,l	————	————

■ Value of p — 1 to 32 (Point No.)

■ Value of f
[MS2681A] 0 to 3.0 GHz
[MS2683A] 0 to 7.9 GHz
[MS2687A/MS2687B] 0 to 325 GHz

■ Value of l
–200.00 to 200.00 dBm (ABSOLUTE)
–200.00 to 200.00 dB (RELATIVE)

■ Suffix code
p: None
f: None: Hz
Hz: Hz
KHZ,KZ: KHz
MHZ,MZ: MHz
GHZ: GHz
l: None: dB or dBm
DB,DBM,DM: dB or dBm

■ Initial setting — (None)

■ Example — MMASKRP△1Ø.7MHZ,-2Ø.5DBM

MNOISE

MNOISE Noise Measure Method

■ Function Selects the calculation method for noise measurement.

Header	Program command	Query	Response
MNOISE	MNOISE△a	MNOISE?	a

■ Value of a
ABS: Absolute method
CN: C/N Ratio method

■ Suffix code None

■ Initial setting ABS: Absolute method

■ Example MNOISE△ABS

MOBW

MOBW OBW Measure Method

■ Function Selects the calculation method for OBW.

Header	Program command	Query	Response
MOBW	MOBW△a	MOBW?	a

■ Value of a
XDB: XdB Down method
N: N% method

■ Suffix code None

■ Initial setting N: N% method

■ Example MOBW△N

MOV

MOV Move Trace

■ Function Copies the specified trace wave data.

Header	Program command	Query	Response
MOV	MOV△tr1,tr2	————	————

■ Value of tr1,tr2 TRA: Trace-A
TRB: Trace-B
■ Suffix code None
■ Example MOV△TRA,TRB

MPS

MPS Marker Position

■ Function Specifies the position of a specified multi marker.

Header	Program command	Query	Response
MPS	MPS△n,p	MPS?△n	MPS△p

■ Value of n 1 to 10
■ Value of p Ø to 500, 1000
■ Suffix code None
■ Initial setting Ø: Left side of the wave display
■ Example MPS△1,25Ø

MSE

MSE Select Multi Marker

■ Function Sets a specified multi marker on or off.

Header	Program command	Query	Response
MSE	MSE△n,sw	MSE?△n	MSE△sw sw=0,1

■ Value of n 1 to 10
■ Value of sw Ø,OFF: Off
1,ON: On
■ Suffix code None
■ Initial setting 1,1: Marker 1: On
2 to 1Ø,Ø: Markers 2 to 10: Off
■ Example MSE△2,ON

MTØ

MTØ Tracking OFF

■ Function Sets the signal tracking function to OFF.

Header	Program command	Query	Response
MTØ	MTØ	———	———

■ Example MTØ

MT1

MT1 Tracking ON

■ Function Sets the signal tracking function to ON.

Header	Program command	Query	Response
MT1	MT1	————	————

■ Example MT1

MTEMP

MTEMP Select Template

■ Function Selects one of templates 1 to 5 used for template management functions.

Header	Program command	Query	Response
MTEMP	MTEMP△n	MTEMP?	n

■ Value of n 1 to 5 (template No.)
■ Suffix code None
■ Initial setting 1
■ Example MTEMP△1

MTEMPDEL

MTEMPDEL Delete Template

■ Function Deletes one point of the template data.

Header	Program command	Query	Response
MTEMPDEL	MTEMPDEL△p	————	————

■ Value of p 1 to 32 (Point No.)
■ Suffix code None
■ Initial setting (None)
■ Example MTEMPDEL△1Ø

MTEMPDSP

MTEMPDSP Template Display Mode

■ Function Specifies how the template management screen is displayed.

Header	Program command	Query	Response
MTEMPDSP	MTEMPDSP△a	MTEMPDSP?	a

■ Value of a GRAPH: GRAPH
LIST: LIST
■ Suffix code None
■ Initial setting GRAPH
■ Example MTEMPDSP△GRAPH

MTEMPIN

MTEMPIN Insert Point

■ Function Adds one point to the template data.

Header	Program command	Query	Response
MTEMPIN	MTEMPIN△p,t,l	————	————

■ Value of p 1 to 32 (Point No.)
■ Value of t –1000 to 1000 s
■ Value of l –200.00 to 200.00 dBm (ABSOLUTE)
–200.00 to 200.00 dB (RELATIVE)
■ Suffix code
p: None
t: None: ms
US: μs
MS: ms
S: s
l: None: dB or dBm
DB,DBM,DM: dB or dBm
■ Initial setting (None)
■ Example MTEMPIN△3.1ØMS,-2Ø.5DBM

MTEMPINI

MTEMPINI Initiate Line / Template

■ Function Initializes the template limit line data.

Header	Program command	Query	Response
MTEMPINI	MTEMPINI△a	————	————

■ Value of a
UP1: LIMIT 1 UPPER
UP2: LIMIT 2 UPPER
LW1: LIMIT 1 LOWER
LW2: LIMIT 2 LOWER
■ Suffix code None
■ Initial setting UP1
■ Example MTEMPINI△UP1

MTEMPL

MTEMPL Select Line

■ Function Selects the type of limit lines used for template management functions.

Header	Program command	Query	Response
MTEMPL	MTEMPL△a	MTEMPL?	a

■ Value of a
`UP1:` LIMIT 1 UPPER
`UP2:` LIMIT 2 UPPER
`LW1:` LIMIT 1 LOWER
`LW2:` LIMIT 2 LOWER

■ Suffix code None
■ Initial setting `UP1`
■ Example `MTEMPLE△UP1`

MTEMPLABEL

MTEMPLABEL Template Label

■ Function Specifies the template label (name).

Header	Program command	Query	Response
MTEMPLABEL	MTEMPLABEL△n,text	MTEMPLABEL?n	text

■ Value of n 1 to 5 (Template No.)
■ text Character string within 30 words enclosed by single or double quotes.
■ Suffix code None
■ Initial setting (None)
■ Example `MTEMPLABEL△1,"RCR-28"`
`MTEMPLABEL△2,'CHECKØ1'`

note: This setting is valid only by the remote command.

MTEMPPD?

MTEMPPD? Read Limit Line Point Date

■ Function Reads out one point of the template data.

Header	Program command	Query	Response
MTEMPPD?	————	MTEMPPD?△p p=1 to 32	t,l t=-1000000000 to 1000000000 Transfers the data with no suffix code in units of 1 µs. l=-200.00 to 200.00 Transfers the data with no suffix code in units of 1 dB.

■ Value of p 1 to 32 (Point No.)
■ Suffix code None
■ Initial setting (None)
■ Example MTEMPPD?△1

MTEMPREL

MTEMPREL Template Level Mode

■ Function Allows the template level data to be set in relative or absolute values.

Header	Program command	Query	Response
MTEMPREL	MTEMPREL△sw	MTEMPREL?	sw

■ Value of sw ON: RELATIVE
OFF: ABSOLUTE
■ Suffix code None
■ Initial setting OFF ABSOLUTE
■ Example MTEMPREL△ON

MTEMPRP

MTEMPRP Replace Point

■ Function Replaces one point of the template data.

Header	Program command	Query	Response
MTEMPRP	MTEMPRP△p,t,l	————	————

■ Value of p 1 to 32 (Point No.)
■ Value of t –1000 to 1000sec
■ Value of l –200.00 to 200.00 dBm (ABSOLUTE)
–200.00 to 200.00 dB (RELATIVE)
■ Suffix code
p: None
t: None: msec
US: µsec
MS: msec
S: sec
l: None: dB or dBm
DB,DBM,DM: dB or dBm
■ Initial setting None
■ Example `MTEMPRP△3.1ØMS,-2Ø.5DBM`

MXMH

MXMH Max Hold

■ Function Sets the mode for processing the trace waveform to MAX HOLD.

Header	Program command	Query	Response
MXMH	MXMH△tr	————	————

■ Value of tr
TRA: Trace A
TRB: Trace B
■ Suffix code None
■ Example `MXMH△TRA`

MXRMODE

MXRMODE Mixer Mode

■ Function Sets the mixer mode to either an internal mixer or an external mixer

Header	Program command	Query	Response
MXRMODE	MXRMODE△a	MXRMODE?	A

■ Value of a INT: INTERNAL
EXT: EXTERNAL
■ Suffix code None
■ Initial cofiguration value
INT: INTERNAL
■ Example of use MXRMODE△INT
■ Restrictions by apparatus and the option
• This command is effective about MS2687A/B.

MZW

MZW Zone Marker Width

■ Function Specifies the zone marker width on the X axis in the point unit.

Header	Program command	Query	Response
MZW	MZW△p	MZW?	MZW△p

■ Value of p 1 to 501, 1001
■ Suffix code None
■ Initial setting w=51
■ Example MZW△1
MZW△51
MZW△5Ø1

MZWF

MZWF Zone Marker Width

■ Function Specifies the zone marker width on the X axis in one of the frequency units.

Header	Program command	Query	Response
MZWF	MZWF△f	MZWF?	f f=1 to 3000000000 =1 to 7900000000 =1 to 30000000000 Transfers the data with no suffix code in units of 1 Hz

■ Value of f
[MS2681A] 1 to 3.0 GHz
[MS2683A] 1 to 7.9 GHz
[MS2687A] 1 to 30.0 GHz

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MA: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial cofiguration value
[MS2681A] Width equivalent to 1 div (300 MHz)
[MS2683A] Width equivalent to 1 div (790 MHz)
[MS2687A] Width equivalent to 1 div (3 GHz)

■ Example
```
MZWF△1ØØ
MZWF△1MHZ
```

NETMASK

NETMASK

■ Function Sets the Netmask address of Ethernet.

Header	Program command	Query	Response
NETMASK	NETMASK△n1,n2,n3,n4	NETMASK?	n1,n2,n3,n4

■ Values of n1, n2, n3, and n4
0 to 255

■ Suffix code None

■ Example `NETMASK△255,255,255,0`

■ Restrictions according to model type and options
This command is available when Option 09: Ethernet interface is installed.

NLV

NLV Noise Measure Execute

■ Function Calculates the Noise measure after sweep.

Header	Program command	Query	Response
NLV	NLV△sw	NLV?	NLV△sw

■ Value of sw Ø: Off
1: On

■ Suffix code None

■ Example `NLV△1`

OBWN

OBWN OBW N% Value

■ Function Sets the conditions of the occupied frequency bandwidth in units of 1%.

Header	Program command	Query	Response
OBWN	OBWN△n	OBWN?	n

■ Value of n 0.01 to 99.99 (0.01 step) : 0.01 to 99.99% (0.01%step)
■ Suffix code None
■ Initial setting 99%
■ Example OBWN△8Ø

OBWXDB

OBWXDB OBW XdB Value

■ Function Sets the conditions of the occupied frequency bandwidth in units of 1 dB.

Header	Program command	Query	Response
OBWXDB	OBWXDB△l	OBWXDB?	l

■ Value of l 0.01 to 100 (0.01 step) : 0.01 to 100 dB (0.01 dB step)
■ Suffix code None : dB
DB : dB
■ Initial setting 25dB
■ Example OBWXDB△6DB

PCF

PCF Peak to Center Frequency

■ Function — Finds the maximum point of the spectrum being displayed, and sets the center frequency to that point.

Header	Program command	Query	Response
PCF	PCF	———	———

■ Example — PCF

PCOUNT?

PCOUNT? Peak Count

■ Function — Investigates the number of multimarkers on each the right/left sides of the current marker, when the Peak Hold function is performed.

Header	Program command	Query	Response
PCOUNT?	———	PCOUNT?	a,b

■ Value of a — 0 to 250, 500
■ Value of b — 0 to 250, 500
■ Suffix code — None
■ Example — PCOUNT?

PINI

PINI Partial Preset

■ Function — Executes partial initialization.

Header	Program command	Query	Response
PINI	PLNI△n	———	———

■ Value of n
0: Preset All (initializes all parameters in the same way as "IP" and "INI.")
1: Preset Sweep Control (initializes sweep control items.)
2: Preset Trace Parameter (initializes trace items.)
3: Preset Level Parameter (initializes vertical-axis items.)
4: Preset Freq/Time parameter (initializes horizontal-axis items.)

■ Example — PINI△Ø

PLS

PLS Direct Plot Start

■ Function Starts direct plotting.

Header	Program command	Query	Response
PLS	PLS△Ø	————	————

■ Example PLS△Ø

■ Note: This command starts the next command processing after completion of the editing print data.
To wait the next command until end of the printing, use the PRINT command.

PMALLCLR

PMALLCLR All Clear

■ Function Cal Factor, Offset, Reference Factor, Duty, Average number of times is initialized.

Header	Program command	Query	Response
PMALLCLR	PMALLCLR	————	————

■ Example PMALLCLR

■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

PMAVG

PMAVG Average On/Off

■ Function In Power Meter, On/Off of Average is switched.

Header	Program command	Query	Response
PMAVG	PMAVG△sw	PMAVG?	sw

■ Value of sw ON: PMAVG ON
OFF: PMAVG OFF
■ Suffix code None
■ Initial setting Off
■ Example PMAVG△ON
■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

PMAVGCNT

PMAVGCNT Average Count

■ Function The Average number of times is set up.

Header	Program command	Query	Response
PMAVGCNT	PMAVGCNT△n	PMAVGCNT?	n

■ Value of n 2 to 10
■ Suffix code None
■ Initial setting 2
■ Example PMAVGCNT△3
■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

PMCALF

PMCALF Cal Factor

■ Function Cal Factor value is set up.

Header	Program command	Query	Response
PMCALF	PMCALF△n	PMCALF?	n

■ Value of n -10.00 to +10.00 dB

■ Suffix code None: dB

DB: dB

■ Initial setting 0 dB

■ Example PMCALF△0

■ Restrictions by apparatus and the option

This command is effective about MS2687A/B Option21/23 Power Meter.

PMOD

PMOD Printer Type

■ Function Selects the type of printer for direct plotting.

Header	Program command	Query	Response
PMOD	PMOD△n	PMOD?	n

■ Value of n

3: Printer .... HP815C (Hewlett Packard)

6: Printer .... BJ-M70 (ESC/p)

13: BMP-format file .... Monochrome

14: BMP-format file .... Color

■ Suffix code None

■ Initial setting 6: Printer .... BJ-M70 (ESC/P)

■ Example

PMOD△6

PMOD△3

PMOFFSET

PMOFFSET Level Offset

■ Function Offset Level value is set up.

Header	Program command	Query	Response
PMOFFSET	PMOFFSET△n	PMOFFSET?	n

■ Value of n -100.00 to +100.00 dB
■ Suffix code None: dB
DB: dB
■ Initial setting 0 dB
■ Example PMOFFSET△0
■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

PMREFFACT

PMREFFACT Reference Factor

■ Function Reference Factor is set up.

Header	Program command	Query	Response
PMREFFACT	PMREFFACT△n	PMREFFACT?	n

■ Value of n -100.00 to +100.00 dB
■ Suffix code None: dB
DB: dB
■ Initial setting 0 dB
■ Example PMREFFACT△0
■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

PMRES

PMRES Power Meter Response

■ Function The measured value of Power Meter is read.

Header	Program command	Query	Response
PMRES	————	PMRES?△a	a

■ Value of a
DBM: Measurement result is returned with a dBm value. 0.01 dBm Resolution.
REL: Measurement result is returned with a relative value. 0.01 dB Resolution
W: Measurement result is returned with a Watt value (mW unit value). It is referred to as resolution of 3 figure of Significant figure.

■ Example PMRES?△DBM

■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

PMRNG

PMRNG Range

■ Function Range is switched.

Header	Program command	Query	Response
PMRNG	PMRNG△n	PMRNG?	n

■ Value of n 1 to 5
■ Suffix code None
■ Initial setting Off
■ Example RMRNG△1
■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

PNLMD

PNLMD

■ Function Changes the measurement mode.

Header	Program command	Query	Response
PNLMD	PNLMD△a	PNLMD?	a

■ Value of a SPECT: Spectrum analyzer mode
SYSTEM: Signal analysis mode
CONFIG: Configuration mode
■ Suffix code None
■ Example `PNLMD△SPECT`
■ Restrictions according to model type and options
"a = SYSTEM" is available when the measurement software (sold separately) is installed.

PORTADRS

PORTADRS

■ Function Sets the Port address of Ethernet.

Header	Program command	Query	Response
PORTADRS	PORTADRS△n	PORTADRS?	n

■ Values of n 3000 to 30000
■ Suffix code None
■ Example `PORTADRS△3111`
■ Restrictions according to model type and options
This command is available when Option 09: Ethernet interface is installed.

POWERON

POWERON Power on State

■ Function Sets the power on status.

Header	Program command	Query	Response
POWERON	POWERON△a	POWERON?	a

■ Value of a
IP: Initialized (Preset) status
LAST: Status at last power-off

■ Suffix code None

■ Initial setting LAST: Status at power-off

■ Example POWERON△LAST

PP

PP Presel Auto

■ Function Tunes the Pre-selector peaking.

Header	Program command	Query	Response
PP	PP	———	———

■ Example PP

■ Restrictions by apparatus and the option

- This command is effective about MS2683A and MS2687A/B.

PRE

PRE Initialize

■ Function Initializes all measurement control parameters to be initialized.
(same function as INI, IP)

Header	Program command	Query	Response
PRE	PRE	———	———

■ Example PRE

PREAMP

PREAMP Pre-amplifier

■ Function Sets On/Off of use of a Pre-amplifier.

Header	Program command	Query	Response
PREAMP	PREAMP△sw	PREAMP?	sw sw=OFF, ON

■ Value of sw
0: Off
OFF: Off
1: On
ON: On

■ Suffix code None

■ Initial cofiguration value
OFF: Off

■ Example of use PREAMP△ON

■ Restrictions by apparatus and the option
This command is effective when the Pre-amplifier of option 08 is mounted.

PRESEL

PRESEL Presel Tune

■ Function Sets the auto tune of preselector device.

Header	Program command	Query	Response
PRESEL	PRESEL△a	PRESEL?	a a= –128 to 127

■ Value of a
AUTO: Auto tune
–128 to 127: MANUAL set
PRESET: 0 set

■ Suffix code None

■ Initial setting Ø (MANUAL) (the preselect tune already registered is not initialozed)

■ Example PRESEL△AUTO

■ Restrictions by apparatus and the option

- This command is effective about MS2683A and MS2687A/B.

PRINT

PRINT Direct Plot

■ Function Executes direct plotting.

Header	Program command	Query	Response
PRINT	PRINT	————	————

■ Example PRINT

PRL

PRL Peak to Reference Level

■ Function Finds the maximum point of the spectrum being displayed, and sets it level to the reference level.

Header	Program command	Query	Response
PRL	PRL	————	————

■ Example PRL

PRTY

PRTY Parity

■ Function Sets the parity bit for RS-232C.

Header	Program command	Query	Response
PRTY	PRTY△n	PRTY?	n

■ Value of n
EVEN: Even
ODD: Odd
OFF: Off (None)

■ Suffix code None

■ Initial setting OFF: Off (None)

■ Example PRTY△EVEN

PSW

PSW Zone Sweep

■ Function Sets the zone sweep to ON/OFF.

Header	Program command	Query	Response
PSW	PSW△sw	PSW?	PSW△sw sw=ON,OFF

■ Value of sw 1,ON: ON
Ø,OFF: OFF
■ Suffix code None
■ Initial setting OFF: OFF
■ Example PSW△ON

PWRMTR

PWRMTR Power Meter On/Off

■ Function On/Off of Power Meter is switched.

Header	Program command	Query	Response
PWRMTR	PWRMTR△sw	PWRMTR?	sw

■ Value of sw ON: Power Meter ON
OFF: Power Meter OFF
■ Suffix code None
■ Initial setting Off
■ Example PWRMTR△ON
■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

PWRFACT

PWRFACT Power Correction Factor

■ Function Sets the Burst power correction factor.

Header	Program command	Query	Response
PWRFACT	PWRFACT△l	PWRFACT?	l

■ Value of l –99.99 to 99.99 dB
■ Suffix code None: dB
■ Initial setting Ø: 0 dB
■ Example PWRFACT△-2.5DB

PWRSTART

PWRSTART Power Measure Start Point

■ Function Specifies the point at which to start burst-power measurement.

Header	Program command	Query	Response
PWRSTART	PWRSTART△p	PWRSTART?	p

■ Value of p 0 to 500, 1000
■ Suffix code None
■ Initial setting Øpoint
■ Example PWRSTART△1ØØ

PWRSTOP

PWRSTOP Power Measure Stop Point

■ Function Specifies the point at which to terminate burst-power measurement.

Header	Program command	Query	Response
PWRSTOP	PWRSTOP△p	PWRSTOP?	p

■ Valur of p 0 to 500, 1000
■ Suffix code None
■ Initial setting 5ØØpoint
■ Example PWRSTOP△4ØØ

RB

RB Resolution Bandwidth

■ Function Sets the resolution bandwidth (same function as RBW).

Header	Program command	Query	Response
RB	RB△f RB△a	RB?	f f=10 to 20000000 Transfers the data with no suffix code in units of 1 Hz

■ Value of f 1 Hz to 3 MHz (1/3 sequence), 5 MHz, 10 MHz, 20 MHz

■ Value of a
- UP: RBW UP
- DN: RBW DOWN
- AUTO: RBW AUTO

■ Suffix code
- f: None: Hz(10^0)
  - HZ: Hz(10^0)
  - KHZ,KZ: kHz(10^3)
  - MHZ,MZ: MHz(10^6)
  - GHZ,GZ: GHz(10^9)
- a: None

■ Initial setting RBW=calculated value when AUTO is selected for RBW

■ Example RB△3KHZ

■ Restrictions according to model type and options

When the Resolution Bandwidth mode is Digital at On, “f = 10 HZ, 30 HZ and 100 HZ” is available.
Refer to “RBM” command for more detailed information.
When the Resolution Bandwidth mode is FFT at On, “f=1 Hz, 3 Hz” is available.

RBM

RBM RBW Mode

■ Function Sets the resolution bandwidth mode.

Header	Program command	Query	Response
RBM	RBM△a	RBM?	RBM△a

■ Value of a
AUTO: Optimum RBW is set up by SPAN and equipment of option.
NRM: Analog bandwidth filter (300 Hz to 20 MHz)
DGTL: Resolution bandwidth by digital signal processing (10 Hz to 1 MHz)
FFT: Resolution bandwidth by FFT signal processing (1 Hz to 1 kHz)

■ Suffix code None

■ Initial setting AUTO: Analog bandwidth filter (300 Hz to 20 MHz)

■ Example `RBM△NRM`

■ Restrictions according to model type and options

This command is available when Option 04: Digital Resolution Bandwidth or Option 02: Narrow Resolution Bandwidth is installed.

RBR

RBR Resolution Bandwidth/Span Ratio

■ Function Sets the RBW/Span Ratio.

Header	Program command	Query	Response
RBR	RBR△f	RBR?	f

■ Value of f 0.001 to 0.100 (resolution 0.001)
■ Suffix code None
■ Initial setting 0.01
■ Example RBR△Ø.Ø5

RBSPAN

RBSPAN Resolution Bandwidth/Span Ratio

■ Function Sets the RBW according to RBW/Span Ratio.

Header	Program command	Query	Response
RBSPAN	RBSPAN△sw	RBSPAN?	sw

■ Value of sw
OFF: OFF
0: OFF
ON: ON
1: ON

■ Initial setting OFF: OFF
■ Suffix code None
■ Example RBSPAN△ON

RBW

RBW Resolution Bandwidth

■ Function Sets the resolution bandwidth.

Header	Program command	Query	Response
RBW	RBW△n	RBW?	RBW△n

■ Value of n

0:	30 Hz
1:	100 Hz
2:	300 Hz
3:	1 kHz
4:	3 kHz
5:	10 kHz
6:	30 kHz
7:	100 kHz
8:	300 kHz
9:	1 MHz
13:	10 Hz
14:	3 MHz
15:	5 MHz
16:	1 Hz
17:	3 Hz
18:	10 MHz
19:	20 MHz

■ Suffix code None

■ Initial setting Calculated value when AUTO is selected for RBW

■ Example `RBW△5`

■ Restrictions according to model type and options

When the Resolution Bandwidth mode is Digital at On; “n = 0, 1 and 13 are available.

Refer to “RBM” for more detailed information.

n=0, 1, 13, 16, 17 is effective when having equipped with Option 02 ‘Narrow Resolution Bandwidth’.

RC

RC Recall Data from Internal Register

■ Function Recalls trace data/parameter data from the built-in memory (same function as RGRC).

Header	Program command	Query	Response
RC	RC△n	————	————

■ Value of n 1 to 24 (Register No.)
■ Suffix code None
■ Example RC△1

RCCSVANT

RCCSVANT

■ Function Loads the antenna factor in CSV format from the memory card.

Header	Program command	Query	Response
RCCSVANT	RCCSVANT△n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example RCCSVANT△1

RCCSVCOR

RCCSVCOR

■ Function Loads the correction factor in CSV format from the memory card.

Header	Program command	Query	Response
RCCSVCOR	RCCSVCOR△n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example RCCSVCOR△1

RCCSVMSK

RCCSVMSK

■ Function Loads the mask data in CSV format from the memory card.

Header	Program command	Query	Response
RCCSVMSK	RCCSVMSK△n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example RCCSVMSK△1

RCCSVTMP

RCCSVTMP

■ Function Loads the template data in CSV format from the memory card.

Header	Program command	Query	Response
RCCSVTMP	RCCSVTMP△n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example RCCSVTMP△1

RCM

RCM Recall Data from Memory Card

■ Function Recalls the measurement conditions (parameters) and measured results (traces) from memory card.

Header	Program command	Query	Response
RCM	RCM△n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example RCM△2 RCM△17

RCS

RCS Write Off Recall Data

■ Function Recalls data from memory card and sets the storage mode to "View".

Header	Program command	Query	Response
RCS	RCS△n	————	————

■ Value of n 1 to 999
■ Suffix code None
■ Example RCS△1

RDATA

RDATA Recalled Data

■ Function Specifies the data to be recalled.

Header	Program command	Query	Response
RDATA	RDATA△a	RDATA?	a

■ Value of a
TP: Trace & Parameter
P: Parameter Only
TPV: Trace & Parameter (view)
PER: Parameter (except RLV)
■ Suffix code None
■ Initial setting TP: Trace & Parameter (provided the already set is not initialized)
■ Example RDATA△TP

RES?

RES? Measure Result

■ Function Reads out the results functions.

Header	Program command	Query	Response
`RES?`	———	`RES?`	data1 data1,data2 data1,data2,data3,data4,data5,data6

■ Values of data1,data2,data3,data4,data5, and data6

Measure control item (corresponding command)	Response	Value of data1	Value of data2
When the measure item or sub item is OFF	`OFF`	Not transferred	Not transferred
FREQ COUNT (MEASΔFREQ,ON)	`f`	Value of f with no suffix code in units of Hz, Resolution: 1 Hz	———
NOISE MEASURE (MEASΔNOISE,ABS) (MEASΔNOISE,C/N)	`l`	Value of l with no suffix code in units of dB (dBm/ch, dBm/Hz, dBc/ch, dBc/Hz). Resolution: 0.01 dB	———
OBW MEASURE (MEASΔOBW,XDB) (MEASΔOBW,N)	`f1,f2`	Occupied bandwidth of f1 with no suffix code in units of Hz. Resolution: 1 Hz	Center frequency of f2 with no suffix code in units of Hz. Resolution: 1 Hz
MASK (MEASΔMASK,CHECK)	`C1,C2`	Value of C1(Limit 1 check result) 0:PASS1, 1:FAIL	Value of C2(Limit 2 check result) 0:PASS1, 1:FAIL
TEMPLATE (MEASΔTEMP,CHECK)	`C1,C2`	Value of C1(Limit 1 check result) 0:PASS1, 1:FAIL	Value of C2(Limit 2 check result) 0:PASS1, 1:FAIL
BURST POWER MEASURE (MEASΔPOWER,EXE)	`l,w`	dB m value of l with no suffix code in units of dBm, Resolution: 0.01 dB	pW value of w with no suffix code in units of pW, Resolution: 1 pW
CHANNEL POWER MEASURE (MEASΔCHPWR,ON)	`l1,l2` (In case of Marker not spot mode)	Value of `l1` with no suffix code in units of dBm. Resolution: 0.01 dB	Value of `l2` with no suffix code in units of dBm/Hz. Resolution: 0.01 dB
	`l` (In case of Marker spot mode)	Value of `l` with no suffix code in units of dBm/Hz Resolution: 0.01 dB	
ADJ CH MEASURE (MEASΔADJ,UNMD) (MEASΔADJ,MOD)	lL1, lU1, lL2, lU2, lL3, lU3	Value of data1	Value of data2
		Lower channel of CHSEPA1 of lL1 with no suffix code in units of dB Resolution: 0.01dB	Upper channel of CHSEPA1 of lU1 with no suffix code in units of dB Resolution: 0.01dB
		Value of data3	Value of data 4
		Lower channel of CHSEPA2 of lL2 with no suffix code in units of dB Resolution: 0.01dB	Upper channel of CHSEPA2 of lU2 with no suffix code in units of dB Resolution: 0.01dB
		Value of data 5	Value of data 6
		Lower channel of CHSEPA3 of lL3 with no suffix code in units of dB Resolution: 0.01dB	Upper channel of CHSEPA3 of lU3 with no suffix code in units of dB Resolution: 0.01dB

If the MEASURE function has caused a calculation error or execution error, the affected value is represented by "***".

■ Example `RES?`

RFAT

RFAT Set RF Attenuator steps

■ Function Sets steps (2 dB/10 dB) of RF attenuator

Header	Program command	Query	Response
RFAT	RFAT△n	RFAT?	n

■ Value of n Ø: 10 dB steps
1: 2 dB steps
■ Suffix code None
■ Initial Setting Ø: 10 dB steps
■ Example RFAT△Ø
■ Restrictions by apparatus and the option
- This command is effective about MS2681A and MS2683A.

RGB

RGB

■ Function Outputs RGB signal on the rear panel.

Header	Program command	Query	Response
RGB	RGB sw	RGB?	sw

■ Value of sw ON: Outputs RGB signal.
OFF: Does not output RGB signal.
■ Suffix code None
■ Initial setting ON: Outputs RGB signal.
■ Example RGB△ON

RGRC

RGRC Recall Data from Internal Register

■ Function Recalls trace data/parameter data from the built-in register (same function as RC).

Header	Program command	Query	Response
RGRC	RGRC△n	————	————

■ Value of n 1 to 24 (Register No.)
■ Suffix code None
■ Example RGRC△1

RGSV

RGSV Save Data into Internal Register

■ Function Saves trace data/parameter data to the built-in register (same function as SV).

Header	Program command	Query	Response
RGSV	RGSV△n	————	————

■ Value of n 1 to 24 (Register No.)
■ Suffix code None
■ Example RGSV△1

RL

RL Reference Level

■ Function Sets the reference level (same function as RLV).

Header	Program command	Query	Response
RL	RL△l RL△a	RL?	l l: No units value depending on the current scalunit. the µV units are selected for V-unit system, and µW units are selected for W-unit system.

■ Value of l Value from –100 dBm to +30 dBm (0.01 dB step)

■ Value of a
UP: LEVEL STEP UP
DN: LEVEL STEP DOWN

■ Suffix code
None : No units value depending on the current scale unit. The V units are always selected when in LIN mode.
DB,DBM,DM: dBm
DBMV: dBmV
DBUV: dBµV
DBUVE: dBµV(emf)
V: V
MV: mV
UV: µV
W: W
MW: mW
UW: µW
NW: nW
PW: pW
FW: fW

■ Initial setting l = –10 dBm

■ Example
RL△-1ØØDBM
RL△5V
RL△-1ØV
RL△UP

RLN

RLN Reference Line

■ Function Specifies the location of the data display standard line obtained using the A-B function.

Header	Program command	Query	Response
RLN	RLN△n	RLN?	RLN△n

■ Value of n
Ø: Top
1: Middle
2: Bottom

■ Suffix code None

■ Initial setting 1: Middle

■ Example RLN△2

RLV

RLV Reference Level

■ Function

Sets the reference level (same function as RL).

Header	Program command	Query	Response
RLV	RLV△l	RLV?	RLV△l l: No units value depending on the current scale unit.The µV units are selected for V-unit system, and µW unitsare selected for W-unit system.

■ Value of l

Value from –100 dBm to +30 dBm (0.01 dB step)
UP: LEVEL STEP UP
DN: LEVEL STEP DOWN

■ Suffix code

None: No units value depending on the current scale unit. The V units arealways selected when in LIN mode.
DB,DBM,DM: dBm
DBMV: dBmV
DBUV: dBµV
DBUVE: dBµV (emf)
V: V
MV: mV
UV: µV
W: W
MW: mW
UW: µW
NW: nW
PW: pW
FW: fW

■ Initial setting

l = –10 dBm

■ Example

```
RL△-1ØØDBM
RL△5V
RL△-1ØV
```

RMK?

RMK? Reference Marker Position

■ Function Reads out the position of the reference marker.

Header	Program command	Query	Response
RMK?	————	RMK?	RMK△a

■ Value of a 0 to 500, 1000
■ Example RMK?

RNGHLD

RNGHLD Range Hold

■ Function AUTO/HOLD of a range is switched.

Header	Program command	Query	Response
RNGHLD	RNGHLD△sw	RNGHLD?	sw

■ Value of sw
HOLD: It is set as a range hold.
AUTO: It is set as a auto range.

■ Suffix code None
■ Initial setting AUTO
■ Example RNGHLD△HOLD
■ Restrictions by apparatus and the option
This command is effective about MS2687A/B Option21/23 Power Meter.

ROFFSET

ROFFSET Ref. Level Offset

■ Function Turns the reference level offset ON/OFF, and sets the offset value.

Header	Program command	Query	Response
ROFFSET	ROFFSET△sw ROFFSET△l	ROFFSET?	OFF l

■Value of sw
ON: ON
OFF: OFF

■ Value of l
–100.00 dB to +100.00 dB (0.01 dB step)

■ Suffix code
None: dB
DB,DBM,DM: dB

■ Initial setting
Ø: ØdB

■ Example
ROFFSET△OFF
ROFFSET△2ØDB

S1

S1 Sweep Mode (Continuous)

■ Function Sets the sweep mode to CONTINUOUS (same function as CONTS).

Header	Program command	Query	Response
S1	S1	————	————

■ Example `S1`

S2

S2 Sweep Mode (Single)

■ Function Sets the sweep mode to SINGLE (same function as SNGLS).

Header	Program command	Query	Response
S2	S2	————	————

■ Example `S2`

SCL

SCL Log/ Linear Scale

■ Function Sets the Y axis magnification of the LOG/LIN scale.

Header	Program command	Query	Response
SCL	SCL△n	SCL?	SCL△n

■ Value of n
Ø: 1 dB/div(LOG SCALE)
1: 2 dB/div(LOG SCALE)
2: 5 dB/div(LOG SCALE)
3: 10 dB/div(LOG SCALE)
4: 1%/dev(LIN SCALE)
5: 2%/dev(LIN SCALE)
6: 5%/dev(LIN SCALE)
7: 10%/dev(LIN SCALE)

■ Suffix code None

■ Initial setting 3: 10 dB/div (LOG SCALE)

■ Example
SCL△Ø
SCL△5

SCR

SCR Scroll

■ Function Scrolls the displayed spectrum to the right or left by the specified scroll amount.

Header	Program command	Query	Response
SCR	SCR△a	———	———

■ Value of a
Ø: SCROLL LEFT
LEFT: SCROLL LEFT
1: SCROLL RIGHT
RIGHT: SCROLL RIGHT

■ Suffix code None

■ Example
SCR△Ø
SCR△RIGHT

SETREL

SETREL Set Relative

■ Function

The present Power Meter measured value is set as the fiducial point of a relative display.

Header	Program command	Query	Response
SETREL	SETREL	————	————

■ Example `SETREL`

■ Restrictions by apparatus and the option

This command is effective about MS2687A/B Option21/23 Power Meter.

SIGID

SIGID Signal Identifier

■ Function Executes sweep which discriminates measured signal and image signal at the time of external mixer use.

Header	Program command	Query	Response
SIGID	SIGID△a	SIGID?	a a=0,1

■ Value of a
0: Off
OFF: Off
1: On
ON: On

■ Sufiix code None

■ Initial cofiguration value
0: Off

■ Setting conditions
When external mixer is Off, this setup serves as execution error.

■ Example of use SIGID△0

■ Restrictions by apparatus and the option
- This command is effective about MS2687A/B.

SNGLS

SNGLS Single Sweep Mode

■ Function Sets the sweep mode to single sweep (same function as S2).

Header	Program command	Query	Response
SNGLS	SNGLS	————	————

■ Example `SNGLS`

SOF

SOF Stop Frequency

■ Function Sets the stop frequency (same function as FB).

Header	Program command	Query	Response
SOF	SOF△f	SOF?	SOF△f f=–100000000 to 3000000000 =–100000000 to 7900000000 =–100000000 to 30000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] –100 MHz to 3.0 GHz
[MS2683A] –100 MHz to 7.9 GHz
[MS2687A/MS2687B] –100 MHz to 30.0 GHz

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MA: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial cofiguration value
[MS2681A] 3.0 GHz
[MS2683A] 7.9 GHz
[MS2687A/MS2687B] 30.0 GHz

■ Example
SOF△123MHZ
SOF△45.6KHZ

SP

SP Frequency Span

■ Function Sets the frequency span (same function as SPF).

Header	Program command	Query	Response
SP	SP△f SP△a	SP?	f f=0 to 3100000000 =0 to 8000000000 =0 to 30100000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] 0 Hz to 3.1 GHz
[MS2683A] 0 Hz to 8.0 GHz
[MS2687A/MS2687B] 0 Hz to 30.1 GHz

■ Value of a
UP: FREQ SPAN STEP UP (same function as SPU)
DN: FREQ SPAN STEP DOWN(same function as SPD)

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial cofiguration value
[MS2681A] 3.0 GHz
[MS2683A] 7.9 GHz
[MS2687A/MS2687B] 30.0 GHz

■ Example SP△1GHZ

SPD

SPD Frequency Span Step Down

■ Function Decreases the frequency span in the 5/2/1 steps (same function as SP△DN).

Header	Program command	Query	Response
SPD	SPD	————	————

■ Example SPD

SPF

SPF Frequency Span

■ Function Sets the frequency span (same function as SP).

Header	Program command	Query	Response
SPF	SPF△f	SPF?	SPF△f f=0 to 3100000000 =0 to 8000000000 =0 to 30100000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f

[MS2681A]	0 Hz to 3.1 GHz
[MS2683A]	0 Hz to 8.0 GHz
[MS2687A/MS2687B]	0 Hz to 30.1 GHz

■ Suffix code

None:	Hz(10^0)
HZ:	Hz(10^0)
KHZ,KZ:	kHz(10^3)
MHZ,MZ:	MHz(10^6)
GHZ,GZ:	GHz(10^9)

■ Initial cofiguration value

[MS2681A]	3.0 GHz
[MS2683A]	7.9 GHz
[MS2687A/MS2687B]	30.0 GHz

■ Example

```
SPF△1Ø1MHZ
SPF△1.5GHZ
```

SPU

SPU Frequency Span Step. Up

■ Function Increases the frequency span in the 1/2/5 steps (same function as SP△UP).

Header	Program command	Query	Response
SPU	SPU	———	———

■ Example

```
SPU
```

SRCHTH

SRCHTH Peak Search Threshold

■ Function Sets the threshold function for detecting a peak point.

Header	Program command	Query	Response
SRCHTH	SRCHTH△a	SRCHTH?	sw sw=OFF,ABOVE,BELOW

■ Value of sw Ø,OFF: No threshold function
1,ON: Threshold function
■ Value of a ABOVE: Above detection
BELOW: Below detection
■ Suffix code None
■ Initial setting OFF: No threshold function
■ Example SRCHTH△ABOVE

SRCNORM

SRCNORM Normalize

■ Function Selects the ON/OFF of the nolmalizing processing (A-B+DL→A).

Header	Program command	Query	Response
SRCNORM	SRCNORM△sw	SRCNORM?	sw sw=ON,OFF

■ Value of sw 1,ON: on
Ø,OFF: off
■ Suffix code None
■ Initial setting OFF: off
■ Example SRCNORM△ON

SS

SS Frequency Step Size

■ Function Sets the frequency step size for stepping up/down the frequency (same function as FSS).

Header	Program command	Query	Response
SS	SS△f	SS?	f f=1 to 3000000000 =1 to 7900000000 =1 to 30000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] 1 Hz to 3.0 GHz
[MS2683A] 1 Hz to 7.9 GHz
[MS2687A/MS2687B] 1 Hz to 30.0 GHz

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Example SS△1MHZ

SSS

SSS Scroll Step Size

■ Function Sets the scroll step size.

Header	Program command	Query	Response
SSS	SSS△n	SSS?	SSS△n

■ Value of n
1: 1 div
2: 2 div
5: 5 div
1Ø: 10 div

■ Suffix code None
■ Initial setting 2: 2 div
■ Example SSS△1

ST

ST Sweep Time

■ Function Sets the frequency sweep time/time span.

Header	Program command	Query	Response
ST	ST△t ST△a	ST?	t t=1.0 to 1000000000 Transfers the data with no suffix code in units of 1 µs.

■ Value of t 1.0 µs to 1000 s (10 ms to 1000 s for frequency axis)

■ Value of a
UP: SWT UP
DN: SWT DOWN
AUTO: SWT AUTO

■ Suffix code
t: None : ms
US: µs
MS: ms
S: s
a: None

■ Initial setting Calculated value when AUTO is selected for SWT

■ Example
ST△AUTO
ST△2ØMS

STF

STF Start Frequency

■ Function Sets the start frequency (same function as FA).

Header	Program command	Query	Response
STF	STF△f	STF?	STF△f f=-100000000 to 3000000000 =-100000000 to 7900000000 =-100000000 to 30000000000 Transfers the data with no suffix code in units of 1 Hz.

■ Value of f
[MS2681A] –100 MHz to 3.0 GHz
[MS2683A] –100 MHz to 7.9 GHz
[MS2687A/MS2687B] –100 MHz to 30.0 GHz

■ Suffix code
None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)

■ Initial setting f=0Hz

■ Example
STF△123MHZ
STF△45.6KHZ

STPB

STPB Stop bit

■ Function Specifies the RS232C stop bit.

Header	Program command	Query	Response
STPB	STPB△n	STPB?	n

■ Value of n
1: 1 bit
2: 2 bit

■ Suffix code None

■ Initial setting 1: 1 bit

■ Example STPB△2

SV

SV Save Data into Internal Registor

■ Function Saves trace data/parameter data to the built-in register (same function as RGSV).

Header	Program command	Query	Response
SV	SV△n	———	———

■ Value of n 1 to 24 (Memory No.)
■ Suffix code None
■ Example SV△1

SVCSVANT

SVCSVANT

■ Function Saves the antenna factor to the memory card in CSV format.

Header	Program command	Query	Response
SVCSVANT	SVCSVANT n	———	———

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example SVCSVANT△1

SVCSVCOR

SVCAVCOR

■ Function Saves the correction data to the memory card in CSV format.

Header	Program command	Query	Response
SVCSVCOR	SVCSVCOR n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example SVCSVCOR△1

SVCSVMSK

SVCAVMSK

■ Function Saves the mask data to the memory card in CSV format.

Header	Program command	Query	Response
SVCSVMSK	SVCSVMSK n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example SVCSVMSK△1

SVCSVTMP

SVCAVTMP

■ Function Saves the template data to the memory card in CSV format.

Header	Program command	Query	Response
SVCSVTMP	SVCSVTMP n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example SVCSVTMP△1

SVCSVWAVE

SVCAVWAVE

■ Function Saves the waveform data to the memory card in CSV format

Header	Program command	Query	Response
SVCSVWAVE	SVCSVWAVE n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example SVCSVWAVE△1

SVM

SVM Save Data into Memory Card

■ Function
Saves the measurement conditions (parameters) and measured results (traces) to memory card.

Header	Program command	Query	Response
SVM	SVM△n	————	————

■ Value of n 1 to 999 (File No.)
■ Suffix code None
■ Example
SVM△17
SVM△2

SWP

SWP Single Sweep/Sweep Status

■ Function
Executes single sweep/Responds to sweep status (sweep completed/sweep in progress). When accepted by the spectrum analyzer, the SWP command causes a single sweep to be executed by setting the sweep mode to 'SINGLE'.
The next command waits without being processed until its single sweep is completed (same function as TS). The SWP? Query command is used to Query the current sweep status (sweep completed/sweep in progress).

Header	Program command	Query	Response
SWP	SWP	SWP?	SWP△sw

■ Value of sw
Ø: Sweep completed
1: Sweep progress

■ Example
SWP
SWP?

SWSTART

SWSTART Restart Sweep

■ Function Restarts the sweep.

Header	Program command	Query	Response
SWSTART	SWSTART	———	———

■ Example `SWSTART`

SWSTOP

SWSTOP Stop Sweep

■ Function Stops the sweep.

Header	Program command	Query	Response
SWSTOP	SWSTOP	———	———

■ Example `SWSTOP`

SWT

SWT Sweep Time

■ Function Sets the frequency sweep time/time span (same function as ST).

Header	Program command	Query	Response
SWT	SWT△t	SWT?	SWT△t t=1 to 1000000000 Transfers the data with no suffix code in units of 1 µs.

■ Value of t 1 µs to 1000 s (10 ms to 1000 s for frequency domain)

■ Suffix code None : ms
US : µs
MS : ms
S : s

■ Initial setting Calculated value when AUTO is selected for SWT

■ Example SWT△1S
SWT△2ØMS

SYS

SYS

■ Function In Signal Analysis mode, changes the system (measurement software installed) to one of the three system areas.

Header	Program command	Query	Response
SYS	SYS△n	SYS?	n

■ Value of n 1 to 3

■ Suffix code None

■ Example SYS△1

■ Note

Needed to know, in advance, what system is installed in each of the three system areas.

■ Restrictions according to model type and options

This command is available when any measurement software is installed.
When no systems installed in a specific area; the current system will be maintained as it is, and no errors will be returned.

TDLY

TDLY Delay Time

■ Function Sets the delay time from the point where trace time triggering occurs.

Header	Program command	Query	Response
TDLY	TDLY△t	TDLY?	t t=-1000000000 to 65500 Transfers the data with no suffix code in units of 1 µs.

■ Value of t –1000 sec to 65.5 ms
■ Suffix code None : ms
US : µs
MS : ms
S : s
■ Initial setting Ø : 0s
■ Example TDLY△2ØMS

TEMP

TEMP Select Template

■ Function Selects one of the function templates.

Header	Program command	Query	Response
TEMP	TEMP△n	TEMP?	n

■ Value of n 1 to 5 (Template No.)
■ Suffix code None
■ Initial setting 1
■ Example TEMP△1

TEMPLOAD

TEMPLOAD Load Template data

■ Function Reads out template data from an external file.

Header	Program command	Query	Response
TEMPLOAD	TEMPLOAD△n	————	————

■ Value of n 1 to 999
■ Suffix code None
■ Example TEMPLOAD△1

TEMPMCL

TEMPMCL Cancel Moving Value

■ Function Returns a template movement to 0.

Header	Program command	Query	Response
TEMPMCL	TEMPMCL	————	————

■ Example TEMPMCL

TEMPMSV

TEMPMSV Save Moved Template Data

■ Function Stores the moved template data in the original template area.

Header	Program command	Query	Response
TEMPMSV	TEMPMSV	————	————

■ Example TEMPMSV

TEMPMVX

TEMPMVX Template Move X

■ Function Moves the template line along the X axis.

Header	Program command	Query	Response
TEMPMVX	TEMPMVX△t t=–1000 to 1000 sec	TEMPMVX?	t

■ Value of t –1000 to 1000 s
■ Suffix code None : ms
US : µs
MS : ms
S : s
■ Initial setting Ø : 0s
■ Example TEMPMVX△1ØMS

TEMPMVY

TEMPMVY Template Move Y

■ Function Moves the template line along the Y axis.

Header	Program command	Query	Response
TEMPMVY	TEMPMVY△l	TEMPMVY?	l

■ Value of l –200.00 to 200.00 dB
■ Suffix code None: dB
DB,DBM,DM: dB
■ Initial setting Ø: 0 dB
■ Example TEMPMVY△-2.5dB

TEMPSAVE

TEMPSAVE Save Template data

■ Function Moves the internal template data to an external file.

Header	Program command	Query	Response
TEMPSAVE	TEMPSAVE△n	————	————

■ Value of n 1 to 999
■ Suffix code None
■ Example TEMPSAVE△1

TEMPSLCT

TEMPSLCT Template Limit Line Select

■ Function — Selects the Limit Line used for evaluating the measured results using the template functions.

Header	Program command	Query	Response
TEMPSLCT	TEMPSLCT△a,sw	TEMPSLCT?△a	sw sw=ON,OFF

■ Value of a
UP1: LIMIT1 UPPER
UP2: LIMIT2 UPPER
LW1: LIMIT1 LOWER
LW2: LIMIT2 LOWER

■ Value of sw
1,ON: ON
Ø,OFF: OFF

■ Suffix code — None

■ Initial setting — OFF

■ Example — TEMPSLCT△UP1,ON

TEN

TEN Title Entry

■ Function — Registers the title character string.

Header	Program command	Query	Response
TEN	TEN△x,y,text	————	————

■ Value of x,y — X and Y values at display start point
(Do not use even if specified. Display location is fixed.)

■ Value of text — Character string within 19 characters enclosed by double or single quotes.

■ Suffix code — None

■ Example — TEN△Ø,Ø,"TITLE SAMPLE"

TEXPAND

TEXPAND Time Expand

■ Function Turns ON/OFF the trace time-expansion functions.

Header	Program command	Query	Response
TEXPAND	TEXPAND△sw	TEXPAND?	sw sw=ON,OFF

■ Value of sw 1,ON: ON
Ø,OFF: OFF
■ Suffix code None
■ Example TEXPAND△ON

TIME

TIME Time

■ Function Sets the time of the built-in clock.

Header	Program command	Query	Response
TIME	TIME△hh,mm,ss	TIME?	hh,mm,ss

■ Value of hh 00 to 23 (Time)
■ Value of mm 00 to 59 (Minute)
■ Value of ss 00 to 59 (Second)
■ Suffix code None
■ Example TIME △Ø8,3Ø,ØØ

TIMEDSP

TIMEDSP Time Display

■ Function Sets time display on or off.

Header	Program command	Query	Response
TIMEDSP	TIMEDSP△sw	TIMEDSP?	sw

■ Value of sw
ON: ON
OFF: OFF
FULL: Clock & Title

■ Suffix code None

■ Initial setting OFF: Off

■ Example TIMEDSP△ON

TITLE

TITLE Title Entry

■ Function Registers the title character string (same function as KSE).

Header	Program command	Query	Response
TITLE	TITLE△text	TITLE?	text

■ Value of text Character string within 32 characters enclosed by single or double quotes.

■ Example
TITLE△"MS2683A"
TITLE△'SPECTRUM ANALYZER'

TLV

TLV Trigger Level

■ Function — Sets the threshold level of sweep the start trigger when the trigger source is video and Ext mode.

Header	Program command	Query	Response
TLV	TLV△l	TLV?	TLV△l

■ Value of l

For EXT:	–10.0 to +10.0 (0.1 V Step)
For video and log:	–100 to 0 (1 dB Step)
For video and linear:	0 to 100 (1% Step)
For video:	–100 to 100 (2% Step)
For video (wide):	HIGH, MID, LOW

■ Suffix code

When the trigger source is video and the step is log

None: dB
DB: dB

When the trigger source is EXT

None: V
V: V

In other case

None

■ Initial setting -4Ø

■ Example TLV△-5Ø

TM

TM Trigger

■ Function Sets the trigger switch and trigger source.

Header	Program command	Query	Response
TM	TM△a	TM?	a

■ Value of a

FREE: FREERUN
VID: VIDEO
WIDEVID: Wide IF Video
LINE: LINE
EXT: EXT

■ Suffix code None

■ Initial setting FREE: FREERUN

■ Example TM△FREE

TMCNT?

TMCNT? Time Count Read

■ Function

Reads the values counted by the integrating meter which integrates the time or which electricity has been turned on.

Header	Program command	Query	Response
TMCNT?	————	TMCNT?	t t = Transfers the data with no suffix code in units of 1 minute.

■ Example TMCNT?

TMMD

TMMD Trace Time Storage Mode

■ Function

Selects the mode for processing the trace TIME waveform.

Header	Program command	Query	Response
TMMD	TMMD△n	TMMD?	TMMD△n

■ Value of n

Ø: NORMAL
1: MAX HOLD
2: AVERAGE
3: MIN HOLD
4: CUMULATIVE
5: OVER WRITE
6: LINEAR AVERAGE

■ Suffix code None

■ Initial setting Ø: NORMAL

■ Example TMMD△Ø

TMWR

TMWR Trace Time Write Switch

■ Function Controls writing of the waveform to trace TIME.

Header	Program command	Query	Response
TMWR	TMWR△sw	TMWR?	TMWR△sw sw=ON,OFF

■ Value of sw
1,ON: ON
Ø,OFF: OFF

■ Suffix code None

■ Initial setting ON: ON

■ Example TMWR△ON

TOUT

TOUT RS232C Time Out

■ Function Sets the time-out time for the RS232C WRITE function.

Header	Program command	Query	Response
TOUT	TOUT△t	TOUT?	t

■ Value of t
Ø: Infinite (wait infinitely)
1 to 255: 1 to 255 s (every 1 s step)

■ Suffix code None

■ Initial setting 3Ø: 30 s

■ Example TOUT△1Ø

TRG

TRG Trigger

■ Function Sets trigger mode.

Header	Program command	Query	Response
TRG	TRG△n	TRG?	TRG△n

■ Value of n
Ø: FREERUN
1 : VIDEO
2: LINE
3 : EXT
7 : Wide IF Video

■ Suffix code None

■ Initial setting Ø: FREERUN

■ Example TRG△1

TRGLVL

TRGLVL Trigger Level

■ Function Sets the sweep-start trigger level when the trigger source = VIDEO, WIDE IF VIDEO, EXT ±10 V.

Header	Program command	Query	Response
TRGLVL	TRGLVL△l	TRGLVL?	l

■ Value of l

–10.0 to +10.0 (0.1 Step) :	when the trigger source is EXT (±10 V) (V units)
–100 to +100 (1 Step) :	when the trigger source is VIDEO and the scale is LOG (dB units)
0 to 100 (1 step):	When the trigger source is VIDEO and the scale is LIN (% units)
–100 to +100 (2 step):	When the trigger source is VIDEO (% units)
HIGH, MID, LOW:	When the trigger source is WIDE IF VIDEO

■ Suffix code

When the trigger source is VIDEO and the scale is LOG
None: dB
DB: dB

When the trigger source is EXT
None: V
V: V

In other case
None

■ Initial setting l=–40

■ Example
TRGLVL△-1Ø.Ø
TRGLVL△9.9

TRGS

TRGS Trigger Switch

■ Function Switches the trigger switch to Free run or Triggered.

Header	Program command	Query	Response
TRGS	TRGS△a	TRGS?	a

■ Value of a FREE: FREERUN
TRGD: TRIGGERED
■ Suffix code None
■ Initial setting FREE: FREERUN
■ Example TRGS△FREE

TRGSLP

TRGSLP Trigger Slope

■ Function Selects the rising or falling slope of the trigger when trigger source is VIDEO or EXT mode.

Header	Program command	Query	Response
TRGSLP	TRGSLP△a	TRGSLP?	a

■ Value of a RISE: Rising edge
FALL: Falling edge
■ Suffix code None
■ Initial setting RISE: Rising edge
■ Example TRGSLP△RISE

TRGSOURCE

TRGSOURCE Trigger Source

■ Function Selects the trigger source. The trigger switch setting is not changed by this command.

Header	Program command	Query	Response
TRGSOURCE	TRGSOURCE△a	TRGSOURCE?	a

■ Value of a
`VID:` VIDEO
`WIDEVID:` WIDE IF VIDEO
`LINE:` LINE
`EXT:` EXT

■ Suffix code None

■ Initial setting `VID:` VIDEO

■ Example `TRGSOURCE△VID`

TRM

TRM Terminator

■ Function Sets the terminator of the Response data transferred on the GPIB.

Header	Program command	Query	Response
TRM	TRM△n	TRM?	n

■ Value of n
`Ø:` LF
`1:` CR/LF

■ Suffix code None

■ Initial setting `Ø:` LF (However, the terminator already registered is not initialized.)

■ Example
`TRM△Ø`
`TRM△1`

TS

TS Take Sweep

■ Function Executes a single sweep synchronously (same function as SWP).

Header	Program command	Query	Response
TS	TS	———	———

■ Example `TS`

TSAVG

TSAVG Take Sweep with Averaging

■ Function Performs synchronous sweeping the number of times specified in the current Averaging setting.

Header	Program command	Query	Response
TSAVG	TSAVG	———	———

■ Example `TSAVG`

TSHOLD

TSHOLD Take Sweep with Max/Min Holding

■ Function Performs synchronous sweeping by the number of times specified in the current holding setting.

Header	Program command	Query	Response
TSHOLD	TSHOLD	————	————

■ Example `TSHOLD`

TSL

TSL Trigger Slope

■ Function Selects triggering on the rising or falling trigger slope.

Header	Program command	Query	Response
TSL	TSL△sw	TSL?	TSL△sw

■ Value of sw `Ø:` Fall
`1:` Rise

■ Suffix code None

■ Initial setting `1:` Rise

■ Example `TSL△Ø`

TSP

TSP Time Span

■ Function Sets the time span of the trace.

Header	Program command	Query	Response
TSP	TSP△t	TSP?	t t=1 to 1000000000 Transfers the data with no suffix code in units of 1 μs

■ Value of t 1 μs to 1000 s

■ Suffix code None : ms
US : μs
MS : ms
S : sec

■ Initial setting 200 msec

■ Example TSP△1ØØ
TSP△1ØØS

TTL

TTL Title Display Switch

■ Function Switches the title display to ON/OFF.

Header	Program command	Query	Response
TTL	TTL△sw	TTL?	sw sw=ON,OFF

■ Value of sw 1,ON: ON
Ø,OFF: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example TTL△ON

TZONE

TZONE Expand Zone

■ Function Switches the time expansion (magnified display) ON/OFF.

Header	Program command	Query	Response
TZONE	TZONE△sw	TZONE?	sw sw=ON,OFF

■ Value of sw
1,ON: ON
Ø,OFF: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example TZONE△ON

TZSP

TZSP Expand Zone Span

■ Function Sets the zone for time expansion (magnified display).

Header	Program command	Query	Response
TZSP	TZSP△t	TZSP?	t t=1 to 1000000000 Transfers the data with no suffix code in units of 1 µs

■ Value of t 1 µs to 1000 s

■ Suffix code
None: ms
US: µs
MS: ms
S: s

■ Initial setting 200 ms

■ Example TZSP△1ØMS

TZSPP

TZSPP Expand Zone Span point

■ Function: Specifies the width of the Expand Zone in term of the number of points.

Header	Program command	Query	Response
TZSPP	TZSPP△p	TZSPP?	p

■ Value of p: 1 to 500, 1000
■ Suffix code: None
■ Initial setting: 1ØØ: 101 points (2 div)
■ Example: TZSPP△51

TZSTART

TZSTART Expand Zone Start

■ Function: Sets the start time for time expansion (magnified display).

Header	Program command	Query	Response
TZSTART	TZSTART△t	TZSTART?	t t=-1000000000 to 65500 Transfers the data with no suffix code in units of 1 µs

■ Value of t: –1000 s to 65.5 ms
■ Suffix code:
None: ms
US: µs
MS: ms
S: s
■ Initial setting: 0 s
■ Example: TZSTART△1ØMS

TZSTARTP

TZSTARTP Expand Zone Start point

■ Function Specifies the start point of the Expand Zone in terms of the number of point.

Header	Program command	Query	Response
TZSTARTP	TZSTARTP△p	TZSTARTP?	p

■ Value of p 0 to 500, 1000
■ Suffix code None
■ Initial setting 2ØØ: 200 point
■ Example TZSTARTP△1ØØ

UANTF

UANTF Select setting user antenna factor table number

■ Function Selects the setting user antenna factor table number.

Header	Program command	Query	Response
UANTF	UANTF△n	UANTF?	n

■ Value of n `1 to 4` (user antenna factor table number)
■ Suffix code None
■ Initial setting `1`
■ Example `UANTF△1`

UCL?

UCL? Query Uncal Status

■ Function Reads out the UNCAL status.

Header	Program command	Query	Response
UCL?	————	UCL?	UCL△n

■ Value of n `Ø:` NORMAL
`1:` During UNCAL
■ Example `UCL?`

UNC

UNC Uncal Display ON/OFF

■ Function Specifies whether 'UNCAL' is displayed when UNCAL occurs.

Header	Program command	Query	Response
UNC	UNC△sw	UNC?	UNC△sw sw=ON,OFF

■ Value of sw
1,ON: ON
Ø,OFF: OFF

■ Suffix code None

■ Initial setting ON: ON

■ Example UNC△ON

note: This setting is valid only by the remote command.

UNT

UNT Unit for Log Scale

■ Function Sets the display unit system in LOG scale mode.

Header	Program command	Query	Response
UNT	UNT△a	UNT?	UNT△a

■ Value of a
Ø: dBm
1: dBμV
2: dBmV
3: V
4: dBμV(emf)
5: W
6: dBμV/m

■ Suffix code None

■ Initial setting Ø: dBm

■ Example UNT△Ø

VAVG

VAVG Average

■ Function Sets averaging ON or OFF and sets the number of averaging processes.

Header	Program command	Query	Response
VAVG	VAVG△sw VAVG△n	VAVG?	n

■ Value of sw 1,ON: ON
Ø,OFF: OFF
■ Value of n 2 to 1024: Number of averaging processes
■ Suffix code None
■ Initial setting 8: 8 times
■ Example VAVG△ON
VAVG△128

VB

VB Video Bandwidth

■ Function Sets the video bandwidth (same function as VBW).

Header	Program command	Query	Response
VB	VB△f VB△a	VB?	f f=1 to 3000000 or OFF Transfers the data with no suffix code in units of 1 Hz.

■ Value of f 1 Hz to 3 MHz
■ Value of a OFF: OFF
AUTO: AUTO
UP: VBW UP
DN: VBW DOWN
■ Suffix code f: None: Hz(10^0)
HZ: Hz(10^0)
KHZ,KZ: kHz(10^3)
MHZ,MZ: MHz(10^6)
GHZ,GZ: GHz(10^9)
a: None
■ Initial setting AUTO
■ Example VB△3ØØHZ

VBCOUPLE

VBCOUPLE Couple Mode

■ Function
Sets the coupled functions to commonly settable or independently settable at the frequency domain and time domain.

Header	Program command	Query	Response
VBCOUPLE	VBCOUPLE△a	VBCOUPLE?	a

■ Value of a
`COM:` Common
`IND:` Independent

■ Suffix code
None

■ Initial setting
`IND:` Independent (The mode already registered is not initialized.)

■ Example
`VBCOUPLE△COM`

VBR

VBR VBW/ RBW Ratio

■ Function
Sets the ratio of video bandwidth to resolution bandwidth when VBW is selected for AUTO.

Header	Program command	Query	Response
VBR	VBR△r	VBR?	r r=0.0001 to 100

■ Value of r
0.0001 to 100 (1/3 sequence)

■ Suffix code
None

■ Initial setting
Trace A,B,BG:VBW/RBW RATIO=1
Trace TIME:VBW/RBW RATIO=1

■ Example
`VBR△1`

VBW

VBW Video Bandwidth

■ Function Sets the video bandwidth.

Header	Program command	Query	Response
VBW	VBW△n	VBW?	VBW△n

■ Value of n

Ø:	1 Hz	8:	3 Hz
1:	10 Hz	9:	30 Hz
2:	100 Hz	1Ø:	300 Hz
3:	1 kHz	11:	3 kHz
4:	10 kHz	12:	30 kHz
5:	100 kHz	13:	300 kHz
6	OFF	14:	3 MHz
7:	1 MHz		

■ Suffix code None
■ Initial setting Calculated value when VBW is selected for AUTO
■ Example VBW△3

VIEW

VIEW View

■ Function Stops writing of the waveform data.

Header	Program command	Query	Response
VIEW	VIEW△tr	————	————

■ Value of tr

TRA:	Trace A
TRB:	Trace B
TRBG:	Trace BG
TRTIME:	Trace TIME

■ Suffix code None
■ Example VIEW△TRB

WINDPOS

WINDPOS Measure Window Position

■ Function Specifies the display position of measured-result display window.

Header	Program command	Query	Response
WINDPOS	WINDPOS△a	WINDPOS?	a

■ Value of n
UPLEFT: Upper left
UPRIGHT: Upper right
LOWLEFT: Lower left
LOWRIGHT: Lowre right

■ Suffix code None

■ Initial setting UPLEFT: Upper left

■ Example WINDPOS△LOWRIGHT

XCH

XCH Exchange Traces

■ Function Exchanges the specified wave data of traces.

Header	Program command	Query	Response
XCH	XCH△tr1,tr2	————	————

■ Value of tr1,tr2 TRA: Trace-A
TRB: Trace-B
■ Suffix code None
■ Example XCH△TRA,TRB

XMA

XMA Trace A Spectrum Data

■ Function Writes/reads the spectrum data to/from trace A (main trace) memory.

Header	Program command	Query	Response
XMA	XMA△p,b	XMA?△p,d	b1,b2,b3 • • (ASCII) b1 b2 b3 • (BINARY)

■ Value of p 0 to 500, 1000 (point No.)
■ Value of b LOG scale: Integer of 0.01 dBm unit (independent of display unit system)

LIN scale: $b = \dfrac{\text{Voltage value (V)}}{\text{Reference level (V)}} \times 10000$

When binary format is specified for response data, data for each point is composed of two bytes. The high-order byte is sent first.
■ Value of d 1 to 501, 1001(number of points)
■ Example XMA△1,-2ØØØ
XMA?△1,2(Reads two-point data items starting from point 1.)

XMB

XMB Trace B Spectrum Data

■ Function Writes/reads the spectrum data to/from to trace B (main trace) memory.

Header	Program command	Query	Response
XMB	XMB△p,b	XMB?△p,d	b1,b2,b3 • • (ASCII) b1 b2 b3 • (BINARY)

■ Value of p 0 to 500, 1000 (point No.)

■ Value of b `LOG scale:` Integer of 0.01 dBm unit (independent of display unit system)

`LIN scale:` $b = \dfrac{\text{Voltage value (V)}}{\text{Reference level (V)}} \times 10000$

When binary format is specified for response data, data for each point is composed of two bytes. The high-order byte is sent first.

■ Value of d 1 to 501, 1001 (number of points)

■ Example `XMB△1,-2ØØØ`

`XMB?△1,2` (Reads two-point data items starting from point 1.)

XMG

XMG Trace BG Spectrum Data

■ Function Writes/reads the spectrum data to/from to trace BG memory.

Header	Program command	Query	Response
XMG	XMG△p,b	XMG?△p,d	b1,b2,b3 • •(ASCII) b1 b2 b3 • (BINARY)

■ Value of p 0 to 500, 1000 (point No.)

■ Value of b `LOG scale:` Integer of 0.01 dBm unit (independent of display unit system)

`LIN scale:` $b = \dfrac{\text{Voltage value (V)}}{\text{Reference level (V)}} \times 10000$

When binary format is specified for response data, data for each point is composed of two bytes. The high-order byte is sent first.

■ Value of d 1 to 501, 1001(number of points)

■ Example `XMG△1,-2ØØØ`

`XMG?△1,2` (Reads two-point data items from point 1.)

XMT

XMT Trace TIME Spectrum Data

■ Function Writes/reads the spectrum data to/from the trace TIME memory.

Header	Program command	Query	Response
XMB	XMT△p,b	XMT?△p,d	b1,b2,b3 • • (ASCII) b1 b2 b3 • (BINARY)

■ Value of p 0 to 500, 1000 (point No.)

■ Value of b `LOG scale:` Integer of 0.01 dBm unit (independent of display unit system)

`LIN scale:` $b = \dfrac{\text{Voltage value (V)}}{\text{Reference level (V)}} \times 10000$

When binary format is specified for response data, data for each point is composed of two bytes. The high-order byte is sent first.

■ Value of d 1 to 501, 1001 (number of points)

■ Example `XMT△1,-2ØØØ`

`XMT?△1,2` (Reads two-point data items starting from point 1.)

YAMP

YAMP Y-Out Amplitude

■ Function Selects the Y-Out amplitude.

Header	Program command	Query	Response
YAMP	YAMP△a	YAMP?	a

■ Value of a
Ø: 0.5
1: 1
2: 5

■ Suffix code None

■ Example YAMP△1

YOFFSET

YOFFSET Y-Out Offset

■ Function Sets the Y-Out Offset voltage.

Header	Program command	Query	Response
YOFFSET	YOFFSET△a	YOFFSET?	a

■ Value of a –2.0 to 2.0 [V]

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

■ Example YOFFSET△2

YPOL

YPOL Y-Out Polarity

■ Function Switches the Y-Out polarity.

Header	Program command	Query	Response
YPOL	YPOL△a	YPOL?	a

■ Value of a
POS: Positive
NEG: Negative

■ Suffix code None

■ Example YPOL△POS

ZEROADJ

ZEROADJ Zero

■ Function Zero point proofreading is performed in the state of no inputting.

Header	Program command	Query	Response
ZEROADJ	ZEROADJ	―――――	―――――

■ Example ZEROADJ

■ Restrictions by apparatus and the option

This command is effective about MS2687A/B Option21/23 Power Meter.

ZEROCAL

ZEROCAL Zero Cal

■ Function Zero point proofreading is performed in the state of no inputting.
After calibration, Power Meter is rectified in the signal input of 50 MHz, 0 dBm.

Header	Program command	Query	Response
ZEROCAL	ZEROCAL	―――――	―――――

■ Example ZEROCAL

■ Restrictions by apparatus and the option

This command is effective about MS2687A/B Option21/23 Power Meter.

∗CLS

∗CLS Clear Status Command

■ Function Clears the status byte register.

Header	Program command	Query	Response
*CLS	*CLS	————	————

■ Example *CLS

∗ESE

∗ESE Standard Event Status Enable

■ Function Sets or clears the standard status enable register.

Header	Program command	Query	Response
*ESE	*ESE△n	*ESE△?	n

■ Value of n 0 to 255

■ Example *ESE△2Ø
*ESE?

∗ESR?

∗ESR? Standard Event Status Register Query

■ Function Returns the current value in the standard event status register.

Header	Program command	Query	Response
*ESR	————	*ESR?	n

■ Value of n 0 to 255

■ Example *ESR?

*IDN?

*IDN? Identification Query

■ Function — Returns the manufacturer name, model number etc. of the equipment.

Header	Program command	Query	Response
*IDN	————	*IDN?	ANRITSU,id,ØØØØ,n

■ Value of id — MS268*A/B (a name of spectrum analyzer)

■ Value of n — 1 to 99 (firmware version No.)

■ Example — `*IDN?`

---

*OPC

*OPC Operation Complete Command

■ Function — Sets bit 0 in the standard event status register when all pending selected device operations have been completed.

Header	Program command	Query	Response
*OPC	*OPC	————	————

■ Example — `*OPC`

*OPC?

*OPC? Operation Complete Query

■ Function Sets the output queue to 1 to generate a MAV summary message when all pending selected device operations have been completed.

Header	Program command	Query	Response
*OPC?	――――	*OPC?	1

■ Example *OPC?

*RST

*RST Reset Command

■ Function Resets the device to the third level.

Header	Program command	Query	Response
*RST	*RST	――――	――――

■ Example *RST

*SRE

*SRE Service Request Enable Command

■ Function Sets the bits in the service request enable register.

Header	Program command	Query	Response
*SRE	*SRE△n	*SRE?	n

■ Value of n 0 to 63, 128 to 191 (current value of the service request enable register)

■ Example *SRE△16

*STB? Read Status Byte Command

■ Function Returns the current values of the status bytes including the MSS bit.

Header	Program command	Query	Response
*STB	————	*STB?	n

■ Value of n

Bit	Bit weight	Bit name	Condition of status byte register
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	————	0= Not used
2	4	ESB(END)	0= Event status not generated 1= Event status generated
1	2	————	0= Not used
0	1	————	0= Not used

■ Example `*STB?`

*TRG

*TRG Trigger Command

■ Function

Same function as that of IEEE488 GET-group-execute-trigger bus command.
For this command, the MS2650/MS2660B/C series executes a single sweep (same function as SWP.)

Header	Program command	Query	Response
*TRG	*TRG	————	————

■ Example

```
*TRG
```

*TST

*TST Self Test Query

■ Function

Executes an internal self-test and returns the details of any errors.

Header	Program command	Query	Response
*TST	————	*TST?	n

■ Value of n

Ø: Self-test completed with no errors.
-32767 to -1,
1 to 327671: Self-test was not completed, or was completed but with errors.

■ Example

```
*TST?
```

*WAI Wait-to-Continue Command

■ Function Keeps the next command on stand-by while the device is executing a command.

Header	Program command	Query	Response
*WAI	*WAI	————	————

■ Example `*WAI`

Appendixes

Appendix A Table of MS2683A Device-Dependent Initial Setting

Table A Device-Dependent Initial Settings (1/5)

Group	Outline	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Frequency	Selects the mode for setting a frequency band.	FREQUENCY MODE	START-STOP		
	Sets the start frequency	START FREQUENCY	0 Hz	---------	0 Hz
	Sets the center frequency	CENTER FREQUENCY	(*1)		(*1)
	Sets the stop frequency	STOP FREQUENCY	(*2)	----------	(*2)
	Sets the frequency span	FREQUENCY SPAN	(*2)	*0 Hz	(*2)
	Sets the center-frequency step size	CENTER FREQ STEP SIZE	1 GHz		
	Sets the scroll step size	SCROLL STEP SIZE	2 div		
	Select Band	BAND SELECT	AUTO		
Level	Sets the reference level	REFERENCE LEVEL	—10 dBm		
	Set the reference level step size	REF LEVEL STEP SOZE	AUTO:1div		
	Sets the scale mode	SCALE MODE	LOG	LOG	*LOG
	Sets the LOG scale	LOG SCALE	10 dB/div	10 dB/div	*10 dB/div
	Sets the LIN scale	LIN SCALE	10%/div	10%/div	---------
	Sets the LOG unit system	LOG SCALE UNIT	Not initialized *RST: dBm		
	Sets the reference level offset	REF LEVEL OFFSET	OFF		
	Sets the reference level offset value	OFFSET VALUE	0 dBm		
	Sets the display line	DISPLAY LINE	OFF		
	Sets the display line level	DISPLAY LINE LEVEL	—60 dBm		
	Selects the ABS or RELmarker level	MARKER LEVEL ABS/REL	A:ABS B:ABS	ABS	ABS
	Sets the correction factor	CORRECTION	Not initialized *RST: OFF		
	Sets the correction factor number	CORRECTION FACTOR No.	*RST: 1		
	RF pre-amplifier	RF PREAMPL	OFF		
	Sets the input impedance	INPUT INPEDANCE	50Ω		

(*1) 1.5 GHz (MS2681A), 3.95 GHz (MS2683A), 15.0 GHz (MS2687A/MS2687B)

(*2) 3.0 GHz (MS2681A), 7.9 GHz (MS2683A), 30.0 GHz (MS2687A/MS2687B)

Table A Device-Dependent Initial Settings (2/5)

Group	Outline	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Display mode	Selects the display mode	DISPLAY MODE	TRACE-A		
	Selects the display format for TRACE-A/B	DISPLAY FORMAT (TRACE-A/B)	A<B		
	Selects the display format for TRACE-A/BG	DISPLAY FORMAT (TRACE-A/BG)	A<BG		
	Selects the display format for TRACE-A/TIME	DISPLAY FORMAT (TRACE-A/TIME)	A<TIME		
	Selects the mode for processing a waveform	TRACE STORAGE MODE	NORMAL	NORMAL	*NORMAL
	Number of traces averaged	AVERAGE No.	8 times		
	Sets the separation of average sweep stops	AVERAGE SWEEP MODE	ON(PAUSE)		
	Sets the separation of hold sweep stops	HOLD SWEEP MODE	OFF(CONTINUOUS)		
	Selects the detection mode	DETECTION MODE	PEAK	SAMPLE	*PEAK
	Sets the delay time	DELAY TIME	------	0 sec	------
	Sets the time span	TIME SPAN	------	# 200 msec	------
	Sets the time expansion zone to ON/OFF	EXPAND ZONE ON/OFF	------	OFF	------
	Sets the expand mode to ON/OFF	EXPAND ON/OFF	------	OFF	------
	Sets the active marker when display mode is trace A/B	TRACE-A/B ACTIVE MKR	TRACE-A	------	------
	Selects the marker mode	MARKER MODE	NORMAL		
	Specifies the zone-marker center	ZONE MAKER CENTER	250 point	250 point	250 point
	Specifies the zone-marker width	ZONE MAKER WIDTH	51 point (1 div)	*1 point	501 point
	Marker search mode	MAKER SEARCH MODE	PEAK		
	Sets the multi marker mode to ON/OFF	MULTI MARKER MODE	OFF		
	Sets the multi marker list to ON/OFF	MULTI MARKER LIST	OFF		
	Multi marker list frequency AES/REL	MULTI MARKER LOST FREQ	ABS		
	Multi marker list level ABS/REL	MULTI MARKER LOST LEVEL	ABS		
	Sets the 'n'th multi marker to ON/OFF (No.1~10)ON/OFF	MULTI MARKER ON/OFF	Not initialized RST: No.1 = ON, No.2 to 10 = OFF		
	Selects the active multi marker	ACTIVE MARKER No.	Not initialized *RST: No.1		
	Search resolution	SEARCH RESOLUTION	10 dB		
	Search threshold	THRESHOLD	OFF		

Table A Device-Dependent Initial Settings (3/5)

Group	Outline	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Trace operation	A-B→A	A-B→A	OFF		
	A-B REFERENCE LINE	REFERENCE LINE	MIDDLE		
	Normalize(A - B None)	NORMALIZE	OFF		
Sweep function	Sets the sweep mode	SWEEP MODE	CONTINUOUS		
	Sets the zone sweep to ON/OFF	ZONE SWEEP	OFF	----------	
	Sets the tracking function to ON/OFF	TRACKING SWEEP	OFF	----------	
	Sets the gate sweep function to ON/OFF	GATE SWEEP	OFF		---------
	Sets the gate delay time	GATE DELAY	0 sec		---------
	Sets the gate length	GATE LENGTH	1 msec		---------
	Sets the gate interval termination, internally or externally	GATE END	INTERNAL		---------
	Sets the trigger switch mode	TRIGGER SWITCH	FREE RUN	FREE RUN	*FREE RUN
	Sets the trigger source	TRIGGER SOURCE	VIDEO		---------
	Sets the external trigger level type	TRIGGER SOURCE(EXT)	–10V		---------
	Selects the trigger slope	TRIGGER SLOPE	RISE		---------
	Sets the trigger level	TRIGGER LEVEL	-40dB		---------
	Trigger level (WIDE IF VEDEO)	TRIGGER LEVEL (WIDE IF VIDEO)	HIGH		
Waveform writing/reading	Sets the trace write switch to ON/OFF	TRACE WRITE SWITCH	ON	ON	ON
	Sets the trace read switch to ON/OFF	TRACE READ SWITCH	ON	ON	ON
Coupled function	Selects the mode for setting the resolution bandwidth	RESOLUTION BANDWIDTH	AUTO	AUTO	*AUTO
	Selects the mode for setting the video bandwidth	VIDEO BAND WIDTH	AUTO	AUTO	*AUTO
	Selects the mode for setting the sweep time	SWEEP TIME	AUTO	AUTO	*AUTO
	Selects the mode for setting the RF attenuator	RF ATTENUATOR	AUTO		
	VBW/RBW ratio at VBW = AUTO	VBW/RBW RATIO	1	1	1
	RBW/Span ratio at RBW = AUTO	RBW/SPAN RATIO	0.01	0.01	0.01
	Sets the coupled functions to COMMON or INDEPENDENT between the frequency or time domain	COUPLE MODE (COMMON/INDEPENDENT)	Not initialized. When shipped from the factory: INDEPENDENT		
SAVE/ RECALL	Selects data to be recalled	RECALLED DATA	Not initialized. When shipped from the factory: View		
Hard copy	Select the printer device mode	PRINTER MODE	Not initialized. When shipped from the factory: BJ-M70 (ESC/P)		

Table A Device-Dependent Initial Settings (4/5)

Group	Outline	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Measure function	Selects the item to be measured	MEASURE ITEM	OFF		
	Sets the counter to the specified resolution	COUNT RESOLUTION	1 kHz		
	Selects the occupied frequency bandwidth measurement method	OBW MEASURE METHOD	Not initialized *RST: N%		
	Sets the occupied frequency bandwidth to N%	OBW N% VALUE	Not initialized *RST: 99%		
	Sets the occupied frequency to X dB	OBW XdB VALUE	Not initialized *RST: 25dB		
	Selects the adjacent channel leakage power measurement method	ADJ-CH MEASURE METHOD	Not initialized *RST: R:TOTAL POWER		
	Selects the adjacent channel leakage power measurement method	ADJ-CH GRAPH	Not initialized *RST: ON		
	Selects the adjacent channel	ADJACENT CH SELECT	Not initialized *RST: BOTH SIDES		
	Sets adjacent separation 1	ADJACENT CH SEPARATION1	Not initialized *RST: 12.5 kHz		
	Sets the adjacent separation 2	ADJACENT CH SEPARATION2	Not initialized *RST: 25.0 kHz		
	Sets the adjacent channel bandwidth	ADJACENT CH BANDWIDTH	Not initialized *RST: 8.5 kHz		
	Sets the adjacent channel center line display	ADJ-CH CENTER LINE	Not initialized *RST: ON		
	Sets the adjacent channel band line display	ADJ-CH BAND LINE	Not initialized *RST: OFF		
	Selects the template	SELECT TEMPLATE	Not initialized *RST: No.1		
	Selects the template level	TEMPLATE LEVEL	Not initialized *RST: ABSOLUTE		
	Sets the template management function	MANEGE TEMPLATE	Not initialized		
	Selects the noise measurement method	NOISE MEASURE METHOD	Not initialized *RST: ABS		

Table A Device-Dependent Initial Settings (5/5)

Group	Outline	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Measure function	BURST POWER START POINT	BURST POWER MEASURE START POINT	100 point		
	BURST POWER STOP POINT	BURST POWER MEASURE STOP POINT	400 point		
Calibration	Frequency calibration	FREQ CAL	ON		
RS-232C	Band rate	BAUD RATE	2400		
	Parity	PARITY	OFF		
	Data bit	DATA BIT	8 bit		
	Stop bit	STOP BIT	1 bit		
	Time-out	TIME OUT	30 sec		
GPIB	Sets the GPIB 2 self address	GPIB SELF ADDRESS	Not initialized. When shipped from the factory: 0		
	trigger sweep time out	TRIGGER SWEEP TIME OUT			
	Sets the DSU (MC8104A) address	DATA STORAGE UNIT ADDRESS	Not initialized. When shipped from the factory: 19		
Title	Sets the title output to ON/OFF	TITLE ON/OFF	Not initialized. When shipped from the factory: ON		
	Selects the title data	TITLE DATA	Not initialized. When shipped from the factory: ALLSPACE		
CAL/ UNCAL	Displays couple failure	UNCAL DISPLAY	Not initialized. Initialized to ON at power-on.		
Spectrum data/ PMC/ETC	Sets the response data to ASCII/BINARY	RESPONSE DATA	Not initialized. When shipped from the factory: ASCII		
	Selects the terminator for LF/CR + LF	TERMINATOR	Not initialized. When shipped from the factory: LF		
Others	Power input status	POWER ON STATE	BEFORE POWER OFF		
	Parameter display system	PARAMETER DISPLAY TYPE	TYPE-1		
	Time display	TIME DISPLAY	OFF		
	Date display system	DATE DISPLAY MODE	YY/MM/DD		
	Comment column display system	COMMENT DISPLAY	OFF		
	Display color pattern	COLOR PATTERN	COLOR1		
	LCD display	LCD DISPLAY	ON		

Note:
- In the above table, in place of the parameters not initialized by the INIT command or P+reset key, the initial settings (indicated by *RST) initialized by the *RST command are listed. In place of the parameters not initialized by the *RST command, the values at the shipment are listed.
- An initial value marked with '*' is a fixed value.
- An initial value marked with '#' is the value at COUPLE MODE = COMMON.

Appendix B 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 NUL 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 < 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	16 SO E 14	36 RS 1E 30	56 . 2E 46	76 > 3E 62	116 N 4E 78	136 ∧ 5E 94	156 n 6E 110	176 ~ 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 / 2F 47	77 ? 3F 63	117 O 4F 79	137 UNT — 5F 95	157 o 6F 111	177 RUBOUT (DEL) 7F 127
	Address command	Universal command	Listen address		Talk address		Secondary address or command	

KEY

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

*USA Standard Code for Information Interchange

Table of GPIB Interface Messages (extended)

b7 →					0		0		0		0		1		1		1		1	
b6 →					0		0		1		1		0		0		1		1	
b5 →					0	① MSG	1	MSG	0	MSG	1	MSG	0	MSG	1	MSG	0	MSG	1	MSG
Bits ② ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → ROW↓	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL		DLE		SP		0		@		P		`		p	
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 (PCG)

Secondary command group (SCG)

Notes:
①MSG=INTERFACE MESSAGE（Sent by ATN of True: Low level.）
②b1=DI 01••••b7=DI 07（b1 through b7 correspond to DI01 to DI07 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
(SCG)	Secondary Command Group
DCL	Device Clear
PPU	Parallel Poll Unconfigure
SPE	Serial Poll Enable
SPD	Serial Poll Disable
UNL	Unlisten
UNT	Untalk

Table of Interface Message group

D108	D107	D106	D105	D104	D103	D102	D101	Interface message group (G)
×	0	0	0	b4	b3	b2	b1	Addressed command G
×	0	0	1	b4	b3	b2	b1	Universal command G
×	0	1	b5	b4	b3	b2	b1	Listen address G
×	0	1	1	1	1	1	1	Unlisten (UNL)
×	1	0	b5	b4	b3	b2	b1	Talker Address G
×	1	0	1	1	1	1	1	Untalk (UNT)
×	1	1	b5	b4	b3	b2	b1	Secondary command G

Table of Address Assignmemts

Address character		Address swich 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	1	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 Plotter
N	.	0	1	1	1	0	14	
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

Appendix C Comparison Table of Controller's GPIB Instructions

Function	Controller		
	IBM-PC (NI-488.2)	IBM-PC (NI-488)	HP9000 series
Outputs data to a device	CALL Send( )	CALL IBWRT( )	OUTPUT device selector; data
Output binary data to a device	CALL SEND Cmds( )		
Assigns data entered from a device to a variable	CALL Receive( )	CALL IBRD( )	ENTER device selector; variable
Assigns binary data entered from a device to a variable			
Initializes an interface	CALL Send IFC( )	CALL IBSIC( )	ABORT select code
Turns REN line on	CALL Enable Remote( )	CALL IBSRE( )	REMOTE device selector (select code)
Turns REN line off	CALL Enable Local( )	CALL IBSRE( ) CALL IBLOC( )	LOCAL device selector (select code) LOCAL device selector (select code + primary address)
Outputs interface message(s) and data		CALL IBCMD( ) CALL IBCMDA( ) (asynchronous)	SEND select code; message string
Triggers a specified device	CALL Trigger( )	CALL IBTRG( )	TRIGGER device selector

Function	Controller		
	IBM-PC (NI-488.2)	IBM-PC (NI-488)	HP9000 series
Initializes devices	CALL DevClear( )	CALL IBCLR( )	CLEAR device selector (select code) CLEAR device selector (select code + primary address)
Prevents a device from being switche d over from remote to local	CALL SendLLO( ) CALL SetRWLS( )	LOCAL LOCKOUT	
Transfers control to a specified device	CALL Pass Control( )	CALL IBPCT( )	PASS CONTROL
Sends out a service request		CALL IBRSV( )	REQUEST select code
Performs serial polling	CALL Read Status Byte( ) CALL AllSpoll( )	CALL IBRSP( )	SPOLL (device selector) (function)
Sets a terminator code		CALL IBEOS( ) CALL IBEOT( )	
Sets a limit value for checking a time-out		CALL IBTOM( )	
Wait to SRQ	CALL WaitSRQ( )	CALL IBWAIT( )	