

MT8801B
Radio Communication Analyzer

MX880115A
GSM Measurement Software
Operation Manual
(Remote Control)

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SECTION 1 GENERAL

This section outlines the Remote Control functions of the MT8801B Radio Communication Analyzer.

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SECTION 1 GENERAL

1.1 General Description

The MT8801B Radio Communication Analyzer, when combined with an external controller, can automate your measurement system. For this purpose, the MT8801B is equipped with an RS-232C interface port and a GPIB interface bus (IEEE Std 488.2-1987) as a standard feature.

1.2 Remote Control Functions

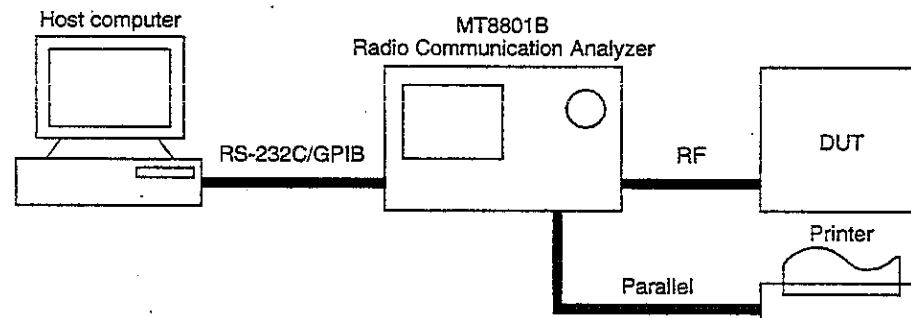
The Remote Control functions of the MT8801B are as follows:

- (1) Controls all functions except the power switch, floppy disk unloading , and some keys including the [Local] key
- (2) Reads out all setting conditions
- (3) Sets the RS-232C interface conditions and GPIB address from the panel
- (4) Executes interrupts and serial polling

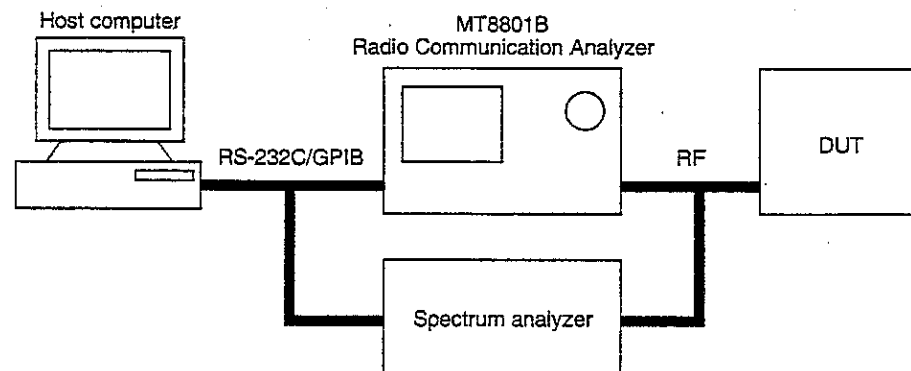
These functions enable to configure the automatic measurement system when the MT8801B is combined with a personal computer and other measuring instruments

1.3 Example of System Configuration Using RS-232C/GPIB

(1) Control by the host computer (1)



(2) Control by the host computer (2)



1.4 RS-232C Specifications

The RS-232C specifications of the MT8801B are shown in the table below.

Item	Specification
Function	Control from an external controller (except power switch)
Communication system	Asynchronous (start-stop method), half-duplex
Communication control	X-ON/OFF control
Baud rate	1200, 2400, 4800, 9600 bps
Data bits	7 bits, 8 bits
Parity	Odd, Even, None
Start bit	1 bit
Stop bit	1 bit, 2 bits
Connector	D-sub 9 pins, female

1.5 GPIB Specifications

The GPIB of the MT8801B provides the IEEE488.1 interface function subsets listed in the table below.

GPIB Interface Functions

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

SECTION 2

DEVICE MESSAGES

This section outlines and lists the device messages of the MT8801B.

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2.1 General Description

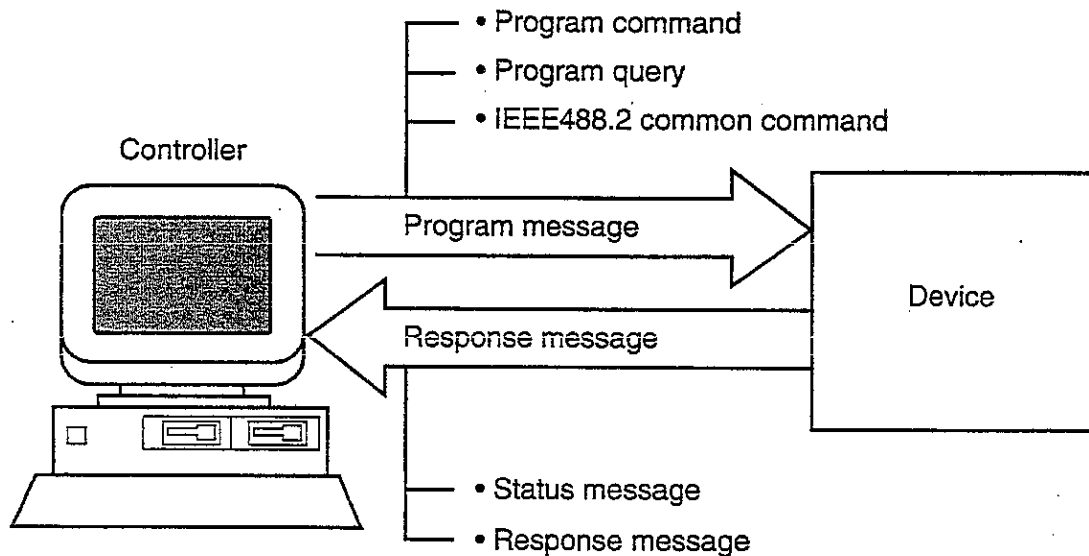
A device message is a data message transmitted between the controller and device via the system interface. Device messages are classified into program messages and response messages.

A program message is an ASCII data message transferred from the controller to the device. Program messages are classified into program commands and program queries.

Program commands are classified into device-specific commands used exclusively to control the MT8801B, and IEEE488.2 common commands. IEEE488.2 common commands are also used for other measuring instruments conforming to IEEE488.2 connected to the bus.

A program query is a command used to obtain a response message from the device. It is transferred from the controller to the device in advance, then the controller receives the response message from the device.

A response message is an ASCII data message transferred from the device to the controller.



Program messages and response messages may have a suffix (units) at the end of the numeric data.

2.2 Suffix Code

The table below shows the suffixes used for the MT8801B.

MT8801B Suffix Codes

Type	Unit	Suffix code
Frequency	GHz	GHZ , GZ
	MHz	MHZ , MZ
	kHz	KHZ , KZ
	Hz	HZ
	Default	HZ
Time	second	S
	m second	MS
	μ second	US
	Default	MS
Level (dB)	dB	DB
	dBm	DBM , DM
	dB μ	DBU
	Default	Determined in conformance with the set scale unit
Level (W)	W	W
	mW	MW
	μ W	UW
	nW	NW
	Default	UW

2.3 IEEE488.2 Common Commands and Supported Commands

The table below lists 39 common commands specified in the IEEE488.2 standard. IEEE488.2 common commands which are supported by the MT8801B are indicated with the © symbol in the table.

Mnemonic	Command name	IEEE488.2 standard	MT8801B supported commands
*ADD	Accept Address Command	Optional	
*CAL	Calibration Query	Optional	
*CLS	Clear Status Command	Mandatory	Àù
*DDT	Define Device Trigger Command	Optional	
*DDT?	Define Device Trigger Query	Optional	
*DLF	Disable Listener Function Command	Optional	
*DMC	Define Macro Command	Optional	
*EMC	Enable Macro Command	Optional	
*EMC?	Enable Macro Query	Optional	
*ESE	Standard Event Status Enable Command	Mandatory	©
*ESE?	Standard Event Status Enable Query	Mandatory	©
*ESR?	Standard Event Status Register Query	Mandatory	©
*GMC?	Get Macor contents Query	Optional	
*IDN?	Identification Query	Mandatory	©
*IST?	Individual Status Query	Optional	
*LMC?	Learn Macro Query	Optional	
*LRN?	Learn Device Setup Query	Optional	
*OPC	Operation Complete Command	Mandatory	©
*OPC?	Operation Complete Query	Mandatory	©
*OPT?	Option Identification Query	Optional	
*PCB	Pass Control Back Command	Mandatory if other than C0	
*PMC	Purge Macro Command	Optional	
*PRE	Parallel Poll Register Enable Command	Optional	
*PRE?	Parallel Poll Register Enable Query	Optional	
*PSC	Power On Status Clear Command	Optional	
*PSC?	Power On Status Clear Query	Optional	
*PUD	Protected User Data Command	Optional	
*PUD?	Protected User Data Query	Optional	
*RCL	Recall Command	Optional	
*RDT	Resource Description Transfer Command	Optional	
*RDT?	Resource Description Transfer Query	Optional	
*RST	Reset Command	Mandatory	©
*SAV	Save Command	Optional	
*SRE	Service Request Enable Command	Mandatory	©
*SRE?	Service Request Enable Query	Mandatory	©
*STB?	Read Status Byte Query	Mandatory	©
*TRG	Trigger Command	Mandatory if DT1	©
*TST?	Self Test Query	Mandatory	©
*WAI	Wait to Continue Command	Mandatory	©

Note: The first character of IEEE488.2 common commands is always *.

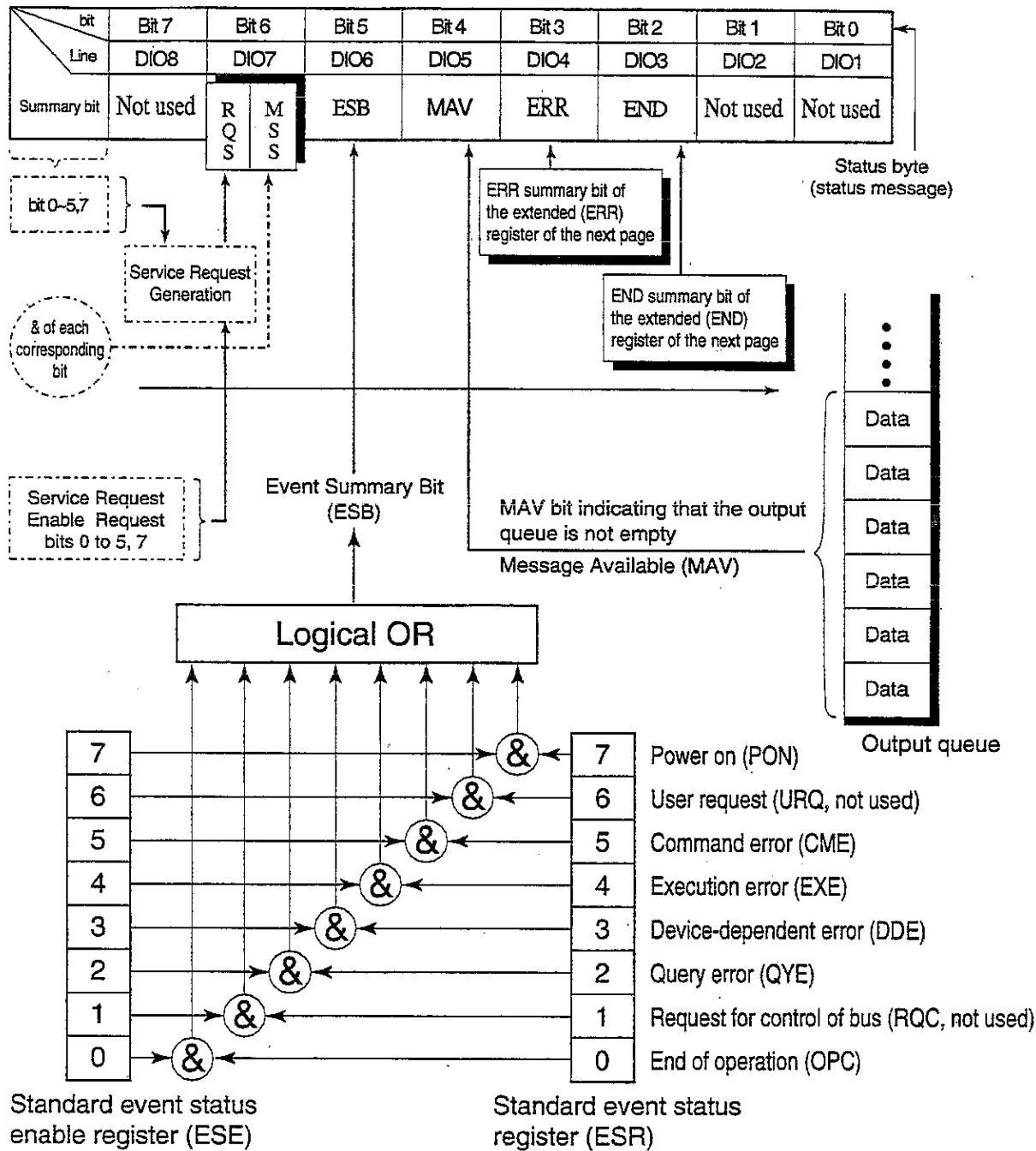
SECTION 2 DEVICE MESSAGES

Table below lists the IEEE488.2 common commands used in the MT8801B.

IEEE488.2 common command				
Command name	Program Msg.	Query Msg.	Response Msg.	Remarks
Clear status	*CLS	---	---	
Standard event status enable	*ESE n	*ESE?	n	n:0 to 255
Standard event status register	---	*ESR?	n	n:0 to 255
Identification query	---	*IDN?	id	ID:Manufacturer name, model name, etc.
Operation complete	*OPC	*OPC?	1	
Reset	*RST	---	---	
Service request enable	*SRE	*SRE?	n	"n:0 to 63,128 to 191"
Read status byte	---	*STB?	n	
Trigger	*TRG	---	---	
Self test	---	*TST?	n	
Wait to continue	*WAI	---	---	

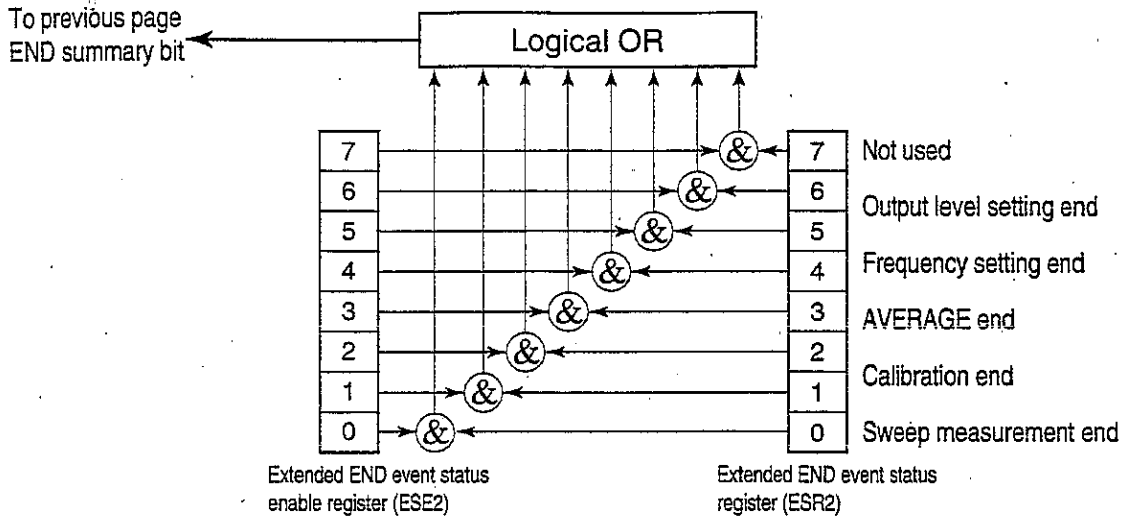
2.4 Status Messages

The diagram below shows the structure of service-request summary messages for the status byte register (STB) used with the MT8801B.

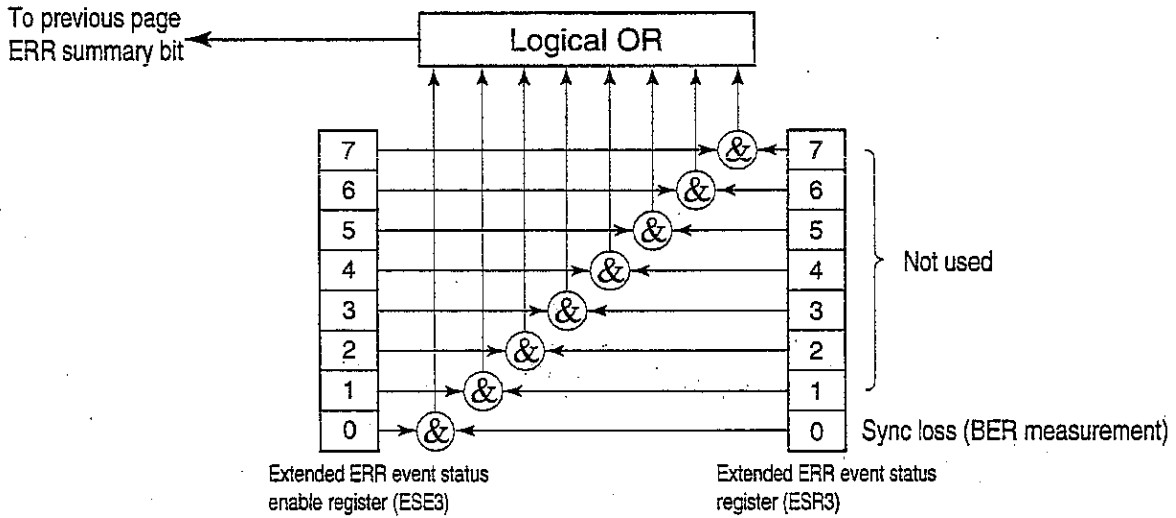


Standard Event Status (STB) Register

Note: & indicates a logical product (AND).



Extended Event Status (END) Register



Extended Event Status (ERR) Register

2.5 Device Message List

MT8801B-specific program commands, query messages, and response messages are listed from paragraph 2.5.1.

• Device message table

(a) Program messages (Program Msg)/query message (Query Msg)

(i) Uppercase characters	:	Reserved words
(ii) Numeric	:	Reserved words (numeric code)
(iii) Lowercase characters in argument		
f (frequency)	:	Real number or integer with decimal point
	Units :	GHZ, MHZ, KHZ, HZ, GZ, MZ, KZ, no units = HZ
t(time)	:	Real number or integer with decimal point
	Units :	S, SC, MS, US, no unit = US
l (level)	:	Real number or integer with decimal point
	Units :	DB, DBM, DM, DBU, W, MW, UW, NW, no units = set SCALE units
n (no units integer)	:	Integer
r (no units real number)	:	Real number
h (no units hexadecimal number)	:	Hexadecimal number
Others	:	Listed in remarks columns of the table

(b) Response messages (Response Msg)

(i) Uppercase characters	:	Reserved words
(ii) Numeric	:	Reserved words (numeric code)
(iii) Lowercase characters in argument		
f (frequency)	:	12-character fixed integer units = HZ
t (time)	:	Real number or integer with decimal point
l (level)	:	Real number or integer with decimal point
u (ratio)	:	Real number or integer with decimal point
s (symbol)	:	Real number or integer with decimal point
n (no units integer)	:	Integer, variable number of digits (Significant digits are output.)
r (no units real number)	:	Real number with decimal point, variable number of digits (Significant digits are output.)
h (no units hexadecimal number)	:	Hexadecimal number
Others	:	Written in remarks columns of the table

Notes: • Integer:NR1 format, real number:NR2 format

• Ø:Zero

Device messages are classified into 7 types according to their valid ranges:

- 1.MT8801B common commands : Valid in all MT8801B modes
- 2.Instrument Setup command : Valid in Instrument Setup panel mode
- 3.TX/RX tester commands : Valid in TX/RX tester and call processing panel modes (on all TX/RX test and call processing screens)
- 4.Setup command parameter command : Valid on the Setup common parameter screen
- 5.TX tester commands : Valid in a range defined on each TX test screen
- 6.RX tester commands : Valid in a range defined on each RX test screen
- 7.Call processing commands : Valid in a range defined on each call processing screen

These device messages are listed below.

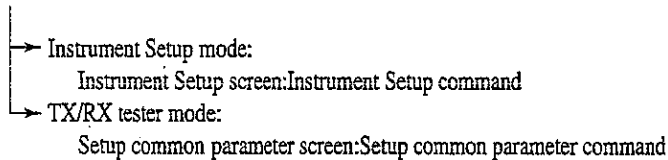
• Relationship between screen hierarchies and commands

[MT8801B common commands]: Valid in all MT8801B modes regardless of screen hierarchies

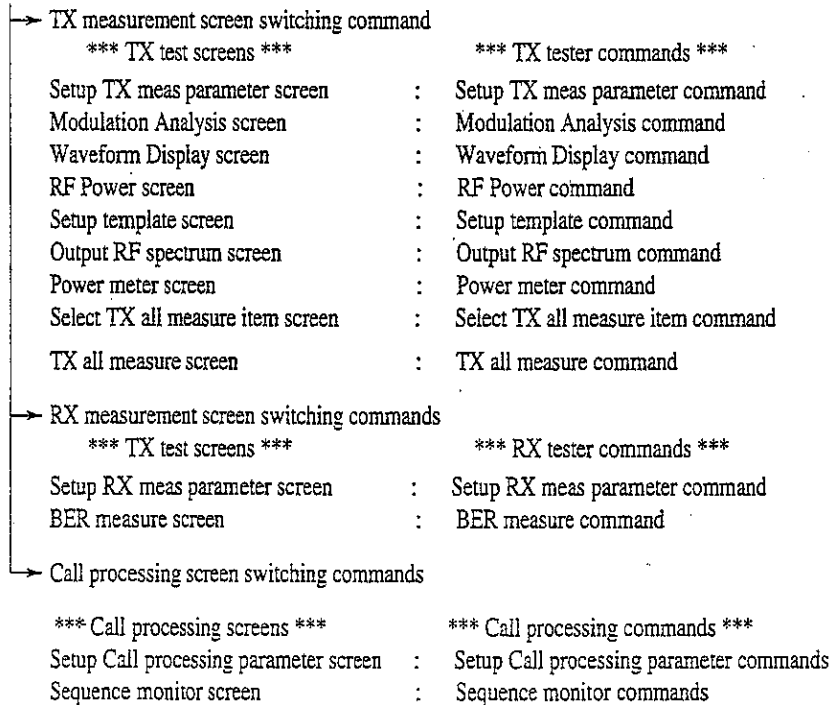
- Save/Recall command
- FD command (Verify)
- Copy command
- Single/Continuous switching command
- Preset command
- Waveform memory read command
- Switch to upper screen command (BS: Back Screen)
- Extended event status command (END)

[Screen hierarchies and commands]

Panel mode switching commands



TX/RX tester command



2.5.1 MT8801B common commands

MT8801B common commands are valid in all MT8801B modes.

(1) Save/Recall commands (parameter saving and calling)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Recall	Recall file	File No.	RCM n	---	---	n:Ø to 99
	Recalled data	Parameter	RDATA p	RDATA?	p	p:Ø to 99
Save	Save file	File No.	SVM n	---	---	n:Ø to 99

(2) FD command (verify)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Verify	On	VERIFY ON	VERIFY?	ON	
		Off	VERIFY OFF	VERIFY?	OFF	

(3) Copy command (copy, printer type)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Copy		PRINT	---	---	
			PLS Ø	---	---	
	Printer type	ESC/P(24DOT)	PMOD 6	PMOD?	6	
		HP	PMOD 3	PMOD?	3	

(4) Single/Continuous switching command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Single	Measurement/ sweep start	SNGLS S2	---	---	
		Measurement/ sweep synchronization	SWP TS	---	---	
	Continuous		CONTS S1	---	---	
		Measurement/ sweep status	Measurement/sweep end During measurement/sweep	---	SWP? SWP?	SWP Ø SWP 1

(5) Preset command (initialization, power-on setting)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Preset		PRE INI IP	---	---	
		Preset value	Initialization Setting at power failure (Previous state) Recall memory No.	POWERON IP POWERON LAST POWERON n	---	---	n:Ø to 99

(6) Waveform memory read commands (XMC, XMD, XMN, XMP)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Modulation analysis	I-Q	MEM C	XMC p \emptyset ,p1,d	XMC? p \emptyset ,p1,d	b,b,b,...	p \emptyset :I,Q selector \emptyset :Q data, 1:I data p1:Start position \emptyset to 147 \emptyset (=0 to 147.0 bit) d:data length 1 to 1471
	Magnitude error	MEM N	XMN p,d	XMN? p,d	b,b,b,...	pl:Start position \emptyset to 147 \emptyset (=0 to 147.0 bit) d:data length 1 to 1471
	Phase error	MEM P	XMP p,d	XMP? p,d	b,b,b,...	p:Start position \emptyset to 147 \emptyset (=0 to 147.0 bit) d:data length 1 to 1471
RF power	RF power	MEM D	XMD p,d	XMD? p,d	b,b,b,...	pl:Start position \emptyset to 145 $\emptyset\emptyset$ (=0 to 147.0 bit) (=100.0 to 1350.0 bit) d:data length 1 to 145 \emptyset 1
Output format	Output format	ASCII	BIN \emptyset	---	---	
			BIN OFF	---	---	
		BINARY	BIN 1	---	---	
			BIN ON	---	---	

(7) Panel mode switching command (TX/RX tester mode, Instrument Setup mode)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	TX/RX tester		PNLMD TESTER	PNLMD?	TESTER	
	Instrument setup		PNLMD SYSTEM	PNLMD?	SYSTEM	

(8) Switch to upper screen command (BS)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Back screen		BS	---	---	

(9) Extended event status command (END)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Event status	END event status	Event status enable	ESE2 n	ESE2?	n	n: \emptyset to 255
		Event status register	---	ESR2?	n	
		Event status enable	ESE3 n	ESE3?	n	n: \emptyset to 255
		Event status register	---	ESR3?	n	

(10) Screen off command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Screen off	Off Reset (Screen ON)	SCREEN OFF *RST	-- --	-- --	

(11) MT8801 Serial Number read-out command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Serial number	--	--	SERIAL?	MTXXXXX	ex. MT22459

(12) Software version read-out command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Software version	--	--	VERSION?	r0,r1	r0: Main version r1: System version ex: 1.00,1.05

2.5.2 Instrument Setup command

The Instrument Setup command is valid in Instrument Panel mode.

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Hardware	Reference frequency	10MHz	REF 10MHZ	REF?	10MHZ	
		13MHz	REF 13MHZ	REF?	13MHZ	
	RF in/out	MAIN	RFINOUT MAIN	RFINOUT?	MAIN	
		AUX	RFINOUT AUX	RFINOUT?	AUX	
Display	Display	On	DISPL ON	---	---	
		Off	DISPL OFF	---	---	
	Title display	DATE/TIME	TTL DATE	TTL?	DATE	
		USER define	TTL USER	TTL?	USER	
		OFF	TTL OFF	TTL?	OFF	
	Title input	User title	TITLE a KSE a	TITLE? ---	a ---	32 character MAX
Select date display mode	Japan (yy-mm-dd)	DATEMODE YMD	DATEMODE?	YMD		
	USA (mm-dd-yy)	DATEMODE MDY	DATEMODE?	MDY		
	Europe (dd-mm-yy)	DATEMODE DMY	DATEMODE?	DMY		
Set and read date	Japan (yy-mm-dd)	DATE yy,mm,dd	DATE?	yy,mm,dd		
Set and read time		TIME hh,mm,ss	TIME?	hh,mm,ss		
Buzzer	Buzzer switch	On	ALARM ON BEP 1 BEP ON	ALARM? --- ---	ON --- ---	
		Off	ALARM OFF BEP 0 BEP OFF	ALARM? --- ---	OFF --- ---	
		Sounds buzzer	BZR	---	---	
GPIB	Terminater	LF	TRM 0	---	---	
		CR/LF	TRM 1	---	---	
RS232C	Baud rate	9600	BAUD 9600	BAUD?	9600	
		4800	BAUD 4800	BAUD?	4800	
		2400	BAUD 2400	BAUD?	2400	
		1200	BAUD 1200	BAUD?	1200	
	Parity	Even	PRTY EVEN	PRTY?	EVEN	
		Odd	PRTY ODD	PRTY?	ODD	
Off		PRTY OFF	PRTY?	OFF		
Data bit	7bits	DTAB 7	DTAB?	7		
	8bits	DTAB 8	DTAB?	8		
Stop bit	1bit	STPB 1	STPB?	1		
	2bits	STPB 2	STPB?	2		
Time out		TOUT t	TOUT?	t		
Delimiter	LF	DELM 0	---	---		
	CR/LF	DELM 1	---	---		

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
color	Select color		COLORPTN COLOR1 COLORPTN COLOR2 COLORPTN COLOR3 COLORPTN COLOR4 COLORPTN USERCOLOR			
	Copy from		COPYCOLOR COLOR1 COPYCOLOR COLOR2 COPYCOLOR COLOR3 COPYCOLOR COLOR4	--- --- --- ---	--- --- --- ---	
	User define	Red, green, blue	COLORDEF n,r,g,b	COLORDEF? n	r,g,b	n=Frame Number Ø to 16 r,g,b= Ø to 7

2.5.3 TX/RX tester command

- The TX/RX tester commands are valid in TX/RX tester and Call processing panel mode (on all RX/TX test screens).
- Query messages of the Setup common parameter command are also valid on the Setup common parameter screen and lower screens (all TX/RX test and Call processing screens). (See paragraph 2.5.4.)

(1) System mode switching command (GSM)

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
GSM		SYS GSM	SYS?	GSM	

(2) TX measurement screen switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup common parameter		MEAS SETCOM	MEAS?	SETCOM	
Setup TX meas parameter		MEAS SETTX	MEAS?	SETTX	
Select TX all measure item		MEAS TXITEM	MEAS?	TXITEM	
TX all measure		MEAS TXALL	MEAS?	TXALL	
Modulation analysis		MEAS MODANAL	MEAS?	MODANAL	
Waveform display		MEAS WAVEFORM	MEAS?	WAVEFORM	
RF power		MEAS RFPWR	MEAS?	RFPWR	
Output RF spectrum		MEAS ADJ,HIGH	MEAS?	ADJ,HIGH	
Power meter		MEAS PWRMTR	MEAS?	PWRMTR	

(3) RX measurement screen switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup common parameter		MEAS SETCOM	MEAS?	SETCOM	
Setup RX meas parameter		MEAS SETRX	MEAS?	SETRX	
Bit error rate		MEAS BER	MEAS?	BER	

(4) Call processing switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup common parameter		MEAS SETCOM	MEAS?	SETCOM	
Setup Call processing parameter		MEAS SETSIG	MEAS?	SETSIG	
Sequence monitor		MEAS SEQMON	MEAS?	SEQMON	

(5) Measure result status command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure result status		--	MSTAT?	n	

- Response value n of MSTAT?

The table below lists the meanings of response values of MSTAT? (measurement result status command).

Value of n	Explanation
0	Normal termination
1	RF input limit
2	Level over
3	Level under
4	Unmeasurable
5	Synchronous word undetectable
6	Synchronization being established (BER Measure)
7	Synchronization loss (BER Measure)
8	Overflow (BER Measure)
9	Unmeasured
12	Time out (TX Measure)

(6) RF input/output connector switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
RF in/out	Main	RFINOUT MAIN	RFINOUT?	MAIN	
	Aux	RFINOUT AUX	RFINOUT?	AUX	

(7) 10 MHz/13 MHz Reference Input checking command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Reference Input		--	EXTREF?	a	a: VALID, INVALID

2.5.4 Setup common parameter command

- Program messages of the Setup common parameter command are valid on Setup common parameter screen.
- Note that Level, Frequency, Channel and Loop Back program messages are also valid on all measurement screens of the TX/RX test and Sequence monitor screen.
- Query messages of the Setup common parameter command are valid on the Setup common parameter screen and lower screens (all TX/RX test and Call processing screens).

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks	
System Combination	System	GSM	SYSCMB GSM	SYSCMB?	GSM		
	Combination	GSM/DCS1800	SYSCMB DCS1800	SYSCMB?	DCS1800		
		GSM/PCS1900	SYSCMB PCS1900	SYSCMB?	PCS1900		
DUT control	DUT control	Call processing ON	DUTCTRL CALLP SIGNAL ON	DUTCTRL? SIGNAL?	CALLP ON		
		Call processing OFF	DUTCTRL NONE SIGNAL OFF	DUTCTRL? SIGNAL?	NONE OFF		
		Control Channel		CTRLCH n	CTRLCH?	n	n:0 to 1023 (1 to 124; GSM)
			TCH Channel	CHAN n	CHAN?	n	n:0 to 1023 (1 to 124; GSM)
Frequency		Step up	CHAN UP	---	---		
		Step down	CHAN DN	---	---		
	TX frequency		TFREQ f	TFREQ?	f	f:0.3 to 3000[MHz] ¹	
	RX frequency		RFREQ f	RFREQ?	f	f:0.3 to 3000[MHz] ¹	
Level	MS power level		MSPWR n	MSPWR?	n	n=0 to 31	
	TX level		RFLVL 0	RFLVL?	0	0:-5 to +42[dBm]/Main -30 to +22[dBm]/Aux.	
		Step up Step down	RFLVL UP RFLVL DN	--- ---	--- ---		
	RX level		OLVL 0	OLVL?	0	0:-143 to -28[dBm]/Main -143 to -3[dBm]/Aux	
Channel & Level	TCH channel & MS Power Level		CHMSPWR n0, n1	CHMSPWR?	n0, n1	n0: TCH channel, 0 to 1023 (1 to 124; GSM) n1: MS Power Level, 0 to 31	
Loop Back		Loop Back On	LOOPBACK ON	LOOPBACK?	ON	-1	
		Loop Back Off	LOOPBACK OFF	LOOPBACK?	OFF	-1	
Signal	Measuring object	MS-NB	MEASOBJ MSNB	MEASOBJ?	MSNB		
		CONTINUOUS	MEASOBJ CONT	MEASOBJ?	CONT	-2	
	TCH slot No.		SLTNUM n	SLTNUM?	n	n:0 to 7 (2 to 6; Call Proc)	

Intermediate class	Function	Function details	Program Msg.	Query Msg	Response Msg	Remarks
Signal	Training sequence	Training sequence 0	TSPAT TSC0	TSPAT?	TSC0	
		Training sequence 1	TSPAT TSC1	TSPAT?	TSC1	
		Training sequence 2	TSPAT TSC2	TSPAT?	TSC2	
		Training sequence 3	TSPAT TSC3	TSPAT?	TSC3	
		Training sequence 4	TSPAT TSC4	TSPAT?	TSC4	
		Training sequence 5	TSPAT TSC5	TSPAT?	TSC5	
		Training sequence 6	TSPAT TSC6	TSPAT?	TSC6	
		Training sequence 7	TSPAT TSC7	TSPAT?	TSC7	
	Timing advance		TMADVANCE n	TMADVACE?	n	n:0 to 63[bit]
Call processing	Start call proc.		CALLSA	----	----	
	Stop call proc.		CALLSO	---	---	
	Paging		CALLPG	----	----	
	Disconnect from NW		CALLDISC	---	---	
	Call proc. status		---	CALLSTAT?	0 (Stop) 1 (Idle) 2 (Paging) 3 (Radio Link) 4 (Registration) 5 (Organization) 6 (Termination) 7 (Communication) 8 (Hand Over) 9 (Disc from NW) 10 (Disc from MS) 11 (Radio Disc) 20 (DUT CONTROL = NONE)	

*1 Program MSG. is valid only when 'CALL STATUS' is 'Communication'.

*2 Program MSG. is valid only when 'DUT CONTROL' is 'NONE'.

2.5.5 TX tester command

- Program messages of the TX tester commands are valid in ranges defined on TX test screen.
- Query messages of the TX tester command are valid on all TX test screens.
- Level, Frequency, and Channel program messages of the Setup common parameter command are also valid on all TX test measurement screens. (See paragraph 2.5.4.)

(1) Setup TX meas parameter command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measurement trigger		Training Sequence	MEASTRG TS	MEASTRG?	TS	
		Video	MEASTRG VIDEO	MEASTRG?	VIDEO	
User cal factor	Band 1		TXUCALBA1 0	TXUCALBA1?	0	0:-30.00 to +30.00[dB]
	Band 2		TXUCALBA2 0	TXUCALBA2?	0	0:-30.00 to +30.00[dB]

(2) Modulation Analysis command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Strage mode	Normal		STRAGE NRM	STRAGE?	NRM	
	Average		STRAGE AVG	STRAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
	Average off		VAVG OFF	---	---	
			VAVG 0	---	---	
	Average count		AVR n	AVR?	n	n=2 to 9999
		VAVG n	VAVG?	n	n=2 to 9999	
Refresh interval		INTVAL EVERY	INTVAL?	EVERY		
		INTVAL ONCE	INTVAL?	ONCE		
Calibration	Calibration		PWRCAL	PWRCAL?	0	
	Calibration cancel		CALCANCEL	---	---	
	Adjust range		ADJRNG	---	---	
Measure result	Carrier frequency		---	CARRF?	f	
	Carrier frequency error		---	CARRFERR?	f	
				---	CARRFERR? un	un:HZ,PPM
	RMS phase error		---	PHASEERR?	u	
	Peak phase error		---	PPHASEERR?	u	
RMS Magnitude error		---	MAGTDERR?	u		
Measure result (GPIB)	+Peak phase error		---	PPHASEERR? +	u	
	-Peak phase error		---	PPHASEERR? -	u	
	RMS phase error		---	MAXPHASEERR?	u	
	Max Hold Value					
	+Peak phase error symbol		---	PPHASESYM? +	s	
	-Peak phase error symbol		---	PPHASESYM? -	s	
	+Peak magnitude error		---	PMAGTDERR? +	u	
-Peak magnitude error		---	PMAGTDERR? -	u		

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure result (GPIB)	RMS magnitude error Max Hold Value		---	MAXMAGTDERR?	u	
	+Peak magnitude error symbol		---	PMAGTDSYM? +	s	
	-Peak magnitude error symbol		---	PMAGTDSYM? -	s	
Measurement result (Multi response)			----	MODANALMEAS?	r0, r1, r2, r3, r4, r5, r6, r7, r8, r9, r10, r11, r12, r13	returns all measurement results see *1
			---	MODANALMEAS?	r0, r1, r2, r3, r4, r5, r6, r7, r8, r9, r10, r11, r12, r13	returns selected measurement results see *1

*1 Multi response

Query format example:

MODANALMEAS? n0, n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13

n0 to n13: Response flag

1= return measurement results

0= not return measurement results

Caution: The number of query parameter is fixed (=14)

Actual query example:

MODANALMEAS? 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

This query returns measurement results of Carrier freq error (ppm) and RMS Phase error

Response format:

r0: Carrier freq

r1: Carrier freq error (Hz)

r2: Carrier freq error (ppm)

r3: RMS phase error

r4: Peak phase error

r5: RMS magnitude error

r6: +Peak phase error

r7: -Peak phase error

r8: +Peak phase error symbol

r9: -Peak phase error symbol

r10: +Peak magnitude error

r11: -Peak magnitude error

r12: +Peak magnitude error symbol

r13: -Peak magnitude error symbol

Actual Response example: (Carrier freq error (ppm) and RMS Phase error)

0.1, 2.82

(3) Waveform display command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Trace format	Trace format	Constellation	TRFORM CONSTEL	TRFORM?	CONSTEL	
			TRFORM IQ	---	---	
		Eye diagram	TRFORM EYE	TRFORM?	EYE	
		Phase error	TRFORM PHASE	TRFORM?	PHASE	
		Magnitude error	TRFORM MAGTD	TRFORM?	MAGTD	
Marker	Marker mode	Normal	MKR NRM	MKR?	NRM	
		Off	MKR OFF	MKR?	OFF	
	Marker position (Symbol)	Symbol	MKRS r	MKRS?	r	r=0 to 147.0[bit]
			MKN r	MKN?	r	r=0 to 147.0[bit]
Marker level		---	---	MKL?	r	
	I	---	---	MKL? I	r	
	Q	---	---	MKL? Q	r	
Strage mode	Strage mode	Normal	STRAGE NRM	STRAGE?	NRM	
		Over write	STRAGE OVER	STRAGE?	OVER	
Calibration	Adjust range		ADJRNG	---	---	
	Calibration		PWRCAL	PWRCAL?	0	
	Calibration cancel		CALCANCEL	---	---	
Scale mode	Interpolation (Constellation)	Non	INTPOL NON	INTPOL?	NON	
		Linear	INTPOL LIN	INTPOL?	LIN	
		10points	INTPOL POINT10	INTPOL?	POINT10	
	Vertical scale (Phase,Magnitude)	5[deg,%]	VSCALE 5	VSCALE?	5	
		10[deg,%]	VSCALE 10	VSCALE?	10	
20[deg,%]		VSCALE 20	VSCALE?	20		
50[deg,%]		VSCALE 50	VSCALE?	50		
	100[deg,%]	VSCALE 100	VSCALE?	100		
Measure result	Refer to Modulation analysis					

(4) RF power command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Window		Slot	WINDOW SLOT	WINDOW?	SLOT	
		On-portion	WINDOW ONPORT	WINDOW?	ONPORT	
		Frame	WINDOW FRAME	WINDOW?	FRAME	
		Leading	WINDOW LEAD	WINDOW?	LEAD	
		Trailing	WINDOW RISE WINDOW TAIL WINDOW FALL	WINDOW?	TAIL	
Marker	Marker mode	Normal	MKR NRM	MKR?	NRM	
		Off	MKR OFF	MKR?	OFF	
	Marker position (Symbol)	Symbol	MKRS r	MKRS?	r	r: -27.0 to 174.0; Slot, On Portion -20.0 to 1274.0; Frame -13.0 to 8.0; Leading 39 to 161; Trailing ditto
			MKN r	MKN?	r	
Marker level		---	MKL?	0		
Storage mode	Normal		STRAGE NRM	STRAGE?	NRM	
	Average		STRAGE AVG	STRAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG 0	---	---	
			KSH	---	---	
	Average count		AVR n	AVG?	n	n: 2 to 9999
			VAVG n	VAVG?	n	n: 2 to 9999
	Max hold		MAX	STRAGE?	MAX	
Min hold		MIN	STRAGE?	MIN		
Cumulative		CUM	STRAGE?	CUM		
Over write		OVER	STRAGE?	OVER		
Wide dynamic range		WIDE	STRAGE?	WIDE		
Refresh interval		INTVAL EVERY	INTVAL?	EVERY		
		INTVAL ONCE	INTVAL?	ONCE		
Calibration	Calibration		PWRCAL	PWRCAL?	0	
	Calibration cancel		CALCANCEL	---	---	
	Adjust range		ADJRNG	---	---	

SECTION 2 DEVICE MESSAGES

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Level	Unit	dBm	UNIT DBM	UNIT?	DBM	
		nW/uW/mW/W	UNIT WATT	UNIT?	WATT	
	Level	Relative	LVLREL ON MTEMPREL ON	LVLREL? MTEMPREL?	ON ON	
		Absolute	LVLREL OFF MTEMPREL OFF	LVLREL? MTEMPREL?	OFF OFF	
Recall template		File No.	SLCTTEMP n	SLCTTEMP?	---	n:Ø to 99
			RCLTEMP n	---	---	n:Ø to 99
Measure result	TX power		---	TXPWR?	0	
			---	TXPWR? un	0	un:DBM,WATT
	Carrier off power		---	OFFPWR?	0	
			---	OFFPWR? un	0	un:DBM,WATT
	On/Off ratio		---	RATIO?	0	
	Power Flatness	Max Power	---	MAXPWR?	0	dB only
		Min Power	---	MINPWR?	0	dB only
	Power vs. time		---	PTLEAD? 1	0	
			---	PTLEAD? 2	0	
			---	PTLEAD? 3	0	
---			PTLEAD? 4	0		
---			PTLEAD? 5	0		
		---	PTTRAIL? 1	0		
		---	PTTRAIL? 2	0		
		---	PTTRAIL? 3	0		
		---	PTTRAIL? 4	0		
		---	PTTRAIL? 5	0		
Template PASS/FAIL (On screen)		---	TEMPPASS? ON	PASS		
		---	TEMPPASS? ON	FAIL		
Template PASS/FAIL (Off screen)		---	TEMPPASS? OFF	PASS		
		---	TEMPPASS? OFF	FAIL		
Measure result (GPIB)	Frame mean power		---	FMEANPWR?	0	
			---	FMENPWR? un	0	un:DBM,WATT
	Slot mean power		---	SMEANPWR?	0	
			---	SMENAPWR? un	0	un:DBM,WATT
Slot power		---	SLOTPWR? n	0	n: Ø to 7	
Reference power for template		---	TEMPPRWR?	0		

SECTION 2 DEVICE MESSAGES

- r14: Power at 552.8us
- r15: Power at 560.8us
- r16: Power at 570.8us
- r17: Template pass/fail (on screen)
- r18: Template pass/fail (off screen)
- r19: Frame mean power (dBm)
- r20: Frame mean power (Watt)
- r21: Slot mean power (dBm)
- r22: Slot mean power (Watt)
- r23: Slot power 0
- r24: Slot power 1
- r25: Slot power 2
- r26: Slot power 3
- r27: Slot power 4
- r28: Slot power 5
- r29: Slot power 6
- r30: Slot power 7
- r31: Reference power for template

Actual Response example: (TX power (dBm),Carrier off power (dBm) and On/Off ratio)

28.24, -43.97, 72.21

(5) Setup template command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Off level		dBm dB	OFFLVL DBN OFFLVL DB	OFFLVL? OFFLVL?	DBM DB	
Level Modify		Level 1	TEMPLVL 1, 0	TEMPLVL? 1	0	0:-100.0 to +100.0[dB]
		Level 2	TEMPLVL 2, 0	TEMPLVL? 2	0	0:-110.0 to +10.0[dB]
		Level 3	TEMPLVL 3, 0	TEMPLVL? 3	0	0:-110.0 to +10.0[dB]
		Level 4	TEMPLVL 4, 0	TEMPLVL? 4	0	0:-110.0 to +10.0[dB]
		Level 5	TEMPLVL 5, 0	TEMPLVL? 5	0	0:-110.0 to +10.0[dB]
		Level 6	TEMPLVL 6, 0	TEMPLVL? 6	0	0:-110.0 to +10.0[dB]
Save template	Save template	File No.	SAVETEMP n	---	---	n:0 to 99

(6) Output RF spectrum command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Strage mode	Normal		STRAGE NRM	STRAGE?	NRM	
	Average		STRAGE AVG	STRAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
	Average off		KSG	---	---	
			VAVG OFF	---	---	
Average count		VAVG 0	---	---		
		KSH	---	---		
Refresh interval		AVR n	AVG?	n	n:0 to 9999	
		VAVG n	VAVG?	n	n:0 to 9999	
Calibration	Calibration		PWRCAL	PWRCAL?	0	
	Calibration cancel		CALCANCEL	---	---	
	Adjust range		ADJRNG	---	---	
Measure result	due to modulation		---	MODPWR? LOW0	0	
			---	MODPWR? LOW100	0	
			---	MODPWR? LOW200	0	
			---	MODPWR? LOW250	0	
			---	MODPWR? LOW400	0	
			---	MODPWR? LOW600	0	
			---	MODPWR? LOW800	0	
			---	MODPWR? LOW1000	0	
			---	MODPWR? LOW1200	0	
			---	MODPWR? LOW1400	0	
			---	MODPWR? LOW1600	0	
			---	MODPWR? LOW1800	0	
			---	MODPWR? LOW 2000	0	
			---	MODPWR? UP0	0	
			---	MODPWR? UP100	0	
			---	MODPWR? UP200	0	
			---	MODPWR? UP250	0	
			---	MODPWR? UP400	0	
			---	MODPWR? UP600	0	
			---	MODPWR? UP800	0	
---	MODPWR? UP1000	0				
---	MODPWR? UP1200	0				
---	MODPWR? UP1400	0				
---	MODPWR? UP1600	0				
---	MODPWR? UP1800	0				
---	MODPWR? UP2000	0				

SECTION 2 DEVICE MESSAGES

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure result	due to switching transient		---	SWPWR? LOW0	0	
			---	SWPWR? LOW100	0	
			---	SWPWR? LOW200	0	
			---	SWPWR? LOW250	0	
			---	SWPWR? LOW400	0	
			---	SWPWR? LOW600	0	
			---	SWPWR? LOW800	0	
			---	SWPWR? LOW1000	0	
			---	SWPWR? LOW1200	0	
			---	SWPWR? LOW1400	0	
			---	SWPWR? LOW1600	0	
			---	SWPWR? LOW1800	0	
			---	SWPWR? LOW 2000	0	
			---	SWPWR? UP0	0	
			---	SWPWR? UP100	0	
			---	SWPWR? UP200	0	
			---	SWPWR? UP250	0	
			---	SWPWR? UP400	0	
			---	SWPWR? UP600	0	
			---	SWPWR? UP800	0	
			---	SWPWR? UP1000	0	
			---	SWPWR? UP1200	0	
			---	SWPWR? UP1400	0	
---	SWPWR? UP1600	0				
---	SWPWR? UP1800	0				
---	SWPWR? UP2000	0				
---	SWPWR? ps,un	0		ps:LOW0 to LOW2000, UP0 to UP2000 un:DBM,DB		
Measurement result (Multi response)			---	RFSPECMEAS?	rmu0, rmi0, rmu1, rmi1, : : rsu0, rsl0, rsu1, rsl1, : :	returns all measurement results see *1
			---	RFSPECMEAS? mn0, mn1, mn2, mn3, mr4, mn5, mn6, mn7, mn8, mn9, mn10, mn11, mn12, sn0, sn1, sn2, sn3, sn4, sn5, sn6, sn7, sn8, sn9, sn10, sn11, sn12	rmu0, rmi0, rmu1, rmi1, : : rsu0, rsl0, rsu1, rsl1, : :	returns selected measurement results see *1

*1 Multi response

Query format example:

RFSPECMEAS? mn0, mn1, mn2, mn3, mn4, mn5, mn6, mn7, mn8, mn9, mn10, mn11, mn12,
sn0, sn1, sn2, sn3, sn4, sn5, sn6, sn7, sn8, sn9, sn10, sn11, sn12

mn0 to mn12, sn0 to sn12 :Response flag

1= return measurement results

0= not return measurement results

Caution: The number of query parameter is fixed (=26)

Actual query example:

RFSPECMEAS? 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0

This query returns measurement results of 100 kHz and 200 kHz

Response format:

rmu0, rmi0, rmu1, rmi1,, rsu0, rsi0, rsu1, rsi1,

rmu: Modulation upper

rmi: Modulation lower

rsu: Switching upper

rsi: Switching lower

Actual Response example: (100 kHz and 200 kHz)

-5.47, -7.42, -35.38, -33.64, 16.96, 16.50, -7.90, -5.92

(7) Power meter command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Range	Range up		RNG UP	----	----	
	Range down		RNG DN	----	----	
	Hold (0.1mW)		RNG2	----	----	
	Hold (1mW)		RNG3	----	----	
	Hold (10mW)		RNG4	----	----	
	Hold (100mW)		RNG5	----	----	
	Adjust range		ADJRNG	----	----	
Calibration	Zero set		ZERASET	---	---	
			ZAJ	---	---	
Measure result	Power		---	POWER? un	0	un:DBM,WATT,DB

(8) Select TX all measure item command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Frequency	Frequency	On	MCARRF ON	MCARRF?	ON	
		Off	MCARRF OFF	MCARRF?	OFF	
	Frequency error measurement	On	MCARRFERR ON	MCARRFERR?	ON	
		Off	MCARRFERR OFF	MCARRFERR?	OFF	
	Frequency error unit	kHz ppm	UCARRFERR KHZ UCARRFERR PPM	UCARRFERR? UCARRFERR?	KHZ PPM	
Frequency error judge	On	JCARRFERR ON	JCARRFERR?	ON		
	Off	JCARRFERRL OFF	JCARRFERRL?	OFF		
Frequency error limit	upper limit	ULCARRFERR f	ULCARRFERR? ULCARRFERR? un	f f	f:0 to 100 [kHz, ppm] un:KHZ,PPM	
Modulation Analysis	RMS phase error measurement	On	MPHASEERR ON	MPHASEERR?	ON	
		Off	MPHASEERR OFF	MPHASEERR?	OFF	
	RMS phase error judge	On	JPHASEERR ON	JPHASEERR?	ON	
		Off	JPHASEERR OFF	JPHASEERR?	OFF	
	RMS phase error limit	upper limit	ULPHASEERR r	ULPHASEERR?	r	r:0.0 to 100.0 [deg]
	Peak phase error measurement	On	MPPHASEERR ON	MPPHASEERR?	ON	
		Off	MPPHASEERR OFF	MPPHASEERR?	OFF	
	Peak phase error judge	On	JPPHASEERR ON	JPPHASEERR?	ON	
		Off	JPPHASEERR OFF	JPPHASEERR?	OFF	
Peak Phase Error limit	upper limit	ULPPHASEERR r	ULPPHASEERR?	r	r:0.0 to 100.0 [deg]	
Magnitude error measurement	On	MMAGTDERR ON	MMAGTDERR?	ON		
	Off	MMAGTDERR OFF	MMAGTDERR?	OFF		
Magnitude error judge	On	JMAGTDERR ON	JMAGTDERR?	ON		
	Off	JMAGTDERR OFF	JMAGTDERR?	OFF		
Magnitude error limit	upper limit	ULMAGTDERR r	ULMAGTDERR?	r	r:0.0 to 100.0 [%]	
RF power	TX power measurement	On	MTXPWR ON	MTXPWR?	ON	
		Off	MTXPWR OFF	MTXPWR?	OFF	
	TX power unit	dBm	UTXPWR DBM	UTXPWR?	DBM	
		W	UTXPWR WATT	UTXPWR?	WATT	
	TX power judge	On	JTXPWR ON	JTXPWR?	ON	
		Off	JTXPWR OFF	JTXPWR?	OFF	
	TX power limit	Lower limit	LLTXPWR 0	LLTXPWR? LLTXPWR? un	0 0	0:-80.0 to +43.0 [dBm] un:DBM,WATT
Upper limit		ULTXPWR 0	ULTXPWR? ULTXPWR? un	0 0	0:-80.0 to +43.0 [dBm] un:DBM,WATT	
Carrier off power measurement	On	MOFFPWR ON	OFFPWR	ON		
	Off	MOFFPWR OFF	OFFPWR	OFF		
Carrier off power unit	dBm	UOFFPWR DBM	OFFPWR	DBM		
	W	UOFFPWR WATT	OFFPWR	WATT		

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
RF power	Carrier off power limit	Upper limit	UOFFPWR ℓ	UOFFPWR? UOFFPWR? un	ℓ ℓ	ℓ : -30.0 to +30.0 [dBm] un: DBM, WATT
	On/Off ratio measurement	On Off	MRATIO ON MRATIO OFF	MRATIO? MRATIO?	ON OFF	
	On/Off ratio judge	On Off	JRATIO ON JRATIO OFF	JRATIO? JRATIO?	ON OFF	
	On/Off ratio limit	Lower limit	LLRATIO ℓ	LLRATIO?	ℓ	ℓ : 0.0 to 100.0 [dB]
	Max Power measurement	On Off	MMAXPWR ON MMAXPWR OFF	MMAXPWR? MMAXPWR?	ON OFF	
	Max Power judge	On Off	JMAXPWR ON JMAXPWR OFF	JMAXPWR? JMAXPWR?	ON OFF	
	Max Power limit	Upper limit	ULMAXPWR r	ULMAXPWR?	r	r: 0.0 to +10.0 [dB]
	Min Power measurement	On Off	MMINPWR ON MMINPWR OFF	MMINPWR? MMINPWR?	ON OFF	
	Min Power judge	On Off	JMINPWR ON JMINPWR OFF	JMINPWR? JMINPWR?	ON OFF	
	Min Power limit	Lower limit	LLMINPWR r	LLMINPWR?	r	r: -100.0 to 0.0 [dB]
	Template Pass/Fail	On Off	MTEMPPASS ON MTEMPPASS OFF	MTEMPPASS? MTEMPPASS?	ON OFF	
	Template Pass/Fail zone	On Off	LTEMPPASS ON LTEMPPASS BOTH	LTEMPPASS? LTEMPPASS?	ON BOTH	
	Time alignment measurement	On Off	MTMALMENT ON MTMALMENT OFF	MTMALMENT? MTMALMENT?	ON OFF	
	Time alignment judge	On Off	JTMALMENT ON JTMALMENT OFF	JTMALMENT? JTMALMENT?	ON OFF	
	Time alignment limit	Lower limit Upper limit	LLTMALMENT r ULTMALMENT r	LLTMALMENT? ULTMALMENT?	r r	r: -64.00 to 1.00 r: -64.00 to 1.00
	Call processing report & measure	RX level report measurement	On Off	MRXLEVEL ON MRXLEVEL OFF	MRXLEVEL? MRXLEVEL?	ON OFF
RX level report judge		On Off	JRXLEVEL ON JRXLEVEL OFF	JRXLEVEL? JRXLEVEL?	ON OFF	
RX level report limit		Lower limit Upper limit	LLRXLEVEL n ULRXLEVEL n	LLRXLEVEL? ULRXLEVEL?	n n	n: 0 to 63 n: 0 to 63
RX quality report measurement		On Off	MRXQUALITY ON MRXQUALITY OFF	MRXQUALITY? MRXQUALITY?	ON OFF	
RX quality report judge		On Off	JRXQUALITY ON JRXQUALITY OFF	JRXQUALITY? JRXQUALITY?	ON OFF	
RX quality report limit		Lower limit Upper limit	LLRXQUALITY n ULRXQUALITY n	LLRXQUALITY? ULRXQUALITY?	n n	n: 0 to 7 n: 0 to 7

SECTION 2 DEVICE MESSAGES

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Call processing report & measure	MS power report measurement	On	MMSPWR ON	MMSPWR?	ON	
		Off	MMSPWR OFF	MMSPWR?	OFF	
	MS power report judge	On	JMSPWR ON	JMSPWR?	ON	
		Off	JMSPWR OFF	JMSPWR?	OFF	
Timing advance report measurement	On	MTMADVANCE ON	MTMADVANCE?	ON		
	Off	MTMADVANCE OFF	MTMADVANCE?	OFF		
Timing advance report judge	On	JTMADVANCE ON	JTMADVANCE?	ON		
	Off	JTMADVANCE OFF	JTMADVANCE?	OFF		
RF power vs time	Leading portion measurement	On	MPTLEAD n, ON	MPTLEAD?	ON	n: 1 to 5
		Off	MPTLEAD n, OFF	MPTLEAD?	OFF	n: 1 to 5
	Leading portion judge	On	JPTLEAD n, ON	JPTLEAD?	ON	n: 1 to 5
		Off	JPTLEAD n, OFF	JPTLEAD?	OFF	n: 1 to 5
	Leading portion limit	Lower limit	LLPTLEAD n, ℓ	LLPTLEAD?	ℓ	ℓ:-100 to 10[dB]
		Upper limit	ULPTLEAD n, ℓ	ULPTLEAD?	ℓ	ℓ:-100 to 10[dB]
Trailing portion measurement	On	MPTTRAIL n, ON	MPTTRAIL?	ON	n: 1 to 5	
	Off	MPTTRAIL n, OFF	MPTTRAIL?	OFF	n: 1 to 5	
Trailing portion judge	On	JPTTRAIL n, ON	JPTTRAIL?	ON	n: 1 to 5	
	Off	JPTTRAIL n, OFF	JPTTRAIL?	OFF	n: 1 to 5	
Trailing portion limit	Lower limit	LLPTTRAIL n, ℓ	LLPTTRAIL?	ℓ	ℓ:-100 to 10[dB]	
	Upper limit	ULPTTRAIL n, ℓ	ULPTTRAIL?	ℓ	ℓ:-100 to 10[dB]	
Output RF spectrum	Switching transients unit	dBm	UADJCH DBM	UADJCH?	DBM	
		dB	UADJCH DB	UADJCH?	DB	
	Output RF spectrum measure	On	MADJCH ps, ON	MADJCH? ps	ON	ps:OF0,OF100,OF200,
		Off	MADJCH ps, OFF	MADJCH? ps	OFF	OF250,OF400,OF600,
Output RF spectrum judge		JADJCH ps, ON	JADJCH? ps	ON	OF800,OF1000,	
		JADJCH ps, OFF	JADJCH? ps	OFF	OF1400,OF1600,	
Output RF spectrum Upper limit	Modulation	ULMODPWR ps, ℓ	ULMODPWR? ps	ℓ	OF1800,OF2000	
	Switching	ULSWPWR ps, ℓ	ULSWPWR? ps	ℓ	ℓ:-100 to 10.0 [dB] -100 to +40.0 [dBm]	
Standard set up	Standard		AITEM STD	---	---	

(9) TX all measure command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Strage mode	Normal		STRAGE NRM	STRAGE?	NRM	
	Average		STRAGE AVG	STRAGE?	AVG	
	Wide dynamic range		STRAGE WIDE	STRAGE?	WIDE	
	Average on	On	VAVG ON VAVG 1 KSG	--- --- ---	--- --- ---	
	Average off	Off	VAVG OFF VAVG Ø KSH	--- --- ---	--- --- ---	
	Average count		AVR n VAVG n	AVG? VAVG?	n n	n:2 to 9999 n:2 to 9999
	Refresh interval		INTVAL EVERY INTVAL ONCE	INTVAL? INTVAL?	EVERY ONCE	
Calibration	Calibration		PWRCAL	PWRCAL?	Ø	
	Calibration cancel		CALCANCEL	---	---	
	Adjust range		ADJRNG	---	---	
Measure judgement	Carrier frequency error		---	JCARRFERR?	b	b:PASS,FAIL
	RMS phase error		---	JPHASEERR?	b	
	Peak phase error		---	JPPHASEERR?	b	
	RMS magnitude error		---	JMAGDERR?	b	
	TX power		---	JTXPWR?	b	
	Carrier off power		---	JOFFPWR?	b	
	On/Off ratio		---	JRATIO?	b	
	Template		---	TEMPPASS?	b	
	Time alignment		---	JTMALMENT?	b	
	RX level		---	JRXLEVEL?	b	
	RX quality		---	JRXQUALITY?	b	
	MS power level		---	JMSPWR?	b	
	Timing advance		---	JTMADVAMCE?	b	
	Leading RF power		---	JPTLEAD? n	b	n:1 to 5
	Trailing RF power		---	JPTTRAIL? n	b	n:1 to 5
Output RF spectrum	FØ to F2000	---	JADJCH? ps	b	ps:OF0,OF100,OF200, OF250,OF400,OF600, OF800,OF1000, OF1400,OF1600, OF1800,OF2000	
Total judgement	Total judgement	PASS	---	JTOTAL?	PASS	
		FAIL	---	JTOTAL?	FAIL	

SECTION 2 DEVICE MESSAGES

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measurement result (Multi response)	Modulation analysis		--	ALLMEAS? MODANAL	n,r0,n,r1,n,r2,n,r3, n,r4	n: 0:PASS 4:FAIL 9:Measurement Off r0:Carrier freq. r1:Carrier freq. error r2:RMS phase error r3:Peak phase error r4:RMS magnitude error
	RF power		--	ALLMEAS? RFPWR	n,r0,n,r1,n,r2,n,r3, n,r4	n: 0:PASS 4:FAIL 9:Measurement Off r0:TX Power r1:Carrier Off power r2:On/Off ratio r3:Time alignment r4:Template PASS/FAIL r5:Max Power r6:Min Power
	RF power vs time		--	ALLMEAS? PWRTM	n,r0,n,r1,n,r2,n,r3, n,r4,n,r5,n,r6,n,r7, n,r8,n,r9	n: 0:PASS 4:FAIL 9:Measurement Off r0: Power at -28us r1: Power at -18us r2: Power at -10us r3: Power at -5us r4: Power at 0us r5: Power at 542.8us r6: Power at 547.8us r7: Power at 552.8us r8: Power at 560.8us r9: Power at 570.8us
	Modulation analysis & RF power		--	ALLMEAS? MODRF, n0, n1, n2, n3, n4, n5, n6, n7, n8, n9, n10,n11, n12, n13, n14, n15, n16, n17, n19, n20, n21	PFn0, r0, PFn1, r1 : : :	returns selected measurement results see *1

SECTION 2 DEVICE MESSAGES

Response format:

PFn0, r0, PFn1, r1,

PF: 0=Pass, 4=Fail, 9=Measurement off

r0: Carrier freq

r1: Carrier freq error

r2: RMS phase error

r3: Peak phase error

r4: Magnitude error

r5: TX power

r6: Carrier off power

r7: On/Off ratio

r8: MAX power

r9: MIN power

r10: Time alignment

r11: Template

r12: Power at -28us

r13: Power at -18us

r14: Power at -10us

r15: Power at -5us

r16: Power at 0us

r17: Power at 542.8us

r18: Power at 547.8us

r19: Power at 552.8us

r20: Power at 560.8us

r21: Power at 570.8us

Actual Response example: (Carrier freq error, RMS Phase error and TX power)

0, 0.1, 2.82, 0, 28.24

*2 Call Processing report Query in TX All Measure Screen

Query format example:

ALLMEAS? CALLP, nØ, n1, n2, n3

nØ to n3 :Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=5)

Actual query example:

ALLMEAS? CALLP, 1, Ø, 1, Ø

This query returns measurement results of RX level and MS Power level

Response format:

PFnØ, rØ, PFn1, r1,

PF: Ø=Pass, 4=Fail, 9=Measurement off

rØ: RX level

r1: RX quality

r2: MS power level

r3: Timing advance

Actual Response example: (RX level and MS Power level)

Ø, 23, Ø, 8

*3 Output RF Spectrum Query in TX All Measure Screen

Query format example:

ALLMEAS? RFSPEC, nØ, n1, n2, n3, n4, n5, n6, n7, n8, n9, n1Ø, n11, n12

nØ to n12 :Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=14)

Actual query example:

ALLMEAS? RFSPEC, Ø, 1, 1, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø, Ø

This query returns measurement results of 1ØØ kHz and 2ØØ kHz

Response format:

PFnØ, MLnØ, MUnØ, SLnØ, SUnØ, PFn1, MLn1, MUn1, SLn1, SUn1,

PF: Ø=Pass, 4=Fail, 9=Measurement off

ML: Modulation Lower

MU: Modulation Upper

SL: Switching Lower

SU: Switching Upper

Actual Response example: (Offset=1ØØ kHz and 2ØØ kHz)

Ø, -7.42, -5.47, 16.5Ø, 16.96, Ø, -33.64, -35.38, -5.92, -7.9Ø

2.5.6 RX tester command

- Program messages of the RX tester commands are valid in ranges defined on RX tester screen.
- Query messages of the RX tester commands are valid on all RX tester screens.
- Level, Frequency, and Channel program messages of the Setup common parameter command are also valid on all measurement screens of the RX test. (See paragraph 2.5.4.)

(1) Setup RX meas parameter command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Data pattern	Pattern(CONTINUOUS)	PN9	PAT PN9	PAT?	PN9	bit:0000 to 1111
		bit	PAT bit	PAT?	bit	
	Pattern(MSNB)	TESTPAT PAT0	TESTPAT?	PAT0		
		TESTPAT PAT1	TESTPAT?	PAT1		
TESTPAT PAT2		TESTPAT?	PAT2			
TESTPAT PAT3		TESTPAT?	PAT3			
TESTPAT PAT4		TESTPAT?	PAT4			
TESTPAT PAT5		TESTPAT?	PAT5			
TESTPAT PAT6		TESTPAT?	PAT6			
TESTPAT PAT7		TESTPAT?	PAT7			
TESTPAT PAT8	TESTPAT?	PAT8				
TESTPAT PAT9	TESTPAT?	PAT9				
MS power level		MSPWR n	MSPWR?	n	n:2 to 19	
BER Measure judge	FER measure judge	On	JBERMEAS FER,ON	JBERMEAS? FER	ON	
		Off	JBERMEAS FER,OFF	JBERMEAS? FER	OFF	
	CRC measure judge	On	JBERMEAS FER,ON	JBERMEAS? FER	ON	Same Msg as FER
		Off	JBERMEAS FER,OFF	JBERMEAS? FER	OFF	Same Msg as FER
Cib measure judge	On	JBERMEAS CIB,ON	JBERMEAS? CIB	ON		
	Off	JBERMEAS CIB,OFF	JBERMEAS? CIB	OFF		
CII measure judge	On	JBERMEAS CII,ON	JBERMEAS? CII	ON		
	Off	JBERMEAS CII,OFF	JBERMEAS? CII	OFF		
BER Sample	FER sample		BERSAMPLE FER,n	BERSAMPLE? FER	n	n:0 to 99999999
	CRC sample		BERSAMPLE FER,n	BERSAMPLE? FER	n	Same Msg as FER
	Cib sample		BERSAMPLE CIB,n	BERSAMPLE? CIB	n	n:0 to 99999999
	CII sample		BERSAMPLE CII,n	BERSAMPLE? CII	n	n:0 to 99999999
BER event upper limit	FER event limit		ULBEREVENT FER,n	ULBEREVENT? FER	n	n:0 to 99999999
	CRC event limit		ULBEREVENT FER,n	ULBEREVENT? FER	n	Same Msg as FER
	Cib event limit		ULBEREVENT CIB,n	ULBEREVENT? CIB	n	n:0 to 99999999
	CII event limit		ULBEREVENT CII,n	ULBEREVENT? CII	n	n:0 to 99999999
User cal factor	Band 1		RXUCALBA1 0	RXUCALBA1?	0	0 :-30.0 to +30.0 dB
	Band 2		RXUCALBA2 0	RXUCALBA2?	0	0 :-30.0 to +30.0 dB

(2) BER measure command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks	
Frequency	Frequency		RFREQ f FR f FC f	RFREQ? --- ---	f --- ---	f:0.3 to 3000[MHz]	
	Channel		CHAN n	CHAN?	n	n:0 to 1023 (1 to 124; GSM)	
	Incremental step	Value	FIS f	FIS?	f	f:1[Hz] to 3000[MHz]	
		Up	FRS UP UFR	--- ---	--- ---		
	Down	FRS DN DFR	--- ---	--- ---			
Relative	reference value	---	FRLR?	f	f:0.3 to 3000[MHz]		
	Value	---	FRLV?	f			
	On	FRL ON FO	FRL? ---	ON ---			
	Off	FRL OFF FF	FRL? ---	OFF ---			
Level	Output level		OLVL 0 OL 0 AP 0	OLVL? --- ---	0 --- ---	0: -143 to -28[dBm]/Main- -143 to -3[dBm]/Aux	
		Incremental step	Value	OLS 0	OLS?	0	0: 0.1 to 80.0[dB]
			Up	OLS UP UOL	--- ---	--- ---	
		Down	OLS DN DOL	--- ---	--- ---		
	Knob	Step up	OLK UP TOL	--- ---	--- ---		
		Step down	OLK DN EOL	--- ---	--- ---		
	Output level resolution	0.1, 1, 10dB	OLR 0	OLR?	0	0: 0.1, 1, 10[dB]	
	Relative		---	ORLR?	0		
			---	ORLV?	0		
			ORL ON LO	ORL? LO	ON ---		
			ORL OFF LF	ORL? LF	OFF ---		
Output level offset		OOS 0 OOF ON OOF OFF	OOS? OOF? OOF?	0 ON OFF	0: -55.0 to 55.0[dB]		
	Output level ON/OFF		LVL ON RO	LVL? ---	ON ---		
			LVL OFF RF	LVL? ---	OFF ---		

SECTION 2 DEVICE MESSAGES

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Level	Voltage display	ENF	VDSPL EMF SPØ3	VDSPL? ---	ENF ---	
		TERM	VDSPL TERM SPØ4	VDSPL? ---	TERM ---	
	Level continuous mode	On	CONT ON	CONT?	ON	
		Off	CONT OFF	CONT?	OFF	
Unit	dBm	OLDBM	---	---		
		OLDM	---	---		
		APDBM	---	---		
		APDM	---	---		
	dBµ	OLDBU	---	---		
		OLDU	---	---		
		APDBU	---	---		
		APDU	---	---		
Calibration		CAL	---	---		
Modulation	Modulation	On	MOD ON	MOD?	ON	
		Off	MOD OFF	MOD?	OFF	
Bit error rate measure	Start/Stop	Start	BERSA	---	---	
		Stop	BERSO	---	---	
	Loop Back Type	FE	LBTYPE FE	LBTYPE?	FE	
NoFE		LBTYPE NOFE	LBTYPE?	NOFE		
BER Sample	FER	BERSAMPLE FER,n	BERSAMPLE? FER	n	n:Ø to 99999999	
	CRC	BERSAMPLE FER,n	BERSAMPLE? FER	n	Same Msg as FER	
	C1b	BERSAMPLE C1B,n	BERSAMPLE? C1B	n	n:Ø to 99999999	
	C11	BERSAMPLE C11,n	BERSAMPLE? C11	n	n:Ø to 99999999	
Measure result	Error rate	FER	---	BERRATE? FER	r	
		CRC	---	BERRATE? CRC	r	
		C1b	---	BERRATE? C1B	r	
		C11	---	BERRATE? C11	r	
	Error event	FER	---	BEREVENT? FER	n	
		CRC	---	BEREVENT? CRC	n	
		C1b	---	BEREVENT? C1B	n	
		C11	---	BEREVENT? C11	n	
	BER receive	FER	---	BERRECEIVE? FER	n	
		CRC	---	BERRECEIVE? CRC	n	
		C1b	---	BERRECEIVE? C1B	n	
		C11	---	BERRECEIVE? C11	n	
Measurement result (Multi response)			---	BERMEAS?	rØ, r1, r2, r3, r4, r5, r6, r7, r8	returns all measurement results see *1
			---	BERMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8	rØ, r1, r2, r3, r4, r5, r6, r7, r8	returns selected measurement results see *1

*1 Multi response

Query format example:

BERMEAS? nØ, n1, n2, n3, n4, n5, n6, n7, n8

nØ to n8 :Response flag

1= return measurement results

Ø= not return measurement results

Caution: The number of query parameter is fixed (=9)

Actual query example:

BERMEAS? 1, Ø, Ø, 1, Ø, Ø, Ø, Ø, Ø

This query returns measurement results of Error rate (FER) and Error event (FER)

Response format:

rØ, r1, r2, r3, r4, r5, r6, r7, r8

rØ: Error rate (FER)

r1: Error rate (CIb)

r2: Error rate (CII)

r3: Error event (FER)

r4: Error event (CIb)

r5: Error event (CII)

r6: BER sample (FER)

r7: BER sample (CIb)

r8: BER sample (CII)

Actual Response example: (Error rate (FER) and Error event (FER))

Ø.ØØØ, Ø

2.5.7 Call processing command

- Program messages of the Call processing commands are valid in ranges defined on Call processing test screen.
- Query messages of the Call processing commands are valid on all Call processing test screens.
- Level, Frequency, and Channel program messages of the Setup common parameter command are also valid on all measurement screens of the Call processing test. (See paragraph 2.5.4.)

(1) Setup Call processing parameter command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Network ID	Ncc		NIDNCC	NIDNCC?	n	n:0 to 7
	Bcc		NIDBCC	NIDBCC?	n	n:0 to 7
Location ID	MCC		LIDMCC	LIDMCC?	n	n:0 to 999
	MNC		LIDMNC	LIDMNC?	n	n:0 to 99
	LAC		LIDLAC	LIDLAC?	n	n:0 to 65535
Neighbor cell allocation			CALLCA n0, n1	CALLCA? n0	n1	n0: 1 to 16 n1:-1 to 1023 (-1 to 124; GSM)
BS-PA-MFRMS	Paging period		MFRMS n	MFRMS?	n	n: 0 to 7; paging period= n+2 [multiframe]
Hand Over type			HOTYPE INTRACELL HOTYPE INTERCELL	HOTYPE? HOTYPE?	INTRACELL INTERCELL	Default is INTRACELL
Mobile Station ID	Paging IMSI		IMSI	IMSI?	n	n:0 to 9999999999999999

(2) Sequence monitor command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Mobile Station control	Start call proc.		CALLSA	---	---	
	Stop call proc.		CALLSO	---	---	
	Paging		CALLPG	---	---	
	Disc. from NW		CALLDISC	---	---	
Status	Call status		---	CALLSTAT?	0 (Stop) 1 (Idle) 2 (Paging) 3 (Radio Link) 4 (Registration) 5 (Organization) 6 (Termination) 7 (Communication) 8 (Hand Over) 9 (Disc from NW) 10 (Disc from MS) 11 (Radio Disc) 20 (DUT CONTROL = NONE)	
	Error status		---	CALLERR?	n0,n1	n0:Call status n1 17:Layer1 error 33:Layer2 error 49:Layer3 error 50:Protocol error
Report & Measure result	Received IMEI		---	CALLIMEI?	flag*,n	
	Received IMSI		---	CALLIMSI?	flag*,n	
	Received NW phone No.		---	CALLNWNO?	flag*,n	
	RX level & RX quality		---	CALLREP?	flag*,n0, n1	n0:RX level n1:RX quality
	MS power level & timing advance		---	CALLPWRTA?	flag*,n0, n1	n0:MS Power level n1:Timing advance
	Time alignment		---	CALLTMAL?	flag*,r	
	Input level		---	CALLLVL?	flag*,l	
	Current channel		---	CALLCH?	flag*,n0, n1	n0:channel n1:slot
	Adjacent cell Monitoring		---	CALLNCELL?	flag*,n0, n1, n2, n3	n0:ARFCN n1:RX Level n2:Ncc n3:Bcc

flag* 0:Not receive

1:Received

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Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Report & Measure result	Test result of each state		---	CALLRSLT? n	17: Layer1 error 33: Layer2 error 49: Layer3 error 50: Protocol error	n=state number 1:Idle 2:Paging 3:Radio Link 4:Registration 5:Origination 6:Termination 7:Communication 8:Hand Over 9:Disc from NW 10:Disc from MS 11:Radio Disc
	Clear test result of all state		CALLRFR	---		
Measurement result (Multi response)			---	SEQMONMEAS?	r0, r11, r12, f12, r2, f13, r3, f14, r4, f15, r51, r52, f16, r6, f17, r71, r72, f18, r81, r82, f19, r9	returns all measurement results see *1
			---	SEQMONMEAS? n0, n1, n2, n3, n4, n5, n6, n7, n8, n9	r0, r11, r12, f12, r2, f13, r3, f14, r4, f15, r51, r52, f16, r6, f17, r71, r72, f18, r81, r82, f19, r9	returns selected measurement results see *1

*1 Multi response

Query format example:

SEQMONMEAS? n0, n1, n2, n3, n4, n5, n6, n7, n8, n9

n0 to n9: Response flag

1= return measurement results

0= not return measurement results

Caution: The number of query parameter is fixed (=10)

Actual query example:

SEQMONMEAS? 1, 0, 0, 0, 0, 1, 0, 0, 0, 1

This query returns measurement results of Call status, RX level & quality and Input level

Response format:

r0, r11, r12, f12, r2, f13, r3, f14, r4, f15, r51, r52, f16, r6, f17, r71, r72, f18, r81, r82, f19, r9

f1: 0=Not receiver, 1=Received

r0: Call status

r11: Call status

r12: Error status

r2: IMSI

r3: IMEI

r4: NW phone No.

r51: RX level

r52: RX quality

r6: Time alignment

r71: MS power level

r72: Timing advance

r81: Channel

r82: Slot

r9: Input level

Actual Response example: (Call status, RX level & quality and Input level)

7, 1, 23, 0, 1, -10.5

SECTION 2 DEVICE MESSAGES

3

3

3

SECTION 3 SETUP

This section describes the RS-232C/GPIB connections to external devices and setting the remote-control interface of the MT8801B.

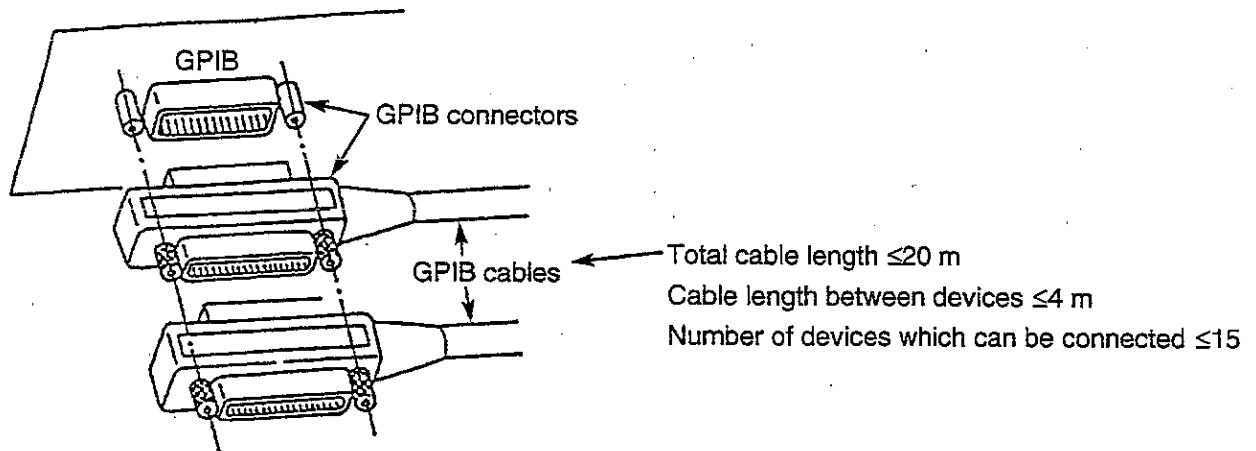
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3.1 Connecting Devices with GPIB Cables

The rear panel has connectors for connecting GPIB cables.

Up to 15 devices, including the controller, can be connected to one system. Connect devices under the conditions described to the right of the diagram below.



Mounting and dismounting of the GP-IB cable must be done after turning off the power switch and pulling out the power cord from the socket. If the power remains on, only signal common line may be disconnected before the other lines, then AC leak voltages are applied to the ICs, and there is a possibility that components such as ICs in the interface unit will be damaged.

CAUTION

The GPIB cables must be connected before the power is turned on.

3.2 Setting GPIB Interface Conditions

Set the GPIB interface on the Instrument Setup screen at the front panel.

Set the following items:

- 1) Interface: Connect to Controller (Initial value: GPIB)
- 2) GPIB: Address (Initial value: 01)

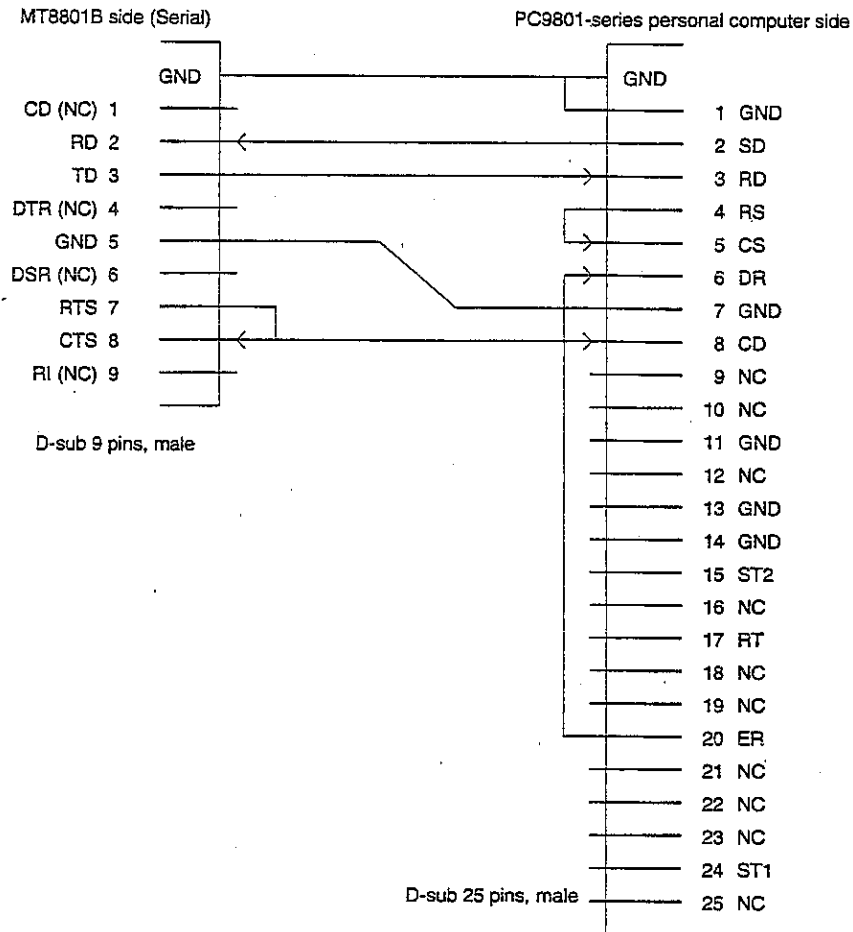
An example of the setting when the GPIB interface is set with the GPIB address 03 is given below.

Step	Key operation	Explanation
(Switching to the Instrument Setup screen)		
1.	[Main Func on off] F6	Sets the Main Func on to display the main menu.
2.	Next Menu[◀]	Sets the Instrument Setup mode.
	[Instrument Setup] F1	Displays the Instrument Setup screen.
(Selecting the remote control interface)		
3.	Cursor [^] [v]	Uses these cursor keys to select "Interface Connect to Controller."
4.	[Set]	Opens the setup window.
5.	Cursor [^] [v]	Selects GPIB on the setting window.
6.	[Set]	Closes the setting window and determines the set value.
(Setting the GPIB address)		
7.	Cursor [^] [v]	Use these cursor keys to select a GPIB address.
8.	[Set]	Opens the setup window.
9.	[0] [3] [Set]	Set the GPIB address to 03.

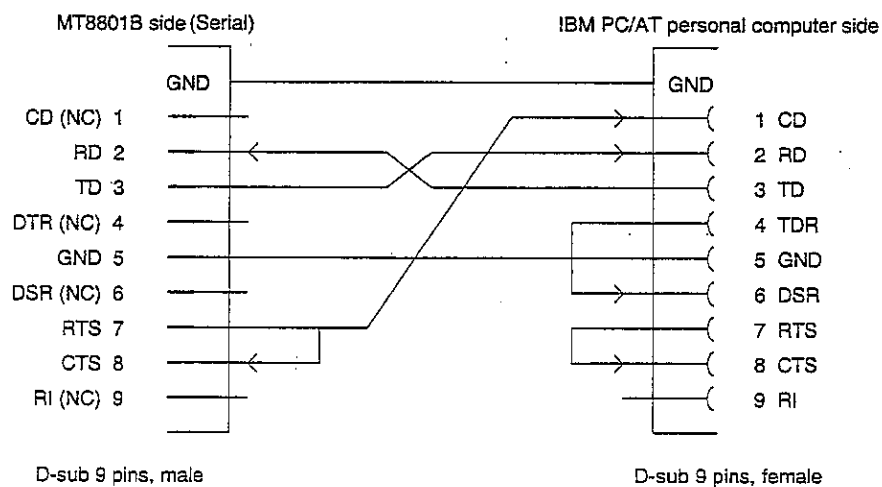
3.3 Connection of RS-232C Interface Signal

Connection of RS-232C interface signal between the MT8801B and a personal computer is shown below.

- Connection to PC98-series personal computer(NEC)



- Connection to IBM PC/AT personal computer



3.4 Setting RS-232C Interface Conditions

Set the RS-232C interface on the Instrument Setup screen at the front panel.

Set the following items:

- 1) Interface: Connect to Controller (Initial value: GPIB)
- 2) RS-232C: Baud Rate (Initial value: 2400)
 - Parity (Initial value: Even)
 - Data Bit (Initial value: 8 bits)
 - Stop Bit (Initial value: 1 bit)

Set the RS-232C interface conditions, as described below.

Step	Key operation	Explanation
(Switching to the Instrument Setup screen)		
1.	[Main Func On/Off] F6	Sets the Main Func on to display the main menu.
2.	Next Menu [◀] [Instrument Setup] F1	Sets the Instrument Setup mode. Displays the Instrument Setup screen.
(Selecting the remote control interface)		
3.	Cursor [^] [v]	These cursor keys are used to select "Interface Connect to Controller."
4.	[Set]	Opens the setup window.
5.	Cursor [^] [v]	Selects RS-232C on the setting window.
6.	[Set]	Closes the setting window and establishes the set value.
(Setting the RS-232C interface)		
7.	Cursor [^] [v]	Uses these cursor keys to select the setting item Baud rate.
8.	[Set]	Opens the setup window.
9.	[^] [v] [Set]	Uses these cursor keys to select a Baud rate value (9600 [bps] etc.).
10.	[^] [v]	Sets other interface conditions in the same way.

3.5 Setting the Items Relating to Remote Control and Panel Key Control

3.5.1 Remote control and panel control keys

The keys and lamps described in this paragraph are assigned on the front panel as exclusive keys and lamps.

1) REMOTE lamp and LOCAL key

The REMOTE lamp indicates that the MT8801B is controlled remotely via the GPIB interface. When the MT8801B is controlled remotely from an external controller via the GPIB interface on the rear panel, the REMOTE lamp lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. The LOCAL key is used to cancel the remote control status of the GPIB interface. When the LOCAL key is pressed, the REMOTE lamp goes off and key entry and rotary encoder entry from the front panel are enabled.

2) PANEL LOCK key

The PANEL LOCK key is used to enable and disable key entry and rotary encoder entry from the front panel. Use the PANEL LOCK key to prevent an operation error on the front panel for automatic measurement or status holding. When the panel is locked, the red lamp on the PANEL LOCK key lights.

3.5.2 Remote control status

If the MT8801B is controlled remotely, the REMOTE lamp on the left of the front panel lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. To change from the remote control to front panel entry status, execute the following steps:

- 1) Halt the remote control.
- 2) If the REMOTE lamp is on, press the LOCAL key to cancel the REMOTE status.



SECTION 4

DEVICE MESSAGE FORMAT

This section describes the format of the device messages transmitted between a controller and the MT8801B via the GPIB system.

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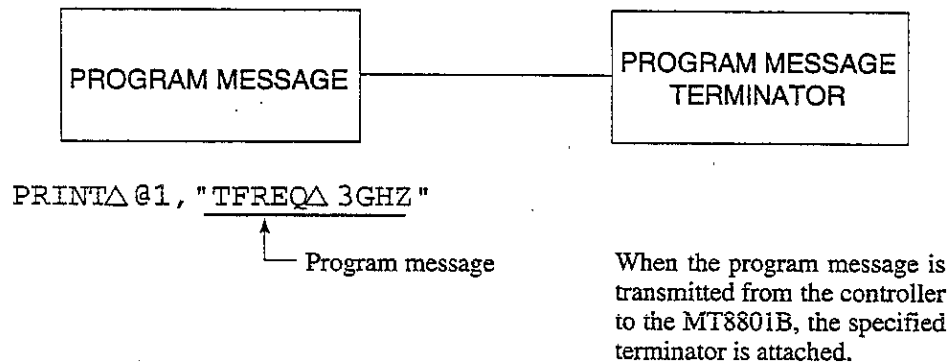


4.1. General Description

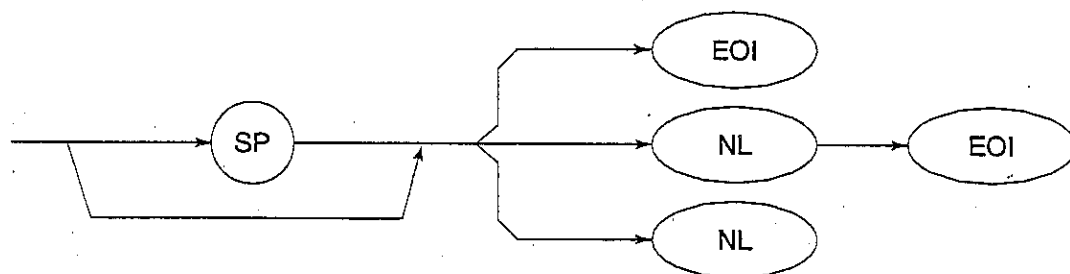
The device messages are data messages that are transmitted between the controller and devices. There are two types of data messages: program messages output from the controller to the MT8801B, and response messages input from the MT8801B by the controller. There are also two types of program commands and program queries in the program message. The program command is used to set this instrument's parameters and to instruct it to execute processing. The program query is used to query the values of parameters and measured results.

4.2 Program Message Format

To transfer program messages from the controller to the MT8801B using the PRINT statement, the program message formats are defined as follows:



(1) PROGRAM MESSAGE TERMINATOR

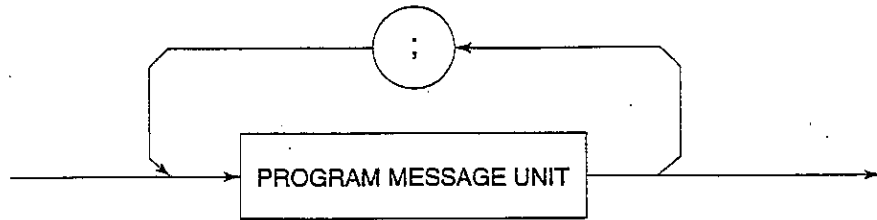


NL : New line or LF (Line Feed)

EOI : The EOI signal of the GPIB interface is used to indicate message termination.

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

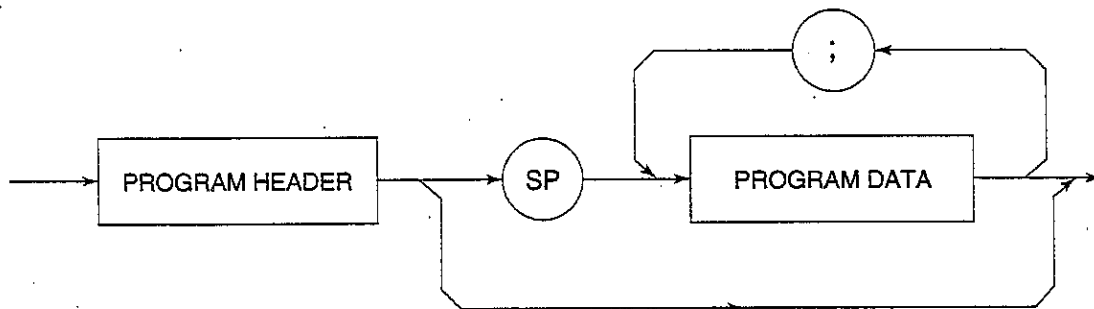
(2) PROGRAM MESSAGE ;



Multiple commands can be output sequentially by concatenating each of them with a semicolon.

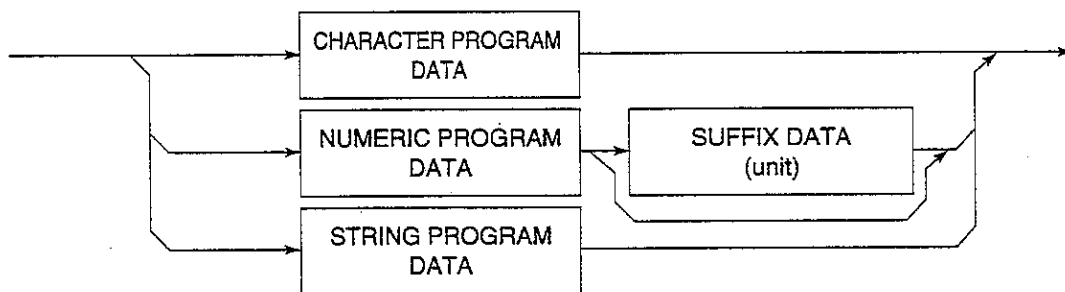
<Example> PRINT Δ @1, "TFREQ Δ 1GHZ ; RFLVL Δ UP"

(3) PROGRAM MESSAGE UNIT



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

(4) PROGRAM DATA



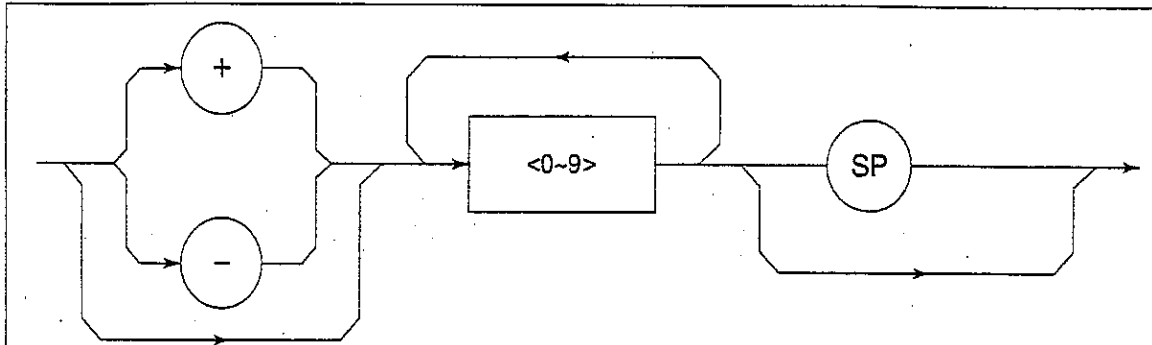
(5) CHARACTER PROGRAM DATA

Character program data consists of uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, the underline "_", and the numbers 0 to 9. These characters can be used in specified combinations.

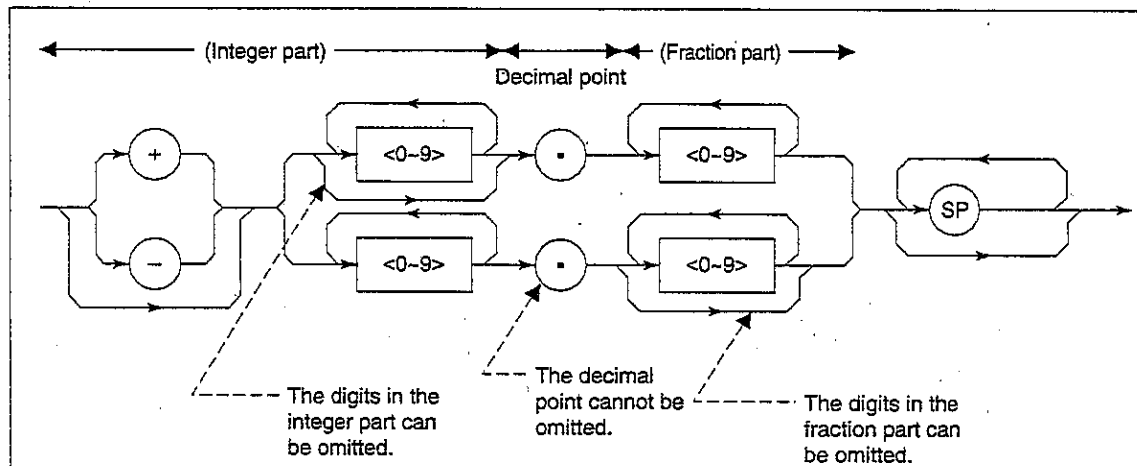
<Example> PRINT Δ @1, Δ "MKR Δ NRM" Sets Marker to Normal.

(6) NUMERIC PROGRAM DATA

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

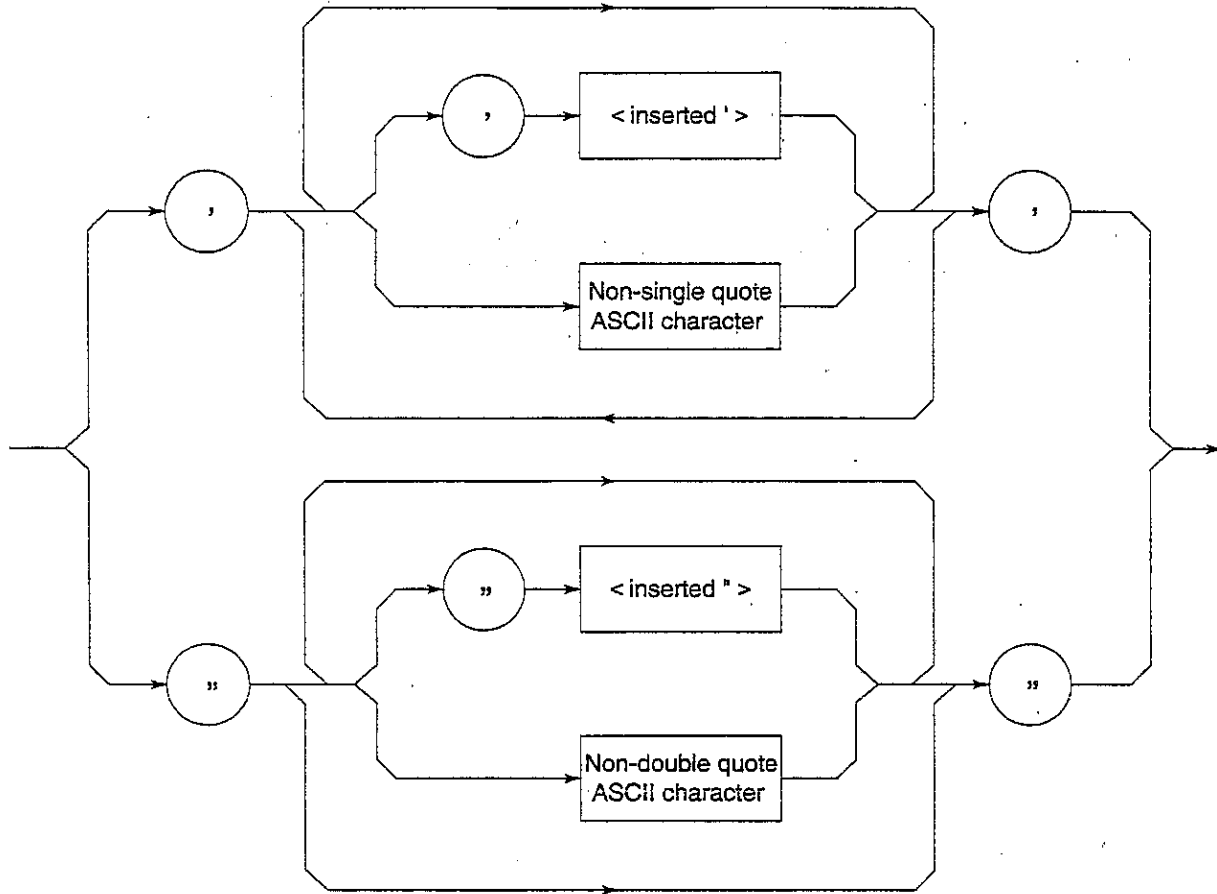
<Integer Format (NR1)>

- Zeros can be inserted at the beginning. → 005, +000045
- No spaces can be inserted between a + or - sign and a number. → 5, +Δ5 (×)
- Spaces can be inserted after a number. → +5ΔΔΔ
- The + sign is optional. → +5,5
- Commas cannot be used to separate digits. → 1,234,567 (×)

<Fixed-Point (real number) Format (NR2)>

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

(7) STRING PROGRAM DATA



•Both ends of string program data must have a pair of double quotation marks "___".

```
PRINT @1, "TITLE 'MT8801B' "
```

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

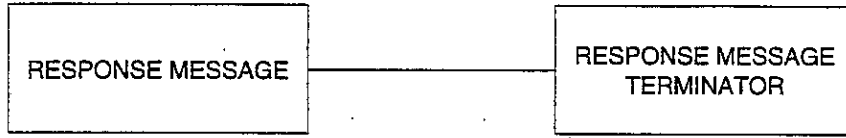
```
PRINT @1, "TITLE 'MT8801B' 'NOISE MEAS' ' ' "
```

Executing TITLE results in MT8801B 'NOISE MEAS'.

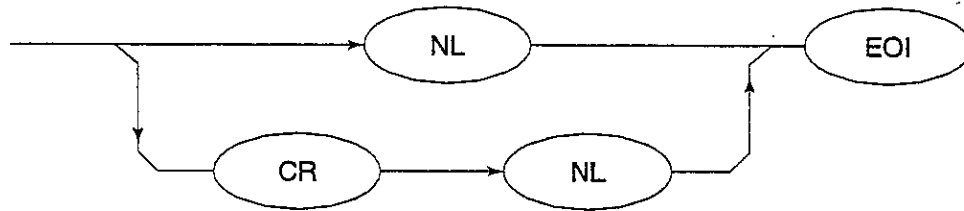
Note: To use the double quotation mark " in the PRINT statement, specify CHR\$ (&H22).

4.3 Response Message Format

To transfer responses messages from the MT8801B to the controller by using the INPUT statement, the response message formats are defined as follows:

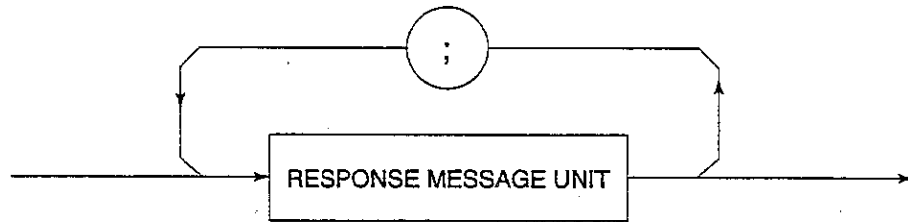


(1) RESPONSE MESSAGE TERMINATOR



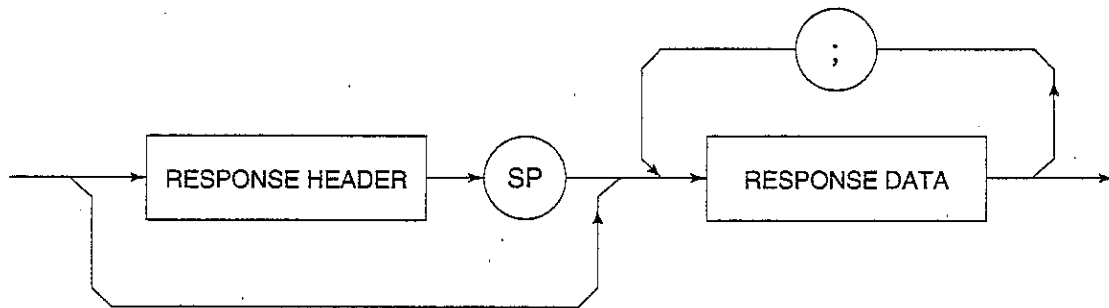
The response message terminator to be used depends on the TRM command.

(2) RESPONSE MESSAGE

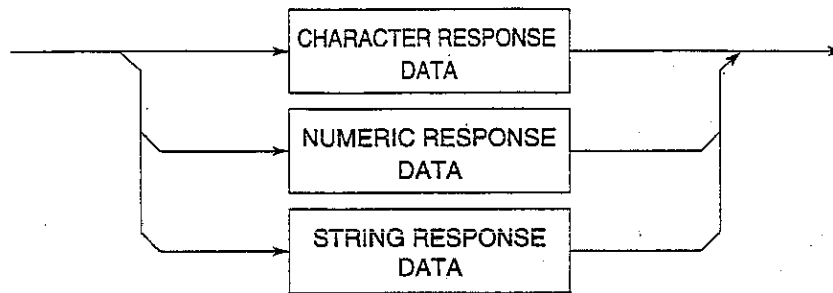


When a query is sent by the PRINT statement with one or more program queries, the response message also consists of one or more response message units.

(3) Normal RESPONSE MESSAGE UNIT



(4) RESPONSE DATA

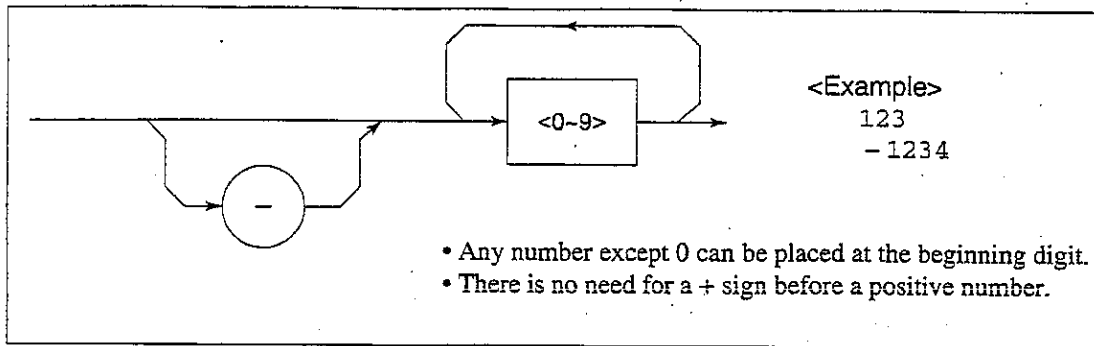


(5) CHARACTER RESPONSE DATA

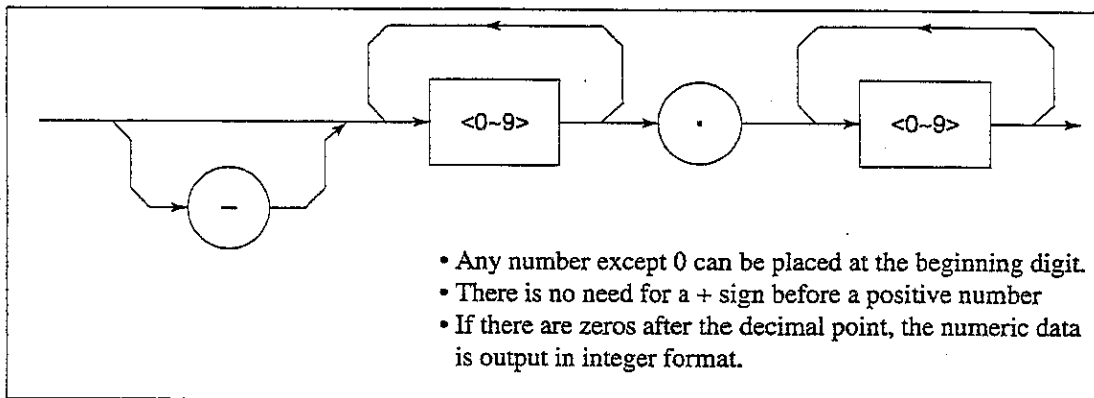
Character response data consists of uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, the underline "_", and the numbers 0 to 9. These characters can be used in specified combinations.

(6) NUMERIC RESPONSE DATA

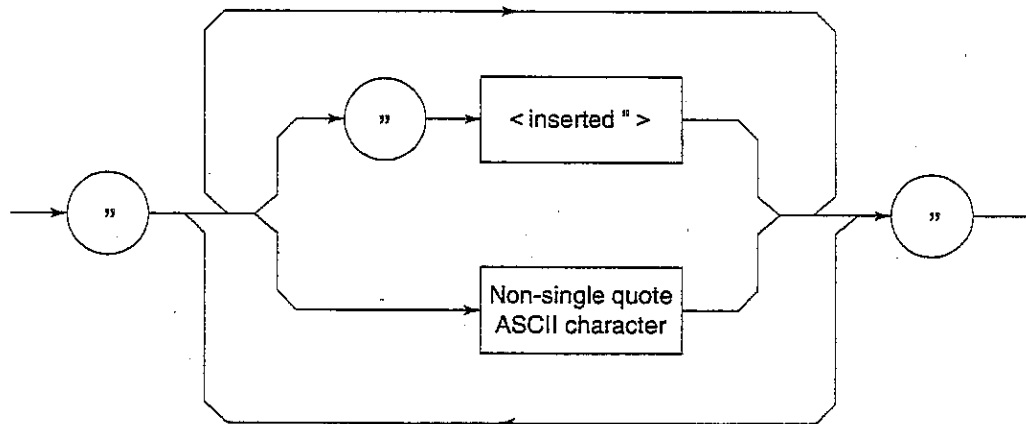
<Integer Format (NR1)>



<Integer Format (NR1)>



(7) STRING RESPONSE DATA



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

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

For details on reading binary format, see paragraph 8.2.2 (4) in Section 8, "SAMPLE PROGRAMS. "

SECTION 5

STATUS MESSAGES

This section describes MT8801B status messages, their data structure and models, and explains the techniques for synchronizing the controller and the MT8801B.

To obtain more detailed status information, the IEEE488.2 standard has more common commands and common queries than the IEEE488.1 standard.

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5.6.5 Wait for service request issuance from the status register 5-22

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

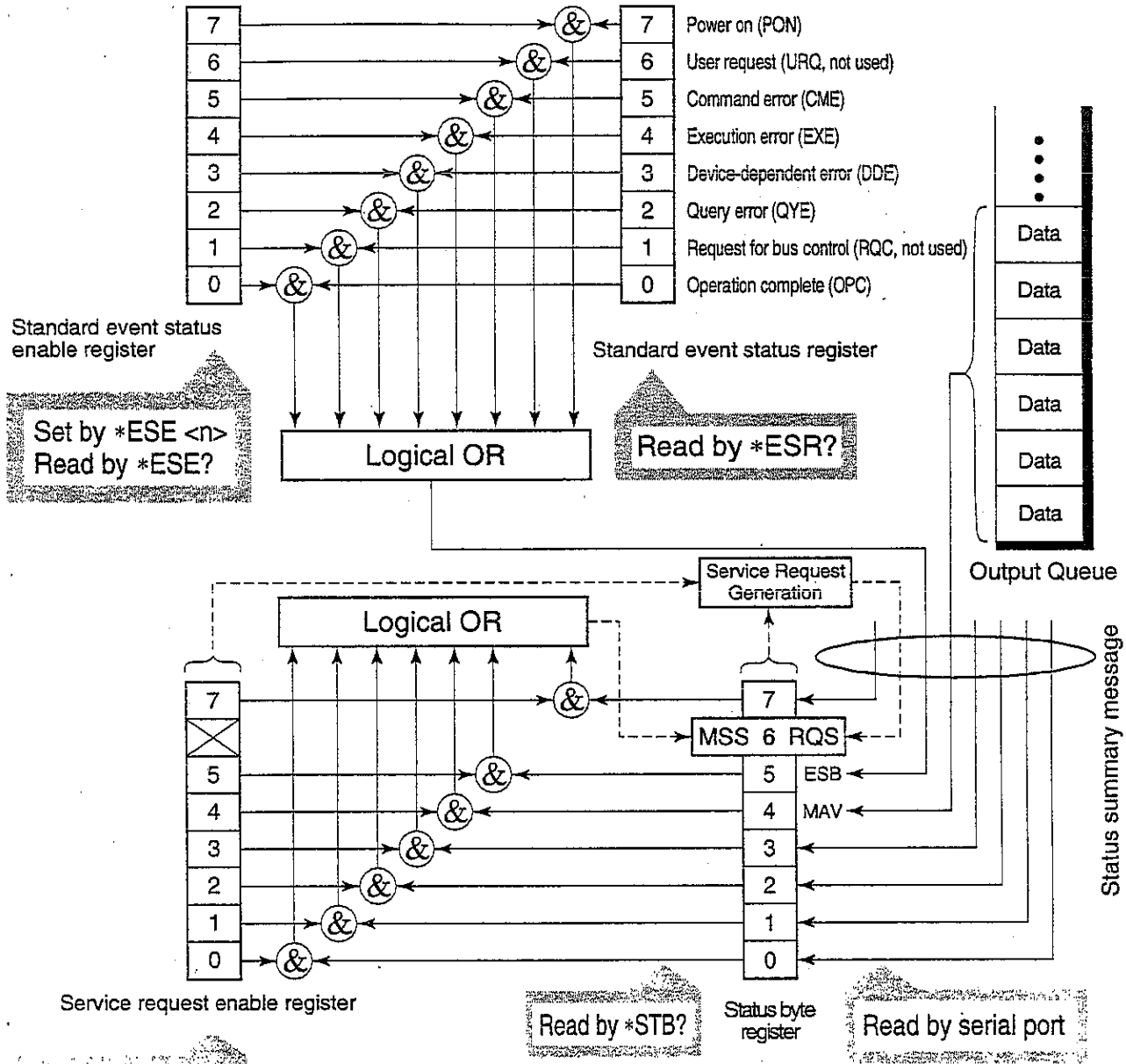
The following pages explain the status summary message and structure of status data that constitutes the status summary message bits, as well as techniques for synchronizing the MT8801B and controller, which use these status messages.

These functions are used by an external controller with the GPIB interface bus.

Almost functions can be used by an external controller with the RS-232C interface.

5.1 IEEE488.2 Standard Status Model

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



Standard Status Model Diagram

The IEEE488.1 status byte is used in the status model. This status byte is composed of seven summary message bits given from the status data structure. To create the summary message bits, there are two models for the data structure: the register model and the queue model.

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

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

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

Standard Event Status Register	Status Byte Register	Output Queue
The Standard Event Status Register has the structure of the previously described register model. In this register, bits are set for eight types of standard events encountered by a device. ① Power on, ② User request, ③ Command error, ④ Execution error, ⑤ Device-dependent error, ⑥ Query error, ⑦ Request for bus control and ⑧ Operation complete. The logical OR output bit is represented by Status Byte Register bit 5 (DIO6) as a summary message for the Event Status Bit (ESB).	The Status Byte Register is a register in which the RQS bit and the seven summary message bits from the status data structure can be set. It is used together with the Service Request Enable Register. When the result of the OR operation of both register contents is not 0, SRQ goes ON. To indicate this, bit 6 of the Status Byte Register (DIO7) is reserved by the system as the RQS bit, which indicates a service request for the external controller. The mechanism of SRQ conforms to the IEEE488.1 standard.	The Output Queue has the structure of the queue model mentioned above. Status Byte Register bit 4 (DIO5) is set as a summary message for Message Available (MAV) to indicate that there is data in the output buffer.

5.2 Status Byte (STB) Register

The STB register consists of device STB and RQS (or MSS) messages. The IEEE488.1 standard defines the method of reporting STB and RQS messages, but not the setting and clearing of protocols or the meaning of STB. The IEEE488.2 standard defines the device status summary message and the Master Summary Status (MSS) which is sent to bit 6 together with STB in response to an *STB? common query.

5.2.1 ESB and MAV summary messages

The following describes the ESB and MAV summary messages.

(1) ESB summary messages

The ESB (Event Summary Bit) summary message is a message defined by IEEE488.2, and is represented by bit 5 of the STB register. This bit indicates whether at least one of the events defined in IEEE488.2 has occurred when the service request enable register is set to enable events after the final reading or clearing of the standard event register.

The ESB summary message bit becomes 1 when the setting permits events to occur if any of the events recorded in the standard event status register becomes 1. The ESB summary bit becomes true when the setting permits events to occur if any of the events registered in the standard event status register is true. Conversely, it is false if none of the recorded events occurs even if events are set to occur.

This bit becomes FALSE (0) when the ESR register is read by the *ESR? query and the ESR register is cleared by the *CLS command.

(2) MAV summary messages

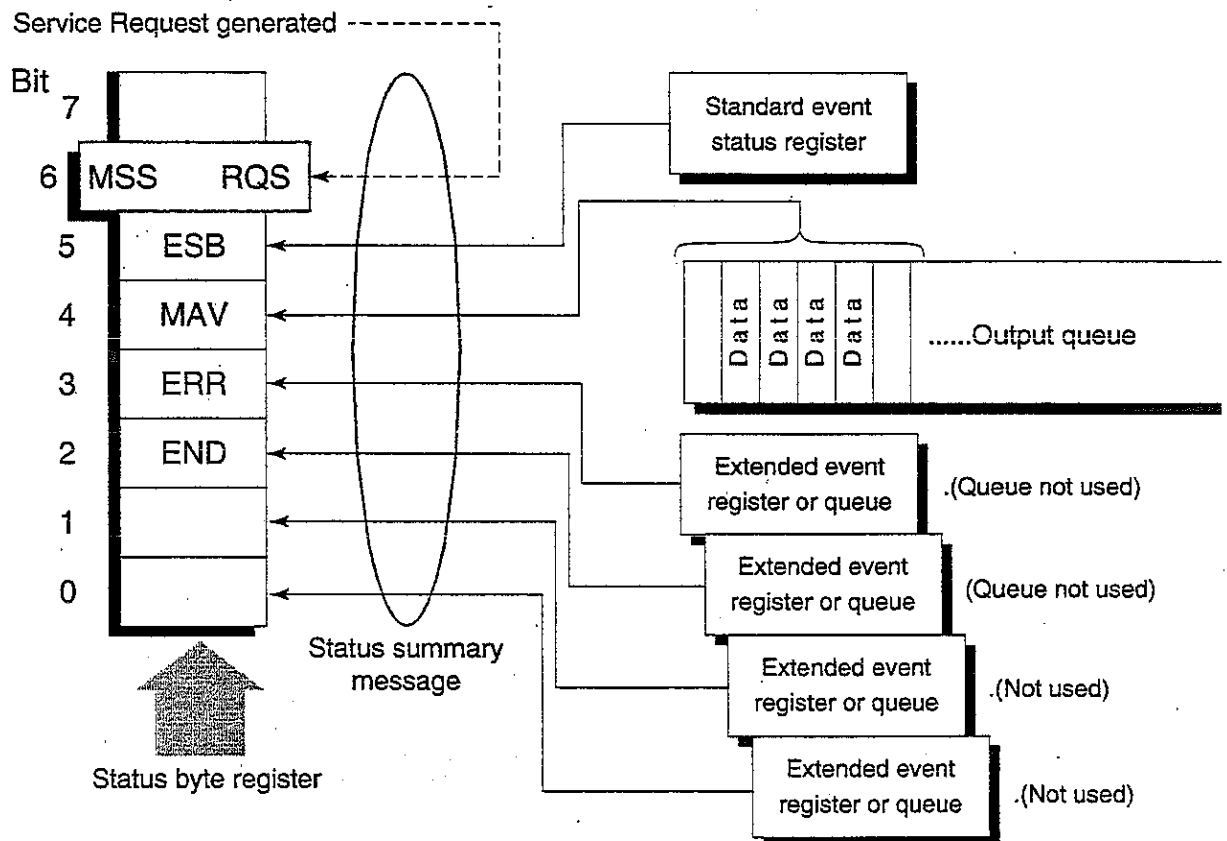
The MAV summary message is a message defined in IEEE488.2 and represented by bit 4 in the STB register. This bit indicates whether the output queue is empty. The MAV summary message bit is set to 1 (true) when a device is ready to receive a request for a response message from the controller and to 0 (false) when the output queue is empty. This message is used to synchronize the exchange of information with the controller. For example, this message can be used to make the controller wait until MAV is true after it sends a query command to the device. While the controller is waiting for a response from the device, it can process other jobs. Reading the output queue without first checking MAV delay all system bus operations until the device responds.

5.2.2 Device-dependent summary messages

The IEEE488.2 standard specifies that bits 7 (DIO8) and 3 (DIO4) to 0 (DIO1) of the status byte register can be used as status register summary bits, or to indicate that there is data in a queue.

Device-dependent summary messages have the respective status data structures of the register model or the queue model. Thus, the status data structure may be either the register to report events and status in parallel or the queue to report conditions and status in sequence. The summary bit represents a summary of the current status of the corresponding status data structure. For the register model, the summary message is true when there is an event set to permit the occurrence of more than one true event; while for the queue model, it is true if the queue is not empty.

As shown below, the MT8801B does not use bits 0, 1 and 7. As it uses bits 2 and 3 as the summary bit of the status register, it has 3 register model types (where 2 types are extended) and one queue model type (with no extension).



5.2.3 Reading and clearing the STB register

Serial poll or the *STB? common query are used to read the contents of the STB register. STB messages conforming to IEEE488.1 can be read by either method, but the value sent to bit 6 (position) is different for each message.

The STB register can be cleared by using the *CLS command.

(1) Reading by serial poll (only when using the GPIB interface)

When using serial poll conforming to IEEE488.1, the device must return a 7-bit status byte and an RQS message bit which conforms to IEEE488.1. According to IEEE488.1, the RQS message indicates whether the device sent SRQ as true or not. The value of the status byte is not changed by serial poll. The device must set the RQS message to false immediately after being polled. As a result, if the device is again polled before there is a new cause for a service request, the RQS message is false.

(2) Reading by the *STB? common query

The *STB? common query requires the device to send the contents of the STB register and an integer format response message from the MSS (Master Summary Status) summary message. The response represents the total binary weighted value of the STB register and the MSS summary message. STB register bits 0 to 5 and 7 are weighted to 1, 2, 4, 8, 16, 32, and 128; and the MSS to 64, respectively. Thus, excepting the fact that bit 6 represents the MSS summary message instead of the RQS message, the response to *STB? is identical to that for serial poll.

(3) Definition of MSS (Master Summary Status)

MSS indicates that there is at least one cause for a service request. The MSS message is represented by bit 6 in a device response to the *STB? query, but it is not generated response to serial poll. In addition, it is not part of the status byte specified by IEEE488.1. MSS is generated by the logical OR operation of the STB register with SRQ enable (SRE) register. In concrete terms, MSS is defined as follows:

(STB Register bit0 AND SRE Register bit0)

OR

(STB Register bit1 AND SRE Register bit1)

OR

:

:

(STB Register bit5 AND SRE Register bit5)

OR

(STB Register bit7 AND SRE Register bit7)

Since bit-6 status of the STB and SR enable registers is ignored in the definition of MSS, it can be considered that bit-6 status is always being 0 when calculating the value of MSS.

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

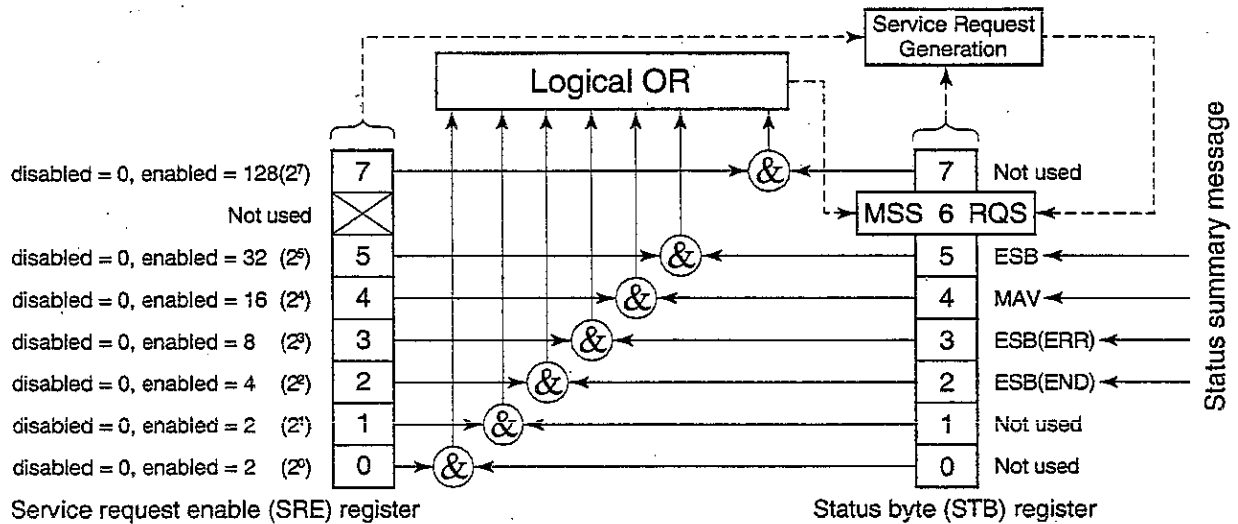
With the exception of the output queue and its MAV summary message, the *CLS common command clears all status data structures (status event registers and queues) as well as the corresponding summary messages.

The *CLS command does not affect settings in the enable registers.

5.3 Enabling the Service Request (SRQ)

All types of summary messages in the STB register can be enabled or disabled for service requests (SRE) by using the program-controlling service request (SRQ) enable operation. The service request enable (SRE) register controls the generation of SRQ in bits 0 to 7 as shown in the diagram below.

Bits in the service request enable register correspond to bits in the status byte register. If a bit in the status byte corresponding to an enabled bit in the service request enable register is set to 1, the device makes a service request to the controller with the RQS bit set to 1. For example, if bit 4 in the service request enable register is enabled, the device makes a request for service to the controller each time the MAV bit is set to 1 when there is data in the output queue.



(1) Reading the SRE register

The contents of the SRE register are read using the *SRE? common query. The response message to this query is an integer from 0 to 255, which is the sum of the bit digit weighted values in the SRE register. SRE register bits 0 to 5 and 7 are respectively weighted to 1, 2, 4, 8, 16, 32, and 128. The unused bit 6 must always be set to 0.

(2) Updating the SRE register

The *SRE common instruction is used to write data to the SRE register. An integer from 0 to 255 is added after the SRE .fm3common instruction.

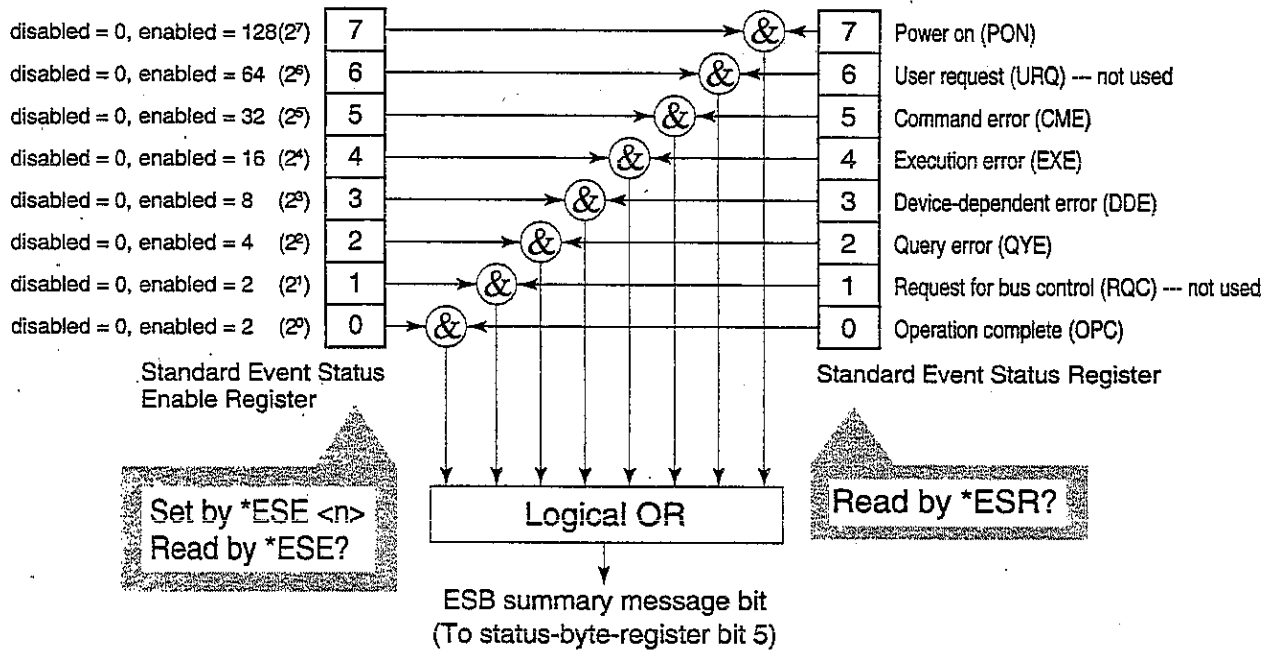
This integer indicates the total number of bits in the SRE register (weighted values: 1, 2, 4, 8, 16, 32, and 128), and sets the corresponding SRE register bit to 0 or 1.

A bit value of 1 indicates an enabled state; 0 indicates a disabled state. Always ignore the value of bit 6.

5.4 Standard Event Status Register

5.4.1 Bit definition of standard event status register

The standard event status register must be available on all devices conforming to the IEEE488.2 standard. The diagram below shows the operation of the standard event status register model. Because the operation of the model is the same as that for the other models already described, the following only explains the meaning of each bit in the standard event status register as defined in the IEEE488.2 standard.



Standard event status enable (ESE) register selects whether the register makes the summary message true when the corresponding bit of the event status register is set.

Bit	Event name	Description
7	Power on (PON)	The power is turned on.
6	User Request (URQ)	Request for local control (rtl). This bit is produced regardless of whether a device is in remote or local mode. It is not used for the MT8801B so, it is always set to 0.
5	Command Error (CME)	An illegal program message, a misspelt command or a GET command within a program is received.
4	Execution error (EXE)	A legal program message, which cannot be executed, is received.
3	Device-dependent Error (DDE)	An error caused by other than CME, EXE or QYE (e.g., parameter error) occurred.
2	Query Error (QYE)	An attempt is made to read data in the output queue though there is none there, or data is lost from the output queue due to some reason (e.g., overflow).
1	Request Control (RQC)	A device is requesting an active controller. This bit is not used for the MT8801B so, it is always set to 0.
0	Operation Complete (OPC)	A device has completed specified operations and is ready to receive new commands. This bit is only set in response to the *OPC command.

5.4.2 Query error details

No.	Item	Description
1	Incomplete program message	If a device receives an MTA from the controller before it receives the terminator of the program message it is receiving, it aborts the incomplete program message and waits for the next one. To abort the incomplete message, the device clears its input-output buffer, reports a query error to the status report section and sets bit 2 in the standard status register to indicate the query error.
2	Interruption of response message output	If a device receives an MLA from the controller before it has sent the terminator of the response message it is sending, it automatically interrupts response message output and waits for the next program. To interrupt the response message output, the device clears its output buffer, reports a query error to the status report section, and sets bit 2 in the standard status register to indicate the query error.
3	Sending the next program message without reading the previous response message	When a device becomes unable to send a response message because the controller has sent another program message immediately following a program or query message, the device aborts the response message and waits for the next program message. It then reports a query error to the status report section as in No.2 above.
4	Output queue overflow	When several program and query messages are executed in succession, too many response messages for the output queue (256 bytes) may be generated. If further query messages are received when the output queue is full, the output queue cannot send corresponding responses due to the overflow situation. If there is overflow in the output queue, the device clears it and resets the section where response messages are created. Then it sets bit 2 in the standard event status register to indicate a query error.

5.4.3 Reading, writing to and clearing the standard event status register

Reading	<p>The register is read by the *ESR? common query.</p> <p>The register is cleared after being read. The response message is an integer format data value obtained by binary weighting the event bit and converting it to a decimal number.</p>
Writing	<p>With the exception of clearing, writing operations cannot be performed externally.</p>
Clearing	<p>The register is only cleared in the following cases:</p> <ul style="list-style-type: none"> ① A *CLS command received. ② The power is turned on. <p>Devices first clear their standard event status registers but later record events that occurred during the sequence in the registers (e.g., setting of the PON event bit).</p> <ul style="list-style-type: none"> ③ An event is read for the *ESR? command.

5.4.4 Reading, writing to and clearing the standard event status enable register

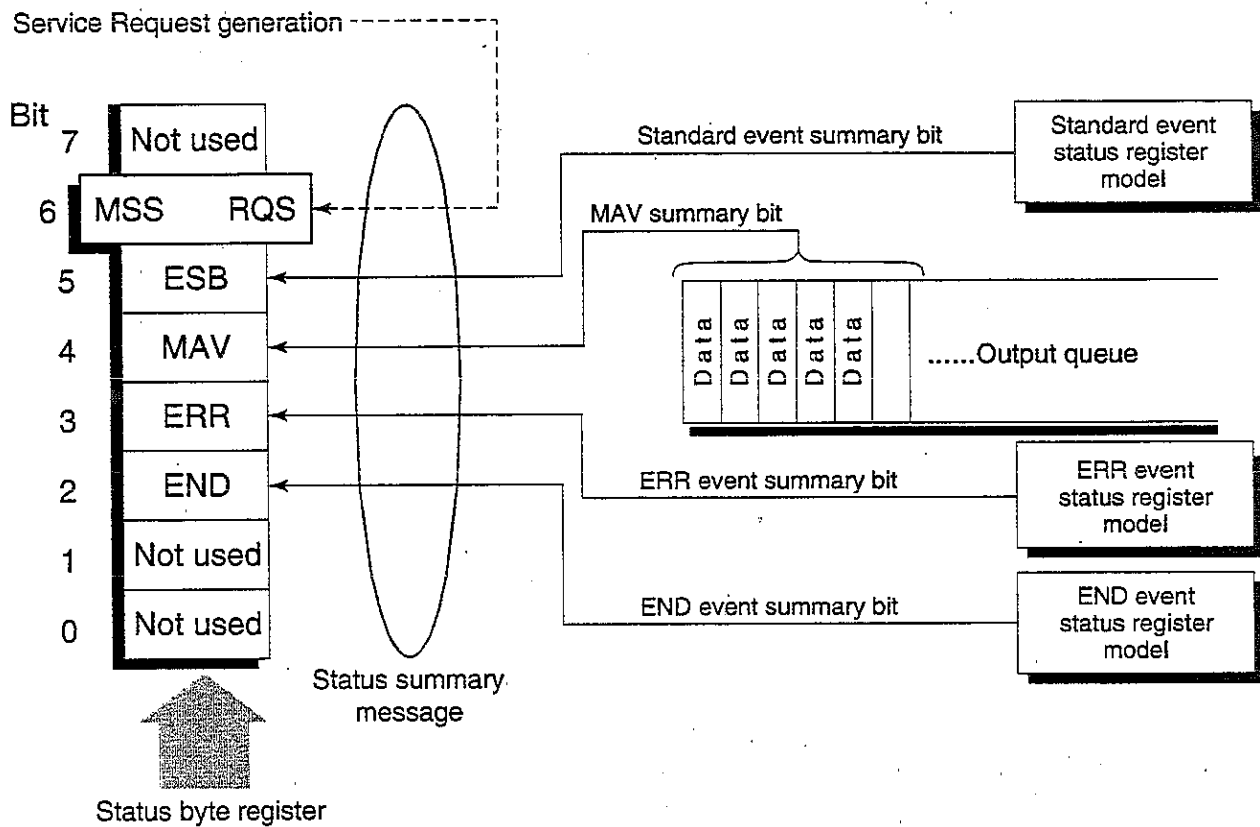
Reading	<p>The register is read by the *ESE? common query.</p> <p>The response message is an integer format data value obtained by binary weighting the event bit and converting to a decimal number.</p>
Writing	<p>The register is written to by the *ESE common command. As bits 0 to 7 of the register are respectively weighted to 1, 2, 4, 8, 16, 32, 64, and 128, data to be written is sent by <DECIMAL NUMERIC PROGRAM DATA> which is the digit total of the bits selected from these bits.</p>
Clearing	<p>The register is cleared in the following cases:</p> <ul style="list-style-type: none"> ① An *ESE command with a data value of 0 is received. ② The power is turned on. <p>The standard event status enable register is not affected by the following:</p> <ul style="list-style-type: none"> ① Changes of the status of the IEEE488.1 device clear function ② An *RST common command is received. ③ A *CLS common command is received.

5.5 Extended Event Status Register

The register models of the status byte register, standard event status register and enable registers are mandatory for equipment conforming to the IEEE488.2 standard.

In IEEE488.2, status-byte-register bits 7 (DIO8), 3 (DIO4) to 0 (DIO1) are assigned to status summary bits supplied by the extended-register and extended-queue models.

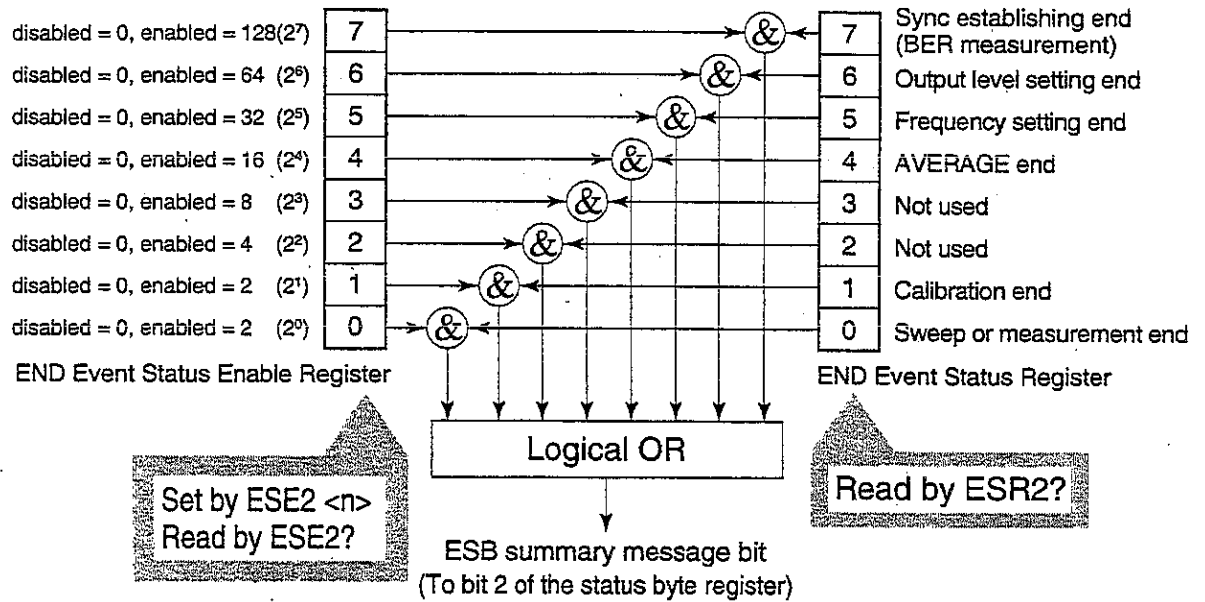
For the MT8801B, as shown in the diagram below, bits 7, 1 and 0 are unused; bits 2 and 3 are assigned to the END and ERR summary bits as the status-summary bits supplied by the extended-register model. As the queue model is not extended, there is only one type of queue: the output queue.



The following pages describe bit definition, the reading, writing to and clearing of bits for the END extended event register model.

5.5.1 Bit definition of END event status register

The following describes the operation of the END event status register model, the naming of its event bits, and what they mean.

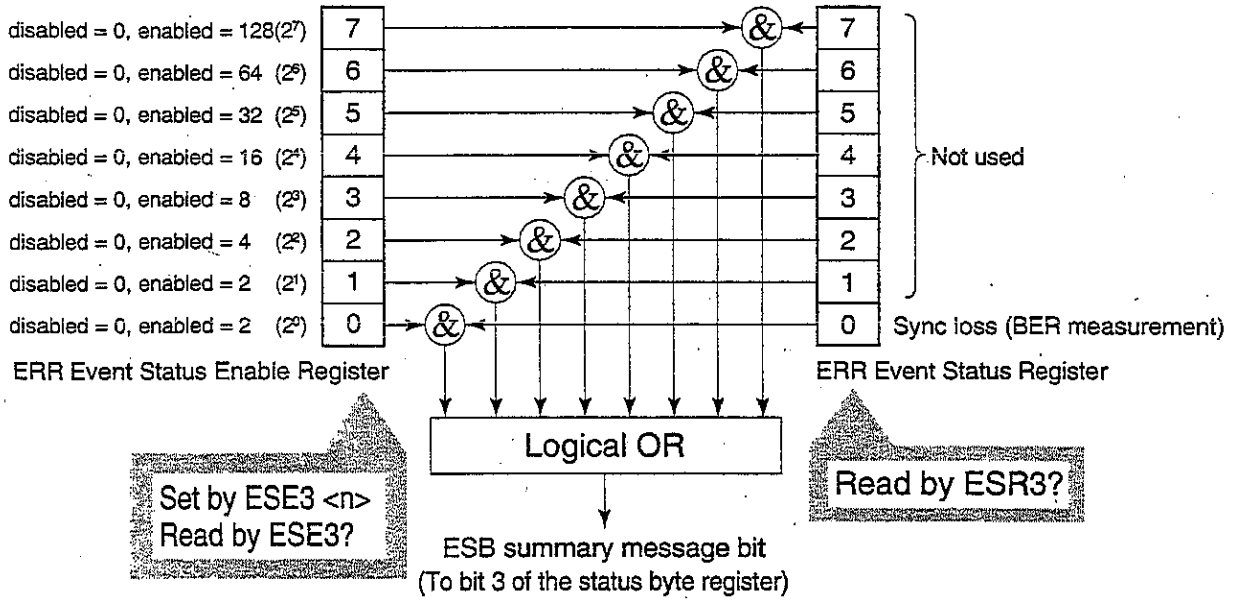


The END event status register selects whether the register makes the summary message true when the corresponding bit of the status register is set.

Bit	Event name	Description
7	Sync establishing end	This bit is set to 1 when synchronization is established after BER measurement starts.
6	Output level setting end	This bit is set to 1 when output level setting ends.
5	Frequency setting end	This bit is set to 1 when frequency setting ends.
4	AVERAGE end	This bit is set to 1 when averaging ends.
3	(Not used)	(Not used)
2	(Not used)	(Not used)
1	CAL end	This bit is set to 1 when calibration ends.
0	Sweep or measurement end	This bit is set to 1 when sweep or measurement ends.

5.5.2 Bit definition of ERR event status register

The following describes the operation of the ERR event status register model, the naming of its event bits, and what they mean.



The ERR event status register selects whether the register makes the summary message true when the corresponding bit of the status register is set.

Bit	Event name	Description
7	(Not used)	(Not used)
6	(Not used)	(Not used)
5	(Not used)	(Not used)
4	(Not used)	(Not used)
3	(Not used)	(Not used)
2	(Not used)	(Not used)
1	(Not used)	(Not used)
0	Sync loss	This bit is set to 1 when synchronization loss is occurred.

5.5.3 Reading, writing to and clearing the extended event status register

Reading	The register is destructively read by a query (e.g., it cleared after being read). The END/ERR event status register is read by ESR2?/ESR3? query. The read value, an integer format data (NR1), is obtained by binary weighting the event bit and converting it to decimal.
Writing	With the exception of clearing, writing operations cannot be performed externally.
Clearing	The register is cleared in the following cases: ① A *CLS command is received. ② The power is turned on. ③ An event is read by the ESR2?/ESR3? query command.

5.5.4 Reading, writing to and clearing the extended event status enable register

Reading	The register is non-destructively read by a query (i.e., not cleared after being read). The END/ERR event status register is read by the ESE2?/ESE3? query. The read value, an integer format data (NR2), is obtained by binary total weighting the event bit and converting it to decimal.
Writing	The END/ERR event status register is written to by the ESE2/ESE3 program command. As bits 0 to 7 of the registers are respectively binary weighted to 1, 2, 4, 8, 16, 32, 64, and 128, write data is sent as the integer format data obtained by total weighting the digit value of bits selected from among them.
Clearing	The register is cleared in the following cases: ① The ESE2/ESE3 program command with a data value of 0 is received for the END/ERR event status register. ② The power is turned on the power-on-status-clear flag is true. The extended event status enable register is not affected by the following: ③ Changes of the status of the IEEE488.1 device clear function ④ An *RST common command is received. ⑤ A *CLS common command is received.

5.6 Techniques for Synchronizing the MT8801B with a Controller

The MT8801B usually treats program messages as sequential commands that do not execute the processing of newly received commands until the previous command has been processed. Thus, special consideration need not be taken for pair-synchronization between the MT8801B and the controller.

If the controller controls one or more devices and synchronizes with them, after all the commands specified for the MT8801B have been processed, the next commands must be sent to other devices.

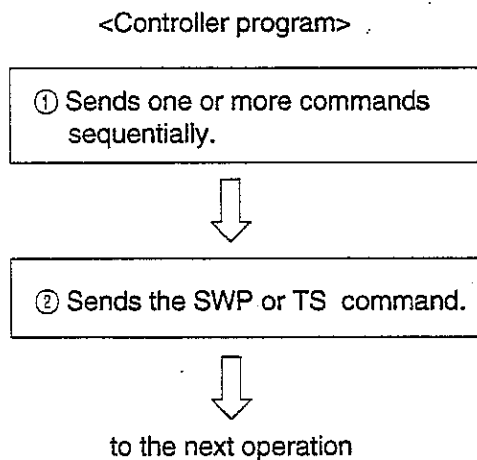
There are five ways of synchronizing the MT8801B with the controller:

- ① Wait for SWP or TS command termination.
- ② Wait for a response after the *OPC? query is sent.
- ③ Wait for SRQ after *OPC is sent.
- ④ Wait for status generation of the status register.
- ⑤ Wait for SRQ by the status register.

5.6.1 Wait for SWP or TS command termination

When the MT8801B starts measurement using the SWP or TS command, it stops accepting the next measurement command until it terminates the measurement. Use this feature to set a synchronization.

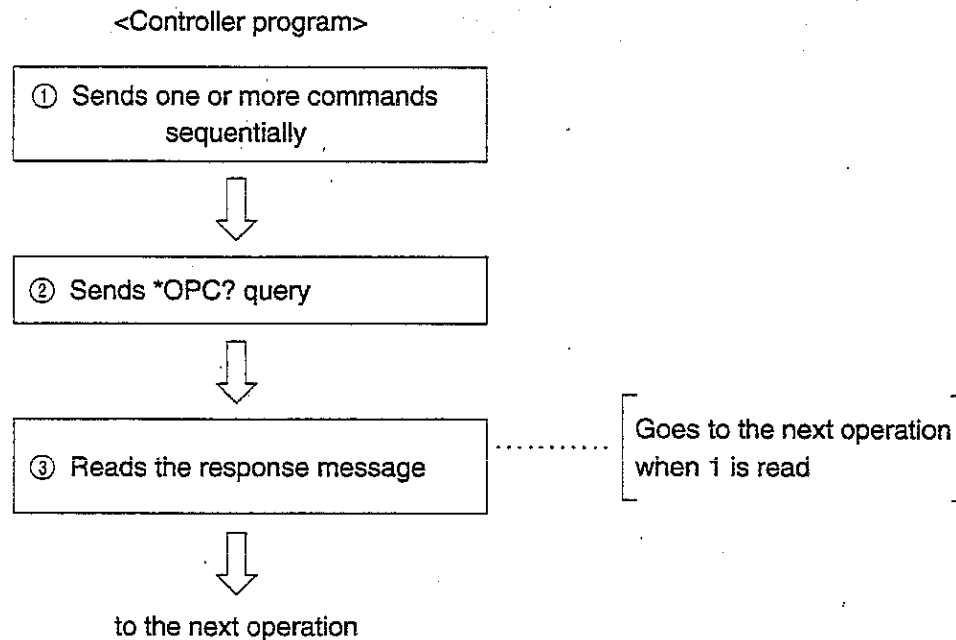
Note: A response may not be returned if there is no measurement termination condition (permanent measurement of BER, etc.). In Average measurement mode, a response may be returned before averaging.



5.6.2 Wait for response after *OPC? query is sent

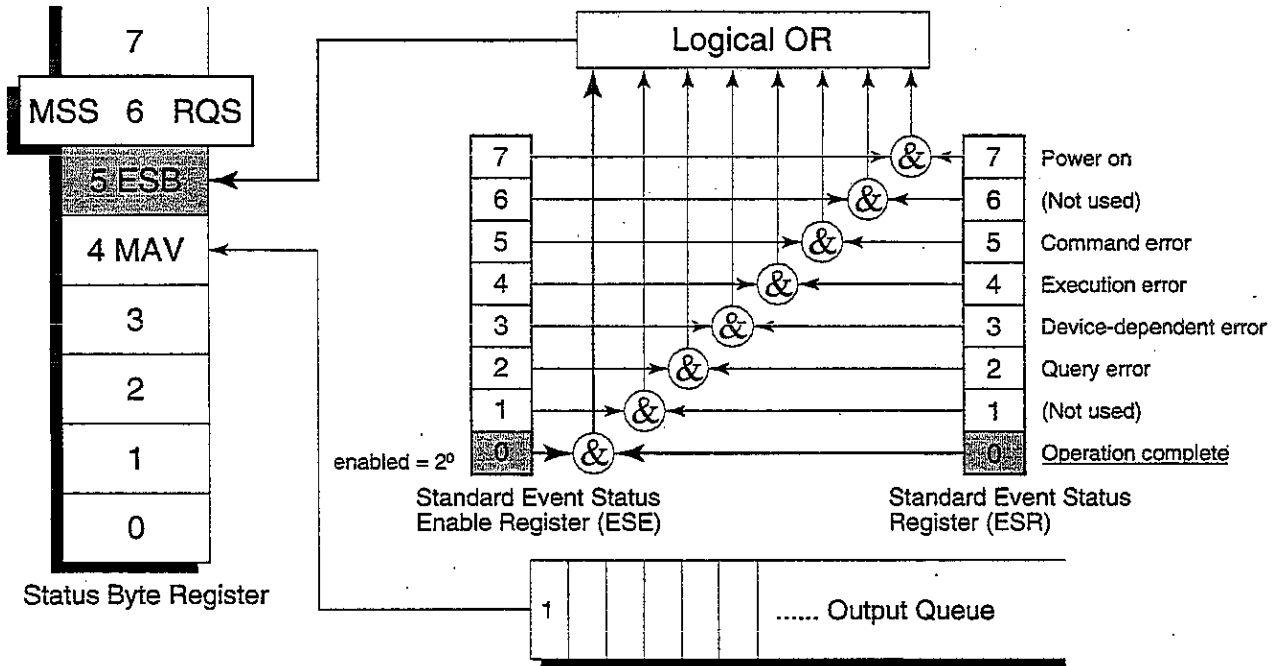
When executing the *OPC? query command, the MT8801B outputs "1" as the response message at the end of the previous command. The controller is synchronized with the MT8801B by waiting for the request message to be entered.

Note: When the read response message is "Q" (command is being executed), wait for about 50 ms until the controller moves to the next operation.

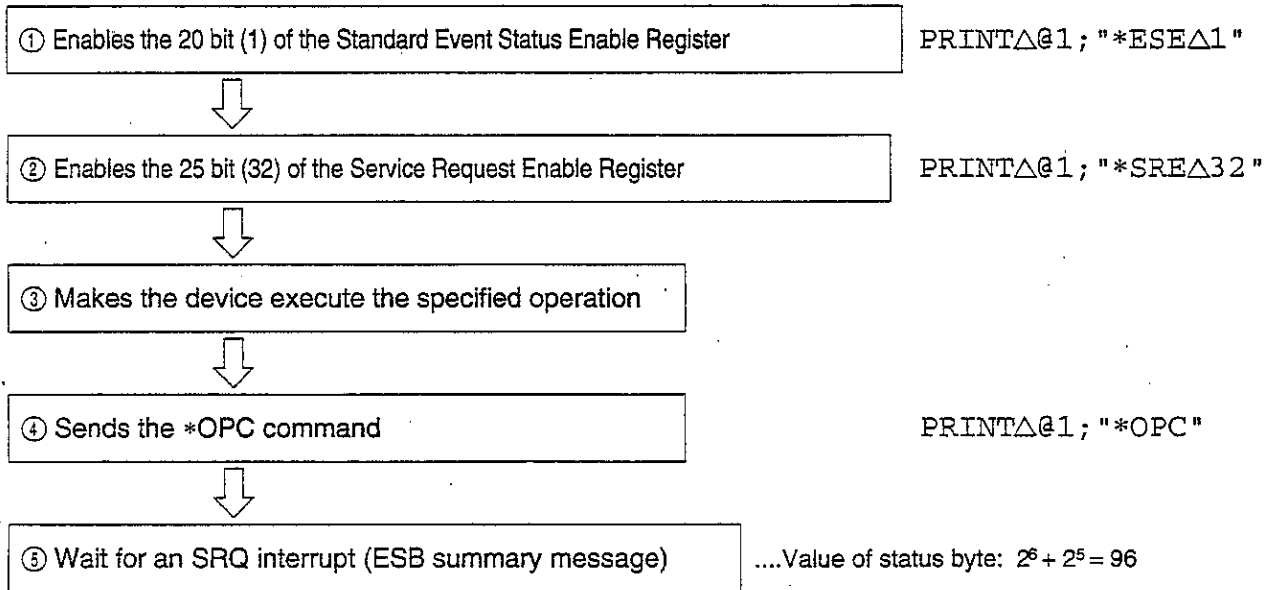


5.6.3 Wait for service request after *QPC is sent

The MT8801B sets the operation-complete bit (bit 0) to 1 when executing the *OPC command. The controller is synchronized with the MT8801B by waiting for SRQ when the operation-complete bit is set for SRQ.



• <Controller program>

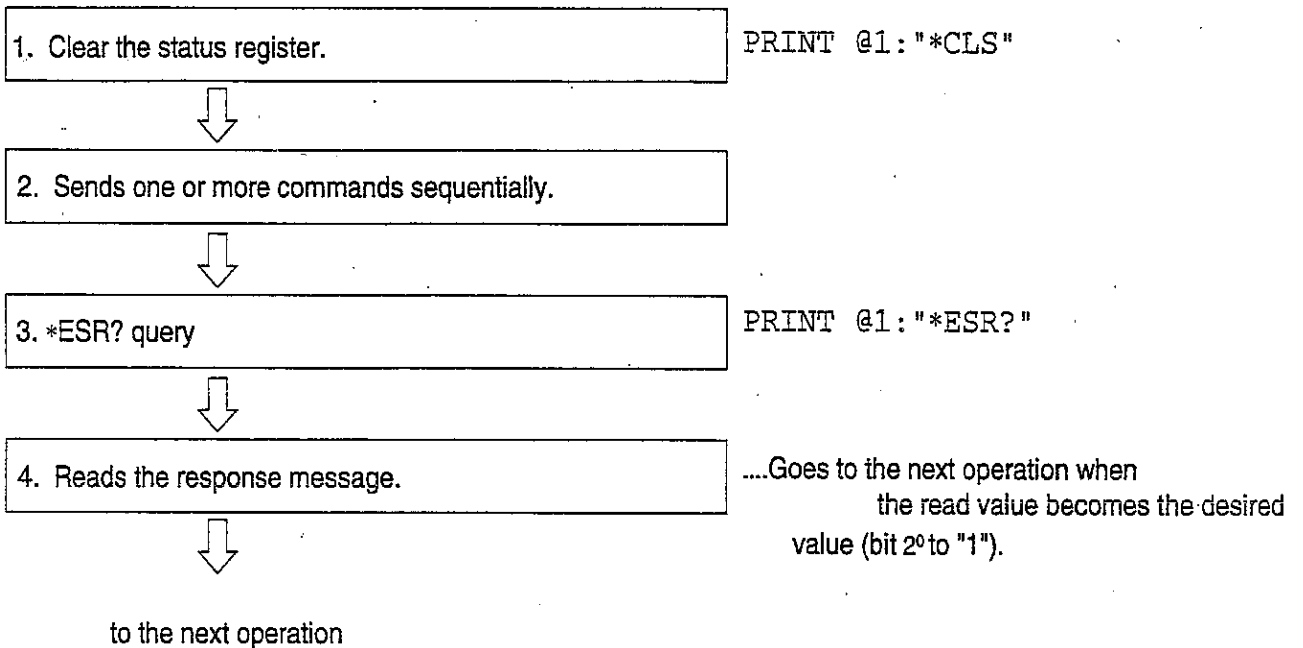


5.6.4 Wait for status generation of the status register

An event status register bit of the MT8801B is set to 1 when the corresponding event occurs. When the *ESR?, ESR2?, or ESR3? query is executed, the MT8801B outputs the value of the corresponding status register as a response message. The controller reads this response message and waits until the response becomes the specified value for synchronization. Reset the event status register immediately before making a desired event occur.

Note: Wait for 50 ms for the controller to go to the next operation after reading a response message.

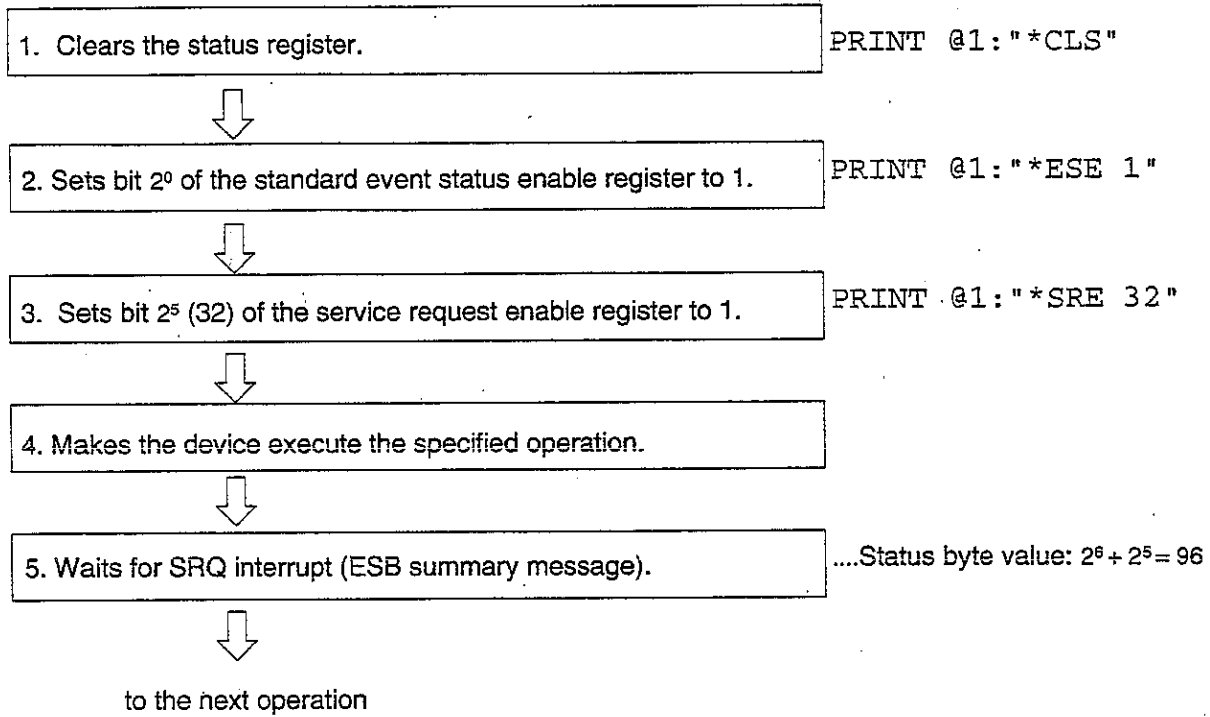
- <Controller program : Synchronization by operation termination bit>



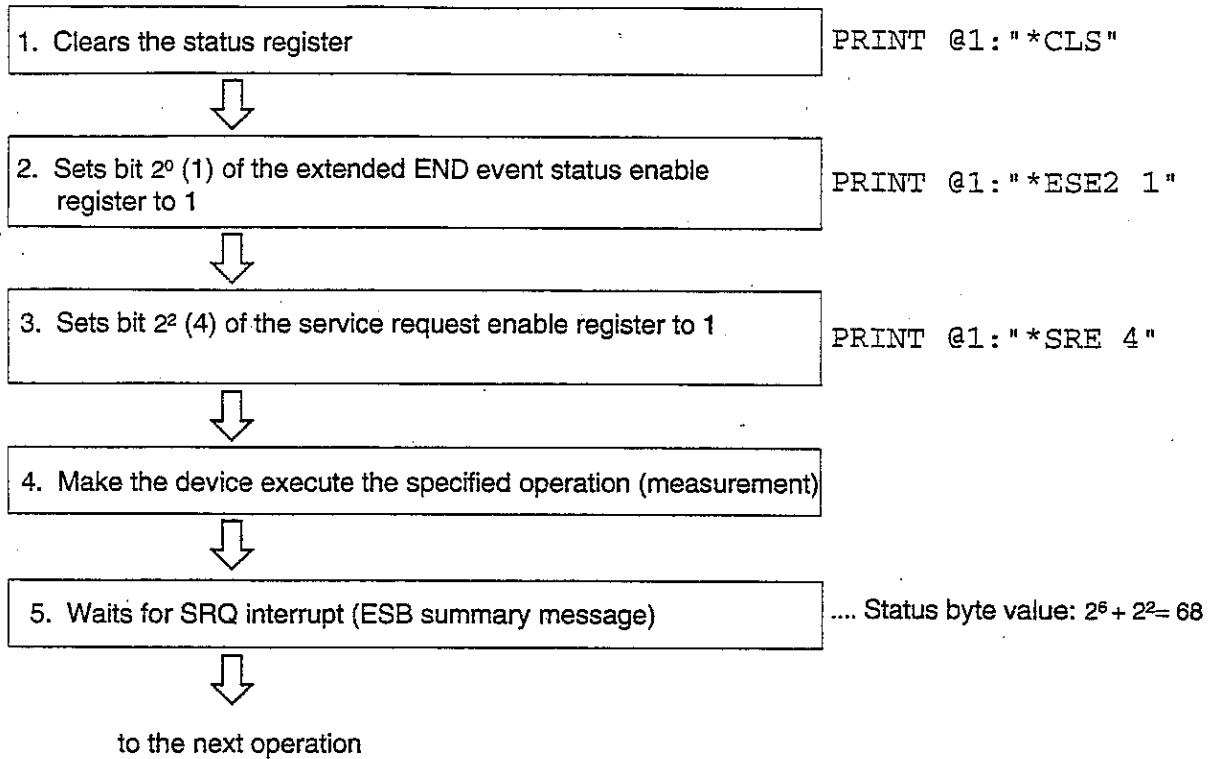
5.6.5 Wait for service request issuance from the status register

An event status register bit of the MT8801B is set to 1 when the corresponding event occurs. After setting these bits to set the RQS, the controller waits the SRQ for synchronization. Reset the event status register immediately before making a desired event occur.

- <Controller program 1: Synchronization by operation termination bit>



• <Controller program 2: Synchronization by the sweep/measurement termination bit>



SECTION 5 STATUS MESSAGES

SECTION 6 INITIAL SETTINGS

This section outlines initialization for the system and describes how to initialize the system. An example of initial settings are written for IBM-PC commands.

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SECTION 6 INITIAL SETTINGS

6.1 General Description

There are three levels of initialization for the GPIB system.

The first level is bus initialization using the IFC statement with the system bus in the idle state.

The second level is initialization for message exchange using the DCL command to enable devices to receive program messages.

The third level is device initialization using the PRE or *RST command to initialize device functions. These levels of initialization prepare a device for operation.

A device must be set to a known state when the power is switched on.

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

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

When controlling with an external controller through the GPIB interface bus, all the initialization functions of the first/second/third levels can be used.

When controlling with an external controller through the RS-232C interface port, the initialization function of the third level (device initialization) can be used. The initialization functions of the first/second levels cannot be used.

6.2 Bus Initialization by the IFC Statement

■ Example

```
ISETAIFC
```

■ Explanation

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

The initialization of interface functions involves erasing the settings (e.g. talker, listener) made by the controller and resetting to the initial states. In the table below, O indicates the initialized functions, Δ indicates partially initialized functions.

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

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

6.3 Initialization for Message Exchange by DCL and SDC Bus Commands

■ Example

WBYTEA&H3F, Δ&H14;

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

WBYTEA&HE3F, Δ&H04, Δ&H23;

Initializes only the device whose address is 3 for message exchange (sending SDC)

■ Explanation

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

■ Items to be initialized for message exchange

The MT8801B by which the DCL or SDC bus command is accepted executes the following:

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

Note: The items listed below are not affected even if DCL and SDC bus command processing is executed:

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

6.4 Device Initialization by the *RST Command

■ Syntax

*RST

■ Example

PRINT @1, "*RST": Initializes the device (MT8801B) whose address is 1 with level 3.

■ Explanation

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

The *RST(Reset) command is used to reset a device (MT8801B) to a specific initial state. Refer to the separate Operation Manual Vol. 1 Appendix B for details of initialization items and initial values.

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

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

6.5 Device Initialization by the PRE/INI/IP Command

■ Syntax

PRE

INI

IP

■ Example (program message)

PRINT @1, "PRE": Initializes the device (MT8801B) whose address is 1 with level 3.

■ Explanation

The PRE, INI and IP commands are MT8801B device-dependent messages which initialize a device with level 3.

Refer to the separate Operation Manual Vol. 1 Appendix B for details of items initialized by the PRE, INI, and IP commands and initial values.

6.6 Device Status at Power-on

When the power is switched on:

- ① Preset value: When a power-off time (POWERON LAST) is selected, the device is set to the status before the last power off.
Preset value: When Recall memory No. (POWERON n) is selected, the device is set to file (number [n]) status.
- ② The Input Buffer and Output Queue are cleared.
- ③ The Parser, Execution Controller, and Response Formatter are initialized.
- ④ The device is put into OCIS (Operation Complete Command Idle State).
- ⑤ The device is put into OQIS (Operation Complete Query Idle State).
- ⑥ The Standard Event Status and Standard Event Status Enable Registers are cleared. Events can be recorded after the registers have been cleared.

For the special case of ①, when the power supply is first turned on after the device is shipped, the initial values are set to those in the initial setting table (refer to separate Operation Manual Vol. 1 Appendix B).

SECTION 7

WAVEFORM DATA STORAGE FORMAT

This section describes the storage format of waveform data fetched by an external computer. The use examples are described in the IBM-PC instructions.

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7.1 Notes on Fetching the Waveform Data

(1) Fetching screen

- The waveform data to be fetched must be displayed on the MT8801B screen.
- Check that the measurement terminates before fetching the waveform data. If Continuous measurement mode is set or measurement does not terminate, the correct data cannot be fetched.

Examples of checking measurement termination:

a) In Continuous measurement mode

1. Switch to Single measurement mode.
2. Read the End Event Status Register (ESR2) and check that the measurement terminates.

b) In Average measurement mode

- Read the End Event Status Register (ESR2) and check that both averaging and measurement terminate.

c) In Single measurement mode

- Read the End Event Status Register (ESR2) and check that the measurement terminates.

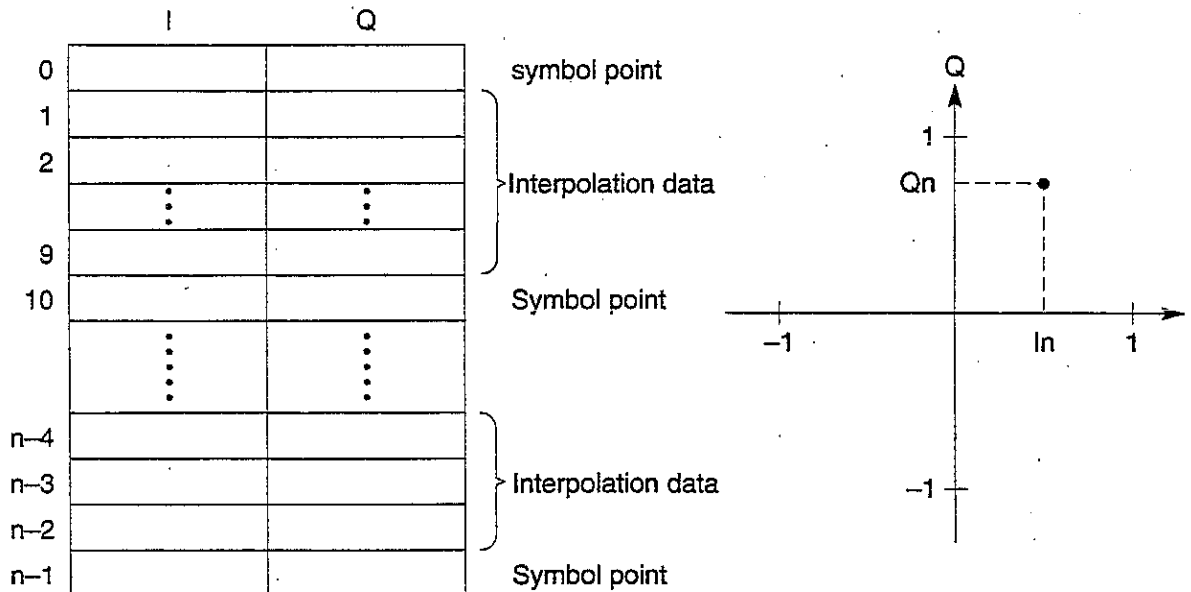
(2) Response data

- When fetching two or more data items together, commas (,) are output as data separators.
- The query command format is designed so that it can fetch all data items together. However, the number of data items actually fetched depends on restrictions placed on the external controller.

7.2 Waveform Data Storage Format

(1) XMC (constellation measurement waveform of modulation analysis)

a) Format



- Stored with the two-dimensional I-Q data.
- n depends on the measuring system (GSM:1470).
- Correspondence to screen display is as follows (INTERPOLATION mode)

NON: Dots represent symbol points (0,10,...,n).

LINEAR: A symbol point is enclosed in a linear line frame (0-10, ...,n)

I0POINT: Dotted lines connect a symbol point and interpolation data (0-1-2-...-n)

b) Range

- Displays an integer value in 0.0001 units (ideal signal 1 = 10000).

c) Use examples

```
Call ibwrt(ud%, "XMC?A 0,0,1")
Call ibrd(ud%, rdbuf$)
I0=Val(rdbuf$)
Call ibwrt(ud%, "XMC?A 1,0,1")
Call ibrd(ud%, rdbuf$)
Q0=Val(rdbuf$)
```


(2) XMD (RF power measurement waveform)

a) Format

0		-100.0 symbol
1		-99.9 symbol
	⋮	
1000		0.00 symbol
1001		0.1 symbol
	⋮	
$10(n-0.1)+1000$		$n-0.1$ symbol
$10n+1000$		$n+100$ symbol

- n depends on the measuring system (GSM:1250).
- Correspondence to the horizontal axis scale of screen display (RF POWER screen) is on a one-to-one ratio.

b) Range

- Displays an integer value in 0.01 dBm units (1 dBm = 100).

c) Use examples

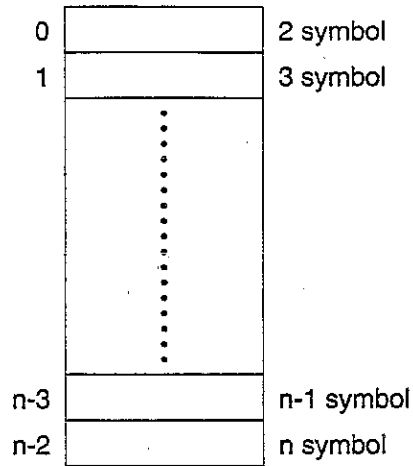
```
Call ibwrt (ud%, "XMD?A480,1")
```

```
Call ibrd (ud%, rdbuf$)
```

```
LVL=Val (rdbuf$)
```

(3) XMN (magnitude error measurement waveform of modulation analysis)

a) Format



- n depends on the measurement system and the Measuring Object.
For GSM MS-NB:147
- Correspondence to the horizontal axis scale of screen display (Magnitude error screen) is on a one-to-one ratio.

b) Range

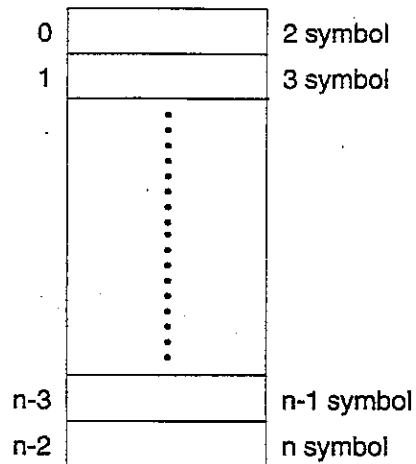
- An integer in 0.01% units represents the range (magnitude error = 1%).

c) Use examples

```
Call ibwrt(ud%, "XMN?Δ100,1")
Call ibrd(ud%, rdbuf$)
LVL=Val(rdbuf$)
```

(4) XMP (phase error measurement waveform of modulation analysis)

a) Format



- n depends on the measurement system and the Measuring Object.

For GSM MS-NB:147

- Correspondence to the horizontal axis scale of screen display (Phase error screen) is on a one-to-one ratio.

b) Range

- An integer in a 0.01 degree unit represents the range (phase error of 1 degree: 100).

c) Use examples

```
Call ibwrt (ud%, "XMP?Δ100,1")
```

```
Call ibrd (ud%, rdbuf$)
```

```
LVL=Val (rdbuf$)
```


APPENDICES

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APPENDIX A ASCII* CODE TABLE

BITS B7 B6 B5 B4 B3 B2 B1				CONTROL				NUMBERS SYMBOLS				UPPER CASE				LOWER CASE																			
0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1								
0	0	0	0	0	NUL	0	10	20	DLE	16	20	40	SP	32	48	60	0	40	64	100	@	64	80	120	P	80	96	140	a	96	112	160	p	112	128
0	0	0	1	1	GTL SOH	1	11	21	LLO DC1	17	21	41	!	33	49	61	1	41	65	101	A	65	81	121	Q	81	97	141	a	97	113	161	q	113	129
0	0	1	0	2	NUL	2	12	22	DC2	18	22	42	"	34	50	62	2	42	66	102	B	66	82	122	R	82	98	142	b	98	114	162	r	114	130
0	0	1	1	3	ETX	3	13	23	DC3	19	23	43	#	35	51	63	3	43	67	103	C	67	83	123	S	83	99	143	c	99	115	163	s	115	131
0	1	0	0	4	SDC EOT	4	14	24	DCL DC4	20	24	44	S	36	52	64	4	44	68	104	D	68	84	124	T	84	100	144	d	100	116	164	t	116	132
0	1	0	1	5	PPC ENO	5	15	25	PPU NAK	21	25	45	%	37	53	65	5	45	69	105	E	69	85	125	U	85	101	145	e	101	117	165	u	117	133
0	1	1	0	6	ACK	6	16	26	SYN	22	26	46	&	38	54	66	6	46	70	106	F	70	86	126	V	86	102	146	f	102	118	166	v	118	134
0	1	1	1	7	BEL	7	17	27	ETB	23	27	47	'	39	55	67	7	47	71	107	G	71	87	127	W	87	103	147	g	103	119	167	w	119	135
1	0	0	0	8	GET BS	8	18	30	SPE CAN	24	30	50	(	40	56	70	8	50	74	110	H	74	90	130	X	90	106	150	h	106	120	170	x	120	136
1	0	0	1	9	TCT HT	9	19	31	SPD EM	25	31	51	)	41	57	71	9	51	75	111	I	75	91	131	Y	91	107	151	i	107	121	171	y	121	137
1	0	1	0	10	A LF	10	20	32	1A SUB	26	32	52	*	42	58	72	:	52	76	112	J	76	92	132	Z	92	108	152	j	108	122	172	z	122	138
1	0	1	1	11	B VT	11	21	33	2B ESC	27	33	53	+	43	59	73	;	53	77	113	K	77	93	133	[	93	109	153	k	109	123	173	{	123	139
1	1	0	0	12	C FF	12	22	34	3C FS	28	34	54	,	44	60	74	<	54	80	114	L	80	96	134	\	96	112	154	l	112	124	174	,	124	140
1	1	0	1	13	D CR	13	23	35	4D GS	29	35	55	/	45	61	75	=	55	81	115	M	81	97	135	]	97	113	155	m	113	125	175	}	125	141
1	1	1	0	14	E SO	14	24	36	5E RS	30	36	56	.	46	62	76	>	56	82	116	N	82	98	136	^	98	114	156	n	114	126	176	.	126	142
1	1	1	1	15	F SI	15	25	37	6F US	31	37	57	/	47	63	77	H	57	83	117	O	83	99	137	UNT	99	115	157	o	115	127	177	RUBOUT (DEL)	127	143
				Address command				Universal command				Listen address				Talk address				Secondary address or command															

KEY octal 25 PPU
 hex 15 NAK 21

GPIB code
 ASCII character
 decimal

*American Standard Code for Information Interchange



APPENDIX B COMPARISON TABLE OF CONTROLLERS' GPIB INSTRUCTIONS

Function	Controller			
	PACKET V (Anritsu)	PC-9800 series (NEC)	IBM-PC	HP9000 series
Outputs data to a device	WRITE @ device number; data	PRINT @ listener address; data	CALL IBWRT()	OUTPUT device selector; data
Outputs binary data to a device	BIN WRITE @ device number; data	WBYTE command; data		
Assigns data entered from a device to a variable	READ @ device number; variable	INPUT @ talker address, listener address; variable INPUT @ talker address, listener address; variable	CALL IBRD()	ENTER device selector; variable
Assigns binary data entered from a device to a variable	BIN READ @ device number; variable	RBYTE command; variable		
Initializes an interface function	IFC @ select code	ISSET IFC	CALL IBSIC()	ABORT select code
Turns REN line on	REN @ select code	ISSET REN	CALL IBSRE()	REMOTE device selector (select code)
Turns REN line off	LCL @ select code (sets all devices local) LCL @ device number (sets only specified devices to listeners, and sends out GTL command)	IRESET REN WBYTE &H3F, listener address, secondary address, &H01;	CALL IBSRE() CALL IBLOC()	LOCAL device selector (select code) LOCAL device selector (select code + primary address)
Outputs interface messages (messages) and data	COMMAND @ select code : character string for message [:data]		CALL IBCMD() CALL IBCMDA() (asynchronous)	SEND select code ; message string
Triggers a specified device	TRG @ device number	WBYTE &H3F, listener address, secondary address, &H08;	CALL IBTRG()	TRIGGER device selector

Function	Controller			
	PACKET V (Anritsu)	PC-9800 series (NEC)	IBM-PC	HP9000 series
Initializes devices	DCL @ select code (all devices bearing a specified select code) DCL @ device number (specified devices only)	WBYTE &H3F,&H14; WBYTE &H3F, listener address, secondary address,&H04;	CALL IBCLR()	CLEAR device selector (selector code) CLEAR device selector (selector code + primary address)
Disables a device from being switched over from remote to local	LLO @ select code	WBYTE &H3F, &H11;		LOCAL LOCKOUT
Transfers control to a specified device	RCT @ device number	WBYTE talker address, &H09;	CALL IBPCT()	PASS CONTROL
Sends out a service request	SRQ @ select code	ISSET SRQ	CALL IBRSV()	REQUEST select code
Performs serial polling	STATUS @ device number	POLL	CALL IBRSP()	SPOLL (device selector) (function)
Sets a terminator code	TERM IS	CMD DELIM	CALL IBEOS(-); CALL IBEOT();	
Sets a limit value for checking a timeout		CMD TIMEOUT	CALL IBTOM()	