MS2602A

Spectrum Analyzer

Operation Manual Vol.3
(GPIB Remote Control)

Ninth Edition

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

Measuring Instruments Division
Measurement Group

ANRITSU CORPORATION

JUN.
1999

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Safety Symbols

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

Symbols used in manual

DANGER	This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.
WARNING	This indicates a hazardous procedure that could result in serious injury or death if not performed properly.
CAUTION	This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

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

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

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

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

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

These indicate that the marked part should be recycled.

MS2602A Spectrum Analyzer
Operation Manual Vol.3 (GPIB Remote Control)

December 1992 (First Edition)
April 1999 (Ninth Edition)

Strategies for the Year 2000 problem

This equipment does not suffer from the Year 2000 problem (Note). However, we recommend that you should check whether your application software, in which this equipment is used as a part, has any Year 2000 bugs because this equipment indicates a year using its last two digits.

Note: The Year 2000 problem

The Year 2000 problem is defined as follow:

Systems computing date data has represented the year as a two-digit number (for example, 1997 is represented as "97"). When the Year 2000 comes or data of 2000 or later is to be computed, the year is indicated as "00", "01" and so on, which causes troubles in comparison of dates, sorting using dates and computation of date data.

Another problem is that Year 2000, a leap year, is not recognized as so.

For Safety

DANGER

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

WARNING

Repair

WARNING⚠

Falling Over

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

For Safety

CAUTION

Cleaning

1. 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.

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

Check Terminal

3. Never input a signal of more than DC 0 V between the measured terminal and ground. Input of an excessive signal may damage the equipment.

Refer to the Section 2 in Basic operating instructions of Operation manual, except the above descriptions.

Equipment Certificate

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

Anritsu Warranty

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

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to 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 Corporation or its representatives at the address in this manual.

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

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 or 1002). 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. In this mode, the highest level within the frequency range between the sample points can be held and traced.

Positive peak detection mode should be used for almost all measurements including normal signal level measurement, pulsed noise analysis, and others. It is impossible to measure the signal level accurately in sample detection mode or in negative peak detection mode.

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	Detection mode
• Normal signal level	POS PEAK
• Random noise	SAMPLE
• Pulsed noise	POS PEAK
• 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.

MEMORY BACK-UP BATTERY REPLACEMENT

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

STORAGE MEDIUM

This equipment stores data and programs using Plug-in Memory cards (PMC) and backed-up memories. Data and programs may be lost due to improper use or failure. ANRITSU therefore recommends that you back-up the memory.

ANRITSU CANNOT COMPENSATE FOR ANY MEMORY LOSS.

Please pay careful attention to the following points. Do not remove the IC card and backed-up memory from equipment being accessed.

(PMC)

- Isolate the card from static electricity.
- The back-up battery in the SRAM card has a limited life; replace the battery periodically.

(Backed-up memory)

- Isolate the memory from static electricity.

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

CE Marking

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

CE Conformity Marking

CE

1. Product Name/Model Name

Product Name: Spectrum Analyzer
Model Name: MS2602A

2. Applied Directive

EMC: Council Directive 89/336/EEC
Safety: Council Directive 73/23/EEC

3. Applied Standards

EMC:

Electromagnetic radiation:

EN55011 (ISM, Group 1, Class A equipment)

Immunity:

EN50082-1

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

*: Performance criteria

A: No performance degradation or function loss

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

Harmonic current emissions:

EN61000-3-2 (Class A equipment)

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

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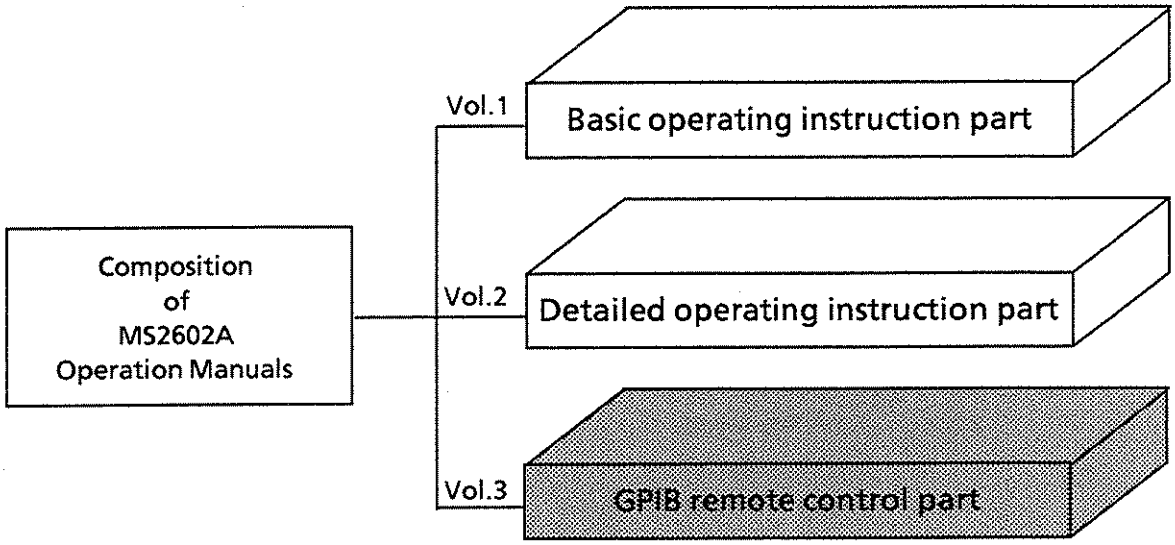
ABOUT THIS MANUAL

(1) Composition of MS2602A Operation Manuals

The MS2602A 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: Basic Operating Instructions: Provides information on the MS2602A outline, preparation before use, panel description, basic operation, performance tests, calibration, storage / transportation, and quick reference for functions other than PTA.

Detailed operating instruction part: Detailed Operating Instructions: Provides information on the detailed operating instructions that expand on the panel description and basic operation in the Basic Operating Instruction Part of the separate Operation Manual. An index is available for the function menu to facilitate quick reference.

GPIB remote control part: Provides information on the MS2602A remote control which conforms with IEEE488.2 standards. To assist creating GPIB programs, this manual gives examples of N_{88} Basic language programs that run on the Nippon Electric Co.(NEC) PC9800 series of personal computers.

(2) GPIB Basic Guide (sold separately)

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

TABLE OF CONTENTS

For Safety iii

SECTION 1 GENERAL 1-1

1.1 GENERAL 1-3
1.1.1 Functions of GPIB 1-3
1.1.2 Functions of the GPIB with two ports 1-3
1.1.3 Examples of system configuration using GPIB 1 / GPIB 2 1-4
1.1.4 Specifications 1-5

SECTION 2 CONNECTING THE BUS AND SETTING THE ADDRESS 2-1

2.1 Connecting Devices with GPIB Cables 2-3

2.2 Checking and Setting GPIB Address 2-4
2.2.1 Panel key layout 2-4
2.2.2 Key operation flow 2-4
2.2.3 Checking the address 2-5
2.2.4 Setting the address for GPIB 1 2-5

SECTION 3 DEVICE MESSAGE FORMAT 3-1

3.1 General Description 3-3
3.1.1 Program message format 3-3
3.1.2 Response message format 3-9

SECTION 4 STATUS STRUCTURE 4-1

4.1 IEEE488.2 Standard Status Model 4-3

4.2 Status Byte (STB) Register 4-5
4.2.1 ESB and MAV summary messages 4-5
4.2.2 Device-dependent summary messages 4-6
4.2.3 Reading and clearing STB register 4-7

4.3 Service Request (SRQ) Enabling Operation 4-8

4.4 Standard Event Status Register 4-9
4.4.1 Bit definition of Standard Event Status Register 4-9
4.4.2 Reading, writing to, and clearing Standard Event Status Register 4-10
4.4.3 Reading, writing to, and clearing Standard Event Status Enable Register 4-10

4.5 Extended Event Status Register 4-11
4.5.1 Bit definition of Extended Event Status Register 4-12
4.5.2 Reading, writing to, and clearing Extended Event Status Register 4-13
4.5.3 Reading, writing to, and clearing Extended Event Status Enable Register 4-13
4.6 Techniques for Synchronizing MS2602A with a Controller 4-14
4.6.1 Wait for response after *OPC? query is sent 4-14
4.6.2 Wait for service request after *OPC is sent 4-15

SECTION 5 INITIAL SETTINGS 5-1
5.1 Bus Initialization by the IFC Statement 5-4
5.2 Initialization for Message Exchange by DCL and SDC Bus Commands ... 5-5
5.3 Device Initialization by the *RST Command 5-6
5.4 Device Initialization by the INI / IP Command 5-7
5.5 Device Status at Power-on 5-7

SECTION 6 SAMPLE PROGRAMS 6-1
6.1 Precautions on Creating the GPIB Program 6-3
6.2 Sample Programs 6-4
6.2.1 Initializing MS2602A 6-4
6.2.2 Reading the frequency and level at marker point 6-6
6.2.3 Reading trace data 6-8
6.2.4 Transferring 2-byte binary data 6-11
6.2.5 Delta marker 6-13
6.2.6 Multimarker function 6-15
6.2.7 Gate functions 6-17
6.2.8 Saving and recalling data 6-20
6.2.9 Adjacent-channel leakage power measurement 6-22
6.2.10 Occupied frequency bandwidth measurement 6-23
6.2.11 Setting template data 6-24
6.2.12 Measuring template 6-26
6.2.13 Burst wave average power measurement 6-27

SECTION 7 TABLE OF DEVICE MESSAGES 7-1

SECTION 8 DETAILED DESCRIPTION OF COMMANDS 8-1

APPENDIX A TABLE OF MS2602A DEVICE-DEPENDENT INITIAL SETTINGS A-1

APPENDIX B ASCII*CODE TABLE B-1

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

SECTION 1
GENERAL

This section outlines the GPIB functions of the MS2602A Spectrum Analyzer.

TABLE OF CONTENTS

1.1 GENERAL 1-3
1.1.1 Functions of GPIB 1-3
1.1.2 Functions of the GPIB with two ports 1-3
1.1.3 Examples of system configuration using GPIB 1 / GPIB 2 1-4
1.1.4 Specifications 1-5

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SECTION 1
GENERAL

1.1 GENERAL

The MS2602A Spectrum Analyzer, when combined with an external controller, can automate your measurement system. For this purpose the MS2602A is equipped with a GPIB interface bus (IEEE std 488.2 1987) as a standard feature.

1.1.1 Functions of GPIB

The functions of the MS2602A GPIB are as follows:

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

(2) Reads out all setting conditions

(3) Sets the GPIB address from the panel

(4) Executes interrupts and serial polling

(5) Configures the automatic measurement system when the MS2602A is combined with a personal computer and other measuring instruments

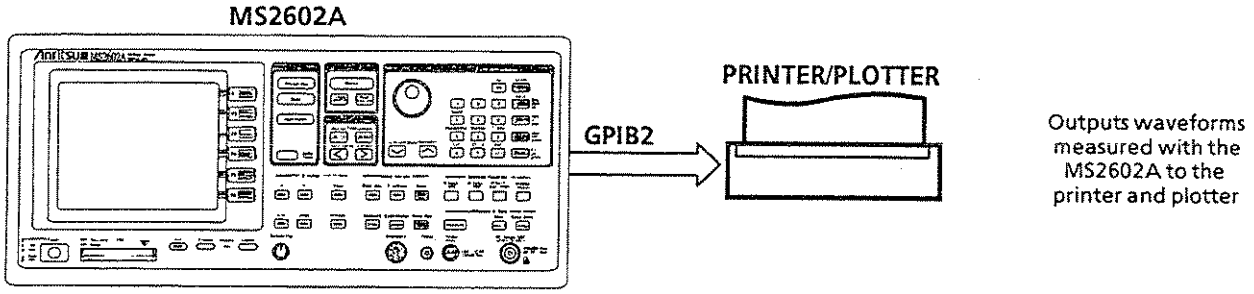
(6) Configures the GPIB with two ports: GPIB 1 and GPIB 2

1.1.2 Functions of the GPIB with two ports

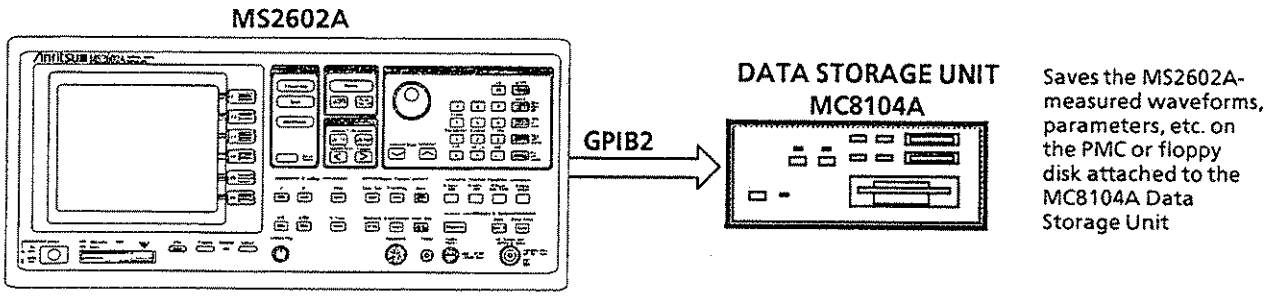
The MS2602A Spectrum Analyzer provides two GPIB ports, GPIB 1 and GPIB 2. The port on the GPIB 1 side is connected to an external controller to automate measurements by remote control, while the port on the GPIB 2 side is used to control peripherals such as printers, plotters, and other devices. This Operation Manual describes the GPIB 1 port which is used for remote control. For hard-copying and other processing via the GPIB 2 port, refer to the SECTIONs 11 and 12 in the Detailed Operating Instruction Part of the separate Operation Manual.

1.1.3 Examples of system configuration using GPIB 1 / GPIB 2

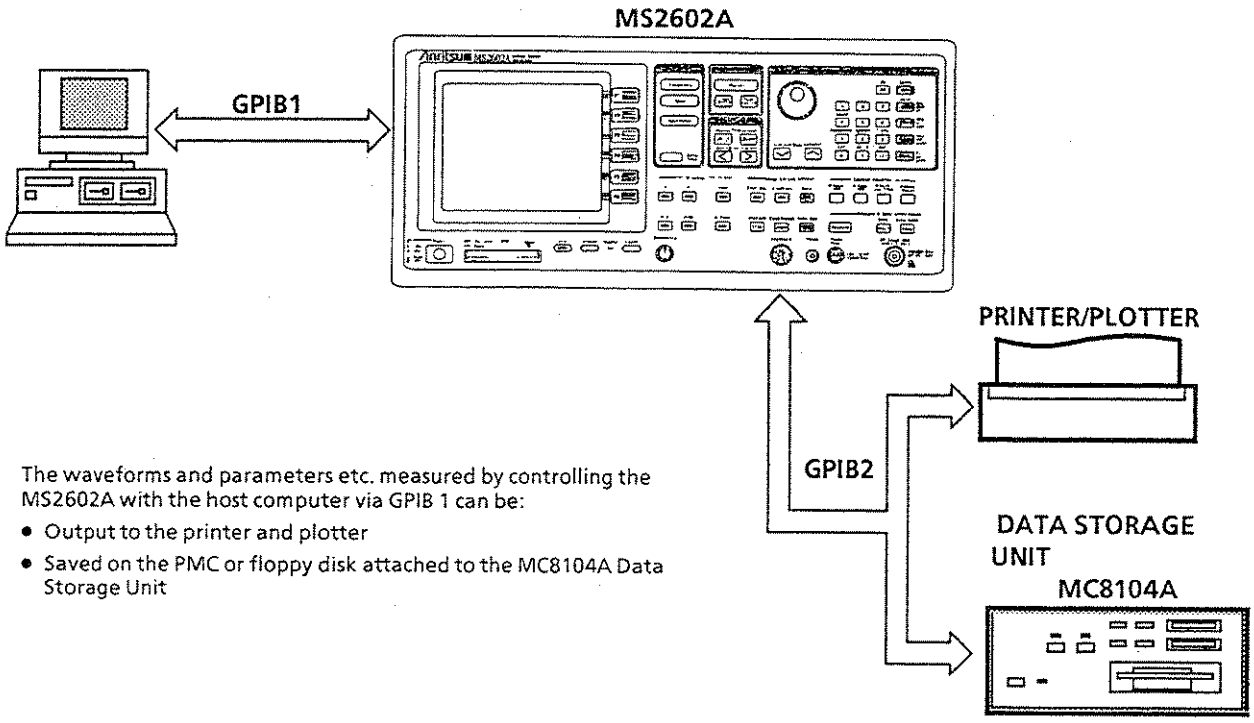
(1) Stand-alone type 1 ····· Panel operation



(2) Stand-alone type 2 ····· Panel operation



(3) Control by the host computer



1.1.4 Specifications

The MS2602A's GPIB 1 and GPIB 2 provide the IEEE488.1 subsets listed in the code columns of the table below.

GPIB 1 Interface Functions

Code	Interface function
SH1	All source handshake functions are provided. Synchronizes the timing of data transmission.
AH1	All acceptor handshake functions are provided. Synchronizes the timing for receiving data.
T6	Basic talker functions are provided. The serial poll function is provided. The talk-only function is not provided. The talker can be canceled by MLA.
L4	Basic listener functions are provided. The listen-only function is not provided. The listener can be canceled by MTA.
SR1	All service request and status byte functions are provided.
RL1	All remote / local functions are provided. The local lockout function is provided.
PP0	Parallel poll functions are not provided.
DC1	All device clear functions are provided.
DT1	Device trigger functions are provided.
C0	Controller functions are not provided.

GPIB 2 Interface Functions

Code	Interface Function
SH1	All source handshake functions are provided. Synchronizes the timing of data transmission.
AH1	All acceptor handshake functions are provided. Synchronizes the timing for receiving data.
T6	Basic talker functions are provided. Serial poll functions are provided. The talk-only function is not provided. A talker can be canceled by MLA.
L4	Basic listener functions are provided. The listen-only function is not provided. A listener can be canceled by MTA.
SR0	Service request and status byte functions are not provided.
RL0	Remote / local functions are not provided. Local lockout functions are not provided.
PP0	Parallel poll functions are not provided.
DC0	Device clear functions are not provided.
DT0	Device trigger functions are not provided.
C1,C2,C3,C4	Controller functions are provided.

SECTION 2
CONNECTING THE BUS AND SETTING THE ADDRESS

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

TABLE OF CONTENTS

2.1 Connecting Devices with GPIB Cables 2-3

2.2 Checking and Setting GPIB Address 2-4

2.2.1 Panel key layout 2-4

2.2.2 Key operation flow 2-4

2.2.3 Checking the address 2-5

2.2.4 Setting the address for GPIB 1 2-5

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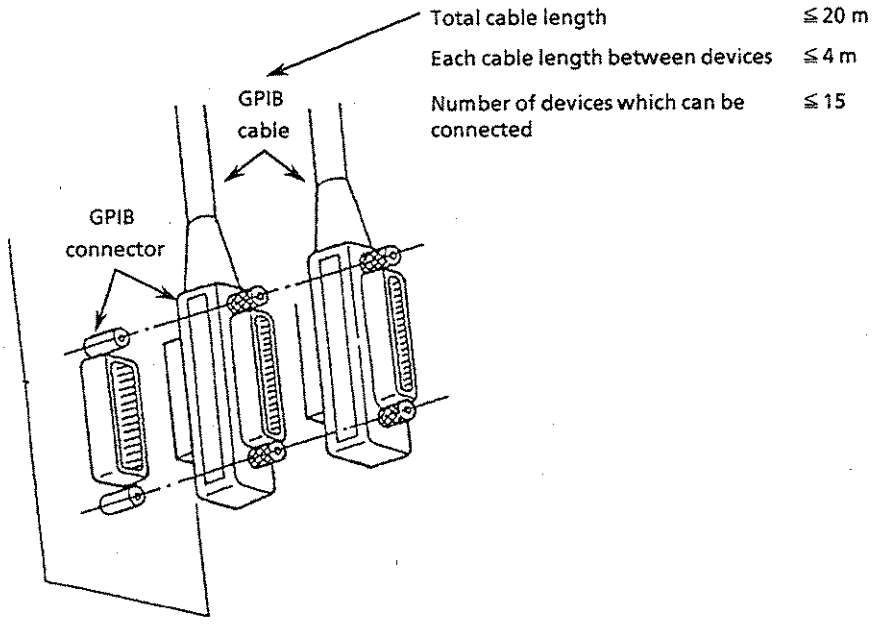
SECTION 2
CONNECTING THE BUS AND SETTING THE ADDRESS

2.1 Connecting Devices with GPIB Cables

The rear panel has connectors for connecting GPIB cables. The cable must be connected before the power is switched on.

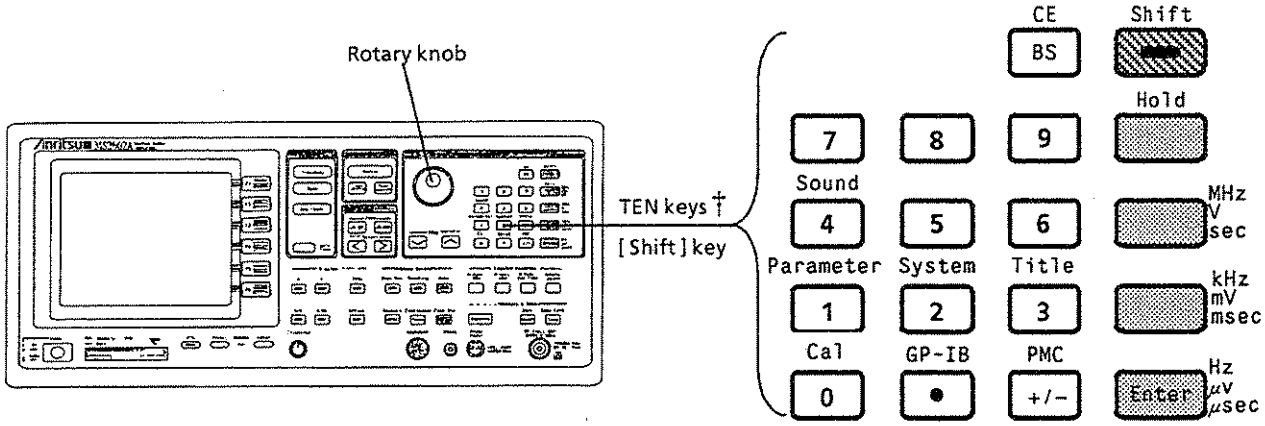
A maximum of 15 devices, including the controller, can be connected to one system.
The restrictions indicated at the right of the diagram below should be observed when connecting many devices to one system.



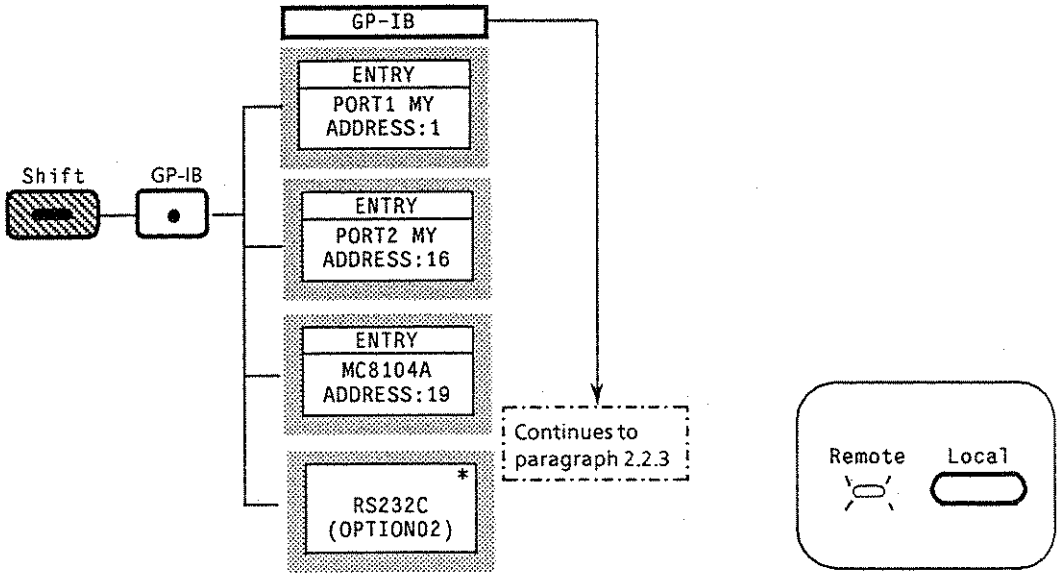
2.2 Checking and Setting GPIB address

The GPIB address of the MS2602A should be set after switching on the power. The address of GPIB 1 has been set to 01 and held by the battery backup at shipment from the factory. If this same number is used for the MS2602A address, it is not necessary to set the address again. To set a new address, the numeric keys and other keys on the front panel are used while the MS2602A is in local mode. The devices on the GPIB are set to local mode at power-on.

2.2.1 Panel key layout



2.2.2 Key operation flow

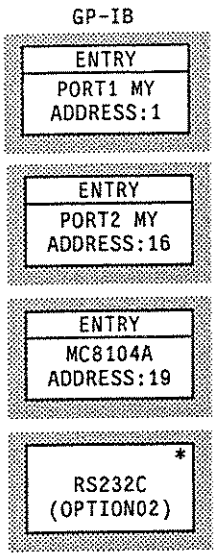


It is impossible to operate the keys on the panel in remote mode while the Remote LED is lit as shown in the upper-right diagram. In this case, press the [Local] key, and the Remote LED goes off to signify local mode. The panel keys can then be used.

† These 18 keys composed of the numeric keys, unit keys, backspace (BS) key, and Shift key are called TEN keys for convenience.

2.2.3 Checking the address

Press the panel keys in the order of [Shift] [•] (GP-IB), and the GPIB menu below will be displayed on the screen. The current address can be checked on this screen.



The current value indicates the GPIB 1's address to control the MS2602A with an external controller. To modify this address, press the F1 soft key, then use the TEN keys to set a new address number.
The current value indicates the MS2602A address on the GPIB 2 side. To modify this address, press the F2 soft key, then use the TEN keys to set a new address number.
The current value indicates the MC8104A address to control the MC8104A Data Storage Unit via GPIB 2. To modify this address, press the F3 soft key, then use the TEN keys to set a new address number.
Options menu

2.2.4 Setting the address for GPIB 1

- Address setting range : 00 ≦ ADDRESS ≦ 30

Example : Checking current address 1 and changing it to address 6

1. Press the panel keys in the order of [Shift] [•] (GP-IB). Check the current address 1 from the menu corresponding to the [F1] soft key.

2. Press the [F1] soft key, and the response shown in the figure below appears in the communication field.

```
GP-IB PORT1
```

3. Press the panel keys in the order of [6] [Enter] to change the address to 6.

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SECTION 3
DEVICE MESSAGE FORMAT

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

TABLE OF CONTENTS

3.1 General Description 3-3
3.1.1 Program message format 3-3
3.1.2 Response message format 3-9

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SECTION 3
DEVICE MESSAGE FORMAT

3.1 General Description

The device messages are data messages that are transmitted between the controller and devices. There are two types of data messages: program messages that are transferred from the controller to this instrument (device), and response messages that are sent 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.

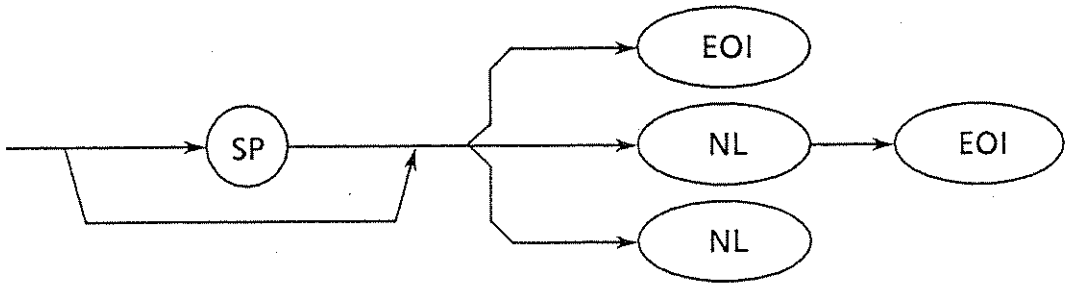
3.1.1 Program message format

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


```
PRINT  @1;"CF 4GHZ"
```

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

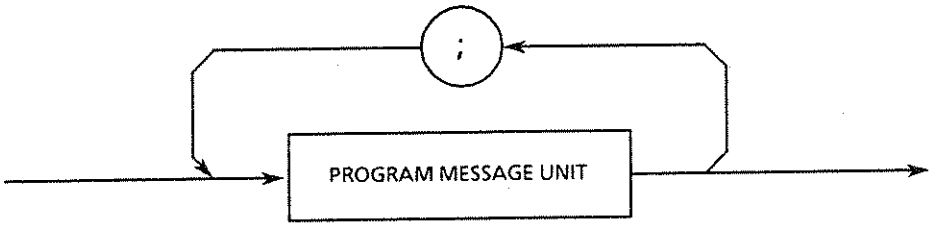
(1) PROGRAM MESSAGE TERMINATOR



NL: Called New line or LF (Line Feed)

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

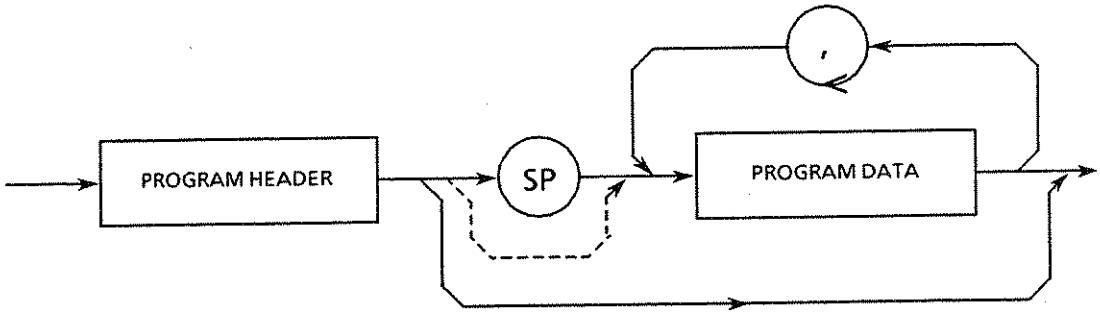
(2) PROGRAM MESSAGE



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

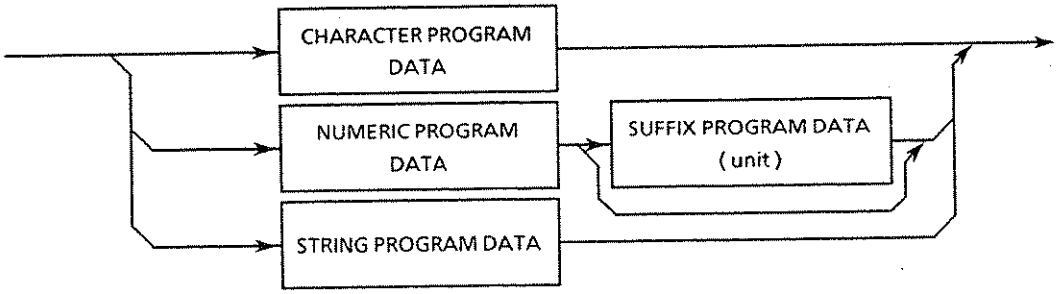
<Example> PRINT @1;"CF 1GHZ;SP 500KHZ"

(3) PROGRAM MESSAGE UNIT



- The IEEE488.2 common command has a leading asterisk " * " that is always placed before the program header.
- A numeric program data allows the (SP) between header and data to be omitted.
- The program query has a trailing question mark " ? " that is always added at the end of the program header.

(4) PROGRAM DATA



(5) CHARACTER PROGRAM DATA

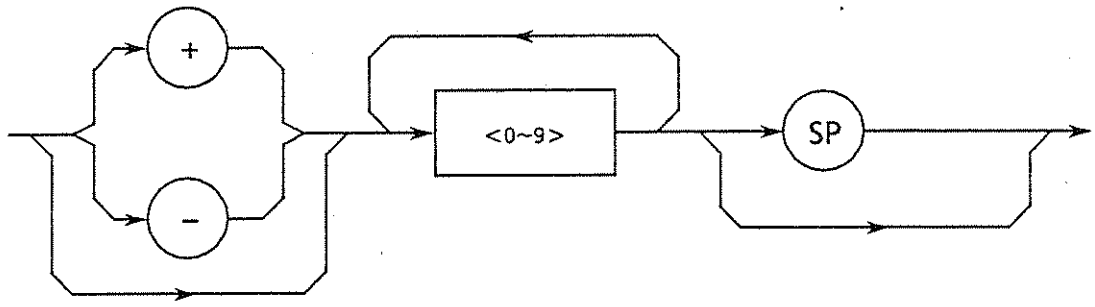
Character program data consists of the upper-case alphabetic characters from A to Z, lower-case alphabetic characters from a to z, the underline of "_" , and the numbers 0 to 9. They can be used in a specified combination.

<Example> PRINT @1; "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

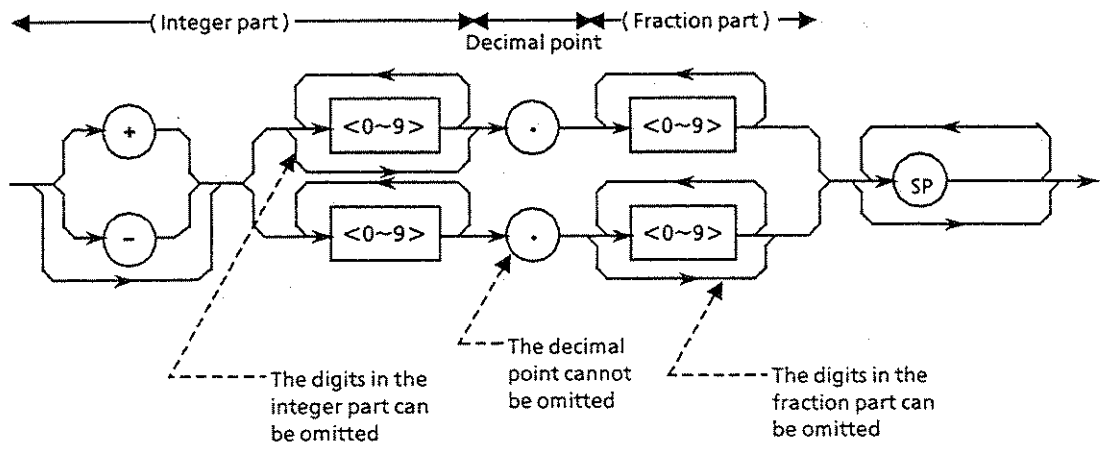
· No spaces can be inserted between a + or − sign and a number → +5, + ␣5 (×)

· Spaces can be inserted after a number → +5␣␣␣

· The + sign is optional → +5, 5

· Commas cannot be used to separate digits → 1,234,567 (×)

< Fixed-Point Format (NR2) >



· The numeric expression of the integer format is applied to the integer part

· No spaces can be inserted between numbers and the decimal point
→ +753␣.123 (×)

· Spaces can be inserted after the digits in the fraction part → +753.123␣␣␣

· A number may not always be placed before the decimal point → .05

· A + or − sign can be placed before the decimal point → +.05, −.05

· A number can end with a decimal point → 12.

(7) SUFFIX PROGRAM DATA (unit)

The table below shows the suffixes used for the MS2602A.

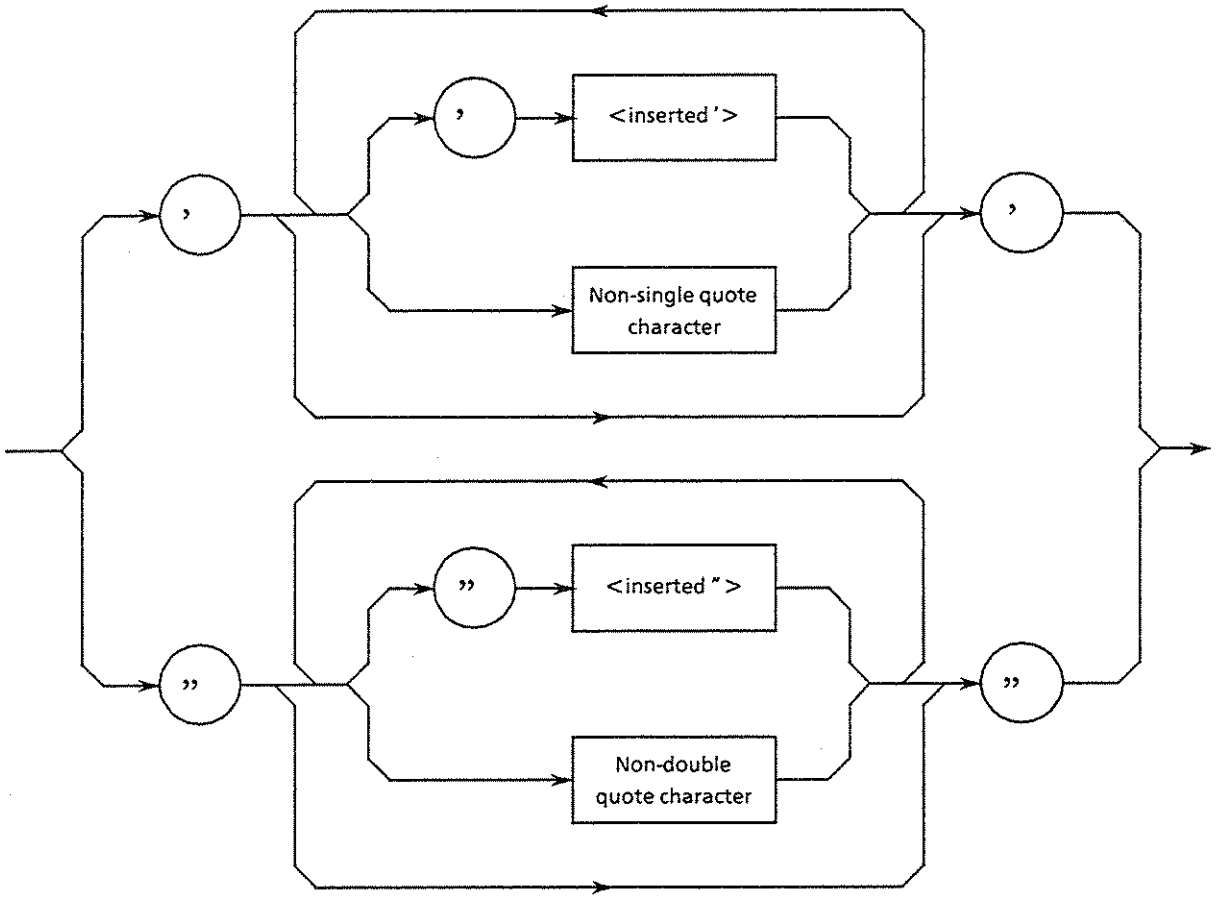
Table of MS2602A Suffix codes (1/2)

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

Table of MS2602A Suffix codes (2/2)

Classification	Unit	Suffix code
Level (W system)	W	W
	mW	MW
	μW	UW
	nW	NW
	pW	PW
	fW	FW
	Default	UW

(8) STRING PROGRAM DATA



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

```
PRINT  @ 1; "TITLE 'MS2602A'"
```

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

```
PRINT  @ 1; "TITLE 'MS2602A''NOISE  MEAS'''  "
```

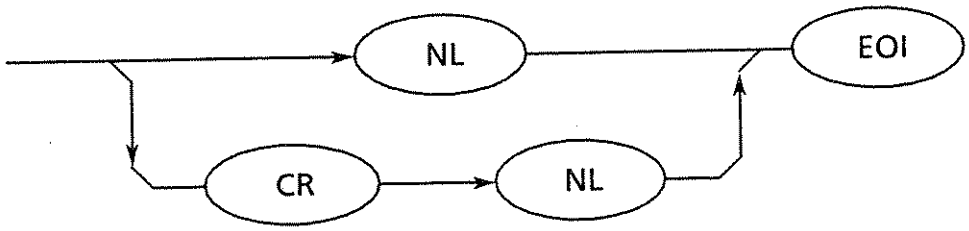
Executing TITLE results in MS2602A 'NOISE MEAS'

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

3.1.2 Response message format

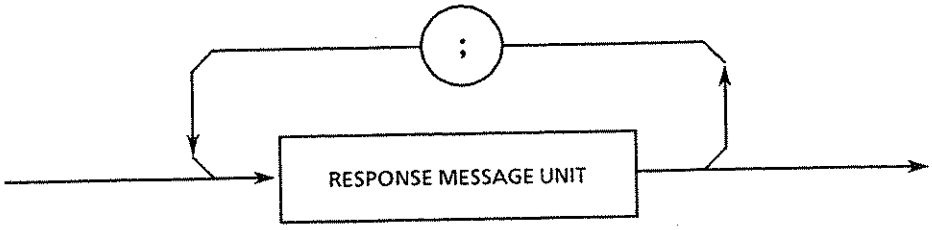
To transfer the response messages from this instrument to the controller using the INPUT statement, the response message formats are defined as follows.

(1) RESPONSE MESSAGE TERMINATOR



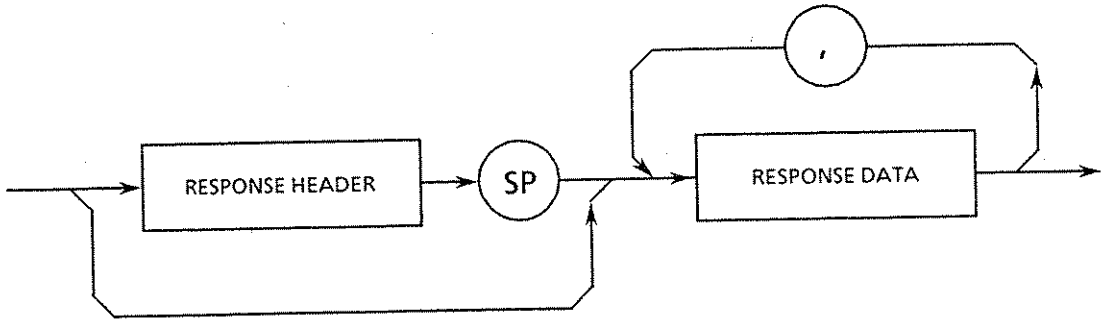
The response message terminator to be used depends on the TRM command.

(2) RESPONSE MESSAGE

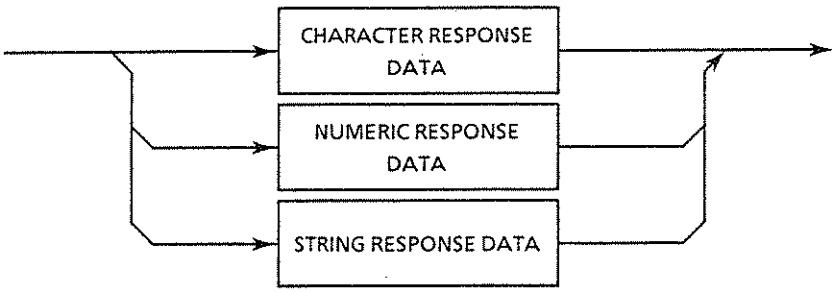


When a query is sent by the PRINT statement with one or more program queries, the response message also consists of one or more response message units.

(3) RESPONSE MESSAGE UNIT (example)



(4) RESPONSE DATA

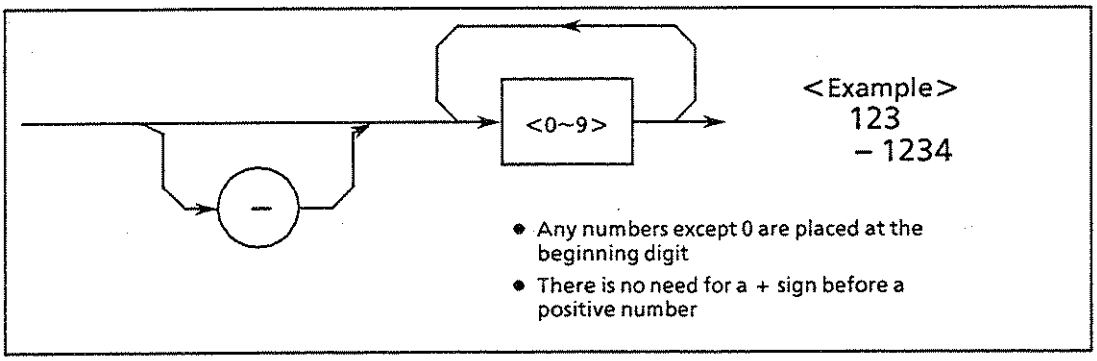


(5) CHARACTER RESPONSE DATA

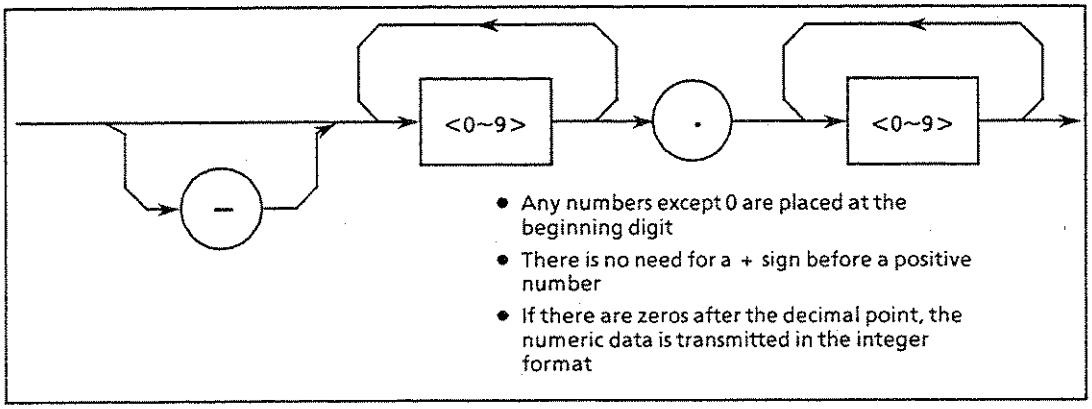
Character response data consists of the upper-case alphabetic characters from A to Z, lower-case alphabetic characters from a to z, the underline "_" , and the numbers 0 to 9. They can be used in a specified combination.

(6) NUMERIC RESPONSE DATA

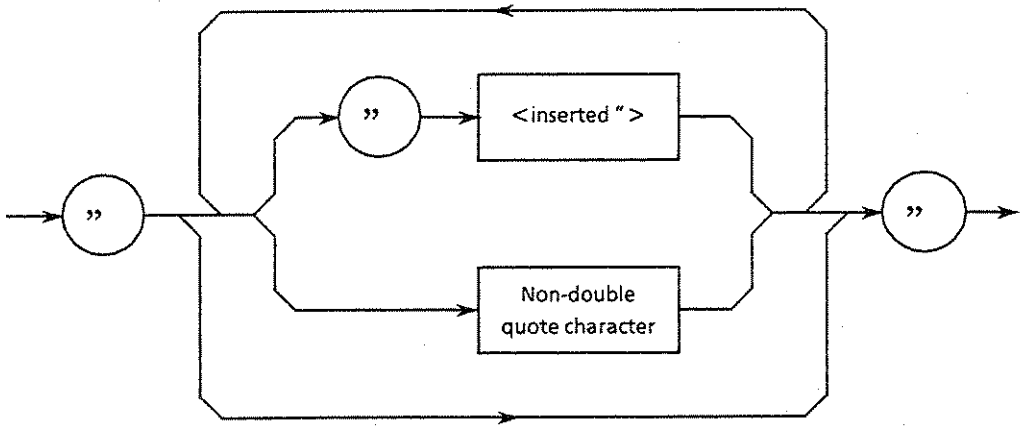
< Integer format (NR1) >



< Fixed-point format (NR2) >



(7) STRING RESPONSE DATA



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

(8) Response message to input the waveform data using binary data

For transmitting binary format data and 2-bite binary data, see example 3-2 (page 6-7 and page 6-9) in SECTION 6, " SAMPLE PROGRAM ".

(Blank)

SECTION 4
STATUS STRUCTURE

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

TABLE OF CONTENTS

4.1 IEEE488.2 Standard Status Model 4-3

4.2 Status Byte (STB) Register 4-5
- 4.2.1 ESB and MAV summary messages 4-5
- 4.2.2 Device-dependent summary messages 4-6
- 4.2.3 Reading and clearing STB register 4-7

4.3 Service Request (SRQ) Enabling Operation 4-8

4.4 Standard Event Status Register 4-9
- 4.4.1 Bit definition of Standard Event Status Register 4-9
- 4.4.2 Reading, writing to, and clearing Standard Event Status Register 4-10
- 4.4.3 Reading, writing to, and clearing Standard Event Status Enable Register 4-10

4.5 Extended Event Status Register 4-11
- 4.5.1 Bit definition of Extended Event Status Register 4-12
- 4.5.2 Reading, writing to, and clearing Extended Event Status Register 4-13
- 4.5.3 Reading, writing to, and clearing Extended Event Status Enable Register 4-13

4.6 Techniques for Synchronizing MS2602A with a Controller 4-14
- 4.6.1 Wait for response after *OPC? query is sent 4-14
- 4.6.2 Wait for service request after *OPC is sent 4-15

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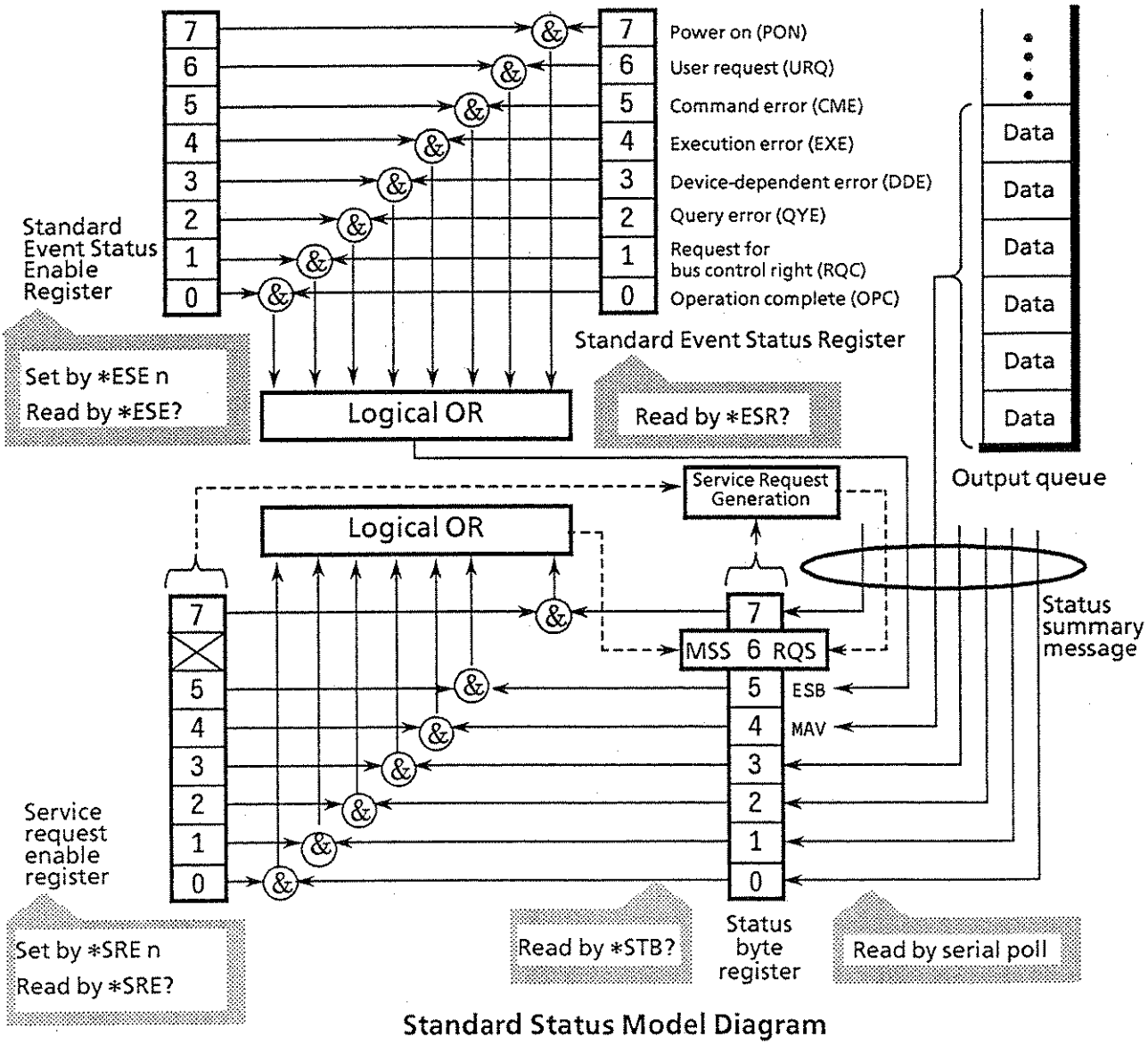
SECTION 4
STATUS STRUCTURE

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

4.1 IEEE488.2 Standard Status Model

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



Standard Status Model Diagram

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

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

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

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

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

4.2 Status Byte (STB) Register

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

4.2.1 ESB and MAV summary messages

This paragraph describes the ESB and MAV summary messages.

(1) ESB summary message

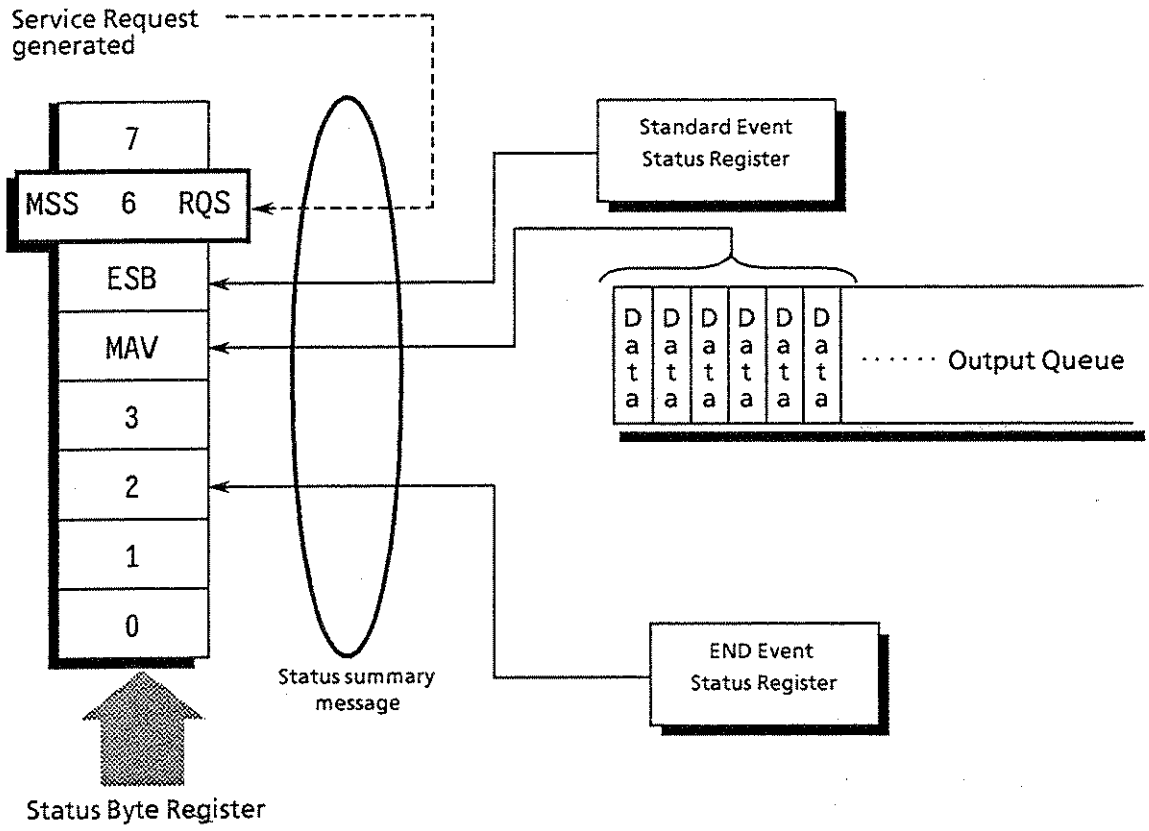
The ESB (Event Summary Bit) is a message defined by IEEE488.2, which uses bit 5 of the STB register. The ESB summary message bit becomes 1 when the setting permits events to occur if any one of the events recorded in the Standard Event Status Register becomes 1. Conversely, it becomes 0 if none of the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

(2) MAV summary message

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

4.2.2 Device-dependent summary messages

As shown below, the MS2602A does not use bits 0, 1, 3, and 7, and uses bit 2 as the summary bit of the END Event Status Register.



4.2.3 Reading and clearing STB register

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

(1) Reading by serial polling

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

(2) Reading by the *STB? common query

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

(3) Definition of MSS (Master Summary Status)

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

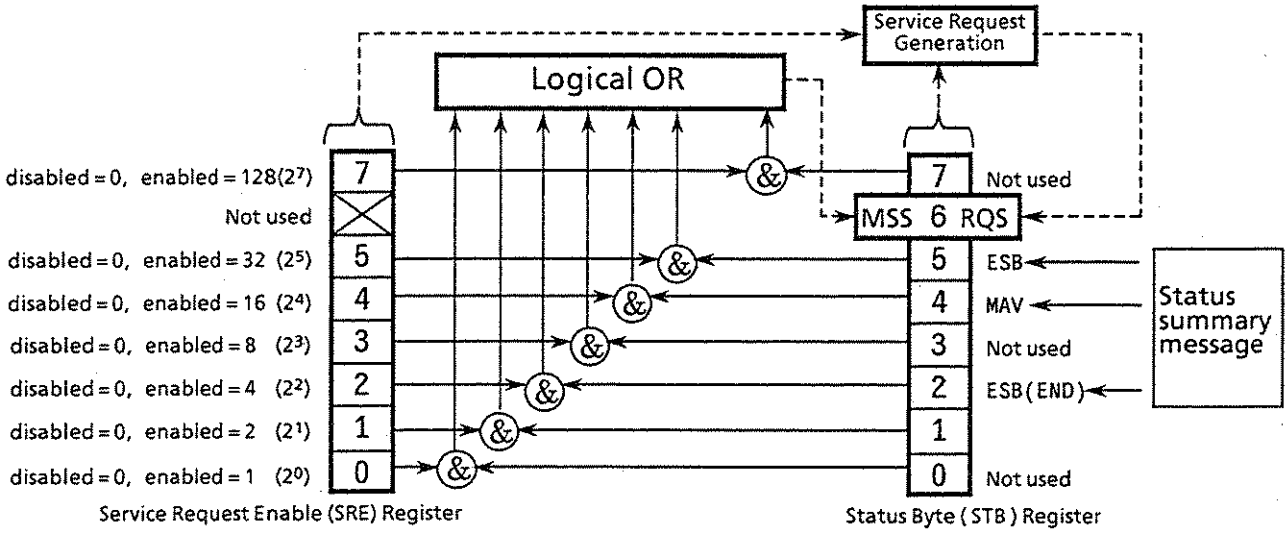
(4) Clearing the STB register by the *CLS common command

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

4.3 Service Request (SRQ) Enabling Operation

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

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



(1) Reading the SRE register

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

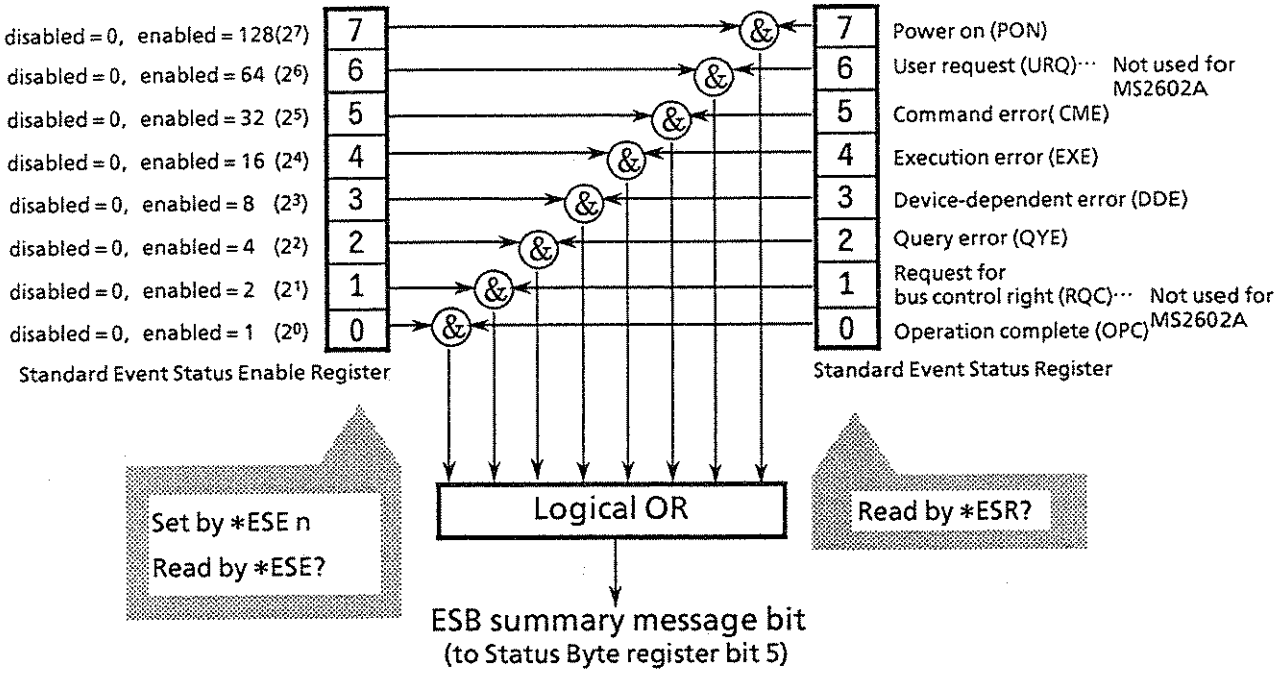
(2) Updating the SRE register

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

4.4 Standard Event Status Register

4.4.1 Bit definition of Standard Event Status Register

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



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

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

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

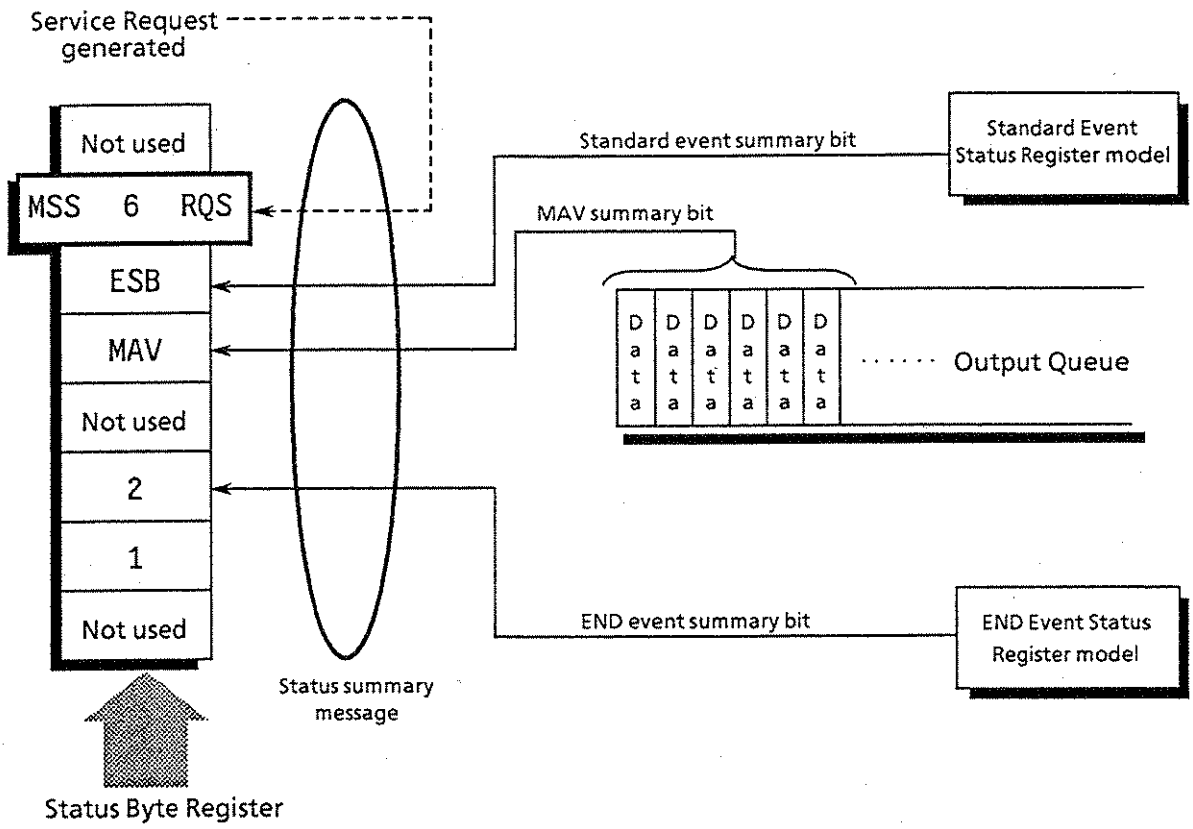
Reading	The *ESR? common query is used to read the ESR register, which is cleared after being read. The response message is integer-format data for which the sum of the binary-weighted event bit is converted to decimals.
Writing	With the exception of clearing, it is impossible to write to the register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

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

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

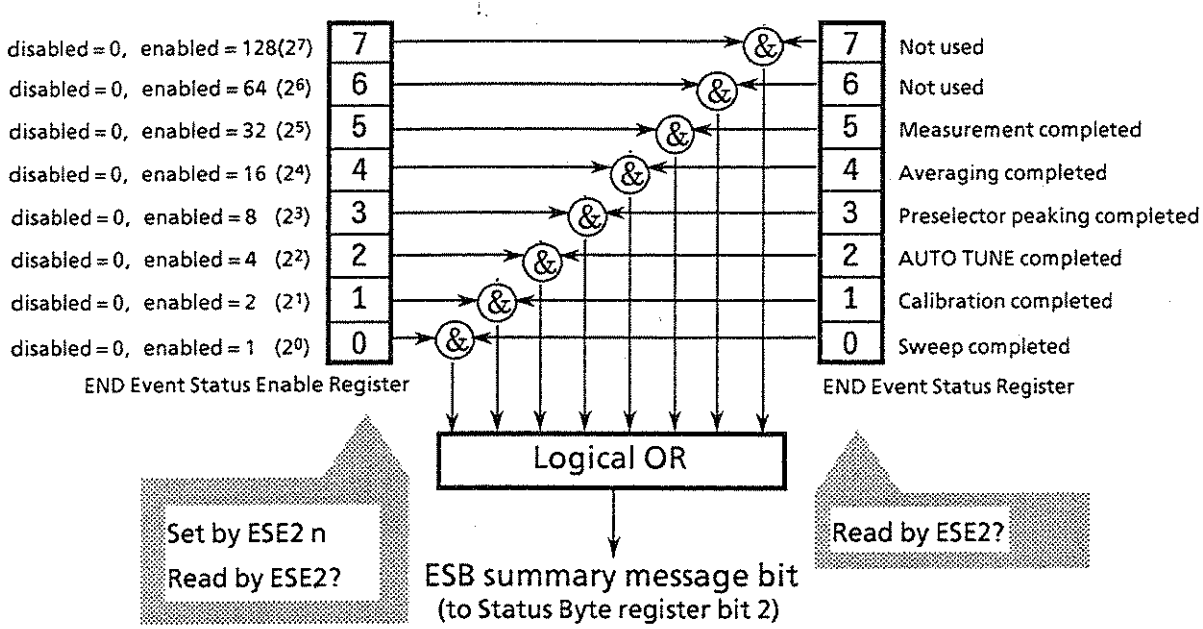
4.5 Extended Event Status Register

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



4.5.1 Bit definition of Extended Event Status Register

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



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

Bit	Event name	Description
7	(Not used)	(Not used)
6	(Not used)	(Not used)
5	Measurement completed	Calculation processing for measuring (frequency count, noise, etc.) has completed
4	Averaging completed	Sweeping the specified number of averaging rate has completed
3	Preselector peaking completed	Preselector peaking has completed
2	AUTO TUNE completed	AUTO TUNE has completed
1	Calibration completed	Any one of ALL CAL, LEVEL CAL, and FREQ CAL has completed
0	Sweep completed	Single sweep has completed or is in standby status

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

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

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

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

4.6 Techniques for Synchronizing MS2602A with a Controller

The MS2602A usually treats program messages as sequential commands that do not execute the processing of newly-received commands until the previous command has been processed. Thus, special consideration need not be taken for pair-synchronization between MS2602A and the controller.

If the controller controls one or more devices and synchronizes with them, after all the commands specified for the MS2602A have been processed, the next commands must be sent to other devices.

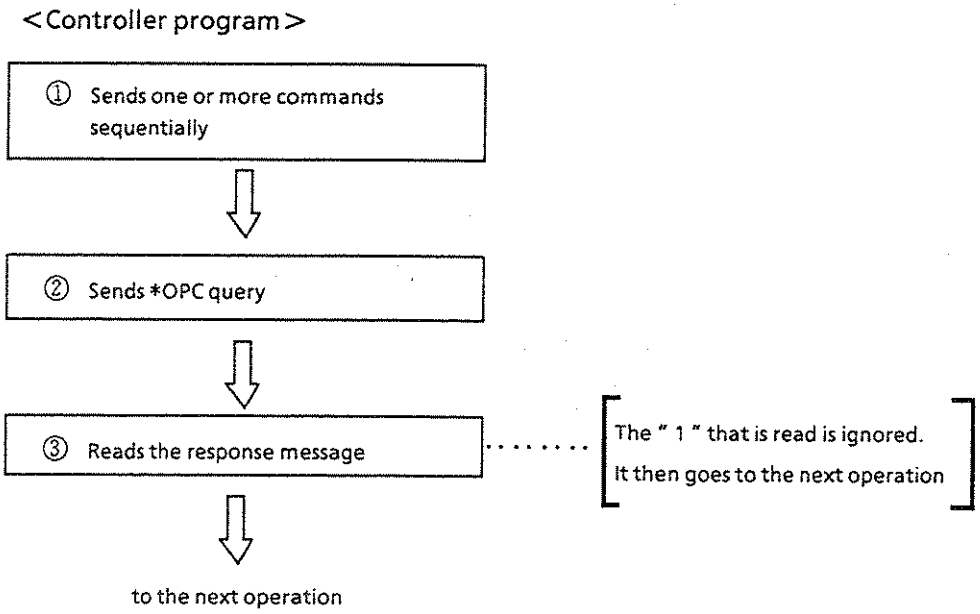
There are two ways of synchronizing the MS2602A with the controller.

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

② Wait for SRQ after *OPC is sent

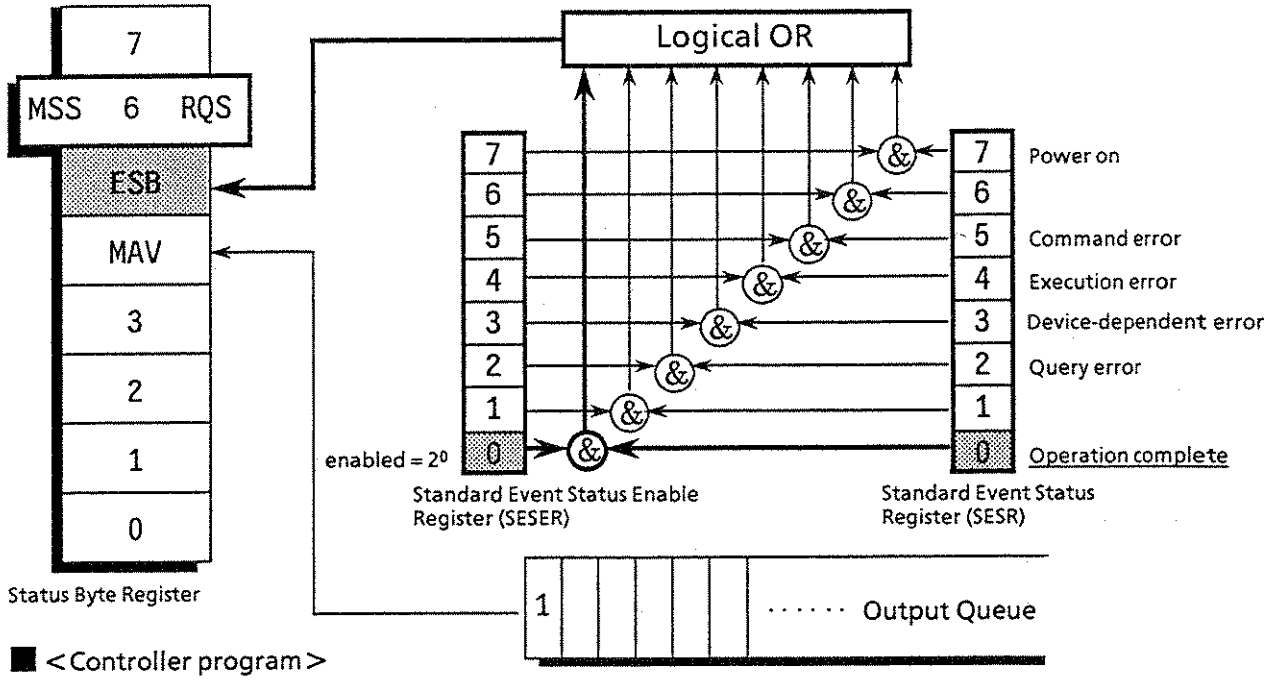
4.6.1 Wait for response after *OPC? query is sent

The MS2602A outputs " 1 " as the response message when executing the *OPC? query command.
The controller is synchronized with the MS2602A by waiting for the response message to be entered.



4.6.2 Wait for service request after *OPC is sent

The MS2602A sets the operation-complete bit (bit 0) to 1 when executing the *OPC command. The controller is synchronized with the MS2602A by waiting for SRQ when the operation-complete bit is set for SRQ.



■ <Controller program>

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

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

⇩

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

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

⇩

③ Makes the device execute the specified operation

⇩

④ Sends the *OPC command

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

⇩

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

(Blank)

SECTION 5
INITIAL SETTINGS

The MS2602A initializes the GPIB interface system using three levels in accordance with the IEEE488.2 specifications. This section describes how these three level initializations are processed and how to instruct the initialization from the controller.

TABLE OF CONTENTS

5.1 Bus Initialization by the IFC Statement 5-4

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

5.3 Device Initialization by the *RST Command 5-6

5.4 Device Initialization by the INI/IP Command 5-7

5.5 Device Status at Power-on 5-7

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SECTION 5
INITIAL SETTINGS

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

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

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

5.1 Bus Initialization by the IFC Statement

■ Example

```
ISET IFC
```

■ Explanation

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

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

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

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

5.2 Initialization for Message Exchange by DCL and SDC Bus Commands

■ Example

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

■ Explanation

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

■ Items to be initialized for message exchange

The MS2602A by which the DCL or SDC bus command is accepted executes the following.

① Input buffer and Output Queue	Cleared, at the same time the MAV bit is also cleared.
② Parser, Execution Controller, and Response Formatter	Reset
③ Device commands including *RST	Clears all commands that prevent these commands from executing.
④ Processing the *OPC command	Puts a device in OCIS (Operation Complete Command Idle State). As a result, the operation complete bit cannot be set in the Standard Event Status Register.
⑤ Processing the *OPC? query	Puts a device in OQIS (Operation Complete Query Idle State). As a result, the operation complete bit 1 cannot be set in the Output Queue.
⑥ Device functions	Puts all functions associated with the message exchange in the idle state. The device continues to wait for a message from the controller.

CAUTION

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

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

5.3 Device Initialization by the *RST Command

■ Syntax

```
*RST
```

■ Example

```
PRINT @1;"*RST" ..... Initializes the device ( MS2602A ) whose address is 1 with level 3
```

■ Explanation

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

The *RST (Reset) command is used to reset a device (MS2602A) to a specific initial state. For details of the items which are initialized and the initial settings, see Appendix A.

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

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

☞ For details on the initial settings of the MS2602A, see Appendix A.

5.4 Device Initialization by the INI / IP Command

■ Syntax

```
INI
IP
```

■ Example (program message)

```
PRINT @1;"INI" ..... Initializes the device ( MS2602A ) whose address is 1 with level 3
```

■ Explanation

The INI and IP commands are MS2602A device-dependent messages which initialize a device with level 3. For details of the items and the initial settings which are initialized by the INI / IP commands, see Appendix A.

5.5 Device Status at Power-on

When the power is switched on:

① The device status is set to the status when the power was last switched off.
In the special case when the power is switched on immediately after delivery of the MS2602A, the MS2602A settings are those listed in the Initial Settings Table (Appendix A).

② The Input Buffer and Output Queue are cleared

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

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

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

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

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SECTION 6
SAMPLE PROGRAMS

This section gives some examples of the N88-Basic program that controls the MS2602A from the NEC-PC9800 personal computer which is used as a controller.

TABLE OF CONTENTS

6.1 Precautions on Creating the GPIB Program 6-3

6.2 Sample Programs 6-4

6.2.1 Initializing MS2602A 6-4

6.2.2 Reading the frequency and level at marker point 6-6

6.2.3 Reading trace data 6-8

6.2.4 Transferring 2-byte binary data 6-11

6.2.5 Delta marker 6-13

6.2.6 Multimarker function 6-15

6.2.7 Gate functions 6-17

6.2.8 Saving and recalling data 6-20

6.2.9 Adjacent-channel leakage power measurement 6-22

6.2.10 Occupied frequency bandwidth measurement 6-23

6.2.11 Setting template data 6-24

6.2.12 Measuring template 6-26

6.2.13 Burst wave average power measurement 6-27

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SECTION 6
SAMPLE PROGRAMS

6.1 Precautions on Creating the GPIB Program

Note the following points when writing GPIB control programs.

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

6.2 Sample Programs

6.2.1 Initializing MS2602A

< Example 1 > Initializes MS2602A

```
10  '-----------------------------
20  ' MS2602A GPIB SAMPLE PROGRAM
30  ' INITIALIZE
40  '-----------------------------
50  ISET IFC ..... Initializes the interface function
60  ISET REN ..... Sets remote enable to true
70  CMD DELIM=0 ..... Selects CR + LF as the delimiter
80  LET SPA=1 ..... Assigns MS2602A address to variable SPA
90  PRINT @SPA;"INI" ..... Initializes MS2602A
100 END
```

The parameters initialized by the above program are shown in Appendix A. The table below lists part of Appendix A.

Table of MS2602A Device-Dependent Initial Settings (part of Appendix A) (1 / 2)

Group	Brief function	Function item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Frequency	Selects the mode for setting the frequency band	FREQUENCY MODE	START-STOP		
	Sets the start frequency	START FREQUENCY	0 Hz	-----	0 Hz
	Sets the center frequency	CENTER FREQUENCY	4.25 GHz		4.25 GHz
	Sets the stop frequency	STOP FREQUENCY	8.50 GHz	-----	8.50 GHz
	Sets the frequency span	FREQUENCY SPAN	8.50 GHz	*0 Hz	8.50 GHz
	Sets the center-frequency step size	CENTER FREQ STEP SIZE	1 GHz		
Level	Sets the reference level	REFERENCE LEVEL	−10 dBm		
	Sets the reference-level step size	REF LEVEL STEP SIZE	AUTO / 1 div		
	Selects the mode for setting the Y axis	SCALE MODE	LOG	LOG	LOG
	Set the LOG scale	LOG SCALE	10 dB / div	10 dB / div	*10 dB / div
Coupled function	Selects the mode for setting the resolution bandwidth	RESOLUTION BANDWIDTH	AUTO	AUTO	*AUTO
	Selects the mode for setting the video bandwidth	VIDEO BANDWIDTH	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		

Table of MS2602A Device-Dependent Initial Settings (part of Appendix A) (2 / 2)

Group	Brief function	Function item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Display mode	Selects the display format	DISPLAY MODE	TRACE-A		
Marker function	Selects the marker mode	MARKER MODE	NORMAL		
	Specifies the zone-marker center	ZONE MARKER CENTER	250 point	250 point	250 point
	Specifies the zone-marker width	ZONE MARKER WIDTH	501 point	*1 point	501 point
	Multimarker mode	MULTI MARKER MODE	OFF		

An initial value appended with "*" represents a fixed value.

There is a '*RST ' command in another GPIB command for executing initialization. The '*RST ' command is used to execute initialization over a wider 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 MS2602A device functions with the IP or INI command, then use the program commands to set only the functions to be changed. This prevents the MS2602A from being controlled while unnecessary functions are set.

6.2.2 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.

```
10  '------------------------------
20  ' MS2602A GPIB SAMPLE PROGRAM
30  ' OUTPUT MKR FREQ&LEVEL
40  '------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  LET SPA=1
90  PRINT @SPA;"INI"
100 PRINT @SPA;"CNF 500MHZ" ..... Sets the center frequency
110 PRINT @SPA;"SPF 10MHZ" ..... Sets the frequency span
120 PRINT @SPA;"SWP" ..... Executes single sweep
130 PRINT @SPA;"PCF" ..... PEAK→CF
140 PRINT @SPA;"PRL" ..... PEAK→REF
150 PRINT @SPA;"MKS 0" ..... Peak search
160 PRINT @SPA;"MKF?" ..... Queries reading frequency at the marker point
170 INPUT @SPA;FREQ ..... Reads the frequency at the marker point
180 PRINT @SPA;"MKL?" ..... Queries reading level at the marker point
190 INPUT @SPA;LEVEL ..... Reads the level at the marker point
200 PRINT USING "MARKER  FREQ=####.###MHz";FREQ/1E+06
210 PRINT USING "        LEVEL=####.## dBm";LEVEL
220 END
```

The center frequency and frequency span are set at line 100 and line 110 respectively. The SWP sweep command at line 120 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.

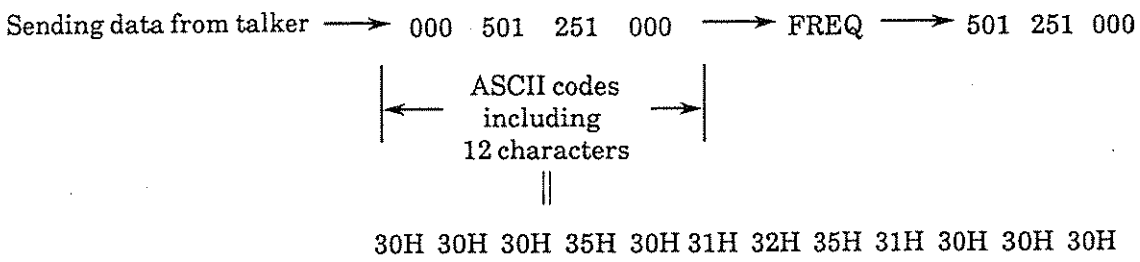
The PCF and PRL commands at lines 130 and 140 operate as follows: the former sets the peak point on the screen to the center frequency, and the latter sets its peak level center frequency to the reference level.

The "MKF?" and "MKL?" at lines 160 and 180 query the frequency and level at the marker point respectively, and the data is read with the INPUT@ statement on the next line. If MLA (My Listen Address) is received 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.

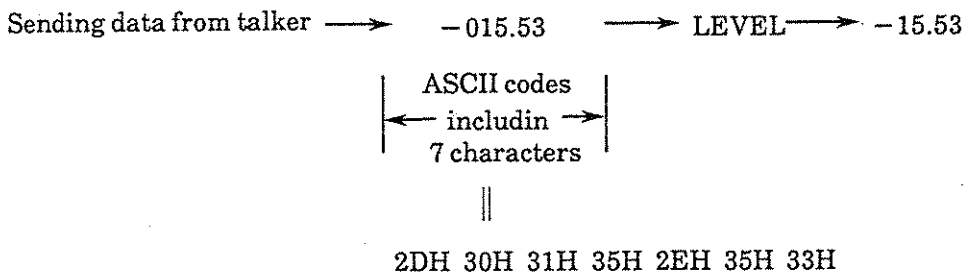
Sending data:

If the frequency and level at the peak point is 501.251 MHz and −15.53 dBm respectively,

■ FREQ



■ LEVEL



Program execution result of <Example 2>

```
MARKER    FREQ=501.251MHz
          LEVEL=-15.53dBm
```

6.2.3 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.

```
10  '------------------------------
20  ' MS2602A GPIB SAMPLE PROGRAM
30  ' OUTPUT TRACE DATA (ASCII)
40  '------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  LET SPA=1
90  PRINT @SPA;"INI"
100 DIM TRACE(500) ..... Declares array variable TRACE ()
110 PRINT @SPA;"CNF 500MHZ"
120 PRINT @SPA;"SPF 10MHZ"
130 PRINT @SPA;"BIN 0" ..... Specifies ASCII as the response data format
140 PRINT @SPA;"SWP" ..... Executes a single sweep
150 FOR I=0 TO 500
160     PRINT @SPA;"XMA?"+STR$(I)+",1" ..... Queries the trace data
170     INPUT @SPA;TRC$ ..... Reads the trace data
180     TRACE(I)=VAL(TRC$) ..... Converts ASCII into numeric data
190     PRINT USING "####.##dBm";TRACE(I)/100
200 NEXT I
210 END
```

The " BIN_0 " at line 130 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. An example of BINARY format is shown in <Example 3-2>.

< Example 3-2 > Transfers data in BINARY format.

```
10  '------------------------------
20  ' MS2602A GPIB SAMPLE PROGRAM
30  ' OUTPUT TRACE DATA (BINARY)
40  '------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  PRINT @1;"INI"
90  DIM TRACE(500)
100 PRINT @1;"CNF 500MHZ"
110 PRINT @1;"SPF 10MHZ"
120 PRINT @1;"BIN 1"  ..... Specifies BINARY as the response data format
130 PRINT @1;"TRM 1"  ..... Sets the terminator to CR + LF
140 PRINT @1;"SWP"  ..... Executes a single sweep
150 PRINT @1;"XMA? 0,501"  ..... Queries the trace data
160 WBYTE &H3F,&H5F,&H20,&H41;
    ..... Specifies PC9801 as listener address 0, and MS2602A as a talker address 1
170 FOR I=0 TO 500
180 RBYTE ;UPRBYTE,LWRBYTE  ..... Reads 2-byte binary data in sequence
190 TRACE(I)=UPRBYTE*256+LWRBYTE  ..... Converts 2-byte data to decimals
200 IF UPRBYTE>=128 THEN TRACE(I)=TRACE(I)-65536
    ..... Converts negative data to decimals
210 PRINT USING "####.##dBm";TRACE(I)/100
220 NEXT I
230 RBYTE ;DMY1,DMY2  ..... Receives terminator data
240 WBYTE &H3F,&H5F;  ..... Releases listener and talker
250 END
```

The " BIN_1 " at line 120 specifies BINARY as the response data format.The terminator indicating that the last data byte transmission is completed is set to CR +LF at line 130. After a single sweep is executed at line 140, the XMA? at line 150 queries the reading trace data. At line 160, the PC9801 (address 0) is specified as a listener, and the MS2602A (address 1) as a talker. At line 180, the 2-byte binary data is read by the PC9801 in sequence from the high-order byte to the low-order byte. At line 190, the 2-byte binary data is converted into decimals to assign them to variable TRACE (1). Line 200 allows data to be correctly read even if the data is negative. The FOR···NEXT statement at lines 170 to 220 converts negative data to decimals repeatedly 501 times.

At line 230, the terminators transferred immediately after the last data byte transmission is completed are assigned to dummy variables DMY1 and DMY2. This prevents the CR + LF (LF for TRM_0) terminators from being assigned elsewhere. Although two variables DMY1 and DMY2 are used here, one variable is used if the terminator is LF. Line 240 is used to release the talker and listener.

Interface message at line 160

```
WBYTE   &H3F,  &H5F,  &H20,  &H41 ;
          |     |     |     |
         UNL   UNT   MLA   MTA
```

UNL = Unlisten: Specifies all devices so that the listener status can be released.

UNT = Untalk: Specifies all devices so that the talker status can be released.

MLA = My Listen Address: If a device receives the listener address code (listener address command − MLA) corresponding to the address (address number) specified for the device (device and controller), it becomes a listener.

The &H20 listener address code specifies a device with address number 0 as listener.

MTA = My Talk Address: If a device receives the talker address code (talker address command − MTA) corresponding to the address (address number) specified for the device (device and controller), it becomes a talker.

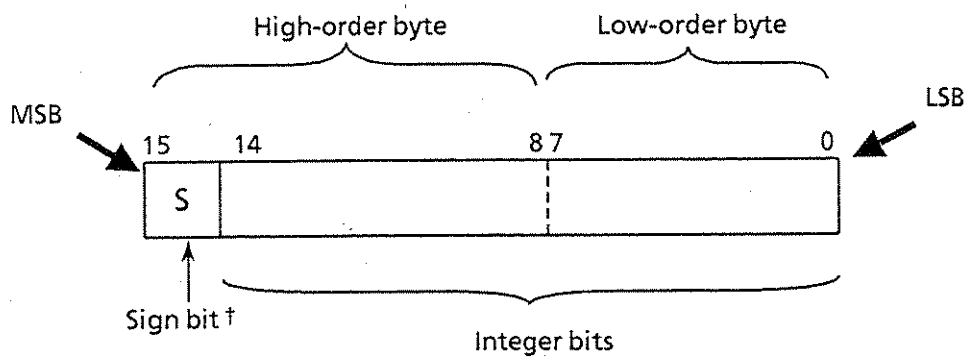
The &H41 talker address code specifies a device with address number 1 as talker.

6.2.4 Transferring 2-byte binary data

Two-byte binary data can lie in the range of the 65536 integers from −32768 to 32767 as shown below, and each is sent out in sequence from the high-order byte to the low-order 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

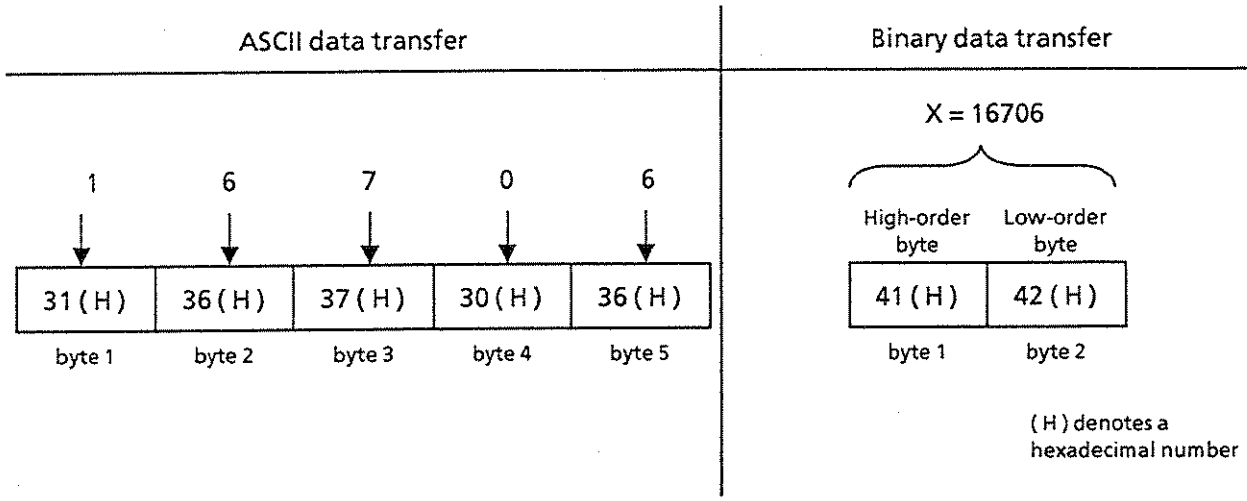
Sign bit: Bit 15 (MSB) is used
Integer bits: Bits 0 through 14 are used. Thus, 16 bits (2 bytes) are used.



Internal Expression of 2-byte Binary Data

† When a negative integer is stored in a numeric variable, its MSB is set to 1 to indicate that it is negative. The negative value is also stored in a numeric variable as a two's-complement.

The transfer of integer 16706 as ASCII data and as binary data is compared below. 5 bytes are necessary for ASCII, whereas only 2 bytes are necessary for binary and no data format conversion is required. Thus, the latter is often used for high speed transfer.



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

Binary notation

	High-order byte								Low-order 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

(Transfer sequence) First byte → Second byte

bit	7	6	5	4	3	2	1	0	
First byte	0	1	0	0	0	0	0	1	High-order byte = 41 (H)
Second byte	0	1	0	0	0	0	1	0	Low-order byte = 42 (H)

6.2.5 Delta marker

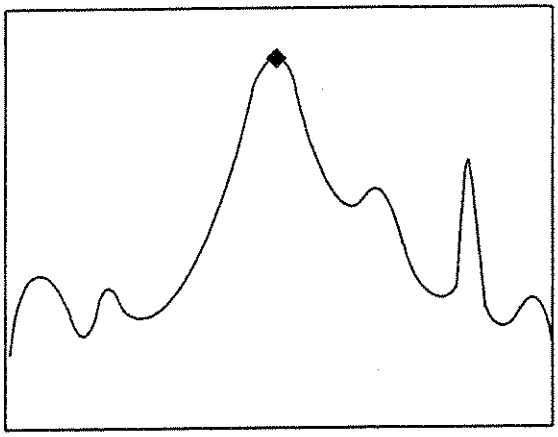
< Example 4 > Using a delta marker, reads out the frequency and level differences between a peak point and the next peak point.

```
10  '------------------------------
20  ' MS2602A GPIB SAMPLE PROGRAM
30  ' OUTPUT DELTA FREQ&LEVEL
40  '------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  LET SPA=1
90  PRINT @SPA;"INI"
100 PRINT @SPA;"CNF 500MHZ"
110 PRINT @SPA;"SPF 100KHZ"
120 PRINT @SPA;"SWP" ..... Executes a single sweep
130 PRINT @SPA;"MKR 0" ..... Sets marker mode to NORMAL
140 PRINT @SPA;"MKS 0" ..... Executes PEAK SEARCH
150 PRINT @SPA;"MKR 1" ..... Sets marker mode to DELTA
160 PRINT @SPA;"MKS 1" ..... Executes NEXT PEAK SEARCH
170 PRINT @SPA;"MKF?" ..... Queries reading frequency difference
180 INPUT @SPA;DFREQ
190 PRINT @SPA;"MKL?" ..... Queries reading level difference
200 INPUT @SPA;DLEVEL
210 PRINT USING "DELTA  FREQ=####.####kHz";DFREQ/1000
220 PRINT USING "       LEVEL=####.##  dB";DLEVEL
230 END
```

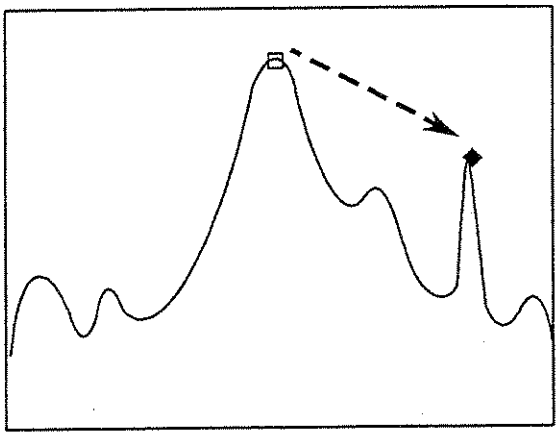
The " MKR_1 " at line 150 is used to set the marker mode to DELTA, so that the reference marker can also be set together to the current marker position.

The " MKS_1 " at line 160 sets the marker search to NEXT PEAK to move the current marker to NEXT PEAK point.

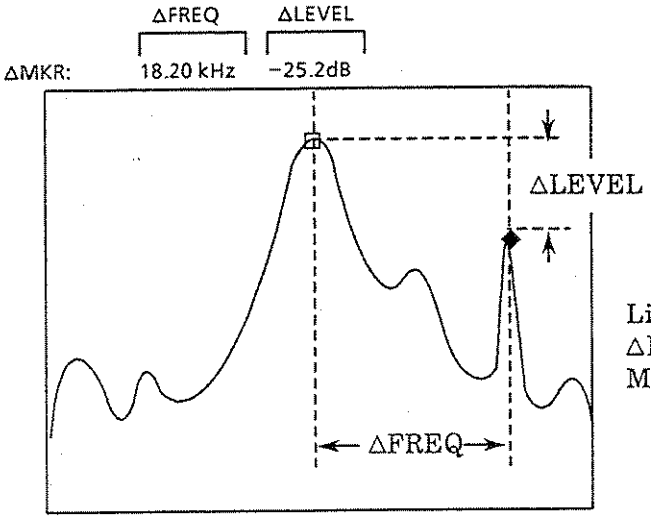
The " MKF? " and " MKL? " at lines 170 and 190 query reading the frequency and level at the current marker position while the marker mode is NORMAL. It is also used to query reading the frequency and level differences between the current marker and the reference marker while the marker mode is DELTA.



Executing PEAK SEARCH at line 140 allows the current marker to be set to the peak point



Line 150 allows the reference marker to be set together to the current marker position. Executing NEXT PEAK SEARCH at line 160 allows the current marker to move to the next peak point as shown to the left.



Lines 170 to 200 read out the ΔFREQ and ΔLEVEL displayed in the upper left of the MS2602A screen

6.2.6 Multimarker function

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

```
10  '------------------------------
20  ' MS2602A GPIB SAMPLE PROGRAM
30  ' MULTI MARKER HIGHEST10
40  '------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  LET SPA=1
90  PRINT @SPA;"INI"
100 PRINT @SPA;"CNF 500MHZ"
110 PRINT @SPA;"SPF 100KHZ"
120 PRINT @SPA;"SWP"
130 PRINT @SPA;"MKMHI" ..... Executes multimarker mode HIGHEST 10
140 FOR I=1 TO 10
150     PRINT @SPA;"MKMP?"+STR$(I)..... Queries reading frequency at the marker point
160     INPUT @SPA;FREQ
170     PRINT @SPA;"MKML?"+STR$(I)..... Queries reading level at the marker point
180     INPUT @SPA;LEVEL
190     PRINT USING "MKR No. ## ####.####MHz ####.##dBm";
        I,FREQ/1E+06,LEVEL
200 NEXT I
210 END
```

The MS2602A 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 140 to 200.

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)

```
10  '------------------------------
20  ' MS2602A GPIB SAMPLE PROGRAM
30  ' MULTI MARKER HARMONICS
40  '------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  LET SPA=1
90  PRINT @SPA;"INI"
100 PRINT @SPA;"STF 0HZ" ..... Sets the start frequency
110 PRINT @SPA;"SOF 3000MHZ" ..... Sets the stop frequency
111 PRINT @SPA;"MKZF 500MHZ" ..... Sets the zone marker center frequency
120 PRINT @SPA;"SWP"
130 PRINT @SPA;"MKMHRM" ..... Sets multimarker mode to HARMONICS
140 FOR I=1 TO 5
150     PRINT @SPA;"MKMP?"+STR$(I)
160     INPUT @SPA;FREQ
170     PRINT @SPA;"MKML?"+STR$(I)
180     INPUT @SPA;LEVEL
190     PRINT USING "MKR No. ## ####.##MHz ####.##dBm";
        I,FREQ/1E+06,LEVEL
200 NEXT I
210 END
```

This program allows the frequency to be set using the START-STOP at line 100 and line 110. The " MKZF_500MHZ " at line 111 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 130 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 140 to line 200. The other parts of this program are the same as < Example 5-1 >.

6.2.7 Gate functions

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

```
10  '------------------------------
20  ' MS2602A GPIB SAMPLE PROGRAM
30  ' GATE TRIGGER
40  '------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  LET SPA=1
90  PRINT @SPA;"INI"
100 DIM TRACE(500)
110 PRINT @SPA;"CNF 500MHZ"
120 PRINT @SPA;"SPF 1MHZ"
130 PRINT @SPA;"RB 100KHZ" ..... Sets RBW
140 PRINT @SPA;"TRG 3 ..... Sets the trigger input to EXT
150 PRINT @SPA;"EXTTYPE 10V" ..... Sets EXT to INPUT 1
160 PRINT @SPA;"TRGLVL 0" ..... Sets the trigger level to 0
170 PRINT @SPA;"GD 50US" ..... GATE DEDAY = 50us
180 PRINT @SPA;"GL 400US" ..... GATE LENGTH = 400us
190 PRINT @SPA;"GE INT" ..... GATE END = INTERNAL
200 PRINT @SPA;"GATE ON" ..... Sets the GATE function to ON
210 FOR TIMER=0 TO 25000:NEXT TIMER ..... Sets the timer
220 FOR I=0 TO 500
230  PRINT @SPA;"XMA?"+STR$(I)+",1"
240  INPUT @SPA;TRC$
250  TRACE(I)=VAL(TRC$)
260 PRINT USING "####.##dBm";TRACE(I)/100
270 NEXT I
280 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. The synchronous signal shown in Fig.6-1 is input to the " INPUT 1 " connector on the MS2602A rear panel. The spectrum is displayed using this synchronous signal and setting conditions.

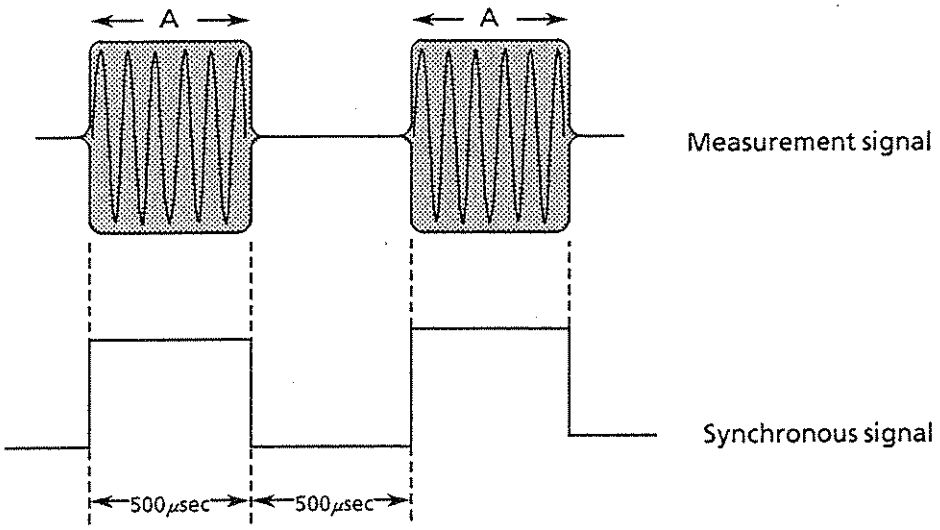


Fig.6-1 Burst Waveform

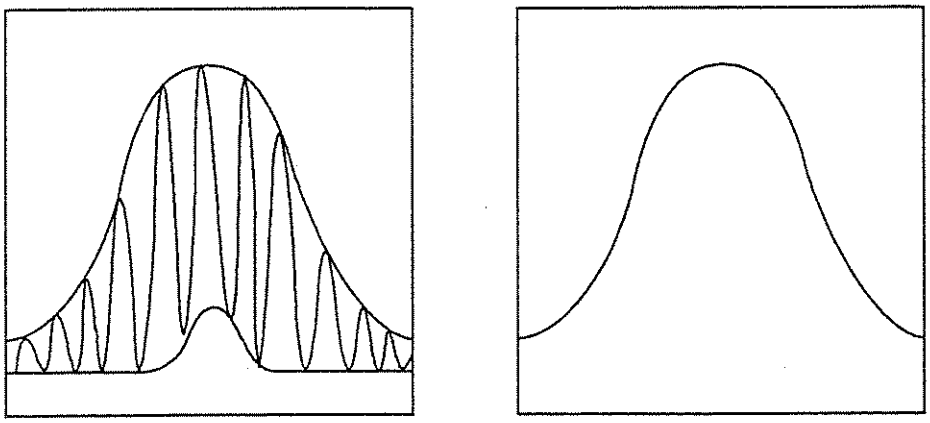


Fig.6-2 Burst Wave Spectrum

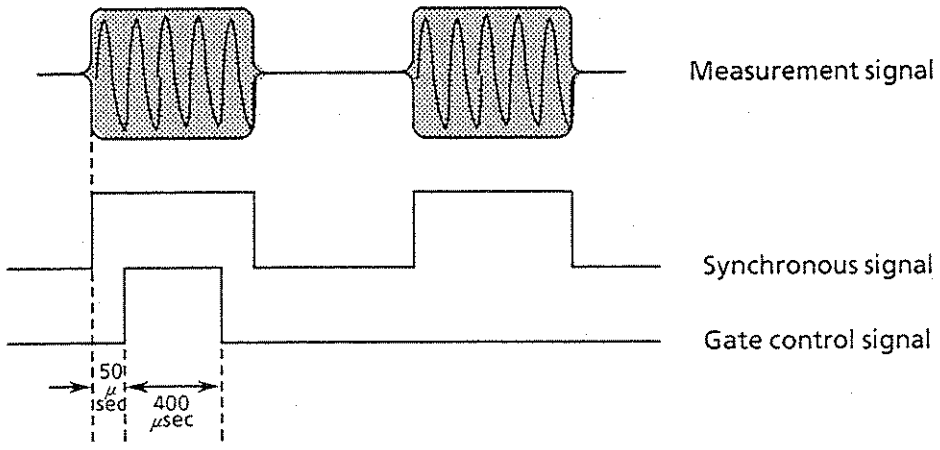


Fig.6-3 Sample Program for Gate-Control Signal Generation Timing

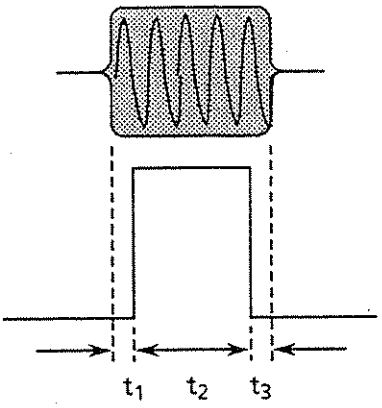
The RBW command at line 130 sets RBW to the optimum value depending on the GATE conditions (GATE DELAY: t_1, GATE LENGTH: t_2) as shown in Table 6-1 below.

The block from lines 140 to 160 sets the trigger signal, and the block from lines 170 to 190 sets the gate conditions. The gate function is set to ON at line 200 provided the timer is set because it takes time to form a perfect waveform which is fully connected.

The block from lines 220 to 270 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	≧2 msec	≧20 μsec	≧1 μsec
3 kHz	≧600 μsec		
10 kHz	≧230 μsec		
30 kHz	≧200 μsec		
100 kHz	≧20 μsec		
300 kHz	≧15 μsec		
1 MHz 3 MHz	≧10 μsec		



6.2.8 Saving and recalling data

< Example 7 > Saves and recalls data to and from PMC.

■ Saving data

```
1000 *SAVPMC
1010 '-----------------------------
1020 ' MS2602A GPIB SAMPLE PROGRAM
1030 ' SAVE TO PMC(FD) SUBROUTINE
1040 '-----------------------------
1050 INPUT "INPUT TITLE";TTL$ ..... Inputs title
1060 PRINT @SPA;"TITLE '"+TTL$+"'" ..... Sets title
1070 MEDIA$="IPMC" ..... MEDIA = INTPMC
1080 PRINT @SPA;"PMCS "+MEDIA$ ..... Sets the MEDIA
1090 INPUT "FILE No.";FILE ..... Inputs FILE No.
1100 PRINT @SPA;"SVM"+STR$(FILE) ..... Saves data
1100 RETURN
```

■ Recalling data

```
1200 *RCLPMC
1210 '-----------------------------
1220 ' MS2602A GPIB SAMPLE PROGRAM
1230 ' RECALL FROM PMC SUBROUTINE
1240 '-----------------------------
1250 MEDIA$="IPMC"
1260 PRINT @SPA;"PMCS "+MEDIA$
1270 INPUT "SELECT RECALL DATA 1=TRACE&PARAM 2=PARAM";RCD
     ..... Selects data to be recalled
1280 IF RCD=2 THEN RCDATA$="P" ELSE RCDATA$="TP"
1290 PRINT @SPA;"RDATA "+RCDATA$ ..... Sets data to be recalled
1300 INPUT "FILE No.";FILE ..... Inputs file No.
1310 PRINT @SPA;"RCM"+STR$(FILE) ..... Recalls data
1320 RETURN
```

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

< Example >

```
        :
200 PRINT @SPA;"SWP"
210 GOSUB *SAVPMC
        :
```

The block from lines 1050 to 1060 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.

The block from lines 1070 to 1080 sets the media to be used for saving to the internal PMC. By changing the data at line 1070 or by specifying a media with the INPUT statement, it is possible to save data to an external PMC or floppy disk (MC8104A is required). FILE No. is input at line 1090 and data is saved to the FILE No. at line 1100.

Line 1270 selects the data to be recalled for trace data including parameters or parameters only. Line 1290 declares the item to be recalled to MS2602A, and the specified file is recalled at lines 1300 to 1310.

6.2.9 Adjacent-channel leakage power measurement

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

```
1000 *ADJ
1010 '-----------------------------
1020 ' MS2602A GPIB SAMPLE PROGRAM
1030 ' ADJ CH MEASURE SUBROUTINE
1040 '-----------------------------
1050 CH$="BOTH"
1060 CHBW$="8.5KHZ"
1070 CHSP$="12.5KHZ"
1075 CHSPF$="25.0KHZ"
1080 PRINT @SPA;"ADJCH "+CH$ ..... Sets the adjacent channel
1090 PRINT @SPA;"ADJCHBW "+CHBW$ ..... Sets the adjacent-channel bandwidth
1100 PRINT @SPA;"ADJCHSP "+CHSP$
1105 PRINT @SPA;"ADJCHSPF "+CHSPF$
                                ..... Sets the adjacent-channel separation

1108 PRINT @SPA;"MADJMOD MOD" ..... Selects R: Total Power
1110 PRINT @SPA;"SWP"
1120 PRINT @SPA;"MEAS ADJ,EXE" ..... Measures the adjacent-channel leakage power
1130 PRINT @SPA;"RES?" ..... Queries the measurement data
1140 INPUT @SPA;LWLEV1,UPLEV1,LWLEV2,UPLEV2
1150 PRINT USING "UPPER SIDE CH1 LEVEL=####.##dBm";UPLEV1
1160 PRINT USING "LOWER SIDE CH1 LEVEL=####.##dBm";LWLEV1
1170 PRINT USING "UPPER SIDE CH2 LEVEL=####.##dBm";UPLEV2
1180 PRINT USING "LOWER SIDE CH2 LEVEL=####.##dBm";LWLEV2
1190 RETURN
```

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

The block from lines 1050 to 1075 assigns adjacent-channel setting values to variables. Both the upper and lower channels to be measured here lie in the 8.5 kHz channel 1 width with 12.5 kHz channel separation channel 2 width with 25.0 kHz channel separation. The block from lines 1080 to 1105 sends the program commands for the adjacent channel to set the MS2602A. After the sweep is executed by the " SWP " command at line 1110, the adjacent-channel leakage power is measured at line 1120. Line 1130 queries reading the measured value at line 1140.

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 1108 as shown below:

```
1108 PRINT @SPA;"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, PEAK → REF. Then return to the modulated state.

6.2.10 Occupied frequency bandwidth measurement

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

```
1000 *OBW
1010 '-----------------------------
1020 ' MS2602A GPIB SAMPLE PROGRAM
1030 ' OBW MEASURE SUBROUTINE
1040 '-----------------------------
1050 NPC=99 ..... Assigns 99 to variable NPC
1060 PRINT @SPA;"OBWN"+STR$(NPC) ..... Sets N%
1065 PRINT @SPA;"MOBW N" ..... Selects N% method
1070 PRINT @SPA;"DET SMP" ..... Sets the detection mode to SAMPLE
1080 PRINT @SPA;"VAVG 16" ..... Sets the averaging rate to 16
1090 PRINT @SPA;"VAVG ON" ..... Sets averaging to ON
1100 FOR I=1 TO 16
1110 PRINT @SPA;"SWP" ..... Repeats the sweep 16 times
1120 NEXT I
1130 PRINT @SPA;"MEAS OBW,EXE" ..... Measures the occupied frequency bandwidth
1140 PRINT @SPA;"RES?"
1150 INPUT @SPA;OBWFREQ,CNTRFRQ
1160 PRINT USING "CENTER FREQ=####.###MHz";CNTRFRQ/1E+06
1170 PRINT USING "##%BW  FREQ=####.###kHz";NPC,OBWFREQ/1000!
1180 RETURN
```

Line 1050 assigns the N% value to a simple numeric variable NPC to set N = 99% in < Example 9 > by sending the OBWN command for setting the occupied frequency bandwidth to MS2602A at line 1060 to 1065. Line 1070 sets the detection mode to SAMPLE. Lines 1080 and 1090 set the averaging rate to 16 and averaging to ON respectively.

The FOR···NEXT statement at lines 1100 to 1120 sends the " SWP " command 16 times to repeat the sweep by the required number of times for averaging processing. Line 1130 measures the occupied frequency bandwidth of the averaging-processed waveform. Line 1140 queries reading the occupied frequency bandwidth and the center frequency of the frequency bandwidth at line 1150.

To make a measurement using X dB DOWN, rewrite four lines as shown below:

```
        ⋮
1050 XDB=25
1060 PRINT @SPA;"OBWXDB"+STR$(XDB)
1065 PRINT @SPA;"MOBW XDB"
        ⋮
1170 PRINT USING "##dB DOWN FREQ=####.###kHz";XDB,
       OBWFREQ/1000
        ⋮
```

6.2.11 Setting template data

< Example 10 > Subroutine for template data

```
1000 *SETTMP
1010 '-----------------------------
1020 ' MS2602A GPIB SAMPLE PROGRAM
1030 ' SET TEMPLATE DATA SUBROUTINE
1040 '-----------------------------
1050 TMPNO=1 ..... Assigns template No.1 to variable TMPNO
1060 PRINT @SPA;"MTEMP "+STR$(TMPNO) ..... Sets the template No.
1070 PRINT @SPA;"MTEMPINI UP1"
1080 PRINT @SPA;"MTEMPINI LW1" ..... Initializes the template data
1090 PRINT @SPA;"MTEMPL UP1" ..... Selects LINIT LINE 1 UPPER
1100 RESTORE *LMTUP1 ..... Specifies the data line for reading
1110 READ N ..... Reads the number of template data points
1120 FOR I=1 TO N
1130     READ TM$,LEV$ ..... Reads the template data ( time, level )
1140     PRINT @SPA;"MTEMPIN"+STR$(I)+","+TM$+","+LEV$
         ..... Sets the template data
1150 NEXT I
1160 PRINT @SPA;"MTEMPL LW1" ..... Selects LINIT LINE 1 LOWER
1170 RESTORE *LMTLW1 ..... Specifies the data line to be read
1180 READ N ..... Reads the number of template data points
1190 FOR J=1 TO N
1200     READ TM$,LEV$ ..... Reads the template data ( time, level )
1210     PRINT @SPA;"MTEMPIN"+STR$(J)+","+TM$+","+LEV$
         ..... Sets the template data
1220 NEXT J
1230 *LMTUP1
1240 '== LIMIT LINE1 UPPER DATA ==
1250 DATA 8
1260 DATA "-50US","-65.2DBM"
1270 DATA "-24US","-65.2DBM"
1280 DATA "-24US","18.8DBM"
1290 DATA "6.643MS","18.8DBM"
1300 DATA "6.643MS","-45.2DBM" ..... Template data
1310 DATA "6.714MS","-45.2DBM"
1320 DATA "6.714MS","-65.2DBM"
1330 DATA "6.950MS","-65.2DBM"
1340 *LMTLW1
1350 '== LIMIT LINE1 LOWER DATA ==
```

```
136Ø DATA 4
137Ø DATA"95US","-2ØØDBM"
138Ø DATA"95US","Ø.8DBM"
139Ø DATA"6.524MS","Ø.8DBM"
14ØØ DATA"6.524MS","-2ØØDBM"
141Ø RETURN
```

..... Template data

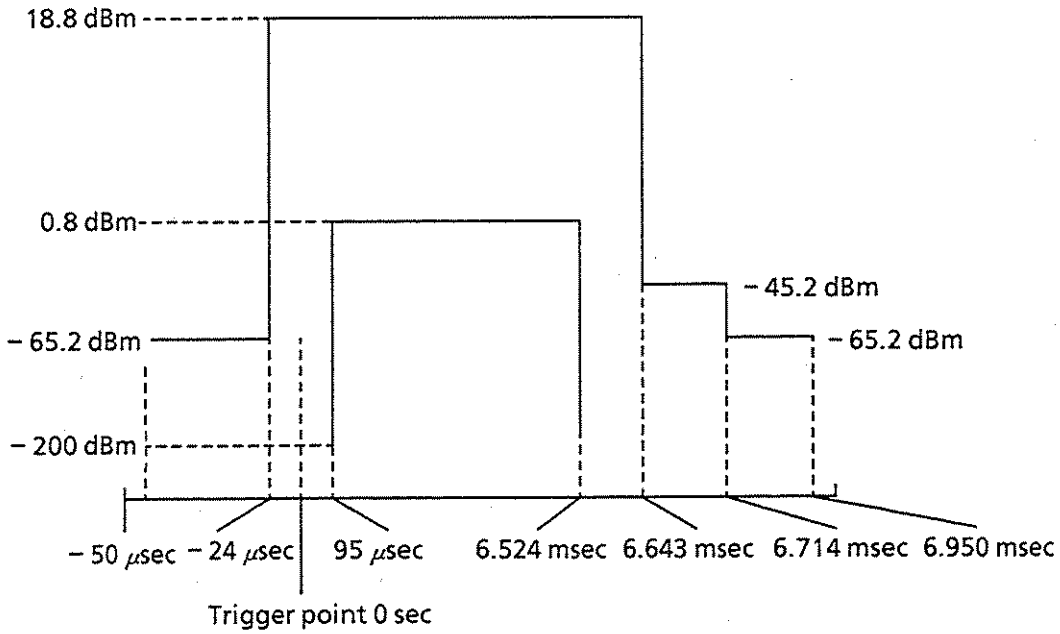


Fig. 6-4 Setting Data

The block from lines 1050 to 1060 selects the template No. to be set. The block from lines 1070 to 1080 initializes the current data settings. The block from lines 1090 to 1150 sets LIMIT LINE 1 UPPER. Line 1100 specifies the line where setting data is written.

Line 1110 reads the number of data points to set the number of loops to N in the FOR···NEXT statement at lines 1120 to 1150. Various data settings are read in the FOR···NEXT block.
The block from lines 1160 to 1220 sets LIMIT LINE 1 LOWER like the block from lines 1090 to 1150.

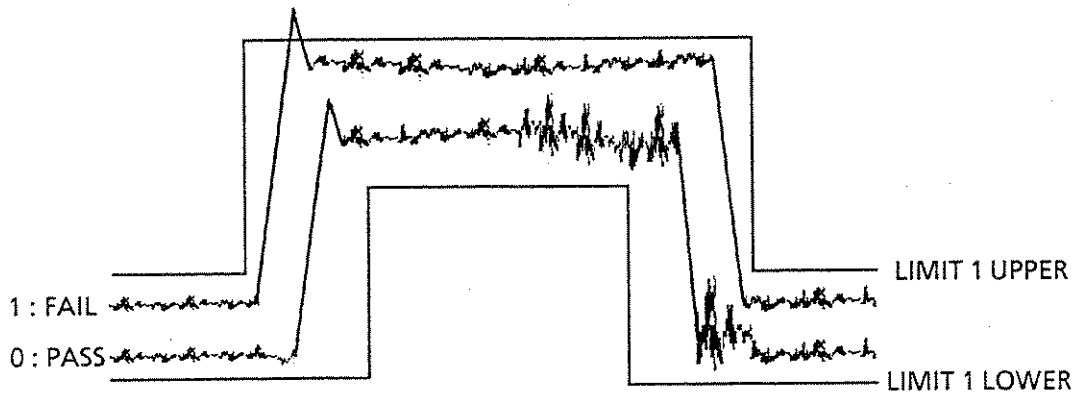
The block from lines 1230 to 1400 contains the DATA statements for setting the data included in these lines as template data. Line 1230 and line 1340 are label lines for the RESTORE statement. Each data item in line 1250 and line 1360 is numeric, and shows the number of data points. In the DATA statements following the DATA statement with this numeric data, the string expressions are listed as string data with units in order of time and level.

6.2.12 Measuring template

< Example 11 > Subroutine for template measurement

```
1000 *MEASTMP
1010 '-----------------------------
1020 ' MS2602A GPIB SAMPLE PROGRAM
1030 ' TEMPLATE MEASURE SUBROUTINE
1040 '-----------------------------
1050 PRINT @SPA;"MTEMP 1" ..... Sets the template No.
1060 PRINT @SPA;"TEMPSLCT UP1,ON" ..... Sets the template to ON
1070 PRINT @SPA;"TEMPSLCT LW1,ON"
1080 PRINT @SPA;"SWP"
1090 PRINT @SPA;"MEAS TEMP,CHECK" ..... Measures the template
1100 PRINT @SPA;"RES?"
1110 INPUT @SPA;CHK1$,CHK2$
1120 PRINT "LIMIT LINE 1"
1130 IF CHK1$="0" THEN PRINT "CHECK PASS!" ELSE PRINT "CHECK FAIL!"
1140 RETURN
```

This subroutine checks whether or not a burst signal waveform exits within a go / no-go line using the set template data. Line 1050 specifies the template No. used for a go / no-go decision. Line 1060 and line 1070 specify LIMIT 1 UPPER and LIMIT 1 LOWER as limit lines respectively. Line 1090 executes template measurement, and line 1100 queries reading data at 1110.



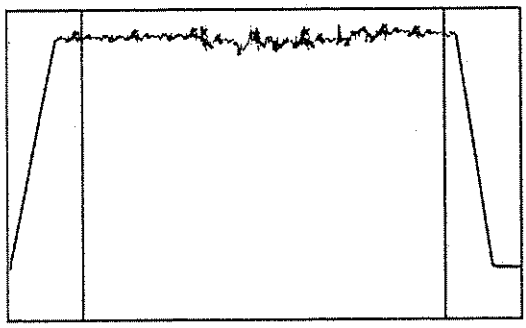
When part of a waveform is beyond LIMIT LINE, a response of " 1 " is generated to indicate FAIL. When the waveform is not beyond LIMIT LINE, a response of " 0 " is generated to indicate PASS.

6.2.13 Burst wave average power measurement

< Example 12 > Subroutine for burst wave average power measurement

```
1000 *MEASPWR
1010 '-----------------------------
1020 ' MS2602A GPIB SAMPLE PROGRAM
1030 ' BURST POWER MEAS SUBROUTINE
1040 '-----------------------------
1050 PWSTART=50 ..... Measurement-starting point = 50 point
1060 PWSTOP=450 ..... Measurement-stopping point = 450 point
1070 PRINT @SPA;"PWRSTART"+STR$(PWSTART) ..... Sets the starting point
1080 PRINT @SPA;"PWRSTOP"+STR$(PWSTOP) ..... Sets the stopping point
1090 PRINT @SPA;"SWP"
1100 PRINT @SPA;"MEAS POWER,EXE" ..... Measures the power
1110 PRINT @SPA;"RES?"
1120 INPUT @SPA;PWRDB PWRW
1130 PRINT USING "####.##dBm ####.##mW";PWRDB,PWRW/1E+09
1140 RETURN
```

This program is a subroutine that measures the burst wave average power. Line 1050 and line 1060 assign 50 and 450 to numeric variables PWSTART and PWSTOP respectively to set the measurement start and stop points on the screen display at lines 1070 and 1080. After the sweep is executed at line 1090, the average power is measured at line 1100. 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, set the center frequency and time delay.

< Example >

```
      :
100 PRINT @SPA;"CNF 500MHZ" ..... Sets the center frequency
110 PRINT @SPA;"SPF 0HZ" ..... Sets the frequency span to 0 Hz for time domain
120 PRINT @SPA;"TSP 550US" ..... Sets the time span
130 PRINT @SPA;"TDLY 25US" ..... Sets the time delay
140 GOSUB *MEASPWR
      :
```

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SECTION 7
TABLE OF DEVICE MESSAGES

This section gives the tables of device messages, which can be used for the MS2602A, classified by the function type according to the contents. For detailed descriptions of commands, see SECTION 8, "DETAILED DESCRIPTION OF COMMANDS."

TABLE OF CONTENTS

Frequency / Amplitude 7-3
Display function 7-6
Signal search 7-11
Marker function 7-11
Coupled function 7-15
Sweep function 7-18
Save / Recall 7-20
Hard copy 7-21
Measure function 7-22
Sound 7-27
Parameter setting 7-27
System setting 7-28
Calibration 7-28
GPIB 7-28
RS-232C 7-29
Title 7-29
CAL / UNCAL 7-29
Spectrum data 7-30
PMC 7-30
PTA control 7-30
Others 7-31
Common command and event status 7-32

(Blank)

Table of MS2602A Device Message (1/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Frequency/ Amplitude	FREQUENCY / AMPLITUDE			
• Frequency	FREQUENCY			
Selects the mode for setting frequency band	FREQ MODE CENTER-SPAN START-SPAN START-STOP	 FRQ_Ø FRQ_1 FRQ_2	 FRQ? FRQ? FRQ?	 FRQ_Ø FRQ_1 FRQ_2
Sets center frequency	CENTER FREQ	CNF_f CF_f	CNF? CF?	CNF_f f
Steps up center frequency	FREQ STEP UP	FUP CF_UP	—— ——	—— ——
Steps down center frequency	FREQ STEP DOWN	FDN CF_DN	—— ——	—— ——
Sets start frequency	START FREQ	STF_f FA_f	STF? FA?	STF_f f
Sets stop frequency	STOP FREQ	SOF_f FB_f	SOF? FB?	SOF_f f
Sets frequency step size	FREQ STEP SIZE	FSS_f SS_f	FSS? SS?	FSS_f f
Sets scroll step size	SCROLL STEP SIZE 1 div 2 div 5 div 10 div	 SSS_1 SSS_2 SSS_5 SSS_1Ø	 SSS? SSS? SSS? SSS?	 SSS_1 SSS_2 SSS_5 SSS_1Ø
Setting the Fine Adj	FINE ADJ ON OFF	 FADJ_ON FADJ_OFF	 —— FADJ?	 —— OFF
Setting the Fine Adj frequency	ADJ	FADJ_f	FADJ?	f
• Span	SPAN			
Sets frequency span	FREQ SPAN	SPF_f SP_f	SPF? SP?	SPF_f f
Steps up frequency span	FREQ SPAN STEP UP	SPU SP_UP	—— ——	—— ——
Steps down frequency span	FREQ SPAN STEP DOWN	SPD SP_DN	—— ——	—— ——
Sets to full span	FULL SPAN	FS	——	——

Table of MS2602A Device Message (2/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Frequency/ Amplitude	**FREQUENCY / AMPLITUDE**			
• Span	**SPAN**			
Sets to zero span	ZERO SPAN	SPF_Ø	SPF?	SPF_Ø
Selects one of the bands	BAND SELECT			
	AUTO : 0 Hz to 8.5 GHz	BNDC_AUTO HNLOCK_OFF HNUNLK	BNDC? HNLOCK? ——	AUTO HNLOCK_OFF ——
	0 : 0 Hz to 2.0 GHz	BNDC_Ø HNLOCK_Ø HN_Ø	BNDC? HNLOCK? HN?	Ø HNLOCK_ON Ø
	1− : 1.7 to 7.5 GHz	BNDC_1- HNLOCK_1 HN_1	BNDC? HNLOCK? HN?	1- HNLOCK_ON 1
	1+ : 6.5 to 8.5 GHz	BNDC_1+ HNLOCK_2 HN_2	BNDC? HNLOCK? HN?	1+ HNLOCK_ON 2
• Level	**AMPLITUDE**			
Sets reference level	REFERENCE LEVEL	RLV_ℓ RL_ℓ	RLV? RL?	RLV_ℓ ℓ
Steps up reference level	REF LEVEL STEP UP	RL_UP	——	——
Steps down reference level	REF LEVEL STEP DOWN	RL_DN	——	——
Sets LOG scale step size	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_1Ø	LSSA?	LSSA_1Ø
Sets LOG scale	LOG SCALE RANGE			
	1 dB / div	SCL_Ø LG_1DB	SCL? LG?	SCL_Ø 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_1ØDB	SCL? LG?	SCL_3 1Ø
	SCALE UP	LG_UP	——	——
	SCALE DOWN	LG_DN	——	——

Table of MS2602A Device Message (3/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Frequency/ Amplitude	FREQUENCY / AMPLITUDE			
• Level	AMPLITUDE			
Sets LIN scale	SCALE LIN RANGE			
	Switching LIN scale	LN	———	———
		LG_Ø	———	———
	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
Sets 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
• Display line	DISPLAY LINE			
Sets Display line to ON/OFF	DISPLAY LINE			
	OFF	DL_OFF	DL?	OFF
	ON	DL_ON	———	———
Sets Display line level	DISPLAY LINE LEVEL	DL_ℓ	DL?	ℓ
Selects displaying absolute value/value relative to the display line (marker level, waveform data)	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 MS2602A Device Message (4/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Frequency/ Amplitude	FREQUENCY/ AMPLITUDE			
• Reference level offset	REFERENCE LEVEL OFFSET			
Offset	OFFSET			
	OFF	ROFFSET_OFF	ROFFSET?	OFF
	ON	ROFFSET_ON	———	———
Offset value	OFFSET VALUE	ROFFSET_ℓ	ROFFSET?	ℓ
• Correction factor relevance	CORRECTION			
Selects the type of correction factor	CORRECTION FACTOR SELECT			
	OFF	CORR_OFF	———	———
		CORR_Ø	CORR?	CORR_Ø
	ON	CORR_ON	———	———
	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 correction factor	CORRECTION FACTOR† ENTRY	CORD_n,f,ℓ	CORD?_n	CORD?_n,f,ℓ
Registers correction factor label	CORRECTION FACTOR† LABEL ENTRY	CORRLABEL_n, "text"	CORRLABEL ?_n	"text"
Initializes correction factor	CORRECTION FACTOR† INITIALIZATION	CORC	———	———
■ Display function	DISPLAY			
• Display mode	DISPLAY FUNCTION			
Selects 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/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

† It is impossible to set manually because of the commands used only for GPIB.

Table of MS2602A Device Message (5/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Display function	DISPLAY			
• Waveform writing	WRITE SWITCH			
Controls writing waveform to trace A	TRACE-A WRITE SWITCH			
	VIEW	AWR_Ø	———	———
		AWR_OFF	AWR?	AWR_OFF
		VIEW_TRA	———	———
	WRITE	AWR_1	———	———
		AWR_ON	AWR?	AWR_ON
		CLRW_TRA	———	———
		A1	———	———
Controls writing 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 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 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	———	———

Table of MS2602A Device Message (6/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Display function	DISPLAY			
• Storage mode	STORAGE MODE			
Selects the mode for processing 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
Selects the mode for processing 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
Selects the mode for processing 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
Average processing	AVERAGE			
	OFF	VAVG_Ø	———	———
		VAVG_OFF	———	———
		KSH	———	———
	ON	VAVG_1	———	———
		VAVG_ON	———	———
		KSG	———	———

Table of MS2602A Device Message (7/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Display function	DISPLAY			
• Storage mode	STORAGE MODE			
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
	n	VAVG_n	VAVG?	n
	DETECTION MODE			
	POS PEAK	DET_Ø	———	———
		DET_POS	DET?	POS
	SAMPLE	DET_1	———	———
		DET_SMP	DET?	SMP
	NEG PEAK	DET_2	———	———
		DET_NEG	DET?	NEG
Selects detection mode	TRACE-A DETECTION MODE			
	POS PEAK	DETM_TRA,POS	DETM?_TRA	POS
	SAMPLE	DETM_TRA,SMP	DETM?_TRA	SMP
	NEG PEAK	DETM_TRA,NEG	DETM?_TRA	NEG
Selects detection mode	TRACE-B DETECTION MODE			
	POS PEAK	DETM_TRB,POS	DETM?_TRB	POS
	SAMPLE	DETM_TRB,SMP	DETM?_TRB	SMP
	NEG PEAK	DETM_TRB,NEG	DETM?_TRB	NEG
	TRACE-TIME DETECTION MODE			
	POS PEAK	DETM_TRTIME,POS	DETM?_TRTIME	POS
	SAMPLE	DETM_TRTIME,SMP	DETM?_TRTIME	SMP
	NEG PEAK	DETM_TRTIME,NEG	DETM?_TRTIME	NEG

Table of MS2602A Device Message (8/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Display function	DISPLAY			
• Time	TIME			
Sets time delay in the time axis sweep mode	DELAY TIME	TDLY_t	TDLY?	t
Sets time span in the time axis sweep mode	TIME SPAN	TSP_t	TSP?	t
Sets time expand mode to ON or OFF	EXPAND ZONE OFF ON	TZONE_Ø TZONE_OFF TZONE_1 TZONE_ON	 TZONE? TZONE?	 OFF ON
Sets time expand mode to ON or OFF	EXPAND OFF ON	TEXPAND_Ø TEXPAND_OFF TEXPAND_1 TEXPAND_ON	 TEXPAND? TEXPAND?	 OFF ON
Sets the start time of time expand	ZONE START	TZSTART_t	TZSTART?	t
Sets the magnified range of time expand	ZONE SPAN	TZSP_t	TZSP?	t
Sets the function for monitoring the trace TIME waveform	FM/TRIGGER MONITOR OFF FM MONITOR EXT TRIGGER MONITOR	 SPFUNC_OFF SPFUNC_FM SPFUNC_EXT	 SPFUNC? SPFUNC? SPFUNC?	 OFF FM EXT
Sets the bandwidth for demodulating FM	FM RANGE 2 kHz / div 20 kHz / div 200 kHz / div	 FMRNG_2KHZ FMRNG_20KHZ FMRNG_200KHZ	 FMRNG? FMRNG? FMRNG?	 2ØØ 2ØØØ 2ØØØØ
Sets the coupling to AC or DC to monitor FM waveform	COUPLING AC COUPLING DC COUPLING	 COUPLE_AC COUPLE_DC	 COUPLE? COUPLE?	 AC DC
• A / B				
Active marker Trace	ACTIVE MARKER TRACE TRACE A TRACE B	 MKTRACE_TRA MKTRACE_TRB		

Table of MS2602A Device Message (9/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Signal search	SIGNAL SEARCH			
Sets the maximum peak point within BG to center frequency	AUTO TUNE	ATUN	——	——
Sets the maximum peak point to center frequency	PEAK to CF	PCF	——	——
Sets the maximum peak point to REF level	PEAK to REF	PRL	——	——
Shifts the spectrum in the right or left direction	SCROLL LEFT	SCR_Ø SCR_LEFT	—— ——	—— ——
	RIGHT	SCR_1 SCR_RIGHT	—— ——	—— ——
■ Marker function	MARKER			
Selects marker mode	MARKER MODE NORMAL	MKR_Ø M2	MKR? ——	MKR_Ø ——
	DELTA	MKR_1 MKD M3	MKR? —— ——	MKR_1 —— ——
	OFF	MKR_2 MKOFF MKOFF_ALL M1	MKR? —— —— ——	MKR_2 —— —— ——
Specifies zone marker center position as a point	ZONE POSITION (point)	MKZ_p MKP_p	MKZ? MKP?	MKZ_p p
Specifies zone marker center position as a frequency or time	ZONE POSITION (freq or time) FREQ SET	MKZF_f MKN_f	MKZF? MKN?	f f
	UP DOWN	MKN_UP MKN_DN	—— ——	—— ——
	TIME SET	MKZF_t MKN_t	MKZF? MKN?	t t
	UP DOWN	MKN_UP MKN_DN	—— ——	—— ——

Table of MS2602A Device Message (10/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Marker function	MARKER			
Specifies zone marker width as a point	ZONE WIDTH (point)	MZW_p	MZW?	MZW_p
Specifies zone marker width as a frequency	ZONE WIDTH (freq)	MZWF_f	MZWF?	f
Specifies zone marker width as a div	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 function	MARKER FUNCTION			
Moves marker frequency to center frequency	MKR to CF	MKR_3	——	——
		MKCF	——	——
		E2	——	——
Sets level at marker to REF level	MKR to REF	MKR_4	——	——
		MKRL	——	——
		E4	——	——
Sets marker frequency to CF step	MKR to CFstep	MKR_5	——	——
		MKSS	——	——
		E3	——	——
Sets delta marker frequency to span	└MKR to SPAN	MKR_6	——	——
		MKSP	——	——
		KSO	——	——
Sets zone frequency to span	ZONE to SPAN	MKR_7	——	——
• Multimarker	MULTI MARKER			
Multimarker	MULTI MARKER			
	OFF	MKMULTI_Ø	——	——
		MKMULTI_OFF	MKMULTI?	OFF
	ON	MKMULTI_1	——	——
		MKMULTI_ON	MKMULTI?	ON

Table of MS2602A Device Message (11/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Marker function	MARKER			
• Multimarker	MULTI MARKER			
Multimarker mode	MULTI MARKER MODE			
	Registers multimarkers on the peak point in descending level order from the maximum level down to the tenth.	MKMHI	——	——
	Registers multimarkers on the harmonic frequency ranging from the reference multimarker frequency up to the tenth.	MKMHRM	——	——
Selects multimarker	SELECT MULTI MARKER			
	The n th marker:			
	Sets to OFF	MKSLCT␣n,Ø MKSLCT␣n,OFF	—— MKSLCT?␣n	—— OFF
	Sets to ON	MKSLCT␣n,1 MKSLCT␣n,ON	—— MKSLCT?␣n	—— ON
Selects the active marker of the multimarkers	ACTIVE MARKER	MKACT␣n	MKACT?	n
Specifies the frequency of the designated multimarker number	MARKER POSITION	MKMP␣n,f	MKMP?␣n	f
Clears all the registered multimarkers	CLEAR MULTI MARKER	MKMCL	——	——
Multimarker list	MULTI MARKER LIST			
	OFF	MKLIST␣Ø MKLIST␣OFF	—— MKLIST?	—— OFF
	ON	MKLIST␣1 MKLIST␣ON	—— MKLIST?	—— ON
Reads out the multimarker level	MULTI MARKER LEVEL QUERY	——	MKML?n	ℓ

Table of MS2602A Device Message (12/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Marker function	MARKER			
• Peak search	PEAK SEARCH			
Peak search mode	PEAK SERCH MODE			
	PEAK	MKS_Ø	——	——
		MKPK	——	——
		MKPK_HI	——	——
		E1	——	——
	NEXT PEAK	MKS_1	——	——
		MKPK_NH	——	——
	DIP	MKS_2	——	——
		MKMIN	——	——
	NEXT RIGHT PEAK	MKS_9	——	——
		MKPK_NR	——	——
	NEXT LEFT PEAK	MKS_1Ø	——	——
		MKPK_NL	——	——
	NEXT DIP	MKS_11	——	——
• Input position	INPUT POSITION			
Reads out reference marker position	REFERENCE MARKER POSITION	——	RMK?	RMK_p
Reads out current marker position	CURRENT MARKER POSITION	——	CMK?	CMK_p
Reads out frequency at marker point	MARKER FREQ QUERY			
	FREQ	——	MKF?	f
	TIME	——	MKF?	t
Reads out level at marker point	MARKER LEVEL	——	MKL?	ℓ
		——	MKA?	ℓ

Table of MS2602A Device Message (13/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Coupled function	COUPLED FUNCTION			
Sets resolution bandwidth	RESOLUTION BANDWIDTH			
	MANUAL	ARB_Ø	ARB?	ARB_Ø
	AUTO	ARB_1	ARB?	ARB_1
		RB_AUTO	——	——
		CR	——	——
	10 Hz	RB_1ØHZ	RB?	1Ø
		RBW_13	RBW?	RBW_13
	30 Hz	RB_3ØHZ	RB?	3Ø
		RBW_Ø	RBW?	RBW_Ø
	100 Hz	RB_1ØØHZ	RB?	1ØØ
		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
	RBW UP	RB_UP	——	——
	RBW DOWN	RB_DN	——	——

Table of MS2602A Device Message (14/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Coupled function	COUPLED FUNCTION			
Sets 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_3HZ	VB?	3
		VBW_8	VBW?	VBW_8
	10 Hz	VB_1ØHZ	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 ratio of VBW and RBW (where VBW = AUTO)	VBW / RBW RATIO			
	RATIO=r	VBR_r	VBR?	r

Table of MS2602A Device Message (15/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Coupled function	COUPLED FUNCTION			
Sets sweep time	SWEEP TIME			
	MANUAL	AST_Ø	AST?	AST_Ø
	AUTO	AST_1	AST?	AST_1
		ST_AUTO	——	——
		CT	——	——
	SWEEP_TIME SET			
	TIME=t	SWT_t	SWT?	SWT_t
		ST_t	ST?	t
	UP	ST_UP	——	——
	DOWN	ST_DN	——	——
Sets RF attenuator to MANUAL or AUTO mode	RF ATTENUATOR			
	MANUAL	AAT_Ø	AAT?	AAT_Ø
	AUTO	AAT_1	AAT?	AAT_1
		AT_AUTO	——	——
		CA	——	——
Sets RF attenuator	0 dB	ATT_Ø	ATT?	ATT_Ø
		AT_Ø	AT?	Ø
	5 dB	ATT_6	ATT?	ATT_6
		AT_5	AT?	5
	10 dB	ATT_1	ATT?	ATT_1
		AT_1Ø	AT?	1Ø
	15 dB	ATT_7	ATT?	ATT_7
		AT_15	AT?	15
	20 dB	ATT_2	ATT?	ATT_2
		AT_2Ø	AT?	2Ø
	25 dB	ATT_8	ATT?	ATT_8
		AT_25	AT?	25
	30 dB	ATT_3	ATT?	ATT_3
		AT_3Ø	AT?	3Ø
	35 dB	ATT_9	ATT?	ATT_9
		AT_35	AT?	35
	40 dB	ATT_4	ATT?	ATT_4
		AT_4Ø	AT?	4Ø
	45 dB	ATT_1Ø	ATT?	ATT_1Ø
		AT_45	AT?	45
	50 dB	ATT_5	ATT?	ATT_5
		AT_5Ø	AT?	5Ø
	55 dB	ATT_11	ATT?	ATT_11
		AT_55	AT?	55
	UP	AT_UP	——	——
	DOWN	AT_DN	——	——
Sets RBW, VBW, and sweep time to AUTO mode	RBW, VBW / SWEEP TIME AUTO	BSAUTO	——	——
Sets coupled function to AUTO mode	COUPLED FUNCTION AUTO	AUTO	——	——

Table of MS2602A Device Message (16/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Sweep function	SWEEP CONTROL			
Sets zone sweep to ON or OFF	ZONE SWEEP			
	OFF	PSW_Ø	———	———
		PSW_OFF	PSW?	PSW_OFF
	ON	PSW_1	———	———
		PSW_ON	PSW?	PSW_ON
Sets tracking function	TRACKING			
	OFF	MKTRACK_Ø	———	———
		MKTRACK_OFF	MKTRACK?	OFF
		MTØ	———	———
	ON	MKTRACK_1	———	———
		MKTRACK_ON	MKTRACK?	ON
		MT1	———	———
Gate function	GATE MODE			
	OFF	GATE_Ø	———	———
		GATE_OFF	GATE?	OFF
	ON	GATE_1	———	———
		GATE_ON	GATE?	ON
Sets gate delay time	GATE DELAY TIME	GD_t	GD?	t
Sets gate length	GATE LENGTH	GL_t	GL?	t
Sets ending gate interval internally or externally	GATE END			
	INTERNAL	GE_INT	GE?	INT
	EXTERNAL	GE_EXT	GE?	EXT
Sets trigger mode (Sets trigger source / trigger switch)	TRIGGER MODE			
	FREERUN	TRG_Ø	TRG?	TRG_Ø
		TM_FREE	TM?	FREE
	VIDEO	TRG_1	TRG?	TRG_1
		TM_VID	TM?	VID
	LINE	TRG_2	TRG?	TRG_2
		TM_LINE	TM?	LINE
	EXT	TRG_3	TRG?	TRG_3
		TM_EXT	TM?	EXT
	TV	TRG_6	TRG?	TRG_6
		TM_TV	TM?	TV
Sets trigger switch	TRIGGER SWITCH			
	FREERUN	TRGS_FREE	TRGS?	FREE
	TRIGGERD	TRGS_TRGD	TRGS?	TRGD

Table of MS2602A Device Message (17/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Sweep function	SWEEP CONTROL			
Sets trigger source	TRIGGER SOURCE			
	VIDEO	TRGSOURCE_VID	TRGSOURCE?	VID
	LINE	TRGSOURCE_LINE	TRGSOURCE?	LINE
	EXT	TRGSOURCE_EXT	TRGSOURCE?	EXT
	TV	TRGSOURCE_TV	TRGSOURCE?	TV
Sets the external trigger level type (when trigger source = EXT)	EXT TRIGGER TYPE			
	INPUT1 (±10 V)	EXTTYPE_10V	EXTTYPE?	10V
	INPUT2 (TTL)	EXTTYPE_TTL	EXTTYPE?	TTL
Selects TV system (when trigger source = TV)	TV TYPE			
	PAL	TVSTND_PAL	TVSTND?	PAL
	NTSC	TVSTND_NTSC	TVSTND?	NTSC
Selects TV horizontal synchronous signal (when trigger source = TV)	TV SYNCHRONIZING SIGNAL			
	VERTICAL	TVSFRM_VERTICAL	TVSFRM?	VERTICAL
	HORIZONTAL-EVEN	TVSFRM_EVEN	TVSFRM?	EVEN
	HORIZONTAL-ODD	TVSFRM_ODD	TVSFRM?	ODD
Selects the number of TV horizontal synchronous signal line (when trigger source = TV)	TV H-SYNC LINE	TVLINE_a	TVLINE?	a
Sets the trigger threshold level for starting sweep	TRIGGER LEVEL	TRGLVL_ℓ	TRGLVL?	ℓ
Selects the slope for detecting the sweep-starting trigger (when trigger source = TV, EXT)	TRIGGER SLOPE			
	RISE	TRGSLP_RISE	TRGSLP?	RISE
	FALL	TRGSLP_FALL	TRGSLP?	FALL
Sets sweep mode to single	SINGLE SWEEP MODE	SNGLS	——	——
		S2	——	——

Table of MS2602A Device Message (18/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Sweep function	SWEEP CONTROL			
Executes / checks single sweep	SINGLE SWEEP / SWEEP STATUS			
	Executing single sweep	SWP TS	—— ——	—— ——
	Checking sweep status	——	SWP?	SWP_Ø
	Sweep completed	——	SWP?	SWP_1
	Sweep in progress			
Continuous sweep mode	CONTINUOUS SWEEP MODE	CONTS S1	—— ——	—— ——
Stops sweep	SWEEP STOP	SWSTOP	——	——
Restarts sweep	SWEEP RESTART	SWSTART	——	——
■ Save / Recall	SAVE / RECALL			
Recalls data from internal memory	RECALL DATA FROM INTERNAL MEMORY	RGRC_r RC_r	—— ——	—— ——
Recalls data from PMC (floppy disk)	RECALL DATA FROM PMC (FD)	RCM_r	——	——
Saves data in internal memory	SAVE DATA INTO INTERNAL MEMORY	RGSV_s SV_s	—— ——	—— ——
Saves data on PMC (floppy disk)	SAVE DATA INTO PMC (FD)	SVM_s	——	——
Displays the directory of the recall memory	MEMORY DIRECTORY	RGDIR	——	——
Sets the recall data	RECALLED DATA TRACE&PARAM PARAM ONLY	 RDATA_TP RDATA_P	 RDATA? RDATA?	 TP P

Table of MS2602A Device Message (19/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Hard copy	HARD COPY			
Starts direct plot	DIRECT PLOT START	PLS_Ø PLOT PRINT	—— —— ——	—— —— ——
• Controls hard copy	COPY CONTROL			
Direct plotting device selection Selects the plotter Selects the printer	DIRECT PLOT DEVICE PLOTTER HP-GL GP-GL PRINTER VP-800 HP-2225 MC8104A UA-455A	 PMOD_Ø PMOD_1 PMOD_2 PMOD_3 PMOD_4 PMOD_5	 PMOD? PMOD? PMOD? PMOD? PMOD? PMOD?	 PMOD_Ø PMOD_1 PMOD_2 PMOD_3 PMOD_4 PMOD_5
Sets the printer GPIB address	PRINTER ADDRESS SET	PRIA_a	PRIA?	a
Sets the plotter GPIB address	PLOTTER ADDRESS SET	PLTA_a	PLTA?	a
Sets the size of the paper output from the plotter	DIRECT PLOT SIZE A4 A3	 PLF_Ø PLF_1	 PLF? PLF?	 PLF_Ø PLF_1
Sets the size of the plot	PLOT AREA FULL SIZE QUATER SIZE	 PLTARA_FULL PLTARA_QTR	 PLTARA? PLTARA?	 FULL QTR
Sets the location of the plot on the paper	PLOT LOCATION renewed automatically Fixed in upper left-corner Fixed in upper right-corner Fixed in lower left-corner Fixed in lower right-corner	 PLTLC_AUTO PLTLC_UPLEFT PLTLC_UPRIGHT PLTLC_LOWLEFT PLTLC_LOWRIGHT	 PLTLC? PLTLC? PLTLC? PLTLC? PLTLC?	 AUTO UPLEFT UPRIGHT LOWLEFT LOWRIGHT
Selects one of the plot items to a plotter	DIRECT PLOT OUTPUT ITEM ALL TRACE ONLY SCALE ONLY	 PLI_Ø PLI_1 PLI_2	 PLI? PLI? PLI?	 PLI_Ø PLI_1 PLI_2
Selects "UPPER LEFT" for the plot location on the paper (Only at AUTO ADVANCE)	PLOTTER LOCATION PRESET	PLTHOME	——	——

Table of MS2602A Device Message (20/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Measure function	MEASURE			
Sets measure function to OFF	MEASURE FUNCTION ALL OFF	MEAS_OFF	——	——
• Frequency measurement	FREQ MEASURE			
Measures 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_Ø	MKFC?	1
		MKFC_ON	——	——
		MEAS_FREQ,ON	——	——
	Transferring measured results	——	RES?	f
Sets 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	——	——
• Noise measurement	NOISE MEASURE			
Measures noise	NOISE MEASURE			
	OFF	MEAS_NOISE,OFF	——	——
	ON	MEAS_NOISE,ON	——	——
	ABSOLUTE executed	MEAS_NOISE,ABS	——	——
	C/N RATIO executed	MEAS_NOISE,CN	——	——
	Transferring measured results	——	RES?	ℓ
Calculation method	ABSOLUTE	MNOISE_ABS	MNOISE?	ABS
	C/N RATIO	MNOISE_CN	MNOISE?	CN

Table of MS2602A Device Message (21/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Measure function	MEASURE			
• Occupied frequency bandwidth measurement	OBW MEASURE			
Measures occupied frequency bandwidth	OBW MEASURE Executes calculation Executes (X dB DOWN) Executes (N%) Transferring measured results (f_1: Occupied bandwidth f_2: Center frequency)	MEAS_OBW,EXE MEAS_OBW,XDB MEAS_OBW,N ——	—— —— —— RES?	—— —— —— f_1, f_2
Calculation method	X dB DOWN method N% method	MOBW_XDB MOBW_N	MOBW? MOBW?	XDB N
Sets the conditions of occupied frequency bandwidth	OBW VALUE x dB n%	OBWXDB_xDB OBWN_n	OBWXDB? OBWN?	x n
• Adjacent channel measurement	ADJACENT CH MEASURE			
Measures adjacent channel	ADJACENT CH MEASURE Executes calculation Executes(UNMODULATED CARRIER) Executes (MODULATED CARRIER) Transferring measured results (ℓ_{L1}: CH1 lower sideband ℓ_{U2}: CH1 upper sideband ℓ_{L2}: CH2 lower sideband ℓ_{U2}: CH2 upper sideband)	MEAS_ADJ,EXE MEAS_ADJ,UNMD MEAS_ADJ,MOD ——	—— —— —— RES?	—— —— —— $\ell_{L1}, \ell_{U1}, \ell_{L2}, \ell_{U2}$
Selects adjacent channel	ADJACENT CH SELECT BOTH SIDES UPPER SIDE LOWER SIDE OFF	ADJCH_BOTH ADJCH_UP ADJCH_LOW ADJCH_OFF	ADJCH? ADJCH? ADJCH? ADJCH?	BOTH UP LOW OFF
Sets adjacent channel bandwidth	ADJACENT CH BANDWIDTH	ADJCHBW_f	ADJCHBW?	f
Sets adjacent channel 1 separation	ADJACENT CH1 SEPALATION	ADJCHSP_f	ADJCHSP?	f
Sets adjacent channel 2 separation	ADJACENT CH2 SEPALATION	ADJCHSPF_f	ADJCHSPF?	f

Table of MS2602A Device Message (22/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Measure function	MEASURE			
• Adjacent channel measurement	ADJACENT CH MEASURE			
Selects calculation method	R : TOTAL POWER (MOD)	MADJMOD_MOD	MADJMOD?	MOD
	R : REF LEVEL (UNMOD)	MADJMOD_UNMD	MADJMOD?	UNMD
Sets graph display to ON/OFF	GRAPH			
	OFF	MADJGRAPH_OFF	MADJGRAPH?	OFF
	ON	MADJGRAPH_ON	MADJGRAPH?	ON
Sets channel center line display to ON/OFF	CHANNEL CENTER LINE			
	OFF	MADJCTRLN_OFF	MADJCTRLN?	OFF
	ON	MADJCTRLN_ON	MADJCTRLN?	ON
Sets channel range line to ON/OFF	CHANNEL BAND LINE			
	OFF	MADJBWLN_OFF	MADJBWLN?	OFF
	ON	MADJBWLN_ON	MADJBWLN?	ON
• Template measurement	TEMPLATE			
Measures template	TEMPLATE MEASURE			
	OFF	MEAS_TEMP,OFF	——	——
	ON	MEAS_TEMP,ON	——	——
	CHECK TEMP	MEAS_TEMP,CHECK	——	——
	Transferring measured results (c_1: LIMIT1 check result, c_2: LIMIT2 check result)	——	RES?	c_1, c_2 (PASS = Ø, FAIL = 1)
Moves template	TEMPLATE MOVE			
	MOVE X	TEMPMVX_t	TEMPMVX?	t
	MOVE Y	TEMPMVY_ℓ	TEMPMVY?	ℓ
	SAVE	TEMPMSV	——	——
	CANCEL	TEMPMCL	——	——

Table of MS2602A Device Message (23/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Measure function	MEASURE			
• Template measurement	TEMPLATE			
Selects template	SELECT TEMPLATE No. 1 2 3 4 5	 TEMP_1 TEMP_2 TEMP_3 TEMP_4 TEMP_5	 TEMP? TEMP? TEMP? TEMP? TEMP?	 1 2 3 4 5
Selects LIMIT line	SELECT LIMIT LINE LIMIT1 UPPER OFF ON LIMIT2 UPPER OFF ON LIMIT1 LOWER OFF ON LIMIT2 LOWER OFF ON	 TEMPSLCT_UP1,Ø TEMPSLCT_UP1,OFF TEMPSLCT_UP1,1 TEMPSLCT_UP1,ON TEMPSLCT_UP2,Ø TEMPSLCT_UP2,OFF TEMPSLCT_UP2,1 TEMPSLCT_UP2,ON TEMPSLCT_LW1,Ø TEMPSLCT_LW1,OFF TEMPSLCT_LW1,1 TEMPSLCT_LW1,ON TEMPSLCT_LW2,Ø TEMPSLCT_LW2,OFF TEMPSLCT_LW2,1 TEMPSLCT_LW2,ON	 ——— TEMPSLCT?UP1 ——— TEMPSLCT?UP1 ——— TEMPSLCT?UP2 ——— TEMPSLCT?UP2 ——— TEMPSLCT?LW1 ——— TEMPSLCT?LW1 ——— TEMPSLCT?LW2 ——— TEMPSLCT?LW2	 ——— OFF ——— ON ——— OFF ——— ON ——— OFF ——— ON ——— OFF ——— ON
• Power measurement	POWER MEASURE			
Measures power	POWER MEASURE MEASURE Transferring measured results (ℓ: dBm value w: pW value)	MEAS_POWER,EXE ———	——— RES?	——— ℓ,w
Sets the point at which power measurement starts	POWER MEASURE START	PWRSTART_p	PWRSTART?	p
Sets the point at which power measurement ends	POWER MEASURE STOP	PWRSTOP_p	PWRSTOP?	p

Table of MS2602A Device Message (24/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Measure function	MEASURE			
• Template management function	MANAGE TEMPLATE			
Measures 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 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
Sets the level data by distinguishing relative value from absolute value	TEMPLATE LEVEL MODE			
	ABSOLUTE	MTEMPREL_OFF	MTEMPREL?	OFF
	RELATIVE	MTEMPREL_ON	MTEMPREL?	ON
Adds the template data by 1 point	INSERT TEMPLATE POINT DATA	MTEMPIN_p,t,ℓ	——	——
Replaces the template data by 1 point	REPLACE TEMPLATE POINT DATA	MTEMPRP_p,t,ℓ	——	——
Reads out the template data by 1 point	READ TEMPLATE POINT DATA	——	MTEMPPD?_p	t,ℓ
Deletes the template data by 1 point	DELETE TEMPLATE POINT DATA	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 MS2602A Device Message (25/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Measure function	MEASURE			
• Template management function	MANAGE TEMPLATE			
Specifies how the template management screen is displayed	DISPLAY TEMPLATE MODE			
	GRAPH	MTEMPDSP_GRAPH	MTEMPDSP?	GRAPH
	LIST	MTEMPDSP_LIST	MTEMPDSP?	LIST
Sets template label	TEMP LABEL	MTEMPLABEL_n,'text'	MTEMPLABEL?n	text
• Measure window display position				
Specifies display position	WINDOW POSITION			
	UPPER RIGHT	WINDPOS_UPRIGHT	WINDPOS?	UPRIGHT
	LOWER LEFT	WINDPOS_LOWLEFT	WINDPOS?	LOWLEFT
	LOWER MIDDLE	WINDPOS_LOWMID	WINDPOS?	LOWMID
	LOWER RIGHT	WINDPOS_LOWRIGHT	WINDPOS?	LOWRIGHT
■ Sound	SOUND			
Selects the function for monitoring the sound from the detector output	AM/FM SOUND MONITOR			
	OFF	MON_OFF	MON?	OFF
	AM	MON_AM	MON?	AM
	FM	MON_FM	MON?	FM
Adjusts the volume of sound monitor	AM/FM SOUND MONITOR VOLUME	MONVOL_v	MONVOL?	v
■ Parameter setting	PARAMETER			
	PARAMETER			
	OFF	PARAM_OFF	PARAM?	OFF
	PARAMETER LIST1	PARAM_1	PARAM?	1
	PARAMETER LIST2	PARAM_2	PARAM?	2

Table of MS2602A Device Message (26/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ System setting	SYSTEM			
Sets the auto sweep time	AUTO SWEEP TIME FAST NORMAL	 ASWT_FAST ASWT_SLOW	 ASWT? ASWT?	 FAST SLOW
Sets the data point	DATA POINT 501 1002	 DPOINT_NRM DPOINT_DOUBLE	 DPOINT? DPOINT?	 NRM DOUBLE
Sets the coupled functions commonly or independently between frequency domain or time domain	COUPLE MODE COMMON INDEPENDENT	 VBCOUPLE_COM VBCOUPLE_IND	 VBCOUPLE? VBCOUPLE?	 COM IND
Setting the display format of the date	DATE DISP YY/MM/DD MMM-DD-YY DD-MMM-YY	 DDTYP_Ø DDTYP_1 DDTYP_2	 DDTYP? DDTYP? DDTYP?	 DDTYP_Ø DDTYP_1 DDTYP_2
■ Calibration	CALIBRATION			
Executes calibration with the internal CAL signal	CALIBRATION ALL FREQ LEVEL	 CAL_Ø CAL_1 CAL_2	 —— —— ——	 —— —— ——
Adjusts bias of preselector	PRESELECTOR TUNE MANUAL AUTO PRESET	 PRESEL_a PRESEL_AUTO PP PRESEL_PRESET	 PRESEL? —— —— ——	 a —— —— ——
■ GPIB	GPIB			
Sets GPIB2 self address	GPIB2 SELF ADDRESS	GPIA_a	GPIA?	a
Sets the GPIB address of MC8104A	MC8104A ADDRESS	DSUA_a	DSUA?	a
Sets the time out period of the talker function	GPIB TIME OUT	GTOUT_t	GTOUT?	t

Table of MS2602A Device Message (27/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ RS-232C†	RS-232C			
Sets baud rate	BAUD RATE			
	300	BAUD_300	BAUD?	300
	600	BAUD_600	BAUD?	600
	1200	BAUD_1200	BAUD?	1200
	2400	BAUD_2400	BAUD?	2400
	4800	BAUD_4800	BAUD?	4800
	9600	BAUD_9600	BAUD?	9600
Sets parity	PARITY			
	EVEN	PRTY_EVEN	PRTY?	EVEN
	ODD	PRTY_ODD	PRTY?	ODD
	OFF	PRTY_OFF	PRTY?	OFF
Sets data bit	DATA BIT			
	7bit	DATB_7	DATB?	7
	8bit	DATB_8	DATB?	8
Sets stop bit	STOP BIT			
	1bit	STPB_1	STPB?	1
	1.5bit	STPB_1.5	STPB?	1.5
	2bit	STPB_2	STPB?	2
Sets the period of reception time out	TIME OUT	TOUT_t	TOUT?	t
■ Title	TITLE			
Title entry	TITLE ENTRY	TITLE_'text' KSE_'text'	TITLE? ——	text ——
Title display	TITLE DISPLAY			
	OFF	TTL_0	——	——
		TTL_OFF	TTL?	TTL_OFF
	ON	TTL_1	——	——
		TTL_ON	TTL?	TTL_ON
	DATE	TTL_2	——	——
		TTL_DATE	TTL?	TTL_DATE
■ CAL / UNCAL	CAL / UNCAL			
Couple failure	UNCAL			
	UNCAL DISPLAY			
	OFF	UNC_0	——	——
		UNC_OFF	UNC?	UNC_OFF
	ON	UNC_1	——	——
		UNC_ON	UNC?	UNC_ON
	UNCAL STATUS			
	NORMAL	——	UCL?	UCL_0
	UNCAL	——	UCL?	UCL_1

† All the commands controlling RS-232C are available only when the option 02 is installed.

Table of MS2602A Device Message (28/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Spectrum data	SPECTRUM DATA			
Trace A memory	TRACE-A MEMORY	XMA_p,b	XMA?_p,d	b
Trace B memory	TRACE-B MEMORY	XMB_p,b	XMB?_p,d	b
Trace BG memory	TRACE-BG MEMORY	XMG_p,b	XMG?_p,d	b
Trace TIME memory	TRACE-TIME MEMORY	XMT_p,b	XMT?_p,d	b
Selects ASCII / Binary	ASCII DATA	BIN_Ø BIN_OFF	—— ——	—— ——
	BINARY DATA	BIN_1 BIN_ON	—— ——	—— ——
■ PMC	PMC			
Selects internal or external PMC (floppy disk)	PMC SELECT Internal PMC External PMC1 External PMC2 External FD	 PMCS_IPMC PMCS_EPMC1 PMCS_EPMC2 PMCS_EFD	 PMCS? PMCS? PMCS? PMCS?	 IPMC EPMC1 EPMC2 EFD
■ PTA control†	PTA CONTROL			
Switches PTA function to ON/OFF	PTA SWITCH OFF ON	 PTA_OFF PTA_Ø PTA_ON PTA_1	 —— PTA? —— PTA?	 —— PTA_Ø —— PTA_1
Selects the mode for controlling PTA via GPIB	PTL I / O MODE† OFF INPUT (COMMAND PROGRAM) OUTPUT (PROGRAM)	 PTL_Ø PTL_1 ——	 —— —— PTL?	 —— —— text
Sets GPIB 2 self address	GPIB (2) SELF ADDRESS	GPIA_a	GPIA?	GPIA_a
Writes /reads to and from the dual port memory	DUAL-PORT MEMORY† READ / WRITE	PMY_a,"b"	PMY_a,c	"b"
Selects the control port for GPIB	CONTROL PORT SELECT† GPIB (1) GPIB (2)	 PORT_1 PORT_2	 PORT? PORT?	 PORT_1 PORT_2

† All the commands controlling PTA are available only when the option 04 or 05 is installed.

Table of MS2602A Device Message (29/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Others	ETC.			
Terminator	TERMINATOR			
	LF	TRM_Ø	——	——
	CR / LF	TRM_1	——	——
Initializes measurement control parameters with level 3	INITIALIZE	INI	——	——
		IP	——	——
Sounds the buzzer	BUZZER ON	BZR	——	——
Buzzer switch	BUZZER SWITCH			
	OFF	BEP_Ø	——	——
		BEP_OFF	——	——
	ON	BEP_1	——	——
		BEP_ON	——	——
Sets the clock in the measuring instrument to the specified time	TIMER SET			
	DATE	DATE_yy,mm,dd	DATE?	yy,mm,dd
	TIME	TIME_hh,mm,ss	TIME?	hh,mm,ss
Reads the live time counted with an integrating meter	TIME COUNT READ	——	TMCNT?	t(hr)

Table of MS2602A Device Message (30/30)

Parameter		Program command	Query	Response
Brief function	Control item			
■ Common command and event status	GPIB COMMON COMMAND EVENT STATUS			
Clears Status Byte Register	CLEAR STATUS COMMAND	*CLS	——	——
Sets bit in Service Request Register	SERVICE REQUEST ENABLE	*SRE␣n	*SRE?	n
Reads out the current value of Status Byte	READ STATUS BYTE	——	*STB?	n
Executes single sweep	TRIGGER COMMAND	*TRG	——	——
Executes self test	SELF TEST	——	*TST	n
Keeps the next command on stand-by during a device command execution	WAIT TO CONTINUE	*WAI	——	——
Returns the manufacturer name, model name etc. of the product	IDENTIFICATION QUERY	——	*IDN?	ANRITSU···
Resets the device with level 3	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 Standard Event Status Enable Register	STANDARD EVENT STATUS ENABLE	*ESE␣n	*ESE?	n
Reads out Standard Event Status Enable Register	STANDARD EVENT STATUS REGISTER	——	*ESR?	n
Controls masking Extended Event Status	EVENT STATUS ENABLE	ESE2␣n	ESE2?	n
Reads out Extended Event Status	EVENT STATUS REGISTER	——	ESR2?	n

SECTION 8
DETAILED DESCRIPTION OF COMMANDS

This section describes in detail the device messages and response messages for the MS2602A. These messages are listed in alphabetical order as shown below.

TABLE OF CONTENTS

AAT 8-6
ADJCH 8-6
ADJCHBW 8-7
ADJCHSP 8-7
ADJCHSPF 8-8
AMD 8-8
ARB 8-9
AST 8-9
ASWT 8-10
AT 8-10
ATT 8-11
ATUN 8-11
AUNITS 8-12
AUTO 8-12
AVB 8-13
AVR 8-13
AWR 8-14
A1 8-14
A2 8-15
BEP 8-15
BGWR 8-16
BIN 8-16
BMD 8-17
BNDC 8-17
BSAUTO 8-18
BWR 8-18
BZR 8-19
B1 8-19
B2 8-20
CA 8-20
CAL 8-21
CF 8-21
CLRW 8-22
CMK ? 8-22
CNF 8-23
CONTS 8-23
CORC 8-24
CORD 8-24
CORR 8-25
CORRLABEL 8-25
COUPLE 8-26
CR 8-26
CRS 8-27
CT 8-27
CV 8-28
DATE 8-28
DDTYP 8-29
DET 8-29
DETM 8-30
DFMT 8-31
DL 8-32
DPOINT 8-33
DSPLV 8-33
DSPLVM 8-34
DSUA 8-34
ESE2 8-35
ESR2 ? 8-35
EXTTYPE 8-36
E1 8-36
E2 8-37
E3 8-37
E4 8-38
FA 8-38
FADJ 8-39

TABLE OF CONTENTS (Continued)

FB 8-39
FDN 8-40
FMRNG 8-40
FRQ 8-41
FS 8-41
FSS 8-42
FUP 8-42
GATE 8-43
GD 8-43
GE 8-44
GL 8-44
GPIA 8-45
GTOUT 8-45
HN 8-46
HNLOCK 8-46
HNUNLK 8-47
INI 8-47
IP 8-48
KSA 8-48
KSB 8-49
KSC 8-49
KSD 8-50
KSE 8-50
KSG 8-51
KSH 8-51
KSO 8-52
LG 8-52
LN 8-53
LSS 8-53
LSSA 8-54
MADJBWLN 8-54
MADJCTRLN 8-55
MADJGRAPH 8-55
MADJMOD 8-56
MC 8-56
MEAS 8-57
MKA ? 8-58
MKACT 8-58
MKC 8-59
MKCF 8-59
MKD 8-60
MKF ? 8-60
MKFC 8-61
MKFCR 8-61
MKL ? 8-62
MKLIST 8-62
MKMCL 8-63
MKMHI 8-63
MKMHRM 8-64
MKMIN 8-64
MKML ? 8-65
MKMP 8-65
MKMULTI 8-66
MKN 8-66
MKOFF 8-67
MKP 8-67
MKPK 8-68
MKR 8-68
MKRL 8-69
MKS 8-69
MKSLCT 8-70
MKSP 8-70
MKSS 8-71
MKTRACE 8-71
MKTRACK 8-72
MKW 8-72
MKZ 8-73
MKZF 8-73
MNOISE 8-74
MOBW 8-74
MON 8-75
MONVOL 8-75
MTEMP 8-76
MTEMPDEL 8-76
MTEMPDSP 8-77
MTEMPIN 8-77
MTEMPINI 8-78
MTEMPL 8-78
MTEMPLABEL 8-79
MTEMPPD ? 8-79
MTEMPREL 8-80
MTEMPRP 8-80
MT0 8-81
MT1 8-81

TABLE OF CONTENTS (Continued)

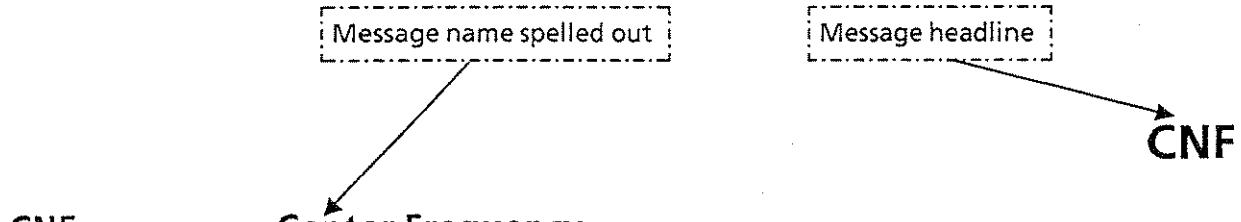
MXMH 8-82
MZW 8-82
MZWF 8-83
M1 8-83
M2 8-84
M3 8-84
OBWN 8-85
OBWXDB 8-85
PARAM 8-86
PCF 8-86
PLF 8-87
PLI 8-87
PLOT 8-88
PLS 8-88
PLTA 8-89
PLTARA 8-89
PLTHOME 8-90
PLTLC 8-90
PMCS 8-91
PMOD 8-91
PMY 8-92
PORT 8-92
PP 8-93
PRESEL 8-93
PRIA 8-94
PRINT 8-94
PRL 8-95
PSW 8-95
PTA 8-96
PTL 8-96
PWRSTART 8-97
PWRSTOP 8-97
RB 8-98
RBW 8-98
RC 8-99
RCM 8-99
RDATA 8-100
RES ? 8-101
RGDIR 8-103
RGRC 8-103
RGSV 8-104
RL 8-105
RLV 8-106
RMK ? 8-107
ROFFSET 8-107
SCL 8-108
SCR 8-108
SNGLS 8-109
SOF 8-109
SP 8-110
SPD 8-110
SPF 8-111
SPFUNC 8-111
SPU 8-112
SS 8-112
SSS 8-113
ST 8-113
STF 8-114
SV 8-114
SVM 8-115
SWP 8-115
SWSTART 8-116
SWSTOP 8-116
SWT 8-117
S1 8-117
S2 8-118
TDLY 8-118
TEMP 8-119
TEMPMCL 8-119
TEMPMSV 8-120
TEMPMVX 8-120
TEMPMVY 8-121
TEMPSLCT 8-121
TEXPAND 8-122
TIME 8-122
TITLE 8-123
TM 8-123
TMCNT ? 8-124
TMMD 8-124
TMWR 8-125
TRG 8-125
TRGLVL 8-126
TRGS 8-126
TRGSLP 8-127

TABLE OF CONTENTS (Continued)

TRGSOURCE 8-127
TRM 8-128
TS 8-128
TSP 8-129
TTL 8-129
TVLINE 8-130
TVSFRM 8-130
TVSTND 8-131
TZONE 8-131
TZSP 8-132
TZSTART 8-132
UCL ? 8-133
UNC 8-133
UNT 8-134
VAVG 8-134
VB 8-135
VBCOUPLE 8-135
VBR 8-136
VBW 8-136
VIEW 8-137
WINDPOS 8-137
XMA 8-138
XMB 8-138
XMG 8-139
XMT 8-139
*CLS 8-140
*ESE 8-140
*ESR ? 8-141
*IDN ? 8-141
*OPC 8-142
*OPC ? 8-142
*RST 8-143
*SRE 8-143
*STB ? 8-144
*TRG 8-144
*TST ? 8-145
*WAI 8-145

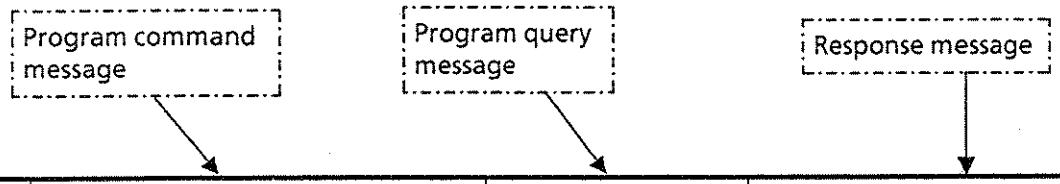
SECTION 8
DETAILED DESCRIPTION OF COMMANDS

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



CNF Center Frequency

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



Header	Program command	Query	Response
CNF	CNF_f	CNF?	CNF_f f= – 100000000 to 0 to 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f –100 MHz to 8.5 GHz

■ Suffix code

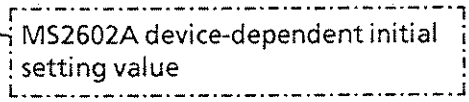
None:	Hz (10^0)
HZ:	Hz (10^0)
KHZ, KZ:	kHz (10^3)
MHZ, MZ:	MHz (10^6)
GHZ, GZ:	GHz (10^9)

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

■ Initial setting Value of f =4.25 GHz

■ Example

```
CNF_123456
CNF_5ØMHZ
CNF?
```



AAT

AAT RF Attenuator

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

Header	Program command	Query	Response
AAT	AAT_a a=0, 1	AAT?	AAT_a a=0, 1

■ Value of a 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_sw sw=BOTH, UP, LOW, OFF	ADJCH?	sw sw=BOTH, UP, LOW, OFF

■ Value of sw 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 adjacent channel.

Header	Program command	Query	Response
ADJCHBW	ADJCHBW_f	ADJCHBW?	f f=10 to 9999990 Transfers the data without suffix code as if represented in units of Hz

■ Value of f 10 Hz to 9.99999 MHz
(10 Hz resolution, a number of less than 10 Hz digits 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 CH1 Sepalation

■ Function Sets the separation of adjacent channel 1.

Header	Program command	Query	Response
ADJCHSP	ADJCHSP_f	ADJCHSP?	f f=0 to 9999990 Transfers the data without suffix code as if represented in units of Hz

■ Value of f 10 Hz to 9.99999 MHz
(10 Hz resolution, provided a number of less than 10 Hz digits 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 9999990 Transfers the data without suffix code as if represented in units of Hz

■ Value of f 10 Hz to 9999990 Hz
(10 Hz resolution, a number of less than 10 Hz digits 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 25.0KHZ

■ Example ADJCHSPF_25.ØkHZ

AMD

AMD Trace A Storage Mode

■ Function Selects the mode for processing trace A waveform.

Header	Program command	Query	Response
AMD	AMD_a a=0 to 5	AMD?	AMD_a a=0 to 5

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

■ Suffix code None

■ Initial setting Ø: NORMAL

■ Example AMD_Ø

ARB

ARB Resolution Band width

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

Header	Program command	Query	Response
ARB	ARB_a a=0, 1	ARB?	ARB_a a=0, 1

■ Value of a
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 frequency sweep time to AUTO or MANUAL.

Header	Program command	Query	Response
AST	AST_a a=0, 1	AST?	AST_a a=0, 1

■ Value of a
Ø: MANUAL
1: AUTO

■ Suffix code None

■ Initial setting 1: AUTO

■ Example
AST_Ø
AST_1

ASWT

ASWT Auto Sweep Time

■ Function Sets the auto sweep time.

Header	Program command	Query	Response
ASWT	ASWT_sw sw=FAST, SLOW	ASWT?	sw sw=FAST, SLOW

■ Value of sw
FAST: FAST
SLOW: NORMAL

■ Suffix code None

■ Initial setting SLOW (provided the address already allocated is not initialized)

■ Example
ASWT_FAST
ASWT_SLOW

AT

AT RF Attenuator

■ Function Sets the RF attenuator.

Header	Program command	Query	Response
AT	AT_a a=AUTO, UP, DN, 0 to 55 5 step	AT?	a a=0 to 55

■ Value of a
AUTO: AUTO
UP: UP
DN: DOWN
Ø to 55(5step): 0 to 55dB (5dB step)

■ Suffix code None: dB
DB: dB

■ Initial setting Calculated value when AUTO is selected for ATT

■ Example
AT_1Ø
AT_55

ATT

ATT RF Attenuator

■ Function Sets the RF attenuator.

Header	Program command	Query	Response
ATT	ATT_a a=0 to 11	ATT?	ATT_a a=0 to 11

■ Value of a

Ø:	0 dB	6:	5 dB
1:	10 dB	7:	15 dB
2:	20 dB	8:	25 dB
3:	30 dB	9:	35 dB
4:	40 dB	1Ø:	45 dB
5:	50 dB	11:	55 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 within the frequency band specified in 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 one of the display unit systems when the LOG scale is selected.

Header	Program command	Query	Response
AUNITS	AUNITS_a a=DBM, DBUV, DBMV, DBUVE, V, W	AUNITS?	a a=DBM, DBUV, DBMV, DBUVE, V, W

■ Value of a
DBM: dBm
DBUV: dBμV
DBMV: dBmV
DBUVE: dBmV (emf)
V: V
W: w

■ 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, ATT) in AUTO mode.

Header	Program command	Query	Response
AUTO	AUTO	——	——

■ Example
```
AUTO
```

AVB

AVB Video Band width

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

Header	Program command	Query	Response
AVB	AVB_a a=0, 1, 2	AVB?	AVB_ a a=0, 1, 2

■ Value of a
Ø: MANUAL
1: AUTO
2: OFF

■ Suffix code None

■ Initial setting 1: AUTO

■ Example
AVB_Ø
AVB_1

AVR

AVR Number of Trace Average

■ Function Sets the averaging rate (number of sweep repetitions) to average the trace display.

Header	Program command	Query	Response
AVR	AVR_a a=0 to 4	AVR?	AVR_a a=0 to 4

■ Value of a
Ø: 4 times
1: 8 times
2: 16 times
3: 32 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 the waveform data to trace A.

Header	Program command	Query	Response
AWR	AWR_a a=ON, 1, OFF, 0	AWR?	AWR_a a=ON, OFF

■ Value of a
ON: TRACE A WRITE ON (Same function as CLRW_TRA)
1: TRACE A WRITE ON (Same function as CLRW_TRA)
OFF: TRACE A WRITE OFF (Same function as VIEW_TRA)
Ø: TRACE A WRITE OFF (Same function as VIEW_TRA)

■ Suffix code None

■ Initial setting 1: TRACE A WRITE ON

■ Example AWR_Ø

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 Trace A Max Hold

■ Function Allows trace A waveform to be processed in MAX HOLD mode (same function as AMD_1).

Header	Program command	Query	Response
A2	A2	——	——

■ Example A2

BEP Buzzer Switch

■ Function Turns the buzzer switch ON or OFF (whether to buzz when an error occurs).

Header	Program command	Query	Response
BEP	BEP_sw sw=ON, 1, OFF, 0	——	——

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting ON: ON

■ Example BEP_ON

BGWR

BGWR Trace BG Write Switch

■ Function Controls writing the waveform data to trace BG.

Header	Program command	Query	Response
BGWR	BGWR_sw sw=ON, 1, OFF, 0	BGWR?	BGWR_sw sw=ON, OFF

■ Value of sw
- ON: TRACE BG WRITE ON (Same function as CLRW_TRBG)
- 1: TRACE BG WRITE ON (Same function as CLRW_TRBG)
- OFF: TRACE BG WRITE OFF (Same function as VIEW_TRBG)
- Ø: 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 Outputs the trace data in ASCII or BINARY format.

Header	Program command	Query	Response
BIN	BIN_a a=0, 1, ON,OFF	——	——

■ Value of a
- Ø: ASCII
- 1: BINARY
- OFF: ASCII
- 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 trace B waveform.

Header	Program command	Query	Response
BMD	BMD_a a=0 to 5	BMD?	BMD_a a=0 to 5

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

■ Suffix code None

■ Initial setting Ø: NORMAL

■ Example BMD_Ø

BNDC

BNDC Band Select

■ Function Selects one of the bands in the frequency range of 0 to 8.5 GHz.

Header	Program command	Query	Response
BNDC	BNDC_a a=AUTO, 0, 1^-, 1^+	BNDC?	BNDC_a a=AUTO, 0, 1^-, 1^+

■ Value of a
AUTO: BAND AUTO = 0 Hz to 8.5 GHz
Ø: BAND 0 = 0 Hz to 2 GHz
1−: BAND 1^- = 1.7 GHz to 7.5 GHz
1+: BAND 1^+ = 6.5 GHz to 8.5 GHz

■ Suffix code None

■ Initial setting AUTO: BAND AUTO = 0 Hz to 8.5 GHz

■ Example
BNDC_AUTO
BNDC_1+

BSAUTO

BSAUTO BW / SWT Auto

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

Header	Program command	Query	Response
BSAUTO	BSAUTO	——	——

■ Example BSAUTO

BWR

BWR Trace B Write Switch

■ Function Controls writing the waveform data to trace B.

Header	Program command	Query	Response
BWR	BWR_a a=ON, 1, OFF, 0	BWR?	BWR_a a=ON, OFF

■ Value of a
- ON: TRACE B WRITE ON (Same function as CLRW_TRB)
- 1: TRACE B WRITE ON (Same function as CLRW_TRB)
- OFF: TRACE B WRITE OFF (Same function as VIEW_TRB)
- Ø: TRACE B WRITE OFF (Same function as VIEW_TRB)

■ Suffix code None

■ Initial setting 1: TRACE B WRITE ON

■ Example BWR_Ø

BZR Sounds Buzzer

■ Function Sounds the buzzer.

Header	Program command	Query	Response
BZR	BZR	——	——

■ Example BZR

B1 Trace B Write ON

■ Function Clears 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 trace B waveform to be processed in MAX HOLD mode (same function as BMD_1).

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

■ Example B2

CA

CA RF Attenuator Auto

■ Function Sets the attenuator to AUTO mode (same function as AAT_1, AT_AUTO).

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

■ Example CA

CAL Calibration

■ Function Selects the way of calibrating this instrument using internal CAL signal.

Header	Program command	Query	Response
CAL	CAL_a a=0 to 2	——	——

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

■ Suffix code None

■ Example CAL_Ø

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 0 to 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f −100 MHz to 8.5 GHz

■ Value of a
UP: CENTER FREQ STEP UP (Same function as FUP)
DN: CENTER FREQ STEP 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 setting Value of f = 4.25 GHz

■ Example
CF_1235456
CF_5ØMHz
CF_UP

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_a a=0 to 500

■ Value of a 0 to 500

■ Example CMK?

CNF

CNF Center Frequency

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

Header	Program command	Query	Response
CNF	CNF_f	CNF?	CNF_f f= −100000000 to 0 to 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f −100 MHz to 8.5 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 Value of f = 4.25 GHz

■ Example
```
CNF_123456
CNF_5ØMHZ
CNF?
```

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
```

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 correction value of 0 dB 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 selected for OFF, it is not valid.

Header	Program command	Query	Response
CORD	CORD␣n,f,ℓ n=0 to 149 f= 0 to 400 GHz ℓ= −100.00 to +100.00 dB (incremented by 0.01 dB steps)	CORD?␣n	CORD␣n,f,ℓ n=0 to 149 f= 0 to 400 GHz (no units) ℓ= −100.00 to +100.00 dB (incremented by 0.01 dB steps)

■ Value of n

0 to 149

■ Value of f

0 to 400 GHz

■ Value of ℓ

−100.00 to +100.00 dB (incremented by 0.01 dB steps)

■ Suffix code

f: None: Hz (10^0)
HZ: Hz (10^0)
KHZ: kHz (10^3)
MHZ: MHz (10^6)
GHZ: 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_a a=0 to 5, OFF	CORR?	CORR_a a=0 to 5

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

■ Suffix code None

■ Initial setting Ø: OFF (provided 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 text A string of up to 30 characters enclosed by double or single quotation marks.

■ Value of n 1 to 5

■ Suffix code None

■ Example
```
CORRLABEL_1,"CORRECTION FACTOR"
CORRLABEL_2,'MS26Ø2A'
```

COUPLE

COUPLE Coupling Mode

■ Function Switches the coupling to AC or DC to monitor FM waveform.

Header	Program command	Query	Response
COUPLE	COUPLE_sw	COUPLE?	sw sw=AC, DC

■ Value of sw AC: AC COUPLING
DC: DC COUPLING

■ Suffix code None

■ Initial setting AC: AC COUPLING

■ Example COUPLE_AC
COUPLE_DC

CR

CR Resolution Band width Auto

■ Function Sets the resolution bandwidth selection to the AUTO mode (same function as ARB_1, RB_AUTO).

Header	Program command	Query	Response
CR	CR	——	——

■ Example CR

CRS Count Resolution

■ Function Selects the frequency resolution of frequency counter.

Header	Program command	Query	Response
CRS	CRS_a a=0 to 3	CRS?	CRS_a a=0 to 3

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

■ Suffix code None

■ Initial setting 3: 1 kHz

■ Example
CRS_Ø
CRS_3

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 Band width 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

DATE

DATE Date

■ Function Sets the clock built in MS2602A instrument to the specified date.

Header	Program command	Query	Response
DATE	DATE_yy,mm,dd	DATE?	yy,mm,dd

■ Value of yy 00 to 99 (year)

■ Value of mm 01 to 12 (month)

■ Value of dd 01 to 31 (day)

■ Suffix code None

■ Example DATE_92,Ø8,31

DDTYP

DDTYP DATE DISP

■ Function Set the display format of the date.

Header	Program command	Query	Response
DDTYP	DDTYP_a a=0,1,2	DDTYP_a	DDTYP_a a=0,1,2

■ Value of a
Ø: YY/MM/DD
1: MMM-DD-YY
2: DD-MMM-YY

■ Initial setting YY/MM/DD

■ Example DDTYP_1

DET

DET Detection Mode

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

Header	Program command	Query	Response
DET	DET_d d=0 to 2 POS, SMP, NEG	DET?	d d=POS, SMP, NEG

■ Value of d
Ø: POSITIVE PEAK
1: SAMPLE
2: NEGATIVE PEAK
POS: POSITIVE PEAK
SMP: SAMPLE
NEG: NEGATIVE PEAK

■ Suffix code None

■ Initial setting Ø: POSITIVE PEAK

■ Example DET_Ø
DET_SMP

DETM

DETM Detection Mode

■ Function Selects the detection mode of the trace specified to A or B.

Header	Program command	Query	Response
DETM	DETM␣tr,sw	DETM?␣tr	sw sw=POS, SMP, NEG

■ Value of tr
TRA: Trace A
TRB: Trace B
TRTIME: Trace TIME

■ Value of sw
POS: POSITIVE PEAK
SMP: SAMPLE
NEG: NEGATIVE PEAK

■ Suffix code None

■ Initial setting POS: POSITIVE PEAK

■ Example
```
DETM␣TRA,POS
DETM␣TRB,SMP
DETM␣TRTIME,SMP
```

DFMT Display Format

■ Function Specifies the format used in the display mode / display.

Header	Program command	Query	Response
DFMT	DFMT_sw	DFMT?	SW sw=A, B, TIME, AB1, AB2, ABG1, ABG2, ATIME1, ATIME2

■ Value of sw

A:	Trace A
B:	Trace B
TIME:	Trace TIME
AB1:	Trace A / Trace B (A & B)
AB2:	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

DL

DL Display line, Display line Level

■ Function Turns the display line ON/OFF and sets its level.

Header	Program command	Query	Response
DL	DL_sw DL_ℓ	DL?	OFF ℓ

■ Value of sw
ON : ON
OFF : OFF

■ Value of ℓ
Value equivalent to -150.00 to +50 dBm (0.01 dB steps)
−1.000000 to 1.000000 MHz (when FM is monitored in trace Time mode)

■ Suffix code
None : Available for the current scale unit, provided μV units are always selected 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 −50.00 dBm

■ Example
```
DL_OFF
DL_-10.0DBM
```

DPOINT

DPOINT Data Point

■ Function Sets the data point.

Header	Program command	Query	Response
DPOINT	DPOINT_sw sw=NRM, DOUBLE	DPOINT?	sw sw=NRM, DOUBLE

■ Value of sw NRM: 501 points
DOUBLE: 1002 points

■ Suffix code None

■ Initial setting NRM: 501 points (provided the address already allocated is not initialized)

■ Example DPOINT_NRM

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_sw	DSPLV?	sw

■ Value of sw 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,sw	DSPLVM?_tr	sw

■ Value of tr

TRA : Trace A
TRB : Trace B
TRTIME : Trace Time
TRBG : Trace BG

■ Value of sw

ABS : Absolute value
REL : Relative value

■ Suffix code

None

■ Initial setting

ABS : Absolute value

■ Example

DSPLVM_TRA,REL

DSUA

DSUA DSU (Data Storage Unit) Address

■ Function

Sets the GPIB address of the MC8104A Data Storage Unit.

Header	Program command	Query	Response
DSUA	DSUA_a a = 0 to 30	DSUA?	a a = 0 to 30

■ Value of a

0 to 30

■ Suffix code

None

■ Initial setting

Value of a = 19 (Provided the address already allocated is not initialized.)

■ Example

DSUA_20

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_a a = 0 to 255	ESE2?	a a = 0 to 255

■ Value of a

0 to 255: Represents the sum of the bit weighted values enabled by the square of the bit number corresponding to bits 0, 1, 2, 3, 4, 5, 6, 7 of END Event Status Register.

■ Suffix code

None

■ Example

ESE2_1

ESR2?

ESR2? Event Status Register (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 decimals. After readout, the END Event Status Register is reset to 0.

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

■ Value of a

0 to 255

■ Suffix code

None

■ Example

ESR2?

EXTTYPE

EXTTYPE Ext Trigger Input Type

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

Header	Program command	Query	Response
EXTTYPE	EXTTYPE_sw	EXTTYPE?	sw sw=10V, TTL

■ Value of sw 1Ø: INPUT 1 (±10V)
TTL: INPUT 2 (TTL)

■ Suffix code None

■ Initial setting 1Ø: INPUT 1 (±10V)

■ Example EXTTYPE_1Ø
EXTTYPE_TTL

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 Marker to CF

■ Function Sets the marker frequency to the center frequency (same function as MKR_3, MKCF).

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

■ Example E2

E3 Marker to CF Step Size

■ Function Sets the marker frequency to the frequency step size (same function as MKR_5, MKSS).

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

■ Example E3

E4

E4 Marker to REF

■ Function Sets the marker level to the reference level (same function as MKR_4, MKRL).

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

■ Example E4

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 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f −100 MHz to 8.5 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 Value of f = 0 Hz

■ Example FA_1GZ

FADJ

FADJ FINE ADJ

■ Function Set the ON/OFF of FINE ADJ, and frequency.

Header	Program command	Query	Response
FADJ	FADJ_ON FADJ_OFF FADJ_f	—— FADJ? FADJ?	—— FADJ_OFF f (Output the value without units or in Hz) (Return the frequency value when it is ON, and return "FADJ_OFF" when it is OFF.)

■ Value of f −50 to 50 kHz

■ Suffix code None: Hz
KHZ , KZ: kHz

■ Initial setting −1.5 kHz

■ Example FADJ_1KHZ

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 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f −100 MHz to 8.5 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 Value of f = 8.5 GHz

■ Example FB_5GHZ

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
```

FMRNG

FMRNG FM Range

■ Function

Sets the bandwidth for demodulating FM when trace TIME is selected for FM monitoring.

Header	Program command	Query	Response
FMRNG	FMRNG_f	FMRNG?	f f=2000 to 200000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f

2 kHz / div
20 kHz / div
200 kHz / div

■ Suffix code

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

■ Initial setting

200 kHz / div

■ Example

```
FMRNG_2ØKHZ
```

FRQ Frequency Mode

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

Header	Program command	Query	Response
FRQ	FRQ_a a=0 to 2	FRQ?	FRQ_a a=0 to 2

■ Value of a
Ø: CENTER-SPAN
1: START-SPAN
2: START-STOP

■ Suffix code None

■ Initial setting 2: START-STOP

■ Example
FRQ_Ø
FRQ_1

FS Full Span

■ Function Sets the frequency span to the full span that is 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 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f

1 Hz to 8.5 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

1 GHz

■ Example

FSS_1GHZ
FSS_1000

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 Allows the gate function to be set to ON or OFF

Header	Program command	Query	Response
GATE	GATE_sw sw=ON, 1, OFF, 0	GATE?	SW sw=ON, OFF

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example GATE_ON

GD

GD Gate Delay

■ Function Sets the delay time of gate.

Header	Program command	Query	Response
GD	GD_t	GD?	t t=0 to 65500 Transfers the data without suffix code as if represented in units of μsec

■ Value of t 0 to 65.5 msec

■ Suffix code
None: msec
US: μsec
MS: msec
S: sec

■ Initial setting Value of t = 0 sec

■ Example GD_2ØMS

GE

GE Gate End

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

Header	Program command	Query	Response
GE	GE_sw sw=INT, EXT	GE?	SW sw=INT, EXT

■ Value of sw
INT: INTERNAL
EXT: EXTERNAL

■ Suffix code None

■ Initial setting INT: INTERNAL

■ Example GE_INT

GL

GL Gate Length

■ Function Sets the length of gate.

Header	Program command	Query	Response
GL	GL_t	GL?	t t=20 to 65500 Transfers the data without suffix code as if represented in units of μsec

■ Value of t 20 μsec to 65.5 msec

■ Suffix code
None: msec
US: μsec
MS: msec
S: sec

■ Initial setting Value of t = 1 msec

■ Example GL_20MS

GPIA

GPIA GPIB 2 Self Address

■ Function Sets GPIB 2 self address.

Header	Program command	Query	Response
GPIA	GPIA_a a=0 to 30	GPIA?	a a=0 to 30

■ Value of a 0 to 30

■ Suffix code None

■ Initial setting Value of a = 16 (provided the address already allocated is not initialized)

■ Example
```
GPIA_Ø
GPIA_3Ø
```

GTOUT

GTOUT GPIB Talker time out

■ Function Sets the time out of the GPIB talker function (plotter/printer output, data output from PTA, etc)

Header	Program command	Query	Response
GTOUT	GTOUT_t	GTOUT?	t

■ Value of t
```
1to255: 1 sec to 255 sec
Ø:      No time out (infinite wait state)
```

■ Suffix code None

■ Initial setting 3Ø: 30 sec

■ Example
```
GTOUT_6Ø
```

HN

HN Band Select

■ Function Selects one of the bands in the frequency range from 0 to 8.5 GHz.

Header	Program command	Query	Response
HN	HN_a a=0 to 2	HN?	a a=0 to 2 ***

■ Value of a
Ø: BAND0
1: BAND1⁻
2: BAND1⁺

■ Suffix code None

■ Initial setting (BAND_AUTO)

■ Example HN_Ø

Note: The response when the band is selected for BAND AUTO becomes " *** ".

HNLOCK

HNLOCK Band Select

■ Function Selects one of the bands in the frequency range from 0 to 8.5 GHz.

Header	Program command	Query	Response
HNLOCK	HNLOCK_a a=0 to 2, OFF	HNLOCK?	HNLOCK_b b=ON, OFF

■ Value of a
Ø: BAND0 (Same function as BNDC_Ø)
1: BAND1⁻ (Same function as BNDC_1-)
2: BAND1⁺ (Same function as BNDC_1+)
OFF: BAND AUTO (Same function as BNDC_AUTO)

■ Value of b
ON: BAND 0, 1⁻, 1⁺
OFF: BAND AUTO

■ Suffix code None

■ Initial setting OFF: BAND AUTO

■ Example HNLOCK_2

HNUNLK

HNUNLK Band Select

■ Function

Allows the bands to be selected in the AUTO mode (Same function as BNDC_AUTO, HNLOCK_OFF).

Header	Program command	Query	Response
HNUNLK	HNUNLK	——	——

■ Example

```
HNUNLK
```

INI

INI Initialize

■ Function

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

Header	Program command	Query	Response
INI	INI	——	——

■ Example

```
INI
```

IP

IP Initialize

■ Function

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

Header	Program command	Query	Response
IP	IP	——	——

■ Example

```
IP
```

KSA

KSA Unit for Log Scale

■ Function

Sets the unit system 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 system 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 system of LOG scale to dBμV (same function as UNT_1).

Header	Program command	Query	Response
KSC	KSC	——	——

■ Example KSC

KSD

KSD Unit for Log Scale

■ Function Sets the unit system 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 Character string within 32 characters enclosed by double quotation marks or single quotation marks

■ Example
```
KSE_"MS26Ø2A"
KSE_'SPECTRUM ANALYZER'
```

KSG

KSG Average ON

■ Function Allows the averaging to be used when set to ON.

Header	Program command	Query	Response
KSG	KSG	——	——

■ Example KSG

KSH

KSH Average OFF

■ Function Turns off the averaging operation to set the mode for processing waveform to NORMAL.

Header	Program command	Query	Response
KSH	KSH	——	——

■ Example KSH

KSO

KSO Delta Marker to Span

■ Function Sets the delta marker frequency to frequency span (same function as MKR_6, MKSP).

Header	Program command	Query	Response
KSO	KSO	——	——

■ Example KSO

LG

LG Scale

■ Function Sets the magnification of Y axis and scale.

Header	Program command	Query	Response
LG	LG_ℓ LG_a	LG?	ℓ ℓ=0, 1, 2, 5, 10

■ 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 Linear Scale

■ Function Sets the Y axis scale to linear mode.

Header	Program command	Query	Response
LN	LN	——	——

■ Example LN

LSS Reference Level Step Size (Manual)

■ Function Sets the step size (manual values) of reference level increasing or decreasing in the specified step level.

Header	Program command	Query	Response
LSS	LSS_ℓ	LSS?	LSS_ℓ ℓ = 0.1 to 100.0 Transfers the data without suffix code as if represented in units of dB

■ Value of ℓ 0.1 to 100.0 dB (0.1dB step)

■ Suffix code None: dB
DB , DBM , DM: dB

■ Initial setting Value of ℓ = 1 dB

■ Example LSS_6
LSS_1Ø

LSSA

LSSA Reference Level Step Size (Auto)

■ Function Sets the step size (auto values) of reference level increasing or decreasing in the specified step level during LOG SCALE.

Header	Program command	Query	Response
LSSA	LSSA_a	LSSA?	LSSA_a a=1, 2, 5, 10

■ Value of a
1: 1 div
2: 2 div
5: 5 div
1Ø: 10 div

■ Suffix code None

■ Initial setting 1: 1 div

■ Example LSSA_1Ø

MADJBWLN

MADJBWLN ADJ-CH Band Line

■ Function Turns 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 Turns 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 Specifies the graph display function of Adj-CH measure with the ON/OFF parameter.

Header	Program command	Query	Response
MADJGRAPH	MADJGRAPH_a a=ON, OFF	MADJGRAPH?	a

■ Value of a
OFF : GRAPH OFF
ON : GRAPH ON

■ Suffix code None

■ Initial setting ON : Graph ON

■ Example MADJGRAPH_ON

MADJMOD

MADJMOD ADJ-CH Measure Method

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

Header	Program command	Query	Response
MADJMOD	MADJMOD_sw sw = MOD, UNMD	MADJMOD?	sw

■ Value of sw MOD : Reference = Total Power (Mod method)
UNMD : Reference = REF LEVEL (un-mod method)

■ Suffix code None

■ Initial setting MOD : R : Total Power

■ Example MADJMOD_MOD

MC

MC Frequency Counter

■ Function Turns ON or OFF the function for measuring the marker frequency during display with the counter (same function as MEAS_FREQ).

Header	Program command	Query	Response
MC	MC_a	——	——

■ Value of a ON: ON
OFF: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example MC_ON
MC_OFF

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, TEMP, POWER

■ Value of data1,data2

Format1: Specifies the measure item and whether to switch it ON/OFF or execute it

OFF	: Measure 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,ON	: Sets template line display to ON
TEMP,OFF	: Sets template line display to OFF
TEMP,CHECK	: Executes template check (and sets template line display to ON)
POWER,EXE	: Executes the burst power calculation

Format2: Specifies the measure item and calculation system, then whether to switch it ON/OFF or execute it

NOISE,ABS	: Sets noise calculation (Absolute method) to ON
NOISE,CN	: Sets noise calculation (C/N ratio method) to ON
OBW,XDB	: Executes OBW calculation (X dB down method)
OBW,N	: Executes OBW calculation (N% method)
ADJ,UNMD	: Executes ADJ-CH calculation (R:Ref Level method)
ADJ,MOD	: Executes ADJ-CH calculation (R:Total Power method)

MKA?

MKA? Marker Level Read

■ 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 f

■ Value of ℓ No unit, Level data with 1 dB unit (when display unit system for marker level is dB), Resolution 0.01 dB

■ Value of v No unit, Level data with 1 nV unit (when display unit system for marker level is V), Resolution 0.1 nV
No unit, Level data with 1 V unit (for EXT TRIG MONITOR), Resolution 0.001 V

■ Value of W No unit, Level data with 1 pw unit (when unit system for marker level is W), Resolution 1 aW

■ Value of f No unit, Frequency data with 1 Hz unit (for FM MONITOR), Resolution 1 Hz

■ Example MKA?

MKACT

MKACT Marker Active

■ Function Selects the active marker among the multimarkers.

Header	Program command	Query	Response
MKACT	MKACT_a a=1 to 10	MKACT?	a a=1 to 10

■ Value of a 1 to 10 (multimarker No.)

■ Suffix code None

■ Initial setting 1: 1

■ Example MKACT_1

MKC Frequency Counter

■ Function

Turns ON or OFF the function for measuring the marker frequency during display with the counter (same function as MEAS_FREQ).

Header	Program command	Query	Response
MKC	MKC_a a=0, 1	MKC?	MKC_a a=0, 1

■ Value of a

Ø: OFF
1: ON

■ Suffix code

None

■ Initial setting

Ø: OFF

■ Example

```
MKC_Ø
MKC_1
```


MKCF Marker to CF

■ Function

Sets the marker frequency 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 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. At 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 μsec

■ Example MKF?

MKFC

MKFC Frequency Counter

■ Function

Turns ON or OFF the function for measuring the marker frequency during display with the counter (same function as MEAS_FREQ).

Header	Program command	Query	Response
MKFC	MKFC_a a=ON, 1, OFF, 0	MKFC?	a a=0, 1

■ Value of a

ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code

None

■ Initial setting

Ø: OFF

■ Example

```
MKFC_Ø
MKFC_ON
```

MKFCR

MKFCR Count Resolution

■ Function

Selects the frequency resolution of frequency counter.

Header	Program command	Query	Response
MKFCR	MKFCR_f MKFCR_a	MKFCR?	f f=1, 10, 100, 1000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f

1 Hz
10 Hz
100 Hz
1 kHz

■ 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

1 kHz

■ Example

```
MKFCR_1HZ
MKFCR_UP
```

MKL?

MKL? Marker Level Read

■ Function Reads out the level data at the marker point. At the delta marker mode, the level differences are read out.

Header	Program command	Query	Response
MKL?	———	MKL?	ℓ v W f

■ Value of ℓ No unit, Level data with 1 dB unit (when display unit system for marker level is dB), Resolution 0.01 dB

■ Value of v No unit, Level data with 1 nV unit (when display unit system for marker level is V), Resolution 0.1 nV
No unit, Level data with 1 V unit (for EXT TRIG MONITOR), Resolution 0.001 V

■ Value of W No unit, Level data with 1 pW unit (when display unit system for marker level is W), Resolution 1 aw

■ Value of f No unit, Frequency data with 1 Hz unit (for FM MONITOR), Resolution 1 Hz

■ Example MKL?

MKLIST

MKLIST Multi Marker List

■ Function Turns ON or OFF the multimarker list.

Header	Program command	Query	Response
MKLIST	MKLIST_sw sw=ON, 1, OFF, 0	MKLIST?	sw sw=ON,OFF

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example MKLIST_ON

MKMCL

MKMCL Clear Multi Marker

■ Function Clears all the registered multimarkers.

Header	Program command	Query	Response
MKMCL	MKMCL	——	——

■ Example MKMCL

MKMHI

MKMHI Multi Marker

■ Function Registers multimarkers on the peak point from the maximum level down to the tenth in descending order.

Header	Program command	Query	Response
MKMHI	MKMHI	——	——

■ Example MKMHI

MKMHRM

MKMHRM Multi Marker

■ Function

Registers multimarkers on the harmonic frequency ranging from the reference active marker frequency up to the tenth.

Header	Program command	Query	Response
MKMHRM	MKMHRM	——	——

■ Example

```
MKMHRM
```

MKMIN

MKMIN Minimum Search

■ Function

Searches the spectrum being displayed for the minimum point 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 multimarkers.

Header	Program command	Query	Response
MKML	——	MKML?_a	ℓ V W f

■ Value of a 1 to 10 (multimarker No.)

■ Value of ℓ No unit, Level data with 1 dB unit (when display unit system for marker level is dB), Resolution 0.01 dB

■ Value of v No unit, Level data with 1 nV unit (when display unit system for marker level is V), Resolution 0.1 nV

No unit, Level data with 1 V unit (for EXT TRIG MONITOR) Resolution 0.001 V

■ Value of W No unit, Level data with 1 pW unit (when display unit system for marker level is W), Resolution 1 aw

■ Value of f No unit, Frequency data with 1 Hz unit (for FM MONITOR) Resolution 1 Hz

■ Suffix code None

MKMP

MKMP Marker Position

■ Function Specifies the frequency of the designated multimarker number.

Header	Program command	Query	Response
MKMP	MKMP_a,f	MKMP?_a a=1 to 10	f f=−100000000 to 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of a 1 to 10 (Multimarker No.)

■ Value of f −100 MHz to 8.5 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 MKMP_5 , 24ØØMHZ

MKMULTI

MKMULTI Multi Marker

■ Function Turns ON or OFF the multimarker.

Header	Program command	Query	Response
MKMULTI	MKMULTI_sw sw=ON, 1, OFF, 0	MKMULTI?	sw sw=ON, OFF

■ Value of sw
ON: ON OFF: OFF
1: ON Ø: 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 8500000000 Transfers the data without suffix code as if represented in units of Hz t=−1000000000 to 1000000000 Transfers the data without suffix code as if represented in units of μsec

■ Value of f −100 MHz to 8.5 GHz (0 to 8.5 GHz (specified when the valid trace is A, B, or BG)

■ Value of t −1000 sec to 1000 sec (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: msec
US: μsec
MS: msec
S: sec

■ Example
```
MKN_100MHZ
MKN_UP
```

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

■ Value of p 0 to 500

■ 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
NR: SEARCH NEXT RIGHT PEAK
NL: SEARCH NEXT LEFT PEAK

■ Suffix code None

■ Example
MKPK_HI
MKPK_NL

MKR

MKR Marker Mode

■ Function Switches the marker mode and executes the 'MKR to ' functions.

Header	Program command	Query	Response
MKR	MKR_a a=0 to 7	MKR?	MKR_a a=0 to 2

■ Value of a
Ø: NORMAL
1: DELTA
2: OFF
3: MKR to CF
4: MKR to REF
5: MKR to CFstep 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 marker level to the reference level (same function as MKR_4, E4)

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_a a=0 to 2, 9 to 11	——	——

■ Value of a
- Ø: SEARCH PEAK (MAX)
- 1: SEARCH NEXT PEAK
- 2: SEARCH DIP (MIN)
- 9: SEARCH NEXT RIGHT PEAK
- 1Ø: SEARCH NEXT LEFT PEAK
- 11: SEARCH NEXT DIP

■ Suffix code None

■ Example
MKS_Ø
MKS_9

MKSLCT

MKSLCT Select Multi Marker

■ Function Specifies one of the 1 to 10 multimarkers and sets the specified marker to ON or OFF.

Header	Program command	Query	Response
MKSLCT	MKSLCT␣a,sw a=1 to 10 sw=ON, 1, OFF, 0	MKSLCT?␣a a=1 to 10	sw sw=ON, OFF

■ Value of a 1 to 10 (multimarker No.)

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: 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

MKSS

MKSS Marker to CF Step Size

■ Function Sets the marker frequency as a 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/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 or OFF.

Header	Program command	Query	Response
MKTRACK	MKTRACK_sw sw=ON, 1, OFF, 0	MKTRACK?	sw sw=ON, OFF

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: 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_a a=0 to 2, 5 to 7	MKW?	MKW_a a=0 to 2, 5 to 7

■ Value of a
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 p=0 to 500	MKZ?	MKZ_p p=0 to 500

■ Value of p 0 to 500

■ 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 or time units.

Header	Program command	Query	Response
MKZF	MKZF_f MKZF_t	MKZF?	f t f=−100000000 to 0 to 8500000000 Transfers the data without suffix code as if represented in units of Hz t=−100000000 to 8500000000 Transfers the data without suffix code as if represented in units of μsec

■ Value of f −100 MHz to 8.5 GHz (specified when the valid trace is A, B, or BG)

■ Value of t −1000 sec to 1000 sec (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: msec
US: μsec
MS: msec
S: sec

■ Example
```
MKZF_1ØØMHZ
MKZF_12ØØØØØØØØ
```

MNOISE

MNOISE Noise Measure Method

■ Function Selects the calculation method of noise measure.

Header	Program command	Query	Response
MNOISE	MNOISE_sw sw=ABS, CN	MNOISE?	sw

■ Value of sw ABS: Absolute method
CN : C/N Ratio method

■ Suffix code None

■ Initial setting ABS: Absolute

■ Example MNOISE_ABS

MOBW

MOBW OBW Measure Method

■ Function Selects the calculation method of OBW.

Header	Program command	Query	Response
MOBW	MOBW_sw sw=XDB, N	MOBW?	sw

■ Value of sw XDB: X dB down method
N : N% method

■ Suffix code None

■ Initial setting N : N% method

■ Example MOBW_N

MON

MON Monitor Mode

■ Function Selects the function for monitoring the sound from the detector output.

Header	Program command	Query	Response
MON	MON_m	MON?	m m=AM, FM, OFF

■ Value of m
AM: Amplitude Modulation
FM: Frequency Modulation
OFF: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example MON_AM

MONVOL

MONVOL Monitor Volume

■ Function Adjusts the volume of sound monitor.

Header	Program command	Query	Response
MONVOL	MONVOL_v v=0 to 20	MONVOL?	v v=0 to 20

■ Value of v 0 to 20 (1step)

■ Suffix code None

■ Initial setting Value of v = 10

■ Example MONVOL_10

MTEMP

MTEMP Select Template

■ Function Selects one of the 1 to 5 templates used for template management functions.

Header	Program command	Query	Response
MTEMP	MTEMP_n n=1 to 5	MTEMP?	n n=1 to 5

■ Value of n 1 to 5 (template No.)

■ Suffix code None

■ Initial setting 1

■ Example MTEMP_1

MTEMPDEL

MTEMPDEL Delete Template

■ Function Deletes the template data by 1 point.

Header	Program command	Query	Response
MTEMPDEL	MTEMPDEL_p	——	——

■ Value of p 1 to 32 (Point No.)

■ Suffix code None

■ Initial setting (None)

■ Example MTEMPDEL_10

MTEMPDSP

MTEMPDSP Template Display Mode

■ Function Specifies how the template management screen is displayed.

Header	Program command	Query	Response
MTEMPDSP	MTEMPDSP_sw	MTEMPDSP?	sw sw=GRAPH, LIST

■ Value of sw GRAPH: GRAPH
LIST: LIST

■ Suffix code None

■ Initial setting LIST

■ Example MTEMPDSP_GRAPH

MTEMPIN

MTEMPIN Insert Point

■ Function Adds the template data by 1 point.

Header	Program command	Query	Response
MTEMPIN	MTEMPIN_p,t,ℓ	——	——

■ Value of p 1 to 32 (Point No.)

■ Value of t −1000 sec to 1000 sec

■ Value of ℓ −200.00 dBm to 200.00 dBm (ABSOLUTE)
−200.00 dB 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 MTEMPIN_3,10MS,-20.5DBM

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

■ 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

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.)

■ Value of text character string within 24 words enclosed by double quotation marks or single quotation marks.

■ Suffix code None

■ Initial setting (None)

■ Example
```
MTEMPLABEL␣1,"RCR-28"
MTEMPLABEL␣2,'CHECKØ1'
```

MTEMPPD?

MTEMPPD? Read Limit Line Point Data

■ Function Reads out the template data by 1 point.

Header	Program command	Query	Response
MTEMPPD?	———	MTEMPPD?␣p p=1 to 32	t ℓ t=−1000000000 to 1000000000 Transfers the data without suffix code as if represented in units of μsec ℓ=−200.00 to 200.00 Transfers the data without suffix code as if represented in units of dB

■ Value of p 1 to 32 (Point No.)

■ Suffix code None

■ Initial setting (None)

■ Example MTEMPPD?␣ℓ

MTEMPREL

MTEMPREL Template Level Mode

■ Function Allows the template level data to be set either in relative values or in absolute values.

Header	Program command	Query	Response
MTEMPREL	MTEMPREL␣sw sw=ON, OFF	MTEMPREL?	sw sw=ON, OFF

■ Value of sw ON: RELATIVE
OFF: ABSOLUTE

■ Suffix code None

■ Initial setting OFF: ABSOLUTE

■ Example MTEMPREL␣ON

MTEMPRP

MTEMPRP Replace Point

■ Function Replaces the template data by 1 point.

Header	Program command	Query	Response
MTEMPRP	MTEMPRP␣p,t,ℓ	——	——

■ Value of p 1 to 32 (Point No.)

■ Value of t −1000 sec to 1000 sec

■ Value of ℓ −200.00 dBm to 200.00 dBm (ABSOLUTE)
−200.00 dB to 200.00 dB (RELATIVE)

■ Suffix code p: None
ℓ: None: dB or dBm
DB, DBM, DM: dB or dBm
t: None: msec
US: μsec
MS: msec
S: sec

■ Initial setting (None)

■ Example MTEMPRP␣3,10MS,−20.5DBM

MTØ Tracking OFF

■ Function Sets the signal tracking function to OFF.

Header	Program command	Query	Response
MTØ	MTØ	——	——

■ Example MTØ

MT1 Tracking ON

■ Function Sets the signal tracking function to ON.

Header	Program command	Query	Response
MT1	MT1	——	——

■ Example MT1

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
TRA: Trace B

■ Suffix code None

■ Example MXMH_TRA

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_w w=1 to 501	MZW?	MZW_w w=1 to 501

■ Value of w 1 to 501 (odd number)

■ Suffix code None

■ Initial setting Value of w = 51

■ Example MZW_1
MZW_51
MZW_5Ø1

MZWF Zone Marker Width

■ Function Specifies the zone marker width on the X axis in the frequency or time units.

Header	Program command	Query	Response
MZWF	MZWF_f	MZWF?	f f=1 to 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f 1 Hz to 8.5 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 frequency width equivalent to 1 div (850 MHz)

■ Example
```
MZWF_100
MZWF_1MHZ
```


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

OBWN

OBWN OBW N% Value

■ Function Sets the conditions of the occupied frequency bandwidth in % unit.

Header	Program command	Query	Response
OBWN	OBWN_r	OBWN?	r r=1 to 99 Transfers the data without suffix code as if represented in % unit

■ Value of r 1 to 99 (1 step): 1 to 99% (1% 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 dB unit.

Header	Program command	Query	Response
OBWXDB	OBWXDB_ℓ	OBWXDB?	ℓ ℓ=1 to 100 Transfers the data without suffix code as if represented in units of dB

■ Value of ℓ 1 to 100 (1 step): 1 to 100 dB (1 dB step)

■ Suffix code None: dB
DB: dB

■ Initial setting 25 dB

■ Example OBWXDB_6DB

PARAM

PARAM Parameter

■ Function Displays the currently parameter list on the screen.

Header	Program command	Query	Response
PARAM	PARAM␣a	PARAM?	a a=1, 2, OFF

■ Value of a Ø, OFF: OFF
1: Parameter list 1
2: Parameter list 2

■ Suffix code None

■ Initial setting OFF: OFF

■ Example PARAM␣1

PCF

PCF Peak to Center Frequency

■ Function Searches the spectrum being displayed for the maximum point and sets the frequency at the point to the center frequency.

Header	Program command	Query	Response
PCF	PCF	——	——

■ Example PCF

PLF Plotting Paper Form

■ Function Specifies the paper size for the plotter

Header	Program command	Query	Response
PLF	PLF_sw	PLF?	PLF_sw

■ Value of sw Ø: A4
1: A3

■ Suffix code None

■ Initial setting Ø: A4

■ Example PLF_1

PLI Direct Plot Output Item For Plotter

■ Function Selects one of the items (waveform only, scale only, etc) to be plotted directly.

Header	Program command	Query	Response
PLI	PLI_a a=0 to 2	PLI?	PLI_a a=0 to 2

■ Value of a Ø: ALL
1: TRACE ONLY
2: SCALE ONLY

■ Suffix code None

■ Initial setting Ø: ALL (Provided the address already allocated is not initialized)

■ Example PLI_Ø

PLOT

PLOT Direct Plot Start

■ Function Starts direct plotting.

Header	Program command	Query	Response
PLOT	PLOT	——	——

■ Example PLOT

PLS

PLS Direct Plot Start

■ Function Starts direct plotting.

Header	Program command	Query	Response
PLS	PLS_a a=0	——	——

■ Value of a Ø: PLOT START

■ Suffix code None

■ Example PLS_Ø

PLTA

PLTA Direct Plot Plotter Address

■ Function Sets the GPIB address of the plotter for direct plotting.

Header	Program command	Query	Response
PLTA	PLTA_a a=0 to 30	PLTA?	PLTA_a a=0 to 30

■ Value of a 0 to 30

■ Suffix code None

■ Initial setting Value of a = 18 (provided the GPIB address already allocated is not initialized)

■ Example PLTA_Ø

PLTARA

PLTARA Plotting Size

■ Function Specifies the size of the plotting area.

Header	Program command	Query	Response
PLTARA	PLTARA_sw	PLTARA?	sw

■ Value of sw FULL : total
QTR : 1/4 size

■ Suffix code None

■ Initial setting FULL : total

■ Example PLTARA_QTR

PLTHOME

PLTHOME Set Home Position

■ Function

Initializes the printing position to the upper left-corner when the LOCATION selected is AUTO.

Header	Program command	Query	Response
PLTHOME	PLTHOME	——	——

PLTLC

PLTLC Plot Location

■ Function

Specifies the print location when the X-Y plotter is set to plot on a quarter of the paper area.

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

■ Value of a

AUTO: Allows the MS2602A to determine the print position automatically and print out to it.
UPLEFT: Upper left
UPRIGHT: Upper right
LOWLEFT: Lower left
LOWRIGHT: Lower right

PMCS

PMCS PMC Select

■ Function

Selects one from the PMC built in the MS2602A, external PMC in the MC8104A, or external floppy disk in the MC8104A.

Header	Program command	Query	Response
PMCS	PMCS_a	PMCS?	a a=IPMC,EPMC1 EPMC2,EFD

■ Value of a

IPMC: PMC built in this instrument
EPMC1: External PMC1
EPMC2: External PMC2
EFD: External FD

■ Suffix code

None

■ Initial setting

IPMC: PMC built in this instrument
(provided the address already allocated is not initialized)

■ Example

PMCS_IPMC
PMCS_EFD

PMOD

PMOD Printer Type

■ Function

Selects the type of printer for direct plotting.
32 bytes × 32 memories

Header	Program command	Query	Response
PMOD	PMOD_a a=0 to 5	PMOD?	PMOD_a a=0 to 5

■ Value of a

Ø: Printer ··· HP-GL
1: Printer ··· GP-GL
2: Printer ··· VP-800 (EPSON system)
3: Printer ··· HP2225 (Hewlett Packard)
4: Printer ··· MC8104A (Anritsu)
5: Printer ··· UA455A

■ Suffix code

None

■ Initial setting

3: Printer ··· HP2225

■ Example

PMOD_2
PMOD_4

PMY

PMY Dual-Port Memory

■ Function Writes to the dual port memory or reads from the memory.

Header	Program command	Query	Response
PMY	PMY_a,b a=0 to 31 b=data	PMY?_a,c a=0 to 31 c=1 to 32	b b=data

■ Value of a Dual port number : 0 to 31

■ Value of b Data enclosed in double or single quotation marks

■ Value of c The number of data items read from the dual port memory : 1 to 32

■ Example
```
PMY_Ø,"5Ø"
PMY?_Ø,1
```

PORT

PORT Control Port Select

■ Function Specifies the GPIB port for controlling the printer, plotter, MC8104A, etc.

Header	Program command	Query	Response
PORT	PORT_a a=1,2	PORT?	PORT_a a=1,2

■ Value of a 1 : GPIB1
2 : GPIB2

■ Suffix code None

■ Initial setting 1 : GPIB1 (provided the port already allocated is not initialized)

■ Example
```
PORT_1
```

PP

PP Presel Auto

■ Function Adjusts the bias of preselector automatically (same function as PRESEL␣AUTO).

Header	Program command	Query	Response
PP	PP	——	——

■ Example PP

PRESEL

PRESEL Presel Tune

■ Function Adjusts the bias of preselector.

Header	Program command	Query	Response
PRESEL	PRESEL␣a	PRESEL?	a a = −128 to 127

■ Value of a
AUTO: Automatic adjustment
−128 to 127: Setting values manually
PRESET: Sets 0

■ Suffix code None

■ Initial setting 0 (MANUAL) (provided the address already allocated is not initialized)

■ Example PRESEL␣AUTO

PRIA

PRIA Direct Plot Printer Address

■ Function Sets the GPIB address of the printer for direct plotting.

Header	Program command	Query	Response
PRIA	PRIA_a a=0 to 30	PRIA?	a a=0 to 30

■ Value of a 0 to 30

■ Suffix code None

■ Initial setting Value of a = 17 (provided the address already allocated is not initialized)

■ Example PRIA_17

PRINT

PRINT Direct Plot Start

■ Function Starts direct plotting.

Header	Program command	Query	Response
PRINT	PRINT	—	—

■ Example PRINT

PRL Peak to Reference Level

■ Function Searches the spectrum being displayed for the maximum point and sets its level to the reference level.

Header	Program command	Query	Response
PRL	PRL	——	——

■ Example PRL

PSW Zone Sweep

■ Function Sets the zone sweep to ON or OFF.

Header	Program command	Query	Response
PSW	PSW_sw sw=ON, 1, OFF, 0	PSW?	PSW_sw sw=ON, OFF

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example PSW_ON

PTA

PTA PTA Switch / PTA Status

■ Function

Sets the PTA to ON/OFF.
Reads whether PTA is BUSY or READY.
(PTA OFF resets the PTA program.)

Header	Program command	Query	Response
PTA	PTA_a	PTA?	PTA_a a=0,1

■ Value of a

Ø : OFF
1 : ON
OFF : OFF
ON : ON

■ Suffix code

None

■ Initial setting

Ø: OFF (provided the PTA OFF is not affected by the INI command)

■ Examples

PTA_Ø
PTA? → PTA_Ø...When PTA is Ready, PTA 0 is transferred.
PTA? → PTA_1...When PTA is Busy, PTA 1 is transferred.

PTL

PTL PTL I / O Mode

■ Function

Selects the mode for controlling PTA via GPIB.

Header	Program command	Query	Response
PTL	PTL_a a=0,1	PTL?	text

■ Suffix code

None

■ Initial setting

OFF (provided the mode already allocated is not initialized)

■ Examples

PTL_Ø : OFF
PTL_1 : Input (A mode to transfer a command or statement to PTA)
PTL? : Output (A mode to transfer a statement from PTA to an external device)

PWRSTART

PWRSTART Power Measure Start Point

■ Function Specifies the point at which measurement is started to measure burst power.

Header	Program command	Query	Response
PWRSTART	PWRSTART␣p	PWRSTART?	p p = 0 to 500

■ Value of p 0 to 500

■ Suffix code None

■ Initial setting 0 point

■ Example PWRSTART␣100

PWRSTOP

PWRSTOP Power Measure Stop Point

■ Function Specifies the point at which measurement is ended to measure burst power.

Header	Program command	Query	Response
PWRSTOP	PWRSTOP␣p	PWRSTOP?	p p = 0 to 500

■ Value of p 0 to 500

■ Suffix code None

■ Initial setting 0 point

■ Example PWRSTOP␣400

RB

RB Resolution Band width

■ Function Sets the resolution bandwidth (same function as RBW).

Header	Program command	Query	Response
RB	RB_f RB_a	RB?	f f=10 to 3000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f 10 Hz to 3 MHz (1 / 3 sequence)

■ 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

RBW

RBW Resolution Band width

■ Function Sets the resolution bandwidth.

Header	Program command	Query	Response
RBW	RBW_a a=0 to 9, 13, 14	RBW?	RBW_a a=0 to 9, 13, 14

■ Value of a
Ø: 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

■ Suffix code None

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

■ Example RBW_5

RC Recall Data from Internal Memory

■ Function

Recalls trace data / parameter data from the built-in memory (same function as RGRC).

Header	Program command	Query	Response
RC	RC_a a=1 to 16	———	———

■ Value of a 1 to 16 (memory No.)

■ Suffix code None

■ Example RC_1

RCM Recall Data from PMC

■ Function

Recalls measurement conditions (parameter) and measured results (trace) from PMC or floppy disk.

Header	Program command	Query	Response
RCM	RCM_ a a=1 to 99	———	———

■ Value of a 1 to 99 (File No.)

■ Suffix code None

■ Example RCM_17
RCM_2

RDATA

RDATA Recalled Data

■ Function Specifies the contents of data recalled.

Header	Program command	Query	Response
RDATA	RDATA␣a	RDATA?	a a=TP, P

■ Value of a TP: Trace & Parameter
P: Parameter Only

■ Suffix code None

■ Initial setting TP: Trace & Parameter
(provided the address already allocated is not initialized)

■ Example RDATA␣TP

RES? Measure Result

■ Function

Reads out the results which are measured and calculated by the measure functions.

Header	Program command	Query	Response
RES	——	RES?	data 1 data 1, data 2 data 1, data 2, data 3, data 4

■ Values of data 1, data 2, data3 and data4

Measure Control item (corresponding command)	Corresponding Response	Value of data1	Value of data2	Value of data3	Value of data4
When the measure item or sub item is OFF	OFF	Not transferred	Not transferred	——	——
FREQ COUNT (MEAS_FREQ,ON)	f	As value of f, transfers the data without suffix code as if represented in units of 1 Hz. Resolution: 1 Hz	——	——	——
NOISE MEASURE (MEAS_NOISE,ABS) (MEAS_NOISE, C/N)	ℓ	As value of l, transfers the data without suffix code as if represented in units of 1 dB (dBm/ch, dBm/Hz, dBc/ch, dBc/Hz). Resolution : 0.01 dB	——	——	——
OBW MEASURE (MEAS_OBW,XDB) (MEAS_OBW, N)	f_1, f_2	As value (occupied bandwidth) of f_1, transfers the data without suffix code as if represented in units of 1 Hz. Resolution: 1 Hz	As value (center frequency) of f_2, transfers the data without suffix code as if represented in units of 1 Hz. Resolution: 1 Hz	——	——

Measure Control item (corresponding command)	Corresponding Response	Value of data1	Value of data2	Value of data3	Value of data4
ADJ CH MEASURE (MEAS_ADJ, UNMD) (MEAS_ADJ, MOD)	ℓ_{L1}, ℓ_{U1}, ℓ_{L2}, ℓ_{U2}	As value (lower channel of CH SEPA 1) of ℓ_{L1}, transfers the data without suffix code as if represented in units of 1 dB. Resolution: 0.01 dB	As value (upper channel of CH SEPA 2) of ℓ_{U1}, transfers the data without suffix code as if represented in units of 1 dB. Resolution: 0.01 dB	As value (lower channel of CH SEPA 2) of ℓ_{L2}, transfers the data without suffix code as if represented in units of 1 dB. Resolution: 0.01 dB	As value (upper channel of CH SEPA 2) of ℓ_{U2}, transfers the data without suffix code as if represented in units of 1 dB. Resolution: 0.01 dB
When the measure item or sub item is OFF	OFF	Not transferred	Not transferred	——	——
TEMPLATE (MEAS_TEMP, CHECK)	C_1, C_2	As value (Limit 1 check result) of C_1, 0: PASS, 1: FAIL	As value (Limit 2 check result) of C_2, 0: PASS, 1: FAIL	——	——
BURST POWER MEASURE (MEAS_POWER, EXE)	ℓ, w	As value (dB values) of ℓ, transfers the data without suffix code as if represented in units of 1 dBm. Resolution: 0.01 dBm	As value (pW values) of w, transfers the data without suffix code as if represented in units of 1 pW. Resolution: 1 pW	——	——

When the MEASURE function has caused a calculation error or execution error, the issued value is indicated as "****".

■ Example RES?

RGDIR

RGDIR Memory Directory

■ Function Displays the directory of recall memory.

Header	Program command	Query	Response
RGDIR	RGDIR	——	——

■ Example RGDIR

RGRC

RGRC Recall Data from Internal Memory

■ Function Recalls trace data / parameter data from built-in memory (same function as RC).

Header	Program command	Query	Response
RGRC	RGRC_a a=1 to 16	——	——

■ Value of a 1 to 16 (Memory No.)

■ Suffix code None

■ Example RGRC_1

RGSV

RGSV Save Data into Internal Memory

■ Function Saves trace data / parameter data to built-in memory (same function as SV).

Header	Program command	Query	Response
RGSV	RGSV_a a = 1 to 16	——	——

■ Value of a 1 to 16 (Memory No.)

■ Suffix code None

■ Example RGSV_1

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: Available for the current scale unit, provided μV unit is always selected in LIN mode.

■ Value of ℓ Value equivalent to −100 dBm to +30 dBm
(0.1 dB step)

■ Value of a UP: LEVEL STEP UP
DN: LEVEL STEP DOWN

■ Suffix code

None:	Available for the current scale unit, provided μV unit is always selected 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 Value of ℓ = −10 dBm

■ Example
```
RL_−100DBM
RL_5V
RL_−10
RL_UP
```

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: Transfers the data without suffix code as if represented in the current scale units (always μV unit in LIN mode).

■ Value of ℓ Value equivalent to −100 to +30 dBm
(0.1 dB step)

■ Suffix code None: Available for the current scale unit, provided μV unit is always selected 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 Value of ℓ = −10 dBm

■ Example
```
RLV_−100DBM
RLV_5V
RLV_−10
```

RMK? Reference Marker Position

■ Function Reads out the position of reference marker.

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

■ Value of a 0 to 500

■ Example RMK?

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 −100.0 dB to +100.0 dB (0.1 dB step)

■ Suffix code None : dB
DB, DBM, DM : dB

■ Initial setting Ø : 0 dB

■ Example ROFFSET␣OFF
ROFFSET␣2ØDB

SCL

SCL Log / Linear Scale

■ Function Sets the magnification of LOG / LIN scale (Y axis).

Header	Program command	Query	Response
SCL	SCL_a a=0 to 7	SCL_?	SCL_a a=0 to 7

■ Value of a
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% / div (LIN SCALE)
5: 2% / div (LIN SCALE)
6: 5% / div (LIN SCALE)
7: 10% / div (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 in the specified scroll step size.

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

SNGLS

SNGLS Single Sweep Mode

■ Function Sets the sweep mode to single (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 0 to 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f −100 MHz to 8.5 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 Value of f = 8.5 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 8600000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f 0 Hz to 8.6 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 setting Value of f = 8.6 GHz

■ Example SP_6GHZ

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 8600000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f 0 Hz to 8.6 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 Value of f=8.6 GHz

■ Example SPF_101MHZ
SPF_3.5GHZ

SPFUNC

SPFUNC Time Trace Special Function

■ Function Sets the function for monitoring the trace time waveform.

Header	Program command	Query	Response
SPFUNC	SPFUNC_sw	SPFUNC?	SW sw=OFF, FM, EXT

■ Value of sw OFF: OFF
FM: FM MONITOR
EXT: EXT TRIGGER MONITOR

■ Suffix code None

■ Initial setting OFF: OFF

■ Example SPFUNC_FM

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

SS

SS Frequency Step Size

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

Header	Program command	Query	Response
SS	SS_f	SS?	f f=1 to 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f 1 Hz to 8.5 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 Scroll Step Size

■ Function Sets the scroll step size.

Header	Program command	Query	Response
SSS	SSS_a	SSS?	SSS_a a=1,2,5,10

■ Value of a
1: 1 div
2: 2 div
5: 5 div
1Ø: 10 div

■ Suffix code None

■ Initial setting 2: 2 div

■ Example SSS_1

ST Sweep Time

■ Function Sets the frequency sweep time / time span.

Header	Program command	Query	Response
ST	ST_t ST_a	ST?	t t=50 to 1000000000 Transfers the data without suffix code as if represented in units of μsec

■ Value of t 50 μsec to 1000 sec (20 msec to 1000 sec for frequency axis)

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

■ Suffix code
t: None: msec
US: μsec
MS: msec
S: sec
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 0 to 8500000000 Transfers the data without suffix code as if represented in units of Hz

■ Value of f −100 MHz to 8.5 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 Value of f = 0 Hz

■ Example
```
STF_123MHZ
STF_45.6KHZ
```

SV

SV Save Data into Internal Memory

■ Function Saves trace data / parameter data to built-in memory (same function as RGSV).

Header	Program command	Query	Response
SV	SV_a a=1 to 16	——	——

■ Value of a 1 to 16 (Memory No.)

■ Suffix code None

■ Example SV_1

SVM

SVM Save Data into PMC

■ Function

Saves the measurement conditions (parameter) and measured results (trace) to PMC or floppy disk.

Header	Program command	Query	Response
SVM	SVM_s s=1 to 99	———	———

■ Value of s 1 to 99 (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 MS2602A device, 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_a a=0, 1

■ Value of a
Ø: Sweep completed
1: Sweep in 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 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 = 50 to 1000000000 Transfers the data without suffix code as if represented in units of μsec

■ Value of t 50 μsec to 1000 sec (20 msec to 1000 sec for frequency axis)

■ Suffix code None: msec
US: μsec
MS: msec
S: sec

■ Initial setting Calculated value when AUTO is selected for SWT

■ Example SWT_1S
SWT_20MS

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

TDLY

TDLY Delay Time

■ Function Sets the delay time from the point where trace time trigger occurs.

Header	Program command	Query	Response
TDLY	TDLY␣t	TDLY?	t t= −1000000000 to 65500 Transfers the data without suffix code as if represented in units of μsec

■ Value of t −1000 sec to 65.5 msec

■ Suffix code
None: msec
US: μsec
MS: msec
S: sec

■ Initial setting Ø: 0 sec

■ Example TDLY␣2ØMS

TEMP

TEMP Select Template

■ Function Selects one of the function templates.

Header	Program command	Query	Response
TEMP	TEMP_n n=1 to 5	TEMP?	n n=1 to 5

■ Value of n 1 to 5 (Template No.)

■ Suffix code None

■ Initial setting 1

■ Example TEMP_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 sec to 1000 sec	TEMPMVX?	t

■ Value of t −1000 sec to 1000 sec

■ Suffix code None : msec
US : μsec
MS : msec
S : sec

■ Initial setting Ø : 0 sec

■ 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 dB to 200.00 dB

■ Suffix code None: dB
DB, DBM, DM: dB

■ Initial setting Ø: 0 dB

■ Example TEMPMVY␣−2.5dB

TEMPSLCT

TEMPSLCT Template Limit Line Select

■ Function Selects the Limit Line used for evaluating the measured results by 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
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting OFF

■ Example TEMPSLCT␣UP1, ON

TEXPAND

TEXPAND Time Expand

■ Function Turns ON or OFF the expand functions of trace time.

Header	Program command	Query	Response
TEXPAND	TEXPAND_sw sw=ON, 1, OFF, 0	TEXPAND?	sw sw=ON, OFF

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting OFF

■ Example TEXPAND_ON

TIME

TIME Time

■ Function Sets the clock built in MS2602A instrument to the specified time.

Header	Program command	Query	Response
TIME	TIME_hh,mm,ss	TIME?	hh,mm,ss

■ Value of hh 00 to 23 (hour)

■ Value of mm 00 to 59 (minute)

■ Value of ss 00 to 59 (second)

■ Suffix code None

■ Example TIME_Ø8,3Ø,ØØ

TITLE

TITLE Title Entry

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

Header	Program command	Query	Response
TITLE	TITLE␣text	TITLE?	text

■ text Character string within 32 characters enclosed by double quotation marks or single quotation marks

■ Example
```
TITLE␣"MS26Ø2A"
TITLE␣'SPECTRUM ANALYZER'
```

TM

TM Trigger

■ Function Sets the trigger switch / trigger source (same function as TRG).
This command allows both the trigger switch and the trigger source to be set.

Header	Program command	Query	Response
TM	TM␣a	TM?	a a=FREE, VID,LINE,EXT, TV

■ Value of a
FREE: FREERUN
VID: VIDEO
LINE: LINE
EXT: EXT
TV: TV

■ Suffix code None

■ Initial setting FREE: FREERUN

■ Example TM␣FREE

TMCNT?

TMCNT? Time Count Read

■ Function

Reads in the values counted by the integrating meter which integrates the time over which electricity has been turned on.

Header	Program command	Query	Response
TMCNT?	——	TMCNT?	t t = Transfers the data without suffix code as if represented in units of hr

■ 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_a a=0 to 5	TMMD?	TMMD_a a=0 to 5

■ Value of a

Ø: NORMAL
1: MAX HOLD
2: AVERAGE
3: MIN HOLD
4: CUMULATIVE
5: OVER WRITE

■ Suffix code

None

■ Initial setting

Ø: NORMAL

■ Example

```
TMMD_Ø
```

TMWR

TMWR Trace Time Write Switch

■ Function Controls writing the waveform to the trace TIME.

Header	Program command	Query	Response
TMWR	TMWR_sw sw=ON, 1, OFF, 0	TMWR?	TMWR_sw sw=ON, OFF

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting ON: ON

■ Example TMWR_ON

TRG

TRG Trigger

■ Function Sets the trigger switch / trigger source (same function as TM).
This command allows both the trigger switch and the trigger source to be set.

Header	Program command	Query	Response
TRG	TRG_a a=0 to 3, 6	TRG?	TRG_a a=0 to 3, 6

■ Value of a
Ø: FREERUN
1: VIDEO
2: LINE
3: EXT
6: TV

■ Suffix code None

■ Initial setting Ø: FREERUN

■ Example TRG_Ø

TRGLVL

TRGLVL Trigger Level

■ Function Sets the threshold level of the trigger for starting the sweep when trigger source = VIDEO, EXT (Input1) are selected

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 (Input1) (V unit)
−100 to +100 (1 Step) ..... when trigger source is VIDEO (% unit)

■ Suffix code
when trigger source is VIDEO None

when the trigger source is EXT None: V
V: V

■ Initial setting Value of ℓ = 0.0

■ Example
```
TRGLVL␣-10.0
TRGLVL␣9.9
```

TRGS

TRGS Trigger Switch

■ Function Switches the trigger switch to Free run or Triggered.

Header	Program command	Query	Response
TRGS	TRGS␣sw sw = FREE, TRGD	TRGS?	sw sw = FREE, TRGD

■ Value of sw
FREE: FREERUN
TRGD: TRIGGERED

■ Suffix code None

■ Initial setting FREE: FREERUN

■ Example
```
TRGS␣FREE
```

TRGSLP

TRGSLP Trigger Slope

■ Function Selects the positive or negative leading edge of the trigger when trigger source is VIDEO or EXT mode.

Header	Program command	Query	Response
TRGSLP	TRGSLP_sw	TRGSLP?	sw sw=RISE, FALL

■ Value of sw
RISE: Positive leading edge
FALL: Negative leading edge

■ Suffix code None

■ Initial setting RISE: Positive leading edge

■ Example TRGSLP_RISE

TRGSOURCE

TRGSOURCE Trigger Source

■ Function Selects the trigger source. Trigger switch setting is not changed by this command.

Header	Program command	Query	Response
TRGSOURCE	TRGSOURCE_sw	TRGSOURCE?	sw sw=VID, LINE, EXT, TV

■ Value of sw
VID: VIDEO
LINE: LINE
EXT: EXT
TV: TV

■ 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_a a=0,1	——	——

■ Value of a Ø: LF
1: CR/LF

■ Suffix code None

■ Initial setting Ø: LF (Provided the terminator already registered is not initialized)

■ Example TRM_Ø
TRM_1

TS

TS Take Sweep

■ Function Executes single sweep synchronously (same function as SWP).

Header	Program command	Query	Response
TS	TS	——	——

■ Example TS

TSP Time Span

■ Function Sets the span of trace time.

Header	Program command	Query	Response
TSP	TSP_ t	TSP?	t t=50 to 1000000000 Transfers the data without suffix code as if represented in units of μsec

■ Value of t 50 μsec to 1000 sec

■ Suffix code None: msec
US: μsec
MS: msec
S: sec

■ Initial setting 200 msec

■ Example TSP_100
TSP_100S

TTL Title Display Switch

■ Function Select the title display from among ON / OFF / DATE.

Header	Program command	Query	Response
TTL	TTL_sw sw=ON, 1, OFF, 0, DATE, 2	TTL?	TTL_sw sw=ON, OFF, DATE

■ Value of sw ON: ON
1: ON
OFF: OFF
Ø: OFF
DATE: DATE
2: DATE

■ Suffix code None

■ Initial setting OFF: OFF (provided the unit already registered is not initialized)

■ Example TTL_ON

TVLINE

TVLINE TV (H-Sync: line)

■ Function Sets the number of lines used in the TV horizontal synchronous signal.

Header	Program command	Query	Response
TVLINE	TVLINE␣a	TVLINE?	a a=5 to 310

■ Value of a
9 to 262 (NTSC EVEN)
10 to 263 (NTSC ODD)
5 to 310 (PAL EVEN)
6 to 310 (PAL ODD)

■ Suffix code None

■ Initial setting a=10

■ Example TVLINE␣10

TVSFRM

TVSFRM TV Synchronizing Signal

■ Function Sets the TV synchronous signal when TV is selected for trigger source.

Header	Program command	Query	Response
TVSFRM	TVSFRM␣sw	TVSFRM?	SW sw=VERTICAL, EVEN, ODD

■ Value of sw
VERTICAL: VERTICAL
EVEN: H-EVEN
ODD: H-ODD

■ Suffix code None

■ Initial setting VERTICAL: VERTICAL

■ Example TVSFRM␣VERTICAL

TVSTND

TVSTND TV Type

■ Function Sets the TV broadcasting system when TV is selected for trigger source.

Header	Program command	Query	Response
TVSTND	TVSTND_sw	TVSTND?	sw sw=PAL, NTSC

■ Value of sw
PAL: PAL
NTSC: NTSC

■ Suffix code None

■ Initial setting NTSC: NTSC

■ Example TVSTND_NTSC

TZONE

TZONE Expand Zone

■ Function Switches the time expand (magnified display) mode to ON or OFF.

Header	Program command	Query	Response
TZONE	TZONE_sw sw=ON, 1, OFF, 0	TZONE?	sw sw=ON, OFF

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting OFF: OFF

■ Example TZONE_ON

TZSP

TZSP Expand Zone Span

■ Function Sets the zone for expanding the time expand (magnified display).

Header	Program command	Query	Response
TZSP	TZSP_t	TZSP?	t t=50 to 1000000000 Transfers the data without suffix code as if represented in units of μsec

■ Value of t 50 μsec to 1000 sec

■ Suffix code None: msec
US: μsec
MS: msec
S: sec

■ Initial setting 200 msec

■ Example TZSP_10MS

TZSTART

TZSTART Expand Zone Start

■ Function Sets the start time of time expand (magnified display).

Header	Program command	Query	Response
TZSTART	TZSTART_t	TZSTART?	t t=−1000000000 to 65500 Transfers the data without suffix code as if represented in units of μsec

■ Value of t −1000 sec to 65.5 msec

■ Suffix code None: msec
US: μsec
MS: msec
S: sec

■ Initial setting 0 sec

■ Example TZSTART_10MS

UCL? Query Uncal Status

■ Function Reads out the UNCAL status.

Header	Program command	Query	Response
UCL?	——	UCL?	UCL_a a=0,1

■ Value of a
Ø: NORMAL
1: During UNCAL

■ Example
```
UCL?
```


UNC Uncal Display ON / OFF

■ Function Sets whether 'UNCAL' is displayed or not when UNCAL has occurred.

Header	Program command	Query	Response
UNC	UNC_sw sw=ON, 1, OFF, 0	UNC?	UNC_sw sw=ON, OFF

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Suffix code None

■ Initial setting ON: ON

■ Example
```
UNC_ON
```

UNT

UNT Unit for Log Scale

■ Function Sets one of the display unit systems in LOG scale mode.

Header	Program command	Query	Response
UNT	UNT_a a=0 to 5	UNT?	UNT_a a=0 to 5

■ Value of a
Ø: dBm
1: dBμV
2: dBmV
3: V
4: dBμV (emf)
5: W

■ Suffix code None

■ Initial setting Ø: dBm

■ Example
```
UNT_Ø
```

VAVG

VAVG Average

■ Function Sets averaging to ON, OFF, or number of processing.

Header	Program command	Query	Response
VAVG	VAVG_sw VAVG_a	VAVG?	a a=2 to 1024

■ Value of sw
ON: ON
1: ON
OFF: OFF
Ø: OFF

■ Value of a 2 to 1Ø24: Averaging rate to process

■ Suffix code None

■ Initial setting 8: 8 times

■ Example
```
VAVG_ON
VAVG_128
```

VB Video Band width

■ 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 without suffix code as if represented in units of Hz

■ Value of f 1 Hz to 3 MHz
OFF: OFF

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

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

■ Initial setting Calculated value when VBW is selected for AUTO

■ Example VB_300HZ

VBCOUPLE Couple Mode

■ Function Sets the coupled functions commonly or independently between frequency domain or time domain.

Header	Program command	Query	Response
VBCOUPLE	VBCOUPLE_sw	VBCOUPLE?	sw sw=COM, IND

■ Value of sw COM: Common setting
IND: Independent setting

■ Suffix code None

■ Initial setting COM: Common setting (provided the unit already registered is not initialized)

■ Example VBCOUPLE_COM

VBR

VBR VBW / RBW Ratio

■ Function Sets the ratio of video bandwidth and 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 Band width

■ Function Sets the video bandwidth.

Header	Program command	Query	Response
VBW	VBW_a a=0 to 14	VBW?	VBW_a a=0 to 14

■ Value of a

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 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 the window for displaying the measure results.

Header	Program command	Query	Response
WINDPOS	WINDPOS_a	WINDPOS?	a

■ Value of a
UPRIGHT : Upper right
LOWLEFT : Lower left
LOWMID : Lower center
LOWRIGHT : Lower right

■ Suffix code None

■ Initial setting UPRIGHT : Upper right

■ Example WINDPOS_LOWRIGHT

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	b_1, b_2, b_3 ···· (When ASCII is specified) $b_1\, b_2\, b_3$ ·····(When BINARY is specified)

■ Value of p 0 to 1001 (point No.)

■ Value of b LOG scale used:
Integers having 0.01 dBm unit (independent of display unit system)

LIN scale used: $$b = \frac{\text{Voltage value (V)}}{\text{Reference level (V)}} \times 10000$$

■ Value of d 1 to 1002 (number of points)

■ Example
```
XMA_1,-2ØØ
XMA?_1,2 ( Reads out two data from point 1 )
```

Note: When the binary format is specified for Response data, each point data is composed of two bytes, and each byte is sent out in sequence from the high-order byte to the low-order byte.

XMB

XMB Trace B Spectrum Data

■ Function Writes / reads the spectrum data to / from trace B (main trace) memory.

Header	Program command	Query	Response
XMB	XMB_p , b	XMB?_p , d	b_1, b_2, b_3 ····· (When ASCII is specified) $b_1\, b_2\, b_3$ ····· (When BINARY is specified)

■ Value of p 0 to 1001 (point No.)

■ Value of b LOG scale used: Integers having 0.01 dBm unit (independent of display unit system)

LIN scale used: $$b = \frac{\text{Voltage value (V)}}{\text{Reference level (V)}} \times 10000$$

■ Value of d 1 to 1002 (number of points)

■ Example
```
XMB_1,-2ØØ
XMB?_1,2 ( Reads out two data from point 1 )
```

Note: When the binary format is specified for Response data, each point data is composed of two bytes, and each byte is sent out in sequence from the high-order byte to the low-order byte.

XMG

XMG Trace BG Spectrum Data

■ Function Writes / reads the spectrum data to / from trace BG memory

Header	Program command	Query	Response
XMG	XMG_p , b	XMG?_p , d	b_1, b_2, b_3 ····· (When ASCII is specified) $b_1\ b_2\ b_3$ ····· (When BINARY is specified)

■ Value of p 0 to 1001 (point No.)

■ Value of b LOG scale used: Integers having 0.01 dBm unit (independent of display unit system)

LIN scale used: $b = \dfrac{\text{Voltage value (V)}}{\text{Reference level (V)}} \times 10000$

■ Value of d 1 to 1002 (number of points)

■ Example
```
XMG_1,-2000
XMG?_1,2  ( Reads out two data from point 1 )
```

Note: When the binary format is specified for Response data, each point data is composed of two bytes, and each byte is sent out in sequence from the high-order byte to the low-order byte

XMT

XMT Trace TIME Spectrum Data

■ Function Writes / reads the spectrum data to / from trace TIME memory.

Header	Program command	Query	Response
XMT	XMT_p , b	XMT?_p , d	b_1, b_2, b_3 ···· (When ASCII is specified) $b_1\ b_2\ b_3$ ··· (When BINARY is specified)

■ Value of p 0 to 1001 (point No.)

■ Value of b LOG scale used: Integers having 0.01 dBm unit (independent of display unit system)

LIN scale used: $b = \dfrac{\text{Voltage value (V)}}{\text{Reference level (V)}} \times 10000$

■ Value of d 1 to 1002 (number of points)

■ Example
```
XMT_1,-2000
XMT?_1,2  ( Reads out two data from point 1 )
```

Note: When the binary format is specified for Response data, each point data is composed of two bytes, and each byte is sent out in sequence from the high-order byte to the low-order byte.

*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␣20
*ESE?

*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? Identification Query

■ Function Returns the manufacturer name, model number etc. of the product.

Header	Program command	Query	Response
*IDN?	———	*IDN?	ANRITSU,MS2602A,0000,n

■ Value of n 1 to 99 (firmware version No.)

■ Example *IDN?

*OPC

*OPC Operation Complete Command

■ Function

Sets the bit 0 digit 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 1 in the Output Queue 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 Reset Command

■ Function Resets the device in the third level.

Header	Program command	Query	Response
*RST	*RST	———	———

■ Example *RST

---

* SRE Service Request Enable Command

■ Function Sets the bits in the Service Request Enable Register.

Header	Program command	Query	Response
*SRE	*SRE	*SRE?	n

■ Value of n 0 to 63, 128 to 191 (current value of Service Request Enable Register)

■ Example *SRE

*STB?

*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	Conditions 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 IEEE488.1 GET-Group Execute Trigger-bus command. For this command, the MS2602A executes a single sweep (the same function as SWP.)

Header	Program command	Query	Response
*TRG	*TRG	———	

■ Example *TRG

*TST? Self Test Query

■ Function Executes a self-test and returns the results of any errors.

Header	Program command	Query	Response
*TST?	———	*TST?	n

■ Value of n

Ø: Indicates that the self-test completed without errors.

−32767 ~ −1, 1 ~ 327671: Indicates that the self-test did not complete, or completed 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
```

(Blank)

APPENDIXES

TABLE OF CONTENTS

APPENDIX A	TABLE OF MS2602A DEVICE-DEPENDENT INITIAL SETTINGS	A-1
APPENDIX B	ASCII*CODE TABLE	B-1
APPENDIX C	COMPARISON TABLE OF CONTROLLER'S GPIB INSTRUCTIONS	C-1

(Blank)

A TABLE OF MS2602A DEVICE-DEPENDENT INITIAL SETTINGS

Table of MS2602A Device-Dependent Initial Settings (1 / 6)

Group	Brief function	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	0Hz	------	0 Hz
	Sets the center frequency	CENTER FREQUENCY	4.25 GHz		4.25 GHz
	Sets the stop frequency	STOP FREQUENCY	8.50GHz	------	8.50 GHz
	Sets the frequency span	FREQUENCY SPAN	8.50GHz	* 0 Hz	8.50 GHz
	Sets the center-frequency step size	CENTER FREQ STEP SIZE	1 GHz		
	Sets the scroll step size	SCROLL STEP SIZE	2 div		
	Selects the band	BAND SELECT	AUTO (0 to 8.5 GHz)		
Level	Sets the reference-level	REFERENCE LEVEL	−10 dBm		
	Sets the reference-level step size	REF LEVEL STEP SIZE	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 dB		
	Sets the display line	DISPLAY LINE	OFF		
	Sets the display line level	DISPLAY LINE LEVEL	−50 dBm		
	Selects the marker level ABS / REL	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		

Table of MS2602A Device-Dependent Initial Settings (2 / 6)

Group	Brief function	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Display mode	Selects 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)	SUB TRACE	------	MAIN TRACE
	Selects the display format for TRACE-A / TIME	DISPLAY FORMAT (TRACE-A / TIME)	SUB TRACE	MAIN TRACE	------
	Selects the mode for processing a waveform	TRACE STORAGE MODE	NORMAL	NORMAL	*NORMAL
	Number of traces averaged	AVERAGE No.	8 times		
	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 expand zone to ON / OFF	EXPAND ZONE ON / OFF	------	OFF	------
	Sets expand mode to ON / OFF	EXPAND ON / OFF	------	OFF	------
	Sets the waveform monitor to ON / OFF	FM / TRIG MONITOR	------	OFF	------
	Sets the bandwidth for demodulating FM	FM RANGE	------	200 kHz /div	------
	Switches the coupling to AC/DC to monitor FM waveforms	FM COUPLING	------	AC COUPLING	------
	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 MARKER CENTER	250 point	250 point	250 point
	Specifies the zone-marker width	ZONE MARKER WIDTH	51 point	* 1 point	501 point
	Sets the multimarker mode to ON / OFF	MULTI MARKER MODE	OFF		
	Sets the multimarker list to ON / OFF	MULTI MARKER LIST	OFF		
	Sets the ' n ' th multimarker to ON / OFF	MULTI MARKER ON / OFF	Not initialized * RST: No.1 = ON, NO.2 to 10 = OFF		
	Selects the active marker from the multimarkers	ACTIVE MARKER No.	Not initialized * RST: No.1		

Table of MS2602A Device-Dependent Initial Settings (3 / 6)

Group	Brief function	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
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 ending gate interval, either 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)	INPUT1		------
	Selects the TV system	TRIGGER SOURCE (TV)	NTSC		------
	Selects TV horizontal synchronous signal	TRIG SOURCE(TV SYNC)	V-SYNC		------
	Selects the number of TV horizontal synchronous signal lines	TV H-SYNC LINE No.	ODD 10		------
	Selects the trigger slope	TRIGGER SLOPE	RISE		------
	Sets the trigger level	TRIGGER LEVEL	25%		------
Writing / reading waveform	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 BANDWIDTH	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

Table of MS2602A Device-Dependent Initial Settings (4 / 6)

Group	Brief function	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
SAVE / RECALL	Select data to be recalled	RECALLED DATA	Not initialized. When shipped from the factory: TRACE & PARAMETER		
Hard copy/plot	Select the printer device mode	PRINTER MODE	Not initialized. When shipped from the factory: HP2225		
	Sets the printer GPIB address	PRINTER GPIB ADDRESS	Not initialized. When shipped from the factory: 17		
	Selects the paper size for plotter	PLOTTER PAPER SIZE	Not initialized. When shipped from the factory: A4		
	Selects the output size from plotter	PLOTTER SIZE	Not initialized. When shipped from the factory: FULL		
	Selects the plot item	PLOT ITEM	Not initialized. When shipped from the factory: ALL		
Sound monitor	Selects the mode for monitoring the sound	AM / FM MONITOR	OFF		
	Adjusts the volume of the sound monitor	MONITOR VOLUME	10		
Measure function	Selects the item to be measured	MEASURE ITEM	OFF		
	Sets the counter to the specified resolution	COUNT RESOLUTION	1 kHz		
	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: 25 dB		
	Selects the adjacent channel	ADJACENT CH SELECT	Not initialized *RST: BOTH SIDES		
	Sets the adjacent separation 1	ADJACENT CH SEPARATION 1	Not initialized *RST: 12.5 kHz		
	Sets the adjacent separation 2	ADJACENT CH SEPARATION 2	Not initialized *RST: 25.0 kHz		
	Sets the adjacent channel bandwidth	ADJACENT CH BANDWIDTH	Not initialized *RST: 8.5 kHz		
	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	MANAGE TEMPLATE	Not initialized. Initialized to OFF at power-on.		
	Selects the noise measurement method	NOISE MEASURE METHOD	Not initialized. *RST: ABS		

Table of MS2602A Device-Dependent Initial Settings (5 / 6)

Group	Brief function	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Measure function	Selects the occupied frequency bandwidth measurement method	OBW MEASURE METHOD	Not initialized. *RST: N %		
	Selects the adjacent channel leakage power measurement method	ADJ-CH MEASURE METHOD	*RST: R : TOTAL POWER		
	Sets the adjacent channel leakage power graph display	ADJ-CH GRAPH	*RST: ON		
	Sets the adjacent channel center line display	ADJ-CH CENTER LINE	*RST: ON		
	Sets the adjacent channel band line display	ADJ-CH BAND LINE	*RST: OFF		
	Sets the window display position for measured results	MEASURE WINDOW POSITION	UPRIGHT		
	Sets the point at which burst power measurement starts	BURST POWER MEASURE START POINT	0 point		
	Sets the point at which burst power measurement ends	BURST POWER MEASURE STOP POINT	0 point		
System setting	Sets the number of data points	DATA POINT NUMBER	Not initialized. When shipped from the factory: 501 point		
	Sets the coupled functions to COMMON or INDEPENDENT between frequency or time domain	COUPLE MODE (COMMON / INDEPENDENT)	Not initialized. When shipped from the factory: COMMON		
Calib-ration	Sets the preselector peaking bias	PRESELECTOR BIAS	Not initialized. When shipped from the factory: 0		
GPIB	Sets the GPIB 2 self address	GPIB2 SELF ADDRESS	Not initialized. When shipped from the factory: 16		
	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: ALL SPACE		
CAL / UNCAL	Displays couple failure	UNCAL DISPLAY	Not initialized. Initialized to ON at power-on.		

Table of MS2602A Device-Dependent Initial Settings (6 / 6)

Group	Brief function	Control item	Initial setting data		
			TRACE-A,B	TRACE-TIME	TRACE-BG
Spectrum data/PMC / ETC	Selects the response data for ASCII / BINARY	RESPONSE DATA	Not initialized. When shipped from the factory: ASCII		
	Selects the media for PMC / floppy disk	MEDIA SELECT	Not initialized. When shipped from the factory: INT PMC		
	Selects the terminator for LF / CR + LF	TERMINATOR	Not initialized. When shipped from the factory: LF		
	Sets the buzzer switch to ON / OFF	BUZZER SWITCH	Not initialized. Initialized to ON at power-on.		

Notes:
- *In place of the parameters not initialized by the INI command (GPIB) or Preset key, the initial settings (Indicated by *RST) initialized by the *RST command (GPIB) are listed in the above table. In place of the parameters not initialized by the *RST command, the values when shipped from the factory are listed.*
- *An initial value marked with ' * ' represents a fixed value.*
- *An initial value marked with ' # ' represents the value at COUPLE MODE = COMMON.*

B ASCII*CODE TABLE

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

KEY

octal
25 PPU
NAK
hex 15 21

GPIB code
ASCII character
decimal

* USA Standard Code for Information Interchange

Table of GPIB Interface Messages (extended)

b7 b6 b5 → / Bits b4 b3 b2 b1 ↓ / ROW ↓	0 0 0	① MSG	0 0 1	MSG	0 1 0	MSG	0 1 1	MSG	1 0 0	MSG	1 0 1	MSG	1 1 0	MSG	1 1 1	MSG
②	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 (PGG)

Secondary command group (SCG)

Notes :

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

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

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

Table of Interface Message Group

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

Table of Address Assignments

Address character		Address switch setting					Primary address	Factory address set device
Talk	Listen	5	4	3	2	1		
b_7 b_6	b_7 b_6	b_5	b_4	b_3	b_2	b_1		
1 0	0 1	↓	↓	↓	↓	↓	10 Decimal	
@	SP	0	0	0	0	0	0	
A	!	0	0	0	0	1	1	
B	"	0	0	0	1	0	2	
C	#	0	0	0	1	1	3	
D	$	0	0	1	0	0	4	
E	%	0	0	1	0	1	5	
F	&	0	0	1	1	0	6	
G	'	0	0	1	1	1	7	
H	(	0	1	0	0	0	8	
I	)	0	1	0	0	1	9	
J	*	0	1	0	1	0	10	
K	+	0	1	0	1	1	11	
L	,	0	1	1	0	0	12	
M	−	0	1	1	0	1	13	Printer 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

(Blank)

C COMPARISON TABLE OF CONTROLLERS' GPIB INSTRUCTIONS

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

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