

W0576AE

ANRITSU CORPORATION

GP-IB
OPERATION MANUAL
ERROR DETECTOR
MP1702A/MP1609A/MP1651A

CERTIFICATION

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

WARRANTY

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

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

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

Copyright © 1990 by ANRITSU CORPORATION
Printed in Japan
All rights reserved. No part of this manual may be reproduced in any form without written permission of ANRITSU CORPORATION.

TABLE OF CONTENTS

SECTION	1	GENERAL	1-1
SECTION	2	GP-IB ADDRESS SETTING	2-1
	2.1	Setting Device Addresses	2-1
	2.2	Pattern Tracking (System Controller) with MP1701A/MP1608A/MP1650A (PPG)	2-2
SECTION	3	GP-IB CABLE CONNECTION	3-1
SECTION	4	INTERFACE FUNCTION	4-1
SECTION	5	GP-IB COMMAND FORMAT	5-1
	5.1	COMMAND FORMAT	5-1
	5.2	Explanation of Symbols and Description	5-1
	5.3	Header Field (HR)	5-2
	5.4	Numeric Data Field (NR)	5-2
	5.4.1	NR1 format (integer type)	5-2
	5.4.2	NR2 format (real number type)	5-3
	5.4.3	Hexadecimal format (HEX type)	5-4
	5.4.4	Binary format (BIN type)	5-5
	5.5	Command Separator	5-6
	5.5.1	SR1 format (semicolon ;)	5-6
	5.5.2	SR1 format (comma ,)	5-6
	5.5.3	SR2 format (line feed LF)	5-7
	5.5.4	SR3 format (END message)	5-7
	5.6	Definition of Space	5-8
SECTION	6	GP-IB MESSAGES	6-1
	6.1	GP-IB Message List	6-1
	6.2	Correspondence with Common Commands	6-11

SECTION	7	DEVICE CLEAR	7-1
SECTION	8	DEVICE TRIGGER	8-1
SECTION	9	MESSAGE BUFFER LENGTH	9-1
SECTION	10	CONTROL MESSAGE AND DATA REQUEST MESSAGE ..	10-1
	10.1	INPUT Section	10-1
	①	Data input threshold voltage ($\overline{\text{Data threshold}}$)	10-2
	②	Data input termination voltage	10-3
	③	Clock input phase ($\overline{\text{Clock phase adjust}}$)	10-4
	④	Clock input termination voltage	10-5
	⑤	(Clock termination)	10-6
	⑥	Delay status ($\overline{\text{Delay unlock?}}$)	10-7
	⑦	Clock input polarity ($\overline{\text{Clock polarity}}$)	10-8
	10.2	PATTERN Section	10-9
	⑧	Output pattern logic ($\overline{\text{Logic mode}}$)	10-10
	⑨	Output pattern ($\overline{\text{Pattern mode}}$)	10-11
	⑩	Output pattern mark ratio ($\overline{\text{Mark ratio mode}}$)	10-12
	⑪	Frame pattern sync ($\overline{\text{Frame sync}}$)	10-14
	⑫	Frame/word length selection ($\overline{\text{Frame/word length}}$) ..	10-15
	⑬	Number of words ($\overline{\text{Number of words}}$)	10-16
	⑭	Word length ($\overline{\text{Word length}}$)	10-18
	⑮	Data length ($\overline{\text{Data length}}$)	11-20
	⑯	Page number ($\overline{\text{Page}}$)	10-22
	⑰	Measurement frame length ($\overline{\text{Frame length}}$)	10-24
	⑱	Pattern bit ($\overline{\text{Pattern bit}}$)	10-25
	⑲	Number of pattern data input bytes	10-28
		(Pattern data $\overline{\text{write}}$)	10-28

Number of pattern data output bytes	⑳
(Pattern data read)	10-30
Pres̄et (all bits on all pages to 0 or 1)	⑳①
Pres̄et (all bits on a page to 0 or 1)	⑳②
MEASUREMENT Section	10-34
Clock loss state (Clock loss intervals?)	⑳③
Sync loss state (Sync loss intervals?)	⑳④
Error detection (Errors?)	⑳⑤
Display mode (Display or measurement)	⑳⑥
Intermediate result display function (Current data) ..	⑳⑦
Measurement mode (Measurement mode)	⑳⑧
Start measurement (Start)	⑳⑨
Stop measurement (Stop)	⑳⑩
Measurement status (Measurements in progress?) ..	⑳⑪
Automatic sync function (Auto sync)	⑳⑫
Selecting real- or measurement-times for display	⑳⑬
(Real time or measurement time)	10-45
Internal timer setting (Rear time setting)	10-46
Measurement time setting (Measurement period) ..	10-47
MEMORY Section	10-48
Memory function switching	⑳⑭
(Memory mode ptn/other)	10-49
File No./directory mode switching	⑳⑮
(File no./directory mode)	10-50
Data recall (Data recall)	⑳⑯
Data save (Data save)	⑳⑰
Data resave (Data resave)	⑳⑱
Floppy disk access status	⑳⑲
(Memory access condition?)	10-55
PRINTER/ALARM MONITOR Section	10-56
Printer function (Printer on/off)	10-57
Manual print (Printer start)	10-58

10-58	43	Manual print (Printer start)
10-59	44	Alarm monitor function (Alarm monitor on/off)
10-60	45	Error detect function (Errors monitor on/off)
10-61	10.6	MEASURE CH MASK SELECT Section
10-62	46	Mask route length selection (Mask route length select)
10-63	47	Number of mask route channels (Measure ch mask select)
10-65	10.7	FUNCTION Section
10-66	48	Number of mark ratio AND bit shifts (Mark ratio bit shift)
10-67	49	Clock loss processing function (Clock loss processing option)
10-68	50	Sync loss processing function (Sync loss processing option)
10-69	51	Error performance threshold selection
10-70	52	Display digit selection (Mantissa display digit)
10-71	53	Intermediate data calculation (Current data calculation)
10-72	54	Error detection mode selection (Error type)
10-73	55	Measurement interval time selection (Interval time)
10-74	56	Data print format selection (Output data format)
10-75	57	Threshold EI/EFI data print selection (Threshold EI/EFI data output)
10-76	58	Error performance data print selection (Error performance data output)
10-77	59	Intermediate data print selection (Intermediate data output option)

One-second data print selection	60
(Output option for one second data)	10-78
One-second data print threshold selection	61
(Data output threshold)	10-79
Paper saving function (Paper saving option)	10-80
Measurement result GP-IB output selection	63
(Measurement type?)	10-81
Other Section	10-82
Service request enable register	64
(Service request enable register)	10-83
Status byte register (Status byte register)	10-85
Standard event status enable register	66
(Event status enable register [Standard])	10-87
Standard event status register	67
(Event status byte register [Standard])	10-89
Extended event status enable register	68
(Event status enable register [Extension])	10-91
Extended event status register	69
(Event status byte register [Extension])	10-93
INITIALIZE (Initialize)	10-95
Intermediate measurement result output function	71
(Output intermediate measurement data?)	10-96
Clear measurement-result-buffer function	72
(Measurement buffer clear)	10-98
Error ratio measurement results (Error ratio?)	10-99
Error count measurement results (Error count?)	10-100
Error intervals measurement results	75
(Error intervals?)	10-102
(Error free interval measurement results	76
(Error free intervals?)	10-103
One-second clock frequency measurement result	77
(Clock frequency?)	10-104

SECTION	11	GP-IB STATUS BYTE	11-1
	11.1	Status Byte Configuration	11-1
	11.2	Description of Registers and Status Bytes	11-3
	11.2.1	SRQ enable register	11-3
	11.2.2	SRQ status byte	11-5
	11.2.3	Standard event status enable register	11-8
	11.2.4	Standard event status byte	11-10
	11.2.5	Extended event status enable register	11-13
	11.2.6	Extended event status byte	11-15
SECTION	12	PATTERN DATA TRANSFER BY DMA	12-1
	12.1	DMA	12-1
	12.2	Commands for Number of Pattern Data Input	
	12.2.1	Number of bytes of pattern data to be transferred	12-2
	12.2.2	Start address of the MP1702A/MP1609A/MP1651A internal RAM to store transferred pattern data and that to output pattern data to be transferred	12-3
	12.3	DMA Program Examples	12-4
SECTION	13	MEASUREMENT RESULT OUTPUT FORMAT	13-1
	13.1	Types of Output Data	13-1
	13.2	Output Format	13-5
	13.2.1	Item data	13-5
	13.2.2	Block data	13-6
	13.2.3	Output Examples	13-9
	13.3	Data Buffering	13-12
SECTION	14	EXECUTING PROGRAMS WRITTEN FOR BY OTHER DEVICES	14-1

SECTION 1 GENERAL

The MP1702A/MP1609A/MP1651A comes equipped with the GP-IB (General Purpose Interface Bus based on IEEE Std. 488.2) as a standard feature. However, the common commands (headers defined in IEEE Std. 488.2 which have an *) are not supported; equivalent control commands are provided in place of these commands.

For details, refer to the relationship between the common commands and the MP1702A/MP1609A/MP1651A commands shown in SECTION 6 GP-IB CONTROL COMMANDS, paragraph 6.2. Also, the MP1702A/MP1609A/MP1651A uses only the necessary standard event status byte functions.

The programmable patterns of the MP1702A/MP1609A/MP1651A can be set via GP-IB, as can the output interface parameters and output parameters. In addition, information on various set patterns parameters can be saved to or read from a 3.5-inch floppy disk. Furthermore, a DMA function enables high-speed transfer of large amounts of pattern data.

In addition to device functions, the MP1702A/MP1609A/MP1651A provides switch-selectable controller functions. The controller functions that can be implemented with the MP1702A/MP1609A/MP1651A are, however, limited to the pattern tracking functions (see paragraph 2.2) that transfer measurement patterns to ANRITSU's Pulse Pattern Generators.

SECTION 2 GP-IB ADDRESS SETTING

2.1 Setting Device Addresses

When using the GP-IB, addresses must be set for each device connected to the bus. To set the GP-IB address of the MP1702A/MP1609A/MP1651A, use the GP-IB ADDRESS switch located on the rear panel.

Addresses 0 to 30 can be set. The five switches are individually weighted so that [5] has a weight of 16, [4] has a weight of 8, [3] has a weight of 4, [2] has a weight of 2, and [1] has a weight of 1. To set the address to 11, for example,

$$11 = 8 + 2 + 1$$

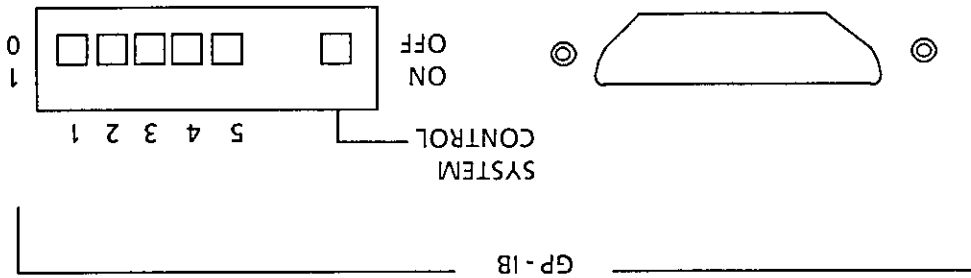
so, set the switches as follows

$$[5] = 0, [4] = 1, [3] = 0, [2] = 1, \text{ and } [1] = 1$$

However, if all switches are set to ON (i.e., 31), the address is assumed to be 0.

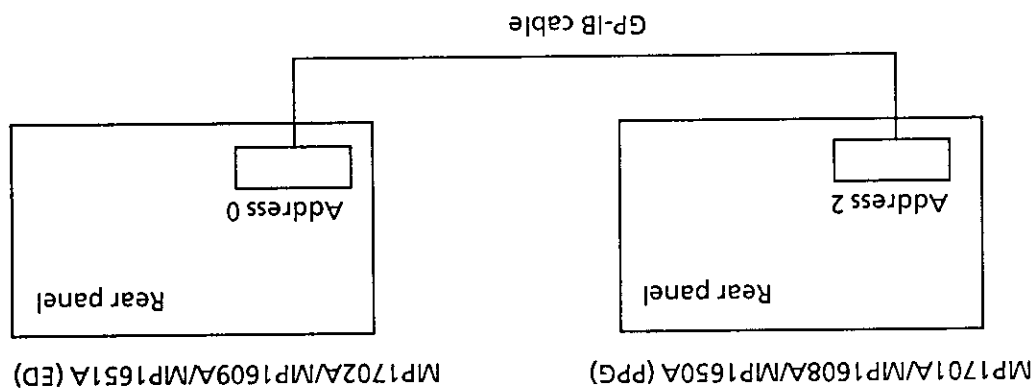
Notes: 1. The MP1702A/MP1609A/MP1651A continuously checks the GP-IB ADDRESS settings as long as the power is on. Therefore, changes in addresses are always accepted.

2. When controlling the MP1702A/MP1609A/MP1651A externally, set the SYSTEM CONTROL on the GP-IB ADDRESS switch to OFF (0).



2.2 Pattern Tracking (System Controller) with MP1701A/MP1608A/MP1650A (PPG)

Step	Procedure
1	Connect the Pulse Pattern Generator (PPG) as shown below.
2	Set SYSTEM CONTROL switch on the MP1702A/MP1609A/MP1651A's GP-IB ADDRESS to ON (1).
3	Set the address of the MP1701A/MP1608A/MP1650A (PPG) to the MP1702A/MP1609A/MP1651A address plus 2. (If the MP1702A/MP1609A/MP1651A address is 0, for example, set the PPG address to "2".)
4	Turn on the power of the MP1702A/MP1609A/MP1651A to enable pattern tracking.



SECTION 3

GP-IB CABLE CONNECTION

Connect the GP-IB cable to the GP-IB connector "GP-IB" located on the rear panel. When connecting the GP-IB cable, fasten the fixing screws to the cable connector, then attach the cable connector to the GP-IB connector of the MP1702A/MP1609A/MP1651A.

Although a GP-IB system can accommodate up to 15 devices, cable lengths are limited as follows:

$$(\text{Total cable length}) \leq 2 \text{ m} \times (\text{number of devices})$$

However, the maximum total length of all cables is 20 m.

The next page shows the GP-IB connection diagram of the MP1702A/MP1609A/MP1651A.

Pin No.	Signal name	Pin No.	Signal name
1	DIO1	13	DIO5
2	DIO2	14	DIO6
3	DIO3	15	DIO7
4	DIO4	16	DIO8
5	EOI	17	REN
6	DAV	18	Signal ground
7	NRPD	19	Signal ground
8	NDAC	20	Signal ground
9	IFC	21	Signal ground
10	SRQ	22	Signal ground
11	ATN	23	Signal ground
12	Shield	24	Signal ground

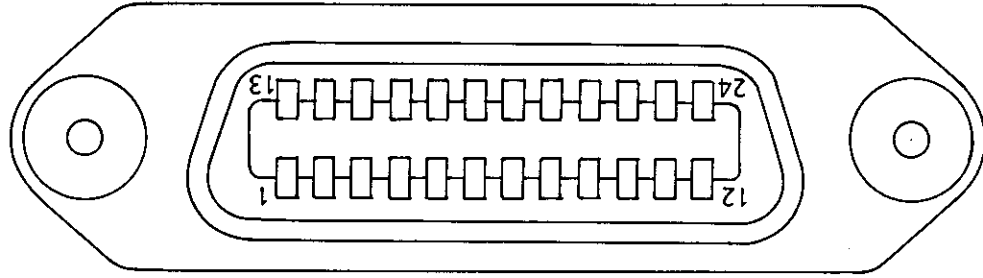


Fig. 3-1 GP-1B Connector

SECTION 4 INTERFACE FUNCTION

The GP-IB interface functions of the MP1702A/MP1609A/MP1651A are listed in Table 4-1.

Table 4-1 GP-IB Interface Functions

Function	Symbol	Explanation
Source handshake	SH1	All source handshake functions provided
Acceptor handshake	AH1	All acceptor handshake functions provided
Talker	T6	Basic talker functions provided Serial polling function provided Talk only function not provided Clear designated talker by listener function provided
Extended talker	TE0	Extended talker function not provided
Listener	L4	Basic listener functions provided Listen only mode function not provided Clear designated listener by talker function provided
Extender listener	LE0	Extended listener function not provided
Service request	SR1	All service request functions provided
Remote/local	RL1	All remote/local functions provided
Parallel polling	PP0	Parallel polling function not provided
Device clear	DC1	All device clear functions provided
Device trigger	DT1	Device trigger functions provided
Controller	C1 C2 C3 C27	System controller functions provided IFC send function provided REN send function provided Interface message function provided
Bus electrical condition	E2	Tri-state driver

SECTION 5

GP-IB COMMAND FORMAT

5.1 COMMAND FORMAT

The MP1702A/MP1609A/MP1651A GP-IB command format consists of a header field that indicates the command type, and a numeric data field that indicates spaces and values. Use at least one space after the header field to separate it from the numeric data field. In the data request message format, the header field, which shows the command type, is followed by [?].

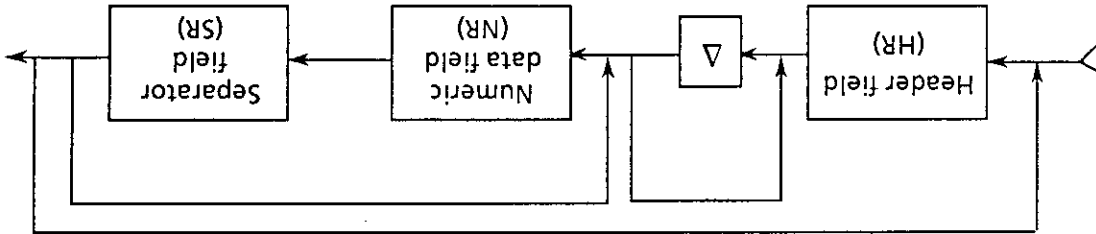
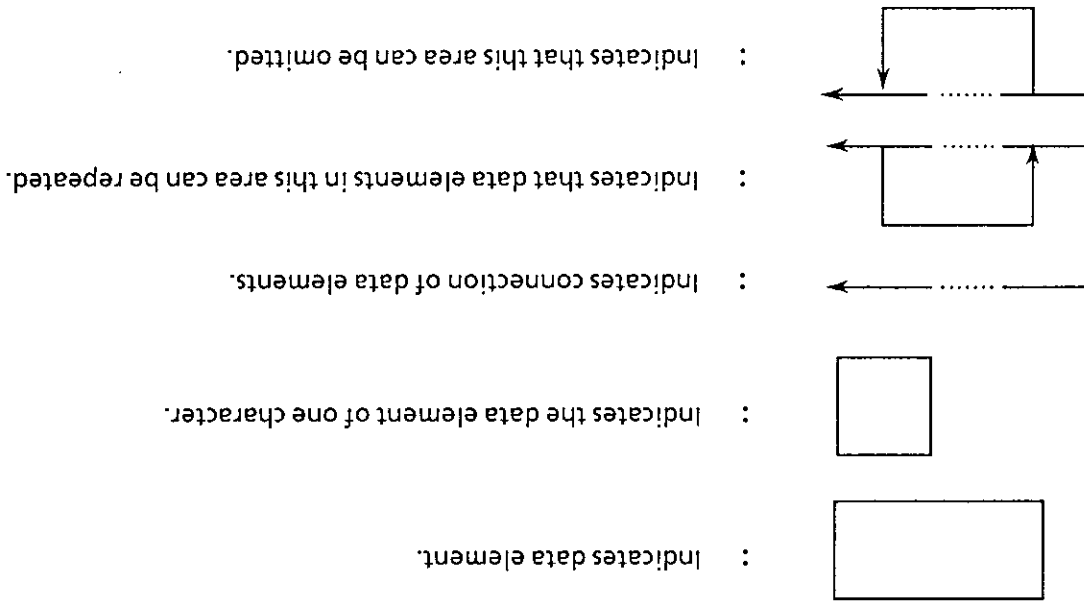


Fig. 5-1 Basic Command Format

5.2 Explanation of Symbols and Description

The method using the figure shown in Fig. 5-1 and the format figures shown in paragraph 5.3 are described below:



5.3 Header Field (HR)

HR2 headers consist of three alphabetic characters (A to Z, a to z).

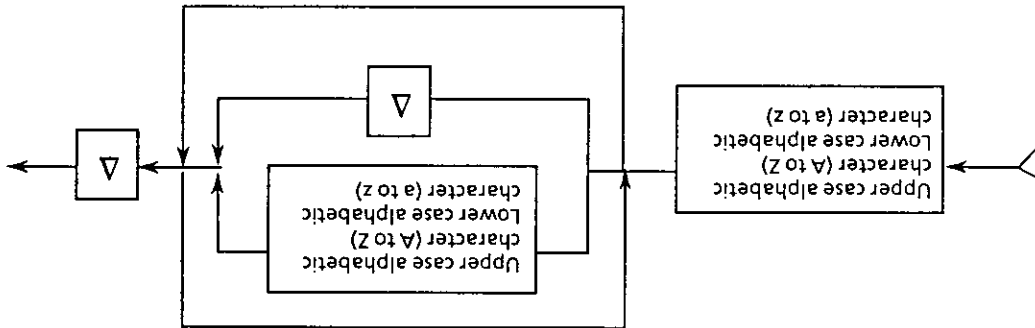


Fig. 5-2 HR2 Format

5.4 Numeric Data Field (NR)

The numeric data field has four formats depending on the command: NRI format (integer type), NR2 format (real number type), Hexadecimal format (HEX type), Binary format (BIN type).

5.4.1 NRI format (integer type)

NRI format is used to represent integers. It consists of a character sign (+, -) followed by a string of integers (0 to 9). The + sign can be omitted, or replaced by a space. Leading spaces can also be inserted to align data, etc.

Examples:

- General representation + 1234, - 567, + 0
- + sign omitted + 1234 → 1234
- + sign replaced + 1234 → Δ1234
- Spaces inserted + 1234 → ΔΔ+1234
- -567 → ΔΔΔ-567

(Δ : Space)

(Δ: Space)

- General representation +1.23, -45.6, -0.12, +34.0, +0.0
- + sign omitted +1.23 → 1.23
- + sign replaced +1.23 → Δ1.23
- Space insertion +1.23 → ΔΔ+1.23
- High-order 0 omitted -0.12 → -.12
- Low-order 0 omitted +34.0 → +34
- +0.0 omitted +0.0 → +0. or +.0

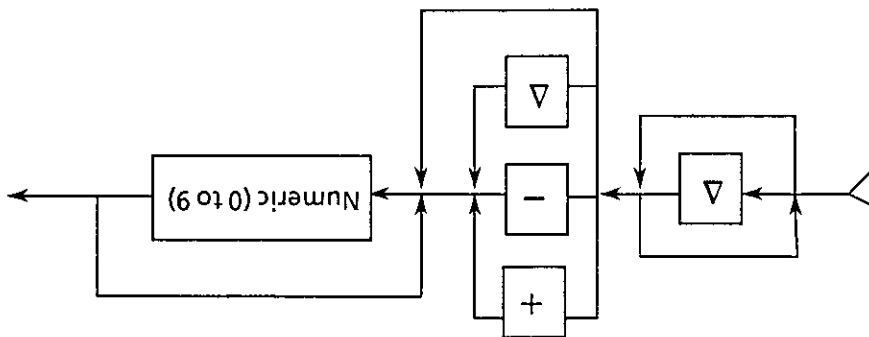
Examples:

NR2 format is used to represent real numbers. It consists of a character sign (+, -) followed by a string of integers (0 to 9), a decimal point (.), and another string of integers (0 to 9).

The + sign can be omitted or replaced and leading spaces can be inserted to align data, as for the NR1 format. When the decimal point is preceded, or followed by 0, the 0 can be omitted.

5.4.2 NR2 format (real number type)

Fig. 5-3 NR1 Format



5.4.3 Hexadecimal format (HEX type)

Hexadecimal format consists of the identifier #H followed a string of integers (0 to 9) and alphabetic characters (A to F). In hexadecimal format, a space can be inserted between the identifier and data. High-order zeros can be omitted.

Examples:

- General representation
#H1234,#H00FF,#H0000
- Spaces inserted
#H1234 → #HΔ1234
- Zeros omitted
#H00FF → #H0FF

(Δ: Space)

#H0000 → #H0
#H00FF → #H0FF
#H00AF → #HΔΔΔ00AF
#H1234 → #HΔ1234

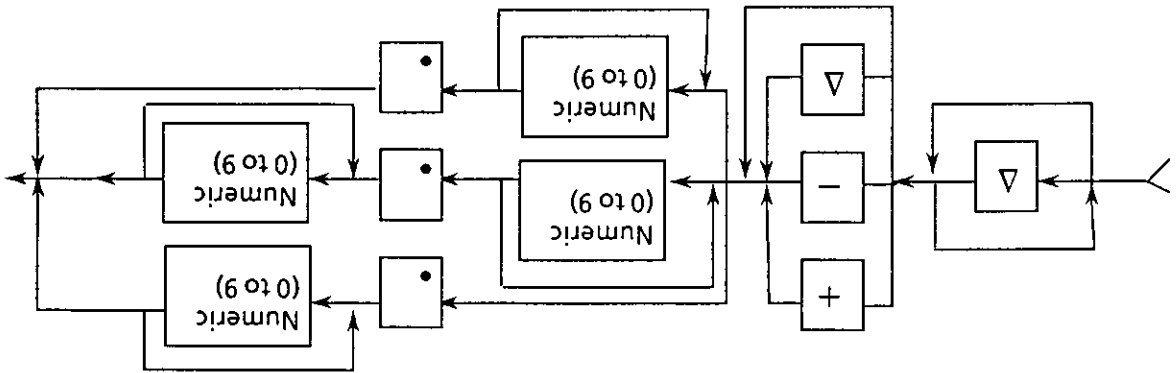
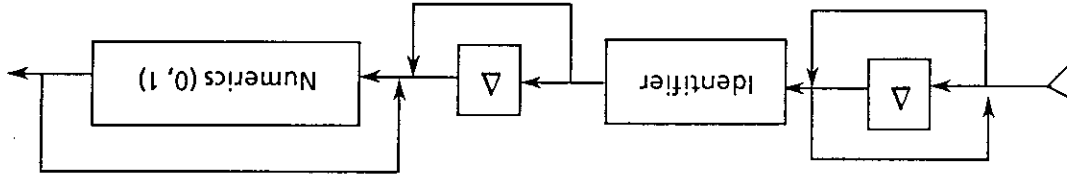


Fig. 5-4 NR2 Format

Fig. 5-6 Binary Format



(Δ: Space)

- General representation
#B11011011,#B00100100,
#B00000000
- Space insertion
#B11011011 → #BΔ11011011
- 0 omission
#B00100100 → #B100100
#B00100100 → #BΔΔΔ00100100

Examples:

When the most significant bit is 0, it can be omitted.

Binary format consists of the identifier #B followed by a string of binary digits (0 and 1). In binary format, a space can be inserted between the identifier and data.

5.4.4 Binary format (BIN type)

Fig. 5-5 Hexadecimal Format

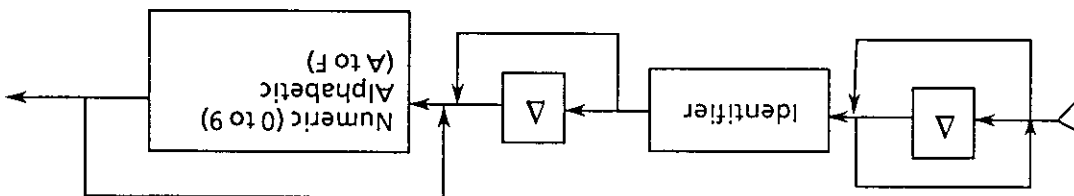
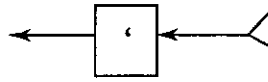


Fig. 5-8 SR1 (Comma,) Format

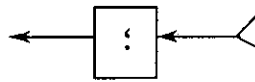


Example: ABC123;45.6 is decoded as two data, "123" and "45.6" following the header "ABC".

The SR1 format (comma,) is used to separate data sent after a header filed.

5.5.2 SR1 format(comma,)

Fig. 5-7 SR1 (Semicolon;) Format



Example: ABC123;DEF45.6 is decoded as two commands, "ABC123" and "DEF45.6".

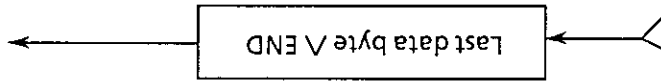
The SR1 format (semicolon;) is used to separate consecutive commands.

5.5.1 SR1 format(semicolon;)

There are four command separators:
 SR1 format (semicolon;) SR1 format (comma,) SR2 format (line feed LF), SR3 format (END message).

5.5 Command Separator

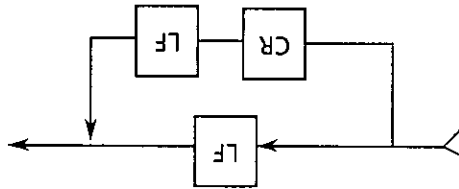
Fig. 5-10 SR3 Format



The SR3 format is used to indicate the end of a command sequence, as does the SR2 format. An END message (EOI line used) can be used as the SR3 format code. (The SR3 and SR2 formats can be used together.)

5.5.4 SR3 format (END message)

Fig. 5-9 SR2 Format



The SR2 format is used to indicate the end of a command sequence. The line feed (LF) code can be used as the SR2 format code. The carriage return (CR) code can also be inserted before the line feed code. When the MP1702A/MP1609A/MP1651A is designated to be a listener, it continues to function as a listener until the SR2 or SR3 format code, described next, is received. When the SR2 format or SR3 format code is received, reception terminates and the received command is decoded.

5.5.3 SR2 format (line feed LF)

5.6 Definition of Space
The MPI702A/MPI609A/MPI651A treats the ASCII codes 00H to 09H and 0BH to 20H as blank spaces.

SECTION 6 GP-IB MESSAGES

6.1 GP-IB Message List

Table 6-1 lists the control messages and data request messages. The messages that can be used depend upon the operation mode. Also, some messages are restricted by conditions that have already been set.

Table 6-1 Outline of GP-IB Commands (1/5)

No.	Function		Header field	Space	Numeric data field	Header field
	Control message	Data request message				
(16)	ADR?	Page number	NRI format			ADR?
(21)	ALL	Preset (all bits on all pages)	NRI format			---
(44)	ALM?	Alarms monitor	NRI format			ALM?
(72)	BCL	Measurement result buffer clear	---		---	---
(18)	BIT	Pattern bit	NRI format			BIT?
			Hexadecimal format			
(53)	CAL	Intermediate data calculation	---			CAL?
(23)	---	Clock loss state	---			CLP?
(49)	CLS	Clock loss processing	NRI format			CLS?
(3)	CPA	Clock input phase (delay)	NRI format			CPA?
(6)	CPL	Clock input polarity	NRI format			CPL?
(4)	CTM	Clock input termination voltage	NRI format			CTM?
(27)	CUR	Intermediate result display	NRI format			CUR?
(52)	DGT	Display light selection	NRI format			DGT?

Table 6-1 Outline of GP-IB Commands (2/5)

No.	Function		Header field	Space	Control message	
	Data request message	Header field			Numeric data field	Header field
(15)	Measurement data length	DLN			NRI format	DLN?
(5)	Delay status	---			---	DLY?
(26)	Display mode	DMS			NRI format	DMS?
(61)	One-second data print threshold selection	DOT			NRI format	DOT?
(1)	Data input threshold voltage	DTH			NR2 format	DTH?
(2)	Data input termination voltage	DTM			NRI format	DTM?
(74)	Error count measurement results	---			---	EC?
(69)	Extended event status register	---			---	EER?
(68)	Extended event status enable register	EES			NRI format	EES?
(76)	Error-free internal measurement results	---			---	EFI?
(75)	Error interval measurement results	---			---	EI?
(68)	Error performance data print selection	EPF			NRI format	EPF?
(73)	Error ratio measurement results	---			---	ER?
(25)	Error detection status	---			---	ERS?
(66)	Standard event status enable register	ESE			NRI format	ESE?
(67)	Standard event status register	---			---	ESR?
(51)	Error performance threshold	ETH			NRI format	ETH?

No.	Control message			Function	
	Data request message	Numeric data field	Header field	Space	Header field
54	ETYP?	NRI format		ETYP	Error detection mode selection
37	FIL?	NRI format		FIL	File No./directory mode switching
17	FLN?	NRI format		FLN	Measurement frame length
56	FMT?	NRI format		FMT	Data print format selection
12	FRM?	NRI format		FRM	Frame/word length selection
77	FRQ?	---		---	One-second clock frequency measurement result
11	FSY?	NRI format		FSY	Frame patterns synchronization
71	IMD?	---		---	Intermediate measurement result output
70	---	---		INI	Initialization
59	ITM?	NRI format		ITM	Intermediate data print selection
55	ITV?	NRI format		ITV	Measurement interval time selection
8	LGC?	NRI format		LGC	Measurement pattern logic
41	MAC?	---		---	Floppy disk access status
36	MEM?	NRI format		MEM	Memory function switching
28	MOD?	NRI format		MOD	Measurement mode
45	MON?	NRI format		MON	Error detection
10	MRR?	NRI format		MRR	Measurement pattern mark ratio
46	MSK?	NRI format		MSK	Mask route length selection

Table 6-1 Outline of GP-IB Commands (3/5)

No.	Control message			Function	
	Data request message	Numeric data field	Header field	Space	Header field
31	MSR?	---	---	---	Measurement status
63	MTY?	---	---	---	Measurement result GP-IB output select status
60	OSC?	NRI format		OSC	One-second data print selection
16	PAG?	NRI format		PAG	Page number
35	PRD?	NRI format		PRD	Measurement time setting
42	PRN?	NRI format		PRN	Print function
43	---	---		PSA	Manual printing
22	---	NRI format		PST	Preset (all bits on 1 page)
62	PSV?	NRI format		PSV	Paper saving function
9	PTN?	NRI format		PTN	Measurement pattern
38	---	NRI format		RCL	Data recall
20	---	NRI format		RED	Number of pattern data output bytes
40	---	NRI format		RSV	Data resave
34	RTM?	NRI format		RTM	Internal timer setting
39	---	NRI format		SAV	Data save
47	SCH?	Binary format		SCH	Number of mask route channels
48	SFT?	NRI format		SFT	Number of mark ratio AND bit shifts
24	SLI?	---		---	Sync loss state

Table 6-1 Outline of GP-IB Commands (4/5)

No.	Control message		Header field	Space	Header field	Function
	Data request message	Numeric data field				
50	SLS?	NRI format			SLS	Sync loss processing
7	SRH?	NRI format			SRH	Automatic phase threshold search
64	SRQ?	NRI format			SRQ	Service request enable register
29	—	—			STA	Start measurement
65	STB?	—				Status byte register
30	—	—			STO	Stop measurement
32	SYN?	NRI format			SYN	Automatic synchronization
57	THR?	NRI format			THR	Threshold EI/EPI data print selection
33	TIM?	NRI format			TIM	Real-time/measurement-time display switching
14	WLN?	NRI format			WLN	Word length
13	WNB?	NRI format			WNB	Number of words
19	—	NRI format			WRT	Number of pattern data input bytes

Table 6-1 Outline of GP-IB Commands (5/5)

Common Command	Corresponding Command	No.	Item on IEEE 488.2 standard
*IDN?	————	————	10.14
*RST	————	————	10.32
*TST?	————	————	10.38
*OPC	————	————	10.18
*OPC?	————	————	10.19
*WAI	————	————	10.39
*CLS	————	————	10.3
*ESE	ESE	(66)	10.10
*ESE?	ESE?	(66)	10.11
*ESR?	ESR?	(67)	10.12
*PSC	————	————	10.25
*PSC?	————	————	10.26
*SRE	SRQ	(64)	10.34
*SRE?	SRQ?	(64)	10.35
*STB?	STB?	(65)	10.36

Table 6-2 Correspondence with Common Commands

6.2 Correspondence with Common Commands

The relationship between the common commands defined by IEEE 488.2 and the MP1702A/MP1609A/MP1651A commands is shown in Table 6-2. The common commands in the table below are defined as essential commands by IEEE 488.2. For a detailed description of the common commands, refer to IEEE 488.2.

SECTION 7 DEVICE CLEAR

When the MP1702A/MP1609A and MP1651A receive the device clear command, they are re-initialized to the power-on state.

If the device clear command is received during a measurement, the measurement is aborted and all measurement data are lost.

At the same time, the rear-panel functions are also re-initialized according to the DIP switch settings. (As the mode is switched from REMOTE to LOCAL, the rear-panel functions are also re-initialized according to the DIP switch settings.)

Furthermore, if the device clear command is received while the floppy disk is being accessed then that, access is aborted.

When the device trigger command is received, the MP1702A/MP1609A/MP1651A operate as though they had received an STA command.

SECTION 8 DEVICE TRIGGER

Also note that the maximum length of messages output by the MP1702A/MP1609A/MP1651A is 512 bytes.

256 characters or less

DTMΔ0; PTNΔ0;; MEMΔ0 (CR/LF)

The maximum message length for data accepted by the MP1702A/MP1609A/MP1651A is 256 bytes (256 characters). Messages longer than 256 bytes are not input to the MP1702A/MP1609A/MP1651A. Therefore, the maximum length of a single GP-IB command line is 256 characters including CR/LF codes.

SECTION 9 MESSAGE BUFFER LENGTH

SECTION 10 CONTROL MESSAGE AND DATA REQUEST MESSAGE

The following examples use HP-BASIC language of the Hewlett-Packard HP9000 series computer.

10.1 INPUT Section

The following pages describe the GP-IB messages of the INPT section. Δ indicates a space.

① Data input threshold voltage (Data threshold)

Set value	Control message	Data request message	Output message
-3.000 V ⋮ +1.750 V	DTHΔ-3.000 ⋮ DTHΔ+1.750	DTH?	DTHΔ-3.000 ⋮ DTHΔ+1.750
The resolution is 0.002 V.			

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "DTHΔ-3.0"

The data input threshold voltage becomes -3.0 V.

Data request message

When the data input threshold voltage is -3.0 V

OUTPUT 700; "DTH?"

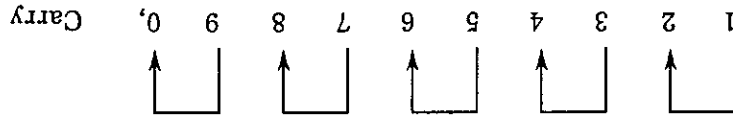
ENTER 700; B\$

PRINT B\$

↑

DTHΔ-3.000 (CR/LF) is output.

Note: If the third decimal place of the number representing the threshold voltage is not a multiple of 0.002 V, then the number is rounded up to the nearest effective value as shown below.



② Data input termination voltage (Data termination)

Set value	DTMΔ0	DTMΔ1	DTMΔ1
Control message	DTMΔ0	DTMΔ1	DTMΔ1
Data request message	DTM?	DTM?	DTMΔ1
Output message	DTMΔ0	DTMΔ1	DTMΔ1

Restrictions

Control message

- In the following cases, this message is invalid and a buzzer rings:
- When the AUTO SEARCH function is ON
 - When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "DTMΔ0"

Sets the data input termination voltage to GND.

Data request message

When the data input termination voltage is GND

OUTPUT 700; "DTM?"

ENTER 700;B\$

PRINT B\$

↑

DTMΔ0 (CR/LF) is output.

③ Clock input phase (Clock phase adjust)

MP1702A/MP1609A				
Set value	Control message	Data request	Output message	Setting Resolution
+ 500 ps ⋮ - 500 ps	CPAΔ500 ⋮ CPAΔ-500	CPA?	CPAΔΔΔ 500 ⋮ CPAΔΔ-500	1 ps

MP1651A				
Set value	Control message	Data request	Output message	Setting Resolution
+ 1000 ps ⋮ - 1000 ps	CPAΔ1000 ⋮ CPAΔ-1000	CPA?	CPAΔΔ 1000 ⋮ CPAΔ-1000	2 ps

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "CPAΔ500"

Sets the clock input phase to 500 ps.

Data request message

OUTPUT 700; "CPA?"

When the clock input phase is 500 ps

ENTER 700;B\$

PRINT B\$

↑

CPAΔΔΔ500 (CR/LF) is output.

④ Clock input termination voltage (Clock termination)

Set value	Control message	Data request message	Output message
GND	CTMA0	CTM?	CTMA0
-2 V	CTMA1	CTM?	CTMA1

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

• When the AUTO SEARCH function is ON

• When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "CTMA0"

Sets the clock input termination voltage to GND.

Data request message

When the clock input termination voltage is GND

OUTPUT 700; "CTM?"

ENTER 700;B\$

PRINT B\$



CTMA0 (CR/LF) is output.

⑤ Delay status (Delay unlock?)

Set value	Control message	Data request message	Output message
READY	—	DLY?	DLYΔ0
BUSY			DLYΔ1

Restrictions

Data request message

None

Examples

Data request message

When the clock-input-phase servo circuit is in a READY state

OUTPUT 700; "DLY?"

ENTER 700;B\$

PRINT B\$

↑

DLYΔ0 (CR/LF) is output.

Note: READY means that the clock-input-phase servo circuit is not in operation. BUSY means that the clock-input-phase servo circuit is in operation.

⑥ Clock input polarity (Clock polarity)

Set value	Control message	Data request message	Output message
CLK	CPLA0	CPLA0	CPLA0
<u>CLK</u>	CPLA1	CPLA1	CPLA1

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "CPLA0"

Sets the clock input polarity to CLK.

When the clock input polarity is CLK.

OUTPUT 700; "CPL?"

ENTER 700;B\$

PRINT B\$

↑

CPLA0 (CRL/R) is output.

⑦ Automatic phase threshold search (Ango search)

Set value	Control message	Data request message	Output message
Auto search OFF	SRHΔ0	SRH?	SRHΔ0
Auto search ON	SRHΔ1		SRHΔ1
When search cannot be performed.	—		SRHΔ2

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SYNC function is OFF
- When the measurement pattern mark ratio is 0/8 or 8/8
- When the mark ratio of the pattern data is less than 1/8 or greater than 7/8 while the measurement pattern PRGM mode
- When the clock is lost
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "SRHΔ0"

Switches the AUTO SEARCH function to OFF.

Data request message

When the AUTO SEARCH function is OFF

OUTPUT 700; "SRH?"

ENTER 700;B\$

PRINT B\$

↑

SRHΔ0 (CR/LF) is output.

10.2 PATTERN Section

The following pages describe the GP-IB messages in the PATTERN section.
Δ indicates a space.

Positive logic	0/8	1/8	1/4	1/2
Negative logic	8/8	7/8	3/4	<u>1/2</u>

Note: When the output pattern is a PRBS pattern and the output pattern logic is changed, the output pattern mark ratio is automatically adjusted.

LGCA0 (CR/LF) is output.

↑

PRINT B\$

ENTER 700;B\$

OUTPUT 700; "LGC?"

When output pattern logic is positive logic (POSITIVE)

Sets positive Output pattern logic (POSITIVE).

OUTPUT 700; "LGCA0"

Control message

Examples

Data request message

None

• When floppy disk is being accessed

• When the AUTOSEARCH function is ON

In the following cases, this message is invalid and the buzzer rings:

Control message

Restrictions

Set value	Control message	LGCA0	LGCA1
Positive logic (POSITIVE)		LGCA0	LGCA1
Negative logic (NEGATIVE)		LGCA0	LGCA1
	Data request message	LGCA0	LGCA1
	Output message	LGCA0	LGCA1

⑧ Output pattern logic (Logic mode)

⑨ Output pattern (Pattern mode)

Set value	Control message	Data request message	Output message
PRGM.WORD	PTNA0	PTN?	PTNA0
PRGM.DATA	PTNA1		PTNA1
PRBS 27-1	PTNA2		PTNA2
PRBS 29-1	PTNA3		PTNA3
PRBS 211-1	PTNA5		PTNA5
PRBS 215-1	PTNA6		PTNA6
PRBS 220-1	PTNA7		PTNA7
PRBS 223-1	PTNA8		PTNA8
PRBS 231-1	PTNA9		PTNA9

Restrictions

Control message

In the following cases, the message is invalid and the buzzer rings:

- When PTNA4 is set

- When the AUTO SEARCH function is ON

- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "PTNA0"

Sets the PRGM.WORD word pattern.

Data request message

When output pattern is PRGM.WORD

OUTPUT 700; "PTN?"

ENTER 700;B\$

PRINT B\$

↑

PTNA0 (CR/LF) is output.

Note: PRGM: Programmable pattern, PRBS: Pseudorandom pattern

When the output pattern is a PRBS pattern, the previous output pattern mark ratio and settings are used.

⑩ Output pattern mark ratio ($\overline{\text{Mark}}$ ratio mode)

Set value	Control message	Data request message	Output message
Positive logic : 0/8 Negative logic : 8/8	MRKΔ0	MRKΔ0	MRKΔ0
Positive logic : 1/8 Negative logic : 7/8	MRKΔ1	MRKΔ1	MRKΔ1
Positive logic : 1/4 Negative logic : 3/4	MRKΔ2	MRKΔ2	MRKΔ2
Positive logic : 1/2 Negative logic : 1/2	MRKΔ3	MRKΔ3	MRKΔ3

Restrictions

Control message

In the following cases, this message is invalid and the buzzer rings:

- When output pattern is in PRGM. (WORD or DATA) mode
 - When AUTO SEARCH function is ON
 - When floppy disk is being accessed
- In the following case, this request message is invalid and ERR is output:
- When the output pattern is PRGM. (WORD or DATA) mode

Examples

Control message

When output pattern logic is positive (POSITIVE) and the output pattern is a PRGM pattern.
OUTPUT 700; "MRKΔ0"

Sets the output pattern mark ratio to 0/8.

When output pattern mark ratio is 0/8.

OUTPUT 700; "MRK?"

ENTER 700;B\$

PRINT B\$

MRKΔ0 (CRLF) is output.

When output pattern is in PRGM (WORD or DATA) mode

OUTPUT 700; "MRK?"

ENTER 700;B\$

PRINT B\$

ERR (CRLF) is output.

Note: When the output pattern is a PRBS pattern, the previous output pattern mark ratio and settings are used.

⑪ Frame pattern sync (Frame sync)

Set value	Control message	Data request message	Output message
OFF	FSYΔ0	FSY?	FSYΔ0
ON	FSYΔ1	FSY?	FSYΔ1

Restrictions

- Control message
- In the following cases, this message is invalid and a buzzer rings:
- When measurement pattern is the PRBS mode
 - When the measurement data length is less than 1024
 - When the measurement bit length (number of words × word length) is less than 1024
 - When the AUTO SEARCH function is ON
 - When floppy disk is being accessed
- Data request message
- In the following cases, the message is invalid and an error (ERR) is output.
- When the measurement pattern is a PRBS pattern

Examples

Control message

OUTPUT 700; "FSYΔ0"

Switches the frame pattern sync function OFF

Data request message

OUTPUT 700; "FSY?"

When the frame pattern sync function is OFF

PRINT B\$

ENTER 700;B\$

OUTPUT 700; "FSY?"

When the measurement pattern is a PRBS pattern

FSYΔ0 (CR/LF) is output.

↑

PRINT B\$

ENTER 700;B\$

OUTPUT 700; "FSY?"

ERR (CR/LF) is output.

⑫ Frame/word length selection (Frame/word length)

Set value	Control message	Data request message	Output message
WORD (normal mode)	FRMA0	FRMA1	FRMA0
FRAME (frame length mode)	FRMA1	FRMA2	FRMA1

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the frame pattern sync function is OFF
- When the measurement pattern is a PRBS pattern
- When the measurement data length is less than 1024
- When the measurement bit length (number of words × word length) is less than 1024
- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

In the following cases, the message is invalid and error (ERR) is output

- When the measurement pattern is a PRBS pattern

Examples

Control message

OUTPUT 700; "FRMA0"

Switches the frame/word length selection to WORD (normal mode)

Data request message

When the frame/word length selection is WORD (normal mode)

OUTPUT 700; "FRM?"

ENTER 700; B\$

PRINT B\$

FRMA0 (CR/LF) is output.

When the measurement pattern is a PRBS pattern

OUTPUT 700; "FRM?"

ENTER 700; B\$

PRINT B\$

ERRΔ0 (CR/LF) is output.

Note (Cont.): When the desired number of words cannot be set, an optimal number derived by comparing the displayed value to the input value is set.

Example: For a word length of 2

When 2100 is input as the number of words, t is changed to 2048 and displayed.

If 2100 is input again, the number of words changes to 2112.

Table 10-1 Relationship between Word Length and Number of Words

Word length	Step width	Range	Number of words	
			Step width	Range
2	1 step	1 to 2048	64 step	2112 to 32768
3	1 step	1 to 1365	128 step	1408 to 32768
4	1 step	1 to 1024	32 step	1056 to 32768
5	1 step	1 to 819	128 step	896 to 32768
6	1 step	1 to 682	64 step	704 to 32768
7	1 step	1 to 585	128 step	640 to 32768
8	1 step	1 to 512	16 step	528 to 32768
9	1 step	1 to 455	128 step	512 to 32768
10	1 step	1 to 409	64 step	448 to 32768
11	1 step	1 to 372	128 step	384 to 32768
12	1 step	1 to 341	32 step	352 to 32768
13	1 step	1 to 315	128 step	384 to 32768
14	1 step	1 to 292	64 step	320 to 32768
15	1 step	1 to 273	128 step	384 to 32768
16	1 step	1 to 256	8 step	264 to 32768

①4 Word length (Word length)

Set value	Control message	Data request message	Output message
2	WLNΔ 2	WLNΔ 2	WLNΔΔ 2
⋮	⋮	⋮	⋮
1 6	WLNΔ 1 6	WLNΔ 1 6	WLNΔ 1 6

The set value is every step in the table above.

Restrictions

- Control message
- In the following cases, this message is invalid and a buzzer rings:
- When the output pattern is not a WORD pattern
 - When FRAME of FRAME/WORD LENGTH is not selected
 - When the AUTO SEARCH function is ON
 - When floppy disk is being accessed
- Data request message
- In the following cases, this request message is invalid and ERR is output:
- When the output pattern is not a WORD pattern
 - When FRAME of FRAME/WORD LENGTH is selected

Examples

- Control message
- When the output pattern is WORD pattern
- OUTPUT 700; "WLNΔ2"
- Sets the word length to 2.
- When the word length is 2
- OUTPUT 700; "WLN?"
- ENTER 700;B\$
- PRINT B\$
- ↑
- WLNΔΔ2 (CR/LF) is output.
- When the output pattern is not a WORD pattern
- OUTPUT 700; "WLN?"
- ENTER 700;B\$
- PRINT B\$
- ↑
- ERR (CR/LF) is output.
- Data request message

Note: If the number of words is not compatible with the word length setting, it is automatically optimized. (See Table 10-1 on the preceding page.)

⑮ Data length (Data length)

Set value	Control message	Data request message	Output message
2	DLNΔ 2	DLNΔ524288	DLNΔΔΔΔΔΔΔ2
5 2 4 2 8 8	DLNΔ524288	DLNΔ524288	DLNΔ524288

However, there are some restrictions on the step value in the table above.

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the output pattern is not a DATA pattern
- When FRAME of FRAME/WORD LENGTH is selected
- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

In the following cases, this request message is invalid and ERR is output:

- When the output pattern is not a DATA pattern
- When FRAME of FRAME/WORD LENGTH is selected

Examples

Control message

When the output pattern is a DATA pattern
 OUTPUT 700; "DLNΔ2"

Sets the data length to 2.

When data length is 2

OUTPUT 700; "DLN?"

ENTER 700;B\$

PRINT B\$

DLNΔΔΔΔΔΔΔ2 (CRLF) is output.

When the output pattern is not a DATA pattern

OUTPUT 700; "DLN?"

ENTER 700;B\$

PRINT B\$

ERR (CRLF) is output.

Data length	Step width
4224 to 524288	128 steps 128N (N = 33 to 4096)
2 to 4096	1 step 524288/128 = 4096

Table 10-2 Numerical Relationship of Data Length

Note: Depending on the data length, data is increment in 1 step or 128 steps. (See Table 10-2.)
 When the input data length is invalid, an optimal value is automatically set by comparing the currently displayed value to the input value.
 When an invalid data length,
 Example:
 When 4100 is input, it is changed to 4096 and displayed.
 If 4100 is input again, the data length is changed to 4224 and displayed.

Set value	Control message	Data request message	Output message
1 : : : 3 2 7 6 8	PAGΔ 1 : : : PAGΔ32768	PAG? 1 : : : PAGΔ32768	PAGΔΔΔΔΔ 1 : : : ADRΔ32768
1 : : : 3 2 7 6 8	ADRΔ 1 : : : ADRΔ32768	ADR? 1 : : : ADRΔ32768	ADRΔΔΔΔΔ 1 : : : ADRΔ32768

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the output pattern is a PRBS pattern
- When AUTO SEARCH function is ON
- When floppy disk is being accessed

In the following case, this message is invalid and ERR is output:

- When the output pattern is a PRBS pattern

Examples

Control message

When the output pattern is a PRGM pattern

OUTPUT 700; "PAGΔ1"

Sets the page number to 1.

OUTPUT 700; "ADRΔ1"

Sets page number to 1.

When the page number is 1

OUTPUT 700; "PAG?"

ENTER 700;B\$

PRINT B\$

↑

PAGΔΔΔΔΔΔ1 (CR/LF) is output.

OUTPUT 700; "ADR?"

ENTER 700;B\$

PRINT B\$

↑

ADRΔΔΔΔΔΔ1 (CR/LF) is output.

Output pattern	WORD	1 to maximum number of words, in 1 word steps										
DATA	1 to value not more than (data length ÷ 16), in single steps (When remainder is 0, up to value of quotient, and when there is a remainder, up to value of quotient + 1, 1 step width)	<table border="1"> <tr> <td><u>Data length</u></td> <td><u>Page number</u></td> </tr> <tr> <td>2 to 16</td> <td>1</td> </tr> <tr> <td>17 to 32</td> <td>2</td> </tr> <tr> <td>33 to 48</td> <td>3</td> </tr> <tr> <td>49 to</td> <td></td> </tr> </table>	<u>Data length</u>	<u>Page number</u>	2 to 16	1	17 to 32	2	33 to 48	3	49 to	
<u>Data length</u>	<u>Page number</u>											
2 to 16	1											
17 to 32	2											
33 to 48	3											
49 to												

Table 10-3 Relationship between Number of Page and WORD/DATA Pattern

When the output pattern is a PRBS pattern
 OUTPUT 700; "PAG?"
 ENTER 700;B\$
 PRINT B\$
 ↑
 FRR (C/R/L/F) is output.

Note: There are two commands for setting page number PAG and ADR.
 They have the same function. The maximum page number depends on the number of words,
 word length, and data length.
 The page number may not exceed the maximum allowed page number.
 Example
 When the data length = 32 and the displayed page number = 1, the maximum page
 number is 2.
 If PAGΔ3 is input, the displayed page number is changed to page 2.

①7 Measurement frame length (Frame length)

Set value	Control message	Data request message	Output message
4	FLNA 4	FLN?	FLNΔ4
⋮	⋮	⋮	⋮
32	FLNA 32		FLNΔ32
Step values are set in multiples of 4.			

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the frame/word length selection is WORD
 - When the measurement pattern is a PRBS pattern
 - When the frame length is not a multiple of 4
 - When the AUTO SEARCH function is ON
 - When floppy disk is being accessed
- In the following cases, the message is invalid and error (ERR) is output:
- When the frame/word length selection is WORD (normal mode)
 - When the measurement pattern is a PRBS pattern

Data request message

Examples

Control message

OUTPUT 700; "FLNΔ4"
Sets the frame length to 4.

Data request message

When the frame length is 4
OUTPUT 700; "FLN?"

ENTER 700;B\$
PRINT B\$

FLNΔ4 (CR/LF) is output.

When the frame/word length selection is WORD (normal mode)

OUTPUT 700; "FLN?"

ENTER 700;B\$

PRINT B\$

ERR (CR/LF) is output.

⑱ Pattern bit (Pattern bit)

Set value	Control message		Data request message
0 : : 65535	BITΔ0 : : BITΔ65535	BITΔ0#H0000 : : BITΔ#HFFFF	BIT?
Output message image			
<p>The current page number and the contents of the bits up to 8 pages are output in the following format:</p> <p>PAGΔ****;BITΔ#H****, #H****, #H****, #H****, #H****, #H****, #H****, #H****</p>			

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the output pattern is a PRBS pattern
- When the AUTOSEARCH function is ON
- When floppy disk is being accessed

Data request message

In the following case, this request message is invalid and ERR is output:

When the output pattern is a PRBS pattern

Examples

Control message

When the output pattern is a PRGM pattern and the bit pattern of 3 pages from the currently set page is set.

OUTPUT 700; "BITΔ10,20,30"

OUTPUT 700; "BITΔ#HFFFF, #H1000, #H2000"

Bit patterns on consecutive pages can be set by separating data from each other with a comma (,).

When setting the page number and pattern bit of 4 pages from the current page.

OUTPUT 700; "PAGΔ10;BITΔ10,20,30,40"

OUTPUT 700; "PAGΔ10;BITΔ#HFFFF, #H1000, #H2000, #H3000"

OUTPUT 700; "ADRΔ10;BITΔ10,20,30,40"

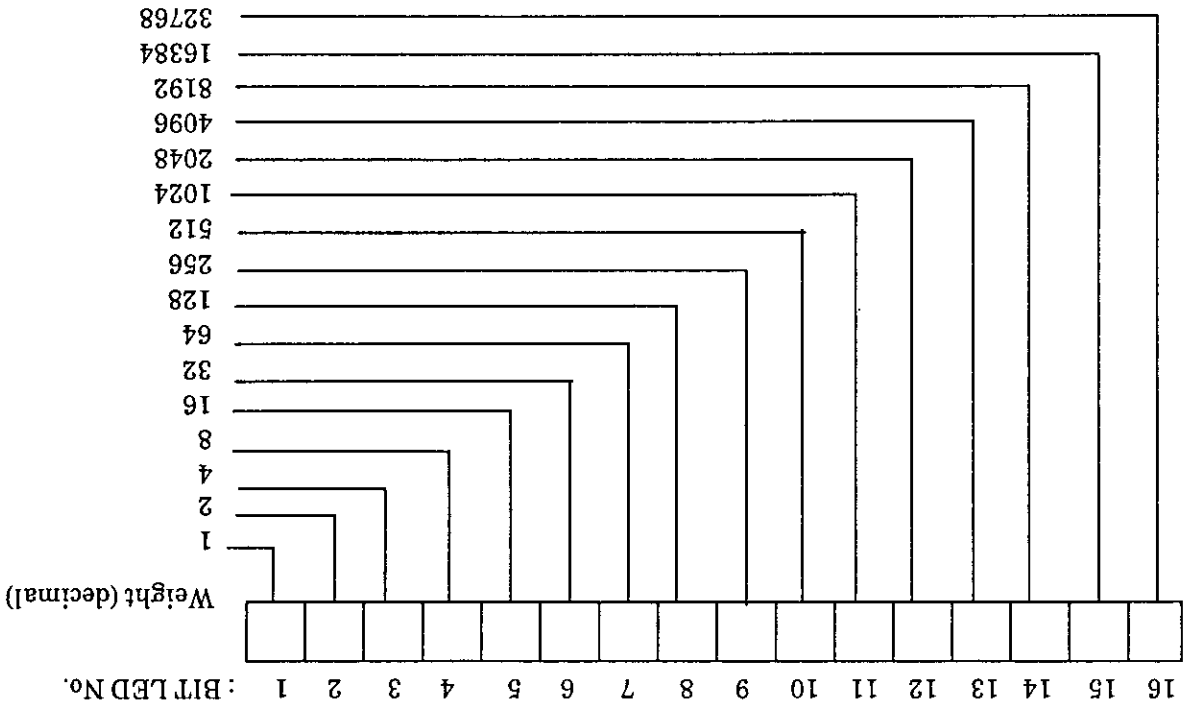
OUTPUT 700; "ADRΔ10;BITΔ#HFFFF, #H1000, #H2000, #H3000"

Data request message When the page number is 1 and the maximum page number is 29, data appears in the following format.

```
OUTPUT 700; "BIT?"  
FOR I = 1 to 4  
ENTER 700; B$  
PRINT B$  
NEXT I "  
↑  
PAGΔΔΔΔΔ1;BITΔ#H0000,#H0000,#H0000,#H0000  
PAGΔΔΔΔΔ9;BITΔ#H0000,#H0000,#H0000,#H0000  
PAGΔΔΔΔ17;BITΔ#H0000,#H0000,#H0000,#H0000  
PAGΔΔΔΔ25;BITΔ#H0000,#H0000,#H0000,#H0000  
When output pattern is a PRBS pattern  
OUTPUT 700; "BIT?"  
ENTER 700; B$  
PRINT B$  
↑  
ERR (CR/LF) is output.
```


Note: Pattern bits are set for the page whose number is given in the NR field. Bit patterns for consecutive pages can be separated with commas (,). However, when the output pattern is a WORD pattern, the number of pattern bits must not exceed the set word-length bits; when the output pattern is a DATA pattern, they are restricted to up to number of bits of quotient [data length / 16; when remainder is 0, up to all bits.]

- BitA1 : Only BIT LED
- BitA16 : Only BIT LED
- BitA10 : Only BIT LED
- BitA#H000F : Only BIT LED's
- BitA#H00F0 : Only BIT LED's
- BitA#H1000 : Only BIT LED
- BitA#HA000 : Only BIT LED's
- Nos. 1 to 4 are set. (Decimal: 15)
- Nos. 2 and 4 are set.
- Nos. 5 to 8 are set. (Decimal: 240)
- Nos. 13 is set. (Decimal: 4096)
- Nos. 14 and 16 are set. (Decimal 40960)



The relationship between the actual bit pattern and data values are shown below:
Set value and bit weight

①9 Number of pattern data input bytes (Pattern data write)

Set value		Number of pattern transfer bytes	Pattern input start address	Control message	Data request message
1	:	65536	0	WRTA1, 0	None
:	:	:	32767	WRTA65536, 32767	
Use "WRTA number of pattern transfer bytes, pattern input start address" format					

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When (the number of pattern transfer bytes + pattern input start address × 2) > 65536

- When the output pattern is a PRBS pattern

- When AUTO SEARCH function is ON

- When floppy disk is being accessed

Examples

Control message

When output pattern is a PRGM pattern

DIM B (9)

READ B (*)

DATA 1,2,4,8,16,32,64,128,256,512

OUTPUT 700; "WRTA20,0"

OUTPUT 700 USING "W"; B(*)



Sets the pattern data corresponding to the DATA statement for the number of pages 1 to 10.

Note: The MP1702A/MP1609A/MP1651A defines the number of pattern data bytes to be transferred by DMA as well as the start address. In addition, it specifies the DMA mode and the internal RAM area storage address.

The relationship between the pattern input start address and the actual page number is:

$$\text{(pattern input start address + 1) = actual page number}$$

The DMA transfer mode is released at the end of pattern data transfer.

However, the following as exception processing is sometimes performed.

- When all pattern data has not been sent even though the number of pattern input bytes have been set, the DMA mode is released and bit 0 (command error bit) of the GP-IB status byte is set to 1 by the time-out function. Time-out occurs after 60 seconds.

- If a new control command is sent while a number of pattern input bytes is set, the new command is assumed to be the pattern data set value.

Pattern data transfer by DMA is also described in SECTION 12.

⑳ Number of pattern data output bytes (Pattern data read)

Data request message	Control message	Set value	
		Number of pattern transfer bytes	Pattern output start address
None	REDA1, 0 : : REDA65536, 32767	0 : : 32767	1 : : 65536
Use "REDA number of pattern transfer bytes, pattern output start address" format			

Restrictions

Control message

- In the following cases, this message is invalid and a buzzer rings:
- When (number of pattern transfer bytes + pattern output start address × 2) > 65536
 - When output pattern is a PRBS pattern
 - When AUTO SEARCH function is ON
 - When floppy disk is being accessed

Examples

Control message

When output pattern is a PRGM pattern
 DIM B (9)
 OUTPUT 700; "REDA20,0"
 ENTER 700 USING "W"; B(*)
 PRINT B (*)



Pattern data from pages 1 to 10 are output.

Note: The number of pattern data bytes to be transferred by DMA and the output start address are defined in the NR fields. The MP1701A/MP1609A/MP1651A also defines the RAM storage area addresses and DMA mode switching.

The relationship between the pattern output start address and the page number is (pattern output start address + 1) = Page number

The DMA transfer mode is released after completion of pattern data transfer or when the following exception occurs.

- When pattern data is not received at all, the DMA mode is released and bit 0 of the GP-IB status byte (the command error bit) is set to 1 by time-out function. Time-out occurs after 60 seconds.

Pattern data transfer by DMA is also described in SECTION 12.

Examples

Control message

When output pattern is a PRGM pattern
OUTPUT 700; "ALLA0"

Sets all bits on all pages to 0.

Note: There are 512k bits of pattern data on all pages.

Restrictions

Control message

- In the following cases, this message is invalid and a buzzer rings:
- When the output pattern is a PRBS pattern
 - When the AUTO SEARCH function is ON
 - When floppy disk is being accessed

Set value	Control message	ALLA1	None	Output message
		ALLA0		
Clear all bits on all pages				
Set all bits on all pages				

②1 Preset (all bits on all pages to 0 or 1)

②② Preset (all bits on a page to 0 or 1)

Set value	Control message	Data request message	Output message	Clear all bits on 1 page	PSTΔ0
				Set all bits on 1 page	PSTΔ1
		None	_____		

Restrictions

Control message

- In the following cases, this message is invalid and a buzzer rings:
- When the output pattern is a PRBS pattern
 - When the AUTO SEARCH function is ON
 - When floppy disk is being accessed

Examples

Control message

When the output pattern is a PRGM pattern
 OUTPUT 700; "PSTΔ0"

Sets all bits on the displayed page to 0.

Note: All bits on a single screen represent all the bits on one page.

10.3 MEASUREMENT Section
The following pages describe the GP-IB messages of the MEASUREMENT section.
Δ indicates a space.

Set value	Control message	—	When clock is not lost
			When clock is lost
Output message	Data request message	CLI?	
		CLIA0	CLIA1

Restrictions

Data request message

None

Examples

Data request message

When the clock is not lost

OUTPUT 700; "CLI?"

ENTER 700;B\$

PRINT B\$

↑

CLIA0 (CR/LF) is output.

24 Sync loss state (Sync loss intervals?)

Set value	Control message		When sync is not lost
	Data request message	SLI?	When sync is lost
Output message		SLIΔ	

Restrictions

Data request message

None

Examples

Data request message

When sync is not lost

OUTPUT 700; "SLI?"

ENTER 700;B\$

PRINT B\$

↑

SLIΔ0 (CR/LF) is output.

25 Error detection (Errors?)

Set value	Control message	Data request message	Output message
When no errors are detected	_____	ERS?	ERSA0
When errors are detected			ERSA1

Restrictions

Data request message

None

Examples

Data request message

When no errors are detected

OUTPUT 700; "ERS?"

ENTER 700;B\$

PRINT B\$

↑

ERSA0 (CR/LF) is output.

26 Display mode (Display or measurement)

Set value	Control message	Data request message	Output message
ERROR RATIO	DMSΔ0	DMS?	DMSΔ0
ERROR COUNT	DMSΔ1		DMSΔ1
ERROR INTERVAL	DMSΔ2		DMSΔ2
ERROR FREE INTERVAL	DMSΔ3		DMSΔ3
CLOCK FREQUENCY	DMSΔ4		DMSΔ4

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "DMSΔ0"

Switches the display mode to ERROR RATIO.

Data request message

When the display mode is ERROR RATIO

OUTPUT 700; "DMS?"

ENTER 700;B\$

PRINT B\$

↑

DMSΔ0 (CRLF) is output.

② Intermediate result display function (Current data)

Set value	Control message	Data request message	Output message
OFF	CURAO	CURA	CURAO
ON	CURAI		CURAI

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "CURAO"

Switches the intermediate result display function OFF.

Data request message

When the intermediate result display function is OFF
 OUTPUT 700; "CUR?"

ENTER 700;B\$

PRINT B\$

↑

CURAO (CRLF) is output.

②8 Measurement mode (Measurement mode)

Set value	Control message	Data request message	Output message
REPEAT	MODΔ0	MODΔ0	MODΔ0
SINGLE	MODΔ1	MOD?	MODΔ1
UNTIMED	MODΔ2	MOD?	MODΔ2

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "MODΔ0"

Switches the measurement mode to REPEAT.

When the measurement mode is REPEAT

OUTPUT 700; "MOD?"

ENTER 700;B\$

PRINT B\$

↑

MODΔ0 (CR/LF) is output.

②9 Start measurement (Start)

Set value	Control message	STA	Restart (when measurement is in progress)
	Data request message	None	Start (when measurement is not in progress)
Output message			—

Restrictions

Control message

In the following cases, the message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Examples

Control message

OUTPUT 700; "STA"

This command causes measurements to be aborted and restarted if it is issued while a measurement is in progress.
 If issued while measurements are not in progress, measurement is initiated.

③0 Stop measurement (Stop)

Set value	Control message	Data request message	Output message
Measurement stopped or terminated	STO	None	—

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When measurements are not in progress
- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Examples

Control message

OUTPUT 700; "STO"

Stops or terminates measurement.

③1 Measurement status (Measurements in progress?)

Set value	Control message	Data request message	Output message
Measurements not in progress	—	MSR?	MSRA0
Measurements in progress			MSRA1

Restrictions

Data request message

None

Examples

Data request message

When measurement is not in progress

OUTPUT 700; "MSR?"

ENTER 700;B\$

PRINT B\$

↑

MSRA0 (CRLF) is output.

③2 Automatic sync function (Auto sync)

Set value	Control message	SYNA0	SYNA1
OFF		SYNA0	SYNA1
ON		SYNA0	SYNA1
	Data request message	SYN?	
	Output message		

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "SYNA0?"

Switches the automatic sync function OFF.

When the automatic sync function is OFF.

OUTPUT 700; "SYN?"

ENTER 700; B\$

PRINT B\$

↑

SYNA0 (CRLF) is output.

③ Selecting real- or measurement-times for display (Real time or measurement time)

Set value	Control message	Data request message	Output message
Y.M.D of internal timer	TIMΔ0	TIMΔ0	TIMΔ0
H.M.S of internal timer	TIMΔ1	TIMΔ1	TIMΔ1
PERIOD (measurement time)	TIMΔ2	TIMΔ2	TIMΔ2
TIMED (remaining measurement time)	TIMΔ3	TIMΔ3	TIMΔ3
ELAPSED (elapsed measurement time)	TIMΔ4	TIMΔ4	TIMΔ4

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "TIMΔ0"

Switches the display parameter to Y.M.D display (year, month, and day of the internal timer).

Data request message

When the display parameter is Y.M.D display (year, month, and day of the internal timer).

OUTPUT 700; "TIM?"

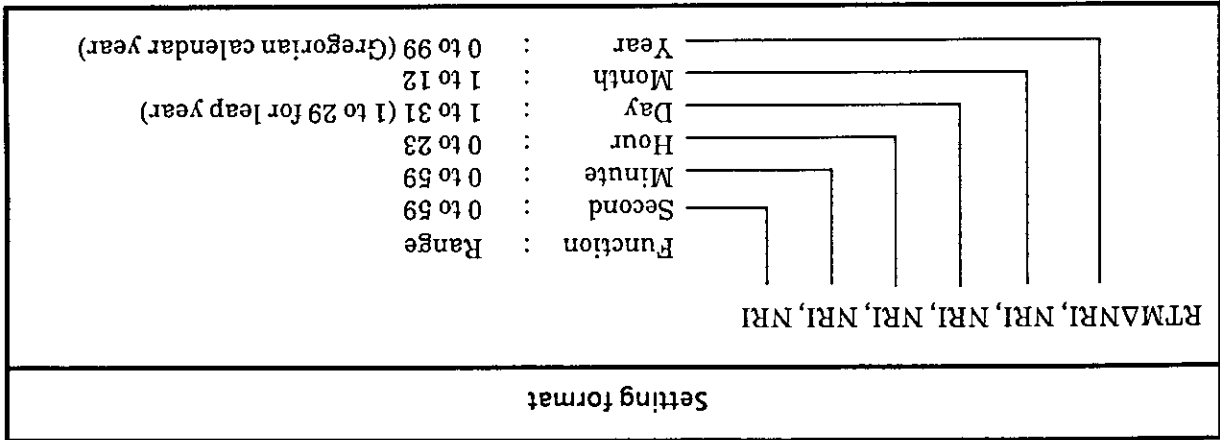
ENTER 700;B\$

PRINT B\$

↑

TIMΔ0 (CR/LF) is output.

34 Internal timer setting (Rear time setting)



Restrictions

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "RTMAΔ90, 03, 10, 00, 10, 29"

Sets the internal timer to 00:10:20 on March 10, 1990 from which the clock starts counting.

Data request message

When the internal timer is 00:10:29 on March 10, 1990

OUTPUT 700; "RTM?"

ENTER 700;B\$

PRINT B\$

↑

RTMAΔ90, 03, 10, 00, 10, 29 (CR/LF) is output.

Note: The NR field cannot be omitted.

35 Measurement time setting (Measurement period)

Setting format	
PRDANRI, NRI, NRI, NRI	<pre> Function : Range Second : 0 to 59 Minute : 0 to 59 Hour : 0 to 23 Day : 1 to 99 </pre>

Control message	PRDΔ00, 00, 00, 00 : RTMΔ99, 23, 59, 59	Data request message	PRD?	Output message	PRDΔ00, 00, 00, 00 : PRDΔ99, 23, 59, 59
-----------------	---	----------------------	------	----------------	---

Restrictions

- Control message
- In the following cases, this message is invalid and a buzzer rings:
 - When the AUTO SEARCH function is ON
 - When floppy disk is being accessed
- Data request message
- None

Examples

Control message OUTPUT 700; "PRDΔ00, 00, 10, 29"

 Sets the measurement time to 10 minutes 29 seconds.

Data request message When the measurement time is 10 minutes 29 seconds

 OUTPUT 700; "PRD?"

↑

PRINT B\$

ENTER 700; B\$

PRDΔ00, 00, 10, 29 (CR/LF) is output.

Note: The NR field cannot be omitted.

10.4 MEMORY Section

The GP-IB commands of the MEMORY section are described on the following pages.
Δ indicates a space.

③6 Memory function switching (Memory mode ptn/other)

Set value	Control message	MEMΔ0	MEMΔ1
PTN mode		MEMΔ0	MEMΔ1
OTH mode		MEMΔ0	MEMΔ1
	Data request message		
	Output message		

Restrictions

Control message

- In the following cases, this message is invalid and a buzzer rings:
- When MEMORY display is in error display mode
 - When AUTO SEARCH function is ON
 - When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "MEMΔ0"

Switches the memory function to the PTN mode.

When memory function is in PTN mode

OUTPUT 700; "MEM?"

ENTER 700; B\$

PRINT B\$

↑

MEMΔ0 (CRLF) is output.

Note: "PTN mode" means the PATTERN mode, in which only pattern data is processed. "OTH mode" means the OTHERS mode, in which other data is processed.

Directory information followed by FILA1 (CRLF) is output in the format shown on the next page.

```

END LOOP
EXIT IF B$="FILA1"
PRINT B$
ENTER 700;B$
LOOP
OUTPUT 700;"FIL?"

```

When memory function is in DIR mode
 FILA0(CRLF) is output.

```

↑
PRINT B$
ENTER 700;B$
OUTPUT 700;"FIL?"

```

When memory function is in FILE No. mode

After the DIR mode is entered, the inserted floppy disk is accessed and the directory information is retrieved. Switches the memory function to the DIR mode.

```

OUTPUT 700;"FILA1"

```

Switches the memory function to the FILE No. mode.

```

OUTPUT 700;"FILA0"

```

Control message

Examples

Data request message

None

- When the MEMORY display is in the error display mode
- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

In the following cases, this message is invalid and a buzzer rings:

Control message

Restrictions

Set value	Control message	Data request message	Output message
FILE No.	FILA0	FILA?	FILA0
DIR	FILA1	FILA1	FILA1

③7 File No./directory mode switching (File no./directory mode)

38 Data recall (Data recall)

File name	Control message	Data request message	Output message
0 : : : 99	RCLΔ0 : : : RCLΔ99	None	_____

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTOSEARCH function is ON
- When floppy disk is being accessed

Examples

Control message

OUTPUT 700; "RCLΔ0"

Reads data for the specified file name from floppy disk and displays it by the set memory function.

Note: When the specified file does not exist, an error messages is displayed and the buzzer rings.

This error message is cleared when a data recall, data save, or data resave command is entered.

39 Data save (Data save)

File name	Control message	Data request message	Output message
0 : : : 99	SAVA0 : : : SAVA99	None	_____

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When in directory (DIR) mode
- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Examples

Control message

When memory system is in FILE No. mode
OUTPUT 700; "SAVA0"

Stores the data in the specified file name under the specified memory conditions.

Note: If the specified file name already exists, an error message is displayed and the buzzer rings. This error message is cleared when a data recall, data save, or data resave command is entered.

④ Data reserve (Data reserve)

File name	Control message	Data request message	Output message
0 : : : 99	RSVA0 : : : RSVA99	None	_____

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the AUTO SEARCH function is ON
- When floppy disk is being accessed

Examples

Control message

OUTPUT 700; "RSVA0"

Overwrites the specified file name with new data and memory conditions.

Note: When the specified file does not exist, an error message is displayed and the buzzer rings.

This error message is cleared when a data recall, data save, or data reserve command is entered.

④1 Floppy disk access status (Memory access condition?)

Setting value	Control message	Data request message	Output message
Not being accessed	_____	MAC?	MACΔ0
Access in progress			MACΔ1

Restrictions

Data request message

None

Examples

Data request message

When floppy disk is not being accessed

OUTPUT 700; "MAC?"

ENTER 700; B\$

PRINT B\$

↑

MACΔ0 (CR/LF) is output.

10.5 PRINTER/ALARM MONITOR Section
The following pages describe the GP-IB messages for the PRINTER/ALARM MONITOR section.
Δ indicates a space.

④2 Printer function (Printer on/off)

Set value	Control message	Data request message	Output message
ON	PRNA1	PRNA1	PRNA1
OFF	PRNA0	PRNA0	PRNA0
		PRN?	

Restrictions

Control message

In the following case, this message is invalid and a buzzer rings:

Data request message

None

Examples

Control message

OUTPUT 700; "PRNA0"

Switches the built-in printer function OFF.

When the built-in printer function is OFF

OUTPUT 700; "PRN?"

ENTER 700;B\$

PRINT B\$

↑

PRNA0 (CR/LF) is output.

Set value	Control message	PSA	Print start
Output message	Data request message	None	_____

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the printer function is OFF
- When measurement is not in progress
- During the first one-second interval after the start of measurement
- When floppy disk is being accessed

Examples

Control message

OUTPUT 700; "PSA"

Outputs intermediate measurement results to the built-in printer.

④ Alarm monitor function (Alarm monitor on/off)

Set value	Control message	ALMΔ0	ALMΔ1
OFF	Data request message	ALMΔ0	ALMΔ1
ON			

Restrictions

Control message

In the following case, this message is invalid and a buzzer rings:

Data request message

None

Examples

Control message

OUTPUT 700; "ALMΔ0"

Switches the alarm monitor function OFF.

When the alarm monitor function is OFF

OUTPUT 700; "ALM?"

ENTER 700;B\$

PRINT B\$

↑

ALMΔ0 (CR/LF) is output.

④5 Error detect function (Errors monitor on/off)

Set value	Control message	MONΔ0	MONΔ1
OFF		MONΔ0	MONΔ1
ON		MONΔ0	MONΔ1
Data request message	Data request message	MON?	
Output message		MONΔ0	MONΔ1

Restrictions

Control message

In the following case, this message is invalid and a buzzer rings:

Data request message

None

Examples

Control message

OUTPUT 700; "MONΔ0"

Switches the error detect function OFF.

When the error detect function is OFF

OUTPUT 700; "MON?"

ENTER 700;B\$

PRINT B\$

↑

MONΔ0 (CR/LF) is output.

Δ indicates a space.

The following pages describe the GP-IB messages for the MEASURE CH MASK SELECT section.

10.6 MEASURE CH MASK SELECT Section

④6 Mask route length selection (Mask route length select)

Set value	Control message	Data request message	Output message
8 route length	MSKΔ0	MSK?	MSKΔ0
16-route length (for using 1ch to 8ch)	MSKΔ1		MSKΔ1
16-route length (for using 9ch to 16ch)	MSKΔ2		MSKΔ2

Restrictions

Control message

In the following case, this message is invalid and a buzzer rings:

- When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "MSKΔ0"

Switches the mask route length to the 8-route length.

When the mask route length is 8-route long

OUTPUT 700; "MSK?"

ENTER 700;B\$

PRINT B\$



MSKΔ0 (CRLF) is output.

④7 Number of mask route channels (Measure $\bar{c}h$ mask select)

When the mask route length is 8-routes long or 16-routes long (1ch to 8ch)			
Set value	Control message	Data request message	Output message
1 to 8ch (OFF) 1 ch only (ON) :	SCHΔ#B00000000 :	SCH?	SCHΔ#B00000000 :
2 to 8ch (ON) 1 to 8ch (ON)	SCHΔ#B11111110 :		SCHΔ#B11111110 :
Each error counter is either masked or not masked depending on the value of each bit in the NR field. 0: OFF (not masked) 1: ON (masked)			

When the mask route length is 16 routes long (9ch to 16ch)			
Set value	Control message	Data request message	Output message
9 to 16ch (OFF) 9ch only (ON) :	SCHΔ#B00000000 :	SCH?	SCHΔ#B00000000 :
10 to 16ch (ON) 9 to 16ch (ON)	SCHΔ#B11111110 :		SCHΔ#B11111110 :
Each error counter is either masked or not masked depending on the value of each bit in the NR field. 0: OFF (not masked) 1: ON (masked)			

Restrictions

- Control message
- Data request message
- None
- When floppy disk is being accessed

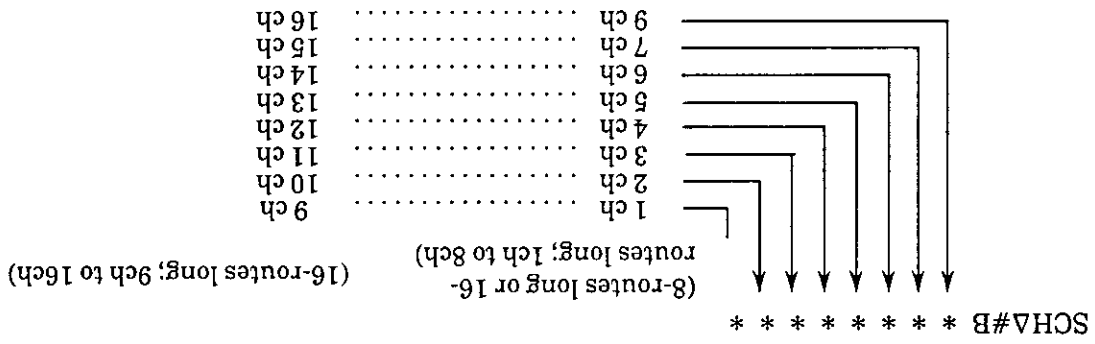
Examples

Control message

When the mask route length is 8-routes long
OUTPUT 700; "SCHΔ#B000000001"

Switches only one channel of the error counter ON (masked).

- When setting multiple conditions, combine the above channels.
- Before setting the number of mask route channels, be sure to select the mask route length.
- The LED display of mask route channels indicates the setting that correspond to the selected mask route length.



Note:

```

MSKΔ2;SCHΔ#B01000000 (CR/LF + EOI) are output.
MSKΔ1;SCHΔ#B00010001 (CR/LF)
↑
NEXT I
PRINT B$
ENTER 700;B$
FOR I = 1 TO 2
  OUTPUT 700; "SCH?"
  15 of the error counter are ON (masked)
When the mask route length is 16-routes long and channels 1, 5 and
MSKΔ0;SCHΔ#B00010001 (CR/LF) is output.
↑
PRINT B$
ENTER 700;B$
OUTPUT 700; "SCH?"
the error counter are ON (masked)
When the mask route length is 8-routes long and channels 1 and 5 of
Data request message
  
```

10.7 FUNCTION Section

The following pages described the GP-IB messages for the FUNCTION section.
Δ indicates a space.

④8 Number of mark ratio AND bit shifts (Mark ratio bit shift)

Set value	Control message	SFTΔ0	SFTΔ1
1-bit shift	Data request message	SFTΔ0	SFTΔ1
3-bit shift		SFTΔ0	SFTΔ1

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:
 When the output pattern is a PRGM. (WORD or DATA) pattern
 When floppy disk is being accessed.

Data request message

In the following case, this request is invalid and ERR is output:
 When the output pattern is a PRGM. (WORD or DATA) pattern

Examples

Control message

When the output pattern is a PRBS pattern
 OUTPUT 700; "SFTΔ0"

Sets the number of mark ratio AND bit shifts to a 1 bit shift.

When number of mark ratio AND bit shifts is 1 bit shift

Data request message

OUTPUT 700; "SFT?"

ENTER 700;B\$

PRINT B\$

SFTΔ0 (CR/LF) is output.

When the output pattern is a PRGM. (WORD or DATA) pattern

OUTPUT 700; "SFT?"

ENTER 700;B\$

PRINT B\$

ERR (CR/LF) is output.

Set value	Control message	CLSΔ0	CLSΔ1
		CLSΔ0	CLSΔ1
Data request message	Output message	CLSΔ0	CLSΔ1
		CLSΔ0	CLSΔ1

④9 Clock loss processing function (Clock loss processing option)

Restrictions

- Control message
 - Data request message
 - None
- In the following case, this message is invalid and a buzzer rings:
 • When floppy disk is being accessed

Examples

Control message OUTPUT 700; "CLSΔ0"
 Excludes clock loss processing from calculations.
 Data request message When clock loss processing is excluded from calculations
 OUTPUT 700; "CLS?"
 ENTER 700; \$
 PRINT \$
 ↑
 CLSΔ0 (CRLF) is output.

Note: When the EXCLUDE option is set, clock loss processing is excluded from calculations.
 When the INCLUDE option is set, clock loss processing is included in calculations.

51 Error performance threshold selection (Error performance threshold)

Set value	Control message	ETHΔ0	ETHΔ1
10E-3	Data request message	ETH?	ETHΔ1
10E-4	Output message	ETHΔ0	ETHΔ1

Restrictions

Control message

Data request message

Examples

Control message

OUTPUT 700; "ETHΔ0"

Switches the error performance measurement threshold to 10E-3.

When the error performance measurement threshold is 10E-3

Data request message

OUTPUT 700; "ETH?"

ENTER 700;B\$

PRINT B\$



ETHΔ0 (CRLF) is output.

52 Display digit selection (Mantissa display digit)

Set value	Control message	DGT?	DGTΔ1
			DGTΔ0
	Data request message		DGTΔ1
	Output message		DGTΔ0

Restrictions

Control message

Data request message

Examples

Control message

OUTPUT 700; "DGTΔ0"
 Switches to 5-digit display.

Data request message

When a 5-digit display is used
 OUTPUT 700; "DGT?"

ENTER 700;B\$

↑

DGTΔ0 (CR/LF) is output.

53 Intermediate data calculation (Current data calculation)

Set value	Control message	Data request message	Output message
Cumulative calculation data	CALΔ0	CAL?	CALΔ0
Current calculation data only	CALΔ1	CAL?	CALΔ1

Restrictions

Control message
 In the following case, this message is invalid and a buzzer rings:
 • When floppy disk is being accessed
 None

Examples

Control message
 OUTPUT 700; "CALΔ0"
 Switches calculation of intermediate data to cumulative calculation data.
 Data request message
 When intermediate data calculation is made for cumulative calculation data

OUTPUT 700; "CAL?"
 ENTER 700; B\$
 PRINT B\$
 CALΔ0 (CR/LF) is output.

⑤4 Error detection mode selection (Error type)

Set value	Control message	Data request message	Output message
Total error	ETVA0	ETVA0	ETVA0
Insertion error	ETVA1	ETVA1	ETVA1
Omission error	ETVA2	ETVA2	ETVA2

Restrictions

Control message

Data request message

None

Examples

Control message

OUTPUT 700; "ETVA0"

Switches the error detection mode to TOTAL ERROR.

When the error detection mode is TOTAL ERROR

OUTPUT 700; "ETV?"

ENTER 700;B\$

PRINT B\$

↑

ETVA0 (CR/LF) is output.

⑤ Measurement interval time selection (interval time)

Set value	Control message	ITV?	ITVΔ0	100 ms
			ITVΔ1	200 ms
			ITVΔ2	500 ms
Output message	Data request message		ITVΔ0	

Restrictions

Control message

Data request message

Examples

Control message

Data request message

OUTPUT 700; "ITVΔ0"
 Switches the measurement interval time to 100 ms.
 When the measurement interval time is 100 ms
 OUTPUT 700; "ITV?"
 ENTER 700;B\$
 PRINT B\$
 ↑
 ITVΔ0 (CR/LF) is output.

56 Data print format selection (Output data format)

Set value	Control message	Data request message	Output message
Standard format	FMTΔ0	FMT?	FMTΔ0
Abridged (short) format	FMTΔ1	FMT?	FMTΔ1

Restrictions

- Control message
- Data request message
- In the following case, this message is invalid and a buzzer rings:
 - When floppy disk is being accessed

Examples

Control message OUTPUT 700; "FMTΔ0"

Data request message Sswitches the data print format to standard format.

Data request message When the data print format is standard format

 OUTPUT 700; "FMT?"

 ENTER 700;B\$

 PRINT B\$

 ↑

 FMTΔ0 (CR/LF) is output.

⑤7 Threshold EI/EFI data print selection (Threshold EI/EFI data output)

Set value	Control message	THRΔ0	ON
		THRΔ1	OFF
Data request message	Output message	THR?	THRΔ0
			THRΔ1

Restrictions

Control message

Data request message

Examples

Control message

Data request message

OUTPUT 700; "THRΔ0"
 Does not print threshold EI/EFI.
 When threshold EI/EFI is not printed
 OUTPUT 700; "THR?"
 ENTER 700;B\$
 PRINT B\$
 ↑
 THRΔ0 (CR/LF) is output.

⑤8 Error performance data print selection (Error performance data output)

Set value	Control message	EPPA0	EPPA1
	Data request message	EPPA0	EPPA1
Output message		EPPA0	EPPA1

Restrictions

Control message

In the following case, this message is invalid and a buzzer rings:
 • When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "EPPA0"

Does not print error performance.

When error performance data is not printed

OUTPUT 700; "EPP?"

ENTER 700;B\$

PRINT B\$

↑

EPPA0 (CR/LF) is output.

Note: Error performance data are output only when the error performance data print selection is ON and the measurement time is 60 seconds or more.

59 Intermediate data print selection (intermediate data output option)

Set value	Control message	ITMΔ0	ITMΔ1
	Data request message	ITMΔ0	ITMΔ1
	Output message	ITMΔ0	ITMΔ1

Restrictions

Control message

Data request message

None

In the following case, this message is invalid and a buzzer rings:
 • When floppy disk is being accessed

Examples

Control message

OUTPUT 700; "ITMΔ0"

Does not output intermediate data to the built-in printer.

When intermediate data is not output to the built-in printer

Data request message

OUTPUT 700; "ITM?"

ENTER 700; B\$

PRINT B\$

↑

ITMΔ0 (CR/LF) is output.

Note:

Intermediate measurement results are output to the built-in printer as follows when both the intermediate data print function and printer function are ON.

< For repeat or single measurements >

• Results are printed every two hours when the measurement time is less than two days.

• Results are printed every day when the measurement time is two days or more.

> For manual (untimed) measurements >

• Results are printed every day.

For details on print formats for the built-in printer, refer to paragraph 5.6.3 in the separate Operations Manual.

Set value	Control message	OSC0	OSC1
OFF		OSC0	OSC1
ON		OSC0	OSC1
	Data request message	OSC?	OSC1
	Output message		OSC0

Restrictions

Control message

Data request message

Examples

Control message

OUTPUT 700; "OSC0"

Does not print the one-second data.

When the one-second data is not printed

Data request message

OUTPUT 700; "OSC?"

ENTER 700; B\$

PRINT B\$

↑

OSCΔ0 (CR/LF) is output.

⑥0 One-second data print selection (Output option for one second data)

⑥1 One-second data print threshold selection (Data output threshold)

Set value	Control message	DOTA0	Error > 0
		DOTA1	Error > 10E-6
		DOTA2	Error > 10E-4
		DOTA3	Error > 10E-3
Data request message	DOT?	DOTA0	
Output message		DOTA1	
		DOTA2	
		DOTA3	

Restrictions

Control message

Data request message

None

In the following case, this message is invalid and a buzzer rings:
 • When floppy disk is being accessed

Examples

Control message

OUTPUT 700; "DOTA0"

Switches the one-second data threshold to ERROR > 0.

When the one-second data threshold is ERROR > 0

Data request message

OUTPUT 700; "DOT?"

ENTER 700;B\$

PRINT B\$

↑

DOTA0 (CR/LF) is output.

⑥2 Paper saving function (Paper saving option)

Set value	Control message	PSVΔ0	PSVΔ1
	Data request message	PSV?	PSVΔ1
Output message	Control message	PSVΔ0	PSVΔ1
	Data request message	PSV?	PSVΔ0

Restrictions

Control message

In the following case, this message is invalid and a buzzer rings:
 • When floppy disk is being accessed

Data request message

None

Examples

Control message

OUTPUT 700; "PSVΔ0"

Switches the paper saving function for one-second data print OFF.

When the paper saving function for one-second data print is OFF

OUTPUT 700; "PSV?"

ENTER 700;B\$

PRINT B\$

↑

PSVΔ0 (CR/LF) is output.

When the SW9 switch setting is changed, turn the power off and then on again, or send the device clear command to read the new value.

Setting of FUNCTION2 SW9	Output method
ON	Output only when data request is issued
OFF	Output each time measurement is completed

Note: Use SW9 of FUNCTION2 on the rear panel to select the regularity with which measurement-results are output by GP-IB.

MTYΔ0 (CRL/F) is output.

↑

PRINT B\$

ENTER 700;B\$

OUTPUT 700; "MTY?"

When the function is set to output measurement results each time measurement is completed

Data request message

Examples

Data request message None

Restrictions

Output method set value	Control message	Data request message	Output message
Each time measurement is completed	_____	MTY?	MTYΔ1
Each time data request command is issued	_____	MTY?	MTYΔ0

⑥3 Measurement result GP-IB output selection (Measurement type?)

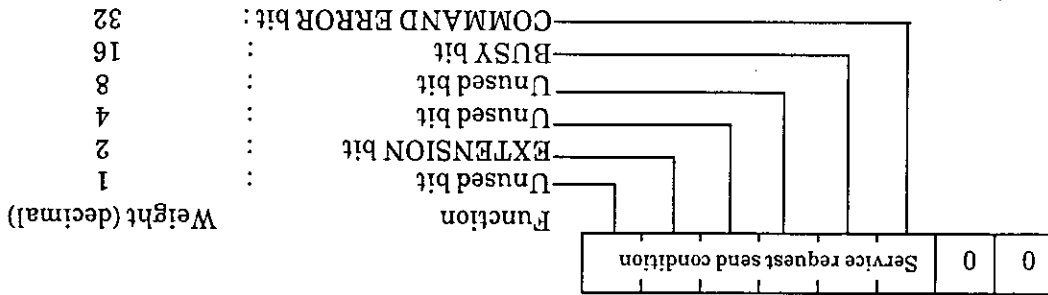
10.8 Other Sections

The GP-IB commands of other sections are described on the following pages.
Δ indicates space.

64 Service request enable register (Service request enable register)

Setting State

Service request enable register configuration
7 6 5 4 3 2 1 0 : bit



Function

Weight 0: Turns the service request send condition OFF.

1: Unused bit

2: Sends a service request when the extended event status register is set.

4: Unused bit

8: Unused bit

16: Sends a service request when there is data to be output via the GP-IB.

32: Sends a service request when the standard event status register is set.

Notes:

- When an SRQ command is received, all the previously set send conditions are cleared.

- When setting multiple service-request conditions total the weight values above.

- Immediately after the power is turned ON, or immediately after a device clear or initialize command is received, all SRQ send conditions are cleared.

SRQΔ63 : SRQΔ0	SRQ?	SRQΔ63 : SRQΔΔ0
Control message	Data request message	Output message

Restrictions

Control message

In the following case, this message is invalid:
When floppy disk is being accessed.

Data request message

None

Examples

Control message

OUTPUT 700; "SRQΔ2"

Sends a service request when the extended event status register
is set.

Data request message

When the extended event status register is set, a service request
send condition is sent

OUTPUT 700; "SRQ?"

ENTER 700; B\$

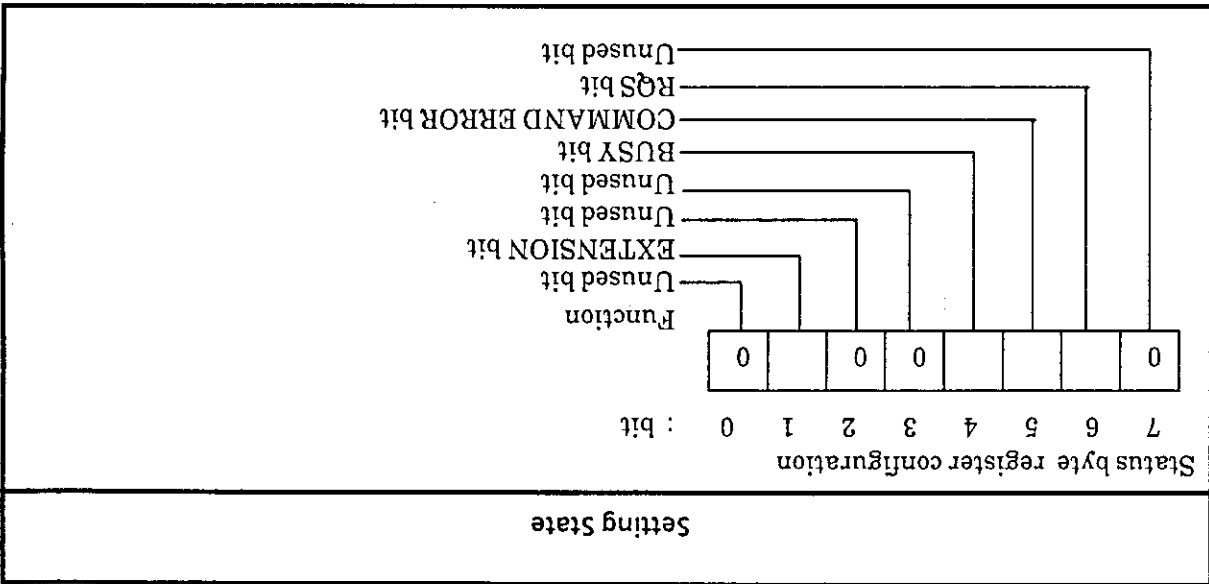
PRINT B\$

↑

SRQΔΔ2 (CR/LF) is output.

Note: The service request enable register and GP-IB status byte are described in SECTION 11.

65 Status byte register (Status byte register?)



Control message	Data request message	STBA#B*****
_____	STB?	Output message

Restrictions

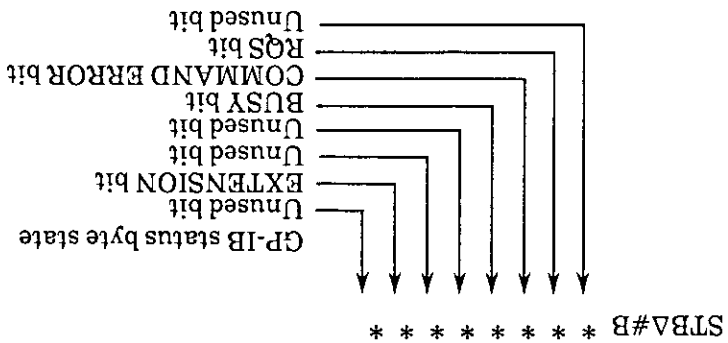
Data request message None

Examples

Data request message

When GP-IB status byte is 01010000
 OUTPUT 700; "STB?"
 ENTER 700; B\$
 PRINT B\$
 ↑
 TBΔ#B01010000 (CRLF) is output.

The status byte register and GP-IB status byte are described in SECTION 11.



Note: This GP-IB status byte is also read during serial polling.

66 Standard event status enable register (Event status enable register [Standard])

Setting State

Standard event status enable register configuration

7	6	5	4	3	2	1	0
0	0	Standard event status send condition	Standard event status send condition	Standard event status send condition	Standard event status send condition	Standard event status send condition	Standard event status send condition

: bit

Function

32	16	8	4	2	1
: : Weight (decimal)	: : Weight (decimal)	: : Weight (decimal)	: : Weight (decimal)	: : Weight (decimal)	: : Weight (decimal)

Standard event status enable register configuration

7	6	5	4	3	2	1	0
0	0	Standard event status send condition	Standard event status send condition	Standard event status send condition	Standard event status send condition	Standard event status send condition	Standard event status send condition

: bit

Function

32	16	8	4	2	1
: : Weight (decimal)	: : Weight (decimal)	: : Weight (decimal)	: : Weight (decimal)	: : Weight (decimal)	: : Weight (decimal)

Weight 0: Turns the standard event status send condition OFF.

1: Unused bit

2: Unused bit

4: Sends the standard event status send condition when a talker is designated (even though the send buffer is empty) or when the send buffer has overflowed.

8: Sends the standard event status send condition when the received command is invalid under current conditions.

16: Sends the standard event status send condition if the numerical data format is wrong or if a HEX value is used when it is not allowed.

32: Sends the standard event status send condition when the header is erroneous.

Note:

- When the ESE command is received, all previously set send conditions are cleared.
- When setting multiple event-status-enable (ESE) conditions, total the weight values above.
- All the ESE send conditions are cleared immediately after the power is turned ON, or immediately after a device clear or initialize command is received.

Control message	Data request message	Output message
ESEΔ0 : ESEΔ63	ESE?	ESEΔ0 : ESEΔ63

Restrictions

Control message

In the following case, this message is invalid.

Data request message

None

Examples

Control message

OUTPUT 700; "ESEA32"

Sends the standard event status byte to the controller when a header error is generated.

When the standard event status send byte is output in response to a

Data request message

header error

OUTPUT 700; "ESE?"

ENTER 700;B\$

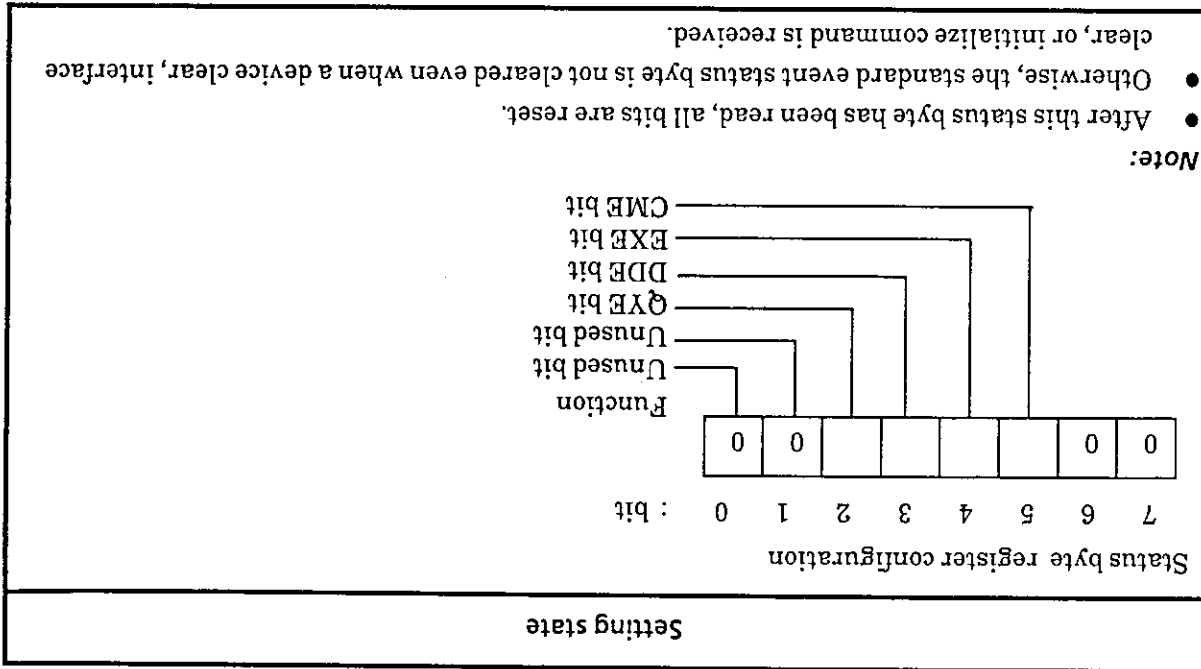
PRINT B\$

↑

ESEA32 (CR/LF) is output.

Note: The standard event status enable register and GP-IB status byte are described in SECTION 11.

67 Standard event status register (Event status byte register) [Standard]



Restrictions

Data request message

None

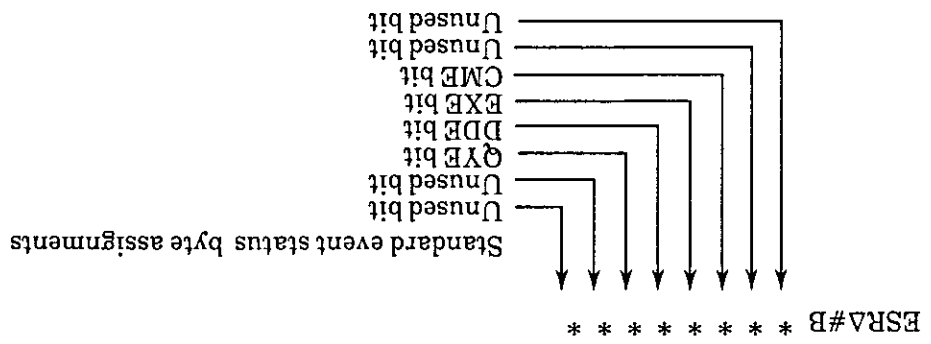
Examples

Data request message

When value of standard event status byte is 00100000
 OUTPUT 700; "ESR?"
 ENTER 700; B\$
 PRINT B\$
 ↑
 ESRΔ#B00100000 (CR/LF) is output.

Control message	Data request message	ESRΔ#B*****
Output message	ESR?	ESRΔ#B*****

Note: The standard event status byte is irrelevant to serial polling. This status byte is considered to be an extension of the COMMAND ERROR bit of the GP-IB status byte.



11. The standard event status byte register and GP-IB status byte are described in SECTION

⑧8 Extended event status enable register (Event status enable register [Extension])

Setting state

7	6	5	4	3	2	1	0	: bit
Extended event status enable register configuration								
Function								
0								
Extended event status send condition								
Function								
ERRORS bit								
CLOCK LOSS bit								
SYNC LOSS bit								
DELAY bit								
PATTERN bit								
FILE ACCESS bit								
MEASURE bit								
64	:							
32	:							
16	:							
8	:							
4	:							
2	:							
1	:							
Weight (decimal)								

Function

Weight 0: Disables sending of the extended event status (EES) byte.

1: Sends the EES byte when an error is detected.

2: Sends the EES byte at clock loss and clock recovery.

4: Sends the EES byte at sync loss and sync recovery.

8: Sends the EES byte when the servo circuit of the clock delay circuit changes from the BUSY to the READY state.

16: Sends the EES byte at completion of programmable pattern setting.

32: Sends the EES byte at completion of a floppy disk.

64: Sends the EES byte at the end of measurement.

Note:

- After an EES command is received, all previously set send conditions are cleared.
- When setting multiple EES conditions, set all appropriate bits.
- Immediately after the power is turned ON or immediately after a device clear or initialize command is received, all EES send conditions are cleared.

Control message	EESA 0 : EESA63	Data request message
Output message	EESAΔ0 : EESAΔ63	EES?

Restrictions

Control message

In the following case, this message is invalid:

Data request message

None

Examples

Control message

OUTPUT 700; "EESA32"

Sends the extended event status byte on completion of a floppy

disk access.

When the EES byte is sent on completion of a floppy disk access

Data request message

OUTPUT 700; "EES?"

ENTER 700; B\$

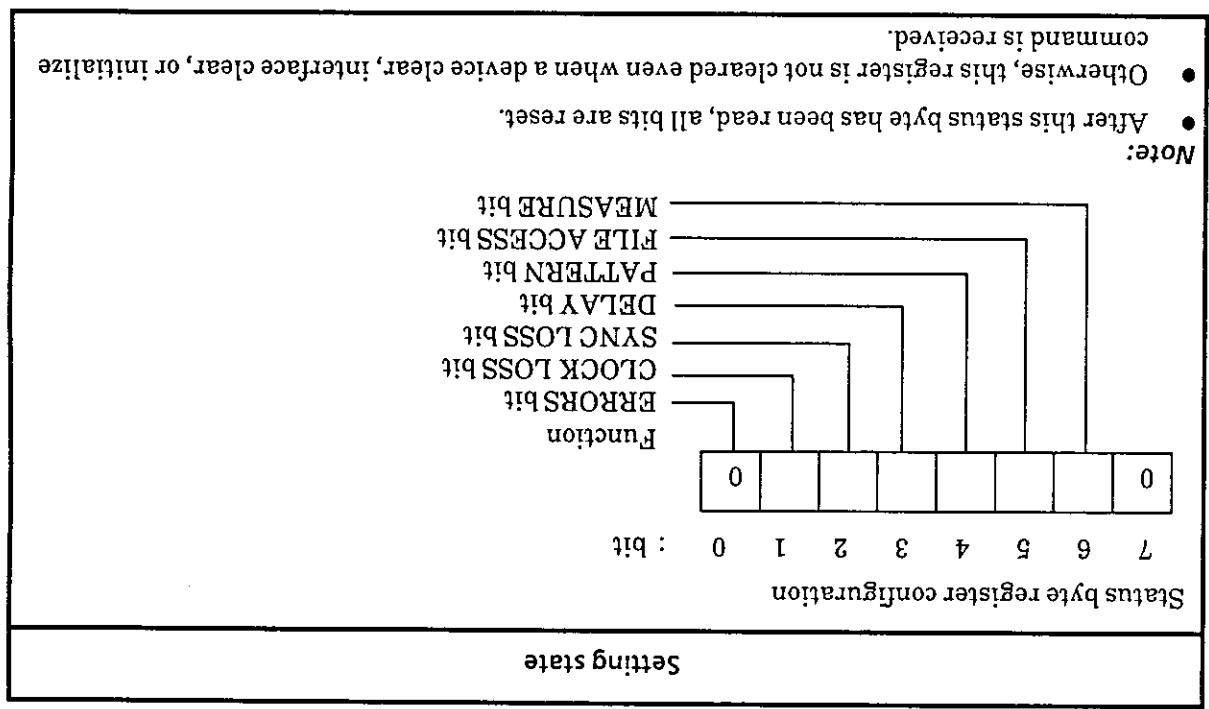
PRINT B\$

↑

EESA32 (CR/LF) is output.

Note: The extended event status enable register and GP-IB status byte are described in SECTION 11.

69 Extended event status register (Event status byte register [Extension])



Control message	_____	ERRA#B*****
Data request message	Data request message	Output message

Restrictions

Data request message None

Examples

Data request message

When the value of the extended event status byte is 01000000

OUTPUT 700; "ERR?"

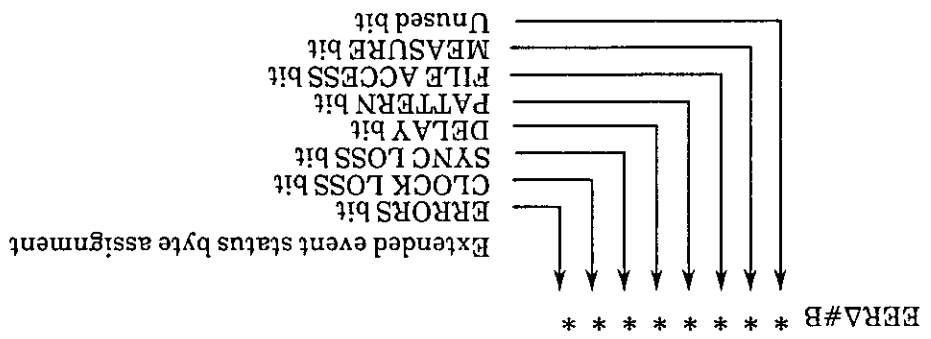
ENTER 700; B\$

PRINT B\$

↑

ERRA#B00100000 (CR/LF) is output.

Note: The extended event status byte is irrelevant to serial polling. This status byte is considered to be an extension of the EXTENSION bit of the GP-IB status byte.



11. The extended event status byte register and GP-IB status byte are described in SECTION

⑦ INITIALIZE (Initialize)

Setting state	Control message	INI	Initialize
Output Message	Data request message	_____	_____

Restrictions

Control message

None

Examples

Control message

OUTPUT 700; "INI"

Reinitializes the MP1702A/MP1609A/MP1651A to factory settings.

Note: This is the same as the initialization operation performed when the power is turned ON while pressing the [LOCAL] key.

If the floppy disk is being accessed when this command is issued, the access is aborted.

```

STA 90, 02, 26, 12, 35, 27 (CR/LF)
STA 90, 02, 26, 12, 35, 27 (CR/LF)
INT 90, 02, 26, 12, 35, 37 (CR/LF)
ELP 0, 00, 00, 10 (CR/LF)
ER 1.0000E-04 (CR/LF)
EC 5000011 (CR/LF)
EI 10 (CR/LF)
EPI 0.0000 (CR/LF)
PFI 0 (CR/LF)
CLI 0 (CR/LF)
SLI 0 (CR/LF+EOI)
    
```

The above code causes the following to be output:

```

↑
END LOOP
EXIT IF B$(1:3)="SLI"
PRINT B$
ENTER 700;B$
LOOP
OUTPUT 700;"IMD?"
    
```

When the data print format is the standard format set for output of standard data

Data request message

Examples

- For the first one-second interval after start of measurement
 - When measurements are not in progress
- When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-IB) is set for output by data request command

Data request message

Restrictions

Control message	Data request message	IMD?	As shown in SECTION 13
Output format			

Function	Outputs intermediate measurement results to GP-IB.
----------	--

Intermediate measurement result output function (Output intermediate measurement data?)

When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-IB) is set to output measurement results each time a measurement is completed
OUTPUT 700; "IMD?"

ENTER 700;B\$

PRINT B\$

↑

EPR (CR/LF) is output

Note: This function operates as though the manual print (43) .

Data request message
(Cont.)

⑦ Clear measurement-result-buffer function (Measurement buffer clear)

Function	Clears the buffer that stores measurement results
----------	---

Control message	Data request message	Output format
BCL	_____	_____

Restrictions

Control message

In the following cases, this message is invalid and a buzzer rings:

- When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-IB) is set for output by data request command
- When a measurement is in progress
- When floppy disk is being accessed

Examples

Control message

OUTPUT 700; "BCL"

Clears the buffer that stores measurement results.

Note: The measurement results that have already been output to the talker task cannot be cleared.

⑦3 Error ratio measurement results (Error ratio?)

Function	Outputs results of error ratio measurements in the designated format. Note that the output value is the value (final data or current data) displayed on the 7-segment LED driver.
----------	---

Control message	_____	
Data request message	ERR?	* Indicates the value of the error ratio whose format is fixed to represent four decimal digit exponential numbers.
Output format	ERRΔΔ*,***E-**	

Restrictions

- When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-1B) is set to initiate output each time a measurement is completed

Examples

Data request message

- When the error ratio is 1.05×10^{-6}

OUTPUT 700;"ER?"
ENTER 700;B\$
PRINT B\$

↑
ERRΔΔ1.0500E-06(CR/LF) is output.

- When the error ratio display is "-"

OUTPUT 700;"ER?"
ENTER 700;B\$
PRINT B\$

↑
ERRΔΔ0.0000E-00(CR/LF) is output.

- When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-1B) is set to initiate output each time a measurement is completed

OUTPUT 700;"ER?"
ENTER 700;B\$
PRINT B\$

↑
ERR(CR/LF) is output.

74 Error count measurement results (Error count?)

Function	Outputs results of error count measurement in the designated format. Note that the output value is the value (final data or current data) displayed on the 7-segment LED driver.
----------	--

Control message	_____	
Data request message	EC?	
Output format	<ul style="list-style-type: none"> • When the error count is less than 1E + 10 ECΔΔ***** * indicates a digit of the error count. • This 10-digit fixed-length format is used when the error count is 1E + 10 or more. ECΔΔ*.*.*.*.*E + ** * Indicates a digit of the error count. In this format, the error count is represented by four decimal digit exponential numbers. 	

Restrictions

Data request message

- When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-1B) is set to initiate output each time a measurement is completed

Examples

Data request message

- When the error count is 10

OUTPUT 700; "EC?"

ENTER 700; B\$

PRINT B\$

↑

ECΔΔΔΔΔΔΔΔΔΔΔΔΔΔ10(CR/LF) is output.

- When the error count is $1.05 \times 10^7 + 6$

OUTPUT 700; "EC?"

ENTER B\$

PRINT B\$

↑

ECΔΔΔ1.0500E + 06(CR/LF) is output.

- When the error count display is “-”

OUTPUT 700;“EC?”

ENTER 700;B\$

PRINT B\$



ECΔΔ1.0000E-99(CR/LF) is output.

- When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-IB) is set to initiate output each time a measurement is completed

OUTPUT 700;“EC?”

ENTER 700;B\$

PRINT B\$



ERRR(CR/LF) is output.

Error free interval measurement results (Error free intervals?)

Function	Outputs the results of the error-free interval measurement in the designated format. Note that the output value is the value (final data or current data) displayed on the 7-segment LED driver.
----------	--

Control message	_____	EFII?	* Indicates a digit of the error-free interval value. In this format, the error-free interval is represented by four decimal digit numbers.
Data request message		EFIIΔΔΔΔ***.****	
Output format			

Restrictions

- When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-IB) is set to initiate output each time a measurement is completed

Examples

Data request message

- When the error-free interval is 99.01 %

OUTPUT 700; "EFII?"

ENTER 700; B\$

PRINT B\$



EFIIΔΔΔΔ99.0100(CR/LF) is output.

- When the error-free interval is " - "

OUTPUT 700; "EFII?"

ENTER 700; B\$

PRINT B\$



EFIIΔ.0000E-99(CR/LF) is output.

- When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-IB) is set to initiate output each time a measurement is completed

OUTPUT 700; "EFII?"

ENTER 700; B\$

PRINT B\$



ERRR(CR/LF) is output.

• When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-IB) is set to initiate output each time a measurement is completed

FRQΔΔΔΔΔΔΔ0.000(CR/LF) is output.

↑

PRINT B\$

ENTER 700;B\$

OUTPUT 700;"FRQ?"

↑

ERRR(CR/LF) is output.

• When the one-second clock frequency is " - "

FRQΔΔΔΔ3000.000(CR/LF) is output.

↑

PRINT B\$

ENTER 700;B\$

OUTPUT 700;"FRQ?"

• When the one-second clock frequency is 3000 MHz

FRQΔΔΔΔ3000.000(CR/LF) is output.

↑

PRINT B\$

ENTER 700;B\$

OUTPUT 700;"FRQ?"

Data request message

Examples

• When the rear-panel FUNCTION switch (for selecting when and how measurement results will be output via GP-IB) is set to initiate output each time a measurement is completed

Data request message

Restrictions

Control message	Data request message	Output format
_____	FRQ?	FRQΔΔΔΔ**** *Indicates a digit of one-second clock frequency data. The output is a fixed-length three-digit decimal value.

Function	Outputs results of one-second clock frequency measurement in the designated format. Note that the output value is the value (clock frequency data for one second) displayed on the 7-segment LED driver.
----------	--

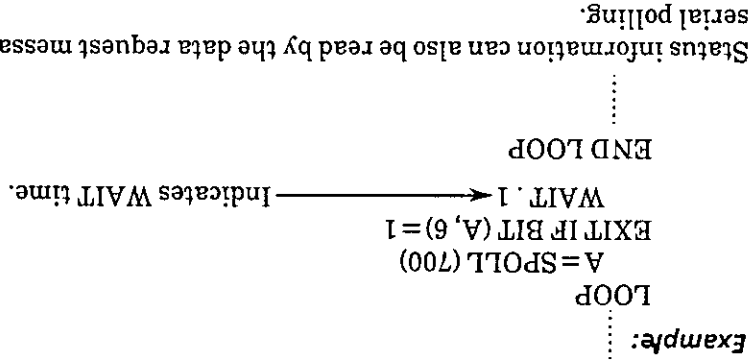
77 One-second clock frequency measurement result (Clock frequency?)

SECTION 11 GP-IB STATUS BYTE

When the MP1702A/MP1609A/MP1651A is serially polled, it outputs a status byte to the controller. In addition, it has a standard event and extended event status bytes that are output in response to data request commands.

Note: When performing serial polls continuously, a WAIT time of about 0.1 s must be provided between serial polls.

If serial polling is performed continuously without a WAIT time, the polling is continuously executed because the polling condition is evaluated before information is sent to the slave tasks.



11.1 Status Byte Configuration

The contents of each status byte is shown in Fig. 11-1.

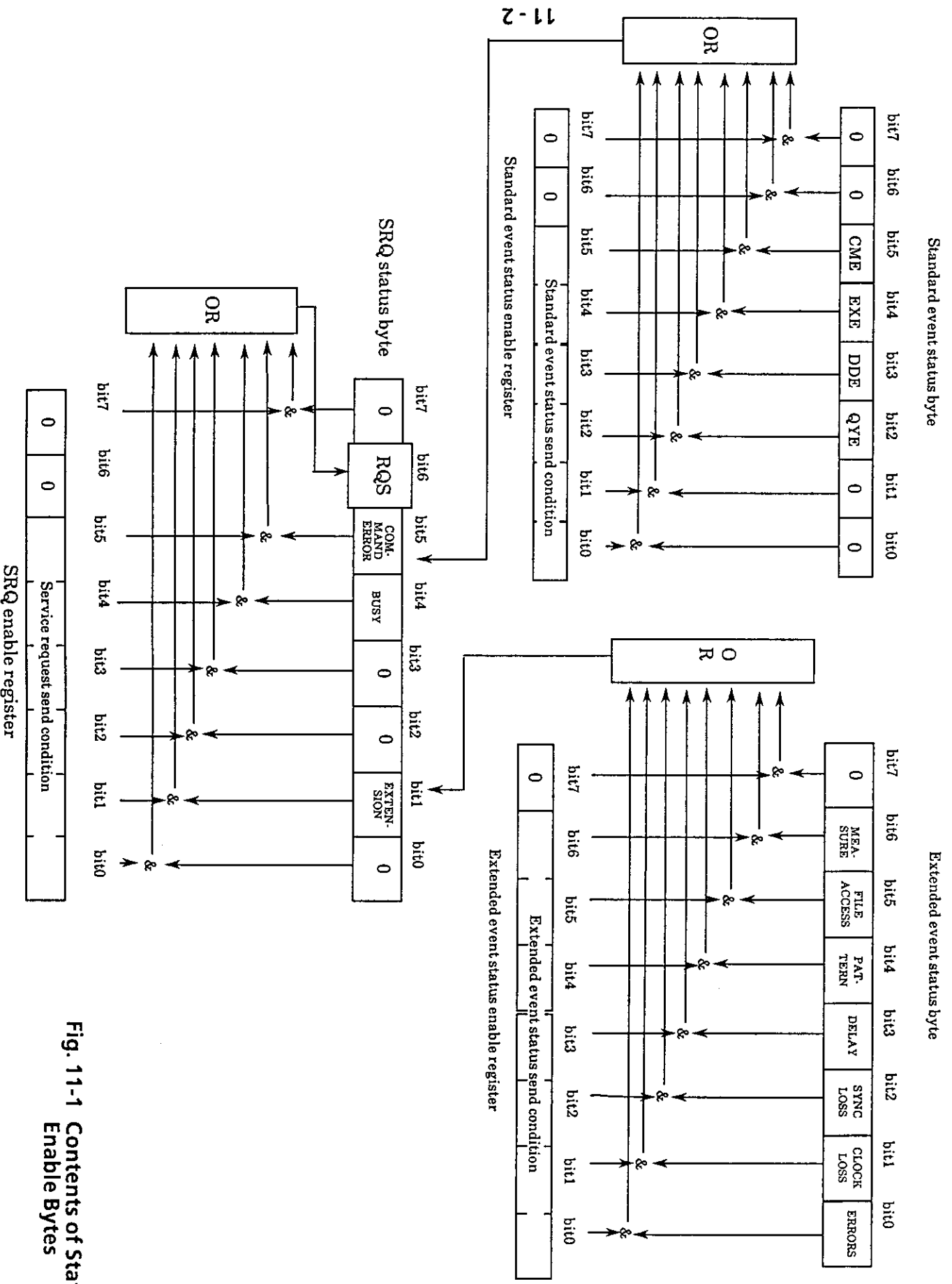


Fig. 11-1 Contents of Status and Enable Bytes

11.2 Description of Registers and Status Bytes

11.2.1 SRQ enable register

Operation

This register is used to set the conditions under which GP-IB command service requests are sent by setting individual RQA status bits ON and OFF.

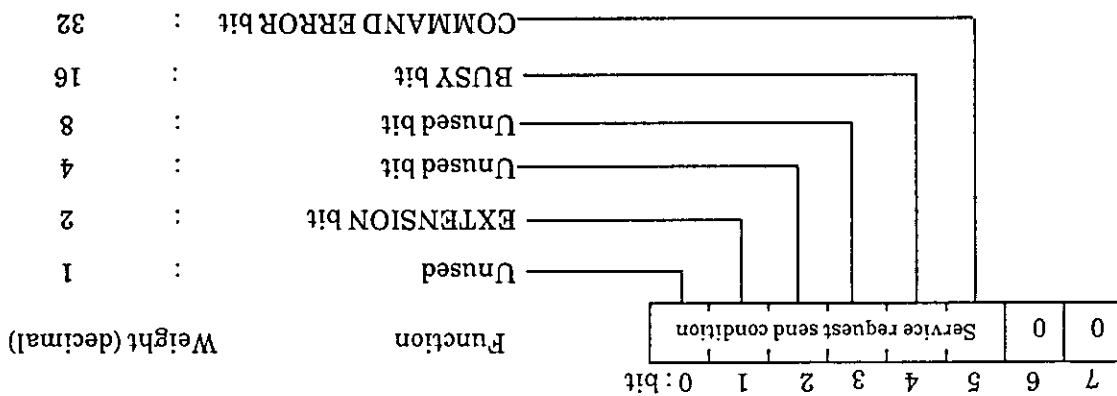
When an event for a bit which has been set to "1" in the SRQ enable register occurs, the RQS bit becomes "1" and an interrupt is sent to the controller.

- When an SRQ command is received, all the previously set send conditions are cleared.
- Multiple service request conditions can also be set.
- Immediately after the power is turned ON and immediately after a device clear or initialize command is received, all SRQ send conditions are cleared.

Command

Control message : SRQΔ0 to SRQΔ63
Data request message : SRQ?
Output message : SRQΔΔ0 (CR/LF) to SRQΔ63 (CR/LF)

Configuration



Function:

weight 0 : Clears the service request send condition.

1 : Unused bit

2: Sends a service request when an event from the extended event status register occurs.

4: Unused bit

8: Unused bit

16: Sends a service request when there is data to be output to the GP-IB.

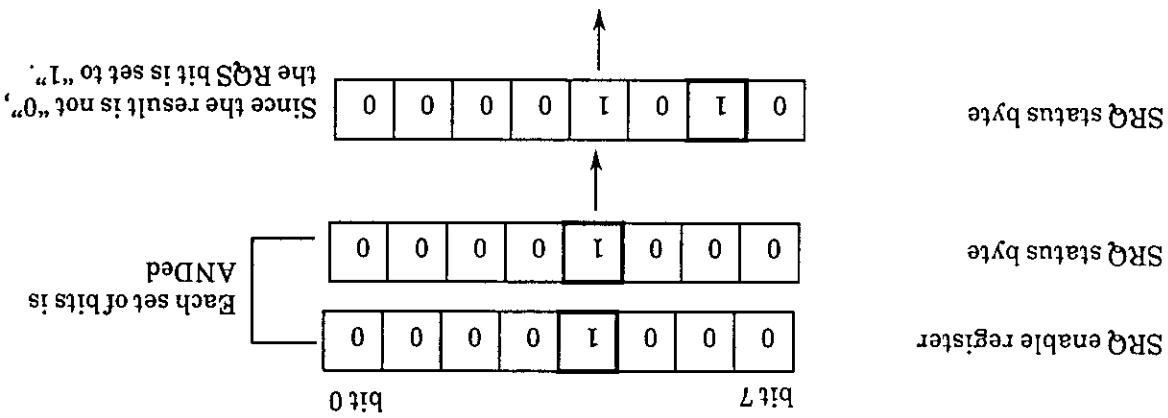
32: Sends a service request when an event from the standard event status register occurs.

11.2.2 SRQ status byte

Operation

The status byte output on the bus when serially polled by the controller.

When an event is generated, it is ANDed with the appropriate SRQ enable bit. If the result is not "0", the RQS bit (bit 6) is set to "1".



This data is output during serial polling or when a data request message is received.

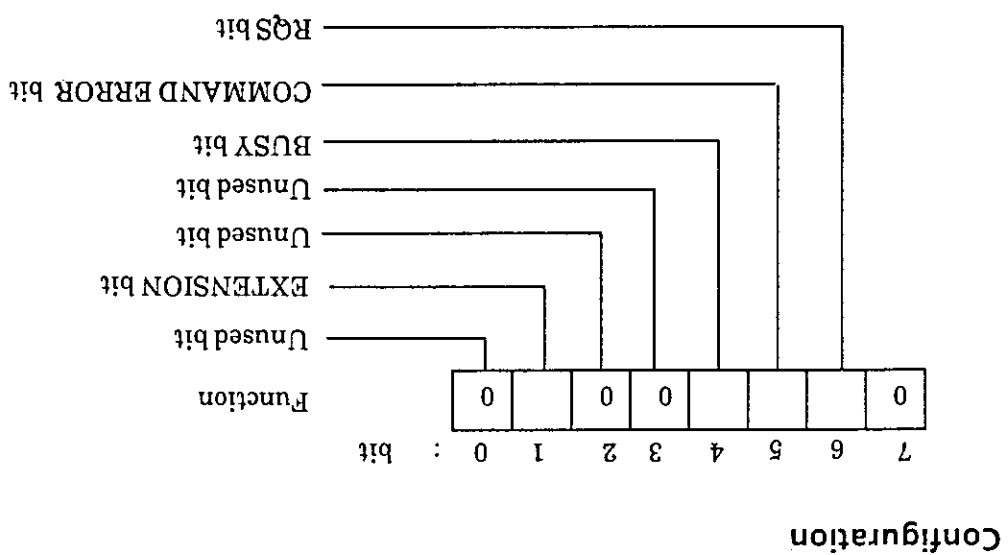
Command

Control message :

Data request message : STB?

Output message : STBΔ#B***** (CR/LF)

(*: Represents "0" or "1" setting at that time)



Name	Bit	Function
_____	7	Not used.
RQS	6	This bit indicates that a service request is being issued. It is set when the bit causing the service request is set, and it is reset after the controller reads the status byte or after a device clear or initialize command has been received. If there is no SRQ event, it is not set.
COMMAND ERROR	5	This bit indicates that one of the errors represented by the standard event status byte and standard event status enable register has occurred. (See Table 11-2.) It is reset after the standard event status byte is read or when a device clear or initialize command is received. If this bit is set when the COMMAND ERROR bit of the SRQ enable register is set, an SRQ is generated.
BUSY	4	This bit is set when there are data to be sent on GP-IB. It is reset when data transfer is completed or when a device clear or initialize command is received. If this bit is set when the BUSY bit of the SRQ enable register is set, an SRQ is generated.
_____	3	Not used.
_____	2	Not used.
EXTENSION	1	This bit is set when the extended event status byte and extended event status enable register conditions are satisfied (See Table 11-3.) It is reset when the extended event status byte is read or when a device clear or initialize command is received. If this bit is set when the EXTENSION enable register is set, an SRQ is generated.
_____	0	Not used.

Table 11-1 GP-IB Status Byte

11.2.3 Standard event status enable register

Operation

This register is used to enable/disable service requests by standard events.

The COMMAND ERROR bit of the SRQ status byte is set when standard events as represented by the bits of the standard event status byte occur.

If a standard event occurs for a status register bit which is "1", the COMMON ERROR bit is set to "1".

- When an ESE command is received, all previously set send conditions are cleared.
- Multiple service request conditions can also be set.
- Immediately after the power is turned ON and immediately after a device clear or initialize command is received, all ESE send conditions are cleared.

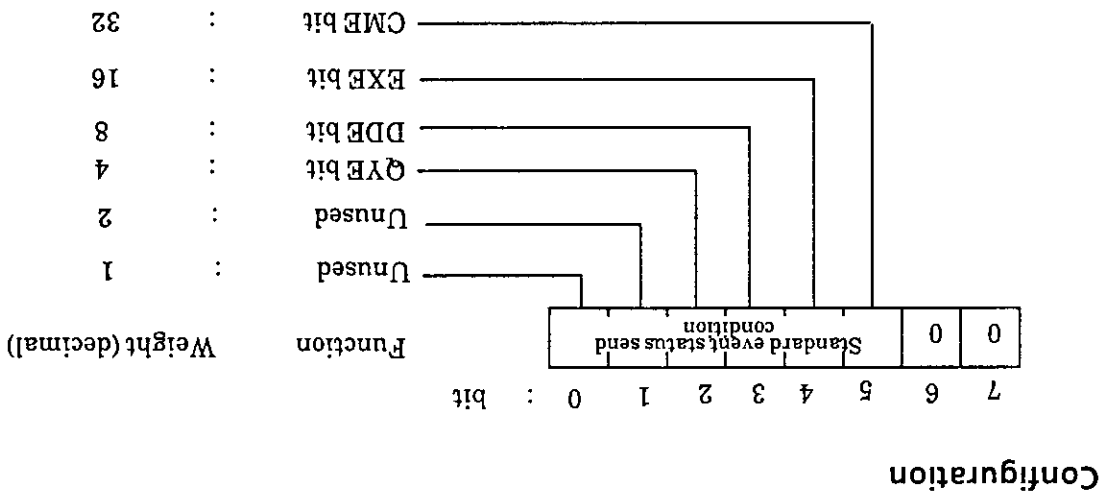
Command

Control message : ESEΔ0 to ESEΔ63

Data request message : ESE?

Output message : ESEΔΔ0 (CR/LF) to ESEΔΔ63 (CR/LF)

- Function: Weight 0 : Clears the standard event status byte.
- 1: Unused bit
 - 2: Unused bit
 - 4: Sends the standard event status send condition when a talker is designated event though the send buffer is empty or when the send buffer has overflowed.
 - 8: Sends the standard event status send condition when a received command is illegally used.
 - 16: Sends the standard event status send condition for numerical errors or when a HEX value is used illegally.
 - 32: Sends the standard event status send condition when a header error occurs.



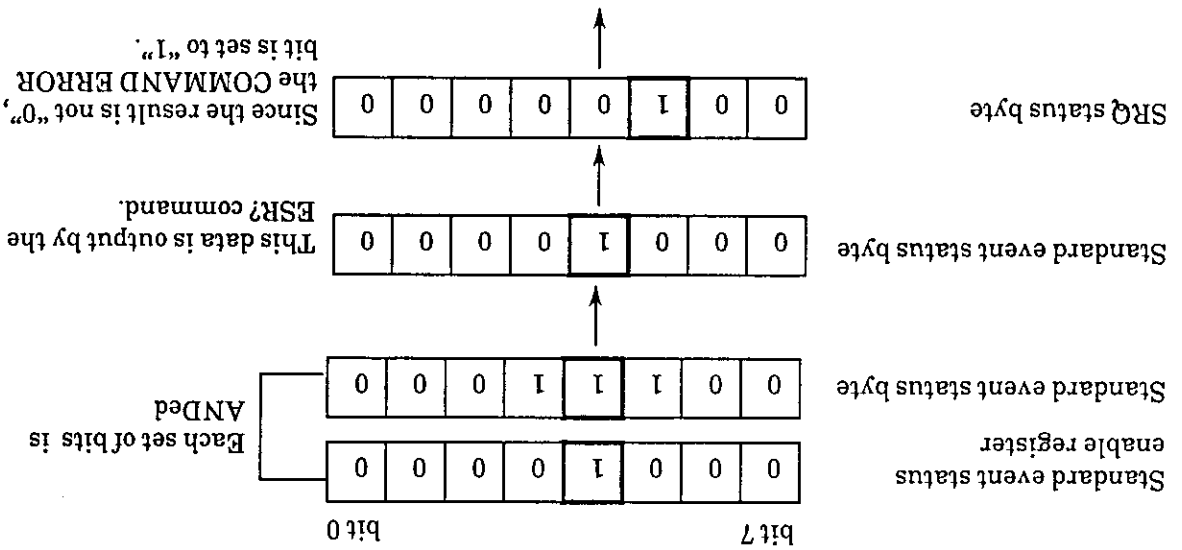
11.2.4 Standard event status byte

Operation

This byte contains information on the data to be output to the bus when a data request message is received.

When an event is generated, it is ANDed with the standard event status enable register. If the result is not "0", the COMMAND ERROR bit of the SRQ status byte is set to "1".

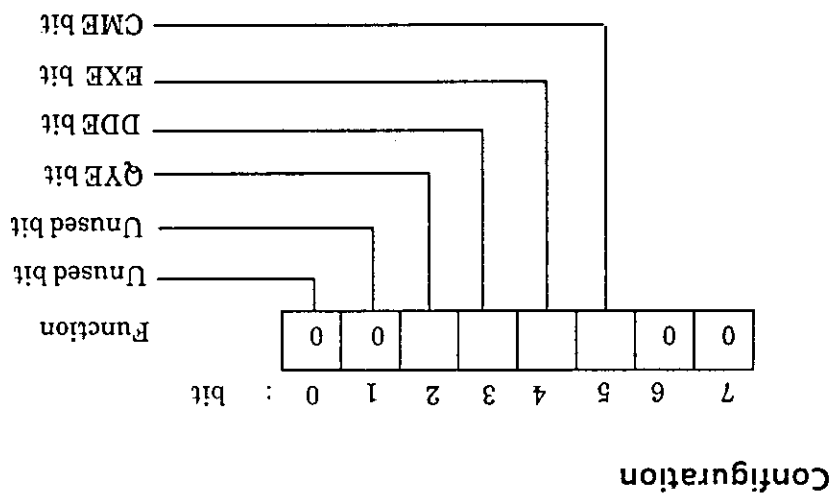
- After the status byte has been read by a data request message, each of its bits is cleared.
- Otherwise, this byte is not cleared even if a device clear, interface clear or initialize command is received.



Command

Control message :
 Data request message : ESR?
 Output message : ESRΔ#B***** (CR/LF)

(*: Represents "0" or "1" setting at that time)



Name	Bit	Function
	6	Not used
CME: Command error	5	<p>This bit is set when an undefined header is received. It is reset when the standard event status byte is read. Otherwise, it is not reset even if a device clear, interface clear, or initialize command is received. If this bit is set after the CME bit of the standard event status enable register has been set by the ESE command, the COMMAND ERROR bit of the status byte will be set.</p>
EXE: Execution error	4	<p>This bit is set when the numerical value is out of range or when a HEX value is illegally used. It is reset when the standard event status byte is read. Otherwise, it is not reset even if a device clear, interface clear, or initialize command is received. If this bit is set after the EXE bit of the standard event status enable register has been set by the ESE command, the COMMAND ERROR bit of the status byte will be set.</p>
DDE: Device dependent error	3	<p>This bit is set when a received command is illegally used. It is reset when the standard event status byte is read. Otherwise, it is not reset even if a device clear, interface clear, or initialize command is received. If this bit is set after the DDE bit of the standard event status enable register has been set by the ESE command, the COMMAND ERROR bit of the status byte will be set.</p>
QYE: Query error	2	<p>This bit is set when the MP1702A/MP1609A/MP1651A is designated a talker even though the send buffer is empty or when the send buffer has overflowed. It is reset when the standard event status byte is read. Otherwise, it is not reset even if a device clear, interface clear, or initialize command is received. If this bit is set after the QYE bit of the standard event status enable register has been set by the ESE command, the COMMAND ERROR bit of the status byte will be set.</p>

Table 11-2 Standard Event Status Byte (1/2)

Command

Command message : EESΔ0 to EESΔ127
 Data request message : EES?
 Output message : EESΔΔ0 (CR/LF) to EESΔ127 (CR/LF)

Operation

11.2.5 Extended event status enable register

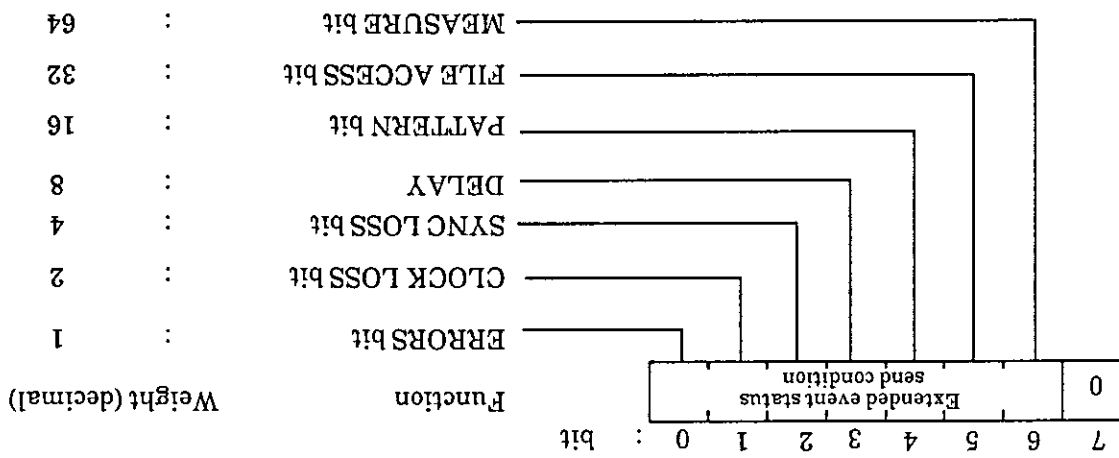
Name	Bit	Function
	1	Not used
	0	Not used

Table 11-2 Standard Event Status Byte (2/2)

This register is used to enable/disable service requests by extended events. The SRQ status byte EXTENSION bit is set to "1" or "0" when an extended event occurs. When an extended event whose enable status bit is set to "1" occurs, the EXTENSION bit is set to "1".

- When an EES command is received, all the previously set send conditions are cleared.
- Multiple service request conditions can also be set.
- All EES send conditions are cleared immediately after the power is turned ON and immediately after a device clear or initialize command is received.

Configuration



Function

- Weight 0: Clears the extended event status send (EES) byte
- 1: Sends the EESS condition when an error is detected.
- 2: Sends the EESS condition at clock loss and clock recovery.
- 4: Sends the EESS condition at sync loss and sync recovery.
- 8: Sends the EESS condition when the servo subcircuit of the clock delay circuit changes from the BUSY to READY state.
- 16: Sends the EESS condition on completion of programmable pattern setting.
- 32: Sends the EESS condition on completion of a floppy disk access.
- 64: Sends the EESS condition when measurements have been completed.

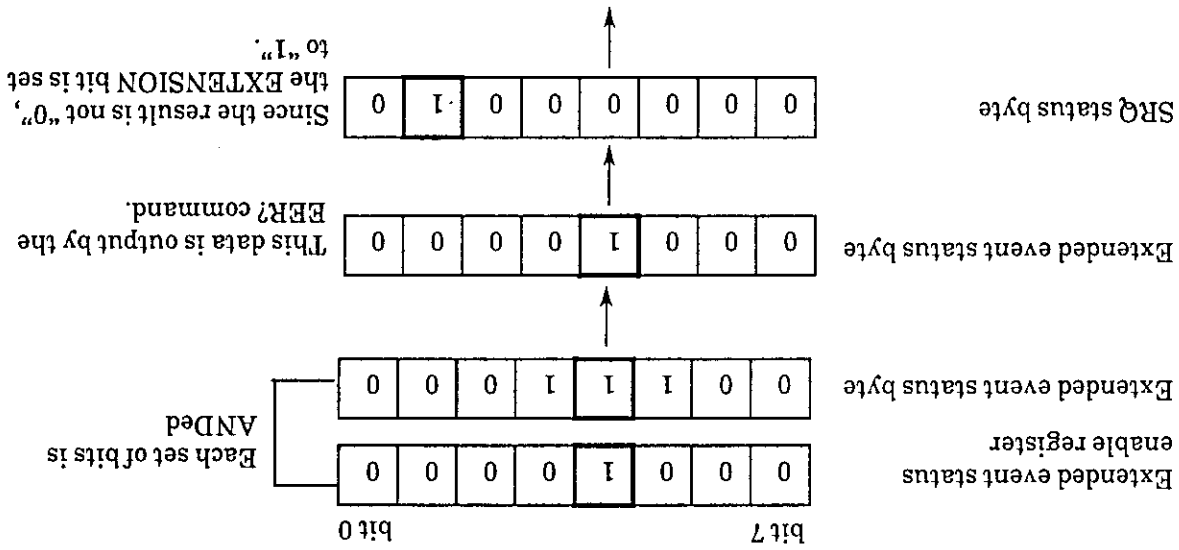
11.2.6 Extended event status byte

Operation

This byte contains information on the data to be output to the bus when a data request message is received.

When an event is generated, the status for that event is ANDed with the same bit in the extended event status enable register. If the result is not "0", the EXTENSION bit of the SRQ status byte is set to "1".

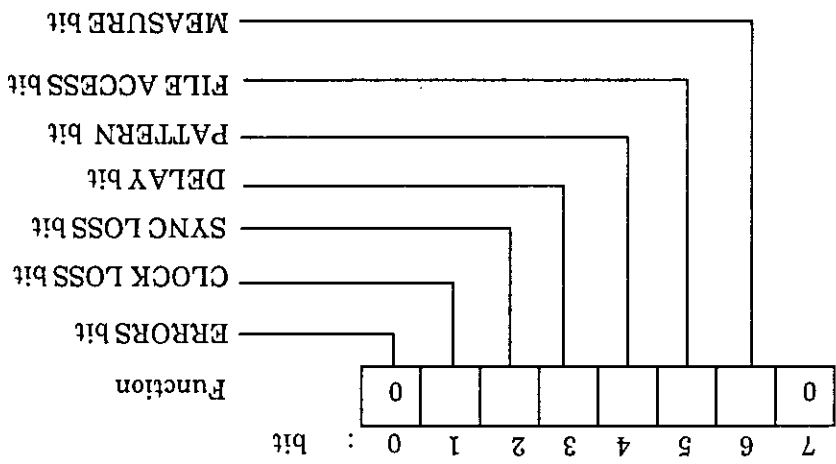
- After the status byte is read by a data request message, all status bytes are cleared.
- Otherwise, this byte is not cleared even if a device clear, interface clear, or initialize command is received.



Command

Control message :
 Data request message : EER?
 Output message : EERΔ#B***** (CRLF)

(*: Represents "0" or "1" at that time)



Configuration

Function	Bit	Name
Unused	7	
<p>This bit is set when measurement is completed and reset when the extended event status byte is read. Otherwise, this bit is not reset, even when the device clear, interface clear, or initialize command is received. If this bit is set after the MEASURE bit of the extended event status enable register has been set by the EES command, the EXTENSION bit of the status byte will be set.</p>	6	MEASURE
<p>This bit is set when access to the floppy disk is completed and reset when the extended event status byte is read. Otherwise, this bit is not reset even when the device clear, interface clear, or initialize command is received. If this bit is set after the FILE ACCESS bit of the extended event status enable register has been set by the EES command, the EXTENSION bit of the status byte will be set.</p>	5	FILE ACCESS
<p>This bit is set upon completion of programmable pattern setting and reset when the extended event status byte is read. Otherwise, this bit is not reset even when the device clear, interface clear, or initialize command is received. If this bit is set after the PATTERN bit of the extended event status enable register has been set by the EES command, the EXTENSION bit of the status register will be set.</p>	4	PATTERN
<p>This bit is set when the clock-input-phase servo circuit changes from the BUSY to the READY state and is reset when the extended event status byte is read. Otherwise, this bit is not reset even when the device clear, interface clear, or initialize command is received. If this bit is set after the DELAY bit of the extended event status enable register has been set by the EES command, the EXTENSION bit of the status register will be set.</p>	3	DELAY

Table 11-3 Contents of Extended Event Status Byte (1/2)

Table 11-3 Contents of Extended Event Status Byte (2/2)

Name	Bit	Function
SYNC LOSS	2	This bit is set when synchronization is lost or recovered and reset when the extended event status byte is read. Otherwise, this bit is not reset even when the device clear, interface clear, or initialize command is received. If this bit is set after the SYNC LOSS bit of the extended event status enable register has been set by the EES command, the EXTENSION bit of the status register will be set.
CLOCK LOSS	1	This bit is set when clock is lost or recovered and reset when the extended event status byte is read. Otherwise, this bit is not reset even when the device clear, interface clear, or initialize command is received. If this bit is set after the CLOCK LOSS bit of the extended event status enable register has been set by the EES command, the EXTENSION bit of the status byte will be set.
ERRORS	0	This bit is set the first time an error is detected and reset when the extended event status byte is read. Otherwise, this bit is not reset even when the device clear, interface clear, or initialize command is received. If this bit is set after the ERRORS bit of the extended event status enable register has been set by the EES command, the EXTENSION bit of the status byte will be set.

SECTION 12 PATTERN DATA TRANSFER BY DMA

As with the conventional instruments (e.g. MP1601A/MP1604A), programmable patterns of up to 512 k bits can be transferred by the BIT command via GP-IB; however, a large amount of time is required. Therefore, the MP1702A/MP1609A/MP1651A has been equipped with a DMA transfer function to facilitate the rapid transfer of pattern data.

12.1 DMA

DMA is the abbreviation of Direct Memory Access and is a method of transferring a large volume of data at high speed (memory to memory transfer).

12.2 Commands for Number of Pattern Data Input Bytes and Number of Pattern Data Output Bytes

The number of pattern data input bytes (WRT command) and number of pattern data output bytes (RED command) GP-IB commands of the MP1702A/MP1609A/MP1651A are described below:

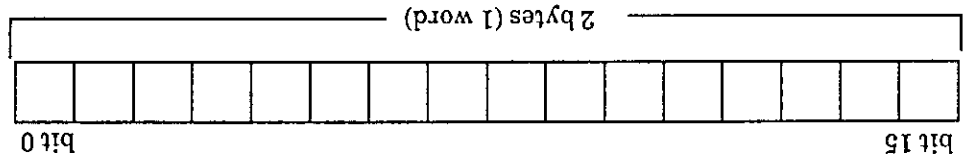
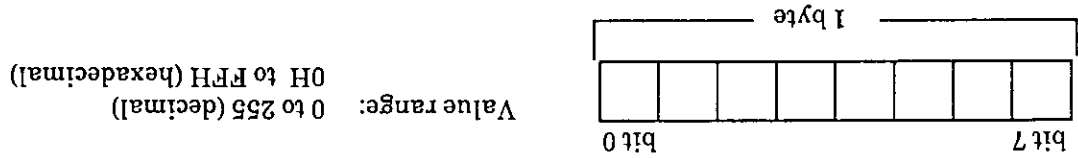
To transfer pattern data, the MP1702A/MP1609A/MP1651A must be given the following information by using the WRT and RED commands:

- Number of bytes of pattern data to be transferred
- The start address for the MP1702A/MP1609A/MP1651A internal RAM location at which received pattern data is to be stored, or the start address for the MP1702A/MP1609A/MP1651A internal RAM location at which the pattern data to be output are stored.

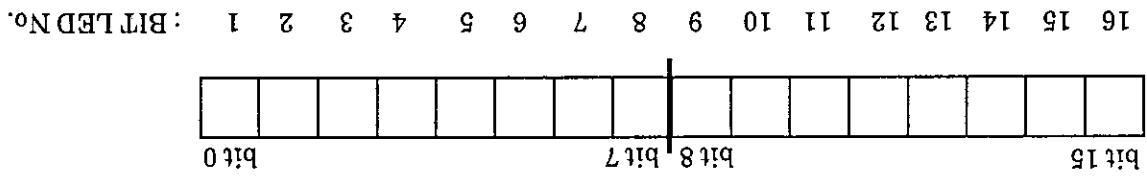
12.2.1 Number of bytes of pattern data to be transferred

A byte consists of 8-bits.

The MP1702A/MP1609A/MP1651A has a 16-bit (2 bytes or 1 word) pattern data format.



The pattern data format is shown below:



The number of pattern data bytes to be transferred equals the number of 8-bit data blocks to be transferred.

2 bytes (data words) are always transferred for each page. Therefore, when only one byte exists, only the high-order byte of the data word (bits 15 to 8, in the figure above) will contain the data byte.

12.2.2 Start address of the MP1702A/MP1609A/MP1651A internal RAM to store transferred pattern data and that to output pattern data to be transferred
 The MP1702A/MP1609A/MP1651A internal RAM address ranges from 0 to 32767. This address range is common to both WORD and DATA patterns.
 The relationship between the displayed page number and the pattern address is shown below:

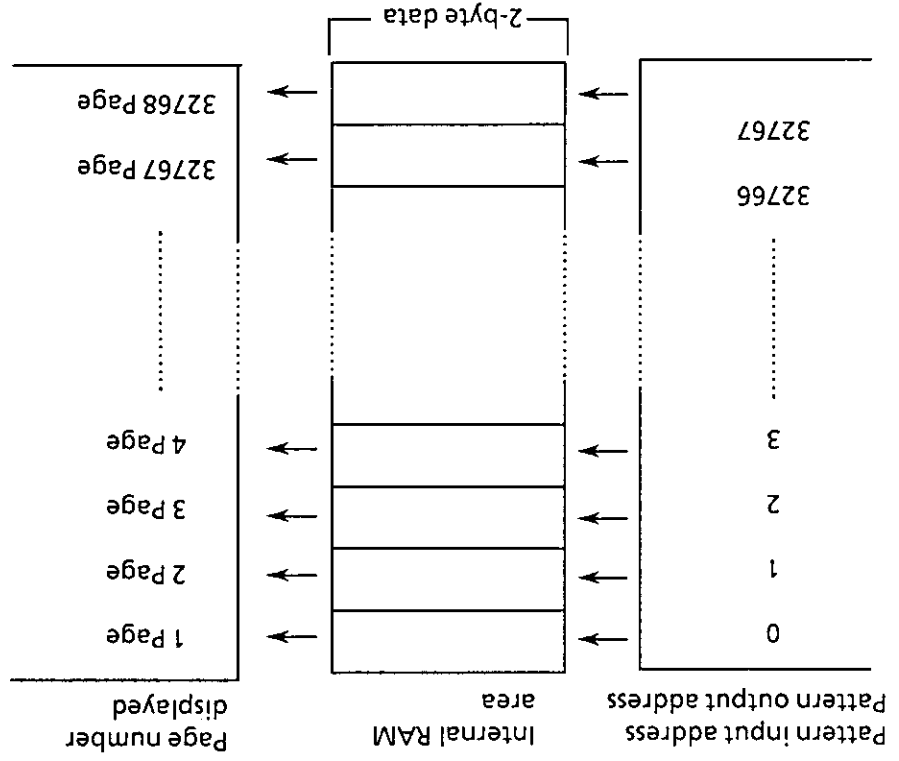


Fig. 12-1 Relationship between Page Number and Pattern Address

12.3 DMA Program Examples

Sample programs that use the DMA function are listed in items (15) and (16) of paragraph 15.4 and 15.5. The functions and formats of each DMA command are illustrated via these programs.

Since odd-numbered addresses cannot be defined on a 16-bit CPU, the following equation defines the relationship between the pattern input/output start address and the page number.

(Pattern input/output start address + 1) = actual page number

SECTION 13 MEASUREMENT RESULT OUTPUT FORMAT

This section describes the measurement result output format when measurement results are output after each measurement is completed.

13.1 Types of Output Data

The table below shows output items and conditions.

Table 13-1 Measurement Result Output Items and Conditions (1/2)

Types of output data		Output items	Time of output
Item data	Measurement data at start	<ul style="list-style-type: none"> · Data and time at start of measurement 	<ul style="list-style-type: none"> · When measurement is started (For repeat measurements, this data is output only at time measurements are started)
	One-second data *	<ul style="list-style-type: none"> · Measurement time · Average error ratio for one second · Error count for one second 	<ul style="list-style-type: none"> · When one-second data print select function is ON and the average one-second error ratio exceeds the one-second data print threshold
	Alarm data	<ul style="list-style-type: none"> · Time of event occurrence and recovery; Event log 	<ul style="list-style-type: none"> · When clock is lost · When clock loss is recovered · When synchronization is lost · When sync loss is recovered (However, this data is not output if sync is lost or recovered while measurement is not in progress.)

* Output thresholds for one-second data are NO ERROR, > 1E-6, > 1E-4, or 1E-3.

Table 13-1 Measurement Result Output Items and Conditions (2/2)

Types of output data	Output items	Time of output
<p>Measurement data at end</p>	<p>Varies depending on the data print format. For details, see the next page.</p>	<p><Repeat measurement> - When each measurement is completed or when aborted. <Single measurement> - When measurement is completed or aborted. <Unlimited measurement> - When measurement is stopped</p>
<p>Intermediate data</p>	<p>Same as measurement data at end. (In this case, however, the most recent measurement time is output in place of the end of measurement time.)</p>	<p>· When intermediate result are requested by the (IMD?) data request command</p>

The table below shows output items for the measurement data at end.

Table 13-2 Output Items of Measurement Data at End (1/2)

Output item	Data print format	Standard	Short (Abridged)
Measurement start time		○	-
Measurement end time (Note 1)		○	○
Elapsed time		○	-
Error measurement data	Average error ratio	○	○
	Total error count	○	○
Interval measurement data	No. of error intervals	○	-
	Error-free intervals ratio	○	-
	No. of power failure intervals	○	-
	No. of clock loss intervals	○	-
	No. of sync loss intervals	○	-
	No. of threshold EI (1E-3, 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, ≤1E-8)	○	○
	Threshold interval measurement data (Note 2)	Threshold EFI ratio (1E-3, 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, ≤1E-8)	○

Note 1: The most recent measurement time is output for intermediate data.

Note 2: These data are output when the threshold EI/EFI measurement data are selected for printing.

Note 3: These data are output when error performance measurement data is ON and the measurement time is 60 seconds or more.

Short (Abridged)	Standard	Data print format				
		Output item	Error performance data (Note 3)	Error-free seconds ratio	Severely errored seconds ratio	Degraded minutes ratio
<input type="radio"/>	<input type="radio"/>	Error-free seconds ratio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	Error performance data (Note 3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	Severely errored seconds ratio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	Degraded minutes ratio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	Unavailable seconds ratio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Table 13-2 Output Items of Measurement Data at End (2/2)

(b) When data is to be printed in the short (abridged) format

1st line : Measurement end time for measurement data at end
 ENDA ** ** ** ** ** ** **
 Year Month Day Hour Minute Second

Most recent measurement time for intermediate data
 INTA ** ** ** ** ** ** **
 Year Month Day Hour Minute Second

2nd line : Average error ratio
 ERAVA.***E-**

3rd line : Total error count (less than 1E + 10)
 ECVAΔ*****

Total error count (1E + 10 or more)
 ECVAΔ.***E+**

Both the threshold interval measurement and error performance data output formats are output after the third line as in the standard format.

(2) Terminator

For other than the last line : SR2 (CR.LF)
 For the last line : SR2 (CR.LF) + SR3 (EOI)

1st line	:	STA	90,	03,	18,	20,	54,	00	_____	Data at start of measurement
2nd line	:	OSD	1,	0000E	-	03,	29999996] One-second data	
3rd line	:	OSD	1,	0000E	-	03,	29999996			
4th line	:	OSD	1,	0000E	-	03,	29999996			
5th line	:	OSD	1,	0000E	-	03,	29999996			
6th line	:	CL	90,	03,	18,	20,	54,	05] Alarm data	
7th line	:	CR	90,	03,	18,	20,	54,	51		
8th line	:	SL	90,	03,	18,	20,	54,	52		
9th line	:	SR	90,	03,	18,	21,	00,	00		
10th line	:	OSD	1,	0000E	-	03,	29999996] One-second data	
11th line	:	OSD	1,	0000E	-	03,	29999996			

(4) Data output example for standard format

1st line	:	STA	90,	03,	18,	20,	53,	10	_____	Data at start of measurement
1st line	:	END	90,	03,	18,	20,	53,	30] Data at end of measurement	
2nd line	:	ER	0,	000E	-	09				
3rd line	:	EC						0		

(3) Basic output example for short (abridged) format

16th line	:	TH8						0. 100. 0000] Data at end of measurement
17th line	:	TH9						0. 0000	
18th line	:	ES						100. 0000	
19th line	:	EFS						0. 0000	
20th line	:	SFS						0. 0000	
21st line	:	DM						0. 0000	
22nd line	:	US						0. 0000	

1st line :	STA	90,	03,	18,	20,	05,	30	—	Data at start of measurement
1st line :	STA	90,	03,	18,	20,	05,	30		
2nd line :	END	90,	03,	18,	20,	05,	33		
3rd line :	ELP			0,	00,	00,	03		
4th line :	ER			0.0000E	-	00			
5th line :	EC						0		
6th line :	EI						0		
7th line :	EFI			0.		0000			
8th line :	PFI						0		
9th line :	CLI						1		
10th line :	SLI						2		

Data at end of measurement

(5) Basic output example for standard format (for "no data" display)

1st line :	STA	90,	03,	18,	20,	54,	00		
2nd line :	END	90,	03,	18,	21,	00,	02		
3rd line :	ELP			0,	06,	02			
4th line :	ER			1.0000E	-	03			
5th line :	EC			14999980					
6th line :	EI						5		
7th line :	EFI			0.000					
8th line :	PFI						0		
9th line :	CLI						46		
10th line :	SLI						38		

Data at end of measurement

13.3 Data Buffering

Data which are not read by the controller via GP-IB, are stored in a buffer.

When there is space in the buffer, data are stored in the order in which output requests are generated. When recalled, they are output chronologically beginning with old data. When the buffer runs out of space, the oldest data with the lowest priority are overwritten.

Data priorities are as follows:

- Block data
 - 1. Measurement data at end : ↓ Higher
 - 2. Intermediate data : ↓ Lower
- Item data
 - 1. Measurement data at start : ↓ Highest
 - 2. Alarm data : ↓
 - 3. One-second data : ↓ Lowest

SECTION 14 EXECUTING PROGRAMS WRITTEN FOR OTHER DEVICES

The following four items must be edited when executing programs written for other devices (MP1601A/MP1604A) on the MP1702A/MP1609A/MP1651A.

1. Leave at least one space after the header (HR) field.

The header field and numeric data field (or identifier) are distinguished by this space.

Example:

```

OUTPUT 700; "DTM0"
      ↑
OUTPUT 700; "DTMΔ0"
    
```

Space inserted here.

2. Use the semicolon (;) separator to separate commands and the comma (,) separate to separate data items.

Examples:

- Command separation

```

OUTPUT 700; "DTMΔ0;PTNΔ0"
      ↑
OUTPUT 700; "DTMΔ0;PTNΔ0"
    
```

Use semicolon(;) here.

- Data separation

```

OUTPUT 700; "BITΔ10;20"
      ↑
OUTPUT 700; "BITΔ10,20"
    
```

Use comma(,) here.

3. When sequential data output requests are received by the MP1702A/MP1609A/MP1651A, only information from the last data request is output, as shown below:

Examples:

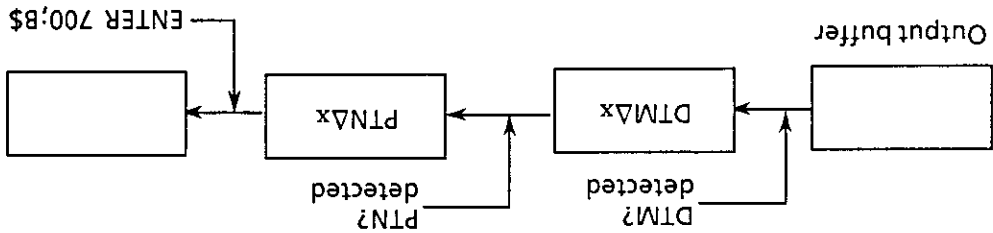
- When one of program code contains multiple data output requests

```

OUTPUT 700;"DTM?;PTN?"
ENTER 700;B$
PRINT B$ → Outputs PTNΔx.
  
```

(x: Status at time of output)

When the above program is executed, the following output buffer operations occur.



The correct data output request program code is as follows:

```

OUTPUT 700;"DTM?"
ENTER 700;B$
PRINT B$ → Outputs DTMΔx.
i
OUTPUT 700;"PTN?"
ENTER 700;B$
PRINT B$ → Outputs PTNΔx.
  
```

(x: Status at time of output)

4. The GP-IB status byte format for the MPI702A/MPI609A/MPI651A includes all conventional as well as some special functions. The MPI702A/MPI609A/MPI651A GP-IB status byte is described in SECTION 11. A sample program is shown in SECTION 15.

(x: Status at time of output)

```

PRINT B$ → Outputs PTNΔx.
ENTER 700;B$
OUTPUT 700;"PTN?"
i

```

```

PRINT B$ → Outputs DTMΔx.
ENTER 700;B$
OUTPUT 700;"DTM?"

```

Above messages should be rewritten as follows:



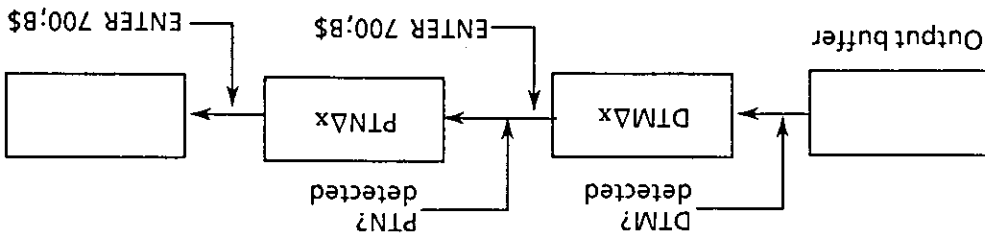
(x: Status at time of output)

```

PRINT B$ → Outputs PTNΔx.
ENTER 700;B$
OUTPUT 700;"PTN?"
OUTPUT 700;"DTM"

```

• When multiple data request messages were sent



When this program is executed, the following output buffer operations occur:

